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WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA

SUSTAINABLE DEVELOPMENT GOALS

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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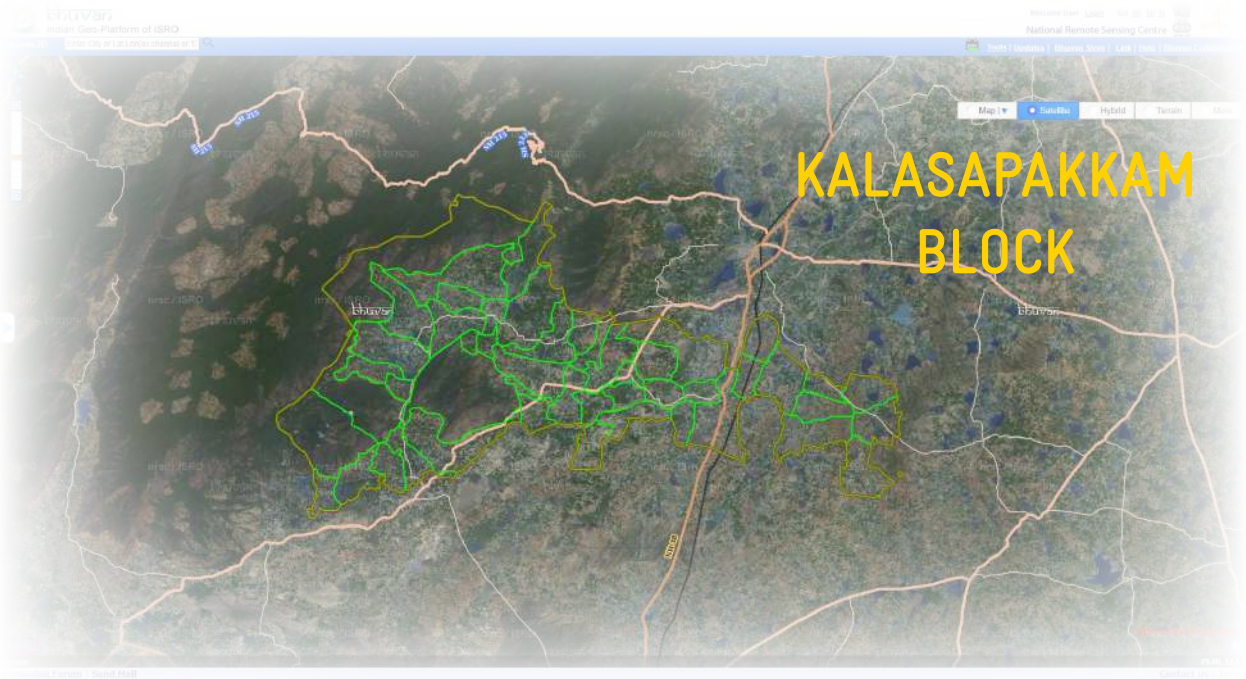
WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

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).

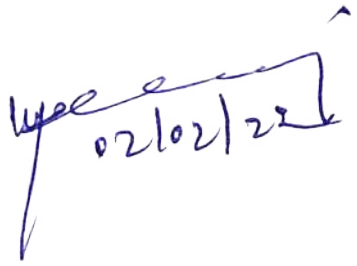
Through GIS based planning in 860 GPs, works identified under CWRM are verified, approved at Gram Sabha. These works would potentially reduce 38% surface runoff to be harvested or recharged by various interventions through ridge to valley watershed approach.

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 a water budget at GP level. The prepared 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 Comprehensive Water Resources Management (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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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

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

NAPCC
National Action on Climate Change

N - S

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

Rabi crop
Sown in winter and harvested in monsoon

S - U

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

SHG
Self Help Group

S - W

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

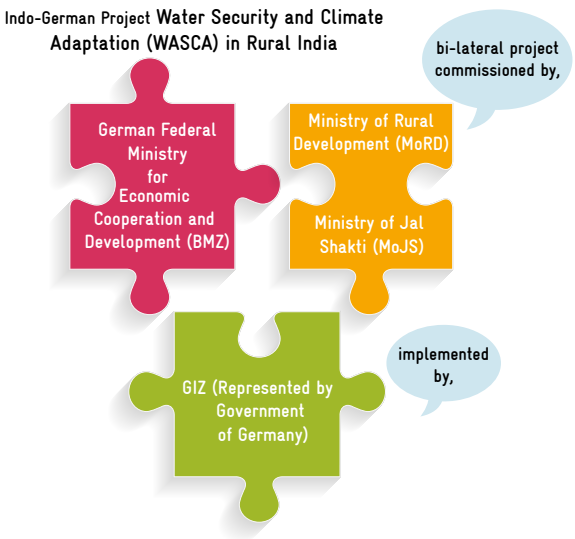
Thirukkural - 11

EXECUTIVE SUMMARY

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

Water security is one of the most alarming issues and key challenges that the world is facing today given the rapid changes in climate. India is not an exception and is facing a similar challenge. Water security is of prime concern especially in the rural areas due to scarce resources and a high dependency on natural resources. To mitigate the ill effects of climate change and focus on efforts to improve water resource management requires a thorough understanding of all key issues. Climate change adaptation and water security strategies have to be evolved with the help of technical knowledge and integrated into the development planning processes across the Nation, State and local level, for holistic and sustainable impacts.

The Indo-German Project "Water Security and Climate Adaptation in Rural India" (WASCA), 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 with an effort 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



Initially WASCA Tamil Nadu conducted a preliminary state level scoping study on the State's Rural Water Security using the 18 vulnerable indicators, which covered four important and interconnected parameters/areas of Climate extremities, water resource, agriculture and socio-economic at the District level. Based on the outcomes of the assessment, Tiruvannamalai and Ramanathapuram Districts were given priority by the State Level Steering Committee headed by the Additional Chief Secretary, RD&PR in November 2019 for implementing the WASCA. These 18 indicators were further studied at the Gram Panchayat (GP) level integrating the Composite Water Resource Management (CWRM) and MGNREGA/S approach to identify the key problems and propose 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 also 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) of 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 was jointly accomplished with research organizations and key sectoral experts in February 2021.

Subsequently, the District Collector, Tiruvannamalai, entrusted preparing Block level reports of water security and climate adaptation for each Block. This Block level report is intended for all planners and managers responsible for addressing issues of 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 all stakeholders involved to understand the issues related to water security in the context of climate change in rural areas and actions through Mahatma Gandhi NREGS and the need for convergence with the 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 is 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

Kalasapakkam Block of Tiruvannamalai District lies between 12°23'50.315"N to 12°32'31.893"N latitude and 78°54'58.728"E to 79°12'13.952"E longitude and is surrounded by Chetput, Polur, Jawadhu Hills, Pudupalayam and Thurinjapuram Blocks (Figure 1.1). The total geographical area of this Block is 22,181.62 ha (221.86 Sq.km). Administratively, this Block comes under Kalasapakkam taluk, with 45 Gram panchayats and 241 habitations in it.

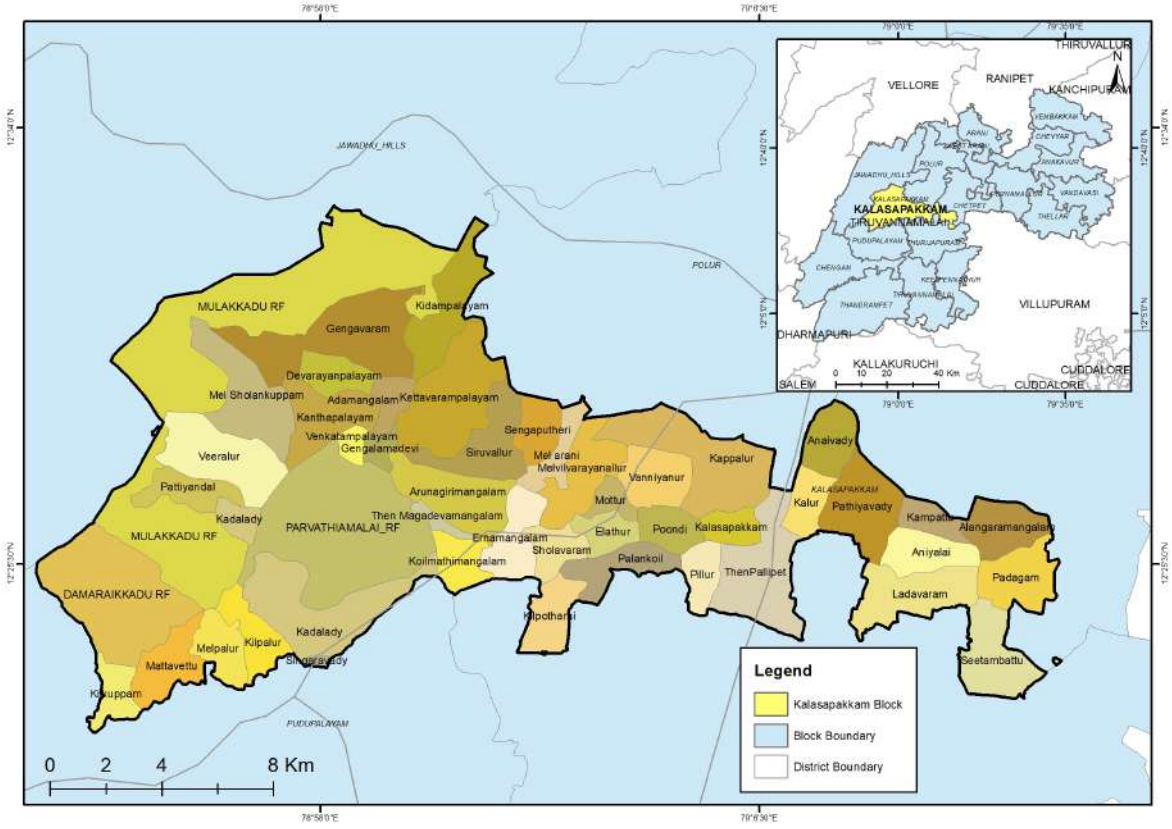


Figure 1.1. Kalasapakkam Block and it's environ

According to Census 2011, the population of Kalasapakkam Block is 1,20,612. The population density of the Block is 544 per Sq. km which is much higher than the District population density (473 per Sq. km) but lower than the State's density (555 per Sq.km). There is a 11.74% increase in the population observed since 2001 in this densely populated rural Block. The percentage of Male population is nearly equal to (50.39 %) female population (49.60%). The proportion of sex ratio is 984 females per 1000 males, which is slightly lower compared to the District average sex-ratio (994 females per 1,000 males). At 71.23%, the average literacy rate of the Block is almost equal to the national average (72.98%). Scheduled Castes and Scheduled Tribes accounted for 27% of the total population. (Thiruvannamalai District profile 2020).

Economically, Kalasapakkam is among the top ten revenue earning Blocks of the Tiruvannamalai District. Agriculture and allied activities, are the primary occupation. Paddy tops as the predominant crop, with 62 % of the irrigated area being cultivated with paddy. The other major crops grown in the Block area are ground nut, other pulses and sugarcane. Under rainfed crops Groundnut tops as the predominant crop with 83.6% of the area cultivated. Other pulses and mango are the other main rain-

> The proportion of sex ratio is 984 females per 1000 males, which is slightly lower compared to the District average sex-ratio (994 females per 1,000 males).

> At 71.23%, the average literacy rate of the Block is almost equal to the national average (72.98%).

fed crops. Significant cultivated areas of banana, dry chilli, coconut and other fruits and vegetables can also be seen. Groundnut and pulses are cultivated both under irrigated and rainfed conditions. Nearly 75 acres are under sericulture and 35 families are engaging in handlooms. A livestock count of 78,632 was recorded during 2019-20. The cattle count is 19,911 and the Block has 33 milk societies with 12,804 litres of milk being produced per day.

> 62 % of the irrigated area being cultivated with paddy.

Hydrologically, Kalasapakkam Block comes under Cheyyar and Varahanadhi sub-basins of Palar and Varahanadhi basins. Katturar River, Karavannar River and Cheyyar River flows through the Block. Cheyyar River and Tondi Veraha macro-watersheds covers the Block with 83 micro watersheds. (Figure 1.2).

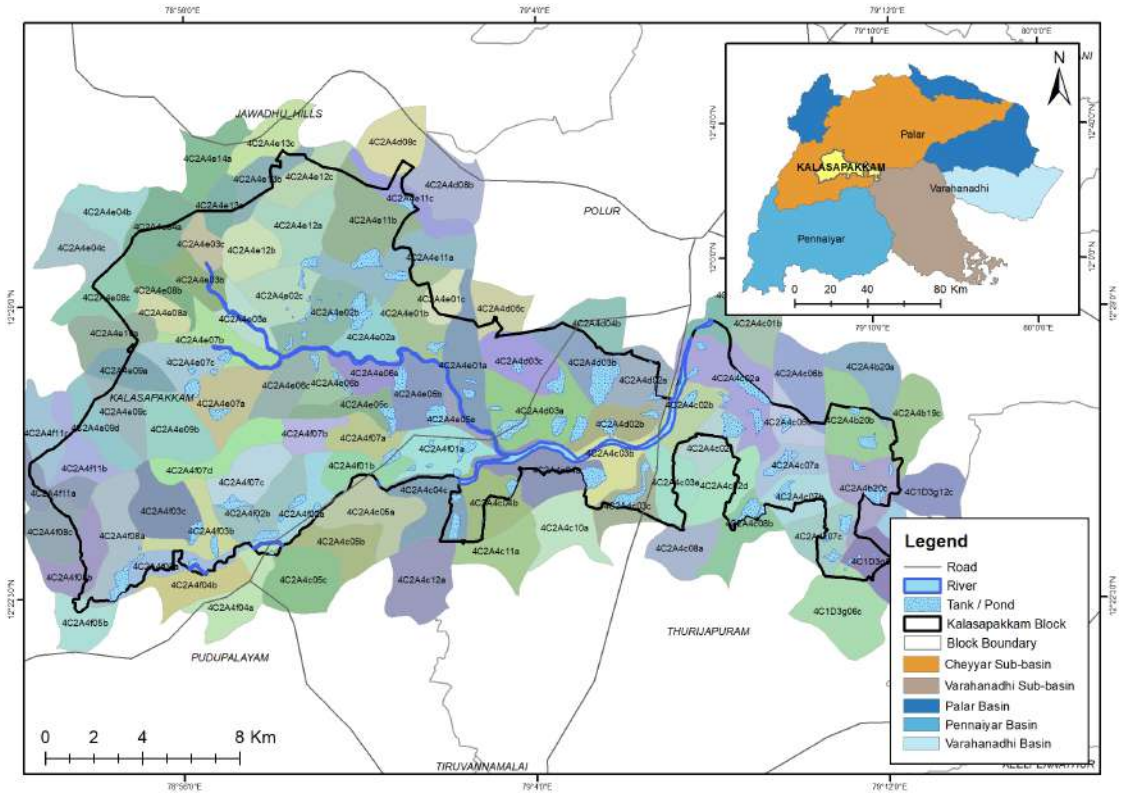


Figure 1.2. Watersheds- Kalasapakkam Block

There are 83 tanks in the Block with the largest tank being the Kettavarampalayam tank, with an area of 273.27 ha. Other important tanks are Melcholan kuppam tank (241.29 ha), Kappalur tank, (235.62 ha), Mattavettu big tank (151.01 ha) Siruvallur tank (150.2 ha) and Kadaladi tank (132.79 ha) (Figure 1.3). The ground water levels in Kalasapakkam Block is in an over exploited state of depletion stage of ground water development. Kadaladi and Kalasapakkam firkas cover the Block and both are in an over exploited stage.

GROUND WATER LEVEL OF THIS BLOCK

OVER EXPLOITED- › 100%	Kadaladi, Kalasapakkam

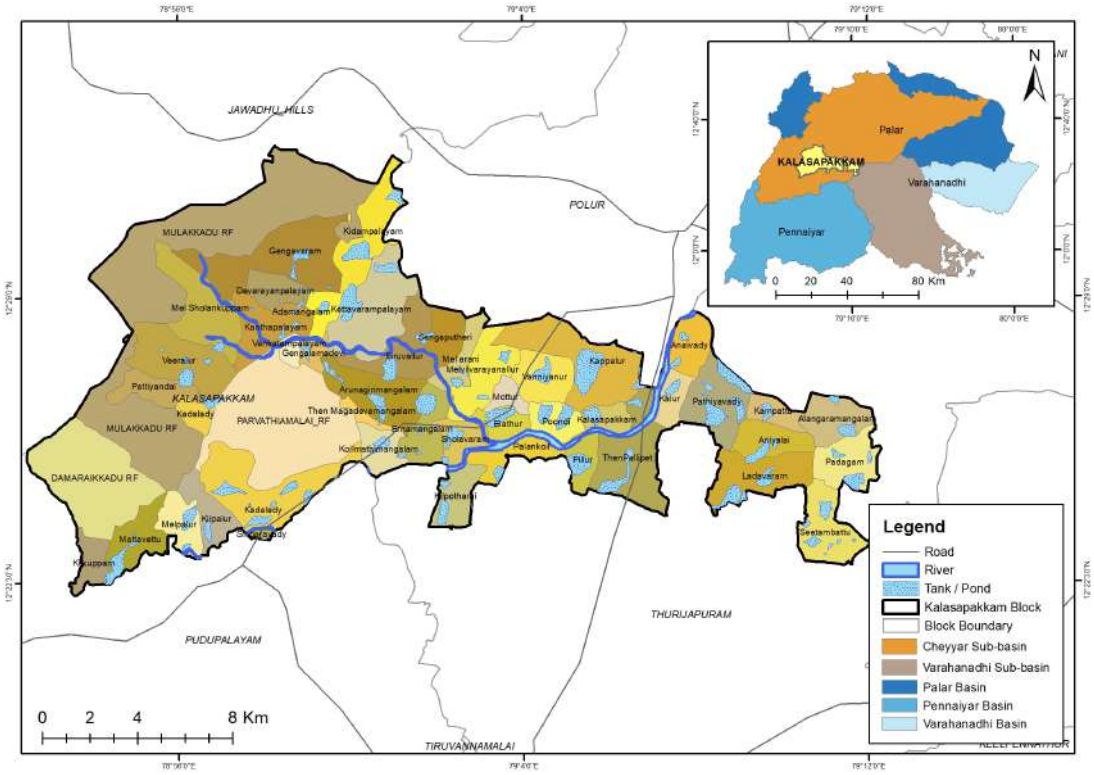
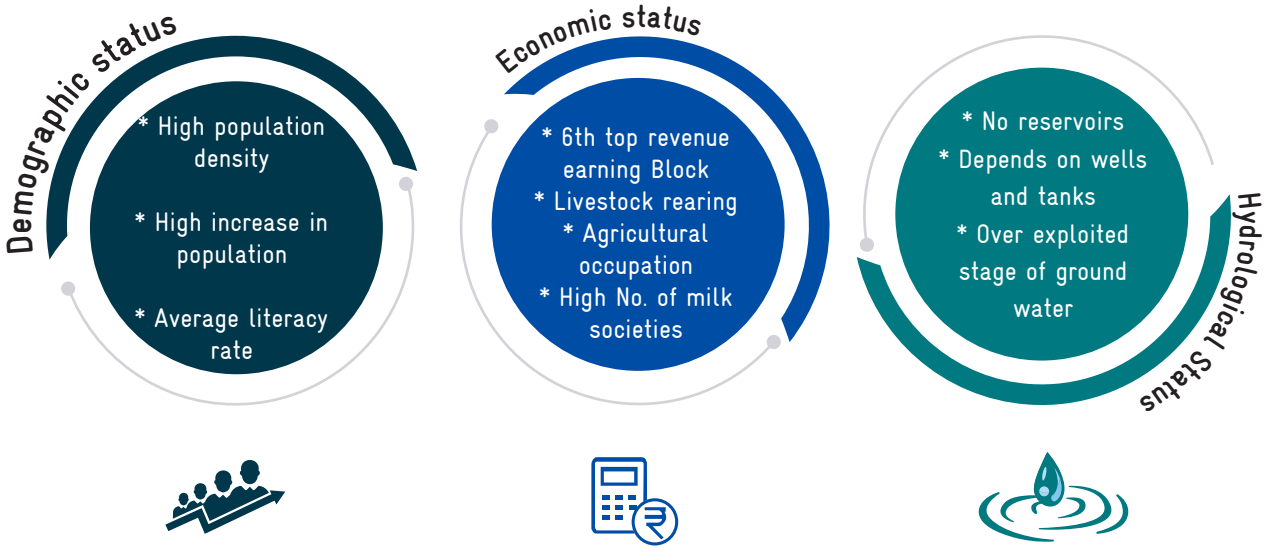


Figure 1.3. Spatial distribution of waterbodies



விண்இன்று 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

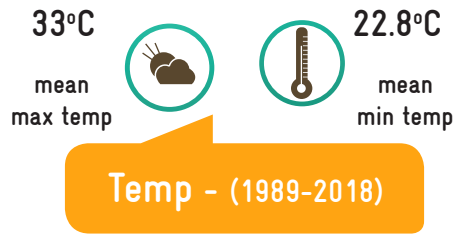
2 CLIMATE AND WATER SECURITY

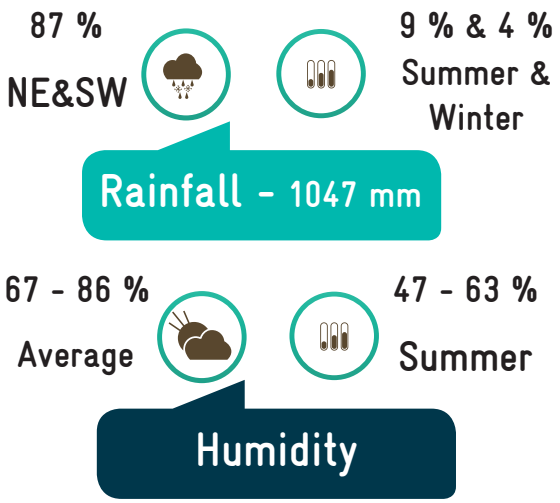
This region has typical tropical climate, located in the North Eastern agro-climatic zone of State and Southern Plateau and Hills region according to the agro climatic regional classification of planning commission. The general climate description of this region is given below (Table 1).

TABLE 1. GENERAL CLIMATE DESCRIPTION

Agro-climatic Region*** (Planning Commission)	Agro-climatic Zone*** (NARP)	Agro Ecological Sub-Region*** (ICAR)
Southern Plateau and Hills region (X)	North Eastern zone (TN-1)	Eastern Ghats (8.3)
Temperature	**Rainfall**	**Humidity**
33 to 22.8 °C	1046.6 mm	67- 86 %

In general, this semi arid region has dry and hot weather. The mean maximum temperature is 33°C and mean minimum temperature is 22.8°C during last 30 years (1989-2018) (IMD). In summer months the maximum temperature goes up to 45°C for few days. The average monthly temperature characteristic during 2020 is shown in Figure 2.1.





Normally this region receives major rainfall from North-East Monsoon (NEM) (October to December) and South-West Monsoons (SWM) (June to September). Past records show the annual average rainfall of this region is 1,047 mm (WRIS, GoI). Both North-East and South-West Monsoons contribute nearly 87 % of the annual rainfall in which SWM is slightly stronger. While summer (March to May) rainfall accounts for 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 % and during summer it ranges between 47-63 %.

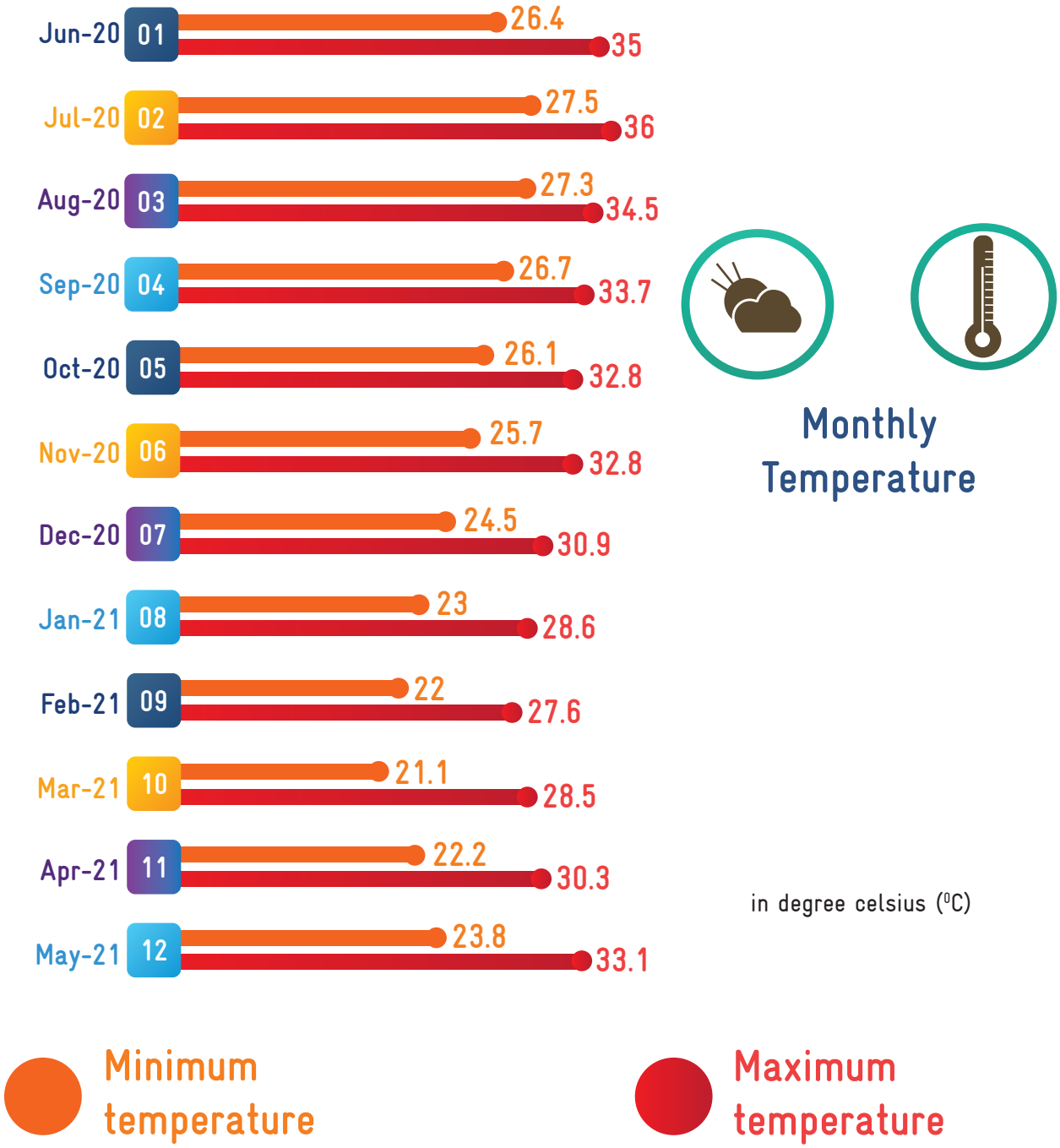


Figure 2.1. Average monthly temperature

The average annual rainfall days are 172 days in which 72 days are from 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 number of rainy days is slightly lesser than SWM, the intensity is more in NEM.

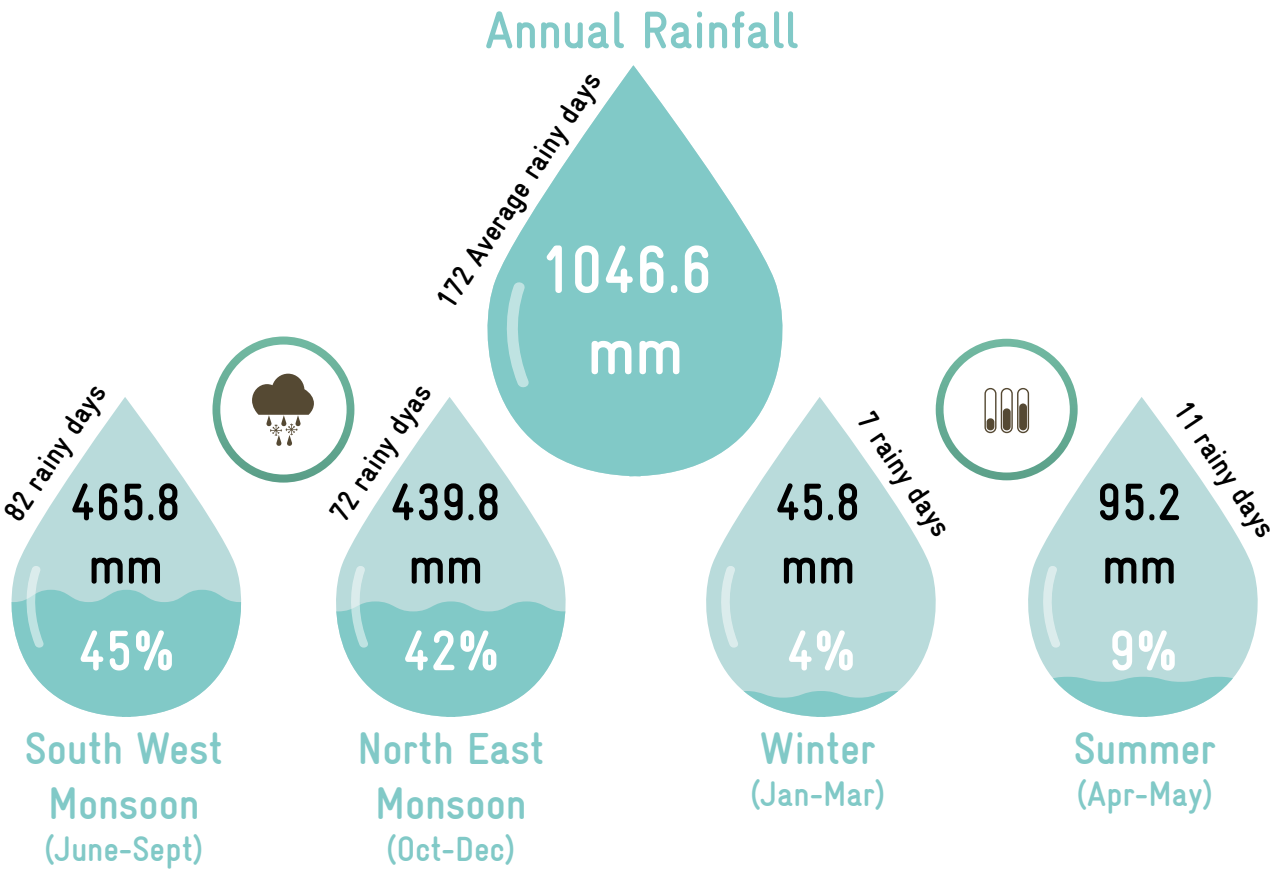


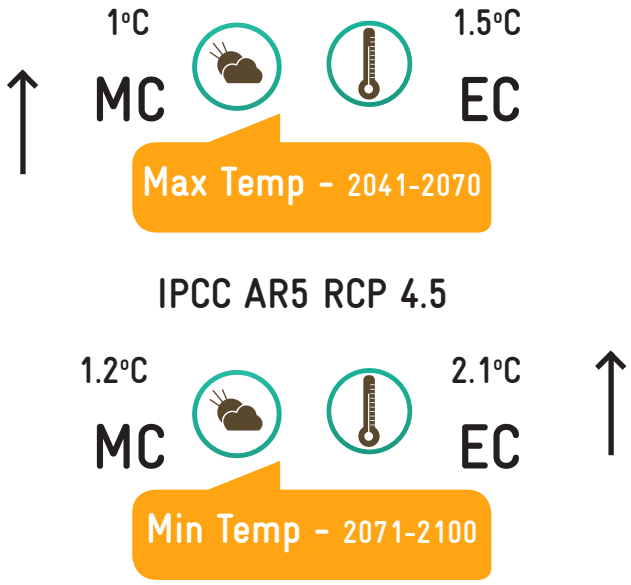
Figure 2.2. Season-wise distribution of annual rainfall

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 an increase in maximum and minimum temperature of 1.2°C and 0.5°C 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 outlines 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 1.5°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. Average annual rainfall for IPCC AR5 RCP4.5 scenarios is projected to increase about 13 % towards MC and increase by about 21 % 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 create shorter rainy seasons and longer dry seasons making river basins more vulnerable. This District experiences climate hazards in the past such as floods, drought and heat waves.

* Flood
* Drought
* Heat waves

Flood

This region experiences heavy rain and flood during deep depressions/cyclones forms in the Bay of Bengal. In recent decades, some 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 Thiruvannamalai District as flood vulnerability spots. 7 locations of this Block are under moderate flood vulnerability.

Drought

Low rainfall coupled with the erratic behaviour of the monsoon in the state makes Tamil Nadu the most vulnerable to drought. Thiruvannamalai District comes under drought vulnerable area as less than 40 % of normal rainfall was received and has experienced frequent droughts in the past, particularly in the years 2003 and 2009. The District also experienced severe drought during the year 2016- 2017. All parts of the District are affected by drought and its consequences are large areas of crop losses and drinking water scarcity. In Kalasapakkam 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 (hot weather) summer season. Heatwaves 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 Kalasapakkam Block are prone to heatwaves.

2.2 WASCA CLIMATE VULNERABILITY INDICATORS

During 2019, WASCA TN conducted a preliminary State level scoping study on the State's rural water security through the 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 observations, WASCA TN study proposed 18 indicators to reflect the State's rural water security through four interconnected CWRM areas viz., 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

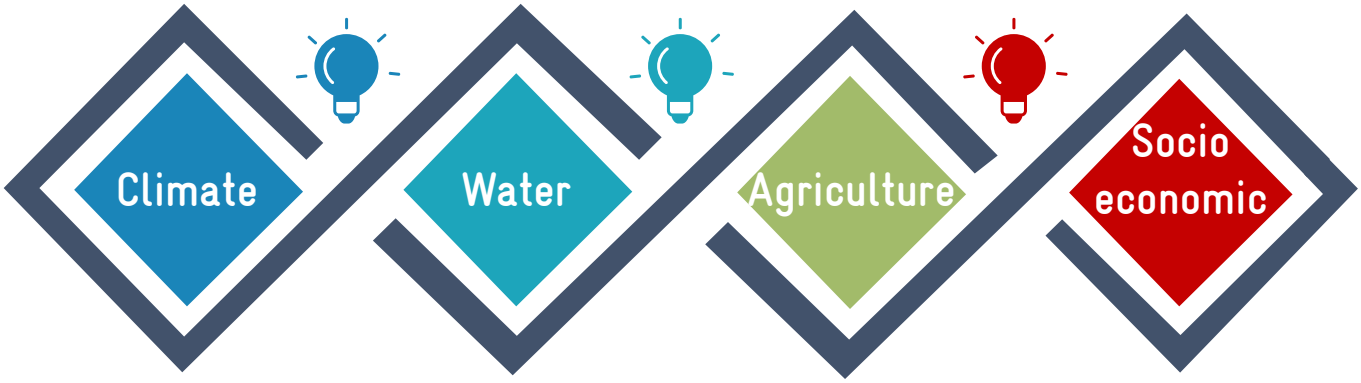
CWRM	Indicators of Rural water security vulnerability	Indicators label	Linked SDG
Climate	Changes in max temperature (^{O}C)	C1	Goal 13
	Changes in min temperature (^{O}C)	C2	
	Changes in rainfall (%)	C3	
	Excess rainfall years	C4	
	Deficient rainfall years	C5	
Water	Ground water extraction (%)	W1	Goal 6
	Ground water Recharge (m^3)	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/m^2)	A3	Goal 15
	Evapo-transpiration (Kg/m^2)	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

Data from these 18 bio-physical and socio-economic indicators was collected at the 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 COMPREHENSIVE 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 socio-economic are further explored at GP level through Composite Water Resource Management (CWRM) approach by GIZ, Department of Rural Development (Mahatma Gandhi NREGS), National Water Mission, Tamil Nadu along with technical partners of WASCA project Viz., 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. Data for the major parameters identified at Block level (Table 3) are collected both from primary and secondary sources to be 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 waterbodies, 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 MGNREGA 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 a 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 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 Khet ko Pani and Per Drop More Crop are the four pillars of PMKSY. Technical inputs for planning are 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 comprising of 1-10 GPs, while deliberating and finalizing prioritization of shelf of projects.

Special focus has been 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 will take into consideration the automatically included and deprived households of SECC to ensure full coverage of poor and vulnerable households. Infrastructure built under the 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.

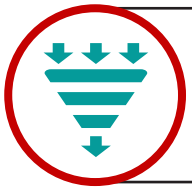
262 Total Kinds of works in Schedule-I of Mahatma Gandhi NREGA

182 Kinds of works relate to NRM alone

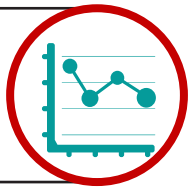
164 Kinds of works related to Agriculture & allied works

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 individuals, it 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 Geographical Information System (GIS) 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 (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.

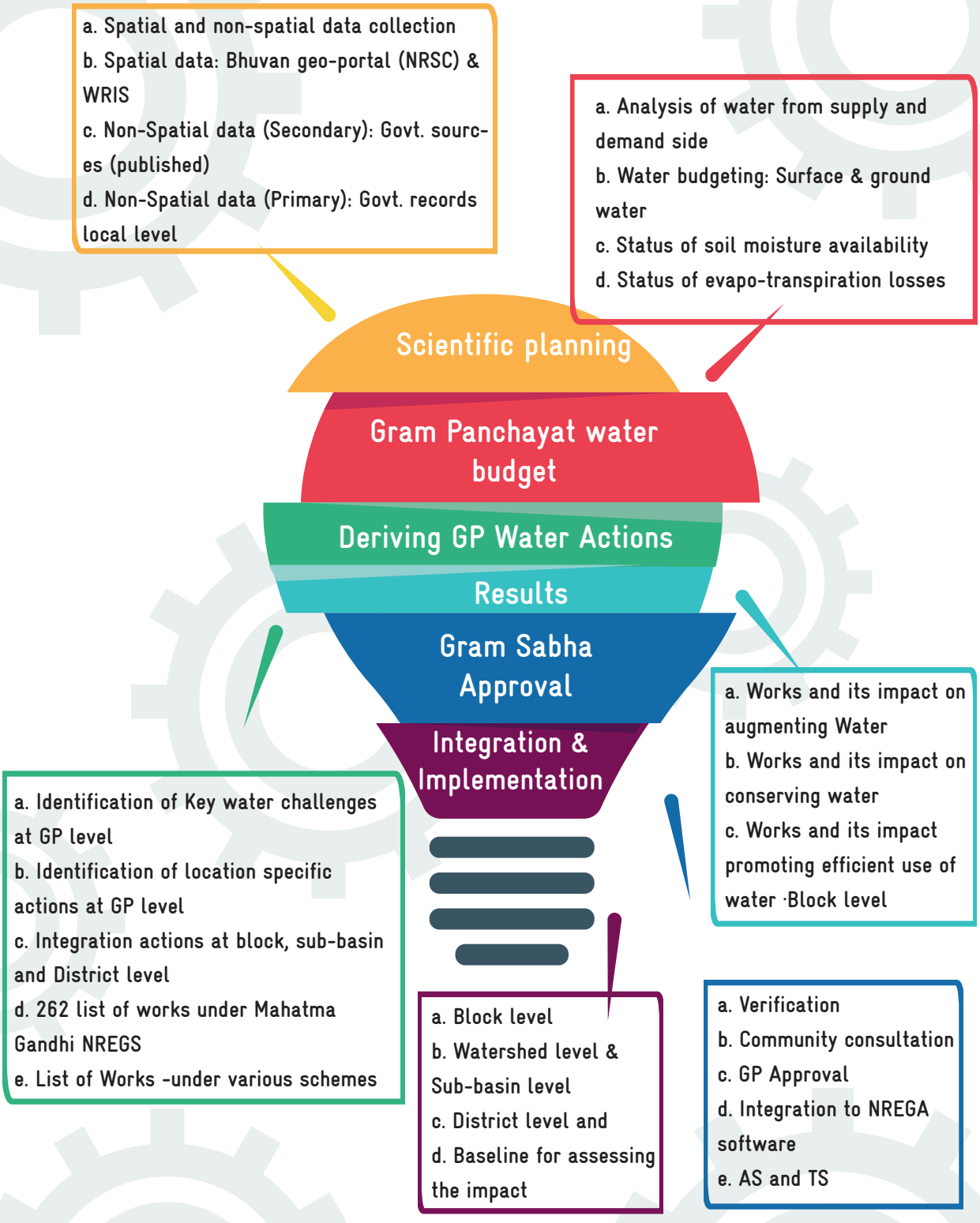


3.1 COMPOSITE WATER RESOURCE MANAGEMENT APPROACH

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 for 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, evapo-transpiration

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).

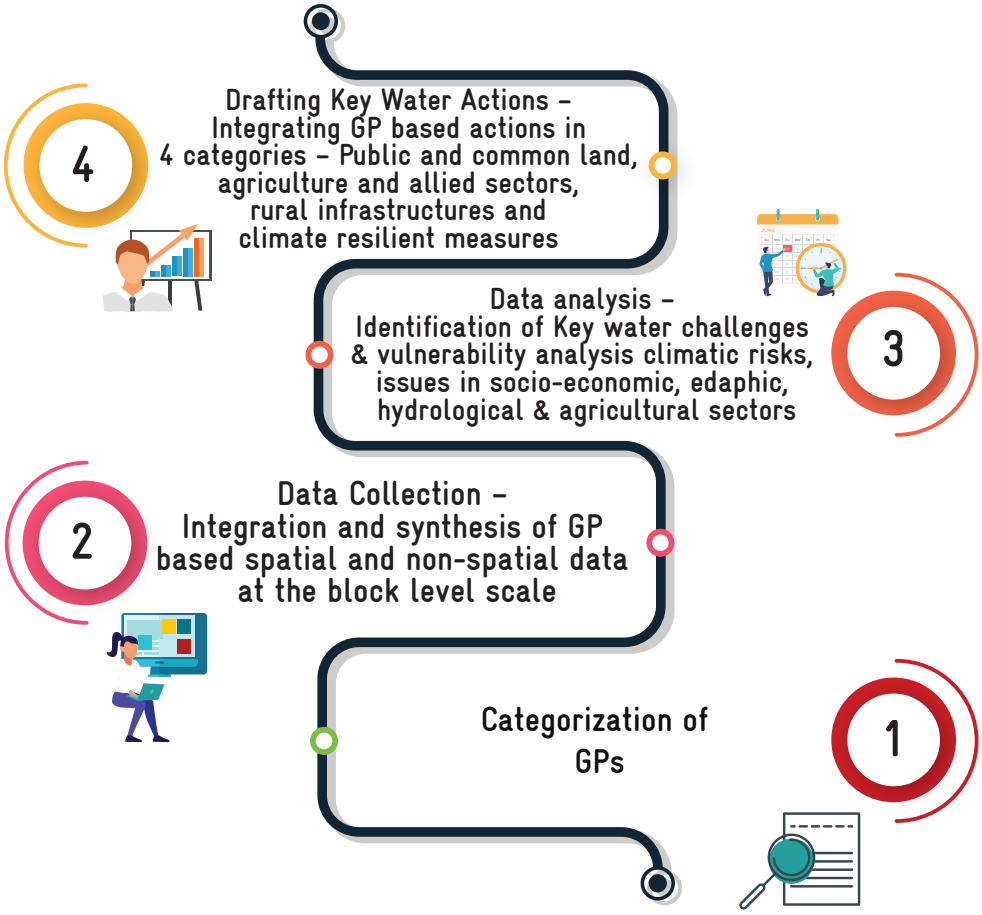
BOX 1. MAJOR COMPONENTS INVOLVE IN CWRM PLANNING WORKOUTS



Such a comprehensive analysis helps in preparing the water budget integrating ground water, surface water through runoff from rainfall, evapo-transpiration 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, and serve as shelf of projects. This shelf of projects is again mapped with the schemes available 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 the National, State, and District Level Steering Committees headed by the Additional Chief Secretary RD&PR and the District Collector respectively in the project area of Tamil Nadu government as a comprehensive and climate adapted planning approach for water security under the Mahatma Gandhi NRGES and National Water Mission.

BOX 2. 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 SLSC

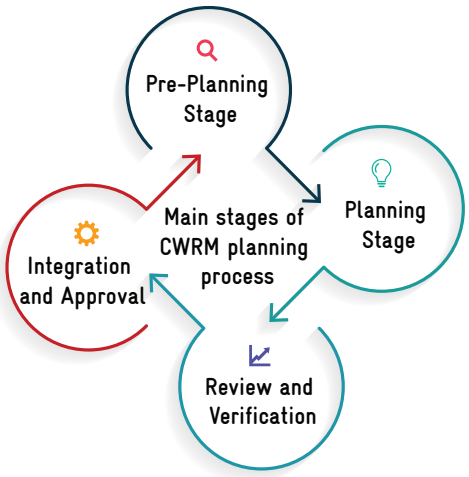
PLANNING STAGE

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 NRM

4. INTEGRATING GP PLANS TO DEVELOP WASCA DISTRICTS CWRM PLANS

INTEGRATION AND APPROVAL

1. Preparation of Integrated plans (at Block, Watershed levels)
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 level

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 data-sets. Based on the above factors, five different types of GPs are classified as Type I, II, III, IV and V. The description of categorization of GPs is given in Annexure 1. The type, number of GPs and name of GPs of Kalasapakkam Block is tabulated in Table 4.

TABLE 4. CATEGORIZATION OF KALASAPAKKAM BLOCK GPs

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
25	GP and revenue village data and boundary match (Type-I)	Adamangalam, Alangaramangalam, Anaivady, Arunagirimangalam, Padagam, Aniyalai, Deverayanpalayam, Gangavaram, Kallur, Kappalur, Kambut, Kettavarampalayam, Melarani Kil Palur, Kidampalayam, Melpalur, Palan Koil, Pathiyavady, Pillur, Sengaputheri,Sholavaram, Thenpalliput, Vanniyanur, Siruvallur, Veeralur
9	Having more than one GPs in one Revenue Village (Type-II)	Elathur, Mottur, Kadalady, Singaravady, Pattiyandal, Thenmathimangalam, Kolimathingalam, Mattavettu, Kilkuppam
9	One GP is falling under more than Type 1 one Revenue Village (Type-III)	Ernamangalam, Gangalamahadevi, Kalasapakkam, Kilpotharai, Ladavaram, Melsholankuppam, Melvilvarayanallur, Poondi, Seethambattu
2	GPs having more than one GP, one Revenue Villages data, boundary (Type IV)	Kanthapalyam, Venkidampalayam

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), wastelands, 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 based analysis is to understand the hydrological and administrative boundaries. This aids in understanding the profile and condition of the watershed at macro or micro level 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 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

Data from a total of 99 parameters were collected, out of which 13 parameters are primary source data and were collected at GP administrative units by GPs officers. 65 parameters are secondary source data 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 Block level. On the other hand, all the climate change observations and projections are at District or regional level and currently, data at Block level is not available. Hence, previous hydro-meteorological disasters are considered to denote the 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

Flood	Drought	Heat Wave
Kanthapalayam, Siruvallur, Ernamangalam, Kettavarampalayam, Gengavaram, Kidampalayam	All villages	All villages

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 are 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 domestic, agriculture and livestock are collected from authorized open sources and analyzed at Block level as follows:

3.5.1 SPATIAL DATA

Spatial data on watershed, drainage and surface waterbodies, ground water potential, lineament, geomorphology, terrain, slope is collected to understand the site-specific problems and take decisions to draft scientific key water actions together with non-spatial data. To understand, interpret and analyse the spatial parameters of the Block available maps downloaded from NRSC, BHUVAN, GoI website are used.

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 has further expanded with landform maps, which were widely used in various fields of hydrology, pedology, geoscience, urban and regional planning etc. Kalasapakkam Block is majorly engrossed with denudation origin pediment and pediplain complex whereas tiny area is noticed with the structural landform in North region and fluvial unit is West region (Figure 3.1). Fundamental information of landform by its units will act as critical input in the identification of suitable sites for NRM activities while preparing CWRM plans.

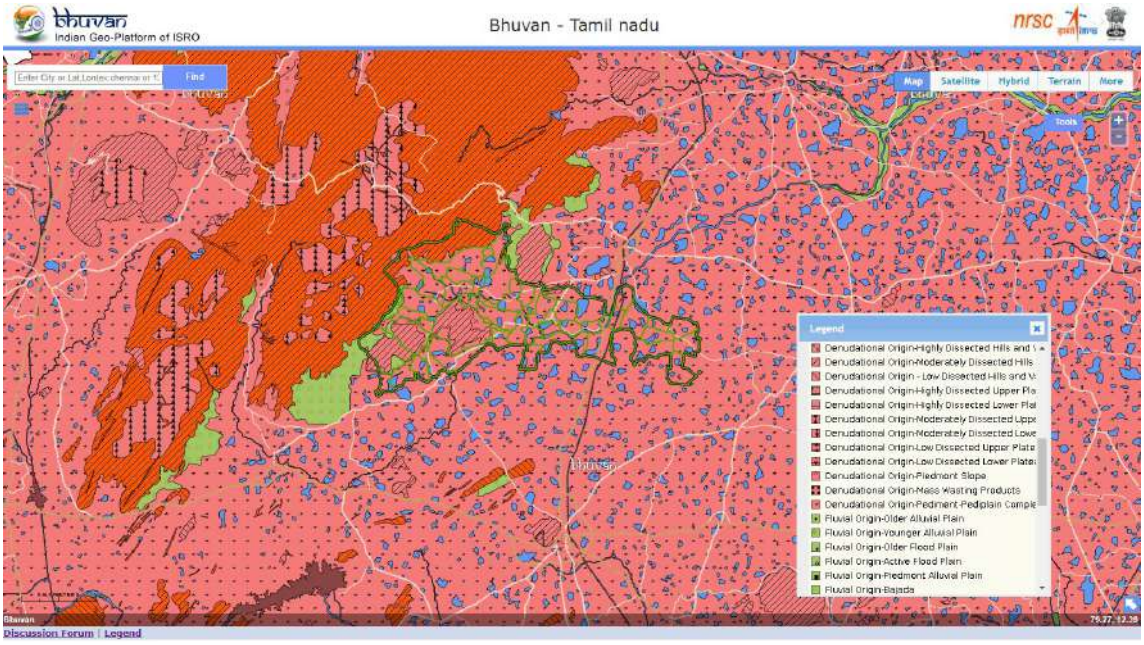


Figure 3.1. Geomorphology map

Landform unit	Area in %	Gram Panchayat
Denudational origin-Pediment- Pediplain complex		
	100%	All GPs

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. Lineament plays a significant role in identification of ground water and oil exploration sources. Lineament is represented with linear features where two different landforms converge or diverge. This site allows water to percolate at a high rate. GP wise lineament type is illustrated in the table below and shown in Figure 3.2. These observations are widely used to locate points of high-water flow especially in groundwater exploration.

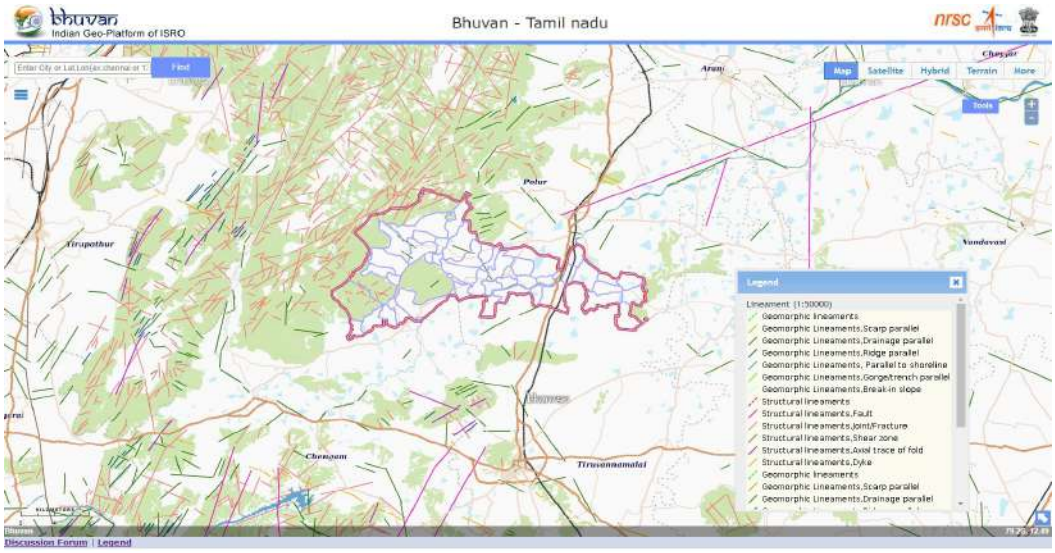


Figure 3.2. Lineament map

Lineament type	Gram Panchayat
Geomorphic lineaments, Drainage parallel	Mel Sholankuppam, Kanthapalayam, Gengavaram, Kettavarampalayam, Siruvallur, Mel Arani, Mel Vilvarayanallur, Then Pallipattu

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. The variations in terrain are observed in Kalasapakkam Block which gives the information regarding the slope and the direction of the water flow is shown in Figure 3.3.

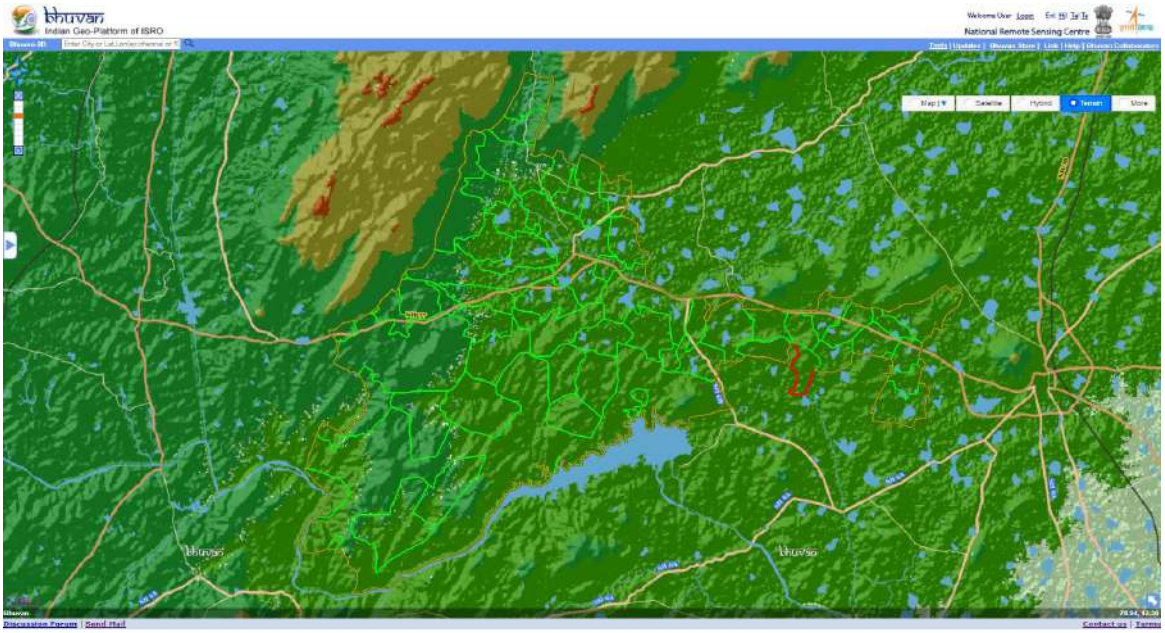


Figure 3.3. Terrain map

3.5.1.4 Contour map: The contour is the most important element in the cartographic representation of the terrain and determines relief forms such as valleys and hills, and the steepness or gentleness of slopes in geometrically. A contour map is illustrated with a series of lines with equal point of elevation. Closely spaced contour lines indicate steep slope and the lines spaced far apart indicate a gentler slope. North and Western region of Block witnessed the dense contour interval indicating the upper land with steep slope (Figure 3.4). 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.

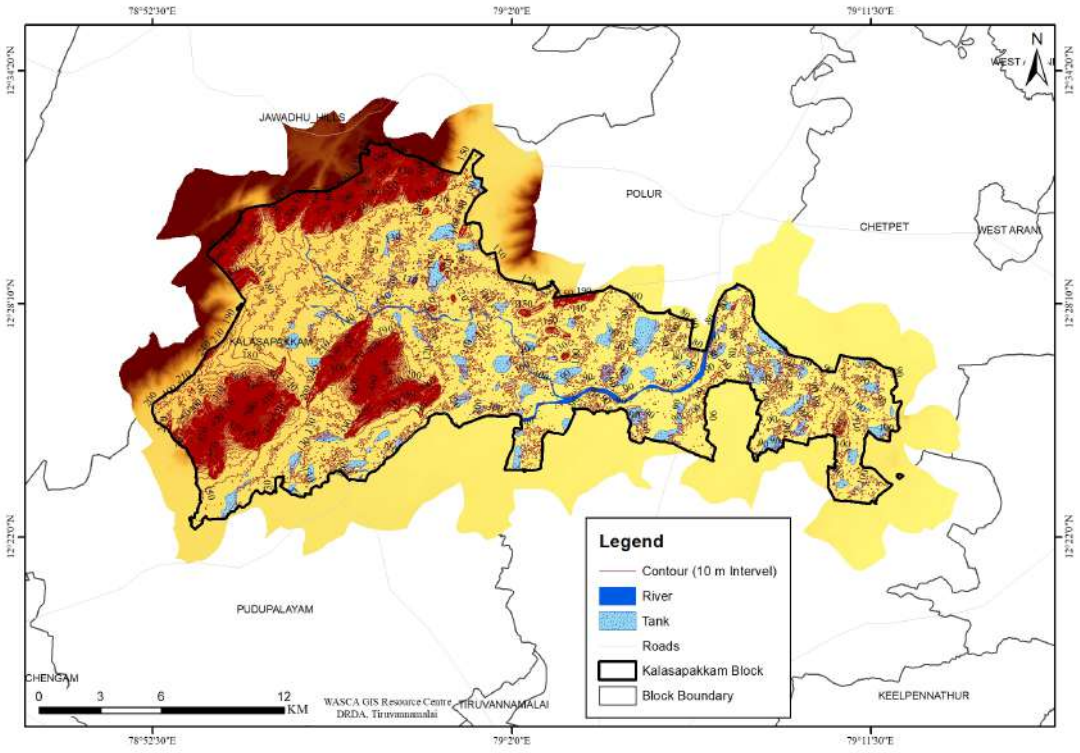


Figure 3.4. Contour map

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. Steep to very flat slope ranges were noticed in the Block (Figure 3.5). The detailed information on GP's slope range is given below. Slope information plays a significant role in identification of soil eroded sites, depth profiles, also used in analysing and further proposing the soil conservation measures such as check dam, bunds, farm ponds, land development activities etc.

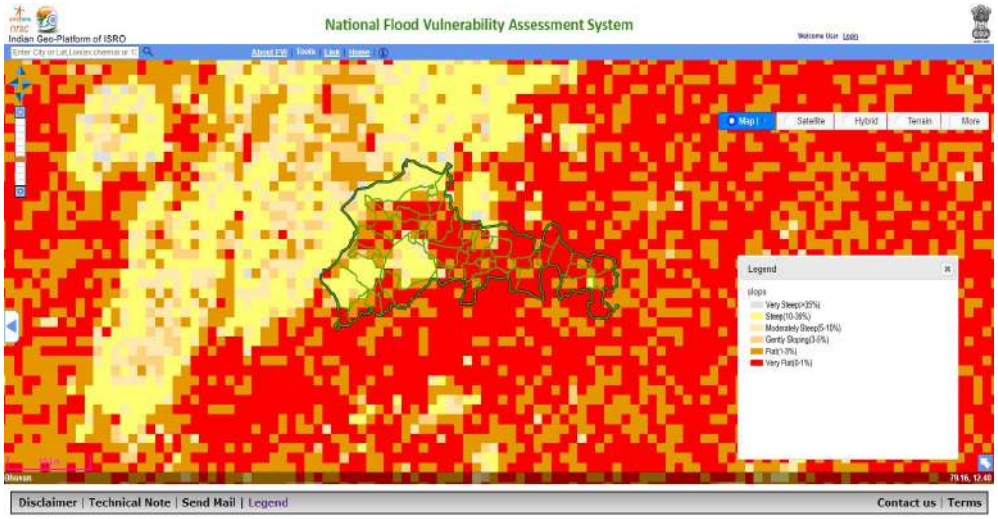
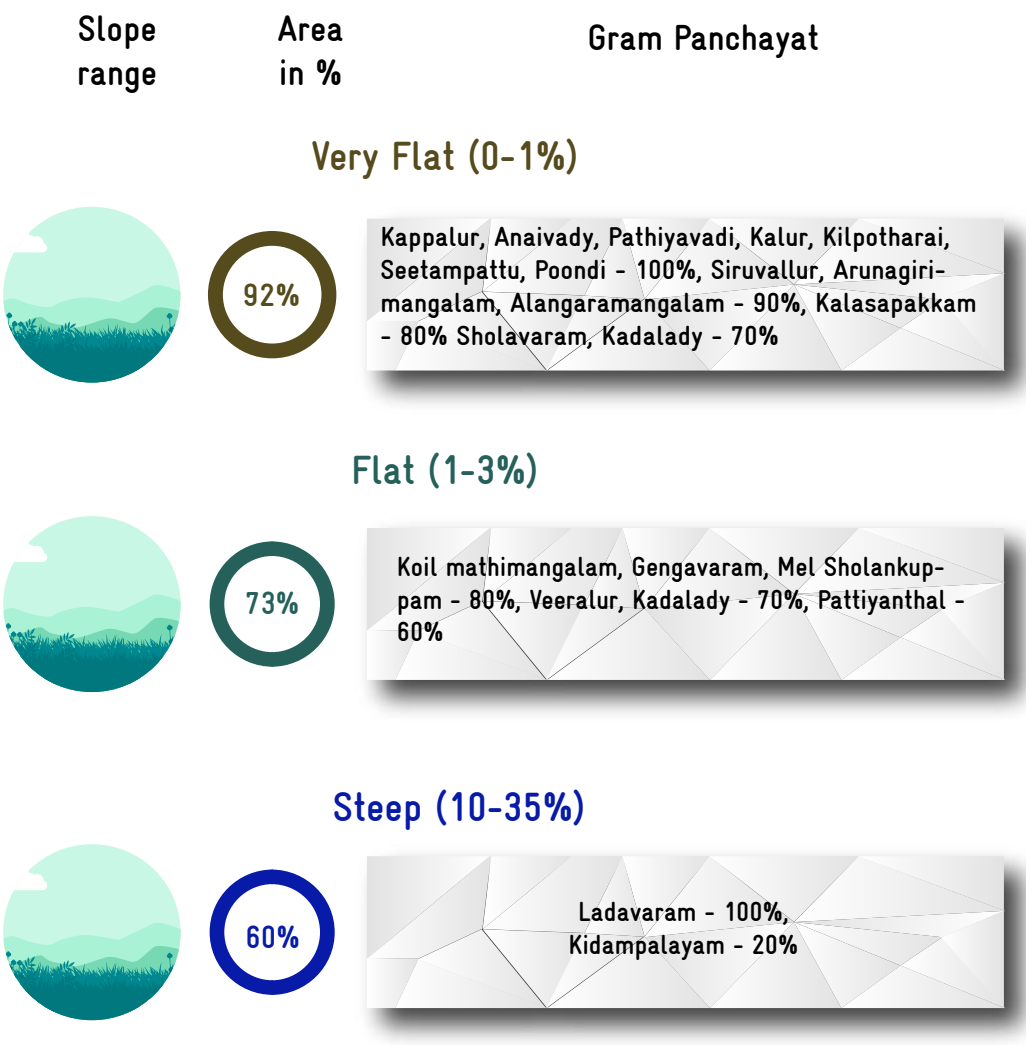


Figure 3.5. Slope map



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 Kalasapakkam Block. Block witnessed the moderate dense to low dense drainage network (Figure 3.6). Drainage network is referred to while identifying suitable sites for soil and water conservation measurements such as check dams, farm ponds, bunds, restoration of gullied region etc.

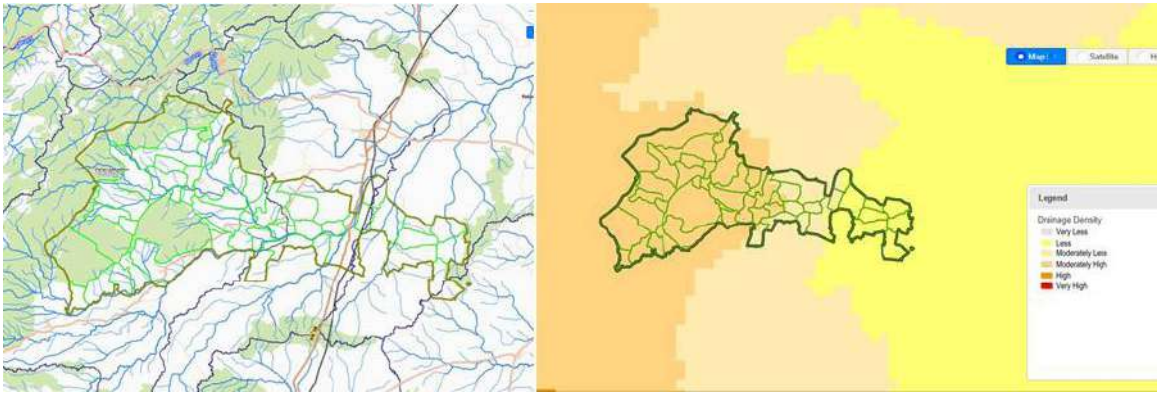


Figure 3.6. Drainage network and density

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. Kalasapakkam 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 and also aids in strengthening the durability of land, soil and water conservation structures downstream.

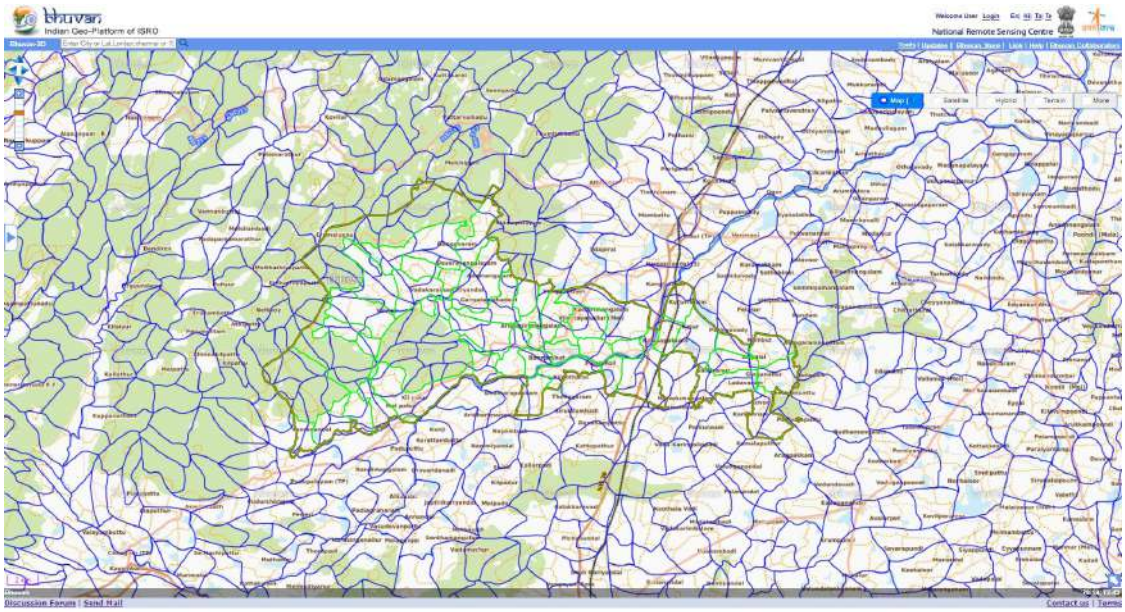


Figure 3.7. Watershed map

3.5.1.8 Ground water perspectives: Ground water is one of the important natural resources in semi-arid region like Kalasapakkam Block. 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. The GPs wise detailed Ground Water (GW) prosperity shown in the illustration below. This specific information will play crucial role in identifying sites for recharge structures in order to address water scarcity issues in the Block.

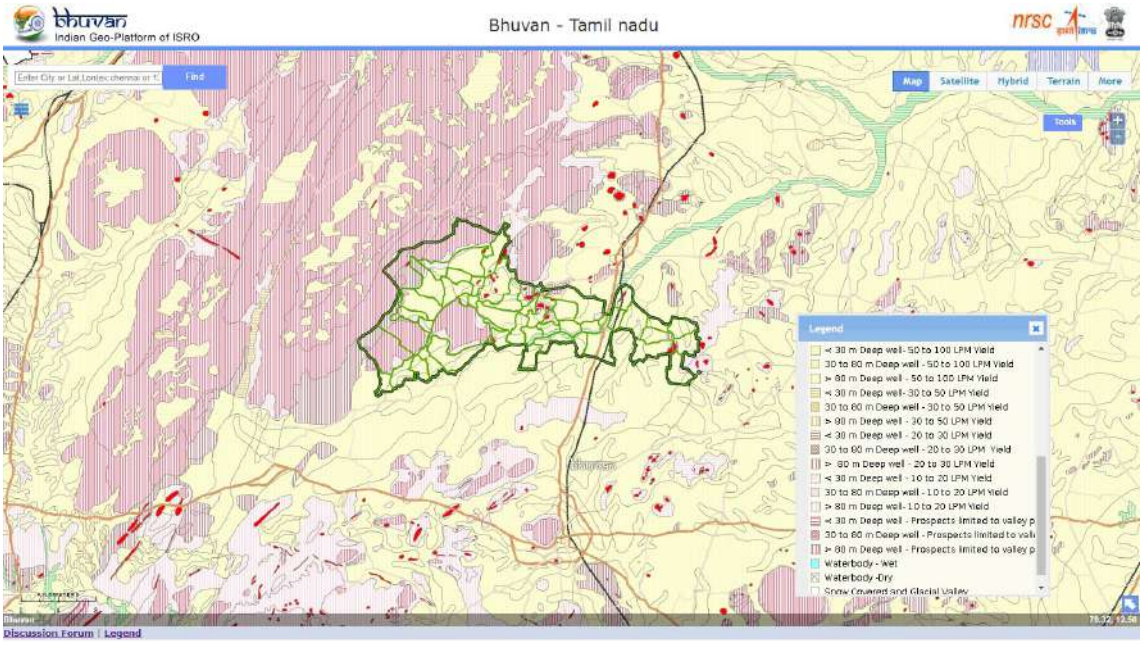


Figure 3.8. Ground water perspective map

Groundwater Prospects	Area in %	Gram Panchayat

› 80 m Deep Well- 50 to 100 LPM Yield

99.6%

Adamangalam, Alangaramangalam, Anaivady, Aniyalai, Arunagirimangalam, Devarayanpalayam, Elathur, Ernamangalam, Gengalamadevi, Gengavaram, Kadaladi, Kalasapakkam, Kalur, Kampattu, Kanthapalayam, Kettavarampalayam, Kidampalayam, Kilkuppam, Kilpalur, Kilpotharai, Koilmathimangalam, Ladavaram, Mattavettu, Melarani, Melpalur, Melvilvarayanallur, Mottur, Padagam, Palankoil, Pathiyavady, Pillur, Poondi, Seetambattu, Sholavaram, Singaravady, Siruvallur, Then magadevamangalam, Thenpallipet, Vanniyanur, Venkatampalayam, Veeralur - 100%, Sengaputheri, Mel Sholankuppam, Kappalur, Pattiyanthal 95%

› 80 m Deep Well- 20 to 30 LPM Yield

5%

Sengaputheri, Mel Sholankuppam, Kappalur, Pattiyanthal

3.5.2 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

Sl. No.	Canal Network	Extent
	Canal Network (m)	
1	Length of Main Canal	89,700
2	Length of Minor Canal	10,927
3	Length of Distributaries	1,200
4	Water Courses (Field Channels)	49,700
	Traditional Water bodies (No.)	
5	Number of Tanks (PWD & Union)	71
6	Number of Ooranis	154
	Irrigation Facilities (ha)	
7	Tank Irrigation	1,974
8	Canal Irrigation	0
9	Open & Tube Well Irrigation	8,804
	Catchment Area wise Available Runoff (ha.m)	
10	Good Catchment Area	2,017
11	Average Catchment Area	218
12	Bad Catchment Area	3,058
	Watershed and Drainage Networks	
13	Length of Natural Drainage Lines (m)	2,07,349
14	Number of Natural Drainage Lines (No.)	198
15	Number of Micro-watersheds (No.)	165
	Water Demand	
16	For Humans (ha.m)	328
17	For Livestock (ha.m)	136
18	For Agriculture (ha.m)	17,845
19	GW utilization for Drinking (%)	72
20	GW utilization for Livestock (%)	80
21	GW utilization for Agriculture. (%)	99
22	SW utilization for Drinking (%)	28
23	SW utilization for Livestock (%)	20
24	SW utilization for Agriculture (%)	1

3.5.2.1 Existing Water Structures

The Block has structured traditional water storage units such as tanks which is the life line of local communities for their lives and livelihoods. It is noticed that the Ooranis (154) are more than tanks (71) (Figure 3.9).

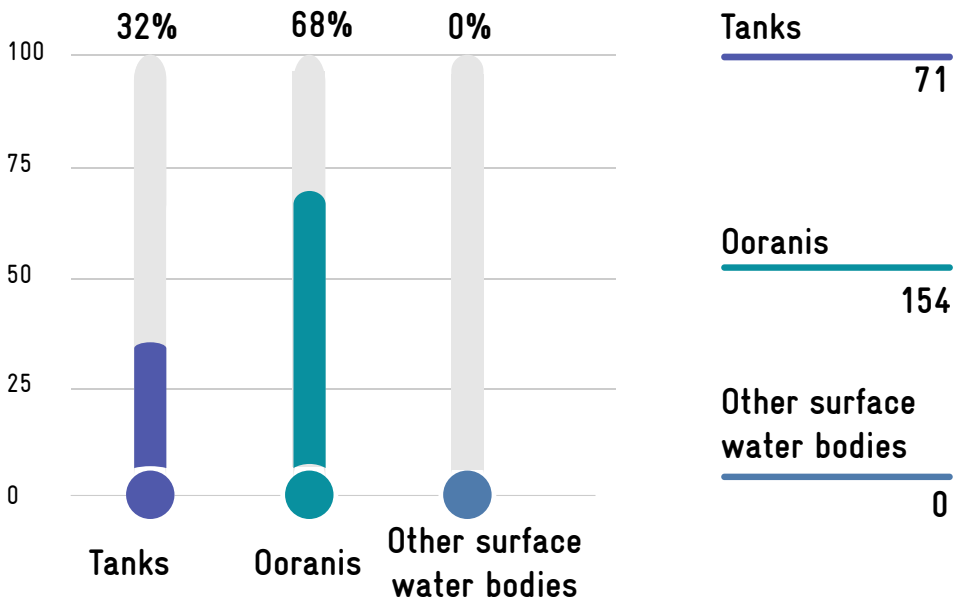


Figure 3.9. Traditional Waterbodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the Block is 10,778.1 ha, of which 81.69 % (8,804 ha) is irrigated through ground water stored in open/tube wells remaining 18.31 % (1,974 ha) area is depends on tanks-based irrigation and there is no canal based irrigation. (Figure 3.10).

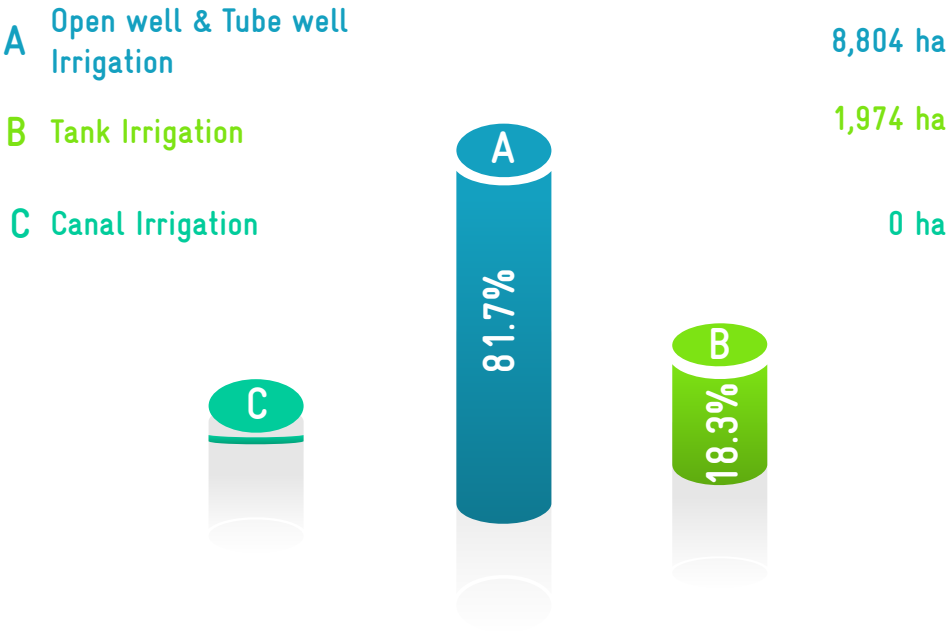


Figure 3.10. Irrigation sources

3.5.2.3 Available run-off

The total available runoff in the catchment area is 5,293.5 ha.m out of which 57.78 % is from bad catchment area followed by 38.1 % from good catchment area and remaining 4.12 % is from average catchment area. As the area is dominated with bad catchment zone which indicates that the rainfall is not being conserved properly so, there is a strong requirement for the construction of water conservation structures. From the table, it is evident that more than half of the total rainwater is flowing as runoff which can be well managed with the increase of some water conservative structures (Figure 3.11).

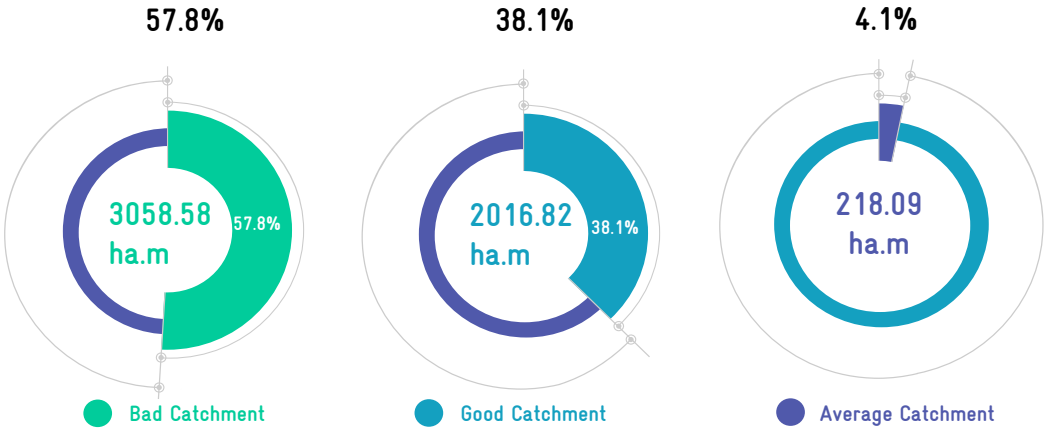
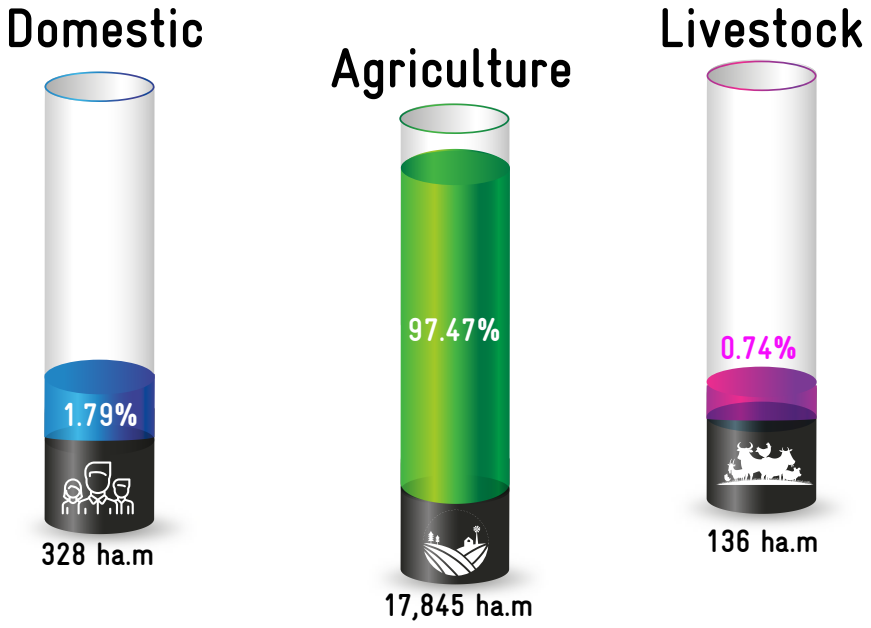


Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is18,308.24 ha.m. The highest demand is from the agriculture sector of 17,845 ha.m (97.47 %) followed by domestic use demand of 328 ha.m (1.79 %) and rest is from livestock.



Out of the total water demand, 72 % for domestic purpose usage is met through ground water while the remaining 28 % from surface water resources. Utilization of 99 % for agriculture and 80 % for livestock is met by ground water (Figure 3.12).

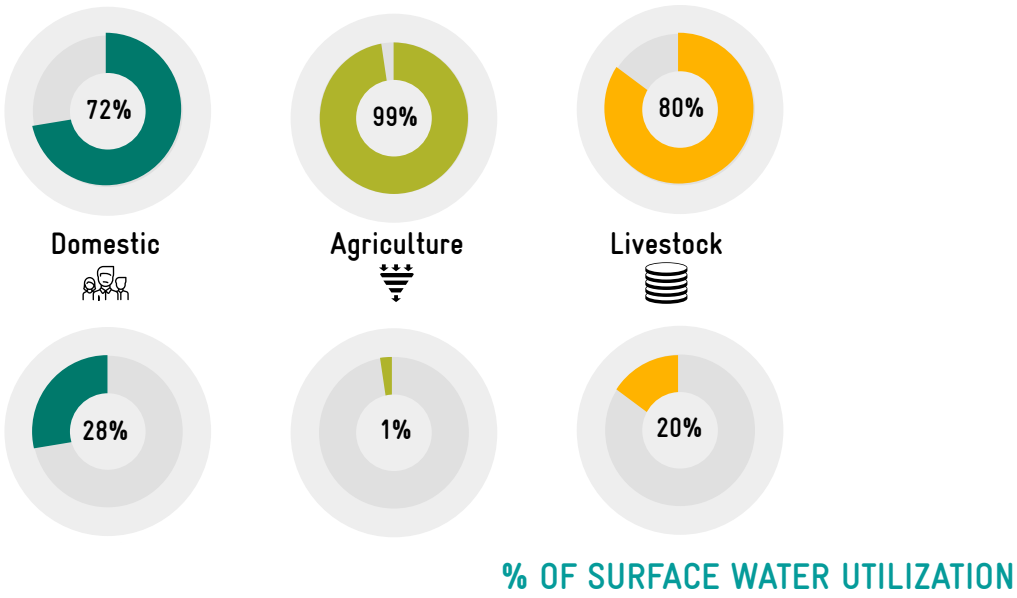


Figure 3.12. Sector-wise water utilization

3.6 CWRM PLANNING ANALYSIS-AGRICULTURE

Agriculture and allied activities are the livelihood resources of most of households in Kalasapakkam Block. 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, wasteland, salt affected land, soil erosion and soil texture were taken into consideration to understand Kalasapakkam Block's problems in order to draft scientific key water actions.

3.6.1.1 Soil texture: The soil consistency of particle size is distinguished through types of soil texture, especially determined by the amount of sand, silt or clay. The Block has diverse soil types and predominant in vertisol and alfisol, with reference to soil texture the proportion of fine texture type soil is dominated in the Block (Figure 3.13). Soil texture reveals details about the soil properties such as water holding capacity, permeability, soil workability and also the ability of plants to grow. This information will help in proposing the relevant conservation measures for natural resources.

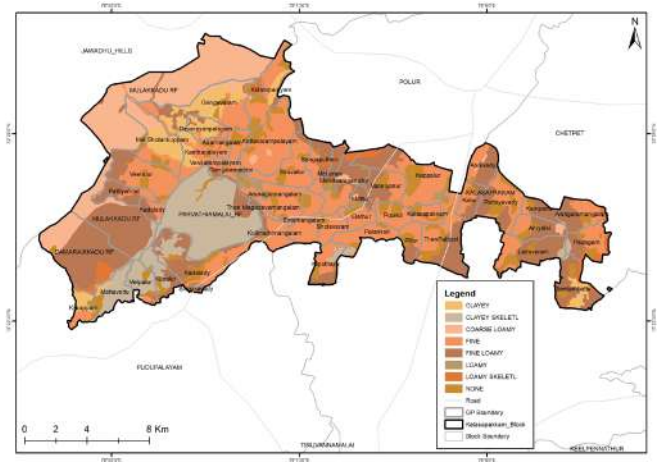


Figure 3.13. Soil texture

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. Western region of the Block witnessed the sheet erosion which is due to the increase in deforestation (Figure 3.14). GP wise soil erosion details are given below. Soil eroded sites are the challenging tasks in implementation of various measures to conserve soil and watershed management.

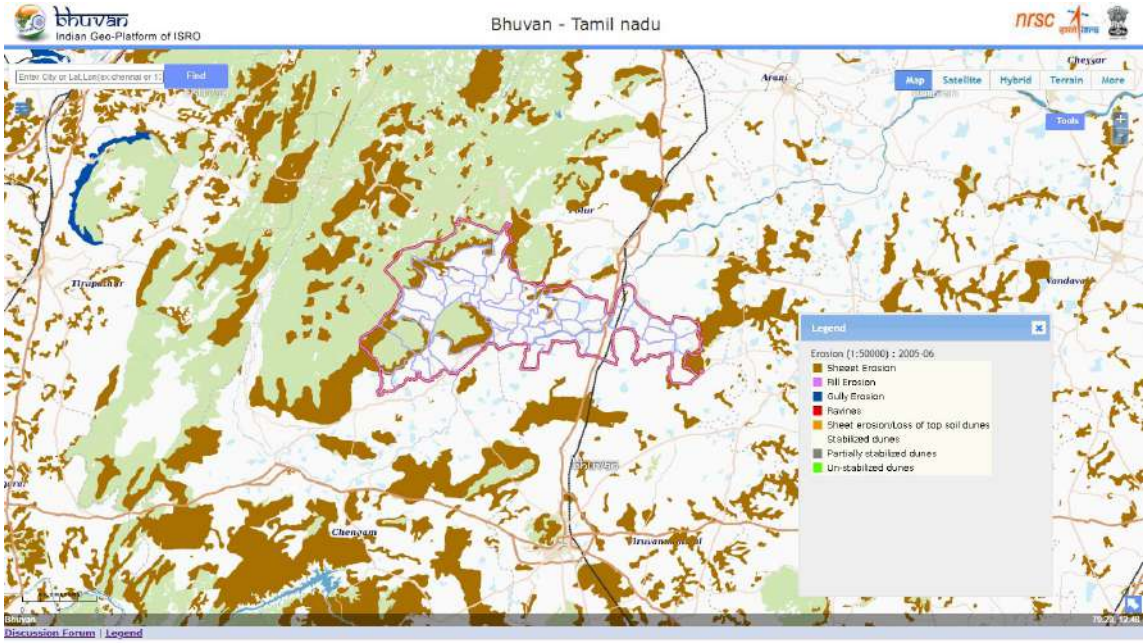
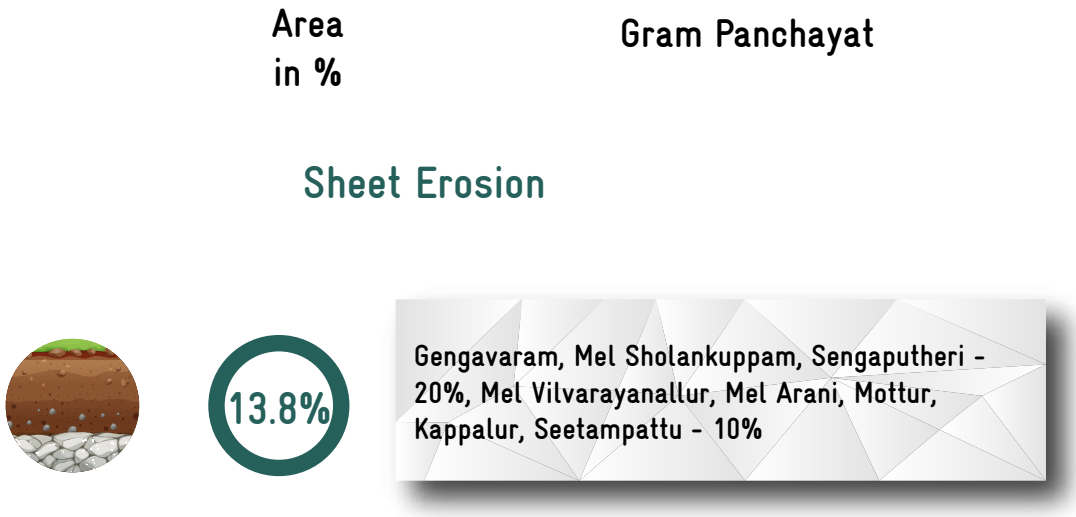


Figure 3.14. Soil Erosion map



3.6.1.3 Land Use & Land Cover (LULC): 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. Kalasapakkam Block is dominated with agriculture and barren land (Figure 3.15). The GP wise LULC are illustrated below. LULC map helps the decision makers and planners to focus on the developmental activities in the fallow land.

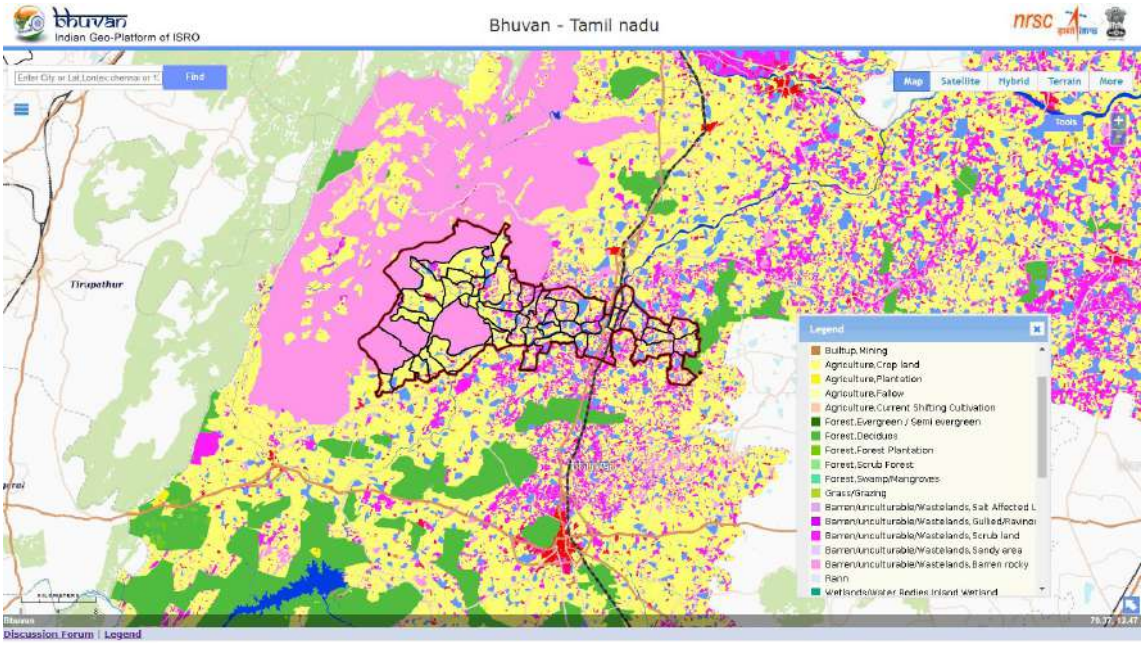


Figure 3.15. Land Use Land Cover map

Land Use	Area coverage in %	Gram Panchayat
Barren Lands	66%	Seetampattu, Padagam, Ladavaram - 90%, Then Pallipattu, Mel Vilvarayanallur - 80%, Sengaputheri, Mottur - 70%, Kalasapakkam - 60%, Kilpotharai, Mel Arani - 40%, Gengavaram -20%
Agriculture crop lands and Plantation	88%	Kilkuppam, Mattavettu, Mel Palur, Kilpalur, Kadalady, Pattiyanthal, Veeralur, Mel Sholankuppam, Kanthapalayam - 100%, Deverayanpalayam, Gengavaram, Kidampalayam, Gengalamahadevi, Koil mathimangalam -90%, Kappalur, Elathur, Sholavaram, Palan Koil - 60%

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. Degraded forest is observed in the Block area (Figure 3.16). Measures to arrest forest degradation by implementing deforestation activities such as horticulture plantation have to be taken up.

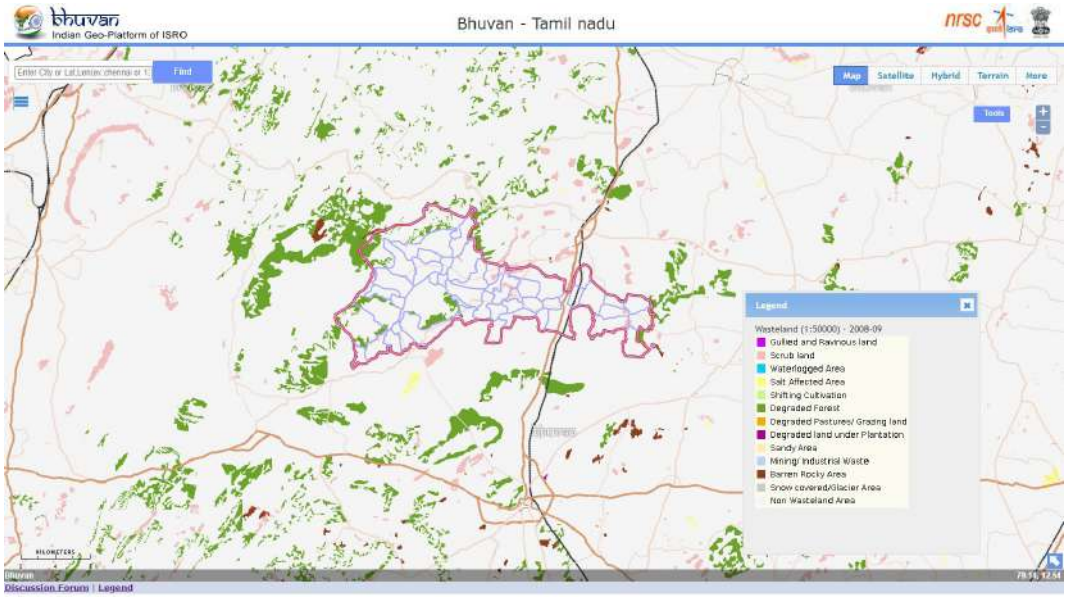


Figure 3.16. Wasteland map

Wasteland type	Area in %	Gram Panchayat
Scrub Land	5.8%	Mel Vilvarayanallur - 10%, Sengaputheri, Kappalur, Mottur, Kettavarampalayam, Gengavaram - 5%

3.6.1.5 Salt affected area: Small patches of salt affected areas is observed in the eastern part of the Kalasapakkam Block in Kappalur panchayat (Figure 3.17). These parcels will act as a direct input during planning process to propose soil conservation measures, mainly activities to reduce salinization and suggestions for alternative cropping.

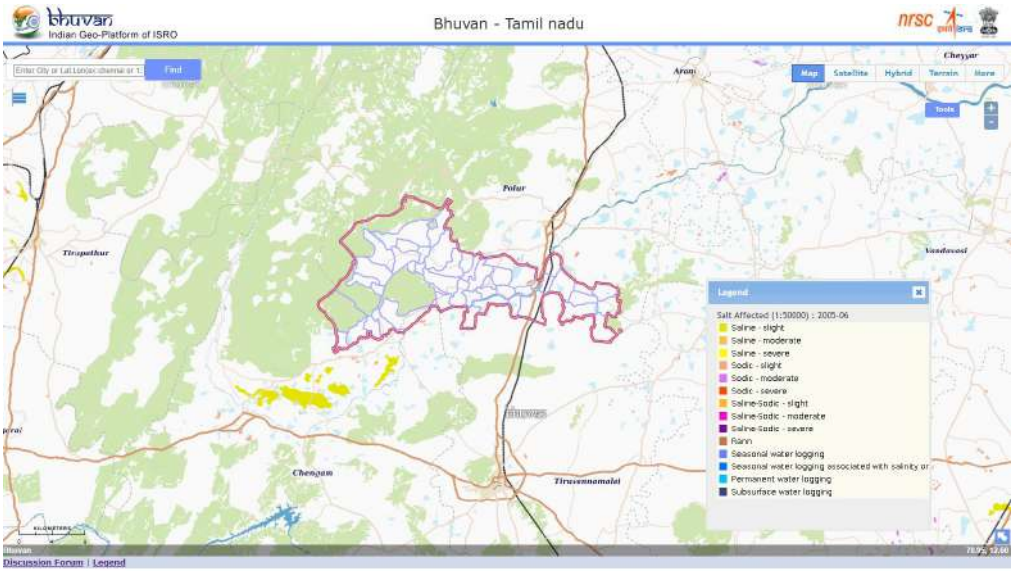


Figure 3.17. Salt Affected Area

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

Sl. No.	Key parameter	Extent
	Area under Land Resources (ha.)	
1	Area Irrigated by Source	10,390
2	Non-Agricultural Uses	4,568
3	Current Fallow land	4,204
4	Unirrigated Land	1,458
5	Fallow Land other than Current Fallows	949
6	Barren & Un-cultivable Land	832
7	Permanent Pastures and Other Grazing Land	398
8	Cultivable Waste Land	250
9	Land Under Miscellaneous	156
10	Forest land	10
	Land under Catchment Area (ha)	
11	Good Catchment	5,410
12	Average Catchment	804
13	Bad Catchment	17,001
	Crop Details	
14	Irrigated Area (ha)	13,128
15	Rainfed area (ha)	226
16	Paddy Cultivation (ha)	9,526
17	Crop Water Requirement - Irrigated condition (ha.m)	17,756
18	Crop Water Requirement - Rainfed condition (ha.m)	88
	Soil Resources: Status of Available Nitrogen (%)	
19	Very Low	6
20	Low	91
21	Medium	3

	Status of Organic Carbon (%)	
22	Very Low	19
23	Low	80
24	Medium	1
	Status of Soil Micro Nutrients (%)	
25	Sufficient	57
26	Deficient	43
	Status of Physical condition of the soil (%)	
27	Slightly Acidic	5
28	Neutral	2
29	Moderately Alkaline	91
	Soil Texture (%)	
30	% of Clay Soil	12
31	% of Fine Soil	66
32	% of Coarse loamy	3
33	Soil Water Permeability (Low, Moderate, high)	Moderate
	Soil moisture and ET	
34	Volumetric Soil Moisture (%)	10
35	Estimated Soil Moisture (ha.m)	4,289
36	ET Losses (ha.m)	9,833
38	ET Losses (ha.m)	6,687
	Means of Water Extraction (%)	
37	Gravity	5
38	Lifting	95
	Irrigation Methods (%)	
39	Wild Flooding	23
40	Control Flooding	77
	Livestock (No.)	
41	Cattle population	34,816
42	Sheep population	8,360
43	Goat population	9,834

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 23,215 ha, the highest of 44.8 % land is used for irrigation by sources, followed by 19.7 % area is used for non-agricultural activities, while less than 5 % of land is fallow land other than current fallows Barren & Un-cultivable, cultivable waste land and Permanent Pastures and other grazing land, forest land etc., (Figure 3.18).

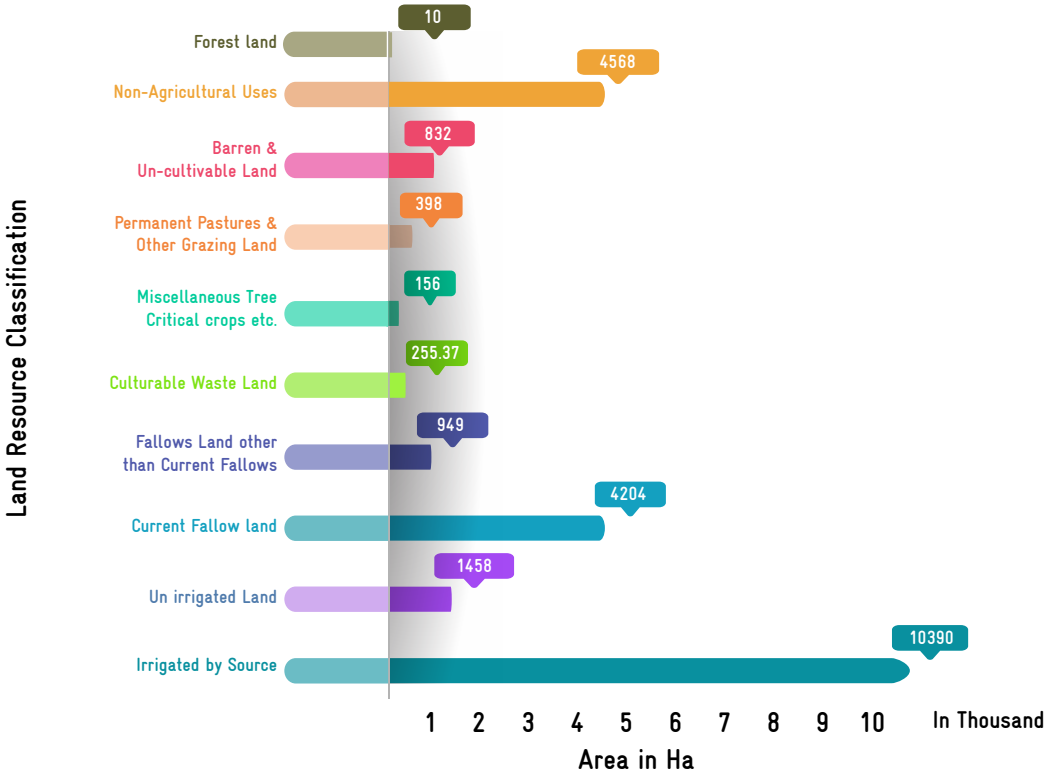


Figure 3.18. Land utilization

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 23,215.2 ha, of the Kalasapakkam Block, the highest of about 73 % is from bad catchment area followed by 23.3 % from good catchment area and remaining is from 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).

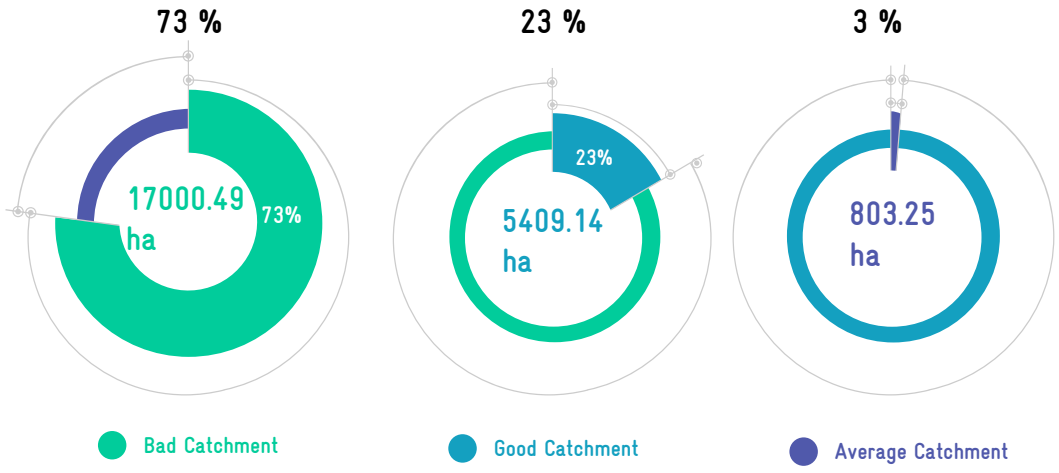


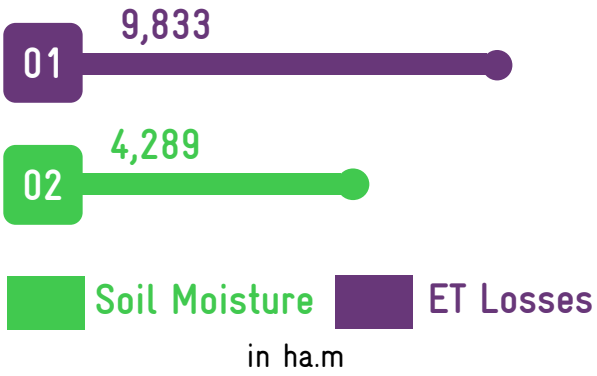
Figure 3.19. Catchment area

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 (10%), is taken for estimating the amount of water stored as soil moisture which accounts to 4,289 ha.m.

3.6.2.4 ET losses

The loss of water through ET is important in water budgeting. The annual total ET loss during 2018-19 was 9,833 ha.m.



3.6.2.5 Macro soil nutrients Nitrogen

The macro soil-nutrients such as nitrogen and organic carbon falls under very low to moderate category in all the soil samples tested. The available nitrogen is very low in 6 % of the samples tested while it was 91 % under low category and remaining is medium Nitrogen (Figure 3.20). According to soil resource map, this Block is identified as one of the nitrogen deficient Block (Tiruvannamalai district profile 2020).

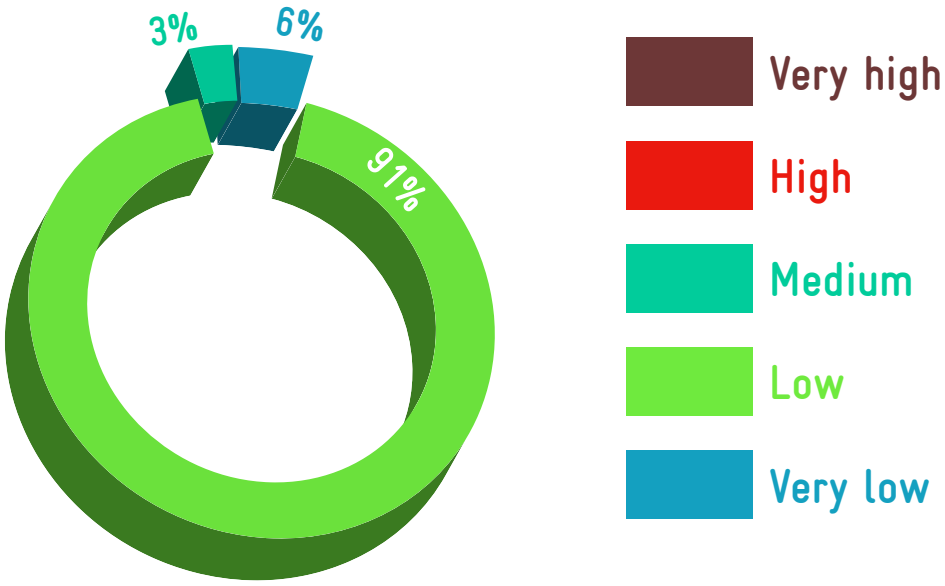


Figure 3.20. Status of available Nitrogen

Organic Carbon Status

A similar trend was recorded for soil organic carbon. Soil organic carbon is also ranges between very low and low in the Block. Nearly 80 % of the soil samples tested witnessed low category carbon content followed by 19 % is falls under very low category while only 1 % falls under medium 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.

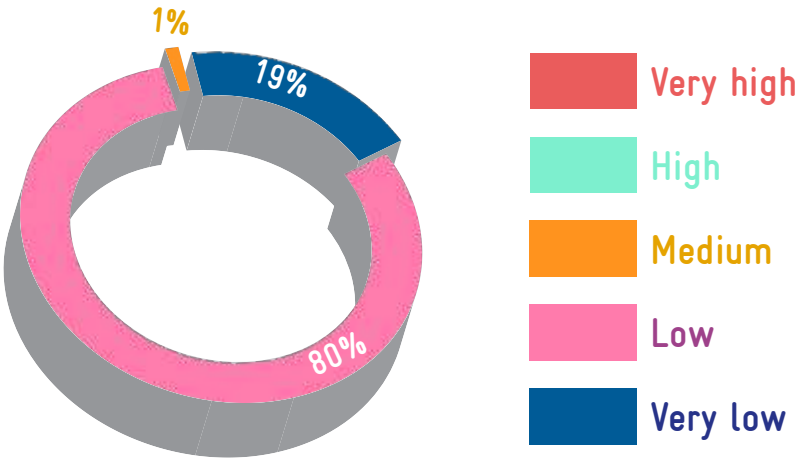


Figure 3.21. Status of soil Organic Carbon

3.6.2.6 Status of the soil micro-nutrients

This Block is one of the 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 43 % and 57 % sufficient in the soils tested. (Figure 3.22)

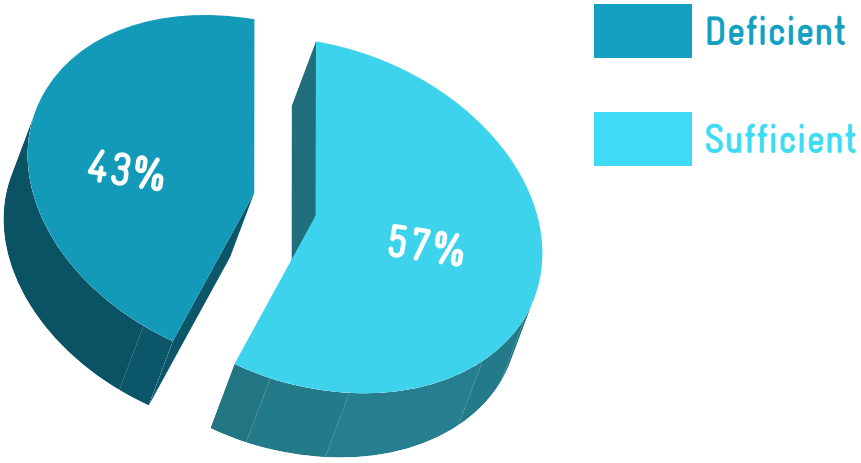


Figure 3.22. Status of soil micro-nutrients

3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 91 % of the soil is moderately alkaline in nature followed by 5 % is slightly acidic and 2 % is neutral in nature (Figure 3.23).

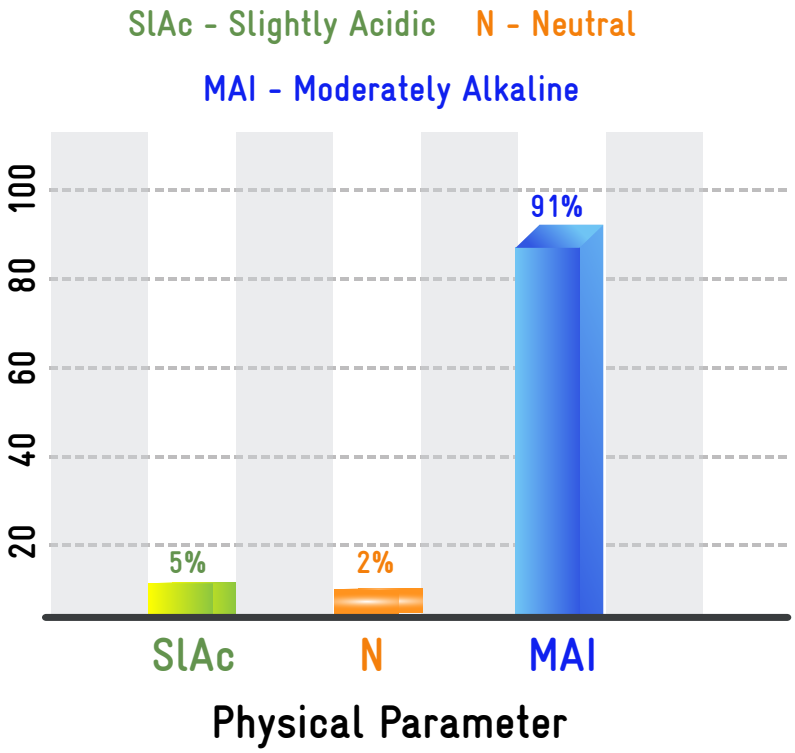


Figure 3.23. Status of pH of soil

3.6.2.8 Cropping pattern and the irrigation

A total of 13,686.3 ha area is used for crop cultivation in which irrigation shares the highest area of 90.94 %, rest is rain-fed irrigation. Overall paddy is the dominated crop (56.34 %) followed by groundnut (19.87 %) while vegetable, red gram, ragi, dry chilli, brinjal, water melon, ladies finger, gourds, banana, guava, medicinal plants, lemon, mango, tomato, coconut are cultivated in less than a percent of the area (Figure 3.24).

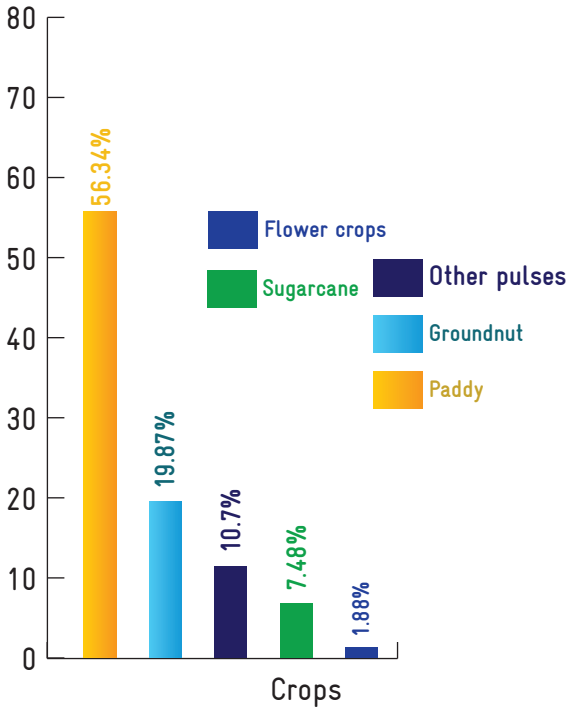


Figure 3.24. Cropping pattern

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 control flooding. In the Block, 77 % of the irrigation is done by control flooding and only 23 % of the irrigation is done by wild flooding (Figure 3.25).

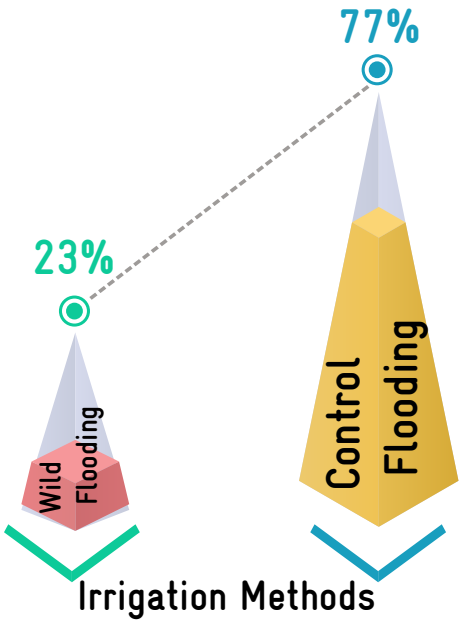


Figure 3.25. Irrigation methods

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, 95 % of the water extraction methods are under lifting means of extraction and only 5 % comes under gravity means of water extraction (Figure 3.26).

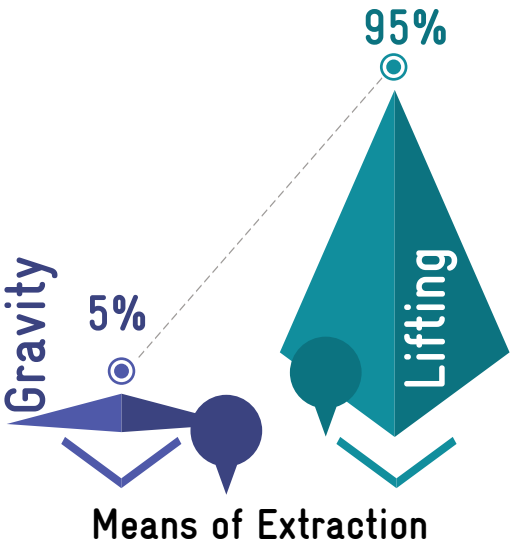


Figure 3.26. Means of water extraction

3.6.2.11 Livestock details

This Block has considerable proportion of livestock resources of which small ruminants such as goat and sheep constitute 34.3 % (18,194) and remaining 65.7 % (34,816) constitutes cattle population (Figure 3.27). The total water requirement for livestock is 136 ha.m. Of the total water demand of 80 % is met through ground water and remaining is from surface water resources.

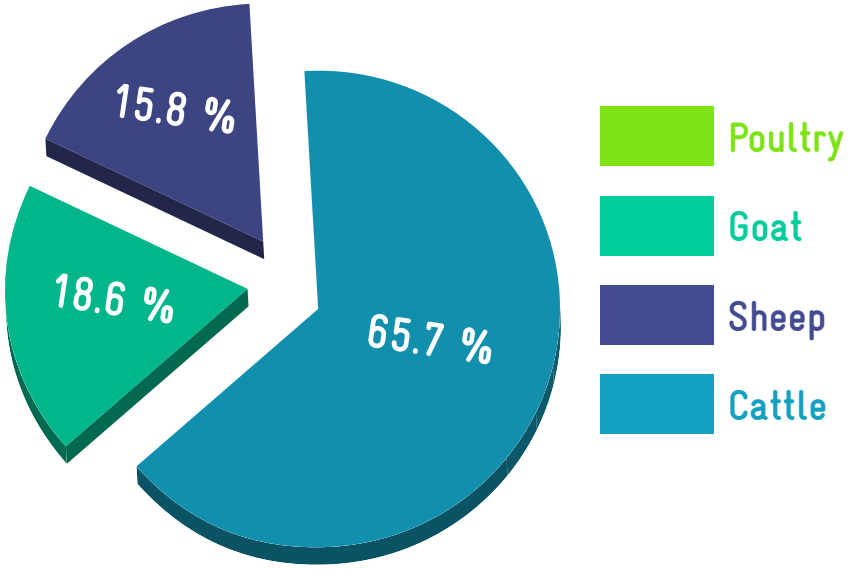


Figure 3.27. Livestock details

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 Kalasapakkam 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

Sl.No.	Parameter	Total
1	Geographical Area (ha)	22,423
2	Male population (No.)	60,830
3	Female population (No.)	59,826
4	Total population (No.)	1,20,656
5	SC population (No.)	28,308
6	ST population (No.)	366
7	Vulnerable population (No.)	28,270
8	Households (HH's) (No.)	34,066
9	Only one room HH's (SECC) (No.)	4,799
10	Female Headed HH's (SECC) (No.)	2,128
11	Vulnerable Households (SECC) (No.)	3,999

12	% of Vulnerable Households (%)	12
13	Registered MGNREGA Job cards (Persons)	54,462
14	Active person working in MGNREGA job Cards (Persons)	44,782
15	Drinking Water Sources (No.)	21,081
16	Ground Water - Drinking source (No.)	178
17	Surface water - Drinking source (No.)	61
18	Sum of drinking water sources (No.)	239
19	HH's have tap water connection for drinking water (No.)	9,235
20	HH's dependent on other sources for drinking water (No.)	8,539
21	Annual Greywater Generation (ha.m)	219

3.7.1 Population:

The total population of this Block is 1.2 Lakh* of which male and female population are balanced almost to equal. 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 23 % of the total population are under vulnerable population (Figure 3.28).

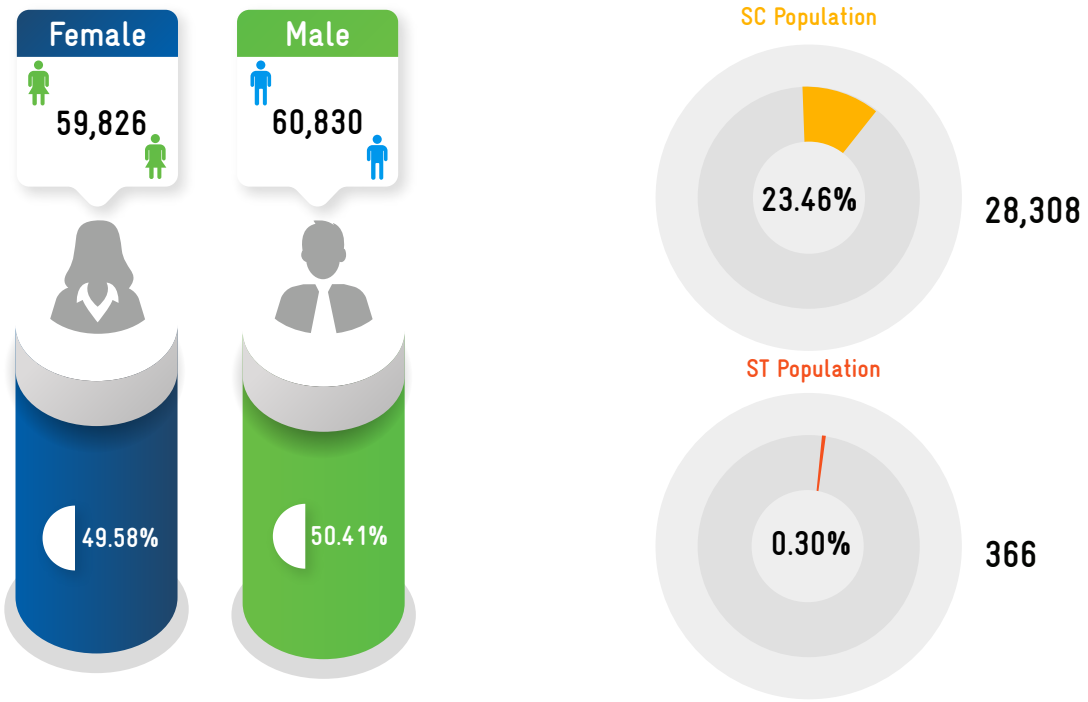


Figure 3.28. Population details

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

3.7.2 Details of households

There are a total of 34,066 households in which 14 % households have only one room, 6 % households are headed by women and 12 % are vulnerable households (Figure 3.29).

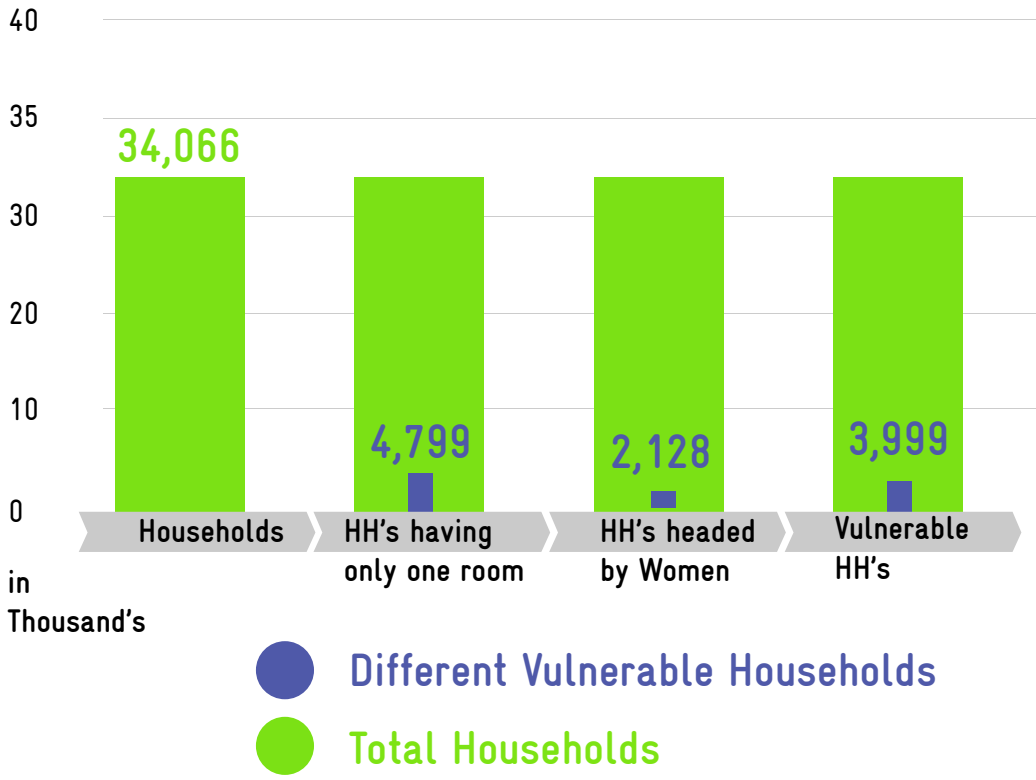


Figure 3.29. Details of Households

3.7.3 Status of Mahatma Gandhi NREGA - job card status

In the Block of the total population of 1.2 lakhs, 54,462 are registered for job cards under Mahatma Gandhi NREGA scheme, in which 82 % of the job cards are in active category (Figure 3.30).

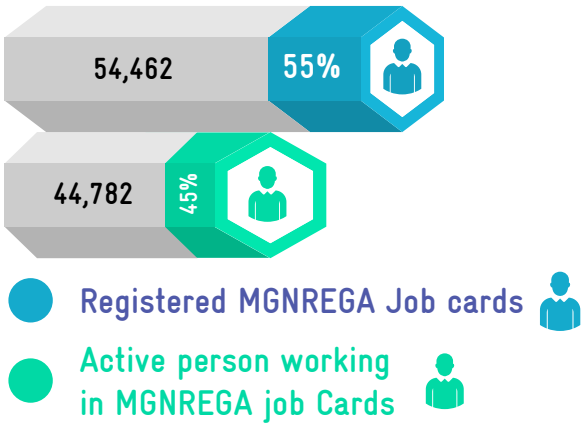


Figure 3.30. Status of MGNREGA job cards

3.7.4 Drinking Water Sources

Nearly 9,235 households have tap water connection and 8,539 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

9,235
Households

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

8,539
Households

3.7.5 Annual Greywater Generation

The grey water generation estimated across this Block is 219 ha.m which is available for reuse or recycle.

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

Morphology

Mel Sholankuppam, Kanthapalayam, Gengavaram

Wasteland

Mel Vilvarayanallur, Seetampattu, Padagam, Ladavaram

Soil erosion

Gengavaram, Mel Sholankuppam, Sengaputheri

Upland/Slope

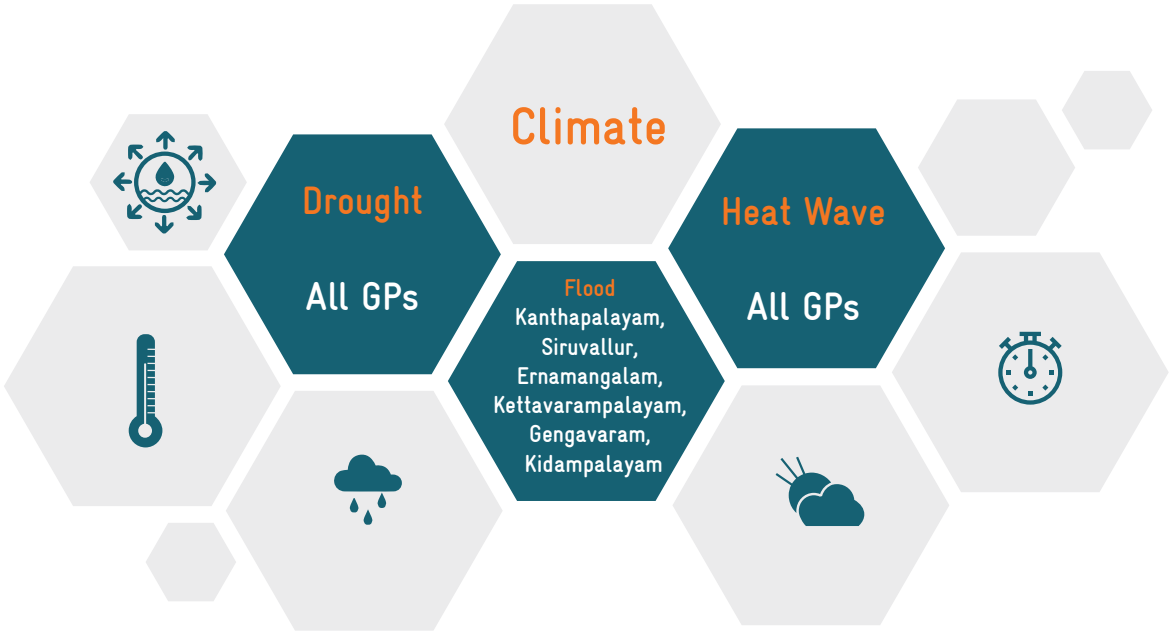
Ladavaram, Kidampalayam, Koil mathimangalam, Gengavaram

Ground water prosperity

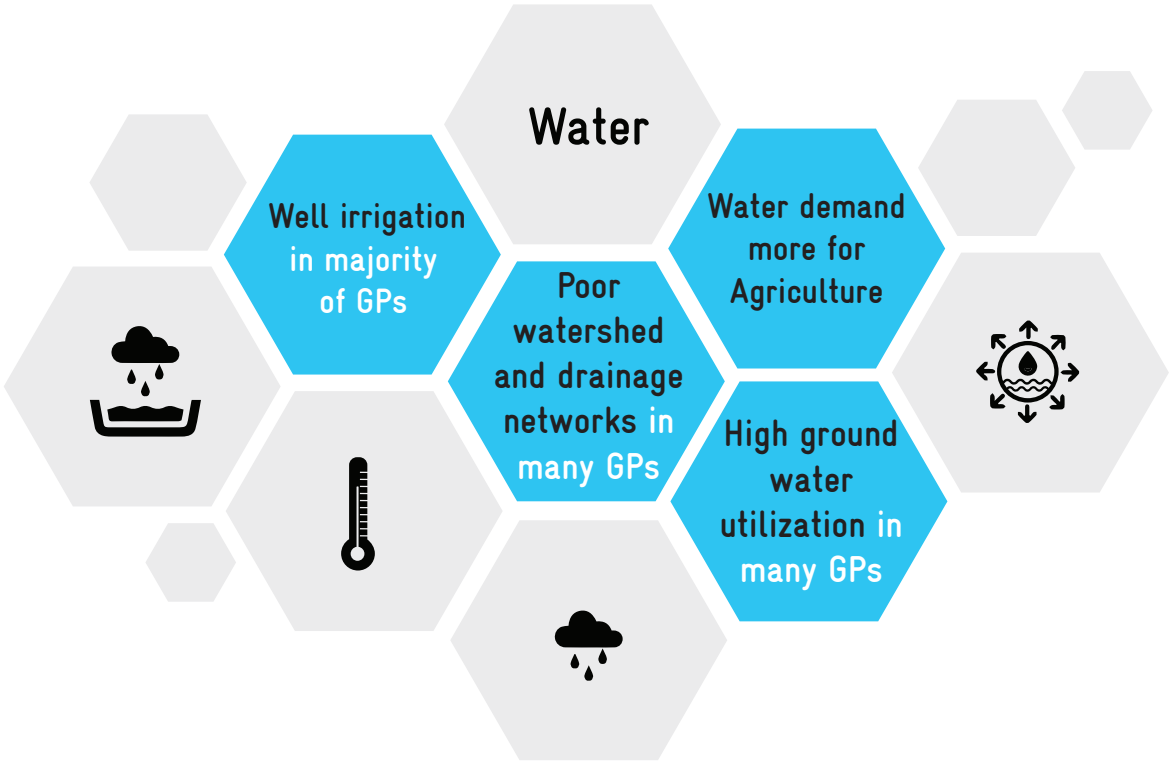
Sengaputheri, Mel Sholankuppam, Kappalur, Pattiyanthal

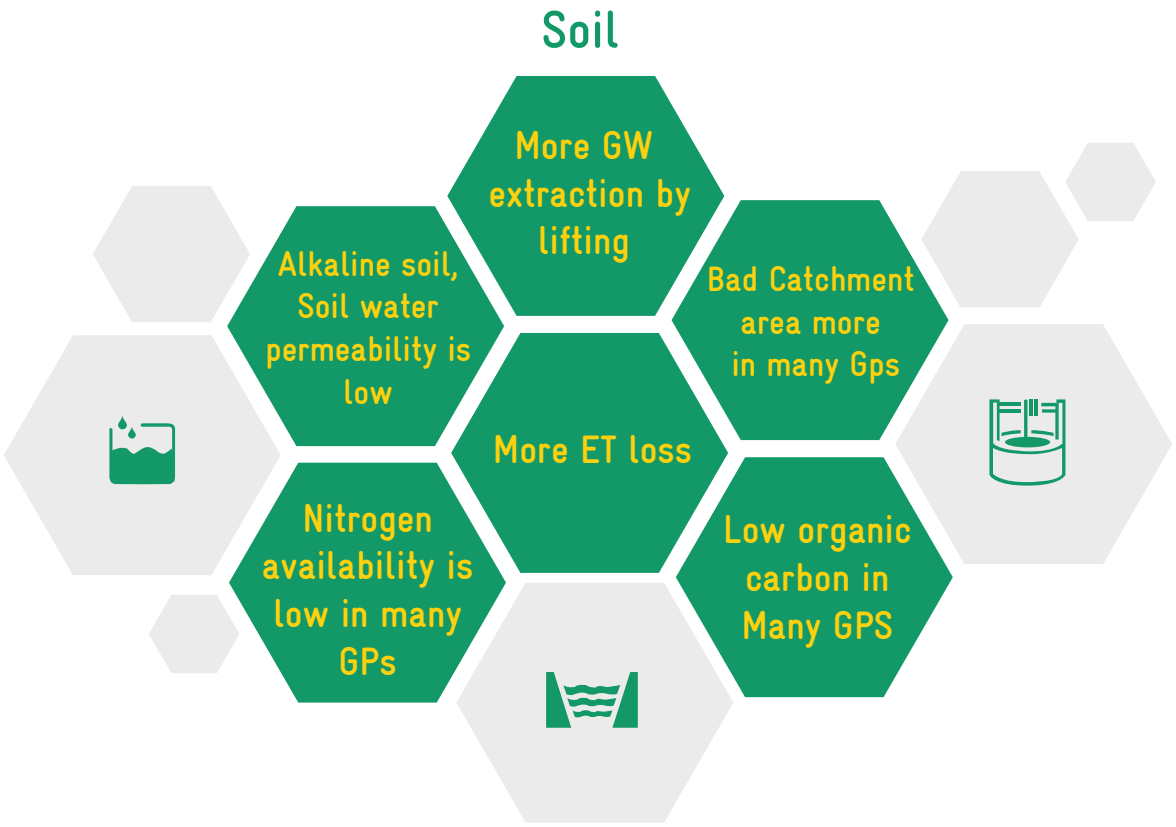
Salt affected area

Kappalur


Climate
Drought
All GPs
Heat Wave
All GPs
Flood
Kanthapalayam, Siruvallur, Ernamangalam, Kettavarampalayam, Gengavaram, Kidampalayam


Socio economic
Population density high in Singaravady, Adamangalam
Vulnerable population high in Kadalady, Melsholankuppam
% of vulnerable households high in Poondi, Gangalamahadevi, Deverayanpalayam
No. of households and female headed households high in Kadalady, Singaravady
Total population, Female population high
Kadalady, Siruvallur, Melsholankuppam
Grey water generation more in Kadalady, Kettavarampalayam
Few GPs (7) HH's have tap water connection for drinking water
Registered MGNREGA job cards and active persons working are low in Singaravady, Sengaputheri


Water
Well irrigation in majority of GPs
Water demand more for Agriculture
Poor watershed and drainage networks in many GPs
High ground water utilization in many GPs


Soil
More GW extraction by lifting
Alkaline soil, Soil water permeability is low
Bad Catchment area more in many Gps
More ET loss
Nitrogen availability is low in many GPs
Low organic carbon in Many GPS

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. Intergovernmental Panel on Climate Change (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).

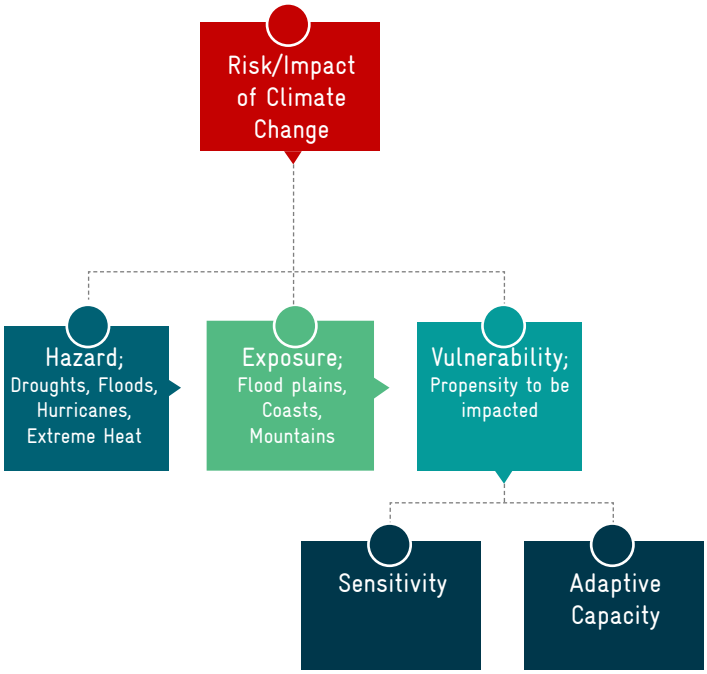


Figure 4.1. Vulnerability of the system as defined by IPCC

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 Sociodemographic (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.

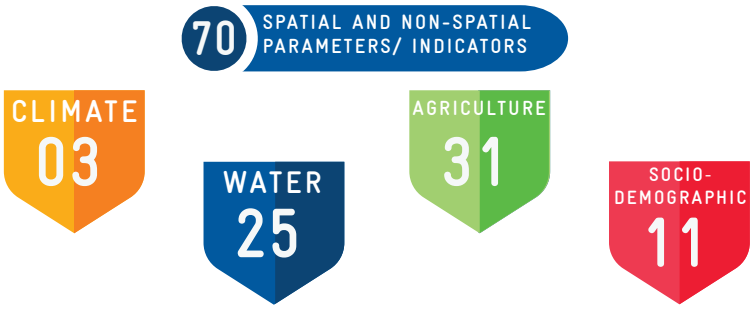


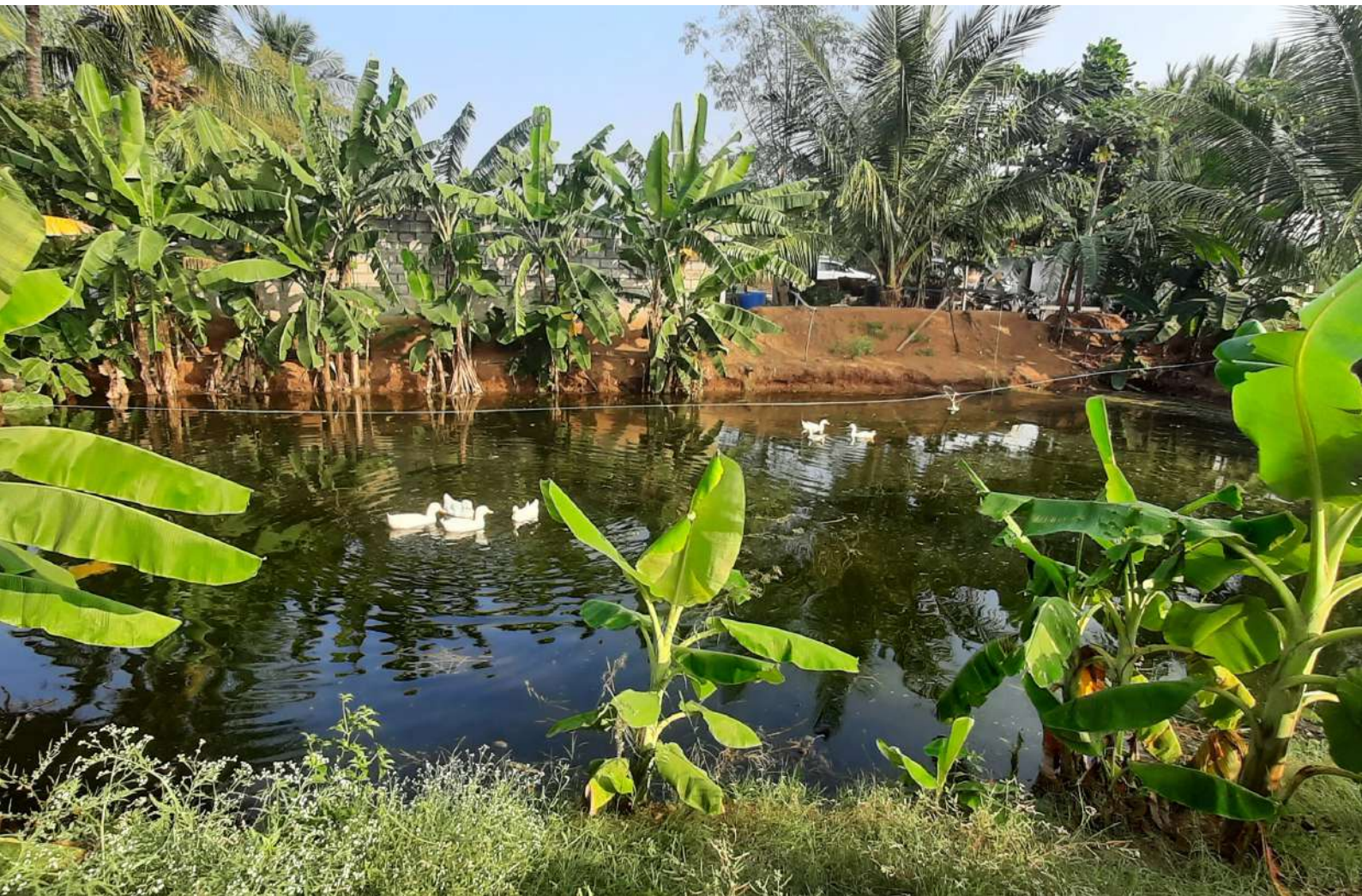
TABLE 9. CWRM PARAMETERS SELECTED FOR BLOCK LEVEL VULNERABILITY

	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 Ooranis	
	Other surface waterbodies	
	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	
	Watershed and Drainage Networks	
	Length of Natural Drainage Lines (m)	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 different vulnerability levels very high, high, medium, low and very low category. The vulnerability assessment methodology is given in Annexure 4. The results show that Veeralur, Gangavaram, Deverayanpalayam, Kanthapalyam, Anaivady, and Melsholankuppam GP's have very high rural water security vulnerability to climate risks. Venkidampalayam, Pattiyandal and Kolimathingalam GPs have very low vulnerability.

Upto	Category	Color range
0.575	very high	
0.551	high	
0.527	medium	
0.503	low	
0.479	very low	



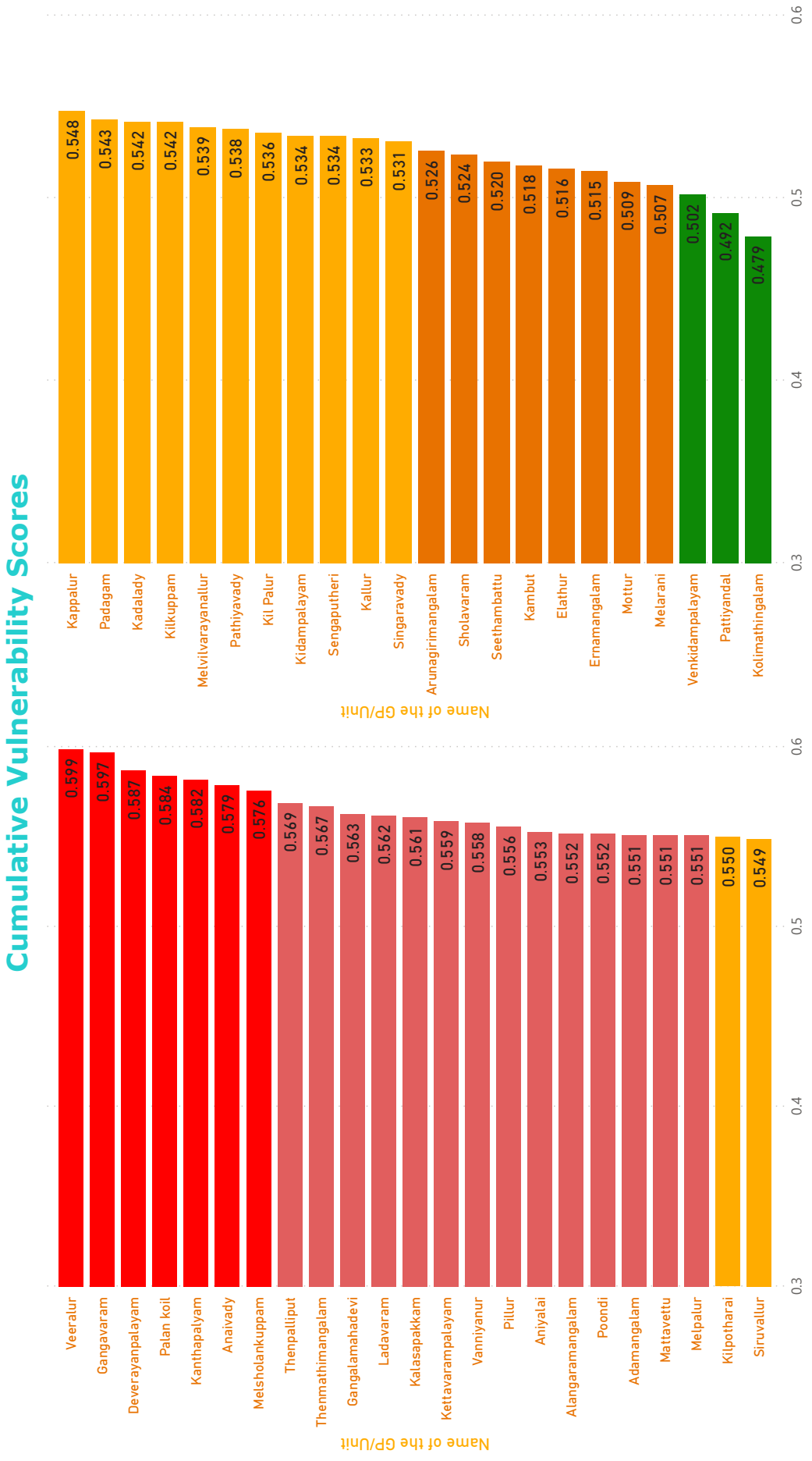


Figure 4.2. Final cumulative vulnerability scores

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 GPs in this Block are affected with droughts and heat waves in last decades whereas Ernamangalam, Gangalamahadevi, Gangavaram, Kettavarampalayam and Kidampalayam GPs have moderate vulnerable to flood.

ERNAMANGALAM, GANGALAMAHADEVI, GANGAVARAM, KETTAVARAMPALAYAM, KIDAMPALAYAM

Water resource vulnerability

The water resources vulnerability index shows that Melsholankuppam, Veeralur, Thenmathimangalam, Gangavaram, Kanthapalyam, Kettavarampalayam, Kilkuppam, GPs has high vulnerable score while Alangaramangalam GP is with low vulnerable score.

MELSHOLANKUPPAM, VEERALUR, THENMATHIMANGALAM, GANGAVARAM, KANTHAPALYAM, KETTAVARAMPALAYAM, KILKUPPAM, ALANGARAMANGALAM

Agriculture resources vulnerability

In agriculture and allied sectors, GPs has highest vulnerable score are Deverayanpalayam, Thenpalliput, Anaivady, Veeralur, Kanthapalyam, Alangaramangalam, Gangavaram, while Pattiyandal has low vulnerable scoure.

DEVERAYANPALAYAM, THENPALLIPUT, ANAIVADY, VEERALUR, KANTHAPALYAM, ALANGARAMANGALAM, GANGAVARAM, PATTIYANDAL

Socio-economic vulnerability

Poondi, Siruvallur, Kadalady, Palan Koil, Alangaramangalam, Singaravady, Kalasapakkam, Deverayanpalayam and Seethambattu GPs witnessed the high socio economic vulnerability while Kolimathingalam witnessed the low vulnerable score.

POONDI, SIRUVALLUR, KADALADY, PALAN KOIL, ALANGARAMANGALAM, SINGARAVADY, KALASAPAKKAM, DEVERAYANPALAYAM, SEETHAMBATTU, KOLIMATHINGALAM

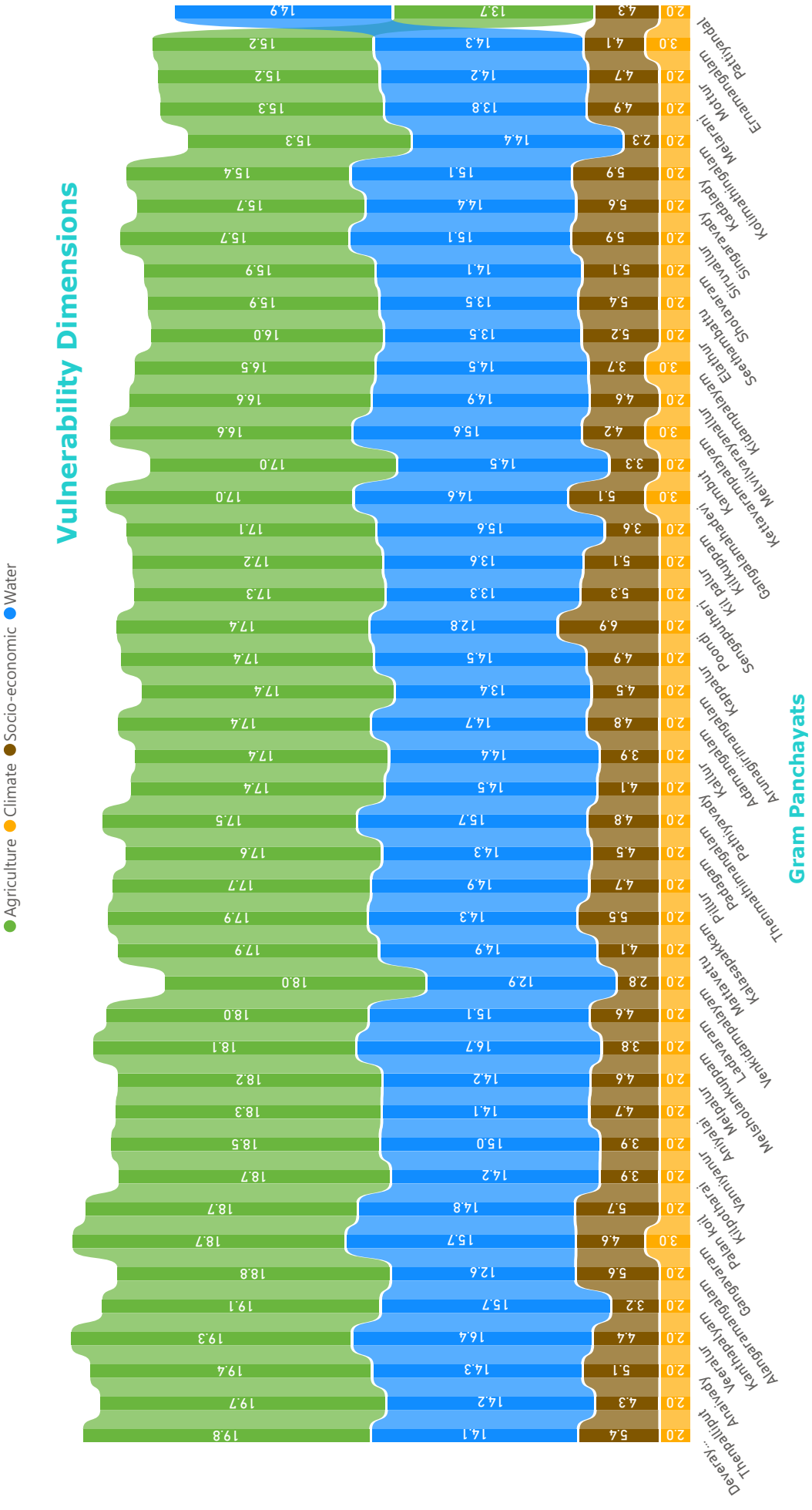
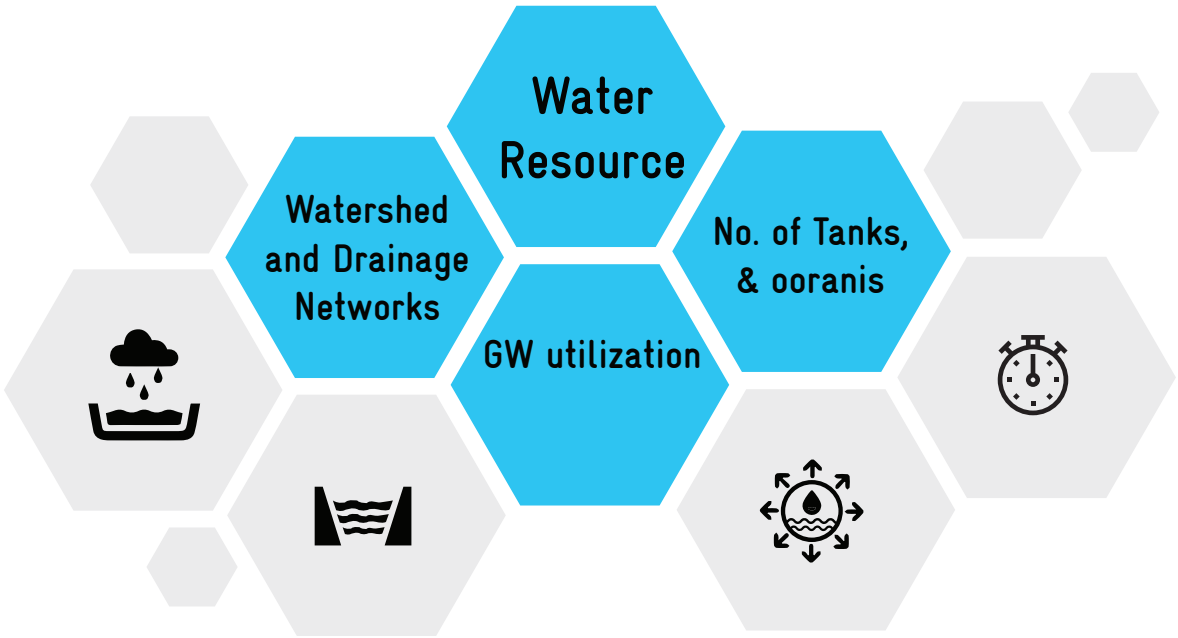
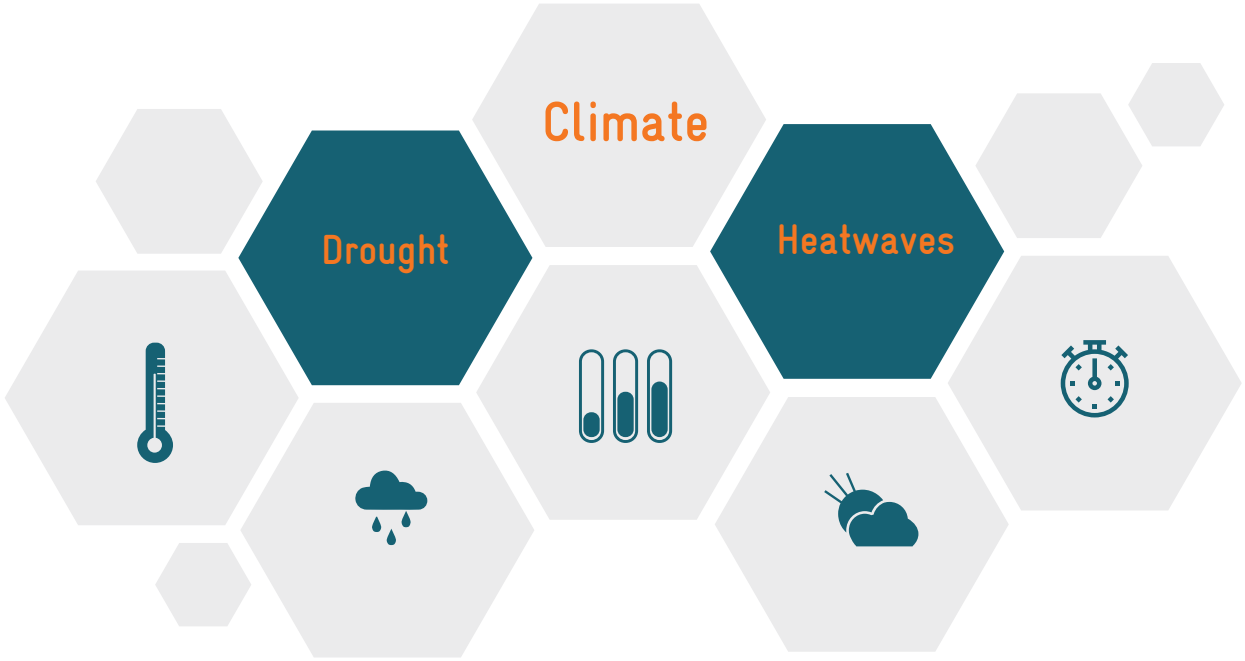
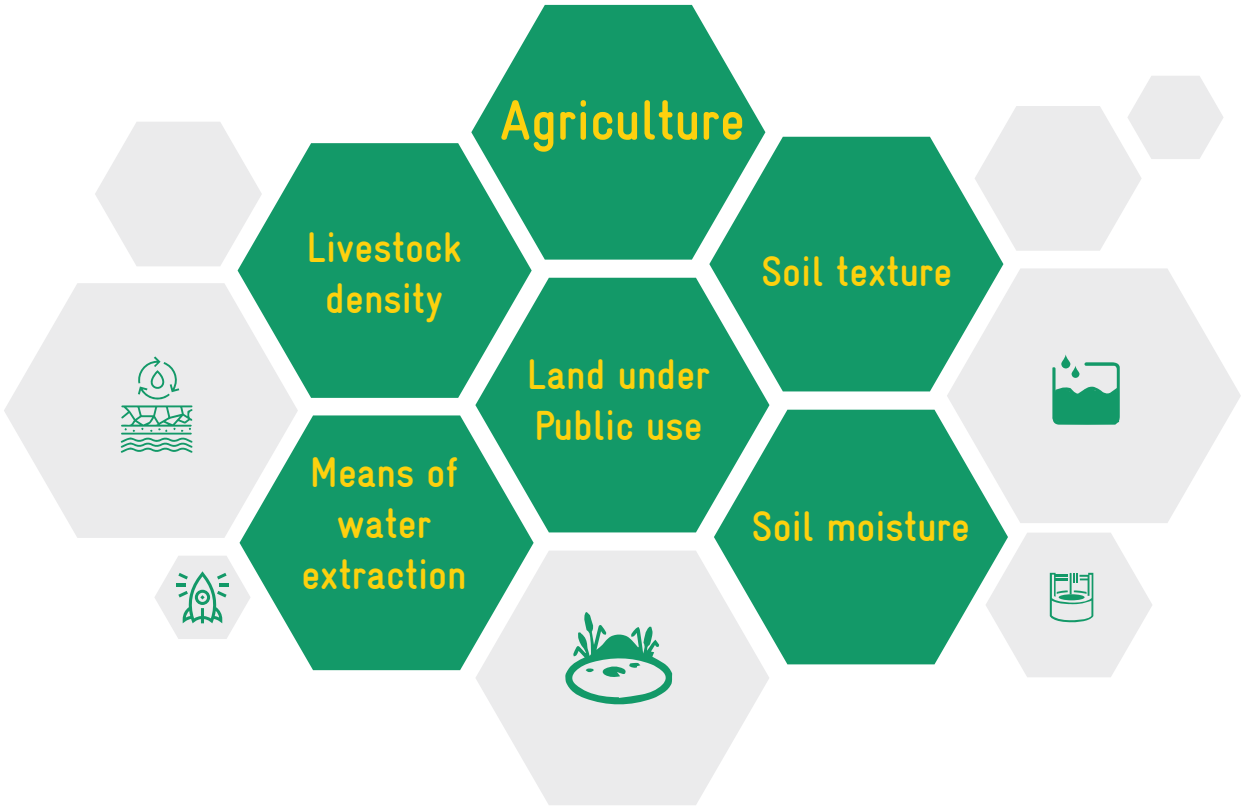


Figure 4.3. GP wise vulnerability dimensions

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 the 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).

5.1 THE PROPOSED AREA UNDER WASCA TREATMENT

Out of 23,215.23 ha available land in Kalasapakkam Block, 3,858.17 ha (16.61 %) area is proposed for treatment under WASCA TN– CWRM planning. A major portion of key water actions is proposed in area irrigated by source i.e. 1,237.45 ha (32.07 %) followed by Non-agricultural uses in 724.9 ha (18.79 %) while less than five percent of cultivable waste land, fallow land other than current fallow, forest land, miscellaneous tree crops etc. land area is proposed for water actions.

TABLE 10. THE PROPOSED AREA FOR WASCA TREATMENT

Land use	Total available land (ha)	WASCA proposed treatment area (ha)
Area Irrigated by Source	10,390	1,237.45
Non-Agricultural Uses	4,568	724.93
Current Fallow land	4,204	485.07
Unirrigated Land	1,458	222.31
Fallows Land other than Current Fallows	949	102.23
Barren & Un-cultivable Land	832	495.06
Permanent Pastures and Other Grazing Land	398	302.99
Cultivable Waste Land	250	158.76
Land Under Miscellaneous Tree Crops etc.	156	125.36
Forest land	10	4

The detailed land wise proposal for WASCA treatments is given in the Table 10 and Figure 5.1. GP wise proposed area for treatment is also attached in Annexure 5.1.

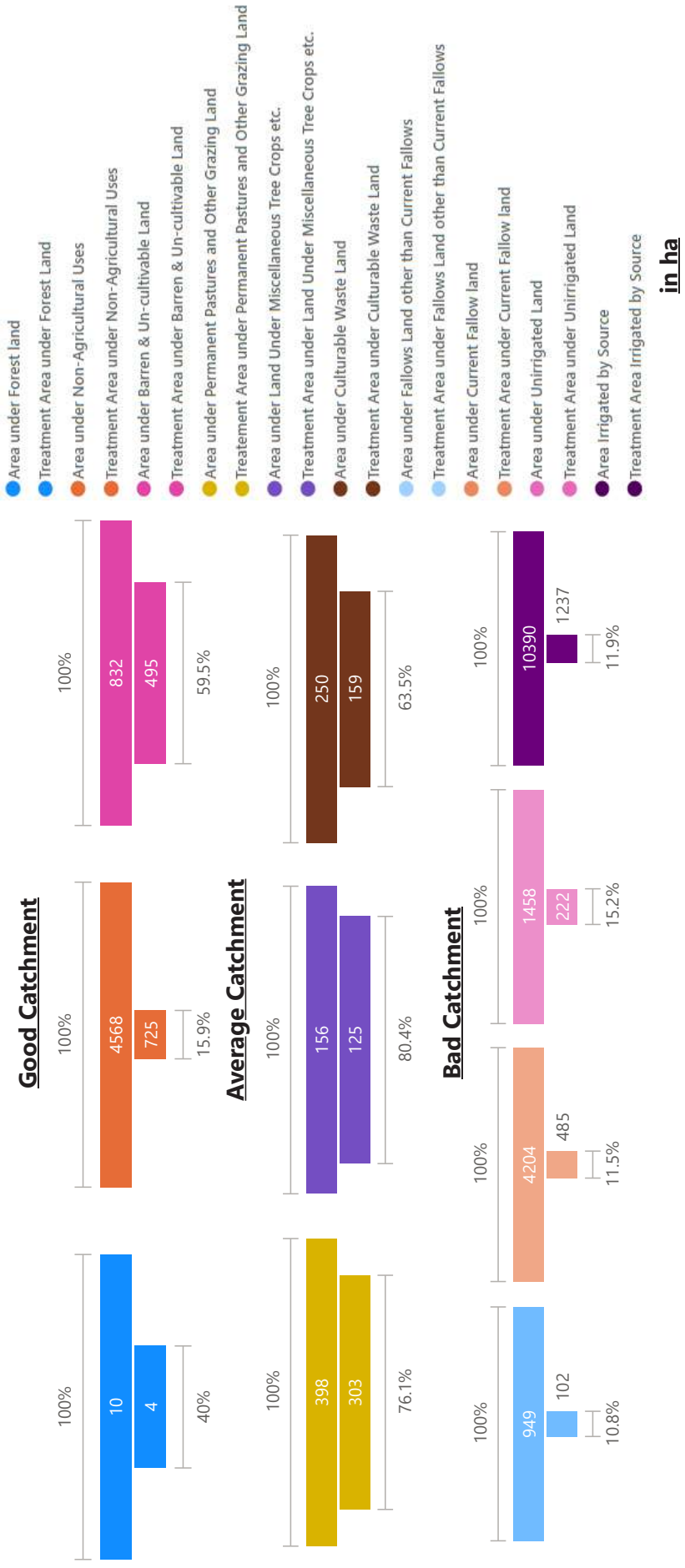


Figure 5.1. WASCA treatment area in percentage

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 1,319.19 ha.m which is 24.92 % of the total runoff. Of the expected runoff conservation, 54.5 % comes from good catchment area, 12.9 % comes from average catchment area and 32.6 % comes from bad catchment area (Figure 5.2).

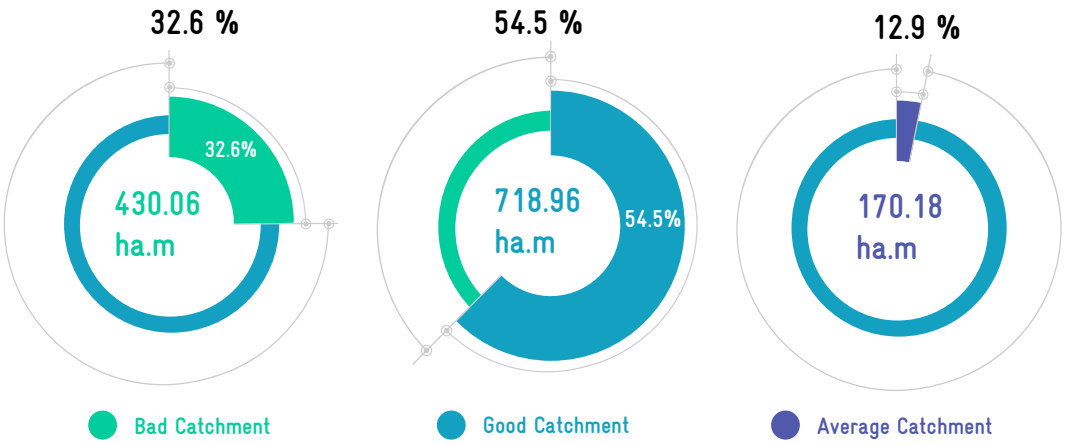


Figure 5.2. Expected conservation after WASCA treatment

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 GP wise works are tabulated in Annexure 5.3.

Work (unit)	Abbreviation (unit)	No.	Extent (area in ha or length in m)
Azolla units - Individual (Number of units)	Az	2,293	
Cattle Shelters (Number of units)	CS	2,313	
Cattle Trough(Number of units)	CT	2,313	
Fodder development - Community & Individual	FD	2,086	
Goat Sheep Shelters (Number of units)	GSS	153	
Poultry Shed (Number of units)	PS	-	
Silvi-pasture Development(Ha)	SPD	223,845	293.81
Soak Pits (Community) (Number of units)	SPC	209	
Soak Pits (Individual) (Number of units)	SPI	550	
Artificial Recharge Structure(Number of units)	ARS	-	
Construction of Farm Ponds - Individual (Number of units)	FP	529	

Construction of new open wells & Recharge Shafts (Number of units)	COWRS	2,555	
Restotaration of water bodies:a.PWD and Tanks(Number)	RPWDT	71	
Restotaration of water bodies:b. Ooran-is(Number)	Ro	33	
Restotaration of water bodies:c. Ponds(Num-ber)	RP	154	
Roof Rain Water Harvesting (Number of units)	RRWH	90	
Water Course - Irrigation Channels - Desilt-ing (Mtrs)	WCICD		6,500
Afforestation in Public/common lands(Ha)	Aff	422,033	527.14
Avenue plantation(km)	AVP	3,284	78,907.60
Block Plantation (Community)(Ha)	BP	425,140	530.98
Canal Bund Plantation(Ha)	CBP	5,413	27,064
Contour Continous Bunds (CCB) for Affor-estaion area(Mtrs)	CCBF	277,618	2,347.67
Drainage Line Treatment (DLT)(Mtrs)	DLT	4,271	21,352
Dry land Horticulture/Agro-forestry - Indi-vidual (Ha)	DLHAI	1,25,655	628
Irrigation Channel Plantation (Mtrs)	ICP	1,300	6,500
Linear Plantation(km)	LP	22,205	1,10,505
Micro Irrigation(Ha)	MI	-	-
Nursery Development(Number of units)	ND	99,276	19,855
Composting (Number of units)	Co	229	-
Farm Bunding with Boundary Trenches - Individual (Ha)	FBBTI	240	601
Land development - Individual (Ha)	LDI	129	315
NADEP Vermi compost (Number of units)	NADEP	2,253	


Proposed works are included the drought proofing, livelihood, land development and WCWH, measures
Land development works over 1,978 ha area
More than 8.5 Lakhs plants planting
2,500 sites for WCWH
8,000 livelihood works

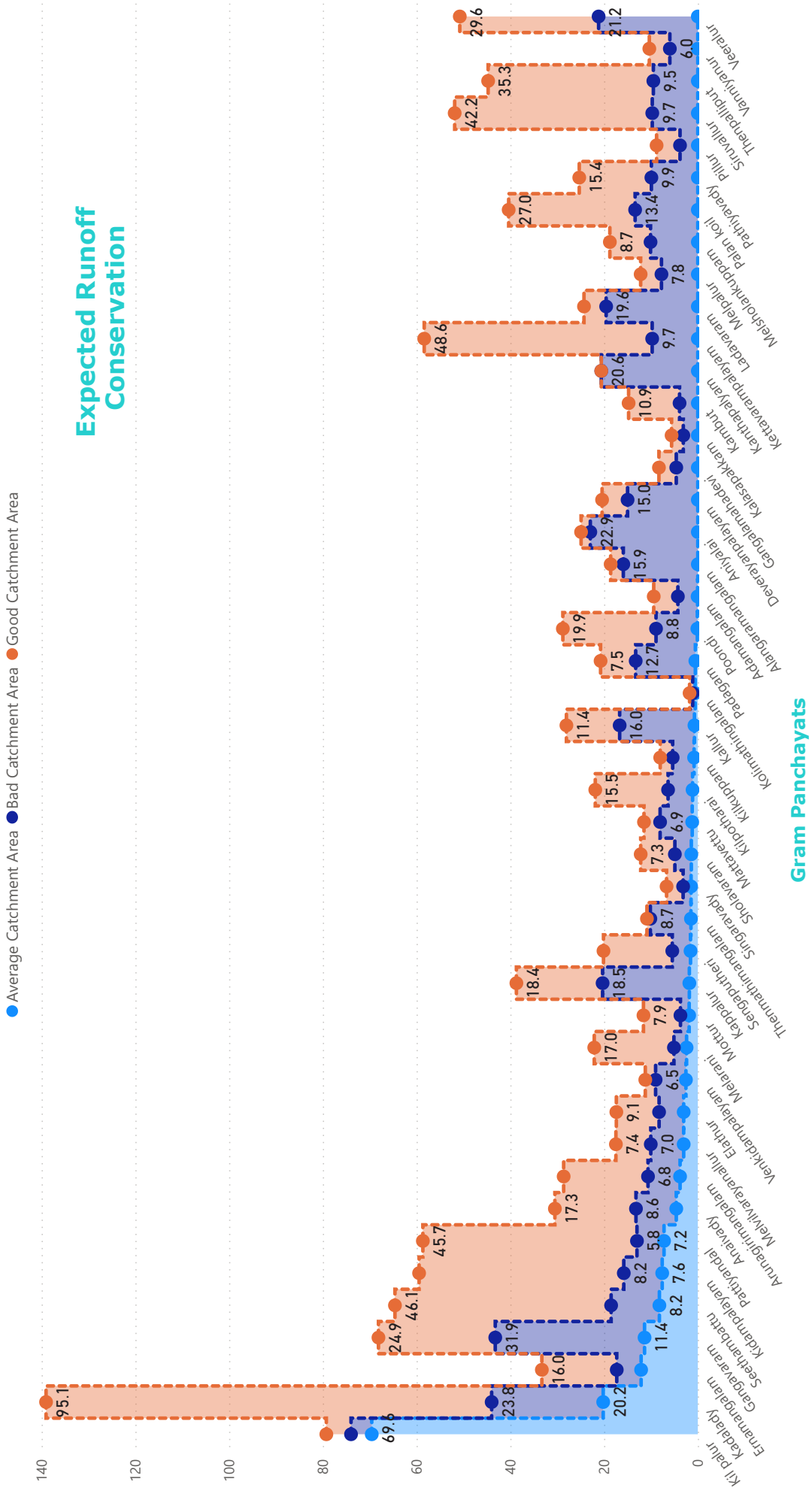


Figure 5.3. Expected GP wise runoff conservation after WASCA treatment

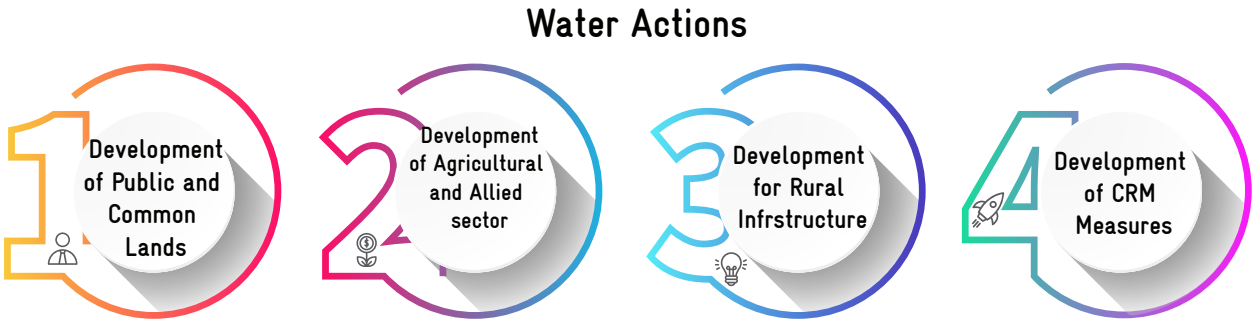
MAHATMA GANDHI NREGS Annual circular 2020-21 (Clause 6.3)

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)	555	10	-	13.9	5,552.2
COMPOSTING(NUMBER OF UNITS)	229	15	0.2	38.9	3,435
AFFORESTATION IN PUBLIC/ COMMON LANDS(ha)	527	3,344	8.6	4,533.4	17,62,756.16
BLOCK PLANTATION (COMMUNITY)(ha)	515	4320	11.1	5,711.6	22,22,899.2
SILVI-PASTURE DEVELOPMENT(ha)	280	6,664	17.1	4,784.8	18,64,653.84
LINEAR PLANTATION(km)	8	703	1.8	15.3	5,958.6
CANAL BUND PLANTATION(ha)	1,037	2,930	7.5	6,713	25,83,280
IRRIGATION CHANNEL PLANTATION (m)	335	6	-	5	2,007
AVENUE PLANTATION(km)	0	703	1.8	0.3	118.8
NURSERY DEVELOPMENT (NUMBER OF UNITS)	476	2,344	15	7,135.1	11,14,982.2
RESTORATION OF WATER BODIES:A.PWD AND UNION TANKS (NO.)	83	800	5	415	66,400
RESTORATION OF WATER BODIES:B. OORANIS (NO.)	0	200	2.0	-	-
RESTORATION OF WATER BODIES:C. PONDS (NO.)	194	200	1.0	388	38,800
ARTIFICIAL RECHARGE STRUCTURE (NO.OF UNITS)	2,522	391	2.5	6,305	9,86,102
WATER COURSE - IRRIGATION CHANNELS - DESILTING (M)	335	3	-	2.5	1,003.5
DRAINAGE LINE TREATMENT (M)	192	5	-	5.8	958.5

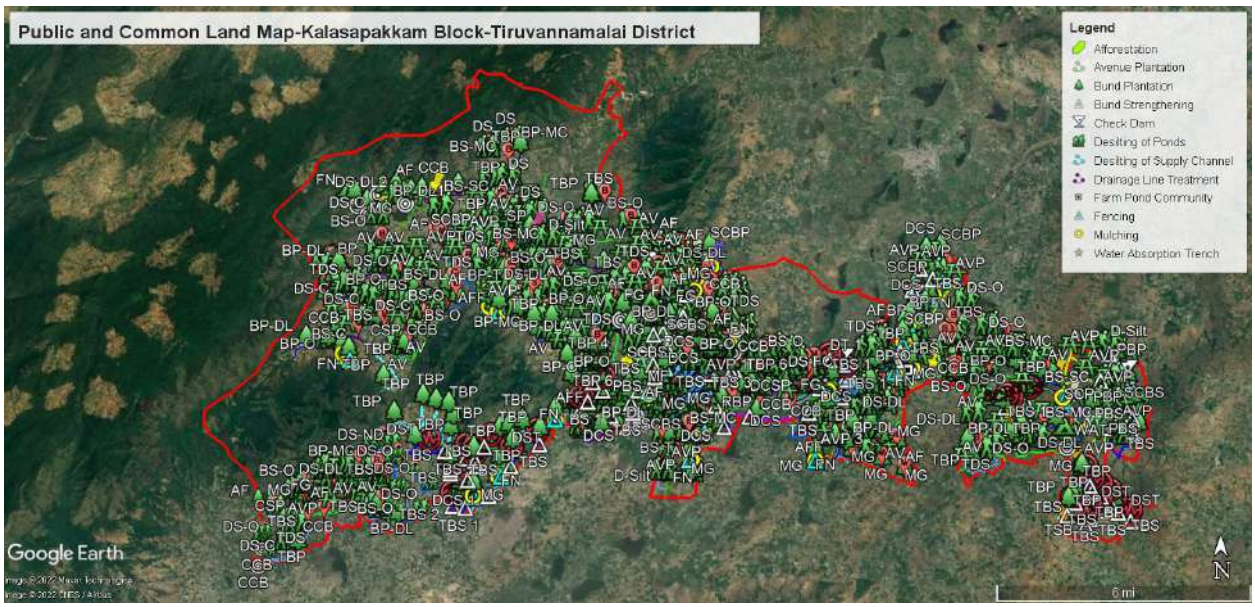


Figure 5.4. Proposed development activities in public and common land

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)	568.1	586	1.5	852.1	3,32,894.88
MICRO IRRIGATION (ha)	0.0	0	1	0	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	484	781	2	968	3,78,004
LAND DEVELOPMENT - INDIVIDUAL (ha)	271.7	3,906	10	2,717.3	10,61,377.38
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	4,163	3,321	8.5	35,385.5	1,38,25,323
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	2,185	23	0.2	327.8	50,255
NADEP VERMI-COMPOST (NUMBER OF UNITS)	2,165	27	0.2	389.7	58,455
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	2,086	2,344	1.5	3,087.3	48,89,584
CATTLE SHELTERS (NUMBER OF UNITS)	2,185	331	2.1	4,632.2	7,23,235
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	767	355	2.3	1,741.1	2,72,285
CATTLE TROUGH (NUMBER OF UNITS)	2,185	6	0.1	109.3	33,110
POULTRY SHED (NUMBER OF UNITS)	1,316	10	0.1	118.4	13,160
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	2,532	926	5	12,660	23,44,632

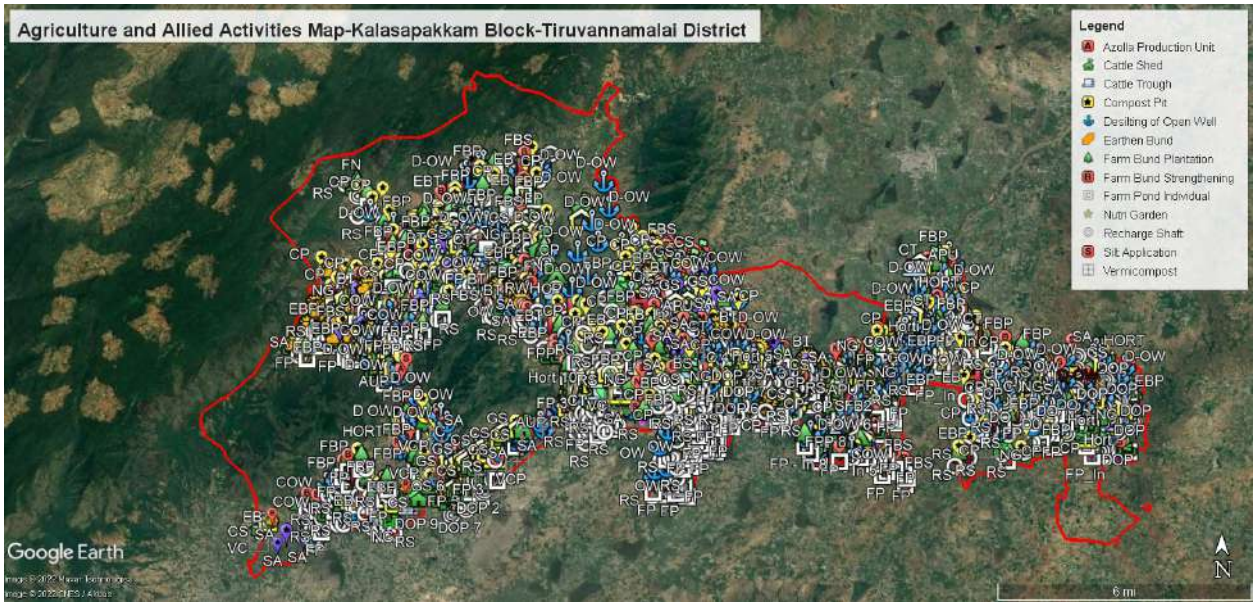


Figure 5.5. Proposed development activities in Agriculture and allied Sectors

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)	485	20	0.1	63.1	9,700
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	2,292	16	0.1	229.2	36,672
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	750	625	4	3,000	468,750

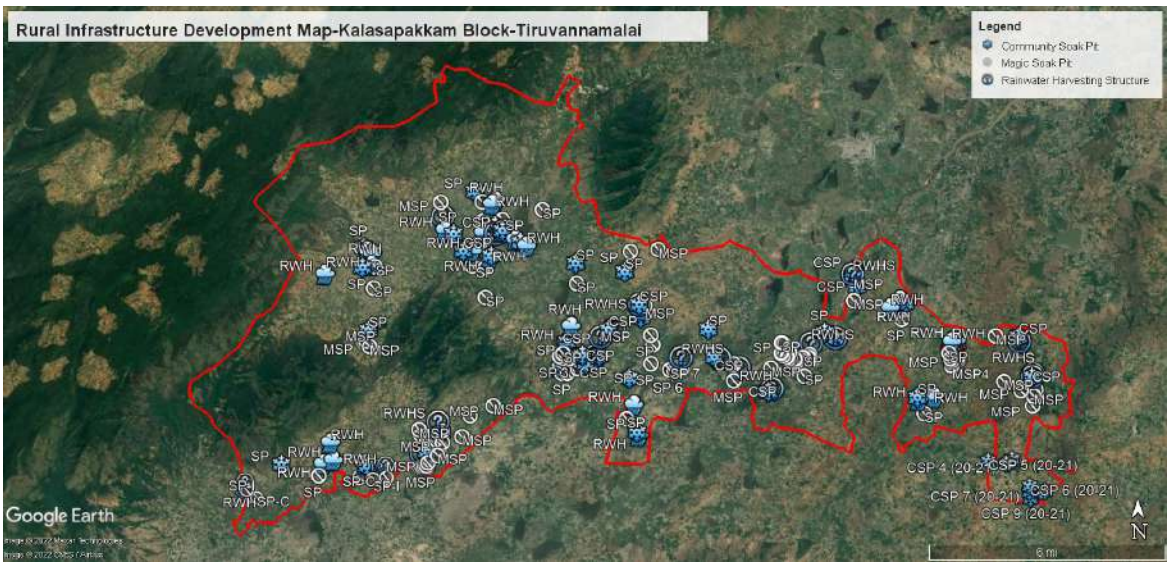


Figure 5.6. Proposed rural infrastructure activities

5.5 PROPOSED 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 (Figure 5.7). As Kalasapakkam Block 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 (Table 15), Micro Irrigation works (Table 16), Silvi-pasture (Table 17), Bamboo Plantation (Table 18) and Mini Forestry (Table 19) are proposed in this Block in saturation mode.

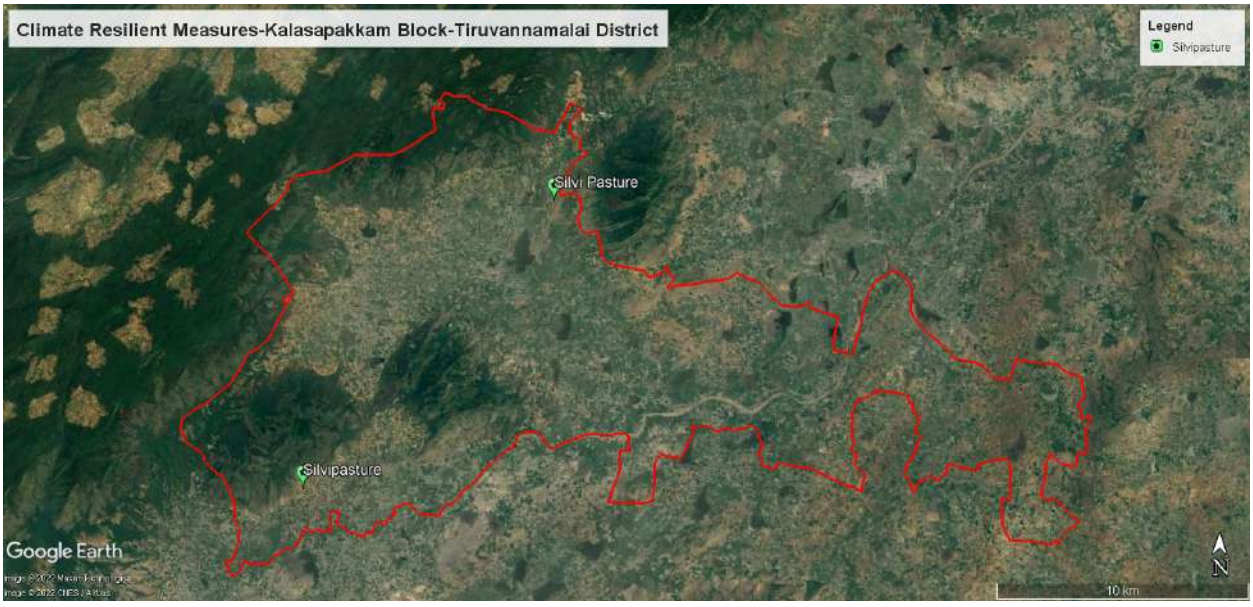


Figure 5.7. Proposed climate resilient measures

TABLE 14. GP WISE PROPOSED CRM

GP	Public and common land	Agriculture and allied activities
Aanaivadi	Micro Irrigation	
Adamangalam	Micro Irrigation	

Adhamangalam		Farm Pond
Alangaramangalam	Micro Irrigation	Farm Pond
Anaivady		Farm Pond
Anniyalai	Micro Irrigation	
Arunagirimangalam	Micro Irrigation	
Devarayanpalayam	Micro Irrigation	Farm Pond
Elathur		Farm Pond
Eranamangalam	Micro Irrigation	
Gengala mahadevi	Micro Irrigation	
Genganallur	Micro Irrigation	
Gengavaram	Micro Irrigation	
Kaalur	Micro Irrigation	
Kadaladi	Micro Irrigation	
Kadalady		Farm Pond
Kalasapakkam		Farm Pond
Kalur		Farm Pond
Kampattu	Micro Irrigation	
Kanthapalayam	Micro Irrigation	Farm Pond
Kappalur	Micro Irrigation	Farm Pond
Kappulur	Silvi pasture	
Ketavarayanpalayam	Micro Irrigation	
Kettavarampalayam		Farm Pond
Kidampalayam	Bamboo plantation	Farm Pond
	Micro Irrigation	
	Mini Forest	
	Silvi pasture	
Kilkuppam		Farm Pond
Kilpalur	Micro Irrigation	Farm Pond
Kilpotharai	Micro Irrigation	
Kizpotharai		Farm Pond
Ladavaram	Micro Irrigation	
Mattavettu	Micro Irrigation	Farm Pond
	Mini Forest	
Melarni	Micro Irrigation	
Melpalur	Micro Irrigation	Farm Pond
Melsolankuppam	Micro Irrigation	
Melsozhakuppam		Farm Pond
Melvilvarayanallur	Micro Irrigation	Farm Pond
Mottur		Farm Pond
Nalanpillaipetral	Micro Irrigation	
Padagam	Micro Irrigation	Farm Pond
Padiyampattu	Micro Irrigation	
Palankoil	Micro Irrigation	Farm Pond
Pannam patu	Micro Irrigation	
Pathiyavadi	Micro Irrigation	
Pathiyavady		Farm Pond

Patiyanthal		Farm Pond
Pillur	Micro Irrigation	Farm Pond
Poondi	Micro Irrigation	Farm Pond
Seenanthal	Micro Irrigation	
Seetampattu		Farm Pond
Seethampattu	Micro Irrigation	
Sengaputheri	Micro Irrigation	
Sholavaram		Farm Pond
Singaravady		Farm Pond
Siruvallur	Micro Irrigation	Farm Pond
Thenagram	Micro Irrigation	
Thenmahadeva mangalam	Micro Irrigation	
Thenpallipattu	Micro Irrigation	Farm Pond
Vadakarai namiyandal	Micro Irrigation	
Vanniyanur	Micro Irrigation	Farm Pond
Veeralur	Micro Irrigation	Farm Pond
Venkatampalayam		Farm Pond
Vinnuvampattu	Micro Irrigation	

TABLE 15. DETAILS OF PROPOSED FARM PONDS ACTIVITIES UNDER CRM

GP	Habitation	No. of Farm pond
Adhamangalam	Adhamangalam	1
Alangaramangalam	Alangaramangalam	1
Anaivady	Anaivady	1
Devarayanpalayam	Devarayanpalayam	4
Elathur	Elathur	1
Kadalady	Kadalady	10
Kalasapakkam	Kalasapakkam	2
Kalur	Kalur	1
Kanthapalayam	Kanthapalayam	3
Kappalur	Kappalur	1
Kettavarampalayam	Kettavarampalayam	1
Kidampalayam	Kidampalayam	1
Kilkuppam	Kilkuppam	1
Kilpalur	Kilpalur	1
Kizpotharai	Kilpotharai	1
Mattavettu	Mattavettu	1
Melpalur	Melpalur	2
Melsozhakuppam	Melsolankuppam	1
Melvilvarayanallur	Melvilvarayanallur	1
Mottur	Mottur	1
padagam	padagam	2
Palankoil	Palankoil	1
Pathiyavady	Pathiyavady	1
Patiyanthal	Pattiyandhal	1
Pillur	Pillur	1
Poondi	Poondi	1

Seetampattu	Seetampattu	1
Sholavaram	Sholavaram	2
Singaravady	Singaravady	1
Siruvallur	Siruvallur	2
Thenpallipattu	Thenpallipattu	1
Vanniyanur	Vanniyanur	1
Veeralur	Veeralur	2
Venkatampalayam	Venkatampalayam	1

TABLE 16. DETAILS OF PROPOSED MICRO IRRIGATION ACTIVITY UNDER CRM

Sl.No	GP	Crops		Irrigation Type		Area(ha)
		Groundnut	Sugarcane	Sprinkler	Drip	
1	**Aanaivadi**	6	1	6	1	4.9
2	**Adamangalam**	1	0	1	0	0.82
3	**Alangaramangalam**	1	0	1	0	0.4
4	**Anniyalai**	2	6	2	6	5.99
5	**Arunagirimangalam**	5	0	5	0	4.18
6	**Devarayanpalayam**	5	0	5	0	4.54
7	**Eranamangalam**	1	0	1	0	0.69
8	**Gengala mahadevi**	2	0	2	0	1.69
9	**Genganallur**	2	0	2	0	2.02
10	**Gengavaram**	21	1	21	1	17.29
11	**Kaalur**	6	0	6	0	5.03
12	**Kadaladi**	8	0	8	0	7.21
13	**kampattu**	1	3	1	3	2.88
14	**Kanthapalayam**	2	0	2	0	0.88
15	**Kappalur**	28	0	28	0	24.14
16	**Ketavarayanpalayam**	14	0	14	0	11.26
17	**Kidampalayam**	18	0	18	0	14
18	**Kilpalur**	5	0	5	0	3.65
19	**Kilpotharai**	3	0	3	0	2.91
20	**Ladavaram**	2	0	2	0	1.16
21	**Mattavettu**	7	0	7	0	5.55
22	**Melarni**	2	0	2	0	1.57
23	**Melpalur**	4	0	4	0	3.13
24	**Melsolankuppam**	15	0	15	0	14.25
25	**Melvilvarayanallur**	2	0	2	0	1.61
26	**Nalanpillaipetral**	2	0	2	0	1.59
27	**Padagam**	0	1	0	1	1.22
28	**Padiyampattu**	3	1	3	1	2.86
29	**Palankoil**	3	0	3	0	2.19
30	**Pannam patu**	2	0	2	0	2.19
31	**Pathiyavadi**	5	0	5	0	4.65
32	**Pillur**	7	0	7	0	4.77
33	**Poondi**	4	0	4	0	2.7
34	**Seenanthal**	5	0	4	1	4.36

35	**Seethampattu**	2	0	2	0	2.12
36	**Sengaputheri**	1	0	1	0	0.63
37	**Siruvallur**	8	0	6	2	6.85
38	**Thenagram**	1	0	1	0	1.4
39	**Thenmahadeva mangalam**	6	0	6	0	6.72
40	**Thenpallipattu**	10	0	10	0	7.54
41	**Vadakarai namiyandal**	1	0	1	0	0.48
42	**Vanniyanur**	7	0	7	0	5.42
43	**Veeralur**	4	0	4	0	3.1
44	**Vinnuvampattu**	1	0	1	0	1.03

TABLE 17. DETAILS OF PROPOSED SILVI-PASTURE ACTIVITY UNDER CRM

Sl.No	GP	Area for Plantation in ha	Total Number of Plants
1	Kappulur	0.66	1,304
2	Kidampalayam	0.875	1,729
Total		**1.535**	**3,033**

TABLE 18. DETAILS OF PROPOSED BAMBOO PLANTATION ACTIVITY UNDER CRM

Sl.No	GP	Area for Plantation in ha	Total Number of Plants	Classification of Land
1	Kidampalayam	0.88	2,188	Mandhaveli
Total		**0.88**	**2,188**	

TABLE 19. DETAILS OF PROPOSED MINI FOREST ACTIVITY UNDER CRM

Sl.No	GP	Area for Plantation in ha	Total No. of Plants (1 ha - 10000 saplings)	Classification of Land
1	Kidampalayam	6.79	67,900	Malai
2	Mattavettu	14.14	1,41,400	Unresolved Barren

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	3,858.17 ha (16.61 %) of the total area treated under WASCA
2	Percentage reduction of run off	2	1,319.19 ha.m (24.9 %) of the total runoff harvested due to WASCA interventions
3	No. of waterbodies restored	3	225 waterbodies (tanks/pond and ooranis) restored
4	Area under afforestation	4	527.14 ha area under afforestation
5	Area under silvi-pasture development	5	279.81 ha under Silvi-pasture plantation
6	Length of drainage line treated	6	7,410 m length of drainage line treated
7	Canal Bund Plantation	7	46,032 number of plants through 1,037 works
8	Nursery development	8	476 units

3,858.17 ha AREA TREATED

1,319.19 ha.m TOTAL RUNOFF HARVESTED

225 WATER BODIES RESTORED

527.14 ha AREA AFFORESTATION

279.81 ha SILVI-PASTURE PLANTATION

7,410 m DRAINAGE LINE TREATED

46,032 PLANTS

476 UNITS NURSERY DEVELOPMENT

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	484 farm ponds established which target the harvest of 8,51,840 cu.m litre of water which has the potential to irrigate 169.4 ha area
2	Improvement in soil health	2,165 NADEP vermi compost units for soil health improvement
3	Farm bunding with boundary trenches	568.08 m in 568 works
4	Dry land development with agro-forestry	4,163 ha under dry land horticulture
5	Households established fodder plots	3,999 vulnerable households established fodder plots

484 FARM PONDS

2,165 COMPOST UNITS

3,999 FODDER PLOTS

4,163 ha DRY LAND DEVELOPMENT WITH AGRO-FORESTRY

6.3 OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

	INDICATOR	OUTCOMES/ IMPACT
1	No. of villages having liquid waste management systems	2,292 individual and 485 community level soak pits established for recycle of grey water benefiting 34,066 HHs
2	Roof rain water harvesting measures	750 common roof rainwater harvesting and storage structures with a target to harvest and store 0.09 ha.m of rainwater for use
3	Nutri-garden	34,066 HHs established nutri-gardens in homesteads and planted 1,70,330 saplings

485 COMMON & **2,292** INDIVIDUAL SOAK PITS

750 COMMON ROOF RAINWATER HARVESTING

34,066 NUTRI-GARDENS

1,70,330 SAPLINGS

6.4 OUTCOMES OF CLIMATE RESILIENCE MEASURES

OUTCOMES OF CLIMATE RESILIENCE MEASURES

	INDICATOR	OUTCOMES/ IMPACT
1	Vulnerable GPs are identified for key water actions	All GPs (62) are vulnerable for drought, heatwaves vulnerability
2	Climate resilient measures are identified for climate risks	5 models are identified via., Farm ponds, Silvi pasture, Bamboo Plantation, Micro Irrigation and Mini Forest 54 farm ponds in 62 GPs 1.53 ha under silvi-pasture with 3,033 plants 0.88 ha under bamboo plantation with 2,188 plants 203.57 ha under Micro irrigation activity 20.93 ha under mini forest activity with 2,09,300 plants

54
FARM PONDS

1.53 ha
SILVI PASTURE

20.93 ha
MINI FOREST

203.57 ha
MICRO IRRIGATION ACTIVITY

Estimated person days

The total estimated person days required for the above propose activities are 3,51,56,344 as specified below Figure 6.1,.

Estimated Cost

The total estimated cost budgeted for the above propose activities is Rs 1,02,348 Lakhs as specified below Figure 6.2.

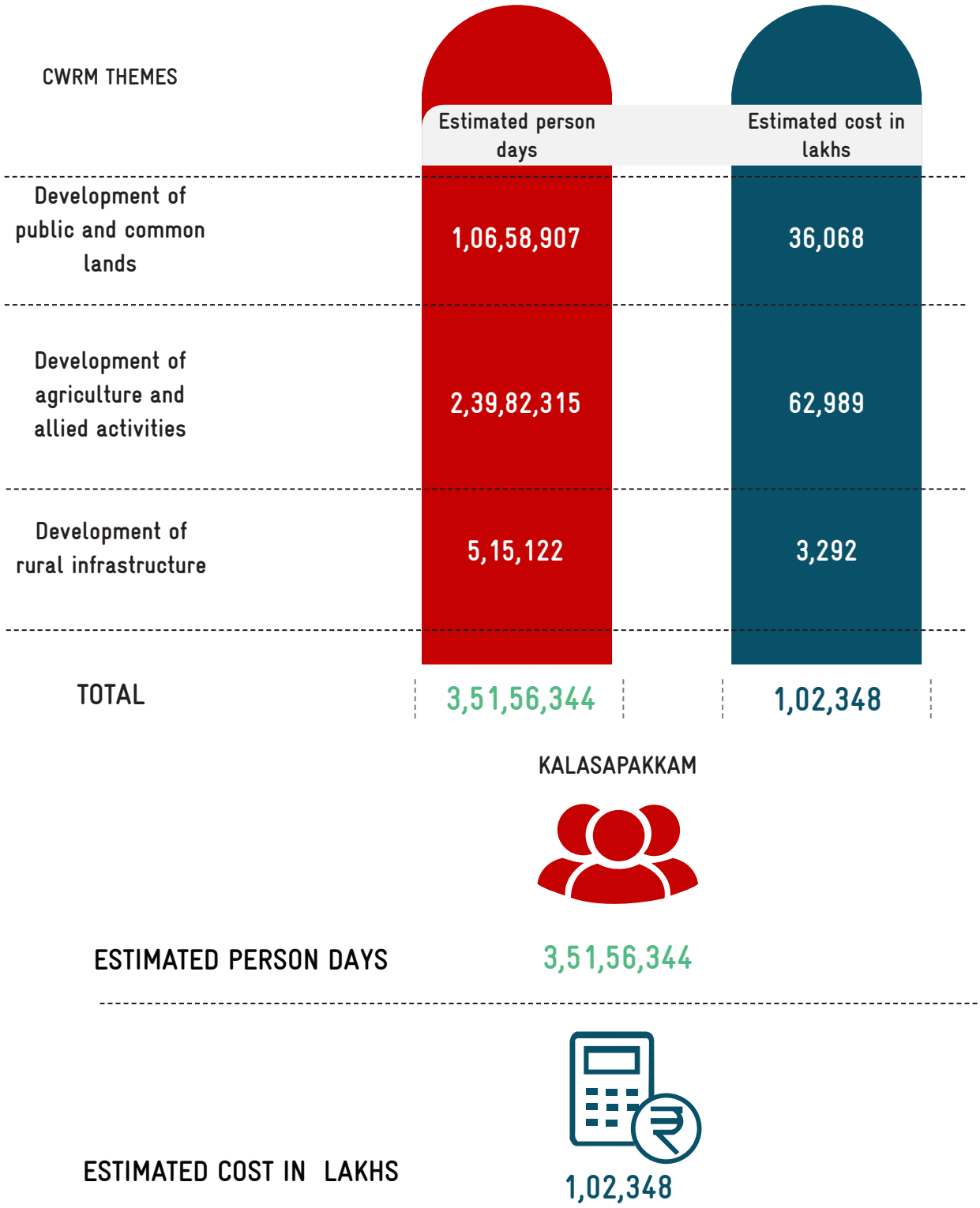


Figure 6.1 & 6.2. Estimated person days & cost for all water actions

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 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.

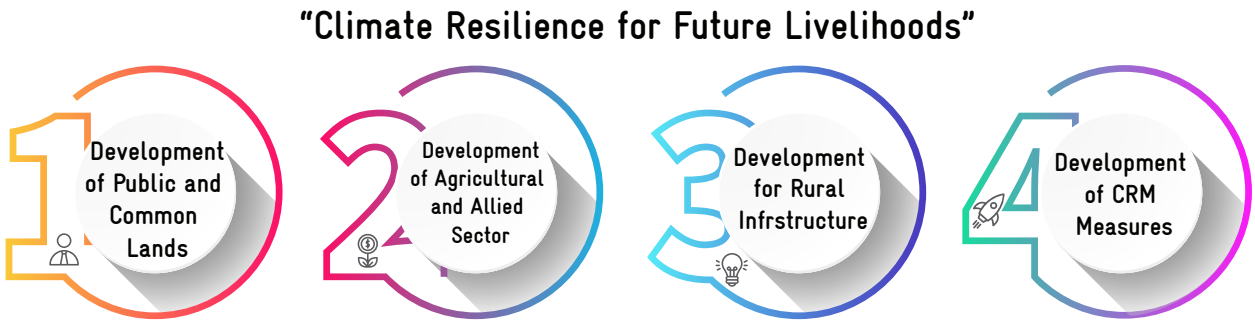
Internationally, the recent process on NDC Enhancement (2020) significantly acknowledge the climate change vulnerability on national sectors including agriculture, energy, and urban areas, especially through impacts on water resources. The role that water and water-related activities play in national 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.

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 20)

TABLE 20. 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 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 21 to 23.

TABLE 21. WATER ACTIONS ON DEVELOPMENT OF PUBLIC & COMMON LANDS & ITS LINKED SDG

Name of the work	No. of CWRM works	Climate Vulnerability Index Impacting (WASCA TN)	Linked SDG Goal
Contour Continuous Bunds for Afforestation area (m)	555	W3	SDG 1,2, 6,13&15
Composting (No. of units)	229	W1	SDG1& 6
Afforestation in Public/common lands (ha)	527	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community) (ha)	515	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	280	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (km)	8	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation (ha)	1,037	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	335	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (km)	0	C1,C2,C3,W3,S2	SDG 1, 6&13

Nursery Development (No. of units)	476	C1,S2,S4	SDG 1,2 &6
Restoration of waterbodies :PWD and Tanks (No.)	83	S2, S1	SDG 6, 1, 13
Restoration of water bodies : Ooranis (No.)	0	S2, S1	SDG 6, 1, 13
Restoration of waterbodies :Ponds (No.)	194	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	2,522	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	335	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (m)	192	W1,W3,W4	SDG1 & 6

TABLE 22. WATER ACTIONS ON DEVELOPMENT OF AGRICULTURAL AND ALLIED SECTOR & ITS LINKED SDG

Name of the Work	No. of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	568	A1,A3,W1,W3	SDG 1,2&6
Micro Irrigation(ha)	0	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	484	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	272	W1,W5,A1,A3,S2,S4	SDG 2, 6&15
Dry land Horticulture/Agro-forestry - Individual (ha)	4,163	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	2,185	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (No. of units)	2,165	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	2,086	A3, S4	SDG 1& 2, 15
Cattle shelters (No. of units)	2,185	S4	SDG 1& 2
Goat/sheep shelters (No. of units)	767	S4	SDG 1& 2
Cattle trough(No. of units)	2,185	W5,S4	SDG 1& 2
Poultry Shed (No. of units)	1,316	S2,S4	SDG 1& 2
Construction of new open wells & Recharge Shafts (No. of units)	2,532	S3,W5,W1	SDG 1,2 & 6

TABLE 23. 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)	485	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	2,292	W3,S2	SDG 1& 6
Roof Rain Water Harvesting (No. of units)	750	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

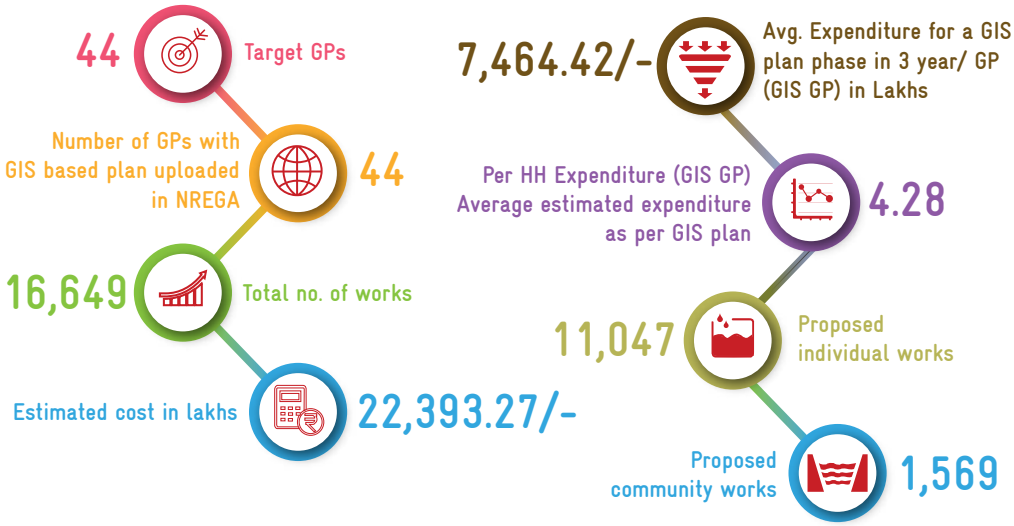
7 IMPLEMENTATION OF GP PLANS

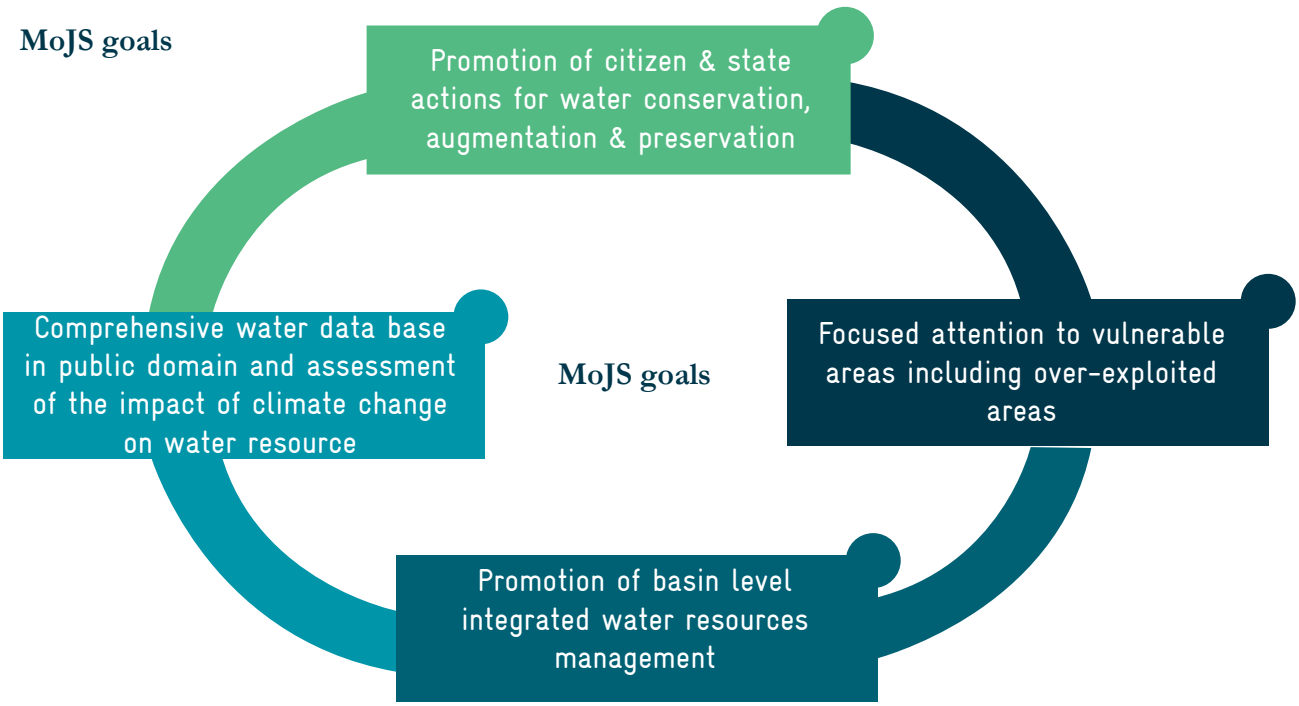
Execution of GP plans includes integrating all verified, approved works in MORD's web enabled application NREGA Soft (https://nrega.nic.in) for mainstreaming WASCA. The target GPs are identified first, the status of GIS based plans and total works along with its expenditure and category wise estimation 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 activities into Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of Kalasapakkam Bock is listed in Table 24 and the details of 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 24. GIS PLAN IMPLEMENTATION- KEY PARAMETERS PERFORMANCE IN KALASAPAKKAM BLOCK





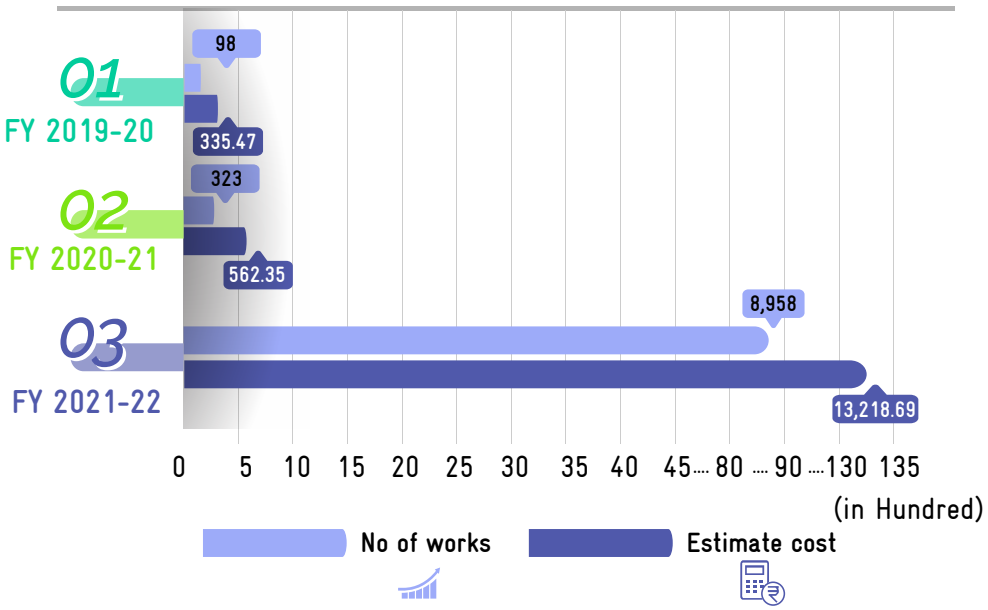


Figure 7.1. Work progress in last three years

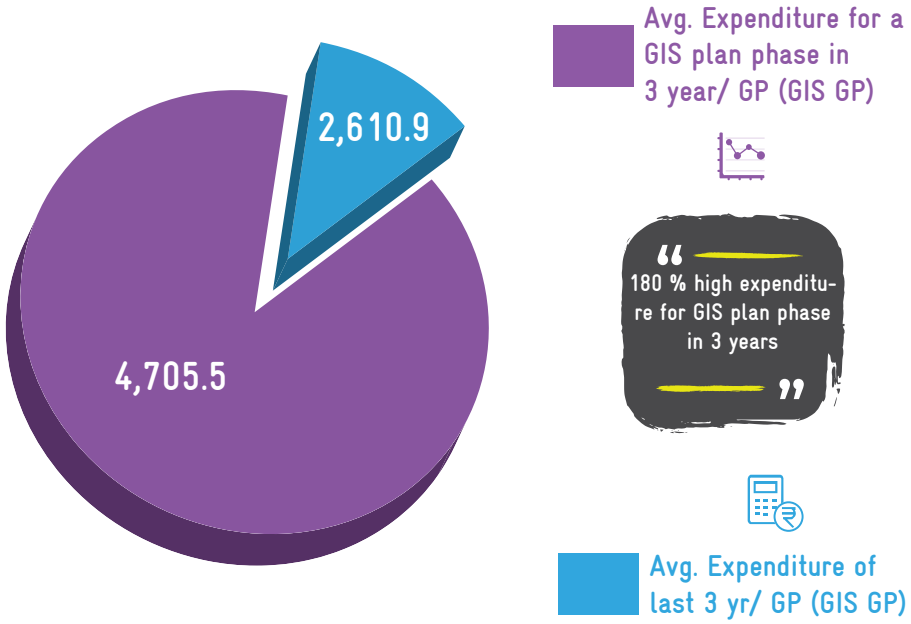
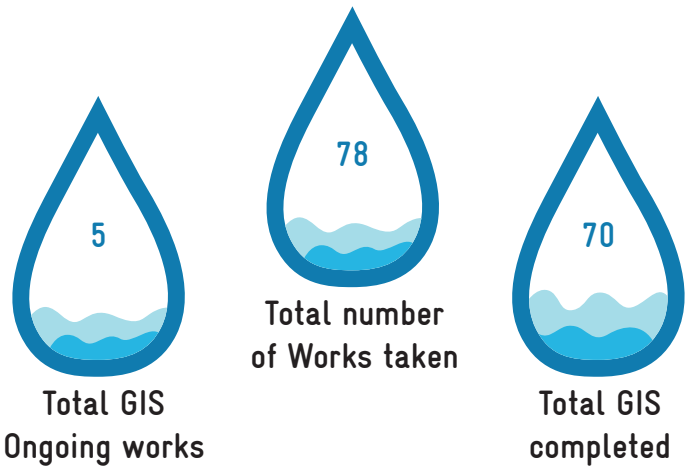


Figure 7.2. Average Expenditure for GIS plan in last 3 years



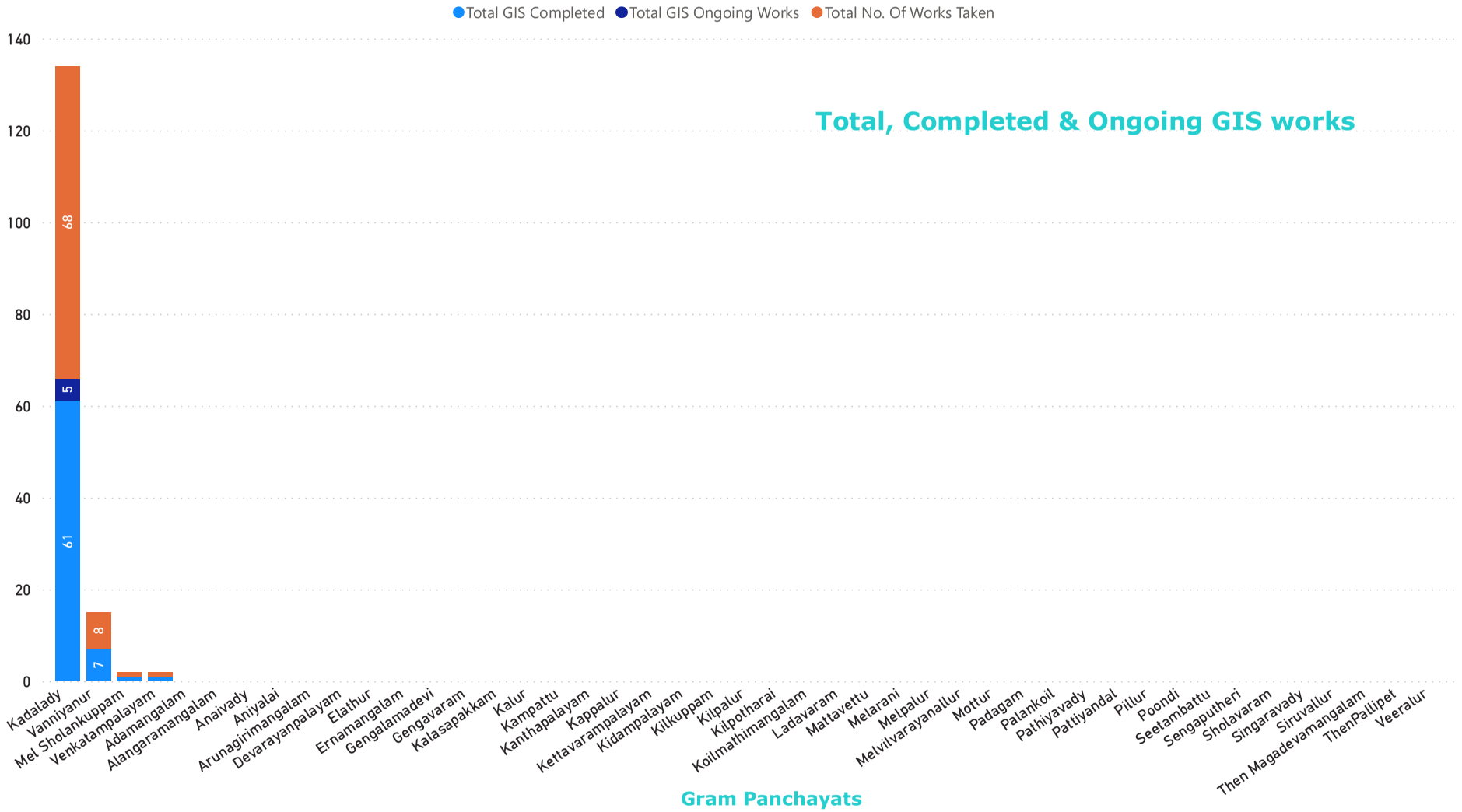
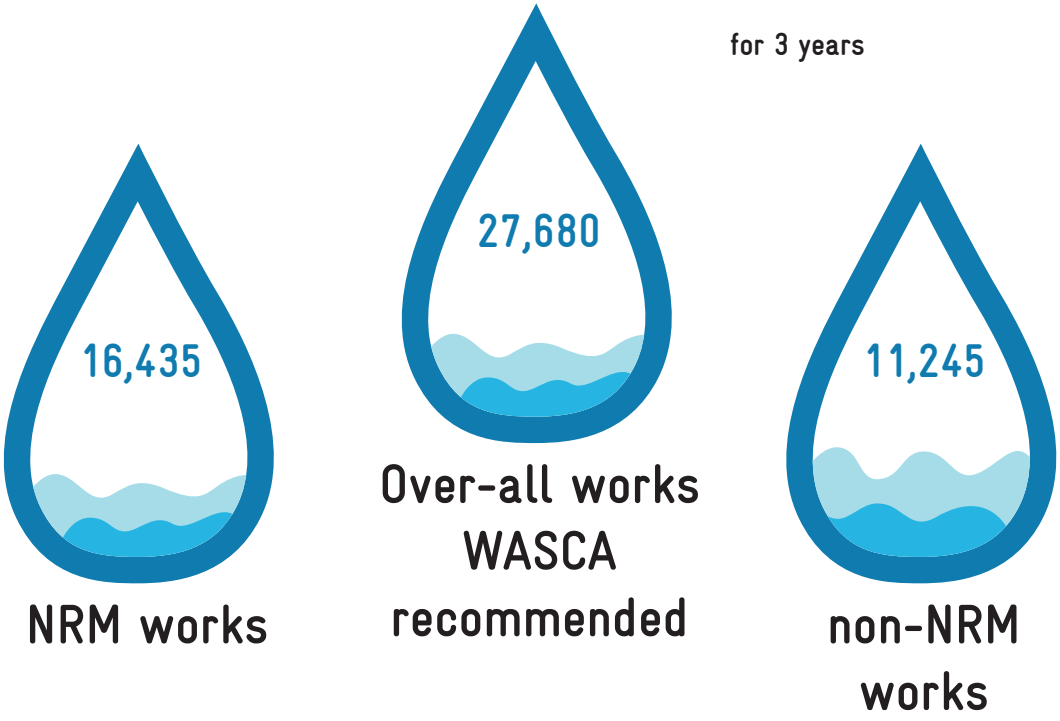


Figure 7.3. GP wise total, completed and ongoing GIS works

7.2 WASCA RECOMMENDED NRM AND NON-NRM WORKS

WASCA recommended 27,680 works for a period of 3 years, out of which 16,435 are NRM works and 11,245 are non NRM works (Figure 7.4). A total of 8,541 works has been uploaded so far for the financial year 2021-22 as on 04/02/2022.



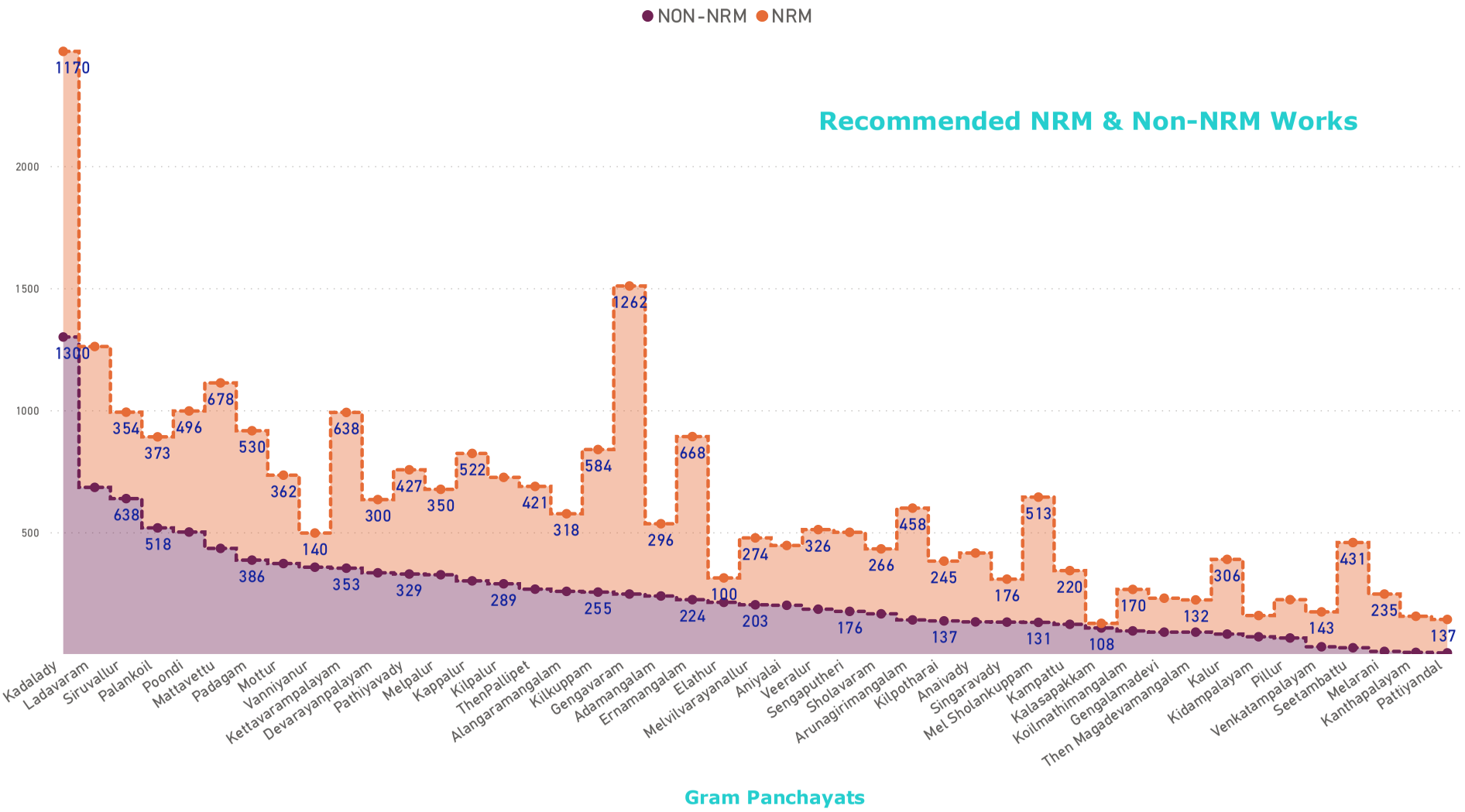


Figure 7.4. GP wise recommended NRM and non-NRM works

7.3 ONGOING WORKS

The ongoing works in Kalasapakkam Block includes Drought Proofing, Rural Connectivity, Rural Sanitation, WCWH and Works on Individuals Land (Category IV). A total of 170 works are ongoing in the Block, in which Works on Individual Land are more (75.9) followed by WCWH (18.2 %) while rural infrastructure works are less in number (< 5 %) (Figure 7.5), GP and work category wise ongoing works are tabulated in Annexure 7.2.

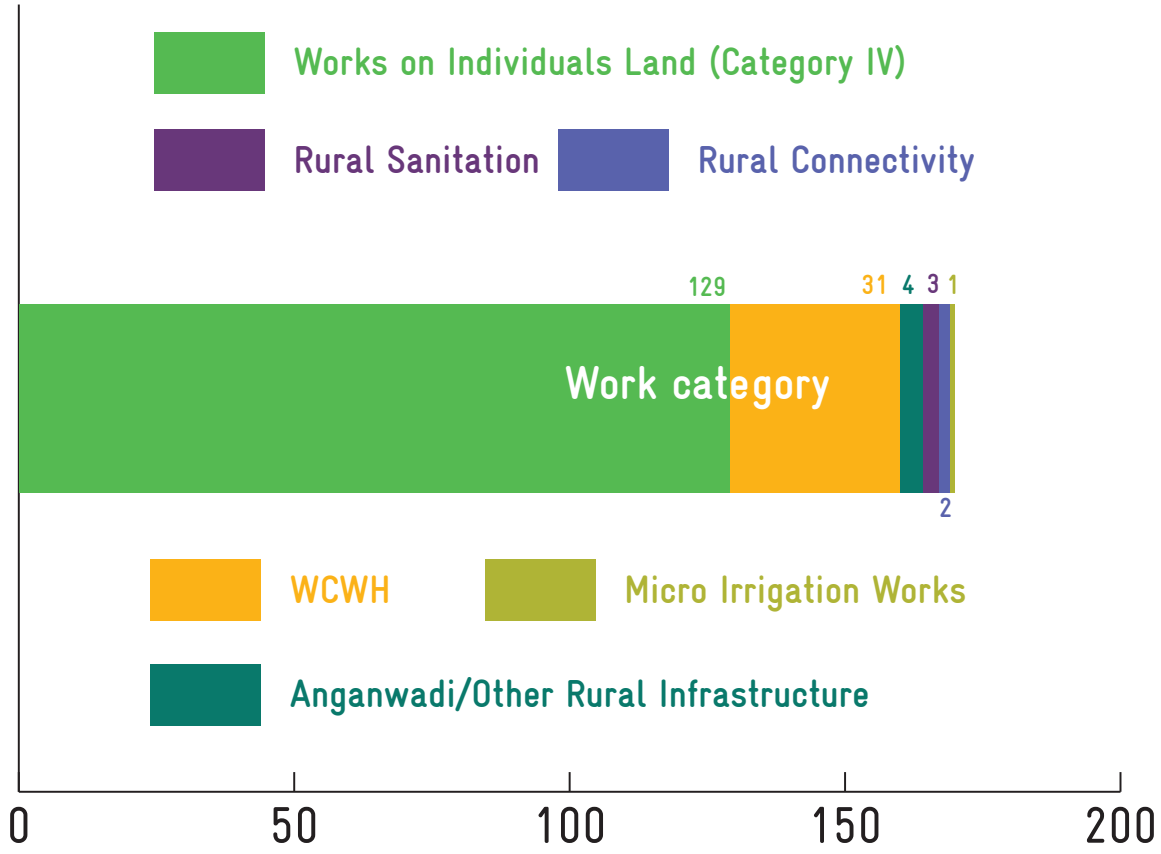


Figure 7.5. Category-wise ongoing works in Kalasapakkam Block

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 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 Kalasapakkam Block is shown in Figure 7.6. The expenditure is high for renovational of traditional and other bodies water bodies followed by watershed development and water conservation and rain water harvesting.

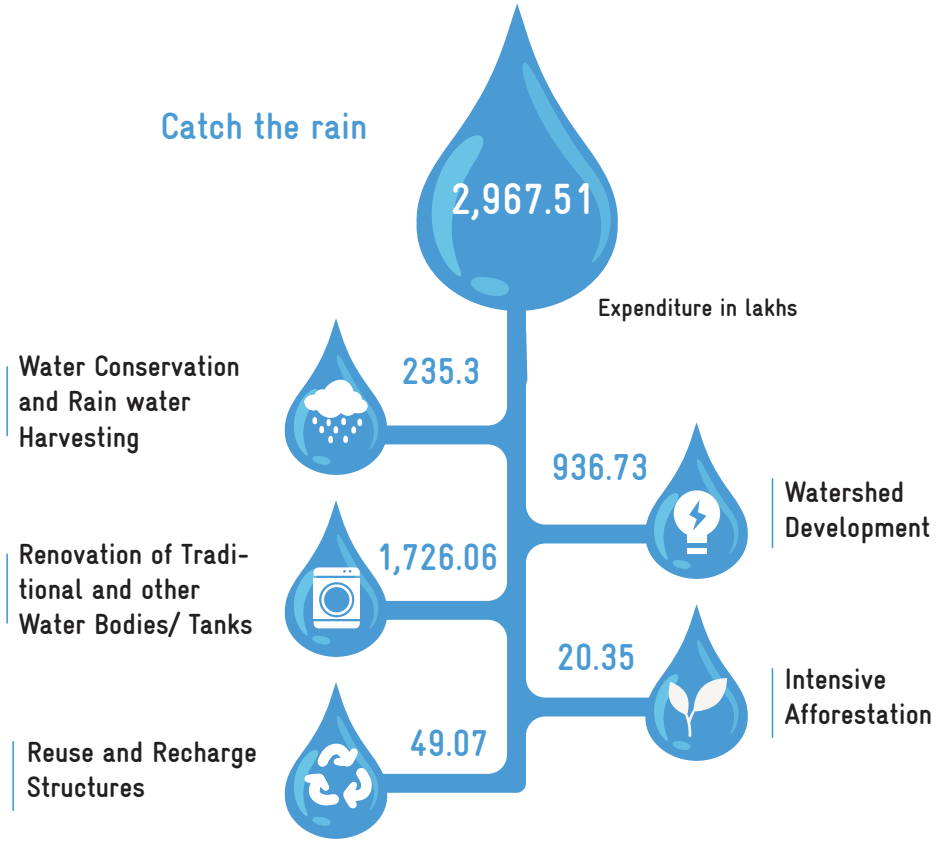
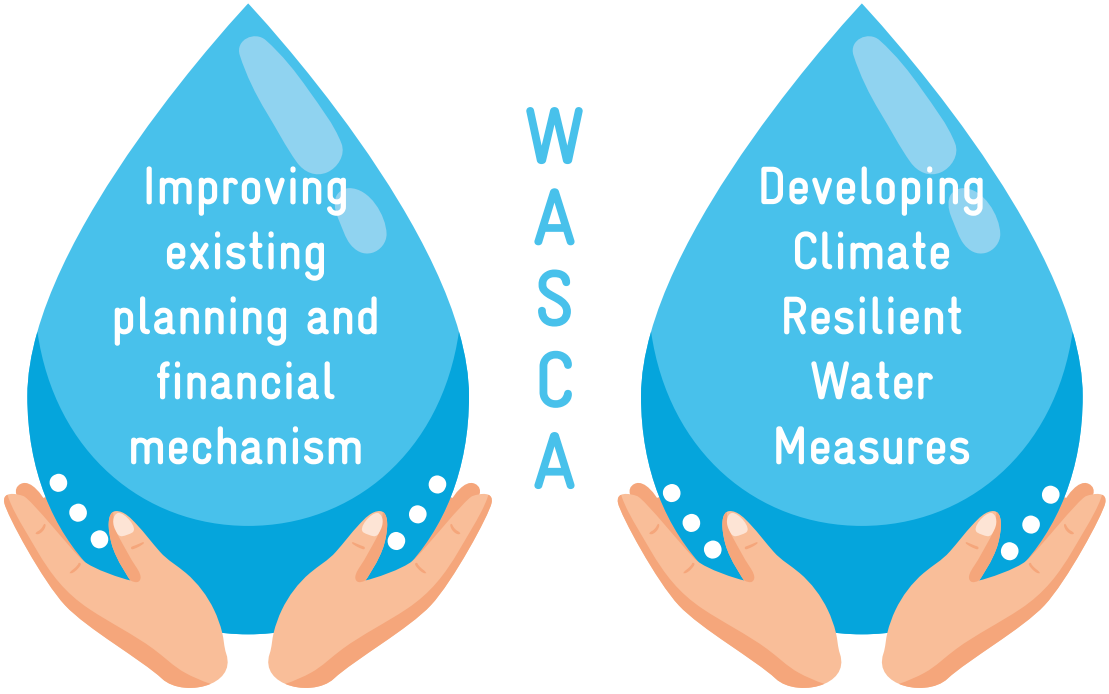


Figure 7.6. Catch the rain campaign in Kalasapakkam Block



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 OF KALASAPAKKAM BLOCK

Cheyyar River and Tondi Veraha macro-watersheds covers Kalasapakkam Block with 83 micro watersheds(Figure 8.1). There are 80 micro-watersheds under Cheyyar River watershed (4C2A4) covering an area of 41183.58 ha. There are 3 micro-watersheds under Tondi Veraha watershed (4C1D3) covering an area of 2246.80 ha (Table 25). Out of 45 GPs in the Block, 43 GPs fall under Cheyyar River (4C2A4) watershed and two GPs have watershed boundaries passing through Cheyyar River and Tondi Veraha. (Table 26 & Figure 8.2). 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.

TABLE 25. GENERAL DESCRIPTION OF MACRO-WATERSHEDS COVERING KALASAPAKKAM BLOCK

Macro-watershed	Area in ha	No. of micro-watersheds
Cheyyar River	41,183.58	80
Tondi Veraha	2,246.80	3

TABLE 26. NO. OF GPs COVERED UNDER WATERSHEDS IN KALASAPAKKAM BLOCK

Name of watershed	No. of GPs
Cheyyar River	43
Cheyyar River & Tondi Veraha	2

Understanding the Block area with respect to its nature of terrain aids in treating the area with appropriate measures at the right place and also ensures efficient management of the watershed (micro or macro). Ridge-based Block area is mapped (zoning) by referring to the spatial thematic datasets and showcased with macro-watershed (Table 27 & Figure 8.3) and GPs boundaries (Table 28 & Figure 8.4). Based on ridge range types such as high, middle, lower and inter variations of the Block area is distinguished into 4 kinds of ridge zones.

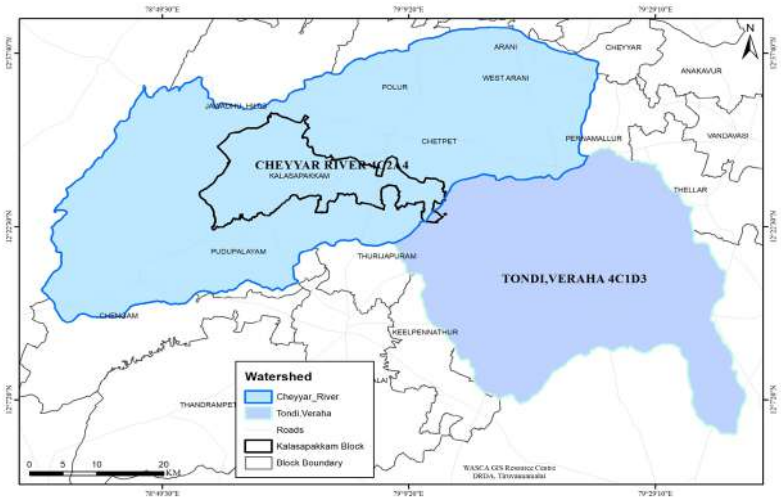


Figure 8.1. Macro-watershed Map of Kalasapakkam Block

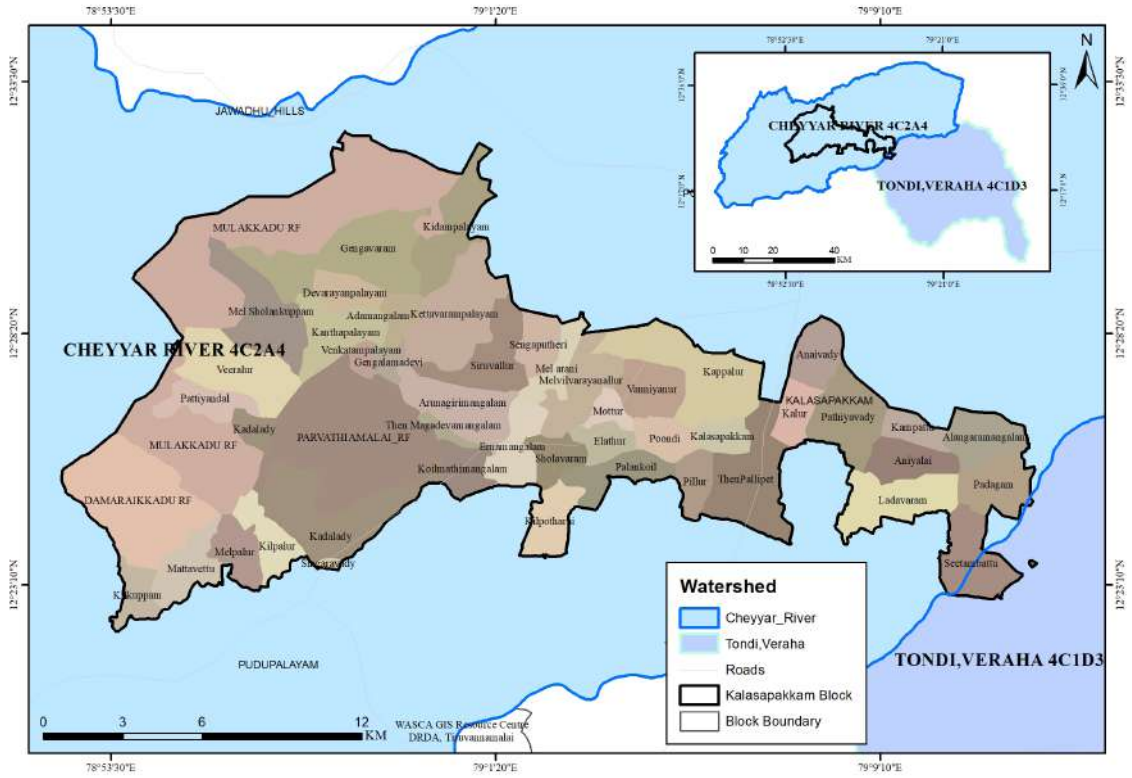


Figure 8.2. Macro-watershed with GPs map

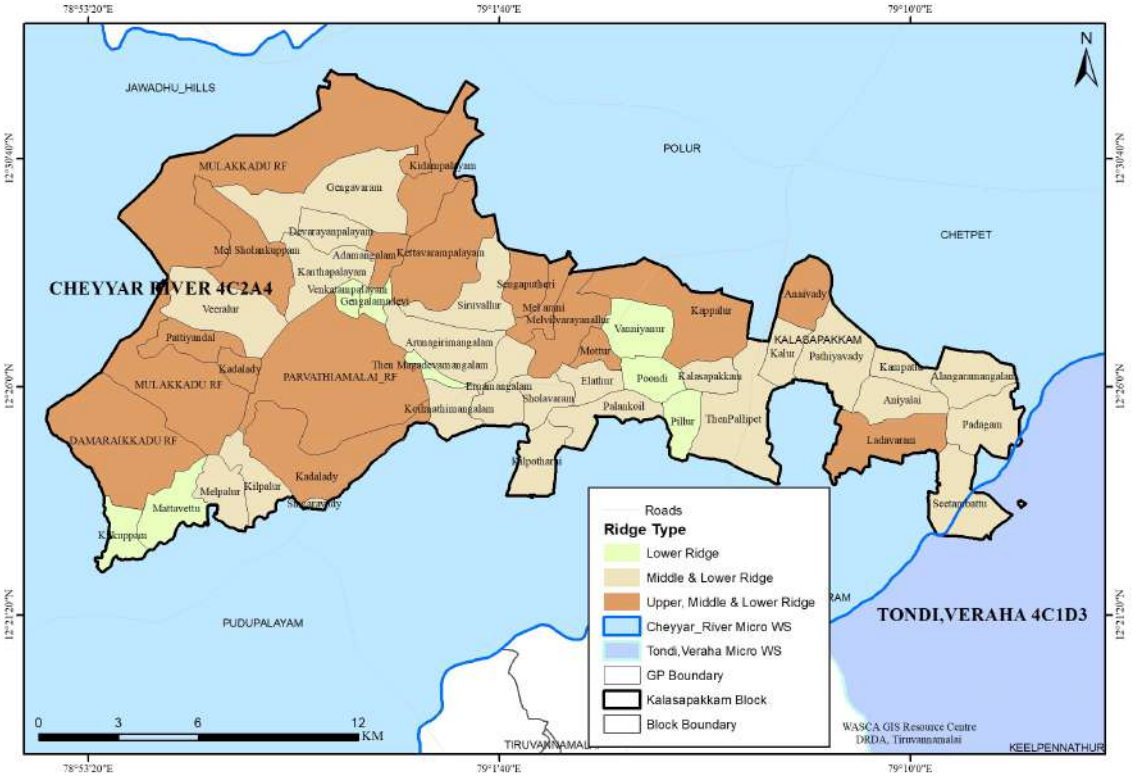


Figure 8.3. Macro-watershed Ridge Map

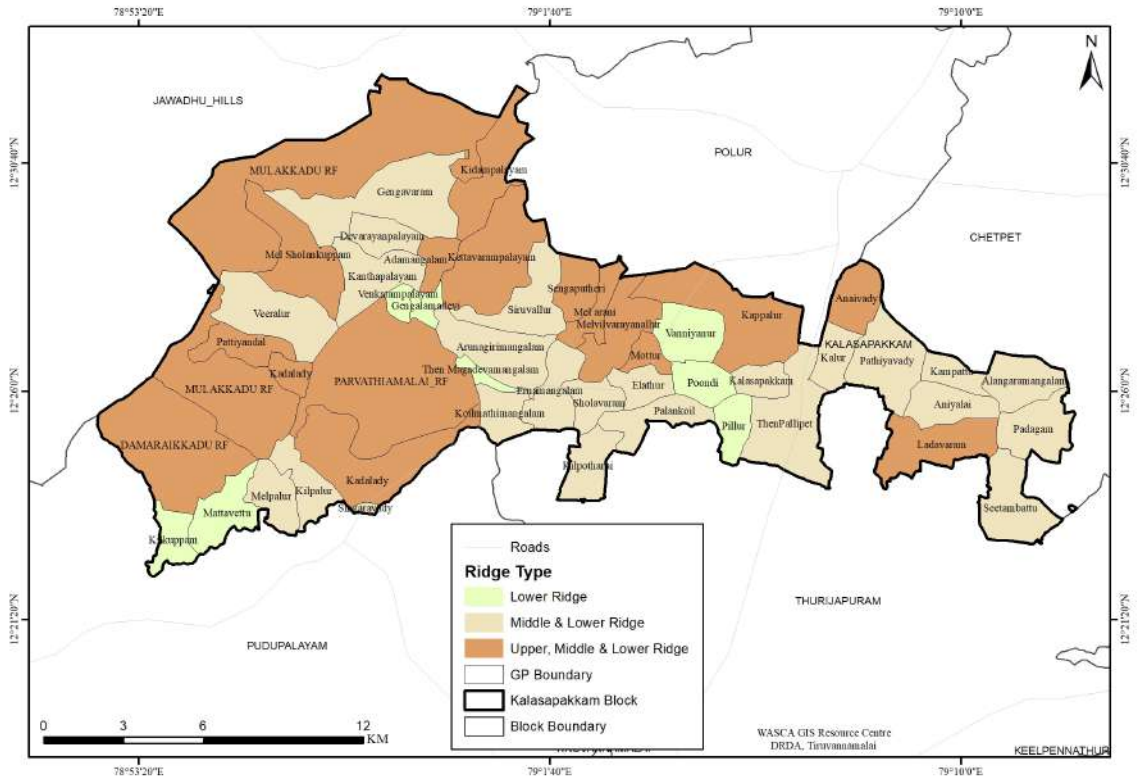


Figure 8.4. GP level Ridge Map

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 Kalasapakkam Block are listed in Tables 30 to 41.

TABLE 27. MICRO-WATERSHED IN KALASAPAKKAM BLOCK FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C2A4e13c	493.75	Upper, Middle & Lower
2	4C2A4e12c	467.56	
3	4C2A4e13b	396.2	
4	4C2A4e11c	430.83	
5	4C2A4e11b	980.78	
6	4C2A4e13a	271.72	
7	4C2A4e12a	634.37	
8	4C2A4e04a	629.45	
9	4C2A4e03c	258.76	
10	4C2A4e12b	482.73	
11	4C2A4e11a	874.53	
12	4C2A4e03b	351.08	
13	4C2A4e08b	305.47	
14	4C2A4e08c	494.92	
15	4C2A4e01a	771.24	
16	4C2A4e01c	276.05	

17	4C2A4e02b	677.49	
18	4C2A4d05c	399.96	
19	4C2A4e08a	248.39	
20	4C2A4e02a	431.34	
21	4C2A4e10a	494.79	
22	4C2A4d03b	577.1	
23	4C2A4d03c	602.38	
24	4C2A4c02a	1080.84	
25	4C2A4e06b	269.87	
26	4C2A4e06c	482.37	
27	4C2A4e09a	426.54	
28	4C2A4e07a	690.03	
29	4C2A4d03a	976.45	
30	4C2A4e09c	435.95	
31	4C2A4e09d	469.43	
32	4C2A4e05c	347.52	Upper, Middle & Lower
33	4C2A4e09b	665.64	
34	4C2A4f11b	455.82	
35	4C2A4f11a	643.08	
36	4C2A4f07a	401.96	
37	4C2A4f07b	281.75	
38	4C2A4f07d	523.28	
39	4C2A4f07c	544.45	
40	4C2A4b20c	643.88	
41	4C2A4f01b	382.63	
42	4C2A4f02a	391.93	
43	4C2A4f02b	604.93	
44	4C2A4f03c	634.24	
45	4C2A4f08a	728.79	
46	4C2A4c07b	462.2	
47	4C2A4f08c	474.56	
48	4C2A4f08b	531.57	
49	4C2A4c01a	644.56	
50	4C2A4e02c	563.08	
51	4C2A4e05b	555.14	
52	4C2A4e06a	370.08	
53	4C2A4b20b	735.83	
54	4C2A4c06c	313.39	Middle & Lower
55	4C2A4c02b	517.21	
56	4C2A4f01a	576.37	
57	4C2A4c04a	797.79	
58	4C2A4c07a	359.74	
59	4C2A4c02d	551.93	
60	4C2A4f03b	438.53	
61	4C2A4e01b	604.08	Lower Ridge
62	4C2A4e03a	337.78	

63	4C2A4e07b	469.84	Lower Ridge
64	4C2A4c06b	577.67	
65	4C2A4e07c	467.53	
66	4C2A4d02a	540.45	
67	4C2A4f11c	531.75	
68	4C2A4e05a	138.29	
69	4C2A4d02b	424.99	
70	4C2A4c02c	430.54	
71	4C2A4c03b	474.71	
72	4C2A4c03a	489.78	
73	4C2A4c03c	447.09	
74	4C2A4c04b	602.42	
75	4C2A4c04c	648.25	
76	4C2A4c08b	518.93	
77	4C2A4c07c	516.44	
78	4C2A4f04a	597.76	
79	4C2A4f03a	401.88	
80	4C2A4f05b	439.14	

TABLE 28. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED IN KALASAPAKKAM BLOCK

Sl.No	Name of the GP	Ridge Type
1	Sengaputheri	Upper, Middle & Lower
2	Melvilvarayanallur	
3	Anaivady	
4	Mel Sholankuppam	
5	Kadalady	
6	Kappalur	
7	Pattiyandal	
8	Adamangalam	
9	Kettavarampalayam	
10	Mel Arani	
11	Kidampalayam	
12	Mottur	
13	Ladavaram	
14	Kampattu	Middle & Lower
15	Siruvallur	
16	Kalasapakkam	
17	Koilmathimangalam	
18	Arunagirimangalam	
19	Devarayanpalayam	
20	Kalur	
21	Ernamangalam	
22	Elathur	
23	Melpalur	
24	Gengavaram	

25	Singaravady	Middle & Lower
26	Kanthapalayam	
27	Kilpalur	
28	Veeralur	
29	Palankoil	
30	Sholavaram	
31	Alangaramangalam	
32	Pathiyavady	
33	ThenPallipet	
34	Aniyalai	
35	Kilpotharai	
36	Then Magadevamangalam	Lower
37	Venkatampalayam	
38	Gengalamadevi	
39	Vanniyanur	
40	Poondi	
41	Pillur	
42	Mattavettu	
43	Kilkuppam	

TABLE 29. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED IN KALASAPAKKAM BLOCK

Ridge falling under Cheyyar river macro-watershed in Kalasapakkam Block			
Sl.No	**Proposed Work**	**Ridge Type**	**Extent**
1	Afforestation in Public/common lands 9 ha)	Upper	527
2	Drainage Line Treatment (m)		21,352
3	CC Check dams (No.)	Middle	46
4	Block Plantation (Community) (ha)		512
5	Silvi-pasture Development (ha)		293
6	Avenue plantation (m)		1,80,509
7	Mini Forest (ha)		4
8	Composting (No.)	Lower	216
9	Canal Bund Plantation (m)		5,284
10	Restoration of water bodies: Tanks and Ooranis (No.)		25
11	Artificial Recharge Structure (No.)		2,398
12	Farm Bunding with Boundary Trenches - Individual (ha)		535
13	Construction of Farm Ponds - Individual (No.)		497
14	Land development - Individual (ha)		240
15	Azolla units - Individual (No.)		207
16	NADEP Vermi compost (No.)		2,174
17	Cattle Shelters (No.)		2,007
18	Goat Sheep Shelters (No.)		674
19	Cattle Trough (No.)		2,106
20	Construction of new open wells & Recharge Shafts (No.)		2,431
21	Soak Pits (Community) (No.)		200

22	Soak Pits (Individual) (No.)	Lower	2,027
23	Roof Rain Water Harvesting (No.)		64
24	Nutri Garden (No.)		381
25	Silt application (No.)		157

TABLE 30. MICRO-WATERSHED IN KALASAPAKKAM BLOCK FALLING UNDER TONDI VERAHA MACRO-WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C1D3g06b	685.59	Middle & Lower
2	4C1D3g11c	630.27	Lower
3	4C1D3g06c	930.94	

TABLE 31. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER ONGUR MACRO-WATERSHED IN THELLAR BLOCK

Sl. No	Name of the GPs	Ridge Type
1	Padagam	Middle & Lower
2	Seetambattu	

TABLE 32. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER & TONDI VERAHA MACRO-WATERSHED IN KALASAPAKKAM BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	CC Check dams (No.)	Middle	1
2	Block Plantation (Community) (ha)		1.8
3	Avenue plantation (m)		5,420
4	Composting (No.)	Lower	13
5	Artificial Recharge Structure (No.)		124
6	Farm Bunding with Boundary Trenches - Individual (ha)		15
7	Construction of Farm Ponds - Individual (No.)		14
8	Land development - Individual (ha)		15
9	Azolla units - Individual (No.)		79
10	NADEP Vermi compost (No.)		79
11	Cattle Shelters (No.)		79
12	Goat Sheep Shelters (No.)		68
13	Cattle Trough (No.)		79
14	Construction of new open wells & Recharge Shafts (No.)		124
15	Soak Pits (Community) (No.)		20
16	Soak Pits (Individual) (No.)		79
17	Roof Rain Water Harvesting (No.)		4
18	Silt application (No.)		6

8.2 MODEL MICRO-WATERSHED- VEERALUR

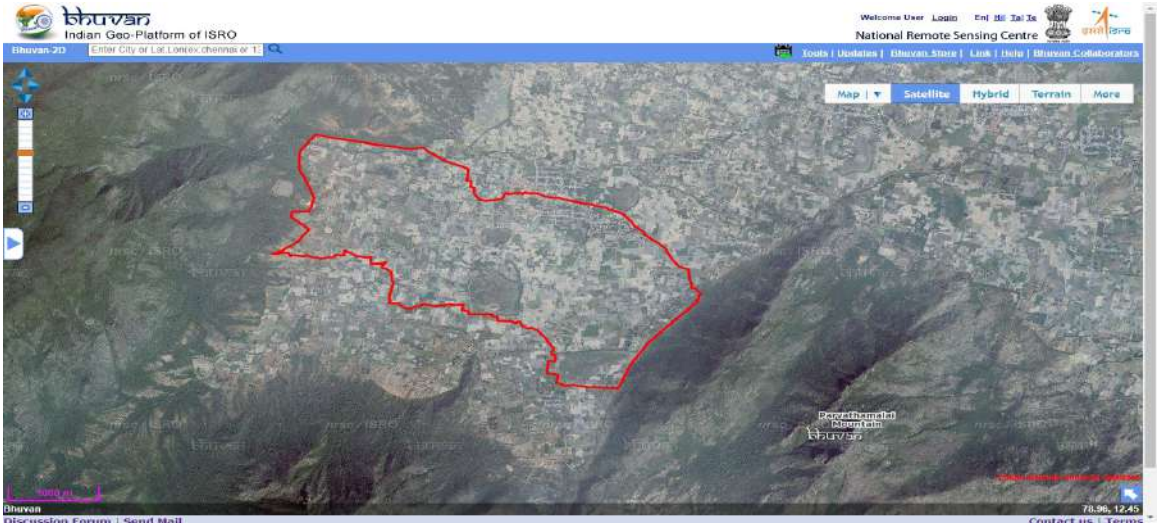


Figure 8.5. Satellite image of Thirakoil micro-watershed

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.

VEERALUR MICRO-WATERSHED

Veeralur micro-watershed covers Veeralur and Mel Sholankuppam GPs in Kalasapakkam Block (Figure 8.5 & 8.6). This micro-watershed is a part of Cheyyar River macro-watershed in Cheyyar sub-basin. The general information, geology, hydrogeology, natural drainage line, catchment area, ground water status, water budget of Veeralur micro-watershed is given below in separate sections followed by proposed works ridge wise proposed treatment area, estimated cost and required person days and key outcomes (Table 33 to 44). Figure 8.7 and 8.8 show the proposed NRM, Non NRM activities for community and individual in Veeralur micro-watershed. The key CWRM parameters for the GPs falling in this micro-watershed is Annexed 8.

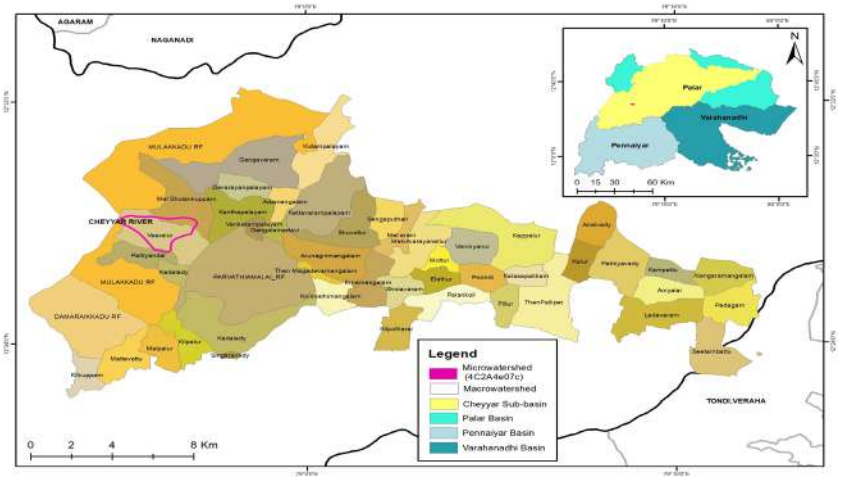


Figure 8.6. Veeralur micro-watershed with GPs

TABLE 33. GENERAL INFORMATION OF THE MICRO-WATERSHED

Description	Name/ Number/ Quantity/ Status
Name of the Micro-watershed	**Veeralur**
Micro-watershed Number	**4C2A4e07c**
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	1. Veeralur
	2. Mel Sholankuppam
Latitude of Micro-watershed (From To)	12°27'4.33"N to 12°28'9.82"N
Longitude of Micro-watershed (From To)	78°54'54.50"E to 78°56'52.08"E
Total area of the Micro-watershed in ha	468
% Micro-watershed area in Veeralur GP	87
% Micro-watershed area in Mel Sholankuppam GP	13
Area of Micro-watershed falling in Veeralur GP (ha)	406
Area of Micro-watershed falling in Mel Sholankuppam GP (ha)	62
Total Population of Veeralur GP	4,812
Total Population of Mel Sholankuppam GP	5,738
Annual Average Rainfall (mm)	1047
Annual maximum Temperature °C	33
Annual Minimum Temperature °C	22.8
Evapo-Transpiration Losses of Veeralur GP (ha.m)	52.5
Evapo-Transpiration Losses of Mel Sholankuppam GP (ha.m)	30.77
Volumetric soil moisture availability (%)	23
Climate Risk	Drought and heat waves
CVI Index Value for Veeralur GP (Based on WASCA Climate study)	0.599
CVI Index Value for Mel Sholankuppam GP (Based on WASCA Climate study)	0.576
Agro-Climatic Zone	North eastern zone (TN-1)
Agro Ecological Sub-Region (ICAR)	Eastern Ghats
Status of Ground water in Veeralur GP	Over Exploited
Status of Ground water in Mel Sholankuppamr GP	Over Exploited

TABLE 34. GEOLOGY, HYDROGEOLOGY OTHER CHARACTERISTICS IN 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 m)	20 to 40
Barren & waste lands	10 ha Scrub Land (middle & lower ridge)

TABLE 35. NATURAL DRAINAGE LINES IN VEERALUR MICRO-WATERSHED

No. of 1st Order drains	2
Total length of natural drainage line (m)	4,350
Drainage density (ha.m)	9.29

TABLE 36. MICRO-WATERSHED'S CATCHMENT AREA

Catchment Area Profile (Strange methodology- CGWB)		
Catchment Area in ha	**Veeralur GP**	**Mel Sholankuppam GP**
Good catchment area	114.57	167.29
Average catchment area	0	0
Bad catchment area	1081.34	606.21

TABLE 37. GROUND WATER STATUS OF MICRO-WATERSHED

Firka Assessment Unit for Veeralur and Mel Sholankuppam GP in ha.m	
Name of the Firka (Assessment Unit) falling under Micro -watershed	Kettavarampalayam
Net Annual Ground Water Availability	2,796.1
Existing Gross Ground Water Draft for Irrigation	3,003.9
Existing Gross Ground Water Draft for domestic and industrial water supply	98.56
Existing Gross Ground Water Draft for All uses	3,102.46
Provision for domestic and industrial requirement supply to 2025	112.03
Net Ground Water Availability for future irrigation development	-319.83

TABLE 38. GP WISE WATER BUDGET OF MICRO-WATERSHED- VEERALUR & MEL SHOLANKUPPAM

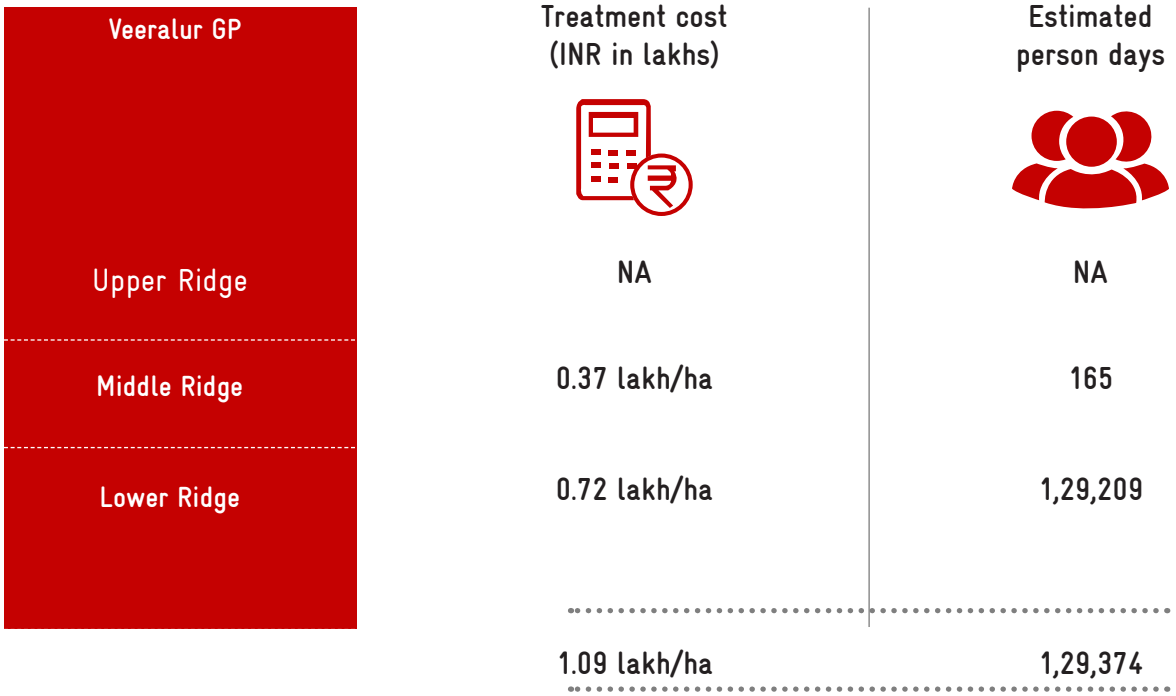
Water Budget in ha.m	Veeralur GP	Mel Sholankuppam GP
Water for Human	13.17	15.71
Water for Agriculture	1,022.5	1,138.4
Water for Animal	3.93	4.54
Village wise water required	1,039.6	1,158.7
Available run-off from rain water (derived from Strange method)	256.4	176.1
Harvested Runoff from Water Harvesting Activities	2.5	0.1
Potential Harvesting from proposed Interventions	50.8	18.8
Total Water harvested	53.3	18.9
Water demand and Supply Difference	-986.4	-1,139.8
Water Demand Supply Gap Status	Deficient	Deficient
Per capita Water Availability (in cum)	532.83	306.9
International Standard per capita water Availability (in cum)	1,700	1,700
Water Availability Gap	-1,167.17	-1,393.1
Water security status	Water Stress	Water Stress

TABLE 39. GP WISE PROPOSED MICRO-WATERSHED WORKS – VEERALUR AND MEL SHOLANKUPPAM

Ridge type	Veeralur GP	Mel Sholankuppam GP
Upper	0	0
Middle	11	0
Lower	340	158
Total	**351**	**158**

TABLE 40. RIDGE WISE TREATMENT AREA, ESTIMATED COST AND PERSON DAYS REQUIRED - VEERALUR AND MEL SHOLANKUPPAM

	Thirakoil GP	Kilputhur GP
Upper Ridge		
Estimated cost for Upper Ridge area (INR in Lakhs)	No Upper Ridge falling in the GP	No Upper Ridge falling in the GP
Total area in ha of Upper Ridge		
Treatment cost of Upper Ridge Lakhs per ha		
Estimated Persondays generated for Treatment of Upper Ridge		
Middle Ridge		
Estimated cost for Middle Ridge area (INR in Lakhs)	1.87	No Middle Ridge falling in the GP
Total area in ha of Middle Ridge	5	
Treatment cost of Middle Ridge (Lakhs per ha)	**0.37**	
Estimated Person days generated for Treatment of Middle Ridge	**165**	
Lower Ridge		
Estimated cost for Lower Ridge area (INR in Lakhs)	289.27	159.48
Total area in ha of Lower Ridge	401	62
Treatment cost of Lower Ridge (INR in Lakhs per ha)	**0.72**	**2.57**
Estimated Person days generated for Treatment of Lower Ridge	**1,29,209**	**85,438**

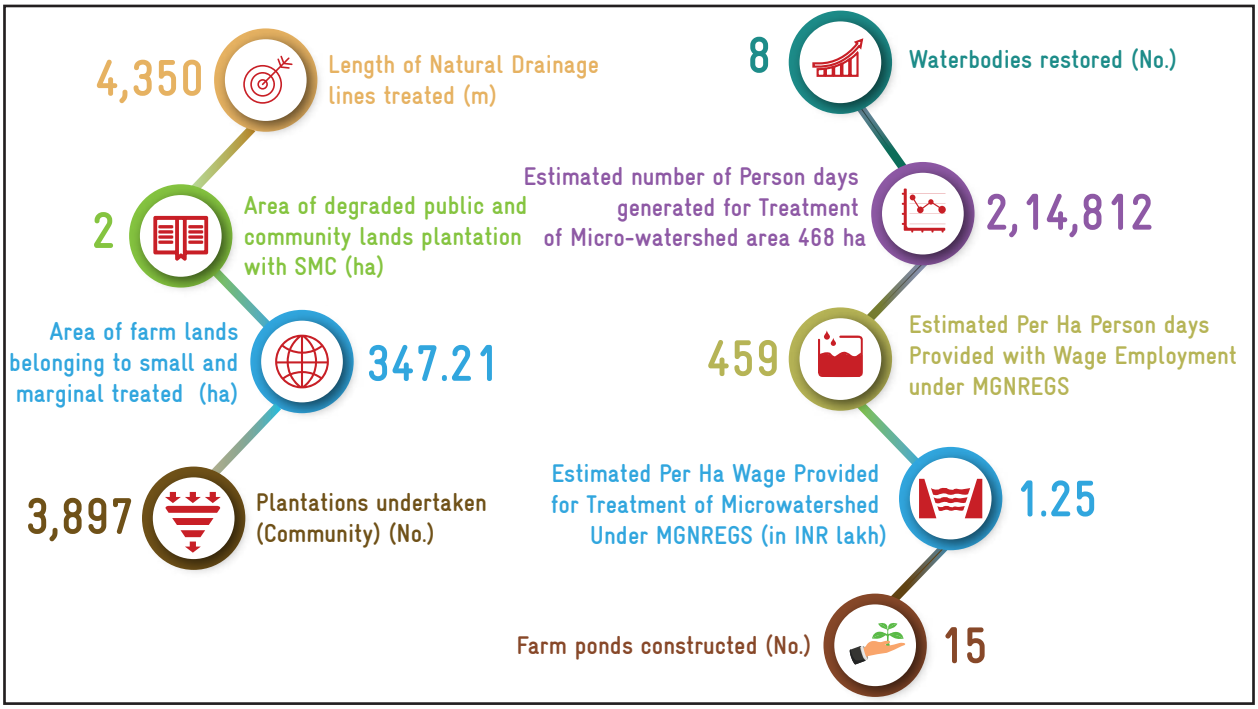


Kilputhur GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	NA	NA
Lower Ridge	2.57 lakh/ha	85,438
	2.57 lakh/ha	85,438

TABLE 41. NATURE AND NO. OF WORKS IN MICRO-WATERSHED

Description	Number
Total No. of works in Micro-watershed area (Arable, Non arable & DLT)	196
Total No. of works in Micro-watershed including livelihood Activities	85
Total No. of works in Micro-watershed including Rural Greywater Management Activities	238

TABLE 42. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)

Veeralur GP	82.5 lakh
Sholankuppam GP	68.61 lakh

TABLE 43. ESTIMATES OF MICRO-WATERSHED IN VEERALUR GP

Proposed Work	Ridge Type	Status of Work	Quantity (Area or No.)	No. of works as per KML	Estimate cost (INR in Lakhs)	Person days
NRM works in Public and Community Lands						
Compost Pit (No.)	Middle	Not commenced	11	11	1.87	165
Loose boulder check dam (No.)	Lower		5	5	4.25	210
Tank bund Plantation (No.)			4	4	7.2	2,812
Block Plantation (ha)			2	1	22.2	8,640
Avenue plantation (km)		Commenced	3.8	2	6.84	2,671
Restoration of Traditional water bodies: (Pond) (No.)			3	3	3	600
Restoration of Traditional water bodies: (Union Tank) (No.)			4	4	50	32,000
Sunken Pit in 1st order drain (No.)		Ongoing	4	4	6.16	1,532
Sub total				**34**	**101.52**	**48,630**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Artificial Recharge Structure for borewell farmers (No.)	Lower	Not commenced	12	12	30	4,692
Farm Bunding with Boundary Trenches - Individual (ha & No.)			15			
			7	7	10.5	4,102
Dryland Horticulture (ha & No.)			3			
			2	2	17	6,642
Silt application (No.)			2	2		
Fodder development - Individual (No.)			19	19	28.12	44,536
Azolla Production units - Individual (No.)		Commenced	19	19	2.85	437
NADEP Vermi compost (No.)			19	19	3.42	513
Construction of Farm Ponds - Individual		Ongoing	10	10	20	7,810
Sub total				**90**	**111.89**	**68,732**
Total				**124**	**213.41**	**1,17,362**
Livelihood enhancement activities for Individual Farmers (dryland)						
Cattle Shelters (No.)	Lower	Commenced	19	19	40.28	6,289
Goat Sheep Shelters (No.)			10	10	22.7	3,550
Cattle Trough (No.)		Not commenced	19	19	0.95	114
Sub total				**48**	**63.93**	**9,953**

Rural Greywater and Rooftop Rainwater Management						
Rainwater Harvesting Structure (No.)	Lower	Not commenced	1	1	4	625
Nutri Garden (No.)			89	89	0.9	10
Soak Pits (Individual) (No.)		Ongoing	89	89	8.9	1,424
Sub total				**179**	**13.8**	**2,059**
Total				**351**	**291.14**	**1,29,374**

TOTAL ESTIMATES OF MICRO-WATERSHED IN VEERALUR GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Veeralur GP	351	291.14	1,29,374

TABLE 44. ESTIMATES OF MICRO-WATERSHED IN MEL SHOLANKUPPAM GP

Proposed Work	Ridge Type	Status of Work	Quantity (Area or No.)	No. of works as per KML	Estimate cost (INR in Lakhs)	Person days
NRM works in Public and Community Lands						
Avenue plantation (km)	Lower	Commenced	0.374	1	0.6732	263
Restoration of Traditional water bodies: (Union Tank) (No.)			1	1	20	16,000
Tank bund Plantation (No.)		Not commenced	1	1	1.8	703
Compost Pit (No.)			2	2	0.34	30
Sub total				**5**	**22.81**	**16,996**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Artificial Recharge Structure for borewell farmers (No.)	Lower	Not commenced	8	8	20	3,128
Farm Bunding with Boundary Trenches - Individual (ha & No.)			4			
			2	2	3	1,172
Dryland Horticulture (ha & No.)			3			
			2	2	17	6,642
Silt application (No.)			2	2		
Fodder development - Individual (No.)			16	16	28.12	44,536
Azolla Production units - Individual (No.)		Commenced	16	16	2.4	368
NADEP Vermi compost (No.)			16	16	2.88	432

Construction of Farm Ponds - Individual (No.)	Lower	Ongoing	5	5	10	3,905
Sub total				**67**	**83.4**	**60,183**
Total				**72**	**106.21**	**77,179**
Livelihood enhancement activities for Individual Farmers (dryland)						
Cattle Shelters (No.)	Lower	Commenced	16	16	33.92	5,296
Goat Sheep Shelters (No.)			5	5	11.35	1,775
Cattle Trough (No.)		Not commenced	16	16	0.8	96
Sub total				**37**	**46.07**	**7,167**
Rural Greywater and Roof rainwater Management						
Rainwater Harvesting Structure (No.)	Lower	Not commenced	1	1	4	625
Nutri Garden (No.)			29	29	0.3	3
Soak Pits (Individual) (No.)		Commenced	29	29	2.9	464
Sub total				**59**	**7.2**	**1,092**
Total				**168**	**159.48**	**85,438**

TOTAL ESTIMATES OF MICRO-WATERSHED IN MEL SHOLANKUPPAM GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Mel Sholankuppam GP	168	159.48	85,438

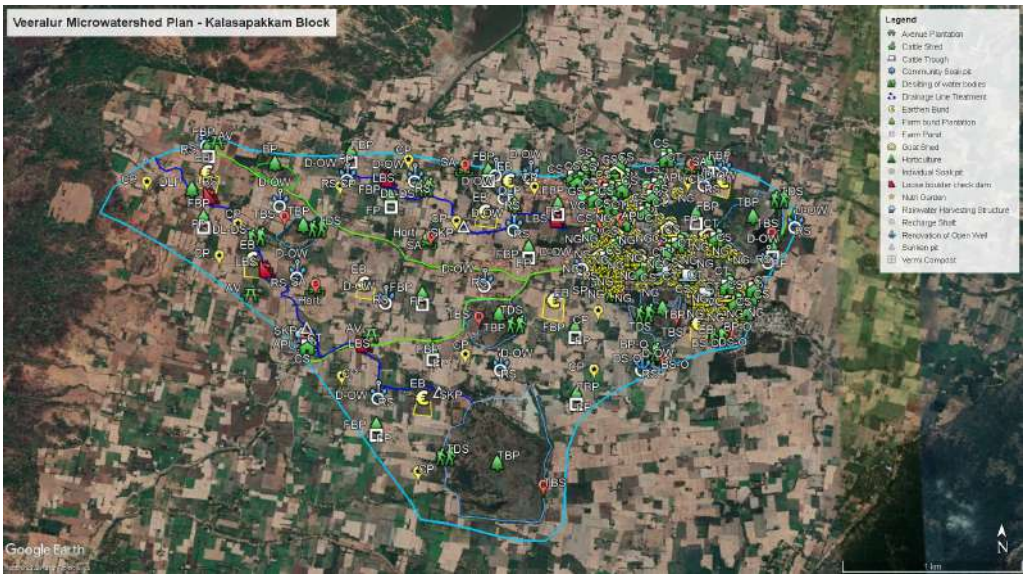
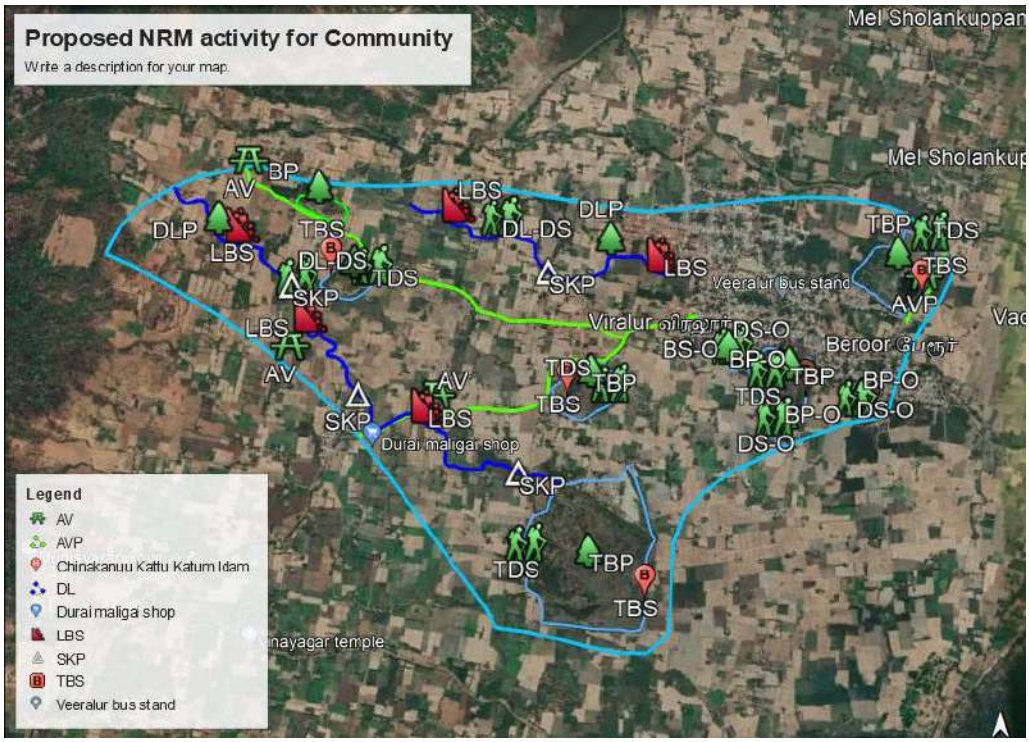


Figure 8.7. Proposed activities in Veeralur micro-watershed


Proposed NRM activity for Community
Write a description for your map.
Mel Sholankuppar
Mel Sholankup
Veeralur bus stand
Viralur விரலூர்
Beroor பேரூர்
Durai maligai shop
nayagar temple
Legend
AV
AVP
Chinakanuu Kattu Katum Idam
DL
Durai maligai shop
LBS
SKP
TBS
Veeralur bus stand


Proposed Non-NRM activity for Community
Write a description for your map.
Mel Sholankuppar
Mel Sholankup
RWH
Veeralur bus stand
Viralur விரலூர்
Beroor பேரூர்
SP
Durai maligai shop
nayagar temple
Legend
Chinakanuu Kattu Katum Idam
Durai maligai shop
RWH
SP
Veeralur bus stand

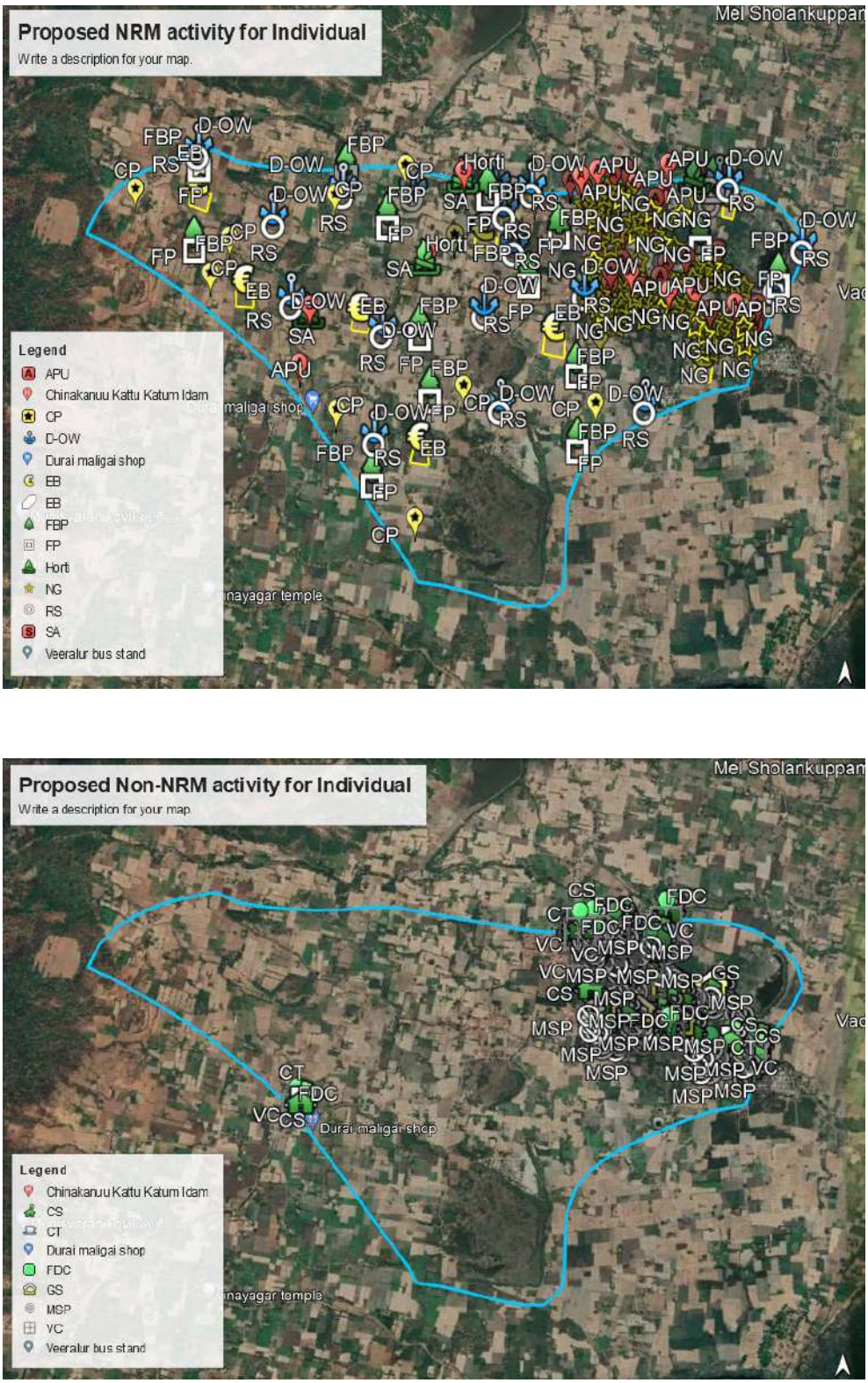


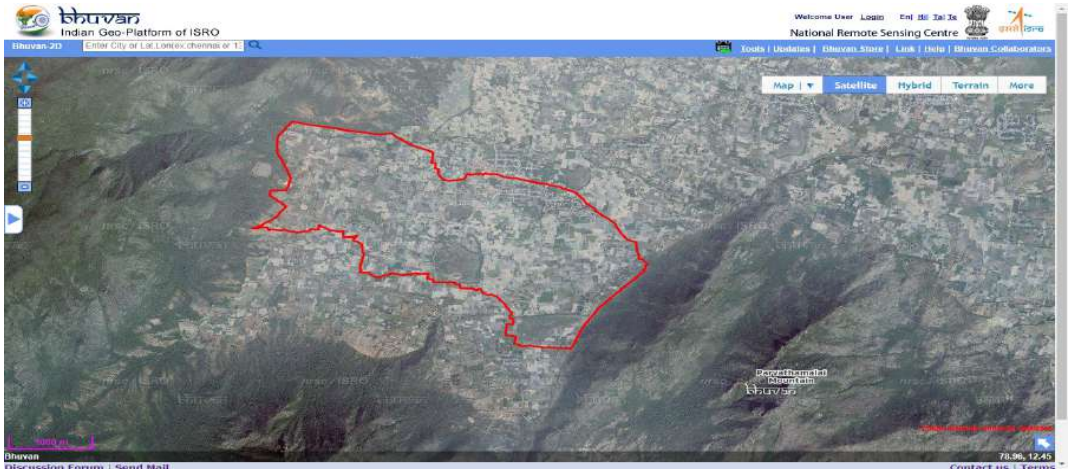
Figure 8.8. Proposed activities in Veeralur micro-watershed A: NRM activities for community. B: Non-NRM activities for community. C: NRM activities for Individuals. D: Non-NRM activities for Individuals

(APU: Azolla Production unit, AVP: Avenue Plantations, CP: Compost pit, CS: Cattle Shed, D-silt: Desilting, D-OW: De-silting open well, CT: Cattle through, EB: Farm Bunding with Boundary Trenches - Individual, FBP: Farm Bund Plantations, FDC: Fodder Development, FP_in: Farm Pond for Individuals, FN: Fencing, GS: Goat shed, Horti: Horticulture, LBS: Loose Boulder Structure, MSP: Soak pits for Individual, NG: Nutrition garden, RS: Artificial Recharge Structure, RWHS: Rain Water Harvesting Structure, SA: Silt Application, VCP: Vermi compost pit)

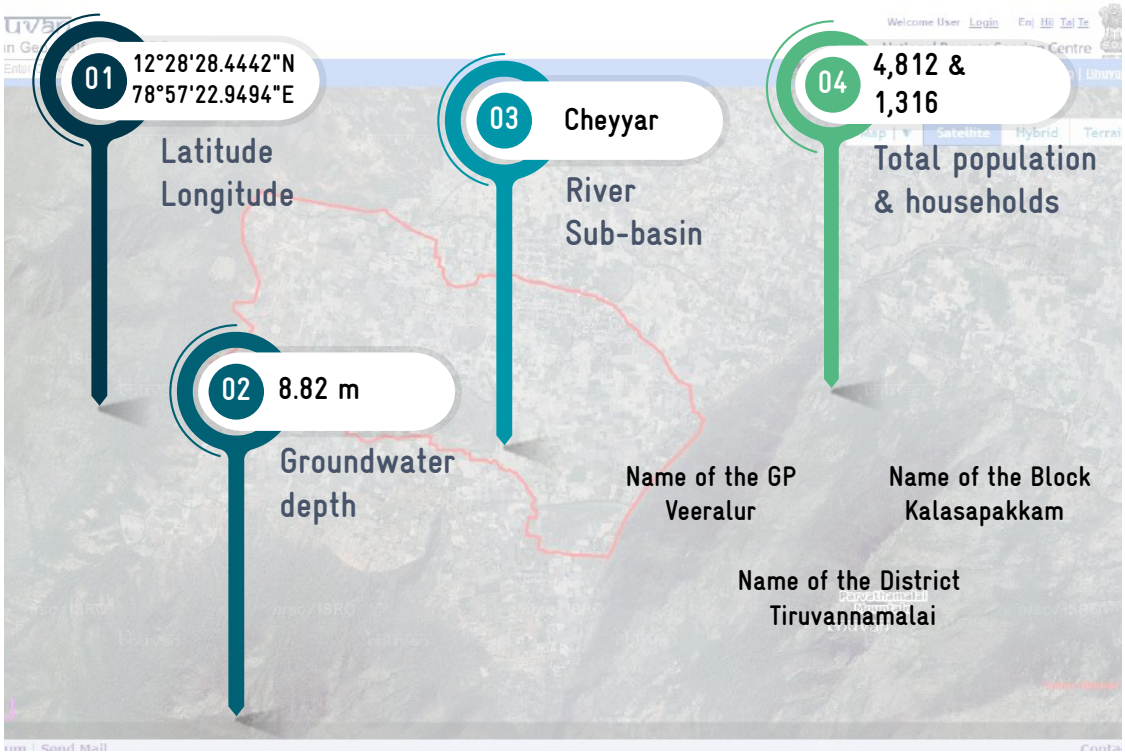
8.3 MODEL GP-VEERALUR

VEERALUR GP

8.3.1 BACKGROUND OF GRAM PANCHAYAT – VEERALUR



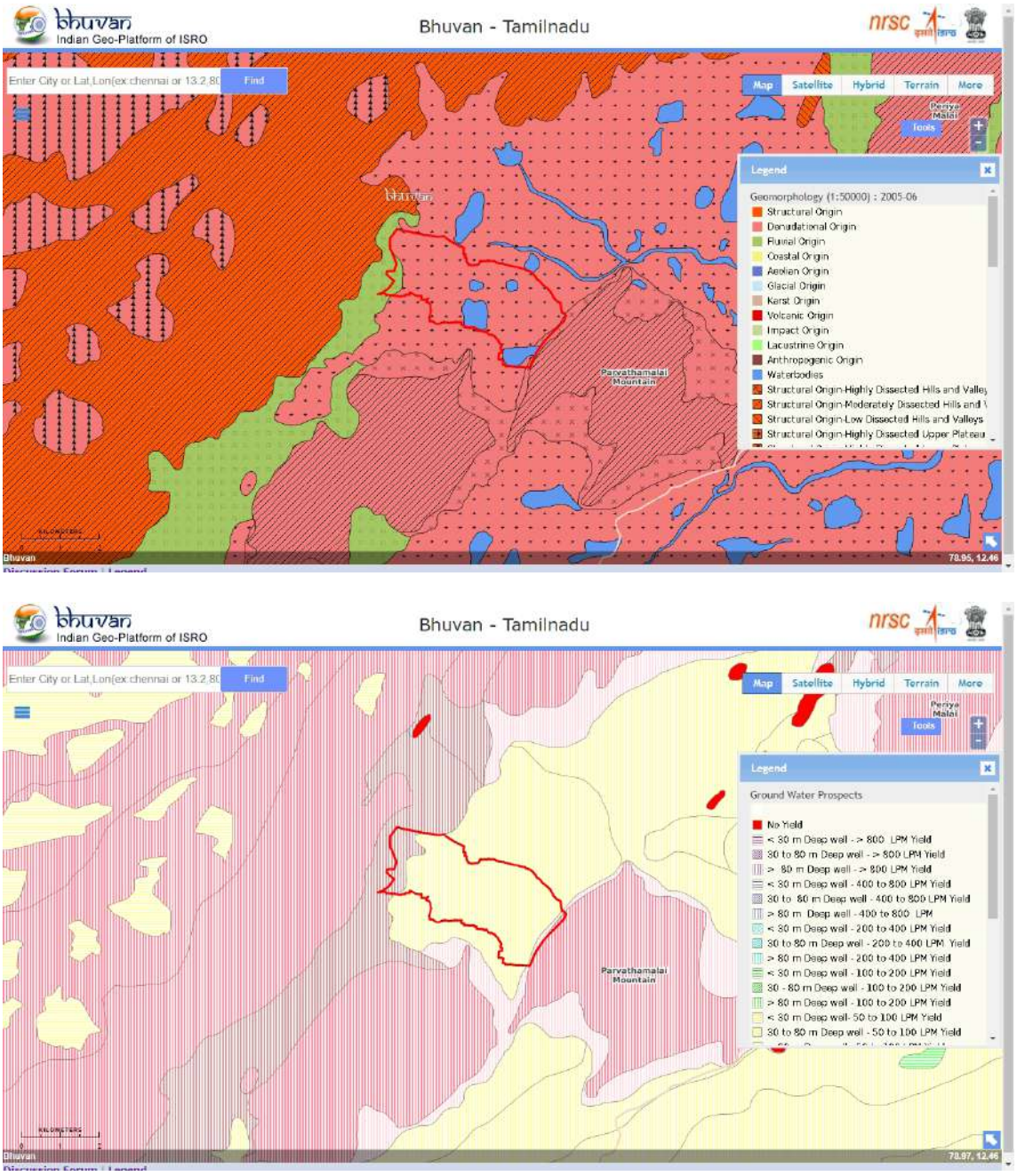
The Veeralur GP is geographically situated between12° 28' 28.4442"N to 78° 57' 22.9494"E and belongs to Kalasapakkam Block of Tiruvannamalai district. The total geographical area of GP is 1,226 ha, AS per Census 2011, total population is 4,812 of which 2,458 are males while 2,354 are female population. The total number of households is 1.316. The ST population is ten and SC population is 1,187 in Veeralur GP (Table 45). The average annual temperature of GP is 27.9 °C, and receives annual average rainfall of 1,047 mm.

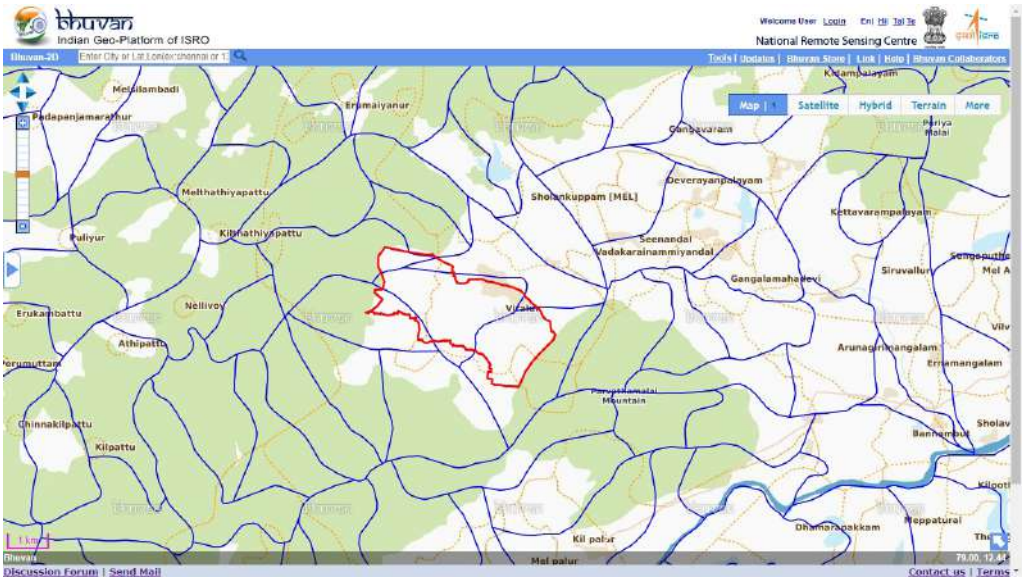


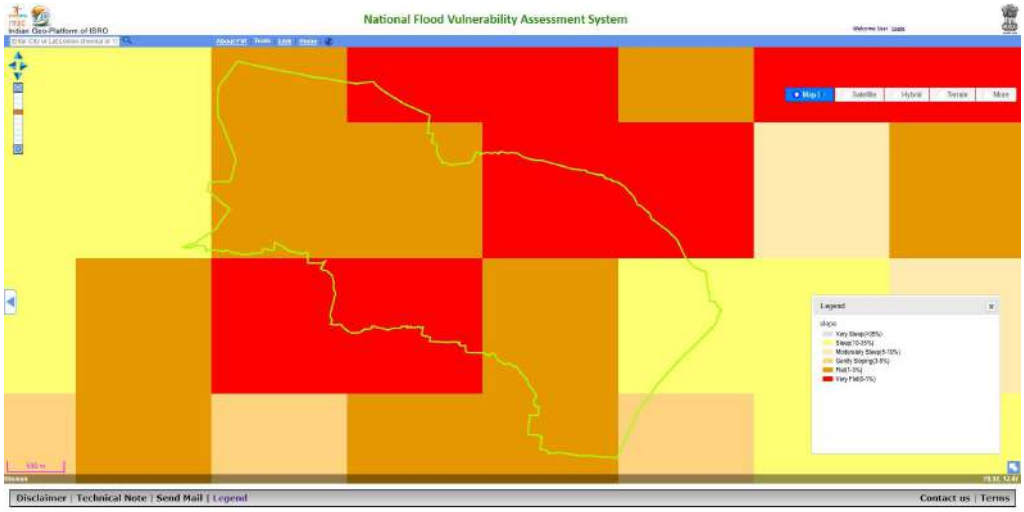
The detailed spatial and non-spatial data considered in the process of preparation of climate resilient measures under CWRM for Veeralur GP is illustrated as follows:

8.3.2 CWRM PLANNING - SPATIAL DATA

CWRM adapted the geospatial technologies in its process of plan preparation towards climate-resilient infrastructure, Water Conservation and Water Harvesting (WCWH) 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 implemented towards conservation of resources. Various thematic datasets for Veeralur GP are displayed in Figure 8.9. Veeralur GP engrossed with denudation origin pediment complex and fluvial landform units (Figure 8.9 A). It is observed that the groundwater prosperity is less than 30 m deep well with 50 to 100 LPM capacity (Figure 8.9 B). Flat terrain is dominant in the GP (Figure 8.9 D), Whereas GP area is falls under one micro-watershed units (Figure 8.9 C). Most of land used for crop cultivation and two large land parcels were indicating the plantation crops (Figure 8.9 F).







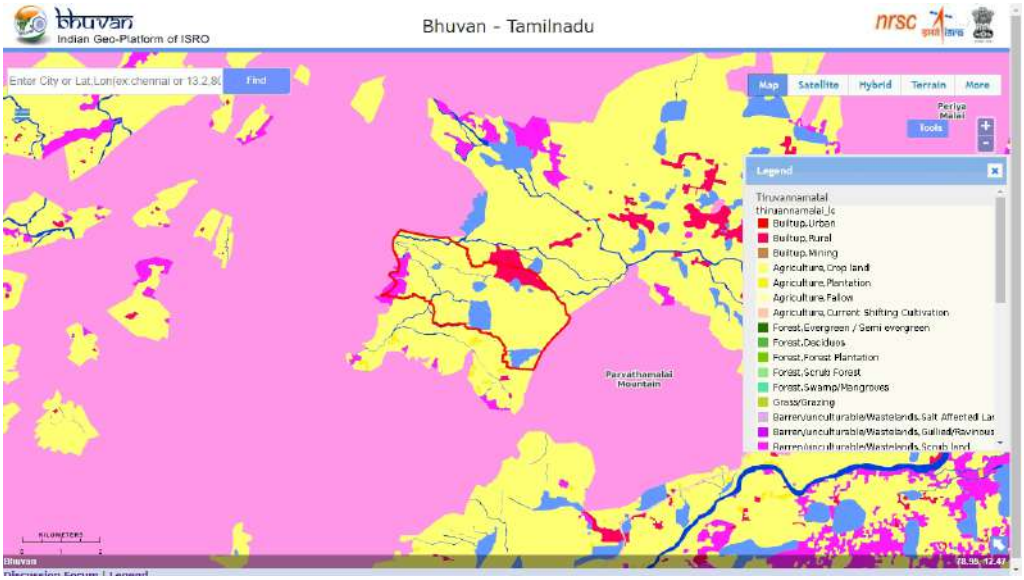


Figure 8.9. Spatial thematic maps of Veeralur GP. A. Geomorphology, B. GW prosperity, C. Watershed, D. Slope, E. LULC

8.3.3 CWRM PLANNING- NON-SPATIAL DATA

The non-spatial data covers four important themes – socio economic, climate, water and agriculture with 116 parameters (Table 46). These non-spatial data is concurrently used for analysis along with the spatial data mentioned above to identify the key water challenges, prepare water budget by understanding the supply and demand and develop water actions to the different land use and slope categories. The process started with mapping of the administrative (habitations/panchayat/revenue village, Block/thaluk), 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.

TABLE 46. NON-SPATIAL DATA- VEERALUR GP

Key CWRM Parameter	Details
Climate Vulnerability Area (CVA) 1: Socio-Economic	
Geographical Area (ha)	1,226
Male Population	2,458
Female Population	2,354
Total Population	4,812
SC Population	1,187
ST Population	10
Vulnerable Population	1,197
Households (HH's)	1,316
Only one room HH's (SECC)	163
Female-Headed HH's (SECC)	57
Vulnerable Households (SECC)	131
% of Vulnerable Households	10
Registered MGNREGA Job cards	2,472
Active person working in job Cards	2,065
Drinking-Water Sources	223
Groundwater sources - Drinking water	4
Surface water sources - Drinking water	2
Annual Grey water Generation (ha.m)	8.78
Climate Vulnerability Area (CVA) 3: Water Resources	
Canal Network (m)	
No. of Tanks (PWD & Union)	6
No. of Ooranis	4
Irrigation Facilities (ha)	
Area under Tank Irrigation	137.21
Area under Open & Tube Well Irrigation	620.25
Catchment Area wise Available Runoff (ha.m)	
Good Catchment Area	54.2

Bad Catchment Area	202.2
Watershed and Drainage Networks	
Length of Natural Drainage Lines	1,555
No. of Natural Drainage Lines	1
Number of Micro Watersheds	5
Water Demand (ha.m)	
Water Demand For Humans	13.17
Water Demand for Livestock	3.93
Water Demand For Agriculture	1,023
% G.W Utilization for Drinking	96
% G.W Utilization for Livestock	98
% G.W Utilization for Agriculture.	100
% SW Utilization for Drinking	4
% SW Utilization for Livestock	2
Climate Vulnerability Area 4: Agriculture	
Area Under Land Resources (ha)	
Area under Non-Agricultural Uses	123
Area under Barren & Un-cultivable Land	21.57
Area under Fallows Land other than Current Fallows	85.78
Area under Current Fallow land	211.91
Area under Unirrigated Land	26.19
Area Irrigated by Source	757.46
Catchment Area (ha)	
Land under Good Catchment	144.57
Land under Bad Catchment	1,081.34
Crop Details (ha)	
Irrigated Area (ha)	774.89
Rainfed area (ha)	4.35
The area under Paddy Cultivation (ha)	602.09
Crop Water Requirement - The irrigated condition (ha.m)	1,021.01
Crop Water Requirement - Rainfed condition (ha.m)	1.52
Soil Resources: Status of Available Nitrogen (%)	
Low	100
Status of Organic Carbon (%)	
Very Low	1
Low	98
Medium	1
Status of Soil Micro Nutrients (%)	
Sufficient	88
Deficient	12

Status of Physical condition of the soil (%)	
Slightly Acidic	3
Moderately Alkaline	97
Soil Texture	
Clay Soil	7
Fine Soil	86
Coarse loamy	7
Soil Water Permeability	Moderate
Soil moisture and ET	
Volumetric Soil Moisture (%)	23
Estimated Soil Moisture(ha.m)	253.67
ET Losses (ha.m)	630.05
Means of Water Extraction (%)	
Gravity	2
Lifting	98
Irrigation Methods (%)	
Wild Flooding	18
Control Flooding	82
Livestock (No)	
Cattle Population	1,057
Sheep Population	12
Goat Population	160

8.3.4 KEY WATER CHALLENGES

Socio-Economic

1. 10% of the households are vulnerable in the village
2. 163 one room households, and 57 female headed households
3. Access to drinking water through tap water connections is very low
4. Grey water generation is 8.78 ha.m; Handling of grey water from households needs attention

Water

1. Ground water status -Over exploited
2. Ten traditional waterbodies in the GP
3. 100 % Agriculture and 98% livestock need met through groundwater
4. 256 ha.m of water is an available runoff -Runoff

Agriculture and Allied Sector

1. 11.79 % of the land covers the common area
2. 88 % of the land covers an individual land area
3. Main crop in the GP is paddy which is cultivated about 602.09 ha of land
4. Crop water requirement for irrigated condition is more
5. 98% of the water is given to paddy fields by lifting methods of irrigation
6. Remaining water is extracted by gravity method of irrigation
7. Bad catchment area is more
8. Soil Nitrogen, organic carbon is low
9. Moderately Alkaline soil
10. Fine soil is predominant in the GP
11. Slightly high ET loss at 630.05 ha.m

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 of the GP. About 10.14 % of the total land area is taken for WASCA treatment activities like plantation and conservation works. The total proposed area for treatment is 124.32 ha with more attention being given for areas irrigated by source followed by areas under current fallow land, Barren and Un-cultivable lands. (Figure 8.10). Through the proposed conservation activities, 50.79 ha.m run off would be harvested in which, about 58.31% of the runoff from the good catchment, 41.68% of the runoff from the bad catchment and zero amount of conservation from the average catchment area (Figure 8.11).

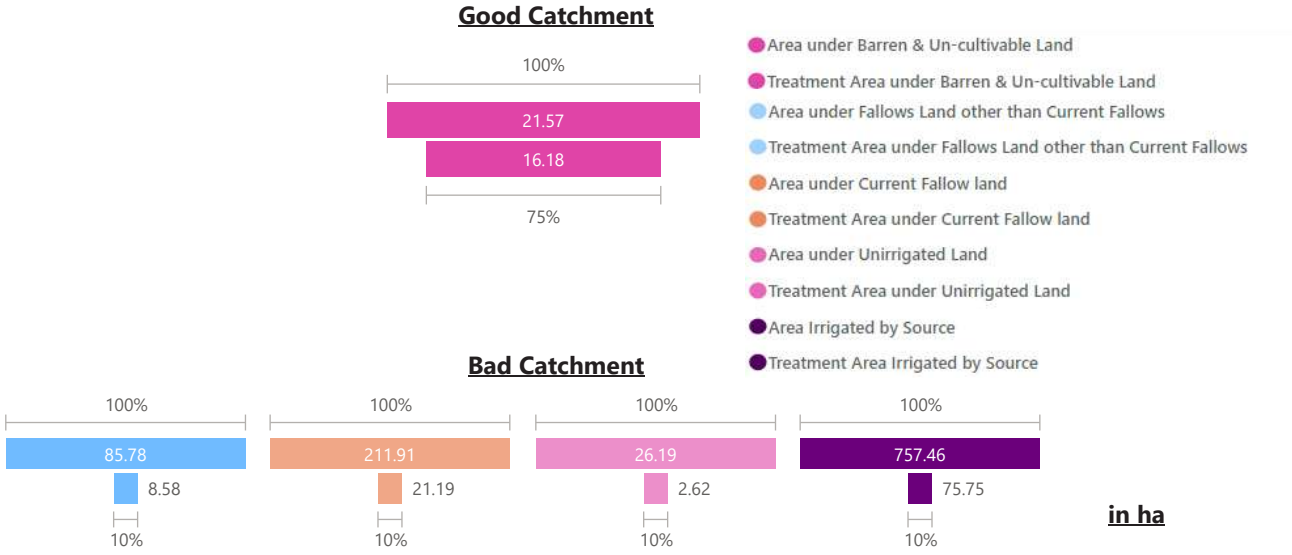


Figure 8.10. Proposed land resource treatment area in Veeralur GP

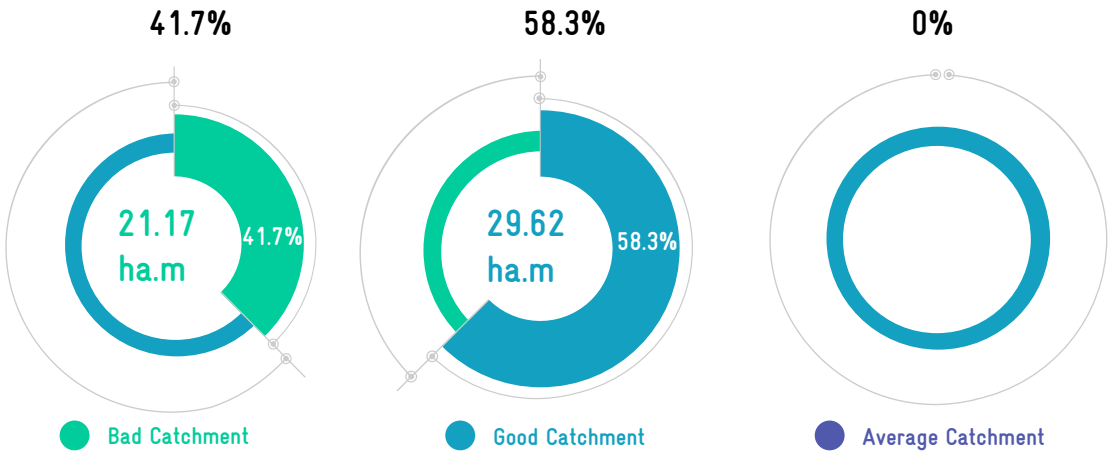


Figure 8.11. Expected run off conservation after treatment in Veeralur GP

The detailed proposed activities along with silent parameters are showed in the Table 47 for 2021-2024. More attention towards common and public land developments are given with appropriate works to improve the resilience of the GP.

TABLE 47. PERSPECTIVE PLAN OF VEERALUR 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 & Lower Ridge				
Composting (No.)	Lower	13	2.21	195
Block Plantation (Community) (ha)	Upper	6	66.60	25,920
Linear Plantation (km)	Middle	4	7.90	3,086
Canal Bund Plantation (km)	Lower	5	37.50	14,650
Avenue plantation (km)	Middle	11	20.52	8,014
Restoration of water bodies:a. PWD and Tanks (No.)	Lower	6	30.00	4,800
Restoration of water bodies:b. Ooranis (No.)		4	4.00	800
Artificial Recharge Structure (No.)		248	620.00	96,968
Drainage Line Treatment (km)		1	45.00	7,500
Sub Total Water Action -1		**298**	**833.73**	**1,61,933**
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	6	9.00	3,516
Construction of Farm Ponds - Individual (No.)		15	30.00	11,715
Land development - Individual (ha)		16	160.00	62,496
Dry land Horticulture/Agro for-estry - Individual (ha)		10	85.00	33,210
Azolla units - Individual (No.)		131	19.65	3,013
NADEP Vermi compost (No.)		131	23.58	3,537
Fodder development - Communi-ty & Individual (No.)		131	193.88	3,07,064
Cattle Shelters (No.)		131	277.72	43,361
Goat Sheep Shelters (No.)		17	38.59	6,035
Cattle Trough (No.)		131	6.55	786
Construction of new open wells & Recharge Shafts (No.)		248	1,240.00	2,29,648
Sub Total Water Action - 2		**967**	**2,083.97**	**7,04,381**
CWRM Water Action 3: Rural Water Management				
CWRM Water Action 3: Works in Lower Ridge				
Soak Pits (Community) (Number of units)	Lower	13	1.69	260
Soak Pits (Individual) (Number of units)		131	13.10	2,096
Roof Rain Water Harvesting (Number of units)		2	8.00	1,250
Sub Total Water Action -3		**146**	**23**	**3,606**
Overall GP - Total		**1,411**	**2,940.49**	**8,69,920**

Regarding CWRM themes of the total number of projects identified, 56.59 % works are in agriculture and allied sector while 34.77% and 8.62 % works are in public and common land, and rural infrastructure respectively. Table 48 provides the estimates of the work budget, and personal days for three years from 2021-2024 in the Veeralur GP.

TABLE 48. 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	298	833.73	1,61,933
Agriculture and Allied sector development	967	2,083.97	7,04,381
Rural water management	146	23	3,606
TOTAL	1,411	2,940.49	8,69,920

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 49). It is expected that the impacts will potentially reduce the vulnerability and improve the resilience of the system to the projected climatic change events and ensured water security.

TABLE 49. WASCA - WATER ACTIONS AND INDICATORS

WASCA CWRM ACTION PLAN

DEVELOPMENT OF PUBLIC AND COMMON LAND

	INDICATOR
1	Number of water bodies restored in the village
2	Area under Block Plantation
3	Percentage reduction in the annual surface runoff
4	The proportion of land treated under WASCA

	OUTCOMES/ IMPACT
1	Ten traditional water bodies restored
2	16.18 ha
3	2.5 ha.m surface runoff harvested and stored
4	15.87 % of the total geographical area of the village treated under WASCA in three years

10
TRADITIONAL WATER BODIES RESTORED

16.18 ha
BLOCK PLANTATION

15.87 %
AREA OF THE VILLAGE TREATED

WASCA CWRM ACTION PLAN

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

	INDICATOR
1	No of structures were established for on-farm (in-situ) water harvesting in dry lands
2	Reducing area under fallow lands
3	Improvement in soil health
4	No of artificial recharge structures proposed

	OUTCOMES/ IMPACT
1	15 farm ponds established
2	297.69 ha under fallow land restored for cultivation
3	131 units of vermi compost established
4	248 artificial recharge structures were established to replenish groundwater flow

15
FARM PONDS

131
VERMI COMPOST

248
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.	13 community level and 131 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.	1,316 households established Nutri-gardens in homesteads

13 COMMUNITY & **131** INDIVIDUAL SOAK PITS

2 COMMON ROOF RAINWATER HARVESTING

1,316 NUTRI-GARDENS

Table 50 provides both the perspective plan for three years' period and the annual plan for the one-year period from 2021-2022 on the shelf of projects/number of works and number of person-days.

TABLE 50. PROPOSALS FOR THE MGNREGS, VEERALUR GP

	No of works	No of person days
Perspective plan	1,411	8,69,920
Annual plan	564	3,47,968

8.3.7 PROPOSED ACTIVITY MAP

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

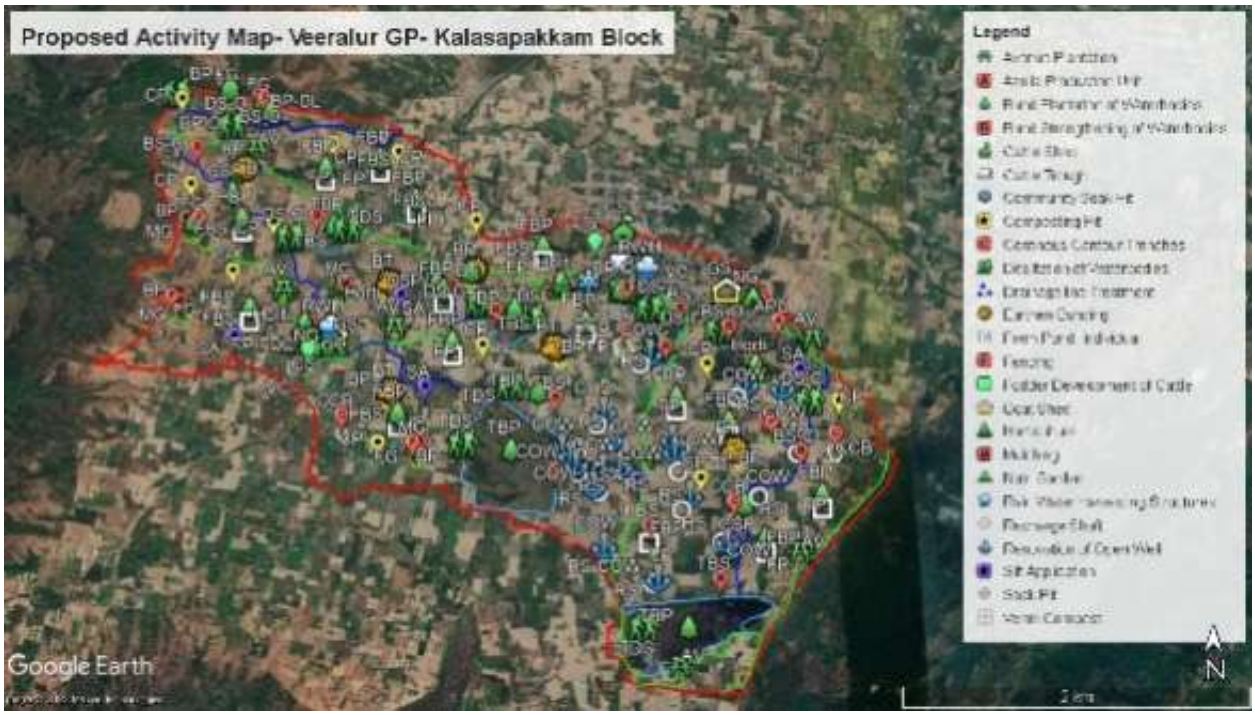


Figure 8.12. Proposed action plan of Veeralur GP

Figure 8.13. Works on Upper Ridge of Veeralur GP

Figure 8.14. Works on Middle Ridge of Veeralur GP

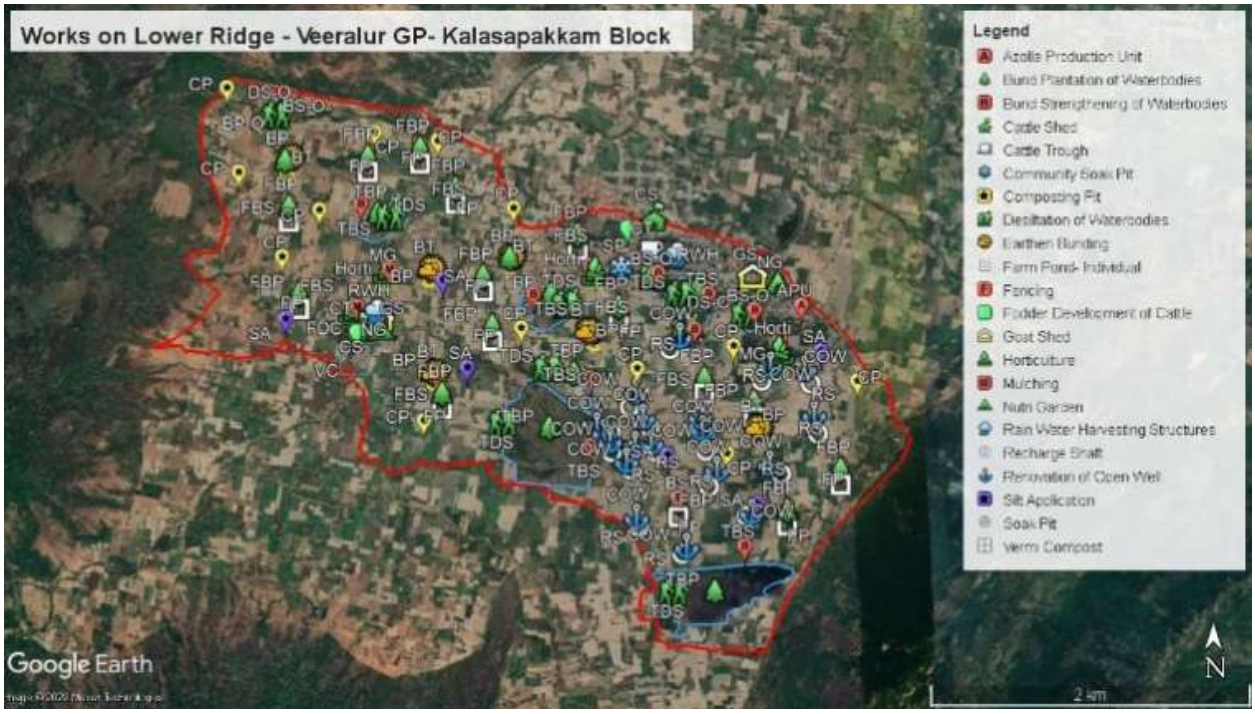
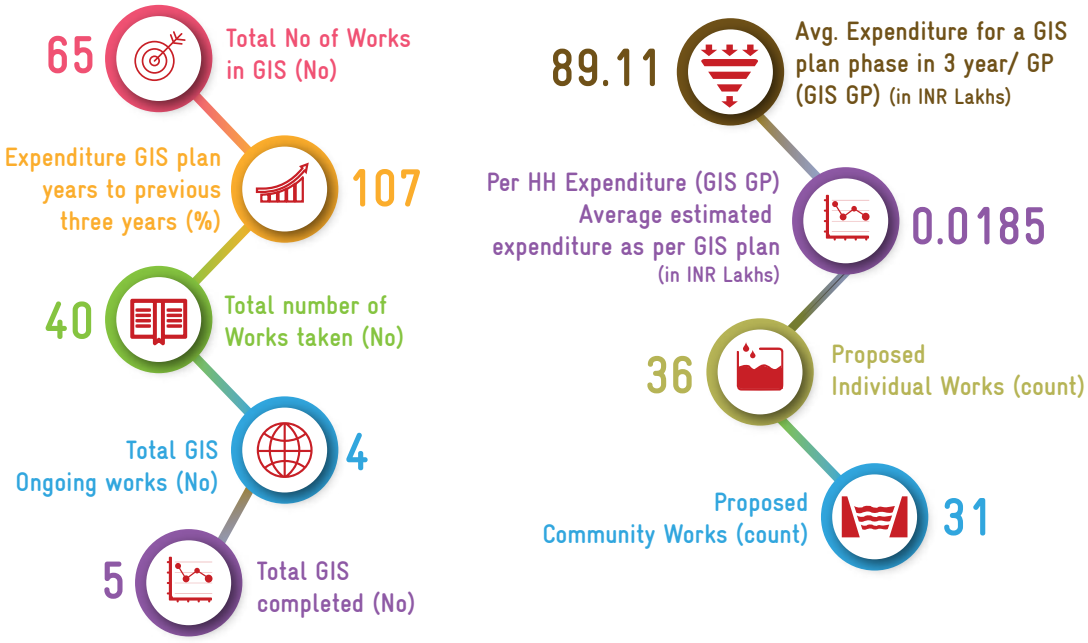


Figure 8.15. Works on Lower Ridge of Veeralur GP

8.3.8 GIS PLAN IMPLEMENTATION, KEY PARAMETERS

The GIS plan implementation and performance of Veeralur GP, Kalasapakkam Block is represented in Table 51.

TABLE 51. KEY PARAMETERS PERFORMANCE IN VEERALUR GP - KALASAPAKKAM BLOCK



நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு

குறள் - 20

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

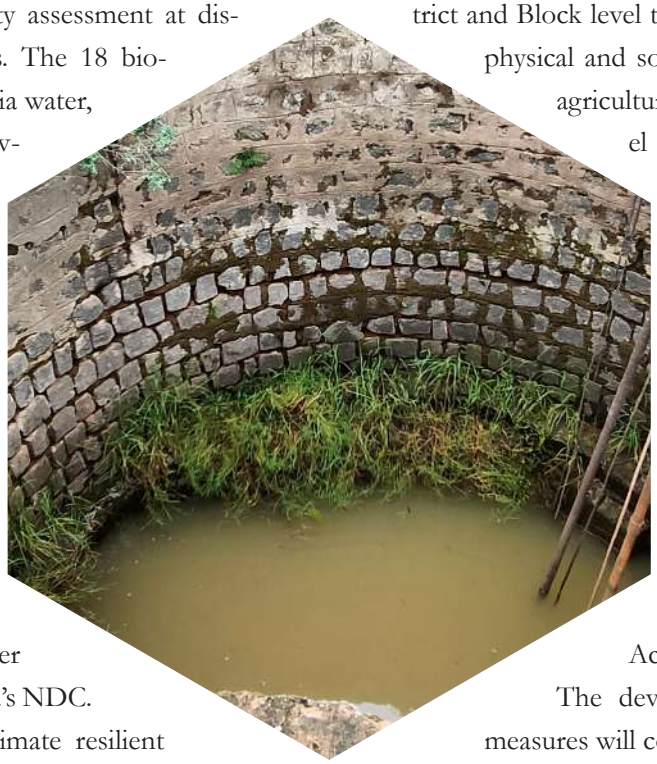
Thirukkural - 20

CHAPTER 9

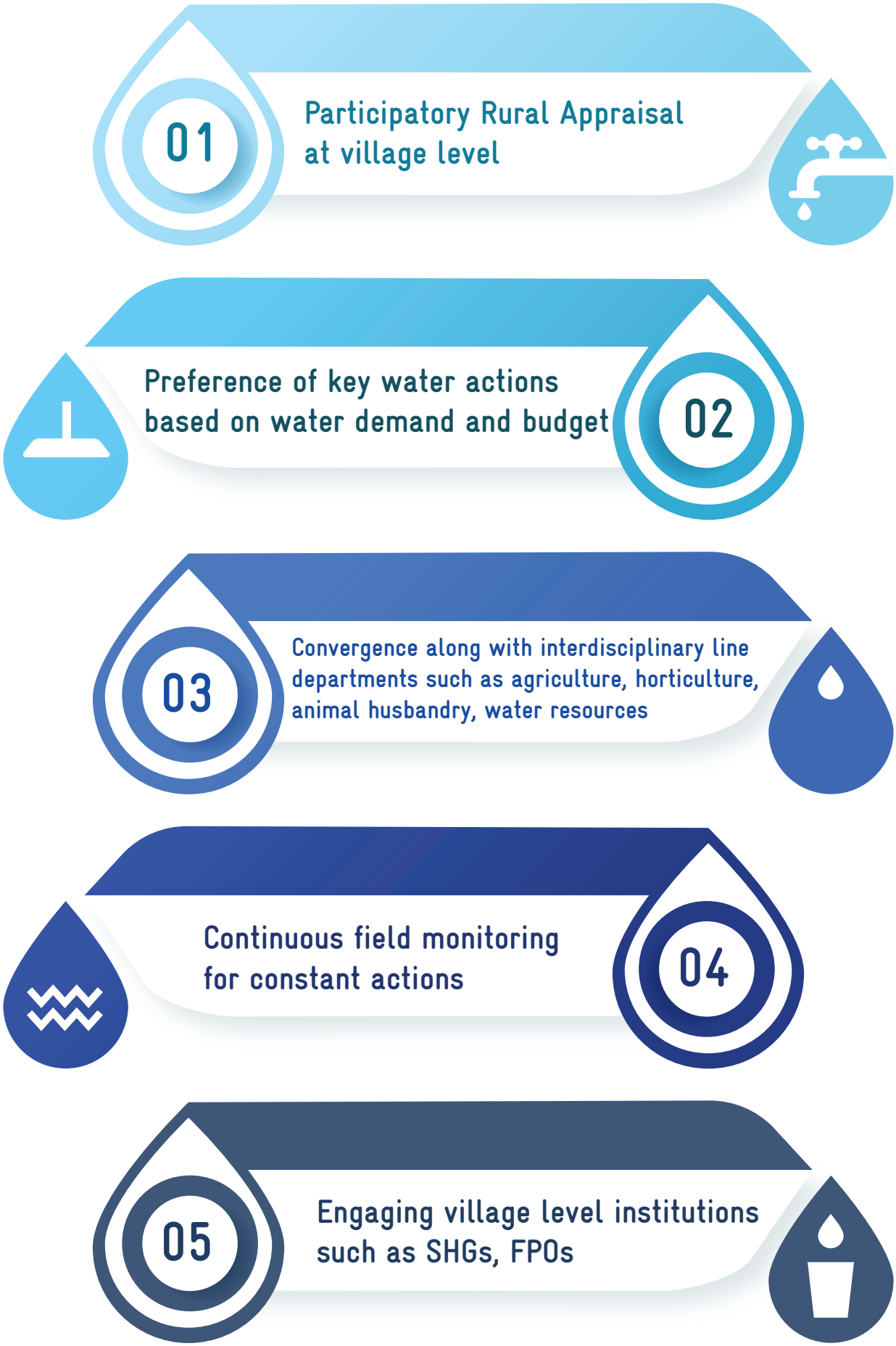
CONCLUSION

"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"

In recent decades, the demand for water is increasing at a fast rate due to rapid increase in population, industrial and economic growth. The evident changes in climate 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 which resulted in lowering of ground water levels and even drying up of wells. 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. The 18 bio-physical and socio-economic indicators 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 the above mentioned four 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 drawn up under WASCA initiatives in public and common land, agriculture and allied sector, rural infrastructure areas. All the indicators/parameters and Key Water Action are aligned to the 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 based on macro and micro-watershed enables to adopt an ecosystem approach in promoting nature-based solutions. The productive impacts are visualized through a 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:


01
Participatory Rural Appraisal at village level
Preference of key water actions based on water demand and budget
02
03
Convergence along with interdisciplinary line departments such as agriculture, horticulture, animal husbandry, water resources
Continuous field monitoring for constant actions
04
05
Engaging village level institutions such as SHGs, FPOs

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	Canal Irrigation				Tradational Water bodies		
	Length of Main Canal (m)	Length of Minor Canal (m)	Length of Distributaries (m)	Water Courses (Field Channels) (m)	Number of Tanks (PWD & Union) (No.)	Number of Ooranis (No.)	Other Surface Water Bodies (No.)
Adamangalam	-	-	-	-	2	6	-
Alangaramangalam	15,000	-	-	10,000	1	3	-
Anaivady	4,000	-	-	1,000	2	-	-
Arunagirimangalam	-	-	-	-	5	-	8
padagam	10,500	-	-	6,000	3	5	-
Aniyalai	4,800	-	-	2,500	2	-	-
Deverayanpalayam	-	-	-	-	2	-	6
Gangavaram	-	-	-	-	3	-	8
Kallur	7,000	-	-	1,500	1	-	-
Kappalur	10,000	-	-	4,500	1	5	-
Kambut	-	-	-	-	1	5	-
Kettavarampalayam	-	-	-	-	3	6	-
Melarani	-	-	-	-	2	2	-
Kil palur	-	-	-	-	1	9	-
Kidampalayam	-	-	-	8,200	-	7	-
Melpalur	-	600	-	-	2	3	-
Palan koil	-	-	-	2,000	-	7	-
Pathiyavady	-	-	-	-	3	7	-
Pillur	-	-	-	-	1	4	-
Sengaputheri	-	-	-	-	-	-	4
Sholavaram	1,300	550	-	-	2	-	2
Thenpalliput	10,800	-	-	-	3	11	-
Vanniyanur	-	-	-	-	1	2	-

Gram Panchayat	Canal Irrigation				Tradational Water bodies		
	Length of Main Canal (m)	Length of Minor Canal (m)	Length of Distributaries (m)	Water Courses (Field Channels) (m)	Number of Tanks (PWD & Union) (No.)	Number of Ooranis (No.)	Other Surface Water Bodies (No.)
Siruvallur	-	-	-	-	2	-	5
Veeralur	-	-	-	-	6	4	-
Elathur	2,400	800	1,200	-	-	1	-
Mottur	1,800	900	-	-	-	7	-
Kadalady	2,700	1,300	-	-	4	9	-
Singaravady	950	450	-	-	1	3	-
Pattiyandal	-	-	-	-	2	4	-
Thenmathimangalam	1,200	300	-	-	-	1	-
Kolimathingalam	1,000	450	-	-	-	6	-
Mattavettu	1,200	700	-	-	1	6	-
Kilkuppam	1,000	700	-	-	-	2	-
Ernamangalam	1,450	550	-	-	4	2	-
Gangalamahadevi	-	-	-	-	-	-	-
Kalasapakkam	4,000	-	-	6,000	1	1	-
Kilpotharai	1,800	780	-	-	2	5	-
Ladavaram	6,500	-	-	-	2	5	-
Melsholankuppam	-	-	-	-	-	-	-
Melvilvarayanallur	-	-	-	-	-	-	-
Poondi	2,500	-	-	4,500	2	6	-
Seethambattu	7,800	-	-	3,500	3	7	-
Kanthapalyam	-	-	-	-	-	-	-
Venkidampalayam	-	2,847	-	-	-	3	-

Gram Panchayat	Irrigation Facilities (ha)			Catchment Area wise Available Runoff (ha.m)			Watershed and Drainage Networks		
	Tank Irrigation	Canal Irrigation	Open & Tube Well Irrigation	Good Catchment Area	Average Catchment Area	Bad Catchment Area	Length of Natural Drainage Lines (m)	Number of Natural Drainage Lines (No.)	Number of Micro Watersheds (No.)
Adamangalam	9	-	99	18	0	29	624	1	2
Alangaramangalam	11	-	59	24	-	74	5,015	7	2
Anaivady	48	-	99	35	5	54	2,110	1	2
Arunagirimangalam	50	-	274	45	5	109	7,950	8	6
padagam	40	-	309	28	1	122	3,883	6	3
Aniyalai	30	-	180	39	-	56	3,784	4	2
Deverayanpalayam	3	-	231	14	-	53	4,820	5	1
Gangavaram	117	-	663	62	15	190	12,663	7	1
Kallur	20	-	95	28	2	40	-	-	1
Kappalur	105	-	196	127	2	147	14,739	7	5
Kambut	11	-	115	14	-	37	2,233	2	3
Kettavarampalayam	69	-	573	122	-	133	8,092	7	6
Melarani	-	-	95	55	3	25	3,626	5	5
Kil palur	40	-	176	23	89	60	6,960	6	4
Kidampalayam	102	-	308	78	10	80	6,998	7	5
Melpalur	20	-	150	33	-	53	8,343	7	4
Palan koil	44	-	59	33	-	67	1,359	2	2
Pathiyavady	74	-	243	88	-	86	2,931	3	4
Pillur	53	-	60	39	-	43	-	-	3
Sengaputheri	21	-	89	29	2	41	16,466	7	3
Sholavaram	9	-	106	38	2	37	2,711	2	5
Thenpalliput	68	-	139	41	-	129	417	3	7
Vanniyanur	42	-	94	40	-	71	4,731	6	3
Siruvallur	155	-	166	60	-	93	7,025	7	4
Veeralur	137	-	620	54	-	202	-	-	-

Gram Panchayat	Irrigation Facilities (ha)			Catchment Area wise Available Runoff (ha.m)			Watershed and Drainage Networks		
	Tank Irrigation	Canal Irrigation	Open & Tube Well Irrigation	Good Catchment Area	Average Catchment Area	Bad Catchment Area	Length of Natural Drainage Lines (m)	Number of Natural Drainage Lines (No.)	Number of Micro Watersheds (No.)
Elathur	17	-	106	40	4	26	1,070	1	3
Mottur	18	-	90	24	2	16	-	-	1
Kadalady	100	-	452	162	26	81	8,283	7	7
Singaravady	55	-	25	12	2	6	-	-	2
Pattiyandal	-	-	-	58	9	29	7,408	7	4
Thenmathimangalam	30	-	86	25	2	44	-	-	-
Kolimathingalam	30	-	86	10	1	17	2,518	3	3
Mattavettu	14	-	492	43	2	65	11,682	7	4
Kilkuppam	14	-	492	29	1	44	4,968	5	3
Ernamangalam	51	-	175	23	16	56	2,642	6	6
Gangalamahadevi	36	-	125	16	-	36	1,317	6	5
Kalasapakkam	74	-	32	55	-	39	-	-	2
Kilpotharai	18	-	71	21	1	62	1,388	1	4
Ladavaram	101	-	151	60	-	110	5,466	7	5
Melsholankuppam	5	-	412	63	-	113	15,862	7	8
Melvilvarayanallur	30	-	165	89	4	65	5,915	7	5
Poondi	25	-	42	57	0	31	2,397	4	4
Seethambattu	50	-	204	58	11	79	2,656	7	6
Kanthapalyam	11	-	312	1	-	81	3,450	7	7
Venkidampalayam	17	-	86	4	3	26	2,847	6	3

Gram Panchayat	Water Demand								
	For Humans (ha.m)	For Livestock (ha.m)	For Agriculture (ha.m)	% GW Utilization for Drinking (%)	% GW Utilization for Livestock (%)	% GW Utilzation for Agriculture. (%)	% SW Utilization for Drinking (%)	% SW Utilization for Livestock (%)	% SW Utilization for Agriculture (%)
Adamangalam	11.12	1.41	78.57	97	89	100	3	11	-
Alangaramangalam	5.40	2.42	101.21	97	88	99	3	12	1
Anaivady	4.05	1.42	103.27	57	96	87	43	4	13
Arunagirimangalam	5.40	2.42	101.21	97	88	99	3	12	1
padagam	8.47	3.97	167.91	93	91	100	7	9	-
Aniyalai	4.65	1.64	108.38	99	91	99	1	9	1
Deverayanpalayam	4.20	1.17	240.60	96	96	100	4	4	-
Gangavaram	13.02	3.96	1,077.66	87	96	100	13	4	-
Kallur	4.46	2.22	98.74	74	99	99	26	1	1
Kappalur	8.45	3.28	486.02	92	95	100	8	5	-
Kambut	3.62	2.01	123.39	64	93	99	36	7	1
Kettavarampalayam	15.58	5.45	842.24	92	93	100	8	7	-
Melarani	7.70	-	111.88	98	-	100	2	100	-
Kil palur	10.22	3.66	457.28	96	94	100	4	6	-
Kidampalayam	7.79	6.52	435.83	67	96	100	33	4	-
Melpalur	5.96	2.94	346.30	96	94	100	4	6	-
Palan koil	5.78	2.40	357.31	86	98	99	14	2	1
Pathiyavady	6.69	3.80	327.47	71	90	100	29	10	-
Pillur	4.16	1.99	197.24	67	98	100	33	2	-
Sengaputheri	5.02	1.51	129.54	97	96	99	3	4	1
Sholavaram	4.80	1.41	201.22	98	99	100	2	1	-
Thenpalliput	7.71	3.16	412.15	69	99	100	31	1	-
Vanniyanur	7.18	4.09	201.10	99	98	93	1	2	7
Siruvallur	14.41	3.22	499.30	98	98	100	2	2	-
Veeralur	13.17	3.93	1,022.54	96	98	100	4	2	-
Elathur	3.74	0.86	188.42	-	-	100	100	100	-

Gram Panchayat	Water Demand								
	For Humans (ha.m)	For Livestock (ha.m)	For Agriculture (ha.m)	% GW Utilization for Drinking (%)	% GW Utilization for Livestock (%)	% GW Utilzation for Agriculture. (%)	% SW Utilization for Drinking (%)	% SW Utilization for Livestock (%)	% SW Utilization for Agriculture (%)
Mottur	5.10	0.53	188.42	69	96	100	31	4	-
Kadalady	21.16	8.90	1,189.71	100	95	100	-	5	-
Singaravady	2.59	0.64	1,189.71	100	95	100	-	5	-
Pattiyandal	3.88	12.71	1,189.71	-	-	100	100	100	-
Thenmathimangalam	3.86	2.70	445.80	-	-	98	100	100	2
Kolimathingalam	3.93	1.05	445.80	73	92	98	27	8	2
Mattavettu	4.03	7.09	503.06	62	94	100	38	6	-
Kilkuppam	4.18	4.72	503.06	80	94	100	20	6	-
Ernamangalam	7.86	2.84	342.93	85	96	100	15	4	-
Gangalamahadevi	2.75	0.46	300.08	-	94	100	100	6	-
Kalasapakkam	13.84	1.43	51.81	89	90	100	11	10	-
Kilpotharai	4.84	1.58	108.05	67	99	100	33	1	-
Ladavaram	9.73	5.79	514.66	94	94	100	6	6	-
Melsholankuppam	15.71	4.54	1,138.44	-	-	100	100	100	-
Melvilvarayanallur	7.77	2.18	202.11	-	-	100	100	100	-
Poondi	4.91	1.61	119.90	66	91	100	34	9	-
Seethambattu	5.93	2.69	421.81	67	93	97	33	7	3
Kanthapalyam	9.48	1.74	273.74	-	-	100	100	100	-
Venkidampalayam	3.57	1.74	298.99	84	97	99	16	3	1

ANNEXURE 3.7

GP WISE STATUS OF AGRICULTURE RESOURCE

Gram Panchayat	Area under Land Resources (ha)									
	Area under Forest land	Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Area under Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Adamangalam	-	48.80	-	0.21	-	-	26.00	19.74	-	107.83
Alangaramangalam	-	57.61	5.77	-	-	-	20.54	91.99	211.67	70.34
Anaivady	-	93.75	-	16.46	-	-	10.54	32.25	97.38	147.03
Arunagirimangalam	-	120.08	-	-	12.39	4.79	-	62.44	196.34	323.63
padagam	-	74.52	-	-	-	2.40	3.34	297.23	-	349.48
Aniyalai	-	74.52	-	-	-	2.40	3.34	297.23	-	349.48
Deverayanpalayam	-	36.30	-	-	-	-	6.60	42.59	0.01	234.30
Gangavaram	-	162.14	3.97	47.92		3.61	3.80	71.08	161.88	779.98
Kallur	-	74.41	1.23	-	4.20	2.14	3.45	57.23	37.44	115.47
Kappalur	-	339.80	-	-	-	8.20	80.86	391.99	14.81	300.31
Kambut	-	34.91	2.70	-	-	-	4.43	47.28	22.26	125.21
Kettavarampalayam	-	63.65	260.49	-	-	-	-	27.13	41.59	642.07
Melarani	-	21.93	186.71	-	-	35.95	-	19.55	0.67	409.57
Kil palur	-	61.93	-	315.31	-	-	4.64	79.19	17.74	220.79
Kidampalayam	-	21.93	186.71	-	-	35.95	-	19.55	0.67	409.57
Melpalur	10.00	79.14	-	-	-	-	-	75.41	37.41	170.35
Palan koil	-	86.69	-	-	-	-	85.00	171.38	-	103.27
Pathiyavady	-	234.99	-	-	-	-	4.81	45.52	166.58	243.04
Pillur	-	104.11	-	-	-	0.08	8.94	99.30	6.27	113.15
Sengaputheri	-	43.90	34.23	6.08	0.98	-	-	101.85	8.96	110.06
Sholavaram	-	102.05	-	-	6.32	-	2.25	40.08	3.66	153.16
Thenpalliput	-	107.98	0.65	-	-	-	94.00	332.28	58.63	207.21
Vanniyanur	-	102.58	4.90	-	-	-	81.82	102.05	61.83	135.46

Gram Panchayat	Area under Land Resources (ha)									
	Area under Forest land	Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Area under Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Critica-lops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Siruvallur	-	97.44	63.00	-	-	-	5.50	170.33	-	320.72
Veeralur	-	123.00	21.57	-	-	-	85.78	211.91	26.19	757.46
Elathur	-	102.44	3.50	1.08	12.60	-	2.64	60.98	1.11	76.38
Mottur	-	62.79	2.15	0.66	7.73	-	1.62	37.37	0.68	46.82
Kadalady	-	432.11	-	-	41.27	50.25	-	13.94	34.17	386.53
Singaravady	-	30.87	-	-	2.95	3.59	-	1.00	2.44	27.61
Pattiyandal	-	154.33	-	-	14.74	17.95	-	4.98	12.21	138.05
Thenmathimangalam	-	66.48	-	1.93	3.01	1.72	2.16	126.15	21.20	83.36
Kolimathingalam	-	25.86	-	0.75	1.17	0.67	0.84	49.06	8.25	32.42
Mattavettu	-	114.43	-	1.27	-	4.16	10.92	28.54	6.70	303.77
Kilkuppam	-	76.28	-	0.85	-	2.78	7.28	19.02	4.46	202.52
Ernamangalam	-	60.03	-	-	4.05	53.34	2.71	53.70	16.45	226.29
Gangalamahadevi	-	41.39	1.00	-	-	-	8.26	21.05	3.79	161.40
Kalasapakkam	-	145.46	-	-	-	-	48.11	47.72	7.43	105.65
Kilpotharai	-	56.70	0.30	-	0.32	4.74	99.05	127.22	17.90	89.66
Ladavaram	-	159.12	0.72	-	-	-	55.24	245.82	34.40	252.17
Melsholankuppam	-	151.87	15.42	-	-	-	63.43	83.52	42.76	416.50
Melvilvarayanallur	-	217.60	20.40	-	11.60	2.10	30.00	54.08	66.59	195.36
Poondi	-	150.17	1.35	0.02	0.43	-	5.67	93.88	-	67.39
Seethambattu	-	140.34	13.31	5.95	31.95	1.14	20.63	144.79	-	254.17
Kanthapalyam	-	2.00	1.49	-	-	-	37.34	69.63	1.85	322.79
Venkidampalayam	-	10.06	-	-	-	12.05	17.00	15.36	3.17	102.72

Gram Panchayat	Land under Catchment Area (ha)			Crop Details				
	Good Catchment	Average Catchment	Bad Catchment	Irrigated Area (ha)	Rainfed area (ha)	Paddy Cultivation (ha)	Crop Water Requirement - Irrigated condition (ha.m)	Crop Water Requirement - Rainfed condition (ha.m)
Adamangalam	48.80	0.21	153.57	57.58	-	-	78.57	-
Alangaramangalam	63.38	-	394.54	103.91	4.29	16.55	99.71	1.50
Anaivady	93.75	16.46	287.20	99.96	37.68	26.08	90.09	13.19
Arunagirimangalam	120.08	17.18	582.41	103.91	4.29	16.55	99.71	1.50
padagam	74.52	2.40	650.05	163.76	-	62.38	167.91	-
Aniyalai	74.52	2.40	650.05	85.90	3.86	9.98	107.03	1.35
Deverayanpalayam	36.30	-	283.50	181.28	-	143.84	240.60	-
Gangavaram	166.11	51.53	1016.74	713.95	10.00	545.00	1074.16	3.50
Kallur	75.64	6.34	213.59	79.16	1.87	58.32	97.53	1.21
Kappalur	339.80	8.20	787.97	400.68	2.09	269.90	485.29	0.73
Kambut	37.61	-	199.18	102.53	3.88	34.22	122.03	1.36
Kettavarampalayam	324.14	-	710.79	560.12	5.02	513.58	840.48	1.76
Melarani	208.64	35.95	429.79	82.43	0.12	49.09	111.84	0.04
Kil palur	61.93	315.31	322.36	312.22	-	284.32	457.28	-
Kidampalayam	208.64	35.95	429.79	335.00	3.04	258.50	434.77	1.06
Melpalur	89.14	-	283.17	243.01	-	205.49	346.30	-
Palan koil	86.69	-	359.65	239.03	5.18	213.31	355.50	1.81
Pathiyavady	234.99	-	459.95	306.73	3.11	143.44	326.22	1.25
Pillur	104.11	0.08	227.66	171.47	-	115.27	197.24	-
Sengaputheri	78.13	7.06	220.87	101.89	1.44	46.47	128.82	0.72
Sholavaram	102.05	6.32	199.15	141.43	-	131.32	201.22	-
Thenpalliput	108.63	-	692.12	403.82	-	175.12	412.15	-
Vanniyanur	107.48	-	381.16	133.04	40.76	104.73	186.83	14.26
Siruvallur	160.44	-	496.55	362.80	4.00	299.00	497.60	1.70
Veeralur	144.57	-	1081.34	774.89	4.35	602.09	1021.01	1.52
Elathur	105.95	13.68	141.11	130.84	-	119.28	188.42	-

Gram Panchayat	Land under Catchment Area (ha)			Crop Details				
	Good Catchment	Average Catchment	Bad Catchment	Irrigated Area (ha)	Rainfed area (ha)	Paddy Cultivation (ha)	Crop Water Requirement - Irrigated condition (ha.m)	Crop Water Requirement - Rainfed condition (ha.m)
Mottur	64.94	8.39	86.49	130.84	-	119.28	188.42	-
Kadalady	432.11	91.52	434.64	851.14	5.71	752.49	1187.57	2.14
Singaravady	30.87	6.54	31.05	851.14	5.71	752.49	1187.57	2.14
Pattiyandal	154.33	32.69	155.23	851.14	5.71	752.49	1187.57	2.14
Thenmathimangalam	66.48	6.66	232.87	296.10	13.79	287.48	437.53	8.27
Kolimathingalam	25.86	2.59	90.57	296.10	13.79	287.48	437.53	8.27
Mattavettu	114.43	5.43	349.93	389.42	0.20	174.13	502.99	0.07
Kilkuppam	76.28	3.62	233.28	389.42	0.20	174.13	502.99	0.07
Ernamangalam	60.03	57.39	299.15	241.54	-	203.49	342.93	-
Gangalamahadevi	42.39	-	194.50	214.22	-	171.08	300.08	-
Kalasapakkam	145.46	-	208.91	37.54	-	29.42	51.81	-
Kilpotharai	57.00	5.06	333.83	102.08	1.19	59.81	107.64	0.42
Ladavaram	159.84	-	587.63	326.31	3.23	25.20	513.53	1.13
Melsholankuppam	167.29	-	606.21	808.30	2.60	728.50	1137.53	0.91
Melvilvarayanallur	238.00	13.70	346.03	167.31	-	91.29	202.11	-
Poondi	151.52	0.45	166.94	85.82	-	65.53	119.90	-
Seethambattu	153.65	39.04	419.59	291.54	34.09	65.00	409.43	12.38
Kanthapalyam	3.49	-	431.61	184.88	-	164.08	273.74	-
Venkidampalayam	10.06	12.05	138.25	222.20	5.00	179.13	297.24	1.75

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)					Status of Organic Carbon (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High	Sufficient	Deficient
Adamangalam	1.82	98.18	-	-	-	29.09	69.09	-	-	1.82	52.00	48.00
Alangaramangalam	1.82	98.18	-	-	-	29.09	69.09	-	-	1.82	52.00	48.00
Anaivady	-	100.00	-	-	-	22.92	77.08	-	-	-	37.00	63.00
Arunagirimangalam	39.83	50.00	10.17	-	-	53.39	46.61	-	-	-	25.00	75.00
padagam	3.70	96.30	-	-	-	22.22	77.78	-	-	-	39.00	61.00
Aniyalai	2.00	98.00	-	-	-	16.00	84.00	-	-	-	56.00	44.00
Deverayanpalayam	-	100.00	-	-	-	22.06	77.94	-	-	-	37.00	63.00
Gangavaram	0.71	98.58	0.71	-	-	24.82	75.18	-	-	-	55.00	45.00
Kallur	1.72	98.28	-	-	-	24.14	75.86	-	-	-	47.00	53.00
Kappalur	2.36	97.64	-	-	-	35.43	64.57	-	-	-	59.00	41.00
Kambut	25.61	71.95	2.44	-	-	24.39	62.20	13.41	-	-	47.00	53.00
Kettavarampalayam	9.41	90.10	0.50	-	-	42.79	57.21	-	-	-	58.00	42.00
Melarani	-	100.00	-	-	-	-	100.00	-	-	-	75.00	25.00
Kil palur	8.22	89.04	2.74	-	-	12.33	87.67	-	-	-	56.00	44.00
Kidampalayam	-	100.00	-	-	-	2.13	97.87	-	-	-	68.00	32.00
Melpalur	-	100.00	-	-	-	-	100.00	-	-	-	71.00	29.00
Palan koil	1.59	98.41	-	-	-	20.63	79.37	-	-	-	45.00	55.00
Pathiyavady	-	100.00	-	-	-	4.90	95.10	-	-	-	60.00	40.00
Pillur	18.75	81.25	-	-	-	46.88	53.13	-	-	-	56.00	44.00
Sengaputheri	-	100.00	-	-	-	21.05	78.95	-	-	-	51.00	49.00
Sholavaram	-	98.21	1.79	-	-	1.79	98.21	-	-	-	82.00	18.00
Thenpalliput	28.00	78.00	-	-	-	28.00	78.00	-	-	-	48.00	52.00
Vanniyanur	1.79	98.21	-	-	-	1.79	98.21	-	-	-	68.00	32.00
Siruvallur	-	100.00	-	-	-	-	99.10	0.90	-	-	88.00	12.00
Veeralur	-	100.00	-	-	-	1.38	97.93	0.69	-	-	88.00	12.00
Elathur	6.94	93.06	-	-	-	31.94	68.06	-	-	-	66.00	34.00
Mottur	3.68	77.91	18.40	-	-	13.50	84.66	1.23	-	0.61	56.00	44.00

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)					Status of Organic Carbon (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High	Sufficient	Deficient
Kadalady	3.68	77.91	18.40	-	-	13.50	84.66	1.23	-	0.61	56.00	44.00
Singaravady	3.68	77.91	18.40	-	-	13.50	84.66	1.23	-	0.61	56.00	44.00
Pattiyandal	3.68	77.91	18.40	-	-	13.50	84.66	1.23	-	0.61	56.00	44.00
Thenmathimangalam	30.23	53.49	16.28	-	-	27.91	68.60	2.33	1.16	-	69.00	31.00
Kolimathingalam	30.23	53.49	16.28	-	-	27.91	68.60	2.33	1.16	-	60.00	40.00
Mattavettu	-	100.00	-	-	-	-	100.00	-	-	-	90.00	10.00
Kilkuppam	-	100.00	-	-	-	-	100.00	-	-	-	90.00	10.00
Ernamangalam	10.34	82.76	6.90	-	-	20.69	79.31	-	-	-	56.00	44.00
Gangalamahadevi	-	100.00	-	-	-	28.85	71.15	-	-	-	55.00	45.00
Kalasapakkam	10.00	90.00	-	-	-	10.00	90.00	-	-	-	52.00	48.00
Kilpotharai	5.56	94.44	-	-	-	33.33	66.67	-	-	-	52.00	48.00
Ladavaram	3.92	96.08	-	-	-	33.33	66.67	-	-	-	43.00	57.00
Melsholankuppam	4.65	95.35	-	-	-	32.56	67.44	-	-	-	73.00	27.00
Melvilvarayanallur	-	100.00	-	-	-	7.50	92.50	-	-	-	59.00	41.00
Poondi	-	100.00	-	-	-	3.85	96.15	-	-	-	30.00	70.00
Seethambattu	14.63	75.61	9.76	-	-	21.95	78.05	-	-	-	54.00	46.00
Kanthapalyam	1.72	98.28	-	-	-	24.14	75.86	-	-	-	47.00	53.00
Venkidampalayam	1.72	98.28	-	-	-	24.14	75.86	-	-	-	47.00	53.00

Gram Panchayat	Status of Physical condition of the soil (%)							
	Moderately Acidic	Strongly Acid-ic	Highly Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alka-line
Adamangalam	-	-	-	-	-	1.79	98.21	-
Alangaramangalam	-	-	-	-	-	1.79	98.21	-
Anaivady	-	-	-	-	-	-	100.00	-
Arunagirimangalam	-	-	-	-	-	-	100.00	-
padagam	-	-	-	-	-	-	100.00	-
Aniyalai	-	-	-	-	-	-	100.00	-
Deverayanpalayam	-	-	-	-	-	-	100.00	-
Gangavaram	-	-	-	-	16.31	1.42	82.27	-
Kallur	-	-	-	-	-	-	100.00	-
Kappalur	-	-	-	-	-	-	100.00	-
Kambut	-	-	-	-	-	-	100.00	-
Kettavarampalayam	0.49	-	-	-	0.97	3.88	94.66	-
Melarani	-	-	-	-	-	-	100.00	-
Kil palur	-	-	-	-	-	-	100.00	-
Kidampalayam	0.71	-	-	-	-	-	99.29	-
Melpalur	-	-	-	-	-	-	100.00	-
Palan koil	-	-	-	-	-	-	100.00	-
Pathiyavady	-	-	-	-	-	-	100.00	-
Pillur	3.13	-	-	-	-	-	96.88	-
Sengaputheri	-	-	-	-	-	-	100.00	-
Sholavaram	-	-	-	-	14.29	1.79	83.93	-
Thenpalliput	-	-	-	-	-	-	-	-
Vanniyanur	-	-	-	-	-	-	100.00	-
Siruvallur	-	-	-	1.80	31.53	-	66.67	-
Veeralur	-	-	-	-	3.45	-	96.55	-
Elathur	-	-	-	-	4.17	2.78	93.06	-

Gram Panchayat	Status of Physical condition of the soil (%)							
	Moderately Acidic	Strongly Acidic	Highly Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline
Mottur	-	-	-	-	-	0.61	99.39	-
Kadalady	-	-	-	-	-	0.61	99.39	-
Singaravady	-	-	-	-	-	0.61	99.39	-
Pattiyandal	-	-	-	-	-	0.61	99.39	-
Thenmathimangalam	-	-	-	-	-	-	100.00	-
Kolimathingalam	-	-	-	1.16	22.09	12.79	63.95	-
Mattavettu	-	-	-	0.88	28.32	0.88	69.91	-
Kilkuppam	-	-	-	0.88	28.32	0.88	69.91	-
Ernamangalam	-	-	-	-	10.34	34.48	55.17	-
Gangalamahadevi	-	-	-	1.92	3.85	-	94.23	-
Kalasapakkam	-	-	-	-	-	-	100.00	-
Kilpotharai	-	-	-	-	-	-	100.00	-
Ladavaram	-	-	-	-	1.92	1.92	96.15	-
Melsholankuppam	-	-	-	-	1.16	-	98.84	-
Melvilvarayanallur	-	-	-	-	-	-	100.00	-
Poondi	-	-	-	-	-	-	100.00	-
Seethambattu	-	-	-	-	41.46	34.15	24.39	-
Kanthapalyam	-	-	-	-	-	-	100.00	-
Venkidampalayam	-	-	-	-	-	-	100.00	-

Gram Panchayat	Soil Texture (%)				Soil moisture and ET			Means of Water Extraction (%)	
	Clay soil	Fine Soil	Coarse loamy	Soil Water Permeability (Low, Moderate, high)	Volumetric Soil Moisture (%)	Estimated Soil Moisture (ha.m)	ET Losses (ha.m)	Gravity	Lifting
Adamangalam	-	100.00	-	Moderate	23.00	35.37	56.40	4.81	95.19
Alangaramangalam	-	41.00	1.00	Moderate	23.00	92.07	226.74	4.07	95.93
Anaivady	-	37.00	4.00	Moderate	23.00	69.84	209.74	4.81	95.19
Arunagirimangalam	-	69.00	18.00	Moderate	23.00	137.91	428.02	4.37	95.63
padagam	6.00	67.00	15.00	Moderate	23.00	150.06	280.98	2.37	97.63
Aniyalai	-	80.00	9.00	Moderate	23.00	150.06	280.98	2.70	97.30
Deverayanpalayam	61.00	34.00	-	Low	23.00	65.21	188.39	2.12	97.88
Gangavaram	43.00	40.00	10.00	Low	23.00	246.62	795.78	1.12	98.88
Kallur	-	88.00	-	Moderate	23.00	50.87	126.32	2.55	97.45
Kappalur	-	72.00	-	Moderate	23.00	183.12	253.36	1.26	98.74
Kambut	-	99.00	-	Moderate	23.00	46.43	118.57	2.13	97.87
Kettavarampalayam	-	83.00	3.00	Moderate	23.00	223.39	549.66	1.29	98.71
Melarani	-	76.00	-	Moderate	23.00	150.06	214.15	5.01	94.99
Kil palur	56.00	34.00	-	Low	23.00	146.66	445.29	1.40	98.60
Kidampalayam	15.00	60.00	-	Moderate	23.00	150.06	329.83	-	100.00
Melpalur	70.00	13.00	-	Low	23.00	67.43	175.08	3.22	96.78
Palan koil	8.00	78.00	-	Moderate	23.00	82.72	83.03	-	100.00
Pathiyavady	-	80.00	-	Moderate	23.00	105.79	329.33	2.99	97.01
Pillur	-	65.00	-	Moderate	23.00	52.38	96.01	3.99	96.01
Sengaputheri	-	90.00	-	Moderate	23.00	60.30	101.37	-	100.00
Sholavaram	-	100.00	-	Moderate	23.00	47.26	131.16	4.50	95.50
Thenpalliput	-	99.00	-	Moderate	23.00	159.34	213.74	5.11	94.89
Vanniyanur	-	82.00	-	Moderate	23.00	88.79	158.62	2.60	97.40
Siruvallur	-	81.00	-	Moderate	23.00	128.70	257.86	2.92	97.08
Veeralur	-	-	-	-	23.00	253.67	630.05	2.36	97.64

Gram Panchayat	Soil Texture (%)				Soil moisture and ET			Means of Water Extraction (%)	
	Clay soil	Fine Soil	Coarse loamy	Soil Water Permeability (Low, Moderate, high)	Volumetric Soil Moisture (%)	Estimated Soil Moisture (ha.m)	ET Losses (ha.m)	Gravity	Lifting
Elathur	-	82.00	-	Moderate	23.00	36.41	73.31	-	100.00
Mottur	-	76.00	10.00	Moderate	23.00	22.32	44.94	-	100.00
Kadalady	15.00	70.00	-	Moderate	23.00	121.02	371.42	2.16	97.84
Singaravady	-	51.00	-	Moderate	23.00	8.65	26.53	9.09	90.91
Pattiyandal	-	97.00	3.00	Moderate	23.00	43.22	132.65	100.00	-
Thenmathimangalam	15.15	48.18	30.61	Low	23.00	55.09	88.04	-	100.00
Kolimathingalam	1.00	95.00	-	Moderate	23.00	21.43	34.24	-	100.00
Mattavettu	94.00	1.00	-	Low	23.00	81.73	250.64	0.51	99.49
Kilkuppam	49.00	34.00	-	Low	23.00	54.49	167.09	-	100.00
Ernamangalam	-	90.00	-	Moderate	23.00	82.00	198.42	5.39	94.61
Gangalamahadevi	-	77.00	-	Moderate	23.00	44.97	132.81	-	100.00
Kalasapakkam	-	73.00	-	Moderate	23.00	48.05	90.92	7.23	92.77
Kilpotharai	13.00	74.00	-	Moderate	23.00	78.01	86.74	6.56	93.44
Ladavaram	4.50	80.00	-	Moderate	23.00	135.32	230.40	3.20	96.80
Melsholankuppam	40.00	27.00	24.00	Low	23.00	142.97	369.25	-	100.00
Melvilvarayanallur	-	78.00	7.00	Moderate	23.00	87.43	219.93	-	100.00
Poondi	-	69.00	-	Moderate	23.00	38.81	54.54	10.58	89.42
Seethambattu	23.00	52.00	-	Moderate	23.00	108.55	234.82	3.54	96.46
Kanthapalyam	32.00	59.00	-	Moderate	23.00	99.61	261.01	-	100.00
Venkidampalayam	11.00	86.00	-	Moderate	23.00	34.57	85.14	-	100.00

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)		
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population
Adamangalam	8.25	91.75	345	4	203
Alangaramangalam	16.21	83.79	584	549	234
Anaivady	32.67	67.33	369	52	85
Arunagirimangalam	15.45	84.55	584	549	234
padagam	11.45	88.55	989	554	403
Aniyalai	14.33	85.67	408	130	279
Deverayanpalayam	1.45	98.55	309	-	110
Gangavaram	15.02	84.98	1045	40	337
Kallur	17.32	82.68	604	34	-
Kappalur	34.82	65.18	854	177	83
Kambut	8.47	91.53	513	237	131
Kettavarampalayam	10.75	89.25	1387	636	226
Melarani	-	100.00	-	-	-
Kil palur	18.49	81.51	946	337	172
Kidampalayam	24.91	75.09	1713	142	567
Melpalur	11.74	88.26	760	106	342
Palan koil	42.85	57.15	643	4	43
Pathiyavady	23.39	76.61	939	634	353
Pillur	46.86	53.14	523	97	21
Sengaputheri	19.06	80.94	397	24	129
Sholavaram	7.42	92.58	381	-	44
Thenpalliput	32.72	67.28	856	93	-
Vanniyanur	30.82	69.18	1095	128	115
Siruvallur	48.23	51.77	865	51	126
Veeralur	18.11	81.89	1057	12	160
Elathur	13.80	86.20	226	30	56
Mottur	16.67	83.33	139	19	35

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)		
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population
Kadalady	18.11	81.89	2315	461	751
Singaravady	68.81	31.19	165	33	54
Pattiyandal	100.00	-	3307	658	1073
Thenmathimangalam	25.91	74.09	678	288	312
Kolimathingalam	25.91	74.09	264	112	122
Mattavettu	2.79	97.21	1817	523	700
Kilkuppam	2.79	97.21	1212	349	467
Ernamangalam	22.46	77.54	746	134	173
Gangalamahadevi	22.30	77.70	117	16	59
Kalasapakkam	69.65	30.35	347	65	310
Kilpotharai	20.51	79.49	428	20	18
Ladavaram	40.13	59.87	1498	515	361
Melsholankuppam	1.08	98.92	1207	72	291
Melvilvarayanallur	15.36	84.64	580	52	117
Poondi	37.28	62.72	1	126	29
Seethambattu	19.70	80.30	681	223	273
Kanthapalyam	3.47	96.53	461	37	118
Venkidampalayam	16.36	83.64	461	37	118

ANNEXURE 3.8

GP WISE DEMOGRAPHIC AND SOCIO ECONOMIC STATUS

Key CWRM Parameter\ GP	Geographical Area	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable population (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vulnerable Households (SECC) (No.)
Adamangalam	203	2,033	2,029	4,062	922	7	929	998	72	72	72
Alangaramangalam	458	1,006	968	1,974	-	27	27	502	157	36	121
Anaivady	320	790	743	1,533	765	-	765	389	141	26	107
Arunagirimangalam	720	1,429	1,381	2,810	1,072	-	1,072	621	39	40	39
padagam	727	1,578	1,516	3,094	697	-	697	788	86	64	79
Aniyalai	402	860	839	1,699	241	-	241	405	80	19	62
Deverayanpalayam	320	790	743	1,533	765	-	765	389	141	26	107
Gangavaram	1,234	2,438	2,318	4,756	1,572	6	1,578	1,121	223	62	175
Kallur	296	811	818	1,629	380	-	380	406	34	28	32
Kappalur	1,136	1,560	1,527	3,087	1,117	11	1,128	771	114	47	94
Kambut	237	656	666	1,322	-	-	-	334	36	22	32
Kettavarampalayam	1,035	2,866	2,824	5,690	31	-	31	1,340	112	68	99
Melarani	295	1,448	1,363	2,811	697	-	697	586	90	34	73
Kil palur	380	1,865	1,867	3,732	721	32	753	908	64	61	63
Kidampalayam	674	1,423	1,422	2,845	109	17	126	668	116	39	93
Melpalur	362	1,100	1,078	2,178	793	-	793	494	92	23	71
Palan koil	446	1,031	1,081	2,112	411	60	471	531	131	34	102
Pathiyavady	695	1,241	1,204	2,445	583	43	626	600	78	33	65
Pillur	332	764	755	1,519	507	8	515	380	33	23	30
Sengaputheri	306	929	903	1,832	599	-	599	424	41	34	39
Sholavaram	308	846	909	1,755	445	-	445	445	45	29	40
Thenpalliput	801	1,438	1,380	2,818	1,027	20	1,047	721	45	65	51
Vanniyanur	489	1,332	1,290	2,622	478	-	478	659	60	42	55
Siruvallur	657	2,627	2,638	5,265	979	7	986	1,229	136	96	124

Key CWRM Parameter\ GP	Geographical Area	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable population (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vulnerable Households (SECC) (No.)
Veeralur	1,226	2,458	2,354	4,812	1,187	10	1,197	1,316	163	57	131
Elathur	260	678	688	1,366	245	-	245	263	65	18	51
Mottur	165	915	948	1,863	191	-	191	784	104	57	90
Kadalady	1,295	3,902	3,828	7,730	2,804	22	2,826	2,501	501	164	400
Singaravady	33	475	472	947	-	-	-	2,501	501	164	400
Pattiyandal	354	713	703	1,416	205	-	205	263	65	18	51
Thenmathimangalam	114	712	697	1,409	21	16	37	263	65	18	51
Kolimathingalam	311	747	687	1,434	228	-	228	700	21	14	19
Mattavettu	480	759	713	1,472	698	-	698	837	100	47	84
Kilkuppam	303	761	766	1,527	399	-	399	837	100	47	84
Ernamangalam	417	1,486	1,385	2,871	1,072	-	1,072	753	59	47	55
Gangalamahadevi	237	505	501	1,006	435	-	435	248	84	15	63
Kalasapakkam	354	2,518	2,537	5,055	1,065	56	1,121	1,273	78	76	77
Kilpotharai	396	868	899	1,767	357	-	357	416	40	18	33
Ladavaram	747	1,775	1,780	3,555	292	-	292	905	192	70	155
Melsholankuppam	774	2,933	2,805	5,738	1,182	-	1,182	1,310	69	66	68
Melvilvarayanallur	598	1,437	1,402	2,839	1,079	-	1,079	637	86	29	69
Poondi	319	896	897	1,793	665	6	671	454	154	45	121
Seethambattu	612	1,061	1,104	2,165	886	-	886	549	118	55	99
Kanthapalyam	435	1,721	1,742	3,463	-	-	-	772	50	45	49
Venkidampalayam	160	649	656	1,305	386	18	-	775	18	35	23

Key CWRM Parameter\GP	% of Vulnerable House-holds (%)	Registered MGNRE-GA Job cards (Per-sons)	Active person working in MGNREGA job Cards (Persons)	Drinking Water Sources (No.)	Ground Water - Drinking source (No.)	Surface wa-ter - Drink-ing source (No.)	sum of drinking water sources (No.)	HH's have tap water connection for drinking water (No.)	HH's de-pendent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Adamangalam	7.00	1,572	1,409	720	5	1	6	6,020	1,204	7
Alangaramangalam	24.00	1,098	832	48	5	1	6	-	576	4
Anaivady	27.00	1,008	945	78	5	2	7	-	74	3
Arunagirimangalam	6.00	1,047	812	161	3	1	4	330	217	5
padagam	10.00	1,368	1,072	212	5	1	6	-	129	6
Aniyalai	15.00	856	713	159	4	1	5	-	395	3
Deverayanpalayam	27.00	1,008	945	69	4	1	5	-	208	3
Gangavaram	16.00	2,585	2,284	92	5	2	7	-	164	9
Kallur	7.93	924	783	-	4	2	6	-	91	3
Kappalur	12.00	1,081	904	163	5	1	6	-	143	6
Kambut	10.00	795	730	18	4	1	5	-	45	2
Kettavarampalayam	7.00	2,879	2,387	219	5	2	7	-	821	10
Melarani	12.49	1,082	790	142	5	2	7	-	145	5
Kil palur	7.00	1,254	915	359	4	1	5	499	372	7
Kidampalayam	13.91	1,737	1,563	140	5	3	8	180	119	5
Melpalur	14.00	1,134	918	279	5	2	7	831	266	4
Palan koil	19.00	980	757	175	4	2	6	-	200	4
Pathiyavady	11.00	1,322	1,019	88	4	1	5	-	114	4
Pillur	7.89	697	529	165	4	2	6	-	234	3
Sengaputheri	9.00	493	411	100	5	1	6	-	308	3
Sholavaram	9.00	730	564	293	5	2	7	392	243	3
Thenpalliput	7.00	1,006	947	60	5	2	7	-	36	5
Vanniyanur	8.00	1,401	1,123	259	5	1	6	658	300	5
Siruvallur	10.00	2,154	1,711	324	5	2	7	-	1,309	10
Veeralur	10.00	2,472	2,065	223	4	2	6	-	826	9

Key CWRM Parameter\GP	% of Vulnerable House-holds (%)	Registered MGNRE-GA Job cards (Per-sons)	Active person working in MGNREGA job Cards (Persons)	Drinking Water Sources (No.)	Ground Water - Drinking source (No.)	Surface wa-ter - Drink-ing source (No.)	sum of drinking water sources (No.)	HH's have tap water connection for drinking water (No.)	HH's de-pendent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Elathur	19.00	595	429	60	4	1	5	-	-	2
Mottur	11.00	880	654	102	4	1	5	-	-	3
Kadalady	16.00	2,208	2,014	276	4	-	4	-	-	14
Singaravady	16.00	306	211	49	4	-	4	-	-	2
Pattiyandal	19.00	767	659	-	1	1	2	-	-	3
Thenmathimangalam	19.00	606	474	74	4	-	4	-	-	3
Kolimathingalam	3.00	644	534	65	4	1	5	-	-	3
Mattavettu	10.00	744	554	461	4	1	5	-	-	3
Kilkuppam	10.00	1,066	878	66	4	1	5	-	-	3
Ernamangalam	7.36	1,046	903	68	4	1	5	-	-	5
Gangalamahadevi	25.52	594	530	-	1	1	2	-	-	2
Kalasapakkam	6.08	1,203	804	6,887	4	4	8	-	-	9
Kilpotharai	8.00	982	664	67	4	1	5	-	-	2
Ladavaram	17.00	1,835	1,575	6,835	4	1	5	-	-	6
Melsholankuppam	5.20	2,741	2,317	-	1	1	2	-	-	10
Melvilvarayanallur	10.82	1,152	833	-	1	1	2	-	-	5
Poondi	27.00	805	440	463	4	3	7	325	-	3
Seethambattu	5.00	844	698	718	3	1	4	-	-	4
Kanthapalyam	6.00	2,029	1,882	-	1	1	2	-	-	6
Venkidampalayam	2.98	732	601	344	4	1	5	-	-	2

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

Key CWRM Parameter	Forest Land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Crit-icalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
Adamangalam	-	2.00	-	0.16	-	-	3.64	2.76	-	15.10
Alangaramangalam	-	-	4.33	-	-	-	4.94	22.12	50.89	7.03
Anaivady	-	46.88	-	16.46	-	-	2.35	7.18	21.67	14.70
Arunagirimangalam	-	60.04	-	-	9.29	3.59	-	3.75	11.78	19.42
padagam	-	-	-	-	-	1.80	0.33	29.72	-	34.95
Aniyalai	-	0.81	0.97	-	-	-	0.71	4.10	-	110.12
Deverayanpalayam	-	-	-	-	-	-	1.78	11.50	-	63.26
Gangavaram	-	81.07	2.98	35.94	-	2.71	0.61	11.37	25.90	124.80
Kallur	-	3.87	0.92	-	3.15	1.61	0.28	4.58	3.00	11.55
Kappalur	-	33.68	-	-	-	6.15	9.70	47.04	1.78	36.04
Kambut	-	17.46	2.03	-	-	-	0.44	4.73	2.23	12.52
Kettavarampalayam	-	-	195.37	-	-	-	-	1.90	2.91	44.94
Melarani	-	16.45	10.42	-	8.59	-	-	-	-	9.47
Kil palur	-	-	-	236.48	-	-	0.32	5.54	1.24	15.46
Kidampalayam	-	4.03	140.03	-	-	26.96	-	2.72	0.09	40.96
Melpalur	4.00	0.99	-	-	-	-	-	10.56	5.24	23.85
Palan koil	-	43.35	-	-	-	-	16.15	32.56	-	19.62
Pathiyavady	-	32.46	-	-	-	-	0.53	5.01	18.32	26.73
Pillur	-	11.45	-	-	-	0.06	0.71	7.84	0.50	11.32
Sengaputheri	-	21.95	25.67	4.56	0.74	-	-	9.17	0.81	9.91
Sholavaram	-	13.46	-	-	4.74	-	0.20	3.61	0.33	13.78
Thenpalliput	-	53.99	0.49	-	-	-	6.58	23.26	4.10	14.50
Vanniyanur	-	1.02	3.68	-	-	-	6.55	8.16	4.95	10.84

Key CWRM Parameter	Forest Land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Critcalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
Siruvallur	-	48.72	47.25	-	-	-	0.55	17.03	-	32.07
Veeralur	-	-	16.18	-	-	-	8.58	21.19	2.62	75.75
Elathur	-	19.76	2.63	0.81	9.45	-	0.50	11.59	0.21	14.51
Mottur	-	12.11	1.61	0.50	5.79	-	0.18	4.11	0.07	5.15
Kadalady	-	17.28	-	-	30.95	37.69	-	13.94	34.17	73.44
Singaravady	-	7.74	-	-	2.21	2.69	-	1.00	2.44	5.25
Pattiyandal	-	38.72	-	-	11.05	13.46	-	0.95	2.32	26.23
Thenmathimangalam	-	1.15	-	1.45	2.26	1.29	0.41	23.97	4.03	15.84
Kolimathingalam	-	0.45	-	0.56	0.88	0.50	0.03	1.47	0.25	0.97
Mattavettu	-	4.99	-	0.95	-	3.12	1.09	2.85	0.67	30.38
Kilkuppam	-	3.32	-	0.64	-	2.08	0.73	1.90	0.45	20.25
Ernamangalam	-	30.02	-	-	3.04	40.01	0.20	3.97	1.22	22.63
Gangalamahadevi	-	7.60	0.75	-	-	-	2.11	5.37	0.97	16.14
Kalasapakkam	-	2.44	-	-	-	-	2.93	2.90	0.45	10.57
Kilpotharai	-	28.35	0.23	-	0.24	3.56	7.92	10.18	1.43	7.17
Ladavaram	-	2.05	0.54	-	-	-	9.39	41.79	5.85	42.87
Melsholankuppam	-	2.55	11.57	-	-	-	3.30	4.34	2.22	41.65
Melvilvarayanallur	-	3.66	15.30	-	8.70	1.58	3.24	5.85	7.20	19.54
Poondi	-	40.68	1.01	0.02	0.32	-	1.53	25.35	-	18.20
Seethambattu	-	2.36	9.98	4.46	23.96	0.86	3.72	26.14	-	25.42
Kanthapalyam	-	1.00	1.12	-	-	-	-	-	-	32.28
Venkidampalayam	-	5.03	-	-	-	9.04	-	-	-	10.27

Land Resources - WASCA Treatment Proposed Area	logic
Treatment Area under Forest Land	40% of the total Area (area after removal of potential voids)
Treatment Area under Non-Agricultural Uses	Identifying Additional Area available for recharge & plantation(if area is above 20 %: consider all the additional area for treatment(ex 24.86 %, 4.86 % is proposed): if the % area is between 15-20 % only, consider 50 % of additional area)
Treatment Area under Barren & Un-cultivable Land	75% of the total Area (area after removal of potential voids)
Treatment Area under Permanent Pastures and Other Grazing Land	75% of the total Area (potential area for treatment after removal of voids)
Treatment Area under Land Under Miscellaneous Tree Crops etc.	75% of the total Area (non- voids area)
Treatment Area under Cultivable Waste Land	75% of the total Area (non- voids area)
Treatment Area under Fallows Land other than Current Fallows	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
Treatment Area under Current Fallow land	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
Treatment Area under Unirrigated Land	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
Treatment Area Irrigated by Source	Bore Well Farmer Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF

ANNEXURE 5.2

GP WISE EXPECTED RUNOFF CONSERVATION AFTER WASCA TREATMENT

Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Adamangalam	5	0	4
Alangaramangalam	3	-	16
Anaivady	17	5	9
Arunagirimangalam	18	4	7
padagam	7	1	13
Aniyalai	2	-	23
Deverayanpalayam	5	-	15
Gangavaram	25	11	32
Kallur	11	1	16
Kappalur	18	2	19
Kambut	11	-	4
Kettavarampalayam	49	-	10
Melarani	17	2	3
Kil palur	5	70	4
Kidampalayam	44	8	8
Melpalur	4	-	8
Palan koil	27	-	13
Pathiyavady	15	-	10
Pillur	5	-	4
Sengaputheri	15	2	4
Sholavaram	7	1	4
Thenpalliput	35	-	9
vanniyanur	4	-	6
Siruvallur	42	-	10
Veeralur	30	-	21
Elathur	9	3	5
Mottur	8	2	2
Kadalady	95	20	24
Singaravady	4	1	2
Pattiyandal	46	7	6
Thenmathimangalam	1	1	9
Kolimathingalam	1	1	1
Mattavettu	3	1	7
Kilkuppam	3	1	5
Ernamangalam	16	12	5
Gangalamahadevi	4	-	5
Kalasapakkam	3	-	3
Kilpotharai	16	1	5
Ladavaram	5	-	20
Melsholankuppam	9	-	10

Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Melvilvarayanallur	7	3	7
Poondi	20	0	9
Seethambattu	46	8	10
Kanthapalyam	-	-	21
Venkidampalayam	2	3	6

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.
Adamangalam	1,596	2	-	-	2,924	72	-	-	-	-	72
Alangaramangalam	-	-	-	-	318	25	-	-	-	-	25
Anaivady	-	-	-	-	3,675	25	-	-	-	-	25
Aniyalai	12,000	15	-	-	1,820	62	13,139	16	-	-	62
Arunagirimangalam	48,032	60	-	-	3,675	39	10,308	13	-	-	39
Deverayanpalayam	-	-	-	-	1,218	107	-	-	-	-	107
Elathur	-	-	-	-	1		-	-	-	-	
Ernamangalam	-	-	-	-	3,038	55	3,200	4	-	-	75
Gangalamahadevi	-	-	-	-	5,581		-	-	-	-	
Gangavaram	64,856	81	-	-	5,293	175	4,548	6	-	-	175
Kadalady	-	-			769		-	-	-	-	
Kalasapakkam	-	-	-	-	975		-	-	-	-	
Kalur	-	-	-	-	2,660	24	114,400	143	393	1,964	24
Kambut	13,964	17	-	-	4,237	32	1,620	2	-	-	32
Kanthapalayam	-	-	-	-	2,946		-	-	-	-	
Kappalur	26,947	34	-	-	318	94	4,920	6	-	-	94
Kettavarampalayam	-	-	-	-	135	99	156,294	195	-	-	99
Kidampalayam	-	-	-	-	1,807	40	-	-	-	-	40
Kil palur	-	-	-	-	5,439	63	-	-	-	-	63
Kilkuppam	2,659	3	-	-	-	84	1,666	2	340	1,700	84
Kilpotharai	22,680	28	-	-	-	33	3,216	4	516	2,580	33
Koilmathingalam	357	0	-	-	-	19	1,104	1	290	1,450	19
Ladavaram	1,639	2	-	-	-	155	432	1	1,300	6,500	155
Mattavettu	3,988	5	-	-	-	84	2,498	3	380	1,900	84

Gram Panchayat	Aff		ARS	AVP		Az	BP		CBP		CS
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Length	No.
Melpalur	796	1	-	-	-	71	-	-	120	600	71
Melarani	8,334	10	-	-	-	-	20,372	25	664	3,320	-
Melsholankuppam	-	-	-	-	-		-	-	-	-	
Melvilvarayanallur	-	-	-	-	-		-	-	-	-	
Mottur	9,689	12	-	-	-	90	5,923	7	540	2,700	90
Padagam	-	-	-	-	-	79	1,440	2	-	-	79
Palan koil	34,676	43	-	-	1,205	102	-	-	-	-	102
Pathiyavady	25,970	32	-	-	-	65	-	-	-	-	65
Pattiyandal	-	-		-	915		-	-	-	-	
Pillur	-	-	-	-	1,440	38	-	-	-	-	38
Poondi	32,543	41	-	-	-	121	1,068	1	500	2,500	121
Seethambattu	-	-	-	-	9,005		-	-	-	-	
Sengaputheri	17,560	22	-	-	-	39	21,126	26	-	-	39
Sholavaram	10,764	13	-	-	-	40	3,792	5	370	1,850	40
Singaravady	-	-			3,093		-	-	-	-	
Siruvallur	38,976	49	-	42	211	124	37,800	47	-	-	124
Thenmathimangalam	-	-	-	1,159	5,795		-	-	-	-	
Thenpalliput	43,192	54		797	3,985	51	392	0	-	-	51
Vanniyanur	815	1	-	1,142	5,710	55	2,940	4	-	-	55
Veeralur	-	-	-	144	720	131	12,942	16	-	-	131
Venkidampalayam	-	-	-	-	-		-	-	-	-	

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Length	Plants	Length	No.	Area	No.	Area
Adamangalam	72	2	-	4	40	1,111	20	-	-	2,762	14	1	3
Alangaramangalam	25	-	-	10	5	-	-	369	1,843			-	-
Anaivady	25	-	-	7	7	-	-	585	2,926			-	-
Aniyalai	62	4	-	5	72	-	-	757	3,784	2,762	14	4	13
Arunagirimangalam	39	6	-	21	109	16,247	108	-	-	3,494	17	3	8
Deverayanpalayam	107	6	-	6	92	1,421	77	-	-	7,655	38	3	7
Elathur		-	-	-	-	-	-	-	-			-	-
Ernamangalam	75	5	-	3	78	-	-	-	-			-	-
Gangalamahadevi		-	-	-	-	-	-	-	-			-	-
Gangavaram	175	16	-	41	265	28,592	285	-	-	16,268	81	8	19
Kadalady		-	-	-	-	-	-	-	-			-	-
Kalasapakkam		-	-	-	-	-	-	-	-			-	-
Kalur	24	-	-	6	38	-	-	-	-			121	303
Kambut	32	4	-	8	46	4,682	39	-	-	1,992	10	1	4
Kanthapalayam		-	-	-	-	-	-	-	-			-	-
Kappalur	94	23	-	32	78	13,897	134	-	-	9,456	47	12	29
Kettavarampalayam	99	2	-	41	229	39,784	245	-	-	4,976	25	1	2
Kidampalayam	40	-	-	10	10	-	-	1,400	6,998			-	-
Kil palur	63	4	-	51	71	48,078	259	-	-	2,257	11	1	4
Kilkuppam	84	3	-	6	197	1,713	29	-	-	2,333	12	1	2
Kilpotharai	33	8	-	17	29	8,456	59	-	-	2,671	13	4	10
Koilmathingalam	19	3	-	7	34	686	5	-	-	272	1	1	1
Ladavaram	155	23	-	25	60	6,281	102	-	-	9,990	50	11	29
Mattavettu	84	3	-	6	197	2,471	44	-	-	3,499	18	1	2
Melpalur	71	6	-	8	60	1,838	45	-	-	3,964	20	3	8
Melarani	-	3	-	7	38	-	-	725	3,626			13	33
Melsholankuppam		-	-	-	-	-	-	-	-			-	-

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Length	Plants	Length	No.	Area	No.	Area
Melvilvarayanallur		-	-	-	-	-	-	-	-			-	-
Mottur	90	4	-	9	42	4,481	30	-	-	951	5	1	2
Padagam	79	13	-	14	124	3,489	67	-	-	6,501	33	6	15
Palan koil	102	19	-	28	24	13,564	112	-	-	6,833	34	10	24
Pathiyavady	65	10	-	16	97	8,976	83	-	-	5,059	25	5	12
Pattiyandal		-	-	-	-	-	-	-	-			-	-
Pillur	38	-	-	18	11	-	-	435	2,175			-	-
Poondi	121	11	-	22	17	11,111	87	-	-	4,507	23	5	13
Seethambattu		-	-	-	-	-	-	-	-			-	-
Sengaputheri	39	5	-	16	36	11,616	73	-	-	1,988	10	2	5
Sholavaram	40	3	-	7	42	4,095	36	-	-	1,792	9	1	2
Singaravady		-	-	-	-	-	-	-	-			-	-
Siruvallur	124	8	-	27	66	21,019	146	-	-	4,966	25	4	9
Thenmathimangalam		-	-	-	-	-	-	-	-			-	-
Thenpalliput	51	14	-	26	56	14,346	103	-	-	4,845	24	7	17
Vanniyanur	55	8	-	10	37	2,942	35	-	-	3,049	15	4	10
Veeralur	131	13	-	15	248	6,722	124	-	-	10,813	54	6	16
Venkidampalayam		-	-	-	-	-	-	-	-			-	-

Gram Panchayat	FD	GSS	ICP		LDI		LP		MI		NADEP
	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.
Adamangalam	72		-	-	3	3	671	2,852	-	-	72
Alangaramangalam		25	-	-	-	-	531	2,654	-	-	25
Anaivady		25	-	-	-	-	248	1,238	-	-	25
Aniyalai	62		-	-	1	2	1,176	5,880	-	-	62
Arunagirimangalam	39		-	-	3	8	984	4,918	-	-	39
Deverayanpalayam	107		-	-	3	7	364	1,821	-	-	107
Elathur			-	-	-	-	-	-	-	-	
Ernamangalam		16	-	-	-	-	291	1,456	-	-	55
Gangalamahadevi			-	-	-	-	-	-	-	-	
Gangavaram	175		-	-	8	19	631	3,157	-	-	175
Kadalady			-	-	-	-	905	4,523	-	-	
Kalasapakkam			-	-	-	-	429	2,145	-	-	
Kalur		9	-	-	4	9	79	395	-	-	24
Kambut	32		-	-	1	4	277	1,384	-	-	32
Kanthapalayam			-	-	-	-	-	-	-	-	
Kappalur	94		-	-	12	29	908	4,539	-	-	94
Kettavarampalayam	99		-	-	1	2	1,257	6,283	-	-	99
Kidampalayam		40	-		11	27	-	-	-	-	
Kil palur	63		-	-	1	4	570	2,849	-	-	63
Kilkuppam	84		-	-	1	2	163	817	-	-	84
Kilpotharai	33		-	-	4	10	540	2,700	-	-	33
Koilmathingalam	19		-	-	-	1	180	902	-	-	19
Ladavaram	155		-	-	11	29	910	4,548	-	-	155
Mattavettu	84		-	-	1	2	925	4,625	-	-	84
Melpalur	71		-	-	3	8	552	2,758	-	-	71
Melarani		-	-	-	5	13	387	1,935	-	-	-
Melsholankuppam			-	-	-	-	-	-	-	-	

Gram Panchayat	FD	GSS	ICP		LDI		LP		MI		NADEP
	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.
Melvilvarayanallur			-	-	-	-	-	-	-	-	
Mottur	90		-	-	1	2	197	987	-	-	90
Padagam	79		-	-	6	15	898	4,490	-	-	79
Palan koil	102		400	2,000	10	24	204	1,020	-	-	102
Pathiyavady	65		-	-	5	12	1,236	6,179	-	-	65
Pattiyandal			-	-	-	-	225	1,123	-	-	
Pillur		38	-	-	5	12	463	2,315	-	-	38
Poondi	121		900	4,500	5	13	734	3,670	-	-	121
Seethambattu			-	-	-	-	629	3,145	-	-	
Sengaputheri	39		-	-	2	5	120	600	-	-	39
Sholavaram	40		-	-	1	2	496	2,479	-	-	40
Singaravady			-	-	-	-	251	1,256	-	-	
Siruvallur	124		-	-	4	-	-	-	-		
Thenmathimangalam			-	-	-	17	1,408	7,038	-	-	51
Thenpalliput	51		-	-	7	10	455	2,273			55
Vanniyanur	55		-	-	4	16	1,059	5,293	-	-	131
Veeralur	131		-	-	6	-	-	-	-	-	
Venkidampalayam			-	-	-						

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	No.	Area	No.	No.	Length
Adamangalam	4,990	998	-	2	-	6	2	126	0	10		-
Alangaramangalam	640	128	-	1	-	3	2	-	-	1		-
Anaivady	1,085	217	-	2	-	-	2	2	14	1	25	-
Aniyalai	2,025	405	-	2	-	-	2	-	-	4		-
Arunagirimangalam	3,105	621	-	5	8	-	2	-	-	6		-
Deverayanpalayam	1,945	389	-	2	6	-	2	-	-	4		-
Elathur			-	-	-	1	2	-	-	-		-
Ernamangalam	275	55	-	4	-	2	2	-	-	5	380	-
Gangalamahadevi			-	-	-	-	2	-	-	-		-
Gangavaram	5,605	1,121	-	3	8	-	2	28,752	36	11		-
Kadalady				4	-	9	2	-	-	-		-
Kalasapakkam			-	1	-	1	2	-	-	-		-
Kalur	406	81	-	1			2	-	-	4	32	-
Kambut	1,670	334	-	1	-	5	2	-	-	3		-
Kanthapalayam			-				2	-	-	-		-
Kappalur	3,855	771	-	1	-	5	2	-	-	8		-
Kettavarampalayam	6,700	1,340	-	3	-	6	2	-	-	13		-
Kidampalayam	200	40	-	-	-	7	2	-	-	4	40	
Kil palur	4,540	908	-	1	-	9	2	189,186	236	9		-
Kilkuppam	4,185	837	-	-	-	2	2	509	1	8		-
Kilpotharai	2,080	416	-	2	-	5	2	-	-	4		-
Koilmathingalam	3,500	700	-			6	2	450	1	7		-
Ladavaram	4,525	905	-	2	-	5	2	-	-	9		-
Mattavettu	4,185	837	-	1	-	6	2	763	1	8		-
Melpalur	2,470	494	-	2		3	2	-	-	5		-
Melarani	585	117	-	2	-	2	2	-	-	6	73	-
Melsholankuppam			-	-	-	-	2	-	-	-		-
Melvilvarayanallur			-	-	-	-	2	-	-	-		-

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	No.	Area	No.	No.	Length
Mottur	3,920	784	-	-	-	7	2	397	1	8		-
Padagam	3,940	788	-	3	-	5	2	-	-	8		-
Palan koil	2,655	531	-	-	-	7	2	-	-	5		2,000
Pathiyavady	3,000	600	-	3	-	7	2	-	-	6		-
Pattiyandal			-	2	-	4	2	-	-	-		-
Pillur	950	190	-	1	-	4	2	-	-			-
Poondi	2,270	454	-	2	-	6	2	12	0	5		4,500
Seethambattu			-	3	-	7	2	-	-			-
Sengaputheri	2,120	424	-	-	4	-	2	3,648	5	4		-
Sholavaram	2,225	445	-	2	2	-	2	-	-	4		-
Singaravady				1	-	3	2	-	-	-		-
Siruvallur			-	-	-	1	2	-	-	-		-
Thenmathimangalam	3,605	721		3	-	11	2	-	-	7		-
Thenpalliput	3,295	659	-	1								
Vanniyanur	6,580	1,316	-	6	-	4	2	-	-	13		-
Veeralur			-	-	-	3	2	-	-	-		-
Venkidampalayam												

ANNEXURE 7.1

GP WISE WASCA RECOMMENDATION AND WORKS UPLOADED

S. No	GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 02/02/2022
1	Adamangalam	535	42
2	Alangaramangalam	576	85
3	Anaivady	415	83
4	Aniyalai	446	92
5	Arunagirimangalam	599	335
6	Devarayanpalayam	634	130
7	Elathur	313	14
8	Ernamangalam	892	854
9	Gengalamadevi	230	126
10	Gengavaram	1509	22
11	Kadalady	2470	557
12	Kalasapakkam	127	122
13	Kalur	389	505
14	Kampattu	343	15
15	Kanthapalayam	156	29
16	Kappalur	823	177
17	Kettavarampalayam	991	834
18	Kidampalayam	159	86
19	Kilkuppam	839	244
20	Kilpalur	725	287
21	Kilpotharai	382	328
22	Koilmathimangalam	266	170
23	Ladavaram	1261	30
24	Mattavettu	1112	17
25	Melarani	247	199
26	Melpalur	676	40
27	Mel Sholankuppam	644	20
28	Melvilvarayanallur	477	56
29	Mottur	734	12
30	Padagam	916	15
31	Palankoil	891	170
32	Pathiyavady	756	343
33	Pattiyandal	143	16
34	Pillur	224	26
35	Poondi	997	233
36	Seetambattu	458	437
37	Sengaputheri	500	276
38	Sholavaram	432	14
39	Singaravady	308	165
40	Siruvallur	992	226
41	Then Magadevamangalam	223	255

S. No	GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 02/02/2022
42	**ThenPallipet**	688	303
43	**Vanniyanur**	497	317
44	**Venkatampalayam**	174	176
45	**Veeralur**	511	58

ANNEXURE 7.2

GP AND WORK CATEGORY-WISE ONGOING WORKS IN KALASAPAKKAM BLOCK

GP	Work Category	Ongoing works
Alliyandal	Works on Individuals Land (Category IV)	2
Anadimangalam	Rural Connectivity	1
	Works on Individuals Land (Category IV)	2
Anmarudai	Works on Individuals Land (Category IV)	3
Arasambattu	Works on Individuals Land (Category IV)	1
Ariyapadi	Drought Proofing	1
Avaniyapuram	Works on Individuals Land (Category IV)	3
Chandrambadi	Works on Individuals Land (Category IV)	3
Endal	Water Conservation and Water Harvesting	2
Erumbur	Drought Proofing	1
Isakolathur	Works on Individuals Land (Category IV)	3
Jagnnathapuram	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Kalyanapuram	Works on Individuals Land (Category IV)	2
Kolappalur	Works on Individuals Land (Category IV)	3
Kolipuliyur	Works on Individuals Land (Category IV)	2
Kottupakkam	Works on Individuals Land (Category IV)	3
Marakkunam	Works on Individuals Land (Category IV)	2
Melanur	Works on Individuals Land (Category IV)	3
Melapoondi	Works on Individuals Land (Category IV)	1
Melathangal	Works on Individuals Land (Category IV)	1
Melnandhiyambadi	Works on Individuals Land (Category IV)	2
Melsathamangalam	Works on Individuals Land (Category IV)	1
Morakaniyanur	Works on Individuals Land (Category IV)	1
Mosavadi	Works on Individuals Land (Category IV)	1
Namathodu	Works on Individuals Land (Category IV)	1
Nambedu	Rural Sanitation	1
	Works on Individuals Land (Category IV)	4
Narayanamangalam	Works on Individuals Land (Category IV)	1
Nariyambadi	Drought Proofing	1
Pernambakkam	Water Conservation and Water Harvesting	1
Poongunam	Works on Individuals Land (Category IV)	2
Ragunadasamudram	Works on Individuals Land (Category IV)	5
Semmambadi	Works on Individuals Land (Category IV)	1
Septankulam	Water Conservation and Water Harvesting	2
Solaiarugavur	Works on Individuals Land (Category IV)	1
Thadinolambai	Water Conservation and Water Harvesting	1
Vallam	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	3
Veppambattu	Works on Individuals Land (Category IV)	3
Villanallur	Water Conservation and Water Harvesting	2

GP	Work Category	Ongoing works
Vinayagapuram	Works on Individuals Land (Category IV)	1
Visamangalam	Works on Individuals Land (Category IV)	3

ANNEXURE 8

CWRM KEY INDICATORS FOR GPs IN VEERALUR MICRO-WATERSHED

CWRM Parameter	Veeralur	Mel Ssholankuppam
Soil Resources: Status of Available Nitrogen (%)		
Very Low	0.00	4.65
Low	100.00	95.35
Status of Organic Carbon (%)		
Very Low	1.38	32.56
Low	97.93	67.44
Medium	0.69	0.00
Status of Soil Micro Nutrients (%)		
Sufficient	88.00	73.00
Deficient	12.00	27.00
Status of Physical condition of the soil (%)		
Slighly Acidic	3.45	1.16
Moderately Alkaline	96.55	98.84
Soil Texture (%)		
Clay soil	0.00	40.00
Fine Soil	0.00	27.00
Course loamy	0.00	24.00
Soil Water Permeability (Low, Moderate, high)		Low
Soil moisture and ET		
Volumetric Soil Moisture (%)	23.00	23.00
Estimated Soil Moisture (ha.m)	253.67	142.97
ET Losses (ha.m)	630.05	369.25
Means of Water Extraction (%)		
Gravity	2.36	0.00
Lifting	97.64	100.00
Irrigation Methods (%)		
Wild Flooding	18.11	1.08
Control Flooding	81.89	98.92
Livestock (No.)		
Cattle Population	1057	1207
Sheep Population	12	72
Goat Population	160	291
Land Resources (ha)		
Non-Agricultural Uses	123.00	151.87
Area under Barren & Un-cultivable Land	21.57	15.42
Fallows Land other than Current Fallows	85.78	63.43
Current Fallow land	211.91	83.52
Unirrigated Land	26.19	42.76
Area Irrigated by Source	757.46	416.50

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