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Report No: PAD00085

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT
ON A
PROPOSED LOAN

IN THE AMOUNT OF US$96.2 MILLION

TO

INDIA

FOR AN

UTTARAKHAND CLIMATE RESPONSIVE RAINFED FARMING PROJECT

MARCH 8, 2024

Agriculture and Food Global Practice
South Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective Jan 30, 2024)

Currency Unit =	US$
INR 83.16 =	US$1

FISCAL YEAR
April 1 - March 31

Regional Vice President:	Martin Raiser
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ABBREVIATIONS AND ACRONYMS

ABGC	Agribusiness Growth Centres	IRR	Internal Rate of Return
AM	Accountability Mechanism	ISM	Implementation Support Mission
B/C	Benefit-cost Ratio	IUFR	Interim Unaudited Financial Reports
CA	Chartered Accountant	KPI	Key Performance Indicators
CERC	Contingent Emergency Response Component	M&E/L	Monitoring and Evaluation and Learning
CH_4	Methane	MIS	Management Information System
CO_2	Carbon dioxide	MM	Millimeter
COP	Conference of the Parties	MRV	Monitoring, Reporting and Verification
CPF	Country Partnership Framework	MSME	Micro, Small, and Medium Enterprises
CRI	Corporate Results Indicator	MWS	Micro-watersheds
CSA	Climate Smart Agriculture	N2O	Nitrous Oxide
DPMU	District Project Management Unit	NDC	Nationally Determined Contributions
E&S	Environmental and Social	NICRA	National Innovations in Climate Resilient Agriculture
ESCP	Environmental and Social Commitment Plan	NITI Aayog	National Institute for Transforming India
ESF	Environment and Social Framework	NPV	Net Present Value
ESS	Environmental and Social Standards	PDO	Project Development Objective
EX-ACT	EX-Ante Carbon-balance Tool	PIP	Project Implementation Plan (also referred to as Project Operations Manual)
EX-ACT VC	EX-Ante Carbon-balance Tool for Value Chains	PMU	Project Management Unit
FHH	Female-headed Household	POM	Project Operations Manual (also referred to as Project Implementation Plan)
FM	Financial Management	POCRA	Maharashtra Project on Climate Resilient Agriculture
FY	Financial Year	PPP	Purchasing Power Parity
GDP	Gross Domestic Product	PPSD	Project Procurement Strategy for Development
GHG	Greenhouse Gas	REWARD	Rejuvenating Watersheds for Agricultural Resilience through Innovative Development
GIS	Geographic Information System	SDP	Springshed Development Plans
GoI	Government of India	SEA	Sexual Exploitation and Abuse
GoUK	Government of Uttarakhand	SEP	Stakeholder Engagement Plan
GP	Gram Panchayat	SH	Sexual Harassment
GPWDP	Gram Panchayat Watershed Development Plans	SNA	Single Nodal Agency
GRM	Grievance Redress Mechanism	SRI	Systems of Rice Intensification
GRS	Grievance Redress Service	STEP	Systematic Tracking of Exchange in Procurement
GSDP	Gross State Domestic Product	tCO2 eq	Tons of CO2 Equivalent
GWP	Global Warming Potential	tCO2eq/ha	Tons of CO2 Equivalent per Hectare
ha	Hectare	TSA	Technical Support Agency
IBRD	International Bank for Reconstruction and Development	UAPCC	Uttarakhand Action Plan on Climate Change
ICAR	Indian Council of Agricultural Research	UCRRF	Uttarakhand Climate Responsive Rainfed Farming Project
IDA	International Development Association	UDWDP II	Uttarakhand Decentralized Watershed Development Project II
IDEA	India Digital Ecosystem of Agriculture	US$	US Dollar
IFMS	Integrated Financial Management System	WMD	Watershed Management Directorate
INR	Indian National Rupee	WUE	Water Use Efficiency
IPCC	Intergovernmental Panel on Climate Change	WWMCs	Water & Watershed Management Committees
IPF	Investment Project Financing		

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DATASHEET

BASIC INFORMATION

Project Beneficiary(ies)	Operation Name		
India	Uttarakhand Climate Responsive Rainfed Farming Project		
Operation ID	Financing Instrument	Environmental and Social Risk Classification	
P179357	Investment Project Financing (IPF)	Moderate	

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
[ ] Alternative Procurement Arrangements (APA)	[ ] Hands-on Expanded Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date
01-Apr-2024	31-Mar-2030
Bank/IFC Collaboration	
No	

Proposed Development Objective(s)

Improve production system resilience to make mountain farming emission competitive and profitable in selected micro-watersheds of Uttarakhand

Components

Component Name	Cost (US$)
Component A: Developing Resilient and GHG-efficient Production Systems	46,837,000.00
Component B: Science-based Development of Resilient Springsheds	62,714,000.00
Component C: Enhancing Income Resilience	14,779,000.00
Component D: Project Management, Monitoring & Evaluation, and Learning	13,721,000.00
Component E: Contingent Emergency Response	0.00

Organizations

Borrower: India
Implementing Agency: Watershed Management Directorate, Government of Uttarakhand

PROJECT FINANCING DATA (US$, Millions)

Maximizing Finance for Development

Is this an MFD-Enabling Project (MFD-EP)? No

Is this project Private Capital Enabling (PCE)? No

SUMMARY

Total Operation Cost	**138.05**
Total Financing	**138.05**
of which IBRD/IDA	**96.20**
Financing Gap	**0.00**

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	96.20

Non-World Bank Group Financing

Counterpart Funding	41.85
Borrowing Agency	34.19

Local Beneficiaries	7.66

Expected Disbursements (US$, Millions)

WB Fiscal Year	2024	2025	2026	2027	2028	2029	2030
Annual	1.22	14.32	30.64	24.50	10.20	9.40	5.51
Cumulative	1.22	15.54	46.18	70.68	80.88	90.28	95.79

PRACTICE AREA(S)

Practice Area (Lead)

Agriculture and Food

Contributing Practice Areas

Climate Change; Digital Development

CLIMATE

Climate Change and Disaster Screening

Yes, it has been screened and the results are discussed in the Operation Document

SYSTEMATIC OPERATIONS RISK- RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Moderate
2. Macroeconomic	Moderate
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	Moderate
8. Stakeholders	Low
9. Overall	Moderate

POLICY 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

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

E & S Standards	Relevance
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Relevant
ESS 10: Stakeholder Engagement and Information Disclosure	Relevant
ESS 2: Labor and Working Conditions	Relevant
ESS 3: Resource Efficiency and Pollution Prevention and Management	Relevant
ESS 4: Community Health and Safety	Relevant
ESS 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Not Currently Relevant
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Not Currently Relevant
ESS 7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Relevant
ESS 8: Cultural Heritage	Not Currently Relevant
ESS 9: 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

Legal Covenants

Sections and Description
Not later than the Effective Date, the Project Implementing Entity, through the PMU, shall prepare and adopt, and, thereafter, maintain throughout the implementation of the Project, the PIP, acceptable to the Bank, containing detailed guidelines and procedures for the implementation of the Project.

Conditions

Type	Citation	Description	Financing Source
Disbursement	Schedule 2, Section III, B	No withdrawal shall be made for payments made prior to the Signature Date, except that withdrawals up to an aggregate amount not to exceed US$ 9,000,000 may be made for payments made prior to this date but on or after March 1, 2023, for Eligible Expenditures under Category (1).	IBRD/IDA
Disbursement	Schedule 2, Section III, B	No withdrawal shall be made for Emergency Expenditures under Category (2), unless and until all the disbursement conditions have been met in respect of said expenditures.	IBRD/IDA

I. STRATEGIC CONTEXT

A. Country Context

1. **Growth is forecast to be between 6.3-7.3 percent in FY23/24 and to remain robust in the medium term**. In FY23/24 India will remain the fastest growing large economy. While consumption growth is expected to slow down (as the post-pandemic rebound dissipates) and export demand to be somewhat depressed by the weak global environment, strong investment growth should keep economic growth elevated. The public investment push should gradually crowd-in private investment which will also be facilitated by healthy corporate profits, easing inflation, India's strong macroeconomic fundamentals and a reduction in bank non-performing loans. The government's efforts to contain current spending coupled with strong revenue performance should contribute to narrowing the general government fiscal deficit (to 8.7 percent in FY23/24), with the debt-to-GDP ratio stabilizing at around 82 percent of GDP over the medium term. India's external position remains favorable, with growing services exports, a narrowing merchandise trade deficit, steady net foreign capital inflows and large foreign exchange reserves of more than USD 600 billion (as of end-2023).

2. **India has made remarkable progress in reducing extreme poverty over the past two decades**. The share of the population living below US$2.15 per person per day (2017 PPP) is estimated to have halved between 2011 and 2019 from 22.5 to 12.7 percent. In line with global trends, extreme poverty increased by two percentage points in 2020 on account of the pandemic. However, broad access to vaccines and government mitigation measures contributed to the return to pre-pandemic poverty levels. The extreme poverty rate is estimated to have declined to 11.9 percent in FY 2021/22, while moderate poverty ($3.65 per person per day) rate is estimated at 40 percent in FY 2021/22.[1] India's long-term progress in reducing extreme poverty was accompanied by a sharp decline in the incidence of multidimensional poverty, from 27.7 percent in 2015/16 to 16.4 percent in 2019/21. Inequality in consumption has remained stable over the past two decades, with a Gini index of around 35. Child malnutrition declined sharply between 2015/16 and 2019/21, with 35.5 percent of children under the age of 5 being stunted. Headline employment indicators have improved since 2020, and unemployment rates have recovered in urban and rural areas but concerns about job quality remain.[2]

3. **Uttarakhand is a Himalayan state and 92 percent of its territory is hilly and mountainous with rugged topography, prone to climatic and seismic disasters.** Approximately 80 percent of the state's estimated population of 11 million live in hilly areas, creating challenges for access to markets and services. Only nine percent of land is cultivated, with 63 percent under forest cover. Having demonstrated a V-shaped recovery from the COVID-19 pandemic, the Gross State Domestic Product (GSDP) of Uttarakhand in FY22 grew at 6.13 percent (at constant prices). Capital infusion for development backed by generous tax benefits contributed to the GSDP growth.[3] The manufacturing and construction sectors account for 50 percent of the GSDP in the state, owing in part to the emergence of capital-intensive Micro, Small, and Medium Enterprises (MSMEs). With the contribution of the agriculture sector declining from 11.5 percent in 2011-12 to 8.8 percent of GSDP in 2021-22, Uttarakhand has been undergoing a structural change. However, the percentage of the population dependent on the agriculture sector remains high (47.2 percent), and the overall sector growth in the state is still positive, thus making it a critical resource to manage risks, support livelihoods and tap growth opportunities.

[1] World Bank. Macro Poverty Outlook (MPO). October 2023.
[2] World Bank. Poverty and Equity Brief. Fall 2023 Edition.
[3] Uttarakhand Economic Survey 2021-22

B. Sectoral and Institutional Context

4. **Agriculture in Uttarakhand remains the primary source of livelihoods for nearly half of its population, and much of it is in rainfed hilly areas.** The cultivated land in the state is divided between predominantly rainfed hilly areas and the more productive valley plainland typically known as irrigated plains. Approximately 80 percent of the farming population is dependent on rainfed hilly areas. The major crops grown are cereals with productivity as low as 1.2 to 1.4 tons/hectare (ha), far below national averages, but with a considerable range of varied cereals such as maize, millets, pulses, horticulture, and integration of livestock, depending on the altitude. On average, the crop yields in the plains are approximately 50 percent higher than those of the hills, because of limited availability of irrigation water, poor in-situ rainwater conservation, and loss of fertile topsoil in the hills. Therefore, while commercially oriented agriculture is practiced in the plains, hill farmers historically have had limited marketable surplus. Of the total landholdings, about 89 percent are small and marginal, where achieving economies of scale is difficult, with high input costs.

5. **Increasing productivity in rainfed hilly areas is challenging and water plays a central and dynamic role**. In the hills, cultivation is characterized by hillside terraces where conventional irrigation practices are not feasible. Annual rainfall is high (1,523 mm) but more than 90 percent is received during the July-September monsoon months, which together with steep slopes, means rapid and large runoff, resulting in soil loss of 40 tons/ha/year. At the same time, there has been an overall reduction in the discharge rate of stream and spring water sources, critical for year-round water supply both for agriculture and the domestic needs of villagers in the state. These stresses compound the constraints to enhancing rainfed agronomic practices and increasing agricultural productivity. Consequently, household incomes are low, and there is a trend of out-migration in the last few decades.

6. **The Government of Uttarakhand's (GoUK) support for rainfed agriculture successfully demonstrated restoration of watersheds for improving water flows and increased productivity, but approaches need greater focus**. Implementing watershed treatment to contribute to improving stream flow and spring discharge, more stabilized runoff, and improved irrigation have been well established and demonstrated, including through the Uttarakhand Decentralized Watershed Development II Project (UDWDP, or *Gramya II* - P131235), which closed successfully in early 2022. Under the UDWDP II, the state made good progress in implementing watershed rehabilitation, improving spring discharge, and bringing sizeable new areas under irrigation, with improved cropping intensity and enhanced productivity of selected crops. However, a more focused springshed[4] rejuvenation and management, combined with dedicated crop input and advisory for enhanced productivity that also addresses emerging climate vulnerabilities, is yet to be systematically addressed at scale.

7. **Rainfed agriculture in the hills is inherently risky due to the linkages between temperature, rainfall, extreme events, and crop cycles. These are further exacerbated by climate change.** The Regional Climate Models projections, which covers Uttarakhand, suggest an average annual increase in temperature of 1.3-1.6 degrees celsius across the state by mid-century and 2.3-5.9 degrees by the end of the century with greater increases in higher altitudes.[5] The increase in frequency of extreme events will impact productivity of most crops due to an increase in temperature and decreased water availability. There will be spatial changes in the diversity of tropical / sub-tropical crops as well as that of temperate crops. Across the country, extreme climatic events have already impacted agriculture by causing

[4] A springshed is a set of watersheds and aquifers that integrate into a system that supplies water to a group of springs.
[5] Tyagi, Neetu, Tripti Jayal, Mukesh Singh, Vipan Mandwal, Atul Saini, Nirbhav, Netrananda Sahu, and Sridhara Nayak. 2022. "Evaluation of Observed and Future Climate Change Projection for Uttarakhand, India, Using CORDEX-SA." *Atmosphere* 13 (6): 947.

fluctuation in the production of major crops, creating pressure on the economy to counter the unexpected deficit in production. National Innovations in Climate Resilient Agriculture (NICRA), a project of the Indian Council of Agricultural Research (ICAR), had predicted a marginal reduction (<2.5 percent) in upland rice yields in 2050 and irrigated rice yields by 7 percent in 2050 and 10 percent in the 2080 scenarios. However, there has already been increasing fluctuation in rice production because of climate impacts, with the country recording an estimated deficit of 7-11 million tons during kharif 2022-23. While some new cropping opportunities may arise with higher temperatures in higher altitudes, these will also be facing new constraints in terms of soil suitability and water availability, and possible increased spread of pests. While variations by district, the climate vulnerability of many mountain areas both globally and in India is considered high.

8. **Springshed management needs to play a key role in rainfed upland agriculture and climate resilience.** Water supply and management play an increasingly critical role in climate change. Historically, in the absence of assured irrigation supply in rainfed areas, comprehensive watershed treatment within a defined hydrological boundary has been the key assurance for moisture retention for rainfed crops, as done under the previous project. However, given the emerging temporal and spatial rainfall variability, watershed management has not been able to ensure full water security through the annual crop cycle. Springsheds and the springs they supply to are a critical year-round source of water for agriculture and domestic purposes for many communities in Uttarakhand. For more strategic watershed management, it is imperative to intervene at the springshed level to ensure water security in more focused areas of micro-watersheds. However, there has been a decline in the number of springs flowing through the year[6], with about 10 percent of spring sources having dried up over the last decade. Further, climate change has exacerbated water insecurity through erratic rainfall, drying of springs, reduced discharge, and diminished spring water quality. It is in this regard that springshed management, is critical for sustaining irrigation water supplies, also at critical times, for improving food security and enhancing productivity from arable and non-arable areas.

9. **Challenges to agriculture productivity, and thus profitability persist, compounded by the pressure of climate change, highlighting the need for strong resilience measures in rainfed farming.** The previous project (UDWDP) showed the production and productivity enhancement opportunities for a range of crops arising from increasing water supply to farms and increasing water, farm, efficiency, and soil improvements. However, the scale of the issues and climate pressures and uncertainties call for further acceleration in this regard. This is particularly important for balancing soil and water management including maximizing organic matter in the soil. Analysis, summits and recommendations in the state over the last few years have also highlighted climate-sensitive agriculture supporting diversification, transitioning towards more intensive horticulture and agroforestry, and integration with livestock. This aims to spread risks stemming from losses in individual crops. In terms of inputs, the need for better quality and variety of drought and pest-tolerant seeds, and integrated pest management also strongly complement diversification. Further, for diversification towards more resistant crops, for example, millets, a reliable seed supply system and appropriate varieties are needed. To confront climate variable impacts and align to the Government of India's (GoI) priorities, the state government plans to establish millet as a dominant crop across the state through this project. While the knowledge on climate resilient agriculture is expanding, for the hilly areas of Uttarakhand like in other mountainous states, there is a pressing need to refine and localize advisories in the overly complex topography with varying microclimates. These need to be also matched with more downscaled agrometeorological information, bringing in more precision agriculture, and science on innovations in climate resilient practices, and understanding the effects on Greenhouse Gas (GHG) emissions and reduction. Special attention will be paid to paddy-cultivated areas that emit significant methane emission.

[6] Report of the NITI Aayog Working Group on Inventory and Revival of Springs in Himalayas for Water Security, Department of Science & Technology, December 2017.

10. **Addressing supply chain gaps and inadequate marketing infrastructure for income resilience is critical to sustaining climate-responsive rainfed production systems.** Maximizing the value of rainfed hill agriculture due to its distinct quality and off-season availability is critical to sustain its potential value, and to deliver more sustainable sources of income is also key to resilience. Mountain ecosystems enable the cultivation of crops, including high-value vegetable crops, during the off-season (when plain states are busy producing cereal crops) for most of the country, thereby providing an opportunity for farmers to benefit from relatively higher prices during that season. Commodities from the hills and mountains are also recognized for high quality varieties, and low use of pesticides. The state is close to major urban markets and population centers including the National Capital Region thereby providing a ready market for high value produce. However, the state is unable to realize its potential and incurs substantial post-harvest losses due to inadequate processing facilities, storage infrastructure, and logistical issues in the mountainous terrain. A cluster approach with aggregating products, upgraded processing and marketing was demonstrated under UDWDP II, but it only supported a relatively small number of farmers, and the enterprise was only just established at the end of the project. Connecting climate-smart precision farming protocol with an effective marketing chain can provide backwards-forward linkages towards a paradigm shift. Agricultural enterprises in the hills will be critical for delivering quality inputs such as seeds. This needs further specialized support for niche markets, geographic indication, targeted markets, and recognizing and branding quality products. Currently, there is also a lack of entrepreneurship among upland smallholders.

11. **Uttarakhand's vision for agricultural growth is fast evolving with the emerging focus on climate change and scaling up.** The GoUK is committed to improving food security, climate resilience and enhancing farmers' income, while aligning with India's Nationally Determined Contributions (NDC[7]) and Conference of the Parties (COP26) commitments towards reducing emissions. The 'Revised Uttarakhand Action Plan on Climate Change'[8] (UAPCC) and the Draft Uttarakhand Agriculture Policy strongly support the rainfed sector's transformation towards improved productivity, climate smart agriculture (CSA) and diversification, ecosystem resilience, agribusiness opportunities towards farmers' resilience and profitability. The UAPCC also notes the importance of springsheds in water-critical resource development.

12. **Uttarakhand holds potential to demonstrate national contribution to global commitments and capitalize its carbon stocks through voluntary carbon markets, as an income enhancing incentive to farmers.** Acknowledging the fact that intensification of agriculture generally increases GHG emissions, productivity and resilience needs to be achieved with careful monitoring and management of practices that stabilize or decrease GHG. In addition to national commitments to reducing emissions intensity, the GoI has paved the way for establishing carbon credit markets in India through the adoption of the Energy Conservation (Amendment) Bill, 2022. The emergence of voluntary carbon markets offers an avenue for incentivizing climate-smart agriculture in the plains and hills, which aligns with the GoUK's aim of reducing GHG emissions through agriculture. A particular area of potential reduction in GHG emissions is the reduction in methane from paddy rice, especially in the lowlands forming part of the wider Uttarakhand agriculture landscape.

13. **Despite the fluxes of GHGs in farmland ecosystem being a complex process, the project is pre-positioned to measure emissions at the farm level to capitalize on the voluntary carbon market as a potential income source for participating farmers,** subject to unfolding of the regulatory and accountability framework for Certified Emission Reduction (CER) by the government. Given that the project by design will implement climate-smart practices on large

[7] Under the updated NDCs, India is committed to reducing the emissions intensity of its gross domestic products by 45 percent from 2005 levels by 2030. India also commits to strengthening adaptation in its updated NDC through investments in sectors vulnerable to climate change particularly agriculture, water resources, and Himalayan region among others.

[8] TERI. 2022 Revision of State Action Plan on Climate Change for Uttarakhand New Delhi: The Energy and Resources Institute.

land area with selected horticulture and agriculture crops, and with a methodology and approach of verification including Monitoring, Reporting and Verification (MRV), the GoUK has encouraged the project to move forward until the GoI provides clear guidelines on where such CER generated by the project will get counted under its NDC. The volatility in the fast-emerging carbon market holds promise for the project to invest in horticulture crops for generating enhanced CER for the beneficiaries.

14. **Uttarakhand can serve as a "Lighthouse" for adaptation of rainfed agriculture to achieve both water and food security, and climate goals, endowed with cutting edge knowledge for addressing the emerging challenge.** With 65 percent of India's agriculture relying solely on rainfall, the State is uniquely positioned to develop viable options and demonstrate effective approaches to increase productivity, while concurrently increasing resilience and minimizing emissions from plains agriculture, and sequestration in the hills. Precision farming will play an increasingly important role in climate resilience and efficient production, however, access and adoption by small and rainfed farmers is still very low. It is here that the State is strategically positioned to capitalise on its distinct ecological settings by demonstrating efficient use of natural resources in watersheds and under rainfed conditions to achieve resilience and mitigation by promoting diverse agricultural productivity resilience and mitigation protocols. The State can contribute to a paradigm shift in addressing productivity concerns while reducing emissions in rainfed farming systems. The State has already established a technical partnership with the National Rice Research Institute to help in monitoring methane emissions from paddy and putting an adaptation/mitigation framework for reducing the same. Pooling inter-institutional synergies to generate protocols for reducing emissions while building terrestrial carbon stock is considered critical for building ecosystem resilience.

C. Relevance to Higher Level Objectives

15. **The proposed project aligns with India's climate commitments and with the World Bank Group Country Partnership Framework** (CPF) for India FY18-FY22 (Report No. 126667-IN), discussed by the Board of Executive Directors on September 20, 2018 and extended to FY25 by the corresponding Performance and Learning Review dated October 23, 2023, in particular the objectives of supporting resource-efficient, inclusive, and diversified growth in the rural sector (CPF Pillar 1). The project will draw on the catalytic approaches outlined in the CPF by: (i) involving the research institutes of global repute in designing, implementing, and monitoring its interventions, the project will leverage the strength of the private sector; (ii) investing in capacity building (technical and operational knowledge) for the project and functionaries of allied departments, the project will strengthen the public sector institutions to replicate the learnings and enhance diffusion of cutting edge technology across the State; and (iii) generating and documenting novel operational knowledge and implementation experience on productivity enhancement while reducing GHG emissions for smallholder agriculture. The project will also support the Lighthouse India initiative to share knowledge among States. The project will generate considerable Climate Co-Benefits.

16. **The proposed project also aligns with the COP21, Paris Agreement towards enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change.** The project aims to significantly strengthen State's adaptation efforts, with science-based support for mainstreaming adaptation as a mainstay of development in the State, as well as mitigating carbon dioxide and methane from agricultural practices. It recognizes that climate adaptation is a global challenge and measures must be undertaken to demonstrate and build adaptation at the cluster level in the State.

II. PROJECT DESCRIPTION

A. Project Development Objective

The project development objective is to improve production system resilience to make mountain farming emission competitive and profitable in selected micro-watersheds of Uttarakhand.

17. In the PDO statement, 'emission competitiveness' refers to net GHG emission reduction due to improved packages of practices in pilot plots relative to similar cropping system under conventional practices. Achieving 'production system resilience' includes benchmarking productivity at pre, and post-production stages to be optimally achieved in the project. Improving watershed / springsheds discharge means increasing the water discharge rate through catchment treatments in spring areas and optimizing water-use efficiency in different cropping systems. 'Profitability' refers to generating income through cost-effective optimum yields of selected crops.

18. The following Key Performance Indicators (KPI) are proposed for measuring the core outcomes of the project:

KPI 1: Water discharge in sample springs (percentage)
KPI 2: Farmers adopting improved agricultural technology (CRI), disaggregated by gender (number)
KPI 3: Crop yield of selected crops (percentage)
KPI 4: GHG emissions from representative cropped land parcels (measured in Kg CO2eq/ ha) (number)
KPI 5: Farm income due to farm-level project interventions, disaggregated by gender (percentage)

B. Project Components

19. The project is built around a comprehensive, multi-sector approach to align with India's commitment to the "Paris Agreement," COP26 and COP27 which support agriculture adaptation to the changing climate, and the World Bank's global focus on promoting climate resilience at the farm level. In support of the state government's shift towards climate adaptation and sustained and green agricultural growth, the proposed project will support the agriculture sector's adaptation and transformation towards production system resilience while reducing emissions from farming practices, leading to increased farmers' profitability. With water as a critical resource, the project will focus on springshed development to enhance availability of perennial water supply and help farmers harness this for agriculture (and domestic use).

20. The project will promote transition to production systems that are climate adaptive, use water, soil and other inputs more efficiently, result in optimum volume and stability in outputs, and are resilient to short and long-term climate variability. Productivity improvement, input-cost reductions, crop diversification and a systematic agribusiness approach to add value to products from the hilly areas, are expected to increase farmers' incomes and broader household resilience. Specialised climate smart land and water practices will also aim to reduce GHG emissions per unit of land while enhancing the capacity of terrestrial ecosystems to act as carbon sinks, thereby contributing to climate change mitigation and adaptation. The project will bring in consortia for the co-creation of CSA knowledge and protocols for technologies and localised advisories. An agricultural digital platform will be developed to underpin the science base, and delivering of services to farmers.

Component A: Developing Resilient and GHG-Efficient Production Systems

21. This component aims to enhance productivity through land treatment and development, while increasing fertilizer efficiency, water productivity, and reducing GHG emissions. To this effect, the multi-expert task team at the district level will help prepare micro plans that will be implemented in a phased manner. Commodity-specific advisories will come from the respective technical agencies having domain knowledge. Participating farmers will be supported to adopt climate-smart agriculture practices, appropriate to hill as well as plain systems, as the latter form a major part of the agriculture economy in the state. The component will rehabilitate springsheds, enhance water supply and restore ecological functions of farmlands.

22. The component provides the foundation for the project to shift cultivation towards optimal input usage pattern, leading to reduced input costs and enhanced average income of farmers. Further, this component will support female-headed households in developing agribusiness plans, provide technical support to leverage other government programs/schemes and allow for aggregation and market linkages. The component activities will enhance productivity to an optimal level keeping in mind the soil deficiencies and cost of cultivation. They will not intend to achieve the national and global productivity targets. Given that rising weather uncertainty has contributed to large-scale damages to crops, more so under rainfed conditions, the component will move away from highly intensive input usage to low-risk optimal input for sustaining productivity and returns per unit of land while reducing emissions. This component will mobilize farmers' groups to accelerate the adoption of demonstrated technologies as per government norms.

23. The project will demonstrate science and evidence based resilient production and productivity improvements, and low emissions systems. The knowledge for these will be co-created with farming communities to ensure farm benefits and identify where these practices and products can be incentivised by market demands, government support mechanisms, or even carbon markets. Such co-creation and new systems will also contribute to the modernization of agricultural research and extension services for efficient soil restoration and efficient soil-water-nutrient interaction, such as water conservation and drainage management, resilient seeds, land development, precision nutrition management practices, and crop diversification. Progress in CSA adoption, productivity, and environmental outcomes will be further tracked to understand factors affecting its uptake for scaling.

24. **Sub-component A1: Supporting Climate Smart and Diversified Production Protocols:** This sub-component forms a core element of the project to support farmers achieve CSA adoption. The project will help localize and test CSA in a participatory manner in representative systems; support farm planning and mobilization of farmers interest groups; and support practices for resilient and GHG efficient farm productivity (especially for flooded rice systems). It will prepare farmers to identify, access, and implement the most suitable practices for CSA with the support of advance weather forecasting in convergence with ongoing government initiatives on weather forecasting.

25. Focused attention will be on bringing more areas under controlled irrigation, promoting protected cultivation, converting abandoned agricultural fallows, promoting diversification of agriculture, and supplementing the incomes of farmers through diversified livelihoods[9] (including small ruminants). It will include optimization of inputs and practices for different typologies of farms while appreciating various trade-offs for farmers. Supported by a landscape approach based on land-use capability, the project will provide quality inputs and deploy early warning advisory systems to ensure adoption of ecologically sensitive and diversified production systems.

26. The project will promote water use efficiency, primarily in terms of crop or livestock production per unit of

[9] According to the Rural Development and Migration Commission of the Government of Uttarakhand, the inability to diversify livelihoods through diversified production pattern in the rural areas is the biggest factor pushing outmigration.

water. The project will support the adoption of practices that reduce the soil water evaporation component and divert more water into transpiration through crop residue management, mulching, row spacing, and irrigation. While the overall focus of the project will be to improve cropping intensity, it will also promote the multiplication of climate-resilient crop varieties (seeds) for kharif and rabi seasons under upland and lowland conditions. While the choice of emission-reducing irrigation methods will feature predominantly during kharif (wet season), water-use efficiency for crop diversification will hold significance during rabi (dry season). With greater efficiency, the project will also identify and monitor those practices which also help to reduce the amount of GHG emissions.

27. Resilience to climate change impacts as well economic shocks give farmers the possibility to diversify to new crops. As the government intends to promote millets as a climate-resilient crop, options for strengthening and adopting millet-based systems will be explored. For millets and other important climate resilience crops and varieties, the ready supply of high-quality seeds will be critical. The project will support farmers groups in the development of seed systems and livestock interventions as part of income resilience. Emphasis will be on stall-feeding, nutrition, health, and breeding services for small ruminants to capture the full range of options for increased productivity and enhanced resilience. This will also include close integration with fodder development on fallow lands.

28. Apart from productivity enhancement in selected commodities, the project will have dedicated land parcels to showcase the methane emission reduction in lowland paddy rice. Such pilots will be managed by a technical partner highlighting various options for reducing Methane (CH_4) and maintaining Carbon dioxide (CO_2) emissions. This will take place in highland and lowland areas of Uttarakhand, which will also provide lessons for wider adoption. Further, the project will help farmers invest in small farm equipment, such as solar energy for water lifting and crop drying, and fuel-efficient agro-logistics, to reduce waste and help offset emissions. Overall, there will also be monitoring of carbon assimilated as biomass (including grain) produced per unit of water used.

29. **Sub-component A2: Building Consortia and Digital Platform for Evidence-based Decision Support:** An evidence-based decision support for CSA will be built on key high-class science partnerships, several of which are possible in the state, but also with national lead science institute. These consortia partnerships will develop knowledge products through a process of co-creation, often with pilot communities, and build a digital data source in the form of advisory and tools, analytics, and data management to support delivery at field, closing the lab-to-land gap. This will be linked to spatial and farm data systems, a digital platform that will provide analytics relevant to the State. The 'consortia' will engage researchers/scientists from leading institutes to support project implementation and enhance technology diffusion. As the project has multi-faceted aspects, no single institution has the expertise to address the technical requirements to achieve the project aims. The proposed 'consortia' will therefore pool subject-specific expertise with clearly defined outputs, such as to: (i) develop resilience protocols to support the adoption of improved agriculture production systems; (ii) develop a precision farming package of practices appropriate for the local rainfed conditions; (iii) deploy irrigation methods and irrigation scheduling (volume) to improve agriculture productivity while reducing integrated GHG emissions;[10] (iv) develop water use efficiency criteria for crops and cropping patterns for building below ground (soil organic carbon) and above ground biomass (productivity); and (v) develop technology for reducing post-harvest loss and create district wise agribusiness growth centers.

30. The consortia approach will help demonstrate the value of interdisciplinary science in realizing the potential of edaphic and climate factors in achieving inclusive climate-resilient productivity and mitigation in agriculture, considering the livelihood challenges in hilly areas. The consortia approach will support the project to become a

[10] Integrated GHGs at the farm level refer to combined emissions of CO_2, CH_4, and N_2O.

knowledge hub. The project will enhance staff capacities at the project and inter-departmental levels to mainstream climate-resilient approaches at the local level. Robust extension protocols based on knowledge generated from the pilots will be used to bring systemic change in rainfed farming at the block/district level.

31. The knowledge generated will have application to other similar geographies, and the project will therefore serve as a lighthouse for other states. For example, the project will utilize tech-generated[11] technologies to harness spatial data combined with real-time field data to develop innovative decision support and advanced analytics systems such as smart farming solutions, resource optimization tools, carbon management and trading tools, and farmers' e-marketplace. The project will also employ digital collaboration and knowledge management tools for effective communication and co-creation among consortium members and reach out to practitioners in the field (including lead and innovative farmers), to enable sustainable mountain farming with state-of-the-art technology.

32. The project will build on existing data systems and Geographic Information System (GIS) and develop a robust digital agriculture ecosystem for use on a widely accessible data platform for the state. This will provide an opportunity to deploy digital technologies in alignment with the GoI's vision of creating a comprehensive core digital agriculture ecosystem as per the India Digital Ecosystem of Agriculture (IDEA) framework, an initiative by the Indian government aimed at transforming the agricultural sector using digital technologies. Data will also come into the platform from partners involved in monitoring and conducting modelling studies related to hydrology and water resources, including crop water budgeting, and CSA production systems and practices in the selected pilot watersheds, under Components A and B. The project will also make use of knowledge and datasets already available with partners. Core priority data platform elements will be (i) building up an Agri Stack of farmer beneficiaries; (ii) asset geocoding; and (iii) service delivery tracking to support program implementation. The platform will then form the basis for targeted and demand-driven user applications developed by third parties. The activities under this sub-component will not collect, store, or use any personal data nor enable the same.

Component B. Science-Based Development of Resilient Springsheds

33. The objective of the component is to improve springshed efficiency by investing in: (i) comprehensive catchment treatment around springsheds; (ii) improving quantity and stability of spring flows through drainage management; and (iii) increased volume of water stored for farm use in farm ponds. With technical inputs from consortia partners, this component will support enhanced participatory micro-watershed planning, incorporating springshed treatment; rehabilitation of degraded common land; and water harvesting/storage from improved spring flows. It will enhance water supply and reliability, ensuring more timely input with water budgeting for each crop, for improved farm productivity under Component A. A plan will be developed for each of the selected vulnerable springsheds, considering climate trends, during early stages of implementation that will provide a roadmap for the implementation of project activities and investment priorities.

34. **Sub-Component B1: Participatory Planning for Springshed Development:** This sub-component will (i) strengthen the capacity of watershed committees to understand science-based springshed hydrology, identify and develop representative locations for project interventions, especially around critical springs in the area; (ii) invest in drawing and analyzing relevant data layers, including hydrology and climate risks, for delineating springsheds and targeting key local land typologies for planning and interventions; and, (iii) engage communities in participatory analysis of trends in water demand and supply, and optimization for farming and livelihoods. The springshed plans developed under this component will integrate data from the participatory micro-planning process coordinated by

[11] Agriculture Revolution 3.0 technologies refer to the integration of modern technologies, such as precision agriculture, remote sensing, and digital tools, into farming practices to improve efficiency, productivity, and sustainability.

the Water & Watershed Management Committee (WWMC). These plans will be subsequently aggregated at the cluster level. A plan provides a detailed resource map, generated by integrating prevailing social, economic, hydrologic and climate features. Potential for soil and vegetative cover carbon sequestration will be assessed.

35. **Sub-Component B2: Enhancing Springshed Hydrology and Water Storage:** The project will invest in enhancing biotic cover in key stream and spring catchment points for aquifer replenishment. Investment in line treatment and locally relevant solutions including regeneration will be based on options identified from time-tested good practices and science-based analysis of optimum typology and location. Participatory implementation and monitoring will ensure strong evidence-based learning for potential scaling-up during the project.

36. The project will also support the implementation of water harvesting and storage structures and build channels for gravity-based farm-level distribution. This includes field channels and farm ponds as appropriate in the area. Actual volume of water stored and variability in supply and distribution will be monitored in a participatory manner. A comprehensive water budgeting exercise will complement the springshed plans. Further, the water budgeting exercise at the springshed level will also include hydrological analyses and evapotranspiration of prevailing cropping pattern. The project will assess demand and supply-side hydrology to quantify possible water use in relation to dependable spring flows in each springshed, hence giving due attention to sustainability, and encouraging water use efficiency. Keeping this in view, in-flow hydrology management will be backed by institutional strengthening and capacity building of stakeholders. Benefits from the expected increase in biotic cover of above-ground and soil carbon will be monitored to assess contribution to carbon sequestration.

Component C: Enhancing Income Resilience

37. The objective of the component is to promote investments in agribusiness to increase the stability and diversity and thus resiliency of incomes of rural and agricultural households in the project area (designated micro-watersheds). This will be through value addition of farm-based produce and enterprise development, tapping into the State's rainfed areas' opportunities and relative strengths, and tapping the surpluses from productivity gains and agriculture expansion resulting from Component A and B. To meet this objective, the project will engage dedicated agribusiness experts at the district level to help in planning entrepreneurship activities at the Gram Panchayat (GP) level, providing facilitation, aggregation, and value-addition to access markets. It will also support the inclusion of the marginal landless households in the watershed development process and benefits. This component will make investments through two sub-components: (i) Supporting Agribusiness and Micro-Enterprises; and (ii) Income Generation Support for Marginalized Groups.

38. **Sub-component C1: Supporting Agribusiness and Micro-Enterprises:** The competitiveness of smallholder farmers will be promoted by facilitating the establishment of demand-driven value *chains* through a participatory approach. Based on the experience of the emerging growth centers under UDWDP II, the project will establish Agribusiness Growth Centers (ABGC), that will enable smallholder farmers to address input supply and post-harvest management issues by ensuring timely availability of seeds and other inputs, aggregating produce, performing primary (sorting, grading, and packaging) and secondary processing activities (oil milling, spice powders, etc.), and developing market linkages. The products developed by the ABGC could be marketed locally or under the aegis of the existing '*Gramyashree*' brand. The ABGCs will be managed by professionals deployed by the smallholder farmers or collectives, such as cooperatives or Farmer Producer Companies from the project area. The project, where needed, will support the development of farmer collectives. The sub-component will also finance value chain studies to identify market gaps, training, workshops, exposure visits, and other activities on agribusiness to build the capacity of relevant stakeholders (farmers, project staff, etc.). Further, the sub-component will build the technical capacities of the project

targeted agribusiness experts to support the development of bankable business plans for micro-enterprises to leverage existing government programs or bank financing.

39. The project will support the development of 10 ABGCs. Specifically, the project will finance (i) infrastructure, equipment, advisory, and operating costs up to a predefined limit in ABGCs; (ii) mobilization of farmers or farmer collectives and capacity building on ABGC management; (iii) support for professional management of the ABGC centers; (iv) value chain and market assessment studies; (v) brand development activities including standardization, and quality control; and (vi) capacity building of project staff on preparing bankable business plans for micro-enterprises.

40. **Sub-component C2: Income Generation Support for Marginalized Groups:** The project will support the inclusion of marginalized and landless households, including women-headed, who will not directly benefit from the major farm related project investments in Component B. The aim is to bridge the economic gap and bring about overall prosperity of the community in the project areas. The approach was implemented successfully under UDWDP II, with strong uptake. The project will finance small-scale income generating activities for such groups against basic business proposals developed with the assistance of field-level staff or locally recruited consultants. After appraisal by the state office, district offices will award the grants and deposit funds directly into the beneficiaries' accounts. The project will also provide skills and business management training to the beneficiaries.

41. The project will support 7,000 marginalized households. Specifically, the project will finance (i) individual grants of up to INR 30,000; (ii) capacity building of beneficiaries from marginalized households in business management and trade-based skill training; and (iii) market linkage support through locally based agribusiness experts.

Component D: Project Management, Monitoring & Evaluation, and Learning

42. The objective of this component is to (i) strengthen the institutions associated with the project; (ii) effectively and efficiently deliver project outputs in a timely and accountable manner with adaptive learning; and (iii) generate and disseminate cutting-edge knowledge on a range of issues related to climate-resilient agriculture.

43. This component will cover all project incremental operating costs. It will ensure proactive and responsive project management and coordination, with well-capacitated staff. Systemic management efforts will also be made to institutionalize project-developed approaches, partnerships, and systems. In addition, this component will finance the establishment of an institutional learning and sharing mechanism for mainstreaming resilient agriculture systems at all levels across the participating departments related to the project.

44. **Project monitoring and evaluation and learning*:*** The project will be supported throughout and on all levels by a robust project Monitoring and Evaluation and Learning (M&E/L) system to track project progress and outcomes (where necessary by project specific surveys and studies), which will maximize analyses made by partnerships, and data collection and access from and to the digital platform. Project specific tracking inputs, outputs, and results from baseline, mid-line and end-line surveys, and specific thematic studies, to ensure the successful implementation and achievements will be coordinated under this component.

45. This will further cover the overall project Monitoring and Impact Evaluation and reporting activities, including the project impact evaluation; the implementation of the project's Information and Communications Technology activities; and the coordination with a human resources agency which will be hired to recruit the project's technical positions in the field. Finally, the Project Management Unit (PMU) will implement all activities related to

communication, public awareness, and outreach, including setting up and maintaining a comprehensive project website that also accommodates a Grievance Redress Mechanism (GRM) for stakeholders to lodge complaints when applicable.

Component E: Contingent Emergency Response Component (CERC).

46. The project will include CERC component with no allocation at project approval. This arrangement shall permit a rapid project restructuring should a disaster strike to direct funds to respond to the emergency.

Table 1: Component-Wise Cost Allocation

		Total project cost		Government co-financing	World Bank co-financing	Beneficiary contribution
	Components	***US$ million***	***% of total***	***US$ million***	***US$ million***	***US$ million***
A	Developing Resilient and GHG-efficient Production Systems	46.837	34%	5.883	36.312	4.642
B	Science-based development of Resilient Springsheds	62.714	45%	16.886	43.245	2.583
C	Enhancing Income Resilience	14.779	11%	2.523	11.823	0.433
D	Project Management, Monitoring & Evaluation and Learning[12]	13.721	10%	8.901	4.820	0.000
	Grand Total	**138.051**	**100%**	**34.1933**	**96.200**	**7.658**

C. Project Beneficiaries

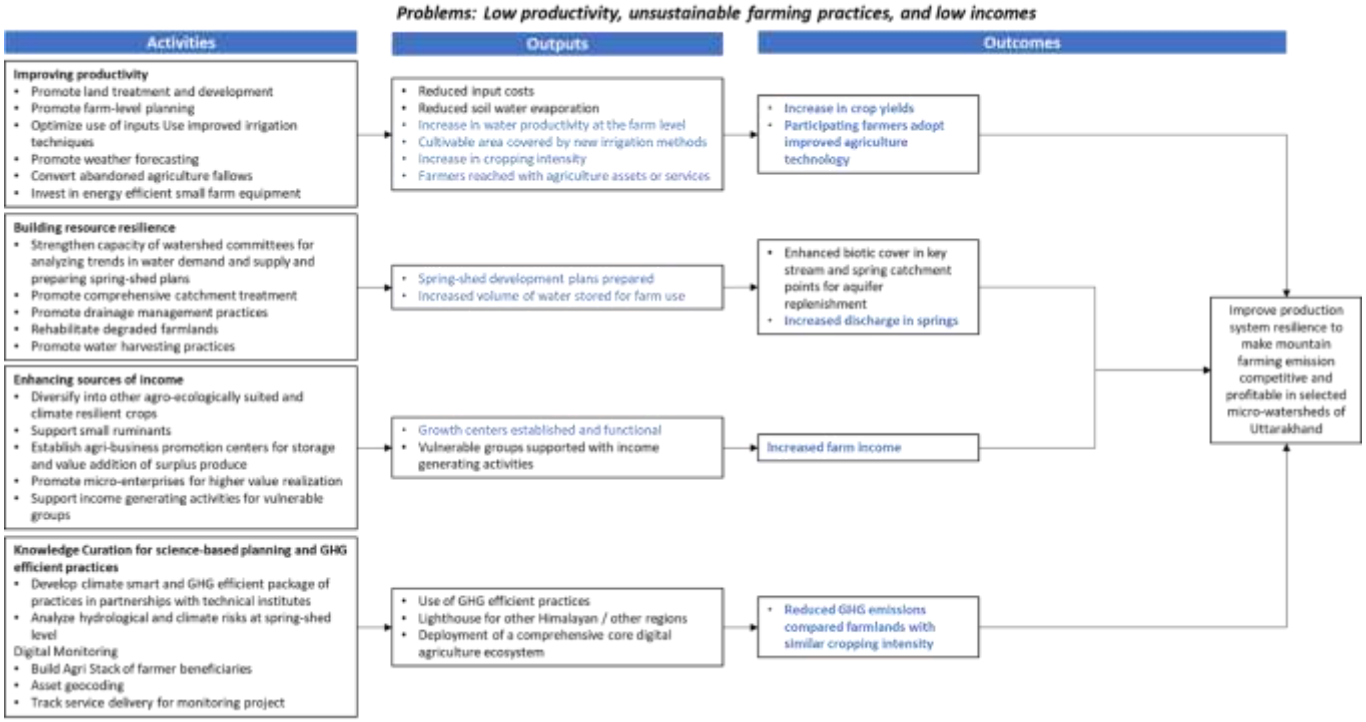
47. **Estimated beneficiaries in the project area are about 364,000, the equivalent to about 76,000 households.** The project will focus on small and marginal farmers, including women farmers, and landless households. The project will be implemented in already selected 58 Micro-Watersheds (MWS) in about 1,000 villages across 8 districts covering a catchment area of 237,634 hectares (ha), which includes arable and non-arable land. All four agro-climatic zones in the state will be covered, of which an aggregate treatable area of 103,146 ha includes fallow and current fallows. The list of selected watersheds and detailed information on the same as agreed between GoUK and the Bank will be included in the Bank-approved Project Implementation Plan (otherwise referred to as the Project Operations Manual).

D. Results Chain

48. The project will address three major challenges faced by areas under rainfed agriculture in Uttarakhand: (i) the productivity of key cereal and horticulture crops in the state remains below par. The issue is further accentuated by the vagaries of climate change and untapped opportunities for contributing to lower GHG production systems; (ii) the spring sheds have become increasingly vulnerable due to inadequate catchment and source sustainability treatments, hence not supporting agriculture adequately; and (iii) there is considerable unrealized agribusiness potential in the state. The key focus areas, activities, outputs, outcomes, and long-term impacts are summarized in the figure below.

[12] Component D includes Front-end Fees.

Figure 1: Theory of Change



49. The key assumptions that underpin the project's results chain include: (i) GoUK's commitment to implement the project; (ii) active leadership of the concerned government department(s) to foster an enabling environment for project implementation including the onboarding of required technical human resources, research institutes, and technical agencies; (iii) smallholder interest in participation and that they see value in adoption of productivity-enhancing and climate smart practices; and (iv) interest in taking up new or furthering existing entrepreneurial opportunities to set up agri-processing, storage, and logistics enterprises.

E. Rationale for Bank Involvement and Role of Partners

50. **The World Bank brings significant global experience in supporting India's rainfed agriculture transformation.** With prior investment support for watershed development, the Bank has accumulated rich experience in understanding and addressing emerging climate-change challenges. The Bank also draws on its knowledge and experience from global operations in watershed development and agriculture and bring in best science-based decision approaches to address productivity challenges in developing resilient rainfed farming systems and reduce GHGs emissions in rainfed areas. This is a climate-smart project with a unique combination of elements which sets it up as a 'lighthouse' project important for generating lessons for adoption across sectors.

51. The proposed project will innovate a scientific approach to planning, matching lab to farmers' resilience and productivity needs, and refine processes for implementing, measuring, and financing practices to reduce GHG emissions in agriculture. Implementation of such approaches is usually outside the purview of conventional government programs and Externally Aided Projects; however, this project aims to demonstrate a proof of concept for further scale-up. The designing and developing of the combination of a methodology and actual measurement of

GHG emissions from land parcels, water budgeting for maintaining water productivity, and springshed management, is a first-of-its kind initiative which is expected to transform rainfed agriculture in Uttarakhand. The Bank will leverage its role as a globally recognized convener of knowledge. It will bring in national and global best practices on the above-mentioned areas, experts and high-quality technical inputs to support project implementation.

F. Lessons Learned and Reflected in the Project Design

52. Project design builds on lessons learned from UDWDP II, the Karnataka Watershed Development II (P122486), and other global good practices such as:

a. **The watershed development through participatory approach ensures ownership and sustainability, leading to readiness for future challenges.** Under the UDWDP II the inclusive capacity development strategy on project management and Environment & Social Framework (ESF) compliance, led to an increase in village administration capacity, which was critical to help the community adopt data-based watershed planning and management.

b. **Greater focus on springsheds to provide more direct water benefits.** While the micro watershed implementation approach provided good results, the increased pressures of climate change and the need to maximise water-related benefits call for greater focus on springsheds. Pilot experience in the State and elsewhere indicates that springshed-based planning and treatment approaches can pay dividends in terms of more direct increases in discharge while reducing surface runoff.

c. **Strengthening productivity needs greater precision and science support for resilience and mitigation**. Building on the experiences of UDWDP II, the greater sustained flows from springs can further optimise diversified productivity. However, this needs to be coupled with much more refined support to the adoption of climate-resilient technologies, and water-use efficiency, with more localised advisories, matching with climate forecasting.

d. **Agribusiness promotion increased income opportunities and promoted a loop that connects adoption of climate-smart technologies with surplus generation for the markets**. UDWDP II established ABGCs in remote villages for aggregating, processing, and marketing farm produce from village clusters. With minor improvements in operational arrangements and strengthening the branding of hill products, these centers could ensure input delivery and capacitate farmers' collectives to drive markets to their benefit. The project will complement the approach by tapping more localized opportunities for value addition through enterprises. The project will draw on extensive experience in other agriculture competitiveness projects.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

53. The project will be implemented by the Watershed Management Directorate (WMD), under the Watershed Department, which is the special purpose vehicle of the GoUK. At the state level, a PMU has been established under the leadership of the Chief Project Director and the Project Director whose positions have already been filled. The PMU will

be responsible for overall project management, financial management, including budgeting and disbursements, monitoring results, procurement, and ESF. At the regional level, the WMD has two Project Directors in Garhwal and Kumaon who will assist the Project Director in project implementation. Further, at the district level, a District Project Management Unit, has been established at each district. Each DPMU is headed by a Deputy Project Director who is responsible for project planning, implementation, and monitoring. The state and district offices will have officers on deputation from all the line departments (including Forest, Agriculture, Horticulture, Animal Husbandry, and Rural Development), both at the state and district level, allowing for convergence with other programs and interdisciplinary competencies for project management.

B. Results Monitoring and Evaluation Arrangements

54. The existing M&E institutional capacity within the PMU will form the basis for the Uttarakhand Climate Responsive Rainfed Farming (UCRRF) project. The WMD already has well-trained and experienced staff, and a strong Monitoring Information System (MIS) and information flow system. One of the major pillars of the new M&E paradigm is to place it within the larger framework of knowledge management and learning. This is expected to play a pivotal role in the project, particularly given its pioneering nature, its focus on GHG emissions, and community participation and ownership with long-term sustainability. Going beyond the conventional model of M&E, which is largely MIS based, the other key focus area would be integration and embedding of the monitoring, evaluation, and learning components in relation to knowledge co-creation consortia, and with the new digital platform for greater effectiveness, real-time data reporting, and evidence-based programming.

55. A full-time Knowledge Manager at the PMU will work in close coordination and collaboration with the ICT & MIS project personnel. The Knowledge Manager will be supported by the M&E Officers at the DPMU level who will have a critical role in ensuring data quality and building a large reservoir of knowledge base reflecting the project's overall innovative and pilot character. Since the M&E system will be fully integrated into the proposed new digital platform with links to the state and national networks, it will be able to provide information access to a much wider audience beyond the project stakeholders.

C. Sustainability

56. **Full alignment with GoI/GoUK development priorities, synergies with other programs, and implementation arrangements provide a robust foundation for project sustainability**. The project fully addresses the GoUK's request to support a shift in the paradigm in addressing the vulnerability of the state's predominantly rainfed agriculture to increasingly frequent climate events through longer-term resilience building. By scaling up climate-resilient technologies and agronomic practices that increase farm productivity, improve water-use efficiency, enhance soil health, and sequester soil carbon, the project lays the foundation for strengthening the adaptive capacity of farming systems and selected value chains to withstand the adverse impacts of recurring climate events over the long term.

57. **The project is designed to contribute to GoI/GoUK priority of achieving emissions reduction under rainfed conditions.** Given the strong commitment demonstrated throughout the project preparation, it is expected that with the successful early implementation of project activities, the government will continue to support activities introduced by the project and leverage synergies with other programs throughout the project's implementation and beyond. This commitment aims to fulfil India's obligations regarding the NDC under COP21.

58. **The project's sustainability is guided by the institutional arrangements for the implementation of the project as a key determinant.** Coordination, technical oversight, and activity implementation are conducted by the

corresponding public institutions at the district, and sub-district, as well as those already existing at the village level, in close consultation with the PMU. The project is fully embedded in the GoUK's administration. This is expected to foster high levels of ownership and commitment to achieving project outcomes and ensuring sustainability.

59. **A substantial portion of the project is dedicated to knowledge and technology transfer to scale up the adoption of agricultural technologies and agronomic practices to help build resilience at the farm level.** Given the tools used for the demonstration and adoption of these technologies and practices, a spillover effect to non-project villages can be expected, thereby further accelerating the scaling up of climate-resilient agriculture in Uttarakhand and consolidating the project sustainability dimension. The project activities will not collect, store or use any personal data nor enable the same.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis (if applicable)

60. **The operation is aligned with the goals of the Paris Agreement on both mitigation and adaptation**. The project is consistent with India's NDC and Uttarakhand State Action Plan on Climate Change on enhancing climate resilience and reducing emissions while transforming rainfed agriculture into a more productive and diversified sector. Concerning mitigation risks, the proposed project activities conform to climate-smart agriculture pillars and are universally aligned with little or no risks of the operation having a negative impact on the State's low-GHG emissions development pathway. With respect to adaptation risks, project design explicitly includes leveraging the state-of-science in climate adaptation and resilience and promoting the adoption of climate-resilient technologies to address climate risks and reduce the risks to an acceptable level.

61. **Building on the experience and capacity of previous projects, the project will strengthen the systems resilience approach**. The proposed project will build firmly on the technical and institutional strengths of the UDWDP II, in terms of participatory watershed planning and implementation support for springshed development, productivity improvements and cluster-based agribusiness development. Additionally, it will recognize and expand on the importance of systems and science-based approaches to resilience. These approaches acknowledge the essential and interconnected roles of watershed, livelihoods, and market-oriented activities in generating both ecosystem and income resilience. The project will draw on cutting-edge experiences of major watershed projects in India, such as Karnataka Watershed Development II, and Rejuvenating Watersheds for Agricultural Resilience through Innovative Development (P172187) at the national level, as well as global good practices from the World Bank portfolio in watersheds and landscape management.

62. **Each component is designed to capitalize on best practices and knowledge from India and globally.** Building on this under Component B and on the solid experiences of UDWDP II, the project will take a focused springshed development approach, drawing on pilot experiences and guidance developed in the state and other Himalayan areas. For component A, the project will take a much more deliberate and stepped-up approach to address climate-sensitive agriculture: both in terms of refining productivity approaches, water-use efficiency, various approaches to diversification, soil, and land management, as well as integrated farming systems, agro-met advisory and precision agriculture. For this, it will draw on the Maharashtra Project on Climate Resilient Agriculture (POCRA; P160408), UDWDP II, and other projects in India, and from the considerable body of science and knowledge from the Indian Council of Agricultural Research and from the Consultative Group on International Agricultural Research, many of which have received support from the Bank. In terms of mitigation, the project will pioneer approaches for integrating

mitigation and monitoring of GHGs. This includes reducing GHGs, especially methane in paddy rice areas and tracking carbon sequestration arising from watershed rehabilitation, as well as from increased biomass and soil carbon resulting from integrated, efficient, and low external input agriculture. The project will develop verifiable measurement tools and methods to explore voluntary carbon market opportunities for these, some of which have been evaluated under the Global Environmental Facility-funded Ecosystem Services Improvement Project, and for consideration in the neighboring Himachal Pradesh-Integrated Development Project. The project will also bring much more science and data-driven approaches, as has been nurtured under the National Agriculture Innovation Project (P092735) and draw on POCRA which has been establishing state data platforms in Maharashtra. For Component C, the project will draw on the extensive experiences of agriculture competitiveness and productive alliance, as well as inclusive cluster development from among others, livelihoods projects in India, but also beyond.

Economic and Financial Analysis

63. **Rationale for public sector financing.** Public capital allocation towards this initiative is advocated based on its strategic alignment with the provision of essential public goods and ecosystem services. By focusing on the holistic rehabilitation of watershed areas, the project endeavors to ameliorate the socio-environmental challenges faced by communities susceptible to the adversities of climatic variances and exogenous shocks. Furthermore, the investment rationale is buttressed by the project's objective to catalyze private sector capital infusion in regions characterized by an underrepresentation of private stakeholders, thereby fostering an environment conducive to economic dynamism.

64. **To assess the project's viability, an initial cost-benefit analysis was conducted.** This thorough evaluation included determining key economic and financial indicators like Net Present Value (NPV), Internal Rate of Return (IRR), the benefit-cost ratio (B/C), payback period and switching cost. The objective was to comprehensively analyze the distinct components and main activities of the entire project to understand its potential returns. The financial analysis assesses project returns for executing bodies, participants, private firms, and beneficiaries, while the economic analysis highlights broader societal returns, informing policymakers.

65. **The assessment integrated essential investment criteria to form the foundational scenario.** Key among these criteria were (i) an evaluation period of 20 years; (ii) an 8 percent social discount rate; (iii) a 10.3 percent cost of capital;[13] and (iv) an anticipated 6-year implementation timeframe. To ensure the robustness of the results, both sensitivity and scenario evaluations were conducted. These evaluations probed into potential shifts in major determinants, including benefits, expenses, review duration, social discount figures, and capital costs. By examining these potential shifts, the resilience of the conclusions was assessed, offering insight into potential variations in outcomes due to changes in key factors.

66. **The economic and financial assessment of the project indicates a promising return on investment. This analysis encompasses the total project cost, including contributions from the government and beneficiaries.** Economic indicators, such NPV, IRR, B/C, and payback period, are estimated at US$267.9 million, 12.45 percent, 1.68, and 11.36 years, respectively. These results incorporate a preliminary valuation of certain ecosystem services, including carbon sequestration, GHG emission reduction, reduction in soil degradation, and an increase in water flow at the micro-watershed levels.

67. **In contrast, from a financial standpoint, the indicators are estimated as follows: NPV at US$100.2 million, IRR at 12.08 percent, B/C ratio at 1.29, and the payback period at 11.50 years, including the potential benefits that**

[13] Average agriculture loan interest rates in India.

could be generated from the carbon credit mechanism. Such results underscore the project's economic and financial potential, indicating its capability to yield significant returns. Below is a table presenting the projected economic and financial metrics for the entire project.

Table 2: Projected Economic and Financial Metrics

Economic indicators (8% cost of capital, 20 years evaluation period)					
Economic Net Present Value (ENPV) (US$ million)	Economic Internal Rate of Return (EIRR) (percent)	Benefit/ Cost Ratio	Payback period (years)	Switching value benefit (%)	Switching value cost (%)
267.9	12.45	1.68	11.36	-40.4	68.9
Financial indicators (8% social discount rate, 20 years evaluation period)					
Financial Net Present Value (FNPV) (US$ million)	Financial Internal Rate of Return (FIRR) (percent)	Benefit/ Cost Ratio	Payback period (years)	Switching value benefit (%)	Switching value cost (%)
100.2	12.08	1.29	11.50	-22.6	29.1

68. **The project's positive NPV and IRR highlight its potential to yield favorable economic outcomes, akin to those noted in similar integrated watershed management projects.** These metrics suggest significant returns, forecasting a yield of US$1.68 for every US$ spent from an economic perspective and US$1.29 from a financial one. However, it is essential to understand that external, unforeseen events can influence the project's economic returns. Should there be a decrease exceeding 40.4 percent in expected net benefits or an increase surpassing 68.9 percent in estimated costs, the project's favorable economic return might be jeopardized. Therefore, it is crucial to employ a proactive risk management strategy and implement precautionary measures to ensure the project's ongoing sustainability and long-term success.

69. **To ensure the robustness of the results, and considering the high uncertainty regarding key investment parameters, sensitivity and scenario analysis were conducted.** This included evaluating the impact of variations in key variables on the estimated economic indicators, such as different evaluation periods of 15 to 30 years, social discount rates of 6 and 10 percent, cost of capital of 8 to 12 percent, low and higher prices of carbon recommended and other variables. Furthermore, possible variations in yields, prices, production costs and adoption rate were evaluated at a range of percentages, including -20 percent, -10 percent, -5 percent, 5 percent, 10 percent, and 20 percent.

70. **In disaggregated terms, components A, B, and C will yield positive economic returns over a 20-year evaluation period.** Component B will also see positive financial returns but over an extended evaluation period of 25 years. Thus, investing in the treatment of micro-watersheds has the potential to generate an economic return of US$1.68 for each US$ invested in these ecosystems.

GHG Analysis based on estimates using Ex-ACT

71. **Preliminary estimates for changes in GHG indicate an overall net reduction in emissions and increased sequestration by the project, mainly from watershed and agriculture interventions, with a small increase in emissions from new agribusiness.** The preliminary GHG analysis using the United Nations Food and Agriculture

Organization's EX-Ante Carbon-balance Tools (EX-ACT) both for land use and agriculture (EX-ACT v.9.4) as well value chains (EX-ACT VC v. 3.5) suggests that over a 20-year period (6 years of implementation and 15 years of capitalization), the project could reduce GHG emissions by 413,394 tCO2eq averaging a reduction of 20,670 tCO2eq per year in a conservative scenario assuming a GHG reduction achievements of 50 percent due to the adoption of practices and technologies oriented to this purpose. This equates to a reduction of 0.5 tCO2/ha/year in the intervention area. The main reductions in GHG would arise from integrated watershed management, reduction of inputs and the application of good agricultural practices, diversification, and conversion of fallow lands. Of this total 1,972 tCO2eq reduction would be due exclusively to the reduction in methane emissions from intermittent drying in paddy rice. However, the implementation of new post-harvest and processing activities would lead to some increased GHG emissions.

B. Fiduciary

(i) Financial Management

72. WMD is well versed with the World Bank Financial Management (FM) requirements. At the state level a project budget head has been created, through which funds will be transferred, to WMD, which will then assign funds to the districts and GPs as per work plans. The funds will flow through the state treasury to a Single Nodal Agency bank account (SNA) at the Project Director level who will further provide limits to Deputy Project Directors for carrying out expenditures. State and district offices will use the SNA bank account for payments. GPs will have project-specific bank accounts which will be added in the SNA system. Accounting for expenditures will be kept in manual books at the offices as well as in the MIS. Cash books and other relevant documents will be kept at the Head office, Districts, and GP levels from which project expenditures will be collated. The project's MIS system will also track the expenditure. Interim Unaudited Financial Reports (IUFR) will be prepared every quarter and submitted to the Bank within 45 days, based on which disbursements will be done. Audits will be conducted by the state office of the Comptroller & Auditor General. Annual audit reports will be submitted to the World Bank within nine months from the end of the financial year. GP project accounts and internal audit will be audited by a Chartered Accountant (CA) firm appointed by WMD. FM risk rating is 'Moderate.' Retroactive financing will be applicable from March 1, 2023, up to a limit of US$9 million.

(ii) Procurement

73. Procurement activities will be carried out following the World Bank's Procurement Regulations for IPF Borrowers dated September 2023. Details of procurement activities are specified in the procurement plan. The project will be subject to the World Bank's Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by International Bank for Reconstruction and Development (IBRD) Loans and International Development Association (IDA) Credits and Grants. A Project Procurement Strategy for Development (PPSD) was developed during the early stages of project preparation. WMD has initiated the procurement of consultancy contracts, required for kick-starting the project. WMD officials are familiar with the procurement process including the Systematic Tracking of Exchange in Procurement (STEP) given their experience in implementing other World Bank-financed projects. Based on previous experience and keeping in view the decentralized procurement at districts across the state, the initial procurement risk rating is determined as 'Moderate'. The World Bank has carried out a procurement risk assessment of WMD. Procurement-related risks have been identified, and mitigation measures have been agreed upon.

C. Legal Operational Policies

Legal Operational Policies	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Area OP 7.60	No

D. Environmental and Social

74. **The environmental and social risk of the project is rated as 'Moderate'.** Overall, the potential impacts are expected to be low to moderate, temporary, and site-specific, which can be managed through appropriate mitigations.

75. **Environment Risk Assessment:** The potential environmental risks relate to minor earthworks associated with springshed treatment, irrigation, water harvesting, and storage structures may result in minor impacts in the slopy terrains. In addition, the productivity enhancement interventions may trigger excess use of water and fertilizers, use of non-permissible/hazardous pesticides, unsafe application and disposal methods, replacement of traditional varieties with hybrids etc. Release of wastes (limited) is also expected from processing activities, besides increased energy and water footprint. Livestock interventions would need measures for resource efficiency and waste management. The project, by design, includes several environmentally benign interventions (climate smart/resilient agricultural practices, springshed treatment, water conservation, micro irrigation, reduction in GHG emissions, carbon sequestration measures, renewable energy use etc.) that would contribute to resource efficiency and emission reduction.

76. **Social Risk Assessment:** The project is expected to have positive social impacts and benefits for farmers and agricultural workers. The project will not involve any land acquisition/ use of forest lands and/or lands with any encumbrances. Transhumant communities are likely to be traversing through four districts. The potential social risks and impacts include (i) impacts on transhumant populations, such as temporarily limited access to grazing lands due to project development activities; (ii) risk of exclusion of vulnerable groups such as tribal communities from project benefits; (iii) worker and public safety risks in case of non-compliance during proposed earthworks, particularly given the hilly areas/terrain; and (iv) lack of a functional Grievance Redressal Mechanism (GRM) at the community level. The Sexual Exploitation and Abuse (SEA)/sexual harassment (SH) risk is assessed to be 'moderate' as per the Social Protection Risk Assessment Tool. The works will be carried out by local community laborers and, therefore, no labor influx is expected. The project will sensitize the WMD on SEA/SH issues, prepare a code of conduct for laborers and other project workers, and establish a gender-based violence (GBV)/SEA/SH-responsive GRM.

77. **An Environmental and Social Commitment Plan (ESCP)** and a Stakeholder Engagement Plan (SEP) have been prepared and disclosed in project districts.[14] The requirements for preparing the required instruments as per the ESF,

[14] ESCP and SEP were disclosed on the WMD website by the Government of Uttarakhand on February 02, 2024 (see http://www.wmduk.gov.in/download/P179357_UCRRFP_FinalESCP.pdf and http://wmduk.gov.in/download/P179357_UCRRFP_FinalSEP.pdf); and the World Bank website on February 2, 2024 (see SEP: https://documentsinternal.worldbank.org/search/34250653 and ESCP: https://documentsinternal.worldbank.org/search/34250571)

including an Environmental and Social Management Framework (ESMF), Labor Management Procedures (LMP), and Indigenous People Policy Framework (IPPF) have been included in the ESCP. The WMD has an Environment Expert, a Social and Institutional Development Expert, a Social Coordinator at each DPMU, and three Social Facilitators at each Field Unit Office.

78. **Gender:** Income disparity among female and male farmers in Uttarakhand is persistent. According to the Periodic Labor Force Survey (2021-22), female farmers make about INR 6,000 a month, less than half of male farmers who make INR 13,000 a month. In Uttarakhand, 21 percent of households are headed by women, with 17 percent of the population living in female-headed households (FHH) (National Family Health Survey (NFHS) - 5). Census data [2011] show that FHH are in general more vulnerable – data show that most of the FHH in rural areas in India have a monthly income less than INR 5,000. Underlying reasons include that men own almost all land in Uttarakhand and therefore have better access to capital for input service including irrigation facilities, quality seeds and fertilizers, and experience in exercising bargaining power when taking produce to the market. As a result, small and marginal women farmers are unable to reap the benefits of scale and go beyond labor-intensive activities. The project will provide catalytic support to female-headed households in generating higher farm income (targeting 30 percent increase in their farm income), and thereby narrowing the gender income gap from farm activities. The project will (i) provide them with technical training on identifying, accessing, and leveraging ongoing government programs; (ii) equip these female-headed households with catalytic support for developing agribusiness plans; (iii) ensure their access to input services such as irrigation, fertilizer and quality seeds; and (iv) work with agribusiness support agencies to procure from female-headed households. The results framework will track progress in narrowing of the income gap through an increase in farm income for female-headed households.

79. **Citizen Engagement:** WMD has experience from UDWDP II in engaging with communities in project preparation and implementation including capacity-building and development of community-based organizations. The UCRRF project will support the formulation of strategies and plans for engagement with communities and other stakeholders during program implementation and service delivery, especially for information sharing, peer support, community implementation, and supervision. The project will: (i) engage communities in participatory analysis of trends in water demand and supply and development of springshed plans through participatory micro-planning process; (ii) strengthen the existing GRM at the WMD and the GP-level GRM of the previous project (UDWDP II) to be efficient, accessible, and responsive for resolving complaints in a timely manner; (iii) develop a community operations manual for engaging communities in preparation and implementation of a comprehensive communication strategy to disseminate information for engaging with relevant stakeholders, particularly to the vulnerable groups such as tribal communities, transhumants, women farmers etc.; and (iv) ensure the community's feedback is incorporated during implementation through the M&E/L activities planned.

80. **Climate Co-Benefits:** Through targeted climate change adaptation and mitigation actions, the project will help the state achieve its vision of enhancing food security, climate resilience, and farmer income. The climate co-benefits from project interventions have been estimated at 68.7 percent by the World Bank. Project investments will directly contribute to strengthening institutional and infrastructure capabilities through specialized climate-smart land and water practices, to reduce GHG emissions per unit of land and increase the capacity of terrestrial ecosystems to function as carbon sinks. Component *B* will develop springsheds to improve the viability of perennial water supply for agriculture and domestic usage. Component A will ensure that production systems are climate informed, resilient to short and long-term climate variability and utilize water, soil, and other inputs more efficiently. This component will also establish consortia for the co-creation of CSA knowledge and an agricultural digital platform to pool subject-specific scientific/technical expertise to scale up climate smart technologies and expanding knowledge base.

Component C will foster the growth of climate-smart agribusinesses and entrepreneurship opportunities to add value to products for the hilly areas, farmers' incomes, and broader household resilience.

V. GRIEVANCE REDRESS SERVICES

81. 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 Grievance Redress Service (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 complaints to the World Bank's independent Accountability Mechanism (AM). The AM houses the Inspection Panel, which determines whether harm occurred, or could occur, as a result of World 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. For information on how to submit complaints to the World Bank's GRS, visit http://www.worldbank.org/GRS. For information on how to submit complaints to the Bank's Accountability Mechanism, visit https://accountability.worldbank.org.

VI. KEY RISKS

82. **The overall risk rating for the project is assessed as "Moderate," with no individual risks assessed as high or substantial**.

VII. RESULTS FRAMEWORK AND MONITORING

PDO Indicators by PDO Outcomes

Baseline	Closing Period
Improved resilience of smallholder farmers and agriculture system	
Water discharge in sample springs (Percentage)	
Feb/2024	Feb/2030
0	20
Farmers adopting improved agricultural technology (Number) CRI	
Feb/2024	Feb/2030
0	40000
➢Farmers adopting improved agricultural technology - Female (Number) CRI	
0	16000
➢Farmers adopting improved agricultural technology - male (Number) CRI	
0	24000
Improving productivity of key agriculture commodities in target areas	
Crop yield of selected crops (Percentage)	
Feb/2024	Feb/2030
0	20
Relative reduction of GHG emission in sample areas against control areas	
GHG emissions from representative cropped land parcels (measured in Kg CO2eq/ ha) (Number)	
Feb/2024	Feb/2030
0	5
Enhanced farm income	
Farm income due to farm-level project interventions (Percentage)	
Feb/2024	Feb/2030
0	25
➢Farm income for female-headed households due to farm level project interventions (Percentage)	
0	30

Intermediate Indicators by Components

Baseline	Closing Period
Component A: Developing Resilient and GHG-efficient Production Systems	
Cultivable area covered by new irrigation methods (Hectare(Ha))	
Feb/2024	Feb/2030
0	20000
Water productivity at farm level (Percentage)	
Feb/2024	Feb/2030
0	30
Cropping intensity (Percentage)	
Feb/2024	Feb/2030
120	175
Farmers reached with agricultural assets or services (Number) CRI	
Feb/2024	Feb/2030
0	50000
➢Farmers reached with agricultural assets or services - Female (Number) CRI	
0	20000
Component B: Science-based Development of Resilient Springsheds	
Participatory and science based springshed plans developed (Number)	
Feb/2024	Feb/2030
0	500
Water harvesting (or storage) capacity (Cubic Meter(m3))	
Feb/2024	Feb/2030
0	50000
Component C: Enhancing Income Resilience	
New Growth Centres established and functional (Number)	
Feb/2024	Feb/2030
0	10
Component D: Project Management, Monitoring & Evaluation, and Learning	
Registered grievances related to the project that are addressed (Percentage)	
Feb/2024	Feb/2030
0	90
Component E: Contingent Emergency Response	

Monitoring & Evaluation Plan: PDO Indicators by PDO Outcomes

Improved resilience of smallholder farmers and agriculture system	
Water discharge in sample springs (Percentage)	
Description	This indicator measures the increase in water discharge of the springs / streams after the catchment treatment in sample springshed areas over a period of time
Frequency	Every year once in pre-monsoon and post-monsoon (peak flow / normal flow)
Data source	Sample springs / streams from second year after the treatment
Methodology for Data Collection	Manual / automatic data recorder at spatial intervals / finalised by the PMU Hydrologist and M&E Agency
Responsibility for Data Collection	PMU and M&E Agency
Farmers adopting improved agricultural technology (Number) CRI	
Description	This indicator measures the number of farmers (of agricultural products) who have adopted an improved agricultural technology promoted by operations supported by the World Bank. "Agriculture" or "Agricultural" includes: crops, livestock, capture fisheries, aquaculture, agroforestry, timber and non-timber forest products. Adoption refers to a change of practice or change in use of a technology that was introduced or promoted by the project. Technology includes a change in practices compared to currently used practices or technologies (seed preparation, planting time, feeding schedule, feeding ingredients, postharvest storage/ processing, etc.). If the project introduces or promotes a technology package in which the benefit depends on the application of the entire package (e.g., a combination of inputs such as a new variety and advice on agronomic practices such as soil preparation, changes in seeding time, fertilizer schedule, plant protection, etc.), this counts as one technology. Farmers are people engaged in farming of agricultural products or members of an agriculture related business (disaggregated by men and women) targeted by the project.
Frequency	Per cropping season after first year
Data source	Project MIS
Methodology for Data Collection	Primary data collection from micro-watersheds
Responsibility for Data Collection	PMU and M&E Agency
Farmers adopting improved agricultural technology - Female (Number) CRI	
Description	This indicator measures the number of female farmers (of agricultural products) who have adopted an improved agricultural technology promoted by operations supported by the World Bank. "Agriculture" or "Agricultural" includes: crops, livestock, capture fisheries, aquaculture, agroforestry, timber and non-timber forest products. Adoption refers to a change of practice or change in use of a technology that was introduced or promoted by the project. Technology includes a change in practices compared to currently used practices or technologies (seed preparation, planting time, feeding schedule, feeding ingredients, postharvest storage/ processing, etc.). If the project introduces or promotes a technology package in which the benefit depends on the application of the entire package (e.g., a combination of inputs such as a new variety and advice on agronomic practices such as soil preparation, changes in seeding time, fertilizer schedule, plant protection, etc.), this counts as one technology. Farmers are people engaged in farming of agricultural products or members of an agriculture related business (disaggregated by men and women) targeted by the project.
Frequency	Per cropping season after first year
Data source	Project MIS
Methodology for Data Collection	Primary data collection from micro-watersheds
Responsibility for Data Collection	PMU and M&E Agency
Farmers adopting improved agricultural technology - male (Number) CRI	
Description	This indicator measures the number of farmers (of agricultural products) who have adopted an improved agricultural technology promoted by operations supported by the World Bank. "Agriculture" or "Agricultural" includes: crops, livestock, capture fisheries, aquaculture, agroforestry, timber and non-timber forest products. Adoption refers to a change of practice or change in use of a technology that was introduced or promoted by the project. Technology includes a change in practices compared to currently used practices or technologies (seed preparation, planting time, feeding schedule, feeding ingredients, postharvest storage/ processing, etc.). If the project introduces or promotes a technology package in which the benefit depends on the application of the entire package (e.g., a combination of inputs such as a new variety

	and advice on agronomic practices such as soil preparation, changes in seeding time, fertilizer schedule, plant protection, etc.), this counts as one technology. Farmers are people engaged in farming of agricultural products or members of an agriculture related business (disaggregated by men and women) targeted by the project.
Frequency	Per cropping season after first year
Data source	Project MIS
Methodology for Data Collection	Primary data collection from micro-watersheds
Responsibility for Data Collection	PMU and M&E Agency
Improving productivity of key agriculture commodities in target areas	
Crop yield of selected crops (Percentage)	
Description	Three cereal crops (paddy, lentil, and finger millet) and two vegetable crops (capsicum and pea) have been selected to measure the increase in productivity post project interventions, which include quality inputs and production technologies
Frequency	Per cropping season, from second year onwards
Data source	Survey data
Methodology for Data Collection	Primary data collection (crop cutting data)
Responsibility for Data Collection	M&E Agency
Relative reduction of GHG emission in sample areas against control areas	
GHG emissions from representative cropped land parcels (measured in Kg CO_2eq/ ha) (Number)	
Description	Reduction in emission of CO_2, CH_4, and N_2O in sample areas with similar cropping intensity as in control area
Frequency	Once in a year, from third year onwards
Data source	Survey data – from exclusively selected fields of crops selected for productivity enhancement that are least influenced by externalities
Methodology for Data Collection	Project will measure CH_4 and CO_2 equivalent in selected sample plots – all IPCC protocols will be followed while collecting sample and transporting it to the laboratory for analysis
Responsibility for Data Collection	Specialized MRV Agency and M&E Agency
Enhanced farm income	
Farm income due to farm-level project interventions (Percentage)	
Description	The income from farm interventions will be measured at the household level pre and post project interventions at the farm level
Frequency	Baseline, midline, and endline
Data source	Survey data
Methodology for Data Collection	Survey data at the household level
Responsibility for Data Collection	M&E Agency
Farm income for female-headed households due to farm-level project interventions (Percentage)	
Description	The income from farm interventions will be measured at the household level pre and post-project interventions at the farm level for female-headed households. Female-headed households will be identified at the time of wealth ranking in project villages
Frequency	Baseline, midline, and endline
Data source	Survey data
Methodology for Data Collection	Survey data at the household level
Responsibility for Data Collection	M&E Agency

Monitoring & Evaluation Plan: Intermediate Results Indicators by Components

Component A: Developing Resilient and GHG-efficient Production Systems	
Cultivable area covered by new irrigation methods (Hectare(Ha))	
Description	Estimated to include controlled irrigation, precision irrigation, water use efficiency practices, soil water practices, and new irrigated areas
Frequency	Annually
Data source	Project MIS
Methodology for Data Collection	Primary data from field staff
Responsibility for Data Collection	PMU
Water productivity at farm level (Percentage)	
Description	This indicator measures the unit of crop produced per unit of water (cubic meter). In other words, water productivity is expressed as a ratio of agricultural production (in kg) over evapo-transpiration (in m^3). It is measured as percent change over baseline compared to control areas.
Frequency	Per irrigation per crop
Data source	Sample survey
Methodology for Data Collection	Water use efficiency and water productivity will be measured through automatic data recorder along with evapo-transpiration or through sensor or through manual mechanism
Responsibility for Data Collection	M&E Agency with the local agriculture university
Cropping intensity (Percentage)	
Description	Assessment of area irrigated in kharif and rabi seasons. Cropping intensity refers to raising of a number of crops from the same field during agricultural year. The following formula is applied for measuring Cropping intensity: Gross cropped area/net sown area x 100
Frequency	Annually
Data source	Survey data
Methodology for Data Collection	Cropping intensity: Gross cropped area/net sown area x 100; based on the cropping sequence of the particular year
Responsibility for Data Collection	M&E Agency in consultation with the local agriculture university
Farmers reached with agricultural assets or services (Number) CRI	
Description	This indicator measures the number of farmers who were provided with agricultural assets or services as a result of World Bank project support. "Agriculture" or "Agricultural" includes: crops, livestock, capture fisheries, aquaculture, agroforestry, timber, and non-timber forest products. Assets include property, biological assets, and farm and processing equipment. Biological assets may include animal agriculture breeds (e.g., livestock, fisheries) and genetic material of livestock, crops, trees, and shrubs (including fiber and fuel crops). Services include research, extension, training, education, ICTs, inputs (e.g., fertilizers, pesticides, labor), production-related services (e.g., soil testing, animal health/veterinary services), phyto-sanitary and food safety services, agricultural marketing support services (e.g., price monitoring, export promotion), access to farm and post-harvest machinery and storage facilities, employment, irrigation and drainage, and finance. Farmers are people engaged in agricultural activities or members of an agriculture-related business (disaggregated by men and women) targeted by the project.
Frequency	Per cropping season after first year
Data source	Project MIS
Methodology for Data Collection	Primary data collection from micro-watersheds
Responsibility for Data Collection	PMU and M&E Agency
Farmers reached with agricultural assets or services - Female (Number) CRI	
Description	This indicator measures the number of farmers who were provided with agricultural assets or services as a result of World Bank project support. "Agriculture" or "Agricultural" includes: crops, livestock, capture fisheries, aquaculture, agroforestry, timber, and non-timber forest products. Assets include property, biological assets, and farm and processing equipment. Biological assets may include animal agriculture breeds (e.g., livestock, fisheries) and genetic material of livestock, crops, trees, and shrubs (including fiber and fuel crops). Services include research, extension, training, education, ICTs, inputs (e.g., fertilizers, pesticides, labor), production-related services (e.g., soil testing, animal health/veterinary services), phyto-

	sanitary and food safety services, agricultural marketing support services (e.g., price monitoring, export promotion), access to farm and post-harvest machinery and storage facilities, employment, irrigation and drainage, and finance. Farmers are people engaged in agricultural activities or members of an agriculture-related business (disaggregated by men and women) targeted by the project.
Frequency	Per cropping season after first year
Data source	Project MIS
Methodology for Data Collection	Primary data collection from micro-watersheds
Responsibility for Data Collection	PMU and M&E Agency
Component B: Science-based Development of Resilient Springsheds	
Participatory and science-based springshed plans developed (Number)	
Description	Dedicated springshed plans within micro-watersheds, incorporating structures designed to local climate trends
Frequency	Annual
Data source	Project MIS
Methodology for Data Collection	Primary data collection from micro-watersheds
Responsibility for Data Collection	PMU
Water harvesting (or storage) capacity (Cubic Meter(m^3))	
Description	Creating water harvesting structures to tap the surplus water from treated springs and streams
Frequency	Annual
Data source	Project MIS
Methodology for Data Collection	Baseline, Midline, and Endline
Responsibility for Data Collection	PMU and M&E Agency
Component C: Enhancing Income Resilience	
New Growth Centres established and functional (Number)	
Description	This indicator measures the number of equipped growth centers run by registered entity earning revenue
Frequency	Annual
Data source	Project MIS
Methodology for Data Collection	Primary data
Responsibility for Data Collection	PMU
Component D: Project Management, Monitoring & Evaluation, and Learning	
Registered grievances related to the project that are addressed (Percentage)	
Description	Percentage of grievances addressed by the project
Frequency	Annual
Data source	Project MIS
Methodology for Data Collection	Primary data
Responsibility for Data Collection	PMU

ANNEX 1: IMPLEMENTATION ARRANGEMENTS AND SUPPORT PLAN

Uttarakhand Climate Responsive Rainfed Farming Project

Implementation Arrangement

1. The project will be implemented by the Watershed Management Directorate (WMD), a special-purpose entity under the Watershed Department of the GoUK, with the following implementation structure:

(i) State Level:

2. **Project Steering Committee:** The project will be implemented by Watershed Management Directorate, GoUK. A 'High Power Committee/Steering Committee' (HPC/SC), will be constituted, involving senior government officials, headed by the Chief Secretary, GoUK. The High-Power Committee will review project activities on a bi-annual basis and provide necessary guidance.

3. **Project Management Unit (PMU):** The established PMU will be headed by the 'Project Director,' a senior-level officer from All India Service. The overall direction and guidance to the project will be provided by the Project Director. The project will involve technical institutions of national and international repute who will provide required support on different project components. The consortium of technical institutions will be working with the PMU to provide technological solutions to the project activities.

(ii) Regional Level:

4. **Regional Project Management Unit**: To support project implementation and its administration, there will be two regional coordination offices, headed by 'Regional Project Directors,' one in the Garhwal region and the other one in the Kumaon region. Each regional office will be staffed to support project coordination functions.

(iii) District Level:

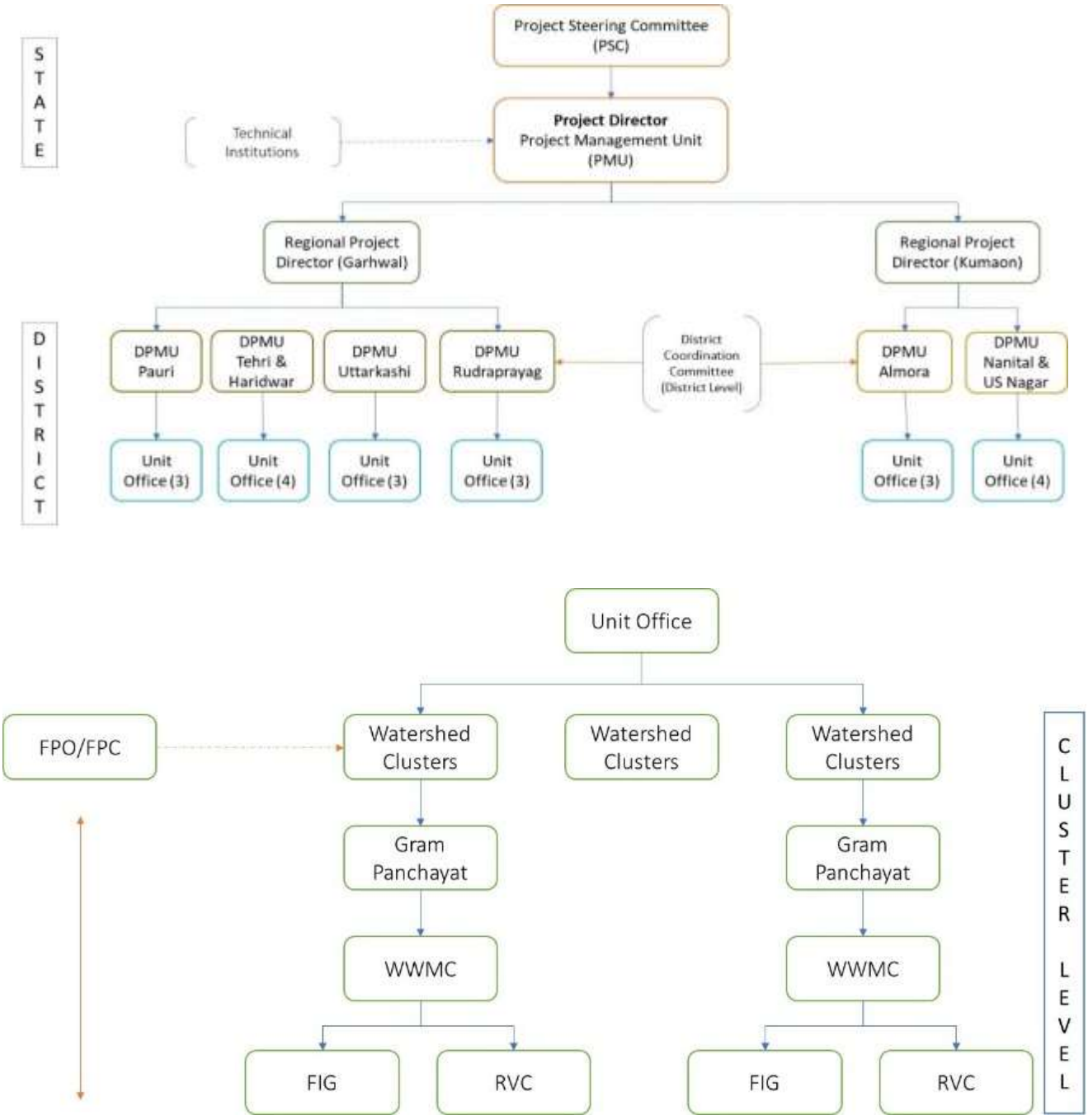
5. **District Project Management Units (DPMU)**: Each project district will have a 'District Project Management Units (DPMU)', headed by the Deputy Director (Dy. Dir). Each DPMU will be well-staffed with experts. The DPMUs will have officials from different disciplines, like engineering, agriculture, horticulture, animal husbandry, and forestry etc. For effective execution, each DPMU will also have domain experts in the areas of M&E, agribusiness, Geo-hydrology, MIS etc., apart from support staff.

(iv) Cluster Level:

6. **Project Unit Office**: Each DPMU will have three to four "Field Implementation Units/Unit Offices" to execute the project at the GP and watershed clusters. Each Unit Office will deal with a cluster of about 20-25 GPs covering identified and delineated watersheds and spring sheds. The number of micro watersheds per cluster may vary depending on the treatment area. Each unit office will have a "Multi-Disciplinary Team" comprising officials from agriculture, horticulture, forestry etc., headed by the "Unit Officer." To execute the project, each unit office will also have domain experts in engineering, agribusiness, MIS etc.

7. **GP Level**: The unit offices will implement project framed activities with the active support and participation of Water and Watershed Management Committee (WWMC) of the Gram Panchayat and existing other community level organizations, like Farmer Interest Group (FIG) and Revenue Village Committee (RVC). Based on the project needs, the project may involve other community organizations existing in the project area.

The organogram of the institution structure



Financial Management

8. **Overall FM capacity:** WMD has implemented two World Bank-financed projects and has adequate FM capacity. The FM risk rating is Moderate.

9. **Budgeting and fund flow:** A dedicated project budget account head has been created and allocation has been

received for project preparation and implementation. Every year the PMU shall collate the budget requirement of the project and submit it to the GoUK for inclusion in the budget as per the budget calendar. Once the annual budget is approved, the funds will be passed on to the PMU through this head. The PMU will open a Single Nodal Account (SNA). Once the budget is approved, the PMU can draw funds from the budget and transfer them to the SNA bank account. DPMUs will have bank accounts linked to SNA bank account. DPMUs will send the request for funds to the PMU along with a work plan based on which the PMU shall provide limits of the SNA bank account. DPMUs can use the linked bank accounts for payment, and it will be automatically adjusted to the SNA bank account. The SNA bank account will provide for the receipt and payment of project funds.

10. **Accounting system**: The PMU will provide funds to DPMUs and account, monitor, and report for the project. Accounting for expenditure will be maintained in manual books at the offices as well as in the MIS. Cash books and other relevant documents will be maintained at the Head office, Districts, and GP levels from which project expenditure will be collated. GP accounts will be consolidated at DPMU level and DPMU accounts will be consolidated at PMU level. The project's MIS system will also track the expenditure and provide reports. DPMUs will conduct reconciliation every month with payments done.

11. **Report-based disbursement:** The State will advance funds for the project and disbursements will be based on IUFRs. These reports will be submitted quarterly within 45 days from the end of the quarter. The IUFR format has been agreed during negotiations.

12. **External audit:** The annual audit of the project financial statements will be carried out by the State Office of the Comptroller and Auditor General as per terms of reference agreed with the Bank. Every year, an audit report will be submitted to the Bank within nine months from the end of the FY. The annual audit report will be disclosed on the PMU website.

13. **Internal audit and GP audit:** The internal audit will be carried out through a chartered accountants (CA) firm. The auditors will be appointed based on selection criteria and terms of reference agreed with the Bank. GP audits for project funds will be done by CA firms appointed by PMU.

14. **FM institutional arrangements & staffing:** The PMU accounts section will be headed by a Chief Finance Officer from the Finance Department and supported by government staff and a CA. The DPMU will be supported by an assistant accountant from government service. Currently staffing is adequate and in future if required staff will be hired from the market.

15. **Disbursement arrangements:** Eligible expenditures will be reimbursed at 80 percent.

Implementation Support Plan

16. The World Bank's implementation support plan primarily involves (i) bi-annual Implementation Support Missions (ISMs); (ii) short thematic technical reviews as needed; (iii) desk reviews; (iv) a Midterm Review, and, if necessary; (v) short missions for fiduciary and safeguard aspects. ISM activities encompass (i) field visits to priority sites; (ii) meetings with various stakeholders; and (iii) comprehensive review and feedback on project progress and monitoring and evaluation reports. The World Bank's technical support team will comprise a diverse mix of skills and expertise drawn from various World Bank Global Practices and IFC as needed to meet the project's requirements.

17. **Fiduciary suppor**t includes regular interactions, ISMs, and thematic reviews, if necessary. ISMs will assess the project's financial management systems, internal controls, and actions taken to address any issues. Additionally, the World Bank's Environment and Social Safeguard team will ensure compliance with the Bank's operational policies and procedures applicable to the project. Safeguard support will be delivered through regular interactions, ISMs, and thematic reviews as needed.