Ministry of Rural Development Ministry of Jal Shakthi

WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA

Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

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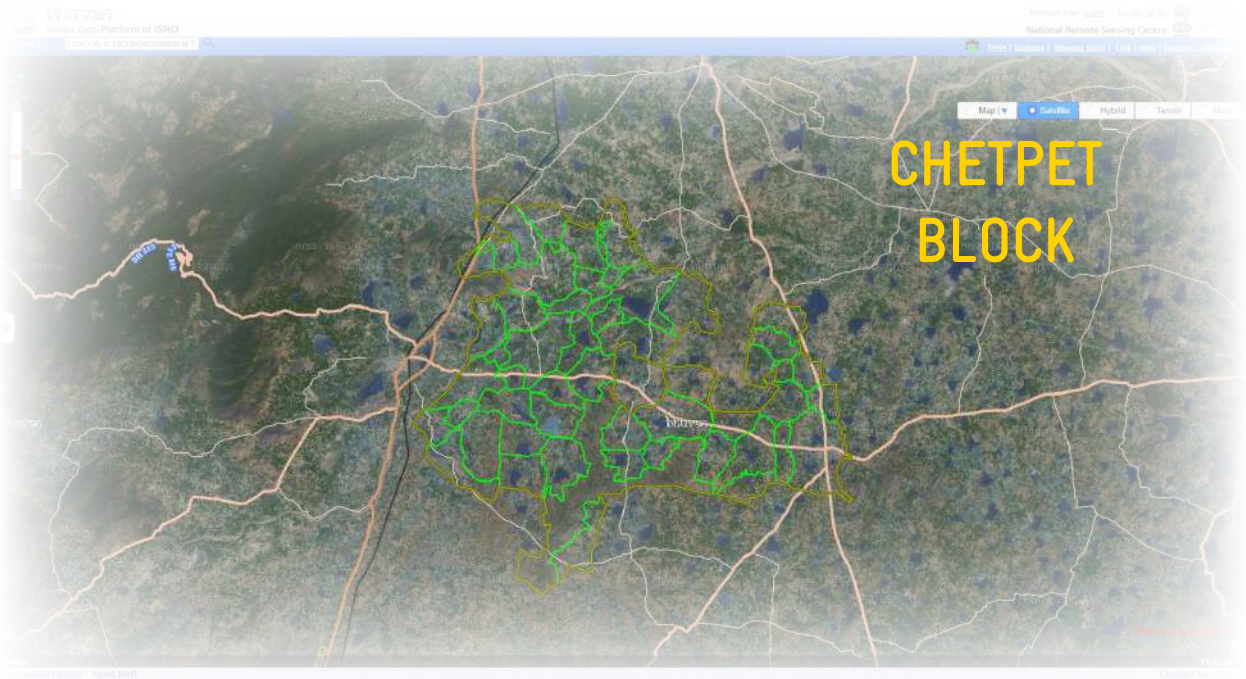
WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



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.

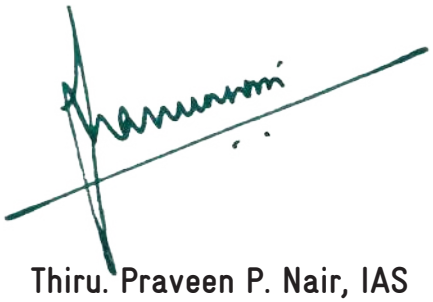
1.	Development of Public and Common lands
2.	Development of Agriculture and allied activities
3.	Development of Rural Infrastructure Management
4.	Development of Climate Resilience Measures

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).

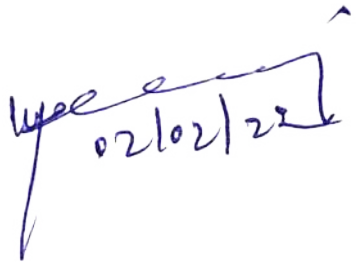
Through GIS based planning in 860 GPs, works identified under CWRM are verified, approved at Gram Sabha. These works would potentially reduce 38% surface runoff to be harvested or recharged by various interventions through ridge to valley watershed approach.

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

SLSC

S - W

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

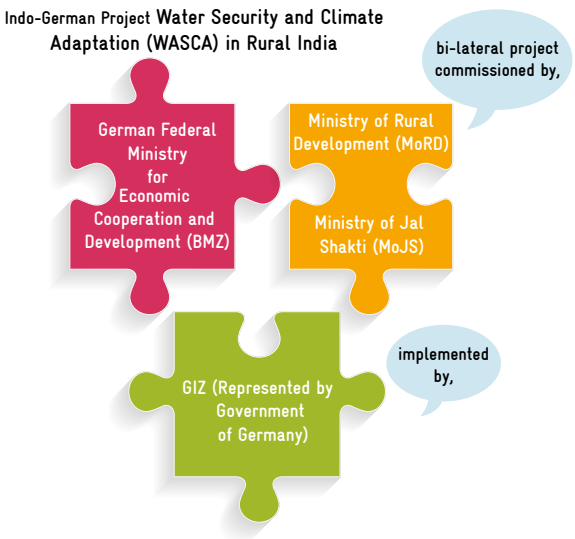
Thirukkural - 11

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

Chetpet Block of Thiruvannmalai District lies between 12°23'26.471"N to 12°34'57.208"N latitude79°8'41.711"E to 79°20'58.51"E longitude and surrounded by Pernallur, West Arani, Polur and Kalasapakkam Blocks (Figure 1.1). The total geographical area of this Block is 23,437 ha (234 Sq.Km). Administratively, this Block comes under Chetpet taluk, with 49 Gram panchayats and 180 habitations in it.

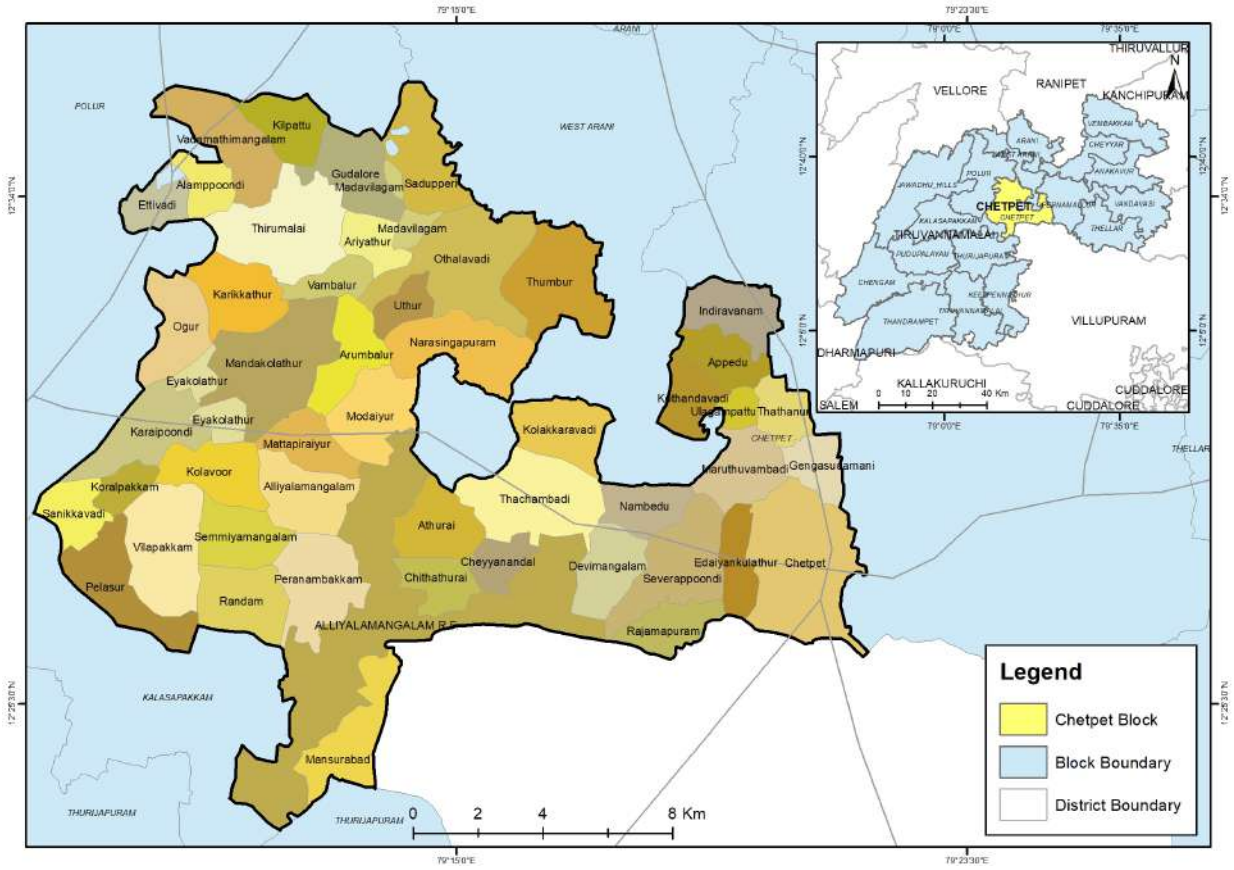


Figure 1.1. Chetpet Block and it's environ

According to Census 2011, the population of Chetpet Block is 1,14,214. The population density of the Block is 464 per Sq. Km which is slightly lower than the District population density (473 per Sq. Km) and lower than the State's density (555 per Sq.Km). There is a 11.20 % increase in the population observed since 2001 in this densely populated rural Block. The percentage of Male population is nearly equal to (50 %) female population (49.97%). The proportion of sex ratio is 1002 females per 1000 males, which is higher compared to the District average sex-ratio (994 females per 1,000 males). At 75.46 % the literacy rate of the Block is slightly higher than the national average (72.98%). Scheduled Castes and Scheduled Tribes accounted for 10.13% of the total population. (Thiruvannamalai District profile 2020).

Economically, Chetpet is 4th least revenue earning Blocks of the Tiruvannamalai District. More than 80% of its inhabitants are farmers, and the primary source of income is agriculture. Paddy tops as the predominant crop, with 62.43 % of the irrigated area cultivated with paddy. The other major crops grown in the Block area are ground nut, other pulses and sugarcane. Under rainfed crops groundnut is a predominant crop with 90% of the area being culti-

> The proportion of sex ratio is 1002 females per 1000 males, which is higher compared to the District average sex-ratio (994 females per 1,000 males).

> At 75.46 % the literacy rate of the Block is slightly higher than the national average (72.98%).

vated with groundnut. Other crops are other pulses, ragi, coconut and lemon. 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. A notable patch (95 acers) of sericulture is practised in the Block. A livestock count of 42,840 was recorded during 2019-20. The cattle count is 23,837 and the Block has 28 milk societies with 13,730 litres of milk being produced per day.

> 62.43 % of the irrigated area cultivated with paddy

Hydrologically, Chetpet Block comes under Cheyyar and Varahanadhi sub basins of Palar and Varahanadhi basins. Cheyyar river flows through the Block. The block has Cheyyar River, and Tondi Veraha macro-watersheds and 86 micro-watersheds (Figure 1.2).

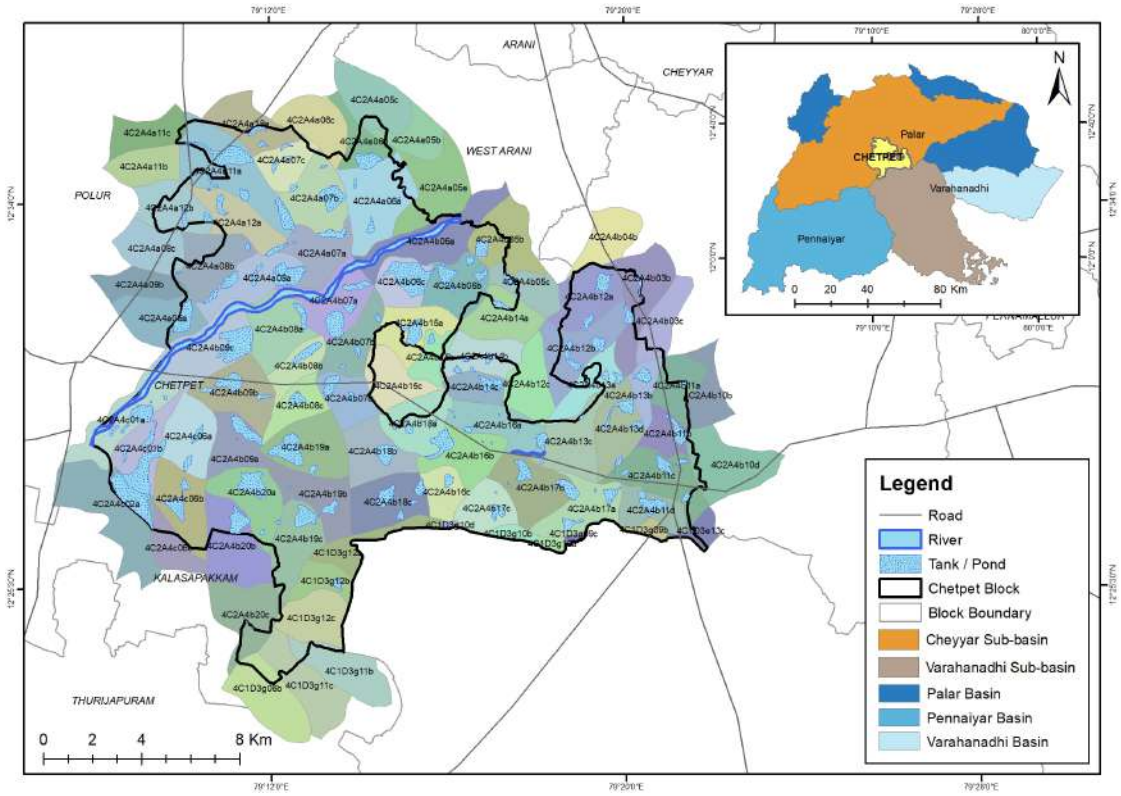


Figure 1.2. Watersheds- Chetpet Block

There are 116 tanks in the Block with the largest tank being the Mandakolathur Tank with a area of 302.02 ha. Other important tanks are Pelasur tank (214.97 ha), Odalavadi Big Tank (173.27 ha), Karapoondi tank (146.15 ha), Saduperi Tank (127.93 ha), Alliyalamangalam Big Tank (112.55 ha) and Thiumalai Tank (105.66 ha) (Figure 1.3). The ground water levels in Chetpet Block is in an over exploited and semi critical state of depletion stage of ground water development. Modayur, Thachambadi and Mandakolathur firkas cover the Block. While Modayur and Thachambadi firkas are over exploited and Mandakolathur firka is in semi critical stage.

GROUND WATER LEVEL OF THIS BLOCK

OVER EXPLOITED- › 100%	Modayur, Thachambadi
SEMI CRITICAL- › 70%&‹ 90%	Mandakolathur

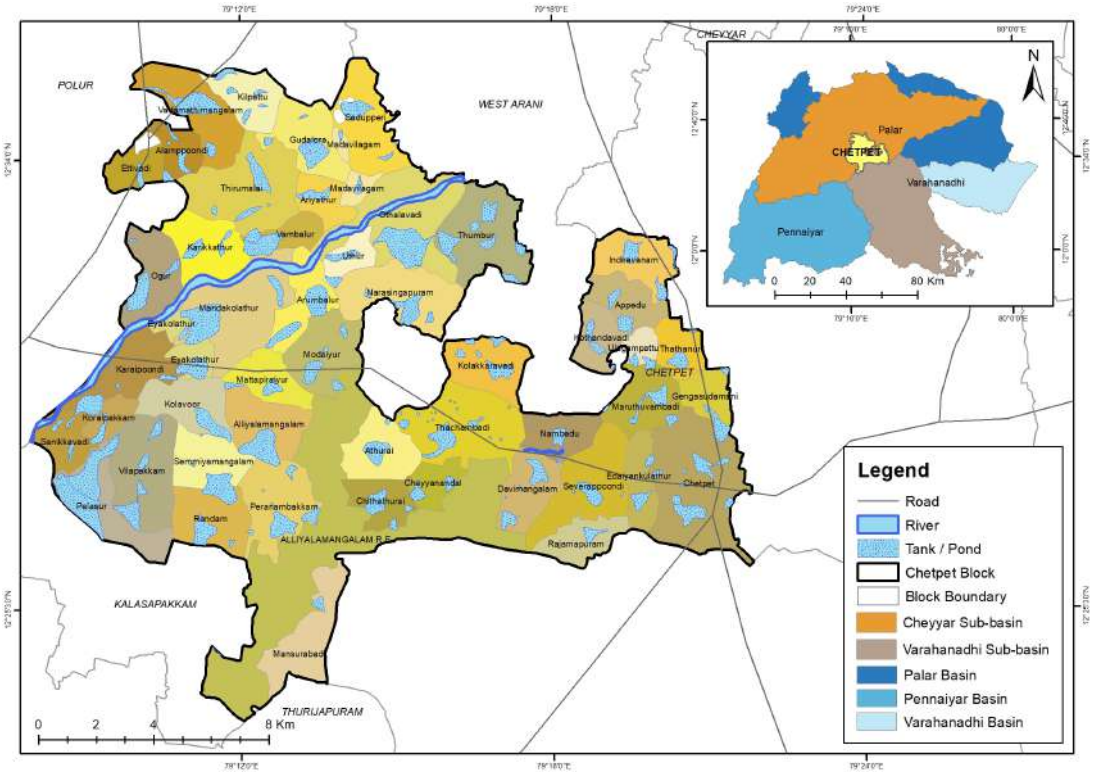
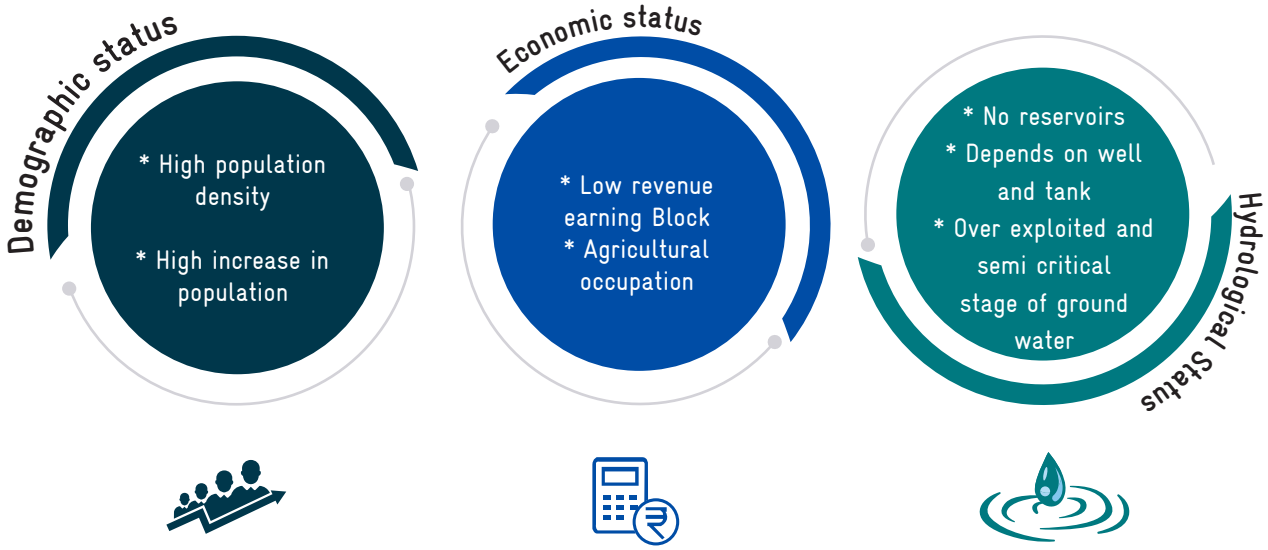


Figure 1.3. Spatial distribution of waterbodies



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

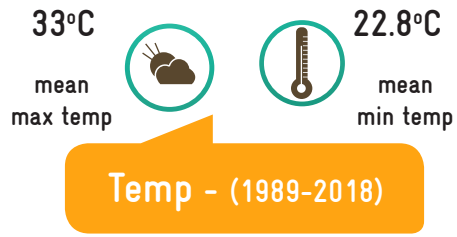
2 CLIMATE AND WATER SECURITY

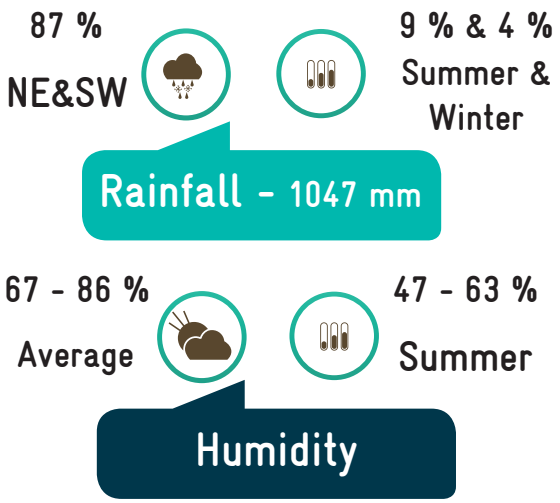
This region has typical tropical climate, located in the North Eastern agro-climatic zone of State and Southern Plateau and Hills region according to the agro climatic regional classification of planning commission. The general climate description of this region is given below (Table 1).

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 %.

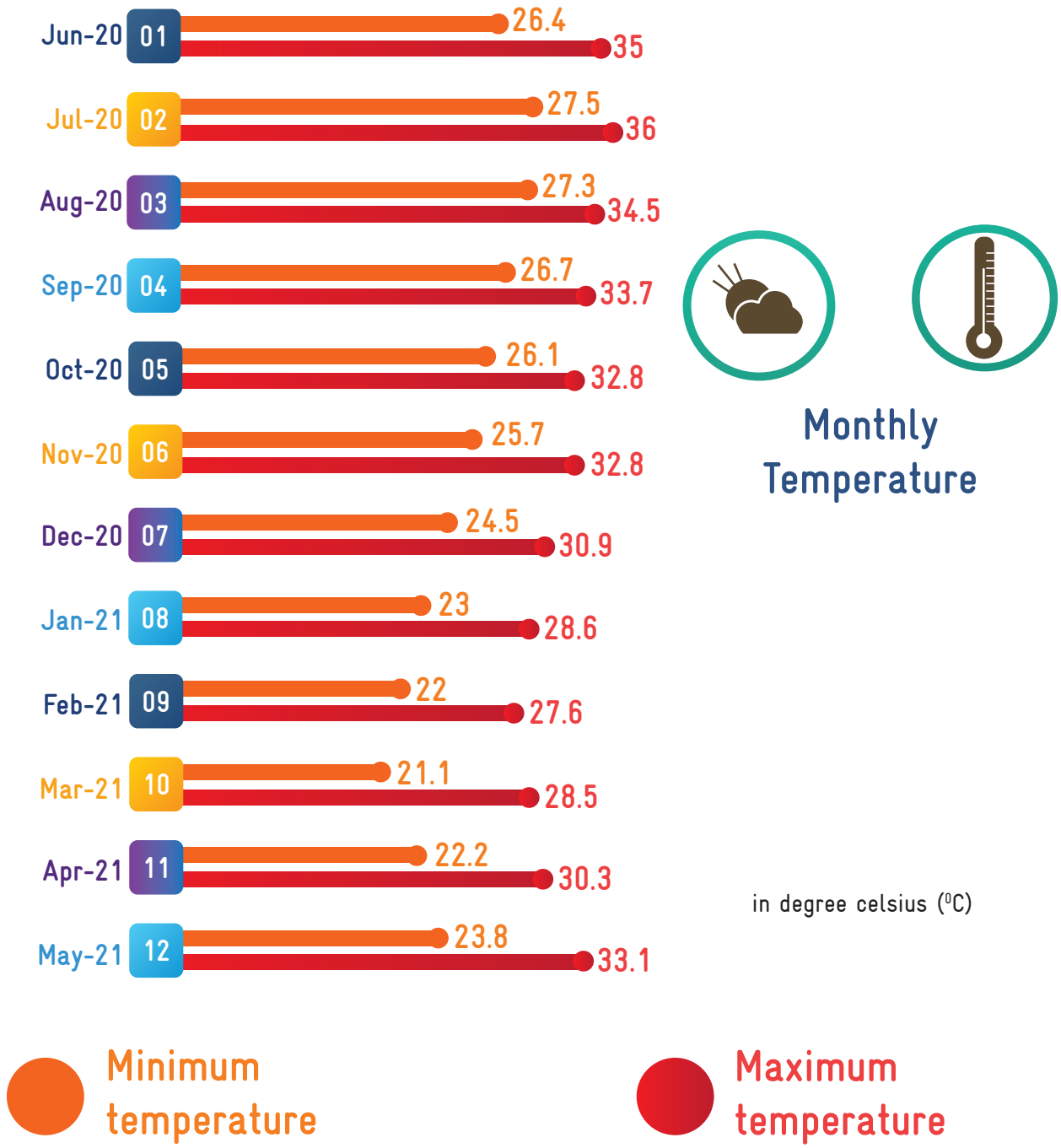


Figure 2.1. Average monthly temperature

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.

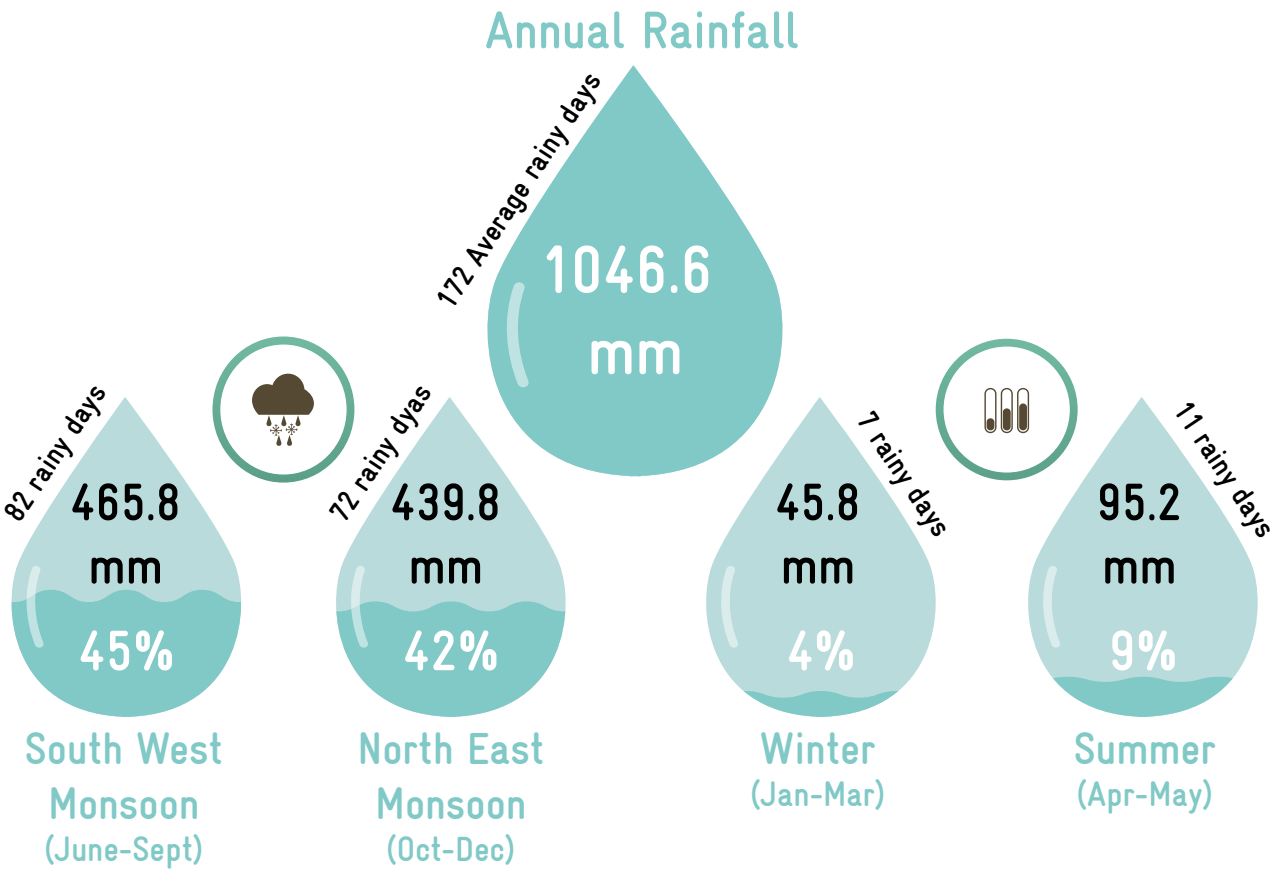


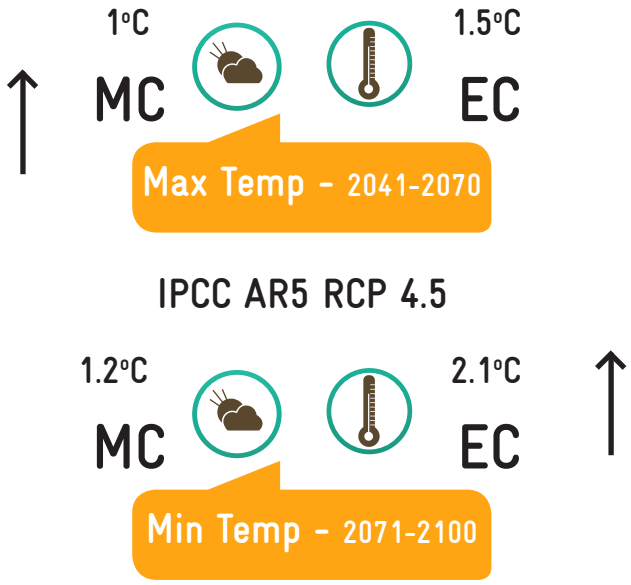
Figure 2.2. Season-wise distribution of annual rainfall

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 indicated 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, all parts were severely affected during 2005, 2010, 2015 heavy rainfall events and Thane (2011) and Vardah (2016) cyclones. State Disaster Management Authority, Government of Tamil Nadu identified 75 locations of Thiruvannamalai District as flood vulnerability spots. Out of this, 5 GPs in Chetpet Block are moderately vulnerable to floods.

Drought

Low rainfall coupled with the erratic behavior 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 area crop losses and drinking water scarcity. In Chetpet 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 Chetpet 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

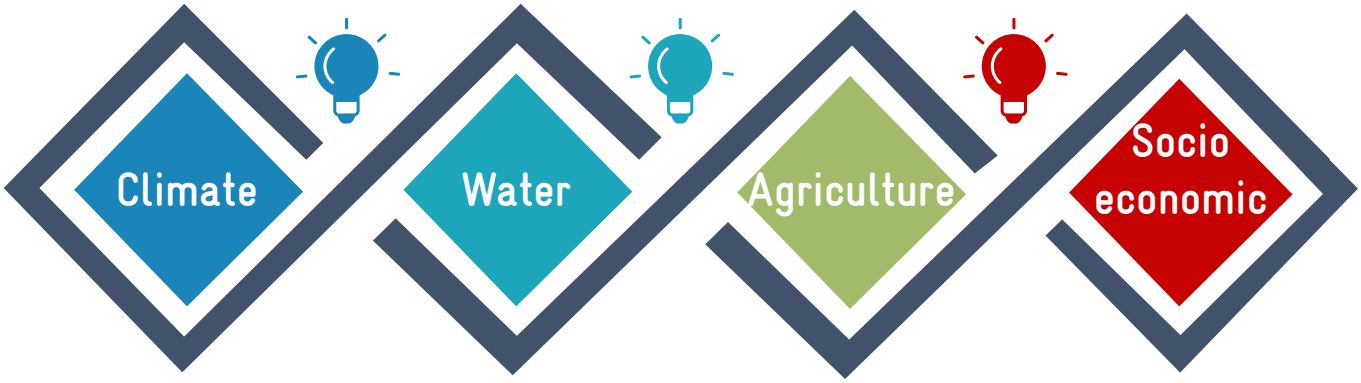
CWRM	Indicators of Rural water security vulnerability	Indicators label	Linked SDG
Climate	Changes in max temperature (OC)	C1	Goal 13
	Changes in min temperature (OC)	C2	
	Changes in rainfall (%)	C3	
	Excess rainfall years	C4	
	Deficient rainfall years	C5	
Water	Ground water extraction (%)	W1	Goal 6
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

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. The major parameters identified at Block level (Table 3) are collected both from primary and secondary sources and analyzed statistically and geospatially.

TABLE 3. MAJOR PARAMETERS IDENTIFIED FOR BLOCK LEVEL VULNERABILITY ASSESSMENT



Climate	Water	Agriculture	Socio economic
Changes in temperature, rainfall and its extremities	Watershed, micro-watershed, and drainage network, traditional 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 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 Khetko Pani and Per Drop More Crop are the four pillars of PMKSY. Technical inputs for planning is to be drawn from the technical resources available in the District under MGNREGS, CSO partners and other line department agencies. In case of planning for NRM works, the technical inputs will be drawn from the joint pool of technical personnel of IWMP in Watershed Cell cum Data Centre (WCDC), Mahatma Gandhi NREGS unit, and Water Resource Department and the Agriculture Department. The technical inputs relating to Excavation, Renovation & Modernization (ERM) of waterbodies may also be sought from the regional office of Central Ground Water Commission (CWC). The GPs will keep in perspective the Macro and Micro-watersheds of 500-100 ha that comprises of 1-10 GPs, while deliberating and finalizing prioritization of shelf of projects.

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

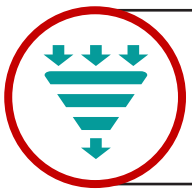
262 Total Kinds of works in Schedule-I of Mahatma Gandhi NREGA

182 Kinds of works relate to NRM alone

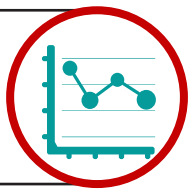
164 Kinds of works related to Agriculture & allied works

85 Water related works out of NRM

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



The GIS (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.

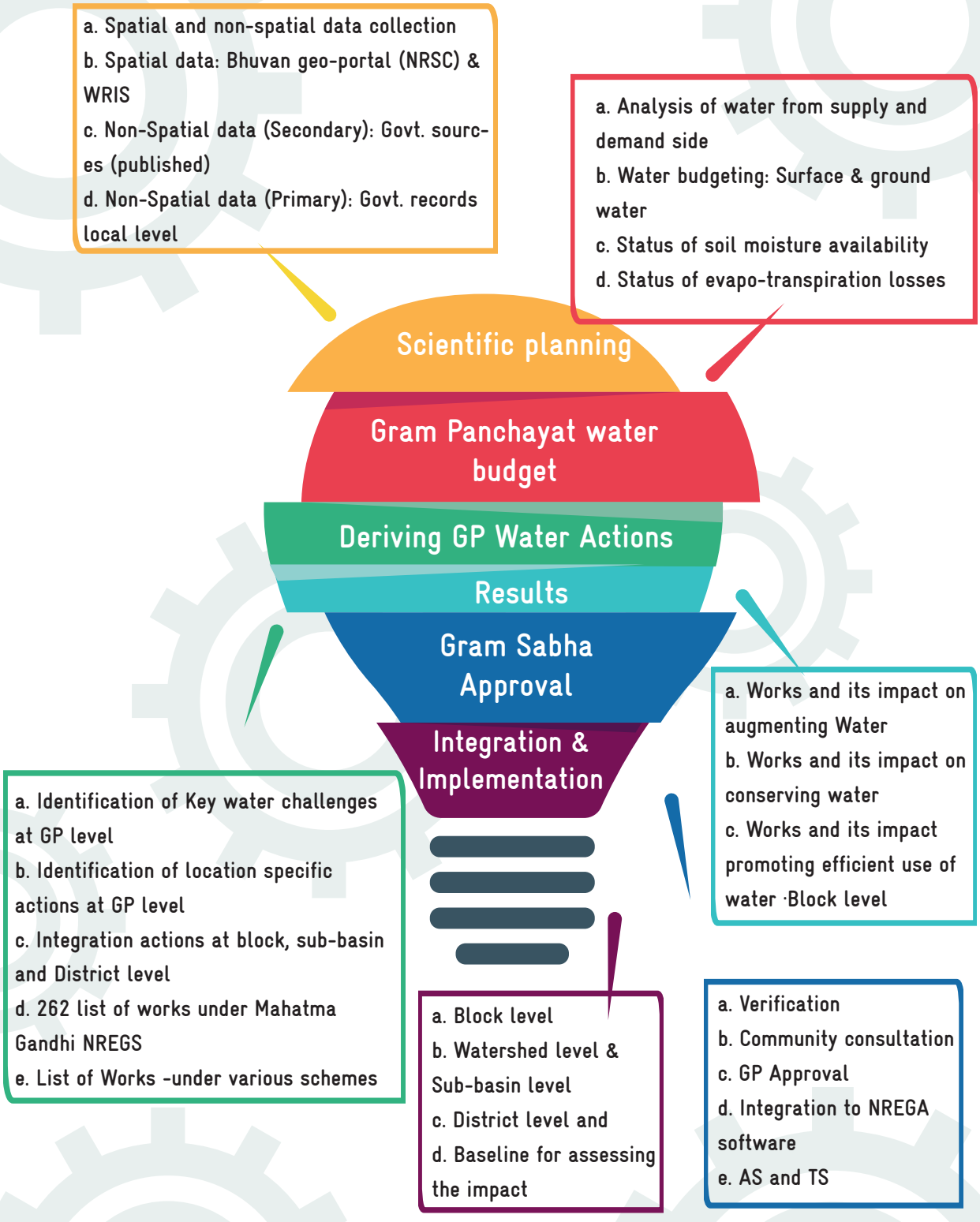


3.1 COMPOSITE WATER RESOURCE MANAGEMENT APPROACH

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).

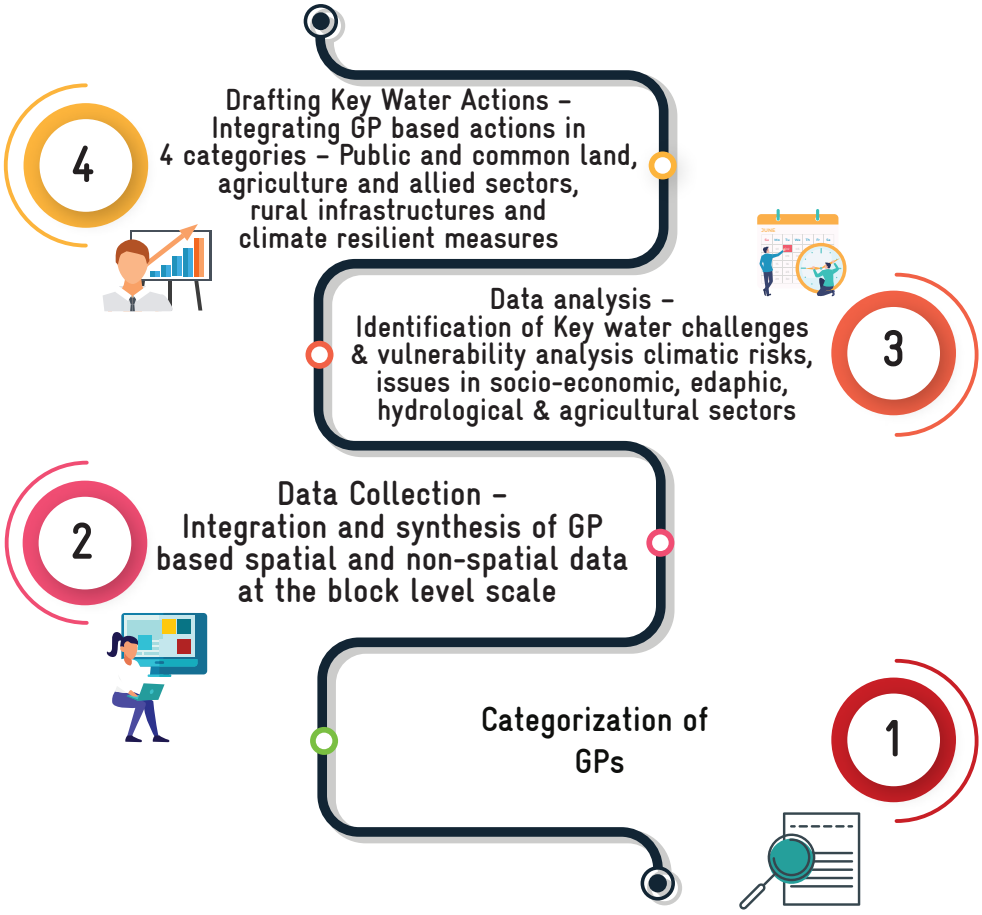
BOX 1. MAJOR COMPONENTS INVOLVED IN CWRM PLANNING



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, to 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 centres 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. MAIN STAGES OF CWRM PLANNING PROCESS

PRE-PLANNING STAGE

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

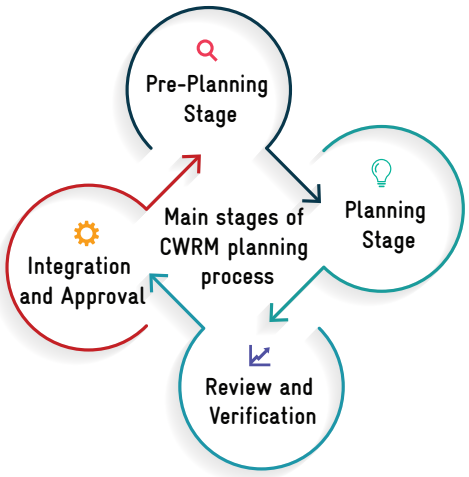
PLANNING STAGE

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

FOUR LEVELS OF CWRM PLANNING UNDER WASCA

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

2. INTEGRATING GP LEVEL PLANS AT BLOCK LEVEL



FOUR LEVELS OF CWRM PLANNING UNDER WASCA

3. INTEGRATING GP PLANS AT WATERSHED AND SUB-BASIN (CATCHMENT) LEVEL ON 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 datasets. Based on the above factors, five different types of GPs are classified as Type I, II, III, IV and V. The description and basis on which GPs are categorized is given in Annexure 1. The details of categorization of Chetpet Block GP's is tabulated in Table 4.

TABLE 4. CATEGORIZATION OF CHETPET BLOCK GPS

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
34	GP and revenue village data and boundary match (Type-I)	Alampoondy, Alliyalamangalam, Appedu, Devimangalam, Ettivady, Kolakkaravady, Thachambady, Indiravanam, Koralpakkam, Randam, Athurai, Cheyyanandal, Edyankulathur, Chittathurai, Gudalore, Ariyathur, Othalavady, Uthur, Vambalure, Mandakolathur, Nambedu, Ulagampattu, Mansurabad, Sanikkavady, Karapoondy, Kilpattu, Kothandavady, Maruthuvambady, Semmiyamangalam, Modiyur, Narasingapuram, Ogur, Peranambakkam, Pelasur
4	Having more than one GPs in one Revenue Village (Type-II)	Gangasoodamani, Thathanur, Rajamapuram, Severapoondi
11	One GP is falling under more than Type 1 one Revenue Village (Type-III)	Arumbulore, Eyakolathur, Kolavoor, Madavilagam, Mattapirayur, Saduperi, Thirumalai, Thumbur, Karikathur, Vadamathimangalam, Vilapakkam

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. The spatial datasets such as Land Use and Land Cover (LULC), waste land, salt and erosion affected lands, drainage lines, ground water potential, lineament, geomorphology, and slope will contribute significantly in the preparation of the most appropriate and suitable science-based decision plans 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

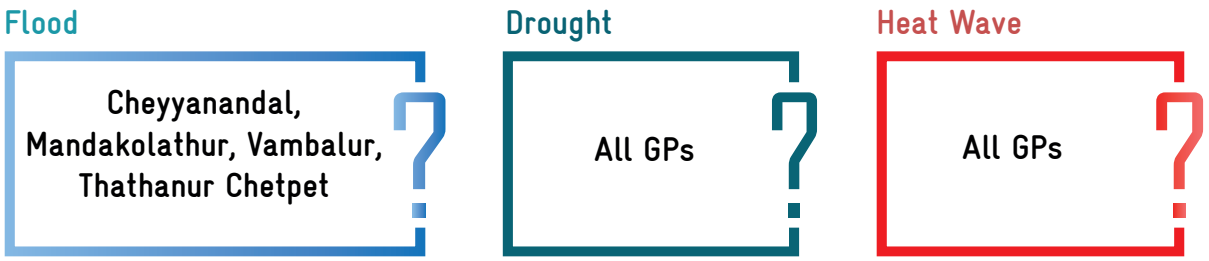
- Water budgeting at GP level to demonstrate the sector wise water demand and available water through the traditional water harvesting and storage bodies and the potential runoff that can be conserved through appropriate actions on the supply side. The difference between demand and supply at the GP level 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 Block's change in climate (temperature, rainfall) extremities and its risks, which was recorded by State Disaster Management Agency, 2020 (Table 5).

TABLE 5. CLIMATE RISKS AND VULNERABLE GP'S



3.5 CWRM PLANNING ANALYSIS – WATER

For effective planning, the available traditional water storage and conveyance structures along with its supply and demand status for different sectors at Block level 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 are as follow

3.5.1 SPATIAL DATA

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

3.5.1.1 Geomorphology: Geomorphology is the study of Landforms and landform evaluation. It is the study of various features that are found on the Earth, such as mountains, hills, plains, rivers, moraines, cirques, sand dunes, beaches, spits, etc., that are created by various agents such as rivers, glaciers, wind, ocean, etc. Geomorphologically, the Block is majorly engrossed with denudation origin pediment, pediplain complex landform unit (Figure 3.1). Pediment is the low relied or plain with gently slope area close to the mountains at their foot with or without debris whereas pediplain is relatively flat rock surface formed by joining of several pediments.

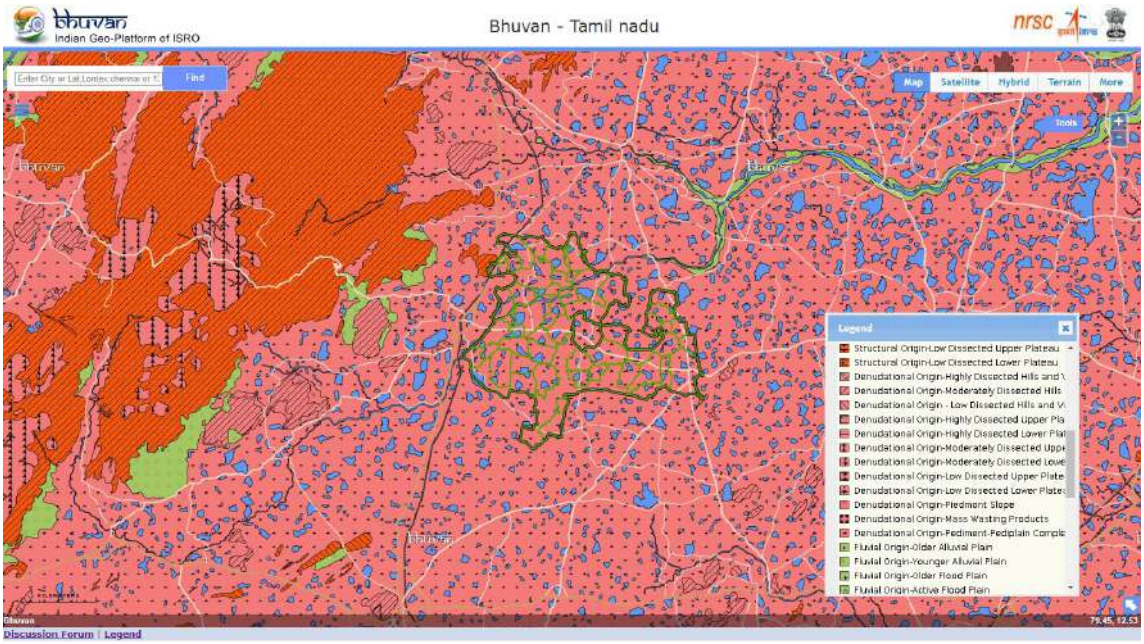


Figure 3.1. Geomorphology map

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 (Figure 3.2). Lineament plays a significant role in identification of ground water and oil exploration sources. Lineament is represented with linear feature where two different landform converges or diverges. This site allows water to percolate at a high rate. GP wise lineament type is illustrated below,

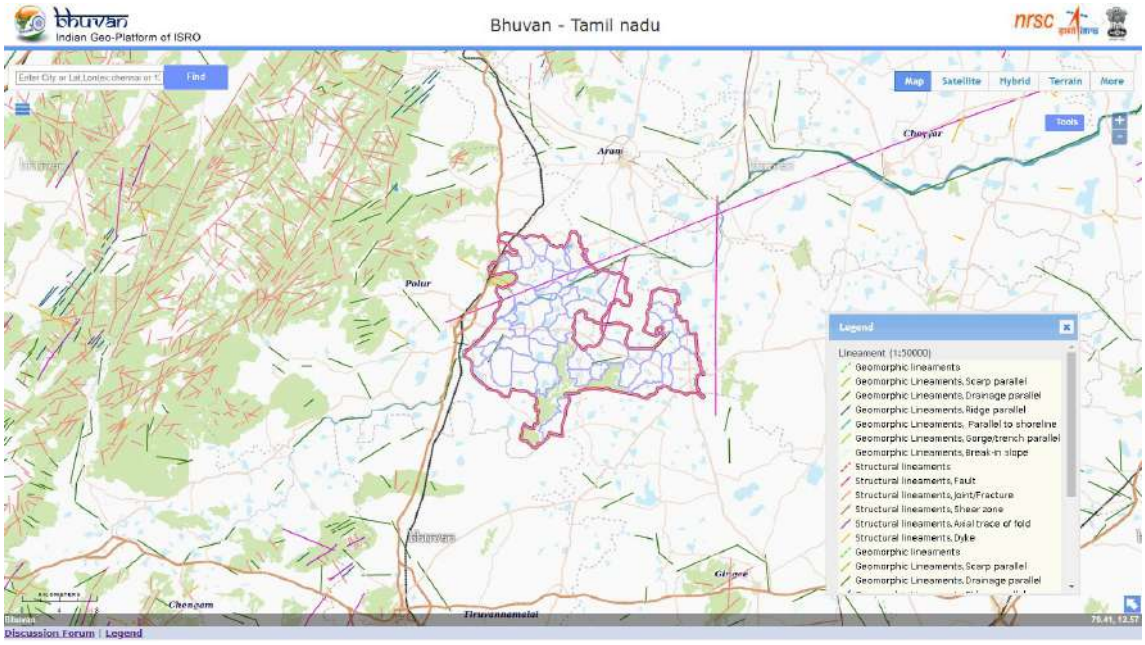
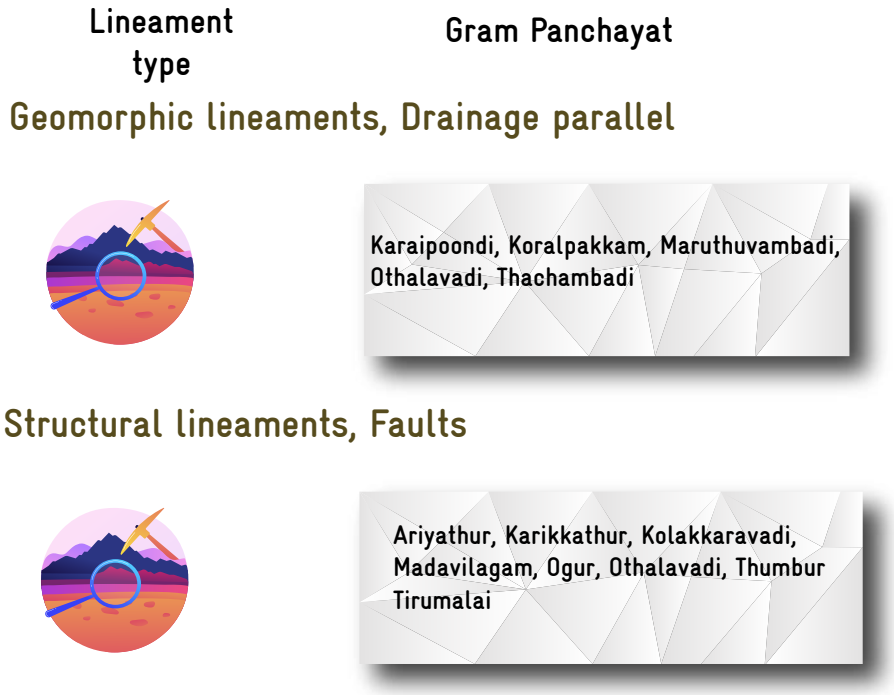


Figure 3.2. Lineament map



3.5.1.3 Terrain: The terrain map is a product of digital elevation model, which gives information related to elevation from above sea level. Terrain of Chetpet Block is shown in Figure 3.3. Block area is distinguished with two elevation ranges, with most of the area in a higher elevation range (green) and a lower elevation range in the east and northern region (greenish grey).

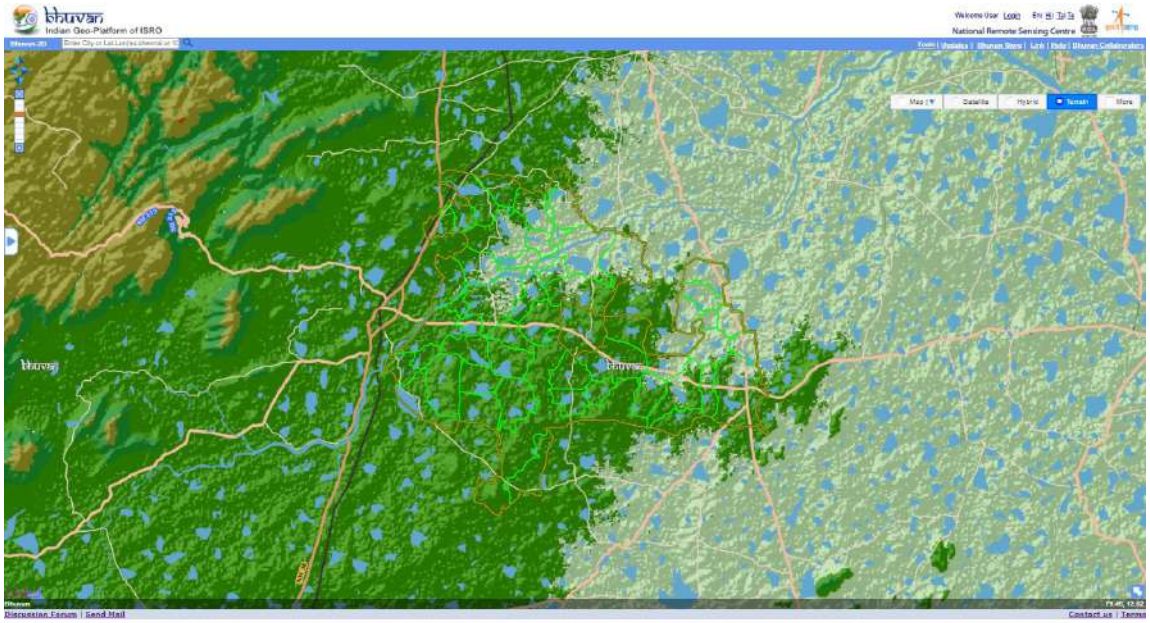


Figure 3.3. Terrain map

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 series of lines with equal point of elevation. The closely spaced contour lines indicate steep slope and the lines spaced far apart would indicate a gentler slope. South and North regions of Chetpet Block shown the higher elevation intervals, and decreased the elevation values as moves towards East from west (Figure 3.4). The contour map also plays a vital role in delineation of watershed area & its units, used in planning and identifying the recharge structures, farm ponds and construction of grey water drain network etc.,

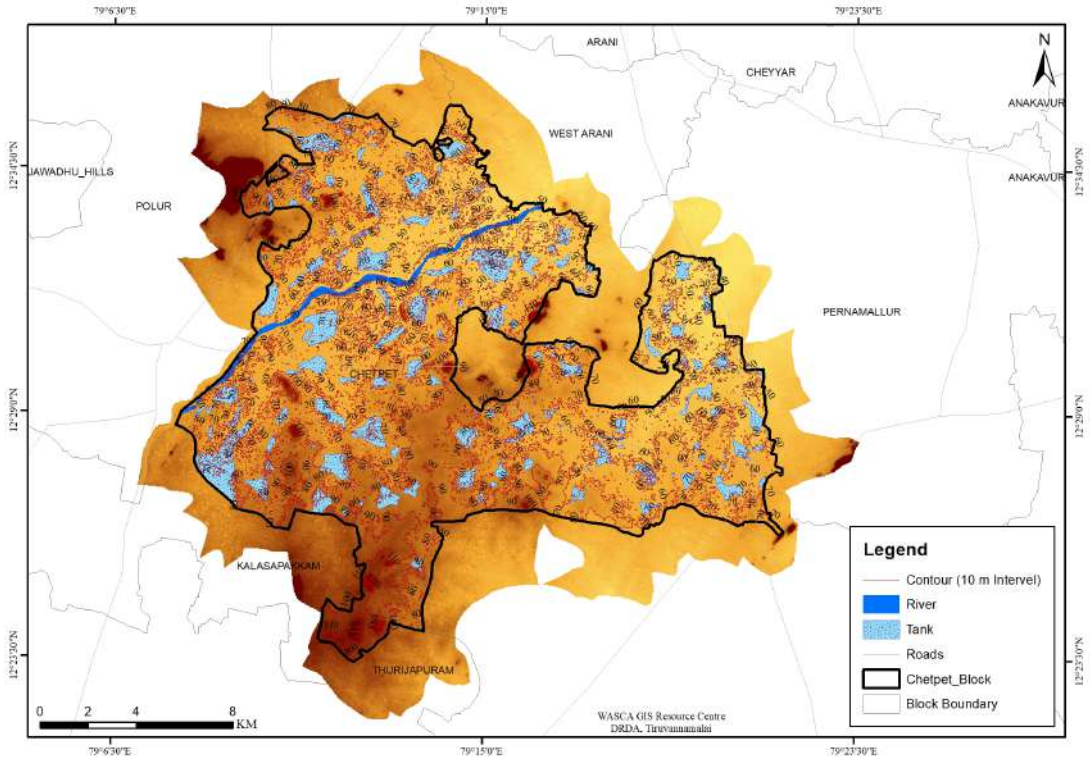


Figure 3.4. Contour map

3.5.1.5 Slope: Slope of terrain is typically expressed in percentage, angle, or in ratio. Slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. It is noticed that with respect to the landform units the slope varies in the Block. Most of area witnessed the very flat slope range, whereas distinctive position with flat range (Figure 3.5). 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.

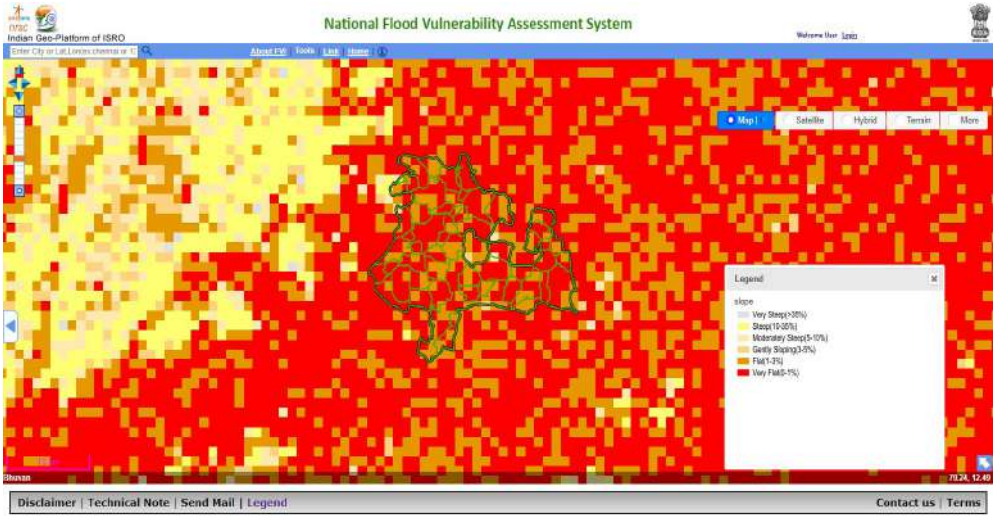


Figure 3.5. Slope map

Slope range	Area in %	Gram Panchayat
Very flat (0-1%)	90%	Mandakolathur, Sadupperi - 100%, Devimangalam, Kolakkaravadi, Maruthuvambadi, Ogur, Othalavadi, Peranambakkam, Sanikkavadi, Thachambadi, Vilapakkam - 90%, Pelasur, Vadamathimangalam - 80%
Flat (1-3%)	58%	Kilpattu, Modaiyur, Thathanur - 80%, Alliyalmangalam, Ettivadi, Gengasudamani, Rajamapuram, Severapoondi, Tirumalai - 60%, Athurai, Thumbur - 50%

3.5.1.6 Drainage Network : The drainage network pattern is influenced by lithological characteristics, regional slope, structural control, climate condition etc. Dendritic or tree pattern drainage system was observed in the Chetpet Block. Block area is drained with less dense drainage network, Northern region of Block drained with higher order stream (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.

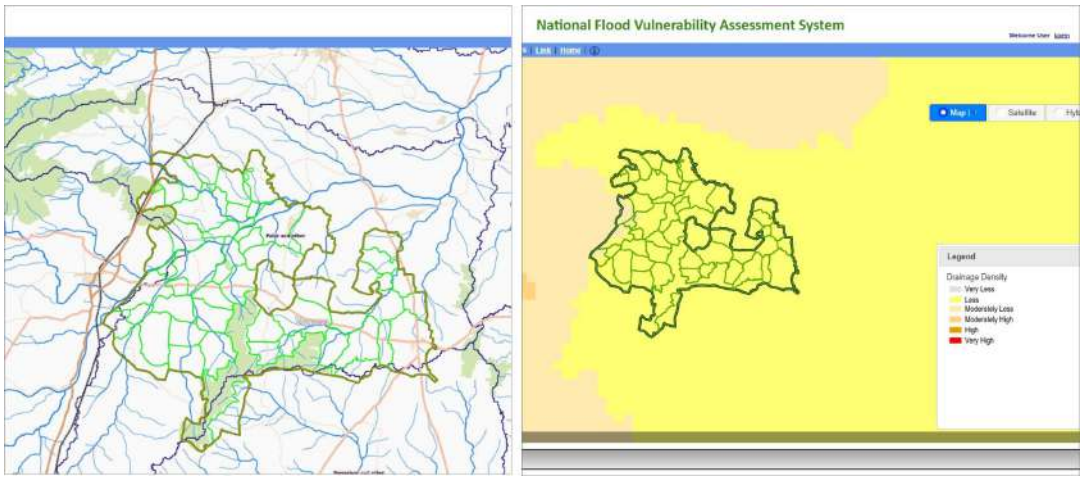


Figure 3.6. Drainage network and density

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. Chetpet Block watershed map is illustrated in Figure 3.7. Watershed is used for the interventions based on Ridge to Valley (R2V) concept and sequencing the plan accordingly. R2V approach intends to conserve each drop of rain water from ridge to a reasonable extent and it ensures the better surface water flow management also aids in strengthening the durability of land, soil and water conservation structures of the downstream.

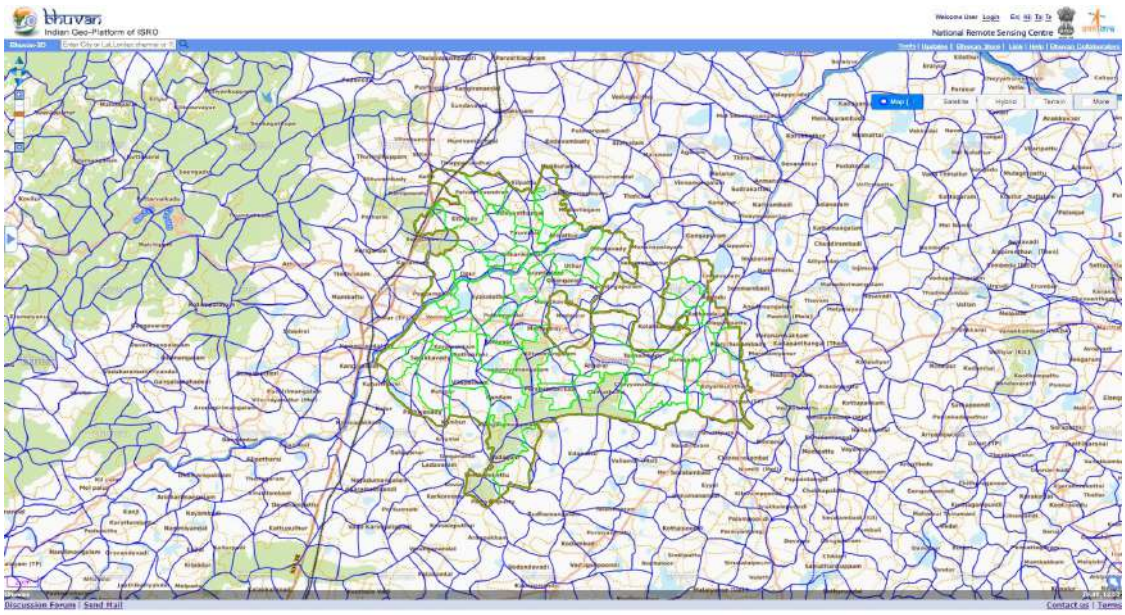


Figure 3.7. Watershed map

3.5.1.8 Ground water perspectives: Ground Water (GW) is one of the important natural resource in semi-arid region like Chetpet Block. The ground water perspective 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. This map will help in identification of tentative locations for construction of recharge structures. In the Block, most areas of the GPs witnessed the ground water above 80 m in deep wells with yield of 50 – 100 LPM, while some GPs with 100-200 LPM over 80 m and some GPs are with no yield (Figure 3.8). The GPs wise detailed GW prosperity shown in below illustration. This specific information will play crucial role in identifying sites for recharge structures in order to address water scarcity issues in the block.

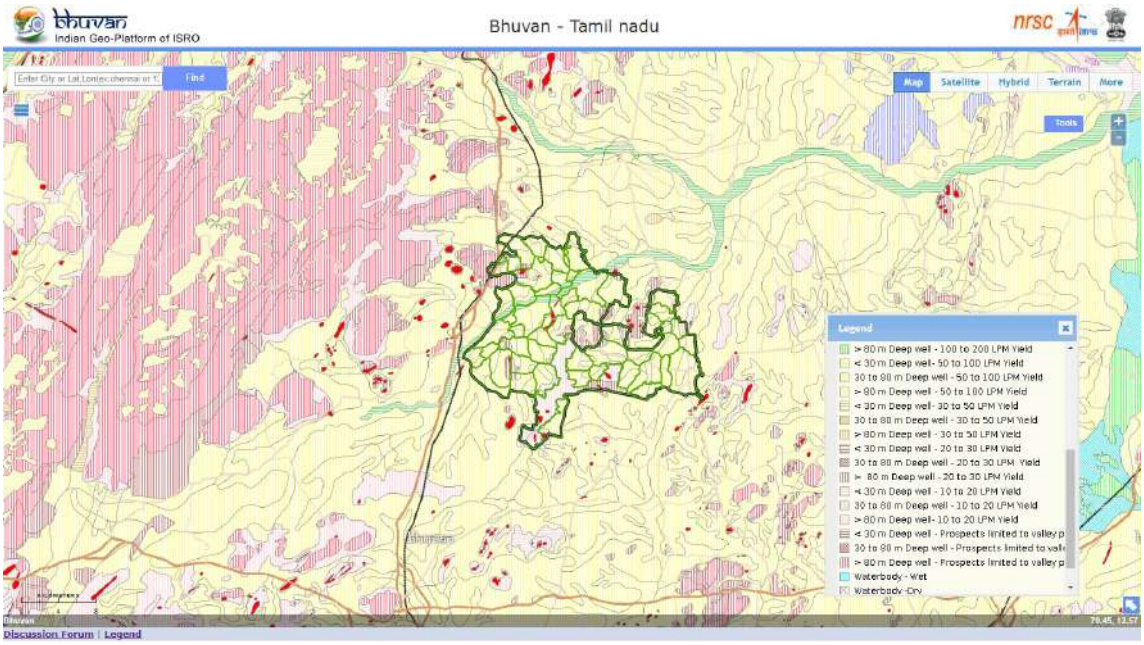
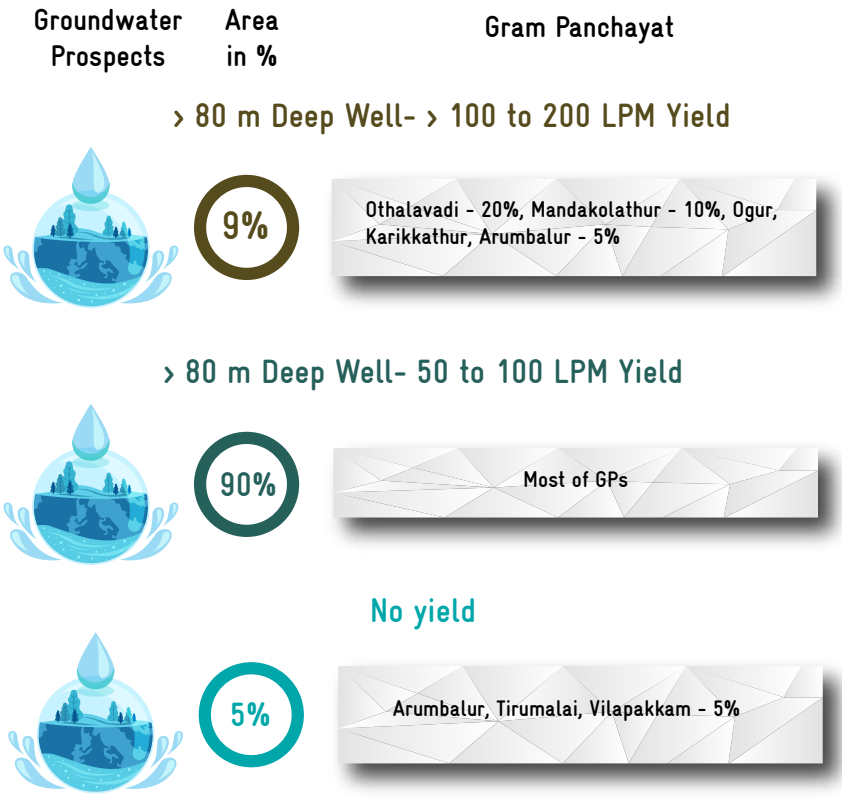


Figure 3.8. Ground water perspective map



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.	Key CWRM Parameter	Extent
	Canal Network	
1	Length of Main Canal (m)	7,060
2	Length of Minor Canal (m)	2,20,159
3	Length of Distributaries (m)	9,110
4	Water Courses (Field Channels) (m)	1,11,320
	Traditional Waterbodies	
5	Number of Tanks (PWD & Union) (No.)	121
6	Other Surface Water Bodies (No.)	208
	Irrigation Facilities (ha)	
7	Tank Irrigation	1,133
8	Open & Tube Well Irrigation	7,067
	Catchment Area wise Available Runoff (ha.m)	
9	Good Catchment Area	2,338
10	Average Catchment Area	227
11	Bad Catchment Area	3,331
	Watershed and Drainage Networks	
12	Length of Natural Drainage Lines (m)	1,48,931
13	Number of Natural Drainage Lines (No.)	168
14	Number of critical Watersheds (No.)	179
	Water Demand	
15	For Humans (ha.m)	258
16	For Livestock (ha.m)	124
17	For Agriculture (ha.m)	17,181
18	GW Utilization for Drinking (%)	48.9
19	GW Utilization for Livestock (%)	85.4
20	GW Utilization for Agriculture (%)	98.8
21	SW Utilization for Drinking (%)	51.1
22	SW Utilization for Livestock (%)	14.6
23	SW Utilization for Agriculture (%)	1.2

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 other surface waterbodies (208) are more than tanks (121) (Figure 3.9).

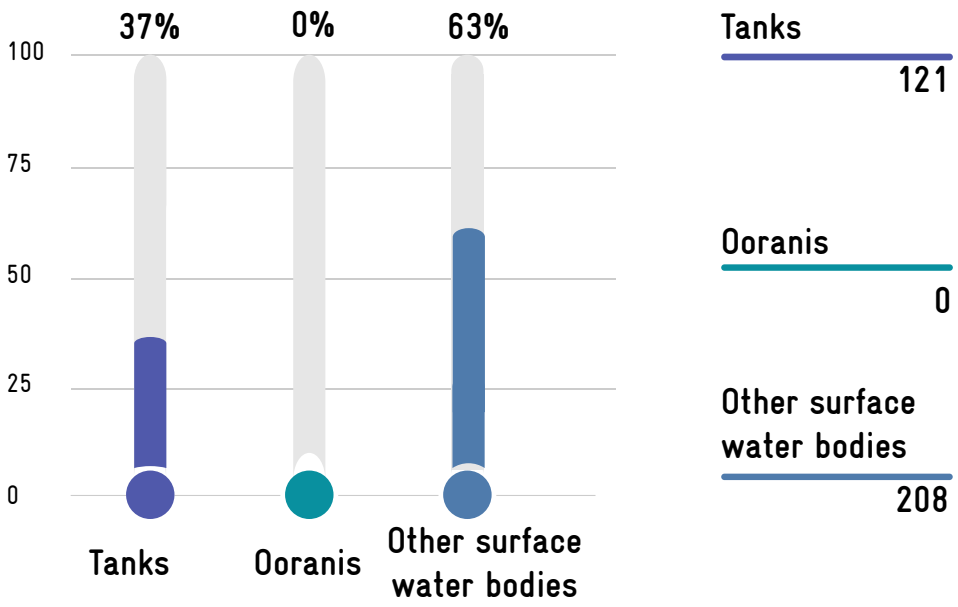


Figure 3.9. Traditional Waterbodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the Block is 8,200 ha, of which 79.4 % (7,067 ha) is irrigated through ground water stored in open/tube wells remaining 12.6 % (1,133 ha) is through tank source irrigation (Figure 3.10).

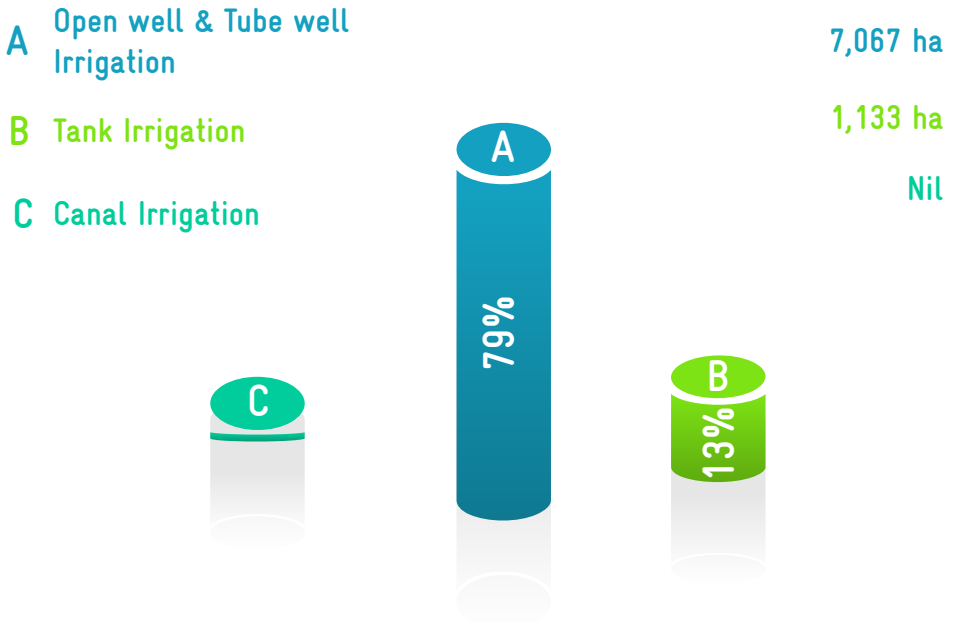


Figure 3.10. Irrigation sources

3.5.2.3 Available Run off

The total available runoff in the catchment area is 5,896 ha.m and in that 56.5 % is from bad catchment area followed by 39.65 % is from good catchment area and remaining 3.8 % is from average catchment area (Figure 3.11). As the runoff area is dominated with bad catchment zone which indicates scope for better management.

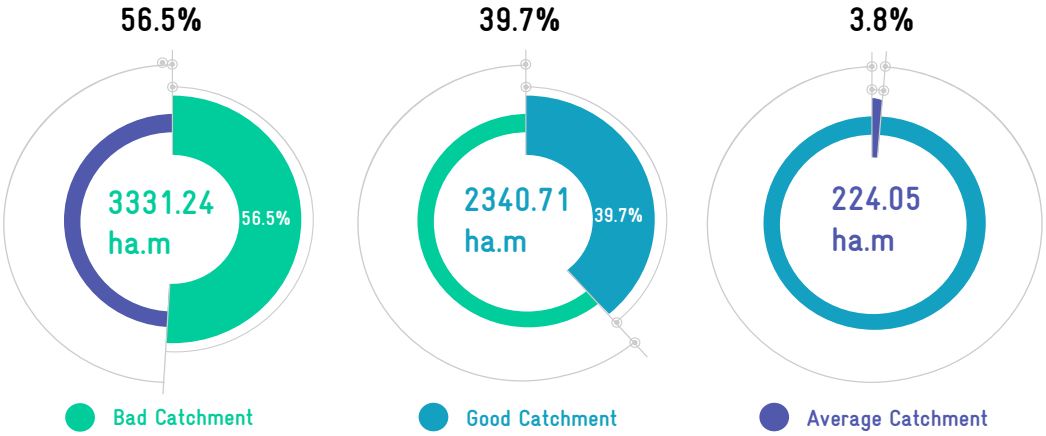
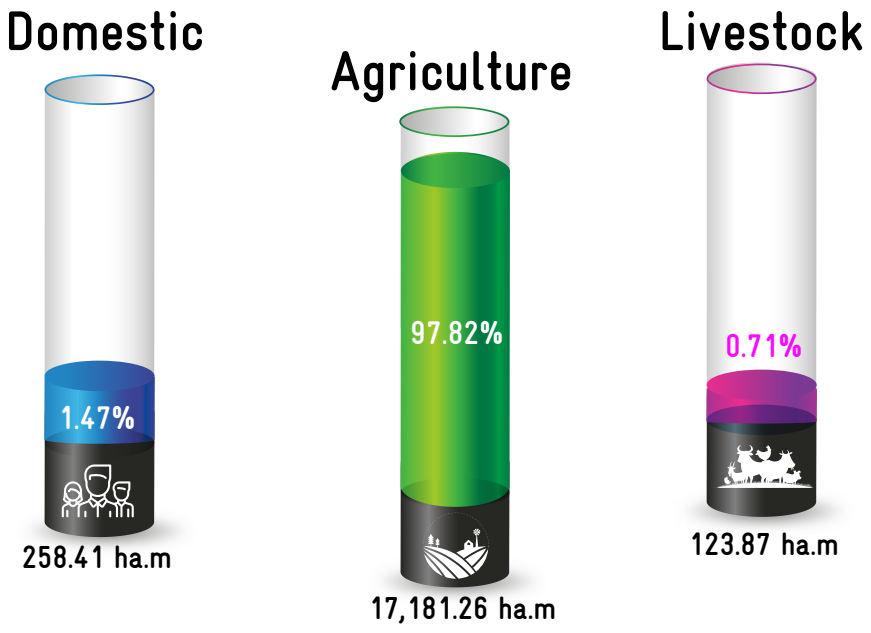


Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 17,563.53 ha.m. The highest demand is from the agriculture sector of 17,181.26 ha.m (97.82 %) followed by domestic use demand of 258.41 ha.m (1.47 %) and rest is from livestock. Out of the total water demand supply, 51.10 % for domestic purpose usage is met through surface water while the remaining is from ground water resources. Utilization of 98 % for agriculture and 85.39 % for livestock is met by ground water (Figure 3.12).



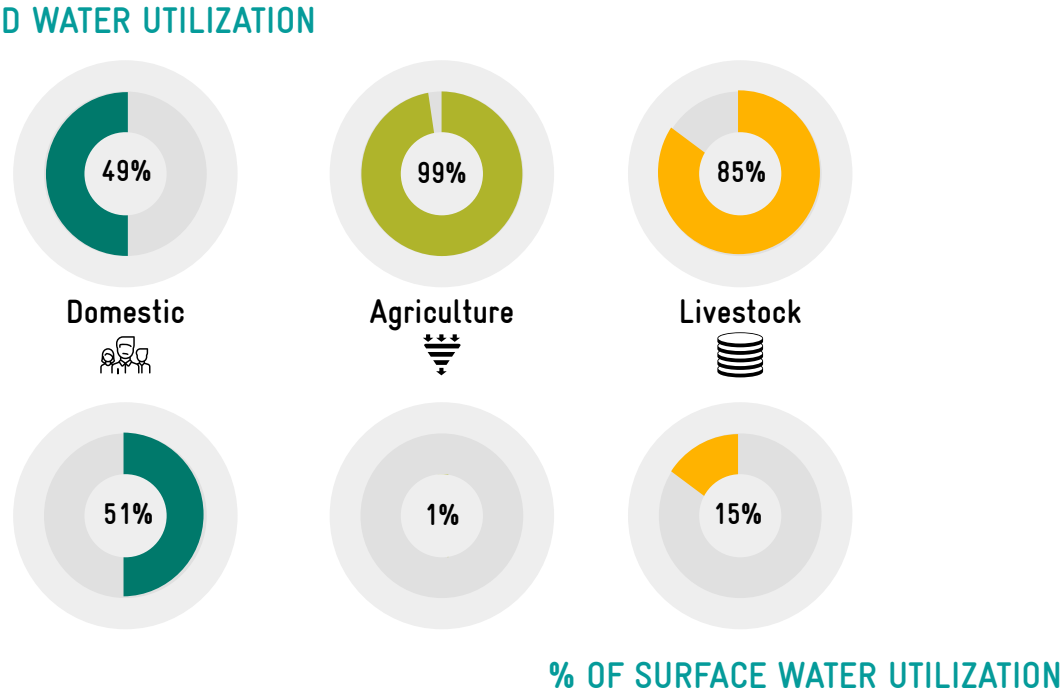


Figure 3.12. Sector-wise water utilization

3.6 CWRM PLANNING ANALYSIS-AGRICULTURE

Agriculture and livestock are the livelihood resources of the households in Chetpet Block of Tiruvannamalai district. 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 Chetpet Block problems in order to draft scientific key water actions.

3.6.1.1 Soil texture: The soil consistency of particle size is distinguished through soil texture types, especially it is determined by amount of sand, silt or clay. Soil texture devise the details about the soil properties such as water holding capacity, permeability, soil workability also the ability of plant to grow and this will help in proposing the relevant conservation measures for natural resources. The Block has predominant fine texture soil followed by fine loamy (Figure 3.13)..

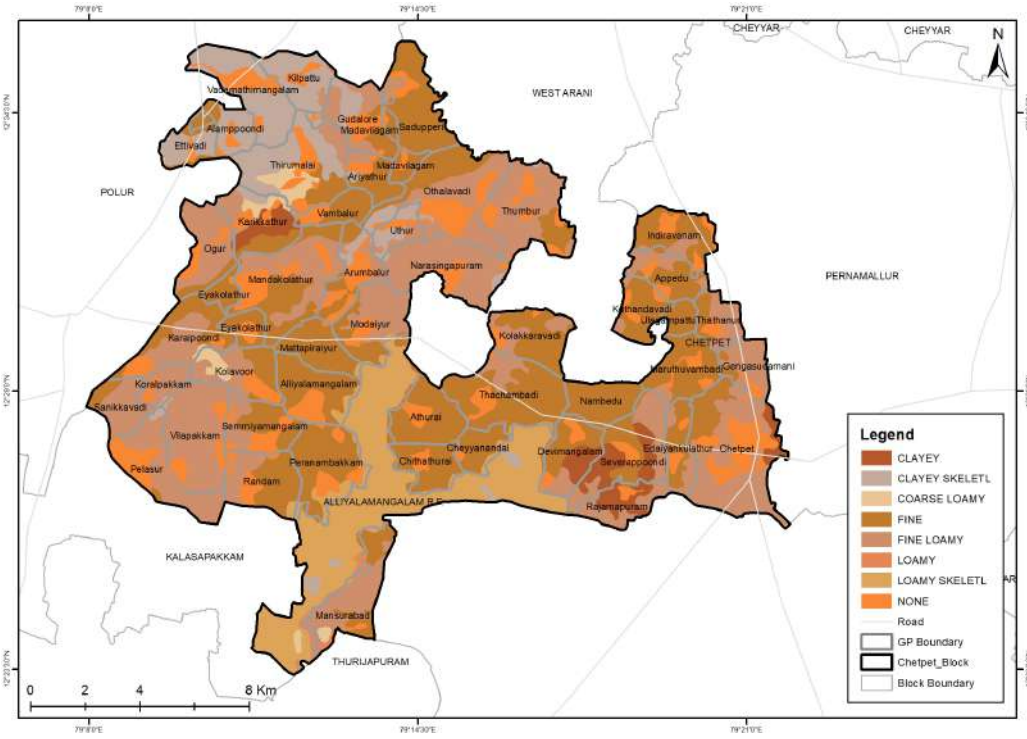


Figure 3.13. Soil texture map

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. Nearly one fourth of the Block area witnessed sheet erosion which may result in deforestation (Figure 3.14). Soil eroded sites are act direct input in the planning process in implementation of soil conservation measures and management.

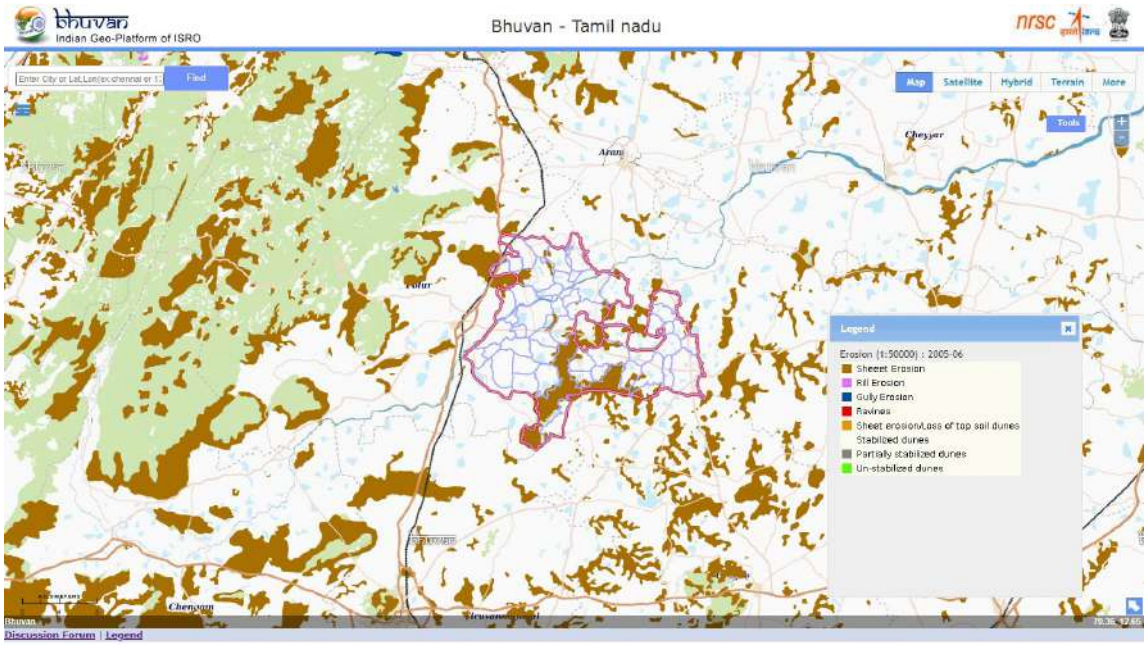
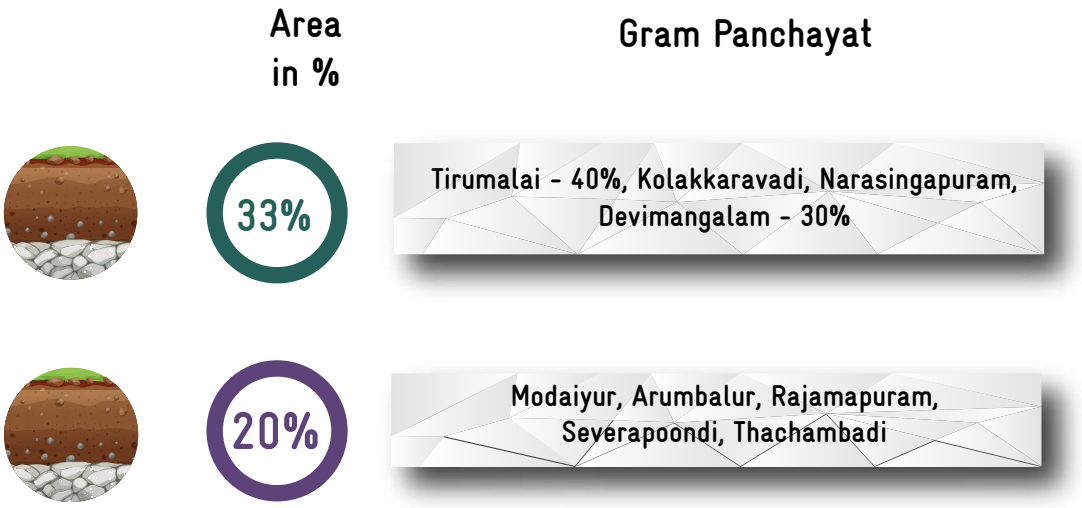


Figure 3.14. Soil Erosion map



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. Chetpet Block is dominated with agriculture land followed by wasteland types and forest area (Figure 3.15). The GP wise LULC tabulated in the illustration.

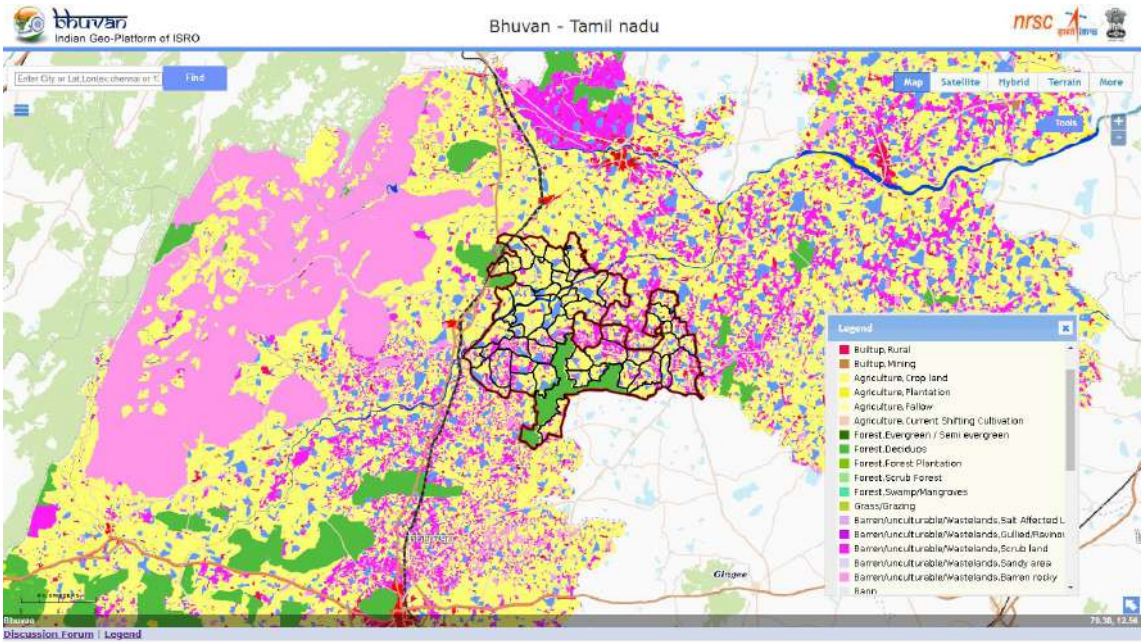


Figure 3.15. Land use land cover map

Land Use	Area coverage in %	Gram Panchayat
Barren Lands	69%	Vilapakkam, Kolavoor, Alliyalmangalam, Semmiyamangalam - 80%, Mattapirayur, Modaiyur - 70%, Thachambadi, Kolakkaravadi, Severapoondi, Karaipoondi, Thumbur - 60%
Agriculture crop lands and Plantation	67%	Mandakolathur, Vadamathimangalam, Kilpattu, Tirumalai, Karikkathur, Ogur - 90%, Gudalore - 80%, Sadupperi, Othalavadi, Athurai, Narasingapuram - 70%, Devimangalam, Chithathurai, Peranambakkam - 60%, Maruthuvambadi - 50%, Appedu, Indiravanam, Gengasudamani, Severapoondi, Rajamapuram - 40%

3.6.1.4 Waste land: A Parcel of land that is not suitable for agriculture activity and mostly covered with dense or open scrub is termed with wasteland. The extent of wasteland will act as a direct input for preparation of plans for land development activities or greenery. Degraded forest, scrub land and barren rock types of wastelands is noticed in the Block (Figure 3.16). Measures are be taken immediately in arresting the forest degradation by implementing deforestation activities such as horticulture plantation.

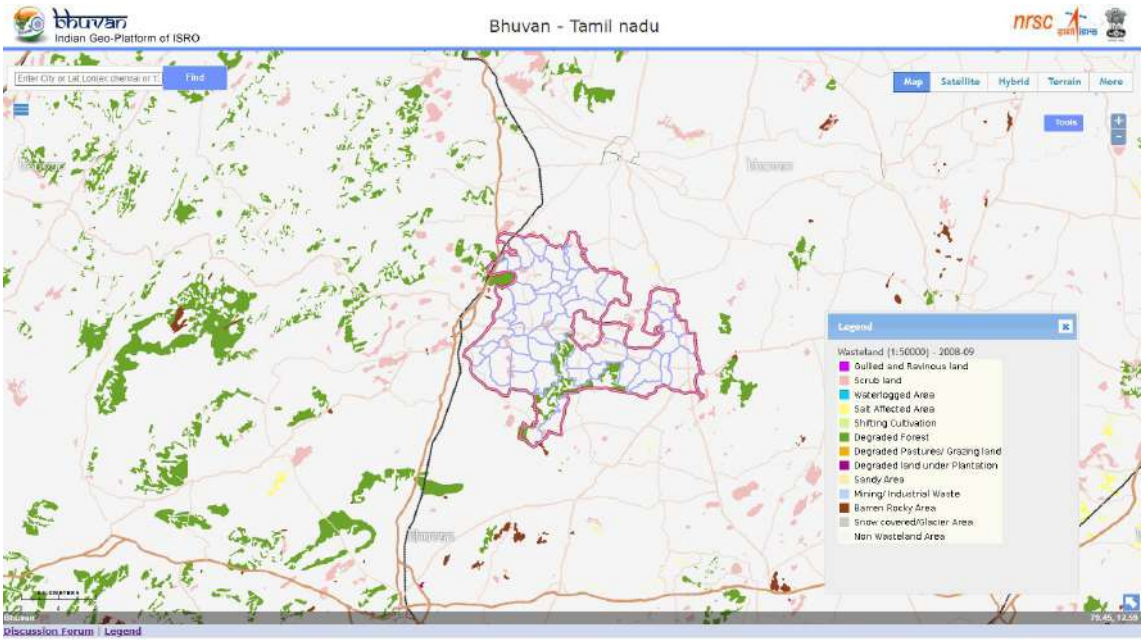


Figure 3.16. Wasteland map

Wasteland type	Area in %	Gram Panchayat
Scrub Land	6%	Vilapakkam - 10%, Thachambadi, Kolakkaravadi, Tirumalai, Kolavoor, Mansurabad - 5%

3.6.1.5 Salt affected area: Othalavadi and Uthur GPs area witnessed five percent area of salt affected (Figure 3.17). These parcels will act as a direct input while planning process to propose soil conservation measures, mainly activities to reduce salinization and suggestions for alternative cropping.

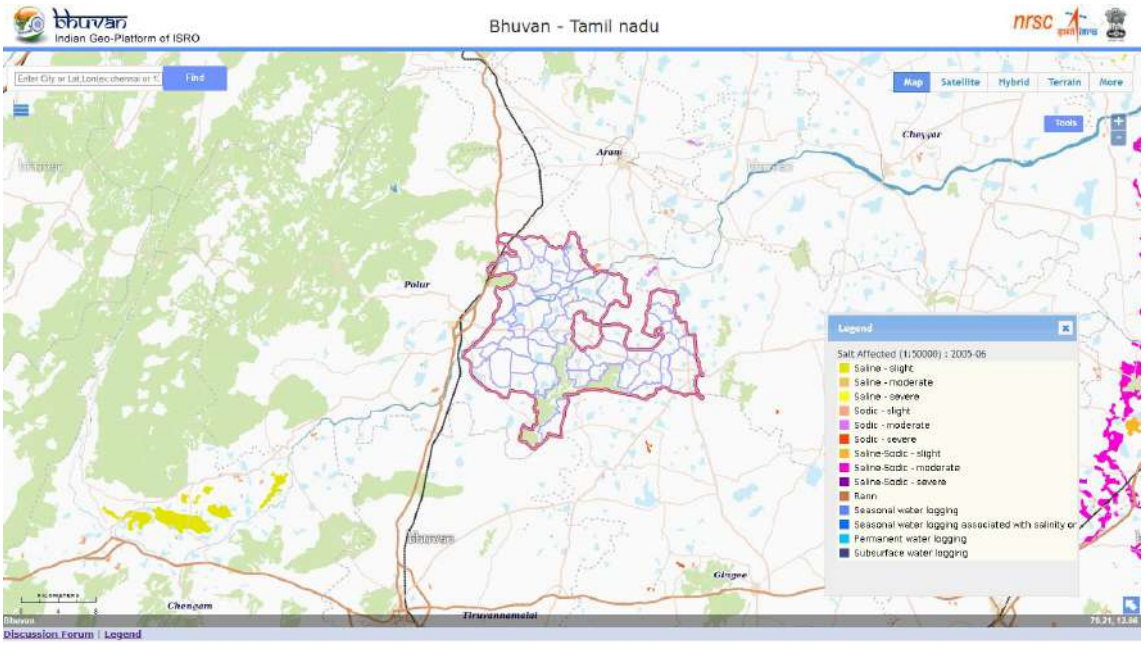


Figure 3.17. Salt Affected Area

Thematic unit	Area in %	Gram Panchayat
Saline	5%	Othalavadi, Uthur

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 CWRM Parameter	Extent
	Land Resources (ha)	
1	Forest land	2.35
2	Non-Agricultural Uses	5,673.24
3	Barren & Un-cultivable Land	559.64
4	Permanent Pastures and Other Grazing Land	532.83
5	Land Under Miscellaneous Tree Crops etc.	73.10
6	Cultivable Waste Land	200.86
7	Fallows Land other than Current Fallows	1,039.51
8	Current Fallow land	5,556.24
9	Unirrigated Land	3,122.63
10	Area Irrigated by Source	8,274.27
	Land under Catchment Area (ha)	
11	Good Catchment	6,235.23
12	Average Catchment	806.79
13	Bad Catchment	17,992.65
	Crop details	
14	Irrigated Area (ha)	12,694.73
15	Rainfed area (ha)	429.18
16	Paddy Cultivation (ha)	9,541.79
17	Crop Water Requirement - Irrigated condition (ha-m)	17,015.85
18	Crop Water Requirement - Rainfed condition (ha-m)	165.40
	Soil Resources: Status of Available Nitrogen (%)	
19	Very Low	26.58
20	Low	66.53
21	Medium	6.90
	Status of Organic Carbon (%)	
22	Very Low	36.19
23	Low	59.97
24	Medium	3.01
25	High	0.13
26	Very High	0.70
	Status of Soil Micro Nutrients (%)	
27	Sufficient	50.14
28	Deficient	47.84
	Status of Physical condition of the soil (%)	
29	Moderately Acidic	0.31

30	Slightly Acidic	5.05
21	Neutral	4.16
32	Moderately Alkaline	90.38
	Soil Texture (%)	
33	Clay soil	11.49
34	Fine Soil	77.14
35	Coarse loamy	3.36
36	Soil Water Permeability (Low, Moderate, high)	Moderate
	Soil moisture and ET	
37	Volumetric Soil Moisture (%)	23
38	Estimated Soil Moisture (ha.m)	19,361.43
39	ET Losses (ha.m)	6,266.70
	Means of water extraction (%)	
40	Gravity	7.84
41	Lifting	92.16
	Irrigation methods (%)	
42	Wild Flooding	16.33
43	Control Flooding	83.67
	Livestock (No.)	
44	Cattle Population	31,623
45	Sheep Population	10,823
46	Goat Population	8,792

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 25,034.67 ha, the highest of 33 % land is used for irrigation, followed by 22.6 % land is non-agriculture land, while cultivable wasteland, land with crop trees and forest land account less than a percent (Figure 3.18).

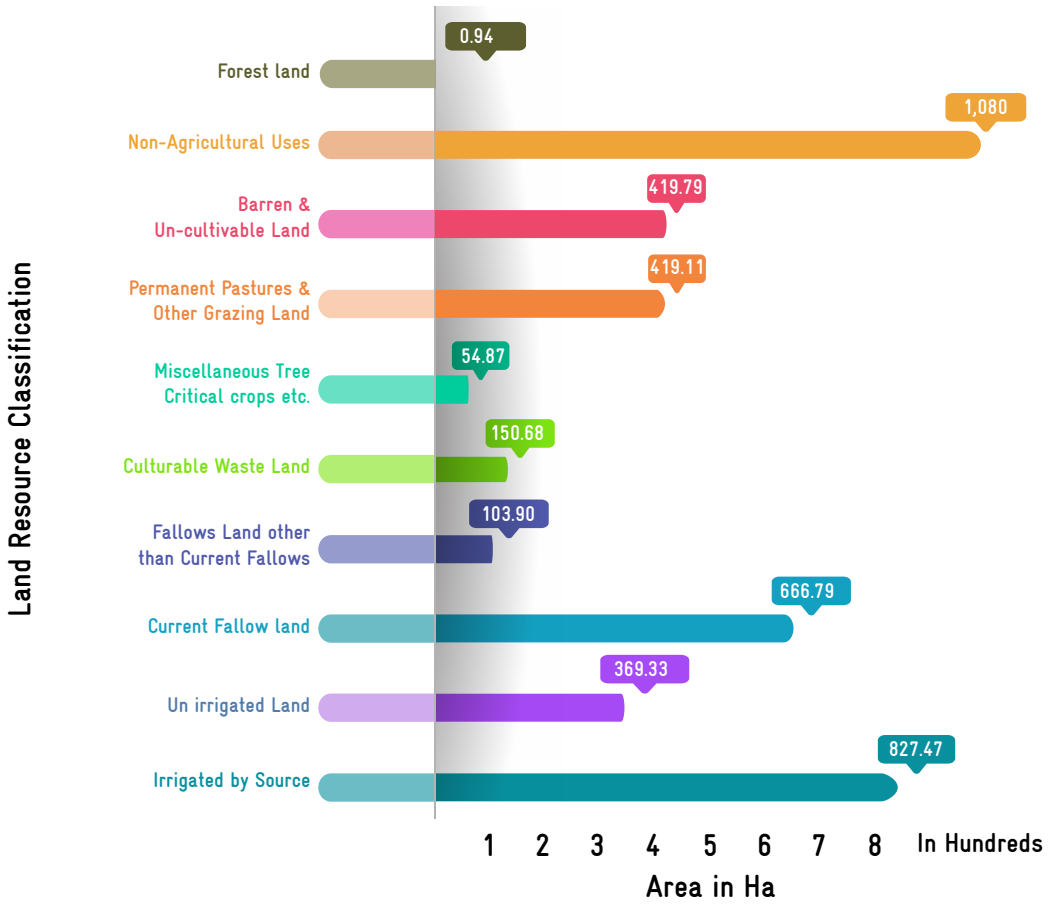


Figure 3.18. Land utilization

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 25,034.67 ha, of the Block, the highest of about 71.87 % is bad catchment area followed by 24.91 % of good and remaining is under average catchment area. This analysis helps to focus on prioritizing the works in the land use systems under the bad catchment area (Figure 3.19).

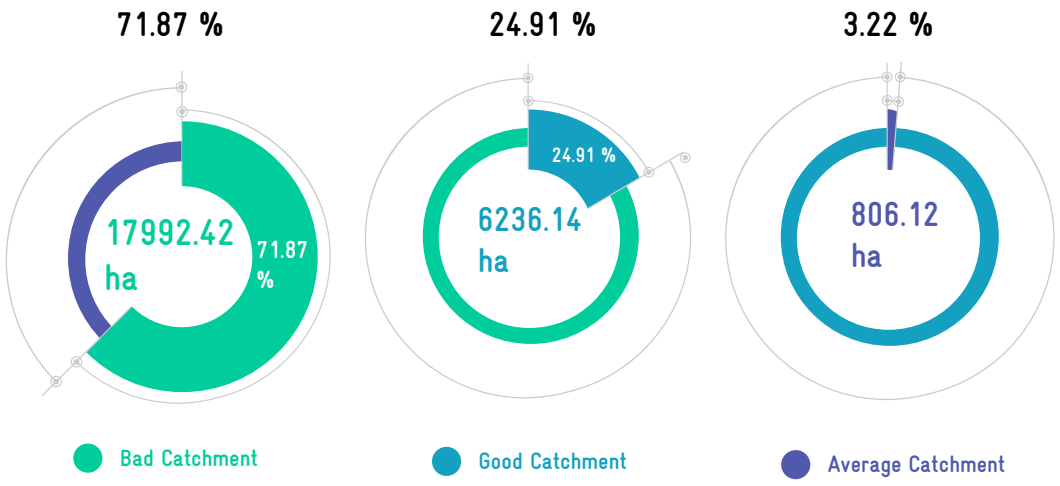


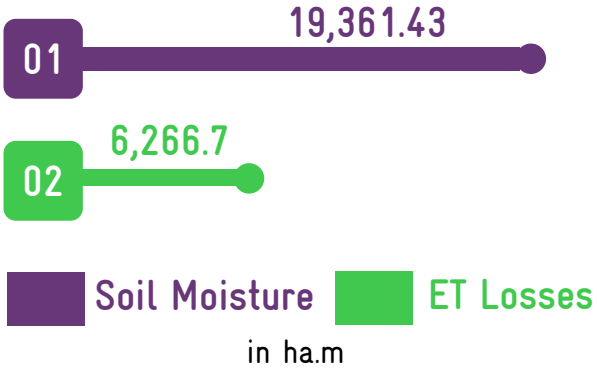
Figure 3.19. Catchment area

3.6.2.3 Soil moisture

Soil is an important medium to store the available water and the storage capacity varies with the type of soil especially its textural composition. In overall composite water budgeting, estimation of stored water in the soil assumes greater significance in this Block because of its significant proportion of area under rain-fed cultivation. The annual average volumetric soil moisture of this Block (23%), is taken for estimating the amount of water stored as soil moisture which accounts to 19,361.43 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 6,266.7 ha.m.



3.6.2.5 Macro soil nutrients Nitrogen

The macro soil nutrients such as nitrogen falls under very low to medium category in all the soil samples tested. The available nitrogen is very low in 26.58 % of the samples tested while it was 66.53 % 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).

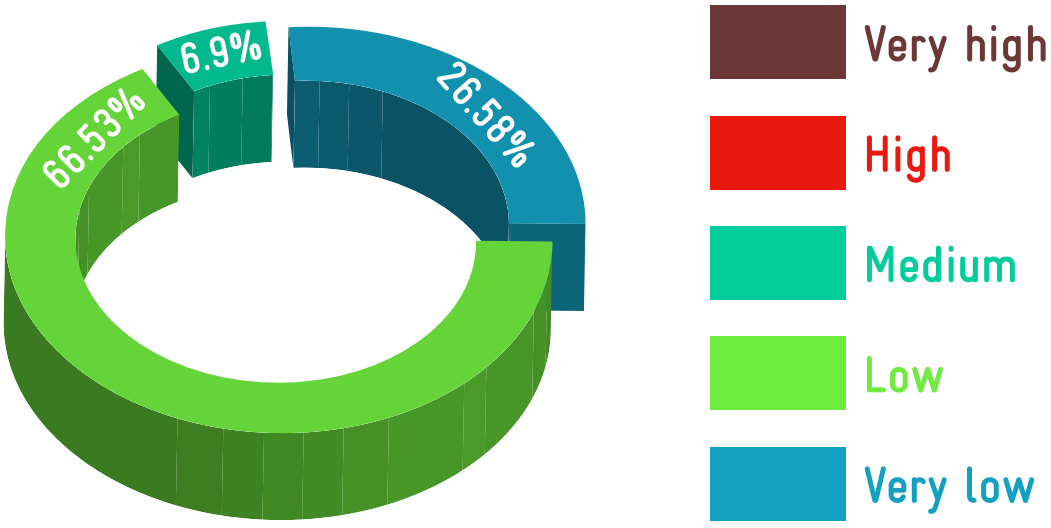


Figure 3.20. Status of available Nitrogen

Organic carbon

A similar trend was recorded for soil organic carbon. Soil organic carbon is also ranges between very low and low in the Block. Nearly 59.97 % of the soil samples tested fall under low category followed by 36.19 % is falls under very low category while 3 % under medium category and less than one percent samples witnessed high and very high organic carbon (Figure 3.21). This indicates that the soil fertility is very poor and further intensive practices will make the soil more vulnerable to degradation over a period of time.

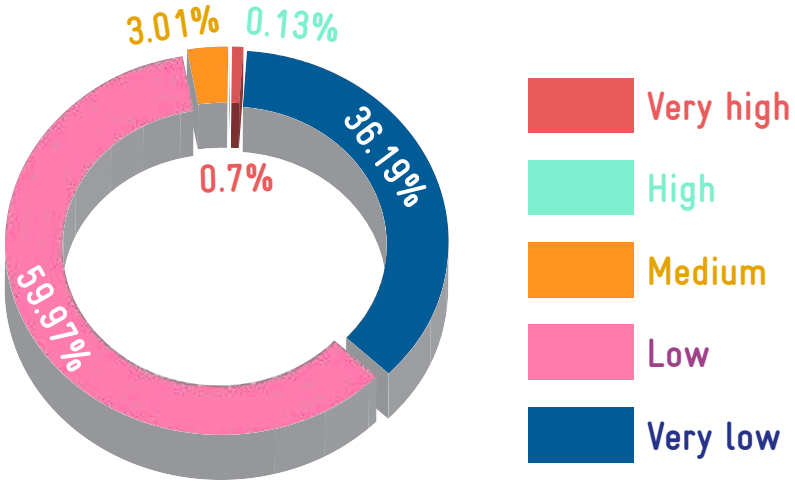


Figure 3.21. Status of soil Organic Carbon

3.6.2.6 Status of the soil micro-nutrients

This Block is one of the nitrogen, zinc and ferrous deficient block of Tiruvannamalai district. The micro-nutrient status of the soil with specific reference to Manganese, Boron and Zinc, Ferrous, Copper, and Sulphate are deficient in 47.84 % and 50.14 % sufficient in the soils tested. (Figure 3.22)

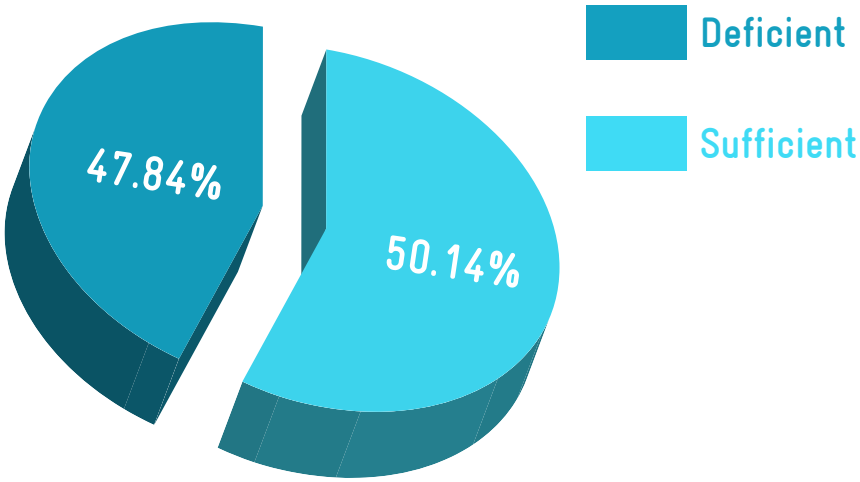


Figure 3.22. Status of soil micro-nutrients

3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 90.38 % of the soil is moderately alkaline in nature followed by 5.05 % is slightly acidic, 4.16 % is neutral in nature and 0.31 % is moderately acidic in nature (Figure 3.23).

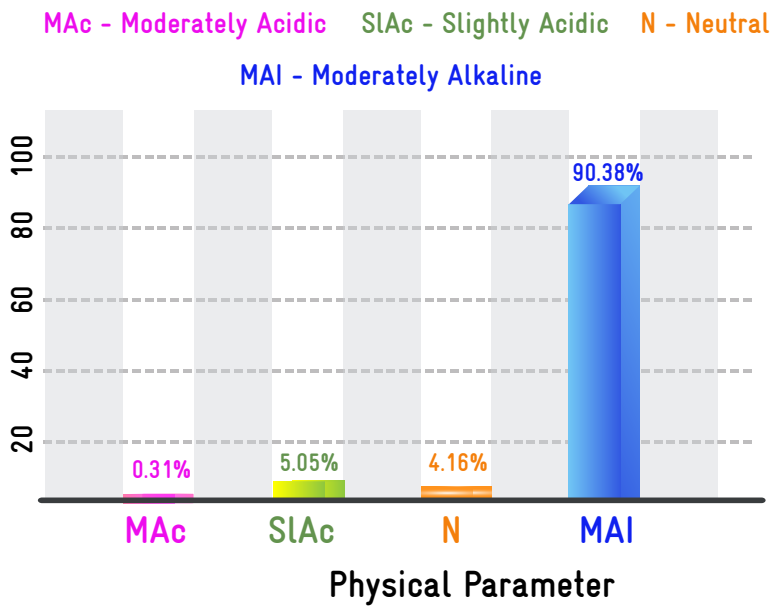


Figure 3.23. Status of pH of soil

3.6.2.8 Cropping pattern and the irrigation

A total of 18,143 ha area is used for crop cultivation in which irrigation shares the highest area of 83.3 % rest is rain-fed irrigation. About 15,120 ha is irrigated area in which paddy crop is dominant (62.4 %) followed by Groundnut (17.69 %). In rain fed cultivation, groundnut is the dominant crop (84%) followed by other pulses (15 %) (Figure 3.24). While red gram, ragi, dry chilli, brinjal, water melon, ladies finger, gourds, banana, guava, medicinal plants, lemon, mango, tomato, coconut were cultivated in minute areas.

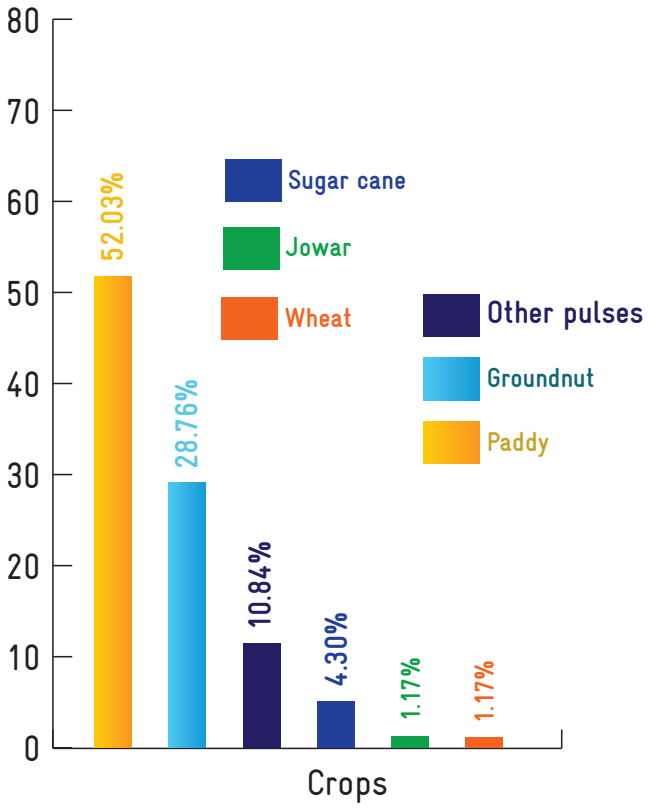


Figure 3.24. Cropping pattern

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, 83.67 % of the irrigation is done by control flooding and only 16.33 % of the irrigation is done by wild flooding (Figure 3.25).

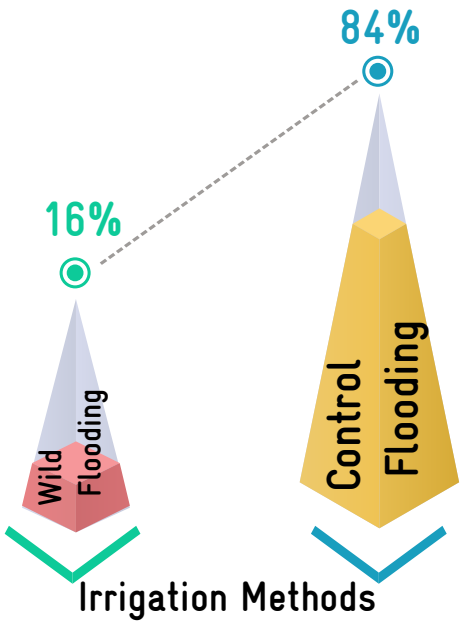


Figure 3.25. Irrigation methods

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, 92.16 % of the water extraction methods are under lifting means of extraction and only 7.84 % comes under gravity means of water extraction (Figure 3.26).

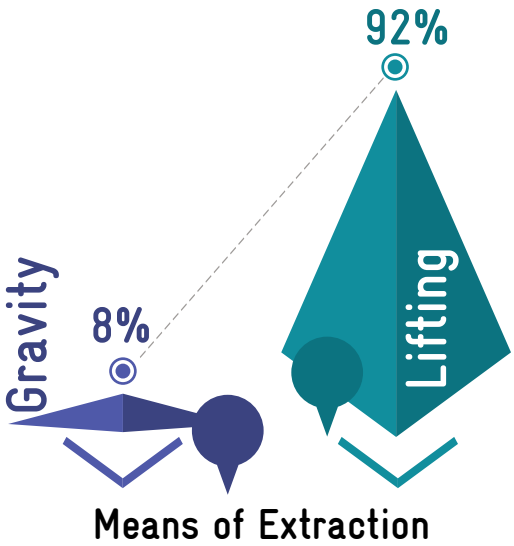


Figure 3.26. Means of water extraction

3.6.2.11 Livestock details

This Block has considerable proportion of livestock resources of which small ruminants such as goat and sheep constitute 21.12 % (10,823) and 17.16 % (8,792) of the total livestock. Cattle population is higher in this block 64.72 % (31,623) (Figure 3.27). The total water requirement for livestock is 123.87 ha.m. Of the total water demand of 85.39 % is met through ground water and remaining is from surface water resources.

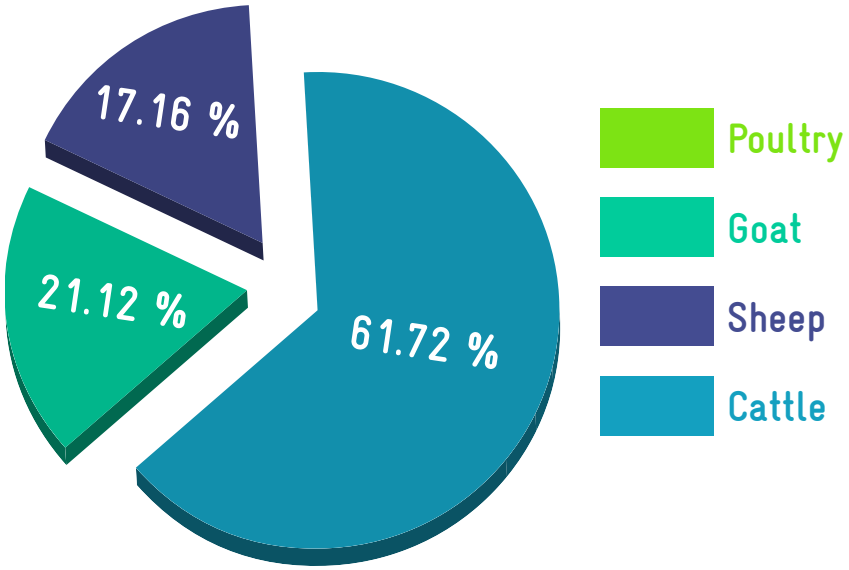


Figure 3.27. Livestock details

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 Chetpet 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.	Key CWRM Parameter	Extent
1	Geographical Area (ha)	24,451
2	Male Population (No.)	47,271
3	Female Population (No.)	47,116
4	Total Population (No.)	94,387
5	SC Population (No.)	11,561
6	ST Population (No.)	416
7	Vulnerable population (No.)	11,991
8	Households (HH's) (No.)	24,185
9	Only one room HH's (No.)	3,326
10	Female Headed HH's (No.)	1,727
11	Vulnerable Households (No.)	2,850
12	% of Vulnerable Households	12
13	Registered MGNREGA Job cards (Persons)	38,403

14	Active person working in MGNREGA job Cards (Persons)	26,815
15	Drinking Water Sources (No.)	5,878
16	Ground Water - Drinking source (No.)	178
17	Surface water - Drinking source (No.)	51
18	Sum of drinking water sources (No.)	229
19	HH's have tap water connection for drinking water (No.)	1,767
20	HH's dependent on other sources for drinking water (No.)	3,545
21	Annual Greywater Generation (ha - m)	172

3.7.1 Population:

The total population of this Block is 94,387 Lakh of which male and female population are balancing equally. 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 13% of the total population are under vulnerable population (Figure 3.28).

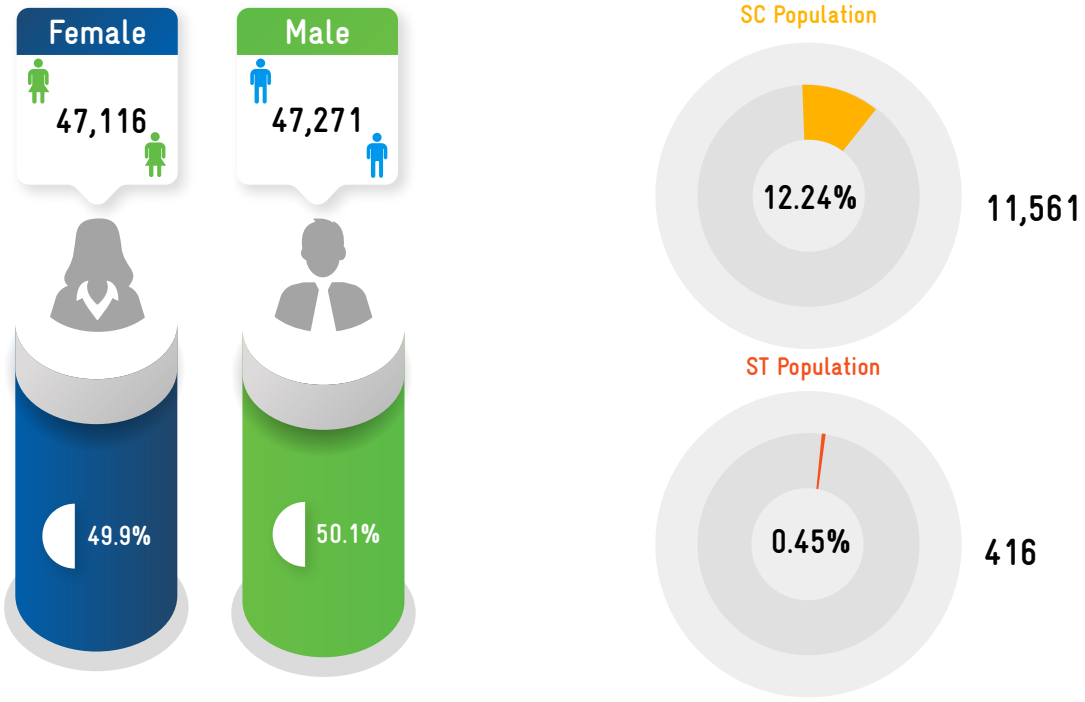


Figure 3.28. population details

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

3.7.2 Details of households

There are a total of 24,185 households in which 14 % households have only one room, 7 % households are headed by women and 12 % are vulnerable households (Figure 3.29).

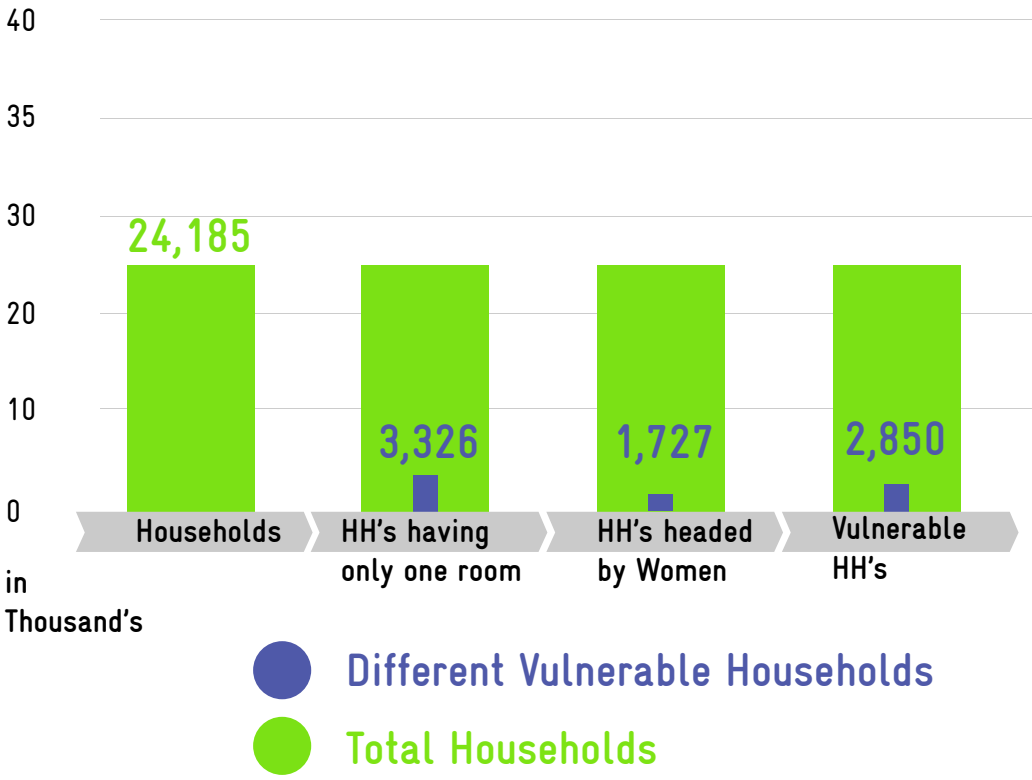


Figure 3.29. Details of Households

3.7.3 Status of Mahatma Gandhi NREGA - job card status

In the Block of the total population of 94,387 Lakhs, 348,403 are registered for job cards in Mahatma Gandhi NREGA scheme in which 70 % of the job cards are in active category (Figure 3.30).

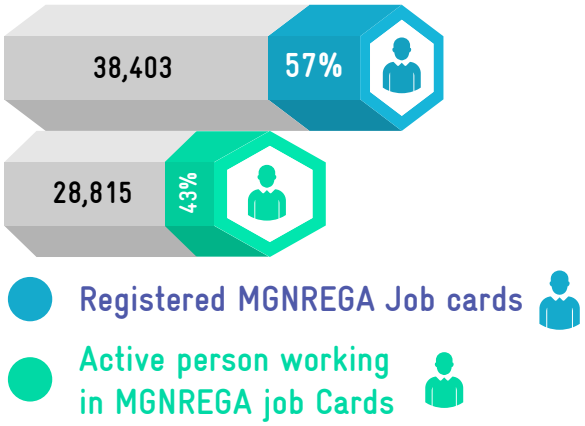


Figure 3.30. Status of MGNREGA job cards

3.7.4 Drinking water sources

Nearly 1,767 households have tap water connection and 3,545 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

1,767
Households

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

3,545
Households

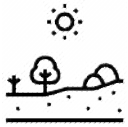
3.7.5 Annual greywater generation

The grey water generation estimated across this Block is 172 ha.m which is available for reuse or recycle.

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

Morphology

Karaipoondi, Ariyathur, Karikkathur



Wasteland

Vilapakkam, Thachambadi, Kolavoor

Soil erosion

Tirumalai, Kolakkaravadi, Narasingapuram

Upland/Slope

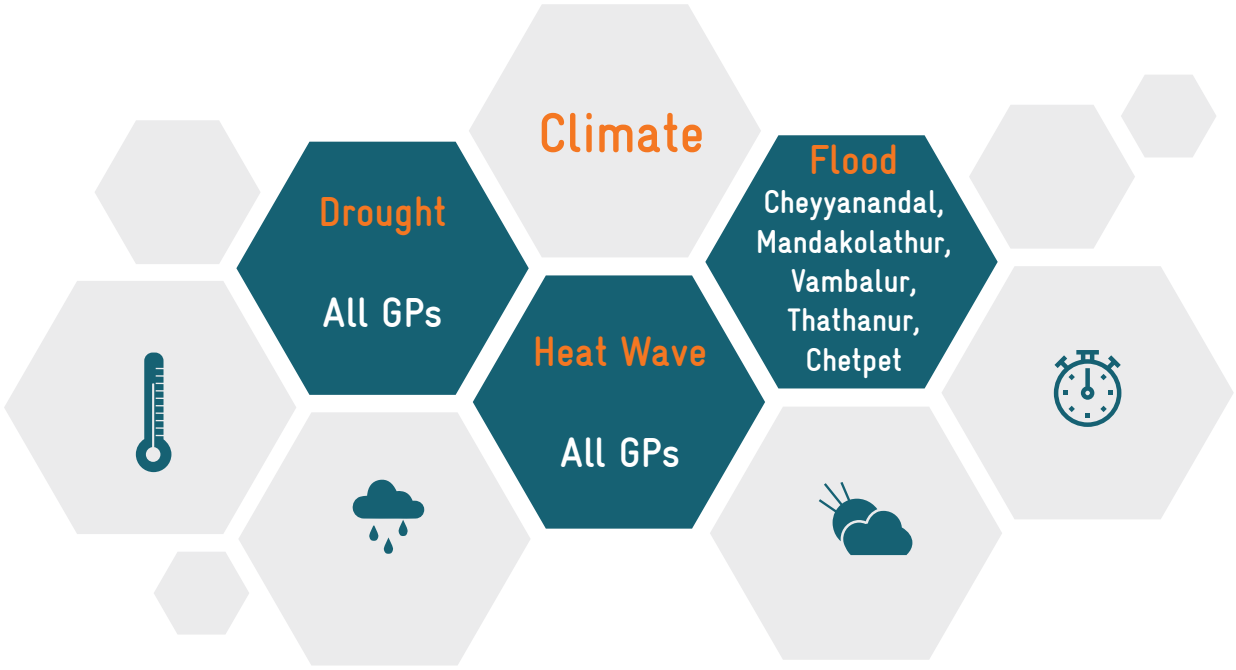
Kilpattu, Modaiyur

Ground water prosperity

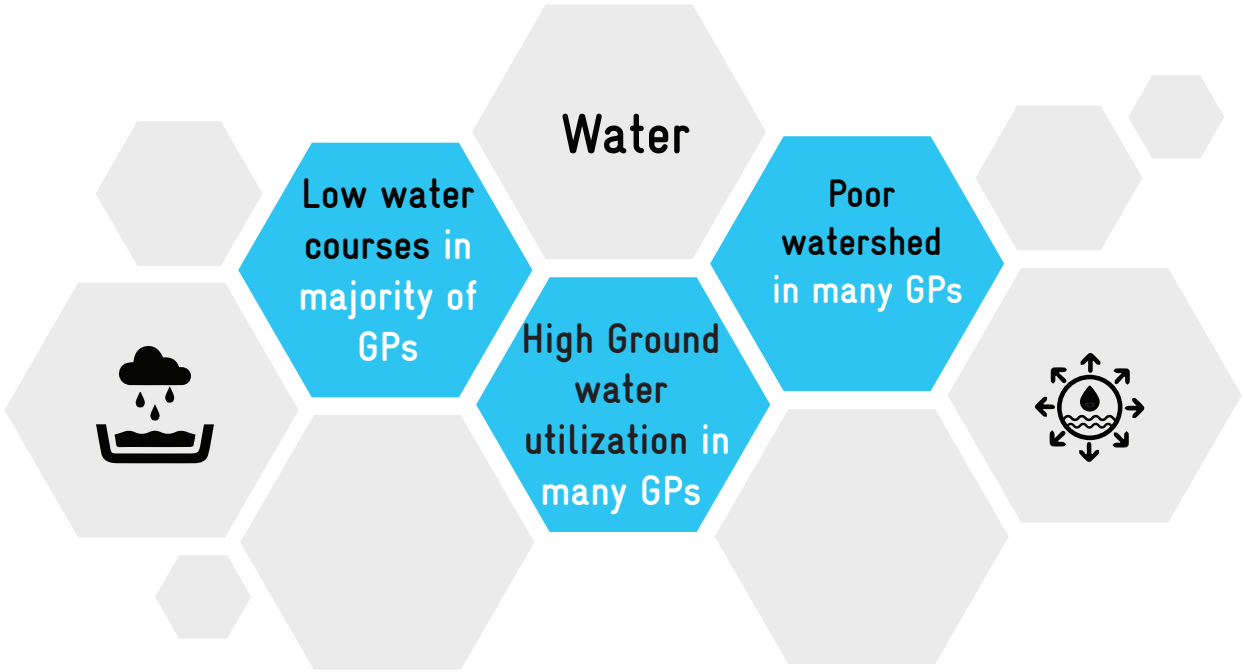
Arumbalur, Tirumalai, Vilapakkam, Arumbalur

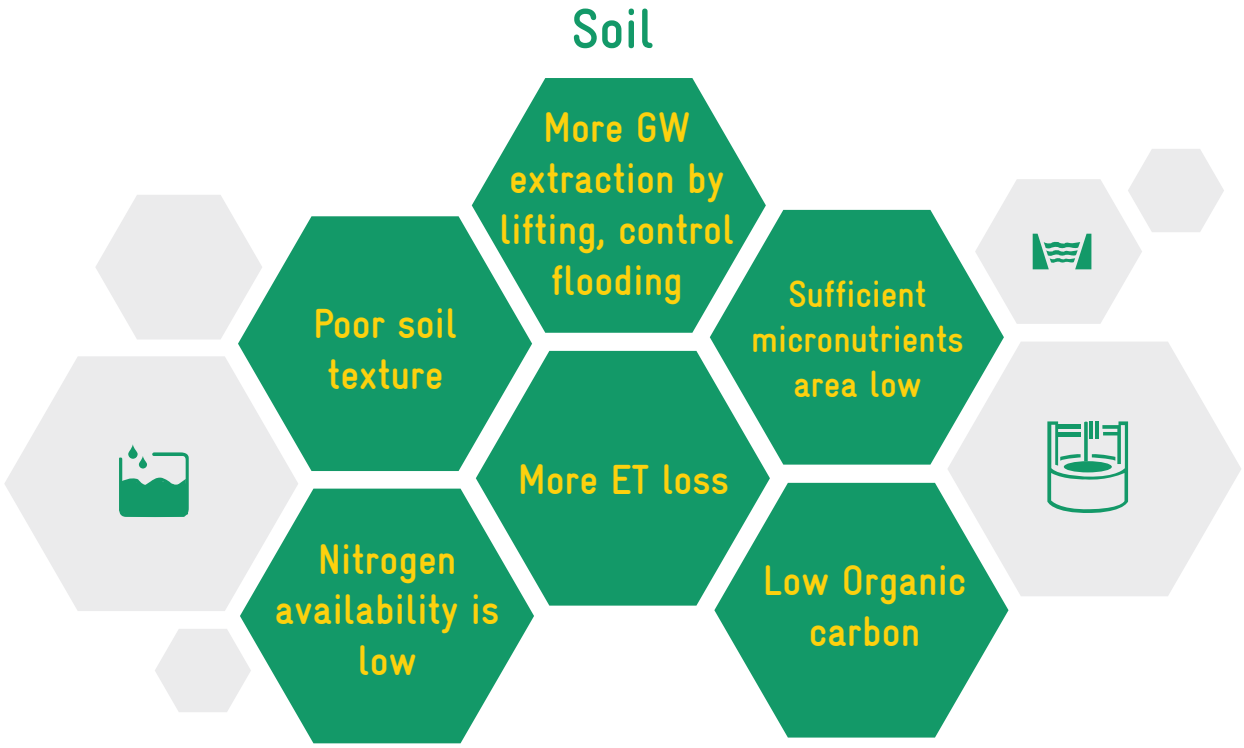
Salt affected area

Othalavadi, Uthur


Climate
Drought
All GPs
Flood
Cheyyanandal, Mandakolathur, Vambalur, Thathanur, Chetpet
Heat Wave
All GPs


Socio economic
Population density high in Ulagampattu, Ettivady, Mansurabad, Kilpattu, Vadamathimangalam
Vulnerable population high in Inam karianadal, Mangalam, Arpakkam
% of vulnerable households high in Narasingapuram, Vambalure, Karikathur
No. of households and female headed households high in Vadamathimangalam, Mansurabad, Rajamapuram, Severapoondi
Total population, Female population high in Vadamathimangalam, Thachambady, Othalavady, Mansurabad
Grey water generation more in Vadamathimangalam, Othalavady
Most of GP HH's do not have tap water connection for drinking water
Registered MGNREGA job cards and active persons working are low in Narasingapuram, Ulagampattu, Thathanur


Water
Low water courses in majority of GPs
Poor watershed in many GPs
High Ground water utilization in many GPs


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

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).

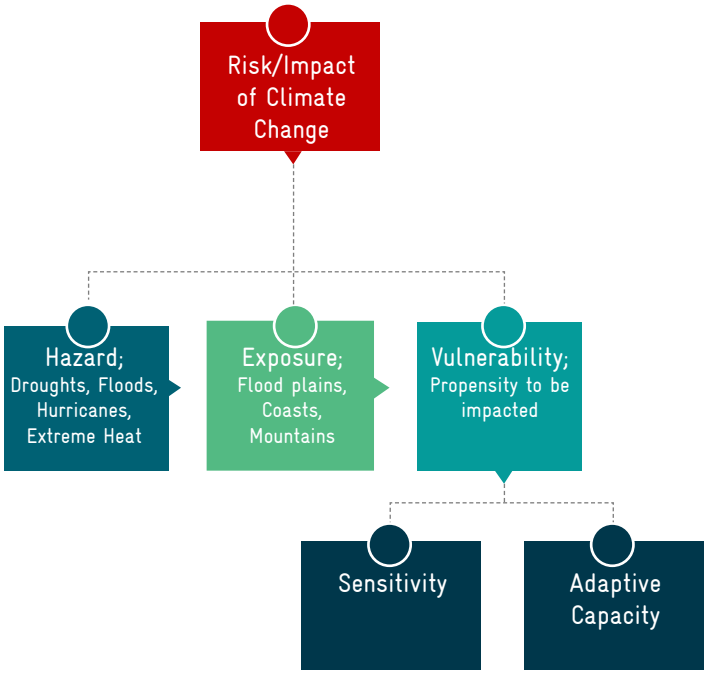


Figure 4.1. Vulnerability of the system as defined by IPCC

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.

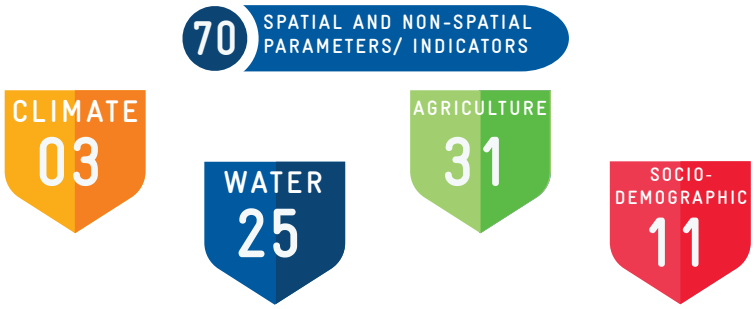


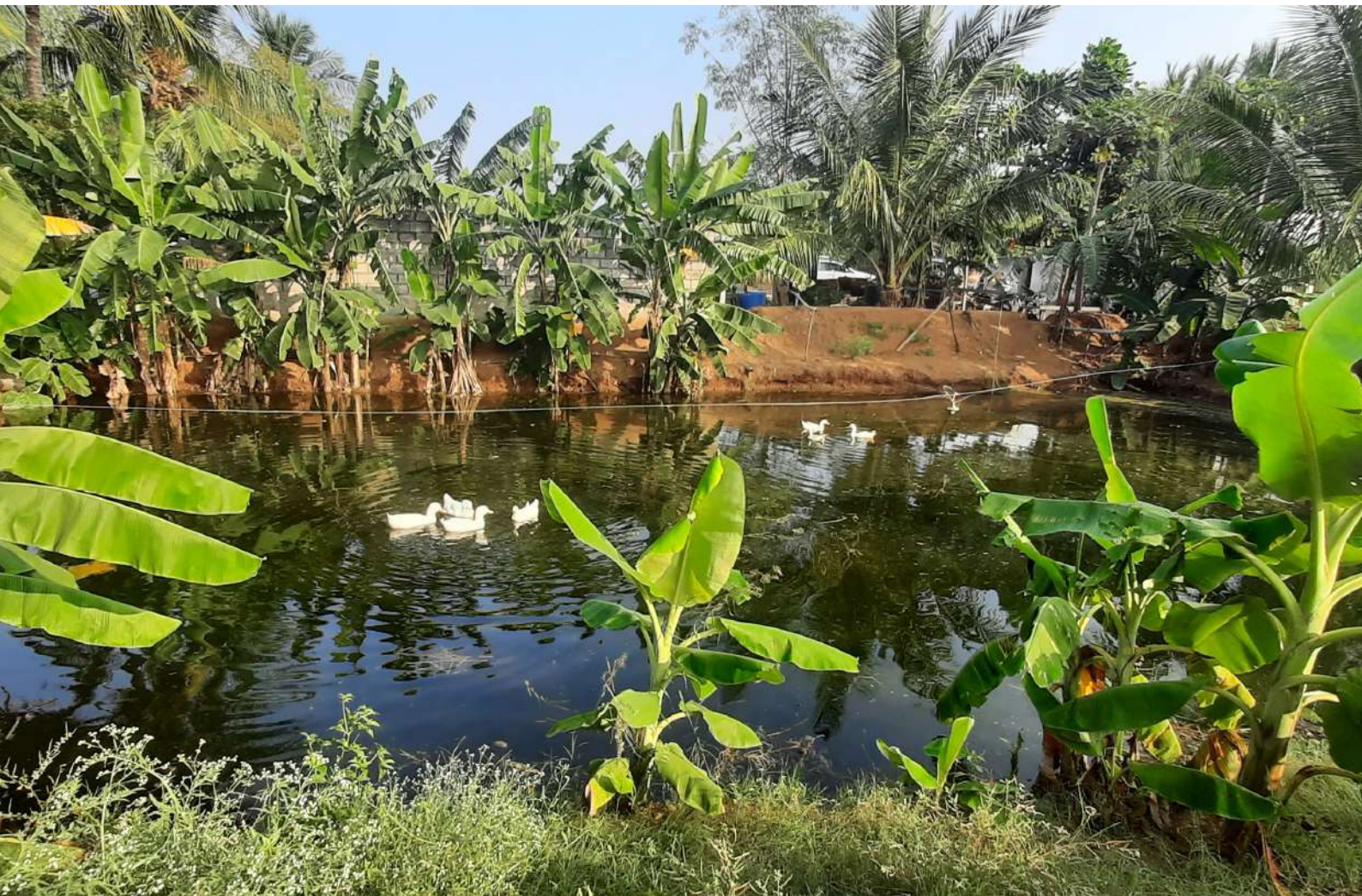
TABLE 9. CWRM PARAMETERS/INDICATORS SELECTED FOR BLOCK LEVEL VULNERABILITY

	Key CWRM Parameter	Vulnerability relationship
Climate	Drought	Climate risk/Sensitivity
	Flood locations	
	Heat Wave	
Water	**Canal Network (in m)**	
	Length of main canal	Adaptive capacity
	Length of minor canal	
	Length of distributaries	
	Water courses (Field channels)	
	Traditional water bodies (in No.)	
	No. of Tanks	Adaptive capacity
	No. of 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 methodology vulnerability assessment is given in Annexure 4. Vadamathimangalam GP shown higher CVI value followed by Gudalore while Eyakolathur GP with low CVI value (Figure 4.2).

Upto	Color range	category
0.563		very high
0.535		high
0.507		medium
0.480		low
0.452		very low



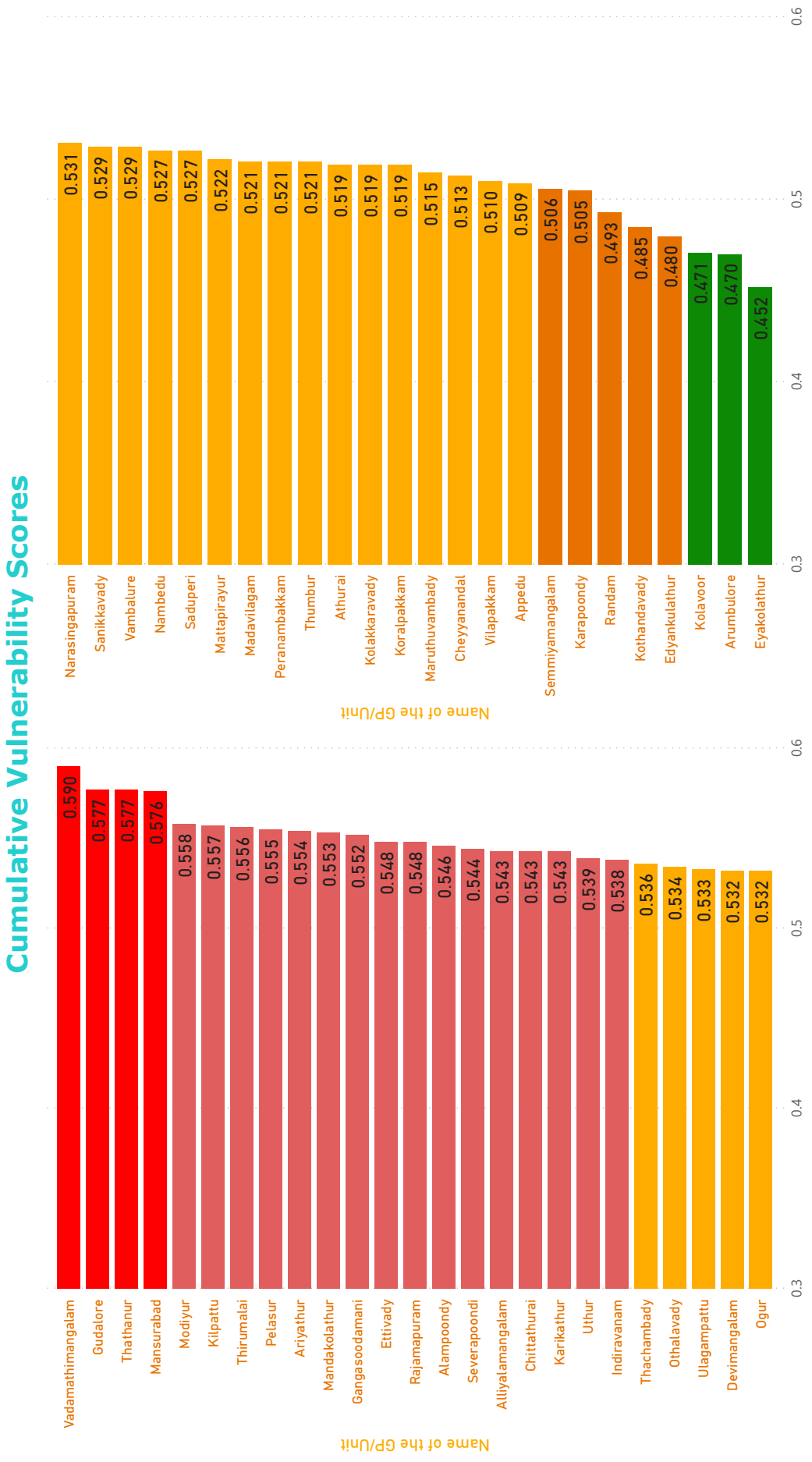


Figure 4.2. Final cumulative vulnerability scores

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 while Cheyyanandal, Mandakolathur, Vambalur, Thathanur and Chetpet GPs are vulnerable to flood.

CHEYYANANDAL, MANDAKOLATHUR, VAMBALUR, THATHANUR CHETPET

Water resource vulnerability

The water resources vulnerability index shows that Rajamapuram, GP have high vulnerability followed by Alliyalamangalam, Vadamathimangalam Mandakolathur, Pelasur, Gudalore GPs while Eyakolathur GP with lower CVI.

RAJAMAPURAM, ALLIYALAMANGALAM, VADAMATHIMANGALAM MANDAKOLATHUR, PELASUR, GUDALORE, EYAKOLATHUR

Agriculture resources vulnerability

In agriculture and allied sectors, Gudalore GP has highest vulnerable score are followed by Alampoondy, Mansurabad, Severapoondi, Uthur, Kilpattu, Pelasur, Vadamathimangalam GPs, while Arumbulore GP with lower CVI.

GUDALORE, ALAMPOONDY, MANSURABAD, SEVERAPOONDI, UTHUR, KILPATTU, PELASUR, VADAMATHIMANGALAM, ARUMBULORE

Socio-economic vulnerability

Athurai GP has high CVI value followed by Vadamathimangalam, Ulagampattu, Chittathurai, Narasingapuram while Rajamapuram GP with low value.

ATHURAI, VADAMATHIMANGALAM, ULAGAMPATTU, CHITTATHURAI, NARASINGAPURAM RAJAMAPURAM

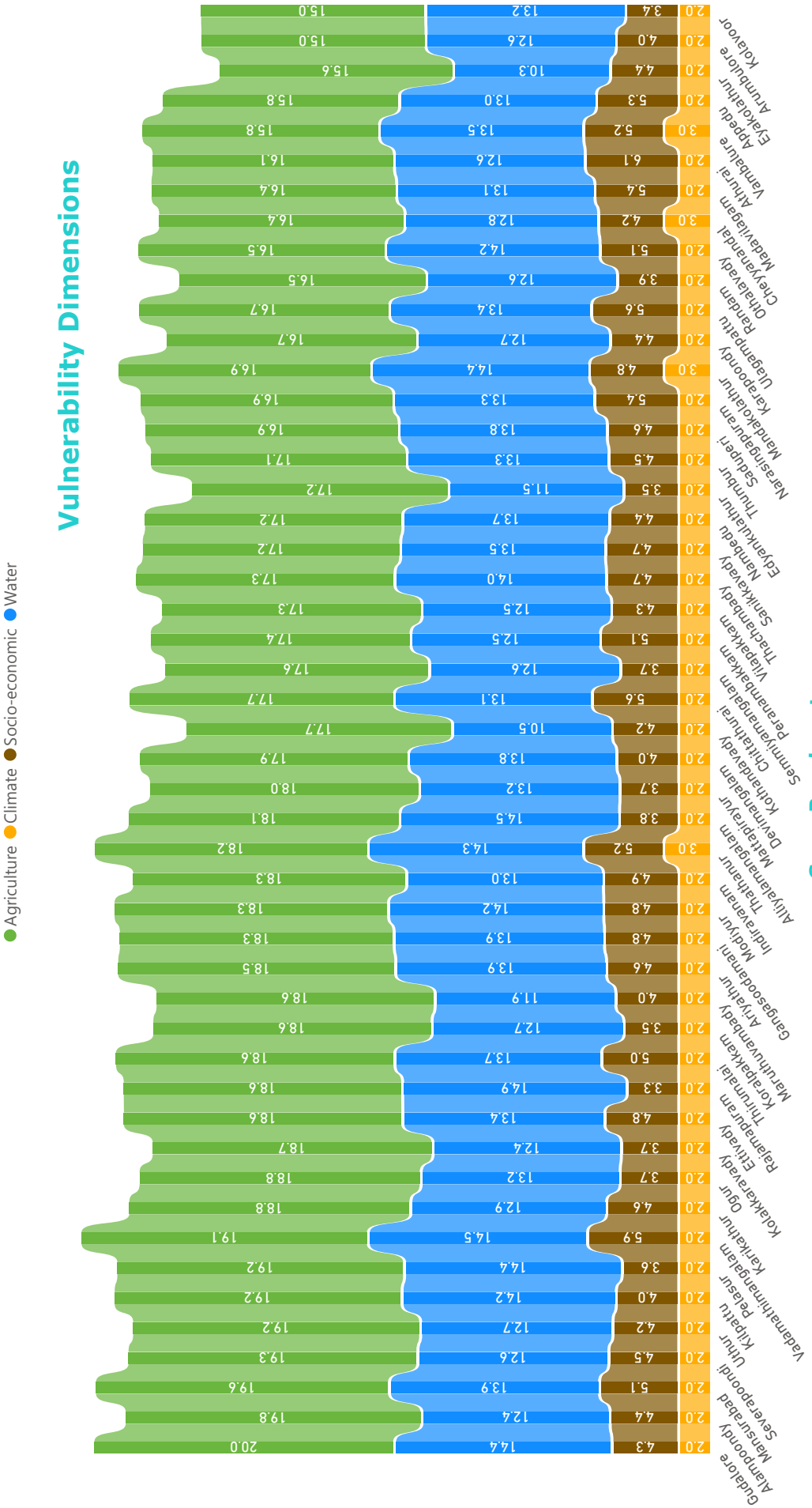
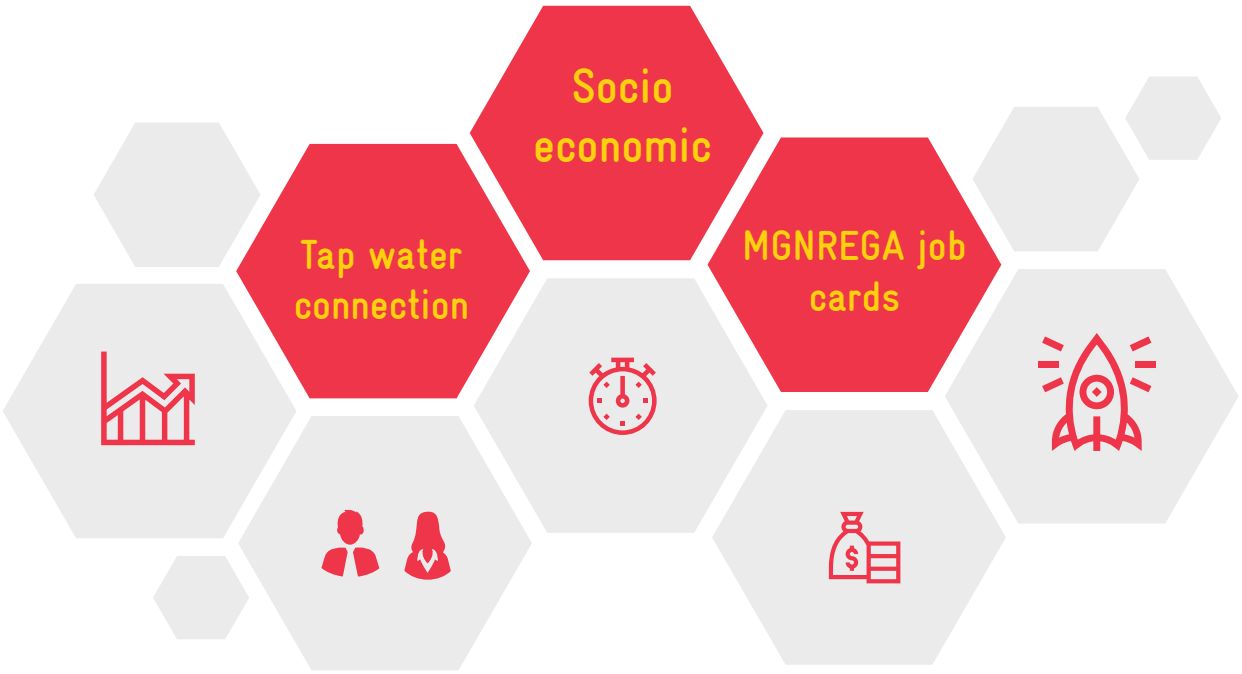
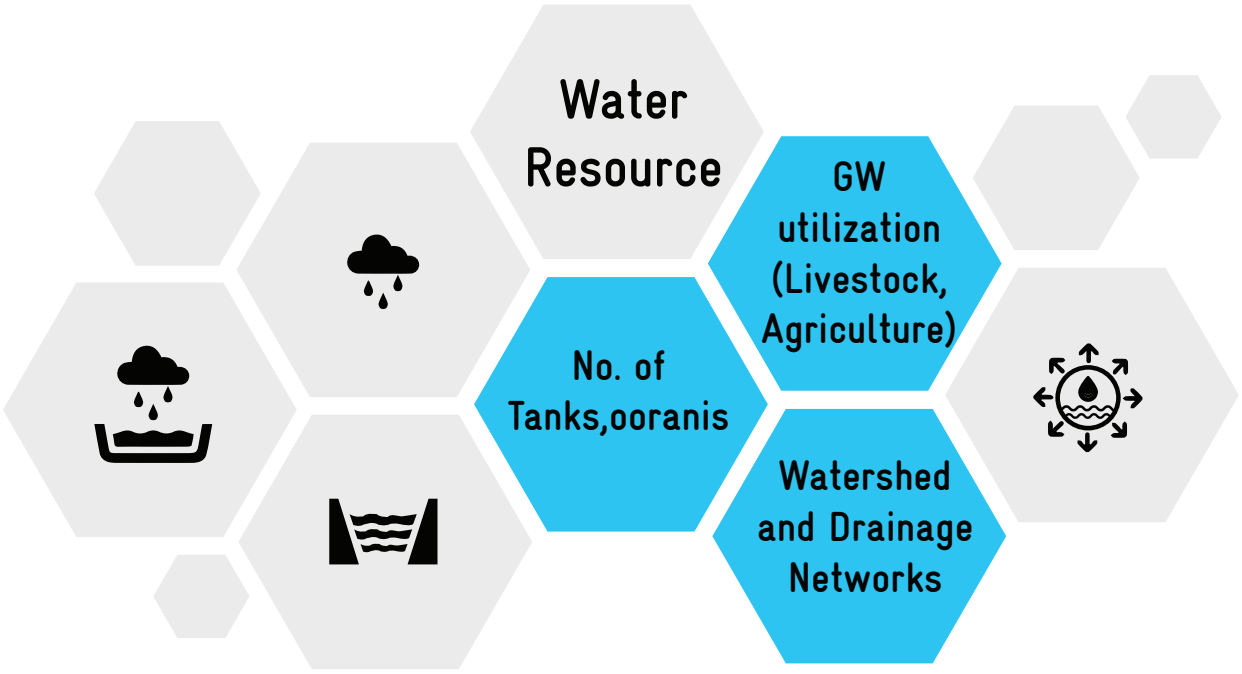
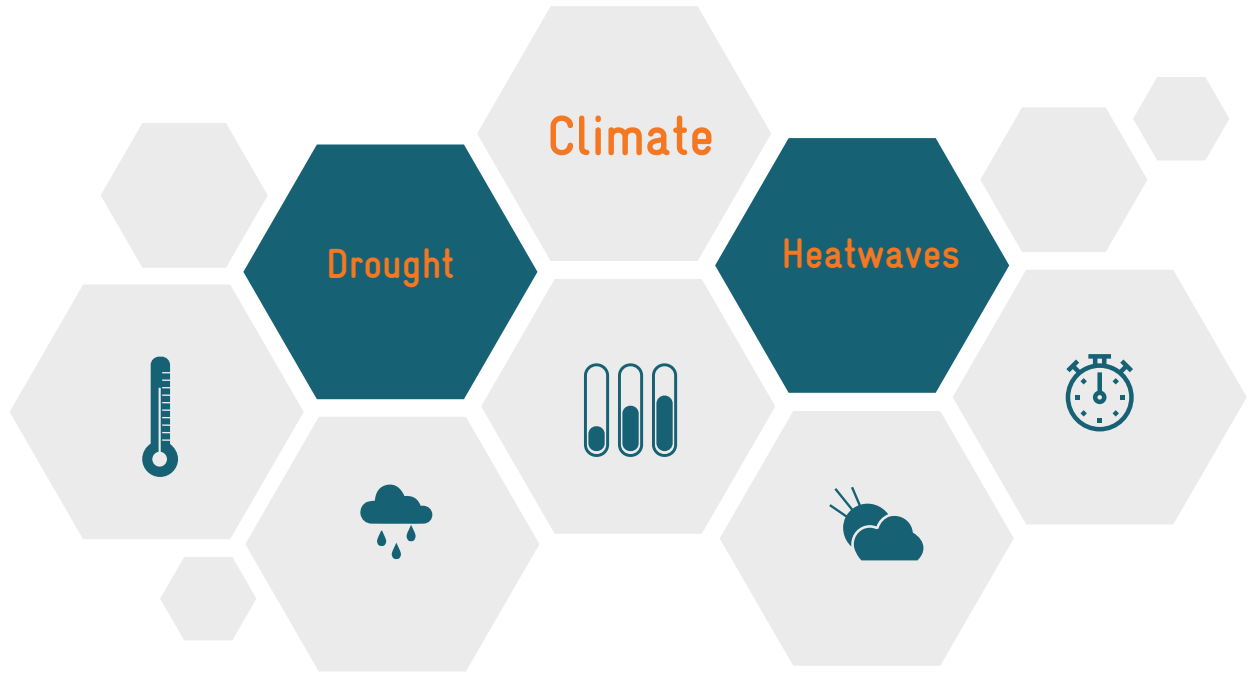


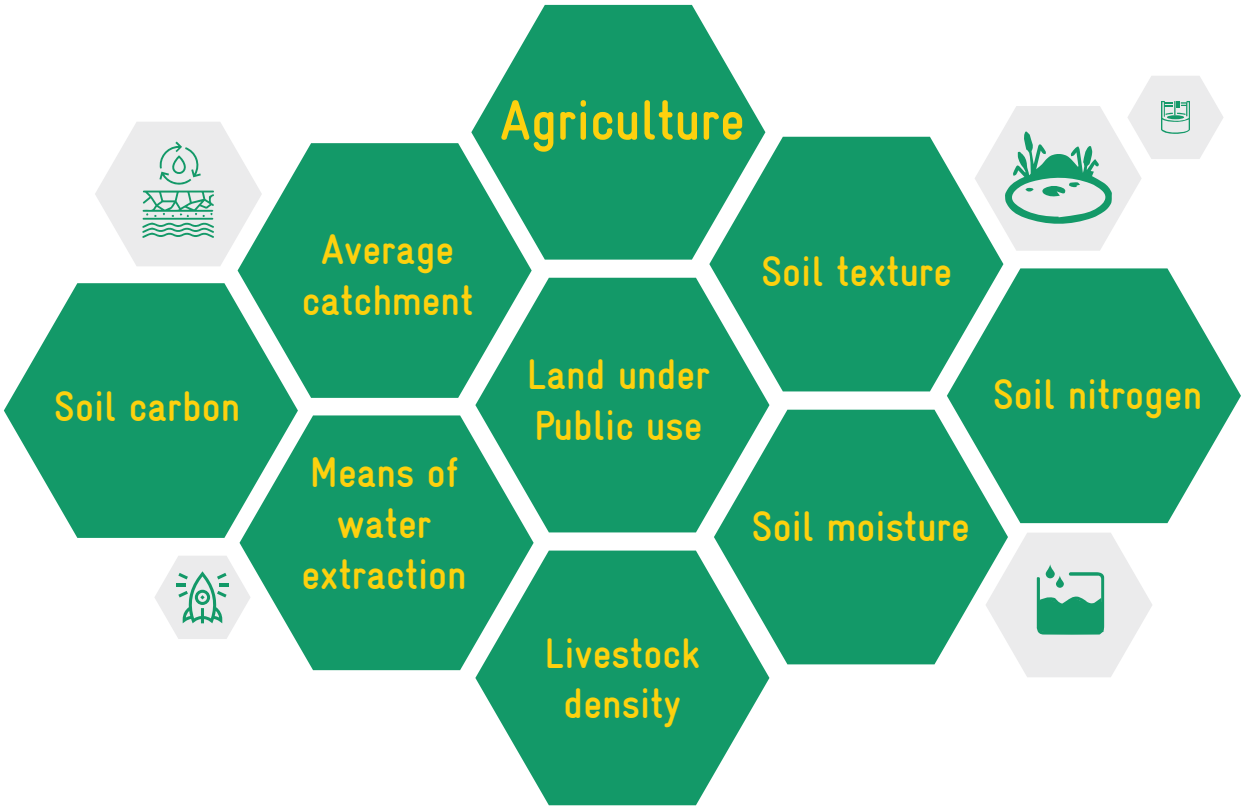
Figure 4.3. GP wise vulnerability dimensions

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 CONVERGENCE

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

5.1 THE PROPOSED AREA UNDER WASCA TREATMENT

Out of 25,034.67 ha available land in Chetpet block, 4,092.91 ha (16.35 %) area is proposed for treatment under WASCA TN – CWRM planning. A major portion of key water actions is proposed in non-agriculture use land of 1,080 ha (20.38.8 %) followed by irrigation land of 827 ha (20.21 %) while less than five percent of forest land, miscellaneous tree crops etc., fallow land and cultivable wasteland area is considered for treatment. 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.

TABLE 10. THE PROPOSED AREA FOR WASCA TREATMENT

Land use	Total available land (ha)	WASCA proposed treatment area (ha)
Barren & Un-cultivable Land	559.64	419.79
Cultivable Waste Land	200.86	150.68
Current Fallow land	5,556.24	666.79
Fallows Land other than Current Fallows	1,039.51	103.90
Forest land	2.35	0.94
Land Under Miscellaneous Tree Crop etc.	73.10	54.87
Non-Agricultural Uses	5,673.24	1,080.04
Permanent Pastures and Other Grazing Land	532.83	419.11
Area Irrigated by Source	8,274.27	827.47
Unirrigated Land	3,122.63	369.33
Total	**25,034.67**	**4,092.91**

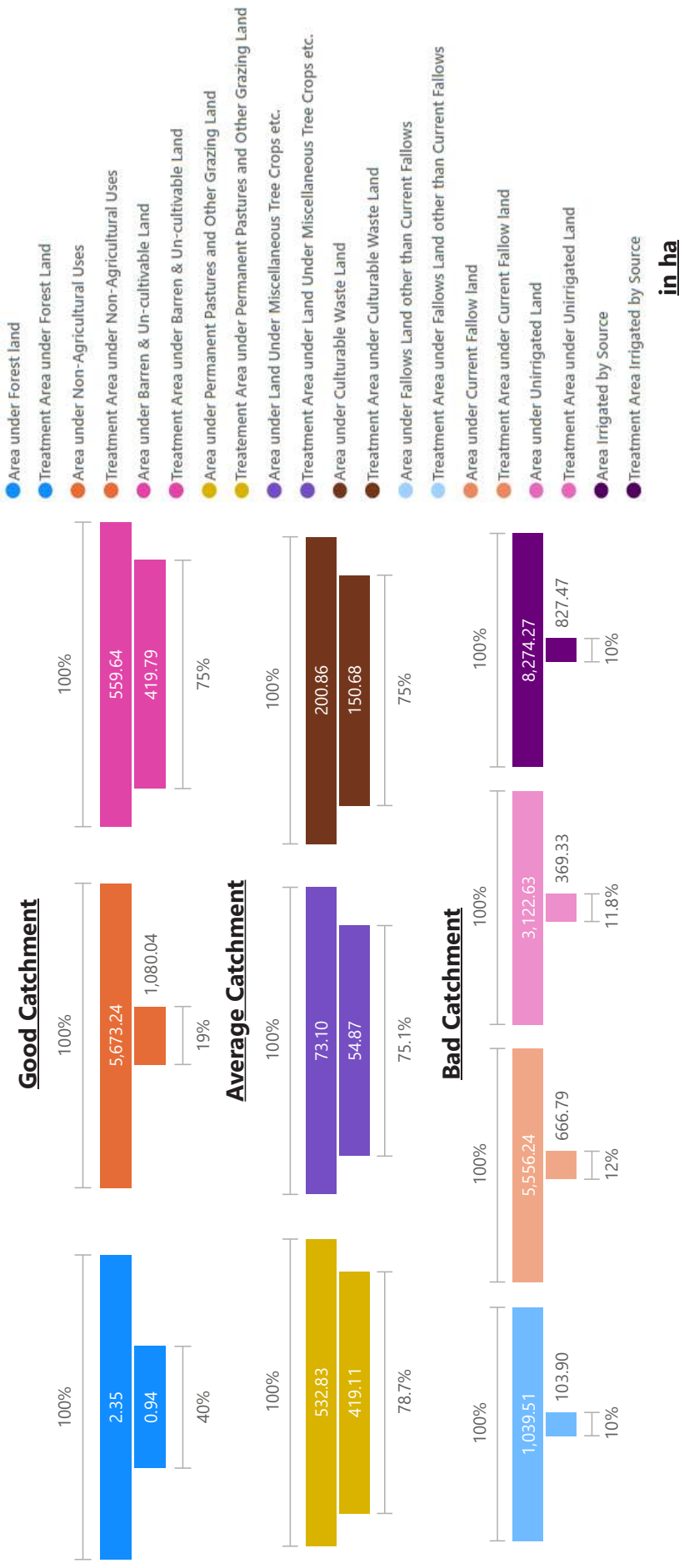


Figure 5.1. WASCA treatment area in percentage

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 1,476.78 ha.m which is 25 % of the total runoff. Of the expected runoff conservation, 48.16 % comes from good catchment area, 9.76 % comes under average catchment area and 42.08 % comes from bad catchment area (Figure 5.2).

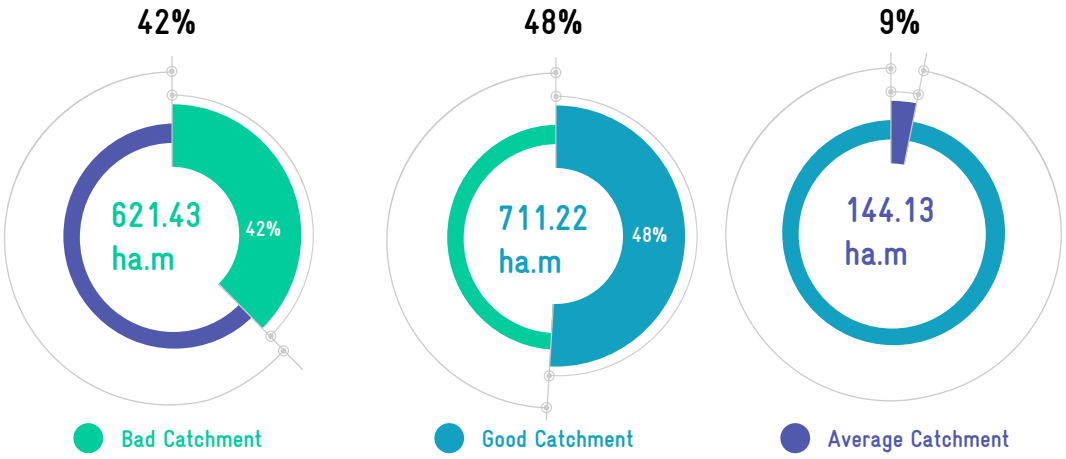


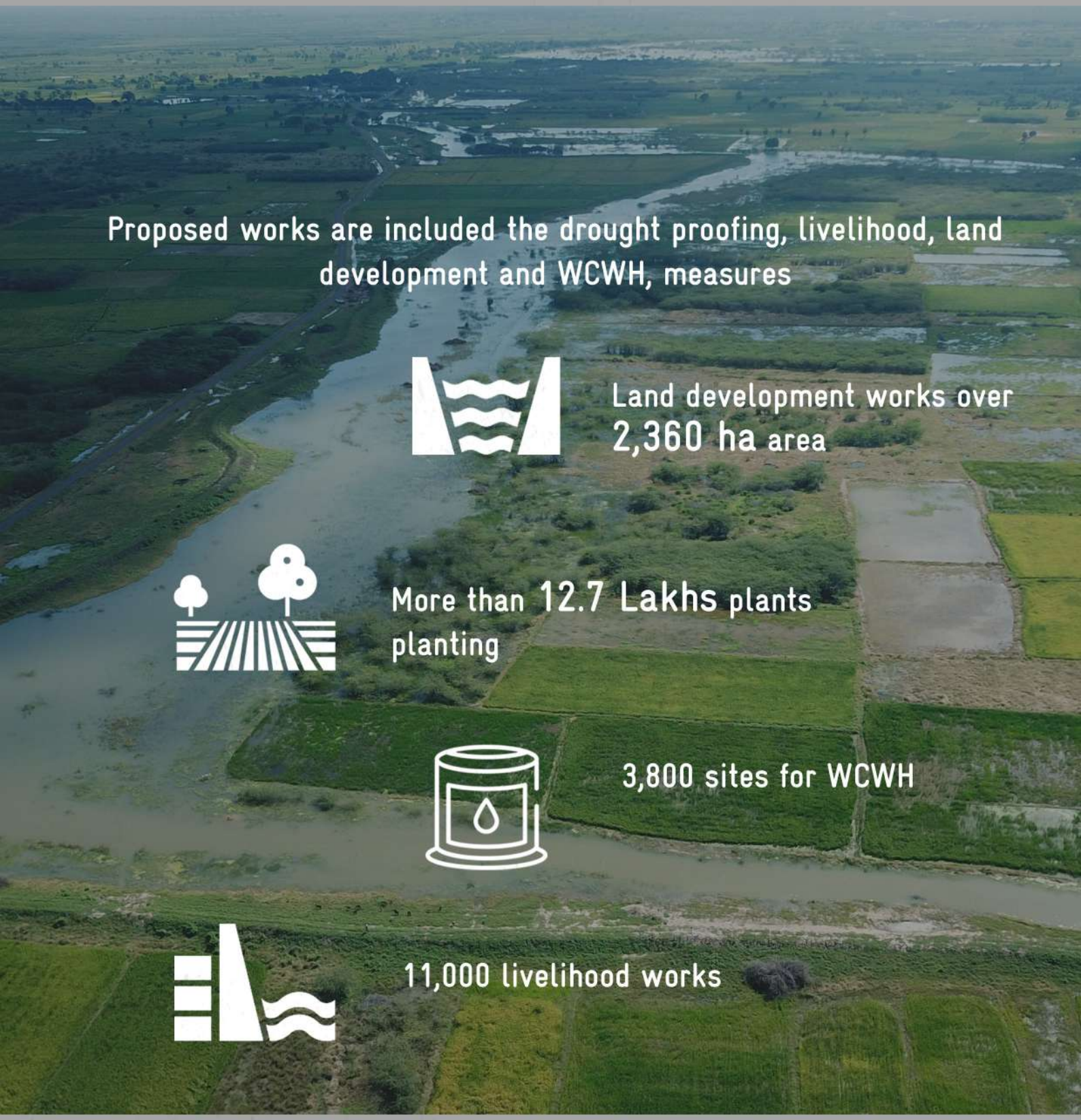
Figure 5.2. Expected conservation after WASCA treatment

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

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

Work (unit)	Abbreviation (unit)	No.	Extent (area in ha or length in m)
Azolla units - Individual (Number of units)	Az	2,054	
Cattle Shelters (Number of units)	CS	2,054	
Cattle Trough(Number of units)	CT	2,054	
Fodder development - Community & Individual	FD	2,054	
Goat Sheep Shelters (Number of units)	GSS	709	
Poultry Shed (Number of units)	PS	1	
Silvi-pasture Development(Ha)	SPD	3,30,176	418
Soak Pits (Community) (Number of units)	SPC	242	
Soak Pits (Individual) (Number of units)	SPI	3,003	
Artificial Recharge Structure(Number of units)	ARS	161	0
Construction of Farm Ponds - Individual (Number of units)	FP	613	
Construction of new open wells & Recharge Shafts (Number of units)	COWRS	2,611	

Restotaration of water bodies:a.PWD and Tanks(Number)	RPWDT	121	
Restotaration of water bodies:b. Ooranis(Number)	Ro	0	
Restotaration of water bodies:c. Ponds(Number)	RP	208	
Roof Rain Water Harvesting (Number of units)	RRWH	98	
Water Course - Irrigation Channels - Desilting (Mtrs)	WCICD	0	1,11,320
Afforestation in Public/common lands(Ha)	Aff	4,43,290	554.83
Avenue plantation(Km)	AVP	299	1,38,830.6
Block Plantation (Community)(Ha)	BP	6,43,212	818.4
Canal Bund Plantation(Ha)	CBP	13,918	69,579
Contour Continous Bunds (CCB) for Afforestaion area(Mtrs)	CCBF	0	0
Drainage Line Treatment (DLT)(Mtrs)	DLT	22,434	1,12,178
Dry land Horticulture/Agro-forestry - Individual (Ha)	DLHAI	72,634	91
Irrigation Channel Plantation (Mtrs)	ICP	22,264	1,11,320
Linear Plantation(Km)	LP	22,507	97,020
Micro Irrigation(Ha)	MI	43	108
Nursery Development(Number of units)	ND	32,582	6,520
Composting (Number of units)	Co	443	160
Farm Bunding with Boundary Trenches - Individual (Ha)	FBBTI	123	309
Land development - Individual (Ha)	LDI	758	1,892
NADEP Vermi compost (Number of units)	NADEP	2,054	


Proposed works are included the drought proofing, livelihood, land development and WCWH, measures
Land development works over 2,360 ha area
More than 12.7 Lakhs plants planting
3,800 sites for WCWH
11,000 livelihood works

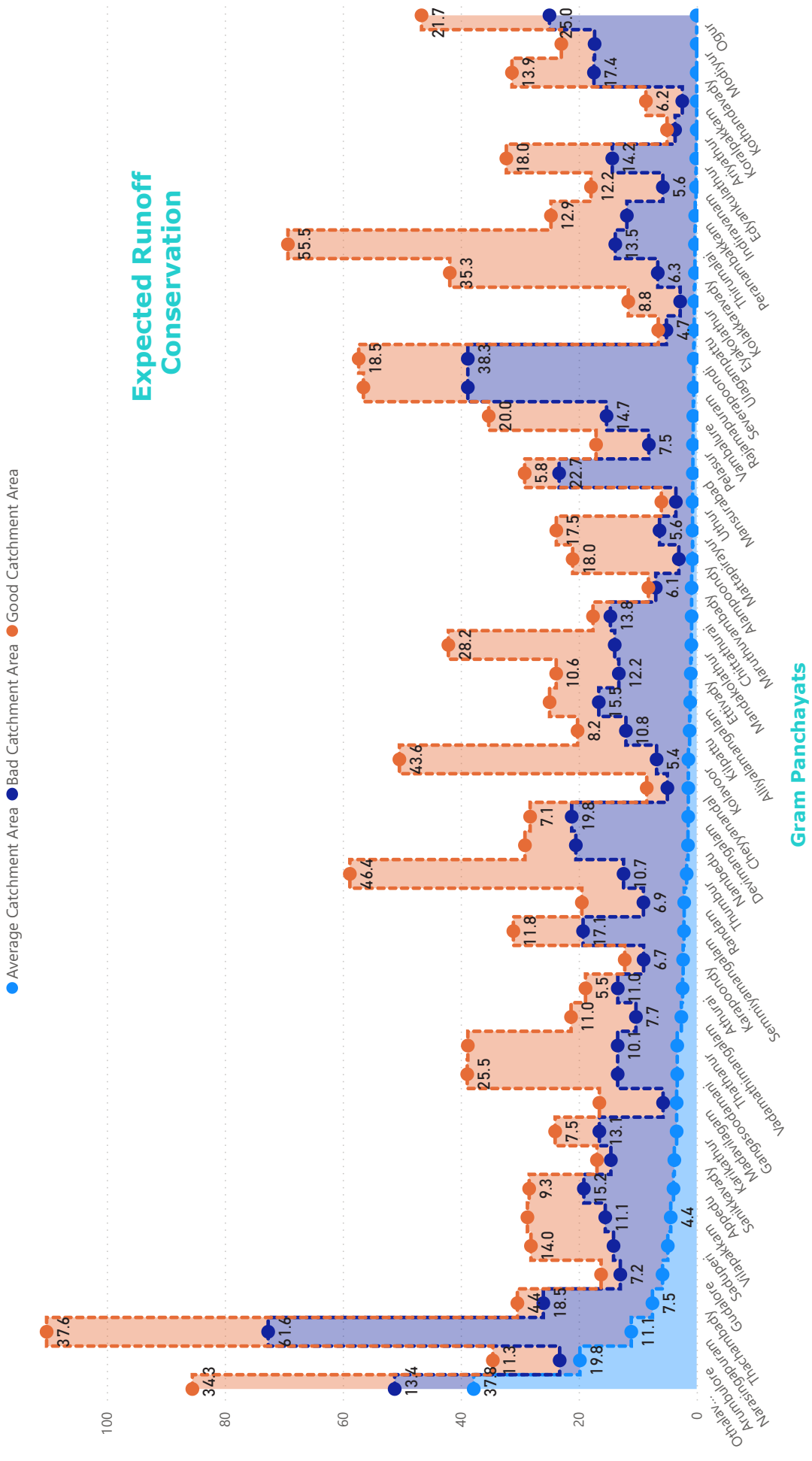


Figure 5.3. Expected GP wise runoff conservation after WASCA treatment

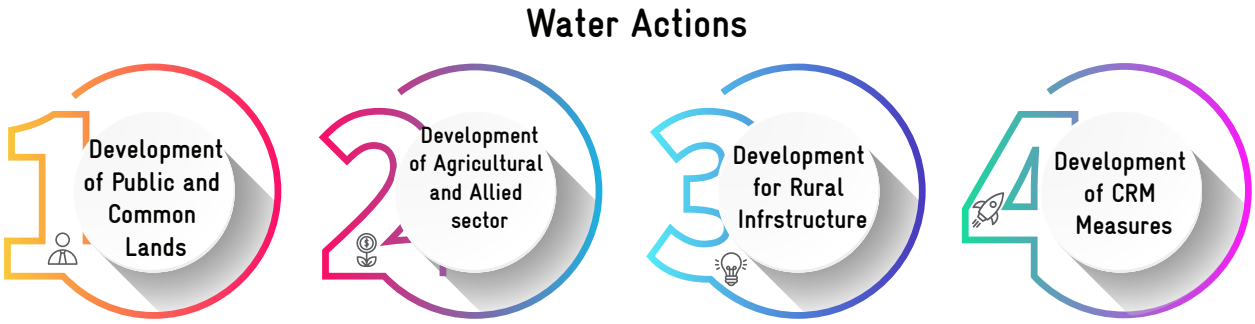
Mahatma Gandhi NREGS Annual circular 2020-21 (Clause 6.3)

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)	697	10	0.025	17.435	6,974
COMPOSTING(NUMBER OF UNITS)	443	15	0.17	75.31	6,645
AFFORESTATION IN PUBLIC/ COMMON LANDS(ha)	555	3,344	8.6	4,771.54	18,55,351.52
BLOCK PLANTATION (COMMUNITY)(ha)	818	4,320	11.1	9,079.80	35,33,760
SILVI-PASTURE DEVELOPMENT(ha)	418	6,664	17.1	7147.8	27,85,552
LINEAR PLANTATION(km)	1	703	1.8	1.6506	644.651
CANAL BUND PLANTATION(ha)	909	2,930	7.5	5,753	22,08,240
IRRIGATION CHANNEL PLANTATION (m)	236	6	0.015	3.546	1418.4
AVENUE PLANTATION(km)	1	703	1.8	2.4984	975.764
NURSERY DEVELOPMENT (NUMBER OF UNITS)	134	2,344	15	2002.875	3,12,982.60
RESTOTARATION OF WATER BODIES: A) PWD AND TANKS (NUMBER)	116	800	5	580	92,800
RESTORATION OF WATER BODIES: B.PONDS (NUMBER)	178	200	1	356	35,600
ARTIFICIAL RECHARGE STRUCTURE (NUMBER OF UNITS)	2,652	391	2.5	6630	1036932
WATER COURSE - IRRIGATION CHANNELS - DESILTING (m)	236	3	0.0075	1.773	709.20
DRAINAGE LINE TREATMENT (m)	447	5	0.03	13.42	2,237

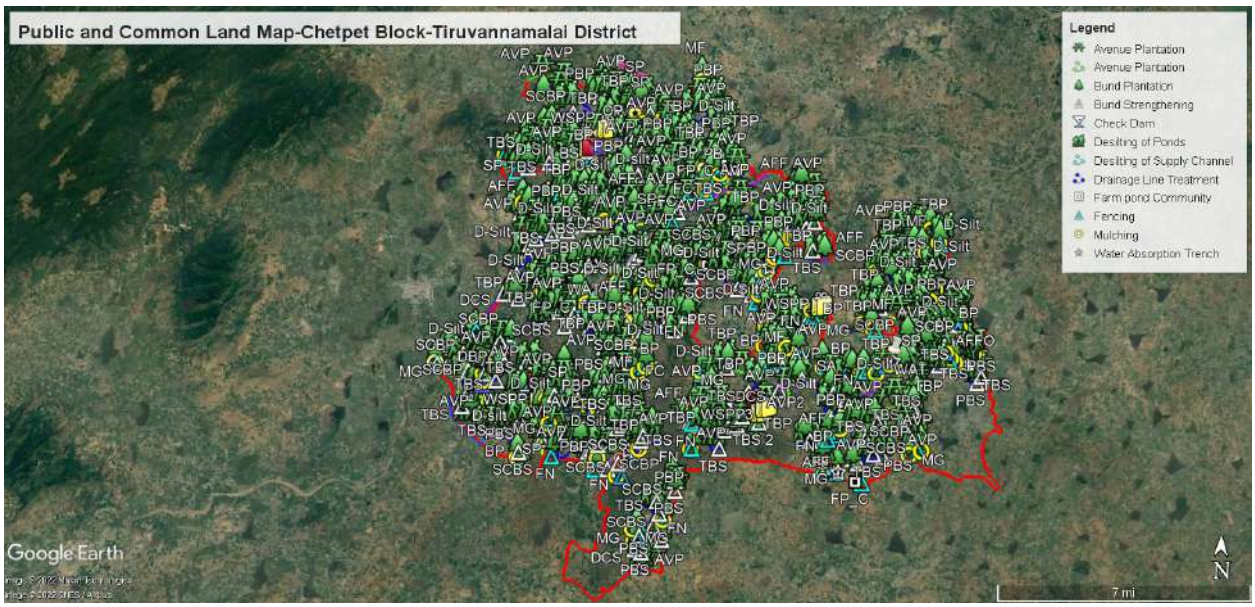


Figure 5.4. Proposed development activities in public and common land

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)	309	586	1.5	463.5	1,81,074
MICRO IRRIGATION (ha)	43	0	1	43	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	613	781	2	1226	4,78,753
LAND DEVELOPMENT - INDIVIDUAL (ha)	1892	3,906	10	18,920	73,90,152
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	91	3,321	8.5	774	3,02,211
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	2,054	23	0.15	308.1	47,242
NADEP VERMI-COMPOST (NUMBER OF UNITS)	2,054	27	0.18	369.72	55,458
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	2,054	2,344	1.48	3,040	48,14,576
CATTLE SHELTERS (NUMBER OF UNITS)	2,054	331	2.12	4,354	6,79,874
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	659	355	2.27	1,496	2,33,945
CATTLE TROUGH (NUMBER OF UNITS)	2,054	6	0.05	102.7	32,324
POULTRY SHED (NUMBER OF UNITS)	334	10	0.09	30.06	3,340
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	2,611	926	5	13,055	24,17,786

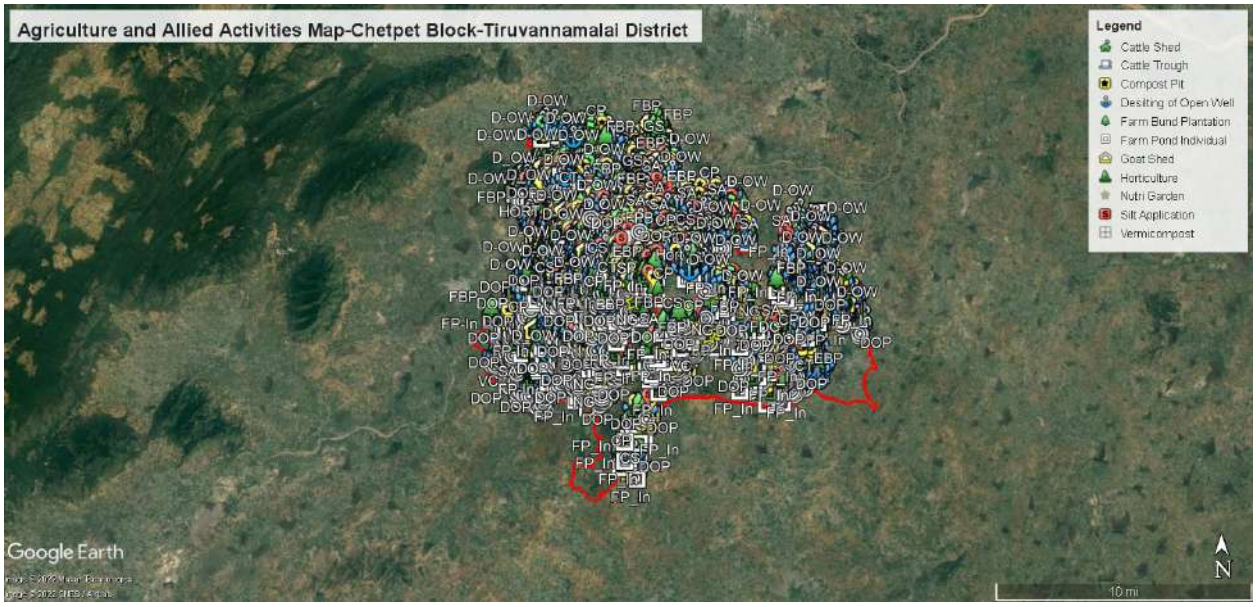


Figure 5.5. Proposed development activities in Agriculture and allied Sectors

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)	20	20	0.13	2.6	400
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	2,795	16	0.1	279.5	44,720
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	122	625	4	488	76,250

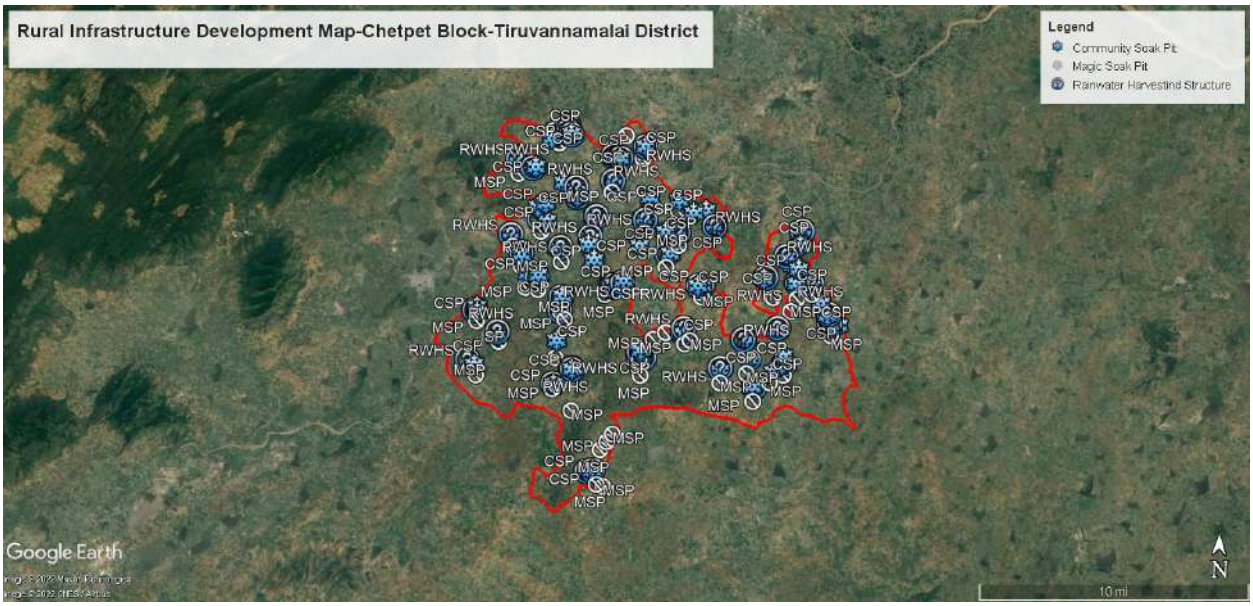


Figure 5.6. Proposed rural infrastructure activities

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 Chetpet 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 Greening of Hills (Table 15), farm ponds (Table 16), Silvi-pasture (Table 17), bamboo plantation (Table 18), Fallow land development (Table 19) and TNIAMP farm pond (Table 20) are proposed in this Block in saturation mode.

TABLE 14. GP WISE PROPOSED CRM

Name of the GPs	Public and common land	Agriculture and allied activities
Alliyalamangalam RF		Greening of Hillocks
Appedu	Fish cultivation	
	Farm Pond	
Arumbalur	Farm Pond	
Cheyyanandal	Farm Pond	
Chithatarai		Fallow land development
Chithathurai	Farm Pond	
Edaiyankulathur	Farm Pond	
Ettivadi	Farm Pond	
Gengaisudamani	Farm Pond	
Karikathur	Farm Pond	
Kolavoor	Farm Pond	
Koralpakkam	Farm Pond	
Madavilagam	Farm Pond	

Mansurabad	Farm Pond	
Mattapiraiyur		Fallow land development
Modaiur	Farm Pond	
Narsingapuram		Greening of Hillocks
Ogur	Farm Pond	
Othalavadi	Farm Pond	
Pelasur	Farm Pond	
Pernampakkam	Farm Pond	
Rajamapuram	Farm Pond	Fallow land development
Sanikavadi	Farm Pond	
Semmiyamangalam	Farm Pond	
Seyyanandal	Fish cultivation	
Thachambadi	Farm Pond	
Thatchampadi		Silvi-pasture Development
Thathanu	Farm Pond	
Thirumalai	Fish cultivation	
	Farm Pond	
Thumbur	Farm Pond	
Tirumalai	Farm Pond	
Uthur	Farm Pond	
Vadamathiman-galam	Farm Pond	
Vambalur	Farm Pond	Fallow LD
Vilapakkam		Bamboo Plantation

TABLE 15. DETAILS OF PROPOSED GREENING OF HILLOCKS ACTIVITIES UNDER CRM

GP	Survey number	Area in Ha	Classification of land
Narsingapuram	185	32.89	Others
Alliyalamangalam RF	-		RF

TABLE 16. DETAILS OF PROPOSED FARM PONDS ACTIVITIES UNDER CRM

Name of the Panchayat	Area of plantation (in ha)	Total No. of Plants
Appedu	Appedu	4
Arumbalur	Arumbalur	1
Chithathurai	Chithathurai	1
Cheyyanandal	Cheyyanandal	1
Edaiyankulathur	Edaiyankulathur	2
Ettivadi	Ettivadi	1
Vadamathiman-galam	Vadamathiman-galam	2
Karikathur	Karikathur	2
Mansurabad	Mansurabad	2
Modaiur	Modaiur	2
Ogur	Ogur	2
Rajamapuram	Rajamapuram	2

Semmiyamangalam	Semiyamangalam	3
Thachambadi	Thachambadi	1
Thirumalai	Thirumalai	2
Vambalur	Vambalur	2
Tirumalai	Tirumalai	2
Gengaisudamani	Gengaisudamani	2
Sanikavadi	Sanikavadi	1
Kolavoor	kolavoor	3
Koralpakkam	Koralpakkam	1
Modaiur	Modaiur	1
Othalavadi	Othalavadi	1
Pelasur	Pelasur	1
Pernampakkam	Pernampakkam	1
Rajamapuram	Rajamapuram	3
Kolavoor	Kolavoor	1
Semmiyamangalam	Semiyamangalam	1
Thathanur	Thathanur	2
Thumbur	Thumbur	1
Uthur	Uthur	3

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

Name of the GP	Name of the Habi-tation	Survey Number	Area for Plantation	Total Number of Plants
Thatchampadi	Thatchampadi	328/1	14.29	1,14,432

TABLE 18. DETAILS OF PROPOSED BAMBOO PLANTATION ACTIVITY UNDER CRM

Name of the GP	Area of plantation	Total No. of Plants (1 Ha - 10000 saplings)	Classification of land
Vilapakkam	18.75	46,875	Others

TABLE 19. DETAILS OF PROPOSED FALLOW LAND ACTIVITIES UNDER CRM

GP	Area in ha.	Area in ha.	Area in ha.
Chithatarai	4.11	0.00	4.11
Mattapiraiyur	0.00	2.00	2.00
Rajamapuram	3.50	45.25	48.75
Vambalur	0.95	0.00	0.95

TABLE 20. DETAILS OF PROPOSED TNIAMP FARM POND ACTIVITIES UNDER CRM

Interested Beneficiary list of TNIAMP farm pond (2020-2021) for Fish Cultivation		
GP	**Name of Farmers**	**Survey No.**
Appedu	Karthikeyan s/o Subramani	223/3B
Thirumalai	Prabakaran s/o Devaraj	92/1
Thirumalai	Perezhilan s/o Prabakaran	94/4A
Seyyanandal	Elumalai s/o Govindhasamy	146/16B, 17C

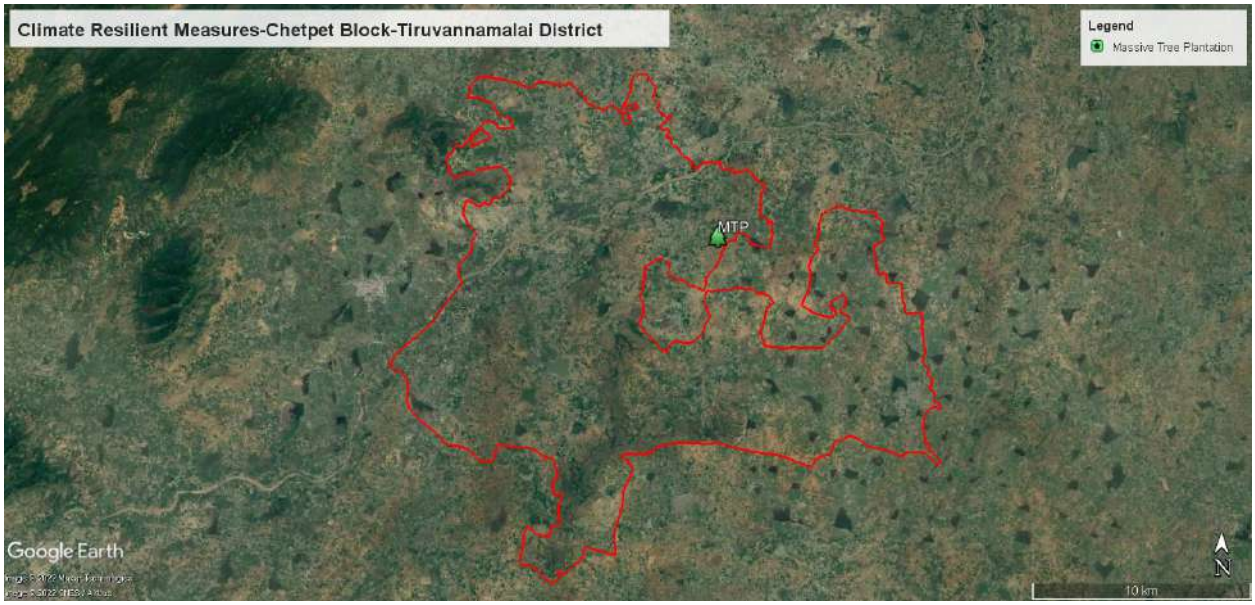


Figure 5.7. Proposed climate resilient measures

All GP wise works are proposed based on watershed and livelihood approach and shown in Annexure 5.3.

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	4,092.91 ha (16.34 %) of the total area treated under WASCA
2	Percentage reduction of run off	1,476.78 ha.m i.e 25 % of the total runoff harvested due to WASCA interventions
3	No. of waterbodies restored	294 waterbodies (tanks/pond and ooranis) restored
4	Area under afforestation	555 ha area under afforestation
5	Area under silvi-pasture development	418 ha under Silvi-pasture plantation
6	Length of drainage line treated	1,039 m length of drainage line treated
7	Canal Bund Plantation	13,918 number of plants through 909 works
8	Nursery development	134 units

4,092.91 ha AREA TREATED

1,476.78 ha.m TOTAL RUNOFF HARVESTED

294 WATER BODIES RESTORED

555 ha AREA AFFORESTATION

418 ha SILVI-PASTURE PLANTATION

1,039 m DRAINAGE LINE TREATED

134 NURSERY DEVELOPMENT

13,918 PLANTS CANAL BUND PLANTATION

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	613 farm ponds established which target the harvest of 10,78,880 cu.m of water which has the potential to irrigate 214.55 ha area in both kharif and rabi seasons
2	Improvement in soil health	2,054 NADEP vermi compost units for soil health improvement
3	Dry land development with agro-forestry	91 ha
4	Households established fodder plots	2,850 vulnerable households established fodder plots

613 FARM PONDS

2,054 COMPOST UNITS

91 DRY LAND HORTICULTURE

2,850 FODDER PLOTS

6.3 OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

	INDICATOR	OUTCOMES/ IMPACT
1	No. of villages having liquid waste management systems	2,795 individual and 20 community level soak pits established for recycle of grey water benefiting 24,185 HHs
2	Roof rain water harvesting measures	122 common roof rainwater harvesting and storage structures with a target to harvest and store 0.15 ha.m of rainwater for use
3	Nutri-garden	24,185 HHs established nutri-gardens in homesteads and planted 1,20,925 saplings

20 COMMON &
2,795 INDIVIDUAL SOAK PITS

122 COMMON ROOF RAINWATER HARVESTING

24,185 NUTRI-GARDENS

1,20,925 SAPLINGS

6.4 OUTCOMES OF CLIMATE RESILIENCE MEASURES

OUTCOMES OF CLIMATE RESILIENCE MEASURES

	INDICATOR		OUTCOMES/ IMPACT
1	Climate resilient measures are identified for climate risks	1	6 models are identified via., Farm ponds, Silvi pasture and Greening of Hillocks, Fallow land development, TNIAMP farm pond for Fish cultivation and Bamboo plantation 50 farm ponds in 29 GPs 4 TNIAMP farm pond for Fish cultivation 14.29 ha under silvi-pasture with 1,14,432 plants Greening of hillocks in 54.32 ha area Bamboo plantation in 18.75 ha with 46,875 plants 55.81 ha fallow land development

50
FARM PONDS

14.29 ha
SILVI PASTURE

55.81 ha
FALLOW LAND DEVELOPMENT

18.75 ha
BAMBOO PLANTATION

Estimated person days

The total estimated person days required for the above propose activities are 2,86,38,927 as specified below Figure 6.1,

Estimated Cost

The total estimated cost budgeted for the above propose activities is Rs. 81,389 Lakhs as specified below Figure 6.2,

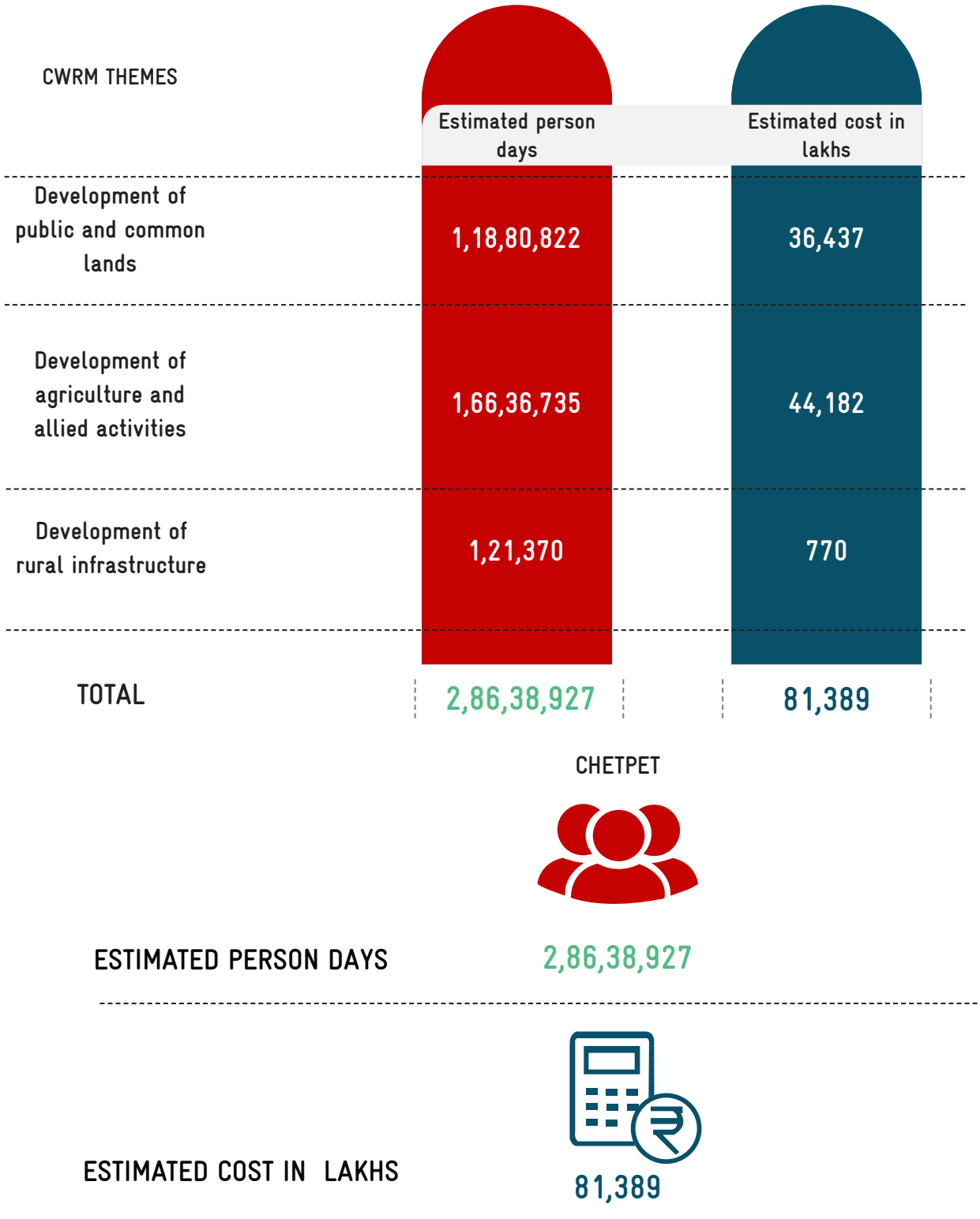


Figure 6.1 & 6.2. Estimated person days & cost for all water actions

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'S PROGRESS THROUGH NDC

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

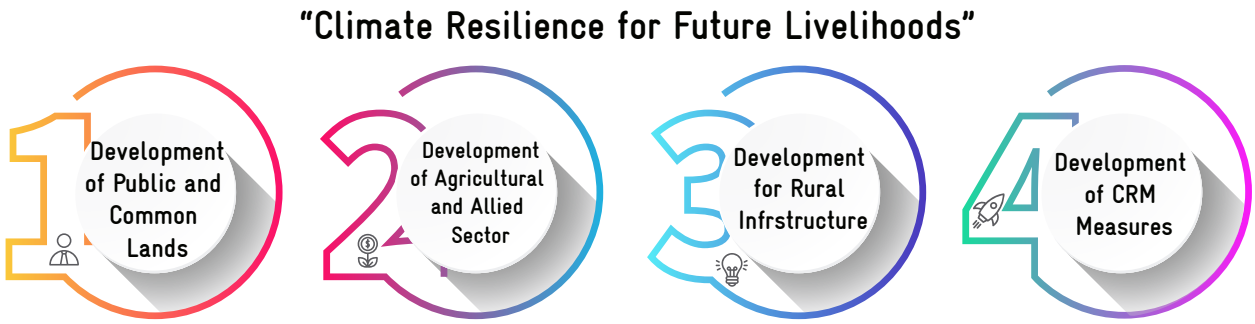
Internationally, the recent process on NDC Enhancement (2020) significantly acknowledge the climate change vulnerability on national sectors including agriculture, energy, and urban areas, especially through impacts on water resources. The role that water and water-related activities play in national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

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

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

6.5.2 WASCA TN SUPPORTS SDG

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



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

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

SDG GOAL 6

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

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

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

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

TABLE 21. 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 22 to 24.

TABLE 22. 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)	697	W3	SDG 1,2, 6,13&15
Composting (No. of units)	443	W1	SDG1& 6
Afforestation in Public/common lands (ha)	555	C1,C2,C3, W3,	SDG 1, 2,6,13&15
C1,C2,C3, W3,	SDG 1, 2,6,13&15	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Block Plantation (Community) (ha)	818	C1,C2,C3,W3	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	418	C1,C2,C3,W3,S2	SGG 12 &15
Linear Plantation (Km)	1	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Canal Bund Plantation (ha)	909	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	236	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (m)	1	C1,C2,C3,W3,S2	SDG 1, 6&13

Nursery Development (No. of units)	134	C1,S2,S4	SDG 1,2 &6
Restoration of waterbodies :PWD and Union Tanks (No.)	116	S2, S1	SDG 6, 1, 13
Restoration of water bodies : Ooranis (No.)	0	S2, S1	SDG 6, 1, 13
Restoration of waterbodies :Ponds (No.)	178	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	2,652	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	236	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (m)	447	W1,W3,W4	SDG1 & 6

TABLE 23. 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)	309	A1,A3,W1,W3	SDG 1,2&6
Micro Irrigation(ha)	43	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	613	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	1,892	W1,W5,A1,A3,S2,S4	SDG 2, 6&
15	458	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Dry land Horticulture/Agro-forestry - Individual (ha)	91	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	2,054	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (No. of units)	2,054	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	2,054	A3, S4	SDG 1& 2, 15
Cattle shelters (No. of units)	2,054	S4	SDG 1& 2
Goat/sheep shelters (No. of units)	659	S4	SDG 1& 2
Cattle trough(No. of units)	2,054	W5,S4	SDG 1& 2
Poultry Shed (No. of units)	334	S2,S4	SDG 1& 2
Construction of new open wells & Recharge Shafts (No. of units)	2,611	S3,W5,W1	SDG 1,2 & 6

TABLE 24. 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)	20	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	2,795	W3,S2	SDG 1& 6
Roof Rain Water Harvesting (No. of units)	122	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

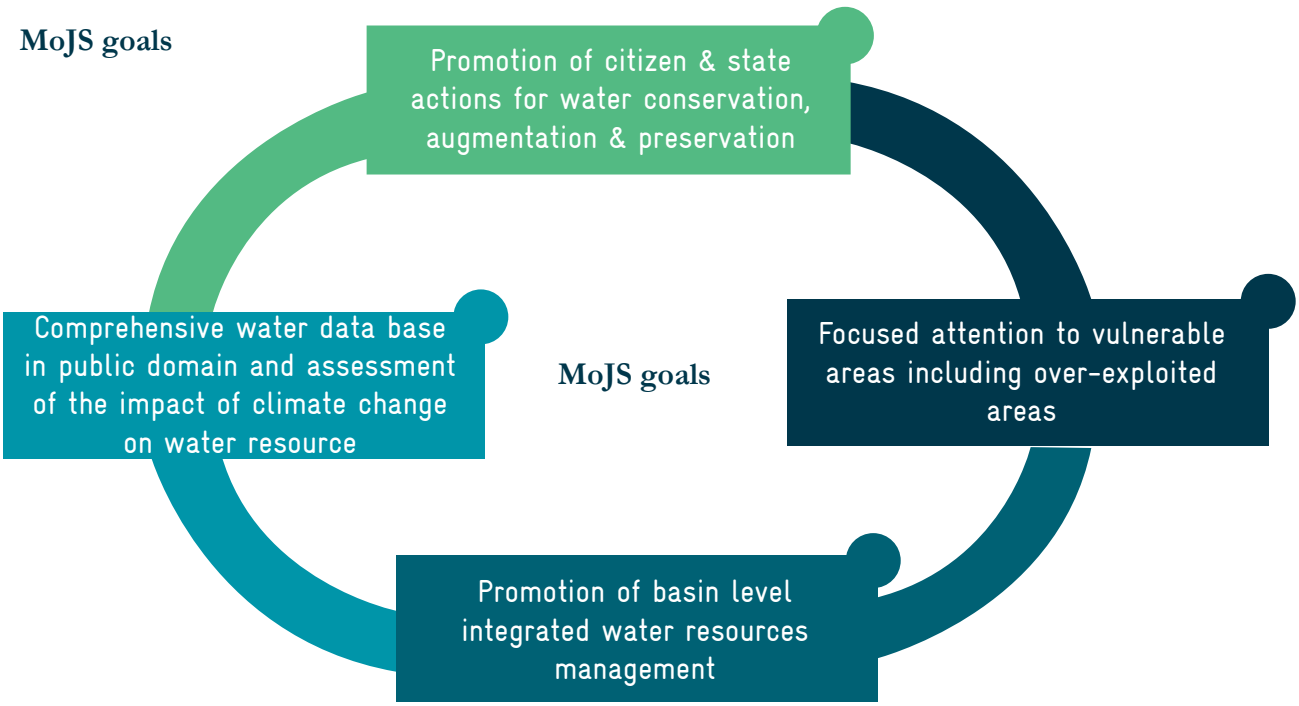
7 IMPLEMENTATION OF GP PLANS

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 Chetpet Block is listed in Table 25 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 25. GIS PLAN IMPLEMENTATION- KEY PARAMETERS PERFORMANCE IN CHETPET BLOCK



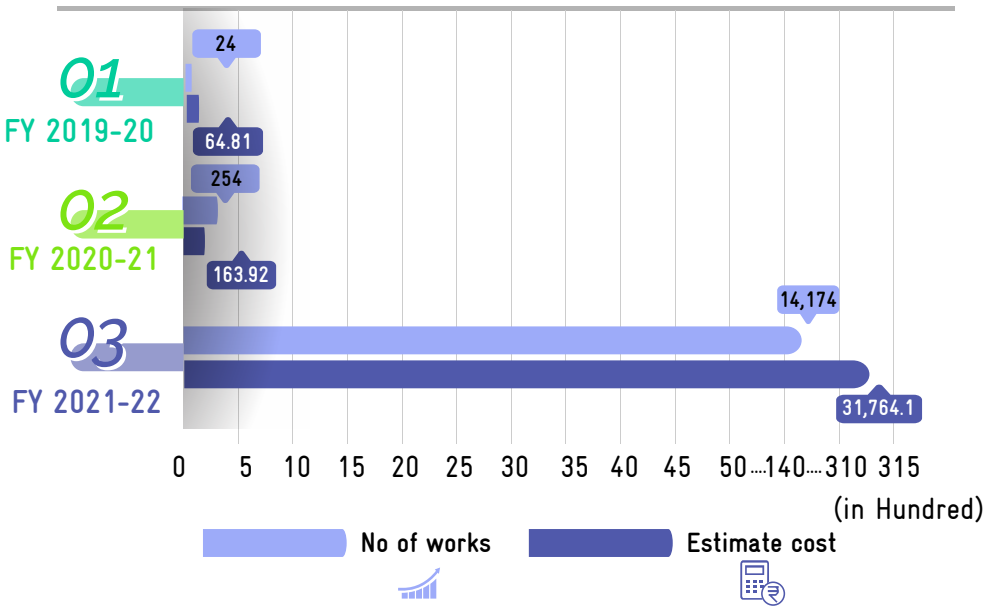


Figure 7.1. Work progress in last three years

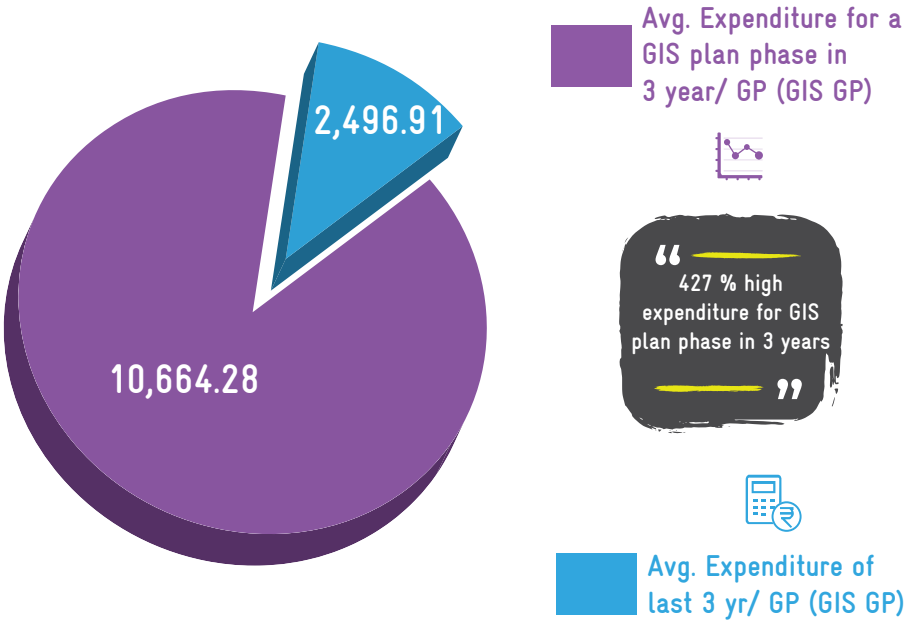
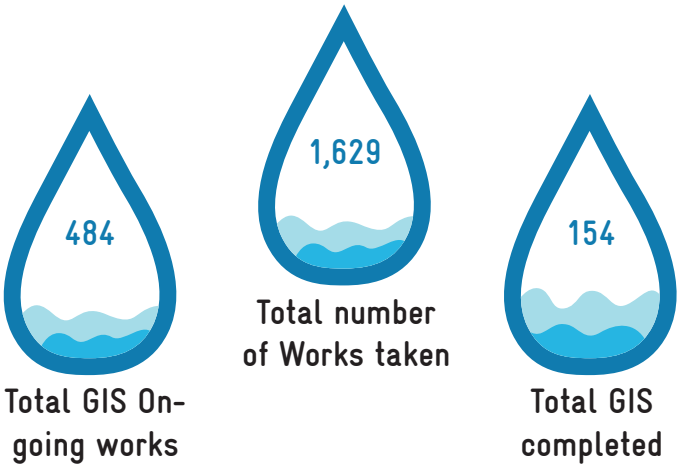


Figure 7.2. Average Expenditure for GIS plan in last three years



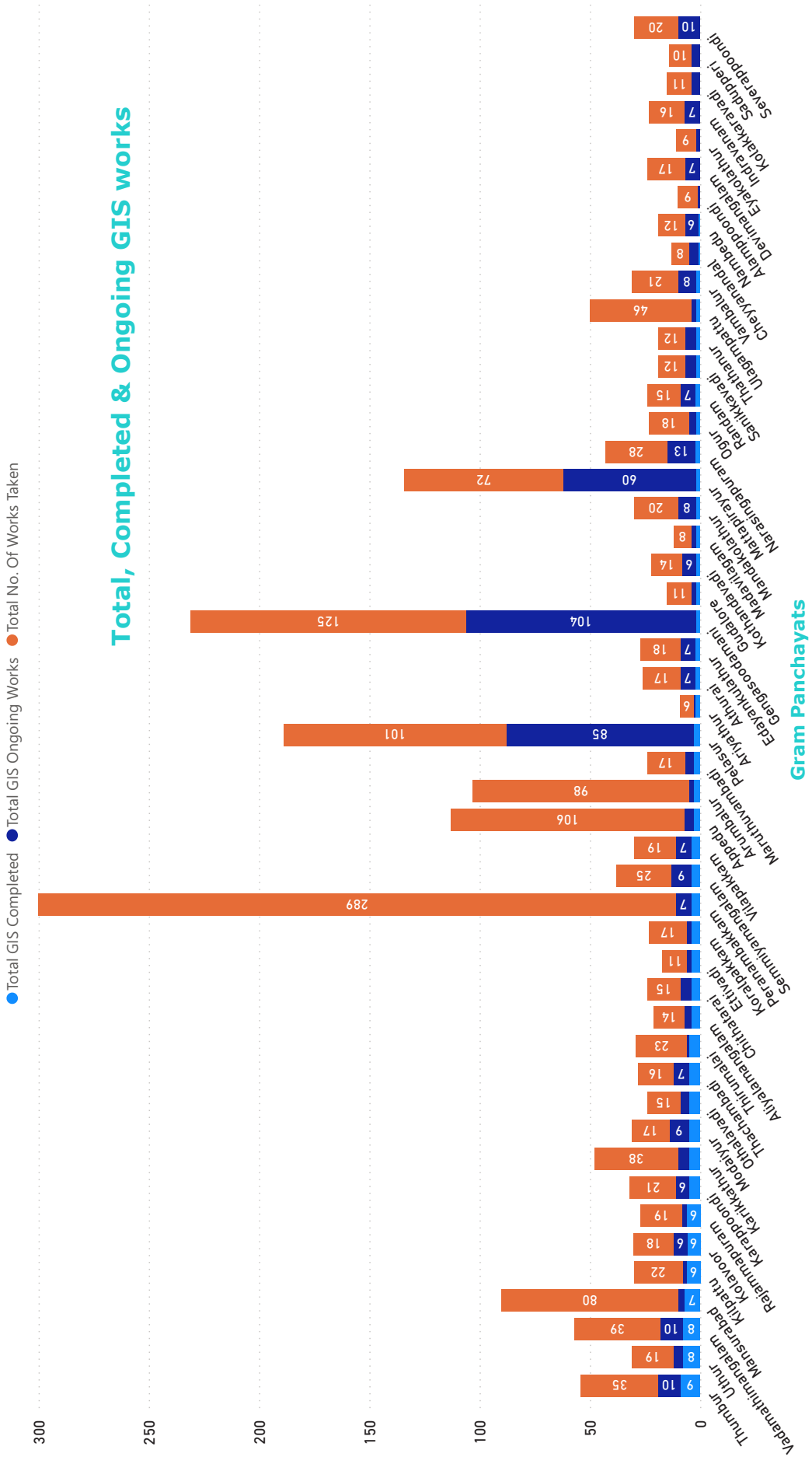
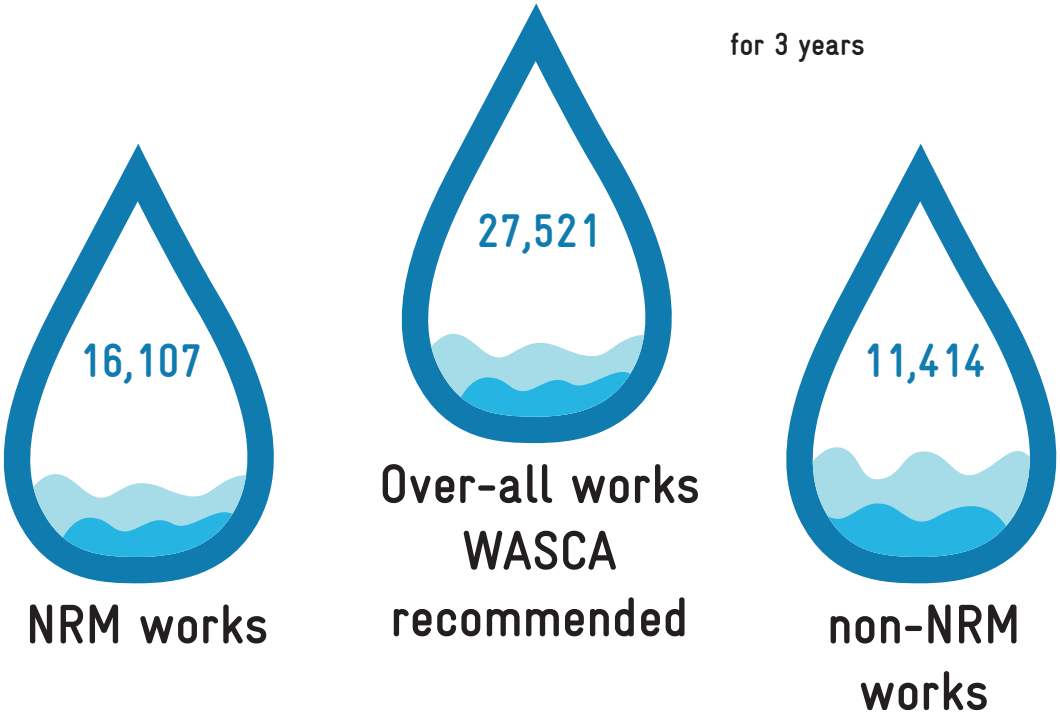


Figure 7.3. GP wise total, completed and ongoing GIS works

7.2 WASCA RECOMMENDED NRM AND NON-NRM WORKS

WASCA recommended 27,521 works for a period of 3 years, out of which 16,107 are NRM works and 11,414 are non NRM works (Figure 7.4). A total of 15,241 works has been uploaded so far for the financial year 2021-22 as on 04/02/2022.



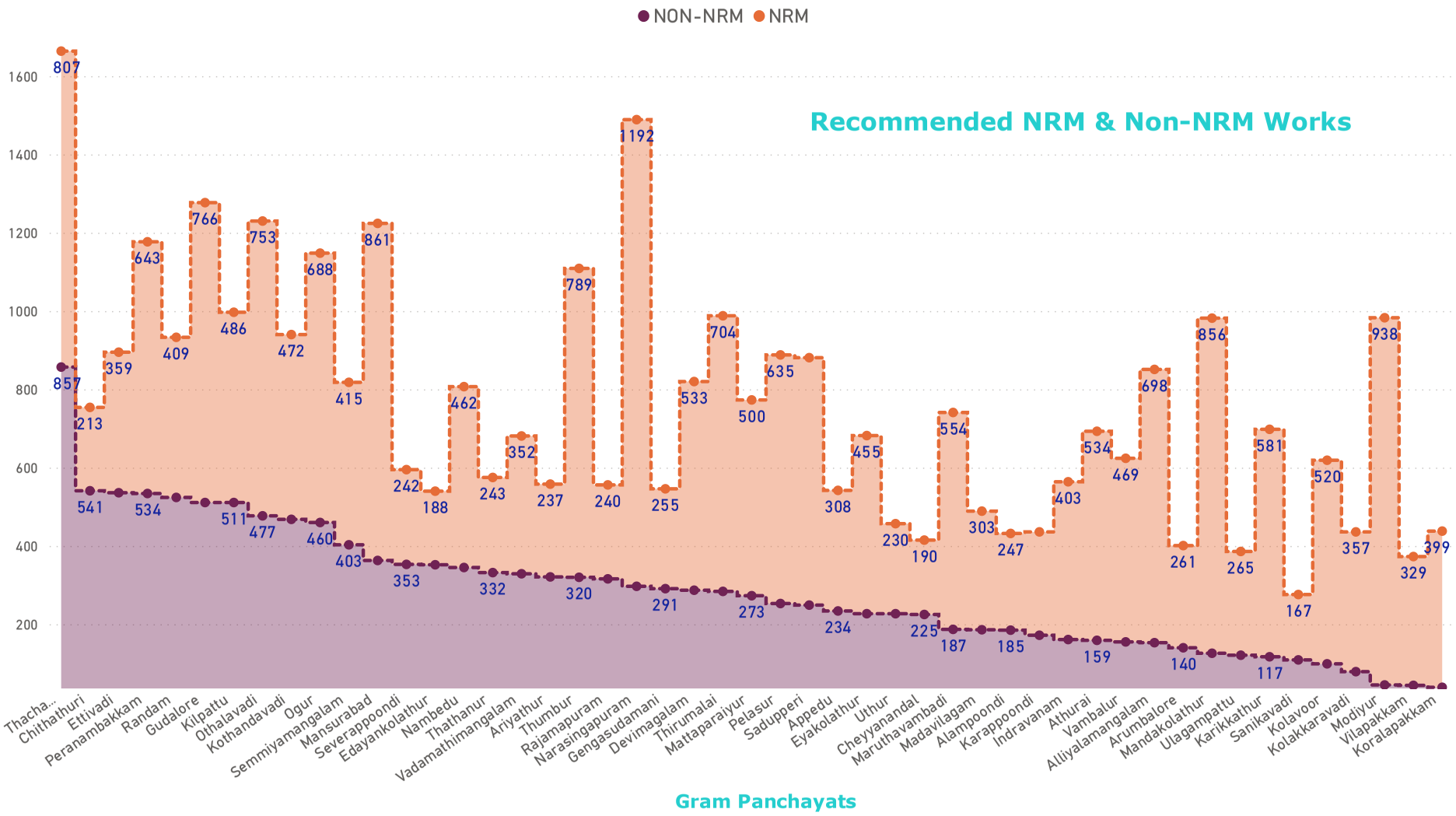


Figure 7.4. GP wise recommended NRM and non-NRM works

7.3 ONGOING WORKS

The ongoing works in Chetpet Block includes Anganwadi/Other Rural Infrastructure, Drought Proofing, Rural Connectivity, Rural Sanitation, WCWH, Works on Individuals Land (Category IV). A total of 187 works are ongoing works in the Block (Figure 7.5) in which individual benefices works shares higher in number while drought proofing, rural infrastructure activities are les in. GP and work category wise ongoing works are tabulated in Annexure 7.2.

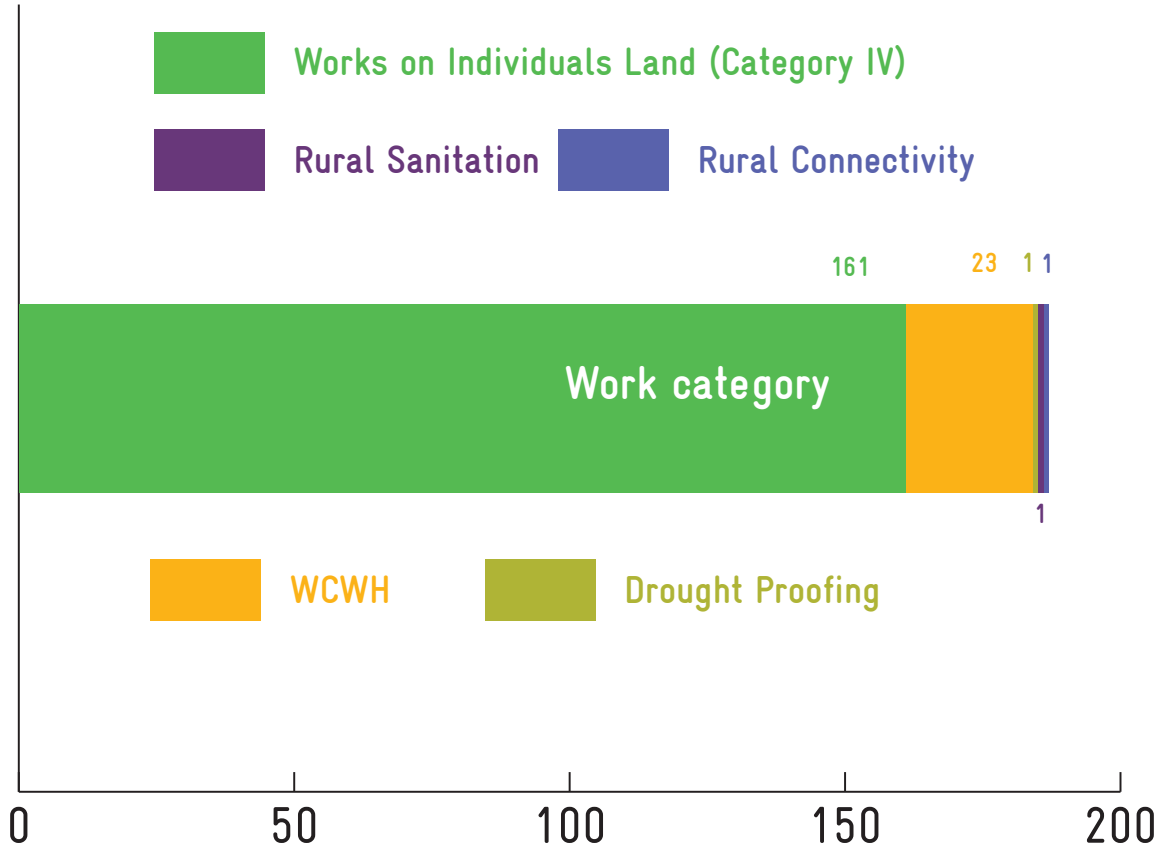


Figure 7.5. Ongoing works in Chetpet Block

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 Chetpet Block is shown in Figure 7.6. The expenditure is high for watershed development followed by rain water conservation.

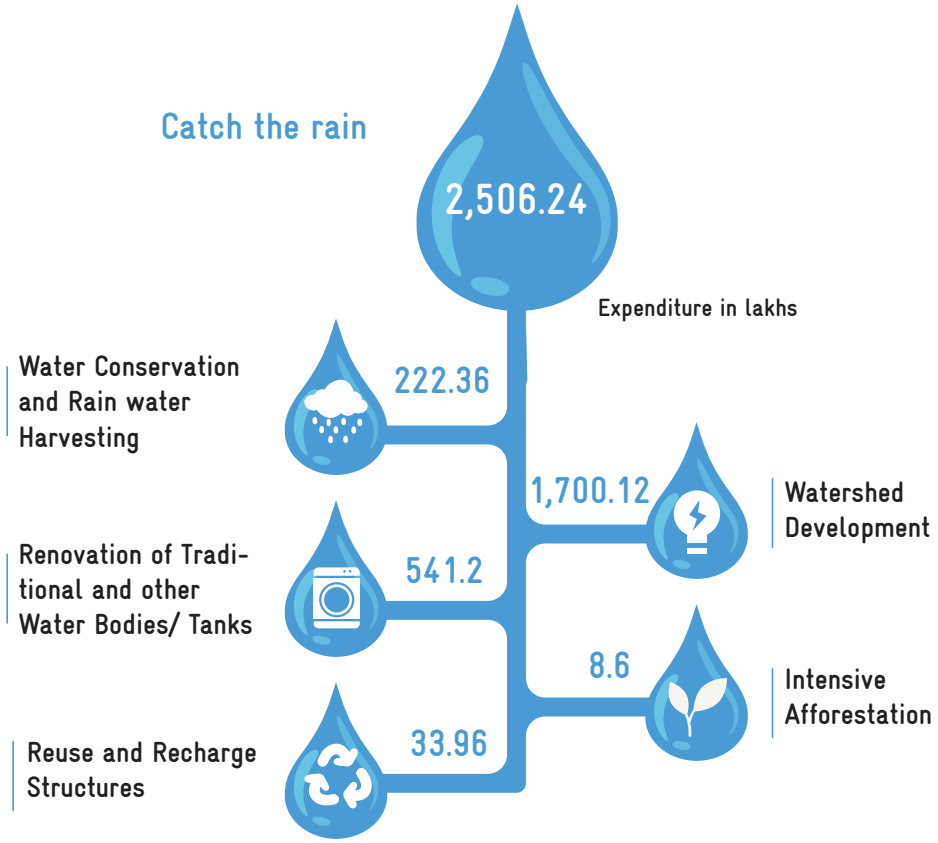
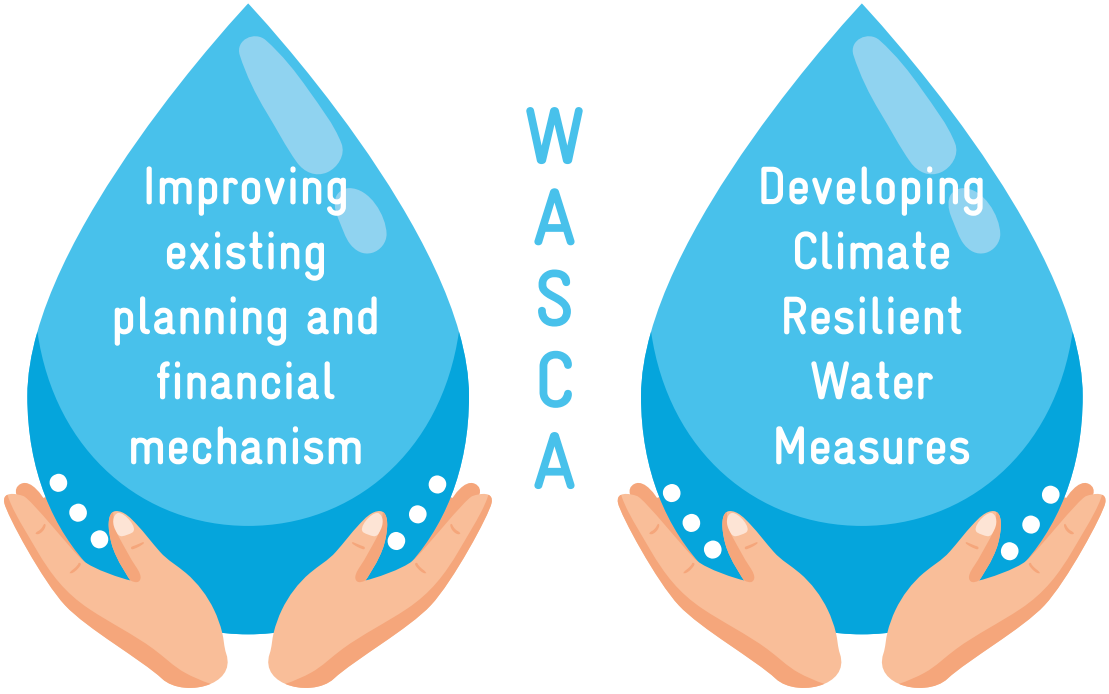


Figure 7.6. Catch the rain campaign in Chetpet Block



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- WATERSHED IN THURINJAPURAM BLOCK

Chetpet Block has two river sub-basins Cheyyar River, and Tondi Veraha Watersheds. Under Cheyyar River watershed (4C2A4) there are 74 micro-watersheds covering an area of 38,453.63 ha. Under Tondi Veraha watershed (4C1D3) there are 12 micro-watersheds covering an area of 7,322.65 ha. (Table 26) Out of 49 GPs in the block, 46 GPs fall under Cheyyar River (4C2A4) Watershed, 1 GP falls under Tondi Veraha (4C1D3) Watershed, 2 GPs have watershed boundaries passing through Cheyyar River and Tondi Veraha. (Table 27). Figure 8.1 & 8.2 illustrates the spatial maps of macro watershed and GPs. All 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 26. GENERAL DESCRIPTION OF MACRO-WATERSHEDS COVERING CHETPET BLOCK

Macro-watershed	Area in ha	No. of micro-watersheds
Cheyyar River	38,453.63	74
Tondi Veraha	7,322.65	12

TABLE 27. NO. OF GPS COVERED UNDER WATERSHEDS IN CHETPET BLOCK

Name of watershed	No. of GPs
Cheyyar River	46
Tondi Veraha	1
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 which 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 (Figure 8.3) and GPs boundaries (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.

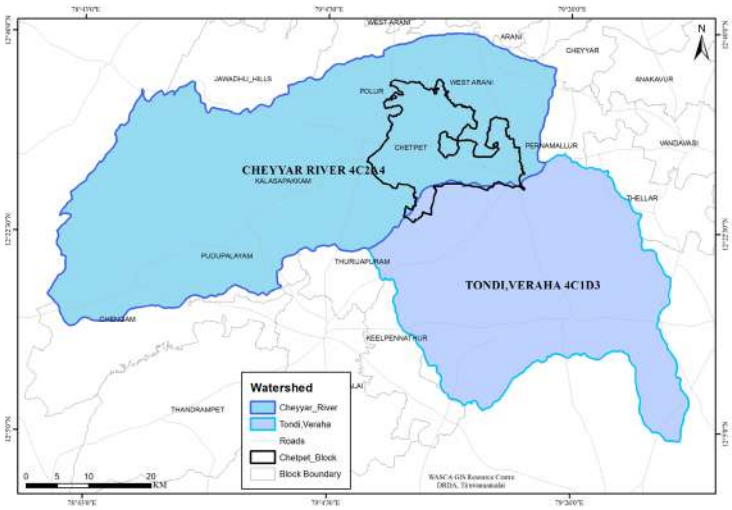


Figure 8.1. Macro-watershed Map of Chetpet Block

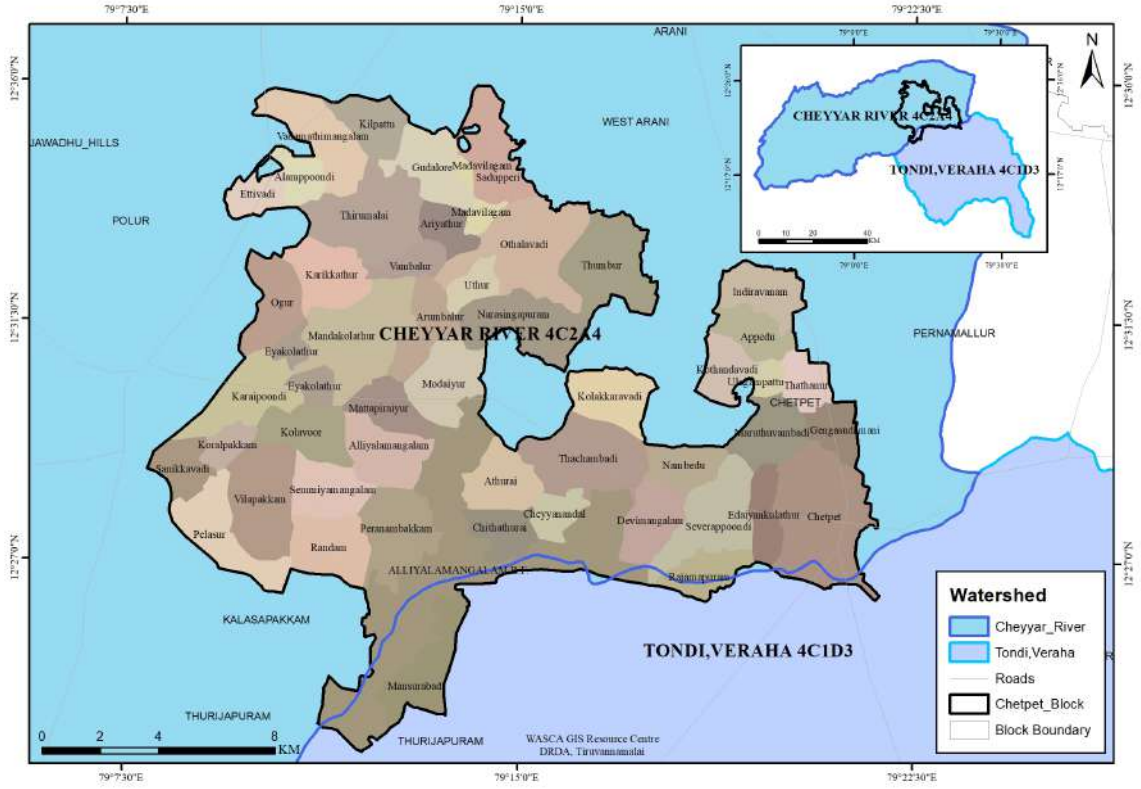


Figure 8.2. Macro-watershed with GPs map

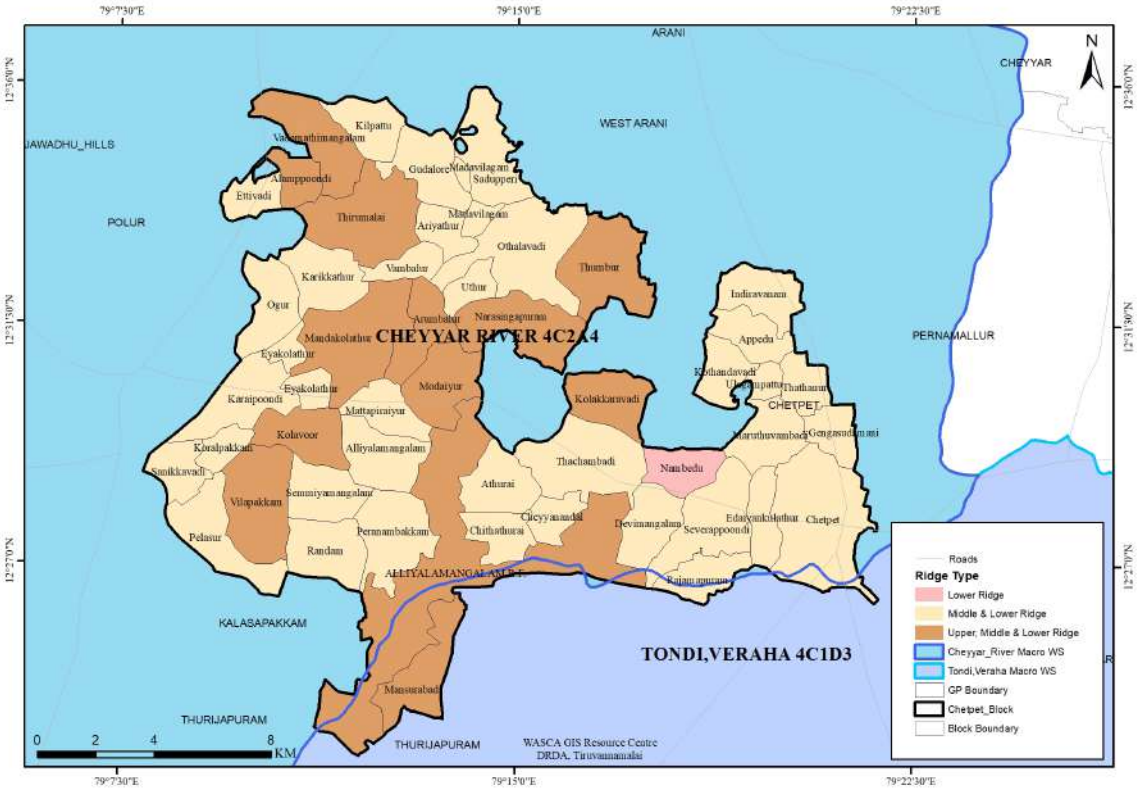


Figure 8.3. Macro-watershed Ridge Map

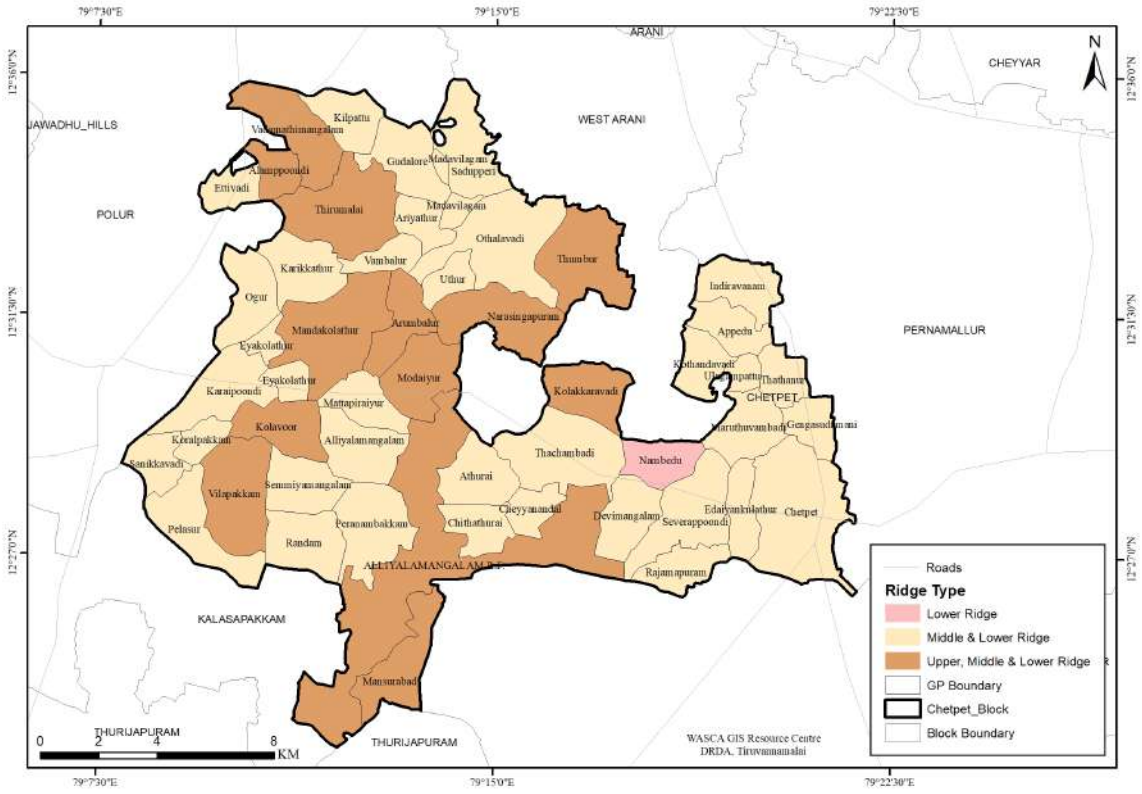


Figure 8.4. GP level Ridge Map

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 Thiruvanamalai Block are listed in Tables 28 to 35.

TABLE 28. MICRO-WATERSHED IN CHETPET BLOCK FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED

Sl.No	Micro watershed Code	Micro watershed Area in ha	Ridge Type
1	4C2A4a11a	988.17	Upper, Middle & Lower
2	4C2A4a12a	480.53	
3	4C2A4b06b	500.62	
4	4C2A4b07a	653.79	
5	4C2A4b15a	497.17	
6	4C2A4b15b	238.33	
7	4C2A4b14b	451.69	
8	4C2A4b15c	433.85	
9	4C2A4b09b	633.11	
10	4C2A4b14c	275.02	
11	4C2A4b07c	391.31	
12	4C2A4c06a	548.42	
13	4C2A4b09a	418.44	
14	4C2A4b19c	570.94	
15	4C2A4a06b	302.28	Middle & Lower
16	4C2A4a18a	503.33	
17	4C2A4a05a	689.09	
18	4C2A4a07c	342.13	

19	4C2A4a07b	609.74	
20	4C2A4a06a	822.61	
21	4C2A4a12b	510.68	
22	4C2A4b06a	788.56	
23	4C2A4b05b	600.91	
24	4C2A4a07a	468.26	
25	4C2A4a08b	590.8	
26	4C2A4b03b	661.41	
27	4C2A4a08a	527.77	
28	4C2A4b06c	379.81	
29	4C2A4b12a	565.68	
30	4C2A4b05c	351.48	
31	4C2A4b14a	506.51	
32	4C2A4b07b	442.48	
33	4C2A4b08a	589.44	
34	4C2A4a09a	562.93	
35	4C2A4b12b	663.26	
36	4C2A4b09c	812.09	
37	4C2A4b08b	293.73	
38	4C2A4b13a	364.09	
39	4C2A4b11a	389.29	
40	4C2A4b13b	222.13	Middle & Lower
41	4C2A4c01a	644.56	
42	4C2A4b08c	332.99	
43	4C2A4b13d	525.22	
44	4C2A4b13c	588.93	
45	4C2A4c01b	497.65	
46	4C2A4b18a	565.5	
47	4C2A4b11b	269.62	
48	4C2A4b19a	667	
49	4C2A4b18b	519.95	
50	4C2A4b16b	483.75	
51	4C2A4b11c	633.2	
52	4C2A4b19b	562.69	
53	4C2A4b17b	616.66	
54	4C2A4c06b	577.67	
55	4C2A4c02a	1080.84	
56	4C2A4b16c	295.59	
57	4C2A4b20a	570.47	
58	4C2A4b17a	549.67	
59	4C2A4b18c	606.22	
60	4C2A4b17c	415.07	
61	4C2A4b11d	358.51	
62	4C2A4b20b	735.83	
63	4C2A4a05c	594.74	Lower

64	4C2A4a06c	502.04	Lower
65	4C2A4a05b	334.84	
66	4C2A4a11c	393.41	
67	4C2A4a08c	468.34	
68	4C2A4a09b	353.33	
69	4C2A4b03c	394.25	
70	4C2A4b12c	479.74	
71	4C2A4b16a	512.89	
72	4C2A4b10d	723.32	
73	4C2A4c06c	313.39	
74	4C2A4b20c	643.88	

TABLE 29. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED IN CHETPET BLOCK

Sl.No	Name of the GP	Ridge Type
1	Alamppoondi	Upper, Middle & Lower
2	Thirumalai	
3	Thumbur	
4	Vilapakkam	
5	Kolavoor	
6	Kolakkaravadi	
7	Vadamathimangalam	
8	Modaiyur	
9	Arumbalur	
10	Narasingapuram	
11	Mandakolathur	
12	Devimangalam	Middle & Lower
13	Gengasudamani	
14	Appedu	
15	Maruthuvambadi	
16	Thathanur	
17	Ariyathur	
18	Ettivadi	
19	Cheyyanandal	
20	Uthur	
21	Vambalur	
22	Mattapiraiyur	
23	Athurai	
24	Thachambadi	
25	Pelasur	
26	Koralpakkam	
27	Semmiyamangalam	
28	Randam	
29	Alliyalamangalam	
30	Chithathurai	

31	Edaiyankulathur	Middle & Lower
32	Kothandavadi	
33	Ulagampattu	
34	Sanikkavadi	
35	Kilpattu	
36	Gudalore	
37	Eyakolathur	
38	Karaipoondi	
39	Madavilagam	
40	Ogur	
41	Karikkathur	
42	Peranambakkam	
43	Indiravanam	
44	Sadupperi	
45	Othalavadi	
46	Nambedu	Lower

TABLE 30. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED IN CHETPET BLOCK

Work wise Details of Cheyyar in Chetpet Block			
Sl.No	**Proposed Work**	**Ridge type**	**Extent**
1	Afforestation in Public/common lands (ha)	Upper	522
2	Drainage Line Treatment (m)		97,068
3	CC Check dams (No.)	Middle	52
4	Block Plantation (Community) (ha)		818
5	Silvi-pasture Development (ha)		340
6	Avenue plantation (m)		1,38,830
7	Composting (No.)	Lower	443
8	Canal Bund Plantation (m)		69,579
9	Restoration of water bodies: Tanks and Ooranis (No.)		329
10	Artificial Recharge Structure (No.)		2,457
11	Farm Bunding with Boundary Trenches - Individual (ha)		308
12	Construction of Farm Ponds - Individual (No.)		556
13	Land development - Individual (ha)		1,864
14	Azolla units - Individual (No.)		1,918
15	NADEP Vermi compost (No.)		1,918
16	Cattle Shelters		1,918
17	Goat Sheep Shelters (No.)		662
18	Cattle Trough (No.)		1,918
19	Construction of new open wells & Recharge Shafts (No.)		2,416
20	Soak Pits (Community) (No.)		215
21	Soak Pits (Individual) (No.)		2,677
22	Roof Rain Water Harvesting (No.)		92
23	Micro Irrigation (ha)		108
24	Fodder Development for Cattle (No.)		1,918

TABLE 31. MICRO-WATERSHED IN CHETPET BLOCK FALLING UNDER TONDI VERAHA MACRO-WATERSHED

Sl.No	Micro watershed Code	Micro watershed Area in ha	Ridge Type
1	4C1D3g12b	615.68	Upper, Middle & Lower
2	4C1D3g12c	548.31	
3	4C1D3g11c	630.27	
4	4C1D3g11b	614.62	
5	4C1D3e13c	545.45	Middle & Lower
6	4C1D3g09b	445.47	
7	4C1D3g10d	307.11	
8	4C1D3g12a	1286.56	Lower
9	4C1D3g10b	498.71	
10	4C1D3g09c	447.7	
11	4C1D3g10a	697.19	
12	4C1D3g06b	685.59	

TABLE 32. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER TONDI VERAHA MACRO-WATERSHED IN CHETPET BLOCK

Sl.No	Name of the GP	Ridge Type
1	Mansurabad	Upper, Middle & Lower Ridge

TABLE 33. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER TONDI VERAHA MACRO-WATERSHED IN CHETPET BLOCK

Sl.No	Proposed Work	Ridge type	Extent
1	Afforestation in Public/common lands (ha)	Upper	14
2	Drainage Line Treatment (m)		7,706
3	CC Check dams (No.)	Middle	1
4	Avenue plantation (m)		3,647
5	Composting (No.)	Lower	14
6	Canal Bund Plantation (m)		1,084
7	Restoration of water bodies: Tanks and Ooranis (No.)		3
8	Artificial Recharge Structure (No.)		65
9	Construction of Farm Ponds - Individual (No.)		17
10	Land development - Individual (ha)		28
11	Azolla units - Individual (No.)		100
12	NADEP Vermi compost (No.)		100
13	Cattle Shelters (No.)		100
14	Goat Sheep Shelters (No.)		21
15	Cattle Trough (No.)		100
16	Construction of new open wells & Recharge Shafts (No.)		65
17	Soak Pits (Community) (No.)		9
18	Soak Pits (Individual) (No.)		172
19	Roof Rain Water Harvesting (No.)		2
20	Fodder Development (No.)		100

TABLE 34. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER & TONDI VERAHA MACRO WATERSHED IN CHETPET BLOCK

Sl.No	Name of the GP	Micro-watershed Area in ha	Ridge Type
1	Rajamapuram	430.54	Middle & Lower
2	Severappoondi	551.93	

TABLE 35. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER & TONDI VERAHA MACRO- WATERSHED IN CHETPET BLOCK

Sl.No	Proposed Work	Ridge type	Extent
1	Afforestation in Public/common lands (ha)	Upper	18
2	Drainage Line Treatment (m)		7,404
3	CC Check dams (No.)	Middle	2
4	Avenue plantation (m)		7,798
5	Composting (No.)		32
6	Canal Bund Plantation (m)	Lower	1,725
7	Restoration of water bodies: Tanks and Ooranis (No.)		15
8	Artificial Recharge Structure (No.)		130
9	Construction of Farm Ponds - Individual (No.)		40
10	Land development - Individual (ha)		0
11	Azolla units - Individual (No.)		36
12	NADEP Vermi compost (No.)		36
13	Cattle Shelters (No.)		36
14	Goat Sheep Shelters (No.)		26
15	Cattle Trough (No.)		36
16	Construction of new open wells & Recharge Shafts (No.)		130
17	Soak Pits (Community) (No.)		18
18	Soak Pits (Individual) (No.)		154
19	Roof Rain Water Harvesting (No.)		4
20	Fodder Development (No.)		36

8.2 MODEL MICRO-WATERSHED- MANDAKOLATHUR

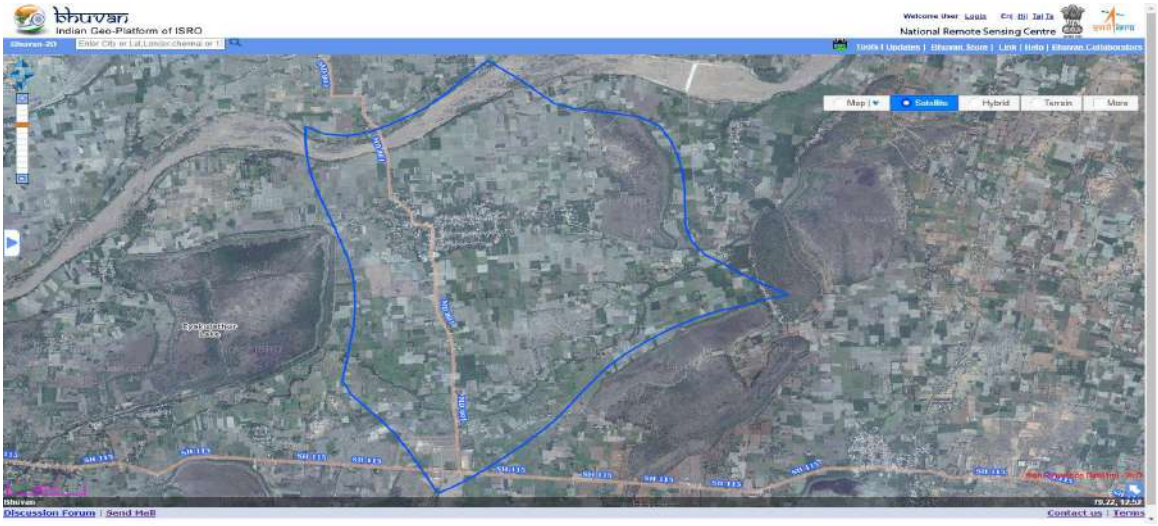


Figure 8.5. Satellite image of Mandakolathur micro-watershed

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.

MANDAKOLATHUR MICRO-WATERSHED

Mandakolathur micro-watershed falls under Mandakolathur and Arumbalur GPs, Chetpet Block in Thiruvannamalai District (Figure 8.5 and 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 Mandakolathur micro-watershed is given below in separate sections followed by proposed works (Figure 8.7 and 8.8), ridge wise proposed treatment area, estimated cost and required person days and key outcomes (Table 36 to 47). The key CWRM parameters for the GPs falling in this micro-watershed is Annexed 8.

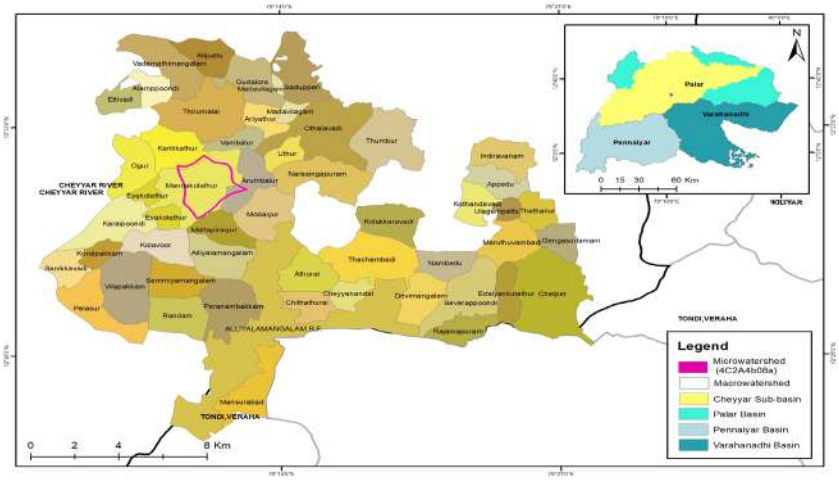


Figure 8.6. Mandakolathur micro-watershed with GPs

TABLE 36. GENERAL INFORMATION OF THE MICRO-WATERSHED

Description	Name/ Number/ Quantity/ Status
Name of the Micro-watershed	**Mandakolathur**
Micro-watershed Number	**4C2A4b08a**
Name of the Basin	Palar
Name of the subbasin	Cheyyar
Name of the Macro-watershed	Cheyyar River
Number of GPs covered under the Micro-watershed	2
Name of the GPs	1. Mandakolathur
	2. Arumbalur
Latitude of Micro-watershed (From To)	12°30'12.66"N to 12°32'7.44"N
Longitude of Micro-watershed (From To)	79°11'35.96"E to 79°13'9.54"E
Total area of the Micro-watershed (in ha)	589
% of Micro-watershed area in Mandakolathur GP	91
% of Micro-watershed area in Arumbalur GP	9
Area of Micro-watershed falling in Mandakolathur GP (ha)	535
Area of Micro-watershed falling in Arumbalur GP (ha)	54
Total Population of Mandakolathur GP	3,273
Total Population of Arumbalur GP	1,200
Annual Average Rainfall (mm)	1047
Annual maximum Temperature (°C)	33
Annual Minimum Temperature (°C)	22.8
Evapo-transpiration Losses of Mandakolathur GP (ha.m)	24.01
Evapo-transpiration Losses of Arumbalur GP (ha.m)	18.7
Volumetric soil moisture availability (%)	23
Climate Risk	Drought and heat waves
CVI Index Value for Mandakolathur GP (Based on WASCA Climate study)	0.553
CVI Index Value for Arumbalur GP (Based on WASCA Climate study)	0.47
Agro-Climatic Zone	North eastern zone (TN-1)
Agro Ecological Sub-Region (ICAR)	Eastern Ghats
Status of Ground water in Mandakolathur GP	Over Exploited
Status of Ground water in Arumbalur GP	Over Exploited

TABLE 37. 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 (m)	30 to 60
Bottom of the unconfined aquifer in soft rock areas (m)	20 to 40
Sheet Erosion	1 ha (middle ridge)

TABLE 38. NATURAL DRAINAGE LINES IN MANDAKOLATHUR MICRO-WATERSHED

No. of 3rd Order drains	1
No. of 4th Order drains	1
Total length of natural drainage line (m)	4,787
Drainage density (ha.m)	8.12

TABLE 39. MICRO-WATERSHED'S CATCHMENT AREA

Catchment Area in ha	Mandakolathur GP	Arumbalur GP
Good catchment area	364.96	178.31
Average catchment area	4.11	93.97
Bad catchment area	551.77	243.37

TABLE 40. GROUND WATER STATUS OF MICRO-WATERSHED

Firka Assessment Unit for Mandakolathur and Arumbalur GP in ha.m	
Name of the Firka (Assesment Unit) falling under Micro-watershed	Mandakolathur
Net Annual Ground Water Availability	2,842.53
Existing Gross Ground Water Draft for Irrigation	1,657.80
Existing Gross Ground Water Draft for domestic and industrial water supply	53.63
Existing Gross Ground Water Draft for All uses	1,711.43
Provision for domestic and industrial requirement supply to 2025	60.96
Net Ground Water Availability for future irrigation development	1,123.77

TABLE 41. GP WISE WATER BUDGET OF MICRO-WATERSHED- MANDAKOLATHUR & ARUMBALUR

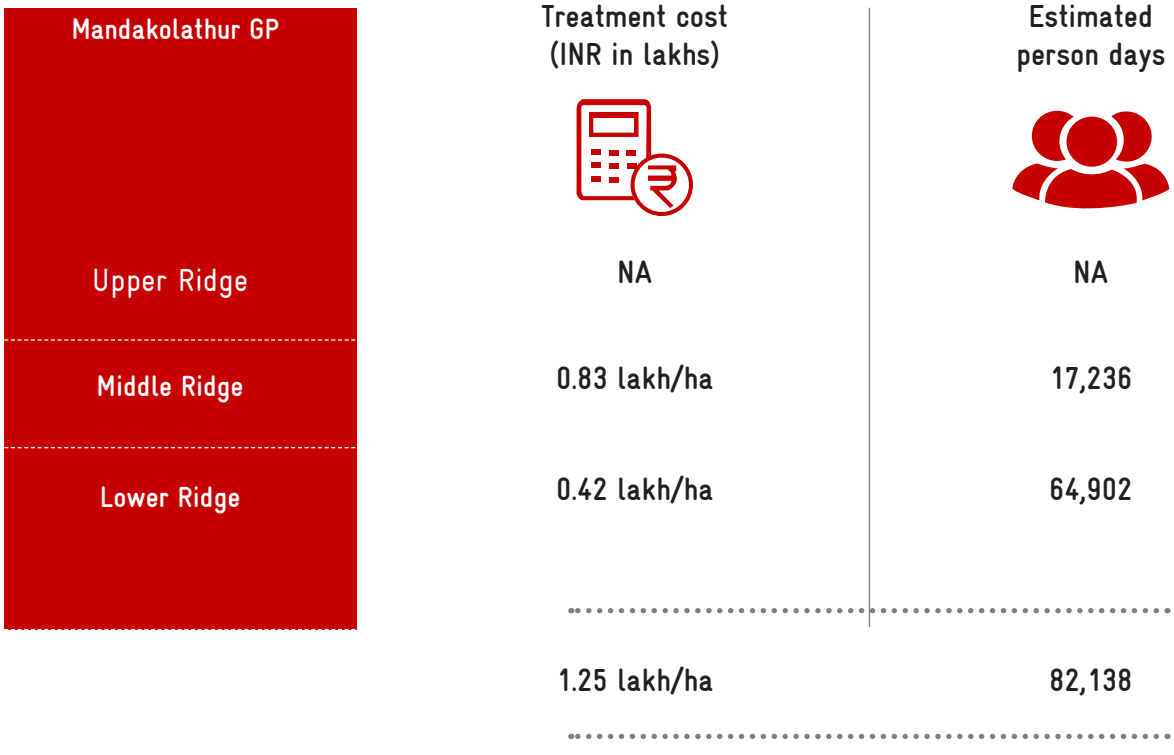
Water Budget in ha.m	Mandakolathur GP	Arumbalur GP
Water for Human	8.96	3.29
Water for Agriculture	510.8	378.7
Water for Animal	4.54	1.92
Village wise water required	524.3	383.9
Available run-off from rain water (derived from Strange method)	241.2	138.8
Harvested Runoff from Water Harvesting Activities	2.8	0.9
Potential Harvesting from proposed Interventions	42	34.6
Total Water harvested	44.8	35.5
Water demand and Supply Difference	-479.4	-348.4
Water Demand Supply Gap Status	Deficient	Deficient
Per capita Water Availability in cum	736.94	1,156.67
International Standard per capita water Availability in cum	1,700	1,700
Water Availability Gap	-963.06	-543.33
Water security status	Water Stress	Water Stress

TABLE 42. GP WISE PROPOSED MICRO-WATERSHED WORKS – MANDAKOLATHUR AND ARUMBALUR

Ridge type	Mandakolathur GP	Arumbalur GP
Upper	0	0
Middle	7	1
Lower	146	29
Total	153	30

TABLE 43. RIDGE WISE TREATMENT AREA, ESTIMATED COST AND PERSON DAYS REQUIRED - MANDAKOLATHUR AND ARUMBALUR

	Mandakolathur GP	Arumbalur GP
Middle Ridge		
Estimated cost for Middle Ridge area (INR in Lakhs)	44.2	1.5
Total area in ha of Middle Ridge	53.5	4.5
Treatment cost of Middle Ridge Lakhs per ha	**0.83**	**0.33**
Estimated Person days generated for Treatment of Middle Ridge	**17,236**	**586**
Lower Ridge		
Estimated cost for Lower Ridge area (INR in Lakhs)	204.49	33.92
Total area in ha of Lower Ridge	481.5	49.5
Treatment cost of Lower Ridge (INR in Lakhs per ha)	**0.42**	**0.69**
Estimated Person days generated for Treatment of Lower Ridge	**64,902**	**10,177**

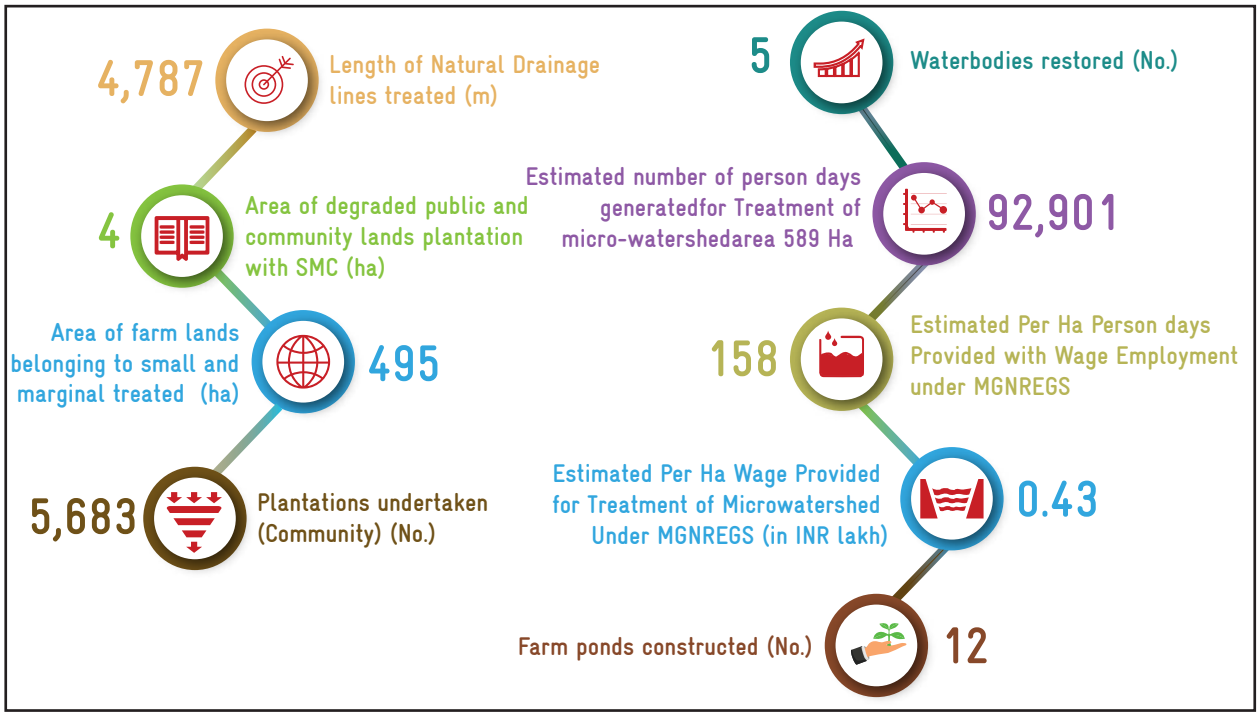


Arumbalur GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	0.33 lakh/ha	586
Lower Ridge	0.69 lakh/ha	10,177
	1.02 lakh/ha	10,763

TABLE 44. NATURE AND NO. OF WORKS IN MICRO-WATERSHED

Description	Number
Total No. of works in Micro-watershed area (Arable, Non arable & DLT)	110
Total No. of works in Micro-watershed including livelihood Activities	37
Total No. of works in Micro-watershed including Rural Greywater Management Activities	36

TABLE 45. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)

Mandakolathur GP	111.11 lakh
Arumbalur GP	54.87 lakh

TABLE 46. ESTIMATES OF MICRO-WATERSHED IN MANDAKOLATHUR 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						
Gabion Check Dam (No.)	Lower	Commenced	2	2	3.2	320
Avenue plantation (Km)			5.29	2	9.522	3,718
Restoration of Traditional water bodies: (Pond) (No.)			4	4	4	800
Restoration of Traditional water bodies: (Union Tank) (No.)			1	1	43.2	16,000
Loose boulder check dam (No.)		Not commenced	4	4	3.4	168
Tank bund Plantation (No.)			1	1	1.8	703
Compost Pit (No.)			9	9	1.53	135
Sunken Pit in 1st order drain (No.)		Ongoing	3	3	4.62	1,149
Afforestation (ha)	Middle	Not commenced	1	1	8.6	3,344
Block Plantation (ha)			1	1	11.1	4,320
Sub total				**28**	**90.97**	**30,657**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Azolla Production units - Individual (No.)	Lower	Commenced	10	10	1.5	230
NADEP Vermi compost (No.)			10	10	1.8	270
Artificial Recharge Structure for borewell farmers (No.)		Not commenced	22	22	55	8,602
Fodder development - Individual (No.)			8	8	11.84	18,752
Silt application (No.)			2	2		
Construction of Farm Ponds - Individual (No.)		Ongoing	9	9	18	7,029
Dryland Horticulture (ha & No.)	Middle	Not commenced	5 2	2	17	6,642
Farm Bunding with Boundary Trenches - Individual (ha & No.)			10 5	5	7.5	2,930
Sub total				**68**	**112.64**	**44,455**
Total				**96**	**203.61**	**75,112**
Livelihood enhancement activities for Individual Farmers (dryland)						
Cattle Shelters (No.)	Lower	Commenced	10	10	21.2	3,310

Goat Sheep Shelters (No.)	Lower	Not commenced	6	6	13.62	2,130
Cattle Trough (No.)			13	13	0.65	78
Sub total				**29**	**35.47**	**5,518**
Rural Greywater and Roof rainwater Management						
Rainwater Harvesting Structures (No.)	Lower	Ongoing	2	2	8	1,250
Soak Pits (Individual) (No.)			16	16	1.6	256
Nutri Garden (No.)		Not commenced	10	10j	0.01	2
Sub total				**28**	**9.61**	**1,508**
Total				**153**	**248.69**	**82,138**

TOTAL ESTIMATES OF MICRO-WATERSHED IN MANDAKOLATHUR GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Vadapulidiyur GP	153	248.69	82,138

TABLE 47. ESTIMATES OF MICRO-WATERSHED IN ARUMBALUR GP

Proposed Work	RidgeType	Status of Work	Extent	No. of works as per KML	Estimate cost (in Lakhs)	Person days
NRM works in Public and Community Lands						
Check dam (No.)	Lower	Not commenced	1	1	8.35	420
Sunken Pit in 1st order drain (No.)		Ongoing	1	1	1.54	383
Sub total				**2**	**9.89**	**803**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Azolla Production units - Individual (No.)	Lower	Commenced	3	3	0.45	69
NADEP Vermi compost (No.)			2	2	0.54	81
Artificial Recharge Structure for borewell farmers (No.)		Not commenced	1	1	2.5	391
Fodder development - Individual (No.)			2	2	2.96	4,688
Construction of Farm Ponds - Individual (No.)		Ongoing	3	3	6	2,343
Farm Bunding with Boundary Trenches - Individual (ha & No.)	Middle	Not commenced	2	1	1.5	586
Sub total				**12**	**13.95**	**8,158**
Total				**14**	**23.84**	**8,961**

Livelihood enhancement activities for Individual Farmers (dryland)						
Cattle Shelters (No.)	Lower	Commenced	3	3	6.36	993
Goat Sheep Shelters (No.)			2	2	4.54	710
Cattle Trough (No.)		Not commenced	3	3	0.15	18
Sub total				**8**	**11.05**	**1,721**
Rural Greywater Management						
Soak Pits (Individual) (No.)	Lower	Commenced	5	5	0.5	80
Nutri Garden (No.)		Not commenced	3	3	0.03	1
Sub total				**8**	**0.53**	**81**
Total				**30**	**35.42**	**10,763**

TOTAL ESTIMATES OF MICRO-WATERSHED IN ARUMBALUR GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Arumbalur GP	30	35.42	10,763

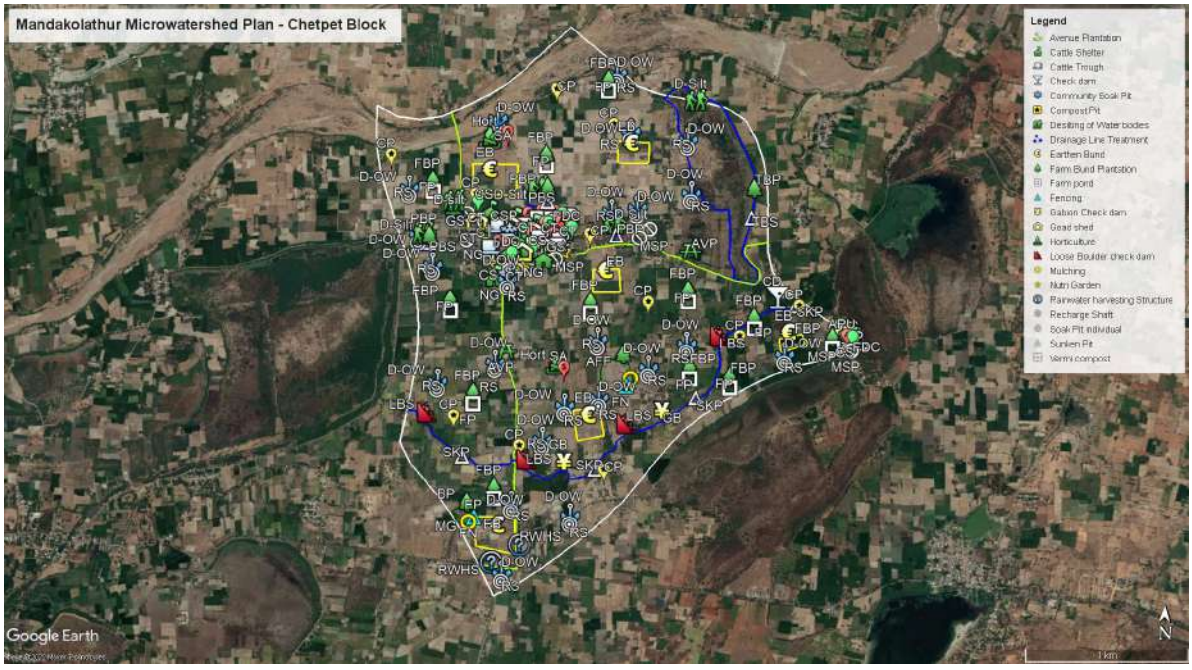
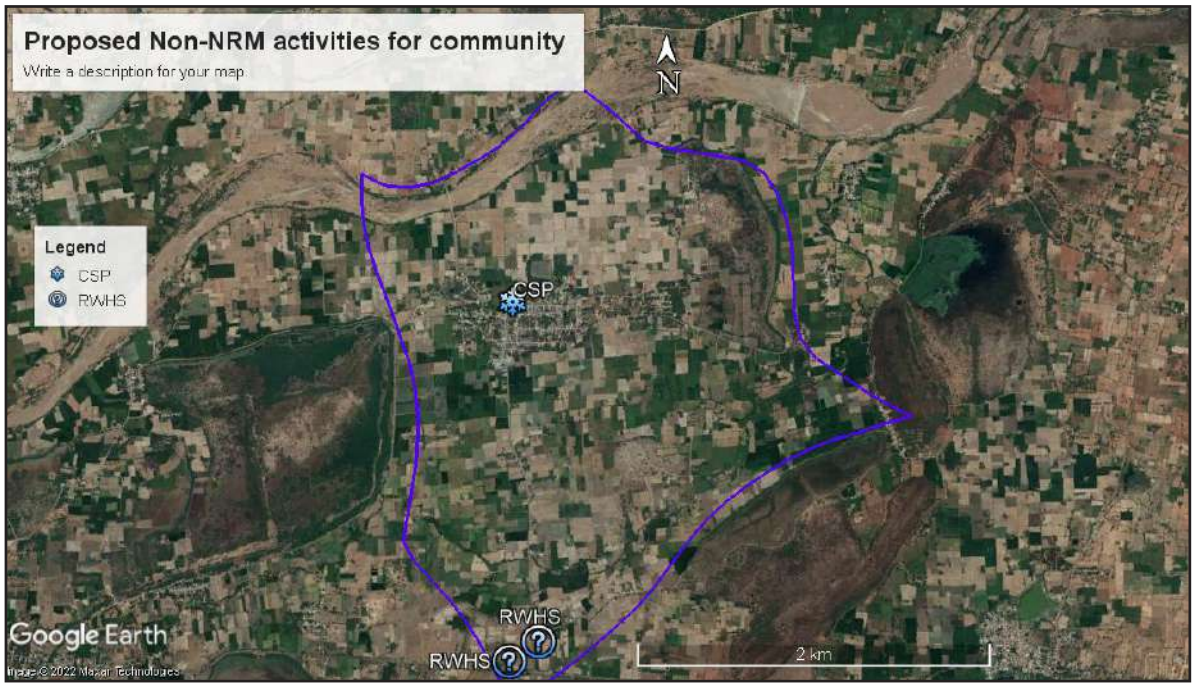
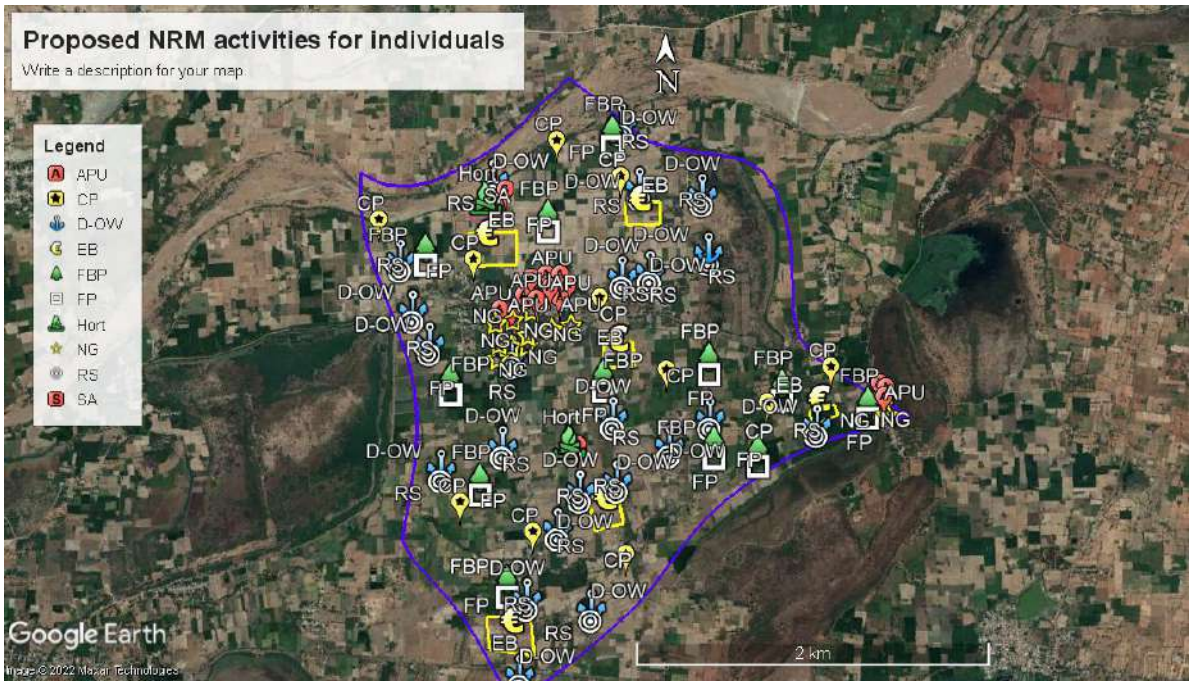


Figure 8.7. Proposed activities in Mandakolathur micro-watershed


Proposed NRM activities for community
Write a description for your map
Legend
AVP
AVP
CD
Drainage Line Treatment
D-Silt
FN
GB
LBS
MG
PBP
N
D-Silt
TBP
PBP
D-Silt
D-Silt
PBP
PBS
PBP
D-Silt
AVP
TBS
PBP
PBS
D-Silt
PBS
CD
SKP
LBS
AFF
AVP
MG
SKP
LBS
FN
GB
LBS
GB
LBS
SKP
SKP
BP
MG
FN
Google Earth
2 km


Proposed Non-NRM activities for community
Write a description for your map
Legend
CSP
RWHS
N
CSP
RWHS
RWHS
Google Earth
2 km



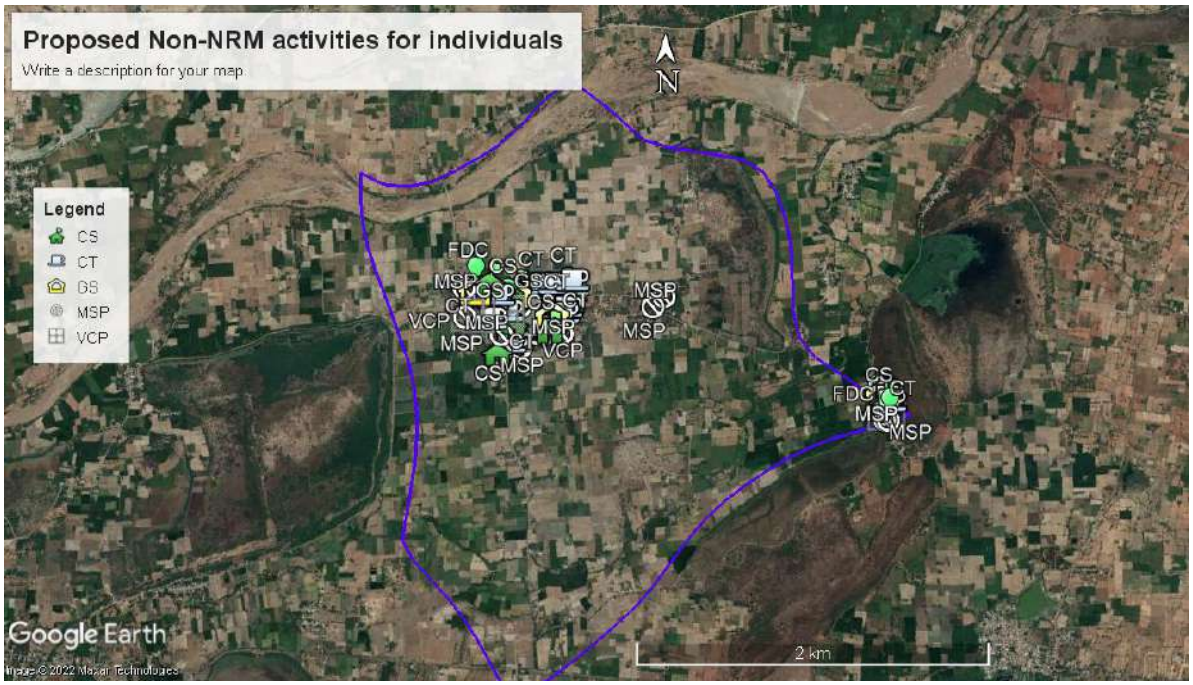


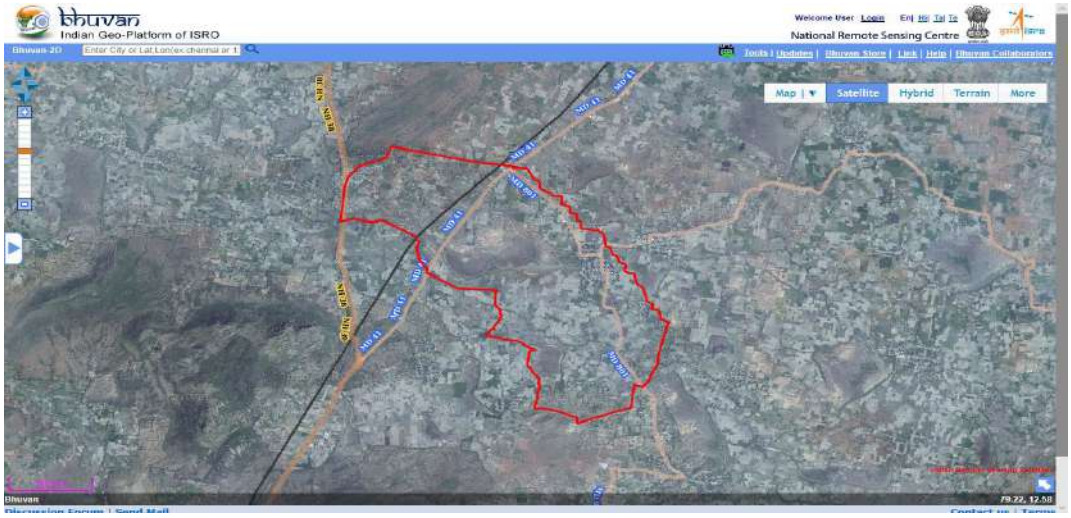
Figure 8.8 Proposed activities in Mandakolathur micro-watershed A: NRM activities for community. B: Non-NRM activities for community. C: NRM activities for Individuals. D: Non-NRM activities for Individuals

(APU: Azolla Production unit, AVP: Avenue Plantations, CP: Compost pit, CS: Cattle Shed, D-silt: Desilting, D-OW: Desilting open well, CT: Cattle through, EB: Farm Bunding with Boundary Trenches - Individual, FBP: Farm Bund Plantations, FDC: Fodder Development, FP: 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)

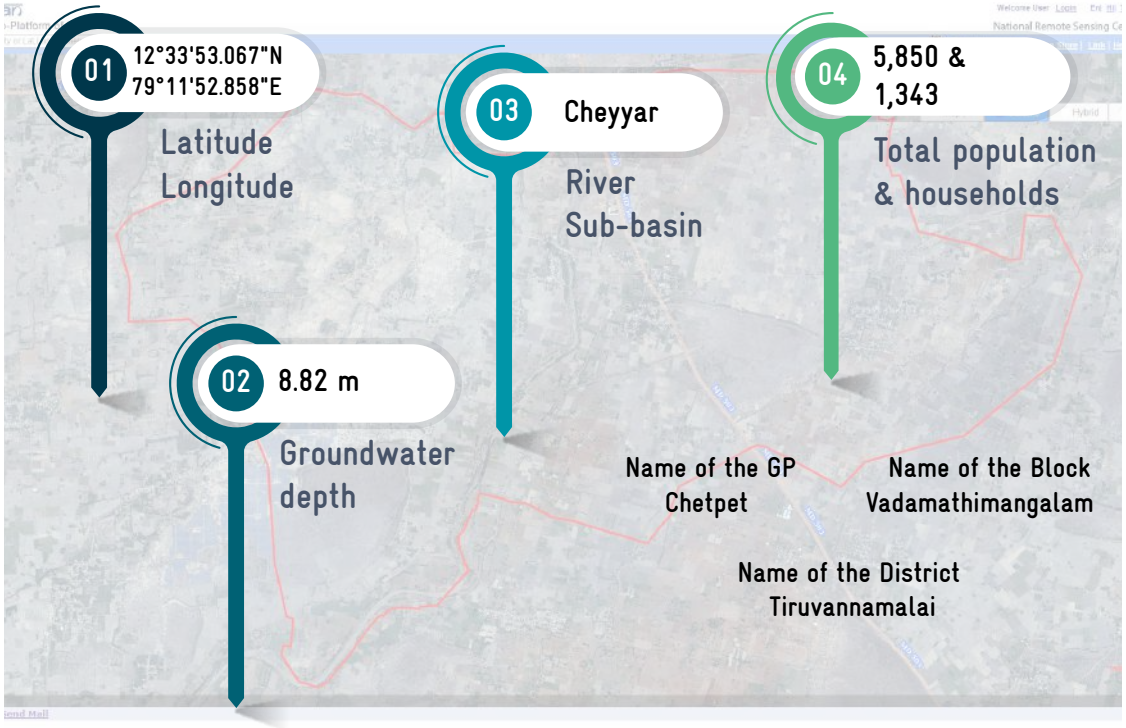
8.3 MODEL GRAM PANCHAYAT

VADAMATHIMANGALAM GP

8.3.1 BACKGROUND OF GRAM PANCHAYAT – VADAMATHIMANGALAM



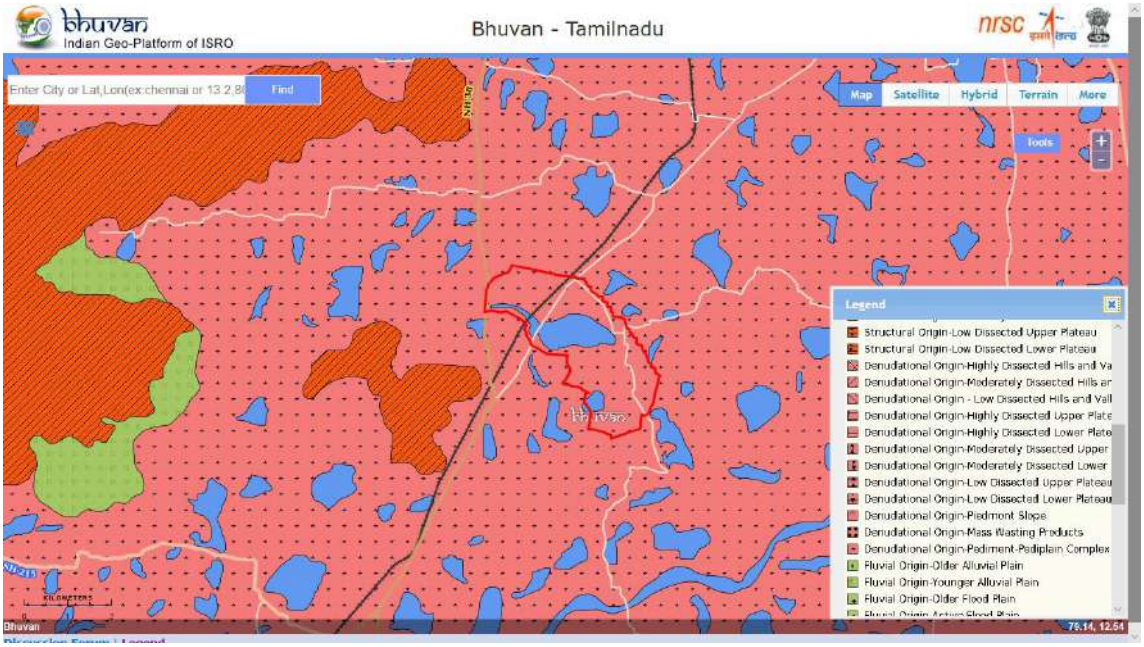
Vadamathimangalam GP is geographically situated between 12°33'53.067"N to 12°35'45.226"N and 79°9'54.321"E to 79°11'52.858"E located in Chetpet Block of Tiruvannamalai District. The total geographical area of GP is 691 ha, As per Census 2011, total population is 5,850 of which 2,895 are males and the female population is 2,955. The total number of households is 1,343. The Schedule Caste constitutes 16% of total population in Vadamathimangalam village. There is no Scheduled Tribe population in the village. (Table 48). The average annual temperature of GP is 27.9 °C, and receives annual average rainfall of 1,047 mm.

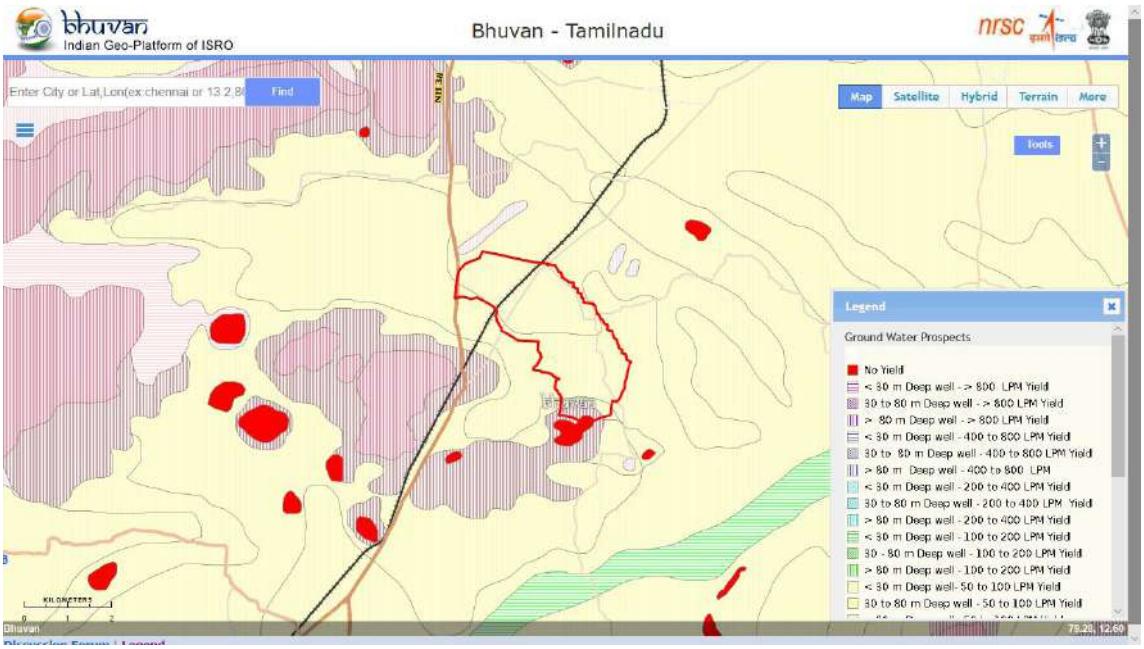


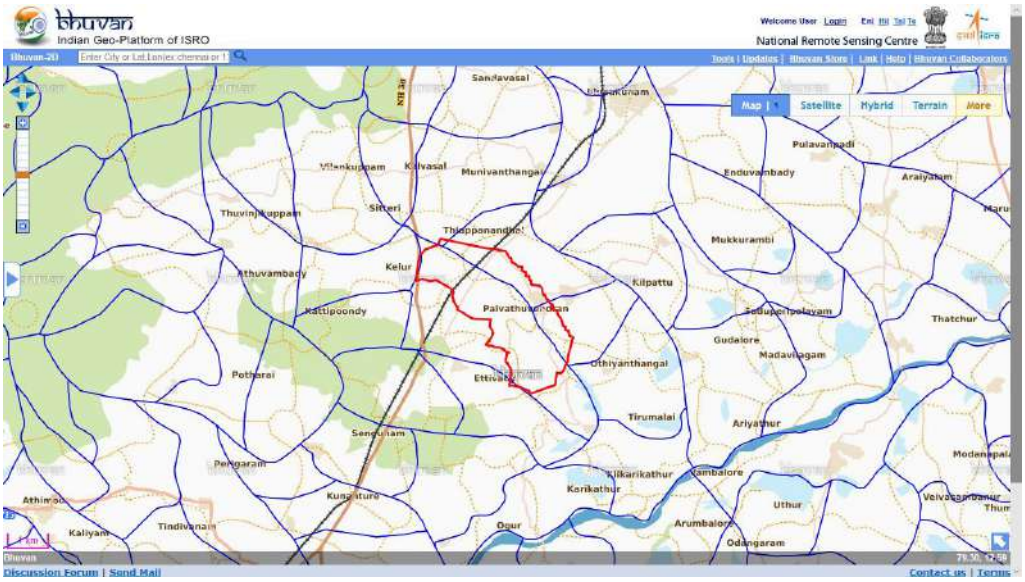
The detailed spatial and non-spatial data considered in the process of preparation of climate resilient under CWRM for Vadamathimangalam GP is illustrated as follows:

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 implement towards conservation of resources. Various thematic datasets for Vadamathimangalam GP are discussed below Figure 8.9.



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Pulavanpadi
Araiyathur
Thatchur
Gudalore
Madavilagam
Othiyanthangal
Tirumalai
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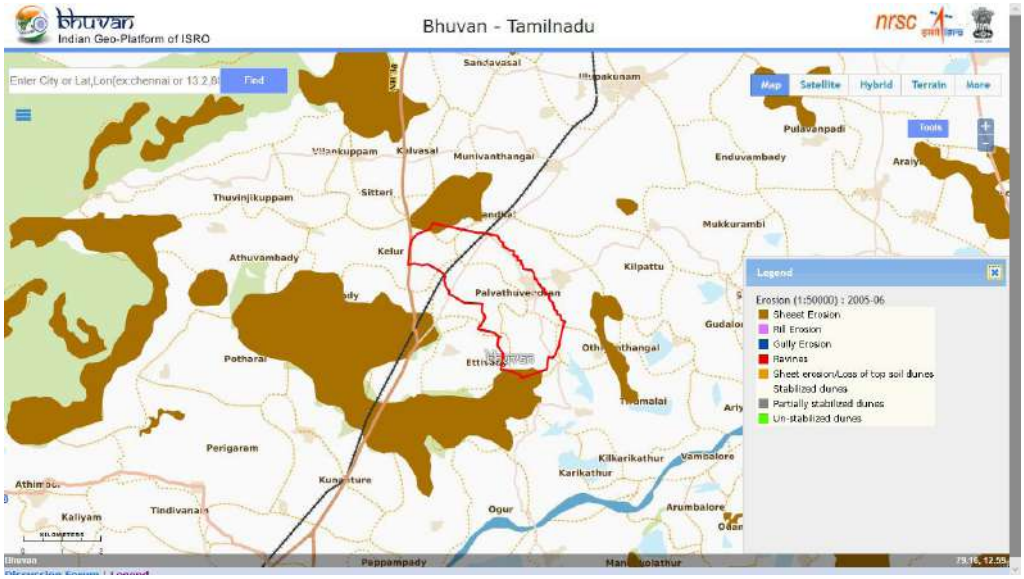
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Rill Erosion
Gully Erosion
Ravines
Sheet erosion/Loss of top soil duries
Stabilized duries
Partially stabilized duries
Un-stabilized duries
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Munivanthangal
Kalvasal
Sitteri
Thuvinjikuppam
Athuvambady
Kelur
Kilpattu
Mukkurambi
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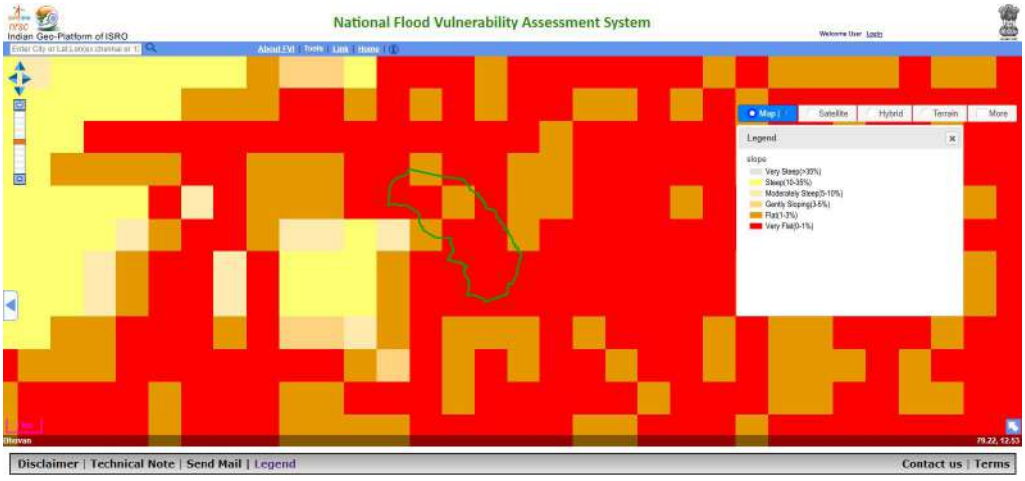
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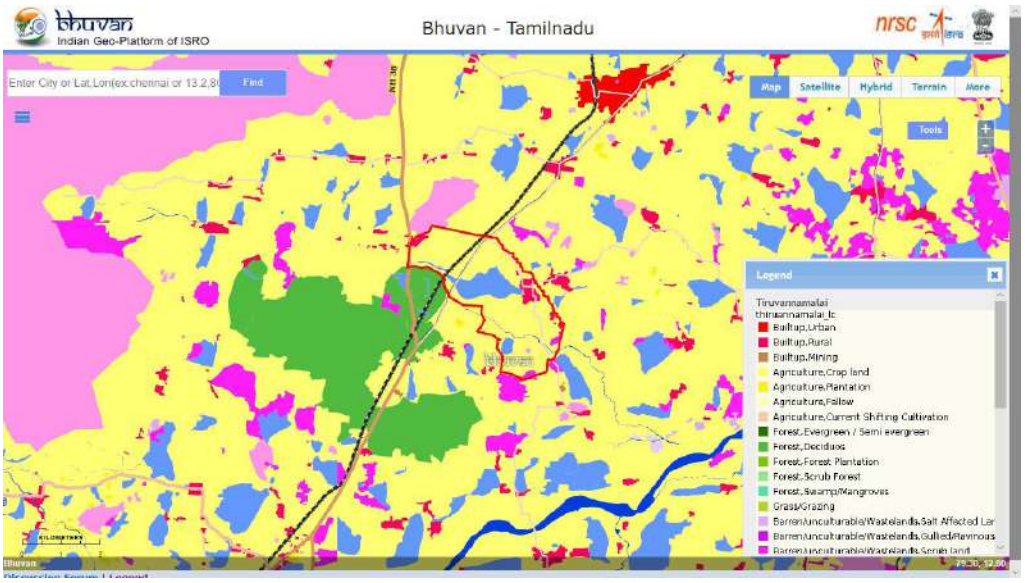


Figure 8.9 Spatial thematic maps of Vadamathimangalam GP. A. Geomorphology, B. GW prosperity, C. Watershed D. Erosion, E. Slope, F. LULC

Vadamathimangalam GP engrossed with denudation origin pediment complex (Figure 8.9 A). It is observed that the groundwater prosperity range between 30 to 80 m deep well with yield of 50 – 100 LPM (B). Very flat terrain is dominant in the GP (E), Whereas GP area is falls under three micro-watershed units (C). Major portion of land is used for agriculture purpose (F).

8.3.3 CWRM PLANNING- NON-SPATIAL DATA

The non-spatial data covered four important themes – socio economic, climate, water and agriculture with 116 parameters (Table 49). These non-spatial data are 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 49. NON-SPATIAL DATA- VADAMATHIMANGALAM GP

Key CWRM Parameter	Details
Climate Vulnerability Area (CVA) 1: Socio-Economic	
Geographical Area (ha)	691
Male Population	2,895
Female Population	2,955
Total Population	5,850
SC Population	941
ST Population	0
Vulnerable population	941
Households (HH's)	1,343
Only one room HH's (SECC)	124

Female Headed HH's (SECC)	107
Vulnerable Households (SECC)	119
% of Vulnerable Households	9%
Registered MGNREGA Job cards	1,720
Active person working in MGNREGA job Cards	1,304
Drinking Water Sources	1,099
Ground Water - Drinking source	5
Surface water - Drinking source	1
Sum of drinking water sources	6
HH's have tap water connection for drinking water	0
HH's dependent on other sources for drinking water	0
Annual Grey water Generation (ha.m)	11
Climate Vulnerability Area (CVA) 2: Climate	
Average Annual Rainfall (mm)	1,047
Average Annual Temperature (°C)	27.9
Ground Water(G.W) Status	Over -Exploited
Climate Vulnerability Area (CVA) 3: Water Resources	
Canal Network (m)	
Length of Minor Canal (m)	2,000
Water Courses (Field Channels) (m)	10,500
Number of Tanks (PWD & Union) (No.)	3
Other Surface Water Bodies (No.)	4
Irrigation Facilities (ha)	
Area under Open & Tube Well Irrigation (ha)	189
Catchment Area wise Available Runoff (ha.m)	
Good Catchment Area	89.70
Average Catchment Area	3.50
Bad Catchment Area	82.10
Watershed and Drainage Networks	
Length of Natural Drainage Lines (m)	3,262
Number of Natural Drainage Lines (m)	3
Number of Micro Watersheds (m)	5
Water Demand (ha.m)	
Water Demand For Humans (ha.m)	16.01
Water Demand for Livestock (ha.m)	6.47
Water Demand For Agriculture (ha.m)	537.68
% G.W Utilization for Drinking	2
% G.W Utilization for Livestock	93
% G.W Utilization for Agriculture.	100
% SW Utilization for Drinking	98

% SW Utilization for Livestock	7
Climate Vulnerability Area (CVA) 4 : Agriculture	
Area Under Land Resources (ha)	
Area under Non-Agricultural Uses	220.75
Area under Barren & Un-cultivable Land	18.50
Area under Permanent Pastures and Other Grazing Land	3.80
Area under Land Under Miscellaneous Tree Crops etc.	1.60
Area under Culturable Waste Land	7.10
Area under Fallows Land other than Current Fallows	89.91
Area under Current Fallow land	127.74
Area under Unirrigated Land	32.45
Area Irrigated by Source	189.11
Catchment Area (ha)	
Land under Good Catchment (ha)	239.25
Land under Average Catchment (ha)	12.50
Land under Bad Catchment (ha)	439.21
Crop Details (ha)	
Irrigated Area (ha)	403.10
Rainfed area (ha)	4.10
Area under Paddy Cultivation (ha)	327.10
Crop Water Requirement - Irrigated condition (ha.m)	536.24
Crop Water Requirement - Rainfed condition (ha.m)	1.44
Soil Resources: Status of Available Nitrogen (%)	
Very Low	45
Low	55
Status of Organic Carbon (%)	
Very Low	54
Low	46
Status of Soil Micro Nutrients (%)	
Sufficient	52
Deficient	48
Status of Physical condition of the soil (%)	
Moderately Alkaline	100
Soil Texture	
Clay Soil	100
Soil Water Permeability	Low
Soil moisture and ET	
Volumetric Soil Moisture (%)	23
Estimated Soil Moisture (ha.m)	470.21
ET Losses (ha.m)	118.47

Means of Water Extraction (%)	
Gravity	4
Lifting	96
Irrigation Methods (%)	
Control Flooding	100
Livestock (No)	
Cattle Population	1,640
Sheep Population	855
Goat Population	465

8.3.4 KEY WATER CHALLENGES

Socio-Economic

1. According to SECC data, 9% of the households are vulnerable in the village
2. Female population is more than male population
3. 124 one room households, and 107 female headed households
4. Access to drinking water through tap water connections is nil
5. Grey water generation is 11 ha.m; Handling of grey water from households needs attention

Water

1. Ground water staus -Over exploited
2. 7 traditional waterbodies in the GP
3. Irrigation depends 100 % on open and tube well
4. 100 % Agriculture and 93% livestock need met through groundwater
5. 175.3 ha-m of water is an available runoff -Runoff; Good and bad catchment area is more

Agriculture and Allied Sector

1. 36.43 % of the land covers the common area
2. 63.56% of the land covers an individual land area
3. Main crop in the GP is paddy which is cultivated about 327.10 ha of land
4. Crop water requirement for irrigated condition is more
5. 96% of the water is given to paddy fields by lifting methods of irrigation
6. Remaining water is extracted by gravity method of irrigation
7. Soil Nitrogen, organic carbon is very low to low
8. Moderately Alkaline soil
9. 100% clay soil is predominant in the GP
10. Slightly high ET loss at 118.47 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 to reduce the vulnerability of the GP. About 9.85% of the total land area is taken for WASCA treatment activities like plantation and conservation works. The total proposed area for treatment is 68.07 ha with more attention being given for area irrigated by source followed by area under current fallow land. (Figure 8.10). Through the proposed conservation activities, 21.3 ha.m run off would be harvested in which, about 51.64% of the runoff from the good catchment, 36.15% of the run off from the bad catchment and negligible amount of conservation from the average catchment area (Figure 8.11).

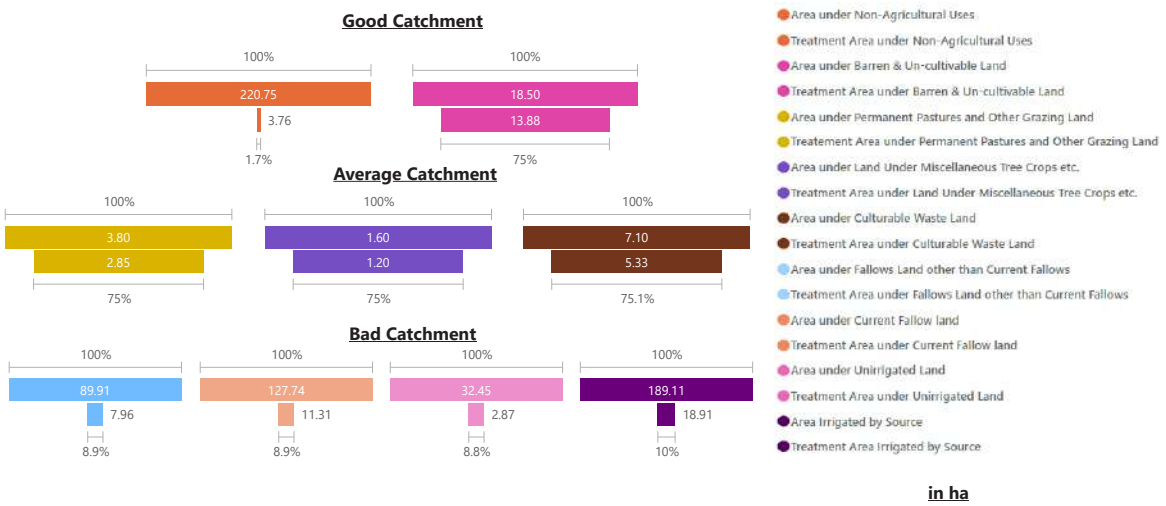


Figure 8.10. Proposed land resource treatment area in Vadamathimangalam GP

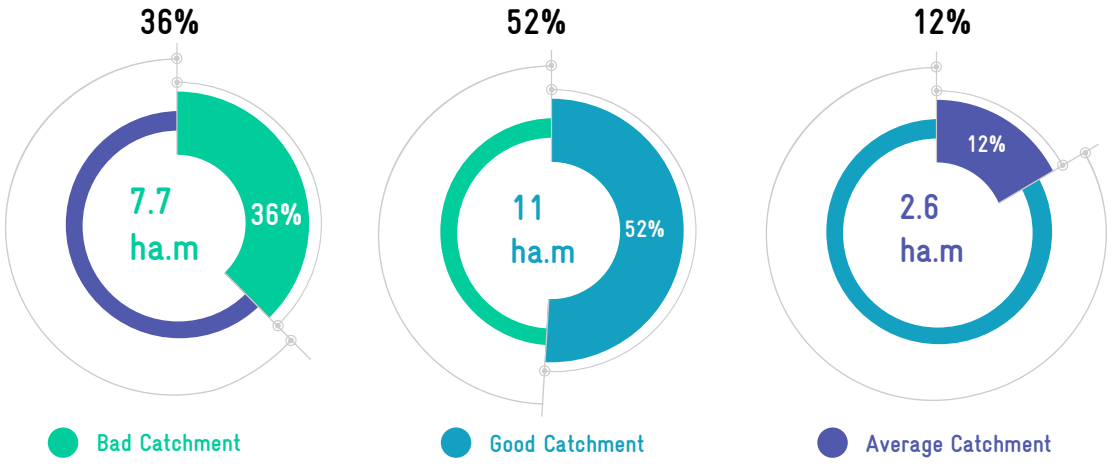


Figure 8.11. Expected run off conservation after treatment in Vadamathimangalam GP

The detailed proposed activities along with silent parameters are showed in the Table 50 for 2021-2024. More attention towards common and public land developments are given with appropriate works to improve the resilience of the GP.

TABLE 50. PERSPECTIVE PLAN OF VADAMATHIMANGALAM GP - FY (2021-2024)

CWRM Water Action 1. Improvement of Public & Common lands development				
Works in Upper, Middle and Lower Ridge				
Name of the Work	**Ridge Type**	**No of Works**	**Estimated cost (INR in Lakhs)**	**Estimated Person Days**
Composting (No.)	Lower	6	1.02	90
Afforestation in Public/common lands(ha)	Upper	1	8.6	3,344
Block Plantation (Community) (ha)	Middle	1	11.1	4,320
Silvi-Pasture Development (ha)		1	17.1	6,664
Tank Bund Plantation (Km)		2	3.6	1,406
Canal Bund Plantation (m)	Lower	1	7.5	2,930
Avenue Plantation (Km)	Middle	4	7.2	2,812
Nursery Development (No.)	Lower	1	15	2,344
Restoration of water bodies: a.PWD and Tanks (No.)		2	2	400
Artificial Recharge Structure (No.)		30	75	11,730
Drainage Line Treatment (m)	Upper	1	0.03	5
Sub Total Water Action -1		**52**	**158.15**	**37,645**
Agriculture & Allied Sector Development				
Works in Lower Ridge				
Farm Bunding with Boundary Trenches - Individual (ha)	Lower	16	24	9,376
Construction of Farm Ponds - Individual (No.)		16	32	12,496
Dry land Horticulture/Agro forestry - Individual (ha)		7	59.5	23,247
Azolla units - Individual (No.)		41	6.15	943
NADEP Vermi compost (No.)		41	7.38	1,107
Fodder development - Community & Individual		41	60.68	96,104
Cattle Shelters (No.)		41	86.92	13,571
Goat Sheep Shelters (No.)		52	118.04	18,460
Cattle Trough (No.)		41	2.05	246
Construction of new wells		30	150	27,780
Sub Total Water Action -2		**326**	**546.72**	**2,03,330**
Rural Water Management				
Works in Lower Ridge				
Soak Pits (Community) (No.)	Lower	14	1.82	280
Soak Pits (Individual) (No.)		145	14.5	2,320
Roof Rain Water Harvesting (No.)		2	8	1,250
Sub total		**161**	**24.32**	**3,850**
Total		**539**	**729.19**	**2,44,825**

Of the total number of projects identified under CWRM themes, 60.48 % works are in agriculture and allied sector while 29.87% works are in rural water management and 9.64 % works are in public and common land. Table 51 provides the estimates of the work budget, and personal days for three years from 2021-2024 in the Vadamathimangalam GP.

TABLE 51. 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	52	158.15	37,645
Agriculture and Allied sector development	326	546.72	2,03,330
Rural water management	161	24.32	3,850
TOTAL	539	729.19	2,44,825

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 52). 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 52. WASCA- WATER ACTIONS AND INDICATORS

WASCA CWRM ACTION PLAN

DEVELOPMENT OF PUBLIC AND COMMON LAND

	INDICATOR		OUTCOMES/ IMPACT
1	No. of water bodies restored in the village	1	Four traditional water bodies restored
2	Area under afforestation (ha)	2	7.5 ha under afforestation
3	Reduction in the annual surface runoff (ha.m)	3	13.2 ha.m surface runoff harvested and stored
4	The proportion of land treated under WASCA (%)	4	17% of the total geographical area of the village treated under WASCA in three years
5	Drainage line treatment (km)	5	2.6 km length of drainage lines treated

4 TRADITIONAL WATER BODIES RESTORED

7.5 ha AFFORESTATION

13.2 ha.m SURFACE RUNOFF HARVESTED

17% AREA OF THE VILLAGE TREATED

2.6 km DRAINAGE LINES TREATED

WASCA CWRM ACTION PLAN

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

	INDICATOR		OUTCOMES/ IMPACT
1.	No of structures were established for on-farm (in-situ) water harvesting in dry lands	1.	16 farm ponds established 217.65 Ha under fallow land restored for cultivation
2.	Reducing area under fallow lands	2.	41 units of vermi compost established
3.	Improvement in soil health	3.	30 artificial recharge structures were established to replenish groundwater flow

16 FARM PONDS

217.65 ha FALLOW LAND RESTORED

41 VERMI COMPOST

30 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.	14 community level and 145 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.	1,343 households established Nutri-gardens in homesteads

4 COMMUNITY & **38** INDIVIDUAL SOAK PITS

2 COMMON ROOF RAINWATER HARVESTING

376 NUTRI-GARDENS

Table 53 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 53. PROPOSALS FOR THE MGNREGS, VADAMATHIMANGALAM GP

	No of works	No of person days
Perspective plan	539	2,44,825
Annual plan	215	97,930

8.3.7 PROPOSED ACTIVITY MAP

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

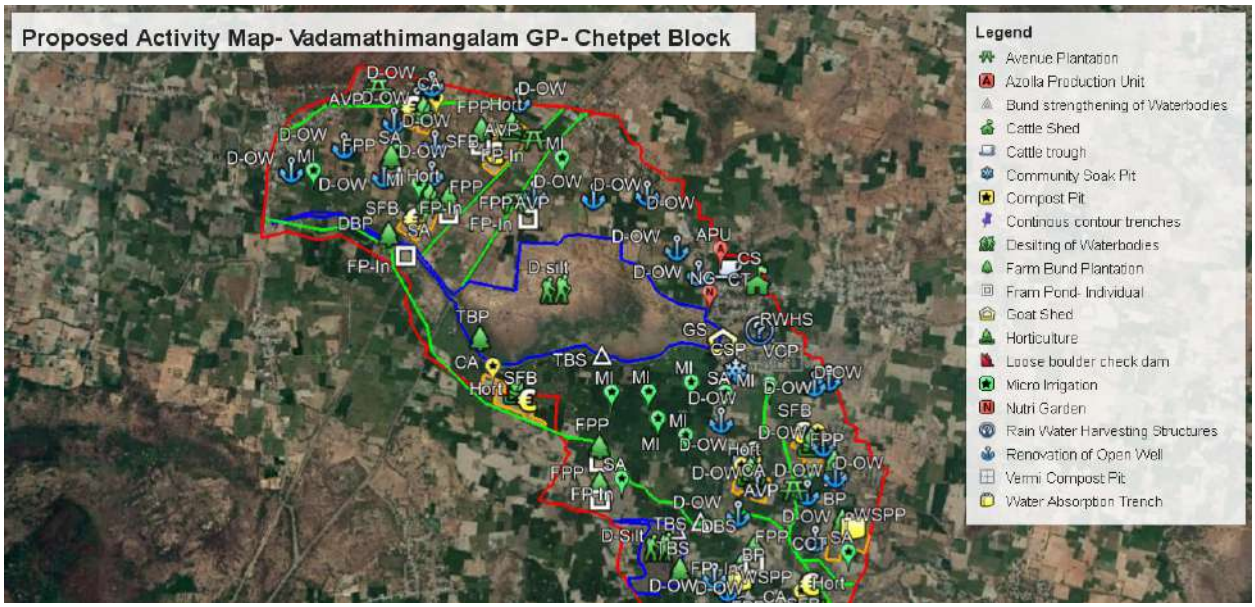


Figure 8.12. Proposed action plan of Vadamathimangalam GP

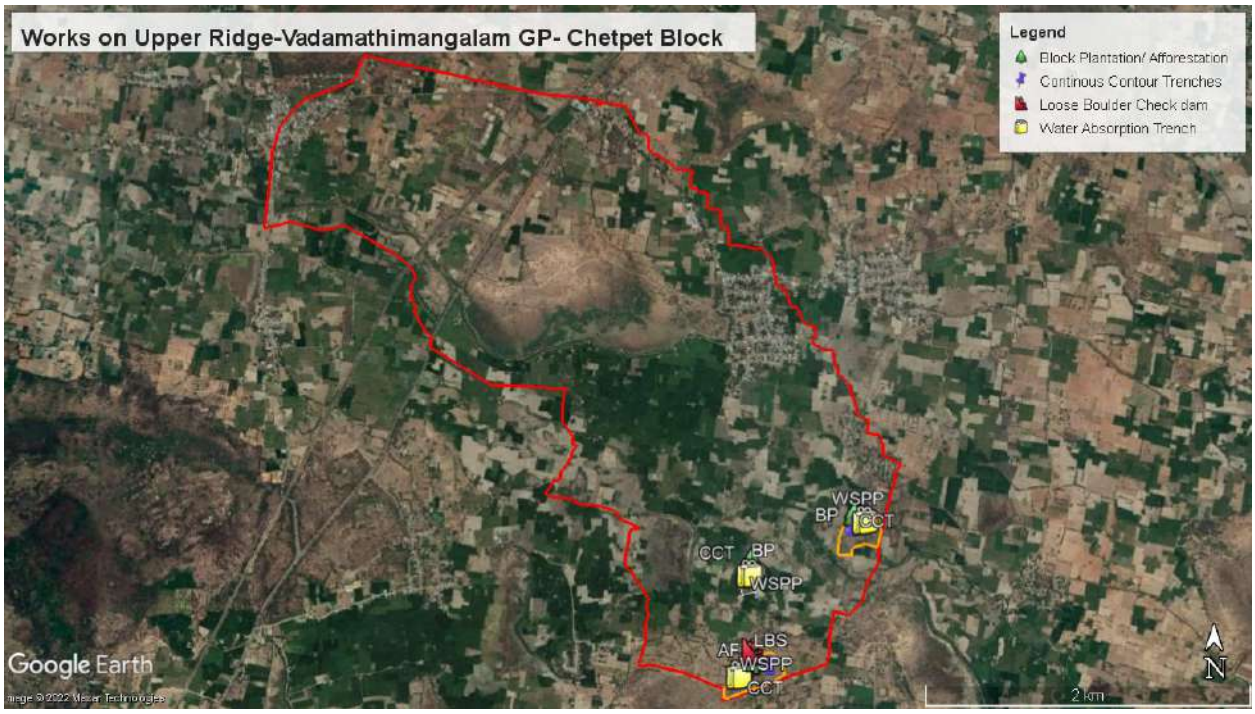


Figure 8.13. Works on Upper Ridge of Vadamathimangalam GP

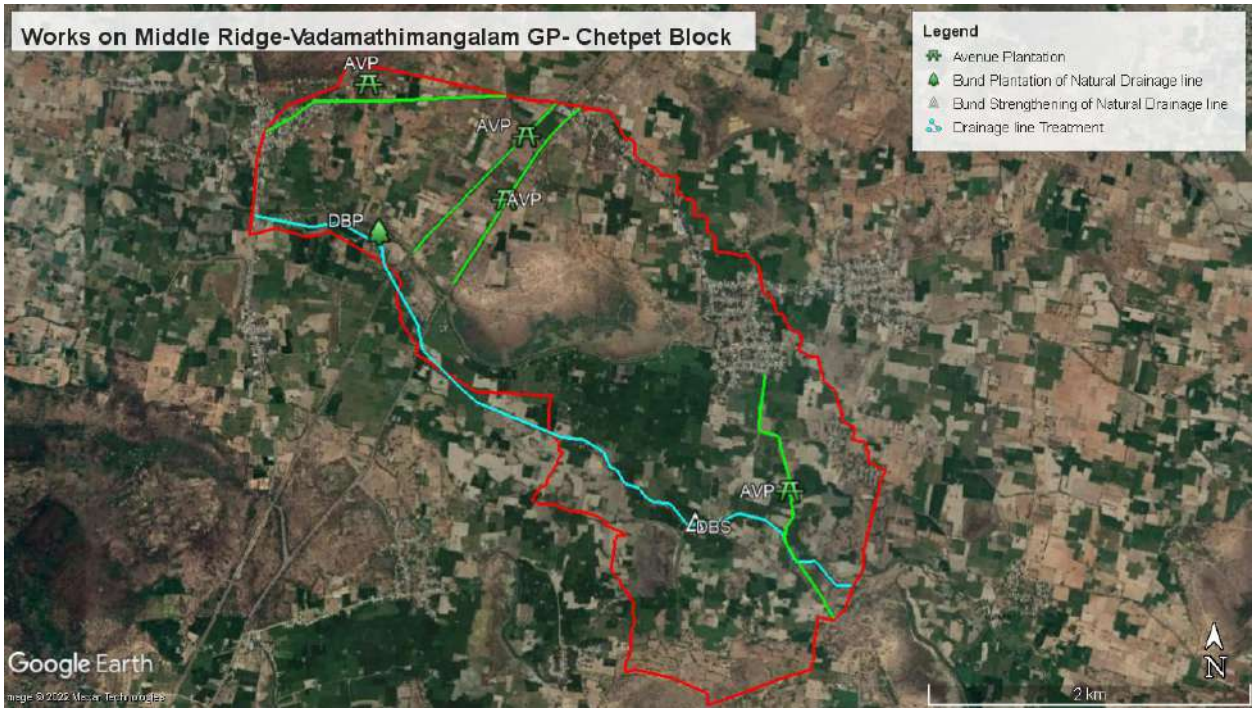


Figure 8.14. Works on Middle Ridge of Vadamathimangalam GP

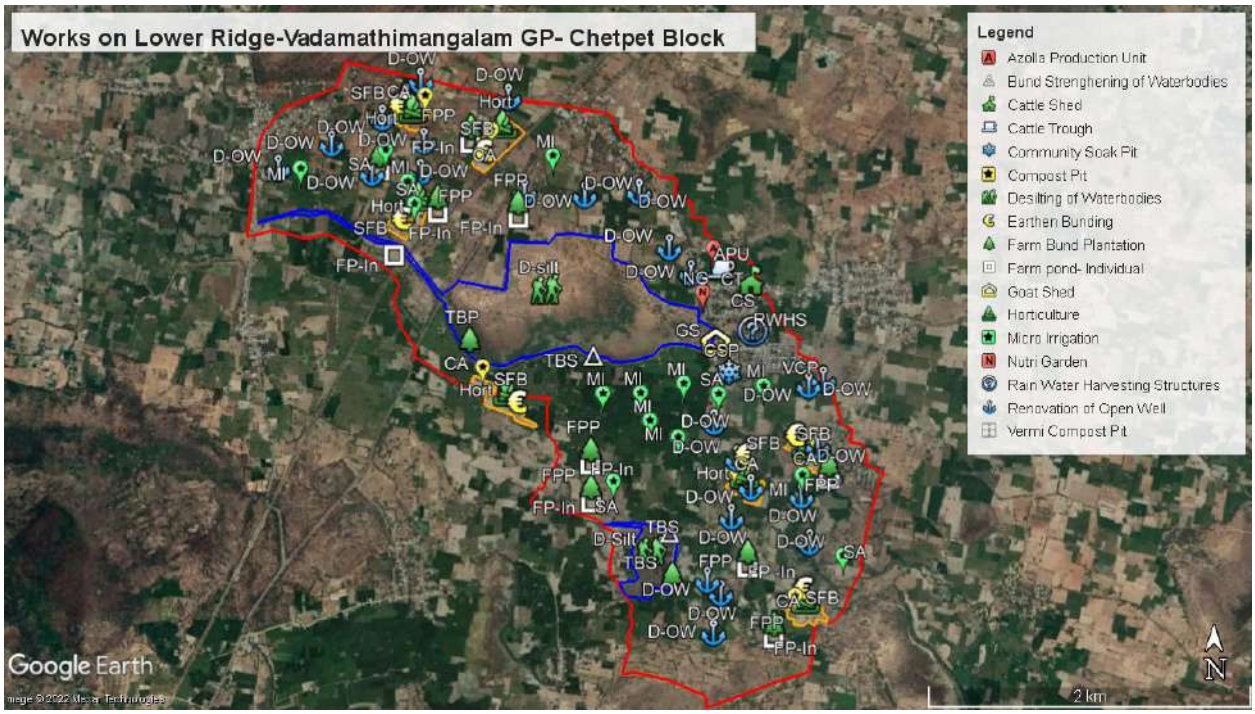
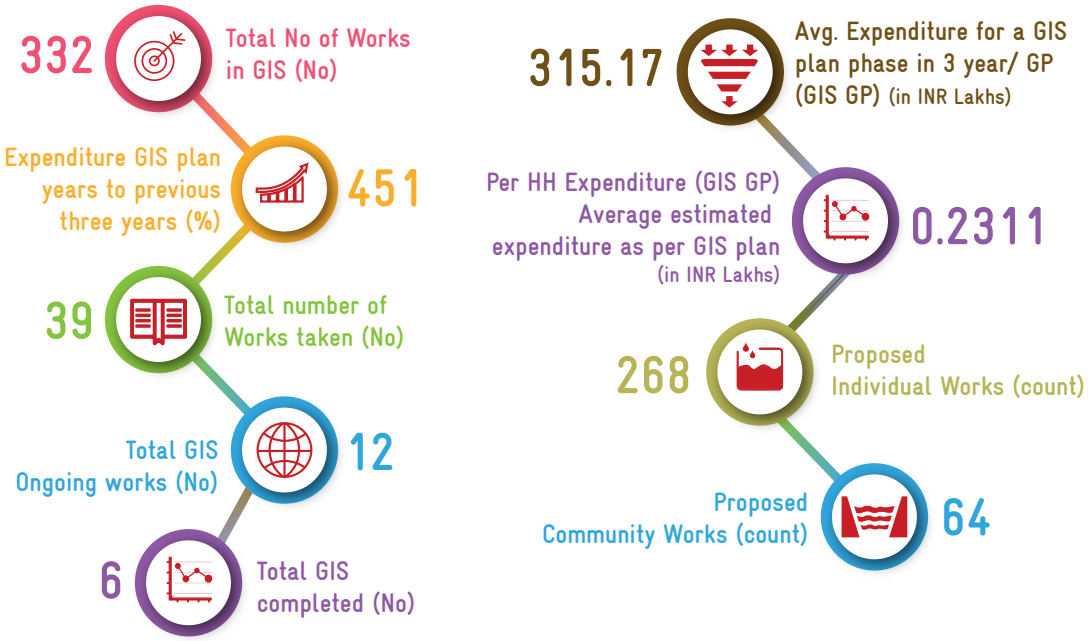


Figure 8.15. Works on Lower Ridge of Vadamathimangalam GP

8.3.8 GIS PLAN IMPLEMENTATION, KEY PARAMETERS

The GIS plan implementation and performance of Naduppatu Block is represented in Table 54.

TABLE 54. KEY PARAMETERS PERFORMANCE IN VADAMATHIMANGALAM GP -CHETPET BLOCK



நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு

குறள் - 20

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

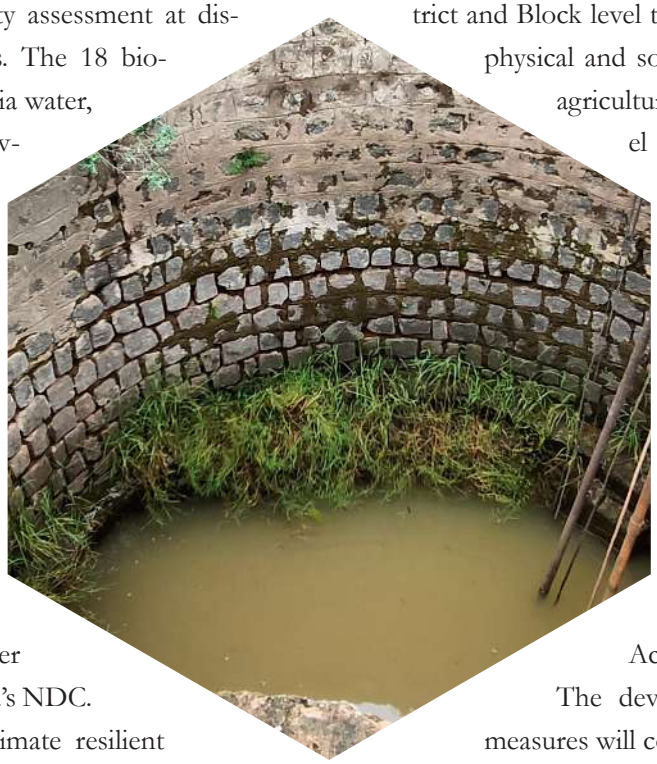
Thirukkural - 20

CHAPTER 9

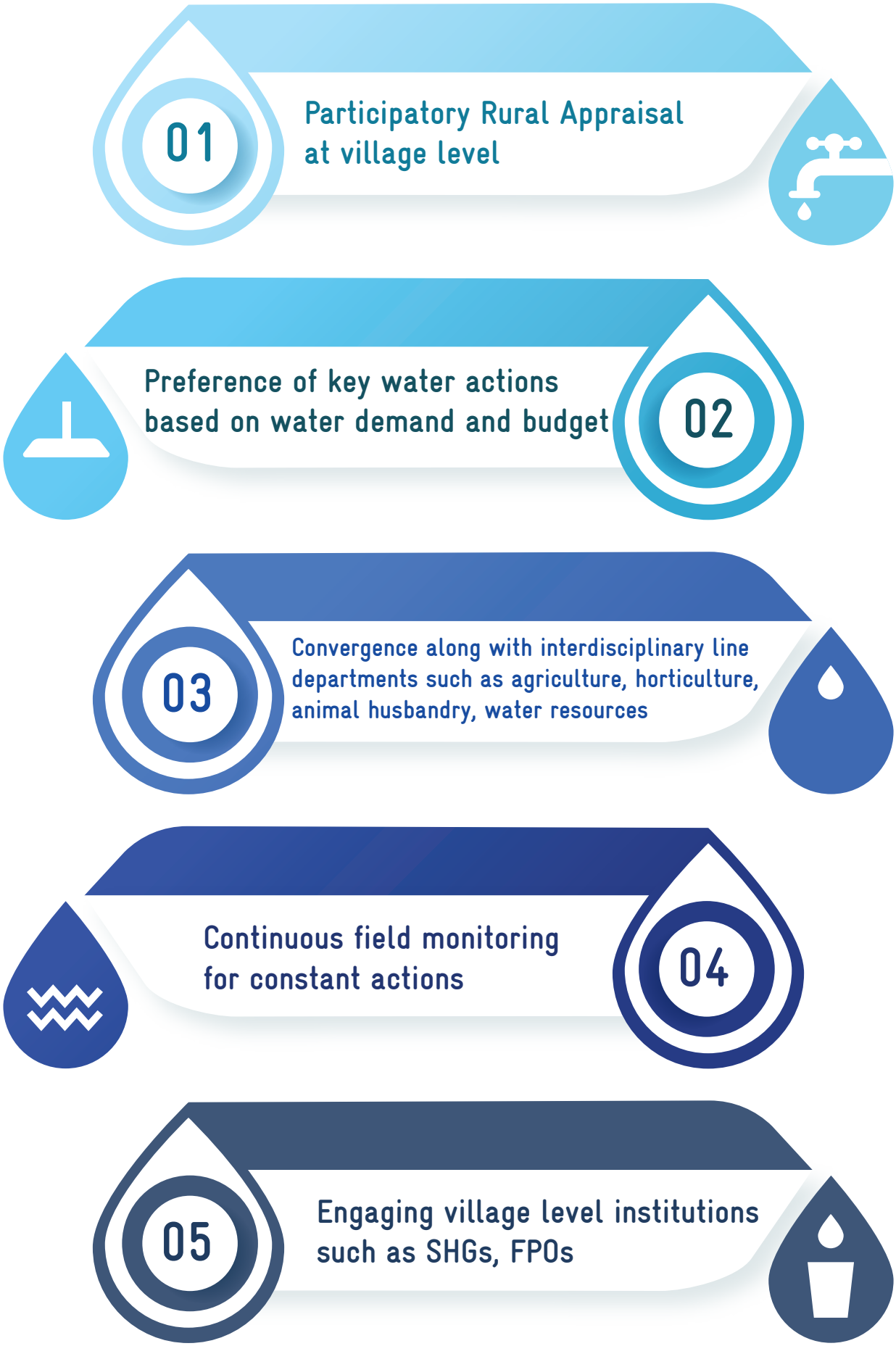
CONCLUSION

"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.)
Alampoondy	-	1,900.0	-	300.0	2.0	-	3.0
Alliyalamangalam	-	4,500.0	-	-	1.0	-	5.0
Appedu	-	-	-	480.0	2.0	-	4.0
Devimangalam	520.0	480.0	380.0	720.0	2.0	-	1.0
Ettivady	-	1,300.0	-	400.0	1.0	-	6.0
Kolakkaravady	-	9,000.0	-	-	3.0	-	1.0
Thachambady	-	-	-	-	3.0	-	11.0
Indiravanam	-	1,600.0	-	-	4.0	-	3.0
Koralpakkam	5,000.0	1,750.0	-	-	1.0	-	5.0
Randam	-	1,960.0	2,050.0	-	3.0	-	5.0
Athurai	960.0	740.0	1,200.0	780.0	1.0	-	8.0
Cheyyanandal	-	3,500.0	-	-	2.0	-	3.0
Edyankulathur	580.0	620.0	480.0	940.0	5.0	-	6.0
Chittathurai	-	3,000.0	-	-	3.0	-	2.0
Gudalore	-	2,700.0	-	-	4.0	-	3.0
Ariyathur	-	700.0	-	-	1.0	-	2.0
Othalavady	-	12,000.0	-	6,700.0	1.0	-	3.0
Uthur	-	4,500.0	-	-	2.0	-	3.0
Vambalure	-	2,000.0	-	-	1.0	-	5.0
Mandakolathur	-	6,000.0	-	-	2.0	-	6.0
Nambedu	-	3,600.0	-	-	2.0	-	3.0
Ulagampattu	-	-	-	-	2.0	-	4.0
Mansurabad	-	-	-	-	1.0	-	2.0

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.)
Sanikkavady	-	2,400.0	-	4,000.0	2.0	-	4.0
Karapoondy	-	6,000.0	-	-	3.0	-	4.0
Kilpattu	-	3,200.0	-	-	5.0	-	1.0
Kothandavady	-	10,000.0	2,000.0	-	2.0	-	6.0
Maruthuvambady	-	13,100.0	-	-	4.0	-	3.0
Semmiyamangalam	-	2,000.0	3,000.0	-	1.0	-	2.0
Modiyur	-	2,450.0	-	-	4.0	-	5.0
Narasingapuram	-	5,924.0	-	-	5.0	-	4.0
Ogur	-	6,900.0	-	-	4.0	-	2.0
Peranambakkam	-	17,100.0	-	-	4.0	-	6.0
Pelasur	-	1,972.0	-	-	1.0	-	8.0
Gangasoodamani	-	2,500.0	-	3,500.0	2.0	-	4.0
Thathanur	-	6,300.0	-	1,700.0	1.0	-	4.0
Rajamapuram	-	5,000.0	-	500.0	1.0	-	3.0
Severapoondi	-	17,663.0	-	6,000.0	1.0	-	10.0
Arumbulore	-	3,100.0	-	4,500.0	2.0	-	1.0
Eyakolathur	-	5,500.0	-	11,200.0	3.0	-	5.0
Kolavoor	-	4,000.0	-	12,500.0	1.0	-	4.0
Madavilagam	-	2,100.0	-	3,000.0	2.0	-	4.0
Mattapirayur	-	4,200.0	-	4,200.0	2.0	-	6.0
Saduperi	-	10,000.0	-	6,000.0	3.0	-	5.0
Thirumalai	-	8,000.0	-	12,000.0	4.0	-	6.0
Thumbur	-	4,500.0	-	6,200.0	5.0	-	4.0
Karikathur	-	4,000.0	-	8,200.0	2.0	-	1.0
Vadamathimangalam	-	2,000.0	-	10,500.0	3.0	-	4.0
Vilapakkam	-	8,400.0	-	7,000.0	5.0	-	8.0

Gram Panchayat	Irrigation Facilities (ha)			Water Quality (No.)		Catchment Area wise Available Runoff (ha.m)		
	Tank Irrigation	Canal Irrigation	Open & Tube Well Irrigation	Chemical Contaminants	Bacterial and Other Contaminants	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Alampoondy	13.2	-	43.8	-	-	22.8	0.9	31.6
Alliyalamangalam	26.4	-	263.2	-	-	44.7	6.7	74.2
Appedu	-	-	94.7	-	-	35.5	6.4	44.6
Devimangalam	-	-	184.2	-	-	43.4	2.2	26.6
Ettivady	9.9	-	47.1	-	-	19.4	1.1	32.7
Kolakkaravady	16.5	-	147.9	-	-	45.4	0.4	62.8
Thachambady	62.9	-	120.6	-	-	77.2	8.2	122.6
Indiravanam	-	-	104.9	-	-	56.4	0.2	57.9
Koralpakkam	27.4	-	63.7	-	-	17.1	-	24.9
Randam	25.0	-	157.1	-	-	68.9	2.8	64.4
Athurai	-	-	94.7	-	-	35.8	3.2	72.4
Cheyyanandal	36.4	-	55.4	-	-	23.7	1.9	30.6
Edyankulathur	24.7	-	52.0	-	-	20.1	0.1	50.5
Chittathurai	-	-	113.2	-	-	32.6	1.4	46.1
Gudalore	26.3	-	143.7	-	-	4.1	7.7	82.9
Ariyathur	26.3	-	81.2	-	-	24.6	-	38.8
Othalavady	-	-	261.7	-	-	67.8	50.4	125.9
Uthur	-	-	77.2	-	-	23.0	0.9	31.3
Vambalure	29.9	-	32.5	-	-	34.5	2.5	25.3
Mandakolathur	80.6	-	234.5	-	-	136.9	1.2	103.2
Nambedu	44.8	-	45.9	-	-	17.7	2.2	52.4
Ulagampattu	-	-	53.8	-	-	12.0	0.6	19.0
Mansurabad	-	-	162.5	-	-	30.7	0.9	67.7
Sanikkavady	21.4	-	155.2	-	-	34.6	5.1	40.7
Karapoondy	-	-	192.2	-	-	74.9	3.1	79.2
Kilpattu	30.1	-	125.5	-	-	31.9	5.7	52.6

Gram Panchayat	Irrigation Facilities (ha)			Water Quality (No.)		Catchment Area wise Available Runoff (ha.m)		
	Tank Irrigation	Canal Irrigation	Open & Tube Well Irrigation	Chemical Contaminants	Bacterial and Other Contaminants	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Kothandavady	-	-	92.8	-	-	28.0	0.6	51.1
Maruthuvambady	-	-	173.5	-	-	36.7	1.2	69.9
Semmiyamangalam	31.2	-	164.4	-	-	44.8	2.5	61.0
Modiyur	33.1	-	189.4	-	-	44.8	0.3	82.4
Narasingapuram	-	-	244.3	-	-	58.4	17.0	102.4
Ogur	-	-	236.2	-	-	43.1	0.1	75.4
Peranambakkam	40.0	-	207.4	-	-	87.5	0.3	87.8
Pelasur	30.6	-	224.7	-	-	71.6	0.8	82.3
Gangasoodamani	81.1	-	115.7	-	-	47.7	4.4	70.5
Thathanur	81.1	-	115.7	-	-	47.7	4.4	70.5
Rajamapuram	-	-	162.0	-	-	56.6	10.9	167.1
Severapoondi	-	-	162.0	-	-	56.6	10.9	167.1
Arumbulore	29.5	-	79.3	-	-	66.9	26.4	45.5
Eyakolathur	17.7	-	77.7	-	-	37.8	0.5	32.5
Kolavoor	24.5	-	136.1	-	-	72.1	1.9	51.8
Madavilagam	23.7	-	46.1	-	-	14.9	4.5	20.3
Mattapirayur	30.3	-	171.2	-	-	32.7	1.0	53.4
Saduperi	23.9	-	244.9	-	-	59.5	6.6	83.7
Thirumalai	44.1	-	211.9	-	-	103.4	0.4	122.6
Thumbur	55.0	-	245.0	-	-	79.0	2.3	106.4
Karikathur	31.6	-	121.5	-	-	53.4	4.5	69.4
Vadamathimangalam	-	-	189.1	-	-	89.7	3.5	82.1
Vilapakkam	53.6	-	348.0	-	-	69.4	5.9	115.1

Gram Panchayat	Watershed and Drainage Networks		
	Length of Natural Drainage Lines (m)	Number of Natural Drainage Lines (No.)	Number of MiCriticalo Watersheds (No.)
Alampoondy	1,900.0	2.0	3.0
Alliyalamangalam	4,500.0	3.0	3.0
Appedu	1,082.0	2.0	3.0
Devimangalam	2,843.0	3.0	2.0
Ettivady	1,719.0	2.0	2.0
Kolakkaravady	8,850.0	6.0	4.0
Thachambady	9,427.0	7.0	3.0
Indiravanam	1,688.0	2.0	3.0
Koralpakkam	1,206.0	2.0	2.0
Randam	3,303.0	6.0	2.0
Athurai	3,520.0	5.0	4.0
Cheyyanandal	1,676.0	3.0	3.0
Edyankulathur	1,980.0	3.0	4.0
Chittathurai	-	-	3.0
Gudalore	857.0	1.0	5.0
Ariyathur	2,466.0	2.0	3.0
Othalavady	2,646.0	3.0	6.0
Uthur	-	-	4.0
Vambalure	1,047.0	1.0	2.0
Mandakolathur	3,269.0	3.0	6.0
Nambedu	2,982.0	3.0	2.0
Ulagampattu	-	-	2.0
Mansurabad	7,706.0	7.0	4.0
Sanikkavady	1,697.0	2.0	2.0
Karapoondy	5,368.0	3.0	5.0
Kilpattu	305.0	1.0	2.0
Kothandavady	2,833.0	4.0	5.0
Maruthuvambady	4,285.0	4.0	4.0

Gram Panchayat	Watershed and Drainage Networks		
	Length of Natural Drainage Lines (m)	Number of Natural Drainage Lines (No.)	Number of MiCriticalo Watersheds (No.)
Semmiyamangalam	3,554.0	5.0	4.0
Modiyur	-	1.0	5.0
Narasingapuram	5,924.0	8.0	6.0
Ogur	4,206.0	6.0	5.0
Peranambakkam	1,126.0	3.0	5.0
Pelasur	1,972.0	3.0	4.0
Gangasoodamani	1,938.0	1.0	3.0
Thathanur	1,299.0	2.0	-
Rajamapuram	-	-	-
Severapoondi	7,404.0	6.0	4.0
Arumbulore	3,333.0	2.0	5.0
Eyakolathur	3,803.4	8.0	2.0
Kolavoor	1,046.3	3.0	4.0
Madavilagam	490.6	1.0	1.0
Mattapirayur	1,471.9	3.0	5.0
Saduperi	3,626.2	2.0	5.0
Thirumalai	4,344.5	4.0	7.0
Thumbur	6,583.0	10.0	5.0
Karikathur	6,076.5	5.0	5.0
Vadamathimangalam	3,261.9	3.0	5.0
Vilapakkam	8,316.0	12.0	6.0

Gram Panchayat	Water Demand								
	For Humans (ha.m)	For Live-stock (ha.m)	For Agricul-ture (ha.m)	% GW Uti-lization for Drinking (%)	% GW Uti-lization for Livestock (%)	% GW Util-zation for Agriculture. (%)	% SW Uti-lization for Drinking (%)	% SW Uti-lization for Livestock (%)	% SW Uti-lization for Agriculture (%)
Alampoondy	1.7	1.2	250.9	47.00	93.00	100.00	53.00	7.00	-
Alliyalamangalam	5.5	3.2	469.7	94.00	94.00	100.00	6.00	6.00	-
Appedu	3.8	1.6	154.4	8.00	96.00	99.00	92.00	4.00	1.00
Devimangalam	4.6	2.0	398.7	50.00	88.00	99.00	50.00	12.00	1.00
Ettivady	4.8	3.0	320.7	3.00	93.00	100.00	97.00	7.00	-
Kolakkaravady	3.2	1.9	611.0	80.00	-	100.00	20.00	100.00	-
Thachambady	10.2	6.2	474.9	5.00	-	99.00	95.00	100.00	1.00
Indiravanam	6.0	2.6	176.7	79.00	94.00	97.00	21.00	6.00	3.00
Koralpakkam	3.1	2.3	147.3	40.00	97.00	96.00	60.00	3.00	4.00
Randam	5.8	1.9	294.4	35.00	96.00	100.00	65.00	4.00	-
Athurai	5.9	3.1	216.6	4.00	90.00	99.00	96.00	10.00	1.00
Cheyyanandal	2.4	1.1	185.1	7.00	90.00	98.00	93.00	10.00	2.00
Edyankulathur	2.0	1.2	162.3	7.00	95.00	95.00	93.00	5.00	5.00
Chittathurai	3.0	0.9	130.6	77.00	93.00	97.00	23.00	7.00	3.00
Gudalore	4.6	2.6	697.0	24.00	95.00	100.00	76.00	5.00	-
Ariyathur	2.4	1.9	341.3	67.00	96.00	99.00	33.00	4.00	1.00
Othalavady	10.9	4.1	679.4	88.00	95.00	99.00	12.00	5.00	1.00
Uthur	3.8	1.6	254.1	65.00	95.00	99.00	35.00	5.00	1.00
Vambalure	2.3	2.2	246.3	65.00	97.00	100.00	35.00	3.00	-
Mandakolathur	9.0	4.5	510.8	73.00	93.00	100.00	27.00	7.00	-
Nambedu	5.4	2.3	212.8	50.00	95.79	99.75	50.00	4.21	0.25
Ulagampattu	3.3	1.9	91.4	50.00	-	99.00	50.00	100.00	1.00
Mansurabad	9.7	4.0	273.4	9.00	97.00	94.00	91.00	3.00	6.00
Sanikkavady	4.8	1.3	286.9	53.00	95.00	99.00	47.00	5.00	1.00
Karapoondy	6.7	1.7	287.6	76.19	91.41	99.29	23.81	8.59	0.71
Kilpattu	8.1	2.2	396.6	63.00	96.00	100.00	37.00	4.00	-

Gram Panchayat	Water Demand								
	For Humans (ha.m)	For Live-stock (ha.m)	For Agricul-ture (ha.m)	% GW Uti-lization for Drinking (%)	% GW Uti-lization for Livestock (%)	% GW Util-zation for Agriculture. (%)	% SW Uti-lization for Drinking (%)	% SW Uti-lization for Livestock (%)	% SW Uti-lization for Agriculture (%)
Kothandavady	2.9	2.0	254.4	75.00	94.00	99.00	25.00	6.00	1.00
Maruthuvambady	4.3	2.0	210.7	55.00	92.00	99.00	45.00	8.00	1.00
Semmiyaman-galam	4.4	1.0	179.2	50.00	89.00	98.00	50.00	11.00	2.00
Modiyur	7.5	4.0	288.7	12.00	96.00	99.00	88.00	4.00	1.00
Narasingapuram	7.5	3.6	831.8	7.00	-	100.00	93.00	100.00	-
Ogur	4.6	3.5	414.9	73.00	98.00	100.00	27.00	2.00	-
Peranambakkam	5.5	1.5	359.7	34.00	97.00	98.00	66.00	3.00	2.00
Pelasur	5.8	2.6	434.0	68.00	78.00	100.00	32.00	22.00	-
Gangasoodamani	3.6	1.1	175.3	84.00	85.00	97.00	16.00	15.00	3.00
Thathanur	2.5	1.1	175.3	64.00	85.00	97.00	36.00	15.00	3.00
Rajamapuram	3.1	1.7	516.6	67.00	87.00	97.00	33.00	13.00	3.00
Severapoondi	6.5	1.7	516.6	60.00	87.00	97.00	40.00	13.00	3.00
Arumbulore	3.3	1.9	378.7	30.00	88.00	100.00	70.00	12.00	-
Eyakolathur	4.8	2.2	140.1	81.00	94.00	100.00	19.00	6.00	-
Kolavoor	4.5	3.7	297.4	85.00	95.00	99.00	15.00	5.00	1.00
Madavilagam	2.4	1.5	130.1	15.00	94.00	99.00	85.00	6.00	1.00
Mattapirayur	3.5	2.7	294.3	70.00	95.00	100.00	30.00	5.00	-
Saduperi	6.8	3.4	733.7	79.00	95.00	99.00	21.00	5.00	1.00
Thirumalai	8.3	3.9	785.8	74.00	89.00	99.00	26.00	11.00	1.00
Thumbur	6.1	3.9	568.0	12.00	97.00	99.00	88.00	3.00	1.00
Karikathur	4.9	2.6	322.2	5.00	92.00	98.00	95.00	8.00	2.00
Vadamathiman-galam	16.0	6.5	537.7	2.00	93.00	100.00	98.00	7.00	-
Vilapakkam	6.8	3.5	365.2	75.00	99.00	100.00	25.00	1.00	-

ANNEXURE 3.7

GP WISE STATUS OF AGRICULTURE RESOURCE

Gram Panchayat	Area under Land Resources (ha)									
	Forest land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Miscellaneous Tree Criticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Alampoondy	-	58.68	2.09	-	1.40	1.97	14.75	97.10	-	57.04
Alliyalamangalam	-	117.69	1.61	19.24	0.90	3.67	24.06	29.17	54.20	289.61
Appedu	-	75.67	19.10	6.48	0.31	16.10	15.35	3.31	125.00	94.70
Devimangalam	-	102.44	13.30	1.11	0.37	6.46	-	50.24	85.44	184.20
Ettivady	-	45.02	6.82	0.71	-	3.20	24.40	92.08	1.68	56.97
Kolakkaravady	-	81.87	39.09	1.35	-	-	12.16	99.12	60.34	164.37
Thachambady	-	196.83	9.16	14.10	2.22	12.79	-	444.41	27.52	183.49
Indiravanam	-	126.21	24.20	-	0.54	-	30.02	107.12	67.48	104.88
Koralpakkam	-	45.71	-	-	-	-		37.05	5.04	91.14
Randam	-	181.26	2.60	7.43	0.02	2.60	74.98	73.20	13.10	183.17
Athurai	-	95.54	-	7.21	-	4.11	9.55	47.40	163.00	167.43
Cheyyanandal	-	63.14	-	4.13	0.88	1.73	5.65	55.82	10.10	91.80
Edyankulathur	-	53.63	-	-	-	0.38	0.02	49.11	144.47	76.72
Chittathurai	-	85.07	1.91	-	0.85	4.10	8.53	77.15	47.80	113.24
Gudalore	-	10.82	-	8.78	0.69	18.01	131.17	43.39	98.53	170.03
Ariyathur	-	65.39	0.33	-	-	-	3.49	43.84	52.90	107.48
Othalavady	-	178.36	2.56	144.91	18.17	16.27	2.84	318.81	89.99	261.65
Uthur	-	57.97	3.37	-	-	3.33	7.01	13.91	69.33	77.19
Vambalure	-	91.92	-	6.82	1.00	0.96	2.08	70.67	0.02	62.36
Mandakolathur	-	364.96	-	-	0.27	3.84	6.16	187.45	43.07	315.09
Nambedu	-	41.13	6.08	1.17	0.08	6.50	2.79	65.75	121.02	90.66
Ulagampattu	-	31.98	-	-	1.91	0.07	-	18.48	29.64	53.75
Mansurabad	-	65.56	16.19	-	-	3.10	4.29	23.27	172.13	162.49
Sanikkavady	-	92.10	0.10	-	18.00	-	-	15.49	25.42	176.56

Gram Panchayat	Area under Land Resources (ha)									
	Forest land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Miscellaneous Tree Criticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Karapoondy	-	199.82	-	1.43	9.70	-	9.99	217.94	3.68	192.17
Kilpattu	-	79.18	5.94	19.63	0.80	-	-	102.00	23.18	156.07
Kothandavady	-	70.53	4.03	-	0.22	2.08	15.31	122.88	42.32	92.79
Maruthuvambady	-	97.76	-	4.01	-	0.09	100.56	15.26	84.38	173.47
Semmiyamangalam	-	84.63	34.77	2.54	0.23	6.29	36.85	67.49	26.14	195.53
Modiyur	-	103.19	16.25	1.08	0.06	-	61.04	78.41	78.91	222.54
Narasingapuram	-	112.24	43.50	14.86	1.47	44.10	21.16	154.53	127.40	244.26
Ogur	-	111.39	3.49	0.39	-	-	73.45	65.04	28.27	236.21
Peranambakkam	-	233.05	0.32	-	-	1.20	-	191.56	30.31	247.61
Pelasur	-	179.58	11.39	0.71	-	2.28	35.28	31.94	117.59	255.33
Gangasoodamani	-	123.88	3.45	14.42	-	1.39	31.80	97.01	51.47	196.77
Thathanur	-	123.88	3.45	14.42	-	1.39	31.80	97.01	51.47	196.77
Rajamapuram	-	138.84	12.12	38.90	-	-	20.40	484.76	226.39	161.98
Severapoondi	-	138.84	12.12	38.90	-	-	20.40	484.76	226.39	161.98
Arumbulore	-	165.85	12.46	91.18	1.84	0.95	20.46	36.81	77.30	108.80
Eyakolathur	-	100.87	-	-	-	1.93	2.00	60.91	15.53	95.40
Kolavoor	-	95.83	96.51	4.42	0.89	1.31	-	64.72	51.79	160.61
Madavilagam	-	39.60	-	15.34	-	0.60	5.41	10.81	22.63	69.75
Mattapirayur	-	73.89	13.43	1.04	-	2.45	6.79	28.84	48.32	201.52
Saduperi	2.35	156.39	-	14.47	2.48	6.36	0.76	60.63	117.48	268.83
Thirumalai	-	212.95	62.72	1.25	-	-	4.17	393.81	1.43	256.00
Thumbur	-	197.91	12.74	0.67	3.54	3.95	14.11	172.63	82.38	300.07
Karikathur	-	133.21	9.18	14.57	0.26	1.12	3.96	200.45	13.60	153.12
Vadamathimangalam	-	220.75	18.50	3.80	1.60	7.10	89.91	127.74	32.45	189.11
Vilapakkam	-	150.23	34.76	11.36	2.40	7.08	54.60	124.96	34.60	401.56

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)
Alampoondy	60.77	3.37	168.89	179.28	-	160.84	250.89	-
Alliyalamangalam	119.30	23.81	397.04	347.32	5.11	266.94	467.48	2.20
Appedu	94.77	22.89	238.36	127.40	4.00	92.00	152.98	1.40
Devimangalam	115.74	7.94	319.88	274.52	15.05	252.84	393.47	5.27
Ettivady	51.84	3.91	175.13	217.86	-	211.96	320.73	-
Kolakkaravady	120.96	1.35	335.99	724.84	2.81	200.38	609.98	0.98
Thachambady	205.99	29.11	655.42	312.89	5.10	306.67	472.45	2.50
Indiravanam	150.41	0.54	309.50	151.50	12.50	95.00	172.07	4.63
Koralpakkam	45.71	-	133.23	134.69	17.25	60.55	141.27	6.04
Randam	183.86	10.05	344.45	193.95	2.04	143.07	293.70	0.71
Athurai	95.54	11.32	387.38	145.33	5.03	116.94	213.71	2.89
Cheyyanandal	63.14	6.74	163.37	117.10	6.78	98.16	181.96	3.12
Edyankulathur	53.63	0.38	270.32	122.73	22.19	94.29	154.05	8.20
Chittathurai	86.98	4.95	246.72	85.96	8.51	62.94	127.04	3.58
Gudalore	10.82	27.48	443.12	492.11	2.50	446.00	695.35	1.65
Ariyathur	65.72	-	207.71	245.66	11.59	216.09	337.24	4.06
Othalavady	180.92	179.35	673.29	447.53	15.91	433.87	673.81	5.57
Uthur	61.34	3.33	167.44	187.66	3.22	158.08	252.59	1.48
Vambalure	91.92	8.78	135.13	177.56	3.06	158.24	245.24	1.07
Mandakolathur	364.96	4.11	551.77	385.88	3.01	249.58	509.70	1.05
Nambedu	47.21	7.75	280.22	144.36	1.45	139.53	212.28	0.54
Ulagampattu	31.98	1.98	101.87	67.00	2.50	57.00	90.57	0.88
Mansurabad	81.75	3.10	362.18	177.03	47.26	152.30	256.58	16.81
Sanikkavady	92.20	18.00	217.47	226.66	6.00	104.25	284.82	2.10
Karapoondy	199.82	11.13	423.78	194.57	5.80	50.30	285.59	2.03
Kilpattu	85.12	20.43	281.25	295.30	3.57	242.60	395.30	1.25

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)
Kothandavady	74.56	2.30	273.30	183.50	10.00	161.00	250.92	3.50
Maruthuvambady	97.76	4.10	373.67	160.70	8.50	130.00	207.76	2.98
Semmiyamangalam	119.40	9.06	326.01	122.95	8.61	108.43	175.90	3.31
Modiyur	119.44	1.14	440.90	191.17	4.09	155.93	286.74	1.93
Narasingapuram	155.74	60.43	547.35	580.06	9.99	538.05	828.11	3.65
Ogur	114.88	0.39	402.97	321.42	-	239.32	414.93	-
Peranambakkam	233.37	1.20	469.48	260.29	13.12	155.68	354.23	5.49
Pelasur	190.97	2.99	440.14	342.79	-	138.01	434.00	-
Gangasoodamani	127.33	15.81	377.05	123.84	16.17	108.28	169.64	5.66
Thathanur	127.33	15.81	377.05	123.84	16.17	108.28	169.64	5.66
Rajamapuram	150.96	38.90	893.53	338.45	30.50	330.00	502.22	14.33
Severapoondi	150.96	38.90	893.53	338.45	30.50	330.00	502.22	14.33
Arumbulore	178.31	93.97	243.37	276.58	2.29	212.03	377.94	0.80
Eyakolathur	100.87	1.93	173.84	119.04	1.00	70.40	139.73	0.35
Kolavoor	192.34	6.62	277.12	241.28	4.88	76.57	295.69	1.71
Madavilagam	39.60	15.94	108.60	94.72	2.06	82.89	129.35	0.72
Mattapirayur	87.32	3.49	285.47	216.36	4.05	80.30	292.91	1.42
Saduperi	158.74	23.31	447.70	531.67	14.05	460.83	728.79	4.92
Thirumalai	275.67	1.25	655.41	542.39	13.30	499.54	780.96	4.88
Thumbur	210.65	8.16	569.19	379.70	9.10	360.28	564.71	3.28
Karikathur	142.39	15.95	371.13	266.06	14.50	191.09	317.16	5.08
Vadamathimangalam	239.25	12.50	439.21	403.10	4.10	327.10	536.24	1.44
Vilapakkam	184.99	20.84	615.72	359.78	-	107.45	365.23	-

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)					Status of Soil Micro Nutrients (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High	Sufficient	Deficient
Alampoondy	-	100.00	-	-	-	12.12	87.88	-	-	-	76.00	24.00
Alliyalamangalam	51.00	49.00	-	-	-	96.00	4.00	-	-	-	50.00	51.00
Appedu	3.92	76.47	19.61	-	-	5.88	94.12	-	-	-	46.00	54.00
Devimangalam	46.99	37.35	15.66	-	-	39.76	57.83	2.41	-	-	58.00	42.00
Ettivady	4.17	95.83	-	-	-	33.33	66.67	-	-	-	71.00	29.00
Kolakkaravady	21.52	78.48	-	-	-	17.72	82.28	-	-	-	43.00	57.00
Thachambady	87.65	12.35	-	-	-	69.14	29.63	1.23	-	-	36.00	64.00
Indiravanam	25.00	75.00	-	-	-	70.00	30.00	-	-	-	54.00	46.00
Koralpakkam	9.09	60.61	30.30	-	-	15.15	81.82	3.03	-	-	45.00	55.00
Randam	-	88.89	11.11	-	-	-	94.44	5.56	-	-	56.00	44.00
Athurai	5.62	71.91	22.47	-	-	2.25	96.63	1.12	-	-	61.00	39.00
Cheyyanandal	45.24	47.62	7.14	-	-	40.48	57.14	2.38	-	-	43.00	57.00
Edyankulathur	15.15	57.58	27.27	-	-	36.36	45.45	15.15	-	3.03	-	-
Chittathurai	11.76	82.35	5.88	-	-	33.82	66.18	-	-	-	50.00	50.00
Gudalore	7.59	92.41	-	-	-	51.90	48.10	-	-	-	37.00	63.00
Ariyathur	58.49	37.74	3.77	-	-	41.51	43.40	15.09	-	-	40.00	60.00
Othalavady	7.60	92.40	-	-	-	34.50	65.50	-	-	-	44.00	56.00
Uthur	54.55	45.45	-	-	-	47.73	47.73	2.27	2.27	-	33.00	67.00
Vambalure	25.00	75.00	-	-	-	3.13	96.88	-	-	-	53.00	47.00
Mandakolathur	22.33	77.67	-	-	-	50.49	49.51	-	-	-	60.00	40.00
Nambedu	40.38	53.85	5.77	-	-	7.69	57.69	34.62	-	-	52.00	48.00
Ulagampattu	21.43	78.57	-	-	-	21.43	78.57	-	-	-	54.00	46.00
Mansurabad	91.26	8.74	-	-	-	91.26	8.74	-	-	-	35.00	65.00
Sanikkavady	98.11	1.89	-	-	-	86.79	13.21	-	-	-	33.00	67.00
Karapoondy	10.34	77.59	12.07	-	-	-	100.00	-	-	-	52.00	48.00
Kilpattu	11.54	88.46	-	-	-	82.26	12.90	-	1.61	3.23	70.00	30.00
Kothandavady	34.48	58.62	6.90	-	-	25.86	74.14	-	-	-	45.00	55.00

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)					Status of Soil Micro Nutrients (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High	Sufficient	Deficient
Maruthuvambady	49.21	44.44	6.35	-	-	68.25	30.16	1.59	-	-	37.00	63.00
Semmiyaman-galam	15.00	85.00	-	-	-	62.50	37.50	-	-	-	51.00	49.00
Modiyur	20.95	79.05	-	-	-	55.24	43.81	0.95	-	-	66.00	34.00
Narasingapuram	31.03	68.97	-	-	-	17.24	82.76	-	-	-	39.00	61.00
Ogur	7.69	89.74	2.56	-	-	15.38	84.62	-	-	-	49.00	51.00
Peranambakkam	2.59	88.79	8.62	-	-	8.62	89.66	1.72	-	-	54.00	46.00
Pelasur	28.83	68.47	2.70	-	-	35.14	64.86	-	-	-	48.00	52.00
Gangasoodamani	-	69.77	30.23	-	-	4.65	93.02	2.33	-	-	53.00	47.00
Thathanur	-	69.77	30.23	-	-	4.65	93.02	2.33	-	-	53.00	47.00
Rajamapuram	18.97	77.59	3.45	-	-	41.38	58.62	-	-	-	63.00	37.00
Severapoondi	18.97	77.59	3.45	-	-	41.38	58.62	-	-	-	63.00	37.00
Arumbulore	15.38	76.92	7.69	-	-	26.19	54.76	19.05	-	-	50.00	50.00
Eyakolathur	-	69.77	30.23	-	-	4.65	93.02	2.33	-	-	57.00	43.00
Kolavoor	-	68.09	31.91	-	-	4.26	91.49	4.26	-	-	51.00	49.00
Madavilagam	-	100.00	-	-	-	53.85	38.46	-	-	7.69	60.00	40.00
Mattapirayur	26.21	73.79	-	-	-	63.11	35.92	-	-	0.97	53.00	47.00
Saduperi	36.28	63.72	-	-	-	66.37	33.63	-	-	-	70.00	30.00
Thirumalai	17.76	80.37	1.87	-	-	43.93	56.07	-	-	-	51.00	49.00
Thumbur	47.50	42.50	10.00	-	-	7.50	60.00	30.00	2.50	-	48.00	52.00
Karikathur	98.25	1.75	-	-	-	47.37	52.63	-	-	-	34.00	66.00
Vadamathiman-galam	45.12	54.88	-	-	-	53.66	46.34	-	-	-	52.00	48.00
Vilapakkam	12.21	87.02	0.76	-	-	31.54	49.23	-	-	19.23	58.00	42.00

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
Alampoondy	-	-	-	-	-	-	100.00	-
Alliyalamangalam	-	-	-	-	-	2.00	98.00	-
Appedu	-	-	-	-	72.55	13.73	13.73	-
Devimangalam	-	-	-	-	4.82	10.84	84.34	-
Ettivady	-	-	-	-	-	-	100.00	-
Kolakkaravady	-	-	-	-	1.27	1.27	97.47	-
Thachambady	-	-	-	-	-	6.17	93.83	-
Indiravanam	-	-	-	-	-	-	95.00	5.00
Koralpakkam	-	-	-	-	-	-	100.00	-
Randam	-	-	-	-	-	16.67	83.33	-
Athurai	-	-	-	5.62	35.96	5.62	52.81	-
Cheyyanandal	-	-	-	9.52	11.90	7.14	71.43	-
Edyankulathur	-	-	-	-	-	-	100.00	-
Chittathurai	-	-	-	-	-	-	100.00	-
Gudalore	-	-	-	-	-	-	100.00	-
Ariyathur	-	-	-	-	22.64	22.64	54.72	-
Othalavady	-	-	-	-	-	1.17	98.83	-
Uthur	-	-	-	-	6.82	4.55	88.64	-
Vambalure	-	-	-	-	9.38	43.75	46.88	-
Mandakolathur	-	-	-	-	-	-	100.00	-
Nambedu	-	-	-	-	-	-	100.00	-
Ulagampattu	-	-	-	-	-	-	100.00	-
Mansurabad	-	-	-	-	0.97	1.94	97.09	-
Sanikkavady	-	-	-	-	-	-	100.00	-
Karapoondy	-	-	-	-	-	-	100.00	-
Kilpattu	-	-	-	-	4.84	-	95.16	-

Gram Panchayat	Status of Physical condition of the soil (%)							
	Moderately Acidic	Strongly Acidic	Highly Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline
Kothandavady	-	-	-	-	10.34	8.62	81.03	-
Maruthuvambady	-	-	-	-	31.75	14.29	53.97	-
Semmiyamangalam	-	-	-	-	-	-	100.00	-
Modiyur	-	-	-	-	-	-	100.00	-
Narasingapuram	-	-	-	-	-	-	100.00	-
Ogur	-	-	-	-	-	-	100.00	-
Peranambakkam	-	-	-	-	1.72	3.45	94.83	-
Pelasur	-	-	-	-	2.70	0.90	96.40	-
Gangasoodamani	-	-	-	-	-	-	100.00	-
Thathanur	-	-	-	-	-	-	100.00	-
Rajamapuram	-	-	-	-	12.07	18.97	68.97	-
Severapoondi	-	-	-	-	12.07	18.97	68.97	-
Arumbulore	-	-	-	-	-	-	100.00	-
Eyakolathur	-	-	-	-	5.88	-	94.12	-
Kolavoor	-	-	-	-	-	-	100.00	-
Madavilagam	-	-	-	-	-	-	100.00	-
Mattapirayur	-	-	-	-	-	-	100.00	-
Saduperi	-	-	-	-	-	-	100.00	-
Thirumalai	-	-	-	-	-	0.93	99.07	-
Thumbur	-	-	-	-	-	-	100.00	-
Karikathur	-	-	-	-	-	-	100.00	-
Vadamathimangalam	-	-	-	-	-	-	100.00	-
Vilapakkam	-	-	-	-	-	-	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
Alampoondy	73.82	15.00	-	Low	23.00	174.35	30.51	-	100.00
Alliyalamangalam	-	71.00	8.00	Moderate	23.00	422.46	189.98	6.00	94.00
Appedu	-	100.00	-	Moderate	23.00	280.35	118.23	6.00	94.00
Devimangalam	27.03	15.54	45.95	Low	23.00	341.12	141.52	1.00	99.00
Ettivady	69.80	17.55	-	Low	23.00	185.86	30.99	14.00	86.00
Kolakkaravady	-	97.00	-	Moderate	23.00	376.43	118.00	8.00	92.00
Thachambady	-	90.00	-	Moderate	23.00	693.69	118.67	20.00	80.00
Indiravanam	-	100.00	-	Moderate	23.00	334.24	90.25	8.00	92.00
Koralpakkam	3.91	90.00	-	Moderate	23.00	133.23	50.21	3.00	97.00
Randam	-	79.00	4.00	Moderate	23.00	357.10	106.34	10.00	90.00
Athurai	-	92.00	3.00	Moderate	23.00	398.70	176.25	13.00	87.00
Cheyyanandal	-	93.00	3.00	Moderate	23.00	170.11	55.81	12.00	88.00
Edyankulathur	-	100.00	-	Moderate	23.00	270.70	115.46	17.00	83.00
Chittathurai	-	94.00	2.00	Moderate	23.00	253.58	84.51	5.00	95.00
Gudalore	23.57	70.00	-	Moderate	23.00	470.60	145.13	9.00	91.00
Ariyathur	6.00	79.00	-	Moderate	23.00	208.04	83.72	7.00	93.00
Othalavady	20.00	74.00	-	Moderate	23.00	855.20	268.68	3.00	97.00
Uthur	46.12	30.00	-	Low	23.00	174.14	76.48	14.00	86.00
Vambalure	2.00	73.00	-	Moderate	23.00	143.91	36.64	20.00	80.00
Mandakolathur	-	100.00	-	Moderate	23.00	555.88	187.10	7.00	93.00
Nambedu	-	100.00	-	Moderate	23.00	294.05	111.15	13.00	87.00
Ulagampattu	-	100.00	-	Moderate	23.00	103.85	44.53	18.00	82.00
Mansurabad	1.00	90.00	4.00	Moderate	23.00	381.47	174.67	4.00	96.00
Sanikkavady	-	86.00	-	Moderate	23.00	235.57	114.83	9.00	91.00

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
Karapoondy	-	84.00	1.00	Moderate	23.00	434.91	108.04	5.00	95.00
Kilpattu	81.14	7.00	-	Low	23.00	307.62	104.23	10.00	90.00
Kothandavady	-	100.00	-	Moderate	23.00	279.63	70.64	10.00	90.00
Maruthuvambady	-	100.00	-	Moderate	23.00	377.77	136.69	4.00	96.00
Semmiyamangalam	-	100.00	-	Moderate	23.00	369.84	117.16	7.00	93.00
Modiyur	-	87.00	4.00	Moderate	23.00	458.29	157.95	4.00	96.00
Narasingapuram	3.00	83.00	-	Moderate	23.00	651.28	202.53	11.00	89.00
Ogur	0.97	82.00	-	Moderate	23.00	406.85	138.26	3.00	97.00
Peranambakkam	-	65.00	15.60	Moderate	23.00	471.00	145.07	6.00	94.00
Pelasur	4.13	93.00	-	Moderate	23.00	454.52	195.03	5.00	95.00
Gangasoodamani	-	100.00	-	Moderate	23.00	396.31	137.11	6.00	94.00
Thathanur	-	100.00	-	Moderate	23.00	396.31	137.11	7.00	93.00
Rajamapuram	-	80.00	20.00	Moderate	23.00	944.55	223.03	5.00	95.00
Severapoondi	-	90.00	10.00	Moderate	23.00	944.55	223.03	10.00	90.00
Arumbulore	12.00	49.00	-	Moderate	23.00	349.80	145.70	6.00	94.00
Eyakolathur	-	100.00	-	Moderate	23.00	175.77	57.91	9.00	91.00
Kolavoor	-	67.00	16.00	Moderate	23.00	380.25	113.64	5.00	95.00
Madavilagam	-	100.00	-	Moderate	23.00	124.54	56.23	10.00	90.00
Mattapirayur	-	96.00	3.00	Moderate	23.00	302.39	130.96	7.00	93.00
Saduperi	-	100.00	-	Moderate	23.00	473.36	211.73	4.00	96.00
Thirumalai	47.37	23.00	13.89	Low	23.00	719.38	135.03	8.00	92.00
Thumbur	1.00	80.00	-	Moderate	23.00	590.09	201.84	4.00	96.00
Karikathur	38.00	40.00	11.00	Moderate	23.00	396.26	94.77	1.00	99.00
Vadamathimangalam	100.00	-	-	Low	23.00	470.21	118.47	4.00	96.00
Vilapakkam	2.00	98.00	-	Moderate	23.00	671.32	234.86	6.00	94.00

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)			
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population	Poultry
Alampoondy	23.00	77.00	299.00	155.00	77.00	-
Alliyalamangalam	9.00	91.00	823.00	239.00	242.00	-
Appedu	-	100.00	406.00	31.00	154.00	-
Devimangalam	-	100.00	445.00	453.00	194.00	-
Ettivady	9.00	91.00	765.00	326.00	282.00	-
Kolakkaravady	10.00	90.00	502.00	117.00	96.00	-
Thachambady	90.00	10.00	1,618.00	484.00	194.00	-
Indiravanam	-	100.00	671.00	277.00	137.00	-
Koralpakkam	70.00	30.00	622.00	44.00	149.00	-
Randam	14.00	86.00	488.00	76.00	120.00	-
Athurai	-	100.00	751.00	596.00	251.00	-
Cheyyanandal	40.00	60.00	275.00	141.00	165.00	-
Edyankulathur	32.00	68.00	320.00	29.00	142.00	-
Chittathurai	-	100.00	235.00	27.00	113.00	-
Gudalore	15.00	85.00	676.00	87.00	302.00	-
Ariyathur	24.00	76.00	502.00	57.00	147.00	-
Othalavady	-	100.00	1,065.00	255.00	259.00	-
Uthur	-	100.00	422.00	105.00	138.00	-
Vambalure	48.00	52.00	585.00	144.00	58.00	-
Mandakolathur	26.00	74.00	1,143.00	575.00	264.00	-
Nambedu	49.00	51.00	603.00	158.00	107.00	-
Ulagampattu	-	100.00	502.00	58.00	97.00	-
Mansurabad	-	100.00	1,066.00	115.00	219.00	-
Sanikkavady	12.00	88.00	332.00	112.00	56.00	-
Karapoondy	-	100.00	418.00	152.00	241.00	-
Kilpattu	-	100.00	580.00	164.00	96.00	-

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)			
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population	Poultry
Kothandavady	-	100.00	509.00	164.00	178.00	-
Maruthuvambady	-	100.00	496.00	196.00	209.00	-
Semmiyaman-galam	16.00	84.00	244.00	38.00	257.00	-
Modiyur	15.00	85.00	1,035.00	412.00	66.00	-
Narasingapuram	-	100.00	935.00	312.00	56.00	-
Ogur	-	100.00	869.00	198.00	36.00	-
Peranambakkam	16.00	84.00	396.00	50.00	69.00	-
Pelasur	12.00	88.00	550.00	-	82.00	-
Gangasoodamani	41.00	59.00	253.00	110.00	353.00	-
Thathanur	41.00	59.00	263.00	110.00	353.00	-
Rajamapuram	-	100.00	402.00	319.00	274.00	-
Severapoondi	-	100.00	402.00	319.00	274.00	-
Arumbulore	27.00	73.00	452.00	517.00	118.00	-
Eyakolathur	19.00	81.00	555.00	280.00	48.00	-
Kolavoor	15.00	85.00	953.00	333.00	163.00	-
Madavilagam	34.00	66.00	390.00	136.00	113.00	-
Mattapirayur	15.00	85.00	707.00	309.00	61.00	-
Saduperi	9.00	91.00	882.00	278.00	142.00	-
Thirumalai	17.00	83.00	942.00	458.00	584.00	-
Thumbur	18.00	82.00	1,032.00	122.00	229.00	-
Karikathur	21.00	79.00	660.00	272.00	309.00	-
Vadamathiman-galam	-	100.00	1,640.00	855.00	465.00	-
Vilapakkam	13.00	87.00	942.00	58.00	53.00	-

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.)
Alampoondy	233	308	325	633	252	-	252	178	6	19	10
Alliyalamangalam	540	1,004	1,005	2,009	365	-	365	489	1	24	8
Appedu	356	701	691	1,392	365	25	390	329	40	25	36
Devimangalam	444	847	819	1,666	216	32	248	399	97	27	76
Ettivady	231	878	870	1,748	169	-	169	440	58	34	51
Kolakkaravady	458	598	586	1,184	241	-	241	278	34	13	28
Thachambady	891	1,836	1,881	3,717	43	51	94	932	153	57	124
Indiravanam	460	1,119	1,083	2,202	388	-	388	516	52	45	50
Koralpakkam	179	592	532	1,124	-	-	-	285	32	15	27
Randam	539	1,086	1,043	2,129	161	-	161	518	73	29	60
Athurai	494	1,059	1,077	2,136	130	-	130	520	124	42	99
Cheyyanandal	233	445	436	881	4	-	4	254	39	25	35
Edyankulathur	324	347	371	718	-	7	7	207	21	11	18
Chittathurai	339	522	565	1,087	317	-	317	251	49	20	40
Gudalore	488	838	845	1,683	267	-	267	450	33	40	35
Ariyathur	273	428	437	865	178	-	178	220	14	32	19
Othalavady	1,034	1,961	2,014	3,975	596	2	598	835	104	49	88
Uthur	232	691	704	1,395	-	13	10	352	31	24	29
Vambalure	236	400	438	838	-	-	-	214	82	18	63
Mandakolathur	921	1,661	1,612	3,273	278	16	294	734	145	45	115
Nambedu	335	1,009	968	1,977	264	11	275	458	62	27	52
Ulagampattu	135	579	612	1,191	98	-	98	260	35	25	32
Mansurabad	447	1,771	1,754	3,525	117	8	125	912	218	63	172
Sanikkavady	328	857	912	1,769	408	-	408	440	30	27	29

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.)
Karapoondy	638	1,226	1,212	2,438	413	-	413	606	47	34	43
Kilpattu	387	1,516	1,448	2,964	372	-	372	646	33	12	27
Kothandavady	350	535	535	1,070	272	-	272	280	28	28	28
Maruthuvambady	475	777	798	1,575	-	16	16	383	29	29	29
Semmiyamangalam	454	823	789	1,612	48	38	86	400	32	26	30
Modiyur	561	1,358	1,363	2,721	847	3	850	660	63	48	59
Narasingapuram	764	1,397	1,340	2,737	17	-	17	599	262	33	193
Ogur	518	846	827	1,673	11	-	11	428	50	35	46
Peranambakkam	705	1,027	994	2,021	604	45	649	532	110	41	89
Pelasur	364	1,128	999	2,127	22	-	22	543	50	25	43
Gangasoodamani	520	619	678	1,297	-	-	-	505	114	52	95
Thathanur	520	458	452	910	140	51	191	505	114	52	95
Rajamapuram	1,083	574	568	1,142	1	-	1	893	81	68	77
Severapoondi	761	1,188	1,198	2,386	203	98	301	893	81	68	77
Arumbulore	516	608	592	1,200	262	-	262	178	6	19	10
Eyakolathur	277	868	895	1,763	202	-	202	388	13	25	17
Kolavoor	476	843	797	1,640	-	-	-	444	61	22	49
Madavilagam	164	408	465	873	42	-	42	234	32	37	34
Mattapirayur	376	657	629	1,286	162	-	162	314	48	13	38
Saduperi	630	1,250	1,214	2,464	474	-	474	587	89	35	73
Thirumalai	932	1,515	1,503	3,018	1,018	-	1,018	673	91	50	79
Thumbur	788	1,108	1,119	2,227	41	-	58	560	62	45	57
Karikathur	529	897	881	1,778	360	-	360	490	113	41	91
Vadamathimangalam	691	2,895	2,955	5,850	941	-	941	1,343	124	107	119
Vilapakkam	822	1,213	1,285	2,498	252	-	252	630	60	46	56

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 depend-ent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Alampoondy	5.56	352	262	142	5	2	7	-	-	1
Alliyalamangalam	1.62	765	564	16	3	1	4	-	-	4
Appedu	10.79	574	398	228	5	1	6	-	829	3
Devimangalam	19.05	558	415	60	5	1	6	1,452	224	3
Ettivady	11.55	952	605	199	3	1	4	-	-	3
Kolakkaravady	9.96	485	403	15	3	1	4	-	-	2
Thachambady	13.33	764	662	277	3	1	4	-	-	7
Indiravanam	9.67	791	514	39	4	1	5	-	-	4
Koralpakkam	9.44	506	373	25	4	1	5	-	-	2
Randam	11.54	1,067	769	26	3	1	4	-	-	4
Athurai	19.12	775	553	482	5	1	6	-	2,074	4
Cheyyanandal	13.70	410	272	106	4	1	5	-	-	2
Edyankulathur	8.70	511	314	162	5	1	6	315	418	1
Chittathurai	16.06	423	257	13	3	1	4	-	-	2
Gudalore	7.80	748	524	66	3	1	4	-	-	3
Ariyathur	8.82	594	326	60	4	1	5	-	-	2
Othalavady	10.48	1,443	947	261	4	2	6	-	-	7
Uthur	8.21	814	466	40	3	1	4	-	-	3
Vambalure	29.35	622	375	46	4	1	5	-	-	2
Mandakolathur	15.67	1,040	757	26	2	1	3	-	-	6
Nambedu	11.24	745	561	245	2	1	3	-	-	4
Ulagampattu	12.31	394	247	24	3	1	4	-	-	2
Mansurabad	18.80	1,532	1,252	119	4	1	5	-	-	6
Sanikkavady	6.61	892	584	30	3	1	4	-	-	3
Karapoondy	7.11	1,214	711	42	3	1	4	-	-	4
Kilpattu	4.13	1,111	871	225	4	1	5	-	-	5

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 depend-ent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Kothandavady	10.00	424	354	24	3	1	4	-	-	2
Maruthuvambady	7.57	450	335	11	3	1	4	-	-	3
Semmiyaman-galam	7.55	727	494	18	4	1	5	-	-	3
Modiyur	8.86	846	719	234	6	1	7	-	-	5
Narasingapuram	32.27	-	-	348	5	1	6	-	-	5
Ogur	10.63	959	643	11	3	1	4	-	-	3
Peranambakkam	16.79	760	561	109	4	1	5	-	-	4
Pelasur	7.83	1,159	718	38	3	1	4	-	-	4
Gangasoodamani	18.89	497	379	254	3	1	4	-	-	2
Thathanur	18.89	454	234	11	3	1	4	-	-	2
Rajamapuram	8.63	576	402	24	3	1	4	-	-	2
Severapoondi	8.63	902	601	50	3	1	4	-	-	4
Arumbulore	5.56	467	349	89	5	1	6	-	-	2
Eyakolathur	4.28	751	506	26	3	1	4	-	-	3
Kolavoor	11.10	773	595	26	3	1	4	-	-	3
Madavilagam	14.32	422	290	101	5	1	6	-	-	2
Mattapirayur	11.94	677	474	20	3	1	4	-	-	2
Saduperi	12.40	858	643	48	3	1	4	-	-	5
Thirumalai	11.69	1,374	995	42	3	1	4	-	-	6
Thumbur	10.16	1,157	587	104	4	1	5	-	-	4
Karikathur	18.65	905	703	185	4	1	5	-	-	3
Vadamathiman-galam	8.85	1,720	1,304	1,099	5	1	6	-	-	11
Vilapakkam	8.86	1,463	947	32	3	1	4	-	-	5

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 Criticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
Alampoondy	-	3.05	1.57	-	1.05	1.48	0.89	5.83	-	5.70
Alliyalamangalam	-	2.11	1.21	14.43	0.68	2.75	0.48	0.58	1.08	28.96
Appedu	-	0.95	14.33	4.86	0.23	12.08	1.69	0.36	13.75	9.47
Devimangalam	-	1.28	9.98	0.83	0.28	4.85	-	9.55	16.23	18.42
Ettivady	-	22.51	5.12	0.53	-	2.40	2.68	10.13	0.18	5.70
Kolakkaravady	-	1.17	29.32	1.01	-	-	1.21	9.88	6.01	16.44
Thachambady	-	4.13	6.87	10.58	1.67	9.59	-	59.22	3.67	18.35
Indiravanam	-	9.34	18.15	-	0.41	-	2.88	10.28	6.48	10.49
Koralpakkam	-	2.53	-	-	-	-	-	3.48	0.47	9.11
Randam	-	24.78	1.95	5.57	0.02	1.95	8.66	8.45	1.51	18.32
Athurai	-	13.06	-	5.41	-	3.08	1.83	9.06	31.16	16.74
Cheyyanandal	-	8.63	-	3.10	0.66	1.30	0.77	7.65	1.38	9.18
Edyankulathur	-	26.82	-	-	-	0.29	-	4.27	12.56	7.67
Chittathurai	-	4.36	1.43	-	0.64	3.08	1.37	12.39	7.67	11.32
Gudalore	-	8.12	-	6.59	0.52	13.51	10.23	3.38	7.69	17.00
Ariyathur	-	1.57	0.25	-	-	-	0.31	3.87	4.66	10.75
Othalavady	-	89.18	1.92	108.68	13.63	12.20	0.31	35.07	9.90	26.17
Uthur	-	2.89	2.53	-	-	2.50	0.58	1.14	5.69	7.72
Vambalure	-	17.46	-	5.12	0.75	0.72	0.61	20.74	0.01	6.24
Mandakolathur	-	71.53	-	-	0.20	2.88	0.99	29.99	6.89	31.51
Nambedu	-	30.85	4.56	0.88	0.06	4.88	0.31	7.39	13.61	9.07
Ulagampattu	-	1.13	-	-	1.43	0.05	-	2.27	3.65	5.38
Mansurabad	-	-	12.14	-	-	2.33	-	4.42	32.70	16.25
Sanikkavady	-	3.22	0.08	-	13.50	-	-	1.02	1.68	17.66

Key CWRM Parameter	Forest Land	Non-Agricultural Uses	Barren & Un-cultivable Land	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	Treatment Area Irrigated by Source
Karapoondy	-	6.99	-	1.07	7.28	-	0.71	15.50	0.26	19.22
Kilpattu	-	0.37	4.46	14.72	0.60	-	-	4.22	0.96	15.61
Kothandavady	-	35.27	3.02	-	0.17	1.56	1.53	12.29	4.23	9.28
Maruthuvambady	-	0.55	-	3.01	-	0.07	7.61	1.16	6.39	17.35
Semmiyamangalam	-	2.54	26.08	1.91	0.17	4.72	2.78	5.10	1.97	19.55
Modiyur	-	1.74	12.19	0.81	0.05	-	5.41	6.95	6.99	22.25
Narasingapuram	-	56.12	32.63	11.15	1.10	33.08	5.29	38.63	31.85	24.43
Ogur	-	55.70	2.62	0.29	-	-	7.81	6.91	3.01	23.62
Peranambakkam	-	30.30	0.24	-	-	0.90	-	32.15	5.09	24.76
Pelasur	-	14.91	8.54	0.53	-	1.71	2.76	2.50	9.20	25.53
Gangasoodamani	-	66.90	2.59	10.82	-	1.04	6.04	18.43	9.78	19.68
Thathanur	-	66.90	2.59	10.82	-	1.04	6.04	18.43	9.78	19.68
Rajamapuram	-	-	9.09	38.90	-	-	1.76	41.85	19.55	16.20
Severapoondi	-	-	9.09	38.90	-	-	1.76	41.85	19.55	16.20
Arumbulore	-	19.90	9.35	68.39	1.38	0.71	1.14	2.05	4.30	10.88
Eyakolathur	-	3.53	-	-	-	1.45	0.09	2.61	0.66	9.54
Kolavoor	-	47.92	72.38	3.32	0.67	0.98	-	7.19	5.75	16.06
Madavilagam	-	19.80	-	11.51	-	0.45	0.76	1.51	3.17	6.98
Mattapirayur	-	36.95	10.07	0.78	-	1.84	0.81	3.44	5.77	20.15
Saduperi	0.94	34.41	-	10.85	1.86	4.77	0.09	7.52	14.57	26.88
Thirumalai	-	106.48	47.04	0.94	-	-	0.49	46.05	0.17	25.60
Thumbur	-	108.85	9.56	0.50	2.66	2.96	1.43	17.54	8.37	30.01
Karikathur	-	6.93	6.89	10.93	0.20	0.84	0.99	50.11	3.40	15.31
Vadamathimangalam	-	3.76	13.88	2.85	1.20	5.33	7.96	11.31	2.87	18.91
Vilapakkam	-	2.56	26.07	8.52	1.80	5.31	4.84	11.07	3.06	40.16

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
Alampoondy	18.00	0.71	2.32
Alliyalamangalam	8.34	1.10	15.50
Appedu	9.27	3.93	15.20
Devimangalam	7.05	1.44	19.75
Ettivady	10.62	1.00	12.20
Kolakkaravady	35.26	0.30	6.30
Thachambady	4.40	7.50	18.50
Indiravanam	12.18	0.11	5.63
Koralpakkam	6.17	0.00	2.44
Randam	10.44	2.12	6.91
Athurai	5.47	2.39	10.99
Cheyyanandal	3.5	1.42	3.55
Edyankulathur	17.96	0.08	14.23
Chittathurai	2.95	0.86	13.77
Gudalore	3.26	5.79	7.16
Ariyathur	1.37	0	3.66
Othalavady	34.3	37.8	13.4
Uthur	2.46	0.7	2.83
Vambalure	19.98	0.58	14.7
Mandakolathur	28.2	0.9	13
Nambedu	8.63	1.474891081	19.01202502
Ulagampattu	1.39	0.42	4.71
Mansurabad	5.84	0.65	22.67
Sanikkavady	2.36	3.79	10.76
Karapoondy	3.2	2.3	6.7
Kilpattu	8.2	1.2	10.8
Kothandavady	13.9	0	17.42
Maruthuvambady	1.25	0.86	6.08
Semmiyamangalam	11.82	2.16	17.1
Modiyur	5.64	0	17.31
Narasingapuram	37.56	11.09	61.56
Ogur	21.69	0	24.96
Peranambakkam	12.87	0.25	11.59
Pelasur	8.95	0.63	7.48
Gangasoodamani	25.5	3.3	10.1
Thathanur	25.4	3.3	10.1
Rajamapuram	17.7	0.5	38.3
Severapoondi	18.5	0.5	38.3
Arumbulore	11.33	19.8	3.43
Eyakolathur	8.8	0.4	2.4
Kolavoor	43.6	1.4	5.4
Madavilagam	10.8	3.4	2.3

Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Mattapirayur	17.5	0.7	5.6
Saduperi	14	4.9	9.2
Thirumalai	55.5	0.3	13.5
Thumbur	46.4	1.7	10.7
Karikathur	7.5	3.4	13.1
Vadamathimangalam	11	2.6	7.7
Vilapakkam	13.2	4.4	11.1

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	Plants	Length	No.
Alampoondy	2,436	3	18	-	1,913	8	1,831	2	140	700	8
Alliyalamangalam	2,376	3	105	-	3,701	7	1,264	2	548	2,741	7
Appedu	21,120	26	38	-	5,467	22	568	1	393	1,964	22
Ariyathur	198	0	-	-	1,035	22	942	1	544	2,719	22
Arumbulore	8,046	10	-	-	3,093	13	11,941	15	-	-	13
Athurai	2,466	3	-	-	2,924	75	7,836	10	-	-	75
Cheyyanandal	1,038	1	-	-	318	28	5,179	6	393	1,964	28
Chittathurai	3,606	5	-	-	3,675	19	2,613	3	393	1,964	19
Devimangalam	11,856	15	-	-	1,820	42	768	1	-	-	42
Edyankulathur	228	0	-	-	3,675	14	16,089	20	393	1,964	14
Ettivady	6,012	8	-	-	1,218	44	13,506	17	-	-	44
Eyakolathur	1,158	1	-	-	1	56	2,118	3	393	1,964	56
Gangasoodamani	2,904	4			3,038	25	40,137	50	-	-	25
Gudalore	10,806	14	-	-	5,581	26	6,492	8	238	1,198	26
Indiravanam	14,520	18	-	-	5,293	32	5,604	7	-	-	32
Karapoondy	-	-	-	-	769	15	4,196	5	-	-	15
Karikathur	6,180	8	-	-	975	62	4,156	5	517	2,583	62
Kilpattu	3,564	4	-	-	2,660	12	223	0	-	-	12
Kolakkaravady	23,454	29	-	-	4,237	25	702	1	177	887	25
Kolavoor	58,692	73	-	-	2,946	53	28,749	36	-	-	53
Koralpakkam	-	-	-	-	318	62	1,519	2	393	1,964	62
Kothandavady	3,666	5			135	51	21,159	26	-	-	51
Madavilagam	360	1	-	-	1,807	39	11,880	15	393	1,964	39
Mandakolathur	2,304	3	-	-	5,439	90	42,919	54	124	619	90
Mansurabad	11,574	14	-	-	3,647	100	-	-	217	1,084	100

Gram Panchayat	Aff		ARS	AVP		Az	BP		CBP		CS
	No.	Area	No.	No.	Length	No.	No.	Area	Plants	Length	No.
Maruthuvambady	54	0	-	-	4,506	19	328	0	458	2,292	19
Mattapirayur	9,528	12	-	-	2,903	71	22,167	28	250	1,252	71
Modaiyur	9,750	12	-	-	3,079	46	1,046	1	219	1,097	46
Nambedu	7,548	9	-	-	2,471	60	24,678	31	339	1,693	60
Narasingapuram	52,560	66	-	-	4,171	-	33,672	42	799	3,994	-
Ogur	2,094	3	-	-	0	87	33,417	42	393	1,964	87
Othalavady	11,298	14	-	-	8,487	56	53,508	67	148	740	56
Pelasur	8,202	10	-	299	1,495	55	8,943	11	259	1,293	55
Peranambakkam	912	1	-	-	7,265	33	18,178	23	176	879	33
Rajamapuram	7,272	9	-	-	688	18	-	-	179	893	18
Randam	3,120	4	-	-	6,976	28	14,867	19	-	-	28
Saduperi	3,816	5	-	-	1	88	4,532	6	393	1,964	88
Sanikkavady	60	0	-	-	0	11	1,934	2	393	1,964	11
Semmiyamangalam	24,636	31	-	-	1	24	1,523	2	393	1,964	24
Severapoondi	7,272	9			7,110	18	-	-	167	832	18
Thachambady	13,170	16	-	-	5,677	108	2,480	3			108
Thathanur	2,904	4	-	-	1,795	25	40,137	50	47	234	25
Thirumalai	37,632	47	-	-	3,234	94	63,885	80	393	1,964	94
Thumbur	10,014	13	-	-	0	103	65,310	82	393	1,964	103
Ulagampattu	-	-	-	-	1,526	-	679	1	-	-	-
Uthur	4,020	5	-	-	4,192	17	1,732	2	175	877	17
Vadamathimangalam	3,184	4	-	-	3,262	41	3,840	19	-	-	41
Vambalure	576	1	-	-	1,570	86	10,479	13	-	-	86
Vilapakkam	25,104	31	-	-	2,737	24	3,486	4	3,088	15,440	24

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Area	Plants	Length	No.	Area	No.	Area
Alampoondy	8	4	-	7	18	-	-	380	1,900				
Alliyalamangalam	7	12	-	15	105	-	-	900	4,500				
Appedu	22	7	-	13	38	-	-	216	1,082				
Ariyathur	22	6	-	6	32	-	-	493	2,466				
Arumbulore	13	6	-	12	32	-	-	667	3,333				
Athurai	75	12	-	15	38	-	-	704	3,520			10	24
Cheyyanandal	28	4	-	6	22	-	-	335	1,676			2	6
Chittathurai	19	7	-	8	45	-	-	-	-			6	14
Devimangalam	42	13	-	15	74	-	-	569	2,843				
Edyankulathur	14	6	-	8	21	-	-	-	-			3	9
Ettivady	44	5	-	10	19	-	-	344	1,719				
Eyakolathur	56	3	-	3	31	-	-	143	716			1	3
Gangasoodamani	25	11	-	16	46	-	-	388	1,938				
Gudalore	26	11	-	15	57	-	-	171	857			10	24
Indiravanam	32	8	-	12	42	-	-	338	1,688			-	-
Karapoondy	15	7	-	10	77	-	-	1,074	5,368			-	-
Karikathur	62	17	-	20	49	-	-	434	2,172				
Kilpattu	12	7	-	10	50	-	-	61	305			-	-
Kolakkaravady	25	7	-	13	59	-	-	1,770	8,850			-	-
Kolavoor	53	6	-	13	54	-	-	209	1,046				
Koralpakkam	62	4	-	5	25	-	-	241	1,206			1	2
Kothandavady	51	7	-	11	37	-	-	567	2,833			4	11
Madavilagam	39	2	-	4	18	-	-	98	491			-	-
Mandakolathur	90	14	-	17	94	-	-	654	3,269				
Mansurabad	100	14	-	17	65	-	-	1,541	7,706			-	-
Maruthuvambady	19	7	-	7	69	-	-	857	4,285			-	-
Mattapirayur	71	6	-	7	68	-	-	294	1,472			-	-
Modaiyur	46	8	-	11	76	-	-	-	-			4	10

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Area	Plants	Length	No.	Area	No.	Area
Nambedu	60	8	-	13	18	-	-	596	2,982			-	-
Narasingapuram	-	25	-	35	98	-	-	1,185	5,924				
Ogur	87	15	-	18	94	-	-	-	0			5	13
Othalavady	56	14	-	25	105	-	-	1,121	5,605				
Pelasur	55	8	-	10	90	-	-	394	1,972			-	-
Peranambakkam	33	12	-	15	83	-	-	225	1,126			8	20
Rajamapuram	18	16	-	20	65	-	-	-	-				
Randam	28	7	-	11	63	-	-	661	3,303			-	-
Saduperi	88	10	-	9	98	-	-	240	1,200			6	16
Sanikkavady	11	4	-	7	62	-	-	280	1,400			1	1
Semmiyamangalam	24	10	-	14	66	-	-	720	3,600			4	11
Severapoondi	18	16	-	20	65	-	-	1,481	7,404				
Thachambady	108	16	-	23	48	-	-	84	422			16	41
Thathanur	25	11	-	16	46	-	-	246	1,229				
Thirumalai	94	14	-	14	85	-	-	869	4,344			9	23
Thumbur	103	11	-	13	98	-	-	263	1,317			7	17
Ulagampattu	-	3	-	4	22	-	-	-	-			-	-
Uthur	17	3	-	4	31	-	-	-	-				
Vadamathimangalam	41	6	101	16	-	-	-	412	2,062	48,984	61	16	41
Vambalure	86	7	-	10	13	-	-	209	1,047				
Vilapakkam	24	6	59	10	-	-	-	-	-	23,650	30	10	24

Gram Panchayat	FD	GSS	ICP		LDI		LP		MI		NADEP
	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.
Alampoondy	8	3	60	300	4	10	289	1,443	-	-	8
Alliyalamangalam	7	2	-	-	11	28	322	1,612	-	-	7
Appedu	22	6	96	480	16	39	547	2,737	-	-	22
Ariyathur	22	4	-	-	3	7	307	1,536	-	-	22
Arumbulore	13	9	900	4,500	44	109	405	2,025	-	-	13
Athurai	75	30	156	780	12	30	160	800	-	-	75
Cheyyanandal	28	15	-	-	6	15	79	395	-	-	28
Chittathurai	19	2	-	-	6	15	430	2,146	-	-	19
Devimangalam	42	31	144	720	12	29	79	2,322	-	-	42
Edyankulathur	14	4	188	940	11	27	345	1,725	-	-	14
Ettivady	44	18	80	400	12	29	325	1,624	-	-	44
Eyakolathur	56	16	2,240	11,200	3	7	762	0	-	-	56
Gangasoodamani	25	22	700	3,500	37	92	403	2,015	-	-	25
Gudalore	26	9	-	-	16	40	436	2,179	-	-	26
Indiravanam	32	13	-	-	13	34	729	3,644	-	-	32
Karapoondy	15	4	-	-	8	21	543	2,713	-	-	15
Karikathur	62	27	1,640	8,200	16	41	659	3,296	-	-	62
Kilpattu	12	3	-	-	11	27	551	2,755	-	-	12
Kolakkaravady	25	8	-	-	15	38	375	1,898	-	-	25
Kolavoor	53	14	2,500	12,500	51	128	379	1,895	-	-	53
Koralpakkam	62	10	-	-	3	6	79	395	-	-	62
Kothandavady	51	17	-	-	15	39	428	2,142	-	-	51
Madavilagam	39	13	600	3,000	1	3	231	1,153	-	-	39
Mandakolathur	90	33	-	-	28	71	1,371	6,857	-	-	90
Mansurabad	100	21	-	-	11	28	348	1,741	-	-	100
Maruthuvambady	19	11	-	-	4	10	375	1,877	-	-	19
Mattapirayur	71	19	840	4,200	7	18	360	1,798	-	-	71
Modaiyur	46	18			9	23	741	3,703	-	-	46

Gram Panchayat	FD	GSS	ICP		LDI		LP		MI		NADEP
	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.
Nambedu	60	13	-	-	20	49	225	1,126	-	-	60
Narasingapuram	-	-	-	-	58	145	938	3,348	-	-	-
Ogur	87	12	-	-	24	59	762	0	-	-	87
Othalavady	56	13	1,340	6,700	87	218	591	2,955	-	-	56
Pelasur	55	4	-	-	12	30	524	2,618	-	-	55
Peranambakkam	33	7	-	-	15	36	642	3,208	-	-	33
Rajamapuram	18	13	100	500	-	-	153	765	-	-	18
Randam	28	4	-	-	14	35	448	2,241	-	-	28
Saduperi	88	21	1,200	6,000	6	15	746	0	-	-	88
Sanikkavady	11	5	800	4,000	8	20	322	0	-	-	11
Semmiyamangalam	24	15	-	-	18	45	280	0	-	-	24
Severapoondi	18	13	1,200	6,000	-	-	335	1,675	-	-	18
Thachambady	108	39	-	-	19	48	748	3,740	-	-	108
Thathanur	25	22	340	1,700	37	92	175	875	-	-	25
Thirumalai	94	52	2,400	12,000	25	61	1,066	5,330	-	-	94
Thumbur	103	18	1,240	6,200	9	24	1,037	1	-	-	103
Ulagampattu	-	-	-	-	2	6	324	1,619	-	-	-
Uthur	17	5	-	-	4	10	436	2,315	-	-	17
Vadamathimangalam	41	52	2,100	10,500	-	-	236	1,568	27	68	41
Vambalure	86	15	-	-	11	26	305	1,528	-	-	86
Vilapakkam	24	4	1,400	7,000	4	9	156	3,681	16	40	24

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	No.	Area	No.	No.	Length
Alampoondy	178	36	-	2	-	3	2	-	-	2	10	300
Alliyalamangalam	489	98	-	1	-	5	2	8,800	11	5	8	-
Appedu	329	66	-	2	-	4	2	4,000	5	3	36	480
Ariyathur	220	44	-	1	-	2	2	-	-	2	19	-
Arumbulore	178	36	-	2	-	1	2	54,400	68	2	10	4,500
Athurai	520	104	-	1	-	8	2	4,000	5	5	99	780
Cheyyanandal	254	51	-	2	-	3	2	2,400	3	3	35	-
Chittathurai	251	50	-	3	-	2	2	-	-	3	40	-
Devimangalam	399	80	-	2	-	1	2	800	1	4	76	720
Edyankulathur	207	41	-	5	-	6	2	-	-	2	18	940
Ettivady	440	88	-	1	-	6	2	800	1	4	51	400
Eyakolathur	388	78	-	3	-	5	2	-	-	4	17	11,200
Gangasoodamani	505	101		2	-	4	2	8,800	11	5	95	3,500
Gudalore	450	90	-	4	-	3	2	5,600	7	5	155	-
Indiravanam	516	103	-	4	-	3	2	-	-	5	50	-
Karapoondy	606	121	-	3	-	4	2	800	1	6	43	-
Karikathur	490	98	-	2	-	1	2	8,800	11	5	91	8,200
Kilpattu	646	129	-	5	-	1	2	12,000	15	6	27	-
Kolakkaravady	278	56	-	3	-	1	2	800	1	3	28	-
Kolavoor	444	89	-	1	-	4	2	2,400	3	4	49	12,500
Koralpakkam	285	57	-	1	-	5	2	-	-	3	27	-
Kothandavady	280	56		2	-	6	2	-	-	3	28	-
Madavilagam	234	47	-	2	-	4	2	9,600	12	2	34	3,000
Mandakolathur	734	147	1	2	-	6	2	-	-	7	115	-
Mansurabad	912	182	-	1	-	2	2	-	-	9	172	-
Maruthuvambady	383	77	-	4	-	3	2	2,400	3	4	29	-
Mattapirayur	314	63	-	2	-	6	2	800	1	3	38	4,200
Modaiyur	660	132	-	4			2	800	1	7	59	

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	No.	Area	No.	No.	Length
Nambedu	458	92	-	2	-	3	2	800	1	5	52	-
Narasingapuram	599	120	-	5	-	4	2	8,800	11	6	193	-
Ogur	428	86	-	4	-	2	2	-	-	4	46	-
Othalavady	835	167	-	1	-	3	2	87,200	109	8	88	6,700
Pelasur	543	109	-	1	-	8	2	800	1	5	43	-
Peranambakkam	532	106	-	4	-	6	2	-	-	5	89	-
Rajamapuram	893	179	-	1	-	3	2	31,200	39	9	77	500
Randam	518	104	-	3	-	5	2	4,800	6	5	60	-
Saduperi	587	117	-	3	-	5	2	8,800	11	6	73	6,000
Sanikkavady	440	88	-	2	-	4	2	-	-	4	29	4,000
Semmiyamangalam	400	80	-	1	-	2	2	1,600	2	4	30	-
Severapoondi	893	179		1	-	10	2	31,200	39	9	77	6,000
Thachambady	932	186	-	3	-	11	2	8,800	11	9	124	-
Thathanur	505	101	-	1	-	4	2	8,800	11	5	95	1,700
Thirumalai	673	135	-	4	-	6	2	800	1	7	79	12,000
Thumbur	560	112	-	5	-	4	2	800	1	6	57	6,200
Ulagampattu	260	52	-	2	-	4	2	-	-	3	32	-
Uthur	352	70	-	2	-	3	2	-	-	4	29	-
Vadamathimangalam	7,245	1,449	-	3	-	4	2	960	1	14	145	10,500
Vambalure	214	43	-	1	-	5	2	-	5	2	63	-
Vilapakkam	3,125	625	-	5	-	8	2	6,816	9	6	63	7,000

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	Alampoondi	247	185
2	Alliyalamangalam	698	153
3	Appedu	308	234
4	Ariyathur	237	321
5	Arumbalore	261	140
6	Athurai	534	159
7	Cheyyanandal	190	225
8	Chithathuri	213	541
9	Devimagalam	533	287
10	Edayankolathur	188	352
11	Ettivadi	359	536
12	Eyakolathur	455	227
13	Gengasudamani	255	291
14	Gudalore	766	511
15	Indravanam	403	161
16	Karappoondi	264	172
17	Karikkathur	581	117
18	Kilpattu	486	511
19	Kolakkaravadi	357	79
20	Kolavoor	520	99
21	Koralapakkam	399	39
22	Kothandavadi	472	468
23	Madavilagam	303	186
24	Mandakolathur	856	126
25	Mansurabad	861	363
26	Maruthavambadi	554	187
27	Mattaparaiyur	500	273
28	Modiyur	938	45
29	Nambedu	462	345
30	Narasingapuram	1192	297
31	Othalavadi	753	477
32	Ogur	688	460
33	Ulagampattu	265	121
34	Pelasur	635	253
35	Peranambakkam	643	534
36	Rajamapuram	240	316
37	Randam	409	524
38	Sadupperi	632	249
39	Sanikavadi	167	109
40	Semmiyamangalam	415	403
41	Severappoondi	242	353

S. No	GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 02/02/2022
42	Thachambadi	807	857
43	Thathanur	243	332
44	Thirumalai	704	284
45	Thumbur	789	320
46	Uthur	230	227
47	Vadamathimangalam	352	329
48	Vambalur	469	155
49	Vilapakkam	329	44

ANNEXURE 7.2

GP AND WORK CATEGORY-WISE ONGOING WORKS IN CHETPET BLOCK

GP	Work Category	No. Ongoing works
Alamppoondi	Works on Individuals Land (Category IV)	1
Aliyalamangalam	Water Conservation and Water Harvesting	3
	Works on Individuals Land (Category IV)	1
Appedu	Water Conservation and Water Harvesting	2
Ariyathur	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	2
Arumbalur	Works on Individuals Land (Category IV)	1
Athurai	Works on Individuals Land (Category IV)	3
Cheyyanandal	Works on Individuals Land (Category IV)	2
Chithatarai	Works on Individuals Land (Category IV)	2
Devimangalam	Works on Individuals Land (Category IV)	1
Edayankulathur	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	1
Ettivadi	Water Conservation and Water Harvesting	1
Eyakolathur	Water Conservation and Water Harvesting	1
Gudalore	Works on Individuals Land (Category IV)	1
Indravanam	Drought Proofing	1
	Water Conservation and Water Harvesting	2
Karikkathur	Works on Individuals Land (Category IV)	3
Kilpattu	Water Conservation and Water Harvesting	1
Kolakkaravadi	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	1
Kolavoor	Works on Individuals Land (Category IV)	3
Koralpakkam	Works on Individuals Land (Category IV)	1
Kothandavadi	Works on Individuals Land (Category IV)	3
Madavilagam	Works on Individuals Land (Category IV)	2
Mandakolathur	Works on Individuals Land (Category IV)	1
Mansurabad	Rural Sanitation	1
	Works on Individuals Land (Category IV)	2
Maruthuvambadi	Works on Individuals Land (Category IV)	1
Mattapirayur	Rural Connectivity	1
	Water Conservation and Water Harvesting	1
Nambedu	Works on Individuals Land (Category IV)	4
Narasingapuram	Works on Individuals Land (Category IV)	1
Ogur	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	3
Othalavadi	Works on Individuals Land (Category IV)	11
Pelasur	Works on Individuals Land (Category IV)	3
Rajammapuram	Works on Individuals Land (Category IV)	1
Randam	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	5

GP	Work Category	No. Ongoing works
Sadupperi	Works on Individuals Land (Category IV)	7
Sanikkavadi	Works on Individuals Land (Category IV)	12
Semmiyamangalam	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	18
Severappoondi	Works on Individuals Land (Category IV)	3
Thachambadi	Works on Individuals Land (Category IV)	11
Thathanur	Works on Individuals Land (Category IV)	1
Thirumalai	Works on Individuals Land (Category IV)	4
Thumbur	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	1
Ulagampattu	Works on Individuals Land (Category IV)	29
Uthur	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	6
Vadamathimangalam	Works on Individuals Land (Category IV)	4
Vambalur	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	3
Vilapakkam	Works on Individuals Land (Category IV)	2

ANNEXURE 8

CWRM KEY INDICATORS FOR GPS MICRO-WATERSHED

CWRM Parameter	Mandakolathur	Arumbalur
Soil Resources: Status of Available Nitrogen (%)		
Very Low	22.33	15.38
Low	77.67	76.92
Status of Organic Carbon (%)		
Very Low	50.49	26.19
Low	49.51	54.76
Medium	0.00	19.05
Status of Soil Micro Nutrients (%)		
Sufficient	60.00	50.00
Deficient	40.00	50.00
Status of Physical condition of the soil (%)		
Moderately Alkaline	100.00	100.00
Soil Texture (%)		
Clay soil		12.00
Fine Soil	100.00	49.00
Soil Water Permeability (Low, Moderate, high)	Moderate	Moderate
Soil moisture and ET		
Volumetric Soil Moisture (%)	23.00	23.00
Estimated Soil Moisture (ha.m)	555.88	349.80
ET Losses (ha.m)	187.10	145.70
Means of Water Extraction (%)		
Gravity	7.00	6.00
Lifting	93.00	94.00
Irrigation Methods (%)		
Wild Flooding	26.00	27.00
Control Flooding	74.00	73.00
Livestock (No.)		
Cattle Population	1143	452
Sheep Population	575	517
Goat Population	264	118
Land Resources (ha)		
Non-Agricultural Uses	364.96	165.85
Area under Barren & Un-cultivable Land	0.00	12.46
Permanent Pastures and Other Grazing Land	0.00	91.18
Land Under Miscellaneous Tree Criticalops etc.	0.27	1.84
Cultivable Waste Land	3.84	0.95
Fallows Land other than Current Fallows	6.16	20.46
Current Fallow land	187.45	36.81
Unirrigated Land	43.07	77.30
Area Irrigated by Source	315.09	108.80

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