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Report No: PAD2409

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF
US$145.0 MILLION

TO

INDIA

FOR A

WEST BENGAL MAJOR IRRIGATION AND FLOOD MANAGEMENT PROJECT
November 12, 2019

Water Global Practice
South Asia Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective October 31, 2019)

Currency Unit =	Indian Rupees
INR70.985 =	US$1

FISCAL YEAR
April 1 – March 31

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ABBREVIATIONS AND ACRONYMS

AGWB	Accountant General, West Bengal
API	Application Programming Interfaces
ATMA	Agricultural Technology Management Agency
BRGF	Backward Regions Grant Fund
BCM	Billion Cubic Meter
CPF	Country Partnership Framework
DDO	Drawing and Disbursing Officer
DPIU	District Project Implementation Unit
DPMU	District Project Management Unit
DVC	Damodar Valley Corporation
DVCA	Damodar Valley Command Area
ED	Environment Department
EFA	Economic and Financial Analysis
ERR	Economic Rate of Return
ESIA	Environmental and Social Impact Assessment
ESMF	Environment and Social Management Framework
ESMP	Environmental and Social Management Plan
ET	Evapo-transpiration
FS	Feasibility Study
GAP	Gender Action Plan
GDF	Gender Development Framework
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GOI	Government of India
GOJH	Government of Jharkhand
GOWB	Government of West Bengal
GRM	Grievance Redressal Mechanism
GRS	Grievance Redress Service
GSDP	Gross State Domestic Product
HAM	Hectare-meter (10,000 m^3)
I&D	Irrigation and Drainage
ICT	Information and Communication Technology
IDCC	Inter-departmental District Coordination Committee
IOT	Internet of Things
IPDP	Indigenous Peoples Development Plan
IPM	Integrated Pest Management
ISP	Irrigation Service Provider
IWD	Irrigation and Waterways Department
KPI	Key Performance Indicator
LBMC	Left Bank Main Canal
M&E	Monitoring and Evaluation
MIS	Management Information System
MPR	Monthly Progress Reports
NCB	National Competitive Bidding
NGO	Non-governmental Organization
NHP	National Hydrology Project
O&M	Operations and Maintenance
PD	Project Director
PDO	Project Development Objective
PIU	Project Implementation Unit
PIM	Project Implementation Manual
PMC	Project Management Consultant
PMKSY	Pradhan Mantri Krishi Sinchai Yojana
PPSD	Project Procurement Strategy for Development
RAP	Resettlement Action Plan
RBMC	Right Bank Main Canal
RFQ	Request for Quotation
RRI	River Research Institute
SCADA	Supervisory Control and Data Acquisition
SCD	Systematic Country Diagnostic
SIA	Social Impact Assessment
SLTC	State level Technical Steering Committee
SPMU	State Project Management Unit
ST	Scheduled Tribe
STEP	Systematic Tracking of Exchanges in Procurement
SWID	State Water Investigation Directorate
TMF	Tribal Management Framework
TOR	Terms of Reference
TPMF	Tribal Peoples' Management Framework
TPP	Tribal Peoples' Plan
TSC	Technical Steering Committee
UAV	Unmanned Aerial Vehicle
WBADMI	West Bengal Accelerated Development of Minor Irrigation
WBMIFMP	West Bengal Major Irrigation and Flood Management Project
WBSWDA	West Bengal State Watershed Development Agency
WRIDD	Water Resources Investigation and Development Department
WUA	Water Users' Association

BASIC INFORMATION

Country(ies)	Project Name	
India	West Bengal Major Irrigation and Flood Management Project	
Project ID	**Financing Instrument**	**Environmental Assessment Category**
P162679	Investment Project Financing	B-Partial Assessment

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Disbursement-linked Indicators (DLIs)	[ ] Small State(s)
[ ] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternate Procurement Arrangements (APA)	

Expected Approval Date	Expected Closing Date
10-Dec-2019	30-Nov-2025

Bank/IFC Collaboration

No

Proposed Development Objective(s)

The Project Development Objectives are to improve irrigation service delivery, strengthen flood risk management and improve climate change resilience in the Project area.

Improving irrigation services includes management reforms as pursued under Component A, and infrastructure modernization to reinforce the management improvements under Component B. Strengthening flood risk management is addressed under Component C. These improvements together will help improve the resilience of the Project area to climate change.

Components

Component Name	Cost (US$, millions)
Component A: Irrigation Management	7.40
Component B: Modernization of Irrigation Infrastructure	65.30
Component C: Flood Management	66.10
Component D: Project Management	5.80

Organizations

Borrower:	Republic of India
Implementing Agency:	Irrigation and Waterways Department of West Bengal

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	413.80
Total Financing	413.80
of which IBRD/IDA	145.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	145.00

Non-World Bank Group Financing

Counterpart Funding	123.80
Borrower/Recipient	123.80
Other Sources	145.00
Asian Infrastructure Investment Bank	145.00

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2020	2021	2022	2023	2024	2025	2026
Annual	8.10	10.43	15.52	20.01	40.69	40.24	10.01
Cumulative	8.10	18.53	34.05	54.06	94.75	134.99	145.00

INSTITUTIONAL DATA

Practice Area (Lead)

Water

Contributing Practice Areas

Climate Change and Disaster Screening

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

Gender Tag

Does the project plan to undertake any of the following?	
a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF	Yes
b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment	Yes
c. Include Indicators in results framework to monitor outcomes from actions identified in (b)	Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Moderate
2. Macroeconomic	Low
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Substantial
5. Institutional Capacity for Implementation and Sustainability	Substantial

6. Fiduciary	Substantial
7. Environment and Social	Substantial
8. Stakeholders	Substantial
9. Other	
10. Overall	Substantial

COMPLIANCE

Policy

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

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✓	
Performance Standards for Private Sector Activities OP/BP 4.03		✓
Natural Habitats OP/BP 4.04	✓	
Forests OP/BP 4.36		✓
Pest Management OP 4.09	✓	
Physical Cultural Resources OP/BP 4.11	✓	
Indigenous Peoples OP/BP 4.10	✓	
Involuntary Resettlement OP/BP 4.12	✓	
Safety of Dams OP/BP 4.37	✓	
Projects on International Waterways OP/BP 7.50	✓	
Projects in Disputed Areas OP/BP 7.60		✓

Legal Covenants

Sections and Description

No later than six (6) months after Effective Date, the Borrower shall cause the Damodar Valley Corporation to undertake a study - under the terms of reference satisfactory to the Bank - for developing flood forecasting models in the area downstream of Durgapur barrage on the Damodar river in an integrated manner with the inflow models to the upstream reservoirs in order to improve the reservoir operations and flood management.

Sections and Description

(a) No later than six (6) months after Effective Date, an independent panel of experts shall be appointed with composition and under the terms of reference consistent with the guidelines of Central Water Commission and acceptable to the Bank (Dam Safety Review Panel or DSRP) - for each of the following sets of Project Dam(s): (i) Tilaiya, Konar, Panchet and Maithon dams; (ii) Tenughat dam; and (iii) Durgapur barrage.
(b) Following the appointment of the DSRPs, (i) each DSRP shall perform periodic inspections and safety assessments of its assigned Project Dam(s) and (its) their appurtenances pursuant to the terms of reference; (ii) the Bank shall be informed of the dates of the field visits of the DSRPs to enable the Bank to send an observer to such DSRPs de-briefings; (iii) a copy of each report prepared by the DSRPs shall be promptly provided to the Bank; and thereafter (iv) critical dam safety measures, if any, recommended by DSRPs shall be implemented in a timely manner.

Sections and Description

No later than twelve (12) months after Effective Date, an Emergency Preparedness Plan for each of the Tenughat, Tilaiya, Konar, Panchet and Maithon dams shall be prepared - or as applicable - updated to the required standard, taking into account the recommendations of its relevant DSRP, all in form and substance satisfactory to the Bank.

Sections and Description

No later than twelve (12) months after Effective Date, an Operation and Maintenance Plan, for each of the Tenughat, Tilaiya, Konar, Panchet and Maithon dams, shall be prepared - or as applicable - updated to the required standard, taking into account the recommendations of its relevant DSRP, all in form and substance satisfactory to the Bank and thereafter implement such plan in a manner satisfactory to the Bank.

Conditions

Type	Description
Effectiveness	The Co-financing Agreement has been executed and delivered and all conditions precedent to its effectiveness or to the right of the Borrower to make withdrawals under it (other than the effectiveness of this Agreement) have been fulfilled.
Effectiveness	The Project Implementing Entity has adopted the Project Implementation Manual in the form and substance satisfactory to the Bank.

INDIA
WEST BENGAL MAJOR IRRIGATION AND FLOOD MANAGEMENT PROJECT

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I. STRATEGIC CONTEXT

A. Country Context

1. **While still high by global standards, India's growth rate has decelerated in the past two years.** After peaking at 8.2 percent in FY16/17, economic growth has been lower in FY17/18 (at 7.2 percent) and FY18/19 (at 6.8 percent). The slowdown has deepened in the current fiscal year with growth expected to reach 6.0 percent for FY19/20, assuming that the external environment remains benign. In addition to relatively low levels of private investment over the past several years, the latest data shows a broadening of the slowdown across all categories of aggregate demand. Although the current account deficit widened to 2.1 percent of gross domestic product (GDP) in FY18/19, robust capital inflows during the second half of the year allowed for a build-up of international reserves to US$411.9 billion at the end of the fiscal year (equivalent to 10 months of imports). Going forward, subdued import growth and benign oil prices are expected to contain the current account balance. On the fiscal side, the general government deficit is estimated to have widened to 5.9 percent of GDP in FY18/19. The deficit is expected to fall over time (to 5.6 percent by FY21/22), although it should rise to 6.0 percent in FY19/20 with significant downside risks (owing to tax cuts recently adopted and the impact of slower economic growth on tax proceeds).

2. **Since the 2000s, India has made remarkable progress in reducing absolute poverty.** Between FY11/12 and 2015, poverty declined from 21.6 to an estimated 13.4 percent at the international poverty line (2011 PPP US$1.90 per person per day), continuing the earlier trend of fast poverty reduction. Thanks to robust economic growth, more than 90 million people escaped extreme poverty and improved their living standards during this period. Despite this success, poverty remains widespread. In 2015, 176 million Indians were living in extreme poverty, while 659 million - half the population- were below the higher poverty line commonly used for lower middle-income countries (2011 PPP US$3.20 per person per day). Implementation challenges of indirect tax reforms, stress in the rural economy and a high youth unemployment rate in urban areas, may have moderated the pace of poverty reduction since 2015.

3. **These impressive achievements in poverty reduction notwithstanding, India's agriculture has been on an unsustainable resource-intensive path**. With an annual per capita water availability of close to 1,000 m^3, India is one of the most water stressed countries in the world. According to the latest Systematic Country Diagnostic (SCD)[1], India's land would need to generate four times more GDP to achieve China's GDP, and India's irrigation water would need to produce five times more agricultural GDP to achieve China's level of water productivity[2]. Inefficient resource use also causes negative environmental impacts such as loss of arable land and biodiversity, declining groundwater tables and pollution of water resources. India is also among the countries most vulnerable to the impacts of climate change, which are amplified by its dependence on climate-sensitive sectors for its livelihoods[3]. The

[1] World Bank Group (2018) India: Systematic Country Diagnostic: Realizing the promise of prosperity (Report No. 126284-IN)
[2] Irrigation uses 688 bm^3 in India and agricultural GDP is 17 percent of an approximate US$2 trillion economy while in China irrigation uses 355 bm^3 and agricultural GDP is about 9.7 percent of an approximate US$10 trillion economy
[3] http://web.worldbank.org/archive/website01291/WEB/0__CO-78.HTM

Government estimates that, in the absence of adaptation or policy changes, farm incomes will decline by 12 percent in the coming years[4].

4. **India will need to adopt a growth path that uses water more efficiently** and that increases productivity and generates jobs in rural areas. Incomes in rural areas need to be boosted through higher agriculture growth and generation of more jobs through rural enterprise.

B. Sectoral and Institutional Context

West Bengal

5. **West Bengal has the sixth largest State economy in India**, and produces over six percent of the country's GDP. In the period 2007-2012, the average gross State domestic product (GSDP) growth rate was 6.2 percent[5], one of the lowest rates in India. Almost 70 percent of the population lives in rural areas, and 22.5 and 14.7 percent of the rural and urban populations, respectively, live below the poverty threshold[6]. Agriculture contributes an estimated 20 percent to the GSDP and employs over 55 percent of the workforce. West Bengal is one of the most important food producing States in India, producing nearly 20 percent of the rice and 33 percent of the potato production. Economic growth, poverty reduction and employment creation depend to a large extent on agricultural growth.

6. **Average paddy yields in West Bengal are on par with the national average** in Rabi (3.4 tons/ha) and higher than the national average in Kharif season (2.7 tons/ha)[7]. At over 185 percent, West Bengal has one of the highest cropping intensities of the country, but much of this high-intensity agriculture comes at the expense of inefficient and unproductive resource use, as irrigated paddy dominates the cropping pattern.

7. **West Bengal is relatively rich in water resources** and accounts for 7.5 percent of the country's water resources. The annual average rainfall is around 1,760 mm, of which 76 percent is received in the monsoon months and the rest in the non-monsoon period. The net annual water resource generated from rainfall in West Bengal amounts to 51.0 billion cubic meters (BCM)[8]. The groundwater resources are 34.2 BCM.

8. **Despite abundance, use of water is low**. Over 20 percent of the rain infiltrates through the soil, and as much as 49 percent is returned to the atmosphere through evapo-transpiration[9]. The State has created little storage to carry abundant monsoon rainfall into the water-scarce post-monsoon season, and the potential to create major storage is limited. The State currently uses about 42 percent of the total annual net replenishment of groundwater.

[4] Climate, Climate Change, and Agriculture – Economic survey 2017-18. http://mofapp.nic.in:8080/economicsurvey/pdf/
[5] http://www.esopb.gov.in/Static/PDF/GSDP/Statewise-Data/StateWiseData.pdf
[6] Indiastat
[7] Indiastat
[8] West Bengal Pollution Control Board (WBPCB), 2009
[9] West Bengal Action Plan on Climate Change http://www.moef.nic.in/downloads/public-information/West-Bengal-SAPCC.pdf

9. **The Government of West Bengal (GOWB) has adopted a rational program for promoting the sustainable use of groundwater**. In the first place, the GOWB replaced the flat rate tariff structure on electricity use in irrigation systems with that of consumption-based metering. West Bengal now has one of the highest tariffs in the country. In the second place, the GOWB has improved the accessibility of groundwater pumps for small and marginal farmers through the removal of the permit requirement for electricity connection applications. While these measures make good sense from a poverty reduction and resource efficiency point of view, it should be noted that only 15 percent of the tube wells in the State are electrified, and that the 85 percent diesel pumps are not affected neither by the high tariffs, nor by the permit removal. It should also be noted that a permit is still required for sinking a well.

10. **West Bengal has 37,660 km^2 of flood-prone area** out of a total geographical area of 88,752 km^2. An analysis of the floods that occurred over the last 41 years shows that the State has not faced a severe flood in only five years. The total devastated area exceeded 20,000 km^2 in four years and the flood of medium magnitude (i.e. between 2,000 to 10,000 km^2) occurred on 10 occasions. In view of its geographical location at the tail end of the Ganga Basin the problem of flood management and drainage in the State is acute.

Damodar Valley Command Area

11. **The Damodar Valley Command Area (DVCA) is located downstream of Durgapur on the Damodar river** in the districts of East and West Bardhaman, Howrah, Bankura and Hooghly. The scheme covers 393,964 ha and provides an important source of livelihoods for 2.68 million people. The canals are fed via headworks at Durgapur Barrage. Flow in the Damodar River to Durgapur is regulated by five upstream dams located in the neighboring State of Jharkhand. Irrigation water is supplied from these dams during three seasons: Kharif (25 July to 31 October), Rabi (25 December to 5 February), and Boro (25 January to 30 April).

12. **The DVCA is 60 years old, and in need of modernization**. Key challenges include degradation of infrastructure and inadequate irrigation management, including poor quality of service delivery, inefficient irrigation and absence of a monitoring system. As a result of the degradation of the system, surface water no longer reaches the middle and tail parts of the canal network. Out of the 41 blocks covered by the DVCA irrigation network, no irrigation water is received by 23 blocks in Rabi season, 19 blocks in the Boro season and three blocks even in the Kharif season. While the design discharge at the head of the LBMC and RBMC are 260 m^3/s and 64 m^3/s respectively, the maximum discharges recorded in 2017 were only 212 m^3/s and 57 m^3/s. Of the 1,700 canal regulatory structures, almost half are severely or moderately damaged. Tail end farmers are compelled to abstract groundwater, which increases the costs of cultivation and undermines the sustainability of the scheme.

13. **Groundwater has traditionally been drawn from shallow aquifers** (to about 20 m deep) with centrifugal pumps, but overuse of this source has obliged farmers to increase the number of deeper wells with submersible pumps. Between 2005 and 2017, the number of semi-critical blocks increased from five to 19 (out of a total of 41 blocks)[10]. Out of 40 monitoring wells in 40 different blocks in the

[10] A semi-critical block is a block where the ground water table has on average been declining by over 0.20m per year over a five-year period.

DVCA, 23 wells showed depletion of more than 3m from 2001 to 2016.

14. **As the system continues to degrade and the effects of climate change increasingly affect system performance**, surface water is progressively being confined to the top end of the system, groundwater use in the tail end continues to increase, groundwater levels continue to decline, and the sustainability of the scheme continues to erode.

15. **The Lower Damodar basin area is historically flood-prone**. Some 33.5 thousand hectares of the cropped area and 461,000 people are affected annually on average. The major causes of floods, waterlogging and drainage congestion in the Project area include inadequate utilization of flood storage potential in the five reservoirs in Jharkhand, river bed siltation, unauthorized construction of bunds across channels and rivers to augment the water availability during Boro ('Boro bunds') and the tidal effect at the outfall of the channels and rivers.

16. **The DVCA is facing financial viability challenges**. The GOWB recognizes that the Project beneficiaries are generally poor and sees irrigation as one of its key public investments to reduce poverty. The GOWB realizes that recovery of Operation and Maintenance (O&M) costs from farmers is important to promote an efficient use of natural and public resources but has adopted the policy that irrigation investment and O&M costs should be covered by the public budget, and that recovery of O&M costs from famers is not a short-term priority.

17. **While the allocation of public funds for O&M has been relatively stable** over the past years, allocation and expenditures lack transparency and are not disclosed. In addition, they cannot be tracked on a scheme basis and do not allow for comparison and benchmarking across the State. Budgets continue to be allocated based on standard per hectare norms and previous years' allocations, and not on a rational assessment of maintenance needs and systematic asset management.

18. **Climate change is expected to amplify the challenges that the system is facing**. In response to increasing unpredictability of rainfall that is associated with climate change, farmers will rely more on groundwater in future, especially during the Kharif season. Rising temperatures will increase crop water requirements and will increase the premium on reliable supplies and the quality of service delivery. Higher climate variability and higher temperatures will increase the demand for groundwater and further jeopardize the sustainability of the system. More extreme weather events will increase flooding, and sea level rise will impede the timely drainage of these floods and will increase sedimentation. Intrusion of saline water will force farmers to increase water withdrawal to flush out the salinity, while making groundwater less suitable for irrigation. In the longer run, more extreme events and higher rates of upstream erosion and downstream sedimentation will also have an impact on the storage capacity of the upstream dams and will reduce their capacity to buffer these extreme events.

19. **The Durgapur barrage and irrigation and flood management in the DVCA are managed by the Irrigation and Waterways Department (IWD) of the GOWB**. The operation, maintenance and management of water distribution are managed by engineers from block level to sub divisional and district levels. IWD supplies water up to the level of field outlets ("chaks"). At chak level, distribution, management and maintenance are done by the beneficiaries that are organized in Chak Committees. Distribution infrastructure is generally absent within chaks and water flows from plot-to-plot.

20. **An institutional analysis of IWD was conducted during Project preparation**. The analysis revealed the following institutional weaknesses in the management of the scheme:

- Water data monitoring is virtually absent. Those data that are being collected are based on hand-written records and visual inspection of gauges. No remote control or automation of hydraulic infrastructure is taking place.
- Gaps exist in the monitoring and management of groundwater. Specifically, while groundwater levels are being monitored by the State Water Investigation directorate (SWID), no monitoring of the magnitude of groundwater withdrawal is undertaken.
- Severe shortages in staffing is a regular feature in the DVCA. IWD is recruiting contractual staff on a seasonal basis to cover the shortfall.
- A Public Expenditure Review that was conducted during Project preparation concluded that O&M is severely underfunded. No systematic process is in place for the planning and prioritization of maintenance works or for the management of hydraulic assets.
- Existing arrangements for gauging user satisfaction with the quality of irrigation service delivery and for grievances redress are weak.
- Lack of transparency in the management of the system, in the allocation of water and in the implementation of maintenance works. IWD does not prepare an annual Citizen Report Card and does not have irrigation service delivery standards.
- Little stakeholder participation in the management of the system and the allocation of water. Water allocation is top-down and there is little opportunity for demand-based water delivery.

C. Higher Level Objective to which the Project Contributes

21. **West Bengal's economic growth, poverty reduction and employment creation are influenced by the performance of the agriculture sector**. Agricultural growth must come from further yield increases and diversification towards crops that produce more value. Achieving these objectives is not possible without irrigation, as higher value agriculture requires more reliable and higher quality of irrigation service delivery. Improving the quality of irrigation service delivery therefore directly contributes to poverty reduction, economic growth and employment creation. It helps create shared prosperity and the assets for the bottom 40 percent of the population, many of whom are part of the target beneficiaries in the Project area.

22. **West Bengal has invested significant public resources in developing irrigation infrastructure**. The State boasts 2.98 million ha of small-, medium- and large-scale irrigation, among the top five States in India in terms of irrigated area per person and per hectare of cropped land. Many of these assets perform below potential. In addition, the public sector is responsible for O&M, which comes at a cost to West Bengal tax payers. Improving the performance of irrigated agriculture and adopting a more rational management of hydraulic assets will increase the return on public investments in rural development and will reduce the annual burden on the public budget.

23. **The proposed Project contributes to the World Bank Group Country Partnership Framework (CPF) FY18-22** that was discussed by the Board on September 20, 2018 (Report No. 126667-IN), including support for more resource-efficient, inclusive and diversified growth in the rural sector. The Project aims to do so by promoting performance-based irrigation service delivery through Irrigation

Service Providers (ISPs). A more client-oriented irrigation service delivery aims to strengthen the inclusiveness of irrigation.

24. **The proposed Project will also contribute to the following "How's"** that the CPF identifies:

(i) Strengthening public sector institutions: the Project will strengthen public sector capacities and introduce and benchmark service delivery standards, client feedback, grievances redress and citizen report cards, and rational asset management.

(ii) Leveraging private finance: the Project will enable the government to access private finance in the medium-term by outsourcing O&M to ISPs. Involving the private sector in public service delivery is expected to make irrigation a more attractive proposition for capital investments from the private sector.

(iii) Lighthouse India: identifying cost-effective measures to improve irrigation performance and close the gap between irrigation potential created (IPC) and irrigation potential utilized (IPU) is of core interest to all Indian States. The proposed Project will reach out to the central Government and other Indian States to disseminate the results of the Project.

(iv) Cross-cutting: the Project aims to improve the sustainability of groundwater use and help the DVCA become more climate resilient and more responsive to floods and droughts.

25. **The Project will contribute to long-term water sector reforms in West Bengal**. Many irrigation schemes, including the DVCA, operate below their potential at a low-level equilibrium and are trapped in a vicious cycle of low-cost recovery and poor quality of service delivery. O&M in West Bengal is financed through the public budget. The annual budget allocation is not based on a rational assessment of irrigation service needs, and is systematically insufficient for adequate O&M. In addition, the provision of irrigation as a free service provides an incentive to water users to consider irrigation water as a "favor" and discourages them from demanding better-quality services. Not charging volumetric fees for irrigation services also undermines efforts to use water more efficiently.

26. **Global experience suggests** that turning a vicious performance cycle into a virtuous cycle requires improving the quality of service delivery before increasing service fees. Improving irrigation service performance and ensuring systematic reporting of performance data to customers improves transparency in the delivery of services and introduces competition and accountability, as well as a willingness to pay for these services. While these reforms will not be fully achieved in the course of the proposed Project, the foundations will be laid for long-term improvements in irrigation service delivery.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

27. The **Project Development Objectives** are to improve irrigation service delivery, strengthen flood risk management and improve climate change resilience in the Project area.

28. Improving irrigation services includes *management reforms* as pursued under Component A, and *infrastructure modernization* to reinforce the management improvements under Component B. *Strengthening flood risk management* is addressed under Component C. These improvements together will help improve the resilience of the Project area to climate change.

B. Project Beneficiaries

29. **The main Project beneficiaries** are farmer households, both male and female-headed, which will directly benefit from more reliable and efficient irrigation water supply and distribution, and from reduced flooding. This includes the 2.68 million people that will directly or indirectly benefit from the Project. Another group of beneficiaries include the State and district irrigation management agencies.

C. PDO-Level Results Indicators

30. **The core outcomes of the Project** will be measured through the following indicators:

To improve irrigation service delivery

#1 – Area provided with improved irrigation or drainage services (Corporate Results Indicator)
#2 – Compliance with agreed water delivery schedule of the ISPs' contract
#3 – Compliance with irrigation water supply from Main Canal to Distributary Canal

To strengthen flood risk management

#4 – Rate of reduced flood depth at the monitoring points compared with equivalent flood depth from 2008-2017

To improve climate change resilience

#5 – Arrest in the rate of decline of groundwater levels in semi-critical blocks in each defined groundwater management rea
#6– No deterioration of groundwater level trends in safe blocks in each defined groundwater management area.

III. PROJECT DESCRIPTION

31. To address unsustainable groundwater use in the Project area, **the Project aims to improve irrigation service delivery in the DVCA** by (i) introducing improvements in irrigation management and reforming institutions, and (ii) investing in canal modernization.

32. **Declining groundwater levels are the result of increasing withdrawals** that in turn are the result of (i) infrastructure degradation and (ii) inadequate management of surface water supplies. Addressing these key challenges and improving the performance of the DVCA scheme requires investments in canal modernization to improve the efficiency and the conveyance capacity to ensure that the canal system is capable of delivering the required supplies and the hydraulic infrastructure supports improved quality of service delivery. This will include, in a number of pilot areas, installing subsurface pressurized pipe micro-irrigation systems.

33. **Addressing the challenges also requires improving the management of surface water supplies** to ensure that IWD has the capacities and incentives to deliver reliable irrigation services. The Project will improve the quality of irrigation service delivery through the introduction of performance-based

management and benchmarking, and recruitment on a contractual basis of ISPs that will become responsible for the management of distributary canals.

Box 1: Groundwater recharge versus surface water efficiency

In many irrigation schemes, more efficient use of surface water has sometimes led to a reduced availability of runoff water, and a reduction in the recharge of groundwater, as savings from irrigation efficiency are used to expand the irrigated area.

In the DVCA, irrigation inefficiency is mostly a top-end phenomenon. Excess water will runoff into the drains and is returned to the river. Improving irrigation efficiency in those top-end parts will therefore reduce return flows to the river but will not affect water availability in out-of-command areas. In addition, groundwater recharge happens mostly during the Kharif season, when close to 400,000 hectares are flood irrigated over a four months period. Improving irrigation efficiency in Rabi and Boro seasons will therefore have a comparatively small impact on groundwater recharge, while at the same time increasing water availability in tail-end areas.

Not all surface water saved through efficiency improvements will be used to replace groundwater. Some of the savings will in fact be used to expand the areas irrigated by surface water in Rabi and Boro. The net savings to groundwater include (i) the surface water that replaces groundwater during Kharif before the end of the monsoon (late October), and (ii) the groundwater that is restored as a result of the annual rotation of the areas irrigated by surface water in Rabi and Boro seasons over a larger area.

The water balance presented in Annex 3 provides a detailed analysis.

34. **Institutional reforms will help consolidate the investments under the Project**. These include introduction of a modern Management Information System (MIS), benchmarking and evidence-based decision making (e.g., on the choice of the areas irrigated during Rabi and Boro seasons), promoting the conjunctive use of surface- and groundwater, introduction of rational asset management and improving transparency through citizen engagement, grievances redress and information sharing about O&M.

35. **The Project aims to strengthen flood risk management** by promoting a pragmatic flood management approach to moderate the frequency and extent of flooding. Structural measures include investments to ensure that flood flow discharge is more evenly shared between the Mundeswari and Amta Channels, including selected desilting, increasing the conveyance capacity of the Mundeswari, construction and rehabilitation of embankments.

36. **The proposed Project will improve the resilience of the Project area to climate change** by improving the efficiency of surface water use so that it can replace groundwater and improve the sustainability of its use. More sustainable groundwater use will help ensure that water users can continue to use groundwater in future to off-set irrigation management and weather volatility.

Alternatives Considered

37. **The following alternatives** have been considered.

- **Rehabilitation versus modernization**: the GOWB recognizes that the circumstances that defined the original system no longer prevail. It has therefore requested the Bank to finance the

modernization of the system, rather than restoring the system to what it was 60 years ago. This would include in particular (i) optimizing the conjunctive use of surface- and groundwater across the Project area and throughout the year, (ii) improving the quality of irrigation service delivery, (iii) establishing a modern MIS that allows systematic monitoring and benchmarking of results indicators in the Project area, (iv) improving the hydraulic integrity of the system to facilitate service delivery and promoting modern irrigation technologies that use water more efficiently, and (v) addressing the annual flooding in the downstream part of the Project area.

- **Irrigation versus Flood Management**: the GOWB recognizes that irrigation and flood management are intricately linked through the operation of upstream reservoirs. Better management of these reservoirs would improve water availability for irrigation and reduce flooding. To fully capture the benefits of, investments in flood risk management have been included in the Project.
- **Capacity Strengthening versus Incentivizing**: the GOWB has expressed strong interest in pursuing important reforms, including (i) outsourcing O&M on a performance basis to ISPs; (ii) introducing rational asset management by establishing long- and medium-term planning of maintenance; and (iii) modernizing and strengthening the monitoring and evaluation capacities of IWD. Successful pursuit of reforms requires capacity strengthening, but it also requires putting in place an adequate ecosystem that provides incentives for stakeholders to internalize and adopt the intended changes. The Project will therefore both strengthen capacities and provide incentives to leverage these capacities for improved irrigation service delivery.
- **Comprehensive or strategic investment**. The Feasibility Study (FS) has analyzed two investment scenarios: a comprehensive upgrading of the hydraulic infrastructure, and a more limited and strategic investment that would focus on priority areas for promoting conjunctive use of ground- and surface water in the Project area. The Economic and Financial Analysis (EFA) found that a strategic modernization is economically and financially more attractive. Therefore, the Project will adopt a limited and strategic upgrading of the infrastructure.

Theory of Change

38. **The Project will address the following challenges:**

- **Inadequate irrigation service delivery.** IWD is responsible for the management of large-scale irrigation systems in West Bengal. In the absence of data monitoring, it is difficult to evaluate the performance of IWD against benchmarks and service standards, or to get a sense of the efficiency and effectiveness of the use of its resources, including the reliability, accuracy and equity of water delivery, quality of services, compliance with agreed delivery schedules, etc. The Project will establish a modern MIS and provide incentives for improved management, including outsourcing of O&M to ISPs on a performance basis.
- **Degraded and outmoded infrastructure.** The physical infrastructure is in poor condition due to deferred maintenance and needs modernization. Mere rehabilitation to the state in which the scheme was when it was conceived is inadequate as circumstances have changed dramatically: groundwater now irrigates a cumulative area of over 450,000 hectares (two-thirds of the total cumulative irrigated area during Kharif, Rabi and Boro seasons), and the system has de facto been converted into a conjunctive use system. In addition, the cropping intensity is now 183

percent, among the highest in India. During Project preparation, an assessment was conducted to identify the location and type of hydraulic infrastructure that will best support the Project's objective to improve the quality and transparency of service delivery. The Project will modernize irrigation infrastructure at all levels and will pilot pressurized water supply in selected chaks.

- **Inefficient use of public resources for O&M**. O&M budgets are allocated on the basis of standard per hectare norms and previous years' allocations, and not on a rational assessment of maintenance needs and systematic asset management. The Project will also introduce modern asset management that will allow for the systematic monitoring and rational assessment of maintenance needs and allocation of resources that is based on these needs.
- **Suboptimal flood risk management**. The downstream parts of the Project area lack the infrastructure to protect against recurrent flooding. The Project will invest in measures to reduce flooding, including selected desilting and repair and improvement of embankments.
- **Limited capacity to adapt to climate change**. Current water use is inefficient and is leading to unsustainable groundwater use, undermining the farmers' capacity to adapt to climate change. The Project will improve efficient use of surface water and improve the long-term sustainability of groundwater use, thereby improving farmers' capacity to respond to water variability.

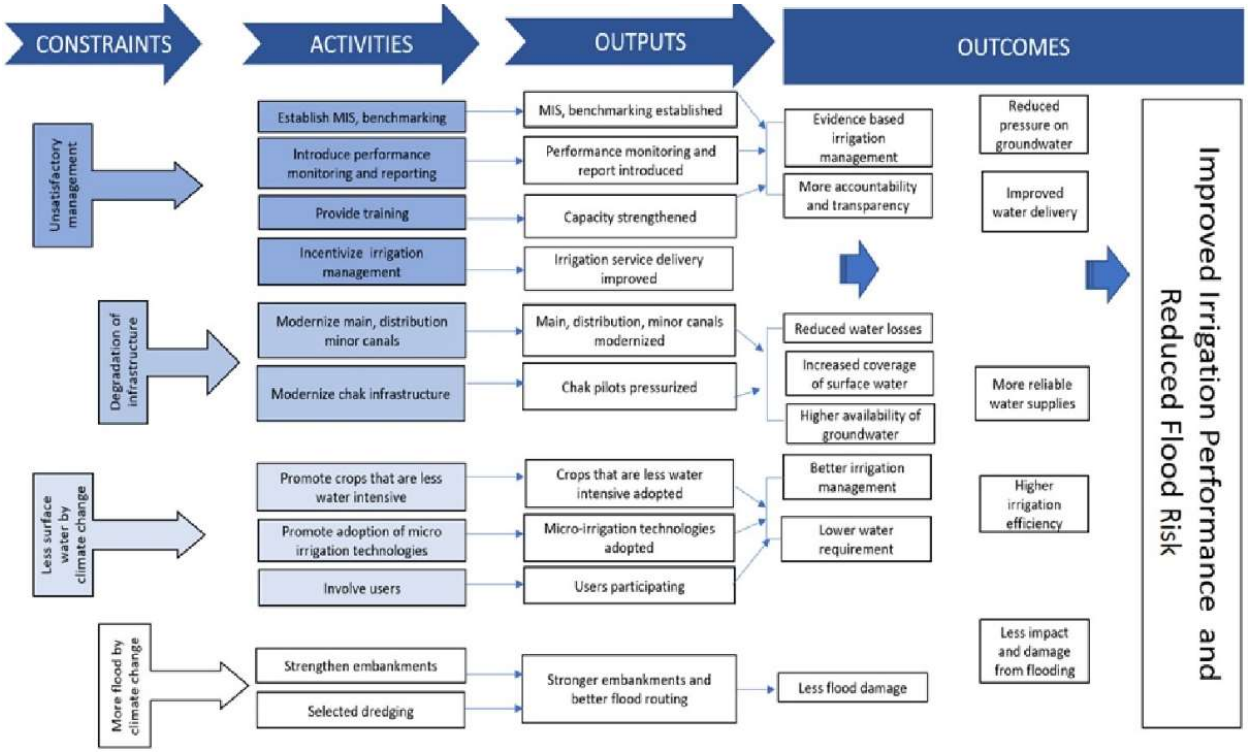


Fig. 1: Theory of Change

A. Project Components

39. **The Project aims to achieve the PDO through the following Components**: (i) *improved management of irrigation* to improve service delivery, and strengthen and reform institutions and

improve monitoring and evaluation (M&E), (ii) strategic investments in the *modernization of irrigation infrastructure* to upgrade hydraulic assets at main, branch, distributary and minor level, and (iii) *strengthen flood risk management* that will invest in flood risk reduction in the downstream parts of the command area. Improving climate change resilience is integrated within each of these components. The Component Project Management will finance Project implementation in accordance with the Project Implementation Manual (PIM).

Component A: Irrigation Management (US$21.1 million, of which US$7.4 million IBRD, US$7.4 million AIIB and US$6.3 million GOWB)

40. This component will improve the management of the DVCA irrigation scheme. The component includes the following sub-Components: (i) establishment of a robust MIS, performance monitoring and SCADA, (ii) improving service delivery, (iii) aquifer management, (iv) capacity strengthening of IWD, and (v) associated investments in agricultural activities. Intermediate indicators include three modules of MIS fully functional, grievances registered related to delivery of Project benefits that are resolved, asset management plan prepared, levels of sustainable groundwater withdrawals defined by the groundwater study, and percentage women engineers recruited by IWD.

Sub-Component A.1: Establishment of MIS, Performance Monitoring and SCADA

41. **The Project will establish a robust MIS** including installing associated data capture, transmission and management infrastructure, as well as SCADA and a control room to improve monitoring of hydraulic data in the Project area.

Sub-Component A.2: Improving Service Delivery

42. **The Project will improve the quality of service delivery** through (i) introduction of performance-based operation of selected irrigation canals – through ISPs – at distributary canal level and below, and promote, through the ISPs, installation of pressurized micro-irrigation system at selected Chak, (ii) capacity building and technical assistance to individual service providers that provide irrigation services to farmers and farmer groups, (iii) introduction of rational asset management including establishment of a geo-tagged asset database, budget planning, development of maintenance standards, and reporting, and (iv) strengthening of accountability and transparency in irrigation services delivery through *inter alia* introducing a benchmarking system of irrigation performance, deploying client feedback tools (such as user surveys, third party complaint system and citizen report cards), improving irrigation services' staff management (through such means as clearer job descriptions, performance evaluation and training) and introducing service level standards.

Sub-Component A.3: Aquifer Management

43. **The Project will establish a groundwater monitoring system** and develop a groundwater knowledge base (by carrying out studies), and prepare and implement an action plan to identify opportunities for groundwater recharge and define levels for sustainable groundwater withdrawal.

Box 2: Incentivizing ISPs

The Project will incentivize irrigation performance through performance-linked payments in the Contract of ISPs. The KPI will include the level of compliance with the water delivery schedules in terms of adequacy, reliability and equity. They will be paid per hectare irrigated within a certain percentage compliance margin of the KPI. KPI and payment per hectare will incentivize the ISPs to encourage use of water as efficiently as possible while meeting minimum irrigation service quality standards.

Increasing efficiency is associated with a wide array of measures, including reducing non-beneficial ET (e.g., by enforcing water allocation rules across chak outlets), reducing operational losses, laser levelling of land, installing micro-irrigation technologies, and switching to crops that use less water. While the ISP will be contractually incentivized to use water more efficiently through any of these measures, global best practice suggests that, in order to fully achieve the intended benefits, willing ISPs also need to be encouraged by signing service delivery agreements (SLA) as part of the Contract, which will help in dissemination of micro-irrigation technologies. ISPs will also provide services to micro irrigation suppliers and farmers to prepare proposals for obtaining subsidy from the GOI's Pradhan Mantri Krishi Sinchai Yojana (PMKSY) scheme. The number of irrigation suppliers that obtain a subsidy from the PMKSY scheme for the installation of micro-irrigation will also be linked to payment to ISPs.

During the 2017/18 Rabi season, IWD implemented a pilot that outsourced O&M to an ISP. The Contractor was successful in improving efficiency and expanding the irrigated area. Based on this pilot, and on preliminary consultations by the Transaction Advisor with several potential candidates during Project preparation, qualified and interested ISPs have been identified. The Project recognizes that ISPs will need significant training to fully understand and be empowered to capture all potential ways in which efficiency and service delivery can be improved. The pool of ISPs that is maintained by IWD for outsourcing O&M works includes over 400 firms. These firms would be the prime target candidates to serve as ISPs and have been consulted extensively during Project preparation. This assessment is also based on the fact that implementation of the contracts is not technically complicated, and that the feedback from potential ISPs will be used for improving bidding parameters before and during the bidding process. The bidding opportunities will however be advertised and other qualified ISPs could also participate in bidding process.

Sub-Component A.4: Capacity Strengthening of IWD

44. **The Project will strengthen the capacity** of IWD staff and ISPs to improve the quality of service delivery including supporting the transformation of the River Research Institute (RRI) into a university-affiliated center of excellence and assisting IWD prepare separate financial reports of the accounts of different irrigation schemes in West Bengal.

Sub-Component A.5: Associated Investments

45. **The Project will carry-out associated investment in agricultural activities** including: (i) diversified cropping (including fruits and vegetables); (ii) water conservation demonstration, including adoption of less water intensive crops; (iii) pressurized micro-irrigation promotion; (iv) capacity strengthening of farmers and farmer producers' organizations; (v) construction of pack houses and support for value chains; and (vi) promotion of pisciculture.

Component B: Modernization of Irrigation Infrastructure (US$186.5 million, of which US$65.3 million IBRD, US$65.3 million AIIB and US$55.9 million GOWB)

46. This component will invest in the modernization of irrigation infrastructure at **main, branch, distributary and minor** level. The component includes the following sub-Components: (i) Main and Branch Canal Modernization, and (ii) Distributary and Minor Canal Modernization. Intermediate indicators include the area provided with new/improved irrigation or drainage services, length of main canals rehabilitated, and the number of pressurized pilots that have been established.

Sub-Component B.1: Main and Branch Canal Modernization

47. The Project will **modernize and upgrade the Right and Left Bank Main Canals (RBMC and LBMC) and Branch Canals**.

Sub-Component B.2: Distributary and Minor Canal Modernization

48. The Project will **modernize and upgrade Distributary Canals, Minor Canals and Sub-Minor Canals**.

Component C: Flood Management (US$188.7 million, of which US$66.1 million IBRD, US$66.1 million AIIB and US$56.5 million GOWB)

49. **The Project will carry out structural measures to reduce flooding in the Project area** including investments to ensure that flood flow discharge is more evenly shared between the Mundeswari and Amta channels, construction and rehabilitation of embankments, construction of fall board shutters, selected desilting, increasing of conveyance capacity of the Mundeswari channel, small improvements and modifications of the channels, construction of groynes, and improving several sluice gates and implementation of critical dam safety measures recommended by Dam Safety Review Panel for Durgapur barrage.

Component D: Project Management (US$16.7 million, of which US$5.8 million IBRD, US$5.8 million AIIB and US$5.1 million GOWB)

50. **The Project will support overall capacity of IWD and SPMU** to coordinate, manage and monitor the implementation of the Project through carrying out of financial management, procurement, environmental and social safeguards management and communication, monitoring and evaluation of the Project as well as recruitment of consultants to support implementation of the Project.

B. Project Cost and Financing (million US$)

Project Components	Project cost	IBRD	AIIB	GOWB
Component A	21.1	7.4	7.4	6.3
Component B	186.5	65.3	65.3	55.9
Component C	188.7	66.1	66.1	56.5
Component D	16.7	5.8	5.8	5.1
Total Costs				
Total Project Costs	413.0	144.6	144.6	123.8
Front End Fees	0.8	0.4	0.4	0.0
Total Financing Required	413.8	145.0	145.0	123.8

C. Lessons Learned and Reflected in the Project Design

51. **The Project design has taken advantage of global experience**, as well as from some of the lessons learned from the implementation of the ongoing West Bengal Accelerated Development of Minor Irrigation Project (P105311). These include:

- A more balanced approach between “last mile” and “first mile” service delivery needs to be adopted to improve the overall viability of irrigation. Global experience suggests that farmer-led organizations continue to face significant challenges, and a recognition is emerging that an exclusive reliance of these organizations undermines the performance of irrigation. At the same time, the effectiveness of farmer-led organizations is significantly compromised if irrigation services to these organizations are unreliable. Merely strengthening the capacities of Chak Committees will not be adequate to improve irrigation performance and the Project will therefore improve the quality of irrigation services to these Committees.
- Incentives need to be provided to improve irrigation efficiency to offset the fact that the benefits of investments in efficiency improvements often accrue to others. Farmers do not have such incentive and are therefore unwilling to improve efficiency. By paying ISPs on a per hectare basis for operating and maintaining irrigation canals, the Project will provide an incentive to these ISPs to spread the water more equitably across the DVCA.
- For sustainability, it is important that O&M expenses are paid for. In practice, this is often translated into full O&M cost recovery from farmers. However, coverage of O&M fees from the public budget is a legitimate way of funding maintenance, provided adequate resources are allocated for satisfactory O&M. By outsourcing O&M, the Project will help make sure that the real costs of O&M are paid for.
- Construction supervision and Project management need to be taken seriously and require allocation of adequate resources to recruit highly qualified specialized construction supervision consultant services that can add value to the SPMU. The Project will outsource construction supervision to a highly qualified PMC.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

52. **IWD is responsible for Project implementation**. It has established an SPMU headed by a Project Director (PD) in the rank of Chief Engineer, and that is supported by two additional PDs at the rank of Superintending Engineer, four deputy PDs at the rank of Executive Engineer, Accounts Officials and other support staff. IWD will be responsible for procurement of all works and non-consultancy services The SPMU will be overall responsible for procurement, contract administration and payment for all consultancy services, irrespective of the value. All the implementing Departments (including Agriculture, Agri-Marketing, Food Processing Industries and Horticulture, Fisheries, and Water Resources Investigation and Development) will be represented in the SPMU by designated Nodal Officers. The PD, SPMU will exercise overall control and be responsible for all Project activities, including those of other Departments.

53. **Two District Project Management Units (DPMUs) have been established**, one in Purba Bardhaman District for implementation of the works of District Project Implementation Units (DPIUs) of Purba Bardhaman and Bankura and another in Howrah/Kolkata District for implementation of the works of DPIUs of Hooghly and Howrah. These DPMUs will also comprise Heads of DPIUs of other concerned implementing Departments, e.g. Agriculture, Agri-Marketing, Food Processing Industries and Horticulture, Fisheries and WRID to ensure inter-departmental coordination at District Level. The DPMUs headed by the additional PDs in the rank of Superintending Engineer will be responsible for procurement of works and non-consultancy services for value not exceeding US$0.28 million. Based on the financial delegation of powers DPIUs will make payment for all civil works contracts entered into by the PMU.

54. **There are four dedicated DPIUs** headed by Deputy PDs in the rank of Executive Engineer, located in the districts of Purba Bardhaman (including Paschim Bardhaman), Bankura, Hooghly and Howrah for execution of Project activities by contract administration and making payment for all works and non-consultancy services irrespective of the value and also all operating costs for running of their own offices. This DPIUs would be responsible for procurement of activities up to US$0.06 million.

55. **Procurement by other implementing Departments will not exceed the threshold of $100,000.** In each case other than WRIDD, the DPMUs of the IWD will be responsible for procurement. In case of WRIDD, the concerned DPIUs of that Department, already conversant with World Bank Procurement norms, will do the procurement to meet their own needs. Funds received by IWD from the State Finance Department will be sub-allotted to the PD, SPMU who will transfer the fund to the identified DPIUs or DPMUs, including identified DPIUs of selected Departments, with an intimation to the parent Departments.

56. **At State level, a Technical Steering Committee (TSC) headed by the Chief Secretary has been established** that consists of the Heads of all concerned Departments. The SLTSC will review broad progress in preparing and implementing the Project, coordinate between Departments and provide guidance on policy matters. The Additional Chief Secretary from IWD will function as Member-Secretary.

57. **The SPMU will recruit specialized consultants' services for construction supervision, Project management support (including procurement) and M&E**. All consultants will report to the Project Director who retains overall responsibility for Project implementation. Fig. 2 presents the implementation arrangements.

B. Results Monitoring and Evaluation

58. **The SPMU will be responsible for overall coordination of Project monitoring**. A consultant will be recruited by the SPMU that will be responsible for M&E, including monitoring of Project progress, Project impact, and achievement of the PDO. The M&E consultant will set up a monitoring system for the Project area that can be accessed on-line, collect data and undertake regular reporting. The monitoring system will be based on the agreed Project outcome indicators and annual performance targets presented in the Results Framework.

59. **The M&E consultant will also serve as monitor of the performance of the ISPs** and the achievement of their contractual KPIs, as well as of the compliance with the bulk water contract between the IWD and the ISPs. To that end, the M&E consultant will use satellite-based verification methodologies as much as possible to ensure transparency and accuracy (e.g., actual ET to monitor irrigation supplies).

60. **The M&E consultant will also monitor Project compliance with social and environmental safeguards,** monitor implementation of the overall Environmental and Social Management Plan (ESMP) and Resettlement Action Plan (RAP) and of specific sub-Project ESMPs as well as impact assessment and supervision of their implementation. The consultant will also help reinforce overall transparency and governance during Project implementation. A baseline survey will be conducted before Project effectiveness and additional surveys are scheduled to be held at mid-term and Project completion. The SPMU will submit to IWD and the Bank a semi-annual performance review.

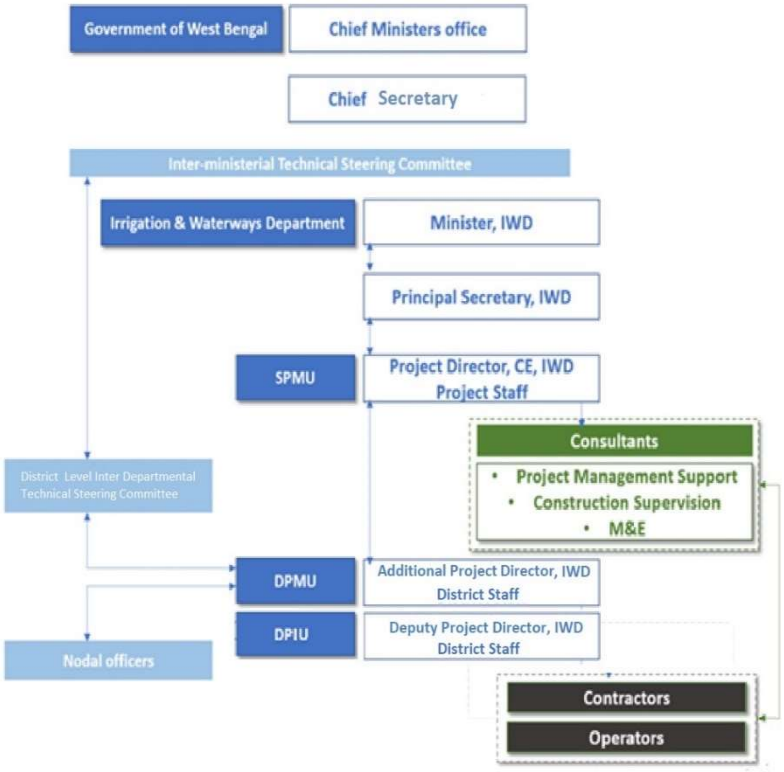
61. **Progress will also be monitored through regular implementation support missions** conducted by the Bank and the GOWB. M&E findings will provide feedback during these missions, and progress reports will be prepared immediately preceding the implementation support missions. A mid-term review of the Project will be undertaken. The final Beneficiary Implementation Completion Report (ICR) will be submitted to the Bank three months prior to the Project's closing date. A separate ICR will be prepared by the Bank no later than six months after the Project's closing date.

C. Sustainability

62. **Institutional Sustainability**: the Project supports transformation towards sustainable irrigation service delivery by addressing three fundamental areas of attention, i.e.: accountability, transparency and financial sustainability as presented in the theory of change. These will be addressed through improved information, accountability and transparency in the management of service delivery through improved management information, the introduction of service standards and asset management.

63. **Technical Sustainability**: the infrastructure will be designed to address the present challenges of irrigation service provision related to staffing levels, skills and costs. An irrigation assessment has identified the type and location of the hydraulic infrastructure that is most appropriate to promote management reforms and best suited to improve irrigation service delivery. More cost-effective technologies for performance monitoring will be introduced. Training in the use and management of these new technologies will be provided. Finally, with the introduction of asset management systems, the functioning and condition of the system will be continuously monitored.

Fig. 2: Implementation Arrangements



64. **Financial sustainability**. Global experience suggests that attempts to recover irrigation service fees from users must start with a significant improvement of the quality of these services, and with an increased capacity to pay. The Project will continue the dependence of irrigation service funding on the public budget but will do so within a broader narrative of ensuring adequate funding for services while improving service delivery, transparency and accountability by outsourcing on a performance basis service delivery to ISPs. Improved quality of irrigation services will help improve farmer incomes. It is on that basis that the Project will contribute in the medium-term to financial sustainability.

D. Role of Partners

65. **The Project will be jointly co-financed by the GOWB, the Asian Infrastructure Investment Bank (AIIB) and the World Bank**. Each party jointly finances the same contracts under the Project in agreed proportions. World Bank Regulations for IPF Borrowers July 2016, Revised November 2017 and August 2018 and Standard Bid documents for procurement, World Bank financial management, disbursement and safeguard policies will be followed. Progress implementation review missions will be conducted jointly, as will the mid-term review and Project evaluation.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

66. **The overall risk rating for the Project is considered Substantial**. The main risks include:

- The *Sector Strategies and Policies* risk is considered Substantial. The GOWB has attempted to prepare but never adopted a State Water Policy. Long-term strategic guidance on irrigation sector performance is important to properly frame the Project within a broader context and longer-term objectives. The Project will continue the dialogue with the GOWB on this broader sector narrative during Project implementation, and will leverage global experience to improve irrigation performance and strengthen the financial viability and sustainability.
- The *Technical Design* risk is considered Substantial. Introducing performance-based irrigation management is an innovation. The Project design is based on incentivizing behavior change by (i) measuring and benchmarking irrigation performance, and (ii) recruiting ISPs. This will help adopt more efficient irrigation and better quality of irrigation services. To mitigate this risk, recovery of service fees from users and downscaling of IWD will not be part of the Project.
- The *Institutional Capacity for Implementation and Sustainability* risk is considered Substantial. IWD has no recent experience in the implementation of Bank-financed Projects. The experience of IWD in working with an ISP is limited to the pilot that IWD implemented in the 2017/18 Rabi season. There is also a limited capacity within IWD in taking full advantage of modern monitoring systems. Capacities of the SPMU will be strengthened, and the SPMU will be adequately staffed with competitively recruited specialists, supported by specialized consultant services.
- The *Fiduciary* risks are considered Substantial. While IWD has established an SPMU that is overall responsible for procurement and coordinating the activities of the Project, it has no prior experience in Bank financed Projects. Keeping in view the scope, size and complexity of procurement activities, the overall capacity of implementing agencies will need to be strengthened. The Project procurement strategy document (PPSD) has been prepared which includes appropriate mitigation measures including but not limited to strengthening the SPMU, DPMU and DPIU regarding procurement staffing and their capacity.
- The *Environmental and Social Risk* is Substantial. The Project has triggered eight safeguards policies and it is expected that some of the environmental impacts of the Projects, while positive overall, require high quality Project implementation oversight and monitoring. The associated safeguards risk is therefore rated substantial. The SPMU will recruit a high-quality safeguards specialist. In addition, strengthening of safeguards capacities of SPMU staff will be conducted systematically during Project preparation and implementation.
- The *Stakeholder* risk is considered Substantial. While all stakeholders are interested in improved performance of irrigation, some of these have a high level of anxiety about the use of the private sector for delivering these services. The Project will launch a communication campaign to inform stakeholders about the details of the Project, including the performance nature of the services, and the fact that the ISPs report to IWD.

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

Table 2: Systematic Operations Risk-rating Tool

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

67. **The EFA has been carried out** considering an analysis period of 40 years. The analysis has been done with the maximization of economic returns on total investment in flood management and irrigation. The analysis is based on a comparison of costs and benefits under two scenarios, "without Project" and "with Project". All costs and benefits are valued in monetary terms and expressed in economic prices, using a Standard Conversion Factor of 0.88. The discount rate used is 12 percent.

68. **Costs**. Investments include the costs for Irrigation Management (Component A), Modernization of Irrigation Infrastructure (Component B) and Flood Management (Component C).

69. **The major benefits include**: (i) *Avoided damages and losses from floods*. There will be substantial benefits because of reduced damages in areas affected by flooding. The associated savings are estimated at economic prices by multiplying the estimated 1999-2017 average per square km unit damage cost with the estimated reduction in flood damage area in post- intervention period (2024-2064). The analysis accounts for increased intensification of flooding events related to climate change; (ii) *Economic activity in other economic sectors*. The economic activity in non-farm sectors in the area will increase due to a reduction in the number of days of inactivity resulting from water-logging. There will be more days of economic activity in post-intervention years than in pre-intervention years, which are multiplied by daily capita income (at constant 2003 prices), adjusted by the GDP growth rate and population growth in each of the districts; (iii) *Reduced withdrawal/depletion of underground water*. There will be a significant increase in the availability of surface water in the post-Project period for those farmers that are now using groundwater. The benefit would be arresting of the decline of groundwater levels. The "without Project" loss to the national economy is calculated by imposing a premium

("depletion premium"), estimated as the additional cost to bring surface water from long distances. The impacts of climate change on groundwater availability are included in the sensitivity analysis.

70. **Some of the benefits have not been quantified**, such as the benefits of improved service delivery and governance of the system. Better management and a more reliable water delivery is expected to translate into agricultural intensification and diversification. As the precise nature of the relationship between better management and intensification/diversification is not known, no attempt has been made to quantify these benefits.

71. **The Economic Internal Rate of Return (EIRR)** is 21.6 percent with a Net Economic Present Value of US$250 million (INR1,775 crores).

72. **Sensitivity Analysis**. A sensitivity analysis found that the Project is economically viable in all scenarios that were considered.

Scenarios	EIRR (%)	NPV at 12%	
		INR crores	USD million
Base case	**21.6**	**1,774**	**250**
1. 10% increase in capital cost	20.1	1,610	227
2. 10% decrease in benefits	20.1	1,451	204
3. 10% increase in benefits	23.0	2,097	295
4. 10% increase in cost & 10% decrease in benefits	18.7	1,289	182
5. 10% decrease in ground water savings	21.5	1,759	248
6. 20% decrease in ground water savings	21.4	1,744	246

Table 3: Sensitivity Analysis of EIRR and NPV

73. **Based on the EFA, the Project is found to be economically viable**, having an EIRR well above 12 percent, under all analyzed scenarios.

B. Technical

74. **A Feasibility Study of the modernization of the irrigation and drainage (I&D) system and of the investments in flood management was conducted** during Project preparation by an international consultant. Detailed design studies have been conducted for the investments, and contracts representing 30 percent of the total loan amount are practically ready for award in keeping with GOI readiness criteria. Terms of References (TORs) Requests for Proposals (RFPs) for the Project Management Consultant and the Human Resources Agency have been issued to the shortlisted Firms in both the cases.

75. **Supervision of the construction works will be outsourced to a PMC that will be recruited competitively**. Contractors for I&D modernization and flood management works will be recruited through National Competitive Bidding (NCB). Work contracts will be packaged so that investments in close proximity to one another and of comparable magnitude will be combined into one package, and the total number of packages kept to a minimum.

C. Financial Management

76. **An assessment of the financial management arrangements was undertaken** in accordance with the Bank Policy and the Bank Directive, Financial Management Manual for World Bank Financed Investment Operations, February 2017.

77. **The Chief Engineer at the SPMU is responsible** for financial management, i.e. maintenance of accounts and records, transactional and financial control, submission of interim unaudited financial reports (IUFRs), annual audit and onward transmission of the audit report to the Bank. All services/consultants and goods will be procured out of advance funds using the Bank procedures.

78. **Budgeting and Funds Flow**. The State Finance Department has made a budget provision of INR3,340 million (US$47.0 million) for the financial year (2019-20) for IWD to meet the Project-related expenditures. IWD in consultation with the State Finance Department and with the approval of the Accountant General, West Bengal (AGWB), has created new detailed heads of accounts for the proposed Project in a manner that will facilitate easy compilation of Project expend from the State's Integrated Financial Management Information System (IFMIS) by Project components/sub components. For the approved budget lines, the PD as the Budget Controlling Officer will issue authorization/s through the State's e-bantan system to designated Drawing and Disbursing Officers (DDOs) at the SPMU, DPMU and DPIUs, as may be required and after getting allotment from IWD. Budget funds will flow through single/multiple lines budget heads. This authority allows the designated DDOs across the State to request the State/District Treasury Offices (run by State Finance Department) to process and make direct electronic payments to consultants, contractual staff, suppliers, contractors and others.

79. **Internal Control**. IWD as a department of the GOWB follows the financial rules and procedures laid down in the State Financial Rules (SFR) and the Central Public Works Accounts Code (for accounting and reporting procedures). All financial controls applicable to routine GOWB expenditures will also apply to the expenditures made from the Project.

80. **Accounting and Reporting**: The accounting responsibility of the IBRD funds lies with the SPMU and the designated DDOs across the State and reported on the State's online IFMIS. Based on the IFMIS quarterly reports of compiled expenditures against the budget line, supplemented by copies of the manual monthly financial reports submitted by the DPMU/DPIUs, IWD will prepare on a quarterly basis a statement of uses of funds, reflecting activity wise expenditures (for the quarter/year/Project to date).

81. **Disbursement Arrangements and Designated Account**: GOWB will pre-finance the expenses from the State budget and seek reimbursement from the World Bank through the Office of Controller of Aids and Accounts (CAAA), GOI on a quarterly basis. No designated account is therefore required for the Project. Funds will be withdrawn on the receipt of quarterly withdrawal applications and transferred to GOWB following the standard Centre-State mechanism of Additional Central Assistance on a back to back basis. The interim unaudited financial reports will provide information on expenditure made in the previous quarter and quarterly disbursements would be made based on these financial reports.

82. **The Statement of Uses of funds prepared by the IWD** will be audited by the State office of the Comptroller and Auditor General of India. The audit report will be submitted to the Bank within nine months of the close of each financial year. The CAG audit of the Project Financial Statements will be in line with the agreed standard TOR for Bank financed Projects.

83. **The overall FM risk profile is moderate** because: (i) the financial management arrangements are mainstreamed into the State and departmental standard processes and systems; (ii) the clear assignment of responsibilities within the department for management and administration of Project funds, and (iii) close oversight by the Bank Task Team. Therefore, the overall financial management arrangements at IWD may be considered adequate to support the use of funds.

D. Procurement

84. **Procurement for the Project** will be carried out in accordance with the World Bank's Procurement Regulations for IPF Borrowers, dated July 2016, revised November 2017 and August 2018, hereafter referred to as "Procurement Regulations", and the provisions of the Loan Agreement. In addition, the Project will also follow the Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants, Dated October 15, 2006 and Revised in January, 2011 and July, 2016. All procurement activities related to incremental operating costs may be done using the prevailing guidelines of the Government of West Bengal.

85. **The SPMU will have overall responsibility for procurement** of 99 percent of the procurement under the Project. The identified line departments may carry out procurement for activities not exceeding 1 percent of the total Project procurement through DPMU or DPIUs.

86. **Procurement activities.** The procurement under four components is related to *structural interventions* including but not limited to de-siltation, rehabilitation and modernization of irrigation canals and drainage channels, regulating structures, restoration of carrying capacity of various canals, slope stabilization, installation of a data monitoring system, remodeling of hydraulic structures, etc. *Non-structural interventions* include development of an MIS, aquifer management, capacity strengthening, and asset management. The proposed civil works activities are not envisaged to exceed NCB threshold of US$40 million. International Competitive Bidding (ICB) is not envisaged. The Project will use the e-procurement system (NIC platform) for procurement of pre-agreed activities which will be cleared by Bank through an online tool Systematic Tracking of Exchanges in Procurement (STEP).

87. **Procurement Risk Assessment.** IWD has no prior experience of World bank funded Projects. All procurement above INR500,000 (appx US$7,000) is generally executed through e-procurement. Implementation of the procurement program will be mainly led by IWD with more than 99 percent of the Project procurement being handled by the SPMU. The other implementing departments include the Department of Food Processing Industries and Horticulture, Agriculture, Water Resource Investigation and Development. Except WRIDD no other department has executed any World Bank funded Project and has limited capacity. Accordingly, it is determined that the pre-agreed activities are not expected to exceed 1 percent of the Project procurement cost and each contract is not expected to exceed the Request for Quotation (RFQ) threshold of US$100,000 which will be mostly through e-procurement.

Other than regular civil work activities the Project envisages some O&M and service delivery contracts which are likely to be more complex and may require some innovative ways of procurement to be carried out by SPMU, IWD. Overall capacity and internal controls will need to be strengthened. Except WRIDD that is presently implementing a Bank-financed Project, the capacity for Project implementation of all other line departments is limited. The activities to be carried out by these line departments will be finalized during the first 18 months. Proposed mitigations are listed in Annex 2.

88. **Project Procurement Strategy Development**. As per the requirement of the Procurement Regulations, a PPSD has been developed. A market analysis has been carried out for different packages of procurement and based on the findings, decisions on packages shall be finalized for civil works to ensure adequate participation of bidders. Based on the PPSD, the procurement plan has been prepared to set out the selection methods to be followed by the Borrower during Project implementation in the procurement of goods, works, non-consulting and consulting services financed by the Bank. The PPSD is a dynamic document and should there be any significant change in the strategy the PPSD shall be revised and agreed with the Bank.

E. Social (including Safeguards)

89. **The adverse social impact of the Project** will be limited to the temporary relocation of squatters during the rehabilitation of canals. Since there will be considerable civil works, there could also be adverse impact on the host community due to influx of labor.

90. **Impacts.** Although the Project does not require acquisition of private land and works will be carried out within the existing river and canal system, OP 4.12 (Involuntary Resettlement) has been triggered as the Project will temporarily relocate commercial and residential structures. The social impact assessment carried out shows that 2,253 households will be affected by the Project due to temporary relocation of 2,637 private structures. Out of these, 1,076 are residential, 773 commercial and the rest is common property. Only 19 scheduled tribe (ST) households will be affected by temporary relocation. A Tribal Peoples' Plan (TPP) has been prepared in consultation with the community as part of the ESMP.

91. **Mitigation measures**. Because not all sub-Project sites have been identified, the Project has prepared an Environment and Social Management Framework (ESMF). The ESMF is to be applied to all activities under this Project. The ESMF includes a Resettlement Policy Framework (RPF), which specifies the procedures, probable impacts, eligibility, entitlements, and other measures to be followed in the event of resettlement and/or land acquisition. Because some Project districts have the presence of indigenous population, a Tribal Peoples' Management Framework (TPMF) has been prepared as part of the ESMF. The TPMF aims to include tribal communities in the Project to achieve the highest possible positive impact of the interventions and to improve their quality of life. The ESMF also includes a Gender Development Framework (GDF), which has helped analyze gender issues during the preparation stages of the Project and design interventions to address women's needs. Gender analysis is part of the social impact assessment (SIA). The ESMF also includes (a) Grievance Redress Mechanism (GRM); (b) specific procedures on public consultation and disclosure; (c) monitoring arrangements; (d) schedule, procedures, and TOR for periodic environmental and social audits; and (e) a plan to augment the institutional capacity of IWD to manage Project-related social issues.

92. **The Project has carried out an Environmental and Social Impact Assessment (ESIA)** and an ESMP has been prepared. The ESIA has identified the adverse impact on local communities and resources due to the influx of laborers and a labor management plan will be prepared. The Project has also prepared a site-specific RAP. Instead of acquiring private land, the Project will adopt direct purchase as per the government order issued for direct purchase of land on a "willing buyer – willing seller" basis if required. The land owner has the right to refuse to sell his/her land. The RAP includes measures to (i) mitigate losses; (ii) engage with local communities and key stakeholders to ensure their inclusion and participation in implementation; (iii) ensure smooth implementation of the RAP and the Gender Action Plan (GAP); (iv) establish a GRM; (v) monitor indicators, and (vi) provide a budget to implement the RAP.

93. **Consultations and Disclosure**. Stakeholder consultations have been carried out in all five Project districts, covering different stakeholders such as farmers of different land holding categories; local service providers; State and district level line departments and agencies; extension institutions (for example, ATMA and Krishi Vigyan Kendra), etc. A total of 22 consultation meetings were conducted with encroachers / squatters (both men and women) on the left bank of the Damodar, Mundeswari, Hurhura and Rampur Khal, and the right bank of the Damodar. The discussions focused primarily on improvements planned by the Project and its anticipated impact on their livelihoods, and access to utilities and services. District level workshops were conducted in each Project district during finalization of Project preparation activities. Adverse social concerns of each Project activities were thoroughly discussed to find suitable Project alternatives. Communities' concerns were mainly focused on encroachment-related issues, land acquisition, loss of agricultural land and agricultural land pollution due to storing of construction material on agricultural land. The majority of local people are expecting improvement of the road infrastructure and construction of a bridge along with flood management and irrigation modernization.

94. **The ESMP addresses all issues that are identified to have a potential for adverse impact**. The plan takes care of encroachment and land alienation issues that the Project aims to avoid as much as possible. Involvement of small and marginal holders is ensured through inclusion in different Project activities. Further, women participation and their safety and security are addressed in the labor camp establishment and management plan that is part is part of the ESMP. Pollution and environment-related issues are addressed in the ESMP under the environment management plan.

F. Environment (including Safeguards)

95. **The Project is expected to yield several environmental benefits** including improvement in irrigation efficiency, reduction in withdrawal of groundwater and reduction of the flood risk. The Project activities could, however, lead to negative impacts on the environment if not properly designed, implemented and managed.

96. **The ESMF that was prepared provides**: (i) procedures for screening and categorization of all Project activities into one of three categories – C1, C2 and C3 based on the potential impacts; (ii) non-permissible activities which may have severe, irreversible, long-term, and adverse environmental impacts; (iii) guidance on mitigation of environmental impacts (including generic mitigation measures, construction related mitigation measures, sample management plans, construction workers' camp

management); (iv) strategy and plan for promotion of Integrated Pest and Nutrient Management; (v) M&E framework; (vi) consultation, information disclosure and grievance redress; (vii) institutional arrangements for implementation; and (viii) budget for ESMF implementation.

97. **The non-permissible activities** include: (i) any activity located within a notified Eco Sensitive Zone (ESZ) and is prohibited from being implemented within an ESZ; (ii) any activity that converts or leads to conversion and/or degradation of significant areas of critical natural habitats (areas officially protected) and/or other natural habitats (including wetlands of significance) and designated forest areas; (iii) any activities involving pesticides that are banned by the Government of India[11]; (iv) any activity involving pesticides that are in Classes Ia, Ib and II of the WHO Recommended Classification of Pesticides by Hazard[12]; (v) any activities involving construction within 100 meters from an archeological site/monument; (vi) any activities involving use of Asbestos Containing Materials (e.g., AC pipes for irrigation, AC sheets for roof); (vii) any activity that violates the provisions of applicable National and State laws; (viii) construction of any new irrigation reservoir dam; and (ix) construction of new canals, new branch canals and new offtake structures.

98. Based on the ESMF, **an ESIA has been undertaken** as part of preparation for the proposed infrastructure investments identified through the Feasibility Study under components B and C of the Project, separate ESMP prepared for irrigation management and flood management investments. Contract package-specific ESMPs have been prepared for investments identified to meet DEA's readiness criteria.

99. **Impacts.** The ESIA has identified the following negative environmental impacts: construction related impacts including air and noise pollution, public and worker safety issues, generation of construction and demolition waste; deterioration of surface water quality due to desiltation works on the Mundeswari River and drainage channels and disposal of 11.75 MCM of desilted material; temporary impacts on 112 ponds (dewatering, soil deposition, etc.) abutting the embankments due to embankment strengthening works; felling of 788 trees (including 262 trees with girth size above 80 cm) for flood wall construction and embankment strengthening works; disposal of land and aquatic vegetation (such as water hyacinth); and disturbance to local fauna, especially vulnerable species such as the Fishing Cat. Increase in the use of agro-chemicals (pesticides and fertilizers) is an indirect impact that could result from improved irrigation in the Project area.

100. **Based on the ESIA, an ESMP has been prepared** that provides mitigation measures specific to the proposed irrigation management and flood management investments. The Project ESMP also includes mitigation plans on the following: Waste Management Plan; labor influx and construction workers camp management plan; and management plan for construction related issues. Based on the Project ESMP, Contract Package specific ESMPs will be developed by the SPMU. These have already been prepared for the investments identified (and constituting nine contract packagees) to meet DEA's readiness criteria. Each contractor will be required to submit an action plan for implementation of the mitigation measures within 14 days of contract signing. The ESMP includes a monitoring plan that covers: (i) a mid-term and end-term audit of ESMP application and effectiveness by a third-party agency;

[11] For list of pesticides banned in India, refer to: *http://cibrc.nic.in/ibr2012.doc*
[12] For list of pesticides in WHO classes Ia, Ib and II, refer to: *http://www.who.int/ipcs/publications/pesticides_hazard_2009.pdf*

and (ii) monitoring selected environmental quality parameters at identified locations, including at sensitive receptors (schools, health centre, parks, etc.) located within 100 m of the construction sites. The ESMP also includes a capacity building plan that provides training on ESMP implementation requirements of staff of IWD, PMC, DPMU and DPIU, line departments and the contractors.

101. **Stakeholder Consultations** were held in the five Project districts with farmers, line department representatives, NGOs during March-September 2018. The key environmental concerns expressed by the stakeholders include: identification of proper locations for temporary storage of construction and demolition waste as well as for desilted material; exploring options for reuse of desilted material; need for addressing inundation/water-logging of agriculture land; need for minimizing tree felling and for ensuring compensatory plantation; need for addressing ground water depletion; sanitation and waste management facilities at construction camps; and compliance with regulatory requirements. The ESMP integrates appropriate measures to respond to the stakeholder concerns.

102. **Disclosure**: The draft ESMF, ESIA and ESMP documents including the executive summary in the local language have been disclosed on the website of IWD on November 30, 2018 and on the Bank's website on December 4, 2018. Stakeholder consultations on the draft documents were organized by IWD on November 16, 2018. Final versions of all the documents have been diclosed on the IWD's website *www.wbiwd.gov.*in on October 22, 2019 and on Bank's website on November 05, 2019.

Borrower's Institutional Capacity for Safeguard Policies

103. **The overall management of the Project including preparation and implementation of safeguard measures lies with IWD**. IWD is a first-time client and has not implemented investment Projects supported by the World Bank or any other multilateral development bank. In view of this, the roles and responsibilities for environmental and social safeguards implementation in the Project have been clearly defined (details are provided in Annex 1). Strengthening of safeguard capacities will be carried out through recruitment of qualified and experienced Safeguard Specialists in the PMC. A capacity building plan has also been developed as part of the ESMP to address gaps in institutional capacity for safeguards management.

Safeguards Policies that apply

104. The following safeguards policies apply to the Project:

- *Environmental Assessment OP/BP 4.01*: Project activities could result in adverse environmental impacts if not properly designed, implemented and managed. An ESMF, an ESIA and an ESMP have been prepared to meet safeguards requirements.
- *Natural Habitats OP/BP 4.04*: Activities involving significant conversion or degradation of critical natural habitats will not be financed under the Project. The impacts of the Project on natural habitats and on vulnerable species in the Project area including riverine stretches have been assessed in the ESIA, and the ESMP has, in consultation with relevant agencies and stakeholders, identified mitigation measures.

- *Pest Management OP 4.09*: The improvement in irrigation service delivery, promotion of crop intensification and diversification might lead to increased use of agro-chemicals. In view of this, an Integrated Pest and Nutrient Management Strategy and Plan has been prepared.
- *Indigenous Peoples OP/BP 4.10*: All five Project districts have a presence of tribes. Bankura has the highest percentage of tribal population (11 percent of the total population), followed by Bardhaman (7 percent) and Hooghly (4 percent). The tribal population in Howrah is less than one percent of the total population. The ESIA shows that less than 1 percent of the people affected by the Project belong to tribal groups. A TPP has been prepared as part of the ESMP.
- *Physical Cultural Resources OP/BP 4.11*: The Project activities are unlikely to impact any protected monuments, as the construction works will be located in the right-of-way of existing irrigation canals and associated structures, river channels, river banks and embankments. The ESIA has identified 31 sites of religious significance and 3 cremation grounds that will be partially affected. Mitigation measures have been proposed in the RAP. The ESMP also includes provisions for dealing with any 'Chance Finds' of archaeological, paleontological, historical significance.
- *Involuntary Resettlement OP/BP 4.12*: The ESIA shows that 2,637 private structures will be impacted due to Project intervention, especially during the rehabilitation of canals. Site-specific RAPs have been prepared that include mitigation measures for affected structures.
  Safety of Dams OP/BP 4.37: The Project area is fed by waters from 5 large dams located in the State of Jharkhand (Tenughat, Tilayia, Konar, Panchet and Maithon). Konar, Panchet and Maithon are included in the ongoing, Bank-financed Dam Rehabilitation and Improvement Project (DRIP, P089985). The following dam safety measures were agreed: (i) a DSRP will be established for each of the following sets of Project Dam(s): (a) Tilaiya, Konar, Panchet and Maithon dams; (b) Tenughat dam; and (c) Durgapur barrage, (ii) (a) each DSRP performs periodic inspections and safety assessments; (b) the Bank is informed of the dates of the field visits of the DSRPs; (c) a copy of each report prepared by the DSRPs is promptly provided to the Bank; and (d) critical dam safety measures recommended by DSRPs are implemented in a timely manner, (iii) a study is undertaken for developing flood forecasting models in the area downstream of Durgapur barrage on the Damodar river in an integrated manner with the inflow models to the upstream reservoirs in order to improve the reservoir operations and flood management, (iv) an Emergency Preparedness Plan for each of the Tenughat, Tilaiya, Konar, Panchet and Maithon dams is prepared, and (v) O&M manuals are prepared for each of the 5 dams and thereafter that such plan is implemented in a manner and substance satisfactory to the Bank.
- *Projects on International Waterways OP/BP 7.50*: The Damodar River drains into the river Hooghly, which is a tributary of the river Ganga river, before flowing into the Bay of Bengal. The Ganga and the Hooghly and their tributaries are considered 'international waterways' for the purpose of this policy. Considering that the focus of the proposed Project is to modernize and upgrade management systems for improved irrigation and flood management, that the Damodar River flows entirely within India, and that India is the lowest downstream riparian of the Hooghly before it drains into the Bay of Bengal, an exception to the notification requirement under paragraph 7(c) of the policy has been approved.

105. *Climate Change Co-Benefits*: The proposed Project will contribute to both climate change mitigation and adaptation co-benefits. Current and projected rising temperature trends lead to decreased rainfall in winters and intensive precipitation in summers. Component A (Irrigation

Management) will support farmers to use groundwater more efficiently, promote adoption of new energy efficient technologies and a reduction in fertilizer use through awareness-raising and capacity-strengthening. Component B (Modernization of Irrigation) will support the modernization of irrigation infrastructure at main, branch, distributary and minor levels, which would bring a more energy and water efficient irrigation system. This would reduce the risk of large crop failures. In addition to restoring the conveyance capacity of the distribution network and reducing non-beneficial ET, significant savings can be made by switching from crops that use large amounts of water such as paddy during Boro season. Under the component, pressurized irrigation pilots will be developed in two chaks. Component C (Flood Management) will invest in structural measures to reduce flooding in the Project area, increasing flood discharge capacity and strengthening embankments. The component will moderate the frequency and extent of flooding.

106. *Greenhouse Gas (GHG) accounting*: A GHG accounting has been conducted. The net emissions of the Project are estimated to be **-2,123,851 tCO_2-eq** over the 40-year life of the Project. The gross emissions are expected to be **1,709,687 tCO_2-eq**. Net annual average emissions are expected to be **-53,096 tCO2-eq**. The Project sees net mitigation due to switching from groundwater pumping to a canal system using surface water. This switch means that zero-emission gravity-based will be replacing groundwater pumping, which relies on diesel and grid-connected electricity to power the pumps. These emission changes are all applicable to subcomponents B1 and B2.

107. The reduction in groundwater pumping due to a partial shift towards surface water systems for sourcing results in net emissions of -888,714 tCO_2-eq. In addition, the partial shift from groundwater to gravity-based surface water canals for moving water from sources to fields results in net emissions of -801,686 tCO_2-eq. Both of these shifts reflect associated energy savings from a reduction in pumping requirements, including using less diesel fuel.

108. Implementing improved water resources management on annual crop land yielded **net emission reductions of -433,451 tCO2-eq**. The reason that improved agricultural practices result in net emission reductions is due to improvements to soil carbon sequestration through such activities.

G. Gender Analysis

109. **Gender analysis:** In West Bengal Female Labor Force Participation (FLFP) is 19 percent which is lower the national average of 25 percent (Registrar General of India, Census 2011). In India, Science, Technology, Engineering and Mathematics (STEM) sectors are perceived to be restrictive to women's participation as many women tend to be discouraged by employers' expectations or demands and often the discomfort of their male colleagues and/ or family members (reasons include safety concerns, and long hours away from home). Added to this, traditional social and cultural values, gender-segregated environments, lack of open and fair discussion of gender-specific issues and problems at work pose barriers for sustained participation of women in STEM sectors across states. Consequently, these factors eliminate a large portion of lucrative engineering jobs resulting in a much smaller share of the job 'pie' for women engineers[13]. Moreover, in non-traditional sectors such as irrigation, women's participation in high skilled STEM jobs remains sub-optimal as most of the irrigation Projects tend to be

[13] Women in Engineering in In India. *https://www.researchgate.net/publication/242023178_Women_in_Engineering_in_India*

located in remote, rural areas. Concerns of safety and long hours on site and in the field deter women engineers from taking up jobs in the sector particularly since women are also expected to perform a large share of domestic duties.

110. Against this backdrop, as part of strengthening institutional capacity of IWD, the Project will address the gender-gap of low participation of women in STEM related job roles. An assessment of women's participation in IWD reveals that only 20 percent of its employees are women. Of this, most female employees are engaged in jobs with low skills, as casual support staff (25 percent) or in clerical jobs (25 percent). At present, 4.5 percent are engineers concentrated in design development and not in construction (civil engineering). This means, that because of the barriers highlighted above, women engineers are not in the field.

111. **Gender action**: The Project will increase the number of women engineers hired to 7 percent from the current baseline of 4.5 percent, during the Project period, with a focus on increasing their numbers in the civil engineering stream. This will be achieved by (i) outreach activities targeting female students enrolled in STEM courses across local universities, (ii) Institute an internship program to encourage female engineering students with the interests, aptitude, leadership skills to undertake STEM pursuits, and then provide them with rigorous skill development opportunities so that they can be subsequently recruited in IWD (iii) Establish an anti-sexual harassment cell in line with the requirements of the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013. To ensure improved work climate and gender sensitivity and effective redressal of harassment at work place, the Project team will organize gender sensitization trainings every six months for the staff in IWD. The Project will also provide separate gender sensitization trainings for IWDs management staff every six months. The reason for including staff in leadership positions for such trainings is due to the hierarchy based organizational culture, which is structured, and respect driven, and staff in leadership positions would further disseminate the message of gender sensitization and creation of healthy workplace culture free from gender discrimination. These proposed actions have been agreed and will be part of the GAP to be prepared under the GDF which is part of the ESMF.

112. **The task team carried out a gender-based violence (GBV) risk assessment** for the Project and it was found to be low. During the implementation of the Project, following actions will be implemented:

- Mapping of response actors
- Awareness regarding GBV among the laborers and communities
- Code of conduct to be signed by laborers/ GBV as part of tool box talk

H. World Bank Grievance Redress

113. **Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported Project** may submit complaints to existing Project-level grievance redress mechanisms or the WB'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 complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to

respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit *http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service*. For information on how to submit complaints to the World Bank Inspection Panel, please visit *www.inspectionpanel.org*.

VII. RESULTS FRAMEWORK AND MONITORING

Results Framework
COUNTRY: India
West Bengal Major Irrigation and Flood Management Project

Project Development Objective(s)

The Project Development Objectives are to improve irrigation service delivery, strengthen flood risk management and improve climate change resilience in the Project area.

Improving irrigation services includes management reforms as pursued under Component A, and infrastructure modernization to reinforce the management improvements under Component B. Strengthening flood risk management is addressed under Component C. These improvements together will help improve the resilience of the Project area to climate change.

Project Development Objective Indicators

Indicator Name	DLI	Baseline	End Target
To improve irrigation service delivery			
Area provided with new/improved irrigation or drainage services (CRI, Hectare(Ha))		0.00	376,448.00
Area provided with improved irrigation or drainage services (CRI, Hectare(Ha))		0.00	376,448.00
Compliance with agreed water delivery schedule of the ISPs' contract (Percentage)		0.00	90.00

Indicator Name	DLI	Baseline	End Target
Compliance with irrigation water supply from Main Canal to Distributary Canal (Percentage)		0.00	90.00
To strengthen flood risk management			
Rate of reduced flood depth at the monitoring points compared with equivalent flood depth from 2008-2017 (Percentage)		0.00	30.00
To improve climate change resilience			
Arrest in the rate of decline of groundwater levels in semi-critical blocks in each defined groundwater management area (Text)		0%	50 percent in area south of Damodar River; 50 perrcent in area between Damodar and Hoogli rivers
No deterioration of groundwater level trends in safe blocks in each defined groundwater management area (Text)		0%	100 percent in area south of Damodar River; 100 percent in area between Damodar and Hoogli rivers

Intermediate Results Indicators by Components

Indicator Name	DLI	Baseline	End Target
Component A: Irrigation Management			
Three modules of MIS functional (Text)		NONE	Fully functional
Grievances registered related to delivery of project benefits that are resolved (Percentage)		0.00	80.00
Of which females (Percentage)		0.00	35.00
Asset Management Plan prepared (Yes/No)		No	Yes
Groundwater study completed to the satisfaction of the Bank (Text)		Not yet started	Completed

Indicator Name	DLI	Baseline	End Target
Percentage of women engineers recruited by IWD (Percentage)		4.50	7.00
Component B: Modernization of Irrigation Infrastructure			
Length of main canals modernized (Kilometers)		0.00	166.90
Component C: Flood Management			
Length of river embankment rehabilitated (Kilometers)		0.00	111.00
Component D: Project Management			
Number of Project monitoring reports submitted on time annually (Number)		0.00	4.00

Monitoring & Evaluation Plan: PDO Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Area provided with new/improved irrigation or drainage services	This indicator measures the total area of land provided with irrigation and drainage services under the project, including in (i) the area provided with new irrigation and drainage services, and (ii) the area provided with improved irrigation and drainage services, expressed in	Annual	Progress reports	M&E consultant in the PIU will collect data	PIU

	hectare (ha).				
Area provided with improved irrigation or drainage services	Measures in hectares the total area of land provided with new or improved irrigation or drainage services in operations supported by the World Bank.	Annual	Progress report	M&E consultant in the PIU will collect data	PIU
Compliance with agreed water delivery schedule of the ISPs' contract	A water delivery schedule will be agreed as part of the annual contract. The M&E consultant will monitor the performance of the ISPs against the agreed delivery schedule.	Annual	Progress reports	M&E specialist in the PIU will collect data.	PIU
Compliance with irrigation water supply from Main Canal to Distributary Canal	IWD and the ISPs will sign annual bulk water delivery contracts that define the amount of water that will be delivered to the head of the Distributary canal. The M&E consultant will monitor the compliance with the contract.	Annual	Progress reports	The M&E specialist in the PIU will collect data.	PIU
Rate of reduced flood depth at the monitoring points compared with equivalent flood depth from 2008-2017	This indicator will measure how much percentage of inundation depth is reduced at the monitoring point compared with similar level of historical	Annual	Progress reports	The M&E specialist in the PIU will collect data.	PIU

	events from 1999-2017. The following historical data of depth by return level will be used as base for comparison: 0.76 to 0.9 m for range of 1.98 - 3.1 year return; 1.4 m for 9 year return; and 1.52 m for 20 year return.				
Arrest in the rate of decline of groundwater levels in semi-critical blocks in each defined groundwater management area	The indicator will measure groundwater level at selected observation wells in each of two areas: i) south of Damodar River and ii) between Damoda and Hoogli rivers during the 5-week pre-monsoon period. The indicator will be considered achieved if the pre-monsoon groundwater level in at least 50 percent of the predefined observation wells in semi-critical blocks in each of the two areas is equal to or above the baseline groundwater level (normalized for trend and rainfall).	Annual	Progress reports	The M&E specialist in the PIU will collect data. Groundwater monitoring and data collection/ analysis will be carried out by State Water Investigation Directorate (SWID).	PIU

	The baseline groundwater level is the average of trend-corrected pre-monsoon water level in the observation wells over 2012–18.				
No deterioration of groundwater level trends in safe blocks in each defined groundwater management area	The indicator will measure groundwater level at selected observation wells in each of two areas: i) south of Damodar River and ii) between Damodar and Hoogli rivers during the 5-week pre-monsoon period. The indicator will be considered achieved if the pre-monsoon groundwater level in 100 percent of the safe blocks shall not have a deteriorating trend. The baseline groundwater level is the average of trend-corrected pre-monsoon water level in the observation wells over 2012–18.	Annual	Progress reports	The M&E specialist in the PIU will collect data. Groundwater monitoring and data collection/ analysis will be carried out by State Water Investigation Directorate (SWID).	PIU

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
Three modules of MIS functional	The MIS with the following modules: administrative functions, irrigation operations and decision support system, and performance monitoring and irrigation efficiency evaluation, will be functional.	Annual	Progress reports	The M&E specialist in the PIU will collect data.	PIU
Grievances registered related to delivery of project benefits that are resolved	Grievances will cover all aspects of project implementation, including, inter alia, grievances related to involuntary resettlement. The GRM will also include a pro-active element through which the PIU will seek comments from beneficiaries once a year, as well as establishing the systems for receiving and processing unsolicited comments/ complaints.	Annual	Progress reports	The M&E specialist in the PIU will collect data.	PIU
Of which females	This breakdown indicator will measure female	Annual	Progress reports	M&E consultant in the PIU will collect data	PIU

	beneficiaries' access to the GRM. The issue might involve gender specific issues.				
Asset Management Plan prepared	The Project will finance introduction of rational asset management, including establishment of a geo-tagged asset database, budget planning, development of maintenance standards, and reporting on these. The indicator will measure if asset management is prepared.	Annual	Progress reports	M&E specialist in the PIU will collect data.	PIU
Groundwater study completed to the satisfaction of the Bank	This indicator will monitor whether the groundwater study completed to the satisfaction of the Bank.	Annual	Progress reports	M&E specialist in the PIU will collect data.	PIU
Percentage of women engineers recruited by IWD	The indicator will measure the Project's addressing the gender gap identified during the Project preparation. The Project will increase the number of women engineers hired to 7 percent from the baseline of 4.5% by a) outreach activities targeting female students	Annual	Progress reports	The M&E specialist in the PIU will collect data.	PIU

	enrolled in STEM courses across local universities; b) gender-sensitive infrastructure in IWD premises such as separate toilets, adequate lighting, separate seating spaces, etc. and c) strengthened anti-sexual harassment cell.				
Length of main canals modernized	This indicator measures the length of the two main canals modernized, including installation of flapgates, repair of cross-regulators and selected lining.	Annual	Progress reports	The M&E specialist in the PIU will collect data.	PIU
Length of river embankment rehabilitated	This indicator will measure progress of rehabilitation work on the left and right banks of the Amta Channel and Mundeswari river by total length of completed works.	Annual	Progress reports	The M&E specialist in the PIU will collect data.	PIU
Number of Project monitoring reports submitted on time annually	This indicator measure the number of Project monitoring reports submitted on time annually.	Annual	Progress reports	M&E consultant in the PIU will collect data	PIU

ANNEX 1: IMPLEMENTATION ARRANGEMENTS

COUNTRY : India
West Bengal Major Irrigation and Flood Management Project

Project Institutional and Implementation Arrangements

1. IWD is responsible for Project implementation. It has appointed an SPMU headed by a Project Director (PD) at the rank of Chief Engineer in IWD to which it has assigned primary responsibility for Project preparation and implementation. The PD is supported by two additional PDs at the rank of Superintending Engineer, four deputy PDs at the rank of Executive Engineer, Accounts Officials and other support staff. Nodal Officers from the Agriculture, Agri-marketing, Horticulture and WRIDD have also been appointed as members of the SPMU. The Nodal Officers will serve as liaison between the IWD and their respective departments. At the District level, two District Project Management Units (DPMUs) have been established (one for Howrah and Hooghly Districts, and one for Bankura and East and West Bardhaman Districts) that are headed by Additional PDs. The DPMUs are functional with a skeleton staffing structure that will be strengthened during Project implementation. Four DPIUs have been established that are headed by Deputy Project Directors in the rank of Executive Engineer, located in the districts of Purba Bardhaman (including Paschim Bardhaman), Bankura, Hooghly and Howrah.

2. At State level, a TSC headed by the Chief Secretary has been established, and consists of the Heads of all concerned Departments. The SLTSC will review broad progress in preparing and implementing the Project, coordinate between Departments and provide guidance on policy matters.

3. The SPMU will recruit specialized consultants' services for procurement, construction supervision, Project management support and monitoring and evaluation. All consultants will report to the Project Director who retains overall responsibility for Project implementation.

Financial Management

4. An assessment of the financial management arrangements has been undertaken in accordance with OP/BP 10 and the Bank Directive, Financial Management Manual for World Bank Financed Investment Operations, February 2017.

5. The Chief Engineer at the SPMU is responsible for financial management, i.e. maintenance of accounts and records, transactional and financial control, submission of interim unaudited financial reports (IUFRs), annual audit and onward transmission of the audit report to the Bank. All services/consultants and goods will be procured out of advance funds using the Bank procedures.

6. **Budgeting and Funds Flow**. The State Finance Department has made a budget provision of INR3,340 million (US$48.5 million) for the financial year (2019-20) for IWD to meet the Project-related expenditures. IWD in consultation with the State Finance Department and with the approval of the Accountant General, West Bengal (AGWB), has created new detailed heads of accounts for the proposed Project in a manner that will facilitate easy compilation of Project expend from the State's Integrated

Financial Management Information System (IFMIS) by Project components/sub components. For the approved budget lines, the PD as the Budget Controlling Officer will issue authorization through the State's e-bantan system to designated DDOs at the SPMU, DPMU and DPIUs, as may be required and after getting allotment from the IWD. Budget funds will flow through single/multiple lines budget heads. This authority allows the designated DDOs across the State to request the State/District Treasury Offices (run by State Finance Department) to process and make direct electronic payments to consultants, contractual staff, suppliers, contractors and others.

7. **Internal Control**: IWD as a department of the Government of West Bengal follows the financial rules and procedures laid down in the State Financial Rules (SFR) and the Central Public Works Accounts Code (for accounting and reporting procedures). All financial controls applicable to routine GOWB expenditures will also apply to the expenditures made from the Project.

8. **Accounting and Reporting:** The accounting responsibility of the IBRD funds lies with the SPMU and the designated DDOs across the State and reported on the State's online IFMIS. Based on the IFMIS quarterly reports of compiled expenditures against the budget line, supplemented by copies of the manual monthly financial reports submitted by the DPMU/DPIUs, IWD will prepare on a quarterly basis a statement of uses of funds, reflecting activity wise expenditures (for the quarter/year/Project to date).

9. **Disbursement Arrangements and Designated Account**: GOWB will pre-finance the expenses from the State budget and seek reimbursement from the World Bank through the Office of Controller of Aids and Accounts (CAAA), GOI on a quarterly basis. No designated account is therefore required for the Project. Funds will be withdrawn on the receipt of quarterly withdrawal applications and transferred to GOWB following the standard Centre-State mechanism of Additional Central Assistance on a back to back basis. The interim unaudited financial reports will provide information on expenditure made in the previous quarter and quarterly disbursements would be made based on these financial reports.

10. The Statement of Uses of funds prepared by the IWD will be audited by the State office of the Comptroller and Auditor General of India. The audit report will be submitted to the Bank within nine months of the close of each financial year. The CAG audit of the Project Financial Statements will be in line with the agreed standard TOR for Bank financed Projects.

11. The overall FM risk profile is moderate because: (i) the financial management arrangements are mainstreamed into the State and departmental standard processes and systems; (ii) the clear assignment of responsibilities within the department for management and administration of Project funds and (iii) close oversight by the Bank Task Team. Therefore, the overall financial management arrangements at DIWD, GOWB may be considered adequate to support the use of funds.

Procurement

12. **General:** Procurement will be carried out in accordance with the World Bank's Procurement Framework 2016. "Procurement Regulations for Borrowers 2016 Revised November 2017 and August 2018" will be applicable for all procurement under the Project. As per requirement of this, a comprehensive PPSD has been prepared that will provide the strategy to be adopted for procurement under Project keeping in view the overall Project operational context, market situations, implementing

agencies capacity and possible procurement risks. The Project procurement shall ensure economy, efficiency, value for money in various structural and nonstructural interventions. Equal opportunity with transparency shall also be maintained. Effective contract management will be imperative to achieving the PDO.

Key procurement under the Project and Market analysis:

13. *Civil works* planned under the Project are small to medium in value and size. The market for these works contracts would be predominantly through bidders available at State and district level. The list of such contractors is available with the Project. The State has an adequate market for raw materials for construction and the supply is assured for most of the construction periods. The Project would, however, ensure advance planning and scheduling of material supply as part of contract management plans. Typically, a Bank Project get a bidder participation rate of 3-5 per bid, however the e-procurement platform, for works procurement to be used by the PWRD, is expected to generate further interest in the market. Major structural interventions include;

- Rehabilitation and remodelling of control/regulating structures to improve conveyance efficiency and minimise losses, together with modernization of existing regulating structures in irrigation canals for stabilization of flow to improve service delivery.
- Desiltation of irrigation canals and drainage channels and slope stabilsation or bank protection works to restore and sustain the designed capacities.
- Strengthening of flood embankments by construction of RCC flood walls on top with sheet piling at foundation level, protecting the countryside slope aginst seepage failure and to increase sustainance against the higher mgnitude of floods having return period upto 10 to 25 years depending on the strategic importance of the embankment from the view point of protection of human habitation and assets , and remodelling of low height embankments by allround armouring with cement concrete, to allow flood spill in a controlled and guided manner, should floods of very high magnitude occur.
- O&M contracts with total estimated cost of contracts for envisaged 9 packages would be around value of US$4.14 million but none of these are likely to be signed during first 18 months of the Project. SPMU has no prior experience in handling of such contracts and will be supported by the Consultant.

14. *Consultancy services*: For most Consulting activities open competition market approach will be followed. Individual consultants hired as staff for the Project will follow the HR policies of the GOWB. Experts required for limited inputs for the Project at various intervals would be hired through Selection of Individual consultant's process. These non-structural activities includes:

- Development of an MIS for capturing all the Project activities and tagging of geo-referenced assets and also integration with the mobile based apps for registering users' demand and feed back;
- Improving service delivery of irrigation water by bringing in changes in the present O&M practices;
- Introducing aquifer managent on regular basis , to monitor the stages of groundwater development through field investigations and otherwise and capturing the data/ results in the MIS to enable more conjunctive use of surface water and grounwater on a sustainable basis.

15. *Procurement of Goods and Non-Consulting Services.* Goods required under the Project would include goods and non-consulting services such as office supplies, consumables, which will follow RFQ method. Goods within the RFQ threshold will be procured using eGems rate contract prices, wherever available. As per PPSD, appropriate procurement method will be selected and mentioned in the procurement plan.

16. **Procurement risk assessment.** Given the core capacity required the procurement will be mainly led by the SPMU with 99 percent of the contracts being awarded by them. Procurement of specific activities prior agreed with SPMU and cleared by World Bank for a value not exceeding US$100,000 would be carried out by selected line departments already identified and anything above this threshold the procurement will be prior reviewed by SPMU to ensure compliance with the agreed procedures and processes. The overall procurement by other line department is not envisaged to exceed 1 percent of the total Project procurement. As per the latest State Government rule, all procurement above US$7,000 (approx. equivalent of INR500,000) will be done thru e-procurement portal http://westbengal-tenders.co.in. The Project will also adhere to this rule. However, the State e-procurement portal does not support consultancy assignments, e.g. issuing of REOI and technical evaluation. In view of the same, all consultancy procurements will be done manually. As the Project involves some new and innovative aspects, there may be challenges related to capacity, execution and contract management. Apart from delays in procurement process, contract management delays and disputes are potential problem areas.

17. **Procurement thresholds and prior review thresholds**. The procurement plan shall set forth those contracts which shall be subject to the World Bank's mandatory Prior Review. The procurement thresholds applicable effective July 2016 will be followed, as part of the new procurement framework, which will be applied to any reduction or enhancement of the threshold levels. All other contracts shall be subject to post review by the World Bank.

18. **Risk mitigation**: Based on the assessment, some of critical mitigation measures put in place are:

- *Staffing and capacity building*: to ensure smooth procurement management, the Procurement Cell in the SPMU will comprise of a dedicated Additional PD (APD), Deputy PD (DPD) and at least two Assistant PDs supported by two Procurement Specialists to be engaged through the Project Management Consultant (PMC). Similarly, the APD heading the DPMU and DPD at the DPIU will handle procurement at these levels. However, skill development of procurement staff shall be carried out as frequently as possible for more successful and efficient performance. A staffing and capacity building plan will be put in place to ensure compliance and consistency across the board. Six officials of the IWD have already undergone training on procurement norms of the World Bank. Additionally, selected officials and staff from line departments will also be nominated for trainings conducted by IIM Lucknow (Noida campus). Alternatively, the Project may conduct customized periodic procurement training. The procurement expert will need to be in place at SPMU and all line departments who are likely to be IA and a procurement officer will be identified for each DPIU. Six officials of the IWD have already undergone training on World Bank procurement management.
- *Procurement manual*: IWD will develop a procurement manual as part of the PIM which shall be aligned to the Bank regulations applicable for the Project. The manual will clearly define the delegations, procurement processes and procedures, oversight mechanism, complaint redressal

and internal controls. It will also provide a link to the Bidding document including contract agreement which shall be use by all IA for any procurement under the Project.

- *Systematic Tracking of Exchanges in Procurement (STEP):* the Project will use STEP, a planning and tracking system, which will provide data on procurement activities, establish benchmarks, monitor delays, and measure procurement performance. The Procurement Plan (PP) for the first 18 months of Project implementation shall be reviewed and cleared by the Bank through STEP. This PP shall be updated at least annually. All procurement to be carried out under the Project shall be included in the PP and is subject to prior clearance by the Bank.

Category	Procurement method threshold	Prior review threshold
	Threshold (US$)	Remarks
Goods, IT and Non-Consulting Services		
Request for Bids (RFB) using Open, International market approach	>= 3 million	• All Contract packages estimated to cost above 2 million including Direct Selection. • All Framework Agreements
Request for Bids (RFB) using the Open, National market approach	<3 million	
Request for Quotations (RFQ), Community Procurement and Commercial Practices	< 0.1 million	
Works (*Turnkey, Supply and Installation of plant and Equipment and PPP) *Contracts		
Request for Bids (RFB) and/or Request for Proposals (RFP) using Open, International market approach	>= 40 million	• All Contract packages estimated to cost above US$10 million including Direct Selection
Request for Bids (RFB) using the Open, National market approach	<40 million	
Request for Quotations (RFQ), Community Procurement and Commercial Practices	< 0.1 million	
Consulting Services		
QCBS, QBS, FBS, LCS,	>= 0.3 million	• All Contract packages estimated to cost above 1 million including Direct Selection
Using the most appropriate market approach	-	
CQS, FBS, LCS	<= 0.3 million	
Using the most appropriate market approach	-	
Individual Consultant (IC)		
Using the most appropriate market approach	depending on nature of services	• Contract packages estimated to cost above 0.3 million including Direct Selection

- *Fiduciary oversight and Procurement Review:* the World Bank shall prior review contracts according to prior review thresholds set in the PP. All contracts not covered under prior review by the World Bank shall be subject to post review. The SPMU shall be responsible for providing the consolidated list of contracts for carrying out the annual procurement post review. An independent consultant will carry out review of selected percentage of procurement activities being carried out by all IA's once in 12 months and SPMU will share the findings with the Bank. The Bank will carry out procurement post review of selected contracts on an annual basis or as and when it is required.

- *Contract management and MIS*: Robust procurement MIS and contract management system will need to be developed inhouse to ensure compliance. This MIS will also help in identifying weak areas and enable to take timely corrective action.
- *Record keeping*. All records pertaining to award of tenders, including bid notification, register pertaining to sale and receipt of bids, bid opening minutes, bid evaluation reports and all correspondence pertaining to bid evaluation, communication sent to/with the World Bank in the process, bid securities, and approval of invitation/evaluation of bids will be retained by respective agencies and uploaded in STEP.
- *Disclosure of procurement information*. The following documents shall be disclosed on the Project website: (a) a PP and updates; (b) an invitation for bids for goods and works for all contracts; (c) Request for Expression of Interest for selection/hiring of consulting services; and (d) contract awards of goods, works, and non-consulting and consulting services.
- *Complaints Handling*. For the procurement-related complaints, the Project will follow the procedure prescribed in the Procurement Regulations (Para 3.26 and 3.31). In order to deal with complaints from bidders, contractors, suppliers, consultants and general public at large, a complaint handling mechanism will be set up at the State level and the detailed procedure is prescribed in the PIM. The community will be required to establish systems and mechanisms for addressing and escalating their grievances and complaints as outlined in the PIM.

Environmental and Social (including safeguards)

19. **Implementation Arrangements**: The overall management of the Project including preparation and implementation of safeguard measures lies with IWD. The PD (Chief Engineer) at the SPMU will be responsible for ensuring policy and regulatory compliance including conformity to the requirements of the safeguard instruments. Similarly, additional PDs (Superintending Engineers) in the DPMUs will be responsible at respective district levels as well as ensuring liaising with other government departments and agencies, and periodic monitoring of safeguards implementation. In order to strengthen capacity, IWD will be supported by a Project Management Consultant (PMC). The PMC will have one Senior Environmental Specialist and one Senior Social cum Gender Development Specialist at the SPMU level. The PMC will also appoint 2 Junior Environment Specialists and 2 Junior Social cum Gender Development Specialists at the DPMU level. The PMC will assist the SPMU in preparing contract package specific ESMPs and in monitoring implementation of the ESMPs. The PMC will work closely with the DPMUs, DPIUs, the relevant line departments and the Contractors.

20. **Monitoring, Reporting and Evaluation**. Monitoring will cover all stages of planning and implementation and will be carried out through the environmental and social safeguard compliance reports that will form a part of Project Report submitted to the Bank every six months. Regular visits by the environmental and social specialists will provide information on compliance. The reports will be reviewed by the PDs in order to identify and resolve technical, managerial, policy or regulatory issues with regards to safeguard compliance. An external audit/evaluation of the ESMP and RAP implementation will also be undertaken at midterm and at the end of the Project implementation.

Monitoring and Evaluation

21. The SPMU will be responsible for overall coordination of Project monitoring. M&E consultants will be recruited by the SPMU for independent monitoring of Project progress, Project impact, and achievement of the PDO. The M&E consultants will set up a monitoring system for the Project area that can be accessed on-line, collect data and undertake regular reporting. The monitoring system will be based on the agreed Project outcome indicators and annual performance targets presented in the Results Framework.

22. The M&E consultants will also serve as independent monitor of the performance of the ISPs and the achievement of their contractual KPIs, as well as of the compliance with the bulk water contract between the IWD and the contractors. To that end, the M&E consultant will use satellite-based verification methodologies as much as possible to ensure transparency (e.g., actual ET to monitor irrigation supplies).

23. The M&E consultant will also monitor Project compliance with social and environmental safeguards. S/he will supervise implementation of the overall ESMP and RAP, and will review and monitor specific Contract Package ESMPs as well as impact assessment and supervision of their implementation. These consultancies will also help reinforce overall transparency and governance during Project implementation. A baseline survey will be conducted before Project effectiveness and additional surveys are scheduled to be held during mid-term review and at Project completion. The SPMU will submit to IWD and the Bank a semi-annual performance review.

24. Progress will also be monitored through regular implementation support missions conducted by the Bank and the GOWB. M&E findings will provide feedback during these missions, and progress reports will be prepared immediately preceding the implementation support missions. A mid-term review of the Project will be undertaken. The final Beneficiary Implementation Completion Report (ICR) will be submitted to the Bank three months prior to the Project's closing date. A separate ICR will be prepared by the Bank no later than six months after the Project's closing date.

ANNEX 2: IMPLEMENTATION SUPPORT PLAN

COUNTRY : India
West Bengal Major Irrigation and Flood Management Project

Strategy and Approach

1. The implementation support strategy includes technical, fiduciary and safeguards support to ensure due diligence over the course of the Project. The approach will include (i) continuous and regular monitoring of Project activities to assess progress and identify potential bottlenecks, (ii) timely advice and guidance, and (iii) ensuring that financial and progress reports are submitted on time.

Implementation Support Plan

2. The Implementation Support Plan includes several review mechanisms to assess progress toward the PDO, progress of Project activities, and effective responses to issues as they arise. Among the review mechanisms will be (i) semiannual Implementation Support Missions, (ii) specific thematic support for specific implementation issues, and (iii) a midterm review that will assess progress, revisit Project design issues and identify areas where adjustments might be needed.

3. The World Bank Implementation Support Plan will include visits to randomly selected Project sites to physically verify Project-financed work. These site visits will also incorporate interaction with Project beneficiaries. Sites to be visited will be selected randomly from a list of Project sites, plus sites identified by the complaint handling system.

4. World Bank implementation support will (i) monitor Project progress and evaluate results on the ground, (ii) address the principal technical, fiduciary, environmental, and social risks, and (iii) provide technical advice as needed on water management, agricultural production, and post-harvest management. The Bank will also provide support on a regular basis. Implementation Support Missions will be at least semiannual and more frequent as seems warranted. These will be complemented by visits by individual task team members to follow up on specific issues.

5. The World Bank will provide any required technical support through sector and institutional specialists. In addition to the Implementation Support Missions, there will be a continuous exchange of information between the World Bank team and Project staff. Support will also address areas where residual risk is higher, as in FM and procurement, as well as safeguards and monitoring and impact evaluation.

6. The Implementation Support Plan (Tables C.1 and C.2) specifies focus areas and skill needs required to provide support at different points in the Project. It will be reviewed regularly and updated as required.

Table C.1. World Bank Support to Project Implementation

Time	Focus	Skills Needed
First 12 months (Year 1)	• Implementation arrangement • Validation of the PIM for year 1 • Quality control processes • Effective functioning of FM systems • Procurement adherence to World Bank Regulations • Environmental and social safeguards • Technical support on PIM specifics • M&E system and rollout of the MIS	• Water Resources Management Specialist • PPP Specialist • Construction Design Specialist • ICT Specialist • Social Safeguards • Environmental Safeguards • FM Specialist • Procurement Specialist • M&E Specialist
Year 2	• Technical support for activities by component and sub-Component • Routine FM and procurement reviews • Management of safeguards and monitoring of progress on safeguards-related measures • M&E • Adjustment of plan for activities by component and sub-Component	• Water Resources Management Specialist • PPP Specialist • Construction Design Specialist • ICT Specialist • Social Safeguards • Environmental Safeguards • FM Specialist • Procurement Specialist • M&E Specialist
Year 3	• Technical support for activities • Routine FM and procurement reviews • Management of safeguards and monitoring of progress on safeguards-related measures • M&E • Midterm review	• Water Resources Management Specialist • PPP Specialist • Social Specialist • Construction Design Specialist • ICT Specialist • Social Safeguards • Environmental Safeguards • FM Specialist • Procurement Specialist • M&E Specialist
Years 4–6	• Adjustment to the PIM • FM and procurement reviews • Management of safeguards and monitoring of progress on safeguards-related measures • M&E	• Water Resources Management Specialist • PPP Specialist • Social Specialist • Construction Design Specialist • ICT Specialist • Social Safeguards • Environmental Safeguards • FM Specialist • Procurement Specialist • M&E Specialist

Time	Focus	Skills Needed
Year 7	• Technical support for activities • Routine FM and procurement reviews • Management of safeguards and monitoring of progress on safeguards-related measures • M&E • Completion review	• Water Resources Management Specialist • Social Specialist • PPP Specialist • Construction Design Specialist • ICT Specialist • Agriculture Specialist • Fisheries Specialist • Agribusiness Specialists • Social Safeguards • Environmental Safeguards • FM Specialist • Procurement Specialist • M&E Specialist • Implementation Completion Review Task Team Leader and assessment team

Table C.2. Skills Mix Required

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Task Team Leader	10	2	Based in New Delhi
PPP Specialist	8	2	Based in New Delhi
FM Specialist	4	2	Based in New Delhi
Procurement Specialist	4	2	Based in New Delhi
Construction Design Specialist	8	2	Consultant, based in Australia
ICT Specialist	4	2	Based in New Delhi
Social and Institutional Development Specialist	4	2	Based in New Delhi
Environmental Safeguards Specialist	4	2	Based in New Delhi
Social Specialist	2	2	Based in New Delhi
Economic Analyst	2	2	FAO/World Bank CP
M&E Specialist	4	2	Based in New Delhi
Lawyer	2	1	Based in New Delhi
Operation Analyst	4	2	Based in New Delhi
Program Assistant	10	—	Based in New Delhi

Note: CP = Collaboration Program; FAO = Food and Agriculture Organization.

ANNEX 3: TECHNICAL ANNEX

COUNTRY : India
West Bengal Major Irrigation and Flood Management Project

A. West Bengal – Damodar River Basin Hydrology

North East India Climate and Rainfall Pattern

1. Substantive changes have occurred in the climate and rainfall patterns in Northeast India between 1870 and 2008[14]; there is little evidence for additional changes in climate parameters since 2008. The apparent trends are for overall annual rainfall to be decreasing (marginally) but for the monsoon period to be wetter, with more intense rainfall. Temperature may be trending up slightly, but long-term trend graphs suggest that this is not significant. The typical rainfall pattern is for a sharp increase in June, leading into the monsoon (Kharif), with a steady decline post monsoon to the winter (Rabi), with a dry hot pre-monsoon period (Boro season).

Damodar Valley - Summary Climate and Rainfall Details															
Climate		Monsoon				Post-Monsoon	Winter			Pre-Monsoon					
Crop Sxeason			Kharif				Rabi			Boro					
Data	**Month**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Avg**	**Tot**
Temp	Min °C	25.4	25.5	25.6	25.2	22.2	16.5	12.6	11.6	17.6	21.5	25.7	24.3	21.1	
	Max °C	34.5	32.4	32.3	32.7	31.8	29.5	26.7	25.6	29.7	34.0	39.8	35.7	32.1	
Humidity	%	78	88	85	85	88	72	73	82	71	75	74	75	79	
Rainfall	mm	210.9	329.9	292.8	248.8	149.1	16.2	5.6	5.2	12.9	40.7	48.7	91.3		1452.1
Eff. Rain	mm	139.7	158.0	154.3	149.8	113.5	15.8	5.5	5.1	12.6	38.0	44.9	77.9		915.1

Table III-1: Climate and Rainfall Details

Damodar River Rainfall and Runoff

2. The rainfall pattern influences the annual runoff and groundwater recharge cycle, with increased river flows from June onwards, and more intense rainfall through the monsoon period. About 85 percent of the annual catchment rainfall typically falls from June to October, when river runoff peaks, which can lead to substantial floods in the middle to late monsoon period. There are five storage dams in the Damodar upper catchment (upstream of Durgapur Barrage) that can attenuate early monsoon runoff and retain water in storage for the Rabi and Boro season crops. Indicative river flows for the past 10 years at Durgapur suggest that only in 2010-2011 was there less flow at Durgapur than would be required post-Project for diversion into the DVCA. The 75 percent reliable annual river flow at Durgapur (5,414 MCM) is almost double the required water diversion at Durgapur to DVCA (2,903 MCM). Therefore, under current projections for rainfall-runoff in the Damodar catchment, the required irrigation surface water diversions at Durgapur can be easily met, at least 9 years out of 10.

[14] Analysis of Rainfall and Temperature Trends in Northeast India, S.K. Jain, Vijay Kumar, and M. Saharia. Int. J. Climatology. (2012), Published online in Wiley Online Library (wileyonlinelibrary.com)

Seasonal Rainfall and Water Management Infrastructure

3. As rainfall is plentiful in the monsoon, Damodar catchment storages can be refilled, whilst still using them in the early monsoon period to mitigate flood risk downstream. The maximum available storage capacity at the five dams, between max WL and min drawdown level (MDDL) is 1,400 MCM as shown in the following Table.

4. In the late monsoon period, IWD, together with the Damodar Valley Reservoir Regulation Committee (DVRRC), will act to maximize the available retained water in storage to support Rabi and Boro season irrigation, as well as to regulate Damodar river flows for other domestic and industrial water users downstream through the dry seasons (winter and pre-monsoon).

Dams and Storage Capacity							
Dam		**Tanughat**	**Konar**	**Tilaiya**	**Maithon**	**Panchet**	**Totals**
Max Cap	MCM	618	210	215	535	303	1881
Min DDL	MCM	161	35	75	93	119	483
Storage	**MCM**	**457**	**175**	**140**	**442**	**184**	**1398**

Table III-2: Dams and Storage Capacity

5. In the monsoon and post-monsoon periods, the abundant river flows can be diverted to provide supplemental irrigation water for the Kharif and start of Rabi seasons, on the back of the seasonal rainfall. This rainfall, assisted with supplemental irrigation supply, will also enable groundwater to be recharged through natural percolation. The Project will increase the surface water coverage during the monsoon season, and this, coupled with rainfall, will reduce the need to use groundwater from June to November/December. On the annual cycle, this should then enable retained and replenished groundwater to be drawn from December to May for the Rabi and Boro crops, to supplement the declining surface water supplies that can be diverted from Damodar River at Durgapur, leading to a more sustainable use of groundwater.

Hydrological Summary

6. There is abundant rainfall, water and land saturation for groundwater recharge during the Kharif season (monsoon); but there is more limited rainfall, low recharge potential, and increased dependence on any available locally stored river water and groundwater for cropping during the Rabi season. With limited Damodar River flow post Rabi season, this places much higher reliance on available groundwater sources to support Boro cropping. More effective conjunctive water management (ground water level monitoring, regulated well development and performance-based operation) will be required to minimize the risk for future or continued stress in semi-critical blocks that could arise or continue with uncontrolled groundwater pumping.

District	GW Recharge (MCM)	Estimated Proportion of District in DVC (%)	Estimated Recharge in DVC (MCM)
Bankura	1,693.05	10%	169.31
Bardhawan	2,826.01	75%	2,119.51
Howrah	282.54	20%	56.51
Hooghly	1,468.88	50%	734.44
	6,270.48		3,079.76

Table III-3: Annual Natural GW Recharge for 4 DVC Districts

B. DVCA – Water Balance

7. Groundwater inflows in the DVCA are estimated to be substantial for the five districts, Bankura, East and West Bardhaman, Howrah and Hooghly, which encompass the DVCA Irrigation area. The collective natural annual groundwater recharge for these districts (see Table) is estimated to be about 3,000 MCM per year (estimate based on approximate proportionate areas of each district covered by the DVCA irrigation system). However, this number ignores the sub-surface outflow from the DVCA.

8. Groundwater use in the DVCA has increased over time. E.g., the ESIA reports that 9 percent, 28 percent and 31 percent of the farmers have been extracting more ground water during Kharif, Rabi and Boro season, respectively, in comparison to 5 years before. As a result, between 2005 and 2017, the number of semi-critical blocks has increased from five to 19 (out of a total of 41 blocks). Out of 40 monitoring wells in 40 different blocks, 23 wells showed depletion of more than 3 meter from 2001 to 2016. At State level, it is estimated that around 42 percent of the State's groundwater resources are being used.

9. A water balance has been prepared for the pre- and post-Project situations (Table III-4). The water balance conservatively assumes that conveyance irrigation efficiency will increase from 55 percent pre-Project to 60 percent post-Project. A small increase in the cropped area will be achieved due to higher efficiency and reduced non-beneficial ET (NBET) losses. It is further assumed that the average surface and groundwater supply does not change, as this does not depend on the Project.

10. The main difference between the pre- and post-Project situations is the increased surface water and reduced groundwater use during Kharif season (columns (2) and (5), and (3) and (6)). Since this happens before the end of spillage of the Jharkhand reservoirs, this is a net irrigation gain. An increase in the efficiency of surface water use will increase the cropped area in Rabi and Boro seasons. No increase in the efficiency of groundwater use is assumed, as its use is already fairly efficient. It is estimated that groundwater is used twice as efficiently as surface water[15].

DVCA Water Balance

Season	Pre-Project			Post-Project		
	Total Area in CCA under cultivation (Ha)	Actual Area Irrigated through Canals (Ha)	Actual Area Irrigated from non-Canal sources (ha)	Total Area in CCA under cultivation (Ha)	Actual Area irrigated through canals (Ha)	Actual Area Irrigated from non-Canal sources (ha)
	(1)	(2)	(3)	(4)	(5)	(6)
Kharif	376,448	178,582	197,866	376,448	376,448	0
Rabi	142,012	19,011	123,001	143,714	20,730	122,984
Boro	172,228	35,164	137,064	175,423	38,362	137,060
Total	690,688	232,757	457,931	695,585	435,540	260,045
	Total Irrigation Water Supply in CCA (MCM)	Water Supply through Canals (MCM)	Water Supply from non-Canal sources (MCM)	Water use in CCA (MCM)	Water Supply through Canals (MCM)	Water Supply from non-Canal sources (MCM)
Kharif	1,988.0	1,243.3	744.6	2,402.5	2,402.5	0.0
Rabi	296.1	65.8	230.2	296.0	65.8	230.2
Boro	1,349.9	434.5	915.4	1,349.9	434.5	915.4
Total	3,633.9	1,743.6	1,890.3	4,048.4	2,902.8	1,145.7
	Total Irrigation Water Use in CCA (m3/ha)	Water Use through Canals (m3/ha)	Water Use from non-Canal sources (m3/ha)	Total Irrigation Water Use in CCA (m3/ha)	Water Use through Canals (m3/ha)	Water Use from non-Canal sources (m3/ha)
Kharif	5,281	6,962	3,763	6,382	6,382	0
Rabi	2,085	3,463	1,872	2,060	3,174	1,872
Boro	7,838	12,356	6,679	7,695	11,326	6,679

Table III-4: Water Balance

[15] *Alberto Garrido, Pedro Martınez-Santos, M. Ramon Llamas: Groundwater irrigation and its implications for water policy in semiarid countries: the Spanish experience. In: Hydrogeology Journal, October 2005.*

ANNEX 4: MAP

COUNTRY : India
West Bengal Major Irrigation and Flood Management Project