Environmental Assessment and Management Framework

Odisha Integrated Irrigation Project for Climate Resilient Agriculture (OIIPCRA)

The Project Director
Odisha Integrated Irrigation Project for Climate Resilient Agriculture
OIIPCRA: OCTDMS
Water Resources Department
Government of Odisha

April 2019

Environmental Assessment and Management Framework

Odisha Integrated Irrigation Project for Climate Resilient Agriculture
(OIIPCRA)

The Project Director
Odisha Integrated Irrigation Project for Climate Resilient Agriculture
OIIPCRA: OCTDMS
Water Resources Department
Government of Odisha

Table of Content

List of Table

List of Figure

List of Abbreviation

ABSOs	Agri-Business Support Organizations
ACZs	Agro-Climatic Zones
APD	Additional Project Director
ASI	Archaeological Survey of India
ATMA	Agricultural Technology Management Agency
BDL	below detectable limit
BoQ	Bill of Quantity
C&D	Construction and Demolition Waste
CCA	Culturable Command Area
CCF	Chief Conservator of Forests
CIB & RC	Central Insecticides Board and Registration Committees
CPCB	Central Pollution Control Board
CRZ	Coastal Regulation Zone
CRZMA	Coastal Regulation Zone Management Authority
CtE	Consent to Establish
CtO	Consent to Operate
DFO	Divisional Forest Officer
DLPMT	District Level Project Monitoring Team
DAFE	Department of Agriculture and Farmers Empowerment
DoC	Department of Cooperation
DoF	Directorate of Fisheries
DoWR	Department of Water Resources
EA	environmental assessment
EHS	Environmental Health and Safety
E-MAP	Environmental Monitoring Action Plan
EMF	Environment Management Framework
EMP	Environmental Management Plan
ESZs	Eco Sensitive Zones
FGD	Focused Group Discussions
FPC	Farmer Producer Company
FPO	Farmer Producer Organizations
FSHG	Female Self-Help Group
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GoO	Government of Odisha
GPS	Global Positioning System
HFL	Highest Flood Level
HTL	High Tide Line
ID crops	Irrigated Dry crops
IFS	Integrated Farming System
IMC	Indian Major Carps
INM	Integrated Nutrition Management
INR	Indian Rupee
IPM	Integrated Pest Management
IPNM	Integrated Pest and Nutrition Management Plan
IWRM	Integrated Water Resources Management
LTL	Low Tide Line
M&E	Monitoring and Evaluation

MIP	Minor Irrigation Project
MoEF&CC	Ministry of Environment, Forest and Climate Change
NABL	National Accreditation Board for Testing and Calibration Laboratories
O&M	Operations and Maintenance
OCTDMS	Orissa Community Tank Development and Management Society
OCTMP	Odisha Community Tanks Management Project
OIIPCRA	Odisha Integrated Irrigation Project for Climate Resilient Agriculture
OP	Operational Policy
OSPCB	Odisha State Pollution Control Board
OUAT	Odisha University of Agriculture and Technology
PCR	Physical Cultural Resources
PD	Project Director
PDO	Project Development Objective
PFC	Primary Fishers Cooperative
PHM	Post-Harvest Management
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
POM	Project Operational Manual
PP	Pani Panchayat
PUC	Pollution Under Control
SDSO	State Dam Safety Organization
SHGs	Self Help Group
SPCB	State Pollution Control Board
SPU	State Project Unit
SRI	System of Rice Intensification
TA	Technical Assistance
TDS	Total dissolved solids
TEL	Threshold Effect Level
TPP	thermal power plant
TSDF	Treatment, Storage, and Disposal Facility
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization
WUA	Water Users Associations

Executive Summary

Agricultural growth in Odisha has been comparatively low to ensure long-term food security. A reasonable agriculture growth may contribute to reducing malnutrition and poverty, especially in rural areas, where more than 80 percent of the state's poor reside. Dilapidated irrigation structures, inadequate management of water and effect of climate change has also crippled agricultural productivity in Odisha. Govt. of Odisha through Orissa Community Tank Development and Management Society (OCTDMS) is preparing "Odisha Integrated Irrigation Project for Climate Resilient Agriculture" with financial support from the World Bank, to increase farm productivity and increase household income in a sustainable manner. Under OIIPCRA 538 minor irrigation (MI) Projects will be rehabilitated (renovation of dilapidated irrigation structures, field channels, weakened bank linings, et.) and, modern sustainable and climate resilient agriculture and horticulture practices will be promoted. The project will be implemented over a period of 6 years in 98 blocks spread across 15 districts of Odisha by OCTDMS. The project will be jointly implemented by the Department of Water Resource (DoWR), Department of Agriculture and Farmer Empowerment (DAFE), Directorate of Fisheries (DoF), Odisha State Agricultural Marketing Board (OSAMB), and Panchayat Raj, with each entity taking the lead on project activities for which they have the institutional mandate. DAFE will take the lead on activities related to project *sub-component 1.1: Climate-Smart Intensification and Diversification of Production* and *1.3: Support to Diversification and Produce Marketing* (working collaboratively with OSAMB on produce developing market intelligence systems and use of e-NAM (National Agriculture Market- an online trading platform for agricultural commodities in India). DoF will be the lead agency on activities in support of aquaculture production as proposed in *sub-component 1.2 - Support to Aquaculture Production*; while activities on improving access to irrigation and water productivity as defined under component 2 will be led by the DoWR, working together with Panchayat Raj on Gram Panchayat tanks. Implementation of activities proposed under *Component-3* will be led by the office of the Agriculture Production Commissioner (APC).

An environmental assessment was carried out to identify and assess potential environmental risks associated with the project and develop an environmental management framework to mitigate any adverse environmental impact and enhance any positive environmental impacts that may arise from the project. Baseline datafor both physical as well as biological environment within the tank and tank command area were assessed for environmental parameters. Nine (9) minor irrigation (MI) tanks representing all seven types of Agro Climatic Zone and four river basins covering entire project area was considered on sample basis for primary level baseline environmental assessment. It was found that irrigation efficiency of these sample minor irrigation projects (MIPs) have decreased significantly due to accumulation of aquatic weeds and silt deposit. During preparation of the environmental management framework (EMF), stakeholder consultations and discussions were held with community-based organizations such as Pani Panchayat (PPs), Farmer Producer Organizations (FPOs), women's groups, fisherfolk in nine sites across seven project districts. Discussions were also held with key institutions of Government of Odisha, including Department of Minor Irrigation, Department of Agriculture, Department of Horticulture, Department of Forestry, State Dam Safety Organization (SDSO) among others.

The key impacts associated with the project financed activities include: the incremental increase in pesticide and fertilizer use; ensuring safety of existing large dams and their associated structures; water quality impacts associated with pisciculture and incremental pesticide, fertilizer usage; disposal of top soil/ earth material generated from digging of bore well and re-sectioning of MI tank; disposal of residual waste like sand, stone chip, metal, wood chips, plastic (from packing material) generated due to construction and demolition activity; dust and noise impact on sensitive receptors like school, health care centre; odour pollution from biodegradable fish waste generated from fish processing activity, food

waste, improper dumping of aquatic weeds, and general health impact on workers due to civil works in the rehabilitation of tanks and irrigation systems.

The focus of the project is to rehabilitate and modernize existing irrigation systems, hence activities will be limited and localized and managed with proper mitigation measures and good engineering design and construction management practices. A detailed analysis of safeguard issues and impacts associated with the project has been carried out as part of the preparation of Environmental Management Framework. The assessment reveals no large scale, significant and/or irreversible impacts due to the proposed project interventions. The project will screen for and avoid undertaking activities that may cause negative impacts on natural habitats, physical cultural resources (PCR) and sensitive environmental receptors.

Environmental Management Plans (EMPs) are prepared for dam safety, pest and nutrient management, civil works and pisciculture to manage associated impacts. The state has an effective dam safety programme in place, with a dam safety panel constituted, and institutional arrangements agreed with Govt. of Odisha (GoO) for OIIPCRA to ensure dam safety in 13 dams above 10 m height identified in the project. Civil works EMP provides mitigation measures to address all related environmental issues like disposal of silt, weed waste and C&D waste generated from construction and renovation work is developed. Training will be provided to farmers, members of PP, SHG, PFC, etc. on implementation of Integrated Pest and Nutrition Management Plan (IPNM), sustainable climate resilient agriculture and pisciculture practices.

The State Project Unit (SPU) established within DoWR is responsible for day-to-day management and coordination of project activities. The SPU will be headed by a Project Director and will be staffed with experts in procurement, financial management, environment and social safeguards, M&E as well as other technical skills e.g. agribusiness, fisheries, etc., that are needed for effective project implementation. At the district level, there will be a District Project Management Team (DPMT), comprising of the Executive Engineer – Minor Irrigation, Project Director Agricultural Technology Management Agency (ATMA), Deputy Director – Horticulture, Deputy Fisheries Officer, and the Executive Engineer – Panchayati Raj. The office of the APC will ensure inter-departmental coordination and integration of workplans and budgets, and effective monitoring of project progress and outcomes. The District Project Management Team, will be chaired by the DC, and will be charged with project execution. The monitoring cell established in the office of the DC will be responsible for regular tracking of project activities at the district level.

A Project Steering Committee (PSC) comprising the Principal Secretaries of Department of Finance, DoWR, DAFE, DoF, Panchayat Raj, and OSAMB, and chaired by Chief Secretary, will be established to provide overall strategic and policy guidance during project implementation and to approve annual workplans and budgets. The PSC will meet at least twice a year to review overall implementation progress.

The EMF includes detailed budget provisions for mitigation measures and capacity building, monitoring and reporting requirements at all levels of project implementation, and concurrent and periodic monitoring and evaluation. Environment specialist the SPU will support the overall implementation of the EMF in the project. The Environment specialist together with the sector specialists, will carry out the requisite monitoring, reporting, and capacity building activities. Additionally, district-level nodal officers of respective line department will support periodic monitoring in association with sectoral experts and Environment Specialist of the SPU. External M&E agency will carry our concurrent monitoring of EMP implementation on quarterly basis and conduct mid and end term evaluation and an external QC/QA agency will be responsible for the quality check of civil works. Capacity building programme across all implementing agencies will be provided to support effective environment, health and safety management practices and integration of the EMPs in the proposed interventions.

Chapter 1: Introduction

1.1 Project Background

Even after transition from a predominantly agro-based economy, agriculture remains a key sector, providing employment and livelihoods to more than 62 percent of the population, and contributing close to 20 percent to the Odisha State's GDP. Like much of India, agricultural growth in Odisha has been low[1], and inadequate to ensure food security[2], effectively contribute to reducing malnutrition[3], and reduce poverty, especially in rural areas[4], where more than 80 percent of the state's poor reside.

Key constraints to improve agricultural sector growth include:

- *Low productivity*: For example, an average farm in Odisha produces only 58 percent, 47 percent, and 22 percent respectively, of the demonstrably achievable yields of paddy, pulses, and sesame;

- *Limited diversification*: Between 2014-2017, for example, the total area devoted to food grains in Odisha increased, while the area under spices, vegetables, fruits, and floriculture - a proxy for diversification - declined[5];

- *Limited access to reliable irrigation*: of the total cultivable area of 8.7 million hectares (ha), only 1.9 million is under irrigation. Only 34 percent[6] of the total irrigation potential of 5.5 million ha has been developed, and groundwater use is negligible despite generally high groundwater levels that in some places lead to waterlogging and flooding;

- *Inadequate management of water resources*: Weaknesses exist in the management of ground and surface water, which comes at a high cost in view of climate change. There is limited stakeholder involvement in decision making on water, and a zero-sum approach to irrigation rehabilitation even in cases where there is scope for win-win outcomes in terms of water availability;

- *Dysfunctional or non-existent value chains for important crops*: Supply chains for most crops are fragmented and uncoordinated, often involving multiple layers of intermediaries in some places, and no players in many other places. Additionally, there are no reliable market information systems to inform farmers' decisions on production and marketing; and

[1] Averaging 2.8 percent per year between 2011-2017, but also characterized by negative growth every alternate year

[2] Based on the Food Security Outcome Index, out of Odisha's 30 districts, only 1 is food secure, 5 are moderately secure, 6 moderately insecure, 13 severely insecure and 5 extremely insecure

[3] 34 percent and 20 percent of children <5 are stunted and wasted respectively, and 8 percent are severely malnourished.

[4] About 36 percent of the rural population continue to subsist below the poverty line.

[5] Government of Odisha, 2018: Odisha Economic Survey of 2017-18.

[6] PAD of OIIPCRA

- *Weaknesses in institutional planning and coordination*: There is suboptimal coordination and cooperation among Government of Odisha (GoO) departments with the joint responsibility of implementing programs in support of agricultural growth (i.e. Department of Agriculture and Farmer Empowerment - DAFE, Department of Water Resources - DoWR, Department of Fishery and Animal Resources Development, Department of Cooperation - DoC, and the Department of Energy). This has often led to inefficient integration, implementation and delivery of services to farmers, thus undermining the impact of government interventions.

In this context, Odisha faces a complex and interconnected constellation of challenges in agriculture: improving sector growth to ensure food security, better nutrition outcomes and double farmers' income, managing its water resources in a more sustainable manner while avoiding climate change impacts and reducing sector GHG emissions - to lessen both the extent of climate change and future needs for adaptation.

The proposed Odisha Integrated Irrigation Project for Climate Resilient Agriculture (OIIPCRA) contributes to these ongoing efforts. The proposal is to support: (i) improved crop productivity for food security and income growth; (ii) farmer adoption of resilient agricultural practices and technologies (both adaptation and mitigation); (iii) diversification[7], especially during the *Rabi* (winter) season and for some areas under upland rice in *Kharif* (monsoon), for income growth, improved nutrition and adaptation to climate change; (iv) more efficient water use and, better quality and reliability of irrigation service delivery; (v) a better framework for more efficient and sustainable management of surface - and groundwater resources; and (vi) improved produce marketing in 15 districts in Odisha. The districts are selected mainly because of high poverty levels, vulnerability to droughts and limited access to reliable irrigation services.

Table 1: Project Particulars

Project Title	Odisha Integrated Irrigation Project for Climate Resilient Agriculture (OIIPCRA)
Proponent	Water Resources Department, Govt. of Odisha
Project Development Objective	To intensify and diversify agriculture production, enhance climate resilience and improve water productivity in selected cascades of Odisha
Financial Support	Govt. of India, Govt. of Odisha and The World Bank
Number of Project Districts	15 Districts
No. of Agro-Climatic Zones	Seven Agro-Climatic Zones (ACZs)
Covered River Basin	4 Nos.
No. of Blocks	98 blocks
No. of MIPs	538
Designed Command Area (in Ha.)	56,293 (Kharif) and 6, 543 (Rabi)
Life Span of the Project	6 Years

1.2 Project Area

The project is planned to be executed in 15 districts of the State which is 50.0 percent of the total districts of the State (Odisha is having 30 administrative districts). The project has identified 538 minor irrigation tanks which will be taken up for intervention, covering a total geographical area of 1.03 lakh ha. spread over 98 blocks of 15 districts. The project intends to minimize the current gap ayacut, improve water use efficiency, enhance water productivity, strengthening participatory irrigation management system and support in facilitating climate resilience in the tank command and beyond.

[7] We define diversification as reducing the emphasis on food grains and increasing the share of high-value agriculture. This will be done taking into account the country policy intent to shift rice production to relatively more water-abundant states like Odisha.

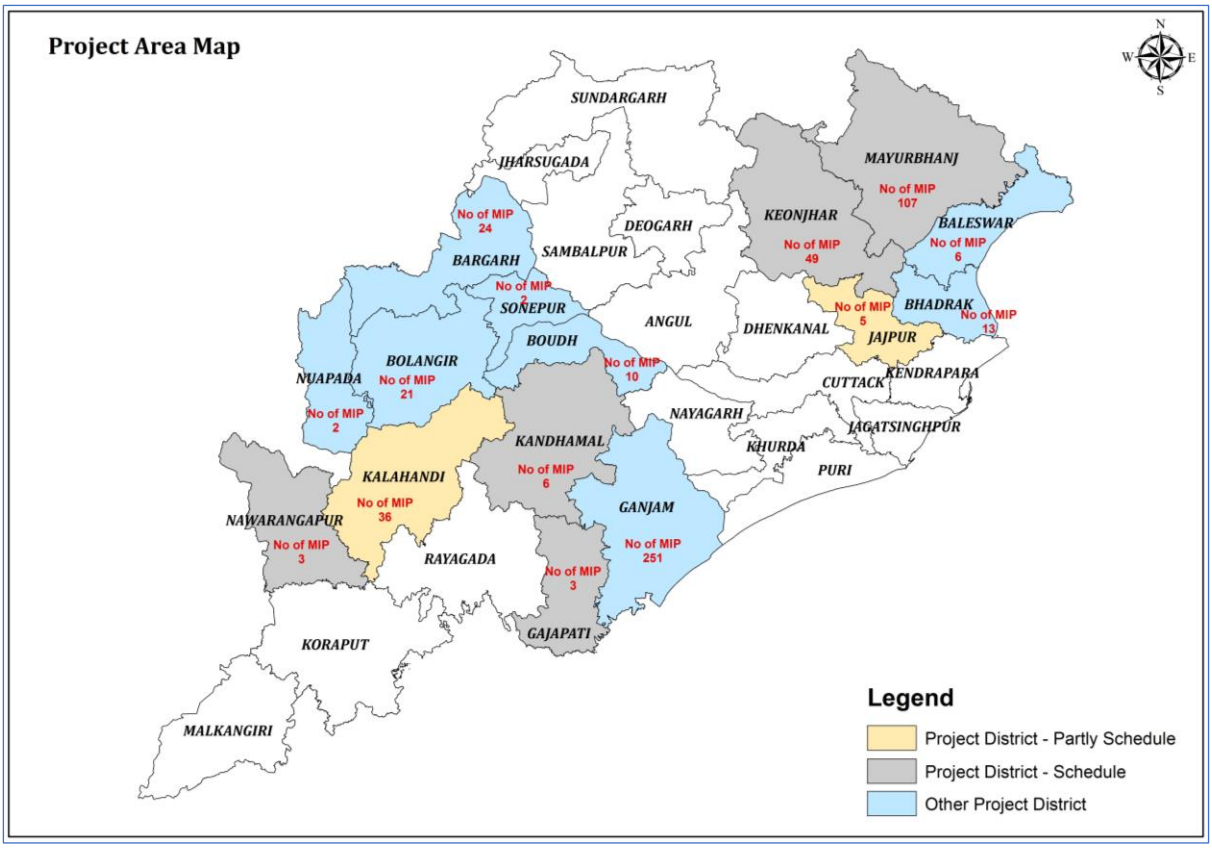


Figure 1: Odisha map showing project districts

Table 2: Details of Minor Irrigation Project considered under OIIPCRA

District	Reservoirs				Diversion Weirs			
	No. of Project	Catchment in Sq. Km	Kharif Designed CCA (Ha)	Rabi Designed CCA (Ha)	No. of Project	Catchment in Sq. Km	Kharif Designed CCA (Ha.)	Rabi Designed CCA (Ha.)
Balangir	15	165.18	3288	623	6	132.51	1521	0
Balasore	1	1.5	42	0	5	51	414	0
Bargarh	19	76.48	1838	279	5	20.95	388	0
Bhadrak	1	3	40	0	12	104.3	1316	60
Boudh	10	18.96	755	0	0	0	0	0
Gajapati	3	16.22	351	121	0	0	0	0
Ganjam	207	519.42	13704.5	591	44	589.83	4445.2	131
Jajpur	0	0	0	0	3	41.6	348	0
Kalahandi	21	74.85	1456	222	15	106.75	2099	202
Kandhamal	1	3.89	109	20	5	22.19	343	30
Keonjhar	33	291.79	9066	2422	16	186.72	2949	635
Mayurbhanj	74	255.57	6397	733	33	414.04	4869	316
Nabarangpur	3	3.56	125	8	0	0	0	0
Nuapada	1	1.05	45	0	1	2.5	41	0
Subarnpur	2	3	94	0	0	0	0	0
Total	391	1434.47	37310.5	5019	145	1672.39	18733.2	1374

***Note**: Two (2) nos. of creeks with cumulative catchment area of 61 sq.m, kharif design CCA of 250 Ha. and rabi design CCA of 150 Ha. located at Jajpur district are also included under OIIPCRA project for intervention.*

1.3 Project Development Objective (PDO) and Components

The project objectively looks at restoration / improvement of the existing irrigation systems, minimize run-off loss, increase water availability in the water bodies within the basin / sub-basins, minimize the gap ayacut with improvement in demand and supply side management, strengthening irrigated agriculture system and over and above improve climate resilience in agriculture sector with water

conservation and management. The project intends to completely restore and renovate the irrigation projects to be taken up in and around four important river basins at the state level.

The Project Development Objective is "**to intensify and diversify agriculture production, enhance climate resilience and improve water productivity in selected cascades of Odisha**". The proposed project will focus on small and marginal farmers, Water Users Associations (WUA / PP), Farmer Producer Organizations (FPO / FPC) and other agricultural entrepreneurs, including women and other vulnerable groups.

The project has four components, i.e., (1) **Project Component A**: Climate-Smart Intensification and Diversification of Production, (2) **Component B**: Improving Access to Irrigation and Water Productivity, (3) **Component C**: Institutional Capacity Strengthening, and (4) **Component D**: Project Management. The Component (A) has three sub-components, i.e., (1) **Sub-component A.1**: Support to Improved Productivity and Climate Resilience, (2) **Sub-component A.2**: Support to Fish Production and (2) **Sub-component A.3:** Support to Diversification and Produce Marketing. Component (B) has two sub-components, i.e., (1) **Sub-Component B.1**: Support to Water Sector Reforms, and (2) **Sub-Component B.2**: Support to Investments in Cascades.

1.4 Project Components / Sub-Components

The project components and sub-components are discussed below.

Component A: Climate-Smart Intensification and Diversification of Production

The objective of this component is to increase agricultural productivity, strengthen the capacity of organized farmer groups to cope or adapt to climate change stresses affecting crop production, and diversify production in Rabi in response to effective demand as expressed by pre-identified commercial off-takers or gleaned from other reliable market signals. Support under this component is proposed to be organized around two mutually inclusive, overlapping and reinforcing subcomponents.

Sub-component A.1*: Support to Improved Productivity and Climate Resilience*

The objectives of the sub-component in the agriculture sector (agriculture and horticulture) are; (i) Reduce the cost of production; (ii) Enhance productivity and climate resilience through technology adoption; (iii) Crop diversification towards market oriented high value crops and (iv) Promote agribusiness through supply chain management and value chain improvement. In this context, the project plans to take up agriculture and horticulture interventions along with Agri-business interventions. The sub-component objectively looks at promoting agricultural technologies that are sustainable and climate resilient vis-à-vis supports improving income of the farmers.

Specific interventions under the project area, (1) promotion of climate resilient seed varieties, (2) Demonstration of climate resilient technologies, (3) Strengthening the extension system, (4) Price forecasting of different commodities, (5) establishment of market infrastructures / processing units, (6) organizing and strengthening farmer's groups, and (7) capacity building of different stakeholders. This sub-component will be executed by the Department of Agriculture and Farmers Empowerment (DAFE) (the Directorate of Agriculture & Food Production and the Directorate of Horticulture are the implementing agencies for agriculture and horticulture interventions, respectively).

Sub-component A.2*: Support to Fish Production*

The project intends to have a holistic approach, in terms of fishery promotion in the project tanks. The project approach to intervene in providing end to end solution, i.e., from seed production to market

linkage where capacity building will be a cross cutting in all the project activities. Based on the feasibility of the tanks, the project will focus on seed promotion augmentation of inland species, improvement of existing hatcheries, establishment of captive nurseries, fish production and management support and facilitating marketing of the produce by providing facilities to the fishermen folk.

The fishery sector intervention objectively looks at (1) increasing the income of fishers by utilizing project tanks / water bodies, (2) propagation of scientific fish farming technologies among the fishers for improved production, (3) strengthening pure line fish seed production and supply chain management, (4) demonstrating intensive and semi-intensive fish farming in the ponds in the project area for higher return to the fishers, (5) strengthening post-harvest management through infrastructure and support to fishers; and (6) support to selected Fishermen Cooperatives and Government Institutions for fishery-based enterprise.

***Sub-component A.3**: Support to Diversification and Produce Marketing*

The objective of this subcomponent is twofold: (i) support farmers to reduce the current emphasis on food grains (especially paddy and wheat) and increase the share of high-value agriculture (e.g. fruits, spices and vegetables) in their overall production structure; and (ii) improve produce marketing to reduce price risks associated with diversification, increase incomes, and ensure sustained farmer adoption of CSA practices. A successful shift in favor of more diversified production would also result into improved nutrition outcomes for farmers and the broader community, help reduce the water footprint of paddy, foster biodiversity, and strengthen resilience of the production systems to climate change.

Under this component, the project would fund Technical Assistance (TA) to the Department of Agriculture and Farmers Empowerment to promote and build productive alliance models for these and other competitive value chains that could emerge during implementation. To support productive alliances, the project will provide funding for (i) increasing farmer awareness of diversification opportunities; (ii) continuous identification of competitive value chains; (iii) farmer experimentation with new crops and training/demonstration of relevant production technologies; (iv) training farmers on production and marketing skills (including on input sourcing, production, aggregation, and new technologies, among others); (v) business plan development; (vi) fostering linkages with the financial sector or other government programs for access to credit; and (vii) financing – on a cost-sharing basis – of selected productive investments identified in the business plans. Project support to crop diversification will be based on agronomic/agro-ecological suitability, comparative advantage of specific cascades, local and national or international market opportunities.

Component B: Improving Access to Irrigation and Water Productivity

Access to reliable irrigation is generally critical to enhancing crop productivity, building resilience to climate change, promoting diversification and access to markets, specifically in the targeted project areas that are characterized by frequent droughts and rainfall variability. The objective of this component is "to increase water use efficiency, reduce water losses and save water during Kharif season, and transfer these savings to Rabi season." To realize this objective, the project will support modernization of hydraulic assets, institutional reforms, and capacity strengthening.

***Sub-Component B.1**: Support to Water Sector Reforms*

Crop diversification and intensification require a higher quality of irrigation service delivery to meet the requirements of grown crops. Traditional arrangements for irrigation management often lack the capacities and incentives to deliver these improved services. The project will pursue institutional

reforms and strengthen decentralized irrigation system management along with incentivizing local Pani Panchayats/ Water User Association to deliver high performing irrigation and O&M services.

Under this sub-component (1) project will support the introduction of Integrated Water Resources Management (IWRM) in one catchment on pilot basis, (2) regulation related to ground water extraction for irrigation will be reformed, (3) support the establishment of a PP support unit within the DoWR, (4) conduct a study into options for PPP in irrigation management to increase the efficiency of water use and improve the quality of irrigation service delivery.

***Sub-Component B.2**: Support to Investments in Cascades*

Under this sub-component, the project will invest in the modernization of hydraulic assets. To that end, a comprehensive water assessment will be conducted in the Project cascades to identify opportunities for reducing water losses and for transferring the savings water for Rabi season. For each of these opportunities, the implications on downstream water use will be identified through preparation of a pre and post-project tank / cascade-wide water balance. Investments include strengthening of canal bunds, modernizing hydraulic canal structures, installation of field channels and sub-surface pressurized pipes, and developing groundwater extraction in safe zones.

Component C: Institutional Capacity Strengthening

This component will primarily strengthen the existing Pani Panchayats (PPs) / Water User Association formed under Odisha Pani Panchayat Act, 2002. Measures will be taken under the component to strengthen the functional and management capacity of the PPs by which they can take up management and maintenance of community-based irrigation infrastructures; apart from water distribution, regulation and efficient use of available water resources. Along with this, capacity building of other local institutions will be taken up such as Farmer Producer Organizations (FPOs), SHGs, etc. Apart from this, the project will take measures for capacity building of Engineers and other stakeholders associated in the project. This component will also support in strengthening OUAT, Bhubaneswar in terms of establishing different centres at the OUAT.

Component D: Project Management

This component will strengthen capacities for project management, monitoring and evaluation (M&E) (including, inter alia, the areas of procurement and financial management) through the provision of goods, consultant services, training, and financing of incremental operating costs. This component will also develop a comprehensive management information and data collection and reporting system on key performance outputs and impact indicators through baseline surveys, participatory assessments, mid-term reviews and final evaluations. Staffing of the SPU will include a number of technical, financial management, M&E and safeguards (social and environmental) experts. Detailed implementation arrangements will be spelled out in the Project Operational Manual (POM). Regular training of SPU staff will be organized to strengthen their capacities to implement the project.

1.5 Implementation Arrangement

The project will be implemented by three line-departments, i.e., (1) Department of Water Resources, Government of Odisha, (2) Department of Agriculture and Farmers Empowerment, Government of Odisha, and (3) Department of Fishery and Animal Resource Development, Government of Odisha, with clearly defined role and responsibilities. The State Project Unit (SPU), located within the Minor Irrigation Department office, will lead the implementation. A Technical Steering Committee, headed by the Chief Secretary, Government of Odisha will be the overall review and policy support system. At

the district level, the office of the Collector and District Magistrate will be the nodal to steer the project and there will be a district level committee, in the name of District Level Project Monitoring Team (DLPMT) to monitor and supervise the project activities.

1.6 Project Duration

Proposed project will be implemented over a period of 6 years starting from 2019 to 2025.

1.7 Objective and Scope of EMF

Principal objective of carrying out environmental assessment for development of Environment Management Framework (EMF) is to identify significant baseline environmental features and all possible impacts due to project implementation. Management framework for all identified environmental issues is prepared to manage identified issues/ challenges. Standalone plan on Integrated Pest and Nutrition Management (IPNM), and Fishery Management is also be developed as part of EMF. Environmental enhancement plan is also suggested to improve potential positive environmental impacts of the project interventions. Environmental assessment is objectively designed to prepare Environmental Management Framework (EMF) of the project, adhering to the World Bank Operational Policy (OP) and need of the project. This is a prerequisite to meet World Bank Safeguard Policies which will ensure that the project activities do not cause any adverse environmental impact and follow the applicable national and state regulations. The EMF is developed on the basis of environmental assessment in the identified project locations.

1.8 Approach and Output

Environmental assessment and capacity assessment were conducted for preparation of EMF. Primary as well as secondary information were used for environmental assessment purpose. Secondary information were collected from respective Govt. departments, project authority and other published sources like internet. Internet based GPS survey was also carried out to ascertain different environmental features within project area. Total 9 MIPs were considered for collection of primary environmental information. All this information was analysed thoroughly to ascertain significant baseline environmental conditions.

Anticipated environmental impacts due to implementation of project activities were assesses and suitable mitigation measures along with monitoring plan, implementation arrangement with budgetary provision is devised.

A state level consultation workshop on disclosure of EMF was conducted to obtain feedback of different stakeholders. Representative from all concerned stakeholders were invited in this workshop. Recommendation and feedback of stakeholder's is incorporated in draft version of EMF to make it final EMF.

1.9 Structure of the document (including EMF components)

Report has four parts, common Introduction, Part A: Environmental Assessment, Part B: Environmental Management Framework and Annexures.

Chapter 1: Background to the project, proposed activities and need and rationale for preparation of the EMF.

Part A: Environmental Assessment

Chapter 2: Applicable law and regulation of Govt. of India, Govt. of Odisha and operational policies of the World Bank in relation with protection and sustainable management of environment are described. Regulatory clearance requirement for project implementation is also described.

Chapter 3: Analysis of all stakeholder's concern in relation with project implementation and operation from environmental point of view.

Chapter 4: Summary of baseline environmental findings are provided. Detail description of baseline environmental condition is placed at Annexure III.

Chapter 5: Anticipated negative impacts due to project implementation.

Part B: Environmental Management Framework

Chapter 6: Proposed mitigation measures to address all identified negative impacts due to project implementation are framed. Non-permissible activities as well as monitoring of mitigation measures, reporting system and mid-term and end-term audit requirement are also described.

Chapter 7: Institutional arrangements, capacity building programme and EMF implementation budget are provided.

Part A – Environment Assessment

Chapter 2: Applicable Environmental Laws and Regulations

Proposed OIIPCRA would be governed by various Acts, Rules and regulations enforced by Ministry of Environment, Forest and Climate Change (MoEF&CC) at the Central level and other regulatory agencies at the State and local levels. Various environmental standards, specifications and guidelines of Central Pollution Control Board (CPCB) and state level agencies will also be applicable.

2.1 Environmental Policies, Laws and Regulations

The list of relevant environmental policies, laws and regulations by Government of India as well as State Govt. of Odisha and their applicability to the project is discussed in below Table.

Table 3: Applicable Environmental Legislations and Specific Requirements for the Project

Sl. No.	Legislation	Description	Regulator	Applicability
	National Policies			
	India's Constitutional Provisions	Article 48-A - lays down a directive principle noting that the state shall endeavour to protect and improve the natural environment. Article 51-A - specify fundamental duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers, and wildlife, and to have compassion for living creatures	MoEFCC, CPCB, Bio-diversity Board	Applicable
	National Conservation Strategy & Policy on Environment & Development, 1992	Policy emphasizes on sustainable and equitable use, prevent and control future deterioration of environmental resources; take steps for restoration of ecologically degraded areas and for environmental improvement.	MoEFCC, CPCB, Bio-diversity Board	Applicable
	National Environmental Policy, 2006	Objective of this policy is to conserve critical environmental resources, integration of environmental concerns in developmental process, efficient use of environmental resources,		Applicable
	National Water Policy, 2012	Policy states that water should be treated as an economic good so as to promote its conservation and efficient use and depletion of ground water should be arrested by introducing improved technologies of water use and incentivizing efficient water use	Ministry of Water Resources, Govt. of India	Applicable
	National Agricultural Policy, 2002	The policy seeks to promote technically sound, economically viable, environmentally non-degrading use of natural resources – land, water and genetic		Applicable

Sl. No.	Legislation	Description	Regulator	Applicability
		endowment to achieve sustainable development of agriculture. The policy while stressing on conjunctive use of surface and ground water intends to promote on-farm management of water resources to optimize use of irrigation potential		
	National Policy of Farmers, 2007	It stresses on rainwater harvesting and aquifer recharge for ensuring sustainability of supply and the need for regulation and control of the development and management of ground water resources.		Applicable
	State Policy			
	State Agriculture Policy, 2013	One of the main objectives of this policy is adoption of INM, IPM, water management, farm mechanization and technology transfer;		Applicable
	Odisha Food Processing Policy'2016	One of the main objectives of this policy is to establish Food Processing Parks and common facilities in terms of warehouses, cold storages, laboratories, packaging and reduce wastage		Applicable
	State Action Plan on Climate Change 2015-2020	Objective is to reduce climate vulnerability, mitigate greenhouse gas (GHG) emission, and enhance resilience and adaptation capability. Total 12 sectors including Agriculture, Fishery, Water Resource and Waste Management are prioritized based on urgency, barriers, continuity and co-benefits (emissions, livelihood resilience and environmental benefits).	Climate Change Cell under Department of Forest and Environment	- Applicable - (Intensification of agriculture may lead to GHG gas emission, policy level changes will promote ground water extraction for irrigation purpose, renovation of irrigation structure will generate C&D waste, cleaning of MI tank to promote fishery which will generate aquatic waste)
A	**National Level**			
1.	Water (Prevention and Control of Pollution) Act, 1974, amended 1988 and it's Rules, 1975.	For the prevention and control of water pollution by controlling discharge of pollutants and maintaining or restoring of wholesomeness of water as per prescribed standards.	Odisha State Pollution Control Board (OSPCB)	- Applicable - There will be generation of wastewater and other water-based pollutants during construction and operations.
2.	Air (Prevention and Control of Pollution) Act, 1981, amended 1987 and it's Rules, 1982.	For prevention, control and abatement of air pollution activities. Establishes ambient air quality standards.	OSPCB	- Applicable - Applicable for construction equipment and machinery's potential to emit air pollution (including transporting vehicles); - The project involves digging, spoil dumping, etc., which will generate fugitive dust.
3.	Environmental (Protection) Act, 1986	To protect and improve overall environment.	MoEFCC, GoI	- Applicable

Sl. No.	Legislation	Description	Regulator	Applicability
	amended 1991 and associated rules / notifications	This act essentially links pollution and natural resource issues. It seeks to supplement existing laws on pollution control and also lays down standards for air quality and noise. For protection and improvement of environment and the prevention of hazards to human beings, other living creatures, plants and property.	CPCB, OSPCB	This is an umbrella legislation for protecting the environment. Many rules/ notifications are formed under this act. As per this Act, the responsibility of administering this legislation rests on the MoEFCC, Central Pollution Control Board (CPCB), and SPCB
a.	EIA Notification, 2006 as amended in 2009 and 2013, 2016	To provide environmental clearance to new development activities following an EIA. Sets out the requirement for environmental clearance to new development activities following an EIA for specified activities/projects.	MoEFCC and SEIAA, Odisha	- Not Applicable[8]. - This is renovation of existing minor irrigation network. - None of the project activities are included in the list of projects requiring Environmental Clearance.
b.	Environment (Protection) Rules, 1986 including amendments.	These rules include specifications on: -Standards for emissions or discharge of environmental pollutants -Prohibitions and restrictions on the location of industries -Procedure for taking samples and submission of samples for analysis, -Prohibition and restriction on the handling of hazardous substances in different areas -Submission of environmental reports	OSPCB	- Applicable - Compliance with emission and disposal standards during construction work.
c.	Municipal Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing and disposal.	OSPCB	- Not Applicable This is applicable in municipal area. MIPs are located in rural areas.
d.	Construction and Demolition Waste Management Rules, 2016	Rules to manage construction waste resulting from construction, remodeling, repair and demolition of any civil structure.	OSPCB	- Applicable - Construction and demolition waste generated from the project works shall be managed and disposed as per the rules
e.	Hazardous and other Wastes (Management and Transboundary	- Rules defines and classifies hazardous waste, and procedures for handling and storage	CPCB and OSPCB	- Applicable - Used engine oil, gear oil, hydraulic oil, spent oil,

[8] The Gazette of India, extraordinary, Part-II, and section (3), sub-section (II), Ministry of Environment and Forest dated 14th September, 2006 notification (S.O. 1533) reads that "… ***the required construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the Schedule to this notification entailing capacity addition with change in process and or technology shall be undertaken in any part of India only after the prior environmental clearance*** *from the Central Government or as the case may be, by the State Level Environment Impact Assessment Authority,…*".

Sl. No.	Legislation	Description	Regulator	Applicability
	Movement) Rules, 2015	- Requires Pollution Control Board's consent for handling hazardous waste - Provides procedures for recycling, reprocessing or reuse, import and export of HW - Rules for development of treatment, storage, disposal facility (TSDF) for hazardous wastes		lubricants etc. will be generated during construction, demolition and re-sectioning.
f.	Noise Pollution (Regulation and Control) Act, 1990 and Rules, 2000.	Standards for permitted level of noise during the day and night have been promulgated by the MoEFCC for various uses. The increasing noise level in public places from various sources have detrimental effects on humans and thereby it is considered necessary to regulate and control noise generating sources to maintain ambient air quality standards through a set of rules. The ambient air quality standards are achieved through enforcement of noise pollution control measures and restrictions on the use sound producing instruments. In case of any violation in silence zone area, complaints to be made to authority and power to prohibit continuance of music sound or noise also falls under within these rules	OSPCB	- Applicable - Noise will be generated during project implementation stage due to different activities like construction, operation and movement of vehicle, heavy equipment.
g.	Notification of Eco Sensitive Zones (ESZs)	ESZs are of significant ecological importance, and to conserve and protect the natural resources and living beings, several zones are declared in the country as eco sensitive zones by notifications. Besides for specific reasons, buffer areas around protected areas (national park, wildlife sanctuaries etc.,) are also declared as ESZ in this notification. - Restriction of activities (including construction, tree cutting, etc.) in the notified zones -Any project activity located in ESZs will require prior permission from ESZ monitoring committee	Forest Department, GoO and MoEFCC	- Not applicable - None of the project activity falls within declared ESZ
h	Wetland (Conservation and Management) Rules, 2010	-For the protection of wetlands and restriction of certain activities within wetlands, provides a regulatory mechanism	Central Wetlands Regulatory Authority	- Not applicable - None of the project activity area falls within the wetlands listed under the Rules.

Sl. No.	Legislation	Description	Regulator	Applicability
		-Applies to protected wetlands notified under the rules (which include Ramsar sites; wetlands in ESZs /United Nations Educational, Scientific and Cultural Organization (UNESCO) sites, high altitudes, etc.) - Rules prohibit: reclamation of wetlands, expansion/ setting new industries, hazardous waste storage, disposal., discharge of untreated effluent, permanent construction within 50 m HFL, etc., -Activities such as the following are regulated: water withdrawal/diversion, treated effluent discharge, dredging, repair of existing infrastructure, buildings and construction		
i	Coastal Regulation Zone (CRZ) Notification, 2011	Protection of fragile coastal belts. This supersedes the CRZ Notification issued in 1991; to ensure livelihood security to the fisher communities and other local communities, living in the coastal areas, to conserve and protect coastal stretches, its unique environment, promote sustainable development considering natural hazards, sea level rise due to global warming Declares coastal stretches as CRZ and restricts new construction, and industrial activities. CRZ (landward side) include the following: (i) land area from High Tide Line (HTL) to 500 m on the landward side on the sea front: (ii) land area between HTL to 100 m or width of creek whichever is less on the landward side along the tidal influenced water bodies connected to sea and; (iii) land area between HTL and LTL. Notification defines CRZ in I. II, III, IV Categories based on the environmental sensitivity and existing development.	Odisha Coastal Regulation Zone Management Authority (CRZMA)	- Not Applicable - Proposed project is renovation of existing irrigation facilities with promotion of pisciculture in irrigation tank. Proposed project activities are outside the CRZ demarcated zone.
j	Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989	- Defines hazardous chemicals - Stipulates rules, procedures to manufacture, storage and import of hazardous chemicals - Requires permission,	Various agencies	- Not Applicable - (Use and storing of any kind of hazardous chemical beyond permissible limit during construction, or any other

Sl. No.	Legislation	Description	Regulator	Applicability
		authorization from various agencies if the total storage exceeds specified quantity; - Requires emergency management plan		project activity, will trigger this rules)
4.	Indian Wildlife (Protection) Act, 1972 amended 1993 and Rules 1995; Wildlife (Protection) Amendment Act, 2002	To protect wildlife and preserve national parks and sanctuaries An Act to provide comprehensive protection of wild animals, birds and plants. This would cover matters concerning appointment of forest authorities, hunting of wild animals, protection of specified plants, conservation of national parks and sanctuaries, trade / commerce in relation to plants and animals and prevention of any offences. Wildlife protected areas are notified under this act.	National Board of Wildlife / State wildlife boards	- Not applicable, - None of the project activities will be taken up in protected areas. Project activities are confined within tank command area.
5.	Indian Forest Act, 1927	To check deforestation by restricting conversion of forested areas into non-forested areas The Indian Forest Act 1927 was enacted to consolidate the law relating to forests, the transit of forest-produce and the duty leviable. Applies to reserved forests, village forests, and protected forests. This act also concerns lands not being the property of government. Provides penalties and procedures with regard to all property, cattle trespasses and powers of Forest officers; declaration of forest areas (reserved, protected and village forests), and regulation of activities within the forests	MoEFCC Odisha Forest Department	- Not Applicable - Proposed renovation of irrigation network and promotion of pisciculture will be restricted within design command area. Renovation work will be undertaken without disturbing or diverting any forest or forest fringe area. Proposed project activities under OIIPCRA do not include any part of forest area.
6.	Forest (Conservation) Act, 1980, amendment 1988	Act provides for conservation of forests Restricts the de-reservation of forests or use of forest lands for non-forest purpose Non-forest purpose means breaking up or clearing of any forest land - Restricts use of forest lands for non-forest purposes - Requires prior permission to take up the works	MoEFCC Odisha Forest Department	- Not Applicable - Proposed renovation of irrigation network and promotion of pisciculture will be restricted within designed command area. Renovation work will be undertaken without disturbing or diverting any forest or forest fringe area. Proposed project activities under OIIPCRA does not include any part of forest area.
8.	Ancient Monuments and Archeological Sites and Remains	Conservation of cultural and historical remains found in India	ASI	- Not Applicable - There exist no nationally protected monuments within

Sl. No.	Legislation	Description	Regulator	Applicability
	(Amendment and Validation) Act, 2010	Act for better and effective preservation of the archaeological wealth of the country, on par with constitutional provisions This Act provides for the preservation of ancient and historical monuments and archaeological sites and remains of national importance, for the regulation of archaeological excavations and for the protection of sculptures, carvings and other like objects. - Notifies 100m around the monument as prohibited area and 100 to 200m as regulated area for construction works; - No excavation/construction work is allowed within 100m boundary of the protected monument; - Requires prior permission of Archaeological Survey of India (ASI) for taking works within 100-200m of the boundary of protected monuments		200 m periphery of proposed project activity sites.
9.	Notification for use of fly ash, 2003 and subsequent amendment, 2016	Reuse large quantity of fly ash discharged from thermal power plant to minimize land use for disposal. - Any construction agency engaged in construction of building with a radius of 300km of coal or lignite based thermal power plant (TPP) shall use only fly ash-based product for construction. - Fly ash shall mandatorily be utilized in asset creation programmes of the Govt. involving construction of building, road, dams and embankment. - Fly ash shall be used in soil conditioner. - Fly ash-based bricks or product shall be used in construction under all Govt. scheme or programme.	MoEFCC	Applicable Presence of TPPs within 300 km radius of proposed project activities are observed. Project activity involves construction of field channels and renovation of irrigation control structure.
10.	Public Liability and Insurance Act, 1991	Protection from hazardous materials and accidents	SPCB	- Applicable Used engine oil, gear oil, hydraulic oil, spent oil, lubricants etc. will be generated during construction, demolition and re-sectioning work.

Sl. No.	Legislation	Description	Regulator	Applicability
11.	Insecticides Act, 1968, Rule 1971	Use of registered and recommended insecticides and non-use of banned insecticides.	Central Insecticides Board and Registration Committees (CIB & RC)	- Applicable (Agricultural activities involve use of pesticide)
12.	Central Motor Vehicle Act, 1988 and Central Motor Vehicle Rules,1989	To check vehicular air and noise pollution	Motor Vehicle Department	- Applicable (During project implementation, there will be use of vehicles and these vehicles need to operate within permissible emission levels)
13.	Contract Labour (Regulation and Abolition) Act, 1970;	The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.	Chief Labour Commissioner, Government of Odisha	- Applicable to all construction works under OIIPCRA - Contractor to obtain a Certificate of Registration as the principal employer;
14.	Orissa Building & Other Construction Workers'(RE&CS) Rules 2002	A rule to regulate the employment and conditions of service of building and other construction workers and to provide for their safety, health and welfare measures and for other matters connected	Labour and Employment Department, Government of Odisha	- Applicable during construction work - Applicable to any building or other construction work employing 10 or more workers; - provide safety measures at the construction work and other welfare measures, first-aid facilities and housing accommodation for workers near the workplace etc.
15	Orissa Agricultural Produce Markets Act, 1956	An act to bring the state under the National Agriculture Market fold to provide better price to the farmers for their produce. The act will provide better regulation of buying and selling of Agricultural produce in the State of Orissa and establishment of Markets for agricultural produce.	Orissa State Agricultural Marketing Board	Applicable Improved irrigation facility and crop diversification along with agriculture value chain development will lead to increase in farm productivity.
16	The Seed Act 1966; Seed Rules 1968; Seeds (Control) Order 1983;	An Act to provide for regulating the quality of certain seeds for sale, and for matters connected therewith.	Central Seed Committee	Not Applicable None of the project activities involve certification of seed. Project does not intend in selling of seed

Sl. No.	Legislation	Description	Regulator	Applicability
17	Fertilizer Control Order 1985; Fertilizer Movement Control Order	Objective of this GO is to regulate equitable distribution of fertilizers and making fertilizers available at fair prices, and fix the maximum prices or rates at which any fertilizer may be sold by a dealer, manufacturer, importer or a pool handling agency	Department of Agriculture and Cooperation	Not Applicable Project does not intend in selling or purchase of fertilizer.

2.1.1 List of Regulatory Clearance Requirements

Regulatory clearance will be required mainly during implementation of construction activities. List of clearance to be obtained from different Govt. agencies are listed below.

Table 4: List of Regulatory Clearance Requirements

Sl. No.	Clearance Required	Applicable Regulation	Issuing Authority	Requirement	Responsibility
1	Consent to Establish (CtE) and Operate (CtO)	Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981	OSPCB	Consent shall be obtained before commencement of construction work for the plant and machinery, i.e. (Batching Plant, Crusher) required for the project.	Contractor
2	Pollution Under Control Certificate	Motor Vehicles Act, 1988		Contractor shall submit undertaking to Executive Engineer (EE- MI) on deployment of latest PUC certified vehicles and machineries and regular renewal of PUC certificate as per motor vehicle act	Contractor

2.2 World Bank Safeguard Policies[9]

The objective of World Bank's environmental safeguard policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for Bank and borrower in the identification, preparation, and implementation of programs and projects. They also provide a platform for the participation of stakeholders in project design. In essence, the safeguard policies ensure that environmental issues are evaluated in decision making, help reduce and manage the risks associated with the project and provide a mechanism for consultation and disclosure of information. The safeguards policies of the World Bank and the implications of these policies for the OIIPCRA project are discussed in Table 5.

[9] Environmental and social safeguard policies of the World Bank <https://policies.worldbank.org/sites/ppf3/Pages/Manuals/Operational%20Manual.aspx >

Table 5: Operational Policies and its Implications for the Project

Operational Policy	Triggered (Yes/No)	Summary of OP	Implications for the Project and Compliance Mechanism
OP 4.01: Environmental Assessment	Yes	The purpose of this policy is to help ensure the environmental and social soundness and sustainability of investment projects. The policy supports the integration of environmental and social aspects of projects in the decision-making process. The OP/BP 4.01 requires that the environmental consequences of the project are taken into consideration during the project cycle and are considered in selection, siting, planning and designing of projects. It emphasizes upon the mitigation measures so as to reduce the adverse environmental impact, if any.	The project aims at rehabilitation and restoration of irrigation infrastructure, agricultural and pisciculture improvement through various measures. These activities could result in adverse environmental impacts, if not properly designed, implemented and managed. An Environmental Management Framework has been prepared, and Environmental Management Plans have been prepared that will be used for managing potential impacts and risks and maximize environmental opportunities. The EMF also includes guidance on screening, a negative list of activities that project will not finance, suggests appropriate mitigation measures and includes a monitoring and capacity building plan for addressing environmental risks.
OP 4.04: Natural Habitats	Yes	The OP promotes environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions.	The project activities (construction works) are limited to existing tank system, irrigation regulatory structures and distribution system. These tanks may be located within proximity to natural habitats. The EMF proposes mitigation action to avoid any impacts to natural habitats from construction/ rehabilitation activities and aquaculture interventions. These include measures to reduce disturbance to avian and other faunal elements associated with the tanks and other smaller water bodies as well as provisions to reduce dust and noise pollution. Smaller water bodies will be protected against any possibility of damage and/or destruction.
OP 4.09: Pest Management	Yes	This policy seeks to minimize and manage the environmental and health risks associated with pesticide use and promote and support safe, effective, and environmentally sound pest management.	With improved availability of surface water, it is likely that use of pesticides may increase with agricultural intensification and diversification. However, the project does not intend to finance any activity that involves procurement of chemical pesticides which may have adverse human and environmental implications. Integrated Pest and Nutrient Management (IPNM) Plan has been prepared under OIIPCRA for scaling-up state-wide Integrated Pest Management and Integrated Nutrient Management efforts and support for safer production and marketing. Adequate provisions have been made to provide training to farmers and other stakeholders on safe handling and disposal of pesticides and other agrochemicals.

Operational Policy	Triggered (Yes/No)	Summary of OP	Implications for the Project and Compliance Mechanism
OP 4.11 Physical Cultural Resources (PCR)	Yes	The policy aims to assist in preserving PCR and in avoiding their destruction or damage. PCR includes resources of archaeological, paleontological, historical, architectural, religious (including graveyards and burial sites), aesthetic, or other cultural significance.	The project activities (construction works) are limited to tank system, irrigation regulatory structures and distribution system. As the structural / construction works are limited to existing irrigation structures / tank bed, PCR are not likely to be adversely affected. However, Orissa has many protected and unprotected monuments and structures which may be in proximity to selected MI tanks. In case of 'Chance Finds' of archaeological, paleontological, historical significance - the chance finds procedure outlined in the Annexure – XI will be followed
OP 4.36 Forests	No	This policy emphasizes upon the management, conservation, and sustainable development of forest ecosystems.	The project activities (construction works) are limited to tank system, irrigation regulatory structures and distribution system. None of the project activities will not be executed in any notified forest area or forest land.
OP 4.37 Dam Safety	Yes	This policy is concerned with ensuring quality and safety in the design and construction of new dams and the rehabilitation of existing dams, and in carrying out activities that may be affected by an existing dam.	There will be no new construction of dams under OIIPCRA. The project may support MIPs which rely on the performance of existing dams. There are 13 MIPs identified in the project area with dam height more than 10 meter out of which only three (3) have dam height more than 15 meter. These dams Will fit the criteria of OP4.37 (exceed 15 m and/or with height of 10-15 m and meet other requirement of crest length, discharge rate and storage volume). The requirements of OP 4.37 will be followed and dams will be reviewed by the State Dam Safety Panel.
OP 7.50 International Water Ways	No	This policy applies to any river, canal, lake, or similar body of water that forms a boundary between, or any river or body of surface water that flows through, two or more states.	Project activity is related to renovation of existing minor irrigation structure, agriculture intensification, promoting pisciculture in MI tank and creation and strengthening of agri. and fishery value chain. Proposed activities will be confined within MI tank command area and does not attract any waterways. All MIPs are located within Odisha state and not part of any international waterway.
OP 7.60 Projects in Disputed Areas	No	This policy is concerned with any project in the disputed area/s concerning two countries	All activities proposed under OIIPCRA will be implemented in 98 blocks spread across 15 project districts of Odisha. Any part of the project does not fall in any disputed area concerning two countries.

Chapter 3: Stakeholder Consultation

3.1 Project Area Coverage under Assessment

Nine sample MI tanks were selected to conduct the environmental baseline analysis for this study. A detailed methodology for sample selection and environmental assessment is provided in Annexure- II. Stakeholder consultations were carried out in and around area of selected nine (9) irrigation project spread across seven project districts. These sampled MIPs represents all seven Agro-climatic zones, four river basins as well as fully scheduled and partly scheduled districts prevailed in project universe. District/ block level offices of Department of Minor Irrigation responsible for the management of MI irrigation tank, Department of Agriculture, Horticulture, Fisheries, State Dam Safety Organization (SDSO)- Bhubaneswar, PP involved with sample irrigation project, FPO, SHG, fisherfolk, etc. operating in surrounding villages were consulted. Consultation was also held with DFO- Brahmapur and CCF- Shimlipal to confirm presence of vulnerable/ endangered flora and fauna within project area. Used study tools for stakeholder consultation is given in Annexure- IV and details are provided in Annex 5a and 5b.

3.2 Stakeholder analysis

Stakeholders departments/ group who have specific interest / stake in proposed project from environmental dimensions are listed below.

1. SPU-OIIPCRA
2. Department of Agriculture and Farmer's Empowerment
3. Odisha Agricultural Marketing Board
4. Directorate of Fisheries
5. State Dam Safety Organisation (SDSO)
6. Directorate of Horticulture
7. Department of Minor Irrigation
8. Odisha State Pollution Control Board
9. Odisha Biodiversity Board
10. DFO, Brahmapur and CCF- Simlipal
11. ATMA,
12. OPDC, CIFA, CIFRI, IIWM, OUAT, FNGOs, CoF and FISHFED

The analysis of different stakeholders of OIIPCRA, their roles, responsibilities and relationships with the project in planning and implementing project interventions is summarized in the Table 6.

Table 6: Details of stakeholders of the project, characteristics, roles and responsibilities

Sl. No.	Stakeholders	Stake/Characteristics	Expertise, roles and responsibilities
1	Farming communities: Men and women farmers, Tribal People	Traditional users /beneficiaries of the project, collaborators of the water management systems with MI department and other line departments	Traditional farmers groups have rich knowledge of water management and agriculture. Actively collaborate with MI department and other line departments for managing the water resources and infrastructure and development of agriculture

Sl. No.	Stakeholders	Stake/Characteristics	Expertise, roles and responsibilities
2	MI and Line departments and training institutions	Legitimate owner of the water bodies, decision making authority in relation with agriculture, horticulture, agri.-processing, implementing agency having budget provision	Implement the project activities, management of MI tank, promote agriculture, fishery, horticulture implementing the government sponsored schemes, provide extension services, etc.
3	DFO, CCF	Legitimate owner of forest and bio-diversity resource	Involved in forest protection and preservation of bio-diversity resource
4	State Dam Safety Organization (SDSO)	Legitimate owner of Large dam, decision making authority,	Monitoring and supervising dam safety aspects, periodic maintenance of large dam
5	Community Based Organizations such as Pani Panchayat (PP) / Water User Association, Farmers Producer Organization (FPO), women SHG, fisherfolk, PFCS etc.	Interest group, primary users of water resources and development of agriculture, horticulture, pisciculture, etc.	Mobilized and trained groups with leaders to support development activities, act as a good platform for the implementation of the project activities

3.3 Stakeholder's Consultation

A range of consultation meetings were organized with local officials of different departments to understand their views from environmental point of view on different aspects of the project. Focused Group Discussions (FGD) were conducted with the farmers of different social and economic categories and different land holding capacity, tribal people, community based organization like Pani Panchayat (PP) / Water User Association, Farmers Producer Organization (FPO), women SHG, fisherfolk to understand their opinion on the project dimensions.

Discussions were conducted at different points of time during the assessment phase. The discussions were primarily related to the project and its activities, people's current livelihood engagement and expected environmental implications of the project. Project activity wise generic as well as specific environmental issues were discussed with different stakeholder and their concerns were captured. Details of stakeholder's consultation with State, District and Block level associated departments and FGD with local communities held at the sample MI command village are given in the Table 7.

Table 7: Date wise consultation carried out with diffrent stakeholders

Date	GP. /Vill., Block, Dist.	MIP Name	Stakeholder Consulted
15th December, 2018	Dandamunda, Chandahandi, Nabarangpur	Dhandamunda MIP	PP- Sibasakti, Dandamunda, Dept. of MI (Dist.), Fertilizer/ Pesticide Distributor
	Ganjam NAC, Ganjam, Ganjam	Jallibandha MIP	PP- Jallibandha, Ganjam, Dept. of MI, Dept. of Agriculture (Block), Fertilizer/ Pesticide Distributor,
	Patbil, Karanjia, Mayurbhanj	Bisipur MIP	PP- Bisipur Pani Panchayat,
	Ganjam NAC, Ganjam, Ganjam	Jallibandha MIP	SHG- Maa Thakurani
	Patbil, Karanjia, Mayurbhanj	Bisipur MIP	SHG- Maa Shidheswari, Dept. of MI, Fertilizer/ Pesticide Distributor
	Patbil, Karanjia, Mayurbhanj	Bisipur MIP	SHG Sanadei
16th December 2018	Dandamunda, Chandahandi, Nabarangpur	Dhandamunda MIP	SHG- Maa Mahalaxmi, Dept. Agriculture, Fishery

Date	GP. /Vill., Block, Dist.	MIP Name	Stakeholder Consulted
	Dandamunda, Chandahandi, Nabarangpur	Dhandamunda MIP	FF – Dhadipani, Chandahandi
	Patbil, Karanjia, Mayurbhanj	Bisipur MIP	FF – Badagaon, Karanjia, CCF- Simlipal, Fertilizer/ Pesticide Distributor
	Dignaria, Nilagiri, Balasore	Khaibandha MIP	FF- Dignaria Fisherfolk, Dept. of MI
	Dhobasil, Nilagiri, Balasore	Khaibandha MIP	FF – Khaibandha, Balasore
17th December 2018	Dhobasil, Nilagiri, Balasore	Khaibandha MIP	PP – Maa Gadachandi, Dept. of Fishery, Agriculture, Hatchery Unit
	Badabanga, Daringbadi, Kandhamal	Cradigappa MIP	PP – Maa Patakunda, Dept. of MI,
	Talakholaghai, Khallikote, Ganjam	Talakholaghai, Mohanpur MIP	SHG – Maa Mangala, Dept. of MI, Agriculture, Fishery
	Dignaria, Nilagiri, Balasore	Khaibandha MIP	SHG – Maa Mangala Kalyani Jon
	Badabanga, Daringbadi, Kandhamal	Cradigappa MIP	SHG – Amarjoty Biswa
18th Decemebr, 2018	Badabanga, Daringbadi, Kandhamal	Cradigappa MIP	FF- Cradigappa fisherfolk, CCF,
19th December, 2018	Ghuchepali, Patnagarh, Bolangir	Dandrabahal MIP	PP- Ganga Jamuna, Dept. of MI, Agriculture, Fishery, FPO
	Ghuchepali, Patnagarh, Bolangir	Dandrabahal MIP	SHG – Maa Bastaran Budhi, Fertilizer/ Pesticide Distributor, Hatchery Unit
	Ghuchepali, Patnagarh, Bolangir	Dandrabahal MIP	SHG- Maa Samalasori SHG, Baglabandha, Fertilizer/ Pesticide Distributor
20th December, 2018	Duarsuni, Bhawanipatna, Kalahandi	Jamunasagar MIP	PP- Jamunasagar, Dept. of MI, Agriculture, Fishery, Fertilizer/ Pesticide Distributor
	Duarsuni, Bhawanipatna, Kalahandi	Jamunasagar MIP	SHG – Jagat Janani
	Duarsuni, Bhawanipatna, Kalahandi	Jamunasagar MIP	FF – Jamunasagar, Bhawanipatna
21st December, 2018	Ganjam NAC, Ganjam, Ganjam	Jallibandha MIP	Dept. of Fishery, DFO- Brahmapur
15th January, 2019	Bhubaneswar, Odisha	___	State Dam Safety Organisation (SDSO), Bhubaneswar
21st January, 2019	Patbil, Karanjia, Mayurbhanj	Bisipur MIP	ITDA- Karanjia, Dept. of Agriculture
22nd January, 2019	Badabanga, Daringbadi, Kandhamal	Cradigappa MIP	ITDA- Baliguda, Dept. of Fishery
22nd January, 2019	Patbil, Karanjia, Mayurbhanj	Bisipur MIP	Dept. of Fishery
23rd January, 2019	Badabanga, Daringbadi, Kandhamal	Cradigappa MIP	Dept. of Agriculture, DFO
29th January, 2019	Harichandanpur, Keonjhar	Kalimati MIP	Dept. of MI, Agriculture
30th January, 2019	Harichandanpur, Keonjhar	Kalimati MIP	PP- Mahabir, Mandakini SHG, FPO
31st January, 2019	Harichandanpur, Keonjhar	Kalimati MIP	Dept. of Forest, Fertilizer/ Pesticide Distributor

** Local farmers from each MI command area was consulted to understand agriculture related issues.*

3.3.1 Stakeholder's Concern / Opinion

Local people/ community were much more concerned about individual or community level facilities and infrastructure facilities to be provided under proposed project rather than its environmental consequences during different phases of project. Communities focus were mainly concentrated on land

acquisition, loss of agricultural land and agricultural land pollution due to stacking of construction material on agricultural land. Very negligible percentage of people were concern about environmental pollution during project implementation. However, all concerned Govt. departments were very much active in their respective domain in terms of environmental pollution prevention and mitigation aspects. Issue wise environmental concerns of different stakeholder and respective measures adopted under OIIPCRA are given in Table 8 and details are provided in Annexure- V(b).

Table 8: Stakeholders concern on environmental issues

MIP	Environmental Concern	Issue Addressed in EMF
Irrigation		
MIP-1	Storage capacity of MIP project is not enough to supply water to total command area.	Tank resectioning will be done which will increase water holding potential.
	Irrigation structure are not in good condition; Sufficient water is not available during Rabi season; hence people are withdrawing ground water for irrigation purpose.	Irrigation structure will be repaired and concrete canal lining work will be done to reduce or eliminate seepage lose. Dam will be strengthened.
MIP-2	Water level goes down to DSL and not sufficient for irrigation purpose during Rabi season. Tank remains absolutely dry during Summer season	Tank resectioning will be done which will increase water holding potential
	Outlet is in broken condition.	All dilapidated irrigation structure will be repaired which will reduce seepage loss as well improve water distribution mechanism.
MIP-3	Distributaries are in dilapidated condition.	All dilapidated irrigation structure will be repaired which will reduce seepage loss as well improve water distribution mechanism. Damaged field channels will be repaired and new field channel will be constructed.
MIP-4	Seepage lose from dilapidated irrigation network; require regular maintenance & canal lining.	All dilapidated irrigation structure will be repaired which will reduce seepage loss as well improve water distribution mechanism. Concrete lining at earthen stretch of canal portion and repairing of existing concrete lining will be done.
	Irrigation water is available only during monsoon season.	Tank resectioning will be done which will increase water holding potential.
	Non-availability of proper fund for renovation work.	Renovation of irrigation infrastructure is one of major components under OIIPCRA. Significant amount is allotted for this work under OIIPCRA project.
	Pani Panchayat members are influenced by political leader.	Training and capacity building of PP/ WUA members will be done under OIIPCRA project.
MIP-5	Storage capacity of the tank is too less which leads to unavailability of water during Rabi season.	Tank resectioning will be done which will increase water holding potential.
	Seepage loss from the broken structure.	All dilapidated irrigation structure will be repaired which will reduce seepage loss as well improve water distribution mechanism. Concrete lining at earthen stretch of canal portion and repairing of existing concrete lining will be done.
MIP-6	Storage capacity of MI tank is not enough to supply water for irrigation to total command area. Availability of water during Rabi and summer season is major concern. The head regulator of MIP tank is not working properly.	Tank resectioning will be done which will increase water holding potential. All dilapidated irrigation structure will be repaired which will improve water distribution mechanism.
	Gate and head regulator are not working properly; fund for regular maintenance work is needed. In some of the areas Pani Panchayat is not active or not functioning	All dilapidated irrigation structure will be repaired which will improve water distribution mechanism. Renovation of irrigation infrastructure is one of major components under OIIPCRA. Significant

MIP	Environmental Concern	Issue Addressed in EMF
		amount is allotted for this work under OIIPCRA project. Training and capacity building of PP/ WUA members will be done under OIIPCRA project.
MIP-7	Irrigation water scarcity is felt during rabi and summer season.	Proper maintenance is required and water retention capacity should be increased
	Sluice gate is not working and fund is needed for regular maintenance.	Fund needed for renovation and maintenance.
	Many pani panchayat is not active or not functioning	Strengthening of Pani Panchayat/ Water User Association required.
MIP-8	Presence of huge aquatic weeds in the tank water restrict sunlight to pass which causes fish mortality.	Weed must be removed from the tank.
	Irrigation water scarcity during Rabi and summer season	There is another MIP named Banamuliya, 6 km away from this MIP, if both the MIP will be merged than no shortage of water for irrigation will happen as told by experienced locals.
MIP-9	No such issue with regards to irrigation water.	However, strengthening of Pani Panchayat / Water User Association is all time requirement.
Agriculture		
MIP-1	Chemical leaching from nearby chemical manufacturing factory happens occasionally which is probably affecting agricultural field.	Proper monitoring of safe disposal of industrial waste should be done
	Excess use of fertilizers and pesticides leads to degradation of soil quality	Create awareness about optimum use of fertilizers and pesticides
	Other issues are fall of immature seed/ fruit/ flower, Increased pest attack, damage to root due to prolonged flooding, etc.	Project will adopt sustainable and climate resilient agriculture practice to combat adverse effect of climate change
MIP-2	High dependency on rain water in absence of adequate irrigation supply for agriculture.	Training on climate resilient agriculture must be given for drought condition may prevail
	Highly dependent on rain fed paddy.	Awareness about crop diversification is required
MIP-3	As water is available throughout year, production and productivity can be improved	Proper training and awareness program should be conducted from government
	Production and productivity of diversified crop is required	Promotion and special training on organic farming can be done
MIP-4	Due to lack of irrigation facility the crops are getting damaged nearer to the harvesting period / pre-harvesting which has a greater impact on the yield.	The functioning of Pani Panchayat / Water User Association is necessary to do a proper monitoring of water which helps in saving the excess flow of water during non-requirement.
	Non usage of bio fertilizer because of delayed result.	People must be aware about the negative impact of the synthetic fertilizer and its impact on the environment.
MIP-5	Due to increase in use of pesticides and fertilizer the soil quality has deteriorated. Soil becoming harder year by year and natural flora in the agricultural land is disappearing.	Recommendation and capacity building need to be done for usage of bio fertilizer.
MIP-6	Soil fertility is deteriorating significantly, due to excess use of pesticides and fertilizer. Farmers are interested to use vermicompost but due to non-availability of proper infrastructure and knowledge they are not able to do so.	Proper training to be given to farmers for usage of organic / bio fertilizer or pesticides. Vermicompost unit need to be opened there.
	Water availability mainly during Rabi and Summer season is main concern. Enough water is not available during Rabi and summer. Also use of fertilizer and pesticide reduce the fertility of soil. Farmers are not using organic fertilizer and pesticides because of slow result.	Water retention capacity should be increased. Training should be given on use of Organic fertilizer and pesticides and adverse effect of chemical fertilizer and pesticides on environment and humans.

MIP	Environmental Concern	Issue Addressed in EMF
MIP-7	Soil quality is deteriorating significantly due to excess use of chemical fertilizer and pesticides.	Proper training to be given to farmers for usage of organic / bio fertilizer or pesticides
MIP-8	Damage to mature crops due to attack by wild animals Barha & Elephant coming from nearby Ambapani forest.	This does not come under preview of OIIPCRA. This is natural phenomenon, related line departments of OIIPCRA has nothing to do in this regards. However, framers may adopt crop insurance with support from Dept. of Agriculture/ compensation provisions of forest department.
MIP-9	Decrease in soil fertility due to excess use of chemical fertilizer and pesticides.	Need to focus on usage of bio fertilizer and pesticides
	Yield rate is low due to traditional practice of cultivation. Excess use of fertilizers and pesticides, is causing damage to soil fertility.	Need to focus on usage of bio fertilizer and pesticides
	Irrigation supply do not reach at tail end farmers during Rabi and Summer season	Increasing irrigation potential of the reservoir by watershed management.
Horticulture		
MIP-1	Vegetable and fruit cultivation during Rabi and Summer season is very less mainly due to non-availability of irrigation water in MI tank and other waterbody.	Importance to be given for improvement of production and productivity in the Summer Season
MIP-2	Vegetable and fruit cultivation at backyard kitchen garden is very less.	Convergence with Horticulture departmental schemes may be a valid option
MIP-3	Vegetable and fruit cultivation at backyard kitchen garden is very less. People are interested to do it in large scale.	Proper training and awareness campaign should be done
MIP-4	People are not interested to carry out horticulture activity as they have other working opportunity.	Capacity building programmes need to be conducted at Panchayat level to produce horticulture product in organic manner.
Fishery		
MIP-1	Pisciculture practice is not adopted due to less availability of water.	Tank resection is to be done, financial support and training to promote pisciculture.
MIP-2	Very less scope of fishery at MI tank, as water level during Rabi and Summer season is very low.	Tank renovation is to be done, financial support and training is needed to promote pisciculture.
MIP-3	Not engaged in fishing activities	Formation of fisher community and awareness is required
MIP-4	Water retention capacity of the tank is very less which is not suitable for fishery activity.	Resectioning of MI tank proposed under OIIPCRA may increase water retentivity
	There is no such mechanism to restrict fish to pass out from MI tank to field channel.	The tank should be closed from all end which would be suitable for the fishery activity. Gates must be installed in the entry and exit water drains of tank.
	SHG members don't have enough knowledge regarding fish species and their diseases.	Capacity building programs need to be conducted at GP level for interested SHG.
	Lack of awareness among the community about benefit of fishery.	Capacity building needs to be done for the fisher community/ people engaged in fishery activity regarding fish cultivation.
MIP-6	Conflict between farmers and fisher on use of water below DSL.	Fisheries activities will be confined below DSL.
MIP-7	To promote fishing activity SHGs were tagged to GP tanks	Training should be given to SHGs group
MIP-8	Due to lack of awareness on financial benefit of fishery, people have not adopted fishery at large scale or for income purpose.	Capacity building needs to be done for the fisher community.
MIP-9	Fish and fingerlings swims away with the flow of water to river water specially during increase in water volume in tank.	Net barricading will be provided under OIIPCRA.
Agribusiness		

MIP	Environmental Concern	Issue Addressed in EMF
MIP-1	Labour availability for agriculture is a serious issue and income from agriculture is very less. Hence, agriculture practice is diluting.	Creating awareness about MSP and improving market linkage, Cold storage /transport facility could be improved
MIP-3	As village is situated in remote area, it's not cost effective for them to transport crop/vegetable to the nearest market.	Cold storage /transport facility could be provided
MIP-4	No active committee of Pani Panchayat / Water User Association or SHG to take up agri business activity.	Strengthening of the Pani Panchayat/ Water User Association need to be done, which gives them a proper understanding of the business activity.
MIP-6	No active committee of Pani Panchayat or SHG to take up agri business activity. Eventually, there are no FPO working in this area.	Strengthening of Pani Panchayat /WUA and formation of FPO need to be done
MIP-9	Selling vegetables only at local market/ within village. Proper market linkage facility is not there.	Storage facility and transportation to nearby market can be organized
Other Issues		
MIP-1	Majority of farmers are not engaged in other livelihood activity except agriculture.	Scope of fish production, processing, mushroom cultivation, backyard farming is there. Only proper training and awareness can improve their income.
MIP-2	Farmers are not involved with other livelihood activities other than agriculture which is done only during monsoon period.	Training and capacity building for other livelihood options like fishery, backyard kitchen garden, mushroom cultivation will be arranged under OIIPCRA.
MIP-3	Situated in elevated hilly area where water is very scarce.	
	Lack of support from local government	Awareness and training program need to be conducted
MIP-4	SHG members are not interested to attend training outside the village because of which their skill as well as capacity building is an issue.	Possibility of arranging village level training will be explored during arrangement of any such training.
MIP-5	Most of the SHG are non-functional and few are operating at below average level.	Capacity building and proper monitoring of SHG need to be done for smooth running of SHG.
MIP-6	SHG members are interested to adopt pisciculture for which they require proper training and extension services.	Capacity building and training program are needed may be provided in the project areas and also beyond project areas
MIP-7	SHG members are interested in different IGA i.e. Goatery, Poultry and pisciculture.	Training and capacity building related to Fishery should be given.
MIP-8	SHG members are not well aware of government or non governments program. They wants to be involve in income generation activities for which they require awareness training.	Strengthening of and capacity enhancement training should be given to SHG member.
MIP-9	SHG members are not well aware of different government or non governments program specially for SHG.	Awareness creation is required.

MIP-1: Dandrabahal MIP; MIP- 2: Khaibandha MIP; MIP- 3: Jallibandha MIP; MIP- 4: Talakholaghai, Mohanpur MIP; MIP- 5: Jamunasagar MIP; MIP- 6: Cradigappa MIP; MIP- 7: Bisipur MIP; MIP- 8: Dandamunda MIP; MIP- 9: Kalimati MIP, Keonjhar

Chapter 4: Environmental Baseline

The objective of conducting baseline environmental assessment is to find out issues and challenges within project and surrounding areas. As renovation of irrigation structure/ system is concentrated within irrigation command area, only command area is considered for field level extensive study. District level data/ information is also considered to find out common issues or challenges with regards to existing practices of pesticide & fertilizer use, irrigation practice, cropping pattern as well as diseases, common diseases in pisciculture, etc. Desk review of available published information/ report as well as initial consultation with SPU and respective district as well as block level line departments like irrigation, fishery, forest was conducted to identify presence of any significant environmental features in an around project area which may have impact to the project implementation. All such identified significant environmental features located in and around sample project location were thoroughly assessed during field level study. In addition to these, "Google" based survey was also conducted to identify presence of significant environmental features like presence of Archaeological sites, Temples, Burning Ghats, Sensitive Receptors, Polluting Industry, Forest area and etc. A checklist on presence of such significant environmental features within 100 meter, 300 meter and 10 Km. radius is developed as part of baseline environmental assessment. Environmental parameters like Air Quality, Surface Water Quality, Soil Quality, Noise Quality was assessed by engaging NABL accredited third party environmental laboratory.

Baseline assessment of environmental features will help in identifying prevailed environmental issues and challenges as well as probable impact during project implementation and operation stage. Findings of baseline assessment will be the foundation in preparing management framework. Baseline value will also help in comparing changes during mid-term as well as end-term evaluation.

4.1 Physical and Biological Environment

Baseline environmental parameters for physical and biological environment were assessed by means of primary as well as secondary data/ information. Baseline findings of significant environmental issues are tabulated below and detail analysis is given in Annexure- III:

Table 9: Environment Baseline

	Parameters	Baseline Findings
	Physical Environment	
1	Agro-climatic zone	• The project is proposed to be implemented in 7 agro-climatic zones (ACZs) out of total 10 ACZ of the State. • Maximum 46.7% MIP are concentrated in Ganjam district which falls under East & South Eastern Coastal Plain (ESCP) followed by 29.0% in North Central Platue (NCP) and 10.6% in Western Central Table Land (WCTL-1). • Minimum 0.6% MIPs are located in Nabrangpur district which falls under Eastern Ghat High Land (EGHL) followed by 1.7% in North Eastern Ghat (NEG).
2	Landuse pattern	• Total geographical area of the 15 project districts is 8340 thousand hectares out of which 520.5 thousand hectares forest area, 51.3 thousand hectares of miscellaneous tree & groves, 162.5 thousand hectares of permanent pasture, 159.1 thousand hectares culturable waste land, 310.9 thousand hectares barren land, 318.3 thousand hectares non-agriculture land and 1643.9 thousand hectares net area sown land falls under 98 nos. project blocks.

	Parameters	Baseline Findings
		• Fifteen (15) project districts have cultivated area of 3581 thousand hectares out of which 1740 thousand hectares is high land, 959 thousand hectares medium and 882 thousand hectares low land
3	Geology and mineral	• None or any part of the MIP command area is protected for mineral resource exploration. • There exists no mining area/ activity in surrounding areas which may pose any threat to proposed OIIPCRA project.
4	Earthquake	• The parts of 5 project districts namely Bargarh, Jajpur, Bhadrak, Mayurbhanj & Balasore fall under moderate risk earthquake zone. Remaining parts of these five districts fall under low damage risk earthquake zones. • Remaining 10 project districts namely Gajapati, Ganjam, Kandhamal, Nawarangpur, Kalahandi, Nuapada, Bolangir, Sonepur, Boudh and Keonjhar fall under low damage risk earthquake zones.
5	Wind and Cyclone	• Entire portion of 3 project districts (Balasore, Bhadrak and Jajpur) and part of other 4 project districts (Mayurbhanj, Ganjam, Gajapati and Keonjhar) falls under High Damage Risk Zone where almost 80% of MIP are located (considering district total). • Entire portion of three project districts (Boudh, Sonepur and Bolangir) and part of other 8 project districts (Keonjhar, Ganjam, Gajapati, Kandhamal, Bargarh, Nuapada, Kalahandi and Nabarangpur) falls under Moderate Damage Risk Zone- A, whereas part of six (6) project districts (Bargarh, Ganjam, Gajapati, Kandhamal, Kalahandi and Nawarangpur) falls under Moderate Damage Risk Zone- B.
6	Flood and Waterlogging	• Part of project district Ganjam, Jajpur, Bhadrak and Balasore are declared flood zone where more than 50% of MIPs are located (considering district total). However, Balasore and Bhadrak districts are affected majorly due to presence of immediate coast of Bay of Bengal. Only 3.5% MIPs are located at Balasore and Bhadrak district. • Command area of sample MIP- Jallibandha located at Ganjam district has witnessed crop damage due to occasional flood by Rushikulya river. • Water logging during rainy season is reported at river adjacent MI command area of MIP- Jallibandha.
7	Surface Water Quality	• Any instance of water pollution at MI tank water from industrial activity is not found at sampled MI tank. • Water quality of all sampled MI tank is fairly good to promote pisciculture activity in MI tank. • Excess use of fertilizer and pesticide is main source of water and soil pollution in command area • Garbage dumping in Dhandamunda MIP (Nabarangpur) tank is reported as one of sources of water pollution.
8	Meteorology	**Temperature** • Project districts experience hot summer with temperatures shooting up to 43°C (Balangir and Kalahandi) in the west and 39°C (Keonjhar) in the east. • The mean summer temperature varies between lowest 20°C and 33°C in project districts. • Heat wave conditions prevail in 3 districts (Kalahandi, Balangir and Kandhamal) of project universe with the temperature crossing 40°C during hot summer. **Relative Humidity** • RH widely ranges between 48% to 91% during winter season, 36% to 83% during summer season and 75% to 91% during rainy season. • Kandhamal has witnessed maximum 91% RH during rainy season followed by Bhadrak (89%) and Majurbhanj and Kalahandi (88%). **Rainfall** • About 63% of the average annual rainfall of the entire project universe is received in the southwest monsoon season, 23% in summer and remaining 14% in winter season. • Yearly average rainfall is maximum (1701 mm.) at Nawarangpur and lowest (1069 mm.) at Bolangir district.

	Parameters	Baseline Findings
		• Maximum average rainfall during southwest monsoon (1075 mm.) as well as summer season (506 mm.) is recorded at Nawarangpur and during winter at Balasore followed by Ganjam. • Minimum average rainfall during southwest monsoon is recorded at Gajapati District (719 mm.) followed by Ganjam (729 mm.) • Only 4 districts (Nawarangpur, Mayurbhanj, Balasore & Gajapati) receive more than state normal annual rainfall of 1460.5 mm.10 • Yearly average rainfall at Gangam district is 1320 mm., where more than 45% MIP area located. This is less than the State normal annual rainfall of 1460.5 mm. **Ambient Air Quality** • Air pollution due to operation of diesel operated thresher / harvester machine in agricultural land and burning of paddy straw on agriculture field is observed as source of air pollution associated with post-harvest agricultural activities.
9	Groundwater Availability	• The stage of ground water was assessed at 30 percent in 98 project blocks. • Nabarangpur, Gajapati and Kandhamal are heavily dependent on ground water for irrigation. • Ground water development status of 7 (Bargarh, Bolangir, Gajapati, Kalahandi, Kandhamal, Nabarangapur and Nuapada) out of 15 project districts (considering 98 project blocks) are assessed to be below the state average of 28 percent. • None of the project area fall under over exploited, critical or semi critical blocks and notified for regulation of ground water development.
10	Ground Water Quality	• Any potential source of ground water contamination within tank command area is not found within sampled MI command area. • Contamination due to saline water intrusion during flood occurrence at coastal project blocks is reported. • Out of 15 project districts, only Bhadrak is fully saline affected. 931 population of only one habitation of Ganjam and 7693 population of 11 habitations of Balasore are reported as saline affected. • Within 98 blocks of 15 project districts, only 9 blocks of Ganjam district, one of Bargarh, one of Boudh, three of Kalahandi districts are found where EC concentration is more than > 2000 µS/ cm. • Nine (9) blocks of Ganjam district, one of Bargarh, one of Boudh, three of Kalahandi districts are found where EC concentration is more than > 2000 µS/ cm. • Chloride concentration above 250 mg/l was reported at 11 blocks of Ganjam, one block from each of Bargarh and Boudh district, three blocks of Kalahandi, two blocks of of Nuapada. Five project blocks of Ganjam, one block from each of Keonjhar and Gagapati district, 7 blocks of Balangir, one block of Boudh, two block of Kalahandi, one block of Nuapada are reported as fluoride contaminated where concentration are found above desirable limit of 1.0 mg./l. • 5556 populations of 6 habitations of Bolangir and 2079 population of 3 habitations of Kalahandi district are reported as fluoride affected. • 137 populations of only one habitation of Nawarangpur and 3691 populations of 4 habitations of Ganjam are reported as nitrate affected. • Total 3,27,963 population of 1197 nos. iron affected habitations are reported within 96 project blocks leaving two project blocks of Nuapada. Highest iron affected habitation is reported at Mayurbhanj (660 habitations) followed by Keonjhar (335 habitations) and Balasore (46 habitations)
11	Soil Type	• Coverage of Red soil is maximum 24% followed by 15% Lateritic and 12% Alluvial soil. • Coverage of Sandy loam and Red & Yellow soil class is equal to 11% and Red & Black soil coverage is only 10%. • Acidic (1%) and Saline (3%) soil coverage is very low in entire project district.

[10] Annual Climate Summary- 2015, National Climate Centre, Climate Service Division, India Meteorological Department

	Parameters	Baseline Findings
12	Soil Quality	• Soil pH of sample collected from command area of 6 sampled MIP ranges between 5.8 to 7.8. • Electric conductivity ranges between minimum 52.6 at Talkholghai, Mohanpur, Ganjam to maximum 110.3 at Cradigappa MI at Kandhamal. • Organic carbon content ranging between 1.32 % at Talkholghai, Mohanpur, Ganjam to 1.64% at Bisipur MI, at Mayurbhanj district. • Arsenic and fluoride content in collected soil samples are found below detectable limit (bdl). • Heavy metal like Chromium and Cadmium are not detected in any of six (6) soil samples. • However, presence of other heavy metal like Zinc, Lead and Copper are found in all soil samples, but at very low percentage and within Threshold Effect Level (TEL)[11] • Iron content is highest 1.82% at Bisipur, Majurbhanj and lowest at 0.14% at Jallibandha, Ganjam. • Manganese content in all soil sample ranges between 0.007 to 0.072 %.
13	Tank Condition and Ecosystem	• Vegetable species like floating weeds: Spirodela sp., Eichhornia crassipes (water hyacinth), emergent weeds: Nymphoides sp., Nymphaea spp. (water lilies), Marsilia quadrifolia, submerged weeds: Potamogeton sp., Ottelia sp., marginal weeds: Jussiaea sp., Cyperus sp., Paspalidium sp., Eleocharis sp., Sagittaria sp., Ipomea spp., have grown in tank water and subsurface. However, quantum of these undesirable species is very nominal in most of the tanks. • Water efficiency has reduced due to natural growth of aquatic weeds in tank • Most of the tanks are silted up due to prolonged silt disposal. • Many irrigation structures like head/ tail regulators, field channels, which were constructed decades ago, were found in dilapidated conditions.
14	Dam Safety	• Dam of 319 reservoir type MIP are earthen whereas 145 diversion weirs are made of concrete and remaining two are creek. • Dam height of only 13 MIPs is more or equal than 10 meter out of which only three (3) have dam height more than 15 meter. • Three dams with dam height > 10 < 15 is not covered by SDSO. All remaining 10 nos. dam with dam height more than 10 meter are covered by SDSO. • Out of 3 nos. MIP not covered under SDSO, two are located in moderate risk earthquake zone (part of district) and all remaining 11 MIPs falls in Low damage risk zone. • 10 MIPs falls in High Cyclone Damage Risk Zone and remaining three in Moderate Damage Risk Zone. • None of these large dams falls in Flood zone.
15	Presence of Industry	• A chemical industry namely Grasim Industry Limited is located approximately 300 meter away from command boundary of Jallibandha MIP, Ganjam- however any kind of chemical leaching to MI command area is not reported. • Presence of any mining industry at immediate vicinity of sample MI tank is not observed.
16	Private Structure and Utilities	• Presence of any structure of encroacher or squatter or private owner which may be impacted is not observed within proposed work zone. • Any private or community structure is not anticipated to be impacted due to any of activities proposed under OIIPCRA.
17	Physical Cultural Resource	• Few temples are found to be present within command area from where occasional pollution to agricultural field is happening only during mass gathering of people during religious festival. • Water and land pollution from burning ghat located within command area may occur during funeral / cremation activity. However, this has no impact on tank or irrigation system. • Sacred grove of Ficus religiosa (Osta Tree) and Ficus benghalensis (Banyan Tree) is located within command area.

[11] In absence of any indian standard, it was compared against "US EPA standard for sediment quality"

	Parameters	Baseline Findings
		• Potagarh or the "buried fort", constructed in 1768, is located in the vicinity to the periphery of Jallibandha MIP, Ganjam district. Potagarh Fort, is also known as Ganjam Fort. • Project will adopt avoidance strategy to eliminate any negative impact on any PCR, hence any adverse impact on PCR like temple, burning ghat and sacred groves is not anticipated.
18	Natural Habitats	• Simlipal National Park is located in the immediate vicinity of Bisipur MIP in Mayurbhanj district. • Rushikulya river flows through the immediately vicinity of the Jallibandha MIP in Ganjam district and the Olive Ridley turtle nesting site located at the Rushikulya river mouth is in proximity (<5 km) to the Jallibandha MIP • Chilika Lake is in proximity to Talakholaghai, Mohanpur MIP in Ganjam district. • Increased usage of fertilizers and pesticides in the command area of these MIPs could have a downstream impact on the water quality. • Implementation of IPNM to restrict pollution of agricultural run offs in these areas will be a key focus of the project
19	Sensitive Receptors	• Sensitive receptors like school, playgrounds have been observed within 100-meter boundary of sampled command area. • Noise and dust pollution during construction activity, regular operation and plying of heavy vehicle, plant and machineries may impact such sensitive receptors during construction stage.
	Biological Environment	
20	Forest Cover	• Forest cover area in these 15 project districts is about 37.5% of total geographical area with compared to state total coverage of 37.3%. Forest cover at Kandhamal (71.2%), followed by Gajapati (57.1%), Nuapada (48%), Nabrangpur (46.5%), Mayurbhanj (42.2%), Boudh (41.2%) and Ganjam (38.4%) is more than state coverage of 37.3%. Forest coverage is lowest at Bhadrak (3.9%) followed by Balasore (8.7%). Bhadrak and Nuapada district are devoid of any reserve forest where as Sonepur district is devoid of any protected forest. • However, project activities are confined within MI command area and none of the proposed activities will take place in forest area.
21	Agriculture crop	• Summer cultivation is limited only in six (6) project districts and cultivated area is very insignificant with respect to Kharif and Rabi cultivation. • Cereal, Pulses and vegetable are main crop cultivated in project districts. • Paddy is the main crop cultivated during kharif season whereas pulses and vegetable are cultivated during Rabi season. Oilseed is also cultivated in moderate amount during Rabi season.
22	Cropping Practices	• Adoption of SRI process of rice cultivation has gained momentum. Majority of farmers are well aware about SRI process of rice cultivation. • Practice of crop rotation is absolutely nil in sampled project area even after moderate knowledge on its potentiality to increase soil fertility. • Mixed cropping and inter-cropping practice are very low in sampled project area. • Use of soil amendments to maintain soil pH level is found as one of best practices adopted by farmers of sampled area.
23	Agro-chemical Use	**Crop Diseases/ pest attack** • Swarming caterpillar, BPH and BLB, stem borer, blast and brown spot, sheathrot and sheath blight diseases in paddy, aphid and pod borer in arhar; flea beetle, cercospora blight, downy mildew, leaf spot diseases in green /blackgram; leaf curl virus in vegetables, root knot nematode, leaf eating caterpillars, fruit & shoot borer of brinjal, termite in mango are common type pest/ diseases observed in project districts. **Pesticide Use** • Pesticide consumption rate is increasing year on year basis in all project districts. Pesticide consumption rate has jumped almost at 7% increase rate during 2011-12 to 2013-14[12].

[12] Source: Source: Economic Survey 2014-15

	Parameters	Baseline Findings
		• Most of the farmers are well familiar with pesticide company's brand name but not aware of pesticide's generic name or constituent main chemical and recommended dosage. However, few marginal farmers have obtained training or undergone awareness programme organized by Block level office of Agriculture Department. • Most of the farmers are not aware about pheromone or light trapping process. Use of these old processes are diluting heavily because of easy availability of chemical pesticides which gives immediate solution. • Use of bio-pesticides by farmers is very low in all sampled area. Farmers have not adopted use of bio-pesticides mainly because of slow effect wrt. chemical pesticides. • Use of WHO classified Ib and II pesticides is reported in all sampled project area. • Awareness level on WHO classified Ib and II pesticides is almost NIL among pesticides retailer as well as farmers. • Farmers are moderately aware about detrimental effect of chemical fertilizer on soil fertility and health consequences. **Fertilizer Use** • Unscientific application of fertilizer (higher doses). Fertilizer consumption in 5 project districts (Nawarangpur- 152.2, Bhadrak- 121.4, Bargarh- 101.8, Balasore- 95.9 and Jajpur- 65.0) in the year of 2016-17 is more than state average consumption rate of 57.11 kg./ hect. for the year 2013-14. • Per hectare fertilizer consumption is almost three times more at Nawarangpur and two times more at Bhadrak district than state average consumption rate of 57.11 kg./ hect. in the year of 2013-14. • Recommendation of Dept. of Agriculture on fertilizer use as per soil health card are not followed by most of the farmers; • Poor adoption of Integrated Plant and Nutrient Management; • Less use of organic manure in comparison to synthetic fertilizers • Less fertilizer efficiency and less adoption of fertigation method of application
24	Pisciculture Practices	**Practice** • Inadequate information on the fisheries resources and the state of the aquatic environment of local people; • Inadequate monitoring, extension and enforcement mechanisms; • Siltation of the tank making most of them not-suitable for pisciculture; • Natural calamities such as unprecedented rain, cyclones and floods, leading to destruction of fish/ aquaculture ponds and systems; **Fish Diseases** • Fish disease like Gill rot, Argulus, Red Spot, Fin rot, Eye fluke is very common in all this sampled project area.
25	Awareness on Climate Change	• Awareness level of farmers on climatic risk on crop cultivation is moderate • Farmers are not that much aware about climate resilient crop varieties

Chapter 5: Analysis of Environmental Impacts

5.1 Introduction

During project implementation it is expected that there will be environmental impact on different receptors like soil, air, surface, worker's health and safety, local community, sensitive receptors, aquatic, terrestrial and marginal flora, fishing community, farmers, pani panchayat/ Water User Association, SHG, etc. Impact will be negative as well as negative in nature. Majority of impacts will be reversible in nature except impact on surface water and soil quality due to use of chemical pesticide, fertilizer and medicine used to control fish diseases.

5.2 Overview of Environmental Impacts

Components and activities of the project, existing environmental scenario in and around the project area were thoroughly assessed to identify potential impact on baseline environmental conditions. Potential negative and positive impacts likely to result from project intervention are analysis and provided in Table 10.

Table 10: Project componnet and activity wise potential negetive impacts

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts
	Component A: Climate-Smart Intensification and Diversification of Production		
	Sub-component A.1: *Support to Improved Productivity and Climate Resilience*		
A.	Crop Diversification & Demonstration	Demonstration of Climate Resilient Crops/ Varieties	Any negative environmental impact is not anticipated as the demonstrations will take up climate resilient practices by agro-climatic zone (based on suitability) by which farmers would able to learn efficient management of natural resource base, adoption of climate resilient technologies and improved environmentally sustainable farm practices.
		Aerobic Rice Demonstration	
		Integrated farming System (IFS)	
		Inter cropping/ Bund plantation	
		Demonstration on cropping systems	
		Demonstration for diversification of ID crops	
		Integrated crop management (INM/IPM)	Any negative environmental impact is not anticipated as awareness of farmers on sustainable and safe use of pesticide and fertilizer will increase.
B	Promotion of environmentally sustainable practices	Subsidy for Solar Pump Sets	Any negative environmental impact is not anticipated. **Positive impact-** Cost for irrigation as well as agricultural input cost will reduce. It will also reduce emission.
		Subsidy for Organic Waste Converter	Any negative environmental impact is not anticipated. **Positive Impact**: converts organic waste/crop residues in to useful compost. Improves air quality by reducing/ minimizing burning of agricultural waste/ crop residue.
		Distribution of moisture meter at free of cost	Any negative environmental impact is not anticipated.

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts
			Positive Impact: increase water use efficiency and water productivity.
		Distribution of farm guard at free of cost to the PP/ WUA	Any negative environmental impact is not anticipated. **Positive Impact**: Control the pests by biological means under IPM; reduce the use of chemical pesticides
C	Post-harvest Management & Agri-business	Creation of rural agri business infrastructure	Residual material may wash off and chock nearby drainage system during rainy season;
			Impact on workers' health and safety during construction work
		Creation of PHM facilities - Mini Processing Plant (Dal Mill, Oil Expeller, Millet processing unit, etc.)	Electricity consumption will be high if latest energy efficient equipment's are not procured;
			Generation and disposal of reusable biodegradable food waste;
		Establishment of CHC (Sheds / Farm Implements / Machineries)	Use of asbestos material as roof
		Buyer-Seller Interface	Any negative environmental impact will not occur.
		Linking Agriculture Markets with E-NAM / Other Portal	Any negative environmental impact will not occur.
		Hiring of Agri-Business Support Organizations (ABSOs)	Any negative environmental impact will not occur.
	Sub-component A.2: Support to Fish Production		
A	Fish Seed Production	Modernizing Fish Hatchery by OPDC	Residual material may wash off and chock nearby drainage system during rainy season;
			Impact on workers' health and safety during construction work
		Portable Fish Hatchery - at 30 locations in the project area by CIFA	Any negative environmental impact will not occur.
		Upgradation of Net manufacturing Unit of OPDC	Any additional significant negative environmental impact is not anticipated due to proposed upgradation.
		Pureline breeding: Germ Plasm improvement programme by OPDC	Any negative environmental impact is not anticipated.
		Fish seed transportation vans with carrier crates by OPDC	Vehicular emission beyond permissible emission limit if not comply with latest emission norms.
B	Fish Feed	Establishment of Mini Fish Feed Mill by OPDC; Establishment of Small Scale Fish Feed Mill by OPDC	Machineries and equipment will be provided for which any environmental impact is not anticipated
C	Fish Production	Tank Culture of IMC (Indian major carps); Polyculture with Mola / Scampi in selected MI tanks along with IMC covering 1000 Ha of the tank by CIFA / OPDC;	Excess use of fish feed, in commercial cultivation of fish in inland fresh water, generally pollutes water. However, use of fish feed for very small-scale fish culture of indigenous species in small size MI tank is not a common practice. Demonstration on best practices will be

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts
		Gift Tilapia Culture to be demonstrated in select areas by OPDC	done under OIIPCRA for which any adverse impact is not anticipated. However, in case of use of fish feed for pisciculture in MI tank may lead to following adverse impacts:
			Use of powdery vegetarian feed will pollute water if left to suspend in water for too long time. Trash fish shreds are irregular in size and have a high loss rate (about 40%). The feed residue deposited on the pond bottom will cause pollution, resulting in a heightened risk of anoxia and mortality rate.
			High moisture Trash fish feed becomes moldy easily. It is vulnerable to bacteria and parasites. The fat of trash fish oxidises and rots easily. Rotten trash fish may cause disease or even death.
			Water pollution due to excess use of medicine to control fish diseases
			Spreading of fish diseases
			Reduction in the usage of genetic diversity of the wild fish varieties
		Demonstration of Pangasius culture in select tanks in the project area by OPDC	Any negative environmental impact will not occur due to demonstration activity.
		Demonstration of climate resilient Fish Production models by CoF, OUAT	Any negative environmental impact will not occur due to demonstration activity.
		Demonstration of cage culture in 11 large MI tanks by CIFRI / and other ICAR Institutes like IIWM	Any negative environmental impact will not occur due to demonstration activity.
		Stocking of self-replicating species by OPDC	Fish mortality may occur if oxygen circulation is not maintained properly
		Demonstration of Integrated Farming system by CoF - Including Duckery in 16 select tanks	Any negative environmental impact will not occur due to demonstration activity.
		Demonstration of aquaponics by CoF - to be taken up in one MI tank	Any negative environmental impact will not occur due to demonstration activity.
		Demonstration of RAS (Recirculatory aqua culture system) by CoF - to be taken up in one MI tank / and other ICAR Institutes like IIWM	Any negative environmental impact will not occur due to demonstration activity.
		Strengthening Women Fisher SHG through promotion of Ornamental Fish Culture through FNGOs / Central Institute of Women in Agriculture	Any negative environmental impact will not occur due to strengthening of SHG.
		Net Barricading by CIFA / CIFRI / OPDC / and other ICAR Institutes like IIWM	Any negative environmental impact will not occur.

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts
		Disease Surveillance undertaken by CoF	Any negative environmental impact will not occur due to disease surveillance programme.
		e-dash data acquisition system procured from CIFRI	Any negative environmental impact will not occur.
		Provision of Life Jacket by FISHFED	Any negative environmental impact will not occur.
D	Process and Value Addition	Supply of ICE Boxes by FISHFED 50LTS	Any negative environmental impact will not occur.
		Supply of ICE Boxes by FISHFED 100LTS	Any negative environmental impact will not occur.
		Supply of ICE Boxes by FISHFED 200LTS	Any negative environmental impact will not occur.
		Provision of DAT (Distress alert transmitter) through FISHFED	Any negative environmental impact will not occur due to demonstration activity.
		Establishment of fish processing units in selected locations for value added products (Eg. Filleting, Pickle making, Cutlrt making etc.) - through CIFT / CIWA / FISHFED and any other identified CBOs / NGOs / Agencies	Generation of food waste from fish processing unit will create bad odour if not managed in scientific way at regular interval; Health hazard due to use of formalin during fish processing and unhygienic practice;
		Strengthening Value chain infrastructure - Hygienic fish / fish product transportation - through CIFT / CIWA / FISHFED and any other identified CBOs / NGOs / Agencies	Vehicular emission beyond permissible emission limit if not comply with latest emission norms;
			Health hazard and spoilage due to unhygienic practice and spoilage due to non-maintenance of suitable temperature in transportation vehicle;
		Strengthening Marketing Infrastructure - modernization of 2 model kiosks for fish and fish product retailing in PPP mode - through CIFT / CIWA / FISHFED and any other identified CBOs / NGOs / Agencies	Generation of fish waste which will create bad odour if not managed in scientific way at regular interval;
		FINSHOP: - One stop aqua shop for Fishery Inputs retailing in PPP mode - through OPDC / FISHFED	Any additional impact is not anticipated due to use of existing infrastructure.
		Establishing Barefoot Training School Unit at Bahalpur by CoF, with replications at Chipilima and Kathfal by OPDC	Module preparation and training will not lead to any environmental pollution/ concern.
	Sub-component A.3: Support to Diversification and Produce Marketing		
A	Area Expansion under Horticulture	Hybrid Vegetable Cultivation (Brinjal, Bitter gourd, Cabbage, Cauliflower etc)	Degradation of soil fertility due to increased application of pesticide and chemical fertilizer; Health impact due to application of pesticide and chemical fertilizer;
		Floriculture (Merigold)	Degradation of soil fertility due to application of pesticide and chemical fertilizer; Health impact due to application of pesticide and chemical fertilizer

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts
B	Horticulture Investment for Vulnerable group	Backyard Nutritional Garden (Papaya, Banana, Drumstick, Klime, Guava, Yam)	Any significant negative environmental impact will not occur.
		Lemon Grass Cultivation	Any negative environmental impact is not anticipated.
		Mushroom Cultivation (Production Unit)	Generated paddy straw and cotton waste will cause odour pollution and decrease local aesthetic value if not disposed in regular manner
C	Soil Health Management	Vermi-compost Pit (3 m x 1 m x 0 .75 m)*2 units	Any negative environmental impact is not anticipated. **Positive Impact**: Convert organic waste in to useful manure for soil application; discourage the crop residue burning; enrich the soils and improve the soil health; reduce the cost of fertilizer application
D	Promoting Micro Irrigation	Drip Irrigation	Any negative environmental impact will not occur due to promotion of solar pump based drip irrigation system
E	Protected Cultivation	Poly green House (Erection + Cultivation)	Any negative environmental impact will not occur
F	Storage Structures	Functional Pack House (9m*6m)	Use of asbestos containing roof material
			Generated construction waste like sand, stone, wood chips (from centering, shuttering work), cut piece of reinforcement and mesh wire if not removed after completion of work may create inconvenience to local people, in terms of health hazard.
			Impact on workers health and safety during construction work
			Generated vegetable waste and waste from packing material may lead to odour pollution and decrease local aesthetic value if not disposed at regular interval
		Cold Room -Solar for 5 mtr tonnes	Generated construction waste like sand, stone, wood chips (from centering, shuttering work), cut piece of reinforcement and mesh wire if not removed after completion of work may create inconvenience to local people, in terms of health hazard.
			Impact on workers health and safety during construction work
			Generated vegetable waste may lead to odour pollution and decrease local aesthetic value if not disposed at regular interval
			Rotting or spoilage of agriculture commodity;

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts
G	Post-harvest Management-Value Addition	Processing Unit -Mechanised fruits and vegetables	Odour pollution from generated food waste if not disposed in regular interval;
		Processing Unit-Lemon Grass Oil	Generation and disposal of organic aqueous waste (CcHD)
		Perforated Van/Refrigerator Vehicle (Solar)	Any negative environmental impact is not anticipated.
	Component B: Improving Access to Irrigation and Water Productivity		
	Sub-Component B.1: Support to Water Sector Reforms		Any negative environmental impact is not anticipated.
	Sub-Component B.2: Support to Investment in Cascades		
A.	Tank System Improvement	Demonstration of bore well with solar pumping system	Loss of top soil due to digging of bore well;
			Generation and disposal of earth material due to digging of bore well;
		Quality Control	Any negative environmental impact will not occur due to quality control measures.
		Catchment treatment	Loss of top soil during excavation of foundation trenches and resectioning of tank
			Dust and air pollution due to flying of stacked up earth; littering during transportation
			Impact on fauna including vulnerable mammal (specially nearby area of forest)
			Organic pollution due to improper dumping of aquatic weeds, shrub stems, stumps, roots, twigs and leave leading to inconvenience to local commuters, odour pollution, etc.
			Air Pollution due to Burning of weeds, shrub stems, stumps, roots, twigs and leave
			Generation of metal scrap (cut piece) from cutting of MS sheet, reinforcement and mesh wire
			Generation of plastic waste
			Sediment transport in streams, canal leading to increased TDS and turbidity; sediment deposition in MI tank leading to reduction in water storage capacity
			Noise pollution due to construction and demolition work and its impact on workers and community health
			Generated construction waste like sand, stone, wood chips (from centering, shuttering work), cut piece of reinforcement and mesh wire if not removed after completion of work may create inconvenience to local people/ farming practices, and health hazard;
			Impact on workers health and safety during construction work

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts
			Safety of large dams
	Component C: Institutional Capacity Strengthening		Any negative environmental impact will not occur due to capacity building measures.

Part B – Environmental Management Framework

Chapter 6: Mitigation Management and Monitoring Plan

6.1 General

This Chapter outlines the Environmental Management Framework (EMF) which is broadly based on the environmental baseline conditions, planned project activities and impacts identified and assessed as part of environmental assessment (EA). For the environmental impacts (both positive and negative), EMF enumerates a set of measures to minimize the adverse impacts and enhance the positive impacts which are intended to be adopted during the project implementation. The most reliable way to ensure the implementation of EMF is to integrate the management measures in the overall project planning, designing, construction and operation phases. This will not only ensure that EMF activities are implemented in accordance with the framework and processes but also that there are adequate funds/resources for implementation and supervision of environmental Management plan.

Assessment made in the process of formulating the EMF indicated that the nature and scale of environmental impacts, their severity, extent and the duration would vary depending on the type, size, and location of activities. EMF has carefully assessed the potential adverse environmental impacts that are likely to occur during the implementation of projects.

6.2 Salient Features of EMF

EMF has been developed to ensure that the projects activities are identified, planned and implemented are environmentally sound. These guidelines serve as a tool to guide the project implementers to address environmental concerns, prepare mitigation plans, and to ensure complete integration of environmental concerns and mitigation measures in the design of the project activities.

The EMF will be applied to all project activities, through the different stages of the project cycle. Proposed EMF interventions are designed on the basis of the current understanding of the environmental. During project planning and implementation, experience and learnings will be used to alter EMF, if required.

6.2.1 Environmental Screening

Screening process will help project authority to take decision of adoption of permissible activities and related impact specific to activities proposed under project package. Project authority shall screen each project package as per following format. Screening exercise will define applicability of different management plan developed to manage anticipated adverse impact. Any package involving any non-permissible activity shall not be considered for execution and mitigation measures proposed against each identified impact shall be followed during project implantation. Environmental screening will also help project authority in identifying any unforeseen impact on CPR like temple, mosque, burning ghat, archaeological and historical significance site and natural habitat.

Table 11: Screening Checklist (Planning Stage)

	Name of MIP	:	
	District	:	
	Block	:	
	Name of Sub Basin	:	
	Area of tank (hectares)	:	
	Height of dam (m)	:	

	Average annual rainfall in command area (mm)	:	
	Soil type in command area	:	
	Command area (ha)	:	
	Command area under cultivation (ha %)	:	
	Environmental Screening Parameters		
	Is any activity affecting ecologically sensitive site, i.e., national park, wildlife sanctuary?	Yes/ No	If yes, the selected the activity should not be financed under the project
	Is the project located along designated wildlife migratory route?	Yes/ No	If yes, the selected the activity should not be financed under the project
	Is there a nearby protected area/ forest/wetland?	Yes/ No	If yes,[13] is there any risk/impact/disturbance to forests and/or protected areas?
	Are there cultural, historic, religious site/buildings within 2 kms of the facility?	Yes/ No	If yes, is there risk/impact to known/unknown historical, religious or cultural sites? If yes, then activity should be avoided, where there is no impact, chance finds procedures would be applicable and if protected site
	Are there any activities located within 200m of a protected site or monument	Yes/ No	If yes, ASI norms should be followed
	Are there any impacts due to civil works/ rehabilitation envisaged in the MIP?[14] - Increase in dust and noise from demolition and/or construction - Generation of construction waste - Excavation/ desilting impacts and soil erosion - Increase sediment loads in receiving water/ impacts to water quality - Removal and disposal of toxic and/or hazardous substances - Changes in local drainage pattern - Removal of aquatic weeds	Yes/ No	If yes, follow EMP for civil works in Annex-VIII of this report.
	Will rehabilitation of canal and tank system potentially cause - Impacts to religious site/Sacred place/Burial place? - Impacts to trees restricted by Forest Department? - Impacts to wildlife habitat? (bird, reptile, insect, fish)	Yes/ No	If yes, the activity should be modified to avoid impacts on these sensitive environmental areas.
	Has there been a site identified to safely dispose waste from civil work?	Yes/ No	If No, site should be identified in consultation with stakeholders.
	Is there a dam within the MIP that is above 10m height	Yes/ No	If yes, notify SDSO to deploy DSP- follow outline in Annex IX.
	Is there a requirement for Labour Camp to be set up for labour accommodation	Yes/ No	If yes, the camp and its access roads should not be set up on forest land or any environmentally sensitive habitat.
	Souring of raw materials (stone, gravel, sand, timber) from verified sources	Yes/ No	

[13]In such cases it would be necessary to reject rehabilitation works in the catchments, if doing so would provoke negative environmental impacts that could not be avoided or mitigated, the activity must be rejected/excluded.

[14]It is expected that the Tanks to be rehabilitated will pass the screening criteria with no problem and will be found suitable for improvements and any small civil works required. In such cases the standard mitigation measures would be all that is needed to minimize any risk of negative environmental impact. The Environmental Management Plan (EMP) in annex VIII would apply.

	Will selected activities increase the use of pesticides and fertilizers	Yes/ No	If yes, has the requisite IPNM awareness and trainings been provided to farmers?
	Do any of the activities require consent from the Pollution Control Board? (such as establishment of Batching Plant, Crusher)	Yes/ No	If yes, has consent been taken?

6.2.2 Non-permissible Activities

Activities that could lead to irreversible and significant negative impacts will not be financed by the project. A list of these activities is given below as per the EA undertaken. Further, activities could be added to this list based on actual project implementation experience:

Table 12: List of non-permissible activities under OIIPCRA

SN.	List of Non-Permissible Activities
a.	Any activity located within a notified Protected Area and Eco Sensitive Zone (ESZ)[15]
b.	Any activity within forest area or critical natural habitat
c.	Any activity located within a Sites of Conservation Importance[16]
d.	Any activity that converts or leads to conversion and/or degradation of significant areas of critical natural habitats (areas officially protected) and/or Sites of Conservation Importance and designated forest areas
e.	Any activity involving pesticides that are banned by the Government of India
f.	Purchase or use of pesticides, insecticides, herbicides and other dangerous chemicals; asbestos and other investments detrimental to the environment.
g.	Any activity involving construction within 100 meters[17] from an archaeological site/monument[18]
h.	Any activity involving use of Asbestos Containing Materials (e.g., AC pipes for irrigation, AC sheets for roof)
i.	Any activity that violates the provisions of applicable National and State laws
j.	Construction of any new irrigation reservoir dam
k.	Construction of new canals and new branch canals
m.	Major rehabilitation/remedial works that expected to lead to significant negative environmental Impacts or large scale silt removal (quantities above 500,000 m^3).

6.2.3 Overview of Management Framework

A brief overview of different type of management plan with their applicability and future action plan is given in Table 13.

[15] Protected Area of Odisha < http://www.wiienvis.nic.in/Database/Orissa_7834.aspx >
[16] Sites of Conservation Importance in Odisha, refer to
< http://www.wiienvis.nic.in/Database/ConservationAreas_844.aspx >
[17] In case of archaeological sites/monuments, the prohibited area is 100 mts and the regulated area is 200 mts.
[18] Protected monuments in Odisha, refer to: http://odishaculture.gov.in/Archaeology/protected_monuments.html

Table 13: Project component and activity wise impact and mitigation measures including monitoring details

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
	Component A: Climate-Smart Intensification and Diversification of Production						
	Sub-component A.1: Support to Improved Productivity and Climate Resilience						
	Post-harvest Management & Agri-business	Creation of rural agri business infrastructure	Generated small quantity of construction waste like sand, stone, wood chips, cut piece of reinforcement and mesh wire, due to creation of selling platform, storage house, if not removed after completion of work may create inconvenience to local people.	Refer EMP for Civil works at Annexure-VIII;	Construction	**Implement**: Contractor (Daily) **Supervise**: Asst. Agriculture Officer (Fortnightly); SPU-Environmental Expert (Quarterly) **Monitoring**: PD ATMA (Monthly) SPU- Environmental Expert (Quarterly)	Type of construction material used; cleanliness of site; disposal method adopted
			Residual material may wash off and chock nearby drainage system during rainy season;	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Asst. Agriculture Officer (Fortnightly); SPU-Environmental Expert (Quarterly) **Monitoring**: PD ATMA (Monthly) SPU- Environmental Expert (Quarterly)	Type of construction material used; cleanliness of site; disposal method adopted; condition of nearby drainage system
			Impact on workers' health and safety during construction work	Refer EMP for Civil Works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Asst. Agriculture Officer (Fortnightly); SPU-Environmental Expert (Quarterly) **Monitoring**: PD ATMA (Monthly) SPU- Environmental Expert (Quarterly)	Availability and usages of PPE, incident and reason of accident at work site
		Creation of PHM facilities - Mini Processing Plant	Electricity consumption will be high if latest energy efficient equipment's are not procured;	The machineries / instruments to be procured / installed	Pre-Construction (Procurement)	**Implement**: Beneficiary (During Purchase)	ISI mark; Energy Rating

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
		(Dal Mill, Oil Expeller, Millet)		should have ISI mark and energy efficiency certification.		**Supervise**: PD- ATMA (During Purchase); SPU- Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA (Monthly) SPU- Environmental Expert (Quarterly)	
			Generation and disposal of reusable biodegradable food waste;	Food waste shall be collected separately and sold to organization preparing organic waste.	Operation	**Implement**: Beneficiary (Daily) **Supervise**: PD- ATMA (Monthly); SPU- Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA (Monthly) SPU- Agronomist & Environmental Expert (Quarterly)	Rate of waste generation with type and frequency of disposal; disposal method
		Establishment of CHC (Sheds / Farm Implements / Machineries)	Use of asbestos material in roof;	Asbestos Containing Materials (e.g., AC sheets for roof) shall not be used	Construction	**Implement**: Contractor (During construction) **Supervise**: Asst. Agriculture Officer (Fortnightly); SPU- Environmental Expert (Quarterly) **Monitoring**: PD ATMA (Monthly) SPU- Environmental Expert (Quarterly)	Type of roof and construction material used
	Sub-component A.2: Support to Fish Production						
A	Fish Seed Production	Modernizing Fish Hatchery by OPDC	Generated small quantity of construction waste like sand, stone, wood chips, cut piece of reinforcement and mesh wire if not removed after completion of work	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: GM OPDC (Monthly); SPU- Environmental Expert (Quarterly) **Monitoring**: GM OPDC & DFO (Monthly)	Type of construction material used; cleanliness of site; disposal method adopted

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
			may create inconvenience to local people.			SPU - Environmental Expert (Quarterly)	
			Residual material may wash off and chock nearby drainage system during rainy season;	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: GM OPDC (Monthly); SPU- Environmental Expert (Quarterly) **Monitoring**: GM OPDC & DFO (Monthly) SPU - Environmental Expert (Quarterly)	Type of construction material used; cleanliness of site; disposal method adopted; condition of nearby drainage system
			Impact on workers' health and safety during construction work	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: GM OPDC (Monthly); SPU- Environmental Expert (Quarterly) **Monitoring**: GM OPDC & DFO (Monthly) SPU - Environmental Expert (Quarterly)	Availability and usages of PPE, incident and reason of accident at work site
		Fish seed transportation vans with carrier crates by OPDC	Vehicular emission beyond permissible emission limit if not comply with latest emission norms;	The van to be procured should comply to Bharat stage III or above;	Pre-Construction	**Implement**: Beneficiary (During Purchase) **Supervise**: GM OPDC (Monthly); SPU- Environmental Expert (Quarterly) **Monitoring**: GM OPDC & DFO (Monthly) SPU - Environmental Expert (Quarterly)	Bharat stage mark
				Regular emission testing shall be done (PUC certification)	Operation	**Implement**: Beneficiary (Before Expiry) **Supervise**: GM OPDC (Monthly); SPU- Environmental Expert (Quarterly) **Monitoring**: GM OPDC & DFO (Monthly)	Availability of UpToDate PUC certificate, Regular renewal and expiry of PUC

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
						SPU - Environmental Expert (Quarterly)	
B	Fish Feed	Establishment of Mini Fish Feed Mill by OPDC; Establishment of Small Scale Fish Feed Mill by OPDC	Generated small quantity of construction waste like sand, stone, wood chips (from centering, shuttering work), cut piece of reinforcement and mesh wire if not removed after completion of work may create inconvenience to local people.	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: GM OPDC (Monthly); SPU- Environmental Expert (Quarterly) **Monitoring**: GM OPDC & DFO (Monthly) SPU - Environmental Expert (Quarterly)	Type of construction material used; cleanliness of site; disposal method adopted
			Residual material if not removed entirely may wash off and chock nearby drainage system during rainy season;	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: GM OPDC (Monthly); SPU- Environmental Expert (Quarterly) **Monitoring**: GM OPDC & DFO (Monthly) SPU - Environmental Expert (Quarterly)	Type of construction material used; cleanliness of site; disposal method adopted; condition of nearby drainage system
			Impact on workers health and safety during construction work	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: GM OPDC (Monthly); SPU- Environmental Expert (Quarterly) **Monitoring**: GM OPDC & DFO (Monthly) SPU - Environmental Expert (Quarterly)	Availability and usages of PPE, incident and reason of accident at work site
C	Fish Production	Tank Culture of IMC (Indian major carps);	Use of powdery vegetarian feed will pollute water if left to suspend in water for too long time. Trash fish shreds are irregular in size and have a high loss rate (about	Refer EMP for Aqua Culture Management Plan at Annexure- VII	Operation	**Implement**: Beneficiary (weekly) **Supervise**: GM CIFA/ OPDC (Monthly); SPU- Fishery & Environmental Expert (Quarterly)	Type of feed purchased and used

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
		Polyculture with Mola / Scampi in selected MI tanks along with IMC covering 1000 Ha of the tank by CIFA / OPDC; Gift Tilapia Culture to be demonstrated in select areas by OPDC	40%). The feed residue deposited on the pond bottom will cause pollution, resulting in a heightened risk of anoxia and mortality rate.			**Monitoring**: GM OPDC/ CIFA & DFO (Monthly) SPU - Fishery Expert & Environmental Expert (Quarterly)	
			High moisture Trash fish feed becomes mouldy easily. It is vulnerable to bacteria and parasites. The fat of trash fish oxidises and rots easily. Rotten trash fish may cause disease or even death.	Use vegetarian fish feed which has a low moisture content and preservation treatment is usually not necessary. If it is stored properly there should not be any bacteria or mould problem.	Operation	**Implement**: Beneficiary (weekly) **Supervise**: GM CIFA/ OPDC (Monthly); SPU- Fishery & Environmental Expert (Quarterly) **Monitoring**: GM OPDC/ CIFA & DFO (Monthly) SPU - Fishery Expert & Environmental Expert (Quarterly)	Type of feed purchased and used
			Water pollution due to excess use of medicine to control fish diseases	Refer EMP for Aqua Culture Management Plan at Annexure- VII	Operation	**Implement**: Beneficiary (weekly) **Supervise**: GM CIFA/ OPDC (Monthly); SPU- Fishery & Environmental Expert (Quarterly) **Monitoring**: GM OPDC/ CIFA & DFO (Monthly) SPU - Fishery Expert & Environmental Expert (Quarterly)	Diseases and used medicine with dose and application method
			Spreading of fish diseases	Refer EMP for Aqua Culture Management Plan at Annexure- VII	Operation	**Implement**: Beneficiary (Monthly) **Supervise**: GM CIFA/ OPDC (Monthly); SPU- Fishery & Environmental Expert (Quarterly) **Monitoring**: GM OPDC/ CIFA & DFO (Monthly)	Frequency of Cleaning of aquatic weed and treatment of pond bed and water with method of treatment; type

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
						SPU - Fishery Expert & Environmental Expert (Quarterly)	and rate of fish feed used
			Reduction in the usage of genetic diversity of the wild fish varieties	Refer EMP for Aqua Culture Management Plan at Annexure- VII	Operation	**Implement**: Beneficiary (during fingerling) **Supervise**: GM CIFA/ OPDC (Monthly); SPU- Fishery & Environmental Expert (Quarterly) **Monitoring**: GM OPDC/ CIFA & DFO (Monthly) SPU - Fishery Expert & Environmental Expert (Quarterly)	Practice of mixed culture with species and its suitability;
		Stocking of self-replicating species by OPDC	Fish mortality may occur if oxygen circulation is not maintained properly	Refer EMP for Aqua Culture Management Plan at Annexure- VII	Operation	**Implement**: OPDC (Daily) **Supervise**: GM OPDC (Monthly); SPU- Fishery & Environmental Expert (Quarterly) **Monitoring**: GM OPDC & DFO (Monthly) SPU - Fishery Expert & Environmental Expert (Quarterly)	Availability and functionality of aerator
		Establishment of fish processing units in selected locations for value added products (Eg. Filleting, Pickle making, Cutlrt making etc.) - through CIFT / CIWA / FISHFED and any other	Generation of food waste from fish processing unit will create bad odour if not managed in scientific way at regular interval; Health hazard due to use of formalin during fish processing and unhygienic practice;	Refer EMP for Aqua Culture Management Plan at Annexure- VII	Operation	**Implement**: Beneficiary (Daily) **Supervise**: GM CIFT / CIWA / FISHFED (Monthly); SPU- Fishery & Environmental Expert (Quarterly) **Monitoring**: GM CIFT/ CIWA/ FISHFED & DFO (Monthly) SPU - Fishery Expert & Environmental Expert (Quarterly)	Cleanliness of site; frequency and method of disinfection;

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
		identified CBOs / NGOs / Agencies					
		Strengthening Value chain infrastructure - Hygienic fish / fish product transportation - through CIFT / CIWA / FISHFED and any other identified CBOs / NGOs / Agencies	Vehicular emission beyond permissible emission limit if not comply with latest emission norms;	The van to be procured should comply to prescribed standards for transportation of fish commodities; The van to be procured should comply to latest Bharat stage III or above;	Pre-Construction Pre-Construction	**Implement**: Beneficiary (Before Purchase) **Supervise**: GM CIFT / CIWA / FISHFED (Before Purchase); SPU- Environmental Expert (Quarterly) **Monitor**: GM CIFT / CIWA / FISHFED & DFO (Monthly) SPU - Fishery Expert & Environmental Expert (Quarterly)	Suitability of vehicle for fish transportation, Emission standard,
				Regular emission testing shall be done (PUC certification)	Operation	**Implement**: Beneficiary (Before expiry) **Supervise**: GM CIFT / CIWA / FISHFED (Before Purchase); SPU- Environmental Expert (Quarterly) **Monitor**: GM CIFT / CIWA / FISHFED & DFO (Monthly) SPU - Fishery Expert & Environmental Expert (Quarterly)	Availability of UpToDate PUC certificate; regularity of renewal
			Health hazard and spoilage due to unhygienic practice and spoilage due to non-maintenance of suitable temperature in transportation vehicle;	Refer EMP for Aqua Culture Management Plan at Annexure- VII	Operation	**Implement**: Beneficiary (Regular) **Supervise**: GM CIFT / CIWA / FISHFED (Monthly); SPU-Fishery & Environmental Expert (Quarterly) **Monitor**: GM CIFT / CIWA / FISHFED & DFO (Monthly) SPU - Fishery Expert & Environmental Expert (Quarterly)	Cleanliness of van; method of disinfection; operating temperature

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
		Strengthening Marketing Infrastructure - modernization of 2 model kiosks for fish and fish product retailing in PPP mode - through CIFT / CIWA / FISHFED and any other identified CBOs / NGOs / Agencies	Generation of fish waste which will create bad odour if not managed in scientific way at regular interval;	Refer EMP for Aqua Culture Management Plan at Annexure- VII	Operation	**Implement**: Beneficiary (Daily) **Supervise**: GM CIFT / CIWA / FISHFED (Monthly); SPU-Fishery & Environmental Expert (Quarterly) **Monitor**: GM CIFT / CIWA / FISHFED & DFO (Monthly) SPU - Fishery Expert & Environmental Expert (Quarterly)	Cleanliness of site; frequency and method of disinfection;
	Sub-component A.3: Support to Diversification and Produce Marketing						
A	Area Expansion under Horticulture	Hybrid Vegetable Cultivation (Brinjal, Bitter gourd, Cabbage, Cauliflower etc)	Degradation of soil fertility due to increased application of pesticide and chemical fertilizer; Health impact due to application of pesticide and chemical fertilizer;	IPNM plan given in Annexure- VI shall be applied	Operation	**Implement**: Beneficiary (during cultivation) **Supervise**: Asst. Horticulture Officer (Quarterly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Name and doses of application of pesticide and fertilizer and awareness of farmers on IPNM
		Floriculture (Merigold)	Degradation of soil fertility due to application of pesticide and chemical fertilizer; Health impact due to application of pesticide and chemical fertilizer	IPNM plan given in Annexure- VI shall be applied	Operation	**Implement**: Beneficiary (during cultivation) **Supervise**: Asst. Horticulture Officer (Quarterly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Name and doses of application of pesticide and fertilizer and awareness of farmers on IPNM
B	Horticulture Investment for Vulnerable group	Mushroom Cultivation (Production Unit)	Generated paddy straw and cotton waste will cause odour pollution and	Regular removal and drying of waste	Operation	**Implement**: Beneficiary (during cultivation)	Generated waste and its disposal/ reuse

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
			decrease local aesthetic value if not disposed in regular manner	material and use it as cooking fuel Cleaning and disinfection of mushroom grown area to maintain hygiene condition		**Supervise**: Asst. Horticulture Officer (Monthly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	mechanism; disinfection mechanism with frequency
F	Storage Structures	Functional Pack House (9m*6m)	Use of asbestos containing roof material	Asbestos Containing Materials (e.g., AC sheets for roof) shall not be used	Construction	**Implement**: Contractor (During construction) **Supervise**: Asst. Horticulture Officer (Fortnightly); SPU-Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Type of roof and construction material used
			Generated construction waste like sand, stone, wood chips (from centering, shuttering work), cut piece of reinforcement and mesh wire if not removed after completion of work may create inconvenience to local people, in terms of health hazard.	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Asst. Horticulture Officer (Fortnightly); SPU-Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Type of construction material used; cleanliness of site; disposal method adopted
			Impact on workers health and safety during construction work	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Asst. Horticulture Officer (Fortnightly); SPU-Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Availability and usages of PPE, incident and reason of accident at work site
			Generated vegetable waste and waste from packing material may lead to odour pollution and decrease local aesthetic value if not disposed at regular interval	Possibility shall be explored for using of vegetation waste as compost material	Pre-Construction	**Implement**: Beneficiary (Fortnightly) **Supervise**: Asst. Horticulture Officer (Monthly); SPU-	Effort made in arranging interested party for composting of waste

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
						Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	
				Vegetable (food) waste shall be stored at earmarked area and disposed to a designated place;	Operation	**Implement**: Beneficiary (Daily) **Supervise**: Asst. Horticulture Officer (Monthly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Location of temporary storage and final disposal
		Cold Room -Solar for 5 mtr tonnes	Generated construction waste like sand, stone, wood chips (from centering, shuttering work), cut piece of reinforcement and mesh wire if not removed after completion of work may create inconvenience to local people, in terms of health hazard.	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Asst. Horticulture Officer (Fortnightly); SPU-Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Type of construction material used; cleanliness of site; disposal method adopted
			Impact on workers health and safety during construction work	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Asst. Horticulture Officer (Fortnightly); SPU-Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Availability and usages of PPE, incident and reason of accident at work site
			Generated vegetable waste may lead to odour pollution and decrease local aesthetic value if not disposed at regular interval	Possibility shall be explored for using of vegetation waste as compost material	Pre-Construction	**Implement**: Beneficiary (Fortnightly) **Supervise**: Asst. Horticulture Officer (Monthly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Effort made in arranging interested party for composting of waste
				Vegetable (food) waste shall be stored at earmarked area and	Operation	**Implement**: Beneficiary (Daily) **Supervise**: Asst. Horticulture Officer (Monthly); SPU-	Location of temporary

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
				disposed to a designated place;		Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	storage and final disposal
			Rotting or spoilage of agriculture commodity;	Maintain specific temperature at cold room	Operation	**Implement**: Beneficiary (Daily) **Supervise**: Asst. Horticulture Officer (Monthly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Range of temperature control in different season; days of shutdown
G	Post-harvest Management-Value Addition	Processing Unit - Mechanised fruits and vegetables	Odour pollution from generated food waste if not disposed in regular interval;	Possibility shall be explored for using of vegetation waste as compost material	Pre-Construction	**Implement**: Beneficiary (Fortnightly) **Supervise**: Asst. Horticulture Officer (Monthly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Effort made in arranging interested party for composting of waste
				Vegetable (food) waste shall be stored at earmarked area and disposed to a designated place;	Operation	**Implement**: Beneficiary (Daily) **Supervise**: Asst. Horticulture Officer (Monthly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Location of temporary storage and final disposal
		Processing Unit-Lemon Grass Oil	Generation and disposal of organic aqueous waste (CcHD)	Possibility shall be explored for using of vegetation waste as compost material;	Pre-Construction	**Implement**: Beneficiary (Fortnightly) **Supervise**: Asst. Horticulture Officer (Monthly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	Effort made in arranging interested party for composting of waste
				Organic aqueous waste shall be stored	Operation	**Implement**: Beneficiary (Daily)	Location of temporary

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
				at earmarked area and disposed to a designated place; Left out portion may be used as cooking fuel after drying		**Supervise**: Asst. Horticulture Officer (Monthly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)	storage and final disposal
	Component B: Improving Access to Irrigation and Water Productivity						
	Sub-Component B.2: Support to Investment in Cascades						
A.	Tank System Improvement	Demonstration of bore well with solar pumping system	Loss of top soil due to digging of bore well;	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Quantity Generated and disposed with location
			Generation and disposal of earth material due to digging of bore well;	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Quantity Generated and disposed with location
		Catchment treatment	Loss of top soil during excavation of foundation trenches and resectioning of tank	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Quantity Generated and disposed with location

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
			Dust and air pollution due to flying of stacked up earth; littering during transportation	Refer EMP for Civil works at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Water Sprinkler Arrangement; Visual appearance of site; Availability of air quality report
			Impact on fauna including vulnerable mammal (specially nearby area of forest)	The contractor and its workers will be educated / sensitized on endangered/ vulnerable species and its protection measures;	Pre-construction	**Implement**: Contractor (Once before initiation of work) **Supervise**: Junior Engineer of MI Dept. (Monthly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Awareness of workers; training received;
				Hunting or poaching of Vulnerable mammal and Snake shall be strictly restricted. On observation, any such species shall be allowed to migrate in nearby area; Not using any threatened/ near threatened species for commercial purpose; Silencer shall be provided with all heavy noise generating machineries (specially nearby area of forest);	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Record of occurrence of such event; method adopted on occurrence of such event; noise reducing measures adopted

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
			Organic pollution due to improper dumping of aquatic weeds, shrub stems, stumps, roots, twigs and leave leading to inconvenience to local commuters, odour pollution, etc.	Refer EMP for Civil Work at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Generated quantity with type; temporary storage area and final disposal area with mechanism
			Air pollution due to burning of weeds, shrub stems, stumps, roots, twigs and leave	Refer EMP for Civil Work at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Generated quantity with type vs. final disposal quantity with area and mechanism
			Generation of wood log/ chips from centering, shuttering work	Refer EMP for Civil Work at Annexure-VIII	Construction	**Implement**: Contractor (Weekly) **Supervise**: Junior Engineer of MI Dept. (Monthly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Type of construction material used; cleanliness of site; disposal method adopted with quantity generated vs. disposed
			Generation of metal scrap (cut piece) from cutting of MS sheet, reinforcement and mesh wire	Refer EMP for Civil Work at Annexure-VIII	Construction	**Implement**: Contractor (Weekly) **Supervise**: Junior Engineer of MI Dept. (Monthly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Type of construction material used; cleanliness of site; disposal method adopted with quantity generated vs. disposed

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
			Generation of plastic waste	Refer EMP for Civil Work at Annexure-VIII	Construction	**Implement**: Contractor (Weekly) **Supervise**: Junior Engineer of MI Dept. (Monthly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Type of construction material used; cleanliness of site; disposal method adopted with quantity generated vs. disposed
			Sediment transport in streams, canal leading to increased TDS and turbidity; sediment deposition in MI tank leading to reduction in water storage capacity	Refer EMP for Civil Work at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Mechanism adopted to restrict soil erosion and sediment transportation; cleanliness of excavated site; temporary storage area with duration
			Noise pollution due to construction and demolition work and its impact on workers and community health	Refer EMP for Civil Work at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Monthly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Availability and use of PPE; Noise reducing measures; sensitive receptor location
			Generated construction waste like sand, stone, wood chips (from centering, shuttering work), cut piece of reinforcement and mesh wire if not removed after completion of work may create inconvenience to local people/ farming practices, and health hazard;	Refer EMP for Civil Work at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Type of construction material used and generated waste; cleanliness of site; disposal method adopted

Sl. No.	Components and sub components	Types of Activities	Potential Negative Impacts	Mitigation Measures	Project Stage	Responsibility/ Frequency	Monitoring Parameters
			Impact on workers' health and safety during construction work	Refer EMP for Civil Work at Annexure-VIII	Construction	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)	Availability and usages of PPE, incident and reason of accident at work site
			Safety of large dams	Refer to Dam Safety Plan in Annexure IX	Construction	**Implement**: Contractor (Daily) **Supervise:** Junior Engineer of MI Dept. (Fortnightly); SPU-EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly); SPU- EE (Monitoring) (Quarterly)	Implementation of remedial measures, No. of dam rehabilitated, periodic evaluation done by DSP

6.2.4 Inclusion of EMP in Bid Document

The EMP should be finalized and approved by the project SPIU Environmental Specialist before finalizing the bid documents, and subsequently incorporated. This is required to fully reflect the sections of the EMP relevant to the contractor in the bid document. This would include:

a. *Mitigation table:* In the Mitigation table, the text describing each measure should not include/repeat what is already covered under the technical specifications, which is being cross-referred. The description should focus on "what" and "where" of the mitigation / enhancement measure as the "how" of the measure is covered under the specification.

b. *Monitoring table*: There are certain environment quality, health and safety and labour monitoring requirements for the contractor. While developing the monitoring requirements table, those that pertain to the contractor should be clearly separated in the bid document.

c. *Cost table*: The items pertaining to the contractor should be clearly separated from those that are to be incurred by any other government agency or supervision consultant.

SPU will also review the various permissions and approvals to be obtained. In order to proceed for signing of contracts. SPU to ensure the following are completed (i) all environmental permission and approvals from relevant authorities (ii) Training and capacity building activities initiated and (iii) stakeholder consultations have been conducted as required.

In addition, contract documents will include references to various Legal provisions/ acts and clauses relating to the environmental and social performance, (compliance with EMP), labour management, occupational health and safety management, and the implementation of the same will be monitored by SPU Environment Specialist.

6.2.5 Monitoring

6.2.5.1 Overall EMF Monitoring

An Environmental Monitoring Plan has been framed for implementation and post implementation phases covering frequency of supervision, indicators to be measured and responsibility of supervision which is given in Table 13. A responsibility matrix for implementation, supervision, verification and monitoring along with frequency of monitoring is provided in Table 14 enlisting different stakeholders like from the SPU, district line departments, contractors etc. Sample monitoring formats have been provided in Annexure- X which shall be revised during project implementation as per relevant.

6.2.5.2 Monitoring of Environmental Parameters

An action plan for quality testing of environmental parameters of Air, Surface Water, Soil and Noise is provided in Annexure X. Considering short working duration at each MI tank, responsibility of monitoring of these parameters is given to Executive Engineer (EE) of respective MI division at District Level. EE will engage NABL/ MoEFCC accredited third party environmental laboratory for sample collection and laboratory analysis. Testing shall be done on quarterly basic (except monsoon season). At least 6 nos. of MI tank where civil work is in progress during reporting quarter shall be selected for sample collection. Quarterly basis sampling and testing shall be continued throughout the civil construction period at any MI tank selected randomly by EE. Sampling location shall be selected in consultation with EE of respective MI division and sampling shall be done as per methodology described in following paragraphs.

6.2.5.3 Mid-term and end-term audit

The external M&E Agency hired by the SPU-OIIPCRA will undertake a mid-term and end-term evaluation of the EMP implementation in order to identify issues, good practices and make recommendations for strengthening E&S management. The evaluation will be undertaken twice during project implementation period of 6 years– at mid-term and at the end of the project. Mid-term audit shall be carried out only after implementation of 30% of project activities or after 2.5 years but before 3.5 years from the date of loan agreement with the World Bank; whichever is prior. The audit reports will be shared by the SPU with the District Level Project Monitoring Team (DLPMT), other implementing agencies and the World Bank. The audit will review implementation status of recommendations/mitigation measures and activities as proposed in the EMF to: i) assess the major environmental non-compliances and propose corrective actions. ii) prepare an audit report that clearly specifies iii) the deviations in implementing environmental measures, if any, iv) positive measures taken, v) suggestions for further improvement of social and environmental management practices, vi) to identify constraints if any in ensuring compliance to the measures outlined in the EMP. Suggested areas to be covered during mid and end term audit are provided in Annexure- X.

Chapter 7: Institutional Arrangement, Capacity Building and Budget

The project will be implemented by three-line departments (Minor Irrigation -DOwR, Agriculture and Farmer Empowerment and Fisheries & Animal Resource Development) with clearly defined responsibilities. The State Project Unit (SPU) at the state level will lead the implementation. OCTDMS will manage and be responsible for implementation of the OIIPCRA project. OCTDMS has deployed a committed team of professionals at all levels, and established a State Project Unit (SPU)-OIIPCRA, at the state level for project implementation. The OIIPCRA shall be coordinated by PD-OIIPCRA. PD-OIIPCRA shall report to Executive body. Executive body will review the progress of the OIIPCRA at regular intervals and shall provide strategic directions, guidance on policy matters and resolve conflicts, if any, amongst the implementing agencies. Executive body shall be chaired by the Principal Secretary-DoWR and comprise of the Director level officers from Agriculture, Spl. Project (PR) and Fisheries.

The main objective of the institutional arrangement is to ensure quality assurance and safety structures to apply environmental and social safeguards. Institutional arrangements for EMF implementation of different project components in 15 project districts would be made such that participation of different stakeholders are ensured. One dedicated environmental specialist at SPU level is deployed to manage environmental safeguard measures with the support of sectoral specialists at SPU. One external monitoring and evaluation (M&E) agency will be placed under OIIPCRA for conducting concurrent monitoring of environmental parameters on quarterly basis and periodic monitoring and evaluation of safeguard implementation. The overall implementation arrangement is given in Figure 2 and institutional and implementation arrangement for EMP implementation is given in table for EMF implementation for OIIPCRA will be as follows:

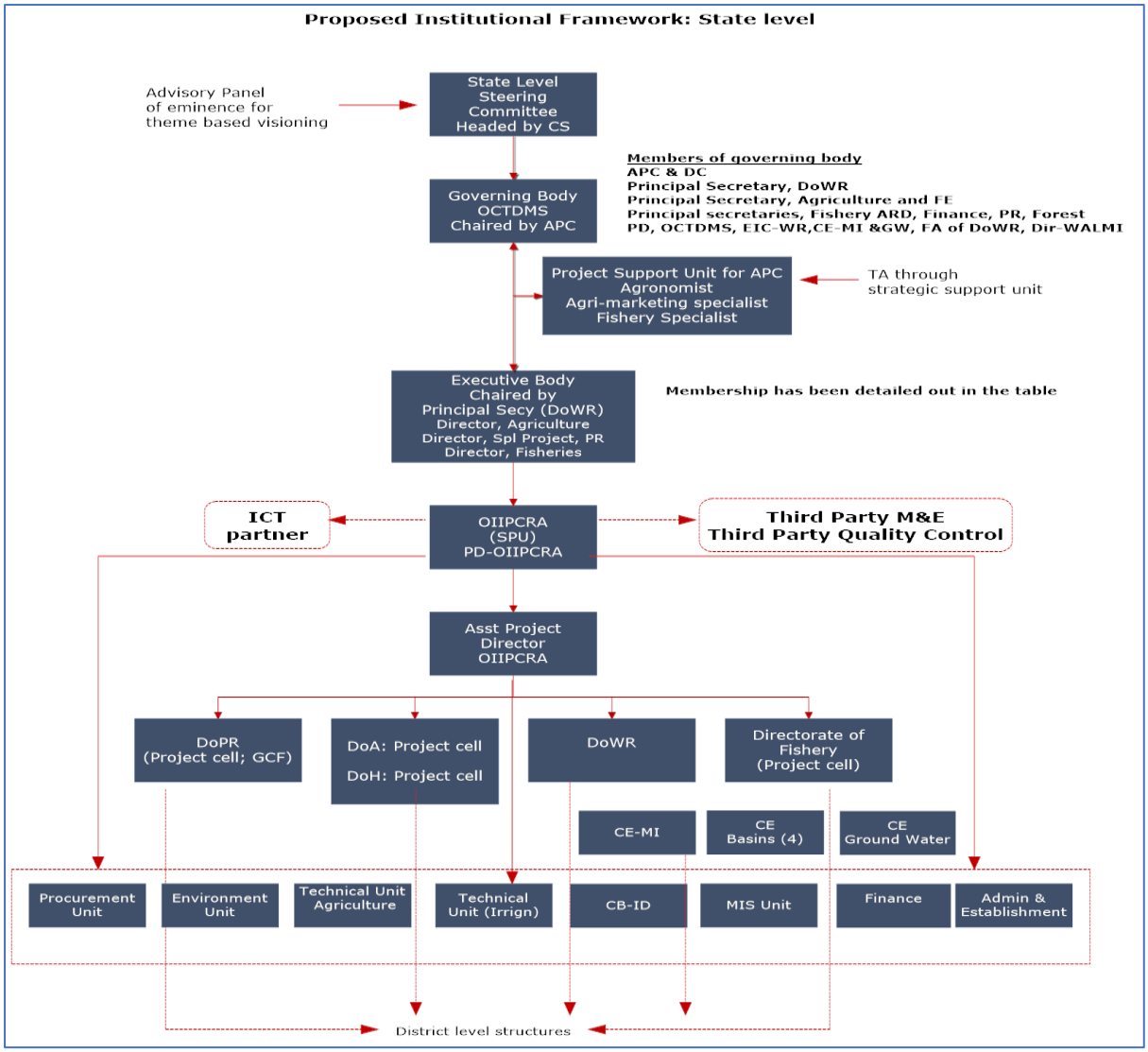


Figure 2: Insititutional arrangement for EMF

7.1 Implementation arrangement of EMF

Implementation arrangement for EMF along with the respective EMPs is given in Table 14. Roles and responsibilities of different stakeholders involved in implementation, supervision and monitoring of environment safeguard measures are given in Table 15.

Environmental expert at SPU level will perform screening exercise for each work package before floating of tender. Environmental expert may consult with Block/ District level Agriculture/ Horticulture/ Fishery/ MI officer and take assistance of Agriculture/ Horticulture/ Fishery/ Irrigation (Minor) expert deputed at SPU level while performing environmental screening exercise. Project authority including contractor and beneficiaries will regularly monitor and supervise implementation of proposed mitigation measures. Project activities are grouped into mainly four categories and each category wise responsibility of EMF implementation are tabulated below.

Table 14: Responsibility of EMF implementation

Component	Screening	Implementation of mitigation measures	Supervision/ verification	Frequency	Monitoring	Frequency
IPNM	SPU- Environmental Expert	PD ATMA, DDH, EE (Monitoring), Farmers	SPU - Agronomist & Environmental Expert	Quarterly (seasonal)[1]	PD ATMA/ DDH	Monthly
					External M&E Agency[2]	Quarterly
					SPU - Agronomist & Environmental Expert	Half yearly
EMP Civil Work						
Minor Irrigation	SPU- Environmental Expert	Contractor, EE (Monitoring)	SPU- EE (Monitoring) and Environmental Expert	Quarterly	EE MI Division	Monthly
					QC/QA Agency	Fortnightly
					SPU-EE (Monitoring) & Environmental Expert	Quarterly
Fishery	SPU- Environmental Expert	Contractor/ Beneficiary, EE (Monitoring),	SPU - Fishery Expert & Environmental Expert	Quarterly	GM OPDC/ CIFA & DFO	Monthly
					SPU - Fishery Expert & Environmental Expert	Quarterly
Agriculture & Horticulture	SPU- Environmental Expert	Contractor/ Beneficiary, EE (Monitoring),	SPU- Agronomist & Environmental Expert	Quarterly	PD ATMA/ DDH	Monthly
					SPU- Agronomist & Environmental Expert	Quarterly
EMP Pisciculture	SPU- Environmental Expert	GM OPDC/ CIFA, GM FISHFED, DFO, Beneficiary, EE (Monitoring)	SPU - Fishery Expert & Environmental Expert	Quarterly	GM OPDC/ CIFA/ FISHFED & DFO	Monthly
					SPU - Fishery Expert & Environmental Expert	Quarterly
Dam Safety	SPU- Environmental Expert	Contractor, DSP, EE (Monitoring)	SPU- EE (Monitoring) and Environmental Expert	Quarterly	EE MI Division	Monthly
					SPU- EE (Monitoring) & Environmental Expert	Quarterly
					QC/QA Agency	Fortnightly

Note: *PD ATMA = Project Director ATMA, DDH= Deputy Director of Horticulture, QSA= Quality and Supervision Agency, M&E Agency= Monitoring and Evaluation Agency, EE= Executive Engineer, GM OPDC= General Manager OPDC, MD FISHFED= Managing Director, DFO= District Fishery Officer,*

[1]Pre, Post and Mid of Kharif and Rabi season

[2]Additionally, the external M&E agency shall also undertake concurrent monitoring of overall safeguards implementation in selected tanks on a quarterly basis.

Table 15: Roles and responsibility for EMF implmentation

Expert	Responsibility
SPU - Environmental Specialist	▪ Providing environmental safeguard related technical inputs on implementation of the different interventions ▪ Site visit and screening of potential environmental impacts of projects that are proposed to be undertaken; ▪ Devising additional mitigation measures against any unforeseen impacts. Modification of EMF/ EMP (if require at all) as per guidance of Environmental safeguard specialist of the World Bank ▪ Supervising the implementation of the environmental mitigation measures ▪ Provide necessary inputs towards formulating training modules. ▪ Coordinating training sessions and awareness programs on EMF/ EMP measures. ▪ Coordinating with external M&E agency in inclusion of EMP/ EMF in bid document as well as contract document ▪ Review of quarterly EMP compliance report prepared by external M&E agency and assess requirement of any further action ▪ Review the Half yearly Environment Monitoring report and sharing it with the World Bank.
SPU - Agronomist	▪ Work site visit and periodic supervision and monitoring of implementation of environmental safeguard measures related to IPNM and civil works proposed under agriculture and horticulture component
SPU- EE (Monitoring)	▪ Implementation of environmental safeguard ▪ Work site visit and periodic supervision and monitoring of implementation of environmental safeguard measures related to civil works of MI tank, irrigation system and dam safety aspects
SPU - Fishery Expert	▪ Work site visit and periodic supervision and monitoring of implementation of environmental safeguard measures related to civil works proposed under pisciculture component and promotion of pisciculture.
EE of MI	▪ Coordinating quarterly monitoring (laboratory testing) of environmental parameters i.e. Soil, Air, Surface water and Noise Quality as per section 6.2.5.2. ▪ Work site visit and monthly basis monitoring of implementation of environmental mitigation measures related to civil work of MI tank, irrigation system and dam safety aspects
PD ATMA/ DDH	▪ Implementation of IPNM plan and periodic monitoring of same
GM OPDC/ CIFA GM FISHFED DFO	▪ Implementation of environmental safeguard measures related to promotion of pisciculture and periodic monitoring of same
M&E Agency	▪ Assist SPU in incorporating work package specific EMP/ EMF in bid as well as contract document ▪ Prepare quarterly report on safeguard implementation (as per Annexure- X(b-1)) ▪ Preparing half yearly compliance report (as per Annexure- X(b-2)) on safeguard implementation (compiling quarterly report on safeguard implementation and testing report of environmental parameters. ▪ Conducting mid-term and end-term evaluation of E&S safeguard implementation
QC/QA Agency	▪ Monitoring of implementation of environmental safeguard measures related to civil works of MI tank, irrigation system and dam safety remedial measures

7.2 Implementation Process of EMF

Following step by step process will be adopted for the successful implementation of EMF and the respective EMPs (Figure 3). Project authority will develop work packages, activities in each package, detail scope under each package in line with the process provided in Figure 3. All non-permissible activities proposed under OIIPCRA shall be considered during formulation of work packages. Any of

MI project attracting any non-permissible activity or proposed project activity which is triggering any non-permissible condition shall be dropped.

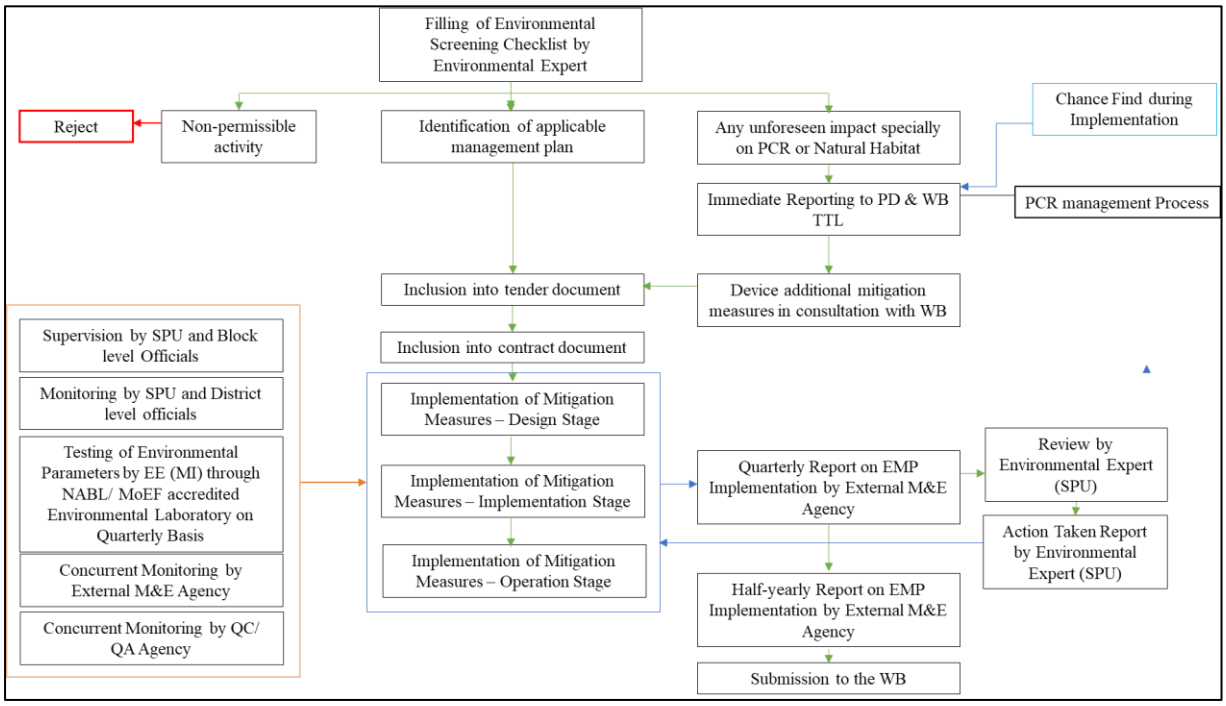


Figure 3: EMF Implementation Process

7.3 Reporting System for EMF

The reporting system will be bottom-up and feedback mechanism will be in a top-down approach in the implementation framework. The external M&E agency will prepare report on environmental safeguards implementation of quarterly basis (sample format provided in Annexure- X which should be revised as relevant). The Environment Expert at the SPU level will review the reports and prepare the action taken report on quarterly basis and appraise to the APD-SPU. The APD-SPU, based on the review of the environment safeguard measures taken at the project level, should discuss with the PD-OIIPCRA at SPU on critical issues for decision. The external M&E agency at the SPU level will prepare half-yearly environmental monitoring reports (sample format provided in Annexure- X which should be revised as relevant) for onwards submission to Environmental specialist at SPU-OIIPCRA. Environmental specialist at SPU, after review of the report, may seek further clarification from external M&E agency/ respective contractor on critical aspects. Finally, half-yearly compliance report will be submitted to the World Bank.

7.4 Capacity Building Plan for EMF

The capacity building program for the officials of SPU-OIIPCRA and other line departments at state, district and block level shall be as follows:

- Orientation program should be organized at the State level for all relevant stakeholders at state level involved in the implementation, supervision and monitoring of the EMF. The orientation programme shall be organised, one prior to start of the project and then during the mid-term review.
- Next level of orientation on Implementation, Monitoring & Supervision of EMF shall be arranged at District level inviting key district level officials who will be involved in EMF implementation, Monitoring & Supervision work. The orientation programme shall be organised, one prior to start of the project and then during the mid-term review.
- The next level of training should be arranged for lines departments members at district and block level. This shall be organized once in a year to acquaint all experts associated with the implementation, supervision and monitoring of EMF/ EMP.
- Community level training workshops on orientation/ sensitization on EMF also will be conducted inviting leader of all community institution such as PP or WUA/ FSHG/ PFCS, Farmer Group and selected beneficiaries. The workshop shall be organised, one prior to start of the project and then during the mid-term review.

The orientation, training plan for the target group, implementing and resource organizations are given in Table 16.

Table 16: Capacity building plan on EMF implementation

Type of Training	Target Group	Frequency	Mode of Training	Resource organization
STATE LEVEL				
Orientation/ Sensitization on EMF; EMF Monitoring Mechanism	SPU- PD, APD, EE (Monitoring), Environmental Expert, Agronomist, Agri-extension Officer, Fishery Expert Line Dept.- Joint Director Agriculture, SE (MI), Deputy Director Fishery (Inland), Directorate of Horticulture, Deputy Director Fishery (Inland), Director (OPDC/ CIFA/ FISHFED/ CIFT/ CIWA)	One at launch of project and one refresher training at mid- term	Presentation, Lectures	Institutions and External Agencies
Implementation of EMF	SPU- PD, APD, EE (Monitoring), Environmental Expert, Agronomist, Agri-extension Officer, Fishery Expert	One at launch of project and one refresher training at mid- term	Presentation, Lectures	Institutions and External Agencies
DIST. & BLOCK LEVEL				
Orientation/ Sensitization on EMF; Implementation of EMF; EMF	DM, ADM, PD ATMA/ DDH, Asst. Agriculture Officer, EE, Junior Engineer (MI Division),	One at launch of project and one refresher training at mid- term	Presentation, Lectures	Institutions and External Agencies

Type of Training	Target Group	Frequency	Mode of Training	Resource organization
Monitoring Mechanism	GM - OPDC/ CIFA/ CIFT/ CIWA/ FISHFED, DFO, Junior Engineer (Fishery), Asst. Fishery Officer PD ATMA, DDH, Asst. Horticulture Officer			
IPNM Plan (Updating skills and knowledge on IPM and INM)	PD ATMA/ DDH, Asst. Agriculture Officer Farmers	One in each of the districts/ every year/ in district where there are interventions	Presentation, Field Demonstrations, lectures, group discussions, case studies	OUAT, Agri Entrepreneurs etc.
EMP on Civil Works	EE, Junior Engineer (MI Division), GM OPDC/ CIFA, DFO, Junior Engineer (Fishery) PD ATMA, DDH, Asst. Horticulture Officer Contractor/ Beneficiary	One in each of the districts/ every year/ in district where there are interventions	Presentation; Lectures	Institutions and External Agencies
EMP on Pisciculture	GM - OPDC/ CIFA/ CIFT/ CIWA/ FISHFED, DFO, Asst. Fishery Officer Fishery Entrepreneurs/ Beneficiary	One in each of the districts/ every year/ in district where there are interventions	Field Demonstrations, lectures, group discussions, case studies	OUAT, Odisha
Community Level Training Workshops on Orientation/ Sensitization on EMF	Leader of all community institution such as PP or WUA/ FSHG/ PFCS, Farmer Group	One in each of the districts/at launch of project and one refresher training at mid- term	Presentation, Lectures, Group Discussions	Institutions and External Agencies

7.5 Overall Budget for EMF Implementation

This budget for environmental monitoring by M&E agency has already been integrated into the overall budget for engagement of third party M&E agency at SPU-OIIPCRA. Overall EMF budget is presented in the following table.

SN	Budget Heads	Unit	Qt.	Unit	Qt.	Unit Cost	Total Cost
A	Waste Management						
	Disposal of Aquatic weed waste					Lumpsum	25,00,000
	Disposal of C&D Waste					Lumpsum	20,00,000
B	Environmental Quality Monitoring by EE					Lumpsum	3,20,00,000
	Monitoring of EMP implementation					Lumpsum	40,00,000
C	**Capacity Building**						
	Training with Refresher						
	SPU & State Level line Dept.	Days	12	Person	6	3,500	2,52,000
	Dist. level line departments	Days	6	Person	30	2,500	4,50,000
	Block level Line Dept.	Days	6	Person	30	2,000	3,60,000
	Contractors	Days	3	Person	75	1,000	2,25,000
	Farmers / FPO training on IPNM	Days	3	Person	5000	500	75,00,000
	Sub-Total						**87,87,000**
	Exposure						
	SPU & State Level line Dept.	Days	5	Person	6	5,000	1,50,000
	Dist level line departments	Days	5	Person	30	3,500	5,25,000
	Block level Line Dept.	Days	5	Person	30	3,500	5,25,000
	FPOs/ SHG/ PP or WUA	Days	2	Person	60	3,000	3,60,000
	Lead Farmers	Days	2	Person	500	1,500	15,00,000
	Sub-Total						**30,60,000**
	Demonstration						
	INM	No.	3	Blocks	60	11,250	20,25,000
	IPM	No.	3	Blocks	60	11,250	20,25,000
	Climate Resilient Farming Tech.	No.	3	Blocks	60	11,250	20,25,000
	Aquaculture	No.	3	Blocks	60	11,250	20,25,000
	Sub-Total						**81,00,000**
D	**Awareness Drive**						
	Workers / Labour Force	No.	2	Site	75	15,000	22,50,000
	IEC Materials	No.	3	Copy	50,000	10	15,00,000
	Sub-Total						***37,50,000***
E	Environment Audit	No.	2			50,00,000	1,00,00,000
F	Cost for Dam Safety						4,00,00,000
	Grand Total						**11,41,97,000**

** Cost in INR*

Cost for capacity building and awareness drive is already considered under overall budget for project *Component C: Institutional Capacity Strengthening*.

Chapter 8: Disclosure of ESMF

State level workshop on disclosure of draft ESMF was organised inviting representatives from stakeholders' departments i.e Agriculture, Horticulture, Fishery, Minor Irrigation, Forest, Orissa Pisciculture Development Corporation Ltd. (OPDC), Agricultural Technology Management Agency (ATMA), Odisha University of Agriculture and Technology (OUAT), State Institution of Technical Laboratory (SITL- pesticide), International Rice Research Institute (IRRI), World Fish, etc.

Baseline environmental situation, significant environmental issues, proposed project activities, anticipated impacts due to project implementation, proposed mitigation measures, non-permissible activities, proposed monitoring and reporting mechanism were disseminated through workshop. A detail power point presentation on measures proposed in ESMF was given and all aspects were discussed thoroughly to capture any concern/ recommendation of representatives of stakeholder's department. It seems that, stakeholders are list concerned about environmental consequences due to proposed implementation of project activities. Participants were much more interested about proposed investment activities and its extend of implementation and financial benefit to local communities.

Concerns/ recommendations of stakeholders are tabulated below with issue addressed in ESMF. Minutes of meeting and attendance sheet of ESMF disclosure workshop is given in Annexure- XII.

Table 17: Issues raised in ESMF disclosure workshop and issue addressed in ESMF

Issue Raised	Addressed in EMF
Whether any activity at catchment area is proposed under OIIPCRA	Project will not make any intervention in catchment area.
What is the requirement of preparing (Integrated Irrigation and Agriculture Plan) IIAP, when District Irrigation and Agriculture Plan (DIAP) is being designed at district?	DIAP is yet to be prepared and may not be available during project execution. Eventually, IIAP will be prepared under OIIPCRA considering micro level issues. So, IIAP will be followed for project implantation.
Whether any de-siltation of MI tank will be carried out? If so silt disposal plan shall be devised for proper management of silt.	There will be no issues of silt disposal as no desiltation is proposed under OIIPCRA.
World fish suggested to explore the possibility of promoting pisciculture in MI tanks where sufficient water is not available throughout the year.	As of now only 90 MI tanks are selected for promotion of pisciculture under OIIPCRA where sufficient water is available throughout the year. Possibility of sustainable pisciculture where water is available for short duration will be explored in consultation with the TTL of World Bank.
Whether composite or random sampling was adopted for selection of 9 number of MI tanks considered for environmental assessment. Based on which criteria this MI tanks were selected.	Criteria like concrete/ earthen dam, dam height more 10 meter, atleast one MI tank from each ACZ, sample from scheduled area, MI tank located near by area of Chilika lake, Rushikulya river were considered during sample selection.
Is there any large dam considered under OIIPCRA project? How SDSO are engaged for monitoring of large dams considered under OIIPCRA?	There are 13 dams with height more than 10 meter out of which 3 have height more than more than 15 meter are considered under OIIPCRA. As per world bank policy, any dam with height more than 10 meter are considered as large dam.
Any MI tank considered under OIIPCRA, located nearby area or any of project activities proposed in the nearby area of any eco	Structural activities proposed under OIIPCRA will mainly be confined within tank and tank command area. Hence any such adverse impact is not

Issue Raised	Addressed in EMF
sensitive zone where IUCN red-listed endangered species found then sufficient mitigation measures shall be adopted to eliminate or minimise any impact on it. Night time civil construction activities may lead to bird mortality of migratory species.	anticipated. Eventually, project will adopt avoidance strategy to intervene in any eco sensitive zone or forest area.
Organic waste converter or demonstration of on-field microbe decomposition may be promoted to manage issues related to burning of paddy straw.	Organic waste converter is already one of the project activities proposed under OIIPCRA.
Tribal people from command area as well as surrounding area shall be included in project designing stage. They should be considered during selection of beneficiaries for project activities.	Tribal as well as vulnerable people from command as well as non-command area will be selected during beneficiary selection. Beneficiaries covering tribal and other vulnerable community will be provided facilities proposed under OIIPCRA and training as part of capacity building programme. Separate plan on tribal people planning framework (TPPF) for inclusion of tribal people is prepared as part of ESMF development. All these measures are already included in TPPF.

Annexure I: Study References

Odisha Economic Survey of 2017-18, Government of Odisha

Odisha Economic Survey 2014-15, Government of Odisha

EIA notification dated 14th September, 2006 notification (S.O. 1533), Ministry of Environment and Forest

Environmental and social safeguard policies of the World Bank
<https://policies.worldbank.org/sites/ppf3/Pages/Manuals/Operational%20Manual.aspx >

State Action Plan on Climate Change (2015- 20), Odisha

ICOLD guideline < https://www.icold-cigb.org/GB/dams/dams_safety.asp >

Protected Area of Odisha < http://www.wiienvis.nic.in/Database/Orissa_7834.aspx >

Sites of Conservation Importance in Odisha,
< http://www.wiienvis.nic.in/Database/ConservationAreas_844.aspx >

Protected monuments in Odisha, refer to:
< http://odishaculture.gov.in/Archaeology/protected_monuments.html >

Agro climatic zone wise distribution of districts in Odisha:
< http://orienvis.nic.in/WriteReadData/links/Agro-climatic%20Zones-183453464.doc >

Land use and land cover of Odisha, ENVIS Centre of Odisha's State of Environment, Forest and Environment Department, Odisha < http://envis.cesodisha.org/landuse/ >

Odisha Agricultural Statistics (2013-14), Directorate of Agriculture & Food Production, Odisha

Mineral Map of Odisha, Geology and Directorate of Geology, Govt. of Odisha
< https://www.odishaminerals.gov.in/Geology/Mineralmap.aspx?GL=download&PL=2 >

Geology and Mineral Map of Odisha
< http://metalworld.co.in/newsletter/2014/May14/Overview0514.pdf >

Geological map of Odisha, ENVIS Centre of Odisha's State of Environment, Forest and Environment Department, Odisha

District wise Mineral Distribution in Odisha, Compendium of Mineral Resources of Odisha- 2009.

GHHAP (Global Seismic Hazard Assessment Program) map of Odisha
< http://asc-india.org/maps/hazard/haz-orissa.htm >

Earthquake Zonation Map of Odisha, Odisha State Disaster Management Authority
< http://www.osdma.org/GISImage.aspx?vchglinkid=GL024&vchplinkid=PL065# >

Population census 2011

Wind and Cyclone Zones of Odisha, Odisha State Disaster Management Authority
< http://www.osdma.org/GISImage.aspx?vchglinkid=GL024&vchplinkid=PL065# >

State Disaster Management Plan, Odisha, August 2013,GoO, OSDMA

Flood Zones of Odisha, Odisha State Disaster Management Authority
< http://www.osdma.org/GISImage.aspx?vchglinkid=GL024&vchplinkid=PL065# >

Ground water year book (2014-15), South Eastern Region, Bhubaneswar

Annual Climate Summary- 2015, National Climate Centre, Climate Service Division, India Meteorological Department

Block wise ground water resource and utilization, ENVIS Centre of Odisha's State of Environment, Forest and Environment Department, Odisha

Ground water year book (2014-15), South Eastern Region- Bhubaneswar, Central Ground Water Board

Dam Safety Activity Report, August- 2018, State Dam Safety Organization, Bhubaneswar

Annex II: Study Methodology

Following step by step process was followed for Environmental Assessment purpose.

2.1 Initial Consultation and Desk Review

Initial consultation with project authority SPU- OIIPCRA was conducted to get idea about project objective and proposed activities. All available preliminary information like Project Concept Note, list of MI project, reports on earlier OCTMP project were collected from department. Detailed analysis of available information was made to understand the nature of the project and project location. Potential environmental features located within project area were preliminarily assessed by internet-based survey and literature review. Detailed consultation was carried out with environmental expert of The World Bank as well as SPU- OIIPCRA to determine sample selection criteria, components of environmental assessment, and EMF. List of all line departments and other stakeholders was prepared in consultation with the team of expert for developing Project Implementation Plan (PIP).

2.2 Inception Activity

An inception report specifying study methodology, sample coverage, study tools and field plan was prepared and submitted to SPU- OIIPCRA. Detail presentation on sampling and study approach was made to SPU- OIIPCRA before initiation of field level assessment and primary data collection. All study tools designed for primary field level study, community consultation and departmental consultation were shared with SPU and vetted by them.

2.3 Data Collection

Baseline data were collected through site visits and on sampling basis, interaction with local people and discussion with project authority, stakeholder consultation, from relevant project records and secondary sources. The studied parameters include physical environment, biological environment, land, water, air, noise, soil, etc. of study area.

Table 1: Source wise study components

Secondary Information		**Primary Information**	
Tank physical details	Temperature	Surface water quality	Physical cultural resource
Block Demographic Profile	Relative Humidity	Ambient Air Quality	Sensitive receptor
Agro-climatic zone	Rainfall	Soil Quality	Cropping Practices
Block land use pattern	Ground Water Availability	Noise Pollution	Crop Disease and Pesticide Use
Land use and land cover within 10 km. radious	Ground Water Quality	GIS Survey	Pest control measures
Geology and Mineral	Soil Type	Land use and land cover of sampled project	Fertilizer use and practice
Earthquake	District Forest Profile	Tank Condition	Pisciculture Practice
Wind and Cyclone	Agricultural Crops	Industrial Pollution	Fish Diseases and medicine use
Flood and Waterlogging	Pesticide Consumption	Encroachment & utility	Awareness on Climate Change
Meteorology	District Fertilizer Use	Public/ community utilities	

2.3.1 Secondary Data

Presence of significant environmental features i.e. forest area, sanctuary, protected area, ASI site, polluting industry like mine, mine based industry etc.. were determined by secondary research. Internet based study was conducted to capture significant natural environmental features located within study universe. Information on the presence of these environmental features were also collected during tank level primary study.

Meteorological information including occurrence of natural hazard within entire project universe was assessed using secondary information. Land use pattern, irrigation facilities, ground water availability & quality, cropping practice, crop production, fertilizer and pesticide consumption in project districts were also assessed during analysis of the secondary information.

2.3.2 Primary Data

Primary survey was conducted mainly to capture information like physical condition of tank, water availability for irrigation, waterlogging, environmental features like presence of Sacred Grove, temple, encroachment, public/ community utilities, cropping practice, fertilizer use, crop disease wise pesticide use, pisciculture practice, fish diseases and use of medicine within tank command area and adjacent area. Presence of any archaeological, paleontological, historical significance sites within 300 meter radius and sensitive receptor like educational institute, health centre, park etc. within 200 meter radius of command area were collected during primary survey.

The primary baseline information on different environmental components were collected through field survey. Field surveys were carried out to collect information on the micro level environmental features such as human settlements, forest, trees on dam, waterbodies, sensitive locations, air, water, noise and soil quality etc. Further, primary sample surveys for the environmental components, such as air, surface water, noise and soil characteristics that are critical in the context of the project were carried out during the study period.

Sampling stations are strategically located in and around the project sites. Soil & Water samples were collected as per recommended procedure. Suitable equipment was used to record Air quality and Noise level at site / near to site. Literature and authentic records were consulted to study the environment status concerning the study areas. Status of pre-project environmental conditions were considered broadly in two aspects, i.e., (1) physical environment and (2) biological environment.

2.3.3 Internet Based Survey

Presence of Archaeological sites, Natural habitat, Forest area within 10 km. radius of respective sample MI tanks were captured by means of site visit as well as internet based study. GPS coordinate of all such features identified during field survey were captured using GPS device and plotted in google earth. Geo map comprising all MI tank considered under OIIPCRA also superimposed in google map. Shortest distance between nearby MI tank and Archaeological sites, Natural habitat, Forest area was measured in this way to ascertain degree of impact if any. Water ways connectivity between nearest MI tank/ tank command area and Natural habitat was also assessed by means of field visit and internet based study to ascertain chances of any adverse impact due latching of chemical pesticide used in agriculture field for cultivation purpose.

2.4 Sampling Criteria

As decided during inception meeting, a total of 9 nos. irrigation tank from proposed 538 nos. MI tank were considered for environmental assessment and EMF development purpose. Following criteria were set forth for selection of sample MI tank.

- At least one irrigation tank from each agro-climatic zone;

- Sample tank covering Scheduled as well as partly Scheduled block;
- Tank shall be selected in such a manner that it covers all river basin of study universe
- 9 nos. minor irrigation projects
- Selected tank shall be blend of earthen as well as concrete dam
- At least one MI tank with dam height more than 10m[1]

Out of total 538 MIP considered under OIIPCRA project, dam height of only 13 MIPs is more than 10 meter out of which only three (3) have dam height more than 15 meter. Dam of 319 reservoir type MIP are earthen whereas 145 diversion weirs are made of concrete and remaining two are creek. Project district wise MI reservoirs and diversion weirs and creek are given in table 2 of EMF report. All these irrigation projects are spread across 7 agro climatic zones (ACZ) out of 10 ACZ prevailed in Odisha state. ACZ as well as district wise distribution of MI tanks are highlighted in Table 1 of Annexure- III. These irrigation projects are spread across 5 river basins.

Table 2: Selected 9 tanks for environmental assessment purpose

Name of the Irrigation Project	Type	Design CCA in ha. (Kharif)	River Basin	Height of Dam/ Weir (in m.) *	Type of Dam/ weir	ACZ
Dandrabahal MIP	Reservoir	52.0	Tel	5.0	Earthen	WCTL-1
Khaibandha MIP	Reservoir	42.0	Budhabalanga	9.2	Earthen	NECP
Jallibandha MIP	Reservoir	41.0	Rushikulya	3.0	Homogeneous earth fill	ESECP
Talakholaghai, Mohanpur MIP	Reservoir	60.0	Rushikulya	4.0	Homogeneous earth fill	ESECP
Jamunasagar MIP	Reservoir	180.0	Tel	10.15	Earthen	WCTL-2
Cradigappa MIP	D/w	60.0	Tel	3.0	Concrete	NEG
Bisipur MIP	D/w	47.0	Baitarani	NA	Concrete	NCP
Dandamunda MIP	Reservoir	40.0	Tel	6.38	Earthen	EGHL
Kalimati MIP, Keonjhar	Reservoir	90.0	Baitarani	15.54	Earthen	NCP

WCTL-1: Western Central Table Land-1 *NECP: North Eastern Coastal Plain*
ESECP: East and South Eastern Coastal Plain *WCTL-2: Western Central Table Land-2*
NEG: North Eastern Ghat *NCP: North Central Platue*
EGHL: Eastern Ghat High Land
NA: Data not available, D/w- Diversion Weir ** as per design parameter*

2.5 Study Tools & Primary Assessment Methodology

Mainly focus group discussions (FGD) methodology was adopted at tank command level. FGD was conducted with at least one Pani Panchayat (PP), Fisher Folk Community, Self Help Group (SHG), Farmers Producer Organization (FPO) from sample MI location. Consultation was held with CCF of Simlipal forest region; DFO Brahmapur, Ganjam and block level office of line departments like Irrigation, Agriculture, Fishery, Integrated Tribal Development Agency (ITDA), Food Processing, Horticulture. Key informants' interview (KII) was conducted with Forest range office, Khallikote, Ganjam. KII was also carried out with local pesticide & fertilizer distributor/ retailer and owner of hatchery unit. All study tools used for primary assessment and capability assessment of stakeholder departments are given in Annexure- IV. In addition to these, state level all line departments were also consulted by team of CTRAN consulting.

[1] As per the World Bank "OP 4.37 - Safety of Dams"; dams that are between 10 and 15 meters in height are treated as large dams if they present special design complexities--for example, an unusually large flood-handling requirement, location in a zone of high seismicity, foundations that are complex and difficult to prepare, or retention of toxic materials

Table 3: Tank wise sample coverage

SL No	MIP	PP	FPO	SHG	Fisherfolk	Fertilizer/ Pesticide	DFO/ CCF	Hatchery
1	Dhandamunda MIP, Nabarangpur	1		1	1	1		
2	Jallibandha MIP, Ganjam			1		1	1	1
3	Talakholaghai, Mohanpur MIP, Ganjam			1				
4	Bisipur MIP, Mayurbhanj	1		1	1	2	1	
5	Khaibandha MIP, Balasore	1		1	1			1
6	Cradigappa MIP, Kandhamal	1		1			1	
7	Dandrabahal MIP, Bolangir	1	1	1	1	2		1
8	Jamunasagar MIP, Kalahandi	1		1	1	1		
9	Kalimati MIP, Keonjhar		1	1	1	1		
	Total	6	2	9	6	8	3	3

PP= Pani Panchayat; FPO= Farmer Producer Organization; DFO= District Forest Officer, Brahmapur; CCF= Chief Conservator of Forest, Simlipal;.

In the absence of PP and FPO of respective tank, consultation was carried out with local farmer group and opinion of local people practicing pisciculture in domestic tank was considered in case of non-availability of fisherfolk.

Table 4: Stakeholders wise adopted study methodology

Stakeholders	Adopted Study Tools/ Methodology
Pani Panchayat (PP)	FGD
Farmers Producer Organization (FPO)	FGD
Self Help Group (SHG)	FGD
Fisherfolk	FGD
DFO/ CCF	Consultation
Irrigation, Agriculture, Fishery, ITDA, Food Processing, Horticulture	Consultation
Pesticide & Fertilizer distributor/ Retailer	KII
Hatchery Unit	KII

FGD= Focus Group Discussion, KII= Key Informants Interview, CCF= Chief Conservator of Forest

2.5.1 Testing of Environmental Parameters

A third-party environmental testing and monitoring laboratory (Centre for Envotech and Management Consultancy Pvt. Ltd., 1st Floor, N-5/305, IRC village, Nayapalli, Bhubaneswar-751015, Odisha) was engaged to collect and analyse soil, ambient air, surface water and ambient noise sample from six locations. Soil samples were collected from irrigation command area of respective irrigation tank, whereas water samples were collected from irrigation tanks. One water sample from Rushikulya river considering its presence at immediate vicinity of nearby irrigation project. Rushikulya River, which ultimately connects with Bay of Bengal after flowing approximately 1 km. from nearby MI tank location, is flowing immediate vicinity of Jallibandha MIP, Ganjam. Sample of air and noise was collected/ recorded from nearby villages.

Table 5: Tank wise sampling description for environetntal testing

Monitoring Location Description Name of Minor/ Major Irrigation Project	Number of Sample Surface Water	Air Quality	Soil Quality	Noise Quality
Jallibandha, Ganjam	Rushikulya River - Downstream of MI point - *1 No.*	1	1	1
Talakholaghai, Mohanpur, Ganjam	*MI tank water - 1 No.*	1	1	1
Cradigappa, Kandhamal	MI Tank water- *1 No.*	1	1	1

Monitoring Location Description Name of Minor/ Major Irrigation Project	Number of Sample Surface Water	Air Quality	Soil Quality	Noise Quality
Upper Suktel Irri. Project, Bolangir	MI Tank water- *1 No.*	1	1	1
Dandamunda, Nabarangpur	MI Tank surround pond water- *1 No.*	1	1	1
Bisipur, Mayurbhanj	MI Tank water- *1 No.*	1	1	1
Total Number of Sample	**6**	**6**	**6**	**6**

2.6 Identification of impact and developing EMF

Anticipated impacts on baseline environmental conditions due to proposed project activities were assessed and suitable mitigation measures were proposed with responsibility of implementation, supervision and monitoring during implementation of mitigation measures. A set of non-permissible activities are also devised to eliminate any significant adverse and irreversible environmental impact. Capacity building plan on implementation of mitigation measures proposed in EMF/ EMP is also framed under EMF.

2.6.1 Overall EMF Development Process

An environmental management framework (EMF)/ plan has already been developed based on environmental assessment carried out in sample tank command area. State level disclosure workshop on draft version of EMF document is already conducted to get mass recommendation of stakeholders group and EMF document has been modified accordingly. Draft EMF documents were also made available in website of Department of Water Resource (DoWR) and the World Bank for public disclosure. Following step by step process was adopted for preparation of final EMF for OIIPCRA.

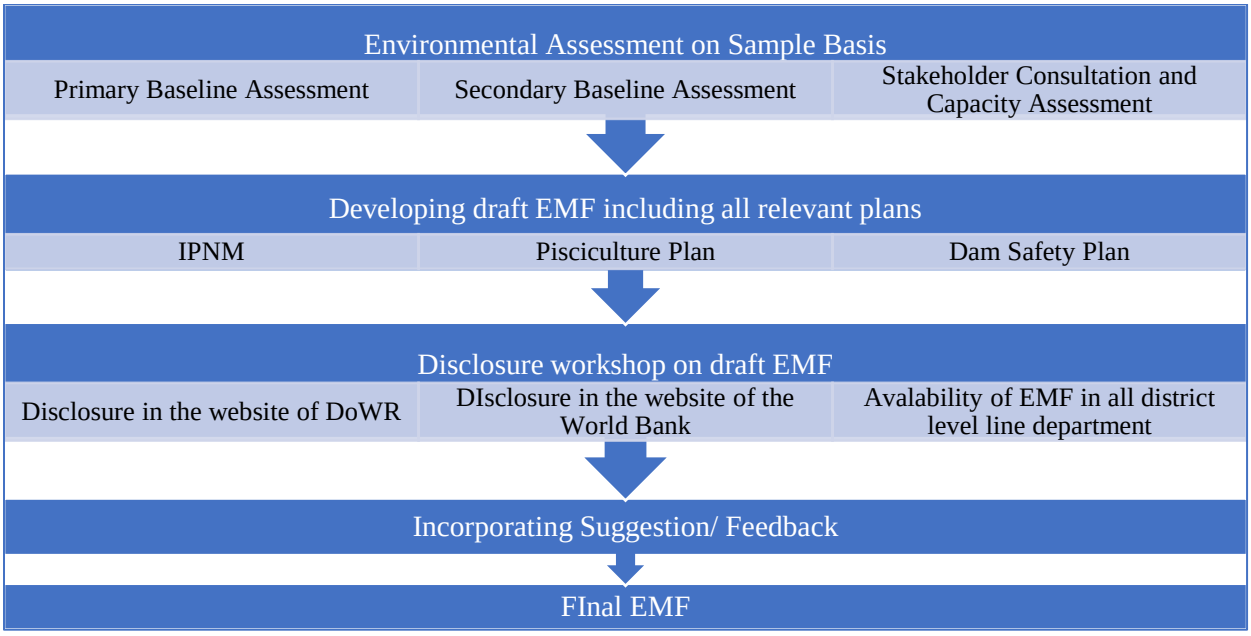


Figure 1: EMF development Process

Annexure III: Environmental Assessment of Baseline Condition

List of Table

List of Figure

3.1 Physical Environment

Baseline environmental parameters for physical environment include survey for pre-project status of land, air, water and climatic conditions of the study area.

3.1.1 Agro-Climatic Zone

The project is proposed to be implemented in 7 agro-climatic zones (ACZs) out of total 10 ACZ of the State. Maximum 46.7% MIP are concentrated in Ganjam district which falls under East & South Eastern Coastal Plain (ESCP) followed by 29.0% in North Central Plateau (NCP) and 10.6% in Western Central Table Land (WCTL-1). Minimum 0.6% MIPs are located in Nabrangpur district which falls under Eastern Ghat High Land (EGHL) followed by 1.7% in North Eastern Ghat (NEG). ACZ as well as project district wise distribution of MI project is tabulated in Table 1.

Table 1: Agro-climatic zone[1] wise MIP distribution

Agro-Climatic Zone	District	No. of Block	No. of GP	No of MIP	% distribution of MIP in ACZ
Eastern Ghat High Land (EGHL)	Nabarangpur	3	3	3	0.6
East & South Eastern Coastal Plain (ESCP)	Ganjam	18	172	251	46.7
North Central Plateau (NCP)	Keonjhar	11	39	49	
	Mayurbhanj	20	82	107	
	Sub-Total	***31***	***121***	***156***	***29.0***
North Eastern Coastal Plain (NECP)	Balasore	5	6	6	
	Bhadrak	5	12	13	
	Jajpur	3	3	5	
	Sub-Total	***13***	***21***	***24***	***4.5***
North Eastern Ghat (NEG)	Gajapati	1	3	3	
	Kandhamal	4	6	6	
	Sub-Total	***5***	***9***	***9***	***1.7***
Western Central Table Land (WCTL-1)	Balangir	10	17	21	
	Bargarh	4	19	24	
	Boudh	1	8	10	
	Subarnapur	1	1	2	
	Sub-Total	***16***	***45***	***57***	***10.6***
Western Central Table Land (WCTL-2)	Kalahandi	10	30	36	
	Nuapada	2	2	2	
	Sub-Total	***12***	***32***	***38***	***7.1***
Total		**98**	**403**	**538**	**100.0**

3.1.2 Land Utilisation Pattern (considering 98 project blocks)

Project universe is broadly divided into 4 physiographic zones namely Coastal Plains, Central Table land, Northern Plateau and Eastern Ghats. Total geographical area of the 15 project districts is 8340 thousand hectares out of which 520.5 thousand hectares forest area, 51.3 thousand hectares of miscellaneous tree & groves, 162.5 thousand hectares of permanent pasture, 159.1 thousand hectares culturable waste land, 310.9 thousand hectares barren land, 318.3 thousand hectares non-agriculture land and 1643.9 thousand hectares net area sown land falls under 99 nos. project blocks. These 15-project districts have cultivated area of 3581

[1] Agrocipmatic zone wise distribution of district:
orienvis.nic.in/WriteReadData/links/Agro-climatic%20Zones-183453464.doc

thousand hectares out of which 1740 thousand hectares is high land, 959 thousand hectares medium and 882 thousand hectares low land[2].

Table 2: Land use pattern of project district (considering 98 project block area only)

District name	Forest area	Miscellaneous tree	Permanent pasture	Cultivated waste	Non-agri uses	Barren land	Current fallow	Other fallow	Net area sown
Nabarangpur	40.8	0.8	1.3	1.6	8.7	2.0	9.2	1.4	81.4
Ganjam	43.7	19.0	16.1	11.0	57.2	42.3	46.3	27.3	249.8
Keonjhar	137.5	3.1	18.0	25.3	42.8	57.5	51.4	26.3	169.9
Mayurbhanj	78.0	16.8	25.9	36.9	48.3	14.4	41.0	41.7	248.7
Balasore	1.5	2.7	8.3	10.0	18.7	2.1	3.5	2.0	97.7
Bhadrak	0.6	3.8	9.0	6.2	18.2	0.5	7.5	3.5	102.9
Jajpur	4.4	1.3	4.3	2.8	10.9	0.8	6.8	3.4	34.7
Gajapati	16.9	0.3	4.0	0.9	3.6	45.6	3.2	1.2	15.3
Kandhamal	77.9	0.3	3.4	4.7	8.6	42.7	10.1	10.3	25.4
Bolangir	35.8	0.8	26.9	13.6	30.2	12.7	35.3	15.8	203.7
Bargarh	14.3	0.2	7.7	8.6	13.6	3.5	18.7	9.7	106.9
Boudh	11.9	0.0	8.6	3.1	8.3	3.0	6.8	3.5	27.8
Sonepur	1.5	0.1	1.5	1.6	2.9	1.6	1.9	1.3	16.7
Kalahandi	46.5	2.0	20.2	29.1	39.0	80.3	47.8	23.0	213.3
Nuapara	9.2	0.2	7.1	3.7	7.4	2.1	13.2	4.5	49.4
Total	**520.5**	**51.3**	**162.5**	**159.1**	**318.3**	**310.9**	**302.8**	**174.8**	**1643.9**

Source: ENVIS Centre of Odisha's State of Environment, Forest and Environment Department, Odisha
< http://envis.cesodisha.org/landuse/>
** All area is in Thousand Hectare*

As multiple demands for land increase, less land is devoted to agriculture and allied sub-sectors. Therefore, intensive cultivation of available cultivable lands, wherever feasible, seems a viable strategy for increasing the gross area under cultivation and augmenting food production. These trends are discernible in project districts as well.

3.1.2.1 Land Use and Land Cover (Sample Area)

Project intervention is confined within MI command area. However, to understand physiological features in an around project area, 10 Km. buffer zone is considered. LULC map covering 10 Km. buffer area is prepared and different class wise coverage is tabulated below and shown in Figure 1 to Figure 8. Presence of significant environmental features are described in respective sections.

Table 3: LULC of 10 Km. radius of sampled MIP

Name of the MIP	District	Agri. Land	Dense Scrub Land	Fallow	Forest	Gullied/ Ravenous Land	Open Scrub Land	Plantation	Road/ Railways
Dhandamunda MIP, Chandahandi	Nabarangpur	17483	600	131	3018		238		
Jalibandha, Ganjam	Ganjam	8150	745	22	3121		1089	365	152
Talakholaghai MIP, Khallikote	Ganjam	12531	979		4088		1490	180	99
Bisipur MIP, Karanjia	Mayurbhanj	12812	1431	120	18406		903	48	

[2] Odisha Agricultural Statistics (2013-14), Directorate of Agriculture & Food Production, Odisha

Khaibandha MIP, Nilagiri	Balasore	22681	542	15	6291	10	205	4	14
Caradigapa MIP, Daringibadi	Kandhamal	10394	4147		12940		1389		30
Dandarabhal MIP, Patnagarh	Balangir	16805	3165	78	5264	10	7764	15	62
Jamunasagar MIP, Bhawanipatna	Kalahandi	16085	2744	31	7784	673	1447	27	583

Name of the MIP	District	Rocky Waste Land	Sandy Area	Settlement	Tree Cover Area	Wasteland	Water body	Wetland	Grand Total
Dhandamunda MIP, Chandahandi	Nabarangpur	100		643	620		800		**23635**
Jalibandha, Ganjam	Ganjam	45	372	940	470		902	1186	**17558**
Talakholaghai MIP, Khallikote	Ganjam	34	0	1003	255	22	13465	113	**34259**
Bisipur MIP, Karanjia	Mayurbhanj	242		1396	1333		327		**37016**
Khaibandha MIP, Nilagiri	Balasore	45		5095	556		639	26	**36125**
Caradigapa MIP, Daringibadi	Kandhamal	2		351	5149	1626	47		**36073**
Dandarabhal MIP, Patnagarh	Balangir	182		611	605		708		**35268**
Jamunasagar MIP, Bhawanipatna	Kalahandi	634		559	6163	541	613		**37886**

Source: Analysed by CTRAN Consulting based on Satellite Imagery and Data Mapping

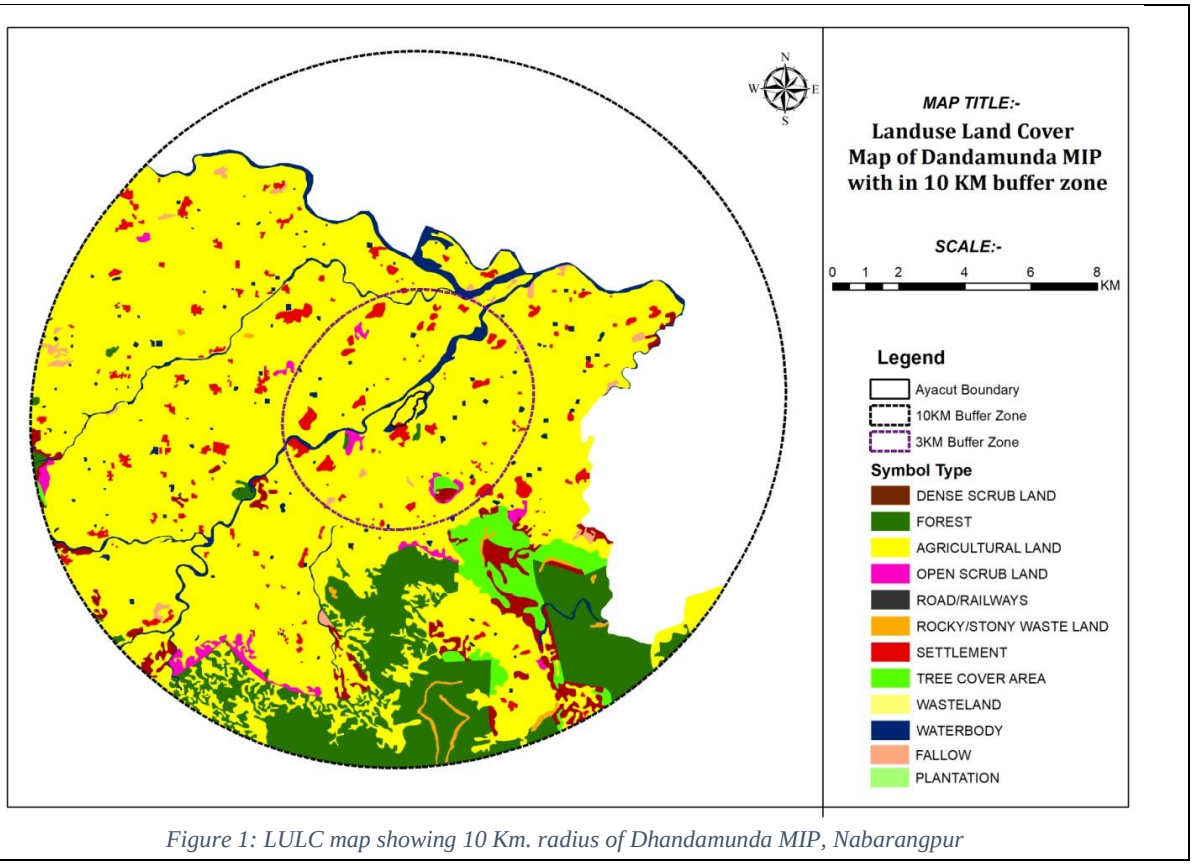


Figure 1: LULC map showing 10 Km. radius of Dhandamunda MIP, Nabarangpur

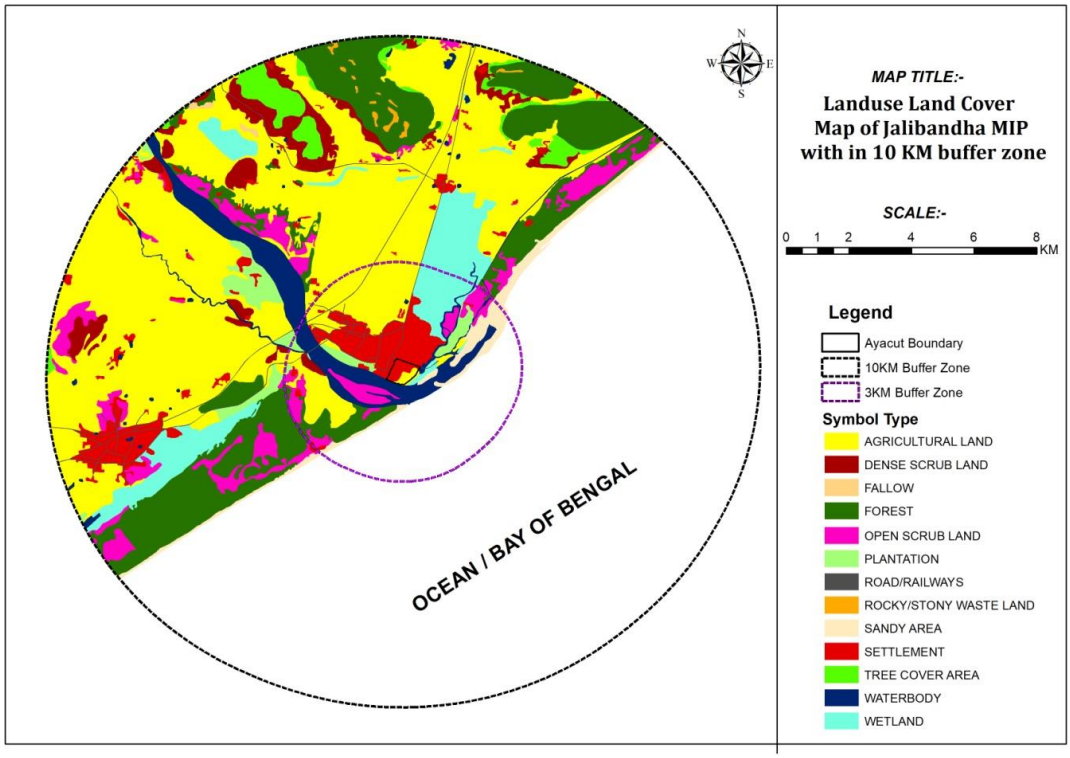


Figure 2: LULC map showing 10 Km. radius of Jallibandha MIP, Ganjam

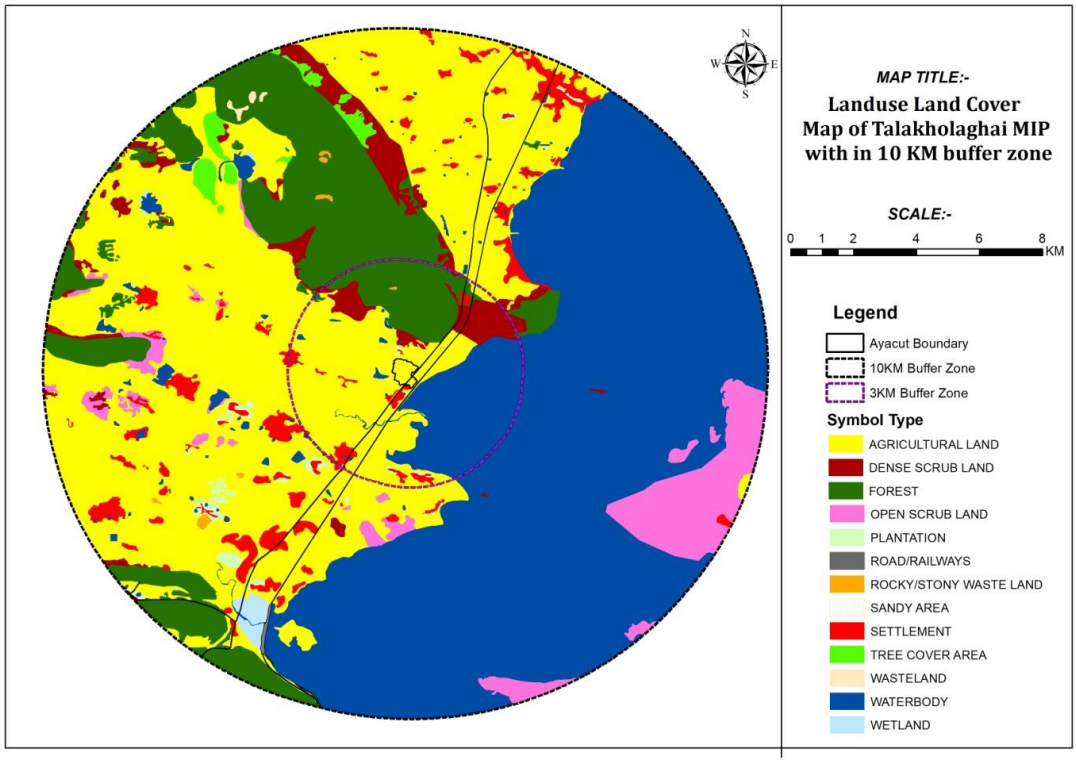


Figure 3: LULC map showing 10 Km. radius of Talakholaghai, Mohanpur MIP, Ganjam

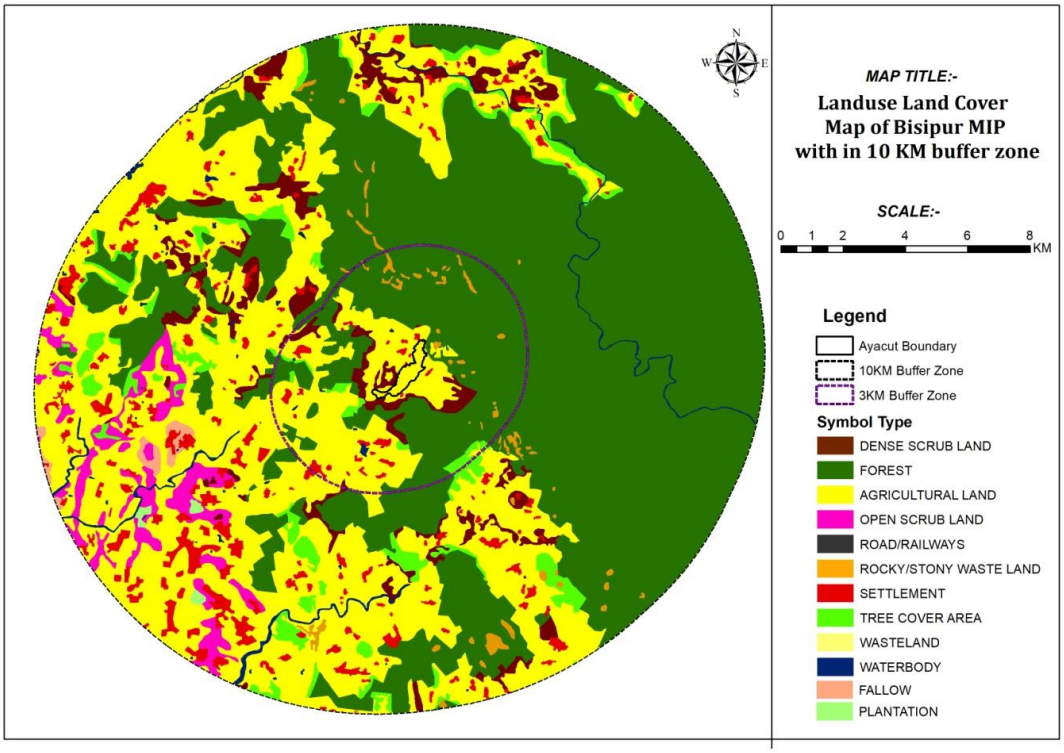


Figure 4: LULC map showing 10 Km. radius of Bisipur MIP, Mayurbhanj

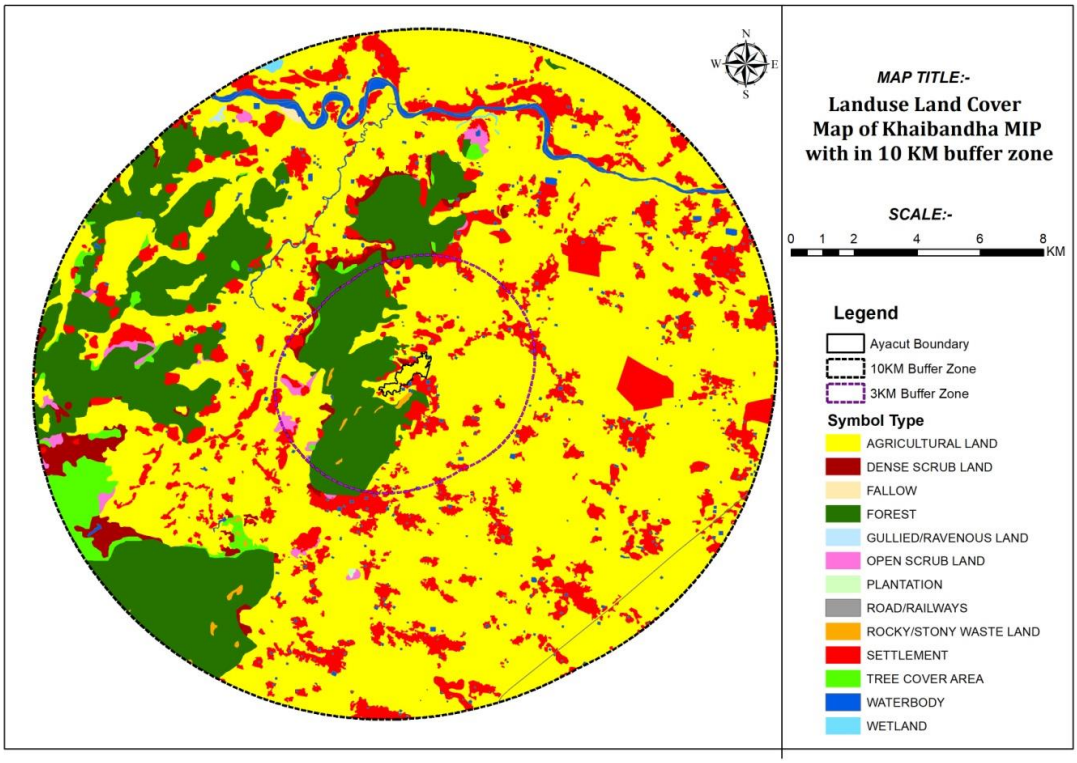


Figure 5: LULC map showing 10 Km. radius of Khaibandha MIP, Balasore

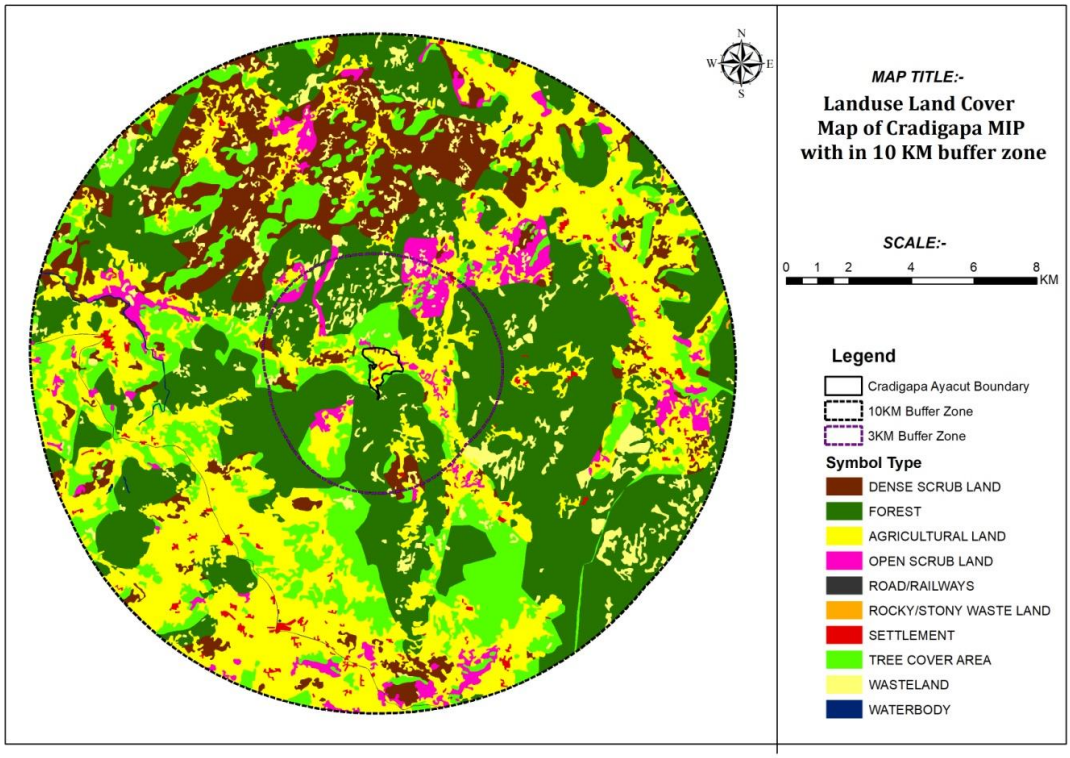


Figure 6: LULC map showing 10 Km. radius of Cradigappa MIP, Kandhamal

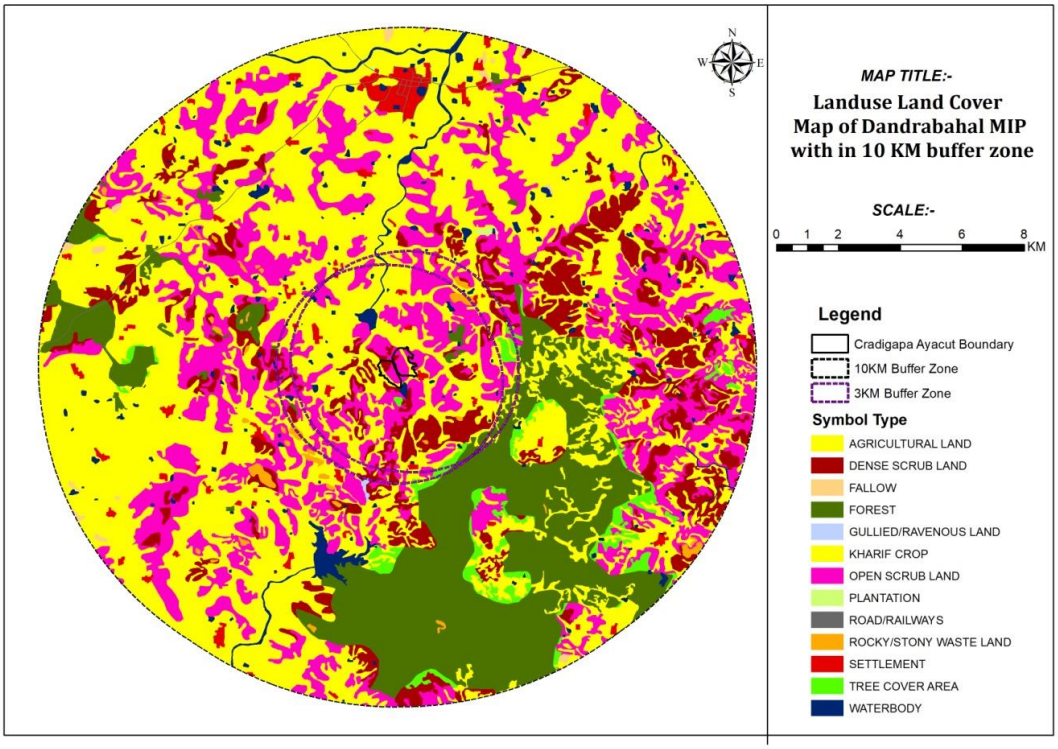


Figure 7: LULC map showing 10 Km. radius of Dandrabahal MIP, Bolangir

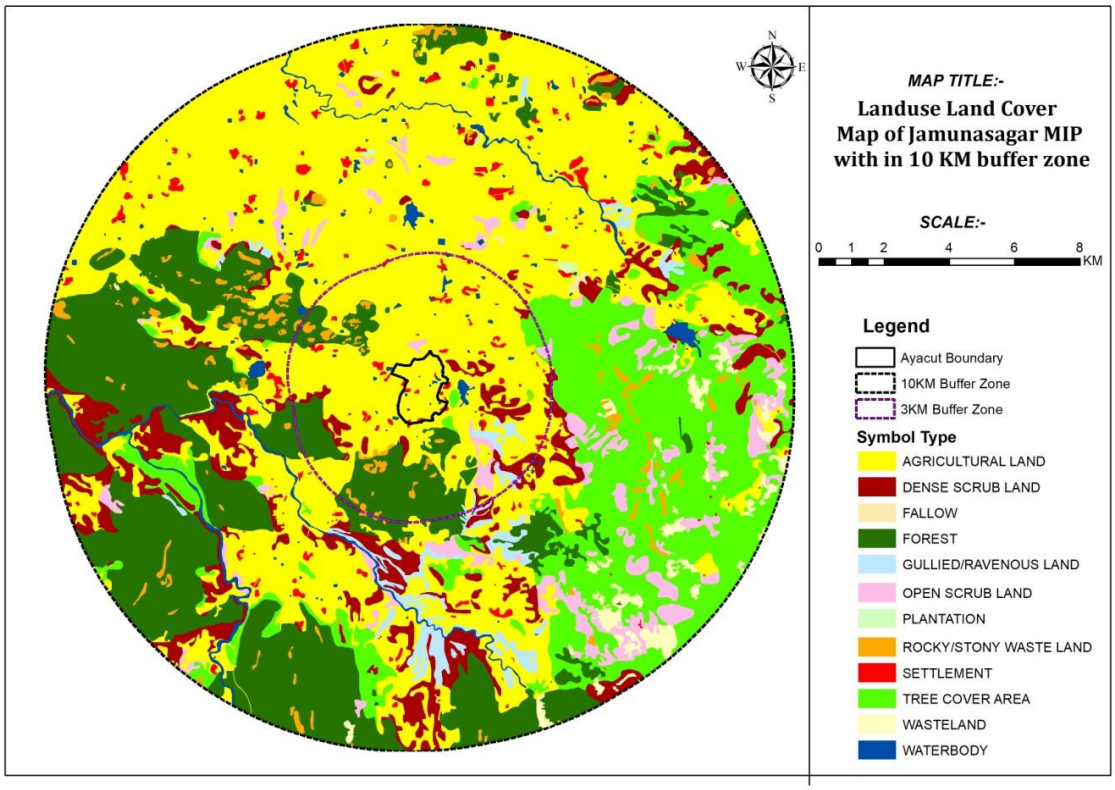


Figure 8: LULC map showing 10 Km. radius of Jamunasagar MIP, Kalahandi

Source: Analysed by CTRAN Consulting based on Satellite Imagery

3.1.3 Geology & Mineral

Odisha, situated on the eastern seaboard of India is one of the gifted parts of the world, where a gamut of mineral resources exists in bounty. Project districts are endowed with large reserves of bauxite, china-clay, chromite, coal, dolomite, fireclay, graphite, gemstones, iron ore, limestone, manganese ore, mineral sand, nickel ore, pyrophylite and quartz. State Directorate of Geology has recently discovered diamond block in the Dharambandha area of Nuapada district. Other minerals of the project districts include copper ore, lead ore, titanium bearing vanadiferous magnetite, talc/ soap stone and high magnesia igneous rocks.

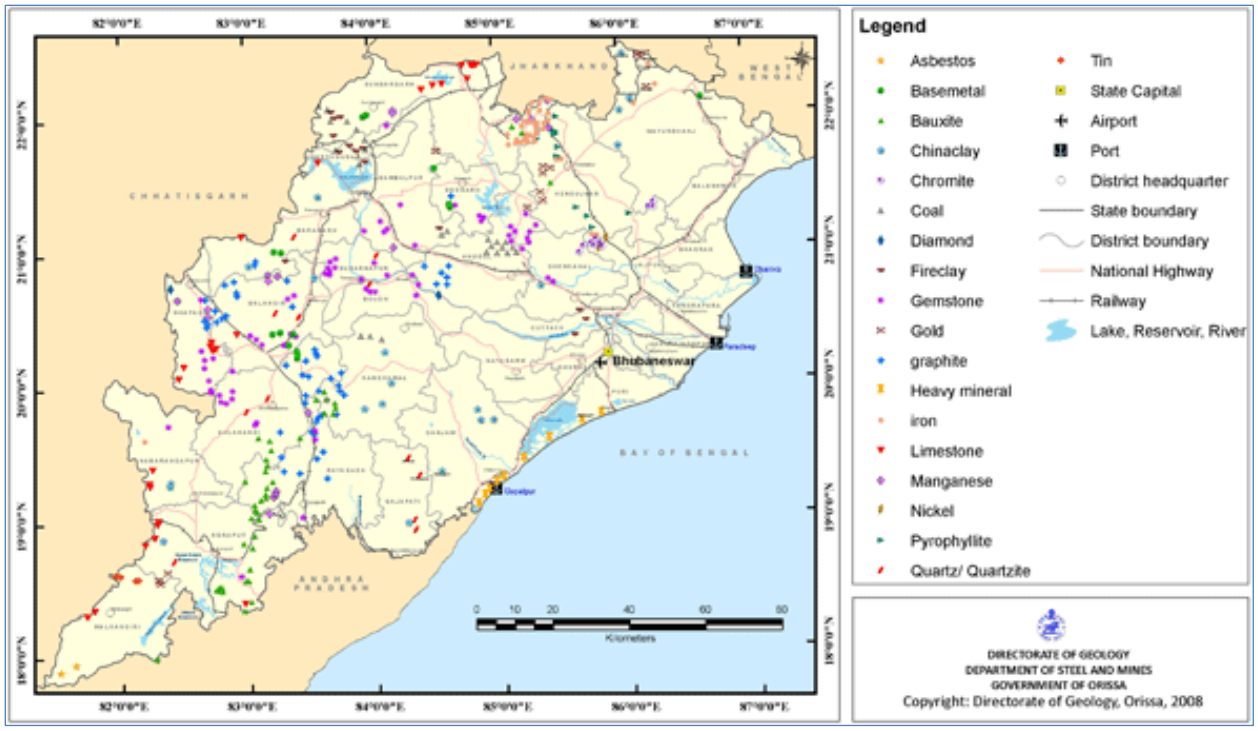
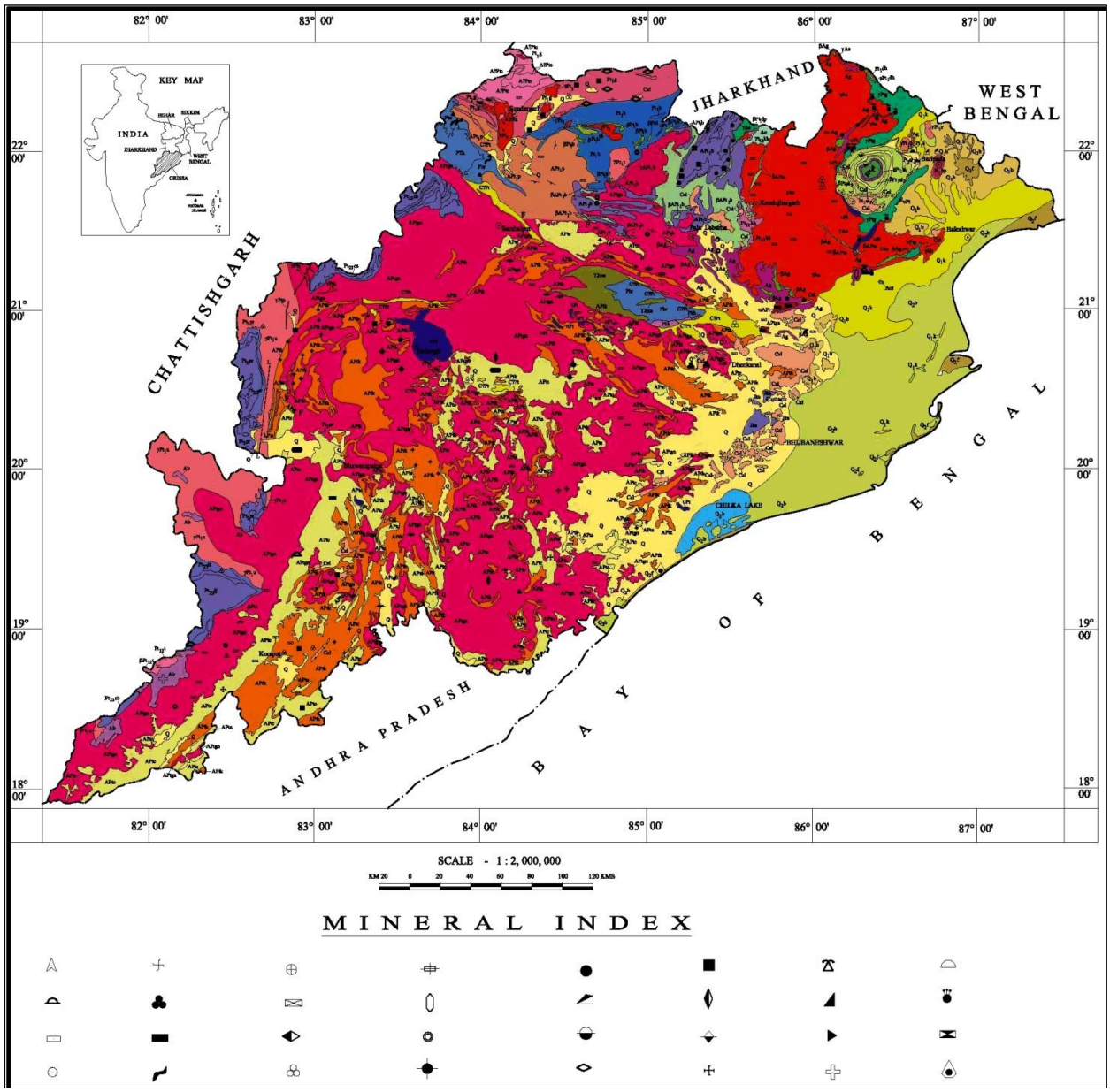


Figure 9: Mineral map of Odisha

Source: Directorate of Geology, Govt. of Odisha
(https://www.odishaminerals.gov.in/Geology/Mineralmap.aspx?GL=download&PL=2)

Figure 10: Geology and Mineral Map of Odisha



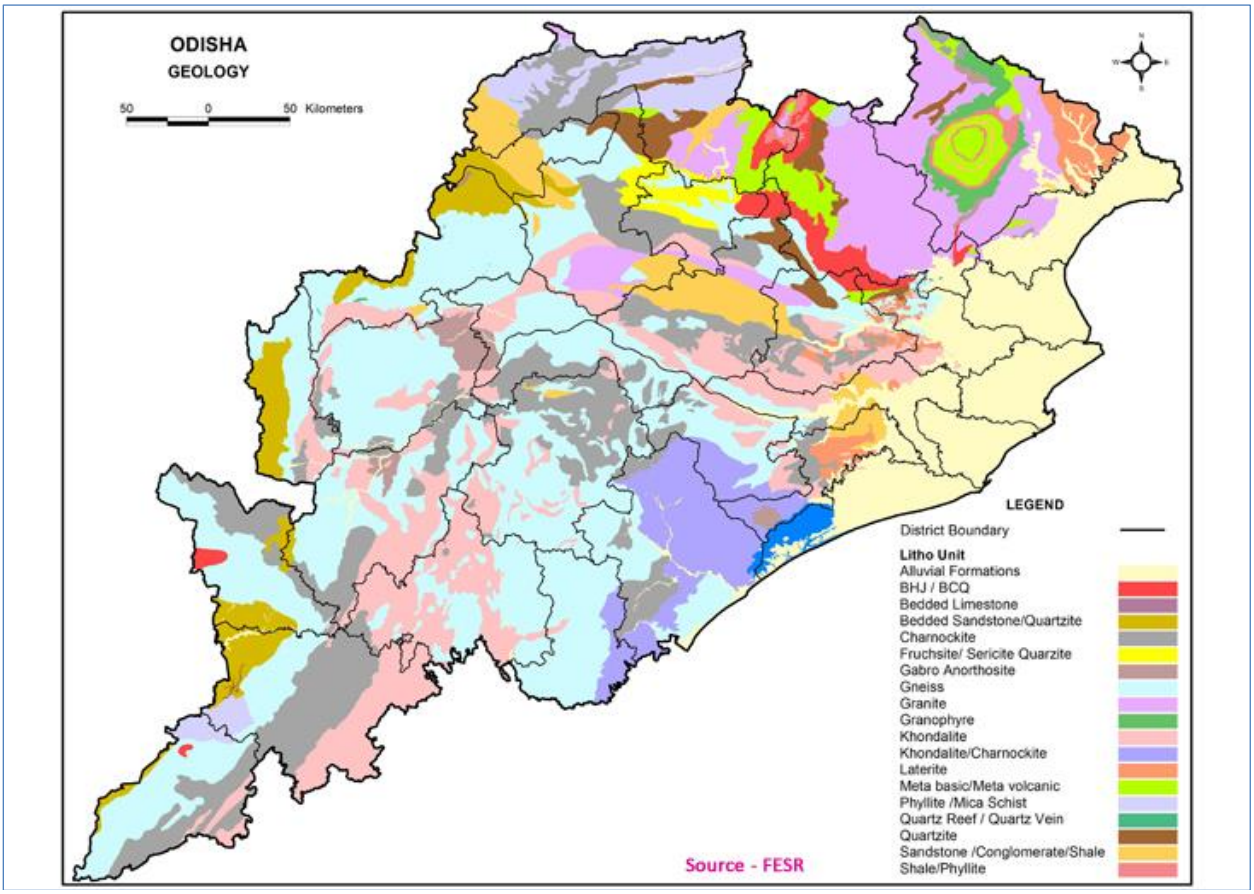
Source: http://metalworld.co.in/newsletter/2014/May14/Overview0514.pdf

The rich mineral wealth of the project districts is attributed to its favourable geological setup. Situated on the eastern fringe of the peninsular India, Odisha has about 72.5% of the area occupied by Precambrian metamorphic rocks (of Archaean and Proterozoic age) which host the majority of the minerals. The Gondwanas hosting the coal resources occur over about 8% of the land mass. The Tertiary and Quaternary formations, occupying rest of the area, provide avenues for aluminous/ nickeliferous laterite and heavy minerals (in beach sand).

The Archaean rocks in northern Odisha include the Supracrustal belts of metasedimentary rocks including Iron Ore Super Group having deposits of iron, manganese, gold and base metals. These are also represented by the gneisses, granite, migmatite (Singhbhum, Bonai and Mayurbhanj Plutons) and mafic/ ultramafic intrusives. These intrusives are associated with the chromite, titaniferous vanadiferous magnetite and PGM.

The Bastar cratonic complex of Archaean age in the Western Odisha includes gneisses, granite, migmatite and Strontium-Tantalum-Niobium bearing pegmatites.

Figure 11: Geological map of Odisha



Source: ENVIS Centre of Odisha's State of Environment, Forest and Environment Department, Odisha

Proterozoic rocks in the western Odisha exhibit platformal sedimentary formations and associated limestone deposits. In north-western Odisha they contain metasediments of low to medium metamorphic grade classified as the Gangpur Group, which host manganese, limestone and Lead-Zinc deposits. In central and southern Odisha, the Proterozoics are represented by the Easternghats granulite belt comprising of khondalite, charnockite, migmatite, anorthosite and alkaline rocks accounting for the mineralisation of bauxite, manganese, graphite and gemstones. The Mesozoic rocks of Gondwana Super Group host the major coal resources of the state.

Formations of Cenozoic age occupy the eastern coastal plains in form of alluvial sediments, ash beds and low level laterite, providing avenues for occurrence of beach sand minerals and building materials. The deltaic fans extending into offshore regions play hosts for oil and gas.

Project districts have a lion's share of the Country's mineral reserves. The chromite, nickel, bauxite, iron ore and coal resources of the state respectively stand at a staggering 83, 92, 55, 38 and 26 percent of India's total reserves. Some of these minerals also account for a visible spot in the world's mineral map. Mineral resource wise distribution in project districts are tabulated in Table 4.

Table 4: Mineral Resource Distribution in Project DIstrict

Mineral	Distribution	Location	Geology
Bauxite	Kalahandi	Karlapat- Pollingpadar,Kutrumali-Tangridongar,Lanjigarh Niyamgiri,Keluamali, Krishunmali etc	Associated with Eastern Ghat Super Group of Rocks i.e. Khondalites and Charnockites; Occur as blankets capping the parent rocks on plateau tops.
	Kandhamal	Anamini Parbat, RukuniCuttack, Demoli, Ushabali etc.	
	Kendujhar	Dholkata pahar	Occur over metatholeitic basalt.
Iron Ore	Kendujhar	Roida-Bhadrasahi, Unchabali, Jajang, Jurudi, Belkundi, Bolani, Khandbandh, Katamati, Thakurani, Gandhamardan, Joda-East, Haromoto, Guali, Kasia, Malangtoli etc.	Iron ore bands occur in layered BIF along with volcano- sedimentary rock piles known as Iron Ore Super Group
	Mayurbhanj	Suleipat, Ghusura, Gorumahisani, Badampahar, etc.	
	Jajpur	Daitari-Tomka	
Chromite	Jajpur	Sukinda Ultramafic complex.	Occur as intrusive into Precambrian metamorphites as well as differentiated layered igneous complexes
	Kendujhar	Boula-Nuasahi Igneous complex.	
	Balasore	Bhalukasuni	
Manganese	Kendujhar	Joda, Chormalda, Katasahi, Jurudi, Parelipado, Roida, Sidhamata, Dubna, Jaribahal (Palsa), Katasahi-Kolha-Rudkela, Gurda	Confined to Shale formation of Horse shoe synclinorium belonging to Precambrian Iron Ore Super Group
	Balangir	Champasar, Bharatbahal, Rengali, Tamiya, Babja, Ucchabapali, Banipali, Biarpali, Gadashankar, Bhaludungri	Associated with Eastern Ghats Super Group of Rocks i.e. quartizites, Khondalites calc- gneiss and calc-granulites as tabular bodies.
Copper	Mayurbhanj	Kesarpur	Occur within sheared metabasics belonging to Proterozoic s of Eastern Singbhum
Lead and Zinc	Balangir	Saintala area	Occur as fracture fillings in quartz veins
	Baragada	Kermeli area.	
	Kalahandi	Sisakhal area.	
Mineral Sand	Ganjam Coast	All along Ganjam coast from A.P.-Odisha border to Ganjam-Puri border. Important Sector are: Gopalpur Sector, Chhatrapur Sector and Prayagi Sector	Eastern Ghats Super Group of rocks on weathering release the heavy minerals, which are carried into the sea by many rivers , tidal waves, littoral drift, wind action etc. have played their part in the concentration of heavy minerals.
Nickel Ore	Sukinda valley (Jajpur) Kansa sector	Saruabil, Sukrangi, Kamarda, Kaliapani, Bhimtangar mines and Kansa sector	Occur as nickeliferous laterite (as over-burden in chromite mines) overlying the serpentinised dunite-peridotite bed rock
	Mayurbhanj	Simlipal compex	
Platinum	Kendujhar	Baula_Nuasahi complex, Amjori sill	Associated with Singhbhum-Odisha craton comprising high grade schist and gneiss intruded by layered mafics and ultramafics
	Jajpur	Sukinda valley	
	Balasore	Bhalukasuni	

Mineral	Distribution	Location	Geology
China Clay	Mayurbhanj	Joshipur, Chanchbani, Dumuria, Jamda, Kadodiha, Jamkeswar & Thakurmunda .Dhobadiha, Kalapathuria, Sorisbari, Jamkesar, Kalikapur, Ramchandrapur, Kathkaranjia, Nanua, Nijli, Mangalpur, Tikasil etc.	Occur in a long belt stretching from southern Singbhum to Mayurbhanj extending upto Kendujhar in the Singbhum Granite belt
	Kendujhar	Unchheibera, Guras, Bholpara, Pradhanpara	
	Nawarangpur	Devdhara, Sorispadar, Ambagan	
Coal	Bargarh, Mayurbhanj	Uneconomic coal occurrences are found in following basins- Gaisilat basin, Katrinjia Basin.	
Fire Clay	Baragada	Telipali, Buramunda, Gaisilat	In the Barakar and Karaharbari formation of Lower Gondwana
Limestone	Nuapada	Chandpala, Sagundunguri, Deobahal, Rohapadar, Gorramura.	Associated with Eastern Ghats Super Group of Rocks and in Khariar Highland Group of rocks
	Balangir	Dhamandanga, Kuliadaha, Hial	Associated with Eastern Ghats Super Group of Rocks
	Baragada	Dungri, Banjipalli,- Jampalli Putka-Saramsil	Associated with Proterozoic cover sediments
Dolomite	Baragada	Nuapara - Putka	Associated with Proterozoic cover sediments
Graphite	Baragada	Temrimal, Tentulikhunti, Hardatal, Ranjitpur,Dahigaon, Menaramunda	Occur within Eastern Ghat Mobile Belt,associated with khondalite, quartzite, calc- silicate, granulite, charnockite, basic granulites and quartzofeldspathi c gneises cross cut by leptynites and pegmatites.
	Balangir	Gerdi, Fulmati, Ganjaudar, Rengali, Sargipalli- Golomunda,Dhandamunda, Godgadbahal, Mahulpati, Banjipali, Dukukamal, Beherapani, Beheramunda, Sapmunda, Mohanilaha, Malisira, Sargibahal	
	Kalahandi	Sargipada, Gaidar, Singjharan, Lamer, Badibahal	
	Kandhamal	Madagurha (Tumudibandh), Bargaon, Dhursi, Mahabali	
	Nuapada	Kirkita, Dharamsagar, Gandabahali	
Pyro-phyllite	Kendujhar	A 90 km long belt extending from Rebna- Palasbahal in the south to Dhobakuchuda- Balabhadrapur in the North. Main deposits are Dhobakuchuda, Baliadihi, Balabhadrapur, Amjor, Madrangojodi, Nitigotha, Roduan ,Rebna,Palasbahal etc.	Associated with Singbhum Granite Phase II that is overlain by Dhanjori quartzites
	Mayurbhanj	Jashipur, Gorumahisani, Bangiriposi and Manada	
Dimension Stone	Ganjam	Gudiapalli area, Dakhinpur, Lanja, Sukunda, Lathi, Bada Dumula, Kandasara, Dasipur, Mathura, Radhamohanpur, Gobinda nagar, Krushnanagar, Nuaparha, Baranga, Dutipur, Gopalpur, Sarahanaipalli, Manikyapur, Hinjlicut, Pathan Punji,	Eastern Ghats Super Group of rocks consisting of khondalites, leptynite, charnockite, pyroxene granulite, nephelene syenite , granite etc. can be categorised as dimension stone.

Mineral	Distribution	Location	Geology
		Kirtipur, Sahaspur, Butasarsingi, Purusottampur, Khetapalli, Patapur, Gudiali, Mandalpur, Matisahi, Kohibiradi, Nuamundia, Bishnuchakra, Kanteipalli, , Olamba, Chakunda, Baragada, Badangi, Ekatapur, Matisahi etc.	
	Nawarangpur	Cheptiamb, Karlapada, Samarcharan, Hatibari, Tohra	
	Nuapada	Bhaira, Dalipathara, Damarkhol	
Quartz & Quartzite	Boudh, Baragada, Kandhamal, Kendujhar, Kalahandi, Mayurbhanj, Nuapada, Subarnapur & Nabrangpur	Numerous occurrences of Boudh, Baragada, Kandhamal, Kendujhar, Kalahandi, Mayurbhanj, Nuapada, Subarnapur & Nabrangpur districts	Quartz occurs in the form of veins and as a constituent of pegmatites. In Odisha, quartz and silica sand deposits are located in the Precambrian terrains Quartzite occurs as beds interstratified with other meta- sedimentaries
High Magnesia Rocks	Jajpur	Sukinda area	Dunite, perodotite, serpentinite, pyroxenites mostly associated with Iron Ore Super Group
	Kendujhar	Managovindpur. Boula Nuasahi area	
	Balasore	Bhalukasoni near Nilgiri	
Gold	Mayurbhanj	Suriagoda, Jagaguda, Ghutudihi, Maredihi, Janudihi, Jhabukucha, Jharadihi, Amdiha, Joshipur, Surda Dhusurapahar (Suleipat)	Occur within boulder-pebbly- quartz conglomerate associated with metasediments and metabasites of Iron Ore super Group
	Kendujhar	Gopur, Salaikena, Dimirimunda, Rangadihi, Gajipur, Odal, Kushkala, Kardangi, Kalima, Koilisuta	Occur within quartz vein associated with Iron Ore Super Group of rocks
Precious and Semi-precious Stones			
Aqua-marine	Balangir	Saraibahal, Sukulimuri, Guchhepalli, Desand, Chhanchanabhata	Associated with Eastern Ghats Granulite Belt interbanded with mafic and ultramafic complexes, anorthosites, and alkaline complexes intruded by granites, pegmatites and quartz vein Contact of beryl bearing pegmatite with ultramafic rocks
	Subarnapur	Badmal, Mursundi, Bairagipalli, Amarpalli	
Chryso-beryl	Kandhamal	Belghar	Occur within pegmatites in khondalite suit of rocks
	Balangir	Ghumsar	Associated with pegmatite intruding into quartzo- feldspathic gneiss
	Kalahandi	Sirjapalli, Tundla, Muribahal	
Garnet	Subarnapur	Siali, Naktamunda, Binika, Subarnapur	Occur in high grade pelitic schist, amphibolites, calc granulite etc.
	Boudh	Boudh, Ramgarh, Kantamal, Manmunda	
	Kalahandi	Banjipadar, Sargidua, Ghatpara	
	Nuapada	Sardhapur, Patialpada, Damjhar, Patialpada, Budhapada, Mantritarai	
	Balangir	Khaliapalli,Kesaipalli, Luhuramunda,	
Ruby	Kalahandi	Jhillingdhar, Hinjlibahal, Kerumunda	Contact of pegmatite and ultramafic rocks associated with cordierite-

Mineral	Distribution	Location	Geology
			sillimanite-garnet schists and para gneisses
Sapphire	Nuapada	Katamal, Karlakot, Amera	High grade pelitic schist at the contact of alkali syenite and pegmatite
Diamond	Nuapada	Kalamidadar valley of Nuapada district Mahanadi river bed particularly from Binika in Subarnapur district to Madhapur in Boudh district.	Diamond occurrences are associated with olivine-lamproite pipes within Bastar cratonic complex or at the interface of Bastar cratonic complex and Proterozoic cover sediments around Kalamidadar of Nuapada district. The secondary diamond occur in association with pebble and gravel of Mahanadi river particularly from Binika in Subarnapur district to Madhapur in Boudh district

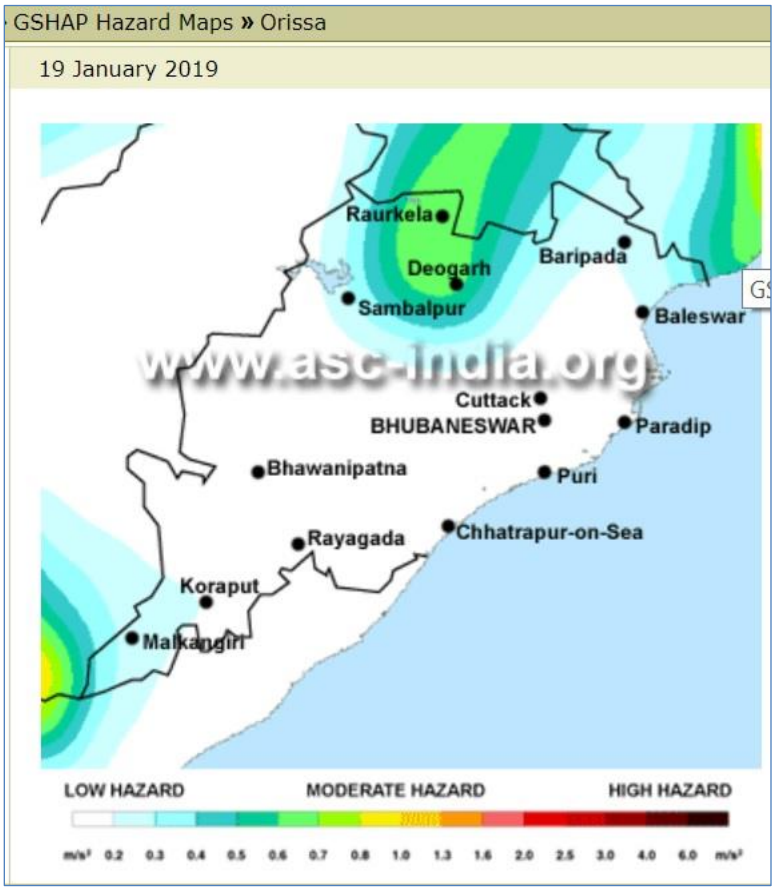
Source: Compendium of Mineral Resources of Odisha- 2009

Findings:

- None or any part of the MIP command area is protected for mineral resource exploration.
- Mining areas are far away from MI command area. Any instance of mine draining in MI command area is reported within study area.
- There exists no mining area which may pose any threat to proposed OIIPCRA project.
- Project implementation is limited within MI command area, hence no impact on mineral resource or any mining activity is anticipated.
- Project will not cause or pose any threat to sub-surface geological formation.

3.1.4 Earthquake

Figure 12: GSHAP map of Odisha



Source: http://asc-india.org/maps/hazard/haz-orissa.htm

The Bureau of Indian Standards (BIS) updated the seismic hazard map of India in 2007. There are no major changes in the zones in Odisha with the exception of the merging of Zones II and I in the 1984 BIS map. A large portion of Odisha comes under earthquake risk zone-II (Low damage risk zone). Districts in the north and south – west of the state lie in Zone II. Districts that lie in the valleys of Mahanadi and Brahmani river lie in zone III, and within Odisha this zone stretches from Jharsuguda along the border with Chhatisgarh in a south-easterly direction towards the urban centers of Bhubaneswar and Cuttack on the Mahanadi Delta. The maximum intensity expected in these areas would be around MSK VII.

According to GSHAP data, the state of Odisha falls in a region of low to moderate seismic hazard.

Table 5: Major disasters occurred in the State of Odisha

Sl. No.	Year	Calamity	No. of districts affected
1	1993	Floods	27
2	1994	Floods	5
3		Drought	10
4	1995	Floods &Cyclone	23
5	1996	Drought	28
6	1997	Drought	16
7	1998	Drought, Heat wave	26
8	1999	Super Cyclone	14
9	2000	Drought	29
10	2001	Floods	24
11	2002	Drought	29
12	2003	Floods	23
13	2004	Floods	5
14	2005	Floods	15
15	2006	Floods	27
16	2007	Floods (July)	12
17	2007	Floods (Aug & Sept)	15
18	2008	Floods (June & September)	21

Sl. No.	Year	Calamity	No. of districts affected
19	2009	Flood & Heavy rain	17
20		Drought / Pest Attack	18
21	2010	Flood & Heavy rain	6
22		Drought	17
23		Unseasonal Cyclonic Rain	24
24	2011	Drought	21
25		Flood	21
26	2012	Drought	4
27		Flood	5
28	2013	Very severe cyclone Phailin / Flood	19

Figure 13: Earthquake zonation map of Odisha

Source: Odisha State Disaster Management Authority
(http://www.osdma.org/GISImage.aspx?vchqlinkid=GL024&vchplinkid=PL065#)

Historically, parts of this State have experienced seismic activity in the M4.0 range. Earthquake in 1995 at Bonaigarh area of Deogarh has caused substantial damage. Prior to this, earthquake tremors were felt in Talcher and Rengali Dam area. Current seismicity is related to activity along Gondwana Basin boundary faults and those associated with continent – oceanic crust transition zone in the Bay of Bengal.

Finding:

- The parts of 5 project districts namely Bargarh, Jajpur, Bhadrak, Mayurbhanj & Balasore fall under moderate risk earthquake zone. Remaining parts of these five districts fall under low damage risk earthquake zones.
- Remaining 10 project districts namely Gajapati, Ganjam, Kandhamal, Nawarangpur, Kalahandi, Nuapada, Bolangir, Sonepur, Boudh and Keonjhar fall under low damage risk earthquake zones.

3.1.5 Wind and Cyclone

Coastal districts of Odisha are vulnerable to multiple natural hazards. Due to its subtropical littoral location, the state is prone to various hydro-meteorological hazards such as tropical cyclones, storm surges and tsunamis. The State has a 480 km long coastline with a significantly high population density in the coastal areas as compared to the interior regions[3].

India's east coast is one of the six most cyclone prone areas in the world. Although the coastline of Odisha is only about 17% of the Indian east coast, it has been affected by nearly 35% of all cyclonic and severe cyclonic storms that have crossed the east coast and associated storm surges that have often inundated large tracts of coastal districts[4]. On an average, about five to six tropical cyclones form in the Bay of Bengal every year, of which two to three are within the mild to severe range. Taking together the storms and severe storms, coastal Odisha is about twice as vulnerable as compared to the other eastern states.

Figure 14: Wind and cyclone affected districts

Source: Odisha State Disaster Management Authority (http://www.osdma.org/GISImage.aspx?vchglinkid=GL024&vchplinkid=PL065#)

[3] As per 2011 census the Population density is 269 persons per sq. km. While in 2001, the population density was 236 persons per sq. km and the population density in costal Districts was 410 per sq km.
[4] State Disaster Management Plan, Odisha, August 2013,GoO, OSDMA

The State has two cyclone seasons, the first during the pre-monsoon period (April – May) and the second during the post-monsoon period (September - November). October is the most crucial month for the Odisha coast. The other months in which storms affect Odisha coast with lesser frequencies are May, September and November. Cyclones ordinarily bring in their trail heavy rains causing severe floods, tidal disasters and saline inundation. Disasters of this kind cause heavy mortality, damage to standing crops and stocked paddy, untold suffering, and damage to private and public properties. In October 1999 the cyclone that hit Odisha was classified as a 'Super Cyclone' due to its severity and left the state virtually paralyzed due to the destruction to its infrastructure and communication systems. The cyclone severely affected five of project districts namely Balasore, Bhadrak, Jajpur, Keonjhor and Mayurbhanje and 9 other districts of Odisha. Year wise list of major cyclones which has affected coastal blocks of Odisha is tabulated in Table 6.

Table 6: List of major cyclones affected coastal districts of Odisha

Cyclone Name	Lowest Pressure (mbar)	Month & Year
BOB 05	968	October, 1999
BOB 06	912	October, 1999
Phailin	940	October, 2013
Hudhud	960	October, 2014
Kyant		October, 2016

Finding:

- Entire portion of 3 project districts and part of other 4 project districts are falls under High Damage Risk Zone where almost 80% of MIP are located (considering district total).
- Entire portion of three project districts and part of other 8 project districts falls under Moderate Damage Risk Zone- A, whereas part of 6 project districts falls under Moderate Damage Risk Zone-A.
- Cyclone risk zone wise distribution of project district is given in Table 7.

Table 7: Cyclone risk zone wise distribution of project districts

VHDRZ- B	HDRZ	MDRZ- A	MDRZ- B
Balasore	Majurbhanj (P)	Boudh	Bargarh (P)
Bhadrak	Keonjhar (P)	Sonepur	Ganjam (P)
Jajpur		Bolangir	Gajapati (P)
Mayurbhanj (P)		Keonjhar (P)	Kandhamal (P)
Ganjam (P)		Ganjam (P)	Kalahandi (P)
Gajapati (P)		Gajapati (P)	Nawarangpur (P)
Keonjhar (P)		Kandhamal (P)	
		Bargarh (P)	
		Nuapada (P)	
		Kalahandi (P)	
		Nabarangpur (P)	

***Source**: Interpreted from Wind and Cyclone Zone map prepared by Odisha State Disaster Management Authority*
VHDRZ- B = Very High Damage Risk Zone- B; HDRZ = High Damage Risk Zone
MDRZ- A = Moderate Damage Risk Zone- A; MDRZ- B Moderate Damage Risk Zone- B
P= indicates part of district

3.1.6 Flood & Waterlogging

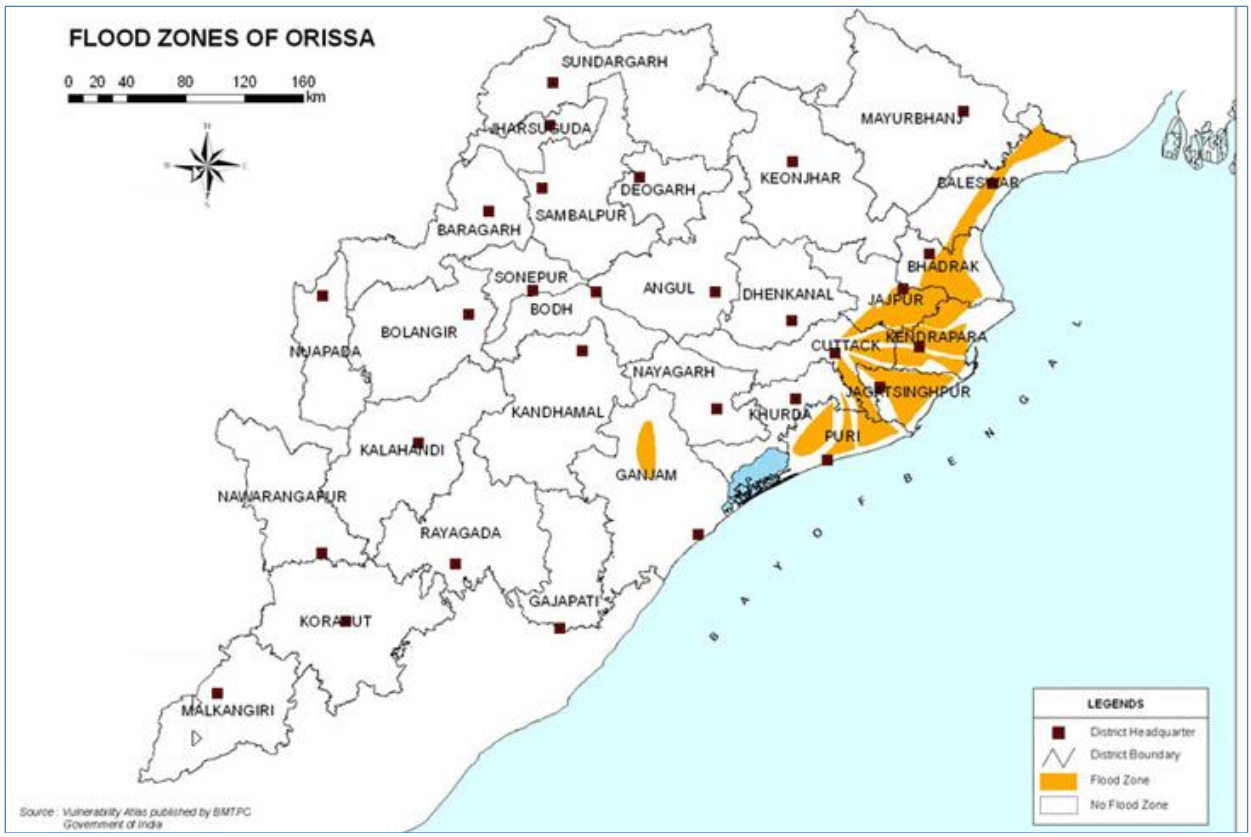
The 482 km long coastline of Odisha exposes the State to flood, cyclones and storm surges. Heavy rainfall during monsoon causes floods in the rivers. Flow of water from neighbouring States of Jharkhand and Chattisgarh also contributes to flooding. The flat coastal belts with poor drainage, high degree of siltation

of the rivers, soil erosion, breaching of the embankments and spilling of floodwaters over them, cause severe floods in the river basin and delta areas.

In Odisha, damages are caused due to floods mainly in the Mahanadi, the Brahmani, and the Baitarani. These rivers have a common delta where flood waters intermingle, and when in spate simultaneously, wreak considerable havoc. This problem becomes even more acute when floods coincide with high tide. The water level rises due to deposits of silt on the river-bed. Rivers often overflow their banks or water rushes through new channels causing heavy damages. Floods and drainage congestion also affect the lower reaches along the Subarnarekha. The rivers Rushikulya, Vansadhara and Budhabalanga also cause occasional floods at lower reaches.

The entire coastal belt is prone to storm surges. The storms that produce tidal surges are usually accompanied by heavy rainfall making the coastal belt vulnerable to both floods and storm surges. People die; livestock perish; houses are washed away; paddy and other crops are lost, and roads and bridges are damaged. The floods of 1980, 1982, 2001 and 2003 in the State were particularly severe; property worth crores of rupees were destroyed in the floods.

Figure 15: Flood affected districts



Source: Odisha State Disaster Management Authority (http://www.osdma.org/GISImage.aspx?vchglinkid=GL024&vchplinkid=PL065#)

Findings

Feeder streams, river and nullas are seasonal and extent of command area of all selected MI tank is ranging between 40 to 171 Ha. Natural drainage system around command area is well enough to pass out any accumulated water during heavy rain. The problem of water logging is not commonly experienced within irrigation command area. Water logging may not pose a major challenge for the project because almost all

tanks are seasonal in nature thereby the scope for water logging and salinity is not anticipated. However, water logging problem observed in small pockets in the coastal area due to high and erratic rainfall (Ganjam- 1320 mm., Balasore- 1684 mm. and Bhadrak- 1422 mm., whereas state annual average rainfall is 1460.5 mm), water table ranging between 2.0 to 5.0 m. bgl[5] may pose some problem specially during monsoon season. Especially, in case of some low lying pockets in coastal areas, there may be instances of water logging that would require attention.

Design command area for Kharif season of all MI tanks considered under OIIPCRA ranges between 20 to 1311 hectares. However, kharif command area of about 60% of the MI tanks are below 70 hectares. Normally medium to large size MI tanks are situated in the uplands and having good gradients except only 4 nos. in coastal district Ganjam (One- 652Ha. and three ranging between 340 – 370 ha.). Because of good gradient of majority of the tanks, normally no such alarming drainage problem persists. As such, drainage is not a serious problem in tank system of Orissa due to various factors such as presence of highly permeable soils, undulating topography and good drainage facility. Mostly, the nullas, streams and rivers are seasonal in nature for which drainage problem normally does not appear to be a threat.

Issues:

- Part of project district Ganjam, Jajpur, Bhadrak and Balasore are declared flood zone where more than 50% of MIPs are located (considering district total). However, Balasore and Bhadrak districts are affected majorly due to presence of immediate coast of Bay of Bengal. Only 3.5% MIPs are located at Balasore and Bhadrak district.
- Command area of sample MIP- Jallibandha located at Ganjam district has witnessed such crop damage due to occasional flood occurrence by Rushikulya river.
- Water logging during rainy season is reported at river adjacent MI command area of MIP- Jallibandha

3.1.7 Surface Water Quality

Water quality of all MI tank were found well within tolerance limit for Inland Surface Water (Class C) with minor deviation of BOD. BOD level in all 4 MI tank water was found with slight deviation from permissible limit but below 4 mg/l. Water quality of Rushikulya river and Chilika lake water was very turbid with TDS value recorded above 8000 mg./l. Total coliform count in river and lake water was respectively higher than water sample collected from MI tank, which indicates anthropogenic pollution are more in river/ lake than MI tank area.

Table 8: Surface water quality in surrounding area of sample MI tank

MIP	Jallibandha	Talkholghai	Cradigappa	Upper suktel	Dandamunda	Bisipur	Tolerance Limits *
Sample Source	Rushikullya River, D/S of MIP	Chilika Lake	MI Tank	MI Tank	MI Tank	MI Tank	
District	Ganjam	Ganjam	Kandhamal	Bolangiri	Nabrangapur	Mayurbhanj	
Block	Ganjam	Khallikote	Daringibadi	Khaprakhol	Chandahandi	Karanjia	
GP	Ganjam NAC	Bania	Badabanga		Dhadipani	Patbil	
pH	8.03	9.13	7.63	8.12	8.1	7.37	6.5-8.5
TDS (mg/l)	9648.0	8856	72	132	223	99	1500
Specific Conductivity (µs/cm)	16830	15340	110	231	390.6	166.9	
Total Coliform (MPN/ 100ml)	900	>1600	270	370	450	370	5000

[5] Ground water year book (2014-15), South Eastern Region, Bhubaneswar

DO (mg/l)	6.8	6.2	6.9	6.5	6.4	6.4	4
BOD (mg/l)	6.8	6.4	3.8	3.6	3.2	3.6	3
Chlorides as Cl (mg/l)	4765	4486	5.9	12.8	24	5.95	600
Fluorides as F (mg/l)	0.65	0.42	0.14	0.28	0.84	0.07	1.5
Cadmium as Cd (mg/l)	bdl	bdl	bdl	bdl	bdl	bdl	0.01
Lead as Pb (mg/l)	0.08	0.064	bdl	bdl	bdl	bdl	0.1
Iron as Fe (mg/l)	0.15	0.17	0.18	0.16	0.19	0.26	50
Magnesium (mg/l)	167.67	199.26	2.91	5.34	14.09	3.89	
Zinc as Zn (mg/l)	0.44	0.38	bdl	0.08	0.12	bdl	15
Calcium (mg/l)	268.5	116.2	6.41	24.84	35.27	5.61	
Sodium as Na (mg/l)	3240.0	3042.0	3.9	8.8	16.6	2.3	
Sulphate as SO4 (mg/l)	168.4	140.2	2.1	6.2	7.8	3.87	400
Arsenic as As (mg/l)	bdl	bdl	bdl	bdl	bdl	bdl	0.2
Nitrates as NO3 (mg/l)	30.4	26.1	0.64	1.2	1.64	2.1	50

Source: Test conducted by CTRAN using NABL accreditated environmental laboratory
*bdl= Below detectable limit; * Inland Surface Waters, Class C (IS: 2296-1982)*

Any instance of water pollution at MI tank water from industrial activity is not found at sampled MI tank. Water quality of all sampled MI tank is fairly good to promote pisciculture activity in MI tank.

Field Finding:
Excessive use of chemical pesticide and fertilizer for cultivation purpose are found as common major source of water and soil pollution of agricultural field located within command area. Skin itching after bathing at Khaibandha MIP (Balasore) indicates water pollution of MI tank water. Undesirable practices like garbage dumping in Dhandamunda MIP (Nabarangpur) tank is reported as one of sources of water pollution. Water pollution from excess use of fish feed is also reported at Khaibandha MIP, Balasore.

Table 9: Source of water and land pollution in command area

Sample MIP	Block	Sources of water & land pollution within command area
Dhandamunda MIP, Nabarangpur	Chandahandi	Use of pesticide, Use of Fertilizer, Garbage deposition in pond
Jallibandha MIP, Ganjam	Ganjam	Chemical release from industry
Talakholaghai, Mohanpur MIP, Ganjam	Khallikote	Use of pesticide and fertilizer
Bisipur MIP, Mayurbhanj	Karanjia	
Khaibandha MIP, Balasore	Nilagiri	Use of fish feeding
Cradigappa MIP, Kandhamal	Daringbadi	Use of pesticide and fertilizer
Dandrabahal MIP, Bolangir	Patnagarh	Use of pesticide and fertilizer
Jamunasagar MIP, Kalahandi	Bhawanipatna	Use of pesticide and fertilizer, Seepage from dumped garbage
Kalimati MIP, Keonjhar	Harichandanpur	Use of Pesticides

Issues:
- Excess use of fertilizer and pesticide is main source of water and soil pollution in command area
- Tank water pollution due to dumping of garbage at MI tank during lean period
- Tank water pollution due to leaching from nearby garbage bumping area

3.1.8 Meteorology

Entire projects universe represents tropical climate, characterised by high temperature, high humidity, medium to high rainfall and short and mild winter. Project districts are dominated by “Tropical wet-dry” or “Tropical savanna climate” as per “Köppen-Geiger classification”. The year is divided mainly into three seasons, the summer season from March to June, the southwest monsoon season from July to September and the winter season from October to February. Skies are mostly heavily clouded to overcast during the

monsoon months and it decreases during the post-monsoon season. Clear or lightly clouded skies are common during the winter and early summer season. Cloudiness increases in the afternoons during the latter half of the summer season.

The State has tropical climate, characterized by high temperature, high humidity, medium to high rainfall and short and mild winters. On the basis of climate type, Odisha has been divided into ten agro-climatic zones. The normal rainfall of the state is 1451.2 mm. About 75% to 80% of rainfall is received from June to September. Floods, droughts and cyclones occur almost every year in varying intensity. The list of major disasters occurred with number of districts affected in Odisha is given in Table 5.

While the global mean temperature rose by 0.5 degree celsius in the last 50 years that of Odisha rose by 1 degree celsius. In ten years average of highest recorded temperatures has increased by 4.4 to 6.6 degree celsius and the average of lowest recorded temperatures has further decreased by 3 to 5.1 degree celsius in various parts of odisha.

Rising temperature has a close relationship with water and forest resources of the locality. Declining water resources in the summer months and thinning forest cover, which otherwise help in moderating temperature and providing adaptation, is a cause of serious worry

Water Resource of Odisha- Issues & Challenges

3.1.8.1 Temperature

Project districts experience hot summer with temperatures shooting up to 39°C (Keonjhar) in the east to 43°C (Balangir and Kalahandi) in the west. During winter season mornings and nights are cool. However, the mean winter temperature varies from lowest 8°C at Kandhamal district to 32°C at Balangir district. The mean summer temperature varies between lowest 20°C and 33°C in project districts.

Summer temperature crosses 40° Celsius mark at North-west districts Balangir, Sonepur and Eastern district Mayurbhanj. Heat wave conditions prevail in 3 districts (Kalahandi, Balangir and Kandhamal) of project universe with the temperature crossing 40°C during hot summer. The highest temperature of 43°C was recorded at Balangir and Kalahandi districts, followed by 41°C in Kandhamal. Temperature remains below 40°C in all other project districts.

Table 10: Project district as well as season wise temparature in ^0C

Station	Project District	Summer (March - June)				Rainy (July- Sept.)				Winter (Octo. - Feb.)			
		FY 2012-13		FY 2013-14		FY 2012-14		FY 2013-15		FY 2012-15		FY 2013-16	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Gopalpur	Ganjam	24	33	25	33	26	33	26	33	18	32	16	31
Keonjhar	Keonjhar	18	40	18	39	21	31	22	31	11	30	10	29
Baripada	Mayurbhanj	18	43	17	38	21	32	20	32	11	31	10	29
Balasore	Balasore	22	36	21	36	25	33	25	32	14	32	13	30
Chandabali	Bhadrak	23	39	21	37	26	33	24	33	15	32	14	31
Kandhamal	Kandhamal	14	38	14	41	20	29	22	31	8	32	8	31
Balangir	Balangir	16	38	NA	NA	NA	NA	NA	NA	13	34	NA	NA
Titlagarh	Balangir	17	43	21	43	22	32	22	32	12	34	10	32
Sonepur	Sonepur	20	43	NA.	NA.	25	32	NA	NA	15	33	NA	NA
Bhawanipatna	Kalahandi	19	42	20	43	23	31	24	32	12	34	11	31
Project		**14**	**43**	**14**	**43**	**20**	**33**	**20**	**33**	**8**	**34**	**8**	**32**

Source: Meteorological Centre, Bhubaneswar
NA- Indicates data not available

3.1.8.2 Relative Humidity

Average relative humidity (RH) in 15 project districts ranges between 40% to 88%. Average RH is lowest (61%) during summer season, followed by 71% during winter and 84% in winter season. RH widely ranges

between 48% to 91% during winter season, 36% to 83% during summer season and 75% to 91% during rainy season. During monsoon period the humidity is very high in the eastern parts and during summer it is dry in the western part of the state. Kandhamal has witnessed maximum 91% RH during rainy season followed by Bhadrak (89%) and Majurbhanj and Kalahandi (88%).

Table 11: Project district as well as season wise relative humidity in %

Stations	District	Summer					Rainy					Winter				
		2012-13		2013-14		Avg.	2012-13		2013-14		Avg.	2012-13		2013-14		Avg.
		08:30	17:00	08:30	17:00		08:30	17:00	08:30	17:00		08:30	17:00	08:30	17:00	
Gopalpur	Ganjam	82	80	83	83	82	83	83	82	80	82	80	70	80	69	75
Keonjhar	Keonjhar	55	42	62	50	52	86	85	86	86	86	72	63	73	66	68
Baripada	Mayurbhanj	67	57	69	62	63	88	78	87	87	85	75	64	76	65	70
Balasore	Balasore	66	69	68	69	68	78	77	79	82	79	66	68	66	67	67
Chandabali	Bhadrak	76	68	80	70	73	89	84	87	84	86	82	72	82	72	77
Kandhamal	Kandhamal	81	54	75	51	65	91	86	91	85	88	91	65	90	67	78
Balangir	Balangir	70	38	NA	NA	54	NA	NA	NA	NA	NA	87	48	NA	NA	67
Titlagarh	Balangir	58	40	57	37	48	85	78	86	75	81	75	65	77	53	68
Sonepur	Sonepur	66	36	NA	NA	51	87	80	NA	NA	84	81	60	NA	NA	71
Bhawanipatna	Kalahandi	57	41	64	50	53	88	79	86	78	83	78	64	80	68	73

Source: Indian Meteorological Department

3.1.8.3 Rainfall

The south-west monsoon normally sets in between 5th - 10th June in the coastal plain of Odisha. Entire project universe is under the full sway of the south-west monsoons by 1st July. South-west monsoons withdraws completely by 15th October. This normal monsoon period fluctuates slightly from year to year basis. Project universe falls under Sub-humid" category as per "Thornthwaite's classification", implying occasional winter rains.

Table 12: Project district wise rainfall in last 5 years (2013 - 2017)

District	2013	2014	2015	2016	2017	Average	2013	2014	2015	2016	2017	Average
	Summer (March - June)						Rainy (Jul - Sept)					
Nawarangpur	816	371	598	423	323	**506**	902	1429	1047	955	1042	**1075**
Ganjam	286	180	260	318	372	**283**	753	971	618	576	726	**729**
Keonjhar	417	256	348	329	367	**343**	876	943	611	816	805	**810**
Mayurbhanj	509	389	465	370	375	**422**	1128	1121	806	894	868	**963**
Balasore	501	403	398	381	471	**431**	936	1215	772	880	819	**925**
Bhadrak	407	307	304	394	258	**334**	750	960	739	941	640	**806**
Jajpur	343	311	332	324	337	**329**	686	1052	784	970	624	**823**
Gajapati	494	435	451	411	448	**448**	641	983	543	715	713	**719**
Kandhamal	322	160	267	239	287	**255**	832	1169	615	749	658	**804**
Bolangir	257	216	229	109	193	**201**	849	982	683	791	597	**780**
Bargarh	231	204	329	172	273	**242**	787	1392	649	793	611	**846**
Boudh	291	139	361	151	310	**250**	585	1513	693	916	676	**877**
Sonepur/ Subarnapur	233	127	338	84	272	**211**	850	1602	602	886	665	**921**
Kalahandi	578	258	322	156	237	**310**	756	1237	830	986	1001	**962**
Nuapada	269	310	368	178	195	**264**	1014	1195	776	808	647	**888**
Total	*5955*	*4066*	*5371*	*4038*	*4717*	***4829***	*12344*	*17764*	*10767*	*12675*	*11089*	***12928***

District	2013	2014	2015	2016	2017	Average		Yearly Average
	Winter (Octo- Feb.)							
Nawarangpur	256	107	22	108	103	**119**		**1701**
Ganjam	783	182	139	175	265	**309**		**1320**
Keonjhar	403	137	90	129	206	**193**		**1346**

District	2013	2014	2015	2016	2017	Average		Yearly Average
			Winter (Octo- Feb.)					
Mayurbhanj	636	152	72	161	262	**256**		**1641**
Balasore	753	185	90	304	309	**328**		**1684**
Bhadrak	663	164	71	191	321	**282**		**1422**
Jajpur	662	185	61	133	362	**281**		**1433**
Gajapati	562	401	107	169	271	**302**		**1468**
Kandhamal	411	184	52	118	239	**201**		**1260**
Bolangir	201	29	29	108	72	**88**		**1069**
Bargarh	206	47	13	69	66	**80**		**1169**
Boudh	324	54	19	67	169	**127**		**1254**
Sonepur/ Subarnapur	230	49	16	78	128	**100**		**1232**
Kalahandi	243	44	29	133	121	**114**		**1386**
Nuapada	164	65	4	61	115	**82**		**1234**
Total	*6496*	*1985*	*812*	*2003*	*3007*	***2861***		***20618***

Source: Indian Meteorological Department

The average annual rainfall over the entire project universe of 15 districts is 20618 mm. with district wise yearly average of 1375 mm. About 63% of the average annual rainfall of the entire project universe is received in the southwest monsoon season, 23% in summer and remaining 14% in winter season. Average southwest monsoon rainfall of project districts ranges between 55- 75% of district yearly average rainfall. Yearly average rainfall is maximum (1701 mm.) at Nawarangpur and lowest (1069 mm.) at Bolangir district. Maximum average rainfall during southwest monsoon (1075 mm.) as well as summer season (506 mm.) is recorded at Nawarangpur and during winter at Balasore followed by Ganjam. Whereas, minimum average rainfall during southwest monsoon is recorded at Gajapati District (719 mm.) followed by Ganjam (729 mm.). Minimum average rainfall during summer season is recorded at Bolangir (201 mm.) followed by Sonepur (211 mm.). The variation in the rainfall from year to year is not high. Only 4 districts (Nawarangpur, Mayurbhanj, Balasore & Gajapati) receive more than state normal annual rainfall of 1460.5 mm.[6], five districts receive more than 1300 mm. but less than state normal annual rainfall, 5 districts receive > 1150 mm. <1300 mm. and remaining one district (Bolangir) less than 1100 mm.

Finding:

- Coastal project districts like Balasore, Bhadrak, Ganjam & Gajapati which fall under very high cyclone damage risk zone or Flood zone receives ample spell of rainfall immediate after cyclone occurrence.
- Yearly average rainfall at Gangam district is 1320 mm., where more than 45% MIP area located. This is less than the State normal annual rainfall of 1460.5 mm.

3.1.8.4 Ambient Air Quality

All tested parameters at all 6 sampled sites are found well within NAAQ standard which justify non-presence of any heavy air polluting industries within sampled MIP. All such sampling points are sufficiently away from road network. Any severe air pollution from anthropogenic activities are not observed within sampled project area except burning of domestic fuel like LPG and kerosene in rural area. Instances of use of fuel wood for household cooking purpose is observed at rural area of tribal dominated district like Majurbhanj, Keonjhar, Kandhamal, Gajapati and Kalahandi.

[6] Annual Climate Summary- 2015, National Climate Centre, Climate Service Division, India Meteorological Department

Table 13: Ambient air quality in surrounding area of sample MIP

MIP / Measured Unit	Jallibandha	Talkholghai, Mohanpur	Cradigappa	Upper suktel	Dandamunda	Bisipur	NAAQ Standard
District	**Ganjam**	**Ganjam**	**Kandhamal**	**Bolangiri**	**Nabrangapur**	**Mayurbhanj**	
Block	**Ganjam**	**Khallikote**	**Daringibadi**	**Khaprakhol**	**Chandahandi**	**Karanjia**	
GP	**Ganjam NAC**	**Bania**	**Badabanga**		**Dhadipani**	**Patbil**	
PM_{10} µg/m^3	63.38	58.78	52.59	55.18	58.59	55.37	100
$PM_{2.5}$ µg/m^3	30.42	28.33	22.08	27.08	29.17	25.42	60
Sulphur Dioxide SO_2 µg/m^3	6.9	6.7	5.2	5.7	6.4	5.9	80
Nitrogen Dioxide NOx µg/m^3	10.81	10.57	9.6	9.83	10.57	10.08	80
Carbon Monoxide CO mg/m^3	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	2
Ammonia NH_3 µg/m^3	<20	<20	<20	<20	<20	<20	400
Ozone O_3 µg/m^3	<10	<10	<10	<10	<10	<10	100
Lead (Pb) µg/m^3	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	1
Nickel (Ni) ng/m^3	<15	<15	<15	<15	<15	<0.6	20*
Arsenic (As) ng/m^3	<0.44	<0.44	<0.44	<0.44	<0.44	<0.44	06*
Benzene (C6H6) µg/m^3	<1	<1	<1	<1	<1	<1	05*
Benzo Pyrene (BaP) ng/m^3	<1	<1	<1	<1	<1	<1	

Source: Test conducted by CTRAN using NABL accreditated environmental laboratory
*Note: * indicates annual value*

PM10, Pb, Ni, As, BaP were collected using Respirable dust sampler (RDS) and SOx, NOx, NH3 and O3 were collected using Gaseous sampling attachment. CO was measured using NDIR with minimum decebal limit of 0.4 mg/m3. PM2.5 was measured using Fine dust sampler (FDS) and analysed in gravimetric method. Sox, NOx, NH3 and O3 were analysed using Spectrophotometer with minimum absorbsion limit upto 005. Pb, Ni, As were analysed by Atomic absorption spectrophotometer (AAS). C6H6 was collected using Benzen Sampler and tested in Gaschromatography. BaP was also tested in Gaschromatography.

Issues:

- Air pollution due to operation of diesel operated thresher / harvester machine in agricultural land.
- Burning of paddy straw on agriculture field

3.1.9 Ground Water Availability

Project universe comprising 98 project blocks of 15 districts has annually replenishable ground water of 5.8 BCM. The overall annual ground water draft in 15 project districts comprising 98 project blocks, as per estimations made in 2011, was 1.7 BCM. Thus, the stage of ground water was assessed at 30 percent in 98 project blocks. The development blueprint for the project blocks Nabarangpur, Gajapati and Kandhamal is heavily dependent on ground water both for water supply to its citizens and irrigation.

Ground water development status of 7 out of 15 project districts (considering 98 project blocks) are assessed to be below the state average of 28 percent. However, none of the project area fall under over exploited, critical or semi critical blocks and notified for regulation of ground water development. This statistics may otherwise give an impression that, ground water development in these 7 project districts being so low, the potentials of it is grossly untapped. But the grassroots facts do reveal a different picture, i.e., of dwindling water levels, ground water sources going dry and ground water quality getting affected.

Table 14: Ground water resource and utilization (considering 98 project blocks)

District	GW Resources (HaM)	Sectoral GW Use (HaM)				Stage of GW Development (%)
		Irrigation	Domestic	Industrial	Total Draft	
Balasore	48328	19577	1743	1512	22832	47
Bargarh	17856	2847	797	33	3677	21
Bhadrak	35805	18169	1454	746	20369	57
Bolangir	39526	7075	2088	160	9323	24
Boudh	6613	1726	281	5	2012	30
Gajapati	4436	374	253	8	635	14
Ganjam	101602	23804	5619	870	30293	30
Jajpur	18115	8164	373	60	8597	47
Kalahandi	62141	9372	3414	227	13013	21
Kandhamal	23523	2498	636	51	3185	14
Keonjhar	68848	16325	1815	2284	20424	30
Mayurbhanj	117803	29389	4303	778	34470	29
Nabarangapur	24458	1711	1034	65	2810	11
Nuapada	15634	2449	614	40	3103	20
Subarnapur	2354	606	183	6	795	34
Total	**587042**	**144086**	**24607**	**6845**	**175538**	**30**

Source: ENVIS Centre of Odisha's State of Environment, Forest and Environment Department, Odisha

Finding:

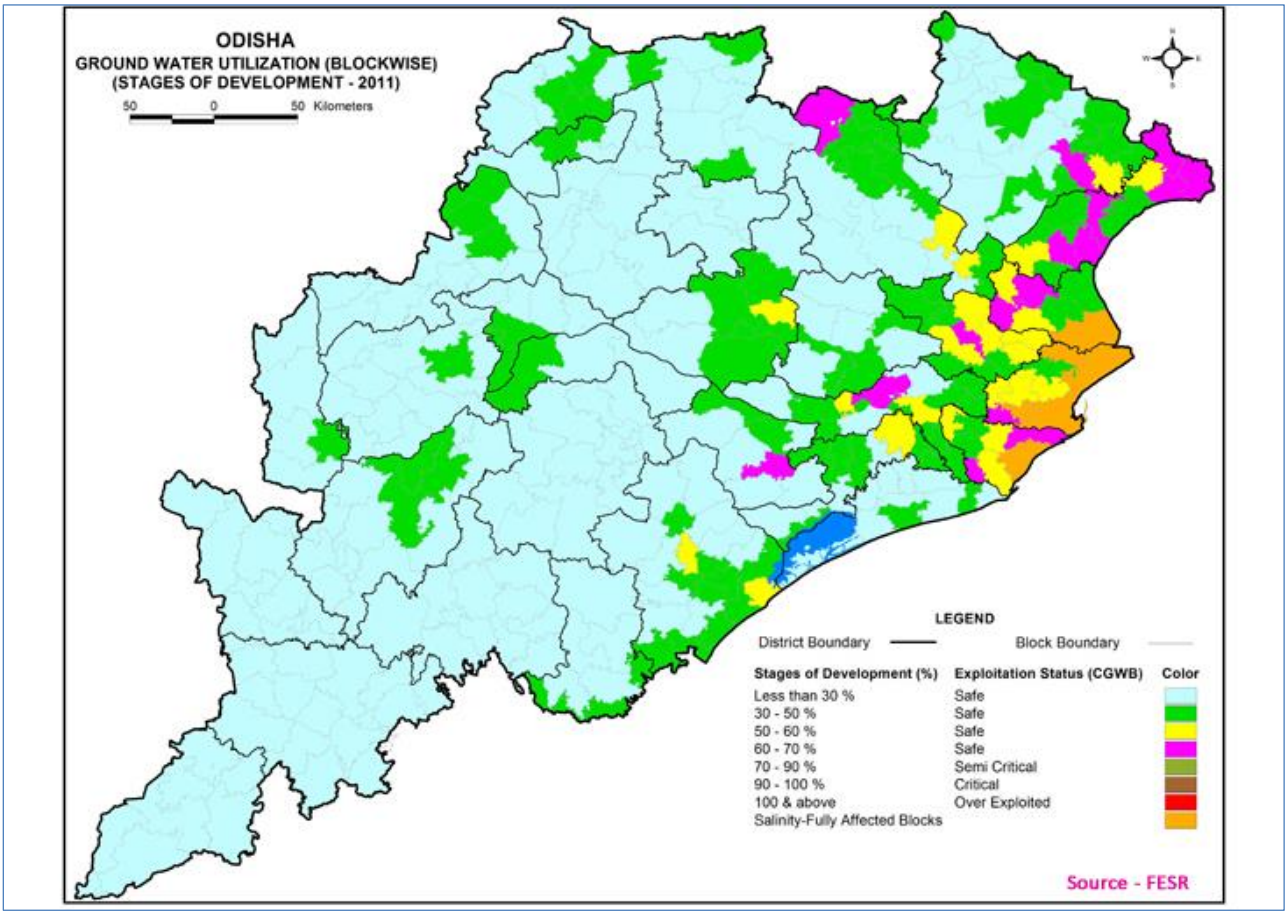
- Extraction of ground water in all the sample project districts for irrigation purpose during Rabi season is observed.
- Ground water table in all sample areas is depleting gradually. Chocking of shallow tube well is becoming regular phenomenon in all sampled district.
- Ground water is also being extracted for drinking purpose at household level in all sampled areas.
- Any potential source of ground water contamination within tank command area is not found within sampled MI command area.
- However, contamination due to saline water intrusion during flood occurrence at coastal project blocks is reported.

3.1.9.1 Ground Water Quality

The chemical quality of ground water of shallow wells in the state is found to vary widely, depending upon the physiography, soil texture and underlain soil formations. The shallow aquifer of inland zone is mostly fresh and relatively saline for coastal plain. These aquifers at places are of high electrical conductivity (E.C.) and chloride concentration. Some of the project districts having high values of E.C. The distribution of fluoride in shallow aquifer show that Balangir, Bargarh, Boudh, Ganjam, Gajapati, Kalahandi, Nuapara, Suvarnapur, districts are above the desirable limit (1.0 mg/L) may be due to anthropogenic activities[7]. Out of 15 project districts, only Bhadrak is fully saline affected.

[7] Ground water year book (2014-15), South Eastern Region- Bhubaneswar, Central Ground Water Board

Figure 16: Map showing ground water developmental status and saline affected districts of Odisha



Source: ENVIS Centre of Odisha's State of Environment, Forest and Environment Department, Odisha

Within 99 blocks of 15 project districts, only 9 blocks of Ganjam district, one of Bargarh, one of Boudh, three of Kalahandi districts are found where EC concentration is more than > 2000 µS/ cm. Similarly, chloride concentration above 250 mg/l was reported at 11 blocks of Ganjam, one block from each of Bargarh and Boudh district, three blocks of Kalahandi, two blocks of of Nuapada. Five project blocks of Ganjam, one block from each of Keonjhar and Gagapati district, 7 blocks of Balangir, one block of Boudh, two blocks of Kalahandi, one block of Nuapada are reported as fluoride contaminated where concentration are found above desirable limit of 1.0 mg./l. List of villages within project blocks where EC, chloride and fluoride concentration is significantly high is tabulated below.

Table 15: Project blocks with cloride and fluoride contamination

District	Block	Village	EC (> 2000 µS/ cm)	Chloride (> 250 mg/ L)	Fluoride (> 1.0 mg/L)
Ganjam	Chhatrapur	Tanganapalli	3226	578	
		Narendrapur	2363	479	
		Govindpur	2000	365	
		Chatrapur		390	
	Dharakote	Suramani	2676	337	1.5
	Ganjam	Huma	4817	1095	
	Hinjilicut	Belagan		273	
		Hinjlikatu	2099	422	
	Jaganathprasad	Saishamuli		376	

District	Block	Village	EC (> 2000 µS/ cm)	Chloride (> 250 mg/ L)	Fluoride (> 1.0 mg/L)
		Chadeiapalli Chhak	2878	766	
	Khalikote	Rambha	2290	422	1.4
	Kukudakhandi	Lathi	2156	333	
	Polasara	Polasora	2284	422	
	Purusottampur	Bananai	2000	358	1.1
	Bellaguntha	Gobara		326	
	Kavisurjyanagar	Gudiali		252	
	Sargad	Sheragada			1.3
	Bhanjanagar	Gallery			1.2
Kendujhar	Ghasipura	Ramchandrapur			2.4
Gajapati	Mohana	Luhaguda			1.4
Balangir	Balangir	Dulusara			1.6
	Puintala	Gaintala			1.6
	Bangomunda	Titisilet			1.5
	Turekela	Kurli			1.2
	Puintala	Dumerbahal			1.2
	Balangir	Bolangir-1			1.11
	Khaprakhol	Phulkimunda			1.1
Bargarh	Gaisilet	Gaisilet	4300	1145	
Baudh	Kantamal	Kantamal	4300	1517	
		Sanrahajhar		489	
		Gohipita			1.1
Kalahandi	Golamunda	Daspur	3220	496	
		Golmunda			2.1
	Junagarh	Badbasul	2640		3.6
		Mahichala		266	
		Baldiamal			1.2
	Kokasara	Sunamala	2700	372	
		Koksara	2000	347	
Nuapada	Komana	Tarbod		363	
	Khariar	Lachhipur		280	
		Ranipur			1.4
		Sanmaheswar			1.3

Source: Ground water year book (2014-15), South Eastern Region- Bhubaneswar, Central Ground Water Board

Cases of fluoride affected habitations and population are found only in two project districts. 5556 population of 6 habitations of Bolangir and 2079 population of 3 habitations of Kalahandi district are reported as fluoride affected. Nitrate contamination is reported only in Nawarangpur and Ganjam district. 137 populations of only one habitation of Nawarangpur and 3691 populations of 4 habitations of Ganjam are reported as nitrate affected. Saline affected habitations are found only in two project districts. 931 population of only one habitation of Ganjam and 7693 population of 11 habitations of Balasore are reported as saline affected. However, cases of iron affected habitations are reported at all project districts except at Nuapada. Total 3,27,963 population of 1197 nos. iron affected habitations are reported within 97 project blocks leaving two project blocks of Nuapada. Highest iron affected habitation is reported at Mayurbhanj (660) followed by Keonjhar (335) and Balasore (46).

Table 16: Project district wise Ground Water Contaminated Habitation and Population (considering only 98 project blocks)

Sl. No.	District	Fluoride Affected		Iron Affected		Nitrate Affected		Saline Affected	
		H	P	H	P	H	P	H	P
1	Nawarangpur	0	0	18	5882	1	137	0	0
2	Ganjam	0	0	9	9387	4	3691	1	931

Sl. No.	District	Fluoride Affected		Iron Affected		Nitrate Affected		Saline Affected	
		H	P	H	P	H	P	H	P
3	Keonjhar	0	0	335	74523	0	0	0	0
4	Mayurbhanj	0	0	660	185039	0	0	0	0
5	Balasore	0	0	46	24813	0	0	11	7693
6	Bhadrak	0	0	8	1313	0	0	0	0
7	Jajpur	0	0	8	2261	0	0	0	0
8	Gajapati	0	0	11	2888	0	0	0	0
9	Kandhamal	0	0	71	11991	0	0	0	0
10	Bolangir	6	5556	12	3493	0	0	0	0
11	Bargarh	0	0	3	1262	0	0	0	0
12	Boudh	0	0	2	571	0	0	0	0
13	Subarnapur	0	0	7	1782	0	0	0	0
14	Kalahandi	3	2079	7	2758	0	0	0	0
15	Nuapada	105	18648	0	0	0	0	0	0
	Total	**114**	**26283**	**1197**	**327963**	**5**	**3828**	**12**	**8624**

Source: ENVIS Centre of Odisha's State of Environment, Forest and Environment Department, Odisha
H= Habitations; P= Population

3.1.10 Soil Type

All 15 project districts are categorised mainly in 9 types of soil classes. Coverage of Red soil is maximum 24% followed by 15% Lateritic and 12% Alluvial soil. Coverage of Sandy loam and Red & Yellow soil class is equal to 11% and Red & Black soil coverage is only 10%. Acidic (1%) and Saline (3%) soil coverage is very low in entire project district.

Table 17: District wise major soil type in percentage (%)

Project District	Sandy loam	Red	Red & yellow	Black	Red & black	Saline	Alluvial	Lateritic	Acid	Others
Nawarangpur	75	12	0	1	0	0	0	0	0	12
Ganjam	0	49	0	6	0	4	23	18	0	0
Keonjhar	0	41	10	0	9	0	11	29	0	0
Mayurbhanj	41	0	0	0	0	15	0	44	0	0
Balasore	0	0	0	0	0	20	56	24	0	0
Bhadrak	7	0	0	0	0	0	57	0	27	8
Jajpur	0	54	0	0	0	6	25	14	0	0
Gajapati	58	0	0	20	0	0	0	22	0	0
Kandhamal	0	98	0	2	0	0	0	0	0	0
Bolangir	0	0	36	19	35	0	0	10	0	0
Bargarh	0	0	NA	0	NA	0	0	NA	0	60
Boudh	0	16	0	31	53	0	0	0	0	0
Sonepur	0	0	49	14	28	0	0	4	0	5
Kalahandi	0	39	34	10	11	0	7	0	0	0
Nuapara	0	56	14	6	18	0	6	0	0	0
Total	**11**	**24**	**11**	**7**	**10**	**3**	**12**	**15**	**1**	**6**

Source: Agriculture Contingency Plan
NA= Data Not Available

Red Soil (Haplustalfs, Rhodustalfs, Ustorthents): Red soil covers about 1505.7 thousand Ha. Presence of excess amounts of oxides of iron imparts red colours to the soil. The soils of the former two districts are heavier in texture and the rest of the districts have light texture soil. The clay fraction of these soils is dominated by kaolinites and illites.

Crops like rice, finger millet, minor millets, niger, potato, brinjal and fruit trees such as mango, jack fruit, guava, papaya and sapota are grown successfully in these soils.

Mixed red and Yellow Soil (Haplustalfs, Paleustalfs, Ustochrepts): These soils occupy 678.2 thousand Ha. of lands being the fourth highest in the project districts. Mixed and yellow soils occur as catenary associations in undulating and rolling terrains which differ in depth, texture and colour. The soils are moderately shallow in depth and coarse-textured. The upland soils are shallower and lighter in texture than the low land soils. Presence of ferruginous concentration and fluctuation of water table imparts the mixed red and yellow colour to the soil. The upland soils are moderately acidic whereas, low land soils are slightly acidic. The low land soils are formed mainly by colluvial deposits.

The upland soils are suitable for crops like rice, finger millet sugarcane, potato, brinjal, tomato and pointed guard. The low land soils are suitable for paddy following pulse as pyra crops. Fruit trees like mango, guava and banana grow well in these soils.

Black Soil (Chromusterts, Us-torthents): There are no regular occurrence of black soils in the project districts. The black colour of the soil is due to presence of titaniferous magnetite, humins, bitumins etc. These soils are formed due to weathering of basic rocks in the low lying areas.

These soils are heavier in texture having clay content more than 30%. Clay minerals are dominated with smectites for which deep cracks are observed during summer. The effective soil depth extends to more than 90 cm. The soils swell on wetting holding maximum amount of moisture. Permeability of these soils is slow which result in severe surface soil erosion.

The soil is suitable for growing rice, jowar, bajra, maize, Bengal gram, safflower, mustard and cotton.

Laterite Soil (Haplustalfs, Plinthustalfs, Ochraqualfs): Lateritic soils occupy 906.6 thousand Ha. of lands in the project districts. Lateritic soils are characterised by compact vesicular structure and rich in hydrated oxides of iron and aluminium with small amounts of manganese, titanium and quartz. These soils are loamy sand to sandy loam in the surface having hard clay pan in the subsoil, crusting is its problem in upland literite. Presence of higher amount of exchangeable aluminium and manganese results in slightly acidic to strongly acidic soil with pH ranging between 4.5 to 5.8.

Rice, finger millet, miner millets and sesamum can grow well with proper fertilizer application. Fruit trees like mango, jackfruit, banana, guava and sapota grow well in this soil.

Deltaic Alluvial Soil (Haplaquepts, Fluvaquents, Ustochrepts): Those soils cover 754.6 thousand ha. of lands and occur in the deltaic regions of the rivers. Textural class of the soil varies from coarse sand to clay and is mostly dependent on geomorphology of the flood plain and the type of alluvial material carried by river water. Water holding capacity of this type of soil is high. Once water-logged, the clay soil takes more time to become ploughable. Drainage is difficult due to slow permeability.

Deltaic alluvial soils are suitable for rice in kharif and for groundnut, mustard, sesamum, potato and vegetables in Rabi. With residual soil moisture, groundnut, green gram and black gram are grown very successfully.

Coastal Saline and Alluvial Soil (Halaquepts, Halaquepts): These soils occur along the coastal belt of the state in a narrow strip extending 5-25 km. inward. The salinity occurs due to littoral deposits of estuarial intrusion of brakash tidal water from sea through creeks. Saline soils are rich in soluble salts of chloride and sulphate in conjunction with sodium and magnesium. Soils of lacustrine sediments of lake Chilika also

get affected by salts due to flooding of brackish lake water in the project districts of Ganjam. During monsoon a buld-up of sub-soil salinity occurs due to high ground water table under low lying situation.

However, during rainy seasons the salinity hazards are low due to dilution and flushing of soluble salts by heavy rains. Rice is the main kharif crop with usual and well distributed rainfall. Although kharif rice does not suffer very much from salinity, very often early drought and cyclonic sea water inundation cause hazards to rice. Salt tolerance high yielding rice varieties like Lunisharee, SR-26B and Mohan out yield the local saline resistant varieties like Sola, Pateni and Cuttack Chandi. Salt tolerance Rabi crops such as safflower, mustard, barley, linseed, chilli, sugarbeet, tomato, spinach and some cucurbits grow well in these soils. Cotton is a successful crop in saline soil if managed properly.

4.2.10.1Soil Quality

Red Soil: The soils are strongly to moderately acidic with low to medium organicmater status and poor water retentive capacity. These soils are deficient in nitrogen and phosphorus. Micronutrients like boron and molybdenum are highly deficient in these soils. These soils have low cation exchange capacity with high phosphate and sulphur absorption property and deficient in calcium and magnesium. Water soluble phosphates get fixed and become non available to crop plants.

Mixed red and Yellow Soil: The upland soils are low in nitrogen and phosphorus whereas, the low land soils are medium in phosphate and high in potassium. Upland light textured soils are deficient in boron and low land soils with rice cropping system under Hirakud command area are deficient in zinc. Soil acidity can be corrected through liming.

Black Soil: The soils pH is neutral to alkaline having free calcium carbonate nodules in the profile. The soil is rich in calcium but deficient in phosphorus, potassium, zinc and boron. Upland rice suffers from iron deficiency. Groundnut, mustard and safflower are found to be respond to application of sulphur. Ammonia volatilization is higher in paddy fields.

Laterite Soil: This soil is poorly fertile with low organic matter. Available nitrogen and phosphate are low and potash is medium. Notrogen is lost due to leaching and phosphate becomes unavailable due to fixation by Fe and Al oxides. Cation exchange capacity of the soil is low, and it is low in percentage base saturation. Sulphur is absorbed as pyrites or zine sulphide.

Deltaic Alluvial Soil: Deltaic alluvial soils are generally fertile, but fertility decreases if the soil is not reached regularly by flood. pH is acidic to neutral. The coarse textured soils are deficient with N, P, K and S.

Coastal Saline and Alluvial Soil: These soils are mostly clay to clay loam in texture and columnar in structure. The pH of these soils varies between 6.0 to 8.0 with a conductivity of 10-40 dS/m in the summer. The exchangeable sodium percentage varies between 18 to 27. The soils are rich in nitrogen, potassium and low to medium in phosphorus. The saline soils are sufficient in sulphate, boron, molybdenum and chloride. Failure of crops normally occurs due to (i) plasmolysis or germinating seeds and roots (ii) depth of young seedings, (iii) reduced uptake of K, Ca and Mg due to presence of excess Na, (iv) toxicity due to B and (v) hydrogen sulphide injury.

Table 18: Soil quality in command area of sampled MIP

MIP	Jallibandha	Talkholghai, Mohanpur	Cradigappa	Upper suktel	Dandamunda	Bisipur
District	Ganjam	Ganjam	Kandhamal	Bolangiri	Nabrangapur	Mayurbhanj
Block	Ganjam	Khallikote	Daringibadi	Khaprakhol	Chandahandi	Karanjia
GP	Ganjam NAC	Bania	Badabanga		Dhadipani	Patbil

MIP		Jallibandha	Talkholghai, Mohanpur	Cradigappa	Upper suktel	Dandamunda	Bisipur
District		Ganjam	Ganjam	Kandhamal	Bolangiri	Nabrangapur	Mayurbhanj
Block		Ganjam	Khallikote	Daringibadi	Khaprakhol	Chandahandi	Karanjia
GP		Ganjam NAC	Bania	Badabanga		Dhadipani	Patbil
p H (1:10)	…	7.25	6.47	7.75	7.25	6.31	5.82
Electrical Conductivity (1:10)	µs/cm	72.3	52.6	110.3	80.8	55.1	91.2
Organic Carbon	%	1.4	1.32	1.56	1.62	1.58	1.64
Texture	%	Sa-75.9 Si-16.2 C-7.8	Sa-72.2 Si-16.7 C-10.7	Sa-6.2 Si-17.3 C-76.4	Sa-5.6 Si-15.8 C-78.4	Sa-6.3 Si-17.1 C-76.3	Sa-7.1 Si-15.9 C-77.0
Phosphorous as P	%	0.014	0.011	0.012	0.016	0.013	0.016
Potassium as K	%	0.068	0.062	0.042	0.038	0.056	0.036
Sulphur as S	%	0.0028	0.003	0.0032	0.0026	0.0022	0.0032
Calcium as Ca	%	0.681	0.62	0.58	0.668	0.56	0.72
Magnesium as Mg	%	0.456	0.482	0.426	0.524	0.48	0.56
Chromium as Cr	%	bdl	bdl	bdl	bdl	bdl	bdl
Lead as Pb	%	0.006	0.004	0.002	0.003	0.002	0.002
Zinc as Zn	%	0.009	0.006	0.003	0.005	0.006	0.003
Cadmium as Cd	%	bdl	bdl	bdl	bdl	bdl	bdl
Arsenic as As	%	bdl	bdl	bdl	bdl	bdl	bdl
Fluoride as F	%	bdl	bdl	bdl	0.002	0.007	bdl
Nickel as Ni	%	0.004	0.002	bdl	bdl	bdl	bdl
Mercury as Hg	%	bdl	bdl	bdl	bdl	bdl	bdl
Boron as B	%	0.0006	0.0004	bdl	bdl	0.0004	bdl
Copper as Cu	%	0.0008	0.0007	0.0004	0.0002	0.0003	0.0004
Iron as Fe	%	0.14	0.16	0.2	0.26	0.48	1.82
Manganese as Mn	%	0.072	0.052	0.008	0.007	0.014	0.018
Molybdenum as Mo	%	bdl	bdl	bdl	bdl	bdl	bdl

Source: Test conducted by CTRAN using NABL accreditated environmental laboratory
bdl= Below detectable limit, Sa= Sand, Si= Silt, C= Clay

Soil pH of sample collected from command area of 6 sampled MIP ranges between 5.8 to 7.8. Electric conductivity ranges between minimum 52.6 at Talkholghai, Mohanpur, Ganjam to maximum 110.3 at Cradigappa MI at Kandhamal. Organic carbon content ranging between 1.32 % at Talkholghai, Mohanpur, Ganjam to 1.64% at Bisipur MI, at Mayurbhanj district. Arsenic and fluoride content in collected soil samples are found below detectable limit (bdl). Heavy metal like Chromium and Cadmium are not detected in all 6 soil samples. However, presence of other heavy metal like Zinc, Lead and Copper are found in all soil samples, but at very low percentage and within Threshold Effect Level (TEL)[8]. Iron content is highest 1.82% at Bisipur, Majurbhanj and lowest at 0.14% at Jallibandha, Ganjam. Manganese content in all soil sample ranges between 0.007 to 0.072 %.

Findings:

- Soil fertility is decreasing due to excess use of chemical fertilizer and pesticides.
- Practice of using biological fertilizer like cow manure (cow dung) is diluting day by day

[8] In absence of any indian standard, it was compared against "US EPA standard for sediment quality"

3.1.11 Tank Condition & Ecosystem

Out of total 538 MIP considered under OIIPCRA project, dam height of only 13 MIPs is more or equal than 10 meter out of which only three (3) have dam height more than 15 meter. Dam of 319 reservoir type MIP are earther whereas 145 diversion weirs are made of concrete and remaining two are creek.

Very less to medium amount irrigation water was available in all sampled MIP. However, the available quantity of water during Rabi season is non-usable for irrigation purpose and is used for cattle drinking purpose. Water availability improves slightly after spell of rain due to retreating monsoon. Those MI tanks located adjacent to nearby habitations are also being used as for bathing and other regular domestic purpose.

Submerged and marginal vegetable species like growing of aquatic weeds in tank bed and side slope is observed in all of the sampled tanks. However, quantum of these undesirable species is very nominal in most of the tanks. Vegetable species like floating weeds: Spirodela sp., Eichhornia crassipes (water hyacinth), emergent weeds: Nymphoides sp., Nymphaea spp. (water lilies), Marsilia quadrifolia, submerged weeds: Potamogeton sp., Ottelia sp., marginal weeds: Jussiaea sp., Cyperus sp., Paspalidium sp., Eleocharis sp., Sagittaria sp., Ipomea spp., have grown in tank water and subsurface.

Most of the tanks are silted up due to prolonged silt disposal. Silted up materials to be excavated in case non-availability of 1.5 meter depth below DSL. Small quantum of earth material will be generated due to digging activity proposed for development of fish refuse centre. All sampled MI tanks are connected with motorised access road.

Many irrigation structures like head/ tail regulators, field channels, which were constructed decade before, were found in dilapidated conditions. Renovation or reconstruction of these damaged structure will lead to generation of C&D waste. However, quantity of C&D waste will be very insignificant in each MIP site.

Table 19: Physical condition of sampled MI tank

MIP	Block	Certified CCA in Ha (Khariff)	Designed CCA in Ha (Rabi)	Height of Dam/ Weir (in m) *	Type of Dam/ weir	Water Availability in Rabi	Presence of Weed in Tank
Dhandamunda MIP, Nabarangpur	Chandahandi	40.00	NA	6.380	Earthen	Medium	Moderate
Jallibandha MIP, Ganjam	Ganjam	42.75	NA	3.000	Homogeneous earth fill	Very Less	Nominal
Talakholaghai, Mohanpur MIP, Ganjam	Khallikote	60.00	NA	4.000	Homogeneous earth fill	Very Less	Nominal
Bisipur MIP, Mayurbhanj	Karanjia	48.00	NA	NA	Concrete	Very Less	Nominal
Khaibandha MIP, Balasore	Nilagiri	42.00	NA	9.200	Earthen	Medium	Moderate
Cradigappa MIP, Kandhamal	Daringbadi	60.00	20.00	3.000	Concrete	Medium	Nominal
Dandrabahal MIP, Bolangir	Patnagarh	52.38	8.00	5.000	Earthen	Very Less	Nominal
Jamunasagar MIP, Kalahandi	Bhawanipatna	171.00	NA	10.150	Earthen	Full	None
Kalimati MIP	Harichandanpur	90.00	440	15.54	Earthen	Full	None

Source: Secondary and primary analysis by CTRAN
*NA= indicates data not available; * as per design parameter*

Issues:

- Sufficient irrigation water during Rabi season is not available in all sampled MI tanks
- Water efficiency has reduced due to natural growth of aquatic weeds in tank
- Small quantum of aquatic weed waste will be generated due to cleaning/ removal of aquatic weeds
- Small quantum of soil will be generated due to digging of fish refuse
- Generation of C&D waste from renovation of existing irrigation structure

3.1.12 Dam Safety

3.1.12.1 Introduction

A safe dam is one which performs its intended functions without imposing unacceptable risks to the public and society by its presence. The International Commission on Large Dams (ICOLD) has been pioneer in projecting various aspects of dam engineering to ensure proper design and construction of safe dams. The Safety of the Dams in our country is the principal concern of State Agencies. Although most of the dams in the country have performed well, there have been few failures. These failures highlighted the need to review the procedures and the criteria those were adopted by various States with the objective of establishing the best assurance of dam safety within the limitations of present state of art. Consequent to the proposal made during the 5th Conference of Irrigation Ministers in November, 1980, the State Dam Safety Organization (SDOC) in Odisha was setup in May,1981. SDOC of Odisha regularly monitor and performs safety audit of all 204 numbers of large dams (as per ICOLD classification). This includes 10 major project dams, 50 medium project dams and rest 144 dams under minor irrigation projects[9].

Since its inception the SDSO is engaged in monitoring the health of dams and rendering necessary advice to the field units. The Annual Health Status of Large Dams are being published every year with the review of significant deficiency identified during inspections, remedial measures, action taken report, activities of the State Dam Safety Organisation and very pertinent information about each large dam of the State.

3.1.12.2 Assessment

Out of total 538 MIP considered under OIIPCRA project, dam height of only 13 MIPs is more than 10 meter out of which only three (3) have dam height more than 15 meter. Only three dams with dam height $\geq 10 < 15$ is not covered by SDSO [last four (Sl. No. 11 to 13) MIPs listed in Table 20]. All remaining 10 nos. dam with dam height more than 10 meter are covered by SDSO.

Table 20: Details of Large dam considered under OIIPCRA

Sl. No.	Name of MIP	Catchment (Sq Km)	River Basin	Water Surface Area (Ha)	Dam Height (in m) *	Dam Length (in m)	Type
1	Jaunria, Bhanga munda, Harichandanpur, Keonjhar	24.6	Baitarani	37.5	15.46	814	Earthen
2	Kalimati, Balipokhari, Harichandanpur, Keonjhar	32.2	Baitarani	71.7	15.54	915	Earthen
3	Bahiya, Taratara, Hatadihi, Keonjhar	5.2	Baitarani	7.9	21.336	123	Earthen
4	Mathanpala, Bijepur, Titlagarh, Balangir	48.6	Tel	145.0	13.5	1450	Earthen
5	Jamunasagar, Duarsuni, Bhawanipatna, Kalahandi	19.4	Tel	25.8	10.15	420	Earthen

[9] Dam Safety Activity Report, August- 2018, State Dam Safety Organization, Bhubaneswar

Sl. No.	Name of MIP	Catchment (Sq Km)	River Basin	Water Surface Area (Ha)	Dam Height (in m) *	Dam Length (in m)	Type
6	Garh, Dhakotha, Anandpur, Keonjhar	21.5	Baitarani	53.8	12.2	681	Earthen
7	Taradia, Kodapada, Anandpur, Keonjhar	22.5	Baitarani	32.4	10.66	271	Earthen
8	Sindhei, Bhandaridiha, Ghasipura, Keonjhar	39	Baitarani	75.0	11.6	1577	Earthen
9	Raghubeda, Santarapur, Ghatagaon, Keonjhar	11.5	Baitarani	10.6	14.8	710	Earthen
10	Jagadala, Malada, Jhumpura, Keonjhar	45.3	Baitarani	37.0	10.68	1018	Earthen
11	Nedam, Sarisapal, Bangriposi, Mayurbhanj	7.8	Budhabalanga	12.3	10	610	Earthen
12	Japimaska, Baliguda, Baliguda, Kandhamal	3.89	Tel	1.9	12.19	137.2	Earthen
13	Kumudabadi, Hatiagarh, Jashipur, Mayurbhanj	10.1	Baitarani	3.2	13.71	494.4	Earthen

** as per design parameter*

Out of 3 nos. MIP not covered under SDSO, two are located in moderate risk earthquake zone (part of district) and all remaining 11 MIPs fall in Low damage risk zone. 10 MIPs falls in High Cyclone Damage Risk Zone and remaining three in Moderate Damage Risk Zone. However, none of these large dams falls in Flood zone Table 21.

Table 21: Natural Hazard Profile of Large Dam

Sl. No.	Name of MIP	Earthquake Zone (Part of District)	Cyclone Risk Zone	Flood Zone
1	Jaunria, Bhanga munda, Harichandanpur, Keonjhar	Low damage	VHDRZ- B & HDRZ	No Flood Zone
2	Kalimati, Balipokhari, Harichandanpur, Keonjhar	Low damage	VHDRZ- B & HDRZ	No Flood Zone
3	Bahiya, Taratara, Hatadihi, Keonjhar	Low damage	VHDRZ- B & HDRZ	No Flood Zone
4	Mathanpala, Bijepur, Titlagarh, Balangir	Low damage	MDRZ- A	No Flood Zone
5	Jamunasagar, Duarsuni, Bhawanipatna, Kalahandi	Low damage	MDRZ- A & B	No Flood Zone
6	Garh, Dhakotha, Anandpur, Keonjhar	Low damage	VHDRZ- B & HDRZ	No Flood Zone
7	Taradia, Kodapada, Anandpur, Keonjhar	Low damage	VHDRZ- B & HDRZ	No Flood Zone
8	Sindhei, Bhandaridiha, Ghasipura, Keonjhar	Low damage	VHDRZ- B & HDRZ	No Flood Zone
9	Raghubeda, Santarapur, Ghatagaon, Keonjhar	Low damage	VHDRZ- B & HDRZ	No Flood Zone
10	Jagadala, Malada, Jhumpura, Keonjhar	Low damage	VHDRZ- B & HDRZ	No Flood Zone
11	Nedam, Sarisapal, Bangriposi, Mayurbhanj	Moderate	VHDRZ- B & HDRZ	No Flood Zone
12	Japimaska, Baliguda, Baliguda, Kandhamal	Low damage	MDRZ- A & B	No Flood Zone
13	Kumudabadi, Hatiagarh, Jashipur, Mayurbhanj	Moderate	VHDRZ- B & HDRZ	No Flood Zone

VHDRZ- B = Very High Damage Risk Zone- B; *HDRZ = High Damage Risk Zone*
MDRZ- A = Moderate Damage Risk Zone- A; *MDRZ- B Moderate Damage Risk Zone- B*

DSO Team and executive engineer of MI division are alternatively monitoring all large dams and giving their recommendation. However, any significant action was not taken on timely manner as per recommendation of inspecting team. Inspection details of large dams by DSO team and executive engineer of MI division are given in Table 22.

Table 22: Last two inspection details of large dam considered under OIIPCRA

Sl. No.	Name of MIP	Date of inspection & Inspecting Officer	Date of inspection & Inspecting Officer
1	Jaunria, Bhanga munda, Harichandanpur, Keonjhar	March 2007- Expert Panel 11/ 05/ 2017- Executive Engineer, MI Division Anndapur	18.03.17- DSO Team
2	Kalimati, Balipokhari, Harichandanpur, Keonjhar	March, 2007- Expert Panel	--
3	Bahiya, Taratara, Hatadihi, Keonjhar	February, 2019- (DSRP-2)	--
4	Mathanpala, Bijepur, Titlagarh, Balangir	06/ 02/ 16- DSO Team	22/ 05/ 14- Executive Engineer M.I Division, Bolangir
5	Jamunasagar, Duarsuni, Bhawanipatna, Kalahandi	December, 2006- Expert Panel	
6	Garh, Dhakotha, Anandpur, Keonjhar	19/ 12/ 17- DSO Team	01/ 06/ 15- Executive Engineer, M.I Division, Anandapur
7	Taradia, Kodapada, Anandpur, Keonjhar	03/ 06/ 16- Executive Engineer, M.I. Division, Anandapur	03/ 06/ 15- DSO Team
8	Sindhei, Bhandaridiha, Ghasipura, Keonjhar	03/ 06/ 16- M.I. Division, Anandpur, Keonjhar	03/ 06/ 15- DSO Team
9	Raghubeda, Santarapur, Ghatagaon, Keonjhar	18/ 03/ 17- DSO Team	---
10	Jagadala, Malada, Jhumpura, Keonjhar	03/ 12/ 2015- Executive Engineer M.I. Division, Keonjhar	05/ 02/ 14- DSRP

3.1.13 Presence of Industry

Proposed renovation of existing irrigation facilities will be confined within MI command area. Presence of any industry within irrigation tank command area is not expected. Any kind of polluting industry which may cause pollution in tank command area or irrigation water was not found around sample MIP except for a chemical manufacturing industry (Grasim Industry) located approximately 300 meter away from command boundary of Jallibandha MIP, Ganjam. However, presence of any industry in an around area of MI command area may potentially impact nearby MI command area or nearby waterbody from which water is being fed to MIP. Use of formalin in fish drying, at the river bank opposite to Rushikulya river where MIP- Jalibandha is located, was reported. Fish drying practices was also observed at household level in nearby habitation of MIP- Jalibandha for commercial purpose. However, any kind of leaching effect of formalin on irrigation command area is not anticipated.

Field Findings:

- A chemical industry namely Grasim Industry Limited is located approximately 300 meter away from command boundary of Jallibandha MIP, Ganjam.
- Local people are in perception that chemical leaching from this chemical industry is affecting nearby soil and ground water quality which is ultimately affecting the farming practice.
- There exists no mining industry in and around sample MIP point.
- Keonjhar and Jajpur are two project districts where mining activity are dominant but presence of any mine/ mining industry in an around sampled MIP point is not found.
- Use of formalin in fish drying to prevent rotting/ act as preservative is visible.

3.1.14 Physical Cultural Resource

Physical cultural resource like temple, burning ghat and sacred groves have been observed within command area of sampled MIPs. Any such resources are not likely to be adversely impacted due to implementation of project activities, as construction works are limited to tank bed, dam and water regulatory and distribution structures.

Table 23: Presence of PCR within command area

MIP	Block	Number of Temple	Number of Burning Ghat	Sacred Grove
Dhandamunda MIP, Nabarangpur	Chandahandi	--	--	--
Jallibandha MIP, Ganjam	Ganjam	--	1	--
Talakholaghai, Mohanpur MIP, Ganjam	Khallikote	1	1	*Ficus religiosa* (Osta Tree) on Talakhola Bund
Bisipur MIP, Mayurbhanj	Karanjia	--	--	--
Khaibandha MIP, Balasore	Nilagiri	--	--	--
Cradigappa MIP, Kandhamal	Daringbadi	1	--	--
Dandrabahal MIP, Bolangir	Patnagarh		1	--
Jamunasagar MIP, Kalahandi	Bhawanipatna	1	1	--

Findings:

- Few temples are found to be present within command area.
- Presence of burning ghat within command area of sample MI is observed.
- Sacred grove of *Ficus religiosa* (Osta Tree) and *Ficus benghalensis* (Banyan Tree) is located within command area.
- Potagarh or the "buried fort", constructed in 1768, is located beyond 200 meter periphery of Jallibandha MIP, Ganjam.
-

3.1.15 Sensitive Receptors

Sensitive receptors like school, playgrounds have been observed within 100-meter boundary of sampled command area. Noise and dust during construction activity and plying of material transporting vehicle may cause adverse impact on such sensitive receptors. However, no health centre was found within 100 meter boundary of sampled command area.

Table 24: Sensitive receptors within 200 meter of command area

MIP	Block	School	Playground
Dhandamunda MIP, Nabarangpur	Chandahandi	--	1
Jallibandha MIP, Ganjam	Ganjam	1	1
Talakholaghai, Mohanpur MIP, Ganjam	Khallikote	--	--
Bisipur MIP, Mayurbhanj	Karanjia	1	--
Khaibandha MIP, Balasore	Nilagiri	1	--
Cradigappa MIP, Kandhamal	Daringbadi	--	--
Dandrabahal MIP, Bolangir	Patnagarh	--	1
Jamunasagar MIP, Kalahandi	Bhawanipatna	--	--

Issue:

- Noise and dust pollution during construction activity, regular operation and plying of heavy vehicle, plant and machineries may impact such sensitive receptors during construction stage.

3.2 Biological Environment

3.2.1 Forest Profile

Project area comprising 15 districts has huge forest cover area with 14252.33 Sq. Km. reserved forest, 8939.00 Sq. Km. protected forest. Forest cover area in these 15 project districts is about 37.5% of total geographical area with compared to state total coverage of 37.3%. Forest cover at Kandhamal (71.2%), followed by Gajapati (57.1%), Nuapada (48%), Nabrangpur (46.5%), Mayurbhanj (42.2%), Boudh (41.2%) and Ganjam (38.4%) is more than state coverage of 37.3%. Forest coverage is lowest at Bhadrak (3.9%) followed by Balasore (8.7%). Bhadrak and Nuapada district are devoid of any reserve forest where as Sonepur district is devoid of any protected forest. However, any of the project activities will not be implemented within forest area.

Table 25: District wise Classification of Forest Area in Odisha -2011-12

Sl. No.	District	Geographical Area	Forest Land under control of Forest Department		Forest Land under Control of Revenue Deptt.			Total Forest Area	% of Forest cover
			Reserve Forests	Un classified Forests *	Demarcated Protected Forests (DPF)	Undemarcated Protected Forests (UDPF)	Other Forests under Revenue Deptt.		
1	2	3	4	5	6	7	8	9	10
1	Nabarangapur	5291	535.3	0.1	685.8	0.0	1241.6	2462.7	46.5
2	Ganjam	8206	1485.7	0.9	143.5	1167.4	352.5	3149.9	38.4
3	Bolangir	6575	1105.7	0.1	3.6	0.0	434.4	1543.9	23.5
4	Balasore	3806	202.7	0.2	21.5	0.0	107.8	332.2	8.7
5	Baragarh	5837	583.5	0.1	541.2	0.0	181.3	1216.2	20.8
6	Bhadrak	2505	0.0	0.0	4.0	33.0	60.1	97.1	3.9
7	Boudh	3098	983.3	1.0	43.5	0.0	249.3	1277.2	41.2
8	Gajapati	4325	416.9	0.1	108.2	1149.4	794.4	2469.0	57.1
9	Jajpur	2899	6.4	0.0	299.3	0.0	419.6	725.3	25.0
10	Kalahandi	7920	1449.0	0.5	488.5	313.4	286.6	2538.0	32.0
11	Kandhamal	8021	2010.1	2.0	1783.3	0.0	1914.5	5709.8	71.2
12	Keonjhar	8303	1834.1	0.3	273.6	220.8	768.4	3097.2	37.3
13	Mayurbhanja	10418	3330.1	2.2	245.1	0.0	814.7	4392.1	42.2
14	Nuapada	3852	0.0	0.4	1505.0	0.0	345.3	1849.7	48.0
15	Subarnapur	2337	309.5	0.0	0.0	0.0	106.2	415.8	17.8
	Project	**83393**	**14252**	**8**	**6146**	**2884**	**8077**	**31276**	**37.5**

Source: District Statistical Hand Book
Note: Area in Sq. Km.
* *(Forest Deptt.,Building, Forest roads nurseries etc.*

3.2.2 Natural Habitat

Odisha with its diversified topography and climate contains several natural habitats known for bio-diversity and a variety of wildlife species. There are two National parks, 18 Sanctuaries and one Biosphere Reserve in the State. There are two notified and one proposed Tiger Reserves namely Similipal, Satkosia and Sunabeda (proposed). Additionally, Odisha has the Chilika Ramsar site and the Gahirmatha marine sanctuary. The protected area for wildlife management constitutes 4.25% of the total geographical area of the State (Department of Forest and Environment, Government of Odisha).

No sampled tank was directly located within any natural habitat. As the project only rehabilitates existing minor irrigation tanks, project impacts are identified to be confined to tanks and no direct impacts on natural habitats are foreseen. However, some natural habitats like the Simlipal Reserve forest, Chilika Ramsar site, Rushikulya river mouth's olive ridley turtle nesting site, etc. were found to be in the proximity (<5 km) of selected sample tanks (Table 26). Presence of any migratory path within command area of sampled MIP was not reported. However, occasional bear attack from nearby Ambapani forest on habitation located at Dandamunda village, Chandahandi block, Nawarangpur district - Dandamunda MIP and elephant attack on the paddy fields at Bisipur MIP (Mayurbhanj), Khaibandha MIP (Balasore) area is reported. Black bucks have been occasionally spotted at Khalikhot area near to sampled MIP at Talakholaghai, Mohanpur MIP, Ganjam.

The environmental screening of project interventions shall determine the presence of any natural habitat (protected or unprotected) within proximity. The DPRs will ascertain the distance and likely impacts and include measures according to the EMF so that there are no direct, indirect, induced or residual impacts on natural habitats. Potential downstream impacts due to increased pesticide usage and its presence in agriculture runoffs, shall be addressed by effective implementation of the IPNM.

Table 26: Presence of Natural habitat within 10km. radious of sample MIP

Sl. No	Name of Sample MIP	Natural Habitat found in proximity to sampled MIPs (<5 km)
1	Dhandamunda MIP, Nabarangpur	Ambapani Sanctuary
2	Talakholaghai, Mohanpur MIP, Ganjam	Chilika lake
3	Jallibandha MIP, Ganjam	Olive ridley turtle nesting zone at Rushikulya river mouth
4	Bisipur MIP, Mayurbhanj	Simlipal Forest Range
5	Khaibandha MIP, Balasore	Kuldiha Wild life Sanctuary
6	Cradigappa MIP, Kandhamal	Daringbadi Udayagiri Forest
7	Dandrabahal MIP, Bolangir	Ostali Reserve Forest
8	Jamunasagar MIP, Kalahandi	--

Source: Assessment by CTRAN consulting for developing EMF of OIIPCRA

3.2.3 Cropping Practices

It seems from response given by respondents that, adoption of SRI process of rice cultivation has gained momentum. Majority of farmers are aware about SRI process of rice cultivation. However, practice of crop rotation is absent in sampled project area even after moderate knowledge on its potentiality to increase soil fertility. Mixed cropping and inter-cropping practice are also very low in sampled project area. Use of soil amendment to maintain soil pH level is found as one of best practices adopted by farmers of sampled area.

3.2.4 Agro-Chemical Use

3.2.4.1 Crop Disease and Pesticide Use

Total pesticide consumption of whole state is increasing gradually year on year basis. Total fertilizer consumption for the state has increased almost by 1.5 times from 1.0 thousand MT in the year 2000-01 to 1.44 thousand MT in the year 2013-14. However, per hectare consumption rate ranges between 157- 169 Gms./ Hect. during this long 14 years' time period. Consumption rate has jumped almost at 7% increase rate during 2011-12 to 2013-14 period[10].

[10] Source: Source: Economic Survey 2014-15

Field Findings:
Use of bio-pesticides like Mangla Gold (Humic Substances Granules), GIM plus, Bio-20, Activzyme, Neem Oil and Biozyme are observed at Bolangir, Kalahandi and Bolangir districts. 7 out of 9 interviewed pesticide distributor/ retailer are familiar with India Govt. banned pesticides list and they have gained knowledge about banned pesticides from training programme organised by Dept. of Agriculture or newspaper or news latter by pesticide company.

Light trapping process of pest control has totally vanished in all sampled project area. However, few farmers are still practicing pheromone trapping process for selected Rabi crop. Almost 70 % respondents are practicing biological treatment of seed as pest control measures.

Issues:

- Pest attack is very common phenomenon in all sample project blocks.
- Pesticide consumption rate is increasing year on year basis in all project districts. Most of the farmers are well familiar with pesticide company's brand name but not aware of pesticide's generic name or constituent main chemical and recommended doge. They apply it as per recommendation of local distributor/ dealer/ retailer. However, few marginal farmers have obtained training or undergone awareness programme organised by Block level office of Agriculture Department.
- Most of the farmers are not aware about pheromone or light trapping process. Use of these old processes are diluting heavily because of easy availability of chemical pesticides which gives immediate solution.
- Use of bio-pesticides by farmers is very low in all sampled area. Farmers have not adopted use of bio-pesticides mainly because of slow effect wrt. chemical pesticides.
- Awareness level on WHO classified Ib and II pesticides is almost NIL among pesticides retailer as well as farmers.
- Use of WHO classified Ib and II pesticides is reported in all sampled project area.
- Farmers are moderately aware about detrimental effect of chemical fertilizer on soil fertility and health but now aware of other environmental consequence.

3.2.4.2 Fertilizer Use

Total fertilizer consumption in 15 project districts has decreased from 321.7 thousand MT in the year 2013-14 to 304.5 thousand MT in the year 2016-17. However, per hectare fertilizer consumption in 5 project districts (Nawarangpur- 152.2, Bhadrak- 121.4, Bargarh- 101.8, Balasore- 95.9 and Jajpur- 65.0) in the year of 2016-17 is more than state average consumption rate of 57.11 kg./ hect. for the year 2013-14. Per hectare fertilizer consumption is almost three times at Nawarangpur and two times at Bhadrak district than state average consumption rate of 57.11 kg. / hect. in the year of 2013-14. Fertilizer consumption rate is almost inline with state average in Gajam district where almost 46% of MIP are located.

Fertilizer consumption rate is relatively low in scheduled project districts – Gajpati, Kandhamal, Keonjhar, Mayurbhanj and Kalahandi except in Nawarargpur and Jajpur. Lowest consumption rate is reported at scheduled district Kandhamal (18.7 kg./ hect.) followed by Keonjhar (32.3 kg./ hect.), Nuapara (34.2 kg./ hect.) and Gajapati (34.9 kg./ hect.).

NPK use ration in project districts in the year 2013-14 was 5.8: 2.1: 1 against state ratio of 5.5: 2.08: 1 in the same year. However, NPK use ration in the project districts for the year of 2016:17 was 4.9: 2: 1; indicates increase in use of Potassium based fertilizer.
Per hectare

Field Findings

Farmers of the project area mostly use Urea, NPK, DAP and MOP fertilizers. Consumption of urea is more than other fertilizers. Use of organic manure (farmyard manure, compost, green manure) is the oldest practiced means of nutrient replenishment. But due to increasing trend of using cow dung as fuel and using crop residue as animal feed, use of organic manure is reduced. People in command area of the project also used animal waste as organic manure for their crops. However, the use of organic manure is less than that of Mineral fertilizers. Use of bio-fertilizer is gaining popularity at snail pace mainly because of high input cost. Presence of vermi composting unit in surrounding villages is reported in 8 cases out of 11 sampled MI tank.

Application of azolla /blue green algae as fertilizer is not reported in all sampled project districts. Other organic managing practices like green manuring and cultivation of N-fixing crops are practiced by almost 50% of respondants. However, bacterial culture treatment practice is significantly low among all respondants.

Key issues:

1. Unscientific application of fertilizer (higher doses). Fertilizer consumption in 5 project districts (Nawarangpur- 152.2, Bhadrak- 121.4, Bargarh- 101.8, Balasore- 95.9 and Jajpur- 65.0) in the year of 2016-17 is more than state average consumption rate of 57.11 kg./ hect. for the year 2013-14.
2. Per hectare fertilizer consumption is almost three times more at Nawarangpur and two times more at Bhadrak district than state average consumption rate of 57.11 kg./ hect. in the year of 2013-14.
3. Recommendation of Dept. of Agriculture on fertilizer use as per soil health card are not followed by most of the farmers;
4. Poor adoption of Integrated Plant Nutrient Management;
5. Input supplier to farmer extension which is more commercial and less technical;
6. Less use of organic manure in comparison to synthetic fertilizers
7. Less fertilizer efficiency and less adoption of fertigation method of application

3.2.5 Pisciculture Practice in Tank

Pisciculture in MI tank considered under OIIPCRA is a very common practice. Pisciculture practice in MI tank are governed by district fisheries officer. These tanks are leased out to local PFCS or SHG for pisciculture purpose. Such 277 MI tanks are presently being leased out to PFCS/ SHG. Lease duration in sampled project districts ranges between 1-3 years.

Pisciculture practice is noticed in 9 sampled tanks. In all cases pisciculture practice is done either by local SHG group or PFCS taking lease from fisheries department or from respective gram panchayat. In case water spread area is less than 40 Ha., tanks are leased out by local Gram Panchayat. Local fish species are primarily being grown in tank command.

Issues:

i. Inadequate information on the fisheries resources and the state of the aquatic environment of local people;
ii. Inadequate monitoring, extension and enforcement mechanisms;
iii. Siltation of the tank making most of them non-operational;
iv. Natural calamities such as unprecedented rain, cyclones and floods, leading to destruction of fish/ aquaculture ponds and systems;

3.2.5.1 Fish Diseases

Fish diseases occur mainly when water become polluted or bacterial/ fungal attack on fish species. Local people can notice water pollution by visual observation of tank water. Colour change, odour or bad smell in water or layer of excess phytoplankton and zooplankton on top of water are few of visual appearance of water pollution. However, testing of tank water was not done by any of the lease holder. Tank location wise commonly occurring fish disease and medicines used to treat fish disease are tabulated below.

Issues:

- Water pollution in tank due to excess use of fish feed is reported at Khaibandha MIP, Balasore.
- Fish disease is very common in all this sampled area
- Disease surveillance by fishery department is not happening at desired interval
- People's awareness about disease specific medicine and dose can be termed as very poor

3.2.6 Awareness on Climate Change

Awareness level of local farmers of sampled tank area on climatic risk on crop cultivation can be termed as moderate. Majority of farmers have moderate knowledge on climatic risk on crop cultivation. Most of them have experienced the changes themselves in their farming practices due to climate change. However, adaptive capacity of local farmers to combat such adverse climatic risk is very less. Majority of farmers are aware about hybrid variant of paddy but not aware of other climate resilient crops. Farmers understanding on climatic matter are tabulated in Table 27.

Table 27: Farmers awareness on climatic change issues

MIP	Block	Awareness on climatic risk on crop cultivation	Aware of climate resilient crop	Climate resilient crop cultivate
Dhandamunda MIP, Nabarangpur	Chandahandi	Fall of immature seed/ fruit/ flower, Drought or drought like condition	Yes	Hybrid Paddy, Maze
Jallibandha MIP, Ganjam	Ganjam	Fall of immature seed/ fruit/ flower, Increased pest attack, Damage to root due to prolonged flooding, Fall of immature fruit, Reduce production of coconut, Income from Agri is very less, Irrigation facility is very poor	Yes	Sweet Potato, Swarna Sabagan, Kanak plus, 1075, 1010, 501, Sadane/Sampada
Talakholaghai, Mohanpur MIP, Ganjam	Khallikote	___	Yes	Hybrid Paddy
Bisipur MIP, Mayurbhanj	Karanjia	Damage to root due to prolonged flooding in Rainy season, Less rainy days leads to crop damage, No Production due to decrease in soil fertility	Yes	Hybrid Paddy (Pooja, ikram)
Khaibandha MIP, Balasore	Nilagiri	Increased pest attack, Damage to root due to prolonged flooding, Reduce in productivity	Yes	Swarna
Cradigappa MIP, Kandhamal	Daringbadi	___	Yes	Hybrid Paddy
Dandrabahal MIP, Bolangir	Patnagarh	Fall of immature seed/ fruit/ flower, Drought or drought like condition & Increase pest attack, Reduce in productivity	No	
Jamunasagar MIP, Kalahandi	Bhawanipatna	Fall of immature seed/ fruit/ flower, Drought or drought like condition,	Yes	Bt. Cotton, Hybrid Paddy and vegetable

MIP	Block	Awareness on climatic risk on crop cultivation	Aware of climate resilient crop	Climate resilient crop cultivate
Kalimati MIP, Keonjhar	Harichandanpur	___	Yes	Hybrid Paddy

Source: Field study conducted by expert team of CTRAN Consulting

Issues:

- Awareness level of farmers on climatic risk on crop cultivation is moderate
- Farmers are not that much aware about climate resilient crop varieties

AnnexURE- IV: Used Study Tools

IV: Study Tools Used for Primary Assessment

IV/1: FGD tool for Pani Panchayat

Actual _____ and certified _____ ayacut area of MI point;
Collection of PP member list (Executive/ General body);
Crop water budgeting;
Availability of water in different season;
Land holding including operational holding of all member of command area;
Meeting or resolution book, meeting register (General/ Executive);
Collect last three-year financial statement (audit statement, ledger & cash book) from PP;
Collect crop wise production/ yield details in last three years from PP;
Tax collection mechanism;

Sl.	**Name of Pani Panchayat (PP)**				**Date of Registration**			
	Number of Member	*1. SC*	_____	*2. ST*	_____	*3. Other*	_____	*4. Total*	_____
		5. No. of Female Member		_____					
	Name of President			**Social Category of President**		*1. SC*	*2. ST*	*3. Other*	
	Does entire command area get irrigation?		*1. Kharif*	*2. Rabi (Winter)*		*3. Boro (Summer)*		*4. Never*	
	Source of Irrigation in Command Area?		**% of Share in Kharif**		**% of Share in Rabi**		**% of Share in Boro**		
	Natural Rain Water:								
	Major Irrigation Project:								
	Minor Irrigation Project (MIP):								
	Local pond/ tank:								
	River/ Lift irrigation (RLIP):								
	Other…								
	Season wise cropping, pesticide and Fertilizer use:								
	Crop varieties	**Monsoon**	**Winter**	**Summer**	**Name of used Pesticide**		**Name of used Fertilizer**		
	Paddy								
	Ground nut								
	Brinjal								
	Pulses (Dal)								

	Tomato					
	Okra (Bhendi)					
	Sweet Potato (Kondamul)					
	Potato					
	Cauliflower					
	Cabbage					
	Mustard					
	Beans					
	Bitter Gourd (Karela)					
	Sugarcane					
	Garlic					
	Onion					
	Cucumber					
	Watermelon					
	Sunflower					
	Chilli					
	Others…					

	What are the climatic risk on crop cultivation?			
	1. Fall of immature seed/ fruit/ flower	*7.*		
	2. Increased pest attack	*8.*		
	3. Drought or drought like condition	*9.*		
	4. Damage to root due to prolonged flooding	*10.*		
	5. Reduce in productivity	*11.*		
	6.	*12.*		
	Are you aware of climate resilient / stress tolerance crop variant/ seed?		*Yes*	*No*
	What are the climate resilient/ stress tolerance crop you cultivate?			
	1. Bt. cotton	4.	7	
	2. Sweet Potato	5	8	
	3. Hybrid paddy	6	9	
	Does people cultivate fish in Major or Minor Irrigation tank?		Yes	No
	Are you aware of climate resilient / stress tolerance fish species?		Yes	No
	Sources of Water & Land Pollution within command area?	*1. Use of Pesticide*	*2. Use of Fertilizer*	*3. Use of Fish Feeding*
		4. Use of Hormone	*5.*	*6.*
		7.	*8.*	*9.*
	Presence of any natural breeding/ nesting point/ fishery at any downstream of canal/ river (Within 15 km)?			

	Address	***Type #*** *(Put 1/2/3/4)*	*Distance from MI Point (in Km.)*
	1.		
	2.		
	3.		
	4.		
	5.		
	6.		
	7.		
	# Type: 1) Fish Breeding; 2) Crocodile nesting; 3) Turtle nesting; 4) Fishery		
	Is there any migratory path within command area?		
	Type of path (Elephant pass/___ / ___?)	Address	
	1.		

	2.	
	3.	

	Presence of cultural and sensitive features within tank command area?			
	Cultural Resource (Put √)	**Number**	**Sensitive receptor (Put √)**	**Number**
	Temple		*School*	
	Church		*Hospital*	
	Masjid		*Children Park*	
	Graveyard		*Playground*	

	Presence of Sacred groove/ Archaeological site/ Polluting industry within tank command area?		
	Name	**Type #** (Put 1/ 2/ 3)	**Address**
	1.		
	2.		
	3.		
	4.		
	5.		
	# Type: 1) Sacred groove (Worshiping/ God tree); 2) Archaeological site; 3) Polluting industry		

	Presence of Natural Habitat/ Mine/ Heavy Polluting industry within 10 km. radius of command area?			
	Feature	**Name**	**Distance from MI point (in Km.)**	**Address**
	Forest			
	Wild Life Sanctuary			
	Lake like Chilika			
	Critically Polluted Area			
	Heavy Polluting Industry			
	Mine			

	Is there any privately owned or Encroached (*Jabardakhal*)/ structure expected to be affected due to project implementation?				Yes	No
	Location	Type of Structure # (Put number)	Number of Structure	SC	ST	Others

 # Type of Structure: 1) Pucca House; 2) Semi Pucca House; 3) Kutchha House; 4) House cum shop; 5) Pucca Shop; 6) Semi Pucca shop; 6) Kutchha Shop; 7) Cattle House; 8) Mandir; 9) Masjid; 10) Graveyard

Type of public utilities expected to be affected during project implementation (Put tick & give Number)

Utilities	*1. Bus stand*	*2. Electric Post*	*3. Light post*	*4. Toilet*	*5. RLI point*	*6. Drinking Water Source*
Number						

How frequent do you conduct soil testing (Put √)	Annually	For each Crop	Never
Application of manure as per soil test (Put √)	For All Crop	For Selected Crop	Not Applied
Use organic manures only / maximum (Put √)	For All Crop	For Selected Crop	Not Applied
Maximum use of synthetic/ chemical fertilizer (Put √)	For All Crop	For Selected Crop	Not Applied
Application of Vermin compost (Put √)	For All Crop	For Selected Crop	Not Applied
Green manuring (Put √)	Annually	Seasonally	Never
Azolla /Blue Green Algae Application (Put √)	For All Crop	For Selected Crop	Not Applied
Bacterial culture treatment (seed treated with bacteria) (Put √)	All Pulses	Selected Pulses	Not Applied
Cultivation of Nitrogen fixing crops (Put √)	Regularly	Occasionally	Never

Integrated pest management (IPM) (Put √)

Pheromone trapping	For All Crop	For Selected Crop	Not Applied
Light trapping	For All Crop	For Selected Crop	Not Applied
Biological Treatment (Predator sprey)	For All Crop	For Selected Crop	Not Applied
Synthetic / inorganic spray / treatment	For All Crop	For Selected Crop	Not Applied
Organic spray	For All Crop	For Selected Crop	Not Applied
Mechanical pest treatment (Manual)	For All Crop	For Selected Crop	Not Applied

Micro/ Pressurized Irrigation facilities within command area? (Put √)

Use of drip irrigation system	1. Owning & using	2. Not owning & not using	3. Owning & not using	4. Not owning & using
Use of sprinkler irrigation system	1. Owning & using	2. Not owning & not using	3. Owning & not using	4. Not owning & using

Farming Practices adopted within Command Area (Put √)

Mixed cropping	*Kharif*	*Rabi*	*Summer*	*All*	*Never*
Intercropping	*Kharif*	*Rabi*	*Summer*	*All*	*Never*
Integrated farming system				1. Yes	2. No
Weed treatment (Weeding)	1.Manual	2. Mechanical	3. Chemical	4.No weeding	

	Soil amendment / treatment (acidic / alkaline)				1. Yes	2. No
	Crop rotation				1. Yes	2. No
	System of rice intensification (SRI)	Kharif	Rabi	Boro	All Season	Never
	Number of Dal mill available within block?				_____ No	None
	Number of Dal mill owned by Adivasi person				_____ No	None
	Number of Rice Mill available within block?				_____ No	None
	Number of Rice mill owned by Adivasi person				_____ No	None
	Name of Dal Mill unit:	Address:			Distance from MI Point	____ Km.
	Sources of Pollution in Dal Mill	Environmental Concern/ Issue		Adopted Mitigation Measures		
	1.					
	2.					
	3.					
	Name of Rice Mill unit:	Address:			Distance from MI Point	____ Km.
	Sources of Pollution in Rice Mill	Environmental Concern/ Issue		Adopted Mitigation Measures		
	1.					
	2.					
	3.					
	Participation of women in agriculture					

	Frequency of conducting meeting by PP	Twice in a month	Monthly	Once in two months	Quarterly	Half-yearly	Yearly	Other
	Executive Body							
	General Body							

	Women participation in Meeting	Very Low	Low	Moderate	High	Very High
	Executive Body					
	General Body					
	Participation of Adivasi member in meeting					
	Frequency of participation by women members	All	Most of the meetings	Irregular	Very Low	
	Executive Body					
	General Body					
	Frequency of Participation of Adivasi member in meeting					
	Women Participation in decision making process	Very Low	Low	Moderate	High	Very High
	Participation of Adivasi member in decision making process					
	Participation of women in cultivation?					

	Participation of Adivasi women in cultivation?					
	Participation of women in selling agricultural product?					
	Participation of Adivasi people in selling agricultural product?					
	How frequent do you prepare crop water budgeting?	Seasonally	Annually	Bi-annual	Others	
	Who prepare crop water budgeting?	PP	Irrigation Dept.	Agri. Dept.		
	Date of preparing last crop water budgeting?				_____	
	How frequent do you collect water tax from each member?	Monthly	Seasonally	Half-yearly	Yearly	Other
	One-time contribution of each member?				Rs._____/-	

Date: Name of Researchers:

FGD Attendance sheet:

Sl. No.	Name of Fisherman	Signature
1		
2		
3		
4		
5		
6		
7		
8.		
9.		
10.		
11.		
12.		

IV/2: FGD tool for FPO

Sl.	1. Name of FPO:	———	2. Year of Registration:	———	*Not applied*	*Applied*
3.	District Name:	Block Name:	GP Name:	Village Name:		
4.	Number of members of FPO	*1. SC:__*	*ST:__*	*Others:__*	*Total:__*	*Female:__*

5. **Business Activity by FPO?** (Put √)

Input Supply (Put √)	**Temporary Storing** (Put √)	**Supply** (Put √)	**Processing** (Put √)
Fertilizer			*Pickle Making*
Pesticide			*Jam/ Jelly making*
Hormone			*Dall Mill*
Seed/ seedling			*Hatchery*
Fish fingerling			*Others…*
Raw/ Primary agri-product.			*Others…*
Raw/ Primary forest-product.			*Others…*
Raw/ Primary Horticulture product			
Others…			
Others…			
Others…			

6. **List down item name of input supply by FPO**

a)

List of Fertilizer	**Pesticide**	**Hormone**	**Seed**	**Seedling**
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7

b)

List of Fish fingerling	**Agri-product.**	**Horticulture product**	**Forest-product.**
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5

c)

List of Pickle	**Jam/ Jelly**	**Dall Mill**	**Fish Hatchery**
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4

	5	5	5				5					
7.	Women participation in decision making? (Put √)			*Nil*	*Very Low*	*Low*	*Moderate*	*High*	*Very High*			
8.	Active involvement of women members in FPO business activity? (Put √)			*Nil*	*Very Low*	*Low*	*Moderate*	*High*	*Very High*			
9.	Participation of women members in regular meeting? (Put √)			*Nil*	*Very Low*	*Low*	*Moderate*	*High*	*Very High*			
10	Number of different age grouped women members in FPO/ FPC?			*Teenager*	*Married*	*Unmarried*	*Widow*	*Senior Citizen*				
				___	___	___	___	___				
11	Adivasi member's participation in decision making? (Put √)			*Nil*	*Very Low*	*Low*	*Moderate*	*High*	*Very High*			
12	Active involvement of Adivasi members in FPO business activity? (Put √)			*Nil*	*Very Low*	*Low*	*Moderate*	*High*	*Very High*			
13	Participation of Adivasi members in regular FPO meeting?			*Nil*	*Very Low*	*Low*	*Moderate*	*High*	*Very High*			
14	Number of different age grouped Adivasi members in FPO/ FPC?			*Teenager*	*Married*	*Unmarried*	*Widow/ er*	*Senior Citizen*				
				____	_____	____	___	____				

Date: Name of Researchers:

FGD Attendance sheet:

Sl. No.	Name of FPO Member	Signature
1		
2		
3		
4		
5		
6		
7		
8.		
9.		
10.		
11.		
12.		
13.		
14.		

IV/3: FGD tool for SHG

1. **Collect list of SHG members with their educational details, age, occupation;**
2. **Collect Meeting register;**
3. **Collect audit statement/ cash book and other related financial documents;**

Sl.	Name of SHG:				Year of Registration:			
	District Name:		Block Name:		Gram Panchayat:		Village Name:	
	Does this SHG currently functioning?						*Yes*	*No*
	Loan Taken History in Last Three Years from SHG?							
	Name of SHG member taken Loan	SC/ ST/ Other	Occupation #		Year of Loan	Purpose of loan		
			Primary	Secondary				
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	# Occupation: *Housewife- 1; Cultivator- 2; Agricultural Labourer- 3; Daily Wage Earner- 4; Salaried- 5; Craft Artisan- 6, Business- 7; Student- 8; Others (specify)- 9.*							
	How frequent each member deposit money?		Weekly	Bi-weekly	Monthly	Bi-monthly	Quarterly	Other..
	Per month/ cycle contribution of members? (in Rs.)		__	__	__	__	__	__
	Name of Bank where A/c. Exist?	*1. Name: ____*						*2. None*
	Type of Bank A/c.						*1. Saving*	*2. Current*
	How do you utilise available fund?							
	1. Loan to SHG members as per requirement			*4. Investment in SHG driven trading/ business.*				
	2. Loan to non-SHG members			*5. None among above options*				
	3. Invest in business activity by non-SHG members			*6. Others..*				
	Name of business activity by SHG group?							
	Business Activity				**Years of Operation**	**Capital Investment**	**% of Portability**	

	1			
	2			
	3			
	4			
	How many members are involved in IGA activity?		____ *Nos*	*None*
	Name of IGA activity by SHG members?			
	1.	2		
	3.	4.		
	5.	6.		

	Do you update attendance register on regular basis?	*Yes*	*No*	*Not Present*
	Do you update meeting resolution on regular basis?	*Yes*	*No*	*Not Present*

	Source of funding?	*1. Saving by members*	*2. Bank Loan*	*3. Income from investment*	*4. Business Profit*	*5. Grant*	*6. Other…*

	Training Received by SHG Members in last three years?			
	Training Tropic	**Year of Training**	**Training Location**	**Organised by**
	1			
	2			
	3			
	4			
	5			

	Will you be interested to involve in business activity:	
	Sl. No.	**Sl. No.**
	__ *Mushroom*	__ *Backyard Nutritional Garden (Papaya, Banana, Drumstick, Klime, Guava, Yam)*
	__ *Fish Processing*	__
	__ *Lemon Grass Cultivation*	__
	__	
	__	

	Will you be interested in receiving training on:	
	Sl. No.	**Sl. No.**
	__ *Demonstration of climate resilient culture*	__ *Integrated farming Syatem (IFS)*
	__ *Demonstration of cage culture*	__ *Demonstration of Integrated Farming system*
	__ *Demonstration of self replicating fish species*	__ *Demonstration of aquapoics*
	__ *Demonstration on Stress tolerant fish/ crop varieties*	__ *Demonstration of RAS (Recirculatory aqua culture system)*
	__ *SRI/DSR demonstration*	__
	__	__

	Participation of Adivasi members in regular meeting?	*Nil*	*Low*	*Very low*	*Moderate*	*High*	*Very High*

	Participation of Adivasi members in decision making?	*Nil*	*Low*	*Very low*	*Moderate*	*High*	*Very High*
	Participation of Adivasi members in IGA activity?	*Nil*	*Low*	*Very low*	*Moderate*	*High*	*Very High*

IV/4: FGD tool for fisherfolk

1. **Consult with Fisher Community, Fishery Dept., Processing Unit, Fish Feed Mill.**
2. **Collect list of Hatchery, Ornamental Fish Farming Unit, Feed Mill, Fish Export House, Processing Unit from Block/ district level Fishery Dept. (OPDC).**
3. **Capture 2-3 photograph of each EGD.**

1.	**Source of Fish Fingerling**	**Name of Unit**	**Distance from MI Tank (in Km.)**	**Name of Available Fish Fingerling**		
	1. Own home made	~~XXXX~~	~~XXXXX~~	1. 2.	3. 4.	5. 6.
	2. Mobile trader	~~XXXXX~~	~~XXXXX~~	1. 2.	3. 4.	5. 6.
	3. Nearby Market	1		1. 2.	3. 4.	5. 6.
		2		1. 2.	3. 4.	5. 6.
		3		1. 2.	3. 4.	5. 6.
		4		1. 2.	3. 4.	5. 6.
	4. Fish Hatchery	1		1. 2.	3. 4.	5. 6.
		2		1. 2.	3. 4.	5. 6.
		3		1. 2.	3. 4.	5. 6.
		4		1. 2.	3. 4.	5. 6.
	4. Others Source (Name)	1		1. 2.	3. 4.	5. 6.
		2		1. 2.	3. 4.	5. 6.
	5. Others Source (Name)	1		1. 2.	3. 4.	5. 6.
		2		1. 2.	3. 4.	5. 6.
2.	Are any women involved in Fish Fingerling selling in local market?			*Yes*	*No*	*Can't Say*

3.	Number of Adivasi household involved in Fish Fingerling selling?				____ *No*	*None*	*Can't say*	
4.	Participation of women in fish catching net making?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*	
5.	**Name of majorly cultivated fish in Pond/ tank/ local water bodies?**							
	1. Rohi	*2. Bhakur*	*3. Mirikali*	*4. Mourali*	*5. Jalanga*	*6. Kalibaisi*		
	7.	*8.*	*9.*	*10.*	*11.*	*12.*		
	13.	*14.*	*15.*	*16.*	*17.*	*18.*		
6.	Does women assist male member of family in pisciculture?					*Yes*	*No*	
7.	Number of Adivasi household involved in commercial pisciculture?				____ No	None	Can't say	
8.	Involvement of Adivasi women in fish catching?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*	
9.	Participation of women workers in pisciculture?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*	
10.	Participation of Adivasi women in pisciculture?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*	
11.	Where you sell this fish?	*1. Local traders*	*2. Local Market*	*3. Processing Unit*	*4. Hotel*			
		5. Export House	*6. Direct Export*	*7. Others….*				
12.	Involvement of Adivasi women in fish selling/ trading?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*	
13.	How many Adivasi house is involved in fish selling in local market?				____ No.	None	Can't say	
14.	How do you measure pollution level in fish pond?	*1. Visual Measures*	*2. Change in water colure*	*3. Odour in water*				
		4.	5.	6.				
15.	How do you transport fish to local market or processing unit or exporter?	1	2					
		3	4					
16.	Does local trader/ people use ice box for fish preservation?	*1. Yes*	*2. No*	*3. Can't Say*				
17.	**Environmental adverse effect due to use of fish feed**							
	Name of Fish feed	*Source of Feed (1. House Grown/ 2. Purchased from Market/ 3. Mill)*	*Adverse Effect*	*Mitigation Measures taken*				
	1.							
	2.							
	3.							
	4.							
18.	**Name of fish feed mill**:		**19. Address**:		**20. Distance from MI Point**	____ Km.		

21.	**Source of Pollution from fish feed mill**			
	Input Material	*Generated Waste*	*Environmental Issues*	*Mitigation Measures taken*

22.	Number of women workers involved in mill?			_____No.	None		Can't say
23.	Women workers participation in fish feed mill?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*
24.	How many Adivasi person is involved in fish feed mill?			_____*No*	*None*		*Can't Say*
25.	Number of Adivasi women involved in fish feed mill?			_____*No*	*None*		*Can't Say*
26.	Involvement of Adivasi women in fish feed mill?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*
27.	Is any child labour involve in fish feed mill?					*Yes*	*No*

29.	**On occurrence of fish disease what measures to you adopt?**		
	Diseases	*Measures Taken/ Used Medicine*	*Environmental Effect of Medicine*
	1.		
	2.		
	3.		
	4.		
	5.		
	6.		
	7.		

30.	Is there any fish processing unit in nearby area?	*1. Yes*	*2. No*	*3. Can't Say*

31.	**Name of Processing Unit:**	**32. Address:**	**33. Distance from MI Point**	____ Km.

34.	**If Yes, provide details of fish Processing Unit**			
	Type of Processing	*Generated Waste*	*Environmental Issues*	*Mitigation Measures taken*
	1			

	2			
	3			
	4			
	5			

35.	Number of women workers involved in fish processing unit?			_____No.	None		Can't say
36.	Women workers participation in fish processing?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*
37.	How many Adivasi person is involved in fish processing unit?			_____*No*	*None*		*Can't Say*
38.	Number of Adivasi women involved in fish processing unit?			_____*No*	*None*		*Can't Say*
39.	Involvement of Adivasi women in fish processing industry?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*
40.	Is any child labour involve in fish processing unit?					*Yes*	*No*
41.	Is there any Fish Export House in nearby area?			*Yes*	*No*		*Can't Say*
42.	**Name of Fish Export Unit:**	**43. Address:**			**44. Distance from MI Point**		___ *Km.*

45.	***Generated Waste from Fish Export House***	***Environmental Effect/ Issues***	***Mitigation Measures taken***
	1		
	2		
	3		
	4		

46.	Number of women workers involved in fish export unit?			_____No.	None		Can't say
47.	Women workers participation in fish export unit?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*
48.	How many Adivasi person is involved in fish export unit?			_____*No*	*None*		*Can't Say*
49.	Number of Adivasi women involved in fish export unit?			_____*No*	*None*		*Can't Say*
50.	Involvement of Adivasi women in fish export industry?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*
51.	Is any child labour involve in fish processing unit?					*Yes*	*No*

52.	**Are you interested to participate in demonstration on:**		
	1. Pangasius culture	*2. Climate resilient culture*	*3. Cage culture*
	4. Self-replicating species	*5. Germ Plasm*	*6. Aquaponics*
	7. Integrated Farming system	*8. Recirculatory aqua culture system*	

53.	Is there any Ornamental Fish Culture Unit?	*1. Yes*	*2. No*	*3. Can't Say*

54	**Name of Unit:**	**55. Address:**	**56. Distance from MI point**	___Km.

57.	**Name of Ornamental Fish Cultured:**	1.	2.	3.
		4.	5.	6.

58.	**Where do you cultivate ornamental fish?**	*1. Earthen Pond*	*2. Pond with concrete bed*
		3.	*4.*

59.	Do you cultivate ornamental fish with indigenous species?	1. Yes	2. No

60.	If Yes, Risk of cultivating ornamental fish with indigenous species?	1.	2.
		3.	4.

61.	***Used Feed***	***Used Medicine***	***Generated Waste Material***	***Environmental Issues/ effect***
	1			
	2.			
	3.			
	4.			
	5.			

62.	Number of women workers involved in Ornamental Fish Culture Unit?			_____*No.*	*None*		*Can't say*
63.	Women workers participation in Ornamental Fish Culture Unit?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*
64.	How many Adivasi person is involved in Ornamental Fish Culture Unit?			_____*No*	*None*		*Can't Say*
65.	Number of Adivasi women involved in Ornamental Fish Culture Unit?			_____*No*	*None*		*Can't Say*
66.	Involvement of Adivasi women in Ornamental Fish Culture industry?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*
67.	Is any child labour involve in this Ornamental Fish Culture Unit?					*Yes*	*No*
68.	Is there any fish Hatchery in this block?					*Yes*	*No*
69.	Number of different type of fish Hatchery in the block?		*Fixed Nos.:* _____		*Portable Nos.:* _____		

70.	**Name of Hatchery:**	**71. Owner Type:** (Own/ Private Company/ Govt.)	**72. Address:**	**73. Distance from MI Point**	___Km.

74.	Type of Hatching Unit?	Portable	Fixed

75.	**Pollution from Hatchery**		
	Used Medicine/ Hormone	*Adverse Environmental Effect*	*Adopted Mitigation Measures*
	1		
	2		
	3		
	4		

76.	Number of women workers involved in Hatchery Unit?			_____No.	None		Can't say
77.	Women workers participation in Hatchery Unit?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*

78.	How many Adivasi person is involved in Hatchery Unit?				_____*No*	*None*	*Can't Say*
79.	Number of Adivasi women involved in Hatchery Unit?				_____*No*	*None*	*Can't Say*
80.	Involvement of Adivasi women in fish Hatching Unit?	*Nil*	*Low*	*Very Low*	*Moderate*	*High*	*Very High*
81.	Is any child labour involve in this Hatchery Unit?					*Yes*	*No*
82.	Does people perform integrated fish farming system in pond/ waterbody?					*Yes*	*No*
83.	Does people culture indigenous species along with exotic species in same pond?					*Yes*	*No*

84.	**Environmental Risk of Integrated fish farming?**	
	Risk/ Environmental Effect	*Adopted Mitigation Measures*
	1	
	2	
	3	
	4	
	5	

85.	**Is there any downstream fishery location?**	*1.*	*2.*
	3.	*4.*	*5. None*
86.	**Is there any natural breeding point of Fish at any downstream point of canal/ river?**	*1.*	*2.*
		3.	*4. None*

Date: Name of Researchers:

FGD Attendance sheet:

Sl. No.	Name of Fisherman	Signature
1		
2		
3		
4		
5		
6		
7		
8.		
9.		
10.		
11.		
12.		

IV/5: Consultation Checklist for DFO Brahmapur

Sl.							
	Duration of Natural Breeding of Turtle						
	Is there any decrease in Turtle Population at Rishikulla point in last ten years						
	Reason of decrease?						
	Has pesticided use in command area and downstream transportation impacted Flora Species?						
	Period of Nesting by olive ridley turtles?						
	Extent of nesting area	Address	From	To			
	Species name of Turtle?						
	Species Name			Local Name	Scientific Name	2018	2017	2016
	1							
	2							
	3							
	4							
	Anticipated Impact on Turtle species							
	Is there any decrease / increase in species number			Last 5 Years		Decrease	Increase	No Change
				Last 10 Years				
	If decrease, reason of decrease in number?							
	Factors affecting nesting of olive ridley turtles?							
	Reason			Mitigation Measures				
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	Does any of project activities impact olive ridley turtles?							
	Impact			Mitigation Measures	Implementing Agency	M&S Agency	Budget	
	1							
	2							
	3							
	4							

	5					

IV/6: Consultation Checklist for CCF, Simlipal

1. **Consult with Simlipal Forest Authority/ DFO.**
2. **Collect list of Flora and Fauna species available within Simlipal forest.**
3. **Consult with Block Level Bio-diversity Board on available flora & fauna species and collect People Bio-diversity Report (PBR).**
4. **Collect list of Flora and Fauna species available in project block/ district.**

1.	Will there be any impact on Simlipal forest due to project implementation?			*Yes*	*No*
2.	Impact	Mitigation Measures		Implementing Agency	Budget for EMP
	1				
	2				
	3				
	4				
	5				
	6				
3.	Does animal drinks water from this MI tank and nearby canal system?			*Yes*	*No*	*Can't say*
4.	Name of Vulnerable Animal Species found outside of Simlipal Forest	1.	2.	3.		
		4.	5.	6.		
		7.	8.	9.		
5.	Is there any Migratory Route in Project District?			*Yes*	*No*	*Can't Say*
6.	Migratory Route Address		Type of Route (Cattel / Elephant/…/… pass?	Period of Pass (Month/ season)	Time of Pass	
	1					
	2					
	3					
	4					
	5					
	6					

Date: Name of Researcher:

IV/ 7: Consultation Chekelist for Line Departments

Integrated Tribal Development Agencies (ITDAs)

Points of Discussion with Integrated Tribal Development Agencies (ITDAs):

1. Tribal Demography in the ITDA Area (Collected Tribal Profile from ITDA);

2. Number of tribal village / GPs where tribal concentration is

    a. Less than 25 %
    b. 25% to 50%
    c. More than 50%

3. Education, Health, Economic Status of Tribal (Data from ITDA);

4. Schemes / Projects / Programs Implemented by ITDA for Tribal Development (Collected Progress Report / Annual Report);

5. Key Tribal Issues, prospects and suggested Measures

    a. Agriculture (land holding, land under FRA, use of land given under FRA, inputs, agricultural credit, production, productivity, agricultural practices, use of fertilizer and pesticides, farming seasons (only Kharif or Kharif and Rabi);
    b. Horticulture (type of crops cultivated, production, productivity etc.);
    c. Fishery (use of tank for fishery, getting fish seeds, no. of times catch fish etc.)
    d. Irrigation (area irrigated, irrigation sources, irrigation in Kharif & Rabi, availability of pump sets for irrigation, surface and ground water irrigation, own irrigation sources-bore well open well etc.);
    e. Infrastructure (type of infrastructures available such as agro-processing units, cold storage, warehouse, pack house, transit godown, community godown, ice factory, dal mill, rice mill / huller, oil extraction unit etc.);
    f. Agribusiness (marketing mechanism, Existence of FPO / FPC, collective marketing / individual marketing, value addition of MFP / agricultural / horticultural commodities etc.);
    g. Health (health care units, health care services mortality, morbidity, malnutrition etc.)
    h. Education (enrolment, retention, girl's education, drop out, special education drive, scholarship, skill development, pre-placement training etc.);
    i. Migration (intensity of migration, places of migration, women & children migration, migration period, registration for migration at GP level etc.);
    j. Forest Produce Collection (MFP) (types of MFPs collected, scope of processing of MFPs, selling mechanism, season of collection of MFPs, issues in collection of MFPs etc.);
    k. Indebtedness (major source of credit, access to institutional credit, SHGs as creditor, key challenges in accessing institutional credit etc.); and
    l. Livelihood (overall engagement pattern, key economic activities and average income, key livelihood challenges, initiatives for livelihood improvement of tribals)

6. Key Measures taken by ITDA in this regard and critical gap

Integrated Tribal Development Agencies (ITDAs)

Points of Discussion with Integrated Tribal Development Agencies (ITDAs)

1. Name of ITDA: Date:
2. Block Name: District:

3. Name of Respondent:

Name of Respondent	Designation
1	
2	
3	
4	

4. Tribal Demography in the ITDA Area (Collected Tribal Profile from ITDA);

5. Number of tribal village / GPs where tribal concentration is

    a. Less than 25 %-: _____ Nos.
    b. 25% to 50%: _____ No.
    c. More than 50%:_____ No.

6. Education, Health, Economic Status of Tribal (Data from ITDA);

7. Schemes / Projects / Programs Implemented by ITDA for Tribal Development (Collected Progress Report / Annual Report);

8. **Key Tribal Issues, prospects and suggested Measures (follow guidance given in 1st Page)**

Tropic	Problem/ Issues	Measures taken by ITDA	suggested Measures for Improvement
Agriculture			
Horticulture			
Fishery			
Irrigation			
Agri processing Infrastructure			
Agri Business			

Tropic	Problem/ Issues	Measures taken by ITDA	suggested Measures for Improvement
Health			
Education			
Migration			
Forest Product Collection			
Credit			
Livelihood			

Name of Researcher:

Dept. of Agriculture

Points of Discussion with Dept. of Agriculture

1. Block Name: District: Date:

2. Name of Respondent:

Name of Respondent	Designation
1	
2	
3	
4	

Does dept. has adopted any Integrated Pest and Nutrition Management Practices: Yes/ No/ taken by ATMA.
Des dept. conduct awareness raising programme on safe use of fertilizer/ and pesticide: Yes/ No.
If yes, mention name of project/ scheme under which this such practice is adopted by dept.

3. Crop Diseases & Pesticide Use

Crop Name	Diseases	Used Pesticide
1		
2		
3		
4		
5		
6		
7		
8		

4. Schemes / Projects / Programs Implemented by Dept. of Agriculture (Collected Progress Report / Annual Report);

5. Use of Ground water for irrigation purpose: Kharif season ____% during Rabi season _____%
6. Sources of Irrigation during Rabi Season: 1)__ 2)__ 3)__

7. Problem Faced in implementing schemes/ project/ programs (specially Environmental & Social issued as well shortage of manpower)

Problem Faced/ Issues/ Challenges	**Adopted Measures**	**Suggestion/ Recommendation for Further Improvement**
1)		
2		
3		
4		
5		

4. Discuss thoroughly on following Topic:

Tropic	**Environmental/ Social Issues**	**Adopted Measures**
Irrigation Water		
Pesticide Use		
Awareness of farmers on safe use of pesticide/ fertilizer		
Ground Water Extraction		

Tropic	Environmental/ Social Issues	Adopted Measures
Sources of Irrigation		
Pollution from Processing Unit (Dal mill/ rice mill)		
Women Participation in 1) Agriculture		
2) Agri Processing		
Industrial Pollution on Agri land		
Shortage of Agri Labour		
Shortage of Cold Storage		
Excess Production		
Drought		
Crop loss due to flood/ cyclone/ animal attack		
Salt Water Intrusion		

Name of Researcher:

Dept. of Fishery

Points of Discussion with Dept. of Fishery

1. Block Name: District Name: Date:

2. Name of Respondent:

Name of Respondent	Designation
1	
2	
3	
4	

3. Does Fishery department cultivate fish in Minor Irrigation (MI) tank: Yes/ No.
4. If no, Who else cultivate fish in Minor Irrigation tank: _____
5. To whom lease is given for pisciculture in MI tank: Cooperative/ Individual Person/ SHG/ Pani Panchayat
6. Who allot this lease: *Dept. of Fishery/ GP/ Irrigation Dept/ Pani Panchayat/ Other (Mention Name)*_____
7. For how many years one time lease is given: *1 Year/ 2 Year/ 3 Year/ 4 Year/ 5 Year*
8. Does department regularly monitor pisciculture practices in MI tank: *Yes/ No/ Do not authorized*
9. Do you regular conduct disease surveillance programme: Yes/ No/ No such initiative taken by dept.
10. How frequent do you conduct disease surveillance: _____
11. Dominant fish species name cultivated in MI tank or local pond: 1) 2) 3) 4) 5) 6) 7)

12. **Diseases & Medicine Use**

Fish Diseases	Used Medicine/ Measures Taken
1	

Fish Diseases	Used Medicine/ Measures Taken
2	
3	
4	
5	
6	
7	
8	

10. Schemes / Projects / Programs Implemented by Dept. of Fishery (Collected Progress Report / Annual Report);

11. Problem experienced during scheme/ project implementation

Problem Faced/ Issues/ Challenges	Adopted Measures	Suggestion/ Recommendation for Further Improvement
1)		
2		
3		
4		
5		

12. Discuss thoroughly on following Topic in relation with Fishery at MI tank/ pond water/ fish processing/ Fish Hatchery and obtain environmental and social issues:

Tropic	Environmental/ Social Issues	Adopted Measures
Conflict using water for Pisciculture and Irrigation		
Impact on fish from used Pesticide in agriculture		
Excess use of medicine by fisherman		
Thieving of Fish from MI pond or pond		
Involvement of Adivasi in Fishing		
Women Participation in 1) Pisciculture		
2) Fish Processing		
Pollution from Fish Hatchery		
Fish disease related issues		
Use of Icebox by fisherman		

Tropic	Environmental/ Social Issues	Adopted Measures
Fish Export		
Fish feed mill		
Awareness of Fisherman on safe practice of pisciculture		

Name of Researcher:

IV/8: Consultation with Fertilizer/ Pesticide Distributor/ Retailer

1. **Consult with pesticide and fertilizer distributor/ dealer or local trader**
2. **Collect fertilizer and pesticide consumption details from Dept. of Agri.**
3. **Collect distributor/ dealer list from Agri. Dept.**

1.	Unit name of distributor:				
2.	Owner name:		3. Contact Number of Owner:		
4.	Total number of authorised distributors in District?			_____ *Nos*	
5.	**Name of authorised distributors/ dealer**	**Address of Dealer**			
	1				
	2				
	3				
	4				
6.	Where from you purchase Pesticide?	*1.*	*2.*		
7.	Where from you purchase Fertilizer?	*1.*	*2.*		
8.	In which Blocks you are supplying/ selling Pesticide?	*1.*	*2.*	*3.*	*4.*
9.	In which Blocks you are supplying/ selling Fertilizer?	*1.*	*2.*	*3.*	*4.*
10.	Whom you supply/ sell pesticide/ fertilizer?	*1. Farmer*	*2. Local shop*	*3. Agri- cooperative*	*4. FPO*
11.	How many local shops of pesticide and fertilizer are available in your locality?	_____ Nos			
12.	Where from farmers purchase Pesticide?	*1. Local Dealer*	*2. Local shop*	*3. Other. (name)___*	
13.	Where from farmers purchase Fertilizer?	*1. Local Dealer*	*2. Local shop*	*3. Other. (name)___*	

14.	**Name of commonly used pesticide**	**Applicable Crop Name**	**Consumption (in Qt)**	
			2017	**2016**
	1.			
	2.			
	3.			
	4.			
	5.			
	6.			

15.	**Name of commonly used Bio - Pesticide**	**Applicable Crop Name**	**Consumption (in Qt)**	
			2017	**2016**
	1.			
	2.			
	3.			
	4.			
	5.			
	6.			

16.	**Name of commonly used Synthetic Fertilizer**	**Applicable Crop Name**	**Consumption (in Qt)**	
			2017	**2016**
	1.			
	2.			
	3.			
	4.			
	5.			
	6.			
17.	**Name of commonly used Organic/ Bio Fertilizer**	**Applicable Crop Name**	**Consumption (in Qt)**	
			2017	**2016**
	1.			
	2.			
	3.			
	4.			
	5.			
	6.			

18.	Are you aware of banned pesticide?		*1. Yes*	*2. No*
19.	If yes, give some name of banned pesticide?	1	2.	
		3.	4.	
20.	**How you came to know about banned pesticide?**			
	1. Knowledge sharing by Agri. Dept.	*2. Attending training/ seminar on it*	*3. News Paper/ magazine*	*4. Other source (name)_____*
21.	Have you ever taken any training on pesticide/ fertilizer use?		*1. Yes*	*2. No*
22.	**If yes, provide details of training**			

Training Tropic	**Organizer**	**Year of Training**	**Place of Training**
1			
2			
3			
4			

23.	Is there any instance of vermi composting in your village?	*1. Yes*	*2. No*	*3. Can't Say*
24.	How many vermi-composting units are there in your village?	*Functional:___*		*Total:___*
25.	Whether use/ consumption of organic/ bio fertilizer increasing year by year?	*1. Yes*	*2. No*	*3. Can't Say*

26.	Reason of nominal or non-increase of organic/ bio fertilizer use?	1.	2.
		3.	4.

27.	Are local farmers aware of banned pesticide?	*1. Few people*	*2. Many people*	*3 None*	*4. Can't say*

Date: Name of Researchers:

FGD with PP- ESMF OIIPCRA

	Participation of women in selling agricultural product?	✓				
	Participation of Adivasi people in selling agricultural product?	✓				
	How frequent do you prepare crop water budgeting?	Seasonally	Annually	Bi-annual	Others Never	
	Who prepare crop water budgeting?	PP	Irrigation Dept.	Agri. Dept.	Revenue Dept.	
	Date of preparing last crop water budgeting?				NIL	
	How frequent do you collect water tax from each member?	Monthly	Seasonally	Half-yearly	Yearly ✓	Other By Revenue Dept
	One-time contribution of each member?				Rs. 02/-	

Bishipur panipanchayat for stationery of PP.

Date: 15 December 2018 Name of Researchers:

FGD Attendance sheet:

Sl. No.	Name of Fisherman	Signature
1	Prasanta Das (secretary).	Prasanta Das
2	Syataban Das	ସ୍ୱାଇ ଚରଣ ଦାଶ
3	Pradeep Senapati	ପ୍ରଦୀପ ସେନାପତି.
4	Kanaka lata Das	କନକଲତା ଦାଶ
5	Jayanti Das	ଜୟନ୍ତୀ ଦାସ.
6	Sagara Das	ସାଗର ଦାସ.
7	Bhadrav Mahanta	Bhadrav Mahanta
8.	Jagoswara Mahanta	Jagoswara Mahanta.
9.	Keshaba Kunra	କେଶବ କୁନ୍ଦର
10.		
11.		
12.		

Bidhipur

June 15 to Oct 30.
Mainly irrigation duration.

Jan to June
(Dry season No irrigation)

Nov to Dec
water available but no crop during that time.

Bidhipur NI2 catchment area - 8.8 sq km.

FGD with PP- ESMF OIIPCRA

	Participation of women in selling agricultural product?		✓		
	Participation of Adivasi people in selling agricultural product?		✓		
	How frequent do you prepare crop water budgeting?	Seasonally	Annually	Bi-annual	Others
	Who prepare crop water budgeting?	PP	Irrigation Dept.	Agri. Dept. R I E - Revenue.	
	Date of preparing last crop water budgeting?				
	How frequent do you collect water tax from each member?	Monthly	Seasonally	Half-yearly	Yearly ✓ Other
	One-time contribution of each member?				Rs. 293/-

Maa Ramachandi, Godahgada One Acre - 100 Rupees

Date: 18-December 2019. Name of Researchers:

FGD Attendance sheet:

Sl. No.	Name of Fisherman	Signature
1	Biddhadhara mohapatra.	ବିଦ୍ୟାଧର ମହାପାତ୍ର
2	Landa gouda.	landa Gouda
3	Ujala mahanty	ଉଜ୍ଜ୍ୱଳ ମହାନ୍ତି
4	Rabi chandra mohanty (Secretary)	ରବି ଚନ୍ଦ୍ର ମହାନ୍ତି
5	Janaki bisvas Ray (cashier)	Janaki Biswas Ray
6		
7		
8.		
9.		
10.		
11.		
12.		

FGD with PP- ESMF OIIPCRA

	Participation of women in selling agricultural product?					
	Participation of Adivasi people in selling agricultural product?					
	How frequent do you prepare crop water budgeting?	Seasonally	Annually ✓	Bi-annual	Others	
	Who prepare crop water budgeting?	PP	Irrigation Dept.	Agri. Dept.	RKVY ✓	
	Date of preparing last crop water budgeting?				June	
	How frequent do you collect water tax from each member?	Monthly	Seasonally	Half-yearly	Yearly	Other Rev. dept.
	One-time contribution of each member?				Rs. 10 /- Kalo irrigation project.	

Date: 20 December 2018 Name of Researchers:

FGD Attendance sheet:

Sl. No.	Name of Fisherman	Signature
1	Bhagaban Behera (pres.)	Bhagaban Behera
2	Satyanarayan modi (secy.)	Satyanarayan Modi
3		
4		
5		
6		
7		
8.		
9.		
10.		
11.		
12.		

	Participation of women in selling agricultural product?			✓	✗
	Participation of Adivasi people in selling agricultural product?			✓	
	How frequent do you prepare crop water budgeting?	Seasonally	Annually	Bi-annual ✓	Others
	Who prepare crop water budgeting?	PP ✓	Irrigation Dept.	Agri. Dept. R.L.E. Convergence Pacell	
	Date of preparing last crop water budgeting?				_____
	How frequent do you collect water tax from each member?	Monthly	Seasonally	Half-yearly	Yearly / Other
	One-time contribution of each member?				Rs. _____/-

Date: 17 December 2018 Name of Researchers: Dalakunda, Kandhamal. Khajana + Water Budgetting

FGD Attendance sheet:

Sl. No.	Name of Fisherman	Signature
1	Sirimali pradhan	Sirimali Pradhan
2	Sebak pradhan	ଶିବକ ପ୍ରଧାନ
3	ASHOK Pradhan	ଅଶୋକ ପ୍ରଧାନ
4	Kasiban pradhan	kasiban pradhan.
5	Jagannath Bindhani	ଜଗନ୍ନାଥ ବିନ୍ଧାଣି
6	Santosh Kumar Pradhan.	ସନ୍ତୋଷ କୁମାର ପ୍ରଧାନ.
7	Bishnu pradhan.	ବିଷ୍ଣୁ ପ୍ରଧାନ
8.		
9.		
10.		
11.		
12.		

	Participation of women in selling agricultural product?		~			
	Participation of Adivasi people in selling agricultural product?		~			
	How frequent do you prepare crop water budgeting?	Seasonally	Annually ~	Bi-annual	Others	
	Who prepare crop water budgeting?	PP	Irrigation Dept.	Agri. Dept. TAHASIL.		
	Date of preparing last crop water budgeting?				_____	
	How frequent do you collect water tax from each member?	Monthly	Seasonally	Half-yearly	Yearly ~	Other
	One-time contribution of each member?				~ Rs. ____/-	

Maharees Pani Panchayat. one Acre - 140.

Date: Name of Researchers: only - Kharif season.

FGD Attendance sheet:

Sl. No.	Name of Fisherman	Signature
1 PRES.	Dileep Behera.	Dilip Behera.
2	Paramananda Sethy.	ପରମାନନ୍ଦ ସେଠି.
3	Ramesh Chandra Behera.	Ramesh Chandra Behera
4 SEC	Benudhara Behera.	Benudhara Behera.
5	Samanta Patel	Samanta Patel
6	Sukhabandhu Mahanana	ସୁଖବନ୍ଧୁ ମହାନ୍ତ
7	Arun Charan	ଅରୁଣ ଚରଣ
8.	Sarvesh Behera.	ସର୍ବେଶ ବେହେରା
9.		
10.		
11.		
12.		

+ Business man ର ମତ ଆମକୁ ଯାହି Possibly. Correct କରି ଦେଇଥିବେ. , mandir ରୁ ଦିଆ ଯିବାକୁ ହୁଏତ ଦେଇଥିବେ

President = 9938406003.
8917543406.

Secretary = ~~9668-968~~
9668613186

	Participation of women in selling agricultural product?			✓	
	Participation of Adivasi people in selling agricultural product?			✓	
	How frequent do you prepare crop water budgeting?	Seasonally	Annually	Bi-annual	Others - Never
M4	Who prepare crop water budgeting?	PP	Irrigation Dept.	Agri. Dept.	-
	Date of preparing last crop water budgeting?				_____
	How frequent do you collect water tax from each member?	Monthly	Seasonally	Half-yearly	Yearly ✓ Other . Rev. 4 qtl
	One-time contribution of each member?				Rs. _____/-

Maa Gada chandi pani panchayat, Khaisandha.

Date: 17th December 2018 Name of Researchers:

FGD Attendance sheet:

Sl. No.	Name of Fisherman	Signature
1	SAMARENDRA JENA	Samarendra Jena
2	JAYA PRAKASH SATAPATHY (SECY.)	Jayaprakash Satapathy
3	RABINDRA MAHANTY	Rabindra Mahanty
4		
5		
6		
7		
8.		
9.		
10.		
11.		
12.		

	Participation of women in selling agricultural product?					
	Participation of Adivasi people in selling agricultural product?					
	How frequent do you prepare crop water budgeting?	Seasonally	Annually	Bi-annual	Others	
	Who prepare crop water budgeting?	PP	Irrigation Dept.	Agri. Dept.		
	Date of preparing last crop water budgeting?				_____	
	How frequent do you collect water tax from each member?	Monthly	Seasonally	Half-yearly	Yearly	Other
	One-time contribution of each member?				Rs._____/-	

Takakholaghai, Mohanpur.

Date:

Name of Researchers:

FGD Attendance sheet:

Sl. No.	Name of Fisherman	Signature
1	Prasanta Das	Prasanta Das
2	Bijay Das.	বিজয় দাস
3	Kalia Das.	Kalia Das
4	Jagendra Das.	জগেন্দ্র দাস
5	Parasu Das.	পরশু দাস
6		
7		
8.		
9.		
10.		
11.		
12.		

ANNEXURE- V: STAKEHOLDER'S CONCERNS / OPINION

MIP	Environmental Concern	Issue Addressed in EMF
Irrigation		
MIP-1	Storage capacity of MIP project is not enough to supply water to total command area.	Tank resectioning will be done which will increase water holding potential.
	Irrigation structure are not in good condition; Sufficient water is not available during Rabi season; hence people are withdrawing ground water for irrigation purpose.	Irrigation structure will be repaired and concrete canal lining work will be done to reduce or eliminate seepage lose. Dam will be strengthened.
MIP-2	Water level goes down to DSL and not sufficient for irrigation purpose during Rabi season. Tank remains absolutely dry during Summer season	Tank resectioning will be done which will increase water holding potential
	Outlet is in broken condition.	All dilapidated irrigation structure will be repaired which will reduce seepage loss as well improve water distribution mechanism.
MIP-3	Distributaries are in dilapidated condition.	All dilapidated irrigation structure will be repaired which will reduce seepage loss as well improve water distribution mechanism. Damaged field channels will be repaired and new field channel will be constructed.
MIP-4	Seepage lose from dilapidated irrigation network; require regular maintenance & canal lining.	All dilapidated irrigation structure will be repaired which will reduce seepage loss as well improve water distribution mechanism. Concrete lining at earthen stretch of canal portion and repairing of existing concrete lining will be done.
	Irrigation water is available only during monsoon season.	Tank resectioning will be done which will increase water holding potential.
	Non-availability of proper fund for renovation work.	Renovation of irrigation infrastructure is one of major components under OIIPCRA. Significant amount is allotted for this work under OIIPCRA project.
	Pani Panchayat members are influenced by political leader.	Training and capacity building of PP/ WUA members will be done under OIIPCRA project.
MIP-5	Storage capacity of the tank is too less which leads to unavailability of water during Rabi season.	Tank resectioning will be done which will increase water holding potential.
	Seepage loss from the broken structure.	All dilapidated irrigation structure will be repaired which will reduce seepage loss as well improve water distribution mechanism. Concrete lining at earthen stretch of canal portion and repairing of existing concrete lining will be done.
MIP-6	Storage capacity of MI tank is not enough to supply water for irrigation to total command area. Availability of water during Rabi and summer season is major concern. The head regulator of MIP tank is not working properly.	Tank resectioning will be done which will increase water holding potential. All dilapidated irrigation structure will be repaired which will improve water distribution mechanism.
	Gate and head regulator are not working properly; fund for regular maintenance work is needed. In some of the areas Pani Panchayat is not active or not functioning	All dilapidated irrigation structure will be repaired which will improve water distribution mechanism. Renovation of irrigation infrastructure is one of major components under OIIPCRA. Significant amount is allotted for this work under OIIPCRA project.

MIP	Environmental Concern	Issue Addressed in EMF
		Training and capacity building of PP/ WUA members will be done under OIIPCRA project.
MIP-7	Irrigation water scarcity is felt during rabi and summer season.	Proper maintenance is required and water retention capacity should be increased
	Sluice gate is not working and fund is needed for regular maintenance.	Fund needed for renovation and maintenance.
	Many pani panchayat is not active or not functioning	Strengthening of Pani Panchayat/ Water User Association required.
MIP-8	Presence of huge aquatic weeds in the tank water restrict sunlight to pass which causes fish mortality.	Weed must be removed from the tank.
	Irrigation water scarcity during Rabi and summer season	There is another MIP named Banamuliya, 6 km away from this MIP, if both the MIP will be merged than no shortage of water for irrigation will happen as told by experienced locals.
MIP-9	No such issue with regards to irrigation water.	However, strengthening of Pani Panchayat / Water User Association is all time requirement.
Agriculture		
MIP-1	Chemical leaching from nearby chemical manufacturing factory happens occasionally which is probably affecting agricultural field.	Proper monitoring of safe disposal of industrial waste should be done
	Excess use of fertilizers and pesticides leads to degradation of soil quality	Create awareness about optimum use of fertilizers and pesticides
	Other issues are fall of immature seed/ fruit/ flower, Increased pest attack, damage to root due to prolonged flooding, etc.	Project will adopt sustainable and climate resilient agriculture practice to combat adverse effect of climate change
MIP-2	High dependency on rain water in absence of adequate irrigation supply for agriculture.	Training on climate resilient agriculture must be given for drought condition may prevail
	Highly dependent on rain fed paddy.	Awareness about crop diversification is required
MIP-3	As water is available throughout year, production and productivity can be improved	Proper training and awareness program should be conducted from government
	Production and productivity of diversified crop is required	Promotion and special training on organic farming can be done
MIP-4	Due to lack of irrigation facility the crops are getting damaged nearer to the harvesting period / pre-harvesting which has a greater impact on the yield.	The functioning of Pani Panchayat / Water User Association is necessary to do a proper monitoring of water which helps in saving the excess flow of water during non-requirement.
	Non usage of bio fertilizer because of delayed result.	People must be aware about the negative impact of the synthetic fertilizer and its impact on the environment.
MIP-5	Due to increase in use of pesticides and fertilizer the soil quality has deteriorated. Soil becoming harder year by year and natural flora in the agricultural land is disappearing.	Recommendation and capacity building need to be done for usage of bio fertilizer.
MIP-6	Soil fertility is deteriorating significantly, due to excess use of pesticides and fertilizer. Farmers are interested to use vermicompost but due to non-availability of proper infrastructure and knowledge they are not able to do so.	Proper training to be given to farmers for usage of organic / bio fertilizer or pesticides. Vermicompost unit need to be opened there.
	Water availability mainly during Rabi and Summer season is main concern. Enough water is not available during Rabi and summer. Also use of fertilizer and pesticide reduce the fertility of soil.	Water retention capacity should be increased. Training should be given on use of Organic fertilizer and pesticides and adverse effect of chemical fertilizer and pesticides on environment and humans.

MIP	Environmental Concern	Issue Addressed in EMF
	Farmers are not using organic fertilizer and pesticides because of slow result.	
MIP-7	Soil quality is deteriorating significantly due to excess use of chemical fertilizer and pesticides.	Proper training to be given to farmers for usage of organic / bio fertilizer or pesticides
MIP-8	Damage to mature crops due to attack by wild animals Barha & Elephant coming from nearby Ambapani forest.	This does not come under preview of OIIPCRA. This is natural phenomenon, related line departments of OIIPCRA has nothing to do in this regards. However, framers may adopt crop insurance with support from Dept. of Agriculture/ compensation provisions of forest department.
MIP-9	Decrease in soil fertility due to excess use of chemical fertilizer and pesticides.	Need to focus on usage of bio fertilizer and pesticides
	Yield rate is low due to traditional practice of cultivation. Excess use of fertilizers and pesticides, is causing damage to soil fertility.	Need to focus on usage of bio fertilizer and pesticides
	Irrigation supply do not reach at tail end farmers during Rabi and Summer season	Increasing irrigation potential of the reservoir by watershed management.
Horticulture		
MIP-1	Vegetable and fruit cultivation during Rabi and Summer season is very less mainly due to non-availability of irrigation water in MI tank and other waterbody.	Importance to be given for improvement of production and productivity in the Summer Season
MIP-2	Vegetable and fruit cultivation at backyard kitchen garden is very less.	Convergence with Horticulture departmental schemes may be a valid option
MIP-3	Vegetable and fruit cultivation at backyard kitchen garden is very less. People are interested to do it in large scale.	Proper training and awareness campaign should be done
MIP-4	People are not interested to carry out horticulture activity as they have other working opportunity.	Capacity building programmes need to be conducted at Panchayat level to produce horticulture product in organic manner.
Fishery		
MIP-1	Pisciculture practice is not adopted due to less availability of water.	Tank resection is to be done, financial support and training to promote pisciculture.
MIP-2	Very less scope of fishery at MI tank, as water level during Rabi and Summer season is very low.	Tank renovation is to be done, financial support and training is needed to promote pisciculture.
MIP-3	Not engaged in fishing activities	Formation of fisher community and awareness is required
MIP-4	Water retention capacity of the tank is very less which is not suitable for fishery activity.	Resectioning of MI tank proposed under OIIPCRA may increase water retentivity
	There is no such mechanism to restrict fish to pass out from MI tank to field channel.	The tank should be closed from all end which would be suitable for the fishery activity. Gates must be installed in the entry and exit water drains of tank.
	SHG members don't have enough knowledge regarding fish species and their diseases.	Capacity building programs need to be conducted at GP level for interested SHG.
	Lack of awareness among the community about benefit of fishery.	Capacity building needs to be done for the fisher community/ people engaged in fishery activity regarding fish cultivation.
MIP-6	Conflict between farmers and fisher on use of water below DSL.	Fisheries activities will be confined below DSL.
MIP-7	To promote fishing activity SHGs were tagged to GP tanks	Training should be given to SHGs group

MIP	Environmental Concern	Issue Addressed in EMF
MIP-8	Due to lack of awareness on financial benefit of fishery, people have not adopted fishery at large scale or for income purpose.	Capacity building needs to be done for the fisher community.
MIP-9	Fish and fingerlings swims away with the flow of water to river water specially during increase in water volume in tank.	Net barricading will be provided under OIIPCRA.
Agribusiness		
MIP-1	Labour availability for agriculture is a serious issue and income from agriculture is very less. Hence, agriculture practice is diluting.	Creating awareness about MSP and improving market linkage, Cold storage /transport facility could be improved
MIP-3	As village is situated in remote area, it's not cost effective for them to transport crop/vegetable to the nearest market.	Cold storage /transport facility could be provided
MIP-4	No active committee of Pani Panchayat / Water User Association or SHG to take up agri business activity.	Strengthening of the Pani Panchayat/ Water User Association need to be done, which gives them a proper understanding of the business activity.
MIP-6	No active committee of Pani Panchayat or SHG to take up agri business activity. Eventually, there are no FPO working in this area.	Strengthening of Pani Panchayat /WUA and formation of FPO need to be done
MIP-9	Selling vegetables only at local market/ within village. Proper market linkage facility is not there.	Storage facility and transportation to nearby market can be organized
Other Issues		
MIP-1	Majority of farmers are not engaged in other livelihood activity except agriculture.	Scope of fish production, processing, mushroom cultivation, backyard farming is there. Only proper training and awareness can improve their income.
MIP-2	Farmers are not involved with other livelihood activities other than agriculture which is done only during monsoon period.	Training and capacity building for other livelihood options like fishery, backyard kitchen garden, mushroom cultivation will be arranged under OIIPCRA.
MIP-3	Situated in elevated hilly area where water is very scarce.	
	Lack of support from local government	Awareness and training program need to be conducted
MIP-4	SHG members are not interested to attend training outside the village because of which their skill as well as capacity building is an issue.	Possibility of arranging village level training will be explored during arrangement of any such training.
MIP-5	Most of the SHG are non-functional and few are operating at below average level.	Capacity building and proper monitoring of SHG need to be done for smooth running of SHG.
MIP-6	SHG members are interested to adopt pisciculture for which they require proper training and extension services.	Capacity building and training program are needed may be provided in the project areas and also beyond project areas
MIP-7	SHG members are interested in different IGA i.e. Goatery, Poultry and pisciculture.	Training and capacity building related to Fishery should be given.
MIP-8	SHG members are not well aware of government or non governments program. They wants to be involve in income generation activities for which they require awareness training.	Strengthening of and capacity enhancement training should be given to SHG member.
MIP-9	SHG members are not well aware of different government or non governments program specially for SHG.	Awareness creation is required.

ANNEXURE VI: INTEGRATED PEST AND NUTRITION MANAGEMENT PLAN (IPNM)

Table of Content

6. 1 Introduction

The project interventions on improved irrigation may lead to agricultural intensification and associated use of agro-chemicals such as pesticides and fertilizers. Therefore, the EMF of the project includes a strategy to introduce Integrated Pest and Nutrient Management (IPNM) to the farmers in the project area. The project will support IPNM as the key strategy to enable farmers to combat pests, diseases and nutrient deficiencies. Effective implementation of IPNM practices will reduce the risk of water pollution through leaching of chemicals from farmlands to water sources, both surface and sub-surface.

6. 2 Objectives of IPNM

IPNM seeks to promote and support safe, effective and environmentally sound pest and nutrient management.

The specific objectives relating to pest management are the following:

1. Minimize crop loss, augment farm production with scientific application of synthetic pesticides;
2. Reduce environmental pollution caused due to the application of synthetic pesticides;
3. Introduction and adoption of biological and cultural methods for managing pests below the Economic Threshold Level (ETL);
4. Reduction in health hazards arising due to chemical pesticides during handling;
5. Minimizing pesticide residues through the application of appropriate doses;
6. Promotion of bio pesticides.

The specific objectives relating to nutrient management are the following:

1. Improving and sustaining soil fertility and land productivity;
2. Reducing environmental degradation due to overuse of synthetic fertilizers;
3. Addressing nutrient deficiencies identified through systematic soil testing;
4. Introduction and adoption of organic methods for meeting plant nutrition needs.

6.3 Baseline Assessment

6.3.1 Agricultural Crops

Three season crop cultivation is observed in project districts. However, summer cultivation is limited only in 6 project districts and cultivated area is very insignificant with respect to Kharif and Rabi cultivation. Cereal, Pulses and vegetable are main crop types cultivated in project districts. Paddy is the main crop cultivated during kharif season whereas pulses and vegetable are cultivated during Rabi season. Oilseed is also cultivated in moderate amount during Rabi season. District wise (considering only 99 project blocks) as well as crop type cultivated area is tabulated below.

Table 1: Season as well as crop wise area cultivated (considering 99 project blocks)

District	Crop	Kharif (Ha.)			Rabi (Ha.)			Summer (Ha.)			Total (Ha.)		
		Irrigated	Rain fed	Total	Irrigated	Rain fed	Total	Irrigated	Rain fed	Total	Irrigated	Rain fed	Total
Balasore	Cereals	25041	62984	88025	3499	0	3499			0	28540	62984	91524
	Pulses				3000	1623	4623			0			
	Oilseeds				2232	670	2902			0			
	Vegetables	5119	9045	14164	9935	1184	11119			0	15054	10229	25283
Bargarh	Cereals	40476	38904	79380	2978	0	2978			0	43454	38904	82358
	Other cereals	566	0	566	163	0	163			0	729	0	729

District	Crop	Kharif (Ha.)			Rabi (Ha.)			Summer (Ha.)			Total (Ha.)		
		Irrigated	Rain fed	Total	Irrigated	Rain fed	Total	Irrigated	Rain fed	Total	Irrigated	Rain fed	Total
	Pulses	2113	19335	21448	0	5961	5961			0	2113	25296	27409
	Oilseeds	1666	9044	10710	618	1407	2025			0	2284	10451	12735
	Fibres	0	2004	2004	0	0	0			0	0	2004	2004
	Other crops	1189	1225	2414	1039	718	1757			0	2228	1943	4171
Bhadrak	cereals										84899	30039	115298
	Pulses										6493	6145	12638
	Oil seeds										2024	170	2194
	Fibre										345	0	345
	other crop										17088	533	17621
Bolangir	Cereals	30862	96633	127495	371	0	371	3393	0	3393	34626	96633	131259
	Coarse cereals	252	4482	4734	534	0	534				786	4482	5268
	Pulses	1914	50486	52400		53589	53589	1558		1558	3472	104075	107547
	Oil seeds	1290	7569	8859		5471	5471	6569		6569	7859	13040	20899
	Fibres		26408	26408								26408	26408
	Vegetables	3394	14295	17689	8516	2520	11036				11910	16815	28725
Boudh	Cereals			20810			760			0			21570
	Coarse Cereals			90			85			0			175
	Pulses			5110			6215			0			11325
	Oil seeds			1285			541			0			1826
	Fibres			90			0			0			90
	Vegetables			1580			3006			0			4586
	Spices			233			254			0			487
	Others			0			10			0			10
Gajapati	Cereals	2200	600	2800	97	0	97	203	0	203	2500	600	3100
	Coarse Cereals	221	5124	5345	24	0	24	16	0	16	261	5124	5385
	Pulses	0	2520	2520	0	535	535	0	0	0	0	3055	3055
	Oil seeds	0	435	435	216	159	375	40	0	40	256	594	850
	Fibre	0	100	100	0	0	0	0	0	0	0	100	100
	Vegetables	325	2105	2430	489	960	1449	231	0	231	1045	3065	4110
	Spices	0	1230	1230	27	45	72	13	0	13	40	1275	1315
Ganjam	Cereals	166707	20704	194360	75	0	75	705	0	705	174436	20704	195140
	Coarse Cereals	18447	31050	49497	1881	83	1964	867	33	900	21195	31166	52361
	Pulses	399	32999	33398	767	154793	155560	2285	27123	29408	3451	214915	207625
	Oilseeds	5659	16639	22298	10214	2033	12247	2513	11521	14034	18386	30193	48579
	Fibres	0	2960	2960	0	0	0	0	0	0	0	2960	2960
	Vegetables	30780	20265	52489	11315	6585	17900	12125	0	12125	55664	26850	82514
	Spices	2434	144	2578	2816	450	3266	0	0	0	5250	594	5844
	Others	0	0	0	0	0	0	2939	0	2939	2939	0	2939
Jajpur (includes all blocks)	Cereals	57450	66170	123620	2860	0	2860	0	0	0	60310	66170	126480
	Coarse cereals	970	2000	2970	100	0	100	0	0	0	1070	2000	3070
	Pulses	440	5170	5610	10530	56350	66880	0	0	0	10970	61520	72490
	Oil seeds	1240	1110	2350	31020	2560	33580	0	0	0	32260	3670	35930
	Fibres	1470	300	1770				0	0	0	1470	300	1770
	Vegetables	9080	2100	11180	12740	0	12740	0	0	0	21820	210	23920
	Condiments and Spices	880	450	1330	4520	0	4520	0	0	0	5400	450	5850
	Sugarcane	0	0	0	2070	0	2070	0	0	0	2070	0	2070
Kalahandi	Cereals	70560	97176	167736	30757	0	30757	0	0	0	101317	97176	198493
	Coarse cereals	5166	14766	19932	849	0	849	0	0	0	6015	14766	20781
	Pulses	0	68243	68243	3476	96756	100232	0	0	0	3476	164999	168475
	Oil seeds	1731	11660	13391	9338	20769	30107	0	0	0	11069	32429	43498
	Fibre	0	44174	44174	0	0	0	0	0	0	0	44174	44174
	Condiments & Spices	864	344	1208	2634	0	2634	0	0	0	3498	344	3842
	Sugarcane	0	0	0	1880	0	1880	0	0	0	1880	0	1880
Kandhamal	Cereals	4849	12546	17395	196	0	196	0	0	0	5045	12546	17591
	Coarse cereals	1208	4497	5705	37	0	37	0	0	0	1245	4497	5742
	Pulses	0	3940	3940	227	3568	3795	0	0	0	227	7508	7735
	Oil seeds	13	4642	4655	215	6560	6775	0	0	0	228	11202	11430
	Fibre	0	11	11	0	0	0	0	0	0	0	11	11
	Vegetables	2334	2750	5084	2717	0	2717	0	0	0	5051	2750	7801
	Condiments & Spices	83	6847	6930	141	0	141	0	0	0	224	6847	7071
Keonjhar	Cereals	58454	89667	148121	2974	0	2974	0	0	0	61428	89667	151095
	Coarse cereals	3005	18165	21170	165	0	165	0	0	0	3170	18165	21335
	Pulses	0	23040	23040	2578	37602	40180	0	0	0	2578	60642	63220
	Oil seeds	0	13691	13691	3293	10067	13360	0	0	0	3293	23758	27051
	Fibre	1420	1867	3287				0	0	0	1420	1867	3287
	Vegetables	10076	15595	25533	20489	0	20489	0	0	0	30565	15595	46160
	Condiments & Spices	994	2412	3406	4561	0	4561	0	0	0	5555	2412	7967

District	Crop	Kharif (Ha.)			Rabi (Ha.)			Summer (Ha.)			Total (Ha.)		
		Irrigated	Rain fed	Total	Irrigated	Rain fed	Total	Irrigated	Rain fed	Total	Irrigated	Rain fed	Total
	Sugarcane	0	0	0	50	0	50	0	0	0	50	0	50
Mayurbhanj	Cereals	80411	147288	81072	1478	0	1478	3494	0	3494	85383	147288	232671
	Coarse cereals	0	206	206	0	0	0	0	0	0	0	206	206
	Pulses	1002	26848	27850	2250	29267	31517	98	0	98	3350	56115	59465
	Oil seeds	134	2732	2866	9547	10980	20527	1083	0	1083	10764	13712	24476
	Fibre	0	1670	1670	0	0	0	0	0	0	0	1670	1670
	Vegetables	13120	40429	53549	30054	5315	35369	0	0	0	43174	45744	88918
Nabarangpur	Cereals	13072	40032	53104	3075	0	3075	0	0	0	16147	40032	56179
	Pulses	0	3158	3158	390	825	1215	1186	0	1186	1576	3983	5559
	Oil seeds	0	0	0	452	0	452	0	0	0	452	0	452
Nuapada	Cereals	13464	24946	38410	810	0	810	0	0	0	14274	24946	39220
	Coarse cereals	0	2550	2550	0	0	0	0	0	0	0	2550	2550
	Pulses	0	19920	19920	0	14844	14844	0	0	0	0	34764	34764
	Oil seeds	4942	5483	10425	3750	359	4109	0	0	0	8692	5842	14534
	Fibre	40	3610	3650	0	0	0	0	0	0	40	3610	3650
	Any other	1513	1173	2686	3200	167	3367	0	0	0	4713	1340	6053
Subarnapur	Cereals	2870	10600	13470	250	0	250	100	0	100	3220	10600	13820
	Coarse cereals	10	50	60	2	0	2	0	0	0	12	50	62
	Pulses	1125	5085	6210	927	4098	5025	200	0	200	2252	9183	11435
	Oil seeds	40	349	389	270	380	650	150	0	150	460	729	1189
	Fibre	0	145	145	0	0	0	0	145	145	0	290	290
	Any other	726	644	1370	1200	50	1250	0	0	0	1926	694	2620

Source: District Irrigation Plan – 2016 <https://pmksy.gov.in/mis/rptDIPDocAllDistrict.aspx?SOBbuGJosmNKnx2PPqk1sJzoFivaooTkhWIoGMassifVYOaDyxFfOTOQQVKug6/bRGdOIMUHhda6BXFpRuVqJ/gY0o5s8TKm6RZxaceTGFWF3jwSakR9XdsPhEdtHrF3sqx1dN8wzkRu5ZW6tCcTZwfx19+4PaFNe/EgFF8t0idodIzpp+pMy3Ry+FUnn6x9 >

6.3.2 Cropping Practices

It seems from response given by respondents that, adoption of SRI process of rice cultivation has gained momentum. Majority of farmers are well aware about SRI process of rice cultivation. However, practice of crop rotation is significantly low in sampled project area even after moderate knowledge on its potentiality to increase soil fertility. Mixed cropping and inter-cropping practice are also very low in sampled project area. Use of soil amendment to maintain soil pH level is found as one of best practices adopted by farmers of sampled area.

Table 2: Cropping practice and soil amendment

MIP	Block	Mixed cropping	Intercropping	Soil amendment	Crop rotation
Dhandamunda MIP, Nabarangpur	Chandahandi	Never	Never	No	Yes
Jallibandha MIP, Ganjam	Ganjam	Never	Never	Yes	No
Talakholaghai, Mohanpur MIP, Ganjam	Khallikote	Never	Never	No	No
Bisipur MIP, Mayurbhanj	Karanjia	Never	Never	No	No
Khaibandha MIP, Balasore	Nilagiri			Yes	No
Cradigappa MIP, Kandhamal	Daringbadi	Never	Never	No	1
Dandrabahal MIP, Bolangir	Patnagarh	Kharif	Never	No	No
Jamunasagar MIP, Kalahandi	Bhawanipatna	Kharif	Kharif	Yes	No

Source: Field study conducted by CTRAN Consulting

6.3.3 Agro-Chemical Use

Crops grown under various agro-climatic situation are affected by a large number of pests and diseases. Most often chemical control is being resorted to protect the crops to avoid crop losses. Besides adopting

situation specific need based Chemical control measures, Government is also providing IPM techniques, Seed Treatment campaigns, e-pest surveillance, etc.

6.3.3.1 Crop Disease and Pesticide Use

With changing climatic conditions, different type of pest attack is increasing[1] year by year. Pest attack has also increased and changing in these changing climatic conditions. To combat pest attack on standing crop, treatment of matured crop, fungicide and etc. and to increase productivity, pesticide use rate for different crops is increasing year on year basis.

Total pesticide consumption of whole state is increasing gradually year on year basis. Total fertilizer consumption for the state has increased almost by 1.5 times from 1.0 thousand MT in the year 2000-01 to 1.44 thousand MT in the year 2013-14. However, per hectare consumption rate ranges between 157- 169 Gms./ Hect. during this long 14 years' time period. Consumption rate has jumped almost at 7% increase rate during 2011-12 to 2013-14 period[2].

Table 3: Year wise pesticide consumption in Odisha

Year	Total Consumption (in thousand MT)	Consumption (Gms./ Hect.)
2000-01	1.00	157.00
2001-02	1.02	159.00
2002-03	1.03	139.00
2003-04	1.03	138.00
2004-05	0.99	148.68
2005-06	1.04	138.53
2006-07	1.10	148.94
2007-08	1.09	143.28
2008-09	1.16	149.10
2009-10	1.22	141.00
2010-11	1.18	159.00
2011-12	1.16	148.00
2012-13	1.21	158.00
2013-14	1.44	169.00

Source: Economic Survey 2014-15
<*http://www.indiaenvironmentportal.org.in/files/file/Odisha%20Economic_Survey_2014-15.pdf*>

Crops grown under various agro-climatic situation are affected by a large number of pests and diseases. Most often chemical control is being resorted to protect the crops to avoid crop losses. The details of pesticides consumption during 2013-14 for whole Odisha are as follows

Table 4: Pesticide consumption in Odisha during 2013-14

Sl. No.	Type of Pesticides	Consumption in MT		
		Kharif' 2013	Rabi' 2013-14	Total
1	Insecticides	470	213	683
2	Fungicides	120	67	187
3	Weedicides	57	49	106
4	Rodenticides	5	2	7
5	Plant growth regulators	6	7	13

[1] Source: <https://www.downtoearth.org.in/news/agriculture/pest-attacks-on-rise-across-india-yet-no-discussion-on-spurious-pesticides-59043> <http://www.orissapost.com/farmers-face-double-whammy-after-dry-spell-pest-attack/
[2] Source: Source: Economic Survey 2014-15

Sl. No.	Type of Pesticides	Consumption in MT		
		Kharif' 2013	Rabi' 2013-14	Total
6	Neem based pesticides and bio-pesticides	130	93	223
	Total	788	431	1219
	Consumption (Gms./ Hect.)	134	148	141

Source: Odisha Agriculture Statistics (2013-14)
< *http://agriodisha.nic.in/content/pdf/Agriculture%20Statistics_2013-14.pdf*>

Field Findings:

Sample MI tank wise crop diseases and used pesticides are listed down in below table. Use of bio-pesticides like Mangla Gold (Humic Substances Granules), GIM plus, Bio-20, Activzyme, Neem Oil and Biozyme are observed at Bolangir, Kalahandi and Bolangir districts. 7 out of 9 interviewed pesticide distributor/ retailer are familiar with India Govt. banned pesticides list and they have gained knowledge about banned pesticides from training programme organised by Dept. of Agriculture or newspaper or newsletter by pesticide company.

Table 5: Crop deseses and used synthetic pesticed at sample MI location

Name of MIP	Block	Disease	Synthetic Pesticide
Dhandamunda MIP, Nabarangpur	Chandahandi	Swarming caterpillar in paddy, BPH and BLB in paddy, Aphid and pod borer in arhar, downy mildew in blackgram, leaf curl virus in vegetables, root knot nematode of brinjal, fruit & shoot borer of brinjal, termite in mango	Monophosphate, Coelophysis, Buprofezin, Malathion, Monocrotophos (Ib)
Jallibandha MIP, Ganjam	Ganjam	Blast and brown spot diseases in paddy, sheathrot and sheath blight diseases in paddy, cercospora blight diseases in blackgram, swamping caterpillar attack on paddy, leaf spot diseases in green/ blackgram	Phaspa, Cypermethrin (II), Propanet, Quizolfop, Thiophanate-methyl, Mycozal, Tricyclazole (II), Mancozeb, Chloropyrophos, Imidachloropid
Bisipur MIP, Mayurbhanj	Karanjia	Leaf folder in paddy, blast and bacterial leaf bligh (BLB) of rice, rice caseworm and leaf folder attack, swarming caterpillar in paddy, brown plant hopper (BPH) in paddy, bacterial leaf streak and blight in rice, cercosporella blight disease in greengram/ arhar, black aphid in greengram/ arhar, stem borer in mango	Monocrotophos (Ib), Triacontanol, Chlorpyrifos (II), Dimethoate (II), Streptomycin, Endosulfan (II), Streptocycline, Mancozeb
Khaibandha MIP, Balasore	Nilagiri	Brown plant hopper (BPH) in paddy, flea beetle in black/Greengram, yellow mosaic virus (YMV) attack on blackgram/ greengram, leaf eating caterpillars on bitter gourd/ leafy vegetables, phomopsis blight of brinjal, black aphid of mango and brinjal	Copper oxychloride (II), Flonicamid, Chlorpyrifos (II), Mancozeb, Phaspa
Dandrabahal MIP, Bolangir	Patnagarh	Gundhy bug in paddy, blast and brown spot diseases in paddy, brown plant hoppers in paddy, pod borer in arhar, flea beetle in black/greengram, blister beetles in arhar, leaf eating caterpillars, Red pumpkin beetle in bitter gourd, leaf spot & blight of bitter gourd/ brinjal	Quizalofop (II), Nuvan, Ekalux, Metalaxyl (II), Streptocycline, Monophosphate, Imidacloprid (II), Cypermethrin (II), Monophosphate,

Name of MIP	Block	Disease	Synthetic Pesticide
Jamunasagar MIP, Kalahandi	Bhawanipatna	Swarming caterpillar in paddy, stem borer in paddy, sheath blight/rot of paddy, flea beetle of black/ Greengram, leaf eating caterpillars in bitter gourd/ brinjal	Monocrotophos (Ib), Imidacloprid (II), Dichlorovinyl Dimethyl Phosphate (DDVP), Buprofezin, Chlorpyrifos (II), Hexaconazole, Ekalux, Streptocycline, Jaggery
Kalimati MIP, Keonjhar	Harichandanpur	Blast, Bacterial leaf blight, brown spot, stealth blight, foot rot in paddy, wilting in sunflower, YMV and powdery mildew in green gram, YMV in black gram, Leaf blight and other fungal disease in Brinjal	Tricyclazole, Plantomycin, streptocycline, Carbendazim, mancozeb, chloropyrifos Imidacloprid, Chloroquine Phosphate

Source: Survey conducted by CTRAN consulting during December, 2018.

Light trapping process of pest control has totally vanished in all sampled project area. However, few farmers are still practicing pheromone trapping process for selected Rabi crop. Almost 70 % respondents are practicing biological treatment of seed as pest control measures.

Table 6: Pest control measures

Sample MIP	Block	Pheromone trapping	Light trapping	Biological Treatment
Dhandamunda MIP, Nabarangpur	Chandahandi	Not Applied	Not Applied	For selected crop
Jallibandha MIP, Ganjam	Ganjam	For selected crop	Not Applied	For selected crop
Talakholaghai, Mohanpur MIP, Ganjam	Khallikote	Not Applied	Not Applied	Not Applied
Bisipur MIP, Mayurbhanj	Karanjia	Not Applied	Not Applied	Not Applied
Cradigappa MIP, Kandhamal	Daringbadi	Not Applied	Not Applied	Not Applied
Dandrabahal MIP, Bolangir	Patnagarh	Not Applied	Not Applied	For all crop
Jamunasagar MIP, Kalahandi	Bhawanipatna	Not Applied	Not Applied	For all crop
Kalimati MIP, Keonjhar	Harichandanpur	Not Applied	Not Applied	Not Applied

Source: Field study conducted by CTRAN Consulting

Issues:

- Pest attack is very common phenomenon in all sample project blocks.
- Pesticide consumption rate is increasing year on year basis in all project districts. Most of the farmers are well familiar with pesticide company's brand name but not aware of pesticide's generic name or constituent main chemical and recommended doge. They apply it as per recommendation of local distributor/ dealer/ retailer. However, few marginal farmers have obtained training or undergone awareness programme organised by Block level office of Agriculture Department.
- Most of the farmers are not aware about pheromone or light trapping process. Use of these old processes are diluting heavily because of easy availability of chemical pesticides which gives immediate solution.
- Use of bio-pesticides by farmers is very low in all sampled area. Farmers have not adopted use of bio-pesticides mainly because of slow effect wrt. chemical pesticides.
- Awareness level on WHO classified Ib and II pesticides is almost NIL among pesticides retailer as well as farmers.

- Use of WHO classified Ib and II pesticides is reported in all sampled project area.
- Farmers are moderately aware about detrimental effect of chemical fertilizer on soil fertility and health but now aware of other environmental consequence.

6.3.3.2 Fertilizer Use

The use of chemical fertilizers substantially improves the productivity and production of crops. Due importance is being given on balanced use of fertilizers in line with the Integrated Nutrient Management (INM) principles, which not only enhances production but also maintains the fertility of the soil. Fertilizer consumption for whole Odisha state in the year of 2013-14 during Kharif was 375.46 thousand MT and 111.68 thousand MT during Rabi season. While there was an increase in Kharif fertiliser consumption (12.3%) the Rabi consumption declined by 28.4% due to less supply of canal water and also the Phailin and Flash flood that inhibited farmers to go for intensive cropping[3]. The details of fertilizer consumption made by different project Districts are tabulated below.

Table 7: Project District wise fertilizer consumption

Project District	20006- 07				2013- 14				2016-17				Consumption (Kg./ Hect.) - 2016-17
	(N)	(P)	(K)	Total	(N)	(P)	(K)	Total	(N)	(P)	(K)	Total	
Nawarangpur	12.3	2.7	2.4	17.3	26.8	8.2	6.5	41.6	23.3	8.4	4.0	35.7	152.2
Ganjam	22.5	4.8	4.3	31.7	29.7	5.9	2.5	38.0	26.3	4.2	3.0	33.6	56.9
Keonjhar	6.5	4.2	0.8	11.5	8.0	4.2	0.9	13.1	7.7	3.3	1.1	12.1	32.3
Mayurbhanj	11.4	4.7	1.9	18.0	14.2	5.3	1.7	21.2	15.0	5.0	2.0	22.0	42.3
Balasore	20.9	8.9	4.5	34.3	19.6	8.4	3.6	31.6	15.0	9.5	5.6	30.2	95.9
Bhadrak	14.2	7.2	2.8	24.2	11.6	6.7	2.0	20.4	13.0	7.7	3.6	24.3	121.4
Jajpur	9.8	3.6	1.9	15.3	9.4	3.7	1.8	14.9	9.6	3.9	2.5	16.0	65.0
Gajapati	3.1	0.8	0.2	4.1	3.3	1.3	0.5	5.1	3.3	0.8	0.3	4.4	34.9
Kandhamal	0.4	0.2	0.1	0.7	0.8	0.4	0.5	1.6	1.7	1.1	0.4	3.1	18.7
Bolangir	11.8	4.9	3.5	20.2	14.4	4.1	3.2	21.6	12.7	5.0	2.5	20.2	44.4
Bargarh	30.0	12.7	8.1	50.8	30.7	13.8	6.7	51.2	26.2	14.4	7.3	47.9	101.8
Boudh	5.5	2.4	1.0	8.9	4.6	1.5	0.4	6.6	4.1	1.6	0.7	6.4	48.9
Sonepur	5.1	2.0	1.0	8.1	7.1	2.8	1.2	11.1	6.1	2.4	1.6	10.1	48.5
Kalahandi	19.2	7.1	3.7	30.0	21.8	8.1	3.6	33.5	18.9	7.3	3.5	29.7	46.5
Nuapara	1.0	0.3	0.2	1.5	6.3	2.8	1.0	10.1	5.8	2.2	0.8	8.8	34.2
Total	173.6	66.6	36.5	276.7	208.2	77.3	36.1	321.7	188.8	76.9	38.8	304.5	

Source: Odisha Agriculture Statics (2013-14) < http://agriodisha.nic.in/content/pdf/Agriculture%20Statistics_2013-14.pdf
Note: N= Nitrogen, P= Phospetic and K= Potassium

- All units are in Thousand MT

Total fertilizer consumption in 15 project districts has decreased from 321.7 thousand MT in the year 2013-14 to 304.5 thousand MT in the year 2016-17. However, per hectare fertilizer consumption in 5 project districts (Nawarangpur- 152.2, Bhadrak- 121.4, Bargarh- 101.8, Balasore- 95.9 and Jajpur- 65.0) in the year of 2016-17 is more than state average consumption rate of 57.11 kg./ hect. for the year 2013-14. Per hectare fertilizer consumption is almost three times at Nawarangpur and two times at Bhadrak district than state average consumption rate of 57.11 kg. / hect. in the year of 2013-14. Fertilizer consumption rate is almost inline with state average in Gajam district where almost 46% of MIP are located.

Fertilizer consumption rate is relatively low in scheduled project districts – Gajpati, Kandhamal, Keonjhar, Mayurbhanj and Kalahandi except in Nawarargpur and Jajpur. Lowest consumption rate is reported at scheduled district Kandhamal (18.7 kg./ hect.) followed by Keonjhar (32.3 kg./ hect.), Nuapara (34.2 kg./ hect.) and Gajapati (34.9 kg./ hect.).

[3] Odisha Agriculture Statistics 2013-14

NPK use ration in project districts in the year 2013-14 was 5.8: 2.1: 1 against state ratio of 5.5: 2.08: 1 in the same year. However, NPK use ration in the project districts for the year of 2016:17 was 4.9: 2: 1; indicates increase in use of Potassium based fertilizer.
Per hectare

Field Findings

Farmers of the project area mostly use Urea, NPK, DAP and MOP fertilizers. Consumption of urea is more than other fertilizers. Use of organic manure (farmyard manure, compost, green manure) is the oldest practiced means of nutrient replenishment. But due to increasing trend of using cow dung as fuel and using crop residue as animal feed, use of organic manure is reduced. People in command area of the project also used animal waste as organic manure for their crops. However, the use of organic manure is less than that of Mineral fertilizers. Use of bio-fertilizer is gaining popularity at snail pace mainly because of high input cost. Presence of vermi composting unit in surrounding villages is reported in 8 cases out of 11 sampled MI tank. Sampled MI tank wise fertilizer usages details are tabulated in table below:

Table 8: Sampled MI wise fertilizer use practice

MIP	Block	Used Fertilizer	Bio-Fertilizer Use	Presence of Vermin composting
Dhandamunda MIP, Nabarangpur	Chandahandi	Urea, Potash, DAP, Ammonia, Sulphate		Yes
Jallibandha, Ganjam	Ganjam	DAP, Urea, Potash, Anusar, Gromor, NPK	MicoLife, Fatra, Cow dung	No
Talakholaghai, Mohanpur, Ganjam	Khallikote	Urea, Potash, Gromor		Yes
Bisipur MIP, Mayurbhanj	Karanjia	DAP, Potash, Urea		Yes
Khaibandha MIP, Balasore	Nilagiri	DAP, Gromor, Super Potash, Urea	Annapurna, Godavari Gold, Mahashakti	Yes
Cradigappa, Kandhamal	Daringbadi	Urea, Potash, DAP, Super Potash, Gromor	Own Compost	Yes
Dandrabahal MIP, Bolangir	Patnagarh	Gromor, Urea, Potash, DAP, NPK, 20.20.0.13, 10.26.26, IPL Super, Ammonia Sulphate	Mangala Gold	No
Jamunasagar MIP, Kalahandi	Bhawanipatna	Urea 40 %, Potash 60 %, DAP (10.46), Gromor, 20.20.0.13 (NPK)	Seed Bed	Yes
Kalimati MIP, Keonjhar	Harichandanpur	DAP, Potash, Urea		Yes

Source: Survey conducted by CTRAN consulting during December, 2018.

Application of azolla /blue green algae as fertilizer is not reported in all sampled project districts. Other organic managing practices like green manuring and cultivation of N-fixing crops are practiced by almost 50% of respondents. However, bacterial culture treatment practice is significantly low among all respondents.

Table 9: Organic manuring practice

MIP	Block	Green manuring	Azolla /Blue Green Algae	Bacterial culture treatment	Cultivation of N fixing crops
Dhandamunda MIP, Nabarangpur	Chandahandi	Never	Not Applied	Selected Pulses	Occasionally
Jallibandha MIP, Ganjam	Ganjam	Annually	Not Applied	Not Applied	Regularly
Talakholaghai, Mohanpur MIP, Ganjam	Khallikote	Annually	Not Applied		Never
Bisipur MIP, Mayurbhanj	Karanjia	Never	Not Applied	Not Applied	Occasionally
Khaibandha MIP, Balasore	Nilagiri	Annually	Not Applied	Not Applied	Never
Cradigappa MIP, Kandhamal	Daringbadi	Annually	Not Applied	Not Applied	Never
Dandrabahal MIP, Bolangir	Patnagarh	Never	Not Applied	Not Applied	Regularly
Jamunasagar MIP, Kalahandi	Bhawanipatna	Never	Not Applied	All	Regularly
Kalimati MIP, Keonjhar	Harichandanpur	Never	Not Applied	Not Applied	Never

Key issues:

1. Unscientific application of fertilizer (higher doses). Fertilizer consumption in 5 project districts (Nawarangpur- 152.2, Bhadrak- 121.4, Bargarh- 101.8, Balasore- 95.9 and Jajpur- 65.0) in the year of 2016-17 is more than state average consumption rate of 57.11 kg./ hect. for the year 2013-14.
2. Per hectare fertilizer consumption is almost three times more at Nawarangpur and two times more at Bhadrak district than state average consumption rate of 57.11 kg./ hect. in the year of 2013-14.
3. Recommendation of Dept. of Agriculture on fertilizer use as per soil health card are not followed by most of the farmers;
4. Poor adoption of Integrated Plant Nutrient Management;
5. Input supplier to farmer extension which is more commercial and less technical;
6. Less use of organic manure in comparison to synthetic fertilizers
7. Less fertilizer efficiency and less adoption of fertigation method of application

6.4 Salient Features of the Project Approach

1. Popularizing IPNM approach among the farming community through awareness, training and exposure;
2. To play a catalytic role in transfer of innovative IPNM skills/methods/techniques to farmers through extension services;
3. Human Resource Development in IPNM by imparting training on IPNM to training of individual service providers, irrigation operators and farmers.

6.5 Major Activities under IPNM Promotion

Table 10: IPNM Strategy and Key Activities

Key Activities	Execution Strategy	Responsibility
Training of individual service providers and irrigation operators on IPNM.	Orientation training by crop type	**Implement**: PD ATMA/ DDH (Before & during cultivation) **Supervise**: Asst. Horticulture Officer (Quarterly); SPU-Agronomist & Environmental Expert (Quarterly) **Monitoring**: PD ATMA/ DDH (Monthly)
Training of Farmers on IPNM through trained individual service providers and irrigation operators	Crop specific orientation on IPM in phased manner	
Developing IEC materials	IEC materials on crop specific IPNM in local language with visual display	

6.6 Capacity Building on IPNM

The project will adopt a cascading approach for the capacity building of farmers where resource persons will be developed through Training of Trainers (TOT) programme. The ground force available for irrigation management, specifically the individual service providers and the irrigation operator staff, will be trained on IPNM initiatives. They will provide support to farmers on IPNM in consultation with the local agriculture officer.

For capacity building, a need assessment related to IPNM will be done with the stakeholders, including mapping of current practices. Based on the findings of Training Need Assessment (TNA), relevant training modules and IEC materials will be developed covering crop specific IPNM practices (crops grown in different agricultural seasons). Trainings will be organized before the on-set of agricultural seasons, i.e., at least 30-45 days before sowing / planting. It will help the farmers to get acquainted with the IPNM and its adoption during actual cropping period. Hand holding support will be rendered to the farmers through the individual service providers and irrigation operators during different stages of crop growth. The capacity building activities plan is presented in the table below.

Table 11:Capacity Building Activates & Follow Up

Capacity Building	**Project Villages**				
	Preparatory Stage	**Pre-Kharif**	**Kharif**	**Pre-Rabi**	**Rabi**
A. Preparatory Phase					
Assessment of Training Needs					
Preparation of Training Content					
Designing Training Modules / IEC Materials					
Piloting of the Training Materials					
Finalising Training Window / Session Plan					
Coordinate with Irrigation Operators and Individual service Providers					
B. Organisation Phase					
Training of Irrigation Operators and Individual service Providers					
Training of farmers					
C. Follow Up Phase					
Monitoring					
Field Guidance					

6.7 Monitoring of IPNM

Key monitoring indicators covering the capacity building efforts on IPNM will be assessed periodically as part of internal monitoring and periodic monitoring by third party.

Table 12:Monitoring of IPNM Promotion

Sl. No.	Activity	Monitoring Areas	Monitoring Indicators	Responsibility [1]	Time Frame
1	Development of IPNM learning materials and its distribution to farmers / farmer's organisations	Learning materials cover crop specific IPNM practices	No. and type of learning materials developed	SPU - Agronomist & Environmental Expert PD ATMA/ DDH	6 months from project inception
		Distribution of learning materials to individual service providers, irrigation operators and farmers	No. of farmers provided with IPNM related learning materials	SPU - Agronomist & Environmental Expert, PD ATMA/ DDH	1 month from printing of documents
2	Training and awareness creation	Training of individual service providers, irrigation operators and farmers on IPNM	No. of farmers of different holding categories trained on IPNM; No. of individual service providers trained on IPNM; No. of women farmers / tenants trained on IPNM	PD ATMA/ DDH; SPU - Agronomist & Environmental Expert	Annually throughout project duration

[1] *Additionally, the external M&E agency shall also undertake concurrent monitoring of IPNM implementation in selected tanks on a quarterly basis.*

6.8 Details on Integrated Pest Management Practices

The Integrated Pest Management (IPM) Practices that will feed into the capacity building program on IPNM are detailed in this section.

6.8.1 Selection of IPM Methods Based on Assessment of Economic Threshold Level

The ETL differs by pest and also by crop types. Pest population is expected to be maintained at levels below those causing economic loss. It is generally assumed that pest tolerant capacity of different crops is limited and when it exceeds or approaching the ETL, chemical control methods can be used. Different pest / disease control methods of IPM will be applied based on the determination of ETL and pest density.

A priority list of different control methods of IPM is presented below.

Table 13:Adoption of IPM Methods & its Priority

IPM Procedures	Methods of Executing	Priority in Application
Cultural	Avoidance of monoculture Improved disease resistant varieties. Summer ploughing. Optimum plant densities. Avoiding excessive irrigation. Avoiding high nitrogenous fertilization.	To be given preference as preventive mechanism

IPM Procedures	Methods of Executing	Priority in Application
	Trap crops	
Biological	Conservation / promotion of bio agents like birds, parasites & pathogens for biological control of pests.	Second Priority
Mechanical	Damage/Destroying all the eggs of the insect; Destroy any material infested by insect, pest and diseases.	Third Priority
Chemical	Chemical Control when the loss is beyond ETL Use of recommended chemicals only	Last Priority when crop loss is beyond ETL

6.8.2 Criteria for Pesticide Selection and Use

The criteria to be followed for the selection and use of pesticides are (1) they must have negligible adverse human health effects, (2) they must be shown to be effective against the target species and (3) they must have minimal effect on non-target species and the natural environment. Secondly, the pesticides banned by Govt. of India should be avoided in the selection and use along with pesticides listed by WHO under Ia, Ib and II.

6.8.3 Pesticide Storage, Handling and Disposal

Precautionary Measures

When administering the pesticides, general precautions to be taken are as follows. Farmers will be educated / aware of taking required protective measures during administering pesticides.

Using Personal Protective Equipment: Personal protective equipment will prevent pesticides from coming in contact with the body or clothing. These also protect the eyes and prevent the inhalation of toxic chemicals. Personal safety gear includes clothing that covers the arms, legs, nose, and head. Farmers will be educated to wear gloves and boots to protect the hand and feet, and hats, helmets, goggles, and face masks to protect the hair, eyes, and nose. Respirators are used to avoid breathing dust, mist or vapour.

Body Wear: Body wear made of cotton are the best but should not be worn without additional protective clothing. When there is a chance of contacting wet spray, large sleeves with cuff-buttons, and pants with buttons at the bottom offer good protection. Aprons: Waterproof rubber or plastic aprons are effective. They should be long enough to protect the general clothing.

Head protection: Dust and mist settle easily on hair. Hats that are water resistant, wide brimmed with sweatbands are effective in protecting it. Many helmets provide attachments for face shields and goggles.

Eye Galss / Goggles: Farmers will be educated / oriented to protect their eyes from splashes, spills, mist, and droplets by using glasses / goggles. Goggles with plain lenses and full side shields are preferable. The lenses may become coated with pesticide droplets during spraying; hence cleaning tissues or an extra pair of goggles are a must.

Face shield: A face shield is a transparent acetate or acrylic sheet which covers the face and prevents it from splashes or dust. Face shields allow better air circulation and provide a greater range of vision than goggles

Hand and feet protection Gloves: Dermal exposure occurs the most in the hand region. The use of gloves reduces this risk. Gloves should be up to 2 to 3" long below the elbow i.e., they should extend to the mid forearm. Waterproof gloves, such as those made of rubber, latex or PVC are preferable. After use, they should be discarded away from ponds, wells, and animals or even incinerated.

Footwear: Shoes made of rubber or synthetic materials like PVC and nitrite can be used to prevent dermal exposure of feet. Protective footwear should be calf-high and worn with the legs of the protective pants on the outside to prevent spray from getting in. Leather or fabric shoes should never be worn as they absorb pesticides. Shoes should be checked for any leakage or damage before use.

Respiratory equipment: A respirator is a device that offers protection to the lungs and respiratory tract. Different kinds of respiratory equipment are used based on the type and toxicity of pesticides. They include nose filters/disposable masks, cartridge respirators, canister-type respirators/gas masks, positive pressure breathing apparatus, self-contained breathing apparatus, and powered air cartridge respirator.

Safety in Application of Pesticides: Misuse of pesticides can be extremely dangerous. Apart from polluting the environment, they may prove fatal to human beings, animals, birds, and fish. Phytotoxicity often results when used in excess in plants. Judicious use, and careful and safe handling may prevent hazards. Safe handling of pesticides involves their proper selection and careful handling during mixing and application.

Safety during Application:

This reduces risk and prevents pollution. It also ensures safety to animals, which may be nearby. The following precautions may be taken while applying pesticides.

1. Wearing protective body cover / personal protective equipment (PPE) by the operator (hand gloves, mask like air purifying / air supplied etc.);
2. Spraying should be done in the windward direction, taking care to see that there are no animals, people, or animal feed nearby;
3. Applying correct dosage and avoiding use of higher dosages than recommended;
4. Checking the sprayer and spraying equipment for leaks before use, using properly maintained and functioning equipment.
5. While applying pesticide, restraining from taking food items, drink or smoke;
6. Do not blow, suck or apply the mouth to any sprayer nozzle or other spraying equipment.
7. Washing hands, face and other body parts with soap after spraying;
8. Wash overalls and other protective clothing at the end of every working day in soap and water and keep them separate from the rest of the family's clothes.
9. In case if any part of the body is exposed and come in contact with the pesticide, it should be washed-off immediately;
10. Change clothes immediately after spray and cleaning body properly.
11. Visit to doctor in case of feeling unwell.

Storage

Precautions to be taken in storing the pesticides are (1) keeping the place of storing of pesticides away from human and animals, (2) keeping away from water sources, (3) keeping at a height which should be out of reach of children, (4) keeping away from exposure to sunlight and moisture, (5) well ventilated place of storing, (6) well stacking to avoid of spillage, (7) away from food / consumable items / must not be stored with food items, and (8) the place of storage should be out of reach of children.

Transportation

Pesticides should be transported (1) in well-sealed and labelled containers, (2) should be transported separately, i.e. not with any other consumable items, cloths, drugs etc., (3) proper stacking to prevent

leakage, (4) display of warning notice on the vehicle transporting pesticides, if transported in bulk with regular checking during transportation.

Disposal System

1. At the end of the day's work, the inside of the spray pump should be washed and any residual pesticides should be flushed out;
2. The rinsing water should be collected and carefully contained in clearly marked drums with a tightly fitted lid. This should be used to dilute the next day's tank loads or disposed properly at disposal sites like pits or digs;
3. Pouring the remaining pesticides into surface water sources like stream, nala, rivers, wells or any drinking-water sources is strictly prohibited;
4. Decontaminate containers where possible. For glass, plastic or metal containers this can be achieved by triple rinsing, i.e. part-filling the empty container with water three times and emptying into a bucket or sprayer for the next application;
5. All empty packaging should be kept away from common approach space and should be returned to the designated organisation / individual for safe disposal. Re-use of empty insecticide containers will be prohibited. The used packages shall not be left outside to prevent their re-use. Used packages shall be broken and buried away from habitation.
6. While purchasing, date of manufacture and date of expiry will be reviewed, as per the print;
7. In case the stock remained unutilised and crossed the date of expiry, it should be returned to the supplier.

Table 14: Safety Precautions in different stages of application of pesticides

SN	Particulars	Safety Measures
1	Purchase	1. Always purchase only required quantity of pesticides and avoid bulk purchase; 2. Purchase as per the prescription of experts from Ag. Dept. / KVKs etc.; 3. Never purchase loose or unsealed containers. Purchase pesticides before the expiry date ends; 4. Don't purchase pesticides without proper label.
2	Storage	1. Avoid storage of pesticides in house premises or near grain storage; 2. Never keep any pesticide near food; 3. Keep all pesticides away from reach of children and livestock; 4. Don't expose them to sunlight for longer period; 5. Keep all pesticides in original container in intact seal;
3	Handling	Never transport any pesticides along with food material.
4	While preparing solution	1. Always use clean water; 2. Always protect your nose, eyes, mouth, ears and hands with clothes; 3. Use hand gloves; 4. Don't eat, drink, smoke or chew while filling the spray tank; 5. Don't smell pesticides; 6. Never mix granules with water except those wettable granules; 7. Avoid spilling of pesticides solution while filling the spray tank.
5	Equipment	1. Select right kind of equipment and nozzle; 2. Don't blow nozzle with mouth; 3. Don't use unwashed sprayer for weedicide or insecticide.
6	While applying pesticides	1. Apply only recommended dose and spray solution; 2. Apply insecticides preferably in the evening. Avoid rainy or hot sunny or windy days; 3. Don't apply pesticides against the wind direction; 4. Thoroughly wash the sprayers & buckets with soap water after spraying;

SN	Particulars	Safety Measures
		5. Buckets used for spraying should not be used for domestic purpose; 6. Avoid entry of animals & workers in the field immediately after spraying.
7	Disposal	1. Left over spray solution should not be drained in to ponds / tanks / water bodies; 2. Should not be disposed off near open well / shallow wells or drinking water source; 3. Used empty containers should be crushed and buried deep in soil; 4. Never re-use empty pesticide container for any other purpose.

6.9 Major Insect Pests by Cultivated Crops and IPM Strategy

Table 15:IPM Strategy by Crop Type

Major insect/ pest	Diseases	IPM strategy
Paddy		
Stem borer Leaf folder Gall midge Green leaf hopper Hispa Mites Thrips Gundy bug	Bacterial leaf blight Leaf spot Leaf Blast Neck blast Stem rot Sheet rot Sheet blight False smut Dirty panicle	**Nursery:** 1. Raise pre-crop kharif grow Sesbania or sunhemp and incorporate 45 days old crop in soil during land preparation wherever possible. 2. Select suitable resistant or moderately resistant variety. 3. Use disease and insect free pure seed. 4. Seed treatment (for diseases) with carbendazim 50% WP @ 2 g/kg seed or Trichoderma/Pseudomonas @ 5-10 g/ha of seed for seed or soil borne diseases and carbosulfan 2 g/kg of seed for root nematodes or as per local recommendations. In termites, endemic areas, seed treatment with chlorpyriphos 20% EC @ 10000 ml/ha along with 10% solution of gum arabica @ 0.25 litre/100 kg seed along with 10% solution of gum Arabica in 3.75 litre of water just before sowing. 5. Timely planting/sowing. 6. Pre-sowing irrigation: Many weeds can be controlled by applying pre-sowing irrigation to area where nursery or seedlings are to be transplanted. The emerged weeds can be ploughed under. 7. Raising of healthy nursery. 8. As far as possible rice seedling should be free from weed seedlings at the time of transplanting. 9. Destruction of left over nursery, removal of weeds from field and cleaning of bunds. 10. Normal spacing with 30-36 hills/ m2 depending on the duration of the variety. 11. 30 cm alley formations at every 2.5 to 3 m distance in plant hopper and sheath blight endemic areas. 12. Balanced use of fertilizers and micro-nutrients as per local recommendations. Proper water management (alternate wetting and drying to avoid water stagnation) in plant hopper, bacterial blight and stem rot endemic areas. Maintain a thin layer of water on soil surface to minimize weed growth. 13. In direct sown rice, the crop should be sown in lines at recommended spacing to facilitate inter-weeding operations. Mechanical methods of weed should be practiced after 2-3 weeks and second time if necessary after 4-6 weeks of sowing. 14. In nursery, spray Chlorantraniliprole (18.5SC) @200ml/Ha in 150-200ltl of water (Or) In the main field, between 15-20 DAT, as a prophylactic measure, apply granules of Chlorantraniliprole (0.4GR) @

Major insect/ pest	Diseases	IPM strategy
		10kg/Ha. (Or) if the pest still persists, at ETL level repeat the spray Chlorantraniliprole (18.5 SC) @200ml/Ha in 150-200l of water. (Or) At both nursery stage and main field, at ETL spray Flubendiamide (40 SC) @125ml/Ha in 150-200lts of water. **Main Crop:** 1. Collection of egg masses and larvae of pest to be placed in bamboo cages for conservation of biocontrol agents. 2. Removal and destruction (burn) of diseased/pest infested plant parts. 3. Clipping of rice seedlings tips at the time of transplanting to minimize carryover of rice hispa, case worm and stem borer infestation from seed bed to the transplanted fields. 4. Use of coir rope in rice crop for dislodging case worm, cut worm and swarming caterpillar and leaf folder larvae etc. on to kerosinized water (1 L of kerosene mixed on 25 kg soil and broadcast in 1ha). 5. Trichogramma japonicum and T chilonis may be released @ 1 lakh/ha on appearance of egg masses / moth of yellow stem borer and leaf folder in the field. 6. Natural biocontrol agents such as spiders, drynids, water bugs, mirid bugs, damsel flies, dragonflies, meadow grasshoppers, staphylinid beetles, carabids, coccinellids, Apanteles, Tetrastichus, Telenomus, Trichogramma, Bracon, Platygaster etc. should be conserved. 7. Collection of egg masses of borers and putting them in a bamboo cage-cum-percher till flowering which will permit the escape of egg parasites and trap and kill the hatching larvae. Besides, these would allow perching of predatory birds. 8. Habitat management: Protection of natural habitats within the farm boundary may help in conserving natural enemies of pests. Management of farmland and rice bunds with planting of flowering weeds like marigold, sun hemp increases beneficial natural enemy population and also reduce the incidence of root knot nematodes. Provide refuge like straw bundles having charged with spiders to help in build up spider population and to provide perch for birds. 9. Spray Dinetofuran (20SG) @200ml/Ha in 150-200 lt of water. (Or) -Spray Pymetrozine (50WG) @300ml/Ha. (Or) Spray Buprofezin (25SC) @750ml/Ha in 150-200lt of water (for green leaf hopper); 10. Spray Spiromesifen (240SC) @500ml/Ha. (Or) Spray Spirotetramet (150 OD) @600ml/Ha in 150-200lt of water (for Mits). 11. Spray Spinosad (45SC) @ 187.5ml/Ha. (for Thrips) 12. Spray Streptocyclin @25gr/Ha. (Or) -Spray Propineb (70WP) @750gr/Ha. (Or) -Spray Mancozeb (75%WG) @1250gr/Ha. (Or) Spray Azoxystrobin (23SC) @750ml/Ha. (Or) -Spray Picoxystrobin (250EC) @320ml/Ha. (Or) -Spray Pyraclostrobin (250EC) @300ml/Ha. (Or) -Spray Kresoximmethyl (50WG) @312.5gr/Ha. (for diseases like bacterial leaf blight, leaf spot, leaf blast); 13. Spray Pencycuron (250SC) @ 187.5ml/Ha. (Or) Spray Thifluzamide (240SC) @375ml/Ha. (Or) Spray Validamycin (3L) @1000ml/Ha. (for sheet blight); 14. Spray Azoxystrobin (23SC) @750ml/Ha. (Or) Spray Picoxystrobin (250EC) @320ml/Ha. (Or) Spray Pyraclostrobin (250EC)@300ml/Ha. (Or) Spray Kresoximmethyl (50WG) @312.5gr/Ha. (for false smut); 15. Spray Azoxystrobin (23SC) @750ml/Ha. (Or) Spray Picoxystrobin (250EC) @320ml/Ha. (Or) Spray Pyraclostrobin (250EC) @300ml/Ha. (Or) Spray Kresoximmethyl (50WG) @312.5gr/Ha. (for Dirty Panicle)

Major insect/ pest	Diseases	IPM strategy
Groundnut		
Aphids Jassids Thrips Leaf Miner Gram pod borer Tobacco caterpillar Groundnut white grub Termite Groundnut Bruchid	Collar rot Stem rot Dry root rot Yello mold	**Monitoring for Pest & Disease** Community level monitoring to know change in destruction and abundance of pest Organise regular pest monitoring and assess bio control potential at every 5 to 10 km distanc randomly. Use pheromone traps for monitoring Spodoptera/Helicoverpa and leaf miner. **Pre-Sowing stage** Deep ploughing in summer. Partial or complete lopping of host plants and retaining of preferred host trees in area of white g Crop rotation with sorghum/pearl millet or maize. Early sowing. Collection and destruction of white grub adults. Installation of 12 light traps/ha or bonfire against Red Hairy Caterpillar **Sowing stage** Two hand hoeing at 20 days and 35-45 days after sowing for effective weed control. Stray planting of cowpea or soybean (for leaf miner) castor and sunflower for S. /itura as trap cr Soil application of castor cake @ 1000 kg/ha or neem cake against stem rot. Continue with light trap or bonfire against RHC. Collection and destruction of egg masses of RHC in the fields around light-trap areas. Seed treatment with Carbendazim @ 4g/kg OR Trichoderma viride, T. harzianum @ 4 g/kg seed **Vegetative stage** Rouge out bud necrosis affected and chump infected plants. Irrigate once. Continue with light trap or bonfire and mechanical collection of RHC egg masses/caterpillars. Install one pheromone trap per ha. for monitoring or 5 trap/ha for mass trapping of Spodoptera. Collection and destruction of- early stage larvae of Bihar hairy cater pillar. Collection and destruction of white grub adults from jujube or neem trees around the field. Install per ha.10-12 bird perches. Two hand or mechanical weeding at 15-20 days after sowing. Release egg parasite, *Telenomus remus* @ 50000/ha, 4 times (7-10 days interval) against Tobac Spray SNPV @ 250LE or B.t @ 1 kg/ha for controlling defoliators. Spray Carbendazim @ 375 g a.i./ha or 2 gm of Chlorothalanil/lit for control of leaf spots and rus Spray Quinalphos @ 1250 ml/ha to control hairy caterpillar. **Flowering stage** Collect and destroy egg masses and early instar larvae of S. litura. Continue Pheromone trap @ 1/ha for monitoring or 5/ha for mass trapping of S. litura Spray neem based formulation @ 2%. Release *Trichogramma chilonsis* (50000/ha) twice and *Cheilomenus sexmaculata* (1250/ha twic **Fruiting stage** Collect egg masses and early instar larvae of S. litura. Spray neem based formulation @ 2%. Spray SNPV @ 250 LE/ha or B.t. 1 kg/ha on need basis. No chemical control applied at the maturity stage. **Storage** Store the pods in polythene lined gunny bags and fill the top of the bags with sand. Mouth of bags not be closed to avoid germination loss.

Major insect/ pest	Diseases	IPM strategy
		Harvest at optimum maturity stage to avoid pod infection.
Greengram/ Blackgram		
Pod borer Spotted pod borer Spiny pod borer Blue butterfly	Bacterial leaf blight Powedry mildew Rust Yellow mosaic	**Mechanical control methods** Remove and destroy stem fly damaged seedlings Pest and Disease Management: Organic Ecosystem Pull out plants manifesting symptoms of sterility mosaic, yellow mosaic, leaf curl and leaf crinkle virus disease since they will serve as a source of inoculum spread by sucking pests Collect eggs, larvae, pupae and adults of the insects to the extent possible to reduce their population (leaf feeding caterpillars, beetles, weevils, grasshoppers etc.) Burn the crop residues after harvest. **Cultural control methods** Sow good and healthy seeds In stem fly endemic areas use a higher seed rate to the extent of 25 - 30% to compensate the loss of seedlings Maintain the fields and bunds free from weeds Avoid crops susceptible to some pests either as mixed crops or in crop rotation Provide T shaped bird perches Grow castor along the borders to trap S.litura, marigold to trap H.armigera and cowpea to trap stem fly. The plant density should not exceed 30 - 35 / sq.m. If it exceeds it creates favourable microclimate suitable for the multiplication of pests and diseases. **Botanical control methods** Spray NSKE (5%) or neem oil (3%) alternatively (aphid, mite, whitefly) **Biological control methods** Spray specific NPV suspensions of H. armigera and S. litura in the evening hours **Behavioural control methods** Set up sex pheromone traps to attract and kill male moths of Helicoverpa armigera and Spodoptera litura. Set up five traps per acre from floral bud formation and change the septa once in 3 weeks Use of light trap to monitor and kill the attracted adult moths of tobacco cut worm.
Cabbage / Cauliflower		
Diamond back moth; Tobacco caterpillar; Stem borer; Cabbage aphid	Damping-off and wire stem; Downy mildew; Alternaria leaf spot; Bacterial black rot	**Nursery Stage**: 1. Prepare raised nursey beds about 10 cm above ground level for good drainage to avoid damping off etc.; 2. Follow soil solarisation for 2-3 weeks using 0.45 mm thick polythene sheet. Sufficient moisture should be present in the soil for solarization; 3. Treat the soil with neem cake at 50 g / m2 impregnated with 10-15 g effective strain of Trichoderma; 4. Seed treatment with effective strain of Trichoderma @ 4 g / kg seed to manage rots. Seedling dip for 30 min with Trichoderma viride 1 % WP @ 10 g / lit water to manage collar rot in cabbage can also be followed; 5. Need based soil drenching with captan 75 WP @ 0.25 % or captan 75 WS @ 0.3 % to manage damping off; 6. Spray NSKE 5% for management of H. undallis which appears in rainy season nursery sometimes. **Main Crop**:

Major insect/ pest	Diseases	IPM strategy
		1. Adopt wide spacing of 60 x 50 cm to reduce the spread of diseases; 2. Growing of Indian mustard as trap crop after every 25 rows of cabbage. (One row of mustard is sown 15 days before cabbage planting and second 25 days after planting of cabbage). First and last row should be of mustard; 3. Mustard traps 80-90% of diamond back moth (DBM) population and other pests like aphids. Spray fenvalerate 5 % EC @ 300 ml / ha in 600 lit water to manage DBM in trap crop mustard. 4. Spraying of B. thuringiensis var.kurstaki 5 WP @ 50 g a.i./ ha or 3 gm / litre at 10 DAP for DBM; 5. Installation of light traps / bulb @ 3 / acre for DBM. Adults are attracted to light trap and fall in water bucket. Within 3-4 days most of the adults get killed; 6. Release egg parasitoid Trichogrammatoideabactrae at 1.0 lakh / ha 3-4 times at weekly interval (optional) 7. Spray mancozeb 75 WP or zineb 75 WP @ 1.5-2 kg / ha in 750-1000 lit water to manage leaf spot; 8. Removal of basal and infected leaves to reduce Alternaria leaf spot and bacterial black rot of early stage; 9. Spray Neem Seed Kernal Extract (NSKE) 5% or malathion 50 EC @ 1500 ml / ha in 1000 lit water for stem / head borer. Spray NSKE 5% at primordia formation (18-25 DAP-head initiation stage - most critical stage) for DBM control. Repeat, if DBM is >1 / plant at 10-15 days interval. Maximum of 3-4 NSKE sprays in one crop season are required. When NSKE are sprayed, thorough coverage of the entire plant surface is must. Use sticker with spray. This will control aphids as well as tobacco caterpillar. 40 kg / ha of NSKE powder is required; 10. Need based spray of spinosad 2.5 SC @ 600 ml or novaluron 10 EC @ 750 ml / ha in 500-1000 lit water for DBM control; 11. Spray acetamiprid 20 SP @ 75 g ha in 500-600 lit water for aphids in late cauliflower; 12. Installation of yellow sticky traps for trapping winged aphids; 13. Collection of egg masses and larvae of tobacco caterpillar as they are gregarious in nature. Scout for papery patches & apply baits; 14. Set up sex pheromone traps @ 5 / ha for mass trapping and to monitor the activity of adult moths; 15. Spray SlNPV @ 250 LE / ha (2x109 POB) 2-3 times in evening with jiggery 2% when larvae are young; 16. Need-based spray of cyantraniliprole 10.26 OD @ 600 g / ha in appr. 500 lit water for tobacco caterpillar;
Brinjal		
Hadda beetle; Aphids; Leaf roller; Leaf hopper; Shoot and fruit borer; Mites (Red spider mite); Nematodes	Damping off; Phomopsis blight and fruit rot; Little leaf; Root-knot nematode	**Nursery Stage**: 1. Green manuring with sunhemp / Dhaincha in July-August; 2. Raised seed bed about 10 cm above ground level for good drainage to avoid damping off etc.; 3. Cover the nursery beds with polythene sheet of 45 gauge (0.45 mm) thicknesses for three weeks during June for soil solarisation which will help in reducing the soil borne insects, diseases like bacterial wilt and nematodes. However, care should be taken that sufficient moisture is present in the soil for its solarization; 4. Seed (5 g / kg seed), nursery (250 g in 50 lit water drenched over 400 sq. mt area) and seedling root dip (1% for 15 min) treatment with Trichoderma viride 1 % to manage damping off or root rot etc. and need based soil drenching with captan 75 WP @ 0.25 %;

Major insect/ pest	Diseases	IPM strategy
		5. Selection of fruit borer resistant varieties / hybrids. **Main Crop**: 1. Setting up of yellow sticky / Delta traps @ 2-3 / acre for white fly; 2. Give 2-3 sprays of NSKE 5% at weekly interval for the control of sucking pests and leaf folder; 3. If incidence of white fly and other sucking insect pests is still above ETL, apply diafenthiuron 50 WP @ 600 g / ha in 500-750 litres water or spiromesifen 22.9 SC @ 400 ml / ha (mites) in 500 lit water; 4. Pheromone traps @ 100 / ha should be installed for monitoring and mass trapping of shoot & fruit borer moths. Replace the lures with fresh lures after every 15-20 days interval; 5. Clipping of damaged shoots from time to time in initial stages; 6. Bird perches @ 10 / acre should be erected; 7. Sprays of NSKE also brings down the borer incidence significantly. Neem oil (Azadirachtin based 1%) application is also helpful in reducing borer infestation, though marginally; 8. Release egg parasitoid T. brasiliensis @ 1-1.5 lakh / ha for shoot & fruit borer, 4-5 times at weekly interval; 9. Apply neem cake @ 250 kg / ha (in two splits) in soil along the plant rows at 25 and 60 DAT for reducing nematodes and borer damage. Don't apply neem cake when there is heavy wind velocity or temperature is above 30^0 C.; 10. Need-based alternate sprays of chlorantraniliprole 18.5 SC @ 200 ml / ha in 500-750 lit water or emmamectin benzoate 5 SG @ 200 g / ha in 600 lit water at 15 days interval effectively controls shoot & fruit borer; 11. Collection & destruction of little leaf affected plants, phomopsis blight affected fruits & field sanitation; 12. Spray zineb 75 WP @ 1.5-2 kg / ha in 750-1000 lit water or carbendazim 50 WP @ 300 g / ha in 600 lit water to manage Phomopsis blight and leaf spot diseases; 13. Continuous cropping of brinjal leads to more borer and bacterial wilt infestation. Therefore, crop rotation with non-solanaceous crops may be followed. 14. The commonly seen natural enemies of pests in brinjal cropping system should be protected from unwanted and excessive sprays of chemical pesticides.
Bitter gourd		
Mites, Aphid, Bettle Fruit fly Catterpillar	Powdery Mildew, Downy mildew	**Cultural control:** Deep ploughing of fields during summer. Soil solarization: Cover the beds with polythene sheet of 45 gauge (0.45 mm) thickness for three weeks before sowing for soil solarization which will help in reducing the soil borne pests. **Biological control:** Apply neem cake/pongamia cake @ 100 kg/acre in soil at the time of last plouging or reducing nematodes, and soil dwelling pests. • Apply Trichoderma spp. @ 2.5 kg/acre along with FYM Conserve predators such as Pennsylvania leather wing beetle (Chauliognathus pensylvanicus); larvae of which feed on pumpkin beetle

Major insect/ pest	Diseases	IPM strategy
		larva. • Conserve parasitoids such as Celatoria setosa (grub) • Spray NSKE 5% **Chemical control:** Apply trichlorfon 5% GR @ 200 g/acre or trichlorfon 5% DUST @ 200 g/acre Generally cucurbit crops require 40: 32: 24 kg N: P: K/acre Apply N in two splits first one (50%) at 25 days after sowing. Apply entire P and K at the time of sowing. Micro nutrient deficiency should be corrected by foliar spray of particular nutrient. To maintain the sex ratio (more number of female flowers), spray borax @ 1 g/l at 2-4 leaf stage
Mango		
		Physical Method 1. Removal and destruction of affected and fallen fruits due to fruit fly and fruit borer infestation 2. Destruction of affected shoots due to shoot borer infestation along with larvae in young orchards. 3. Remove the dead and weak branches in order to reduce the inoculum of various pathogens. 4. Keep the stalks of the fruit clear by removing dried rachis, small leaves which harbor the disease and pests inoculums. Remove the unfruited panicles to avoid scratching injury to fruits, put dried leaves in between adjacent fruits. 5. Ploughing/weeding or digging of the soil under tree canopy. This will expose the hibernating pupae of gall midge and other pests like fruit borer, fruit fly etc. 6. Avoiding overcrowding of the laterals and foliage as it develops the favourable microclimate for pest and disease build up. 7. It also prevents the penetration of the pesticide sprays which invites the pest resurgence due to residual population. Therefore, proper thinning/centre opening should be done and trees be kept open and well aerated. **Cultural Method** • The neem products particularly Nimbicidine @ 2 ml/lit can control 50 to 60% hopper population and hence it can be used during lean periods of outbreak right from the bud burst stage and thereafter in 10 to 15 days interval, so that hopper build up will be checked without disturbing natural enemies like red ants, spiders and lace wing bugs and coccinellids which are common predators in mango garden. **Chemical Method**

Major insect/ pest	Diseases	IPM strategy
		• For blossom protection, use 5ml Fenvalerate 20 EC or 9ml Decamethrin 2.8 EC or 20ml Quinalphos 25 EC or 1.2 g Clothianidine 50 WDG or 1.0 g Thiomethoxam 25 WDG or 20 ml Phenthoate 50 EC per 10 lit of water. • Midge : Fenitrothion (0.05%) • Thirps : Phosalone (0.05%) if intensity is more apply Thiomethoxam 25% 2gm or Spinosad 45% 2.5 ml/10 lit. • Mealy bugs : DDVP (0.05%) during advance stage of fruit development • Shoot borer: Quinalphos • The trees and branches when cut, invites the stem borer problem. Therefore, cut portions should be treated with pesticide and applied with Bordeaux mixture **Biological Method** • Glyricidia is a major host of mealy bugs, *Ferissia virgata* which is predominant species of mealy bugs in Konkan region. The incidence was noticed in the month of March. Therefore, the population of mealy bugs on glyricidia should be monitored form March onwards and if noticed, glyricidia stumps should be chopped off and destroyed. • Explore the possibility of releasing, *Cryptolemus montrizerae*, a potential predator of mealy bugs during second fortnight of March as spray schedule will already be exhausted by this time and hence, there is no hurdle in establishment of predator population.
Marigold		
Aphids Bettle & Weevils Leaf Hopper Red spider mites	Wilt & stem rot Collar rot Leaf spot & blight Powdery mildew	Spraying of Phosphamidon 0.02% at 10-15 days interval helps to check the population of the aphids. Spraying of systemic insecticides like Roger @ 2 ml/ litre of water on the under surface of the leaves effectively controls the insects. Sprayings of Quinalphos (0.05%) as soon as the pest infestation is observed. Spraying of miticides like Kelthane (2 ml/litre of water) or Dicofol (0.1%) is effective against the mites. Soil treatment with captan, mancozeb and Fosetyl-Al Spraying Sulfex(3g/Litre of water) and Mancozeb(2g/ litter of water) Soil sterilization by Formalin @ 2% before sowing and spraying of Dithane Z-78 @ 2g/liter of water

***Note**: In the changing scenario, consultations will be made with local SAUs, KVKs, Agriculture Dept. on recommended package of practices for IPM in crops that are specific to a particular geographical area / project location.*

6.10 Details on Integrated Nutrient Management Practices

The Integrated Nutrient Management (INM) Practices that will feed into the capacity building program on IPNM are detailed in this section.

INM embraces soil, nutrient, water, crop, and vegetation management practices, tailored to a particular cropping and farming system. The INM aims at improving and sustaining soil fertility and land productivity and reducing environmental degradation. It optimizes the condition of the soil, with regard to its physical, chemical, biological and hydrological properties, for the purpose of enhancing farm productivity, while minimizing land degradation. It not only provides tangible benefits in terms of higher yields, but also conserve the soil resource.

INM also contributes to pest management. Stressed crops are more susceptible to disease and to the effects of pest attacks. Crops growing in poorly structured soil, under low or unbalanced nutrient conditions or with inadequate water supply will be stressed. Responding to disease or pest attacks by applying pesticides is a costly symptomatic approach to a syndrome which is better addressed by improving the ecological conditions and systems within which the crops are cultivated.

INM practices combine use of inorganic, organic and biological resources in a reasonable way to balance efficient use of limited resources and ensure ecosystem sustainability.

At the farm level, integrated and synergistic approach will be adopted under INM, involving the following.

1. Matching the land use requirements with the land qualities present in the area, i.e., the biological, chemical and physical properties of the soil, and the local climatic conditions (temperature, rainfall etc.);
2. Seeking to improve yield by identifying and overcoming the most limiting factors that influence yield;
3. Better plant management, i.e., (i) planting at the beginning of the rain to increase protective ground cover to enhance infiltration and biological activity and (ii) timely weeding to reduce crop yield losses;
4. Promotion of complementary crop, livestock and land husbandry practices in combination to maximize addition of organic materials and recycle farm wastes, so as to maintain and enhance soil organic matter levels;
5. Land management practices that ensure favourable soil moisture conditions for the proposed land use (e.g. moisture conservation in low rainfall areas, drainage in high rainfall areas);
6. The replenishment of soil nutrients through an integrated plant nutrition management approach like organic manuring, application of crop residues, rhizobial N-fixation, Phosphorous and other nutrient uptake;
7. Efficient fertiliser use with application of appropriate quantities and method of application to minimizes losses (for example, rather than broadcasting, project will educate farmers to apply fertilizer into the soil directly).
8. Combinations of crop, livestock and land husbandry practices that reduce rainfall impact, improve surface infiltration, and reduce the velocity of surface run-off thereby ensuring soil loss below the ‘tolerable’ level;
9. Crop rotation, agro-forestry and soil restorative practices that maintain and enhance the soils physical properties thereby encouraging root development and rainfall infiltration;
10. Promotion of crop-livestock system in project clusters as a part of integrated nutrient management strategy;

11. Nutrient monitoring during growing stage by using colour chart and application of nutrients accordingly.

ANNEXURE VII: AQUACULTURE PLAN

7.1 Introduction

Pisciculture in tank command and value chain development is proposed under OIIPCRA project. To promote pisciculture and development of sustainable value chain infrastructure, a management plan will be prepared. Management plan will address all related environmental issues, institutional development and capacity building including monitoring plan for implementation of plan.

7.2 Baseline Assessment

7.2.1 Pisciculture Practice in Tank

Pisciculture in MI tank considered under OIIPCRA is a very common practice. Pisciculture practice in MI tank are governed by district fisheries officer. These tanks are leased out to local PFCS or SHG for pisciculture purpose. Such 277 MI tanks are presently being leased out to PFCS/ SHG. Lease duration in sampled project districts ranges between 1-3 years.

Pisciculture in sampled MI tanks is reported as well. Pisciculture practice is noticed in 9 sampled tanks. In all cases pisciculture practice is done either by local SHG group or PFCS taking lease from fisheries department or from respective gram panchayat. In case water spread area is less than 40 Ha., tanks are leased out by local Gram Panchayat. Jamunasagar MIP has been leased out to Maa Manikeshari PFCS by fisheries department, Dhandamunda MIP and Dandrabahal MIP (Bolangir) has been leased out to individual person. Local fish species are primarily being grown in tank command area and captured either for own consumption or commercial selling purpose. Sampled area wise genetically modified and cultivated fish species are listed down in below table.

Table 1: Majorly cultivated fish species in tank

Sample MIP	Block	Details	Majorly cultivated fish in Pond/ tank
Dhandamunda MIP, Nabarangpur	Chandahandi	Dandamunda, Dhadipani, Chandahandi, Nabarangpur	Rohi, Bhakur, Mirikali, Grass Crap, Sliver Crap
Jallibandha MIP, Ganjam	Ganjam	Ganji (Personal)	Rohi, Bhakur, Mirikali, Mourali, Kalibosh, Gadisa, Kau, Karandi, Pradan (Barami)
Bisipur MIP, Mayurbhanj	Karanjia	Badagaon, Karanjia	Rohi, Bhakur
Khaibandha MIP, Balasore	Nilagiri	Govt. Hatchery, Village-Dignaria, Balasore	Bhakur, Mirkali, Chaina Rohi, Jayanti Rohi, Grass Crap
Khaibandha MIP, Balasore	Nilagiri	Khaibandha, Balasore (Govt. High school teacher)	Kerandi, Rohi, Kantia, Bahal, Silver calf, Glas Calf, Prawn, Bhakur, Mirkali
Dandrabahal MIP, Bolangir	Patnagarh	Maa Samalasori SHG, Baglabandha, Kendumundi, Patnagarh	Rohi, Bhakur, Mirkali, Silver, Silver Carp
Jamunasagar MIP, Kalahandi	Bhawanipatna	Jamunasagar, Bhawanipatna, Kalahandi	Rohi, Bhakur, Mirkali, Bilati Rohi, Grass Crap
Kalimati MIP, Keonjhar	Harichandanpur	Balipokhari, Harichandanpur	Rohu, Bhakura, Mirkali, Grass carp

Issues:

i. Inadequate information on the fisheries resources and the state of the aquatic environment of local people;

ii. Inadequate monitoring, extension and enforcement mechanisms;
iii. Siltation of the tank making most of them non-operational;
iv. Death of fish due to pesticide leaching into tank has been reported by local farmers of Jalibandha MIP;
v. Natural calamities such as unprecedented rain, cyclones and floods, leading to destruction of fish/ aquaculture ponds and systems;

7.2.1.1 Fish Diseases

Fish diseases occur mainly when water become polluted or bacterial/ fungal attack on fish species. Local people can notice water pollution by visual observation of tank water. Colour change, odour or bad smell in water or layer of excess phytoplankton and zooplankton on top of water are few of visual appearance of water pollution. However, testing of tank water was not done by any of the lease holder. Tank location wise commonly occurring fish disease and medicines used to treat fish disease are tabulated below.

Table 2: Sample location wise commonly occuring fish diseses and used medicine

Sampled MIP	Block	Diseases	Used Medicine
Dhandamunda MIP, Nabarangpur	Chandahandi	Gill rot	Bitavir, Gut pro
Jallibandha MIP, Ganjam	Ganjam	Argulus, Gill rot,	Trichlophill
Bisipur MIP, Mayurbhanj	Karanjia	Red Spot, Fin rot	KMnO4, Trichlophill
Khaibandha MIP, Balasore	Nilagiri	Argulus, Fungal/Bacteria	KMnO4, Paracure-BT, CIFAX
Khaibandha MIP, Balasore	Nilagiri	Eye fluke,	Gut pro, Trichlophill
Dandrabahal MIP, Bolangir	Patnagarh	Argulus	Trichlophill
Jamunasagar MIP, Kalahandi	Bhawanipatna	Gill rot, Argulus	KMnO4, Gut pro
Kalimati MIP, Keonjhar	Harichandanpur	Fin rot, Gill rot, Argulus,	KMnO4, Copper, Copper sulphate

Source: Field study conducted by CTRAN Consulting

Issues:

- Water pollution in tank due to excess use of fish feed is reported at Khaibandha MIP, Balasore.
- Fish disease is very common in all this sampled area
- Disease surveillance by fishery department is not happening at desired interval
- People's awareness about disease specific medicine and dose can be termed as very poor

7.3 Objective

Objective of developing aquaculture plan is to promote sustainable pisciculture practices and value chain development. This will increase water productivity hence increase in family income through alternative livelihood. Increase in capture based fresh water pisciculture will reduce dependency on neighbour state for importing fish to meet state demand.

7.4 Approach for Aquaculture Plan Preparation

Following broad principles shall be taken care of while promoting pisciculture in MI tank:

- Availability of DSL of minimum 2 meter from normal ground water.
- Water availability during different season;
- Consider only those tanks which can hold water at least for 6 months at a stretch;
- Select native species which are dominant in respective MI tank region;
- Develop water sharing mechanism among different water users of respective MI tank;

- Assess condition of irrigation structure/ water controlling mechanism, leaching of fertilizer and pesticide may occur if regulating structures are dilapidated.
- Develop disease specific mitigation plan in consultation with Department of Fishery, Govt. of Odisha
- Device monitoring and supervision mechanism;
- Involve pani panchayat and SHG operating in surrounding area to maintain social integrity
- Consider water quality of respective MI tank;
- Avoid MI tanks located at Very High Damage Risk Cyclone Zone- B and High Damage Risk Cyclone Zone (Baleswar, Bhadrak, Jajpur, Mayurbhanj, Ganjam, Gajapati, Keonjhar)
- Avoid MI tanks located at declared flood zone (Ganjam, Jajpur, Bhadrak and Baleswar)

7.4.1 Institutional Arrangement

Directorate of Fishery will be nodal person for promotion of pisciculture in MI tank and marketing of product. Directorate of fishery will prepare Aquaculture Plan taking input from all implementing departments associated with apiculture related activities proposed under OIIPCRA. Following stakeholders' departments will be associated for preparing plan and implementation of same.

- Directorate of Fishery, Govt. of Odisha,
- Odisha Pissiculture Development Corporation (OPDC),
- Central Institute of Fresh Water Aquaculture (CIFA),
- College of Fisheries (CoF), OUAT,
- FNGOs,
- Fish federation (FISHFED),
- Central Institute of Fisheries Technologies (CIFT),
- Central Inland fisheries research Institute (CIFRI)
- and other ICAR Institutes like IIWM,

7.5 Mitigation Plan

Following mitigation measures shall be considered while preparing Aquaculture Plan and implemented during project implementation and operation.

Table 3: Mitigation measures to be adopted during pisciculture and related trading

Key Impact	Mitigation Measures	Project Stage	Monitoring Responsibility	Frequency of Monitoring
Use of powdery vegetarian feed will pollute water if left to suspend in water for too long time. Trash fish shreds are irregular in size and have a high loss rate (about 40%). The feed residue deposited on the pond bottom will cause pollution, resulting in a heightened risk of anoxia and mortality rate.	Use pellet feed of the appropriate size and density. It will significantly reduce loss and environmental pollution caused by the feed residue.	Operation	**Implement**: Beneficiary	Weekly
			Supervise: GM CIFA/ OPDC; SPU- Fishery & Environmental Expert	Monthly Quarterly
			Monitor: SPU - Fishery Expert & Environmental Expert GM OPDC/ CIFA & DFO	Quarterly Monthly
		Operation	**Implement**: Beneficiary	Weekly

Key Impact	Mitigation Measures	Project Stage	Monitoring Responsibility	Frequency of Monitoring
High moisture Trash fish feed becomes moldy easily. It is vulnerable to bacteria and parasites. The fat of trash fish oxidises and rots easily. Rotten trash fish may cause disease or even death.	Use vegetarian fish feed which has a low moisture content and preservation treatment is usually not necessary. As long as it is stored properly there should not be any bacteria or mold problem.		**Supervise**: GM CIFA/ OPDC; SPU- Fishery & Environmental Expert	Monthly Quarterly
			Monitor: SPU - Fishery Expert & Environmental Expert GM OPDC/ CIFA & DFO	Quarterly Monthly
Water pollution due to excess use of medicine to control fish diseases	Use recommendation dose of prescribed medicine as per instruction	Operation	**Implement**: Beneficiary	Weekly
			Supervise: GM CIFA/ OPDC; SPU- Fishery & Environmental Expert	Monthly Quarterly
			Monitor: SPU - Fishery Expert & Environmental Expert GM OPDC/ CIFA & DFO	Quarterly Monthly
Spreading of fish diseases	Use vegetarian fish feed instead of Trash fish feed; regular cleaning of aquatic weed; occasional treatment of water and pond bed to maintain right pH condition	Operation	**Implement**: Beneficiary **Supervise**: GM CIFA/ OPDC; SPU- Fishery & Environmental Expert **Monitor**: SPU - Fishery Expert & Environmental Expert GM OPDC/ CIFA & DFO	Monthly Monthly Quarterly Quarterly Monthly
	Undertake Disease Surveillance at regular frequency and adopt mitigation measures	Operation		
Reduction in the usage of genetic diversity of the wild fish varieties	Maintain mixed fish culture with suitable species of wild fish and species proposed under OIIPCRA	Operation	**Implement**: Beneficiary	During fingerling
			Supervise: GM CIFA/ OPDC; SPU- Fishery & Environmental Expert	Monthly Quarterly
			Monitor: SPU - Fishery Expert & Environmental Expert GM OPDC/ CIFA & DFO	Quarterly Monthly
Fish mortality of self-replicating species may occur if oxygen circulation is not maintained properly	Provide sufficient surface agitation	Operation	**Implement**: OPDC	Daily
			Supervise: GM OPDC; SPU- Fishery & Environmental Expert	Monthly Quarterly
			Monitor: SPU - Fishery Expert & Environmental Expert GM OPDC & DFO	Quarterly Monthly
		Operation	**Implement**: Beneficiary	Daily

Key Impact	Mitigation Measures	Project Stage	Monitoring Responsibility	Frequency of Monitoring
Generation of food waste from fish processing unit will give bad odour if not managed in scientific way at regular interval;	Waste material shall be stored in an earmarked location and disposed at a designated place at regular interval. Regular disinfection of surrounding area		**Supervise**: GM CIFT / CIWA / FISHFED; SPU- Fishery & Environmental Expert	Monthly Quarterly
			Monitor: SPU - Fishery Expert & Environmental Expert GM CIFT / CIWA / FISHFED & DFO	Quarterly Monthly
Health hazard due to use of formalin during fish processing and unhygienic practice	Use of formalin shall be as per prescribed volume.	Operation	**Implement**: Beneficiary	Daily
			Supervise: GM CIFT / CIWA / FISHFED; SPU- Fishery & Environmental Expert	Monthly Quarterly
			Monitor: SPU - Fishery Expert & Environmental Expert GM CIFT / CIWA / FISHFED & DFO	Quarterly Monthly
Health hazard and spoilage due to unhygienic practice and spoilage due to non-maintenance of suitable temperature in transportation vehicle	Keep neat and clean of fish transportation vehicle; Regular cleaning and disinfection of transportation vehicle to maintain hygiene condition; Always maintain required temperature by refrigeration system	Operation	**Implement**: Beneficiary	Regular
			Supervise: GM CIFT / CIWA / FISHFED SPU- Fishery & Environmental Expert	Monthly Quarterly
			Monitor: SPU - Fishery Expert & Environmental Expert GM CIFT / CIWA / FISHFED & DFO	Quarterly Monthly

ANNEXURE- VIII: EMP FOR CIVIL WORKS

	Parameter	Impacts	Mitigation	Institutional Arrangement
Pre- Construction				
	Stakeholder information and communication	If view of different stakeholders are not considered during design stage, it may create hinderance or obstruction to project implementation	State and district level sharing workshop on disclosure of EMF document was done inviting representatives from all stakeholder group	Implement: PD SPU (OIIPCRA)
			Local people will be informed regarding closure of irrigation system during construction work	**Implement:** EE MI Division **Supervise:** SPU- EE (Monitoring) and Environmental Expert **Monitor:** SPU- EE (Monitoring) and Environmental Expert
	Utilities	Any public utility is not anticipated to be impacted due to proposed renovation of irrigation facilities and other activities proposed under OIIPCRA. However, access to public utilities or infrastructures may be affected during construction work.	Access roads to public utilities should be used for storing construction machines and materials. Signage should be used to prior construction with the name and contact details of the responsible person with the contractor and the intended time for works.	**Implement:** Contractor **Supervise:** SPU- EE (Monitoring) and Environmental Expert **Monitor:** EE MI Division (Monthly); SPU-EE (Monitoring) & Environmental Expert (Quarterly)
	Sensitive Receptors	Dust and air pollution due to flying of stacked up earth; littering during transportation;	Identification of sensitive receptors like school, health centre and playground within 100 meter radius of construction site	**Implement:** Contractor **Supervise:** SPU- EE (Monitoring) and Environmental Expert **Monitor:** EE MI Division (Monthly); SPU-EE (Monitoring) & Environmental Expert (Quarterly)
		Noise pollution due to construction and demolition work and plying of construction vehicle		
	Physical and Cultural Resources (PCR)	The project activities (construction works) are limited to existing irrigation structures and hence, impacts on PCR are not anticipated. However, several PCRs have been in identified in the vicinity of selected sample tanks and also, many parts of project area fall in scheduled area, which might have unidentified PCRs that could	Follow Guidance on PCR Management – Annex 11 and EMF Process Flow (Figure 3 – EMF Implementation Process in EMF) Presence of any PCR, archaeological monuments (protected and unprotected) in an around project influence sites which may be impacted due to implementation of any of project activities shall be identified at screening stage (refer to Annex 11 Guidance on PCR Management).	**Screening:** SPU- Environmental Expert; **Implementation:** Contractor, EE MI Division **Supervise:** SPU- Environmental Expert, SPU EE (Monitoring) **Monitor:** SPU- Environmental Expert, SPU EE (Monitoring)

	Parameter	Impacts	Mitigation	Institutional Arrangement
		be affected by irrigation rehabilitation works.	Avoidance strategy to eliminate any such impact shall be adopted first. In case of unavoidable circumstances the design/ DPR should be modified such that a strategy of avoidance is adopted. (As project will only rehabilitate existing irrigation assets it is unlikely there will be any significant irreversible impacts.)	
		Orissa has many protected and unprotected monuments and structures which may be in proximity to selected MI tanks.	In case of 'Chance Finds' of archaeological, paleontological, historical significance, chance finds procedure outlined in the Annexure – XI will be followed.	**Identification**: SPU- Environmental Expert; **Implement:** EE (MI department) (Regular) **Supervise:** SPU - PD (OIIPCRA) (As and when) **Monitor:** EE MI Division (As and when); SPU- EE (Monitoring) & Environmental Expert (As and when)
Construction				
	Silt/ soil Disposal	Generation and disposal of earth material due to digging of bore well;	Soil material shall be used to strengthen surrounding area of bore well; Excess soil will be used for strengthening of nearby MI tank bund.	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
	Loss of top soil	Loss of top soil due to digging of bore well;	Top soil shall be stored separately and spread over nearby agricultural field	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
		Loss of top soil during excavation of foundation trenches and resectioning of tank	Top soil shall be stored separately and spread over MI tank bund	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly)

	Parameter	Impacts	Mitigation	Institutional Arrangement
				Monitoring: EE -MI division (Monthly)
	Aquatic Weed Management	Organic pollution due to improper dumping of aquatic weeds, shrub stems, stumps, roots, twigs and leave leading to inconvenience to local commuters, odour pollution, etc.	Identification of temporary storage locations for drying and temporary storage of the aquatic weed waste in consultation with the EE of respective MI division and the local people. The locations shall not be within 100 m of the Sensitive Receptors like educational institute, healthcare centre, children park.	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
			Local community will be allowed to collect the shrub stems, stumps, roots for use as fuelwood and fencing material and weeds for domestic use such as using it as fuel, animal fodder or for composting.	
			Sale or free lifting of dry/semi-dry weed waste for onward processing into compost, ropes (for handicrafts and furniture making), fodder, etc.	
	C&D waste	Generated construction waste like sand, stone if not removed after completion of work may create inconvenience to local people, health hazard;	Code of practice as suggested in Orissa Public Works Department Code Volume –II (OPWD Code, vol-II) shall strictly be followed while handling C&D waste. Residual construction material shall be stored separately and cleaned immediate after completion of work; construction site shall be cleaned before rainy season;	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
	Metal Waste	Generated metal waste like cut piece of reinforcement and mesh wire if not removed after completion of work may create inconvenience to local people, health hazard;	Residual construction material shall be stored separately and cleaned immediate after completion of work; Metal waste, if any, shall be collected and stored separately and sold to authorised recycler;	**Implement**: Contractor (Weekly) **Supervise**: Junior Engineer of MI Dept. (Monthly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
	Plastic Waste	Generation of Plastic waste	Provide waste bins on site for collection and disposal of plastic waste, cans and food waste. These bins shall be frequently emptied at approved dump sites. Plastic waste shall be collected and stored separately and sold to authorised recycler	**Implement**: Contractor (Weekly) **Supervise**: Junior Engineer of MI Dept. (Monthly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)

	Parameter	Impacts	Mitigation	Institutional Arrangement
	Ambient Noise	Noise pollution due to construction and demolition work and its impact on workers and community health	Heavy noise emitting equipment shall be fitted with silencer. Noise barrier shall be provided to generator set.	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Monthly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
			Construction workers shall be provided with PPEs (earmuff) to minimise health impact due to noise pollution	
	Air Quality	Dust and air pollution due to flying of stacked up earth; littering during transportation	Regular water sprinkling arrangement on silt material specially during hot-summer season to maintain soil moisture and minimise dust pollution;	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
			At soil staking site in proximity of sensitive receptors, at least air quality monitoring during construction period shall be carried out.	
		Air Pollution due to Burning of weeds, shrub stems, stumps, roots, twigs and leave	Contractor shall not adopt practice of burning weeds, shrub stems, stumps, roots, twigs and leaves in open place;	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
			Discourage local community in burning of weeds, shrub stems, stumps, roots, twigs and leaves in open place;	
	Water Quality	Sediment transport in streams, canal leading to increased TDS and turbidity; sediment deposition in MI tank leading to reduction in water storage capacity	Excavated sediment shall not be stored on river or canal embankment except on MI tank embankment; Muck/ soil may be stored on MI tank embankment for temporary period of maximum 10 days.	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
			Excess muck/ soil shall also be cleared from MI tank bed immediate after completion of construction work.	
			Slopes of embankments to be constructed and maintained at a stable gradient according to design specifications to minimize erosion.	
			Embankments shall not be left un-compacted during construction works to minimize wind and water erosion.	
			Immediate shifting of desilted materials after dewatering from MI tank embankment to next designated stacking point to minimize the potential for erosion into MI tank bed or side by agricultural field;	

	Parameter	Impacts	Mitigation	Institutional Arrangement
	Soil Quality	Mixing of C&D waste with soil	C&D waste including construction material shall be stored after providing bed lining arrangement to restrict mixing with soil material;	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
		Mixing of oil (diesel) with soil may deteriorate soil fertility	Bulk purchase of fuel material shall be avoided; fuel (oil) shall be stored in double line containment with provision of bed lining; fuel shall not be temporarily stored at agricultural land	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
	Vegetation waste management	Generated wood chips/ logs (from centering, shuttering work) if not removed after completion of work may create inconvenience to local people, health hazard;	There should be no burning of vegetation waste on site. Residual construction material shall be stored separately and cleaned immediate after completion of work; Local people shall be allowed to take wood waste to use as cooking fuel;	**Implement**: Contractor (Weekly) **Supervise**: Junior Engineer of MI Dept. (Monthly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
	Storage of Construction material	Impact on agricultural land, if stored in agricultural field	Prior consent of land owner shall be obtained; Crop compensation against any loss of standing crop / crop season shall be provided to land owner	**Implement:** Contractor (Before Storing) **Supervise**: Junior Engineer of MI Dept. (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
			Bed lining arrangement with side bund shall be provided at storage site if stored at agricultural land to restrict any mixing of residual construction material; residual material including lining arrangement shall properly be removed immediate after completion of work to the satisfaction of land owner	
	Physical and Cultural Resource (PCR)	Impact on PCR	Avoidance strategy to eliminate any such impact shall be adopted first as per Annex 11 Guidance on PCR Management. In case of unavoidable circumstances, the design/ DPR should be modified such that a strategy of avoidance is adopted. (As project will only rehabilitate existing	**Implementation:** Contractor, EE MI Division **Supervise:** SPU- Environmental Expert, SPU EE (Monitoring) **Monitor:** SPU- Environmental Expert, SPU EE (Monitoring)

	Parameter	Impacts	Mitigation	Institutional Arrangement
			irrigation assets it is unlikely there will be any significant irreversible impacts.	
	Chance Find	Chance find of archaeological, paleontological, historical significance	In case of 'Chance Finds' of archaeological, paleontological, historical significance, chance finds procedure outlined in the Annexure – XI will be followed.	**Implement:** Contractor, EE MI Division **Supervise:** SPU - PD (OIIPCRA) (As and when) **Monitor:** EE MI Division (As and when); SPU- EE (Monitoring) & Environmental Expert (As and when)
	Worker Occupational Health and Safety	Impact on workers health and safety during construction work	Provision of first aid kits; Ensure use of PPEs by all construction workers; Enforcing wearing fire/flame resistant cloth and aprons during cutting and welding operation; Ensuring use of PPEs such as welding helmet, hand goggles, Respirators specially during cutting and welding operation; Ensuring use of hand and forearm protecting leather gloves; safety goggles; steel-toed safety shoes; and upper foot guards to protect the instep area from impact or compression.	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Division (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)
		Provision of safe and hygiene drinking water	Contractor shall make arrangement for required quantity with desirable quality of drinking water at each working site	
		Provision of separate toilet blocks for male and female workers at site	Provide temporary and separate toilet blocks for male and female workers at each work site; toilet block shall be sufficiently away from any water coerce to ensure that it's do not mixed with water	
	Worker Welfare (Accommodation)	Provision of safe accommodation with minimum necessary amenities for workers	As local people/ labour will be hired on temporary basis, any such accommodation like labour camp will not be required; rented house will be arranged for those technical workers coming from other area; material will be stored at separate rented house at nearby area of worksite	Implement: Contractor **Supervise**: Junior Engineer of MI Division (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)

	Parameter	Impacts	Mitigation	Institutional Arrangement
	Community Health and Safety	Road accident of local people due to collision or breakdown of construction vehicle	Cases of road accident will be referred to nearby healthcare centre after primary first aid by contractor;	**Implement**: Contractor (Daily) **Supervise**: Junior Engineer of MI Division (Fortnightly); SPU- EE (Monitoring) & Environmental Expert (Quarterly) **Monitoring**: EE -MI division (Monthly)

Annexure- IX: Dam Safety Management Plan

9.1 Background

The GoO has a State Dam Safety Organisation (SDSO) that is responsible to provide safeguard mechanism and undertake regular monitoring of dams having height of 15 meters and above. Orissa has 204 numbers of large dams (as per ICOLD classification). This includes 10 major project dams, 50 medium project dams and rest 144 dams under minor irrigation projects. The SDSO has a dam safety review panel that undertakes a detailed appraisal of dams once in ten years as per International Commission on Large Dams (ICOLD) and Central Water Commission (CWC's) dam safety norms. In case of any emergency, it has provision of providing immediate services against the request of minor irrigation department for an assessment of dam safety status; otherwise SDSO only focuses on major concrete dams.

It is important to mention here that with respect to the quality assurance for the tanks, the GoO has agreed to use this Dam Safety panel to help in active monitoring of the minor irrigation tanks covered under OIIPCRA project on a regular basis. The dam safety panel comprises of qualified hydrologists, structural engineers and geologists. It has also been agreed that the panel will support review of dam safety measures in case of tanks having dam height of 10 meters and above. Based on preliminary survey and identification, it appears that there are thirteen dams above the height of 10 m out of which three dams are above height of 15m covered which would require dam safety measures as per OP 4.37 of the World Bank policies. The three dams above 15m Jaunriam Kalimati, and Bahiya have been assessed by State Dam Safety Review panel under DSO practices in 2006, 2007 and 2019 respectively.

The table below provides a summary of the identified dams of height (10-15m) and above 15m height.

Table 1: MIP s with dam height >10m considered under OIIPCRA

Sl. No.	Name of MIP	Catchment (Sq Km)	River Basin	Water Surface Area (Ha)	Dam Height (in m) *	Dam Length (in m)	Type
1	Jaunria, Bhanga munda, Harichandanpur, Keonjhar	24.6	Baitarani	37.5	15.46	814	Earthen
2	Kalimati, Balipokhari, Harichandanpur, Keonjhar	32.2	Baitarani	71.7	15.54	915	Earthen
3	Bahiya, Taratara, Hatadihi, Keonjhar	5.2	Baitarani	7.9	21.336	123	Earthen
4	Mathanpala, Bijepur, Titlagarh, Balangir	48.6	Tel	145.0	13.5	1450	Earthen
5	Jamunasagar, Duarsuni, Bhawanipatna, Kalahandi	19.4	Tel	25.8	10.15	420	Earthen
6	Garh, Dhakotha, Anandpur, Keonjhar	21.5	Baitarani	53.8	12.2	681	Earthen
7	Taradia, Kodapada, Anandpur, Keonjhar	22.5	Baitarani	32.4	10.66	271	Earthen
8	Sindhei, Bhandaridiha, Ghasipura, Keonjhar	39	Baitarani	75.0	11.6	1577	Earthen

Sl. No.	Name of MIP	Catchment (Sq Km)	River Basin	Water Surface Area (Ha)	Dam Height (in m) *	Dam Length (in m)	Type
9	Raghubeda, Santarapur, Ghatagaon, Keonjhar	11.5	Baitarani	10.6	14.8	710	Earthen
10	Jagadala, Malada, Jhumpura, Keonjhar	45.3	Baitarani	37.0	10.68	1018	Earthen
11	Nedam, Sarisapal, Bangriposi, Mayurbhanj	7.8	Budhabalanga	12.3	10	610	Earthen
12	Japimaska, Baliguda, Baliguda, Kandhamal	3.89	Tel	1.9	12.19	137.2	Earthen
13	Kumudabadi, Hatiagarh, Jashipur, Mayurbhanj	10.1	Baitarani	3.2	13.71	494.4	Earthen

** as per design parameter*

Table 2: Assessment of major dams covered under Dam Safety Panel

Sl. No.	Name of MIP	Reference Report	Key Observations (summary)
	Dam height > 15 meter		
1	Jaunria, Bhanga munda, Harichandanpur, Keonjhar (Expert Panel - March 2007)	March 2007- Expert Panel	1. In Left H.R, The screw gear box of the emergency gate has been stolen for last couple of years. 2. Leakage is noticed at the corner of the left abutment and return wall of spillway as the flowing water will gradually carry the mortar from masonry joints. 3. There is localized depression in the upstream rip-rap between RD 200m to 275m. 4. Due to rain some erosion / sloughing are noticed between RD 215m to 240m just above the rock toe. 5. Rain cuts are there on the downstream slope between RD 520m to 600m. 6. There is some vegetation growth on the upstream and downstream slopes. 7. The toe drain and outfall drain have been chocked. 8. The most critical is the condition of falls constructed across the spill channel to negotiate the difference of head. Due to flood of 1993 and 1999, following damages have occurred. **1st Fall** • Foundation of end still basin eroded. • Guide wall downstream of apron has been damaged. • Left earthen guide bund between 1st and 2nd fall washed away thus forming a new channel for passage of flood water. • There is leakage of water between the body wall of the fall and the left abutment. • Rough stone packing has also been washed away. **2nd fall** • Left abutment upstream portion has collapsed. • The downstream portion of the left abutment has tilted. • Body wall of the fall has suffered damage in the middle portion and RCC capping has given way for about 10m. • Dented sills are also damaged. • The left guide bund between 2nd and 3rd fall has been washed away for approximately 10m including collapse of wing wall. **3rd fall** • Loose stone apron provided in the downstream has been disturbed. • The spill channel meet s parent nallah at a distance of nearly 25m from the end sill.

Sl. No.	Name of MIP	Reference Report	Key Observations (summary)
			Operation and maintenance procedure Unless routine and regular maintenance is carried out, the minor distress will aggravate.
2	Kalimati, Balipokhari, Harichandanpur, Keonjhar (Expert Panel - March 2007)	March, 2007- Expert Panel	1. There is leakage through the weep holes of both abutments of spill way and through crack on left abutment wall. 2. Leakage is observed in the downstream slope of earth dam adjacent to the right abutment wall. 3. Minor depression also has been observed adjacent to the upstream wing wall of right abutment, indicating possible development of piping. 4. Leakage is also noticed above the H.R barrel at the downstream toe of the earth dam. 5. A 1.20m (400 ft) deep sink hole has occurred in the upstream slope of dam at the junction to masonry wall of the gate well. **Operation and maintenance procedure** There is no operational rule for the project as the spill way is un-gated. Painting, greasing and oiling of gates of the head regulator and hoising system should be taken up regularly on priority basis.
3	Bahiya, Taratara, Hatadihi, Keonjhar	February, 2019- (DSRP-2)	The toe drain and portion of rock toe has been silted up. There is no arrangement to measure the seepage. There is leakage of water from Head regulator. There are some leakage of water through bottom rock foundation of spillway. The downstream slope of the earth dam has been eroded severely due to absence of surface drainage arrangement. Both service and emergency gates of H.R. requires painting and lubrication. Routine maintenance like preparing the rain cuts, clearing the toe drain and removing vegetation growth may be done on priority basis.
	Dam height > 10 < 15 meter		
1	Mathanpala, Bijepur, Titlagarh, Balangir	06/ 02/ 16- DSO Team and 22/ 05/ 14- Executive Engineer M.I Division, Bolangir	There is provision of toe drain only for 180.00m length of dam which is fully silted up. There is no well-defined outfall drain. It is full of grasses and silt. Surface drainage in D/S slope is not available. Dam top width is less than 3.00m against the design width of 3.66m. There is depression / undulations at many patches having no all weather road. There are some hair cracks developed on the top of dam. The edges of dam is eroded due to surface runoff resulting in reduction of effective width. There is no parapet wall. The edge of dam is having insufficient number of guard stones There are undulation/ depressions at many places in both U/S and D/S slopes. The D/S slope is full of rain cuts and ant hills. There is profuse growth of grasses and bushes. The rock toe is chocked due to deposition of silt over it as D/S slope is eroded due to surface runoff at several locations. The wearing coat over the surplus escape has been damaged. Leakage through the the foundation of surplus Escape is noticed. The existing seepage measurement is by float method. There is leakage in outlet well as well as in gate. Enormous noise is generated during operation of gate. There is no catwalk to operative platform of outlet gate.

Sl. No.	Name of MIP	Reference Report	Key Observations (summary)
			The stone packing after 1st fall is completely damaged. As it appears the heavy scouring is occurring due to steep fall. Retrogression is noticed beyond the left bank protection wall in tail channel. Emergency Action Plan is not yet prepared. The overall health status of dam is in good for normal operation.
2	Jamunasagar, Duarsuni, Bhawanipatna, Kalahandi	December, 2006- Expert Panel	There are slushy patches with occurrence of seepage is noticed at RD 180.00m near the toe of the dam. There is no defined outfall drain. There is profuse weed growth and rain cuts in some location of d/s slope. u/s packing is disturbed in some locations. Leakage is seen at RD 150m of d/s side of earth dam Seepage measurement is not conducted as there is no instrument for the purpose. Crest profile has been heavily undulated. The wheel tracks and pot holes are present abundantly. The edges are not in proper profile. The earthen road is existing on crest of the dam. There is no provision of steps to top of the dam. Conduit pipe of the head regulator is damaged. Water supply to the canal was provided by cutting the flank in the left side of the HR as a temporary arrangement. From 3rd to 6th fall of the surplus escape, the existing abutment retaining walls of masonry structure is in damaged condition. Emergency Action Plan is not prepared The earth dam top and slopes are settled and eroded and not in proper section. The d/s turfing has been damaged. The pointing in return wall & abutment wall is damaged. No painting work has been done to the surface of outlet gates. The d/s channel is getting scoured day by day severely.
3	Garh, Dhakotha, Anandpur, Keonjhar	19/ 12/ 17- DSO Team and 01/ 06/ 15- Executive Engineer, M.I Division, Anandapur	The catchment area intercepted at dam site is 21.50sq.km. The design flood adopted is 194.00 Cumec. No geological investigation was carried out either project preparation stage or during construction period. The toe drain is silted up. Stagnant pool of water is observed adjacent to the toe of the dam at RD 500m-600m due to a high land adjacent to the toe of the dam near RD500m. The outfall drain is not in proper shape & grade. Vegetation growth is observed in the toe drain area as well as in the outfall drain area. Surface drainage arrangement on the D/S slope has not been provided. V-notch installed earlier has been damaged. The edges of crest have eroded at some locations resulting reduced effective width of dam top. The ramp is damaged. Dam top road is of earthen surface. Neither parapet wall nor guard stones are provided on dam top. U/S pitching has been disturbed at some locations. Rain cuts are there on the D/S slope of the earth dam The Rock toe has been silted up. D/S turfing has been damaged at patches. Tree growth and ipomoea, grass and other vegetation growth is observed on U/S & D/S slope. Ant hills are there on the D/S surface of the dam. Cracks are observed on the surface of the spillway body. Vegetation growth is observed over the stilling basin. Plastering of the 1st fall has been damaged. Apron packing after 2nd fall has been disturbed. Water is leaking through the left and right abutment at RL 75.75m. Necessary instruments like V-Notch, Piezometer are not installed. Right HR gate is not functioning since long. Emergency Action Plan is not prepared U/S riprap has been disturbed at different places. Guard stones & chainage stones are not provided on top of dam.

Sl. No.	Name of MIP	Reference Report	Key Observations (summary)
			No Longitudinal and cross drains are provided.
4	Taradia, Kodapada, Anandpur, Keonjhar	03/ 06/ 16- Executive Engineer, M.I. Division, Anandapur and 03/ 06/ 15- DSO Team	U/s rip rap has been disturbed in few locations & vegetation growth was also found in the u/s slope. The river/nalla portion is not clear for effective flow of seepage water. Guard stones & chainage stones are not provided on top of dam. Necessary instruments like V-Notch, Piezometer are not installed. No Longitudinal and cross drains are provided. Leakage is noticed through the outlets in its closed position. The surface of the gates and painting is deteriorated. The connecting bolts are loosed/damaged and the rubber seals are damaged. Leakage water is observed in d/s left side abatement. Tail channel is retrograded at a distance of 130mtr from the spillway. The 2nd and 3rd grade wall provided earlier are fully damaged. Rock toe is buried under soil & Toe drain is silted. Vegetation growth was found on d/s slope & the turfing was damaged. Rain cuts were also seen. Spillway is un-gated. There is one Service gate & one Emergency gate and both are not functioning. Painting is deteriorated. Gate shaft is found tilted. Lubrication of gates damaged. The tail channel has been retrograded for a distance of 70m from the spillway where the first fail structure was built. Two Grade walls at RD 180m & 300m have been collapsed completely. The reservoir is safe for normal operation, but immediate repair & restoration of appurtenant structures is essential.
5	Sindhei, Bhandaridiha, Ghasipura, Keonjhar	03/ 06/ 16- M.I. Division, Anandpur, Keonjhar and 03/ 06/ 15- DSO Team	RR stone masonry of the free board portion has been damaged. Upstream rip-rap has been disturbed in few locations between RD 0.00m to 590.00m. Vegetation growth was also found in the u/s & d/s slopes. Slope erosion and rain cuts have developed in d/s slope due to public using the berm as walk path. Guard stones & chainage stones are not provided on top of dam. Wet patches/seepage is noticed on the d/s of dam within 200m from the toe of the dam. There is settlement and displacement of stones in the rock toe. Abnormal leakage is noticed through the rock toe in gorge position. Necessary instruments like V-notches are not installed for measurement of seepage. No longitudinal and cross drains are provided. Leakage water is observed in d/s left side abutment. Tail channel is retrograded at a distance of 60mtr from the spillway. The grade wall provided earlier is fully damaged. Spillway is un-gated There is one head regulator at RD 192.0m. There is one service gate & one Emergency gate and both are functional. But painting has deteriorated. Leakage is observed in d/s of left side wing of HR. Stray boulders are found inside head regulator bay. Minor cracks found on the skin of body weir along with calcinations marks. The stilling basin is dry on the day of inspection but there were deposits of stones in it. Overall condition of the energy dissipation arrangement is good. The dam is safe for normal operation. Maintenance of Dam & appurtenant structures should be given due importance for maintaining the safety of the dam.
6	Raghubeda, Santarapur,	18/ 03/ 17- DSO Team	The U/S & D/S slope of the dam is full of vegetation. Also, the present nallah & outfall drain are covered with trees & bushes.

Sl. No.	Name of MIP	Reference Report	Key Observations (summary)
	Ghatagaon, Keonjhar		Seepage water is seen in the outfall drain. RD pillars and guard stones are not provided on the dam top. U/S rip-rap & Rock toe of the dam has been completely disturbed. Gully formed at left side butting point of the dam. At extreme left dyke seepage point found near d/s slope. A crack has developed on body of the spillway, also abrasion/pitting observed on the surface of spillway. Boulders have been disturbed in the apron below the stilling basin of the spillway. There is single H/R present in the dam having only service gate. All iron parts lack lubrication. Necessary instruments like Piezometer, V-Notch etc. has yet not been installed The general condition of the dam is good. Regular maintenance is necessary. The dam is safe for normal operation.
7	Jagadala, Malada, Jhumpura, Keonjhar	03/ 12/ 2015-Executive Engineer M.I. Division, Keonjhar and 05/ 02/ 14-DSRP	Horizontal cracks are developed in top of earth dam and heavy rain cuts appeared in d/s slope. U/S rip-rap, D/S toe drain and rock toe needs repair. There is standing pool of water in the d/s area at RD180m,518m and 820m. Leakage observed on the side of the support wall. V-notches to measure seepage discharge is not yet installed. DSRP has recommends raising of earth dam, installation of solid parapet wall and additional spillway to meet the revised design flood of 630 cumecs against the present design flood of 339.60 cumecs.

9.2 Procedures for Dam Safety Assessment and Monitoring

The project will not support construction of new dams, however some proposed MIPs (as identified in Table above) under OIIPCRA may rely on the performance of existing large dams. The existing dams would need to be evaluated for their safety status and performance history in accordance with OP 4.37 provisions. An effective dam safety operation is already underway in the State of Orissa under the State Dam Safety Organisation. A Dam Safety Panel has been operationalised with key experts for the purpose of OIIPCRA (the TOR attached in Appendix- 1)

The State Dam Safety Panel shall undertake comprehensive review from dam safety and operation and maintenance point of view and recommend the remedial measures for rehabilitation of MI tanks that have bund height more than 10m considered under OIIPCRA. Within the first 6 months of project implementation, the three dams above 15m height will be re-assessed by DSP. The project will support all costs associated with this review (including ancillary, recurring and non-recurring cost). A report will be prepared by DSP and reviewed by Director DSP and the SPU-OIIPCRA and subsequently shared with the World Bank for review.

The State Dam Safety Panel will be guided by the Government of Odisha related legislations, regulations, standards and guidelines, and World Bank's Operational Policy on Safety of Dams OP 4.37. The DSRP

will also monitor the implementation of remedial works for large dams, if needed, and issue guidelines to the field engineers on any remedial measures to be taken for implementation of rehabilitation of these 13 dam (MIP) if needed. The DSP, executive engineer from MI department and SPU representatives will monitor the implementation of the remedial actions recommended as needed.

As per preliminary estimation with SDSO, OIIPCRA and WR department, approximately an amount of Rs. 75 lakhs/- per MI tank (applicable for additional four tank) will be allocated towards maintenance, monitoring and surveillance expenses. Thus total budget for dam safety plan implementation will be 3 crore rupees over a period of 6 years project duration of OIIPCRA.

The following table outlays the procedures that will be followed as per OP 4.37 Safety of Dams

	Mitigation Measures	**Responsibility**
Pre- Construction / DPR preparation Large Dams	Specifically for large dams (as defined in OP 4.37 above height of 15m) Government of Orissa will arrange for the dam safety panel to (a) inspect and evaluate the safety status of the existing dam, its appurtenances, and its performance history; (b) review and evaluate the O&M procedures; and (c) provide a written report of findings and recommendations for any remedial work or safety-related measures necessary to upgrade the existing dam to an acceptable standard of safety in accordance with the provisions of OP 4.37 annex A (Box 3). For all/ any remedial works proposed, the work be designed and supervised by competent professionals. All recommendations arising from structural assessment will be integrated into the works package and cost for that DPR.	State Dam Safety Panel.

	Mitigation Measures	Responsibility
Pre- Construction / DPR preparation Small Dams (10-15m height)	If selected MIPs incorporate the rehabilitation of small dams/bunds or rely on the performance of small dams below that threshold of 15m, the DPR preparation process will need to ensure standard dam safety engineering measures approved by a qualified engineer/state dam safety panel. Any remedial actions would need to be incorporated in the civil works to be undertaken.	Qualified Engineers in DPR team, State Dam Safety Panel and SPU- OIIPCRA
Supervision of Remedial works	The DSP will also provide expert inputs to monitor the implementation of remedial works for large dams, and issue guidelines to the field engineers on any remedial measures to be taken for implementation of rehabilitation of these 13 dam (MIP) if needed. General Construction supervision will be undertaken by construction supervision and quality control consultant, who will report to the SPU-OIIPCRA and MI department.	Dam Safety Panel CSQC consultant
Monitoring	Executive Engineer of MI department from that division will undertake general surveillance as per the checklist in Box 1 M&E agency will also conduct monitoring at Mid-Term and Final Impact assessment as per the checklist in box 2 SDSO will also conduct periodic inspection of all these 13 dams at 5 years and 10 years interval respectively as per laid down Govt. norms. Mitigation action will also be taken as per laid down Govt. process.	Executive Engineer MI Department M&E Agency State Dam Safety Organisation

Checklist for general surveillance by executive engineer (as per DSO)

A detailed checklist has been developed to do the monitoring and evaluation of dam safety (for tank and ancillary works) of 13 MIPs with more than 10-meter height considered under OIIPCRA. The details are as given hereunder:

A. Embankment Structures

(a) Settlement: The embankments and downstream toe areas should be examined for any evidence of localized or overall settlement, depressions or sink holes.

(b) Slope Stability: Embankment slopes should be examined for irregularities in alignment and variances from smooth uniform slopes, unusual changes from original crest alignment and elevation, evidence of movement at or beyond the toe, and surface cracks which indicate movement.

(c) Seepage: The downstream face and toes, contact with structures, and the downstream valley areas should be examined for evidence of existing or past seepage. The sources of seepage should be investigated to determine cause and potential severity to dam safety under all operating conditions. Increase or decrease trend of seepage should be monitored. The presence of animal burrows and tree growth on slopes should be examined.

(d) Drainage: Signs of water logging, slushy condition, and standing pool downstream of the dam should be monitored. Conditions of cross drains and out fall drain should be reported.

(e) Slope protection: The slope protection should be examined for erosion, formed gullies and wave-formed notches and benches that have reduced the embankment cross-section or exposed less wave resistant materials. The adequacy of Slope protection against waves, currents, and surface run-off that may occur at the site should be evaluated. The condition of vegetative cover should be evaluated where pertinent.

B. Spillway structures

(a) Spillway: The spillway should be examined to pass the revised designed flood flow. The Leakage through junctions with dam, leakage through the body of spillway, Cracks, peeling of plaster should be noted.

(b) Stilling Basin (Energy Dissipaters): Stilling basins should be examined for scour or erosion which may create or present a potential hazard to the safety of the dam. The existing condition of the channel downstream of the stilling basin should be determined.

(c) Downstream [D/S] Channel: Channel immediately downstream should be examined for conditions for safe passage of flood discharge.

C. Outlet work

The structure and all features should be examined for any condition which may impose operational constraints on the outlet works. Entrances to intake structures and outlet channel should be examined for conditions such as silt or debris accumulation which may reduce the discharge capabilities of the outlet works. The interior surfaces of conduits should be examined for erosion, corrosion, cavitations, cracks, joint separation and leakage at cracks or joints.

D. Safety and performance instrumentation

Instruments which have been installed to measure behaviour of the structures should be examined for proper functioning. The available records and readings of the installed instruments should be reviewed to detect unusual performance or distress of the structure.

Emergency Action Plan [EAP]: An exclusive plan needs to be prepared to meet the emergency requirements called "Emergency Action Plan" encompassing inundation maps for maximum spillway flood in case of dam breach and preparedness plan for the emergency. Upon finding a hazardous condition that could lead to a dam breach or upon discovering a potential dam breach or dam breach in progress, the project authority shall issue dam breach warnings to inhabitants in areas immediately downstream of the dam.

Pre and Post Monsoon Inspection: Pre-monsoon and Post-monsoon inspection of these 13 dams will be will be carried out by the field engineers as per the guidelines prescribed by the Central Water Commission (in line with checklist given above). The reports shall be submitted to OIIPCRA along with SDSO by end of June and November, respectively. Each year these reports of inspections will be reviewed at State Dam Safety Organization & the Annual Health status of the dams will be published and sent to Government in Department of Water Resources and Central Water Commission for their appraisal.

Box 1 Checklist for General Surveillance

Dam Aspect	Key Challenges/ Risks	To be monitored in Planning and Implementation phase	Responsibility for implementation
Embankment	Settlement of embankment	Strengthening of embankment by approved engineering methods based on recommendation of expert panel.	Dept. of MI
	Cracks on crest	Repair of cracks on crest as per standard procedure	Dept. of MI
	Concavity of upstream	Restore slope to designed profile by earthwork in benching or with stone riprap depending on depth of concavity.	Dept. of MI
	Rain cuts, ant hills, rodent holes	Repair of rain cuts by back filling. Remove ant hills and rodent holes up to the root and back fill with suitable earth laid in layers duly compacted. White ant treatment to be adopted when problem is wide spread.	Dept. of MI
	Displaced riprap	Removing and repacking of stone riprap with supply of stone as necessary.	Dept. of MI
	Degraded berk of the embankment	Longitudinal slope may be constructed in the berk location, leading to slope drains. Turfing may be adopted where ever required	Dept. of MI
	Invisible toe drains due to weed growth and covered up by soil	Weed growth be cleaned by uprooting. The choked toe drains be cleaned of all earth deposit by removing and repacking. Graded filter below the drains need be replaced	Dept. of MI
	D/S area	Excavate slushy drainage to drain out the area. If required filter drains may be provided.	Dept. of MI
	Lack of surface drainage arrangement	Construct shallow earthen/ masonry drains to drain out the area	Dept. of MI
	Leakage through junctions of dam with outlet barrel and spillway	The leakage path to be investigated opened out and sealed with fresh earth work laid and compacted in suitable layers. Proper bonding with masonry structure to be ensured.	Dept. of MI
Spillway / Surplus weir	Cracks, leakage in spillway	Cracks need to be sealed with cement or epoxy. Source of leakage to be located and same sealed by grouting.	Dept. of MI
	Inadequate spillway capacity	Additional length of spillway to be provided. Encroachment of free board for some extent for short duration may be allowed. Raising of height of the dam to cater to the increased maximum water level may be required.	Dept. of MI

Dam Aspect	Key Challenges/ Risks	To be monitored in Planning and Implementation phase	Responsibility for implementation
	Degraded Energy Dissipation Arrangement	Restoration of the energy dissipation arrangement by suitable repair.	Dept. of MI
	Retrogression warranting undermining of parent structure	In specific cases additional drop walls may be constructed in the spill channel. Cut off walls may be constructed to check retrogation/ undermining.	Dept. of MI
Head Regulators / Head sluice	Leakage of water through the Head regulator gates	Repair/ replacement of gates.	Dept. of MI

Box 2 BP 4.37 Annex A- Dam Safety Reports Suggested Content

BP 4.37, Annex A - Dam Safety Reports: Content and Timing

These procedures were prepared for use by World Bank staff and are not necessarily a complete treatment of the subject.

BP 4.37 - Annex A
October, 2001

1. *Plan for construction supervision and quality assurance*. This plan is provided to the Bank by appraisal. It covers the organization, staffing levels, procedures, equipment, and qualifications for supervision of the construction of a new dam or of remedial work on an existing dam. For a dam other than a water storage dam,[1] this plan takes into account the usual long construction period, covering the supervision requirements as the dam grows in height--with any accompanying changes in construction materials or the characteristics of the impounded material--over a period of years. The task team uses the plan to assess the need to fund components under the loan to ensure that dam-safety-related elements of the design are implemented during construction.

2. *Instrumentation plan*. This is a detailed plan for the installation of instruments to monitor and record dam behavior and the related hydrometeorological, structural, and seismic factors. It is provided to an independent panel of experts (the Panel) and the Bank during the design stage, before bid tendering.

3. *Operation and maintenance (O&M) plan*. This detailed plan covers organizational structure, staffing, technical expertise, and training required; equipment and facilities needed to operate and maintain the dam; O&M procedures; and arrangements for funding O&M, including long-term maintenance and safety inspections. The O&M plan for a dam other than a water storage dam, in particular, reflects changes in the dam's structure or in the nature of the impounded material that may be expected over a period of years. A preliminary plan is provided to the Bank for use at appraisal. The plan is refined and completed during project implementation; the final plan is due not less than six months prior to the initial filling of the reservoir. Elements required to finalize the plan and initiate operations are normally financed under the project.[2]

4. *Emergency preparedness plan*. This plan specifies the roles of responsible parties when dam failure is considered imminent, or when expected operational flow release threatens downstream life, property, or economic operations that depend on river flow levels. It includes the following items: clear statements on the responsibility for dam operations decision making and for the related emergency communications; maps outlining inundation levels for various emergency conditions; flood warning system characteristics; and procedures for evacuating threatened areas and mobilizing emergency forces and equipment. The broad framework plan and an estimate of funds needed to prepare the plan in detail are provided to the Bank prior to appraisal. The plan itself is prepared during implementation and is provided to the Panel and Bank for review not later than one year before the projected date of initial filling of the reservoir.

---

1. For example, a mine tailings, ash impoundment, or slag storage dam.
2. In the dam safety practice of several countries, the operation and maintenance plan includes both the instrumentation plan and the emergency preparedness plan as specific sections. This practice is acceptable to the Bank, provided the relevant sections are prepared and finalized according to the timetable set out in this annex.

Appendix- 1: TOR for Dam Safety Review Panel

Terms of Reference: Short Term Consultancy

Expert Panel for Periodical Dam Safety Monitoring

Odisha Integrated Irrigation Project for Climate Resilient Agriculture (P 163533)

1. **Introduction:**

Government of Odisha is implementing the World Bank supported Odisha Integrated Irrigation Project for Climate Resilient Agriculture (OIIPCRA) through the Department of Water Resources (DoWR). The Govt. of India in the Department of Economic Affairs (DEA), in the Ministry of Finance, has approved the OIIPCRA on 23.2.2017. The cost outlay of the project is US$ 230.62 Million (Rs. 1,560 Cr) out of which US$ 161.44 Million (Rs. 1,092 Cr) is funded through World Bank assistance at 70:30 (Centre: State) cost sharing. The period of the project is 6 Years from 2019 to 2024.

The project is being implemented through the "Odisha Community Tank Development & Management Society (OCTDMS)", a Special Purpose Vehicle (SPV) created under the Department of Water Resources (DoWR), Government of Odisha.

2. **Brief Report:**

In the 1st phase of the project, 538 Nos. Of Minor Irrigation projects have been identified for rehabilitation in 15 Districts of Odisha in 4 river basins e.g. Rushikulya, Budhabalang, Baitarani and Tel Sub-basin covering about 56, 200 Ha. Out of the above there are 13 number of reservoir project (as per Annexure-I) having dam height equal to or more than 10 m and 9 (nine) out of the above 13 projects are coming under the purview of the Dam Safety Organisation as large dams.

The project authority on recommendation of the World Bank desires to bring the above 13 dams to be reviewed periodically by the Dam Safety Organisation of the State as being done for the large dams.

The Chief Engineer, Dam Safety, Odisha (DSO in short) will be the Nodal Office on the formation of Expert Panel for Dam Safety for OIIPCRA project.

3. **Key Tasks:**

i. The DSO would form an Expert Panel of members who will inspect the dams as being done for the large dams as per standard prescribed by the State DSO.

ii. The panel shall consist with minimum two member engineers, one from Hydrology and the other from Civil/Structural expert. The third member will be a Geologist.

iii. The Expert Panel will visit at least once to all the above 13 dams in the first 12 (twelve) months of formation of the panel and submit their inspection and review through an interim report (for urgency if any) or a final report within 30 days of inspection.

iv. The Expert Panel will also require to visit on request, the above 13 dams as and when warranted in case of urgency seeking for expert advice on safety measures. The Panel may also be requested to inspect any other dam beyond the above list coming under OIIPCRA, if situation warrants.

v. The Expert panel will provide Yearly inspection report on health/safety precautions/ proposed measures along with any other information of importance for all the above 13 dams as per the format prescribed duly recommended by DSO.

vi. The fees and expenses along with logistics shall be provided by the project authorities (OIIPCRA) as per the recommendation of DSO/ State Govt approved rates.

vii. The expiry of the Expert Panel will be a maximum of 5 (Five) years from the formal acceptance of the proposal to be renewed every year by the project authorities.

4. Reporting Procedure:

4.1 Separate report shall be prepared by DSO/DSRP for each inspected dam and shall include, but not to be limited to

a. Assessment of the condition of the structure based on the visual observations and available data on the design, hydrology, construction, operation, maintenance and performance of the structure.

b. Recommendations for any emergency measures or actions, if required to assure the immediate safety of the structure,

c. Recommendations for remedial measures and actions related to design, Construction, Operations, Maintenance and inspection of the structure, if required

d. Recommendations for additional detailed studies, investigations and analysis, if required

e. Recommendations for improvements in routine maintenance and inspection of dam, if required

4.2 The report shall be prepared by DSO/DSRP team jointly with in the block period of a visit, and each report shall be dully signed by every member of the DSRP team before its submission to the State Project Management Unit.

Sd/-11.3.2019

Project Director, OCTDMS-cum-
Additional Secretary to Govt., DoWR

Table of Content

ANNEXURE- X(A): GUIDELINE FOR AIR, SURFACE WATER, SOIL QUALITY MONITORING DURING PROJECT IMPLEMENTATION

One (1) sample, each on Air, Surface Water, Soil and Noise quality will be considered at a time from one MI point. Thus, total 4 nos. samples covering all parameters will be drawn against one MI tank during a quarter.

Air sample shall be drawn from the command area nearest to dam location on eight hourly average basic for one day. Surface water sample will be collected from the reservoir and command and mixed in equal volumetric proportion to make one composite sample. Soil sample shall also be collected in similar manner from two different locations of one MI tank and mixed in equal volumetric proportion to make one composite sample. Noise quality of one location shall be recorded during construction work in progress. Environmental parameter wise monitoring details are given in Table 1.

Table 1: Quarterly basis monitoring details of environmental parameters

Sl. No	Parameters	Items to be Tested	No of Location	Location Details	Frequency of Testing
1	Air Quality	As per Table 2	6 MI tanks where civil work is in progress during reporting quarter	1 location from each site	Quarterly (Except rainy season)
2	Surface Water Quality	As per Table 2	6 MI tanks where civil work is in progress during reporting quarter	1 composite sample from each site mixing two separate sample	Quarterly (Except rainy season)
3	Soil Quality	As per Table 2	6 MI tanks where civil work is in progress during reporting quarter	1 composite sample from each site mixing two separate sample	Quarterly (Except rainy season)
4	Noise Level	Leq dB (A) (Day & Night)	6 MI tanks where civil work is in progress during reporting quarter	1 location from each site	Quarterly (Except rainy season)

Table 2: Testing Parameters

Inland Surface Water (Class C)		Ambient Air Quality (AAQ)		Soil Quality Testing	
(IS: 2296-1982)		(NAAQS)- 2009			
Sl. No.	Parameters	Sl. No.	Parameters	Sl. No	Parameters
1	pH Value	1	PM_{10}	1	pH
2	Dissolved Oxygen	2	$PM_{2.5}$	2	Electrical Conductivity
3	Biochemical Oxygen Demand (3 days at 27^0C)	3	Sulphur Dioxide (SO2)	3	Organic Carbon
4	Total Coliforms (TC)	4	Nitrogen Dioxide (NO2)	4	Texture
5	Colour	5	Ozone (O3)	5	Phosphorous as P
6	Fluoride (as F)	6	Lead (Pb)	6	Potassium as K
7	Cadmium (as Cd)	7	Carbon Monoxide (CO)	7	Sulphur as S
8	Chloride (as Cl)	8	Ammonia (NH3)	8	Calcium as Ca
9	Chromium (Cr 6+)	9	Benzene (C6H6)	9	Magnesium as Mg
10	Total Desolved Solid (TDS)	10	Benzo(a)Pyrene (BaP)	10	Chromium as Cr
11	Sulphates (SO4)	11	Arsenic (As)	11	Lead as Pb
12	Lead (as Pb)	12	Nickel (Ni)	12	Zinc as Zn
13	Coppur (Cu)			13	Cadmium as Cd
14	Arsenic (as As)			14	Arsenic as As
15	Iron (as Fe)			15	Fluoride as F
16	Phenolic Compound (C6H5OH)			16	Nickel as Ni
17	Zinc (as Zn)			17	Mercury as Hg
18	Anionic detergent (MBAS)			18	Boron as B
19	Oil & Grease			19	Copper as Cu
20	Nitrate (as NO_3)			20	Iron as Fe
				21	Manganese as Mn
				22	Molybednum as Mo

ANNEXURE- X (B-1): FORMAT FOR QUARTERLY REPORT ON EMP IMPLEMENTATION

(To be filled by M&E Agency (Quarterly)

Bi-monthly Report **Reporting Period: ……..**

I. Package Description

1.1	Contract Package	
1.2	Name of the project component and activity	
1.3	Name of the Contractor	
1.4	Work Completed for the Month	Earth work/ Concrete work/ Masonry / Flood Wall/ PCC lining
		Others Specify….

II. Establishment of Contractors Camp - Yes / No

1 **Usage of Camp -** Plant / Machines/ Labour

1.1 If Plant - Crusher unit/ HMP/ WMM / Any Other

1.2 If Machinery stocking - Yes / No

Sl.N0	**Type of Machinery in Operation**	**Number**	**Fitness/ PCB certificate obtained**	**Remarks – Repaired at camp / sent to Garage**
1	***Rollers & Compaction equipment.***			
2	***Excavators, Bull Dozers and Graders***			
3	***Tippers/ Dumpers and Water Bowsers (Tankers).***			
4	***Vibrating Plate Compactor Earth Rammer***			
5	***Vibro Sinker***			
6	***Arc Welding Apparatus***			
7	***Power Roller***			

8	***Concrete Batching Plant (15m3/Hr) capacity***			
9				
10				
11				

1.3 Labour - Permanent / Transit

S.No	**Particulars**	**Remarks**
i	Total Number of Labourers employed?	ST : SC: Others:
ii	Number of Male labourers?	ST : SC: Others:
iii	Number of female labourers?	ST : SC: Others:
iv	Number of local labourers?	ST : SC: Others:
v	Name the village from where the labour comes from?	
vi	Number of migrant labourers?	Male: Female:
vii	Number of dwelling units in the camp?	Pucca : _____Number Kutcha : _____Number
viii	Water Supply provided?	
ix	Drinking water supply provided?	Tube well/ Open Well/ Tanker/ supply water etc
x	Number of Toilets provided?	
xi	Separate toilet provided for women?	Yes/ No
xii	Type of Toilet?	Leach pit / Soak Pit / Septic tank
xii	Number of Bath rooms provided?	
xiii	Separate Bath rooms provided for women?	Yes / No
xiv	Drainage facility provided?	
xv	Availability of Health centre?	Nearest:
xvi	First Aid Facility Available?	
xix	Health Camp / HIV awareness conducted?	Yes / No If yes provide details
xx	Fuel used in the Camp?	Fire wood/ Kerosene/ LPG
xxi	Does the Camp have Workshop for Repair?	Yes / No

xxii	Any Oil Spill taking Place?	Yes / No
xxiii	Oil / Grease traps / solid platforms provided?	Yes / No

1.4.1	Storage of Fuel	Temporary/ Permanent
1.4.2	Type of Fuel Stored?	HSD/ Petrol
1.4.3	License Obtained?	Yes/ No
1.6	Any Blasting Material Stored?	Yes/ No
1.6.1	License Obtained ?	Yes/ No

III. Haulage Road **Existing Road/ Temp Road Created**

1. Maintenance of Haulage Road done? Yes / No
2. Dust Suppression Measures taken? Yes / No

IV. Quarries Under Operation Yes / No

1. If Yes, Number of Quarries in use and locations?
2. If No, Name of Vendor, from whom the material Purchased (Certificate of Vendor to be enclosed)
3. Are the Vehicles used for Supplying material were covered? Yes / No

V. Erosion Control Measures: Silt Traps/ Construction in Lean Season / Compaction Taken up

VI. Dump Sites:

Identified - Yes / No
Low lying areas Used - Yes/ No
Disposal Sites – identified - Yes/ No

VIII. Storage of Material: Adj . to Canal / ROW/ Agri. Land / etc.

1. **Blockage of Natural drains** Yes / No

IX. Dust Control Measure:

S.No.	Measure	Remarks
1	Dust control devices are available	Yes/ No
2	Sprinkling of water carried out.	Yes/ No
3	Cover on the vehicles	Yes/ No
4	Cover on stack materials	Yes/ No

X. Noise Control Measure:

S.No.	Measure	Remarks
1	Machines establishes in nearby area of Habitation	Yes / No
2	Away from Habitations	Yes / No
3	Noise control measures are provided?	Yes / No
4	Regular maintenance of machineries are done?	Yes / No

XI. Safety Measures Taken:

S.No.	Measure	Remarks
1	Whether first aid facilities are provided at site?	Yes/No
2	Whether personal protective equipment given to all workmen at site?	Yes/No
3	Whether safety belts / ribbons used at work site	Yes/No
4	Whether gum boots, tarring unfits, spectacles etc. given to person handling bitumen?	Yes/No

XII. Environmental Monitoring/ Testing Details

Sl. No	Type of Test	Number of Locations	Date of Test (last conducted)	Remarks
1	Air Quality			
2	Noise Quality			
3	Ground Water			
4	Surface Water			
5	Soil Quality			
6	Sediment Quality			

(Note: Env. Testing should be from the SPCB/ MoEF/ NABL Approved Laboratory)

* Attach copy of testing report)

Signature of the Contractor: **Signature of the Project Manager:**

Name of the Specialist: **Name of the Project Manager:**

Date: **Date Verified:**

ANNEXURE- X (B-2): FORMAT FOR SPU'S HALF YEARLY E&S MANAGEMENT MONITORING REPORT

(This format will also be used for Mid-term and End-term Audit)

Chapter I: Project Background:

1.1 Project Overview and Contextual Relevance
1.2 Project Development Objectives
1.3 Project Components and Activities
1.4 Environmental Management Framework
1.5 Social Management Framework

Chapter II: Regulatory Requirement and Compliances

2.1 Environmental Regulatory Requirements and Compliances (Project Specific)

2.1.1 Consent to Establish and Consent to Operate under Air & Water Pollution
2.1.2 Letter of Authorization for handling hazardous Waste (if applicable)
2.1.3 Tree cutting permission from DFO
2.1.5 Clearance for Disposal of Dredged materials from WBPCB
2.1.6 Agreement letter with Pvt. Land owner for borrowing earth (if required)
2.1.7 GP Clearance for establishment of Labour Camp and Temporary Disposal of Waste aterial
2.1.8 PUC Compliance / Certificate from RTO
2.1.9 Authorization / Permission of Material Supplier
2.1.10 Any other compliances that are required

2.2 Social Regulatory Requirements and Compliances

2.2.1 SIA Notification (if land acquisition is involved)
2.2.2 Notification for Land Acquisition (as per LARR Act), if any
2.2.3 Labour License
2.2.4 Any other compliances that are required

Chapter III: Environmental Performance

3.1 Soil Pollution
3.2 Water Pollution
3.3 Noise Pollution
3.4 Waste Management / Sediment Disposal & Management
3.5 Pest Management
3.6 Management of Flora and Fauna / Local Bio-diversity
3.7 Physical Cultural Resources, its Protection and Management

Chapter IV: Social Performance

4.1 People's Understanding and Awareness of the Project
4.2 Land Acquisition, Rehabilitation and Resettlement (if required)
4.3 Gender Inclusion
4.4 Tribal Inclusion and Safeguards
4.5 Project Impact on Vulnerable Groups
4.6 Safety and Security of Workers

Chapter V: Monitoring and Supervision

5.1 Monitoring of Environmental Parameters and Measures Taken
5.2 Monitoring of Social Parameters and Measures Taken

Chapter VI: Information Disclosure, Consultation, and Participation

Chapter VII: Grievance Redress Mechanism (GRM)

Chapter VIII: Conclusions and recommendations

Annexure I: List of Documents Reviewed and Verified

Annexure II: List of Project Sites Visited and Consultations

Suggested Areas of Mid-term and End-term Audit

Some suggested areas where the audit will cover:

Preparation of Package Specific Contractor's EMP:

- Was EMF/EMP and contractors EHS conditions were included in bid documents and contractor agreement documents?
- Has the package specific Contractor's EMP and contractors EHS been prepared within stipulated time period?
- Was cost for EMF implementation considered in contractors contract packages or BoQ documents?

Preparation of Plan Before Implementation:

- Has the contractor prepared OHS plan and vetted it from implementing agency?
- Was testing of silted material done by contractor before initiation of resectioning of dam?
- Was detail silt disposal plan along with other management plan e.g vegetable waste, C&D waste, etc. as per EMF prepared and implemented accordingly?

Regulatory Compliance:

- Has the contractor/ implementing agency obtained and regularly updated all regulatory permissions?
- Does project violate any related environmental laws of State Govt. of Odisha or Govt. of India

Implementation of EMF:

- Whether all EMF measures were followed during project implementation?
- Whether EHS measures are adopted as per plan?
- Was equipment/ machineries maintained properly and pollution testing (PUC) done regularly?

Monitoring of E&S aspects in project activities:

- Is the SPU and other line department undertaking periodic and regular concurrent monitoring of the E&S implementation in the project activities?
- Was quarterly monitoring report prepared incorporating testing report on Air, Surface Water, Soil & Noise quality?
- Was half-yearly compliance report prepared and submitted to the World Bank?
- Was testing of environmental parameters carried out on regular basis?

Institutional arrangements for management of E&S aspects:

- Are the E&S Specialists at the SPU and other line departments available?
- Whether M&E agency was engaged for entire project implementation period?

Capacity building arrangements for management of E&S aspects:

- What training programs on E&S aspects have been organized for the SPU and other line departments?
- What training programs on E&S aspects have been organized for the contractors?

The format for the 'Audit Report on EMP Implementation' is provided in Annexure- X(b-2).

ANNEXURE- XI: GUIDANCE ON PCR MANAGEMENT

1. PCR Definition

As per World Bank policy OP 4.11, Physical Cultural Resources (PCR) are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings, and may be above or below ground, or under water. Their cultural interest may be at the local, provincial or national level, or within the international community.

2. PCR Baseline

The current project only rehabilitates existing tanks and hence, no direct impacts on PCR is anticipated. However, a few PCRs have been identified in the vicinity of selected sample tanks during environmental assessment (Annex 3, Section 3.1.14). Odisha has several centrally protected Archaeological Survey of India (recognized by Archaeological Survey of India). Some of the ASI protected sites in the project districts are provided in table 1.

Table 1. ASI protected sites in Odisha

District	ASI sites
Bolangir	Chausathi Yogini temple together with three minor shrines.
Boudh	Temples of Nila-Madhava and Siddhesvara.
Gajapati	Bhima Temple, Kunti Temple, Yudhishthira Temple
Ganjam	Gangadharaswami Temple, Jagadiswara Temple, Asokan Rock Edict, Potagarh Fort
Jajapur	Ratnagiri, Udaygiri (hills with sculptures, inscriptions, and images); Langudi hill – ancient buddhist site; Siriapur – monolithic pillar,
Kalahandi	Asurgarh Fort
Keonjhar	Paintings on the rock locally known as Ravana Chhaya and other ancient monuments and remains
Mayurbhanj	Neolithic and Paleolithic sites in Baidyapur, Kuchai and Kuliana; ruins of ancient fort and brick temples in Haripur,

3. Management of PCR

3.1 Screening and Consultation

Information dissemination about the project should take place at the project site/village/block/district level and communities should be consulted in identifying PCRs. During the environmental screening of project interventions, presence of any PCR and any likely impacts on those PCR should be identified.

3.2 Environmental management measures for existing PCRs

PCRs identified at the screening stage should be analyzed for the extent of impacts. If impacts on PCRs are ascertained, a PCR management plan should be developed and included in the contractor's bid document. Good practices and mitigation measures provided in EMP civil works in Annex 8 in the EMF should be practiced and be a part of the bid documents to ensure elimination of negative impacts on the PCRs and

their access. Additionally, a list of mitigation measures has been enlisted below which should be implemented together with the EMP.
(i) Restrict movement of heavy machinery near the structures up to 20 m
(ii) Avoid disposal or tipping of earth within 10m of the structures
(iii) Contractor shall provide necessary barricading/noise barriers to the suggested locations of PCRs prior to commencement of work so that any traditional or religious ceremony's occurring during construction will not be disturbed.
(iv) Access to the PCRs should not be compromised, safe and continuous access will be provided.
(v) Access to these properties shall be kept clear from dirt and grit while changing the approach/ or implementing improvement measures around the structures.
(vi) In case of presence of water bodies like tanks, wells etc. associated with any religious structure, all necessary precautions should be taken avoid adverse impacts on their water quality and quantity

3.2. Management of Chance Finds

(i) Suspension of Work
If a PCR comes to sight during the execution of the works, the contractor shall stop the works. After stopping work, the contractor must immediately report the discovery to the respective EE of MI department at District level. Respective EE of MI department at District level immediately inform PD at SPU level regarding the discover.
(ii) Demarcation and protection of the Discovery Site
With the approval of the respective EE of MI department at District level, the contractor is then required to temporarily demarcate, and limit access to, the site. Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remains, a guard should be present until the responsible authority takes over.
(ii) Reporting to Archaeological Survey of India (ASI)
The responsible archaeologist in the Archaeological Survey of India (ASI) should be immediately notified, who in turn should notify the responsible authorities, the ASI and local authorities (within less than 24 hours). Responsible authorities would oversee protecting and preserving the site before deciding on the proper procedures to be carried out.
(iii) Continuation or suspension of works: The significance and importance of the findings will be assessed per various criteria relevant to cultural heritage including aesthetic, historic, scientific or research, social and economic values. Decision on how to handle the finding will be reached based on the above assessment and could include changes in the project layout (in case of finding an irrevocable remain of cultural or archaeological importance), conservation, preservation, restoration or salvage. Implementation of the authority decision concerning the management of the finding. Construction work could resume only when permission is given by ASI after the decision concerning the safeguard of the heritage is fully executed. The relevant findings will be recorded in the EMP monthly progress report, and quarterly safeguards report to the World Bank to assess the overall effectiveness of the project's cultural property mitigation, management, and activities, as appropriate.
(iv) Delay in works: In case of delay incurred in direct relation to Archaeological findings not stipulated in the contract (and affecting the overall schedule of works), the contractor may apply for an extension of time. However, the contractor will not be entitled for any kind of compensation or claim other than what is directly related to the execution of the archaeological findings works and protections
(v) Inclusion of management provision in contract documents: These procedures must be referred to as standard provisions in construction contracts, when applicable. During project supervision, the Site Engineer shall monitor the above regulations relating to the treatment of any chance find encountered are observed.

***(v) Reporting in EMP progress report*:** The relevant findings will be recorded in the EMP monthly progress report, and quarterly safeguards report to the World Bank to assess the overall effectiveness of the project's cultural property mitigation, management, and activities, as appropriate.

3.3. Institutional Arrangement for PCR Management

Table2. Institutional arrangement for PCR management

	Implementation	**Supervision/Verification**
Screening	SPU Environment Specialist EE MI Division	
Consultation	EE MI Division SPU Environmental Specialist SPU EE (Monitoring)	SPU Environmental Specialist SPU EE (Monitoring)
Environmental Management Measures for existing PCRs	Contractor	EE MI Division SPU Environment Specialist SPU EE (Monitoring)
Environmental Management Measures for chance finds	Contractor EE MI	SPU Environment Specialist PD SPU

3.4. Capacity building

Contractor, SPU and district staff involved in execution of the project shall be briefed on the basics of physical cultural resources management plan. The training shall aim at enabling non-experts in physical cultural resources to identify, prevent damage to physical cultural resources, record and report whenever they encounter any Chance finds according to the provisions of this plan.

Minutes of the Appraisal and Sharing Workshop on Environmental and Social Management Framework (ESMF) for OIIPCRA

Organized By: SPMU-OIIPCRA, OCTDMS.

Venue: Conference Hall of OCTDMS.

Date: 11.30 am, 12th April, 2019.

"Environmental and Social Management Framework (ESMF)" is prepared as a safeguard policy document for implementation of the OIIPCRA project. In observance of the Bank's requirement to be disclosed to public as well as to the stake holders under the project, a limited exposure to the draft frame work document on Environment & Social Management had been organized through a workshop on 23.3.2019 with the State Project Management Unit officers. The draft ESMF document was already disclosed in the DoWR website since 18.3.2019. To share the ESMF disclosure document more intensively, a State Level Workshop was organised on 12.4.2019 to which the state level as well as many of the district level stake holder officers were invited to the event. The Additional Project Director (Engg), Project Engineers and thematic experts of OCTDMS along with team members of CTRAN Consultancy were present in the discussion. The name of the stakeholders/ officers which include the Engineers of Minor Irrigation Divisions under the project and also outside of the project, Agriculture Department, Fisheries, OUAT and World Fish attended the disclosure is annexed herewith.

The Additional Project Director (Engg) introduced the scope of the project along with its social and environmental impact aspects in brief to the participants followed by a detailed power point presentation by CTRAN.

Dr. Ashok Kumar Singha, Managing Director, CTRAN on-behalf of the CTRAN Consultancy who assisted in preparing the document briefed the contents with key environmental and social related issues and its management framework. All the relevant aspects of ESMF was discussed and disclosed to the participants. Discussion also evolved on how the project is to address the issues relating to indigenous communities.

Specific baseline issues, potential impacts due to planned project activities in relation to environment and its mitigation measures were discussed thoroughly during presentation. Baseline findings like presence of any significant environmental features, saline, heavy metal, iron, fluoride and chloride affected project blocks, use of pesticides and fertilizers, pisciculture practice and diseases, condition of MI tanks and irrigation structures were elaborated. Justification of triggering conditions for each Operational Policies (OPs) of the World Bank was discussed with special emphasis.

The stakeholders participated with interest in exchanging views and questions on

various provisions in the framework. The participants agreed to pass it on to their subordinate officers for its observance in the field. As per suggestion by the participants present it was proposed to organize the disclosure at district level & community level for wide dissemination in the project districts involving the civil society participants, NGOs after the election code of conduct is over.

The Issues raised by the participants are listed herewith:

- Tribal people from command area as well as surrounding area shall be included in project designing stage. They should be considered during selection of beneficiaries for project activities.
- Whether any activity at catchment area is proposed under OIIPCRA.
- What is the requirement of preparing IIAP, when DIAP is being designed at the district?
- Whether any de-siltation of MI tank will be carried out? If so, silt disposal plan shall be devised for proper management of silt.
- Worldfish suggested exploring the possibility of promoting pisciculture in MI tanks where sufficient water is not available throughout the year? World fish
- Whether composite or random sampling was adopted for selection of 9 number of MI tanks considered for environmental assessment. Based on which criteria this MI tanks were selected?
- Is there any large dam considered under OIIPCRA project? How SDSO are engaged for monitoring of large dams considered under OIIPCRA?
- Any MI tank considered under OIIPCRA located nearby area or any of project activities proposed in the nearby area of any eco sensitive zone where IUCN Red listed endangered species may be found then sufficient mitigation measures shall be adopted to eliminate or minimise any impact on it. Night time civil construction activities may lead to bird mortality of migratory species.
- Organic waste converter or demonstration of on-field microbe decomposition may be promoted to manage issues related to burning of paddy straw.

The meeting was concluded with a request to everyone present to submit their personalised suggestions to this office by 1st of May' 2019 in order to review and incorporate the same in the framework.

12.04.19

Additional Project Director, (Engg) -cum-

Chief Engineer, M&E, DoWR.

Annexure

SHARING & DISCLOSURE WORKSHOP ON 'ENVIROMENT & SOCIAL MANAGEMENT FRAME WORK' UNDER OIIPCRA

VENUE: Conference Hall of OCTDMS

Date: 12th April 2019, 11.30 am

SL	Name of Participant	Designation	Contact No	Contact e-mail	Signature
1	Nagendra Kumar Mallick	~~AAO~~ cum-Nodal officer of OIIPCRA	9438080860	nagenmallick@gmail.com	
2	Arjuna charan Sahu	Joint Quality Control Inspector O/o-DDA, Cranjam	9437646350	arjunasahu1963@gmail.com	
3	Nimai charan Das	AAO (Depnt.), O/o DDA Ganjam	9437434372	Nimai charan Das @gmail.com	12.4.19
4	Nilakantha Padhi	~~XEN~~ AEE, M.I. Sub Div. Udala.	7978100196	nrpadhi2016@gmail.com	12/4/19
5	Akshaya Kumar Samantaroy	A.E.E, M.I. Sub Div Bangiripos:	9437190568	akshaya-9133@gmail.com	12/4/19
6	Sanjay Kumar Mohanty	EE, Minor Irr Division, Jashipur	9437177667.	eemijashipur@yahoo.com	12/4/19
7	Jagat Jyoti Satpathy	E.E. Minor Irr. Div., Khordha.	9437115962	eemidkhurda@yahoo.co.in	12/4/19
8	Basanta Sekhar Panda	E.E. M.I. Cuttack	9437/258779	eemidcuttack@yahoo.co.in	12/4/19
9	Manas Ranjan Nath	E.E. M.I. Div" Ganjam NO-II Berh	94374-13327	mi2-exe.engr@yahoo.co.in	12/4/19
10	Nihar Ranjan Bishoyi	Asst. SXE MI Div Anandapur/Keonjhar	9937587849	nihar.civil24@gmail.com	12-4-19
11	Mamata Mohapatra	DFO, Kendrapara	8280059651	dfokendraparа@gmail.	12/4/19
12	Abhisek Mohanty	Consultant C-TRAN	7978633950	abhisek.mohanty@ctran.com	

Annexure

13	Arundhati Panda	CTRAN	8280049614	arundhati.panda@ctranconsulting.com	
14	Suresh Ch. Jena	J.E, M.I. Section Chilika (Gm-I)	9437266006	sureshjena2012@gmail.com	
15	Uma Sankar Sethy	A.E. M.I. Section Hinjili	9438722411	umasankar.vs28@gmail.com	
16	Narasingha Charan Dash	J.E., M.I. Section Rushemari (Gm-I)	8270903120	nedashid@gmail.com	
17	Pradeep Kumar Panda	AEE MI Bhajanagar	9437217740	pradeepkp63@gmail.com	12/4/19
18	Gopal Krishna Das	EE (MI) Div Ganjam I	9437857941	grdas1961@rediffmail.com	12.4.19
19	Sadananda Mahapatra	DDF. Bolangir	9437454598	ddfbzbolangir@gmail	
20	Jagadish Ch. Pande	DFO, KHORDHA	9437269613	dfokhordha2011@gmail.com	
21	P.K. Panigrahi	Addl, OPDC	9583815841	mdopdc@gmail.com	
22	S.N. Chinara	Officer In-Charge OPDC INCP Plant	9437749373.	opdc_orissa@yahoo.co.in	
23	SUMIT DASH	ASST. MANAGER (TECH) OPDC NET UNIT	8270440723	opdc_orissa@yahoo.com	
24	P.K. Dey	D.F.O, SDB Sub Basin	9337039164		
25	Dr. R. Mishra	Professor, College of Fisheries	9437633770	rabinmishrafishery@gmail.com	12/4/19
26	Dr. S. Nanda	Prof. & Director in charge, College of Fishery	9437389929	dsamyukta.nanda@rediffmail.com	12/4/19
27	Dr. S.K. Udgata	Prof, College of Fisheries, Ranital	9437480688	udgatask2002@gmail.com	12/4/19

Annexure

28	Sarat Ch. Behera	Asst. Director Horticulture, Ganjam	9437132770	ddhganjam@gmail.com	
29	Bhubaneswar Jena	DPD ATMA, Khordha c/o DD, Khordha	9438326325	ddakhu.dag@nic.in	
30	Dr. Sanat Mishra	Sr. Scientist, DWM, CHES, Bhubaneswar	9439831414	mishrasanat@yahoo.com	
31	Bhaskar Baruk	DDA Khurda	9438500070	aaobhaskarbaruk@gmail.com	
32	Dr. L.M. Garnayak	Professor, OUAT	9861155313	lmgarnayak@yahoo.co.in	
33	Dhiren Kumar Samal	APD, OIIPCRA	9437031011	samaldk@yahoo.co.in	
34	Dr. Ashok Kumar Das	MD, CTRAN	94370-67019	ashoc1@yahoo.com	
35	Dr. Indramani Dhada	Env Expert, OIIPCRA	800 5382785	idhada@gmail.com	12/4/19
36	Dr. Pradeep Kumar Sarangi	Sr. Analyst, CITL, Co-ordinator C.C.CEN DAFP (O)	9437280974	sranalyst.dap@nic.in	12.4.19
37	Dr. D.N. Biswal	Chief Dist. Vety. Officer, Rayagada	9238875751	dbendvaci@yahoo.co.in	12/4/19
38	Prof. P.K. Rout	Dean Extension, OUAT, Bhubaneswar	9937563162		
39	Dr. Arun Padiyar	Project Manager Worldfish Project	9778312868	a.padiyar@worldfishcenter.org	
40	Sisanta Ku. Panda	ATO (Trg) O/o D.H. (O)	9437283785	ahobinit2016@gmail.com	
41	Dr. Jayanta Ku Nayak	ADH, COF, Dera	9438298921	drjayanta1969@gmail.com	

Annexure

42	Dinendra Kumar Samal	AEE	9438445230		DS — amal
43	P. S. Acharya	AEC, OUIPCRA	9437006700	[illegible] gmail.com	[illegible]
44	B. P. Dwivedy	OUIPCRA	7328073555	abcdwivedy@gmail.com	[illegible]
45	K. K. Subudhy	AEE	9861072945	cr.kksubudhy@gmail.com	[illegible]
46	B. S. S. Patro.	EE, OUIPCRA	9437261684	bsspatro@gmail.com.	[illegible]
47	Suraj kumar Roy	Manager Accts	9437655246	[illegible]	[illegible] 14/11/19
48	Archaya Kumar Jena.	D.O. OCTDMS	7504179795	—	[illegible]
49	Mahata Rupal Behera	Multiskill Asst, OCTMP	9776039868	mahata.behera@redoffmail.com	[illegible]
50	Manoranjan Sahoo	IS ICB Expert	9937017354	cbis.oiipcra@gmail.com	[illegible]
51	Sudharanjan Samal	Agro-Economist, OUIPCRA	9439615130	sasamal67@gmail.com	[illegible]
52	Sudhanshu Ku. Nanda	Agronomist. SPU.	9861124871	Sudhanshunanda1964@gmail.com	[illegible]
53					
54					
55					
56					

Figure 1 Group discussion with women SHG at BISIPUR MIP

Figure 2 Consultation at irrigation disvision for Cradigappa MIP

Figure 3 Group discussion with fisher folks at Ganjam MIP

Figure 4 Consultation with PP members at khaibandh MIP

Figure 5 Group discussion with women SHGs at Talakholaghai, Mohanpur MIP

Figure 6 Consultation with Pani Panchayat members of Bisipur MIP

Figure 7 Group discussion with SHG at Dandrabahal MIP

Figure 8 KII with Fertiliser and Pesticide distributor at Chandahandi MIP

Figure 9 Group discussion with Ganga Jamuna Pani Panchayat at Dandrabahal MIP

Figure 10 KII with Fertiliser traders at Bhawanipatna for Jamunasagar MIP

Figure 11 Image of Talakholaghai Mohanpur MIP Tank

Figure 12 Image of Bisipur MIP Tank during visit

Figure 13 Image of catchment area of Khaibandh MIP

Figure 14 Image of Khaibandh MIP Tank

Figure 15: ESMF sharing workshop on 23rd March, 2019

Figure 16: ESMF sharing workshop on 23rd March, 2019

Figure 17: ESMF sharing workshop on 23rd March, 2019

Figure 15: ESMF sharing workshop on 23rd March, 2019

Figure 16: ESMF sharing workshop on 23rd March, 2019

Figure 17: ESMF sharing workshop on 23rd March, 2019

Figure 1 Group discussion with women SHG at BISIPUR MIP

Figure 2 Consultation at irrigation disvision for Cradigappa MIP

Figure 3 Group discussion with fisher folks at Ganjam MIP

Figure 4 Consultation with PP members at khaibandh MIP

Figure 5 Group discussion with women SHGs at Talakholaghai, Mohanpur MIP

Figure 6 Consultation with Pani Panchayat members of Bisipur MIP

Figure 7 Group discussion with SHG at Dandrabahal MIP

Figure 8 KII with Fertiliser and Pesticide distributor at Chandahandi MIP

Figure 9 Group discussion with Ganga Jamuna Pani Panchayat at Dandrabahal MIP

Figure 10 KII with Fertiliser traders at Bhawanipatna for Jamunasagar MIP

Figure 11 Image of Talakholaghai Mohanpur MIP Tank

Figure 12 Image of Bisipur MIP Tank during visit

Figure 13 Image of catchment area of Khaibandh MIP

Figure 14 Image of Khaibandh MIP Tank

Figure 15: ESMF sharing workshop on 23rd March, 2019

Figure 16: ESMF sharing workshop on 23rd March, 2019

Figure 17: ESMF sharing workshop on 23rd March, 2019

CTRAN Consulting Ltd.
A1-A2, Lewis Plaza, Lewis Road
BJB Nagar, Bhubaneswar-14, Odisha