THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

FOR OFFICIAL USE ONLY

Report No: PAD4885

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROGRAM APPRAISAL DOCUMENT
ON A

PROPOSED LOANS

IN THE TOTAL AMOUNT OF

US$320 MILLION EQUIVALENT

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

GREEN AGRICULTURAL AND RURAL REVITALIZATION PROGRAM – PHASE I

March 10, 2022

Agriculture and Food Global Practice
East Asia and Pacific Region

CURRENCY EQUIVALENTS

Exchange Rate Effective February 28, 2022

Currency Unit =	Chinese Yuan (CNY)
CNY 1 =	US$0.16
CNY 1=	Euro 0.14
US$1 =	CNY 6.31
US$1 =	Euro 0.89
Euro 1 =	CNY 7.07
Euro 1 =	US$1.12

FISCAL YEAR
January 1 – December 31

Regional Vice President: Manuela V. Ferro

Regional Director: Benoit Bosquet

Country Director: Martin Raiser

Practice Manager: Dina Umali-Deininger

Task Team Leader(s): Ladisy Komba Chengula, Wendao Cao

ABBREVIATIONS AND ACRONYMS

APA	Alternate Procurement Arrangements
ARAB	Agriculture and Rural Affairs Bureaus
ASF	African Swine Fever
BOD	Biological Oxygen Demand
CCB	Climate Co-Benefits
CEB	Comprehensive Enforcement Bureau
CERC	Contingent Emergency Response Component
CH_3	Ammonia
CH_4	Methane
CNAO	China National Audit Office
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
COOP	Market and Supply Cooperative
CPF	Country Partnership Framework
CPMO	County Program Management Office
CSA	Climate Smart Agriculture
DARA	Department of Agriculture and Rural Affairs
DEE	Department of Ecological Environment
DHE	Dragon Head Enterprises
DHRSS	Department of Human Resources and Social Security
DHURC	Department of Housing and Urban-Rural Construction
DLI	Disbursement Linked Indicator
DLR	Disbursement Linked result
EA	Engagement Area
EEB	Ecology and Environment Bureaus
EFA	Expenditure Framework Assessment
EIA	Environmental Impact Assessment
EMB	Emergency Management Bureaus
EMS	Environmental management systems
EPA	Environmental Protection Agencies
EPI	Environmental Performance Index
ESSA	Environmental and Social System Assessment
EU	European Union
FA	Farmer Association
FB	Forestry Bureau
FC	Farmer Cooperative
FLW	Food Loss and Waste
FSA	Fiduciary Systems Assessment
FYP	Five Year Plan
GAP	Green Agricultural Practices
GARR	Green Agricultural and Rural Revitalization

GDP	Gross Domestic Product
GHGs	Greenhouse Gas Emissions
GI	Geographical Indication
GPG	Global Public Goods
GPL	Government Procurement Law
GRS	Grievance Redress Service
HC	Health Commissions
HEIS	Hands-on Enhanced Implementation Support
H_2S	Hydrogen Sulphide
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion Report
IFMIS	Integrated Financial Management Information System
IPF	Investment Project Financing
IPRCC	International Poverty Reduction Center of China
IVDP	Integrated Village Development Plan
LA	Loan Agreement
MARA	Ministry of Agriculture and Rural Affairs
M&E	Monitoring & Evaluation
MEE	Ministry of Ecology and Environment
MFD	Maximizing Finance for Develoment
MIS	Management Information System
MNR	Ministry of National Resources
MOF	Ministry of Finance
MOHURD	Ministry of Housing Urban and Rural Development
MPA	Multiphase Programmatic Approach
MTR	Mid-Term Review
MWR	Ministry of Water Resources
NDC	Nationally Determined Contribution
NDRC	National Development and Reform Commission
NH_3N	Ammonia Nitrogen
NRAA	National Rural Revitalization Administration
NRB	Natural Resource Bureaus
N_2O	Nitrous Oxide
NPS	Non-point Source
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OPRC	Operational Procurement Review Committee
PA	Project Agreement
PAO	Provincial Audit Offices
PAP	Program Action Plan
PASA	Programmatic Advisory Services and Analytics
PDO	Program Development Objective
PDOF	Provincial Department of Finance

PDRC	Provincial Development and Reform Commission
PforR	Program for Results
PIU	Program Implementation Unit
PMO	Program Management Office
PRTC	Public Resource Transaction Center
RA	Results Area
R&D	Research and Development
RF	Results Framework
RPMO	Regional Program Management Office
RRP	Rural Revitalization Program
RRPL	Rural Revitalization Promotion Law
RRS	Rural Revitalization Strategic Plan
SA	Social Assessment
SC	State Council
SORT	Systematic Operations Risk Tool
TA	Technical Assistance
TBL	Tendering and Bidding Law
TFP	Total Factor Productivity
TN	Total Nitrogen
TOC	Theory of Change
TP	Total Phosphorus
TSA	Treasury Single Account
VA	verification agency
VC	Value Chains
WA	withdrawal application
WRB	Water Resource Bureau
WTS	Wastewater Treatment System
WUA	Water User Association
WWTF	Wastewater Treatment Facilities

CONTENTS

DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
China	Green Agricultural and Rural Revitalization Program for Results - Phase I	
Project ID	**Financing Instrument**	**Does this operation have an IPF component?**
P177590	Program-for-Results Financing	No

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[ ] Fragile State(s)
[ ] Contingent Emergency Response Component (CERC)	[ ] Fragile within a non-fragile Country
[ ] Small State(s)	[ ] Conflict
[ ] Alternate Procurement Arrangements (APA)	[ ] Responding to Natural or Man-made Disaster
[ ] Hands-on Enhanced Implementation Support (HEIS)	

Expected Project Approval Date	Expected Closing Date
31-Mar-2022	30-Jun-2028

Bank/IFC Collaboration

No

Proposed Program Development Objective(s)

The Program Development Objective (PDO) is to enhance environmentally sustainable agricultural and rural infrastructure development in selected areas of Guangxi and Guizhou.

Organizations

Borrower :	PEOPLE'S REPUBLIC OF CHINA
Implementing Agency :	Project Center, Guizhou Provincial Rural Revitalization Administration
Contact:	Song Gao
Title:	Director General

Telephone No:	085186827253
Email:	gzgarr@163.com
Implementing Agency :	Foreign Capital Project Management Center, Guangxi Agriculture and Rural Affairs Department
Contact:	Huiwu Wang
Title:	Director General
Telephone No:	07712182975
Email:	gxnywzxm@163.com

COST & FINANCING

SUMMARY

Government program Cost	5,016.00
Total Operation Cost	5,016.00
Total Program Cost	5,016.00
Total Financing	5,016.00
Financing Gap	0.00

Financing (USD Millions)

Counterpart Funding	**4,696.00**
Borrower/Recipient	4,696.00
International Bank for Reconstruction and Development (IBRD)	**320.00**

Expected Disbursements (USD Millions)

Fiscal Year	2022	2023	2024	2025	2026	2027	2028
Absolute	0.00	22.47	61.35	97.11	77.65	58.35	3.08
Cumulative	0.00	22.47	83.81	180.92	258.57	316.92	320.00

INSTITUTIONAL DATA

Practice Area (Lead)

Agriculture and Food

Contributing Practice Areas

Environment, Natural Resources & the Blue Economy, Governance, Social Protection & Jobs, Water

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Low
2. Macroeconomic	Low
3. Sector Strategies and Policies	Low
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Substantial
7. Environment and Social	Substantial
8. Stakeholders	Low
9. Other	
10. Overall	Substantial

COMPLIANCE

Policy

Does the program depart from the CPF in content or in other significant respects?

[ ] Yes [✔] No

Does the program require any waivers of Bank policies?

[ ] Yes [✔] No

Legal Operational Policies

	Triggered
Projects on International Waterways OP/BP 7.50	Yes
Projects in Disputed Areas OP/BP 7.60	No

Legal Covenants

Sections and Description
Program Institutions

Program Agreements (PAs), Schedule, Section I.B.1: The Program Implementing Entity shall maintain, and cause to be maintained, the following entities, with composition, powers, functions, staffing, facilities and other resources acceptable to the Bank: (a) at regional/provincial level: (i) the Program Leading Group; (ii) the Provincial/Regional Program Management Office; (iii) the Program Implementation Unit; and (iv) an expert advisory panel; and (b) at county level: (i) a leading group in each of the Program Counties; and (ii) a management office in each of the Program Counties.

Sections and Description
Program Action Plan

Loan Agreement (LA), Section I.B: The Borrower shall, and shall cause the Program Implementing Entities to, take, all measures necessary to comply with, or all measures necessary to enable the Program Implementing Entities to comply with the provisions of Section I.B.2 of the Schedule to the Program Agreement.

PAs, Schedule, Section I.B.2: The Program Implementing Entities shall, and shall cause the Program Counties to: (a) undertake the actions set forth in the Program Action Plan (as it relates to their Respective Part of the Program); (b) not amend, revise or waive, nor allow to be amended, revised or waived, the provisions of the Program Action Plan (as it relates to their Respective Part of the Program), or any provision thereof, without the prior written agreement of the Bank; and (c) maintain policies and procedures adequate to enable it to monitor and evaluate, in accordance with guidelines acceptable to the Bank, the implementation of the Program Action Plan (as it relates to their Respective Part of the Program).

Sections and Description
Verification Agency

PAs, Schedule, Section III.4: The Program Implementing Entity shall, not later than three (3) months after the Effective Date, hire, and thereafter maintain, throughout the period of Program implementation, verification

agent(s) having experience and qualifications in the relevant technical fields, acceptable to the Bank, and under terms of reference, including a time-table and adequate budget for its activities, acceptable to the Bank, to monitor and verify the achievement of the DLRs related to their Respective Part of the Program.

Sections and Description
Program Implementation Plan

PAs, Schedule, Section I.B.3: The Program Implementing Entities shall, and shall cause the Program Counties to, apply, throughout the period of implementation of their Respective Part of the Program, the Program Implementation Plan in a timely and efficient manner acceptable to the Bank. The Program Implementing Entities shall, and shall cause the Program Counties to, not amend, suspend, or waive said Program Implementation Plan or any provision or schedule thereof, without the prior written agreement of the Bank. In the event of any inconsistency between the provisions of the Program Implementation Plan and those of this Agreement or the Loan Agreement, the provisions of this Agreement and the Loan Agreement shall prevail.

Sections and Description
Annual Work Plans and Budget Allocations

PAs, Schedule, Section I.B.4: The Program Implementing Entities shall, and shall cause the Program Counties to: (a) carry out activities under the Program during each fiscal year in accordance with Annual Work Plans and Budget Allocations; (b) prepare and furnish to the Bank by December 15 in each year, beginning in 2022, the Annual Work Plan and Budget Allocations, summarizing the Program activities to be undertaken and projected targets for the following calendar year, including the proposed overall annual budget allocations for the Program, including the proceeds of Loan A and Loan B; and (c) thereafter, ensure the implementation of the Program during the following calendar year in accordance with the Annual Work Plan and Budget Allocation, in a manner satisfactory to the Bank.

Sections and Description
Mid-term Review

PAs, Schedule, Section III.2: The Program Implementing Entities shall prepare, under terms of reference acceptable to the Bank, and furnish to the Borrower and the Bank no later than August 31, 2025, a consolidated mid-term review report for their Respective Part of the Program, summarizing the results of the monitoring and evaluation activities carried out from the inception of their Respective Part of the Program, and setting out the measures recommended to ensure the efficient completion of their Respective Part of the Program and to further the objectives thereof.

Conditions

Type	Financing source	Description
Effectiveness	IBRD/IDA	LA, Article V, 5.02: Each of the Program Implementing Entities has adopted its respective Program Implementation Plan in form and substance acceptable to the Bank.

I. STRATEGIC CONTEXT

A. Country Context

1. **After 40 years of rapid economic growth, China eradicated absolute poverty in 2020.** According to the last accessible household survey data from 2018, the share of people living below the extreme international poverty line of US$1.90 per day had fallen below 1 percent. Despite this remarkable achievement, however, economic vulnerabilities remain widespread, especially, although not exclusively, in rural areas.

2. **Close to one-fifth of China's population remains economically vulnerable; two-thirds of these people inhabit rural areas.** About 250 million Chinese remain below the US$5.50 poverty line recommended for upper middle-income countries (MICs), of which two-thirds reside in rural areas. Approximately 40 percent of China's population (or 570 million people) live in rural areas; and many of them are vulnerable to falling back into poverty in case of an economic shock or natural disaster.

3. **China's rural economy is challenged by natural and human resource constraints along with institutional weaknesses that diminish the effectiveness of ample government support.** China has limited natural resource endowments. For example, water availability is only 8 percent of global water resources and arable land is 13 percent of the world total. Small farm sizes (93 percent of farms are less than 1 hectare) and aging farmers (averaging about 54 years) constrain agricultural modernization. Underinvestment in agriculture and rural public services, such as research and development (R&D),[1] extension and advisory services, and storage and cold chains, and in vocational skill development adversely affect labor and land productivity. Given these constraints, rural income continues to lag significantly despite considerable investments in rural infrastructure, including rural roads, water and sanitation, and irrigation and drainage systems. Limited institutional and governance capacity at the subnational level (e.g., program budgeting, targeting of poverty and farm support, monitoring and evaluation (M&E)) and weak farmer organizations (e.g., farmer cooperatives, water user associations) continue to hamper the efficient delivery of rural public services and development of viable agro-food enterprises.

4. **Moreover, China's past rapid agricultural growth has come at the cost of increasing environmental degradation and natural resource depletion.** It is estimated that the cost of environmental degradation and resource depletion in China amounts to about 9 percent of its GDP, 10 times higher than corresponding levels in Korea and Japan.[2,3] China was ranked 120th out of 180 countries for environmental performance across 24 indicators in 10 categories: air quality, water and sanitation, heavy metals, biodiversity and habitat, forests, fisheries, climate, energy, water resources, and agriculture. The environmental performance index (EPI) shows that China is lagging behind many other upper MICs, such as Brazil, Mexico, Russia, and Turkey, with comparable per capita income.

5. **To put rural development on a more sustainable and at the same time greener footing, China adopted the Rural Revitalization Program (RRP, 2018–2035) in 2017.** The RRP is being implemented through a series of five-year Rural Revitalization Strategic Plans (RRS), which form the basis for the proposed operation. Program objectives and

[1] The ratio of agricultural R&D expenditures to agricultural GDP increased from 0.14 in 2002 to 0.46 in 2018, but that is still significantly lower than that of developed countries, which average from 1.0 to 2.0.
[2] World Bank and State Environmental Protection Administration (2007). Cost of pollution in China.
[3] World Bank Group and DRC (2018). "China 2030: Building a Modern, Harmonious and Creative Society." The World Bank and Development Research Center of the State Council, the People's Republic of China.

milestones have been further elaborated in annual policy documents[4] and in the 14th Five-Year Plan (FYP, 2021–2025) for the National Green Development of Agriculture[5] (for further details, see below on the Government Program).

6. **Despite the greater prominence given to green agricultural development in national planning documents, in practice the government's rural revitalization and greening objectives are not fully coordinated.** Central and regional/provincial government transfers targeting rural revitalization do not consider green, low-carbon, and sustainable agriculture and rural development as primary objectives. Instead, agricultural support policy measures (e.g., input subsidies, guaranteed purchase schemes, cheap credit, etc.) have been tied to farmland area, production volumes, and yield, without considering environmental costs and benefits. Moreover, critical funding gaps remain for some rural public services, especially rural wastewater and solid waste management. Thus, there is an urgent need for developing new governance frameworks for mobilizing fiscal resources (and tracking expenditures), which can be transferred to counties to achieve specific targets for the green, low-carbon, and sustainable agriculture and rural development objectives.

7. **The adoption of green technologies and practices by farmers and producer cooperatives is further hampered by perverse incentives, commercial risks, and insufficient farm-level knowledge.** Specifically, farmers face the following challenges: (a) input-oriented subsidies encourage the use of more harmful chemical agricultural inputs, especially fertilizer and pesticide, in crop production than necessary; (b) climate-smart agricultural technologies and practices, including the use of formula fertilizer, fertigation, organic and green manure, and livestock and poultry manure treatment and recycling facilities, require upfront investments; but risk-averse and credit-constrained farmers are reluctant to switch; (c) farmers need extensive technical training and capacity building to fully master the details of green agricultural technologies and practices, but local institutional capacity to deliver such knowledge is limited; and (d) farmers find it difficult to recoup the costs of producing green agricultural products unless they are certified as green or organic, or registered as geographical indication (GI), and are sold in niche markets, in which consumers are willing to pay premium prices.

8. **Guangxi Zhuang Autonomous Region ("Guangxi") and Guizhou province are among the poorest administrative regions in China, and are well-suited for this operation**. With GDP per capita at about US$6,700 and US$6,400 in 2020, respectively, Guangxi and Guizhou are among the bottom four poorest provinces out of mainland China's 31 administrative regions. Agriculture continues to represent a sizable part of their economies, with larger than average rural populations in both provinces, and their agro-climatic conditions are similar. From 2015 to 2020, Guangxi's and Guizhou's poverty rates declined from 10.2 percent and 7.8 percent respectively to 0.6 percent, faster than the national average, partly with support from the World Bank. Using the Program for Results (PforR) instrument, the Bank supported Guangxi's poverty reduction program, focusing on better targeting, access to services, and more integrated M&E from 2018 to 2021. The Bank also piloted a value chain approach to increase income generation opportunities for the rural population through the Guangxi Rural Poverty Alleviation Pilot Project. Similarly, in Guizhou, through the Guizhou Rural Development Project, the Bank supported agricultural modernization through improved organizational arrangements and strengthened public services delivery. These past successful interventions, their predominantly rural profile, similar agro-climatic conditions, and dominant agricultural value chains make Guizhou and Guangxi well-suited for phase 1 of

[4] Traditionally, the first Central Document issued by the Central Committee of the Communist Part of China and the State Council each year has focused on agricultural reforms and modernization of the rural economy.
[5] A joint notice of the Ministry of Agriculture and Rural Affairs, National Development and Reform Commission, Ministry of Science and Technology, Ministry of Natural Resources, Ministry of Ecology and Environment, and National Forestry and Grassland Administration (Nong Gui Fa [2021] No. 8) issued in August 2021.

this PforR, which combines rural revitalization with greening of agricultural production at the provincial scale. Based on experiences gained in this operation, the approach is expected to be extended to additional provinces with different agricultural value chains in future years.

9. **The Green Agricultural and Rural Revitalization (GARR) PforR also provides incentives for strengthening institutional delivery mechanisms to ensure a sharper focus on green agricultural development and rural development results** while keeping the focus on poor and vulnerable households in Guangxi and Guizhou. It also provides additional incentives to leverage World Bank financing to enhance the efficiency and impact of the phased RRS, through improvements in governance frameworks, such as the platforms for program-based budgeting and public expenditure tracking, M&E, and verification of results.

B. Sectoral (or Multi-Sectoral) and Institutional Context

Green Agricultural Development

10. **China has one of the largest agricultural sectors in the world**. In 2020, China's agricultural GDP amounted to US$1.13 trillion (constant 2010 US$), equivalent to 7.7 percent of the national GDP. Agricultural GDP has increased 4.5 percent per year on average over the past 40 years, driven mainly by higher total factor productivity (TFP), the introduction of new technologies, and large producer subsidies, mostly for rice, wheat, and maize production, which today exceed levels in the European Union and United States. Despite its limited natural resource endowment, China produces about 18 percent of the world's cereal grains, 29 percent of the world's meat, and 50 percent of the world's vegetables. China also plays an important role in international agricultural trade. The country is the largest importer of soybeans, maize, beef and aquatic products, and is the largest exporter of chemical fertilizer. As a large producer, consumer, and trader, China's producer support and international trade policies have significant global implications.

11. **China is the largest global emitter of greenhouse gases (GHGs) from agriculture, accounting for 13 percent of the total.**[6] The main sources of China's agricultural GHG emissions are enteric fermentation from ruminant animals (28.7 percent), excessive or improper synthetic fertilizer use (21.8 percent), paddy rice cultivation (16.0 percent), and poor livestock waste (manure, sewage, and urine) management (10.5 percent). The agricultural sector emits an estimated 828 million tons of carbon dioxide (CO_2) equivalent per year.[7,8] Climate models estimate that, without serious national mitigation efforts, agricultural emissions in China will rise to 1,350 million tons per year by 2050. In 2018, China's agricultural sector accounted for about 11 percent of the country's GHG emissions – the third-largest source after energy and industry.

12. **At the same time, excessive use of chemical fertilizer is one of the major non-point sources (NPS) of water pollution in China.** The country is now the largest chemical fertilizer user globally, in both absolute terms and per unit of land. Most of this fertilizer is not taken up by the targeted plants, but instead dispersed through the air, soil, and water. About 67 percent of monitored groundwater sites are polluted and 32 percent of the major rivers fail to meet basic quality standards required for sources of drinking water supply. About 7 percent of irrigated lands are contaminated with polluted water. The National Sustainable Agricultural Development Plan (2015–2030) targets zero growth of fertilizer as part of efforts to combat NPS pollution and to reduce GHG emissions, and, since 2015, the amount of chemical fertilizer

[6] The main agricultural and land use change GHG emissions are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).
[7] According to China's Third National Communication to the UNFCCC of December 2018. Although this is the official figure reported by China, other sources such as *Climate Watch* put the level of China's agricultal sector emissions closer to 730 million tons.
[8] The social cost of carbon is a measure of the economic harm from those impacts, expressed as the dollar value of the total damages from emitting 1 ton of carbon dioxide into the atmosphere. The current central estimate of the social cost of carbon is more than US$50 per ton in today's dollars.

use has been declining. Nonetheless, the amount of fertilizer applied per unit area in China is still about five times that of the EU, three times the global average, and twice that of the U.S. Thus, potential exists for cutting nitrogen applications by 30–60 percent without reducing yields in China's major grain-producing areas.

13. **Untreated manure from livestock and poultry operations is also one of the major sources of water pollution in China**. In 2017, pollutants measured in terms of the country's total chemical oxygen demand (COD), total nitrogen (TN), and total phosphorus (TP) were 21.44, 3.04, and 0.32 million tons,[9] respectively. Agricultural sources accounted for 50 percent, 47 percent, and 67 percent of these pollutants, respectively. The livestock subsector is the major contributor of water pollution in China, accounting for 96 percent of COD, 38 percent of TN, and 56 percent of TP. Since 2016, the government has implemented efforts to increase the treatment rate of animal manure, setting a target of 80 percent in the latest 14th FYP. In 2020, the recycling rate of livestock and poultry manure was 75.9 percent. The untreated livestock and poultry manure discharged into water bodies causes a sharp decline in soluble oxygen, leading to eutrophication and algae blooms. As a result, water quality is compromised, and aquatic biodiversity is altered. Untreated manure may also increase the concentration of nitrates in groundwater due to the leakage of nutrients. Untreated manure is also a major source of air pollution in the form of hazardous gases (e.g., ammonia and hydrogen sulphide and GHGs), as well as stench and dust.

14. **The low rate of recycling agricultural plastics is another major environmental challenge.** China has the largest agricultural area under plastic film mulch in the world. This is mainly because of its rapid expansion into fruit and vegetable production – a response to dietary diversification locally and abroad. Over the past two decades, the area under plastic film in China grew more than 150 times and surpassed 20 million hectares, using nearly 1.2 million tons of plastic film. In 2020, the recovery rate of agricultural plastic film was 80 percent. However, the recycling rate of plastic mulch was less than 60 percent (14th FYP target is 85 percent). The environmental impact of this practice is ambiguous. On the one hand, plastic film mulching has played an important role in China's agricultural development due to its ability to warm soil, retain moisture, and reduce pesticide residues in soil. Over time, this has significantly increased crop yield (e.g., 20–35 percent in grains and 20–60 percent in cash crops) and hence farm income. On the other hand, the widespread use of plastic film mulching has generated large quantities of plastic waste. Improper collection, treatment, and disposal of agricultural plastics contribute to air, water, and soil pollution as well as ecosystem degradation. Large quantities of plastic film mulch have ended up in streams, rivers, and ultimately the world's oceans, thus endangering wildlife. Although the policy framework for plastic collection and recycling and the use of micro-thin plastics in agriculture has recently tightened, enforcement in rural areas remains patchy at best. In 2019, the government put forth *Opinions on accelerating the prevention of agricultural mulch pollution*.[10] The document set several high-level targets, including that, by 2020, the area covered in plastic film will cease to grow and 80 percent of mulch films will be collected and recycled. By 2025, the policy aims for nearly all agricultural membranes to be recovered and for plastic film residues to decline. In 2020, China introduced a roadmap for phasing out the reliance on a variety of short-lived plastics by 2025. Its multiple pronged approach includes measures to reduce and replace plastics with degradable mulch, increasing recycling rates, improving plastics management, and investing in science and technology.[11]

[9] FAO (Food and Agriculture Organization of the United Nations). 2021. FAOSTAT [EB/OL]. http://www.fao.org/faostat/en/#data,2021-07-10.
[10] *Opinions of the Ministry of Agriculture and Rural Affairs, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Finance, the Ministry of Ecology and Environment, and the State Administration of Market Supervision and Administration on accelerating the prevention of Agricultural Mulch Pollution*. Release date: July 4, 2019.
[11] NDRC (National Development and Reform Commission). 2020. "About the Ministry of Ecology and Environment of the National Development and Reform Commission."

15. **Agriculture contributes significantly to China's GHG emissions but is also highly vulnerable to climate change.** Despite this, agriculture is one of the few sectors for which China has not developed an overall strategy on climate adaptation. The increasing severity and frequency of extreme weather events (especially floods and droughts), rising sea levels, destruction of ecosystems, and loss of biodiversity will significantly weaken China's agricultural production capacity. For every 1 degree increase in temperature from the historical level, global food production, including rice, maize, and wheat, will decrease by 3 to 10 percent.[12] The mountainous areas of Guangxi and Guizhou are exposed to extreme events such as heavy rains and floods and to a lesser extent longer dry spells on a seasonal basis, as well as climate variability. Guangxi is also characterized as having high flood risk and medium water scarcity risk, especially in karst mountain areas, where the majority of the rural population is located. In both Guangxi and Guizhou, areas with medium water scarcity could potentially transition into more adverse conditions with climate-induced drought affecting crops. Mountainous conditions combined with average annual rainfall of 1,500 to 2,000 mm could result in floods and landslides, which could damage rural infrastructure. These climate-induced hazards might increase in the future because of climate change. Thus, the adoption of climate-smart agricultural practices is critical for sustainably increasing agricultural productivity, building resilience to climate change, and reducing GHG emissions. In addition, construction of climate-resilient rural infrastructure will enhance sustainability.

16. **The Green Agricultural and Rural Revitalization PforR will support China's efforts to reduce the agricultural environmental footprint from the three major sources**: (i) excessive or improper chemical fertilizer and pesticide use, (ii) poor livestock and poultry manure management, and (iii) overuse and improper disposal of agricultural plastics. These are the major sources of water (point and non-point source), soil, and air pollution in China. The GHG emissions from these activities also contribute to global warming and climate change. Additional co-benefits will be realized by adopting climate-smart agricultural practices, including technologies that increase irrigation water use efficiency (e.g., fertigation, drip irrigation) and the return of crop straw to the soil. Thus, developing standards, regulations, and guidelines for green agricultural development together with their enforcement mechanisms is critical.

Rural Infrastructure

17. **Despite China's massive investments in infrastructure and public services, a wide gap still exists between urban and rural areas.** For key pollution-related risks, the priority is investments in rural solid waste and wastewater management, the priority areas under Results Area 3 of the GARR PforR. Additional needs relate to the shortage of agricultural processing infrastructure and cold storage, which reduce the value added in local food production and hence income-generating opportunities. In addition, public services such as animal health and veterinary services, extension and advisory services, business development services, and marketing services, including e-commerce, are inadequate. These needs are supported in the context of strengthening green agricultural value chains under Results Area 2 of the GARR PforR.

18. **One of the cross-cutting challenges in addressing rural infrastructure and service gaps is the low capacity for infrastructure planning, prioritization, and life-cycle operation and management of local infrastructure assets.** Following guidelines issued by the State Council in 2019, the improvement of rural infrastructure at the village level is promoted through the development of Integrated Village Development Plans (IVDPs). The GARR PforR supports the development of such plans as a key instrument for addressing local needs in a differentiated way, building local capacity, and strengthening accountability to improve the management of public services. The GARR PforR also draws on prior

[12] Challinor, A. J., Watson, J., Lobell, D. B., Howden, S. M., Smith, D. R., & Chhetri, N. 2014. A meta-analysis of crop yield under climate change and adaptation. Nature Climate Change 4 (4): 287–91.

experience in rural poverty reduction in building stronger IT-based M&E systems for management and operation as well as performance evaluation of rural infrastructure assets.

Rural Solid Waste Management

19. **Rural solid waste collection and treatment fall way behind the levels in urban areas.** In 2019, waste generation was estimated at 0.76 kg/capita/day in rural areas. However, up to half of the rural solid waste may not be disposed of safely, thus turning into a major source of environmental pollution.[13] Although urban waste collection is almost universal, in 2017, it was estimated that only 47 percent of rural waste was disposed of according to the existing national standards.[14] In 2018, the Ministry of Agriculture and Rural Affairs (MARA) reported that rural solid waste was not properly managed in at least a quarter of China's administrative villages, where open dumping was normal and littering was ubiquitous.[15] China is currently piloting the separation of rural solid waste into four categories (organics, recyclables, hazardous, residual) at source. In rural areas, kitchen (organic) waste is mostly used by households as animal feed and recyclables are partially collected outside the public service (e.g., by informal and private sector due to low profit margins and long transportation distance). But residual waste and hazardous waste often remain uncollected and are littered into the environment, placed at informal dumpsites, or burned by the population. Separating rural solid waste at the source would also facilitate the collection and recycling of agricultural plastic (e.g., plastic mulch film residues, pesticide containers, and chemical fertilizer packages).

20. **China has put in place several policies and plans for improving rural solid waste management.** In 2015, the *Opinions on Comprehensive Implementation of Rural Solid Waste Management* issued by the Ministry of Housing, Urban and Rural Development (MOHURD) and ten other ministries require localities to establish rural waste management systems that follow the management modality of "waste collection by villages, transfer by towns, and treatment by counties." In 2018, the State Council issued a *Three-Year Action Plan for Rural Living Environment Improvement (2018–2020)* promoting the establishment of a comprehensive and diverse rural waste management system centered around waste minimization and recycling. The plan also set a target of 90 percent coverage of solid waste collection facilities in administrative villages nationwide by the end of 2020.[16] However, many provinces report that this target is yet to be achieved and that unauthorized dumping of waste continues at scale. Waste collection facilities (e.g., collection containers and pads) often remain idle due to the unavailable waste flow chain. The latter includes transfer stations, storage facilities, treatment facilities, and financing and institutional capacity that ensure that waste is managed holistically from generation to final placement. Recognizing these challenges, the *14th FYP on Municipal Solid Waste Separation and Treatment Facilities Development Plan* ((National Development and Reform Commission (NDRC)/MOHURD, 2021–2025) envisages rural waste management to gradually integrate with the urban system. In June 2020, MOHURD launched a nationwide program to pilot urban-rural integrated waste management and rural waste separation[17] in 141 demonstration counties. In April 2021, MOHURD issued the *Standards for Rural Municipal Solid Waste Collection, Transfer, and Treatment*, setting up standards and technical specifications for the construction and operation of rural systems of segregated waste collection, transfer, and treatment, while considering diverse local conditions.

[13] Urban and Rural Municipal Solid Waste in China and the Circular Economy, World Bank (2019).
[14] China Association of Urban Environmental Sanitation, the China Municipal Waste Development Report (October 2017).
[15] http://www.xinhuanet.com/gongyi/2018-09/30/c_129964054.htm
[16] Coverage of waste collection infrastructure (e.g., collection bins and pads) should not be confused with service coverage of the population, assessed to remain far lower.
[17] *http://www.mohurd.gov.cn/wjfb/202006/t20200624_246034.html*

21. **Although the rural solid waste policy framework has been tightened in the past five years, enforcement remains a key challenge,** partly because of the fragmented institutional authority over and responsibilities for rural solid waste services. MOHURD is responsible for planning, construction, and operations and maintenance (O&M) of solid waste management facilities; service delivery; and data and information management. The Market and Supply Cooperative (COOP), a nationwide network, handles resource recycling in rural areas. The MARA organizes the treatment of agricultural waste, including agricultural mulch film and plastic packaging. Environmental monitoring of and compliance with solid waste management and resource recycling facilities are the responsibility of the Ministry of Ecology and Environment (MEE). Because several institutions have different mandates, an effective institutional coordination framework is needed to better manage rural solid waste.

22. **The Green Agricultural and Rural Revitalization PforR will focus on rural solid waste collection and sorting in villages and transfer to townships' waste-handling facilities.** The PforR will not support county-level solid waste treatment because incineration and landfills are activities with high environmental risk. The PforR complements a series of Bank-funded operations aimed at abating solid waste and plastic pollution in rural areas, as described in Box 1.

Box 1. Evolution and Complementarity of IBRD Operations for Pollution Abatement in Rural Areas

Point source pollution control in China has improved through significant investment in the collection and treatment of domestic wastewater, with the urban wastewater treatment rate increasing from 15 percent in 1991 to more than 95 percent in 2020. Most of these improvements have occurred in urban areas, in particular large cities. The situation is different in rural areas, where challenges remain in rural point source and agricultural NPS pollution, giving rise to persistent pollutants driving non-compliance with water quality standards – primarily organic matter (COD), nitrogen, and phosphorus. Plastic pollution, which is at the origin of the global marine plastics problem, follows similar patterns, with plastic collection and recycling improving in cities but lagging far behind in small towns and rural areas.

Recently approved IBRD operations focus on helping the Chinese government and provincial and county authorities enhance solid and plastic waste management and wastewater treatment policies and institutions, and invest in physical pollution abatement in the rural space.

The Hubei Smart and Sustainable Agriculture Project (P168061) approved in FY20 promotes integrated environmentally sustainable and climate-smart agriculture and agri-food quality and safety in targeted value chains and landscapes in Hubei Province. This includes preventing and mitigating pollution from heavy metals and plastics

The Plastic Waste Reduction Project (P174267) approved in FY21 improves plastic waste management nationally and subnationally and reduces plastics pollution from municipal solid waste. This project should be followed by a second one in FY23 that would continue to improve the policy framework while also investing in plastic abatement in rural areas.

The Food Safety Improvement Project (P162178) approved in FY21 supports food safety management at national and targeted subnational levels and reduces food safety risks in selected value chains, including due to contamination of soil and water through a range of contaminants, including plastics.

The Yangtze River Protection and Ecological Restoration Program (P171644) approved in December 2021 improves institutional coordination, enhances ecological protection, and reduces water pollution loads in select regions of the Yangtze River Basin, including from uncollected or mishandled rural waste and agricultural plastics. A follow-on project is planned.

The Yellow River Basin Ecological Protection and Pollution Control Program (P172806) under preparation and proposed for approval in FY22 is expected to improve institutional coordination, enhance ecological protection, and reduce water pollution loads in select regions of the Yellow River Basin. This would entail reducing marine plastics pollution through improved collection and treatment of wastewater and improved agricultural practices.

Rural Wastewater Management

23. **Rural wastewater collection, treatment, and recycling have increasingly become a major concern in China.** In 2018, China had 2.45 million villages with a total population of 580 million.[18] Simple pit latrines and flush toilets connected to septic tanks are commonly used in rural areas. But many villagers still face poor sanitation and hygiene conditions because of inadequate, outdated, and/or faulty sanitary facilities. The sewage generated in these villages each day is approximately 17.6 million m^3, but daily treatment capacity is only about 494,700 m^3, which means that only 2.8 percent of wastewater is treated.[19] The untreated wastewater discharged into the environment generates all kinds of health risks and NPS water pollution due to higher content of COD, TN, TP, and ammonia nitrogen (NH_3N).

24. **China has several policies and programs for improving rural wastewater treatment systems (WTS).** The *Plan for Preventing Water Pollution* published by the State Council (SC) in 2015 requires rural WTS to use a standard design for construction and management. These unified standards have led to over-designed rural wastewater infrastructure with little prospect for recouping investment and meeting the O&M costs. Going forward, rural WTS design standards need to be customized to fit local conditions. The 13th FYP (2016–2020) set a target for rural wastewater treatment rate of more than 60 percent[20] by the end of 2020. However, despite increased subsidies and vigorous promotion from the central government, only about 25 percent of Chinese villages have WTS.[21] Many of these WTS are not fully functional because of unsuitable technology, insufficient financial resources for O&M, ineffective governance structure, weak institutional capacity for enforcing effluent discharge standards, and limited public participation. Because of the scattered villages and difficult terrain in some parts of the country, the logistics of transferring large volumes of wastewater remain challenging.

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

25. **The PforR is aligned with the World Bank's Country Partnership Framework (CPF, FY2020–2025) for China (Report No. 11785-CN),**[22] which was discussed by the World Bank Board of Directors on December 5, 2019. The CPF focuses on closing the remaining institutional gaps and supporting interventions that generate significant global public goods (GPGs). The PforR supports the implementation of China's October 2021 updated Nationally Determined Contribution (NDC)[23] and is consistent with a range of recent climate policy commitments made by the country, including the Glasgow Leaders' Declaration on Forests and Land Use and a joint declaration signed by China and the United States in the margin of the UNFCCC COP26 providing, among other things, for incentives and programs to reduce methane emissions from the agricultural sector.

26. **The main GPGs supported by this operation are the following (Box 2)**: (i) GHG emission reductions; (ii) agricultural plastics recovery, treatment, and recycling; and (iii) biodiversity conservation and protection. The GARR PforR

[18] Ministry of Housing and Urban-Rural Development of the People's Republic of China. 2018. Chinese Urban–Rural Construction Statistical Yearbook (2018). China Planning Press, Beijing (in Chinese).
[19] Ibid.
[20] In 2018, Zhejiang and Jiangsu provinces and Shanghai and Beijing municipalities had more than 70 percent of the villages with WTS.
[21] National Bureau of Statistics of China. 2018. China Statistical Yearbook (2018). China Statistics Press, Beijing.
[22] World Bank Group. 2021. China – Country Partnership Framework for the Period FY2020–2025. (Report No. 117875-CN) World Bank Group, Washington, D.C. https://documents1.worldbank.org/curated/en/902781575573489712/pdf/China-Country-Partnership-Framework-for-the-Period-FY2020-2025.pdf.
[23] China updated its NDC targets to include the following: (i) carbon dioxide emissions will strive to peak by 2030, and strive to achieve carbon neutrality by 2060; (ii) by 2030, China's carbon dioxide emissions per unit of GDP will drop by more than 65 percent compared with 2005; (iii) the proportion of non-fossil energy in primary energy consumption will reach about 25 percent; (iv) the forest volume will increase by 6 billion cubic meters compared with 2005; and (v) the total installed capacity of solar power generation will reach more than 1.2 billion kilowatts.

is directly linked to Engagement Area 2 (EA2) of the CPF Promoting Greener Growth. Under EA2, the Bank aims to support the government's efforts to (i) reduce air, soil, water, and marine plastics pollution; (ii) demonstrate sustainable agricultural practices and improve agro-food product quality and safety; and (iii) strengthen institutional capacity for sustainable natural resource management (especially the efficient use of scarce arable land and water). The PforR is also aligned with the World Bank Group's Green, Inclusive, and Resilient Development (GRID) framework and the World Bank Group Climate Change Action Plan (2021–2025).[24]

Box 2. Contribution of the PforR to Global Public Goods

The PforR contributes to the following GPGs: (i) reducing agricultural plastics pollution, (ii) reducing GHG emissions, and (iii) improving biodiversity protection and restoration.

Reducing agricultural plastics pollution: The PforR will contribute to the reduction of plastics entering the main waterways and ending up in the world's oceans/seas. Both Guizhou Province (upper reaches of Yangtze River) and Guangxi Province (upper reaches of Pearl River) are among the major contributors of agricultural plastics, which affect marine ecosystems and wildlife via entanglement, indigestion, and ecotoxicity. The PforR builds on an increasing portfolio of World Bank-financed programs and projects supporting the collection and removal of plastic waste, including agricultural plastic film that commonly ends up in waterways. The PforR will support the collection and recycling of agricultural plastic (e.g., plastic mulch film residues, pesticide containers, and chemical fertilizer packages) in the demonstration counties.

Reducing GHG emissions: The PforR is expected to generate substantial climate mitigation co-benefits through the reduction of GHG emissions (e.g., CO_2, CH_4, and N_2O measured in tons of CO_2 equivalent) by (i) supporting the reduction of chemical fertilizer use; collection, treatment, and recycling of livestock and poultry manure; (ii) supporting the adoption of climate-smart agricultural practices (e.g., increasing water and land use efficiency; using improved seeds, breeds, and animal feeds; increasing the use of formula and organic fertilizer; and adopting fertigation technologies and integrated pest management (IPM) practices); (iii) reducing food loss and waste (FLW) from more efficient agricultural value chains; and (iv) supporting collection and sorting/separation, transfer, and treatment/recycling of rural solid waste and wastewater.

Improving biodiversity protection and restoration: Guangxi and Guizhou are part of the Pearl and Yangtze River basins, respectively. These basins are globally significant biodiversity hotspots, as their waterways, floodplains, and wetland systems provide habitat to a range of endangered species. The PforR will indirectly contribute to the protection and restoration of biodiversity through the reduction of point and NPS pollution (especially from chemical and high-toxic-residue pesticides and treatment and recycling of livestock and poultry manure and domestic wastewater) and through the promotion of IPM technologies (e.g., use of pest lamps and insect glue boards, biological pesticides, and low-residue high-efficiency pesticides).

The activities under the PforR also contribute to improving food safety, reducing health risks related to China's large food exports, and through improved market infrastructure and livestock rearing and handling practices helping to reduce the risk of zoonotic diseases. These impacts, however, are not central to the theory of change and thus not separately monitored.

27. **The GARR PforR aims to finance green agricultural and rural development activities that generate substantial climate co-benefits through both mitigation and adaptation measures.** The PforR will generate climate co-benefits from mitigation measures in several ways. First, by reducing GHG emissions (e.g., CO_2, CH_4, and N_2O measured in CO_2 equivalent) from crop production systems through the reduction of chemical fertilizer use. Second, by reducing GHG emissions (e.g., removal of COD, CH_4, and NH_3N) from livestock and poultry production systems through the collection, treatment, and recycling of manure. Third, by reducing GHG emissions (e.g., COD, biological oxygen demand (BOD), or five-day biological oxygen demand (COD5) and NH_3N) through circular economy practices, including the efficient use of

[24] Alignment with the "World Bank. 2021. Green, Resilient, and Inclusive Development. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/36322 License: CC BY 3.0 IGO."GRID (link) and the Climate Change Action Plan 2021–2025 (link) "World Bank Group. 2021. World Bank Group Climate Change Action Plan 2021–2025: Supporting Green, Resilient, and Inclusive Development. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/35799 License: CC BY 3.0 IGO" is seen in the PforR's focus on environmental sustainability objectives, while increasing resilience to climate change threats, mitigating emissions, and promoting inclusivity in economic opportunities.

treated wastewater, such as reuse for irrigation to build resilience to drought, use of treated sludge and compost material as a replacement of chemical fertilizer, and use of nature-based solutions such as retention ponds or contructed wetlands to filter pollutants from rural solid waste and wastewater. Fourth, by supporting the collection, transfer, and recycling of agricultural plastics (e.g., mulch film residues, pesticide and chemical fertilizer packages) and use of biodegradable mulch film. The GARR PforR will also generate climate co-benefits from adaptation measures. These include (i) adoption of climate-smart agricultural practices (e.g., recycling of crop straw/residues, increasing efficiency of irrigation water use, fertigation,[25] and water management in paddy rice); (ii) reducing FLW (e.g., through village-level cold storage facilities and cold chains, improved postharvest handling technologies, and processing); and (iii) increased energy use efficiency (e.g., in primary production through new efficient farm machinery, use of renewable energy (solar and wind power for irrigation), and in value addition, such as conversion of biogas to energy). The climate co-benefits will be measured in CO_2 equivalent of GHG emissions reduced from PforR-supported activities.

28. **Although it is relatively easy to measure the PforR's contribution to the generation of the climate co-benefits, its impacts on biodiversity protection and restoration will be difficult to measure.** However, the experience from the Guangdong Agricultural Pollution Control Projects shows significant improvement in biodiversity (e.g., pollinators in fruit orchards and fish and amphibian species in paddy rice fields) in the farmland ecosystem because of the reduction of agricultural pollutants (especially chemical fertilizer and high-residue pesticide) and the promotion of IPM technologies (e.g., use of pest lamps and insect glue boards, biological pesticides, and low-residue high-efficiency pesticides).

29. **The reduction of pollutant loads entering waterways will generate local environmental benefits.** These will mainly arise from the reduction of the point source and NPS water pollution (e.g., COD, TN, and TP) through the reduction and efficient use of chemical fertilizer (e.g., improving application rate and improving timing and precision of application) and increased use of formula and organic fertilizer, and treatment and recycling of livestock and poultry manure as well as rural wastewater. One of the key local environmental benefits would be the improvement of water quality, with associated improved health outcomes such as a decline in waterborne diseases in rural areas.

30. **The PforR draws lessons and experience from Bank-financed agricultural and rural development projects in China and the Transforming Rural China study.** These include ongoing or recently closed projects supporting sustainable agriculture (Hubei Sustainable and Smart Agriculture Project (P168061) and Climate-Smart Staple Crop Production Project (P144531)); agricultural pollution control (Hunan Integrated Management of Agricultural Land Project (P153115) and Guangdong Agricultural Pollution Control Project (P127775, TF018176)); value chain development (Jiangxi Farm Produce Distribution System Project (P147009); agriculture finance (Henan Green Agriculture Finance Project (P169758)); and food quality and safety (China Food Safety Improvement Project (P162178)). These projects are piloting new sustainable agricultural practices through a combination of technical assistance, public investment, green finance, and matching grants to farms and cooperatives. The PforR also builds on the long history of Bank involvement in poverty alleviation/reduction (Guangxi Poverty Alleviation Project (P153892), Shaanxi Poor Rural Areas Community Development Project (P153541), Poverty Alleviation in Poor Areas Project (P133326) supporting the International Poverty Reduction Center in China (IPRCC), Sichuan, Gansu, and Guizhou provinces, the Guizhou Rural Development Project (P133261), and the Guangxi Poverty Reduction PforR (P163138)), which has helped to target central and provincial budget transfers to achieve greater impact in poverty reduction, including by pooling funds from various budget lines locally and introducing the PforR instrument. The design of the PforR is also informed by the recently completed studies undertaken as part of

[25] Fertigation is the injection of fertilizer, used for soil amendments, water amendments, and other water-soluble products, into an irrigation system. Fertigation is related to chemigation, the injection of chemicals into an irrigation system.

the Bank's Programmatic Advisory Services and Analytics (PASA) on forthcoming *Transforming Rural China – Greening Agricultural Modernization*. The PASA studies undertaken include: (i) Toward a Greener China – A Review of Recent Agricultural Support Policies and Public Expenditure; (ii) Rural Transformation and Policies in China; (iii) An Overview of Degradation and Restoration of Ecosystems and Landscapes in China; (iv) Agricultural Water Use Efficiency Experience in China; (v) Analysis of Farmland Policy for Greening Agricultural Modernization; (vi) Challenge of Agricultural Pollution in China; and (vii) Promoting a New Agricultural Research and Development Strategy for Greener Development in China.

31. **The proposed GARR PforR presents an opportunity for the Bank to leverage these experiences to bring poverty reduction and sustainable agricultural practices together in one design, while helping the government improve the effectiveness and results orientation of its Rural Revitalization Strategy**. The value added of the Bank lies in introducing a greater focus on results into the substantial public investments made in rural areas and in helping to improve the coherence of activities across the multiple agencies involved in implementing the RSS. The PforR instrument is thereby capitalizing on the evolving national and provincial policy frameworks (e.g., eco-compensation)[26] for results-based fiscal transfers to improve a range of environmental outcomes. In leveraging budget resources under the RSS, the PforR instrument provides geographic coverage beyond that possible under the standard Investment Project Financing (IPF) instrument. A key contribution is strengthening institutional capacity and developing governance frameworks (e.g., regulations, standards, and guidelines for green development and program budgeting, expenditure tracking, and M&E and verification of results) for implementing the RRS plan, which can be rolled out throughout the country or to other provinces (i.e., beyond the PforR's geographic boundaries of participating counties). The PforR instrument can also help the government to repurpose its agricultural subsidies toward achieving green and sustainable agricultural development. Guizhou and Guangxi have requested Bank support based on their positive track record with past projects to help them increase the impact of their substantial RRS-related commitments.

32. **The proposed GARR PforR complements other Bank-supported operations in the management of solid waste and water resources prepared under the current CPF.** The China Plastic Waste Reduction Project (P174267) approved in June 2021 builds on the tightened national framework for solid waste management to support plastic waste avoidance, separation, and recycling in two pilot cities, Chongqing and Ningbo. This work is being extended to rural areas under a follow-up operation (P176989), planned for Board presentation in FY23. The GARR PforR complements this work by focusing on the avoidance and improved collection of plastic waste at the farm and village level. Problems of NPS pollution of waterways are also addressed in the Yangtze River Protection and Ecological Restoration Project (P178338) approved by the Board in December 2021 and the proposed Yellow River Resilience Program (P172806). These operations focus on the inter-jurisdictional coordination issues involved in pollution abatement at the river-basin level. The GARR PforR moves further upstream to work directly with farmers on adopting greener agricultural production practices. The parallel and focused engagement on related issues working at the farm, village, county, province, and river-basin levels provides significant opportunities for knowledge exchange and learning that will facilitate the scaling up of successful experiences nationally.

II. PROGRAM DESCRIPTION

[26] Eco-compensation is a system of payments for ecosystem services (PES). It aims at incentivizing local governments, private and state-owned enterprises, and farmers to adopt better environmental management practices to protect ecosystems. The Sloping Land Conversion Program (SLCP), or the "Green for Grain" scheme in China, is one of the largest PES in the developing world, with a total investment of more than US$69 billion. Its initial goal was to decrease soil erosion, deforestation, and flood risk by restoring forest and grasslands. The scheme operates through cash transfers to farmers in return for reforesting marginal agricultural land. Payments are made only after verification that the trees planted have at least an 85 percent survival rate. Additional subsidies are available for specific tree species.

A. Government Program

33. **In 2017, the Chinese government adopted an ambitious national RRP, which is implemented in phases of five-year RRS plans.** The national RRS plan provides the overarching rural development vision and broadly defined actions. The RRS plans are framed around the "Three rurals": agriculture, rural areas, and farmers. The main objectives of the RRS plans are to sustainably increase rural income, increase access to rural infrastructure and public services, and improve the living environment in rural areas. The national RRS plan phase 1 (2018–2022) focuses on consolidating and sustaining the poverty eradication gains, and has four pillars: (i) green agricultural development, (ii) agricultural modernization, (iii) rural infrastructure and public services, and (iv) rural governance. The national RRS phase 1 overlaps with the transition period (2021–2025),[27] which also coincides with the 14th FYP (2021–2025).

34. **The green agricultural development pillar of RRS phase 1 has seven sub-programs.** The latter are further elaborated in the 14th FYP for the National Green Development of Agriculture Plan[28]: (i) *strengthening the protection and utilization of agricultural resources* – protecting and improving the quality of farmland, improving the efficiency of agricultural irrigation water use, and protecting agricultural biological resources; (ii) *preventing and controlling agricultural NPS pollution* – promoting the reduction in fertilizer use and increasing the efficiency of fertilizer and pesticide use, promoting the recycling of livestock and poultry manure and crop straw, and strengthening white (agricultural plastics) pollution control; (iii) *strengthening agricultural ecological protection and restoration* – protecting and restoring farmland ecology, protecting and restoring agricultural ecosystems, and strengthening ecological protection in key river basins; (iv) *building green and low-carbon agricultural industry chains* – promoting green agricultural value chains, industrial agglomeration, and circular economy; and promoting pollution-free, green, organic, and geographic indication (GI) agricultural products; (v) *improving the innovation system for green agricultural technology development* – promoting innovations in green agricultural science and technologies, accelerating the adoption of green agricultural practices (GAP), and building green talents and skills; (vi) *improving the governance systems and mechanisms for enhancing green development of agriculture* – improving the legal framework for green agricultural technology development and innovations, creating incentives and strengthening mechanisms for regulating agricultural inputs, and continuing with market reforms; and (vii) *planning and implementing green agricultural development* – strengthening organizational leadership and carrying out performance evaluations.

35. **Similarly, the rural infrastructure and public services pillar of the RRS plan phase 1 has six sub-programs**: (i) *building an ecologically livable beautiful village* – coordinating the management of landscapes and ecosystems, promoting rural ecological civilization, and building a clean living environment; (ii) *improving rural habitat environment* – constructing rural solid waste (garbage) and wastewater (sewerage) treatment systems, improving rural domestic waste collection and disposal systems, promoting classification and resource reuse (recycling) of waste, and promoting the "toilet revolution"; (iii) *improving the appearance of the village* – professionally planning the layout of villages, rehabilitating village buildings to preserve original cultural (traditional) architecture, constructing rural and household roads, renovating public space and courtyard environment, promoting rural greening, and enhancing village landscapes; (iv) *improving the rural water infrastructure network* – building a network of rural water conservancy infrastructure for improving water saving, water supply, flood control, and disaster mitigation; improving rural drinking water quality and

[27] Transition from the Poverty Reduction Program to the Rural Vitalization Program with the first phase of RRS plan (2018–2022) focusing on consolidating and sustaining extreme poverty alleviation gains and tackling pollution and greening the economy in the next five years.
[28] A joint notice of the Ministry of Agriculture and Rural Affairs, National Development and Reform Commission, Ministry of Science and Technology, Ministry of Natural Resources, Ministry of Ecology and Environment, and National Forestry and Grassland Administration (Nong Gui Fa [2021] No. 8) issued in August 2021.

safety; and constructing, rehabilitating, and modernizing irrigation systems and drainage and pumping stations; (v) *strengthening rural transport infrastructure* – constructing roads connecting rural areas to urban centers; upgrading rural transport logistic facilities; deepening reforms in long-term mechanisms for rural roads operations and maintenance; improving public transportation routes; and providing public transportation; and (vi) *building a modern energy system in rural areas* – optimizing the energy supply structure; developing solar, biomass, water, and wind energy; improving rural energy infrastructure networks; accelerating the upgrading of new rural power grids; and promoting the extension of gas supply facilities to rural areas.

36. **The Rural Revitalization Promotion Law (RRPL) provides a legal framework for implementing the RRS plan**.[29] The RRPL is promulgated based on four key principles: (i) prioritizing the development of agriculture and rural areas, including guarantees for capital investment and rural public services; (ii) adhering to the dominant status of farmers, including protecting farmers' democratic rights and other legitimate rights and interests, and safeguarding farmers' fundamental interests; (iii) adhering to the harmonious coexistence of people and nature, including coordinating the management of landscapes and ecosystems and promoting green development and ecological civilization; and (iv) persevering in reform and innovation, including letting markets play the role of resource allocation, continuing structural reforms, and promoting high-quality development of agricultural value chains. The Rural Revitalization Administration offices have already been set up at the national, provincial, and county levels to implement the RRP.

37. **RRS plan phase 1 is embedded in the 14th FYP (2021–2025) and linked to the National Sustainable Agricultural Development Plan (2015–2030).** The 14th FYP emphasizes that economic and social development should be based upon sound management of the environment and ecosystems, along with sustainable use of natural resources. It articulates the need to "*promote green development to achieve harmonious coexistence of humans and nature*." The 14th FYP also emphasizes the need to (i) accelerate green and low-carbon development, (ii) improve environmental quality, (iii) improve the quality and stability of ecosystems, and (iv) improve resource use efficiency. The National Sustainable Agricultural Development Plan (2015–2030) focuses on (i) green agricultural development, targeting zero growth of fertilizer and pesticide use; (ii) establishing standards and regulatory frameworks for livestock waste discharge and agricultural pollution; (iii) putting in place economic incentives for improving environmental performance (e.g., eco-compensation); and (iv) promoting a circular economy (e.g., recycling of crop and livestock waste, bio-energy generation). Guangxi and Guizhou have developed their respective provincial RRS plan phase 1 by cascading and customizing the national RRS plan phase 1 to fit their local priorities. They both aim to address the most pressing agricultural and rural development challenges within the available fiscal space.

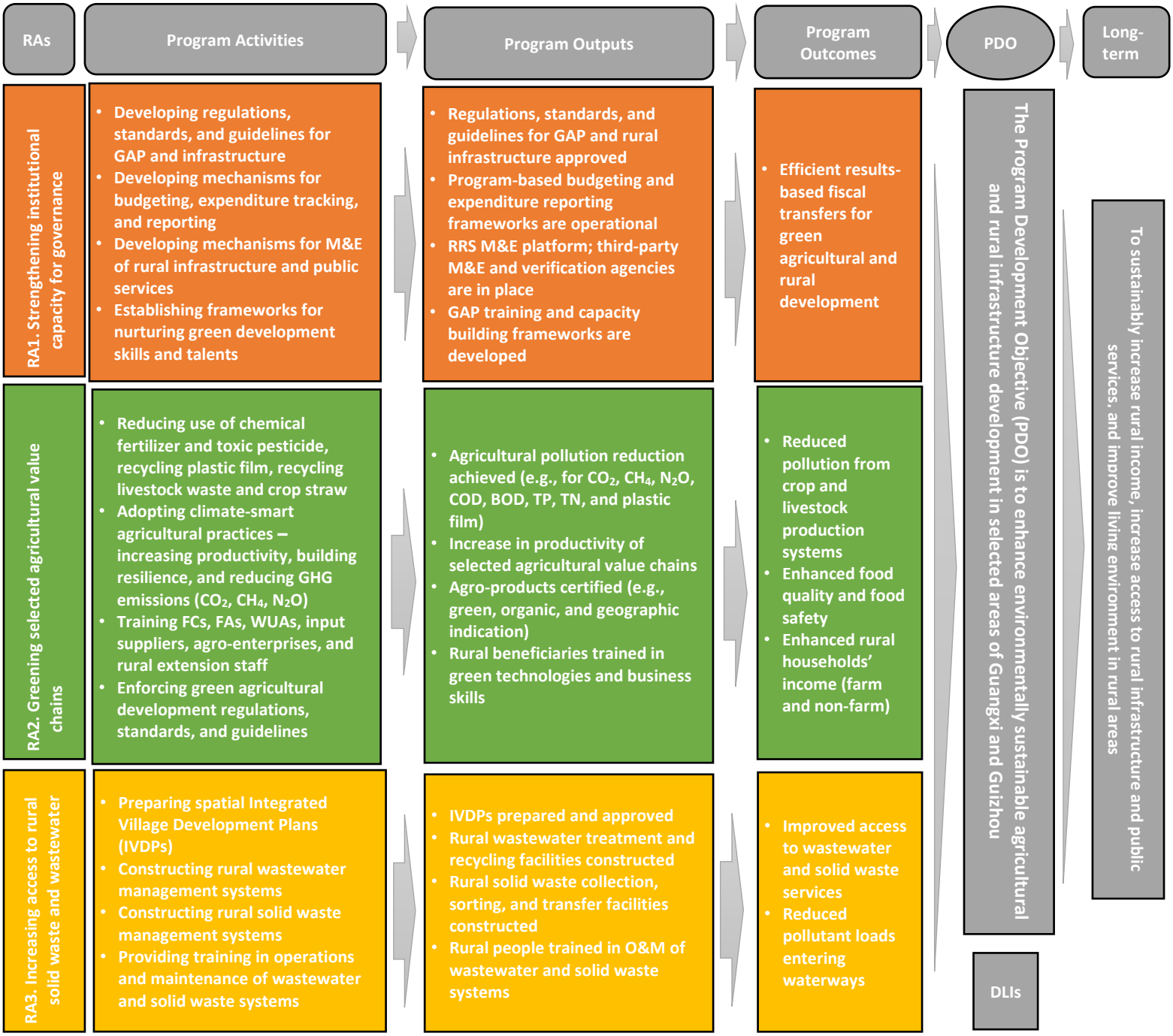
B. Theory of Change

38. **The PforR contributes to the achievement of the government's RRP, which is implemented in phased RRS plans.** The objectives of the government's RRP are "*to sustainably increase rural incomes (on- and off-farm), increase access to rural infrastructure and public services, and improve the living environment in rural areas*." The government's RRP aims to revitalize rural areas on all fronts: industries, human resources, culture, ecosystems, and institutions. The program development objective of the PforR is "*to enhance environmentally sustainable agricultural and rural infrastructure development in selected areas of Guangxi and Guizhou.*" The GARR PforR will also substantially contribute to GPGs (see Box 2). In addition, the GARR PforR will contribute to global knowledge by widely sharing the approaches and methodologies for measuring declines in GHG emissions from chemical fertilizer, livestock and poultry manure, and

[29] Adopted by the National People's Congress on April 29, 2021,

wastewater and solid waste management systems. Figure 1 shows the Theory of Change (TOC) with the results chain (RAs, activities, outputs, and outcomes) and how they contribute to the achievement of the PDO.

Figure 1: Theory of Change for the GARR Program for Results



39. **The Bank's PforR support focuses on three Results Areas (RAs):** (i) RA1 – Strengthening institutional capacity for governance to improve institutional coordination and management frameworks for results-based green agriculture and rural infrastructure development (wastewater and solid waste management systems); (ii) RA2 – Greening selected agricultural value chains to sustainably increase rural income by adopting environmentally friendly production practices; and (iii) RA3 – Increasing access to rural solid waste and wastewater services to improve the rural living environment and reduce pollutants. The activities under each RA are described in detail in Section C: PforR Program Scope. The expected direct outcomes of implementing activities under these RAs include: (i) RA1: efficient results-based fiscal transfers to support green agricultural and rural development activities; (ii) RA2: reduced point and NPS water pollution from crop, livestock, and poultry production systems;; and (iii) RA3: improved rural living standards and access to basic public services and reduced pollutant loads entering waterways. The expected indirect outcomes of implementing activities under the RA2 include: (a) enhanced food quality and food safety; (b) reduced FLW; (c) reduced risks of emerging infectious disease (EID) outbreaks; and (d) increased rural household income (farm and off-farm).

C. PforR Program Scope

40. **The PforR will be implemented in the Guangxi Zhuang Autonomous Region and Guizhou Province.** The two mountainous provinces are in the southwest of China. Guangxi is situated in China's southern frontier area, facing Beibuwan Gulf in the south (total length of the coastline is about 1,500 km) and bordering Vietnam on the southwest. Guangxi Province covers more than 236,700 km^2. Guizhou is a landlocked province covering more than 176,167 km^2. The two provinces are among the least developed of China and agriculture still plays a critical role in their economies.

I. Guangxi Zhuang Autonomous Region

41. **Guangxi has 50.19 million people, of which about 37 percent belong to various ethnic minorities (predominately Zhuang, accounting for 31 percent).** In 2020, Guangxi's total GDP was estimated at CNY 2,215.7 billion (US$346.20 billion), ranking 19th out of mainland China's 31 provinces/autonomous regions. With a per capita GDP of CNY 44,201 (US$6,906), Guangxi ranks 29th in the country. In 2020, agricultural production was as follows: rice (10.14 million tons), vegetables (38.31 million tons), sugarcane (74.13 million tons), and fruits (27.86 million tons). These four major crops are heavy users of chemical fertilizer, pesticide, and agricultural plastic film. Guangxi is among the top-ten largest users of chemical fertilizer, pesticide, and agricultural plastics in China. In 2020, the total sown area of crops in Guangxi was 6.11 million hectares. The total use of chemical fertilizer (nutrient) was 2.48 million tons, while pesticide use was 66,026 tons, ranking eighth and seventh in the country, respectively. During the same time, the use of agricultural plastics and plastic film was 48,712 tons and 34,678 tons, ranking 19th and 13th in the country, respectively. Plastic film covered 432,900 hectares, ranking 13th in the country.

42. **Guangxi is also one of the largest producers of livestock and poultry in China.** The subsector is dominated by the pig and poultry industries. In 2020, about 28.12 million pigs and 1.15 billion poultry were slaughtered. During the same year, the standing pig population was 18.28 million (see Table 2). Guangxi ranks 12th and fourth in pig and poultry production in the country, respectively. In addition, Guangxi ranks 12th and 18th in mutton and beef production in China, respectively. These livestock and poultry production systems are generating significant amounts of manure, which need to be better managed. During the 13th FYP, Guangxi government actively promoted the use of livestock and poultry manure and the zero-growth action of chemical fertilizer use. By 2020, the standing pig population declined by nearly 40 percent due to the African swine fever (ASF) outbreak in 2018. The ongoing recovery of pig production is projected to significantly increase the amount of manure in the next decade. Thus, more investments are needed to further improve the management of livestock and poultry, including in facilities for the collection, treatment, and recycling of manure.

II. Guizhou Province

43. **Guizhou Province has about 40 million people, of which about 40 percent belong to various ethnic minorities.** In 2020, Guizhou's GDP was estimated at CNY 1,782.6 billion (US$278.53 billion), ranking 20th in the country, and per capita GDP at CNY 46,207 (US$7,220), ranking 25th. Guizhou's crop production is dominated by vegetables, fruits, and paddy rice. In 2020, the province produced vegetables (29.91 million tons), fruits (5.48 million tons), and paddy rice (4.16 million tons), which use significant amounts of chemical fertilizer, pesticide, and agricultural plastic film. In 2020, the total sown area of crops in Guizhou was 5.48 million hectares. The amounts of chemical fertilizer (in nutrient) and pesticide used were 788,000 tons and 8,423 tons, ranking 23rd and 25th nationally, respectively. The amount of agricultural plastic film used was 45,411 tons, covering 371,500 hectares, ranking 21st and 16th, respectively. Guizhou Province reported that in 2020 the recovery rate of agricultural plastics was 83.56 percent.

44. **Guizhou is also one of the largest livestock and poultry producing provinces in China.** The subsector is dominated by poultry and pig production, although cattle and sheep populations are also increasing. In 2020, the province slaughtered a total of 16.61 and 176.02 million pigs and poultry, respectively. In the same year, the standing pig population was 13.64 million. Nationally, Guizhou ranks 13th and 20th in pig and poultry production, respectively. The pig population is currently on the rise because ASF is largely under control. There is also a rapid expansion of poultry production, targeting the Greater Bay Area (Guangdong–Hong Kong SAR, Macau SAR, China) and the relatively richer eastern province markets. The quantity of livestock and poultry manure is projected to increase steadily in the next decade. Therefore, improving manure management remains a key priority of the Guizhou government. According to Guizhou Province's monitoring reports, the livestock and poultry manure utilization rate in 2020 was 86.43 percent. Although there has been some improvement in the management of manure, which is one of the major sources of water, soil, and air pollutants, more investments are needed to achieve the pollution reduction targets set in the 14th FYP.

Program Boundary

45. **The PforR will support selected sub-programs under Pillar 1 (Green agricultural development) and Pillar 3 (Rural infrastructure and public services) of the government's RRS plan phase 1 (2018–2022), which overlaps with the 14th FYP (2021–2025)**. The PforR will be implemented over a six-year period from FY2023 to FY2028 (Table 1). The PforR will be implemented in 12 counties in Guangxi (out of 111) and 15 counties in Guizhou (out of 88). In Guangxi, the selected counties/districts are Pinggui, Ziyuan, Luocheng, Tiandeng, Rong'an, Xingbin, Xincheng, Tiandong, Bobai, Yuzhou, Mashan, and Zhongshan. In Guizhou Province, the selected counties/districts are Bijiang, Sinan, Yinjiang, Songtao, Jinping, Shibing, Taijiang, Luodian, Guiding, Sandu, Libo, Xingren, Zhenfeng, Xiuwen, and Xifeng. These counties/districts were selected based on agreed criteria of strategic relevance, including: (see Annex 3). (a) geographic distribution, that is, demonstration counties from different municipalities/cities; (b) inclusiveness – at least one or two ethnic minority autonomous cities; (c) large user of chemical fertilizer and pesticide – to maximize the impacts of NPS pollution control (e.g., reducing CH4, N2O, and CO2 emissions and TN and TP pollutants); (d) large producer of livestock and poultry – to maximize the impacts of better management of manure and other waste (dead animals and by-products), for example, reducing COD, BOD, and ammonia nitrogen; (e) large user of agricultural plastics – to help collect, treat, and recycle mulch film and fertilizer and pesticide packages; (f) lack of/inadequate solid waste management system (e.g., for collecting, sorting, and treating and converting to organic fertilizer or biogas/energy generation); and (g) lack of/inadequate wastewater management system (e.g., for collecting, treating, and recycling water for irrigation and/or construction of wetlands).

Table 1: Summary of the GARR PforR Program Boundary

Description	Government Rural Revitalization Program/RRS plan phase 1 (under the 14th FYP 2021–2025)	Program supported by the World Bank's GARR PforR
Objectives[30]	1. To sustainably increase rural income, increase access to rural infrastructure and public services, and improve the living environment in rural areas.	To enhance environmentally sustainable agricultural and rural infrastructure development in selected areas of Guangxi and Guizhou.
Duration	RRP (2018–2035) RRS plan phase 1 (2018–2022)/14th FYP (2021–2025)	FY2023–2028
Geographic coverage	Mainland China: 22 provinces, 4 municipalities, and 5 autonomous regions	Guangxi (12 counties/districts) and Guizhou (15 counties/districts). These provinces are among the bottom 10 in terms of per capita income.
Sub-programs (SPs)/Results Areas (RAs)	**A. Green Agricultural Development Pillar** 1. Strengthening the protection and utilization of agricultural resources 2. Strengthening the prevention and control of agricultural NPS pollution 3. Strengthening agricultural ecological protection and restoration 4. Building green and low-carbon agricultural industry chains 5. Improving the innovation system for green agricultural technology development 6. Improving the governance systems and mechanisms for enhancing green development of agriculture 7. Planning and implementing green agricultural development **B. Rural Infrastructure and Public Services Pillar** 8. Building an ecologically livable beautiful village 9. Improving rural habitat environment 10. Improving the appearance of the village 11. Improving rural water infrastructure network 12. Strengthening rural transportation infrastructure 13. Building a modern energy system in rural areas	**Green Agricultural and Rural Revitalization PforR RAs** • RA1: Strengthening institutional capacity for governance (RRS plan SP #6) • RA2: Greening agricultural value chains (RRS plan SPs #1, #2, #4, and #5) • RA3: Increasing access to rural solid waste and wastewater services (RRS plan SPs #9, #10, and #11)
Overall financing	• National Program: Total financing of US$960 billion (22 provinces, 4 municipalities, and 5 autonomous regions, 2022–2025)	• Total IBRD loan of US$320 million • Government financing for a total of US$4.696 billion for Guangxi and Guizhou (27 PforR counties/districts)

46. **The PforR will support three RAs to be implemented in Guangxi and Guizhou:** (i) Strengthening institutional capacity for governance, (ii) Greening selected agricultural value chains, and (iii) Increasing access to rural solid waste and wastewater services. These RAs are briefly described below.

[30] Aims to revitalize rural areas on all fronts: industries, human resources, culture, ecosystems, and institutions.

47. **RA1: Strengthening institutional capacity for governance.** RA1 aims at developing governance, training, and capacity-building frameworks needed to enhance the effectiveness of the government's RRS plans. Activities under RA1 include (i) developing provincial regulations, standards, and guidelines for green agricultural development and rural infrastructure development; (ii) establishing provincial mechanisms for green agricultural development program budgeting, expenditure tracking, and reporting; (iii) establishing provincial mechanisms for M&E of rural infrastructure, public services and the profile of rural villages; and (iv) developing provincial frameworks/action plans for nurturing green skills and talents in rural areas. The provincial regulations, standards, and guidelines will strengthen the legal framework for green agricultural technologies and innovations and mechanisms for regulating agricultural inputs and livestock and poultry waste management. The program budgeting and expenditure tracking framework is critical for transparently allocating fiscal resources based on the delivery of verifiable results, and for enhancing accountability through the established M&E of results and reporting of expenditures. Similarly, the development of green skills and talents is key to accelerating the adoption of GAP to reduce the agriculture's environmental footprint. The provincial governance frameworks and institutional capacity-building action plans will be piloted in the 27 PforR counties/districts and scaled up province-wide and shared nationwide.

48. **RA2: Greening selected agricultural value chains.** RA2 aims to sustain and consolidate the poverty reduction gains by supporting environmentally friendly agricultural production practices and value addition activities to increase rural income (farm and off-farm). RA2 will support climate-smart agricultural practices in selected value chains. The aim is to achieve the triple wins: increase productivity, build resilience to climate change, and reduce GHG emissions. Activities under RA2 include supporting activities aimed at (i) strengthening the protection and utilization of agricultural resources (i.e., building resilience), such as protecting and improving quality of farmlands and improving the efficiency of agricultural irrigation water use (e.g., rehabilitating irrigation systems and supporting drip irrigation); (ii) preventing and controlling agricultural NPS water pollution, such as reducing chemical fertilizer use while increasing the efficiency of chemical fertilizer use (e.g., through fertigation, deep placing, timing), low-residue pesticide use, soil testing and use of formula and organic fertilizer, recycling of livestock and poultry manure and crop straw/residues, and collection and recycling of agricultural plastics – all aimed at reducing GHG emissions and sequestering carbon; (iii) building green and low-carbon agricultural industry chains, such as green, organic, and GI agricultural products; (iv) providing infrastructure needed for the development of green agricultural value chains (e.g., constructing/rehabilitating climate-resilient production/access roads, rehabilitation of irrigation and drainage systems, and construction/rehabilitation of cold storage facilities to reduce FLW); (v) nurturing green skills and talents in rural areas (e.g., training and capacity building of farmer cooperatives (FCs), farmer associations (FAs), water user associations (WUAs), input stockists, and agro-entrepreneurs); and (vi) enforcing green agricultural development regulations and standards (e.g., toxic pesticide use, effluent discharge standards, and burning of straw). These activities will be mainly implemented by farmers, FAs, FCs, WUAs, and agro-enterprises, with subsidies from provincial and county governments.

49. **RA3: Increasing access to rural solid waste and wastewater services.** RA3 aims to improve the living conditions in rural areas, reduce point and NPS pollution, and help to reduce GHG emissions. RA3 will also promote the rural circular economy (e.g., efficient use of treated wastewater, such as reuse for irrigation and compost material as a substitute for chemical fertilizer as well as using nature-based solutions to reduce pollution, including constructed retention ponds and wetlands to filter pollutants. RA3 activities include supporting activities aimed at (i) preparing spatial Integrated Village Development Plans (IVDPs), which will guide future rural investments; (ii) improving the rural habitat environment, such as constructing or rehabilitating climate-resilient rural solid waste (garbage) transfer and wastewater (sewerage) treatment facilities; improving rural domestic waste collection and disposal systems, including sorting/separation and

resource utilization (recycling) of solid waste and improving sanitation – the "toilet revolution"; and (iii) providing training and capacity building in the O&M of wastewater and solid waste facilities. These activities will be implemented by the relevant provincial and county government departments.

PforR Program Financing

50. **The total program financing is US$5,016 million, of which Guangxi will finance US$2,846 million and Guizhou US$1,850 million, while the Bank will provide an IBRD loan of US$320 million equivalent (Table 2).** The PforR will ensure that allocation of the IBRD loan to the various DLIs provides incentives to attract both public and private investment to reduce nutrient and pollutant loads (NPS pollution) emanating from chemical fertilizer use, livestock and poultry manure, as well as domestic wastewater entering waterways. These activities will generate both global (e.g., GHG emission reductions) and local (e.g., improved water quality) environmental benefits.

Table 2: Summary of PforR Program Financing Plan

Source	Guangxi PforR		Guizhou PforR		Total PforR	
	Amount (US$ million)	% of Total Financing	Amount (US$ million)	% of Total Financing	Amount (US$ million)	% of Total Financing
Government	2,846	95.0	1,850	91.6	4,696	93.6
IBRD	150	5.0	170	8.4	320	6.4
Total Program Financing	2,996	59.7	2,020	40.3	5,016	100

Note: Covers only 27 counties for Guangxi and Guizhou.

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

51. **The Program Development Objective is to enhance environmentally sustainable agricultural and rural infrastructure development in selected areas of Guangxi and Guizhou.** The program is expected to contribute to the achievement of the government's RRS plan phase 1 targets through (a) strengthening institutional capacity to govern rural development activities; (b) reducing point and NPS agricultural pollution (e.g., COD, NH_3N, and TP) and GHG emissions; (c) improving efficiency of natural resource use (especially land and water); (d) building resilience to climate change and improving food safety (e.g., adoption of climate-smart agricultural practices and agro-product certification); (e) improving access to rural infrastructure and public services (e.g., solid waste and wastewater management facilities and value chain development infrastructure, such as production/access roads, and improved irrigation and drainage systems); and (f) strengthening rural institutions (e.g., training and capacity building and subsidies/matching grants provided to FCs, FAs, WUAs, agricultural input suppliers, and agro-entrepreneurs).

52. **The following are the proposed PDO-level indicators:**

(i) Nutrient load reduction (ammonia nitrogen and total phosphorus) achieved under the PforR in program counties;
(ii) Chemical oxygen demand pollution load reduction achieved under the PforR in program counties;
(iii) Greenhouse gas emission reductions achieved under the PforR in program counties; and
(iv) Beneficiaries reached with assets or public services (disaggregated by gender and ethnic minority) under the PforR in program counties.

53. **The PforR's contribution to GPGs from GHG emission reductions will be indirectly calculated during program implementation.** This will be done at the mid-term and the end of the program (compared with the 2020 baseline values) by using M&E data on quantities of nutrient load reduction and pollutant load reduction achieved under PDO/outcome indicators (i) and (ii) above to calculate the tons of CO_2 equivalent reduced from the mitigation measures. This approach would give third-party verification agencies sufficient time to verify the results using the agreed protocols. Additional GHG reductions will be derived from adaptation measures, such as a reduction in FLW, adoption of climate-smart agricutural practices (e.g., technologies that increase water use efficiency such as drip irrigation and fertigation), returning crop straw/residues to soil, using green manure, and practicing crop rotation.

54. **A summary of activities supported under the PforR that will substantially contribute to GHG emission reductions is provided in Annex 3: Technical Assessment (Table 5 to Table 7).** The PforR will ensure that incentives are realigned to attract both public and private investment to reduce pollution loads (NPS pollution) emanating from livestock and poultry manure, as well as domestic wastewater entering waterways. These activities will generate local environmental benefits.

E. Disbursement-Linked Indicators and Verification Protocols

55. **The choice of disbursement-linked indicators (DLIs) for the PforR is based on four factors:** (a) the importance of the indicator that signals a critical action/output along the results chain, critical to achieving the PDO; (b) assessed need to introduce a strong financial incentive to deliver a result; (c) practical aspects of verifying achievement; and (d) capacity of borrowers to achieve the DLIs during the implementation period of the PforR (Table 3). Other performance indicators are absorbed into the Program Action Plan (PAP) and the PforR's Results Framework.

Table 3: Disbursement-Linked Indicators

Disbursement-Linked Indicators	Rationale for Selection
RA1: Strengthening institutional capacity for governance	
DLI1: Development and use of a comprehensive IT-based M&E system for rural infrastructure, public services and profile of rural villages	The purpose of this DLI is to enable Guangxi and Guizhou to develop a comprehensive rural revitalization M&E system as an integrated tool for recording, analyzing, and reporting the performance of RRP implementation. Once developed, the IT-based M&E system will be used by county governments to record, analyze, and report the performance of RRP implementation, and use the information to develop annual work plans. Thus, the IT-based M&E system is a decision support tool to help manage the RRP implementation and evaluate performance. This includes the performance of transfer stations, storage facilities, treatment facilities, financing and technical institutions to ensure that rural wastes are managed holistically from generation to sorting/separation, transfer treatment and final placement or reuse; and contributions to the GHG emissions and pollutants reduction.
DLI2: Development and use of an IT-based system for green agricultural program-based budgeting and expenditure reporting	The purpose of this DLI is to enable Guangxi and Guizhou to develop an IT-based green agricultural program-based budgeting and expenditure reporting system that adopts RRS plan expenditure classification. County governments will adopt and use the platform to integrate, consolidate, or pool earmarked budgets from various sources to finance priority sub-programs under RRS plans. The IT-based system is a tool for enhancing transparency of budget allocations to support green agricultural development and improving accountability of expenditures, aimed at achieving targets for GHG emissions and nutrient and pollutant reduction.

Disbursement-Linked Indicators	Rationale for Selection
DLI3: Adoption of local regulations, standards and guidelines on green agricultural development and number of agro-products produced in the Program Counties that are certified and/or registered as green, organic or geographical indication pursuant to said regulations, standards and guidelines	The purpose of this DLI is to enable Guangxi and Guizhou to adopt the MARA's national regulations, standards, and guidelines for green agricultural development and customize or tailor them to fit and meet regional/provincial conditions and requirements. County governments will use the approved regional/provincial regulations, standards, and guidelines to certify and register green, organic, and GI agro-products. The standards and guidelines are therefore critical for ensuring that agro-products meet the targets for GHG emissions and nutrient and pollutant load reductions prior to being certified as either green or organic products or being registered as GI agro-products.
RA2: Greening selected agricultural value chains	
DLI4: Tonnes of chemical fertilizer reduced due to the adoption of green technologies and sustainable practices in selected crop production systems in the Program Counties	The purpose of this DLI is to track the quanty and intensity of chemical fertilizer reduction from selected value chains (e.g., rice, fruits, and vegetables). The aim is to achieve Guangxi's and Guizhou's targets for reducing agricultural NPS water pollution and increasing the utilization rates set in the RRS plans under the 14th FYP. The reductions can be achieved partly by increasing the efficiency of chemical fertilizer use or reducing its use (e.g., by improving the rate, timing, placement, or precision of application) and partly by using substitutes, including organic, green, and formula (based on soil testing) fertilizers, and fertigation technologies. These improved practices have been proven to substantially mitigate GHG emissions and reduce nutrient loads.
DLI5: Percentage increase of treated and recycled livestock and poultry manure from large scale and small scale farms in the Program Counties	The purpose of this DLI is to track the quantities of livestock and poultry manure that are collected, treated, and recycled into organic fertilizer, biogas/energy generation, and irrigation water. The aim is to achieve the Guangxi's and Guizhou's comprehensive manure utilization rates and pollutant reduction targets set in the provincial RRS plans under the 14th FYP. Manure management activities contribute substantially to GHG emission reductions (e.g., by removing COD, BOD, and NH_3N and efficiently using recovered gases and treated effluents from livestock and poultry production systems).
DLI6: Percentage increase of recovered and recycled agricultural plastics in the Program Counties	The purpose of this DLI is to track the quantities of agricultural plastics (e.g., mulch film, greenhouse film, and fertilizer and pesticide packaging materials) pollution reduction. The reduced agricultural plastics pollution can be achieved through increasing quantities that are recovered, treated, and recycled, along with increased use of substitutes, including biodegradable mulch film and crop straw mulch. The aim is to meet the Guangxi's and Guizhou's agricultural plastics recovery rate targets set in the provincial RRS plans under the 14th FYP. Plastic mulch film is a major contributor to waterborne plastics pollution, which ends up in oceans and adversely affects marine ecosystems and biodiversity.
RA3: Increasing access to rural solid waste and wastewater services	
DLI7: Number of Integrated Village Development Plans approved by Program Counties	The purpose of this DLI is to help Guangxi's and Guizhou's governments to properly plan rural infrastructure development under the phased RRS plan. The spatial IVDP, which includes settlement, farmland, forestry/protected land, recreation, social services, and infrastructure, would guide future rural investment to meet regional/provincial standards for improving the village living environment. Spatial IVDPs are the future investment decision support tools. Spatial planning would help to avoid land use changes and guide investment in wastewater treatment facilities and solid waste management systems. The recycling of treated waste would help to reduce GHG emissions and pollutants entering waterways.

Disbursement-Linked Indicators	Rationale for Selection
DLI8: Number of demonstration villages with newly constructed or rehabilitated existing climate resilient wastewater treatment facilities and established solid waste collection, sorting and transfer systems	The purpose of this DLI is to track the improvement of rural wastewater treatment facilities and solid waste management systems to prevent pollutants (e.g., COD, TP, and NH_3N) from entering waterways and to improve living conditions in the demonstration villages. The treatment and recycling of wastewater would contribute to a substantial reduction in GHG emissions. This DLI also contributes to the achievement of rural circular economy, including through the efficient use of treated wastewater (e.g., reuse for irrigation to build resilience to drought), use of compost material (e.g., as a substitute for chemical fertilizer), and use of nature-based solutions (e.g., retention ponds or constructed wetlands to filter pollutants).

56. **The verification of achievement of the eight DLIs will be carried out by a third-party agency based on agreed protocols.** The provincial governments will prepare consolidated reports on the achievement of results using M&E data and information collected and reported by the county government agencies and/or third-party M&E firms hired under the program. All M&E data and information collected by these agencies and firms will be uploaded onto the MIS. The third-party verification agency will use the MIS data and information and field visits to verify the reported results. The detailed verification protocols for each DLI are presented in the Technical Assessment report and are summarized below.

57. **DLI1: Development and use of a comprehensive IT-based M&E system for rural infrastructure, public services and profile of rural villages.** DLI1 includes two sub-DLIs that aim at developing an IT-based M&E system at the regional/provincial level and for county governments to use and maintain the system.

58. **DLI1.1: Guangxi and Guizhou develop a comprehensive IT-based M&E system for rural infrastructure, public services, and profile of rural villages.** The data collected, analyzed, and reported through the system shall include basic information on access to rural infrastructure and public services, such as wastewater and solid waste in all administrative villages in program counties; and village socio-economic parameters.

59. **Verification protocol:** A third-party VA verifies whether: (a) the relevant provincial/regional RRBs have developed and installed the IT-based M&E system for rural infrastructure, public services and profile of rural villages, through on-site review of the system and the official/regular performance evaluation documents, or reports generated; (b) the system meets data security standards; and (c) the regional/provincial RRB issues guidelines for installing and using the system at the county level. A single disbursement is made upon achieving the results.

60. **DLI1.2: Program Counties install and use the comprehensive IT-based M&E system developed under DLI1.1 to record, analyze, and report on the performance of rural infrastructure, public services, and the profile of rural villages.** The county governments are expected to use the data and information for the development of annual RRS work plans and 15 th FYP RRS.

61. **Verification protocol:** The third-party VA verifies whether the IT-based M&E system has been adopted/installed and can generate the required official reports regularly in the 27 program counties. Scalable Disbursement Linked Results (DLRs) are defined requiring the installation and use of the M&E system by all 27 program counties by 2025. The scalable disbursements are made progressively against the number of counties that have first installed and used the IT-based M&E system in the respective year to generate the monitoring reports, including on the performance of the solid waste and wastewater facilities. These reports are key to informing the O&M decision-making processes in the program counties.

62. **DLI2: Development and use of an IT-based system for green agricultural program-based budgeting and expenditure reporting.** This DLI is also subdivided into two parts.

63. **DLI2.1: Guizhou and Guangxi develop a program-based budgeting and expenditure tracking IT-based system for green agricultural development.** The IT-based system shall be capable of performing the following functions: (a) capturing and integrating financial data related to green agricultural development from various sources; (b) identifying, processing, and transferring financial data from the government treasury system; (c) generating regular budget and expenditure tracking reports; and (d) ensuring financial data security. The regional/provincial DARA and/or RRB issues guidelines for the installation and use of the IT-based program budgeting to the 27 program counties.

64. **Verification protocol:** The third-party VA verifies whether the IT-based program budgeting system is fully operational and capable of generating the required regular (quarterly and annual) financial reports. A single disbursement is made upon achieving the results.

65. **DLI2.2: Program counties install and use the program-based budgeting and expenditure tracking IT-based system developed under DLI2.1.** The 27 program counties remain responsible for entering accurate and timely program-based budget and expenditure data in the IT-based system; and for preparing and submitting the required regular budget and expenditure reports.

66. **Verification protocol:** The third-party VA verifies whether: (a) the IT-based program budgeting and expenditure tracking system is being used; (b) the required regular financial reports are prepared; and (c) financial data and information are used for performance evaluation and decision-making processes in the 27 program counties. Disbursements are scalable and are made against the number of counties in a calendar year (until 2025), which have achieved for the first time the above results.

67. **DLI3: Adoption of local regulations, standards and guidelines on green agricultural development and number of agro-products produced in the Program counties that are certified and/or registered as green, organic or geographical indication pursuant to said regulations, standards and guidelines.** This DLI also has two sub-DLIs:

68. **DLI3.1: Guizhou and Guangxi adopt local regulations, standards and guidelines on green agricultural development based on the relevant regulations, standards and guidelines adopted by MARA.** Experience shows that some provinces (especially those targeting Greater Bay Area markets) have food safety standards that are higher than the national standards. The adopted/customized regulations, standards, and guidelines are approved by the relevant authorities at the regional/provincial level. The regional/provincial DARA issues official notice to the 27 program counties to use them.

69. **Verification protocol:** The third-party VA verifies the approved documents (i.e., regulations, standards, and guidelines) and a single disbursement is made upon achieving the results.

70. **DLI3.2: Number of agro-products produced in the Program counties certified and/or registered as green, or organic, or GI using the regional/provincial regulations, standards and guidelines.** This sub-DLI aims to provide evidence that the program counties are: (a) supporting agro-producers to meet environmental and food safety standards, and (b) using the adopted local regulations, standards, and guidelines for the certification and registration of agro-products to help farmers/enterprises to fetch premium prices in the markets.

71. **Verification protocol:** The third-party VA verifies the green and organic agro-product certificates issued by the regional/provincial DARA and GI registrations for agro-products issued by the MARA. Disbursements are scalable and are made against the number of agro-products that are certified or registered in a calendar year.

72. **DLI4: Tonnes of chemical fertilizer reduced due to the adoption of green technologies and sustainable practices in selected crop production systems in the Program counties.** The total reduction in chemical fertilizer use is achieved by: (a) reducing application intensity (e.g., quantity per unit area) and increasing utilization rate (e.g., timing, placement, or precision of application to enhance absorption by roots); and (b) deploying four substitute green technologies: application of organic, green manure (nitrogen fixing crops), and formula (based on soil testing) fertilizers and fertigation. The cumulative chemical fertilizer use reduction under (a) will be monitored using MARA's national platform. The cumulative chemical fertilizer use reduction under (b) will be estimated using conversion coefficients approved by MARA (see details in Annex 3). It is difficult to calculate annual chemical fertilizer utilization rates. This is because they are calculated from experimental data on fertilizer absorption by types of crop and over multiple seasons. The experiments use MARA's methodology to monitor fertilizer application rates and crop yields, and account for crop nutrient use.[31] Therefore, the Program counties will only collect data on the quantity and area (hectares) of chemical fertilizer use and substitute green technologies use; and prepare annual reports. Reduction in chemical fertilizer use will be calculated from a decrease in application intensity and an increase in the use of substitute green technologies using the conversion coefficients approved by the MARA.

73. **Verification protocol:** The third-party VA verifies: (i) the cumulative quantity of organic and formula fertilizers, and area under the green manure and fertigation practices in selected crops systems, which are monitored by county DARAs and reported annually to the Bank by regional/provincial DARAs; and (ii) whether the appropriate coefficients are used for conversion into pure tonnes of fertilizers through random sampling. The third-party VA checks whether the random sample results are comparable to the reported reduction in chemical fertilizer use due to the adoption of green technologies and practices. Chemical fertilizer reduction targets and budgets are spread over the 2024–2027 program implementation period. Disbursements are scalable and are made against the number of the target net tonnes of chemical fertilizer reduction achieved in the program counties in a calendar year.

74. **DLI5: Percentage increase of treated and recycled livestock and poultry manure[32] from large scale and small scale farms in the Program counties.** The cumulative data on quantity of manure collected, treated, and recycled will be obtained from two sources: (a) large farms with on-site treatment facilities; and (b) centralized treatment facilities for small livestock and poultry farms, and centralized facilities for small-scale farms (Guizhou). MARA has established a national platform for monitoring quantities of livestock and poultry manure produced, collected, treated and utilized (e.g., as organic fertilizer, conversion to biogas/energy, and crop irrigation). Data from this platform enables MARA and DARAs to scientifically calculate the comprehensive utilization rate of livestock and poultry manure. Supplementary data will be collected directly from the on-site ledgers of large and medium scale livestock and poultry farms; and through annual M&E socio-economic surveys.

75. **Verification protocols:** Quantities reported by the three sources of data will be verified by the third-party VA based on: (a) random sampling of large and small -scale farms[33] and the centralized manure treatment facilities; and (b) by reviewing other supporting documents, such as inspection reports from county DARAs and annual M&E socioeconomic survey reports. Livestock and poultry manure treatment and recycling targets and budgets are spread over 2024-2027 program implementation period. Third-party VA verifies the results and estimates the annual manure treatment rates.

[31] In representative counties, field fertilization experiments for major crops are designed, fertilization rates and crop yields are monitored, and crop nutrient use is estimated using scientific methods.
[32] This refers to the manure, urine, and sewage produced in livestock and poultry breeding and production activities.
[33] 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 chickens, and 30 or more head of cattle.

Disbursement will be made against the percentage increase of livestock and poultry manure treated and recycled that is achieved in the program counties over the period of Program implementation up to the total allocation for this DLI.

76. **DLI6: Percentage increase of recovered and recycled agricultural plastics in the Program counties.** This DLI tracks the cumulative quantity of agricultural plastics (greenhouse film, mulch film and chemical and fertilizer packaging materials) used and recovery rate.[34] The MARA has established a national platform for monitoring these two parameters. The platform mainly tracks the use and recovery of greenhouse and mulch films. Greenhouse film recovery is almost guaranteed because it involves large farms, and the residues are of high value. As a result, producers and suppliers of greenhouse film are recovering the residues. In contrast, mulch film, which is of low value, is not widely recovered. The program will focus more on increasing the number of collection centers and recycling facilities for this type of plastics. In addition to the MARA's platform, data on agricultural plastic film collection will be obtained from: (a) the inventories established at county and village-level collection centers or sites, (b) records (on-site ledgers) of agricultural plastics use by large farm enterprises and professional farmer cooperatives, and (c) records (on-site ledgers) from agro-input sale networks, solid waste sorting centers, and recycling centers, among others.

77. **Verification protocol:** The recovery and recycling quantities will be verified by the third-party VA using random sampling methods and field visits to review the collection and recycling ledgers. Agricultural plastics recovery and recycling targets and budgets are spread over the 2024–2027 program implementation period. Third-party VA verifies the results and estimates the annual agricultural plastics recovery and recycling rates. Disbursement will be made against the percentage increase of agricultural plastics recovered and recycled that is achieved in program counties over the period of Program implementation up to the total allocation for this DLI.

78. **DLI7: Number of Integrated Village Development Plans (IVDPs) approved by Program counties.** The county RRB will collect data on the number of IVDPs prepared by hired professional firms. The IVDPs will be approved by the relevant county authorities for implementation at the county level to ensure that they meet the required technical, environmental, and social standards that will be specified in the Program Implementation Plan (PIP).

79. **Verification protocol:** The third-party VA will verify the achievements reported by reviewing the minutes of meetings approving the spatial IVDPs and the final documents provided by the county/district RRB on a random sampling basis. Disbursements will be made against the number of IVDPs approved each year.

80. **DLI8: Number of demonstration villages with newly constructed or rehabilitated existing climate resilient wastewater treatment facilities and established solid waste collection, sorting and transfer systems.** Data on the number of constructed or rehabilitated and operational wastewater treatment facilities and solid waste management systems will be collected by the relevant departments at the county level during the handover of the facilities/systems.

81. **Verification protocol:** The third-party VA will verify whether the facilities/systems are fully operational by random sampling of batches completed and accepted each year. The third-party VA will also verify whether the facilities/systems are meeting county effluents discharge standards. Disbursement will be made against the number of demonstration villages with waste management facilities/systems that are meeting the county effluents discharge in each year, based on the unit price.

[34] The recovery rate of agricultural film = the amount of agricultural film recovered divided by the amount of agricultural film used times 100.

III. PROGRAM IMPLEMENTATION

A. Institutional and Implementation Arrangements

82. **The relevant regional/provincial government departments and program counties will be responsible for implementing the PforR and delivering results under the DLIs.** Their PforR implementation will be coordinated by the regional/provincial government departments. Guangxi and Guizhou will each establish a provincial-level Program Leading Group (PLG) to be chaired by the vice governor responsible for implementing the phased RRS plan; and drawing members (at deputy director general level) from the provincial Development Reform Commission (PDRC), Department of Finance (DOF), RRB, DARA, HURDB, Natural Resource Bureau (NRB), Water Resource Bureau (WRB), Ecology and Environment Bureau (EEB), and other relevant departments, to provide strategic guidance and oversee the PforR implementation.

83. ***Guangxi Region***. The Guangxi DARA, which will be primarily responsible for implementing activities under RA2 (Greening selected agricultural value chains) in the province, will also serve as the location for the Regional Program Management Office (RPMO). The RPMO will be responsible for the overall coordination, M&E, reporting of PforR implementation, and delivery of the following results: DLI2, DLI3, DLI4, DLI5, and DLI6.

84. **In addition, a regional-level Program Implementation Unit (PIU) will be established under the RRB.** The PIU will be responsible for coordinating, monitoring, and reporting to the RPMO on the delivery of the following results**:** DLI1, DLI2, DLI7, and DLI8. The RRB will work closely with other departments responsible for rural wastewater treatment facilities and solid waste management systems development: DARA, WRB, HURDB, EEB, NRB, and Comprehensive Enforcement Bureau (CEB), among others. An expert panel will be established to provide Technical Assistance to the RPMO/PIU. The regional-level institutional arrangements (leading group and management office) will be replicated at each of the participating county/district government levels.

85. ***Guizhou Province***. The provincial RRB, which will be primarily responsible for coordinating implementation of RA3 (Increasing access to rural infrastructure and public services), will also serve as the location for the Provincial Program Management Office. The PPMO will be responsible for the overall coordination, M&E, reporting of PforR implementation, and delivery of the following results in the province: DLI1, DLI7, and DLI8. The provincial RRB will work closely with other departments responsible for rural wastewater treatment facilities and solid waste management systems development: DARA, WRB, HURDB, EEB, and NRB, among others.

86. **Similarly, a provincial-level PIU will be established under DARA.** The PIU will be responsible for coordinating, monitoring, and reporting to the PPMO on the delivery of the following results: DLI3, DLI4, DLI5, and DLI6. The PIU will coordinate the activities of relevant divisions/stations responsible for crops (chemical fertilizer and pesticide reductions, straw management), livestock (manure and other waste management), and training and capacity building (members and leaders of FCs, FAs, WUAs and input supplier enterprises, and extension staff). An expert panel will be established to provide TA to the PPMO/PIU. The provincial-level institutional arrangements (leading group and management office) will be replicated at each of the participating county/district government levels.

87. **The National Rural Revitalization Administration (NRRA), through the International Poverty Reduction Center in China (IPRCC)** has an institutional mandate to engage in the implementation of the RRP. Accordingly, the Bank expects to remain engaged with NRRA/IPPRC to ensure knowledge dissemination and scaling-up of lessons, approaches and methodologies, and good practices developed in Guangxi and Guizhou.

B. Results Monitoring and Evaluation

88. **Each province will prepare an M&E plan, specifying the units of measurement, baseline values, targets, data sources for each indicator, methodology, and responsibility for collection and reporting.** The provinces will recruit third-party M&E agencies to collect, analyze, and report survey-based data. Administrative data will be collected by the relevant county government departments implementing the PforR activities.[35] The M&E data will be stored in the MIS for the PforR. The M&E of the livestock and poultry manure pollution reduction and wastewater treatment and recycling will be based on the already established monitoring and verification system under the MEE/Environmental Protection Agencies (EPAs). Similarly, the M&E of the chemical fertilizer reduction will follow M&E protocols established by the MARA. This will provide a solid basis for official recognition and credibility of the PfoR's disbursement-linked results. The M&E system will be linked to the IT-based platforms for rural infrastructure management and the IT-based program budgeting and expenditure reporting system. This will enable the provinces to not only evaluate the results and performance of the PforR activities but also analyze the cost-effectiveness of the various activities implemented to generate the results. The regional/provincial PMOs will prepare and submit to the Bank consolidated semi-annual progress reports (including findings of third-party M&E reports), a mid-term review (MTR) report, and an Implementation Completion Report (ICR). The regional/provincial PMOs will periodically submit to the Bank the third-party VA's verification reports on the achievement of DLR to enable IBRD loan disbursements against the DLIs.

C. Disbursement Arrangements

89. **The Bank will advance to Guangxi and Guizhou provinces up to 25 percent of their total IBRD loan amounts for the PforR by loan effectiveness.** After the DLIs against which the advances have been disbursed are achieved, the amounts of the advances will be deducted from the total amount to be disbursed against such DLIs. The Bank will record any amounts of advance as disbursed for an achieved DLR ("recovered") after it has notified the MOF (International Economic and Financial Cooperation Department) of its acceptance of the evidence of achievement of the results for which the advance was provided.

90. **The regional/provincial PMOs will be responsible for consolidating reports from provincial agencies participating in the PforR and submitting them to the PDOF, copying the county PMO.** IBRD loan disbursements will be made periodically upon receiving and accepting the third-party verification reports on the DLR for the respective DLIs. The amount of submitted withdrawal application (WA) will depend on the verified results. Some annual allocations are scalable and non-fixed, meaning that the Bank can disburse for over-performance up to the DLIs' total allocation. Over-performance will enable the PDOFs to bring forward disbursements from Years 4 and 5 to Years 3 and 4, respectively. The PDOFs can apply for disbursements as soon as the provinces achieve the results, provide the necessary evidence verified by the third-party VA to the Bank, and the Bank accepts the evidence in a formal notice to the MOF specifying the eligible disbursement amounts. A designated account (DA) for Guangxi and Guizhou PDOF will be set up in Euro and U.S. dollars, respectively .

[35] The DRCs are responsible for fund allocations based on an evaluation of county achievements, which relies on data provided by sector departments. The DOFs 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. DNRs are responsible for IVDPs preparation. DEEs are responsible for monitoring water and air quality. HURDs are responsible for monitoring wastewater services. DARAs are responsible for agricultural plastic film and NPS pollution.

D. Capacity Building

91. **Given that the responsibility for delivering most of the DLIs is with the counties, capacity building for planning, budgeting, implementation, and M&E and reporting will be needed.** Overall, capacity gaps remain on how to design and implement specific activities to achieve the expected results, conduct effective M&E of the results, and strengthen the linkages (better manage the results chain) between inputs, outputs, and outcomes to achieve the PDO of the PforR. technical assistance (TA) will also be needed to strengthen the capacity for program-based budgeting and expenditure reporting (including compliance with fiduciary requirements), management of rural infrastructure (wastewater and solid waste management), and handling of environmental and social safeguard issues (e.g., assessment of impacts of rural investments and putting in place acceptable mitigation measures) at the county level. The value added of the Bank financing is to bring in international experience in these aspects, especially with the program-based budgeting and expenditure tracking and results-based fiscal transfers to the counties and rural areas. The PforR also incorporates training and capacity building (nurturing green skills and talents) for the beneficiaries, including members of FCs, FAs, and WUAs; input suppliers; extension workers; and agro-enterprises. The RF includes intermediate indicators to measure the performance of training and capacity-building activities.

IV. ASSESSMENT SUMMARY

A. Technical (including program economic evaluation)

Geographic Boundary

92. **In Guangxi , the PforR will be implemented in 12 out of 111 counties/districts:** Pinggui, Ziyuan, Luocheng, Tiandeng, Rong'an, Xingbin, Xincheng, Tiandong, Bobai, Yuzhou, Mashan, and Zhongshan. In Guizhou, the PforR will be implemented in 15 out of 88 counties/districts: Bijiang, Sinan, Yinjiang, Songtao, Jinping, Shibing, Taijiang, Luodian, Guiding, Sandu, Libo, Xingren, Zhenfeng, Xiuwen, and Xifeng. These counties/districts were selected based on agreed criteria, including (a) geographic distribution (i.e., demonstration counties from different municipalities/cities); (b) inclusiveness (at least one or two ethnic minority autonomous cities); (c) large user of chemical fertilizer and pesticide (to maximize impacts of NPS pollution control, e.g., reducing CH_4, N_2O, and CO_2 emissions and TN and TP pollutants); (d) large producer of livestock and poultry, to maximize the impacts of better management of manure and other waste (dead animals and by-products), for example, reducing COD, BOD, and ammonia nitrogen; (e) large user of agricultural plastics, to help collect, treat, and recycle mulch film and fertilizer and pesticide packages; (f) lack of/inadequate solid waste management system (e.g., for collecting, sorting, and treating; and converting to organic fertilizer or biogas/energy generation); and (g) lack of/inadequate wastewater management system (e.g., for collecting, treating, and recycling water for irrigation and/or construction of wetlands).

93. **Technical assessment of the PforR was undertaken using data and information provided by the national, provincial, and county governments during program preparation.** It focused on four key aspects: (i) strategic relevance and technical soundness, (ii) expenditure framework, (iii) M&E capacity, and (iv) economic justification for Bank financing.

Strategic Relevance

94. **Guangxi and Guizhou regional/provincial leaders are committed to addressing the environmental challenges** related to overuse of chemical fertilizer, improper management of livestock and poultry manure, and inadequate recovery and recycling of agricultural plastics in the agricultural sector (see Section 1.A). The leadership of the two provinces has also expressed its commitment to addressing the challenges related to underdeveloped rural solid waste and wastewater services. These commitments are presented in Guangxi's and Guizhou's "proposals on comprehensively promoting rural

revitalization and accelerating agricultural and rural modernization." Their regional/provincial RRS plans are included in the 14th FYP (2021–2025). This presents an opportunity for the Bank to support the two regional/provincial governments' efforts to promote green agricultural and rural development activities through results-based financing.

Technical Soundness

95. **The proposed green agricultural development activities are consistent with China's National Green Development of Agriculture Plan.** They will significantly reduce the GHG emissions and pollutants entering waterways, hence contributing to the achievement of China's emissions' peaking and zero growth targets, by 2030 and 2060, respectively. The priority activities involve (i) strengthening the protection and use of agricultural resources, including protecting and improving the quality of farmland, improving the efficiency of agricultural irrigation water use, and protecting agricultural biological resources; (ii) preventing and controlling agricultural NPS pollution. including promoting a reduction in fertilizer use and increasing the efficiency of fertilizer and pesticide use, promoting the recycling of livestock and poultry manure and crop straw, and strengthening white (agricultural plastics) pollution control; (iii) strengthening agricultural ecological protection and restoration, including protecting and restoring farmland ecology, protecting and restoring agricultural ecosystems, and strengthening ecological protection in key river basins; (iv) building green and low-carbon agricultural industry chains, including promoting green agricultural value chains, industrial agglomeration, and circular economy; and promoting pollution-free, green, organic, and GI agricultural products; and (v) improving the innovation system for green agricultural technology development, including promoting innovations in green agricultural science and technologies, accelerating the adoption of green agricultural practices (GAP), and building green talents and skills.

96. **The proposed solid waste and wastewater management activities will also contribute to the reduction in GHG emissions and pollutants entering waterways.** These activities will help to improve living conditions in rural areas and contribute to the improvement of water quality in the Yangtze and Pearl River basins. These main activities include (i) improving rural habitat environment, including constructing rural solid waste (garbage) and wastewater (sewerage) treatment systems, improving rural domestic waste collection and disposal systems, promoting classification and resource use (recycling) of waste, and promoting the "toilet revolution"; (ii) improving village appearance, professionally planning the layout of villages, rehabilitating village buildings to preserve original cultural (traditional) architecture, constructing rural and household roads, renovating public space and courtyard environment, promoting rural greening, and enhancing village landscapes; and (iii) building a modern energy system in rural areas; developing solar, biomass, water, and wind energy; improving rural energy infrastructure networks; accelerating upgrading of new rural power grids; and promoting the extension of gas supply facilities to rural areas.

97. **To complement Guangxi's and Guizhou's pollutant reduction efforts, the PforR will support innovations.** Specifically, fertilizer use reduction will be complemented by (i) improving soil nutrient management through deep placement of formular fertilizer; (ii) using formula and slow-release fertilizer; (iii) investing in fertigation facilities for vegetables and fruit orchards; (iv) using mechanized fertilization; (v) using organic fertilizer from treated livestock and poultry manure and green manure to replace chemical fertilizer; and (vi) crop rotation with green manure plants. Similarly, livestock waste management will be improved through (i) more efficient aerobic composting, bedding preparation, and matrix transformation for solid feces; (ii) full-amount field incorporation upon storage or upon combined processing of storage and anaerobic treatment for liquid manure; and (iii) improved manure transport vehicles and facilities. Finally, plastic collection and reduction include measures to (i) replace, recover, and recycle plastic mulch, and (ii) develop cost-effective degradable mulch.

98. **Maximizing Finance for Develoment (MFD).** The PforR will support the creation of an enabling environment for attracting private investment in greening agricultural value chains. China has an established system of mobilizing private capital to support agricultural development. Under its agricultural industrialization (*Chanye Fupin*) policy, Guangxi and Guizhou provincial governments will provide incentives to agro-enterprises (often called Dragon Head Enterprises, DHEs) with productive partnership/contractual arrangements with farmer cooperatives to invest in the production, value addition, and marketing of branded agro-products. The DHEs become responsible for the quality and safety of the agro-products, which means they are liable for enforcing standards. Incentives provided include performance-based subsidies, allocation of land for agricultural production and processing facilities, construction of industrial parks, and tax rebates/holidays. For example, large pig farms investing in high-rise production and manure treatment facilities are given an output-based subsidy (e.g., CNY 800/m^2) to offset a portion of investment costs upon the facilities becoming operational and meeting environmental standards. Similar performance-based subsidies are provided to the medium- and large-sized livestock and poultry farms that are investing in livestock waste management (e.g., collection, treatment, and conversion into organic fertilizer or energy/biogas). Such farms are required to receive waste from small livestock and poultry farms to help smallholder producers with manure management. The PforR will encourage the Guangxi and Guizhou provincial governments to expand the scope of such support to private enteprises willing to invest in green agricultural value chains and the management of rural wastes and to reduce pollution.

99. **Citizen engagement.** The proposed PforR has been promoting citizen engagement through wide stakeholder consultation during the environmental and social systems assessment including local communities and benefiting farmers. The citizen engagement mechanism during project implementation will include the following: (a) contact details of persons from project management offices receiving feedback and complaints will be made public during the disclosure process in all project townships and project counties as part of the grievance redress mechanism; and (b) participatory approaches will be used under DLI7. Records of people participating in the planning and implementation of the IVDPs will be kept at the village level. Citizen engagement will be used as a tool for transparency and accountability, including full disclosure of plans, budgets, expenditures, and results. In addition, a comprehensive GARR PforR communication strategy will be developed and implemented to inform the wider public of the achievement of results and share widely lessons learned and approaches and methodologies for upscaling nationwide.

100. **Climate co-benefits.** The PforR will generate both climate change mitigation and adaptation benefits in the two provinces in line with China's NDC.

101. *Climate change mitigation:* The PforR will generate mitigation co-benefits through (i) reducing GHG emissions (measured in CO_2 equivalent) by promoting the reduction in chemical fertilizer use; collection, treatment, and recycling of livestock and poultry manure; and adoption of climate-smart agricultural practices; and (ii) supporting investments in treatment and recycling of rural domestic wastewater and solid waste.

102. *Climate change adaptation:* The PforR will also generate adapatation co-benefits: (i) adoption of climate-smart agricultural practices (e.g., recycling of crop straw/residues, increasing efficiency of irrigation water use, fertigation, and water management in paddy rice); (ii) reducing FLW (e.g., through village-level cold storage facilities and cold chains, improved postharvest handling technologies, and processing); and (iii) increased energy use efficiency (e.g., in primary production through new efficient farm machinery and using renewable energy (solar and wind power for irrigation), and in value addition, such as conversion of biogas to energy).

103. **GHG emission reductions accounting.** The estimates from the EX-ACT tool show that the GARR PforR is expected to reduce GHG emissions by 9.0 million tons CO_2-e over a period of 20 years (including 5-year implementation). Net GHG

emissions are quantified by focusing on activities under RA2 and RA3. Specifically, four sources of quantifiable net GHG emission reductions from mitigation measures have been assessed: (i) GHG emission reductions from reduced fertilizer use and improved application practices; (ii) treatment and reuse or use of livestock and poultry manure; (iii) recovery and recycling of agricultural plastic film and packaging materials; and (iv) treatment and recycling of wastewater and solid waste. The net GHG emission reductions are most likely to be higher than the 9.0 million tons CO_2-e presented here because of the net GHG emission reductions due to adaptation measures. In addition, the 9.0 million tons CO_2-e net GHG emission reductions represent only the mitigation attributable to the IBRD's financing. Finally, the calculations of net GHG emission reductions are limited to the 27 program counties. Thus, huge potential exists to scale up these activities in the two provinces.

104. **Gender.** With respect to gender considerations, the social assessment (SA) and gender analysis identified that women have become the key labor force for crop production in the project areas. They are therefore, negatively affected by limited access to green agricultural technologies and participation in the transformation of agriculture value chain. The program presents opportunities to promote women's equal employment in the greening of agriculture value chain through empowering female farmers with green knowledge and skills, and getting them better prepared for the emerging job opportunities. Recognizing the special interests and demands of female farmers, the PforR design has emphasized female participation in program supported crop and livestock production, and their equal employment opportunity in green agriculture value chain value (e.g., agro-processing, logistics, cold chains and marketing, including through e-commerce), capacity building and M&E activities. Specific indicators related to women's participation are included in the Program Results Framework and will be closely monitored under RA3 of the PforR.

Capacity Building

105. **As indicated above, the technical capacity of the region/provinces in green agriculture and rural infrastructure is generally adequate.** Both the central and provincial governments are paying high attention to training and capacity building of farmers and extension workers, and developing rural talents. During the 13th FYP period, the Ministry of Agriculture and Rural Affairs launched a five-year program to develop new-type occupational farmers who will be equipped with a wide variety of skills: from soil management and crop production to marketing and business planning. In addition, the Department of Human Resources and Social Security (DHRSS) is organizing short-term training for farmers and returning migrant workers. Under the PforR, TA and an outreach program through training and demonstration will be provided, based on needs assessment for the various categories (farmers, input suppliers, enterprises, and extension workers), development of training modules, outsourcing the delivery of training activities, and evaluating adoption rates.

Economic Assessment

Rationale for public sector financing of the PforR

106. **The GARR PforR will strengthen institutional capacity for governance, generate public goods (both global and domestic) due to pollution reductions, and provide basic rural public services.** The program will directly contribute to GPGs through (i) reducing GHG emissions by supporting measures to reduce chemical fertilizer use and increase efficiency; collection, treatment, and recycling of livestock and poultry manure; and adoption of climate-smart agricultural technologies and practices; (ii) supporting investments in treatment and recycling of rural wastewater and solid waste; and (iii) supporting investments aimed at increasing the collection, transfer, and recycling of agricultural plastics. The GARR PforR will also indirectly contribute to the protection and restoration of biodiversity in the farmland ecosystem through

the reduction of agricultural pollutants (especially chemical fertilizer and pesticide) and promoting IPM technologies. Further, the GARR PforR will improve the efficiency and effectiveness of public goods delivery through strengthening institutional frameworks or governance systems (e.g., M&E, program budgeting, and expenditure tracking) and capacity building at the regional/provincial and county levels. This will help the regional/provincial governments to adopt results-based fiscal transfers to finance activities aimed at achieving green agricultural and sustainable rural development objectives, which are set in their respective 14th FYP and phase 1 RRS plans.

Value added of Bank support

107. **The Bank's involvement will help expose the counterparts to international experience and good practices in green agricultural development,** climate-resilient rural public infrastructure, and environmental and ecosytem protection and management. In addition, the Bank involvement can incorporate into the government's RRS the lessons learned and experience gained from other Bank-financed agricultural and rural development projects in China and related knowledge products. The recently completed studies undertaken as part of the Bank's Programmatic Advisory Services and Analytics (PASA), "Transforming Rural China – Greening Agricultural Modernization," are particularly relevant for both informing the GARR PforR design and for its implementation (see Section C). The Bank's involvement will help leverage its vast international experience and good practices in green agricultural development, rural wastewater and solid waste management, NPS water pollution control, and environmental/ecological restoration. This involvement will also help to strengthen the governance frameworks for the implementation of the RPP, using the PforR instrument to leverage greater results-orientation of government transfers and improved cross-agency cooperation.

Assessment methodology

108. The economic assessment compares a scenario of "no government program" with a scenario of a government program, including Bank support. This approach is used because, under a PforR, government and Bank funds are combined to achieve results, with virtually no distinction at the activity level between government-financed and Bank-financed achievements. This approach can determine whether the overall Program – which Bank financing partly supports – is socially beneficial after considering economic benefits and economic costs. Given the wide range and multi-purposes of the program's interventions, the economic assessment has been conducted by RAs using different methodologies.

Results Area 1: Strengthening institutional capacity for governance

109. RA1 will strengthen institutional capacity to develop and improve governance frameworks (e.g., regulations, standards, and guidelines for green development; and program budgeting, expenditure tracking, and M&E) for implementing the RRS plan. Effectiveness and impact of the public expenditures will be enhanced by linking the disbursement of funds to the achievement of specific results. RA1 will also improve transparency and accountability of governance systems. Although not directly generating benefits itself, RA1 will create an enabling environment for the implementation and enhance the impact of activities under RA2 and RA3. Furthermore, it will help to upscale green agricultural development and rural public service province-/region-wide, thus far exceeding the program's scope. As such, no separate analysis is needed for activities under RA1.

Results Area 2: Green agricultural development

110. RA2 involves support to farmers, cooperatives, and enterprises in the form of matching grants or output-based subsidies. The support to developing green value chains (VCs) generates both private (increased productivity/income) and public (reduced GHG emissions and nutrient/pollutant loads entering waterways) benefits. Adoption of new climate-smart

agriculture (CSA) technologies and practices promoted by the program partly depends on the profitability of farm operations/VCs.

111. **Economic analysis:** Cost-benefit analysis has been conducted to assess the economic viability of RA2 by aggregating activities in crop production (VCs) and manure treatment interventions per physical targets as contained in DLI 4 and DLI 5, and based on crop production and manure treatment models in financial analysis. Annex 3 provides the detailed incremental costs and benefits used. The following assumptions have been applied for the analysis: (a) carbon shadow prices are set following World Bank guidelines: "Guidance note on the shadow price of carbon in the economic analysis" (November 2017)[36]; (b) program life is 20 years; (c) the discount rate adopted by the analysis is 6 percent, chosen according to guidelines from the NDRC, which is in line with the World Bank's guidance for discount rate[37]; and (d) taxes, duties, and subsidies are not included as they represent transfer payments instead of real costs or benefits to society as a whole. Cash flows of benefits and costs for RA2 are projected over a 20-year period to estimate their economic rate of return (ERR). The ERR with GHG reductions is estimated at 13 percent (with low carbon shadow price) and 14 percent (with high carbon shadow price) and the ERR without GHG reductions at 11 percent, which are all above the discount rate of 6 percent, indicating that RA2 is economically viable.

112. **Financial analysis:** The financial benefits of the project are analyzed based on the incremental benefits and incremental costs of the program from the perspective of farmers/cooperatives. Assumptions for this analysis are the same as for the economic analysis except that (a) subsidies for farmers/manure treatment facilities are treated as income and (b) the GHG reduction benefits are excluded as they cannot be internalized by farmers/owners of manure treatment facilities. The major crop production models targeted for fertilizer reduction are selected for the financial analysis with the results as shown in Table 4.

Table 4: Results of Financial Analysis for Major Crop Value Chains

Technical packages to be adopted	Main crop	FIRR with subsidies (%)	FIRR without subsidies (%)
Formula fertilizer and/or organic fertilizer and/or green manure	Paddy rice	14	11
Fertigation and/or formula fertilizer and/or organic fertilizer	Vegetable	18	15
Fertigation and/or formula fertilizer and/or organic fertilizer	Fruit	17	14

113. The crop financial analysis shows that, in the long term, green agricultural technologies and practices are financially viable even without subsidies. However, subsidies are justified during the initial years for the following reasons: (i) promoting the adoption of new technologies and practices, (ii) compensating farmers for their contribution to public goods generation (e.g., GHG emission reductions and nutrient and pollutant reductions), and (iii) providing upfront financial incentives to hedge against the risks associated with switching to new technologies and practices. Experience has

[36] According to the World Bank's guidance note on the shadow price of carbon in economic analysis issued on November 12, 2017, projects' economic analysis should use a low and high estimate of the carbon price starting at US$40 and US$80, respectively, in 2020, and increasing to US$50 and US$100 by 2030. The low and high values on carbon prices are extrapolated from 2030 to 2050 using the same growth rate of 2.25 percent per year that is implicit from 2020 to 2030, leading to values of US$78 and US$156 by 2050.

[37] 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 E&S benefits.

shown that, once the new technical packages are proven to be financially viable, farmers will continue to use them even without subsidies.

114. **For manure treatment**, new construction of a centralized livestock and poultry manure treatment and recycling facility has been adopted for analysis. The facility will adopt "odorous fermentation bed" technology with annual treatment capacity of 500,000 tons of manure (for roughly 7,000 standing pigs annually). Based on the estimated capital investment, operational costs, and revenues, the facility will have a FIRR at 4 percent without subsidies and 11 percent with subsidies for construction costs. The financial analysis of the manure treatment facility shows that it is not financially viable without subsidies.[38] Because the centralized facilities will provide manure treatment services to small-scale livestock and poultry farms and generate substantial public goods by reducing the quantity of pollutants entering waterways, strong justification exists for the program to provide subsidies for its construction. The analysis also shows that, with subsidies, the facility could run profitably. In fact, Guangxi has demonstrated that the centralized facility, after completion, could be managed by a private entity on concessional arrangement for profitable operations.

Results Area 3: Increasing access to rural solid waste and wastewater services

115. RA3 involves the preparation of IVDPs, which are the planning tool for guiding public service investment at the village level. IVDPs will contribute to the efficient allocation of resources as one of the economic benefits. However, the main activities are related to the construction of the village-level wastewater and solid waste treatment and recycling facilities. Their economic benefits include improvement in health outcomes (e.g., reduced incidences of waterborne diseases) and reduced pollutants entering waterways (i.e., improving water quality), which are not easily quantifiable. Given the mountainous topography of Guangxi and Guizhou with small natural villages scattered all over, the construction or rehabilitation of decentralized rural wastewater and solid waste management facilities is seen as the most cost-effective way of delivering public services. This is because, over the long term, the cost of transferring waste to centralized township or urban treatment plants is higher than the construction or rehabilitation of decentralized rural facilities.

Expenditure framework assessment

116. **Program expenditure framework:** The 2023–2027 estimated program expenditure in 12 pilot counties of Guangxi Zhuang Autonomous Region and 15 counties of Guizhou Province is US$5,016 million. The government will fund US$4,696 million equivalent and the IBRD loan will fund US$320 million equivalent or 6.4 percent of the program.

117. **The overall funding appears adequate and sustainable.** The central and provincial governments provide adequate transfers to counties to implement agricultural development and rural revitalization. Although more transfers are in the form of general transfers and counties are granted more discretion in program implementation, the central and provincial governments provide technical guidance and conduct performance evaluation to motivate counties to deliver the program results, in particular gearing counties to focus their agricultural development program on becoming greener. Both the central and provincial governments are committed to providing more budget for the poorer counties to cushion the impact of the COVID-19 pandemic.

118. **However, the EFA revealed some systemic weaknesses in the program expenditure management, including** (i) the lack of monitoring reporting for expenditures on green agricultural activities out of the overall expenditures on agriculture; (ii) the inadequate budget allocation to rural solid waste and wastewater treatment, that is, the overall budget

[38] This is supported by the analysis in the government ICR for the Guangdong Agricultural Pollution Control Project, in which, out of 21 pig farms, only 3 high-rise facilities are financially viable without subsidies.

allocation to rural infrastructure; and (iii) the lack of linkages between village development plans and budgets. If these concerns are addressed, the expenditure framework will be deemed adequate**.**

119. **Fiscal impact:** The project is not expected to generate any incremental tax or other revenues for the provincial government. However, by reducing pollution releases, this may help the Guangxi Zhuang Autonomous Region and Guizhou Province to avoid sizable expenditures on downstream water quality improvement and healthcare. Guangxi and Guizhou have fully integrated their IBRD loan repayments into their provincial budgets. Thus, the overall fiscal impact is expected to be manageable. The interventions introduced in this PforR will support the Guangxi Zhuang Autonomous Region and Guizhou Province in enhancing the efficiency and effectiveness of public expenditure management, enable a more strategic allocation of fiscal resources at the county level toward green agriculture, better prioritize and coordinate the development of village infrastructure, and improve accountability through budget transparency and active engagement of citizens, while incentivizing county governments to deliver good-quality and equitable green agricultural and solid waste and wastewater services.

Results framework and M&E capacity

(See paragraph 88 under Results Monitoring and Evaluation.)

B. Fiduciary

120. **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 and other proposed mitigation measures that will be implemented, the program's fiduciary systems, including the financial management, 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.

121. **Financial management risks.** Major risks identified include the following: (i) Although the 14th Five-Year Plan has been prepared for green agriculture and rural revitalization, no budget is allocated to the plan. The financing gaps associated with toilet improvement and rural solid waste and wastewater collection, transfer, and treatment were identified during the assessment. (ii) The budget quota was distributed to counties/cities in batches and some program funds were delivered in the second half of the year or even at 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. (iii) Some earmarked funds are integrated by the provincial government and distributed to counties (28 earmarked funds are integrated in Guangxi and 17 in Guizhou). But it is hard for the county to use these integrated funds in line with its development strategy and priorities since some upper-level government entities still monitor the achievement of the performance indicators attached to the earmarked funds. As a result, a mismatch between the funds requested and funds received for some activities was noted, and some activities included in the village revitalization plan cannot be implemented in an integrated manner. (iv) "Program" is not a budget classification element in China and the required program financial reporting can't be generated from the government treasury system. (v) Government auditors did not audit the program funds and prepare the program audit report.

122. **Mitigation measures for the major financial management risks will include the following:** (i) Program-based budgeting should be prepared to ensure that program funds can be secured and related government entities should revise their investment direction and allocate more funds to the areas that are defined as priorities in the PforR program. (ii) Provincial entities should revisit their budget quota distribution and take actions to ensure that the budget quota can be timely distributed to the county/city. (iii) Related government entities may need to revisit fund integration and monitoring measures to give the counties more flexibility on fund use in line with their development strategy and priorities. (iv) Several budget line items that are used to capture program expenditures have been identified and a tailored program financial reporting template will be designed for the proposed program. (v) The Bank will work with the Provincial Audit Offices (PAOs) to develop the terms of reference for program auditing to ensure that program funds can be audited in line with the Bank's policy (see Annex 6).

123. **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 the 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 resource transaction centers, which provide facilities and modern platforms for processing procurement activities electronically (see Annex 6).

Procurement exclusions

124. Under the program, no high-value contracts will be awarded exceeding the Bank's Operational Procurement Review Committee (OPRC) thresholds.[39]

125. **Procurement risks and mitigation measures.** The following major procurement risks have been identified: (i) The intervention of multiple agencies, such as finance, development reform, agricultural and rural affairs, rural revitalization, housing and rural-urban construction, natural resources, ecological and environmental, water bureaus and city administration bureaus (comprehensive administrative law enhancement bureaus), etc., might be challenging to the implementation of the program. (ii) Multiple implementation agencies involved in procurement transactions might not be aware of the lists of debarred and temporary suspended firms declared by the World Bank and other multilateral development banks. Although most of the contracts are of small size, and it is unlikely that these contracts would be awarded to firms debarred or under temporary suspension by the World Bank or other multilateral development banks, (iii) the World Bank may not be informed of fraud allegations and corruption issues during implementation. (iv) Not all the program counties have a public resource transaction center (PRTC), but they have to process open competitive procurement at municipal PRTCs. During busy seasons, municipal PRTCs are lacking in rooms for conducting bid opening and evaluation sessions and implementation agencies have to queue for room space, leading to delay in procurement processes, thus negatively affecting the implementation of the program. (v) The program will be implemented at the township and county level. Most of the program's activities comprise simple works geographically spread out for the construction and/or rehabilitation of small basic infrastructure and small-value services. The procurement will most often be conducted through direct contracting because of the contract's tiny value and thus limited interest of contractors, consulting supervisions, or design consulting firms in participating. (vi) Contracts may not be completed within the contractual completion time and the contract completion audit may not be completed in a timely manner.

[39] OPRC thresholds for substantial risk projects are US$75 million for works; US$50 million for goods, information technology, and non-consulting services; and US$20 million for firm consultants.

126. **The following mitigation measures have been proposed:** (a) The regional/provincial program implementation agencies and the county program leading groups oversee and supervise the program implementation, and the rights and obligations of each agency are clearly defined so as to (i) limit overlapping of responsibilities, (ii) define the role of each agency, and (iii) avoid undesirable delays; and a procurement agent should be hired to assist with competitive bidding processes. (b) (i) Guangxi and Guizhou PPMOs shall, upon project loan effectiveness, issue an official instruction (to be incorporated also in the PIP) to cause the implementation agencies at the county level and township government to ensure that no contract will be awarded to a firm or individual that is on the debarred list or under temporary suspension; (ii) the updated lists of the debarred and temporarily suspended firms and individuals should be shared on a regular basis and whenever the list is updated with the agencies in charge of procurement; 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. (c) the Program Action Plan (PAP) shall also 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. (d) The implementation agencies plan the procurement activities ahead and book as early as possible the bid opening and bid evaluation rooms. (e) To avoid abuse in the adoption of non-competitive processes, the proposed mitigation actions comprise the following: (i) the county government shall maintain a long list of qualified firms, contractors, suppliers, and service providers, to have a wide range of options for inviting firms; (ii) the county government shall enhance data collection and when possible add a procurement method in the integrated financial management information system (IFMIS). (f) Human, financial, and policy resources should be allocated by Guangxi DARA and Guizhou RRB for close monitoring of contract implementation progress to minimize or avoid foreseeable cost overruns and/or implementation delays.

127. **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.

128. **Fiduciary supervision.** Procurement and FM are subject to an 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. The Finance Department or bureaus at various levels exercise regular supervision and oversight for procurement following the procedures of the Government Procurement Law (GPL).

129. **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, anti-corruption 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 concerns to any of these 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 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 Loan Agreement (LA) and Program Agreements (PAs) 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

130. **The government's program investments to be supported by the PforR are not expected to induce any long-term or irreversible adverse environmental and social (E&S) impacts.** The PforR outcomes are intended to reduce pollution of air, water, and land; increase efficiency of natural resource (especially land and water) use; and protect the environment and restore degraded landscapes and ecosystems in the selected provinces. The PforR is therefore regarded to have net positive E&S impacts. Any potential activities with significant adverse E&S impacts that are sensitive, diverse, or unprecedented on the environment and/or affected people were excluded in the PforR preparation. Within the PforR boundary, activities with potentially adverse E&S impacts are expected to be limited in scope and be site specific with proper mitigation measures to be designed and implemented.

131. **An Environmental and Social System Assessment (ESSA) has been conducted to provide a comprehensive review of the E&S legal framework and procedures in China, and in Guangxi and Guizhou.** The review recommended actions to address gaps and opportunities to enhance performance during the PforR implementation, covering all PforR-supporting interventions in the two provinces. The ESSA was conducted applying 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, 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 the selected counties, with extensive meetings and interviews with key stakeholders ranging from implementing agencies to government officials at provincial, county, township, and village levels and representatives of local communities. Observations and discussions during these visits provided a good understanding of the potential E&S impacts associated with the PforR activities and procedures and capacity of government departments for dealing with such impacts, including measures adopted under relevant laws and regulations.

132. **The E&S risks/impacts associated with the PforR are deemed to be substantial considering the diverse activities supported under the PforR**. E&S screening was conducted on the proposed PforR activities to exclude those with high potential to cause significant adverse impacts on the environment and/or affected people, including (i) construction of new livestock/poultry farms; (ii) relocation or shutdown of livestock/poultry farms; (iii) treatment of domestic solid waste (such as incineration and landfill); (iv) construction, extension, or upgrading of township or urban wastewater treatment facilities; (v) use of straw or manure in biogas power generation; (vi) construction of new irrigation systems; (vii) construction or upgrading of rural roads for public transportation; (viii) activities that may overlap with ecological resettlement; and (ix) any other activities that have high environmental impacts.

133. **With the application of these exclusion criteria, the PforR will focus on supporting small-scale physical investments,** including rural wastewater collection and treatment facilities; rural domestic solid waste collection, sorting, and transfer systems; livestock and poultry manure collection, treatment, and use; collection of agricultural plastic mulch film and fertilizer and pesticide packaging materials; straw collection and recycling/returning to soil; and construction of production/access roads for farmland, improvement of existing irrigation and drainage systems, and cold storage facilities, among others. Thus, the potential negative E&S impacts associated with the PforR activities include (i) temporary small-scale construction-related and site-specific risks/impacts, such as dust, wastewater, noise, solid waste, soil erosion, limited land acquisition or use, and occupational health and safety (OHS) issues; and (ii) impacts on the local environment and ecosystem resulting from the operation/implementation of PforR-supported facilities/activities, such as treated effluent and solid waste from rural wastewater treatment facilities, odor emission from solid waste and manure management facilities, waste plastics, potential NPS pollution by fertilizer and pesticide, labor management

issues, workers' health and safety, and impacts on farmers' livelihoods, among others. These adverse E&S impacts are neither significant nor irreversible and can be well identified and readily avoided, minimized, and mitigated through known and demonstrated technologies and good management practices. The downstream E&S risks/impacts of proposed TA activities are anticipated to be positive in the long term.

134. **OP 7.50: Projects on International waterways policy is applicable to GARR PforR,** because the rehabilitation of existing small-scale irrigation and drainage systems and construction or rehabilitation of village wastewater treatment facilities (WWTFs). These activities will involve the use or potential pollution of the Pearl River basin, which is shared between China and Vietnam, the latter being upstream country. The irrigation and drainage activities will involve the use of water from the tributaries of the Pearl River, which is considered an international waterway as defined in paragraph 1 of the Policy. The WWTFs are not relevant to the application of OP 7.50 as they will improve the water quality of the river and do not pose any risk of pollution. The small-scale irrigation and drainage activities will be implemented in 12 counties in Guangxi and 15 counties in Guizhou. Among the 12 counties in Guangxi, Tiandeng County in Congzuo City has one-third of its territory located in the Zuo River catchment area, which China shares with Vietnam. The remaining two-thirds of Tiandeng County's territory fall under the You River catchment area that flows exclusively in China.

135. **It is the Bank team's assessment that the rehabilitation of the existing small-scale irrigation and drainage systems fall within the riparian notification exception under paragraph 7(a) of OP 7.50**, and they: (i) will not affect water quality or flow in the upstream riparian country; and (ii) will not be adversely affected by the other riparian's possible water use. The program activities within the remaining 11 counties in Guangxi fall also within the riparian notification exception under paragraph 7(c) of OP 7.50. The riparian notification exception was approved by the Regional Vice President, as required under OP 7.50, on March 3, 2022.

136. **The ESSA recommends that the PforR be used as an opportunity to enhance E&S management capacity and the implementation of green agricultural and rural revitalization plans across sectors and among various stakeholders, particularly at the county level.** This could be achieved by (a) improving pollution control at solid waste transfer facilities and enhancing workers' PPE and sanitary and refreshment facilities; (b) providing supportive O&M funds to rural wastewater treatment facilities and training to O&M personnel to strengthen their O&M capacity and raise their OHS awareness; (c) providing training to farmers on managing chemical fertilizer, pesticide, plastic mulch film, fertilizer and pesticide packaging materials, and other agricultural waste; and (d) enhancing social impact/risk management for the construction of small and rural facilities by strengthening the existing project assessment and management systems. To implement these recommendations, the following actions have been included in the PAP: (a) the PMOs/PIUs should design and implement pollution control and OHS management plans for solid waste transfer facilities; (b) the PMOs/PIUs should provide more funds and training to improve O&M of rural wastewater treatment facilities; and (c) the PMOs/PIUs should provide more training to farmers on improving green agricultural practices and waste management.

137. **Consultation and information disclosure. Relevant stakeholders, including both government agencies at regional/provincial, county, and township levels and local communities, were consulted through meetings, field visits, and online interviews.** The draft ESSA report was shared with the Guangxi and Guizhou PPMOs, relevant provincial government departments, and all PforR counties in January 2022. Virtual consultation meetings were carried out with the key stakeholders on January 18, 2022, for Guizhou and on January 20, 2022, for Guangxi. The participants voiced their support in implementing the proposed PforR 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 management system. Some participants provided valuable opinions to improve the accuracy of the ESSA

description in the local context, which has been reflected in the revised ESSA. The updated ESSA was disclosed on the World Bank's website on February 9, 2022, and on the Guangxi and Guizhou websites on February 8, 2022.

138. Communities and individuals that believe that they are adversely affected because of a Bank-supported PforR operation, as defined by the applicable policy and procedures, can 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 can 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 can 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 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

139. **The overall risk rating for the proposed PforR is *Substantial*.** The PforR aims to support the government's RRS plan phase 1, which focuses on consolidating and expanding the extreme poverty eradication gains through green agricultural and rural development interventions. The PforR design is informed by the regional/provincial proposals submitted and selected based on criteria set by the MOF and NDRC and agreed by the Bank. Engagements with MOF, NDRC, MARA, NRRA, and IPRCC at the central government level, and with PDOF, PDRC, PRRA, and DARA at the provincial level helped to further improve the PforR design. However, this PforR is a pilot, in which the governance frameworks will be developed and tested in the participating counties/districts prior to rolling out province-wide and/or nationwide. Thus, although small in scale, the magnitude of the demostration effect of this PforR will be felt across China.

140. **The political, governance, and macroeconomic risks remain *Low*.** The proposed PforR is closely aligned with the government's RRP (2018–2035) and other key national strategies and plans for green agricultural and rural development. The approval of the RRPL (2021) provides further evidence of high political commitment to implementing the RRP through phased RRS plans. There is also high political commitment and strong coordination nationally through the MOF, NDRC, and MARA, and at the regional/provincial and county/district levels through their respective DOFs, DRCs, and DARAs, as well as other sectors. The provinces and counties also have their respective RRS plans under the 14th FYP and green agricultural development plans that re-affirm and formalize these commitments. Despite the ongoing COVID-19 pandemic, China's macroeconomic conditions are relatively better than those of many other large economies globally. Following a strong 8 percent cyclical rebound in GDP growth in 2021, the World Bank expects growth in China to slow to 5.1 percent in 2022, closer to its potential – the sustainable growth rate of output at full capacity.

141. **The risk related to sector strategies and policies is *Low*.** The proposed PforR is informed by a comprehensive set of sectoral policies, strategies, and programs. Some potential risks are associated with efforts to improve cross-sectoral coordination, but these are internalized into the PforR design. Guangxi and Guizhou regional/provincial governments will be responsible for the use of the IBRD loan, with the county-/district-level sector agencies and/or bureaus (DARA, RWB, RRB, DOHURB, DEE, DNR, etc.) responsible for implementing the PfoR's green agricultural and rural revitalization interventions. The PLGs at the regional/provincial and county/district levels will be responsible for cross-sectoral coordination to ensure that results are delivered.

142. **The technical design-related risk is *Moderate*.** The proposed PforR involves two provinces, Guangxi and Guizhou. Therefore, the risk of inadequate inter-jurisdictional and cross-sectoral coordination remains. However, the regional/provincial PLGs will be key to resolving coordination problems. The PforR financing involves putting in place robust third-party M&E and verification mechanisms. Setting up a robust M&E system and recruiting credible third-party VAs will be critical to the success of the PforR. These requirements are included in the PAPs and, whenever possible, international experience will be sought. In addition, significant efforts will be made to train and build the capacity of provincial and county-/district-level staff to implement the PforR effectively and efficiently.

143. **The implementation capacity risk is *Substantial*.** Despite significant experience and capacity to implement IPF operations, Guangxi and Guizhou have limited experience with PforR financing. This is further complicated by the multi-province nature of the proposed PforR. Both provinces lack practical experience in results-based financing in agricultural and rural infrastructure programs. The responsibility for implementing the PforR remains with county governments, which have limited institutional capacity. To mitigate this risk, the number of participating provinces under phase 1 is limited to two. The regional/provincial PLGs will provide the much-needed policy guidance and strategic direction. Guangxi and Guizhou will establish regional/provincial PMOs with full-time staff to manage the day-to-day implementation of the PforR. To enhance capacity to implement the PforR, TA and training will be provided to PMO staff at the provincial and county levels.

144. **Fiduciary risks are *Substantial*.** Despite the existence of a generally satisfactory public procurement system within government, supported by relatively strong procurement planning and implementation capacity at the regional/provincial level, as well as the financial management system for IPFs, the fiduciary assessment report shows lapses in tendering and bidding processes, which need to be addressed. To mitigate this risk with PAPs, such as the issuing of an official notice that no contract shall be awarded to a firm or individual on either a debarred or temporary suspension list, an annual external audit to include randomly selected contracts to check on whether they have been awarded to either debarred or temporarily suspended firms has been included. In addition, training and capacity building on financial management and procurement will be provided during the PforR implementation to address any deficiencies identified. Appropriate audit arrangements will be put in place and an independent third-party VA will be hired to verify the achievement of PforR results, prior to IBRD loan disbursement against the respective DLIs.

145. **Environmental and social risks are *Substantial*.** The overall E&S risk is rated Substantial considering the diverse activities included in the PforR. The PforR will have significant and broadly positive E&S impacts in the selected areas of Guangxi and Guizhou. E&S screening was conducted on the proposed PforR activities and those that could potentially cause significantly adverse impacts on the environment and/or people were excluded. The regional/provincial governments were assessed to have well-established systems for managing potential risks/impacts of the PforR activities, which include (i) temporary small-scale construction-related and site-specific risks/impacts, such as dust, wastewater, noise, solid waste, soil erosion, limited land acquisition or use, and OHS concerns; and (ii) impacts on the local environment and ecosystem resulting from the operation/implementation of PforR-supported facilities/activities, such as leakage of untreated effluents from rural WWTFs, odor emission from solid waste transfer and manure management facilities, agricultural plastics waste, NPS pollution from chemical fertilizer and pesticide, labor management issues, workers' health and safety, and impacts on farmers' livelihoods, among others. These potential adverse E&S impacts are neither significant nor irreversible and can be easily identified and readily avoided, minimized, and mitigated through known and demonstrated technologies and good management practices. The downstream E&S risks/impacts of proposed TA activities are anticipated to be positive in the long term.

146. **The stakeholder risk is *Low*.** Wide consultations on the proposed PforR were held with key stakeholders during the preparation and appraisal missions, as well as the ESSA preparation and disclosure processes. Guangxi and Guizhou will put in place a grievance redress mechanism to ensure that PforR-affected people have an opportunity to complain and seek redress. Citizen engagement will continue during the PforR implementation period to enhance transparency and accountability in the verification and reporting of results under each DLI.

ANNEX 1. RESULTS FRAMEWORK MATRIX

Results Framework
COUNTRY: China
Green Agricultural and Rural Revitalization Program for Results - Phase I

Program Development Objective(s)

The Program Development Objective (PDO) is to enhance environmentally sustainable agricultural and rural infrastructure development in selected areas of Guangxi and Guizhou.

Program Development Objective Indicators by Objectives/Outcomes

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
To enhance environmentally sustainable agricultural and rural infrastructure development								
1. Nutrient load reduction (Ammonia-Nitrogen (NH3N), Total Phosphorus (TP)) achieved under the PforR in program counties (Tones/year)		0.00	2,466.00	4,514.00	6,846.00	9,189.00	11,757.00	34,787.00
2. Chemical Oxygen Demand (COD) pollution load reduction achieved under the PforR in program counties (Tones/year)		0.00	23,351.00	33,686.00	45,659.00	57,910.00	66,060.00	226,667.00
3. Greenhouse gas (GHG) emissions reduction achieved under the PforR in		0.00			1,350,000.00			2,260,000.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
the program counties (Metric tons/year)								
4. Beneficiaries reached with assets or public services (disaggregated by gender and ethnic minority) under the PforR in program counties (Number)		0.00	43,535,285.00	5,099,120.00	5,663,010.00	6,226,960.00	6,790,971.00	6,790,971.00
(a) female (Number)		0.00	2,181,200.00	2,453,381.00	2,725,589.00	2,997,423.00	3,270,095.00	3,270,095.00
(b) ethnic minority (Number)		0.00	2,127,686.00	2,434,430.00	2,741,187.00	3,047,958.00	3,354,744.00	3,354,744.00

Intermediate Results Indicator by Results Areas

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Results Area 1: Strengthening institutional capacity for governance								
1. Development and use of a comprehensive IT-based M&E system for rural infrastructure and public services (Number)		0.00	0.00	12.00	20.00	23.00	27.00	27.00
2. Development and use of an IT-based system for green agricultural program-based budgeting and expenditure reporting (Number)		0.00	0.00	12.00	23.00	23.00	27.00	27.00
3. Number of agro-products certified and/or registered in the PforR counties as either green, organic or GI using the approved regional/provincial regulations, standards and guidelines (Number)	DLI 5, 6	0.00	30.00	108.00	167.00	210.00	255.00	255.00
4. Number of program counties have adopted the evidence-based 15th rural revitalization five-year plan (Number)	DLI 1, 2	0.00	0.00	4.00	13.00	23.00	27.00	27.00
Results Area 2 - Greening selected agricultural value chains								

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Tonnes of chemical fertilizer reduced due to the adoption of green technologies and sustainable practices in selected crop production systems in the Program Counties (Tones/year)		0.00	9,738.00	17,824.00	27,105.00	36,286.00	46,423.00	137,376.00
5. Quantity of organic fertilizer used in the program counties (Tones/year)	DLI 7, 8	0.00	263,642.00	709,381.00	1,099,039.00	1,479,381.00	1,903,670.00	5,455,113.00
6. Quantity of formula fertilizer used in the program counties (Tones/year)		0.00	33,060.00	62,819.00	89,681.00	118,671.00	146,181.00	450,411.00
7. Area under fertigation in program counties (Hectare(Ha))		0.00	2,017.00	3,252.00	4,430.00	5,702.00	7,197.00	22,597.00
8. Area under green manure in the program counites (Hectare(Ha))		0.00	7,224.00	11,341.00	15,966.00	20,616.00	26,053.00	81,199.00
9. Beneficiaries who have been trained in the green agricultural technologies and practices (farmers, input suppliers, enterprises/agri-businesses, extension staff), disaggregated by gender) (Number)		0.00	11,815.00	12,373.00	13,158.00	14,188.00	15,146.00	66,680.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Of which female (Number)		0.00	2,098.00	2,019.00	2,065.00	2,186.00	2,153.00	10,521.00
10. Beneficiaries who have adopted green agricultural technologies and practices (farmers, input suppliers, enterprises/agri-businesses, extension staff), disaggregated by gender) (Percentage)		30.00			50.00			80.00
Of which female (Percentage)		30.00			50.00			80.00
Tons of livestock and poultry manure treated and recycled in the PforR counties (Tones/year)	DLI 9, 10	0.00	1,638,238.00	2,702,483.00	3,981,937.00	5,433,234.00	6,587,636.00	20,343,528.00
11. Manure treated by large farms in the program counties (Tones/year)		0.00	686,800.00	990,778.00	1,342,902.00	1,703,239.00	1,942,951.00	6,666,670.00
12. Manure treated at centralized and small-scale manure treatment facilities constructed for small and medium scale farms in the program counties (Tones/year)		0.00	951,438.00	1,711,705.00	2,639,035.00	3,729,995.00	4,644,685.00	13,676,858.00
13. Centralized manure treatment facilities constructed for small and medium scale farms in the program counties (Number)		0.00	29.00	58.00	90.00	122.00	156.00	156.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
14. Manure treatment facilities constructed for small scale farms in the program counties (Guizhou) (Number)		0.00	835.00	402.00	499.00	410.00	412.00	2,558.00
Tons of agricultural plastics recovered and recycled in the PforR counties (Tones/year)	DLI 11, 12	0.00	7,405.00	7,537.00	7,643.00	7,741.00	7,543.00	37,869.00
15. Quantity of agricultural plastic film recovered and recycled in the program counties (Tones/year)		0.00	6,998.00	7,083.00	7,146.00	7,208.00	6,991.00	35,427.00
16. Quantity of agricultural chemical (fertilizer, pesticide, fungicide) packaging materials recycled in the program counties in program counties (Tones/year)		0.00	407.00	453.00	497.00	533.00	552.00	2,442.00
Results Area 3 - Increasing access to solid waste and wastewater services								
Number of spatial Integrated Village Development Plans (IVDPs) approved by the relevant PforR counties' authorities (Number)	DLI 13, 14	0.00	0.00	61.00	185.00	260.00	336.00	336.00
17. Counties implementing the approved guidelines for wastewater and solid waste management in rural		0.00	0.00	16.00	22.00	27.00	27.00	27.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
villages in the program counties (Number)								
18. Beneficiaries trained in O&M of rural villages wastewater and solid waste management systems in program counties (Number)		0.00	8,313.00	9,159.00	9,973.00	10,616.00	11,250.00	49,311.00
Number of demonstration villages with newly constructed or rehabilitated climate resilient wastewater treatment facilities and established solid waste collection, sorting and transfer systems (Number)	DLI 15, 16	0.00	20.00	40.00	70.00	90.00	112.00	112.00
19. Percentage of rural domestic wastewater facilities in demonstration villages meeting effluent discharge standards (Percentage)		0.00	60.00	75.00	80.00	80.00	80.00	80.00
20. Percentage of rural domestic solid waste and agricultural plastic film in demonstration villages that is collected, sorted and transferred (Percentage)		0.00	50.00	60.00	65.00	70.00	70.00	70.00
21. Percentage of newly created and upgraded jobs held by women in the		0.00	10.00	20.00	30.00	40.00	50.00	50.00

Indicator Name	DLI	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
transformation of agricultural value chain and in the rural waste management and environmental rehabilitation (Percentage)								

.

Monitoring & Evaluation Plan: PDO Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
1. Nutrient load reduction (Ammonia-Nitrogen (NH3N), Total Phosphorus (TP)) achieved under the PforR in program counties	Cumulative quantities of the annual reduction of nutrient loads (NH3N, TP) achieved due to fertilizer use reduction and increase in efficiency in selected value chains (e.g., rice, fruits and vegetables).	Annual	Annual Reports	Nutrient load reduction is estimated based on pollutant discharge coefficients used in accordance with the MARA guidelines and sample surveys that generate program specific data to help refine such coefficients.	PPMOs and third-party M&E firm
2. Chemical Oxygen Demand (COD) pollution load reduction achieved under the PforR in program counties	Cumulative quantities of the annual reduction of pollution load (COD) achieved due to the improved management of livestock and poultry manure and wastewater treatment in demonstration villages in program counties.	Annual	Annual Reports	COD reduction from improved management of livestock and poultry manure is estimated based on scientific methodologies approved by MARA and guidelines provided to provinces. COD reduction from rural watewater treatment is estimated based on the guidelines provided by MHURD	PPMOs and third-party M&E firm
3. Greenhouse gas (GHG) emissions reduction achieved under the PforR in the program counties	This indicator measures the reduction in metric tons of GHG emissions from the activity of chemical fertilizer reduction, manure	baseline, mid-term, end-term	mid-term report, end-term report	Convert from the activities with coefficients provided	PPMOs & experts

	management, plastic recycled, and solid waste incineration				
4. Beneficiaries reached with assets or public services (disaggregated by gender and ethnic minority) under the PforR in program counties	Number of the people in program counties who directly derive benefits (disaggregated by gender and ethnic minority) from program intervention (i.e., IT-based systems, green value chain development, wastewater and solid waste treatment and other public services etc.).	Semi-annual	Semi-annual Reports	Semi-annual reports prepared using administrative data provided by program county RRB	Program county RRB
(a) female					
(b) ethnic minority					

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
1. Development and use of a comprehensive IT-based M&E system for rural infrastructure and public services	Establishment of an IT-based system that enables provinces to expand the scope of IT-based rural infrastructure (or assets) management system to include wastewater and solid waste activities. The IT-based system will enable county governments to monitor and evaluate investments, O&M of facilities, and whether the rural infrastructure meet the provincial environmental standards. IT-based systems will also be used for decision-making support/tool and to improve transparency and accountability.	Annual	Annual Reports	Annual reports confirming establishment of the system by Provincial/Regional RRA and its status of use in the program counties	Provincial/Regional RRA
2. Development and use of an IT-based system for green agricultural program-based budgeting and expenditure reporting	Establishment of an IT-based program-based budgeting plans and expenditure reporting system that adopts RRS plan expenditure classification. The platform	Annual	Annual Reports	Annual reports confirming establishment of the system by Provincial/Regional RRA and Deptartments of Finance and its status of	Provincial/Regional RRA/DOFs

	would enable county governments to consolidate or pool fiscal resources from various earmarked budgets to finance priority sub-programs and track expenditures under the RRS plan. This will show the contribution of PforR to green agricultural development.			use in the program counties	
3. Number of agro-products certified and/or registered in the PforR counties as either green, organic or GI using the approved regional/provincial regulations, standards and guidelines	This indicator measures both number of product certificates and the number of geographical indication (GI) registered by using the approved regional/provincial regulations, standards and guidelines.. Product certification is defined as agri-products certified as organic and green according to national standards set by MARA. Geographical indication (GI) certificates are done according to national standards.	Annual	Annual Reports	Annual reports confirming certified green and organic, and registered Geographical Indication (GI) agricultural products under the PforR in program counties.	Provincial/Regional PMOs and county PMOs
4. Number of program counties have adopted the evidence-based 15th rural	This indicator focuses on tracking the impact of the	Once	Final report	Collection of the government documents	PPMOs

revitalization five-year plan	M&E system of rural revitalization program on the development of rural revitalization strategy. It is measured by the number of counties that have adopted the 15th rural revitalization five-year plan using the information collected through the M&E system.				
Tonnes of chemical fertilizer reduced due to the adoption of green technologies and sustainable practices in selected crop production systems in the Program Counties					
5. Quantity of organic fertilizer used in the program counties	Cumulative quantities of organic fertilizer used by farmers in various crop production systems as a replacement for the chemical fertilizers.	Annual	Annual Reports	Monitored by program county PMO in accordance with the MARA guidelines and verified by third-party M&E firm	PPMOs and third-party M&E firm
6. Quantity of formula fertilizer used in the program counties	Cumulative quantities of formula fertilizers used by farmers in various crop production systems as substitutes to chemical fertilizers.	Annual	Annual Reports	Monitored by program county PMOs in accordance with the MARA guidelines and verified by third-party M&E firm	PPMOs and third-party M&E firm
7. Area under fertigation in program counties	Cumulative number of hectares (ha) under fertigation practices. Fertigation is the injection	Annual	Annual Reports	Monitored by program county PMOs in accordance with the MARA guidelines and	PPMOs and third-party M&E firm

	of fertilizers, used for soil nutrients amendments, water amendments and other water soluble products into an irrigation system. Fertigation is related to chemigation, the injection of chemicals into an irrigation system			verified by third-party M&E firm	
8. Area under green manure in the program counites	Cumulative number of hectares under green manure (nitrogen fixing crops), including vetch (genus Vicia), which will be incorporated into the soil to increase organic matter and nutrients and improve soil structure.	Annual	Annual Reports	Monitored by program county PMOs in accordance with the MARA guidelines and verified by third-party M&E firm	PPMOs and third-party M&E firm
9. Beneficiaries who have been trained in the green agricultural technologies and practices (farmers, input suppliers, enterprises/agri-businesses, extension staff), disaggregated by gender)	Cumulative number of people (farmers, input suppliers, enterprises/agri-businesses, extension staff) trained in green agricultural technologies and practices disaggregated by gender/ethnic minority	Semi-annual	Semi-annual reports	Semi-annual reports prepared using administrative data from MIS	Program County PMOs
Of which female					
10. Beneficiaries who have adopted green agricultural technologies and practices (farmers, input suppliers,	Percentage of the people who have been trained and have adopted green	Baseline, mid-term and end-	Baseline, mid-term and end-term reports	Three times (baseline, mid-term and end-term) socio-economic surveys	Program county PMOs

enterprises/agri-businesses, extension staff), disaggregated by gender)	agricultural technologies and practices.	term		by Program county PMOs	
Of which female					
Tons of livestock and poultry manure treated and recycled in the PforR counties					
11. Manure treated by large farms in the program counties	Cumulative quantity (tons) of livestock and poultry manure that are collected, treated and recycled by large farms into organic fertilizer, biogas/energy generation, and irrigation water in the program counties.	Annual	Annual reports	Monitored by program county PMOs in accordance with the MARA guidelines and verified by third-party M&E firm	PPMOs and third-party M&E firm
12. Manure treated at centralized and small-scale manure treatment facilities constructed for small and medium scale farms in the program counties	Cumulative quantity (tons) of livestock and poultry manure that are collected, treated and recycled by centralized and small-scale manure treatment facilities for small and medium scale farms in program counties	Annual	Annual Reports	Monitored by program county PMOs in accordance with the MARA guidelines and verified by third-party M&E firm	PPMOs and third-party M&E firm
13. Centralized manure treatment facilities constructed for small and medium scale farms in the program counties	Cumulative number of centralized manure treatment facilities newly constructed for small and medium scale farms in the program counties. Small and medium-scale animal farms are defined as less than 500 head of pigs, less	Annual	Annual Reports	Annual reports monitored through administrative data provided by county PMOs	Program county PMOs

	than 2,000 egg chickens (Layers), less than 10,000 meat chicken (Broilers), and/or less than 30 head of cattle.				
14. Manure treatment facilities constructed for small scale farms in the program counties (Guizhou)	Cumulative number of small scale manure treatment facilities newly constructed for small and medium scale farms in the program counties in Guizhou.	Annual	Annual Reports	Annual reports monitored through administrative data provided by county PMOs	Program County PMOs
Tons of agricultural plastics recovered and recycled in the PforR counties					
15. Quantity of agricultural plastic film recovered and recycled in the program counties	Cumulative quantity (tons) of agricultural plastic mulch film (dry weight of plastic wastes) recovered, treated and recycled in the program counties.	Annual	Annual Reports	Monitored by program county PMOs in accordance with the MARA guidelines and verified by third-party M&E firm	PPMOs and third-party M&E firm
16. Quantity of agricultural chemical (fertilizer, pesticide, fungicide) packaging materials recycled in the program counties in program counties	Cumulative number (tons) of agricultural chemical (fertilizer, pesticide, fungicide) packaging materials recovered, treated and recycled in the program counties	Annual	Annual Reports	Monitored by program county PMOs in accordance with the MARA guidelines and verified by third-party M&E firm	PPMOs and third-party M&E firm
Number of spatial Integrated Village Development Plans (IVDPs) approved by the relevant PforR counties' authorities					
17. Counties implementing the approved guidelines for wastewater and solid waste	Development of guidelines for wastewater and solid	Annual	Annual Reports	Annual reports confirming development	Provincial/Regional PMOs

management in rural villages in the program counties	waste management in rural villages by provincial/regional government and approved and used in program counties			of the guidelines by Provincial/Regional goverments and their status of approval and use in the program counties	
18. Beneficiaries trained in O&M of rural villages wastewater and solid waste management systems in program counties	Cumulative number of people trained in O&M of rural villages wastewater and solid waste management systems in the program counties	Semi-annual	Semi-annual reports	Semi-annual reports prepared using administrative data from MIS	Program County PMOs
Number of demonstration villages with newly constructed or rehabilitated climate resilient wastewater treatment facilities and established solid waste collection, sorting and transfer systems					
19. Percentage of rural domestic wastewater facilities in demonstration villages meeting effluent discharge standards	Percentage of wastewater properly treated and managed per the rural wastewater management guideline in the pilot villages.	Semi-annual	Semi-annual reports	Data will be recorded by County RRBs in MIS based on self-report of piloted villages; desk-reviewed by the M&E agencies with 30% number of such villages verified onsite; Semi-annual reports prepared by two provinces	Program County PMOS
20. Percentage of rural domestic solid waste and agricultural plastic film in demonstration villages that is collected, sorted and transferred	Percentage of rural solid waste and agricultural plastic waste collected, sorted and treated according to the per the	Semi-annual	Semi-annual Reports	Data will be recorded by County RRBs in MIS based on self-report of piloted villages; desk-reviewed by the M&E	Program County PMOs

	rural solid waste management guideline in the pilot villages.			agencies with 30% number of such villages verified onsite; Semi-annual reports prepared by two provinces	
21. Percentage of newly created and upgraded jobs held by women in the transformation of agricultural value chain and in the rural waste management and environmental rehabilitation	The indicator will be calculated as the percentage of women or female employees in entities that receive the Program support in the transformation of production, processing, packaging, marketing and sales of green agricultural products and in the newly constructed rural wastewater management facilities.	Annual	Annual Reports	Annual reports prepared using administrative data generated by county commerce bureau	Program county PMOs

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

Disbursement Linked Indicators Matrix				
DLI 1	DLI1: Development and use of a comprehensive IT-based M&E system for rural infrastructure, public services and profile of rural villages (Guizhou)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	6,800,000.00	4.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	1.00		1,360,000.00	US$1,360,000 for the develop of the IT-based M&E system for rural infrastructure, public services and profile of rural villages
2024	10.00		3,626,666.67	US$362,666.67 per program county
2025	5.00		1,813,333.33	US$362,666.67 per program county
2026	0.00		0.00	US$362,666.67 per program county
2027	0.00		0.00	US$362,666.67 per program county

DLI 2	DLI1: Development and use of a comprehensive M&E system for the implementation of the Rural Revitalization Program (Guangxi)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	5,984,991.25	4.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	1.00		1,196,991.25	US$1,196,991.25 for the development of the IT-based M&E system for rural infrastructure, public services and profile of rural villag
2024	10.00		3,990,000.00	US$399,000 per program county
2025	2.00		798,000.00	US$399,000 per program county
2026	0.00		0.00	US$399,000 per program county
2027	0.00		0.00	US$399,000 per program county

DLI 3	DLI2: Development and use of an IT-based system for green agricultural program-based budgeting and expenditure reporting (Guizhou)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	11,900,000.00	7.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	1.00		2,380,000.00	US$2,380,000 for the development of the IT-based system for green agricultural program-based budgeting and expenditure reporting
2024	10.00		6,346,666.67	US$634,666.67 per program county
2025	5.00		3,173,333.33	US$634,666.67 per program county
2026	0.00		0.00	US$634,666.67 per program county
2027	0.00		0.00	US$634,666.67 per program county

DLI 4	DLI2: Development and use of an IT-based system for green agricultural program-based budgeting and expenditure reporting (Guangxi)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	10,473,750.00	7.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	1.00		2,094,750.00	US$2,094,750 for the development of the IT-based system for green agricultural program-based budgeting and expenditure reporting
2024	10.00		6,982,500.00	US$698,250 per program county
2025	2.00		1,396,500.00	US$698,250 per program county
2026	0.00		0.00	US$698,250 per program county
2027	0.00		0.00	US$698,250 per program county

DLI 5	DLI3: Adoption of regulations, standards and guidelines on GAP and number of products produced in the Program Counties that are certified and/or registered as either green, organic or GI (Guizhou)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	6,800,000.00	4.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	1.00		1,360,000.00	US$ 1,360,000 for the adoption of the provincial regulations, standards and guidelines on green agricultural development
2024	31.00		1,196,028.37	US$38,581.56 per agro-product
2025	36.00		1,388,936.17	US$38,581.56 per agro-product
2026	46.00		1,774,751.77	US$38,581.56 per agro-product
2027	28.00		1,080,283.69	US$38,581.56 per agro-product

DLI 6	DLI3: Adoption of regulations, standards and guidelines on GAP and number of products produced in the Program Counties that are certified and/or registered as either green, organic or GI (Guangxi)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	5,985,000.00	4.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**

Baseline	0.00		
Prior Results	0.00	0.00	
2023	1.00	1,197,000.00	US$ 1,197,000 for the adoption of the provincial regulations, standards and guidelines on green agricultural development
2024	25.00	1,050,000.00	US$42,000 per agro-product
2025	39.00	1,638,000.00	US$42,000 per agro-product
2026	27.00	1,134,000.00	US$42,000 per agro-product
2027	23.00	966,000.00	US$42,000 per agro-product

DLI 7	DLI4: Tonnes of chemical fertilizer reduced due to the adoption of green technologies and sustainable practices in selected crop production systems in the Program counties (Guizhou)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Tones/year	25,500,000.00	15.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	5,568.00		1,667,398.68	US$ 299.46 per ton of chemical fertilizer reduced

2024	10,781.00	3,228,488.72	US$ 299.46 per ton of chemical fertilizer reduced
2025	16,180.00	4,845,278.50	US$ 299.46 per ton of chemical fertilizer reduced
2026	22,668.00	6,788,181.27	US$ 299.46 per ton of chemical fertilizer reduced
2027	29,956.00	8,970,652.83	US$ 299.46 per ton of chemical fertilizer reduced

DLI 8	DLI4: Tonnes of chemical fertilizer reduced due to the adoption of green technologies and sustainable practices in selected crop production systems in the Program counties (Guangxi)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	2.24	15.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	4,170.00		1,792,140.90	US$429.77 per ton of chemical fertilizer reduced.
2024	7,043.00		3,026,870.11	US$429.77 per ton of chemical fertilizer reduced.
2025	10,925.00		4,695,237.25	US$429.77 per ton of chemical fertilizer reduced.

2026	13,618.00	5,852,607.86	US$429.77 per ton of chemical fertilizer reduced.
2027	16,467.00	7,077,022.59	US$429.77 per ton of chemical fertilizer reduced.

DLI 9	DLI5: Percentage increase of treated and recycled livestock and poultry manure from large scale and small scale farms in the Program Counties (Guizhou)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Percentage	30,600,000.00	18.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	82.00			
Prior Results			0.00	
2023	0.00		0.00	US$4,080,000 per percentage increase for small scale farms/ US$2,040,000 per percentage increase for large scale farms
2024	0.00		0.00	US$4,080,000 per percentage increase for small scale farms/ US$2,040,000 per percentage increase for large scale farms
2025	0.00		0.00	US$4,080,000 per percentage increase for small scale farms/ US$2,040,000 per percentage increase for large scale farms

2026	5.00	10,200,000.00	US$2,040,000 per percentage increase
2027	5.00	20,400,000.00	US$4,080,000 per percentage increase

DLI 10	DLI5: Percentage increase of treated and recycled livestock and poultry manure from large scale and small scale farms in the Program Counties (Guangxi)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Percentage	26,932,500.00	18.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	85.00			
Prior Results			0.00	
2023	0.00		0.00	0.00
2024	0.00		0.00	0.00
2025	0.00		0.00	0.00
2026	5.00		8,977,500.00	US$1,795,500 per percentage increase for large scale farms
2027	5.00		17,955,000.00	US$3,591,000 per percentage increase for small scale farms

DLI 11	DLI6: Percentage increase of recovered and recycled agricultural plastics in the Program Counties (Guizhou)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Percentage	18,700,000.00	11.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	79.00			
Prior Results			0.00	
2023	1.00		2,337,500.00	US$2,337,500 per percentage increase
2024	2.00		4,675,000.00	US$2,337,500 per percentage increase
2025	2.00		4,675,000.00	US$2,337,500 per percentage increase
2026	2.00		4,675,000.00	US$2,337,500 per percentage increase
2027	1.00		2,337,500.00	US$2,337,500 per percentage increase

DLI 12	DLI6: Percentage increase of recovered and recycled agricultural plastics in the Program Counties (Guangxi)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Percentage	16,458,750.00	11.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**

Baseline	82.00		
Prior Results		0.00	
2023	1.00	3,291,750.00	US$3,291,750 per percentage increase
2024	1.00	3,291,750.00	US$3,291,750 per percentage increase
2025	1.00	3,291,750.00	US$3,291,750 per percentage increase
2026	1.00	3,291,750.00	US$3,291,750 per percentage increase
2027	1.00	3,291,750.00	US$3,291,750 per percentage increase

DLI 13	DLI7: Number of Integrated Village Development Plans (IVDPs) approved by Program Counties (Guizhou)			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	13,600,000.00	8.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	0.00		0.00	US$75,555.56 per approved integrated village development plan

2024	45.00	3,400,000.01	US$75,555.56 per approved integrated village development plan
2025	60.00	4,533,333.33	US$75,555.56 per approved integrated village development plan
2026	40.00	3,022,222.22	US$75,555.56 per approved integrated village development plan
2027	35.00	2,644,444.44	US$75,555.56 per approved integrated village development plan

DLI 14	DLI7: Number of Integrated Village Development Plans (IVDPs) approved by Program Counties (Guangxi))			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	11,969,880.00	8.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	0.00		0.00	US$76,730 per approved integrated village development plan
2024	40.00		3,069,200.00	US$76,730 per approved integrated village development plan
2025	64.00		4,910,720.00	US$76,730 per approved integrated village development plan

2026	32.00	2,455,360.00	US$76,730 per approved integrated village development plan
2027	20.00	1,534,600.00	US$76,730 per approved integrated village development plan

DLI 15	DLI8: Number of demonstration villages with newly constructed or rehabilitated existing climate resilient wastewater treatment and solid waste collection, sorting and transfer systems (Guizhou))			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	56,100,000.00	33.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	0.00		0.00	US$935,000 per demonstration village
2024	0.00		0.00	US$935,000 per demonstration village
2025	20.00		18,700,000.00	US$935,000 per demonstration village
2026	25.00		23,375,000.00	US$935,000 per demonstration village
2027	15.00		14,025,000.00	US$935,000 per demonstration village

DLI 16	DLI8: Number of demonstration villages with newly constructed or rehabilitated existing climate resilient wastewater treatment and solid waste collection, sorting and transfer systems (Guangxi))			
Type of DLI	**Scalability**	**Unit of Measure**	**Total Allocated Amount (USD)**	**As % of Total Financing Amount**
Output	Yes	Number	4.93	33.00
Period	**Value**		**Allocated Amount (USD)**	**Formula**
Baseline	0.00			
Prior Results	0.00		0.00	
2023	0.00		0.00	US$949,543.27 per demonstration village
2024	0.00		0.00	US$949,543.27 per demonstration village
2025	20.00		18,990,865.40	US$949,543.27 per demonstration village
2026	22.00		20,889,951.94	US$949,543.27 per demonstration village
2027	10.00		9,495,432.70	US$949,543.27 per demonstration village

Verification Protocol Table: Disbursement Linked Indicators	
DLI 1	DLI1: Development and use of a comprehensive IT-based M&E system for rural infrastructure, public services and profile of rural villages (Guizhou)
Description	DLI1 includes two sub-DLIs that aim at developing an IT-based M&E system at the provincial level and for county governments to use and maintain the system. DLI1.1: Program Counties install and use the comprehensive IT-based M&E system developed under DLI1.1 to record, analyze, and report on the performance of rural infrastructure, public services, and the profile of rural villages. The data collected, analyzed, and reported through the system shall include basic information on access to rural infrastructure and public services, such as wastewater and solid waste in all administrative villages in program counties; and village socio-economic parameters. DLI1.2: Program Counties install and use the comprehensive IT-based M&E system to record, analyze, and report on implementation of rural infrastructure, public services, and profile of rural villages developed under DLI1.1. The county governments are expected to use the data and information for the development of annual RRS work plans and 15 th FYP RRS.
Data source/ Agency	Management Information System at Provincial RRB
Verification Entity	Third party verification agency (VA)
Procedure	**Verification Protocol for 1.1:** A third-party VA verifies whether: (a) the provincial RRB has developed and installed the IT-based M&E system for rural infrastructure, public services and profile of rural villages, through on-site review of the system and the official/regular performance evaluation documents, or reports generated; (b) the system meets data security standards; and (c) the provincial RRB issues guidelines for installing and using the system at the county level. A single disbursement is made upon achieving the results. **Verification Protocol for 1.2:**The third-party VA verifies whether the IT-based M&E system has been adopted/installed and can generate the required official reports regularly in the 15 program counties. Scalable Disbursement Linked Results (DLRs) are defined requiring the installation and use of the M&E system by all 15 program counties by 2025. The scalable disbursements are made progressively against the number of counties that have first installed and used the IT-based M&E system in the respective year to generate the monitoring reports, including on the performance of the solid waste and wastewater facilities. These reports are key to informing the O&M decision-making processes.

DLI 2	DLI1: Development and use of a comprehensive M&E system for the implementation of the Rural Revitalization Program (Guangxi)
Description	DLI1 includes two sub-DLIs that aim at developing an IT-based M&E system at the regional level and for county governments to use and maintain the system. DLI1.1: Guangxi develops a comprehensive IT-based M&E system for rural infrastructure, public services, and profile of rural villages. The data collected, analyzed, and reported through the system shall include basic information on access to rural infrastructure and public services, such as wastewater and solid waste in all administrative villages in program counties; and village socio-economic parameters. DLI1.2: Program Counties install and use the comprehensive IT-based M&E system developed under DLI1.1 to record, analyze, and report on the performance of rural infrastructure, public services, and the profile of rural villages. The county governments are expected to use the data and information for the development of annual RRS work plans and 15 th FYP RRS.
Data source/ Agency	Management Information System at Provincial/Regional RRA
Verification Entity	Third party verification agency (VA)
Procedure	**Verification Protocol for 1.1:** A third-party VA verifies whether: (a) the regional RRB has developed and installed the IT-based M&E system for rural infrastructure, public services and profile of rural villages, through on-site review of the system and the official/regular performance evaluation documents, or reports generated; (b) the system meets data security standards; and (c) the regional RRB issues guidelines for installing and using the system at the county level. A single disbursement is made upon achieving the results. **Verification Protocol for 1.2:** The third-party VA verifies whether the IT-based M&E system has been adopted/installed and can generate the required official reports regularly in the 12 program counties. Scalable Disbursement Linked Results (DLRs) are defined requiring the installation and use of the M&E system by all 12 program counties by 2025. The scalable disbursements are made progressively against the number of counties that have first installed and used the IT-based M&E system in the respective year to generate the monitoring reports, including on the performance of the solid waste and wastewater facilities. These reports are key to informing the O&M decision-making processes.
DLI 3	DLI2: Development and use of an IT-based system for green agricultural program-based budgeting and expenditure reporting (Guizhou)
Description	This DLI is also subdivided into two parts: DLI2.1: Guizhou develops a program-based budgeting and expenditure tracking IT-based system for green agricultural development. The IT-based system shall be capable of performing the following functions: (a) capturing and integrating financial data related to green agricultural development from various sources; (b) identifying, processing, and transferring financial data from the government treasury system; (c) generating regular budget

	and expenditure tracking reports; and (d) ensuring financial data security. The provincial DARA and/or RRB issues guidelines for the installation and use of the IT-based program budgeting to the 15 program counties. DLI2.2: Program counties install and use the program-based budgeting and expenditure tracking IT-based system developed under DLI2.1. The 15 program counties remain responsible for entering accurate and timely program-based budget and expenditure data in the IT-based system; and for preparing and submitting the required regular budget and expenditure reports.
Data source/ Agency	Provincial RRB and DOF
Verification Entity	Third-party verification agency
Procedure	**Verification Protocol for 2.1:** The third-party VA verifies whether the IT-based program budgeting system is fully operational and capable of generating the required regular (quarterly and annual) financial reports. A single disbursement is made upon achieving the results. **Verification Protocol for 2.2:** The third-party VA verifies whether: (a) the IT-based program budgeting and expenditure tracking system is being used; (b) the required regular financial reports are prepared; and (c) financial data and information are used for performance evaluation and decision-making processes in the 15 program counties. Disbursements are scalable and are made against the number of counties in a calendar year (until 2025), which have achieved for the first time the above results.
DLI 4	DLI2: Development and use of an IT-based system for green agricultural program-based budgeting and expenditure reporting (Guangxi)
Description	This DLI is also subdivided into two parts: DLI2.1: Guangxi develops a program-based budgeting and expenditure tracking IT-based system for green agricultural development. The IT-based system shall be capable of performing the following functions: (a) capturing and integrating financial data related to green agricultural development from various sources; (b) identifying, processing, and transferring financial data from the government treasury system; (c) generating regular budget and expenditure tracking reports; and (d) ensuring financial data security. The regional DARA and/or RRB issues guidelines for the installation and use of the IT-based program budgeting to the 12 program counties. DLI2.2: Program counties install and use the program-based budgeting and expenditure tracking IT-based system developed under DLI2.1. The 12 program counties remain responsible for entering accurate and timely program-based budget and expenditure data in the IT-based system; and for preparing and submitting the required regular budget and expenditure reports.
Data source/ Agency	Regional DARA, RRB and DOF
Verification Entity	Third-party verification agency

Procedure	**Verification Protocol for 2.1:** The third-party VA verifies whether the IT-based program budgeting system is fully operational and capable of generating the required regular (quarterly and annual) financial reports. A single disbursement is made upon achieving the results. **Verification Protocol for 2.2:** The third-party VA verifies whether: (a) the IT-based program budgeting and expenditure tracking system is being used; (b) the required regular financial reports are prepared; and (c) financial data and information are used for performance evaluation and decision-making processes in the 12 program counties. Disbursements are scalable and are made against the number of counties in a calendar year (until 2025), which have achieved for the first time the above results.
DLI 5	DLI3: Adoption of regulations, standards and guidelines on GAP and number of products produced in the Program Counties that are certified and/or registered as either green, organic or GI (Guizhou)
Description	This DLI also has two sub-DLIs: DLI3.1: Guizhou adopts local regulations, standards and guidelines on green agricultural development based on the relevant regulations, standards and guidelines adopted by MARA. Experience shows that some provinces (especially those targeting Greater Bay Area markets) have food safety standards that are higher than the national standards. The adopted/customized regulations, standards, and guidelines are approved by the relevant authorities at the regional/provincial level. The provincial DARA issues official notice to the 15 program counties to use them. DLI3.2: Number of agro-products produced in the Program counties certified and/or registered as green, or organic, or GI using the provincial regulations, standards and guidelines. This sub-DLI aims to provide evidence that the program counties are: (a) supporting agro-producers to meet environmental and food safety standards, and (b) using the adopted local regulations, standards, and guidelines for the certification and registration of agro-products to help farmers/enterprises to fetch premium prices in the markets.
Data source/ Agency	Provincial DARA
Verification Entity	Third party verification agency
Procedure	**Verification Protocol for 3.1:** The third-party VA verifies the approved documents (i.e., regulations, standards, and guidelines) and a single disbursement is made upon achieving the results. **Verification Protocol for 3.2:** The third-party VA verifies the green and organic agro-product certificates issued by the regional/provincial DARA and GI registrations for agro-products issued by the MARA. Disbursements are scalable and are made against the number of agro-products that are certified or registered in a calendar year.

DLI 6	DLI3: Adoption of regulations, standards and guidelines on GAP and number of products produced in the Program Counties that are certified and/or registered as either green, organic or GI (Guangxi)
Description	This DLI also has two sub-DLIs: DLI3.1: Guangxi adopts local regulations, standards and guidelines on green agricultural development based on the relevant regulations, standards and guidelines adopted by MARA. Experience shows that some provinces (especially those targeting Greater Bay Area markets) have food safety standards that are higher than the national standards. The adopted/customized regulations, standards, and guidelines are approved by the relevant authorities at the regional/provincial level. The provincial DARA issues official notice to the 12 program counties to use them. DLI3.2: Number of agro-products produced in the Program counties certified and/or registered as green, or organic, or GI using the regional regulations, standards and guidelines. This sub-DLI aims to provide evidence that the program counties are: (a) supporting agro-producers to meet environmental and food safety standards, and (b) using the adopted local regulations, standards, and guidelines for the certification and registration of agro-products to help farmers/enterprises to fetch premium prices in the markets.
Data source/ Agency	Regional DARA
Verification Entity	Third party verification agency
Procedure	**Verification Protocol for 3.1:** The third-party VA verifies the approved documents (i.e., regulations, standards, and guidelines) and a single disbursement is made upon achieving the results. **Verification Protocol for 3.2:** The third-party VA verifies the green and organic agro-product certificates issued by the regional/provincial DARA and GI registrations for agro-products issued by the MARA. Disbursements are scalable and are made against the number of agro-products that are certified or registered in a calendar year.
DLI 7	DLI4: Tonnes of chemical fertilizer reduced due to the adoption of green technologies and sustainable practices in selected crop production systems in the Program counties (Guizhou)
Description	The total reduction in chemical fertilizer use is achieved by: (a) reducing application intensity (e.g., quantity per unit area) and increasing utilization rate (e.g., timing, placement, or precision of application to enhance absorption by roots); and (b) deploying four substitute green technologies: application of organic, green manure (nitrogen fixing crops), and formula (based on soil testing) fertilizers and fertigation. The cumulative chemical fertilizer use reduction under (a) will be monitored using MARA's national platform. The cumulative chemical fertilizer use reduction under (b) will be estimated using conversion coefficients approved by MARA (see details in Annex 3). It is difficult to calculate annual chemical fertilizer utilization rates. This is because they are calculated from experimental data on fertilizer absorption by types of crop and over multiple seasons. The experiments use MARA's methodology to monitor fertilizer application rates and crop yields, and

	account for crop nutrient use. Therefore, the Program counties will only collect data on the quantity and area (hectares) of chemical fertilizer use and substitute green technologies use; and prepare annual reports. Reduction in chemical fertilizer use will be calculated from a decrease in application intensity and an increase in the use of substitute green technologies using the conversion coefficients approved by the MARA.
Data source/ Agency	Provincial DARA and RRB
Verification Entity	Third-party verification agency
Procedure	**Verification Protocol:** The third-party VA verifies: (i) the cumulative quantity of organic and formula fertilizers, and area under the green manure and fertigation practices in selected crops systems, which are monitored by county DARAs and reported to the Bank by provincial DARA annually; and (ii) whether the appropriate coefficients are used for conversion into pure tonnes of fertilizers through random sampling. The third-party VA checks whether the random sample results are comparable to the reported reduction in chemical fertilizer use due to the adoption of green technologies and practices. Chemical fertilizer reduction targets and budgets are spread over the 2024–2027 program implementation period. Disbursements are scalable and are made against the number of the target net tonnes of chemical fertilizer reduction achieved in the program counties in a calendar year.
DLI 8	DLI4: Tonnes of chemical fertilizer reduced due to the adoption of green technologies and sustainable practices in selected crop production systems in the Program counties (Guangxi)
Description	The total reduction in chemical fertilizer use is achieved by: (a) reducing application intensity (e.g., quantity per unit area) and increasing utilization rate (e.g., timing, placement, or precision of application to enhance absorption by roots); and (b) deploying four substitute green technologies: application of organic, green manure (nitrogen fixing crops), and formula (based on soil testing) fertilizers and fertigation. The cumulative chemical fertilizer use reduction under (a) will be monitored using MARA's national platform. The cumulative chemical fertilizer use reduction under (b) will be estimated using conversion coefficients approved by MARA (see details in Annex 3). It is difficult to calculate annual chemical fertilizer utilization rates. This is because they are calculated from experimental data on fertilizer absorption by types of crop and over multiple seasons. The experiments use MARA's methodology to monitor fertilizer application rates and crop yields, and account for crop nutrient use. Therefore, the Program counties will only collect data on the quantity and area (hectares) of chemical fertilizer use and substitute green technologies use; and prepare annual reports. Reduction in chemical fertilizer use will be calculated from a decrease in application intensity and an increase in the use of substitute green technologies using the conversion coefficients approved by the MARA.

Data source/ Agency	Regional DARA and RRB
Verification Entity	Third-party verification agency
Procedure	**Verification Protocol:** he third-party VA verifies: (i) the cumulative quantity of organic and formula fertilizers, and area under the green manure and fertigation practices in selected crops systems, which are monitored by county DARAs and reported to the Bank by regional DARA annually; and (ii) whether the appropriate coefficients are used for conversion into pure tonnes of fertilizers through random sampling. The third-party VA checks whether the random sample results are comparable to the reported reduction in chemical fertilizer use due to the adoption of green technologies and practices. Chemical fertilizer reduction targets and budgets are spread over the 2024–2027 program implementation period. Disbursements are scalable and are made against the number of the target net tonnes of chemical fertilizer reduction achieved in the program counties in a calendar year.
DLI 9	DLI5: Percentage increase of treated and recycled livestock and poultry manure from large scale and small scale farms in the Program Counties (Guizhou)
Description	The cumulative data on quantity of manure collected, treated, and recycled will be obtained from two sources: (a) large farms with on-site treatment facilities; and (b) centralized treatment facilities for small livestock and poultry farms, and centralized facilities for small-scale farms. MARA has established a national platform for monitoring quantities of livestock and poultry manure produced, collected, treated and utilized (e.g., as organic fertilizer, conversion to biogas/energy, and crop irrigation). Data from this platform enables MARA and DARAs to scientifically calculate the comprehensive utilization rate of livestock and poultry manure. Supplementary data will be collected directly from the on-site ledgers of large and medium scale livestock and poultry farms; and through annual M&E socio-economic surveys.
Data source/ Agency	Provincial DARA and RRB
Verification Entity	Third-party verification agency
Procedure	**Verification Protocols:** Quantities reported by the three sources of data will be verified by the third-party VA based on: (a) random sampling of large and small -scale farms and the centralized manure treatment facilities; and (b) by reviewing other supporting documents, such as inspection reports from county DARAs and annual M&E socioeconomic survey reports. Livestock and poultry manure treatment and recycling targets and budgets are spread over 2024-2027 program implementation period. Third-party VA verifies the results and estimates the annual manure treatment rates. Disbursement will be made against the percentage increase of livestock and poultry manure treated and recycled that is achieved in the program counties over the period of Program implementation up to the total allocation for this DLI. Baseline manure

	treatment and recycling value for the large farms is 90 percent and for small farms is 82 percent.
DLI 10	DLI5: Percentage increase of treated and recycled livestock and poultry manure from large scale and small scale farms in the Program Counties (Guangxi)
Description	The cumulative data on quantity of manure collected, treated, and recycled will be obtained from two sources: (a) large farms with on-site treatment facilities; and (b) centralized treatment facilities for small livestock and poultry farms. MARA has established a national platform for monitoring quantities of livestock and poultry manure produced, collected, treated and utilized (e.g., as organic fertilizer, conversion to biogas/energy, and crop irrigation). Data from this platform enables MARA and DARAs to scientifically calculate the comprehensive utilization rate of livestock and poultry manure. Supplementary data will be collected directly from the on-site ledgers of large and medium scale livestock and poultry farms; and through annual M&E socio-economic surveys.
Data source/ Agency	Regional DARA and RRB
Verification Entity	Third-party verification agency
Procedure	**Verification Protocols:** Quantities reported by the three sources of data will be verified by the third-party VA based on: (a) random sampling of large and small -scale farms and the centralized manure treatment facilities; and (b) by reviewing other supporting documents, such as inspection reports from county DARAs and annual M&E socioeconomic survey reports. Livestock and poultry manure treatment and recycling targets and budgets are spread over 2024-2027 program implementation period. Third-party VA verifies the results and estimates the annual manure treatment rates. Disbursement will be made against the percentage increase of livestock and poultry manure treated and recycled that is achieved in the program counties over the period of Program implementation up to the total allocation for this DLI. Baseline manure treatment and recycling value for the large farms is 90 percent and for small farms is 85 percent.
DLI 11	DLI6: Percentage increase of recovered and recycled agricultural plastics in the Program Counties (Guizhou)
Description	This DLI tracks the cumulative quantity of agricultural plastics (greenhouse film, mulch film and chemical and fertilizer packaging materials) used and recovery rate. The MARA has established a national platform for monitoring these two parameters. The platform mainly tracks the use and recovery of greenhouse and mulch films. Greenhouse film recovery is almost guaranteed because it involves large farms, and the residues are of high value. As a result, producers and suppliers of greenhouse film are recovering the residues. In contrast, mulch film, which is of low value, is not widely recovered. The program will focus more on increasing the number of collection centers and recycling facilities for this type of plastics. In

	addition to the MARA's platform, data on agricultural plastic film collection will be obtained from: (a) the inventories established at county and village-level collection centers or sites, (b) records (on-site ledgers) of agricultural plastics use by large farm enterprises and professional farmer cooperatives, and (c) records (on-site ledgers) from agro-input sale networks, solid waste sorting centers, and recycling centers, among others.
Data source/ Agency	Provincial DARA and RRB
Verification Entity	Third-party verification agency
Procedure	**Verification Protocol:** The recovery and recycling quantities will be verified by the third-party VA using random sampling methods and field visits to review the collection and recycling ledgers. Agricultural plastics recovery and recycling targets and budgets are spread over the 2024–2027 program implementation period. Third-party VA verifies the results and estimates the annual agricultural plastics recovery and recycling rates. Disbursement will be made against the percentage increase of agricultural plastics recovered and recycled that is achieved in program counties over the period of Program implementation up to the total allocation for this DLI.
DLI 12	DLI6: Percentage increase of recovered and recycled agricultural plastics in the Program Counties (Guangxi)
Description	This DLI tracks the cumulative quantity of agricultural plastics (greenhouse film, mulch film and chemical and fertilizer packaging materials) used and recovery rate. The MARA has established a national platform for monitoring these two parameters. The platform mainly tracks the use and recovery of greenhouse and mulch films. Greenhouse film recovery is almost guaranteed because it involves large farms, and the residues are of high value. As a result, producers and suppliers of greenhouse film are recovering the residues. In contrast, mulch film, which is of low value, is not widely recovered. The program will focus more on increasing the number of collection centers and recycling facilities for this type of plastics. In addition to the MARA's platform, data on agricultural plastic film collection will be obtained from: (a) the inventories established at county and village-level collection centers or sites, (b) records (on-site ledgers) of agricultural plastics use by large farm enterprises and professional farmer cooperatives, and (c) records (on-site ledgers) from agro-input sale networks, solid waste sorting centers, and recycling centers, among others.
Data source/ Agency	Regional DARA and RRB
Verification Entity	Third-party verification agency
Procedure	**Verification Protocol:** The recovery and recycling quantities will be verified by the third-party VA using random sampling methods and field visits to review the collection and recycling ledgers. Agricultural plastics recovery and recycling targets

	and budgets are spread over the 2024–2027 program implementation period. Third-party VA verifies the results and estimates the annual agricultural plastics recovery and recycling rates. Disbursement will be made against the percentage increase of agricultural plastics recovered and recycled that is achieved in program counties over the period of Program implementation up to the total allocation for this DLI.
DLI 13	DLI7: Number of Integrated Village Development Plans (IVDPs) approved by Program Counties (Guizhou)
Description	The county RRB will collect data on the number of IVDPs prepared by hired professional firms. The IVDPs will be approved by the relevant county authorities for implementation at the county level to ensure that they meet the required technical, environmental, and social standards that will be specified in the Program Implementation Plan (PIP).
Data source/ Agency	Provincial RRB
Verification Entity	Third-party verification agency
Procedure	**Verification Protocol:** The third-party VA will verify the achievements reported by reviewing the minutes of meetings approving the spatial IVDPs and the final documents provided by the county/district RRB on a random sampling basis. Disbursements will be made against the number of IVDPs approved each year.
DLI 14	DLI7: Number of Integrated Village Development Plans (IVDPs) approved by Program Counties (Guangxi))
Description	The county RRB will collect data on the number of IVDPs prepared by hired professional firms. The IVDPs will be approved by the relevant county authorities for implementation at the county level to ensure that they meet the required technical, environmental, and social standards that will be specified in the Program Implementation Plan (PIP).
Data source/ Agency	Regional RRB
Verification Entity	Third-party verification agency
Procedure	**Verification Protocol:** The third-party VA will verify the achievements reported by reviewing the minutes of meetings approving the spatial IVDPs and the final documents provided by the county/district RRB on a random sampling basis. Disbursements will be made against the number of IVDPs approved each year.
DLI 15	DLI8: Number of demonstration villages with newly constructed or rehabilitated existing climate resilient wastewater treatment and solid waste collection, sorting and transfer systems (Guizhou))
Description	Data on the number of constructed or rehabilitated and operational wastewater treatment facilities and solid waste management systems will be collected by the relevant departments at the county level during the handover of the

	facilities/systems.
Data source/ Agency	Provincial RRB
Verification Entity	Third-party verification agency
Procedure	**Verification Protocol:** The third-party VA will verify whether the facilities/systems are fully operational by random sampling of batches completed and accepted each year. The third-party VA will also verify whether the facilities/systems are meeting county effluents discharge standards. Disbursement will be made against the number of demonstration villages with waste management facilities/systems that are meeting the county effluents discharge in each year, based on the unit price.
DLI 16	DLI8: Number of demonstration villages with newly constructed or rehabilitated existing climate resilient wastewater treatment and solid waste collection, sorting and transfer systems (Guangxi))
Description	Data on the number of constructed or rehabilitated and operational wastewater treatment facilities and solid waste management systems will be collected by the relevant departments at the county level during the handover of the facilities/systems.
Data source/ Agency	Regional RRB
Verification Entity	Third-party verification agency
Procedure	**Verification Protocol:** The third-party VA will verify whether the facilities/systems are fully operational by random sampling of batches completed and accepted each year. The third-party VA will also verify whether the facilities/systems are meeting county effluents discharge standards. Disbursement will be made against the number of demonstration villages with waste management facilities/systems that are meeting the county effluents discharge in each year, based on the unit price.

ANNEX 3. SUMMARY TECHNICAL ASSESSMENT

The Context

1. **The PforR will be implemented in the Guangxi Zhuang Autonomous Region and Guizhou Province.** These two mountainous provinces are in the southwest of China. Guangxi is situated in China's southern frontier area, facing Beibuwan Gulf in the south (total length of the coastline is about 1,500 km) and bordering Vietnam to the southwest. Guangxi Province covers more than 236,700 km^2. Guizhou is a landlocked province covering 176,167 km^2. The two provinces are among the least developed of China and agriculture still plays a critical role in their economies.

2. **Guangxi has 50.19 million people, of which about 37 percent belong to various ethnic minorities (predominately Zhuang, accounting for 31 percent).** Guangxi's total GDP is estimated at CNY 2,215.7 billion (US$346.2 billion equivalent), ranking 19th in the country. With a per capita GDP of CNY 44,201 (US$6,906 equivalent), Guangxi ranks 29th in the country among the mainland China's 31 provinces/autonomous regions. Agriculture remains a key subsector in Guangxi, with production in 2020 reaching the following: rice (10.14 million tons), vegetables (38.31 million tons), sugarcane (74.13 million tons), and fruits (27.86 million tons) (Table 1). These four major crops are heavy users of chemical fertilizer, pesticide, and agricultural plastic film. In 2020, the aggregate output value of Guangxi's agriculture, forestry, animal husbandry, and fishery was CNY 591.33 billion (US$92.40 billion equivalent), of which agricultural output value was CNY 326.88 billion (US$51.08 billion equivalent) and animal husbandry output value was CNY 101.90 billion (US$15.92 billion equivalent). Guangxi is among the top-ten largest users of chemical fertilizer, pesticide, and agricultural plastics in China. In 2020, the total sown area of crops in Guangxi was 6.11 million hectares. The total use of chemical fertilizer (nutrient) was 2.48 million tons, while the use of pesticide was 66,026 tons, ranking eighth and seventh in the country, respectively. During the same time, the use of agricultural plastic and plastic film was 48,712 tons and 34,678 tons, ranking 19th and 13th, respectively. The total area covered by plastic film was 432,900 hectares, ranking 13th nationally. Under the 14th FYP, the Guangxi government remains committed to reducing chemical fertilizer use and improving the management of agricultural plastics (e.g., recovery and recycling), including through the promotion of substitutes, such as organic fertilizer and biodegradable plastics.

Table 1: Yield, Sown Area, and Yield per Unit Area of Major Crops in Guangxi in 2020

Description	Rice	Wheat	Maize	Soybean	Tubers	Vegetables	Sugarcane	Fruits
Production (10,000 tons)	1,013.7	0.6	273.3	15.4	52.6	3,830.8	7,412.5	2,785.7
Area (10,000 hectares)	176.01	0.39	59.70	9.64	26.73	153.59	87.48	135.26

3. **Guangxi is also one of the largest producers of livestock and poultry in China.** The subsector is dominated by the pig and poultry industries. In 2020, about 28.12 million pigs and 1.15 billion poultry were slaughtered. During the same year, the standing pig population was 18.28 million (see Table 2). Guangxi ranks 12th and fourth in pig and poultry production in the country, respectively. In addition, Guangxi ranks 12th and 18th in mutton and beef production, respectively. These livestock and poultry production systems are generating significant amounts of manure, which need to be better managed. During the 13th FYP, the Guangxi government actively promoted the use of livestock and poultry manure and the zero-growth action of chemical fertilizer use. By the end of 2020, the utilization rate of livestock and poultry manure in the province reached 92.77 percent, an increase of 29.77 percentage points compared with the 2016 level, and exceeded the national average by 17.77 percentage points. By 2020, the standing pig population declined by nearly 40 percent because of the African swine fever (ASF) outbreak in 2018. Given the ongoing recovery of pig production, the amount of manure is projected to increase significantly over the next decade. Thus, more investments

will be needed to further improve the management of livestock and poultry, including for collection, treatment, and recycling.

Table 2: Livestock Subsector in Guangxi Province in 2020

Description	Pigs	Cattle (beef)	Mutton	Poultry	Cattle (dairy)
Number slaughtered (10,000 head, 10,000 animals)	2,281.2	131.2	228.0	11,4571.5	
Year-end inventory (10,000 head)	1,828.3	124.6	239.2		5.9
Production (10,000 tons)	174.1	13.6	3.6	179.9	11.2
National ranking	12th	18th	12th	4th	N.A.

4. **Guizhou Province has a total population of about 40 million, of which about 40 percent belong to various ethnic minorities.** In 2020, Guizhou's GDP was estimated at CNY 1,782.6 billion (US$278.53 billion equivalent), ranking 20th out of mainland China's 31 provinces/autonomous regions, with per capita GDP at CNY 46,207 (US$7,220 equivalent), ranking 25th. About 80 percent of Guizhou's total land is in the karst Wuling and Wumeng mountains area. These geographic conditions, combined with poor accessibility, pose significant challenges to sustainable and economically viable agricultural development. Nevertheless, agriculture remains a key sector and an entry point for rural development, long-term employment, and income generation opportunities for the population that will not migrate. Agriculture also provides new opportunities for returnees with good agro-business ideas.

5. **Guizhou Province has about 40 million people, of which about 40 percent belong to various ethnic minorities.** In 2020, Guizhou's GDP was estimated at CNY 1,782.6 billion (US$278.53 billion equivalent), ranking 20th out of mainland China's 31 provinces/autonomous regions, and per capita GDP at CNY 46,207 (US$7,220 equivalent), ranking 25th. Guizhou's crop production is dominated by vegetables, fruits, and paddy rice. In 2020, the province produced 29.91 million tons of vegetables, 5.48 million tons of fruits, and 4.16 million tons of paddy rice. These crops use significant amounts of chemical fertilizer, pesticide, and agricultural plastic film. In 2020, the total sown area of crops in Guizhou was 5.48 million hectares (see Table 3). The amounts of chemical fertilizer (in nutrient) and pesticide used were 788,000 tons and 8,423 tons, ranking 23rd and 25th in the country, respectively. The amount of agricultural plastic film used, and the area covered by plastic film were 45,411 tons and 371,500 hectares, ranking 21st and 16th nationally, respectively. Guizhou Province reported that, in 2020, the recovery rate of agricultural plastic was 83.56 percent.

Table 3: Yield, Sown Area, and Yield per Unit Area of Major Crops in Guizhou in 2020

Description	Rice	Wheat	Maize	Soybean	Tubers	Vegetables	Sugarcane	Fruits
Production (10,000 tons)	416.0	33.4	220.3	22.4	319.4	2,990.9	21.1	548.1
Area (10,000 hectares)	66.51	13.81	50.15	21.18	98.81	151.13	47.64	77.95

6. **Guizhou is also one of the largest livestock- and poultry-producing provinces in China.** The subsector is dominated by poultry and pig production, although cattle and sheep populations are also increasing. In 2020, the province slaughtered a total of 16.61 and 176.02 million pigs and poultry, respectively. In the same year, the standing pig population was 13.64 million (Table 4). Nationally, Guizhou ranks 13th and 20th in pig and poultry production,

respectively. The pig population is currently on the rise because ASF is largely under control. There is also a rapid expansion of poultry production, targeting the Greater Bay Area (Guangdong–Hong Kong SAR, China–Macau SAR, China) and the relatively richer eastern province markets. The quantity of livestock and poultry manure is projected to increase steadily in the next decade. Therefore, improving the management of manure remains one of the key priorities of the Guizhou government. According to Guizhou Province's monitoring reports, the livestock and poultry manure utilization rate in 2020 was 86.43 percent. Although there has been some improvement in the management of manure, which is one of the major sources of water, soil, and air pollutants, more investment will be needed to fully achieve the pollution reduction targets set in the 14th FYP and phase 1 RRS plan.

Table 4: Livestock Production in Guizhou Province in 2020

Description	Pigs	Cattle (beef)	Mutton	Poultry	Cattle (dairy)
Number slaughtered (10,000 head, 10,000 animals)	1,661.8	176.1	297.4	17,602.2	
Year-end inventory (10,000 head)	1,364.1	488.6	382.4		1.3
Production (10,000 tons)	146.3	23.1	5.0	30.8	5.3
National ranking	13th	12th	12th	20th	N.A.

7. **Two collection, transportation, and treatment models for rural domestic waste management exist:** (i) urban-rural disposal model and (ii) area-based disposal model. Under the urban-rural disposal model, rural domestic waste is collected in villages, transferred to towns, and disposed of at centralized disposal sites of each county. In contrast, under the area-based disposal model, each village has its own small-scale domestic waste management facility for collection, treatment, and recycling. The threshold of transportation distance between urban centralized disposal sites and villages determines which of these two models is more cost-effective. Guangxi and Guizhou use their respective distance decision-making models supported by GIS software to obtain the threshold of collection and transportation distances. In both provinces, results show that (i) distance threshold decreases as the village population increases; (ii) when the village population size is up to 20,000 people, it is more cost-effective to use the area-based disposal model; and (iii) the amounts of per capita domestic waste output, the average life of the facilities, cost of building new small-scale area-based treatment facilities, and cost of collection and transportation of waste play a critical role in determining the choice of waste management model to be implemented.

Geographic Boundary

8. **In Guangxi Province, the PforR will be implemented in 12 out of 111 counties/districts.** The counties/districts are Pinggui, Yuanxian, Luocheng, Tianetang, Rong'an, Xingbin, Xincheng, Tiandong, Bobai, Yizhou, Mashan, and Zhongshan. In Guizhou Province, the PforR will be implemented in 15 out of 86 counties/districts. The counties/districts are Bijiang, Sinan, Yinjiang, Songtao, Jinping, Shibing, Taijiang, Luodian, Guiding, Sandu, Libo, Xingren, Zhenfeng, Xiuwen, and Xifeng. These counties/districts were selected based on agreed criteria: (a) geographic distribution, that is, demonstration counties from different municipalities/cities; (b) inclusiveness – at least one or two ethnic minority autonomous cities; (c) large user of chemical fertilizer and pesticide – to maximize the impacts of NPS pollution control (e.g., reducing CH_4, N_2O, and CO_2 emissions and TN and TP pollutants); (d) large producer of livestock and poultry – to maximize the impacts of better management of manure and other waste (dead animals and by-products), for example, reducing COD, BOD, and ammonia nitrogen; (e) large user of agricultural plastics – to help collect, treat, and recycle

mulch film and fertilizer and pesticide packages; (f) lack of/inadequate solid waste management system (e.g., for collecting, sorting, and treating and converting to organic fertilizer or biogas/energy generation); and (g) lack of/inadequate wastewater management system (e.g., for collecting, treating, and recycling water for irrigation and/or construction of wetlands).

9. **Technical assessment of the PforR has been undertaken using data and information provided by the national, provincial, and county governments during program preparation.** The technical assessment focused on four key aspects: (i) strategic relevance and technical soundness, (ii) expenditure framework, (iii) M&E capacity, and (iv) economic justification for Bank financing.

Strategic Relevance

10. **Guangxi and Guizhou leaders are committed to addressing the environmental challenges** related to overuse of chemical fertilizer, improper management of livestock and poultry manure, and inadequate recovery and recycling of agricultural plastics in the agricultural sector. The leadership of the two provinces has also expressed its commitment to addressing the challenges related to underdeveloped rural solid waste and wastewater services. These commitments are presented in Guangxi's and Guizhou's "proposals on comprehensively promoting rural revitalization and accelerating agricultural and rural modernization." This presents an opportunity for the Bank to support the two provincial governments' efforts to promote green agricultural and rural development activities through results-based financing.

Chemical Fertilizer Use

11. **In China, the total use of agricultural chemical fertilizer has shown a negative growth trend for five consecutive years since 2015,** with an average annual decrease of about 2.6 percent. Chemical fertilizer application intensity also dropped from 369.9 kg/ha in 2015 to 313.5 kg/ha in 2020, while the utilization rate for major crops reached 40.2 percent, an increase of 7.2 percentage points over 2013. It is projected that, by 2025, the utilization rate of chemical fertilizer for major crops will reach 43 percent.

12. **In Guangxi and Guizhou, however, chemical fertilizer intensity is significantly above the national average.** In 2020, the pure amount of agricultural chemical fertilizer used in Guangxi and Guizhou was 788,000 and 2.479 million tons, respectively. In 2019, the fertilizer application intensity of major crops was about 400 kg/ha for rice, 460 kg/ha for maize, more than 1,000 kg/ha for sugarcane, 600 kg/ha for fruits, and 1,100 kg/ha for vegetables. These high rates of chemical fertilizer application cause significant NPS pollution in waterways and contribute to GHG emissions and climate change. In addition, this high fertilizer application intensity is a major concern for food safety.

13. **China has put in place national and provincial policies, regulations, standards, and guidelines for chemical fertilizer reduction and efficiency enhancement.** "Zero growth" of chemical fertilizer use was adopted under the 13th FYP. The goal was to promote the green development of agriculture. The central government also issued a series of policy documents to promote in chemical fertilizer use and increase in efficiency or utilization rate. In 2015, the MARA issued the *National Agricultural Sustainable Development Plan (2015–2030)*. In 2017, the SC issued *Opinions on Innovative Systems and Mechanisms to Promote Green Agricultural Development*. In 2018, the MARA issued *Technical Guidelines for Agricultural Green Development (2018–2030)*. In 2020, six ministries and commissions jointly issued the *Action Plan for the Tough Battle of Agricultural and Rural Pollution Control (2021–2025)*. In 2020, a notice of work on *Doing a Good Job in Replacement of Chemical Fertilizer with Organic Fertilizer Pilot Program in Fruit, Vegetable, and Tea* was launched. In 2021, the 14th FYP for National Agricultural Green Development was jointly issued by the MARA and five other national agencies.

14. At the subnational level, Guangxi and Guizhou have also issued a series of regional/provincial policies, regulations, and development plans. These include the *Action Plan for Zero Growth of Fertilizer Use in Guangxi (2020)*; the 14th FYP for Promoting Agricultural and Rural Modernization in Guangxi; Guangxi's *Notice on Green, High-Quality, and Efficient Actions (2020)*; the Work Plan for the Protection and Improvement of Cultivated Land Quality; and *Negative Growth of Fertilizer Use in Guizhou Province (2020)*.

15. **China has developed technical approaches and practices for fertilizer use reduction and efficiency enhancement.** Four technical approaches are commonly used to achieve these goals. First is to promote precise fertilization. Based on the different agro-ecological soil conditions, crop yield potential, and comprehensive nutrient management requirements, fertilization rates (kg/area) for each region/agro-ecological zone and crop type are established to reduce overuse of chemical fertilizer. Second is to adjust the composition of fertilizer use. The ratio of nitrogen, phosphorus, and potassium is optimized to promote the interaction of macro-elements and medium and trace elements. The optimization and upgrading of fertilizer products are complemented by using high-efficiency chemical fertilizer. Third is to improve the fertilization method. This includes undertaking soil testing and developing formula fertilizer, mechanical deep placing of chemical fertilizer, integrating irrigation water and soluble chemical fertilizer (fertigation), using slow-release and high-efficiency fertilizer, and foliar fertilizer application. Fourth is to replace chemical fertilizer with organic fertilizer. This includes using organic nutrient resources and replacing some chemical fertilizer with organic fertilizer. Soil fertility and structure are improved by returning crop straw and residues to fields, planting green manure, and using biogas fertilizer and organic fertilizer from treated livestock and poultry manure.

16. **The national- and regional-/provincial-level chemical fertilizer use reduction and efficiency enhancement estimates are mainly based on field experiments.** By soil testing and applying formula fertilizer in experimental fields, the fertilizer utilization rate of main crops can be estimated through the monitoring of fertilization rates and crop yields, and accounting for crop nutrient use. In addition, the amounts of chemical fertilizer reduction due to the use of substitute green technologies, including the use of formula fertilizer, organic fertilizer, fertigation, and green manure, are estimated using established coefficients (Table 5).

Table 5: Reduction in Chemical Fertilizer Use by Substitute Technologies

Technical approach	Reduced chemical fertilizer use (pure tons)
Formula fertilizer (ha)	0.03
Organic fertilizer (tons)	0.02
Fertigation (ha)	0.225
Green manure (ha)	0.09

Livestock and Poultry Manure Management

17. **By the end of 2020, the national stock of live pigs, cattle, sheep, and poultry was 406.50 million, 95.62 million, 306.55 million, and 6.78 billion, respectively.** The MARA, by implementing measures to increase the utilization of livestock and poultry manure resources, helped increase the national comprehensive utilization rate of manure to 76 percent.

18. **During the 13th FYP, the General Office of the SC issued *Opinions on Accelerating the Resource Utilization of Livestock and Poultry Breeding Wastes*.** The MARA issued *Specifications for the Construction of Facilities for the Resource Utilization of Manure in Large-scale Livestock and Poultry Farms*, *Livestock and Poultry Waste Resource Utilization,* and

Poultry Manure Land Carrying Capacity Calculation Technical Guidelines. In addition, the MARA jointly with the MEE issued the *Assessment Method for the Resource Utilization of Livestock and Poultry Breeding Wastes*.

19. **In 2021, the MARA issued the 14th FYP for the Combined Construction of National Livestock and Poultry Manure Utilization, Planting, and Breeding.** The plan focuses on returning and utilizing livestock and poultry manure in the field, improving the quality of facilities and equipment, and strengthening extension services. The plan aims to integrate crop production and animal breeding RRS implementation. By 2025, the plan targets supporting more than 250 pilot counties to construct livestock and poultry manure treatment facilities; establish demonstration bases for returning manure to fields (including 11 in Guangxi and 9 in Guizhou); and promote the use of composted manure and liquid manure in accordance with local conditions. The plan also intends to support the construction of manure storage facilities and promote biogas fertilizer return to the field and other technical models, along with the construction of manure and sewage transportation pipeline networks. The MARA strives to reach an 80 percent nationwide comprehensive utilization rate of livestock and poultry manure by 2025.

20. **Technologies for livestock and poultry manure resource utilization are in place.** These are based on the *Typical Model of Resource Utilization of Livestock and Poultry Manure* issued by the Department of Animal Husbandry of the Ministry of Agriculture on March 22, 2017. This mainly includes the following models: (i) full collection and return of manure, (ii) specialized energy utilization of manure, (iii) solid manure composting, (iv) odorous fermentation bed, (v) fecal bedding reuse, and (vi) sewage standard discharge models. Guangxi prefers the odorous fermentation bed and solid manure composting models as the main technologies for the resource utilization of livestock and poultry manure. Guizhou opts mainly for the odorous fermentation bed, solid manure composting, specialized energy utilization, and full collection and return of manure to the field (water and fertilizer integration) models.

21. **Guangxi has clear baseline and target values for the treatment and recycling of livestock and poultry manure.** In 2020, total livestock and poultry manure generation in the 12 program counties was 16.63 million tons, of which 14.81 million tons were treated and reused, with the comprehensive utilization rate of manure reaching 91.97 percent. Of the total amount of manure generated, 2.70 million tons came from large-scale livestock and poultry farms, of which about 2.55 million tons were treated and reused, with a comprehensive utilization rate reaching 94.18 percent. By 2027, Guangxi is targeting generating 20.73 million tons of livestock and poultry manure, treating and recycling 19.39 million tons, and achieving a comprehensive utilization rate of manure of 93.56 percent. Of this total amount, the quantity of manure to be generated by large-scale farms is projected to reach 3.29 million tons, the treated and reused amount 3.10 million tons, and the comprehensive utilization rate 93.99 percent. Similarly, the amount of manure generated from small farms (households) is projected to reach 17.43 million tons, the treated and reused quantity of manure 16.30 million tons, and the comprehensive utilization rate of manure to reach 93.48 percent.

22. **Under the program, Guangxi is planning to construct 90 centralized livestock and poultry manure treatment and recycling facilities to cater to the needs of small farms.** The upgrading of treatment plants at large-scale farms through output-based subsidies, together with the newly constructed centralized facilities, will increase Guangxi's manure treatment capacity by 4.58 million tons and increase the comprehensive utilization rate of manure by 1.59 percent. The manure treatment capacity of large-scale farms will increase by 552,000 tons, while the centralized facilities' capacity will increase by 4.03 million tons. Guangxi has set annual targets for the increase in manure treatment and recycling. Consistently, Guangxi proposes to allocate program budgets in accordance with the increase in the amount of manure treated and recycled in each year of the program's life. The budget proportions for the 2023–2027 period are 19, 16, 21, 22, and 22 percent, respectively.

23. **Similarly, Guizhou has clear baseline and target values for the treatment and recycling of livestock and poultry manure.** In 2020, the total amount of manure generated in the 15 program counties was 7.98 million tons, of which 6.71 million tons were treated and reused, achieving a comprehensive utilization rate of manure of 84.12 percent. Of the total amount, the quantity of manure from the large-scale farms was 2.37 million tons, the treated and recycled quantity was 2.14 million tons, and the comprehensive utilization rate was 90.32 percent. The quantity of livestock and poultry manure from small farms (households) was 4.63 million tons, the treated and reused amount was 3.81 million tons, and the comprehensive utilization rate was 82.17 percent. By 2027, Guizhou projects the total output of livestock and poultry manure in the 15 project counties to reach 9.77 million tons, the treated and reused manure to be 8.94 million tons, and the comprehensive utilization rate to reach 91.54 percent. Of the total amount, the output of manure from large-scale farms will be 3.96 million tons, the treated and reused manure 3.69 million tons, and the comprehensive utilization rate 93.3 percent. Guizhou will also set up 24 new organic fertilizer processing plants, which will further increase the utilization of manure resources by 2.23 million tons and increase the comprehensive utilization rate by 7.42 percent. The large-scale farms will contribute 1.55 million tons and the small farms (households) will add 543,100 tons.

Agricultural Plastics Pollution Control

24. **According to the China Rural Statistical Yearbook (2020), in 2019, the use of agricultural plastic film nationwide was 2.41 million tons**, a decrease of 2.32 percent from the previous year. The area covered by plastic film was 264 million mu, a decrease of 0.77 percent from the previous year. In the same year, the use of agricultural plastics in Guangxi was 47,500 tons, of which plastic mulch film was 34,100 tons, covering an area of 6.42 million mu. In Guizhou, the use of agricultural film was 44,100 tons, of which plastic mulch film was 23,400 tons, and the plastic mulch film covered 5.24 million mu.

25. **In recent years, the MARA and other relevant departments have implemented a raft of measures aimed at increasing agricultural mulch film recovery and recycling,** improving the quality and durability of plastic mulch film by increasing its thickness, and promoting substitution of conventional plastic mulch film with biodegradable mulch film materials. At present, the national agricultural film recovery rate has stabilized at about 80 percent, while "white pollution" control measures continue to be implemented. According to the 14th FYP National Agricultural Green Development Plan, by 2025, the agricultural plastics recovery rate is expected to reach 85 percent.

26. **China has adopted policies, laws, regulations, and standards governing agricultural plastics use reduction.** These include the *Law on the Prevention and Control of Soil Pollution* (2019) and *Law on the Prevention and Control of Environmental Pollution by Solid Wastes* (1996). The MARA, MEE, the Ministry of Industry and Information Technology (MIIT), and the State Administration for Market Regulation (SAMR) jointly issued *Administrative Measures for Agricultural Films* (2020). In addition, the MARA, MIIT, and the NDRC issued *Opinions on Accelerating the Prevention and Control of Agricultural Plastic Film Pollution* (2019). The NDRC and MEE issued *Opinions on Further Strengthening the Control of Plastic Pollution* (2020). The SAMR has revised the mandatory national standard for *Polyethylene Blow-Molded Agricultural Ground Cover Film* to increase the thickness, build weather resistance, and improve the recyclability of mulch film from the source. More recently, the national standards for *Fully Biodegradable Agricultural Ground Covering Film* have been released, which clearly stipulate (a) the technical specifications, (b) methodology for testing and evaluating fully biodegradable mulch film, and (c) guidelines for regulating the healthy development of the biodegradable plastics industry.

27. **The14th FYP National Agricultural Green Development Plan aims to vigorously promote the recycling of agricultural mulch film.** The plan emphasizes implementing a strict agricultural film management system, including the

strengthening of the management of agricultural film production, sales, use, recycling, and reuse. The plan also calls for the use of sustainable plastic film mulching technology and for reducing the area under plastic film mulching. Strengthening market supervision and prohibiting manufacturers from producing and enterprises from purchasing and selling agricultural mulch film that does not meet national standards are also a top priority under the plan. The plan is proactively promoting the use of environmentally friendly biodegradable plastic mulch film, treating and reusing waste plastic mulch film, supporting professional agricultural film recycling, developing machines for picking up plastic mulch film residues, constructing agricultural mulch film residue storage and treatment facilities, and expanding the network of plastic mulch film collection in rural areas. The plan provides for piloting the regional agricultural film recycling subsidy system and exploring the establishment of an extended producer responsibility (EPR) system for plastic mulch film. Finally, the plan emphasizes the need for establishing and improving sites for monitoring agricultural mulch film residues on farmland.

28. **The 14th FYP also promotes the recycling and disposal of agricultural chemical packaging materials.** Strictly managing pesticide packaging materials and establishing the EPR system for the manufacturers of pesticides is a top priority. This is in line with the principle that whoever produces the pesticides shall also collect the waste packaging materials and recycle them according to the national standards. Other measures, such as a deposit system and paid recycling, are encouraged to incentivize pesticide users to return packaging waste to input suppliers. Relying on the agricultural input suppliers' network, the plan is to establish packaging material collection centers/sites, improve the pesticide packaging waste recycling system, and promote the harmless disposal of pesticide packaging waste. The plan also involves strengthening supervision of pesticide packaging waste recycling and disposal activities. Finally, the collection, recycling, and disposal of fertilizer packaging waste is also one of the priorities of the 14th FYP. Fertilizer packaging materials with no use value will be included in the rural domestic waste treatment system for centralized treatment.

Technical Soundness

29. **The PforR is technically sound because it is geared toward helping Guangxi and Guizhou provinces to address their agricultural and rural development challenges.** The Bank's PforR support focuses on three Results Areas: (i) RA1: Strengthening institutional capacity for *governance* – to improve institutional coordination and management frameworks for results-based green agriculture and rural infrastructure development (wastewater and solid waste management systems); (ii) RA2: Greening agricultural value chains – to sustainably increase rural income by adopting environmentally friendly production practices; and (iii) RA3: Increasing access to rural solid waste and wastewater services – to improve the rural living environment and reduce pollutants. The activities under each RA are described in detail in Section C (PforR Program Scope). The expected outcomes of implementing activities under these RAs include (i) RA1 – efficient results-based fiscal transfers to support green agricultural development and rural development activities; (ii) RA2 – reduced point and NPS water pollution from crop, livestock, and poultry production systems; enhanced food quality and food safety; and increased rural household income (farm and off-farm); and (iii) RA3 – improved access to solid waste and wastewater services and reduced pollutant loads entering waterways.

30. **The three RAs and associated DLIs will significantly contribute to GPGs.** These include (i) significant reduction in GHG emissions due to reduced use of chemical fertilizer and increased fertilizer use efficiency in selected agricultural value chains; (ii) a reduction in point and NPS water pollution due to a reduction in fertilizer use and treatment and recycling of livestock and poultry manure; (iii) reduced agricultural plastics pollution due to collection, sorting, and recycling of rural solid waste; and (iv) increased biodiversity in farmland due to reduced pollution from chemical fertilizer and pesticide. As far as possible, these co-benefits will be monitored, evaluated, and quantified. Their total estimated

CO_2 equivalent values will be included in the economic and financial analysis of the PforR. Tables 6 to 8 summarize the PforR's mitigation and adaptation measures that are likely to generate substantial GHG emission reductions or climate co-benefits.

31. To complement the pollutant reduction efforts, the PforR will support innovations. Specifically, fertilizer use reduction will be complemented by (i) improving soil nutrient management through deep placement of formula fertilizer; (ii) using formula and slow-release fertilizer; (iii) investing in fertigation facilities for vegetables and fruit orchards; (iv) mechanized fertilization; (v) using organic fertilizer from treated livestock and poultry manure and green manure to replace chemical fertilizer; and (v) crop rotation with green manure plants. Similarly, livestock waste management will be improved through (i) more efficient aerobic composting, bedding preparation, and matrix transformation for solid feces; (ii) full-amount field incorporation upon storage or upon combined processing of storage and anaerobic treatment for liquid manure; and (iii) improved manure transportation vehicles and facilities. Finally, plastic collection and reduction includes measures to (i) replace, recover, and recycle plastic mulch and (ii) develop cost-effective degradable mulch.

Table 6: RA2: Greening Agricultural Value Chains: Eligible GHG Emission Reduction Activities

Category	Eligible Activity	Screening Criteria
1. Agriculture: GHG emission reductions	• Reduction of non-CO_2 GHG emissions from agricultural practices or technologies	• This includes activities that shall demonstrate a substantial reduction in net GHG emissions or carbon intensity (e.g., tCO_2e/unit of outcome). • Potentially eligible activities under the PforR include more efficient nitrogen fertilizer use (by improving the rate, type, timing, placement, or precision of application, formula and organic fertilizer use), manure management including anaerobic digestion, drainage management, improved crop breeds and biotechnology that reduce emissions, and water management in paddy rice.
2. Agriculture: carbon sequestration	• Agricultural activities that contribute to increasing carbon stock in the soil or avoiding loss of soil carbon through erosion control measures	• This includes activities that shall demonstrate a substantial increase in the above- or below-ground carbon stock. • Potentially eligible activities under the PforR include degraded land rehabilitation, erosion control measures, reduced tillage intensity and cover crops, crop rotation, higher inputs of organic matter to soil, processing and application of manure/digestate preferably with biogas capture for energy, perennial cropping systems, cultivation of deep-rooting species, circular/integrated activities that enhance carbon stock, fire management, and peatland restoration and conservation.
3. Agriculture: energy efficiency	• Reduction in energy consumption in operations	• This includes activities that shall demonstrate a substantial reduction in net GHG emissions, carbon intensity, or energy intensity against a selected benchmark. • Potentially eligible activities under the PforR include increasing energy efficiency of crop production and increasing use of energy-efficient equipment for agricultural processing and storage. • Examples of operations are traction, irrigation, pumping, harvesting, crop cooling, storage, and transportation.
4. Livestock: GHG emission reductions	• Activities that reduce methane or other GHG emissions from livestock	• This includes activities that shall demonstrate a substantial reduction in net GHG emissions, or carbon intensity (e.g., tCO_2e/unit of outcome). • Potentially eligible activities under the PforR include manure management with biodigesters, wastewater management, improved feeding practices, feed production with reduced GHG emissions, investments in reducing feed losses along the value chain, sourcing low-emission feeds or forage to increase feed conversion efficiency and reduce methane emissions, and efficiency improvement measures to reduce the herd size.
5. Livestock: carbon sequestration	• Livestock production activities that improve carbon	• The eligible activities shall demonstrate a substantial increase in the above- or below-ground carbon stock.

	sequestration through rangeland management	• Potentially eligible activities under the PforR include improved pasture management to increase soil carbon stocks and reduce erosion, improved grazing management, circular or integrated activities that enhance carbon stock, promotion of silvo-pastoralism, and nitrification-inhibiting practices in pastures.
6. Food and diet: resource use efficiency	• Activities that reduce food losses or waste or promote lower-carbon diets	• This includes activities that shall demonstrate a substantial reduction in net GHG emissions, or carbon intensity (tCO_2e/unit of outcome). • Potentially eligible activities under the PforR include food waste utilization (circular economy systems), policy interventions resulting in reduced food waste, and investments in avoided food losses along the value chain (e.g., better-managed cold-chain infrastructure to reduce crop, or food spoilage).

Table 7: RA3: Wastewater Management: Eligible GHG Emission Reduction Activities

Category	Eligible Activity	Screening Criteria
1. Energy and resource efficiency and GHG emission reduction in wastewater management	• Greenfield and brownfield projects that promote improved operation and maintenance to reduce wastewater leakages, promote energy savings, and meet or exceed wastewater treatment targets	• This includes activities that shall demonstrate a substantial increase in energy efficiency or a substantial reduction in net GHG emissions. • Potentially eligible activities under the PforR include (i) training programs that emphasize wastewater leak detection and prevention, improved maintenance, or energy efficiency improvements; and (ii) programs ensuring that the levels of removal of biochemical oxygen demand (BOD) or five-day biochemical oxygen demand (BOD5), chemical oxygen demand (COD), or nitrogen[40] reach or exceed their targets.
2. GHG emission reduction in wastewater management	• Greenfield projects that reduce methane or nitrous oxide emissions through wastewater, fecal sludge or septage collection and treatment	• This includes activities that shall demonstrate a substantial reduction in net GHG emissions. The treatment system shall remove BOD. If there is no treatment of the collected wastewater, fecal sludge, or septage, that is, no BOD is removed, as part of the project, the activity shall not be eligible. • Potentially eligible activities under the PforR include (i) the treatment systems that remove BOD (if there is no treatment of the collected wastewater, fecal sludge, or septage, that is, no BOD is removed, as part of the PforR, the activity shall not be eligible); (ii) anaerobic treatment activities that generate an appreciable amount of methane and use it in energy generation or production processes, or, if use of methane is not economically viable, flare methane to release carbon dioxide; and (iii) appropriate mitigation measures are put in place to minimize and control methane leakage.
3. Emission reduction in wastewater collection	• Greenfield or brownfield projects that improve latrines or collection of wastewater, fecal sludge, or septage	• This includes activities that shall demonstrate a substantial reduction in net GHG emissions once treatment of the collected material is considered. • Potentially eligible activities under the PforR include (i) gravity-based collection systems in greenfield projects are eligible if they result in near-zero energy-related GHG emissions due to a lack of energy use; (ii) building or improving latrines with reduced anaerobic conditions compared to the baseline scenario; and (iii) investments in wastewater, fecal sludge, or septage collection that lead to a substantial reduction in net GHG emissions through collection and treatment.

[40] For wastewater, fecal sludge, or septage systems that are ex ante expected to result in net GHG emission reductions through collection and treatment, reaching or exceeding their targeted levels of BOD, BOD5, COD, or nitrogen removal is necessary for ensuring net emission reductions of methane or nitrous oxide.

4. Efficient use of wastewater	• Wastewater reuse	• This includes activities that shall demonstrate a substantial reduction in net GHG emissions between the wastewater reuse activity and the expected activity to be replaced or prevented. • Potentially eligible activities under the PforR include (i) graywater and blackwater reuse at the building or local level, (ii) treated wastewater reuse for irrigation, (iii) treated sludge as a fertilizer replacement, and (iv) nature-based solutions using retention ponds or constructed wetlands as part of integrated flood risk management.

Table 8: RA3: Solid Waste Management: Eligible GHG Emission Reduction Activities

Category	Eligible Activity	Screening Criteria
1. Waste collection and transport	• Separate collection and transport of source-segregated waste fractions	• The activity shall support recovery of eligible materials aimed at preparing them for reuse or recycling, including recovery and valorization of bio-waste. • Potentially eligible activities under the PforR include the deployment or operation of (i) waste collection equipment (e.g., bins and containers, including underground systems); (ii) waste collection and transport vehicles; (iii) technological equipment and applications of information and communications technologies (e.g., for collection route optimization, pay-as-you-throw schemes, product tracking, and take-back systems); and (iv) construction or operation of infrastructure for separate waste collection (e.g., civic amenity centers, vehicle depots, and vehicle washing, maintenance, and repair facilities).
2. Waste storage and transfer	• Temporary storage, bulking, or transfer of separately collected source-segregated waste fractions	• The activity shall support recovery of eligible materials aimed at preparing them for reuse or recycling, including recovery and valorization of bio-waste. • Potentially eligible activities under the PforR include construction or operation of temporary storage, bulking, or transfer facilities and ancillary equipment and vehicles.
3. Material recovery from solid waste	• Material recovery from separately collected or pre-sorted waste involving processes other than mechanical processes	• The activity shall be aimed at recovering secondary materials from waste in preparation for reuse or recycling. • Examples of typical feedstock used in this activity are plastic and rubber waste, spent oils, lubricants, solvents, and other chemicals produced by households and businesses.
4. Recovery and valorization of bio-waste	• Anaerobic digestion of separately collected bio-waste	• Bio-waste means biodegradable garden and livestock waste; food and kitchen waste from households and wholesale and retail markets; and comparable waste from food-processing plants. • Potentially eligible activities under the PforR include (i) greenfield projects –construction or operation of new plants and small-scale units for anaerobic digestion of bio-waste, for biogas treatment or utilization, or for the treatment of digestates for use as fertilizer or soil conditioner; and (ii) brownfield projects – modification, replacement, or upgrading of existing facilities resulting in improved methane yield from the anaerobic digestion process (e.g., by enabling co-digestion of bio-waste with other biodegradable feedstock such as agricultural residues and manure); - reduced methane leakages (e.g., sealed digestate storage tanks); - enhanced biogas utilization (e.g., through biogas conversion to bio-methane and its

		compression for use as a fuel or injection in a natural gas grid); or - enhanced digestate utilization (e.g., through additional composting and storage).
5. Recovery and valorization of bio-waste	• Composting of separately collected bio-waste	• The bio-waste shall be segregated at the source and collected separately. • The compost produced shall be used as a natural fertilizer or soil conditioner or, when it can be demonstrated that there is no market for such use, it shall be used for other purposes (e.g., as backfilling or cover material), but shall not be incinerated. • Potentially eligible activities under the PforR include (i) greenfield projects: (a) construction or operation of new composting plants, including equipment for the conditioning of compost for use as fertilizer or soil conditioner; and (b) deployment of household and community-based composting schemes; and (ii) brownfield projects – modification, replacement or upgrading of existing facilities resulting in a reduction in methane emissions from composting plants (e.g., equipment for active aeration of windrows) or improvements in compost quality (e.g., equipment for compost conditioning and valorization).

32. **Maximizing Finance for Develoment (MFD).** The PforR will create an enabling environment for attracting private investment in agricultural value chains. Under the agricultural industrialization policy, Guangxi and Guizhou provincial governments are providing incentives to agro-enterprises with productive partnership with farmer cooperatives to invest in the production, value addition, and marketing of products. Incentives provided include performance-based subsidies. For example, a proportion of the investment costs is offset by the government once the processing facilities become operational and meet EPA standards. The provincial governments provide similar performance-based subsidies to large and medium-sized livestock and poultry farms that are investing in livestock waste management (e.g., collection, treatment, and conversion into organic fertilizer or energy/biogas). Such private waste management facilities are required to receive waste from small livestock and poultry farms to help smallholder producers with waste management. The PforR will encourage the Guangxi and Guizhou provincial governments to expand the scope of such support to add value to agricultural products, better manage rural wastes, and reduce pollution.

Citizen Engagement

33. The proposed PforR has been promoting citizen engagement through wide stakeholder consultations during the environmental and social systems assessment, including local communities and benefiting farmers. The citizen engagement mechanism during project implementation will include (a) contact details of persons from project management offices receiving feedback and complaints will be made public during the disclosure process in all project townships and project counties as part of the grievance redress mechanism; and (b) participatory approaches will be used under DLI7 (Number of spatial IVDPs) approved by the relevant PforR county authorities. Records of people participating in the planning and implementation of the IVDPs will be kept at the village level. Citizen engagement will be used as a tool for transparency and accountability, including full disclosure of plans, budgets, expenditures, and results. In addition, a comprehensive GARR PforR communication strategy will be developed and implemented to inform the wider public of the achievement of the results and share widely the lessons learned and approaches and methodologies for upscaling nationwide.

34. **Climate Co-Benefits (CCB).** The estimates from the EX-ACT tool show that the GARR PforR is expected to reduce GHG emissions by 9.0 million tons CO_2-e over 20 years (including 5-year implementation). Net GHG emissions are quantified by focusing on activities under RA2 (Greening selected agricultural value chains) and RA3 (Increasing access to rural solid waste and wastewater services). Specifically, there are four sources of quantifiable net GHG emission reductions from mitigation measures that have been assessed: (i) the GHG emission reductions from reduced fertilizer use and improved application practices; (ii) the treatment and reuse or utilization of livestock and poultry manure; (iii) the recovery and recycling of agricultural plastic film and packaging materials; and (iii) the treatment and recycling of wastewater and solid waste.

35. The net GHG emission reductions are most likely to be higher than 9.0 million tons CO_2-e presented here because of the net GHG emission reductions due to adaptation measures. These include (i) adoption of climate-smart agricultural practices (e.g., recycling of crop straw/residues, increasing efficiency of irrigation water use, fertigation, and water management in paddy rice); (ii) reducing FLW (e.g., through village-level cold-storage facilities and cold chains, improved postharvest handling technologies, and processing); and (iii) increased energy use efficiency (e.g., in primary production through new efficient farm machinery, use of renewable energy (solar and wind power for irrigation), and in value addition, such as conversion of biogas to energy). In addition, the 9.0 million tons CO_2-e net GHG emission reductions represent only the mitigation attributable to IBRD financing. Finally, the calculations of the net GHG emission reductions are limited to the 27 program counties. However, huge potential exists to scale up these activities in the two provinces.

Gender Result Chain

36. **Gender Gap Analysis.** As Chinese women increasingly participate in farming activities, they have limited access to information and extension services which affect their uptake of green agricultural technologies and participation in the transformation of agriculture value chains. According to the White Paper of "Gender Equality and Women's Development in China" in 2015, women account for about 70 percent of agricultural labor force.[41] In past decades, a significant number of people have migrated from rural to urban areas for jobs, and the majority of them were men. Women, especially those between the ages of 36 and 50, tended to remain in rural communities and spending more hours on the farm.[42] Notwithstanding the increasing farm participation role of women, it is still men who make major decisions on rural affairs as a result of their better access to agricultural technologies, knowledge, and information. In China, agricultural extension is still an important driver in technology introduction and adoption. However, research suggests that the top-down approach of the extension services in China further reinforces the men-dominant social norms in knowledge dissemination, which in fact prioritize men in technical training and capacity building activities.[43] As a result, women's technology adoption rates are affected by their limited access to resources, including their lesser access to credit, information, and discriminatory practices in dissemination of new technologies.[44] As an example, baseline data from demonstration counties in Guangxi shows a mixed picture of women's participation in the emerging e-commerce of agricultural products, i.e. on the existing e-commerce platforms for agricultural products, women account for 20 to 65 percent of the registered vendors. While the total number of registered vendors for green agricultural products are much smaller, the proportion of female vendors in the subgroup varies from 14 to 60 percent. The differences can be explained partly by the uneven distribution of green knowledge and skills among practitioner of different age, education and gender, different access and quality of green agriculture extension services, and the lack of reliable channels to monitor and report gender disaggregated information.

37. The program presents opportunities to promote women's equal employment in the greening of agriculture value chain through empowering female farmers with green knowledge and skills, and getting them better prepared for the emerging job opportunities. Greening the agricultural sector is envisioned to generate and upgrade a large number of green and decent jobs in China. In a sector in which women make up the majority of the labor force, there is an urgent need to improve female farmers access to green agriculture knowledge and skills through training and capacity development activities that target at women's needs. In addition, specific initiatives will be applied to support female farmers in translating acquired knowledge and skills into employment opportunities in the fast-growing green agriculture value chain. Such initiatives will keep abreast of the market trends and take the advantage of technological innovations, for example, the expanding digitalization of agricultural economy in China. According to statistics, the online retail sales of agricultural products accounted for about 30% of the retail sales of rural commodities in 2019. Under the COVID pandemic, the digital economy continues to expand, and the government plans to further promote the development grass-roots e-commerce network and services. As Chinese government keep promoting the standardization and certification of green products (currently a collective category of green, organic and Geographic Information (GI) agricultural products), new jobs will be created, and some existing work will be upgraded to meet the green standards

[41] Gender Equality and Women's Development in China (September 2015), Information Office of the State Council of the People's Republic of China. *http://www.scio.gov.cn/zfbps/ndhf/2015/Document/1449896/1449896.htm*

[42] International Food Policy Research Institute (2012) The Feminization of Agriculture with Chinese Characteristics. Discussion Paper. *http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/126960/filename/127171.pdf*

[43] Chen et al (2015) Research in the Promotion Mode of Water Saving Irrigation Technology under the Background of Agricultural Feminization—A Case Study of Wuwei City, Gansu Province

[44] UNWomen (2011) Rural Women's Access to Science and Technology in the Context of Natural Resource Management

under the Program, including the development of rural wastewater and solid waste management system. In the transformation of green agriculture and rural revitalization, it is vital that women could take advantage of the proliferation of green technologies to ensure equal job opportunities as men do. Therefore, as a core part of the Program plan to nurture green skills and talents, training and capacity building activities will be tailored to the interest and demand of women to help building their knowledge and skills for green agriculture, and facilitate their application of green technologies, which include reducing chemical fertilizer and improving management of livestock and poultry manure, reducing pollution from agriculture plastics, and improving the ability to utilize emerging digital tools and services e.g. online learning, livestreaming and other e-business models for the marketing of green agricultural products, and know-how for mobile-based payment and billing services. Additionally, in the efforts to improve rural infrastructure and access to basic public services in demonstration counties, women will also be trained and prepared for the new employment opportunities in the wastewater and solid waste facilities to be constructed at their villages.

38. Outcome oriented indicators will be used to report women's equal employment opportunity in green agriculture value chain as the gender result under the Program. To measure the gender result, the Program will track and report the percentage of newly created and upgraded jobs held by women in the transformation of agricultural value chain and in the rural waste management and environmental rehabilitation. Specifically, the indicator will be calculated as the percentage of women or female employees in entities that receive the Program support in the transformation of production, processing, packaging, marketing and sales of green agricultural products (either green, organic or Geographical Indication using the approved regional/provincial regulations, standards and guidelines) and in the newly constructed rural wastewater management facilities. With a target of women accounting for no less than 50 percent of the jobs, the figure will reflect women's application of green knowledge and skills in both the transformation of agriculture value chain and newly developed rural public service provision in the Program demonstration counties. In addition, the Program will track and monitor gender-disaggregated information for other indicators that involve both men and women, i.e., capacity building activities nurturing green development skills and talents. Source of information will be from the government employment statistics and survey results.

Results Monitoring and Evaluation

39. **M&E capacity will need to be strengthened during the PforR implementation.** Each province will prepare an M&E plan, specifying the units of measurement, baseline values, targets, data sources for each indicator, methodology, and responsibility for collection and reporting. The provinces will recruit third-party M&E agencies to collect, analyze, and report survey-based data. Administrative data will be collected by the relevant county government departments implementing the PforR activities. The M&E data will be stored in the MIS for the PforR. The M&E of the livestock and poultry manure pollution reduction and wastewater treatment and recycling will be based on the already established monitoring and verification system under the MEE/EPAs. Similarly, the M&E of chemical fertilizer reduction will follow M&E protocols established by the MARA. This will provide a solid basis for official recognition and credibility of the PfoR's DLR. The M&E system will be linked to the IT-based platforms for rural infrastructure management and the IT-based program budgeting and expenditure reporting system. This will enable the provinces to not only evaluate the results and performance of the PforR activities but also analyze the cost-effectiveness of various activities implemented to generate the results. The regional/provincial PMOs will prepare and submit to the Bank consolidated semi-annual progress reports (including findings of third-party M&E reports), a mid-term review report, and an Implementation Completion Report. The regional/provincial PMOs will periodically submit to the Bank the third-party VA's verification reports on the achievement of DLR to enable IBRD loan disbursements against the DLIs.

40. **The regional/provincial PMOs will be responsible for consolidating reports from provincial agencies participating in the PforR and submitting them to the PDOF, copying the CPMO.** IBRD loan disbursements will be made periodically upon receiving and accepting the third-party verification reports on the DLR for the respective DLIs. The amount of submitted withdrawal application (WA) will depend on the verified results. Some annual allocations are scalable and non-fixed, meaning that the Bank can disburse for over-performance up to the DLIs' total allocation. Over-performance will enable the PDOFs to bring forward disbursements from Years 4 and 5 to Years 3 and 4, respectively. The PDOFs can apply for disbursements as soon as the provinces achieve the results, provide the necessary evidence verified by the third-party VA to the Bank, and the Bank accepts the evidence in a formal notice to the MOF specifying the eligible disbursement amounts.

Capacity Building

41. **As indicated above, the technical capacity of the region/provinces in green agriculture and rural infrastructure is generally adequate.** Both the central and provincial governments are paying high attention to training and capacity building of farmers and extension workers, and developing rural talents. During the 13th FYP period, the MARA launched a five-year program to develop new-type occupational farmers who will be equipped with a wide variety of skills – from soil management and crop production to marketing and business planning. In addition, the Department of Human Resources and Social Security (DHRSS) is organizing short-term training for farmers and returning migrant workers. Under the PforR, TA and the outreach program through training and demonstration will be provided based on needs assessment for the various categories (farmers, input suppliers, enterprises, and extension workers), development of the training modules, outsourcing the delivery of training activities, and evaluating the adoption rates.

42. **Given that the responsibility of delivering most of the DLIs is with the counties, capacity building for planning, budgeting, implementation and M&E, and reporting will be needed.** Overall, capacity gaps remain on how to design and implement specific activities to achieve the expected results, conduct effective M&E of the results, and strengthen the linkages (better manage the results chain) between inputs, outputs, and outcomes to achieve the PDO of the PforR. TA will also be needed to strengthen the capacity for program-based budgeting and expenditure reporting (including compliance with fiduciary requirements), management of rural infrastructure (wastewater and solid waste management), and handling of environmental and social safeguard s issues (e.g., assessment of impacts of rural investments and putting in place acceptable mitigation measures) at the county level. The value added of Bank financing is to bring in international experience in these aspects, especially with program-based budgeting and expenditure tracking and results-based fiscal transfers to the counties and rural areas. The PforR also incorporates training and capacity building (nurturing green skills and talents) for the beneficiaries, including members of FCs, FAs, WUAs, input suppliers, extension workers, and agro-enterprises. The RF includes intermediate indicators to measure the performance of training and capacity-building activities.

Economic and Financial Assessment

Rationale for public-sector financing of the PforR

43. The GARR PforR will strengthen institutional capacity for governance, generate public goods (both global and domestic) due to pollution reductions, and provide basic rural public services. The program will directly contribute to GPGs through (i) reducing GHG emissions by supporting measures to reduce chemical fertilizer use and increase efficiency; collection, treatment, and recycling of livestock and poultry manure; and adoption of climate-smart agricultural technologies and practices; (ii) supporting investments in treatment and recycling of rural wastewater and

solid waste; and (iii) supporting investments aimed at increasing the collection, transfer, and recycling of agricultural plastics. The GARR PforR will also indirectly contribute to the protection and restoration of biodiversity in the farmland ecosystem by reducing agricultural pollutants (especially chemical fertilizer and pesticide) and promoting IPM technologies. Further, the GARR PforR will improve the efficiency and effectiveness of public goods delivery through strengthening institutional frameworks or governance systems (e.g., M&E, program budgeting, and expenditure tracking) and capacity building at the regional/provincial and county levels. This will help the regional/provincial governments to adopt results-based fiscal transfers to finance activities aimed at achieving green agricultural and sustainable rural development objectives, which are set in their respective 14th FYP and phase 1 RRS plans.

Value added of Bank support

44. The Bank's involvement will help expose the counterparts to international experience and good practices in green agricultural development, climate-resilient rural public infrastructure, and environmental and ecosytem protection and management. In addition, Bank involvement can incorporate into the government's RRS the lessons learned and experience gained from other Bank-financed agricultural and rural development projects in China and related knowledge products. The recently completed studies undertaken as part of the Bank's Programmatic Advisory Services and Analytics (PASA), "Transforming Rural China – Greening Agricultural Modernization," are particularly relevant for both informing the GARR PforR design and for its implementation (see Section C).

45. The Bank's involvement will help leverage its vast international experience and good practices in green agricultural development, rural wastewater and solid waste management, NPS water pollution control, and environmental/ecological restoration. The Bank has also supported the implementation of several projects related to ecosystem restoration and water pollution control in China, and conducted analytical work, including through the Country Water Resources Partnership Strategy, the Water Governance Strategy, and studies on eco-compensation mechanisms. Lessons learned and good practices generated from these projects and analytics can be readily used to enhance the effectiveness and impact of the GARR PforR during its implementation.

Assessment methodology

46. The economic assessment compares a scenario of "no government program" to a scenario of a government program, including Bank support. This approach is used because, under a PforR, government and Bank funds are combined to achieve results, with virtually no distinction at the activity level between government-financed and Bank-financed achievements. This approach can determine whether the overall Program, which the Bank financing partly supports, is socially beneficial after considering economic benefits and economic costs. Given the wide range of the program's interventions, the economic assessment has been conducted by RAs, using different methodologies.

Results Area 1: Strengthening institutional capacity for governance

47. RA1 will strengthen institutional capacity to develop and improve governance frameworks (e.g., regulations, standards, and guidelines for green development, and program budgeting, expenditure tracking, and M&E) for implementing the RRS plan. Effectiveness and impact of the public expenditures will be enhanced by linking the disbursement of funds to the achievement of specific results. RA1 will also improve transparency and accountability of governance systems. Although not directly generating benefits itself, RA1 will create an enabling environment for the implementation and enhance the impact of activities under RA2 and RA3. Furthermore, it will help to upscale green agricultural development and rural public service province-/region-wide, far exceeding the program's scope. As such, no separate analysis is needed for activities under RA1.

Results Area 2: Green agricultural development

48. RA2 involves support to farmers, cooperatives, and enterprises in the form of matching grants or output-based subsidies. The support to green value chain development generates both private (increased productivity/income) and public (reduced GHG emissions and nutrient/pollutant loads entering waterways) benefits. Adoption of new CSA technologies and practices promoted by the program partly depends on the profitability of farm operations/VCs.

49. **Economic analysis:** Cost-benefit analysis has been conducted to assess the economic viability of RA2 by aggregating activities in crop production (VCs) and manure treatment interventions per physical targets as contained in DLI4 and DLI5, and based on crop production and manure treatment models in financial analysis. The incremental economic costs include (a) investment cost for technical package adoption, (b) operational costs for agricultural production, and (c) training and capacity-building costs. The major benefits included in the analysis are (a) incremental crop production increases and price premiums from quality improvement; (b) savings from reduced agricultural input costs, including fertilizer, agrochemicals, diesel, and irrigation water; (c) income from bio-gas, electricity, and organic fertilizer generated by manure treatment; and (d) benefits from GHG emission reductions. Other substantial positive externalities (e.g., reduced pollution of water and soil and biodiversity improvement are not included in the analysis as they are not readily quantifiable). The following assumptions have been applied for the analysis: (a) carbon shadow prices are set following the World Bank "Guidance note on the shadow price of carbon in the economic analysis" (November 2017)[45]; (b) program life of 20 years; (c) the discount rate adopted by the analysis is 6 percent, chosen according to guidelines from the NDRC, which is in line with the World Bank's guidance for discount rate[46]; and (d) taxes, duties, and subsidies are not included as they represent transfer payments instead of real costs or benefits to society as a whole.

50. **The results of the economic analysis:** Cash flows of benefits and costs for RA2 are projected over a 20-year period to estimate their economic rate of return (ERR). The ERR with GHG reductions is estimated at 13 percent (with low carbon shadow price) and 14 percent (with high carbon shadow price) and ERR without GHG reductions at 11 percent, which are all above the discount rate of 6 percent, indicating that RA2 is economically viable.

51. **Financial analysis:** The financial benefits of the project are analyzed based on the incremental benefits and incremental costs of the program from the perspective of farmers/cooperatives. Assumptions for the financial analysis are the same as for the economic analysis except that (a) subsidies for farmers/manure treatment facilities are treated as income and (b) the GHG reduction benefits are excluded as they cannot be internalized by farmers/owners of manure treatment facilities. Major crop production models targeted for fertilizer reduction are selected for the financial analysis, with the results as shown in Table 9.

[45] According to the World Bank's guidance note on the shadow price of carbon in economic analysis issued on November 12, 2017, projects' economic analysis should use a low and high estimate of the carbon price starting at US$40 and US$80, respectively, in 2020 and increasing to US$50 and US$100 by 2030. The low and high values on carbon prices are extrapolated from 2030 to 2050 using the same growth rate of 2.25 percent per year that is implicit from 2020 to 2030, leading to values of US$78 and US$156 by 2050.

[46] 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 E&S benefits.

Table 9: Results of Financial Analysis for Major Crop Value Chains

Technical packages to be adopted	Main crop	FIRR with subsidies (%)	FIRR without subsidies (%)
Formula fertilizer and/or organic fertilizer and/or green manure	Paddy rice	14	11
Fertigation and/or formula fertilizer and/or organic fertilizer	Vegetables	18	15
Fertigation and/or formula fertilizer and/or organic fertilizer	Fruits	17	14

52. The crop financial analysis shows that, in the long term, green agricultural technologies and practices are financially viable even without subsidies. However, the subsidies are justified during the initial years for the following reasons: (i) promoting the adoption of new technologies and practices, (ii) compensating farmers for their contribution to public goods generation (e.g., GHG emission reductions and nutrient and pollutant reductions), and (ii) providing upfront financial incentives to hedge against the risks associated with switching to new technologies and practices. Experience has shown that, once the new technical packages are proven to be financially viable, farmers will continue to use them even without subsidies.

53. **For manure treatment**, new construction of a centralized livestock and poultry manure treatment and recycling facility has been adopted for analysis. The facility will adopt "odorous fermentation bed" technology with annual treatment capacity of 500,000 tons of manure (for roughly 7,000 standing pigs annually). Based on estimated capital investment, operational cost, and revenues, the facility will have a FIRR at 4 percent without subsidies and 11 percent with subsidies for construction costs.

54. **The financial analysis of the manure treatment facility shows that it is not financially viable without subsidies.**[47] Because the centralized facility will provide manure treatment services to small-scale livestock and poultry farms and generate substantial public goods by reducing the quantity of pollutants entering waterways, there is strong justification for the program to provide subsidies for its construction. The analysis also shows that, with subsidies, the facility could run profitably. In fact, Guangxi has demonstrated that the centralized facility, after completion, could be managed by a private entity on concessional arrangement for profitable operations. No sensitivity test is warranted because (a) conservative values of outputs and income are used in the analysis throughout the program's life and (b) significant unquantifiable positive externalities (e.g., water, soil quality, and biodiversity improvement) are not included in the financial analysis.

Results Area 3: Increasing access to rural solid waste and wastewater services

55. RA3 involves the preparation of IVDPs, which are the planning tool for guiding the public service investment at the village level. IVDPs will contribute to the efficient allocation of resources as one of the economic benefits. However, the main activities are related to the construction of the village-level wastewater and solid waste treatment and recycling facilities. Their economic benefits include improvement in health outcomes (e.g., reduced incidences of waterborne diseases) and reduced pollutants entering waterways (i.e., improving water quality), which are not easily quantifiable. Given the mountainous topography of Guangxi and Guizhou with small natural villages scattered all over, the construction or rehabilitation of decentralized rural wastewater and solid waste management facilities is seen as the most cost-

[47] This is supported by the analysis in the government ICR for Guangdong Agricultural Pollution Control Project, in which, out of 21 pig farms, only 3 high-rise facilities are financially viable without subsidies.

effective way of delivering public services. This is because, in the long term, the cost of transferring rural waste to centralized township treatment plants is higher than that of construction or rehabilitation of decentralized rural facilities.

Expenditure Framework Assessment

56. **The 2023–2027 estimated program expenditures are US$6,016 million.** The government will fund US$4,696 million equivalent, whereas the IBRD loan will fund US$320 million, representing a share of 6.4 percent (see Table 10). The proposed PforR will account for about 74 percent of the government agricultural development program and 32.5 percent of the government rural revitalization program in 27 selected pilot counties in Guangxi Zhuang Autonomous Region and Guizhou Province, respectively. Table 11 shows the forecasted program expenditures by RAs in Guangxi and Guizhou from 2023 to 2027.

Table 10: Program Financing (2023–2027)

Source	Guangxi Province		Guizhou Province		Total	
	Amount (US$ million)	% of total financing	Amount (US$ million)	% of total financing	Amount (US$ million)	% of total financing
Government	2,846	95.0	1,850	91.6	4,696	93.6
IBRD	150	5.0	170	8.4	320	6.4
Total	2,996	59.7	2,020	40.3	5,016	100

Table 11: Program Expenditures by Result Areas in Program Counties (2023–2027)

Result Areas	2020 actual (US$ million)		2023–2027 estimated (US$ million)			
	Guangxi	Guizhou	Guangxi	Guizhou	Sub-total	Share (%)
RA1	41.6	58.0	207.9	290.2	**498.1**	**10.6**
RA2	192.1	201.9	960.3	1,009.3	**1,969.6**	**41.9**
RA3	335.6	110.0	1,677.9	550.0	**2,227.9**	**47.4**
Sub-total	**569.2**	**369.9**	**2,846.0**	**1,849.5**	**4,695.5**	

57. **The Expenditure Framework Assessment (EFA) was conducted based on information provided by Guangxi and Guizhou governments, a review of public financial management regulations, and interviews with government officials during the field visits.** The EFA included the following dimensions: (i) fiscal sustainability and resource predictability, (ii) well-functioning budget allocation and execution, and (iii) incentives for efficient service delivery and value for money.

58. **Intergovernmental fiscal context:** China is a highly decentralized country in terms of fiscal expenditures and is highly centralized in terms of revenues. For these PforR-related activities, county governments have the main responsibility for the program implementation and the corresponding expenditures are recorded under the county government's budget. Counties rely on three HLG transfers to finance these activities: two are general transfers, namely, Transfer for poor areas and Transfer for central-local shared functions on agriculture, forestry, and water affairs; and one is an earmarked transfer (Special transfers for agricultural, forestry, and water affairs).

59. **Program budget structure and classification:** The provincial governments in China adopt a uniform budget classification to prepare budgets and report government expenditures following the instructions of the central Ministry of Finance. Both Guangxi and Guizhou have developed an integrated financial management system to track budgetary expenditures. The Department of Agriculture and Rural Affairs (DARA) has the main responsibility for implementing the

government program of "Agricultural and Rural Modernization" and records the related expenditures under the budget item Agriculture and Rural Affairs (code 21301). The government rural revitalization program is mainly implemented by the Rural Revitalization Administration and the related expenditures are recorded under the budget item Poverty Alleviation (code 21305). After achieving the goal of lifting all out of extreme poverty, China is transiting to pursuing rural revitalization, but the relevant expenditures are still recorded under the budget line Poverty Alleviation. The PforR expenditure program is defined as selected sub-items of the government program that covers RA2 and RA3 activities (see Table 11). Based on the budget data of 2020, the PforR program is 44.8 percent of the government program, 44.4 percent for Guangxi, and 45.3 percent for Guizhou.

60. **Financial sustainability and funding predictability:** The sources of funding for both agricultural development and rural revitalization have been stable. Financial sustainability is not a major concern for the program. Despite the unfolding COVID-19 pandemic, the overall financial situation in Guangxi Region and Guizhou Province and in the 27 pilot counties is sound and stable. The COVID-19 pandemic is expected to have a limited and short-lived impact on government finance. To ensure adequate resources to finance public services and cushion the impact on jobs and household income, the national government significantly increased direct transfers to county governments.

61. Nevertheless, the review of the county governments' expenditures on rural infrastructure and public services revealed the prevailing presence of unfunded allocation to wastewater treatment and solid waste collection, transfer, and treatment. The overall funding for rural infrastructure is available, but the counties will need to release more funds from water supply and rural roads, which by and large have been completed.

62. **Expenditure performance:** The quality of expenditure program management will be critical to achieving the program objectives. The budget outlay in 12 pilot counties of Guangxi and 15 of Guizhou is generally in compliance with the policies and instructions of the high-level government.

63. **The expenditure performance management for RA2 is found adequate for earmarked transfers and performance evaluation has played an instrumental role in steering counties to deliver green agriculture objectives**. In both provinces, the funding for RA2 activities is managed by the DARA and several central and program earmarked funding programs are well linked to the green agricultural development objectives. An example is the largest earmarked transfer, Agriculture Production Development Fund, which accounts for about 50 percent of the total earmarked transfers for the agricultural sector (Table 12). Performance in fund use is monitored and reported annually, which measures the alignment of expenditures with strategic objectives, outcome on agricultural production, including green development, and the robustness of the expenditure management system. The performance result is used in deciding the following year's fund allocation among subnational governments with a weight of 20 percent.

Table 12: Program Expenditures by Functions (US$): Government versus PforR in 27 Project Counties

Code	Budget line	Government program		PforR program		
		15 counties of Guizhou	12 counties of Guangxi	Result Area	15 counties of Guizhou	12 counties of Guangxi
21301	**Agriculture and Rural Affairs**	295.8	330.4			
2130101	Administrative Operation	40.0	23.5	RA1	40.0	23.5
2130102	General Administrative Services	1.4	1.8	RA1	1.4	1.8
2130103	Agency Service	0	2.2			
2130104	Business Operation	38.7	35.8	RA2	38.7	35.8
2130105	Farm Reclamation Operation	0	0.0	RA2	0.0	0.0

Code	Budget line	Government program		PforR program		
		15 counties of Guizhou	12 counties of Guangxi	Result Area	15 counties of Guizhou	12 counties of Guangxi
2130106	Technology Transformation and Promotion Services	11.2	40.7	RA2	11.2	40.7
2130108	Pest Control	3.7	15.4	RA2	3.7	15.4
2130109	Agricultural Product Quality and Safety	0.4	1.3	RA2	0.4	1.3
2130110	Law Enforcement Supervision	0.1	0.1	RA2	0.1	0.1
2130111	Statistical Monitoring and Information Services	0.6	0.1	RA1	0.6	0.1
2130112	Industry Business Management	0.1	1.3	RA2	0.1	1.3
2130114	Foreign Exchange and Cooperation	0	0.1			
2130119	Disaster Prevention and Relief	3.8	1.6	RA2	3.8	1.6
2130120	Stable Farmers' Income Subsidy	0	0.0			
2130121	Agricultural Structural Adjustment Subsidies	8.3	0.9	RA2	8.3	0.9
2130122	Agricultural Production Development	65.0	53.0	RA2	65.0	53.0
2130124	Rural Cooperative Economy	0.5	5.9	RA2	0.5	5.9
2130125	Agricultural Processing and Promotion	4.0	2.7	RA2	4.0	2.7
2130126	Rural Social Undertaking	2.3	10.1			
2130135	Protection, Restoration, and Utilization of Agricultural Resources	24.7	13.2	RA2	24.7	13.2
2130142	Rural Road Construction	1.5	11.8	RA2	1.5	11.8
2130148	Refined Oil Price Reform Subsidy to Fishery	0.9	2.3			
2130152	Subsidy for College Graduates to Work at the Grassroots Level	0	1.3			
2130153	Farmland Construction	40.0	8.4	RA2	40.0	8.4
2130199	Other Agricultural and Rural Expenditures	45.4	97.0			
21305	**Poverty Alleviation/Rural Revitalization**	520.2	951.8			
2130501	Administrative Operation	15.3	5.1	RA1	15.3	5.1
2130502	General Administrative Services	0.7	11.0	RA1	0.7	11.0
2130503	Agency Service	0	0.1			
2130504	Rural Infrastructure Construction	110.0	335.6	RA3	110.0	335.6
2130505	Production Development	270.5	283.3			
2130506	Social Development	4.7	39.3			
2130507	Poverty Alleviation Loan Awards and Interest Subsidies	0.4	10.4			
2130550	Poverty Alleviation Institutions	1.8	6.0			
2130599	Other Poverty Alleviation Expenditures	116.8	260.9			
Total Amount		816	1,282.2		369.9	569.2
As percentage of government program					45.3	44.4

64. **The subprogram for rural revitalization (RA3) is to be reoriented from currently almost exclusively focusing on rural roads and drinking water to covering other public infrastructure and services** such as the renovation of toilets, the recycling and disposal of sewage, and the collection, classification, transfer, and treatment of garbage in rural areas, which are the main concerned services for this PforR. As 2021 is the first year in which the government program transits from poverty reduction to rural revitalization, the government puts high priority on consolidating the achievements of

poverty alleviation. More than half of RRTF is used for industrial development, with the main objective being to sustain farmers' industrial income. Of the funds being allocated for village infrastructure and improvement of living conditions, the majority are spent on supplying rural drinking water, rural roads, and village revitalization (e.g., greening, lighting, house renovation, etc.), while the share of expenditures on rural toilets, sewage, and garbage is less than 1 percent.

65. **In summary, budgets appear largely adequate relative to expected results and aggregated fiscal sustainability issues were not identified as a core concern associated with the expenditures.** The transfers that the project counties received from the central and provincial governments are stable and predictable. Both the central and provincial governments are committed to gearing more budgets toward the poverty counties to cushion the impact of the COVID-19 pandemic.

66. **The expenditure framework is deemed adequate, with the following points needing to be addressed during implementation:**

- In green agricultural development, the central and provincial governments have adopted a variety of measures to steer county governments to deliver green agriculture results. However, the budgets that are spent on activities that support green agriculture are not monitored and reported. This makes it impossible to assess the county governments' efforts. The Bank team recommends that the central and provincial governments consider: (i) developing a green agriculture expenditure taxonomy and monitoring the expenditures on green agriculture and (ii) allocating agriculture-related transfers among counties based on the achievement of green agriculture results to enhance the incentives.
- In rural infrastructure and public services, although funding is available to project counties, the governments need to allocate more funds out of the RRTF for wastewater and solid waste collection and treatment. To ensure expenditure efficiency and value-for-money, the governments should develop an integrated village plan to inform the annual project selection and budget allocation. The integrated village plan should be developed by considering: (i) the connection of the villages to the county's infrastructure network system; (ii) the costs of the infrastructure assets over their life cycle, including capital expenditures and O&M; and (iii) the financing constraint faced by the villages and their sponsoring county governments. Institutional capacity of the project counties needs to be developed and enhanced to appropriately manage the project in these new areas.

67. **Guangxi Region and Guizhou Province should make recourse to a 25 percent PforR advance disbursement to manage the transition from poverty reduction to rural revitalization.** The provinces will need to manage a transition from poverty alleviation to rural revitalization, which requires some additional fiscal resources.

ANNEX 4. SUMMARY FIDUCIARY SYSTEM ASSESSMENT

Program Scope

1. The program will support a subset of activities from the government's national program for rural revitalization as implemented through the subnational provincial programs in Guangxi and Guizhou provinces. Program implementation 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 program objectives. This annex summarizes the main conclusions of the FSA.

Fiduciary System Assessment

2. The scope of the Fiduciary System Assessment is based on the defined boundary and Program Expenditure Framework. The fiduciary team assessed the fiduciary systems of the key implementing agencies at the provincial and county levels, including Provincial Finance Department (PDF), Development Reform Committee (PDRC), Rural Revitalization Administration (RRA), Department of Agriculture and Rural Affairs (DARA), Department of Housing and Urban-Rural Construction (DHURC), Department of Ecological Environment (DEE), and Audit Office. A set of fiduciary assessment data collection sheets was provided to the program counties (12 in Guangxi and 15 in Guizhou) during the preparation mission and most of them submitted the required information. In addition, four counties (Bobai and Yulin in Guangxi and Xifeng and Xingren in Guizhou) were visited and the corresponding line bureaus were interviewed during the preparation mission.

3. The assessment concludes that the program's fiduciary systems are adequate for meeting the 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.

Public Financial Management System

4. The Budget Law of the People's Republic of China, 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. Budgets are prepared at each level of government and each level of government follows a similar process that is relatively standardized throughout China. At the county level, where the PforR will be carried out, sector entities prepare and submit their budget proposals to the corresponding technical division of the county finance bureau for review in early September. Both operating and capital budgets are reviewed for consistency and alignment with higher-level government priorities and policies. A "two-up, two-down process" is followed to arrive at the final budget proposal, which is presented to the county's People's Congress, usually in February. Since the county sector entities prepare their budget in line with the pre-noticed quota, there were no big gaps in most counties between the requested and approved program budget in two provinces in the past three years. However, there are quite a few exceptional counties in which the requested program budget could not be fully satisfied because of a shortage of available funds.

5. Although the 14th Five-Year Plan has been prepared for green agriculture and rural revitalization, no budget is allocated to it. Some government officials expressed their concerns about the shortage of funds in implementing the activities in the plan, especially the financing gaps associated with toilet improvement and rural solid waste and

wastewater collection, transfer, and treatment, and these are activities the Bank would like to support under the proposed program. Since these activities are defined as a local government responsibility, the transfers from upper-level government (central and provincial) are quite limited, and county governments are responsible for exploring the financing sources by themselves, although the financial capacity of most counties is quite weak. The main financing source is non-tax revenue (sales of land), but it is not stable and has become decreased in recent years. The data on fund allocation of rural revitalization cohesion funds, which is one of the main financing sources for these kinds of activities, were collected and analyzed. The rural revitalization cohesion funds are mainly used in three areas: industrial development, rural infrastructure, and social development. About half of the funds are allocated to industrial development. The funds allocated to rural infrastructure represented about 25% in 2020 and 22% in 2021, while the portion on toilets and wastewater and solid waste were about 3% and 1%, respectively, in those years. Most counties did not even arrange funds for these areas.

6. It is also noted that, to mobilize the counties to use the upper-level transfer funds more efficiently in line with their development strategy and priority, some earmarked funds are integrated by the provincial government and distributed to counties (28 earmarked funds are integrated in Guangxi and 17 in Guizhou). However, the mission noted that it is hard for the counties to use these integrated funds in line with their development strategy and priorities since some upper-level government entities still monitor the achievement of the performance indicators attached to the earmarked funds and the counties could not freely use the integrated funds for those areas that are their priorities but not the upper-level government entities' priorities. As a result, a mismatch between the funds requested and funds received for some activities was noted during the field visit, and some activities, including in the village revitalization plan, cannot be implemented in an integrated manner.

7. All budgetary entities were required to prepare accrual-basis financial reporting starting from January 1, 2019. However, the accrual-basis financial reporting is neither submitted to the People's Congress nor audited by external auditors. The primary financial report at each level of government is therefore the budget execution report, which is prepared on a cash basis. Several budget items that capture the program expenditures were selected and the data were analyzed to review the execution status. The budget completion rate is quite satisfactory in program counties of Guizhou Province, which demonstrates that the budgetary entities take budget execution seriously and, once the budget is approved, completion is not a questionable issue.

8. Upper-level government transfers are normally distributed to counties in batches. Most central government transfers for the current year are distributed at the end of the previous year; the others and most provincial government transfers are delivered to counties in different months of the year and some funds are delivered in the last quarter of the year. The provincial finance department sometimes integrates several earmarked funds and distributes them to counties together. The county finance bureau logs the allocated budget quota in the budget system, which enables project implementing agencies to apply for payment following established procedures.

9. An integrated financial management information system (IFMIS) has been established in both provinces. A payment plan for each contract is entered and approved in the system. The payment plan indicates the threshold for direct and authorized payments, which supports the two payment modalities in China's treasury system. Supporting documents for direct payments, applicable to larger payment amounts above the threshold, are reviewed and then approved by the relevant finance bureau sector division and signed off by management before payment through the treasury system. Authorized payments for amounts below the threshold are entered in the treasury system by the budget entity and payment is made by the commercial bank and cleared overnight. Vendor or contractor invoices include vendor

bank account number and other relevant information to make the payment. The budget entity retains the original documents. Since cash-basis accounting is being used by the county finance bureau, the budgetary entities are responsible for monitoring the payable amount due to contractors/suppliers. Based on interviews with some counties, the payment period sometimes is about 6 months.

10. Each county maintains a Treasury Single Account (TSA) and makes payments through a network of commercial banks. The provincial-level treasury can transfer funds to counties at the time of quota allocation through monthly transfers or can monitor payment plans in the system and transfer sufficient funds for counties to cover payments.

11. Counties participating in the assessment indicated that they had not experienced cash shortages. Indicators to measure cash flow availability were not observed. The lack of such indicators is not considered a weakness, given the program's strong funding and availability of cash when needed. Continued strong growth in China's economy suggests that national and provincial governments will continue to make cash available to the program as needed.

12. Since "program" is not a budget classification element, program-based financial reports cannot be generated from the government treasury system. By analyzing program activities and related government budget line items, some budget items (refer to Table 12) that are used to capture program expenditures have been identified and the template will be designed based on these items. The financial reporting template will be finalized and agreed by both parties before loan effectiveness. However, the expenditures captured in these items are more than program expenditures as program expenditures are not tagged in the government treasury system. The information about these budget items can be generated from the IFMIS directly, the data are reliable, and it is easier to track program expenditures by reviewing the detailed vouchers when the external auditors carry out the annual program audit.

13. 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, result verification procedures, etc. For example, related government decrees have been issued for some earmarked funds, which are the main financing sources of program activities, to regulate the usage of these earmarked funds to ensure that the budget could be used for the intended purposes.

14. Provincial sector departments also established many regulations/decrees toward their responsible earmarked funds, and conduct regular or irregular supervision on these funds. Almost all program counties prepared detailed practical guidance on these upper-level regulations/decrees.

15. The IFMIS has been established in both provinces. County finance bureaus are required to report their budget execution monthly by using the data generated from the IFMIS so that budget execution can be monitored closely. Some county line bureaus also submit their monthly fund use reports to upper-level administrative bureaus/departments. Meanwhile, provincial sector departments conduct budget performance evaluation annually to assess whether the public funds are used properly, and the predetermined performance indicators are achieved. The MIS has also been set up in the rural revitalization administration sector with a comprehensive database. Every program activity can be tracked. Government officials conduct field supervision by using the data generated from the MIS.

16. Three layers of the program activity supervision system have been established in both provinces: (a) provincial sector departments carried out regular supervision on some selected counties, for example, the provincial RRA supervised Xiuwen and Xifeng counties every year; (b) municipal sector bureaus also conducted regular reviews on some counties, for example, the municipal development and reform committee supervised Congjiang County every year and

the municipal agriculture and rural affairs bureau visited Xiuwen County every year; and (c) county line bureaus supervised program activities in different manners, for example, regular self-check and irregular cross-verify were practiced in Xingren, Duyun, Ziyuan, and Yizhou counties; a third party was hired to supervise program activities in some counties in both provinces; and the internal audit unit conducted its regular review in several counties.

17. Internal audit practice complies with the Audit Law and the related regulations as issued by the China National Audit Office (CNAO). Article 3 of CNAO Decree No. 11 of 2018 defines five types of internal audit: financial revenue and expenditure audit, accountability audit, performance audit, audit of the implementation of key policies, and internal control and risk audit. Based on the interviews with provincial entities, counties visited, and data collected, it is noted that the internal audit function has not been widely established in the two provinces. At the provincial level, no internal audit function has been set up in related departments but the supervision and performance evaluation bureaus (the unit responsible for internal audit) within the provincial finance department carry out their inspection on the usage of program funds. At the county level, besides the supervision and performance evaluation unit being established within each county finance bureau, several county line bureaus are equipped with an internal audit unit that is responsible for inspection-/internal audit-related tasks.

18. Both provinces and the counties received various external audits and inspections throughout the year, primarily focusing on the proper usage of public funds. The annual external audit findings on budget execution by the provincial audit offices (PAO) are included in their annual report to the provincial People's Congress, and the full audit report is published on the PAO official website. However, because of personnel shortage in the audit offices, not every budgetary unit is audited yearly. The audit strategy for government auditors is to conduct audits on a rolling basis, and for audits to cover multiple years.

19. The audit bureaus in counties carry out audits on budget execution and have access to the necessary data without any restrictions. Several material issues and systemic and control risks are usually detected and disclosed in the audit reports, and remedial action is taken by the audited units effectively and timely. The audit bureaus submit their audit reports to the legislature in a timely manner after receiving the financial reports. The standing committees of the county People's Congress provide timely approval of the audit reports and call for in-depth hearings on the main findings of these reports once a year.

20. Although government auditors indeed audit program funds when they carry out a budget execution audit, accountability audit, and other types of audit, no specific program audit was conducted by PAOs and audit offices of the interviewed counties on the usage of program funds in the past years. To mitigate this risk, an annual program audit is required, and the audit of the proposed program will be conducted by the PAOs. Besides auditing budget execution and other provincial-level entities, the PAOs have been the auditors of Bank-financed projects in the two provinces for about three decades. The PAOs also have experience with auditing PforR projects. The first year's audit report issued by the PAOs is subject to a quality review by the CNAO.

21. To gain reasonable assurance on the proper usage of program funds, the CNAO and the PAOs will agree with the Bank on audit TOR and conducting annual program financial statement audits that will be publicly disclosed. The CNAO and the PAOs will adopt the audit approach and coordination mechanisms used in other Bank-financed PforR operations. The PAOs will coordinate internally to minimize the chances of duplicate audits conducted by different auditors, and to maximize reliance on each other's findings. The auditors will conduct the financial audit on the PforR financial statements in accordance with the audit TOR to meet the Bank's audit requirements. The audit report will be submitted to the Bank

within nine months of the end of the calendar year. Each PAO will issue an audit report separately for its own part. It has been agreed that the program audit would focus on the following aspects:

- Whether the transfers from central and provincial governments have been delivered to the counties timely and completely.
- Whether the program funds are used properly and in line with the applying regulations and procedures, by sampling of program counties.
- Whether the Bank's procurement and safeguard policies and requirements have been fully complied with by all counties.
- Whether the domestic regulations and requirements have been strictly implemented.
- Whether the program financial reporting fairly presents the sources and use of program funds.
- Public procurement system.

22. The Tendering and Bidding Law (TBL) and Government Procurement Law (GPL) are the primary public procurement laws governing public procurement in China. The TBL focuses on construction-related works, goods, and consulting services, while the GPL focuses on fiscal budget funds that finance purchasing activities carried out by government departments, institutions, and organizations. The demarcation line is not clear between the two until the issuance of a monetary threshold[48] for tendering and bidding activities by NDRC and guidance documents by MOF, NDRC, and the respective line ministries. Each province and line ministry issues procurement-related guidance and orders to regulate procurement in its respective administrative jurisdiction or sector. Although fragmented, no conflict occurs with the two laws. Anti-corruption policies and measures are available in laws and regulations to prevent, report, detect, investigate, prosecute, and sanction fraud and corruption.

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

24. The key stakeholders of procurement under the program are line government agencies, procuring entities, procurement agents, design institutes, supervisors, transaction centers, and the selected suppliers/contractors/consultants. The line government agencies plan and obtain approval for the activities to be carried out under the program. Procurement agents assist the procuring entity (government agency itself or its delegated agencies) in preparing procurement documents and facilitating the procurement process. Design institutes make a technical contribution to the procurement process. Supervisors monitor contract implementation. Transaction centers provide service to the procurement process and supervise the process simultaneously. The selected suppliers/contractors/consultants implement the contract as agreed with the employer/purchaser/client.

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

Procurement Overview

[48] https://www.ndrc.gov.cn/xxgk/zcfb/fzggwl/201803/W020190905495130858389.pdf

26. The PforR program will cover all kinds of procurement (i.e., works, goods, and consulting services) and will comprise construction, rehabilitation, and upgrading of rural wastewater management systems and rural solid waste management systems (i.e., agricultural plastic film, agricultural chemical packaging material collection and recycling, supply of wastewater pipelines); construction of treatment and recycling facilities for livestock and poultry manure; acquisition of organic fertilizer; consulting services of engineering design; construction supervision services; developing regulations, standards, and guidelines for GAP and infrastructure; developing mechanisms for budgeting, expenditure tracking, and reporting; developing mechanisms for M&E of rural infrastructure and public services; and training in O&M of wastewater and solid waste systems and training of FCs, FAs, WUAs, input suppliers, agro-enterprises, and rural extension staff. The program-related provincial-level policies and guidelines will be developed by relevant provincial-level government agencies. Some of the activities related to a reduction in fertilizer use; collection, sorting, and recycling of rural solid waste; and enhanced protection and conservation of agricultural ecosystems would be financed through subsidies.

Procurement Performance

27. Procurement is usually efficient. The time from publication of the procurement notice to the deadline for bid submission and opening is normally 20 calendar days. Bid evaluation is usually completed in one day. Once the evaluation is completed, the contract award recommendation is disclosed to all bidders for three days on the official website of the government and the website of the public resource transaction center. If no complaint is received within the standstill period, the contract is awarded promptly and signed within 30 calendar days from the contract award. The bidding process is usually competitive. The data provided by the selected program counties show that competition is adequate. Since most of the contract value is below the threshold of open competitive bidding, competitive negotiation and competitive dialogue are often used, with a minimum of three bidders as mandatorily required by the regulations. In some counties, direct contracting is also allowed when the contract cost estimate is below the threshold of open competitive bidding to reduce the cost of bidding and increase efficiency. The contractor/supplier/service provider is selected from a long list prepared by the county finance bureau through competitive selection. A specific discount rate from the offered price by the contractor/supplier/service provider is also specified in the list of contractors/suppliers/service providers, depending on the category/type of the work/services.

28. During the FSA, data were also collected on cancelation and re-bidding of procurements. Cancelation and re-bidding rarely occur.

Key Conclusions and Recommendations

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

30. **Major financial management risks identified in the fiduciary systems assessment are**: (i) Although the 14th Five-Year Plan has been prepared for green agriculture and rural revitalization, no budget is allocated. The financing gaps associated with toilet improvement and rural solid waste and wastewater collection, transfer, and treatment were identified during the assessment. (ii) Budget quota was distributed to counties/cities in batches and some program funds

were delivered in the second half of the year or even at 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. (iii) Some earmarked funds are integrated by the provincial government and distributed to counties (28 earmarked funds are integrated in Guangxi and 17 in Guizhou). But it is hard for the county to use these integrated funds in line with its development strategy and priorities since some upper-level government entities still monitor the achievement of the performance indicators attached to the earmarked funds. As a result, a mismatch between the funds requested and funds received for some activities was noted, and some activities included in the village revitalization plan can't be implemented in an integrated manner. (iv) "Program" is not a budget classification element in China and the required program financial reporting can't be generated from the government treasury system. (v) Government auditors did not audit the program funds and prepare the program audit report.

31. The proposed mitigation measures follow: (i) Program-based budgeting should be prepared to ensure that program funds can be secured, and related government entities should revise their investment direction and allocate more funds to areas that are defined as priorities in the PforR program. (ii) Provincial entities should revisit their budget quota distribution and take actions to ensure that the budget quota can be timely distributed to the county/city. (iii) Related government entities may need to revisit fund integration and monitoring measures to give the counties more flexibility on fund use in line with their development strategy and priorities. (iv) Several budget line items that are used to capture program expenditures have been identified and a tailored program financial reporting template will be designed for the proposed program. (v) The Bank will work with the PAOs to develop the TOR for program auditing to ensure that program funds can be audited in line with the Bank's policy.

32. 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. The government has recently encouraged the use of electronic bidding. All open-bidding competitive processes are conducted by public resource transaction centers, which provide facilities and modern platforms for processing procurement activities electronically.

33. **The following major procurement risks have been identified:** (i) The intervention of multiple agencies, such as finance, development reform, agricultural and rural affairs, rural revitalization, housing and rural-urban construction, natural resources, ecological and environmental, water bureaus, and city administration bureaus (comprehensive administrative law enhancement bureaus), etc., might be challenging to the implementation of the program. (ii) Multiple implementation agencies involved in procurement transactions might not be aware of the lists of debarred and temporary suspended firms declared by the World Bank and other multilateral development banks, although most of the contracts are of small size, and it is unlikely that these contracts would be awarded to firms debarred or under temporary suspension by the World Bank or other multilateral development banks. (iii) The World Bank may not be informed of fraud allegations and corruption issues during implementation. (iv) Not all the program counties have a public resource transaction center (PRTC) and they have to process open competitive procurement at municipal PRTCs. During busy seasons, municipal PRTCs are lacking in rooms for conducting bid opening and evaluation sessions. Implementation agencies have to queue for room space, leading to delays in the procurement process, thus negatively affecting the program implementation. (v) The program will be implemented at the township and county level. Most of the program's activities comprise simple works geographically spread out for the construction and/or rehabilitation of small basic infrastructure and small-value services. Procurement will most often be conducted through direct contracting because

of the contract's tiny value, and thus limited interest of contractors, consulting supervisions, or design consulting firms in participating. (vi) Contracts may not be completed within the contractual completion time and the contract completion audit may not be completed in a timely manner.

34. **The following mitigation measures have been proposed:** (a) The regional/provincial program implementation agencies and the county program leading groups oversee and supervise the program implementation and the rights and obligations of each agency need to be clearly defined to: (i) limit overlapping of responsibilities, (ii) define the role of each agency, and (iii) avoid undesirable delays; and a procurement agent should be hired to assist with competitive bidding processes. (b) Guangxi and Guizhou PPMOs shall, upon project loan effectiveness, (i) issue an official instruction (to be included also in the PIP) to cause the implementation agencies at the county level and township government to ensure that no contract will be awarded to a firm or individual that is on the debarred list or under temporary suspension; (ii) share the updated lists of the debarred and temporarily suspended firms and individuals on a regular basis and whenever the list is updated with the agencies in charge of procurement; 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. (c) A PAP shall 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. (d) The implementation agencies plan the procurement activities ahead and book as early as possible the bid opening and bid evaluation rooms. (e) To avoid abuse in the adoption of non-competitive processes, the proposed mitigation actions comprise the following: (i) the county government shall maintain a long list of qualified firms, contractors, suppliers, and service providers to have a wide range of options for inviting firms, and (ii) the county government shall enhance data collection and, when possible, add procurement methods in the IFMIS. (f) Human, financial, and policy resources should be allocated by Guangxi DARA and Guizhou RRB for close monitoring of contract implementation progress to minimize or avoid foreseeable cost overruns and/or implementation delays.

35. **Fiduciary risk rating.** Taking into consideration the above-mentioned financial management and procurement risks and the proposed mitigation measures, the overall fiduciary risk of the program is rated as Substantial.

36. **Fiduciary supervision.** Procurement and FM are subject to annual audits by government audit offices. Procurement following the procedures of the TBL is subject to regular supervision and oversight by DRCs at various levels and relevant sector authorities. The Finance Department or bureaus at various levels exercise regular supervision and oversight for procurement following the procedures of the GPL.

37. **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, anti-corruption 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 concerns 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 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 LA and the PAs will also oblige the client to fully comply with obligations under the World Bank's Anti-Corruption Guidelines for PforR operations.

ANNEX 5. SUMMARY ENVIRONMENTAL AND SOCIAL SYSTEMS ASSESSMENT

1. The PforR will promote green and sustainable agricultural and rural development in Guangxi and Guizhou and is thus expected to bring overall E&S benefits. The implementation of activities under the PforR 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 management systems, procedures, capacity, and performance at provincial and county levels, and hence recommends necessary actions to address the identified gaps to enhance E&S performance during the PforR implementation. This annex summarizes the main conclusions of the ESSA.

2. **Potential environmental and social effects.** An E&S risk screening was conducted for the PforR-supported activities during the ESSA preparation, and it concluded that the overall E&S risk rating of this PforR is Substantial.

3. **The PforR will support non-point source pollution control and rural living environment improvement activities in terms of rural domestic wastewater collection and treatment,** rural domestic solid waste collection and transfer, agricultural plastics collection, existing livestock farms' manure treatment and recycling, institutional and capacity-building activities, etc. These activities will generate E&S benefits of reduced NPS pollutant discharge into water bodies, enhanced agro-ecological systems, and improved rural living environment. Activities with the potential to cause significant adverse impacts on the environment and/or people are excluded, including (i) construction of new livestock/poultry farms; (ii) relocation or shutdown of livestock/poultry farms; (iii) rural water supply; (iv) treatment of domestic solid waste (such as incineration and landfill); (v) construction, extension, or upgrading of township or urban wastewater treatment facilities; (vi) use of straw or manure in biogas power generation; (vii) construction of new irrigation systems; (viii) construction or upgrading of rural roads for the purpose of public transportation; (ix) activities that may overlap with ecological resettlement; and (x) other activities that have substantial environmental impacts and are classified as Category A projects as per domestic regulations.

4. **The main potential adverse E&S impacts associated with the PforR activities include** (i) temporary construction-related and site-specific risks/impacts, such as dust, wastewater, noise, solid waste, labor management, small-scale land acquisition, and temporary land use, among others; (ii) impacts on local environment and ecosystem resulting from the operation/implementation of project-supported facilities/activities, such as leakage of untreated effluent from rural wastewater treatment facilities, odor emission from solid waste transfer and manure treatment facilities, and potential NPS pollution from chemical fertilizer and pesticide; (iii) labor management issues, such as protection of workers' health and safety for contractors related to operation of construction equipment, living environment risks in work sites, camps, and living areas, among others; (iv) disturbance to nearby communities, such as traffic and safety issues during construction; and (v) impacts on farmers' livelihoods due to permanent land acquisition and temporary land occupation. These potential adverse E&S impacts are neither significant nor irreversible and can be easily identified and readily avoided, minimized, and mitigated through known and demonstrated technologies and good management practices.

5. **Assessment of environmental and social management system.** A comprehensive review of the legal and regulatory framework for E&S management relevant to the PforR activities was conducted, including legal framework, management procedures, and institutional arrangements, performance, and capacity.

6. Overall, China has established a comprehensive legal framework for management of E&S issues at both national and provincial levels (including Guangxi and Guizhou provinces), which consists of laws, regulations, guidelines, and standards consistent with the Bank's PforR Policy and Directive. The legal framework provides a reasonable basis for addressing the E&S issues related to the PforR activities.

7. **Environmental management systems (EMSs).** Since the promulgation of its first Environmental Protection Law in 1979, China has gradually developed a comprehensive environmental management legal framework. In recent years, the Chinese government has been making efforts to reform its EMSs by enhancing its law enforcement capacity. A variety

of laws, regulations, and guidelines have been, or are in the process of being, issued or updated by national and local governments regarding environmental management in terms of Environmental Impact Assessment (EIA), pollution control, natural habitat conservation, OHS management, etc.

8. The key government stakeholders involved in environmental management under the PforR include various levels of ecology and environment bureaus (EEBs), housing and urban-rural development bureaus (HURDBs), agriculture and rural affairs bureaus (ARABs), natural resource bureaus (NRBs), forestry bureaus (FBs), health commissions (HCs), emergency management bureaus (EMBs), etc. EEBs review and approve domestic EIA instruments, oversee the environmental compliance of all PforR facilities/activities, and manage the construction and operation of rural wastewater treatment facilities. The HURDBs are in charge of rural domestic solid waste collection, transfer, and disposal. The ARABs supervise activities related to fertilizer and pesticide use and reduction, agricultural plastic and crop straw collection, livestock/poultry manure treatment and recycling, etc. The FBs are responsible for natural habitat management. The HCs and EMBs have overall responsibility for OHS management.

9. Consultations with government stakeholders at provincial, county, township, and village levels and site visits to typical projects in the sample counties Guangxi and Guizhou have demonstrated that the legal framework, implementation procedures, and institutional arrangements and performance related to environmental management of the PforR activities are consistent with the core principles of the Bank's PforR ESSA Guidance and can provide generally effective EMSs for the implementation of the PforR activities. The assessment also identifies some inadequacies in the EMSs. For example, at some rural waste transfer stations, leachate and odor collection and treatment systems are inefficient, and workers' protection, sanitation, and resting facilities are not enough. In addition, most rural wastewater treatment facilities do not have sufficient O&M funds and professional skills, etc.

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 PforR activities. Subject to the potential social impacts and risks identified, the social system assessment focused on the dimensions concerning social impacts and risk 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. Guangxi and Guizhou 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 the 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 labor authorities established a tripartite mechanism in labor relations with trade unions and enterprises to solve relevant labor problems. The cultural departments are responsible for managing adverse impacts on physical cultural heritage. The NRBs enforce land acquisition, compensation, and resettlement with support from and coordination by township governments and village committees. The Ethnic and Religious Affairs Bureaus (ERABs) develop the related development plans as required by the jurisdictional governments, protecting the lawful rights and interests of minority residents. Other line bureaus, such as social security bureaus, women's federations, 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 and support vulnerable groups. For example, poverty reduction offices or countryside revitalization bureaus are mainly responsible for poverty reduction, the 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 positive. However, the assessment also identified some minor gaps for further improvement to enhance social impacts, which is mainly for some of the PforR facilities, especially scattered small facilities, such as manure disposal facilities, small wastewater treatment facilities,[49] and small rural waste collection and transfer facilities. There is no social risk or impact assessment executed and no management and monitoring plans formulated at the preparation stage, and record keeping and documentation of the public participation and grievance redress activities at the project implementation stage need improvement.

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 Bank's latest guidance notes[50] on public consultation in response to the outbreak. Relevant stakeholders, including line government departments, enterprise representatives, workers, and local communities, were consulted in the process through virtual meetings and field visits to selected counties. The draft ESSA report was shared with Guangxi and Guizhou provincial PMOs, relevant provincial government authorities, and all 27 PforR counties, and online consultation workshops were carried out with the key stakeholders at provincial and county levels in January 2022. The participants voiced their support for implementing the proposed PforR 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 management systems. Some participants provided valuable opinions on the ESSA context, which have been reflected in the revised ESSA. The ESSA was disclosed on the Bank's website on February 9, 2022, and on the Guangxi and Guizhou regional/provincial websites on February 8, 2022.

14. **Key conclusions and recommendations.** The ESSA concluded that, although the national and provincial systems for addressing E&S impacts are generally consistent with the Bank's PforR Policy and Directive, some room still exists to improve strengthening the efficiency and effectiveness of E&S management under the PforR. The key recommendations follow:

(i) Improve rural solid waste transfer stations by building or updgrading the leachate and odor collection and treatment systems and providing necessary PPE, sanitation, and resting facilities for workers.

(ii) Provide sufficient O&M funds to rural WWTFs and professional skills training to O&M staff.

(iii) Provide farmers with training on chemical fertilizer reduction, organic fertilizer replacement, and agricultural plastics management. Local ARABs should develop training plans on rational and scientific application of fertilizer and proper management of waste plastics (mulch film and pesticide and fertilizer packages), conduct publicity and education to raise farmers' awareness of environmental protection, and establish subsidization and incentive mechanisms.

(iv) For small investment projects, a special chapter is included in the feasibility study report for detailed social risk identification and assessment according to Social Stability Risk Assessment (SSRA) regulations, including the social risk management plan and the monitoring plan formulated. Second, for large investment projects, a special SSRA will be conducted according to the SSRA regulations at the feasibility study stage to identify, screen, and assess potential social risks, including the social risk management plan and the monitoring plan formulated. Another aim is to improve record keeping for public participation and

[49] Typically, these WWTFs have a maximum capacity of treating 500 m3 per day and average of 50–100 m3 per day.
[50] Technical Note: Public Consultation and Stakeholder Engagement in World Bank-Supported Operations When There Are Constraints on Conducting Public Meetings (dated March 20, 2020).

grievance redress activities. Monitoring reports are submitted to the county PMOs semi-annually, which should also be included in the semi-annual reports submitted to the provincial PMOs.

15. To implement these recommendations, the following actions are proposed in the PAP:

(i) Improve leachate and odor management measures and workers' PPE, sanitation, and resting facilities for rural domestic solid waste transfer stations;

(ii) Improve funding and professional skills for O&M of rural wastewater treatment facilities; and

(iii) Provide training to farmers on reduction in chemical fertilizer use, using organic fertilizer, and managing agricultural plastics.

ANNEX 6. PROGRAM ACTION PLAN

Action Description	Source	DLI#	Responsibility	Timing		Completion Measurement
1. Issue an official notification that no contract will be awarded to either a firm or an individual appearing on either the World Bank's debarred list or under temporary suspension list.	Fiduciary Systems		RPMO/PPMO	Other	No later than loan effectiveness	Provincial/Regional official notifications to counties are issued and copies are shared with the World Bank
2. Regularly inform the World Bank of any credible and material allegations of fraud and/or corruption regarding the PforR's activities as part of the overall PforR's reporting requirements.	Fiduciary Systems		RPMO/PPMO	Recurrent	Semi-Annually	Reflected in the PforR's quarterly/annual progress reports
3. Guangxi and Guizhou to Issue updated policies related to funds integration and budget performance evaluation measures that increase the discretion of the county governments to utilize funds in line with their development plans and priorities.	Fiduciary Systems		RPMO/PPMO and relevant government agency	Due Date	31-Dec-2022	Document is issued by the relevant government agencies and shared with the World Bank.
4. Implement measures to improve rural solid waste transfer stations by enhancing leachate	Environmental and Social Systems	DLI 8	PHURDD, county HURDBs	Recurrent	Continuous	RPMO/PPMO submit transfer stations' completion acceptance reports as well as semi-annual progress reports to the World Bank, to provide information about completion

and odour management facilities and providing PPE, sanitation and resting facilities for workers.						and operation of the relevant facilities.
5. Undertake measures to ensure availability of adequate operations and maintenance (O&M) funding for the wastewater treatment facilities.	Environmental and Social Systems	DLI 8	PEEDs, county EEBs	Recurrent	Continuous	RPMO/PPMO submit O&M funding arrangement documents as well as semi-annual progress reports to the Bank, to provide information about O&M funding arrangement
6. Prepare and implement detailed training and capacity building plans: (a) GA skills training plan; (b) training plan for the O&M of the rural solid waste and wastewater facilities; and (c) capacity building plans supporting the achievement of DLIs.	Other		RPMO/PPMO and CPMOs	Recurrent	Yearly	The training and capacity building plans are prepared by PMOs and cleared by the Bank. Records of the people trained in various skills are kept in the MIS.

ANNEX 7. IMPLEMENTATION SUPPORT PLAN

Main focus of implementation support

Time	Focus	Skills Needed	Resources Estimate
First 12 months	Support for startup activities	Task Team Leaders	4 SW and 2 trips/staff (a total of 8 SW)
	Support for the establishment of IT-based systems for budgeting/expenditure tracking, and O&M of infrastructure	Financial Management Specialist Economist Municipal Engineer	4 SW and 2 trips/staff (a total of 12 SW)
	Support for the establishment of the M&E system and complete baseline surveys	M&E Expert	4 SW and 2 trips/staff
	Support for the hiring of independent third-party verification agents	M&E Expert Agriculture Economist Municipal Engineer	4 SW and 2 trips/staff (a total of 12 SW)
	Training and capacity building in the fiduciary (FM and procurement) system	Financial Management Specialist Procurement Specialist	4 SW and 2 trips/staff (a total of 8 SW)
	Training and capacity building in environmental and social safeguards	Environmental Management Specialist Social Development Specialist	4 SW and 2 trips/staff (a total of 8 SW)
12–48 months	Program implementation support		
	Review of implementation progress toward achieving PDO of the PforR	Task team Leaders	1 SW/2 staff/year
	Conduct two implementation support missions for each region/province per year	Core PforR task team	4 SW/staff/twice a year (for a total of 120 SW/year)
	Review the semi-annual third-party monitoring and third-party verification agency reports	Task Team Leaders and Technical Experts for each DLI	4 SW/year
	Review the annual audit reports	Fiduciary teams	1 SW/year
	Review the semi-annual environmental and social safeguards reports	Safeguards team	2 SW/year
	Provide training and capacity building in fiduciary and environmental and social safeguards	Fiduciary and Safeguards teams	2 SW/PforR life
	Conduct the mid-term review mission	Core PforR task team	4 SW/staff/once (for a total of 60 SW)
	Prepare Program Completion Report	Core PforR task team	4 SW/staff (for a total of 8 SW)
Other			

Task Team Skills Mix Requirements for Implementation Support (Template)

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Task Team Leader	10/year	3/year	
Co-Task Team Leader	10/year	3/year	
Economist	4/year	2/year	
Financial Management Specialist	6/year	2/year	
Procurement Specialist	4/year	2/year	
Environmental Management Specialist	4/year	2/year	
Social Management Specialist	4/year	2/year	
Municipal Engineer	4/year	2/year	
Water Resoure Engineer	4/year	2/year	
Gender Speciaist	2/year	2/year	
Livestock Management Specialist	4/year	2/year	
Agribusiness Specialist	4/year	2/year	

Note: All staff are based in country offices

Team List

No.	Name	Title	Unit
1.	Mr. Ladisy Komba Chengula	Lead Agriculture Economist	SEAAG
2.	Mr. Wendao Cao	Senior Agricultural Economist	SEAAG
3.	Mr. Xueming Liu	Agricultural Econmist	FAO
4.	Ms. Yuan Wang	Senior Procurement Specialist	EEAR1
5.	Mr. Yi Dong	Senior Financial Management Specialist	EEAG1
6.	Ms. Min Zhao	Senior Economist	EEAG1
7.	Mr. Dewen Wang	Senior Social Protection Economist	HEASP
8.	Mr. Paul Jonathan Martin	Lead Natural Resource Management Specialist/Peer Reviewer	SLCEN
9.	Mr. Paavo Eliste	Lead Agricultural Economist/Peer Reviewer	SAEA3
10.	Mr. Johannes Georges Pius Jansen	Senior Agricultural Economist/Peer Reviewer	SLCAG
11.	Mr. Kai Kaiser	Senior Governance and Public Sector Specialist/Peer Reviewer	EECG1
12.	Mr. Bin Xu	Environmental Engineer	SEAE1
13.	Mr. Alejandro Alcala Gerez	Operations Manager	EACCF
14.	Mr. Yiren Feng	Senior Environmental Specialist	SEAE1
15.	Ms. Liping Xiao	Senior Education Specialist	HEAED
16.	Ms. Minghe Zheng	Finance Officer	WFACS
17.	Mr. Aristeidis Panou	Senior Counsel	LEGAS
18.	Mr. Minghe Tao	Senior Municipal Engineer	SEAU2
19.	Ms. Yunqing Tian	Program Assistant	EACCF
20.	Ms. Xuan Peng	Senior Program Assistant	EACCF
21.	Ms. Fang Yang	Gender Specialist Consultant	EACF

No.	Name	Title	Unit
22.	Mr. Guoxin Zhou	Social Specialist Consultant	SEAS1
23.	Ms. Chunyan Hou	Environmental Specialist Consultant	SEAE1
24.	Ms. Li Du	Senior Financial Consultant	SEAW1
25.	Mr. Yun Ma	Financial Consultant	SEAW1
26.	Mr. Hongkun Yang	Procurement Specialist Consultant	EEAR1

ANNEX 8. MAP (CHN4602)