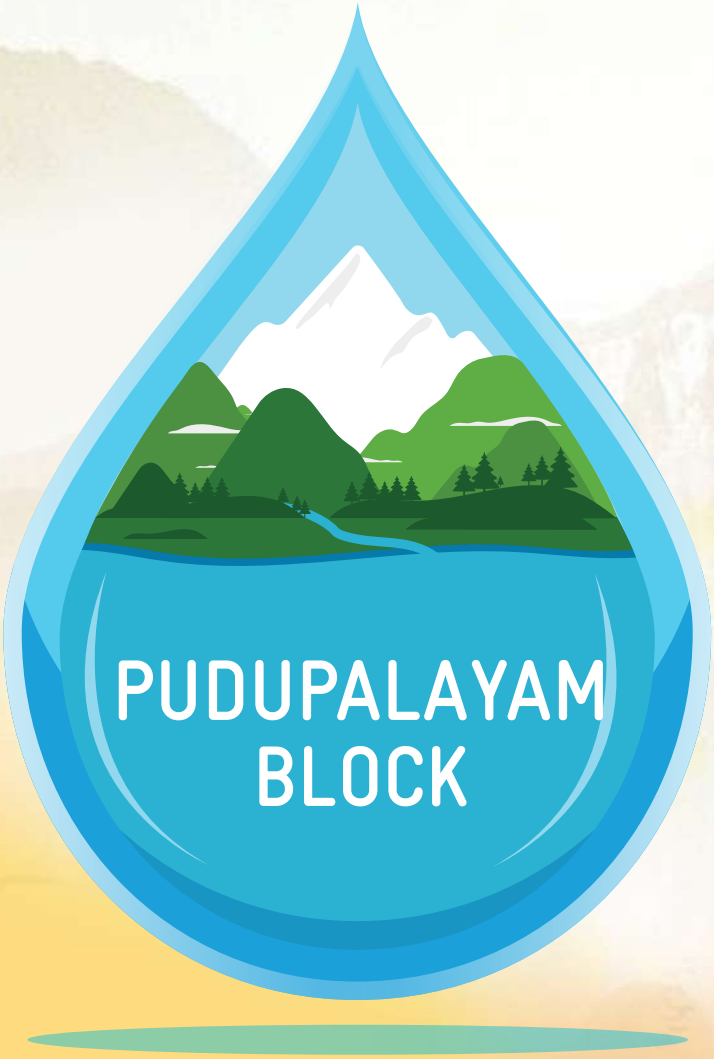
Ministry of Rural Development Ministry of Jal Shakthi

WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

District Rural Development Agency, Tiruvannamalai &
WASCA, GIZ, New Delhi

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Registered offices:
Directorate of Rural Development and Panchayat Raj
Panagal Building, 4th and 5th floor, Jeenis Road, Saidapet, Chennai-600015
T : +91 44 24336105/24337436/24337440/24336102; E : drd@tn.nic.in; I: https://tnrd.gov.in/

Bonn and Eschborn, Germany
Water Security and Climate Adaptation in Rural India
A2/18, Safdarjung Enclave, New Delhi 110 029, India
T : +91 11 4949 5353; F : + 91 11 4949 5391; E : info@giz.de; I : www.giz.de

Responsible:
Thiru. Praveen Nair I.A.S
Director, Rural Development & Panchayat Raj Department, Govt of Tamil Nadu
E: mgnrgs.drd@gmail.com

Thiru. B Murugesh I.A.S
District Collector, Tiruvannamalai, Govt of Tamil Nadu
Email: collrtvm@nic.in

Mr. Rajeev Ahal
Director, Natural Resource Management and Agroecology, GIZ India
E: rajeev.ahal@giz.de

Authors:
Dr. Anushiya J, Consultant - Climate & NRM, Mr. Pradeep M S, Consultant - RS & GIS, Mrs. Sabari V K - Editorial Support

GIZ
Mr. V.R. Sowmithri - Technical Expert, Dr. Radha Priya P - Jr. Technical Expert

MSSRF
Dr. Rengalakshmi R - Director, Mr. Nagarajan R, Mr. Nandeesha P, Mr. Karunamoorthi M, Mr. Samu Jebaraj V, Mr. Arun Siddharth R, Ms. Yogalakshmi R, Mr. Kumaragurubaran R

Content Review:
GIZ
Krishan Tyagi

Directorate of Rural Development and Panchayath Raj
Thiru. Kumar S S - ADRD (MGNREGS), Thiru. Harikrishnan R - CE, Thiru. Saravanakumar A - SE,
Thiru. Ashokan N - AD (MGNREGS)

District Rural Development Agency
Thiru. M. Prathap I.A.S - Additional Collector, Thiru. Ramakrishnan P - EE, Thiru. Harikrishnan K - AE

Design and Layout:
Mr. Manikandan T

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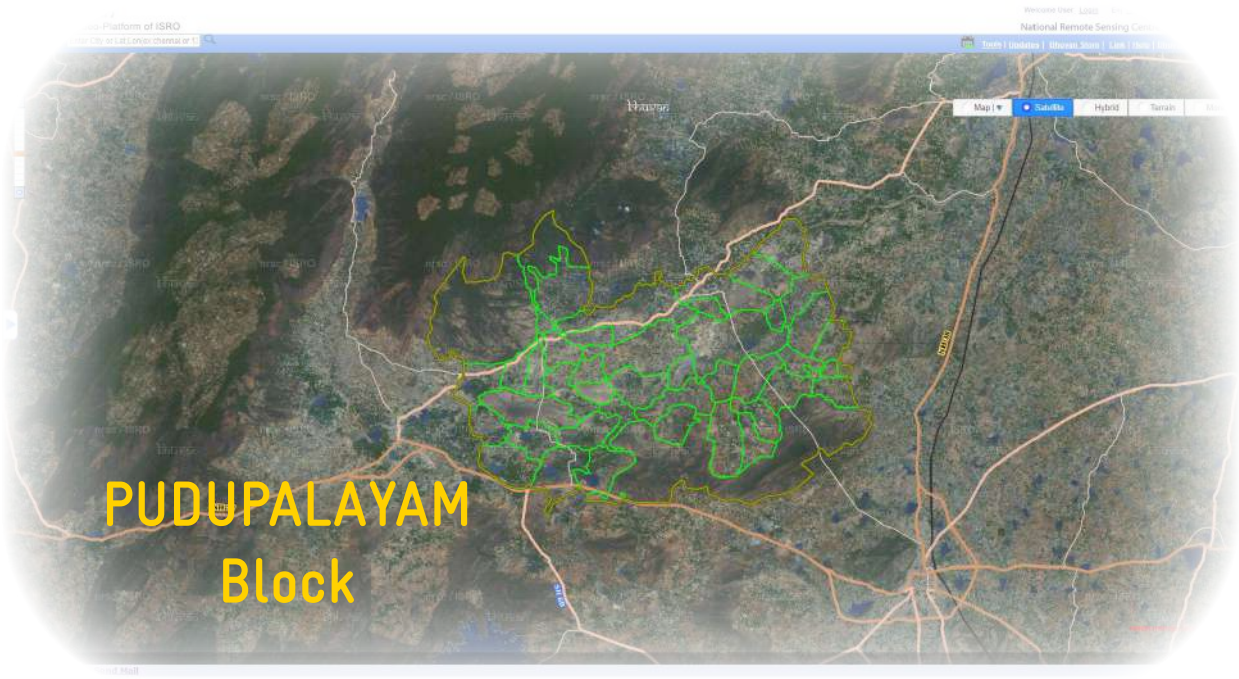


Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

District Rural Development Agency, Tiruvannamalai &
WASCA, GIZ, New Delhi

FOREWORD

Thiru. Praveen P. Nair, IAS
Director of Rural Development
and Panchayat Raj

Tamil Nadu government is implementing the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) by assuring adequate and accessible wage employment while simultaneously creating productive individual and community assets to fulfil the infrastructure and livelihood needs of the people in rural areas. The Government intends to prioritise the strategies under this scheme to focus on creating Climate Resilient Villages and individual income generating assets and works in the coming years in a convergence model.

> "Close to 10 lakh NRM and Non- NRM works are identified, verified, approved by Gram Panchayat"

There will be a reorientation of priorities under MGNREGS with livelihood promotion and poverty alleviation as goals in addition to Natural Resource Management, asset creation and agriculture development. The approach to Natural Resource Management will be on a saturation mode with GIS based planning. The impact of each intervention will be maximised through convergence.

In this context, implementation of Water Security and Climate Adaptation (WASCA) a technical cooperation project GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH) Indo-German Technical Cooperation project in Tamil Nadu is of paramount importance. WASCA is being implemented in Tiruvannamalai and Ramanathapuram district.

The project focused on GP level planning driven by scientific data, climate information, climate risk, climate vulnerability assessments & ranking, watershed approach, water budgeting (Ground and surface water), land use, agriculture, livestock, soil parameters and GIS thematic maps. A Composite Water Resources Management Planning (CWRMP) frame works is adopted. The GP level works thus identified are mapped to climate vulnerabilities, SDG goals and its Indicators, Intended Nationally Determined Contributions (INDC) for climate Change. This mapping exercise is unique and first of its kind in the country for a plan at GP level.

This approach helped to complete 1,289 GP level plans in holistic way for a period of three years. Close to 10 lakh NRM and Non- NRM works are identified, verified, approved by Gram Panchyat. Out of the shelf

of projects, in the year 2021-22 FY, 2,80,000 works are uploaded in NREGA soft GIS planning portal. This is one of the largest number of works uploaded by any district or state for the current financial year.

Under WASCA four major interventions are being undertaken in pilot districts.

1.	Development of Public and Common lands
2.	Development of Agriculture and allied activities
3.	Development of Rural Infrastructure Management
4.	Development of Climate Resilience Measures

Under the leadership of District Collector, Additional Collector (Development), Engineers of District Rural Development Agencies (DRDA), line departments and GP office bearers the implementation of approved works from WASCA are discussed during monthly district level convergence meetings.

The present Block report is a synthesis of all GPs in the Block discussed in detail on four major heads, Socio-Economic, Climate, Water and Agriculture the key for any rural development. The Block level CWRM book will help the GP, Block officers and Gram Panchayats in planning, implementing works in holistic manner, reducing water scarcity in the district.

I take this opportunity to thank GIZ, the technical partners, District WASCA resource Centres for their continued effort to work with DRDA and State RDPR for making MGNREGS more integrated.

"The block level CWRM book will help the GP, Block officers and Gram Panchayats in planning, implementing works in holistic manner, reducing water scarcity in the district"

Thiru. Praveen P. Nair, IAS
Director of Rural Development
and Panchayat Raj

FOREWORD

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

The Block Level, Composite Water Resources Management Plan is an unique initiative of District Rural Development Agency, Tiruvannamalai & the Indo German project on Water Security and Climate Adaptation in Rural India (WASCA) implemented by GIZ. This is the culmination of three years of efforts by the project team and government officials, assisted by knowledge partners and a myriad of departments. At the national level, this process is anchored in the Ministry of Rural Development and supported by National Water Mission, Ministry of Jal Shakti.

> **Block level report uses strong scientific data and analysis using GIS and statistical data to develop a medium-term picture of water**

The state government of Tamil Nadu, with core support from Director Thiru. Praveen Nair I.A.S., Department of Rural Development and a host of water related departments, under the active leadership of the District Collector, Thiru. B.Murugesh, I.A.S., has embarked on this strategic response to the strong crisis of water security which is affected by climate change that we are increasingly witnessing. This Block level report uses strong scientific data and analysis using GIS and statistical data to develop a medium-term picture of water and climate and their interactions. These have driven a scenario projection, to respond to which key thrust areas of actions, with their inherent strategies and resultant activities have been brought together into a plan that will work to change this possible reality.

As humans, we have to plan to avert the future potential disasters and capture latent opportunities, using the human, technical and financial resources available to us. As wise humans, we should do it strategically to not only adapt to that reality, but to initiate actions that help to mitigate that possible future also along with.

The Block report focuses on sustainable water resource management, as it is the true driver for all development in a natural resource dependent rural livelihood scenario. The climate actions initiated not through

separate climate funds, but by leveraging existing public programmes and schemes, such as Mahatma Gandhi NREGA, to act now and decisively.

We sincerely hope that this innovative Block Level plan is not only a success for itself but shows that way how the state government can plan for all of its …. Blocks!

We look forward to its success!

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

FOREWORD

Thiru. B. Murugesh, IAS
District Collector,
Tiruvannamalai

Tiruvannamalai is the second largest district in Tamil Nadu. The topography of Tiruvannamalai is almost plain sloping from west to east. Tiruvannamalai experiences hot and dry weather condition throughout the year. It is dry land region where farmers cultivate a single crop groundnut and some part of the district cultivate paddy coinciding north east monsoon. Groundwater plays an important role in the food production of the district. Ground water level and water quality ground water discharge and recharge are critical aspects of climate change. 85 % cultivation area of the district is met through groundwater.

All eighteen Blocks in the district are categorized as over exploited or critical as per latest state reports on groundwater status. Mahatma Gandhi NREGA is key scheme in the district, providing unskilled wage employment, asset creation for poor and marginal. The district has implemented in campaign mode in convergence, farm pond construction.

> "GIS based planning in 860 GPs, works identified under CWRM are verified, approved at Gram Sabha"

To enhance scientific works identification in MGNREGS, with technical support of GIZ under WASCA bilateral project, the Composite Water Resource Management (CWRM) approach is used for analyzing various parameters including spatial and temporal changes and also technique to provide solution for improving the four water (Ground water, Surface water, Rain water and Soil Moisture).

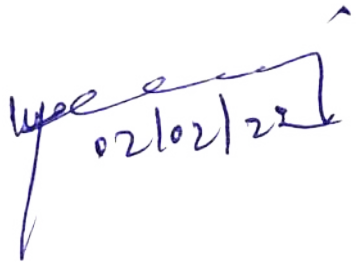
Through GIS based planning in 860 GPs, works identified under CWRM are verified, approved at Gram Sabha. These works would potentially reduce 38% surface runoff to be harvested or recharged by various interventions through ridge to valley watershed approach.

Hence, the developed CWRM plan at GP level would help to improve the statues of Water,Socio Economic, Climate, and Agricultural parameters in the district. The developed GP level plan by using CWRM is an integrated approach covering NRM (Narural Resource Management) and non NRM works.

The Innovative approach of climate Resilient measures (CRM) is helping the district to mitigate the cli

mate hazard. The micro level systematic planning at GP level really brings a change in the climate aspects in the district. Water is the key factor for all development works, increasing the ground and surface water capacity would boost the economy and enhance climatic condition throughout the district.

Hence, all the GPs plans are analyzed, synthesized with mapping of SDG goals, INDC contributions to climate change in form of Block level report. The Block level reports really help rural development department and other convergence departments to do the systematic planning by using the data and technique. Wishes the contributors who have involved in bringing out this report for district development.



Thiru. B. Murugesh, IAS
District Collector,
Tiruvannamalai

MESSAGES

Thriu. M .Prathap, IAS
Additional Collector (Development) /
Project Director, DRDA

The present climate change crisis is inextricably linked to water. It induces extreme weather events, reduces the predictability of water availability, decreases water qualityand threatens sustainable development, biodiversity and enjoyment of the human rights to safe drinking water and sanitation. Building resilience towards Water Security and Climate Adaptation is inevitable for an integrated water resource management which WASCA is targeting. WASCA pilot study started in the district during January 2019 with developing inclusive Composite Water Resources Management (CWRM) plans for all GPs in this district. It also supported in building the capacity of the Engineers in GIS based planning adopting. The district officials with the technical support of WASCA Resourcecenter in the district has completed the CWRM plans for all theGPs.The CWRM plans assessed both the supply and demand prepared a water budget at GP level. The suitable key actions are identified for the development of public and common land, agriculture and allied activities and rural infrastructureat GP level through scientific process including hydrological, agricultural and socio economic perspectives.These GP plans are verified at the ground level by the Block and GP officials of DRDA and are consolidated at Block and district levels for prioritizing the actions and planning. The expected outcome of the WASCA project on completion will form a major chunk of DRDA of districts water security particularly the works related to cascade tank development, fallowland development, roof rain water harvesting, watershed works for treating drainage lines,improving dry lands with farm trench cum bund, farm ponds, pasture development,Block plantation with soil conservation. This demonstration project on water security and climate adaptation and its convergence approach at Panchayat level could be scaled-up and replicated. Subsequently, the Block level reports are envisioned to water resources planners and other stakeholders works on challenges of adapting to climate change with a portfolio of potential actions to reduce vulnerability. I assure this booklet of good practice example will guide the best adaptation practices towards climate resilience. I wish the entire team, stakeholders, experts, technical people involved in generating this good learning practice.

“Block level reports are envisioned to water resources planners and other stakeholders works on challenges of adapting to climate change”

M. P—

Thriu. M .Prathap, IAS
Additional Collector (Development) /
Project Director, DRDA

MESSAGES

Thiru. S.S Kumar
Additional Director (MGNREGS),
RD&PR

The Mahatma Gandhi National Rural Employment Guarantee Scheme in Tamil Nadu focuses on Natural Resources Management, Grey Water Management, Farm Ponds in individual lands, afforestation and plantations in community areas, water harvesting and conservation measures. To implement works in saturation mode, it is important to have holistic plans prepared in every Gram Panchayat.

GIZ technical cooperation project on Water Security and Climate Adaptation (WASCA) being implemented in Tiruvannamalai and Ramanathapuram district is an example of holistic GP plans considering the land, water, soil, geology and social aspects.

> **"Water Security and Climate Adaptation (WASCA) is an example of holistic GP plans considering the land, water, soil, geology and social aspects"**

Through District level GIS resource centres, GIZ with the partners MSSRF build capacity of Block, GP level technical officers of Rural Development Department in completion of 1,289 GP plans. In preparation of GP level plans, Nationally approved Composment (CWRMP) frame works is adopted along with Bhuvan NRSC ISRO GIS platform.

Total 3,00,000 works identified through CWRM are uploaded in NREGA Soft. The works focused on treatment of all-natural drainage lines, rejuvenation of traditional waterbodies, afforestation, trench cutting, gully plugs, recharge-shaft, farm ponds, check dams, farm bunds, soak pits etc. These works identified through GIS planning are verified on ground and approved by Gram Panchayat.

The Block level report provides the details of the parameters used for preparing plans, analysis of the situation, works for over coming the short term and long-term goals of climate resilience and productive assets. This report will be useful for all functionaries implementing MGNREGS.

Thiru. S.S Kumar
Additional Director (MGNREGS),
RD&PR, Government of Tamil Nadu

MESSAGES

Thiru R. Harikrishnan
Cheif Engineer,
MGNREGS, RD&PR

Water Security and Climate Adaptation (WASCA) a bilateral project of Ministry of Rural Development (MoRD) (MGNREGS), Ministry of Jalsakthi (National Water Mission) and GIZ (German Corporation for International Cooperation GmbH) started in the year 2019-20 and for next three years.

In our state, Centre for Climate Change and Disaster Management (CCCDM-Anna University) has conducted the scoping study based on 18 Vulnerability parameters (Socio-economic, agriculture, water and climate parameters) and identified the most vulnerable two districts for project implementation. The two districts are Tiruvannamalai in Northern Tamil Nadu and Ramanathapuram South coastal aspirational district. For implementing WASCA project Composite Water Resource Management (CWRM) Plan is used.

> **"Whole planning process followed a bottom-up approach in identifying appropriate actions based on scientific analysis"**

The CWRM plans assessed both the supply and demand for water using data pertaining to land resources, climate parameters, catchment areas, soil, surface runoff, agriculture and prepared a water budget. Besides, it has identified a set of key water actions for the development of public and common land, agriculture and allied activities and rural infrastructure. The whole planning process followed a bottom-up approach in identifying appropriate actions based on scientific analysis. I consider such decentralized level of planning is necessary in ensuring water security in the context of increasing climate change impacts.

Thiru R. Harikrishnan
Cheif Engineer,
MGNREGS, RD&PR

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ANNEXURE

ABBREVIATIONS AND ACRONYMS

A - D

%
Percentage

^{0}C
Degree Celsius

AR
Assessment Report

CCB
Contour Continuous Bunds

CCCDM
Centre for Climate Change and Disaster Management

CRM
Climate Resilient Measures

CuM
Cubic Meter

CVI
Climate Vulnerability Index

CWRM
Composite Water Resource Management

CWRMP
Composite Water Resource Management Plan

DEM
Digital Elevation Model

D - H

DLSC
District Level Steering Committee

DLT
Drainage Line Treatment

DRD&PR
Department of Rural Development & Panchayat Raj

ET
Evapo-transpiration

FPO
Farmer Producer Organization

FY
Financial Year

GIS
Geographical Information System

GIZ
Deutsche Gesellschaft für Internationale

Govt.
Government

GP
Gram Panchayat

GW
Ground Water

ha
Hectare

I - M

ha.m
Hectare Meter

HH
Households

ICAR
Indian Council for Agriculture Research

IMD
Indian Meteorological Department

INR
Indian Rupees

IPCC
Intergovernmental Panel on Climate Change

IWRM
Integrated Water Resources Management

Kharif crop
Sown in Monsoon and harvested close to Autumn

Km
Kilometer

KML
Keyhole Markup Language

LULC
Land use and land cover

M - N

Max
Maximum

MCM
Million Cubic Meter

MC
Mid Century

MCM
Million Cubic Meter

Mahatma Gandhi NREGA
Mahatma Gandhi Rural Employment Guarantee Act

Mahatma Gandhi NRGES
Mahatma Gandhi Rural Employment Guarantee Scheme

Min
Minimum

mm
Millimeter

MoEFCC
Ministry of Environment, Forest and Climate Change

MoJS
Ministry of Jal Shakti

MoRD
Ministry of Rural Development

M
Meters

N - S

NAPCC
National Action on Climate Change

NARP
National Agricultural Research Project

NADEP
Nadepkaka

NDC
Nationally Determined Contributions

NEM
North-East monsoon

NGO
Non-Governmental Organization

NITI
National Institution for Transforming India

No.
Number

NRM
Natural Resource Management

NRSC
National Remote Sensing Centre

NWC
National Water Commission

PWD
Public Works Department

S - U

Rabi crop
Sown in winter and harvested in monsoon

RDPR
Rural Development & Panchayat Raj

RF
Reserve Forest

RTRWHS
Roof top rain water harvesting structures

RWHS
Rain Water Harvesting System

SAPCC
State Action Plan on Climate Change

SC
Scheduled Caste

SDG
Sustainable Development Goal

SDMA
State Disaster Management Authority

SDMRI
Suganthi Devadasan Marine Resources Institute

SECC
Socio Economic and Caste Census

S - W

SHG
Self Help Group

SLSC
State Level Steering Committee

ST
Scheduled Tribe

SWM
South-West monsoon

UN
United Nations

SW
Surface Water

TN
Tamil Nadu

WASCA
Water Security and Climate Adaptation

WCWH
Water Conservation and Water Harvesting

வான்நின்று உலகம் வழங்கி வருதலால்
தான்அமிழ்தம் என்றுணரற் பாற்று

குறள் - 11

The genial rain ambrosia call
The world but lasts while rain shall fall

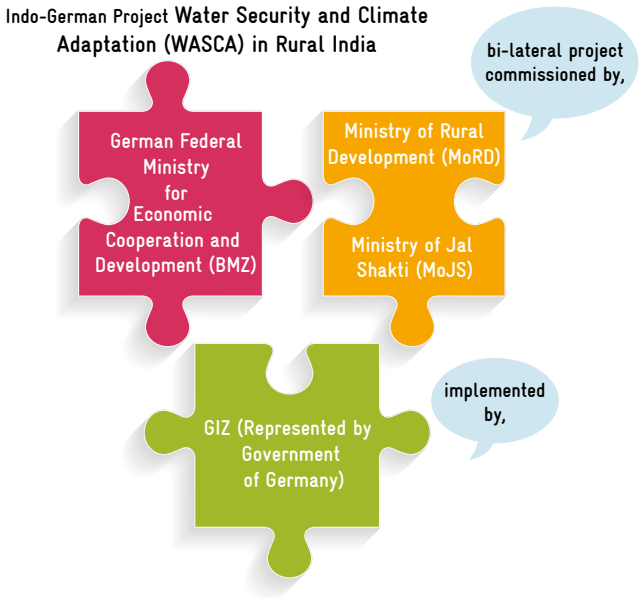
Thirukkural - 11

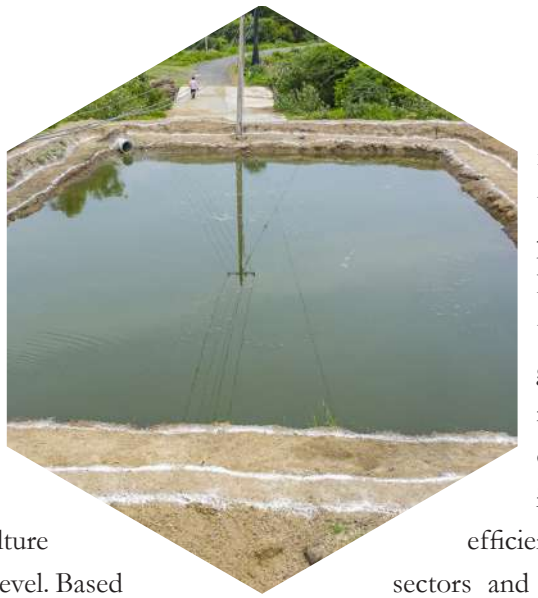
EXECUTIVE SUMMARY

> "Aims to improve water resource management with respect to water security and climate adaptation"

Water security is an alarming issue and one of the key challenges of the world under climate change scenario. While, the rural areas in particular are of prime concern due to its scarce resources and high natural resource dependency requires thorough understanding, adapting, and applying technical knowledge in all its dimensions. This involves integrating climate change adaptation into the development planning processes and strategies across all relevant sectors and at all levels.

The Indo-German Project "Water Security and Climate Adaptation in Rural India", is a bi-lateral project commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) in partnership with the Ministry of Rural Development (MoRD) and Ministry of Jal Shakti (MoJS) and implemented by GIZ (Represented by Government of Germany). This project aims to improve water resource management with respect to water security and climate adaptation and to establish a framework for integrating water perspectives into planning and implementing adaptation actions that promotes climate resilience. It is implemented under technical cooperation from BMZ-GIZ with implementation under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA/S) and National Water Mission (Catch the Rain Campaign) under MoRD, MoJS respectively. In Tamil Nadu State, the project is jointly implemented by the Department of Rural Development & Panchayat Raj, (DRD&PR) Government of Tamil Nadu, Chennai and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, New Delhi.





Initially, WASCA Tamil Nadu conducted preliminary state level scoping study on State's rural water security under climate lens through 18 influencing indicators to reflect state's rural water security through four interconnected areas namely, climate extremities, water resources, agriculture and socio-economic at district level. Based on the assessment, Tiruvannamalai and Ramanathapuram districts are prioritized by the State Level Steering Committee headed by the Additional Chief Secretary, RD&PR in November 2019 for implementing the WASCA. Then, the indicators are further explored at Gram Panchayat (GP) level through Composite Water Resource Management (CWRM) approach focusing on Mahatma Gandhi NREGA/S approach to identify the key problems and propose the key actions for implementation in each district.

With focus on water-related climate action and integrated water resource management (IWRM) principles, the project WASCA aims to significantly contribute towards Sustainable Development Goals for ensuring efficient, sustainable, and inclusive water outcomes. Implementation of key water actions support the National Water Mission, one of the eight missions under the National Action Plan for Climate Change (NAPCC) to achieve their objective of promoting basin level IWRM. It also explored possible contributions towards the larger goals of Nationally Determined Contribution's (NDC) climate adaptation through its work on improving water efficiency in agriculture and allied sectors and ecosystem development. The State and District Steering Committee approved the process during May 2020 and the whole progress is jointly accomplished with research organizations and key sectoral experts in February 2021.

Subsequently, the District Collector, Tiruvannamalai, entrusted the Block level report of water security and climate adaptation for each Blocks. The Block level report is intended for all planners and managers responsible for addressing adaptation in natural resource management and water-dependent economic sector and for those who provide support to achieve a coherent and strategic response to adaptation planning. This report also helps stakeholders to understand the issues related to water security in the context of climate change in rural areas and actions through Mahatma Gandhi NRGES and the need for convergence with concerned line departments.

Block level report is intended for all planners and managers responsible for addressing adaptation in natural resource management and water-dependent economic sector

This report was structured with nine chapters

1

The First chapter outlines the generic demographic, socio economic and hydrological aspects of the Block

2

The Second chapter addresses water security through the lens of changing climate. The past and future climate change scenarios are discussed along with climate risks. The 18 vulnerability indicators used in WASCA TN's scoping study are summarized and analysis on Block level vulnerability assessment are briefed

3

The Third chapter elaborates the process of CWRM approach and its framework along with categorization of GPs, collection and analysis of spatial and non-spatial data of climate, water, agriculture and socioeconomic areas

4

The Fourth chapter discusses the Intergovernmental Panel on Climate Change (IPCC) vulnerability assessment and GP vulnerability scores based on the degree of vulnerability through sensitivity and adaptive capacity in 4 areas

5

The Fifth chapter explores key water actions under Mahatma Gandhi NREGA convergence and its proposed actions as developments in public and common land, agriculture and allied sectors, rural infrastructures and climate resilient measures

6

The Sixth chapter sketches the projected outcomes of planning and development in public and common land, agriculture and allied sectors, rural infrastructures and its linkage with NDC and SD goals

7

The Seventh chapter provides the process of GP plan implementation, its integration in to Mahatma Gandhi NREGA soft and about NRM and Non NRM works progress

8

The Eight chapter provides model case study on one micro-watershed and GP from the Block to illustrate how CWRM planning processes unfolds into analysis, results and impacts from macro-watershed to the lowest planning unit GP

9

The Ninth chapter concludes with the significance of Block level study and recommendations

துப்பார்க்குத் துப்பாய துப்பாக்கித் துப்பார்க்குத்
துப்பாய தூஉம் மழை

குறள் - 12

The rain begets the food we eat
And forms a food and drink concrete

Thirukkural - 12

CHAPTER 1

1 ABOUT THE BLOCK

Pudupalayam, a rural block of Tiruvannamalai District lies between 12°15'54.59"N to 12°25'11.572"N latitude and 78°49'4.049"E to 79°1'52.796"E longitude and is surrounded by Kalasapakkam, Thurinjapuram, Keelpennathur, Chengam and Jawadhu Hills blocks (Figure 1.1). The total geographical area of this flat terrain block is 19,726 ha (197.26 sq.Km). Administratively, this block comes under Chengam taluk, with 37 village panchayats and 218 habitations in it.

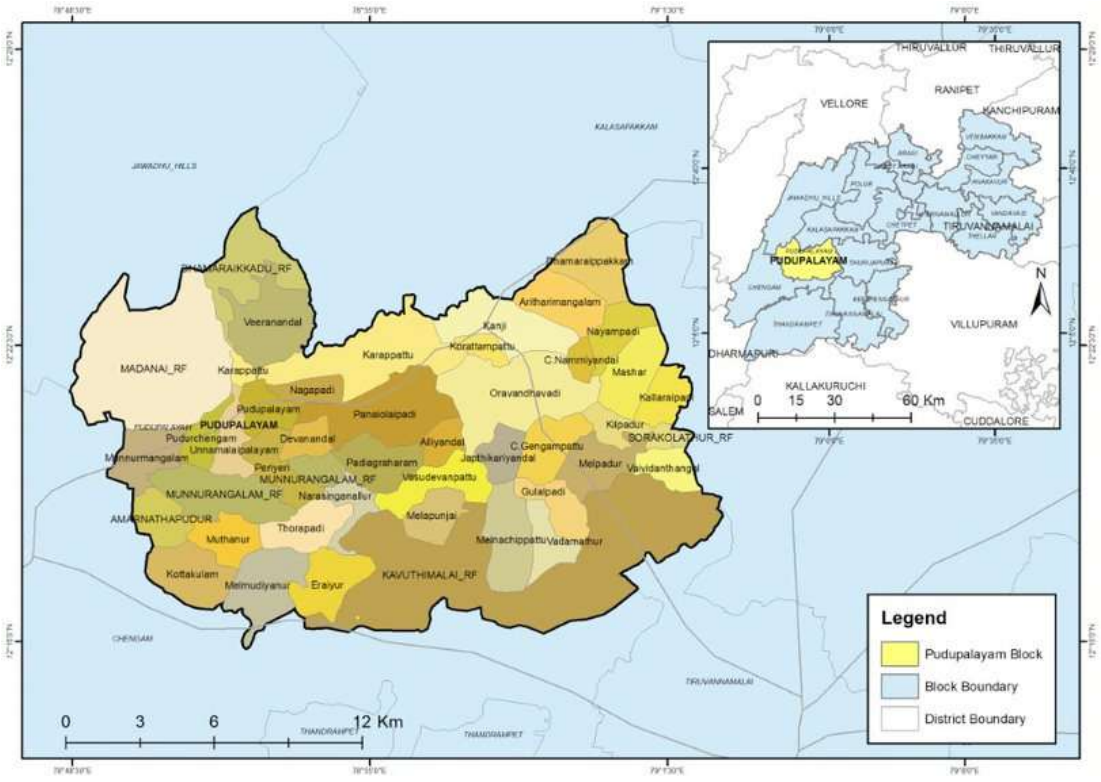


Figure 1.1. Pudupalayam Block and it's environ

According to Census 2011, the population of Pudupalayam Block is 1,00,873. The population density of the Block is 284 per sq. Km which is much lower than the district population density (473 per sq. Km) and State's density (555 per sq. Km). There is 19.93% increase in the population observed since 2001 in this densely populated rural block. The percentage of male population is higher (50.61 %) than the female population (49.38%). The proportion of sex ratio is 976 females per 1,000 males, which is lower compared to the district average sex-ratio (994 females per 1,000 males). The literacy rate of female population is lower (42.76%) than male literacy (57.24%). The average literacy rate of the block is much lower than national average (72.98%). scheduled castes and scheduled tribes accounted for 28% of the total population (Thiruvannamalai district profile 2020).

Economically, Pudupalayam is among the top 10 revenue earning blocks of the Tiruvannamalai district. Agriculture and allied activities, are the primary occupation followed by livestock rearing. Paddy tops as the predominant crop, with 67 % of the irrigated area cultivated with paddy. The other major crops grown in the block area are ground nut, sugarcane, pulses, and red gram. Significant cultivated areas of banana, brinjal, ladies finger, dry chilli and ragi can also be seen. Groundnut and pulses are cultivated both under irrigated and rainfed conditions. The sericulture is practiced in very small patch; the under mulberry is 0.50 Acre with 114 Kg of cocoon production. A livestock counts of 55,707 was recorded during 2019-20. The Block has 22 milk societies with 6,894 litres of milk being produced during 2019-20.

> The proportion of sex ratio is 976 females per 1,000 males, which is lower compared to the district average sex-ratio (994 females per 1,000 males).

> The average literacy rate of the block is much low-er than national average (72.98%).

> nearly 67% of irrigated area are cultivated with paddy

Hydrologically, Pudupalayam block comes under Aliyar, Thrurinjalar and Cheyyar sub basins under Pennaiyar and Palar river basin. Karavanar and Cheyyar rivers passes through the block and it has 3 macro watersheds viz., Cheyyar River, Pamban and Thurinjalar Watersheds and 87 micro watersheds. Figure 1.2 shows the hydrological location of the Block including watersheds.

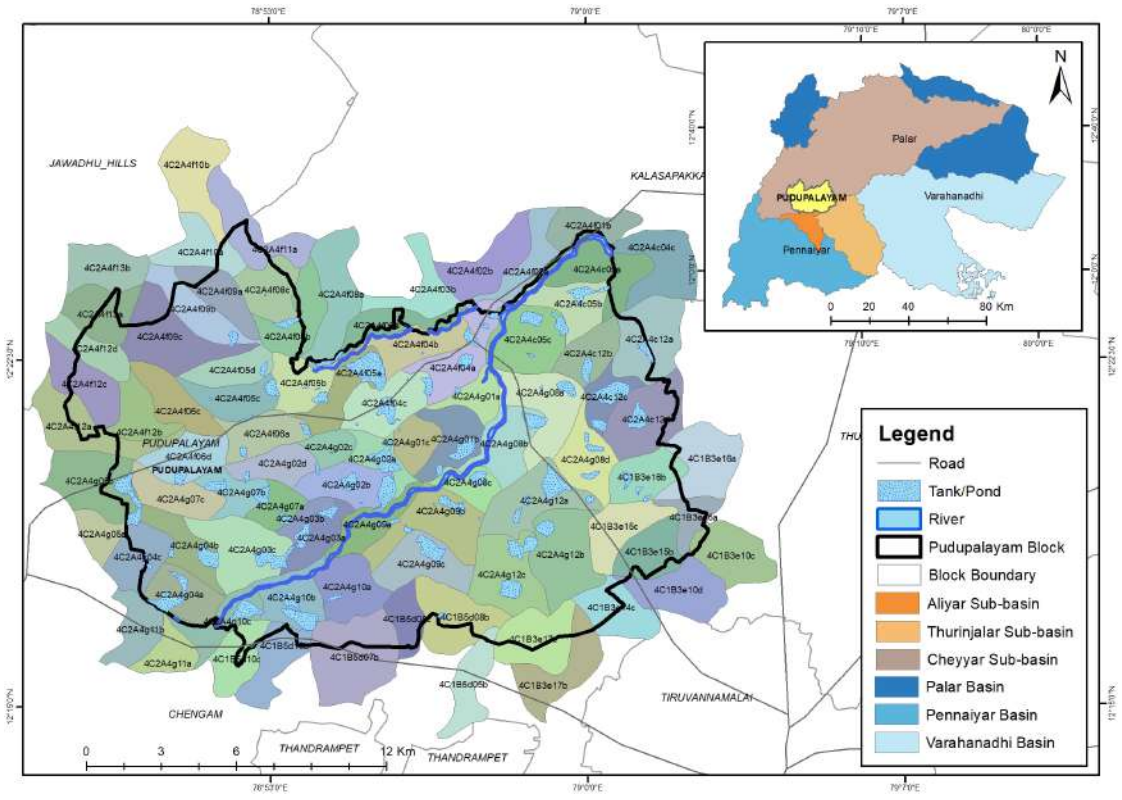


Figure 1.2. Watersheds - Pudupalayam Block

There are 75 tanks in the Block with the largest tank being the Karapattu tank with an area of 190.69 ha. Other important tanks are Alathur tank (145.8 ha), Mashar tank (143.35 ha), Panaiolaipadi tank (106.88 ha), Munnar mangalam tank (97.9 ha), Oravanthavadi tank (97.3 ha) and Eraiyur big tank (95.9 ha) (Figure 1.3). Even though there are rivers and tanks in the Block, the ground water in Pudupalayam Block is of serious concern and over exploited. The Eraiyur (T) firka which covers this Block is at an over exploited stage of ground water development.

GROUND WATER LEVEL OF THIS BLOCK

OVER EXPLOITED- › 100%	Pudupalayam & Eraiyur

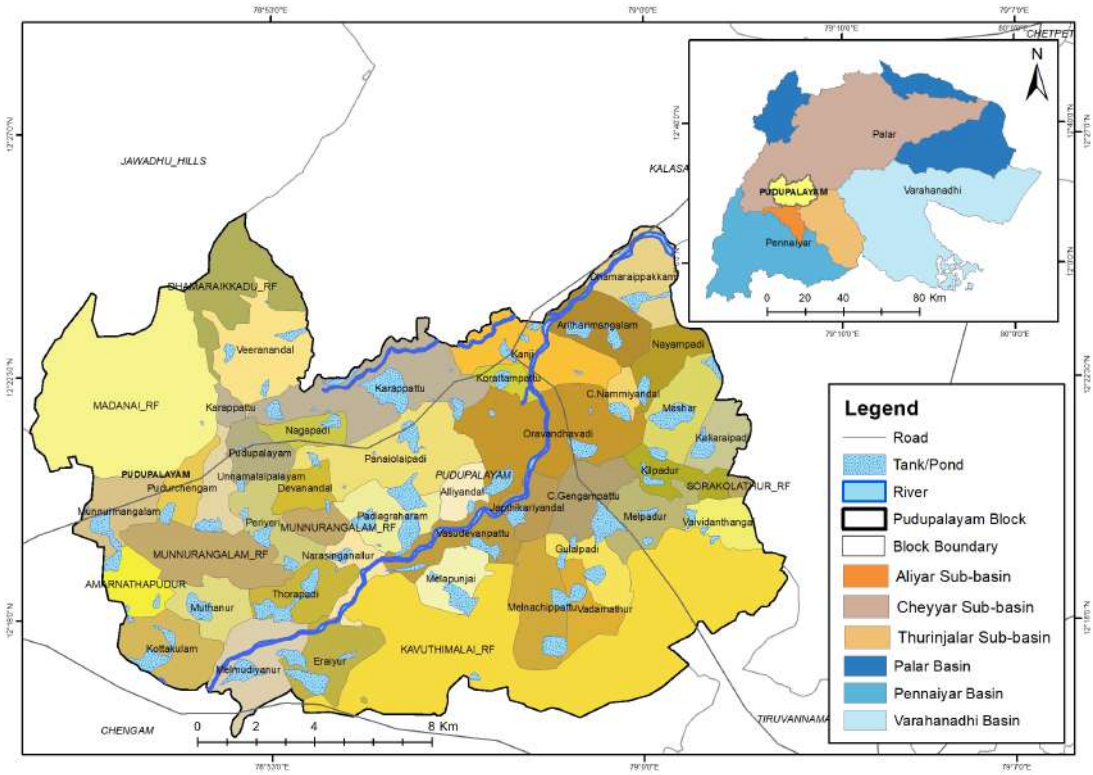
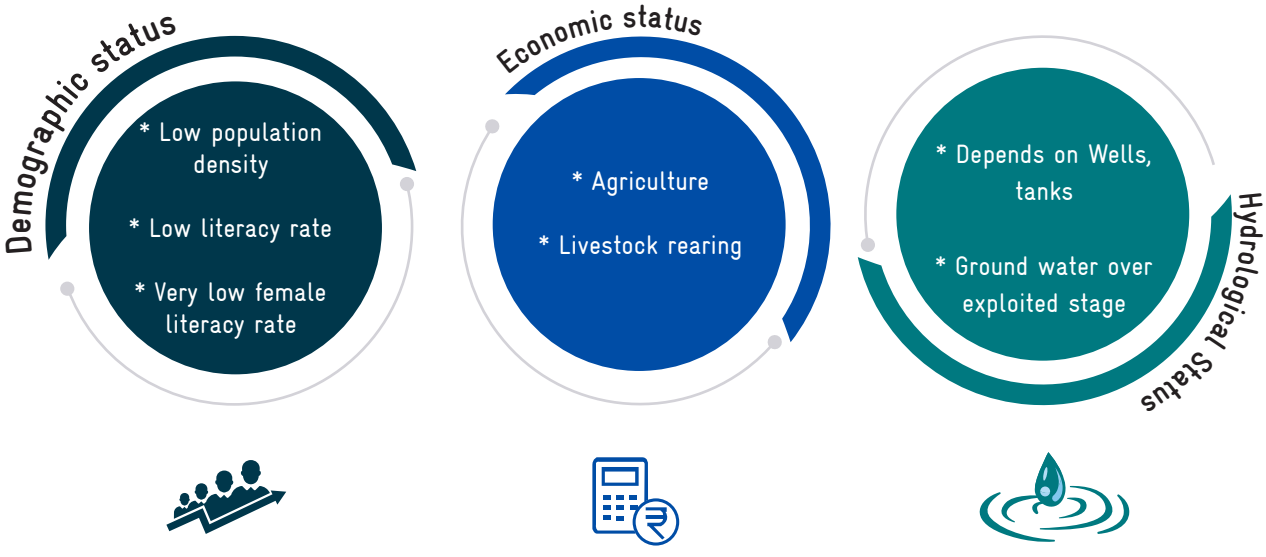


Figure 1.3. Spatial distribution of waterbodies



வின்இன்று பொய்ப்பின் விரிநீர் வியனுலகத்து
உள்நின்று உடற்றும் பசி

குறள் - 13

Let clouds their visits stay, and dearth
Distresses all the sea-girt earth

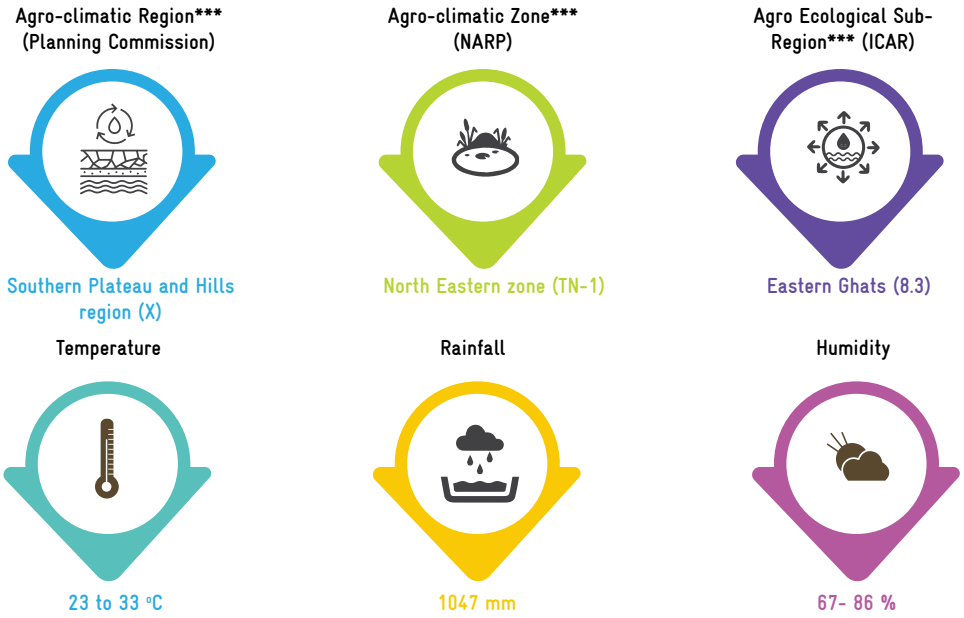
Thirukkural - 13

CHAPTER 2

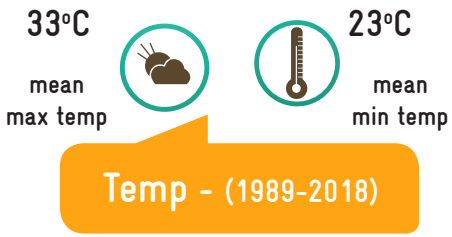
2 CLIMATE AND WATER SECURITY

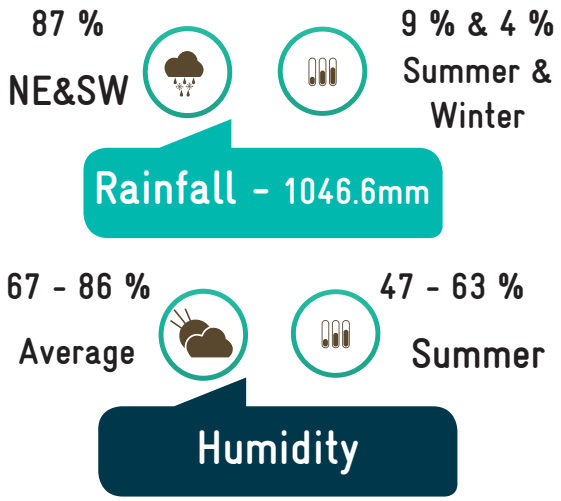
This region has typical tropical climate, located in the North Eastern agro-climatic zone of State and Southern Plateau and Hills region according to the agro climatic regional classification of planning commission. The general climate description of this region is given below (Table 1).

TABLE 1. GENERAL CLIMATE DESCRIPTION OF THE BLOCK



In general, this arid region has dry and hot weather. The mean maximum temperature is 33°C and mean minimum temperature is 23°C during last 30 years (1989-2018) (IMD). In summer months the maximum temperature goes up to 45°C for fewer days. The monthly average temperature characteristic during 2020 are shown in Figure 2.1.





Normally this region receives major rainfall from North-East Monsoon (NEM) (October to December) and South-West Monsoon (SWM) (June to September). Past record shows the annual average rainfall of this region is 1047mm (WRIS, GoI). Both NEM and SWM contribute nearly 87 % of the annual rainfall in which SWM is slightly stronger. While summer (March to May) rainfall accounts 9 % of the total rainfall and winter (January, February) season has low contribution (4%) to the annual rainfall (Figure 2.2). The average relative humidity is 67- 86 %t and during summer it ranges between 47-63 %.

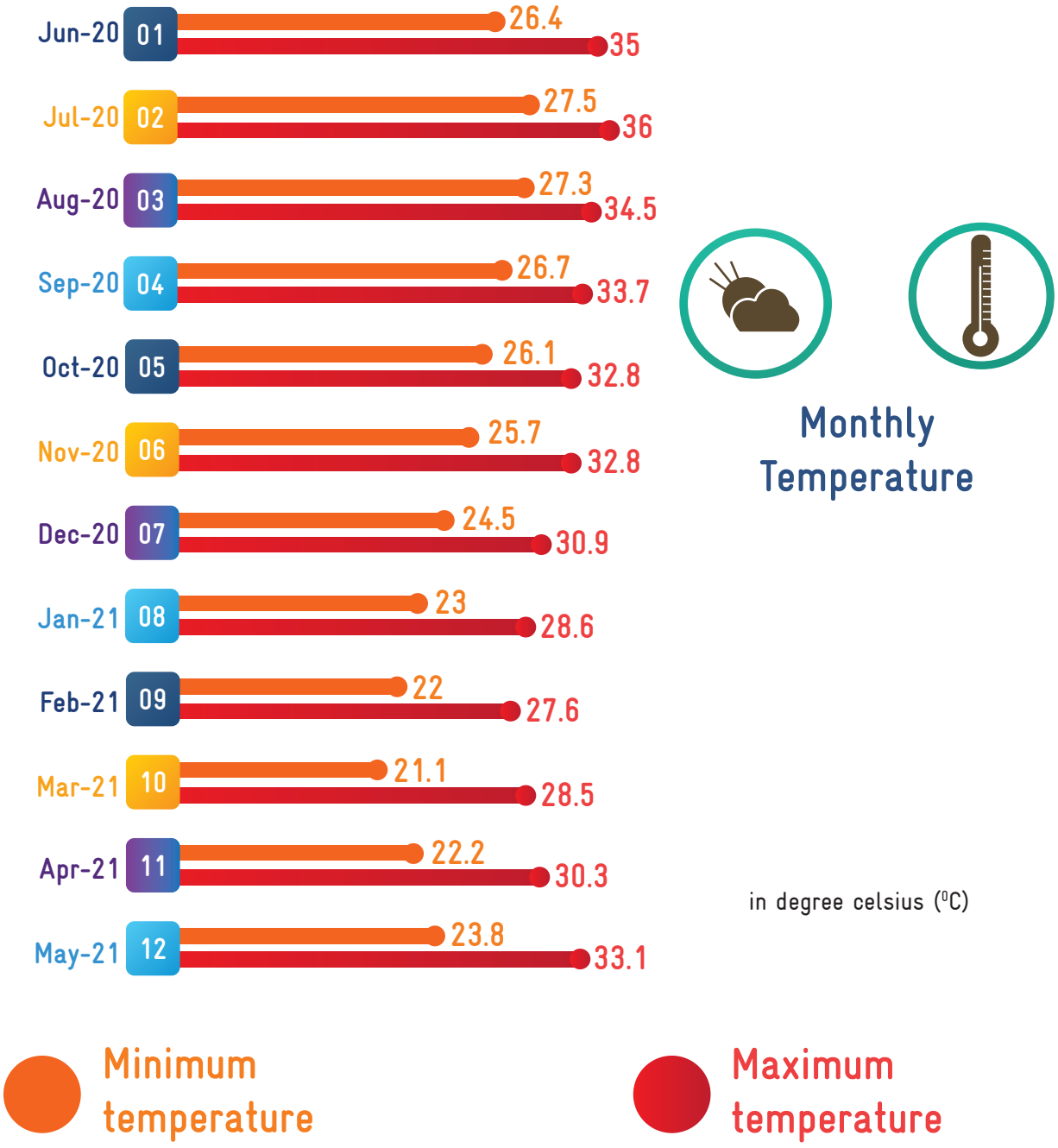


Figure 2.1. Average monthly temperature during 2020

The average annual rainfall days are 172 days in which 72 days are form NEM and 82 days are from SWM months. Onset of SWM rainfall starts in the 1st week of June and cessation would be in the 1st week of October. Onset of NEM rainfall starts in the 2nd week of October and cessation would be in the 4th week of December. Though the No. of rainy days is slightly lesser than SWM, the intensity is more in North East monsoon.

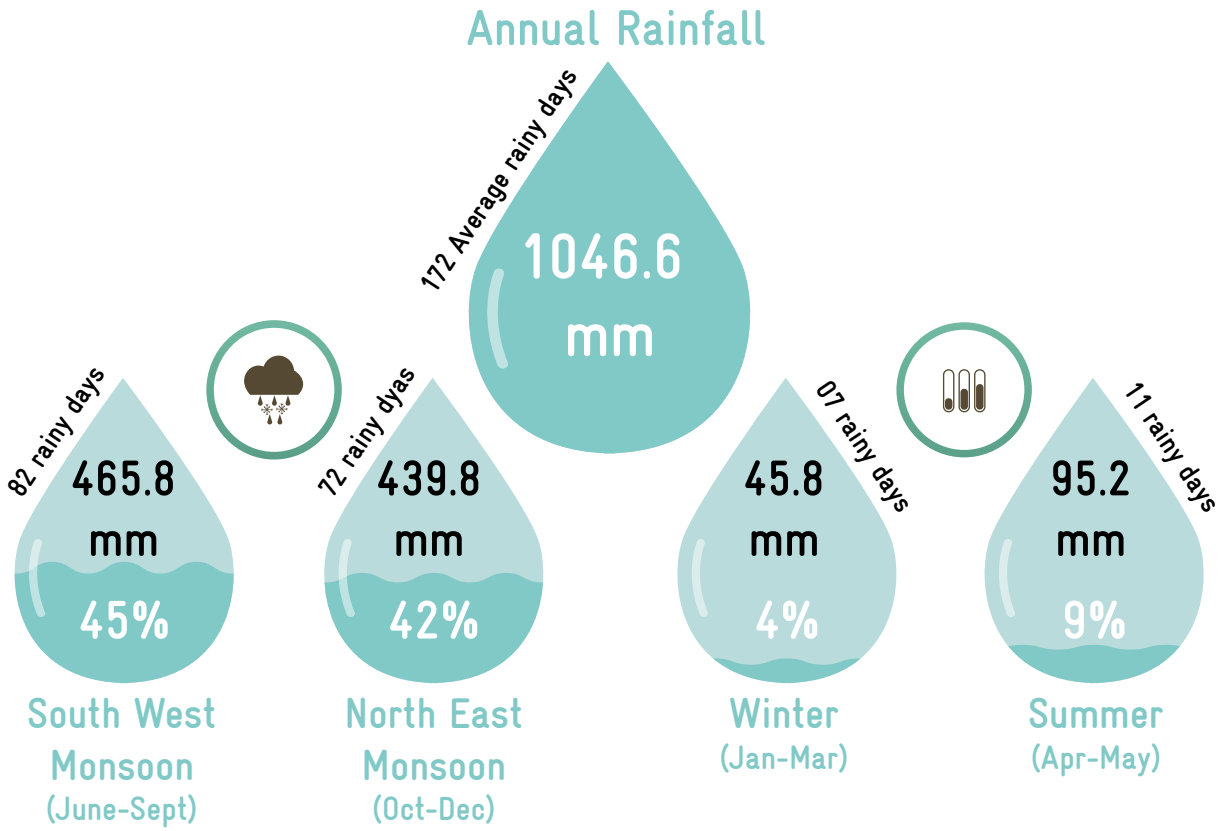


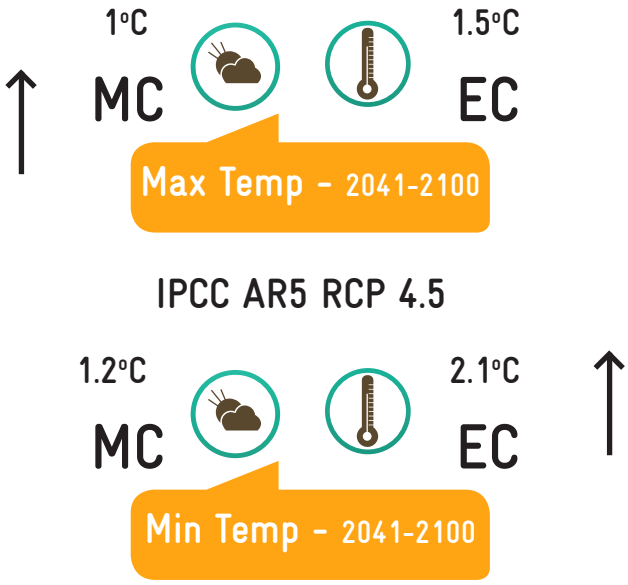
Figure 2.2 Season wise distribution to annual rainfall

In recent decades, the world is witnessing significant changes in its climate. These changes include increase in average temperature, variations in the rainfall intensity and its frequency. This region is also no exception, and 1.2^{0}C and 0.5^{0}C increase in maximum and minimum temperature was observed during 1951 to 2015 (IMD). The rainfall variability is also well observed. During 1951 to 2015, there were 15 excess rainfall years (above normal rainfall) and 15 deficient rainfall years (below normal rainfall) recorded. The consecutive excess and deficient rainfall lead to rainfall variability and its extremities. Since this region is heavily dependent on monsoon rains, it is prone to droughts when the monsoons fail. As rainfall is the major source for determining water storage, existing water resources such as rivers, dams and major and minor tanks fail along with deficient rainfall years.

The continuous assessment reports of Intergovernmental Panel on Climate Change (IPCC) cautioned that the changes in climate have a key role in intensifying and triggering extreme events, such as floods, droughts, heatwaves, and tropical cyclones, which are all likely to increase in the future also.

Recent IPCC Assessment Report 6 (AR 6) predicts that climate changes will increase in all regions of the globe over the coming decades and that even with 1.5°C of global warming, there will be increasing heat waves, longer warm seasons, and shorter cold seasons – which will become more intense at 2°C of warming.

Climate projection based on global climate models indicate that there would be 1°C increase in maximum temperature in mid-century (MC) period (2041-2070) and 1.50°C increase in end-century (EC) period (2071-2100) from the baseline scenario under RCP 4.5 climate scenario in this region. The minimum temperature would increase nearly 1.2°C and 2.1°C during MC and EC periods. The average annual rainfall for IPCC AR5 RCP4.5 scenarios is projected to increase about 13 percent towards MC and increase by about 21 per cent towards EC period.



The observed and projected climate changes will have serious impacts in the areas of,

* surface and ground water availability
* river flow
* water quality
* soil moisture
* evapo-transpiration

* 1.2°C increase in maximum temperature during 1951-2015
* 0.5°C increase in minimum temperature during 1951-2015
* 1°C increase in max temp during 2041-2070 (RCP4.5)
* 1.5°C increase in max temp during 2071-2100 (RCP 4.5)

As a result, these impacts pose severe risks to dependent sectors such as agriculture and allied activities, industry, and livelihoods of people, particularly the vulnerable sector.

2.1 CLIMATE RISKS

Increasing temperature, fluctuating rainfall patterns and its extremities creates shorter rainy seasons and longer dry seasons makes river basins more vul¬ner-able. This district experiences climate hazards in the past such as floods, drought and heat waves.

* Flood
* Drought
* Heat waves

?

Flood

Being situated approximately 100 Km from Bay of Bengal, this region experiences heavy rain and flood during deep depressions/cyclones forms in the Bay of Bengal. In recent decades, all parts were severely affected during 2005, 2010, 2015 heavy rainfall events and Thane (2011) and Vardah (2016) cyclones. State Disaster Management Authority, Government of Tamil Nadu identified 75 locations of Tiruvannamalai district as flood vulnerability spots. However, Pudupalayam Block is not vulnerable to floods during the past cyclones.

Drought

Low rainfall coupled with the erratic behaviour of the monsoon in the state makes Tamil Nadu the most vulnerable to drought. This district comes under drought vulnerable area as it receives less than 40% of the normal rainfall and experiences frequent droughts in the past years particularly in the years 2003 & 2009. But severe drought was experienced in the year 2016- 2017. All parts are affected by drought and its consequences; there are large areas of crop losses and drinking water scarcity. In Pudupalayam Block, all GP's are prone to drought.

Heat Wave

A heatwave is a period of abnormal high temperatures, more than the normal maximum temperature that occurs during the summer season. Heat waves typically occur between March and June. The extreme temperatures and resultant atmospheric conditions adversely affect people living in these regions as they cause physiological stress, sometimes resulting in death. Normally, all parts of this district witnesses heat waves. All GPs in Pudupalayam Block are prone to Heatwaves.

2.2 WASCA CLIMATE VULNERABILITY INDICATORS

During 2019, WASCA TN conducted preliminary State level scoping study on State rural water security under climate lens and identified climate and water security hotspots/potential geographical areas for project demonstration through scientific criteria jointly with Centre for Climate Change and Disaster management (CCCDM), Anna University. The vulnerability of a region to the climate depends on several intrinsic factors such as physical, social, economic, and environmental conditions. On the basis of ground reality and accurate observation, WASCA TN study proposed 18 indicators to reflect State's rural water security through four interconnected CWRM areas namely, climate extremities, water resources, agriculture and socio-economic to assess climate-water vulnerability at the district level (Table 2).

TABLE 2. BIOPHYSICAL AND SOCIO-ECONOMIC INDICATORS USED IN VULNERABILITY ASSESSMENT

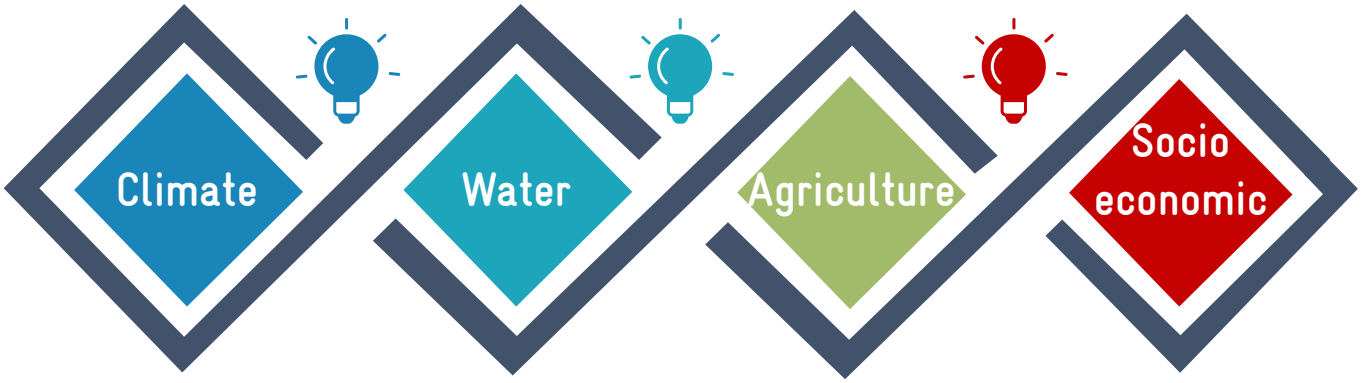
CWRM Area	Indicators of Rural water security vulnerability	Indicators label	Linked SDG
Climate	Changes in max temperature (°C)	C1	Goal 13
	Changes in min temperature (°C)	C2	
	Changes in rainfall (%)	C3	
	Excess rainfall years	C4	
Water	Deficient rainfall years	C5	
	Ground water extraction (%)	W1	Goal 6
	Ground water Recharge (m3)	W2	
	Surface water availability (mm)	W3	
	Water gap (mcm)	W4	
	% of contamination	W5	
Agriculture	Rainfed area (%)	A1	Goal 15
	Cropping intensity (%)	A2	Goal 2
	Soil moisture (Kg/m2)	A3	Goal 15
	Evapotranspiration (Kg/m2)	A4	
Socio-economic	Rural proportion (%)	S1	Goal 2
	Multidimensional poverty index	S2	Goal 1
	Source of drinking water within premises in rural (%)	S3	Goal 6
	Marginal farmers land holdings (%)	S4	Goal 1

These 18 biophysical and socio-economic indicators data were collected at district level and categorized into exposure, sensitivity and adaptive capacity for the analysis. The vulnerability ranking was given based on IPCC protocol of vulnerability assessment methodology. Based on the analysis, Ramanathapuram and Tiruvannamalai districts were selected by the State Level Steering Committee headed by the Secretary RD&PR in Nov 2019 for implementing the WASCA. Subsequently, all the key water actions, CWRM planning and implementation works are envisaged for the above districts through these influencing indicators collectively under four CWRM areas viz. climate, water, agriculture and socio economic.

2.3 COMPRESSIVE ANALYSIS OF BLOCK LEVEL VULNERABILITY

WASCA TN has progressed towards Block level climate vulnerability mapping in order to strengthen water resources and build context specific climate resilient models at GP level. The 18 vulnerability indicators at district level under four areas via climate, water, agriculture and socioeconomic are further explored at GP level through Composite Water Resource Management (CWRM) approach by GIZ, Department of Rural Development (MGNREGS), National Water Mission, Tamil Nadu along with technical partners of WASCA project namely jointly MS Swaminathan Research Foundation (MSSRF), Prime Meridian and key sectoral experts. Based on national level workshop on WASCA for GIS based planning using IWRM principles, a Composite Water Resources Management plan framework was customized to suit to Tamil Nadu State's conditions, including climate vulnerability as per the scoping study recommendations, Major CWRM parameters are thus identified under four areas via climate, water, agriculture and socio-economic for advancements towards actions. The major parameters identified at Block level (Table 3) are collected both from primary and secondary sources and analyzed statistically and geospatially.

TABLE 3. MAJOR PARAMETERS IDENTIFIED FOR BLOCK LEVEL VULNERABILITY ASSESSMENT



Climate	Water	Agriculture	Socio economic
Changes in temperature, rainfall and its extremities	Watershed, Micro-watershed, and drainage network, traditional water bodies, canal networks, irrigation facilities, catchments area wise available runoff, ground water and surface water utilization, ground water status, ground water availability, evapo-transpiration losses, and water demand for drinking, agriculture and livestock	Land resources, land use under different categories, catchment area, means of water extraction, irrigation methods, crop details, status of soil resources including macro and micro nutrients, soil physical condition, soil moisture, and livestock details	Area, population, gender, vulnerable population and household, details of MGNEGRA job seekers, drinking water sources and grey water generation

ஏரின் உழாஅர் உழவர் புயலென்னும்
வாரி வளங்குன்றிக் கால்

குறள் - 14

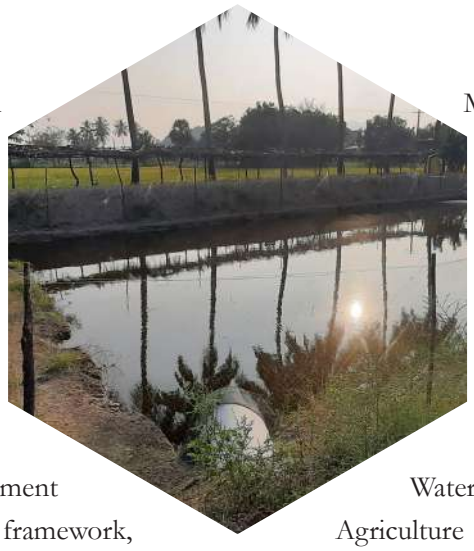
Unless the fruitful shower descend
The ploughman's sacred toil must end

Thirukkural - 14

CHAPTER 3

CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA

3 CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA



GIZ has evolved a GP based CWRM planning approach for facilitating convergent planning under MGNREGA for Water Security and Climate Adaption. This is as per the recommendations of National Level Workshop organized in February 2020, by MoRD, MoJS, GIZ, along with State Rural Development Department of WASCA. While developing the framework, inputs from all relevant stakeholders were considered including communities, public institutions, civil society, research organizations, and private agencies. The basis on which GIS based planning was developed for all GPs is the Annual Master Circular issued during 2021-22 and the Annual Planning Circular issued in September 2020 by MoRD.

The planning exercise for Mahatma Gandhi NREGS will be part of the convergent planning exercise for the Ministry. The thrust is on planning for works related to Natural Resource Management (NRM), Agriculture & Allied Activities and Livelihood related works on individual lands leading to sustainable livelihoods as well as provisioning of livestock shelters for the individual households. The NRM related works under MGNREGS will be taken up in convergence with other programmes such as Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), Integrated Watershed Management Programme (IWMP) and Command Area and Water Management (CAD&WM) schemes for better outcomes of the water conservation and water harvesting measures at farm level. PMKSY aims to achieve a high degree of effective water availability and use for Indian farms especially in water scarce regions. IWMP, Mission Water Conservation, Har Khetko Pani and Per Drop More Crop are the four pillars of PMKSY. Technical inputs for planning is to be drawn from the technical resources available in the district under MGNREGS, CSO partners and other line department agencies. In case of planning for NRM works, the technical inputs will be drawn from the joint pool of technical personnel of IWMP in Watershed Cell cum Data Centre (WCDC), Mahatma Gandhi NREGS unit, and Water Resource Department and the Agriculture Department. The technical inputs relating to Excavation, Renovation & Modernization (ERM) of waterbodies may also be sought from the regional office of Central Ground Water Commission (CWC). The GPs will keep in perspective the Macro and Micro-watersheds of 500-100 ha that comprises of 1-10 GPs, while deliberating and finalizing prioritization of shelf of projects.

Special focus is given to vulnerable households and communities while preparing estimates for anticipated demand, list of works on individual land, and list of other works that provide direct individual benefits. The Convergent Planning Exercise shall make use of automatically included and deprived Households of SECC to ensure full coverage of poor and vulnerable households. Infrastructure built under Mahatma Gandhi NREGS leads to increased water availability for irrigation, groundwater recharge, increased agricultural production, and carbon sequestration. The Ministry of Environment, Forest and Climate Change recognizes Mahatma Gandhi NREGA as one of the 24 key initiatives to address the problem of climate change, while playing a significant role in improving the livelihood conditions of the vulnerable people. Planning and design of works under Mahatma Gandhi NREGS should take into account, impacts of climate change in order to ensure resilience of vulnerable rural communities and make the benefits sustainable in the long run.

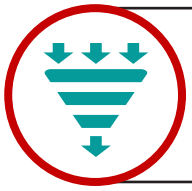
262 Total Kinds of works in Schedule-I of Mahatma Gandhi NREGA

182 Kinds of works relate to NRM alone

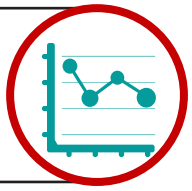
164 Kinds of works related to Agriculture & allied works

85 Water related works out of NRM

In pursuance of Schedule-I of Mahatma Gandhi NREGA, 262 kinds of works/ activities have been identified as permissible works, of which 182 kinds of works are related to NRM alone. Among NRM works, 85 activities focus on water conservation and harvesting while 164 works are related to Agriculture and allied works. As MGNREGA activities benefit both the community and individual`s levels. This should typically change 'relief works mode' to an integrated NRM perspective. Planned and systematic development of land and harnessing of rain-water following watershed principles should become the central focus of Mahatma Gandhi NREGS work across the country to sustainably enhance farm productivity and income of poor people. Even the works on private lands should be taken up following the principles of watershed management in an integrated manner. To facilitate evidence based scientific NRM planning process, Technological support shall be taken from National Remote Sensing Centre, ISRO for identification and holistic planning of permissible works in the watersheds using web-GIS platform (Bhuvan Geoportal). The GIS (Geographical Information System) plans shall be comprehensive ones incorporating all eligible works under Mahatma Gandhi NREGS and the same shall be implemented in a phased manner. Section 22 of Annual Master Circular provides the key steps for GIS based planning.



The GIS plans shall be comprehensive ones incorporating all eligible works under Mahatma Gandhi NREGS and the same shall be implemented in a phased manner

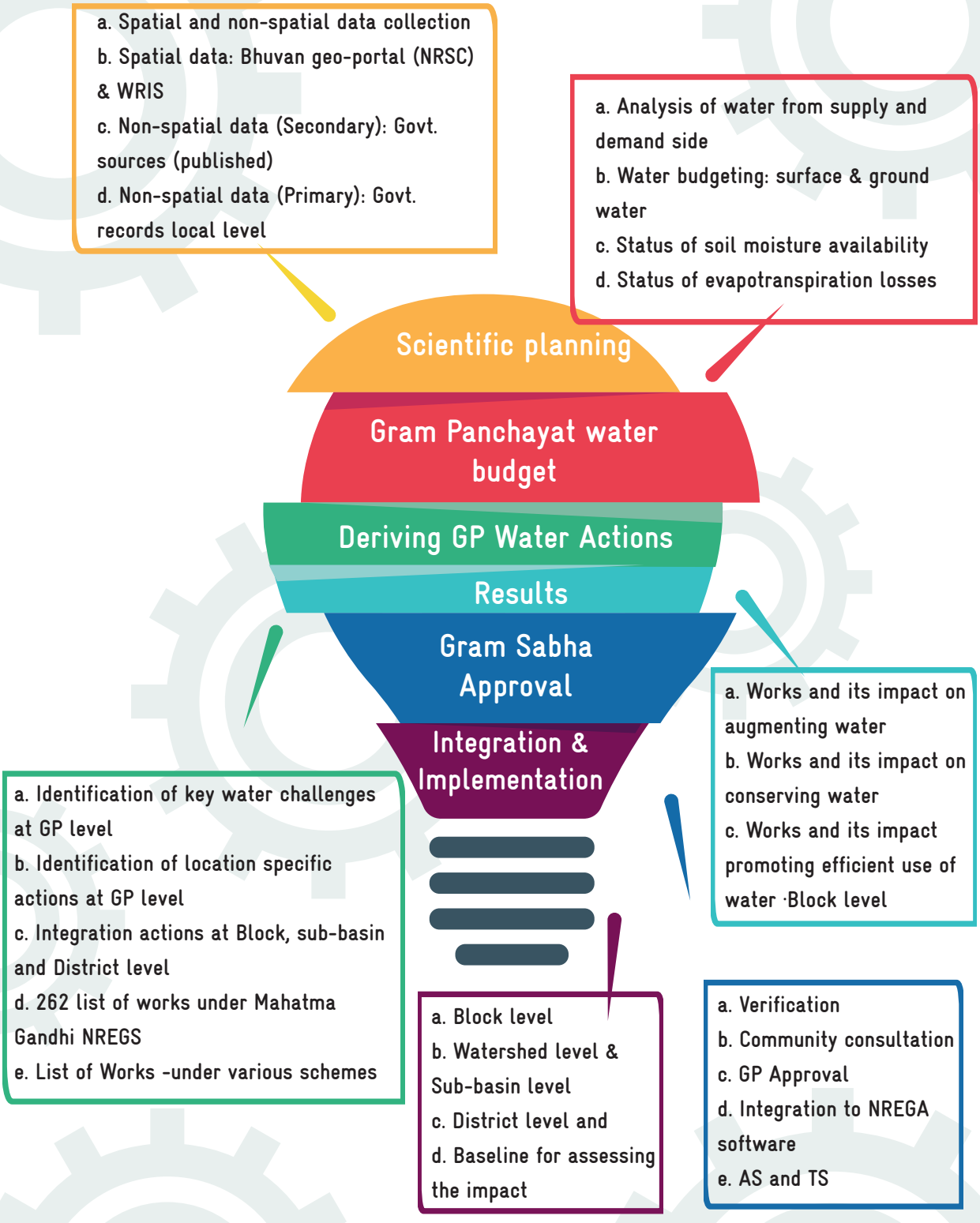


3.1 COMPOSITE WATER RESOURCE MANAGEMENT APPROACH FOR WASCA

CWRM approach for WASCA uses simple scientific tools that can help Block or GP level officer to organize, analyze and prepare a developmental draft plan for participatory discussion at GP level. This approach involves analyzing key water challenges using both non-spatial and geo-spatial data in GIS, coupled with extensive ground truth verification. The non-spatial data includes the socio-economic, climatic, hydrological, edaphic and agricultural areas which are concurrently used for analysis along with the spatial data obtained from remote sensing in GIS platform. It starts with mapping of the administrative (habitations/panchayat/revenue village, Block/taluk), agro-ecological (regional and sub-regional, climatic and agricultural zonation's) and hydrological (drainage points/watersheds/sub basin) units keeping GP as the lowest unit of planning and execution. Following this, a detailed socio-economic profile was mapped covering male/female population, proportion of SC and ST population, vulnerable households, access to employment in Mahatma Gandhi NREGS and proportion of works carried out in the village through amount of budget utilized as well as actual works completed. The climatic parameters including maximum and minimum temperature, season-wise rainfall and rainy days, evapotranspiration

and soil moisture are used to understand the climate related issues. The next step is to assess land use, watersheds, drainage networks and surface runoff, existing water supply and storage systems, water management for the key sectors and water demand and prepare the water budget for the GP (Box 1).

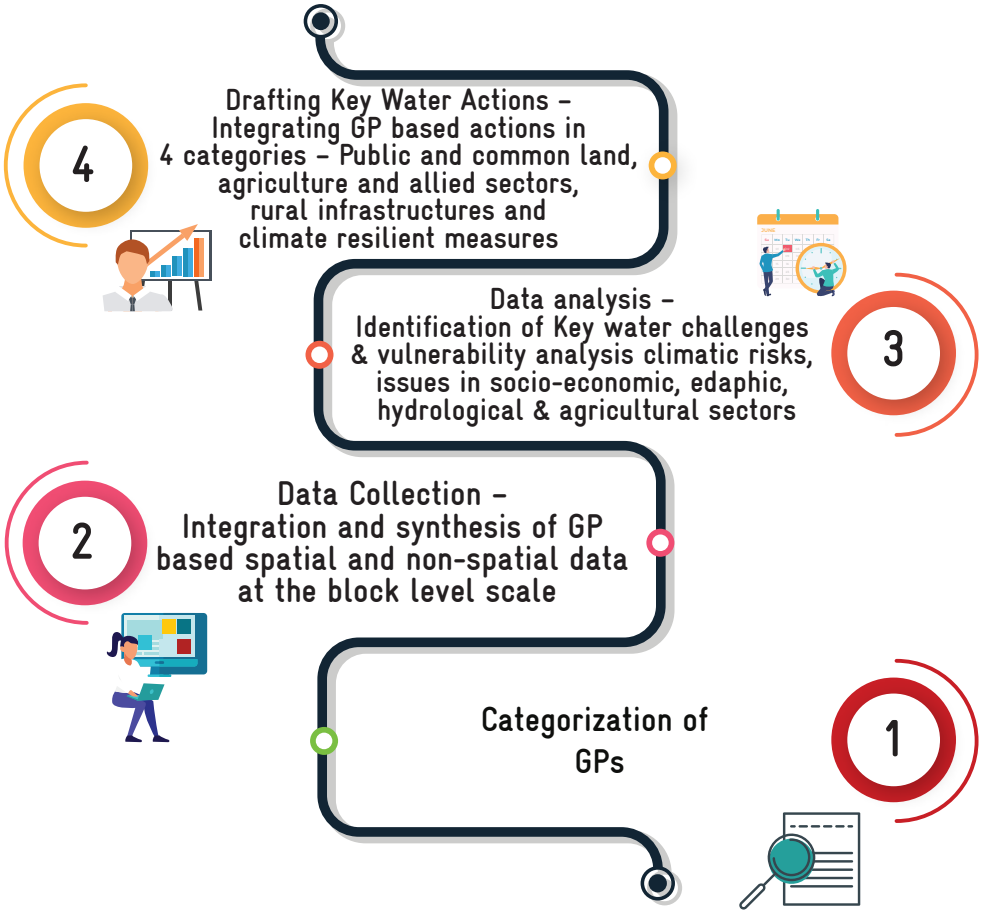
BOX 1. MAJOR COMPONENTS INVOLVE IN CWRM PLANNING WORKOUTS



Such a comprehensive analysis helps in preparing the water budget integrating ground water, surface water through runoff from rainfall, evapotranspiration and soil moisture which further helps to identify potential areas of action to augment the water resources in public /common land, agriculture and allied sectors and rural infrastructure dimensions. The analysis also helps to understand the areas of interest and appropriate climate resilient measure as an adaptive measure to the emerging climate change scenarios. The water challenge linked water actions are the key in developing the perspective plan for the water secured GPs, to serve as shelf of projects. These shelf of projects are again mapped with the available schemes and financial plans for execution, adopting convergence and inter-sectoral principles. In the execution process the district level technical and administrative teams are involved in planning, monitoring and evaluation in terms of outcome/impact mapping. In the execution stage, the approach of saturation of works, planning at watershed approach (ridge to valley), and convergence are some of the key aspects that needs attention for a tangible outcome in both NRM as well as livelihoods.

The district WASCA resource centers established in the project area, facilitates this whole process for planning and implementation. This comprehensive and integrated approach has been accepted nationally and by state governments as a comprehensive and climate adapted planning approach for water security. The whole process has been categorized into four stages – pre planning, planning, review and verification and integration and approval (Box 2).

STEPS INVOLVED IN BLOCK LEVEL ANALYSIS THROUGH CWRM APPROACH



This integrated approach has been accepted by National, State, and District Level Steering Committees headed by Additional Chief Secretary RD&PR and District Collector respectively in the project area of Tamil Nadu government as a comprehensive and climate adapted planning approach for water security under Mahatma Gandhi NREGS and National Water Mission.

BOX 2. MAIN STAGES OF CWRM PLANNING PROCESS

PRE-PLANNING STAGE

1. Categorizing GPs for planning as per Mahatma Gandhi NREGS guidelines
2. Human resource and capacity building at administrative levels for planning facilitation
3. Capacity Building of State, District level officers towards implementing the Mahatma Gandhi NREGS
4. Building District specific CWRM framework and indicators suitable to the terrain and geography
5. Identification of Phases for pre pilot GPs for planning (4 GP Plans per Block) as per DLSC and SLSCas per DLSC and SLSC

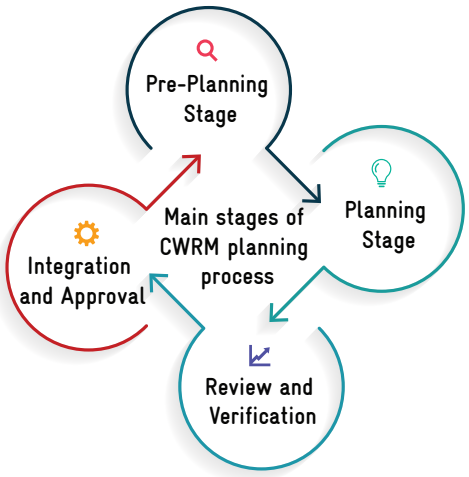
PLANNING STAGE

1. Collection on Non-Spatial statistical data as per MoRD guidelines and CWRMP
2. Collection of Spatial as per MoRD guidelines and CWRMP
3. Water Budget Estimation (as per CWRMP guidelines)
4. Conducting district specific studies on Ground Water Assessment as per CWRM
5. Inclusion on Non-NRM activities under Mahatma Gandhi NREGS with CWRMP
6. Identification of Key Water Challenges - CWRMP
7. Identification of Key Water Actions -CWRMP

FOUR LEVELS OF CWRM PLANNING UNDER WASCA

1. DEVELOPING PLANS AT LOWEST ADMINISTRATIVE LEVEL: GP LEVEL PLANS

2. INTEGRATING GP LEVEL PLANS AT BLOCK LEVEL



FOUR LEVELS OF CWRM PLANNING UNDER WASCA

3. INTEGRATING GP PLANS AT WATERSHED AND SUB-BASIN (CATCHMENT) LEVEL ON NATURAL RESOURCES

4. INTEGRATING GP PLANS TO DEVELOP WASCA DISTRICTS CWRM PLANS

INTEGRATION AND APPROVAL

1. Preparation of Integrated plans (Block, Watershed)
2. District Level WASCA Plan
3. Approval at GP level for preparation of Labour budget using CWRM frame work outcomes
4. Approval of District plan at DLSC as per above recommendations of GP level
5. Submitting approved District WASCA plan from DLSC to SLSC for financing and convergence

REVIEW AND VERIFICATION

1. Matching spatial data as per Mahatma Gandhi NREGA- MoRD guidelines on GIS based planning
2. Field Verification, GP level Meetings for inclusion in labour budget 2021-22
3. Approvals of verified works at GP by the Block and GP level officers implementing Mahatma Gandhi NRGES
4. Integrating verified, approved works into NREGA soft (MORD NIC Portal) for mainstreaming WASCA
5. Regular review on progress at each levels

3.2 CATEGORIZATION OF GPS

The CWRM uses both spatial and non-spatial data for developing GP level plans. Most of the non-spatial data are available at the revenue village level. To synchronize planning at GP, keeping data availability and administrative boundary for GIS planning, various GP's are categorized based on revenue village boundaries, for collecting and organizing the datasets. Based on the above factors, five different types of GPs are classified as Type I, II, III, IV and IV. The description on categorization of GP's is annexed (Annexure 1). Details of categorization of GPs in Pudupalayam Block is tabulated in Table 4.

TABLE 4. CATEGORIZATION OF PUDUPALAYAM BLOCK GPS

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
25	GP and revenue village data and boundary match (Type-I)	Alliandal, Aridharimangalam, Dhamarapakkam, Eraiyur, Kanji, C.Gengampattu, Japthikariyandal, Kallarpadi, Kilpadur, Kottakulam, Melapunjai, Melmudiyanur, Melpadur, Muthanur, C.Nammiyandal, Narasinganallur, Nayambadi, Perieri, Padiagraharam, Pudurchengam, Thorapadi, Unnamalaipalayam, Vadamathur, Veeranandal, Voividanthangal
6	Having more than one GPs in one Revenue Village (Type-II)	Munnuramangalam, Amarnathapudur, Karapattu, Nagapadi, Davanandal, Panaiolapadi
6	One GP is falling under more than Type 1 one Revenue Village (Type-III)	Gulalpadi, Korattambattu, Mashar, Melnachipattu, Oravanthavadi, Vasudevanpattu

3.3 DATA COLLECTION

The CWRM planning framework has four vulnerability areas, integrating both non-spatial and spatial parameters with 18 indicators based on the IWRM and climate adaptation principles. The planning process comprises of the following dimensions in a scientific and organized manner to prepare a meaningful plan at the lowest administrative unit i.e. GP plans.

SPATIAL DATA

The spatial datasets are supportive evidence to understand the existing conditions and issues in the area/ region. Considering the spatial datasets such as Land Use and Land Cover (LULC), waste land, salt and erosion affected lands, drainage lines, ground water potential, lineament, geomorphology, and slope will play a significant contribution in the preparation of the most appropriate and suitable science-based decision plan towards holistic development of the region, emphasized with the water actions. The use of different spatial data to assess and confirm the key water challenges along with the non-spatial data is discussed below:

NON SPATIAL DATA

- Characterization of catchment landscapes based on the ten-fold land use classification to know available land area in both public and individual land ownership and its current position in terms of available area and use, its links with surface runoff as good, average and bad runoff.

- Watershed analysis to understand the hydrological and administrative boundaries, know the vulnerable and good micro-watersheds, its location, distribution of different land use within the micro-watersheds for planning relevant water actions

- Soil characteristics including the macro and micro nutrient status, physical quality of the land using pH values and textural soil quality to understand its permeability, infiltration and water holding capacity which are crucial for soil moisture content

- The agriculture and livestock datasets help in understanding the quantum of water requirement of the key crops and type of cropping systems adopted, number and type of different livestock resources and its water requirement vis-a-vis its linkage to livelihoods of the vulnerable population in the village

- Grey water generation at GP level to understand the quantum of grey water available and existing methods of its use. This information is essential to plan the effective strategies for recycle and reuse

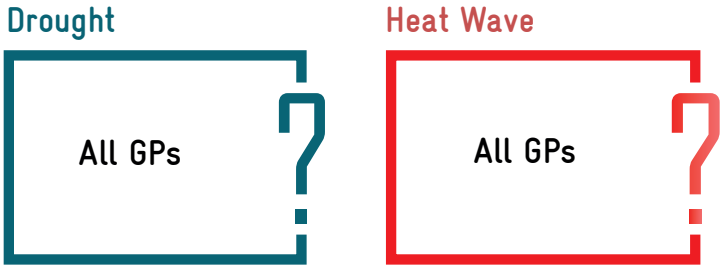
- Water budgeting at GP level to demonstrate the sector wise water demand and available water through the traditional water harvesting and storage bodies and the potential runoff that can be conserved through appropriate actions on the supply side. The difference between demand and supply at the GP level helps the communities to understand the gap and practice the necessary water actions.

Over all data from 99 parameters were collected, in which 13 parameters are from primary source and collected from GP administrative units by GPs officers, 65 parameters are secondary source and collected from Govt. sources and authentic websites and the remaining 21 requisite parameters for water budgeting and grey water were calculated using standards/suitable methods or formulas. CWRM parameters and its data sources is attached in the Annexure 3.1 to 3.3. The methods, and formulas used for water budgeting is attached in Annexure 3.4 and for grey water generation in Annexure 3.5.

3.4 CWRM PLANNING ANALYSIS – CLIMATE

All the CWRM parameters are intended at the Block level. On the other hand, all the climate change observations and projections are at district or regional level. Current data at the Block level is not available at present. Hence, previous hydro-meteorological disasters are considered to denote Block's change in climate (temperature, rainfall) extremities and its risks, which was recorded by State Disaster Management Agency, 2020 (Table 5).

TABLE 5. CLIMATE RISKS AND VULNERABLE GP'S



3.5 CWRM PLANNING ANALYSIS – WATER

For effective planning, the available traditional water storage and conveyance structures along with its supply and demand status for different sectors at Block level is necessary. Both spatial and non-spatial data including details and status on watershed and drainage network, canal network, irrigation facilities, catchments area wise available runoff, conserved runoff, present ground water extraction, water demand for domestic, agriculture and livestock, ground water utilization for domestic, agriculture and livestock are collected from authorized open sources and analyzed at Block level.

3.5.1 SPATIAL DATA

Spatial data of geomorphology, lineament, terrain, slope drainage network, surface waterbodies, ground water potential, and watershed were collected to understand the site-specific problems and together with non-spatial data, take decisions to draft scientific key water actions. Available Bhuvan source thematic spatial maps/website view was referred to understand, interpret and analyze the spatial parameters of the Block.

3.5.1.1 Geomorphology: Geomorphology deals with the scientific study of "landforms and landscapes, including their description, type, and genesis". Landform is the end product resulting from the interactions of the natural surface genesis and the type of rock. The scope of geomorphology was further expended with landform maps, which are widely used in various fields of hydrology, pedology, geoscience, urban and regional planning etc. Broadly, Pudupalayam Block is engrossed with structural, denudational, and fluvial origin landform units (Figure 3.1).Most of block area engrossed with denudational origin-pediment- pediplain complex, whereas Structural origin- moderately dissected hill is noticed in the southern part and fluvial origin younger plain in the north-eastern part of the Block. Fluvial landforms are formed by influences of water flow, which can be found in the foot of the denudational landforms. Fundamental information of landform by its units will act as critical input in the identification of suitable sites for NRM activates under CWRM plan preparation.

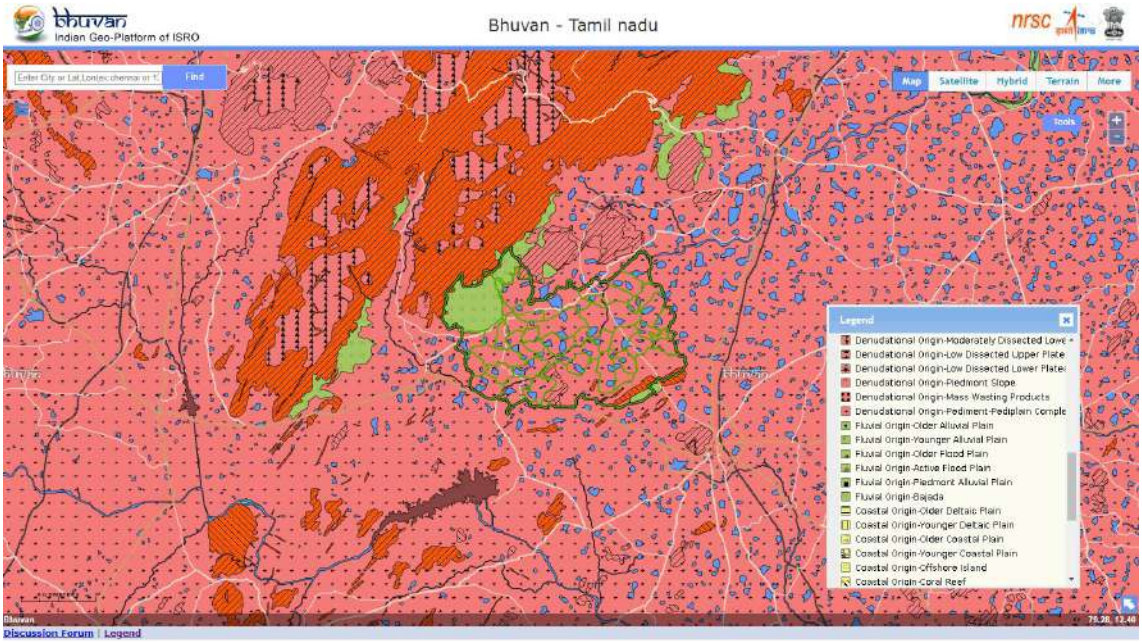


Figure 3.1. Geomorphology map

3.5.1.2 Lineament: The lineament is also a lithological unit which reveals the hidden architecture of rock basement, representation of an underlying geological structure such as a fault, fracture (Figure 3.2). Lineament plays a significant role in identification of ground water and oil exploration sources. Lineament is represented with linear feature where two different landform converges or diverges. This site allows water to percolate at a high rate. Generally dense lineament found in the structural origin landform, while dispersed lineament between two landform zones. GP wise lineament type is illustrated in the below table. These observations are widely used to locate points of high-water flow especially in groundwater exploration.

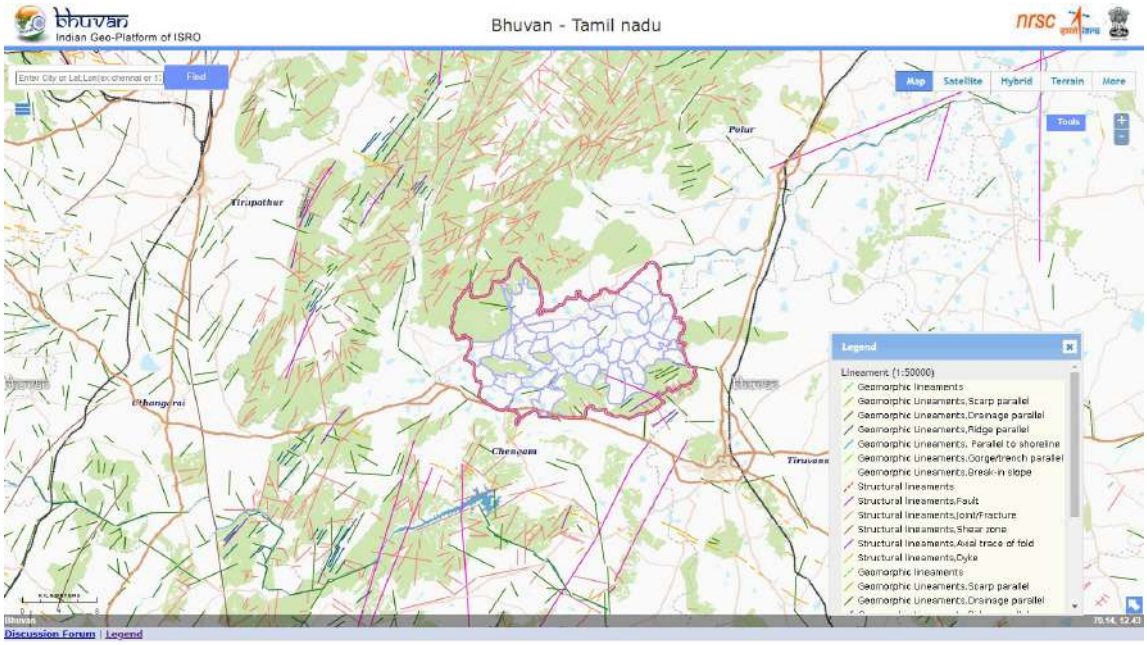
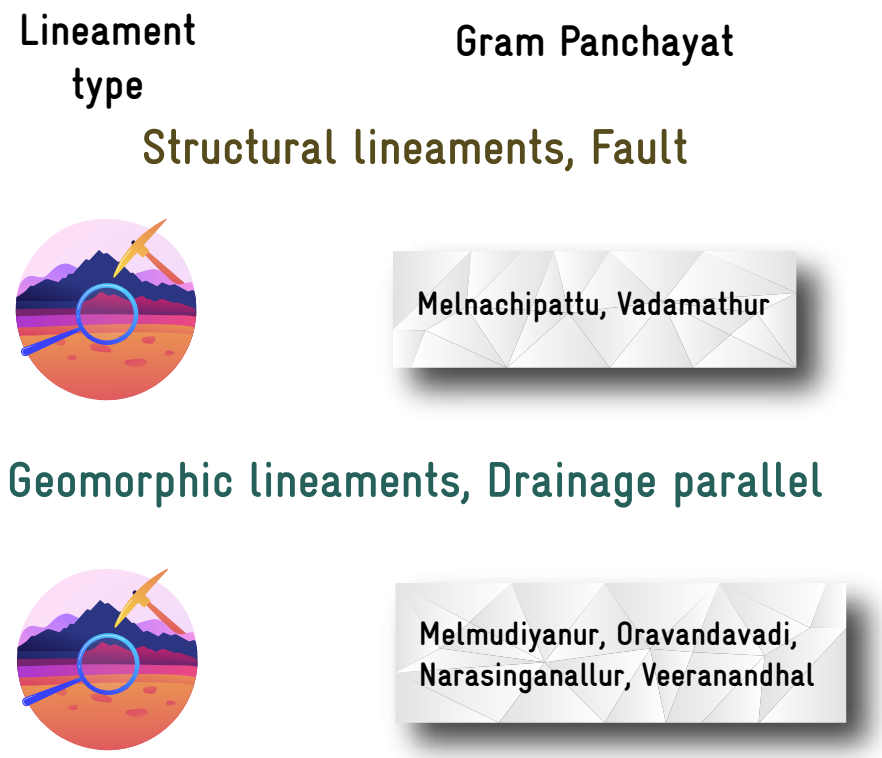


Figure 3.2. Lineament map



3.5.1.3 Terrain: The terrain map is a product of Digital Elevation Model (DEM), which gives information related to elevation from above sea level used to represent the relief features. A similar elevation range is noticed in the Block area with the available scale map. This map will be useful in identification of better suitable sites for proposing the water and soil conservation related activities. Pudupalayam Block terrain map is shown in Figure 3.3.

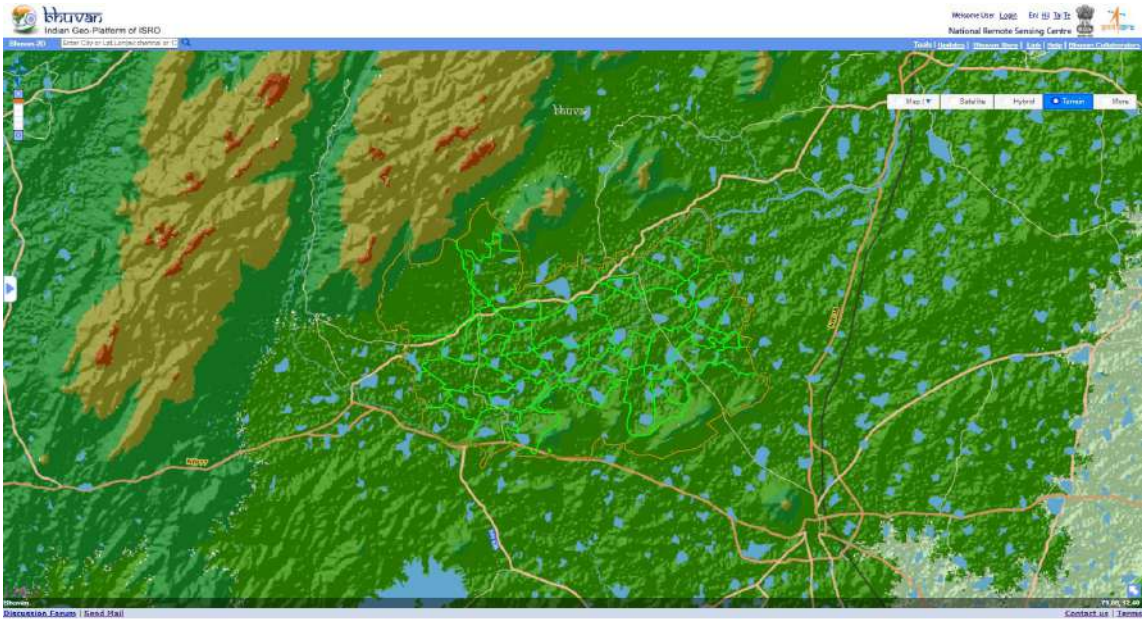


Figure 3.3. Terrain map

3.5.1.4 Contour map: The contour is the most important element in the cartographic representation of the terrain and only one which determines relief forms such as valleys and hills, and the steepness or gentleness of slopes in geometrically. A contour map is illustrated with contour lines which shows the elevation of that earth surface from above sea level. The constant vertical distance between two consecutive contours, i.e. their height difference, is called contour interval. Density of the contour lines are related to the geomorphologic units. The mountain/ hilly areas are witnessed in high density, same is noticed in the Block. The contour map also plays a vital role in delineation of watershed & its units, used in planning and identifying the recharge structures, farm ponds and construction of grey water drain network etc., (Figure 3.4).

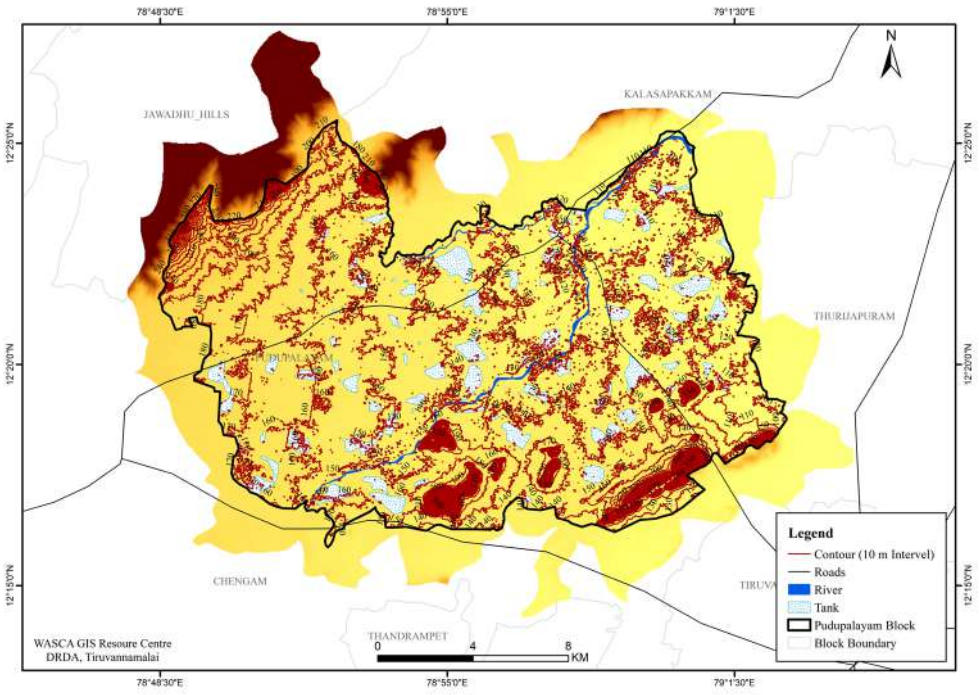


Figure 3.4. Contour map

3.5.1.5 Slope: The average slope of a terrain feature is calculated from contour lines on a topology map or DEM. Slope is typically expressed in percentage, angle, or in ratio. Slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. It is noticed that with respect to the landform units the slope varies in the Block (Figure 3.5). Flat and very flat slope ranges were noticed in the Block, GP wise detailed is shown in the below illustration. Slope information plays a significant role in identification of soil eroded sites, depth profiles, also used in analyzing / proposing the soil conservation measures such as check dam, farm ponds etc.

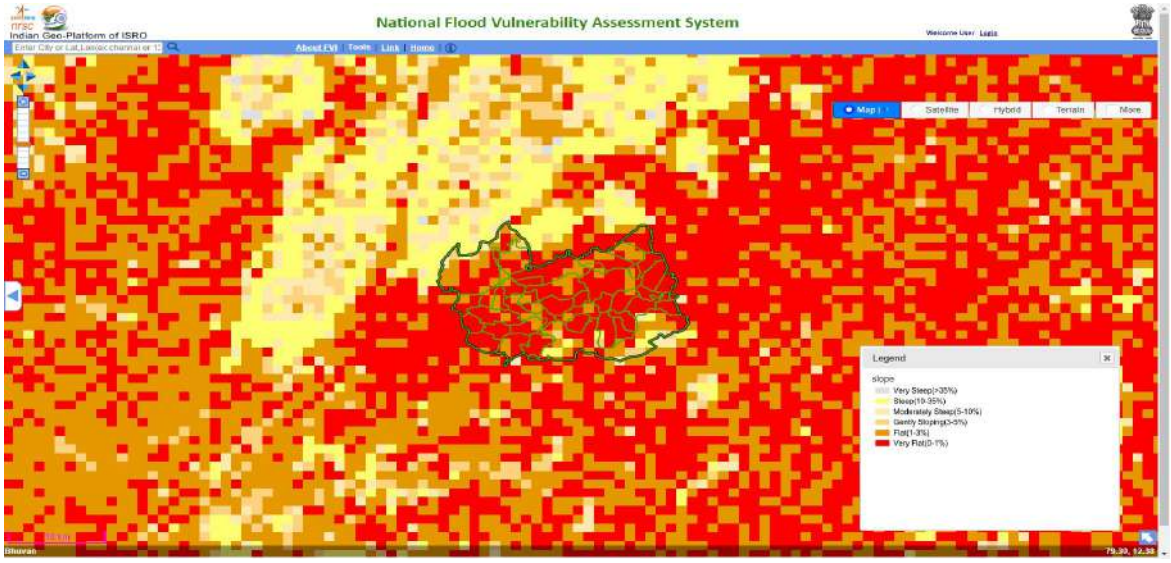


Figure 3.5. Slope map

Slope range	Area in %	Gram Panchayat
Very flat (0-1%)	92%	Amarnathapudur, Japthikariyandal, Kallaraipadi, Kilpadur, Mashar, Muthanur, Nagapadi, Voividanthangal -100%, C.Gengampattu, Eraiyur, Gulalpadi, Kottakulam, Melapunjai, Melnachipattu, Nayambadi, Vadamathur -90%, Dhamaripakkam, Kanji, Oravandavadi -80%, Karapattu -70%
Flat (1-3%)	66%	Aritharimangalam -90%, Korattampattu -70%, Devanandal, Unnamalaipalayam -60%, Periyeri -50%

3.5.1.6 Drainage Network: The Drainage network pattern of a region is particularly dependent on the lithological characteristics, regional slope, structural control, climate condition etc. Dendritic or tree pattern drainage system was observed in the Pudupalayam Block with moderate high to moderate less drainage network density (Figure 3.6). The dendritic pattern is characterized by irregular branching of tributary streams in all directions. Drainage network is referred to while identifying suitable sites for soil and water conservation measurements such as dams, ponds, bunding, restoration of gullied region etc.

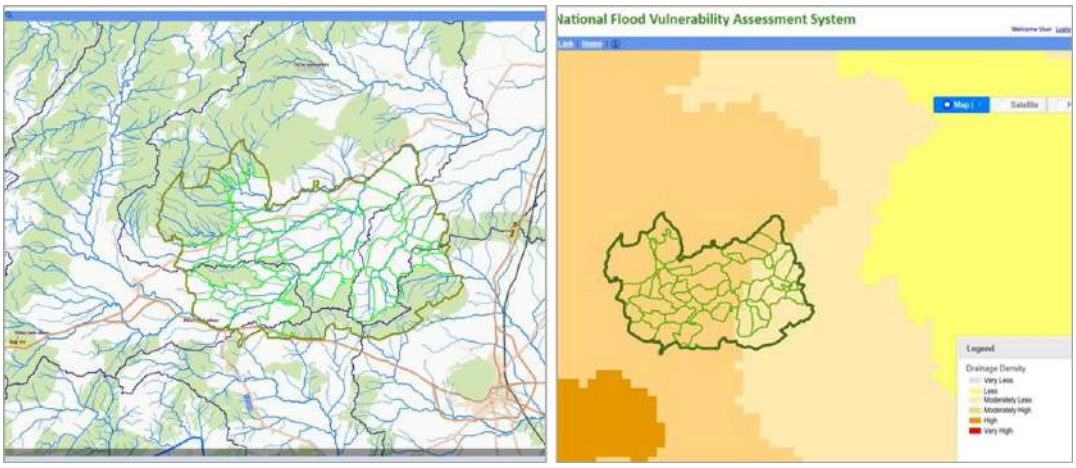


Figure 3.6. Drainage network and density map

3.5.1.7 Watershed: Implementation of any water management measure requires a suitable hydrological unit. A properly delineated watershed forms a convenient hydrological unit for computation of water balance parameters and thus implementation of water management schemes. Also, in achieving a better sustainability in development mainly NRM at the grass root level, watersheds are recognized as viable and effective management units and adopted in most of the developmental programmes such as IWMP, MGNREGA etc. A watershed is the area/region of land where all of the water that falls in it and drains off goes into the common outlet. Pudupalayam Block watershed map is illustrated in Figure 3.7. Watershed is used for the interventions based on Ridge to Valley (R2V) concept and sequencing the plan accordingly. R2V approach intends to conserve each drop of rain water from ridge to a reasonable extent and it ensures the better surface water flow management also aids in strengthening the durability of land, soil and water conservation structures of the downstream.

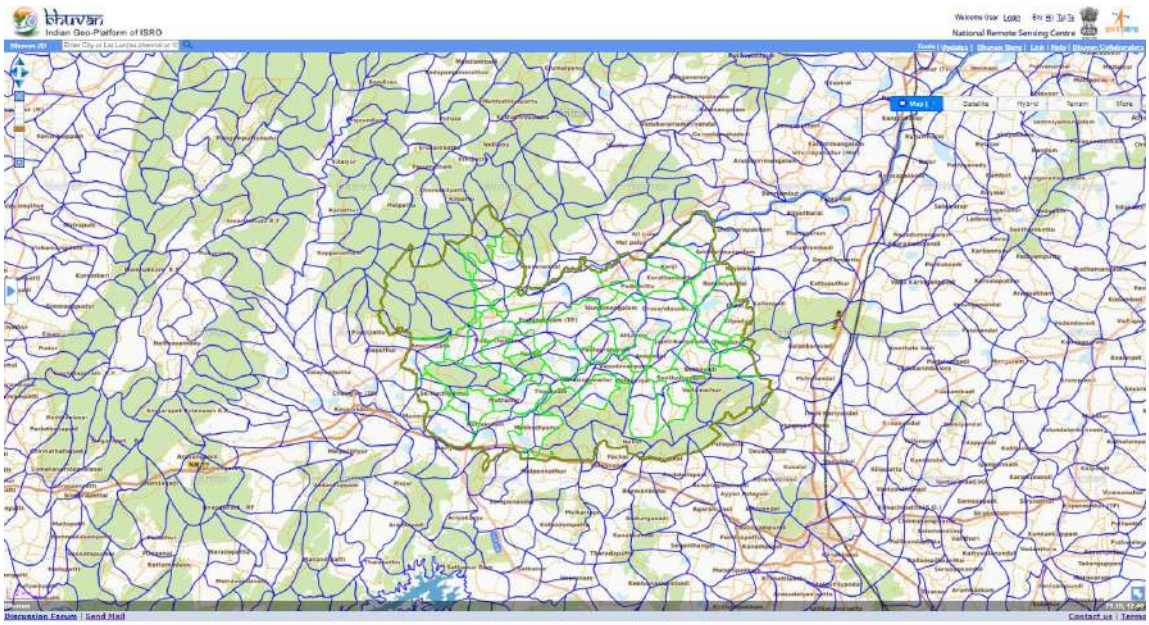


Figure 3.7. Watershed map

3.5.1.8 Ground water perspectives: The ground water perspectives map is the integration of lithology, geomorphology, geological structures, hydro geomorphic datasets, which provides the required information related to ground water exploration and the probable ground water prospects (Figure 3.8). This map will help in identification of tentative locations for construction of recharge structures. Most of GPs in the block had the ground water yield at > 80 m deep of 50 to 100 LPM Yield, while Anapathur GP yield at > 80 m deep well - Prospect limited to valley. This specific information is taken into account while identifying sites for planning recharge structures to address water scarcity in a more effective manner for the Block.

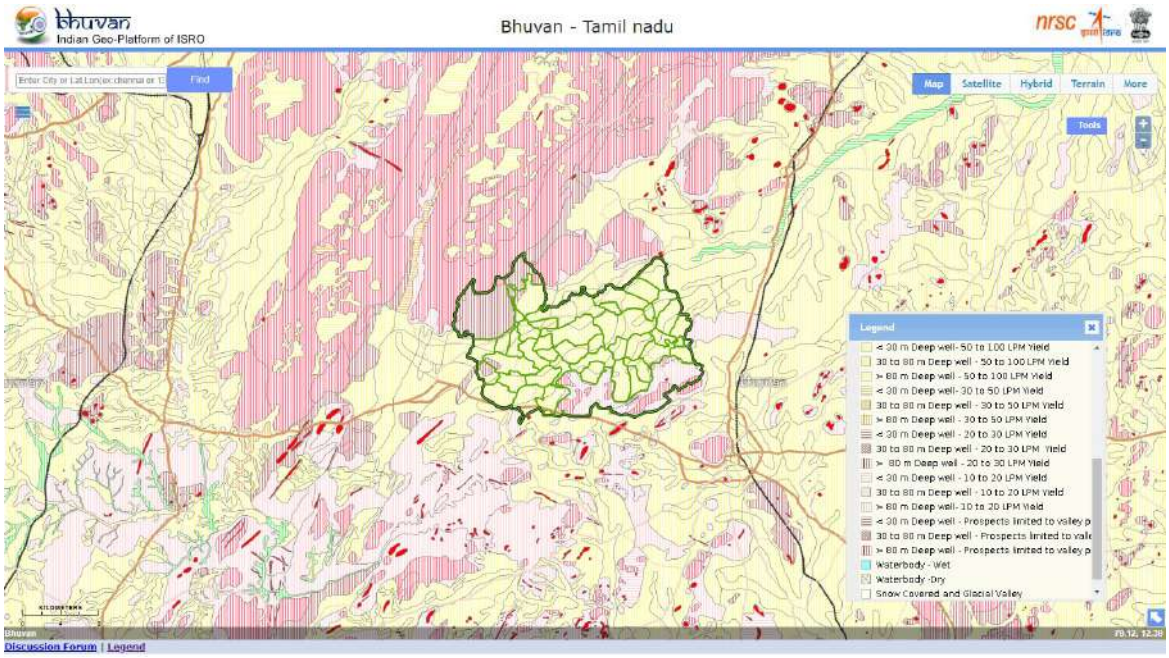


Figure 3.8. Ground water perspective map

Groundwater Prospects	Area in %	Gram Panchayat
> 80 m Deep Well- 50 to 100 LPM Yield	30%	All GPs Except Veeranandal and Amarnathapudur
> 80 m Deep well - Prospect limited to valley	30%	Anapathur

3.3.2 NON-SPATIAL DATA

Water resource based non-spatial secondary data related to irrigation facilities such as canal, traditional waterbodies, water quality, demand and supply were collected from Govt. sources (Table 6). GP wise current water resources state and its supply and demand side are shown in Annexure 3.6.

TABLE 6. CWRM PARAMETER BASED WATER RESOURCES STATUS IN THE BLOCK

S No	Parameter	Total
	Traditional Water bodies (in no.)	
1	No. of tanks (PWD & union)	75
2	No. of Ooranis	68
	Area under Irrigation facilities (ha.)	
3	Tank Irrigation	1,850
4	Canal Irrigation	543
5	Open & tube well Irrigation	4,618
	Catchment area-wise available runoff (in ha.m)	
6	Good catchment area	1,530
7	Average catchment area	40
8	Bad catchment area	208
	Watershed and drainage networks	
9	Length of natural drainage lines (in m)	1,57,749
10	No. of natural drainage lines	173
11	No. of micro-watersheds	153
	Water Demand	
12	Water demand for Humans (in ha.m)	245
13	Water demand for Livestock (in ha.m)	149
14	Water demand for Agriculture (in ha.m)	19,177
15	% GW utilization for Drinking	72
16	% GW utilization for Livestock	90
17	% GW utilization for Agriculture.	76
18	% SW utilization for Drinking	28
19	% SW utilization for Livestock	10
20	% SW utilization for Agriculture	24

3.5.2.1 Existing Water Structures

The Block has structured traditional water storage units such as tanks, and ooranis which are the life line of local communities for their lives and livelihoods. The Block has 75 tanks and 68 ooranis (Figure 3.9).

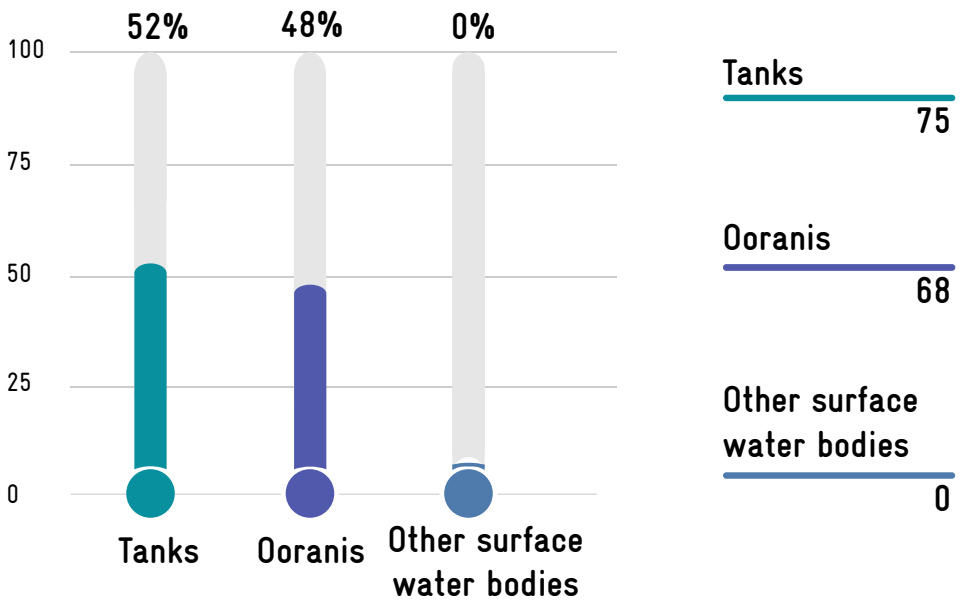


Figure 3.9. Traditional water bodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the block is 7,011 ha, of which 66 % (4,618 ha) is irrigated through ground water stored in open/tube wells. 26% (1,850 ha) is irrigated through tanks and the remaining 8 % (543 ha) area is irrigated through canals (Figure 3.10).

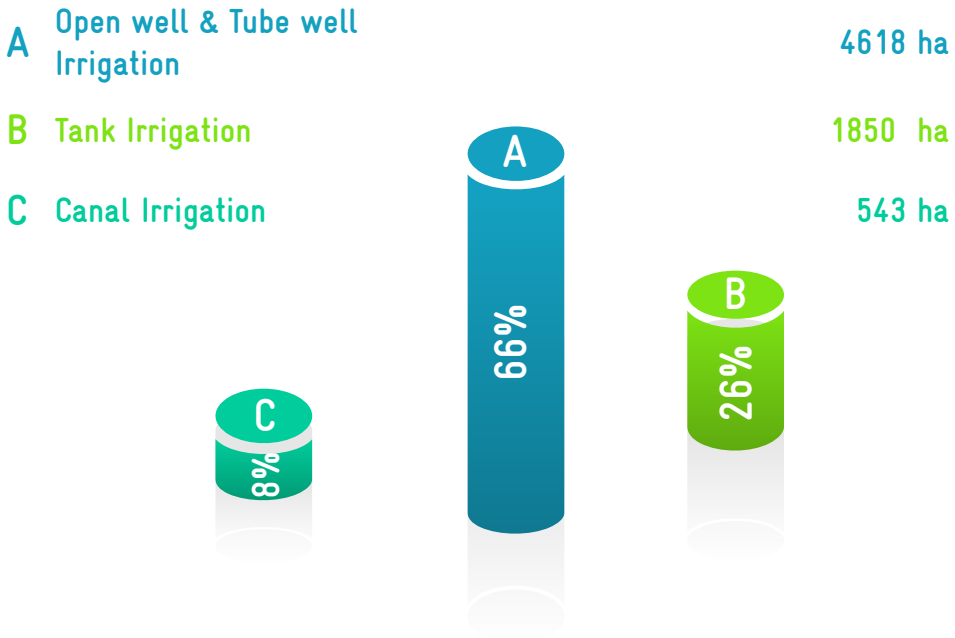


Figure 3.10. Irrigation sources

3.5.2.3 Available Run off

The total available runoff in the catchment area is 4,276 ha.m and in that 36 % (1,530 ha.m) comes under good catchment area, 2 % (76 ha.m) comes under average catchment area and 62% (2,669 ha.m) comes under bad catchment area. As the area has more bad catchment area (almost twice that of good catchment area), the run-off generated is more. The amount of runoff generated in bad catchment area is 1.7 times higher than good catchment area and more than 31 times in average catchment areas (Figure 3.11).

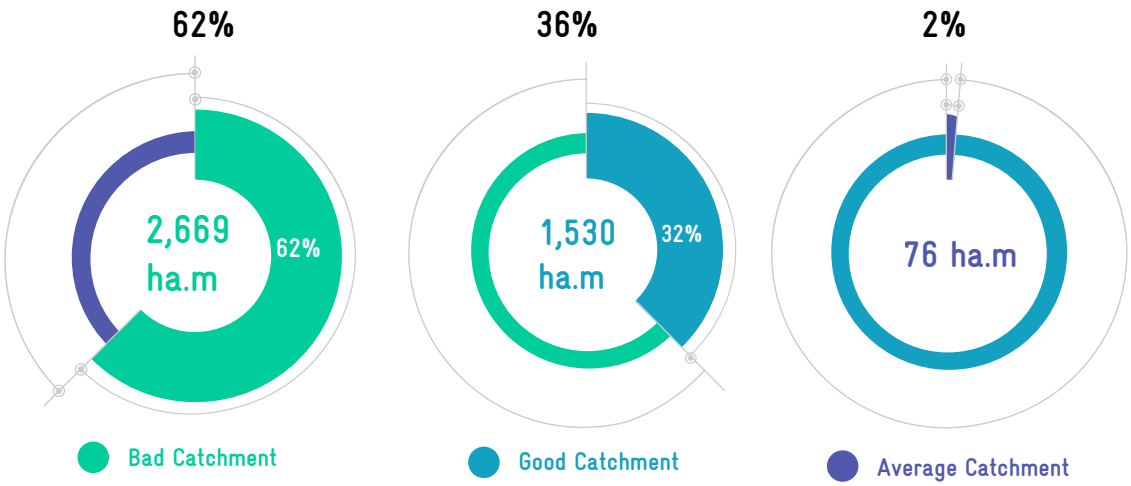
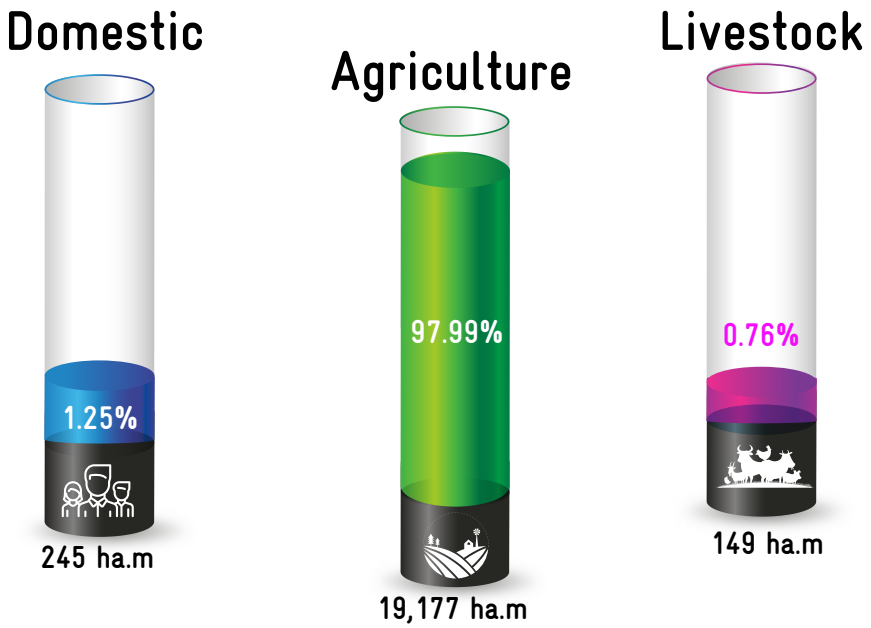


Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 23,772 ha.m. Out of the total water demand, 72% for domestic purpose usage is met through Ground water while the remaining 28% demand is met through surface water resources. utilization of 76% for agriculture and 90% utilization for livestock is met by ground water. More groundwater is used for domestic, agriculture and livestock purposes (Figure 3.12).



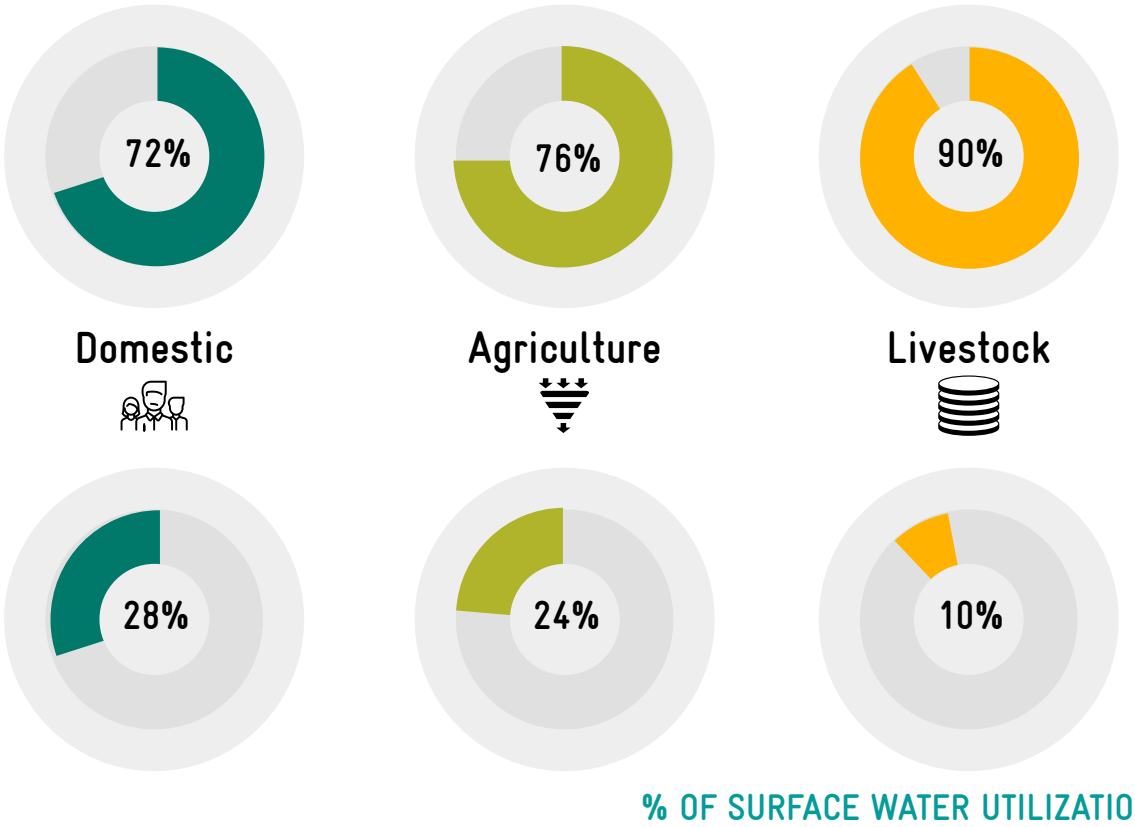


Figure 3.12. Sector wise water utilization

3.6 CWRM PLANNING ANALYSIS-AGRICULTURE

Agriculture is the primary livelihood of the households in Pudupalayam Block followed by livestock resources. Considering water and monsoon patterns, the key agriculture factors such as soil, land, crop and livestock related parameters are employed in CWRM planning.

3.6.1 SPATIAL DATA

Bhuvan based spatial data for LULC, waste land, salt affected land, soil erosion and soil texture were taken into consideration to understand Pudupalayam Block's problems in order to draft scientific key water actions.

3.6.1.1 Soil texture: The Block has diverse soil types and predominant in vertisol and alfisol, with reference to soil texture, the proportion of fine texture type is dominated followed by clay skeletal and course loamy (Figure 3.13).

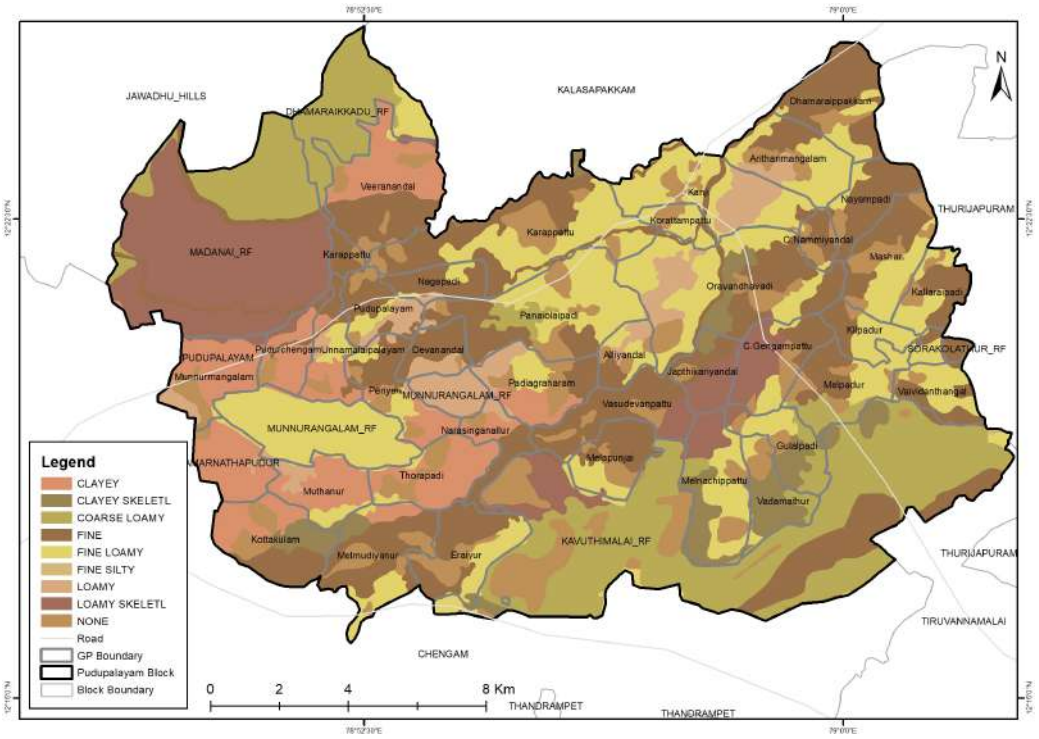


Figure 3.13. Soil texture

3.6.1.2 Soil erosion: Soil erosion is a natural process of displacement of upper layer of soil caused by dynamic erosion agents i.e. water, air, plants and humans. Sheet erosion is commonly observed in the Block and below illustration gives GP and area wise details (Figure 3.14). The data on soil eroded units will give direct input in preparation of plans, to suggest soil conservation and watershed management activities.

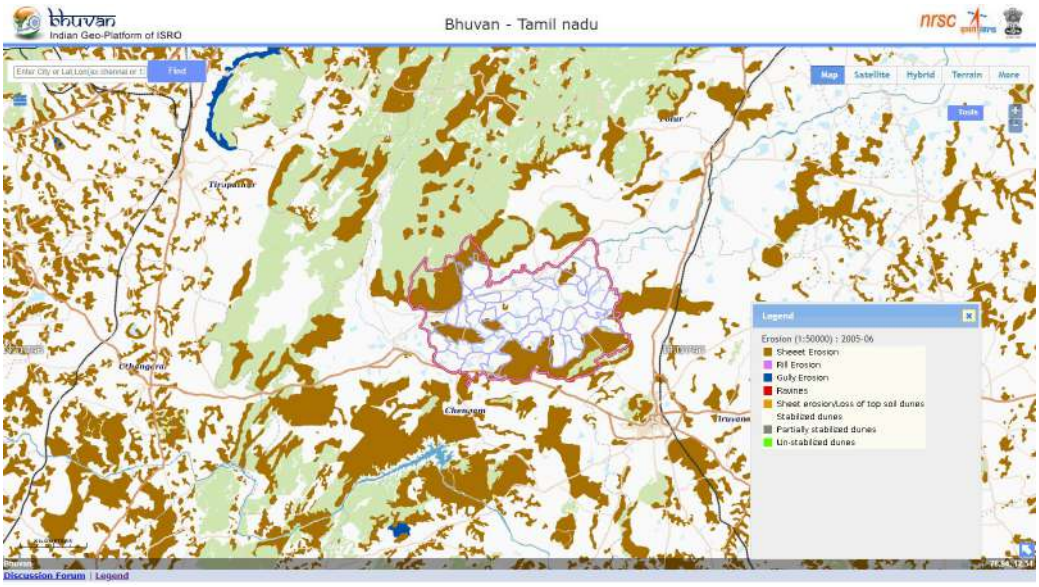
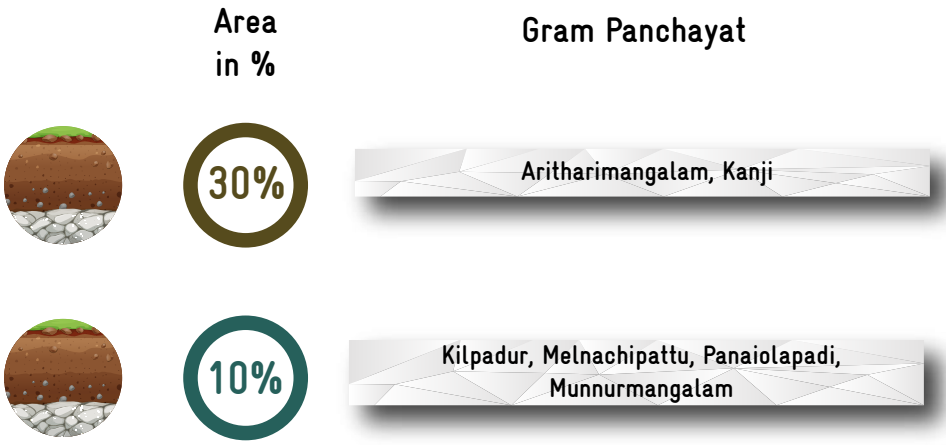


Figure 3.14. Soil erosion map



3.6.1.3 Land Use and Land Cover: LULC are two separate terminologies which are often used interchangeably. In general, land cover is defined as 'the observed biophysical cover on the Earth's surface'. It includes vegetation and man-made features as well as bare rock, bare soil, and inland water surfaces; while land use refers to 'the way in which land has been used by humans and their habitat, usually with the accent on the functional role of land for economic activities'. LULC has become increasingly important which, in turn, underlines many environment-development policies. Pudupalayam Block is majorly covered by the agricultural crop and plantation followed by barren land (Figure 3.15). GP wise LULC is tabulated below. LULC map helps the decision makers and planners to focus on the fallow land development activities.

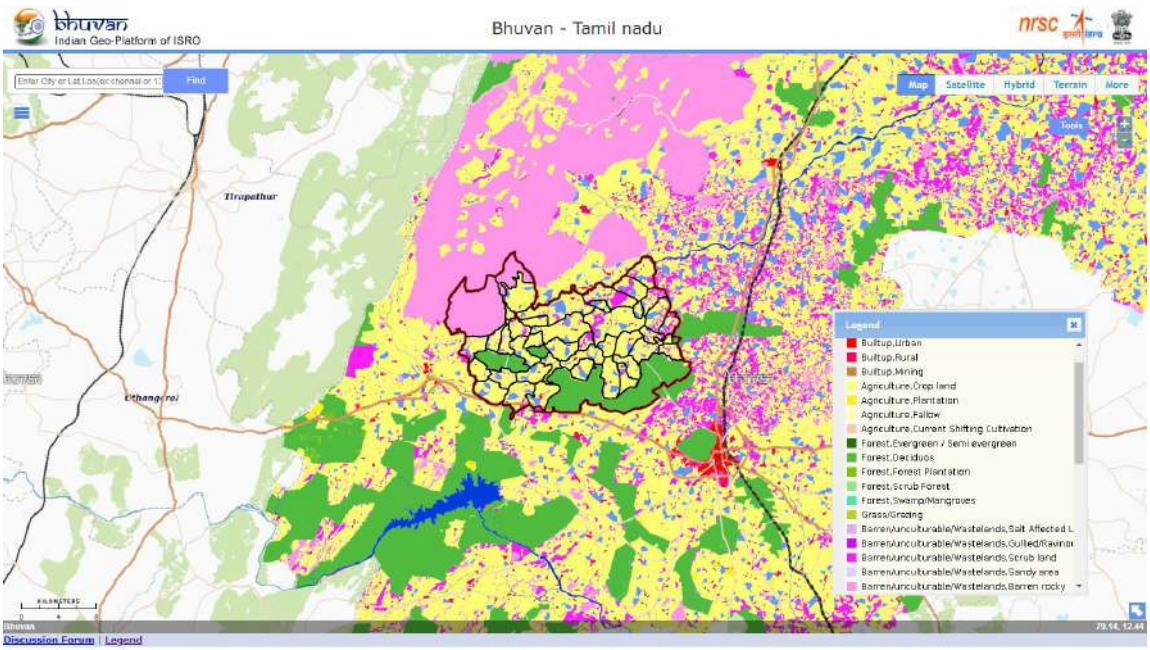
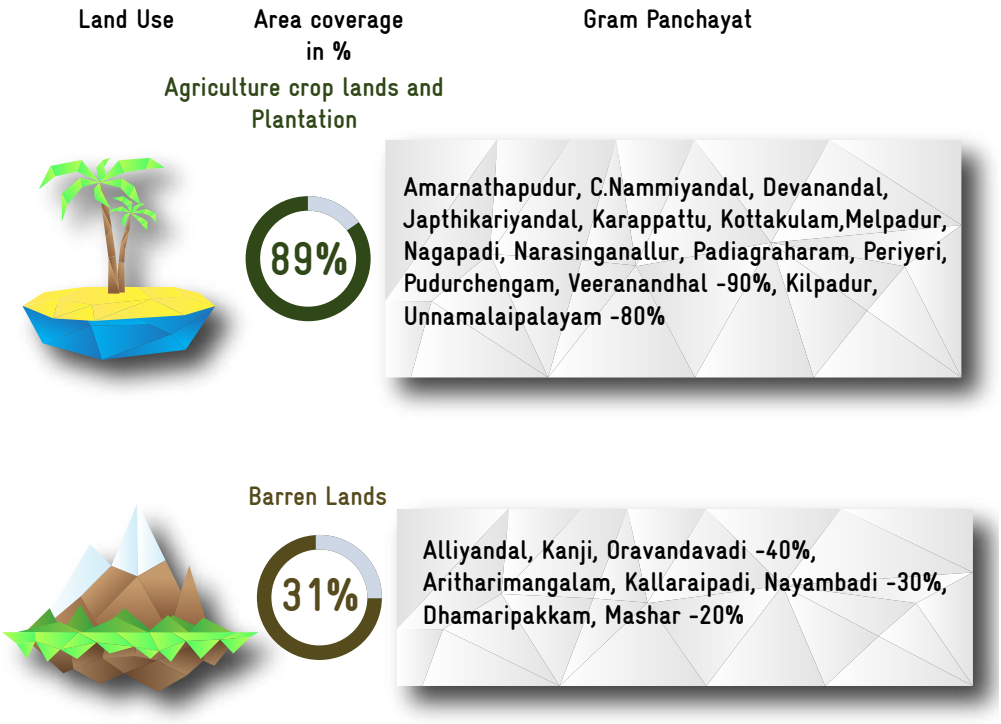


Figure 3.15 . Land Use Land Cover map



3.6.1.4 Waste land: A Parcel of land that is not suitable for any agriculture activity and mostly covered with dense or open scrub is called as wasteland. The extent of Wasteland will act as a direct input for preparation of plans for land development activities or greenery. Salt affected minute patches of wasteland parcels with scrub land were noticed in the Pudupalayam Block (Figure 3.16). During planning for the GPs, plantation measures have been taken up in the identified portions to convert the wasteland into productive land.

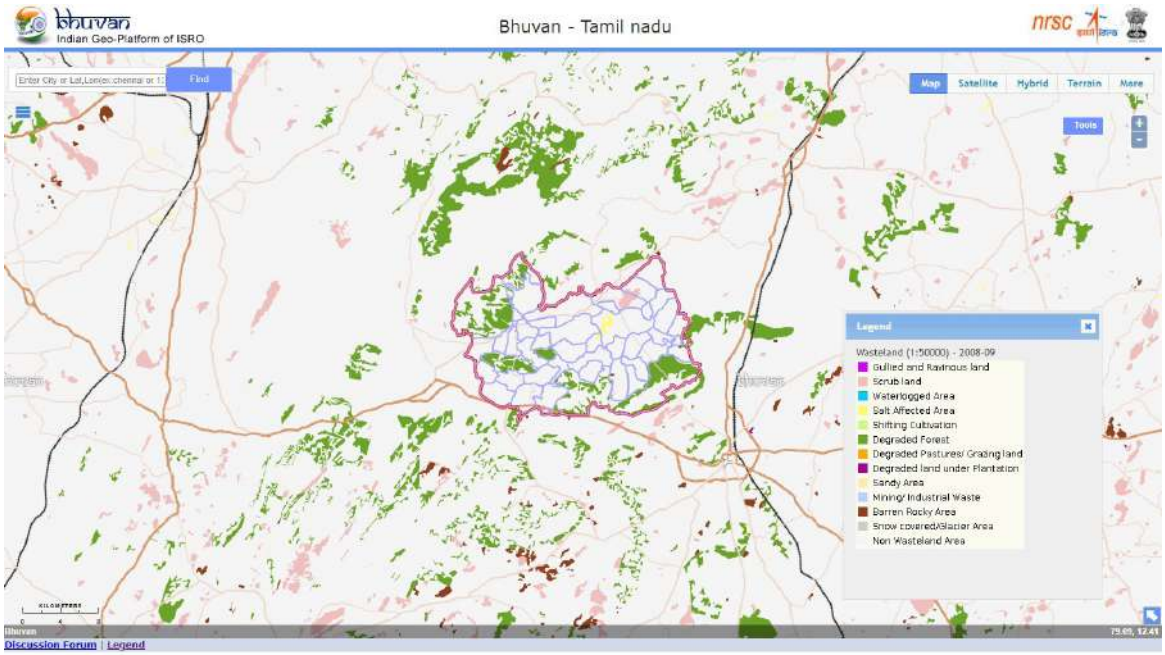
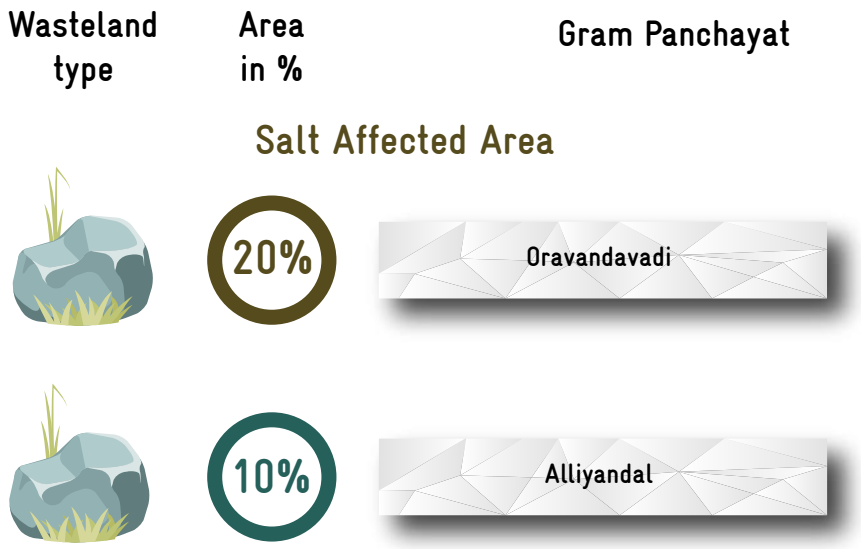


Figure 3.16. Wasteland map



3.6.1.5 Salt affected area: Slight saline affected area were noticed in the Alliyandal GP of 50% area and in some GPs (Figure 3.17). These parcels will act as a direct input while planning process to propose soil conservation measures, mainly activities to reduce salinization and suggestions for alternative cropping.

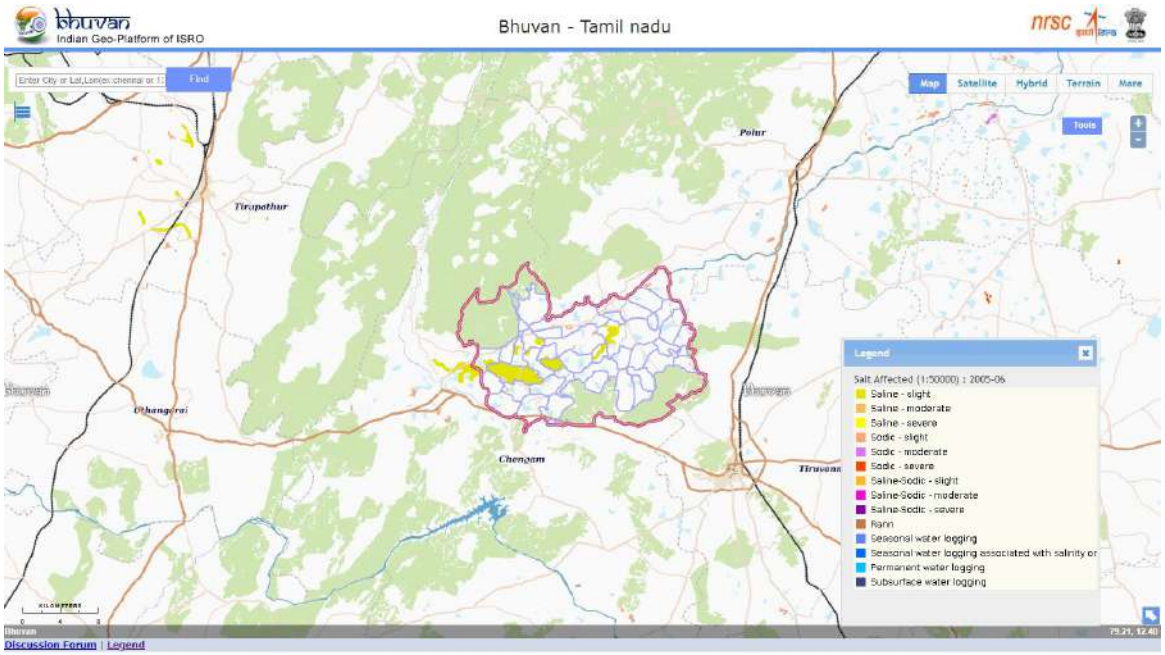
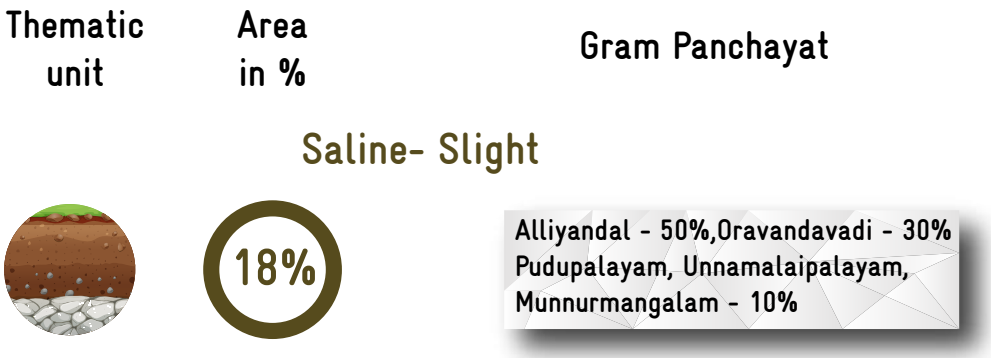


Figure 3.17. Salt affected area map



3.6.2 NON-SPATIAL DATA

Agriculture based non-spatial secondary data related to land resources, catchment, crop type, soil micro-macro nutrient, moisture, ET and livestock data were collected from govt. sources (Table 7.) The key CWRM parameters of agriculture area for all GPs are tabulated in Annexure 3.7.

TABLE 7. CWRM PARAMETER-BASED AGRICULTURE RESOURCES STATUS IN THE BLOCK

S No	Key CWRM Parameter	Total
	Area Under Land Resources in ha	
1	Non-Agricultural Uses	4,023
2	Barren & Un-cultivable Land	58
3	Land Under Miscellaneous Tree Crops etc.	26
4	Cultivable Waste Land	246
5	Fallows Land other than Current Fallows	1,102
6	Current Fallow land	5,505
7	Unirrigated Land	309
8	Irrigated by Source	7,357
	Catchment Area (in ha.)	
9	Good Catchment	4,081
10	Average Catchment	272
11	Bad Catchment	14,272
	Crop details	
12	Irrigated Area (ha)	12,506
13	Rainfed area (ha)	2,312
14	Area under Paddy Cultivation (ha)	9,599
15	Crop Water Requirement - Irrigated condition (ha.m)	18,322
16	Crop Water Requirement - Rainfed condition (ha.m)	855
	Soil Resources: Status of Available Nitrogen %	
17	Very Low	22
18	Low	74
19	Medium	4
	Status of Organic Carbon %	
20	Very Low	28
21	Low	70
22	Medium	1
23	Very High	1
	Status of Soil Micro Nutrients %	
24	Sufficient	56
25	Deficient	44
	Status of Physical condition of the soil %	
26	Moderately Acidic	1
27	Slightly Acidic	1
28	Neutral	3
29	Moderately Alkaline	94

	Soil Texture %	
30	Clay Soil	18
31	Fine Soil	54
32	Coarse loamy	4
33	Soil Water Permeability	Moderate
	Soil moisture and ET	
34	Volumetric Soil Moisture %	23
35	Estimated Soil Moisture (ha.m)	3,359
36	ET Losses (ha.m)	6,092
	Means of Water Extraction %	
37	Gravity	16
38	Lifting	84
	Irrigation Methods %	
39	Wild Flooding	34
40	Control Flooding	66
	Livestock (No)	
41	Cattle population	38,922
42	Sheep population	9,555
43	Goat population	7,232

3.6.2.1 Land utilization

The standard land use classification helps to understand the distribution and the extent of different land use categories. As the runoff and water harvesting actions are linked to the land use systems, its distribution across the geographical boundary of the Block is necessary to take decisions. Of the total land area of 18,625 ha, the highest of 39 % land is irrigated by source irrigation, followed by current fallow of 30% while barren and cultivable wasteland area of less than one percent is utilised (Figure 3.18).

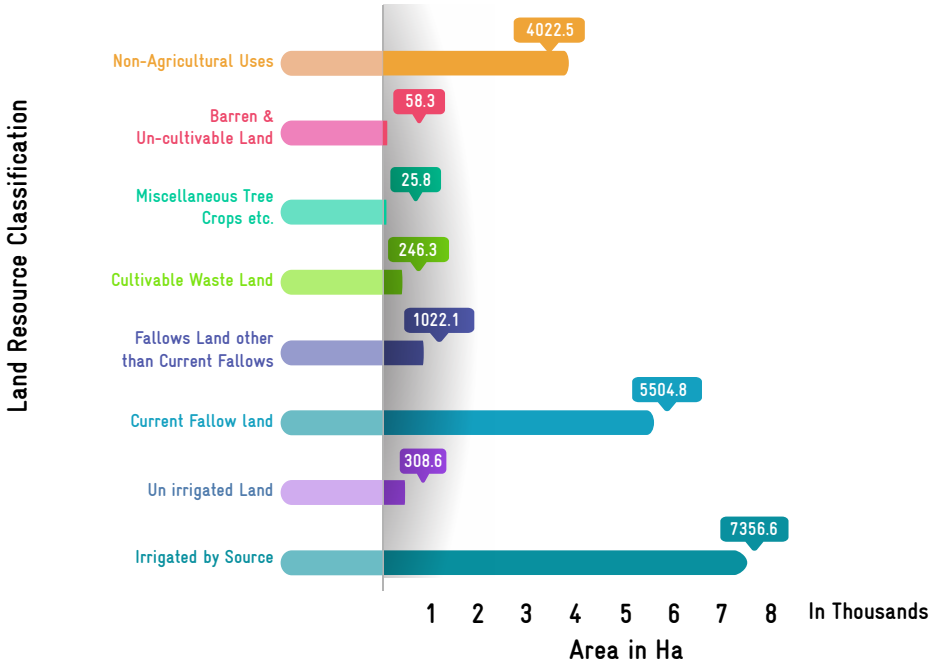


Figure 3.18. Land utilization

3.6.2.2 Catchment Area

The land use types in each of the GPs are categorized into three different types of runoff; good, average and bad catchment area. Out of total catchment area of 18,625 ha, of the Block, about 21.91 % is good catchment area, 76.62 % is bad catchment area and only 1.4% is under average catchment area. This analysis helps to focus on prioritizing the works in the land use systems under the good and bad catchment areas (Figure 3.19).

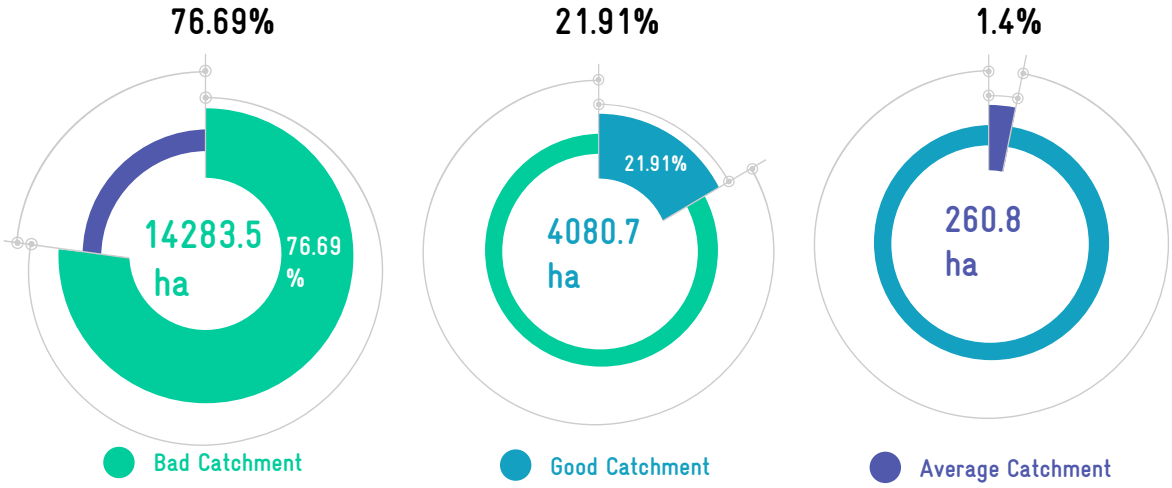


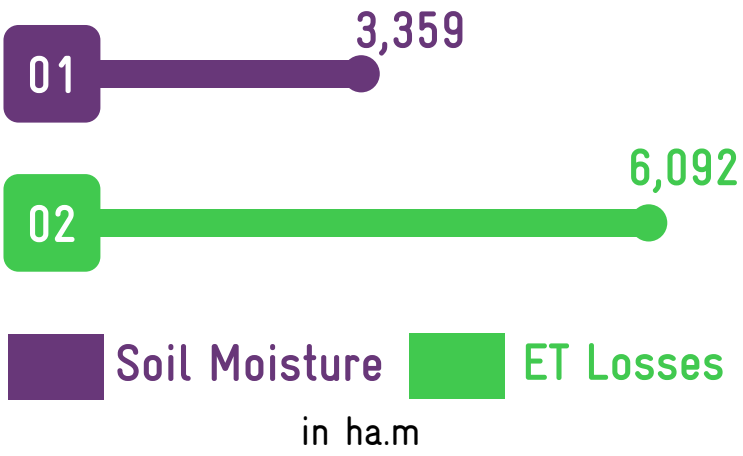
Figure 3.19. Catchment area

3.6.2.3 Soil moisture

Soil is an important medium to store the available water and the storage capacity varies with the type of soil especially its textural composition. In overall composite water budgeting, estimation of stored water in the soil assumes greater significance in this Block because of its significant proportion of area under rain-fed cultivation. The annual average volumetric soil moisture of this Block (23%), is taken for estimating the amount of water stored as soil moisture which accounts to 3,359 ha.m.

3.6.2.4 ET losses

ThThe loss of water through ET is important in water budgeting. The annual total ET loss during 2018-19 was 6,092 mm with monthly average of 507.6 mm.



3.6.2.5 Macro-nutrients

Nitrogen:

The macro soil nutrients such as nitrogen and organic carbon falls under very low to low category in all the soil samples tested. The available nitrogen is very low in 22 % of the samples tested while it was 74 % under low category (Figure 3.20). According to soil resource map, this Block is identified as one of the nitrogen deficient Block (Tiruvannamalai district profile 2020).

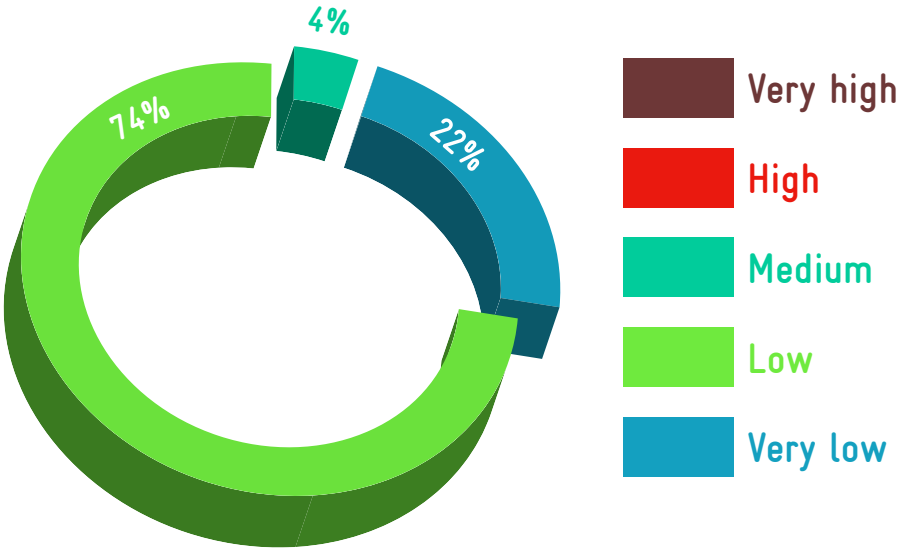


Figure 3.20. Status of available Nitrogen

Organic carbon:

A similar trend was recorded for soil organic carbon. Soil organic carbon is also ranges between low and very low in this Block. Nearly 70% of the soil samples tested fall under low category and 28% of the soil samples tested fall under very low category. (Figure 3.21). This indicates that the soil fertility is very poor and further intensive practices will make the soil more vulnerable to degradation over a period of time.

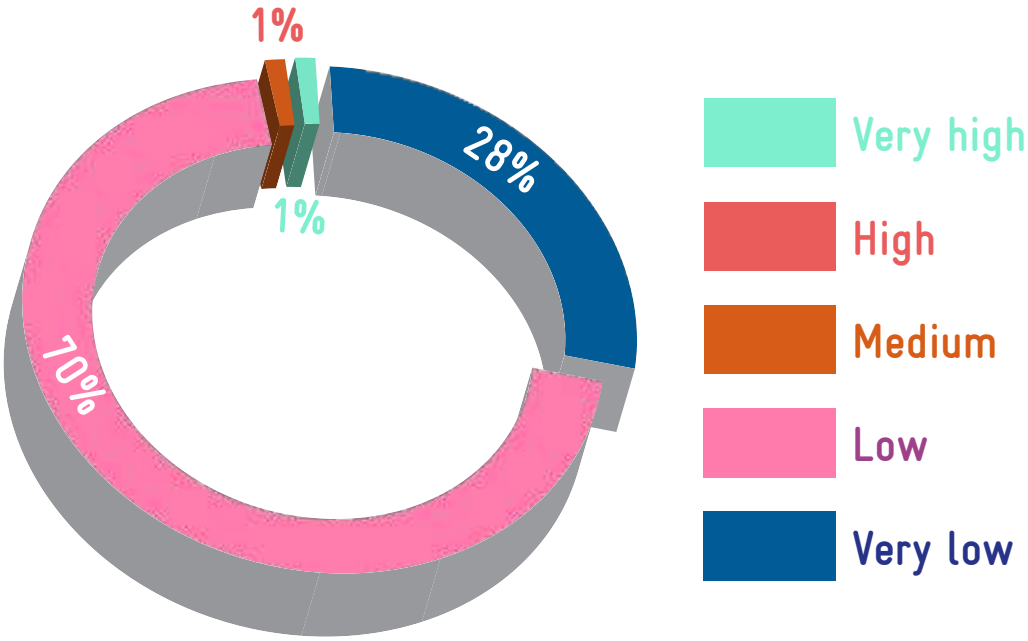


Figure 3.21. Status of soil Organic Carbon

3.6.2.6 Status of the soil micro nutrients

This Block is one of the Nitrogen, zinc and ferrous deficient Block of Tiruvannamalai district. The micro-nutrient status of the soil with specific reference to Manganese, Boron and Zinc, Ferrous, Copper, and Sulphate are deficient in 44 % and 56 % sufficient in the soils tested. (Figure 3.22)

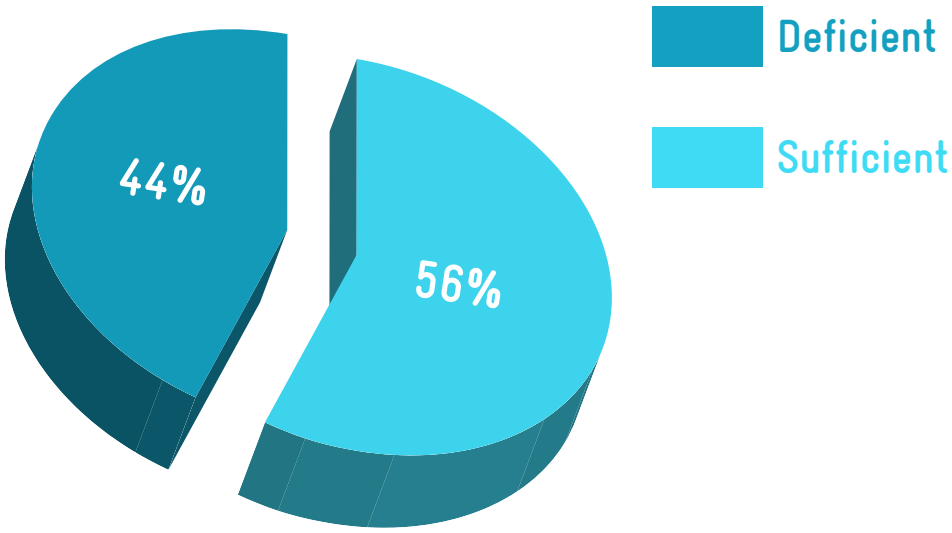


Figure 3.22. Status of soil micro-nutrients

3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 94 % of the soil is moderately alkaline in nature, 1% is slightly acidic, 1% is moderately acidic, and 3 % is neutral in nature as shown in Figure 3.23.

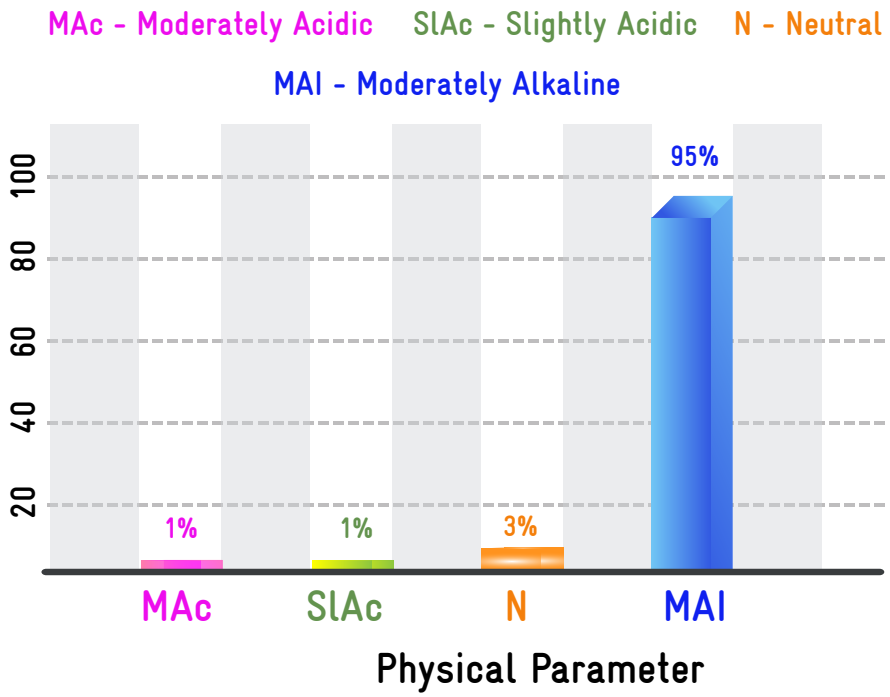


Figure 3.23. Status of pH of soil

3.6.2.8 Cropping pattern and the irrigation

Of the total area under cultivation, 74 % is under irrigation and the remaining 26 % is under rain-fed cultivation. Among the crops cultivated under irrigation, paddy is predominantly cultivated and accounts to about 67 % followed by sugarcane of 11.5 % while pulses are the rain-fed predominate crops with 50 % followed by ground nut 44 % and it is common crop between irritation and rain-fed. Also crops such as Ragi, horticulture and vegetables were cultivated (Figure 3.24).

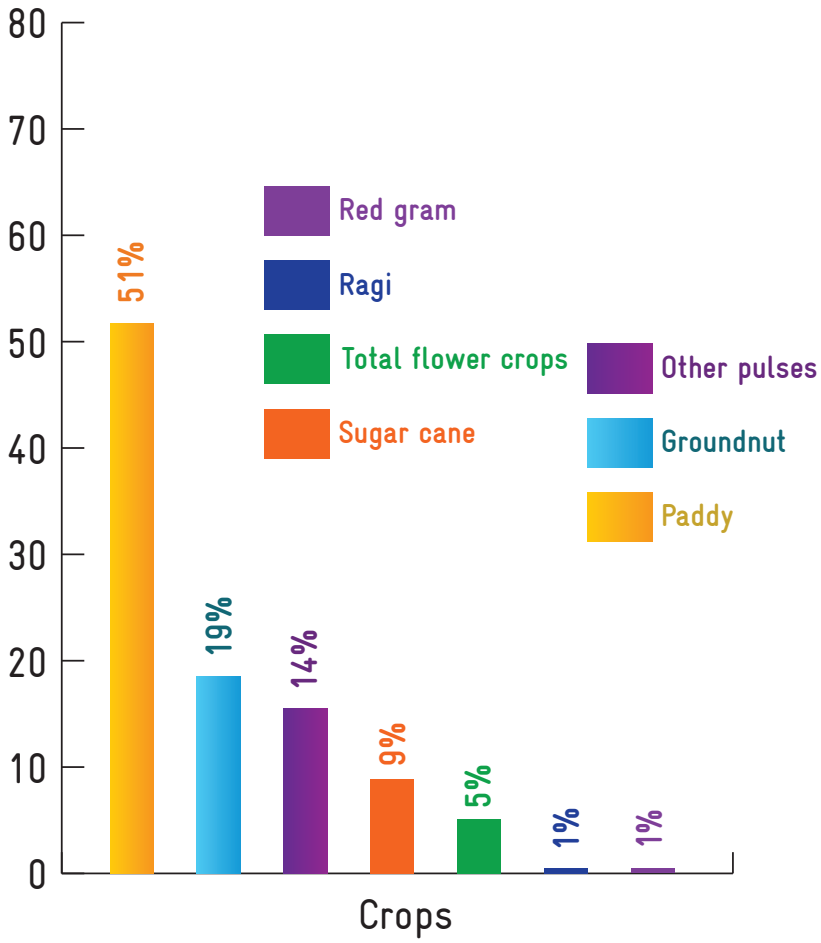


Figure 3.24. Cropping pattern

3.6.2.9 Irrigation Methods

In case of the surface water resources, wild flooding is the primary method of irrigation. But in case of ground water resources, the predominant type of irrigation is controlled flooding. In the Block, 66 % of the irrigation is done by control flooding and only 34% of the irrigation is done by wild flooding (Figure 3.25).

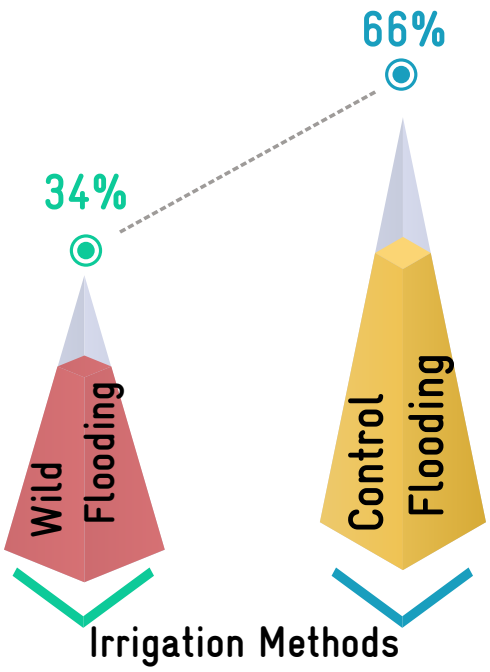


Figure 3.25. Irrigation methods

3.6.2.10 Means of Water Extraction

Water is extracted in two ways, one by gravity and another is by lifting. Water is drawn from surface water sources such as tanks, ponds etc., by using gravity method and that of ground water sources such as open well, hand pump, bore well by using lifting method. In the Block, since the dependence on ground water sources is more, 84% of the water extraction methods are under lifting means of extraction and only 16 % comes under gravity means of water extraction (Figure 3.26).

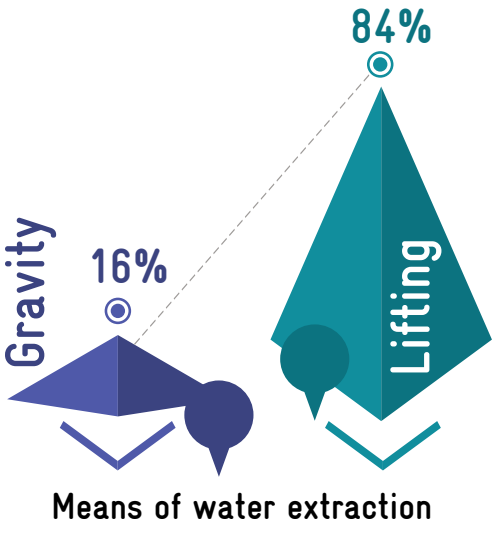


Figure 3.26. Means of water extraction

3.6.2.11 Livestock Details

This Block has considerable proportion of livestock resources of which small ruminants such as sheep and goat constitute 17 % and 13 % of the total livestock. While cattle population is higher in this Block 70 % (Figure 3.27). The total water requirement for livestock is 149 ha.m. Of the total water demand of 149 ha.m, 90 % is met through ground water and remaining 10 % is from surface water resources.

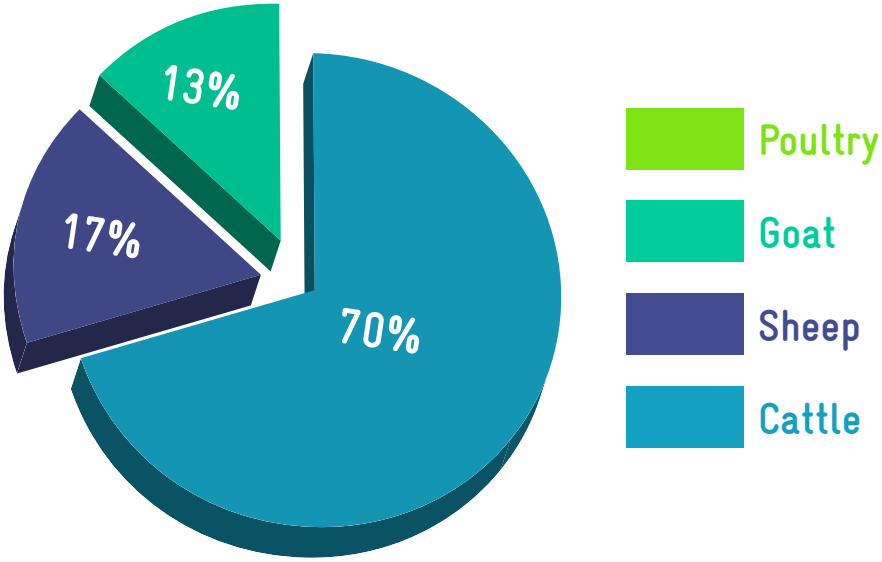


Figure 3.27. Livestock details

3.7 CWRM PLANNING ANALYSIS-SOCIO ECONOMIC

The demographic details such as population, gender, vulnerable population/ households, drinking and grey water details are collected from authentic primary and secondary sources and analyzed. Data of MGNREGA job holders is also taken for the analysis. Table 8 lists the demographic and socio-economic status of Pudupalayam Block. GP wise demographic and socio economic status are attached in Annexure 3.8.

TABLE 8. CWRM PARAMETER BASED SOCIO-ECONOMIC STATUS IN THE BLOCK

S No	Key CWRM Parameter	Total
1	Geographical Area (ha)	20,079
2	Male population	45,603
3	Female population	44,202
4	Total population	89,805
5	SC population	28,166
6	ST population	1,226
7	Vulnerable population	29,392
8	Households (HH's)	23,933
9	Only one room HH's (SECC)	3,222
10	Female Headed HH's (SECC)	1,140

11	Vulnerable Households (SECC)	2,096
12	% of Vulnerable Households	8.75
13	Registered MGNREGA Job cards (persons)	38,967
14	Active person working in MGNREGA job Cards (persons)	30,295
15	Drinking Water Sources	7,918
16	Ground Water - Drinking source	154
17	Surface water - Drinking source	46
18	sum of drinking water sources	200
19	HH's have tap water connection for drinking water	21,871
20	HH's dependent on other sources for drinking water	2,772
21	Annual Greywater Generation (ha.m)	163

3.5.1 Population

The total population of this Block is 0.89 Lakhs of which the women proportion is almost equal to proportion of men. In the CWRM planning process due attention is given for the intersecting variables such as gender, class, caste and marital status and availability of safe drinking water resources. In the Block, about 32.7 % of the total population are under vulnerable population (Figure 3.28).

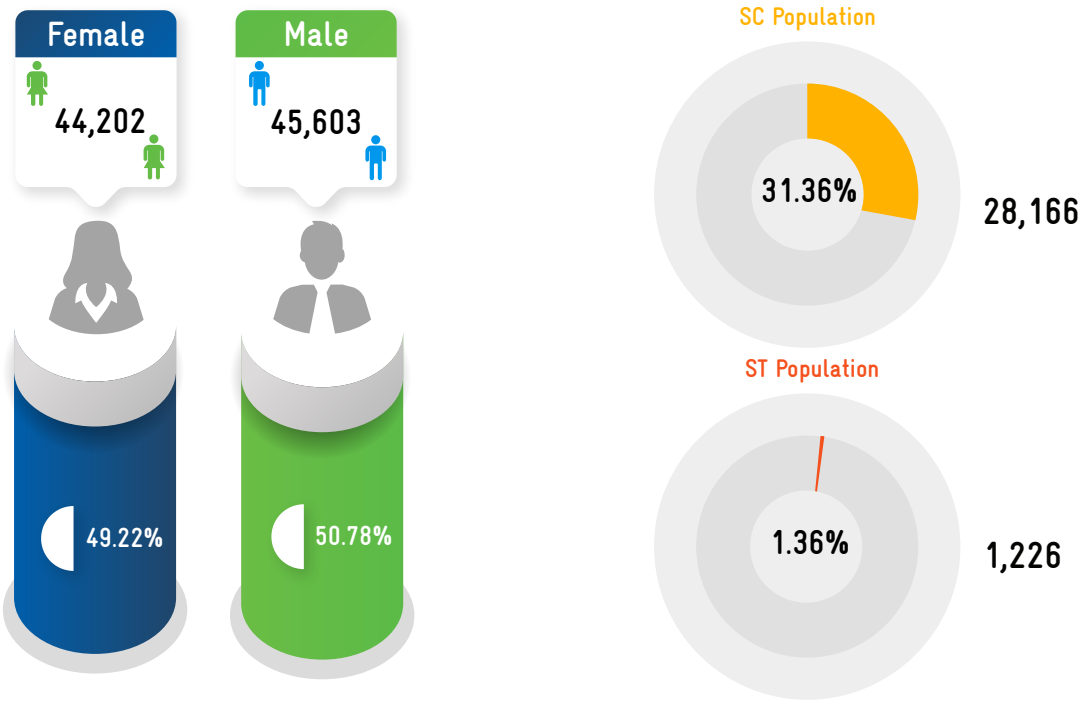


Figure 3.28. Population details

**population figure may differ from Census 2011 due to categorization of GPs based on revenue panchayat boundaries*

3.7.2 Households

There are a total of 23,933 households in which 13.46 % households have only one room, 4.76 % households are headed by women and 8.75 % are vulnerable households (Figure 3.29).

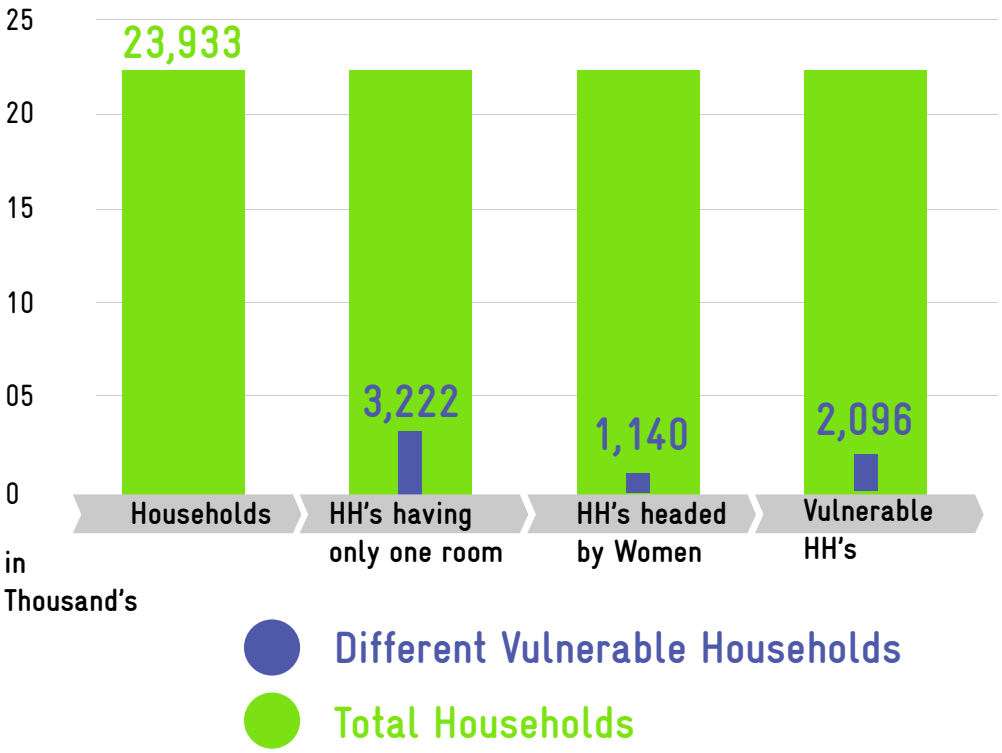


Figure 3.29. Details of Households

3.7.3 Status of Mahatma Gandhi NREGA - job card status

In the Block of the total population of 0.89 Lakhs, 38,967 are registered for job cards in Mahatma Gandhi NREGA scheme in which 78 % of the job cards are in active category (Figure 3.30).

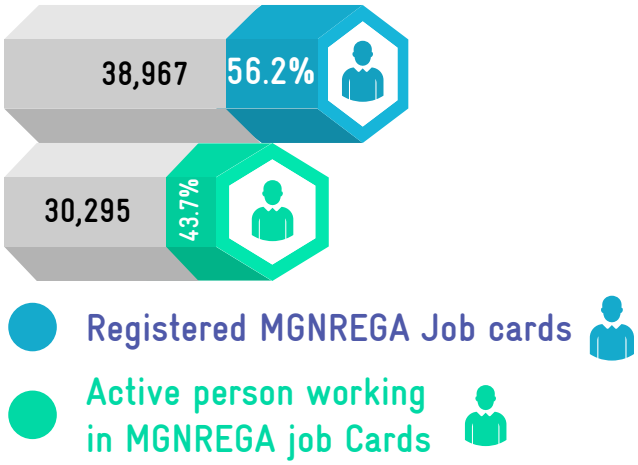


Figure 3.30. Status of MGNREGA job cards

3.7.4 Drinking Water Sources

Nearly 21,871 households have tap water connection and 2,772 households depend on other water sources for domestic use, where other sources included RTRWHS / Tanka (roof rain water harvesting systems, hand pump, open wells, bore wells, tank/ pond/ oorani, springs and river/ streams.

Tap water connection

21,871
Households

Other sources include RTRWHS / Tanka (Roof Rain Water harvesting Systems, hand pump, Open well, Bore well, Tank/ Pond/ Oorani, Springs and River/ Streams

2,772
Households

3.7.5 Annual Greywater Generation

The grey water generation estimated across this Block is 163 ha.m which is available for reuse or recycle.

SPATIAL DATA DERIVED AREA SCOPE FOR TREATMENT MEASURES IN GP'S

Morphology

Melnachipattu, Kavuthimalal RF, Veeranandhal and Eraiyur

Soil erosion

Aritharimangalam, Kanji, Kilpadur

Ground water prosperity

Anapathur, Amarnathapudur

Wasteland

Oravandhavadi, Alliyandal

Upland/Slope

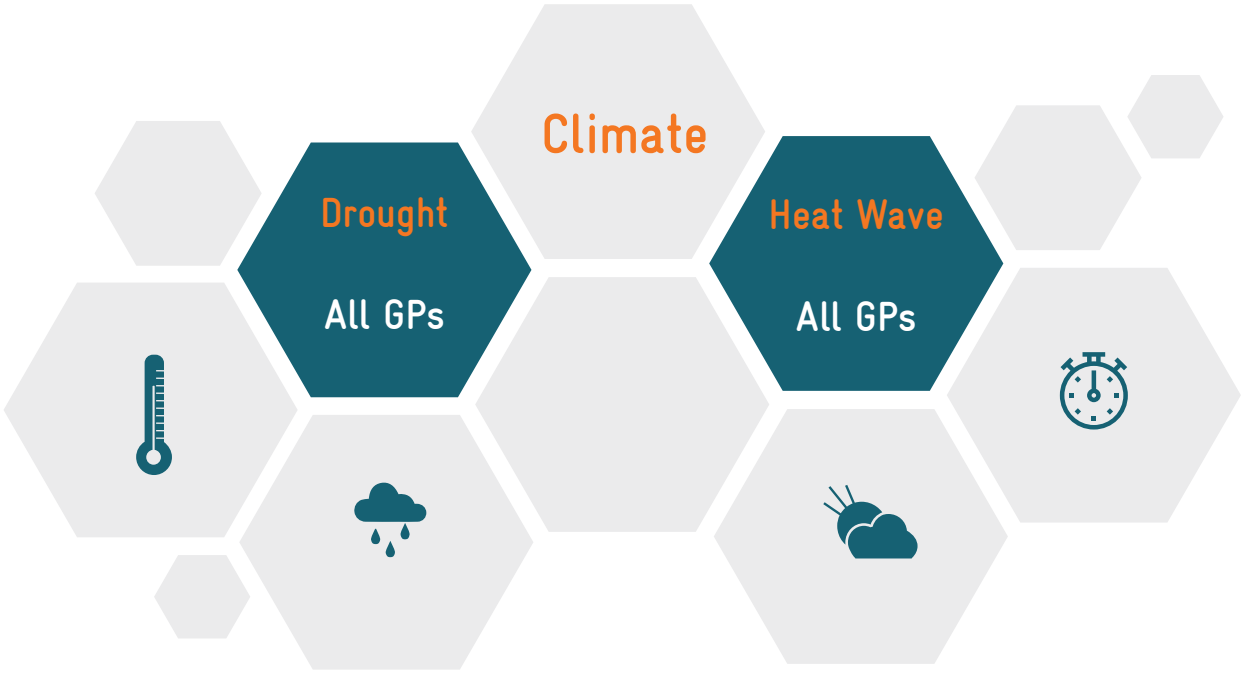
Aritharimangalam, Korat-tampattu and Kavuthimalal RF

Drainage network

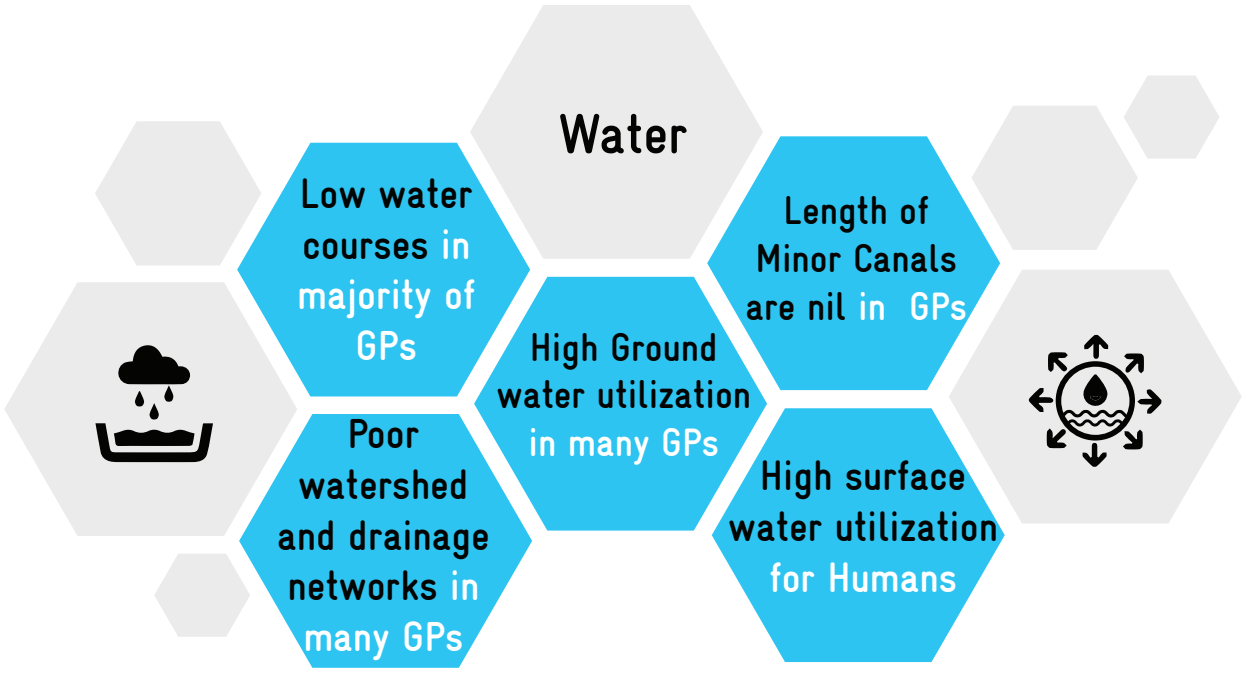
Kavuthimalal RF, Aritharimangalam

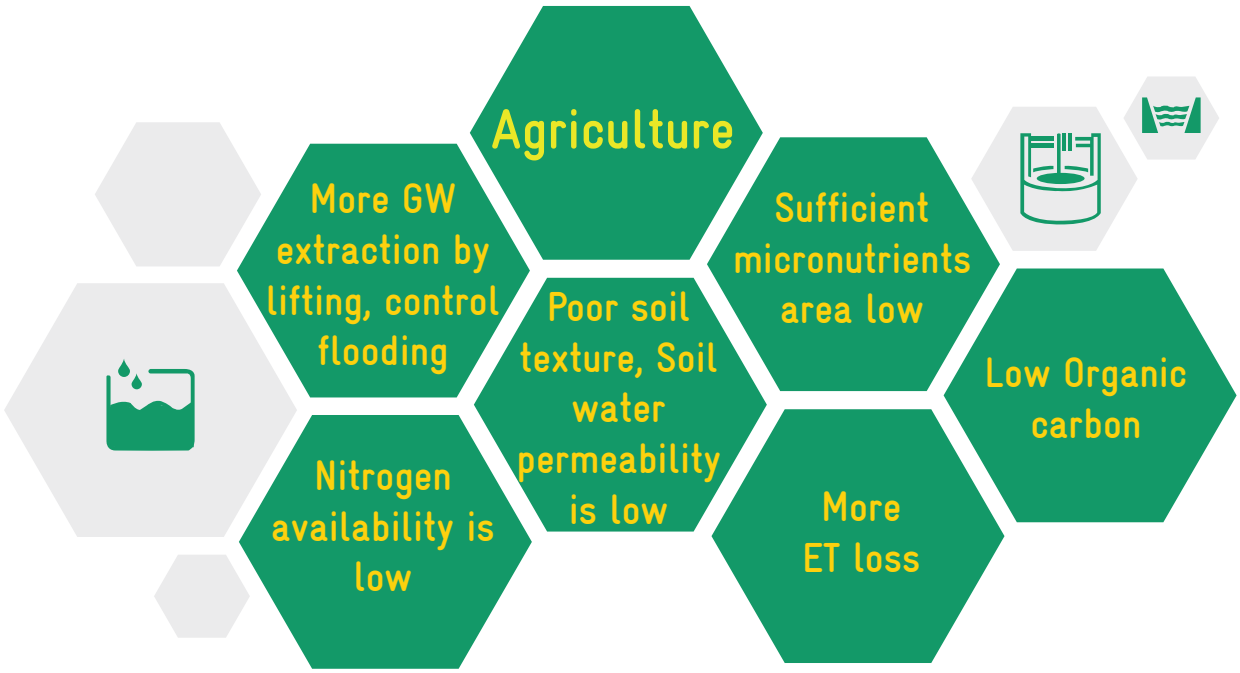
Salt affected area

Alliyandal, Oravandhavadi


Climate
Drought
All GPs
Heat Wave
All GPs


Socio economic
Population density high in C.Nammiyandal, Alliandal
Most of GP HH's have tap water connection for drinking water
Total population, Female population high in Kanji, Melmudiyanar, Karapattu & Oravonthevadi
Vulnerable population high in Melmudiyanur & Melnachipattu
Grey water generation more in Kanji, Oravanthavadi, Karapattu and less in Kilpadur & Gulalpadi
% of vulnerable households high in Melpadur low in Amarnathapudur Munnuramangalam & Kottakulam
No of households and female headed households high in Kanji, Melmudiyanur, Oravonthevadi, Nagapadi, Karapattu
Registered MGNREGA job cards & active persons working are low in Alliandal, Kilpadur, C.Nammiyandal, Unnamalaipalayam, & Gulalpadi


Water
Low water courses in majority of GPs
Length of Minor Canals are nil in GPs
High Ground water utilization in many GPs
Poor watershed and drainage networks in many GPs
High surface water utilization for Humans


Agriculture
More GW extraction by lifting, control flooding
Sufficient micronutrients area low
Poor soil texture, Soil water permeability is low
Low Organic carbon
Nitrogen availability is low
More ET loss

கெடுப்பதூஉம் கெட்டார்க்குச் சார்வாய்மற் றாங்கே
எடுப்பதூஉம் எல்லாம் மழை

குறள் - 15

Destruction it may sometimes pour
But only rain can life restore

Thirukkural - 15

CHAPTER 4

4 VULNERABILITY RANKING OF GP

The vulnerability assessment has been carried out using IPCC methodology. IPCC defined Vulnerability as 'the propensity or predisposition to be adversely affected' (IPCC 2014). Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and the lack of capacity to cope and adapt. It is determined by sensitivity and adaptive capacity of the system (Figure 4.1).

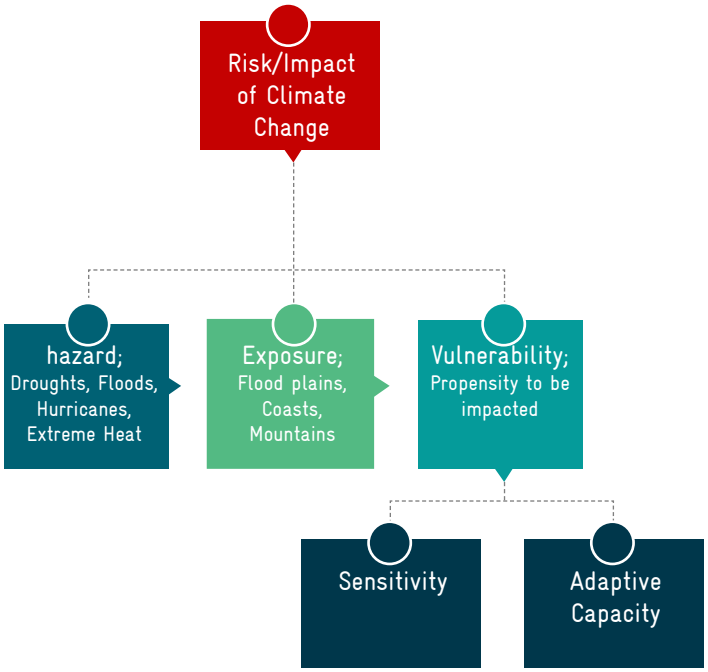


Figure 4.1. Vulnerability of the system as defined by IPCC

Generally, vulnerability assessments are made to identify:

- current and potential hotspots
- entry points for intervention
- drivers of vulnerability
- priorities adaptation interventions

The CWRM parameters which been explored through rigorous study were considered here to address the key water challenges at GP level. About 70 spatial and non-spatial parameters/ indicators under 4 dimensions via Climate (3), Water (25), Agriculture (31) and Socio-demographic (11) are categorized into adaptive capacity, sensitivity and exposure indicators for vulnerability analysis as per IPCC norms. Table 9 lists CWRM parameters/indicators, its rationale to vulnerability, source of data and its linkage with WASCA TN's primary 18 indicators.

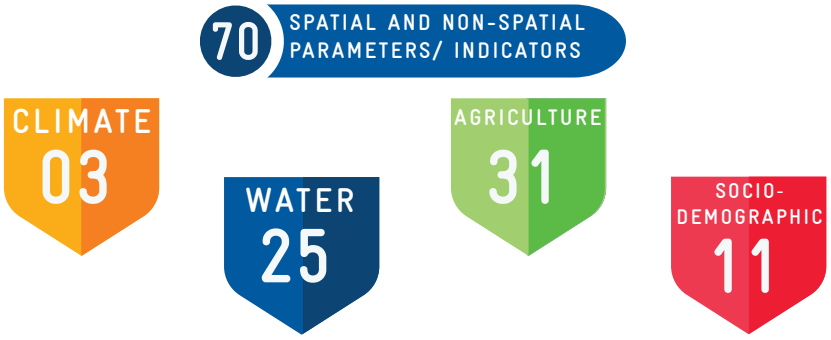


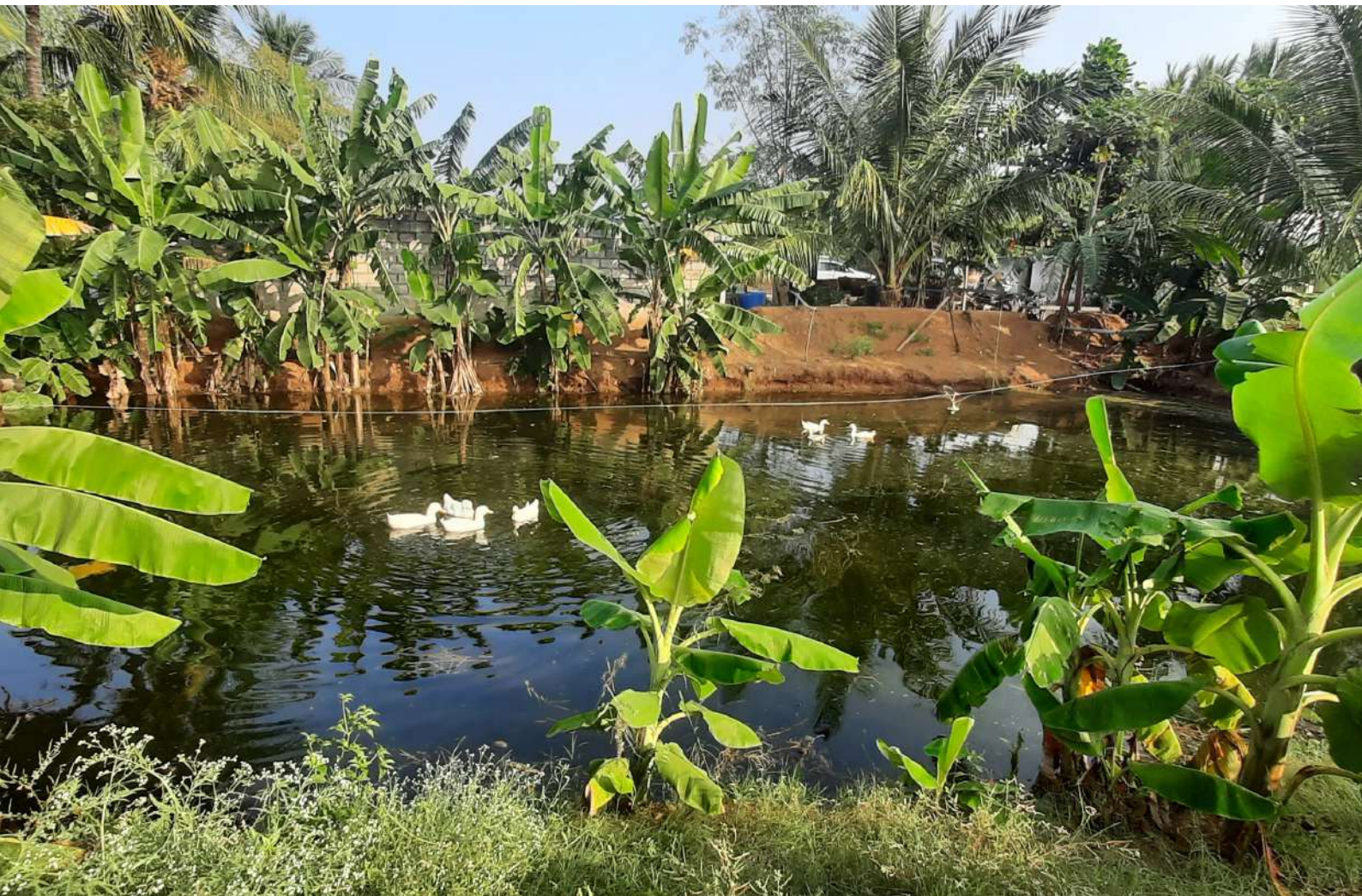
TABLE 9. CWRM PARAMETERS/INDICATORS SELECTED FOR BLOCK LEVEL VULNERABILITY

	Key CWRM Parameter	Vulnerability relationship
Climate	Drought	Climate risk/Sensitivity
	Flood locations	
	Heat Wave	
Water	**Canal Network (in m)**	
	Length of main canal	Adaptive capacity
	Length of minor canal	
	Length of distributaries	
	Water courses (Field channels)	
	Traditional water bodies (in No.)	
	No of Tanks	Adaptive capacity
	No of Oranis	
	Other Surface Water Bodies	
	Irrigation Facilities (in ha)	
	Area under Tank Irrigation	Sensitivity
	Area under Canal Irrigation	
	Area under Open & Tube Well Irrigation	
	Catchment Area wise Available Runoff (ha-m)	
	Good Catchment Area	Sensitivity
	Average Catchment Area	
	Bad Catchment Area	
Water	**Watershed and Drainage Networks**	
	Length of Natural Drainage Lines	Adaptive capacity
	Number of Natural Drainage Lines	
	Number of Micro-watersheds	
	Water demand (ha-m)	
	For Humans	Sensitivity
	For Livestock	
	For Agriculture	
	% GW utilization for Drinking	
	% GW utilization for Livestock	
	% GW utilization for Agriculture.	
	% SW utilization for Drinking	
	% SW utilization for Livestock	
	% SW utilization for Agriculture	
Agriculture	**Area under land resources (in ha)**	
	Forest land	Adaptive capacity
	Non-Agricultural Uses	
	Barren & Un-cultivable Land	
	Permanent pastures and Other grazing land	
	Land under miscellaneous tree crops etc.	
	Cultivable wasteland	
	Fallows land other than current fallows	Sensitivity
	Current fallow land	
	Unirrigated land	
	Area irrigated by source	

Agriculture	**Land under catchment area (ha)**	
	Good Catchment	Adaptive capacity
	Average Catchment	
	Bad Catchment	Sensitivity
	Crop Area details (in ha)	
	Irrigated Area	Sensitivity
	Rainfed area	
	Soil Resources: Status of available Nitrogen (in %)	
	Very low to low	Sensitivity
	Status of Organic Carbon (in %)	
	Very low to low	Sensitivity
	Status of Soil Micro Nutrients (in %)	
	Deficient	Sensitivity
	Status of Physical condition of the soil (in %)	
	Highly acidic/alkaline	Sensitivity
	Slightly acidic	Adaptive capacity
	Neutral	
	Moderately alkaline	
	Soil Texture (in %)	
	Clay	Sensitivity
	Fine	Adaptive capacity
	Coarse loamy	
	Soil Water Permeability (Low, Moderate, high)	
	Soil moisture and ET (in ha-m)	
	Estimated soil moisture	Adaptive capacity
	ET losses	Sensitivity
	Means of Water Extraction (in %)	
	Lifting	Sensitivity
	Irrigation Methods (in %)	
	Wild flooding	Sensitivity
	Livestock (in No.)	
	Livestock density (cattle, sheep, Goat, poultry)	Sensitivity
Socio economic	Population density (persons per ha)	Sensitivity
	Demographic (in %)	
	Female Proportion	Sensitivity
	Vulnerable population Proportion	
	Economic (In %)	
	Only one room HH's	Sensitivity
	Female headed HH's	
	Vulnerable households	
	MGNREGA (in %)	
	Registered MGNREGA Job cards	Adaptive capacity
	Active person working in MGNREGA job Cards	
	Water accessibility (in %)	
	HH's have tap water connection for drinking water	Adaptive capacity
	HH's dependent on other sources for drinking water	Sensitivity
	Annual Greywater Generation (in ha.m)	

The identified indicators are from different sources and measured in different units. As the vulnerability assessment is about ranking, the indicators have to be in common units. This is done through normalization. The normalized indicators are aggregated and categorized to very high, high, medium, low and very low vulnerability level. The methodology for vulnerability assessment is given in Annexure 4.1. Kanji GP has very high vulnerability to climate risks followed by Muthanur.Amarnathapudur, Kottakulam, Thorapadi and Veeranandal GPs. While Davanandal GP is less vulnerability score (Figure 4.2).

CVI score up-to	Vulnerability Category	Color code
0.546	very high	
0.520	high	
0.494	medium	
0.468	low	
0.441	very low	



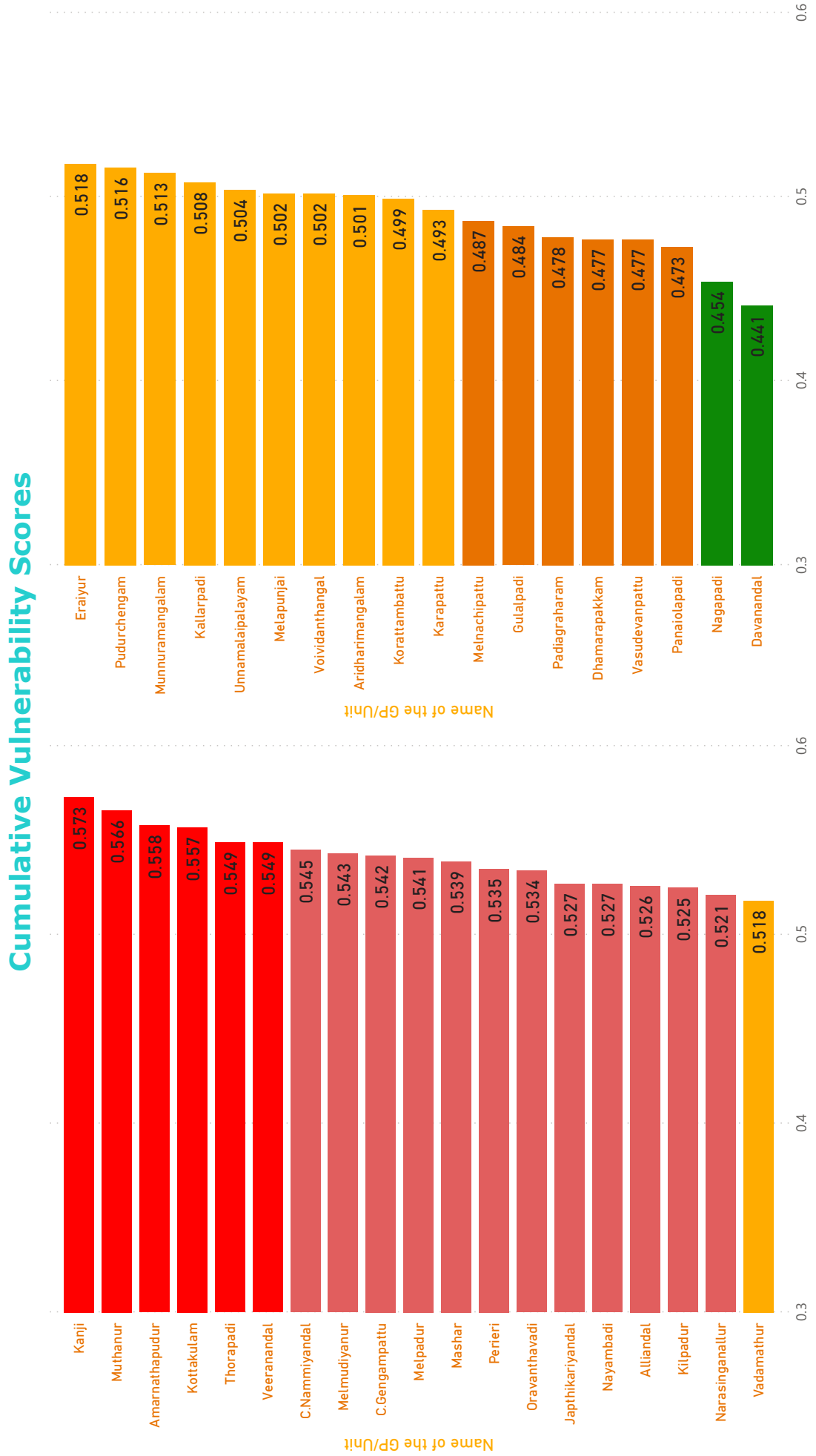


Figure 4.2. Final cumulative vulnerability scores

Sectoral vulnerability

The vulnerability indices were calculated within climate risks, water resource, agriculture and socio-economic dimensions and are shown in Figure 4.3 to identify area wise vulnerable GPs.

Climate risks vulnerability

The climate risk vulnerability index shows that all villages in this Block are affected with droughts and heat waves in last decades.

ALL VILLAGES

Water resource vulnerability

The water resources vulnerability index shows that Kanji, Kottakulam, Karapattu GPs have high vulnerable followed by Muthanur, Japthikariyandal, Melapunjai, Oravanthavadi and Melpadur GPs

KANJI, KOTTAKULAM, KARAPATTU, MUTHANUR, JAPTHIKARIYANDAL, MELAPUNJAI, ORAVANTHAVADI, MELPADUR

Agriculture resources vulnerability

In agriculture and allied sectors, Amarnathapudur GP has highest vulnerable score followed by Thorapadi, Muthanur, Kottakulam, Veeranandal, Vadamathur, C.Gengampattu and Mashar GPs

AMARNATHAPUDUR, THORAPADI, MUTHANUR, KOTTAKULAM, VEERANANDAL, VADAMATHUR, C.GENGAMPATTU, MASHAR

Socio-economic vulnerability

Alliandal, Melnachipattu, C.Nammiyandal, Kanji, Melpadur Eraiyur GPs have high socio economic vulnerability

ALLIANDAL, MELNACHIPATTU, C.NAMMIYANDAL, KANJI, MELPADUR, ERAIYUR

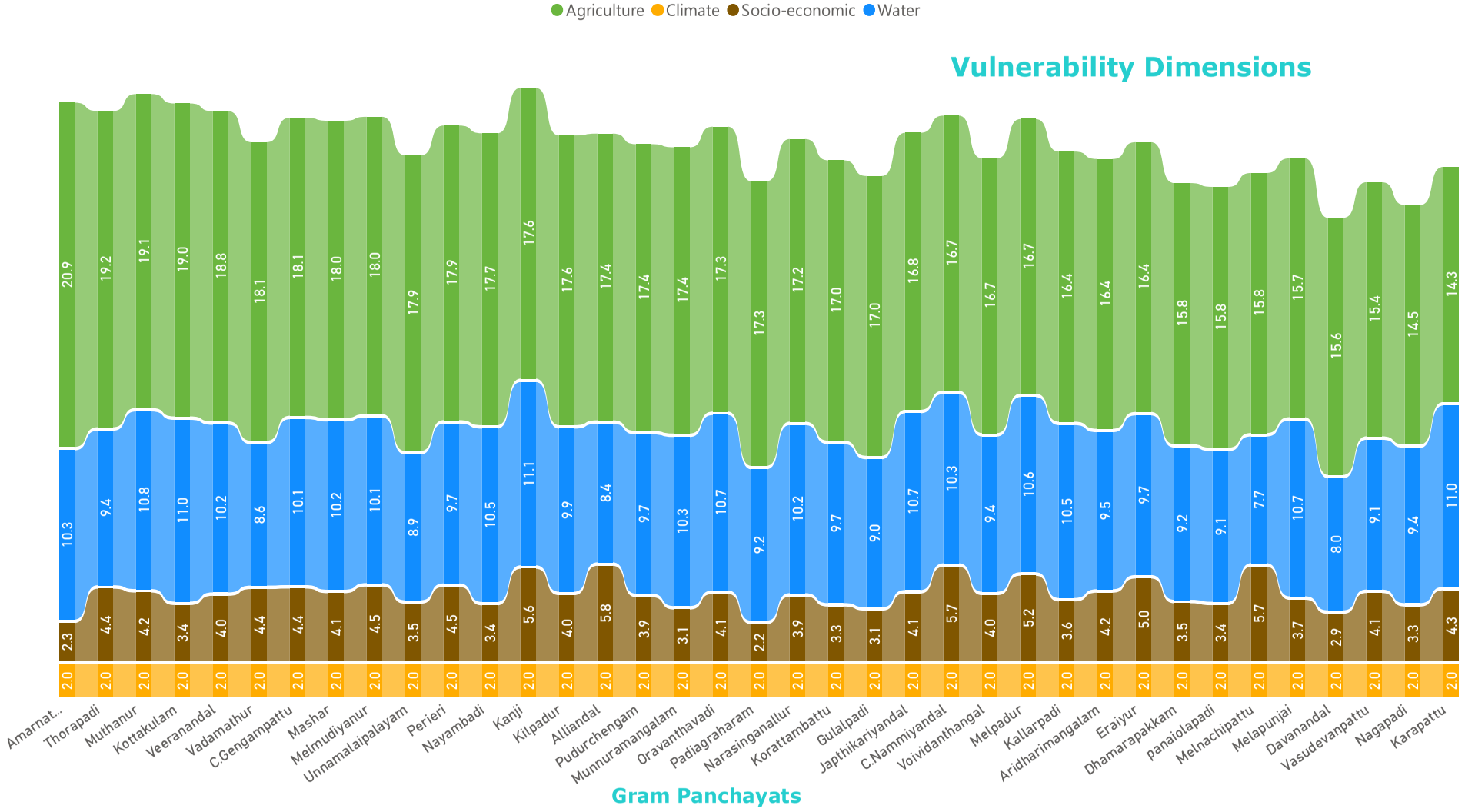
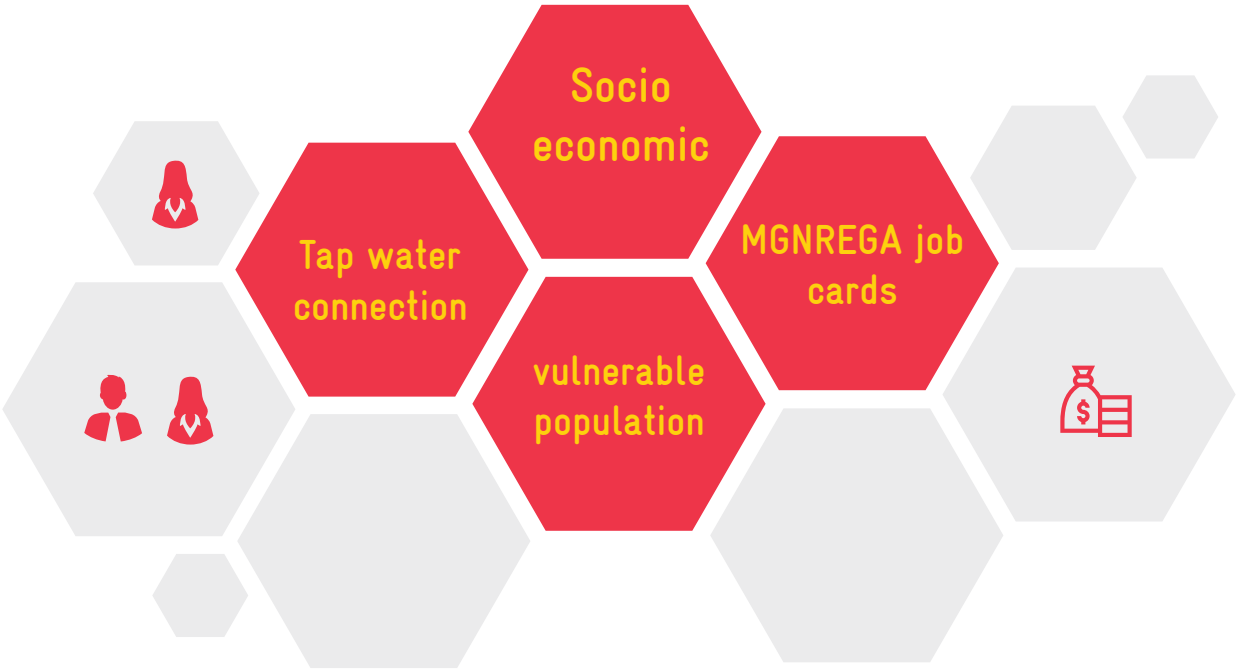
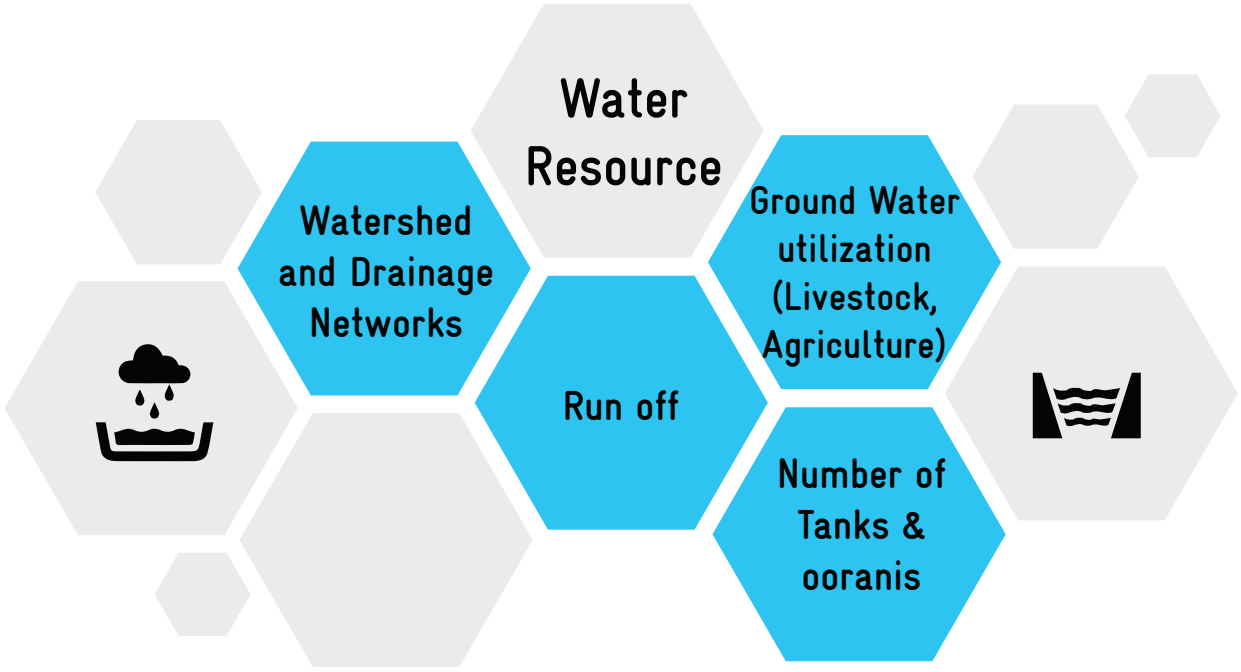
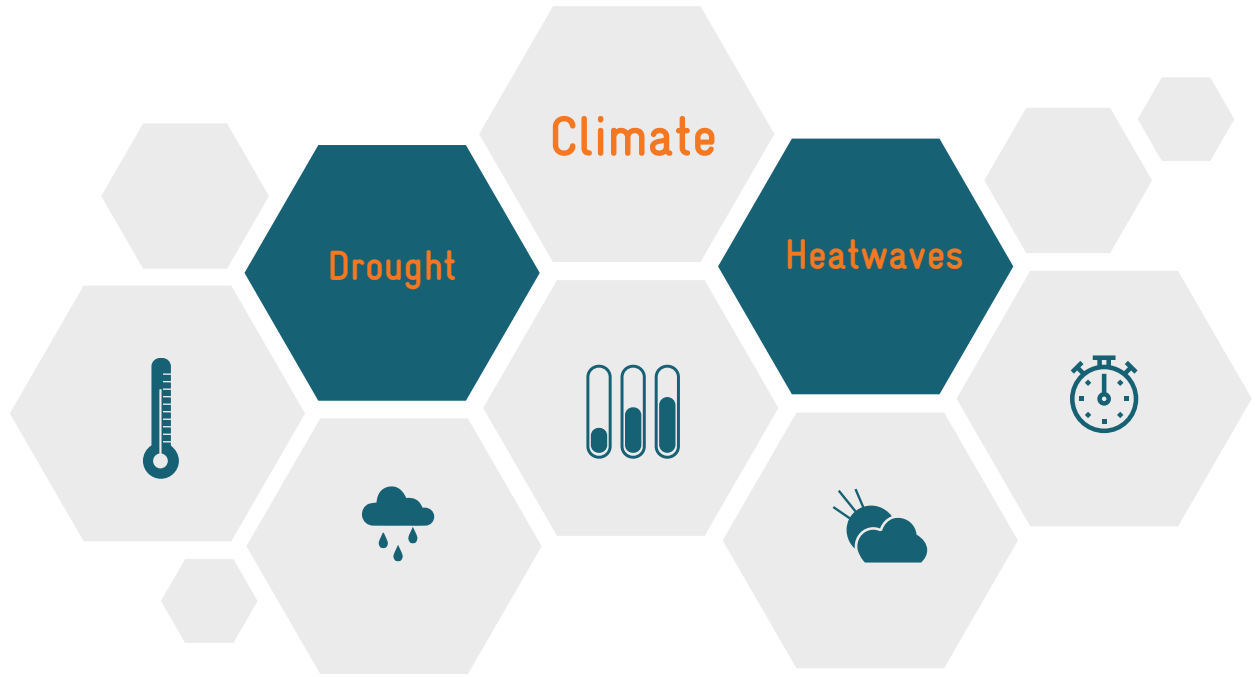


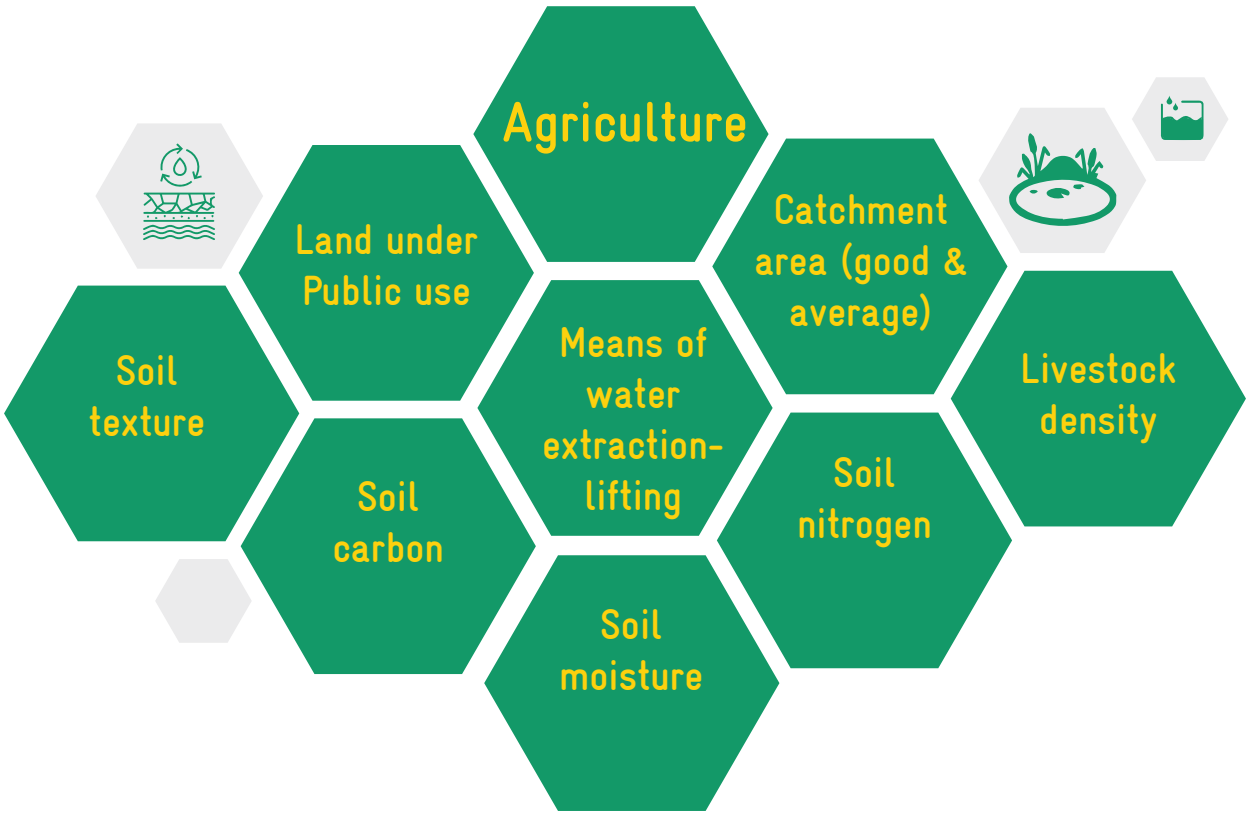
Figure 4.3. GP wise vulnerability dimensions

Contributing indicators to the total vulnerability









Based on the vulnerability assessment, high attention has been given to identify more shelf of works/actions in the resource management in order to reduce the vulnerability and increase its adaptive capacity towards climate change.

விசும்பின் துளிவீழின் அல்லால்மற் றாங்கே
பசும்புல் தலைகாண்பு அரிது

குறள் - 16

No grassy blade its head will rear
If from the cloud no drop appear

Thirukkural - 16

CHAPTER 5

PROPOSED KEY WATER ACTIONS UNDER MAHATMA GANDHI NREGS CONVERGENCE

5 PROPOSED KEY WATER ACTIONS UNDER MAHATMA GANDHI NREGS CONVERGENCE

After identifying the key water issues at GP level through vulnerability analysis, the area for key water action treatments were proposed. The comprehensive and holistic understanding of the key water challenges adopting the eco-system approach enable to identify water action works in public and common land (afforestation, soil and water conservation, improving the traditional water storage and catchment assets etc.,), agriculture and allied sector (farm ponds, artificial recharge structures, on-farm plantation, irrigation methods, livestock - fodder development etc.,) and rural infrastructure (on safe drinking water and efficient handling of grey water). Proposed works on watershed and livelihood approach shown in Annexure 5.3.

5.1 THE PROPOSED AREA UNDER WASCA TREATMENT

Out of 18,265 ha available land in Pudupalayam Block, 1,846 ha (10 %) area is proposed for treatment under WASCA TN– CWRM planning. A major portion of key water Actions is proposed in irrigation land followed by cultivable wasteland while minute area of land under miscellaneous tree etc. has been proposed for significant pilot treatments. The detailed land wise proposal for WASCA treatments is given in the Table 10. GP wise proposed area for treatment is also attached in Annexure 5.1.

TABLE 10. THE PROPOSED AREA FOR WASCA TREATMENT

Land Use	Total available land (ha)	WASCA proposed treatment area (ha)
Non-Agricultural Uses	4,023	275
Land under miscellaneous tree, crops etc.	26	20
Cultivable Waste Land	246	195
Fallows Land other than Current Fallows	1,102	94
Current Fallow land	5,505	513
Unirrigated Land	309	31
Irrigated by Source	7,357	576
Total	**18,625**	**1,846**

Nearly 79 % of current wasteland was prioritized for treatment followed by 76 % of Land Under Miscellaneous Tree Crops etc. While non agriculture land six percent area was considered for treatment under WASCA-TN (Figure 5.1).

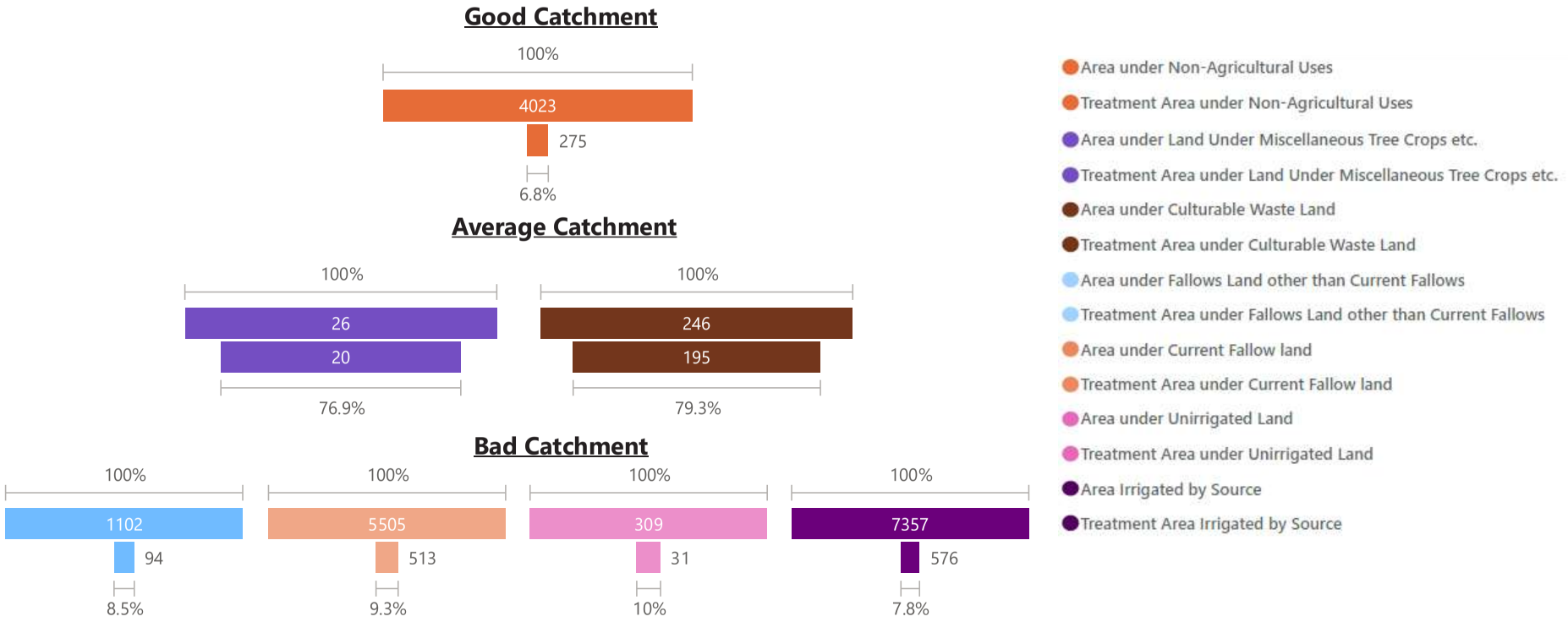


Figure 5.1. WASCA treatment area in percentage

Expected runoff conservation after WASCA treatment

The productive developmental activities that were taken up in the WASCA proposed areas are termed as key water actions. With the above proposed treatment area, the expected runoff harvested due to WASCA intervention would be around 436 ha.m which is 16 % of the total runoff. Of the expected runoff conservation, 43% comes from good catchment area, 9 % comes under average catchment area and 48 % comes from bad catchment area (Figure 5.2).

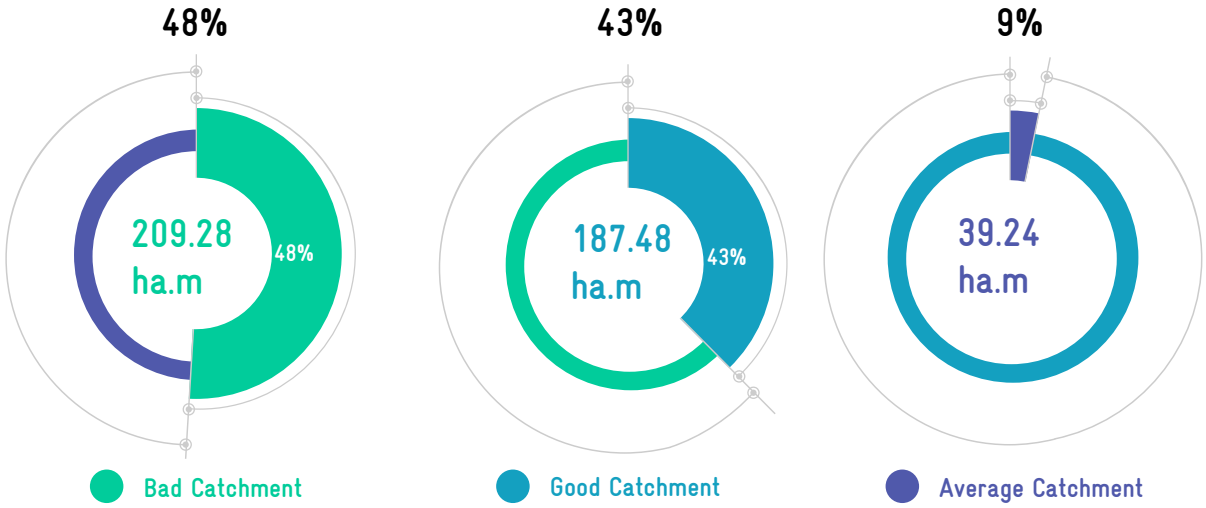


Figure 5.2. Expected conservation after WASCA treatment

The GP wise expected runoff conservation after completion of WASCA treatment is shown in Figure 5.3 (Annexure 5.2).

All the works are proposed based on watershed and livelihood approach. The summary statistics of all proposed works are given below. The detailed list of works for all GP are attached in Annexure 5.3.

Work (unit)	Abbreviation (unit)	No.	Extent (area in ha or length in m)
Azolla units - Individual (Number of units)	Az	1,275	
Cattle Shelters (Number of units)	CS	1,179	
Cattle Trough(Number of units)	CT	1,179	
Fodder development - Community & Individual	FD	1,275	
Goat Sheep Shelters (Number of units)	GSS	538	
Poultry Shed (Number of units)	PS	1,275	
Silvi-pasture Development(Ha)	SPD	0	0
Soak Pits (Community) (Number of units)	SPC	187	
Soak Pits (Individual) (Number of units)	SPI	2,013	
Artificial Recharge Structure(Number of units)	ARS	132.8	290
Construction of Farm Ponds - Individual (Number of units)	FP	466	

Construction of new open wells & Recharge Shafts (Number of units)	COWRS	552	
Restotaration of water bodies:a.PWD and Tanks(Number)	RPWDT	75	
Restotaration of water bodies:b. Ooran-is(Number)	Ro	0	
Restotaration of water bodies:c. Ponds(Num-ber)	RP	68	
Roof Rain Water Harvesting (Number of units)	RRWH	74	
Water Course - Irrigation Channels - Desilt-ing (Mtrs)	WCICD		8,005
Afforestation in Public/common lands(Ha)	Aff	19,6203	243.18
Avenue plantation(Km)	AVP	377.6	1,888
Block Plantation (Community)(Ha)	BP	2,43,146	307.5
Canal Bund Plantation(Ha)	CBP	0	0
Contour Continous Bunds (CCB) for Affor-estation area(Mtrs)	CCBF	0	0
Drainage Line Treatment (DLT)(Mtrs)	DLT	27,978	1,39,874
Dry land Horticulture/Agro-forestry - Indi-vidual (Ha)	DLHAI	3,25,570	417
Irrigation Channel Plantation (Mtrs)	ICP	1,601	8,005
Linear Plantation(Km)	LP	21,505	80,256
Micro Irrigation(Ha)	MI	197	492
Nursery Development(Number of units)	ND	57,776	11,553
Composting (Number of units)	Co	209	769
Farm Bunding with Boundary Trenches - Individual (Ha)	FBBTI	443	860
Land development - Individual (Ha)	LDI	192	484
NADEP Vermi compost (Number of units)	NADEP	1,179	


Proposed works are included the drought proofing, livelihood, land development and WCWH, measures
Land development works over 2,000 ha area
More than 8.7 Lakhs plants planting
1,300 sites for WCWH
8,900 livelihood works

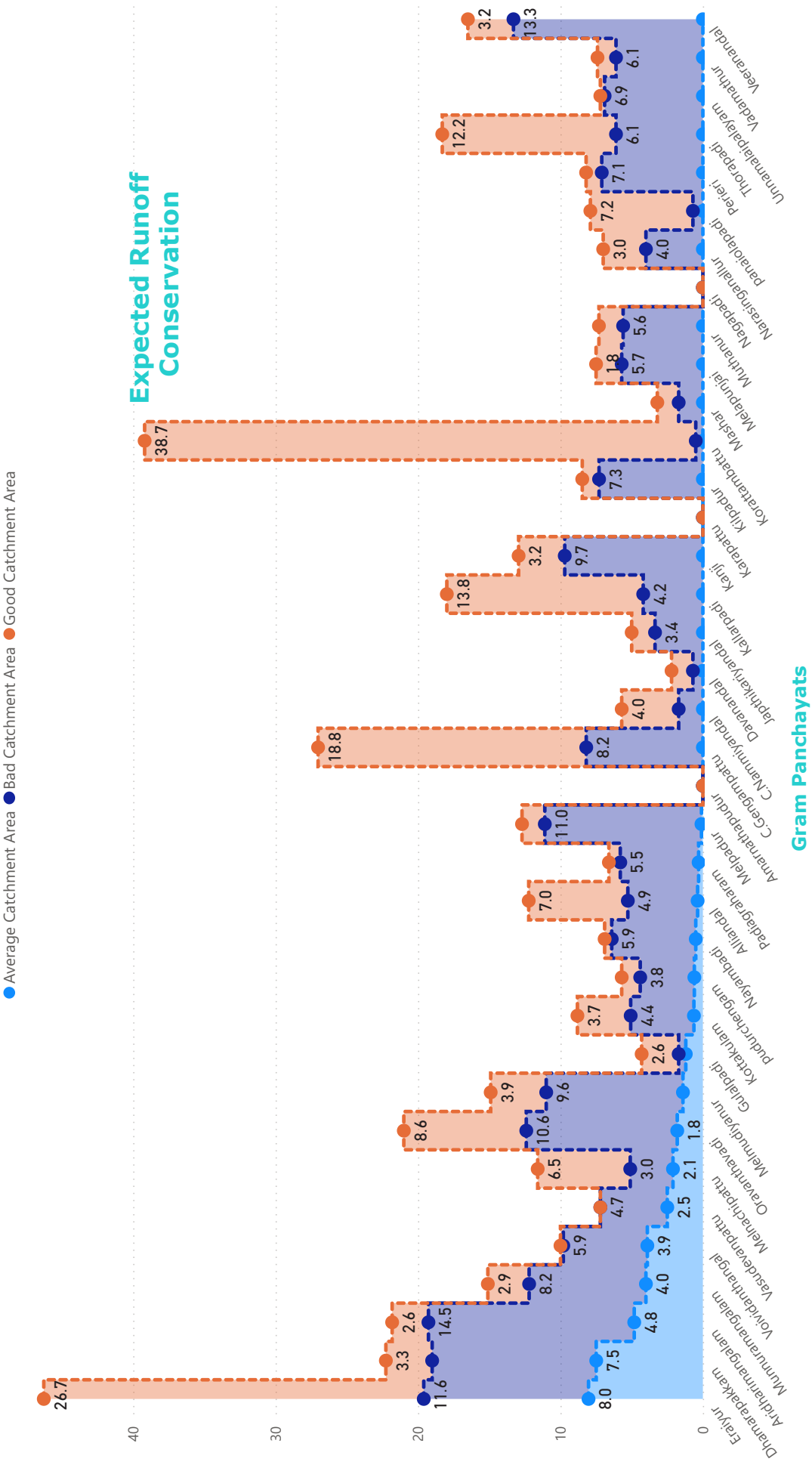


Figure 5.3. Expected GP wise runoff conservation after WASCA treatment

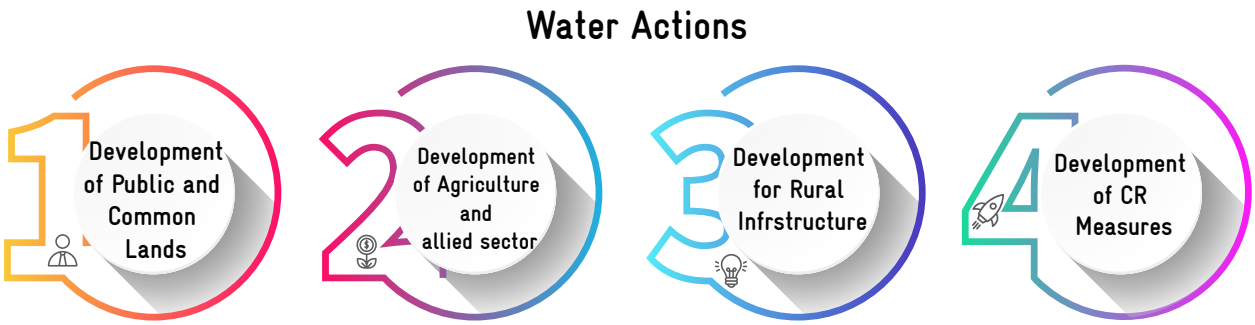
Mahatma Gandhi NREGS Annual circular 2020-21 (Clause 6.3)

Planning and design of works under Mahatma Gandhi NREGS should take into account, impacts of climate change in order to ensure resilience of vulnerable rural communities and make the benefits sustainable in the long run. Specifically, the following things should be ensured:

I. Historical and projected climate change data, especially incidence of droughts and floods, along with vulnerability assessment at the district, block or gram panchayat level should be used in the planning and design of Mahatma Gandhi NREGS works.

II. Different kinds of complementary Natural Resource Management (NRM) works such as land development with plantation on the bunds, farm ponds, and compost pits should be combined, in order to ensure durability of assets and resilience of communities that depend on such assets.

The Key Water Actions proposed under 4 categories through Mahatma Gandhi NREGS convergence of considering its models under Right to Plan and Prepare a Shelf of Projects (Clause 6) are



5.2 DEVELOPMENT OF PUBLIC & COMMON LANDS

The effective water augmentation measures are proposed in public and common lands via massive tree plantation, restoration of waterbodies etc., as listed in Table 11 and Figure 5.4.

DEVELOPMENT OF PUBLIC AND COMMON LANDS

TABLE 11. DETAILS OF WORK PROPOSED TO DEVELOP PUBLIC AND COMMON LANDS

	NO. OF WORKS	PERSON DAYS PER UNIT	UNIT COST IN INR (LAKHS)	ESTIMATED COST IN INR (LAKHS)	ESTIMATED PERSON DAYS
CONTOUR CONTINOUS BUNDS (CCB) FOR AFFORESTATION AREA(M)	915	10	0.025	22.9	9,147
COMPOSTING(NUMBER OF UNITS)	209	15	0.17	35.5	3,135
AFFORESTATION IN PUBLIC/ COMMON LANDS(HA)	243	3,344	8.6	2,091.3	8,13,194
BLOCK PLANTATION (COMMUNITY)(HA)	308	4,320	11.1	3,413.3	13,28,400
SILVI-PASTURE DEVELOPMENT(HA)	27	6,664	17.1	461.7	1,79,928
LINEAR PLANTATION(KM)	1	703	1.8	1.0	401
CANAL BUND PLANTATION(HA)	2,980	2,930	7.5	21,286.0	82,76,270
IRRIGATION CHANNEL PLANTATION (M)	313	6	0.015	4.7	1,877
AVENUE PLANTATION(KM)	1	703	1.8	1.7	661
NURSERY DEVELOPMENT (NUMBER OF UNITS)	271	2,344	15	4,066.3	6,35,423
RESTOTARATION OF WATER BODIES: A) PWD AND TANKS (NUMBER)	56	800	5	280.0	44,800
RESTORATION OF WATER BODIES: B.OORANIS (NUMBER)	0	200	2	0	0
RESTORATION OF WATER BODIES: C) PONDS (NUMBER)	192	200	1	384.0	38,400
ARTIFICIAL RECHARGE STRUCTURE (NUMBER OF UNITS)	1,651	391	2.5	4,127.5	6,45,541
WATER COURSE - IRRIGATION CHANNELS - DESILTING (MTRS)	313	3	0.0075	2.3	938
DRAINAGE LINE TREATMENT (M)	1,854	5	0.03	55.6	9,270

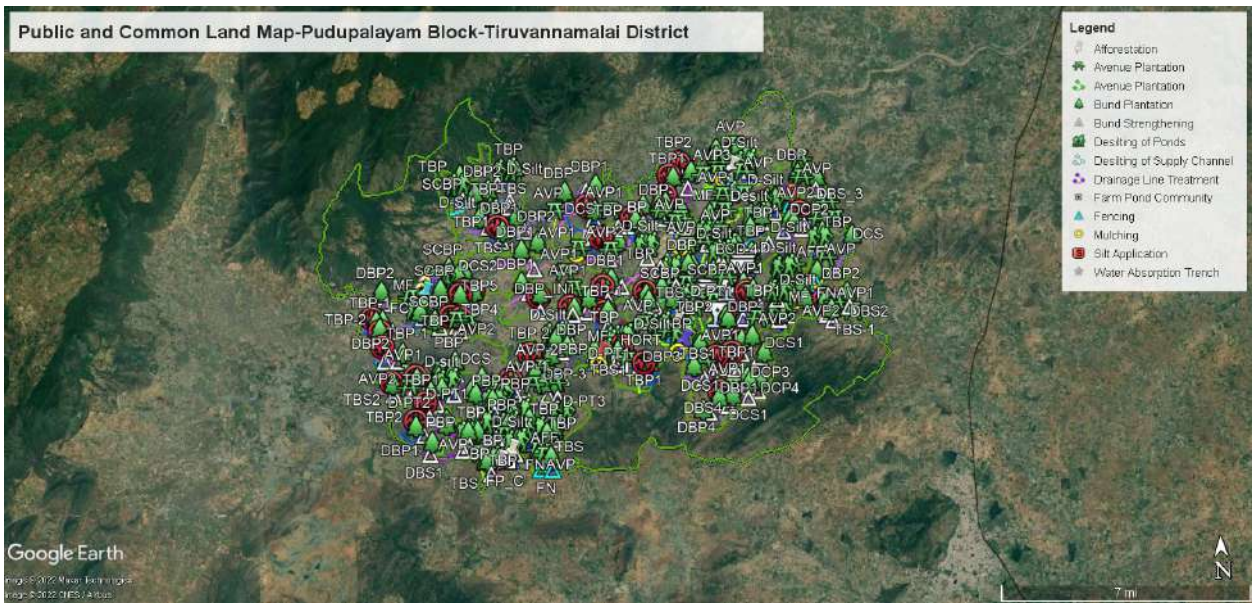


Figure 5.4. Map of Proposed development activities in public and common land

5.3 DEVELOPMENT OF AGRICULTURE AND ALLIED SECTOR

Based on the assessment, the works which enhance the agriculture and allied sectors particularly for irrigation, soil and live stocks are proposed in the lands under individual ownership (Table 12 & Figure 5.5).

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

TABLE 12. DETAILS OF WORKS PROPOSED TO DEVELOP AGRICULTURE AND ALLIED SECTORS

	NO. OF WORKS	PERSON DAYS PER UNIT	UNIT COST IN INR (LAKHS)	ESTIMATED COST IN INR (LAKHS)	ESTIMATED PERSON DAYS
FARM BUNDING WITH BOUNDARY TRENCHES - INDIVIDUAL (ha)	860	586	1.5	1,290.3	5,04,071
MICRO IRRIGATION (ha)	197	0	1	197.0	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	456	781	2	912.0	3,56,136
LAND DEVELOPMENT - INDIVIDUAL (ha)	484	3,906	10	4,835.1	18,88,590
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	417	3,321	8.5	3,541.1	13,83,529
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	1,160	23	0.15	174.0	26,680
NADEP VERMI-COMPOST (NUMBER OF UNITS)	1,138	27	0.18	204.8	30,726
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	1,160	2,344	1.48	1,716.8	27,19,040
CATTLE SHELTERS (NUMBER OF UNITS)	1,138	331	2.12	2,412.6	3,76,678
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	175	355	2.27	397.3	62,125
CATTLE TROUGH (NUMBER OF UNITS)	1,138	6	0.5	56.9	26,828
POULTRY SHED (NUMBER OF UNITS)	978	10	0.09	88.0	9,780
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	552	926	5	2,760.0	5,11,152

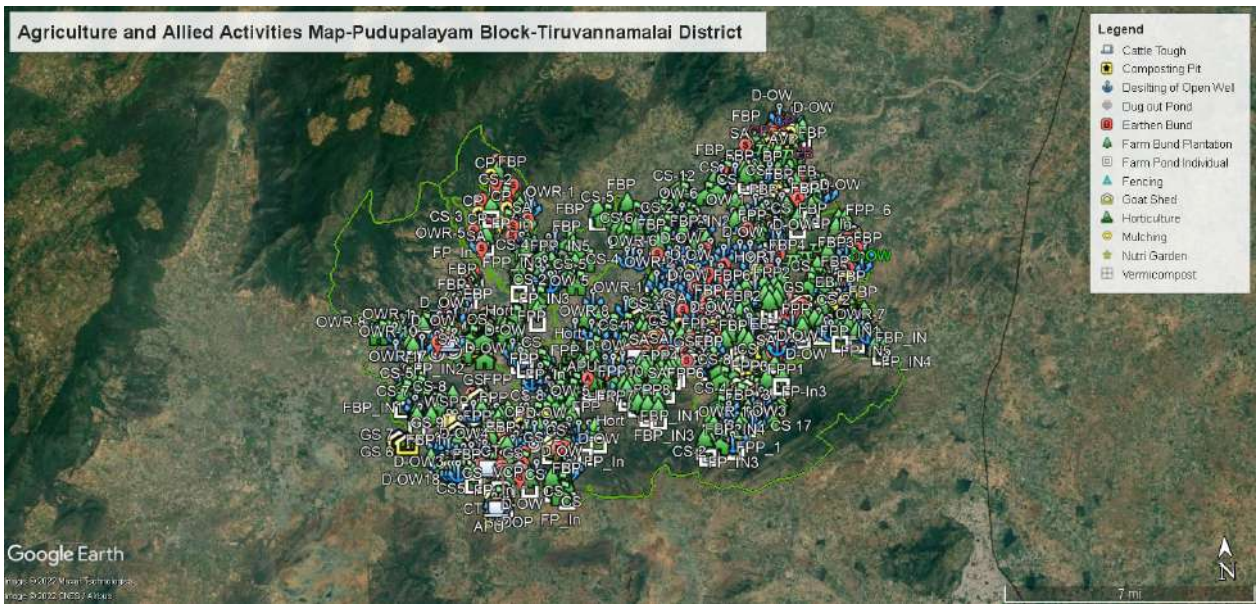


Figure 5.5. Map of Proposed development activities in Agriculture and allied Sectors

5.4 DEVELOPMENT OF RURAL INFRASTRUCTURE

The prominent works on constructing structures for water harvesting and grey water management are proposed as in Table 13 and Figure 5.6.

DEVELOPMENT OF RURAL INFRASTRUCTURE

TABLE 13. DETAILS OF WORK PROPOSED TO DEVELOP RURAL INFRASTRUCTURE

	NO. OF WORKS	PERSON DAYS PER UNIT	UNIT COST IN INR	ESTIMATED COST IN INR (LAKHS)	ESTIMATED PERSON DAYS
SOAK PITS (COMMUNITY) (NUMBER OF UNITS)	187	20	0.13	24.31	3,740
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	1,898	16	0.1	189.80	30,368
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	74	625	4	296.00	46,250

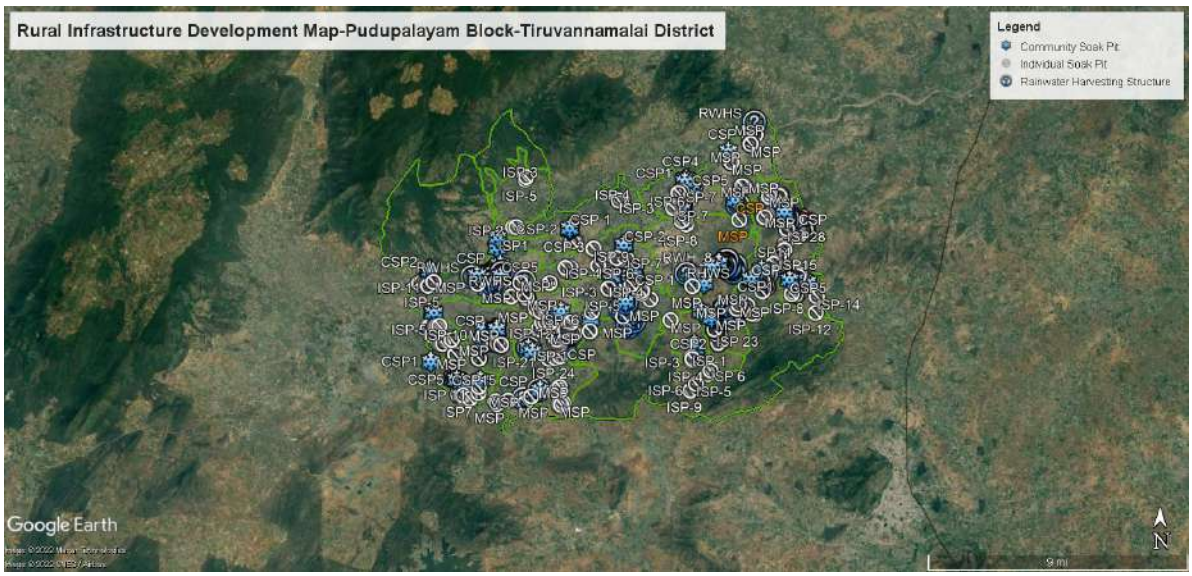


Figure 5.6. Map of Proposed rural infrastructure activities

5.5 DEVELOPMENT OF CLIMATE RESILIENCE MEASURES

Climate resilient measures are proposed to enable the system to cope up with future climate risks such as droughts, heatwaves and floods. As Pudupalayam district is a drought prone area and frequently exposed to severe droughts, more measures are proposed to manage droughts and its subsequent impacts (Table 14). CRM such as farm ponds and silvi-pasture development are proposed in this Block in saturation mode. The proposed activities and its details are given in Table 15.

TABLE 14. GP WISE PROPOSED CRM

Sl.No	GP	Agriculture and allied activities	Public and common land
1	Amarnathapudhur	Farm Pond	
2	Amarnathapudur	Farm Pond	
3	Aritharimangalam	Farm Pond	
4	C.Gengampattu	Farm Pond	
5	C.Nammiyanthal	Farm Pond	
6	Eariyur	Farm Pond	
7	Eraiyur	Farm Pond	
8	Gulalpadi	Farm Pond	
9	Japthikariyandal	Farm Pond	
10	Japthikariyanthal	Farm Pond	
11	Kanji	Farm Pond	
12	Karapattu	Farm Pond	
13	Kilpadur	Farm Pond	
14	Korattampattu	Farm Pond	
15	Kottakulam	Farm Pond	
16	Mashar	Farm Pond	
17	Melapunjai	Farm Pond	
18	Melmudiyanur	Farm Pond	
19	Melnachipattu	Farm Pond	

20	Munnurmangalam	Farm Pond	
21	Muthanur	Farm Pond	
22	Narasinganallur	Farm Pond	
23	Nayambadi	Farm Pond	
24	Oravandavadi	Farm Pond	
25	Padiagraharam	Farm Pond	
26	Panaiolaipady	Farm Pond	
27	Periyeri		Silvi-pasture Development
28	Pudhurchengam	Farm Pond	
29	Thorapadi	Farm Pond	
30	Unnamalaipalayam	Farm Pond	
31	Vaividanthangal	Farm Pond	
32	Veeranandal	Farm Pond	Silvi-pasture Development

TABLE 15. DETAILS OF PROPOSED FARM PONDS ACTIVITIES UNDER CRM

Panchayat/habitaion	No. of Farm pond
Amarnathapudhur	2
Amarnathapudur	8
Aritharimangalam	2
C.Gengampattu	1
C.Nammiyanthal	1
Eariyur	1
Eraiyur	1
Gulalpadi	1
Japthikariyandal	1
Japthikariyanthal	2
Kanji	5
Karapattu	3
Kilpadur	1
Korattampattu	1
Kottakulam	9
Mashar	1

Panchyat/habitaion	No. of Farm pond
Melapunjai	1
Melmudiyanur	5
Melnachipattu	3
Munnurmangalam	3
Muthanur	2
Narasinganallur	3
Nayambadi	1
Oravandavadi	5
Padiagraharam	1
Panaiolaipady	1
Pudhurchengam	2
Thorapadi	1
Unnamalaipalayam	4
Vaividanthangal	1
Veeranandal	4
Total	**77**

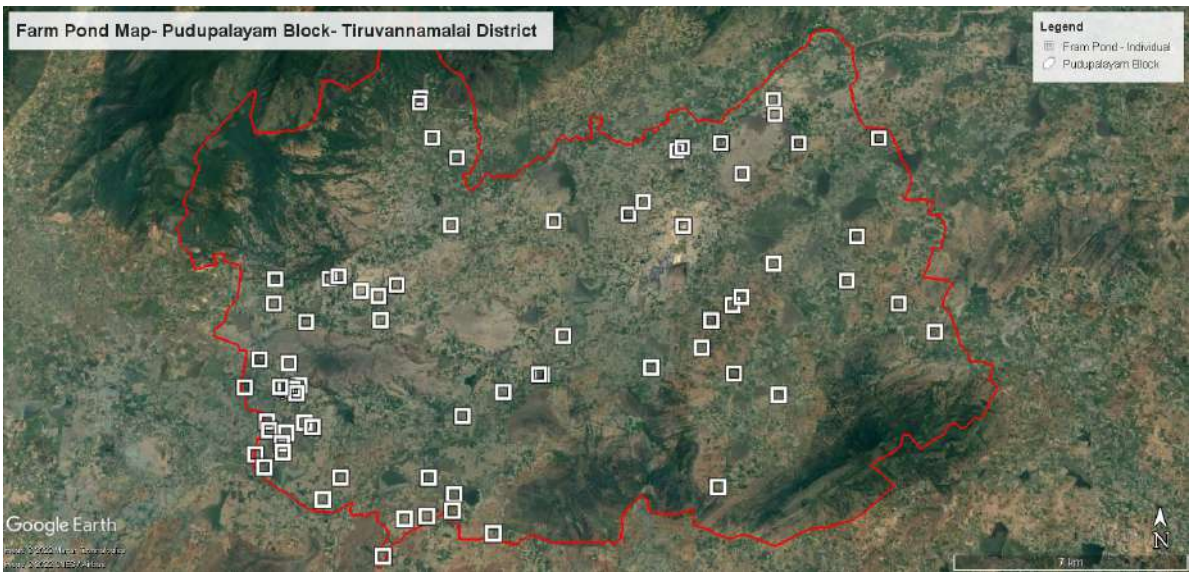


Figure 5.7. Map of Proposed climate resilient measures

நெடுங்கடலும் தன்நீர்மை குன்றும் தடிந்தெழிலி
தான்நல்கா தாகி விடின்

குறள் - 17

The ocean's wealth will waste away
Except the cloud its stores repay

Thirukkural - 17

CHAPTER 6

PROJECTED OUTCOMES OF PLANNING

6 PROJECTED OUTCOMES OF PLANNING

In view of Mahatma Gandhi NRGES guidelines, key water actions are proposed based on climate vulnerability assessment and challenges at GP level for three years period from 2021- 2022 to 2023-2024. At the end of the implementation period during 2024, the following productive outcomes are envisaged on successful accomplishment of all proposed key water actions. The anticipated outcome will reduce the water security vulnerability and increase the resilience of the GPs under current and projected climatic change scenarios.

6.1 OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

	INDICATOR		OUTCOMES/ IMPACT
1	Proportion of Land development under WASCA treatment	1	1,846 ha (10 %) of the total area treated under WASCA
2	Percentage reduction of run off	2	436 ha.m i.e 16 % of the total runoff harvested due to WASCA interventions
3	No. of waterbodies restored	3	248 waterbodies (tanks/pond and ooranis) restored
4	Area under afforestation	4	243.18 ha area under afforestation
5	Area under silvi-pasture development	5	27 ha under Silvi-pasture plantation
6	Length of drainage line treated	6	1,287 m length of drainage line treated

1,846 ha
AREA TREATED

436 ha.m
TOTAL RUNOFF HARVESTED

248
WATER BODIES RESTORED

243.18 ha
AREA AFFORESTATION

27 ha
SILVI-PASTURE PLANTATION

1,287 km
DRAINAGE LINE TREATED

6.2 OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED SECTOR

OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

	INDICATOR		OUTCOMES/ IMPACT
1	Assessment of sources of water for live-stock and agriculture demand No of structures established for on-farm *(in-situ)* water harvesting in dry lands	1	456 farm ponds established which target the harvest of 80.256 ha m of water which has the potential to irrigate 160 ha area in both kharif and rabi seasons
2	Improvement in soil health	2	1,138 NADEP vermi compost units for soil health improvement
3	Changes in the micro-irrigation practices	3	860 ha Farm bunding with trenches
4	Dry land development with agro-forestry	4	416 ha under dry land horticulture
5	Households established fodder plots	5	1,160 vulnerable households established fodder plots

456 FARM PONDS

1,138 COMPOST UNITS

860 ha FARM BUNDING

416 ha DRY LAND HORTICULTURE

1,160 FODDER PLOTS

6.3 OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

	INDICATOR		OUTCOMES/ IMPACT
1	No. of villages having liquid waste management systems	1	1,898 individual and 187 community level soak pits established for recycle of grey water benefiting 23,933 households
2	Roof rain water harvesting measures	2	74 common roof rainwater harvesting and storage structures with a target to harvest and store 1850000 or 0.185 ha m of rain-water for use

187 COMMON &
1,898 INDIVIDUAL SOAK PITS

74 COMMON ROOF RAINWATER HARVESTING

6.4 OUTCOMES OF CLIMATE RESILIENCE MEASURES

OUTCOMES OF CLIMATE RESILIENCE MEASURES

	INDICATOR		OUTCOMES/ IMPACT
1	Vulnerable GPs are identified for key water actions	1	All GPs (40) are vulnerable for drought, heatwaves and 1 GP area for flood vulnerability
2	Climate resilient measures are identified for climate risks	2	2 models are identified via., Farm ponds, and Silvi pasture 72 farm ponds in 31 GPs 3.345 ha under silvi pasture with 6611 plants

72
FARM PONDS

3.345 ha
SILVI PASTURE

6611
PLANTS

Estimated person days

The total estimated person days required for the above propose activities are 1,99,63,077 as specified in below Figure 6.1.

Estimated Cost

The total estimated cost budgeted for the above propose activities is Rs 55,330 Lakhs as specified below in Figure 6.2.

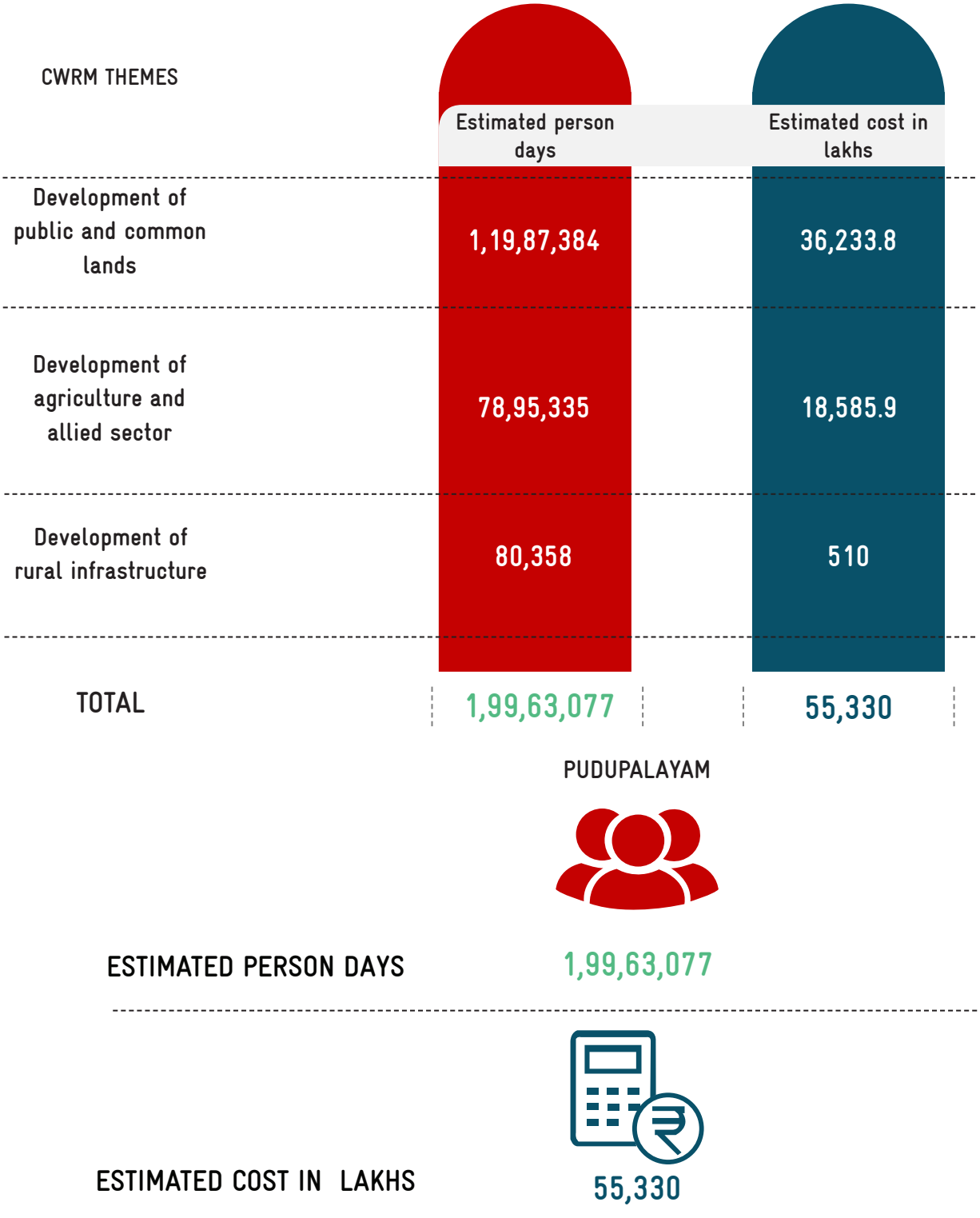


Figure 6.1 & 6.2 Estimated person days & cost for all water actions

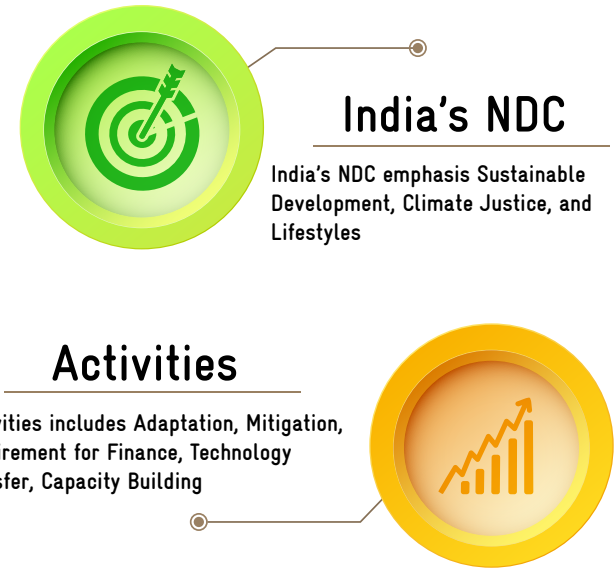
6.5 LINKAGES TO SDGS, NDCS

The 2030 Agenda and the Paris Agreement put forth an innovative and complementary framework for accelerating action and achieving ambitious sustainable development objectives. Under the 2030 Agenda, a series of 17 global Sustainable Development Goals (SDG) have been agreed that are to be universally achieved. Under the Paris Agreement countries are committed to reduce greenhouse gas emissions through Nationally Determined Contributions (NDC) in order to strengthen resilience to climate change. Both The SDGs and Paris Agreements demands urgent climate action and linking WASCA activities with these two agendas is indispensable.

6.5.1 NATIONALLY DETERMINED CONTRIBUTION GOALS AND WASCA TN'S PROGRESS THROUGH NDC

2015 was a historic year in which 196 Parties came together under the Paris Agreement to transform their development trajectories so that they set the world on a course towards sustainable development, aiming at limiting warming to 1.5 to 2 degrees C above pre-industrial levels. Through the Paris Agreement, Parties also agreed to a long-term goal for adaptation – to increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production. Additionally, they agreed to work towards making finance flows consistent with a pathway towards low greenhouse gas emissions and climate- resilient development. Nationally Determined Contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement (Article 4, Paragraph 2) requires each Party to prepare, communicate and maintain successive NDCs that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

Internationally, the recent process on NDC Enhancement (2020) significantly acknowledge the climate change vulnerability on national sectors including agriculture, energy, and urban areas, especially through impacts on water resources. The role that water and water-related activities play in national economies has been increasingly recognized in most Nationally Determined Contributions (NDCs). Many parties included measures related to flooding and drought and chose to include qualitative information on the likely effect of climate change on key sectors.

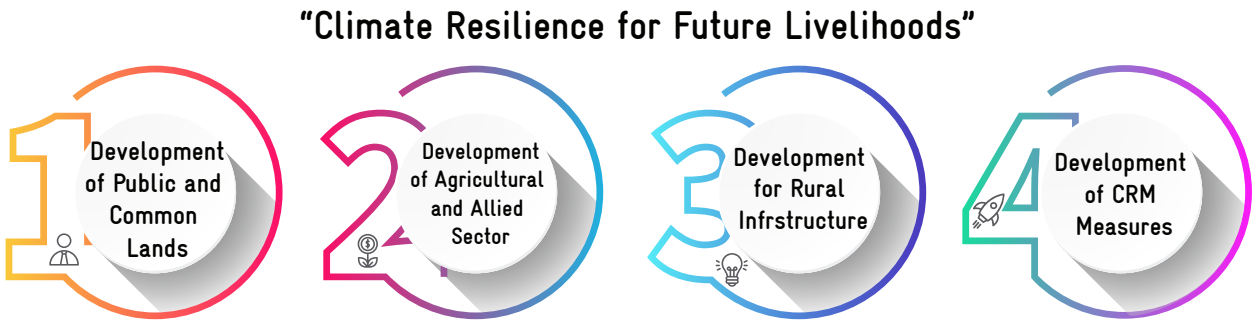


WASCA TN marching on the road to support India's NDC vision by,

1. Supporting creation of an additional carbon sink of 2.5–3 billion tonnes through additional forest and tree cover
2. Enhancing investments in development programs for climate change adaptation in vulnerable sectors
3. Implementing programs to achieve the sustainable natural resource management and efficient utilization of natural resources, leading to a reduction in the "ecosystem footprint"
4. Providing qualitative information on the likely effect of climate risks on key sectors via, water, agriculture and allied sector and socio economic

6.5.2 WASCA TN SUPPORTS SDG

WASCA – TN's four major actions for making "Climate Resilience for Future Livelihoods" are envisaged through SDGs.



TN WASCA will achieve the above actions working closely with Mahatma Gandhi NREGA programme of Ministry of Rural Development and National Water Mission programme of (MoJS). These two ministries are the key stakeholders for WASCA. Apart from these two ministries, the works under WASCA TN are closely linked with Ministry of Agriculture and MoEFCC. The commitments of the above mentioned four ministries towards SDG goals achievements are mapped in connection with the interventions under WASCA Tamil Nadu. The intervention under WASCA TN has direct and indirect contribution to the SDGs and its national targets set as per NITI Aayog.

6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.A, 6.B

SDG GOAL 6

SDG 6 by 2030 : Ensure availability and sustainable management of water and sanitation for all

6.1	Achieve universal and equitable access to safe and affordable drinking water for all
6.2	Achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3	Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
6.4	Increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
6.5	Implement integrated water resources management at all levels (6.5.1)
6.6	Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
6.A	Expand international cooperation and capacity-building support to developing countries in water-and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
6.B	Support and strengthen the participation of local communities in improving water and sanitation management

Indicators considered for district and Block level vulnerability assessment of WASCA TN which is also used in SDG India 2020-21 report (Table 16).

TABLE 16. COMMON VULNERABILITY INDICATORS USED IN WASCA TN & SDG INDIA 2020-21

Head count ratio as per the Multidimensional Poverty Index	
	Persons provided employment as a percentage of persons who demanded employment under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

Percentage of rural population getting safe and adequate drinking water within premises through Piped Water Supply

Percentage of rural population having improved source of drinking water

Percentage of ground water withdrawal against availability

Percentage of Blocks/mandals/talukas over-exploited

Percentage of area covered under afforestation schemes to the total geographical area

Percentage of degraded land over total land area

Percentage increase in area of desertification

The indicators used for district level vulnerability assessment along with its linked SDGs are already tabulated in (Table 2). The detailed proposed water actions in CWRM which was assessed based on the vulnerability dimensions are linked with climate vulnerability index and SGDs are tabulated in Table 17 to 19.

TABLE 17. WATER ACTIONS ON DEVELOPMENT OF PUBLIC & COMMON LANDS & ITS LINKED SDG

Name of the work	Number of CWRM works	Climate Vulnerability Index Impacting (WASCA TN)	Linked SDG Goal
	8,931	W3	SDG 1,2, 6,13&15
Contour Continuous Bunds (CCB) for Afforestation area(m)	915	W3	SDG 1,2, 6,13&15
Composting (No. of units)	209	W1	SDG1& 6
Afforestation in Public/common lands(ha)	243	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community)(ha)	308	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development(ha)	27	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (Km)	1	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation(ha)	2,980	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	313	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (Km)	1	C1,C2,C3,W3,S2	SDG 1, 6&13

Nursery Development (No. of units)	271	C1,S2,S4	SDG 1,2 &6
Restoration of waterbodies: PWD and Tanks (Number)	56	S2, S1	SDG 6, 1, 13
Restoration of waterbodies: Ponds (Number)	192	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	1,651	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	313	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (m)	1,854	W1,W3,W4	SDG1 & 6

TABLE 18. WATER ACTIONS ON DEVELOPMENT OF AGRICULTURAL AND ALLIED SECTOR & ITS LINKED SDG

Name of the Work	Number of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	860	A1,A3,W1,W3	SDG 1,2&6
Micro Irrigation(ha)	197	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	456	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	484	W1,W5,A1,A3,S2,S4	SDG 2, 6&
15	458	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Dry land Horticulture/Agro-forestry - Individual (ha)	417	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	1,160	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (No. of units)	1,138	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	1,160	A3, S4	SDG 1& 2, 15
Cattle shelters (No. of units)	1,138	S4	SDG 1& 2
Goat/sheep shelters (No. of units)	175	S4	SDG 1& 2
Cattle trough (No. of units)	1,138	W5,S4	SDG 1& 2
Poultry Shed (No. of units)	978	S2,S4	SDG 1& 2
Construction of new open wells & Recharge Shafts (No. of units)	552	S3,W5,W1	SDG 1,2 & 6

TABLE 19. WATER ACTIONS ON RURAL WATER MANAGEMENT & IT'S LINKED SDG

Name of the work	No. of CWRM works	CVI	Linking SDG
Soak Pits (Community) (No. of units)	187	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	1,898	W3,S2	SDG 1& 6
Roof Rain Water Harvesting (No. of units)	74	W3,S1,S3	SDG 1& 6

சிறப்பொடு பூசனை செல்லாது வானம்
வறக்குமேல் வானோர்க்கும் ஈண்டு

குறள் - 18

The earth beneath a barren sky
Would offerings for the gods deny

Thirukkural - 18

CHAPTER 7

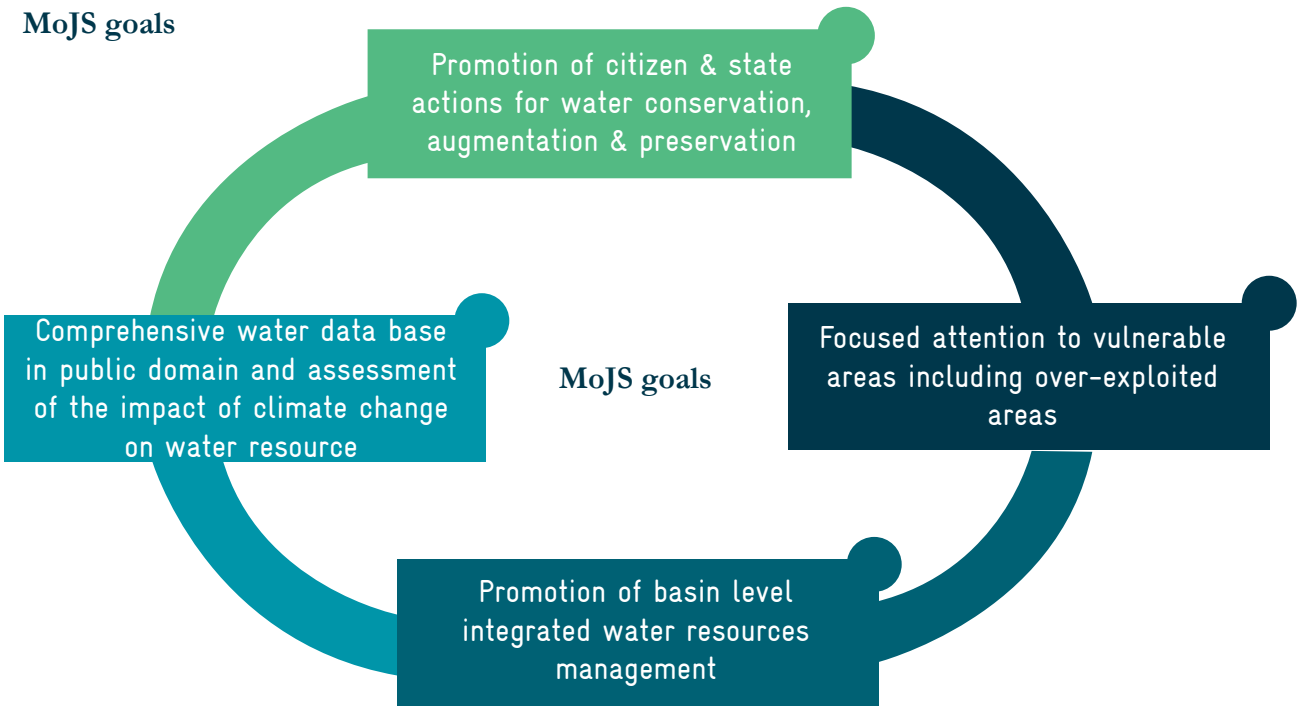
7 IMPLEMENTATION OF GP PLANS

Execution of GP plans includes integrating all verified, approved works in MORD's web enabled application NREGA Soft (https://nrega.nic.in) for mainstreaming WASCA. The target GPs are identified first, the status of GIS based plans and total works along with its expenditure and category wise estimation cost of works as per GIS Plan, GIS based planning cumulative report are uploaded as given below

7.1 INTEGRATION INTO NREGA SOFT

WASCA is progressing towards digitizing and integrating GP level GIS based plans, both NRM and Non NRM into Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of Pudupalayam Bock is listed in Table 20 and work progress, expenditure during the past 3 financial years are shown in Figure 7.1 and 7.2. The Total No. of works, ongoing and completed GIS works are shown in Figure 7.3. The GP wise recommendations and works uploaded are given in Annexure 7.1.

TABLE 20. GIS PLAN IMPLEMENTATION- KEY PARAMETERS PERFORMANCE IN PUDUPALAYAM BLOCK



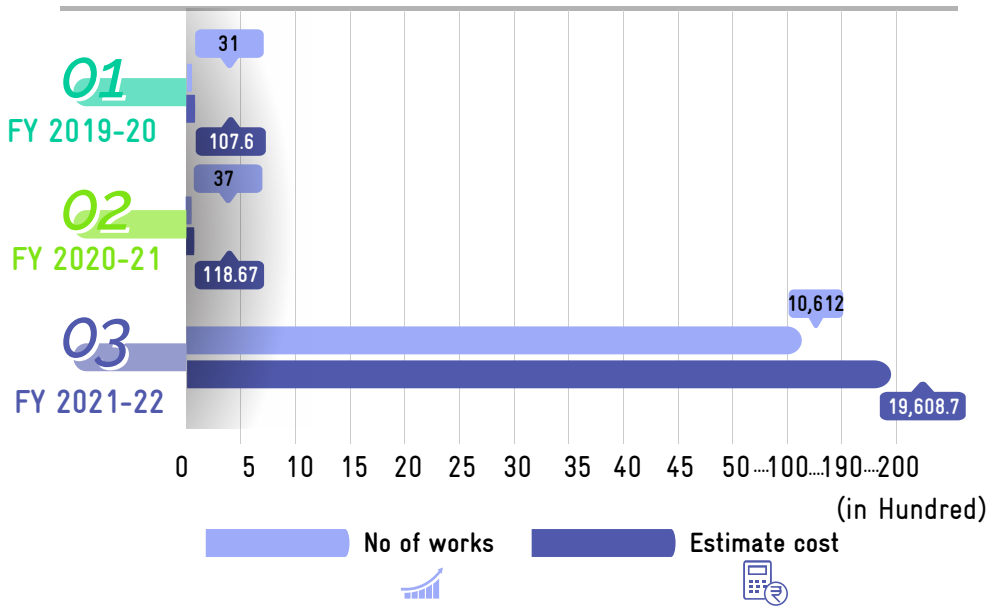


Figure 7.1. Work progress in last 3 years

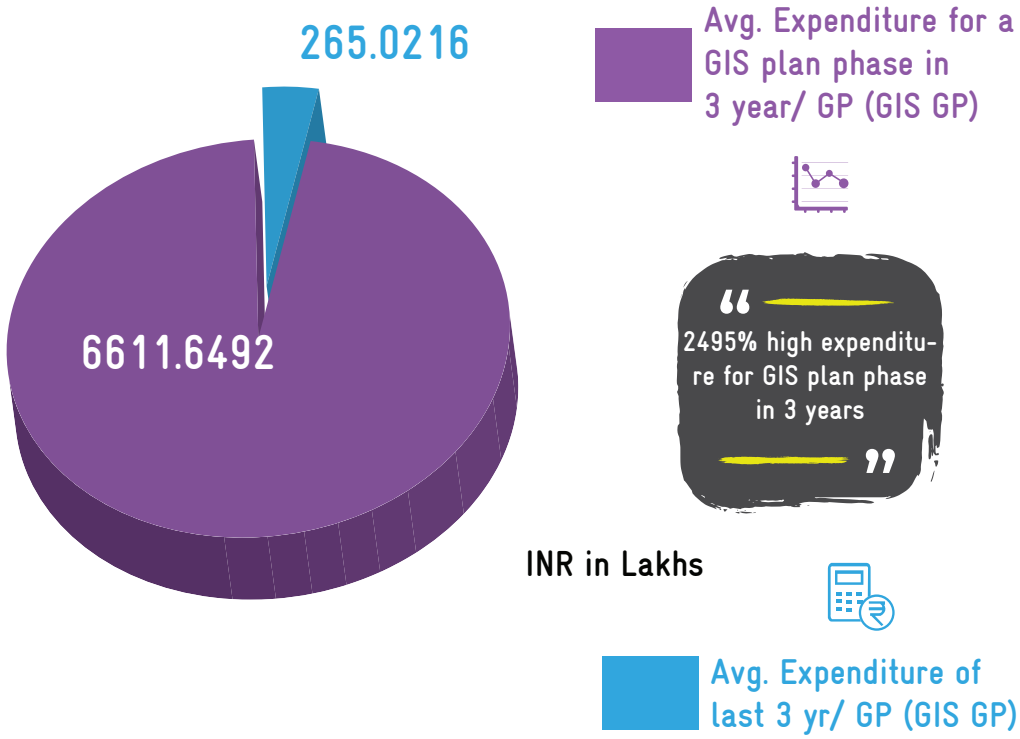
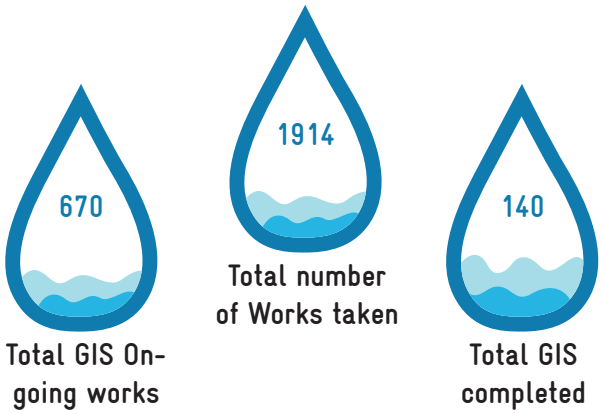


Figure 7.2. Average Expenditure for GIS plan in last 3 years



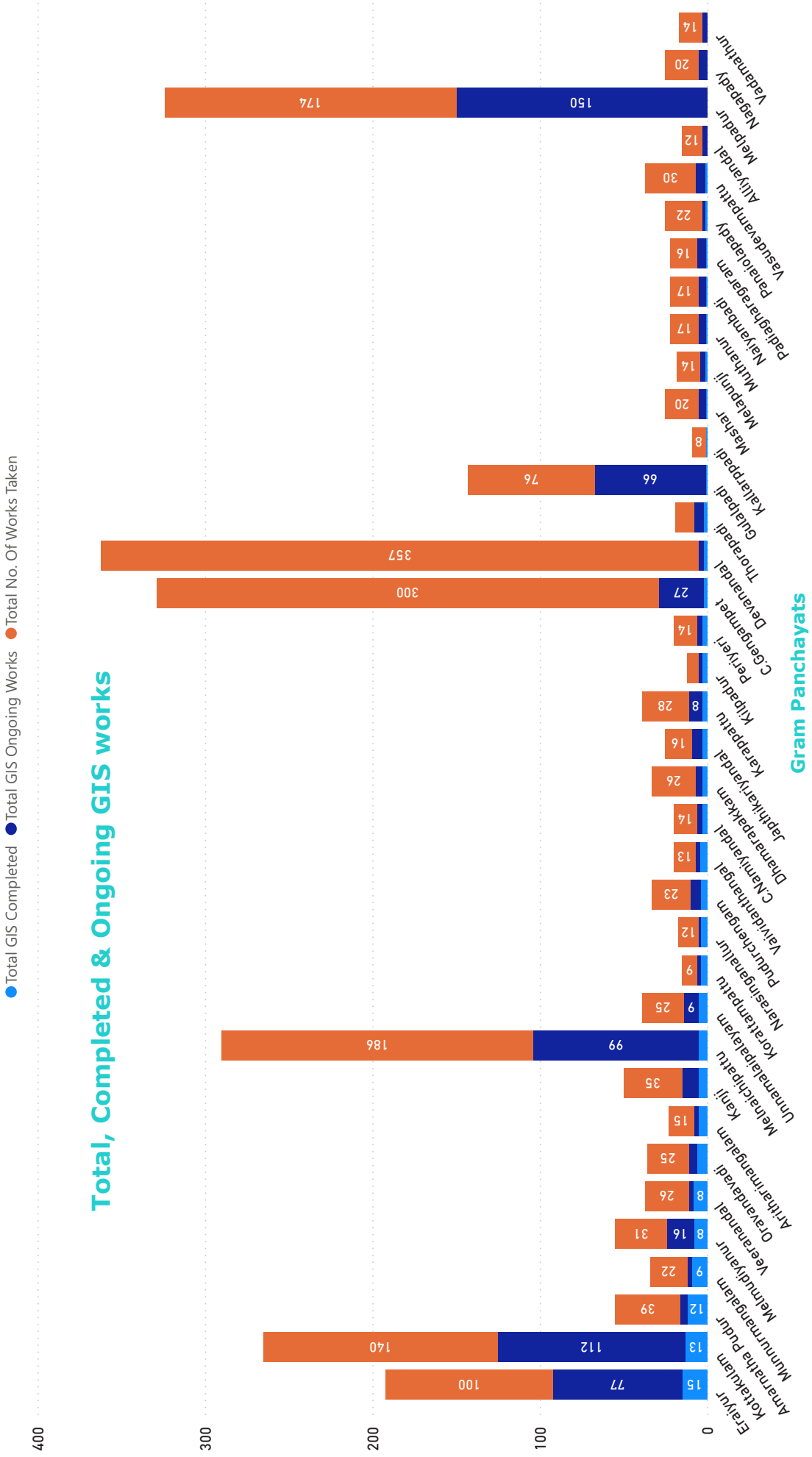
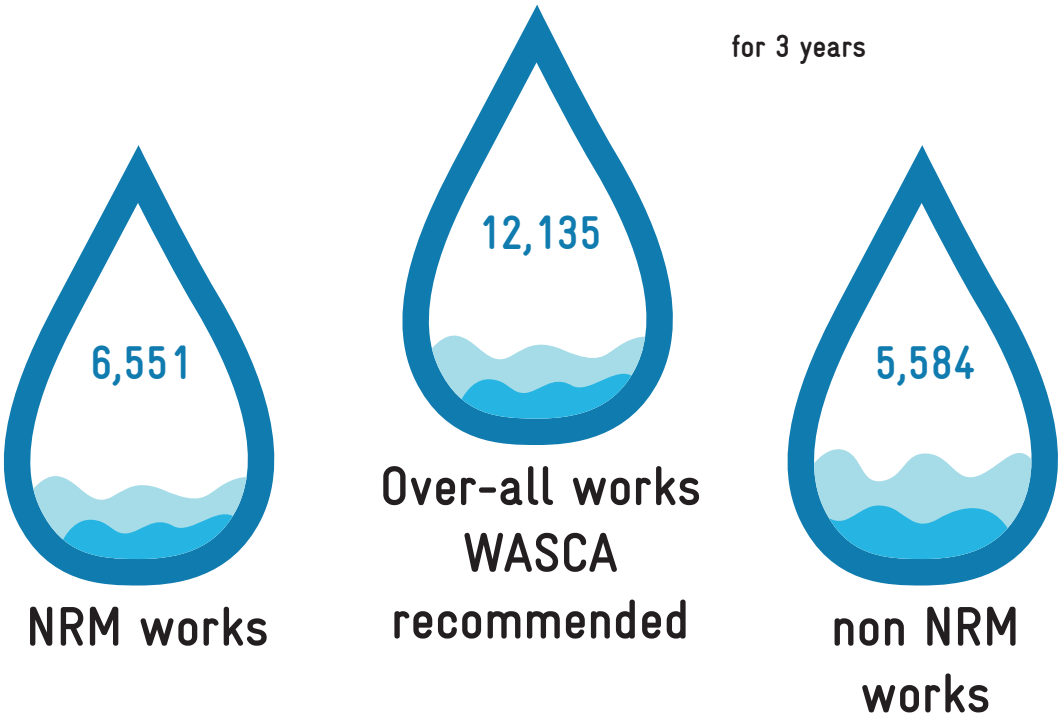


Figure 7.3. GP wise total, completed and ongoing GIS works

7.2 NRM AND NON NRM WORKS

Over-all works WASCA recommended for 3 years are 12,135, out of that 6,551 are NRM works and 5,584 are non-NRM works. A total of 9,950 works are uploaded so far for the financial year 2021-22.



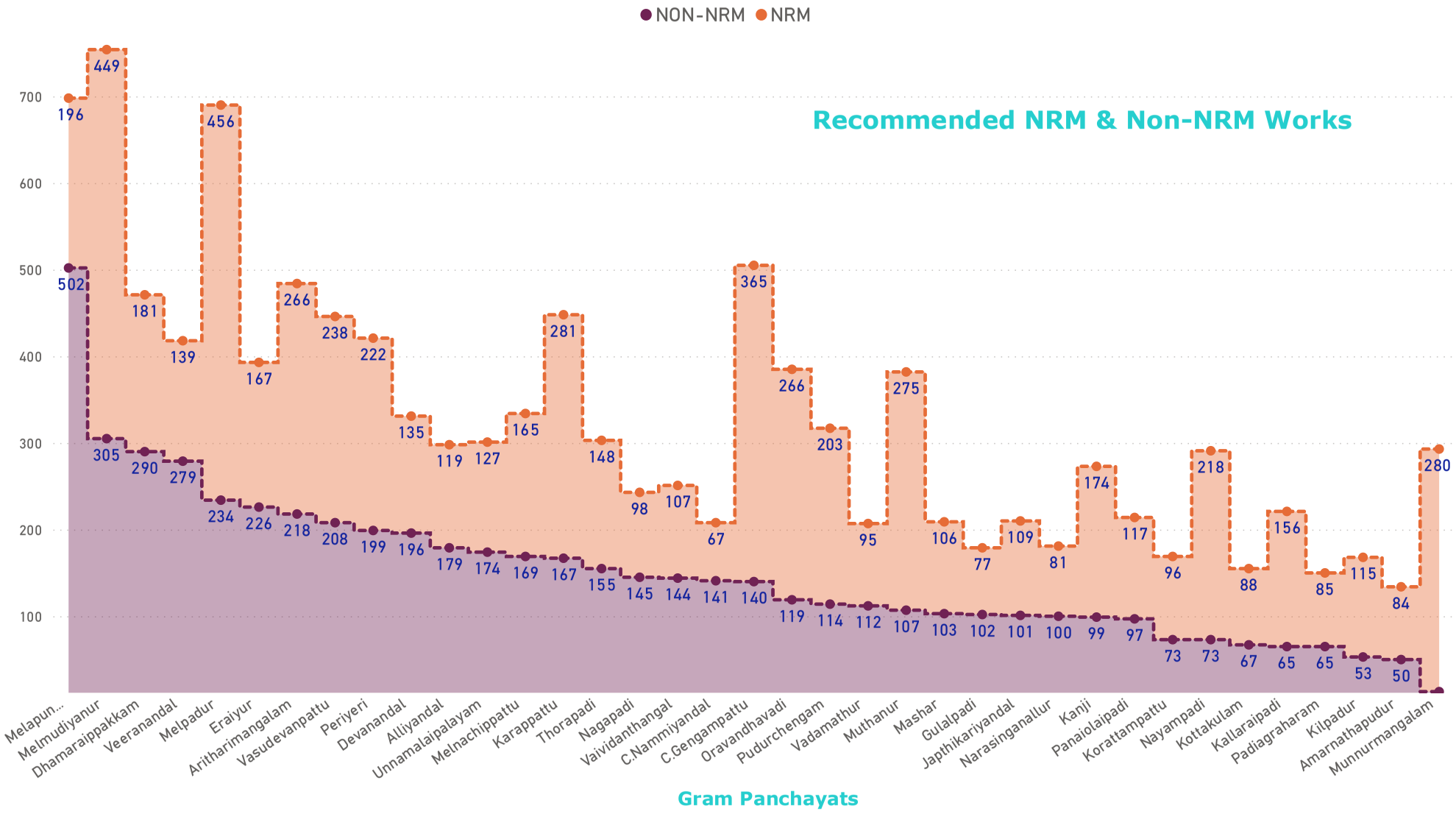


Figure 7.4. GP wise recommended NRM and non-NRM works

7.3 ONGOING WORKS

The ongoing works in Pudupalayam Block includes Anganwadi/Other Rural Infrastructure, Drought Proofing, Rural Connectivity, Rural Sanitation, WCWH, Works on Individuals Land (Category IV). A total of 136 works are ongoing in the Block, whereas, WCWH shares the highest of 48 % followed by Individual beneficiary's category works of 38 % while drought proofing and Anganawadi/other rural infrastructure works are less in number (Figure 7.5). The GPs and work category-wise details of works are tabulated in the Annexure 7.2.

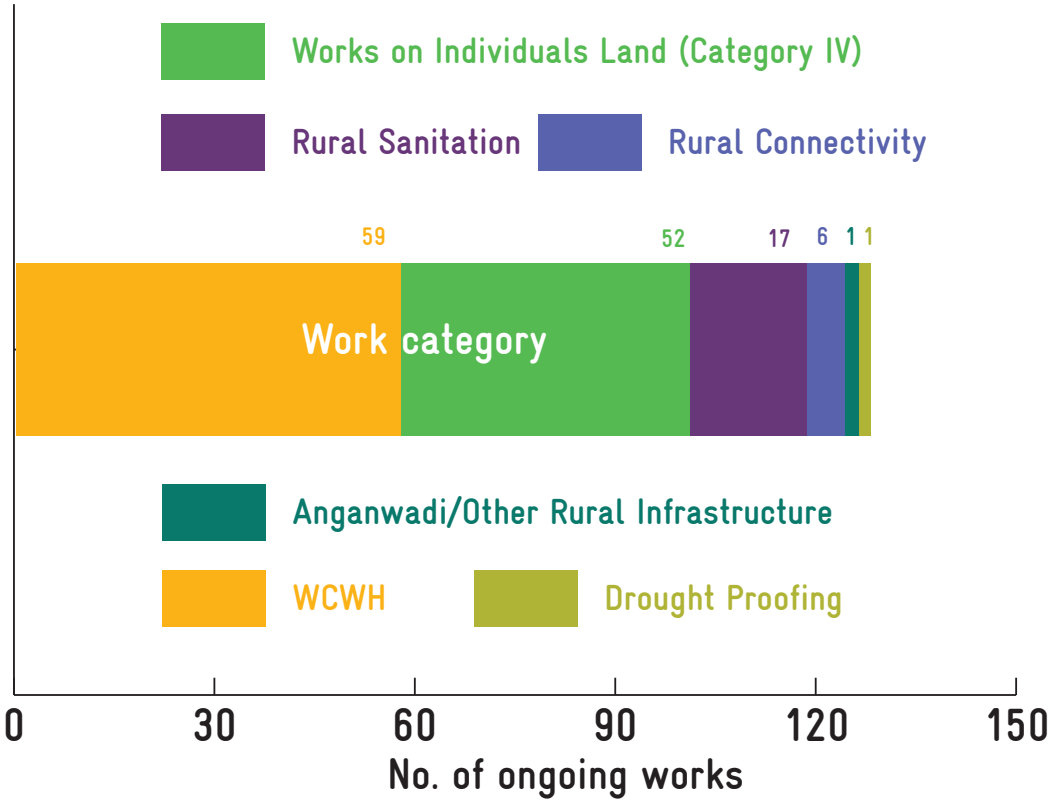


Figure 7.5. Category-wise ongoing works in Pudupalayam Block

7.4 CATCH THE RAIN

The NWM's campaign "Catch the Rain" with the tagline "Catch the rain, where it falls, when it falls" is to nudge the states and stakeholders to create appropriate Rain Water Harvesting Structures (RWHS) suitable to the climatic conditions and sub-soil strata before monsoon season. Under this campaign, drives to make check dams, water harvesting pits, rooftop RWHS etc., removal of encroachments and de-silting of tanks to increase their storage capacity; removal of obstructions in the channels which bring water to them from the catchment areas etc., repairs to step-wells and using defunct bore wells and unused wells to put water back to aquifers etc., are to be taken up with the active participation of people. The expenditure towards progressive works on Catch the rain campaign of Pudupalayam Block is shown in Figure 7.6.

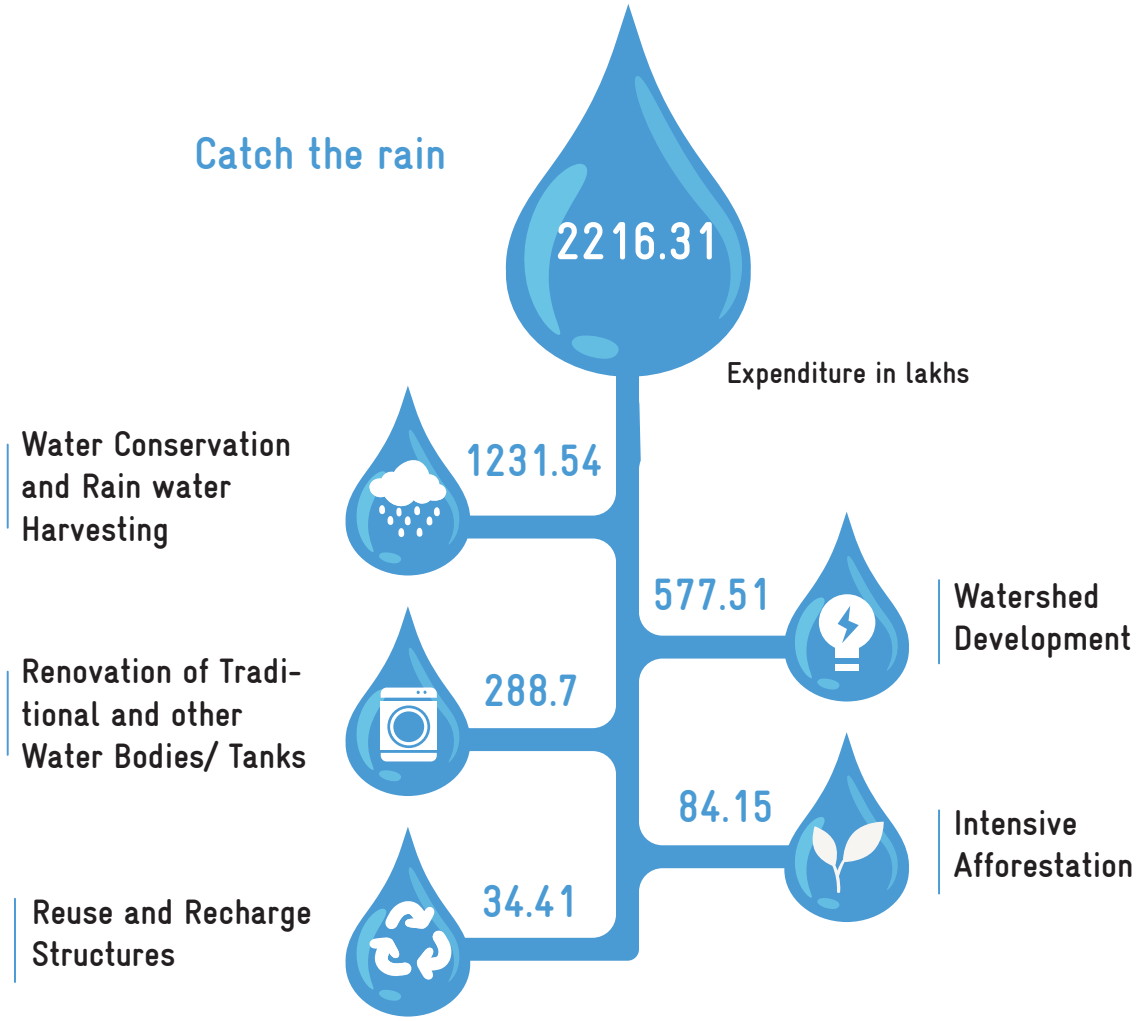


Figure 7.6. Catch the rain campaign in Pudupalayam Block

தானம் தவம்இரண்டும் தங்கா வியன்உலகம்
வானம் வழங்கா தெனின்

குறள் - 19

Were heaven above to fail below
Nor alms nor penance earth would show

Thirukkural - 19

CHAPTER 8

8 CASE STUDY

This chapter illustrates how CWRM planning processes unfolds the analysis, results and impacts from macro-watershed to the lowest planning unit, the GP through case studies. Case studies explain the need for an integrated multi-tier approach to address the issues of water conservation seen through the lens of climate change. Case studies on micro watersheds and GP are expounded holistically through macro watersheds to warrant long-term benefits. This integrated approach will help in watershed assessment, management and monitoring of implementation projects efficiently.

8.1 MACRO-WATERSHEDS IN PUDUPALAYAM BLOCK

Pudupalayam block has three river sub-basins Cheyyar River, Pamban and Thurinjalar Watersheds. Under Cheyyar River watershed (4C2A4) consists of 71 micro-watersheds covering an area of 25,945 ha. Under Pamban watersheds (4C1B5) consists of 6 micro-watersheds covering an area of 1,324 ha. Under Thurinjalar watershed (4C1B3) consists of 10 micro-watersheds covering an area of 2,306 ha. Out of 37 GPs in the block, 31 GPs falling under Cheyyar River (4C2A4) watershed, 3 GPs under Cheyyar River (4C2A4) & Pamban watershed (4C1B5) and 3 GPs under Cheyyar River (4C2A4) & Thurinjalar (4C1B3) watersheds Table 21 & 22.

TABLE 21. GENERAL DESCRIPTION OF MACRO-WATERSHEDS COVERING PUDUPALAYAM BLOCK

Macro-watershed	Area in ha	No. of micro-watersheds
Cheyyar River	25,945	71
Pamban	1,324	6
Thurinjalar	2,306	10

TABLE 22. NO. OF GPS COVERED UNDER WATERSHEDS IN PUDUPALAYAM BLOCK

Name of macro-watershed	No. of GPs
Cheyyar River	31
Cheyyar River and Pamban	3
Cheyyar River and Thurinjalar	3

Figure 8.1 & 8.2 show the boundary of Cheyyar River, Pamban and Thurinjalar Watershed boundaries on Pudupalayam Block boundary. The micro watershed based works are identified using Basin, Sub-basin, and micro-watershed with GP administrative boundaries through composite water resources management plan approach. The ridge map of macro-watershed and GPs in Pudupalayam Block are shown in Figure 8.3 and 8.4.

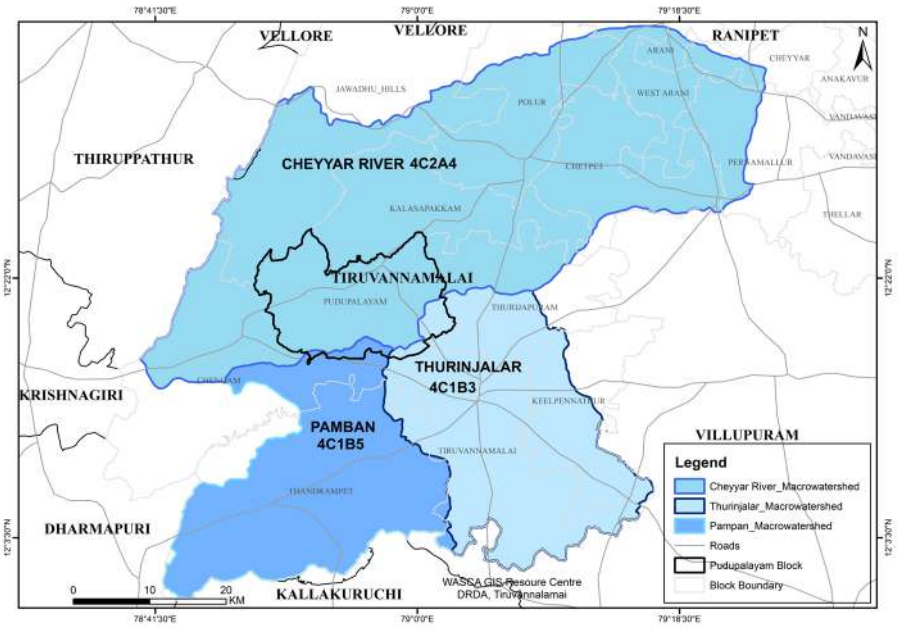


Figure 8.1. Macro-watershed map- Pudupalayam Block

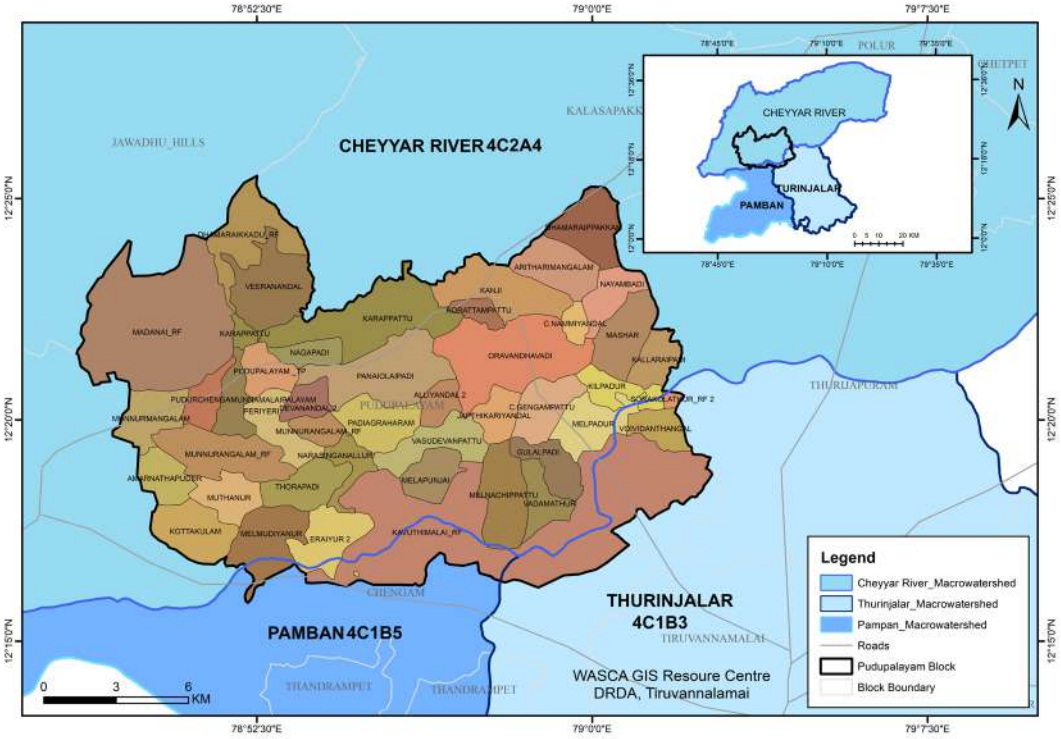


Figure 8.2. Macro-watershed with GPs map - Pudupalayam Block

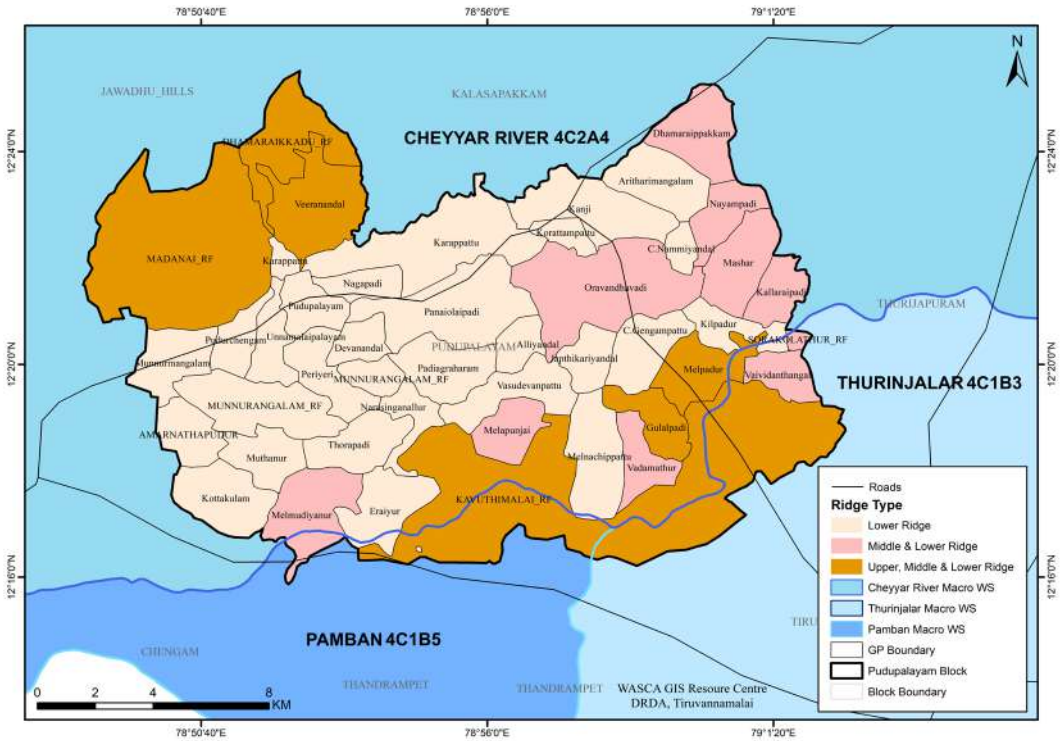


Figure 8.3. Macro-watershed and ridge map-Pudupalayam Block

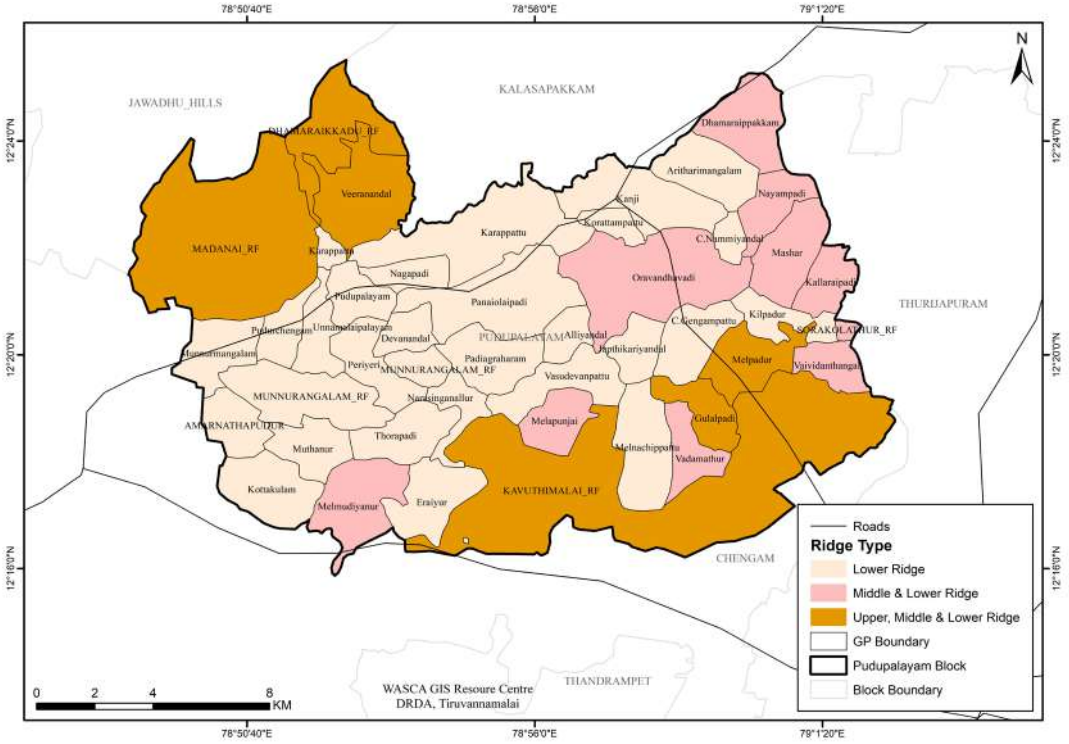


Figure 8.4. GP level ridge map -Pudupalayam Block

All the proposed works are identified using basin, sub-basin, and micro watershed with GP administrative boundaries through composite water resources management plan approach. The ridge details, GPs proposed works in all macro-watersheds in Pudupalayam block are listed in Table 23 to 31.

TABLE 23. RIDGE DETAILS OF MICRO- WATERSHED IN PUDUPALAYAM BLOCK FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED

Sl. No	Micro-watershed Code	Micro watershed Area in ha	Ridge type
1	4C2A4f08c	405.81	Upper, Middle & Lower
2	4C2A4f09b	366.17	
3	4C2A4f09a	341.52	
4	4C2A4f13a	190.93	
5	4C2A4f12d	250.09	
6	4C2A4g08d	527.89	
7	4C2A4g09a	432.47	
8	4C2A4g09b	757.84	
9	4C2A4g12b	830.62	
10	4C2A4g09c	601.44	
11	4C2A4g12c	762.17	
12	4C2A4g10a	559.76	
13	4C2A4c05a	472.01	Middle & Lower
14	4C2A4f08b	245.08	
15	4C2A4f09c	655.02	
16	4C2A4f05d	377.32	
17	4C2A4f05b	413.03	

18	4C2A4g08a	753.94	Middle & Lower
19	4C2A4c12d	620.49	
20	4C2A4g10b	521.2	
21	4C2A4f10b	2.93	Lower
22	4C2A4f11a	155.41	
23	4C2A4f01b	0.33	
24	4C2A4f02a	6.68	
25	4C2A4f02b	0.47	
26	4C2A4f10a	106.58	
27	4C2A4f08a	22.87	
28	4C2A4c04c	0.07	
29	4C2A4f03b	2.13	
30	4C2A4f13b	2.27	
31	4C2A4c05b	488.14	
32	4C2A4c12a	302.61	
33	4C2A4f04a	550.59	
34	4C2A4c05c	736.92	
35	4C2A4f03a	121.46	
36	4C2A4f04b	498.32	
37	4C2A4c12b	422.84	
38	4C2A4f12c	355.76	
39	4C2A4f05a	484.29	
40	4C2A4c12c	306.22	
41	4C2A4f06c	476.58	
42	4C2A4g01a	284.77	
43	4C2A4f12b	394.21	
44	4C2A4f12a	269.92	
45	4C2A4f04c	623.43	
46	4C2A4f05c	443.88	
47	4C2A4g01b	482.74	
48	4C2A4g08b	573.81	
49	4C2A4f06a	472.27	
50	4C2A4g01c	315.38	
51	4C2A4g02c	227.31	
52	4C2A4g02a	315.9	
53	4C2A4f06d	493.39	
54	4C2A4g02d	388.77	
55	4C2A4g05b	203.27	
56	4C2A4g12a	730.83	
57	4C2A4g07c	450.59	
58	4C2A4g02b	513.56	
59	4C2A4g08c	297.46	
60	4C2A4g07b	329.24	
61	4C2A4g07a	268.16	
62	4C2A4g03b	176.03	
63	4C2A4g03a	343.85	

64	4C2A4g04b	446.61	Lower
65	4C2A4g05a	5.59	
66	4C2A4g03c	771.85	
67	4C2A4g04c	266.43	
68	4C2A4g04a	473.96	
69	4C2A4g10c	250.87	
70	4C2A4g11b	2.66	
71	4C2A4g11a	0.13	

TABLE 24. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED IN PUDUPALAYAM BLOCK

Sl.No	GP	Ridge type
1	Gulalpadi	Upper, Middle & Lower Ridge
2	Veeranandal	
3	Kallaraipadi	Middle & Lower
4	Nayambadi	
5	Mashar	
6	Vadamathur	
7	Dhamaraippakkam	
8	Melapunjai	
9	Oravandavadi	
10	Kanji	Lower
11	Korattampattu	
12	C.gengampattu	
13	Panaiolaipadi	
14	Periyeri	
15	Karappattu	
16	Padiagraharam	
17	Vasudevanpattu	
18	Unnamalaipalayam	
19	Devanandal 2	
20	Japthikariyandal	
21	Pudurchengam	
22	Munnurmangalam	
23	Aritharimangalam	
24	C.nammiyandal	
25	Alliyandal 2	
26	Narasinganallur	
27	Thorapadi	
28	Muthanur	
29	Kottakulam	
30	Nagapadi	
31	Amarnathapudur	

TABLE 25. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED IN PUDUPALAYAM BLOCK

Work wise Ridge Details of Cheyyar River in Pudupalayam Block			
Sl. No	**Proposed Work**	**Ridge type**	**Extent**
1	Afforestation in Public/common lands (ha)	Upper	154
2	Drainage Line Treatment (DLT) (m)		1,20,427
3	CC Check dams (No.)	Middle	40
4	Block Plantation (Community) (ha)		245
5	Linear Plantation (m)		31,760
6	Avenue plantation (m)		81,541
7	Agro Forestry (ha)		1.58
8	Mini Forest (ha)		4.57
9	Composting	Lower	159
10	Restoration of waterbodies: Tanks and Ooranis (No.)		148
11	Artificial Recharge Structure (No.)		1,261
12	Farm Bunding with Boundary Trenches - Individual (ha)		661
13	Construction of Farm Ponds - Individual (No.)		377
14	Land development - Individual (ha)		134
15	Azolla units - Individual (No.)		1,003
16	NADEP Vermi compost (No.)		981
17	Cattle shelters (No.)		947
18	Goat/sheep shelters (No.)		134
19	Cattle trough		947
20	Construction of new open wells & Recharge Shafts (No.)		418
21	Soak Pits (Community) (No.)		116
22	Soak Pits (Individual) (No.)		1,215
23	Roof Rain Water Harvesting (No.)		58
24	Nutri Garden (No.)		46,854
25	Silt application (No.)		139

TABLE 26. MICRO -WATERSHED IN PUDUPALAYAM BLOCK FALLING UNDER PAMBAN MACRO-WATERSHED

Pamban Macro watershed – Ridge Details: Pudupalayam Block			
Sl. No	**Micro watershed Code**	**Micro watershed Area in ha**	**Ridge type**
1	4C1B5d08b	456.57	Upper, Middle & Lower
2	4C1B5d08c	269.87	
3	4C1B5d07b	379.83	
4	4C1B5d10c	114.72	Lower
5	4C1B5d10b	76.20	
6	4C1B5d05b	27.14	

TABLE 27. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER & PAMBAN MACRO-WATERSHED IN PUDUPALAYAM BLOCK

Gram Panchayat falling under Cheyyar River &Pamban macro-watershed in Pudupalayam Block		
Sl. No	**Name of the GP**	**Ridge type**
1	Melmudiyanur	Middle & Lower
2	Eraiyur 2	Lower
3	Melnachippattu	

TABLE 28. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER & PAMBAN MACRO-WATERSHED IN PUDUPALAYAM BLOCK

Work wise Ridge Details of Cheyyar River & Pamban in Pudupalayam Block			
Sl. No	**Proposed Work**	**Ridge type**	**Extent**
1	Afforestation in Public/common lands (ha)	Upper	68
2	Drainage Line Treatment (m)		17294
3	Fencing (Km)		4
4	Block Plantation (Community) (ha)	Middle	57.3
5	CC Check dams (No.)		5
6	Linear Plantation (m)		25254
7	Avenue plantation (Km)		5731
8	Mini Forest (ha)		2.93
9	Compost Pit (No.)	Lower	22
10	Nursery Development (No.)		1
11	Restoration of waterbodies: Tanks and Ooranis (No.)		20
12	Artificial Recharge Structure (No.)		197
13	Farm Bunding with Boundary Trenches - Individual (ha)		64
14	Construction of Farm Ponds - Individual (No.)		43
15	Land development - Individual (ha)		113
16	Dryland Horticulture/Agroforestry - Individual (ha)		11
17	Azolla units - Individual (No.)		220
18	NADEP Vermi compost (No.)		146
19	Cattle shelters (No.)		146
20	Goat/sheep shelters (No.)		72
21	Cattle trough (No.)		146
22	Construction of new open wells & Recharge Shafts (No.)		113
23	Soak Pits (Community) (No.)		10
24	Soak Pits (Individual) (No.)		72
25	Roof Rain Water Harvesting (No.)		6
26	Nutri Garden (No.)		721
27	Silt application (No.)		47

TABLE 29. MICRO-WATERSHED IN PUDUPALAYAM BLOCK FALLING UNDER THURINJALAR MACRO-WATERSHED

Thurinjalar Macro watershed – ridge details: Pudupalayam Block			
Sl. No	**Micro watershed Code**	**Micro watershed Area in ha**	**Ridge type**
1	4C1B3e16b	437.28	Upper, Middle & Lower
2	4C1B3e15a	177.99	
3	4C1B3e15c	511.25	
4	4C1B3e15b	415.76	
5	4C1B3e10c	37.69	Lower
6	4C1B3e14c	209.6	
7	4C1B3e17c	367.45	
8	4C1B3e17b	68.78	
9	4C1B3e16a	70.78	Lower
10	4C1B3e10d	10.35	

TABLE 30. GRAM PANCHAYAT FALLING UNDER CHEYYAR RIVER & THURINJALAR MACRO-WATERSHED IN PUDUPALAYAM BLOCK

Gram Panchayat falling under Cheyyar River &Pamban macro-watershed in Pudupalayam Block		
Sl. No	**Name of GPs**	**Ridge type**
1	Kilpadur	Lower
2	Voividanthangal	Middle & Lower
3	Melpadur	Upper, Middle & Lower

TABLE 31. WORK WISE RIDGE DETAILS OF CHEYYAR RIVER & THURINJALAR IN PUDUPALAYAM BLOCK

Sl. No	**Proposed Work**	**Ridge type**	**Extent**
1	Afforestation in Public/common lands (ha)	Upper	20
2	Drainage Line Treatment (m)		2153
3	Fencing (Km)		2
4	Block Plantation (Community) (ha)	Middle	5
5	Avenue plantation (m)		6728
6	CC Check dams (No.)		3
7	Compost Pit (No.)	Lower	28
8	Nursery Development (No.)		1
9	Restoration of waterbodies: Tanks and Ooranis (No.)		12
10	Artificial Recharge Structure (No.)		183
11	Farm Bunding with Boundary Trenches - Individual (ha)		134
12	Construction of Farm Ponds - Individual (No.)		46
13	Land development - Individual (ha)		14
14	Dryland Horticulture/Agroforestry - Individual (ha)		58
15	Azolla units - Individual (No.)		52
16	NADEP Vermi compost (No.)		52
17	Cattle shelters (No.)		52
18	Goat/sheep shelters (No.)		10

19	Cattle trough (No.)	Lower	52
20	Construction of new open wells & Recharge Shafts (No.)		21
21	Soak Pits (Community) (No.)		14
22	Soak Pits (Individual) (No.)		111
23	Roof Rain Water Harvesting (No.)		6
24	Nutri Garden (No.)		4479
25	Silt application (No.)		14

8.2 MODEL MICRO-WATERSHED -ORAVANDAVADI

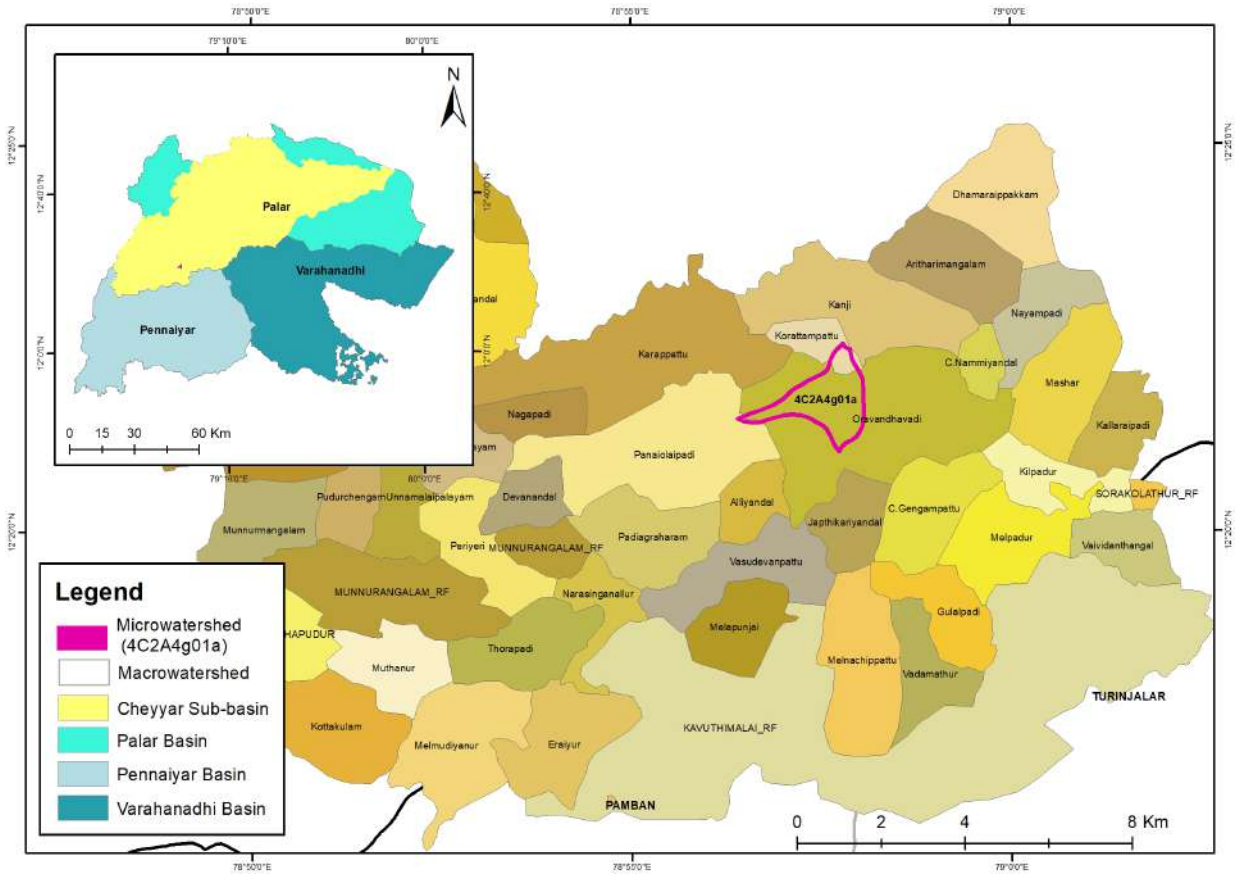


Figure 8.5. Oravandavadi micro-watershed map

The micro watershed case study addresses the issues of water conservation and climate change through integrated approach. The decentralized micro watershed planning has been conceived for holistic development and management to ensure sustainable long-term benefits. The micro-watershed plan has been sequenced from ridge to valley for proper implementation of different development programs. This includes coordination of various natural components like groundwater, surface water, geology, hydrogeology, catchment, land use, soil, population, salt affected water along with various water resource supply and demand component. The ultimate goal is to achieve and maintain a balance between resources development to increase the welfare of the population.

ORAVANDAVADI MICRO-WATERSHED

Oravandavadi micro-watershed falls under Oravandavadi and Korattampattu GP, Pudupalayam Block in Tiruvannamalai District. This Micro-watershed is the part of Cheyyar Macro-watershed in Cheyyar sub-basin (Figure 8.5). The general information, geology, hydrogeology, natural drainage line, catchment area, ground water status, water budget of Oravandavadi Micro watershed is given Table. Proposed activities respect to NRM and non-NRM and beneficiaries are depicted in Figure 8.6 and 8.7. Ridge wise proposed treatment area, estimated cost and required person days and key outcomes (Table 32 to 43). The key CWRM parameters for the GPs falling in this micro watershed is in Annexed 8.

TABLE 32. GENERAL INFORMATION OF THE MICRO-WATERSHED

Description	Name/ Number/ Quantity/ Status
Name of the micro-watershed	**Oravandavadi**
micro-watershed Number	**4C2A4g01a**
Name of the Basin	Palar Basin
Name of the subbasin	Cheyyar Sub Basin
Name of the Macro-watershed	Cheyyar River
Number of GPs covered under the micro-watershed	2
Name of the GPs	Oravandavadi and
Korattampattu	12°39'43.72"N to 12°41'23.96"N
Latitude of micro-watershed (From To)	12°21'0.56"N to 12°22'24.40"N
Longitude of micro-watershed (From To)	78°56'24.99"E to 78°58'3.81"E
Total area of the micro-watershed in ha	285
Percentage of micro-watershed area in Oravandavadi GP	88
Percentage of micro-watershed area in Korattampattu GP	12
Area of micro-watershed falling in Oravandavadi GP in ha	252
Area of micro-watershed falling in Korattampattu GP in ha	33
Total population of Oravandavadi GP	5,578
Total population of Korattampattu GP	1,518
Annual Average Rainfall (mm)	1,047
Annual maximum Temperature (°C)	33
Annual Minimum Temperature (°C)	22.8
Evapotranspiration Losses of Oravandavadi GP (ha.m)	51.17
Evapotranspiration Losses of Korattampattu GP (ha.m)	10.84
Volumetric soil moisture availability (%)	23
Climate Risk	Drought and heat waves
CVI Index Value for Oravandavadi GP (Based on WASCA Climate study)	0.534
CVI Index Value for Korattampattu GP (Based on WASCA Climate study)	0.499
Agro-Climatic Zone	North eastern zone (TN-1)
Agro Ecological Sub-Region (ICAR)	Eastern Ghats
Status of Ground water in Oravandavadi GP	Over Exploited
Status of Ground water in Korattampattur GP	Over Exploited

TABLE 33. GEOLOGY, HYDROGEOLOGY OTHER CHARACTERISTICS OF AKKUR MICRO-WATERSHED

Geology occurrence in % (Hard rock)	100
Geology Quality	Moderate
Depth of weathered zone and/or maximum depth of fractures in Hard Rock area in m	30 to 60
Bottom of the unconfined aquifer in soft rock areas in meters	20 to 40
No of lineaments passing through the micro-watershed	One
Type of lineaments passing through the micro-watershed	The lineaments in lower ridge,
The lineaments are parallel to drainage line.	
Barren & waste lands (ha)	78.4 (lower ridges)
Geology occurrence in % (Hard rock)	100
Geology Quality	Moderate
Depth of weathered zone and/or maximum depth of fractures in Hard Rock area in meters	30 to 60
Bottom of the unconfined aquifer in soft rock areas in meters	20 to 40
Sheet Erosion (ha)	61 (Upper and Middle Ridge)

TABLE 34. NATURAL DRAINAGE LINES IN ORAVANDAVADI MICRO-WATERSHED

No. of 1st Order drains (No.)	2
No. of 2nd Order drains (No.)	1
No. of 3rd Order drains (No.)	1
Total length of natural drainage line (m)	3,768
Drainage density (ha.m)	13.22

TABLE 35. MICRO-WATERSHED'S CATCHMENT AREA

Catchment Area in ha	Oravandavadi GP	Korattampattu GP
Good catchment area	260.34	114.96
Average catchment area	6.56	0
Bad catchment area	1,237.8	217.63

TABLE 36. GROUND WATER STATUS OF MICRO-WATERSHED

Firka assessment Unit for Oravandavadi, Korattampattu in ha.m		
Firka Assessment Unit in ha.m	**Oravandavadi**	**Korattampattu**
Name of the Firka (assesment unit) falling under micro-watershed	Eraiyur	Pudupalayam
Net annual ground water availability	3,474.06	4,145.63
Existing gross ground water draft for irrigation	2,841.50	5252
Existing gross ground water draft for domestic and industrial water supply	1,741.83	261.79
Existing gross ground water draft for all uses	4,583.33	5,513.79
Provision for domestic and industrial requirement supply to 2025	1,979.76	297.55
Net ground water availability for future irrigation development	-1,347.21	-1,403.92

TABLE 37. GP WISE WATER BUDGET OF MICRO -WATERSHED- ORAVANDAVADI & KORATTAMPATTU

Firka assessment unit in ha.m	Oravandavadi	Korattampattu
Water for human (ha.m)	15.27	4.16
Water for agriculture	1,417.2	257.4
Water for animal	5.93	2.85
Village wise water required	1,438.4	264.4
Available run-off from rain water (derived from strange method)	330.9	83.8
Harvested runoff from water harvesting activities	0.6	0.2
Potential Harvesting from proposed Interventions	29.5	26.3
Total water harvested	30.1	26.5
Water demand and supply difference	-1,408.3	-237.91
Water demand supply gap Status	Deficient	Deficient
Per capita water availability in cum	593.22	552.04
International standard per capita water availability in cum	1700	1700
Water availability gap	-1106.78	-1147.96
Water security status	Water Stress	

TABLE 38. GP WISE PROPOSED MICRO-WATERSHED WORKS- ORAVANDAVADI & KORATTAMPATTU

Proposed works in ridge	Oravandavadi	Korattampattu
Upper	-	-
Middle	6	3
Lower	181	65
Total	187	68

TABLE 39. RIDGE WISE TREATMENT AREA ESTIMATED COST AND PERSON DAYS REQUIRED

	Oravandavadi GP	Korattampattu GP
Upper Ridge		
No Upper falling in the GP		
Middle Ridge		
Estimated cost (INR in Lakhs)	9	4.5
Total area (ha)	13	3
Treatment cost (Lakhs/ha)	**0.69**	**1.5**
Estimated person days	**3,516**	**1,758**
Lower Ridge		
Estimated cost (INR in Lakhs)	188.31	80.50
Total area (ha)	239	30
Treatment cost (Lakhs/ha)	**0.78**	**2.68**
Estimated person days	**66,718**	**16,974**

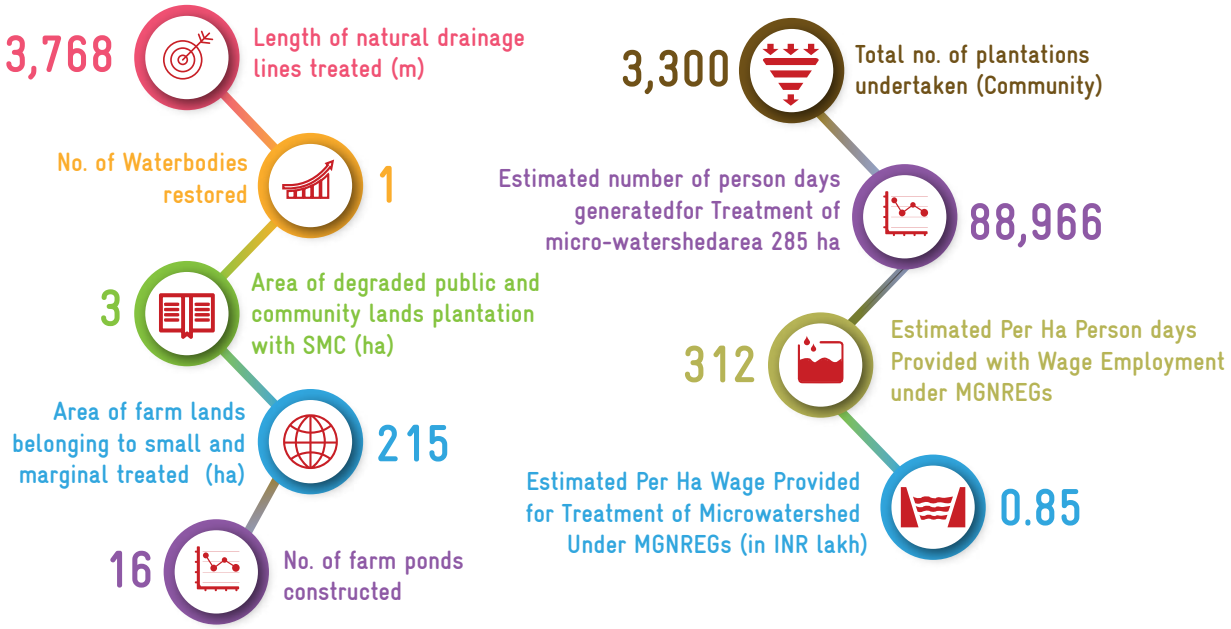
Oravandavadi GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	0.69 lakh/ha	3,516
Lower Ridge	0.78 lakh/ha	66,718
TOTAL	1.47 lakh/ha	70,234

Korattampattu GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	1.5 lakh/ha	1,758
Lower Ridge	2.68 lakh/ha	16,974
TOTAL	4.18 lakh/ha	18,732

TABLE 40. NATURE AND NO. OF WORKS IN MICRO-WATERSHED

Description	Number
Total No. of works in micro-watershed area (Arable, Non arable & DLT)	160
Total No. of works in micro-watershed including livelihood Activities	45
Total No. of works in micro-watershed including Rural Greywater Management Activities	50

TABLE 41. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)

Oravandavadi	99.12 lakh
Korattampattu	55.49 lakh

TABLE 42. ESTIMATES OF MICRO-WATERSHED IN ORAVANDAVADI GP

Sl. No	Proposed work	Ridge type	Work status	Quantity (Area or No.)	No. of works as per KML	Estimate cost in Lakhs	Person days
NRM works in Public and Community Lands							
1	Loose Boulder Check dam	Lower	Not commenced	4	4	3.4	168
2	Sunken Pit			4	4	6.16	1,532
3	Avenue plantation			4,140	4	7.2	2,812
4	MTP (Afforestation)			1	1	8.6	3,344
5	Compost Pit			13	13	2.21	195
Sub total					26	27.57	8,051

Works in Individual Farmer lands (Agriculture and Allied Activities)							
6	Artificial recharge structure for borewell farmers	Lower	Not commenced	16	16	40	6,256
7	Dryland horticulture			1.34 1	1	8.5	3,321
8	Silt application			1	1		
9	NADEP vermi compost			13	13	2.34	351
10							
11	Desilting of open well			16	16	16	3,200
12	Fodder development - Individual			13	13	19.24	30,472
13	Farm bunding with boundary trenches - individual	Middle & Lower		15 6	6	9	3,516
14	Azolla production units - individual	Lower	Commenced	13	13	1.95	299
15	Construction of farm ponds - individual		Ongoing	11	11	22	8,591
Sub total					**90**	**119.03**	**56,006**
Total					**116**	**146.6**	**64,057**
Livelihood enhancement activites for Individual Farmers (dryland)							
16	Cattle shelters (No.)	Lower	Commenced	13	13	27.56	4,303
17	Goat/sheep shelters (No.)			7	7	15.89	2,485
18	Cattle trough (No.)		Not commenced	13	13	0.65	78
Sub total					**33**	**44.1**	**6,866**
Rural Greywater and Roof rainwater Management							
19	Roof Top Rainwater Structure	Lower	Not commenced	1	1	4	625
20	Soak Pits (Individual)	Lower	Ongoing	24	24	2.592	384
21	Nutri Garden	Lower	Not commenced	13	13	0.013	2
Sub total					**38**	**6.605**	**1,011**
Grand total					**187**	**197.31**	**71,934**

TABLE 43. ESTIMATES OF MICRO-WATERSHED IN KORATTAMPATTU GP

Sl. No	Proposed work	Ridge type	Work status	Quantity (Area or No.)	No. of works as per KML	Estimate cost in Lakhs	Person days
NRM works in Public and Community Lands							
1	Loose Boulder Check dam	Lower	Not commenced	1	1	0.85	42
2	Sunken Pit			1	1	1.54	383
3	Gabion Check dam			2	2	3.2	320
4	CC Check dam			1	1	8.35	420
5	Avenue plantation			721	1	1.3	506
6	MTP (Block Plantation)			2	1	11.1	4,320
7	Compost Pit			3	3	0.51	45
8	Restoration of Traditional waterbodies: Ponds		Commenced	1	1	1	200
Sub total					**11**	**27.85**	**6,236**
Works in Individual farmer lands (Agriculture & Allied Activities)							
9	Artificial Recharge Structure for borewell farmers	Lower	Not commenced	5	5	12.5	1,955
10	NADEP Vermi compost			5	5	0.9	135
11	Desilting of Open Well			5	5	5	1,000
12	Fodder development - Individual			5	5	7.4	1,120
13	Farm Bunding with Boundary Trenches - Individual	Middle & Lower		7.5 3	3	4.5	1,758
14	Construction of Farm Ponds - Individual	Lower	Ongoing	5	5	10	3,905
15	Azolla Production units - Individual		Commenced	5	5	0.75	115
Sub total					**33**	**41.05**	**9,988**
Total					**44**	**68.9**	**16,224**
Livelihood enhancement activities for Individual Farmers (dryland)							
16	Cattle shelters	Lower	Commenced	5	5	10.6	1,655
17	Goat/sheep shelters			2	2	4.54	710
18	Cattle trough		Not commenced	5	5	0.25	30
Sub total					**12**	**15.39**	**2,395**
Rural Greywater and Roof rainwater Management							
	Soak Pits (Individual)	**Lower**	**Ongoing**	**7**	**7**	**0.7**	**112**
	Nutri Garden		**Not commenced**	**5**	**5**	**0.01**	**1**
Sub total					**12**	**0.71**	**113**
Grand total					**68**	**85**	**18,732**

TOTAL ESTIMATES OF MICRO-WATERSHED IN ORAVANDAVADI & KORATTAMPATTU

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Oravandavadi	187	197.31	71,934
Korattampattu GP	68	85	18,732

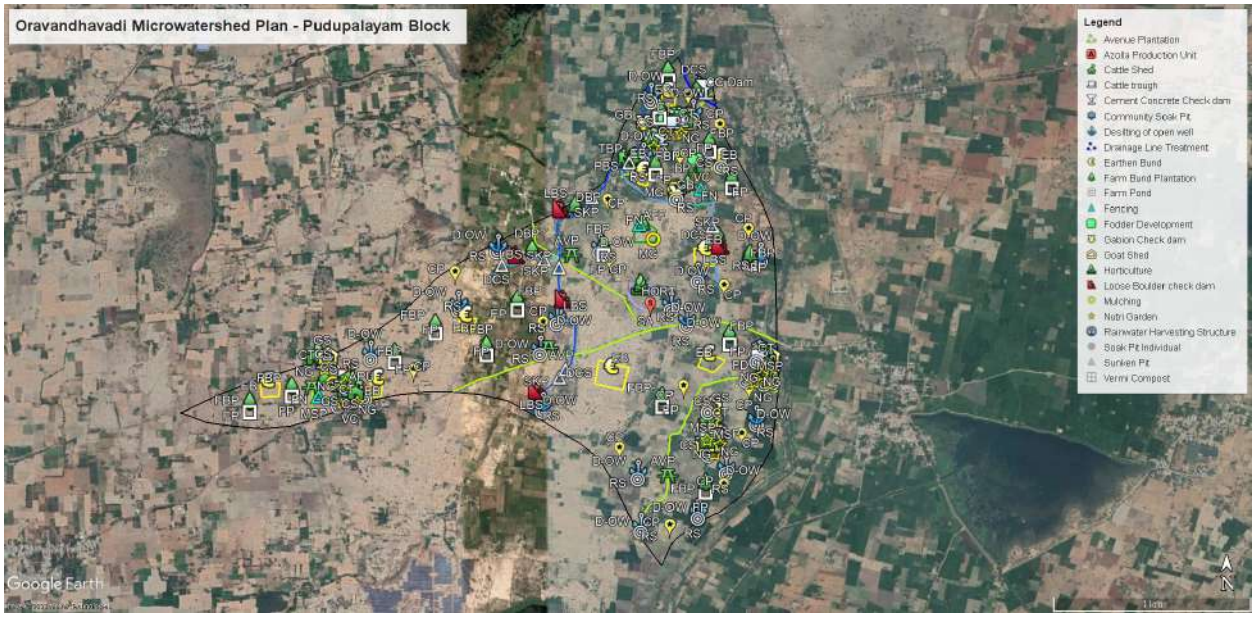


Figure 8.6. Map of Proposed activities in Oravandavadi micro-watershed

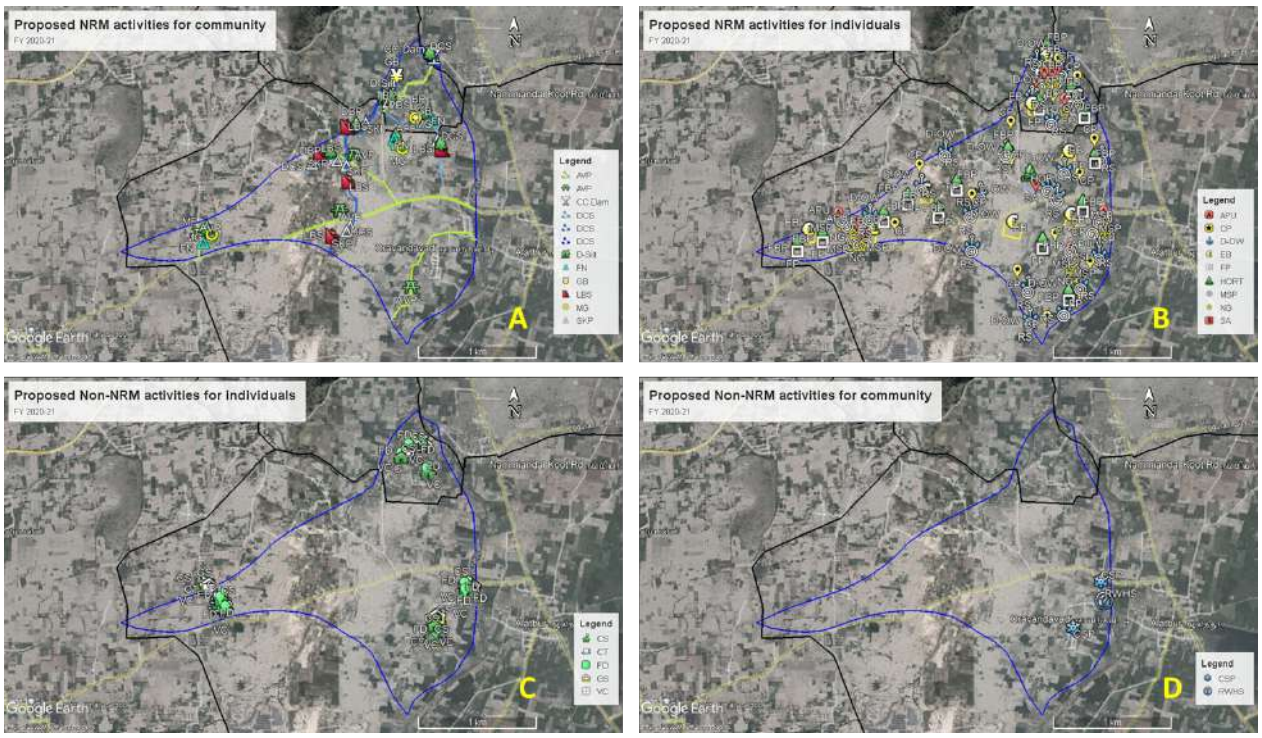


Figure 8.7. Maps of Proposed activities in Oravandavadi micro-watershed

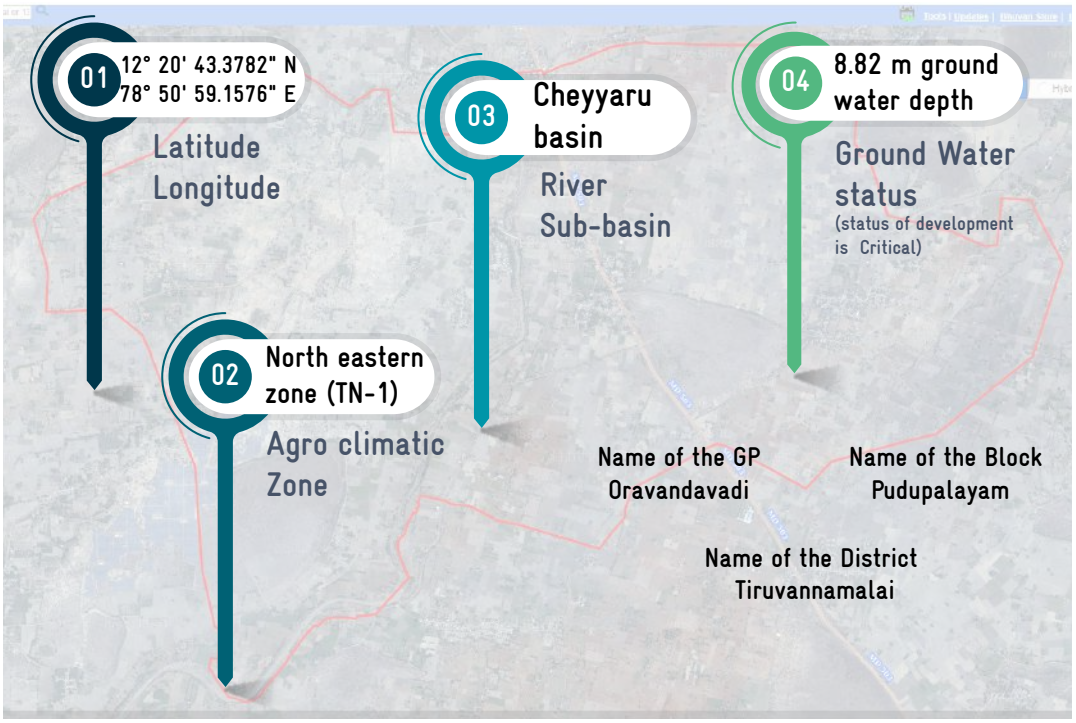
8.3 MODEL GP

ORAVANDAVADI BLOCK

8.3.1 CWRM PLANNING - SPATIAL DATA

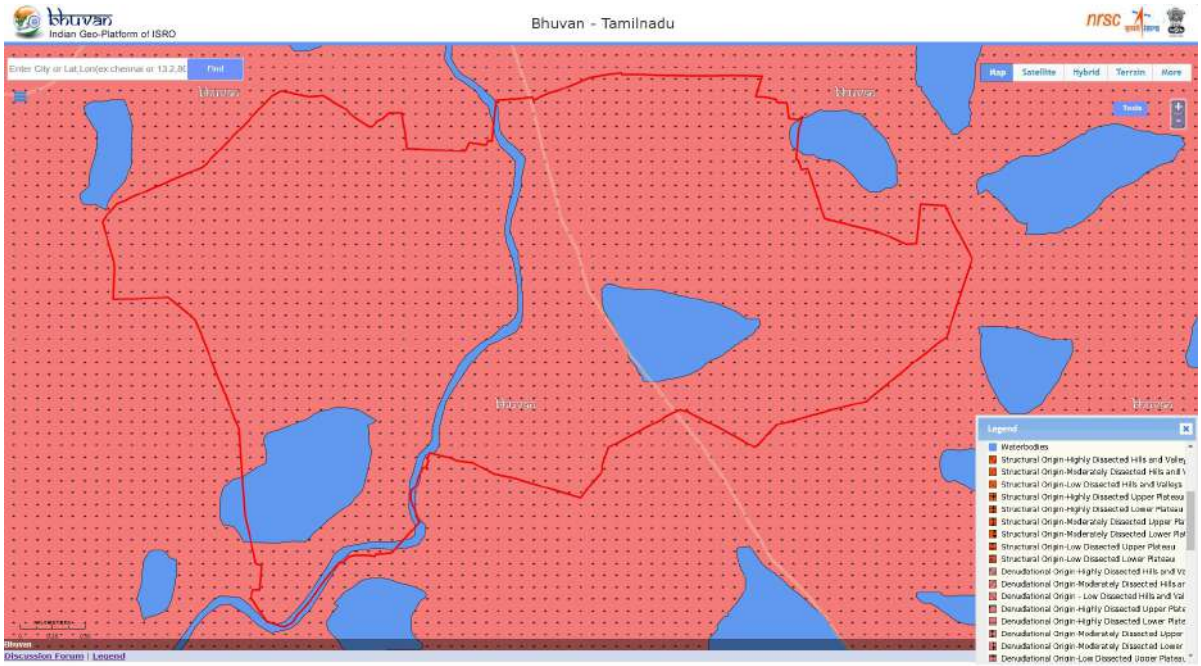
The Oravandavadi GP is located in Pudupalayam Block of Tiruvannamalai district, Tamil Nadu. Oravandavadi GP is geographically situated between 12° 20' 43.3782" N & 78° 50' 59.1576" E . The total geographical area of GP is 1,505 ha with total population of 5,578 and about 1,229 households. This GP belongs to North Eastern Agro-climatic Zone of the state, and receives an annual average rainfall of 1,047 mm. The general description of this GP is given in Table 44. The detailed spatial and non-spatial data considered in the process of preparation of climate resilient plans under CWRM for Oravandavadi GP are discussed here.

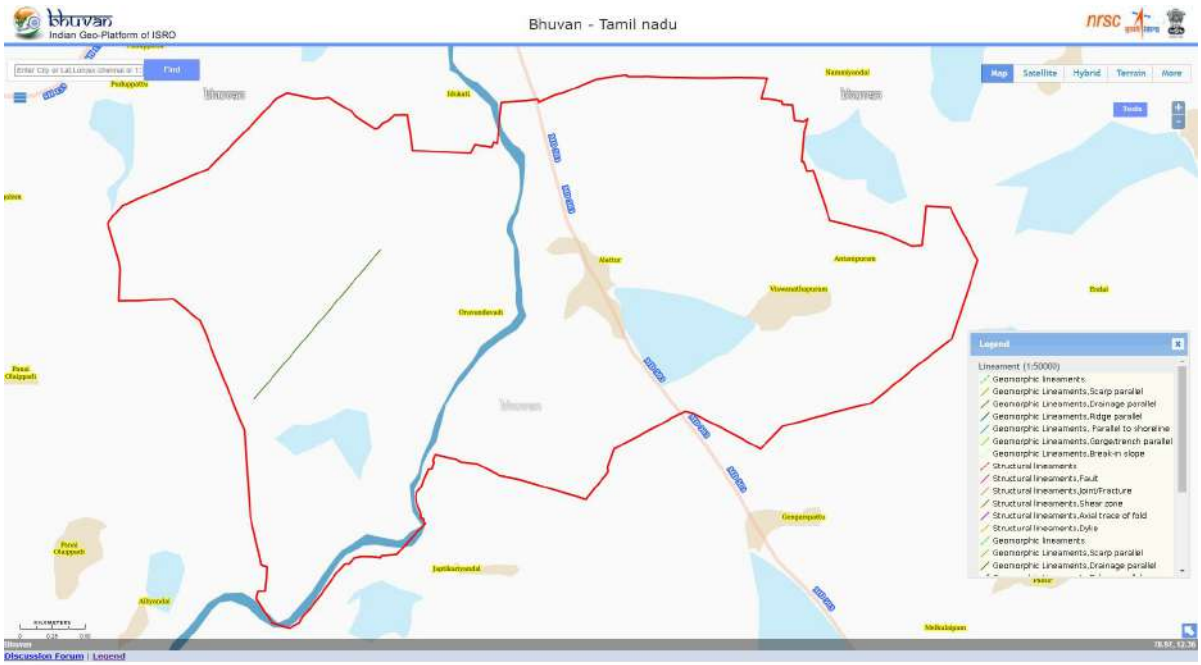
TABLE 44. GENERAL DESCRIPTION OF ORAVANDAVADI GP

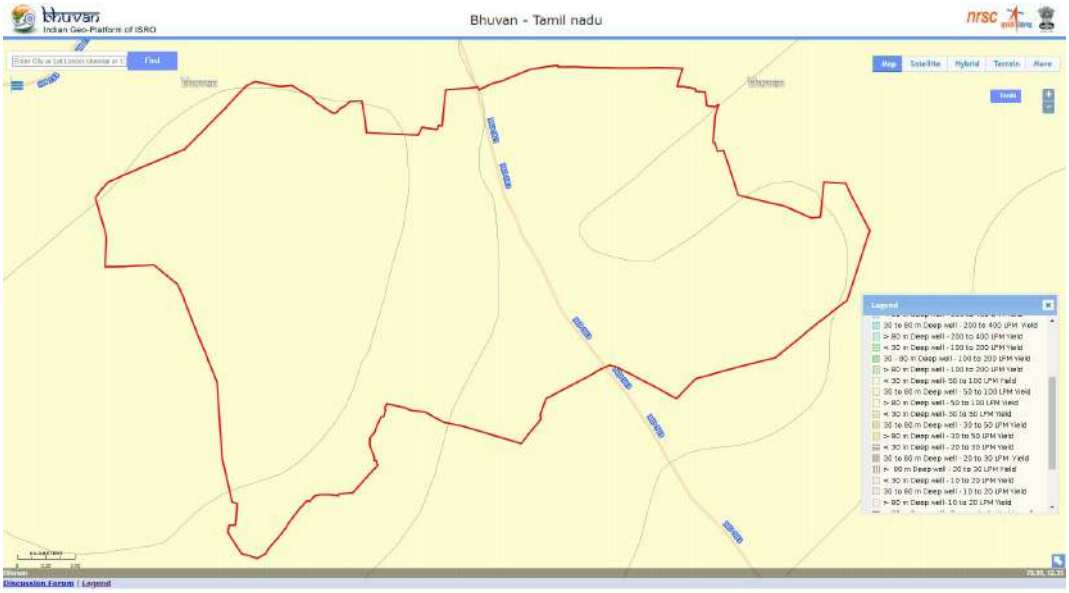


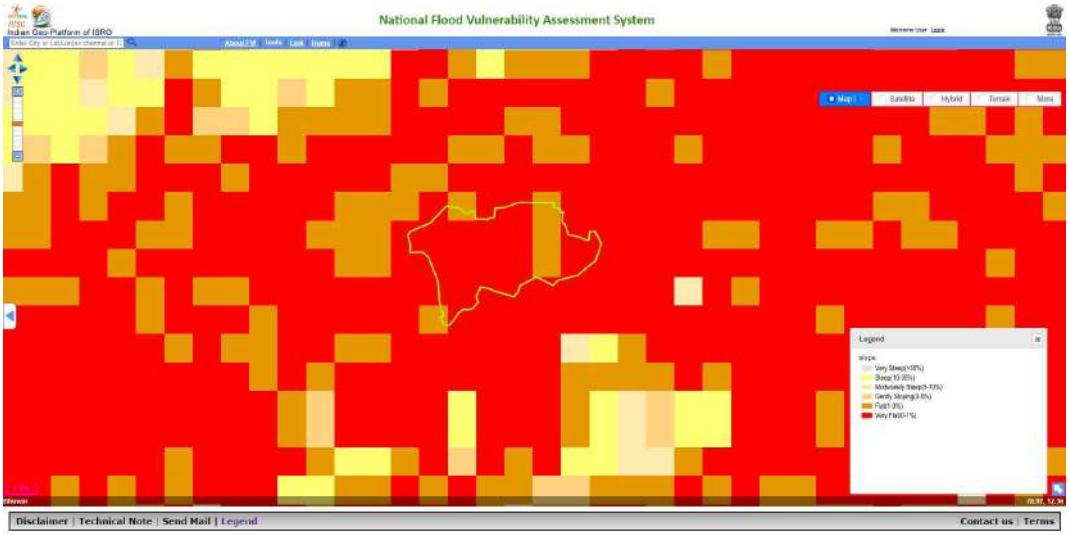
8.3.2 CWRM planning - spatial data:

CWRM adapted the geospatial technologies in its process of plan preparation towards climate-resilient infrastructure, Water Conservation Water Harvesting etc. at cadastral levels. Geospatial datasets allow players to understand the study area in terms of geomorphology, lineaments, salt-affected area, erosion, watershed, LULC, and wasteland. In some cases, spatial data will serve as a direct input for a particular activity to be implement towards conservation of resources. Various thematic datasets for Oravandavadi GP are discussed below Figure 8.9.






Bhuvan
Indian Geo-Platform of ISRO
Bhuvan - Tamil nadu
nrsc


Indian Geo-Platform of ISRO
National Flood Vulnerability Assessment System
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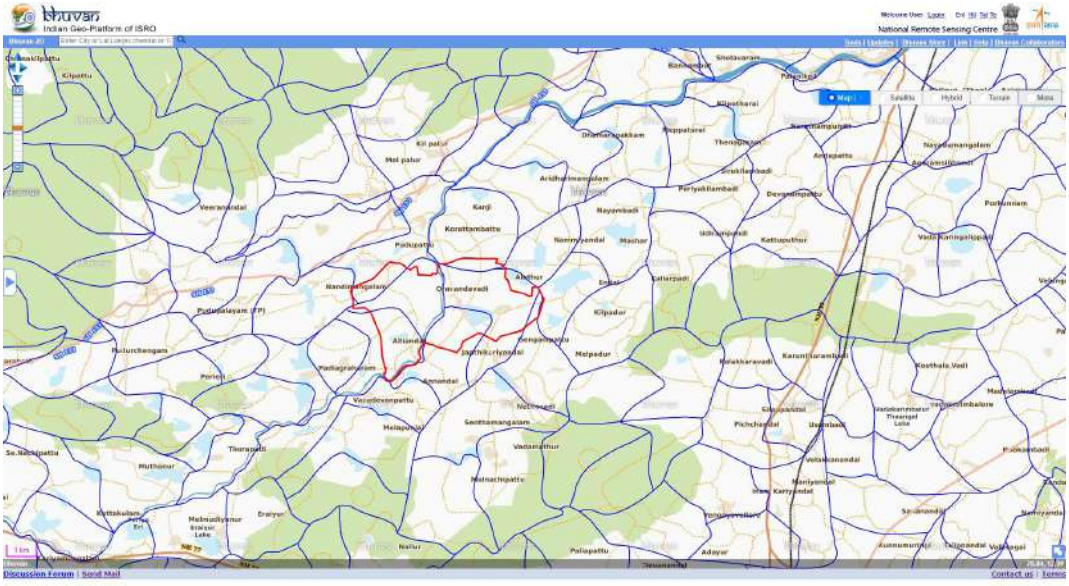

Bhuvan
Indian Geo-Platform of ISRO
National Remote Sensing Centre

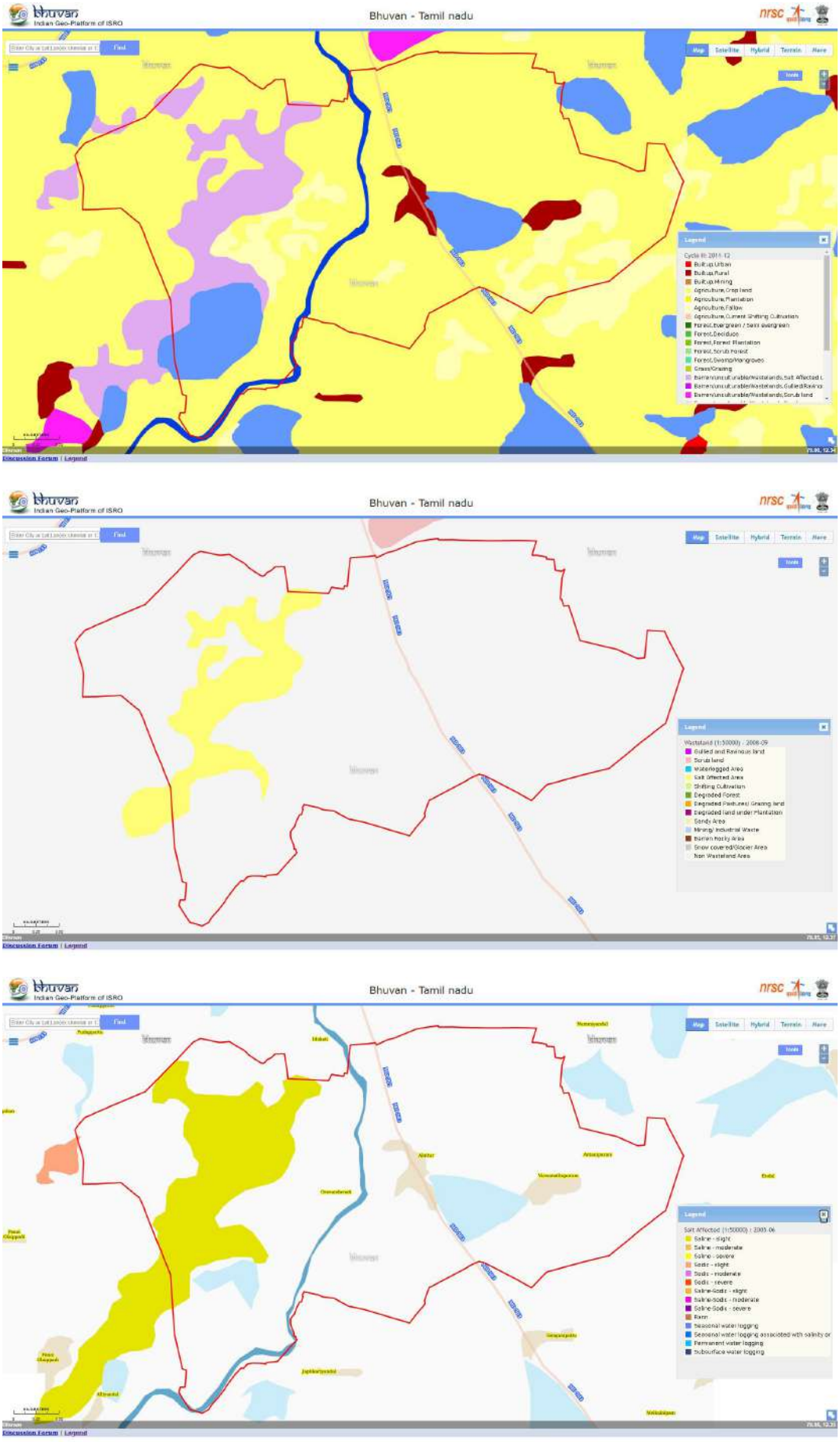


Figure 8.8. Spatial thematic maps of Oravandavadi GP. A. Geomorphology, B. Lineament, C. GE prosperity, D. Slope, E. Watershed, F.LULC, G. Wasteland, H. Salt affected area.

Oravandavadi GP engrossed with denudation origin pediment complex (A) landform unit and a geomorphic ridge parallel lineament directed towards North-East from South-West in western region (B). It is observed that the groundwater is greater than 80m deep well with 50 to 100 liter per minute capacity (C). Very flat terrain is dominated in the GP (D), Whereas GP area is falls under six micro-watershed units (E). Most of land used for crop cultivation (F) and a large land parcels of wasteland is noticed (G), which is salt affected (H).

8.3.3 CWRM PLANNING-NON-SPATIAL DATA

The non-spatial datasets include four major themes related to the 116 parameters – socio economic, climate, water and agriculture (Table 45). This data will be used for analysis along with the spatial data in identifying the key water challenges, by estimating the water budgeting and for proposing water actions at the most suitable sites in the GP. The non-spatial data analysis started with mapping of the administrative, agro-ecological and hydrological units considering GP as the lowest administrative unit of action plan and implementation of proposed developmental activities.

TABLE 45. NON-SPATIAL DATA- ORAVANDAVADI GP

Key CWRM Parameter	Details
Climate Vulnerability Area - 1 : Socio-Economic	
Geographical Area	1,505
Male population	2,867
Female population	2,711
Total population	5,578
SC population	1,313
ST population	13
Vulnerable population	1,326
Households (HH's)	1,229
Only one room HH's (SECC)	165
Female-Headed HH's (SECC)	65
Vulnerable Households (SECC)	135
% of Vulnerable Households	10.98
Registered MGNREGA Job cards (%)	53
Active person working in job Cards (%)	47
Drinking-Water Sources	48
GW sources - Drinking water	219
SW sources - Drinking water	1,010
Annual Grey water Generation	10.18
Climate Vulnerability Area : Climate	
Average Annual Rainfall	1,047
Average Annual Temperature °C	27.9
GW Status	Over -Exploited

Climate Vulnerability Area 3: Water Resources	
Canal Network in meters	
Number of Ooranis	3
Other Surface Water Bodies	3
Area under Irrigation Facilities	
Tank Irrigation	226.53
Open & Tube Well Irrigation	517.89
Catchment Area wise Available Runoff	
Good Catchment Area	97.6
Average Catchment Area	1.8
Bad Catchment Area	231.5
Watershed and Drainage Networks	
Length of Natural Drainage Lines	23,279.5
Number of Natural Drainage Lines	5
Number of micro-watersheds	11
Water Demand	
For Humans	15.27
For Livestock	5.93
For Agriculture	1,417
% GW utilization for Drinking	96
% GW utilization for Livestock	94
% GW utilization for Agriculture.	97
% SW utilization for Drinking	4
% SW utilization for Livestock	6
% SW utilization for Agriculture	3
Climate Vulnerability Area 4: Agriculture	
Area under Land Resources in ha	
Non-Agricultural Uses	257.32
Barren & Un-cultivable Land	3.02
Land Under Miscellaneous Tree Crops etc.	5
Cultivable Waste Land	1.56
Fallows Land other than Current Fallows	145.17
Current Fallow land	333.85
Unirrigated Land	14.36
Area Irrigated by Source	744.42
Land under Catchment Area in ha	
Good Catchment	260.34
Average Catchment	6.56
Bad Catchment	1237.8

Crop Details in ha	
Irrigated Area	913.15
Rainfed area	128.03
The area under Paddy Cultivation	772.74
Crop Water Requirement - The irrigated condition	1372.35
Crop Water Requirement - Rainfed condition	44.81
Soil Resources: Status of Available Nitrogen in %	
Low	45
Status of Organic Carbon	
Low	46
Status of Soil Micro Nutrients	
Sufficient	74
Deficient	26
Status of Physical condition of the soil	
Moderately Acidic	4
Moderately Alkaline	96
Soil Texture	
% of Clay Soil	9
% of Fine Soil	68
Soil Water Permeability	Moderate
Soil moisture and ET	
Volumetric Soil Moisture	23
Estimated Soil Moisture	286.9
ET Losses	614.08
Means of Water Extraction	
Gravity	1
Lifting	99
Irrigation Methods	
Wild Flooding	30
Control Flooding	70
Livestock	
Cattle population	1,524
Sheep population	635
Goat population	357

8.3.4 KEY WATER CHALLENGES

Socio-Economic

1. 23 % vulnerable population according to SECC data
2. 10.98% of the households are vulnerable
3. Access to drinking water through tap water connections is very low
4. Challenges in handling of grey water

Water

1. 3 traditional waterbodies in the GP
2. 97% of groundwater is taken for agriculture, 94% of groundwater is taken for livestock and 96% of groundwater is used for humans
3. 3% of surface water is used for agriculture, 6% of surface water is used for livestock.
4. 330 ha-m of water is an available runoff

Agriculture and Allied Sector

1. 18 % of the land covers the common areaConsiderable portion under current fallow (29 %)
2. 82% of the land covers an individual land area and more activities should be given in individual land areas
3. The main crop in the GP is paddy which is cultivated about 772 ha of land
4. The main source for paddy cultivation is groundwater
5. 88% of the water is given to paddy fields by lifting methods of irrigation
6. Remaining water is extracted by gravity method of irrigation
7. Fine soil is predominant in the GP

8.3.5 PERSPECTIVE PLAN WORKS PROPOSED- WATER ACTIONS

The appropriate and site-specific works are identified for the development of public and common land, agriculture and allied activities, rural infrastructures, and climate-resilient measures to reduce the vulnerability in the GP. The total proposed area for treatment is 65.32 ha, nearly 4.4% of the land area is taken for WASCA activities like plantation, conservation works (Figure 8.10). Through the proposed conservation activities, 21 ha.m run off would be harvested in which, about 41% of the runoff from the good catchment, 9% of the runoff from the average catchment and 50% of the conservation from the bad catchment area (Figure 8.11).

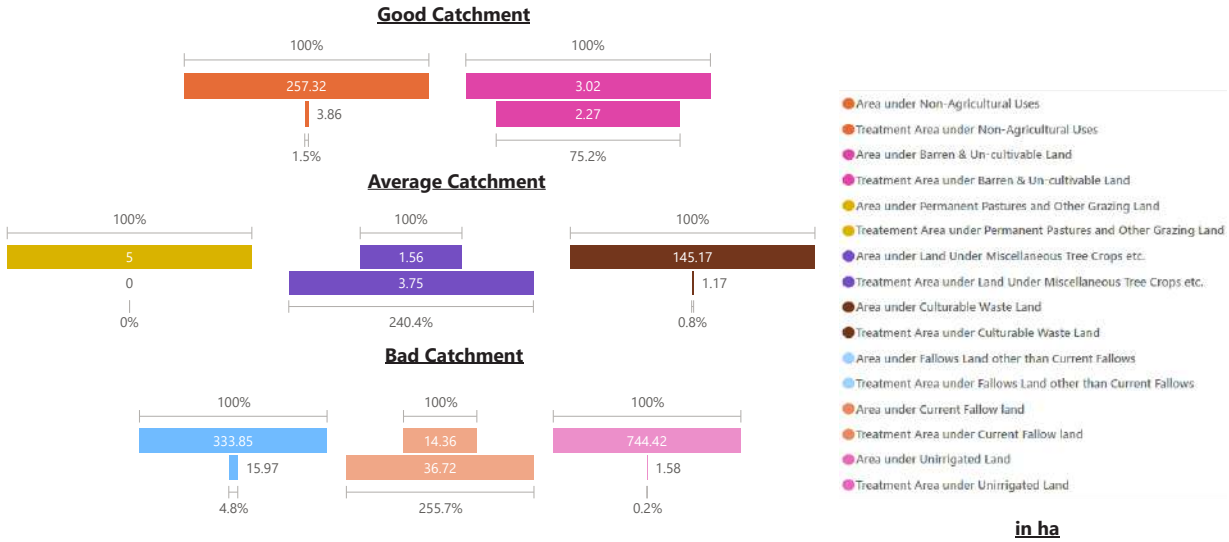


Figure 8.10. Proposed land resource treatment area in Orandavadi GP

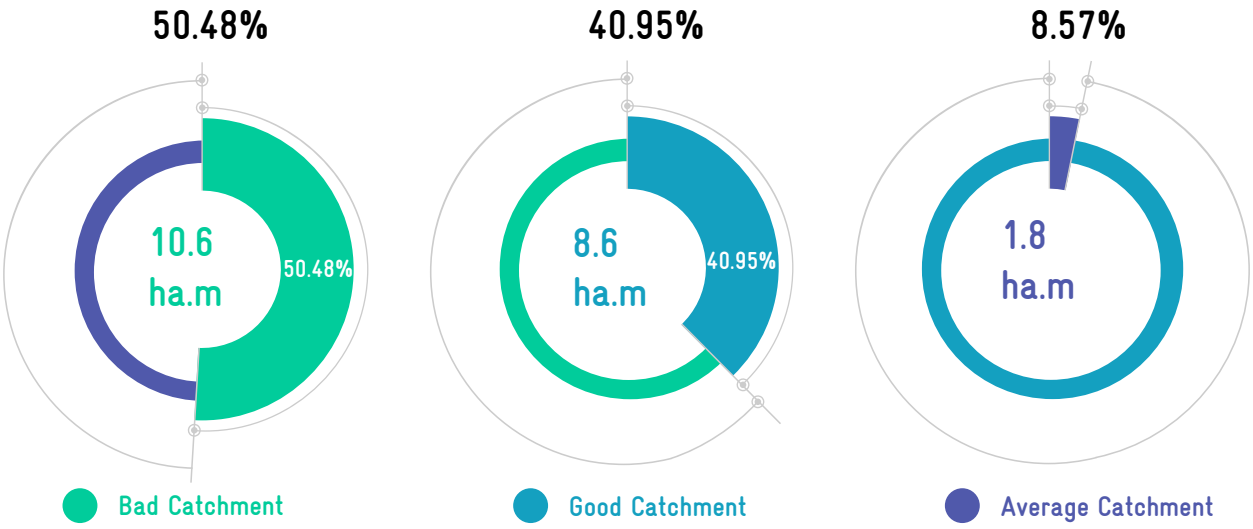


Figure 8.11. Expected run off conservation after treatment

The table 46 shows the detailed perspective plan and estimates of the work, budget, and person-days for three years from 2021-2022 to 2023-2024 in the Orandavadi GP. Since it is a vulnerable village, attention was given to include appropriate works to improve the common and public land development in order to improve the resilience of the GP.

TABLE 46. PERSPECTIVE PLAN OF ORANDAVADI GP - FY (2021-2024)

Name of the work	Ridge type	No. of Works	Estimated cost (INR in Lakhs)	Estimated Person Days
CWRM Water Action 1: Improvement of public & common lands development				
CWRM Water Action 1: Works in upper& middle ridge				
Contour Continuous Bunds for Afforestation area (m)	Upper Ridge	1	0.03	10
Composting (No.)	Lower Ridge	68	11.56	1,020
Block Plantation (Community) (ha)	Middle Ridge	2	22.2	8,640
Linear Plantation (Km)		6	10.8	4,218
Avenue plantation (Km)		3	5.4	2,109
Restoration of waterbodies: a.PWD and Tanks (No.)	Lower Ridge	3	15	2,400
Restoration of waterbodies. Ooranis (No.)		3	3	600
Artificial Recharge Structure (No of units.)		33	82.5	12,903
Drainage Line Treatment (DLT) (m)	Upper Ridge	1	0.03	5
Sub Total Water Action -1		**13390**	**120**	**151**
CWRM Water Action 2: Agricultural and allied Sector development				
CWRM Water Action 2: Works in Lower Ridge				
Farm Bunding with Boundary Trenches - Individual (ha)	Lower Ridge	27	40.5	15,822
Micro Irrigation (ha)		74	74	
Construction of Farm Ponds - Individual (No of units)		27	54	21,087
Land development - Individual (ha)		3	30	11,718
Dryland Horticulture/Agroforestry - Individual (ha)		3	25.5	9,963
Azolla units - Individual (No. of units)		135	20.25	3,105
NADEP Vermi compost (No. of units)		135	24.3	3,645
Fodder development - Community & Individual		135	199.8	3,16,440
Cattle shelters (No.of units)		135	286.2	44,685
Goat/sheep shelters (No.of units)		67	152.09	23,785
Cattle trough (No. of units)		135	6.75	810
Construction of new open wells & Recharge Shafts (No.of units)		207	1035	1,91,682
Sub Total Water Action -2		**1083**	**1948**	**6,42,742**

CWRM Water Action 3: Rural Water Management				
CWRM Water Action 3: Works in Lower Ridge				
Soak Pits (Community) (No.of units)	Lower	12	1.56	240
Soak Pits (Individual) (No.of units)		123	12.3	1,968
Roof Rain Water Harvesting (No. of units)		2	8	1,250
Subtotal		**137**	**22**	**3,458**
Grand total		**1340**	**2121**	**6,78,105**

Regarding CWRM themes of the total No. of projects identified, 81 % works are in agriculture and allied sector while 9 % works are in public and common land, and 10% works are in rural infrastructure respectively. Table 47 provides the estimates of the work budget, and personal days for three years from 2021-2024 in Orandavadi GP.

TABLE 47. SUMMARY OF WORKS IDENTIFIED AND ESTIMATED PERSON-DAYS FOR 2021-2024

CWRM themes	No of works	Estimated budget (INR in lakhs)	Estimated person days
Public and common land development	120	150.52	31,905
Agriculture and Allied sector development	1,083	1,948	6,42,742
Rural water management	137	22	3,458
TOTAL	1,340	2,121	6,78,105

8.3.6 IMPACTS

The proposed water actions based on the above key water challenges cover a period of three years from 2021- 2022 to 2023-2024. At the end of the implementation period i.e. in the year 2024, the following impacts are envisaged (Table 48). It is expected that these impacts will potentially reduce the vulnerability and improve the resilience of the system to the projected climatic change events and ensured water security.

TABLE 48. WASCA- WATER ACTIONS AND INDICATORS

WASCA CWRM ACTION PLAN

DEVELOPMENT OF PUBLIC AND COMMON LAND

	INDICATOR		OUTCOMES/ IMPACT
1	Number of water bodies restored in the village	1	Six traditional water bodies restored
2	Percentage reduction in the annual surface runoff	2	70.79 ha m surface runoff harvested and stored
3	The proportion of land treated under WASCA	3	21% of the total geographical area of the village treated under WASCA in three years
4	Drainage line treatment	4	11 km length of drainage lines treated

6 TRADITIONAL WATER BODIES RESTORED

70.79 ha AFFORESTATION

21% AREA OF THE VILLAGE TREATED

11 km DRAINAGE LINES TREATED

WASCA CWRM ACTION PLAN

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

	INDICATOR		OUTCOMES/ IMPACT
1.	No of structures were established for on-farm (in-situ) water harvesting in drylands	1.	27 farm ponds established
2.	The reducing area under fallow lands	2.	479 ha under fallow land restored for cultivation
3.	Improvement in soil health	3.	135 units of vermicompost established
4.	No of artificial recharge structures proposed	4.	33 artificial recharge structures were established to replenish groundwater flow

27 FARM PONDS

479 ha FALLOW LAND RESTORED

135 VERMI COMPOST

33 ARTIFICIAL RECHARGE STRUCTURES

WASCA CWRM ACTION PLAN

DEVELOPMENT OF RURAL INFRASTRUCTURE

INDICATOR	
1.	Number of villages having complete solid and liquid waste management systems
2.	Roof rainwater harvesting measures
3.	Nutri gardens

OUTCOMES/ IMPACT	
1.	12 community level and 123 individual level soak pits were constructed for grey water management to maintain hygiene in the village
2.	Two units of roof rainwater harvesting and storing established
3.	1,229 households established Nutri-gardens in homesteads

12 COMMUNITY & **123** INDIVIDUAL SOAK PITS

2 COMMON ROOF RAINWATER HARVESTING

1,229 NUTRI-GARDENS

The following table provides both the perspective plan for three years period and the annual plan for one year period from 2021-2022 on the shelf of projects/No. of works and No. of person-days (Table 49).

TABLE 49. PROPOSALS FOR THE MGNREGS, ORANDAVADI GP, TIRUVANNAMALAI DISTRICT

	No of works	No of person days
Perspective plan	1,340	6,78,105
Annual plan	602	2,98,527

8.3.7 PROPOSED ACTIVITY MAP

The proposed activity map for, Orandavadi GP, Pudupalayam Block shows a shelf of projects for all three year works from 2021-2024 (Figures 8.12 to 8.15).

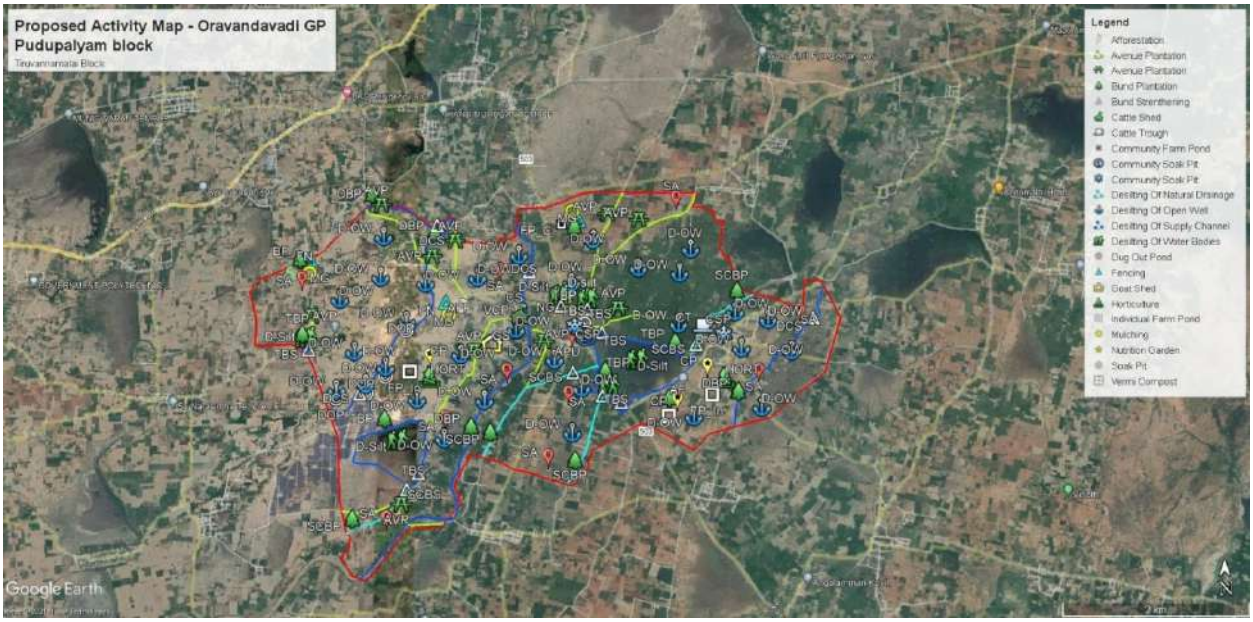


Figure 8.12. Action plan map of Orandavadi GP

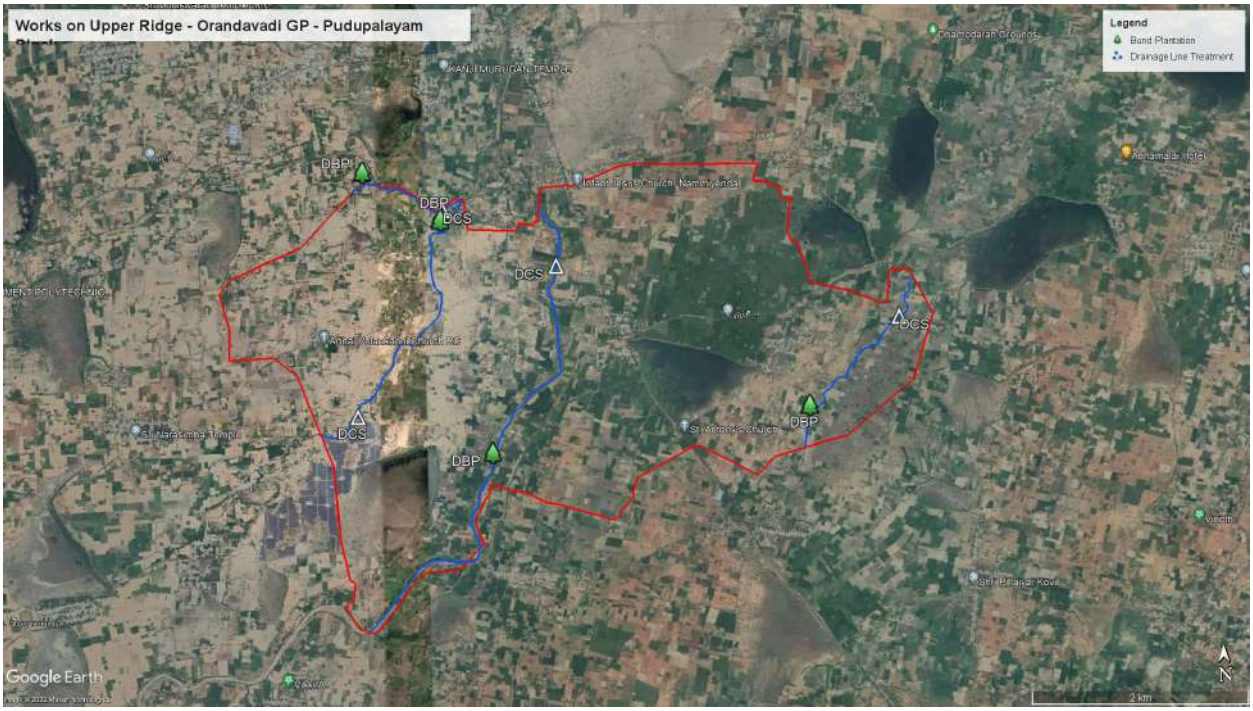


Figure 8.13. Map of Works on upper ridge- Orandavadi GP

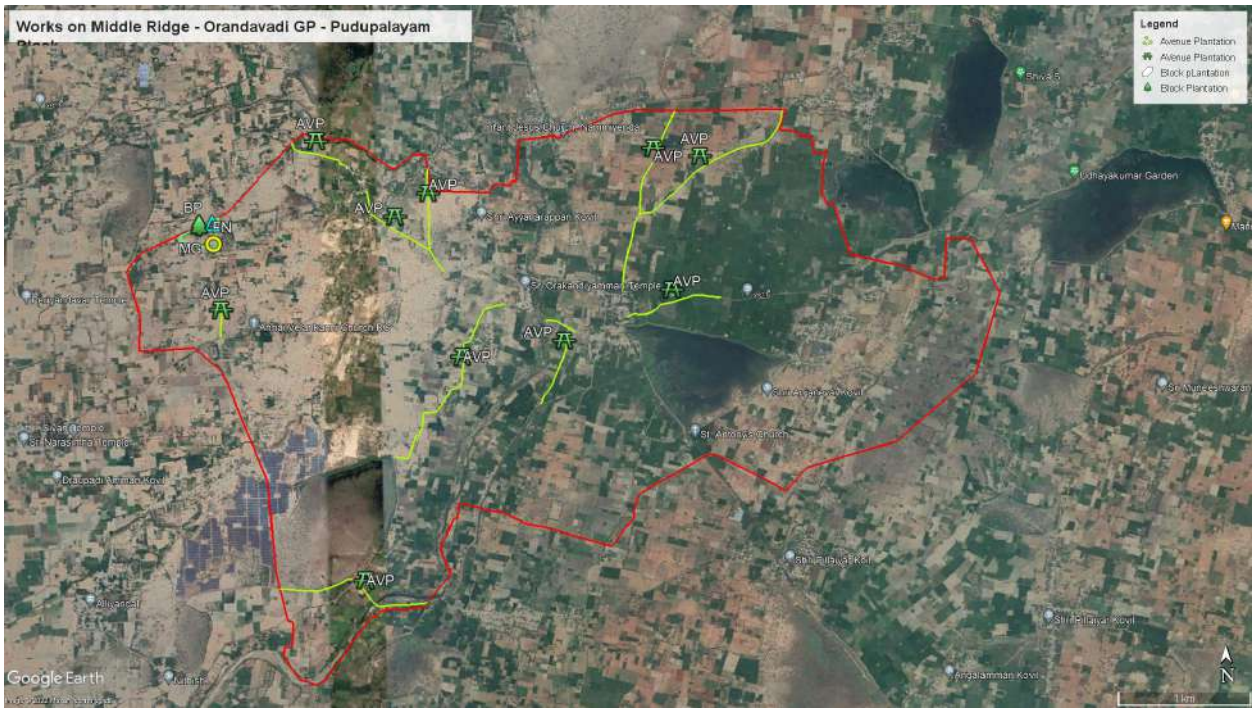


Figure 8.14. Map of Works on middle ridge-Orandavadi GP

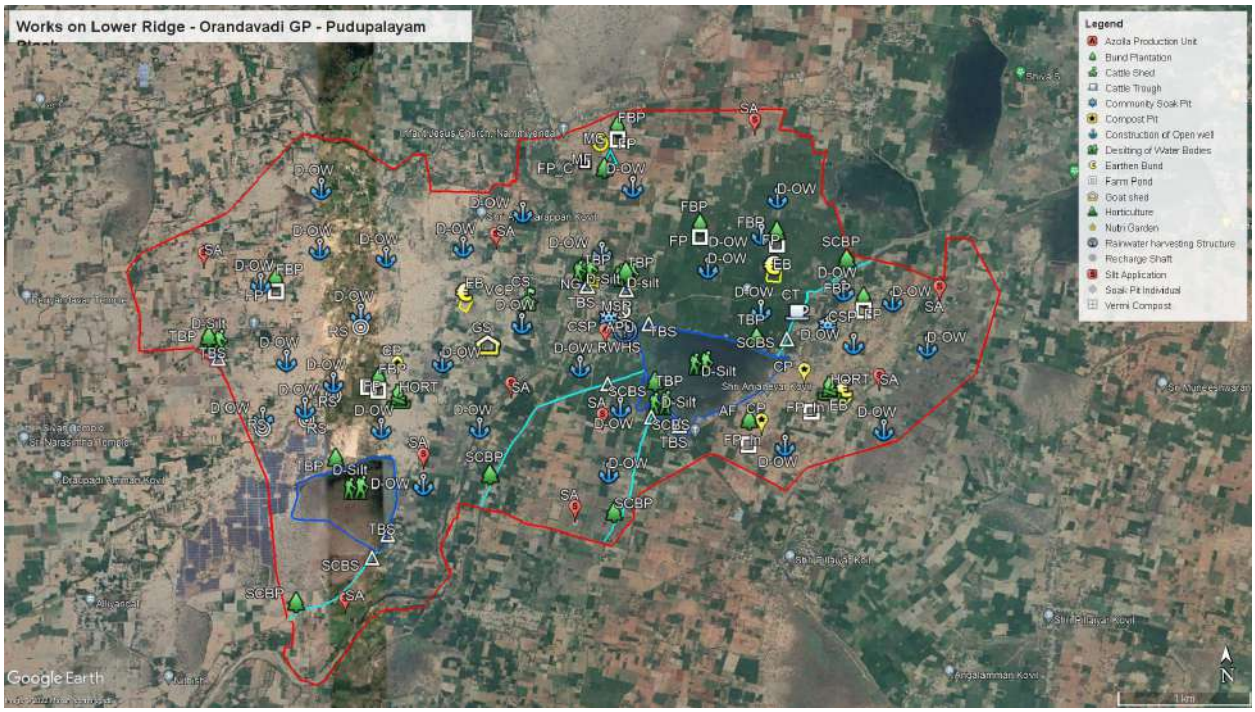
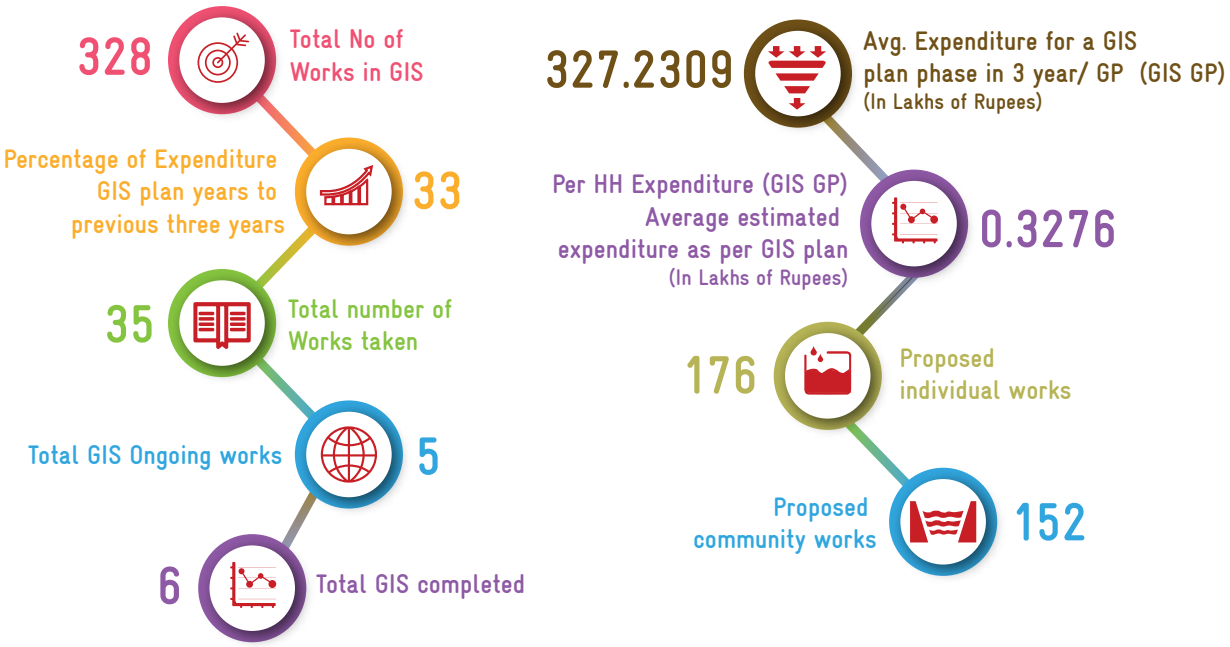


Figure 8.15. Map of Works on lower ridge - Orandavadi GP

8.3.8 GIS PLAN IMPLEMENTATION, KEY PARAMETERS

The GIS plan implementation and performance in Pudupalayam Block is represented in Table 50.

TABLE 50. GIS PLAN IMPLEMENTATION, KEY PARAMETERS PERFORMANCE OF ORANDAVADI GP



நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு

குறள் - 20

Water is life that comes from rain
Sans rain our duties go in vain

Thirukkural - 20

CHAPTER 9

CONCLUSION

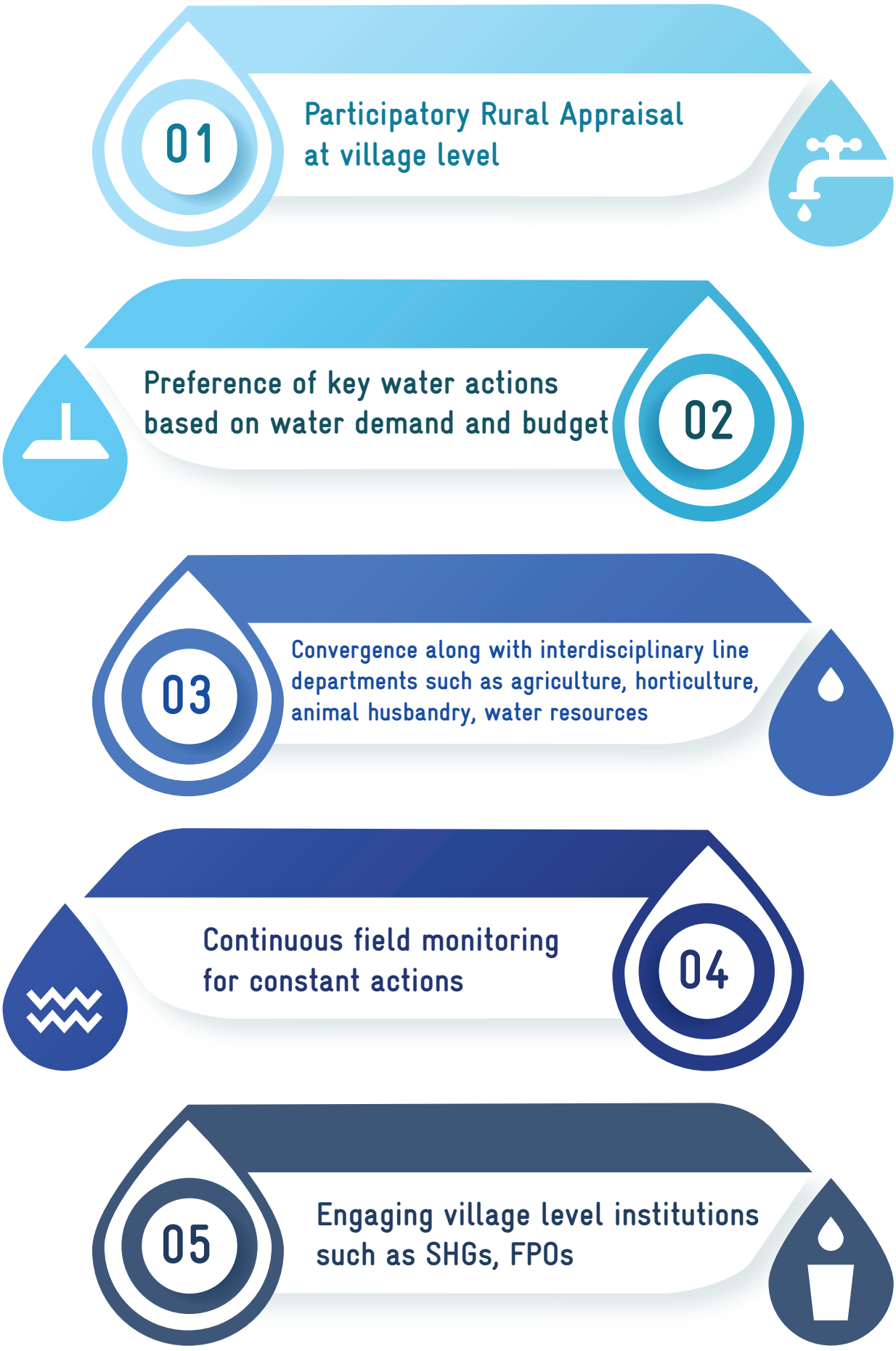
CONCLUSION

> **"WASCA TN took an initiative to address the problem holistically through comprehensive vulnerability assessment at district and block level to identify the vulnerable area and its key problems"**

In recent decades, the water demand is increasing at a fast rate due to rapid surge of population, industrial and economic growth. The evident changes in climate change and its extremities are bringing more threats to water security. Frequent monsoon failures lead to acute water scarcity and severe droughts. Thus, dependency on ground water has increased many folds during recent years that has resulted in lowering of ground water levels and even drying up of wells. WASCA TN took an initiate to address the problem holistically through comprehensive vulnerability assessment at District and Block level to identify the vulnerable area and its key problems. The 18 biophysical and socio-economic indicator of four interrelated areas via water, agriculture, socio-economic and climate used at District level are further expanded to 110 parameters at Block level. The spatial and non-spatial CWRM parameters for four 4 above mentioned interrelated areas are used to represent risk, sensitivity and adaptive capacity of the GPs, which eventually reflects rural water security. The key problems of the Blocks are identified and the best possible adaptation options 'key water actions' are intended under WASCA initiatives in public and common land, agriculture and allied sector, rural infrastructure areas. All the indicators/parameters and key water action are accompanied with appropriate SDG and India's NDC. The developmental activities in the 3 areas along with climate resilient measures will contribute in reducing the vulnerability and building the resilience of the local communities at the GP level. The GP based planning and integration at the Block level enables to adopt ecosystem approach in promoting nature based solutions. The productive impacts are visualized through convergence approach by mobilizing necessary finance, knowledge and technologies at the end of the three years of implementation. This integrated Block level approach will be more effective with Block level climate information which is not currently available.

Recommendations towards stable development and its progressive outcome are,

Recommendations towards stable development and its progressive outcome are:



ANNEXURES

ANNEXURE 1

TYPES OF GPS

Type of GP	Description
I	Both GP and revenue village data and boundary match
II	Having more than one GPs in one Revenue Village
III	One GP is falling under more than Type 1 one Revenue Village
IV	GPs having more than one GP, one Revenue Villages data, boundary
V	Newly formed GP after 2011 census publication

* Note: The CWRM uses spatial and non-spatial data for developing Gram Panchayat level plans. Most of the data for non-spatial are available at revenue village level in the project area. To synchronize planning at GP keeping data availability and administrative boundary for GIS planning, various GP's are categorized based on revenue village boundaries, for collecting and organizing the datasets. Based on the above factors, five different types of GPs are classified as above.

ANNEXURE 3.1

KEY CWRM PARAMETER FROM SECONDARY SOURCES

Key CWRM Parameter	Secondary Source
Socio economic	
Geographical Area	Census-2011, MoHA, GOI *https://censusindia.gov.in/2011census/dchb/DCHB.html*
Male Population	
Female Population	
Total Population	
SC Population	
ST Population	
Vulnerable population	
Households (HH's)	Socio-economic caste census (SECC) 2011 *https://secc.gov.in/homePageLgd.htm*
Only one room HH's	
Female Headed HH's	
Vulnerable Households	
% of Vulnerable Households	
Registered MGNREGA Job cards	*http://mnregaweb4.nic.in/netnrega/app_issue.aspx?page=s&lflag=eng&state_name=TAMIL%20NADU&state_code=29&fin_year=2020-2021&source=national&Digest=3ics8+9Z9fEQ8yzj5E3qcQ*
Active person working in MGNREGA job Cards	
Water Resources	
Irrigation Facilities	Census-2011, MoHA, GOI *https://censusindia.gov.in/2011census/dchb/DCHB.html*
Area under Tank Irrigation	
Area under Canal Irrigation	
Area under Open & Tube Well Irrigation	
Water Quality	*https://ejalshakti.gov.in/IMISReports/Reports/WaterQuality/WQ/rpt_WQ_DistrictProfile_S.aspx?Rep=0&RP=Y*
Chemical Contaminants	
Bacterial and Other Contaminants	
Watershed and Drainage Networks	NRSC, ISRO, GoI
Length of Natural Drainage Lines	
Number of Natural Drainage Lines	
Number of Micro-watersheds	
Agriculture	
Land Resources	*https://censusindia.gov.in/2011census/dchb/DCHB.html*
Area under Forest land	
Area under Non-Agricultural Uses	
Area under Barren & Un-cultivable Land	
Area under Permanent Pastures and Other Grazing Land	
Area under Land Under Miscellaneous Tree Crops etc.	
Area under Cultivable Waste Land	
Area under Fallows Land other than Current Fallows	

Area under Current Fallow land	*https://censusindia.gov.in/2011census/dchb/DCHB.html*
Area under Unirrigated Land	
Area Irrigated by Source	
Soil Resources: Status of Available Nitrogen	*https://soilhealth.dac.gov.in/NewHomePage/NutriPage*
Very Low (VL)	
Low (L)	
Medium (M)	
High (H)	
Very High (VH)	
Status of Organic Carbon	
Very Low (VL)	
Low (L)	
Medium (M)	
High (H)	
Very High (VH)	
Status of Soil Micro Nutrients	
Sufficient	
Deficient	
Status of Physical condition of the soil	*https://soilhealth.dac.gov.in/NewHomePage/NutriPage*
Acidic Sulphate	
Strongly Acidic	
Highly Acidic	
Moderately Acidic	
Slightly Acidic	
Neutral	
Moderately Alkaline	
Strongly Alkaline	
Soil Texture	NRSC
% of Clay Soil	
% of Fine Soil	
% of Coarse loamy	
Soil Water Permeability	standard table
Soil moisture and ET	*https://indiawris.gov.in/wris/#/*
Volumetric Soil Moisture	
Livestock	*https://farmer.gov.in/livestockcensus.aspx*
Cattle Population	
Sheep Population	
Goat Population	
Poultry	

ANNEXURE 3.2

KEY CWRM PARAMETERS FROM PRIMARY SOURCES

Key CWRM Parameter	Primary Data
Water sources	
Drinking Water Sources	Block level officer/ GP level assistants
HH's have tap water connection for drinking water	
HH's dependent on other sources for drinking water	
Canal network	
Length of Main Canal	Block level officer/ GP level assistants
Length of Minor Canal	
Length of Distributaries	
Water Courses (Field Channels)	
Traditional water bodies	
Number of Tanks (PWD & Union)	Block level officer/ GP level assistants
Number of Ooranis	
Other Surface Water Bodies	
Crop details	
Irrigated Area	Village G return data
Rainfed area	
Area under Paddy Cultivation/irrigated	

ANNEXURE 3.3

KEY CWRM PARAMETER GENERATED -PRIMARY DATA

Key CWRM Parameter	Methods/Formulas Used
Water Demand	Standard Norms are in Annexure 3.4
Water Demand For Drinking	
Water Demand for Livestock	
Water Demand For Agriculture	
% G.W Utilization for Drinking	
% G.W Utilization for Livestock	
% G.W Utilization for Agriculture.	
% SW Utilization for Drinking	
% SW Utilization for Livestock	
% SW Utilization for Agriculture	
Annual Greywater Generation	Standard Norms are in Annexure 3.5
Available Runoff	Strange table method (based on rainfall, land area)
Run Off Conserved	Formula (based on tank storage, built up, linear measurement)
Estimated Soil Moisture	calculation & formula
ET Losses	calculation & formula
Means of Water Extraction (Gravity/ Lifting)	(Number of Gravity or lifting /Total number of extraction)*100
Irrigation Methods (Wild/Control)	(corresponding irrigation area/ total irrigation area)*100

ANNEXURE 3.4

STANDARD NORMS FOR CALCULATING WATER DEMAND

	Water Users	Total Annual Requirement (Ha.m)
1	Human	population*0.0027375
2	Animals	Total water requirement for animals
3	Agriculture	Total volume of water in agriculture (Both irrigated and rainfed)
4	Others (Industrial)	
	Total water De-mand	Addition of all 4 category
	Water Users	**Requirement met by Ground Water**
1	Human	water demand for human* Ground water percentage (coming from drinking water sources)
2	Animals	water demand for animals* Ground water percentage (coming from Livestock table)
3	Agriculture	Total volume of water in irrigated source
4	Others (Industrial)	
	Total water De-mand	Addition of all 4 category
	Water Users	**Requirement met by Surface Water**
1	Human	water demand for human* Surface water percentage (coming from drinking water sources)
2	Animals	water demand for animals* surface water percentage (coming from Livestock table)
3	Agriculture	Total volume of water in rainfed source
4	Others (Industrial)	
	Total water De-mand	Addition of all 4 category
	Water Users	**% of Ground Water**
1	Human	Ground water percentage (coming from drinking water sources)
2	Animals	Ground water percentage (coming from Livestock table)
3	Agriculture	(Total volume of water in irrigated source/Total ground water requirement)*100
4	Others (Industrial)	
	Total water De-mand	Addition of all 4 category
	Water Users	**Requirement met by Surface Water**
1	Human	Surface water percentage (coming from drinking water sources)
2	Animals	surface water percentage (coming from Livestock table)
3	Agriculture	(Total volume of water in rainfed source/Total surface water requirement)*100
4	Others (Industrial)	
	Total water De-mand	Addition of all 4 category

* Based on the land use, slope, and soil type, the catchments are classified as good, average and bad. In the CWRM framework, we used land use as a key factor for the classicization of catchments.

Good catchment area: It consists of the runoff generated from sloppy lands with dense forest cover and areas where the ground is covered with a reduced rate of infiltration. It includes area under forest, area under non-agricultural use, barren and un-cultivable lands, and area under permanent pastures and other grazing land areas.

Average catchment area: It denotes the land uses related to the types of land under miscellaneous tree crops, culturable waste, and fallow land other than current fallow areas where the land surfaces are undulated terrain, moderately sloppy along with a medium infiltration rate.

Bad catchment area: It covers the area where the terrain is flat with very less vegetative cover, the land use categories under current fallow, total unirrigated and irrigated area with less surface runoff

ANNEXURE 3.5

STANDARD NORMS FOR GREY WATER GENERATION CALCULATION

	Waste water generation Source	Per day/unit waste water generation in L (Standard Value)
1	Bathing	15
2	Washing	10
3	Toilet	10
4	Cleaning	5
5	Cooking and cleaning Utensils	5
6	Others	5
	Total	**50**
	Waste water generation Source	**Daily volume of Grey water in L**
1	Bathing	Bathing water requirement in litres * Total population
2	Washing	washing water requirement in litres * Total population
3	Toilet	Toilet water requirement in litres * Total population
4	Cleaning	Cleaning water requirement in litres * Total population
5	Cooking and cleaning Utensils	cooking and cleaning utensils water requirement in litres * Total population
6	Others	other purpose water requirement in litres * Total population
	Total	**50*total population**
	Waste water generation Source	**Annual Grey water in CuM**
1	Bathing	(Daily volume of grey water for bathing in litres *365) / 1000
2	Washing	(Daily volume of grey water for washing in litres *365) / 1001
3	Toilet	(Daily volume of grey water for toilet in litres *365) / 1002
4	Cleaning	(Daily volume of grey water for cleaning in litres *365) / 1003
5	Cooking and cleaning Utensils	(Daily volume of grey water for cooking and washing utensils in litres *365) / 1004
6	Others	(Daily volume of grey water for other purposes in litres *365) / 1005
	Total	**(Total daily volume of grey water in litres *365)/ 1000**
	Annual Grey water generated in Ha.m	**Annual Grey water in Cum/10000**

ANNEXURE 3.6

GP WISE STATUS OF WATER RESOURCE AND ITS SUPPLY AND DEMAND

Gram Panchayat / Key CWRM Parameter	Canal network		Irrigation Facilities			Catchment Area wise Available Runoff		
	Number of Tanks (PWD & Union)	Number of Ooranis	Area under Tank Irrigation	Area under Canal Irrigation	Area under Open & Tube Well Irrigation	Good Catchment Area	Average Catchment Area	Bad Catchment Area
	No.	No.	ha	ha	ha	ha - m	ha - m	ha - m
Alliandal	1	-	18	-	26	14	1	36
Aridharimangalam	2	-	60	-	42	53	6	76
Dhamarapakkam	2	1	88	-	126	60	10	82
Eraiyur	2	1	-	93	66	54	11	102
Kanji	2	-	-	-	164	41	-	129
C.Gengampattu	2	-	54	-	235	39	-	77
Japthikariyandal	2	-	-	116	14	30	-	42
Kallarpadi	1	-	-	-	141	26	-	58
Kilpadur	1	-	15	-	51	18	-	55
Kottakulam	2	-	67	-	127	50	1	98
Melapunjai	2	-	-	94	44	38	-	59
Melmudiyanur	3	5	126	-	280	73	2	108
Melpadur	2	-	-	-	255	45	0	79
Muthanur	1	1	58	-	190	33	-	62
C.Nammiyandal	1	-	41	-	36	22	-	17
Narasinganallur	1	-	2	-	126	18	-	40
Nayambadi	1	-	-	90	50	30	1	61
Perieri	3	-	49	-	107	37	-	65
Padiagraharam	2	5	119	-	105	79	0	62
pudurchengam	1	2	30	-	58	25	1	45
Thorapadi	2	6	78	-	97	75	-	53
Unnamalaipalayam	1	3	15	-	84	17	-	52

Gram Panchayat / Key CWRM Parameter	Canal network		Irrigation Facilities			Catchment Area wise Available Runoff		
	Number of Tanks (PWD & Union)	Number of Ooranis	Area under Tank Irrigation	Area under Canal Irrigation	Area under Open & Tube Well Irrigation	Good Catchment Area	Average Catchment Area	Bad Catchment Area
	No.	No.	ha	ha	ha	ha - m	ha - m	ha - m
Vadamathur	2	5	27	-	86	21	-	56
Veeranandal	4	4	112	-	497	70	-	131
Voividanthangal	3	3	-	149	17	20	5	56
Munnuramangalam	3	3	145	-	248	55	5	140
Amarnathapudur	2	2	145	-	248	55	5	140
Karapattu	2	2	-	-	-	-	-	-
Nagapadi	2	3	-	-	-	-	-	-
Davanandal	2	2	-	-	-	65	6	48
Panaiolapadi	2	4	-	-	-	41	6	48
Gulalpadi	3	3	72	-	147	33	3	54
Korattambattu	2	2	85	-	74	43	-	41
Mashar	2	1	115	-	137	54	-	87
Melnachipattu	4	4	48	-	121	45	9	104
Oravanthavadi	3	3	227	-	518	98	2	232
Vasudevanpattu	2	3	54	-	97	55	3	76

Gram Panchayat / Key CWRM Parameter	Run Off Conserved (Exisiting)			Watershed and Drainage Networks		
	Good Catchment Area	Average Catch-ment Area	Bad Catchment Area	Length of Natural Drainage Lines	Number of Natu-ral Drainage Lines	Number of MiC-riticalo Watersheds
	ha - m	ha - m	ha - m	m	No.	No.
Alliandal	7	0	5	6,282	6	2
Aridharimangalam	3	5	14	2,013	3	3
Dhamarapakkam	3	7	12	2,453	3	2
Eraiyur	27	8	12	3,447	4	3
Kanji	3	-	10	6,334	7	3
C.Gengampattu	19	-	8	5,597	7	4
Japthikariyandal	2	-	3	830	1	2
Kallarpadi	14	-	4	2,915	3	2
Kilpadur	1	-	7	875	2	4
Kottakulam	4	1	4	1,717	2	3
Melapunjai	2	-	6	3,755	5	2
Melmudiyanur	4	1	10	4,477	7	5
Melpadur	2	0	11	638	1	4
Muthanur	2	-	6	4,293	5	2
C.Nammiyandal	4	-	2	908	1	2
Narasinganallur	3	-	4	-	-	6
Nayambadi	1	1	6	2,913	3	3
Perieri	1	-	7	4,408	4	5
Padiagraharam	1	0	6	2,350	4	3
pudurchengam	1	1	4	3,430	1	5
Thorapadi	12	-	6	1,163	2	3
Unnamalaipalayam	0	-	7	2,869	4	6
Vadamathur	1	-	6	4,143	6	3
Veeranandal	3	-	13	7,531	7	7
Voividanthangal	0	4	6	640	2	3
Munnuramangalam	3	4	8	2,678	2	4

Gram Panchayat / Key CWRM Parameter	Run Off Conserved (Exisiting)			Watershed and Drainage Networks		
	Good Catchment Area	Average Catch-ment Area	Bad Catchment Area	Length of Natural Drainage Lines	Number of Natu-ral Drainage Lines	Number of MiC-riticalo Watersheds
	ha - m	ha - m	ha - m	m	No.	No.
Amarnathapudur	-	-	-	3,664	5	6
Karapattu	-	-	-	12,066	7	9
Nagapadi	-	-	-	2,448	3	4
Davanandal	2	-	1	4,053	4	3
Panaiolapadi	7	-	1	10,985	6	7
Gulalpadi	3	1	1	3,764	5	2
Korattambattu	39	-	1	806	2	5
Mashar	2	-	2	5,369	6	4
Melnachipattu	7	2	3	9,370	14	5
Oravanthavadi	9	2	11	23,280	22	11
Vasudevanpattu	-	3	5	3,285	7	6

Gram Panchayat / Key CWRM Parameter	Water Demand								
	Water Demand For Humans	Water Demand for Livestock	Water Demand For Agriculture	% G.W Utilization for Drinking	% G.W Utilization for Livestock	% G.W Utilzation for Agriculture.	% SW Utilization for Drinking	% SW Utilization for Livestock	% SW Utilization for Agriculture
	ha - m	ha - m	ha - m	%	%	%	%	%	%
Alliandal	5	2	152	0.76	0.96	0.95	0.24	0.04	0.05
Aridharimangalam	5	2	602	1.00	0.94	0.96	0.00	0.06	0.04
Dhamarapakkam	5	2	417	1.00	0.93	0.92	0.00	0.07	0.08
Eraiyur	11	4	495	0.43	0.95	0.91	0.57	0.05	0.09
Kanji	16	3	690	1.00	0.99	0.97	0.00	0.01	0.03
C.Gengampattu	5	2	421	0.76	0.93	0.92	0.24	0.07	0.08
Japthikariyandal	6	3	190	1.00	0.92	0.82	0.00	0.08	0.18
Kallarpadi	5	3	344	0.72	0.93	0.92	0.28	0.07	0.08
Kilpadur	4	1	247	1.00	0.92	0.86	0.00	0.08	0.14
Kottakulam	8	7	395	0.80	0.98	0.97	0.20	0.02	0.03
Melapunjai	4	12	209	0.21	1.00	0.89	0.79	0.00	0.11
Melmudiyanur	12	8	543	0.16	0.96	0.92	0.84	0.04	0.08
Melpadur	6	3	320	0.06	0.96	0.87	0.94	0.04	0.13
Muthanur	7	4	375	0.68	0.95	0.99	0.32	0.05	0.01
C.Nammiyandal	4	2	204	0.86	0.94	0.97	0.14	0.06	0.03
Narasinganallur	4	2	244	0.81	0.94	0.98	0.19	0.06	0.02
Nayambadi	4	2	595	0.91	0.88	0.93	0.09	0.12	0.07
Perieri	6	4	537	0.84	0.92	0.97	0.16	0.08	0.03
Padiagraharam	4	2	513	1.00	0.96	0.98	0.00	0.04	0.02
pudurchengam	4	5	378	0.70	0.96	0.99	0.30	0.04	0.01
Thorapadi	8	4	341	0.10	0.97	0.99	0.90	0.03	0.01
Unnamalaipalayam	2	2	374	0.05	0.93	0.99	0.95	0.07	0.01
Vadamathur	5	2	225	0.11	0.96	0.89	0.89	0.04	0.11
Veeranandal	8	6	1,094	1.00	0.97	1.00	0.00	0.03	0.00

Gram Panchayat / Key CWRM Parameter	Water Demand								
	Water Demand For Humans	Water Demand for Livestock	Water Demand For Agriculture	% G.W Utilization for Drinking	% G.W Utilization for Livestock	% G.W Utilzation for Agriculture.	% SW Utilization for Drinking	% SW Utilization for Livestock	% SW Utilization for Agriculture
	ha - m	ha - m	ha - m	%	%	%	%	%	%
Voividanthangal	6	3	73	0.19	0.95	0.51	0.81	0.05	0.49
Munnuramangalam	6	3	758	0.63	0.95	0.99	0.37	0.05	0.01
Amarnathapudur	5	3	758	0.63	0.95	0.04	0.37	0.05	0.96
Karapattu	14	6	1,389	1.00	0.98	0.04	0.00	0.02	0.96
Nagapadi	5	6	1,389	1.00	0.98	0.04	0.00	0.02	0.96
Davanandal	4	6	1,036	1.00	0.04	0.04	0.00	0.96	0.96
Panaiolapadi	8	6	1,036	1.00	0.04	0.04	0.00	0.96	0.96
Gulalpadi	4	2	227	0.88	0.95	0.04	0.12	0.05	0.96
Korattambattu	4	3	257	0.81	0.97	0.04	0.19	0.03	0.96
Mashar	7	3	547	1.00	0.92	0.93	0.00	0.08	0.07
Melnachipattu	9	6	379	0.77	0.94	0.88	0.23	0.06	0.12
Oravanthavadi	15	6	1,417	0.96	0.94	0.97	0.04	0.06	0.03
Vasudevanpattu	9	7	8	0.88	0.98	0.93	0.12	0.02	0.07

ANNEXURE 3.7

4.2 GP WISE STATUS OF AGRICULTURE RESOURCE

Gram Panchayat / Key CWRM Parameter	Land Resources							
	Non-Agricultural Uses	Barren & Un-cultivable Land	Land Under Miscellaneous Tree Critica-lops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
	ha	ha	ha	ha	ha	ha	ha	ha
Alliandal	38	-	-	2	26	122	2	44
Aridharimangalam	142	-	-	23	40	264	0	102
Dhamarapakkam	161	-	1	34	62	150	11	214
Eraiyur	138	6	4	34	115	269		159
Kanji	108	-	-	-	76	441	11	164
C.Gengampattu	104	-	-	-	38	87	-	289
Japthikariyandal	79	-	-	-	-	82	14	130
Kallarpadi	70	-	-	-	10	157	4	141
Kilpadur	43	4	-	-	33	195	2	66
Kottakulam	133	2	-	3	160	167	2	194
Melapunjai	102	-	-	-	18	158	-	138
Melmudiyanur	194	0	-	7	56	88	25	406
Melpadur	115	4	0	-	-	146	24	255
Muthanur	84	4	-	-	3	69	11	249
C.Nammiyandal	57	-	-	-	-	12		77
Narasinganallur	39	9	-	-	-	68	19	129
Nayambadi	79	-	2	-	23	141	21	140
Perieri	97	-	-	-	2	189	0	156
Padiagraharam	210	-	1	-	-	108	-	225
pudurchengam	66	0	3	-	8	143		88
Thorapadi	199	2	-	-	-	61	46	175

Gram Panchayat / Key CWRM Parameter	Land Resources							
	Non-Agricultural Uses	Barren & Un-cultivable Land	Land Under Miscellaneous Tree Critica-lops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
	ha	ha	ha	ha	ha	ha	ha	ha
Unnamalaipalayam	45	-	-	-	7	166	4	99
Vadamathur	54	3	-	-	2	183		113
Veeranandal	177	9	-	-	-	79	12	610
Voividanthangal	54	-	2	16	9	120	2	166
Munnuramangalam	146	-	-	19	85	261	7	394
Amarnathapudur	146	-	-	19	85	261	7	394
Karapattu	-	-	-	-	-	-	-	-
Nagapadi	-	-	-	-	-	-	-	-
Davanandal	173	-	-	21	-	62	22	173
panaiolapadi	110	-	-	21	-	62	22	173
Gulalpadi	85	4	1	9	20	48	0	219
Korattambattu	115	0	-	-	-	56	3	159
Mashar	143	0	-	-	45	148	21	252
Melnachipattu	113	8	1	31	31	354	-	169
Oravanthavadi	257	3	5	2	145	334	14	744
Vasudevanpattu	145	-	4	5	-	254	0	151

Gram Panchayat / Key CWRM Parameter	Catchment Area			Crop Details				
	Good Catchment	Average Catchment	Bad Catchment	Irrigated Area	Rainfed area	Area under Paddy Cultivation	Crop Water Requirement - Irrigated condition	Crop Water Requirement - Rainfed condition
	ha	ha	ha	ha	ha	ha	ha-m	ha-m
Alliandal	38	2	195	104	19	76	144	7
Aridharimangalam	142	23	406	379	66	323	576	25
Dhamarapakkam	161	36	438	263	87	243	384	32
Eraiyur	144	38	543	310	118	255	451	44
Kanji	108	-	692	435	58	378	668	22
C.Gengampattu	104	-	414	273	88	239	387	34
Japthikariyandal	79	-	226	111	92	88	156	34
Kallarpadi	70	-	311	221	69	208	318	26
Kilpadur	47	-	296	153	88	125	213	34
Kottakulam	135	3	523	261	30	204	385	10
Melapunjai	102	-	314	134	62	119	185	24
Melmudiyanur	195	7	575	313	117	237	499	44
Melpadur	119	0	425	197	108	161	278	42
Muthanur	88	-	332	253	12	156	370	5
C.Nammiyandal	57	-	89	130	15	118	198	6
Narasinganallur	48	-	216	165	10	130	240	4
Nayambadi	79	2	326	336	109	209	554	41
Perieri	97	-	347	352	37	308	522	14
Padiagraharam	210	1	332	320	23	268	504	10
pudurchengam	66	3	239	242	12	147	373	5
Thorapadi	201	-	282	229	13	170	336	5
Unnamalaipalayam	45	-	277	237	9	206	371	3
Vadamathur	57	-	298	168	66	103	200	25
Veeranandal	186	-	701	848	2	442	1,093	1
Voividanthangal	54	19	299	34	93	12	37	35

Gram Panchayat / Key CWRM Parameter	Catchment Area			Crop Details				
	Good Catchment	Average Catchment	Bad Catchment	Irrigated Area	Rainfed area	Area under Paddy Cultivation	Crop Water Requirement - Irrigated condition	Crop Water Requirement - Rainfed condition
	ha	ha	ha	ha	ha	ha	ha-m	ha-m
Munnuramangalam	146	19	747	517	25	378	749	9
Amarnathapudur	146	19	747	517	25	378	749	9
Karapattu	-	-	-	934	53	702	1,370	19
Nagapadi	-	-	-	934	53	702	1,370	19
Davanandal	173	21	257	653	147	531	984	52
panaiolapadi	110	21	257	653	147	531	984	52
Gulalpadi	88	10	287	166	56	104	206	21
Korattambattu	115	-	218	158	41	145	243	14
Mashar	144	-	466	331	104	264	511	36
Melnachipattu	121	32	555	250	128	163	334	45
Oravanthavadi	260	7	1,238	913	128	773	1,372	45
Vasudevanpattu	145	10	406	13	1	-	7	1

Gram Panchayat / Key CWRM Parameter	Soil Resources: Status of Available Nitrogen					Status of Organic Carbon				
	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
	%	%	%	%	%	%	%	%	%	%
Alliandal	-	1.00	-	-	-	0.15	0.85	-	-	-
Aridharimangalam	0.12	0.87	0.02	-	-	-	1.00	-	-	-
Dhamarapakkam	0.12	0.87	0.01	-	-	0.01	0.99	-	-	-
Eraiyur	0.32	0.67	0.01	-	-	0.44	0.56	-	-	-
Kanji	0.02	0.96	0.02	-	-	-	0.99	0.01	-	-
C.Gengampattu	0.08	0.90	0.02	-	-	0.45	0.55	-	-	-
Japthikariyandal	-	1.00	-	-	-	0.03	0.97	-	-	-
Kallarpadi	0.61	0.36	0.03	-	-	0.21	0.61	0.18	-	-
Kilpadur	0.07	0.82	0.11	-	-	0.18	0.80	0.01	-	-
Kottakulam	0.28	0.70	0.02	-	-	0.50	0.40	0.10	-	-
Melapunjai	-	1.00	-	-	-	-	0.67	-	-	0.33
Melmudiyanur	0.58	0.42	-	-	-	0.39	0.61	-	-	-
Melpadur	0.14	0.79	0.07	-	-	0.32	0.67	-	-	0.02
Muthanur	0.26	0.74	-	-	-	0.55	0.45	-	-	-
C.Nammiyandal	0.25	0.75	-	-	-	0.25	0.75	-	-	-
Narasinganallur	0.10	0.86	0.04	-	-	0.25	0.75	-	-	-
Nayambadi	0.06	0.94	-	-	-	0.04	0.96	-	-	-
Perieri	0.34	0.62	0.04	-	-	0.24	0.75	0.01	-	-
Padiagraharam	0.06	0.94	-	-	-	-	1.00	-	-	-
pudurchengam	0.19	0.63	0.19	-	-	0.37	0.63	-	-	-
Thorapadi	0.17	0.76	0.07	-	-	0.24	0.76	-	-	-
Unnamalaipalayam	0.38	0.59	0.03	-	-	0.41	0.59	-	-	-
Vadamathur	0.06	0.33	0.49	0.12	-	0.29	0.67	0.04	-	-
Veeranandal	0.20	0.72	0.09	-	-	0.25	0.74	0.01	-	-
Voividanthangal	0.32	0.68	-	-	-	0.45	0.55	-	-	-
Munnuramangalam	0.78	0.22	0.01	-	-	0.65	0.35	0.01	-	-

Gram Panchayat / Key CWRM Parameter	Soil Resources: Status of Available Nitrogen					Status of Organic Carbon				
	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
	%	%	%	%	%	%	%	%	%	%
Amarnathapudur	0.78	0.22	0.01	-	-	0.65	0.35	0.01	-	-
Karapattu	0.06	0.86	0.08	-	-	0.15	0.84	0.01	0.00	-
Nagapadi	0.06	0.86	0.08	-	-	0.15	0.84	0.01	0.00	-
Davanandal	0.07	0.93	-	-	-	0.37	0.63	-	-	-
panaiolapadi	0.07	0.93	-	-	-	0.37	0.63	-	-	-
Gulalpadi	0.52	0.48	-	-	-	0.55	0.42	0.03	-	-
Korattambattu	0.20	0.80	-	-	-	0.02	0.98	-	-	-
Mashar	0.57	0.43	-	-	-	0.37	0.60	0.03	-	-
Melnachipattu	0.15	0.83	0.02	-	-	0.42	0.58	-	-	-
Oravanthavadi	-	1.00	-	-	-	-	1.00	-	-	-
Vasudevanpattu	0.07	0.93	-	-	-	0.70	0.30	-	-	-

Gram Panchayat / Key CWRM Parameter	Status of Soil Micro Nutrients		Status of Physical condition of the soil					Soil Texture			
	Sufficient	Deficient	Acidic Sulphate (AS)	Moderately Acidic (MAc)	Slighly Acidic (SlAc)	Neutral (N)	Moderately Alkaline (MAI)	% of Clay Soil	% of Fine Soil	% of Coarse loamy	Soil Water Permeability
	%	%	%	%	%	%	%	%	%	%	Low, Moderate, high
Alliandal	1	0	-	-	0	-	1	-	1	-	Moderate
Aridharimangalam	1	0	-	-	-	0	1	-	1	-	Moderate
Dhamarapakkam	1	0	-	0	-	-	1	-	1	-	Moderate
Eraiyur	0	1	-	-	-	-	1	0	1	0	Moderate
Kanji	1	0	-	-	-	0	1	-	1	-	Moderate
C.Gengampattu	1	0	-	-	-	-	1	-	0	-	Moderate
Japthikariyandal	1	0	-	0	0	0	1	0	0	-	Moderate
Kallarpadi	1	0	-	-	-	0	1	-	1	-	Moderate
Kilpadur	1	0	-	-	-	-	1	-	1	-	Moderate
Kottakulam	1	1	-	-	-	-	1	1	0	-	Low
Melapunjai	1	0	-	-	-	-	1	-	1	-	Moderate
Melmudiyanur	0	1	-	-	-	-	1	0	1	-	Moderate
Melpadur	1	0	-	-	-	0	1	0	1	0	Moderate
Muthanur	1	0	-	-	-	-	1	1	0	-	Low
C.Nammiyandal	1	0	0	-	-	0	1	-	1	-	Moderate
Narasinganallur	1	0	-	-	-	-	1	0	1	-	Moderate
Nayambadi	1	0	-	0	-	0	1	-	1	-	Moderate
Perieri	1	1	-	-	-	0	1	0	1	-	Moderate
Padiagraharam	1	0	-	-	-	-	1	0	0	-	Moderate
pudurchengam	1	0	-	-	-	-	1	1	0	-	Low
Thorapadi	0	1	-	-	-	0	1	1	0	-	Low
Unnamalaipalayam	0	1	-	0	0	0	1	0	0	-	Moderate
Vadamathur	1	1	-	-	-	0	1	1	0	0	Low

Gram Panchayat / Key CWRM Parameter	Status of Soil Micro Nutrients		Status of Physical condition of the soil					Soil Texture			
	Sufficient	Deficient	Acidic Sulphate (AS)	Moderately Acidic (MAc)	Slighly Acidic (SlAc)	Neutral (N)	Moderately Alkaline (MAI)	% of Clay Soil	% of Fine Soil	% of Coarse loamy	Soil Water Permeability
	%	%	%	%	%	%	%	%	%	%	Low, Moderate, high
Veeranandal	0	1	0	-	-	0	1	0	0	-	Low
Voividanthangal	0	1	-	-	-	-	1	-	1	-	Moderate
Munnuramangalam	0	1	-	-	0	0	1	-	0	1	High
Amarnathapudur	0	1	-	-	0	0	1	1	0	-	Low
Karapattu	1	0	0	-	0	0	1	0	1	-	Moderate
Nagapadi	1	0	0	-	0	0	1	-	1	-	Moderate
Davanandal	0	1	-	-	-	-	1	-	1	-	Moderate
panaiolapadi	0	1	-	-	-	-	1	-	1	0	Moderate
Gulalpadi	1	0	-	-	-	-	1	0	0	0	Low
Korattambattu	1	0	-	0	-	-	1	-	1	-	Moderate
Mashar	1	0	-	-	-	0	1	-	1	-	Moderate
Melnachipattu	1	0	-	-	0	-	1	0	0	0	Moderate
Oravanthavadi	1	0	-	0	-	-	1	0	1	-	Moderate
Vasudevanpattu	1	0	-	-	-	0	1	0	1	-	Moderate

Gram Panchayat / Key CWRM Parameter	Soil moisture and ET			Means of Water Extraction		Irrigation Methods		Livestock		
	Volumetric Soil Moisture	Estimated Soil Moisture	ET Losses	Gravity	Lifting	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population
	%	Ha - M	Ha - M	%	%	%	%	Number	Number	Number
Alliandal	0	45	24	0	1	0	1	468	154	27
Aridharimangalam	0	99	82	0	1	1	0	557	185	158
Dhamarapakkam	0	109	182	0	1	0	1	561	217	206
Eraiyur	0	135	131	0	1	1	0	1,077	249	322
Kanji	0	159	141	0	1	-	1	742	-	82
C.Gengampattu	0	95	232	0	1	0	1	579	167	229
Japthikariyandal	0	52	116	0	1	-	1	808	439	216
Kallarpadi	0	72	116	0	1	-	1	695	321	168
Kilpadur	0	69	54	0	1	0	1	217	133	50
Kottakulam	0	121	157	0	1	0	1	1,942	130	228
Melapunjai	0	72	111	0	1	1	0	3,217	38	51
Melmudiyanur	0	134	347	0	1	0	1	2,039	896	54
Melpadur	0	99	146	0	1	-	1	738	130	172
Muthanur	0	77	209	0	1	0	1	1,026	424	95
C.Nammiyandal	0	20	62	0	1	1	0	478	85	196
Narasinganallur	0	52	119	0	1	0	1	622	190	206
Nayambadi	0	75	131	0	1	1	0	437	404	173
Perieri	0	80	125	0	1	0	1	960	447	426
Padiagraharam	0	77	182	0	1	1	0	594	203	34
pudurchengam	0	56	73	0	1	0	1	1,354	124	376
Thorapadi	0	65	177	0	1	0	1	1,010	180	62
Unnamalaipalayam	0	64	83	0	1	0	1	548	336	43
Vadamathur	0	69	91	0	1	0	1	606	141	76
Veeranandal	0	163	500	0	1	0	1	1,556	85	378

Gram Panchayat / Key CWRM Parameter	Soil moisture and ET			Means of Water Extraction		Irrigation Methods		Livestock		
	Volumetric Soil Moisture	Estimated Soil Moisture	ET Losses	Gravity	Lifting	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population
	%	Ha - M	Ha - M	%	%	%	%	Number	Number	Number
Voividanthangal	0	73	137	0	1	1	0	768	142	213
Munnuramangalam	0	176	322	0	1	0	1	720	297	58
Amarnathapudur	0	176	322	0	1	0	1	720	297	58
Karapattu	0	-	-	1	-	0	1	1,716	105	171
Nagapadi	0	-	-	1	-	0	1	1,716	105	171
Davanandal	0	64	157	1	-	1	0	1,636	659	263
panaiolapadi	0	64	157	1	-	0	1	1,636	659	263
Gulalpadi	0	69	177	0	1	0	1	628	78	227
Korattambattu	0	50	130	0	1	1	0	756	115	120
Mashar	0	107	220	0	1	0	1	854	316	435
Melnachipattu	0	137	137	0	1	0	1	1,657	280	686
Oravanthavadi	0	287	614	0	1	0	1	1,524	635	357
Vasudevanpattu	0	96	125	0	1	0	1	1,760	189	182

ANNEXURE 3.8

GP WISE DEMOGRAPHIC AND SOCIO-ECONOMIC STATUS

Gram Panchayat / Key CWRM Parameter	Geographical Area	Male Population	Female Population	Total Population	SC Population	ST Population	Vulnerable popupation	Households (HH's)	Only one room HH's (SECC)	Female Headed HH's (SECC)
	ha	No.	No.	No.	No.	No.	No.	No.	No.	No.
Alliandal	234	801	868	1,669	969	-	969	389	72	20
Aridharimangalam	571	932	883	1,815	951	23	974	387	115	16
Dhamarapakkam	634	925	866	1,791	-	-	-	414	100	15
Eraiyur	726	2,077	2,012	4,089	1,126	-	1,126	946	19	32
Kanji	800	2,884	2,989	5,873	1,070	29	1,099	1,458	110	70
C.Gengampattu	518	963	1,035	1,998	790	10	800	439	63	28
Japthikariyandal	305	1,024	1,011	2,035	976	7	983	437	27	12
Kallarpadi	381	1,022	980	2,002	733	-	733	439	26	11
Kilpadur	343	686	633	1,319	618	-	618	294	51	19
Kottakulam	661	1,430	1,390	2,820	1,254	-	1,254	652	2	24
Melapunjai	417	808	833	1,641	444	40	484	399	45	21
Melmudiyanur	776	2,279	2,201	4,480	1,570	6	1,576	1,124	72	66
Melpadur	544	1,138	1,181	2,319	970	-	970	606	154	40
Muthanur	420	1,284	1,192	2,476	861	303	1,164	541	44	12
C.Nammiyandal	146	669	704	1,373	771	-	771	331	50	26
Narasinganallur	264	794	732	1,526	552	-	552	356	44	12
Nayambadi	407	836	789	1,625	600	13	613	907	105	37
Perieri	444	1,153	1,126	2,279	602	110	712	499	77	17
Padiagraharam	544	776	754	1,530	8	-	8	907	105	37
pudurchengam	309	781	812	1,593	691	13	704	377	33	20
Thorapadi	482	1,518	1,432	2,950	861	-	861	656	122	28
Unnamalaipalayam	321	475	430	905	290	59	349	199	41	6
Vadamathur	355	1,009	984	1,993	904	-	904	430	60	24

Gram Panchayat / Key CWRM Parameter	Geographical Area	Male Population	Female Population	Total Population	SC Population	ST Population	Vulnerable popupation	Households (HH's)	Only one room HH's (SECC)	Female Headed HH's (SECC)
	ha	No.	No.	No.	No.	No.	No.	No.	No.	No.
Veeranandal	887	1,486	1,449	2,935	706	120	826	687	97	34
Voividanthangal	372	1,140	1,051	2,191	878	63	941	511	75	18
Munnuramangalam	504	1,081	1,011	2,092	995	109	1,104	652	2	24
Amarnathapudur	504	1,081	1,011	2,092	995	109	1,104	652	2	24
Karapattu	1,449	2,645	2,469	5,114	844	10	854	1,551	106	59
Nagapadi	263	881	874	1,755	284	4	288	1,551	156	59
Davanandal	252	810	753	1,563	33	-	33	818	89	44
panaiolapadi	1,145	1,429	1,431	2,860	324	12	336	1,041	117	54
Gulalpadi	385	705	644	1,349	316	133	449	338	45	18
Korattambattu	333	763	755	1,518	442	-	442	416	5	28
Mashar	610	1,222	1,165	2,387	692	31	723	565	80	30
Melnachipattu	707	1,615	1,547	3,162	1,611	9	1,620	39	712	59
Oravanthavadi	1,505	2,867	2,711	5,578	1,313	13	1,326	1,229	165	65
Vasudevanpattu	561	1,614	1,494	3,108	1,122	-	1,122	696	34	31

Gram Panchayat / Key CWRM Parameter	Vulnerable Households (SECC)	% of Vulnerable Households	Registered MGNREGA Job cards	Active person working in MGNREGA job Cards	Drinking Water Sources	Ground Water - Drinking source	Surface water - Drinking source	sum of drinking water sources	HH's have tap water connection for drinking water	HH's dependent on other sources for drinking water	Annual Greywater Generation
	No.	%	Persons	Persons	No.	No.	No.	No.	No.	No.	ha.m
Alliandal	56	0.15	540	417	147	5	2	7	387	-	3
Aridharimangalam	85	0.22	800	693	82	3	1	4	320	-	3
Dhamarapakkam	75	0.18	694	502	83	3	1	4	459	-	3
Eraiyur	23	0.02	1,842	1,135	316	4	2	6	284	720	7
Kanji	98	0.07	1,589	1,280	794	4	2	6	1,198	575	11
C.Gengampattu	53	0.12	805	688	145	5	2	7	505	-	4
Japthikariyandal	23	0.05	1,005	794	20	3	-	3	523	-	4
Kallarpadi	22	0.05	859	693	27	3	1	4	500	-	4
Kilpadur	41	0.14	591	424	25	4	-	4	304	-	2
Kottakulam	9	0.01	1,407	1,183	52	3	-	3	640	-	5
Melapunjai	38	0.10	1,003	727	110	4	2	6	535	17	3
Melmudiyanur	70	0.06	1,826	1,545	505	5	2	7	925	505	8
Melpadur	120	0.20	1,159	764	210	5	2	7	535	-	4
Muthanur	34	0.06	1,074	778	99	4	1	5	610	-	5
C.Nammiyandal	43	0.13	548	401	114	4	1	5	350	-	3
Narasinganallur	34	0.10	762	508	40	4	1	5	502	-	3
Nayambadi	85	0.09	876	682	57	4	1	5	486	-	3
Perieri	59	0.12	1,083	944	775	5	1	6	367	640	4
Padiagraharam	59	0.07	1,021	797	21	3	-	3	497	-	3
Pudurchengam	29	0.08	786	685	46	4	1	5	389	-	3
Thorapadi	94	0.14	1,251	948	260	5	1	6	604	-	5
Unnamalaipalayam	31	0.15	558	489	408	5	1	6	600	315	2
Vadamathur	49	0.11	849	661	239	5	3	8	390	-	4
Veeranandal	78	0.11	1,476	1,044	35	3	-	3	823	-	5

Gram Panchayat / Key CWRM Parameter	Vulnerable Households (SECC)	% of Vulnerable Households	Registered MGNREGA Job cards	Active person working in MGNREGA job Cards	Drinking Water Sources	Ground Water - Drinking source	Surface water - Drinking source	sum of drinking water sources	HH's have tap water connection for drinking water	HH's dependent on other sources for drinking water	Annual Greywater Generation
	No.	%	Persons	Persons	No.	No.	No.	No.	No.	No.	ha.m
Voividanthangal	58	0.11	920	743	98	4	2	6	534	-	4
Munnuramangalam	9	0.01	1,059	909	220	5	1	6	550	-	4
Amarnathapudur	9	0.01	1,059	909	220	5	1	6	550	-	3
Karapattu	92	0.06	2,050	1,277	36	3	-	3	1,478	-	9
Nagapadi	127	0.08	878	796	21	4	1	5	431	-	3
Davanandal	76	0.09	695	616	24	4	-	4	367	-	3
panaiolapadi	98	0.09	1,376	1,090	915	4	-	4	754	-	5
Gulalpadi	37	0.11	650	530	207	5	3	8	500	-	2
Korattambattu	12	0.03	665	552	417	5	3	8	362	-	3
Mashar	65	0.12	899	654	607	5	-	5	567	-	4
Melnachipattu	39	0.12	1,059	811	106	4	3	7	691	-	6
Oravanthavadi	135	0.11	1,994	1,751	270	5	2	7	1,460	-	10
Vasudevanpattu	33	0.05	1,259	875	167	4	2	6	894	-	6

ANNEXURE 4

IPCC VULNERABILITY ASSESSMENT METHODOLOGY

Normalization of Indicators:

In order to make the indicators free from the units, normalization has done. The normalization process varies depending on the nature of relationship of that particular indicator with the vulnerability. The following formula are used,

- for indicators with positive relationship with vulnerability

$$x_{ij}^{P} = \frac{Xij - Min\, i\{Xij\}}{(Max\, i\{Xij\} - Min\, i\{Xij\}}$$

- for indicators with negative relationship with vulnerability

$$x_{ij}^{n} = \frac{Max\, i\{Xij\} - Xij}{Max\, i\{Xij\} - Min\{Xij\}}$$

Aggregation and categorization of Indicators

The normalized values of indicator sets are aggregated to obtain the vulnerability index and categorized in to high, medium and low vulnerability classes.

$$VI = \frac{\sum_{i}^{N} K_i S_i}{K_i}$$

X_{ij} is the value of j^{th} indicator for i^{th} GP and X^{P}_{ij} is the normalized value

X_{ij} is the value of j^{th} indicator for i^{th} GP and x^{n}_{ij} is the normalized value

ANNEXURE 5.1

GP WISE WASCA PROPOSED TREATMENT AREA

Gram Panchayat / Key CWRM Parameter	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
	ha	ha	ha	ha	ha	ha	ha	ha	ha
Alliandal	18.87	-	-	-	1.32	3.80	17.69	0.32	4.41
Aridharimangalam	6.82	-	-	-	17.14	8.85	58.09	0.11	10.21
Dhamarapakkam	8.69	-	-	0.82	25.82	11.16	26.99	2.05	21.42
Eraiyur	69.20	4.20	-	2.93	25.66	13.78	32.18	-	15.91
Kanji	5.04	-	-	-	-	5.10	29.65	0.75	16.38
C.Gengampattu	52.18	-	-	-	-	4.56	10.38	-	28.88
Japthikariyandal	4.57	-	-	-	-	-	4.22	0.70	13.05
Kallarpadi	35.05	-	-	-	-	0.49	7.68	0.18	14.09
Kilpadur	-	3.17	-	-	-	4.71	27.45	0.24	6.58
Kottakulam	6.18	1.28	-	-	2.25	2.12	2.21	0.03	19.38
Melapunjai	4.61	-	-	-	-	1.72	14.99	-	13.80
Melmudiyanur	9.71	0.33	-	-	4.88	3.48	5.51	1.55	40.63
Melpadur	1.15	3.05	-	0.31	-	-	28.79	4.72	25.53
Muthanur	0.84	3.00	-	-	-	0.19	4.38	0.72	24.86
C.Nammiyandal	10.90	-	-	-	-	-	1.54	-	7.67
Narasinganallur	0.39	6.78	-	-	-	-	6.59	1.85	12.87
Nayambadi	0.79	-	-	1.79	-	2.17	13.19	1.93	14.02
Perieri	0.97	-	-	-	-	0.19	22.40	0.02	15.59
Padiagraharam	2.10	-	-	1.12	-	-	7.02	-	22.46
pudurchengam	0.66	0.23	-	2.23	-	0.65	11.02	-	8.81
Thorapadi	1.99	1.65	-	-	-	-	8.73	6.55	17.46
Unnamalaipalayam	0.45	-	-	-	-	1.07	25.46	0.68	9.92

Gram Panchayat / Key CWRM Parameter	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
	ha	ha	ha	ha	ha	ha	ha	ha	ha
Vadamathur	0.54	2.34	-	-	-	0.20	20.95	-	11.33
Veeranandal	1.77	6.54	-	-	-	-	8.98	1.40	60.96
Munnuramangalam	7.28	-	-	-	14.40	1.12	3.45	0.10	39.35
Amarnathapudur	2.48	-	-	-	16.32	7.92	24.29	0.68	36.60
Karapattu	-	-	-	-	-	-	-	-	-
Nagapadi	-	-	-	-	-	-	-	-	-
Davanandal	2.95	-	-	-	18.05	-	2.47	0.89	6.92
panaiolapadi	1.87	-	-	-	18.05	-	2.47	0.89	6.92
Gulalpadi	1.44	3.18	-	0.86	7.26	0.80	1.91	-	8.78
Korattambattu	-	97.63	0.09	-	-	-	-	2.23	0.11
Mashar	2.44	0.37	-	-	-	1.82	5.91	0.86	10.07
Melnachipattu	1.93	6.43	-	0.82	26.35	1.25	14.17	-	6.76
Oravanthavadi	3.86	2.27	-	3.75	1.17	15.97	36.72	1.58	-
Vasudevanpattu	6.43	-	-	3.22	3.93	-	12.10	-	7.20

ANNEXURE 5.2

GP WISE EXPECTED RUNOFF CONSERVATION AFTER WASCA TREATMENT

GP name	Good Catchment Area ha.m	Average Catchment Area ha.m	Bad Catchment Area ha.m
Alliandal	6.96	0.37	4.90
Aridharimangalam	2.55	4.82	14.45
Dhamarapakkam	3.25	7.49	11.52
Eraiyur	26.68	8.03	11.57
Kanji	3.24	-	9.70
C.Gengampattu	18.83	-	8.19
Japthikariyandal	1.64	-	3.36
Kallarpadi	13.79	-	4.19
Kilpadur	1.18	-	7.29
Kottakulam	3.74	0.63	4.44
Melapunjai	1.80	-	5.70
Melmudiyanur	3.90	1.40	9.60
Melpadur	1.60	0.10	11.00
Muthanur	1.70	-	5.60
C.Nammiyandal	4.00	-	1.70
Narasinganallur	3.00	-	4.00
Nayambadi	0.50	0.50	5.90
Perieri	1.10	-	7.10
Padiagraharam	0.80	0.30	5.50
pudurchengam	1.30	0.60	3.80
Thorapadi	12.20	-	6.10
Unnamalaipalayam	0.30	-	6.90
Vadamathur	1.30	-	6.10
Veeranandal	3.20	-	13.30
Voividanthangal	0.20	3.90	5.90
Munnuramangalam	2.90	4.00	8.20
Amarnathapudur	-	-	-
Karapattu	-	-	-
Nagapadi	-	-	-
Davanandal	1.50	-	0.70
panaiolapadi	7.20	-	0.70
Gulalpadi	2.60	1.20	0.50
Korattambattu	38.70	-	0.50
Mashar	1.50	-	1.70
Melnachipattu	6.50	2.10	3.00
Oravanthavadi	8.60	1.80	10.60
Vasudevanpattu	-	2.50	4.70

ANNEXURE 5.3

GP-WISE PROPOSED WORKS BASED ON WATERSHED AND LIVELIHOOD APPROACH (AREA IN ha / LENGTH IN m / PLANTS IN No.)

Gram Panchayat	Aff		ARS	AVP		Az	BP		CBP		CS
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Length	No.
Alliandal	1,056	1	-	-	-	34	11,322	14	-	-	34
Amarnathapudur	13,056	16	-	-	-	18	1,983	2	-	-	18
Aridharimangalam	13,710	17	17	-	-	61	4,094	5	-	-	61
C.Gengampattu	-	-	-	-	-	35	31,305	39	-	-	35
C.Nammiyandal	-	-	-	-	-	12	781	1	-	-	12
Davanandal	14,443	18	-	-	-	41	2,358	3	-	-	41
Dhamarapakkam	20,658	26	50	-	-	50	5,216	7	-	-	50
Eraiyur	23,886	30	-	-	-	64	41,520	52	-	-	64
Gulalpadi	8,350	10	-	-	-	16	1,151	1	-	-	16
Japthikariyandal	-	-	-	-	-	21	2,743	3	-	-	21
Kallarpadi	-	-	-	-	-	17	21,030	26	-	-	17
Kanji	-	-	66	-	-	25	3,023	4	-	-	25
Karapattu	-	-				43	-	-	-	-	43
Kilpadur	2,538	3	-	-	-	15	-	-	-	-	15
Korattambattu	68	-	-	-	-	19	78,105	98	-	-	19
Kottakulam	2,820	4	-	-	-	13	3,706	5	-	-	13
Mashar	292	-	-	-	-	21	1,952	2	-	-	21
Melapunjai	-	-	-	-	-	152	2,766	3	-	-	152
Melmudiyanur	4,168	5	-	-	-	115	2,640	3	-	-	41
Melnachipattu	26,228	33	-	-	-	41	1,543	2	-	-	41
Melpadur	2,768	3	-	-	-	18	1,562	2	-	-	18
Munnuramangalam	13,056	16				18	1,983	2	-	-	18
Muthanur	2,720	3	-	-	-	26	1,140	1	-	-	26
Nagapadi	-	-	-	-	-	43	-	-	-	-	43
Narasinganallur	6,147	8	-	-	-	16	530	1	-	-	16
Nayambadi	-	-	-	-	-	11	1,081	1	-	-	11
Oravanthavadi	1,816	2	-	378	1,888	65	3,120	4	-	-	38
Padiagraharam	-	-	-	-	-	15	2,860	4	-	-	15

Gram Panchayat	Aff		ARS	AVP		Az	BP		CBP		CS
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Length	No.
Panaiolapadi	14,443	18				41	1,495	2	-	-	41
Perieri	-	-	-	-	-	24	1,327	2	-	-	24
Pudurchengam	184	-	-	-	-	29	792	1	-	-	34
Thorapadi	1,496	2	-	-	-	25	2,703	3	-	-	25
Unnamalaipalayam	-	-	-	-	-	14	607	1	-	-	14
Vadamathur	2,122	3	-	-	-	15	732	1	-	-	15
Vasudevanpattu	3,144	4	-	-	-	44	1,286	6	-	-	44
Veeranandal	5,930	7	-	-	-	39	2,412	3	-	-	39
Voividanthangal	11,104	14	-	-	-	19	2,278	3	-	-	19

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI	
	No.	No.	Area	No.	No.	No.	Area	Plants	Length	No.	Area
Alliandal	34	5	-	9	10	-	-	1,256	6,282		
Amarnathapudur	18	13	69	22	-	-	-	733	3,664	27,794	35
Aridharimangalam	61	15	-	18	-	-	-	403	2,013		
C.Gengampattu	35	9	-	12	1	-	-	1,119	5,597		
C.Nammiyandal	12	1	12	10	-	-	-	182	908	4,609	6
Davanandal	41	1	10	10	-	-	-	811	4,053	4,113	5
Dhamarapakkam	50	12	-	15	1	-	-	491	2,453		
Eraiyur	64	12	-	18	1	-	-	689	3,447		
Gulalpadi	16	1	11	10	-	-	-	753	3,764	4,596	6
Japthikariyandal	21	4	-	5	46	-	-	166	830		
Kallarpadi	17	4	-	7	1	-	-	583	2,915		
Kanji	25	10	-	11	1	-	-	1,267	6,334		
Karapattu	43	-	-	9	-	-	-	2,413	12,066	-	-
Kilpadur	15	8	-	8	21	-	-	175	875		
Korattambattu	19	-	102	-	-	-	-	161	806	79,978	100
Kottakulam	13	5	-	11	51	-	-	343	1,717		
Mashar	21	3	19	12	-	-	-	1,074	5,369	7,462	9
Melapunjai	152	9	-	10	38	-	-	751	3,755		
Melmudiyanur	41	4	-	10	112	-	-	895	4,477		
Melnachipattu	41	6	22	15	-	-	-	1,874	9,370	8,872	11
Melpadur	18	14	85	23	-	-	-	128	638	33,989	42
Munnuramangalam	18	2	10	11	-	-	-	536	2,678	3,885	5
Muthanur	26	2	20	11	-	-	-	859	4,293	7,964	10
Nagapadi	43	-	-	9	-	-	-	490	2,448	-	-
Narasinganallur	16	3	22	12	-	-	-	-	-	8,640	11
Nayambadi	11	7	29	16	-	-	-	583	2,913	11,720	15
Oravanthavadi	38	-	-	13	207	-	-	2,217	11,085	2,080	3
Padiagraharam	15	4	30	13	-	-	-	470	2,350	4,800	15

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI	
	No.	No.	Area	No.	No.	No.	Area	Plants	Length	No.	Area
Panaiolapadi	41	1	10	10	-	-	-	2,197	10,985	4,113	5
Perieri	24	9	42	18	-	-	-	882	4,408	16,658	21
Pudurchengam	34	5	-	14	23	-	-	-	-	-	-
Thorapadi	25	6	39	15	-	-	-	233	1,163	15,764	20
Unnamalaipalayam	14	11	42	20	-	-	-	574	2,869	16,601	21
Vadamathur	15	8	33	17	-	-	-	829	4,143	13,118	16
Vasudevanpattu	44	5	52	14	39	-	-	207	1,035	4,840	6
Veeranandal	39	4	77	13	-	-	-	1,506	7,531	30,840	39
Voividanthangal	19	6	33	15	-	-	-	128	640	13,134	16

Gram Panchayat	FBBTI		FD	GSS	ICP		LDI		LP		MI	
	No.	Area	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area
Alliandal			34	7	-	-	8	21	556	2,780	-	-
Amarnathapudur	35	69	18	16	-	-	7	16	305	1,525	15	37
Aridharimangalam			61	19	-	-	15	38	736	3,680	-	-
C.Gengampattu			35	12	-	-	19	48	702	3,510	-	-
C.Nammiyandal	6	12	12	6	-	-	-	1	592	2,959	4	10
Davanandal	5	10	41	36	-	-	1	2	380	1,900	3	7
Dhamarapakkam			50	19	-	-	18	45	438	2,190	-	-
Eraiyur			64	17	-	-	39	97	-	-	-	-
Gulalpadi	6	11	16	6	-	-	1	1	1,628	8,140	4	9
Japthikariyandal	4	2	21	8	-	-	3	7	424	2,120	-	-
Kallarpadi			17	6	-	-	12	31	172	860	-	-
Kanji	10	18	25	1	-	-	6	14	598	2,992	-	-
Karapattu	-	-	43	7	-	-	-	-	247	1,236	-	-
Kilpadur	11	16	15	6	-	-	4	11	1,184	1	-	-
Korattambattu	51	102	19	7	-	-	-	-	363	1,815	40	100
Kottakulam	7	4	13	1	-	-	5	13	229	1,145	-	-
Mashar	9	19	21	20	-	-	2	4	603	3,015	4	10
Melapunjai	9	8	152	2	-	-	5	12	2,408	12,038	-	-
Melmudiyanur	17	42	115	48	-	-	2	9	764	0	-	-
Melnachipattu	11	22	41	21	-	-	3	8	566	0	3	7
Melpadur	42	85	18	9	-	-	7	17	1,757	1	20	51
Munnuramangalam	5	10	18	16	-	-	1	2	370	1,851	2	5
Muthanur	10	20	26	22	-	-	1	2	412	2,062	6	15
Nagapadi	-	-	43	7	-	-	-	-	561	2,806	-	-
Narasinganallur	11	22	16	12	-	-	2	4	744	3,720	5	13
Nayambadi	15	29	11	22	-	-	3	8	297	1,485	5	13
Oravanthavadi	-	-	65	14	975	4,877	-	-	-	-	-	-
Padiagraharam	15	30	15	10	-	-	2	5	247	1,235	8	20
Panaiolapadi	5	10	41	36	-	-	1	2	320	1,599	3	7
Perieri	21	42	24	26	-	-	5	11	491	2,455	7	19

Gram Panchayat	FBBTI		FD	GSS	ICP		LDI		LP		MI	
	No.	Area	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area
Pudurchengam	-	-	29	10	626	3,128	-	-	562	2,812	-	-
Thorapadi	20	39	25	10	-	-	3	7	391	1,954	10	24
Unnamalaipalayam	21	42	14	17	-	-	5	13	79	395	6	15
Vadamathur	16	33	15	8	-	-	4	10	1,184	1	5	12
Vasudevanpattu	26	52	44	37	-	-	3	13	363	1,815	13	33
Veeranandal	39	77	39	8	-	-	2	5	229	1,145	27	67
Voividanthangal	16	33	19	9	-	-	3	7	603	3,015	7	18

Gram Panchayat	NADEP	ND		PS	RPWDT	RP	RRWH	SPD		SPC	SPI	WCICD
	No.	Plants	HH	No.	No.	No.	No.	No.	Area	No.	No.	Length
Alliandal	34	389	78	34	1	-	2	-	-	4	56	-
Amarnathapudur	18	546	109	18	2	2	2	-	-	5	55	-
Aridharimangalam	61	387	77	61	2	-	2	-	-	4	85	-
C.Gengampattu	35	439	88	35	2	-	2	-	-	4	53	-
C.Nammiyandal	12	1,340	268	12	1	-	2	-	-	3	34	-
Davanandal	41	1,944	389	41	2	2	2	-	-	5	49	-
Dhamarapakkam	50	414	83	50	2	1	2	-	-	4	75	-
Eraiyur	64	-	-	64	2	1	2	-	-	-	-	-
Gulalpadi	16	1,360	272	16	3	3	2	-	-	3	34	-
Japthikariyandal	21	437	87	21	2	-	2	-	-	4	23	-
Kallarpadi	17	439	88	17	1	-	2	-	-	4	22	-
Kanji	25	1,458	292	25	2	-	2	-	-	15	98	-
Karapattu	43	6,676	1,335	43	2	2	2	-	-	17	167	-
Kilpadur	15	294	59	15	1	-	2	-	-	3	41	-
Korattambattu	19	1,584	317	19	2	2	2	-	-	4	40	-
Kottakulam	13	652	130	13	2	-	2	-	-	7	9	-
Mashar	21	2,216	443	21	2	1	2	-	-	6	55	-
Melapunjai	152	399	80	152	2	-	2	-	-	4	38	-
Melmudiyanur	41	575	115	115	3	5	2	-	-		115	-
Melnachipattu	41	2,884	577	41	4	4	2	-	-	7	72	-
Melpadur	18	2,344	469	18	2	-	2	-	-	6	59	-
Munnuramangalam	18	2,572	514	18	3	3	2	-	-	6	64	-
Muthanur	26	2,172	434	26	1	1	2	-	-	5	54	-
Nagapadi	43	2,080	416	43	2	3	2	-	-	5	52	-
Narasinganallur	16	1,412	282	16	1	-	2	-	-	4	35	-
Nayambadi	11	1,532	306	11	1	-	2	-	-	4	38	-
Oravanthavadi	38	325	65	65	3	3	2	-	-	3	65	4,877
Padiagraharam	15	1,508	302	15	2	5	2	-	-	4	38	-
Panaiolapadi	41	3,232	646	41	2	4	2	-	-	8	81	-
Perieri	24	2,112	422	24	3	-	2	-	-	5	53	-

Gram Panchayat	NADEP	ND		PS	RPWDT	RP	RRWH	SPD		SPC	SPI	WCICD
	No.	Plants	HH	No.	No.	No.	No.	No.	Area	No.	No.	Length
Pudurchengam	34	145	29	29	1	2	2	-	-	2	29	3,128
Thorapadi	25	2,076	415	25	2	6	2	-	-	7	66	-
Unnamalaipalayam	14	2,076	415	14	1	3	2	-	-	4	42	-
Vadamathur	15	2,195	439	15	2	5	2	-	-	4	44	-
Vasudevanpattu	44	1,986	397	44	2	3	2	-	-	5	50	-
Veeranandal	39	3,500	700	39	4	4	2	-	-	7	70	-
Voividanthangal	19	2,076	415	19	3	3	2	-	-	5	52	-

ANNEXURE 7.1

GP WISE WASCA RECOMMENDATION AND WORKS UPLOADED

Name of the GP	WASCA Recom-mendation for 3 Years	Works uploaded for FY-2021-22 as on 16/11/21
Alliyandal	298	160
Amarnathapudur	134	176
Aritharimangalam	484	367
C.Gengampattu	505	358
C.Nammiyandal	208	159
Devanandal	331	220
Dhamaraippakkam	471	285
Eraiyur	393	296
Gulalpadi	179	330
Japthikariyandal	210	326
Kallaraipadi	221	128
Kanji	273	155
Karappattu	448	238
Kilpadur	168	153
Korattampattu	169	219
Kottakulam	155	353
Mashar	209	188
Melapunjai	698	306
Melmudiyanur	754	623
Melnachippattu	334	523
Melpadur	690	379
Munnurmangalam	293	141
Muthanur	382	327
Nagapadi	243	135
Narasinganallur	181	144
Nayampadi	291	322
Oravandhavadi	385	293
Padiagraharam	150	191
Panaiolaipadi	214	584
Periyeri	421	148
Pudurchengam	317	126
Thorapadi	303	159
Unnamalaipalayam	301	179
Vadamathur	207	360
Vaividanthangal	251	233
Vasudevanpattu	446	366
Veeranandal	418	300
Total	**12135**	**9950**

ANNEXURE 7.2

GP AND WORK CATEGORY-WISE ONGOING WORKS IN PUDUPALAYAM BLOCK

Name of the GP	Work Category	No. of Ongoing works
Alliyandal	Rural Connectivity	1
	WCWH	1
Alathurai	WCWG	1
Amarnatha Pudur	WCWH	2
Aritharimangalam	Rural Connectivity	1
	WCWH	1
C.Gengampet	WCWH	2
C.Namiyandal	WCWH	1
Devanandal	WCWH	2
Dhamarapakkam	WCWH	2
	Works on Individuals Land (Category IV)	1
Eraiyur	WCWH	1
Gulalpadi	Drought Proofing	1
	Rural Sanitation	1
	WCWH	3
Japthikariyandal	WCWH	1
	Works on Individuals Land (Category IV)	1
Kallarppadi	WCWH	2
Kanji	WCWH	3
Karappattu	WCWH	1
Kilpadur	WCWH	1
Korattampattu	WCWH	1
	Works on Individuals Land (Category IV)	1
Kottakulam	Rural Sanitation	5
	WCWH	2
Mashar	WCWH	1
Melapunji	WCWH	2
Melmudiyanur	WCWH	1
	Works on Individuals Land (Category IV)	3
Melnaichipattu	WCWH	2
	Works on Individuals Land (Category IV)	25
Melpadur	Rural Sanitation	8
	WCWH	3
	Works on Individuals Land (Category IV)	3

Name of the GP	Work Category	No. of Ongoing works
Munnurmangalam	WCWH	2
	Works on Individuals Land (Category IV)	2
Muthanur	WCWH	2
Nagapady	Rural Connectivity	1
	WCWH	1
Naiyambadi	WCWH	1
Narasinganallur	WCWH	1
Oravandavadi	Rural Connectivity	1
	WCWH	1
Padiagharagaram	Rural Connectivity	1
	WCWH	2
Panaiolapady	WCWH	1
Periyeri	WCWH	1
Pudurchengam	WCWH	1
	Works on Individuals Land (Category IV)	4
Thorapadi	WCWH	3
	Works on Individuals Land (Category IV)	9
Unnamalaipalayam	Rural Connectivity	1
	Rural Sanitation	3
	WCWH	1
Vadamathur	WCWH	2
Vaividanthangal	WCWH	2
Vadathinnalur	Drought Proofing	1
Vasudevampattu	Anganwadi/Other Rural Infrastructure	1
	WCWH	1
	Works on Individuals Land (Category IV)	2
Veeranandal	WCWH	2
	Works on Individuals Land (Category IV)	1
Total		**136**

ANNEXURE 8

CWRM KEY INDICATORS FOR GPS IN DEVANANDAL & ADAIYUR MICRO-WATERSHED

Sl. No.	Key CWRM Parameter	Oravanthavadi	Korattambattu
Soil Resources: Status of Available Nitrogen (%)			
1	Very Low	-	19.51
2	Low	100	80.49
Status of Organic Carbon (%)			
3	Very Low	-	2.44
4	Low	100	97.56
Status of Soil Micro Nutrients (%)			
5	Sufficient	74	53
6	Deficient	26	47
Status of Physical condition of the soil (%)			
7	Moderately Acidic	3.51	2.44
8	Moderately Alkaline	96.49	97.56
	Strongly Alkaline		
Soil Texture (%)			
9	Clay Soil	8.83	-
10	Coarse loamy	67.81	76.61
11	Soil Water Permeability	Moderate	Moderate
Soil moisture and ET			
12	Volumetric Soil Moisture	23	23
13	Estimated Soil Moisture	286.9	50.08
14	ET Losses	614.08	130.18
Means of Water Extraction (%)			
15	Gravity	1.43	6.33
16	Lifting	98.57	93.67
Irrigation Methods (%)			
17	Wild Flooding	30.43	53.48
18	Control Flooding	69.57	46.52
Livestock (No.)			
19	Cattle Population	1524	756
20	Sheep Population	635	115
21	Goat Population	357	120
Land Resources (ha)			
22	Non-Agricultural Uses	257.32	114.86
23	Barren & Un-cultivable Land	3.02	0.1
24	Land Under Miscellaneous Tree Criticalops etc.	5	-
25	Culturable Waste Land	1.56	-
26	Fallows Land other than Current Fallows	145.17	-
27	Current Fallow land	333.85	55.71
28	Unirrigated Land	14.36	2.84
29	Area Irrigated by Source	744.42	159.08

Department of Rural Development & Panchayat Raj,
Government of Tamil Nadu
Panagal Building, 4th and 5th floor
Jeenis Road, Saidapet, Chennai-600015
T : +91 44-24336105/24337436/24337440/24336102
E: drd@tn.nic.in; I: https://tnrd.gov.in/

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
A2/18, Safdarjung Enclave
New Delhi-110029, India
T : +91 11-49495353
E : info@giz.de; I: www.giz.de