



basin can expect a hotter future, with more, and more variable, rainfall. A 10–21 percent increase in runoff is forecast for 2041–2070 relative to 1970–2000,<sup>38</sup> which is likely to exacerbate flooding and associated economic costs<sup>39</sup> and increase the levels and variations in water pollution (including plastic debris) due to more intense precipitation and floods events resulting in spikes in runoff. Changes in the hydrological regime are likely to increase pressure on biodiversity and ecosystems, particularly sensitive wetland and floodplain species, and the fact that past flows are not necessarily a good predictor of future flows will have implications for longer-term ecological protection. Water pollution also contributes to GHG emissions, notably due to methane released from the eutrophication process that occurs in nutrient-enriched waters. The overapplication of synthetic fertilizers also leads directly to GHG emissions from the soil, most notably nitrogen dioxide.<sup>40</sup>

**10. Efforts to improve ecological protection and reduce water pollution in the Yangtze River Basin are critical if the Government is to achieve its stated water and environment objectives.** The Government's overarching objectives are articulated by a series of targets and plans for water and the environment. The 'Most Stringent System for Water Resource Management' was established in 2012, setting 'Three Red Lines' with specific targets for water withdrawals, water use efficiency, and water quality. The 'Water Ten Plan', issued in 2015, proposed measures to strengthen water pollution control and improve ecosystem services. These have been complemented by three further 'redline' policies promoting green development: the 'Ecological Redlines', the 'Environmental Quality Baseline', and the 'Resource Utilization Threshold'. These complement wide-ranging sectoral reforms aimed at addressing persistent pollution challenges. For example, a National Sustainable Agricultural Development Plan (2015–2030) targets zero growth of fertilizer as part of efforts to combat NPS pollution and reduce GHG emissions. The waste management sector is under transition as part of efforts toward a circular economy. Sector developments include policies banning certain plastic waste imports in 2017, plastic pollution control measures (January 2020), and specific provisions in the Solid Waste Law (April 2020) to improve the management of solid waste and reduce plastics use, including agricultural plastic film.<sup>41</sup> Moreover, China's National Biodiversity Conservation Strategy and Action Plan (2011–2030) targets measures to address environmental pollution given the significant impacts on aquatic, riverine, and coastal biodiversity and habitats, specifically prioritizing efforts in Yangtze River to improve conservation of rare and critically endangered species, such as the Siberian white crane, Chinese sturgeon, and finless porpoise. The geographic and economic significance of the Yangtze River Basin ensures that progress within the Basin will substantially determine national outcomes.

**11. Significant public and private infrastructure investments have resulted in improved water quality in the Yangtze River Basin; however, further improvements will require institutional measures.** The proportion of major river basins meeting drinking water standards (class I–III) increased from 61 percent in 2011 to 83 percent in 2020. Despite these achievements, control of some specific pollutants remains challenging. Total phosphorus levels, for example, remain above national standards in some water quality monitoring sections.<sup>42</sup> The portion of lakes and reservoirs in the Yangtze River Basin exhibiting 'moderate' eutrophication<sup>43</sup> increased from 31 percent in 2009 to 42 percent in 2018.<sup>44</sup> While further infrastructure investments are needed for the control and treatment of point and non-point sources of pollution in specific locations, broader and sustained improvements will require improvements in institutions and management

<sup>38</sup> CWR. 2016. *Yangtze Water Risks, Hotspots, and Growth*. China Water Risk, Hong Kong SAR, China ([link](#)).

<sup>39</sup> Floods in 2020, for example, affected 63 million people and caused estimated economic costs of US\$26 billion. See Pike, L. 2020. "China's Summer of Floods is a Preview of Climate Disasters to Come." *Inside Climate News*, August 17, 2020 ([link](#)).

<sup>40</sup> Dijuan, X. et al. 2021. "China's Greenhouse Gas Emissions for Cropping Systems from 1978–2016." *Scientific Data* 8 (171) ([link](#)).

<sup>41</sup> NDRC and MEE. 2019. *Further Strengthening Plastic Pollution Control* ([link](#)).

<sup>42</sup> 2013–2018 Yangtze River Basin and Southwest Rivers Water Resources Bulletin and the 2020 Annual Report on Surface Water Quality for the Yangtze River Basin and Southwest Rivers.

<sup>43</sup> Eutrophication is a process in which a water body becomes enriched with nutrients (notably phosphorus and nitrogen), leading to rapid algal growth and consequent oxygen depletion and ecological degradation (including fish deaths). Eutrophication can leave water unfit for human consumption.

<sup>44</sup> Changjiang Water Resources Commission (CWRC) Draft Program Proposal (November, 2021).



systems. These include harmonized and better-enforced standards, integrated monitoring platforms, basin-wide data and management systems that can improve coordination between branches and levels of government, and improved technical understanding of pollution hotspots and sources.

**12. Recognizing these needs, the Yangtze River Protection Law<sup>45</sup> was approved by the National People's Congress on December 26, 2020.** The law came into effect in March 2021 and is the first legislation for a specific river basin in China. It was formulated to strengthen the protection and restoration of the ecological environment in the Yangtze River Basin; it proposes the establishment of a National Yangtze River Basin Coordination Mechanism<sup>46</sup> and infers obligations on the national line agencies and provinces to align with its goals of ecological protection and improved water quality. The law calls for local governments to establish water quality baselines, prepare total phosphorus pollution control plans, reduce pollutant discharge through investments in wastewater treatment facilities and piped networks, and control agricultural NPS pollution, including through the promotion of organic fertilizers and control of agricultural plastic film. The law also calls on governments to protect and restore ecological function and biodiversity (including through ecological flows) and improve systems for information sharing and inter-jurisdictional cooperation. The law is an element of the Government's national strategy for the YREB, which was articulated in the 'YREB Development Plan' developed by the National Development and Reform Commission (NDRC) in 2016.

**13. The Yangtze River Protection Law represents the latest in a series of national-level reforms aimed at improving the management of natural resources and the coordination of water resources development.** Earlier reforms include an amendment to the National Water Law in 2016 to support integrated planning and coordinated basin development.<sup>47</sup> Water-related responsibilities were reorganized within the administrative government system in 2018, with water pollution control responsibilities transferred to the Ministry of Ecology and Environment (MEE), a new Ministry of Natural Resources (MNR) established, and responsibilities within the Ministry of Water Resources (MWR) consolidated. The Government established the River Chief System (RCS), a network of officials at the provincial, municipal, county, and township levels, who are assigned responsibility for outcomes along each section of every major waterway. The system evolved from efforts to solve water pollution issues in Lake Tai in 2007<sup>48</sup> and was implemented nationally in 2016. It raises the priority of water-related issues and has proven useful in addressing challenges of coordination and cooperation between responsible departments and regions.<sup>49</sup> Implementation of the RCS is supported through various mechanisms including River Chief Offices (RCOs), that usually sit within water agencies at the respective levels.<sup>50</sup> China now has over 1.2 million river chiefs with more than 460,000 in the Yangtze River Basin, providing opportunities to address information asymmetries, promote integrated basin management, and increase public participation in the decision-making process.<sup>51</sup>

<sup>45</sup> The Yangtze River Protection Law of the People's Republic of China (March 2021) ([link](#)).

<sup>46</sup> The coordination mechanism has the responsibility of "coordinating, guiding and supervising Yangtze River protection work; coordinating and negotiating the management work between relevant State Council departments and provincial-level governments along the river; organizing and coordinating joint law enforcement; organizing the establishment and improvement of relevant standards, monitoring, risk early warning, assessment and evaluation, information sharing and other systems in the Yangtze River basin, and carrying out overall coordination of the operation of all systems."

<sup>47</sup> Clause 15 of the amended Water Law indicates that "planning for regions within the boundary of a river basin should follow [principles of] river basin planning, and sector planning should follow [principles of] integrated planning."

<sup>48</sup> Li Y, J Tong, and L Wang. 2020. "Full Implementation of the River Chief System in China: Outcome and Weakness." *Sustainability* 12 (9): 3754. ([link](#))

<sup>49</sup> The River and Lake Chief System is intended to strengthen enforcement and accountability regarding water use control, water quality protection, and restoration of degraded waterways. River chiefs at the village-level are required to patrol no less than once a week while also promoting river protection and mobilizing the community to assist in the removal of waste. See "Opinions on Full Implementation of the River Chief System across the Country" (2016) ([link](#)).

<sup>50</sup> The six complementary mechanisms supporting the river chiefs are (a) River Chief Meetings; (b) Information Sharing; (c) Information Reporting; (d) Supervision; (e) Accountability and Incentives; and (f) Completion and Acceptance.

<sup>51</sup> Wu, et al. 2020. "Public Participation of the River Chiefs System in China: Trends, Problems, and Perspectives." *Water* 12: 3496 ([link](#)).



14. While these institutional reforms provide the foundation for integrated river basin management, the transition is challenged by overlapping institutional and jurisdictional mandates, among other factors. The YREB Development Plan and Yangtze River Protection Law are relatively high-level instruments, and their measures require new regulations and operating procedures at multiple levels of government. More broadly, while the institutional reforms of 2018 signaled an important shift toward environmentally oriented water policies and clarified responsibilities, they also created challenges such as the division of responsibilities in basin-level organizations between water quantity management (under the MWR), water quality management (under MEE), and ecosystem services (under MNR). China's river basin organizations do not have the administrative authority or the coordination mechanisms required to align provincial actions, build consensus with local government, or arbitrate in cases of dispute. Operating efficiency in some water-related infrastructure is low, and the knowledge base for integrated river basin management (for example, eco-hydrology and related pollution flows) requires further development. Key water-related data are still segregated across various platforms and agencies, and the availability of data and consistency over time and between different sources remain a challenge.<sup>52</sup> Data sharing within and between the RCS and the traditional basin management authorities is limited, and data collection protocols are not fully standardized.<sup>53</sup> Addressing these challenges requires an appropriate institutional framework, such as that envisaged by the National Yangtze River Basin Coordination Mechanism, the continued resolve of political leaders, and mechanisms that can facilitate inter-jurisdictional cooperation and cross-sectoral coordination.

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

15. The proposed Yangtze River Protection and Ecological Restoration Program (YRPERP, or the 'Program', see Section II) emphasizes global public goods. This is aligned with the World Bank Group's Country Partnership Framework (CPF) for China (FY 2020–2025) (Report No. 117875-CN), which was discussed by the World Bank Board of Executive Directors on December 5, 2019,<sup>54</sup> and the new phase of the World Bank Group's engagement in China. Specifically, the program focuses on institutions and systems for integrated basin management that can make a significant contribution to global public goods through pollution reduction and biodiversity protection (Box 1). It thus contributes to Engagement Area 2 of the CPF, "promoting greener growth," by reducing water and marine plastic pollution and strengthening sustainable management of natural resources. Moreover, lessons and knowledge generated by the Program are expected to be relevant for addressing integrated natural resource management issues elsewhere and may be scaled up (including with non-World Bank Group resources) in other basins in China and internationally. The Program aligns with the World Bank Group's Green, Inclusive, and Resilient Development (GRID) framework and the Climate Change Action Plan 2021–2025.<sup>55</sup>

<sup>52</sup> Hsu, A., et al. 2012. "Seeking Truth from Facts: The Challenge of Environmental Indicator Development in China." *Environmental Development* 3: 39–51.

Zhang, B., et al. 2021. "Big Data Challenges in Overcoming China's Water and Air Pollution: Relevant Data and Indicators." *SN Appl. Sci.* 3: 469 ([link](#)).

<sup>53</sup> Wang, Y., and X. Chen. 2021. "River Chief System as a Collaborative Water Governance Approach in China." *International Journal of Water Resources Development* 36 (4): 610–630 ([link](#)).

World Bank and DRC (Development and Reform Commission). 2018. *Watershed: A New Era of Water Governance in China - Synthesis Report*. World Bank, Washington, D.C.

<sup>54</sup> World Bank Group. 2021. *China - Country Partnership Framework for the Period FY2020–2025*. (Report No. 117875-CN) World Bank Group, Washington, D.C. ([link](#)).

<sup>55</sup> Alignment with GRID ([link](#)) and the Climate Change Action Plan 2021-2025 ([link](#)) is seen in the Program's focus on environmental sustainability objectives, while increasing resilience to climate change threats, mitigating emissions, and promoting inclusivity in economic opportunities (see Section II for Program Description).

**Box 1. Contribution of the Yangtze River Protection and Ecological Restoration Program to Global Public Goods**

The Program contributes to three primary global public goods: reduce pollution (plastics and phosphorus), support biodiversity, and reduce GHG emissions.

- **Marine plastics:** The Yangtze River is estimated to be one of the world's largest single riverine sources of plastics, which affect marine ecosystems and wildlife via entanglement and indigestion and ecotoxicity.<sup>56</sup> The Program builds on an increasing portfolio of World Bank-financed projects supporting the collection and removal of plastic waste,<sup>57</sup> including agricultural plastic films that commonly ends up in waterways.<sup>58</sup> The Program will support the development of implementation plans for plastic pollution management in demonstration provinces for longer-term institutionalized impact.
- **Greenhouse gases:** The Program will lessen eutrophication and thus methane emissions from waterways, a potent GHG source.<sup>59</sup> This will be achieved through the support for measures such as manure management and reuse, increased treatment plant operating efficiencies, and management plans for key nutrient pollutants, actions that reduce nutrient loads in waterways and thus eutrophication.
- **Phosphorous:** Phosphorus contributes to reduced water quality in lakes and rivers and contributes to algal blooms and hypoxia in coastal seas. An imbalance in the global phosphorus cycle is a major threat to ecosystems globally, driving biodiversity loss, fish kills, and GHG emissions at a global scale and degrading coastal ecosystems.<sup>60</sup> These effects will be exacerbated by climate change. Support for improved phosphorus source identification, measurement, and mitigation under the Program is expected to benefit ecosystems locally while providing lessons for improved phosphorus management in large watersheds globally.
- **Biodiversity:** The Yangtze River Basin is a globally significant biodiversity hotspot.<sup>61</sup> Its waterways, floodplains, and wetland systems provide habitat to a range of endangered species and internationally migratory birds, and the Poyang and Dongting Lakes—target areas within the Program—are home to five Ramsar Wetlands of International Importance.<sup>62</sup> The Program will support implementation of water and environment management plans that promote habitat protection, as well as ecological flows that safeguard water for the environment. The Program will also support research on ecological restoration and protection measures at the basin level.

The actions supported by the Program that contribute to these outcomes are described further in section II.

**16. A Program for Results (PforR) has been identified as the most appropriate instrument to help improve the targeting and results orientation of public expenditures in support of the YREB.** The PforR is designed to support a nested hierarchy of interlinked institutional improvements at multiple levels—basin, province, sub-basin, and county—that are required to address the Basin's challenges in a complex and evolving development context (box 2). The PforR instrument leverages significant resources under existing Government programs, providing for impact beyond traditional Investment Project Financing (IPF). The PforR focuses on a subset of activities where the Government wants to enhance efficiency, effectiveness, and impact of expenditure by linking the disbursement of funds to the achievement of specific results. The reliance on Government systems, and the design of the Program through a nested hierarchy, is aligned with China's fiscal governance structure and differentiated responsibilities across governance levels (as specified under the Yangtze River Protection Law). The PforR instrument is also conceptually aligned with the results-based design of many of China's land

<sup>56</sup> Lebreton, L., et al. 2017. River Plastic Emissions to the World's Oceans. *Nature Communications* 8: 15611 ([link](#)).

<sup>57</sup> China Plastic Waste Reduction Project ([link](#)).

<sup>58</sup> Hubei Smart and Sustainable Agriculture Project ([link](#)).

<sup>59</sup> Downing, J. A., et al. 2021. Protecting Local Water Quality Has Global Benefits. *Nature Communications* 12: 2709 ([link](#)).

<sup>60</sup> Global Partnership on Nutrient Management. ([link](#))

<sup>61</sup> WWF. 2020. *Living Yangtze Report*. World Wildlife Fund, Beijing ([link](#)).

<sup>62</sup> Ramsar-recognized wetlands within the Program's target sub-basins are: Poyanghu, Poyang Lake Nanji wetlands, Dong (East) Dongting Lake, Xi (West) Dongting Lake, and Nan (South) Dongting Lake. Ramsar sites are important biodiversity hotspots. The Dong (East) Dongting Lake wetland, for example, is an important migration stopover and wintering area for the critically endangered Siberian Crane (*Leucogeranus leucogeranus*), the endangered Oriental Stork (*Ciconia boyciana*), and 12 other globally threatened waterbirds. It also serves as a refuge for the critically endangered Chinese Sturgeon (*Acipenser sinensis*) and the Finless Porpoise (*Neophocaena phocaenoides*).



and water management programs (known as eco-compensation), making it a natural complement in this sector.<sup>63</sup> The PforR financing is complemented by a basin-level IPF to support cross-jurisdictional technical assistance (TA) activities at the basin scale.

#### Box 2. Evolution of World Bank Support in the Yangtze River Basin

The World Bank has a long history of supporting China's efforts toward sustainable development. Since 1981, the World Bank has financed more than 170 projects with over US\$26 billion in commitments in China. The majority of these have been in transport (31 percent of financing), water (24 percent) and energy (16 percent) (Figure 1). Water's proportion is above the World Bank's global average (which is around 15 percent), placing China among the largest of the Bank's borrowers in the water sector. Projects have been increasingly concentrated in the provinces of the Yangtze River Basin, accounting for 64 percent of projects (81) and 57 percent (US\$10.15 billion) of financing between 2009 and 2018 (Figure 2).



Figure 2. World Bank Financing and Number of Projects by Province

In more recent years, project focus has evolved toward more complex issues around integrated water resource management, ecological protection, and natural resources institutions. The YRPERP will build on China's now considerable capacity for infrastructure development by focusing on contemporary challenges of inter-jurisdictional cooperation and cross-sectoral coordination. It supports a nested hierarchy of activities that link financing with performance-based targets at the basin, provincial, and local levels, to address challenges of ecological protection and water pollution. World Bank support aims to unblock institutional processes that are limited not by technical capacity but by constraints and incentives that undermine collaboration and data sharing across and between levels of government. The Program aims to have long-term institutional impact by linking financing to performance-based targets, strengthened monitoring and evaluation (M&E), analytical and policy development, and demonstration effects that amplify the impacts achieved within the Program's demonstration counties into longer-term provincial and basin-wide outcomes.

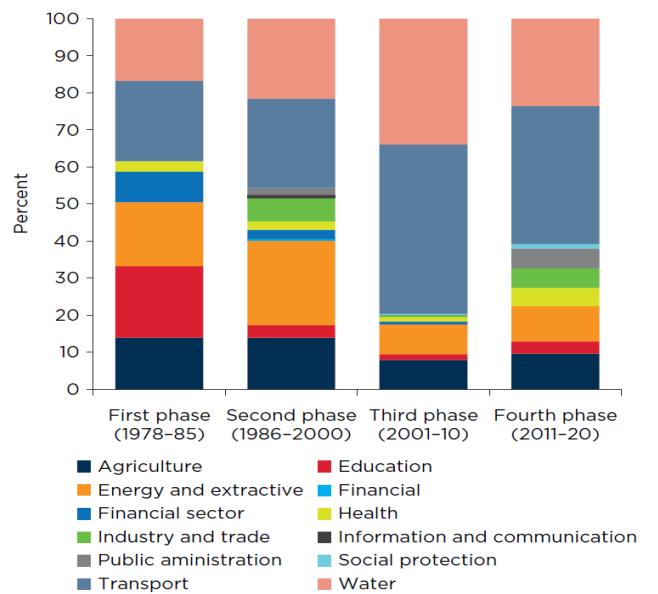


Figure 1. Sectoral Distribution of World Bank Financing in China during the Four Phases of Development

The design of these projects has evolved to respond to the changing development context. Early support in the water sector focused on infrastructure and rural development. The Yangtze River Basin Water Resources Project (P003596), for example, approved in 1995, supported multi-purpose dam construction, flood management measures, and the rehabilitation and construction of irrigation schemes with capacity building. The subsequent CN-Yangtze Dike Strengthening (P064730) Project in 1998 and the Changjiang/Pearl River Watershed Rehabilitation Project (P081255) in 2006, focused on essential infrastructure and sustainable rural development.

<sup>63</sup> Eco-compensation programs aim to financially incentivize improved land and water management by sub-national governments, firms, or households. See World Bank. 2021. *Eco-compensation in China's Evolving Environmental Management Regime: Ecological Protection and Water Pollution Control in the Yangtze River Basin*. World Bank Group, Washington, D.C. Forthcoming.



## II. PROGRAM DESCRIPTION

### A. Government Program

17. **The PforR will support a subset of activities from the sub-national provincial programs for the YREB in Jiangxi and Hunan Provinces.** These form part of a national program for the YREB which is articulated through the YREB Development Plan. The YREB Development Plan aims to prioritize ecological protection, river basin coordination, and integrated development across the YREB. Implementation of the YREB Development Plan is guided by the ‘Action Plan for Yangtze River Protection and Restoration’ (the Action Plan).<sup>64</sup> In addition, provincial-level subsidiary plans outline local actions and the expected results that contribute to the YREB Development Plan and Action Plan. These national-level and provincial-level plans are an integrated package that collectively define the Government program. The national-level plans provide the overarching vision and broadly defined actions, with the provincial subsidiary plans outlining more specific actions tailored to each province’s circumstances. The Yangtze River Protection Law (see para. 12) provides important elements of the legal framework for the Government’s program. The Program assists the selected provinces to meet some of the requirements under the Law and implement their provincial-level plans. Two provinces, Jiangxi and Hunan, have been selected for support under the World Bank-financed Program (discussed further in Section C below).

18. **The Government’s program at the provincial level in Jiangxi is outlined in the ‘5-Rivers-1-Lake’ Plan.**<sup>65</sup> Issued in March 2019, the 5-Rivers-1-Lake Plan covers the Poyang Lake Basin, defined by the lake and its five major tributaries,<sup>66</sup> which spans 94 percent of the province. The plan aims to “promote coordinated socio-economic development and sustainable resource management, safeguard the health of rivers and lakes, and ensure environmental protection while supporting a rich, beautiful, happy and modern Jiangxi.” It outlines the basic principles, guidelines, and implementation arrangements for management and protection of Poyang Lake Basin, along with specific activities and targets within seven priority areas: (a) coordination for integrated management; (b) spatial management and shoreline protection; (c) water resources protection; (d) water pollution control including solid waste management; (e) water environment improvement; (f) rehabilitation of river and lake ecosystems; and, (g) enhancement of river-and-lake management capacity. Implementation is supported by the Jiangxi River Basin Eco-Compensation Mechanism, which pools<sup>67</sup> a range of financing sources including earmarked funds from national, provincial, municipal, and county governments, as well as private sector contributions.

19. **The Government’s program at the provincial level in Hunan is outlined in the ‘Integrated Water and Environment Management Plan for Dongting Lake Basin’.**<sup>68</sup> Issued by NDRC in December 2018, the plan covers Dongting Lake Basin, defined by the lake and its four major tributaries.<sup>69</sup> The basin area spans 97 percent of Hunan, along with small parts of Hubei Province. The objective of the plan is to ensure the safety of water supply and to significantly improve water and environmental quality. It outlines the basic principles, guidelines, and implementation arrangements for governance

<sup>64</sup> Eight priorities are outlined in the Action Plan: (a) establishing an ecological and environmental control system and strictly implementing the ecological redlines; (b) investigating and managing sewerage outlets and promoting integrated land-water monitoring and management systems; (c) strengthening the control of industrial pollution and reducing environmental risks; (d) improving environment conditions in rural areas including control of agricultural non-point source pollution; (e) addressing gaps in environment-related infrastructure, and ensuring the security of drinking water sources; (f) strengthening pollution control from inland waterways transport, and preventing environmental risks at harbors and ports; (g) optimizing the allocation of water resources and ensuring ecological flow requirements; and (h) enhancing ecosystem protection. See MEE and NDRC. 2019. *Action Plan for the Uphill Battle for the Conservation and Restoration of the Yangtze River* ([link](#)).

<sup>65</sup> ‘5-Rivers-1-Lake’ refers to the Gan, Fu, Xin, Rao, and Xiu Rivers that flow into Poyang Lake.

<sup>66</sup> The Gan, Fu, Xin, Rao, and Xiu Rivers are the major tributaries of Poyang Lake.

<sup>67</sup> The Jiangxi River Basin Eco-Compensation Mechanism is not a single provincial budget line and instead comprises a related set of budget lines (coherently monitored and implemented) that form a program. See Technical Assessment (Annex IV).

<sup>68</sup> NDRC. 2018. *Integrated Water and Environment Management Plan for Dongting Lake Basin* ([link](#)).

<sup>69</sup> The Yuan, Xiang, Zi, and Li Rivers are the major tributaries of Dongting Lake.



and protection and describes specific activities, expected results, and indicative targets. To support the Dongting Lake Basin Plan, the implementation plan<sup>70</sup> includes specific targets, including that by 2025: (a) 95 percent of rivers and waterbodies will reach water quality of Grade III, and the level of total phosphorous will be reduced by 10 percent relative to 2018; (b) the utilization rate of animal manure will remain at least 75 percent, and fertilizer consumption will remain at zero growth relative to 2020; (c) the coverage rate of rural wastewater treatment facilities will reach 90 percent, and the coverage rate of rural solid waste collection and treatment will reach 100 percent; and, (d) the area of wetland restoration will reach 1 million mu (66,000 ha). As in the Jiangxi program, the Hunan program pools a range of financing sources including earmarked funds from national, provincial, municipal, and county governments, as well as private sector contributions.

## B. Results Logic

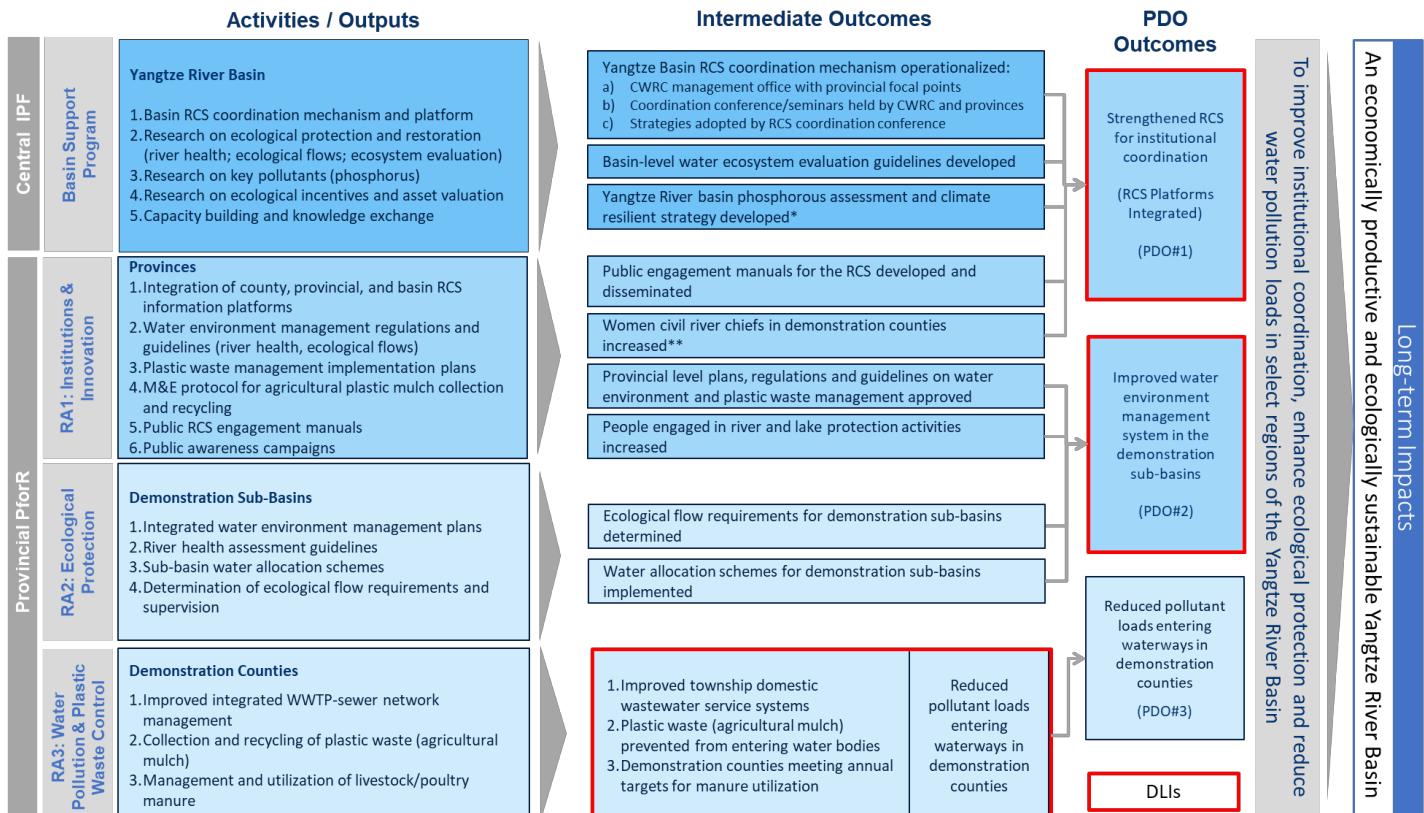
20. **The Program contributes to a long-term vision of an economically productive, ecologically sustainable, and climate resilient Yangtze River Basin (Figure 3).** The core challenges that the Program addresses include insufficient coordination of ecological and water management actions across jurisdictions and sectors; a need for provincial-level guidelines, regulations, and policies to operationalize the new Yangtze River Law; inefficient wastewater treatment; deficiencies in the management of NPS pollution, including farm manure and agricultural plastic films; and a need for greater technical understanding (and data sharing) on key issues of pollution and ecological management, particularly under expected climate shifts within the Basin (see para. 9). The Program will support interventions that address these challenges on four levels: (a) basin-level coordination, technical guidance, and capacity building; (b) provincial-level development of policies, regulations, and guidelines; (c) sub-basin-level ecological protection and integrated water management; and, (d) county-level activities to reduce plastics and nutrient pollution. The expected results are captured in the three outcomes linked to the Program Development Objective (PDO)—on institutional strengthening, ecological management, and water pollution reduction—and reflect the Program’s contribution to the Government’s program. A detailed description of the Program’s structure, activities, and outcome indicators is presented in section II.C.

21. **Key assumptions required for the Program’s success are that:** (a) cross-sectoral coordination and inter-jurisdictional cooperation at the national, provincial, and local levels will work effectively both for implementation of Program activities (for example, information and data sharing) and M&E of Program results; (b) the Basin RCS platform is established on schedule to facilitate connection of the provincial platforms; (c) provincial policies developed and approved under the Program are enforced and not contradicted by county- or municipality-level actions; (d) there are no major droughts or external events that undermine the ability to meet the minimum flow requirements; (e) improved treatment, management, and reuse of on-farm manure leads to reduced nutrient runoff; (f) there are no major external changes to pollutant loads that overwhelm the Program’s contribution to key pollution reduction targets; and, (g) improved RCS information platforms inform river chief actions.

<sup>70</sup> Hunan Province. 2019. *Implementation Plan for the Dongting Lake Integrated Water Environment Management Plan in Hunan Province (2018–2025)* ([link](#)).



Figure 3. Theory of Change for the YRPERP



Notes: DLI = Disbursement linked indicator, RA = Results area, WWTP = Wastewater treatment plant,

\* = climate indicator, \*\* = gender indicator.

### C. PforR Program Scope

22. **The PforR will support a subset of activities from the sub-national provincial programs for the YREB in Jiangxi and Hunan Provinces that form part of the national program for the YREB.** Activities supported by PforR financing contribute to ecological protection and water pollution reduction goals contained in the provincial plans (see paras. 18 and 19) that themselves contribute to the overarching YREB Development Plan (see para. 17) (Figure 4). The timeline for the PforR is 2022 to 2026, with 2021 being the baseline year against which outcomes are measured.

23. **The Program has a layered geographic scope reflecting the tiered governance structure of the YREB national program.** The YREB covers nine provinces and two municipalities<sup>71</sup> from the 19 provinces and autonomous regions that fall within the Yangtze River Basin. The results areas, indicators, outputs, and outcomes are consistent across the two target provinces, Hunan and Jiangxi. The geographic scope of the Program differs by activity—with basin-, province-, sub-basin-, and county-level activities reflecting the differentiated responsibilities of government and nature of the activity.

- **The Program's geographic focus within Jiangxi Province is the Poyang Lake Basin.** The lake basin covers 94 percent of the province and 90 out of 100 of the province's counties. Within this area, the PforR will focus select activities within three results areas. Results Area 1 supports activities at the provincial level aimed at institutional improvements. Results Area 2 supports ecological protection and climate resilience in the Gan River sub-basin, which has a length of 766 km and a catchment area of 83,500 km<sup>2</sup> covering 51 percent of

<sup>71</sup> Yunnan, Sichuan, Chongqing, Guizhou, Hubei, Hunan, Jiangxi, Anhui, Jiangsu, Zhejiang, and Shanghai.



the province, making it the largest river in Jiangxi Province and the fourth largest tributary of the Yangtze River in terms of annual runoff. The sub-basin includes 44 counties in Jiangxi Province, including more than 10 counties that were designated national-level poverty counties before 2021. Results Area 3 supports activities to reduced water pollution and transmission of plastic waste in the demonstration counties of Dayu county, Chongyi county, and Yudu county of Ganzhou municipality; Yongfeng county of Ji'an municipality; Yugan county of Shangrao municipality; and Fuliang county of Jingdezhen municipality.

- **The Program's geographic focus within Hunan Province is the Dongting Lake Basin.** The lake basin covers 97 percent of the province, 100 of the province's counties along with parts of Guangxi, Guizhou, Chongqing, and Hubei. The total catchment area is 262,000 km<sup>2</sup>, accounting for 14 percent of the Yangtze River Basin, and includes four major tributaries. Within this area, the PforR will focus select activities within three results areas. Results Area 1 supports activities at the provincial level aimed at institutional improvements. Results Area 2 supports ecological protection and climate resilience in the Yuan River sub-basin, the second largest river in Hunan Province with a length of 1,033 km and a catchment area of 89,163 km<sup>2</sup> covering 24 percent of the province. Results Area 3 supports activities to reduced water pollution and transmission of plastic waste in the demonstration districts and counties of Miluo county-level city of Yueyang municipality, Ziyang district of Yiyang municipality, Shimen county of Changde municipality, and Yuanling county of Huaihua municipality.

24. **The Program's geographic focus thus targets two of the most important middle-reach provinces of the Yangtze.** Hunan and Jiangxi face important pollution challenges, including NPS from extensive agricultural development, and are home to critical natural resource assets including the unique ecologies of Poyang and Dongting lakes and their associated tributaries (which are major tributaries for the basin), as well as sub-national provincial YREB programs ready for support and scaling. Within these provinces, demonstration counties were selected based on several factors, including: (a) an RCS in place and either an existing management information platform or willingness to connect to the provincial river chief platform; (b) a long-term water environment protection plan or an equivalent plan under preparation; (c) plans to take innovative measures to ensure sustainability of program investments; and (d) location within the demonstration sub-basins.

**Figure 4. Relationship between the PforR Program and Multilevel Government program**

<b>Yangtze River Economic Belt National Program</b>	
World Bank IPF Supporting Inter-Jurisdictional Activities across the Yangtze River Basin (NDRC YREB / CWRC) YREB Development Plan and Yangtze River Protection and Restoration Action Plan Yangtze River Protection Law	
<b>Jiangxi YREB Sub-National program</b> <b>Provincial Plan for Protecting and Managing Five Rivers and One Lake (2019-2025)</b> <ul style="list-style-type: none"><li>• Support institutions, ecological restoration and pollution reduction</li><li>• Covers all 100 counties in Poyang Lake catchment and Jiangxi</li><li>• Financed by government, financing institutions, and private sector</li><li>• Scale: CNY 14 billion (~ US\$2 billion) (2016-2020)</li><li>• 2022-2026 estimated at ≥ US\$ 2.53 billion</li></ul> <b>Jiangxi World Bank PforR Program</b> <ul style="list-style-type: none"><li>• Expenditure Framework: River Basin Eco-Compensation</li><li>• Demonstration Sub-Basin: Gan + 4 Rivers</li><li>• Demonstration Counties: 6</li><li>• IBRD = US\$196.25 million 2022-2026</li></ul>	<b>Hunan YREB Sub-National program</b> <b>Dongting Lake Basin Integrated Water Environment Management Plan (2018-2025)</b> <ul style="list-style-type: none"><li>• Support institutions, ecological restoration and pollution reduction</li><li>• Covers 100 counties in Dongting Lake Basin of 122 in Hunan</li><li>• Financed by government, financing institutions, and private sector</li><li>• Scale: CNY 14.07 billion (~ US\$2.16 billion) (2018-2020)</li><li>• 2022-2026 estimated at ≥ US\$3.63 billion</li></ul> <b>Hunan World Bank PforR Program</b> <ul style="list-style-type: none"><li>• Expenditure Framework: Water Environment Funds</li><li>• Demonstration Sub-Basin: Yuan River and Lake Sub-Basin</li><li>• Demonstration Counties: 4</li><li>• IBRD = US\$196.25 million 2022-2026</li></ul>



25. In addition to the PforR financing of provincial-level activities, the Program includes a Central Basin IPF to support basin-level activities aligned with the national program for the YREB (with the central government as the borrower for the IPF). The Program's Central Basin IPF is proposed to be financed by an IBRD loan in the amount of US\$7.5 million. The supported activities will promote cross-sectoral coordination and inter-jurisdictional cooperation toward improving water quality, ecological protection, and climate resilience in the Yangtze River Basin, through enhanced coordination mechanisms, research and policy options for water pollution reduction, ecological guidelines and standards, improved data compilation and management, and capacity building. NDRC, through the Program Steering Committee, will provide strategic guidance for the implementation of the Central Basin IPF, with a Central Project Management Office (CPMO) hosted by the Changjiang Water Resources Commission (CWRC), the basin management authority for the Yangtze River under the MWR, being responsible for day-to-day implementation. Activities under the Central Basin IPF are detailed in annex 7 and summarized below:

- (a) **Operationalization of the basin-level RCS collaboration mechanism.** This comprises operationalization of a basin-level RCS collaboration mechanism, a forum for decision-making, coordination, learning, and inter-jurisdictional strategy development. The design for such a mechanism was completed by the CWRC with World Bank support in 2021.<sup>72</sup> This mechanism will be complemented by a basin RCS platform to promote inter-jurisdictional sharing of river management and climate-related information.<sup>73</sup> This includes technical protocols and capacity building for data collection and use of the platform, which will also be connected with provincial platforms supported under the PforR.
- (b) **Research on ecological protection and restoration of lakes and tributary systems.** This comprises research inputs for policies and guidelines for freshwater ecosystem restoration and protection. Research will support river health guidelines to inform evaluation of riverine ecology, guidelines for determining appropriate ecological flows, and mechanisms for protection and restoration of the aquatic ecosystems of Poyang Lake, Dongting Lake, and important tributaries (namely the Jialing, Wujiang and Chishui Rivers). Poyang and Dongting Lakes are China's largest freshwater lakes and important biodiversity hotspots, providing habitat for an array of international migratory bird species and local endangered species,<sup>74</sup> while also facing continued water pollution, ecological damage, and climate-related threats from runoff extremes, flooding, and extended periods of reduced flow.
- (c) **Investigation and tracing of water pollution sources.** This comprises research inputs for policies and guidelines for persistent pollutants, focused on phosphorus. This includes identification of major phosphorus sources, transportation of phosphorus in the Yangtze River system, and the impact of climate change

<sup>72</sup> Working rules for this mechanism were drafted in 2021 with World Bank financing under the China Economic Transformation and Institutional Capacity Building Project (P144270).

<sup>73</sup> Platforms include data on administration and management, ecology and hydrology, including data that are important for climate-informed management decisions, policies and strategies. Variables included on typical platforms include water level and flow, weather, water temperature, pH, dissolved oxygen, pollution, and sediment indicators, as well as statistics for emergency coordination.

<sup>74</sup> Both lakes are recognized for their biodiversity. Poyang, for instance, provides habitat for at least 102 species of aquatic plants, 122 species of fish, and 300 species of birds. Almost all the world's critically endangered Siberian Crane (*Grus leucogeranus*), endangered Oriental Stork (*Ciconia boyciana*) and over half of the world's threatened Swan Geese (*Anser cygnoides*) and White-naped Cranes (*Grus vipio*) winter at the lake, which was recognized on the original Ramsar Convention List of 42 important wetlands worldwide. Ecological health assessments of the lake have shown a downward trend, due to water quality changes and abnormal water level fluctuations resulting from human activity, water diversion, and climate change. See: You, et al. 2019. "Poyang Lake Wetland Ecosystem Health Assessment of Using the Wetland Landscape Classification Characteristics." *Water* 11 (4): 825 ([link](#)).



(extreme precipitation and runoff events) on phosphorus pollution as well as the proposing of technical and policy options for prevention and control of phosphorus pollution under climate extremes.<sup>75</sup>

- (d) **Research on ‘value realization mechanisms’ (ecological incentives).** This comprises research for the development of innovative incentive mechanisms for ecosystem protection, including on the economic value of ecosystem services in the Yangtze River Basin, methods for integrating ecological data into statistical accounts, definition and clarification of natural resources property rights, and the design of incentive mechanisms for ecosystem and water quality protection (such as eco-compensation, water markets, and pollution discharge fees).
- (e) **Capacity building and program implementation support.** Activities to support technical capacity, including training and knowledge exchanges (including international exchanges focused on Basin coordination mechanisms), support for the operation of the Program Steering Committee, and program implementation support (including consolidated Program reporting).

**Figure 5. Overview of the Government Program and PforR Program: Results Areas and Activities by Geographic Unit**

		Results Area 1: Improving Institutions and Innovations	Results Area 2: Advancing Ecological Protection through Integrated River Basin Management	Results Area 3: Reducing Water Pollution and Transmission of Plastic Waste
Government Program <sup>76</sup>	Jiangxi	<i>5-Rivers-1-Lake Plan (2019–2025)</i> Covers 94 percent of the province and 90 of the 100 counties		
	Hunan	<i>Integrated Water Environment Management Plan for Dongting Lake Basin (2018–2025)</i> Covers 97 percent of the province and 100 of 122 counties		
PforR Program	Geographic boundary	<b>Provinces</b> Jiangxi Province Hunan Province	<b>Demonstration Sub-Basins</b> Gan River in Jiangxi Province Yuan River in Hunan Province	<b>Demonstration Counties</b> 6 counties in Jiangxi Province 4 counties in Hunan Province
	Program Activities	(1) Integration of county, municipal, provincial, and basin RCS information platforms (2) Development of water environment management regulations and guidelines (3) Development of plastic waste management plans (4) Development of monitoring and evaluation protocol for agricultural plastic film collection (5) Development and dissemination of RCS public engagement manuals (6) Public awareness campaigns	(1) Development of integrated water environment management plans (2) Development of river health assessment guidelines (3) Implementation of sub-basin water allocation schemes (4) Determination of ecological flow requirements and supervision	(1) Improved integrated wastewater management services (2) Prevention of plastics entering waterbodies through collection of agricultural plastic waste (3) Management and utilization of livestock/poultry manure

<sup>75</sup> More intense rainfall under climate change is expected to lead to higher nutrient runoff, with phosphorus in particular showing large spikes in concentration that degrades water quality. Elevated temperatures could further lead to an increased growth of harmful algal blooms due to warmer water. Development of a Yangtze River Basin phosphorous assessment and climate resilience strategy, which will propose strategies to mitigate such phosphorus-related harms, is a climate indicator in the results framework.

<sup>76</sup> The PforR will support a subset of activities from the Government's sub-national provincial programs as part of the national program for the YREB.



26. **The Program's results areas support a nested hierarchy of activities, at provincial, sub-basin, and county levels.** PforR results areas are aligned with the basin-level activities under the Central Basin IPF. The PforR results areas are the following:

- **Results Area 1: Improving Institutions and Innovations (provincial level).** This results area will support institutional improvements for inter-jurisdictional cooperation and cross-sectoral coordination in Hunan and Jiangxi. Activities under Results Area 1 include
  - (a) Strengthening of RCS coordination through the integration of county and municipal, provincial, and basin-level RCS information platforms;
  - (b) Development of provincial-level policies, regulations and guidelines on integrated water environment, ecological protection, and plastic waste management; and
  - (c) Public engagement in water management, through pollution awareness campaigns, participatory management and river cleanup activities, and development and dissemination of public engagement manuals for the RCS.

Activities supported by Results Area 1 will be implemented by the Provincial Development and Reform Commission (PDRC) as the coordinating counterpart, with the Provincial Department of Finance (PDF), Department of Water Resources (DWR), Department of Ecology and Environment (DEE), and Department of Agricultural and Rural Affairs (DARA) in each province. The supported activities are expected to provide institutional coordination and the policy foundation for environmental and water management outcomes and increased ecological resilience via healthier river and lake ecosystems, across the two provinces. Activities will further contribute to climate adaptation and mitigation through increased public awareness and extensive climate-related data integration and sharing.<sup>77</sup>

- **Results Area 2: Advancing Ecological Protection through Integrated River Basin Management (sub-basin level).** This results area will support ecological protection and climate resilience of river and lake ecosystems in the demonstration sub-basins of Gan River Basin (Jiangxi) and Yuan River Basin (Hunan). Activities under Results Area 2 include
  - (a) Strengthening of integrated water environment management systems, including water environment management plans;
  - (b) Development of river health assessment and ecological flow guidelines based on national standards;
  - (c) Implementation of water allocation schemes based on national standards; and
  - (d) Determination of ecological flow requirements and incorporation into county water allocations to ensure long-term restoration and protection of the ecosystem services.

Activities supported by Results Area 2 will be implemented by the PDRC as the coordinating counterpart, with the DWR and DEE. Activities will contribute to improved ecological protection by safeguarding water for the environment as well as through policy, planning, and data measures that strengthen the long-term basis for protection of aquatic ecosystems. Activities will further contribute to climate adaptation and

<sup>77</sup> Two specific contributions to climate adaptation are envisaged under Results Area 1: (1) The public engagement manuals to be developed under the River Chief System will include a specific chapter on climate considerations, providing guidance on: (a) raising people's awareness on climate change impacts and risks, (b) promoting climate-sensitive behaviors, such as reducing pollution to avoid algae blooms; and (c) raising preparedness for climate change-induced drought and flood. (2) The river chief data platforms that will be connected under results area 1 contain extensive climate-relevant data (see footnote 73); integrating these data will assist water resource managers in understanding trends, responding with climate-sensitive management actions, and devising climate-sensitive strategies and plans.



mitigation through climate-related data collection and climate-sensitive planning and ecological restoration, as well as through improved water management under climate-change-induced runoff and water quality extremes.<sup>78</sup>

- **Results Area 3: Reducing Water Pollution and Transmission of Plastic Waste (county level).** This results area will support reduction of point- and non-point-source pollution in demonstration counties. This will contribute to the reduction of water pollution loads, including plastics, by improving the operation of township wastewater systems, improving the management and utilization of livestock/poultry manure, and collecting and recycling agricultural plastic waste, in line with provincial policies in the demonstration counties. Activities under Results Area 3 include:
  - (a) Improved integrated wastewater management services and collection systems at township level;
  - (b) Prevention of plastics entering waterbodies through collection and recycling of agricultural plastic film; and
  - (c) Reduced nutrient runoff via improved management and utilization of livestock/poultry manure.

Results Area 3 will be implemented by the DARA and Department of Housing and Urban-Rural Development (DHURD), and respective equivalents in demonstration counties. In addition to the benefits of reduced water pollution loads and more efficient wastewater operations, activities supported by Results Area 3 are expected to contribute to reduced GHG emissions.<sup>79</sup>

27. **Results areas are aligned with, and supported by, the activities undertaken as part of the Central Basin IPF, as part of the YRPERP's nested hierarchy design.** The Central Basin IPF supports the operationalization of the RCS collaboration mechanism at the Basin level, with Results Area 1 supporting the connection of provincial-level RCS data platforms to the basin-level RCS platform to be established by the CWRC. The Central Basin IPF also supports research aimed at informing and harmonizing provincial-level guidelines, regulations, and policies while providing capacity building and knowledge exchange activities that will support their implementation. The Central Basin IPF focuses its ecological research activities and resulting management recommendations on Poyang Lake and Dongting Lake Basins (key biodiversity hotspots and target areas under Results Area 2). Alignment of Program elements are further discussed in Section IV.

28. **Program financing.** Total Program financing over 2022–2026 is expected to be US\$6,526 million, of which an expected US\$6,126 million (93.87 percent) will be funded by the Government and US\$400 million equivalent (6.13 percent) financed through IBRD (Table 1). Of the US\$6,126 million Government financing, it is estimated that US\$2,519 million will come from Jiangxi Province and US\$3,607 million will come from Hunan Province. The IBRD loan will comprise US\$392.5 million equivalent as part of the PforR in support to the two sub-national provincial programs, with US\$196.25 million for each province, and US\$7.5 million equivalent for the Central Basin IPF. The proposed PforR will exclude high-risk activities with potentially adverse impacts on the environment and or affected people. In addition, it will exclude

<sup>78</sup> Four specific contributions to climate adaptation and mitigation are envisaged under Results Area 2: (1) Ecological flows maintain ecosystem function and provide habitat, expanding thermal refugia by providing microclimates that buffer organisms from the impact of heat, and aid in building ecological resilience to extreme events such as floods and droughts. They also contribute to increasing terrestrial and aquatic carbon sinks. (2) The Gan River Water Environment Information Platform will collect climate-related data to support management to mitigate the impacts of climate extremes on target riverine ecosystems. (3) Integrated water environment plans for the sub-basins will include specific chapters on climate change impacts and potential management responses. These plans will incorporate climate considerations (for example, flood risks) in their infrastructure investment recommendations. (4) Ecological flows will promote stability in water levels, reducing methane emissions and thus generating mitigation benefits (see Rosentreter, et al. [2021], [link](#)). All four results are due to actions under DLI.2.

<sup>79</sup> Net emissions reductions from Program-supported activities within the demonstration counties (DLI.3) include mitigation (net) of 25,705 tons CO<sub>2</sub>-e annually from improved wastewater treatment; and 13,244 tons CO<sub>2</sub>-e annually from utilization of livestock/poultry manure, for total net emissions reductions of 38,949 tons CO<sub>2</sub>-e annually and 584,239 tons CO<sub>2</sub>-e over 15 years. See annex 3 for GHG emissions calculations.



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.

**Table 1. Program Financing (2022–2026)**

Source	Central (IPF)		Jiangxi (PforR)		Hunan (PforR)		Total	
	Amount (US\$, millions, equiv.)	% of Total						
Government	0	0	2,519	92.77	3,607	94.84	6,126	93.87
IBRD	7.5	100	196.25	7.23	196.25	5.16	400	6.13
<b>Total program financing</b>	<b>7.5<sup>80</sup></b>	<b>0.12</b>	<b>2,715.25</b>	<b>41.60</b>	<b>3,803.25</b>	<b>58.28</b>	<b>6,526</b>	<b>100</b>

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

29. The PDO is ‘to improve institutional coordination, enhance ecological protection and reduce water pollution loads in select regions of the Yangtze River basin’.

##### 30. PDO-level indicators:

- **PDO#1: River Chief System platforms integrated:** indicated by the number of counties and municipalities that have established and maintained a functional connection between their river chief information platform and the provincial river chief information platform and the number of provinces that have established and maintained a connection between their provincial platform and the basin river chief information platform (for integrated data sharing from local to basin scale).
- **PDO#2: Improved water environment management system for the demonstration sub-basins:** indicated by the number of defined water environment management actions undertaken at sub-basin level, including (a) approval of sub-basin water environment protection plans for the two sub-basins; (b) enhancement of inter-jurisdictional cooperation (that is, water environment information sharing platform for Jiangxi and a technical guideline for data connections to improve the RCS information platform for Hunan); and (c) compliance of ecological flows (meeting defined flow targets) on the mainstream and major tributaries, in each of the two demonstration sub-basins.
- **PDO#3: Reduced pollutant loads entering waterways in demonstration counties:** indicated by the number<sup>81</sup> of key pollutant reduction targets met (yes/no) by the demonstration counties. The pollution reduction targets refer to three annual targets: (a) reductions in chemical oxygen demand (COD)<sup>82</sup> (quality difference between inflow and outflow) at township wastewater treatment plants, (b) the weight (tons) of agricultural plastic film collected; and (c) livestock/poultry manure utilization rates (that is, treatment and use of manure for biogas and organic fertilizer) and two one-off targets: (a) establishment of integrated wastewater service systems agreements and (b) establishment of wastewater management strategies.

<sup>80</sup> Not more than CNY 48 million as approved by the central government, with the actual amount during implementation to be based on an agreed annual workplan submitted by the CWRC to the World Bank.

<sup>81</sup> There are three pollutant reduction targets for each of the two provinces each year for 2022–2026.

<sup>82</sup> Chemical oxygen demand (COD) is a measure of water and wastewater quality, with greater oxygen demand associated with greater water contamination. COD is often used as a measure of WWTP efficiency.



31. The Results Framework is presented in annex 1. Data for indicators are collected at the country and/or provincial level, using consistent definitions and measurement, and are aggregated for reporting (see section III.B).

#### E. Disbursement Linked Indicators and Verification Protocols

32. **The Program's DLIs quantify the parameters and values that need to be achieved to trigger disbursements (Table 2).** Each province is responsible for measuring achievement of DLIs within a consistent framework allowing for aggregation and reporting at the Program level. DLIs that were chosen (a) represent improvements in key aspects of the Government program and the key priorities in each results area; (b) are within the control of the Government; (c) are achievable in the Program period; and (d) are verifiable. They prioritize the use of existing indicators and reporting mechanisms within the Government system where possible, to ensure sustainability.

33. **Verification will be carried out on an annual basis by a third-party agent based on data collected by the provincial and county agencies.** At the county level, inspection will be conducted by the county Program Management Office (PMO) on behalf of the county government; at the province level, sample inspections will be conducted by the Provincial PMO (PPMO) on behalf of the provincial government. County-level inspections will cover county-level Program activities; provincial-level inspections will randomly select a percentage (differing by activity) of the reported accomplishments in the demonstration counties. The verification agencies will be contracted by the PPMOs using a consistent and agreed verification protocol. The World Bank will review and provide feedback on the terms of reference (TOR) for the verification agent, with the final agreement subject to confirmation of acceptability by the World Bank. The Program verification procedures and implementation arrangements are to be detailed in an M&E plan for the Program.

**Table 2. Overview and Rationale for Disbursement Linked Indicators**

Disbursement Linked Indicator	Rationale for Selection
<b>Results Area 1: Improving Institutions and Innovations</b>	
DLI 1: River Chief System Platforms Integrated	The purpose of this DLI is to improve the effectiveness of the RCS as a mechanism for cross-sector coordination and inter-jurisdictional cooperation through information sharing. It supports establishing and maintaining the connection of county and municipality river chief information platforms to the provincial information platform and connection of the provincial platforms to the basin platform.
<b>Results Area 2: Advancing Ecological Protection through Integrated River Basin Management</b>	
DLI 2: Improved water environment management system in the demonstration sub-basins	The purpose of this DLI is to improve environmental water management. It supports approval of water environment protection plans for the demonstration sub-basins, enhancement of inter-jurisdictional cooperation through facilitating information and data sharing, and monitoring compliance of ecological flows on the mainstream and major tributaries, in each of the two demonstration sub-basins.
<b>Results Area 3: Reducing Water Pollution and Transmission of Plastic Waste</b>	
DLI 3: Reduced pollutant loads entering waterways in demonstration counties	The purpose of this DLI is to improve systems for wastewater services and to reduce plastic and NPS pollution in waterways. It supports the establishment of integrated wastewater systems, the collection of agricultural plastic waste, and the increased utilization of livestock and poultry manure.

34. **DLI 1: River Chief System platform integrated.** DLI 1 is defined as the number of counties and municipalities that have established and maintained a functional connection between their river chief information platform and the provincial river chief information platform and the number of provinces that have established and maintained a connection between their provincial platform and the basin river chief information platform.

- **Verification:** Information on the number of river chief platforms connected and transmitting data will be collected by the provincial RCOs and verified through the verification agency.



35. **DLI 2: Improved water environment management system in the demonstration sub-basins.** DLI 2 is a composite index with a series of discrete actions with recurrent compliance monitoring, including (a) approval of water environment protection plans covering the demonstration sub-basins (Gan River in Jiangxi and Yuan River in Hunan); (b) establishment of a water environment information platform (Jiangxi) or issuing technical guidelines on data connection for the RCS information platform (Hunan); and (c) implementation of ecological flows (meeting defined flow targets) on the mainstream and major tributaries, in each of the two demonstration sub-basins.

- **Verification:** Public disclosure of the integrated water environment management plans will be required for verification, along with publication of monthly ecological flow monitoring bulletins. This information, plus the status of the information platform (in Jiangxi supporting data sharing and decision-making) and public disclosure of the Technical Guideline on data connection for the RCS information platform (in Hunan), will be collected by the DEE and the RCO in the two provinces, respectively, and verified through the verification agency.

36. **DLI 3: Reduced pollutant loads entering waterways in demonstration counties.** DLI 3 includes three sub-DLIs that are aimed at reducing plastic and point and non-point source pollution in waterways and mitigating GHG emissions:

- **DLI 3.1 (improved township domestic wastewater service systems)** is defined by (a) integrated wastewater management strategies issued considering institutional arrangements, financial sustainability, plant and network operations and maintenance (O&M), climate resilience, social inclusion and low-carbon technologies, among others; (b) integrated institutional arrangements for plant and network O&M; (c) COD reductions (that is, plant efficiency) that increase annually during project implementation at WWTPs due to improved utilization of plant capacity.

**Verification:** Confirmation of integrated wastewater systems is based on (a) county-level integrated wastewater management strategies are publicly disclosed at county government websites; (b) valid contracts of integrated county wastewater collection and treatment; (c) verification of COD concentrations according to environment bureau real-time monitoring data records.

- **DLI 3.2 (plastic waste (agricultural plastic film) prevented from entering water bodies)** is defined by the quantity of agricultural plastic film recovered through plastic collection. Plastic film is a major contributor to waterborne plastics pollution.

**Verification:** Data on agricultural plastic film collection will be obtained from the inventories established at county-level collection sites (including agro-input sale networks, solid waste sorting centers, and recycling centers among others) and verified by the verification agencies based on random sampling.

- **DLI 3.3 (demonstration counties meeting annual targets for manure utilization)** is defined by the number of counties meeting their annual livestock and poultry manure utilization ratio targets (%) in the demonstration counties. Unutilized and improperly managed manure is a source of NPS water pollution and GHG emissions. Utilization of manure includes generation of biomass energy and use as organic fertilizer on fields (a partial substitute for GHG-intensive synthetic fertilizer).

**Verification:** Regular data on the quantities of livestock and poultry manure produced and utilized are reported in the direct reporting system of the Ministry of Agriculture and Rural Affairs (MARA). Reported quantities will be verified based on random sampling of large-scale farms<sup>83</sup> and other supporting documents (for example, inspection reports from the county agricultural bureau) by the verification agencies.

<sup>83</sup> A large-scale animal farm is defined as 500 or more head of pigs, 2,000 or more egg chickens, 10,000 or more meat chicken, or 30 or more head of cattle.



37. In addition to underpinning the PDO across the three results areas, all DLIs contribute to the Program's climate change adaptation and mitigation benefits. RCS data platform connections (DLI 1), as well as the Gan River Environment Information Platform (DLI 2) will support the sharing of climate-relevant hydrological and ecological data necessary for coordinated climate-sensitive management actions, strategies, and plans; integrated water and environmental management plan for the Yan River (DLI 2) will include climate impacts and management responses and incorporate climate considerations (for example, flood risks) in infrastructure investment planning; ecological flows (DLI 2) are expected to increase resilience to temperature extremes and drought, as well as mitigate low-flow related methane emissions and build up carbon stocks; Integrated Wastewater Management Strategies will include options for treatment plant resilience measures (for example, for site selection in the context of flood-related risks) and low-carbon technologies (for example, installation of energy management systems) (DLI 3.1), while county-level investments will deliver substantial GHG mitigation through improved wastewater service systems and utilization of manure waste to replace chemical fertilizer use (see footnotes 77 and 78 and para. 64). DLI-supported adaptation and mitigation is further supported by actions under the broader Results Framework and the Central Basin IPF (see para. 25).

### III. PROGRAM IMPLEMENTATION

#### A. Institutional and Implementation Arrangements

38. A Program Steering Committee (PSC) will be led by the Office of the Leading Group for the Development of the Yangtze River Economic Belt under NDRC (YREB Coordination Office). The YREB Coordination Office works in coordination with other NDRC departments, notably Rural Economy, Environment and Natural Resources, and Regional Revitalization, to promote implementation of the national YREB strategy through policy formulation and high-level planning.<sup>84</sup> The PSC will be headed by a senior official of the YREB Coordination Office and comprise representatives from the Ministry of Finance (MOF), MWR, MEE, Ministry of Housing and Urban-Rural Development (MHURD), and MARA, among others, along with representatives from the participating provinces. The PSC will be responsible for providing overall coordination and guidance. It will be supported by a CPMO and an expert advisory panel that will provide technical support and expert advice to the PSC.

39. The Central Program Management Office (CPMO) will be hosted by the Changjiang (Yangtze) Water Resources Commission (CWRC). The CWRC is a river basin authority under the MWR, with a mandate to undertake integrated water resources management (including water conservation and allocation), basin planning, water infrastructure construction, and scientific and policy research. The CPMO will be responsible for coordination, reporting, management, including management of environmental and social (E&S) aspects, and M&E of the activities under the Central Basin IPF, the provision of capacity building, support to the PSC, along with Program implementation support, including consolidated Program reporting. The CWRC will host the CPMO given its alignment between its mandate and the Program objectives, plus technical capacity, to ensure an integrated river basin approach. The CPMO may also select public institutes under the CWRC to carry selected activities under the Central Basin IPF using eligibility criteria set forth in the Project Operations Manual.<sup>85</sup>

40. Provincial Program Management Offices (PPMO) will be hosted by the Provincial DRCs. The PPMOs are responsible for coordinating activities among sector departments in the two provinces. The PDRCs have established

<sup>84</sup> While the NDRC YREB Coordination Office is responsible for the national YREB strategy, a separate policy division of NDRC is responsible for the Yangtze Law specifically (with implementation of the law the responsibility of various implementing agencies and provinces).

<sup>85</sup> The selected executing agencies will be required to establish a Management Office, headed by a qualified officer and supported by adequate staff, to manage all activities until completion. The CWRC will sign an implementation agreement with each of the selected executing agencies to define the roles and responsibilities in implementation of each of the tasks, as well as eligible costs. The engagement of public institutes established practice in World Bank financed projects in China, including in the GEF Mainstreaming Integrated Water and Environment Management Project (P145897), Economic Transformation and Institutional Capacity Building Project (P144270), Building a Modern Fiscal System Technical Assistance Project (P154694), Yunnan Highway Asset Management Project (P132621), and Guangdong Compulsory Education Project (P154621).



Provincial YREB Offices—corresponding with the national YREB Coordination Office at NDRC—that are responsible for realizing the objectives of the national YREB strategy at the provincial level. The PPMOs are responsible for preparation of provincial-level Program documents and Program implementation management. They will report to Provincial PSCs, which will comprise senior representatives from relevant departments, with similar structure and mandate as the national PSC. Similar implementation arrangements will be set up at each demonstration county.

Figure 6. Overview of Implementation Arrangements



## B. Results Monitoring and Evaluation

41. **An M&E plan will be prepared, specifying the unit of measurement, baseline value, targets, and data sources for each indicator, along with the methodology and responsibility for data collection and reporting.** Existing government systems based on the relevant technical guidelines applied by authorities at all levels will be used for results measurement; these systems have proven effective at documenting the achievements and impacts of a wide range of ecological protection and water pollution control measures under other (World Bank and non-World Bank) projects. The CPMO and PPMOs will prepare and submit semiannual progress reports (including M&E reports), a mid-term review report (expected no later than October 31, 2024), and a Program Implementation Completion and Results Report (ICR) by Program close. Reporting on the Program will be consolidated by the CPMO based on reports from the PPMOs and the relevant implementation agencies responsible for the basin activities and submitted to the World Bank for review. The consolidated mid-term review report and the completion report covering the Program will also be submitted by the CPMO to the PSC for strategic guidance.

42. **The M&E system will draw on the capabilities of departments experienced in M&E within their area of responsibility.** Verification protocols will be based on existing Government technical guidelines, supported through a strengthened verification system of random-sample inspections and field surveys (see section II on DLIs and verification). The PDRCs are responsible for fund allocations based on an evaluation of county achievements, which relies on data provided by sector departments. The PDFs are responsible for monitoring the management and disbursement of funds. The respective DWRs are responsible for monitoring ecological flow compliance and providing data on water resource management, DEEs are responsible for monitoring water quality, DHURDs are responsible for monitoring wastewater services, and DARAs responsible for agricultural plastic film and NPS pollution.



### C. Disbursement Arrangements

43. **Both Jiangxi and Hunan Provinces have indicated that they would like to apply for a 25 percent advance payment (US\$49.0625 million for Jiangxi Province and EUR 42.125 million for Hunan Province) under the PforR.** The amount of the advance will be deducted from the total amount due to be disbursed when the DLIs are achieved, and the World Bank will record an amount of the advance as disbursed for an achieved Disbursement Linked Result ('recovered') after it has notified the borrower of its acceptance of the evidence of achievement of the result for which the advance was provided. The reclassified amount will become available for further advances. The cumulative disbursement in the first two years after Board approval is not reasonably expected to exceed 60 percent of each IBRD loan based on the amount of the advance, along with the DLIs expected to be achieved in the first two years of implementation, the timing of the annual verification cycles (which will need to be completed before disbursements against achieved DLIs), and the disbursement schedule of the Basin IPF. Accordingly, the IBRD loan for this operation is not deemed as fast disbursing. The World Bank requires that the borrower refund any advances (or portion of advances) if the DLIs have not been met (or have been only partially met) by the Program closing date. If by the end of the Program, the PforR financing amount disbursed exceeds the total amount of Program expenditures, the borrower refunds the difference to the World Bank.

44. **The PPMO will be responsible for consolidating reports from provincial agencies participating in the PforR and submitting to the PDF, copying the CPMO.** Disbursements will be made annually upon verification of the results of the DLIs (see section II on DLIs and verification). The PPMO will submit a verification letter with the results to the World Bank and, upon acceptance of the verification results by the World Bank, the PDF will prepare disbursement applications and submit them to the World Bank. The applied disbursed amount will depend on the verified results. Some annual allocations are scalable and non-fixed, meaning that the World Bank will disburse for over-performance up to the DLIs' total allocation (see annex 2). Over-performance will enable the PDF to bring forward disbursements from Year 4 and 5 to Years 2 and 3. The PDF can apply for disbursements as soon as the province meets targets, provides the necessary evidence to the World Bank, and the World Bank accepts that evidence in a formal notice to the borrower with the disbursement amounts. The PDF can also ask to be reimbursed for any results achieved beyond the indicative annual target up to and not exceeding the total PforR target and amount allocated for those DLIs that are scaleable and confirmed by the World Bank. A Designated Account (DA) for the Jiangxi PDF will be set up in US dollars, while a separate DA will be set up for Hunan PDF in euros.

### D. Capacity Building

45. **Technical capacity is generally strong but will benefit from capacity building in select areas.** The technical assessment (see section IV) has identified areas requiring strengthening which are reflected in actions captured by the Results Framework. These include development of a public engagement manual for river chiefs with details on the roles and responsibilities of all parties, increasing gender inclusion, capacity building, technical support, the means for inclusion of local knowledge in decision-making, and provisions for citizen feedback and increasing gender inclusion. The development of strategic plans for sustainable wastewater services by counties is intended to improve their operational efficiency, with training on chemical fertilizer use and agricultural waste management for farmers aimed at improving water pollution control. Provinces are responsible for these measures. The Central Basin IPF will also provide capacity building on technical topics, including indexes for monitoring river health, and the determination, monitoring, and supervision of ecological flows, through workshops and study exchanges.

46. **The participating provinces are experienced with IPF projects but have less experience with results-based financing in the water and environment sector.** Fiduciary and E&S assessments have identified needs including strengthened occupational health and safety (OHS) procedures and management for temporary workers in relation to construction and facilities operation, strengthened monitoring mechanisms on livelihood restoration for those affected by land acquisition, strengthened community engagement and public consultation, and strengthened grievance redress



recording systems. Training on the Environmental and Social Framework (ESF) and the related standards applications will be provided to the CPMO for implementation of the Central Basin IPF, as this is the first time the CPMO has used the ESF.

#### IV. ASSESSMENT SUMMARY

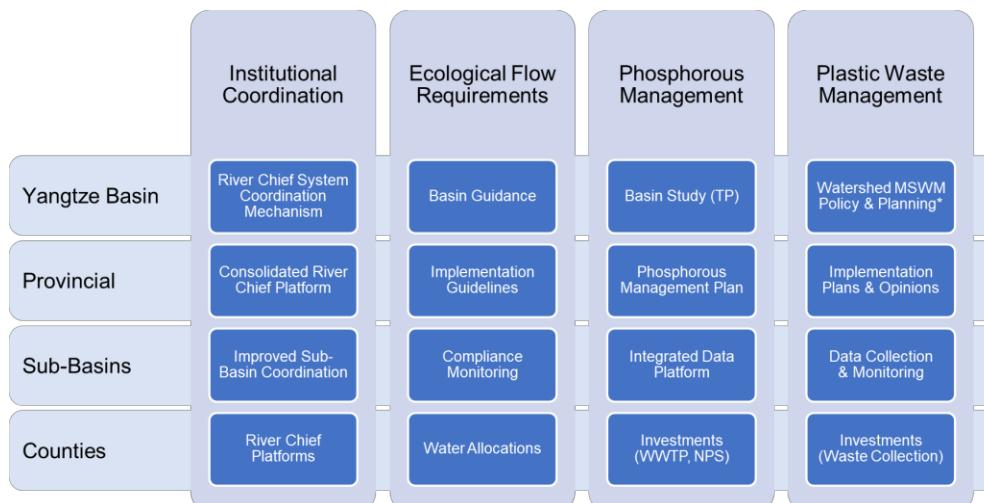
##### A. Technical (including program economic evaluation)

###### Technical Assessment

47. **The technical assessment has established a sound PforR boundary.** The Program is embedded within the Government's national program for the YREB at the central basin level and within the sub-national programs at the provincial level. These provide a nested hierarchy of activities and objectives, aligned with administrative responsibilities of the different levels of government and the provisions of the Yangtze River Protection Law (see section I). The law's passage was a key step toward ecological protection and restoration of the Yangtze River and reflects the importance placed by the Government on the strategy for the YREB. The activities supported by the Program contribute to implementation of the law and more broadly to the YREB strategy. The two provinces are critical to outcomes in the Yangtze River Basin and have signaled their commitment to the national strategy through their subsidiary plans (see Program Description, section II). Provincial plans have targets aligned with the 14th FYP. In geographic terms, Jiangxi and Hunan are key to the Basin's environmental outcomes with their location in the middle reaches of the basin, major source tributaries, and high agricultural and industrial production.

48. **The assessment confirmed the soundness of the activities and their connection to the Program's desired outcomes.** Three distinct but complementary sets of activities are included in the design (see section II) that are integral to the Government program: improvement of institutional mechanisms for coordination around ecological protection and water pollution control (Results Area 1); enhanced integrated water environment planning and ecological flows in target sub-basins (Results Area 2); and activities that contribute to reduce pollutants entering waterways (Results Area 3) (Figure 7). These are supported by the Central Basin IPF that will provide: (a) inter-jurisdictional cooperation and data sharing; (b) research-based technical guidance related to key activities, such as guidelines for the evaluation of river health and ecological flows, strategies for total phosphorous pollution prevention and control, and recommendations for the systematic protection and restoration of Poyang Lake and Dongting Lake; and (c) overall coordination and TA.

Figure 7. Overview of Program Outputs by Governance Level



Note: TP = Total Phosphorus.

\* Implemented by NDRC as part of the China Plastic Waste Reduction Project (Report No: PAD4309).



49. **The technical assessment found that cross-sector coordination and inter-jurisdictional cooperation—the focus of Results Area 1—remain the most challenging task for improving basin management.** The Program will support the RCS, specifically its coordination platforms and data sharing. The RCS promotes water resources protection, shoreline management, water pollution prevention and control, water environment management, and restoration of water ecology.<sup>86</sup> Under the RCS, each part of a river and lake is assigned to a particular official at the provincial, municipality, county, and township levels, which helps address coordination and assignment-of-responsibility challenges between departments and regions. With more than 1.2 million river and lake chiefs appointed, over 460,000 in the Yangtze River Basin, this innovative system seeks to address the challenges of integrated water resources management (IWRM) and water pollution control through promoting cross-sector coordination and inter-jurisdictional cooperation. The challenges of cross-sector coordination and inter-jurisdictional cooperation have been recognized in previous World Bank engagements with lessons derived for the present Program (Box 3).

50. **Support for coordination mechanisms and data sharing platforms under Results Area 1 (and the Central Basin IPF) is an important element of a more effective RCS.** A basin-level collaboration mechanism for the RCS was established by the CWRC in July 2021. The coordination mechanism revolves around the six main tasks of the river chiefs, with the aim of promoting coordination among the 19 provincial RCOs and the CWRC, and is expected to facilitate joint planning and coordination in policy implementation for river protection and restoration. Design of the mechanism was financed through the World Bank TA project ‘Promoting Economic Reform and Capacity Building’. A working conference and information management platform are to be established under the basin RCS coordination mechanism. The working guidelines for the basin RCS coordination mechanism requires each of the provincial RCOs to strengthen cooperation and coordination through the joint development, co-management, and sharing of information, with the CWRC to lead in establishing a water-related information management system for the Yangtze River Basin. Each of the provincial RCOs is required to establish a provincial-level RCS information management system and provide, maintain, and update information in a timely manner to ensure the completeness, accuracy, timeliness, and availability of information and data to promote the basin-wide information-sharing system and big data center. Data include sectoral planning (water, mining, environment, waterway, and so on), water resources, water quality, water ecology, water emergency, and pollution discharge licenses. The information platforms for the provincial RCOs will be connected to the national-level platform for the inter-ministerial joint committee on the RCS administered by the MWR and to the basin-level information platform to be developed by the CWRC. Counties and municipalities will connect their local river chief information platforms to the provincial platforms as part of Results Area 1.

51. **The assessment confirmed a sound policy framework and rationale for integrated water environment management planning and ecological flows—the focus of Results Area 2.** The Yangtze River Protection Law commits governments to determine, allocate, and monitor ecological flows for the Yangtze River's mainstream, major tributaries, and important lake sections.<sup>87</sup> The technical assessment indicates that the provinces are working on systems to determine ecological water allocations, yet water allocation formulas are based on relatively simplistic hydrological indexes to determine minimum flow requirements rather than detailed assessments of ecological requirements. The Program will support the development and approval of basin-level guidelines for the determination of river health and ecological flows as part of the Central Basin IPF. At the provincial level, the Program will support the monitoring and supervision of

<sup>86</sup> State Council and the CPC Central Committee. 2016. *Opinions on Fully Promoting the River Chief Mechanism*.

<sup>87</sup> The law requires river basin management agencies of the water resources departments to include ecological water in the annual water allocation plan to meet the basic ecological needs, ensure ecological flow during the dry season and fish spawning period, maintain the water volume and level of important lakes, and maintain a balance of salt and fresh water in the Yangtze River estuary. The law also requires that water conservancy, hydropower, and shipping hub projects on the mainstream and major tributaries of the Yangtze River, and in the upper reaches of important lakes, incorporate ecological water allocations in daily operation and allocation procedures. Where the discharge does not meet the requirements of ecological flow discharge, the water resources departments at or above the county level are required to determine and supervise corrective measures.



ecological flows. It will also support the development and approval of sub-basin or provincial-level instruments to reduce pollution, including solid waste management plans and phosphorus management guidelines.

**52. Results Area 3 supports activities that reduce pollutants entering waterways and complements other Program components.** Activities at demonstration county level include point source pollution control through improvements in access and operations of township domestic wastewater collection and treatment services, along with NPSs of pollution through improved management of plastic waste and increased utilization and management of animal manure. Article 46 of the Yangtze River Protection Law requires provincial governments to formulate a total phosphorus pollution control plan and organize its implementation (supported by Results Area 2). The Central Basin IPF study on key pollutants will focus on a basin-level assessment of total phosphorous as well as establish the thresholds of key pollutants flowing into the Yangtze River, helping the provinces to set emission control targets in the provincial plan. These can help guide provinces in preparing their own total phosphorus control plans, under an overall basin total phosphorus control target.

**53. The Program's interventions within demonstration counties—focused on wastewater services, the prevention of plastics entering waterways, and increased use of organic fertilizers—are emphasized in the Yangtze River Protection Law.** Article 47 requires county governments to make plans for the construction of centralized sewage treatment facilities and supporting sewer networks, to improve sewage collection and treatment capacities, and also emphasizes the need to clarify responsibilities and implement unified management. The national 14th FYP for wastewater management calls for promotion of integrated wastewater collection and treatment services. Similarly, Article 48 commits to strengthening the prevention and control of agricultural NPS pollution, with the application of chemical fertilizers to be reduced, the use of organic fertilizers to be promoted, and agricultural waste such as plastic films to be disposed appropriately. The dumping, burying, or treatment of solid waste is forbidden within control areas for rivers and lakes in the Yangtze River Basin (Article 49), and the county-level governments are required to strengthen joint prevention and control of illegal transfer and dumping. In addition to direct activities toward these requirements under Results Area 3, the Program contributes through support for the provincial-level plans and guidelines for plastics and agricultural pollution management (Results Area 1).

**54. Gender dimensions have been incorporated into the Program design to address gaps in participation and decision-making roles in both the RCS and township wastewater utilities.** These are based on preliminary assessments in Jiangxi and Hunan Provinces that show women are substantially underrepresented among both official and civil river chiefs, with five or more male river chiefs for every female in the data sample provided by demonstration counties.<sup>88</sup> Underrepresentation of women in these roles can influence the degree to which communities change pollution behavior, the types of investments prioritized, and the women's ability to gain experience and increase their job opportunities. To address the gaps, the Program will include activities to improve engagement and awareness, along with methods to increase participation, female voice and agency in the local RCS and wastewater utilities. A basin-level case study of the RCS will analyze the extent and drivers of the gender gap, raise awareness among Government officials, and draw lessons to refine program actions. A provincial public engagement manual to be developed as an intermediate outcome indicator will include provisions to increase women's participation and decision-making roles. Implementation of the manual will contribute to the Program's target of increasing female civil river chiefs from around 11 to 30 percent in the demonstration counties. Activities to address key gender gaps in township wastewater utilities are based on the finding that women represent less than 40 percent of technical and managerial positions and female staff earn a quarter less, on average, than male staff among the sample survey. Gender stereotypes about leadership and decision-making and limited implementation of the Women's Development Plan are among the key drivers. To address these gaps, the Program includes provisions to address obstacles in attracting, recruiting, retaining, and advancing women as part of the wastewater management strategies to be developed by the demonstration counties under the related DLI.

<sup>88</sup> The responsibilities and roles of civil river chiefs play an important role in river management and protection, complementing the formal river chiefs. The MWR issued 'Implementation Opinions on promoting River Chief System' requiring enhancing the role of civil river chiefs in promoting river management policies, collecting public feedback, supervising river chief performance, and bridging communications. ([link](#))

**Box 3. The World Bank's experience in strengthening institutions for the management of transboundary river basins**

The YRPERP draws on lessons from a range of World Bank-financed programs and analytical work in transboundary river basins. Although the Yangtze River is contained within China, it flows through 19 provinces, which have a high degree of autonomy in the Chinese system. In combination with China's multi-tiered governance structure (national, basin, provincial, and local), this creates challenges similar to those seen in transboundary contexts. In response, the YRPERP links financing to performance-based targets that strengthen institutions for inter-jurisdictional cooperation and cross-sectoral coordination. Specific actions are aligned with the functions and responsibilities of existing organizations through a nested hierarchy of activities at the basin, provincial, and local levels, providing a Program framework aligned with the decentralized and polycentric nature of river basin management in China. Key lessons were derived from the following:

- **The Danube Water Program (P159654)** illustrates the importance of institutional and policy support for strong utilities and sustainable water and wastewater services. Since the adoption of the European Union Water Framework Directive, European Union countries have used a river basin approach for water management, including the 19 countries that share the Danube River Basin. The Program supports the basin countries by informing the policy dialogue and strengthening institutional capacity through partnerships with regional, national, and local stakeholders.
- **The Nile Basin Program (P156765)** highlights the benefits of investing in data and information to support infrastructure planning and development, as well as capacity building, in managing joint development of shared water resources. The World Bank has been investing in the countries of the region for more than 20 years under a shared vision to cooperatively and jointly develop shared water resources. Regional norms and processes have been established to share information and conduct joint modelling to inform the prioritization, planning, and implementation of investment projects across the basin.
- **The Ganga River Basin Project (P119085)** provides an example of measures to address water pollution and strengthen basin management. Building on an earlier World Bank project that financed sewage infrastructure in pollution hotspots along the river, the project is building the capacity of the National Ganga River Basin Authority to establish management tools, investigate environmental flow options, and collect and share data in a complex multi-state governance setting.
- **The Lake Victoria Environmental Management Program (P100406 and P103298)** illustrates the challenges of coordination relating to environmental management in transboundary basins. The Program provided long-running support for collective management and governance through policy, legal, and institutional reforms. These focused on environmental management in pollution hotspots, mechanisms for cooperative management between the partner states, and environmental restoration of degraded sub-catchments, highlighting the time required to realize results when addressing NPS pollution.
- **The Murray-Darling River Basin** provides an example of basin-wide institutions and management tools to safeguard water for the environment. Analytical work in partnership with the Australian Water Partnership has highlighted institutional arrangements for the allocation and measurement of environmental flows (environmental water holders) in inter-jurisdictional contexts. A Basin-wide Environmental Watering Strategy sets out objectives for river health, with water then allocated to improve flows; water holders decide where and when environmental water will be delivered to achieve those environmental objectives.
- **The Framework for Adaptation to Climate Change in the Water Sector in Mexico (P120134)** was a Development Policy Loan supporting the government's efforts to mainstream adaptation to climate change in the water sector by strengthening institutions, creating water banks, regulations, and monitoring capacity in integrated water resources management, as well as incentives to improve data collection and flows of information; establish watershed management programs to improve water quality at sub-national levels; improve the productivity of irrigation; and, strengthen wastewater treatment to improve water quality for groundwater recharge.

These activities, set within complex inter-jurisdictional spaces with parallels to the Yangtze River Basin, have influenced YRPERP activities on data sharing and coordination, integrated management planning, capacity building, environmental water allocations, and the use of demonstration investments to influence cross-boundary outcomes. It is also expected that YRPERP experience will similarly contribute to global knowledge on mechanisms for transboundary management in multilevel governance contexts (for example, systems within federated states or under regional management bodies). The Chinese experience in complementing infrastructure-led water sector development with inter-jurisdictional institutions for sustainable water management will be valuable for World Bank clients looking to make a similar transition as their development needs evolve.



## Program Financing

55. **As the Program boundaries are established within the two sub-national provincial plans, the Program expenditure framework is assessed at the provincial level.** Implementation of the national YREB program is funded through a range of instruments at the provincial and local level in accordance with the responsibilities for expenditures on ecological and environmental protection issued in May 2020.<sup>89</sup> The actions required to meet the objectives of the Program are not linked to specific government budget allocations, with the YREB Development Plan calling on inputs from a range of stakeholders, including all levels of government. Eco-compensation mechanisms include those specific to river basins, forestry, wetlands, green supply chain and procurement, ecological industries, and green finance and are recognized as some of the financing instruments that will help achieve the goals of the national YREB strategy and its provincial subsidiary plans. The expenditure framework thus comprises multiple relevant budget lines rather than a single Government program fund.

56. **The expenditure framework in Jiangxi Province presents an adequate basis for the PforR.** Implementation of the ‘5-Rivers-1-Lake’ Plan is partly funded from the provincial government’s ‘River Basin Ecological Compensation Program’ (RBECP). This covers all 100 counties in Jiangxi, including over 90 counties in the Poyang Lake Basin. The RBECP is intended to support ecological protection, water quality improvement, forest protection and improvement, and livelihoods. Each county is evaluated against three sets of indicators annually: (a) water quality; (b) forest and ecological conservation; and (c) water resource and water environment integrated management, with funds allocated according to results. An estimated CNY 14 billion (US\$2 billion) has been invested through the RBECP from 2016 to 2020 (averaging around US\$400 million annually), including approximately US\$1.4 billion from the central government through the National Key Ecological Zone Program (NKEZP) supplemented through general provincial budget allocations and county contributions. These funds increased substantially from 2016 to 2018 and stabilized in 2019 and 2020, despite the impacts of tax cuts and COVID-19 on fiscal revenues. According to the Jiangxi Provincial Department of Finance, the RBECP funds will reach CNY 3,275 million (US\$500 million) in 2021 and will be maintained at least at this level during the 14th FYP period and beyond, based on which it is estimated that the RBECP funds for 2022 to 2026 will amount to CNY 16,375 million (US\$2,519 million).

57. **The provincial program is managed by the Budget Division of the PDF with results evaluated by the PDRC with support from sector departments.** There is no program-based expenditure classification in China’s budget management system, so the expenditures under the RBECP cannot be tracked precisely. However, the use of the RBECP funds can be assessed through the annual self-review reports prepared by the counties.<sup>90</sup> According to the self-review reports, most local governments (65 percent) use the RBECP as earmarked funds, with some local governments (28 percent) blending the RBECP with other financial sources at the county level. These show RBECP expenditures on water pollution reduction (28.5 percent), water ecological management (13.3 percent), waste management (12.9 percent), rural and urban environment improvement (13.3 percent), forest improvement (5.9 percent), and institution improvements (4 percent).

58. **The expenditure framework in Hunan Province presents an adequate basis for the PforR.** Implementation of the ‘Integrated Water Environment Management Plan for Dongting Lake Basin’ Plan is funded from a number of sources covering the entire Dongting Lake Basin. From 2018 to 2020, roughly CNY 14 billion (US\$2.16 billion) was allocated from the central and provincial governments for water environment management in the Dongting Lake Basin. The total funding increased significantly from CNY 4.3 billion in 2018 to CNY 4.8 billion in 2019 and CNY 4.9 billion in 2020. This indicates that the source of funds for the Government program in Hunan Province is stable and guaranteed. These funds were primarily from four programs (see annex 3). In 2018, the largest source of financing came from Rural Environment

<sup>89</sup> 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) ([link](#)).

<sup>90</sup> Among the 100 districts and counties under the jurisdiction of Jiangxi Province, 97 districts and counties have provided the World Bank with self-examination reports on ecological compensation funds in the river basin. Except for the districts and counties under the jurisdiction of Jingdezhen, the prefecture-level city, which provide self-examination reports in 2017, the other districts and counties provided self-examination reports for 2018.



Improvement from DARA, accounting for 43 percent of the total financing while Water Pollution Reduction from the DWR made up the largest share (49 percent) in 2020. In terms of funding source by department (Table 5), DARA provides the largest proportion (49.34 percent), followed by the DWR (37.70 percent) and DHURD (12.97 percent). The total Government financing for the program during the program implementation period (2022 to 2026) is estimated at CNY 23,446 million (US\$3,607 million) based on the average financing for the three years from 2018 to 2020.

**59. The final expenditures related to water environment management in Hunan Province were determined through an analysis of the statement of government final accounts for the past three years.** According to the final account data, about CNY 24.34 billion (US\$3,760 million) was used on water environment management from 2018 to 2020. Almost 50 percent of the expenditures were used for ‘Water Pollution Prevention and Treatment’, which includes expenditures for wastewater treatment plants and pipelines. This was followed by expenditures for ‘Rural Environment Management’ (24.58 percent), which includes rural wastewater treatment, waste management, and NPS pollution reduction. Those two expenditures together (approximately CNY 17 billion) exceed the financing amount in the three years (CNY 14.07 billion), indicating sufficient funding sources for the provincial program. Provincial commitments toward implementation of the Government program under the 14th FYP (2021 to 2025) amount to CNY 37.12 billion (US\$5.73 billion), of which CNY 7.41 billion (US\$1.14 billion) is allocated toward investments in water supply protection, CNY 21.99 billion (US\$3.40 billion) invested in water pollution prevention and treatment, and CNY 7.72 billion (US\$1.19 billion) invested in water ecological protection and restoration, providing an adequate basis for this PforR.

**60. Economic conditions in the provinces and the fiscal position of the provincial governments are sound and stable (see annex 3).** While the economic downturn in the wake of the COVID-19 pandemic negatively impacted Government finances, revenues are estimated to have recovered alongside economic activity in 2021. The budget allocation for the Program’s activities accounts for around 1.0 and 1.2 percent of the general budget revenue in Jiangxi and Hunan, respectively, so financial sustainability and continuity of program-related activities in the years beyond the Program are not at risk.

#### Economic Evaluation Overview

**61. Benefits from the Program are expected to accrue at both local and global levels.** At the local level, increases in biodiversity and vegetative cover can be expected, together with a decrease in pollutants in major waterways and thus periods of eutrophication, which can be expected to improve the amenity value of rivers and lakes, recreation opportunities, real estate values, fishery productivity, shipping services, and tourism and reduce costs of water treatment. Global benefits will result from improved biodiversity, such as benefits to internationally migratory birds (Dongting and Poyang Lake are important migratory bird habitats), reduced coastal eutrophication, and reduced marine plastic debris. Climate benefits (GHG mitigation) will be derived from reduced eutrophication<sup>91</sup> of lakes and waterways caused by discharges of livestock waste and wastewater and displaced use of synthetic fertilizer, as well as from more efficient wastewater treatment and collection systems.

**62. To estimate the Program’s economic benefits, benefit transfer from available environmental valuation research in China was used.** The economic values of water quality and ecological improvement are challenging to quantify due to the dispersed spatial extent of benefits across the basin, the wide range (and indirect nature) of benefit types, and data limitations. However, four studies provide benefit estimations that can be adapted to the parameters of this program to indicate its likely economic values. These studies utilize the contingent valuation method<sup>92</sup> (CVM) to capture the broad range of benefits (both use and non-use economic values) that are expected. Benefit estimates are incorporated into a simple benefit-cost analysis (BCA), applied at the sub-basin level for Poyang Lake and Dongting Lake Basins. The

<sup>91</sup> Eutrophication, caused by excessive richness of nutrients, increases the emission of methane, which is 28 times as potent as carbon dioxide at trapping heat in the atmosphere (based on IPCC, AR5).

<sup>92</sup> Contingent valuation method uses questionnaires targeted to affected populations to elicit their willingness to pay (WTP) for non-market environmental goods such as avoidance or reduction of pollution impacts. It has been applied extensively to water pollution issues.



assessment implicitly combines activities under Results Area 1, Results Area 2, and Results Area 3 to value outcomes as a combined water and environmental quality improvement. The assessment compares a ‘no program’ scenario to a scenario of a Government program including World Bank support.<sup>93</sup>

**63. Upper and lower levels of program benefit, based on household WTP and adjusted for provincial population and income, are compared to total program costs (Table 3).** A lower bound on household WTP of 0.55 percent was used, based on the lower range of available estimates. A 15-year period of analysis was used, with benefits starting in Year 5 of and increasing to their full value within two years. Across scenarios, the program is economically robust at both 6 and 12 percent discount rates. Annex 2 contains further detail.

**Table 3. Economic Rate of Return (ERR) and Net Present Value (NPV) by Basin**

	ERR (%)	NPV @ 6% (US\$, millions)
Poyang Lake Basin	15.7	1,957
Dongting Lake Basin	18.3	3,684

### **GHG Emissions Mitigation**

**64. GHG emissions reductions of 0.58 million tons CO<sub>2</sub>-e are expected due to PforR Program activities (Table 4), with an implied value (based on a shadow price of carbon) of US\$17.9–36.3 million over the economic life of the Program.**<sup>94</sup> Quantification of GHG emissions focuses on DLIs 3.1 and 3.3. Mitigation is assessed over 15 years and is compared to a no-Program scenario (baseline). Upgrades to the wastewater network and treatment operations is expected to reduce emissions due to leakage of wastewater to groundwater. The treatment and reuse of livestock/poultry manure (through on-farm treatment facilities and organic fertilizer displacement of synthetic fertilizer) is also expected to substantially mitigate emissions. This assessment does not include the expected emissions reductions through institutional, policy, and planning measures<sup>95</sup> nor through ecological restoration (due to challenges in quantifying these reductions). The quantitative estimates presented here should thus be considered a lower bound on the Program’s GHG mitigation. Annex 3 contains further detail.

**Table 4. GHG Mitigation from Quantifiable Program Activities over 15 Years (tons CO<sub>2</sub>-e)**

DLI	Activity	Project Gross Emissions	Baseline Emissions	Net Emissions	Net Average Annual Emissions
3.1	Wastewater	778,161	1,163,738	-385,577	-25,705
3.3	Manure	9,796,186	9,994,848	-198,662	-13,244
<b>Total</b>		<b>10,574,347</b>	<b>11,158,586</b>	<b>-584,239</b>	<b>-38,949</b>

### **B. Fiduciary**

**65. Adequacy of the Program’s fiduciary systems.** Pursuant to the World Bank’s Policy and its associated Directive on PforR Financing of November 10, 2017 and June 20, 2019, respectively, as well as the World Bank’s PforR Fiduciary Systems Assessment Guidance Note issued on June 30, 2017, the World Bank’s Fiduciary Team carried out a fiduciary systems assessment (FSA). According to the FSA, and given the agreed actions to strengthen the fiduciary systems reflected in the Program Action Plan (PAP) and other proposed mitigation measures that will be implemented, the Program’s fiduciary

<sup>93</sup> This approach is used because under a PforR, Government and World Bank funds are combined to achieve results, with limited distinction at the activity level between World Bank-financed and Government-financed achievements.

<sup>94</sup> The shadow price of carbon is set at US\$38 per ton (lower bound) and US\$75 per ton (upper bound) in 2017, increasing by 2.25 percent per year, and applied to the quantified emissions reductions (in the form of an NPV) calculated here. See annex 3 for details.

<sup>95</sup> Plans and policies under Results Area 1 and 2 also aim to drive water quality improvements (and are thus expected to reduce water-quality-related methane emissions, see Downing et al. [2021], [link](#)).



systems, including the financial management (FM), procurement, and governance systems, are considered to adequately meet the requirements laid out in the World Bank's PforR Policy and Directive. They provide reasonable assurance that the Program's financing proceeds will be used for the intended purposes, with due attention to the principles of economy, efficiency, effectiveness, transparency, and accountability.

66. **Financial Management risks.** Major risks identified include the following: (a) inadequate supervision on the usage of Program funds by related provincial entities may bring potential risk of improper use of Program funds given that there is no requirement for provincial governments to report Program expenditures in Hunan Province and the reporting requirement stipulated in Government decrees have not been strictly implemented in Jiangxi Province; (b) the program has no budget classification element and the required Program financial reporting cannot be generated from the Government treasury system; and (c) Government auditors have thus far not audited program funds and have not prepared any program audit reports. Although the proposed Program will be limited to the water and environment-related sectors, a number of activities will be included, which is expected to pose challenges to the auditors when planning Program audits.

67. **Mitigation measures** for the major FM risks will include (a) developing a tailored format for Program financial reporting drawing on the experiences of other PforR projects in China, designed and agreed on by the World Bank and the PDFs; (b) the World Bank working with the Provincial Audit Office (PAO) to develop TOR to help coordinate Program audits; and (c) outlining a pilot program for tagging Program related expenditures in the Government treasury system in the Program Implementation Plan (PIP), allowing Program financial reports to be generated directly from the treasury system and facilitate the external audit within the demonstration counties.

68. **Procurement overview.** The Government of China has a robust legal framework for procurement, which includes the Tendering and Bidding Law of 1999; the Government Procurement law of 2003; and regulations and orders issued at national, provincial, and county levels. Although the laws could be modernized and aligned to modern principles such as 'value for money' and 'fit for purpose', both offer a fair playing field for bidders and promote transparency and competitiveness. The Government has recently encouraged the use of electronic bidding. All open bidding competitive processes are conducted by public resources transaction centers, which provide facilities and modern platforms for processing procurement activities electronically.

69. **Procurement risks and mitigation measures.** Four major procurement risks have been identified.

- (a) Contracts may be awarded to firms or individuals that are debarred or under temporary suspension by the World Bank or other multilateral development banks. The following mitigation measures are proposed: (i) upon Program loan effectiveness, the Provincial Program Office shall issue a high-level official letter or official instruction to require Program Implementation Agencies (PIAs) to ensure that no contract will be awarded to ineligible firms or individuals; (ii) procurement staff at the PPMO are to check the latest list of debarred and temporarily suspended firms and individuals before contract award to ensure contracts are being awarded only to eligible firms or individuals; and (iii) 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.
- (b) The World Bank may not be informed of fraud allegations and corruption issues during implementation. A PIP shall therefore require the client to inform the World Bank of any credible and material allegations of fraud and any corruption issues as part of the Program progress reports, as mandated in the Loan Agreement.
- (c) In Jiangxi, the Price Commitment Method is widely used for bid evaluation by using the cost estimate as a key reference for contract price determination. To avoid substantial deviation between contract price and



the prevailing market price level, the PPMO is required to regularly update the cost estimate by taking account of market variants in a timely manner to ensure realistic value for money is being achieved.

- (d) Contracts may not be completed within the contractual completion time, and the contract completion audit may not be completed in a timely manner. Human, financial, and policy resources should be allocated by Hunan and Jiangxi PDRCs for close monitoring contract implementation progress to minimize or avoid foreseeable cost overruns and/or implementation delays.

70. **Fiduciary risk rating.** Considering the abovementioned FM and procurement risks, along with the proposed mitigation measures, the overall fiduciary risk rating is assessed as 'Substantial'.

71. **Fiduciary supervision.** Procurement and FM are subject to annual audit by government audit offices. Procurement following the procedures of the Tendering and Bidding Law (TBL) is subject to regular supervision and oversight by DRCs at various levels and relevant sector authorities (water, environment protection, agriculture, housing and construction, land and natural resources). The Finance Department or Bureaus at various levels exercise regular supervision and oversight for procurement following the procedures of the Government Procurement Law (GPL).

72. **Fraud and corruption risks.** The Government has institutions in place to combat fraud and corruption. These institutions are designed to prevent, report, detect, investigate, prosecute, and sanction fraud and corruption. These institutions include the discipline inspection commissions within all implementation agencies, supervision bureaus, anticorruption bureaus under People's Procuratorates, and audit offices, all at central, provincial, prefectural, and county levels. These agencies have comprehensive mandates to combat fraud and corruption. Any bidder or any party can report fraud and corruption issues to any of these government agencies. The World Bank's right to conduct an inquiry into such allegations or other indications, independently or in collaboration with the borrower regarding activities and expenditures supported by the Program, as well as its right to access to the required persons, information, and documents will be observed in accordance with the standard arrangements for this purpose between the Government and the World Bank. The Program's Legal Agreement will also oblige the client to fully comply with obligations under the World Bank's Anti-Corruption Guidelines for PforR operations.

### C. Environmental and Social

73. **An Environmental and Social System Assessment (ESSA) was conducted to provide a comprehensive review of E&S systems and procedures at the national level, as well as in Jiangxi and Hunan Provinces.** The review recommended actions to address gaps and opportunities to enhance performance during PforR implementation. In addition, relevant provisions of the World Bank ESF have been applied to the Central Basin IPF and an Environmental and Social Management Framework (ESMF), a Stakeholder Engagement Framework (SEF), and an Environmental and Social Commitment Plan (ESCP) prepared in accordance with the requirements of the ESF.

74. **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; (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. Observation and discussions during these visits provided a good understanding of the potential E&S impacts associated with the Program's activities and procedures and capacity of government departments for dealing with such impacts, including measures adopted under relevant laws and regulations.

75. **The ESSA considers the E&S risk associated with the PforR Program to be substantial.** The Program will have significant and broadly positive E&S effects in the Program regions, including reduced wastewater, plastic waste, and agricultural pollution; improved river and lake water quality; and ecological environment rehabilitation. E&S screening was conducted on the proposed Program activities to exclude those with the potential to cause significant adverse impacts



on the environment and or potentially affected people, including (a) activities involving closure or relocation of livestock, poultry, or aquaculture farming; (b) activities involving large-scale infrastructure construction; (c) activities that have substantial impacts on river hydrology and ecology; and (d) activities involving the allocation or conveyance of water, including inter-basin water transfers or other activities, that could result in significant changes to water quality or availability. After applying these exclusion criteria, the Program will support pollution control and ecological restoration activities including county- and township-level wastewater treatment plants and pipelines, agricultural plastic film collection and recycling, waste treatment of existing livestock farms, and institutional and capacity building activities. The main potential adverse impacts identified include construction-related impacts such as dust, noise, disturbance of water bodies, soil erosion, wastewater and solid waste management, construction workers' and community's health and safety, labor management, small-scale land acquisition or restricted land access, temporary land use; impacts during operation such as effluent discharge of wastewater treatment facilities, safe operation of facilities, labor management issues, workers' health and safety, and safe application of fertilizers; impacts on farmers' livelihoods; and also the potential indirect downstream impacts of TA 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. Neither OP 7.50 - Projects on International Waterways nor OP 7.60 - Projects in Disputed Areas is applicable to the Program.

76. **The ESSA concludes that China has established a comprehensive system for the management of E&S issues at both national and provincial levels, including in Jiangxi and Hunan Province.** The system consists of laws, regulations, guidelines, specifications, and standards principally consistent with the World Bank's PforR Policy and Directive. This system provides an acceptable basis for addressing the possible E&S issues related to activities supported under the Program.

77. **The ESSA recommends that the PforR be used as an opportunity to strengthen the E&S management capacity of different stakeholders.** This could be achieved by (a) providing training on chemical fertilizer use and agricultural waste management to farmers; (b) establishing a sustainable incentive mechanism to increase collection rate, in which the existing jobholders should be appropriately considered, for example, the village cleaners; (c) enhancing the OHS management of the enterprises involved in the Program activities; and (d) establishing a social impacts and risks screening, public participation, monitoring, and reporting mechanism. To implement these recommendations, three actions have been included in the Program Action Plan (PAP): (a) provincial and county agriculture and rural affairs bureaus shall provide trainings on chemical fertilizer use and agricultural waste management to farmers; (b) PIAs shall strengthen OHS training and regular health checkup for all in-service workers, including temporary workers; and (c) PIAs shall establish a social impacts and risks screening, public participation, monitoring, and reporting mechanism and strengthen information and record management in social risk management.

78. **Consultation and information disclosure.** Relevant stakeholders, including both government departments, enterprise representatives, and local communities, were consulted through meetings and field visits to selected counties. The draft ESSA report was shared with the Jiangxi and Hunan PPMOs and selected counties (six counties of Dayu, Chongyi, Yugan, Yongfeng, Fuliang, and Yudu in Jiangxi; four counties of Shimen, Ziyang, Miluo, and Yuanling in Hunan), and consultation workshops were carried out with the key stakeholders at the provincial and county levels. The participants 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 participants provided valuable opinions to improve the accuracy of the ESSA description in local context, which have been reflected in the revised ESSA. The draft ESSA was disclosed on the World Bank's website on November 1, 2021, and on the two provincial websites on November 4, 2021.

79. **The E&S risks associated with the Central Basin IPF are rated Substantial.** The relevant provisions of the ESF apply. The Central Basin IPF is not anticipated to support any physical activities but consists of basin studies on river health and ecological flows, baseline studies and development of guidelines related to key pollutants such as phosphorus, research to inform implementation of the Yangtze River Protection Law, capacity building, institutional coordination



mechanisms, and information management, along with the compilation of Program results and reporting. Implementing the Central Basin IPF is assessed to have moderate social risks. The potential risk relates mainly to health and safety risks to field workers (for example, researchers) and inadequate consultations with stakeholders and are not considered likely to cause any direct adverse environmental impacts. There could be basin-wide downstream E&S implications related to the implementation of the products or outcomes of the TA. The downstream E&S impacts could include environmental impacts from new construction, rehabilitation, and operation of wastewater and solid waste collection and treatment facilities, labor risks, community health and safety, restrictions on land use, resettlement, and exclusion risks for vulnerable groups, among others. The overall environmental and social risk classification (ESRC) is thus rated as Substantial.

80. **The relevant provisions of the World Bank ESF have been applied and the relevant instruments disclosed.** An ESMF, an SEF, and an ESCP have been prepared for the Central Basin IPF in accordance with the requirements of the ESF and disclosed on July 25, 2021.<sup>96</sup> Both the ESMF and the SEF provide operational guidance for applying relevant Environmental and Social Standards (ESS) to TA activities, creating added value for enhancing the operability of policy recommendations while incorporating considerations on significant E&S risks. The ESCP documents the material E&S measures and actions to identify, assess, and mitigate E&S risks and impacts (including downstream risks) in connection with the TA activities. The updated and final ESF instruments (including ESMF, ESCP, and SEF) have been cleared and disclosed by the World Bank and have been redisclosed locally on November 8, 2021.

81. 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 redress mechanism or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address pertinent concerns. Affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/GRS>. For information on how to submit complaints to the World Bank Inspection Panel, please visit <http://www.inspectionpanel.org>.

## V. RISK

82. **The overall risk is rated Substantial.** The risk assessment is informed by the results of the technical, fiduciary, and environmental and social systems assessments, with a summary of substantial (or higher) risks provided below.

83. **The technical design risk is rated Substantial.** The Program's focus on improving cross-sectoral coordination and inter-jurisdictional cooperation poses a technical risk given the involvement of multiple levels of government and line agencies. Challenges around cross-sectoral coordination and inter-jurisdictional cooperation motivated the 2018 ministerial reforms (see section I), and the Yangtze River Protection Law recognizes the importance of an integrated approach to river basin management and ecological protection. While the law calls for the establishment of a National Coordination Mechanism, this mechanism has not yet been confirmed and there remains some ambiguity about the roles and responsibilities of the various agencies, with coordination and information flow challenged by existing governance structures. The Program attempts to address this risk through its support to coordination measures (specifically Results Area 1), as well as through construction of DLIs aligned with existing well-defined areas of responsibility.

84. **The risk related to sector strategies and policies is rated Substantial.** The Program is informed by a comprehensive set of Government strategies and programs with high-level political support. The YREB Development Plan

<sup>96</sup> <http://www.cjw.gov.cn/zwzc/gsgg/56781.html>.



is a high-level program that calls on inputs from a range of stakeholders, including all levels of government, but is not linked to specific government budget allocations. While the boundaries of the YREB are broad, including a wide range of potential activities implemented through various stakeholders and financing mechanisms, it is the sub-national provincial programs that form the Government program, a sub-set of which is supported by the PforR. The boundaries of the PforR have been clearly defined within the context of the sub-national provincial programs and screened to delineate the boundary between those in the PforR and those outside its perimeter. The support at the basin level is provided through an IPF component, which also allows for clearly defined activities. Institutional coordination and cooperation remain a challenge to efficient implementation of sector strategies. Limited data sharing between institutions and narrowly defined institutional mandates makes cross-sectoral implementation of policies challenging, and it is assumed that provincial policies developed and approved under the Program will be enforced and not contradicted by county- or municipal-level actions. Strengthening the RCS relies on a number of different stakeholders, along with the establishment and integration of management information systems, to inform a number of actions that can deliver on the expected outcomes improvements in inter-jurisdictional cooperation at the basin level.

85. **The implementation capacity risk is rated Substantial.** Despite significant experience in IPF operations, there is limited experience with results-based financing in the water and environment sectors. Preparation has focused on defining simple DLIs that target priority outcomes and ensure sufficient cashflow. Training for provincial and local government officials on the rationale and implementation of PforR has been used to improve understanding. Implementation capacity is also a risk at the central level, where the implementing agency (NDRC) has limited human resources for day-to-day oversight. Support from the CWRC is being used to mitigate this capacity risk.

86. **The fiduciary risk is rated Substantial.** Fiduciary systems, including the FM, procurement, and governance systems, are considered adequate to meet the World Bank's requirements. Risks include the potentially weak capacity for local governments to raise counterpart funds. In addition, the Government program has no budget classification element, and the required Program financial reporting cannot be generated from the Government treasury system. Government auditors have not yet audited the Program's funds. A tailored format for Program financial reporting will be used drawing on the experiences of other PforR projects in China, and the annual external audit process shall be used to ensure ineligible firms or individuals have not received contracts.

87. **The environment and social risk is rated Substantial.** The Program will have significant and broadly positive E&S effects in the target regions, and E&S screening has been conducted on the proposed Program activities to exclude those that could cause significant adverse impacts on the environment and or potentially affected people. Central and sub-national governments have well-established systems for mitigating risks. Risks arise from the potential implementation of products or outcomes of the TA, including the basin-level studies on water pollution and ecological protection and province-level plans and policies. Such indirect E&S implications could include impacts from construction, rehabilitation, and operation of wastewater and solid waste collection and treatment facilities, labor risks, community health and safety risks, restrictions on land use, resettlement, and exclusion risks for vulnerable groups, among others. Risk mitigation is provided by the ESF instruments prepared for the Central Basin IPF, the ESSA, and measures included in the PAP.

88. **The stakeholder risk is rated Substantial.** The Program aims to improve institutional coordination, an ambition that inherently faces stakeholder risks, given the need to coordinate and find consensus among disparate actors at different levels of government. The Program's design addresses this issue by supporting a coordination mechanism at the basin level and promoting cooperation in data sharing and knowledge exchange. Program-supported activities rely on cooperation of sector agencies. The role of the PDRC as the provincial-level counterpart and the use of results-based financing that incentivizes action across sector agencies help mitigate this risk.



## ANNEX 1. RESULTS FRAMEWORK MATRIX

## Results Framework

COUNTRY: China

Yangtze River Protection and Ecological Restoration Program

## Program Development Objective(s)

To improve institutional coordination, enhance ecological protection and reduce water pollution loads in select regions of the Yangtze River Basin

## Program Development Objective Indicators by Objectives/Outcomes

Indicator Name	DLI	Baseline	Intermediate Targets				End Target
			1	2	3	4	
To improve institutional coordination, enhance ecological protection and reduce water pollution							
1. River Chief System Platforms Integrated (Number)	DLI 1	80.00	126.00	133.00	223.00	235.00	249.00
2. Improved water environment management system in the demonstration sub-basins (Text)	DLI 2	No	Integrated water and environment management plan approved for Yuan River in Hunan and Gan River in Jiangxi	Jiangxi: Water environment information platform established for the Gan River Basin. Hunan: Technical Guidelines issued for provincial river chief system information platform	The Ecological Flow Requirements at approved control sections on the mainstream and major tributaries of the Gan River in Jiangxi and Yuan River in Hunan have been complied with for at least 90% of the days of the Calendar Year (excluding the days of	The Ecological Flow Requirements at approved control sections on the mainstream and major tributaries of the Gan River in Jiangxi and Yuan River in Hunan have been complied with for at least 90% of the days of the Calendar Year (excluding the days of	The Ecological Flow Requirements at approved control sections on the mainstream and major tributaries of the Gan River in Jiangxi and Yuan River in Hunan have been complied with for at least 90% of the days of the Calendar Year (excluding the days of



Indicator Name	DLI	Baseline	Intermediate Targets				End Target
			1	2	3	4	
3.Reduced pollutant loads entering waterways in demonstration counties (Number)		0.00	39.00	36.00	33.00	32.00	30.00
-	-	-	-	-	-	-	-



### Intermediate Results Indicator by Results Areas

Indicator Name	DLI	Baseline	Intermediate Targets				End Target
			1	2	3	4	
<b>Improving Institutions and Innovations</b>							
1. Yangtze River Basin River Chief System collaboration mechanism operationalized (Text)		Basin River Chief System Mechanism Regulation published and provincial focal points confirmed	Basin River Chief System Management Office established and conference held	Basin Level Training for River Chief offices held	Seminar on the Poyang and Dongting Lake Ecological Protection and Governance held	Joint Prevention and Control Management Strategy for River and Lake Protection in the Yangtze River Basin adopted/endorsed	Basin River Chief System Seminar held
2. Provincial level policies, regulations and guidelines on water environment and plastic waste management issued (Number)		1.00	7.00	10.00	12.00	12.00	12.00
3. Public engagement manual for the river chief system developed and disseminated (Yes/No)		No	Yes	Yes	Yes	Yes	Yes
4. People engaged in river/lake protection activities (Number (Thousand))		0.00	180.00	360.00	540.00	720.00	900.00
5. Women civil river chiefs in demonstration counties (Percentage)		12.50	14.50	19.00	21.00	28.00	30.00
<b>Advancing Ecological Protection through Integrated River Basin Management</b>							
6. Basin-level water-based ecosystem evaluation guidelines developed and		No	No	Drafted	Consulted	Endorsed	Disseminated



Indicator Name	DLI	Baseline	Intermediate Targets				End Target
			1	2	3	4	
disseminated (Text)							
7. Ecological flow requirements determined for demonstration sub-basins (Yes/No)	No	No	Yes	Yes	Yes	Yes	Yes
8. Water allocation schemes for the demonstration sub-basins implemented (Yes/No)	No	No	Yes	Yes	Yes	Yes	Yes
<b>Reducing Water Pollution and Transmission of Plastic Waste</b>							
9. Yangtze River Basin phosphorous assessment and climate resilience strategy developed (Text)	No	No	Drafted	Consulted	Endorsed	Disseminated	
10. Reduced pollutant loads entering waterways in demonstration counties (Yes/No)	No						Yes
10.1 Improved township domestic wastewater service systems (Text)	DLI 3	Number of wastewater management strategies issued: Jiangxi: 0; Hunan: 0 Number of integration arrangement established: Jiangxi: 0; Hunan: 0 COD Reduced (tons): Jiangxi: 3,603.15; Hunan: 2,753	Number of wastewater management strategies issued: Jiangxi: 3; Hunan: 1 Number of integration arrangement established: Jiangxi: 2; Hunan: 1 COD Reduced (tons): Jiangxi: 3,931.98; Hunan: 3,451	Number of wastewater management strategies issued: Jiangxi: 3; Hunan: 3 Number of integration arrangement established: Jiangxi: 2; Hunan: 0 COD Reduced (tons): Jiangxi: 4,082.87; Hunan: 4,480	Number of wastewater management strategies issued: Jiangxi: 0; Hunan: 0 Number of integration arrangement established: Jiangxi: 0; Hunan: 0 COD Reduced (tons): Jiangxi: 4,307.88; Hunan: 4,982	Number of wastewater management strategies issued: Jiangxi: 0; Hunan: 0 Number of integration arrangement established: Jiangxi: 0; Hunan: 0 COD Reduced (tons): Jiangxi: 4,440.17; Hunan: 5,356	Number of wastewater management strategies issued: Jiangxi: 0; Hunan: 0 Number of integration arrangement established: Jiangxi: 0; Hunan: 0 COD Reduced (tons): Jiangxi: 4,573.56; Hunan: 6,151
10.2 Plastic waste (agricultural film) prevented from entering water bodies (Metric ton)	DLI 4	0.00	592.60	1,324.67	2,102.17	2,917.22	3,754.74



Indicator Name	DLI	Baseline	Intermediate Targets				End Target
			1	2	3	4	
10.3 Demonstration counties meeting annual targets for manure utilization (Number)	DLI 5	0.00	10.00	10.00	10.00	10.00	10.00



Monitoring & Evaluation Plan: PDO Indicators					
Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
1. River Chief System Platforms Integrated	Jiangxi: (a) 100 counties and 11 municipalities have established and maintained a functional connection with Provincial RCS Platform; and (b) Provincial River Chief System Platform is connect to Basin RCS Platform under CWRC  Hunan: (a) 122 counties and 14 municipalities have established and maintained functional connection with Provincial RCS Platform, and (b) Provincial RCS Platform is connect to Basin RCS Platform under CWRC.  A Functional Connection means a connection between a county- or municipal-level river chief system platform and the provincial river chief system platform, through	Annual	Report from verification agency	PDWR/RCO Records	Provincial PMOs and Provincial River Chief Offices



	which the county- or municipal platform: (a) uploads on a monthly basis (or such other frequency established in the Program Implementation Plan for the specific data category) multi-sectoral data to the provincial platform; (b) uploads on a monthly basis (or such other frequency established in the Program Implementation Plan for the specific data category) data from sectoral agencies; and (c) makes selected data publicly-available; all in accordance with data-related protocols and procedures, acceptable to the Bank, as set forth in the Program Implementation Plan.				
2. Improved water environment management system in the demonstration sub-basins	Improved integrated water environment management is defined by the following: (1) Integrated water environment management plans means a provincial plan, acceptable to the Bank, to be adopted by Hunan and Jiangxi that sets	Annual	Report from verification agency	(1) Water Ecological Environment Protection Plan for Yuan/Gan River Basin is publicly disclosed and accessible on PDEE website (2) (Jiangxi) PDEE and PEPC records; (Hunan) PDWR/PRCO	<b>Hunan:</b> Provincial PMOs and (1): PDEE (2): PDWR (3): PDWR <b>Jiangxi:</b> Provincial PMOs



	<p>out requirements on, inter alia, water environment, water ecology, and related issues for (a) Yuan River Basin in Hunan and (b) Gan River Basin in Jiangxi.</p> <p>.</p> <p>(2) Information platform means:</p> <p>(a) Basin level water-environment information platform: Jiangxi Water Environment Information platform is used by the Provincial Environmental Protection Commission (PEPC) with cross-sector and inter-jurisdiction data sharing and public participation for the Gan River Basin.</p> <p>(b) Provincial river chief system information platform: a Technical Guideline for Data Connection issued to improve the river chief system information platform in Hunan.</p> <p>(3) The Ecological Flow Requirements at approved</p>			records (3) Monthly ecological flow monitoring bulletins	and (1): PDEE (2): PDEE (3): PDWR
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	<p>control sections on the mainstream and major tributaries of the Gan River in Jiangxi and Yuan River in Hunan have been complied with for at least 90% of the days of the Calendar Year (excluding the days of Eligible Emergencies)</p> <p>Ecological flow requirement means the minimum and sensitive ecological flow targets approved by Hunan and Jiangxi in accordance with the prevailing national technical standards and/or guidelines, including targets for control sections in the Gan River in Jiangxi and in the Yuan River in Hunan.</p> <p>“Eligible Emergencies” means emergencies duly declared by the Program Implementing Entities due to severe droughts, extreme water pollution events [, or such other emergency specified in the</p>			
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	Program Implementation Plan, all] in accordance with the Borrower's and the Program Implementing Entities' prevailing laws and procedures, specified in the Program Implementation Plan.				
3.Reduced pollutant loads entering waterways in demonstration counties	Annual number of county-level targets met by Hunan and Jiangxi Provinces (annually) based on 10 demonstration counties with 5 targets: 3 annual targets per county, (i.e. COD reduction, agricultural plastic film collection and manure utilization), and 2 one-off targets, (i.e. wastewater management strategy and integrated agreements). Annual targets from 2022 to 2026 are listed in the PIP.	Semi-annual	Semi-annual report on provincial program progress	Data collection by Demonstration County PMOs and submitted to Provincial PMO	Provincial PMOs and demonstration counties



Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
1. Yangtze River Basin River Chief System collaboration mechanism operationalized	Operationalization means: (1) Coordination mechanism management office is established and provincial focal points are appointed (2) Working conferences and seminars held (3) At least one management strategy for rivers/lakes governance adopted	Semi-annual	Semi-annual progress report of the Basin IPF	CWRC Meeting Minutes and Working Records	CPMO
2. Provincial level policies, regulations and guidelines on water environment and plastic waste management issued	Cumulative number of provincial-level water environment management policies, regulations and guidelines, including:  Hunan: (1) Dongting Lake Protection Regulations (2021) (2) Provincial implementation plan for plastic waste management (2021) (3) Provincial river/lake health evaluation	Semi-annual	Semi-annual report on provincial program progress  Official documents available	<b>Hunan:</b> Provincial PMO and 1. PDRC/PDEE 2. PDRC 3. PDWR 4. PDWR 5. PDEE 6. PDARA  <b>Jiangxi:</b> Provincial	



	<p>guidelines (2023)</p> <p>(4) Provincial implementation plan to ensure ecological flows for key rivers (2024)</p> <p>(5) Provincial Dongting Lake total phosphorus pollution control and reduction action plan (2022)</p> <p>(6) Provincial implementation plan for agricultural plastic film collection (2023)</p> <p>Jiangxi:</p> <p>(1) Gan River Basin Water Ecology and Environment Management Regulation (2024)</p> <p>(2) Provincial Implementation Plan for Strengthening Plastic Pollution Management (2020)</p> <p>(3) Measures to accelerate the green transformation of express delivery packaging (2021)</p> <p>(4) Provincial Domestic Solid Waste Management Regulations (2022)</p>			PMO and 1. PDEE 2. PDRC 3. PDRC 4. PDHURD 5. PDWR/PRCO 6. PDARA
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	(5) Provincial River/Lake (Reservoir) Health Evaluation Guidelines (2021) (6) Provincial M&E protocol for agricultural plastic film collection (2023)				
3. Public engagement manual for the river chief system developed and disseminated	RCOs develop and disseminate public engagement manual to guide the implementation and evaluation of public awareness raising activities and campaigns, public feedback and other river protection related activities, specifically addressing (1) how to increase and monitor women's participation; (2) raise awareness and preparedness for extreme climate events.	Semi-annual	Semi-annual report on provincial program progress	Manual publicly disclosed by provincial RCO	Provincial PMOs and Provincial river chief offices
4. People engaged in river/lake protection activities	Number of public participants (accumulative people times) registered for river protection activities under the RCS, including: (1) civil river chiefs; (2) volunteers for river cleanup and protection; (3) river	Semi-annual	Semi-annual report on provincial program progress	Provincial RCO records	Provincial PMOs and <b>Provincial River Chief Offices</b>



	cleaners; and (4) river rangers.				
5. Women civil river chiefs in demonstration counties	Percentage of females among the civil river chiefs in the demonstration counties	Semi-annual	Semi-annual report on provincial program progress	County-level RCO records	Provincial PMOs and Demonstration Counties
6. Basin-level water-based ecosystem evaluation guidelines developed and disseminated	Technical guidelines for the health assessment of aquatic ecosystems focusing on the Dongting Lake and Poyang Lake Basins developed and disseminated using good international industry practice.	Semi-annual	Semi-annual progress report of the Basin IPF	Acceptance Report of Guidelines for Health Assessment of Aquatic Ecosystems in the Two Lakes Basin	CPMO
7. Ecological flow requirements determined for demonstration sub-basins	Ecological flow requirements determined in accordance with national sector standards for (a) Yuan River Basin (Hunan Province) and (b) Gan River Basin (Jiangxi Province)	Semi-annual	Semi-annual report on provincial program progress	PDWR-issued provincial technical documents for determination of ecological flow targets, including for Yuan River Basin and Gan River Basin	Provincial PMOs and PDWR
8. Water allocation schemes for the demonstration sub-basins implemented	Total amount of water allocated in accordance with national standards to counties within (a) Yuan River Basin (Hunan Province) and (b) Gan River Basin (Jiangxi Province)	Semi-annual	Semi-annual report on provincial Program progress	Municipal water allocation plans in the Yuan and Gan River Basins are provided by PDWR	Provincial PMOs and PDWR
9. Yangtze River Basin phosphorous assessment and climate resilience	The study will focus on the middle and upper reaches	Annual	Annual progress	Provided by CWRC	CPMO



strategy developed	of the Yangtze River pollutant source identification and inventory analysis and develop management strategies under different climate scenarios, especially under extreme events		report of Basin IPF		
10. Reduced pollutant loads entering waterways in demonstration counties					
10.1 Improved township domestic wastewater service systems	Improved wastewater service system is defined by: (1) Integrated wastewater management strategy means a county-level strategy, acceptable to the Bank, to be issued by each Demonstration County, that sets out institutional arrangements, financial sustainability, performance based measures for integrated operation and maintenance, including considerations on employment equity and a workforce roadmap for addressing gender gaps, measures to increase climate resilience and promote low-carbon	Semi-annual	Report from verification agency	(1) County-level integrated wastewater management strategies are publicly disclosed at county government websites (2) COD concentrations can be verified according to automatic real-time monitoring records by environment bureau (3) Institutional integration verified by valid or official documents of integrated wastewater collection and treatment services as detailed in the PIP	Demonstration counties and PPMO



	technologies. (2) Annual COD Reduced measured by influent COD minus discharged COD at WWTPs. (3) Wastewater Treatment Plant and Network Integration Arrangement means an arrangement, acceptable to the Bank, to be established by each Demonstration County in the form of a contract, an agreement or such other instrument set forth in the Program Implementation Plan, specifying the roles, responsibilities and performance standards for the provision of integrated wastewater services by service provider(s) assigned with the operation and maintenance of the wastewater treatment plants and/or the sewage network. The targets in each year are annual targets.				
10.2 Plastic waste (agricultural film) prevented from entering water bodies	The weight of agricultural plastic film collected at collection and treatment	Semi-annual	Report from verification agency	Inventories at the agricultural plastic film collection and treatment	Demonstration counties and PPMO



	network sites (including agro-input sale networks, solid waste sorting centers, recycling centers, and so on) in the demonstration counties.			network sites	
10.3 Demonstration counties meeting annual targets for manure utilization	Number of demonstration counties meeting the annual target ratio (%) of the livestock and poultry manure (tons) utilized (for organic fertilizer, biomass energy, or other means) by farms to the total amount generated annually (tons) by large-scale pig, cow or chicken farms (or such other farms described in the Program Implementation Plan) in each Demonstration County, as such target ratio is set forth in the Program Implementation Plans.	Semi-annual	Report from verification agency	Verification will be based on large-scale farms (defined in Verification Table) in demonstration counties. <b>Data source:</b> from MARA direct reporting system and can be verified by supporting materials such as inventories, manure utilization contracts, inspection reports by county agricultural and environment bureaus.	Demonstration counties and PPMO



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

Disbursement Linked Indicators Matrix				
DLI 1	DLI 1a. River Chief System Platforms Integrated (Hunan)			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Output	Yes	Number	40,443,557.00	10.11
Period	Value		Allocated Amount (USD)	Formula
Baseline	30.00			
2022	68.00		7,919,881.00	US\$116,468.8 for each platform connected to the provincial platform
2023	68.00		7,919,881.00	US\$116,468.8 for each platform connected to the provincial platform
2024	137.00		8,201,265.00	US\$547,492 for the provincial platform connected to basin one; US\$56,277.745 for each functional connection maintained
2025	137.00		8,201,265.00	US\$547,492 for maintaining the provincial platform connected with the basin one; US\$56,278 for each functional connection maintained



2026	137.00		8,201,265.00	US\$547,492 for maintaining the provincial platform connected with the basin one; US\$56,278 for each functional connection maintained
<b>DLI 2</b>	DLI 2a. Improved water environment management system in the demonstration sub-basins (Hunan)			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Outcome	No	Text	39,599,408.00	9.90
Period	Value		Allocated Amount (USD)	Formula
Baseline	No			
2022	Integrated Water and Environment Management Plan covering, among others, for the Yuan River basin approved		12,811,573.00	US\$12,811,572.7 for the approval of the integrated water and environment management plan for the Yuan River basin
2023	Technical guidelines for data connection under the river chief system Information platform issued		12,811,573.00	US\$12,811,572.7 for the issuance of the technical guidelines for data sharing under the river chief system Information platform
2024	The Ecological Flow Requirements at approved control sections on the mainstream and major tributaries of the Yuan River have been complied with for at least 90% of the days of the CY (excluding the days of Eligible Emergencies)		4,658,754.00	US\$4,658,753.71 per year
2025	The Ecological Flow Requirements at approved control sections on the mainstream and major		4,658,754.00	US\$4,658,753.71 per year



	tributaries of the Yuan River have been complied with for at least 90% of the days of the CY (excluding the days of Eligible Emergencies)		
2026	The Ecological Flow Requirements at approved control sections on the mainstream and major tributaries of the Yuan River have been complied with for at least 90% of the days of the CY (excluding the days of Eligible Emergencies)	4,658,754.00	US\$4,658,753.71 per year
<b>DLI 3</b>	DLI 3-1a. Improved township municipal wastewater service system (Hunan)		
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)
Outcome	Yes	Text	57,722,424.00
Period	Value	Allocated Amount (USD)	Formula
Baseline	0 Integrated Wastewater Management Strategy issued; 0 Wastewater Plant and Network Integration Arrangement Established; 2753 tons of COD reduced		
2022	1 Integrated Wastewater Management Strategy issued; 1 Wastewater Plant and Network Integration Arrangement Established; 3451 tons of COD reduced at township-level wastewater treatment plants in the Demonstration Counties	9,423,052.00	US\$1886.80 per ton of COD reduced; US\$1.46m for one strategy issued; US\$1.46m for one integration arrangement established
2023	3 Integrated Wastewater Management Strategy issued; 4480 tons of COD reduced at township-level wastewater treatment plants in the Demonstration Counties	12,820,424.00	US\$1886.80 per ton of COD reduced; US\$1.46m for one strategy issued; US\$1.46m for one integration arrangement established



2024	1 Wastewater Plant and Network Integration Arrangement Established; 4982 tons of COD reduced at township-level wastewater treatment plants in the Demonstration Counties	10,855,874.00	US\$1886.80 per ton of COD reduced; US \$1.46m for one strategy issued; US\$1.46m for one integration arrangement established
2025	2 Wastewater Plant and Network Integration Arrangement Established; 5356 tons of COD reduced at township-level wastewater treatment plants in the Demonstration Counties	13,017,396.00	US\$1886.80 per ton of COD reduced; US \$1.46m for one strategy issued; US\$1.46m for one integration arrangement established
2026	6151 tons of COD reduced at township-level wastewater treatment plants in the Demonstration Counties	11,605,678.00	US\$1886.80 per ton of COD reduced; US\$1.46m for one strategy issued; US\$1.46m for one integration arrangement established

DLI 4 DLI 3-2a. Plastic waste (agricultural film) prevented from entering water bodies (Hunan)				
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Intermediate Outcome	Yes	Metric ton	29,236,241.00	7.31
Period	Value		Allocated Amount (USD)	Formula
Baseline	0.00			
2022	250.00		4,018,175.00	US\$16.07 per kg of agricultural plastic film collected
2023	622.50		5,987,081.00	US\$16.07 per kg of agricultural plastic film collected
2024	1,011.50		6,252,280.00	US\$16.07 per kg of agricultural plastic film collected



2025	1,412.00	6,437,116.00	US\$16.07 per kg of agricultural plastic film collected
2026	1,819.00	6,541,589.00	US\$16.07 per kg of agricultural plastic film collected

DLI 5	DLI 3-3a. Demonstration counties meeting annual targets for manure utilization (Hunan)			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Intermediate Outcome	Yes	Number	29,248,370.00	7.31
Period	Value		Allocated Amount (USD)	Formula
Baseline	0.00			
2022	4.00		5,849,674.00	US\$1.46m per year per county that achieves their annual target
2023	4.00		5,849,674.00	US\$1.46m per year per county that achieves their annual target
2024	4.00		5,849,674.00	US\$1.46m per year per county that achieves their annual target
2025	4.00		5,849,674.00	US\$1.46m per year per county that achieves their annual target
2026	4.00		5,849,674.00	US\$1.46m per year per county that achieves their annual target



DLI 6	DLI 1b. River Chief System Platforms Integrated (Jiangxi)			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Period	Value		Allocated Amount (USD)	Formula
Baseline	50.00			
2022	58.00		7,847,400.00	US\$135,300 for each functional connection established or maintained
2023	65.00		7,847,255.00	US\$120,727 for each functional connection established or maintained
2024	86.00		8,045,103.00	US\$197,903 for provincial platform connected to basin platform; US\$92,320 for each functional platform connected or maintained
2025	98.00		8,045,200.00	US\$197,900 for the maintenance of the provincial with the basin connection US\$80,900 for maintaining county connections
2026	112.00		8,045,156.00	US\$197,900 for maintenance of the connection of the provincial with the basin platform; US\$70,696 for maintaining county connections



DLI 7	DLI 2b. Improved water environment management system in the demonstration sub-basins (Jiangxi)			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Outcome	No	Text	39,000,000.00	9.75
Period	Value		Allocated Amount (USD)	Formula
Baseline	No			
2022	Integrated water and environment management plan for Gan River basin approved		12,000,000.00	US\$12 million for the approval of the Integrated water and environment management plan for Gan River Basin
2023	A water environment information platform for the Gan River basin established		12,000,000.00	US\$12 million for the establishment of water environment information platform for the Gan River basin
2024	The Ecological Flow Requirements at approved control sections on the mainstream and major tributaries of the Gan River have been complied with for at least 90% of the days of the CY (excluding the days of Eligible Emergencies)		5,000,000.00	US\$5 million per year
2025	The Ecological Flow Requirements at approved control sections on the mainstream and major tributaries of the Gan River have been complied with for at least 90% of the days of the CY (excluding the days of Eligible Emergencies)		5,000,000.00	US\$5 million per year
2026	The Ecological Flow Requirements at approved control sections on the mainstream and major		5,000,000.00	US\$5 million per year



	tributaries of the Gan River have been complied with for at least 90% of the days of the CY (excluding the days of Eligible Emergencies)			
DLI 8	DLI 3-1b. Improved township municipal wastewater service system (Jiangxi)			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	
Outcome	Yes	Text	58,940,212.00	
Period	Value		Allocated Amount (USD)	Formula
Baseline	0 Integrated Wastewater Management Strategy issued; 0 Wastewater Plant and Network Integration Arrangement Established; 3603.15 tons of COD reduced at township-level wastewater treatment plants			
2022	3 Integrated Wastewater Management Strategy issued; 2 Wastewater Plant and Network Integration Arrangement Established; 3,931.98 tons of COD reduced at township-level wastewater treatment plants		13,650,356.00	US\$2,200 per ton of COD reduced; US\$1m per county issuing a strategy; US\$1m per county establishing an integration arrangement
2023	3 Integrated Wastewater Management Strategy issued; 2 Wastewater Plant and Network Integration Arrangement Established; 4,082.87 tons of COD reduced at township-level wastewater treatment plants		13,982,314.00	US\$2,200 per ton of COD reduced; US\$1m per county issuing a strategy; US\$1m per county establishing an integration arrangement
2024	2 Wastewater Plant and Network Integration Arrangement Established; 4,307.88 tons of COD reduced at township-level wastewater treatment		11,477,336.00	US\$2,200 per ton of COD reduced; US\$1m per county issuing a strategy; US\$1m per county establishing an integration



	plants		arrangement
2025	4,440.17 tons of COD reduced at township-level wastewater treatment plants	9,768,374.00	US\$2,200 per ton of COD reduced; US\$1m per county issuing a strategy; US\$1m per county establishing an integration arrangement
2026	4,573.56 tons of COD reduced at township-level wastewater treatment plants	10,061,832.00	US\$2,200 per ton of COD reduced; US\$1m per county issuing a strategy; US\$1m per county establishing an integration arrangement

DLI 9 DLI 3-2b. Plastic waste (agricultural film) prevented from entering water bodies (Jiangxi)				
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Intermediate Outcome	Yes	Metric ton	29,229,674.00	7.31
Period	Value		Allocated Amount (USD)	Formula
Baseline	0.00			
2022	342.65		5,174,015.00	US\$15.1 per kg of agricultural plastic film collected
2023	702.17		5,428,752.00	US\$15.1 per kg of agricultural plastic film collected
2024	1,090.67		5,866,350.00	US\$15.1 per kg of agricultural plastic film collected
2025	1,505.22		6,259,705.00	US\$15.1 per kg of agricultural plastic



				film collected
2026	1,935.74		6,500,852.00	US\$15.1 per kg of agricultural plastic film collected
<b>DLI 10</b>	DLI 3-3b. Demonstration counties meeting annual targets for manure utilization (Jiangxi)			
Type of DLI	Scalability	Unit of Measure	Total Allocated Amount (USD)	As % of Total Financing Amount
Intermediate Outcome	Yes	Number	29,250,000.00	7.31
Period	Value		Allocated Amount (USD)	Formula
Baseline	0.00			
2022	6.00		5,850,000.00	US\$975,000 per county that achieves their annual target
2023	6.00		5,850,000.00	US\$975,000 per county that achieves their annual target
2024	6.00		5,850,000.00	US\$975,000 per county that achieves their annual target
2025	6.00		5,850,000.00	US\$975,000 per county that achieves their annual target
2026	6.00		5,850,000.00	US\$975,000 per county that achieves their annual target



## Verification Protocol Table: Disbursement Linked Indicators

DLI 1	DLI 1a. River Chief System Platforms Integrated (Hunan)
Description	Hunan: (a) 122 counties and 14 municipalities have established and maintained functional connection with Provincial RCS Platform, and (b) Provincial RCS Platform is connect to Basin RCS Platform under CWRC. A Functional Connection means a connection between a county- or municipal-level river chief system platform and the provincial river chief system platform, through which the county- or municipal platform: (a) uploads on a monthly basis (or such other frequency established in the Program Implementation Plan for the specific data category) multi-sectoral data to the provincial platform; (b) uploads on a monthly basis (or such other frequency established in the Program Implementation Plan for the specific data category) data from sectoral agencies; and (c) makes selected data publicly-available; all in accordance with data-related protocols and procedures, acceptable to the Bank, as set forth in the Program Implementation Plan.
Data source/ Agency	Provincial River Chief Office
Verification Entity	Verification agency
Procedure	<p><b>Verification:</b> Provincial platform working; Random sample inspection verification of 10% of those information platforms that have completed connection will be conducted to verify if they are connected and perform the three functions; The provincial platform can be verified through the basin platform in 2024, and its maintenance on an annual basis for the remaining period of Program implementation.</p> <p><b>Disbursement</b> is made scalable based on the number of platform connections (with the three functions performed) and will not exceed the target set for that year. The Bank will disburse US\$547,492, respectively, for the Hunan provincial platform connected to basin one and for the subsequent two years for maintaining its functions; for year 1 and 2, US\$116,468.8 will be disbursed to each new connection made (the maximum target for Year 1 and Year 2 is 68 respectively); for year 3 to 5, the bank will disburse US\$56,277.745 to each county and municipal platforms performing the three functions (maximum 136 platforms each year).</p>
DLI 2	DLI 2a. Improved water environment management system in the demonstration sub-basins (Hunan)
Description	Improved integrated water environment management is defined by the following: (1) Integrated water environment management plan adopted by Hunan covering, among others, the Yuan River basin; the plan will need to be acceptable to the Bank, and set out requirements on, inter alia, water environment, water ecology, and related issues, for the Yuan River Basin in Hunan . (2) Basin-level water environment information platform: a Technical Guideline for Data Connection issued



	<p>to improve the river chief system information platform in Hunan. (3) The Ecological Flow Requirements at approved control sections on the mainstream and major tributaries of the Yuan River have been complied with for at least 90% of the days of the CY (excluding the days of Eligible Emergencies). “Eligible Emergencies” means emergencies duly declared by the Program Implementing Entities due to severe droughts, extreme water pollution events [, or such other emergency specified in the Program Implementation Plan, all] in accordance with the Borrower’s and the Program Implementing Entities’ prevailing laws and procedures, specified in the Program Implementation Plan.</p>
Data source/ Agency	Verification report from an independent agency
Verification Entity	Verification agency
Procedure	<p><b>Verification</b> methods are outlined below:</p> <p>(1) Water ecological environment protection plan covering Yuan River Basin is publicly disclosed (as a part of the provincial integrated water and environment management plan for key river basins).</p> <p>(2) Technical Guideline provided by PDWR/PRCO for verification</p> <p>(3) The compliance rate of the mainstream and key tributaries of Yuan River can be verified through the Government line agency's ecological flow monthly monitoring bulletins for key rivers.</p> <p><b>Disbursement</b> will be made upon each target being met.</p> <p>1) The disbursement on the achievement of the Integrated Water and Environment Management Plan for Hunan Province is not specific to a given year, the World Bank will disburse US\$12,811,527.7 on the achievement made before the end of CY26;</p> <p>2) The Bank will disburse US\$12,811,527.7 for the Technical Guidelines issued for data connection by the provincial river chief office;</p> <p>3) From CY24-CY26, the disbursement on the achievements for Ecological Flow requirements are specific to a given year, if the ecological flow requirement is not complied for at least 90% of the calendar year, no disbursement will be made;</p> <p>The three achievements (disbursement linked results) are independent of one another.</p>
DLI 3	DLI 3-1a. Improved township municipal wastewater service system (Hunan)
Description	Improved wastewater service system is defined by: (1) the issuance of integrated wastewater management strategy by each demonstration county; such strategy will need to set out institutional arrangements, financial sustainability, performance-based measures for integrated operation and maintenance, including considerations on employment equity and a workforce roadmap for addressing gender gaps, measures to increase climate resilience and promote low-carbon



	technologies (2) COD Reduced at township-level WWTPs will be measured by influent COD minus discharged COD at the WWTPs (3) Wastewater Treatment Plant and Network Integration Arrangement established. It means an arrangement, acceptable to the Bank, to be established by each Demonstration County in the form of a contract, an agreement or such other instrument set forth in the Program Implementation Plan, specifying the roles, responsibilities and performance standards for the provision of integrated wastewater services by service provider(s) assigned with the operation and maintenance of the wastewater treatment plants and/or the sewage network.
Data source/ Agency	Demonstration counties and PPMO
Verification Entity	Verification agency
Procedure	<p><b>Verification:</b></p> <p>(1) Institutional integration can be verified by valid or official documents of integrated county wastewater collection and treatment services as detailed in the PIP</p> <p>(2) Influent COD and discharge COD can be verified according to automatic real-time monitoring records at environmental authority.</p> <p>(3) County-level integrated and sustainable wastewater management strategies are publicly disclosed at county government websites.</p> <p><b>Disbursements</b> are made according to the formula. Disbursement is made scalable based on the number of counties issuing strategies, establishing integration arrangement and the timing of completion of these actions is indicative. The cumulative total target of COD reduction t (24,420 tons) can be achieved during any time year of Program implementation, and the Bank will make disbursement based on the actual achievement in each calendar year.</p>
DLI 4	DLI 3-2a. Plastic waste (agricultural film) prevented from entering water bodies (Hunan)
Description	The weight of agricultural plastic film collected at collection and treatment network sites (including agro-input sale networks, solid waste sorting centers, recycling centers, and so on) in the demonstration counties.
Data source/ Agency	Demonstration counties and PPMO
Verification Entity	Verification agency
Procedure	<p><b>Verification:</b> 10% of inventories made by agricultural plastic film collection and treatment network sites (including solid waste sorting centers, farm plastic film sale sites, agro packaging material recycling stations, waste recycling stations, and others) in the demo counties will be randomly selected for verification.</p>



	<p><b>Disbursement</b> will be made scalable based on the amount of agricultural plastic film collected from the demonstration counties and the annual targets and timing of completion are indicative. The cumulative total target of agriculture plastic film collected (1,819,000 kg) can be achieved during any time year of Program implementation, and the Bank will make disbursement based on the actual achievement in each calendar year. The disbursement for this DLI is going to be made based on kilograms as the unit of measurement.</p>
DLI 5	DLI 3-3a. Demonstration counties meeting annual targets for manure utilization (Hunan)
Description	Number of demonstration counties meeting the annual target ratio (%) of the livestock and poultry manure (tons) utilized (for organic fertilizer, biomass energy, or other means) by farms to the total amount generated annually (tons) by large-scale pig, cow or chicken farms (or such other farms described in the Program Implementation Plan) in each Demonstration County, as such target ratio is set forth in the Program Implementation Plans.
Data source/ Agency	Demonstration counties and PPMO
Verification Entity	Verification agency
Procedure	<p><b>Verification will be based on large-scale farms in demonstration counties which are defined as below:</b></p> <p>A farm with <math>\geq</math> 500 heads of pigs (annual production), <math>\geq</math> 2,000 egg chickens, <math>\geq</math> 10,000 meat chickens, <math>\geq</math> 50 meat cattle, and <math>\geq</math> 100 dairy cattle</p> <p>During implementation, each year, 10% samples out of all the large-scale animal farms will be randomly selected and verified if they have completed their annual targets according to the MARA reporting system (if possible, pig, chicken and cattle farms must be included)</p> <p><b>Data source:</b> Animal waste production, treatment and resource utilization data can be acquired from the established MARA direct reporting system and can be verified by supporting documents such as manure utilization contracts, agricultural bureau inspection reports and so on.</p> <p><b>Disbursement</b> is made if that the calendar year's target is being met by the individual county.</p>
DLI 6	DLI 1b. River Chief System Platforms Integrated (Jiangxi)
Description	Jiangxi: (a) 100 counties and 11 municipalities have established and maintained a functional connection with Provincial RCS Platform; and (b) Provincial River Chief System Platform is connect to Basin RCS Platform to be established by CWRC A Functional Connection means a connection between a county- or municipal-level river chief system platform and the provincial river chief system platform, through which the county- or municipal platform: (a) uploads on a monthly basis (or



	such other frequency established in the Program Implementation Plan for the specific data category) multi-sectoral data to the provincial platform; (b) uploads on a monthly basis (or such other frequency established in the Program Implementation Plan for the specific data category) data from sectoral agencies; and (c) makes selected data publicly-available; all in accordance with data-related protocols and procedures, acceptable to the Bank, as set forth in the Program Implementation Plan.
Data source/ Agency	Provincial River Chief Office
Verification Entity	Verification agency
Procedure	<p><b>Verification:</b> Provincial platform is functioning; Random sample inspection verification of 10% of those information platforms that have completed connection will be conducted to verify if they are connected and perform the three functions; The provincial platform can be verified through the basin platform in 2024. In Jiangxi, supporting documents to verify the three criteria include: (1) Platform operation follows 'RCO working Rules' issued on 2020 June 1; (2) Data sharing records available for verification complying with the 'Jiangxi River Chief System Information Platform Technical Plan (2021)'; (3) reliable records of public participation, for example, public access records, available for checking</p> <p><b>Disbursement</b> is made scalable based on the number of platform connections (with the three functions performed) and will not exceed the target set for that year. The Bank will disburse US\$197,903, respectively, for the Jiangxi provincial platform connected to basin one and US\$197,900 for each of the subsequent two years for maintaining its functions; for year 1, US\$135,300 will be disbursed to each new connection made with the three functions performed (the maximum target for Year 1 is 58); for year 2, the Bank will disburse US\$120,727 to each county and municipal platforms connected or maintained performing the three functions (maximum 65 platforms); for year 3, the Bank will disburse US\$92,320 to each county and municipal platforms connected or maintained performing the three functions (maximum 85 platforms); for year 4, the Bank will disburse US\$80,900 to each county and municipal platforms connected or maintained performing the three functions (maximum 97 platforms); for year 5, the Bank will disburse US\$70,696 to each county and municipal platforms connected or maintained performing the three functions (maximum 111 platforms each year).</p>
DLI 7	DLI 2b. Improved water environment management system in the demonstration sub-basins (Jiangxi)
Description	Improved integrated water environment management is defined by the following: (1) Integrated water environment management plans means a provincial plan, acceptable to the Bank, to be adopted by each of the Program Implementing Entities that sets out requirements on, inter alia, water quantity, water environment, water ecology, water security for Gan River Basin in Jiangxi. (2) The Water Environment Information platform is established and used by the Provincial



	Environmental Protection Commission (PEPC) with cross-sector and inter-jurisdiction data sharing and public participation for the Gan River Basin (3) The Ecological Flow Requirements at approved control sections on the mainstream and major tributaries of the Gan River have been complied with for at least 90% of the days of the CY (excluding the days of Eligible Emergencies). “Eligible Emergencies” means emergencies duly declared by the Program Implementing Entities due to severe droughts, extreme water pollution events [, or such other emergency specified in the Program Implementation Plan, all] in accordance with the Borrower’s and the Program Implementing Entities’ prevailing laws and procedures, specified in the Program Implementation Plan.
Data source/ Agency	(1) Water Ecological Environment Protection Plan for Gan River Basin is publicly disclosed and accessible on PDEE website (2) PDEE and PEPC records (3) Monthly ecological flow monitoring bulletins
Verification Entity	Verification agency
Procedure	<p><b>Verification</b> methods are outlined below:</p> <p>(1) Water ecological environment protection plan of key river basins (including Gan River Basin) is publicly disclosed.</p> <p>(2) The platform is established with the mentioned functions operational and available for inspection.</p> <p>(3) The compliance rate of the mainstream and key tributaries of Gan River can be verified through the Government's ecological flow monthly monitoring bulletins for key rivers and lakes.</p> <p><b>Disbursement</b> will be made upon each target being met.</p> <p>1) The disbursement on the achievement of Integrated Water and Environment Management Plan for Jiangxi Province is not specific to a given year, the bank will disburse US\$12,000,000 on the achievement made before the end of CY26;</p> <p>2)The disbursement on the achievement of the establishment of a water information platform for the Gan River Basin is not specific to a given year, the Bank will disburse upon achievement being met;</p> <p>3) From CY24-CY26, the disbursement on the achievements for Ecological Flow requirements are specific to a given year, if the ecological flow requirement is failed to be met, no disbursement will be made;</p> <p>The three achievements( disbursement linked results) are independent of one another.</p>
DLI 8	DLI 3-1b. Improved township municipal wastewater service system (Jiangxi)
Description	Improved wastewater service system is defined by: (1) Integrated wastewater management strategy means a county-level strategy, acceptable to the Bank, to be issued by each Demonstration County, that sets out institutional arrangements, financial sustainability, performance based measures for integrated operation and maintenance, including considerations on employment equity and a workforce roadmap for addressing gender gaps, measures to increase climate resilience and promote low-carbon technologies (2) COD Reduced measured by influent COD minus discharged COD at WWTPs (3)



	<p>Wastewater Treatment Plant and Network Integration Arrangement means an arrangement, acceptable to the Bank, to be established by each Demonstration County in the form of a contract, an agreement or such other instrument set forth in the Program Implementation Plan, specifying the roles, responsibilities and performance standards for the provision of integrated wastewater services by service provider(s) assigned with the operation and maintenance of the wastewater treatment plants and/or the sewage network.</p>
Data source/ Agency	Demonstration counties and PPMO
Verification Entity	An independent verification agency
Procedure	<p><b>Verification:</b></p> <p>(1) County-level strategic integrated and sustainable wastewater management plans are publicly disclosed at county-level government websites</p> <p>(2) Influent COD and discharge COD can be verified according to automatic monitoring records at wastewater treatment plants</p> <p>(3) Institutional integration can be verified by valid or official documents of integrated county wastewater collection and treatment services as detailed in the PIP</p> <p><b>Disbursements</b> are made according to the formula. Disbursement is made scalable based on the number of counties issuing strategies, establishing integration arrangements and the timing of completion of these actions is indicative. The cumulative total target of COD reduction t (21,336.46 tons) can be achieved during any time year of Program implementation, and the Bank will make disbursement based on the actual achievement in each calendar year.</p>
DLI 9	DLI 3-2b. Plastic waste (agricultural film) prevented from entering water bodies (Jiangxi)
Description	The weight of agricultural plastic film collected at collection and treatment network sites (including agro-input sale networks, solid waste sorting centers, recycling centers, and so on) in the demonstration counties.
Data source/ Agency	Demonstration counties and PPMO
Verification Entity	Verification agency
Procedure	<p><b>Verification:</b> 10% samples of inventories made by agricultural plastic film collection and treatment network sites (including solid waste sorting centers, farm plastic film sale sites, agro packaging material recycling stations, waste recycling stations, and others) in the demo counties will be randomly selected for verification.</p> <p><b>Disbursement</b> will be made scalable based on the amount of agricultural plastic film collected from the demonstration</p>



	counties and the annual targets and timing of completion are indicative. The cumulative total target of agriculture plastic film collected (1,935,740 kg) can be achieved during any time year of Program implementation, and the Bank will make disbursement based on the actual achievement in each calendar year. The disbursement for this DLI is going to be made based on kilograms as the unit of measurement.
<b>DLI 10</b>	DLI 3-3b. Demonstration counties meeting annual targets for manure utilization (Jiangxi)
<b>Description</b>	Number of demonstration counties meeting the annual target ratio (%) of the livestock and poultry manure (tons) utilized (for organic fertilizer, biomass energy, or other means) by farms to the total amount generated annually (tons) by large-scale pig, cow or chicken farms (or such other farms described in the Program Implementation Plan) in each Demonstration County, as such target ratio is set forth in the Program Implementation Plans.
<b>Data source/ Agency</b>	Demonstration counties and PPMO
<b>Verification Entity</b>	Verification agency
<b>Procedure</b>	<p><b>Verification will be based on large-scale farms in demonstration counties which are defined as below:</b> A farm with ≥ 500 heads of pigs (annual production), ≥ 2,000 egg chickens, ≥ 10,000 meat chickens, ≥ 50 meat cattle, and ≥ 100 dairy cattle</p> <p>During implementation, each year, 10% samples out of all the large-scale animal farms will be randomly selected and verified if they have completed their annual targets according to the MARA reporting system (if possible, pig, chicken and cattle farms must be included)</p> <p><b>Data source:</b> Animal waste production, treatment and resource utilization data can be acquired from the established MARA direct reporting system and can be verified by supporting documents such as manure utilization contracts, agricultural bureau inspection reports and so on.</p> <p><b>Disbursement</b> is made if that year's target is being met by the individual county.</p>

**ANNEX 3. (SUMMARY) TECHNICAL ASSESSMENT**

1. **The Program is designed to address some of the key challenges facing IWRM in China.** Complex problems exist in interregional, intergovernmental, and inter-departmental collaboration, which reduces coordination and thus efficiency of water resources and water environment management. The implementation difficulties of IWRM in China may be ascribed to factors such as an amorphous definition, operational difficulties, departmental conflicts, and lack of defined authority for river basin management.<sup>97</sup> Recent institutional reforms in China are facilitating improved coordination and cooperation. For example, the Yangtze River Protection Law, passed in 2020, provides a legal foundation for basin-specific coordination in China and could be eventually transposed to other major river basins. It is the first legislation for a specific river basin in China and infers specific obligations on the national agencies and provinces, delineates responsibilities, and requires systems for information sharing and establishing of forums for knowledge exchange and decision-making between jurisdictions. The River Chief System (RCS), implemented nationwide in 2016, is another example of an institution that facilitates inter-jurisdictional cooperation. The system is formed by a network of officials, each responsible for their own section of river but coordinated through sub-national and national forums and data sharing platforms that help create a unified view of the basin. The ministerial reform of 2018 and the ministries that resulted are also important steps forward, with complementary responsibilities for water management brought together. The Program supports implementation efforts related to these reforms through its nested hierarchy of activities across three Results Areas and the Central Basin IPF. This annex summarizes the technical assessment, covering the Program's boundary and definition, expenditure framework, diagnostic of key challenges, and suitability of the activities to address these challenges (see full Technical Assessment for further detail).

**Program Boundary**

2. **The PforR will support a subset of activities from the Government's sub-national provincial programs for the YREB as defined in Jiangxi and Hunan Provinces.** Supported activities contribute to ecological protection and water pollution reduction goals contained in the provincial plans that themselves contribute to the overarching national plan. The provincial plans represent the Government's program (in conjunction with the province's 14<sup>th</sup> Five Year Plans) and contain a larger set of activities than the Bank's Program; these activities are described (and screened for high risk activities) in the full Environmental and Social Systems Assessment. The timeline for the PforR is 2022 to 2026, with 2021 the baseline year against which outcomes are measured. The Program's geographic scope and demonstration counties are described in Section II.C.

**Program Expenditure Frameworks**

3. **China has a highly decentralized fiscal structure, with responsibilities for providing public services decentralized to sub-national governments.** As of 2019, sub-national governments accounted for 85.30 percent of total public expenditure. Tax rates for major taxes are set centrally with revenues being shared between different levels of governments. In addition, significant shares of revenues are transferred from the central government to the provinces and from provinces to lower-level governments, both as earmarked and general-purpose grants. These transfers are generally adequate to cover the gap between revenues and recurrent expenditures at the sub-national level. Counties receive transfers from upper-level governments and play a key role in providing public services to the residents. The expenditure responsibility between the central government and provinces and in turn between province and county governments were further delineated during the 13th FYP, helping to increase clarity around SNG mandates and accountability. Notably, the high degree of fiscal decentralization mean that many substantial national programs do not

<sup>97</sup> Wang and Chen. 2020. "River Chief System as a Collaborative Water Governance Approach in China." *Int. J. Water Resour. Dev.* 36: 610–630 ([link](#)).



have an explicit budget framework at the central level; budget is instead allocated at provincial and local levels in alignment with the overarching vision set by the central government.

**4. The Program's hierarchical design is aligned with the responsibilities for ecological and environmental protection are divided at central, provincial, and local levels.** According to the Reform Plan for Delineating the Functions and Expenditure Responsibility between the Central Government and Provinces regarding Ecology and Environment Protection,<sup>98</sup> national-level ecological environment planning, policy and law making, implementation monitoring, management, law enforcement, and capacity building has been classified as a central functionality; prevention and control of water pollution in key basins such as the Yangtze has been classified as shared functionality; and local-level ecological environment planning, policy and law making, implementation monitoring, management, law enforcement, and capacity building, as well as the prevention and control of agricultural and rural pollution, solid waste pollution, chemical pollution, groundwater pollution, and other local air and water pollution, has been classified as local functionality. Following such principles, the Program activities for Results Area 1 and Results Area 2 will be financed by the provincial governments with support of the central government, and the Program activities for Results Area 3 will be financed mainly by county governments with support of the provincial government.

**5. Total Program financing over 2022–2026 is expected to be US\$6,526 million.** An expected US\$6,126 million (93.87 percent) will be funded by the Government and US\$400 million (6.13 percent) will be financed by IBRD loan (see Section II.C). Of the US\$6,126 million government funding, it is estimated that US\$2,519 million will come from Jiangxi Province and US\$3,607 million will come from Hunan Province. The IBRD loan will comprise US\$392.5 million as part of the PforR in support to the two sub-national provincial programs, with US\$196.25 million for each province, and US\$7.5 million for the Central Basin IPF. The Program Expenditure Framework is defined at the Provincial level, through the Jiangxi – River Basin Eco-Compensation Program, and budget lines associated with the Hunan - Integrated Water Environment Management Plan for Dongting Lake Basin.

#### *Jiangxi: River Basin Eco-Compensation Program (RBECP)*

**6. In November 2015, Jiangxi Province initiated the RBECP, defined by the ‘River Basin Ecological Compensation Methods in Jiangxi Province (for Trial Implementation)’ (The Methods).** The Program covered 100 counties in the Poyang Lake basin including its five major tributaries of Gan, Fu, Xinjiang, Rao, and Xiu. From 2016 to 2020, managed by the Jiangxi PDF, about CNY 14 billion (US\$2 billion) of Government expenditure was channeled through the RBECP (averaging around US\$400 million annually, Table 3.1). The amounts grew substantially from 2016 to 2018 and stabilized in 2019 and 2020, despite the negative impacts of tax cuts and COVID-19 on fiscal revenue. According to officials from the Jiangxi PDF, the RBECP funds will reach CNY 3,275 million in 2021 and at least maintain this level during the 14th FYP period and beyond. Therefore, the World Bank team estimates the RBECP funds in 2022 to 2026 will reach CNY 16,375 million, or US\$2,915 million (using an exchange rate of 6.5:1).

**Table 3.1. Scale of River Basin Ecological Compensation Funds in Jiangxi Province (2016–2026)**

	2016	2017	2018	2019	2020	2022–2026 (est.)
Total funding (CNY, millions)	2,091	2,690	3,125	3,118	3,125	16,375
% of total general public budget revenue	0.97	1.20	1.32	1.25	1.25	2.00
% of GDP	0.11	0.13	0.14	0.13	0.12	0.13

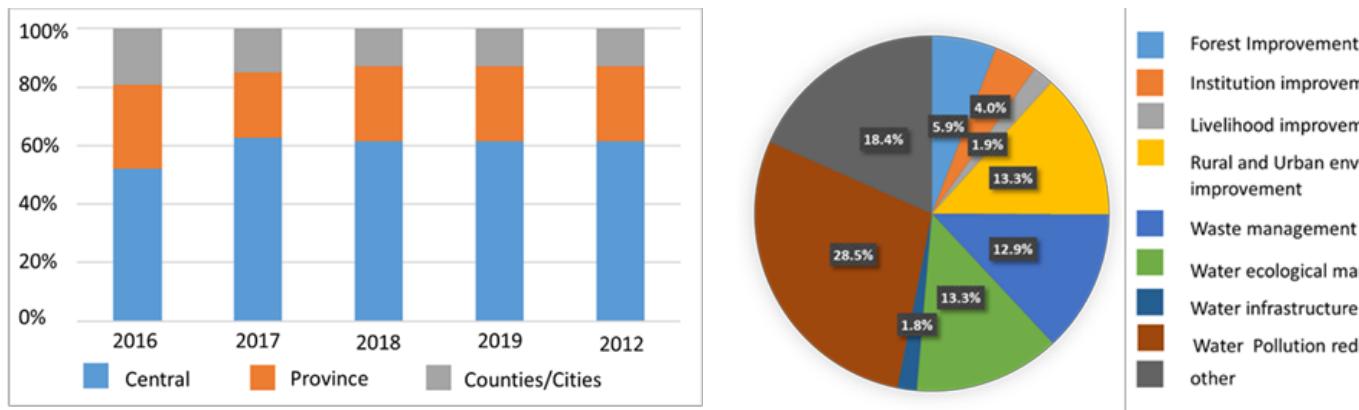
Source: Jiangxi Provincial Department of Finance.

<sup>98</sup> Guo Ban Fa [2020] No. 13 ([link](#)).



7. **The Program has a variety of funding sources and is relatively stable.** Among the US\$2 billion channeled through the program between 2016-20, approximately US\$1.4 billion was a general transfer from the central government and the NKEZP, with the rest coming from the provincial general budget and contributions from the counties (Figure 3.1). Funds allocated by the central government accounted for the highest proportion, more than 60 percent since 2017. This suggests that the source of funds for the RBECP in Jiangxi Province is relatively stable and guaranteed.

Figure 3.1. Funding Sources of RBECP in 2016 to 2020 (left) and Areas of Expenditure in 2018 (right)



Source: World Bank analysis based on Jiangxi PDF data.

8. **Expenditure of the RBECP is aligned with the proposed Program activities.** According to The Methods issued in 2015 and amended in 2018, the RBECP funds should be mainly used for ecological protection, water environment management, improvement of people's livelihoods, and related activities. There is no program-based expenditure classification in China's budget management system, so the expenditures arranged from the RBECP funds cannot be tracked precisely. Based on self-review reports, most local governments (64.95 percent) use the RBECP as earmarked funds, and a small proportion of local governments (27.84 percent) blend the RBECP with other financial sources at the county level. As shown in Figure 3.1 (right), of all the RBECP spending, the expenditures on water pollution reduction accounted for 28.5 percent, water ecological management for 13.3 percent, waste management for 12.9 percent, rural and urban environment improvement for 13.3 percent, forest improvement for 5.9 percent, and institution improvement for 4.0 percent. In general, the expenditure of the RBECP is aligned with the proposed Program activities.

#### Hunan: Integrated Water Environment Management Plan for Dongting Lake Basin

9. **In Hunan, the major Program activities—water pollutant reduction, water ecological restoration and relevant institutional innovation—are covered by the 'Integrated Water Environment Management Plan for Dongting Lake Basin' (2018–2025).** The Plan is financed by several sources of budget funding and covers the entire Dongting Lake Basin. From 2018 to 2020, roughly CNY 14 billion (US\$2.16 billion) was allocated from the central and provincial governments for water environment management in the Dongting Lake Basin. The total funding increased significantly from CNY 4.3 billion in 2018 to CNY 4.9 billion in 2020. This suggests that the source of funds for the Government program in Hunan Province is relatively stable and guaranteed. These funds were primarily from four programs (Table 3.3). In terms of funding source by department, DARA provides the largest proportion (49.34 percent), followed by DWR (37.70 percent) and DHURD (12.97 percent). The total program financing during the 14th FYP (2022 to 2025) is estimated at CNY 23,446 million (US\$3,607 million) based on the average financing for the three years from 2018 to 2020.



**Table 3.2. Scale of Water Environmental Management Funds in Hunan Province (2018–2026)**

	2018	2019	2020	2022–2026 (Estimated)
Total funding (CNY, millions)	4,300	4,807	4,961	23,446
% of total general public budget revenue	1.50	1.60	1.65	1.58
% of GDP	0.12	0.12	0.12	0.12

**Table 3.3. Funding Sources for Water Environmental Management in Hunan 2018–2020 (CNY, millions)**

Funding Source	Agency	2018	2019	2020
Wastewater and Waste (including sludge management)	DHURD	516.91	708.29	598.78
Rural Environment Improvement (including rural waste and wastewater management)	DARA	1,857.12	1,315.24	969.61
Water pollution control and reduction	DWR	1,146.48	1,744.31	2,412.22
Livestock and Poultry Breeding Pollution Management	DARA	779.09	1,039.59	980.05

10. **Final expenditure of the Government program suggests sufficient funding is being provided.** According to the final account data, about CNY 17.6 billion (US\$2,708 million) was spent on water environment management from 2018 to 2020. Almost 66 percent of the expenditures were used for ‘Water Pollution Prevention and Treatment’, which includes expenditures for wastewater treatment plants and pipelines, followed by expenditures for ‘Rural Environment Management’ (34 percent), which includes rural wastewater treatment, waste management, and NPS pollution reduction. Those two expenditures together roughly match the financing amount in the three years (CNY 14.07 billion), indicating sufficient funding sources for the Provincial Program. Provincial commitments toward implementation of the Government program under the 14th FYP (2021 to 2025) amount to CNY 37.12 billion (US\$5.74 billion), of which CNY 7.41 billion (US\$1.14 billion) is allocated toward investments in water supply protection, CNY 21.99 billion (US\$3.40 billion) invested in water pollution prevention and treatment, and CNY 7.72 billion (US\$1.19 billion) invested in water ecological protection and restoration, providing an adequate basis for this PforR.

**Table 3.4. Budget Expenditure on Water Environment Management in Hunan 2018–2020 (CNY, billions)**

Code	Expenditure	2018	2019	2020	Total
2110302	Water Pollution Prevention and Treatment	2.94	4.20	4.48	11.62
2110402	Rural Environment Management	1.72	2.39	1.87	5.98

Source: Hunan Provincial Department of Finance.

### Program Expenditure Efficiency

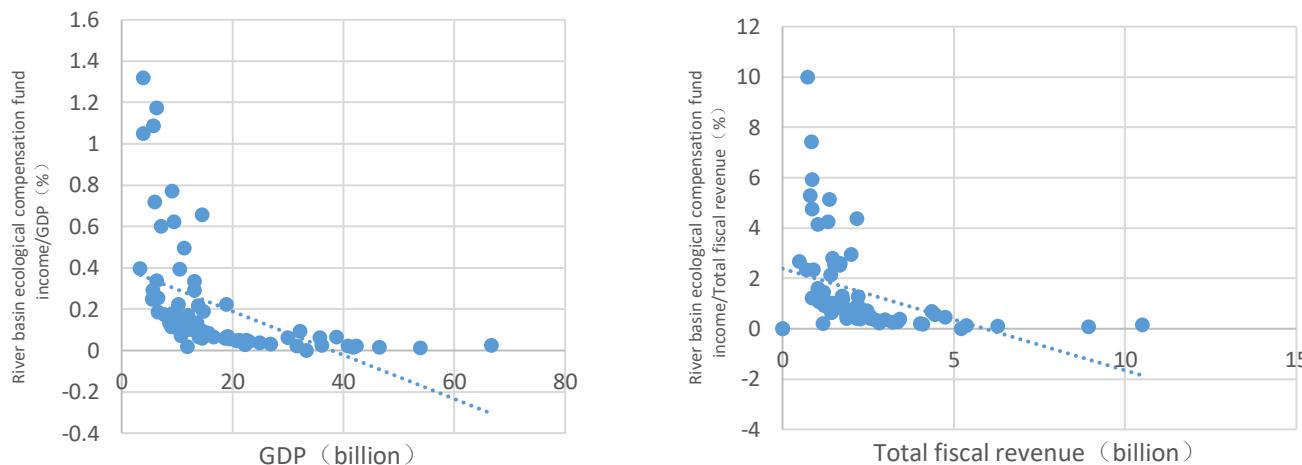
11. **Program expenditure efficiency focuses on whether the Program expenditures can achieve the desired targets and realize value for money.** The following mechanisms are supportive of efficiency:

- *Funding Allocation Rule:* RBECP funds are allocated to different counties according to four sets of indicators: (a) performance in water environment improvement; (b) performance in forest quality improvement; (c) performance in water resource management; and (d) the ecological importance of the county. Each year, evaluation of those indicators is conducted by relevant departments and the results used to determine the counties’ available amounts for the subsequent year. Therefore, the funding allocation rule provides a strong incentive for the counties to achieve the desirable objectives set by the provincial government and helps ensure value for money.



- *Expenditure performance evaluation rules:* In Hunan, expenditure performance evaluation rules have been established and applied to all the earmarked funds, which help ensure value for money. So far, the team has not been able to access the evaluation reports, so the effectiveness of the performance evaluation is still uncertain.
- *Higher Level Government Transfer Mechanism:* Program financing in both provinces is targeted toward lagging regions. According to self-reviewed reports from 76 counties in 9 municipalities in Jiangxi Province in 2018, the amount of the RBECP allocated to each county (cities, districts) has a significant negative correlation with its economic development level and with the level of local government financial resources (see Figure 3.2). The less developed the local economy is, and the less its fiscal revenues are, the greater the amount of RBECP allocated. This is in line with compensation for the foregone development opportunity of less-developed counties to protect their environment and ecology.

**Figure 3.2. Allocated RBECP and GDP (left), Total Fiscal Revenue (right) by County in 2018**



Source: World Bank team based on data from Jiangxi and Hunan PDFs.

## Financial Sustainability

12. **The overall financial situation in Jiangxi and Hunan Provinces appears stable** (Table 3.1 and Table 3.2). The unfolding context associated with COVID-19 is expected to have negative short-lived impact on the Government finance. The budget funding of the Program activities accounts for only about 1 percent of the general budget revenue in Jiangxi (Table 3.1), so financial sustainability is not a major concern. Similarly, in Hunan, the overall financial situation is sound and stable; it can also be seen that the budget funding of the Program activities accounts for only about 1 percent of the general budget revenue in Hunan (see Table 3.6).



## The World Bank

Yangtze River Protection and Ecological Restoration Program (P171644)

**Table 3.5. Financial Situation in Terms of General Public Budget, Jiangxi (CNY, billions)**

	CNY, billions					As Percentage of GDP (%)				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
<b>Expenditure</b>	<b>60.85</b>	<b>63.70</b>	<b>73.73</b>	<b>69.81</b>	<b>86.98</b>	<b>3.31</b>	<b>3.15</b>	<b>3.25</b>	<b>2.83</b>	<b>3.39</b>
<b>Revenue</b>	<b>14.66</b>	<b>24.88</b>	<b>27.98</b>	<b>28.98</b>	<b>29.29</b>	<b>0.80</b>	<b>1.23</b>	<b>1.23</b>	<b>1.17</b>	<b>1.14</b>
Tax	4.05	11.74	13.91	14.26	14.11	0.22	0.58	0.61	0.58	0.55
Non-tax	10.61	13.14	14.07	14.72	15.17	0.58	0.65	0.62	0.60	0.59
<b>Transfer from upper-level govts</b>	<b>213.33</b>	<b>231.06</b>	<b>244.82</b>	<b>269.04</b>	<b>224.97</b>	<b>11.60</b>	<b>11.43</b>	<b>10.78</b>	<b>10.91</b>	<b>8.76</b>
Tax rebate	20.44	25.96	25.96	25.96	—	1.11	1.28	1.14	1.05	—
General transfer	128.81	138.02	150.21	224.24	—	7.00	6.83	6.61	9.09	—
Earmarked transfer	65.34	68.86	69.92	22.55	—	3.55	3.41	3.08	0.91	—
(-) Transfer to upper-level government	1.26	1.76	1.26	3.70	2.21	0.07	0.09	0.06	0.15	0.09
<b>Transfer from lower-level govts</b>	<b>-179.44</b>	<b>-208.34</b>	<b>-216.45</b>	<b>-238.24</b>	<b>-192.63</b>	<b>-9.76</b>	<b>-10.31</b>	<b>-9.53</b>	<b>-9.66</b>	<b>-7.50</b>
Transfer from cities and counties	8.41	4.98	5.05	9.82	6.91	0.46	0.25	0.22	0.40	0.27
(-) Transfer to lower-level governments	187.85	213.32	221.50	248.06	199.54	10.22	10.55	9.75	10.06	7.77
<b>Transfer from general fund budget and others</b>	<b>1.54</b>	<b>1.72</b>	<b>4.92</b>	<b>6.76</b>	—	<b>0.08</b>	<b>0.09</b>	<b>0.22</b>	<b>0.27</b>	—
<b>Overall balance</b>	<b>-10.76</b>	<b>-14.38</b>	<b>-12.46</b>	<b>-3.26</b>	—	<b>-0.59</b>	<b>-0.71</b>	<b>-0.55</b>	<b>-0.13</b>	—
<b>Change in cash balance</b>	<b>4.69</b>	<b>4.22</b>	<b>3.01</b>	<b>-0.73</b>	—	<b>0.25</b>	<b>0.21</b>	<b>0.13</b>	<b>-0.03</b>	—
<b>Withdrawal from reserve</b>	<b>-0.71</b>	<b>1.54</b>	<b>0.92</b>	<b>-3.73</b>	—	<b>-0.04</b>	<b>0.08</b>	<b>0.04</b>	<b>-0.15</b>	—
<b>Financing</b>	<b>6.78</b>	<b>8.62</b>	<b>8.53</b>	<b>7.73</b>	—	<b>0.37</b>	<b>0.43</b>	<b>0.38</b>	<b>0.31</b>	—
Borrowing	64.77	53.82	53.15	42.03	36.60	3.52	2.66	2.34	1.70	1.42
Debt amortization	57.99	45.20	44.62	34.31	—	3.15	2.24	1.96	1.39	—

*Notes and Source:* Jiangxi PDF. For 2020, the general public budget expenditures and revenues are budget execution figures instead of final accounts figures, and the other figures are from adjusted budget. For other years, all are final accounts figures.

**Table 3.6: Financial Situation in terms of General Public Budget, Hunan (CNY Billion)**

	Billion CNY				As Percentage of GDP (%)			
	2016	2017	2018	2019	2016	2017	2018	2019
<b>Expenditure</b>	<b>55.69</b>	<b>63.82</b>	<b>75.12</b>	<b>79.55</b>	<b>1.81</b>	<b>1.89</b>	<b>2.07</b>	<b>1.99</b>
<b>Revenue</b>	<b>42.31</b>	<b>48.12</b>	<b>51.44</b>	<b>51.93</b>	<b>1.37</b>	<b>1.42</b>	<b>1.42</b>	<b>1.30</b>
Tax	32.08	34.59	38.14	37.83	1.04	1.02	1.05	0.95
Non-tax	10.23	13.53	13.30	14.10	0.33	0.40	0.37	0.35
<b>Transfer from Upper-Level Governments</b>	<b>310.28</b>	<b>325.53</b>	<b>346.61</b>	<b>362.69</b>	<b>10.06</b>	<b>9.62</b>	<b>9.54</b>	<b>9.09</b>
Tax Rebate	27.55	30.93	30.94	30.93	0.89	0.91	0.85	0.78
General Transfer	181.62	196.18	214.21	307.71	5.89	5.80	5.90	7.71
Earmarked Transfer	104.30	101.94	104.19	30.73	3.38	3.01	2.87	0.77
(-) Transfer to Upper-level Government	3.19	3.52	2.73	6.68	0.10	0.10	0.08	0.17
<b>Transfer from Lower-Level Governments</b>	<b>-316.92</b>	<b>-323.14</b>	<b>-336.83</b>	<b>-355.08</b>	<b>-10.27</b>	<b>-9.55</b>	<b>-9.27</b>	<b>-8.90</b>



	Billion CNY				As Percentage of GDP (%)			
	2016	2017	2018	2019	2016	2017	2018	2019
Transfer from cities and counties	6.46	6.23	11.44	11.10	0.21	0.18	0.31	0.28
(-) Transfer to Lower-Level Governments	323.38	329.37	348.27	366.18	10.48	9.74	9.59	9.18
<b>Transfer from GFB and Others</b>	<b>3.51</b>	<b>1.83</b>	<b>0.30</b>	<b>0.35</b>	<b>0.11</b>	<b>0.05</b>	<b>0.01</b>	<b>0.01</b>
<b>Overall Balance</b>	<b>-16.51</b>	<b>-11.48</b>	<b>-13.60</b>	<b>-19.66</b>	<b>-0.54</b>	<b>-0.34</b>	<b>-0.37</b>	<b>-0.49</b>
<b>Change in cash balance</b>	1.42	-3.96	-1.44	-1.07	0.05	-0.12	-0.04	-0.03
<b>Withdrawal from Reserve</b>	-2.13	-1.31	-1.97	2.84	-0.07	-0.04	-0.05	0.07
<b>Financing</b>	<b>17.22</b>	<b>16.75</b>	<b>17.01</b>	<b>19.89</b>	<b>0.56</b>	<b>0.50</b>	<b>0.47</b>	<b>0.50</b>
Borrowing	186.90	119.24	110.20	122.22	6.06	3.52	3.03	3.06
Debt Amortization	169.68	102.49	93.19	102.33	5.50	3.03	2.57	2.57

Notes and source: Department of Finance, Hunan Province. The final accounts for 2020 are not available at time of writing.

## Technical Soundness

13. **The technical assessment confirmed the soundness of the activities and their connection to the Program's desired outcomes.** Three distinct but complementary sets of activities are included in the PforR design: improvement of institutional mechanisms for coordination around ecological protection and water pollution control (Results Area 1); enhanced integrated water environment planning and ecological flows in target sub-basins (Results Area 2); and activities that contribute to reduced pollutants entering waterways (Results Area 3). These are supported by the Central Basin IPF that will provide (a) overall coordination; (b) technical guidance to provinces to ensure alignment across the basin related to key activities, such as the guidelines for the evaluation of river health and ecological flows, strategies for total phosphorous pollution prevention and control, and recommendations for the systematic protection and restoration of Poyang Lake and Dongting Lake; and (c) inter-jurisdictional information and data sharing.

### *Results Area 1: Improving Institutions and Innovations for Integrated River Basin Management*

14. **Complex problems exist in interregional, intergovernmental, and inter-departmental collaboration in water resources management, which reduces the coordination of water resources and water environment management.** The inefficiency of IWRM and the difficulty of implementing it in China may be ascribed to factors such as amorphous definition, operational difficulty, departmental conflicts, and lack of authority in river basin management.<sup>99</sup> Institutional reforms in China are facilitating improved coordination and cooperation but require further operationalization and deepening to deliver on their potential.

15. **A focus of the Program is the RCS, a key institutional innovation that aims to address these challenges.** Since its formalization nationwide in 2016,<sup>100</sup> more than 1.2 million river and lake chiefs have been appointed at provincial, municipal, county, and township, and village levels. Each part of a river and lake is assigned to a particular official who is responsible for addressing coordination and cooperation between departments and regions. There are six main tasks focused on (a) water resources protection; (b) shoreline management; (c) water pollution prevention and control; (d) water environment management; (e) restoration of water ecology; and (f) law enforcement. The results are included in the administrative assessment of the officials in charge, providing career-related incentives and accountability mechanisms, within a system that works across agency lines. River chiefs receive assistance and support from the River Chief Office, which often sits within the related water agencies at the respective levels. The office is composed of chiefs and key staff from major related departments. Regular river chief meetings bring sector department leaders together for consultation and decision-making.

<sup>99</sup> Wang, Y. H., and X. N. Chen. 2020. "River Chief System as a Collaborative Water Governance Approach in China." *Int. J. Water Resour. Dev.* 36: 610–630.

<sup>100</sup> State Council and the CPC Central Committee. 2016. "Opinions on Fully Promoting the River Chief Mechanism."



16. **Information management platforms are required under the national guidelines and are being established at various levels of government to support RCS implementation and operation.** These range from relatively simple administrative systems to more sophisticated information platforms with decision-support functions supported by physical monitoring networks and public participation.<sup>101</sup> A national pilot-level platform has been developed, and a range of provincial and local level platforms are being implemented on a trial basis. However, these often have limited functionality and are only partially connected across different jurisdictions and levels of government.

17. **A basin wide coordination mechanism for the RCS along the Yangtze River was proposed by the CWRC through 'Working Guidelines' issued on July 26, 2021.** When operating, the mechanism will bring together the 19 Provincial RCOs and the CWRC for consultation and decision-making, including through a working conference organized by CWRV. The coordination mechanism is supported by an office set up at the CWRC, headed by the Director of the CWRC RCO. Working guidelines outline the mechanism's intended key tasks, including research and policy development, data collection and monitoring, sharing of experience, and public outreach.<sup>102</sup> Design of the basin-wide RCS coordination mechanism was supported through the World Bank-financed TA project 'Promoting Economic Reform and Capacity Building' and its establishment included as part of the CWRC's plan during the 14th FYP period for implementing the Yangtze River Protection Law.

18. **An information management platform is to be established under the basin RCS coordination mechanism.** The working guidelines for the basin RCS coordination mechanism requires each of the Provincial RCOs to strengthen cooperation and coordination through the joint development, co-management, and sharing of information. Under the provision of the working guidelines, the CWRC is to lead in establishing an information management system for the Yangtze River Basin RCS. Each of the provinces is required to establish their provincial-level platforms, which should be synchronized for basin-wide information-sharing. Each of the members of the coordination mechanism is required to provide continuously updated data on sectoral planning (water, mining, environment, waterways), water resources, water quality, water ecology, water-related emergencies, and pollution discharges, among others. Among other uses, these data are important for climate-informed management decisions, policies and strategies including water management and pollution control under flow extremes. The integration of the basin and provincial systems – the latter also drawing on the local level systems – intends to eventually provide a comprehensive information basis for IWRM from county to basin level.

19. **The RCS also provides an opportunity to promote engaging the public in river protection and water pollution control.** The River Chiefs are active in organizing public awareness campaigns and education programs; appointing nongovernmental river chiefs, inspectors, and cleaners; supporting volunteer groups; and setting up hotlines and mobile applications for citizen engagement and feedback on the performance of their river chiefs.<sup>103</sup> These efforts are to be

<sup>101</sup> For sophisticated platforms data include: (a) administrative functions relating to the river chiefs (river patrols, water pollution and illegal natural resources exploitation supervision, reporting and resolution coordination, public participation); (b) water quantity data (precipitation, water level, flow, hydrology information); (c) water quality data (temperature, pH, dissolved oxygen, conductivity, turbidity, ammonia nitrogen, total phosphorus, total nitrogen, permanganate index, fluoride), (d) monitoring of soil and water conservation, illegal construction and solid waste dumps; and (e) drainage and solid waste management (drainage networks, conveyance systems, sewage pipelines and pump stations). See full technical assessment for more details.

<sup>102</sup> Key tasks for the mechanism stipulated in the working guidelines include: (a) conducting studies to support planning of transboundary rivers and lakes; (b) implementing the water resource management mechanism; (c) jointly promoting shoreline protection of the Yangtze River; (d) jointly promoting water pollution reduction and eutrophication management; (e) jointly promoting river and lake ecological protection and restoration; (f) jointly enforcing relevant regulations and policies; (g) establishing a monitoring network covering hydrology, water quality, water ecology, and so forth; (h) establishing information sharing and river health assessment; (i) conducting joint research on key issues including water ecology restoration technologies, horizontal eco-compensation and so forth; and (j) conducting information, education, and communication (IEC) activities and improving public awareness.

<sup>103</sup> For instance, the Guangzhou Water Affairs Bureau as a public WeChat account for Guangzhou water control complaints, through which citizens report illegal activities or dirty rivers and lakes online and receive corresponding cash bonuses. Similarly, Deqing County, Huzhou City, Zhejiang Province, initiated the Ecological Green Currency mechanism, which provides rewards for reporting.



supported by the basin-wide RCS coordination mechanism, the working rules for which requires the 19 provinces and the CWRC to promote public awareness and participation of the river and lake chief systems and the Yangtze River Protection Law, to enhance the public's sense of responsibility and participation in river and lake protection. Public participation also provides an opportunity to increase community awareness of climate change issues—including increased flood and drought risks, water scarcity, and water quality implications. However, there are currently no systematic guidelines to structure engagement of the public in efforts around ecological protection, water pollution control, and climate resilience for the Basin overall or in many Basin jurisdictions.

**20. The challenges and opportunities identified for strengthening mechanisms for coordination and collaboration have informed Results Area 1 and the Central Basin IPP.** The RCS can be improved by the following: (a) Accelerated implementation of the basin-level mechanism and working conference for better coordination between the river basin organization and the provinces; (b) Integration and expansion of the data monitoring and information sharing platforms for a holistic and real-time understanding of biophysical conditions and river chief operations; (c) Deployment of advanced technologies such as remote sensing that can complement manual river patrols and provide insights for inter-jurisdictional decision-making; (d) Use of third-party monitoring and verification to strengthen the accountability of the river chiefs; (e) Development of guidance for public engagement in the form of manuals to share approaches and lessons across jurisdictions, including for climate change awareness; (f) Greater focus on gender balance in river chief appointments, both paid and voluntary. These actions have informed the construction of DLI.1 and other parts of the Results Framework.

#### *Results Area 2: Advancing Ecological Protection through Integrated River Basin Management*

**21. Functional riverine ecosystems and their biodiversity require that sufficient water is allocated for environmental purposes.<sup>104</sup>** China has conducted ecological flow practices for around 40 years but in limited ways. In April 2020, the MWR issued an Opinion<sup>105</sup> aiming to strengthen ecological flow practices by determining the ecological flow targets for important rivers and lakes, establishing ecological flow monitoring and regulation systems, and setting targets to ensure ecological flows for the mainstream and major tributaries of the Yangtze River by 2025. The Opinion required the river basin commissions and local water departments to consider the ecological flow requirements as rigid targets in water allocation. In July 2020, the MWR further announced a Working Plan,<sup>106</sup> which set targets to determine ecological flows for important rivers and lakes including those of the Yangtze River Basin. Determination of ecological flow requirements for 52 rivers and lakes in the Yangtze River Basin was included in the tasks for the CWRC from 2020 to 2022, including Xiang, Zi, Yuan, and Li Rivers in Hunan and the Gan, Fu, and Xin Rivers in Jiangxi. Jiangxi and Hunan are responsible for determining the ecological flows for Poyang Lake and Dongting Lake.

**22. The Yangtze River Protection Law commits governments to increasing ecological water management in the Yangtze River Basin (Article 31).** The law requires water resources department to include the ecological water volume in the annual water allocation plan to meet basic ecological flow demand of rivers and lakes, ensure ecological flow during the dry season and fish spawning period, and to maintain water levels in important lakes. Jiangxi and Hunan provinces have identified ecological flow requirements based on minimum flow methods,<sup>107</sup> as well as augmented flow requirements for some specific river segments flowing through important ecological areas. Regarding the Program's sub-basins, the overall water allocation plan for Hunan's Yuan River was approved in November 2020,<sup>108</sup> and the plan for Jiangxi's Gan

<sup>104</sup> Arthington, et al. 2018. "The Brisbane Declaration and Global Action Agenda on Environmental Flows." *Frontiers in Environmental Science* 6 (45) ([link](#)).

<sup>105</sup> MWR. 2020. "Guiding Opinion on Determining and Ensuring Environmental Flows of Rivers and Lakes." ([link](#))

<sup>106</sup> MWR. 2020. "Working Plan to Determine Ecological Flow for Important Rivers and Lakes." ([link](#))

<sup>107</sup> Two types of minimum flow methods are typically applied: (a) 10 percent of long-term average flow and (b) the average flow of the driest month with 90 percent exceedance probabilities (the Q90 approach).

<sup>108</sup> DWR. 2019. "Ecological Flows for Critical Cross-sections in Hunan Province." ([link](#))



River is under preparation. However, such plans only establish the water quota at the provincial level and require a further allocation to the county level.

23. **The effectiveness of ecological flows would also benefit from consideration of intra-annual variations.** More detailed water allocation plans are needed to determine the annual, seasonal, and monthly allocations required to ensure ecological function, which rely on particular water cycles as much as minimum flows. This is particularly the case in the context of climate change, which is expected to cause greater variability in flows and place pressure on aquatic ecosystems that compounds other pressures such as human use and development. Water dispatch plans are required to manage basin water use, jointly operate reservoirs, and respond to the emergencies of droughts and water contamination disasters, balanced with these ecological needs. Ecological outcomes would also benefit from consideration of both water quantity and quality requirements in allocation decisions.

24. **Actions have been identified based on the assessment to strengthen ecological flows and integrated river basin water environment management under the Program.** These include: (a) Water resources allocation to the county level as the basis for water withdrawal licensing; (b) Ecological flows implemented and monitored against minimum performance standards; (c) Tailored river/lake ecosystem health evaluation guidelines developed by the provinces to guide the determination of ecological flows, which will then be used for ecological flow supervision in the demonstration sub-basins (this aims to extend minimum flow type ecological allocations for broader consideration of river ecosystem health considerations in line with international practice); (d) An inter-provincial river chief cooperation mechanism to strengthen integrated cross-border water environment management in the Yuan river;<sup>109</sup> and (d) A dedicated ecological environment management information platform for the Gan river, covering both water pollution control and ecological protection and restoration, with decision support function for more effective operational management and supervision. These actions inform the design of DLI.2 and other parts of the Results Framework.

### *Results Area 3: Reducing Water Pollution and Transmission of Plastic Waste*

25. **The Yangtze River Protection Law requires governments to address point source and non-point source pollutants.** Article 47 requires counties to improve urban and rural wastewater collection and treatment capacities, clarify entities responsible, and implement unified management of systems. Similarly, Article 48 commits governments to strengthening the prevention and control of agricultural non-point source pollution, with the use of organic fertilizers to be promoted and agricultural waste such as agricultural plastic film to be appropriately disposed. Support for counties under Results Area 3 aims to address these priorities with a focus on phosphorus pollution, which has become the primary pollutant in many areas of the Yangtze. The Yangtze River is among the top five major rivers globally most severely affected by phosphorus<sup>110</sup> with significant sources including fertilizer use, livestock and poultry operations, and wastewater. The technical assessment found that phosphorus concentrations spike to levels beyond prescribed limits more frequently than other pollutants in the Program's sub-basins.<sup>111</sup> Actions further support reduction of COD from wastewater and agricultural plastics.

### *Improving Point Source Pollution through Improved Wastewater Management*

26. **China has invested substantially in its wastewater infrastructure systems since 1996 and achieved nearly universal coverage.** The emphasis of China's wastewater treatment now is to improve the quality of services as well as the efficiency of investment by enhancing financial viability and leveraging private sector participation. Wastewater collection is separated from wastewater treatment in many localities, resulting in large portions of the collection network

<sup>109</sup> The mainstem of the Yuan river is shared between Hunan and Guizhou Provinces.

<sup>110</sup> Mckonnen and Hoekstra. 2017. "Global Anthropogenic Phosphorus Loads to Freshwater and Associated Grey Water Footprints and Water Pollution Levels: A High-Resolution Global Study." *Water Resources Research* 54 (1): 345–358 ([link](#)).

<sup>111</sup> Technical assessment of water pollution is supported by the World Bank's Poyang Lake Water Pollution and Plastic Study, supported by ProBlue, in partnership with Tsinghua University. The study examines nutrient and plastics pollution concentrations, transmission pathways, hotspots, and policy options for their reduction.



lacking sufficient funding for maintenance, which leads to low pollution concentration of intake water of WWTPs and idle capacity of WWTPs.<sup>112</sup>

**27. Assessment in demonstration counties reveal that almost all the counties have sufficient wastewater treatment capacity, but face efficiency and management challenges.** Challenges include: (a) the domestic wastewater management services are fragmented, with the treatment plants being managed by one entity, mostly outsourced private sector operators, while the sewer network is managed by the county bureau or county-level public entity or company, resulting in a lack of accountability for ensuring service quality; (b) influent concentrations (Biological Oxygen Demand [BOD] and COD) to the treatment facilities are usually low as a result of the combined effect of incomplete collection networks and household connections, mixed wastewater and stormwater drainage, and poor conditions of the existing network due to deferred maintenance, resulting in many WWTPs operating at a low efficiency level; and (c) a lack of sustainable financing with the costs of the domestic wastewater management services covered from two sources: (i) a wastewater service charge paid by the customers that typically covers only the outsourced treatment service provider who is responsible for the O&M of the WWTP and (ii) subsidies through budget allocations from the county finances, which are used for O&M of the wastewater collection system and often limited to urgent repairs. The assessment also found gender gaps among workers in the sector.<sup>113</sup>

**28. In response to these challenges, the Program supports actions to strengthen integrated wastewater management services.** Actions include: (1) Development of integrated wastewater management strategy in demonstration counties, including financial sustainability, integrated O&M, employment equity, workforce roadmap for women and climate resilience and low-carbon technologies; (2) Increased COD reduction (influent COD minus discharged COD) at township-level wastewater treatment plants; and (3) Integrated institution agreements: one entity responsible for O&M of sewer network and wastewater treatment plants. These actions define the design of DLI.3-1. Resulting improvements of systems' efficiencies (both plants and their sewerage networks) are expected to have GHG mitigation benefits in addition to reduced water pollution.

#### *Reducing Plastic Waste Entering Waterways*

**29. The Yangtze River is a major contributor to global marine plastic pollution.** The Yangtze River Basin reportedly transmits the largest total volume of marine plastics of any of the world's rivers, with an estimated 0.33 (range 0.31–0.48) million tons of plastic discharged into the East China Sea annually.<sup>114</sup> The Government is tackling the plastic pollution issue through investments in solid waste management, bans on the import of waste recycling materials, bans on some single-use plastic items, regulations on the use of agricultural plastic film, improved monitoring, reporting and supervision, and promotion of eco-design and material recycling, among other measures.

**30. Agricultural film is a major contributor to riverine and marine plastic pollution due to the lack of management system, that is, collection and recycling, in rural areas.** China has the world's largest agricultural film consumption (2.6 million tons in 2015) and land coverage (around 20 million ha).<sup>115</sup> The recycling rate of agricultural film is less than two-thirds.<sup>116</sup> While agricultural film has important benefits in terms of water efficiency and crop growth, uncollected plastic film waste in fields is negatively impacting land productivity. In 2017, MARA issued 'Action Plan for Recycling Agricultural

<sup>112</sup> See NDRC and MHURD. 2020. "14th Five-year development plan on municipal wastewater treatment and reuse." The plan points out that an insufficient or ill-maintained wastewater network poses a challenge for China's wastewater sector.

<sup>113</sup> The team collected data from four rural wastewater treatment utilities. These were found to have policies for equal recruitment and pay, as well as equal training opportunities for both male and female staff. However, on average, female staff earned 25 percent less than male staff, including for women in managerial positions. See full technical assessment for detail.

<sup>114</sup> Lebreton, et al. 2017. "River Plastic Emissions to the World's Oceans." *Nature Communication* 8: 15611.

<sup>115</sup> According to Prof. Yan Rongchang from the Academy of Agricultural Sciences ([link](#)).

<sup>116</sup> MARA (2017). Notice of the Ministry of Agriculture on Issuing the "Agricultural Film Recycling Action Plan. ([link](#))



Film' setting the target of recycling 80 percent of agricultural film by 2020. Hunan and Jiangxi are major users of agricultural plastics<sup>117</sup> and have set targets for collection and recycling in line with the central government's targets.<sup>118</sup>

**31. The two main challenges are to provide adequate financial incentives to farmers for collection, and to establish financially sustainable channels for recycling.** The Program will provide support for activities that address these challenges in support of high levels of collection and recycling in demonstration counties (see full technical assessment for county-level baselines and targets). Agricultural plastic film collection and statistics systems will be established with inventories made by the collection sites. Farmers, especially large-scale farmers, will be required to use standard agricultural plastic films that can be recycled and reused. The Program (under Results Area 2) will further support development of a Provincial M&E protocol for agricultural film collection and recycling in Jiangxi, as well as support the implementation of the Provincial Implementation Plan for Strengthening Plastic Pollution Management in Hunan.

#### *Addressing Non-Point Source Pollution through Manure Management*

**32. China's livestock and poultry subsectors is a major contributor of non-point sources of pollution.** Animal manure production amounts to nearly 4 billion tons per year in China,<sup>119</sup> with untreated manure and wastewater from livestock operations delivering pathogens, nutrients (nitrogen and phosphorus), heavy metals, and drugs (antibiotics) into waterways. According to the Second National Pollution Source Consensus (2010), COD discharge from the Livestock and Poultry Breeding Industry amounted to 10.01 million tons, contributing 93.76 percent of agricultural pollution; total nitrogen and total phosphorous discharges amounted to respectively 0.60 million and 0.12 million tons, contributing 42.14 and 56.46 percent of agricultural pollution. Cognizant of these and other challenges within the agriculture sector, MARA issued the 2017 Notice of Five Actions for Green Development of Agriculture, including measures for: (a) improving management of livestock manure; (b) replacing chemical fertilizers with organic fertilizers; (c) encouraging straw treatment; (d) recycling agricultural plastic film; and (e) aquatic biodiversity protection.

**33. Collection, separation, treatment and re-use or safe disposal of manure is critical for addressing these pollution challenges, and also contributes to GHG emissions mitigation.** The collection and separation of animal wastes, proper disposal of treated solids and liquids, and recycling (composting organic fertilizers, or using for waste to energy in biogas facilities) can have significant benefits. The resource utilization rate of animal manure in both Hunan and Jiangxi reached their target of 75 percent in 2020. Treated animal manure was mainly used as a replacement for chemical fertilizers (which could further reduce agricultural NPS pollution), as well as for producing gas and electricity, both pathways are effective at reducing GHG emissions relative to manure disposal in waterways or anaerobic ponds. The 14th Five-Year Period calls for (a) further increasing the resource utilization rate to 85 percent; (b) establishing a system of animal waste treatment, processing, and returning to the field as fertilizer; and (c) attracting private financing through innovative modes, including public-private partnership and other mechanisms. The county-level utilization ratio will be measured on farm sites as a sub-DLI (DLI 3.3), with the aim of gradually increasing the level of animal manure utilization in selected counties and maintaining the level of utilization where it is already high (no less than 80 percent). This intervention will be complemented by the development and dissemination of a provincial agricultural NPS pollution management best practice guidelines. Details on county-level production, utilization, and utilization target rates are presented in the full Technical Assessment.

#### **Gender Gap Analysis and Indicators**

**34. During the technical consultations with stakeholders, discussions were held followed by a survey and rapid assessment to understand the gender issues around women's participation in local river and lake management, especially**

<sup>117</sup> For example, Hunan recorded a total of 83,792 tons of agricultural plastics in 2019, ranking 12<sup>th</sup> nationally and 5<sup>th</sup> in the YREB.

<sup>118</sup> For example, Hunan has set a target for 80 percent recycling rate of agricultural film by the end of 2020 and almost complete recycling by 2025 with a complete agricultural film producing, selling, using, recycling, and management system established province wide. This will be led by DARA. See Hunan PDRC and DEE. 2020. "Implementation Plan to further strengthen plastic pollution control."

<sup>119</sup> Based on statements by the Ministry of Agriculture ([link](#)).

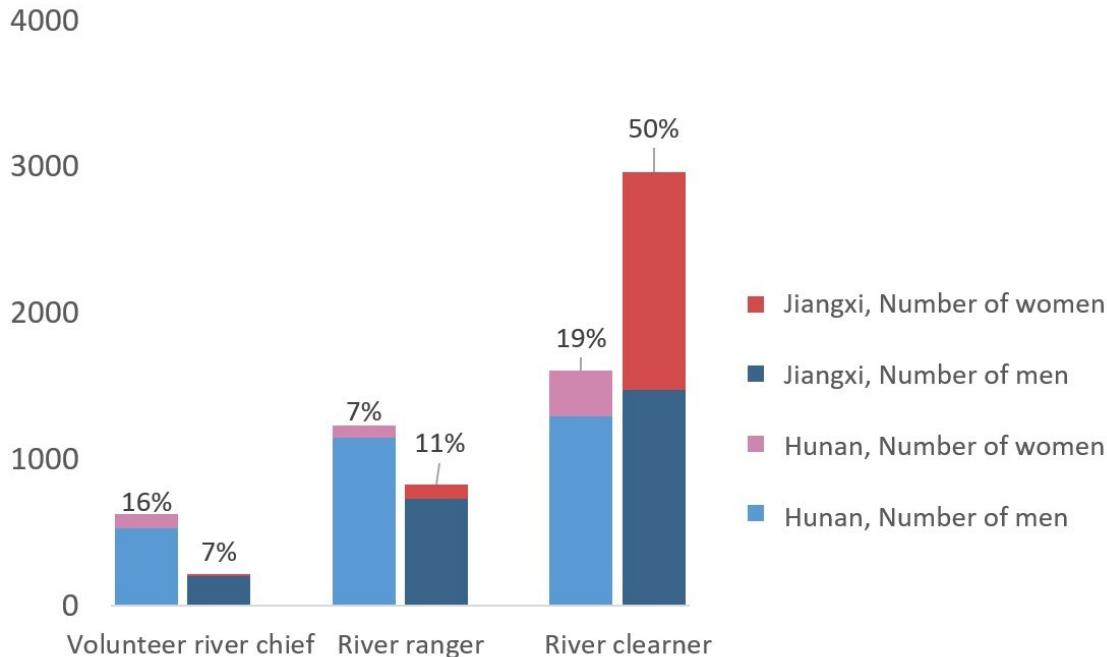


the River Chiefs System (RCS), and women's job opportunities at local wastewater treatment utilities. Preliminary data was collected from the demonstration counties and the gender results chain below has been developed based on an analysis of the data.

35. **There are opportunities to close gender gaps in river and lake management.** Based on data collected by the Bank team from counties in Jiangxi and Hunan, women are underrepresented as river chiefs with a female to male ratio of 1:5 (Figure 3.3). An extreme example is seen in Yuanling city, in which the proportion of male to female river chief is 13 to 1. In Milo County, less than 4 percent of the river cleaners are women. On average, 7 percent of river rangers and 19 percent of river cleaners are women. Considering the types of investments prioritized under the project, where women may place greater influence on raising the public awareness and mobilizing more effective public engagement as well as communication, the smaller number of women in these roles limit the degree to which communities internalize behavior change on clean water and pollution control. In the six demonstration counties in Jiangxi, the situation is similar for civil river chiefs and river rangers, with respectively 7 percent and 11 percent of them being women. However, there is a much better gender balance for the river cleaners in Jiangxi, with about 50 percent of the work done by women.

36. **Gaps also exist at local water treatment utilities in both equal access to jobs and equal pay for the same types of jobs.** The rapid assessment found that women account for less than 40 percent of the technical positions and about one-third of the managerial positions. In addition, female staff earn a quarter less than male staff in average in Hunan. This is particularly true for women at managerial positions. Disaggregated data by location further shows diversity among the utilities. These rural water treatment utilities reportedly have policies for equal recruitment and pay, as well as equal training opportunities for both male and female staff. However, the identified issues in equal employment opportunities and equal pay indicate gaps in the quality and implementation of these policies, which have a direct impact on the ability of women to gain experience and participate economically in emerging job opportunities in water sector and to advance to management positions.

**Figure 3.3. Proportion of Women in River Management in Jiangxi and Hunan**



Source: World Bank analysis based on county data.



37. **Gender Action and Indicators.** The Program includes activities to address key gender gaps in women's participation and decision-making roles in both the river chief system and the wastewater utilities. Under Result Area 1, a provincial level, public engagement manual is proposed to be developed for the River Chief System as an Intermediate Indicator. This will include provisions to increase gender inclusion and build women's capacity to engage and serve in citizen river chief positions, collaborate with women's organization to provide technical training, mentoring, and study tours to women RCs and increase women's capacity and their engagement in local river management decision-making. It will include provisions for collaborating with women's organizations to organize public awareness campaigns on the importance of women's contributions to river management decision making; document women's participation in public decision-making on river management and track the proportion of women as citizen river chiefs in demonstration counties. Implementation of the Manual is expected to contribute to the Program's target of increasing the participation of women from around 11 percent to 30 percent in the demonstration counties (IO5). These provincial level activities are to be complemented by a basin-level case study to shed further light on the basin-level baseline and drivers of the gender gap, raise awareness among Government officials within the basin on these gaps, and draw lessons to fine-tune the program actions to augment female voice and agency in the RCS system. Under Result Area 3, help the wastewater management utilities in developing and implementing a gender-inclusive workforce plan that includes provisions to address obstacles in attracting, recruiting, retaining, and advancing women as part of the wastewater management strategies to be developed by the demonstration counties under the related Disbursement Linked Indicator. These actions will build on and adapt from international experience on prohibiting recruitment for male-only employees, offering affordable childcare, family leave for males as well as females, equal training opportunities for female staff, and gender awareness training for wastewater service staff. Gender gaps, actions, and indicators are summarized in Table 3.6.

**Table 3.7: Theory of Change for Gender Gaps, Actions, and Indicators.**

Gender Gaps	Gender Gap data	Drivers of the gender gap	Potential Actions to Reduce Gap	Gender Indicators
Few women have decision-making roles in River management	Preliminary data shows that few women have decision-making roles in the RCS, with only five or more male citizen river chiefs for every female in the sample. <sup>120</sup>	Gender stereotypes about leadership and decision-making  Limited local capacity in the implementation of National Women's Development Plan actions on women and decision-making and women and the environment <sup>121</sup>	Under RA1 -- Develop the public engagement manual for the RCS, including provisions to increase gender inclusion, develop procedures to build women's capacity to engage and serve in these positions, and increase women's awareness of these opportunities through increasing their overall engagement.  -- Improve the proportion of women as citizen river chiefs in the RCS, improve women's leadership and participation in river and pollution prevention and river/lake	RCS strengthened and supported through implementation of measures and monitoring of gender dimension incorporated in RCS.  -- Development and implementation of RC manual for public participation incorporating measures for women's inclusion in river management (under IO3)  -- women's share of River Chief positions in demonstration counties (IO5)

<sup>120</sup> The official river chiefs are the administrative heads of the governments at corresponding jurisdiction of the rivers. In addition, a number of people were selected as civil River Chiefs to play an important role in promoting river management policies, collecting public feedback, supervising river chief performance and bridging communications. The project will focus on increasing women's share of leadership among the civil river chiefs.

<sup>121</sup> China Women's Federation web site. China Plan for Women's Development 2010-2020. ([link](#))



Gender Gaps	Gender Gap data	Drivers of the gender gap	Potential Actions to Reduce Gap	Gender Indicators
			<p>cleanup</p> <p>-- Provide technical training, mentoring, and study tours to women RCs and RCO staff, collaborate with women's organization to organize public awareness campaigns on the importance of women's contributions to river management decision making.</p> <p>-- Document women's participation in public decision-making on river management and track inputs by gender in the river chief information system of demonstration counties</p> <p>--Conduct a basin-level case study to shed further light on the basin-level baseline and drivers of the gender gap, raise awareness among Government officials within the basin on this gap, and draw lessons to fine-tune the program actions to augment female voice and agency in the RCS system (in coordination with Central Basin IPF).</p>	
Gaps exist between men and women working at rural water treatment utilities in both equal access to jobs (especially technical and managerial	The rapid assessment found that women account for less than 40% of the technical positions and about one-third of the managerial positions. In addition, female technical and	--Gender stereotypes lead to m/f occupational segregation --Gender biases in hiring and advancement <sup>122,123</sup> --Lack of enforcement of	<p>Under RA 3</p> <p>--Conduct an organizational gender assessment of entities providing township wastewater services in the program demonstration counties using the Equal Aqua tools to identify barriers to women's employment in the sector.</p> <p>--Develop and implement a</p>	Gender-inclusive wastewater workforce plan incorporated in integrated wastewater service strategy and approved by Program implementing agencies. (under IO10.1)

<sup>122</sup> ILO (2017). Wastewater and jobs; the Decent Work Approach to Reducing Untreated Wastewater, SECTOR working paper no. 314. The section on gender (pp. 16-17) documents global lack of women's employment in the wastewater sector ([link](#)).

<sup>123</sup> IMF 2021. China's Rebalancing and Gender ([link](#)).



Gender Gaps	Gender Gap data	Drivers of the gender gap	Potential Actions to Reduce Gap	Gender Indicators
positions) and equal pay for the same types of jobs.	managerial staff earn 5-25% less than their counterparts for different categories of work.	existing laws on gender equality in employment	gender-inclusive workforce plan to reduce obstacles in attraction, recruitment, retention, and advancement of women in the wastewater service sector. Such measures may include: --Prohibiting recruitment for male-only employees --Gender awareness training for wastewater service staff including findings of the organizational assessment. --Affordable childcare -- Family leave for males as well as females -- Training opportunities for female staff	

### Economic Assessment

38. **Public sector financing is justified by expected positive externalities in line with the Program's focus on public goods.** The Program will generate environmental benefits from reducing water pollution including reduced marine debris, providing habitat for plant and animal species, and generating global benefits through reduced GHG emissions. Specific private sector actors do not capture the economic benefits of most Program outcomes, limiting the possibility for private financing for many activities (that is, benefits are diffuse and public). The Program will develop institutional systems, which will sustain and scale the activities delivering these benefits beyond the Program's life, with a focus on increasing transparency and efficiency in achieving these outcomes relative to a 'no Program' scenario.

39. **The PforR will provide value-add by focusing on a subset of activities where the Government wants to enhance efficiency, effectiveness, and impact of expenditure.** The design of the World Bank Program, in the form of a nested hierarchy of activities (see Section II in the main text), helps align actions of governments across levels (that is, vertically) and across jurisdictional borders (horizontally) in support of basin-wide and sub-basin wide outcomes, in ways that do not always occur under traditional programming and governance arrangements. The World Bank's involvement will increase central and provincial governments' exposure to international experience and best practices in integrated basin management, water pollution control, and ecological flows and ensure lessons from recent World Bank-supported ecological restoration and water pollution control projects are incorporated into the broader Government program for the Yangtze River Basin.

### Assessment Methodology

40. **This economic assessment uses a simple BCA based on benefit transfer, applied at the sub-basin level for Poyang Lake and Dongting Lake Basins.** The assessment implicitly combines activities under Results Area 1, Results Area 2, and Results Area 3 to value outcomes as a combined water environment quality improvement. Results Area 1 (institutional strengthening) is seen as facilitating outcomes achieved under Results Area 2 and Results Area 3. The assessment compares a scenario of no Government program to a scenario of a Government program including World Bank support. This approach is used because under a PforR, Government and World Bank funds are combined to achieve results, with



limited distinction at the activity level between World Bank-financed and Government-financed achievements. This approach can determine whether the overall program – of which Bank financing part-supports – is net socially beneficial.

41. **Expected benefits from the program will accrue at both local and global levels.** At the local level, increases in biodiversity and vegetative cover can be expected, together with a decrease in pollutants in major waterways and thus periods of eutrophication, which can be expected to improve the amenity value of rivers and lakes, recreation opportunities, real estate values, fishery productivity, shipping services, tourism, and reduced costs of water treatment. Global benefits will result from improved biodiversity, such as benefits to internationally migratory birds (Dongting and Poyang Lake are important migratory bird habitats), reduced coastal eutrophication, and reduced marine plastic debris. Climate benefits (GHG mitigation) will be mainly derived from reduced eutrophication<sup>124</sup> of lakes and waterways caused by discharges of livestock waste and wastewater. Costs are based on total program funding over 2021–2026, which is expected to be US\$6,526 million, of which an expected US\$6,126 million (93.87 percent) will be funded by the Government and US\$400 million (6.13 percent) financed by the proposed IBRD loan (see Section II.C). Of the US\$6,126 million Government funding, it is estimated that US\$2,519 million will come from Jiangxi Province and US\$3,607 million will come from Hunan Province.

42. **To estimate the program's economic benefits, benefit transfer from available environmental valuation research in China was used.** The economic values of water quality and ecological improvement are challenging to quantify due to the dispersed spatial extent of benefits across the basin, the wide range (and indirect nature) of benefit types, and data limitations. However, a number of studies provide benefit estimations that can be adapted to the parameters of this program to indicate likely economic values. These studies utilize the contingent valuation method<sup>125</sup> (CVM) to capture the broad range of benefits (both use and non-use economic values) that are expected. Economic assessment at the lake basin level considers the benefits from the program as a whole (that is, as a package of activities) within its basin areas, thus capturing the bulk of provincial-level and county-level activities. The Program's geographic focus within Jiangxi is Poyang Lake Basin, which covers 94 percent of the province. The Program's geographic focus within Hunan is Dongting Lake Basin, which covers 97 percent of the province.

43. **A survey of relevant literature found four studies well-suited to comprehensively valuing water environment improvements in river basins (Table 3.8).** A lower bound of 0.55 percent and an upper bound of 2.9 percent for WTP as a percentage of gross household income was found across studies for comprehensive impacts of water pollution, including water treatment and health values, amenity values, recreational values, and ecological values (existence value to people). While they are broad, these attributes are similar to those expected from the present program and thus provide rough indications of the population's comprehensive valuation (that is, including both use and non-use values) of the outcomes of the program. The lower identified estimate was used for a conservative approximation (0.55 percent of household income) of the values Jiangxi and Hunan residents place on improving water quality in these two basins. Adjustment for these provinces' population and per capita income levels were made and estimates compared to the total program cost (Table 3.8).

<sup>124</sup> Eutrophication, caused by excessive richness of nutrients, increases the emission of methane, which is more than 25 times as potent as carbon dioxide at trapping heat in the atmosphere.

<sup>125</sup> Contingent valuation method uses questionnaires targeted to impacted populations to elicit their WTP for non-market environmental goods, such as avoidance or reduction of pollution impacts. It has been applied extensively to water pollution issues.



Table 3.8. Summary of Water Quality-related WTP Studies in China

Water Body and Reference	Study Objective/Content	WTP (percentage of household income)
Cha Bai and Nan Sha He rivers, Beijing (Day and Mourato 1998) <sup>126</sup>	Aimed to determine the value of maintaining river water quality in all rivers in the Beijing region	0.8–1.3
Yangtze River, Jiangsu Province (Lu and Guo 2003) <sup>127</sup>	Aimed to determine the value of drinking water without pollution from chemical fertilizers	2.0
Lake Puzhehei, Yunnan Province (Wang et al. 2011) <sup>128</sup>	Aimed to determine the total value of a project to improve the water quality of Lake Puzhehei by one grade level (Grade III to Grade II)	2.9
Hongze Lake, Jiangsu Province (Lei et al. 2013) <sup>129</sup>	Aimed to determine value of amenity provided by the lake (fourth largest freshwater lake and one of the most polluted in China)	0.55

Table 3.9. Estimation of Annual WTP Value and Government program Cost<sup>130</sup>

	Provincial Population (Million)	Annual Per Capita Gross Income (US\$)	WTP (0.55% of income) (US\$, millions, annual)	Government program Cost (US\$, millions, total)
Jiangxi (Poyang Lake Basin)	40.90	5,172	1,163	2,714
Hunan (Dongting Lake Basin)	67.10	5,700	2,104	3,802

44. **Net economic benefits are positive under a range of discount rates based on conservative assumptions.** Overall program benefits have been projected with the assumptions that (a) investment will be completed within 5 years; (b) benefits will accrue starting from year 5 for a total of 15 years, with full benefits being reached from year 7 onward; (c) operating and maintenance costs of infrastructure and other recurrent costs will be 10 percent of the total program investment cost; and (d) discount rates are 6 and 12 percent<sup>131</sup> (Table 3.10).

Table 3.10. ERR and NPV of Water and Ecology Improvements in Program Sub-basins Based on Benefit-Transfer (US\$, millions)

	ERR (%)	NPV @ 6%	NPV @ 12%
Poyang Lake Basin (lower estimate)	15.7	1,957	1,590
Dongting Lake Basin (lower estimate)	18.3	3,684	752

<sup>126</sup> Day, B. and Mourato, S. (1998). Willingness to pay for water quality maintenance in Chinese rivers. The Centre for Social and Economic Research on the Global Environment Working Paper. ([link](#))

<sup>127</sup> Lu, Y and Guo, D. (2003). Willingness to Pay for Reducing Agricultural-Induced Water Pollution in Zhenjiang City, China. Paper prepared for the Roles of Agriculture International Conference, Food and Agriculture Organization of the United Nations, 20-22 October, Rome, Italy.

<sup>128</sup> Wang et al. (2013). Valuing Water Quality Improvement in China: A Case Study of Lake Puzhehei in Yunnan Province. *Ecological Economics* 94. ([link](#))

<sup>129</sup> Huang, et al. (2013). Public demand for remediating a local ecosystem: comparing WTP and WTA at Hongze Lake, China, Lake and Reservoir Management, 29:1, 23-32. ([link](#))

<sup>130</sup> World Bank team's calculation based on 2020 data available from official statistics.

<sup>131</sup> See World Bank. 2015. *Technical Note on Discounting Costs and Benefits in Economic Analysis of World Bank Projects*. The discount rate is recommended to be 6 percent for investments with long-term unquantified social and environmental benefits. See: NDRC. 2006. *Economic Analysis of Construction Projects: Methods and Parameters*. China Planning Press, Beijing.



## Greenhouse Gas Emissions Mitigation Assessment

45. A quantification of GHG net emissions is made for the PforR Program, focused on DLIs 3.1 and 3.3 (Table 3.11). Quantification does not include emissions reductions through institutional, policy and planning measures (DLI.1 and DLI.2) although these are expected to have considerable (but difficult to quantify) emissions mitigation benefits (see para. 47). Emissions are assessed over 15 years consistent with the economic analysis.

- **DLI 3.1:** Improvements to the wastewater network is expected to prevent leakage of around 9,000 kg of COD annually into primarily groundwater, mitigating methane emissions. Based on the World Bank's GHG Accounting Tool for Water Sector Lending Projects, improvements are estimated to result in a net annual mitigation of 25,705 tons CO<sub>2</sub>-e.
- **DLI 3.3:** treatment and reuse of livestock/poultry manure is expected through increased use of on-farm treatment facilities and organic fertilizer reuse (substituting for synthetic fertilizer). Manure treatment and reuse is expected to be 1,048,300 tons (Hunan) and 473,100 tons (Jiangxi) due to Program activities. Based on the FAO Ex-ACT GHG calculation tool, and with use of a conservative nitrogen fertilizer replacement value (0.5), improvements are estimated to result in a net annual mitigation of 13,244 CO<sub>2</sub>-e.

**Table 3.11. Greenhouse gas mitigation from quantifiable Program activities over 15 years (tons CO<sub>2</sub>-e)**

DLI	Activity	Project gross emissions	Baseline emissions	Net emissions	Net Average Annual Emissions
3.1	Wastewater	778,161	1,163,738	-385,577	-25,705
3.3	Manure	9,796,186	9,994,848	-198,662	-13,244
<b>Total</b>		<b>10,961,424</b>	<b>10,574,347</b>	<b>-584,239</b>	<b>-38,949</b>

46. In total, the program is expected to realize at least 0.58 million tons CO<sub>2</sub>-e in emissions mitigation over a 15-year period, with an implied value (based on a shadow price of carbon) of US\$ 17.9–36.3 million<sup>132</sup> over the economic life of the Program. The calculations are limited to the 10 demonstration counties that are the target of the Bank's financing, and for conservativeness does not include scale-up throughout the wider government program supported by the Program.

47. Other elements of the Program under DLI.1 and DLI.2 are expected to have substantial GHG mitigation benefits on top of those calculated here. These are challenging to quantify, and so the quantitative estimates above should be considered a lower bound on the Program's overall GHG mitigation. Policies and plans implemented under DLI.2 are expected to lead to longer-term water quality improvements through reduced nutrient pollution and thus reduced eutrophication,<sup>133</sup> through their support for nutrient pollution mitigation (the integrated water and environment management plan for the Gan River). Mitigation is also expected due to implementation of environmental water flows under DLI.2, due to stabilized water levels that supports aquatic vegetation and mitigates methane emissions.<sup>134</sup> DLI.1 supports data platforms that underpin water quality management and pollution control, further contributing to longer-term mitigation benefits (see para. 37 and footnotes 77 and 78 for further detail on climate benefits).

<sup>132</sup> The shadow price of carbon represents emissions' global externality value and is set at US\$38 per ton (lower bound) and US\$75 per ton (upper bound) in 2017, increasing by 2.25 percent per year. This calculation represents the net present value (at lower and upper bound prices) of the quantified emissions mitigation at a 6 percent discount rate, over 15 years consistent with the economic analysis. See World Bank Group (2017). Shadow Price of Carbon in Economic Analysis ([link](#)).

<sup>133</sup> Eutrophication causes methane emissions due to anaerobic decomposition and has been an issue within the Program's sub-basins. Notably, Poyang and Dongting Lakes have experienced instances of eutrophication. More broadly, nutrient pollution may contribute to downstream and offshore eutrophication in the East China Sea. A recent study calculated the present value of the global social cost of eutrophication-driven methane emissions from lakes at an annual amount of US\$0.21–2.31 trillion (US\$ 2015). See Downing, J. A., et al. 2021. "Protecting Local Water Quality Has Global Benefits." *Nature Communications* 12: 2709 ([link](#)).

<sup>134</sup> Rosentreter, et al. (2021). Half of global methane emissions come from highly variable aquatic ecosystem sources. *Nature Geoscience*, 14: 225–30 ([link](#))

**ANNEX 4. (SUMMARY) FIDUCIARY SYSTEMS ASSESSMENT**

1. **Program Scope.** The PforR will support a subset of activities from the Government's sub-national provincial programs for the YREB in Jiangxi and Hunan Provinces. The provincial plans represent the Government's program (in conjunction with the province's 14th Five Year Plans) and contain a larger set of activities than the Bank's Program. Implementation of the Program will follow the existing national, provincial, and sectoral legal framework and practices for fulfilling public financial management, public procurement, and governance responsibilities. The FSA provides a comprehensive review and analysis of the current systems, identifies risks, and recommends mitigation measures for implementation to enhance the performance of the current systems in meeting the Program objectives. This annex summarizes the main conclusions of the FSA.

2. **Assessment of Fiduciary Systems.** There is no difference between government program and the Program financed by the Bank regarding geographic boundary. In Jiangxi, the Program covers about 100 counties included in the River Basin Eco-Compensation Mechanism for the "5-Rivers-1-Lake" Plan; in Hunan, the Program covers about the same number of counties included in the Integrated Water Environment Management Plan for Dongting Lake Basin. The FSA assessed the public financial management system and the public procurement system of key program implementing agencies and their line agencies. These agencies include but not limited to, at provincial level, Finance Bureau (FB), Development and Reform Commission (DRC), Department of Environment and Ecology (DEE), Department of Water Resources (DWR), Department of Agriculture and Rural Affairs (DARA), and Provincial Audit Office (PAO); and at county level, Water Resource Bureau (WRB), Housing and Construction Bureau (HCB), Agriculture and Rural Affairs Bureau (ARAB), of four counties in Hunan and six counties in Jiangxi. The assessment covers the review of the PFM cycle, Program systems and capacity improvements, and the Program implementation support.

3. The assessment concludes that the Program's fiduciary systems are adequate for meeting Bank's PforR Policy and Directive requirements. The systems can reasonably assure that the Program's financing proceeds will be used for the intended purposes, with due attention to the principles of economy, efficiency, effectiveness, transparency, and accountability.

4. **Public Financial Management System.** The Budget Law of the People's Republic of China (PRC), issued in 2015 and revised in 2018, has set the budget management framework for the central government and local governments at all levels in China. Jiangxi Province integrated fiscal transfers from the central government, budgetary funds from local governments and the market, and established Jiangxi's River Basin Ecological Compensation Fund since 2016 (the Program the Bank will finance). The budget quota of compensation fund is distributed to city/county government in two tranches. The first tranche which mainly comes from central government transfers is distributed in advance at the end of the previous year, and the second one mainly from provincial government is normally delivered in the second half of the current year. The city/county government used to integrate the first tranche in their annual government budget, but the treatment of the second tranche is various. Some counties included the second tranche in their annual budget based on the projection and made adjustment later on, while others just waited the distribution of budget quota. In Hunan province a program called "Dongting Lake Water Environment Comprehensive Treatment Program" has been approved by the State Council with total estimated budget of CNY 59.18 billion covering the period from 2018-2025. However, program budget was not prepared, and no clear funding sources were identified for each program activity. Instead, sectoral departments were required to integrate various available financing sources. In addition, some of the upper level transferring funds are distributed to counties in the form of general budget rather than ear-marked budget, and counties are playing essential roles in deciding how to use the program funds although central and provincial government set up the requirement on minimized percentage of using transferring funds on program activities.

5. Per the county's self-reporting in 45 counties of Jiangxi province, the average utilization rate of the program funds was 90.67% in the past three years. Through analyzing the final accounts in Hunan province for the past three years it is



noted that Hunan used about CNY 24.34 billion on water environmental management from the year 2018 to 2020, roughly matching the total allocated budget, indicating program activities were mostly implemented as planned. Governments at all levels have integrated all financial funds into the treasury single account (TSA) system. All revenues are directly collected into the treasury account or the special financial account, and all expenditures are paid to the contractors/suppliers/beneficiaries through the TSA.

6. Since program is not a budget classification element, it is hard to trace the program expenditures from the existing Government treasury system. In Hunan Province, the counties receiving program funds are not required to report program expenditures regularly to upper-level government. In Jiangxi Province, although government decree requires that county government report to PDRC and PFD about its program expenditures annually, such requirement has not been strictly implemented always. As a result, program expenditures are not properly monitored and managed at provincial level.

7. There is adequate control over, and stewardship, of program funds, with well-defined delegation of authority. Following the national policy and regulations issued by the MOF and NDRC, the provincial governments have issued a series of regulations regarding fund management, implementation measures, and result verification procedures, and so on. Based on the interviews on counties visited, it was noted that internal audit function had not been widely established within county budgetary units, however, the supervision and performance evaluation unit (the unit responsible for the internal audit) within county finance bureau sometimes carried out its supervision on the usage of compensation funds.

8. Although government auditors indeed audit program funds when they carry out budget execution audit, accountability audit and other types of audits, no specific audit was conducted by provincial audit offices (PAOs) and audit offices of interviewed counties on the usage of program funds in the past years. The audit of the proposed Program will be conducted by the provincial audit offices. Besides conducting the audit on budget execution and other provincial level entities, the PAOs have been the auditors of World Bank-financed projects in two provinces for about three decades. They are the auditors the Bank accepted in China. The first year's audit report issued by the PAOs is subject to the quality review by the China National Audit Office (CNAO).

9. **Public Procurement System.** TBL and GPL are the primary public procurement laws governing public procurement in China. TBL focuses on construction related works, goods, and consulting services, while GPL focuses on fiscal budget funds financed purchasing activities carried out by government departments, institutions, and organizations. The demarcation line is not very clear between the two until the issuance of monetary threshold<sup>135</sup> for tendering and bidding activities by NDRC and guidance documents by the MOF, NDRC, and respective line ministries. Each province and line ministry issue procurement related guidance and orders to regulate procurement in its respective administrative jurisdiction or sector. Though fragmented, there's no conflict with the two laws. Anti-corruption requirements and measures are available in laws and regulations to prevent, report, detect, investigate, prosecute, and sanction fraud and corruption conducts.

10. The assessment analyzed data, interviewed, and discussed in person with procuring entities and public transaction centers (mandated by government for providing service and supervision to purchasing activities through open and selective bidding) on procurement legal framework implementation in practice. It identifies no deviations from the legal requirements.

11. The key stakeholders of procurement under the Program are line government agencies, procuring entity, procurement agent, design institute, supervisor, transaction center and the selected supplier / contractor / consultant. The line government agencies plan and get approval the activities to be carried out under the Program; the procurement agent assist the procuring entity (government agency itself or its delegated agencies) to prepare procurement documents and facilitate the procurement process; design institute provides technical contribution to the procurement process; supervisor monitors contract implementation; transaction center provides service to procurement process and supervises

<sup>135</sup> <https://www.ndrc.gov.cn/xxgk/zcfb/fzggwl/201803/W020190905495130858389.pdf>



the process simultaneously; the selected supplier / contractor / consultant implements the contract as agreed with the employer / purchaser / client.

12. A complaint mechanism is provided in both TBL and GPL. Complainant has the right to file a complaint with the procuring entity or supervising authority of the procuring entity. GPL further allows administrative reconsideration or administrative proceeding to the People's court in case the complainant is unsatisfied with the resolution or any delay handling of the case by the supervising authority of the procuring entity.

13. **Key Conclusions and Recommendations.** A comprehensive PFM framework has been established including government regulations, decrees, standards, and procedures, and so on which regulate the program activities to ensure program funds are used for the intended purposes. However, the enforcement is various at different places and the Bank's involvement could strengthen the institutional capacity of related government entities. Given Program is not an element for budget classification in China, which brings challenges on most PFM areas. During the fiduciary assessment, the major financial management risks have been identified and mitigation measures provided:

- (a) The financing sources of the program is quite comprehensive as it integrates funds from very broad sources and some of them are one time compensation funds. Multiple-year program budgeting should be prepared to ensure program funds could be secured and county government could prioritize its investment to enhance the efficiency of its scarce financing resources.
- (b) Budget quota was distributed to counties/cities in batches and some program funds were delivered in the second half year or even the year end which prevents the county government from including the entire program funds in its annual budget and delays the implementation of planned activities. Provincial entities should revisit their budget quota distribution and take actions to ensure the budget quota could be distributed to county/city in advance.
- (c) 'Program' is not a budget classification element in China and the required Program financial reporting can't be generated from government treasury system. A blue tagging mechanism which can trace program expenditures from government existing integrated financial management system has been recommended and it is expected to be piloted, especially in those demonstration counties, during project implementation. This also creates fundamental basis for generating program financial reporting from the Government treasury system.
- (d) No requirement by provincial government on reporting of program expenditures in Hunan province and the reporting requirement stipulated in government decrees were not strictly implementation in Jiangxi province. A tailored program financial reporting templet will be designed which can capture the data from government system and used by the project upon agreed by related government entities.
- (e) Absence of efficient supervision by related provincial entities on the usage of program funds may bring potential risk of improper use of program funds. The decrees about program expenditure supervision should be established in Hunan province. Provincial entities involved should strengthen the supervision on program funds in line with related government decrees.
- (f) Government auditors did not audit the program funds and prepare the program audit report. The Bank will work with the Provincial Audit Offices (PAO) to develop the terms of reference (TOR) for program auditing to ensure program funds could be audited in line with the Bank's policy.

14. The Program has a robust legal framework for procurement, which includes the Tendering and Bidding Law of 1999; the Government Procurement law of 2003; and regulations and orders issued at national, provincial, and county levels. Although the laws could be modernized and aligned to modern principles such as 'value for money' and 'fit for



purpose', both offer a fair playing field for bidders and promote transparency and competitiveness. Four major procurement risks have been identified and mitigation measures provided:

- (a) Contracts may be awarded to firms or individuals that are debarred or under temporary suspension by the World Bank or other multilateral development banks. The following mitigation measures are proposed: (i) upon Program loan effectiveness, the Provincial Program Office shall issue a high-level official letter or official instruction to require Program implementation agencies (PIAs) to ensure that no contract will be awarded to ineligible firms or individuals; (ii) procurement staff at the Provincial Program Office are to check the latest list of debarred and temporarily suspended firms and individuals<sup>136</sup> before contract award to ensure that contract being awarded to eligible firms or individuals only; and (iii) 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.
- (b) The World Bank may not be informed of fraud allegations and corruption issues during implementation. A Program Implementation Plan (PIP) shall therefore require the client to inform the World Bank of any credible and material allegations of fraud and any corruption issues as part of the Program progress reports, as mandated in the Loan Agreement.
- (c) In Jiangxi, the Price Commitment Method is widely used for bid evaluation by using the cost estimate as a key reference for contract price determination. To avoid substantial deviation between contract price and the prevailing market price level, the PMO is required to regularly update the cost estimate by taking account of market variants in a timely manner to ensure realistic value for money is being achieved.
- (d) Contracts may not be completed within the contractual completion time, and the contract completion audit may not be completed in a timely manner. Human, financial and policy resources should be allocated by Hunan and Jiangxi PDRCs for close monitoring contract implementation progress to minimize or avoid foreseeable cost overruns and/or implementation delays.

**Table 4.1. Program Fiduciary Systems Risks and Mitigation Measures**

Risk	Mitigation Action
The contracts may be awarded to firms or individuals which are debarred or under temporary suspension by the World Bank or other multilateral development banks.	PAP: (1) The PDRC shall, upon Program loan effectiveness, issue a high-level official letter or official instruction to implementation agencies to ensure that no contract will be awarded to ineligible firms or individuals. (2) One of the duties of the procurement staff at the Hunan and Jiangxi PMO will be to check the latest World Bank lists of the debarred and temporarily suspended firms and individuals before contract award to ensure that contracts are awarded to eligible firms or individuals. (3) The TOR for annual external audit includes the task of randomly selecting awarded contracts to check whether they have been awarded to ineligible firms or individuals.
The World Bank may not be informed of any credible and material allegations of fraud and corruption during the implementation of the Program.	PAP: The PPMO shall regularly inform the World Bank of any credible and material allegations of fraud and corruption in the Program progress report, as required in the Loan Agreement and the Program Agreement.
The financing sources of the Program are quite comprehensive, integrating funds from very broad sources, and some of them are one-time compensation funds; budget quota was distributed to counties/cities in batches and some Program funds were delivered in	PIP: Multiple-year program budgeting should be prepared to ensure Program funds could be secured and the county government could prioritize its investment to enhance the efficiency of its scarce financing resources; provincial entities should revisit their budget quota

<sup>136</sup> <https://www.worldbank.org/en/projects-operations/procurement/debarred-firms>



Risk	Mitigation Action
the second half of the year or even the year-end, which prevents the county government from including the entire Program funds in its annual budget and delays the implementation of planned activities.	distribution and take actions to ensure the budget quota could be distributed to the county/city in advance.
'Program' is not a budget classification element in China and the required Program financial reporting cannot be generated from the Government treasury system.	PIP: A blue tagging mechanism which can trace Program expenditures from the Government's existing integrated FM system has been recommended and it is expected to be piloted during project implementation, especially in those demonstration counties. Provincial finance departments will decide when and how to implement this piloting by considering the readiness of government reform on the integrated financial management information system.
No requirement by provincial government on reporting of program expenditures in Hunan Province and the reporting requirement stipulated in government decrees were not strictly implementation in Jiangxi Province. Absence of efficient supervision by related provincial entities on the usage of Program funds may bring potential risk of improper use of program funds.	PIP: Related decrees on Program expenditure supervision should be set up in Hunan Province. Provincial entities involved should strengthen the supervision on Program funds in line with related Government decrees. Guidance and training should be provided on supervision and performance evaluation unit as they are performing the internal audit function.
Government auditors did not audit the Program funds and prepared the Program audit report.	The World Bank will work with the PAOs to develop the TOR for program auditing to ensure Program funds could be audited in line with the World Bank's policy.
In Jiangxi, the most common procurement method is the Price Commitment Method. The Price Commitment Method displays the procurement principles of being open, fair, and transparent but it is questionable as to whether it offers value for money as the price is predetermined and bidders can't offer a lower price.	PAP: For value for money to be achieved, it is critical that the cost estimating process is robust and that unit prices are regularly updated to ensure the cost estimate is as accurate as possible.
Based on the analyses of the contract administration, most contracts were completed within the contractual period. However, 55 out of 272 contracts (20.2 percent) in Hunan and 58 out of 254 contracts (22.8 percent) in Jiangxi could not be completed within the contractual completion time; the longest delay was one year. Some contract completion audit could not be conducted on time.	PIP: Procedures or a guidance note should be produced by Hunan and Jiangxi PDRCs that clearly define the undertaking of contract administration responsibilities in line with the domestic regulatory framework.

15. **Program Implementation Support.** Proposed fiduciary implementation support includes the following:

- Review Program implementation progress, including achievement of Program results and PAP implementation.
- Assess timeliness and adequacy of Program fund appropriation as approved in the budget.
- Continuously assess and monitor the performance of the FM and procurement systems under the Program and provide suggestions for enhanced efficiency and effectiveness.
- Monitor application of the PforR anticorruption guidelines.
- Monitor performance of the fiduciary systems and the audit report, including the implementation of the PAP.
- Monitor the PforR financial statement reporting process and assist the client as necessary.
- Monitor the contracts implementation, including cost, time, and quality control.
- Help the client resolve implementation issues and carry out institutional capacity building.
- Assist the CNAO and the audit offices at the provincial and county levels in strengthening audit arrangements.
- Hold regular trainings for provincial and county audit offices, particularly with respect to procurement post audit to build capacity.
- Monitor changes in fiduciary risks of the Program and, as relevant, compliance with the fiduciary provisions of legal covenants.

**ANNEX 5. SUMMARY ENVIRONMENTAL AND SOCIAL SYSTEMS ASSESSMENT**

1. The Program will support improvement in water and ecological quality in river and lake basins in Jiangxi and Hunan and is thus expected to bring overall E&S benefits. The implementation of activities under the Program will rely on the existing national and provincial legal framework and institutional system for managing E&S issues. The ESSA provides a comprehensive review of relevant E&S risk systems and procedures and tracking of performance in China nationally, and in Jiangxi and Hunan provinces, and recommends necessary actions to address the identified gaps as well as opportunities to enhance E&S performance during implementation. This annex summarizes the main conclusions of ESSA.

2. **Potential Environmental and Social Effects.** An E&S risk screening was conducted for the Program-supported activities, during ESSA preparation, and concluded that the overall E&S risk rating of this Program is Substantial.

3. The Program will support pollution control and ecological restoration activities including construction and upgrading of county and township wastewater treatment plants and pipelines, agricultural plastics collection and recycle, waste treatment of existing livestock farms, and institutional and capacity-building activities. These activities will generate E&S benefits of reduced pollutant discharge to water bodies and improved river and lake water quality and basin ecological environment. Activities with the potential to cause significant adverse impacts on the environment and/or people are excluded, including activities that (a) involve closure or relocation of livestock, poultry, or aquaculture farming; (b) involve large-scale infrastructure construction; (c) have substantial impacts on river hydrology and ecology; and (d) involve the allocation or conveyance of water, including inter-basin water transfers or other activities, resulting in significant changes to water quality or availability. The ESSA has formulated an E&S exclusion list.

4. The main adverse E&S impacts include construction-related impacts such as dust, noise, disturbance of water body, soil erosion, wastewater and solid waste management, construction worker and community's health and safety, labor management, small scale of land acquisition, temporary land use, and potential impacts to vulnerable groups; impacts during operation such as effluent discharge from wastewater treatment facilities, safe operation of facilities, workers' health and safety, safe application of fertilizers, and impacts on farmers' livelihood; and also the potential downstream indirect impacts of TA 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. Neither OP/BP 7.50 International Waterways nor OP/BP 7.60 Disputed Areas are applicable to the Program.

5. **Assessment of Environmental and Social Management System.** A comprehensive review of the legal and regulatory framework for E&S management relevant to the activities supported under the PforR was conducted, including institutional arrangements, management procedures and their implementation, institutional capacity, and performance.

6. Overall, China has established a comprehensive system for the management of E&S issues at both national and provincial levels (including Jiangxi and Hunan provinces), which consists of laws, regulations, guidelines, specifications, and standards principally consistent with the World Bank's PforR Policy and Directive. This system provides a reasonable basis for addressing the E&S issues related to activities supported under the PforR.

7. **Environmental Management System.** Since the promulgation of its first Environmental Protection Law in 1979, China has gradually established a comprehensive environmental management legal framework, becoming one of the region's most dynamic environmental law frameworks. In recent years, the Government of China has worked to reform its environmental management system by enhancing its law enforcement and prevention approach. A set of laws, regulations, and technical guidelines have been—or are in the process of being—issued or updated by national and local governments regarding EIA for construction projects and OHS management.

8. The key PforR government stakeholders involved in environmental, health, and safety management include various levels of ecology and environment bureau (EEB), health commission, emergency management bureau, construction bureau, water resource bureau, and agriculture and rural affairs bureau. The EEB is responsible for reviewing



and approving the EIA documents and supervising the environmental compliance of activities under this PforR during the construction and operation phases; the water resource bureau reviews and approves the projects' water and soil conservation reports; the emergency management bureau and health commission take overall responsibility of OHS management; the construction bureau has sector management authority for wastewater and solid waste projects; and the agriculture and rural affairs bureau supervises the activities involving fertilizer, agricultural plastics, and livestock waste.

9. Consultations of government departments at provincial, county, township, and village levels and site visits to typical projects in selected counties of Jiangxi and Hunan provinces, have demonstrated that the domestic environmental management systems, implementation mechanisms, and institutional arrangements related to the Program activities are principally consistent with the World Bank's PforR Policy and Directive and can provide a generally effective management framework for the implementation of the Program activities. The assessment results also indicate inadequacies in the implementation of some environmental management systems, mainly including weak environmental protection and participation awareness of farmers in chemical fertilizer reduction and agricultural plastics recycling, and inadequate OHS training for contracted and temporary workers involved in the waste collection activities.

10. **Social Management System.** The assessment concludes that China has formulated a series of laws and policies at the national and local levels and has established appropriate management agencies and mechanisms to govern social risks in relation to the Program's activities. Subject to the potential social impacts and risks identified, the social system assessment focused on the dimensions concerning social impacts and risks assessment and management system, cultural heritage protection, occupational health and community safety, land acquisition and resettlement, public participation, ethnic minorities, and vulnerable groups. The social systems are deemed comprehensive and consistent with the World Bank PforR Policy and Directive.

11. Jiangxi and Hunan have established management agencies with clear responsibilities and qualified staff at the provincial, municipal, and county levels for managing corresponding social risks and impacts. The ESSA report assessed the organizational setup of relevant social authorities against the principles and elements as set out in the World Bank Guidance. For example, China has established a functioning mechanism of Social Stability Risk Assessment, which is implemented by related project implementation agencies and managed through the committees of provincial and county political and legislative affairs of related regional governments. The cultural departments are responsible for managing adverse impacts on physical cultural heritage. The natural resource bureaus enforce land acquisition, compensation, and resettlement with the support of and coordination by township governments and village committees. Other line bureaus, such as social security bureaus, labor bureaus, among others, are also to be involved in the process of livelihood restoration for project-affected persons. China has set up various competent authorities to manage to support and assistance to different vulnerable groups. For example, poverty reduction offices or countryside revitalization bureaus are mainly responsible for poverty reduction, disabled person federation for assistance to disabled people, civil affairs bureaus for support to left-behind old people and children, and women's federations for assistance to women.

12. During the preparation, the engagement with various stakeholders from both provincial and county levels, and the solid due diligence of relevant prior similar projects, concluded that the social management systems are well functioning in line with the regulations and that the overall social outcomes in similar domestic projects are fairly good. However, the assessment also identified some minor gaps for further improvement to enhance social impacts, including (a) strengthening the recording and documentation for the processes of social risk screening, public consultation and information disclosure process, and grievance redress mechanism (GRM) operation; (b) extending the physical and occupational health examinations to contract workers or/and temporary workers; and (c) establishing monitoring mechanism for social risk management of World Bank-financed activities.

13. **Consultation and Information Disclosure.** Despite the impacts of the COVID-19 pandemic, the team explored various means (both face-to-face and virtual) to meaningfully engage with relevant stakeholders, following the World



Bank's latest guidance notes<sup>137</sup> on public consultation in response to the outbreak. Relevant stakeholders, including line government departments, enterprise representatives, the workers, and local communities, were consulted in the process through meetings and field visits to selected counties. The draft ESSA report was shared with Jiangxi and Hunan PPMO and selected counties (six counties of Dayu, Chongyi, Yugan, Yongfeng, Fuliang, and Yudu in Jiangxi and four counties of Shimen, Ziyang, Miluo, and Yuanling in Hunan) and consultation workshops were carried out with the key stakeholders at provincial and county levels. The participants 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 participants provided valuable opinions to improve the accuracy of the ESSA description in local context, which have been reflected in the revised ESSA. The draft ESSA has been disclosed on the World Bank's website on November 1, 2021, on the provincial website in Jiangxi on October 27, 2021 and Hunan on November 04, 2021.

14. **Key Conclusions and Recommendations.** The assessment concluded that although the national and provincial system for addressing E&S impacts is principally consistent with the World Bank's PforR Policy and Directive, opportunities do exist for strengthening the efficiency and effectiveness of E&S risk management under the Program. The key recommendations are as follows:

- (a) **Provide training on chemical fertilizer use and agricultural waste management to farmers.** The provincial (and county) agriculture and rural affairs bureau should develop relevant training programs, prepare training materials, and conduct trainings during Program implementation. Meanwhile, subsidy and incentive mechanisms are suggested, where appropriate.
- (b) **Hunan provincial (and county) agriculture and rural affairs bureau should establish a sustainable incentive mechanism** to increase the collection rate of agricultural plastics, in which the existing jobholders should be appropriately considered, for example, the village cleaners.
- (c) **Enhance the OHS management of the enterprises involved in the Program activities.** For jobs with potential occupational hazards, take such measures as occupational hazard identification and pre-job, on-the-job, and post-job health checkup. Strengthen OHS training for contracted and temporary workers (including emergency response and proper use of personal protective equipment).
- (d) **Establish a social impacts and risks screening, public participation, monitoring, and reporting mechanism.** The PIAs shall monitor and record the implementation of social impacts and risks (including land acquisition and resettlement impacts, support for vulnerable groups, and so on) screening, mitigation measures implementation, information disclosure, public participation, and GRM. Disclose to the public the hotlines and contacts of GRM and establish an effective external communication mechanism.

15. To implement these recommendations, three actions are included in the PAP.

- (a) Provincial and county agriculture and rural affairs bureaus shall provide trainings on chemical fertilizer use and agricultural waste management to farmers.
- (b) The PIAs shall strengthen OHS training and regular health checkups for all in-service workers, including temporary workers.
- (c) The PIAs shall establish a social impacts and risks screening, public participation, monitoring, and reporting mechanism and strengthen information and record management in social risk management.

<sup>137</sup> Technical Note: Public Consultation and Stakeholder Engagement in World Bank-Supported Operations when there are Constraints on Conducting Public Meetings (dated March 20, 2020).

**ANNEX 6. PROGRAM ACTION PLAN**

Action Description	Source	DLI#	Responsibility	Timing		Completion Measurement
Provide training on chemical fertilizer use and agricultural waste management to farmers.	Environmental and Social Systems	DLI 5	PDARA and CDARAs	Other	Throughout Program implementation stage	Hunan and Jiangxi PPMOs will submit semiannual progress reports to the World Bank, including a training program for chemical fertilizer use and agricultural waste management, and relevant records.
Provide occupational health and safety (OHS) training and carry out health checkups for all in-service workers, including temporary workers.	Environmental and Social Systems		PPMO	Other	Throughout Program implementation stage	Hunan and Jiangxi PPMOs will submit semiannual progress reports to the World Bank, including OHS training and health checkup records.
Establish a social impacts and risks screening, public participation, monitoring, and reporting mechanism, and strengthen information and record management in social risk management.	Environmental and Social Systems		PPMO	Other	Throughout Program implementation stage	Hunan and Jiangxi PPMOs will submit semiannual progress reports to the WB, including records of social impacts and risks screening and mitigation, information disclosure, public participation, grievance redress and supports to vulnerable groups.
Include in the TOR for annual external audit the task of randomly selecting awarded contracts to check whether they have been awarded to firms or individuals debarred or suspended by the World Bank.	Fiduciary Systems		PPMO	Recurrent	Yearly	A copy of the TOR is sent to the Bank
Issue official letter/instruction	Fiduciary Systems		PPMO	Recurrent	Continuous	Agencies report to the Bank each occurrence of F+C within 1



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to implementation agencies to ensure no contract will be awarded to debarred&temporarily suspended firms&individuals". Timing "by effectiveness", responsibility PDRC&Completion Measurement copy of letter in the PIP.						month.
The ToR of the Procurement Staff includes responsibility to check the Bank list of debarred and temporarily suspended firms and individuals on a daily basis; share with all implementation agencies and inform the Bank promptly of fraud and corruption.	Fiduciary Systems		PPMO	Recurrent	Continuous	Agencies report to the Bank each occurrence of F+C within 1 month.
Issue procedures or a guidance note defining the contract administration responsibilities in line with the regulatory framework	Fiduciary Systems		PPMO	Recurrent	Semi-Annually	Provincial notification is issued and provided to the Bank as part of the PIP
Establish a cost estimating process for regularly updating the unit price used in procured contracts.	Fiduciary Systems		PPMO	Recurrent	Continuous	Reflect the status in the Program progress report

**ANNEX 7. BASIN SUPPORT PROGRAM**

**1. The Program includes an IPF to support basin-level activities that contribute to the national program for the YREB.** The supported activities will promote cross-sectoral coordination and inter-jurisdictional cooperation toward improved water quality and ecological protection in the Yangtze River Basin. The central component contributes to the Program's nested hierarchy of activities by supporting implementation of the national YREB program at the basin level, while further facilitating the implementation of the sub-national YREB programs at provincial, sub-basin, and local levels. This annex describes the central component motivation, connection to the provincial Program components, activities, financing, fiduciary, environmental, and social considerations.

**2. A Program Steering Committee (PSC) will be led by the Office of the Leading Group for the Development of the Yangtze River Economic Belt under NDRC (YREB Coordination Office).** The YREB Coordination Office works in coordination with other NDRC departments, notably Rural Economy, Environment and Natural Resources, and Regional Revitalization to promote implementation of the national YREB strategy through policy formulation and high-level planning.<sup>138</sup> The PSC will be headed by a senior official of the NDRC YREB Coordination Office and comprise representatives from the MOF, MWR, MEE, MHURD, and MARA, among others, along with representatives from the participating provinces. The PSC will be responsible for providing overall coordination and guidance. It will be supported by a CPMO and an expert advisory panel that will provide technical support and expert advice to the PSC.

**3. The Central Program Management Office (CPMO) will be hosted by the Changjiang (Yangtze) Water Resources Commission (CWRC).** The CWRC is a river basin authority under the MWR, with a mandate to undertake integrated water resources management (including water conservation and allocation), basin planning, water infrastructure construction, and scientific and policy research. The CPMO will be responsible for coordination, reporting, management, including management of E&S social aspects, and M&E of the activities under the Central Basin IPF, the provision of capacity building, support to the PSC, along with Program implementation support, including consolidated Program reporting. The CWRC will host the CPMO given its alignment between its mandate and the Program objectives, plus technical capacity, to ensure an integrated river basin approach. The CPMO may also select public institutes under the CWRC to carry selected activities under the Basin IPF using eligibility criteria set forth in the Project Operations Manual.<sup>139</sup>

<sup>138</sup> While the NDRC YREB Coordination Office is responsible for the national YREB strategy, a separate policy division of NDRC is responsible for the Yangtze Law specifically (with implementation of the law the responsibility of various implementing agencies and provinces).

<sup>139</sup> The selected executing agencies will be required to establish a Management Office, headed by a qualified officer and supported by adequate staff, to manage all activities until completion. The CWRC will sign an implementation agreement with each of the selected executing agencies to define the roles and responsibilities in implementation of each of the tasks, as well as eligible costs. The engagement of public institutes established practice in World Bank-financed projects in China, including in the GEF Mainstreaming Integrated Water and Environment Management Project (P145897), Economic Transformation and Institutional Capacity Building Project (P144270), Building a Modern Fiscal System Technical Assistance Project (P154694), Yunnan Highway Asset Management Project (P132621), and Guangdong Compulsory Education Project (P154621).

**Figure 7.1. Overview of Implementation Arrangements**

4. **Activities supported by the Central Basin IPF are motivated by the objectives, roles, and responsibilities outlined in the Yangtze River Protection Law.** The law represents a key legislative step toward advancing implementation of the national YREB program. It defines high-level obligations on central, basin, provincial, and county governance including (a) basin-level coordination mechanisms; (b) standards, technical guidelines, and strategies for management of resource protection, ecosystem restoration and protection of biodiversity, along with pollution control; (c) provincial institutional strengthening, policy, and strategic planning; (d) sub-basin-level TA and innovations for integrated water environment management; and (e) county-level activities focused on reducing pollution loads, including plastics. The central component activities support the central government's implementation of the law across these areas (described in the following paragraphs), and further support provinces in implementation of the law in their areas of responsibility also through links to the provincial sub-programs.

5. **Basin-level activities under the central component will support forward-looking policy directions provisioned under the national YREB program.** These are aligned with the roles and responsibilities outlined in the Yangtze River Protection Law. Activities are arranged into five sub-components:

- **Sub-component 1 - Operationalization of the basin-level river chief system collaboration mechanism.** The objective of this sub-component is to promote development of basin-level coordination mechanisms. River chiefs play a key role in water quality and ecological protection, as recognized by the Yangtze River Protection Law. The sub-component will support establishment of a basin-level RCS collaboration mechanism (a forum for decision-making, coordination, and learning) within the CWRC to promote the coordination of river protection and restoration activities by river chiefs, and the establishment of a basin-level information sharing platform, envisaged to be linked to the existing national-level platform and provincial-level platforms. The working rules for the collaboration mechanism were drafted in 2021 with World Bank



financing.<sup>140</sup> Basin-wide data sharing and a collaboration mechanism aim to increase the alignment of river chief activities with basin-wide priorities.

- **Sub-component 2 - Research on ecological protection and restoration of lakes and tributary systems.** The objective of this sub-component is to provide research inputs for policies and technical guidelines for freshwater ecosystem restoration and protection. As stipulated by the Yangtze River Protection Law, basin-level guidelines are required at the basin level for river health and ecological flow. This research will provide guidance in implementing river health and ecological flow under the law. This sub-component will support research on freshwater ecosystems and river health using field surveys and desktop reviews to inform the guidelines. It will support the following activities:
  - (a) **Research for river health guidelines.** This activity will inform the evaluation of riverine ecology conditions, including physical, chemical, and biological parameters, that define a composite index. This index can be used to inform a desired future state (including climate change considerations) and provides a foundation for identification of actions toward that state. The activity outputs will include technical guidelines for the assessment of aquatic ecosystems, focusing on the Dongting Lake, Poyang Lake Basins and tributaries to the Yangtze River.
  - (b) **Research for systemic protection and restoration of representative aquatic ecosystems.** This activity focuses on Poyang Lake and Dongting Lake, which are target sub-basins within the Program's provincial components, along with important tributaries such as Jialing River, Wujiang River, and Chishui River. The activity will propose mechanisms for coordinating protection and restoration efforts for the lakes, drawing on field surveys, desktop reviews, and domestic and international knowledge and best practices analysis. Research outputs can inform future scaled-up mechanisms across the basin.
- **Sub-component 3 - investigation and tracing of water pollution sources.** The objective of this sub-component is to provide research inputs for management strategies and technical guidelines for persistent pollutants in the Yangtze River Basin. This includes research on phosphorus sources and flows, which will support a total phosphorous management framework for the Yangtze River Basin, coordinated emergency response mechanisms and a set of technological solutions for the Yangtze River Basin, as required by the Yangtze River Protection Law and the provincial 14 FYPs. Total phosphorus is becoming the primary pollution indicator that still exceeds regulated standards in the Yangtze River. Research will include review of international best practices, identification of major sources and hotspots, analysis of total phosphorus pollution behavior under extreme climate impacts (elevated precipitation and runoff) and propose climate-sensitive policy options to address total phosphorus pollution in targeted sub-basins and across the Yangtze River Basin.
- **Sub-component 4 - Research on ‘value realization mechanisms’ (ecological incentives).** The objective of this sub-component is to develop innovative incentive mechanisms for ecosystem protection. This activity will investigate the economic value of ecosystem services in the Yangtze River Basin; determine methods for integrating ecological data into existing statistical accounts; and design eco-compensation mechanisms and pollution fee standards for water quality, quantity, and ecological assets. The activity will address current difficulties in measurement, trading, liquidity, and property rights definition in eco-compensation and trading programs.

<sup>140</sup> The Economic Transformation and Institutional Capacity Building Project (P144270) provided financing for TA on a range of priority reform areas, including river basin management.



- **Sub-component 5 - capacity building and program implementation support.** The objective of this sub-component is to promote data sharing and technical capacity and support program implementation. Specific activities are as follows:
  - (a) **Capacity-building trainings and knowledge exchanges.** This activity will help strengthen technical capacity in sub-national institutions for river basin water environment management, including implementation of the technical guidelines and standards informed by research undertaken in sub-components 2–4. It will also include knowledge exchanges for the study of basin coordination mechanisms internationally.
  - (b) **Program implementation support.** This activity will support overall Program activities, including facilitating and/or undertaking all planned Basin IPF activities, support for the operation of the Program Steering Committee, and Program implementation support, including consolidated Program reporting.

6. The cost table for the Central Basin IPF prepared by NDRC/CWRC has been reviewed by MoF who have confirmed up to CNY 48 million equivalent to be financed through the IBRD loan as part of the YRPERP. However, the actual amount during implementation will be based on the annual workplans agreed with the World Bank, and further reviewed through internal government budget processes.

### **Environmental and Social**

7. The Central Basin IPF component focuses on Type II TA activities and would have broad E&S benefits. The Central Basin IPF aims at promoting cross-sectoral coordination and inter-jurisdictional cooperation toward the common goals of improving water quality and ecological protection in the Yangtze River Basin. The Program's Central Basin IPF primarily consists of TA activities with regard to Yangtze River Basin water and environmental protection, including investigation and traceability of water pollution, inter-correlation of water ecosystems, case studies of systematic environmental protection and restoration, ecological protection incentive programs, and related capacity-building and international knowledge exchange activities.

8. The Central Basin IPF could have substantial downstream environmental risks and impacts. The Central Basin IPF is not anticipated to support any physical activities, directly draft policies or regulations, or support feasibility studies/technical designs for future investment projects. Therefore, implementation of this central component is not likely to cause any direct adverse environmental impacts but may involve significant stakeholder engagement and public consultation. The Central Basin IPF potentially has indirect impacts related to the implementation of the products or outcomes of the TA activities. For example, there could be construction/operation nuisance and community health and safety risks from civil works of physical investment projects following the TA recommendations, such as wastewater and solid waste collection and treatment facilities, sampling and monitoring stations, ecological remediation and river/lake connection works, and so on. Studies aiming to reduce pollutants (for example, phosphorus and plastic waste) released in the river basin may have downstream implications on resource efficiency and pollution management, such as relocation/shutting down/upgrading of industrial enterprises; reduced use of chemical fertilizer and pesticides; agricultural and industrial water efficiency improvement; and control and disposal of hazardous chemicals, agricultural wastes, and plastic wastes. The studies will also need to consider and assess potential impacts on aquatic life, water rights, water uses, ecosystem services and broader implications from the perspectives of hydrology, climate change, sedimentation, urbanization, and industrialization. Meanwhile, there could be a risk of communicable disease transmission caused by people gathering for trainings, workshops, meetings, and so on, particularly given the context of the COVID-19 pandemic.

9. The Central Basin IPF could have substantial downstream social risks and impacts. Implementing the Central Basin IPF itself would have moderate social risks, mainly related to health and safety for field workers and meaningful



stakeholder engagement. However, adopting and enforcing the study outputs could have potentially significant downstream social changes among relevant communities; enterprises; institutions; and vulnerable groups (such as ethnic minorities, the workers, farmers, and so on) through regulating land and resources use and constructing and operating physical facilities to improve water quality and improve ecological environment, and so on. The ESMF identified the potential downstream social risks, including labor risks, community health and safety, restriction on land use, resettlement, and exclusion risks for vulnerable groups. Exclusion risks would potentially relate to livelihood impact to farmers by limiting land use and inadequate consultations with ethnic minorities, and livelihood impacts to workers potentially experiencing layoff, among others.

10. An ESMF and an SEF have been prepared for the Central Basin IPF consistent with the ESF. The ESMF screened the potential E&S risks and established the principles, procedures, and requirements for managing the underlying E&S risks and impacts of the TA activities. The SEF differentiated the roles and responsibilities for CPMO and TA implementing agencies regarding effective stakeholder engagement throughout the process of TA studies. Both the ESMF and SEF provide operational guidance for applying relevant ESSs to TA activities and creating added value for enhancing the operability of policy recommendations while incorporating solid considerations on significant E&S risks.

11. The material actions have been agreed with the borrower and committed in the ESCP. The ESCP commits the CPMO, the expert advisory panel, and the TA implementing agencies (that is, Executing Agencies and any additional contractors for TA activities) to ensure adequate assistance is mobilized from E&S experts. The TORs for TA activities, subject to the World Bank's prior review, shall require TA implementing agencies to have E&S specialists' input on E&S analysis consistent with relevant ESS, and also carry out meaningful stakeholder engagement throughout the TA activities. Before initiating a TA activity, the implementing agency shall formulate a specific stakeholder engagement plan (SEP). The CPMO shall ensure that the TA implementing agencies shall carry out a focused E&S assessment to assess the potential downstream risks, and the policy recommendations shall include appropriate recommendations consistent with ESF requirements. Both the CPMO and TA implementing agencies shall enable ongoing meaningful consultation with representative stakeholders overall the full cycle of TA studies. The CPMO will monitor the E&S performance of the Central Basin IPF and report to the World Bank on a semiannual basis.

12. Information disclosure and public consultation. During preparation, the CWRC, on behalf of the NDRC YREB Coordination Office, conducted preliminary stakeholder engagement and consultation to inform the preparation of E&S documents. The draft documents (including ESMF, ESCP, and SEF) were disclosed locally on July 25, 2021.<sup>141</sup> The E&S documents have captured advice and comments received from stakeholders. The final E&S documents have been disclosed on the World Bank's website in October 2021 and were redislosed on the local website on November 08, 2021.

## Fiduciary

### ***Financial Management***

13. **Institutional arrangements.** The CPMO established within the CWRC is responsible for the overall financial management of the central component. Although the CWRC has even been implementing a World Bank-financed project, none of the current CWRC staff has such experience. Per review of the CVs of the financial staff assigned, it is noted that they are qualified to take project FM-related responsibilities. The financial staff are required to take the self-learning on the E-learning platform developed by the World Bank and pass the test before the signing of loan agreement.

14. Since it is hard to define the scope of government investment and collect the required financial data, it is agreed that the Central Basin IPF will be solely financed by IBRD loan and no counterpart funds will be accounted and reported.

<sup>141</sup> <http://www.cjw.gov.cn/zwzc/gsgg/56781.html>



The loan agreement will be signed between IBRD and the People's Republic of China through its MOF. The MOF will be responsible for the repayment.

15. **Disbursement arrangements.** The borrower has decided that disbursements will be documented via the transaction-based disbursement method. The primary World Bank disbursement method will be advances to the DA. One DA in Chinese yuan will be opened and managed by the CWRC. Withdrawal applications (WAs) will be prepared by PMO to request World Bank disbursements and to document the use of World Bank financing. WAs will include supporting documents in the form of Statement of Expenditures and source documents identified in the Disbursement and Financial Information Letter issued by the World Bank. Direct payment and reimbursement from the loan account may also be used, provided the WA value is above the minimum application amount.

16. The World Bank loan for the IPF component would disburse against 100 percent of eligible expenditures (taxes inclusive), consisting of goods, consulting services, non-consulting services, training and workshop, and incremental operating costs. Retroactive financing not to exceed US\$1.5 million will be allowed for payments made prior to the date of the Loan Agreement for the Project, but on or after August 1, 2021 as specified in Loan Agreement, for eligible expenditures under the Central Basin IPF.

17. **Budgeting.** The CWRC will prepare annual loan utilization plan and submit to MOF for approval by the end of November each year. The approved annual plan will be submitted to the World Bank as well. Budget variance analysis will be conducted on semiannual basis by the CWRC and necessary actions will be taken to ensure that the project could be implemented as planned.

18. **Funds flow.** The World Bank loan proceeds will flow from the World Bank into project DA to be set up at and managed by the CWRC. The CWRC will be directly responsible for the management, maintenance, and reconciliation of the DA activities. To ensure proper usage of project funds, payment requests will be prepared by CPMO and reviewed by related divisions of the CWRC by following its internal procedures (the procedures have been documented in project financial management manual). The World Bank loan proceeds will be disbursed to the DA and then to contractors or paid directly to contractors based on the WA instructions.

19. **Accounting and financial reporting.** A centralized project financial management mechanism would be adopted in the project, that is, all project disbursement- and financial management-related tasks would be handled by the PMO within the CWRC. The Circular No. 13: 'Accounting Regulations for the Bank-financed Projects' issued by the MOF will be adopted in the project. PMO will be managing, monitoring, and maintaining its project accounting records for the activities they execute. Original supporting documents will be retained by PMO. The unaudited semiannual project interim financial reports (format and content in accordance with the abovementioned Circular No.13 agreed with the MOF) will be prepared and furnished to the World Bank by PMO no later than 60 days following each semester, in form and substance satisfactory to the World Bank.

20. **Internal control.** The internal control system comprises (a) primary FM responsibilities of the PMO that will be, but not limited to, reviewing expenditure reporting and financial reports. PMO will be responsible for day-to-day FM work and submitting project financial reports to the World Bank in compliance with legal documents; (b) the CWRC will oversee the project DA and the using of the World Bank loan for its intended purpose; (c) appropriate FM duty segregation in the PMO; and (d) annual external audit to evaluate the performance of the overall internal control system. A set of sound internal control procedures have been established in the CWRC and the project will fully rely on its existing internal control system. All internal control procedures have been documented in project financial management manual prepared by the CWRC.

21. **Audit arrangements.** The foreign funds audit center within CNAO has been assigned by CNAO as auditor for the project. The annual audit report will be issued by the foreign funds audit center, who have extensive experience with previous World Bank projects and is deemed acceptable to the World Bank. In addition, according to CNAO's quality



assurance procedures, each first year's audit report issued by the audit center should be reviewed by CNAO before the audit report is submitted to the World Bank. The CPMO will be responsible for submitting the annual audit report of the project financial statements to the World Bank within six months after the end of each calendar year (June 30). According to the agreement reached with the MOF and CNAO, the audit report and audited financial statements will be made publicly available in both World Bank and CNAO's official websites. This requirement is stipulated in the Loan Agreement.

## **Procurement**

22. **Applicable procurement rules and procedures.** Procurement for the central IPF component will be carried out in accordance with the 'World Bank Procurement Regulations for IPF Borrowers', dated November 2020 (hereafter referred to as the World Bank Procurement Regulations), as required by the provisions of the Legal Agreement. In addition, the World Bank's Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants, dated October 2006, and thereafter revised in January 2011 and July 2016, will be applicable. The World Bank's Systematic Tracking of Exchanges in Procurement (STEP) tool will be used to prepare, clear, and update PPs and record all procurement transactions.

23. **Institutional arrangements for procurement.** A CWRC team functioning as the CPMO will play the procurement role under the Basin IPF. The current proposal is a team of five to six members with one team head and four to five team members responsible for respective project management functions. The assessment found the appointed procurement staff has relevant domestic and limited World Bank-financed project procurement experience (one contract). Working closely with the CWRC are various public entities that could be selected as executing agencies, in accordance with eligibility criteria acceptable to the World Bank, for implementing activities covering their respective mandates following government policies and arrangements. An implementation agreement will be signed between CPMO and each EA to govern the roles and responsibilities of each side. The remaining activities under the project (apart from activities to be carried out by selected executing agencies), and any contract-based procurement carried out by a selected EA (apart from incremental cost financed activities) will follow the World Bank Procurement Regulations (November 2020) for selection of the most appropriate consultant(s) / supplier(s) / contractor(s) to carry out the assignment(s). A project office will be set up inside each selected executing agency staffed with individuals as focal points for their respective functions. At the time of assessment, procurement staff at executing agency level had not been appointed yet. Given that no procurement is expected at the executing agency level during the initial period of the project, a procurement assessment may be carried out before procurement is initiated at each executing agency, if necessary.

24. **Procurement Risk Assessment and Mitigation Measures.** Based on the World Bank's assessment, there are two key procurement risks. The first is the lack of knowledge and experience of carrying out procurement following the World Bank's Procurement Regulations, and the second is the possibility of hiring CWRC affiliated agencies on a single source basis without justifications acceptable to the World Bank. To mitigate the above risks, the following mitigation measures are proposed and agreed with CPMO: (a) procurement staff will need to participate World Bank procurement online training through the online training platform<sup>142</sup> to get acquainted with the World Bank's procurement requirements; (b) procurement staff will receive hands-on training on STEP system; (c) the procurement section of the project operation manual states procurement roles and responsibilities of CPMO and executing agencies, internal procedures and controls; (d) advise affiliated agencies who expressed interest to CWRC assignment under the project of their ineligibility to participate in advance; (e) wider circulation of procurement notices to non-affiliated agencies to engender their interest; and (f) report to the World Bank any potential or actual conflict of interest or eligibility issues to see what solutions may be provided.

25. **Major procurement envisaged under the project.** The Basin IPF would finance TA, goods and non-consulting services, and incremental operating expenses. Major activities under the Central Basin IPF focuses on five aspects: (a)

<sup>142</sup> [http://www.wbelp.com/WebPage/Project/html/Home\\_Index.html](http://www.wbelp.com/WebPage/Project/html/Home_Index.html)



coordination mechanisms; (b) policy support for ecological protection and environmental restoration; (c) policy and technical support for water pollution; (d) policy support for ecological incentive mechanisms; (e) capacity building and program support.

26. Quality- and Cost-Based Selection, Quality-Based Selection, Selection Based on the Consultants' Qualifications, and Direct Selection methods will be adopted for most of the consulting services contract. State owned research institutions, colleges, associations, and consulting companies may be eligible to participate only if they meet the Bank's eligibility and conflict of interest requirements as stated in the Regulations. Request for Bids and Request for Quotations may be more suitable for the procurement of goods and non-consulting services contracts depending on the contract cost estimate. Direct Selection will be adopted if and when fully justified.

27. **Project Procurement Strategy for Development (PPSD) and Procurement Plan (PP).** Based on paragraphs 4.1–4.5 of the World Bank's Procurement Regulations, a PPSD and an accompanying project PP have been prepared by the CPMO in close consultation with the World Bank. The PPSD states how procurement activities will help the project achieve its development objective and deliver best value for money using the fit-for-purpose procurement and risk-managed approach, giving due consideration to specific project needs and to the country's operational and market context. Decisions on the selection methods and market approaches to be adopted in the project PP are justified in the PPSD. This information will be made available in the project's database, on the World Bank's external website, and at the project implementing agency's office. The PP will be updated in a way that reflects actual implementation needs and institutional capacity and will be agreed upon by the World Bank through STEP. The PPSD may need to be updated during project implementation.

28. **Use of STEP.** It is mandatory that all procurement transactions for post- and prior-review contracts under the project be recorded in and processed through STEP, the World Bank's planning and tracking system. This ensures comprehensive information on procurement and implementation of all contracts for goods, non-consulting services, and consulting services awarded under the whole component will automatically be made available. This tool will be used to manage the exchange of information (such as procurement documents, bid evaluation reports, no objections, contracts, and so on) between implementing agencies and the World Bank. The World Bank team will provide training to the borrower on how to establish its account and use the STEP tool.

29. **Procurement methods and World Bank oversight.** The thresholds of individual procurement methods and the requirements for the World Bank's prior review are shown in the PP. These will need to be followed for project procurement activities, which will be agreed upon based on specific World Bank procurement requirements and the justifications provided in the PPSD. Specific procurement requirements will be included in the project PP; however, any changes to the needed procurement thresholds during project implementation will have to be justified in the updated PPSD and reflected in the updated PP. In addition to prior review, supervision carried out from the World Bank offices, World Bank procurement supervision missions will visit the field at least once a year to carry out procurement supervision or post-review of procurement activities. The post-review sampling ratio of contracts will be 1:10.

**ANNEX 8. IMPLEMENTATION SUPPORT PLAN**

1. Support for implementation of the PforR will require close attention and continuous support from the World Bank team. The PforR instrument is new to some government teams involved in the Program. This annex outlines the key activities to address risks identified by the risk assessment and provides the TA needed to improve the quality of Program implementation. Emphasis is placed on (a) supporting early-stage implementation and building institutional capacity; (b) reviewing implementation progress (including that of the PAP) and achievement of Program results and DLIs; (c) providing support to resolve emerging implementation issues; (d) monitoring the adequacy of systems performance, and monitoring compliance with Legal Agreements; and (e) supporting the Government in monitoring changes in risks.

2. The strategy and approach for implementation support includes an emphasis on the technical, fiduciary, and E&S support needed during implementation. The World Bank team provided technical expertise during preparation and will continue to provide technical support during implementation, as well as guidance to the agencies on Fiduciary and E&S aspects to ensure completion of the actions agreed in the PAP. 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 TA to address shortcomings identified during the assessment, most notably around audits and the reporting expenditures.

3. Given the multi-provincial, cross-sectoral characteristics of the Program significant resources above the regional norms will be needed during implementation. The integration of the PforR and the IPF also requires expertise and assistance with both instruments during implementation. This support will be ensured through leadership and close contributions from team members in the China Country Office, located in Beijing, with additional support and leadership from international technical specialists. This combination will leverage the World Bank's global knowledge and local expertise to enable timely and effective responses to the needs of the borrowers. Formal implementation support missions and field visits covering all aspects of implementation will be conducted periodically during implementation. The characteristics of the program necessitate that these implementation support missions will be longer than the standard single province or agency engagement. Tables 8.1 and 8.2 outline the estimated inputs from different specialists and resources required at different stages of Program implementation.

**Table 8.1. Main Focus of Implementation Support**

Time	Focus	Skills Needed	Resources Estimate (Staff Weeks)
First 12 months	<ul style="list-style-type: none"><li>• Implementation of program management systems</li><li>• Setting up cross administrative-level coordination mechanism</li><li>• Staff capacity building, on-the-job training on E&amp;S and fiduciary</li><li>• Procurement process and training</li><li>• E&amp;S training, support to implementation of policy requirements</li><li>• Technical support to activities and implementation</li><li>• Financial management and disbursement training and capacity building</li></ul>	<ul style="list-style-type: none"><li>• Core team, particularly technical, FM, procurement, E&amp;S experts</li><li>• Integrated water and environment management expert</li></ul>	72
12–48 months	<ul style="list-style-type: none"><li>• Technical support to implementation</li><li>• Conduct policy and technical research</li><li>• Review of environmental, social, and financial performance of central components</li><li>• Continued improvements in project management systems including fiduciary and safeguards</li><li>• Program Midterm Review</li></ul>	<ul style="list-style-type: none"><li>• Core team, particularly technical, FM, procurement, E&amp;S experts</li><li>• Integrated water and environment management expert</li></ul>	120



Time	Focus	Skills Needed	Resources Estimate (Staff Weeks)
Other	<ul style="list-style-type: none"> <li>Completion of activities</li> <li>Capacity building and facilitate knowledge exchange and events</li> <li>Support technical and financial analysis of program investments</li> <li>End-term evaluation and client ICR</li> </ul>	<ul style="list-style-type: none"> <li>Core team, particularly technical, FM, procurement, E&amp;S experts</li> <li>Integrated water and environment management</li> </ul>	56

**Table 8.2. Task Team Skills Mix Requirements for Implementation Support**

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Task team leader/program management	10 annually	Three in the first year, two thereafter	Internationally based staff
Task team leader(s)/program management	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	3–4 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 water environment expert	2–4 annually	Two per year	Consultant (national)
Solid waste management expert	2–4 annually	Two per year	Consultant (national)
Big data and AI expert	2 annually	One per year	Consultant (national)

Note: AI = Artificial Intelligence.



## ANNEX 9. TEAM LIST

No.	Name	Title	Unit
1.	Ms. Delphine Arri	Senior Environmental Engineer	SENL
2.	Mr. Xavier Chauvet De Beauchene	Lead Water Supply and Sanitation Specialist, Peer Reviewer	SSAW1
3.	Mr. Harold Bedoya	Operations Manager	EACCF
4.	Mr. Jianxin Chen	Senior Interpreter	SEAW1
5.	Mr. Ladisy Komba Chengula	Lead Agriculture Economist	SEAAG
6.	Mr. Yi Dong	Senior Financial Management Specialist	EEAG1
7.	Ms. Li Du	Senior Financial Consultant	SEAW1
8.	Mr. Yiren Feng	Senior Environmental Specialist	SEAE1
9.	Mr. Alejandro Alcala Gerez	Operations Manager	EACCF
10.	Ms. Si Gou	Water Resources Specialist	SEAW1
11.	Mr. Nagaraja Rao Harshadeep	Lead Environment Specialist, Peer Reviewer	SENCR
12.	Ms. Jingrong He	Senior Procurement Specialist	EEAR1
13.	Ms. Nevena Ilieva	Operations Adviser	SEADR
14.	Mr. Parameswaran Iyer	Global Advisor	SWADR
15.	Mr. David James Kaczan	Economist, Task Team Leader	SEAE1
16.	Mr. Abedalrazq F. Khalil	Sector Leader, Peer Reviewer	SSADR
17.	Ms. Yoonhee Kim	Sector Leader	SEADR
18.	Ms. Anqi Li	Program Assistant	WFACS
19.	Mr. Xiaokai Li	Lead Water Resource Specialist, Task Team Leader	SEAW1
20.	Mr. Xiawei Liao	Water Resources Specialist	SEAW1
21.	Mr. Xueming Liu	Senior Economist Consultant	FAO
22.	Mr. Yun Ma	Financial Consultant	SEAW1
23.	Mr. Aristeidis Panou	Senior Counsel	LEGAS
24.	Mr. Christian Albert Peter	Practice Manager, Former-Task Team Leader	SENL
25.	Mr. Kai Shang	Social Development Specialist	SEAS1
26.	Ms. Qi Tian	Senior Water Resource Management Specialist	SEAW1
27.	Ms. Linjie Wang	Environmental Economist Consultant	SEAW1
28.	Mr. Peishen Wang	Senior Environment Specialist	SEAE1
29.	Ms. Xiaolan Wang	Senior Operations Officer	EACCF
30.	Ms. Yuan Wang	Senior Procurement Specialist	EEAR1
31.	Ms. Anna Wielogorska	Lead Procurement Specialist	EEAR1
32.	Mr. Marcus Wishart	Lead Water Resource Specialist, Task Team Leader	SEAW1
33.	Ms. Dan Xie	Program Assistant	EACCF
34.	Mr. Jian Xie	Senior Environmental Specialist, Peer Reviewer	SAEE2
35.	Ms. Fang Yang	Gender Specialist	EACF
36.	Mr. Songling Yao	Senior Social Development Specialist	SEAS1
37.	Ms. Carmen Rosa Yee-Batista	Senior Water Supply and Sanitation Specialist, Peer Reviewer	SLCWA
38.	Mr. Xiangang Zeng	Senior Environmental Economist Consultant	SEAW1
39.	Ms. Fang Zhang	Senior Financial Management Specialist	EEAG1
40.	Ms. Xinchen Zhang	Environmental Specialist	SEAE1
41.	Ms. Ruxin Zhao	Team Assistant	EACCF
42.	Ms. Minghe Zheng	Finance Officer	WFACS
43.	Mr. Guoxin Zhou	Social Specialist Consultant	SEAS1
44.	Ms. Ping Zuo	Senior Social Specialist Consultant	SEAS1



### ANNEX 10. MAPS





The World Bank

Yangtze River Protection and Ecological Restoration Program (P171644)

