Executive Summary

1.0 Introduction

The command area of the Damodar Valley Corporation (DVC)is served by a canal network having a total length of 2734 km in the downstream of Durgapur Barrage. It is spread over 41 administrative development blocks in the districts of Bankura, East Bardhhaman, West Bardhhaman, Hooghly and Howrah. The Damodar Valley Corporation Area (DVCA) canals currently irrigate around 3,32,000 ha in the Kharif season (out of a design area of 3,93,800 hectares), 20,000 ha in the Rabi season on the basis of an earmarked allocation, and an average of 28,000 ha in the summer (Boro) season, depending on the amount of water remaining in upstream reservoirs and after meeting priority needs. The total area irrigated (including all sources of water) is approximately 1,00,000 hectares each in the Rabi and Boro seasons. The main sources of water in areas that are not covered by canal water are wells and ponds.

The DVCA was developed more than six decades ago and is now degraded. Numerous regulating structures andcross drainage structures, distributaries and minors have been severely damaged. Thesilted up canal network along with loss of water due to seepage in critical zones of unlined canals has led to reduction in efficiency and scanty irrigation, particularly in tail reaches. This has resulted in increased ground water use especially during Rabi and Boro seasonsby the tail end farmers as they are not getting the required amount of water at the time of need as per the irrigation schedule. The gap between irrigation potential created and utilized is increasing, in spite of adequate water availability at the barrage point in normal monsoon years. It is therefore necessary to revamp structures and critically affected canal stretches and develop a suitable system for real-time operation and monitoring of irrigation by embracing latest technologies.

The Lower Damodar sub-basin adjoining the two branches of main Damodar, i.e. Mundeswari River and Lower Damodar (Amta) Channel is historically flood prone. This area measures around 1.887 lakh hectare (1887 sq. km.) and is spread over two Municipalities and 20 Administrative Development Blocks. Around 4.61 lakh people and 0.335 lakh hectare (335 sq. km.) of cropped area are affected annually due to flood related inundation in the Lower Damodar sub-basin.

The Irrigation and Waterways Department (I&WD), Government of West Bengal plan to undertake comprehensive interventions to rejuvenate the irrigation system and manage floods under the project titled ‘West Bengal Major Irrigation and Flood Management Project (WBMIFMP)’ with financial support from the World Bank.

The Environmental and Social Impact Assessment (ESIA) of the WBMIFMP has been carried out to identify potential adverse impacts due to implementation of the proposed project. An Environmental and Social Management Plan (ESMP) has been developed to mitigate identified adverse impacts. This document includes the ESIA and the ESMP. A Pest Management Plan (PMP) and Tribal People’s Plan (TPP) have beendeveloped and are includedin this document. A standalone Resettlement Action Plan (RAP) has also been prepared.

2.0 Project Description

The prime objective of the proposed project is to rejuvenate and rehabilitate theexisting irrigation network for sustainable development in the DVCA and management of floods in Lower Damodar Sub-Basin. The project will be implemented over a period of five years in 31 irrigated, 10 irrigated as well as flood affected and 10 non-irrigated flood affected blocks spread across five districts (Bankura, East Bardhhaman, West Bardhhaman, Howrah and Hooghly). The expected results of the project are to improve irrigation in order to benefit agriculture in the DVCA and to reduce annual flooding in the Lower Damodar sub-basin area.

The project has four components:

- Component A: Irrigation Management: This component will improve the management of the DVC irrigation scheme. The component includes the following subcomponents: (i) establishment of MIS and performance monitoring, (ii) improving the quality of service delivery, (iii) aquifer management, and (iv) capacity strengthening.
- Component B: Modernization of Irrigation Infrastructure: This component will invest in the modernization of irrigation infrastructure at main, branch, distributary and minor level. The component includes the following subcomponents: (i) Main and Branch Canal Modernization, and (ii) Distributary and Minor Canal Infrastructure Modernization.
- Component C: Flood Management: This Component will invest in structural measures to reduce flooding in the Project area. The investments include channel de-silting works, flow regulation structure modification and embankment reconstruction at key locations. In close collaboration with the World Bank-funded Dam Rehabilitation and Improvement Project, the investment would also include measures to strengthen forecasting and analysis capability to improve dam operation and water storage management in upstream reservoirs.
- Component D: Project Management: This component will strengthen IWD and the SPMU's capacity for Project management, monitoring and evaluation (M&E) (including, inter alia, the areas procurement and financial management) through the provision of goods, consultant services, training, and financing incremental operating costs.

The total project cost is 413 Million USD, of which 145 Million USD will be financed by the International Bank for Reconstruction and Development (IBRD), 145 Million USD will be financed by the Asian Infrastructure Investment Bank (AIIB) and 123 Million USD will be financed by the Government of West Bengal.

3.0 Legal & Regulatory Compliance

The legal and regulatory requirements for the project interventions under applicable acts / rules and policies for social and environment safeguards have been identified. This includes the requirement of permits / licenses under different rules /regulationsfor various interventions in the project. All agencies involved in implementing project activities, including contractors, shall follow applicable state and central government laws and regulations. These include: prior permission for tree felling from the Department of Forest; consent for establishment of hot mixing plant,

batching plant, etc., from the West Bengal Pollution Control Board; approval of local government authority and the State Project Management Unit (SPMU) in the I&WD for sites identified for camp establishment, temporary storage and disposal of waste materials, etc.

An outline of the applicable environmental and social safeguards policies of the World Bank has been presented. These are: 1) OP- 4.01 Environmental Assessment, 2) OP- 4.04 Natural Habitat, 3) OP- 4.09 Pest Management, 4) OP- 4.10 Indigenous People, 5) OP- 4.11 Cultural property 6) OP– 4.12 Involuntary displacement and resettlement and 7) OP– 4.37 Safety of dams.

There is presence of tribal population in the project area hence OP- 4.10 on Indigenous People has been triggered. Presence of huge number encroachers/ squatter on left embankment of Damodar, Upper Rampur and Hurhura canal and Damodar right dwarf embankment has triggered OP- 4.12 on Involuntary Resettlement. OP 4.11 on Cultural property has been triggered as 46 Bedi's and 31 temples will be affected. A standalone document on RAP is prepared to deal with encroachers/ / squatters, public utilities, community property resources (temples, *bedi*, burning ghats, etc.).

4.0 Environmental and Social Baseline

Information on the environmental and social baseline status of the project area has been collected through site visits, field survey and interactions with key stakeholders supplemented by secondary data sources. The baseline status covers three aspects (1) physical (2) biological and (3) social environment.

The zone of influence of the project is considered asthe area within a radius of 500m, 3km and 10km for all Category-1 and Category- 2 activities (except for the activity flood wall and sheet pile construction for which a 5 m radius is considered). Various environmental and social features present within the delineated zones were captured by means of primary as well as secondary study. Sensitive receptors such as schools, hospitals, parks, etc., located within 100 m of the proposed worksites have also been identified.

The baseline study included analysis of various environmental parameters such as ambient air quality, river water quality, sediment quality of river bed and ambient noise quality. Information on ground water quality and biodiversitywas obtained from secondary sources. Information on trees likely to be felled, status of ground water utilization, use of sprinkler and drip irrigation system, use of agro-chemicals was collected through primary study.

A sample of 703 House Hold (HH) was drawn from theproject area. The details are as under:

Table 1: Block wise details of sample households

Sl. #	**District**	**# of blocks**	**# of municipality**	**# of sample households**
1	Bankura	2		57

2	PurbaBardhaman	8		188
3	Paschim Bardhaman	1		30
4	Howrah	8	1	197
5	Hooghly	7	1	231
	Total	**26**	**2**	**703**

Maximum two villages from each sample block were selected randomly for HH sample collection.Proximity to Damodar river, main canal and branch canal were considered for village selection. 28 HH from each sample block were selectedtaking 14 HH from each sample village. At least one FGD with local community wasconducted at each sample village.

Among all the project districts, Howrah is having highest population density and Bankura has the lowest. The sex ratio of Hooghly district is highest and the decadal growth rate of project district varies from 9.5 percent in Hooghly to maximum of 13.5 percent at Howrah. All these districts have Scheduled Caste (SC) population and average SC population (31.2%) in project districts is marginally below the state average (32.65%). 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 average literacy rate (78.7) in project districts is higher than state (76.3%) and national (73%) average. There is a gap between male and female literacy, which is most pronounced in Bankura. Elsewhere the gender gap is less than the national average (16.2%).The male worker population in the project districts is around 51.0 percent and female worker population is around 49.0 percent. The average land holding of farmers / families in the project areas (villages near the project sites in the project blocks) found to be 77 Katha or 1.28 acres.

A census survey of probable impacted encroachers/squatters/utilities/ community resourcesfollowed by socio-economic study was conducted for development of Resettlement Action Plan (RAP).

The key information on the baseline environmental and social status is as follows:

- Availability of surface water for cultivation has not changed during Kharif in last five years. But, in 35.7 percent cases, there is short supply of water during Rabi and in 41.5 percent cases, there is short supply in Boro season in comparison to the situation 5 years before. As a result, ground water extraction and utilization has increased. Growth in utilization of ground water during Kharif is less than that of Rabi and Boro.
- Only 11.8 percent farmers use drip irrigation occasionally and 4.0 percent farmers use sprinkler irrigation.
- Pesticide use in project area is significant and includes use of pesticides in WHO classes Ia, Ib and II.

- Ambient air quality and noise levels at sampled locations are within the Maximum Permissible Limits.Water quality of Damodarat the sampled locations meets the standards for ‘drinking water source with/without conventional treatment’.
- Since the year 2001, the Mundeswari River is completely dry except in the monsoon season, due to sand deposition and low channel gradient.
- The physical quality tests of Mundeswari River sediment reveal that it can be safely used for embankment or road construction. The chemical quality tests of the Mundeswari River and canal sediments reveal that concentrations of Chromium, Zinc, Lead are within Threshold Effect Level (TEL) and Probable Effect Levels (PEL). Copper and Cadmuim concentrations exceed TEL but are within/at PEL.
- The significant faunal species in the project area include the Fishing Cat, Mongoose, Asian Small Clawed Otter, Fresh Water Turtles/Terrapins, Jungle Cat, Jackal, Monitor Lizard, etc., in addition to several species of birds including the White-eyed Pochard. There are also a few threatened fish species found in the Damodar river.
- There is no forest area in the identified working zone of the project. The Ramnabagan Wild Life Sanctuary is located at a distance of 2.5 km away from the DVC canal and 3.7 km away from the Damodar river.

5.0 Environmental and Social Impacts

Based on social and environment parameters the project activities are placed in the following three impact categories:

- Category 1 (High): Desiltation of Mundeswari River and 41 drainage canals.
- Category 2 (Medium): Irrigation modernisation activities; Flood management activities excluding desiltation of Mundeswari River and other 41 drainage canals; Agricultural infrastructure; Promotion of farm activities like crop diversification; Cage culture fishery.
- Category 3 (Low): Establishment of MIS and Performance Monitoring; Improving Service Delivery; Aquifer Management; Capacity Strengthening

The EIA has identified the following key negative environmental impacts:

- Construction related impacts including air and noise pollution, public and worker safety issues, construction and demolition waste generation, etc.;
- Generation of about 11.75 MCM of desilted material that needs to be disposed including 7.11 MCM from MundeswariRiver, 0.35 MCM from undivided Damodar river desiltation, 3.59 MCM from MadariaKhal re-sectioning, 0.64 MCM from RonerKhal re-sectioning and 0.045 MCM from desiltation of other 39 drainage canals;
- Generation of construction and demolition waste including 1.48 MCM ofcement concrete waste and 0.148 MCM of reinforced material waste due to demolition of existing regulating structures, sluices,and other structures (private, commercial and community buildings and structures).
- Deterioration of surface water quality due to desiltation works on the Mundeswari River and drainage channels;
- 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);
- Disposal of cleared land and aquatic vegetation (such as water hyacinth);
- Disturbance to local fauna, especially vulnerable species such as the Fishing Cat.
- Increase in use of agro-chemicals (pesticides and fertilizers) is an indirect impact that could result from improved irrigation in the project area.

The EIA has identified the following key negative social impacts:

- Altogether 2253 households will be affected by the project due to relocation of 2637 private structures. These include houses, shops, boundary walls, toilets, cattle shops, sheds, bedi (platforms), etc.
- Out of these 2637 structures, 1076 are residential, 773 are commercial and rest are common property resources.
- The community utilities and facilities that will be impacted due to flood wall and embankment strengthening work include: 396 electric poles, 112 ponds, 46 bedi, 31 temples, 19 clubs, 12 tubewells, 9 pump houses, 9 transformers, 6 bridges, 4 political party offices, 4 bus stops, 3 burning ghats, a school, an anganwadi (pre-school) and a light post. The impact ranges from partial damage to the structure to its complete removal.
- Only 19 ST households will be affected due to proposed eviction of encroachers / squatters.

6.0 Environmental and Social Management Plan

Non-permissible activities: A list of activities that are not permissible under the project have been identified. These include: Any activity located within a notified Eco Sensitive Zone (ESZ) and is prohibited from beingimplemented within an ESZ;Any activity that converts or leads to conversion and/or degradation of significant areas of criticalnatural habitats (areas officially protected) and/or other natural habitats (including wetlands ofsignificance) and designated forest areas;Any activity that promotes or supports pesticides that are banned by the Government of India;Any activity that promote or support pesticides that are in WHO Classes Ia, Ib and II; Any activity that involves construction within 100 meters from an archeological site/monument; Any activity that involves use of Asbestos Containing Materials (e.g., AC pipes for irrigation, ACsheets for roof); Any activity that violates the provisions of applicable National and State laws;Construction of any new irrigation reservoir dam;Construction of new canals, new branch canals and new off-take structures; Acquisition of private land on permanent basis.

Environmental and Social Management Plans (ESMP): The ESMPs for the project are the following:

- Project ESMP: Developed by the SPMU - WBMIFMP with support from ESIA Consultant. Provides mitigation measures specific to each project activity. ESMP Includes thefollowing: Activity specific ESMP; Construction and Demolition Waste Management Plan; Hazardous Waste Management Plan; Disposal plan for de-silted material; Labor Influx and Construction Workers Camp Management plan; Management plan for Construction related issues.

- Contract Package ESMP: To be developed for each contract package by Project Implementation Unit (PIU) with support from safeguard specialist at Project management Consultant (PMC).
- Contractor's ESMP: To be developedfor eachcontractpackage within14 days ofdelivery of letterof acceptance by the Contractor with support from safeguard specialist at PMC. Provides action plan for implementation ofmitigation measures including details ofquantities, locations, tie-ups with third partyentities, etc.Includes implementation plans on the followingcritical issues:Waste Management;Labor Influx and Construction Workers CampManagement;Construction related issues.

Pest Management Plan (PMP):The PMP is an action plan for promoting integrated pest and nutrient management in the project area. It describes the package of practices, capacity building activities, monitoring plan, institutional arrangements, etc., for promotion of integrated pest as well as nutrient management.

Tribal People's Plan (TPP):The TPP has been prepared based on social assessment in consultation with the affected tribal communities. It sets out the measures through which the project will ensure that (a) Indigenous Peoples affected by the project receive culturally appropriate social and economic benefits; and (b) when potential adverse effects on Indigenous Peoples are identified, those adverse effects are avoided, minimized, mitigated, or compensated for.

A standalone Resettlement Action Plan (RAP) has also beenprepared for theproject. RAP apart from potential adverse impacts specifies cut-off date for eligibility; mitigation measures; institutional arrangement for implementation and budgetary requirement.

7.0 Environmental and Social Monitoring Plan

The project will take up monitoring and evaluation of the ESMP implementationat two levels as below:

- Monitoring and Evaluation of the ESMP implementation of the project as a whole: The application and effectiveness of ESMP elements including preparation of Contract Package ESMPs, preparation and implementation of Contractor's ESMPs, monitoring, capacity building and institutional arrangements will be monitored. For every contract under the project, statutory compliances of the contractor will be monitored. Mid-term and end-term audit of the environmental and social management aspects of the project will also be undertaken by engaging third party M&E agency.
- Monitoring of Mitigation Measures and Environmental Quality: This will monitor the effectiveness of implementation of the identified mitigation measures and the environmental quality parameters relevant to each project activity.Locations where environmental quality monitoring is to be undertaken have been identified. The parameters to be monitored will include:
  - Environmental aspects: Water quality (Surface & Ground); Air quality; Noise levels around sensitive locations; Soil quality; Sediment quality; Compensatory afforestation & plant survival rate; Construction camp management; Waste management & debris removal; Pesticide management (agricultural component); Site restoration.

- Social aspects: Resettlement and compensation for acquisition; Livelihood restoration of PAFs / PAPs; Safety at work; Gender participation in works; Awareness program on HIV/AIDS.

8.0 Stakeholder Consultation

Stakeholder consultation has been an integral part of the environmental and social assessment and has provided inputs for the preparation of Social and Environment Management Plan (ESMP). The consultations were organized basically for two important purposes, i.e., (1) to share project objectives and proposed project interventions with the identified stakeholder groups and (2) to consult with the stakeholders and document their concern, with particular reference to social and environmental impacts of the proposed project interventions.

Stakeholder consultations were carried out in all the five project districts, covering different stakeholders such as farmers of different holding category, local service providers, state and district level line departments and agencies, extension institutions (for example, ATMA and Krishi Vigyan Kendra), NGOs, etc., during March-September 2018.

A total of 22 consultation meetings were conducted with the encroachers / squatters (both men and women) on the left embankment of Damodar, Mundeswari, Hurhura and Rampur Khal and right embankment of Damodar. Discussion was primarily on project planned improvement and strengthening measures and its anticipated impact on their livelihood, accessibility to utilities and services. District level workshop/s were conducted in each project district during finalization of project activities. Adverse social concerns of each project activities were thoroughly discussed to find out suitable project alternatives. Local communities are much more concerned about project activities and infrastructure facilities to be provided under this project. Communities focus were mainly concentrated on encroachment related issues, land acquisition, loss of agricultural land and agricultural land pollution due to staking of construction material on agricultural land. Majority of local peoples are expecting improvement of road infrastructure and construction of bridge along with flood management and irrigation modernization.

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 de-silted material; exploring options for reuse of de-silted 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; compliance with regulatory requirements; etc.

A state level workshop was also conducted in November 2018 forsharing the ESIA and ESMP prepared for this project with the key stakeholders.

The ESMP integrates appropriate measures to respond to the stakeholder concerns.

9.0 Capacity Building

The capacity building plan includes training of I&WD teams at state and district levels, training of PMC staff, training of contractors and officials of other relevant line departments on implementation of ESMP. In addition to training programs,

exposure visits and demonstrations are planned. Training on Environment, Health and Safety (EHS) and code of conduct for workers is also includedin the capacity building plan.

10.0 Grievance Redressal Mechanism

The grievance redress mechanism would be in place throughout the project duration. A platform for grievance redresswillbe organized and regular meetings will be conducted so as to allow people to put forth their grievances, if any. It will help the appropriate authority to find solutions and amicably address the issues. The project, apart from the web-based system, will have a three-tire grievance redress mechanism, i.e., (1) at the project site level (up to DPMU level), (2) State level (SPMU level) and (3) Judiciary level.

11.0 Institutional Arrangement for Implementation of ESMP

The State Project Management Unit (SPMU) will be responsible for overall planning and implementation of the entire project. There will be two DPMUs and four DPIUs under the SPMU for project implementation. Four line departments (Agriculture, Agri Marketing, Food Processing Industries and Horticulture and Fishery) will also be involved in implementing specified project activities. The SPMU and DPMUs will be staffed with the engagement of consultants, experts and various other categories of contractual staff to support the project.

Each implementing unit/agency will ensure that the ESMP is followed during project implementation. The PMC to be engaged for the project will have anexperienced Senior Environmental Specialist and aSenior Social cum Gender Development Specialist at SPMU level. The PMC will also have two junior Environmental Specialists and two junior Social cum Gender Development Specialists at DPMU level. The Senior Specialists will directly report to the Project Director (PD). The Junior Specialists placed at DPMU will report to theAPD as well as to the Senior Specialist at SPMU. These Specialistswill assist the SPMU and DPMUs in implementing and monitoring environmental and social mitigation measures as per ESMP and in preparingperiodicstatus reports.

12.0 Budget for ESMP Implementation

The cost of implementation of the ESMP has either been integrated into the main activity cost or has been provided for through a provisional sum in every contract package. The cost of human resources and audit of the ESMP implementation has been separately ear-marked. In all, a sum of INR 74,77,52,661 has been provided for the ESMP implementation.