Integrated surface water management through rejuvenation of 20 tanks and 32 village ponds for Climate Change Adaptation in Puducherry

Detailed Project Report for funding under National Adaptation Fund for Climate Change

Department of Science, Technology & Environment

Government of Puducherry

PREPARED BY NABARD CONSULTANCY SERVICES PRIVATE LIMITED

NABCONS | NEW DELHI

Integrated surface water management through rejuvenation of 20 tanks and 32 village ponds for Climate Change Adaptation in Puducherry

September 8, 2015

Prepared By:

NABARD Consultancy Services Pvt. Ltd (NABCONS)

NABARD Tower, 24, Rajendra Place, New Delhi-110125

Tel: 011-25745102 Email: headoffice@nabcons.in

Web: www.nabcons.com

DISCLAIMER

This Detailed Project Report has been prepared by NABARD Consultancy Services (NABCONS) for Department of Science, Technology and Environment (DSTE), Government of Puducherry, based on the inputs and information shared by the officials of DSTE, Department of Agriculture and PWD, Puducherry. The views expressed in this report are advisory in nature and do not represent or reflect the policies of NABARD or NABCONS on the subject. NABCONS / NABARD accepts no financial liability whatsoever to anyone in using this material.

Contents

Project Summary 5
PROJECT BACKGROUND 7
1.1 Project Background and Context: 7
1.2 Project Objectives: 18
1.3 Details of Project/ Programme Executing Entity 19
1.4 Project Components and Financing 21
1.5 Projected Calendar: 31
Project Justification 34
2.1 Component-wise details and justification of the project components 34
2.2 Details on Economic, social and environmental benefits project 36
2.3 Sustainability of intervention 37
2.4Analysis of the cost-effectiveness of the proposed project 38
2.5 Alignment with the National and State Action Plans and other Policies / Programmes 39
2.6 Component wise technical standards 40
2.7 Duplication Check 40
2.8 Details on Stake-holder consultation 42
2.9 Learning and knowledge management component to capture and disseminate lessons learned for the proposed project. 43
2.10 Sustainability of the project/programme outcomes 44
2.11 Overview of the environmental and social impacts and risks identified 44
Implementation Arrangements 46
3.1 Arrangements for project / programme implementation. 46
3.2 Measures for financial and project / programme risk management 47
3.3 Describe the monitoring and evaluation arrangements and provide a budgeted 48
3.4 Results framework for the project proposal is as following: 49
3.5 Detailed budget with budget notes 50
3.6 Disbursement schedule with time bound milestones 50
Annexure-I Irrigation map of Puducherry
Annexure-II Ground water change in Puducherry (1987 and 2010)
Annexure-III Tanks and Ponds in cascade in Puducherry
Annexure-IV Location Details of 20 Irrigation Tanks
Annexure-V Detailed Cost Estimate for 20 Tanks
Annexure-VI Detailed cost estimates for 32 ponds
Annexure-VII Water level data of 7 Exploratory Bore Wells
Annexure VIII Details of Storage Capacity of 20 tanks
Annexure IX Details of Storage Capacity of 32 ponds
Annexure X Yield data of various crops

List of Tables & Figures

Table 1: Contact Details of Nodal Officer of the Executing Entities 6
Table 2: Performance of major crops in Puducherry 12
Table 3: Yearwise use of different source for irrigation 12
Table 4: List of 20 Irrigation Tanks 16
Table 5: Location detail of village ponds 16
Table 6: Demographic details of Puducherry 17
Table 7: Details of Project Execution Agency 19
Table 8: Available manpower for the implementation of proposed project 19
Table 9: Availability of suitable infrastructure with executing agency 20
Table 10: Project components and financing 21
Table 11: Cost Abstract for the project 29
Table 12: Proposed calender for the implementation of project 31
Table 13: Capacity Building Plan 33
Table 14: Vulnerability Assessment 36
Table 15: Justification of the Project 36
Table 16: Associated benefits of the proposed project 36
Table 17: Weighing of project objectives 39
Table 18: Sustanability of prject 44
Table 19: Environmental & Social principles 44
Table 20: Risk and risk mitigation measures 47
Table 21: Result framework for the proposed project 49

Figure 1: Rainfall pattern in Puducherry (100 year data), Source: PWD 10
Figure 2: Projected Rainfall and Temperature 11
Figure 3: Sea water intrusion in Puducherry 14

Project Summary

Project Proposal for funding under National Adaptation Fund for Climate Change Submission

Title of Project: "Integrated surface water management through rejuvenation of 20 tanks and 32 village ponds for Climate Change Adaptation in Puducherry"

Project Objectives:

- To adapt with changed climatic condition in respect to rising sea level, increasing salinity of ground water and availability of water supply to stakeholders.
- Diminish reliance on ground water resources and restore surface water bodies.
- To prevent intrusion of Salinization of fresh water aquifers by ground water recharging.
- To promote agricultural income from better cropping pattern and production.
- Promoting afforestation activities in the bund and control bund soil erosion.
- To minimize water evaporation due to afforestation in association to climate proofing
- To promote inland pisciculture
- To meet future water demand of Puducherry region

Project Sector: Water Resource Development under National Water Mission (NWM) and Mission for Green India & Sustainable Agriculture code as described in UT Action Plan on Climate Change

Name of Executing Entities:

- Department of Science and Technology, Government of Puducherry
- State Ground Water Unit and Soil Conservation, Department of Agriculture, Puducherry
- Public Works Department, Government of Puducherry
- Puducherry Water Resources Organization (PWRO)

Beneficiaries:

General Public, Farming Community, Industries

Project Duration:

Implementation in 2 years starting from April 2016 till April 2018.

Capacity Building till April 2020.

Amount of Financing Requested (Rs.): Rs. 17,50,70,000/-

Project Location:

All the selected tanks and ponds are situated in North West part of Puducherry.

State:

Union Territory of Puducherry

District:

As mentioned in the locational details of the specific sites of the project.

Contact Details of the Nodal Office of the Executing Entities:

Table 1: Contact Details of Nodal Officers of the Executing Entities

Agency	Contact Person (Designation)	Contact Details
Department of Science and Technology, Government of Puducherry	Shri M. Dwaraknath, Director, DSTE, Gov. of Puducherry	Email: dwarak98@gmail.com Mobie: 9443716026
State Ground Water Unit and Soil Conservation, Department of Agriculture, Puducherry	Shri V. Radhakrishnan, Hydro-geologist, State Ground water unit, DoA, Gov. of Puducherry	Email: radhakrishnan.jb@gmail.com Mobie: 9443075527
Public Works Department, Government of Puducherry	Shri G. Paneer, J.E., Irrigation Division, PWD, Puducherry	Email: paneer125@yahoo.co.in Mobie: 9443440331
Puducherry Water Resources Organization (PWRO)	Shri V. Radhakrishnan, Joint Project Coordinator, State Ground water unit, DoA, Gov. of Puducherry	Email: radhakrishnan.jb@gmail.com Mobile: 9443075527

PROJECT BACKGROUND

1.1 Project Background and Context:

a) Brief information on the problem the proposed project/programme is aiming to solve:

Union Territory of Puducherry has 35 million cubic meters (MCM) of surface water and 150 MCM of groundwater. As per Central Ground Water Board and PWD, demand is exceeding the availability by 20%. UTP has also high monsoon variability as well as the sea level rise, which has affected the gradient at the sub-surface level leading to salinity in aquifers. At Puducherry coast, deep water waves (approx. 2.1-2.2 m) occur from south and southwest during southwest monsoon and from northeast during northeast monsoon. Further, as per the scientific studies, the sea level rise was estimated to be 0.085 mm/ year during the past 54 years. This is likely to be more with the enhanced frequency of extreme events like Thane cyclone. As per the hydrological investigation, UTP's groundwater level has dropped in coastal areas up to 12 meters. Excess withdrawal of groundwater is coupled with temperature rise [as per the UTP Action Plan on Climate Change (UTPAPCC) using the PRECIS tool and A1B scenario, the summer temperature rise is about 3-4 deg Celsius] resulting in drying up of a large number of open wells in drought-prone regions of the UTP.

The country's water demand is mainly dependent on the precipitation (estimated to be around 4000 km^3/year), and trans-boundary flows which it receives in its rivers and aquifers from the upper riparian countries. Amongst the total precipitation, including snowfall, the availability from surface water and replenishable groundwater is estimated as 1869 km^3 of which only 433 km^3 from groundwater resources can be put to beneficial use due to various constraints of topography. Although large scale ground water use in India is a unique feature, the ground water development in some areas, is leading to over-exploitation of the available ground water and consequently to the falling trend in the ground water levels. Country's total ground water resources is 433 km^3, which is being over-exploited leading to falling trend in the ground water levels **(NWM).**

The Puducherry region solely depends upon ground water for all purposes viz.. Irrigation, industrial and domestic since in the middle of 1980's which resulted in drastic declination of ground water levels throughout Puducherry region to a depth of 12 to 45 mts BGL and also sea water has intruded into the ground water aquifers to a distance of 1 to 4 kms inland along the coastal tract. Actually the main source of irrigation prior to 1987 was 86 no's of tanks and lakes which were supplemented by 3,000 numbers of shallow tube wells fitted with ordinary centrifugal motor pump sets. The practice of conjunctive usage of surface and ground water was neglected since middle of the 1980's and thereafter the entire requirement of water is being met out from groundwater which is mainly due to improper maintenance of tanks/lakes and also considerable number of village ponds numbering around 600 have not been properly maintained for harvesting rain water.

The traditional tank system in Union Territory of Puducherry (UTP) used to provide excellent irrigation in the past. The discontinuance of traditional tank irrigation indicates a departure from community based approach to private bore-well based one. This has resulted in reducing the adaptive capacity of the eco-system to increased climate variability and change, making the communities more and more vulnerable. Sea level rise, increasing temperature and extreme events worsened the situation. This has resulted in a situation of rapid ground water depletion and increased salinization. The tanks get silted for about 100 mm every year due to fresh in flow thereby decreasing the capacity by 2%. Hence there is a need to restore the capacity of water bodies. This requires urgent attention.

The task of rehabilitation of tanks have been taken up by this administration under Tank Rehabilitation Project, Puducherry (TRPP) with the financial assistance of European Union in the year 1998 and has come to a closure in 2004 under which 84 numbers of tanks have been desilted and their water holding capacity has been increased from 46 MCM to 75 MCM which has given a good impact in the ground water regime of Puducherry. Now, it is proposed to take up the renovation of 32 village ponds and 20

tanks in a phased manner to increase the recharge capacity of the ponds and tanks additionally in the villages.

Considering the foreseeable challenges of monsoon variability and sea level rise in UTP, a project titled "Integrated surface water management for climate change adaptation through rejuvenation of traditional tanks and village ponds" is proposed to undertake an integrated surface water management strategy by reviving traditional tank irrigation and renovating village ponds as a climate change adaptation strategy. This project is formulated in order to achieve the goal to meet out the future water demand of Puducherry region. Basically this region depends on ground water aquifers for domestic and irrigation use. The aquifers get recharged from monsoon rains and water stored in irrigation tanks and river beds. Due to rapid urbanization and population growth in this region, the existing ground water aquifers were exploited, causing sea water intrusion. The capacities of tanks in use, gets diminished and are to be deepened to store more water and thus enhance ground water recharge.

b) Adherence to Economic, social, development and climate change in line with the State Action plan on Climate Change and relevant Missions under National Action Plan on Climate Change:

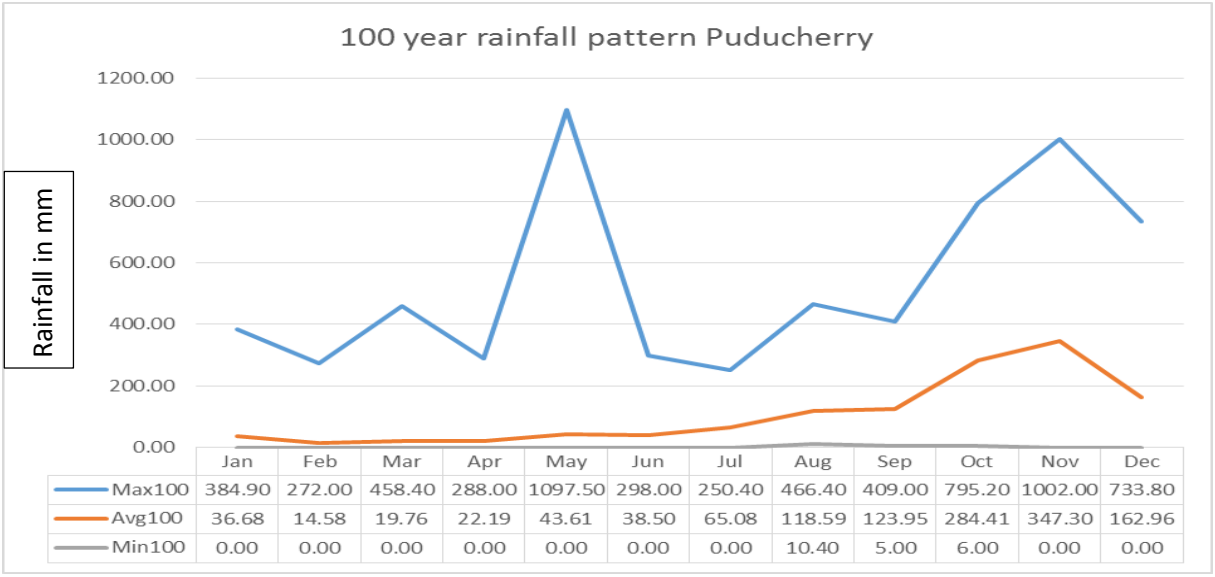
The project is on priority of Government of Puducherry, as it achieves economic and social development while addressing climate change. The economic benefits of the project include: diversification of livelihood opportunities and increase in income due to higher water availability and lesser reliance on ground water. The social benefits include: formation of community level institutions such as Tank User Associations , capacity building, knowledge dissemination and increased awareness about climate change.

Strategy II. 2 of Water Mission document (under NAPCC) emphasizes on "Promotion of traditional system of water conservation". Specific activities under this strategy relate to expeditious implementation of programme for repair, renovation and restoration of water bodies in areas / situations sensitive to climate change by increasing capacity of minor tanks, and Rehabilitating water bodies, with changed focus.

After the Prime Ministerial announcement during 2008 the UT Action Plan on Climate Change prepared by the Puducherry Government emphasized two components under which the proposed project is falling which are namely Mission for Green India & Sustainable Agriculture and National Water Mission.

Therefore, this project is in full conformity with National Action Plan as well as the UT action plan on climate change of Puducherry.

c) Climate analysis and vulnerability analysis



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max100	384.90	272.00	458.40	288.00	1097.50	298.00	250.40	466.40	409.00	795.20	1002.00	733.80
Avg100	36.68	14.58	19.76	22.19	43.61	38.50	65.08	118.59	123.95	284.41	347.30	162.96
Min100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.40	5.00	6.00	0.00	0.00

Figure 1: Rainfall pattern in Puducherry (100 year data), Source: PWD

As per the IMD, reversal of winds from south-west to north-east direction is observed during mid-October which is followed by rainfall during October to December. During the North East monsoon seasons, depressions and storms from the Bay of Bengal bring heavy rains, thunderstorms, and gusty winds to the UTP which receive less rainfall from SW Monsoon.

The period December to January is the most pleasant and coolest part of the year. As per the PWD the dry period extends up to the end of August and then onwards wet period starts and is at the peak during November. Relative humidity is generally high above 70%, during August to April. From the 100 year rainfall data, it was observed that the average annual rainfall in Puducherry is about 1277 mm. The maximum downpour was during

October – November, 2005. The heaviest rain fall in the history occurred in May 1943 amounting to 1097 mm. The rainiest month is November, contributing to about 30% of the annual rainfall. The variability of rainfall is fairly large. There are on an average 55 rainy days per year. The ten year data shows that north east monsoon onset is around third week of October. The rainfall though remains surplus, however, high run off along the gradient leaves nothing for the crops in April. The main crop paddy in the UTP is heavily dependent on the monsoon rain. In the last few years due to the variation in sea-surface temperature and other effects, either monsoon onset is delayed or immediately after onset there is a long break. The projected rainfall and temperature as calculated using PRECIS tool (Geetalaxmi, et.al) under A1B scenarios have been presented below:

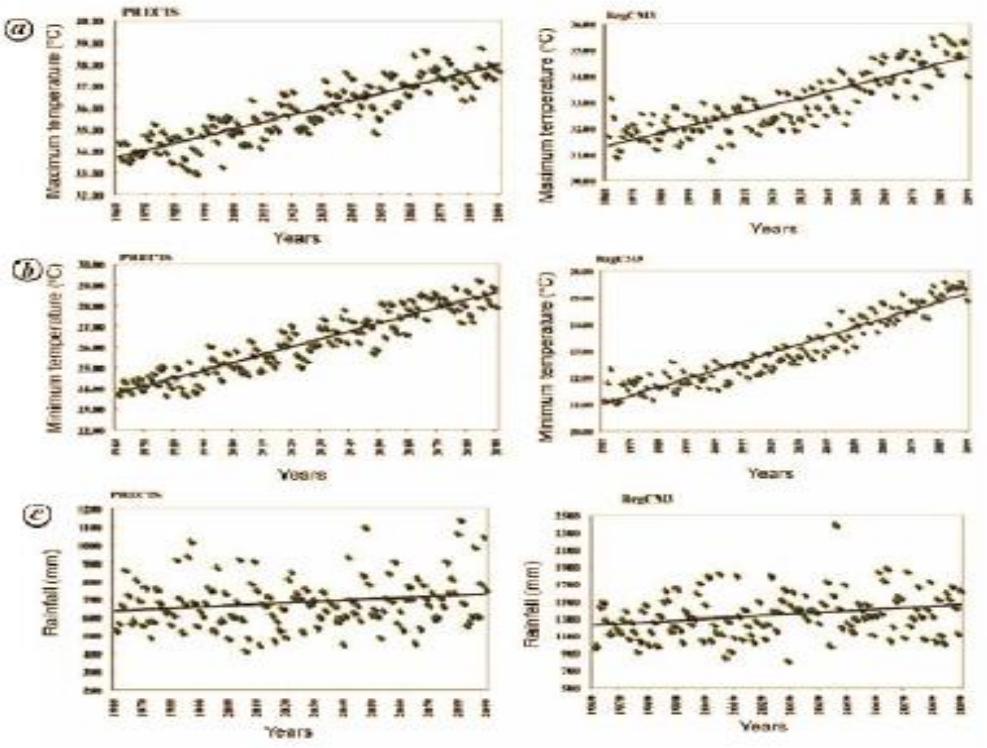


Figure 2: Projected Rainfall and Temperature

As per the SAPCC, Puducherry receives its highest normal rainfall (average of 30 years) from north east monsoon around 832 mm followed by south west monsoon in the range of 365 mm. Unlike Puducherry, North-western part of the UTP remain moisture stressed and saline water intrusion is about 4 km inland in southern region, 2 km towards central

region and <2 km in northern region. About 60% of the proposed tanks are in North-west.

Further, Secular decline and high fluctuation in output of crops have been observed in the UTP as indicated in Table 2. This can be attributed to vagaries of monsoon and resultant shift of people from agriculture, out-migration.

Table 2: Performance of major crops in Puducherry

Crop	2007-08		2008-09		2009-10		2010-11	
	Average Yield (kg/ha)	Total Output (Tonnes)	Average Yield (kg/ha)	Total Output (Tonnes	Average Yield(kg/ha)	Total Output (Tonnes	Average Yield (kg/ha)	Total Output (Tonnes
Rice	2609	53324	2441	50716	2501	52330	2596	51960
Ragi	2352	167	2641	103	2676	91	2217	51
Cumbu	2078	133	1818	100	1850	111	2324	79
Cholam	1750	5	1600	3	1550	9	-	0
Thenai	600	1	600	1	600	1	-	0
Blackgram	133	301	266	361	172	169	530	597
Greengram	125	272	190	233	88	94	470	701
Other pulses	917	33	944	17	833	5	846	22
Sugarcane	98328	228416	83457	162323	138518	247254	157327	277683

Source: Department of agriculture, Government of Puducherry

Since the closure of European union project, there has been no tank irrigation for agriculture as shown in Table 3. This has grave implication on ground water as well as energy use. The contribution of tanks towards augmenting ground water recharge and addressing climate variability is w ell justified from the results of the European Union Project. However, there have been no project undertaking desiltation activities post 2004 and adversing impacts of climate variability, saline water intrusion.

Table 3: Yearwise use of different source for irrigation

Classification	Years					
	2003-04	2006-07	2007-08	2008-09	2009-10	2010-11
Canals	316	6472	6170	5707	5755	4558
Tanks	-	-	-	-	-	-
Tube wells	15026	11222	10896	10443	10187	10164
Ordinary wells	-	-	-	-		-
Other Sources	2002	56	45	42	49	47
Net Area Irrigated (hectares)	17344	17730	17111	16202	15991	14769
% of net irrigated to net area sown	84	86.55	86.12	84.36	85.36	79.55
Area irrigated more than	14092	10453	9826	10566	10512	10703

Classification	Years					
	2003-04	2006-07	2007-08	2008-09	2009-10	2010-11
once in the same year (hectares)						
Total irrigated area (gross) (hectares)	31436	28183	26937	26768	26503	25472
% of total irrigated area (gross) to total sown area	84.09	78.41	77.67	81.69	83.06	81.03

Source: Directorate of Economics & Statistics, Puducherry and Public Works Department, Puducherry.

Vulnerability

Uncertainty in the monsoon rain, increased variability and more frequent and intense extreme events (i.e. tsunami, sea level rise and may be high incidence of hydrological drought due to temperature rise) is the most likely future scenario in UTP due to climate change. The ground water in UTP is already in critical stage. The smallholder agriculture and fisheries sector will be particularly affected, and are likely to be highly vulnerable to agro-meteorological droughts and water shortages. The main source of water supply for Puducherry region is ground water for all of its uses. Though there is a network of system and non-system tanks, the region depends entirely on its ground water resources. Though the network of tanks were quite effective during the French regime under the "Syndica Agricole" system, however, after the independence, the tanks have been neglected and people shifted over to ground water extraction which provided them with the much needed freedom of water usage, as per their individual needs. This trend of total dependence on ground water became predominant from the 1970s, after which the population of tube wells burgeoned. This resulted in the drastic lowering of ground water table, which could be witnessed with the drop of around 32 mts in the ground water levels over a period of 33 years.

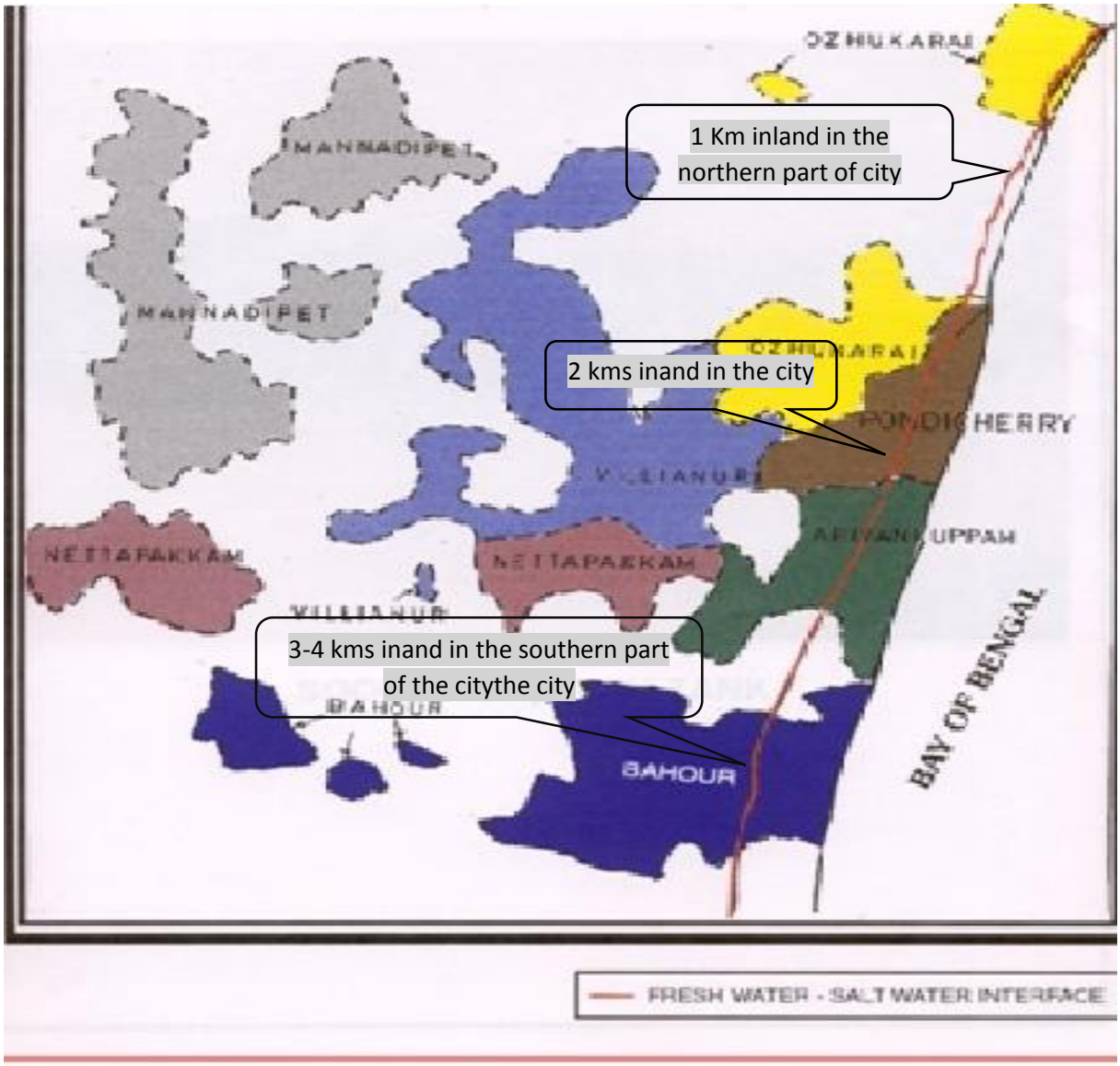


Figure 3: Sea water intrusion in Puducherry

In a coastal region like Puducherry, there is the added danger of the ingress of seawater. For example, in 10 to 15 villages of Bahour, where groundwater has become saline; the villagers are supplied water through tankers from commune headquarters. The shallow aquifers along the coast show signs of salinity. Due to over pumping, there has been a reversal of gradient in several areas. Salt water has intruded up to a distance of 5 to 7 km from the coast. Any further extraction of groundwater has to be done only beyond this distance.

The people have moved out of agriculture due to high climate variability and temporary surge in income due to real estate development and other service sector activities due to

rapid urbanization, cheaper paddy and sugar getting dumped in UTP also led farmers to search alternative vocation. Paddy is cultivated in two-third of the Gross Cropped Area of the state. Paddy-sugarcane-millet pattern has undergone change it is almost paddy mono-cropping in areas like Bahour. Due to the discontinuance of tank irrigation nutrient-rich tank silt application on agricultural fields in order to increase soil fertility has also been discontinued. This has lowered the overall productivity of the soil.

Urgency

It is important to address the ecosystem level impact while addressing the tank adaptation measure for small holders. First of all, the excessive extraction for all uses has caused a drop in the water table at a number of locations. The declining trend over 10 years is of the order of 15 to 30 m in the West and about 7 m in the Eastern part of Puducherry. Urban sprawl has also contributed to lower recharge through reduction of vegetation cover and wetlands. This has resulted in occupational shift, temperature rise and vulnerability of flora and fauna. Extraction has gone to 35-50 m and up to 100 m in some places. A secular decline in the water potential levels, which shows that the ground water use exceeds recharge which is unsustainable and needs to be addressed urgently. It indicates the urgency with which the tank adaptation measures need to be carried out, else there will be permanent damage to the aquifers in several regions of the UTP and the reclamation cost will be far more than the current investment.

d) Project Location Details

Irrigation Tanks

Tanks and Ponds in cascade in Puducherry are appended in **Annexure-III**. Location Details of 20 Irrigation Tanks are appended in **Annexure-IV**.

List of 20 Irrigation Tanks is indicated in Table 4.

Table 4: List of 20 Irrigation Tanks

SI. No.	Tank no.	Name of Tank	System tank	Ayacut area in ha	Water-spread area in ha	Capacity in mcft
1	72	Bahour Tank	S	728.98	321.55	193.5
2	46	Abishegapakkam Tank	S	308.90	42.43	53.0
3	51	Korkadu Tank	S	202.97	65.28	48.2
4	77	Kirumambakkam Tank	S	203.39	65.25	43.0
5	5	Murungapakkam Tank	S	46.73	41.08	31.0
6	30	Vadhanur Tank	S	164.73	106.37	28.0
7	4	Olandai Tank	S	72.43	42.57	14.0
8	56	Embalam Vannan Eri (Tank)	S	43.59	20.93	9.0
9	38	Madagadipet Tank	S	87.89	20.93	6.50
10	26	Mannadipet Tank (control)	NS	11.69	4.17	2.0
11	16	Katterikuppam tank	S	94.97	49.8	6.5
12	25	Koonichempet pazhayaeri	S	32.07	16.12	4.6
13	27	Thirukkanur priaeri tank	S	63.77	18.43	13
14	7	Thondamanatham velleri tank	S	51.07	35.79	12.46
15	36	ThiruvandarKovil tank.	S	75.32	16.45	2.2
16	52	EmbalamVakkraneri tank	S	81.69	14.97	16
17	81	Manapet tank	S	115	14.89	4.16
18	83	Keezh parikkalpet tank.	S	88	5.3	1.97
19	68	Karayamputhur Vannaneri	S	31.7	18.58	2.29
20	86	Kurivinatham Tank	S	13.69	9.58	15

Village Ponds

Out of 609 village ponds, 32 numbers of village ponds, located in the North Western parts of Puducherry region, where maximum depletion of ground water is noticed, are proposed to be taken up for renovation under the project. List of 32 village ponds to be renovated is indicated in Table 5.

Table 5: Location detail of village ponds

Sl. No.	Name	Village	Area_Ha
Mannadipet Commune Area			
1	Uthu_Kulam	Kunichampet	0.152
2	Velan_Kulam_Kuttai	Kunichampet	0.172
3	Thamarai Kulam	Kunichampet	0.504
4	Ayyanar_Kovil_Kulam	Kunichampet	0.156
5	Sethi_Kuttai	Thirubhuvanai	0.450
6	Thamarai_Kulam	Thirubhuvanai	0.440
7	Kulam	Thirubhuvanai	0.603
8	Ural_Kuttai	Thirubhuvanai	1.410
9	Kulam	Vadhanur	1.768

Sl. No.	Name	Village	Area_Ha
10	Kulam	Vadhanur	3.343
11	Vezhal Kuttai	Thiruvandarkoil	0.164
12	Ural Kuttai	Thiruvandarkoil	0.419
13	Sudukadu_Kulam	Thiruvandarkoil	0.165
14	Arippan_Kulam	Sorapet	2.754
15	Attai_Kulam	Sorapet	0.444
16	Amman_Kulam	Sorapet	0.476
17	Kaliyatha_Kuttai	Sanyasikuppam	0.118
18	Kulam	Sanyasikuppam	0.218
19	Kalkatti Kulam	Mannadipet	0.433
20	Ayyanar Kulam	Mannadipet	0.287
21	Gingee Kulam	Manalipet	0.373
22	Alakala_Kuttai	Madagadipet	0.238
23	Sandai_Kuttai	Madagadipet	0.313
Nettapakkam Commune Area			
24	Pandashozhanoor_Kuttai	Pandasozhanallur	0.680
25	Ural Kulam	Madukarai	0.438
26	PillayarKovil Kulam	Madukarai	0.443
27	Ural Kulam	Madukarai	0.599
28	Pidari Kulam	Madukarai	0.492
29	Ayyanar Kovil Kulam	Embalam	0.426
30	Ayyanar Kovil Kulam	Embalam	0.225
Villianur Commune Area			
31	Thirukanchi Kulam	Thirukanji	1.254
32	Sitheni Kuttai	Ramanathapuram	0.329

e) Demographic details of the population of Puducherry:

Table 6: Demographic details of Puducherry

Description	Yr 2011	Yr. 2001
Approximate Population	12.48 Lakhs	9.74 Lakh
Actual Population	1,247,953	974,345
Male	612,511	486,961
Female	635,442	487,384
Population Growth	28.08%	20.56%
Percentage of total Population	0.10%	0.09%
Sex Ratio	1037	1001
Child Sex Ratio	967	967
Density/km2	2,547	2,034
Density/mi2	6,603	5,267
Area(Km2)	490	479
Area mi2	189	185
Total Child Population (0-6 Age)	132,858	117,159
Male Population (0-6 Age)	67,527	59,565
Female Population (0-6 Age)	65,331	57,594

Description	Yr 2011	Yr. 2001
Literacy	85.85%	81.24%
Male Literacy	91.26%	88.62%
Female Literacy	80.67%	73.90%
Total Literate	957,309	696,367
Male Literate	497,378	378,758
Female Literate	459,931	317,609

Source: Census Survey 2011

1.2 Project Objectives:

The primary objective is to combat impacts of climate variability, saline water intrusion by adopting conjunctive use of surface water and ground water through increasing water storage capacity of tanks and village ponds which get filled up during monsoon period and augmenting ground water recharge. This project will reduce dependence on ground water, ensure enhanced water recharge of the aquifers of this region, and therefore prevent saline water intrusion and ensure water availability during dry periods. Due to over extraction of water from the existing aquifers in this region and in the neighbouring Tamil Nadu this region witness steep draw down in the ground water aquifers and the sea water intrusion.

- The To adapt with changed climatic condition in respect to rising sea level, increasing salinity of ground water and availability of water supply to stakeholders.
- Diminish reliance on ground water resources and restore surface water bodies.
- To prevent intrusion of Salinization of fresh water aquifers by ground water recharging.
- To promote agricultural income from better cropping pattern and production.
- Promoting afforestation activities in the bund and control bund soil erosion.
- To minimize water evaporation due to afforestation in association to climate proofing
- To promote inland pisciculture
- To meet future water demand of Puducherry region

1.3 Details of Project/ Programme Executing Entity

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

Table 7: Details of Project Execution Agency

Agency	Details	
Department of Science and Technology, Government of Puducherry	Registration No.	N/A
	Registered Address	PHB Building, Anna Nagar,Pondicherry-5
	Project Office Address	
State Ground Water Unit and Soil Conservation, Department of Agriculture, Puducherry	Registration No.	N/A
	Registered Address	DoA, Thattanchavady, Pondicherry 605 009
	Project Office Address	
Public Works Department, Government of Puducherry	Registration No.	N/A
	Registered Address	Central Office, PWD 34, Lal Bahadur Sastri Street Puducherry - 605 01
	Project Office Address	
Puducherry Water Resources Organization (PWRO)	Registration No.	N/A
	Registered Address	Lawspet, Puducheryr 605 008
	Project Office Address	

b) Available technical manpower for the proposed project implementation

Table 8: Available manpower for the implementation of proposed project

Agency	Manpower
Department of Science and Technology, Government of Puducherry	Director-1, Senior Scientific Officer-1, Scientific Officer-1, Scientist-1, Environmental Engineer-1, Superintendent-1, Junior Engineers and Laboratory Assistants.
State Ground Water Unit and Soil Conservation, Department of Agriculture, Puducherry	Engineers in the Cadre of Agricultural officers (Engineering), Deputy Director (Agrl. Engineering) , Joint Director (Agrl.Engg.) and Additional Director(Agrl.Engg.), A.O(Hydrogeology) and Hydrogeologists
Public Works Department, Government of Puducherry	Chief Engineer-1, Executive Engineer-12, Assistant Engineer-65, Junior Engineer-218, Drafts Man-40, Superintendent Engineer-3.
Puducherry Water Resources Organization (PWRO)	Senior Hydrologist, Technical Experts, Hydrogeologist (Junior Level) , GIS System Analyst and Data Entry Operators

c) Three largest Climate Change Adaptation Projects handled (if already implemented)

This is the first climate change adaptation project in the Union Territory of Puducherry.

d) Three largest community based NRM based projects handled

i. Project on the renovation of tanks and lakes was carried out by Irrigation Division of PWD in coordination with the State Ground Water Unit of

Department of Agriculture from 1996 to 2004 with European Union Assistance.

ii. Subsequent to the scarcity of the canal water in Karaikal region, 90 numbers of community tubewells were constructed in Karaikal region of this U.T for supplementing the surface water irrigation and the tubewells were helpful to the farmers for taking up the preparatory works of cultivation.

e) Three largest NRM projects of State Government

i) Hydrology Project II (a World Bank funded project) - 8 year project since 2006 onwards for better water resources management in Puducherry

ii) Project on digital mapping of eco sensitive zones around the Oussudu lake through GIS and GPS techniques.

f) Comment of availability of suitable infrastructure for implementation proposed projects (vehicles, computers, required software/ tools, etc.)

Table 9: Availability of suitable infrastructure with executing agency

Agency	Suitable Infrastructure	
Department of Science and Technology, Government of Puducherry	Civil Infrastructure	A sophisticated Data Centre with state of the art servers and plotters , readily available for taking up the preliminary works of the project as well as for undertaking the monitoring and evaluation of the programme. Sufficient numbers of four wheelers, two wheelers are avaialble with the agencies. State of the art water resources data centre with Arc GIS suite software , latest image processing software with sufficient numbers of servers are available with the agencies. Besides, adequate number of ground water , hydrometeorology and water quality monitoring with telemetry provisions are available with the agencies.
	Logistics	
	Technology	
State Ground Water Unit and Soil Conservation, Department of Agriculture, Puducherry	Civil Infrastructure	
	Logistics	
	Technology	
Public Works Department, Government of Puducherry	Civil Infrastructure	
	Logistics	
	Technology	
Puducherry Water Resources Organization (PWRO)	Civil Infrastructure	
	Logistics	
	Technology	

g) None of Executing Entities (EE) was blacklisted, barred from implementation of projects, and faced any charges / legal cases related to mismanagement of project and funds.

The executing entities have never been blacklisted or barred from implementation of any projects. While selection of agency for capacity building, it will be ensured that the selected agency also comply on this criteria.

1.4 Project Components and Financing

Table 10: Project components and financing

S.N	Project/Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (Lacs)
1	Rejuvenation of 20 irrigation tanks	i. Replenishment of ground water level ii. Increase in storage capacity of tank iii. Creation of livelihood and assets	i. Maintenance of ecological balance ii. Prevention of salinity ingress iii. Increase in water availability iv. Higher crop yields and farmer's income	1000
2	Renovation of 32 nos of village ponds and construction of recharge structures in the renovated ponds to augment recharge @ Rs. 15 Lakh per pond	i. Replenishment of ground water level ii. Increase in storage capacity of village ponds iii. Creation of livelihood and assets	i. Maintenance of ecological balance ii. Prevention of salinity ingress iii. Increase in water availability iv. Higher crop yields and farmer's income	480
3	Capacity Building of tank user associations	i. Participatory Micro-Vulnerability Assessment ii. Participatory Micro-Planning	i. Equitable benefit sharing ii. Community involvement and ownership iii. Local institutions development	100
4	Project Management (M&E and Knowledge Management)	i. Identification of recorrective measures ii. Knowledge sharing and dissemination	i. Project completion in time bound manner ii. Transparency and credibility	90
5	Programme Execution Cost (Administrative and Miscellaneous Expenses)			20
6	Total Project/Programme Cost			1690
7	Project formulation cost (1% project cost or Rs 10 Lacs, whichever is lesser)			10
8	Project/Programme Cycle Management Fee charged by the NIA (3% project cost)			50.7
	Amount of Financing Requested			1750.7

COMPONENT 1: Rejuvenation of 20 irrigation tanks

Executing agency: Public Works Department (PWD)

Details of activities:

Under this component, it is proposed that 20 prioritized tanks will be climate proofed through activities such as de-silting, catchment treatment and enhancing water holding capacity of the tanks. It will be executed by involving tank user associations for livelihood planning and asset creation. De-silting of the tanks would increase the water holding

capacity of the tanks, thus recharging the ground water and preventing salinity ingress. This activity would involve following **sub-activities**:

Activity 1.1: Earth work, excavation and dressing of banks on the prioritized tanks to be undertaken as per the norms.

Activity 1.2: Digging holes and dressing with surplus earth: It will involve digging of holes in the ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1.

Activity 1.3: Surplus silt will be applied in both paddy and sugarcane field

Activity 1.4: Sinking of the recharge well: This will involve boring of specified diameter using approved drilling method to the required depth based on the available hydrological and lithological data of the tanks including bentonite mud circulation of approved specific gravity.

Activity 1.5: Fixing cement concrete rings

Activity 1.6: Replacement of Sluice Shutter

Detailed activities proposed in each tanks:

In general, in all the above 20 tanks, it is proposed to deepen arangani portion to a depth of 30 cm, to repair the existing sluice shutters, to construct required number of recharge wells and to plant tree saplings along bund.

Bahour Tank (Tank No.72): The detailed estimate is prepared for the work ''Rejuvenation of Bahour tank for an amount of Rs.1,08,00,000/-. The Bahour tank is situated 22km apart from Puducherry town. The Bahour commune is called as Rice town of Puducherry. The Bahourtank is mainly used for irrigating to the Agriculture fields in nearby areas. There is one Anicut also constructed across the Pennaiyarriver in the Sornavour village. The maximum depth of water level is 3.60mts and the total length of bund is 8290m. The surplus water of Bahour tank is discharged through the surplus channel with Pannithittu regulator tail end point and the supply channel is 7kms length. The proposal is mainly

deepening the arangani portion to a depth of 30cm and length of 4.70kms, to repair the 8 sluice shutters, to construct 12 nos of recharge well and to plant 2500 tree saplings along bund.

Abishegapakkam tank (Tank No.46): The detailed estimate is prepared for the work of rejuvenation of Abishegapakkam tank for an amount of Rs.68,00,000/- the Abishegapakkam tank is located 13 Km apart from Puducherry town, the total Ayacut area is 308.90 HA. The water spread area is 42.43 HA. Capacity of tank is 53.Mcft. and FTL. is 2.30 mt. The water is received from Malaradikkalvaikal and major parts supplied from Authuvaikal feeder channel. This river water reaches to Kariyambathoor village after feeding water to number of tanks and various potential ponds in Tamil Nadu and Puducherry States. The Inlet structure was constructed during the year 1961 and the Inlet structures shutter arrangements are totally found in damaged condition. The proposal is mainly deepening the arangani portion to a depth of 30cm and length of 2.50kms, to repair the 5 sluice shutters, to construct 12 nos of recharge well and to plant 2500 tree saplings along bund.

Korkadu tank (Tank No.51): The detailed estimate is prepared for the work of Rejuvenation of Korkadu tank in Nettapakkam commune, Puducherry for an amount of Rs.66,20,000/- The Korkadu tank is situated 16km apart from Puducherry town. The tank capacity is 48.2mcft, ayacut area is 202.9HA. The water spread area is 65.28H. The FTL is 1.5mt and capacity of tank is 48.2H. This channel supply water to the adjoining agriculture fields and also received the water from Kizhor Anicut and connected to river Penniyar. In order to increase water storage capacity of the eri it is proposed to desilt the arangani portion.The proposal is to deepening the arangani portion to a depth of 30cm and length of 2.80kms, to repair the 3 sluice shutters, to construct 12 nos of recharge well and to plant 2500 tree saplings along bund.

Kirumambakkam tank (Tank No.77): The detailed estimate is prepared for the work of Rejuvenation of Kirumambakkam tank in Puducherry, for an amount of Rs.50,50,000/-. The Kirumampakkm tank is situated 19km apart from Puducherry town. This tank water

is used for agriculture purpose. The Kirumampakkm tank recharged from Sithieri surplus channel through Moonukannu regulator and Palayam Madaghu and also the surplus water from Bahourtank. The FTL is 1.75m and the total capacity of tank is 43mcft and the total length of bund around the eri is 3.61km hence it is proposed to deepen the arangani portion of tank, in order to increase the recharging capacity of tank. The proposal is mainly deepening the arangani portion to a depth of 30cm and length of 2.00 kms, to repair the 6 sluice shutters, to construct 10 nos of recharge well and to plant 2500 tree saplings along bund.

Murungapakkam tank (Tank No.5): The detailed estimate is prepared for the work of Rejuvenation of Murungapakkam tank in Puducherry for an amount of Rs.59,00,000/-. The Murungapakkam tank is situated 5 Km apart from Puducherry town. The Ayacut area is 46.73 HA. Water spread area is 41.08 HA. And capacity of the tank is 31 MCFT. And FTL is 1.63 Mt. This tank receives water from Sankaraparani, Pennayar and Pambayar, Guduvaiyar and Malatar rivers. Water stored in the tank from the river was catering the need of formers. Hence, to store more water in the tank, it is proposed to deepen by desilting the tank. The proposal is to mainly deepening the arangani portion to a depth of 30cm and length of 2.00 kms, to repair the 4 sluice shutters, to construct 12 nos of recharge well and to plant 2500 tree saplings along bund.

Vadhanur tank (Tank No.30): The detailed estimate is prepared for the work of Rejuvenation of the Vadhanur Tank in Puducherry, for an amount of Rs.45,30,000/- . The Vadhanur Eri/Tank is situated 22km apart from Puducherry town. The Vadhanur village is located in Mannadipet commune and the tank capacity is 28mcftarea. The ayacut is 164.73HA and water spread area is 106.37HA. This is the only source available for irrigation at Vadhanur and water is used mainly for agriculture purpose. The proposal is to deepening the arangani portion to a depth of 30cm and length of1.50kms, to repair the 5 sluice shutters, to construct 8 nos of recharge well and to plant 2500 tree saplings along bund.

Olandai tank (Tank No.4): The detailed estimate is prepared for the work of Rejuvenation of Olandai tank in Puducherry, for an amount of Rs.53,50,000/- . The Olandai tank is located 5 Km apart. Puducherry town. The total Ayacut area is 72.43 HA. And water spreaded area is 42.57 HA and capacity of tank is 14 MCFT. And FTL is 2.10 mt. This tank receives water from two main rivers Sankaraparani and Pennaiyar. Water stored in the tank from the rivers was catering the needs of farmers. Hence for increasing the capacity of tank, it is proposed to deepen the tank by desilting. The proposal is mainly deepening the arangani portion to a depth of 30cm and length of 2.50kms, to repair the 3 sluice shutters, to construct 8 nos of recharge well and to plant 2500 tree saplings along bund.

Embalam Vannan Eri tank (Tank No.56): The detailed estimate is prepared for the work of Rejuvenation of Embalam Vannan Eri in Nettapakkam Commune, Puducherry, for an amount of Rs.36,00,000/- . The Embalam Vannaneri is situated 16 Kmapart from Puducherry town. This tank is having a capacity of 9mcft and ayacut area is 43.59HA, the water spread is 20.93 HA and FTL is 1.5m.It receives water from Korkadu feeder channel near Thookkupalam. The excess water is discharged to Vakkaran Eri channel. The two sluices used to supply water to adjoining agriculture fields through supply channel for the crop period. For increasing the storage capacity, it is proposed to desilt the tank.The proposal is to deepening the arangani portion to a depth of 30cm and length of 1.50kms, to repair the 2 sluice shutters, to construct 6 nos of recharge well and to plant 2500 tree saplings along bund.

Madagadipet tank (Tank No.38): The detailed estimate is prepared for the work of Rejuvenation of Madagadipet tank, in Puducherry, for an amount of Rs.48,00,000/- The Madagadipet tank is situated at 24km from Puducherry tank. The Ellis Anicut is located in Pennaiyarriver and flows to Azhagal channel and branches to sellangalOdai and Valavanur tank. The tank capacity is 6.5mcft and ayacut is 87.89HA. The tank water is supplied to the adjoining fields and for increasing the storage capacity of tank, it is required to be desilted by rough excavation. The proposal is to deepening the arangani portion to a depth of 30cm and length of 1.90 kms, to repair the 3 sluice shutters, to construct 8 nos of recharge well and to plant 2500 tree saplings along bund.

Mannadipet tank (Tank No.26): The detailed estimate is prepared for the work of Rejuvenation of Mannadipet tank in Puducherry, for an amount of Rs.49,00,000/-. The Mannadipet Eri tank located 30km apart from Puducherry town. The Ayacut area is 11.69 HA and water spreader area is 4.17HA and the capacity of the tank is 2mcft with FTL of 1.8m. This is the only source of water available to supply to the surrounding fields for cultivation. The water received by this tank is by rain as well as from Vikkaravandy channel, hence in order to increase the capacity of tank, The proposal is mainly deepening the arangani portion to a depth of 30cm and length of 1.70kms, to repair the 4 sluice shutters, to construct 8 nos of recharge well and to plant 2500 tree saplings along bund.

Katterikuppam Tank (Tank No.16): The detailed estimate is prepared for the work ''Rejuvenation of Katterikuppam tank for an amount of Rs.55,50,000/-. The Katterikuppam tank is situated about 20 km North West from Puducherry town. The Katterikuppam tank is mainly used for irrigating to the Agriculture fields in nearby areas. The ayacut area is 94.97 Ha with water spread area of 49.80Ha .There are 4 sluices in this tank. The maximum depth of water level is 2.95mts and the total length of bund is 2225m. The surplus water of Suthukeni periyaeri tank discharged through the surplus channel feeds this tank. The surplus from this tank feeds Katteri tank through Katteri feeder canal. The proposal is to deepen arangani portion to a depth of 30 cm and length of 1900mts, to repair the 4 sluice shutters, to construct 8 nos of recharge well and to plant 2000 tree saplings along bund.

Koonichempet pazhayaeri tank (Tank No.25): The detailed estimate is prepared for the work ''Rejuvenation of Koonichempet pazhayaeri for an amount of Rs.46,20,000/-. The Koonichempet pazhayaeri is situated about 28 km North West from Puducherry town. The Koonichempet pazhayaeri is mainly used for irrigating to the Agriculture fields in nearby areas. There are 3sluice in this tank. The proposal is to deepen arangani portion to a depth of 30 cm and length of 1200mts, to repair the 3 sluice shutters, to construct 10 nos of recharge well and to plant 2500 tree saplings along bund.

Thirukkanur periaeri (Tank No.27): The detailed estimate is prepared for the work ''Rejuvenation of Thirukkanur periaeri for an amount of Rs.47,70,000/-. The Thirukkanur periaeri is situated about 25 km North west from Puducherry town. The Thirukkanur periaeri is mainly used for irrigating to the Agriculture fields in nearby areas. There are 3sluice in this tank. The proposal is to deepen arangani portion to a depth of 30 cm and length of 1450mts, to repair the 3 sluice shutters, to construct 8 nos of recharge well and to plant 2500 tree saplings along bund.

Thondamanatham velleri (Tank No.7): The detailed estimate is prepared for the work ''Rejuvenation of Thondamanatham velleri tank for an amount of Rs.59,00,000/-. The Thondamanatham velleri tank is situated about 25 km North West from Puducherry town. The Thondamanatham velleri tank is mainly used for irrigating to the Agriculture fields in nearby areas. The ayacut area is 51.07 Ha with water spread area of 35.79Ha .There are 3sluice in this tank. The maximum depth of water level is 2.20mts and the total length of bund is 1900 m. The proposal is to deepen arangani portion to a depth of 30 cm and length of 1500mts, to repair the 6 sluice shutters, to construct 9 nos of recharge well and to plant 2000 tree saplings along bund.

Thiruvandar Kovil tank (Tank No.36): The detailed estimate is prepared for the work ''Rejuvenation of Thiruvandar Kovil tank for an amount of Rs.47,70,000/-. The Thiruvandar Kovil tank is situated about 25 km West from Puducherry town. The Thiruvandar Kovil tank is mainly used for irrigating to the Agriculture fields in nearby areas. The ayacut area is 75.32 Ha with water spread area of 16.45Ha .There are 3sluice in this tank. The maximum depth of water level is 2.20mts and the total length of bund is 1750 m. The proposal is to deepen arangani portion to a depth of 30 cm and length of 1650 m, to repair the 2 sluice shutters, to construct 8 nos of recharge well and to plant 2500 tree saplings along bund.

Embalam Vakkraneri (Tank No.52): The detailed estimate is prepared for the work ''Rejuvenation of Embalam Vakkraneri tank for an amount of Rs.28,00,000/-. The Embalam Vakkraneri tank is situated about 18 km South west from Puducherry town.

The Embalam Vakkraneri tank is mainly used for irrigating to the Agriculture fields in nearby areas. The ayacut area is 81.69 Ha with water spread area of 14.97Ha .There are 2 sluice in this tank .The total length of bund is 750m. The proposal is to deepen arangani portion to a depth of 30 cm and length of 650 mts, to repair the 2 sluice shutters, to construct 6 nos of recharge well and to plant 2000 tree saplings along bund.

Manapet tank (Tank No.81): The detailed estimate is prepared for the work ''Rejuvenation of Manapet tank for an amount of Rs.21,00,000/-. The Manapet tank is situated about 18 km South from Puducherry town. The Manapet tank is mainly used for irrigating to the Agriculture fields in nearby areas. The ayacut area is 115 Ha with water spread area of 14.89Ha .There are 2sluices in this tank. The total length of bund is 1233 m. The proposal is to deepen arangani portion to a depth of 30 cm and length of 700 m, to repair the 2 sluice shutters, to construct 4 nos of recharge well and to plant 2500 tree saplings along bund.

Keezh Parikkalpet tank (Tank No.83): The detailed estimate is prepared for the work ''Rejuvenation of Keezh Parikkalpet tank for an amount of Rs.42,50,000/-. The Keezh Parikkalpet tank is situated about 18 km South from Puducherry town. The Keezh Parikkalpet tank is mainly used for irrigating to the Agriculture fields in nearby areas. The ayacut area is 88 Ha with water spread area of 5.3 Ha .There are 2sluice in this tank. The total length of bund is 1292m. The proposal is to deepen arangani portion to a depth of 30 cm and length of 1100 m, to repair the 2 sluice shutters, to construct 10 nos of recharge well and to plant 2000 tree saplings along bund.

Karayamputhur Vannaneri (Tank No.68): The detailed estimate is prepared for the work ''Rejuvenation of Karayamputhur Vannaneri tank for an amount of Rs.38,00,000/-. The Karayamputhur Vannaneri tank is situated about 32 km South west from Puducherry town. The Karayamputhur Vannaneri tank is mainly used for irrigating to the Agriculture fields in nearby areas. The ayacut area is 31.7 Ha with water spread area of 18.58 Ha .There are 3sluice in this tank. The total length of bund is 1720m. The proposal is to

deepen arangani portion to a depth of 30 cm and length of 1100 m, to repair the 3 sluice shutters, to construct 8 nos of recharge well and to plant 2500 tree saplings along bund.

Kurivinatham Tank (Tank No.86): The detailed estimate is prepared for the work ''Rejuvenation of Kurivinatham tank for an amount of Rs.30,90,000/-. The Kurivinatham Tank is situated about 30 km South west from Puducherry town. The Kurivinatham Tank is mainly used for irrigating to the Agriculture fields in nearby areas. The ayacut area is 73 Ha. There is 1 sluice in this tank. The total length of bund is 931m. The proposal is to deepen arangani portion to a depth of 30 cm and length of 850 m, to repair the 1 sluice shutters, to construct 6nos of recharge well and to plant 2500 tree saplings along bund.

In general, in all the above 20 tanks, it is proposed to deepen arangani portion to a depth of 30, to repair the existing sluice shutters, to construct required number of recharge well and to plant tree saplings along bund.

Cost Abstract:

Table 11: Cost Abstract for the project

S.N	Name of tanks	Project cost (lakhs)
1	Rejuvenation and deepening the Bahour tank in Bahour Commune Puducherry.	108.00
2	Rejuvenation and deepening the Abishegapakkam tank in Ariankuppam Commune Puducherry.	68.00
3	Rejuvenation and deepening the Korkadu tank in Nettapakkam Commune Puducherry.	66.20
4	Rejuvenation and deepening the Kirumampakkam tank in Bahour Commune, Puducherry.	50.50
5	Rejuvenation and deepening the Murungapakkam tank in Puducherry.	59.00
6	Rejuvenation and deepening the Vadhanur tank in M annadipet commune, Puducherry.	45.30
7	Rejuvenation and deepening the Olandai tank in Puducherry.	53.50
8	Rejuvenation and deepening the Embalam Vannan Eri (Tank)tank in Nettapakkam commune, Puducherry.	36.00
9	Rejuvenation and deepening the Madagadipet tank in Mannadipet commune, Puducherry.	48.00
10	Rejuvenation and deepening the Mannadipet tank in Mannadipet Commune Puducherry.	49.00
11	Rejuvenation and deepening the Katterikuppam tank in Mannadipet Commune Puducherry.	55.50
12	Rejuvenation and deepening the Koonichempet pazhayaeri tank in Mannadipet Commune Puducherry.	46.20
13	Rejuvenation and deepening the Thirukkanur priaeri tank in Mannadipet Commune Puducherry.	47.70
14	Rejuvenation and deepening the Thondamanatham velleri tank in Villianur	59.00

S.N	Name of tanks	Project cost (lakhs)
	Commune Puducherry.	
15	Rejuvenation and deepening the ThiruvandarKovil tank in Mannadipet Commune Puducherry.	47.70
16	Rejuvenation and deepening the EmbalamVakkraneri tank in Netappakam Commune Puducherry.	28.00
17	Rejuvenation and deepening the Manapet tank in Bahour Commune Puducherry.	21.00
18	Rejuvenation and deepening the Keezh parikkalpet tank in Bahour Commune Puducherry.	42.50
19	Rejuvenation and deepening the KarayamputhurVannaneri tank in Bhour Commune Puducherry.	38.00
20	Rejuvenation and deepening the Kurivinatham Tank in Bahour Commune Puducherry.	30.90
	Total project cost (Rs)	**1000.00**

(Rupees Ten Crores only)

Component 2: Renovation of 32 nos of village ponds and construction of recharge structures in the renovated ponds to augment recharge

Executing agency: : State Groundwater Unit & Soil Conservation, Department of Agriculture, Puducherry

Activities with cost details:

1. Desilting of the pond : Rs. 3.00 lakhs
2. Providing of retaining wall : Rs. 5.00 lakhs
3. Construction of recharge shafts : Rs. 5.00 lakhs
4. Desilting and lining of water supply channels leading to pond and other miscellaneous works : Rs. 2.00 lakhs

Total : **Rs. 15 lakhs**

Cost of renovation of 32 no of ponds @ Rs 15 Lakhs per pond : Rs. 480 lakhs

Detailed cost estimate is appended as Annexure VI

For the village ponds, the convergence plan would be worked out with Local Area Development Department for issuing job cards under MNREGA.

Component 3: Capacity Building of tank user associations

This activity involves formation of 20 tank user associations and preparation of tank level micro-plan to focus on the institutional development for reviving the tank-user associations on the principles of equity and benefit sharing. **Sub-activities** are as follows:

- Participatory Micro-Vulnerability Assessment at tank level
- Participatory Micro-Planning exercise at the tank level

Component 4: Project Management (M&E and Knowledge Management)

It is proposed that a Project Management Unit will be established for regularly monitoring the implementation of activities and developing knowledge products for disseminating information to wider public/platforms. The sub-activities under this activity are as follows:

- Formation of a project management unit (PMU)
- Development of a project level Management Information System (MIS) and Reporting system
- Preparation of resource materials in English and local language

1.5 Projected Calendar:

Table 12: Proposed calender for the implementation of project

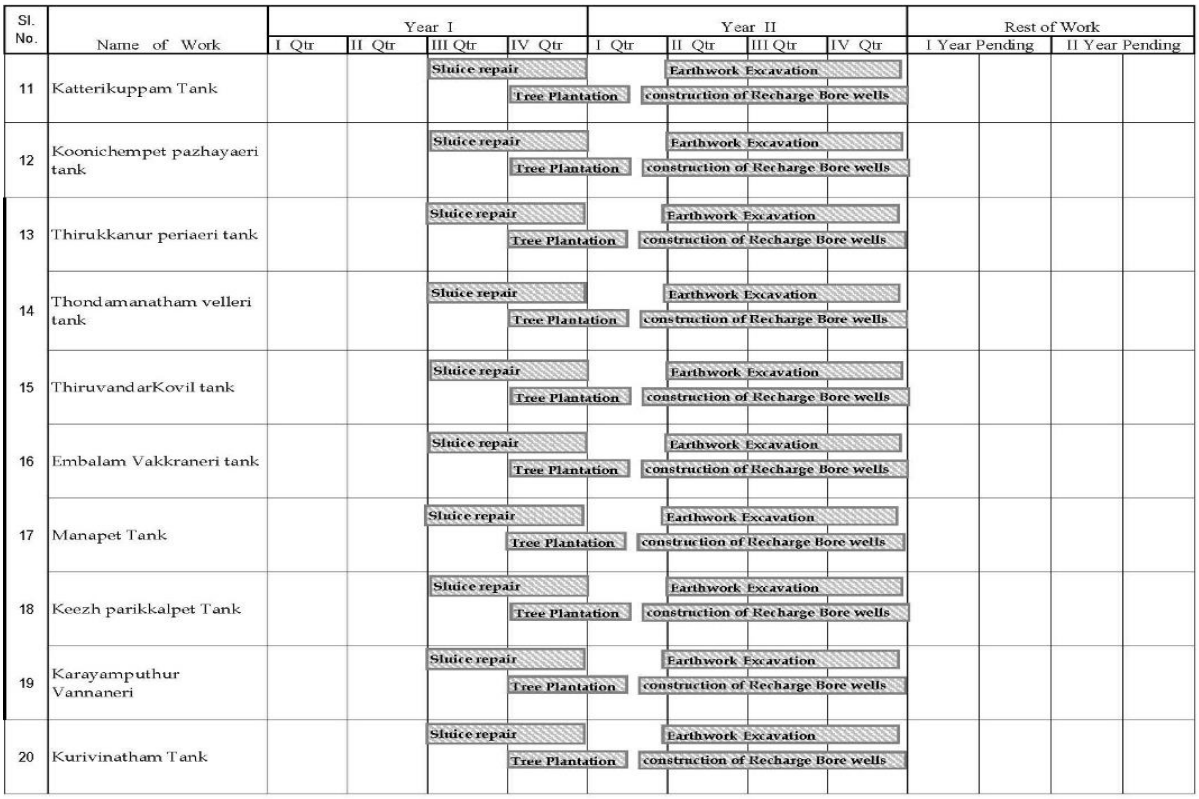
Milestones		Expected Dates
Component 1: Rejuvenation of 20 irrigation tanks		
• Start of Implementation	:	April 2016
• Time duration	:	2 years
• Mid-term Review (if planned)	:	----
• Programme Closing	:	April 2018
• Terminal Evaluation	:	----

All the 20 tank rejuvenation and deepening works can be taken up for implementation simultaneously in all tanks and will be completed within a year time. Schedule for the project implementation has been given below;

TIME SCHEDULE

Name of Project: Rejuvenation of 20 Irrigation tanks in Puducherry

Sl. No.	Name of Work	Year I				Year II				Rest of Work			
		I Qtr	II Qtr	III Qtr	IV Qtr	I Qtr	II Qtr	III Qtr	IV Qtr	I Year Pending		II Year Pending	
1	Bahour Tank			Sluice repair	Tree Plantation		Earthwork Excavation	construction of Recharge Bore wells					
2	Abishegapakkam Tank			Sluice repair	Tree Plantation		Earthwork Excavation	construction of Recharge Bore wells					
3	Korkadu Tank			Sluice repair	Tree Plantation		Earthwork Excavation	construction of Recharge Bore wells					
4	Kirumampakkam Tank			Sluice repair	Tree Plantation		Earthwork Excavation	construction of Recharge Bore wells					
5	Murungapakkam Tank			Sluice repair	Tree Plantation		Earthwork Excavation	construction of Recharge Bore wells					
6	Vadhanur Tank			Sluice repair	Tree Plantation		Earthwork Excavation	construction of Recharge Bore wells					
7	Olandai Tank			Sluice repair	Tree Plantation		Earthwork Excavation	construction of Recharge Bore wells					
8	Embalam Vannan Eri (Tank)			Sluice repair	Tree Plantation		Earthwork Excavation	construction of Recharge Bore wells					
9	Madagadipet Tank			Sluice repair	Tree Plantation		Earthwork Excavation	construction of Recharge Bore wells					
10	Mannadipet Tank			Sluice repair	Tree Plantation		Earthwork Excavation	construction of Recharge Bore wells					



Milestones		Expected Dates
Component 2: Renovation of 32 nos of village ponds		
• Start of Implementation	:	April 2016
• Time duration	:	2 years
• Mid-term Review (if planned)	:	----
• Programme Closing	:	April 2018
• Terminal Evaluation	:	----
Component 3: Capacity Building of tank user associations		
• Start of Implementation	:	April 2016
• Time duration	:	4 years
• Mid-term Review (if planned)	:	----
• Programme Closing	:	April 2020
• Terminal Evaluation	:	----

Table 13: Capacity Building Plan

Capacity Building Plan	Year 1				Year 2				Year 3				Year 4			
Inception	*															
Participatory Vulnerability assessment		*														
Micro-planning including crop planning and business planning		*	*	*												
Process Training (hydrology, business planning, book keeping)		*		*	*	*		*		*		*		*		*
Benefit sharing							*		*	*	*	*			*	
Conflict resolution	*				*				*				*			

Project Justification

2.1 Component-wise details and justification of the project components

i. Business-as-usual scenario for the targeted sector

UTP has high monsoon variability as well as the sea level rise, which has affected the gradient at the sub-surface level leading to salinity in aquifers. At Puducherry coast, deep water waves (approx. 2.1-2.2 m) occur from south and southwest during southwest monsoon and from northeast during northeast monsoon. As per the scientific studies, the sea level rise was estimated to be 0.085mm/year during the past 54 years. This is likely to be more with the enhanced frequency of extreme events like Thane cyclone. In a coastal region like Puducherry, there is the added danger of the ingress of seawater. For example, in 10 to 15 villages of Bahour, where groundwater has become saline; the villagers are supplied water through tankers from commune headquarters. The shallow aquifers along the coast show signs of salinity. Due to over pumping, there has been a reversal of gradient in several areas. Salt water has intruded up to a distance of 5 to 7 km from the coast. Any further extraction of groundwater has to be done only beyond this distance.

As per the hydrological investigation, UTP's groundwater level has dropped in coastal areas up to 12 meters. Excess withdrawal of groundwater is coupled with temperature rise [as per the UTP Action Plan on Climate Change (UTPAPCC) using the PRECIS tool and A1B scenario, the summer temperature rise is about 3-4 deg Celsius] resulting in drying up of a large number of open wells in drought-prone regions of the UTP.As per the scientific studies, it is proposed that a tank bed accumulates about 0.20 to 1.00 meters of silt in 5 to 6 Monsoon seasons, which reduces the storage capacity of the tank and also impedes the rate of vertical flow of recharge because of its low permeability. If there is no catchment treatment, silt load even increases further due to local temperature rise. This has resulted in reducing the adaptive capacity of the eco-system to increased climate variability and change, making the communities more and more vulnerable.

In the current scenario, the people have moved out of agriculture due to high variability and temporary surge in income due to real estate development and other service sector activities due to rapid urbanization, cheaper paddy and sugar getting dumped in UTP also led farmers to search alternative options. As a result, Paddy is cultivated in two-third of the Gross Cropped Area of the state. Paddy-sugarcane-millet pattern has been replaced with almost paddy mono-cropping in areas like Bahour. Due to the discontinuance of tank irrigation, nutrient-rich tank silt application on agricultural fields in order to increase soil fertility has also been discontinued. This has lowered the overall productivity of the soil. The excessive extraction for all uses has caused a drop in the water table at a number of locations. The declining trend over 10 years is of the order of 15 to 30 m in the West and about 7 m in the Eastern part of Puducherry. Urban sprawl has also contributed to lower recharge through reduction of vegetation cover and wetlands. Extraction has gone to 35-50 m and up to 100 m in some places. Therefore, it puts strong case for conjunctive usage of surface and ground water for adapting to climate change effects like sea level rise, salinization, rise in temperatures and eratic weather.

ii. Specific adaptation activities to be implemented to reduce the climate change vulnerability compared to the business-as-usual situation

Following adaptation activities are proposed to be implemented to reduce the climate change vulnerability compared to the business-as-usual situation:

- De-silting of tanks and village ponds
- Construction of recharge shafts in the area adjoining tanks and ponds
- Providing of retaining wall
- Replacement of Sluice Shutter in tanks
- Desilting and lining of water supply channels leading to ponds
- Planting of saplings along the bunds
- Training on the conservation measures and sustainable harvesting
- Development of Benefit sharing protocol
- Capacity Building of tank user associations
- Participatory Micro-Vulnerability Assessment

- Participatory Micro-Planning

Table 14: Vulnerability Assessment

Primary Obj.	Key Vulnerability	Adaptation Measure	Co-benefits
To improve traditional tank irrigation and take up sustainable agriculture reducing the dependency on deep tube wells and thus arrest ground water depletion and sea water intrusion	Depletion of ground water to very critical	De-silting of tanks & restoring community (TUA) rights to tank silt; use silt in agri field	Eco-system restoration and soil quality improvement
	Shifting to private bore-well system from an established commune based system damages the eco-system, apart from higher energy use.	In innovative cascade mode small scale farm ponds can be restored Introduction of horticulture and agroforestry/plantation along the tank system.	Livelihood restoration, gender and social cohesion along the tank institutions Improvement of soil organic carbon and carbon sequestration Mitigation co-benefit in terms of less use energy for water pumping
	Saline water intrusion damages to crop, fish, etc.	Proper management of salinity and fish habitat	Water quality improvement

iii. Justification with regards to components as on the concrete adaptation activities of the project, and their contribution to climate resilience

Table 15: Justification of the Project

Project Components	Concrete adaptation activities	Contribution to climate resilience
Rejuvenation of 20 irrigation tanks	i. De-silting of tank ii. Catchment treatment iii. Sinking of the recharge well iv. Fixing cement concrete rigs to retaining wall v. Replacement of Sluice Shutter	i. Enhancing water holding capacity of the tanks ii. Replenishment of ground water level iii. Prevention of salinity ingress iv. Maintenance of ecological balance v. Prevention of gulley erosion vi. Higher crop yields and farmer's income
Renovation of 32 nos of village ponds and construction of recharge structures in the renovated ponds to augment recharge	i. Desilting of the pond ii.Providing of retaining wall iii.Construction of recharge shafts iv.Desilting and lining of water supply channels leading to pond and other miscellaneous works	i. Enhancing water holding capacity of the tanks ii. Replenishment of ground water level iii. Prevention of salinity ingress iv. Maintenance of ecological balance v. Prevention of gulley erosion Higher crop yields and farmer's income
Capacity Building of tank user associations	i. Participatory Micro-Vulnerability Assessment ii. Participatory Micro-Planning	i. Community involvement and ownership ii. Local institutions development
Project Management (M&E and Knowledge Management)	Workshops, Monitoring & Evaluation studies	i. Knowledge sharing and dissemination ii. Gap identification

2.2 Details on Economic, social and environmental benefits project

Table 16: Associated benefits of the proposed project

Concrete adaptation measure-evidenced	Adaptation benefit category		
	Social	Economic	Environmental
• De-silting of tanks and village ponds • Construction of recharge shafts in the area adjoining tanks and ponds • Providing of retaining wall • Replacement of Sluice Shutter in tanks	Tank Users' Associations strengthened, better understanding	Diversified into livelihoods with reduced reliance on water.	Bio-physical: Tank hydrology improved, ponds in cascade recharged, Greater

Concrete adaptation measure-evidenced	Adaptation benefit category		
	Social	Economic	Environmental
• Desilting and lining of water supply channels leading to ponds • Planting of saplings along the bunds • Training on the conservation measures and sustainable harvesting • Development of Benefit sharing protocol • Capacity Building of tank user associations • Participatory Micro-Vulnerability Assessment • Participatory Micro-Planning	of the climate vulnerability		surface and ground water access from restored tanks. Tank management systems established; Water quality improved

2.3 Sustainability of intervention

The project activities are in conformity with the strategy on "Promotion of traditional system of water conservation" highlighted under the National Water Mission of the National Action Plan on Climate Change, which envisages increasing the capacity of minor tanks and rehabilitating the water bodies. This project has various innovative and sustainable practices for adapting to the challenges of climate change, which includes tank restoration, increasing the agricultural productivity including restoration of riparian vegetation. Tank user associations are also proposed to be set up to aid scientific planning, monitoring and achieve equitable benefit sharing.

With the rejuvenation of the village ponds, the recharging of ground water in the aquifers being presently tapped will increase considerably, which is expected to result in arresting of further declining of ground water levels considerably and in the improvement in the quality of ground water in villages

There are two kinds of sustainability the financial sustainability as well as social sustainability. Both these issues are mutually reinforcing. The project promotes both financial and social sustainability. It is visualized that the climate proofing of the tanks will ensure sustainable ground water use. Further, agriculture practices also helps in generating livelihood of the village population.

Even in the short-run, the return to profitable crops with assured irrigation can help addressing the climate variability and risk of crop failure. With due market linkage, the return from the farm is sustainable at household level. It also reduces undesirable fluctuation in income from service sector and cost and disruption to family life.

The third aspect of this project is partnership and convergence of various related departments and community based organizations. A strong element of capacity building input would sustain these partnerships. This will serve as a model for up scaling.

Capacity building and Information and Knowledge Management are invariable components of the project that will enable better up scaling as well as integration of water and agriculture management practices into development programmes and schemes.

2.4Analysis of the cost-effectiveness of the proposed project

i. *Comparison of alternative options available:*

The cost-effectiveness of the proposal is based on the relevance of the problem aiming at addressing Climate Change variability by focusing on occupational shift, ecosystem loss and erosion of traditional institution and ecological structures.

Private Bore well as an alternative is costly from a project point of view. It is difficult to estimate the quantum of mal-adaptation due to depletion of ground water and loss of aquifers. However from an investment point of view, the following analysis is given.

A typical recharge bore well investment in the riverbed costs about Rs3.3 lakh for a tank. Assuming the tank caters to 500 farmers (conservative) and out of which 10 farmers decided only on private bore-well investment each costing at about Rs 2.5 lakh would work out to be about Rs 25 lakh. The water use (unregulated) and the energy cost can be added to that. This amount exceeds the recharge bore well investment. Private bore well investment is thus a costly alternative.

Reclamation cost for saline ingress as an alternative: The cost of reclamation is highly prohibitive. According to a NABARD paper the potential loss of income is about Rs

50,000/ha per year. Here the cost works out to be Rs 40,000/ha including livelihood diversification, institutional development and transformational cost. Thus the investment in this project is efficient as compared to the opportunity cost. The ecosystem benefit is additional.

Transformational impact: Convergence with the government schemes will be made during the project implementation for potential future up scaling.

Disappearance of some indigenous fish species, which cannot survive in shallow water or do not find a favourable breeding environment and ecosystem cost for this loss can't be computed.

Returning to millets farming will act as a source of nutrition for poor and also this has good market linkage to existing industries in the region. **Alternative to service sector employment** is unstable and cyclical and is high cost (compared to assured irrigation scenario).

Positive externalities will include: reduced migration. The project will arrest mobility to low value added services sector from agriculture sector. Excessive conflict in the real estate trade and family dispute can also be reduced.

ii. Weighing of project activities:

Table 17: Weighing of project objectives

Type of Activity	List of Activities	Funding Requirement (in Rs Lakhs)
Investment activities	- Rejuvenation of 20 irrigation tanks - Renovation of 32 no's of village ponds	1480
Capacity building activities	- Capacity Building of tank user associations	100
Project management activities	- Project Management (M&E and Knowledge Management)	90

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

As stated in the problem statement, Union Territory of Pondicherry has specific issues and local needs to meet the challenges of climate change. State Action Plans on Climate

Change was prepared by Puducherry after the announcement made by Prime Minister of India in the Conference of State Environment Ministers held on August 18, 2009. The UT of Pondicherry prioritized projects/ activities which had to be carried out under Solar Mission, Enhanced Energy Efficiency, Sustainable Habitat, Mission for Green India & Sustainable Agriculture, National Water Mission and National Mission on Strategic Knowledge broad sectors.

The proposed project is in lieu to State Action Plan on Climate Change and can be classified under Mission for Green India & Sustainable Agriculture and National Water Mission. The strategies which were proposed in SAPCC under these two categories and matches with the component of proposed project can be relate with plantation and objectives of bringing change in cropping pattern under Mission for Green India & Sustainable Agriculture. In case of National Water Mission, the convergence of objectives are related to ground water recharging and desalination of sea water In order to meet out the drinking water problems in Coastal Villages.

2.6 Component wise technical standards

There are no technical standards requirement pertaining to execution of components of the project. Further, the project does not cause any adverse environmental and social impact, and requires no clearance.

2.7 Duplication Check

The objective of the project "Integrated Surface Water Management for Climate Resilient Agriculture through Rejuvenation of Traditional Tanks" is addressing the vulnerabilities to water resources due to climate change impacts such as climate variability and saline intrusion. The purpose of the project is integrated development of water resources to serve requirements of not only agriculture but also domestic as well as industrial sector. More than 68 percent of the population of Puducherry is urbanized and thus the urban beneficiary of this project would contribute a large section of the society.

Similar kind of activities are also being carried out under Pradhan Mantri Krishi Sinchayi Yojana (PMKSY). However, the purpose of those activities under PMKSY is different than

what has been proposed in this DPR. PMKSY has four components. These components are mainly focusing upon providing/ enhancing irrigation facility for agricultural land. The first component of PKSY is Accelerate Irrigation Benefit Programme (AIBP) which focus on faster completion of ongoing major and medium irrigation projects. The second component is PMKSY (Har Khet ko Pani) i.e. irrigation facility to all agricultural field. Coming to the third component i.e. PMKSY (per drop more crop), it focuses on better management of water resources to enhance the productivity of water used in agricultural field. The last component of the scheme is PMKSY (Watershed Development). This component of the scheme focuses upon the issue of agricultural and rural land and water requirement for agriculture purpose mainly. An overview of the components of the PMKSY appears to be focusing mainly on irrigation related aspects.

The proposed project found to be more appropriate to get funded under NAFCC as the impact of the project matches more with the objectives of NAFCC as mentioned in "Implementation Guidelines for NAFCC". The project "Integrated Surface Water Management for Climate Resilient Agriculture through Rejuvenation of Traditional Tanks" addresses the issues of agriculture, environment, urban water requirement, issues related to quality of water near to costal area, industrial requirement etc.

An undertaking is also provided stating that the proposed project is not being funded under any other scheme in the Union Territory of Puducherry.

Components of the project is related to Agricultural Department for planting of trees and maintained to get rain fall regularly. By desilting the irrigation tanks, necessary water storage capacity will be improved and also by providing recharge bore wells in the tanks for getting recharge of the ground water. It is proposed that the project will make participation of tank user associations and self-help groups in the project implementation, maintenance and usufruct activities.

Some components of the project will have linkages with other programmes and the investment plans for this project has excluded those direct expenditures from the budget.

There is no scheme ongoing in the UT of Pondicherry which takes up the activity such as plantation of agro-forest species, diversification of cropping system.

2.8 Details on Stake-holder consultation

The key stakeholders are the farmers who have moved out of agriculture to other vocations and those who are still in farming. Apart from that the other stakeholders include:

- Society at large
- Industries
- Government Departments and community based organizations
    - The line department staff of PWD, agriculture department, forest department, fishery department. Functionaries of the Local Area Development Department, Commune Panchayats, etc.
    - Academic and research professionals from Puducherry University (Ecology and Environment), Aquaculture and Ocean stream. Pollution Control Board will be roped in for specific inputs.
    - Civil society organizations like MSSRF, Auroville network may also be roped in for PRA, vulnerability assessment and capacity building
    - Financial institutions like NABARD, Small Framer Agribusiness Consortium (SFAC) and commercial banks will be roped in for credit and market linkages.

Brainstorming meetings and field visits were held to identify the priority projects/ areas of intervention under the UTP Action Plan on Climate Change (UTPAPCC) involving key departments of Govt. of Puducherry on June 8, 2015, with the technical support provided by GIZ. Based on the discussion, a project titled "Integrated surface water management for climate resilient agriculture through rejuvenation of traditional tanks" was shortlisted for developing a detailed proposal for accessing funding through National Adaptation Fund for Climate Change (NAFCC). Based on the need and the feasibility of

implementation of the activities, a detailed proposal has been prepared in-consultation with all key departments.

Apart from the farmers who have switched from farming to non-farming activities, the farmers who are currently engaged in farming and fishery will be made aware about the adaptation benefits of the programme. Investment will be made in the formation of tank user association ensuring equitable representation of both land holders, landless famers (agri-labourers) and lease holders.

Some educated, un-employed youth will be given training to be skilled in different activities relating to hydrological measurement, conservation and management of agro-forestry system, agri-value chain, fishery value chain, management of bank linkage and book keeping.

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

The Project Management Unit has to be established to ensure smooth implementation of the project. The same PMU will also be given the task of knowledge management through documentation and dissemination of information pertaining to best cases in the area as well as the results obtained from any such projects implemented at other places.

The MIS system of the PMU will be used for effective reporting and the formats of the reports will be availed in such a way that it reflects the results of each component. This will be helpful in identifying the best cases or in documenting the success stories/ thematic studies.

Based on the documentation, the same will be disseminated in local language as well as in English through multiple media interface.

2.10 Sustainability of the project/programme outcomes

Table 18: Sustanability of prject

Expected outcomes	Expected Concrete Outputs	Sustainability mechanism	Responsible party/ies
Water Availability	-Replenishment of ground water level -Increase in storage capacity of tank	-Retaining wall and plantation -Check the silting of tank & pond	PMU & TUA
Decreased Salinity	-Increase in ground water level -Conjunctive use of ground and surface water.	Proper maintenance of structures	PMU & TUA
Prevention of gully erosion	-Bund formation, landscaping and plantation near to pond/ tank sides.	Capacity Building of TUA in maintenance of landscape near tank/ pond	PMU & TUA
Promotion of alternative cropping pattern	-Increased water availability for other crops.	Self-sustaining	PMU & TUA
Ecological Balance	-Replenishment of ground water. -Plantation.	Proper maintenance of plantation through TUA	PMU & TUA
Increased income of farming community	-Diversification of livelihood opportunities. -Capacity Building of local people	Awareness programme for farmers about the benefits which could be derived on successful implementation of the proposed project	PMU & TUA

2.11 Overview of the environmental and social impacts and risks identified

Table 19: Environmental & Social principles

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	✓	×
Access and Equity	✓	×
Marginalized and Vulnerable Groups	✓	×
Human Rights	✓	×
Gender Equity and Women's	✓	×
Empowerment	✓	×
Core Labour Rights	✓	×
Indigenous Peoples	✓	×

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks – further assessment and management required for compliance
Involuntary Resettlement	✓	×
Protection of Natural Habitats	✓	×
Conservation of Biological Diversity	✓	×
Climate Change	✓	×
Pollution Prevention and Resource	✓	×
Efficiency	✓	×
Public Health	✓	×
Physical and Cultural Heritage	✓	×
Lands and Soil Conservation	✓	×

Implementation Arrangements

3.1 Arrangements for project / programme implementation.

The implementation of the project will be through a multi-department coordination with the overall responsibility led by the Department of Science, Technology and Environment (DSTE), Government of Puducherry. The project is proposed to be steered by a **Steering Committee on Climate Change headed by Chief Secretary-Government of Puducherry**, with members from Departments of Agriculture (DoA); Department of Science, Technology and Environment (DSTE); Finance; Forest; Local Area Development; National Bank for Agriculture and Rural Development (NABARD) Puducherry; Ecology and Environment, Puducherry University and MS Swaminathan Research Foundation (MSSRF).

The project will be implemented through tank user associations. Therefore an experience partner shall be roped in to conduct vulnerability assessment and micro-planning exercise. They will help in developing interface and interaction of the project villagers to learn about the importance of adaptation to climate change. They will conduct workshop at tank user level on conflict resolution, crop planning, business planning and use of ICT (now-casting data from IMD in mobile), assessment of soil health for crop planning, assessment of tank hydrology and also aquatic health.

The external monitoring agency while preparing the baseline also will familiarize villagers on key indicators for concurrent monitoring and these indicators will be identified in a participatory method.

The project will be coordinated by the Climate Change cell (under Department of Science and Technology, Government of Puducherry) acting as the Project Management Unit (PMU). Public Works Department (PWD), forest department, agriculture department, fishery department and civil society organizations will act as Project Executing Entities. The steering committee chaired by Chief Secretary responsible for preparation and implementation of SAPCC, will give overall strategic direction to the project. NABARD

representative will also be part of the technical steering committee. An external monitoring agency will help in base line and end line survey.

Implementation mechanism

- The proposed project activity is part of the SAPCC and duly endorsed.
- Field Visit to a sample tank has been conducted for project simulation
- Detailed discussions with stakeholders have been initiated
- DPR has been duly prepared for prioritized tanks and technical sanctions have been obtained

3.2 Measures for financial and project / programme risk management

Table 20: Risk and risk mitigation measures

Risk	Risk Rating	Mitigation Measure
Technical	Low	Not required (Technology adopted for implementation has been practised earlier, and therefore there are no risks associated with the use of technology)
Implementation	Low	Not required (The project executing agencies have requisite competent manpower and infrastructure available for implementation of project, and hence there are no risks associated with implementation)
Socio-economic risks: -Conflict at TUA level, -Capacity Building of TUA,	Medium	The project has no adverse social impacts, however the issues of conflict at tank user associations level and response during capacity building activities may arise, which can be addressed through community mobilization.
Environmental	Low	Not required

The project has important synergy between adaptation and mitigation. The restoration of aquifers and protection from salinity is good adaptive measures. The reduced energy consumption helps in mitigation. Plantation of agro-forestry species helps in carbon sequestration as well as improving soil organic carbon. Grass species help as binding materials and check soil erosion and considered as a good adaptation option. Better recharge too would help in improving the water quality of tanks and ponds. The project does not have any negative environmental externality. Social benefits include durable

bond between family and communities, enhanced social capital due to savings and benefit sharing. Possible social risks involve political capture or elite capture or unmitigated consequence of conflicts especially between fishers and tank users. This is planned to be resolved at the very outset during the micro-plan preparation.

3.3 Monitoring and evaluation arrangements

The project monitoring plan has been given in the following table. This includes both concurrent evaluation, baseline and end-line assessment by third party monitoring agency.

M&E Plan Activity	Responsible Person	Y-1	Y2	Y3	Y4	Timeframe
Baseline study	PMU, external al agency	✓				Q1 of Y-1
Semi-annual reports and annual reports	PMU, CB partner	✓	✓	✓		Q2 & Q4 of each year
Knowledge product preparation and dissemination workshop	PMU, CB partners		✓			Q4 in Y-2
MIS and web based dataflow	PMU, TUA	✓	✓	✓		Recurring
End line survey	PMU, external agency			✓		Q4 Y-3

The Puducherry Water Resources Organization is already monitoring the ground water levels in the Pondicherry region through its network of 37 numbers of observation tube wells constructed under Hydrology Project, Phase-II. The ground water flow in the region is towards the east. The effect of recharge as well the improvement of the quality of the ground water will be monitored with the help of the observation tube wells constructed in Puducherry region.

Provision has been made to deepen the Arangani portion of 20 tanks, and to replace the sluice shutters. The output/ performance shall be adjudged after completion of this project with reference to the existing systems/past records. The recharge well can also be utilized as observation of ground water table season wise fluctuation.

3.4 Results framework for the project proposal is as following:

Table 21: Result framework for the proposed project

Outcome/ Output	Indicator	Baseline	Target	Verification Source	Risk Assumptions
Component-1 &2: Rejuvenation of 20 irrigation tanks and Renovation of 32 nos of village ponds and construction of recharge structures in the renovated ponds to augment recharge					
Outcomes: i. Maintenance of ecological balance ii. Prevention of salinity ingress iii. Increase in water availability iv. Increase in crop yield					
Output 1.1: Ground water recharge	Ground water level	Water level data of 7 Exploratory Bore Wells during the Year 2013,2014 & 2015 in Months of Feb, June & September is appended as **Annexure VII**	Increase in water level by 1-3 metre, depending upon rainfall	Field Survey	Low risk during implementation period, however, continuous maintenance by TUA has to be ensured.
Output 1.2: Water spread area	Storage capacity of tank/ pond	Current Storage Capacity and Target Storage Capacity of 20 tanks and 32 ponds is appended as **Annexure VIII & Annexure IX**			
Output 1.3: Crop yield	Crop yield	Yield data of various crops for the Year 2010-11 is available, and appended as **Annexure X**	Increase in yield by 5-15%, depending upon rainfall		
Component-3: Capacity Building of tank user associations					
Outcome: i. Equitable benefit sharing ii. Community involvement and ownership iii. Local institutions development					
Output-3.1: Training and Capacity Building	Number of various programmes conducted	--	On an average 2-3 programs per tank/ pond	Field Survey	Medium risk pertaining to conflicts at TUA level and responses to training programme
Component-4: Project Management (M&E and Knowledge Management)					
Outcomes: i. Project completion in time bound manner ii. Transparency and credibility					
Output 4.1: Knowledge sharing and dissemination	Number of Case studies/ success stories documented	---	10	Field Survey and publications	Low risk

3.5 Detailed budget with budget notes

Break down of execution costs (Administrative and Misc. Expenses) :

Salary for project staff		10.00 lakhs
POL, internet, telephone @ 10,000 per month		2.40 lakhs
Travelling, meeting, field visits etc.		5.00 lakhs
Purchase of Field Equipments		1.60 lakhs
Miscellaneous		1.00 lakhs
	Total	20.00 lakhs

3.6 Disbursement schedule with time bound milestones

Component	Funding Plan (in Lacs)				Total
	Year – 1	Year – 2	Year-3	Year-4	
Rejuvenation of 20 tanks	400	600			1000
Restoration of 32 village ponds	300	180		-	480
Capacity Building	25	25	25	25	100
Project Management (M&E and Knowledge Management)	45	45			90