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Report No: PAD5181

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF US$250 MILLION

TO THE

PEOPLE'S REPUBLIC OF CHINA

FOR A

CHINA PLASTIC WASTE REDUCTION PROJECT (SHAANXI)

March 2, 2023

Environment, Natural Resources and the Blue Economy Global Practice
East Asia and Pacific Region

CURRENCY EQUIVALENTS

Exchange Rate Effective February 10, 2023

Currency Unit =	Chinese Yuan (CNY)
US$1.00 =	CNY 6.81

FISCAL YEAR
January 1 - December 31

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ABBREVIATIONS AND ACRONYMS

CCDR	Country Climate and Development Report
CE	Citizen Engagement
CPF	Country Partnership Framework
CPMO	County Project Management Office
DA	Designated Account
DARA	Department of Agriculture and Rural Affairs
DFIL	Disbursement and Financial Information Letter
E&S	Environmental and Social
EIA	Environmental Impact Assessment
EPR	Extended Producer Responsibility
ERR	Economic Rate of Return
ESC	Environmental Sanitation Center
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standards
EV	Electric Vehicle
FM	Financial Management
FMM	Financial Management Manual
FSR	Feasibility Study Report
FYP	Five-Year Plan
GCRF	Global Crisis Response Framework
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GRM	Grievance Redress Mechanism
ICR	Implementation Completion and Results Report
KPI	Key Performance Indicator
KWTP	Kitchen Waste Treatment Plant
M&E	Monitoring and Evaluation
MARA	Ministry of Agriculture and Rural Affairs
MEE	Ministry of Ecology and Environment
MIS	Monitoring and Information System(s)
MOF	Ministry of Finance
MOHURD	Ministry of Housing and Urban-Rural Development
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
MTR	Midterm Review
NDC	Nationally Determined Contribution
NDRC	National Development and Reform Commission
NPV	Net Present Value
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
PAD	Project Appraisal Document
PBIF	Performance-Based Incentive Financing

PDO	Project Development Objective
PDRC	Provincial Development and Reform Commission
PFD	Provincial Finance Department
PIU	Project Implementation Unit
PLG	Project Leading Group
POM	Project Operations Manual
PMO	Project Management Office
PP	Procurement Plan
PPMO	Provincial Project Management Office
PPSD	Project Procurement Strategy for Development
PSC	Project Steering Committee
RAP	Resettlement Action Plan
SEF	Stakeholder Engagement Framework
SEP	Stakeholder Engagement Plan
SIA	Social Impact Assessment
STEP	Systematic Tracking of Exchanges in Procurement
SWM	Solid Waste Management
TA	Technical Assistance
T/y	Tonnes/year
UMB	Urban Management and Law Enforcement Bureau

TABLE OF CONTENTS

DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
China	China Plastic Waste Reduction Project (Shaanxi)	
Project ID	**Financing Instrument**	**Environmental and Social Risk Classification**
P176989	Investment Project Financing	High

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Performance-Based Conditions (PBCs)	[ ] Small State(s)
[ ] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternate Procurement Arrangements (APA)	[ ] Hands-on Enhanced Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date
23-Mar-2023	31-Dec-2029

Bank/IFC Collaboration

No

Proposed Development Objective(s)

To reduce plastic pollution from municipal solid waste in selected under-served rural areas of Shaanxi Province, improve provincial plastic waste management, and draw lessons on plastic waste management relevant at the national level.

Components

Component Name	Cost (US$, millions)
Component 1: Institutional Strengthening and Capacity Building	11.00
Component 2: Municipal Solid Waste Management Improvement and Agricultural Plastic Waste Management Pilot	326.00
Component 3: Project Management, Monitoring and Evaluation	3.00

Organizations

Borrower:	People's Republic of China
Implementing Agency:	Provincial Development and Reform Commission

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	340.00
Total Financing	340.00
of which IBRD/IDA	250.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	250.00

Non-World Bank Group Financing

Counterpart Funding	90.00
Borrower/Recipient	90.00

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2023	2024	2025	2026	2027	2028	2029	2030
Annual	0.00	10.00	25.17	39.00	40.10	54.48	53.02	28.23

Cumulative	0.00	10.00	35.17	74.17	114.27	168.75	221.77	250.00

INSTITUTIONAL DATA

Practice Area (Lead)

Environment, Natural Resources & the Blue Economy

Contributing Practice Areas

Urban, Resilience and Land

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	Moderate
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Moderate
6. Fiduciary	Moderate
7. Environment and Social	High
8. Stakeholders	Moderate
9. Other	
10. Overall	Substantial

COMPLIANCE

Policy

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

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

Environmental and Social Standards Relevance Given its Context at the Time of Appraisal

E & S Standards	Relevance
Assessment and Management of Environmental and Social Risks and Impacts	Relevant
Stakeholder Engagement and Information Disclosure	Relevant
Labor and Working Conditions	Relevant
Resource Efficiency and Pollution Prevention and Management	Relevant
Community Health and Safety	Relevant
Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Relevant
Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant
Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Relevant
Cultural Heritage	Relevant
Financial Intermediaries	Not Currently Relevant

NOTE: For further information regarding the World Bank's due diligence assessment of the Project's potential environmental and social risks and impacts, please refer to the Project's Appraisal Environmental and Social Review Summary (ESRS).

Legal Covenants

Sections and Description

Institutional Arrangements

Project Agreement (PA), Schedule, Section I.A.1: The Project 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) the Provincial Project Steering Committee; (b) the Provincial Project Management Office; (c) a Project leading group in Baoji City and each of the Project Districts/Counties; and (d) Project management office or implementation unit, as the case may be, in Baoji City and each of the Project Districts/Counties.

Sections and Description

Annual Work Plans

PA, Schedule, Section I.B.1: The Project Implementing Entity shall: (a) prepare and furnish to the Bank by October 31 in each year, beginning in 2023, a draft Annual Work Plan for review and comment, summarizing the implementation progress of the Project for the said year and the activities under the Project to be undertaken in the following calendar year, including the proposed annual budget for the Project; (b) taking into account the Bank's comments, finalize and furnish to the Bank no later than December 31 in each year, beginning in 2023, the Annual Work Plan, acceptable to the Bank; and (c) thereafter ensure the implementation of the Project during the following calendar year in accordance with the Annual Work Plan agreed with the Bank and in a manner acceptable to the Bank.

Sections and Description

Project Operations Manual

PA, Schedule, Section I.B.2: The Project Implementing Entity shall apply the Project Operations Manual in a timely and efficient manner acceptable to the Bank.

Sections and Description

Environmental and Social Standards

PA, Schedule, Section I.C: The Project Implementing Entity shall ensure that the Project is: (a) carried out in accordance with the Environmental and Social Standards, in a manner acceptable to the Bank; and (b) implemented in accordance with the Environmental and Social Commitment Plan.

Sections and Description

Financing Arrangements

PA, Schedule, Section I.D: The Project Implementing Entity shall make loan proceeds of the Loan available to the Project Districts/Counties, under terms and conditions acceptable the Bank.

Sections and Description

Performance-based Incentive Financings

PA, Schedule, Section I.E: The Project Implementing Entity shall cause the Project Districts/Counties to : (a) make PBIFs to Eligible Beneficiaries in accordance with eligibility criteria and procedures acceptable to the Bank as set out in the PBIF Sub-manual; and (b) shall only make the proceeds of the PBIFs available to such Eligible Beneficiaries after the respective Project District/County has: (i) entered into an Implementation Agreement with the Eligible Beneficiary on terms and conditions acceptable to the Bank, and (ii) upon the submission of evidence acceptable to the Bank verifying the performance of the Eligible Beneficiaries in accordance with the terms of the Implementation Agreement and the PBIF Sub-Manual.

Sections and Description

Mid-term Review

PA, Schedule, Section II.2: The Project Implementing Entity shall prepare, under terms of reference acceptable to the Bank, and furnish to the Bank no later than June 30, 2026, a consolidated mid-term review report for the Project.

Conditions

Type	Financing source	Description
Disbursement	IBRD/IDA	LA, Schedule 2, Section III.B.1(b): No withdrawal shall be made for PBIFs under Category (2), until and unless the Bank is satisfied, and has notified the Borrower of its acceptance, that the Project Implementing Entity has adopted and incorporated in the Project Operations Manual, the PBIF Sub-Manual, in form and substance acceptable to the Bank.

I. STRATEGIC CONTEXT

A. Global and Country Context

Global Context

1. **Over 80 percent of ocean plastics is estimated to come from unmanaged or poorly managed municipal solid waste[1] (MSW) due to improper waste management operations, infrastructure, and systems**.[2] Global MSW generation is projected to increase by 73 percent between 2020 and 2050.[3] The proportion of plastics in the waste is also expected to increase, driven by growth in prosperity, urbanization, and consumption. Today, around 33 percent of all MSW is dumped openly.[4] Plastics are found in every type of natural environment[5] and an estimated 8 million tonnes[6] accumulate in the world's oceans annually.[7] MSW is also responsible for 5 percent of global CO_2e emissions[8] as well as 20 percent of global methane that stems from human activity.[9] In a business-as-usual scenario, both the flow of plastics to the oceans and greenhouse gas (GHG) emissions from waste will continue to increase along with increasing waste generation. Substantial investments and improvements will be required to reverse these trends.

2. **China plays an important role in reducing global marine pollution, as it is the largest consumer and producer of plastic.** Its policies and investments have a direct and material contribution to the global marine public goods agenda. Today China contributes to ocean plastic waste pollution mainly through discharge of MSW from rural areas. One-quarter to one-half of China's rural MSW—including municipal and agricultural waste—is not adequately collected, treated, or disposed,[10] thus remaining in the environment where it can migrate to waterways and the ocean. In contrast, urban MSW is nearly universally collected and treated. This reflects China's concerted efforts over the past decade to significantly improve urban waste systems. Recognizing rural areas lag in service coverage and quality of waste management, and are thus a source of pollution, China has recently started to shift its attention from urban to rural regions, including through targeted policy guidance, development of technical specifications, and steps toward increasing financial resources for rural systems. It also seeks, through the present project, to learn from and, in time, replicate-at-scale best practice in rural waste management—an area universally regarded as more difficult to organize and sustain compared to urban systems. As rural waste management remains a global challenge, China's efforts could potentially offer replicable models to other mid- or low- income countries. Addressing China's lagging rural municipal solid waste management (MSWM) systems will be an essential step toward minimizing plastic ocean debris originating from China and reducing global plastic pollution.

[1] MSW is defined to include *residential, commercial, and institutional waste*, in line with the definition of MSW by the Organisation for Economic Co-operation and Development (OECD), Eurostat, United States Environmental Protection Agency (US EPA), and the "What a Waste 2.0" report produced by the World Bank (2018).
[2] Ocean Conservancy, and McKinsey Center for Business and Environment. 2015. "Stemming the Tide: Land-based Strategies for a Plastic-Free Ocean."
[3] Kaza, S., S. Shrikanth, and S. Chaudhury. 2021. *More Growth Less Garbage*. World Bank.
[4] World Bank. 2018. *What a Waste 2.0*.
[5] UNEP (United Nations Environment Programme). 2018. *Plastic Planet: How Tiny Plastic Particles and Polluting our Soil*.
[6] The tonne is a metric unit of mass equal to 1,000 kilograms. It is also referred to as a metric ton.
[7] Jambeck et al. 2015. "Plastic Waste Inputs from Land into the Ocean." *Science* 347: 768-771.
[8] World Bank. 2018. *What a Waste 2.0*.
[9] Global Methane Assessment, CCAC, and UNEP. 2021. "Global Methane Pledge." Methane is among the most powerful drivers of climate change. Reducing methane emissions has been prioritized as an urgent climate measure by the international community.
[10] Rural Infrastructure and Basic Public Services Section, Communique of the 3rd National Agriculture Census (December 2017) http://www.stats.gov.cn/tjsj/tjgb/nypcgb/qgnypcgb/201712/t20171215_1563589.html.

Country Context

3. **After decades of impressive growth, China has made a strong commitment to transition toward a more balanced and sustainable growth model focused on sustainable resource management, environmental protection, and ecological conservation.** China's rapid growth over the last four decades has led to impressive poverty reduction but has also been accompanied by significant pollution and GHG emissions. Rapid growth was made possible by a wide range of reforms, which transformed China's state-dominated, planned, rural, and closed economy, enabling more than 850 million people to escape poverty. One of the negative externalities of this rapid development has been environmental pollution and impacts on health, natural resources, and ecosystems. Recognizing these challenges, China has made a strong commitment to transition toward a more balanced and sustainable growth model focused on sustainable resource management, environmental protection, and ecological conservation. The 14th Five-Year Plan (FYP) (2021–2025) continues the focus of the previous two FYPs on improved resource utilization, energy efficiency, emission reduction, and pollution abatement, as well as on the preservation and restoration of ecosystems. In 2020, China committed to reach carbon peaking by 2030 and zero net carbon emissions by 2060. These objectives led to a series of policy initiatives, including major decisions concerning solid waste management (SWM), plastic pollution control, green and low-carbon resource circularity, and decarbonization. As an overarching measure, China has amended the Circular Economy Law and launched the 14th FYP on Circular Economy, which aim to decouple economic growth from resource consumption and pollution and achieve a reduction in carbon emissions. This and other policies summarized in subsequent sections provide a solid basis for the World Bank's assistance through a programmatic approach to plastic waste reduction, of which this project is a part (see paragraph 12).

B. Sectoral and Institutional Context

4. **Efforts to transition toward a circular economy in China are evolving quickly.** Sector developments are driven by efforts to reduce pollution and transition to more sustainable practices. Important recent initiatives include, among others, (a) "Further Strengthening Plastic Pollution Control" policy document (2020) that envisages targeted measures regarding single-use plastics; (b) the new "Law on Solid Wastes" (2020) that introduces sustainability measures; and (c) the "Guiding Opinions on Accelerating the Development of a Green and Low-Carbon Circular Economy" (2021) focused on recycling and utilization of renewable resources. Collectively, these documents create a framework for improved waste management and significant progress has already been observed in urban China.

5. **Nearly all urban waste[11] and around half of the rural waste is collected and treated; the remaining rural MSW may remain in the environment and is considered a major source of environmental pollution.**[12] China generates approximately 449 million tonnes/year (t/y) of MSW, of which 138–150 million tonnes is from rural areas.[13] As with other municipal services, the eastern coastal cities offer better access to and quality of waste services as compared to the inland west; similarly, waste services are, in general, more developed in urban core areas compared to peri-urban and rural areas. For rural China, official statistics are scarce since services are not well established. In 2017, based on estimates for earlier years, it was assessed that 47 percent of the generated rural MSW is disposed of in line with national standards.[14] In late 2017, the National Bureau of Statistics of China reported that MSW in one-quarter to one-half of villages in China remains unmanaged.[15]

[11] China Statistical Yearbooks (2018, 2019, 2020).
[12] China Association of Urban Environmental Sanitation, the China Municipal Waste Development Report (October 2017).
[13] Urban and Rural Municipal Solid Waste in China and the Circular Economy, World Bank (2019).
[14] Ibid.
[15] Rural Infrastructure and Basic Public Services Section, Communique of the 3rd National Agriculture Census (December 2017). http://www.stats.gov.cn/tjsj/tjgb/nypcgb/qgnypcgb/201712/t20171215_1563589.html.

6. **Shaanxi Province has a higher percentage of rural waste left in the environment than most provinces in China.** Around 80 percent[16] of the rural MSW in the province is inadequately disposed of and subject to migration to water bodies, rivers, and the ocean, compared to approximately 40 percent in the rest of West China and 50 percent in Northeast China.[17] Shaanxi is located within both the Yellow and the Yangtze River watersheds, which together with their tributaries serve as significant conduits of plastics to the ocean. With a population of almost 40 million, the province generates 8.94 million tonnes of MSW, of which approximately 3.2 million tonnes are from rural areas. Like other parts of China, waste generation is expected to continue to increase in Shaanxi, driven by economic growth and urbanization (nationally, there is a 67 percent projected increase between 2020 and 2050[18]). This further emphasizes the need to rapidly improve waste systems and reduce the percentage of waste that is left unmanaged. The outcomes intended under this project—reduced leakage of plastic waste to the environment, increased collection/treatment of MSW, and the introduction of novel approaches in waste management—will have demonstrative effect beyond Shaanxi. The project is intended to bring international good practices and demonstrate a scalable approach toward the transformation of rural waste management in China.

7. **China has recently started shifting its attention within the municipal solid waste management (MSWM) sector from urban to rural areas as part of an effort to equalize the quality of urban and rural services and reduce pollution.** Currently, large volumes of rural waste remain in the environment due to a lack of sufficient infrastructure and equipment, low capacity, high cost and insufficient financing, and dispersed institutional responsibilities for planning and operations. The 14th FYP on MSW Separation and Treatment Facilities Development (National Development and Reform Commission (NDRC)/Ministry of Housing and Urban-Rural Development (MOHURD) (2021) envisages rural waste management to gradually integrate with the much more developed urban system and encourages the adoption of a regional approach including strategic planning, construction of shared facilities, and coordinated interjurisdictional service delivery. In April 2021, MOHURD issued the Standards for Rural MSW Collection, Transfer, and Treatment that provide general standards and technical specifications for the construction and operation of rural systems. Other policies and programs in support of China's accelerated urban-rural integration are similar in their focus to diminish urban-rural disparities in access to and quality of services.

8. **The MSWM sector in China is financed mainly by general revenue subsidies.** Urban SWM systems have suffered from low waste fees that do not cover municipal handling costs. Following the revision of the Solid Waste Law in 2020, local authorities above county level are required to establish charging systems following the "polluter pays" principle. Rural areas and local authorities below county level are typically more fiscally constrained, while the unit cost for waste handling is often higher due to the long transport distances and low quantities. As costs continue to increase following the introduction of waste separation at source and more advanced treatment, long-term financing along with cost optimization and effectiveness become increasingly important for rural waste services.

9. **China has the largest agricultural area under plastic films (also known as 'plastics mulch') in the world, and about one-third of that plastic remains in the soil after use.[19] In Shaanxi, essentially all ground plastic film remains either uncollected from land or is dumped after use.[20]** The area under plastic cover in China grew more than 150-fold between 1982 and 2018 and reached over 18 million ha, corresponding to a total of 2.5 million tonnes of plastic

[16] MOHURD, https://www.mohurd.gov.cn/gongkai/fdzdgknr/sjfb/tjxx/index.html.
[17] Rural Infrastructure and Basic Public Services Section, Communique of the 3rd National Agriculture Census (December 2017) http://www.stats.gov.cn/tjsj/tjgb/nypcgb/qgnypcgb/201712/t20171215_1563589.html.
[18] Kaza, S., S. Shrikanth, and S. Chaudhury. 2021. *More Growth Less Garbage*. Washington, DC: World Bank.
[19] http://nyncj.taian.gov.cn/art/2021/8/27/art_45390_10289212.html
[20] Feasibility Study Reports (FSRs), November 2022.

films used.[21] Plastic film has been key to increased farm yields, helping China achieve food security for its large population and reduce food loss. At the same time, plastic film presents a serious environmental challenge if not managed properly. Government strategies to reduce pollution are based on its "reduce, reuse, and replacement" approach, that is, a calibrated approach promoting responsible use of plastics by the agri-food systems working on both demand and supply sides. In terms of "reuse", a national pilot program led by the Ministry of Agriculture and Rural Affairs (MARA) was rolled out in three provinces to test the transition to thicker[22] film (>0.01 mm) and extended producer responsibility (EPR) arrangements for agricultural plastics. The pilots are based on a system of subsidies paid to farmers, waste recycling outlets, and processing enterprises. In terms of "replacement", MARA is subsidizing a pilot for biodegradable films; and in terms of "reduce", MARA advocates reduction in usage of plastic film where possible. MARA plans the establishment of ledger systems at national as well as province-city-county levels, based on regular inputs by counties, capturing plastic film purchase and use, and collection, handling, and recycling data. MARA is also leading the establishment of a plastic film residue monitoring network in some provinces. The pilot results of the above initiatives[23] across China have been uneven. Presently, no single approach has been developed for nationwide replication, and the establishment of a long-term mechanism for agricultural plastic film waste pollution control remains a key challenge.[24]

10. **The governance of MSWM in China involves a large number of government agencies,** including NDRC which is responsible for strategy and policy formulation; MOHURD is responsible for the planning, construction, and operation and maintenance (O&M) of waste facilities; the Ministry of Commerce organizes and regulates the market-based resource recycling from urban waste streams; the Market and Supply Cooperative handles resource recycling in rural areas; MARA organizes the treatment of agricultural wastes; and the Ministry of Ecology and Environment (MEE) is focused on environmental compliance monitoring. These institutional responsibilities are mirrored at the subnational level. The ministerial mandates and responsibilities cascade to line departments at the four administrative levels under the central government.

C. Relevance to Higher Level Objectives

11. **The project is aligned with the World Bank Group (WBG) Country Partnership Framework (CPF, Report No. 117875-CN) for China for the period of FY2020–2025** which was discussed by the World Bank Board of Executive Directors on December 5, 2019, and in particular its Engagement Area 2 "Promoting Greener Growth", Objective 2.2 of "reducing air, soil, water, and marine plastic pollution." In particular, the project addresses the key aspects of the CPF and ensures the continued value added of the World Bank to China's sustainable development in the following ways: (a) "Promoting Greener Growth" (Engagement Area 2) - the project seeks to inform national policies, support institutional strengthening at provincial and local levels, pilot innovations, and invest in urban-rural integrated systems and service delivery; (b) "Sharing the Benefits of Growth" (Engagement Area 3) - the project seeks to benefit under-served rural areas that are experiencing higher levels of environmental pollution and higher incidence of poverty; (c) "Addressing Global Public Goods" (CPF Selectivity Criterion) - the project helps China meet its marine plastics and climate change commitments through the reduction of plastic waste pollution from MSW streams and GHG emissions from waste; (d) "Policies and Institutions for Sustainable IBRD Graduation" (CPF Selectivity Criterion) - the project brings novel approaches and good international practices and builds institutional capacities; (e) "Supporting Critical Services in Lagging Regions" (CPF Selectivity Criterion) - the project helps toward equalizing the MSW service in under-served rural areas and pilots fit-for-purpose solutions that are economically, environmentally,

[21] China Rural Statistical Yearbook (1992, 2002, 2012) and http://www.gov.cn/zhengce/2020-09/01/content_5538889.htm.
[22] Ultra-thin plastic film is less robust, fragile, and technically difficult to recover after use. In 2017, China updated the national standard, increasing minimum plastic film thickness from 0.008 mm to 0.01 mm.
[23] In provinces different than Shaanxi.
[24] Zhang Bin et al. 2019. "Current Situation and Prospect of Agricultural Film Pollution Management in China."

and technically viable in the local context; and (f) "Strategic Pilot of Approaches that Address Development Priorities, Especially in Areas Relevant to Other Developing Countries" (CPF Selectivity Criterion). Through two-way knowledge sharing, the project introduces good international practices to China by leveraging the World Bank's global footprint and experience and pilot innovative solutions as demonstration and for further replication locally and internationally. Through its support to reduce plastic waste pollution, the project will bring environmental and health benefits to the population of participating counties and contribute to the WBG's twin goals of ending extreme poverty and promoting shared prosperity.

12. **The project will help reduce plastic pollution in support of the global public goods agenda and is part of the World Bank's programmatic engagement on addressing marine plastic pollution from China**. First, the majority of plastic debris globally comes from poorly managed municipal waste systems[25] and therefore improved waste management is critical in reducing the plastic pollution loads to the environment. In China, up to half of the rural waste is not managed well and is a source of environmental pollution; in addition, a large volume of the rural plastic film used in agriculture also remains in the environment. This project has at its core the objective to reduce plastic leakage from rural areas to the environment through establishing systems and processes that could be replicated across provinces and inform national agencies in their efforts to improve rural waste management (see also figure 1, Theory of Change). Second, the project builds on recent World Bank investments in China, leverages ongoing analytical work, and is part of a programmatic engagement to tackle marine plastic pollution that follows a multifaceted approach (see box 1): (a) at the national level, support to policy and institutional strengthening targeting plastics production and use and the management of plastic waste is provided under the China Plastic Waste Reduction Project (P174267); (b) support toward a comprehensive approach for rural areas to reduce plastic waste pollution is offered under the proposed project, whereas village practices at the household level are supported under the Green Agricultural and Rural Revitalization Project (P177590); (c) for urban areas, enhanced resource efficiency toward circular practices is supported under the China Plastic Waste Reduction Project (P174267); (d) reducing plastic waste pollution in agriculture is supported under the Hubei Smart and Sustainable Agricultural Project (P168061); (e) reducing the use of plastics in food packaging is supported under the China Food Safety Improvement Project (P162178); (f) river protection and ecological restoration including clean-up of accumulated debris is supported under the Yangtze River Protection and Ecological Restoration Program (P171644) and Yellow River Basin Ecological Protection and Environmental Pollution Control Program (P172806).

Box 1. Evolution and Complementarity of World Bank Lending and Analytical Support for Plastic Pollution Abatement

Recent World Bank lending and analytical support focus on helping the Chinese Government and provincial county authorities enhance plastic and waste management policies and institutions and invest in physical plastics pollution abatement:

The "Ningbo Municipal Solid Waste Minimization and Recycling Project" (P123323) approved in FY13 aimed to enhance waste segregation and minimization in Ningbo.

The "China Municipal Solid Waste Management Project" (P126832) approved in FY14 aimed to introduce best available techniques and best environmental practices in MSW incineration.

The "Hubei Smart and Sustainable Agriculture Project" (P168061 co-financed by the Global Environment Facility - P172224) approved in FY20 promotes integrated environmentally sustainable and climate-smart agriculture and agri-food quality and safety in targeted value chains and landscapes, including preventing and mitigating pollution from heavy metals and plastics.

The "China Plastic Waste Reduction Project" (P174267) was approved in FY21 for policy strengthening and resource efficiency and pollution reduction, focusing on plastic pollution from MSW in urban areas of Ningbo and Chongqing.

The "China Food Safety Improvement Project" (P162178) approved in FY21 supports food safety management at national and

[25] As indicated in paragraph 1 above over 80 percent of plastic debris comes from MSW.

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, and reduces the use of plastics in agriculture production and food packaging.

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. This operation is followed by a second program focusing on Hubei Province, in addition to Hunan and Jiangxi Provinces supported in the first project.

The "Yellow River Basin Ecological Protection and Pollution Control Program" (P172806) approved in FY22 is expected to improve institutional coordination, enhance ecological protection, and reduce water pollution loads in select regions of the Yellow River Basin. The program will indirectly contribute to reducing marine plastic pollution through improved collection and treatment of wastewater and improved agricultural practices.

The "Green Agricultural and Rural Revitalization Program" (P177590) approved in FY22 aims at enhancing environmentally sustainable agricultural and rural infrastructure development in selected areas of Guangxi and Guizhou and will support China's efforts to reduce the agricultural environmental footprint from the three major sources, including agricultural plastics.

The ongoing ASA "China: Supporting Marine Plastic Debris Solutions" (P170079) (forthcoming in FY23) aims to deepen knowledge on marine debris plastics sources, transport, and impacts and develop strategies for plastics monitoring and reduction in plastics use and releases to the environment, and to inform and strengthen policies and raise awareness. This work has supported a high-level mapping of contributing sources of marine plastics and the identification of interventions for the further development of policies and management programs. Preliminary, working-level results are available for discussion with Chinese authorities and will form part of the policy dialogue with central agencies including NDRC.

13. **The project is the second World Bank lending project to reduce plastic pollution from China's MSW.** It will build on and leverage the work planned under the China Plastic Waste Reduction Project (P174267) and the ongoing programmatic analytical program China: Supporting Marine Plastic Debris Solutions (P170079). The Project Development Objective (PDO) of the first project is "to improve plastic waste management at the national and sub-national level, and to reduce plastics pollution from MSW"; it includes measures to support policy strengthening led by NDRC and investments in pollution reduction and resource efficiency mainly in the urban areas of Ningbo and Chongqing.[26] The focus of the proposed project is on reduction of plastic pollution through systemic measures mainly in under-served rural areas,[27] capturing of lessons learned relevant for the development of national approaches for plastic waste management specifically targeting rural areas, and support to improving institutional capacities at provincial and local levels. The two projects focus on urban and rural areas respectively with vastly differing baselines, capacities, contribution to pollution loads, and abilities to transition toward a circular economy. Since most of China's plastic leakage happens in rural areas, the proposed project is focused on a largely rural province, with investments at the county level and below.

14. **Links between the two projects.** The two projects will be implemented largely in parallel and are expected to inform and leverage their respective activities. Policy work led by NDRC under the first project will be informed by experiences and lessons under the proposed project related to the development of key performance indicators (KPIs), monitoring processes for rural waste, national guidelines on institutional setup, allocation of responsibilities in waste management, and urban-rural integration approaches. The proposed project will also inform the work of

[26] These include the following: (a) through a large national-level component implemented by NDRC, support upstream policies and solutions to reduce plastic production and consumption (for example, material redesign, plastic substitution, market mechanisms to increase the use of recycled plastics), performance evaluation mechanisms and standards for provinces/municipalities/cities, and identification of gaps and opportunities to improve the institutional setup and responsibilities for waste management and (b) improve SWM at the subnational level and reduce pollution from waste, mainly in selected urban areas in Ningbo and Chongqing. Two small rural districts in Chongqing are included in the first project on a pilot basis whereas larger support to rural areas and urban-rural integration in waste management has been envisaged under this follow-up project.

[27] Villages, towns, townships, peri-urban areas at below county level. In China, rural areas may fall under municipalities.

MOHURD toward the development of national guidelines on urban-rural integration models. It is expected to inform the process of developing a national ledger on agricultural plastic film led by MARA and in time feeds into it.

15. **The project supports the recommendations in the China Country Climate and Development Report (CCDR)**[28], specifically "Policy Package 3: Enhance Climate Resilience and Low Carbon Development in Rural Landscapes and Urban Areas" related to plastic waste pollution, recycling, and low-carbon rural development. The project will support reduction of GHG emissions as a result of reduction in waste dumping, closure of landfills including installation of landfill gas management systems (targeting an important source of methane), source segregation and secondary sorting to extract organics and dry recyclables, treatment of organic waste, and reduced plastic pollution of soils that serve as natural carbon sinks.

16. **The project aligns fully with Pillar 4 of the World Bank's Global Crisis Response Framework (GCRF) on "Strengthening Policies, Institutions and Investments for Rebuilding Better" and is consistent with the Framework for Green, Resilient, Inclusive Development (GRID) approach.** The project will support green and sustainable growth through investments under Component 2 in solid waste and plastic waste management that will reduce pollution and improve resource efficiency. Institutional strengthening and capacity building is supported under Components 1 and 3, with multiple activities focusing on strengthening regulations and institutional measures in Shaanxi Province, informing national policies, and enhancing knowledge among national agencies. Specifically, the project design supports the GCRF Pillar 4's focus on the following thematic areas: "Institutional Strengthening and Capacity Building", "Climate Smart Policies and Investments", and "Green and Sustainable Growth".

17. **The project is well aligned with the 14th FYP objectives and plans to reduce plastic pollution and narrow the urban-rural dualism through equalized public service delivery as well as China's overall commitments to reduce GHG emissions under its Nationally Determined Contribution (NDC).** The project will contribute to China's efforts to peak its carbon dioxide emissions before 2030 and achieve carbon neutrality by 2060,[29] as well as its goal to advance circularity by promoting the recycling of wastes including waste plastics, as established in its Mid-Century Long-Term Low GHG Emission Development Strategy.[30] The project will help reinforce the objectives, targets, and measures envisaged in the Law on Solid Wastes (2020), the "Plastic Pollution Management Action Plan in the 14th FYP Period" by NDRC and MEE (2021), and the "Circular Economy Development Program" by NDRC (2021). On rural waste management, the project has closely aligned its activities with the "14th FYP on MSW Separation and Treatment Facilities Development" by NDRC/MOHURD (2021), "Notice on Further Strengthening Rural Solid Waste Collection, Transfer and Treatment System" by MOHURD and six other ministries (2022), and most recently the "Action Plan to Address Rural and Agricultural Pollution Bottlenecks (2021–2025)" by MARA and four other ministries (2022).

18. **Shaanxi and the 11 participating counties/districts were selected due to the low baseline in waste management and strong commitment and proven capacity for implementation; the experiences and lessons learned are expected to have broad application across the country.** First, the province is centrally located with a good mixture of sparsely populated and denser counties/districts, as well as flat and mountainous terrain. Baseline conditions in rural areas are low—in most of the participating counties/districts, the safe disposal rate of rural waste is between 0 and 10–12 percent. The diversity of local geography, population density, and waste characteristics offer conditions for developing variations of the rural waste management model. The counties/districts are located within both the Yellow and the Yangtze River watersheds, which together with their tributaries serve as conduits of

[28] China Country Climate and Development Report, World Bank (October 2022).
[29] China's NDC. Submitted to the UNFCCC in October 2021. https://unfccc.int/NDCREG.
[30] Submitted alongside China's NDC. https://unfccc.int/sites/default/files/resource/China%E2%80%99s%20Mid-Century%20Long-Term%20Low%20Greenhouse%20Gas%20Emission%20Development%20Strategy.pdf.

plastics to the ocean. Second, all 11 counties/districts have committed to follow the urban-rural integration in service delivery model and have developed their feasibility studies accordingly. Third, following four decades of China-World Bank collaboration, by the end 2020, Shaanxi has implemented 34 investment lending projects with total commitment of US$1.6 billion. The province has adequate experience and capacity to implement World Bank operations and has been providing guidance, inhouse capacity building, and support to less experienced counties/districts participating in the project. The project will support the countries/districts to close the infrastructure and service gaps in rural waste management, increase collection, ensure safe handling and disposal, and minimize the outlets for plastic waste leakage. Shaanxi's experiences and lessons learned in the project are expected to have broad application in China; together with Ningbo and Chongqing supported in the first project, these three provinces provide a balanced mix of urban-rural waste management.

19. **The project will support the implementation of an integrated urban-rural waste management system in Shaanxi Province.** This will include both vertical integration (that is, "village collects, town transports, county treats", which is the current model that is often not implemented in practice and the village waste remains in situ) and horizontal optimization where treatment facilities and transportation are shared and utilized jointly by neighboring villages and towns. Given the high cost of rural waste management, an integrated approach is warranted, as it allows for more cost-effective waste services for which operational cost recovery is more easily achievable. At the national level, MOHURD has initiated several pilots in this regard and is in the process of developing framework approaches for urban-rural integration. The project is both guided by this work and will be informing it, including by bringing in the vast international experience in regional service provision.[31] It will inform national-level work toward establishing models for urban-rural integration in waste management. As the lessons learned feed into the evolving national policy and regulatory framework on rural waste management led by MOHURD, they will be replicated nationally.

II. PROJECT DESCRIPTION

A. Project Development Objective (PDO)

20. The objectives of the Project are to reduce plastic pollution from municipal solid waste in selected under-served rural areas of Shaanxi Province, improve provincial plastic waste management, and draw lessons on plastic waste management relevant at the national level.

21. **PDO Level Indicators**:

(a) Reduced leakage of plastics to the environment from improved waste management operations (Metric tons/year)
(b) Safe disposal ratio of municipal solid waste (Percentage)
(c) GHG emissions reduction from improved waste management systems, including resource recycling/ recovery (Metric tons CO_2e/year)
(d) Strengthened provincial regulations and institutional measures for plastic waste management (Number)
(e) Urban-rural integrated model for municipal solid waste service developed by Shaanxi and disseminated to national agencies (Yes/No).

[31] There is a large body of knowledge and experiences internationally related to regional service delivery, more commonly referred to as inter-municipal cooperation (for example, World Bank. 2021. *Bridging the Gap in Solid Waste Management: Governance Requirements for Results*, GIZ. 2013. *Operator Models Respecting Diversity: Concepts for Sustainable Waste Management*). While the international approaches will likely be hard to apply as is in China, lessons could be drawn as they relate to cost efficiencies and operational optimization.

B. Project Components

22. **The design of the components is aligned with the World Bank's GCRF Pillar 4 on "Strengthening Policies, Institutions and Investments for Rebuilding Better"**, with focus on the following thematic areas: "Institutional Strengthening and Capacity Building", "Climate Smart Policies and Investments", and "Green and Sustainable Growth". The specific contributions of project components and subcomponents to GCRF Pillar 4 are highlighted below in the components' description. The project will finance goods, works, non-consulting services, consulting services, incremental operating costs, training, and performance-based incentive financing (PBIF) as outlined below.

Component 1. Institutional Strengthening and Capacity Building (Total: US$11 million, IBRD: US$11 million)

23. **Subcomponent 1A. Development of integrated urban-rural waste service model (Total: US$1.2 million, IBRD: US$1.2 million).** The subcomponent will support the development of the urban-rural integrated waste service model that will be piloted in Shaanxi. The model will be based on an integrated planning process, optimal technology application, O&M, economics and finance, stakeholder engagement, and performance evaluation, all of which are new to local MSWM systems in China and incorporate international good practices. The model will feature optimized waste volumes, transport distances, and facility capacities for additional cost efficiencies from operations. As waste management costs will be higher in rural areas, the model will demonstrate the cost reduction and cost efficiency benefits of regional service provision. It will identify barriers to interjurisdictional collaboration and outline a set of incentives to stimulate integration. The model will include variations (or sub-models) based on local conditions, geography and terrain, waste volumes, distances, and so on, as well as a dedicated section on recycling, starting from waste separation at source,[32] through segregated handling, transfer, and treatment. The model will be developed in close coordination with MOHURD and inform its work on preparing national guidance, drawing lessons, and demonstrations (GCRF Pillar 4: Institutional Strengthening and Capacity Building).

24. **Subcomponent 1B. Central and sub-national knowledge sharing on plastic waste management (Total: US$0.7 million, IBRD: US$0.7 million).** The subcomponent will support Shaanxi to facilitate knowledge exchanges and bring together Shaanxi and relevant national agencies (NDRC, MOHURD, and MARA), as well as, as needed, Ningbo and Chongqing for technical consultation, demonstration, and two-way feedback; replication of pollution control measures in China to address plastic waste pollution from rural waste flows; and support to plastic recovery for mechanical recycling along with associated GHG emission reduction as a result of improved waste management practices. Specific activities will include (a) annual roundtable dialogue organized by Shaanxi with NDRC, MOHURD, MARA and, as needed, provinces under the first project and others; (b) annual thematic seminars organized by Shaanxi with the above central agencies and, as needed, other entities; (c) development of a case study on plastic waste reduction from Shaanxi to capture the provincial experience under the project for further dissemination and demonstration, including efforts to recover and recycle plastic and associated GHG emissions reductions; and (d) additional knowledge management activities such as study tours, including internationally, and dissemination. (See also paragraph 14 on links between the two projects). (GCRF Pillar 4: Institutional Strengthening and Capacity Building).

25. **Subcomponent 1C. Provincial and local institutional strengthening and capacity building (Total: US$9.1 million, IBRD: US$9.1 million).** This subcomponent will assist Shaanxi and project districts/counties develop the needed policies, institutional and financing arrangements, O&M tools, and public participation to extend MSWM service to under-served rural areas. Key areas of support relate to urban-rural integrated MSW planning, integration of the two parallel MSW systems, the development of monitoring and information system (MIS), establishment of a

[32] There is significant potential for valorization and recycling based on the waste composition (food waste - 60 percent, plastics - 12 percent, paper - 9 percent, glass - 3 percent, metals - 1 percent). *Source*: China Industry Information network (www.chyxx.com).

cross-departmental coordination, carbon emissions accounting and abatement plan, regulatory and incentive measures for agricultural plastic film pollution control including a data ledger, PBIF, public outreach, capacity building, and knowledge exchanges, capacity assessment, training and capacity building for county/district/subdistrict agencies responsible for MSW service provision (GCRF Pillar 4: Institutional Strengthening and Capacity Building).

Component 2. Municipal Solid Waste Management Improvement and Agricultural Plastic Waste Management Pilot (Total: US$326 million, IBRD: US$236 million)

26. **Subcomponent 2A. Integrated urban-rural waste management (IBRD: US$225.1 million).** This subcomponent will support investments to upgrade and extend the MSWM systems to under-served rural areas in 11 counties/districts of Shaanxi toward better service coverage, reduced pollution, and operational efficiency and sustainability. The system extensions into rural areas will be developed and operated under the integrated urban-rural model (under Subcomponent 1A). This subcomponent will support the following activities (see annex 2 for financing breakdown): (a) Waste collection: providing waste collection infrastructure, temporary storage facilities, and collection and transport equipment for rolling-out comprehensive collection services at the village level for mixed and, where applicable, source segregated waste; (b) Waste transfer and sorting: Construct, expand, or upgrade transfer stations, provide transfer vehicles and supporting equipment, and construct waste sorting facilities to allow waste collected from villages to be transported for recycling or treatment; (c) Treatment: Construct on-site compost facilities for rural organic waste, construct or expand kitchen waste and bulky waste treatment plants, close and remediate landfills as well as wild dumps, and divert rural waste to more preferred ways of treatment; (d) Education and public outreach: Construct educational and public outreach amenities to demonstrate the benefits of improved MSWM, reduced pollution, waste prevention, minimization, recovery, segregation, recycling, and reuse. (GCRF Pillar 4: Institutional Strengthening and Capacity Building).

27. **Subcomponent 2B. Agricultural plastic film waste management pilot (IBRD: US$10.9 million).** As part of a pilot approach to increase plastic film collection and treatment, this subcomponent supports activities in seven counties/districts of Shaanxi that include the following: (a) agricultural plastic film collection equipment and facilities, temporary storage and transfer facilities, and long-haul transfer equipment will be provided and (b) PBIF mechanism will offer financing to incentivize farmers/cooperatives/enterprises to shift to thicker agricultural plastic film and then collect and transport the used plastic film to designated outlets for further treatment. The PBIF will focus on ground film and reflective film—the two types of agriculture film constitute the largest leakage to the environment in Shaanxi. The PBIF mechanism will be designed under Subcomponent 1C and will be implemented as an incentive program with exit arrangements. The monitoring and evaluation (M&E) for incentive allocation will rely on a ledger system developed under Subcomponent 1C. The ledger system will allow traceability of agricultural film usage and will facilitate the process of monitoring, reporting, and enforcement of national and Shaanxi level regulations on transitioning to thicker agricultural plastic film by both sellers/suppliers and users. (GCRF Pillar 4: Institutional Strengthening and Capacity Building).

28. Combined with regulatory measures led by Shaanxi Province, the PBIF will support Subcomponent 2B and will provide a financial incentive to enhance and change farmers' willingness and behavior to use thicker plastic film in compliance with national standards and collect and transport the used plastic film to designated areas. The incentive will benefit farmers/farmers' associations/enterprises as follows: (a) the PBIF will be offered against verified utilization of standard/thicker ground plastic film by farmers and cooperatives and (b) the PBIF will be offered against verified collection of used plastic from farmland and placement at designated collection points (from where it will be transported for safe handling and treatment as part of the MSWM system). (For further detail see annex 1.)

Component 3. Project Management, Monitoring and Evaluation (Total: US$3 million, IBRD: US$3 million)

29. This component will support the operation of project management/implementing agencies in Shaanxi Province to ensure smooth project implementation and compliance with World Bank and domestic policies and procedures. Activities to be financed include project-management-related training and capacity building for key stakeholders (for example, the Provincial/County Project Management Offices (PMOs) and staff from related government agencies at the provincial and local levels; consultancy services for contract management; accounting and financial management (FM); project reporting; third party monitoring of the implementation of the project's environmental and social (E&S) instruments; and knowledge management systems.

30. **Project readiness.** The project follows a framework approach and has a substantial degree of readiness. Detailed activities for loan finance under Component 1 have been identified and appraised, and implementation will commence at loan effectiveness. Investments under Subcomponent 2A for the first 18 months in four Batch 1 districts/counties (Linwei, Chengcheng, Chencang, and Baoji city proper) have been determined and the respective E&S documents have been prepared and disclosed. Detailed designs are under preparation. The remaining specific activities under Subcomponent 2A (Batch 2) will be confirmed during implementation based on results from their respective feasibility studies along with the preparation of site-specific E&S documents.

31. **Private capital mobilization.** The project does not envisage private capital financing given its specific focus on establishing a sustainable MSWM system that is currently lacking in rural areas, making them unattractive to private capital. However, the project will gradually start to create an enabling environment for private investments once the MSWM services are extended to rural areas, along with the introduction of performance standards, monitoring and control processes, and budget resources for waste services. In the longer run, project achievements are expected to facilitate private investments due to the rolling out of policies and regulations guiding rural waste management in the key areas of waste separation at source and recycling, with a focus on plastics and higher value recyclables, as well as the requirements for plastic film.

32. **Climate change mitigation.** Activities and outcomes from the project will support China achieve its climate commitments and contribute to the global public good. The project supports addressing system weaknesses in waste management, which if not addressed will increase the vulnerability of the target areas to climate risks and lead to negative climate externalities.[33] The project follows the "waste hierarchy"[34] principle and supports the transition from open dumping and landfilling to more preferred treatment options that lead to a reduction in GHG emissions, in addition to a reduction in land and air pollution. The project follows the "proximity"[35] principle by supporting separation and treatment of organic waste in situ. Finally, the project does not support infrastructure that would have "lock-in effect"[36] in moving up the waste hierarchy. Under Component 1, the project enables GHG emission reduction as a result of new and systemically improved MSWM systems in terms of planning, financing, and capacity to operate integrated waste services (collection, transfer, sorting, and disposal of MSW). Interventions under Component 2 that directly result in GHG emission savings are (a) reduction in waste volumes currently

[33] For example, if waste, including plastics, continues to accumulate in the environment without proper collection, transport, and treatment and/or is disposed of along rivers and low-lying areas, causing contamination of soils and flooding and migration to water bodies, and/or is openly burned, generating short-lived air pollutants including black carbon.

[34] The principle defines a preferred order of waste management practice—subject to technical feasibility, affordability, and financial sustainability constraints—from prevention, reuse, recycling, recovery, to disposal.

[35] The principle that waste should be treated close to source, subject to cost-effectiveness criteria and the economies of scale associated with larger, centralized treatment or disposal facilities.

[36] For example, if large recovery facilities were supported, they would compete with recycling outlets for the same high calorific value material.

dumped in the environment by rural communities; (b) avoidance of methane emissions through the closure of landfills along with landfill gas management systems; (c) source segregation and secondary sorting to increase the organic waste volume sent to anaerobic digestion with biogas recovery as well as dry recyclables (plastic, metal, glass, and so on) sent for recycling, as opposed to new virgin production with high energy intensity and a large carbon footprint; (d) increase in energy recovery, replacing the coal-intensive grid electricity generation; (e) reduced plastic pollution of soils that serve as natural carbon sinks; (f) composting of separated at source organic waste; and (g) construction and bulky waste sorting for reuse and recycling. Component 3 interventions facilitating institutional strengthening include an increase in the technical skills of county and township officials to sustainably manage the newly introduced solid waste systems. Project-related GHG reduction has been calculated as an input to the economic analysis and to inform PDO-level indicator 3. GHG emission reductions are estimated at an average of 414,000 tCO_2e/year over the project's economic lifetime.[37] (See the detailed component description in paragraphs 16, 18, 20 and 22 of annex 2.)

33. **Climate change adaptation.** The project counties/districts are located within the basins of the Yangtze and Yellow Rivers, along the Han River and Wei River tributaries, and are prone to flooding and inundation caused by climate change. Risk reduction measures have been incorporated to reduce climate risks and limit exposure and vulnerability to the impacts of climate change. Specifically, project locations have been/will be screened for potential threats to site integrity from natural hazards such as floods, landslides, and earthquake, in line with the requirements of the Environmental, Health, and Safety Guidelines for Waste Management Facilities under the Environmental and Social Framework (ESF). The planning, engineering design, and operation of the new/expanded SWM facilities will take resilience issues into account. Specifically, designs developed under Component 1 and construction activities under Component 2 will be subject to national codes on Urban Flood Control Planning (GB51079-2016), Urban Drainage Planning (GB50318-2017), and Seismic Design of Buildings (GB50011-2016). Best practices on climate resilient infrastructure design and management will be applied to increase climate resilience.

34. **Citizen engagement (CE).** The project has a wide range of stakeholders. Subcomponent 1C includes specific activities to mainstream the public outreach toward sustainable outcomes. The project stakeholder engagement framework (SEF) identified broader stakeholders that would influence relevant project activities and set out entry points to seek feedback to refine the project design and implementation. Per the SEF, the county PMOs will consult various beneficiary groups semiannually to track their satisfaction and feedback. The site-specific stakeholder engagement plans (SEPs), for instance, for Batch 1 investments, will detail the arrangements and proper resources—both financial and staff—to engage citizens effectively. The project Environmental and Social Commitment Plan (ESCP) includes an explicit action to build the PMO's capacity to promote CE. The social monitoring consultant will systematically monitor and report the outcomes of CE as part of the external social monitoring report. Emphasis will be placed on strengthening the grievance redress mechanism (GRM).

35. **Gender.** The project will promote equal and better economic opportunities for both genders in the development of SWM systems. Gaps identified based on a preliminary survey in project counties show that women and men working at solid waste treatment utilities have unequal access to jobs, especially in technical/managerial positions. In the three selected counties, women's labor participation rate is 8–11 percentage points lower than for men. Similar employment gap exists in the SWM sector, and the issue is more apparent and pervasive in rural Shaanxi. Preliminary analysis shows that fewer women were hired for local waste management jobs. According to data from three counties/districts, out of the 5,154 community sanitation workers, only 1,637 or less than one-third are women; the proportion of women doing technical work is even lower (13.3 percent), and there is only one woman out of the 1,271 waste transfer workers. Consultations with female workers show that social norms around women's

[37] Excel files for GHG accounting are available in the Project File.

roles and appropriate work for women further job segregation, including limiting their access to jobs in the SWM sector and their ability to move into technical and management functions. The development of integrated SWM systems offers opportunities to improve gender balance in jobs in the sector and sustain women's employment at each level of the system. Women are commonly perceived as less suitable for such work and are often discouraged to apply. This has a long-term impact on women's confidence and willingness to participate in the SWM sector and leads to fewer qualified female candidates in the market. As a result, many women are de-skilled to do informal, lower pay jobs. The project will provide a targeted skill training program to help women get better prepared for new jobs created in the sector. Such skill training would include driving, waste sorting, processing and transfer, and leadership programs with an emphasis on practical learning of skills that will be required in the new jobs created. In addition, the project will help SWM sector companies/organizations develop an equitable working environment by providing gender awareness trainings for management and human resources and help them develop and implement a gender-inclusive workforce plan to address barriers in attracting, recruiting, retaining, and advancement of female workers at SWM facilities. These actions will be monitored by the share of new jobs created in the SWM sector in project counties/districts (45 percent are for women). Refer to annex 2 for the gender analysis.

C. Project Beneficiaries

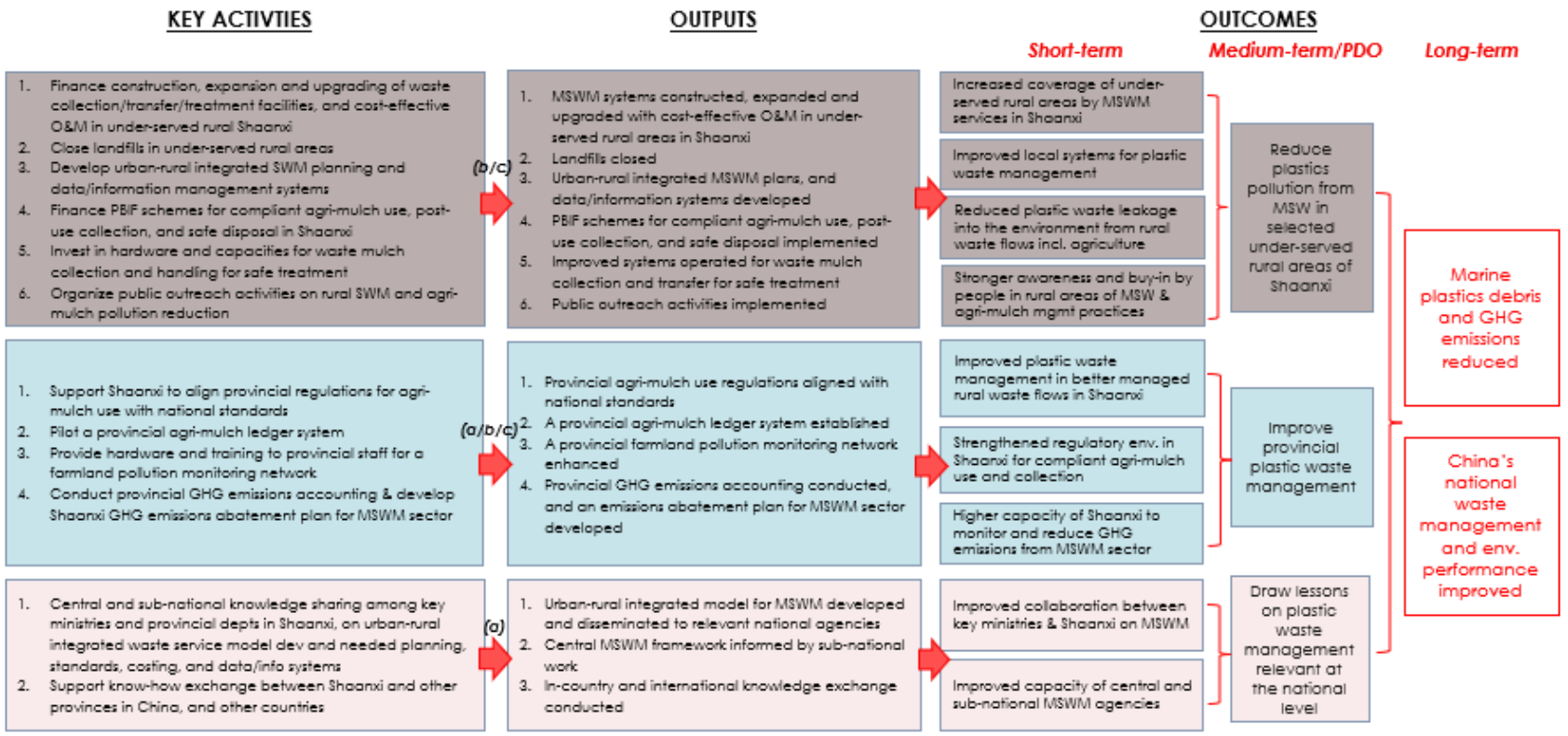
36. The beneficiaries include a population of 5.4 million, mainly rural residents in 11 districts/counties located along the Wei and Han Rivers[38] of Shaanxi Province (Linwei, Chengcheng, Pucheng, Baishui, Jingyang, Jintai, Weibin, Chencang, Fengxiang, Nanzheng, and Hanbin), who will benefit directly from enhanced MSWM services and lower risk of waste pollution as well as government officials, city administrative staff, and SWM service entities' staff in Shaanxi involved in planning and implementing the integrated urban rural MSWM and agricultural plastic waste management at the provincial, municipal, county, and town levels and will build their expertise and capacity from the technical assistance (TA) and training activities of the project and officials of central ministries who are managing the national policies, guidelines, and government demonstration programs for equalizing urban and rural SWM services and agricultural plastic pollution can benefit from the dialogue with Shaanxi.

D. Results Chain

37. The long-term outcomes of this project are to improve China's waste management and environmental performance and reduce plastic leakage to the ocean from mismanaged waste flows. Specifically, the project seeks to reduce plastic leakage to the ocean from waste flows originating from under-served rural areas of Shaanxi—a less developed province with high percentage of mismanaged rural waste that spans the water basins of China's two major rivers, Yellow and Yangtze Rivers—and lead to improved rural MSWM that has benefited from lessons learned and demonstrations through this project (see figure 1).

[38] Wei River and Han River are major tributaries of Yellow and Yangzi Rivers, respectively.

Figure 1. Results Chain (Theory of Change)



Main assumptions: (a) GoC's political will and resources allocation to support equalizing urban and rural MSWM services will continue, and SWM policies & systems will be enforced effectively; (b) economic growth and demographic trends will continue as projected in Shaanxi; and (c) biodegradable plastics or other technologically and economically viable materials would not substitute plastics in daily life or the agriculture sector at any time soon. Note: GoC = Government of China; GHG = Greenhouse Gas; MSWM = municipal solid waste management; O&M = operation & maintenance; PBIF = performance-based incentive financing

E. Rationale for Bank Involvement and Role of Partners

38. **The global goal of curbing marine plastic pollution can only be achieved with China's contribution to the effort, and the World Bank is well positioned to provide the needed support.** First, this project is part of a comprehensive program for the East Asia and Pacific region. The World Bank has mobilized resources to assist East Asia and Pacific countries in addressing the marine plastic debris challenge through financing, TA, and capacity-building activities. In 2019, PROBLUE—an umbrella multi-donor trust fund, housed at the World Bank, that supports the sustainable and integrated development of marine and coastal resources in healthy oceans—extended its support to East Asia and Pacific. Within this framework, China, among other East Asia and Pacific countries such as Indonesia, the Philippines, Vietnam, and Cambodia, is supported by the World Bank in the development and implementation of policies and regulations, enhancement of analytical and decision-making capacity, regional exchanges, and broader cooperation.

39. **Second, the project is the result of the World Bank's programmatic engagement on addressing marine plastic leakage in China.** It stems from analytical work conducted in FY19–22 and is the second World Bank lending operation to reduce plastic waste from MSW in China. The proposed project builds on the ongoing engagement with NDRC, which is the lead national agency for the first project and will also inform national policies and initiatives led by MOHURD and MARA. This will be the first project to focus on plastic waste management in rural areas in China and offers significant potential for the World Bank to introduce expertise and relevant experience from around the world. It is complemented by a series of operations in the agricultural, water, and environment sectors to support China's capacity to reduce plastics waste and marine pollution (see also paragraphs 12 and 13).

40. **Third, the World Bank brings in global knowledge and experience in SWM and plastic pollution reduction and can facilitate peer-to-peer collaboration among participating provinces in the plastic waste reduction projects, as well as international research organizations and think tanks.** The World Bank brings global expertise to China and the project from its decades of experience with SWM projects in all regions, with comprehensive national SWM programs ranging from investments in facilities to institutional capacity building, operational management, waste reduction, and recycling. The World Bank can showcase the benefit of urban-rural integration in the delivery of services and sharing of waste processes and facilities, based on experiences and lessons learned from other countries. In addition, significant knowledge has been built in recent years in the domain of reducing plastic waste leakages from waste to the environment to combat marine pollution challenges. The World Bank is well placed to coordinate action with other development partners and international organizations, for instance, the Asian Development Bank that has developed a program to promote action on Plastic Pollution from Source to Sea in Asia and the Pacific, including in China,[39] and with the German Agency for International Cooperation (Deutsche Gesellschaft fur Internationale Zusammenarbeit, GIZ) for the promotion of circular economy concepts.

F. Lessons Learned and Reflected in the Project Design

41. As flagged by the Independent Evaluation Group (IEG) report "Transitioning to a Circular Economy: An Evaluation of the World Bank Group's Support for Municipal Solid Waste Management (2010–20)", **to achieve more sustainable and scalable outcomes in SWM, support by the World Bank should give priority to the adoption and implementation of waste hierarchy practices and address the entire waste value chain (collection, transport, recycling, recovery, and disposal) in an integrated, phased, and incremental manner tailored to client needs and capabilities.** The project design is firmly guided by good international practice in this regard, has incorporated the principles of the waste hierarchy, and is tailored to local needs and development priorities.

[39] https://www.adb.org/projects/53068-001/main.

42. **Collaboration between central government, local governments, and communities is essential when introducing new approaches and systems**. As has been learned from previous World Bank urban projects, central government commitment and leadership and effective collaboration between the different tiers of government are critical to lead and inspire the initiation of reforms and ensure smooth project execution. This project supports regular knowledge exchanges and coordination between Shaanxi, NDRC, MOHURD, and MARA for central guidance to local policy applicability and local demonstration of central initiatives.

43. **Sustainable financing is key to SWM systems.** These systems have higher operating costs than other public services (for example, water supply and sanitation) in both absolute terms and relative to capital costs. There are many cases internationally where MSW systems collapsed after operational funding became insufficient. It is therefore vital to ensure funding for system operations, preferably from revenues (waste tariffs collected from waste generators) or otherwise from long-term budget support or subsidies. The project design has made an effort to optimize costs and achieve efficiency in operations by shared services and facilities, has made provision for the inclusion of operating costs in local budgets, and will explore options for gradual cost recovery from users.

44. **Designing an incentive framework to encourage transition to new practices requires a thorough understanding of local conditions, costs, and behavior change drivers.** The project design has benefited from the successful experience of Ningbo (under the Ningbo Municipal Solid Waste Minimization and Recycling Project P123323) on the structure and approach for the PBIF mechanism (especially since the PBIF mechanism has not always been successfully sustained in other countries). Given the need for extensive consultations with and capacity building of village committees and farmers associations to arrive at the most effective system and build an equitable performance incentive program that rightfully places incentives and triggers, the project will dedicate the first year of implementation to study these issues with support from a TA consultancy. This will include a detailed study of the behavior patterns of villagers and farmers; market conditions in terms of the availability, type, and cost of plastic film; market opportunities for recycling; the type of locally grown crops with their mulching requirements; opportunities for mechanized collection of film; and market suppliers and resellers. The details of the PBIF mechanism will thereafter be designed and rolled out during the second year of project implementation.

45. **The project design builds on experiences from earlier government demonstration projects.** Its design has benefited from technical discussions with MARA and its national experts and leading research and pilots[40] for agricultural plastic film waste reduction. Lessons learned incorporated in Subcomponent 2B include: (a) plastic film residue monitoring is necessary to inform the implementation of corrective actions; (b) needs and designs vary greatly based on local conditions, norms, and farming requirements; (c) a ledger system is critical for lifecycle monitoring of plastic film sales, purchase, use, collection, and disposal/recycling; (d) transparency and public engagement in identifying beneficiaries, data registry, results verification, and incentive allocation are essential; and (e) addressing the problem along the entire chain is better than focusing only on either users or sellers.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

46. A Project Steering Committee (PSC) established at the provincial level and comprising senior officials from relevant provincial departments will provide overall policy and strategic guidance for project implementation. The

[40] Since 2017, MARA has supported agriculture plastic film waste reduction demonstration in 100 counties in three western provinces - Gansu, Ningxia, and Inner Mongolia, with targeted policy interventions and earmarked central budget allocation.

PSC will be responsible for facilitating the coordination and discussions with central ministries on the policy aspects of integrated urban-rural MSWM, agricultural plastic waste management, and knowledge sharing. The existing PPMO housed in the Provincial Development and Reform Commission (PDRC) will be responsible for overall project management. The PPMO comprises competent staff specialized in engineering, procurement, FM, and E&S aspects. Its major responsibilities include (a) overall project coordination and management including fiduciary functions as well as E&S risk assessment and management; (b) annual budget preparation; (c) project-wide quality assurance; (d) progress monitoring and regular reporting to the World Bank and the PSC; (e) interdepartmental coordination; and (f) training and guidance for local implementing agencies. At the city/county/district level, Project Leading Groups (PLGs) mirroring the composition of the provincial PSC are established. Baoji city has established a city-level PMO to take overall project management and coordination responsibilities and the four district Urban Management and Law Enforcement Bureaus (UMBs) will manage and implement activities in their territories. The PMOs for the remaining project counties/districts are also established and will directly implement their own activities.

B. Results Monitoring and Evaluation Arrangements

47. An M&E framework has been established to monitor implementation progress and progress toward the achievement of the PDO. PDO-level indicators and the intermediate results indicators by components, including the definition, baseline, cumulative target value, reporting frequency, methodology for data collection, and responsibility for data collection, are described in the Results Framework (Section VII). The PPMO, with inputs from the county/district PMOs and Project Implementation Units (PIUs), will be responsible for data collection and reporting. A project implementation support consulting team will be hired by the PPMO to assist with overall project supervision and M&E. Independent specialized monitoring institutes will be engaged for monitoring and reporting of implementation and compliance with environmental management and resettlement plans. Semiannual reporting will be prepared on implementation progress. A midterm review (MTR) will be carried out within 36 months of loan effectiveness to assess performance and recommend needed adjustments to achieve the PDO. An Implementation Completion and Results Report (ICR) shall be prepared within six months after the end of the project, based on a comprehensive review of the effectiveness, efficiency, technical, financial, and economic, institutional, and knowledge aspects of the project.

C. Sustainability

48. **Strategic alignment with global and national goals.** Addressing marine plastic pollution is a global goal, which has been explicitly reflected in a series of top-down campaigns that China has set up since 2019, especially the new Law on Solid Wastes, Waste-Free City Program, and cross-ministerial policy notes on plastics pollution control. Local enforcement of these policies requires synchronized objectives and actions, strengthened institutions, coordinated solutions, large-scale and sustainable financing, and effective public engagement. The project provides an opportunity to support local implementation of the evolving national framework and at the same time feed local lessons and experiences to national agencies and inform the process of further policy development and the development of related guidelines and implementation mechanisms. Lessons learned fed back into the national policy-making process will ensure sustainability of the authorities' commitments.

49. **O&M financing.** International experience shows that budget allocations and subsidies are typically required for waste management investments and are often required to cover operating costs especially in rural areas that are less densely populated or when more environmentally beneficial but financially expensive waste handling and treatment is introduced. Ideally, operating costs, especially in urban areas, should over time be covered by revenue collected from waste generators as well as any byproducts such as the sale of recyclables (as expected in the case of Ningbo and Chongqing under the first project and envisaged by national legislation). As this project is focused on

rural areas, at this stage it seeks to establish a system that is reliably financed mainly through budget allocations, while, in parallel, it starts to explore options for cost recovery. Once the waste system is functional and affordability increases, gradual introduction of tariffs should be considered.

50. **E&S sustainability.** The main premise of this project is environmental sustainability and contribution to the global public good by reducing pollution and plastic leakage to soils, waterways, and oceans and by achieving lower GHG emissions. By supporting policies and mechanisms for improved waste management, the project seeks to enhance the environmental sustainability of the sector. Sustainability will be further ensured through the substantial inclusion and participation of urban and rural communities, as well as local and provincial governments. Beyond institutional and capacity building, the project will seek to enhance the overall environmental awareness of the population with regard to waste generation, handling, and utilization. Effective public outreach and communication and improved gender inclusivity in waste management are also targeted.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis

51. **Technical.** All project components are designed to support the realization of the objectives and targets of China and Shaanxi for plastic pollution control and urban-rural integration in SWM over the 14th FYP period. The technical design has been informed by and has adopted international good practices on regional integration to the local context. The project focuses on the functionality and sustainability of MSWM systems that are extended to under-served rural areas, the required administrative structure and cross-departmental coordination, adequate fiscal and financing arrangements, and the forward-looking waste hierarchy principle toward waste circularity. System design incorporates the least cost and practical solutions with proven effectiveness as well as the principles of reducing, reusing, and recycling. Design capacities and workflows are based on waste generation projections, considering demographic and economic developments as well as trends in waste composition, and the impacts of current waste management policies. Key factors for success are the rollout of integrated urban-rural systems and smooth transition of administrative arrangements for the management of the urban-rural model, accompanied by comprehensive outreach campaigns to build public support for the new systems as well as changed behaviors.

52. The 11 participating counties/districts of Shaanxi span the Yellow River and Yangtze River Basins, where the unmanaged rural waste is a source of plastic pollution to waterbodies and the ocean. Nine counties/districts are in the Guanzhong Plain that hosts most of the province's population and offers the highest pollution reduction potential. Nanzheng and Hanbin districts are in the mountainous South and feature difficult terrain and large distances, offering good potential to demonstrate system optimization. In most of the 11 counties/districts, the safe disposal rate of rural waste is between 0 and 10–12 percent due to significant gaps in waste collection and transfer systems. Noncompliant ultra-thin agricultural plastic film (0.004 mm) is widely used without proper systems and oversight for compliant application, post-use collection, and transportation to safe treatment.

53. Of the 11 jurisdictions, four (the counties of Linwei and Chengcheng under Weinan Municipality and Jintai and Chencang Districts under Baoji Municipality), referred to as Batch 1 counties, have had their feasibility and investment plans under Subcomponent 2A appraised by the World Bank along with their E&S risk assessments/plans; the E&S documents have been disclosed publicly (see paragraph 64). Detailed designs for Batch 1 investments will be completed by loan effectiveness. The design of Batch 1 activities follows the integrated urban-rural model, which is based on integrated planning, optimal transportation, and waste handling operations for shared facilities and services. The design of Batch 2 activities will follow the same urban-rural model. The approach and practical experiences gained under the project will be codified under Subcomponent 1A for further replication.

54. Batch 1 jurisdictions generate larger amounts of waste, have higher technical readiness to proceed with urban-rural integration in service delivery, and can start implementation immediately after effectiveness, which have been the reasons for their inclusion in the Batch 1 investments. Specific activities in Batch 1, with total cost of US$112 million (33 percent of total project cost), include procurement of waste containers, 857 units of vehicles for solid waste collection and transportation, construction of 1,710 small collection points, reconstruction of three medium-size transfer stations with capacity of 200 tonnes/day (one) (t/d) and 100 t/d (two), construction of 19 small transfer stations each with capacity below 100 t/d, rehabilitation of one recyclable sorting center (135 t/d), construction of one parking and maintenance facility for vehicles, closure of four sanitary landfills, and so on. The implementation schedule for these activities will vary from several months (procurement of equipment) to approximately three years (construction or expansion of treatment facilities). Activities under Batch 2 that are included in the feasibility studies will be confirmed during implementation along with the development of E&S documents. Batch 2 activities are expected to be designed during the first 18 months of implementation.

55. All policy/TA activities under Component 1 and Subcomponent 2B have been identified, terms of reference are under preparation, and their implementation will commence after loan effectiveness. Under Component 1, these include activities related to urban-rural integrated planning, development of online MSWM systems, establishment of cross-departmental coordination, carbon emissions accounting and abatement plan, public outreach, and central-subnational knowledge exchanges. Under Subcomponent 2B, the regulatory and market supervision strengthening, design and pilot of the plastic film ledger, the PBIF mechanism manual, and the detailed incentive schemes will be designed in the first year of implementation; the PBIF mechanism itself is expected to be phased in during Year 2, initially in two or three of the seven counties where Subcomponent 2B will be piloted. By the end of Year 3, all seven counties are expected to have a functional PBIF mechanism system in place.

56. **Economic analysis.**[41] MSWM in rural areas is expensive due to low volumes and large distances. To reduce costs and increase efficiencies, the international experience points to regional approaches where population centers cooperate in the planning and provision of service. Efficiencies are achieved through shared treatment facilities and shared operations of infrastructure such as transfer stations and sorting lines. Additional benefits are better professionalization of the service including compliance with legal requirements, streamlined monitoring, shared experiences, and optimization of processes. In the case of Shaanxi, under Batch 1, service option scenarios for rural areas were developed and compared on technical and cost grounds for capital and operating finance requirements. The most optimal scenario using net present value (NPV) was chosen and will be supported under the project. Batch 2 investments will follow the same approach. The economic rate of return (ERR) and NPV for the project, the fiscal impact on participating counties, and the affordability levels were also assessed and are presented below. The analysis points to an economically viable project which is also fiscally affordable for the participating counties.

57. A cost-benefit analysis has been conducted to assess the economic viability of the project, which compares with and without project scenarios at the county/district level and aggregates the investments at the project level. Major quantifiable benefits from the project include (a) value generated from recycled materials; (b) avoided waste disposal costs due to waste segregation, recycling, and efficiency gains from waste management logistics; (c) environmental and health benefits; (d) job creation from improved waste management service and enlarged service areas; and (e) climate co-benefits from the value of carbon offsets due to reduced GHG emissions. Major non-quantified economic benefits include (a) avoided natural capital loss due to plastic leakage into the riverine and

[41] A stand-alone annex presenting the Economic and Fiscal Impact Analyses and Excel files for ERR/NPV calculations and fiscal impact assessment results by county/district are available in the Project File.

marine ecosystems; (b) reduced leachate pollution for irrigation and drinking water supplies; and (c) enhanced institutional capacity benefiting areas far beyond the project's geographical coverage.

58. The project-level economic internal rate of return and NPV,[42] aggregated from the county/district-level investments, are 11 percent and US$122.09 million, respectively, without carbon offset benefits or 19 percent and US$378.03 million with the carbon shadow price. The results indicate that the project is economically viable both at the project level and at the county/district level.

59. **Fiscal impact assessment.** Following the revision of the Solid Waste Law in 2020, local authorities above county level will reform the charging system to follow the polluter pays principle. Rural areas and local authorities below county level are typically more fiscally constrained, while the unit cost for waste handling tends to be higher due to long transport distances and low quantities. Shaanxi Province has decided that the county governments will extend waste services to lower-level governments and finance the cost of transporting MSW from village storage areas to the sites of final treatment and disposal. The fiscal impact assessment has therefore been conducted at the county/district level to gauge the local governments' fiscal capacity to ensure project sustainability. The results show that the total cost for MSWM as a percentage of county/district budgets is between 0.04 percent and 2.1 percent, indicating that the participating counties/districts are in a good fiscal position to ensure financial sustainability of the O&M of MSWM. Further, the current cost per capita for MSWM as a percentage of per capita income ranges from 0.12 percent to 0.4 percent,[43] indicating a high potential to increase tariffs to cover O&M costs. Project counties/districts have firmly committed to allocating sufficient annual budget resources to cover (a) counterpart funding during implementation and (b) incremental O&M costs for the facilities and works built under the project.[44] In addition, the project supports the development of cost recovery scenarios through increased tariffs.

B. Fiduciary

60. **FM.** The PPMO will have the overall responsibility for project monitoring and coordination, as well as providing guidance to the county-level PMOs and PIUs, which will implement respective activities at the county level and will be responsible for daily project FM work. One Designated Account (DA) will be opened and maintained at Shaanxi Provincial Finance Department (PFD). World Bank assessment of project FM arrangements dated September 7, 2022, has identified FM-related risks, and concerned mitigating measures as elaborated in annex 1. With the implementation of the proposed actions, the FM arrangements will satisfy the World Bank's requirements under the World Bank Policies and the residual FM risk after mitigation is assessed as Moderate.

61. **Procurement.** Procurement under the project will be carried out in accordance with the World Bank's Procurement Regulations for Goods, Works, Non-Consulting and Consulting Services dated November 2020, referred to as "Procurement Regulations". Procurement by eligible beneficiaries under Subcomponent 2B related to the PBIF mechanism will typically be based on the predominant commercial practices in China. "Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants", revised as of July 1, 2016, shall apply to the project. The World Bank's planning and tracking system (Systematic Tracking of Exchanges in Procurement, STEP) will be mandatorily used to prepare, clear, and update Procurement Plans (PPs) and conduct all procurement transactions. A Project Procurement Strategy for Development (PPSD) has been developed by the

[42] Social discount rate is at 6 percent according to NDRC's guideline for investment projects with substantial public goods provision, which is also in line with the social discount rate as recommended in World Bank's *Technical Note on Discounting Costs and Benefits in Economic Analysis of World Bank Projects* (2015).
[43] Internationally recognized measure of affordability has been 1 percent of the disposable income of the population, typically medium decile. See World Bank. 2021. *Bridging the Gap in Solid Waste Management*.
[44] Commitment letters from all counties have been shared with the World Bank.

PPMO as well as the PP for the initial 18 months project implementation. At the provincial level, the PPMO will be responsible for project procurement, while the procurement of small-value, low-risk contracts may be carried out by county/district PMO/PIUs. Based on the procurement risk assessment dated September 7 ,2022 and after considering mitigation measures, the residual overall procurement risk for the project is assessed as Moderate.

C. Legal Operational Policies

	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

D. Environmental and Social

62. **The environmental risk is Substantial, and the social risk is High.** The E&S risk classification is based on available information, the type and nature of investments, institutional capacities and experience with similar work, and underlying implementation challenges. Works under Component 2 are likely to generate significant adverse risks and impacts on human population and the environment, with most of these related to landfill closures (including the remediation of legacy landfill issues) and the construction and operation of waste treatment facilities. The project is not expected to use a large quantity of water and energy and will not lead to high water demand. The facilities will be in developed areas and are unlikely to involve natural and critical habitats. The project will neither introduce alien species nor purchase and use natural products. The implementation of Component 1 will have broader and long-term downstream E&S implications. The adverse E&S risks and impacts of Component 3 are deemed to be low.

63. **The project is adopting a combination of framework and site-specific plan approaches.** The framework approach is adopted for the overall project, while a site-specific plan approach is adopted for appraised project activities. Batch 1 investments consist of the construction of small collection points in villages and communities, purchase of vehicles, construction/rehabilitation of small and medium-size transfer stations (including a sanitary vehicle maintenance center), rehabilitation of a recyclable sorting center, and the closure of four sanitary landfills. The Shaanxi PPMO has prepared an Environmental and Social Management Framework (ESMF), an SEF, and an ESCP for the overall project. The ESMF comprises several relevant thematic framework planning tools, for example, resettlement framework, labor management procedure framework, ethnic minority development framework, and templates for applicable E&S assessment instruments. The E&S package for the Batch 1 investments includes the Environmental Impact Assessment (EIA) and the Environmental and Social Management Plan (ESMP), the Social Audit Report, the Social Impact Assessment Report, the Labor Management Procedure, the Resettlement Action Plan (RAP), and the SEP. See annex 1 for more details on the overall E&S risk management approach.

64. **Information disclosure.** The PPMO disclosed the draft E&S framework and site-specific E&S documents for Batch 1 investments on the PDRC's official website on September 23, 2022. The final E&S documents were disclosed locally on the PDRC's official website on November 23, 2022. The final ESMF and site-specific E&S documents for Batch 1 investment were disclosed by the World Bank on November 24, 2022, whilst the Appraisal Stage ESRS, ESCP and SEP were disclosed by the Bank on November 28, 2022. The Project Information Document was disclosed by the World Bank on November 30, 2022.

V. GRIEVANCE REDRESS SERVICES

65. **Grievance Redress Service (GRS).** Communities and individuals who believe that they are adversely affected by a project supported by the World Bank may submit complaints to existing project-level grievance mechanisms or the Bank's GRS. The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the Bank's independent Accountability Mechanism (AM). The AM houses the Inspection Panel, which determines whether harm occurred, or could occur, as a result of Bank non-compliance with its policies and procedures, and the Dispute Resolution Service, which provides communities and borrowers with the opportunity to address complaints through dispute resolution. Complaints may be submitted to the AM at any time after concerns have been brought directly to the attention of Bank Management and after Management has been given an opportunity to respond. Information on how to submit complaints to the Bank's GRS is available at http://www.worldbank.org/GRS. For information on how to submit complaints to the Bank's AM, information is available at https://accountability.worldbank.org.

VI. KEY RISKS

66. **The overall risk for the project is rated Substantial on account of Substantial environmental risk and High social risk.** The E&S documents have outlined differentiated measures, consistent with the ESF, to screen, assess, and manage specific investments with medium, substantial, and high environmental or social risks. On that basis, the ESCP, ESMF, and SEF set out explicit provisions to strengthen internal and external E&S capacity for various institutions (for example, PPMO, PMOs, and PIUs). The local natural resources bureaus have issued land use pre-examination options to endorse the site siting for physical activities in Batch 1 investments. County/district governments have agreed upon time-bound actions to remedy landfill legacy social issues (that is, noncompliance with land approvals and community health and safety concerns) on time before bidding for landfill closure. Batch 2 investments will follow a similar approach to Batch 1 and take a proactive approach to explore alternative locations with lower E&S risks for facilities, remedy landfill legacy issues, and obtain the Government's early endorsement of site selection through quality E&S assessment and stakeholder engagement. The Shaanxi PPMO will engage third-party monitoring for E&S aspects to inform an adaptive E&S management during implementation. Moderate risks relate to the novelty of the integrated urban-rural approach that requires interjurisdictional coordination and re-allocation of responsibilities and resources. To this end, the project takes a cautious and gradual approach. It will improve waste management in rural areas based on the prevailing modality of 'collection by village, transport by town, disposal by county' and in parallel support Shaanxi to develop a waste shed regional approach focused on integrated planning and service optimization that will demonstrate cost savings and efficiency of operations.

67. Overall, the macroeconomic risks to project outcomes are assessed as low. Shaanxi Province, like many other provinces, is experiencing fiscal challenges due to recurrent COVID-19 outbreaks and the housing sector downturn. The province recorded an estimated fiscal deficit of 7.9 percent of gross domestic product (GDP) in the first three quarters of 2022, marginally higher than the 7.7 percent recorded last year. At the same time, Shaanxi's explicit direct debt-to-GDP ratio is estimated at 29.1 percent of GDP in the first nine months of 2022, which is broadly in line with the province average. However, total average annual counterpart financing needs for the project are estimated to account for less than 0.1 percent of provincial fiscal expenditure and revenue. Additionally, the project investments are fully aligned with government priorities and investment plans as also underscored by the counties' commitment letters that mitigate the risk of insufficient counterpart funding.

VII. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY: China

China Plastic Waste Reduction Project (Shaanxi)

Project Development Objectives(s)

To reduce plastic pollution from municipal solid waste in selected under-served rural areas of Shaanxi Province, improve provincial plastic waste management, and draw lessons on plastic waste management relevant at the national level.

Project Development Objective Indicators

Indicator Name	PBC	Baseline	Intermediate Targets						End Target
			1	2	3	4	5	6	
Reduce plastic pollution from MSW in selected under-served rural areas of Shaanxi province									
A. Reduced leakage of plastics to the environment from improved waste management operations (Metric tons/year)		0.00	0.00	0.00	4,000.00	14,000.00	30,000.00	38,400.00	38,400.00
B. Safe disposal ratio of municipal solid waste (Percentage)		15.00	15.00	15.00	20.00	38.00	68.00	76.00	76.00
C. GHG emissions reduction from improved waste management systems including resource recycling/recovery (Metric tons CO2e/year) (Metric tons/year)		0.00	0.00	0.00	0.00	290,000.00	310,000.00	330,000.00	330,000.00

Indicator Name	PBC	Baseline	Intermediate Targets						End Target
			1	2	3	4	5	6	
Improve provincial plastic waste management									
D. Strengthened provincial regulations and institutional measures for plastic waste management (Number)		0.00	0.00	1.00	1.00	2.00	4.00	5.00	5.00
Draw lessons from plastic waste management at the national level									
E. Urban-rural integrated model for municipal solid waste service developed by Shaanxi and disseminated to national agencies (Yes/No)		No	No	No	No	No	Yes	Yes	Yes

Intermediate Results Indicators by Components

Indicator Name	PBC	Baseline	End Target
Component 1 - Institutional Strengthening and Capacity Building			
1. Shaanxi provincial inter-departmental coordination mechanism governing urban-rural SWM integration established and operational (Yes/No)		No	Yes
2. Shaanxi province technical standards and guidelines for urban-rural waste management as well as local policy and technical guidance for rural waste separation developed and adopted (Yes/No)		No	Yes

Indicator Name	PBC	Baseline	End Target
3. Integrated urban-rural SWM information platforms established and operational in project counties/districts (Yes/No)		No	Yes
4. KPIs and the related monitoring processes related to rural waste collection and transportation developed and adopted (Yes/No)		No	Yes
5. Action plan adopted for effective transition to standard plastic film (thicker than 0.01mm) (Yes/No)		No	Yes
6. Consultations and knowledge exchange events between Shaanxi and central agencies on urban-rural integration in MSWM (Number)		0.00	6.00
Component 2 - MSWM Improvement and Agricultural Plastic Waste Pilot			
7. Coverage of integrated MSW service in rural areas (Percentage)		10.00	72.00
8. Number of landfills (open dumpsites) closed (Number)		0.00	6.00
9. Rehabilitated, expanded or newly constructed transfer stations and sorting lines (Number)		0.00	70.00
10. Increased farmland using agricultural plastic film with thickness of 0.01mm or above (Percentage)		0.00	68.00
11. Increase in agricultural plastic film waste collected and safely disposed based on the Performance-based Incentive Financing mechanism (Percentage)		0.00	75.00
Corporate Indicators			
12. Residents satisfaction rate of MSWM service of which women (Percentage) (Percentage)		28.00	83.00
13. Share of new jobs created in the SWM sector in project counties/districts of which women (Percentage)		0.00	45.00

Monitoring & Evaluation Plan: PDO Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
A. Reduced leakage of plastics to the environment from improved waste management operations	Calculated by multiplying the increased MSW that is collected and properly disposed by 12% plastic composition plus the increase of agricultural plastic film collected and delivered to county MSW facilities. Baseline: 88,565t/year MSW reach proper treatment and disposal; Zero [0] t/y of agricultural plastic film reach proper treatment and disposal.	Annual	PPMO monitors and reports in implementation progress report	Based on transportation and collection statistics as recorded in transfer stations and disposal and treatment facilities	CPMO/PIUs
B. Safe disposal ratio of municipal solid waste	MSW originating from rural areas treated and disposed in county/district treatment facilities as percentage of total collected MSW	Annual	Implementation progress report	Based on the statistics of municipal solid waste treated and disposed	CPMO/PIUs
C. GHG emissions reduction from improved waste management systems including resource recycling/recovery (Metric tons CO2e/year)	GHG emission abatement based on tonnage of MSW diverted from dumping, landfilling, organic waste processed and recyclables delivered to sorting	Annual	PPMO monitors and reports in implementation progress report	Based on IPCC approved methodology used at appraisal	Shaanxi PPMO

	enterprises for further processing.				
D. Strengthened provincial regulations and institutional measures for plastic waste management	1=one intermediate indicator 1 to 5 achieved; 2= two intermediate indicators 1 to 5 achieved, etc. Achievement of 4 out of 5 intermediate indicators will demonstrate strengthened plastic waste management.	Annual	Monitored by DRC and PPMO reflects in the implementation progress report	DRC collects information and report to PMO	DRC
E. Urban-rural integrated model for municipal solid waste service developed by Shaanxi and disseminated to national agencies	Report by Shaanxi for demonstration purposes that describes the urban-rural integrated waste service model that include financing, institutional arrangements and governance, and performance evaluation - developed and disseminated to NDRC, MOHURD, MARA.	Annual	Implementation Progress Report	Review of the final report and confirmation of receipt by NDRC, MOHURD and MARA.	Shaanxi PPMO

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
1. Shaanxi provincial inter-departmental coordination mechanism governing urban-rural SWM integration established	Shaanxi province inter-departmental collaboration mechanism including the	Annual	Implementation Progress Report	Shaanxi Administrative Order and meetings' minutes	Shaanxi PPMO

and operational	env. sanitation, rural and agricultural and finance and commerce bureaus.				
2. Shaanxi province technical standards and guidelines for urban-rural waste management as well as local policy and technical guidance for rural waste separation developed and adopted	Per indicator name	Annual	Implementation Progress Report	Shaanxi Administrative Order adopting the standards/ guidelines/ policies	Shaanxi PPMO
3. Integrated urban-rural SWM information platforms established and operational in project counties/districts	Information platform that captures data related to MSW and plastics.	Annual	Implementation Progress Report	Shaanxi government administrative order	Shaanxi PPMO
4. KPIs and the related monitoring processes related to rural waste collection and transportation developed and adopted	KPIs for performance related to MSW and agricultural plastic waste, cascaded to administrative levels of i.e. village, town, and county/district.	Annual	Implementation Progress Report	Shaanxi administrative order	Shaanxi PPMO
5. Action plan adopted for effective transition to standard plastic film (thicker than 0.01mm)	Provincial action plan that includes enforcement provisions to phase out plastic film thinner than 0.01mm	Annual	Action plan adopted by Shaanxi province	Implementation Progress Report	PPMO
6. Consultations and knowledge exchange events between Shaanxi and central agencies on urban-rural integration in MSWM	Annual round-table meetings and thematic seminars, facilitated by Shaanxi's DRC, with central agencies on urban-rural integration	Annual	Implementation progress report	Round-table meetings and thematic seminars conducted	Shaanxi DRC
7. Coverage of integrated MSW service in rural areas	Percentage of villages in the participating counties/districts covered	Annual	Implementation progress report	Based on the number of project villages as of the total number of	CPMOs/PIUs

	by the project under the urban-rural integration model.			villages in project counties and districts	
8. Number of landfills (open dumpsites) closed	Partial or full closure of sanitary landfills and full closure of dumpsites	Annual	Implementation progress report	Based on the number of landfills (open dumpsites) closed in project areas	CPMO/PIUs
9. Rehabilitated, expanded or newly constructed transfer stations and sorting lines	Newly constructed, upgraded or expanded transfer stations and sorting lines	Annual	Implementation Progress Report	Based on the number of transfer stations and sorting lines constructed/expanded/ upgraded	CPMO/PIUs
10. Increased farmland using agricultural plastic film with thickness of 0.01mm or above	Increase in farmland area covered by thicker plastic film as a percentage of all farm area in the participating counties that uses plastic film (ticker than 0.01mm). Baseline: zero	Annual	Implementation Progress Report	CPMO records in the Implementation Progress Report, based on Ledger data	CPMOs/PIUs
11. Increase in agricultural plastic film waste collected and safely disposed based on the Performance-based Incentive Financing mechanism	The amount of agriculture plastic film collected and disposed in county/district treatment facilities as a percentage of all agriculture plastic film used in the participating counties. Baseline: zero	Annual	Implementation Progress Report	Based on collection statistics captured by the ledger system, and transportation data as recorded in transfer stations and disposal facilities.	CPMO/PIUs
12. Residents satisfaction rate of MSWM service of which women (Percentage)	Weighted average percentage of project counties/districts, captured	At mid-term and project	Implementation Progress Report	Surveys	PPMO

	by beneficiary surveys. Baseline based on survey by Shaanxi province in August 2022.	closure			
13. Share of new jobs created in the SWM sector in project counties/districts of which women	Per indicator name	Annual	Implementation Progress Report	PPMO monitors and reports in Implementation Progress Report	County/district PMOs/PIUs

Annex 1. Implementation Arrangements and Support Plan

1. **PSC.** The PSC has been established at the provincial level, chaired by the Director General of the Shaanxi PDRC (see figure 1.1). It comprises senior officials from the provincial departments and their local subsidiaries, including the Departments of Finance, Ecology and Environment, Housing and Urban-Rural Development, Agriculture and Rural Affairs, Commerce, Bureau of Rural Revitalization, Supply and Marketing Cooperative, and Baoji Municipality, Xianyang Municipality, Weinan Municipality, Hanzhong Municipality, and Ankang Municipality. The PSC will provide overall policy and strategic guidance on the implementation of the project. It is also responsible for facilitating the coordination and discussions with central ministries on the policy aspects of integrated urban-rural MSWM, agricultural plastic waste management, and knowledge sharing.

2. **PPMO**. Shaanxi Province has designated the existing provincial PPMO housed in the PDRC to prepare and implement the project. The PPMO has rich experience in the coordination and implementation of World Bank and Asian Development Bank loan-financed projects. The PPMO comprises competent staff specialized in engineering, procurement, FM, and E&S. Its major responsibilities are (a) overall project coordination and management, including fiduciary functions as well as E&S risk assessment and management; (b) annual budget preparation; (c) project-wide quality assurance; (d) progress monitoring and regular reporting to the World Bank and the PSC; (e) interdepartmental coordination; and (f) training and guidance to local PMOs/PIUs.

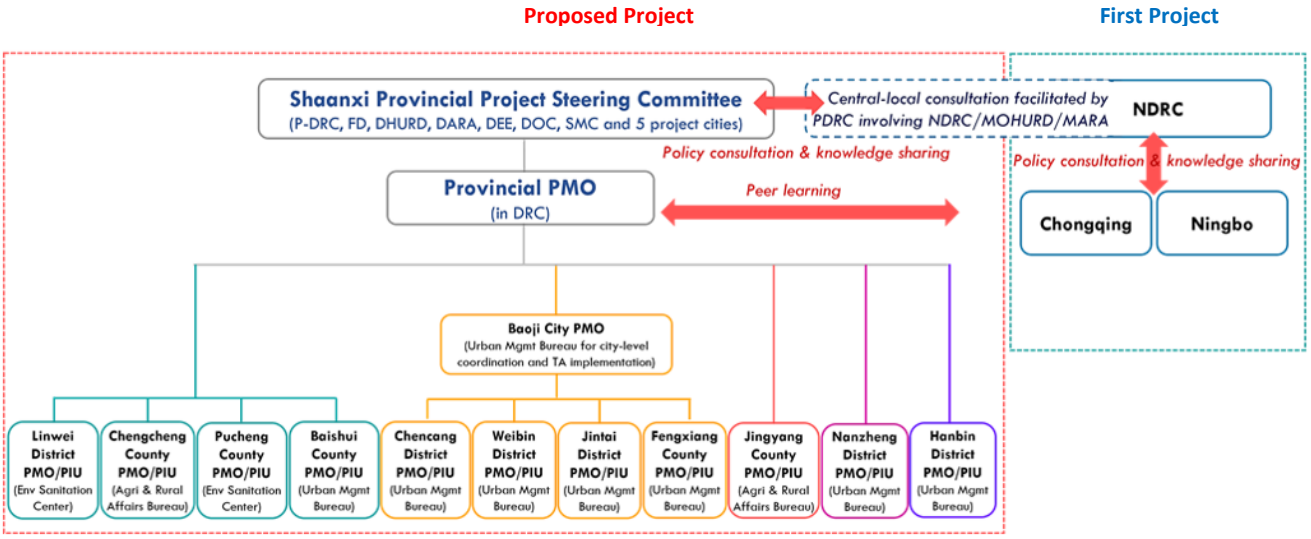
3. **PLGs, PMOs, and PIUs at city/county/district levels.** As four districts—Weibin, Jintai, Chencang, and Fengxiang—of Baoji city are participants of the project, a city-level PLG chaired by the vice mayor has been established; the rest of the participating counties/districts have established county/district-level PLGs chaired by their respective mayors. They will provide policy direction for project implementation in their respective jurisdictions. Baoji city has established a city-level PMO housed in Baoji UMB to carry out overall project management and coordination responsibilities while the four district UMBs will manage and implement activities in their respective territories. Based on local institutional mandates and responsibilities, the PMOs for the remaining project counties/districts (Linwei, Chengcheng, Pucheng, Baishui, Jingyang, Nanzheng, and Hanbin) are established and housed either in their UMB, Environmental Sanitation Center (ESC), or Agriculture and Rural Affairs Bureau. These county/district PMOs will also directly implement their own activities.

Procurement and FM

4. **Procurement**. At the provincial level, the PPMO will be responsible for project procurement. Project county/district PMOs/PIUs will join the procurement activities carried out by the PPMO and sign the works, goods, and non-consulting and consulting services contracts under their respective components or subcomponents. Procurement of small-value, low-risk contracts may be carried out by county/district PMOs/PIUs.

5. **Procurement risk assessment**. An assessment of the implementing agencies' procurement capacity identified the following main procurement risks: (a) delays and noncompliance with World Bank Procurement Regulations either due to their lack of familiarity with specific World Bank procurement rules and procedures or due to the preference to comply with local procedures when local regulations conflict with World Bank Procurement Regulations and where procurement is to be conducted at local government public resources trading centers; (b) lack of familiarity on the part of PMO/PIU procurement staff with the procurement needs of World Bank-funded projects; and (c) delays in payments, cost overruns, and failure to meet completion dates due to weak contract management capacity.

Figure 1.1. Institutional Arrangement and Central-Local Knowledge Sharing (supported under Subcomponent 1B)



6. **Risk mitigation.** All PMOs/PIUs have designated procurement staff who have already completed the fiduciary e-learning courses developed by the World Bank Beijing Office and received certificates. To mitigate the above-mentioned risks, the following actions will be taken during project implementation: (a) a procurement agent with experience in World Bank procurement and contract management procedures will be recruited to help the PMOs/PIUs; (b) a project management consulting firm with experience in World Bank procurement and contract management procedures will be hired early on to help the PMOs/PIUs in project implementation; (c) more in-depth training to the PMOs/PIUs on Procurement Regulations will be delivered by the World Bank and the Chinese procurement training network sponsored by Tsinghua University or equivalent, during project implementation on a regular basis. Hands-on support will be provided as needed; (d) the PPMO will provide regular training to the PMO and PIU procurement staff on World Bank Procurement Regulations, methods, and procedures, as well as on the use of standard procurement documents and evaluation principles; (e) a procurement manual, as part of the Project Operations Manual (POM), will be disseminated by the PPMO upon agreement by the World Bank to guide project implementation; (f) procurement support will be provided to the project agencies by the World Bank's procurement specialist on a continuing basis during implementation; (g) annual procurement supervision missions will be conducted to review procurement progress and provide guidance; and (h) the PMOs/PIUs and the World Bank team will keep close contact to identify and address issues that may arise in the procurement process and in the management of contracts. With the above risk mitigation measures, the PMOs/PIUs should be able to manage the procurement of the project satisfactorily and the overall procurement risk for the project is assessed as Moderate.

7. **Major procurements envisaged under the project**. World Bank loan proceeds will be used for the procurement of (a) TA activities supporting provincial urban-rural integrated MSWM planning and management, agricultural plastic film pollution control related consulting services, and the public outreach and capacity-building program and (b) construction and upgrading of waste transfer stations, kitchen waste treatment facilities, landfill closure, construction of comprehensive waste management, publicity and

education/training centers, sorting centers for recyclables, construction waste processing plants, parking and maintenance centers for waste transfer vehicles, smart SWM platform, rural waste collection points, waste separation MIS, waste separation and collection systems (waste bins, smart segregated waste collection cabins, transfer vehicles, recyclables collection points, and so on), residual plastic film collection machines, and so on. (see annex 2, table 2.5).

8. **PPSD and PP.** Based on paragraphs 4.1–4.5 of the World Bank's Procurement Regulations, a PPSD and a PP have been prepared by the PPMO in close consultation with the World Bank. Decisions on the selection methods and market approaches to be adopted in the project PP are justified in the PPSD. Based on the PPSD, both the national and international markets will be interested, and both are capable of executing the contracts included in the project. The procurement activities under the project mainly include works, goods, and consulting services. Works and goods will be procured using Request for Bids which will be carried out through open competition by approaching national markets; Quality- and Cost-Based Selection, Quality-Based Selection, and Consultants' Qualifications-based Selection will mainly be used for the selection of consultants, which will be carried out through open competition by approaching both international and national markets, considering the size of the contracts and interest from both international and domestic firms. This information will be made available in the project's database, on the World Bank's external website, and at the project implementing agency's office. The PP will be subject to updates to reflect evolving implementation needs and institutional capacity and will be agreed to by the World Bank through STEP.

9. **Procurement methods and World Bank oversight**. The thresholds of individual procurement methods and the requirements for the World Bank's prior review are shown in the PP. Specific procurement requirements will be included in the PP; any changes to set procurement thresholds during project implementation will have to be justified in the updated PPSD and reflected in the updated PP. In addition to prior review supervision by the World Bank, World Bank procurement supervision missions will visit project locations at least once a year to carry out procurement supervision or post review of procurement activities. The post-review sampling ratio of contracts will be 1:10.

10. **FM**. The PPMO housed in Shaanxi PDRC will be responsible for daily project FM work. One DA will be opened and maintained at Shaanxi PFD, which will monitor the World Bank loan withdrawal procedure and be responsible for debt management.

11. **Risks and mitigating measures.** The assessment of project FM arrangements by the World Bank has identified the following shortcomings: (a) lack of World Bank operational experience by all implementing agencies at the county level and (b) lack of sufficient baseline information and reliable tools for data collection to carry out verification for the PBIF mechanism intended as an incentive program under Subcomponent 2B. The team has conducted FM assessment to all project PMOs and PIUs through one-on-one discussion with each of them and documents review. All project financial staff have passed the World Bank's FM and disbursement e-learning courses and have received completion certificates which is one of the critical elements for capacity assessment. Other detailed arrangements will be addressed in the Financial Management Manual (FMM). In addition, the following risk management measures will be adopted in view of the above risks: (a) preparation and issuance of FMMs (as part of the POM) acceptable to the World Bank to standardize project FM related roles, responsibilities, and procedures; (b) mechanisms subject to PBIF, including the design and application of the agriculture film ledger system and the introduction of TA on policy gap diagnosis, baseline assessment, methodology feasibility study, operational guidelines, and technical guidance; and (c) extensive FM training by the World Bank, complemented by the PPMO and the Shaanxi PFD

(which have rich experience with World Bank-financed operations) conducting additional workshops and sharing experience. The residual FM risk after mitigation is assessed as Moderate.

12. **Project costs and on-lending arrangement.** The total estimated project cost is US$340 million, with an IBRD loan of US$250 million. The LA will be signed between IBRD, and the People's Republic of China through the Ministry of Finance (MOF). MOF will on-lend the loan proceeds to Shaanxi provincial government, represented by the Shaanxi PFD, which will further on-lend the World Bank loan to the project counties through their respective prefecture finance bureaus.

13. **Budgeting.** The annual project implementation plan, including the budget and resources, will be prepared by the implementing agencies, and reviewed by the respective county PMOs. These plans will be submitted to the PPMO for comments and review. The budget for counterpart funds committed by governments will be reviewed and approved by the respective People's Congress and will be included in the sector budget. Based on the approved budget and implementation progress, the finance bureaus will provide government appropriations to the project. Budget variance analyses will be conducted on a semiannual basis to inform management of significant variances from the plan that may need corrective action. The World Bank will work with the implementing agencies and relevant PMOs to supervise the project budgeting system, enhance budget preparation, and improve budget execution reporting. Commitment letters for counterpart funds and for operating/maintenance funds have been issued by each county/district.

14. **Funds flow.** One DA will be opened in US dollars and will be managed by the Shaanxi PFD, with a ceiling as documented in the Disbursement and Financial Information Letter (DFIL). Supporting documents required for payments from the DA or the World Bank loan account will be prepared and submitted by the implementing agencies to the county finance bureaus for first review and then escalated to the PPMO for further review before going to the provincial finance bureau. Withdrawal applications for requesting replenishment, reimbursement, direct payment, or special commitment will be finally submitted by Shaanxi PFD to the World Bank. The withdrawal procedure in China has to be aligned with the domestic on-lending layer of review and procedure. In practice, to ensure an efficient withdrawal process, the working standard for each layer will be defined in the FMM which will be officially distributed by PFD to each PMO and PIU as well as the respective finance bureaus. For budget execution, first, the project counterpart funds are committed to be included in the government budget to ensure availability. The budget will be appropriated based on the actual implementation progress. Meanwhile, the local finance bureau, PPMO, and the World Bank will have regular meetings and progress supervision.

15. **Project accounting and reporting.** The administration, accounting, and reporting of the project will be set up in accordance with Circular #13 'Accounting Regulations for World Bank Financed Projects', issued in January 2000 by MOF. The standard set of project financial statements has been agreed between MOF and the World Bank. The implementing agencies will be responsible for daily project FM work, including counterpart funds management and payments, project accounting, and financial reporting. The PPMO will consolidate the project financial statements. The consolidated project's interim financial report (IFR) should be furnished to the World Bank by the PPMO no later than 60 days after the end of each calendar semester. The standard set of project financial statements has been agreed between MOF and the World Bank and includes the following: (a) Balance sheet of the project, (b) Statement of sources and uses of fund by project components, (c) Statement of implementation of LA, (d) Statement of DA, and (e) Notes to the financial statements (required only for annual financial statements).

16. **Internal control.** Accounting policy, procedures, and regulations for World Bank projects were issued by MOF, and the FMM will align with the FM and disbursement requirements among the implementing agencies. In addition, the PPMO will provide guidance and supervision to the companies covering (a) compliance with Circular #13 for project accounting and financial reporting; (b) examination of the usage of the World Bank loan and the eligibility of project expenditures as well as the efficiency of withdrawal procedures and funds flow; (c) contract management; and (d) budget preparation and variance analysis. The supervision results will be documented and filed.

17. **Audit.** One annual audit report will be issued and submitted to the World Bank as addressed in table 1.1. According to the World Bank policy on Access to Information, the audit report for all investment lending operations for which the invitation to negotiate was issued on or after July 1, 2010, needs to be made publicly available on time and in a manner acceptable to the World Bank. The audit reports will be made publicly available on the website of the provincial auditor. Following the World Bank's formal receipt of the audited financial statements, it will also make them available to the public in accordance with the World Bank Policy on Access to Information.

Table 1.1. Audit Report Requirements

Audit Report	Auditor	Submitted By	Due Date
Consolidated project financial statements	Shaanxi Provincial Audit Office	PPMO	June 30 of each calendar year

18. **Disbursement arrangements.** Applicable disbursement methods will include advance, reimbursement, direct payment, and special commitment. Supporting documents required for World Bank disbursement under the different disbursement methods are documented in the DFIL. One DA in US dollars will be opened at a commercial bank acceptable to the World Bank and will be managed by Shaanxi PFD. The ceiling of each DA is documented in the DFIL. Table 1.2 indicates the amount allocated to each disbursement category and the percentage of disbursements for each category.

Table 1.2. Disbursement Categories

Category	Allocated Loan Amount (US$)	Percentage of Expenditures to Be Financed (inclusive of taxes)
(1) Goods, works, non-consulting services, consulting services, Training, and Incremental Operating Costs	240,360,000	100
(2) PBIFs	9,640,000	100 (of amounts disbursed)
TOTAL	250,000,000	

19. The World Bank loan allocation to the PBIF component will be a separate disbursement category for ease of monitoring. In addition, a PBIF sub-manual acceptable to the World Bank is a disbursement condition against the PBIF mechanism category. Performance-based financing has been adopted in a number of World Bank-supported operations in China—in the rural, urban, environment, and agriculture sectors—and extensive experiences have been accumulated regarding FM-related arrangements. Retroactive financing in the amount of $50 million is available for payments made on or after November 1, 2022, for eligible expenditures in disbursement category (1), as specified in the LA.

20. For the PBIF mechanism approach, World Bank finance will be channeled to the defined beneficiaries (likely farmers, farmers cooperatives/enterprises, village committees) according to the implementation agreement signed jointly between the county PMO and the eligible beneficiary. The following financing principles and measures should be followed by relevant parties to ensure that robust internal control systems are in place for project funds to be used for the intended purpose effectively and efficiently:

(a) **Implementation agreement.** Based on approved annual implementation plans, implementation agreements will be signed with the beneficiaries. These implementation agreements will define the role and responsibility of each party and will include (i) activities to be financed, (ii) expected performance, (iii) ceiling of the World Bank financing (if needed) and predetermined unit cost, (iv) implementation schedule, (v) procurement requirements (if any), (vi) verification and acceptance procedures, (vii) disbursement terms, (viii) disclosure, and (ix) terms of termination.

(b) **Eligibility of expenditures.** The World Bank financing will be disbursed subject to achievement of expected performance as described in Subcomponent 2B, PBIF Sub-Manual agreed with the World Bank, and the implementation agreement. The eligibility will be subject to different scenarios that will be determined and covered in the PBIF sub-manual to be developed with assistance from a technical consultant (firm) during the first year of project implementation. Following screening of the clients' proposal, the World Bank financing would cover, but may not be limited to, (i) incentive subsidy subject to the unit cost difference between thick and thin agricultural plastic film or (ii) actual cost of equipment/facilities/soft activities for plastic film picking, transfer, and so on. All payments will be made upon verified achievement of defined performance.

(c) **Amount of financing.** According to different eligibility subject to different scenarios, the eligible amounts under the PBIF mechanism may result from a verified measurable quantity (weight) multiplied by a pre-determined unit cost (subsidy standard). The pre-determined unit costs concurred with the World Bank's technical team will be specified in the PBIF sub-manual and implementation agreement that shall be strictly followed. Meanwhile, actual costs for equipment/facility procured and services purchased could be eligible as well.

(d) **Verification and disbursement mechanism.** The district/county PMO jointly working with township Shaanxi Department of Agriculture and Rural Affairs (DARA) and/or village committee or contracted third-party independent verification entities, if needed, shall verify the outputs by milestone and the cumulative actual cost incurred. The PBIF disbursement will be based on verification certificates issued by the district/county PMO. A ledger system with complete and accurate data maintained is required for the performance or output verification. The ledger system will be rolled out and upgraded programmatically during the project life; it will be maintained by each individual county DARA and roll into a province-wide system in a top-down approach and maintained by the provincial agricultural bureau to integrate multiple functions on data collection and maintenance, monitoring, results verification, performance analysis, and so on. The system will record information on plastic film supply, consumption, collection, and transportation.

(e) **Disclosure.** Each district/county PMO and village committee shall disclose on an annual basis to the public the completion information including name of farmer's household (subject to acceptable protocols on collection and processing of personal data to be set out in the PBIF sub-manual), verified performance, and the amount of World Bank financing received.

(f) **Financial accounting and reporting.** The district/county PMO will take the responsibility of maintaining the accounting records, the original or copies, and financial reporting based on the activities and costs actually incurred. The beneficiaries also need to maintain the original records such as implementation agreement, invoices, verification certificates, bank record for the incentive received, and so on, for the purposes of verification and the governments and the Bank's supervision.

(g) **Procurement.** Procurement, if needed under the PBIF mechanism, will follow the World Bank's requirements as outlined in the project documents.

Environment and Social

21. **Shaanxi PPMO has confirmed the Batch 1 activities for a site-specific E&S assessment**, as discussed in the main body of the Project Appraisal Document (PAD). For Batch 1 activities, ESS1, ESS2, ESS3, ESS4, ESS5, ESS6, ESS8, and ESS10 are relevant, and they do not involve either natural habitats or critical habitats as well as legally protected cultural heritages and heritages at the local level. The E&S package for the Batch 1 investments includes EIA and ESMP, Social Audit Report, Social Impact Assessment (SIA), LMP, RAP, and SEP. In the EIA, the potential environmental risks and impacts were analyzed and alternatives for siting of facilities, routes of waste transportation, and compaction technology were developed and compared to select the ones with the least E&S impacts. Gross GHG emissions were estimated using the methodology agreed by the World Bank. A quick cumulative impact assessment was conducted. Mitigation measures, including environmental code of practice and site-specific measures and occupational health and safety (OHS) measures, emergency preparedness plan, soil erosion control plan, traffic management plan, and monitoring plan as well as the institutional arrangement and capacity-building plan have been designed and incorporated into the ESMP. Cost estimates for the environmental management were made. The SEP was developed at the early stage of the Environmental Assessment.

22. **The site-specific social audit and social assessment for the Batch 1 investments has been completed.** The assessment concludes that the closure of landfills would entail significant community health and safety risks and OHS risks and have legacy issues on land and resettlement (see below). Constructing new SWM activities will involve minor land acquisition but will not induce physical displacement. Gaps were observed against laws and ESS2 in terms of labor conditions (for example, contract conditions, wages, working hours) and OHS management for certain types of workers engaged or involved in existing facilities and waste collection services in relevant project areas. The measures in the relevant social documents to avoid, minimize, remedy, or compensate for the identified social risks and impacts and to strengthen opportunities and inclusions have been confirmed with the PMO/PIUs. The ESCP includes material measures and actions to remedy the social risks for the Batch 1 investments.

23. **Legacy issues**. Three of the four landfills identified for closure under Batch 1 have legacy issues. The stand-alone Social Audit Report for Batch 1 investments provides a comprehensive description of the issues, corresponding legacy circumstances for each of the landfills, and remedial actions. Two among the four landfills are not conforming with land zoning/planning requirements and have not obtained land approvals. A third landfill has community health concerns (that is, there are people living in the safety exclusion zone). During project preparation, the PPMO facilitated discussions among the PMOs, the feasibility study team, natural resources bureaus, and E&S consultants to determine remedial actions which were subsequently agreed and include the following: (a) engineering and non-engineering measures will be applied in the closure and post-closure design per the EIA/SIA to address and minimize the community health risks and (b) the PMOs have agreed to resolve the land approval noncompliance before starting the bidding for landfill closure. The agreed time-bound remedial actions for legacy issues were documented in the Social Audit Report. A brief summary of the specific legacy issues and corrective actions for Batch 1 investment is included in respective E&S documents. As part of the broader social monitoring, a social institute will be hired to monitor and confirm that identified issues are resolved per the agreed action plan.

24. **Stakeholder engagement**. During project preparation, an SEF and SEP were prepared to guide and document the extensive engagement with stakeholders (including vulnerable groups) to confirm the site selection for Batch 1 investments and understand stakeholders' concerns and seek their advice to improve the project design and mitigate E&S risks and impacts. The PPMO and the E&S consultants used various approaches to consult stakeholders, including consultative meetings (approximately 30), focus group discussions (approximately 65 focus groups that brought together more than 500 participants), interviews with individual society members (approximately 450), and a survey (extended to 2,794 residents in the project areas). Crucial influential authorities were engaged through face-to-face and virtual meetings to formulate permitting roadmaps and refine the project implementation schedules. With the stakeholders' meaningful inputs, the E&S assessment narrowed the scope to focus on substantive E&S issues; improve project designs; and strengthen risk mitigation measures, ESCP, and future engagement plans. On September 14–15, 2022, the E&S consultants held a workshop with the PMO/PIUs, the design institutes, and selected government agencies to introduce the assessment findings and proposed measures, procedures, and plans for E&S risk management. After confirmation and clarification by the E&S consultant, the PMO/PIUs endorsed the recommendations and action plans presented in a set of the framework and site-specific E&S documents.

Implementation Support Plan

25. The strategy for implementation support has been developed based on the project design, E&S risks, the diverse implementing agencies involved, and a link to the China Plastic Waste Reduction Project (P174267). The project will require continuous dialogue with central authorities (NDRC, MOHURD, MARA) as well as Chongqing and Ningbo Municipalities. This is particularly applicable in the case of facilitating links between NDRC that implements the central component of the first project and Shaanxi that implements the proposed project (since both projects are operationally and legally distinct). The implementation support plan will be reviewed and updated based on a periodic assessment of the risks and the appropriateness of the mitigation measures being implemented, to ensure that it meets the project's implementation support needs over time.

26. The World Bank's implementation support strategy combines periodic supervision with timely technical support and policy advice, as necessary. Implementation support will include the following: (a) an implementation support mission every six months, (b) interim technical discussions and field visits, (c) monitoring and reporting by the PMO on implementation progress and achievement of results, (d) external M&E of E&S compliance, (e) annual financial audits and FM reporting, and (f) periodic procurement post reviews. The World Bank will visit as many project sites as possible to address project implementation issues and comprehensively assess progress toward achieving PDO. In particular, the following measures will be taken in the early implementation stage when implementation challenges are expected to be more significant:

(a) **Capacity building.** Project districts/counties are new to World Bank-financed projects and lack the capacity to implement a project of this size and complexity. Significant training and hands-on support will be required on engineering, fiduciary, and E&S management. The project includes comprehensive capacity-building TA for (i) consultant services to the PPMO for project implementation and management, M&E, and so on; (ii) targeted training programs, including domestic and overseas study tours for PMO staff to strengthen their capacity in managing respective components; and (ii) knowledge exchange with central ministries.
(b) **Technical guidance.** To ensure the cost reduction and cost efficiency benefits of waste sheds are incorporated in the design of infrastructure, specific expertise on MSWM and agricultural pollution will be assembled during the semiannual implementation support missions to review and provide advice and

guidance on technical designs of infrastructure works and implementation. In addition, the PPMO, the local PMOs, and the PIUs will receive TA in reviewing project designs and bid documents from project management.

(c) **M&E.** The MIS specialist will provide continued support to MIS development and maintenance and provide feedback on a regular basis on the performance of the MIS operated by the PIU and the local governments. A specialist will support the PIU in improving the capacity of overall evaluation.

(d) **Fiduciary.** The World Bank will provide hands-on guidance on the review and audit reporting procedures. Similarly, procurement activities will be spread widely among entities, types of procurement, and size of contracts. This will require intensive implementation support through technical consultations and in-person visits, as needed.

(e) **E&S risks.** Mitigation of E&S risks is a core part of risk management for this project, especially on account of the framework approach adopted for loan-financed activities from Year 2 of implementation as well as legacy issues identified for Batch 1 and possibly Batch 2 investments. The World Bank will review external monitoring reports on E&S risk management and will carry out intensive site visits during implementation support missions for a first-hand assessment of compliance with World Bank E&S risk requirements, including these related to legacy issues. Emphasis will be placed on strengthening of the GRM and other feedback loops to solicit feedback and grievances from beneficiaries.

(f) **Gender.** A gender specialist will assess whether women actively participate in the planning and decision-making process and whether project design responds to women's needs and increases the potential for women's participation. They will propose strategies and modifications to promote fair working conditions for both women and men, considering the differentiated impacts on women and men in employment opportunities, remuneration, livelihoods, workload, and occupational health.

27. The proposed implementation support plan is in table 1.3. The MTR will be carried out no later than mid-2026.

Table 1.3. Implementation Support Plan

Focus	Skills
Time Needed: 0–18 months	
• Developing a schedule for annual knowledge sharing and consultations between central and local agencies in place • Building capacity for the PPMO and district/county PMOs • Onboarding procurement agent, project management consultants, and independent E&S monitoring consultant • Procuring services and works for first-year investment activities • Providing technical support to activities and implementation • Resolving land non-compliance/legacy issues for Batch 1 investments and preparation of E&S documents for Batch 2 investments • Preparing policy works and research • Conducting baseline of plastic film and ledger system design by district/county	• Core team, particularly FM, procurement, M&E, E&S experts. • SWM expert • Rural/agricultural environmental expert
Time Needed: 18–48 months	
• Procurement of services and works for Years 2–4 investment activities and construction • Synergy of policy work and physical improvements at central and local levels • Review and assessment of PBIF mechanism • Midterm review of project • Peer learning between provinces	• Core team, particularly FM, procurement, M&E, E&S experts • Rural/agricultural environmental expert

Focus	Skills
Time Needed: 48–72 months	
• Procurement of services and works for remaining investment activities and construction • Completion of activities • Capturing of impacts and lessons learned • Facilitation of knowledge exchange and events to consolidate project learnings • Finalization of detailed learning and analysis and preparation for end-of-project evaluation • Carrying out of end-term evaluation and client ICR	• Core team, particularly FM, procurement, M&E, E&S experts • Rural/agricultural environmental expert

28. **Skill mix.** Task team skill mix requirements for implementation support are proposed in table 1.4.

Table 1.4. Skill Mix and Team Composition

Skills Needed	Staff Weeks	Number of Missions	Comments
Task team leader(s)	24	Three in the first year, two thereafter	Internationally based and country-based staff
Procurement specialist	4	Two per year	Country-based staff
FM specialist	4	Three in the first year (focus on PBIF), two thereafter	Country-based staff
Operations/M&E specialist	2	Two per year	Country-based staff
Environmental risk specialist	4	Three in the first year, two thereafter	Country-based staff
Social risk specialist	4	Three in the first year, two thereafter	Consultant (national)
SWM engineer	4	Two per year	Consultant (national)
Agricultural plastic pollution specialist	2	One per year	Consultant (national)
Gender specialist	1	One per year	Consultant (national)

Annex 2: Detailed Project Description[45]

Policy, Institutional, and Operational Context

1. **China is increasingly adopting circular economy approaches in waste management.** The sector is under transition and efforts toward circularity are evolving fast. Developments are driven by efforts to reduce pollution and transition to more sustainable practices. From July 2017, China started to ban the import of various types of waste recycling materials including most waste plastics. Other recent initiatives include the following: (a) the "Waste-Free City Initiative"[46] first launched in December 2018 with around 10 cities to pilot comprehensive programs to improve the management of all types of solid wastes; (b) the policy document "Further Strengthening Plastic Pollution Control"[47] (January 2020) that envisages measures to ban the use of certain single-use plastic items; substitute many other single-use plastics with biodegradable materials; regulate better the use of agricultural plastic film; improve monitoring, reporting, and supervision; and promote eco-design and material recycling; (c) the new "Law on Solid Wastes" (April 2020) introducing sustainability measures; and (d) the "Guiding Opinions on Accelerating the Development of a Green and Low-Carbon Circular Economy" issued by the State Council (February 2021) which highlighted some important elements in waste management for circular economy transition, that is, the merging of the 'two networks' for the collection of low-value segregated waste and higher-value recyclables and the enforcement of EPR, although no specifics have been made available. A number of other recent central government reports[48] continue to prioritize waste as a key sector and subject to reform.

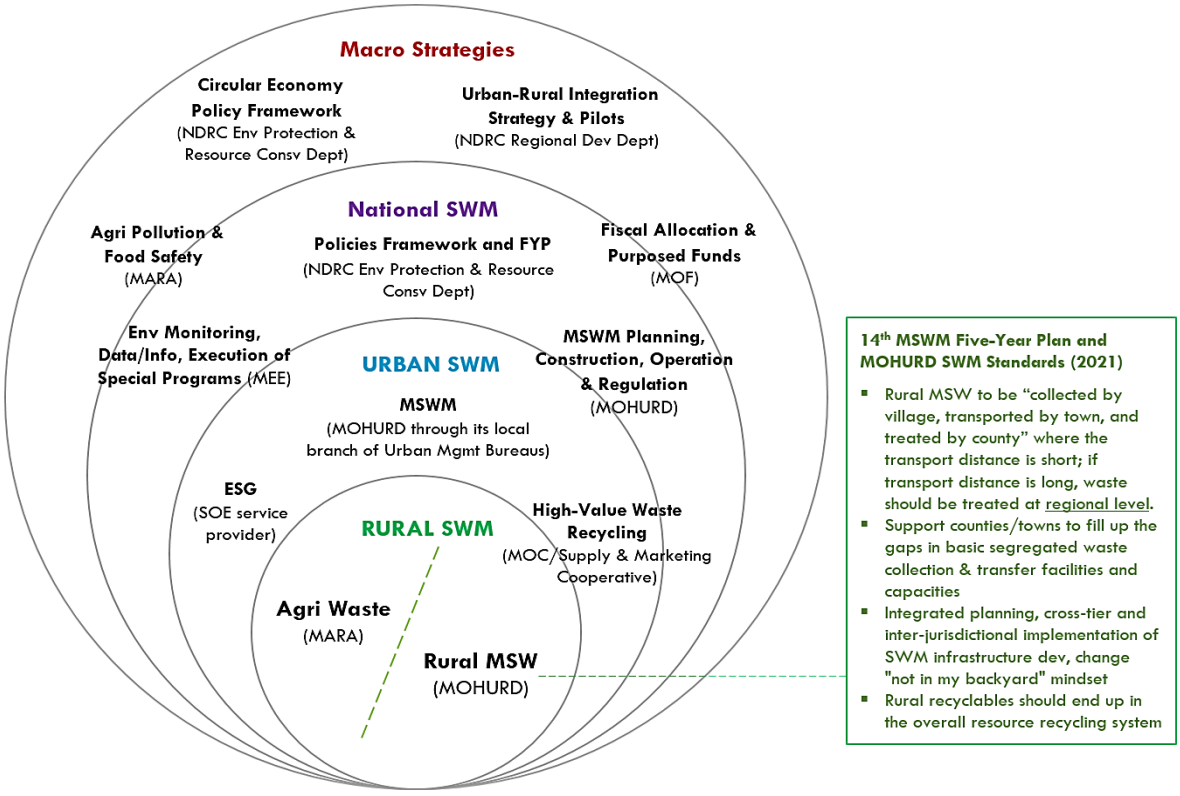
2. **Despite this comprehensive policy framework that demonstrates high-level political commitment for reforming the sector, obstacles to implement it remain.** Going beyond the policy objectives, some implementation modalities and economic drivers remain uncertain and significant efforts will be needed to define precise technical requirements and establish relevant standards and procedures. Improving coordination between institutions levels and developing appropriate mechanisms for planning, implementation, control, and enforcement will also be required. Measures to improve waste management services have traditionally been concentrated in urban areas, increasing the imbalances with rural China. A more balanced approach is being considered lately. Recent policy guidance related to rural waste management is emerging and aims to correct existing gaps, including (a) lack of clear policies on waste management at below county level; (b) fragmentation of institutional authority and responsibilities for the sector; (c) ineffective enforcement and monitoring of rural environmental management; (d) weak institutions, especially the lack of clear accountability and coordination among government authorities, and performance evaluation system; (e) significant gaps in waste facilities, especially at village and township levels; and (f) inadequate financing for the construction or operation, or both, of the rural waste management system.

3. **The governance of MSWM in China involves a large number of government agencies** (figure 2.1). The ministerial mandates and responsibilities cascade to line departments at the four administrative levels

[45] This annex is complementary to the information already provided in the main body of the PAD and does not repeat material in the main body.
[46] Waste-Free City Initiative approved by the State Council (December 2018).
[47] Further Strengthening Plastic Pollution Control, NDRC and MEE (January 2020).
[48] Report on the Implementation of 2019 Plan for National Economic and Social Development and on the 2020 Draft Plan for National Economic and Social Development by NDRC (May 2020); Report on Work of the Government by the Premier of the State Council (May 2020); Report on the Execution of Central and Local Budgets for 2019 and on Draft Central and Local Budgets for 2020 by MOF (May 2020).

under the central government, in declining order as province, prefecture, county, and township. The subnational and local line departments (that is, urban management bureaus) are responsible for MSWM in their jurisdictions. Subnational governments are authorized to formulate own waste management measures in line with the national targets and strategies. Local governments at the county level and above are responsible for the construction, operation, and service delivery of MSWM systems. Local governments are also given the mandate to design and implement tariff schemes for waste service.

Figure 2.1. Administrative Departments of Urban and Rural MSWM in China



Source: Team illustration based on allocation of responsibilities stipulated in government policy notes.

4. **In terms of operations, urban China has achieved near universal collection and safe handling rate.**[49] In contrast, rural MSWM lags and is considered a major source of pollution. Source separation of waste into four streams (organics, recyclables, hazardous, and residual) has started in most of urban China and need time to mature and improve. Separation at source in peri-urban areas and in rural China is being piloted. In 2019, incineration accounted for 50 percent in the treatment mix, landfilling around 47 percent, and biological treatment 3 percent. As landfilling continues to decline, incineration and biological treatment of organic waste are expected to continue to increase. In rural areas, kitchen (organic) waste is mostly used by households as animal feed, recyclables are partially collected outside the public stream (by informal and private sector due to low profit margins and long transport distance), and other residual waste and hazardous waste are often either littered to the environment, placed at informal dumpsites, or burnt by the population.

[49] China Statistical Yearbooks (2018, 2018, 2019, 2020, 2021).

5. **Although data on waste recycling are not precisely recorded, according to the World Bank assessment recycling plays a significant role in China's waste value chain.** In 2019, 18.9 million tonnes of plastics were recycled, representing a recycling rate of 27 percent. Following the ban on waste imports, the recycling of plastics increased between 2017 and 2019 reaching 18.9 million tonnes but declined in 2020 to 16.1 million tonnes that can partly be explained by the occurrence of COVID-19 pandemic. China has adopted 35 percent municipal waste recycling target for urban areas to be achieved by 2020.[50] The 14th FYP introduces a new nationwide target, requiring at least 60 percent of MSW to be recovered by the end of 2025 (including energy recovery). The plan does not specify what shall be the recycling rate achieved within the overall recovery target for MSW. There are no separate targets for packaging waste or specific recycling targets for plastic waste or other materials. Barriers to higher recycling rates of waste plastics include the parallel functioning of two separate systems[51] for waste collection characterized by high level of informality, limited development of separate waste collection systems from households, and low predictability and market fluctuations for waste recyclables. Regulatory instruments and drivers such as plastic recycling targets, minimum recycling content, and EPR for packaging waste are not yet in place.

Shaanxi Provincial Context

6. Shaanxi is a province in northwest China with an area of 205,000 km^2. It has a total population of 39.5 million,[52] of which 63 percent live in urban areas. In 2021, Shaanxi ranked 15th among all provinces in China by economic output. The province is geographically divided into three areas: the northern and central parts are in the Yellow River watershed with the central part (also known as the Guanzhong plain) being the most developed region in Shaanxi where most of the province's population reside. The mountainous southern part is in the Yangtze River watershed. The project will be implemented in five prefectures in central and southern Shaanxi.

7. **MSWM in urban Shaanxi**. In 2020, 8.94 million tonnes of MSW from urban sources was collected and nearly fully treated (95 percent through landfills).[53] Approximately 13 percent of this waste was plastics. Compared with more developed provinces, urban Shaanxi is lagging in (a) waste separation at source which is currently in place only in the capital city of Xian; (b) waste diversion from landfilling, which remains the main treatment method; and (c) private sector involvement that remains below levels in coastal provinces.

8. **Shaanxi lags most provinces in China in rural MSW services.** Even in places where a nominal service model of 'village collects, town transfers, and county treats' is in place, the actual operational efficiency remains low. The province generates approximately 3.2 million tonnes MSW from rural areas. Much of this waste collected by villages, instead of being transferred for proper handling in towns and eventually safe treatment/disposal in counties/districts, is generally dumped in the outskirts of villages and towns causing pollution to soil and water bodies. Data show that in 2020, approximately 20 percent of the rural MSW in

[50] At the time of issuing this PAD there was no published official statistical information confirming that such recycling target has been achieved.

[51] The collection of MSW is divided into two separate systems—the collection of residual MSW and separately collected fractions (including waste plastics) organized by local authorities as part of their environmental sanitation responsibilities and the market-based and mostly private recyclable resource network collects secondary raw materials from households and the commercial sector, including recyclables collected by informal sector. The latter network functions on a commercial basis, relies on the value of collected material, and is focused on high-value recyclables. Some cities have started integrating the two systems (for example, Beijing and Ningbo) as encouraged by central policy guidance (by NDRC).

[52] The 7th National Census of China (2021).

[53] There are 41 waste treatment facilities (including 6 incinerators) for cities in Shaanxi with total daily capacity of 28,400 tonnes and 71 waste treatment facilities serving counties with total daily capacity of 10,333 tonnes.

Shaanxi was safely handled and the province was in the bottom 30 percent among other provinces by level of investments in the sector, particularly at town/township level (see figures 2.2–2.4).[54] The main causes include (a) insufficient infrastructure, facilities, and capacity to move waste collected from villages for further handling, (b) lack of finance for the construction and O&M of collection/transfer facilities and services, and (c) unclear accountability and poor coordination among administrative agencies.

Figure 2.2. Shaanxi among Other Provinces: Harmless Treatment Ratio and Investment in Rural SWM System at TOWN Level (建制镇级) in 2020

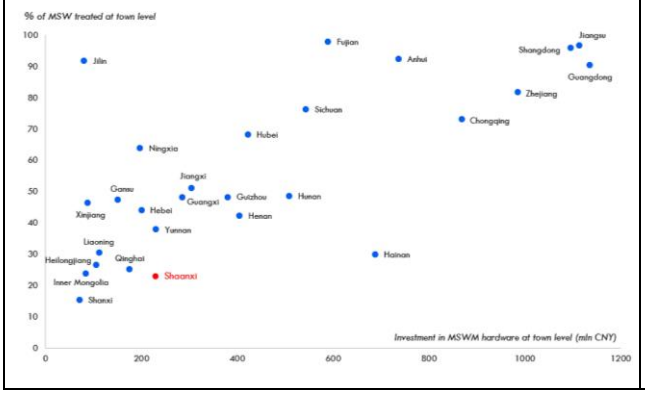
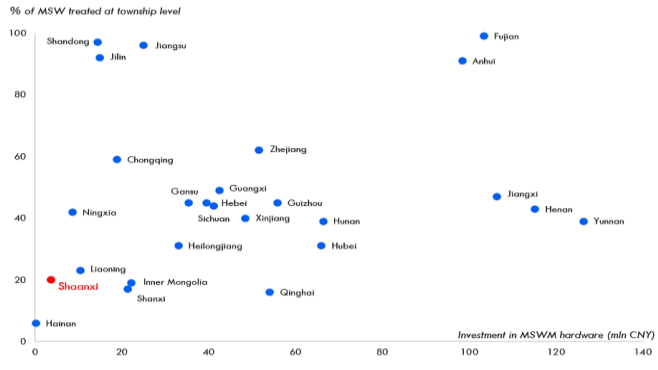
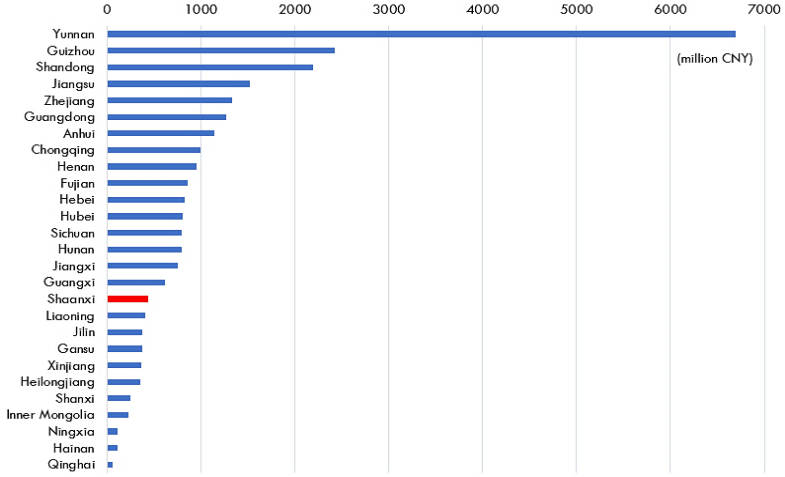


Figure 2.3. Shaanxi among Other Provinces: Harmless Treatment Ratio and Investment in Rural SWM System at TOWNSHIP Level (乡级) in 2020



9. Provincial MSWM strategies for the 14th FYP period have set out objectives, quantitative targets, and key actions to be taken for both urban and rural areas. By 2025, Shaanxi aims to establish segregated waste collection, transfer and treatment system, and regulation framework at prefecture level and above; phase out landfills and divert solid waste to preferable treatment methods; and have at least 35 percent of waste originated from urban areas recycled for reuse.[55] For rural waste, by 2025 the province plans to have optimized vertical models of urban-rural integrated waste management ("village collects, town transfers, and county treats") which will cover 90 percent of villages. In parallel, waste separation will be rolled out in rural areas wherever possible, and dumpsites will be closed, cleaned up, and banned. Some key

Figure 2.4. Shaanxi among Other Provinces: Investment in Rural SWM System at VILLAGE Level (村级) in 2020



Source: Task team illustration for provinces that are 50%-75% urbanized. All data based on published data by MOHURD and referenced above.

[54] MOHURD (https://www.mohurd.gov.cn/gongkai/fdzdgknr/sjfb/tjxx/index.html).
[55] Shaanxi Provincial Implementation Plan to Accelerate the High-Quality Roll-out of Municipal Solid Waste Separation (June 2022).

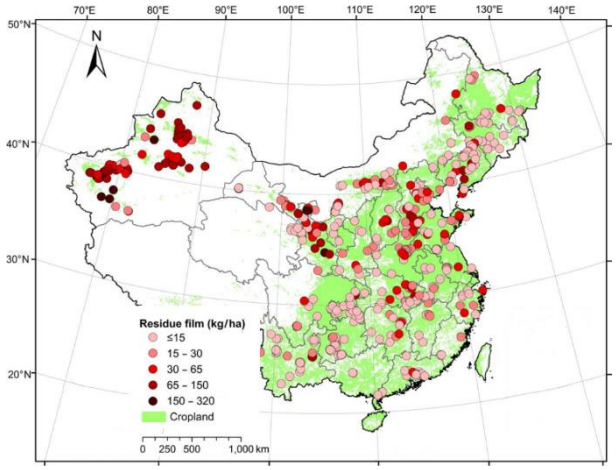
areas for action are stipulated in the recently released provincial strategy for rural MSWM,[56] including county-based planning for urban-rural integrated SWM; technically and economically viable integration models for various rural scenarios; infrastructure, facilities, and O&M for rural waste collection, transfer, and treatment; enhanced human capacity for service delivery; costing and financing; waste reduction at source; enforcement of technical standards (GB/T51435-2021) in rural waste management; and government performance M&E at tiers for rural waste management.

10. **Agricultural plastic film use and pollution management.** Agricultural plastic film is wildly applied in Shaanxi and has been instrumental for boosting product output and quality, especially of vegetables, fruits, and maize. Three major types of plastic films are in use—greenhouse film (54,000 t/y), ground plastic film (20,000 t/y), and reflective film (16,000 t/y).[57] Main users of plastic films are farms of scale (that is, vegetable/fruit producers), cooperatives, and smallholders. Of the three types, greenhouse film is nearly fully collected after use for recycling. The ultra-thin plastic film used predominantly for ground cover is unattractive for recycling, which in combination with existing waste service gaps results in most of it being not collected. It remains in the soil and accumulates over time. Reflective films that are mainly used in growing apples are thicker and more attractive for recycling but are nevertheless not properly disposed or recycled due to a combination of waste service collection and transport gaps and weak enforcement.

11. **Shaanxi lags other provinces in efforts and programs to address pollution from agricultural plastic film**. Shaanxi is not part of the national plastic film pollution reduction demonstration program that features targeted TA (for example, activities aiming to reduce plastic film use), administrative interventions, and earmarked fiscal allocation. The provincial regulatory enforcement is weak; although a 2021 provincial administrative order[58] calls for compliance to the national standard on agricultural plastic film quality (>0.01 mm thickness, GB13735-2017) for pollution control purpose, the use of noncompliant ultra-thin film remains predominant (0.004 mm was found to be the default agricultural film used in all project counties/districts). A range of government agencies are responsible for compliant film production, sale, and use; however, as a result of weak oversight and enforcement, producers, sellers, and users are in most cases not held accountable for noncompliance. In addition, there is a lack of systematized plastic film waste handling service, no local Shaanxi plastic film producers and recycling enterprises, and generally rather low awareness of users. Shaanxi's 14th FYP objective is to achieve 85 percent plastic film collection after use by 2025, which is to be achieved mainly through (a) stronger enforcement of the national standard in plastic film manufacturing, sell, and use; (b) province-wide plastic film residue monitoring, for which a network of initially 300 monitoring points has been commissioned in 2021; and (c) a ledger system at provincial/city/county levels to make plastic film sell, use, and collection trackable.

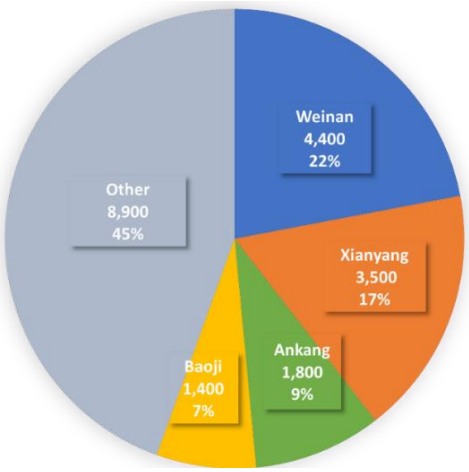
[56] Notice on Further Improving Rural Solid Waste Collection, Transfer and Treatment Systems Construction and Management (Shaanxi Provincial Housing and Urban-Rural Development Department, August 2022).
[57] Shaanxi DARA (2022).
[58] Notice on Accelerating Agricultural Plastic Mulch Pollution Prevention and Control, issued by Provincial DARA, November 2021. http://www.shaanxi.gov.cn/xw/ldx/bm/202111/t20211118_2200723.html.

Figure 2.5. Agri Plastic Film Residue Levels in China



Source: Zhang, D. et al. 2020. "Plastic Pollution in Cropland Threatens Long-Term Food Security."

Figure 2.6. Over 20,000 Tonnes of Ground Film Is Used in Shaanxi Every Year, with 55 Percent in Project Cities



Source: Shaanxi DARA.

Project Description

12. **PDO.** To reduce plastic pollution from municipal solid waste in selected under-served rural areas of Shaanxi Province, improve provincial plastic waste management, and draw lessons on plastic waste management relevant at the national level.

13. **Overall design.** This project builds on the earlier China Plastic Waste Reduction Project and will focus on waste management in rural areas. It is centered around the World Bank's development priorities in China, including policy and regulatory improvement, institutional strengthening, global public goods challenges, improved information availability and reliability, citizen involvement, knowledge sharing, and creating of conditions to leverage investments. First, the project will reduce plastic waste leakage to the environment and the world's oceans from rural waste flows. By investing in the integrated urban-rural waste management systems and service delivery, the project will (a) improve plastic waste capturing through increased coverage of the under-served rural areas by waste services; (b) pilot an integrated management model to reduce agricultural plastic film leakage; (c) increase waste diversion from landfilling; (d) strengthen the regulatory environment toward improved waste pollution control, monitoring, traceability, and control; and (e) support the development of effective institutional arrangements and capacities. Second, the project combines improved collaboration between national and subnational levels. With a strong link to the central policy work under the first project and central-local consultations led by DRC and supported by NDRC, this project will demonstrate institutional setup for urban-rural integrated SWM, division of responsibilities, and related performance evaluation processes. The project will inform MOHURD's work in creating models for urban-rural integration in waste management based on international good practices and pilots in Shaanxi and will inform the work of MARA on mechanisms to address the persistent agricultural plastic film pollution, incentive schemes, and ledger system operations and the work of NDRC under the first project.

14. **Participating province and county/districts.** As explained in the main body of the PAD, Shaanxi was selected for the project as a province with low baseline conditions in rural waste management and a province that contributes to marine plastic pollution due to its location within both the Yellow and Yangtze watersheds. The project will support the extension of MSWM services to under-served rural areas in 11

districts/counties, among which 7 will also pilot agricultural plastic film pollution reduction (see table 2.1). The 11 counties/districts were selected based on high concentration of population, low rural waste safe disposal rate, prevalent use of ultra-thin plastic film, and geographic variations offering good potential to demonstrate system optimization.

Table 2.1. Baseline of Project Districts and Counties

County/ District	Population		SWM Baseline				Agricultural Plastic Film Baseline				
	Urban (# of communities)	Rural (# of towns)	*Urban Waste Gen. (t/d)*	*Urban Waste Treated (%)*	*Rural Waste Gen.(t/d)*	*Rural Waste Treated (%)[a]*	*Greenhouse (GH, t/y)*	*Ground film (GF, t/y)*	*Area under Ground Film (GF, ha)*	*Reflective Film (RF, t/y)*	*GF/RF properly treated (%)*
1. Linwei	364,000 (6)	359,500 (14)	400	99	274	0	5,643	369	4,670	36	0
2. Chengcheng	113,700 (1)	200,100 (9)	118	98	149	10	500	200	3,070	800	0
3. Chencang	152,900 (3)	314,500 (11)	186	99	244	12	532	320	3,940	0	0
4. Pucheng	202,000 (2)	466,000 (15)	246	99	270	0	3,752	1,017	19,400	244	0
5. Baishui	107,560 (1)	116,270 (7)	89	97	91	0	94	88	1,140	900	0
6. Jingyang	89,000 (1)	329,300 (8)	117	99	145	99	2,750	786	12,670	0	0
7. Hanbin	367,700 (4)	307,200 (23)	368	100	280	12	187	220	4,470	0	0
8. Jintai	405,200 (7)	97,100 (4)	494	98	57	58	—	—	—	—	—
9. Weibin	423,500 (5)	31,900 (3)	441	99	36	0	—	—	—	—	—
10. Fengxiang	168,800 (6)	217,400 (12)	173	94	122	42	—	—	—	—	—
11. Nanzheng	274,700 (2)	302,900 (20)	200	26	277	0	—	—	—	—	—
Total	**2,669,060 (27)**	**2,742,170 (124)**	**2,832**	—	**1,945**	—	**13,458**	**3,000**	**49,360**	**1,980**	**0**

Source: Feasibility Study Reports (FSRs), November 2022.
Note: a. Share of rural waste for landfill or recycling combined.

15. **Project components, estimated costs, and financing.** The project is organized along three components; project costs and financing are in table 2.2.

Table 2.2. Estimated Costs and Financing (US$, millions)

Project Components	Project Cost	IBRD	Borrower
Component 1: Institutional Strengthening and Capacity Building	11.0	11.0	0
1A: Development of integrated urban-rural waste service model	1.2	1.2	0
1B: Central and sub-national knowledge sharing on plastic waste management	0.7	0.7	0
1C: Provincial and local institutional strengthening and capacity building	9.1	9.1	0
Component 2: Municipal Solid Waste Management Improvement and Agricultural Plastic Waste Management Pilot	326.0	236.0	90.0
2A: Integrated urban-rural waste management	315.1	225.1	90.0
2B: Agricultural plastic film waste management pilot	10.9	10.9	0
of which PBIF	9.6	9.6	0
Component 3: Project Management, Monitoring and Evaluation	3.0	3.0	0
Total	340.0	250.0	90.0

Note: RMB 6.8 = US$1.

16. Table 2.3 provides a further breakdown of IBRD-financed activities under Subcomponent 2A.

Table 2.3. Breakdown of IBRD-Financed Activities under Subcomponent 2A

Activities under Component 2A	Cost (US$, millions)
(a) **Waste collection**	**36.6**
of which for collection of source segregated waste	7.0
(b) **Waste transfer and sorting**	**75.0**
Transfer stations and equipment	65.0
of which for source segregated waste	37.0
Sorting lines	10.0
(c) **Treatment** (treatment facilities construction, rehabilitation, and landfill closure)	**110.0**
(d) **Education and public outreach** (publicity and education centers improvements)	**3.5**
Total	225.1

17. **Component 1: Institutional Strengthening and Capacity Building.** The component will provide TA for analytical work and system design of SWM systems, institutional strengthening, and capacity building, as well as for coordination and consultations between Shaanxi Province and line ministries. Since narrowing the urban-rural gaps in public services provision in China requires strong political will, collaboration among government agencies, and a synergy of top-down and bottom-up initiatives, the project will support consultations between Shaanxi and the plastic waste administrative ministries (NDRC, MOHURD, and MARA). Consultations will help guide Shaanxi in designing the integrated urban-rural waste service model and corresponding policy/institutional arrangements as well as applying agreed KPIs and aligned institutional responsibilities for rural waste management; this will then inform work carried out nationally by MOHURD and NDRC. The pilot of agricultural plastic film pollution reduction by Shaanxi will be aligned with MARA's agenda.

18. **Subcomponent 1A: Development of integrated urban-rural waste service model.** The subcomponent will support the development of urban-rural integration waste service model that is tested in the project counties in Shaanxi. Presently, rural waste management is not functioning well in Shaanxi and the models based on different local conditions and international good practices will feature operational efficiency and cost-effectiveness, with potential for replication. The focus is on integrated waste flow from waste generated in under-served county rural areas through handling and safe disposal in an integrated manner. Attention is placed on the integrated planning process, optimal technology application, O&M, economics and finance, stakeholder engagement, and performance evaluation, all new to local MSWM systems. The model will include a dedicated section on recycling, starting from waste separation at source, through segregated handling, transfer, and treatment. It will also include a section on separation of organic waste at source and in-situ treatment options (composting and similar) for rural areas. Fiscal impact and financing of the newly established, improved, or expanded services are of special focus to ensure the sustainability of the systems.

19. Efficiency concerns of the integrated waste service systems make it necessary to introduce the concept of regional SWM, under which two or more jurisdictions optimize waste volumes, transport distances, treatment facility capacities in a shared manner for additional cost efficiencies from operations, of treatment facilities and storage/transportation. The model will identify barriers in interjurisdictional collaboration and propose a set of fiscal and economic incentives to stimulate integration. International experience will be brought in, for example, where transfers toward capital investments are provided on the basis of established regional cooperation among jurisdictions. The activity will be developed in close coordination with MOHURD and inform its work on preparing national guidance and demonstration programs.

20. **Subcomponent 1B: Central and sub-national knowledge sharing on plastic waste management.** This subcomponent will be implemented in synergy with the central component under the first project and inform and benefit from planned technical activities under the central component of the first project related to national policy on plastic pollution reduction. Knowledge sharing and consultations supported under the proposed project will bring together NDRC, MOHURD, MARA, and Shaanxi for technical consultations, demonstration, and a two-way feedback flow and facilitate replication of pollution control measures from rural waste flows, along with associated GHG emission reductions as a result of improved waste management practices. The consultations will be organized by DRC. As part of its policy mandate and workings leading the plastic pollution agenda in China and to inform its work under the first project, NDRC plans to convene MOHURD and MARA and coordinate central-level participation in the consultations under the proposed project. The experiences and acquired knowledge from Shaanxi will inform national work carried out by NDRC, MOHURD, and MARA during the 14th FYP period with regard to urban-rural integrated waste management and agricultural plastic film pollution reduction. Specific areas of consultations will include, but not be limited to, the rural waste service delivery models and related national guidance notes by MOHURD, institutional setup and performance evaluation on waste management and pollution control by NDRC, and a national ledger system for agricultural plastic film pollution control planned by MARA.

21. Consultation will take the form of regular roundtable meetings or workshops during project implementation. NDRC, MOHURD, and MARA will provide strategic orientation and share experience from related government demonstrations in China. Depending on the need, discussions may involve other line ministries on an indirect or ad hoc basis. Specific activities will include (a) annual roundtable dialogue with NDRC, MOHURD, MARA, Shaanxi, and, as needed, Ningbo and Chongqing; (b) annual thematic seminars with the above central agencies, Shaanxi, and, as needed, the provinces under Plastics 1; (c) development of a case study on plastic waste reduction from Shaanxi to capture its experiences under the project for further dissemination and demonstration; and (d) additional knowledge management activities such as study tours, including internationally, and promotional/dissemination activities. The consultation window in Shaanxi is the PSC, led by DRC and comprises the PFD, Shaanxi Housing and Urban and Rural Development Department, DARA, Ecology and Environmental Protection Department, and other stakeholder agencies.

22. **Subcomponent 1C: Provincial and local institutional strengthening and capacity building.** The subcomponent will assist Shaanxi and project districts/counties develop needed policies, institutional and financing arrangements, O&M tools, and public participation to extend MSWM service to the under-served rural areas. Key areas of support are listed below, and specific activities are in table 2.4.

(a) **Area 1 - Urban-rural integrated MSW planning.** Taking a regional approach for service delivery, this area addresses the waste service coverage and operational modalities in various local contexts of Shaanxi Province. It will develop waste sheds, financing mechanisms and incentive structure, technologies including in-situ and industrial organic waste composting, waste minimization, waste separation at source and classification, reuse and recycling, construction, and institutional arrangements of regional facilities, and so on.

(b) **Area 2 - Research on integration of the two parallel MSW systems.** This area aims to inform Shaanxi on the merging of the formal MSWM system with existing material recycling systems and promote source separation of waste and material recycling in Shaanxi.

(c) **Area 3 - Development of provincial and local MSWM MIS platforms** aimed at establishing an interlinked online MSWM network. City and district/county-level MIS are operational platforms for daily management and real-time monitoring of the expanded local waste management to cover rural areas. Over time and with interconnection to the provincial MIS, the network will also

realize its information portal functions with database on waste generation, collection, recycling, and disposal as well as the energy output and environmental emissions for recovered materials.

(d) **Area 4 - Establishment of cross-departmental coordination mechanism** for plastic waste reduction. This area aims to establish and operationalize a cross-departmental coordination mechanism for coordinated planning and management of MSW services including waste minimization, segregation, in-situ composting and utilization of industrial kitchen waste treatment facilities, increased recycling, reduced pollution, and improved monitoring. The market and supply cooperatives responsible for resource recycling in rural areas will join the cross-departmental coordination mechanism.

(e) **Area 5 - Development of carbon emissions accounting and abatement plan for the MSWM sector.** This area will monitor and analyze the energy consumption and GHG emissions in the value chain of MSWM; identify regulatory measures to promote the waste reduction, separation at source, and recycling; and develop a pathway to abate the GHG emission in the MSW sector.

(f) **Area 6 - Regulation, incentives, and compliance monitoring tools for agricultural plastic film pollution control.** Those measures will be part of the integrated approach to pilot in Shaanxi and will include (i) cross-departmental action plan for more effective enforcement and monitoring of the national standard (GB13735-2017) for thicker agricultural plastic film, with clear accountability of compliant film production, sale, use, and collection in Shaanxi; (ii) in-depth feasibility studies in pilot districts/counties to support the development of the Sub-Manual for Subcomponent 2B, including plastic film use baseline surveys, customized PBIF schemes in respective local context, and county/district agricultural plastic film ledger design; (iii) a provincial ledger system for monitoring of plastic film use and collection with connection to city/county/district levels and MARA system when ready; and (iv) provincial plastic film residue monitoring network. The activity is expected to reduce pollution and preserve the integrity of soils that serve as natural carbon sinks along with soils' natural characteristics for agricultural food production. It is expected to also facilitate recycling due to the use of thicker plastic film.

(g) **Area 7 - Public outreach, capacity building, and knowledge exchange.** This important area aims to raise public awareness, especially in the rural areas of Shaanxi, on MSWM including source separation, reduction, recycling, illegal dumping, compliant agricultural plastic film use and waste collection, and so on. Public consultations, training, and knowledge exchanges will be developed and carried out.

(h) **Area 8 - Training and capacity building for county/district/subdistrict agencies responsible for MSW service provision.** Capacity assessment of the county's/district's/sub-district's ESCs responsible for service provision, development of capacity enhancement plans for the ESCs (focused on service provision and operations or contract management - in cases where the service provision will be outsourced), and capacity building by a professional technical adviser.

Table 2.4. Activities for Strengthening Institutions and Capacity

Areas where national-level work toward improving plastic waste management will be informed through regular roundtable discussions and workshops linking central and subnational levels and supported under Subcomponent 1B
1B.1) Rural household waste baseline in regions of China (to inform MOHURD's work) 1B.2) Rural waste minimization and recycling approaches (to inform MOHURD's work) 1B.3) Urban-rural MSWM system enhancement at the county level (to inform MOHURD's work) 1B.4) Costing and financing for urban-rural integrated MSWM (to inform MOHURD's work) 1B.5) Community-based participatory rural waste management (to inform MOHURD's and MARA's work) 1B.6) National ledger system for agricultural plastic film use and waste plastic film collection (to inform MARA's work and feed into an intended national ledger system) 1B.7) Lessons learned from testing KPIs and the related monitoring processes related to rural waste collection and transportation (to inform NDRC's work supported under the first project) 1B.8) Lessons learned from institutional alignment of responsibilities for waste management including plastics (to inform NDRC's work supported under the first project)
Provincial and local activities under Subcomponents 1A and 1C
MSW related 1A.1) Research on costs and possible financing mechanisms for rural waste service 1A.2) Development of integrated urban-rural waste service model to include costing modalities, financing mechanisms and incentive structure, technologies, construction, and institutional arrangements (including waste shed division and governance structure) 1A.3) Review of the performance M&E system of integrated urban-rural waste service (consistent with NDRC TA under the first project) 1C.1) TA activities to support provincial urban-rural integrated MSWM planning: ▪ Establishment of a process for urban-rural integrated SWM planning ▪ Behavioral study to inform *Shaanxi Rural Waste Separation Implementation Plan* ▪ Research and establishment of a rural waste recycling and resource reuse system in Shaanxi ▪ Research on options for gradual cost recovery from users ▪ Experiment of third-party service provision (from Shaanxi or other advanced provinces), under the new urban-rural integrated model ▪ Research on in-situ smaller-scale waste treatment models in remote rural areas of Shaanxi 1C.2) Research on the integration of the two networks in rural areas, considering the experience in Ningbo under the first project and NDRC's guidance 1C.3) Provincial online MSWM MIS (similar to that in Ningbo and Chongqing) 1C.4) Provincial cross-departmental knowledge exchanges for plastic waste reduction 1C.5) Provincial GHG emissions accounting and abatement plan for the rural MSWM sector *Agricultural plastic film related* 1C.6.1) Provincial/city cross-departmental action plan to improve enforcement of national standard (GB13735-2017) 1C.6.2) In-depth feasibility studies in pilot districts/counties to develop the Sub-Manual of Subcomponent 2B 1C.6.3) Provincial ledger system for agricultural plastic film sale, use, and post-use collection 1C.6.4) Demonstration of thicker (>0.015 mm) agricultural plastic film application and post-use collection 1C.6.4) Strengthening of provincial soil pollution monitoring network 1C.7) Public outreach and engagement program 1C.8) Training and capacity building of Environmental and Sanitation Group service under the urban-rural integrated service model (including peer learning and study tours to advanced eastern provinces of Zhejiang, Jiangsu, and Beijing-Tianjin-Hebei area)

23. **In-depth feasibility studies for Subcomponent 2B implementation under Subcomponent 1C, Area 6**. The county/district-specific feasibility studies are critical for the design and implementation of Subcomponent 2B

on agricultural plastic film pollution reduction. The feasibility studies need to cover the following key areas in each district/county and the findings will inform the development of the Sub-Manual of Subcomponent 2B, including (a) baseline situation of ground plastic film and reflective film use: amounts, distribution, application, users, and acquisition of films; (b) agricultural plastic film waste service system: collection, storage site selection, transfer optimization, treatment or reuse facilities, and capacity; (c) cost and financing; (d) stakeholder and accountability; (e) customized PBIF schemes in local context; and (f) ledger system design (county/district level).

24. **PBIF mechanism designed under Subcomponent 1C, Area 6.** The PBIF will provide an incentive to enhance and change farmers' willingness and behavior to use thicker plastic film and collect and transport the used plastic film to designated areas. The PBIF will be focused on ground film and reflective film which are the main source of agriculture plastic pollution. It will benefit farmers/farmer associations/village committees as follows: (a) PBIF will be offered against verified utilization of standard/thicker ground film by farmers and cooperatives in compliance with GB13735-2017 and (b) PBIF will be offered against verified collection from farmland used plastic film that is placed at the designated collection points, from where the plastic film will be transported to safe handling and treatment as part of the MSWM system.

25. **A ledger system will be established at the county, city, and provincial levels, under the leadership of agricultural and rural affairs department.** The ledger system will make agricultural plastic film sale, use, and collection trackable and serve as a tool for both regulatory monitoring by the Government and output monitoring and verification under the project. Starting from the seven pilot districts and counties, the ledger system is expected to be rolled out to the province and upgraded programmatically during the project life. It will be maintained by each individual county/district agricultural bureau and feed into a province-wide MIS that will be maintained by the provincial DARA and will integrate multiple functions on data collection and maintenance, monitoring, results verification, performance analysis, and so on.

26. **Shaanxi's soil pollution monitoring network will be expanded with loan finance under this subcomponent.** The network focuses on agricultural plastic film residue in soil; it is in early stage now with initially 300 monitoring points across the province. The expanded network to pilot districts and counties will help verify project outcome in agricultural plastic pollution reduction.

27. **Component 2. Municipal Solid Waste Management Improvement and Agricultural Plastic Waste Management Pilot.** The component is organized in two subcomponents as follows.

28. **Subcomponent 2A: Integrated urban-rural waste management.** This subcomponent will support investments to upgrade and extend the urban MSWM systems (collection, transfer, recycling, and treatment; see table 2.3) to under-served rural areas in Shaanxi, toward better service coverage, reduced pollution, and improved operational efficiency and sustainability (see table 2.5). The systems will be constructed and operated under the integrated service models following two technical pathways: (A) in areas where the incumbent model of "village collects, town transfers, and county treats" is operable, the project will finance the physical and operational improvements where gaps still exist—that will include hardware and capacity not only in the rural areas but in the urban systems for them to handle the waste flows from rural sources and (B) in places where the service does not exist or the incumbent model is not technically or economically viable, the project will support the adoption of a regional approach across contiguous jurisdictions for better efficiency and economy of scale. In the latter option, the subcomponent will support integrated planning and interjurisdictional arrangements for the construction of waste facilities, their operation, waste service delivery, cost sharing, and compliance issues. While both models (A) and (B) lead to urban-rural integration

and economies of scale, model (B) allows to depart from the default system and explore further efficiencies in costs and logistics.

29. Subcomponent 2A includes activities related to (a) waste collection; (b) waste transfer and sorting; (c) treatment presented below; and (d) education and public outreach which, through support to public outreach amenities and educational outreach activities, will demonstrate the benefits of improved MSWM, reduced pollution, waste prevention, minimization, recovery, segregation, recycling, and reuse.

30. **The project adopts a combination of framework and site-specific approach**. Four jurisdictions (Linwei District, Chengcheng County, Chencang District, Baoji city proper) are ready to implement respective investment activities once the project becomes effective (hereinafter referred to as 'Batch 1 activities') and site-specific E&S documents have been prepared and disclosed. The remaining activities under Subcomponent 2A (batch 2) will be confirmed based on respective feasibility studies along with the preparation of site-specific E&S documents during implementation. The activities included in the project during implementation will be those that fall within Shaanxi's investment program at the time of project appraisal (see table 2.5) and follow an integrated urban-rural approach built on cost efficiencies and optimization (see box 2.1). Compared with other project districts/counties, the four jurisdictions in Batch 1 (a) generate MSW in greater amounts especially waste originating from rural areas (including from agriculture); (b) show strong political will and technical readiness to integrate MSWM between urban and rural; (c) have well-identified gaps and therefore justifiable demand for immediate loan support; and (d) are more ready to implement the project, given related local policies and plan, institutions, and other resources.

Table 2.5. Shaanxi Investment Plan

Collection	Transfer	Treatment	O&M	Agri Plastic Film
ACTIVITIES FOR IMMEDIATE IMPLEMENTATION				
1. Linwei District, Weinan (Batch 1), US$40.26 million				
• Build 510 collection points in 281 villages • Build 500 segregated waste collection points in urban communities	• Build 5 town-level transfer stations (80 t/d × 3, 60 t/d × 2) • Upgrade 3 urban transfer stations (200 t/d, 100 t/d × 2) • 70 units of compactors and transportation vehicles	• Close 1 landfill (Ma Jia Gou, 5.1 million m^3) • Upgrade 1 urban waste sorting center (Huashan Ave 135 t/d)	• MSWM online system • Public education center (300 m^2) • Capacity building	• Plastic film waste collection and transfer system • PBIF for compliant use and post-use handling • Plastic film ledger • Expand soil pollution monitoring network • Public outreach
2. Chengcheng County, Weinan (Batch 1), US$17.20 million				
• 195 collection vehicles for villages	• Build 1 compression transfer station in city (100 t/d) • Build 8 town-level transfer stations (30 t/d) • 55 units of solid waste collection and transportation vehicles	• Close county landfill (1.06 million m^3) • Close Raotou Town landfill (220,000 m^3)	• MSWM online system • Public education center • Capacity building	• Plastic film waste collection and transfer system • PBIF for compliant use and post-use handling • Plastic film ledger • Expand soil pollution monitoring network • Public outreach
3. Baoji city proper (Batch 1), US$20.5 million				
		• Close Chang Shou Gou landfill (5.11 million m^3)	• MSWM online system • Public education center • City-level TAs and capacity building	n.a.

Collection	Transfer	Treatment	O&M	Agri Plastic Film
4. Chencang District, Baoji (Batch 1), US$32.05 million				
• 80,320 waste bins • Build 170 village collection points • Build 500 urban segregated waste collection points/sheds • Build 30 collection sheds, upgrade 2 sheds	• Build 2 compression urban transfer stations (45 t/d, 80 t/d) • Build 3 town-level mobile compression transfer stations (16 t/d, 24 t/d) • 521 units of collection and transportation vehicles • 16 suction trucks and sweepers • 6 sanitary workers' time break sheds with 100 tool boxes	• Build parking lot (11,000 m^2) for waste transfer vehicles and machinery, with 30 EV charging poles and vehicle maintenance center	• MSWM online system • Public education center • Capacity building	• Plastic film waste collection and transfer system • PBIF for compliant use and post-use handling • Plastic film ledger • Expand soil pollution monitoring network • Public outreach
ACTIVITIES UNDER BATCH 2				
3.1 Baoji city proper, US$41.17 million				
		• Training and education center • Waste plastic sorting center (15,000 t/y) • Construction and decoration waste recycling facility (30,0000 t/y) • Expansion of kitchen waste treatment facility (100 t/d)		
4.1 Chencang District, Baoji US$5.7 million				
		• Construction and decoration of waste treatment facility • Training and education center		
5. Pucheng County, Weinan US$22.08 million				
• Build 588 collection points in 275 villages • Build 305 collection points in 147 urban communities • 275 collection vehicles for village solid waste collection	• 80 units of transfer vehicles and lifting machinery	• Close county landfill (zone 1) (650,000 m^3) • Build 1 bulky waste dismantling facility (3,200 m^2, 10 t/d)	• MSWM online system • Public education center • Capacity building	• Plastic film waste collection and transfer information management system • PBIF for compliant use and post-use handling • Quality assessment of collected plastic film waste and agriculture plastic film waste collection machine promotion • Public outreach
6. Baishui County, Weinan, US$14.73 million				
• 225 solid waste collection vehicles for villages, • 1,280 waste bins for villages • 210 garbage sorting kiosks	• Build 1 compression transfer station (200 t/d) • Build 7 mobile compression transfer stations (20 t/d) • 37 units of collection and transportation vehicles	• Close 1 landfill (1.075 million m^3) • Build 1 bulky waste dismantling facility (1,000 m3 t/d)	• MSWM online system • Public education center • Capacity building	• Plastic film waste collection and transfer management information system • PBIF for compliant use and post-use handling • Monitoring and assessment system for agriculture plastic film waste on the farmland • Public outreach
7. Jintai District, Baoji, US$13.58 million				
• 24,139 waste bins for rural areas • 150 shelters for sanitary workers in urban areas • 23 village level collection points	• 129 units of solid waste collection and transportation vehicles • One transfer station for rural area • Upgrading of 12 transfer stations in urban area	• Parking lot for sanitary vehicles with area of 4,000 m^2 and 15 charging poles	• MSWM online system • Public education centers • Capacity building	n.a.

Collection	Transfer	Treatment	O&M	Agri Plastic Film
	• 24 sprinkling trucks for urban areas • 3 trucks for recyclable waste collection • 4 trucks for kitchen waste, • 1 truck for hazardous waste			
8. Weibin District, Baoji, US$15.52 million				
• 518 solid waste collection points in urban and rural areas • 5,000 waste bins for urban/rural areas • 244 collection vehicles for villages and urban areas • 300 fruit bins • 50 toolboxes • 263 sanitary work shelters	• 37 solid waste collection and transportation vehicles,4 new installed transfer stations • Upgrading of 3 transfer stations • 45 sprinkling trucks • 3 trucks for hazardous waste, kitchen waste, and bulky waste collection/transportation	• Sanitary vehicle parking lot with total area of 4,300 m^2 and 20 e-charging poles	• MSWM online system • Public education centers • Capacity building	n.a.
9. Fengxiang District, Baoji, US$21.85 million				
• Build/upgrade solid waste collection points (154: 14 new built and 140 upgraded) in rural areas • 400 solid waste collection points in urban areas • 105,600 waste bins for urban/rural areas • 1,938 collection vehicles for urban/rural areas	• Build 2 transfer stations in rural area • 31 solid waste transportation vehicles, 1 truck for hazardous waste collection/transportation	• Close district landfill • One bulky waste treatment center	• Capacity building • Public outreach • Solid waste monitoring and management information system	n.a.
10. Jingyang County, Xianyang, US$17.62 million				
		• One bulky waste treatment center with 5 t/d and total area of 1,800 m2 • One vegetable waste treatment and processing facility with capacity of 100,000 t/y	• Public education center • Capacity building	• 20 agriculture plastic film waste monitoring and assessment stations • 9 plastic waste collection points • PBIF for compliant use and post-use handling • County plastic waste collection and management information system • Public outreach
11. Nanzheng District, Hanzhong, US$29.5 million				
• 633 solid waste collection points for urban and rural areas, • 22,294 waste bins for urban and rural areas	• Build/ upgrade 8 transfer stations in urban and rural areas • 81 SW collection and transportation vehicles	• Close Jiangnan landfill (designed capacity of 1,110,000 m^3)	• MSWM online system • Public education center • Capacity building	n/a
12. Hanbin District, Ankang, US$34.65 million				
• 245 SW collection vehicles for villages • 500 SW collection points • 100,000 waste bins	• Build 16 transfer stations • 107 SW collection and transportation vehicles • 10 kitchen waste collection/transportation vehicles	• Build 1 kitchen waste treatment plant • Pilot rural organic waste treatment	• SWM information system, • Public outreach • Capacity building	• PBIF for compliant use and post-use handling

31. **Linwei District, Weinan**. The district has 14 towns and 6 urban communities, with a total area of 1,221 km^2 and a total population of 724,000, roughly split in half between urban and rural areas. In 2021, urban waste generation was approximately 400 t/d inclusive of household and street waste and 99 percent was safely treated. Rural areas generated about 274 t/d of waste, which was mostly unmanaged. Plastic waste ranges from 10.5 percent to 13.0 percent in the waste composition. In Linwei, the project will finance (a) waste collection facilities in under-served villages and urban communities; (b) construction/upgrading of town-level and urban transfer stations and procurement of transport equipment to move waste collected from villages to treatment facilities in the urban system; (c) closure of a landfill (Ma Jia Gou) to divert waste to other ways of safe treatment; (d) upgrading of a waste sorting facility; (e) district MSWM MIS; and (f) PBIF, ledger system, and collection/transfer system for agriculture plastic film waste reduction. The activities will be implemented by the ESC, a public entity under the district government responsible for urban SWM and cleansing.

Figure 2.7. Linwei Urban and Rural Waste Flows

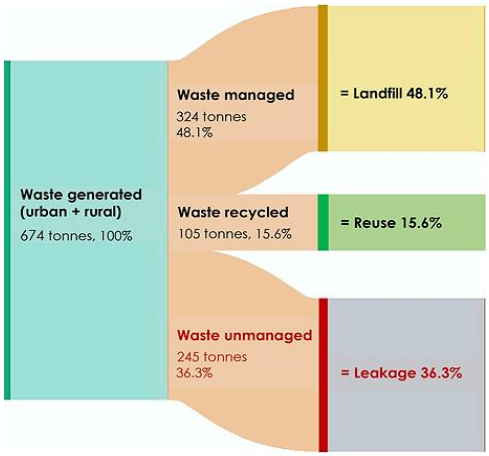
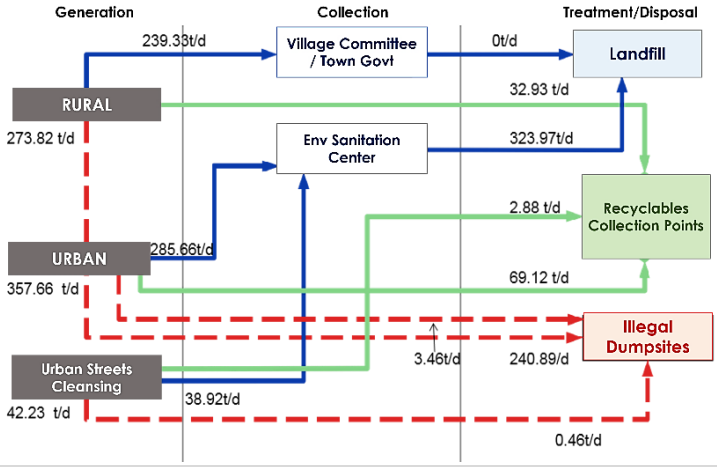


Figure 2.8. Linwei MSW Mass Balance



Source: Linwei FSR, November 2022.

32. **Chengcheng County, Weinan.** The county has 9 towns and 1 urban community, with total area of 1,121 km^2 and a population of 314,000, roughly split in half between urban and rural areas. In 2021, urban waste generation was 118 t/d including household and street waste, which was 99 percent properly treated or recovered. Waste from rural sources was 149 t/d and only about 10 percent was treated/recycled. Waste recycled included total waste generation of 266.74 t/d in Chengcheng which includes 13.3 percent plastic waste. In Chengcheng, the project will finance (a) waste collection vehicles for under-served villages; (b) construction of one transfer station in city and eight towns and procurement of long-hauling transfer vehicles; (c) closure of two landfills (county and town levels); (d) county MSWM MIS; and (e) PBIF, ledger system, and collection/transfer system for agricultural plastic film waste reduction. The activities will be implemented by the ESC, a public entity established in 2002, for urban SWM and cleansing.

Figure 2.9. Chengcheng Urban and Rural Waste Flows

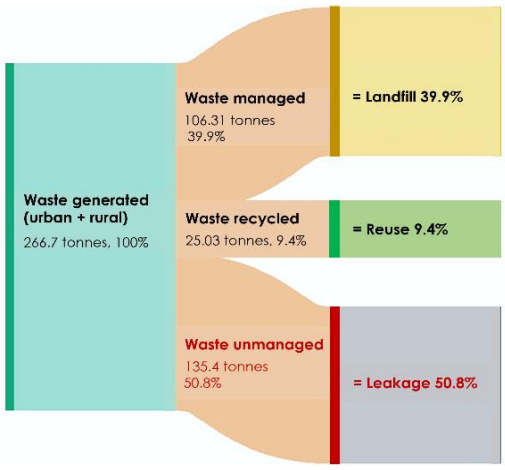
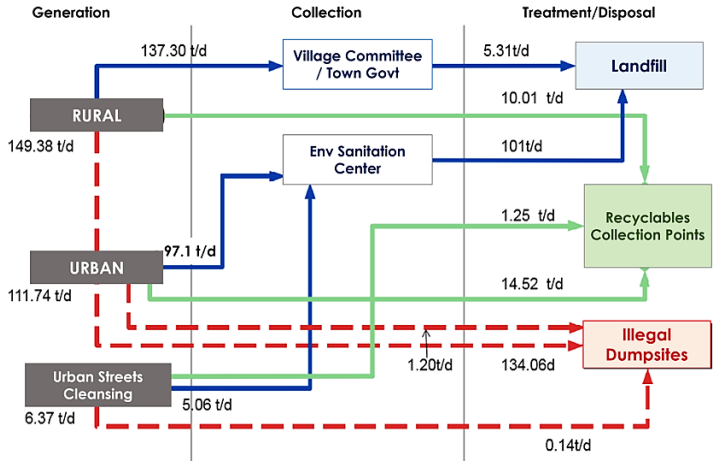


Figure 2.10. Chengcheng MSW Mass Balance



Source: Chengcheng FSR, November 2022.

33. **Chencang District, Baoji.** The district covers 11 towns and 3 urban communities with a total area of 2,058km^2. Total population is 467,400, two-thirds of whom live in the rural areas. In 2021, total waste generation in urban areas is 186 t/d, including household and street waste, which was nearly fully managed and treated. Total rural waste generation was 244 t/d and only 12 percent was landfilled or recycled. In Chencang, the project will finance (a) waste collection facilities for under-served rural and urban areas and collection vehicles for villages; (b) construction of two transfer stations in city and three transfer stations in towns and procurement of transfer equipment; (c) construction of one parking lot and maintenance facility for waste transfer vehicles; (d) construction of a decoration waste treatment facility; (e) district MSWM MIS; and (f) PBIF, ledger system, and collection/transfer system for agricultural plastic film waste reduction. The activities will be implemented by the district UMB, a government agency responsible for urban SWM, cleansing, and landscaping.

Figure 2.11. Chencang Urban and Rural Waste Flows

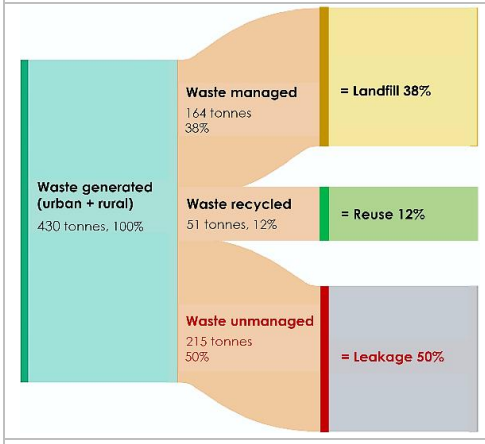
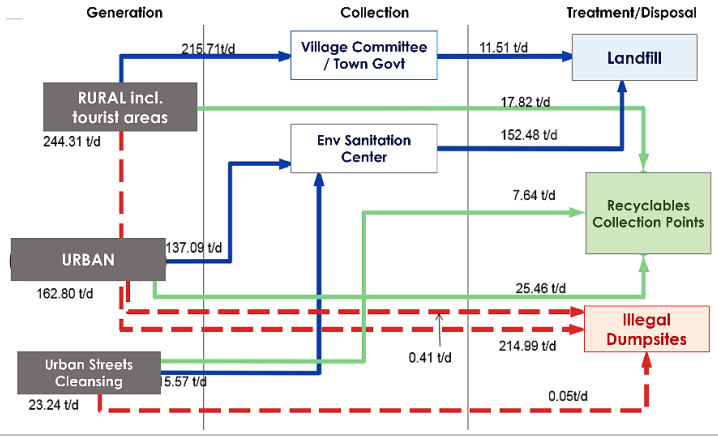


Figure 2.12. Chencang MSW Mass Balance



Source: Chencang FSR, November 2022.

34. **City of Baoji final treatment**. Taking a regional approach, the collected MSW from four districts—two urban districts of Hanbin and Jingtai and two rural districts of Chencang and Fengxiang—will be transported to Chang Shou Gou area in Jintai District for final treatment. The loan will finance (a) closure of Chang Shou Gou landfill and (b) city MSWM MIS. More treatment facilities including construction of a plastic waste sorting facility and a construction waste processing line and expansion of an existing KWTP are planned in Batch 2. The activities will be implemented and managed by the Baoji city UMB, a government agency responsible for SWM planning and final treatment at the city level.

35. **Subcomponent 2B: Agricultural plastic film waste management pilot.** The subcomponent is the investment portion of the integrated approach to curb agricultural plastic film leakage into the environment. The overall objective of the pilot is to catalyze the province's transition to standard plastic film (that is, thicker plastic film); change farmers' and seller's behaviors in plastic film sell, use, and handling; and have the needed systems and services in place for post-use collection and handling. With that achieved, the piloted system for plastic film pollution control is expected to improve and establish conditions for more ambitious initiatives (for example, recycling and EPR). Soil characteristics will be improved as a result of this subcomponent, both in terms of natural characteristics for agricultural production and the soils' ability to serve as carbon sink. Focus will be on ground film and reflective film—the two types that are heavily used[59] and most polluting in Shaanxi. World Bank loan will support the following activities in seven pilot counties/districts:

(a) **Plastic film waste handling system** that includes essential infrastructure and facilities for post-use plastic film collection from farmland, temporary storage, and transportation to disposal/recovery facilities of the local MSWM system.

(b) **Customized PBIF** to local context to incentivize identified beneficiaries (such as farmers cooperatives) to first transition from non-compliant ultra-thin plastic film to standard films (>0.01 mm) and then collect the film after using manually or mechanically from the soil and store and transport it to designated outlets and from there to disposal or recovery facilities. Currently, the use of ultra-thin ground film (0.004 mm) is predominant in project districts/countries, making it technically difficult to collect from farmland and costly to treat or recycle. Second, the proper storage, transfer, and safe disposal of plastic film waste can only happen hand-in-hand with improvement to the rural waste management system, with available hardware and service. The PBIF mechanism may target different beneficiaries in the seven counties depending on the plastic film waste management workflow and their specific roles. As an incentive approach, the PBIF mechanism is not indefinite subsidization, and the schemes will be designed and implemented with exit arrangements. The incentive will bridge the period until the ledger system is available and well in use, allowing monitoring and control of sell, use, and post-use handling of standard plastic film; it offers positive reinforcement of national requirements to transition to thicker film; and an opportunity to couple it with public outreach and sensitization on the benefits of improved pollution control.

(c) **Ledger system** to be established and maintained at village and county/district levels for the traceability of agriculture plastic film sell, purchase, post-use collection, and transfer. The ledger has two major roles under this project—as M&E tool for results verification and PBIF fund allocation and the dynamic compliance monitoring tool to capture non-compliance by plastic film producers, sellers, and buyers/users. Such information will be used by local and provincial regulators for compliance action. Shaanxi aims to digitalize and connect county/district ledgers with the provincial ledger (to be established under Subcomponent 1C), which will greatly improve the plastic film traceability and

[59] Approximately 2,500 t/y of ground film and 2,000 t/y of reflective films, in seven pilot counties/districts.

regulatory monitoring of the province. The specifics of the PBIF mechanism under Subcomponent 2B will be designed during implementation and will take several steps as indicated in table 2.6.

Table 2.6. Implementation Schedule of Agriculture Plastic Film Subcomponent

	Year 1	Year 2	Year 3	Year 4-6
Stage 1				
- Adoption of cross-departmental Action Plan to enforce GB13735-2017 and accelerate transition to thicker film	√	√	√	√
- In-depth feasibility studies of pilot districts/counties to formulate Operations Sub-Manual - Ledger design and rollout to 7 counties/districts - Design optimization of agricultural plastic film waste handling systems	√ √	√ √		
- Public awareness raising activities	√	√	√	√
Stage 2				
- Effective enforcement and regulatory monitoring - PBIF implementation and allocation		√	√	√
- Agricultural plastic film waste handling facilities and service provision - Learning from other provinces	√	√	√	√
Stage 3				
- M&E and results verification		√	√	√
- Know-how exchange			√	√

36. **POM.** The POM will outline the process of financing by the World Bank's loan activities under Batch 2 that have been included in Shaanxi's investment plan at the time of project appraisal with reference to the framework E&S project documents disclosed by appraisal. The urban-rural integrated MSW services will be based on optimal transportation and handling plans and follow the agreed methodology at the time of project appraisal and outlined in the POM (see box 2.1).

37. **Component 3. Project Management, and Monitoring and Evaluation**. This component will support the operation of project management/implementing agencies in Shaanxi Province, to ensure smooth project implementation and compliance to World Bank and domestics policies and procedures. Activities to be financed include project management related training and capacity building for key stakeholders (for example, PPMO, County/District Project Management Office and staff from related government agencies at provincial and local levels), consultancy services for contract management, accounting and FM, project reporting, independent monitoring of the implementation of the project's E&S instruments, and knowledge management systems.

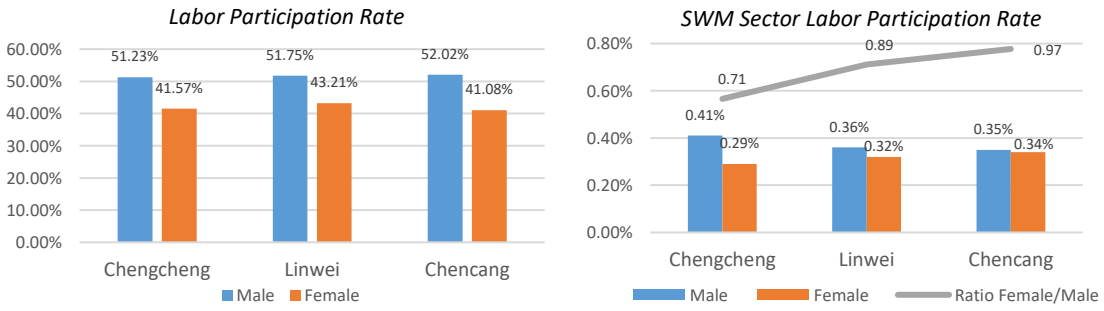
Box 2.1. Development of Options Scenarios for Linwei District (as example)
The modeling to arrive at the most optimal routing and combinations of container size/trucks load/compaction ratio/use of shared routes and number and location of transfer stations is achieved using a combination of platforms including satellite image/mapping systems (www.tianditu.gov.cn*, Gaode mapping at* www.amap.com *and* map.baidu.com/@12573153.72,3258106.27,12z). Relevant information was then entered into an Excel model, including population of Hukou and residents in county villages/rural areas, population change projection over a 20-year period for each village along with generated MSW estimated daily considering seasonal variations, volumes of waste, and distances. Five scenarios were considered, for example, each village sends the collected waste directly to the final treatment/disposal facility following the route defined through applicable commercial transportation (3 tonne and 5 tonne compactors), redefined transportation routes where villages share the transportation means and transfer stations (three such routes were identified along with locations of transfer stations identified along the master routes), and five optional locations for transfer stations were also tested. The resulting scenarios have been interpreted in Excel and compared in terms of their requirements for capital and O&M cost using NPV.

Gender Analysis

38. **Social norms limit women's economic opportunities in the SWM sector in Shaanxi.** In the three selected counties,[60] female labor participation rate is 8–11 percentage points less than male labor participation rate. Similar employment gap exists in the SWM sector, and the issues are more apparent and pervasive in rural Shaanxi. Preliminary analysis shows that fewer women were hired for local waste management jobs. According to data from three counties/districts, out of the 5,154 community sanitation workers, only 1,637 or less than one-third are women and there is only one woman out of the 1,271 waste transfer workers. The gap is partially rooted in the traditional and social norms that limit women's roles outside of households. In villages, men usually go out for jobs and women need to shoulder an excess of unpaid domestic care work responsibilities and farming activities. Although women were more interested in waste management issues in their communities and expressed a strong interest in participating in such activities during interviews, these constraints often limited women's participation in formal[61] and stable jobs. Preliminary analysis shows that about half of the jobs in SWM sector are formal jobs (with a contract), while the ratio of female/male labor participation in formal jobs are relatively low in Chengcheng (0.71) and Linwei (0.89), indicating that there are more women who are engaged in informal waste management jobs.

39. **Fewer women engaged in formal, technical positions in the SWM sector due to stereotyped job perception and skill gaps.** The preliminary assessment found less share of women working in SWM sector, notable for technical or managerial positions (figure 2.14). Survey results show that only 12–15 percent of technical positions are occupied by women. Women's participation across formal occupations in the sector is even more unbalanced in rural Shaanxi as evidenced by the following data collected from the three counties (figure 2.15). It is observed that formal waste work, especially technical work, is dominated by men in the Shaanxi SWM sector, partly because the technical work in this social context usually involves heavy work and sometimes requires technical credentials such as a truck driving license. Women are commonly perceived as less suitable for such work and are often discouraged to apply for such jobs. This has a long-term impact on women's confidence and willingness to participate in the SWM sector and leads to fewer qualified female candidates in the market. As a result, many women are de-skilled to do informal, lower pay jobs. One example is that women (sometimes wife to the truck driver) can play the role of "entourage" to the male driver in the waste transfer tasks, whose contribution is not formally counted or recognized unlike that of men.

Figure 2.13. Labor Participation Rate and SWM Sector Labor Participation Rate in Chengcheng, Linwei, and Chencang



[60] Chengcheng County, Linwei District, and Chencang District of Weinan City, Shaanxi Province.
[61] With formal jobs, an employee is hired by a company under an established working agreement that includes salary or wages, health benefits, and defined work hours and workdays. Informal jobs refers to work in which an employer hires an employee without an established working agreement.

40. **Structural gender pay gap is also witnessed in the SWM sector.** The preliminary assessment found that women earn 8 to 19 percent less than their male counterparts (figure 2.16). Some of the plastic waste picking/separation/storage work undertaken by rural women fall into the category of informal activities which are unpaid and unprotected. The gender differences in average salary can also be explained by the fact that women are less engaged in the technical and managerial types of jobs, which drag down the average level of their salary. In the context of the SWM sector, technical work mainly refers to physically demanding work including driving waste transfer vehicles. Another example is in the waste sorting center, where men who are able to handle metal cutting/sorting earn more than women who are more likely to handle the sorting of plastic or paper (less lucrative). Such pay gap is more associated with the job segregation in SWM sector due to women's lack of required skills.

Figure 2.14. Proportion of Women Working in SWM Sector in Chengcheng, Linwei, and Chencang

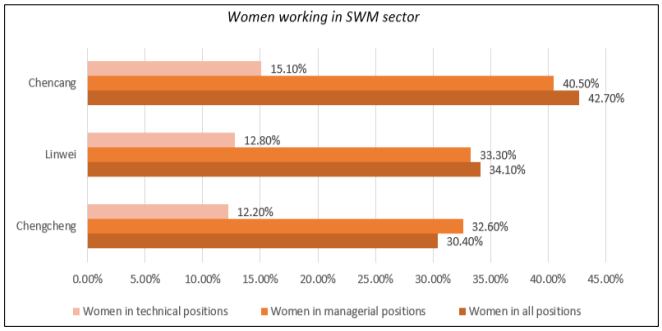


Figure 2.15. Proportion of women working in SWM sector – Urban versus Rural

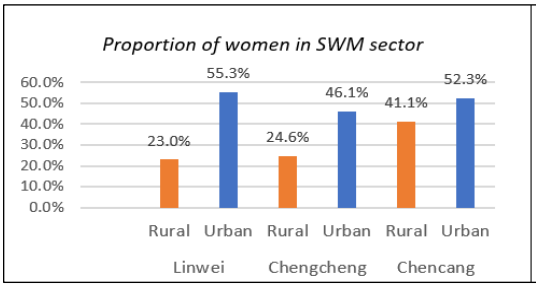
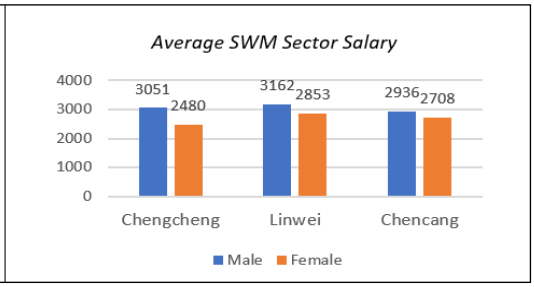


Figure 2.16. SWM Sector Average Salary in Chengcheng, Linwei, and Chencang



Gender Action

41. To narrow the gaps in women's economic participation in the SWM sector in Shaanxi, the project will carry out the following activities that aim to address supply and demand distortions through (a) targeted skill training program to improve the employability of women for new job opportunities in the sector and (b) supporting employers in developing and applying fair employment practices.

42. **First, targeted skill training program will be carried out to help women acquire new knowledge and skills to prepare for new job opportunities.** Pre-vocational training workshops will be organized in project areas that proactively target women. Such skill training would include driving, waste sorting, processing and transfer, and leadership programs with an emphasis on practical learning of skills that will be required in the new jobs to be created locally. For specific technical work with limited female participation, incentives will be provided to encourage women's engagement, for example, providing small stipends to female trainees upon signing commitment forms or completion bonus for women who successfully complete the training or acquire new jobs. The PMO will work closely with community organizations and local women's federations to enroll women in the training activities and raise the awareness to counter stereotypes that constraint women from more and better job opportunities in the sector. For example, community-based events will be organized to showcase examples of women benefit from such training program and gain greater income

through skills training. Brochures and campaigns should feature outstanding female staff and workers in the SWM sector to help them gain public recognition and to become models for women who are thinking of entering the SWM labor market or preparing to work for the sector and to mitigate social bias that women are unsuitable for technical or managerial roles in SWM sector. In rural areas especially, the training program should target the waste pickers/informal workers with the aim to help them acquire necessary skills and basic knowledge of the sector to be prepared for the formal jobs created by the project and to stay competitive in the job market after the project lifespan. Along with the development of the integrated urban-rural SWM system in Shaanxi, PMO will document and monitor the number of jobs created under the project that are held by both men and women, including disaggregated data by job types to highlight the change for technical and managerial positions. And midterm and final gender assessment will be conducted to capture the impact of gender actions.

43. **Second, the project will support the employers in waste management sector in Shaanxi Province to achieve greater gender balance in recruitment and retention of staff/workers.** With the development of the integrated urban-rural SWM systems in Shaanxi, job opportunities will be created at village, township, and county/district levels. These contract-based job opportunities, such as waster transfer drivers, cleaners at the waste collection room, and workers at the transfer station will sustain beyond the life of the project since the landscape of the SWM systems will be reshaped and these positions will be a crucial part of the increasingly integrated systems. The SWM facilities supported by the project need to ensure equitable and sustainable employment opportunities for both genders in terms of recruitment process, contract type, career development, and adapting of international experience on eliminating gender discrimination in employment. The project will work with specialized agency to carry out targeted capacity development program to help SWM facilities improve their human resource system to achieve and sustain the change. Such measures include (a) gender awareness training at the management level and human resource of the SWM sector companies and organizations; (b) review of recruitment and promotion policies and processes in SWM sector with gender gap identified; (c) planning and implementation of concrete activities including targeted outreach campaigns especially in rural areas to address the gender gaps at workplace. For example, when new job positions open, SWM facilities should send out brochures and notices of recruitment to both the rural and urban communities, especially where there is limitation of access to web/digital information, to ensure that the information be disseminated to female potential applicants. The employers should use skill-based assessment to check candidate qualification for the role, and de-biased recruiting practices will be applied such as anonymized CVs, structured interview methods, and so on, to eliminate gender-related bias in recruiting process. For payment and compensation, transparency will be introduced in processes, policies, and criteria for decision-making on salary ranges, promotion, and reward to address the pay gap. PMO will also help the SWM sector in Shaanxi Province to exchange with each other good practices and lessons learned from these actions, to ensure that the improvement of gender inclusiveness in the sector is a sustained effort.

44. A related indicator is set to measure the proportion of women who obtain and sustain a contract-based job in the newly developed urban-rural SWM system in Shaanxi Province. The target is set with consideration of existing gender profile of people working the sector—the preliminary gender assessment shows 35.6 percent of workers are women. Considering the above-mentioned project interventions to enhance women's skills and capacity of SWM facilities, it is anticipated that more women will get formal employment opportunities in the newly developed waste collection, transfer, and sorting segments of the integrated urban-rural SWM system. The target value for the indicator is tentatively set to be 45 percent with reflection on the overall target of national plan for women's economic participation and the achievable improvement from the current situation.

Annex 3. Project Map