

Climate Adaptation in Wetlands along the Mahanadi River Catchment area in Chhattisgarh

Detailed Project Report

Submitted to

**National Adaptation Fund for Climate Change,
Ministry of Environment, Forest and Climate Change**

Submitted by

Government of Chhattisgarh



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Detailed Project Report (DPR) for funding under National Adaptation Fund for Climate Change

Title of Project/Programme: Climate Adaptation Strategies in Wetlands along Mahanadi River Catchment areas in Chhattisgarh
Project/Programme Objective/s: <ul style="list-style-type: none">➤ Develop baseline on climate change vulnerability to ecosystems and local livelihood in the project areas.➤ Promote an integrated climate adaptation strategy for wetlands and its dependent communities through water conservation and demand side management.➤ Improving adaptive capacity of farmers and other wetland dependent local communities.➤ Identify good practices and successes from this pilot project and develop knowledge products for wide dissemination for replications in wetland management across the State of Chhattisgarh.
Name of Executing Entity/ies/Department: State Centre for Climate Change
Project/ Programme Sector: Climate Change Adaptation
Beneficiaries: Farmers and wetland dependent communities along the Mahanadi River Catchment area in Chhattisgarh
Project Duration: 4 Years
Start Date: August, 2016 End Date: July, 2020
Amount of Financing Requested (Rs.): 24.95 Crore Project Location: Three wetland and watershed sites in central Chhattisgarh State: Chhattisgarh District: Dhamtari, Mahasamund and Baloda Bazar
Contact Details of Nodal Officer of the Executing Entity/ies/: Dr. Arvind A. Boaz, IFS Principal Chief Conservator of Forest & State Nodal Officer for Climate Change, Aranya Bhavan, Medical College Road, Raipur – 492001, Chhattisgarh Ph: 0771-2552221, Fax: 0771-2552210 Email: draboaz@yahoo.com

1. Project Background

1.1 Project Background and Context:

Brief State Profile:

Chhattisgarh, which is the 10th largest state in India, with an area of 135,190 km² (52,200 sq mi). The northern and southern parts of the state are hilly, while the central part is a fertile plain. Deciduous forests of the Eastern Highlands Forests cover roughly 44 percent of the state. In the north lies the edge of the great Indo-Gangetic plain. The Rihand River, a tributary of the Ganges, drains this area. The eastern end of the Satpura Range and the western edge of the Chota Nagpur Plateau form an east-west belt of hills that divide the Mahanadi River basin from the Indo-Gangetic plain. The central part of the state lies in the fertile upper basin of the Mahanadi River and its tributaries. This area has extensive rice cultivation.

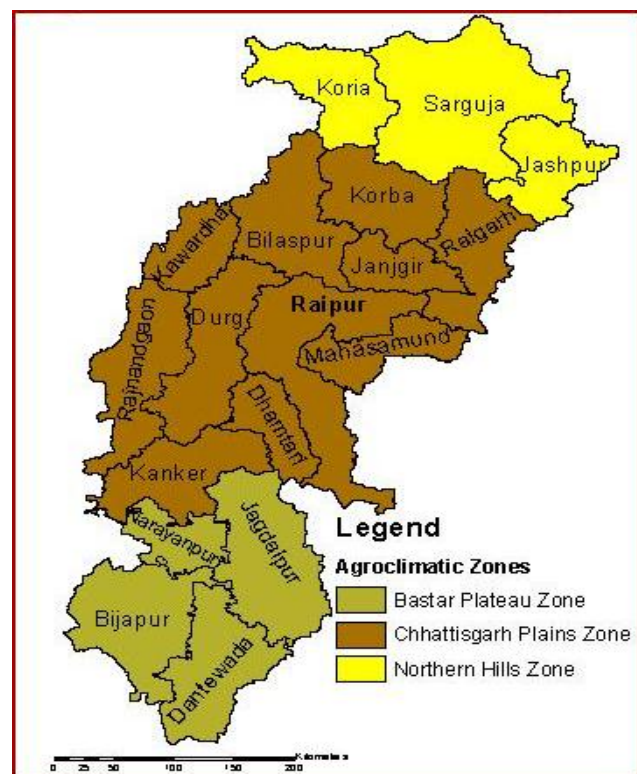
The climate of Chhattisgarh is tropical. It is hot and humid because of its proximity to the Tropic of Cancer and its dependence on the monsoons for rains. Summer in Chhattisgarh is from April to June and temperatures can reach 48°C (100°F). The monsoon season is from late June to October and is a welcome respite from the heat. Chhattisgarh receives an average of 1,292 millimetres (50.9 in) of rain. Winter is from November to January and it is a good time to visit Chhattisgarh. Winters are pleasant with low temperatures and less humidity. The temperature varies between 30 and 47°C (86 and 117°F) in summer and between 5 and 25°C (41 and 77°F) during winter. However, extremes in temperature can be observed with scales falling to less than 0°C to 49°C.

On the basis of regional topography Chhattisgarh region is divided into three agro-ecological regions, the Northern Hills, the Central Plains and the Bastar Plateau.

Figure 1: Chhattisgarh – agro-climatic zones

Northern Hills: The region harbours dense forests, hills and water reservoirs. It is home to several indigenous tribal communities such as Paharikorba and Pando, etc. Governed largely by tribal customs, culture and traditions, in the rural areas of the region, people are dependent largely on agriculture and non-timber forest produce (NTFP). The region is also rich and coal and other mineral resources.

Central plains: Mahanadi is the primary source of water for irrigation and domestic use in this region. Owing to the presence of large number of indigenous varieties of rice, the central plains of Chhattisgarh are known as the



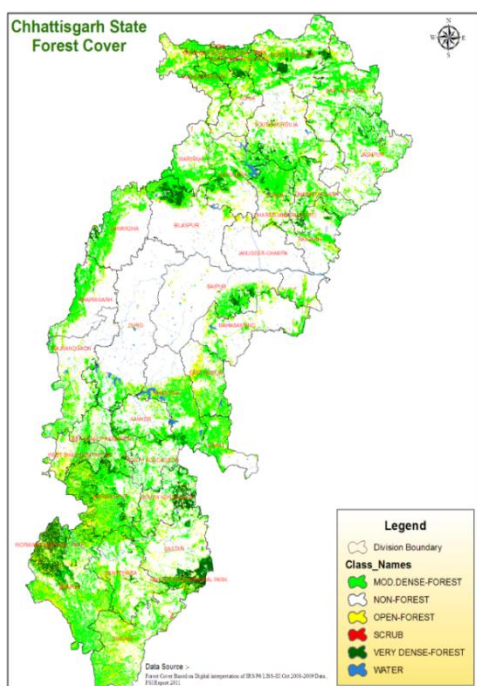
‘rice bowl’ of Central India. Bilai and Durg are well known urban areas, both with large steel plants. **Source: IGAU**

Bastar Plateau: The region is known for its varied and rich forests, diverse tribal population, and unique culture. The people of the region are dependent on traditional agriculture and forests for their livelihood. The Bailadila mines in Dantewada district represent the limited industry in the region.

Table 1: Agriculture profile

Agro Climatic Zone	Districts Included	Total Geo. Area	Net sown area	Irrigation %	Cropping Intensity
C.G. Plains (15 Districts)	Raipur, Gariaband, Balodabazar, Mahasamund, Dhamtari, Durg, Balod, Bemetara, Rajnandgaon, Kabirdham, Bilaspur, Mungeli, Korba, Janjgeer, Raigarh & a part of Kanker Districts (Narharpur & Kanker Block)	68.49 lakh ha. (50%)	32.95 Lakh ha.	43 %	139
Bastar Plateau (7 Districts)	Jagdalpur, Narayanpur, Bijapur, Kondagaon, Dantewada, Sukma and the remaining part of Kanker Districts	39.06 lakh ha. (29%)	6.40 Lakh ha.	5 %	122
Northern Hills (5 Districts)	Sarguja, Surajpur, Balrampur, Korias, Jashpur & Dharamjaigarh Tehsil of Raigarh Districts	28.47 lakh ha. (21%)	8.35 Lakh ha.	11 %	135

- In 2011, nine more districts were created, taking total number of districts to 27 from 18.



Rich Forest Reserves: Over 44% of the geographic area is recorded forest area (59,772 km²) representing an important carbon sink for India. As per Champion & Seth Classification, the state has ten forest types that belong to two forest type groups viz. Tropical Moist Deciduous and Tropical Dry Deciduous.

Figure 2: Forest Cover Map of Chhattisgarh

Source: Chhattisgarh SAPCC

1.2 Wetlands in Chhattisgarh

Area estimates of various wetland categories for Chhattisgarh have been carried out using GIS layers by the Space Application Centre and data on wetland boundary, water-spread, aquatic vegetation, and turbidity is available. Total 7711 wetlands have been mapped at 1:50,000 scale in the State. In addition, 27823 wetlands (smaller than 2.25 ha) have also been identified and delineated as point feature. There is a significant reduction in the extent of open water from post-monsoon to pre-monsoon. It is reflected in all the wetland types (Table 2).

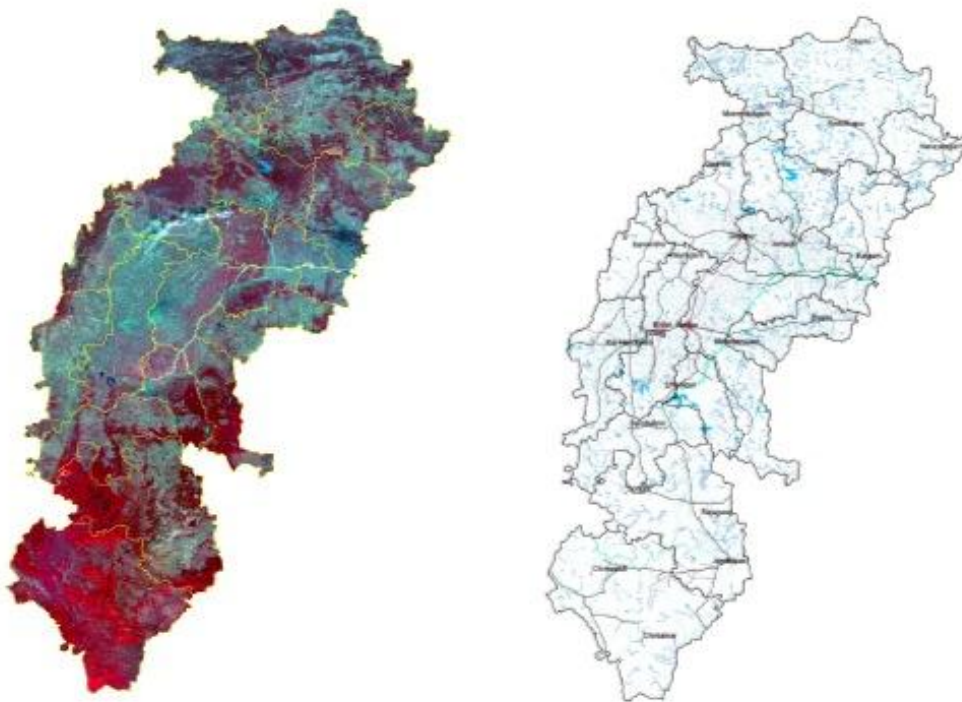


Figure 3: Wetlands of Chhattisgarh

Source: National Wetland Atlas, 2010, produced by Space Application Centre

Table 1: Area estimates of wetlands in Chhattisgarh

Sr. No.	Wetland Category	Number of Wetlands	Total Wetland Area	% Of wetland area	Open Water	
					Post-monsoon Area Sq. Km	Pre-monsoon Area Sq. Km
Inland Wetlands- Natural						
1	Lakes/Ponds	-	-	-	-	-
2	Ox-bow lakes/ Cut-off meanders	6	26	0.01	26	13
4	Riverine wetlands	8	174	0.05	83	76
5	Waterlogged	-	-	-	-	-
6	River/Stream	156	179088	52.99	124712	93095
Inland Wetlands -Man-made						
7	Reservoirs/Barrages	604	90389	26.74	85148	54012
8	Tanks/Ponds	6906	40226	11.90	33671	26366
9	Waterlogged	31	240	0.07	174	116
	Sub-Total	7711	310143	91.77	243814	173678
	Wetlands (<2.25 ha), mainly Tanks	27823	27823	8.23	-	-

Source: National Wetland Atlas, 2010, produced by Space Application Centre

1.3 Brief Profile of Wetlands in the three districts:

MAHASAMUND

Mahasamund district is spread out in an area of 4702 sq.kms. The district lies in between 20°31'30" latitude and 80°00 to 83°15'45" longitude. Granite rocks can be found in Bagbahra, Basna and Pithora region. District comprises 732 wetlands accounting for 16557 hectare. This includes the small wetlands (<2.25 ha), which are 1743. In terms of area, these small wetlands constitute a significant fraction of wetlands extent (10.53%) assuming that each wetlands would be on an average 1 ha in extent. The river/stream category ranked first in terms of extent (about 37%) comprising 6136 ha of area followed by reservoir/ barrage (4829 ha) and Tank/Pond (3835 ha). The seasonal reduction in open water spread is observed to be 11468 ha in post monsoon got reduced to 6857 ha in pre-monsoon.

Area under aquatic vegetation is less, around 508 ha during post-monsoon season and 2312 ha during pre-monsoon. Detail of estimates of wetlands in Mahasamund are given in Table below

Area estimates of wetlands in Mahasamund

Sr.No	Wettcode	Wetland Category	Wetland Number	Total wetland area	% of wetland area	Open Water		
						Post-Monsoon Area	Pre-Monsoon area	
	1100	Inland wetland- Natural						
1	1101	Lakes/Ponds	-	-	-	-	-	-
2	1102	Ox-bow lakes/cut-off meanders	-	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-	-
4	1104	Riverine Wetlands	2	14	0.08	10	11	
5	1105	waterlogged	-	-	--	-	-	
6	1106	River/Stream	8	6136	37.06	3916	1643	
	1200	Inland wetlands –Man-made						
7	1201	Reservoirs/Barrages	51	4829	29.17	4598	2585	
8	1202	Tanks/Ponds	671	3835	23.16	2944	2618	
9	1203	Waterlogged	-	-	-	-	-	-
10	1204	Salt pans	-	-	-	-	-	-
		Sub-total	732	14814	89.47	11468	6857	
		Wetland(<2.25ha) , mainly tanks	1743	1743	10.53	-	-	-
		Total	2475	16557	100.00	11468	6857	-

Area under Aquatic Vegetation	508	2312	-
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Area under turbidity levels		
Low	3096	4161
Moderates	7216	1801
High	1156	895

RAIPUR (Baloda Bazar district was part of Raipur, during the Wetland survey)

Raipur districts is situated on the fertile plains of Chhasstigarth region. The district is divided into two major physicals divisions, namely the Chhasttigarth plain and hilly areas. The chief crop of this region is paddy. Raipur is biggest city of the region and a fast developing important industrial centre. Mahanandi is the principal river of this districts. The total geographical area of the districts is 12507 sq.km.

Districts comprises 1201 wetlands accounting for 44211 ha. This includes the small wetlands (<2.25 ha), which are 4567. In terms of area, these small wetlands constitute a significant fraction

of the wetland extent (10.3%) assuming that each wetlands would be on an average 1 ha in extent. The river/stream category ranked first in terms of extent (about 57%) comprising 25231 ha of area followed by reservoir/barrage (7527 ha) and tank/ponds (6768 ha). The seasonal reduction in open water spreads is observed to be 26783 ha in post monsoon got reduced to 18739 ha in pre-monsoon.

Area under aquatic vegetation is very less around 181 ha during post-monsoon season and 2130 ha during pre-monsoon. Quantitative turbidity of water is mainly, moderate in pre-monsoon and low-monsoon seasons. Details of estimates of wetland in Raipur are given in Table

Area estimates of wetlands in Raipur

Sr.No	Wettcode	Wetland Category	Wetland Number	Total wetland area	% of wetland area	Open Water		
						Post-Monsoon Area	Pre-Monsoon area	
	1100	Inland wetland- Natural						
1	1101	Lakes/Ponds	-	-	-	-	-	-
2	1102	Ox-bow lakes/cut-off meanders	-	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-	-
4	1104	Riverine Wetlands	4	61	0.014	34	31	
5	1105	Waterlogged	-	-	--	-	-	
6	1106	River/Stream	13	25231	57.07	14412	10947	
	1200	Inland wetlands –Man-made						
7	1201	Reservoirs/Barrages	82	7527	17.03	6971	3696	
8	1202	Tanks/Ponds	1104	6768	15.31	5323	4043	
9	1203	Waterlogged	7	57	0.13	43	22	-
10	1204	Salt pans	-	-	-	-	-	-
		Sub-total	1210	39644	89.67	26783	18739	
		Wetland(<2.25ha) , mainly tanks	4567	4567	10.53	-	-	-
		Total	5777	44211	100.00	26783	18739	-

Area under Aquatic Vegetation	181	2130	-
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Area under turbidity levels		
Low	3649	10899
Moderates	20524	6743
High	2610	1097

DHAMTARI

The total geographical area of the district is 4049 sq.km. The district comprises 191 wetlands accounting for 26909 ha. This includes the small wetlands (<2.25 ha), which area 1134. In terms of area, these small wetlands constitute a significant fraction of the wetlands extents (4.21%) assuming that each wetlands would be on an average 1 ha in extent. The reservoirs category ranked first in term of extent (about 57.6%) comprising 15506 ha of area followed by river/ stream (9429 ha) and tank/pond (840 ha). The seasonal reduction in open water spreads is observed to be 19676 ha in post- monsoon got reduced to 11891 ha in pre-monsoon.

Area under aquatic vegetation is very less, around 52 ha during post monsoon season and 2981 ha during pre-monsoon. Quantative turbidity of water is mainly moderates in post-monsoon and low-pre-monsoon seasons. Detail of estimates of wetlands on Dhamtari are given in table.

Area estimates of wetlands in Dhamtari

Sr.No	Wettcode	Wetland Category	Wetland Number	Total wetland area	% of wetland area	Open Water		
						Post-Monsoon Area	Pre-Monsoon area	
	1100	Inland wetland- Natural						
1	1101	Lakes/Ponds	-	-	-	-	-	-
2	1102	Ox-bow lakes/cut-off meanders	-	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-	-
4	1104	Riverine Wetlands	-	-	-	-	-	
5	1105	waterlogged	-	-	--	-	-	
6	1106	River/Stream	15	9429	35.04	3584	1398	
	1200	Inland wetlands –Man-made						
7	1201	Reservoirs/Barrages	14	15506	57.62	15388	9886	
8	1202	Tanks/Ponds	162	840	3.12	704	607	
9	1203	Waterlogged	-	-	-	-	-	-
10	1204	Salt pans	-	-	-	-	-	-
		Sub-total	191	25775	95.79	19676	11891	
		Wetland(<2.25ha) , mainly tanks	1134	1134	4.21	-	-	-
		Total	1325	26909	100.00	19676	11891	-
Area under Aquatic Vegetation						52	2981	-
Area under turbidity levels								
Low						4778	9174	
Moderates						14210	2670	
High						688	47	

2. Brief information on the problem the proposed project is aiming to solve

The Chhattisgarh State has five river basins in a geographical area of 1,35,100 Sq Km. The Mahanadi Basin covers 75,858.45 Sq Km, Godavari basin 38,694 Sq Km, Ganga Basin 18406 sq km, Brahmani basin 1394 Sq km and Narmada basin covers 743 sq km. At present only 22% is being used for irrigation, industrial and domestic purpose. Similarly 13,678 MCM of ground water is available, of which 20% has so far been harnessed. (WRD, 2012)

The Mahanadi River Basin covers more than 50% of the total area of Chhattisgarh. It is the lifeline of the State, supplying drinking water to the largest cities and providing water resources for farmers and most of the state's industrial production. Its importance is such that any future variability in water availability in the basin due to climate change or other factors will pose a serious risk to livelihoods and economic productivity. The river is also important for irrigation, industry use and drinking water supply in Chhattisgarh and neighbouring state Odisha.

Studies on the impact of climate change on water resources across India show a current and projected future decrease in water availability in major basins, as well as increased runoff due to land use changes (Mall et al., 2006). At the same time an increase in incidence of extreme rainfall is expected to produce more floods. Initial research suggests that the Mahanadi River is particularly vulnerable to incidence of flooding, although particularly in the part of the river flowing through Odisha, as well as increased runoff in September and drought in April (Gosain et.al, 2006 & 2011; Asokan and Dutta, 2008). Without increased water storage facilities, higher runoff would result in reduced water availability, and together with increased drought conditions, is likely to impact industry operations as well as potentially drinking water availability.

The Government of India has recognised the risk of future water availability and the National Water Mission recommends integrated water resources management for the conservation of water, minimising wastage and ensuring equitable distribution both across and within the states. However, the Government of Chhattisgarh faces a number of challenges to effective water resource management in the Mahanadi River Basin, in particular:

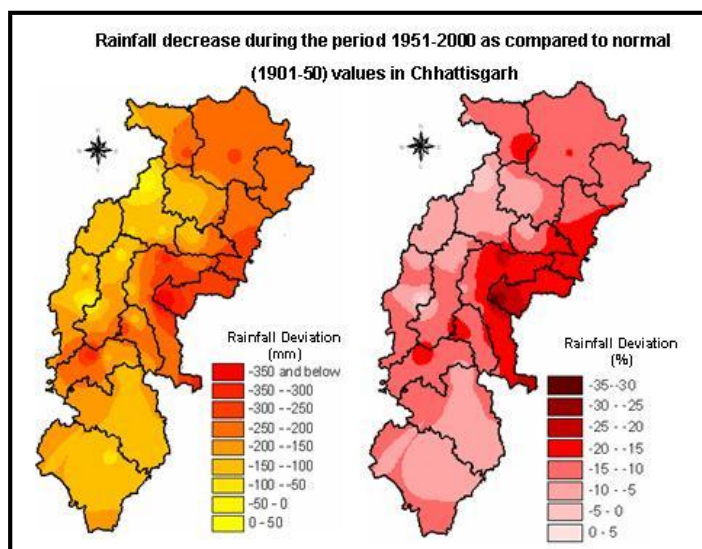
- Lack of reliable data and analysis on current and projected future availability of water resources in the Mahanadi River Basin, under climate change scenarios;
- Lack of understanding and awareness of vulnerability of water resources from climate change and increased demand;
- Water storage, and construction of dams/embankments and reservoirs or other water harvesting techniques for flood control and drought management have significant economic costs;
- Lack of demand side management practices
- Inadequate institutional capacity to monitor and manage water resources in the river basin, including allocation of water to different users.

- Sustainable use of wetlands in the basin for biodiversity conservation and local livelihood support
- Lack of climate smart agriculture practices among the farmers in the Catchment area

“The pilot project aims to identify impacts of climate change in ecosystems and communities in three wetland sites along Mahanadi River Catchment Area in Chhattisgarh and promote climate adaptation through water conservation and demand management and improve adaptive capacity of farmers and other wetland dependent vulnerable communities. The success of this pilot project will help in developing better strategies for wetland management in Chhattisgarh”.

3. Climate Change and vulnerability analysis in Chhattisgarh and project sites.

Current and historic rainfall variability: Chhattisgarh receives an average of 1,292 millimetres (50.9 in) of rain, mostly during the monsoon season (June-Oct). Historical rainfall patterns during the past century have been studied across the state – see Figure 4.¹ It shows that in some districts like Raipur, Mahasamund, Raigarh there has been a significant decrease in average rainfall. The timing of rainfall is very important. Rainfall in June is extremely important for commencement of sowing, and crops are sensitive to any changes in rainfall patterns. For example for long duration paddy, weeding and biasi operations as well as plant growth need at least 50mm rain per week, without a gap of more than 7-9 days between the rainy days, throughout the months of June-September.

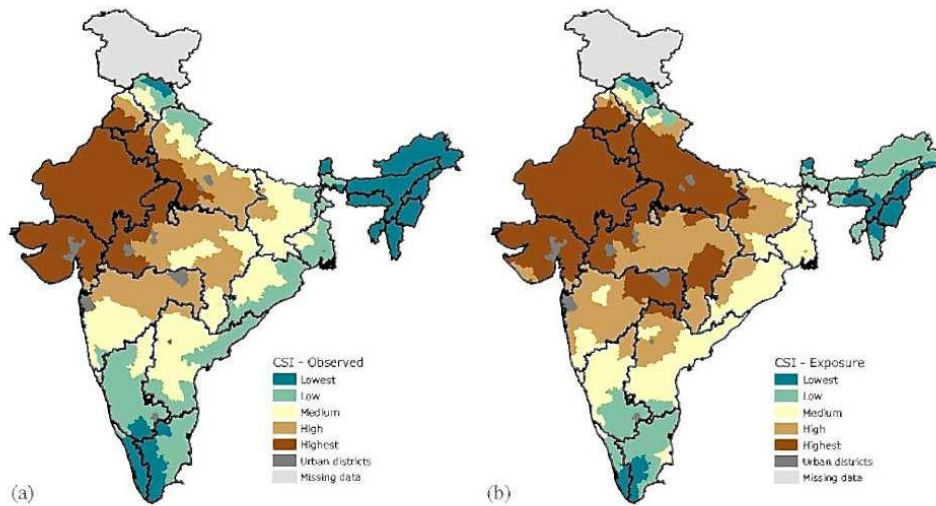


a) **Current and historic temperature trends:** Chhattisgarh has a tropical climate due to its proximity to the Tropic of Cancer and dependence on monsoon rains. Temperatures can reach 48°C in summer (April – June), and drop to as much as 5°C in winter (Nov-June) although further extremes have been observed. Almost 16 districts covering the Bastar Plateau and Central plains have been identified as being prone to droughts (Gupta, 2002).

b) **Future impacts and vulnerability to climate change:** There is no comprehensive study on the projected impact of climate change in Chhattisgarh in different sectors. However, from regional and global trends it is possible to identify trends. Using World Climate Data Centre model for present using data (1950-2000) and IPCC AR5 future climate change projections, it suggests a possible increase in temperature by up to 2 degrees by 2050 in Chhattisgarh. While annual average rainfall is expected to decrease, there is a projected increase in extreme rainfall events. National and global studies suggest that the current trend of changing weather patterns, with an erratic start date for the rains, will continue, which will

¹ For the period 1901-2000 Indira Gandhi Agriculture University in Raipur used statistics from about 40 rain gauge stations located in different districts of Chhattisgarh to compare differences in rainfall patterns during 1900-1950 and 1951-2000, and prepare GIS maps.

have a large impact on agricultural productivity (as discussed above). Some studies have suggested that Chhattisgarh is particularly vulnerable to these impacts. For example, O'Brien et al. (2004) used the example of Indian agriculture to examine regional vulnerability to climate change in combination with other global stressors. The results of the study show Chhattisgarh region to be among the most sensitive regions to climate change, especially in agriculture sector.

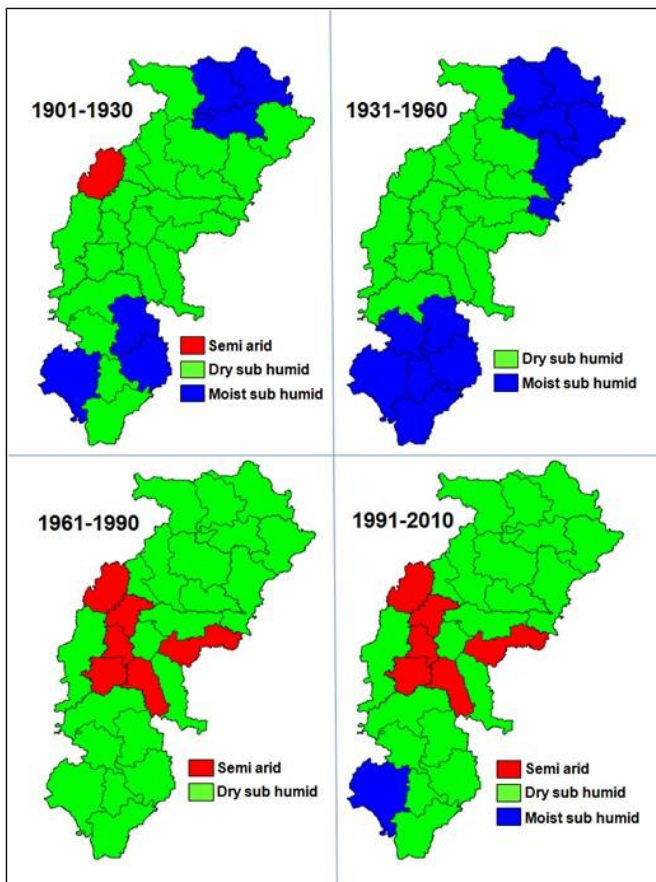


Source: Brien et al. 2004

Climate Change pressure

- This includes declining annual rainfall, increase in summer temperatures, and delay in monsoon rains, extreme rainfall events, and failure in monsoon causing droughts.
- This affects overall hydrological cycle on wetland recharging capacity

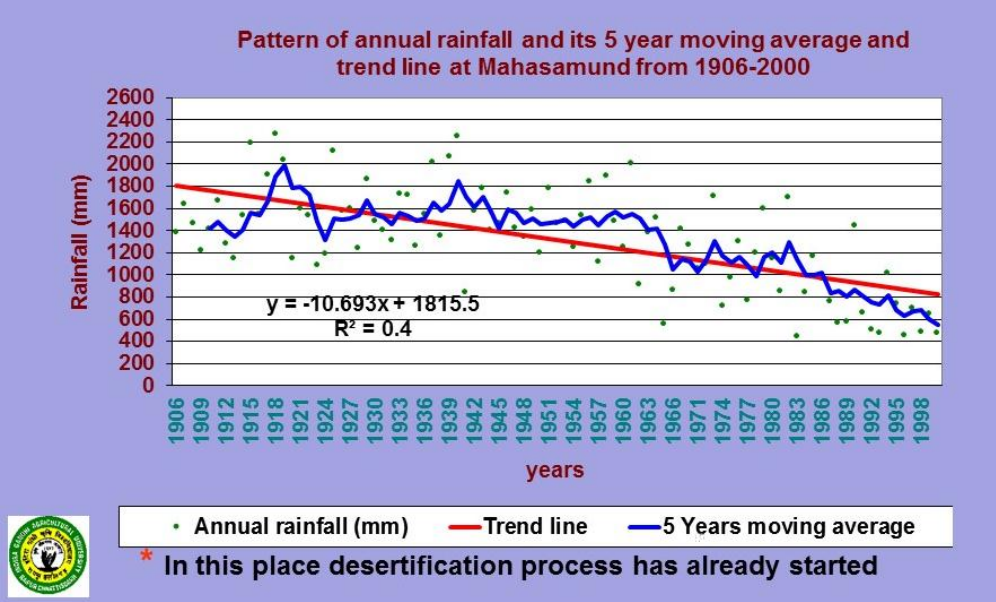
Level of urgency and risks arising from delay in conceptualizing adaptation Strategy:



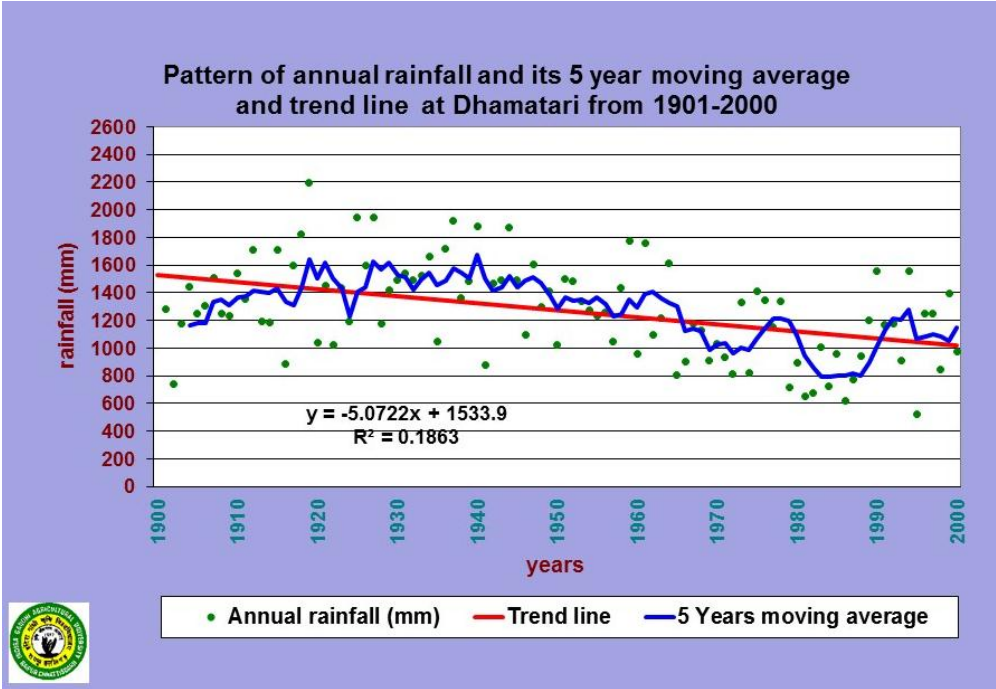
Source: Indira Gandhi Agriculture University

The Indira Gandhi Agriculture University has observed from over 50 year rainfall data analysis that the Districts of Baloda Bazar, Mahasamund and Dhamtari are facing more rainfall changes. Due to declining rainfall pattern the districts agro climate is moving from Sub Humid to Semi Arid.

There is also reported changes in crop sequences in these districts by the Agriculture University studies. The declining rainfall pattern can in future affect the crop production, drinking water supply and local livelihood of the region. Thus immediate intervention is required.



Declining Rainfall pattern in Mahasamund District

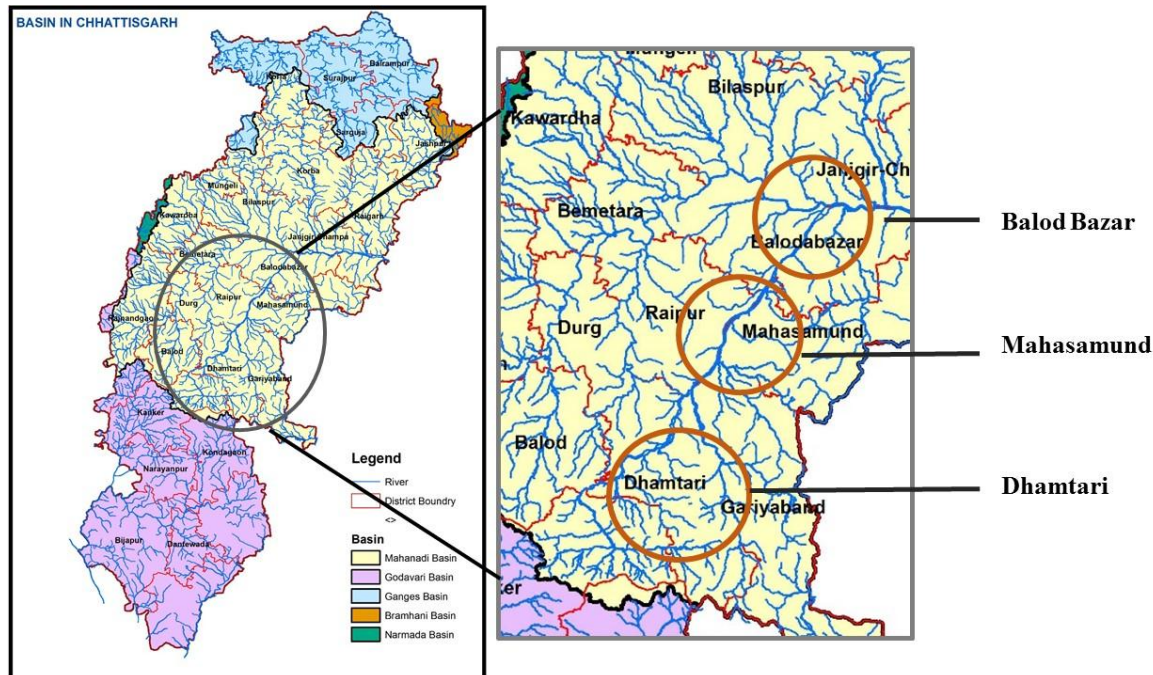


Declining rainfall pattern in Dhamtari District

Source: Indira Gandhi Agriculture University, Raipur

4. Project Location Detail; Block/Tehsil/District

The project will develop specific climate adaptation strategies at three project sites along the catchment area of Mahanadi river basin in Chhattisgarh.



Source of Basin Map: Hydrology Project, Chhattisgarh Water Resources Department

4.1 Site Selection:

Using the maps of watershed developed by Chhattisgarh Council on Science and Technology (Annexures), the sites were identified in the three districts in discussion with Divisional Forest Officer, District Water Shed officer and other officials exact sites within the district was selected

The criteria for site selection includes

- Sites that has more of vulnerable communities like marginal farmers and forest dependent communities.
- Has a mix of forest, agriculture and wetlands
- Where water resources and wetlands have shown decline, thus affecting agriculture and local livelihood.
- The watershed area will be around 5000-10000 ha per site where “Ridge to Valley” concept and climate smart wetland management through demand side management on as an adaptation strategy can be implemented.

Accordingly following sites are identified in the three districts

Sl. No.	District	Forest Range	Watershed Code	Proposed treatment area
1.	Baloda Bazar	Arjuni	4G2E6	6000 ha
2.	Mahasamund	Mahasamund	4G2F3	6000 ha
3.	Dhamtari	Dugli	4G2G3	8000 ha
		TOTAL		20,000 ha

In each of site one wetland in each of the below category will be selected for the project.

Natural Wetlands: Riverine Wetlands & Rivers/ Streams (Tributary of Mahanadi)

Artificial Wetlands: Reservoirs/ Barrages, Tanks/Ponds, Waterlogged land

The three district profile on land use, population density, water bodies and watersheds along with code classification as per Government of India Integrated Water Shed Programme are given in Annexure II of this proposal.

Demographic profile of the project areas

Chhattisgarh State has a total population of 2.55 Crore as per 2011 census. The rural population was 1.96 Crore (0.78 Crore Scheduled Tribe). The Human Development Index was measured as 0.35 in 2009-10, which is one of the lowest in India. Much of population in Chhattisgarh are poor and vulnerable, primarily due to the large tribal populations who have less secure livelihoods, and less access to modern infrastructure, education and health care facilities.

District Name	Total Population Person	% SC Popl.	% ST Popl.	% Illiterate population	% Working Population	% Marginal cultivator of working population	% Marginal Agri labourers of Working Population
Dhamtari	662403	7.00	29.09	32.86	52.46	3.86	12.43
Mahasamund	913232	13.23	29.59	39.49	49.89	6.10	26.28
Raipur	2635532	20.27	15.59	39.91	46.89	6.25	27.63

Source: Census, 2011

5. Project objectives:

- Develop baseline on climate change vulnerability to ecosystems and local livelihood in the project areas.
- Promote an integrated climate adaptation strategy for wetlands and its dependent communities through water conservation and demand side management.
- Improving adaptive capacity of farmers and other wetland dependent local communities.
- Identify good practices and successes from this pilot project and develop knowledge products for wide dissemination for replications in wetland management across the State of Chhattisgarh.

6. Details of Project/ Programme Executing Entity:

a) Name, Registration No. & Date, Registered Address, Project Office Address (for the proposed project)

Address of Executing Agency:

1. Chief Executive Officer/ Nodal Officer
State Centre for Climate Change
State Forest Research and Training Institute
Baloda Bazar Road, Zero Point
Raipur.Ph:0771-2285120

Address of sub offices at field level

2. **Divisional Forest Officer,**
Division Dhamtari,
Chhattisgarh
Ph:07774 -240544
3. **Divisional Forest Officer,**
Mahasamund Division,
Chhattisgarh
Ph: 0771-2427640
4. **Divisional Forest Officer**
Baloda Bazar Division,
Chhattisgarh
Ph: 0771-252228

The programme executing entity State Centre for Climate Change, will lead the project implementation and will involve sectoral climate change cells from Water Resources, Agriculture and Forest Department. More details in section 3 (a)

6.1 Available technical manpower for the proposed project implementation:

The State Centre for Climate Change and the District Climate Cell will have following staff for the project implementation. The recruitment of these staff is likely to begin soon.

S.No	Name of post	No. of posts
1.	Nodal Officer/ Director General – Rank of PCCF as additional charge	1
2.	Additional CEO – Rank of APCCF by deputation	1
3.	Joint Director – Rank of CCF by deputation	2
4.	Scientist B	2
5.	Research Associates	2
6.	Junior Research Fellow	3
7.	Project Assistant	3
8.	Programmer (Website and Database management)	2
8.	Administrative officer	1
9.	Accounts Officer	1

The permanent staff will be supported by research assistants, field assistants and data entry operators on contractual basis. A separate project management team at field level will be setup on contractual basis for this project.

6.2 Three largest community based NRM based projects handled by the State

Work under the Green India Mission: - The Forest Department is the nodal agency for this mission. The mission has multiple objectives including improved quality of forest cover, increased forest/ tree cover, improved ecosystem services, increased forest based livelihood income, and enhanced annual carbon sequestration, with bottom-up participatory approach with Gram Sabha/Joint Forest Management Committees (JFMCs) at the helm of planning, decision making and implementation, involvement of local educated youth. State has adopted a landscape based approach - 11 landscapes identified in Chhattisgarh in three agro-climatic zones; preparatory activities including awareness, outreach and communications, micro-plans, landscape survey, detailed mapping, nursery development, etc. are underway.

Sustainable livelihoods through JFM and NTFPs: Active and on-going programme, with 7887 Forest Management Committees covering over 33,190 Sq. Km and over 27.63 lakh members from forest/forest fringe dwelling communities; network of peoples' protected areas established for sustainable livelihoods including health cover. These initiatives have yielded excellent dividends

State Biodiversity Strategy & Action Plan: Developed under the National Biodiversity Strategy and Action Plan with holistic objectives and strategy specific to conserving Chhattisgarh's biological diversity.

Lac Development Programme: - to develop cultivation, processing and marketing of lac;

Supply/distribution of seedlings: - In order to create an interest among people and encourage greening of/ afforestation in non-forest areas, saplings are supplied at concessional rates through this programme, which is operational in all the districts of the state;

6.3 Three largest Climate Change Adaptation / NRM projects of State Government.

HariyaliPrasarYojana: - to encourage agro-forestry/ farm forestry the scheme targets scheduled castes and tribes and small farmers of other communities to raise plantations on their uncultivated lands of their preferred species;

River bank plantation programme: - riverbank plantations have been taken up to control soil erosion and associated problems;

Regeneration of degraded bamboo forests: - Clearing dead, damaged, and entangled bamboo shoots, doing the necessary ground clearance and soil culture and mounding the rhizomes. These operations help in the regeneration of the clumps and growth of strong shoots and increase the productivity of the bamboo forests.

Ground Water Conservation: - The programme has as its objective the increase in ground water levels, plantations on barren lands - for soil conservation and flood control;

6.4 Infrastructure availability

Infrastructure: The State Centre for Climate Change has been established in a floor area of 1500 sq ft. in the building of State Forest Research Institute. The office space, knowledge management cell and staff room has been established.

Computers and Software: A separate proposal for computer and accessories is with the State Government and is likely to be approved soon. However, purchase of specific software like MIKE, HYDRO, ARC GIS, and other climate modelling software would have to be purchased under the project component or outsourced to Chhattisgarh Council on Science and Technology.

7. Project / Programme Components and Financing:

Project/ Programme Components	Expected concrete outputs	Expected outcomes	Amount (Rs)
1. Develop baseline climate change vulnerability of ecosystems and communities in the project site	Complete understanding of existing and future challenges to ecosystems and livelihoods due to climate change in the nearly 20,000+ ha project site	Baseline for adaptation planning, and monitoring	55,00,000
2. Promote an integrated climate adaptation strategy in the wetlands through - Water conservation that includes storage structure, catchment area treatment, river bank plantation, pond bunding etc. - Demand side management such as climate smart agriculture, crop diversification, irrigation efficiency etc.	- Improved water storage and conservation structures like farm ponds, check dams etc. (Annex I) - Improved water use efficiency through various demand side management activities	- Improved Water conservation - Improved Water use efficiency	13,49,00,000
3. Improving adaptive capacity of farmers and other wetland dependent local communities - Agro and farm management advisories - Through alternate livelihood options such as goatery, poultry, duckery, fisheries. - Sustainable collection, processing and marketing of NTFP products - Fodder development	- Improved capacity of over 1500 farmers in the region - Alternate livelihood options for over 500 forest dependent communities - Income from NTFP - Income from poultry, duckery and other livelihood options	- Improved resilience to local livelihood - Enhanced adaptive capacity	7,54,25,000
4. Knowledge Management	Best practices in the project captured	Knowledge products such as brochures, videos, manuals developed	64,65,000
6. Project/Programme Execution cost @8% of estimated programme cost			2,00,00,000
7. Total Project/Programme Cost			24,29,00,000
8. Project/Programme Cycle Management Fee charged by the Implementing Entity @3% of total project fee			66,99,000
Amount of Financing Requested			24,89,15,000

8. Project Calendar:

Indicate the dates of the following milestones for the proposed project/programme (projects which have four or more than four years of implementation period would require to have mid-term review after two years of implementation).

Milestones	Expected date
Phase I	
Inception and project preparation phase	August 2016- December 2016
Project Implementation	January, 2017
Mid-term Review (if planned)	July, 2018
Project/Programme Closing	July, 2020
Terminal Evaluation	August, 2020

9. PROJECT JUSTIFICATION

9.1 Current Challenges

Wetland management in Mahanadi basin in Chhattisgarh is a multi-stakeholder issue, and some of the gaps of existing approaches in wetland management and watershed development in Chhattisgarh are

- Lack of a wetland management strategy in the context of climate change impacts.
- Lack of climate smart agriculture practices among farmers.
- Lack of involvement of local people in wetland management.
- Micro irrigation in areas less than 2000 ha are affected by lack of effective watershed practices
- There is no storage facilities, so water scarcity becomes high in villages during summer.
- Lack of best practices on water resource conservation and efficient usage
- Challenges such as lack of funds, lack of technical expertise in planning, lack of coordination among various departments persists.
- Deforestation and degradation of forests making more surface runoffs and soil erosion.
- Lack of climate change knowledge in infrastructure planning has led to more losses, like damage to water storage systems and canals due to extreme rainfall events
- Lack of climate lens or climate adaptation approaches in watershed management programmes
- Lack of participatory approach in watershed management.

There must thus be a coherent approach in wetland management using a climate adaptation approaches for sustainable management of its resources.

Further in the detailed site surveys and stakeholder consultations during the DPR several key issues emerged which are listed below

Agriculture and allied sectors

- Decrease in soil fertility and crop productivity, increased incidences of droughts.
- Dependency on mono cropping pattern system
- Decrease in agriculture related employment generation
- Increase in farmer's risk to crop productivity because of unpredictable climatic condition
- Farmer's distressed migration
- Lack of weather related information and agro advisory services
- Low productive cattle.
- Less availability of fodder & grazing areas.
- Poor animal management.

Forest & ecosystem

- Deforestation and degradation
- Low water retention,
- Soil Erosion
- Decrease in NTFP production
- Loss in Bio diversity

Watershed and wetland sector

- Over exploitation of ground & surface water.
- Lack of proper method of irrigation and low irrigation efficiency.
- Lack of runoff management practices.
- Increased turbidity and siltation in wetlands due to soil erosion in upper catchment areas.
- Lack of maintenance of existing water bodies.

Health sector

- Poor health condition of community especially women & child.
- High cases of malnutrition.
- High anaemic condition in women.
- Incidence of seasonal diseases like diarrhea, fever, malaria etc.

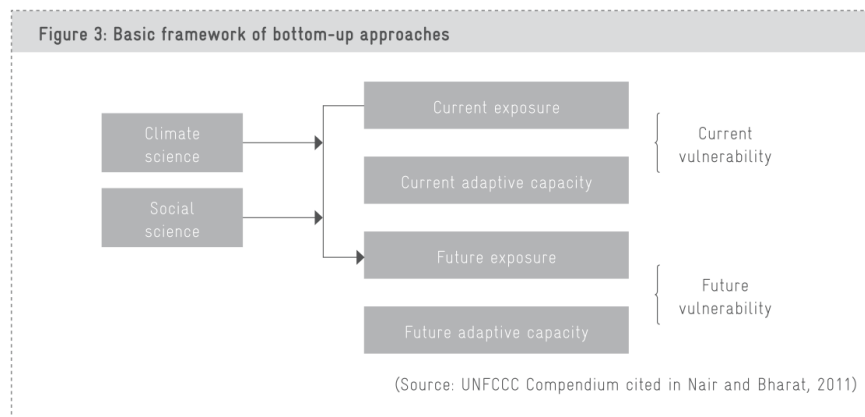
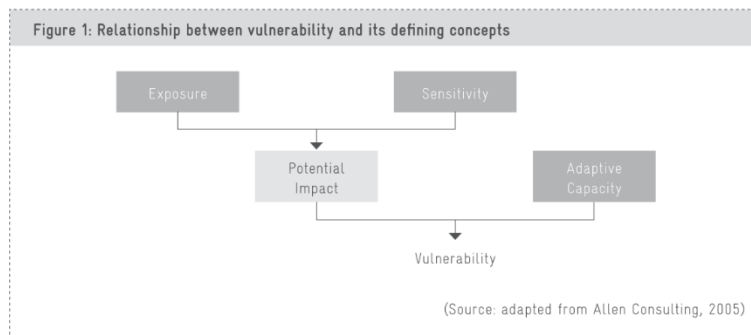
9.2 Proposed Interventions

Keeping in view of past experience in watershed development, this project proposes to work on **both supply and demand side management** . The project shall have water conservation and demand side management as a major adaptation strategy, while improving local livelihood and their adaptive capacity by following ways.

Component 1: Baseline development of vulnerability of ecosystems and communities to climate change in the project site

Activity 1.1: Detailed vulnerability assessment in the project sites as per methodology and framework of MoEFCC. This activity will be done in the Phase I

Vulnerability to climate change is the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with, adverse impacts of climate change - IPCC



Source: MoEF&CC Vulnerability Assessment Framework, 2015

Impact Assessment: The Government will engage with institutes and experts that are currently using advanced models such as the IITM Pune for CORDEX model to know the present and future impacts of climate change at fine resolution. The Indian Institute of Tropical Meteorology in Pune has been contacted to provide impact assessments using latest model. Rainfall and Temperature data for last hundred years are available with Indira Gandhi Agriculture University, in Raipur.

Hydrological model: The state has an active Water Resource Department that in support from World Bank funded Hydrology project has collected hydrological data for entire Chhattisgarh and also have installed flood gauges, piezometers, and other monitoring equipment. The data for the project will be made available from State Data Centre, Chhattisgarh. Advanced models such as Integrated Global Systems Model (IGSM) will be used for this project.

Sensitivity: The Chhattisgarh State Council on Science and Technology has engaged with the Space Application Centre in collecting various GIS layers and Remotely sensed data for sectors like water resources, forests, agriculture etc.

Adaptive Capacity: Such data in combination with socio economic data such as household income, poverty, access to drinking water, etc.

Geographic Information System and Remote Sensing Data: GIS data for the wetlands are available at the National Wetland Atlas. The Chhattisgarh State Council for Science and Technology has delineated wetlands in GIS shape file format. Land use and land cover changes and changes in wetland structure will be studied using remote sensing data of satellite images like IRS, LISS etc. **Software used will be: ARC GIS, IDRIS,**

Composite Vulnerability Index: A GIS based overlay analysis and statistical analysis will be performed to get composite vulnerability index for the three project sites and will be kept as baseline for developing adaptation strategies.

Output 1.1: Baseline vulnerability to climate change mapped in the project site.

Component 2: Promote an integrated climate adaptation strategy in the wetlands through

Activity 2.1: Water conservation that includes storage structure, catchment area treatment, river bank plantation, pond bunding etc.

Watershed Management: The project will use **Away from business as usual watershed programmes, through** a ridge to valley climate resilient approach, keeping in view the important role of forests in the highlands towards ground water recharge and stream flows.

It is estimated that, about 15000- 20000 ha of land will be treated through various soil conservation and afforestation measures in the selected sites. The earth work will be done at 150cum/ha and will be as per requirement and after complete assessment of the area.

Continuous Contour Trench (CCT): CCTs will be made by excavating soil along the contours on relatively steep sloping degraded lands for in situ conservation of rainfall. It will facilitate retention of soil moisture for longer period and help in establishment of vegetative cover in the degraded area. CCTs are highly suitable for areas receiving low rainfall The structures are laid

across the hill slope (varying between 8 to 35 %) and are suitable for treatment of upper reaches of watersheds. Cross section of CCT varies between 0.15 to 0.3 sq.m. The usual cross section of CCT is (in terms of width x depth) is 0.6 m x 0.3 m, 0.6 m x 0.5 m, 0.5 m x 0.3 m or 0.5 x 0.5 m

Staggered Contour Trench (SCT): Poor alignment of contours in case of CCTs over long length would result in breaches due to concentration of runoff. A breach in one CCT would lead to chain reaction. The difference in design of SCTs and CCTs is that the horizontal and vertical intervals are half of those of CCTs in case of SCTs to handle the same volume of runoff. This is suitable for treatment of sloping upper reaches of watersheds with slope more than 8%. The length of trench varies between 2-3 m (keeping base width of A-frame in mind) for easy layout of contours. The cross section of SCT varies between 0.15 to 0.3 sq.m similar to CCT.

Water Absorption Trench (WAT): In order to handle the unexpected runoff from the treated hillock/sloping degraded lands with CCT/SCT, Water Absorption Trenches (WATs) will be provided at every 100 m horizontal interval. WATs are also provided along the boundary of hillocks. Cross section of WAT is generally 1.00 sq. m with trapezoidal/square cross section. In case soil depth is not adequate WAT with cross section of 0.5 sq. m will be given. For the WAT with trapezoidal section, side slope of 0.5:1 is usually followed. WAT need to be laid along the contour and ends of WAT should lead to drain excess water.

Contour Bunding (CB): Contour bund is an earthen embankment made on the contour. Series of contour bunds break the velocity of flowing water and control water erosion. Contour bunds make the water to walk rather than running and help in increasing the infiltration opportunity time. Contour bund is the best treatment measures for middle reaches of watersheds with multidirectional slope. Governing factor for bund height is a) depth of water to be impounded (0.3 m as a thumb rule could be taken) ; b) Depth of flow over the weir and c) Free board. Cross section varies between 0.4 to 0.7 sq m. Distance between two contour bunds varies between 25 to 60 m depending upon the slope.

Field Bunding (FB) (Paddy Bunds): Field bunding refers to construction of earthen bund by and large across the slope to control soil erosion and insitu conservation of rainfall. Field bunding reduces the velocity of flowing water and improves the soil moisture regime in the field. Farm bunding is provided in private lands, where land is put for cultivation or in case of cultivable

wastelands. It should not be used as boundary bund. As in CB, cross section of field bund varies between 0.4 to 0.7 sq m depending upon the expected rainfall(24-hr 10 year return period) and soil type. Only bund across slope is recommended. Stabilisation of bund is done with grass seeding.

Stone outlet: Stone outlets are provided in field bund/contour bund for disposing the excess water safely to downside. It resists bunds from breaching. Length of stone outlet varies from 1 m to 2 m depending upon the slope and runoff. Where local stones are not available, pipe outlet is provided. However, pipe outlets are prone to stealing. In such cases, vegetative outlets could also be made to dispose the excess water safely.

Farm pond /dug out structure: Dug out or excavated ponds are the most common and simplest type of ponds. A dug out pond is formed by excavating a pit at a site which has already a natural depression. The excavated soil is used for forming an embankment around the pond particularly stronger one across the slope. The basic principle is that the pond should be located where the largest storage volume with least earth work is possible. The ponds are constructed in a way that minimum water surface area is exposed to reduce evaporation losses. When construction is done with human labour, any increase in depth beyond 3 m becomes uneconomical since the cost increases out of proportion to the volume of excavation and hence the storage capacity created. The sub-soil should allow minimum seepage losses as far as possible.

Stone bunding: Stone bunds are constructed across the steep sloping land by and large on the contour at a pre-determined spacing for developing land for cultivation or to put at least under pasture development. These are constructed at places where stones are available readily in the field. Stone bunds across the slope at regular interval would help in reducing the velocity of flowing water and control soil erosion from the field. The salient points in respect of contour bunding are given below:

- Stone bunding is recommended where stones are available locally.
- Where making trench/bund is not possible due to shallow soils or rock exposed
- It is laid on hilly/steep slopes (more than 6-8%). It can also be done in lands with 3-6% slope in which stones
- are spread/exposed in the field

- Cross section of stone bund may vary between 0.15 – 0.25 sq m with suitable side slope (considering the cost limitations)

Stone Gully Plug (SGP): Gully plugs are useful in reducing the channel gradient and flow velocity, thus facilitating more infiltration opportunity time for water and help in recharging ground water. · When fairly good size stones (of about 225 mm) are available locally, low cost loose boulder/Stone Gully Plugs (SGPs) could be made

Earthen Gully Plug (EGP): In places, where loose boulder is not available, earthen nala bund/Earthen Gully Plug (EGP) is considered for the first order channels. · The design of earthen nala bund is similar to stone gully plug except the difference in material (i.e. soil in case of EGP earthen nala bund) and upstream and downstream side slopes. Also, rubble stone pitching upto Full Supply Level (FSL) on the upstream side is considered for stability. · The combination of earthen nala bund and vegetative barriers Vitex, Agave and Napier will help in stabilizing the grade of gully and reducing the runoff.

Gabion Structure: Gabion structures are made with boulders packed closely in wire mesh cages made with Galvanized Iron (GI) wire of 8-10 gauge thickness with mesh size of 7.5-15 cm.

Gabion structures are economical as compared to cement structures. They may be constructed in main gullies/ channels for retention of debris and soil accumulation without ponding. These structures encourage good plant cover not only along the bank but also in the bed of the stream due to increased moisture regime.

Gabion structures have a long life (20-25 years) almost similar to cement masonry permanent structures. Usually Gabions are 1m to 1.5 m wide and 1 or 0.5 m high; their length can vary between 2 to 10 m

In addition to watershed development along the catchment area the project will focus on improving vegetation cover in the wetland areas through *JFM*, agro-forestry/ farm forestry systems especially for scheduled castes and tribes and small farmers of other communities to raise plantations on their uncultivated lands of their preferred species;

Riverbank plantations shall be taken up to control soil erosion and associated problems;

Bamboos provide excellent vegetative cover around wetland and are also economically useful. In support of National Bamboo Mission ***Regeneration of degraded bamboo forests along the wetlands will be encouraged*** - Clearing dead, damaged, and entangled bamboo shoots, doing the necessary ground clearance and soil culture and mounding the rhizomes. These operations help in the regeneration of the clumps and growth of strong shoots and increase the productivity of the bamboo forests. The programme helps to increase in ground water levels, plantations on barren lands - for soil conservation and flood control;

Proposed interventions key points

- Run off management interventions by constructing different water conservation & harvesting structure.
- Introduction of water saving techniques in irrigation.
- Catchment area treatment & maintenance of existing water bodies.
- Promotion of vegetation to reduced soil erosion
- Introduction of soil/water conservation intervention
-

Output 2.1: Enhanced Water Conservation

Activity 2.2: Demand side management such as Improved Irrigation efficiency.

This will cover use of modern drip irrigation systems, promoting less water intensive crops and native horticulture trees that are less water intensive. This will also involve support to local level governance for water allocation and utilisation

Component 3: Improving adaptive capacity of farmers and other wetland dependent local communities.

Activity 3.1: Improved adaptive capacity of farmers by shifting to climate smart agriculture practices

Activity	Approach
Climate Smart Agriculture	<ul style="list-style-type: none"> ➤ Support on climate resilient and smart agriculture practices such as Systematic Rice Intensification (SRI) and on sustainable use of organic fertilisers and pesticides, ➤ Providing support in smart and water efficient irrigation system, and also advisory on cropping pattern, crop diversification that reduces pressures on wetlands ➤ Advisory on agro meteorology, agro marketing etc ➤ Agro advisory services on cropping pattern, nutrient and farm management. ➤ Use of improved high yielding and drought resistant seeds and ➤ Promoting of inter and multi cropping ➤ Crop insurance and access to marketing facilities ➤ Establishment of seed bank and farmers motivation to grow seeds on its own field

Activity 3.2 Improving adaptive capacity of wetland dependent communities other than farmers

Activity	Approach
Improving Fisheries	<ul style="list-style-type: none"> ➤ Increased fisheries production in the wetlands can support local livelihood and also enhance biodiversity. ➤ The Central Inland Fisheries Board will be contacted for support in pisciculture and aquaculture in wetlands.
Duck Farming	<ul style="list-style-type: none"> ➤ Suitable smaller wetlands of size <2 ha will be explored for options of duck farming and support to local communities in duck farming as livelihood option will be made.

Ecotourism	<ul style="list-style-type: none"> ➤ Wetlands of high biodiversity and aesthetic values will be promoted for ecotourism activities, that will be a means of livelihood generation and economic activity for local people
Horticulture	<ul style="list-style-type: none"> ➤ Possible plantation support of horticultural crops Integrated forestry/horticulture plantation & Management
Other livelihood options	<ul style="list-style-type: none"> ➤ Apiculture ➤ Emphasis on cattle breed development & management programme ➤ Piloting & promotion of green fodder at community level. ➤ Identification and promotion of NTFP based income generation activities

Activity 3.3 Health related interventions

Proposed adaptation interventions in health sector	<ul style="list-style-type: none"> ➤ Promotion of preventive health care system ➤ Health camps & trainings ➤ Promotion of kitchen garden & back yard nutritional plantation. ➤ Drudgery reduction measures like smock less chulha, glass roof tiles and clean kitchen practices. ➤ Drinking water treatment like chlorination, purification etc.
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Component 4: Knowledge Management

Activity 4.1: Identify the best practices on climate adaptation that emerges from this pilot project and capture them, and disseminate through knowledge management tools like brochures, manuals, audio visual aids etc. The Knowledge management will be done through Chhattisgarh State Knowledge Management Cell on Climate Change, which is part of the State Centre for Climate Change.

Output 4.1: Successful strategies developed for replication on wetland management.

10. Justification with regards to components as on the concrete adaptation activities of the project, and how these activities contribute to climate resilience

Project/ Programme Components	Climate Resilience Contribution
1. Develop baseline climate change vulnerability of ecosystems and communities in the project site	Baseline development, prioritize adaptation activities
2. Promote an integrated climate adaptation strategy in the wetlands through <ul style="list-style-type: none"> - Water conservation that includes storage structure, catchment area treatment, river bank plantation, pond bunding etc. - Demand side management such as climate smart agriculture, crop diversification, irrigation efficiency etc. 	Reduces biophysical vulnerability, improves ecosystem services. Resilience of wetland improved
3. Improving adaptive capacity of farmers and other wetland dependent local communities <ul style="list-style-type: none"> - Agro and farm management advisories - Through alternate livelihood options such as goaterly, poultry, duckery, fisheries. - Sustainable collection, processing and marketing of NTFP products - Fodder development 	Improves livelihood options thus reducing socio-economic vulnerability
4. Knowledge Management	“Soft Adaptation” strategy

10.1 Details on Economic, social and environmental benefits project / programme

(Reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations)

EE may like to use following table to present the key benefits

Component	Key benefits (direct)		
	Social	Economic	Environmental
1. Develop baseline climate change vulnerability of ecosystems and communities in the project site	No direct benefits as they are only baseline studies. However, the results of these two activities will help in developing appropriate adaptation plan in numerous watersheds in the three agro climatic zones,		
2. Promote an integrated climate adaptation strategy in the wetlands through <ul style="list-style-type: none"> - Water conservation that includes storage structure, catchment area treatment, river bank plantation, pond bunding etc. - Demand side management such as climate smart agriculture, crop diversification, irrigation efficiency etc. 	Non market benefits from increased ecosystem services,	Market benefits like Irrigation and drinking water supply	Improved ecosystem services and resilience to climate change
3. Improving adaptive capacity of farmers and other wetland dependent local communities <ul style="list-style-type: none"> - Agro and farm management advisories - Through alternate livelihood options such as goatery, poultry, duckery, fisheries. - Sustainable collection, processing and marketing of NTFP products - Fodder development 	Increased social activities	Increased income and livelihood opportunities	Environmentally sustainable development
4. Knowledge Management	Replication of success of this pilot project in other wetland sites in Chhattisgarh		

10.2 Sustainability of intervention

i. How will the project assure that the benefits achieved through its investments are sustained beyond the lifetime of the project?

Some of the key results of this programme will feed into ongoing and existing schemes of the Government a few are discussed below;

1. Water Resources Department is already implementing several water resources monitoring project, the enhanced capacities of officials and strategies for wetland management will help in improving water resource management strategies in wetlands in other areas of Mahanadi basin and other river basins of Chhattisgarh.
2. Will feed into developing sector specific action plan in water sector under National Water Mission.
3. Forest department will integrate the climate adaptation strategies in wetlands in the Forest Working Plans of this region thus it sustains in long term.
4. JFM, Gram Sabha and local communities have enhanced capacities in natural resource management.
5. Knowledge management through capture and dissemination of best practices on climate adaptation in wetlands will help in wetland management across the State and in other parts of India.
6. Maintenance of build climate resilience in the wetland will have to maintained by States own funds by integrating the adaptation strategies in the States existing programmes, a few as discussed above.

10.3 Analysis of the cost-effectiveness of the proposed project:

i. Cost effectiveness will compare alternative options available and how the proposed components/ intervention are best for given climatic conditions . It will also how the community has preferred the selected interventions and their views / concerns are addressed while designing the project/ programme

The proposal should compare to other possible interventions that could have taken place to help adapt and build resilience in the same sector, geographic region, and/or community.

A comparison of the chosen option vis-a-vis alternative options may be provided as per the table given below:

Activity	Proposed alternative	Benefits
1. Develop baseline climate change vulnerability of ecosystems and communities in the project site	No alternative available	Complete mapping of baseline vulnerability to climate change in the project site for developing specific adaptation and mitigation activities
2. Promote an integrated climate adaptation strategy in the wetlands through <ul style="list-style-type: none"> - Water conservation that includes storage structure, catchment area treatment, river bank plantation, pond bunding etc. - Demand side management such as climate smart agriculture, crop diversification, irrigation efficiency etc. 	The proposed actions are largely on using local level materials and labour and cost effective	No modern construction equipment or machinaries are required
3. Improving adaptive capacity of farmers and other wetland dependent local communities <ul style="list-style-type: none"> - Agro and farm management advisories - Through alternate livelihood options such as goatery, poultry, duckery, fisheries. - Sustainable collection, processing and marketing of NTFP products - Fodder development 	Best possible strategies for livelihood development are given	Improved livelihood
4. Knowledge Management	Identify best practices emerging from this project.	Use the pilot project replicated successful wetland management in the State.

10.4 Alignment with the National and State Action Plans and other Policies / Programmes:

(Describe how the project / programme is consistent with national or subnational sustainable development strategies, including, where appropriate, national or sub-national development plans, poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist)

National Policy	Project Elements related to the policy
National Green mission : To reach national target of 33% land area under forest and tree cover from the current level of 23%, Mission to be taken up on degraded forest land through direct action by communities, organized through Joint Forest Management (JFM) Committees and guided by Department of Forests	The Joint Forest Management under the project will be through JFM committees and as per the JFM guidelines of Government of India
National mission on Sustainable Agriculture : Mission aims to devise strategies to make Indian agriculture more resilient to climate change.	The promotion of sustainable agriculture practices in the wetland areas is a related topic to the mission
National Water Mission: The overall objective of the NWM, is "conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within States through integrated water resources development and management.	Watershed and wetland management is within the objectives of the National Water Mission.
National mission on Strategic knowledge of climate change : Mission to identify the challenges of and the responses to climate change through research. Understand the Socio-economic impacts of climate change including impact on health, demography, mitigation patterns and livelihoods of vulnerable communities.	The Knowledge Management Component of the project is in concurrence with this mission, further assessing socio economic vulnerability and developing adaptation activities for improving their resilience and livelihood is covered in this project
The theme of India's 12th Five-Year Plan is "Faster, sustainable, more inclusive growth". The 12th five year plan (2012-2017) released by the planning commission of India aims at inclusive and sustainable growth.	The project will show for more sustainable development at local level by biodiversity conservation and sustainable wetland management
State Action Plan on Climate Change (SAPCC)– Chhattisgarh; The SAPCC has identified eight primary sectors for climate adaptation and mitigation actions; Water, Agriculture, Forests and Biodiversity are three primary sectors for adaptation. The SAPCC discusses and emphasises on watershed development, joint forest management, building resilience to primitive tribal group.	Climate adaptation in primary sectors i.e water, agriculture and forests and biodiversity and among vulnerable groups is proposed in this project, which is one of the key objectives of the SAPCC

10.5 Component wise technical standards:

(Describe how the project / programme meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, standards related to pollution control, etc. The details need to be provided for each of the interventions proposed)

Activity	Applicable standard	Application to project
Promote an integrated climate adaptation strategy that enhances wetland resilience to climate change and increases its ecosystem services especially focusing on water retention and supply	The National Environment Policy of 2006 recognises that India is vulnerable to climate change and informs that the development policies should integrate climate change concerns especially on reducing vulnerability	The programme addresses climate change impacts, vulnerability to climate change and adaptation strategies
	The National Water Policy (2012) is a comprehensive document which discusses the water management issues .The salient features of the policy which are particularly relevant to adaptive water management in the context of climate change	The project addresses water resource development and conservation through watershed and wetland development programmes.
	Integrated Watershed Development Programme Guidelines, 2011 The Department of Land Resources, Government of India has devised guidelines on watershed development	The project will follow strictly the guidelines of the IWMP programme for watershed development.
Improving adaptive capacity of farmers and other wetland dependent communities	Forest Rights Act, 2006 The Act seeks to recognize and vest the forest rights and occupation in forest land in forest dwelling Scheduled Tribes and other traditional forest dwellers	There will be no relocation or rehabilitation of tribes

10.6 Duplication Check:

(Describe if there is duplication of project / programme with other funding sources, if any)

Project	Objective	Complementarity	Geographical coverage/ agency
Hydrology project Phase I & II funded by World Bank and Government of India	<ul style="list-style-type: none"> The overall Project Development Objective is to extend and promote the sustained and effective use of Hydrologic Information System by all potential users concerned with water resources planning and management thereby contributing to improved productivity and cost-effectiveness of water related investments 	Provides detailed hydrological data for the proposed project	<p>Entire Chhattisgarh</p> <p>The project was launched in December 1995 and continued from 5 April 2006 to May 2014</p>
Integrated Watershed Development Project	Under IWDP watershed development activities were taken up in the State but is presently not covered fully	Availability of watershed codes and guidelines	2008 onwards.
Afforestation, river bank development and other forest development activities	The forest department activities are annual aims at restoration of degraded forests and forest development	Afforestation in watershed areas	ongoing

11. Details on Stake-holder consultation:

(Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations).

The DPR preparation team visited the three project sites and conducted stakeholder discussions. The discussions were held in presence of field level forest officials and Joint Forest Management committees, Gram Sabha were invited. The Stakeholder surveys for Mahasamund and Baloda Bazar districts were held in February, 2016. While the stakeholder discussions for site Dugli in Dhamtari was held during August, 2015.

Following community perceptions were noted during the stakeholder discussions:

- Rainfall pattern is changing and the farmers recognise decline in annual rainfall and increased incidences of drought.
 - Frequency of drought has increased from 3 to 5 years to 2 to 3 years.
 - Duration of summer period has increased from 4 months to 6 months.
 - Temperature has increased up to 45 degree centigrade in summer months.
 - Because of above climatic changes it is becoming difficult to maintain survival of forestry plantation.
 - Forest produce like gum and fruits & flowers is being reduced year by year.
 - Local biodiversity changes are being observed such as changes in bird migration, flowering of certain trees and fruiting period etc.
-
- In above context we have visited forest villages and conducted group discussion and village meetings. Peoples are well aware with the effects of climate change as mentioned above, but they have not started yet to think upon it.
 - They told us that ground water is being depleted, surface water is also reducing. Because of erratic and less rainfall, farming is being effected badly.
 - Use of chemical fertilizer has increased and because of this soil is losing its fertility. Crop yield is reducing, cost of cultivation has increased. Because of above adverse effects of climate change people are migrating in search of employment in nearby towns and out of state.
 - Health of human and livestock both have greatly affected by number of vector borne diseases.



Field surveys in Duglil, Dhamtari District



Discussions with JFM Committees and Women Self Help Groups

12. Learning and knowledge management component to capture and disseminate lessons learned for the proposed project.

The State Government has established a State Centre on Climate Change, which has a Knowledge Management Cell. The Cell will coordinate research studies and documentation on various aspects of climate change in the State, with Central and State Universities, and other research institutions. Further the Cell shall also act as nodal agency in documenting traditional knowledge, which is very important on climate adaptation planning.



Under this project specific knowledge management will be

- Identifying the impacts of climate change on wetlands in the catchment area of Mahanadi basin in Chhattisgarh, document it through publication of report, journal articles etc.
- The adaptation strategies evolved to reduce both biophysical and socio economic vulnerability will be captured and used for adaptation planning in other wetlands of Chhattisgarh.
- The knowledge dissemination will be through audio visual aids and through vernacular language medium.
- The project will blend traditional knowledge and practices with frontier technologies to enhance adaptive capacities.

12.1 Sustainability of the project/programme outcomes has been taken into account when designing the project / programme

Activity no.	Expected outcomes	Expected concrete outputs	Sustainability mechanism	Responsible party/ies
1.	Develop baseline climate change vulnerability of ecosystems and communities in the project site	Forms the baseline for specific adaptation strategies and needs for policy changes	State Centre for Climate Change is skilled on vulnerability assessment	State Centre for Climate Change and Water Resource Department
2.	Promote an integrated climate adaptation strategy in the wetlands through <ul style="list-style-type: none"> - Water conservation that includes storage structure, catchment area treatment, river bank plantation, pond bunding etc. - Demand side management such as climate smart agriculture, crop diversification, irrigation efficiency etc. 	Integrated adaptation strategies in wetland through water conservation and demand side management	District development departments, Gram Sabha and other stakeholders trained on Water resource management	Gram Sabha, District administration/ Climate change cell
3.	Improving adaptive capacity of farmers and other wetland dependent local communities <ul style="list-style-type: none"> - Agro and farm management advisories - Through alternate livelihood options such as goatery, poultry, duckery, fisheries. - Sustainable collection, processing and 	Improved adaptive capacity of farmers and other wetland dependent communities	Forest Department trained on wetland management in the context of climate adaptation and sustainable management	Forest Department

	marketing of NTFP products - Fodder development			
4.	Knowledge Management	Capture best practices on climate adaptation in wetlands	Knowledge management	State Knowledge management cell on climate change

12.2 Provide an overview of the environmental and social impacts and risks identified as being relevant to the project / programme

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Compliance with the Law	The project is in compliance with National legislation and in concurrence with state policies like State Water policies. 12 th plan etc.	None
Access and Equity	The project provides fair and equitable access to the project beneficiaries	
Marginalized and Vulnerable Groups	give priority beneficiary will be weaker groups like SC, ST and marginal agriculture labourers, Women headed household etc. selected in consultation with Gram Sabha.	
Human Rights	No human rights violation involved	None
Gender Equity and Women's Empowerment	Gender component will be included in formation of JFM committees, Self Help Group etc.	None
Core Labour	The project will follow Government regulations on labour rights like number of hours of work, equal wage for men and women and payment schedule etc. The rates will also be government approved for all project activities	None
Rights Indigenous Peoples	Rights of indigenous people will be respected including FRA	None
Involuntary Resettlement	Resettlement if any will be on the basis of Forest Rights Act, 2006 and will be managed by Tribal Development Department and Gram Sabha, this project will not involve in assisting involuntary resettlement	Not applicable
Protection of Natural Habitats	There is not going to be any damage to natural habitat in this project, any construction activity like water harvesting and storage structure will be ensured to have minimal damage and will largely be on traditional like use of local material and boulders than concrete constructions	Minimal impact but will be managed by the project
Conservation of Biological Diversity	The vegetation, including trees and grasses, that will be promoted for the catchment treatment will be local and endemic to the area.	None

	<p>The selection of specific plant species will be undertaken in consultation with the local population and based on the recommendations of the Forest Department for the district. The project would not cause any impact on biodiversity values and will only enhance biodiversity</p>	
Climate Change	<p>The project is basically for enhancing the adaptive capacity of the wetland dependent community against adverse impact of climate change and also contributes to GHG emissions through afforestation and JFM activities</p>	None
Pollution Prevention and Resource Efficiency	<p>Project is not expected to create any environmental pollution and aims for higher resources efficiency for better management of available natural resources like water, plantation species (locally available), etc.</p> <p>The waste generated during construction (e.g. cement bags) will be disposed of through a safe disposal mechanism. The used bags and any plastic material generated due to any of activity of the project will be collected and disposed of through the solid waste disposal mechanism of the nearby town and will not be allowed to litter in the village and the countryside.</p> <p>The project will undertake an assessment of the impact of the use of machinery and heavy vehicles during the construction activity on the pond and the catchment infrastructure</p>	None
Public Health	<p>No component of this project shall have any public health risks</p>	None
Physical and Cultural Heritage	<p>No damage to physical or cultural heritage is expected in this project</p>	None
Lands and Soil Conservation	<p>The project will only help in land and soil conservation</p>	None

13. IMPLEMENTATION ARRANGEMENTS

a) Describe the arrangements for project / programme implementation.

i. **Who will implement the project and what are their comparative advantages and capacity compared to other potential implementing institutions?**

The State Centre on Climate Change shall be the executing agency. The Government of Chhattisgarh has formed a State steering committee under the chairmanship of Chief Secretary with principal secretaries of various departments as members. The State Nodal Officer for climate change shall be the executive officer for the programme implementation.

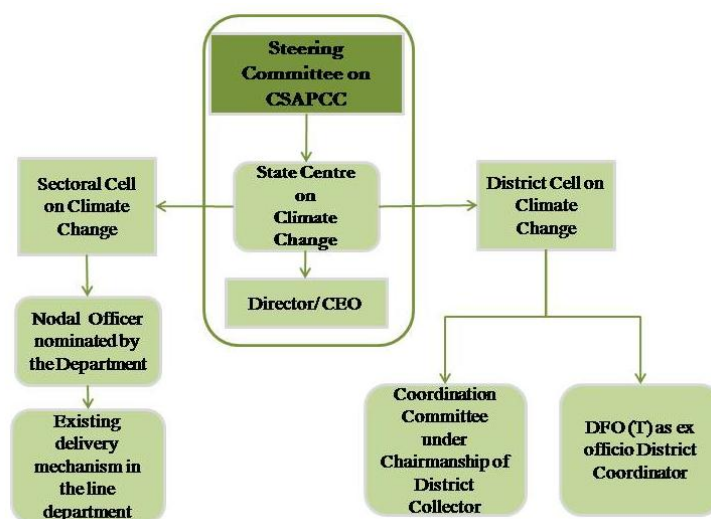


Fig 6: Organisational Structure of State Centre on Climate Change

The district cell on climate change, which will function under the chairmanship of District Collector with Divisional Forest Officer as Ex officio coordinator will coordinate at local level. The following state departments will be involved in programme implementation

- Department of Panchayat and Rural Development
- Forest Department
- Agriculture and Animal Husbandry Department
- Fisheries department
- Water Resources Department
- Scheduled Tribes welfare department
- Local governing institutions- Gram Sabha
- NABARD and State Level Nodal Agency for Watershed Development
- Chhattisgarh Council for Science and Technology as technical partner
- NGO partners identified by the Government

In addition there will be around 10 academic/research institutions involved like Indira Gandhi Agriculture University, Chhattisgarh Academy of administration, State Forest Research Institute etc for research and training activities

13.1 How will the project be coordinated with (and/or mainstreamed into) related development activities of the targeted sector?

Institutional arrangement for the implementation of the project and their role in the project is as follows:

Institutional Structure	Composition/Membership	Role and Responsibility
State Steering Committee	Chief Secretary with principal secretaries of various departments as members. Two expert members on the knowledge of Climate Change will be members of this committee, the CEO of State Centre on Climate Change will be the member secretary	Provide guidance and direction to the project activities and identify policy level issues that can be fed to relevant departments for policy development
Technical Advisory Group	The Technical Advisory Group will be constituted for the purpose of the project with experts in the field of Forestry, Climate Change and development of Adaptation Strategies, Agriculture/Civil Engineering , Hydrologist, Rural Marketing, Institution Development etc.	Provide technical inputs to the team members and guidance in the field. Assess relevance and impact of the climate adaptive strategies Make recommendation to the Project Team on technical matters to incorporate the same in the implementation of the project
Project team	The Field Management Team comprising of Senior Technical Members who will be assisted by Junior Technical Members and placed at the district level; and The Cluster Implementation Team comprising of Field Associates located at the district level.	Overall responsibility of the implementation of the project. Engage with external stakeholders to achieve project objectives Responsible to the NIE and for fulfilling monitoring and evaluation activities under the project
District steering committee	District Steering Group will be comprise of the membership of District Collectors, and district level officials from various departments. The District Forest Officer of the district will also be the ex officio coordinator.	Facilitate project implementation at the district level, Facilitate coordination between different departments for the smooth implementation of activities at the project level, Monitor the project activities and assess the benefit an impacts.
External monitoring and evaluation	Appointed as consultant by steering committee	To monitor and advise on any gaps and challenges in implementation
Local governing bodies	Gram Sabha, Joint Forest Management committees and Self Help Groups	Participate in all project activities at field level.

		Participate in capacity building events and exposure visits
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13.2 Describe the measures for financial and project / programme risk management (also include environmental and social risk, if any).

Risk	Rating (High / Medium / Low, etc.)	Mitigation Measure
Challenges in assessment of baseline impacts of climate change and wetlands	Low risk -Climate Impacts on Forests still doesn't have perfect models	Multi-model output will be used to verify the impact analysis
Participatory vulnerability analysis	Low - Willingness of local people to participate	Can be achieved through local level officials help
Identify alternate livelihood options to improve their socio economic status	Low- The success of alternate livelihood options	Only best of livelihood options that can be successful and sustainable is selected
Capacity building	Low- Willingness to learn among on a new skills	Interactive and field based learning exercises
Failure of livelihood options like duck farming, fisheries	Medium	Extensive consultation with animal husbandry and fisheries department will be made to select right species and investments

13.3 Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan. (Monitoring and evaluation cost need to be included in executing entity management cost).

Monitoring and Evaluation: The State Centre on Climate Change shall act as a Monitoring and Evaluation body. Monitoring and Evaluation (M&E) framework is important to assess the implementation process with respect to the targets envisioned, financial resources used and strategies accomplished. Further, measurable, reportable, and verifiable (MRV) frameworks for monitoring adaptation and mitigation will be established at the beginning of this project.

The monitoring system of the project will comprise of the following components.

Inception Report : Project Inception Workshop will be held within the two months of the start of the project. The workshop will be attended by the members of the institutions that have been identified as members of the Steering Committee and the Technical Advisory Group. Among other things the Inception Workshop will include:

- (i) assist stakeholders to understand the objectives of the project and visualize their respective roles and responsibility in the implementation and results of the project
- (ii) establish reporting and communication protocols and familiarise with project decision making structure and processes
- (iii) presentation of project activities and major milestones and the expected outcome of the project
- (iv) the annual work plan will be presented to the stakeholders along with the indicators, means of verification, and monitoring and reporting frameworks and schedules

The Inception Report will be submitted within one month of holding the workshop.

Performance Monitoring: Performance monitoring will be carried throughout the project period. The monitoring cycle will be quarterly and the report will be shared with the members of the State and District Steering Committee. The Performance Monitoring Report will include the following components:

(a) Progress Tracking: Conduct of activities against their time line will be tracked every quarter. The process entails conduct of review meeting and each activity will be tracked in terms of its progress and state of implementation. The review will be followed up with finalizing the next quarter plan of activities that will incorporate spill over and inadvertent delays.

(b) Risk Management: Every quarter the risks will be monitored and the action taken for managing each risk will be reviewed. The exercise will also include identification of new risks and allocation of responsibility for managing it.

(c) Output to Outcome: Tracking Performance monitoring will undertake monitoring and review of output to outcome tracking.

(d) Financial Monitoring: Quarterly financial monitoring will be undertaken in order to review the progress of financial utilization and for ensuring that the expenditure for each head is according to the financial norms specified in the budget and agreed procurement processes.

1.3 Project Completion

(a) Project Completion Report: At the end of the project a Project Completion Report will be prepared and submitted on an agreed format that will consolidate all the activities carried out during the project, its achievements, and results along with evidence of impact and benefit.

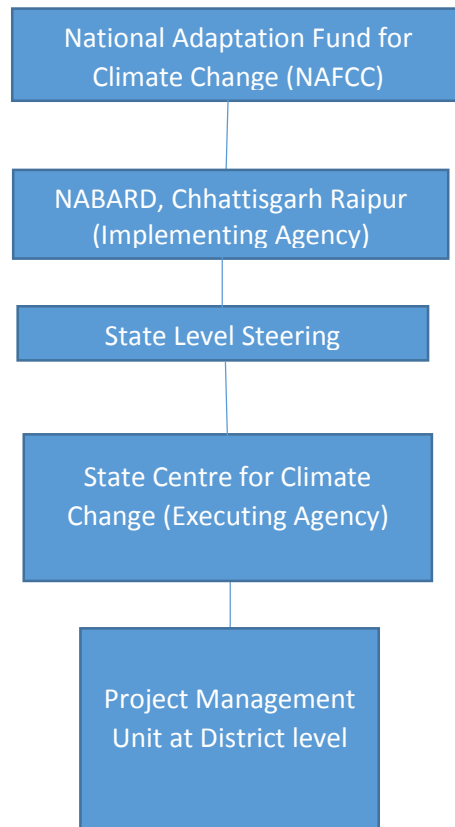
(b) Audited Statement A detailed Audited Statement of accounts will be prepared and submitted in funds received and spent under the project.

13.4 End Term Evaluation

An End Term Evaluation will be conducted for the project.

Monitoring and evaluation plan Activity	Responsible person	Yr. I	Yr. II	Yr. III	Yr. IV	Total	Time frame
Inception report	Nodal Officer	First quarter					3 months
1. Develop baseline climate change vulnerability of ecosystems and communities in the project site	Nodal Officer and sectoral nodal officer from water resources and forest department	First two quarter					6 months
2. Promote an integrated climate adaptation strategy in the wetlands through <ul style="list-style-type: none"> - Water conservation that includes storage structure, catchment area treatment, river bank plantation, pond bunding etc. Demand side management such as climate smart agriculture, crop diversification, irrigation efficiency etc.	Nodal Officer for Climate Change and Nodal Officer at Department of Panchayat and rural development						9 months
3. Improving adaptive capacity of farmers and other wetland dependent local communities <ul style="list-style-type: none"> - Agro and farm management advisories - Integrated Cattle Development Centre for breed development and management - Through alternate livelihood options such as goatery, poultry, duckery, fisheries. - Sustainable collection, processing and marketing of NTFP products, Fodder development 	Nodal Officer for Climate Change and nodal officer in Forest Department						39 months
4. Knowledge Management	Nodal Officer Knowledge management cell						39 months

Also include notes supporting above proposed activities. Include notes on reporting mechanism for monitoring and evaluation.



13.5 Include a results framework for the project proposal, including milestones, targets and indicators with gender disaggregated data (as per the format in annexure1).

Project description/ Outcome & output	Measurable indicators	Baseline	Target	Means of verification	Risks and assumptions
Overall Objective:					
Developing climate adaptation strategies in wetlands along Mahanadi River Catchment area in Chhattisgarh					
Component 1: Baseline development of vulnerability of ecosystems and communities to climate change in the project site					
Output 1.1 Baseline vulnerability to climate change mapped in the project site	Vulnerability index	Baseline vulnerability of ecosystems and livelihoods defined	To cover detailed vulnerability of entire site	MoEFCC framework on vulnerability assessment	Risks: Uncertainty in climate projections Assumptions: the model give best fit results for future climate change impacts
Component 2: Promote an integrated climate adaptation strategy in the wetlands					
Output 2.1 Enhanced Water Conservation	Water quality and quantity in the wetlands	Water conservation structures and practices as on base year	To improve water conservation in the wetland areas	Water quality and quantity	Risks: Data availability and accuracy may be an issues
Output 2.2 Enhanced demand side management	Data on water supply and demand assessed from stakeholder survey and field data collection	Water use for year 2000, 2010 in terms of Million litres per day (MLD) as unit, also in water availability changes measured	Wetlands that are under over stress of water consumption is identified	Measurable indicators – MLD in water supply and use and MCM in water availability changes	Risks: gaps in ground water data, industrial consumption that are not metered Assumptions: data on surface water consumption will be accurately available

		in Million Cubic Meters.			
Component 3- Improving adaptive capacity of farmers and other wetland dependent local communities					
Output 3.1: Improved adaptive capacity of farmers by shifting to climate smart agriculture practices	Agriculture and crop productivity data	Baseline data as on the inception stage.	Over 1500 farmers shift to climate smart agriculture practices	Changes in crop productivity	Risks: Changes in such data can be due to other factors also
Output 3.2: Improved adaptive capacity of wetland dependent communities other than farmers	Number of forest dependent communities benefitted	Baseline JFMc and other data	Over 500 forest dependent communities have enhanced adaptive capacity	Income generation and registers maintained by Gram Sabha	
Output 3.3: Improved health	Number of families benefitted	Baseline health indicators	Over 2000 families aware of better healthcare	Changes in health indicators	
Component 4: Knowledge Management.					
Output 4.1: Successful strategies developed for replication on wetland management.	Number of knowledge products developed	Zero or no knowledge product available	Over 10000 stakeholders made aware on climate smart wetland management		

14. Include a detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

Component	Activity	Unit	Unit Cost	Year 1		Year 2		Year 3		Year 4		Total		
				Unit	Amt	Unit	Amt	Unit	Amt	Unit	Amt	Unit	Amt	
A. Project Implementation Cost														
Component 1: Baseline development of vulnerability of ecosystems and communities to climate change in the project site	Activity 1.1 Baseline vulnerability to climate change mapped in the project site													
	Consultancy fees to Chhattisgarh Council of Science and Technology to develop detailed watershed maps, land use and other data analysis before and after the project. (including purchase of data and software such as satellite images and image processing software like IDRISI, ARC GIS)	Lump sum		10								5		15
	Consultancy fees to IIT Delhi or such institutions to provide detailed analysis on impacts of climate change on water resources using hydrology and downscaled climate models (This will include permanent purchase of modelling software such as MIKE, HYDRO, SWAT, etc)	Lump sum		20										20
	- Socio economic survey costs and collecting household level data and	Lump sum		5								5		10

	analysis and identifying vulnerable groups, setting up baseline												
	- Data collection and analysis on Consumption data on surface and ground water in the wetlands for drinking water, irrigation and other supply.	Lump sum		5						5		10	
Sub Total				40		0		0		15		55	
Component 2- Promote an integrated climate adaptation strategy in the wetlands	Activity 2.1 Water conservation that includes storage structure, catchment area treatment, river bank plantation, pond bunding etc.												
	Watershed development interventions As per annex III			30.68		239.82		258.83		80.66		610.00	
	Water harvesting structures like bunds developed with boulders and local materials (construction of tanks, piping costs) in Numbers												
	- Fodder plantation (Plantation of fodder plants in and around village and wasteland areas)												
	Activity 2.2 Enhanced climate adaptation in wetland through Forest management.												
	- Assessing baseline forest cover, forest biomass, NTFP production etc. (Forest survey, NDVI etc)		0	0	9.00	0	0.00	0	0.00	0	0.00	0	9.00
	- River bank plantation, soil conservation, wetland rejuvenation for 100 ha @ 1,08,430 per ha		0	0	25.00	0	40.00	0	40.00	0	5.00	0	110.00
	- Wetland siltation removal and other management activity		0	0	100.00	0	100.00		100.00	0	80.00	0	380.00

	- Involving JFM committees in forest management in Minor Forest Produce collection and marketing, forest harvesting, timber extraction, etc.	0	0	15.00	0	15.00	0	15.00	0	15.00	0	60.00
	- Integrating Climate Adaptation Strategies in the working plan of forests in the catchment areas including rotation period, improvement strategies in RDA (Reforestation of Degraded Areas) in the three districts - Plantation in pond bunds - Agro forestry plantation works	0	0	20.00	0	20.00		20.00	0	20.00	0	80.00
	Activity 2.3 Demand side management such as Improved Irrigation efficiency											
	- Improving irrigation efficiency and access to modern tools like drip irrigation, solar pumps etc.	0	0	0.00	0	75.00	0	25.00	0	0.00	0	100.00
	Sub total			199.6		489.8		458.8		200.6		1349.0
				8		2		3		6		0
Component 3: Improving adaptive capacity of farmers and other wetland dependent communities.	Activity 4.1 Improved adaptive capacity of farmers by shifting to climate smart agriculture practices											
	Climate smart agriculture practices support such as training on SRI, agro meteorology advisory, smart irrigation, crop intensification, crop diversification etc (Family)	0.05	7	37.50	750	39.38	750	41.25	750	43.50	3000	161.63
	Activity 4.2 Improving adaptive capacity of wetland dependent communities other than farmers											
	Support in sustainable NTFP collection, and marketing to tribal and other forest dwellers. Creation of SHG,	7	3	21.00	3	22.05	3	23.10	3	24.36	12	90.51

	Village committees and NTFP processing centres in Nos											
	Intregrated cattle development center in Nos	10	3	30.00	3	31.50	3	33.00	3	34.80	3	129.30
	Support in other livelihood options like Fisheries, Duck farming, Horticulture etc. in Nos	0.5	100	50.00	100	52.50	100	55.00	100	58.00	400	215.50
Activity 4.3 Improving health of vulnerable communities												
	Health care system training in No. s	0.1	30	3.00	30	3.15	30	3.30	30	3.48	120	12.93
	Health camps in No. s	0.15	5	2.25	15	2.36	15	2.48	15	2.61	60	9.70
	Promotion of kitchen garden & backyard nutritional plantation (Families)	0.1	25	12.50	125	13.13	125	13.75	125	14.50	500	53.88
	Drudgery reduction measures like smock less chulha, glass roof tiles and clean kitchen practices. (Families)	0.25	75	18.75	75	19.69	75	20.63	75	21.75	300	80.81
				36.50		38.33		40.15		42.34		157.32
Sub total				175.00		183.75		192.50		203.00		754.25
Component 4: Knowledge Management	Activity 4.1: Identify the best practices on climate adaptation that emerges from this pilot project and capture them, and disseminate through knowledge management tools like brochures, manuals, audio visual aids etc. The Knowledge management will be done through Chhattisgarh State Knowledge Management Cell on Climate Change,	5	3	15.00	3	15.75	3	16.50	3	17.40	3	64.65

	which is part of the State Centre for Climate Change											
Sub total				15.00		15.75		16.50		17.40		64.65
Total Project implementation Cost				429.68		689.32		667.83		436.06		2222.90
Project Implementation fee to NABARD	Project/Programme Cycle Management Fee charged by the Implementing Entity - @3%			12.89		20.68		20.03		13.08		66.69
Sub total				12.89		20.68		20.03		13.08		72.63
PROJECT MANAGEMENT	Project Management											
	Project management team salary	24		24		26.40		29.04		31.94		111.38
	Travel	6		6		6.60		7.26		7.99		27.85
	Contingency and office expenses	2		2		2.20		2.42		2.66		9.28
	Monitoring and Evaluation	2		2		2.20		2.42		2.66		9.28
	Meetings and discussion of programme progress at State, District and field committees.	2		2		2.20		2.42		2.66		9.28
	Honorarium, field expenses and meeting of technical advisory committee	5		5		5.50		6.05		6.66		23.21
	Miscellaneous expenses	2		2		2.20		2.42		2.66		9.28
Sub total				43		47.30		52.03		57.233		199.56
GRAND TOTAL				485.58		757.30		739.89		506.38		2495.13

Note: NIE cost is taken 3 % of the total cost (Implementation + Project Management Cost)

f) Include a disbursement schedule with time-bound milestones at the component level

Instalment	Percentage	Amount	Year	Milestones
First	25%	6,25,00,000	October, 2015	Project Initiation, inception workshop, etc.
Second	25%	6,25,00,000	January, 2016	Progress monitoring completed, review by steering committee
Third	25%	6,25,00,000	October, 2017	Annual Review, workshop
Fourth	20%	5,00,00,000	July, 2019	End of project review
Fifth	5%	1,25,00,000	September , 2019	Final report, workshop and completion

Banking details for transaction of funds

Account Name	Member Secretary, Steering Committee, SAPCC
Type of Registration	Government of Chhattisgarh
Address for correspondence	Dr. Arvind A. Boaz, IFS Principal Chief Conservator of Forest & State Nodal Officer for Climate Change, AranyaBhavan, Medical College Road, Raipur – 492001, Chhattisgarh Ph: 0771-2552221, Fax: 0771-2552210 Email: draboaz@yahoo.com
Bank Name	Punjab National Bank
Address of Bank	Opp. LIC building, Vidhan Sabha Road, Pandri, Raipur, Chhattisgarh – 492006
Account Number	2966000100095327
MICR Code	492024003
IFSC Code	PUNB0296600

Annex 1(a) : Comments and actions as per Technical Steering Committee meeting held on 16 September, 2016

Sl. No.	Comments	Actions
	NABARD	
1.	As identification of climate change impacts in Mahanadi basin and vulnerability assessment of wet lands are proposed as a part of the project concept, justification may please be provided as to how adaptation strategies and adaptive capacity improvement of farmers (Component 3 &4) are firmed up?	The justification is provided
2.	Capacity building of officials of various Departments like Forestry, Water Resources (component 5), proposed in the concept note, is not an eligible activity for financing under NAFCC and hence may be deleted.	Capacity building has been removed but knowledge management is kept
3.	Watershed management (Component 3) with interventions like CCT, WAT, Contour bunds etc., appears to be the major interventions proposed in about 20,000 ha of area. These measures are also supported under on-going watersheds funded under IWMP. Justification as to how, these measures are different from the interventions under the existing programmes, may please be provided	Climate smart watershed management is proposed in addition demand side management is taken as important adaptation strategy
4.	Stakeholder consultation was reported to have been conducted way back in January 2013. As stakeholder consultation is an important mechanism for involving all the stakeholders in the project and designing project interventions, it is advised to conduct some more consultations especially with vulnerable communities in the project area like small and marginal farmers, women, SC/ST, other vulnerable communities etc. before the DPR state	A revised stakeholder consultation report has been added in the report.
5.	Knowledge management was found mentioned in page 41. However, it is not clear that whether required amount has been budgeted. In case State Government proposes to meet from their regular budget, a mention may please be made in the DPR	Knowledge management has been separately budgeted

6.	As majority of interventions proposed are individual oriented one, need for screening Environmental and Social risks may be assessed especially with respect to access & equity, gender equity etc. Towards this end, selection criteria for beneficiaries for interventions may be detailed in the proposal	Selection criteria for beneficiaries will be discussed with State Government welfare departments and as per state and national policies.
	Ministry of Agriculture	
8.	For traditional agricultural practices, agro-biodiversity of the area must be considered and	It is considered in the revised DPR
9.	Plantations on the pond bund area could be considered.	
	Ministry of Health	
10.	For the vulnerability and baselines assessment, health indicators such as food and water borne illness and nutritional issues could be included and co-benefits highlighted and measured against set indicators	Baseline vulnerability assessment and health related adaptation strategies has been added.
	Ministry of Water Resources	
11.	The DPR should highlight the measures that would be implemented to improve availability of water.	Demand management strategies such as agriculture crop diversification, irrigation use efficiency has been given
12.	Improving quality of village ponds so water supply to villages is improved	
13.	Recharge of ground water and on-farm water management practices	
		Measures to improve water quality and surface and ground water recharge shall be proposed further

Annexure 1: References

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Annexure I A Cost estimates guidelines for various activities in Watershed

Sr. No	Treatment	Area (ha)	Unit RM/No (RM-Running Metre)	Size (Cross Section)	Total units Volume in cubic metre		Rate (Rs/ unit)		Cost		Total Cost (TFO)
							Labour	Material	Labour	Material	
1	2	4	5	6	7		8	9	10	11	12
a	Contineous Contour Trench	3000	75000	0.18	13500	cum	79.5	0	1073250	0	1073250
b	Water Absorption Trench	2000	25000	0.6	15000	cum	79.5	0	1192500	0	1192500
c	Stone Bunding	0	25000	0.36	9000	cum	90.34	0	813060	0	813060
e	Grass Seeding & Dryland Horticulture / afforastation	20000	20000	1	20000	Kg	0	125	0	2500000	2500000
a	Paddy Bunding	5000	50000	0.54	27000	cum	63.6	0	1717200	0	1717200
b	Repair of Paddy Bunding	5000	25000	0.24	6000	cum	63.6	0	381600	0	381600
c	Pipe Outlet/ Stone outlet		3000	1	3000	no	68.25	270	204750	810000	1014750
e	Farm Pond (15 X 15X 3)	0	350	1	350	No.	43924	0	15373400	0	15373400
	Repair of Farm Pond / Old Pond	0	50	1	50	No.	43924	0	2196200	0	2196200
a	Gully Plug		500		500	no	523	0	261500	0	261500
b	LBS		500		500	no	2612	0	1306000	0	1306000
c	Gabian		300		300	no	16223	29231	4866900	8769300	13636200
d	Check Dam (CD)		30		30	no	290684	193789	8720520	5813670	14534190
e	Repair of CD (No./ Cum)		10		10	no	200000	300000	2000000	3000000	5000000
	Sub total(5)										60999862

****The cost structure of Pipeoutlet, farm pond, gully plug, LBS, Gabian, Check dam and repair of CD to be done as per the design specification

Annexure III: Watershed management costs

SN	Treatment	Unit RM/No (RM- Runni ng Metre)	Unit rate	Year wise Target & Budget								Total	
				Yr I		Yr II		Yr III		Yr IV		Target	Budget
				Target	Budget	Target	Budget	Target	Budget	Target	Budget		
a	Contineous Contour Trench	cum	79.5	500	39750	5000	397500	5000	397500	3000	238500	13500	1073250
b	Water Absorption Trench	cum	79.5	0	0	3000	238500	5000	397500	7000	556500	15000	1192500
c	Stone Bunding	cum	90.34	500	45170	3500	316190	4000	361360	1000	90340	9000	813060
e	Grass Seeding & Dryland Horticulture / afforastation	Kg	125	1000	125000	6000	750000	8000	1000000	5000	625000	20000	2500000
a	Paddy Bunding	cum	63.6	1000	63600	10000	636000	10000	636000	6000	381600	27000	1717200
b	Repair of Paddy Bunding	cum	63.6	500	31800	2500	159000	2500	159000	500	31800	6000	381600
c	Pipe Outlet/ Stone outlet	no	338.25	100	33825	1000	338250	1000	338250	900	304425	3000	1014750
e	Farm Pond (15 X 15X 3)	No.	43924	50	2196200	100	4392400	150	6588600	50	2196200	350	15373400
	Repair of Farm Pond / Old Pond	No.	43924	5	219620	20	878480	20	878480	5	219620	50	2196200
a	Gully Plug	no	523	100	52300	300	156900	100	52300		0	500	261500
b	LBS	no	2612	100	261200	300	783600	100	261200		0	500	1306000
c	Gabian	no	45454		0	200	9090800	100	4545400		0	300	13636200
d	Check Dam (CD)	no	484473		0	10	4844730	15	7267095	5	2422365	30	14534190
e	Repair of CD (No./ Cum)	no	500000		0	2	1000000	6	3000000	2	1000000	10	5000000
	Sub total(5)				3068465		23982350		25882685		8066350		60999850
	In Lakhs				30.68		239.82		258.83		80.66		610.00

Annexure IV: Maps showing Wetlands, Watersheds, Landuse and Population of selected districts

