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WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA

SUSTAINABLE DEVELOPMENT GOALS

Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

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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).

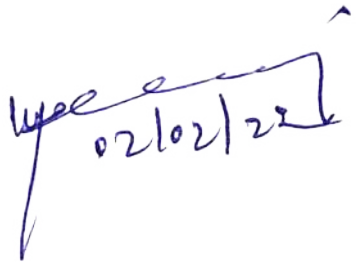
Through GIS based planning in 860 GPs, works identified under CWRM are verified, approved at Gram Sabha. These works would potentially reduce 38% surface runoff to be harvested or recharged by various interventions through ridge to valley watershed approach.

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—H

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

MESSAGES

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

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

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

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

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

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

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

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

MESSAGES

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

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

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

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

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

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

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ABBREVIATIONS AND ACRONYMS

A - D

%
Percentage

^{0}C
Degree Celsius

AR
Assessment Report

CCB
Contour Continuous Bunds

CCCDM
Centre for Climate Change and Disaster Management

CRM
Climate Resilient Measures

CuM
Cubic Meter

CVI
Climate Vulnerability Index

CWRM
Composite Water Resource Management

CWRMP
Composite Water Resource Management Plan

DEM
Digital Elevation Model

D - H

DLSC
District Level Steering Committee

DLT
Drainage Line Treatment

DRD&PR
Department of Rural Development & Panchayat Raj

ET
Evapo-transpiration

FPO
Farmer Producer Organization

FY
Financial Year

GIS
Geographical Information System

GIZ
Deutsche Gesellschaft für Internationale

Govt.
Government

GP
Gram Panchayat

GW
Ground Water

ha
Hectare

I - M

ha.m
Hectare Meter

HH
Households

ICAR
Indian Council for Agriculture Research

IMD
Indian Meteorological Department

INR
Indian Rupees

IPCC
Intergovernmental Panel on Climate Change

IWRM
Integrated Water Resources Management

Kharif crop
Sown in Monsoon and harvested close to Autumn

km
Kilometer

KML
Keyhole Markup Language

LULC
Land use and land cover

M - N

Max
Maximum

MCM
Million Cubic Meter

MC
Mid Century

Mahatma Gandhi NREGA
Mahatma Gandhi Rural Employment Guarantee Act

Mahatma Gandhi NRGES
Mahatma Gandhi Rural Employment Guarantee Scheme

Min
Minimum

mm
Millimeter

MoEFCC
Ministry of Environment, Forest and Climate Change

MoJS
Ministry of Jal Shakti

MoRD
Ministry of Rural Development

M
Meters

NAPCC
National Action on Climate Change

N - S

NARP
National Agricultural Research Project

NADEP
Nadepkaka

NDC
Nationally Determined Contributions

NEM
North-East monsoon

NGO
Non-Governmental Organization

NITI
National Institution for Transforming India

No.
Number

NRM
Natural Resource Management

NRSC
National Remote Sensing Centre

NWC
National Water Commission

PWD
Public Works Department

Rabi crop
Sown in winter and harvested in monsoon

S - U

RDPR
Rural Development & Panchayat Raj

RF
Reserve Forest

RTRWHS
Roof top rain water harvesting structures

RWHS
Rain Water Harvesting System

SAPCC
State Action Plan on Climate Change

SC
Scheduled Caste

SDG
Sustainable Development Goal

SDMA
State Disaster Management Authority

SDMRI
Suganthi Devadasan Marine Resources Institute

SECC
Socio Economic and Caste Census

SHG
Self Help Group

S - W

SLSC
State Level Steering Committee

ST
Scheduled Tribe

SWM
South-West monsoon

UN
United Nations

SW
Surface Water

TN
Tamil Nadu

WASCA
Water Security and Climate Adaptation

WCWH
Water Conservation and Water Harvesting

வான்நின்று உலகம் வழங்கி வருதலால்
தான்அமிழ்தம் என்றுணரற் பாற்று

குறள் - 11

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

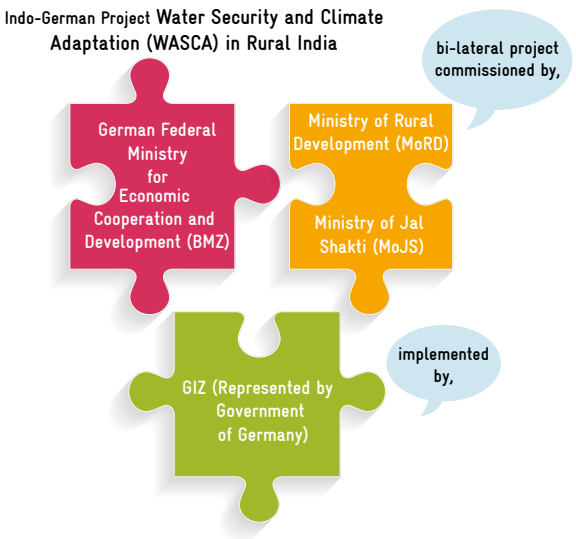
Thirukkural - 11

EXECUTIVE SUMMARY

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

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

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



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

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

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

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

This report is structured with nine chapters

1

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

2

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

3

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

4

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

5

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

6

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

7

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

8

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

9

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

துப்பார்க்குத் துப்பாய துப்பாக்கித் துப்பார்க்குத்
துப்பாய தூஉம் மழை

குறள் - 12

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

Thirukkural - 12

CHAPTER 1

1 ABOUT THE BLOCK

Thellar Block in Tiruvannamalai district lies between 12°20'55.325"N to12°30'48.669"N latitude and 79°25'28.022"E to 79°39'11.559"E longitude. The Block is surrounded by Pernamallur and Vandavasi Blocks on the border of the Tiruvannamalai District and Villupuram District (Figure 1.1). The total geographical area of this Block is 29,063 ha (290 Km^2). Administratively, this Block comes under Vandavasi taluk, with 61 Gram panchayats and 277 habitations in it. Thellar has historical significance and is known for the two Battles of Thellar fought between Pallavas and Chollas. Thellar was the place, where the famous Chola Dynasty met its end in the second battle of Thellar.

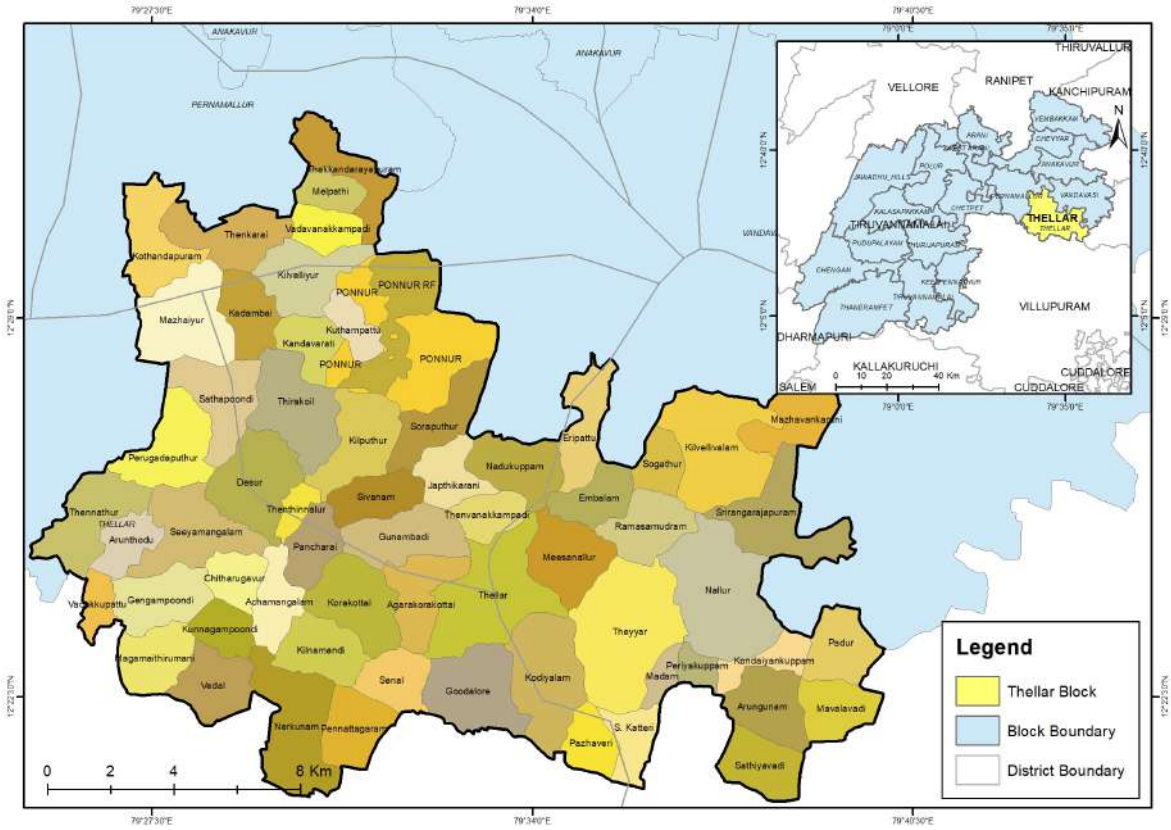


Figure 1.1. Thellar Block and it's environ

According to Census 2011, the population of Thellar Block is 96,453. The population density of the Block is 320 per Km^2 which is much lower than the district population density (473 per Sq. km) and the State's density (555 per Km^2). There is 3.591% increase in the population observed since 2001. The percentage of Male population is nearly equal to (50.01 %) female population (49.98%). The proportion of sex ratio is 977 females per 1000 males, which is slightly lower compared to the district average sex-ratio (999 females per 1,000 males). The literacy rate of female population is lower (43.04%) than male literacy (56.96%). At 72.35%, the average literacy rate of the Block is almost equal to the national average (72.98%). Scheduled Castes and Scheduled Tribes accounted for 31% of the total population (Thiruvannamalai district profile 2020). Economically, Thellar is among the top ten (7th top) high revenue Blocks of the Tiruvannamalai district. Agriculture and allied activities, are the primary occupation. Paddy tops as the predominant crop, with 58.11 % of the irrigated area cultivated with paddy. The other major crops grown in the Block area are ground nut, sugarcane and other pulses. Under rainfed crops groundnut and other pulses are mainly cultivated. Significant cultivated areas of banana, mango, dry chilli, coconut and other fruits and vegetables can also be seen. Ground-

> The proportion of sex ratio is 977 females per 1000 males, which is slightly lower compared to the district average sex-ratio (999 females per 1,000 males).

> At 72.35%, the average literacy rate of the Block is almost equal to the national average (72.98%).

nut and pulses are cultivated both under irrigated and rainfed conditions. A huge livestock count of 62,397 was recorded during 2019-20. The cattle count is 13, 613 and the Block has 25 milk societies with 6,394 litres of milk being produced per day. Nearly 385 families are engaged in handloom.

> 58.11 % of the irrigated area cultivated with paddy.

Hydrologically, Thellar Block comes under Kiliyar, Varahanadhi and Ongur sub-basins of Palar and Varahanadhi basins. River Kiliyar flows through the Block. Killiyar, Ongur and Tondi Veraha macro watersheds covers the Block with 80 micro watersheds (Figure 1.2).

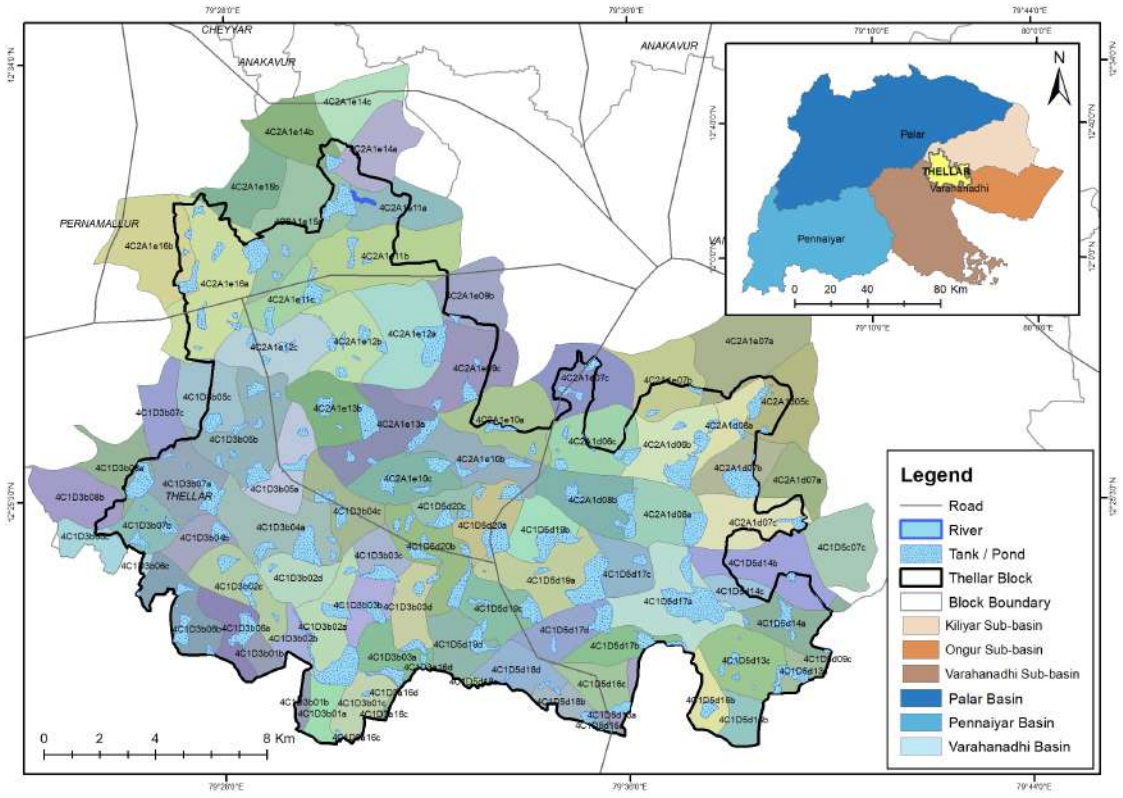


Figure 1.2. Watersheds- Thellar Block

There are 149 tanks in the Block with the largest tank being the Nallur big tank with an area of 248.1 ha. Other important tanks are Nerkunam Tank (190.20 ha), Seeyamangalam Tank (141.7 ha), Ponnur big tank (140.4 ha), Thellar big tank (134 ha), Theyyar big tank (117.4 ha) and Vedal Tank (106.48 ha) (Figure 1.3). The ground water levels in Thellar Block are of in serious concern. Thellar, Desur and Malaiyur firkas cover the Block. Thellar firka is in a critical state, Desur and Malaiyur firkas are in an over exploited stage.

GROUND WATER LEVEL OF THIS BLOCK

OVER EXPLOITED- › 100%	Desur, Malaiyur
CRITICAL- › 90% & ‹=100%	Thellar

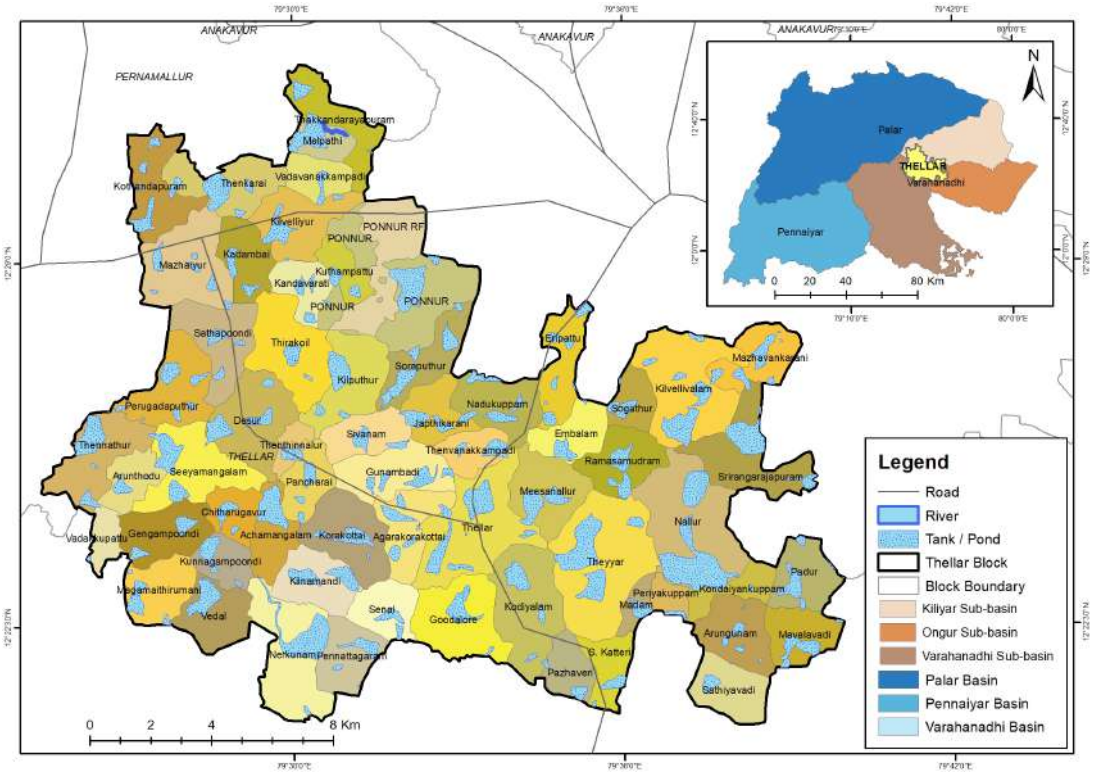
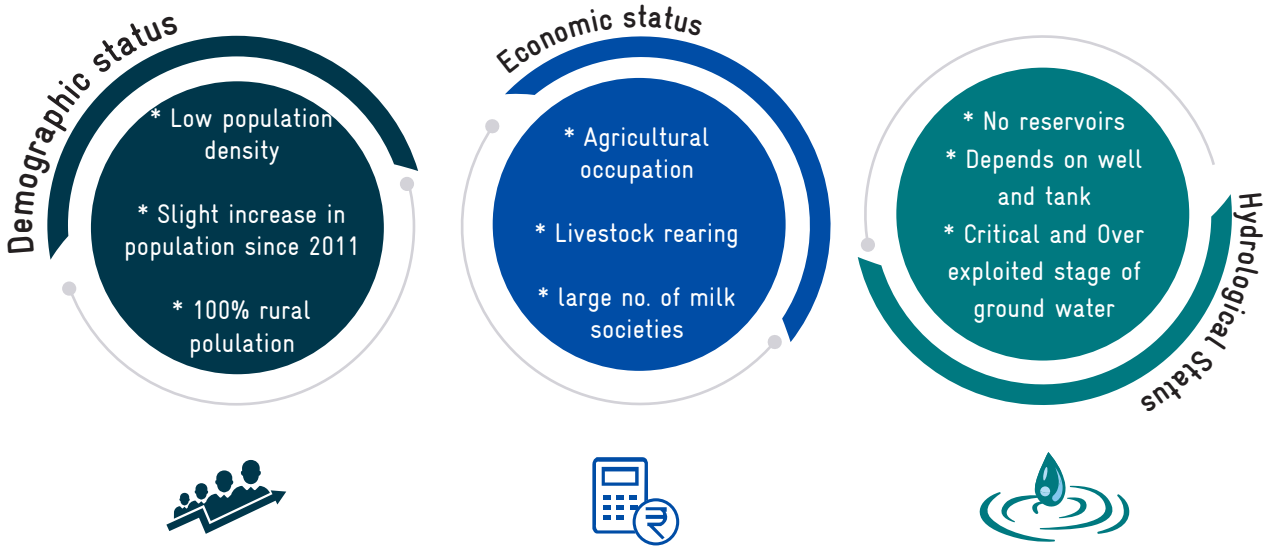


Figure 1.3. Spatial distribution of waterbodies



விண்இன்று பொய்ப்பின் விரிநீர் வியனுலகத்து
உள்நின்று உடற்றும் பசி

குறள் - 13

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

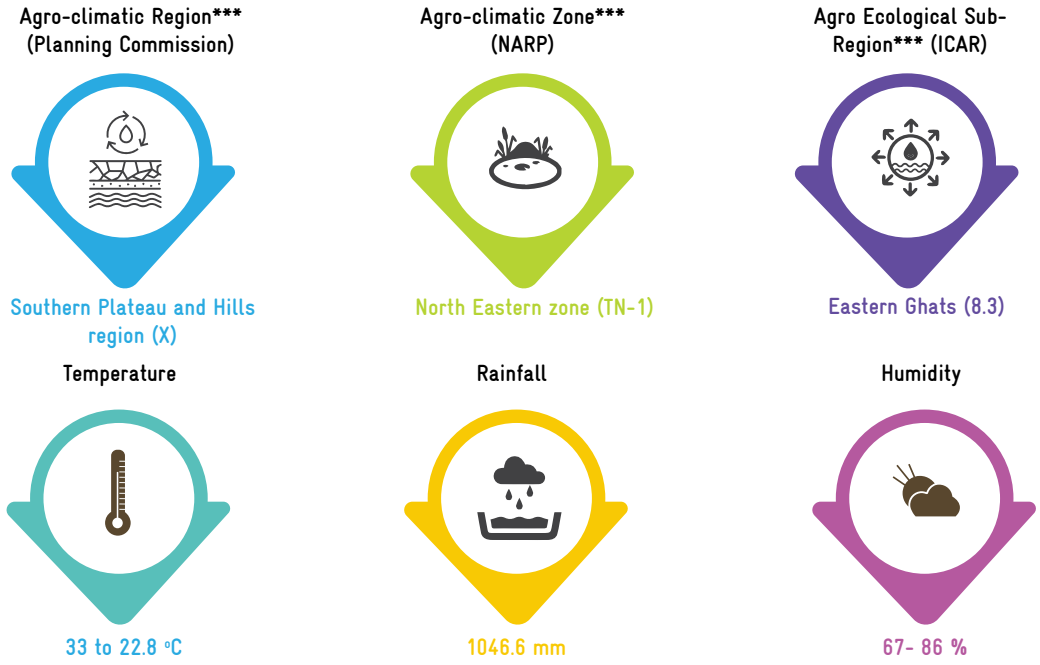
Thirukkural - 13

CHAPTER 2

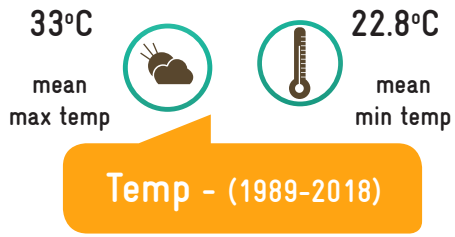
2 CLIMATE AND WATER SECURITY

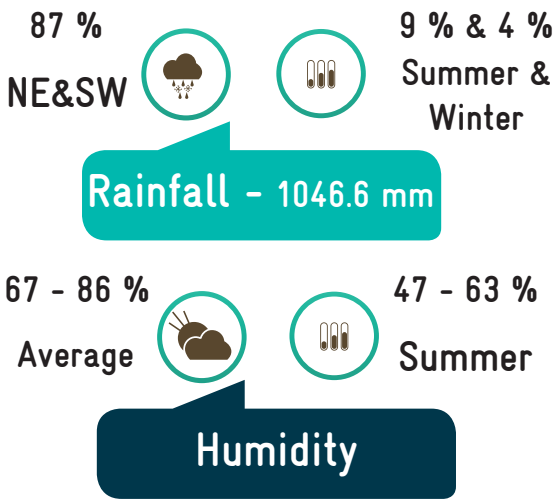
This region has typical tropical climate, located in the North Eastern agro-climatic zone of State and Southern Plateau and Hills region according to the agro climatic regional classification of the planning commission. The general climate description of this region is given below (Table 1).

TABLE 1. GENERAL CLIMATE DESCRIPTION



In general, this 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 1,046.6 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 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 %.

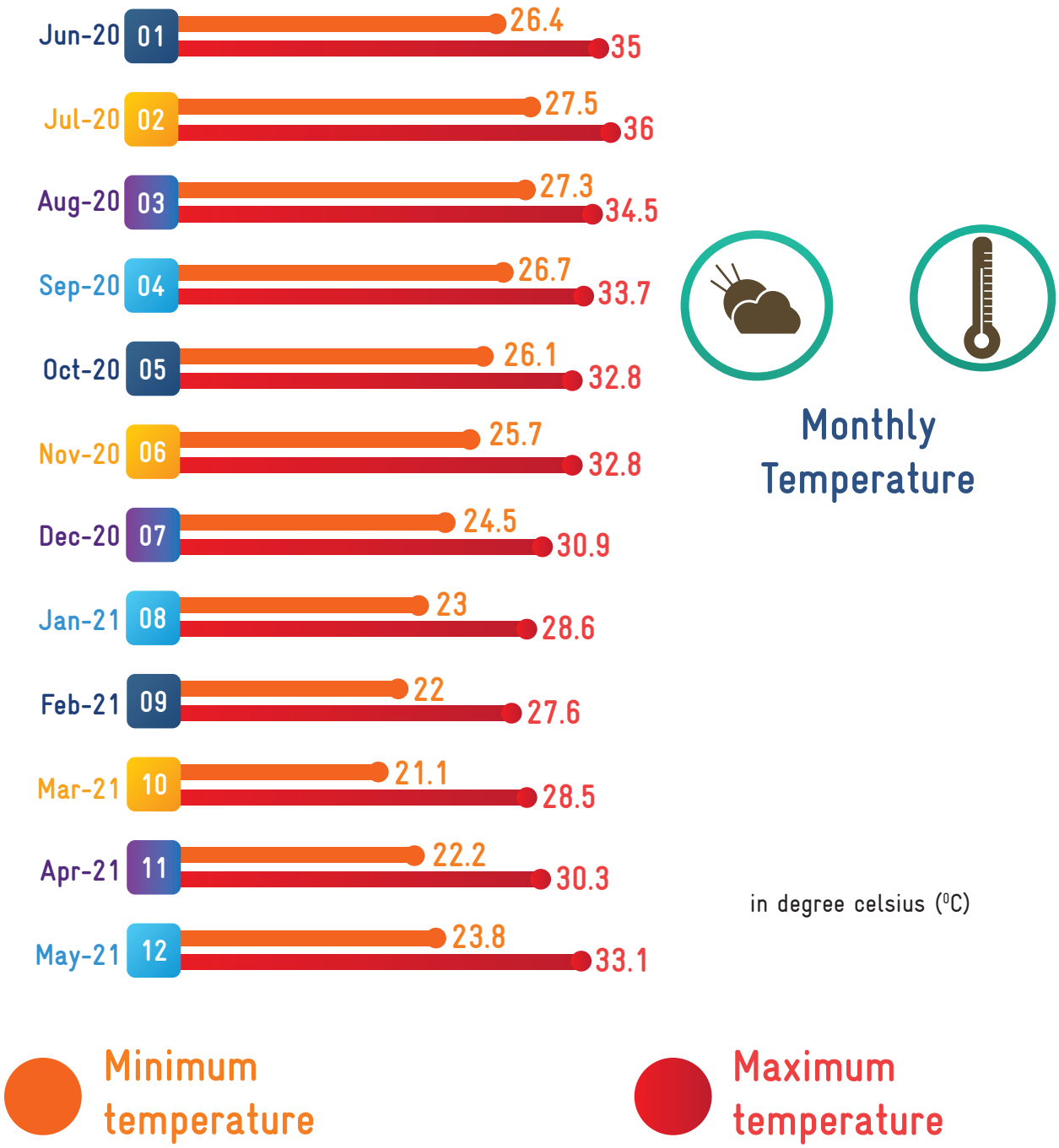


Figure 2.1. Average monthly temperature

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.

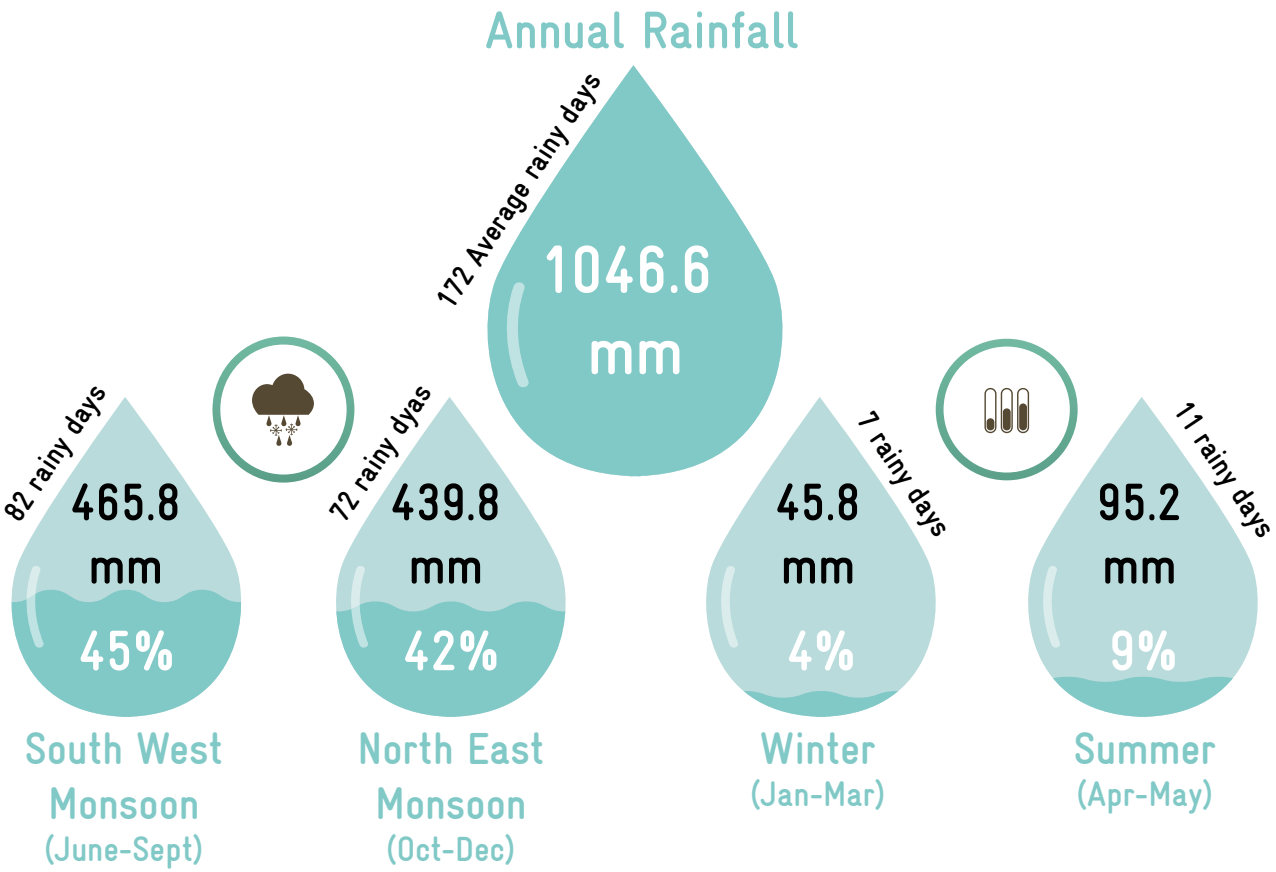


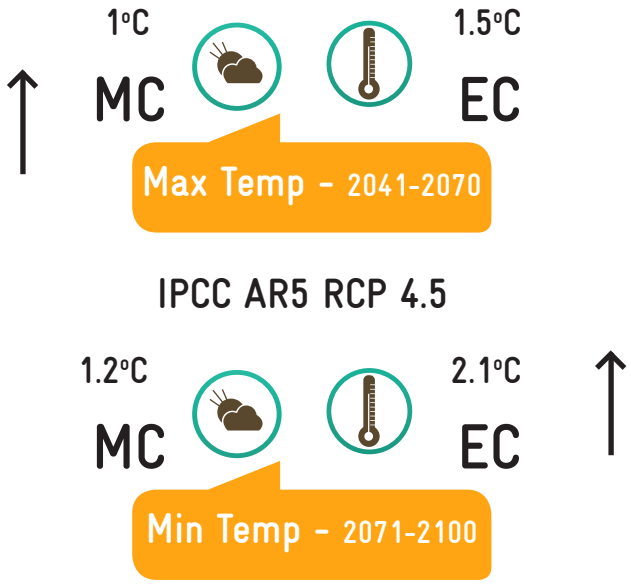
Figure 2.2. Season-wise distribution of annual rainfall

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 scenario 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

Being situated approximately 100 Km from Bay of Bengal, this region experiences heavy rain and flood during deep depressions/cyclones forms in the Bay of Bengal. In recent decades, all parts were severely affected during 2005, 2010, 2015 heavy rainfall events and Thane (2011) and Vardah (2016) cyclones. State Disaster Management Authority, Government of Tamil Nadu identified 75 locations of Tiruvannamalai District as flood vulnerability spots. In Thellar Block, 3 GPs are moderately vulnerable to floods.

Drought

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

Heat Wave

A heat wave is a period of abnormal high temperatures, more than the normal maximum temperature that occurs during the (hot weather) summer season. Heat waves typically occur between March and June. The extreme temperatures and resultant atmospheric conditions adversely affect people living in these regions as they cause physiological stress, sometimes resulting in death. Normally, all parts of this District witnesses heat waves. All GPs in Thellar 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 the Centre for Climate Change and Disaster management (CCCDM), Anna University. The vulnerability of a region to the climate depends on several intrinsic factors such as physical, social, economic, and environmental conditions. On the basis of ground reality and accurate observation, WASCA TN study proposed 18 indicators to reflect State's rural water security through four interconnected CWRM areas 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 the GP level through Composite Water Resource Management (CWRM) approach by GIZ, Department of Rural Development (Mahatma Gandhi NREGS), National Water Mission, Tamil Nadu, along with technical partners of WASCA project Viz., MS Swaminathan Research Foundation (MSSRF), Prime Meridian and key sectoral experts. Based on national level workshop on WASCA for GIS based planning using IWRM principles, a Composite Water Resources Management plan framework was customized to suit to Tamil Nadu State's conditions, including climate vulnerability as per the scoping study recommendations. Major CWRM parameters are thus identified under four areas via climate, water, agriculture and socio-economic for advancements towards actions. Data for the major parameters identified at Block level (Table 3) are collected both from primary and secondary sources to be analyzed statistically and geospatially.

TABLE 3. MAJOR PARAMETERS IDENTIFIED FOR BLOCK LEVEL VULNERABILITY ASSESSMENT

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

ஏரின் உழாஅர் உழவர் புயலென்னும்
வாரி வளங்குன்றிக் கால்

குறள் - 14

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

Thirukkural - 14

CHAPTER 3

CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA

3 CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA

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

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

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

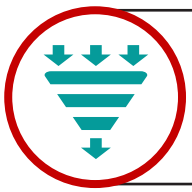
262 Total Kinds of works in Schedule-I of Mahatma Gandhi NREGA

182 Kinds of works relate to NRM alone

164 Kinds of works related to Agriculture & allied works

85 Water related works out of NRM

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



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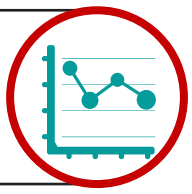
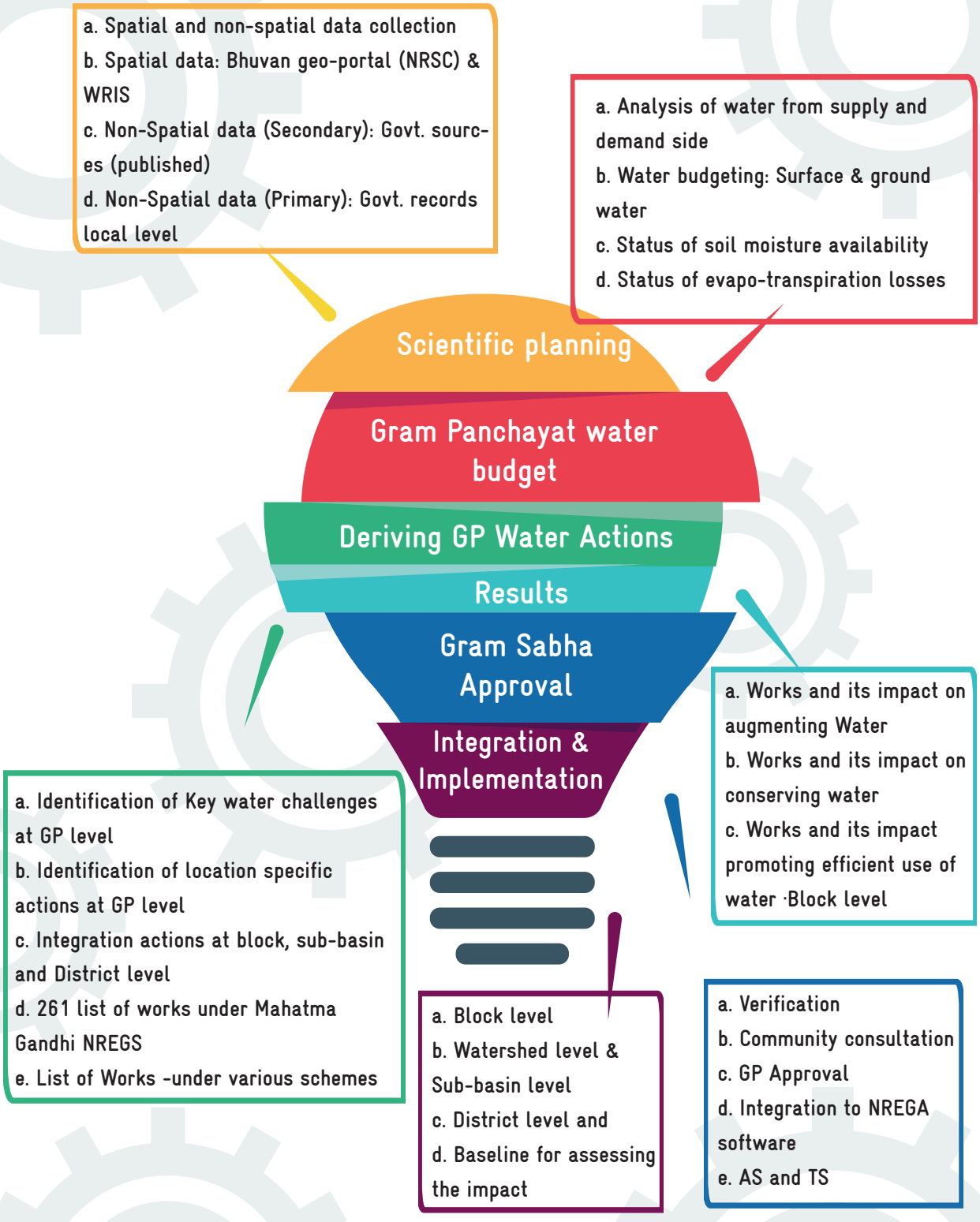


3.1 COMPOSITE WATER RESOURCE MANAGEMENT APPROACH

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

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

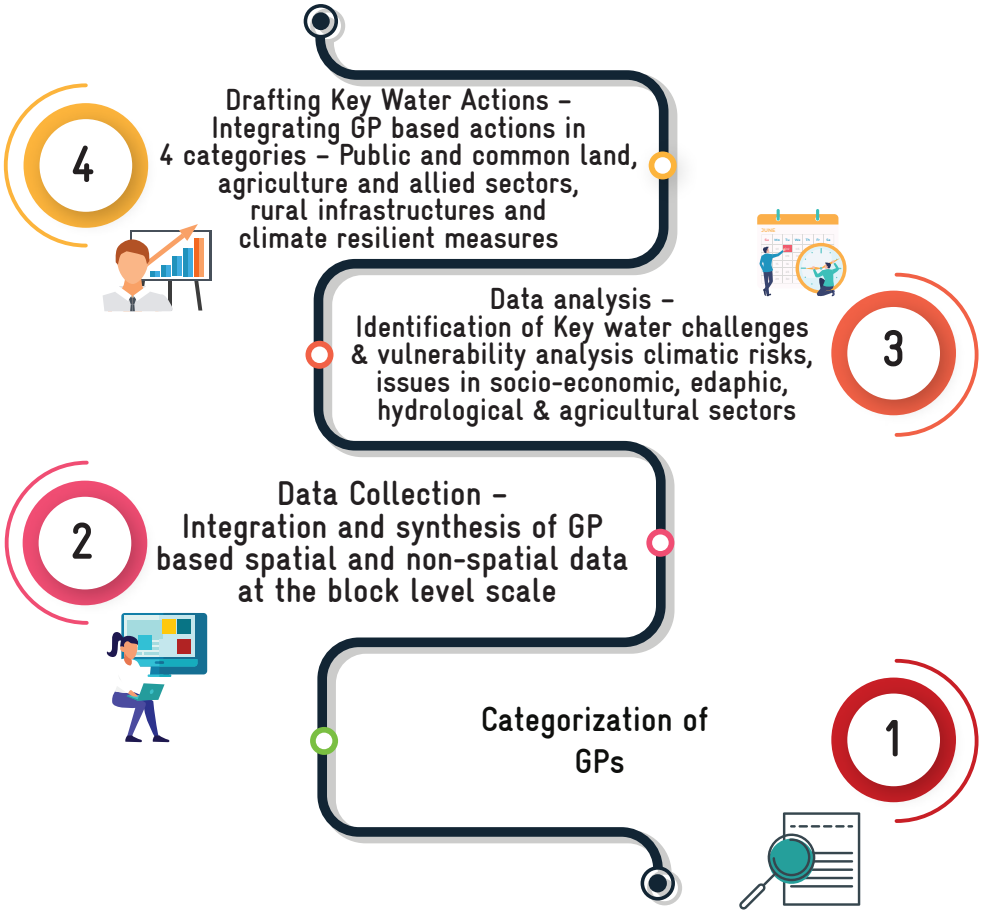
BOX 1. MAJOR COMPONENTS INVOLVE IN CWRM PLANNING WORKOUTS



Such a comprehensive analysis in preparing the water budget integrating ground water, surface water through runoff from rainfall, evapo-transpiration and soil moisture helps to identify potential areas of action to augment the water resources in public and common land, agriculture and allied sectors and rural infrastructure dimensions. The analysis also helps to understand the areas of interest and to take an appropriate and adaptive climate resilient measure to the emerging climate change scenarios. The water challenge linked water actions are the key in developing the perspective plan for the water secured GPs and serve as shelf of projects. This shelf of projects is again mapped to the available schemes and financial plans for execution, adopting convergence and inter-sectoral principles. In the execution process the District level technical and administrative teams are involved in planning, monitoring and evaluation in terms of outcome/impact mapping. In the execution stage, the approach of saturation of works, planning at watershed approach (Ridge to Valley), convergence is some of the key aspects that needs attention for a tangible outcome in both natural resource management 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 in to 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 Nationally and by State and District level steering committees headed by additional Chief Secretary RD&PR and District collectors respectively in the project area of TN State government as a comprehensive and climate adapted planning approach for water security under Mahatma Gandhi NREGA and National Water Mission.

BOX 2. STAGES OF CWRM PLANNING PROCESS

PRE-PLANNING STAGE

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

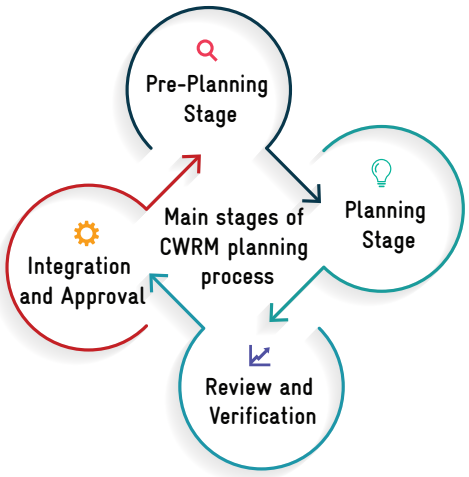
PLANNING STAGE

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

FOUR LEVELS OF CWRM PLANNING UNDER WASCA

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

2. INTEGRATING GP LEVEL PLANS AT BLOCK LEVEL



FOUR LEVELS OF CWRM PLANNING UNDER WASCA

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

4. INTEGRATING GP PLANS TO DEVELOP WASCA DISTRICTS CWRM PLANS

INTEGRATION AND APPROVAL

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

REVIEW AND VERIFICATION

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

3.2 CATEGORIZATION OF GPs

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

TABLE 4. CATEGORISATION OF THELLAR BLOCK GPs

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
46	GP and revenue village data and boundary match I	Achamangalam, Arunkunam, Arunthodu, Chitharugavoor, Embalam, Eripattu, Goodalur, Japthikaranai, Kadambai, Kandavaratti, Kilnamandi, Kilputhur, Mavalavadi, Kilvillivalam, Kilvelliyur, Koothampattu, Korakottai, Kothandapuram, Kunnagampundi, Mahamai Thirumani, Mazhavankaranai, Meesanallur, Melpathi, Nerkunam, Padur, Palaveri, Pancharai, Pennattagaram,Ponnur, Ramasamudram, S Katteri, Sathapoondi, Sathiyavadi, Seeyamangalam, Senal, Sivanam, Sogathur, Thellar, Thenkkarai, Thennathur, Thenthinnalur, Thenvanakkambadi, Thirakoil, Vadakkupattu,Vadavanakkambad, Vedal
1	Having more than one GP in one Revenue Village II	Kondiyankuppam
14	One GP is falling under more than Type 1 one Revenue Village III	Periya Kuppam, Nallur, Madam, Theyyar, Agarakorakottai, Gengamppoondi, Goonambadi, Kodiyalam,Malaiyur, Nadukuppam, Perunkadaputhur, Soraputhur, Thakkandarayapuram, Sri Ranagarajapuram

3.3 DATA COLLECTION-SPATIAL & NON SPATIAL

The CWRM planning framework has four vulnerability areas and integrated 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 data is supportive evidence to understand the issues in the areas of Land Use and Land Cover (LULC), wastelands, salt and erosion affected lands, drainage lines, ground water potential, lineament, geomorphology and slope for science-based decision on water actions. The use of different spatial data to assess and confirm the key water challenges along with the non-spatial data given 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

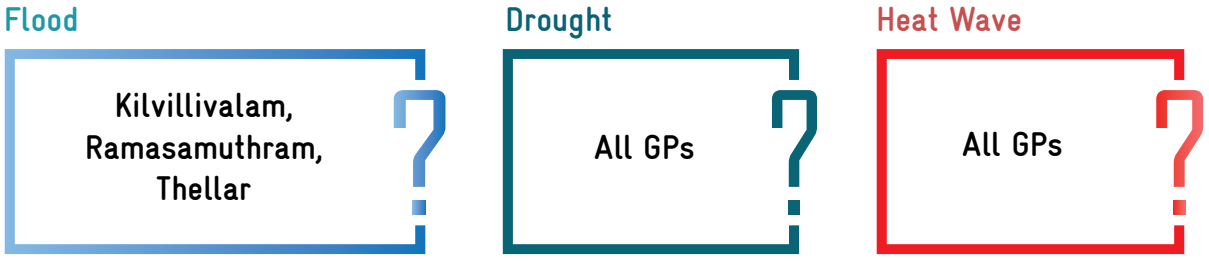
- Water budgeting at GP level to demonstrate the sector wise water demand and available water through the traditional water harvesting and storage bodies and the potential runoff that can be conserved through appropriate actions on the supply side. The difference between demand and supply at the GP level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

A total of 99 parameters of data were collected, in which 13 parameters are primary data and collected at the GP level by GP level officers. 65 parameters are secondary data collected from authentic Government sources and its websites; data for the remaining 21 requisite parameters for water budgeting and grey water is calculated using standard and suitable methods and formula. CWRM parameters and its sources are annexed as (Annexure 3.1, 3.2, 3.3). The methods, and formulas used for water budgeting is attached in Annexure 3.4 and for grey water generation in Annexure 3.5.

3.4 CWRM PLANNING ANALYSIS – CLIMATE

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

TABLE 5. CLIMATE RISKS AND VULNERABLE LOCATIONS



3.5 CWRM PLANNING ANALYSIS – WATER

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

3.5.1 SPATIAL DATA

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

3.5.1.1 Geomorphology: Geomorphology is the study of landforms and their evaluation or 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. Geomorphological mapping has evolved from a purely field-based exercise aimed at accurate depiction of landforms on a map. Geomorphologically, Thellar Block consists of denudation origin pediment, pediplain complex landform unit (Figure 3.1). Pediment is the low relied or plain with a gentle slope area close to the foot of the mountains with or without debris whereas pediplain is relatively flat rock surface formed by joining of several pediments.

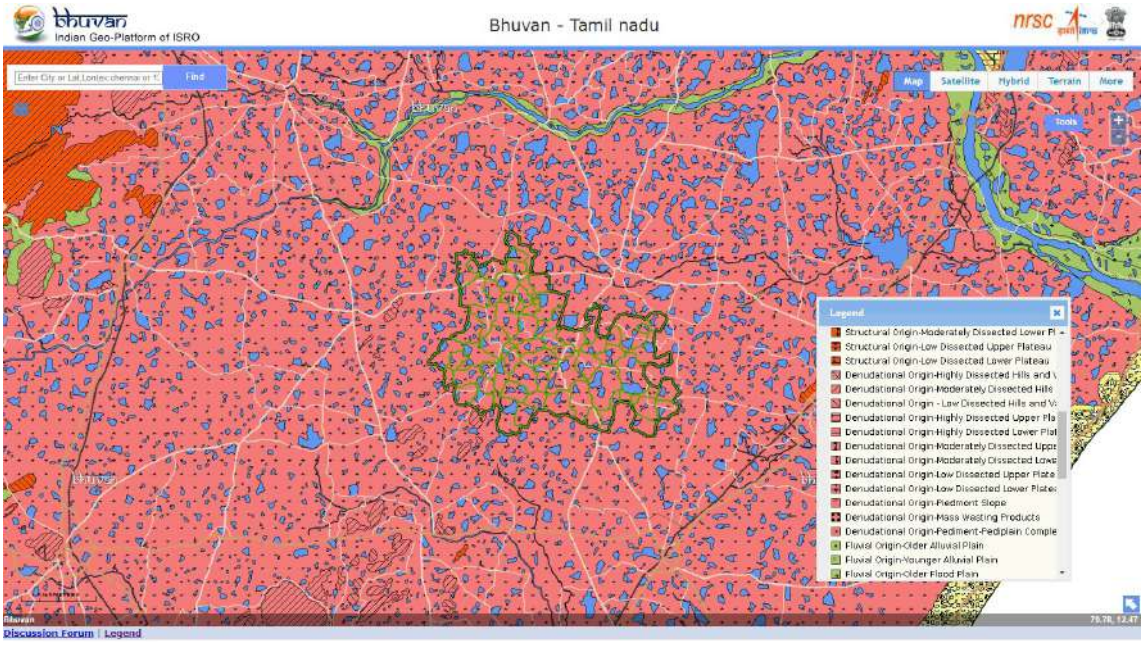


Figure 3.1. Geomorphology map

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 with two different landforms- converge or diverges. This site allows water to percolate at a high rate. The lineament details with respect to the GPs is illustrated in the table below. These observations are widely used to locate points of high-water flow especially in groundwater exploration.

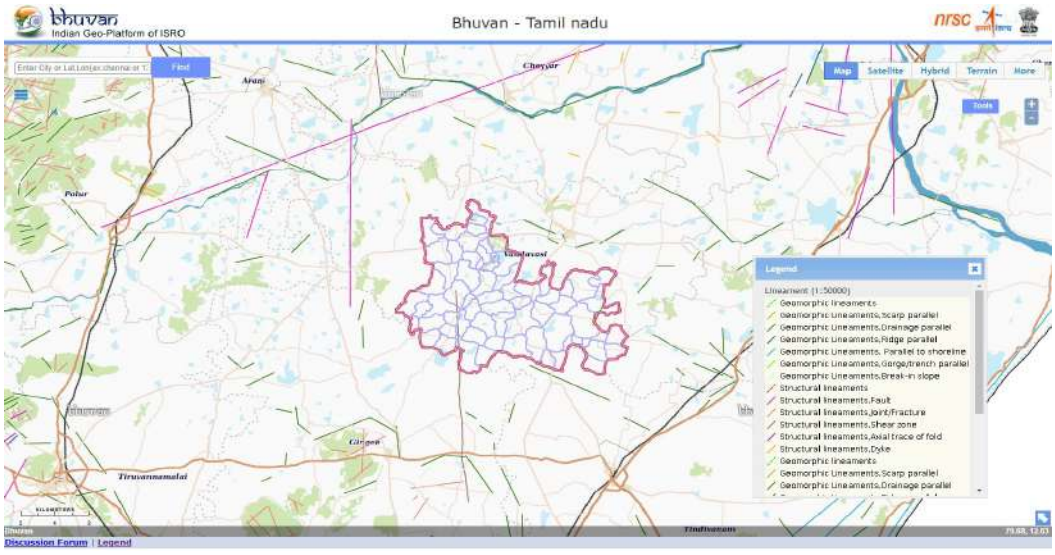


Figure 3.2. Lineament map

Lineament type	Gram Panchayat
Structural lineaments, Shear zones	Seeyamangalam, Chitharugavoor, Achamangalam, Nerkunam

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 Thellar Block is shown in Figure 3.3 and the Block area is distinguished with a uniform elevation range (greenish grey).

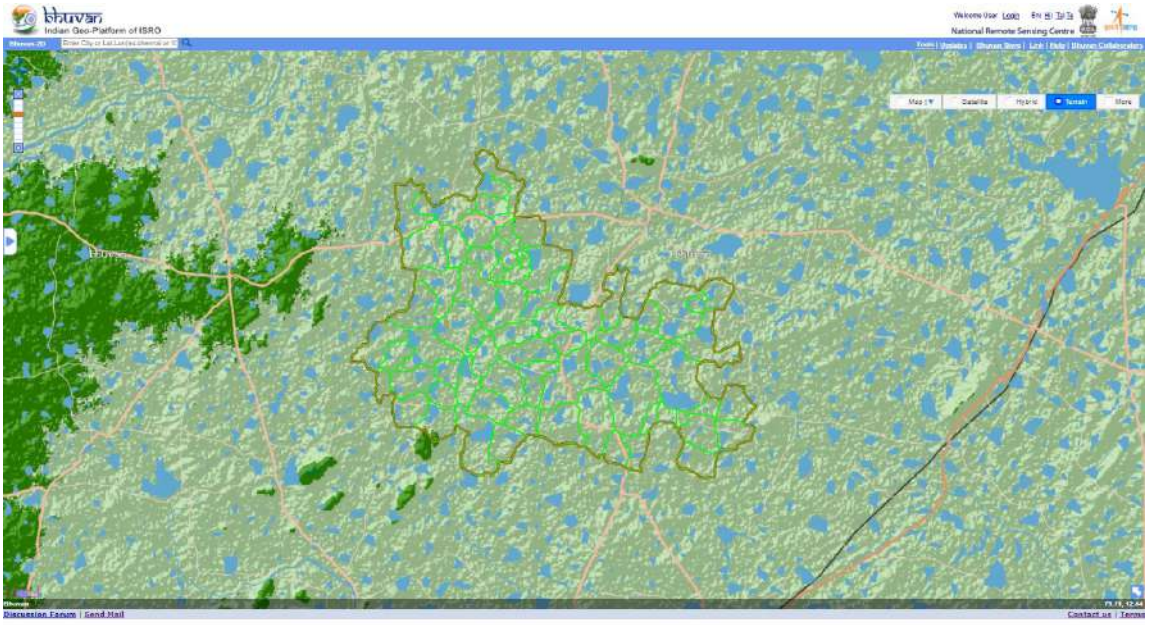


Figure 3.3. Terrain map

3.5.1.4 Contour map: The contour is one of the important elements in the cartographic representation of the terrain and determines relief forms such as valleys and hills, and the steepness or gentleness of slopes, geometrically. A contour map is illustrated with a series of lines with equal points of elevation. Closely spaced contour lines indicate steep slope and the lines spaced far apart indicate a gentler slope. Since the Block witnessed flat terrain lower elevation of intervals are noticed in the region (Figure 3.4). The contour map also plays a vital role in delineation of watershed & its units, used in planning and identifying the recharge structures, farm ponds and construction of grey water drain network etc.

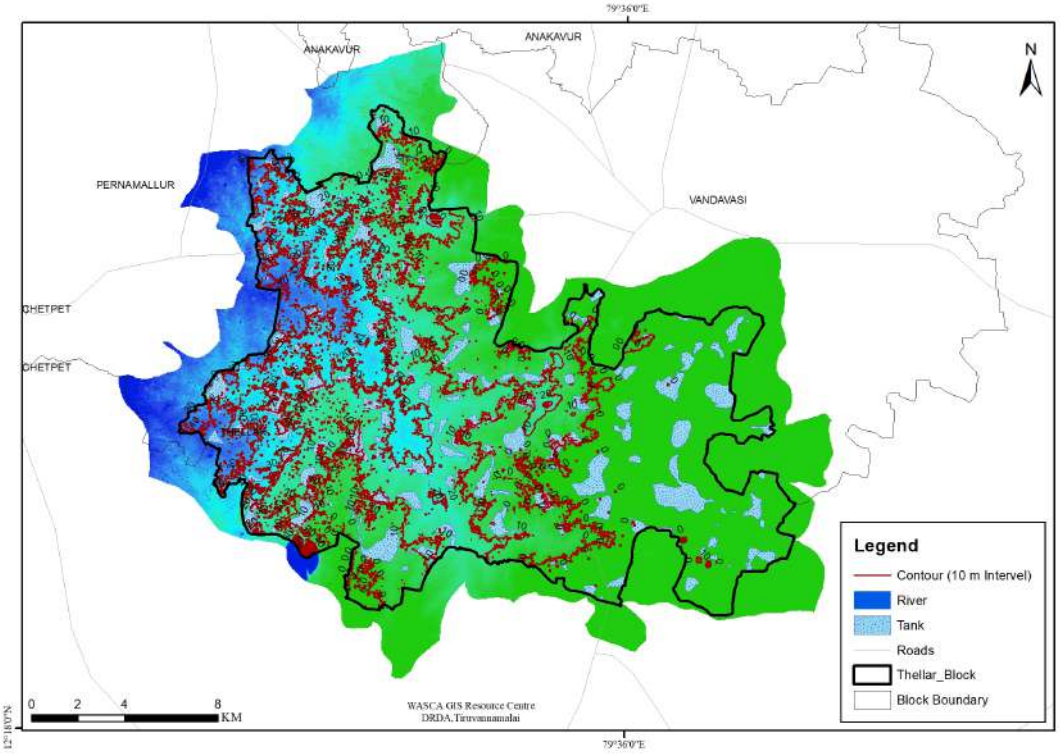


Figure 3.4. Contour map

3.5.1.5 Slope: The average slope of a terrain feature is calculated from contour lines on a topology map or DEM. Slope is typically expressed in percentage, angle, or in ratio. Slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. It is noticed that with respect to the landform units the slope varies in the Block (Figure 3.5). Flat (1-3 %) and very flat (0-1 %) slope ranges were noticed in the Block. 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.

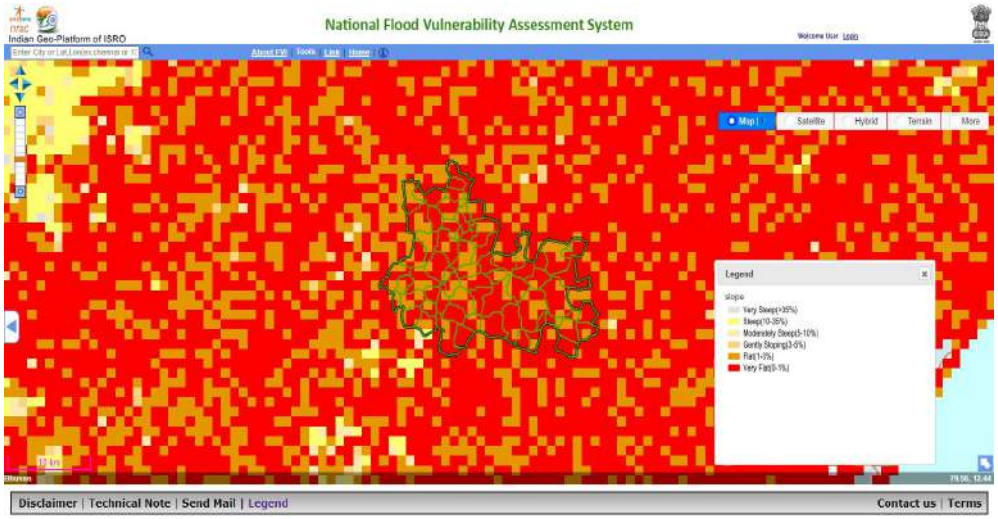


Figure 3.5. Slope map

Slope range	Area in %	Gram Panchayat
Very Flat (0-1%)	93%	Pennattagaram, Kilnamandi, Kodiyalam, Goodalur, Kadambai, Japthikaranai, Sathiyavadi, Padur, Embalam, Sri rangarajapuram - 100%, Thenkkarai, Theyyar, Nallur, Arunkunam, Meesanallur, Nadukuppam, Nerkunam, Chitharugavoor, Kil Villivalam, Tirakoil, Kil Velliyur - 90%, Seeyamangalam, Thellar - 70%
Flat (1-3%)	55%	Vanakkambadi - 80%, Sivanam - 70%, Theyyar, Kil puthur, Ponnur - 60%, Korakottai, Kil villivalam, Sathapoondi, Malaiyur, Kothandapuram - 50%, Seeyamangalam - 20%

3.5.1.6 Drainage Network : The drainage network pattern of a region is particularly dependent on the lithological characteristics, regional slope, structural control, climate condition etc. Dendritic or tree pattern drainage system was observed in the Block with less dense drainage network (Figure 3.6). Drainage network is referred to while identifying suitable sites for soil and water conservation measurements such as check dams, farm ponds, bunds, restoration of gullied region etc.

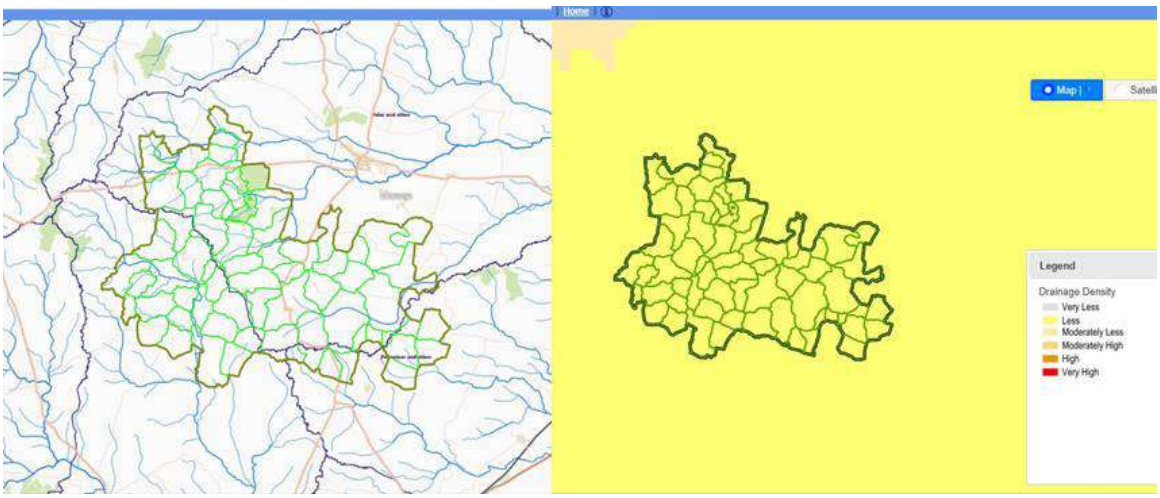


Figure 3.6. Drainage network and density

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

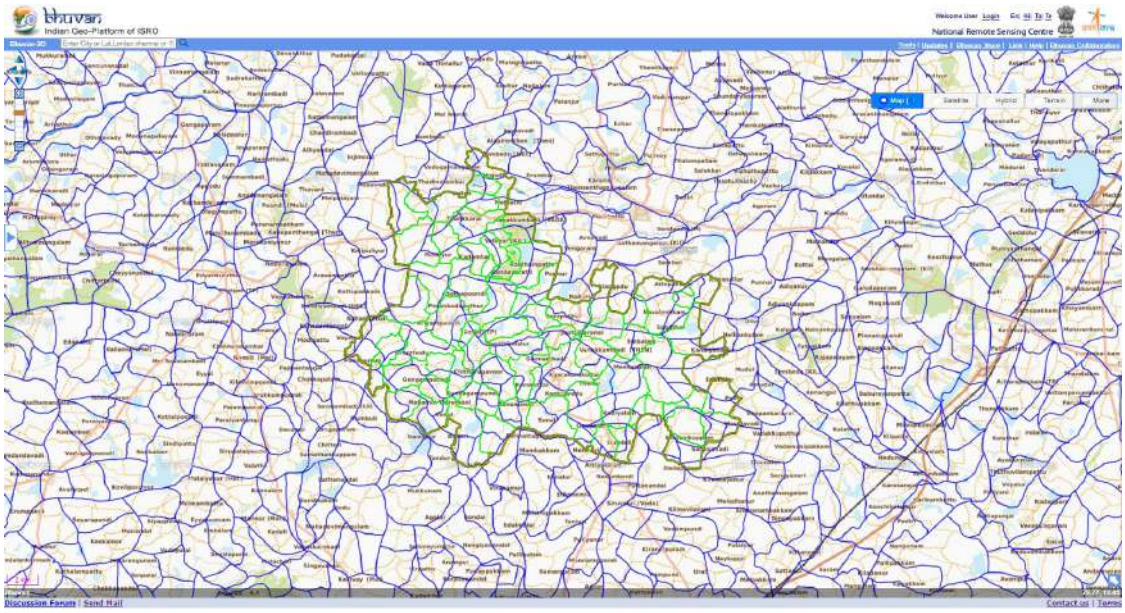


Figure 3.7. Watershed map

3.5.1.8 Ground water perspectives: Ground water is one of the important natural resources in a semi-arid region like Thellar Block. The ground water perspectives map is the integration of lithology, geomorphology, geological structures, hydro geomorphic datasets, which provides the required information related to ground water exploration and the probable ground water prospects. This map will help in identification of tentative locations for construction of recharge structures. In the Block, most of the GPs have witnessed a GW yield of 50 to 100 LPM in above 80 m deep well, whereas small patches in the Gengampoondi, Arunkunam and Mahamai Thirumani panchayats with no yield (Figure 3.8). This specific information will play a crucial role in identifying sites for recharge structures in order to address water scarcity issues in the Block.

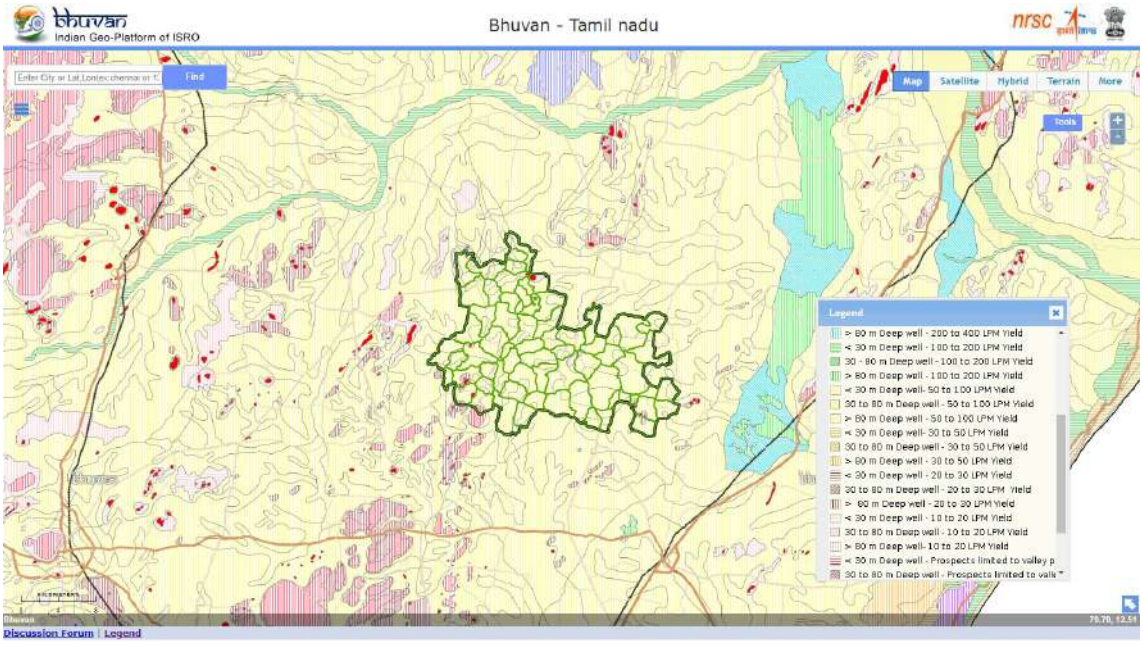
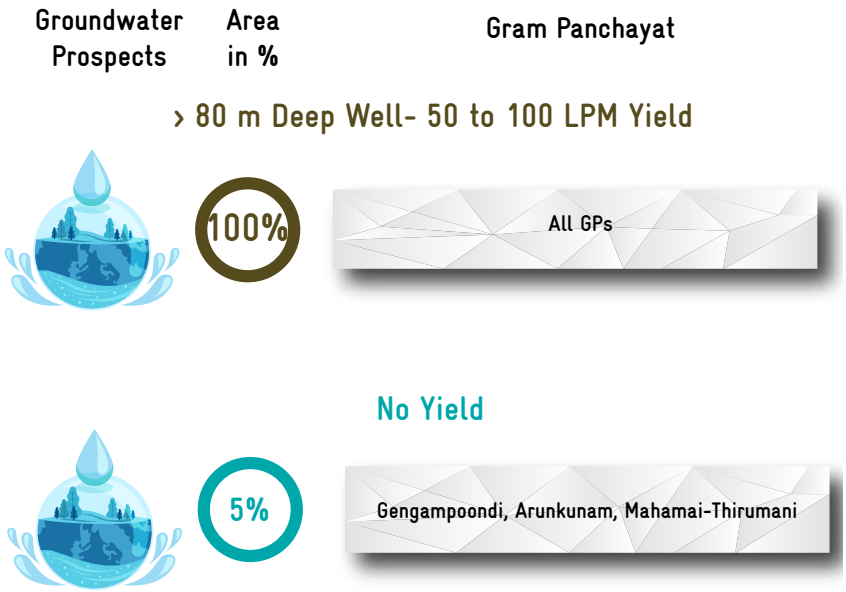


Figure 3.8. Ground water perspective map



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.	Canal Network	Extent
	Canal Network (m)	
1	Length of Main Canal	4
2	Length of Minor Canal	13,480
3	Length of Distributaries	1,45,628
4	Water Courses (Field Channels)	1,30,895
	Traditional Water bodies (No.)	
5	Number of Tanks (PWD & Union)	154
6	Number of Ooranis	223
	Area under Irrigation Facilities (ha)	
7	Tank Irrigation	1,990.29
8	Canal Irrigation	48.25
9	Open & Tube Well Irrigation	5,384.01
	Catchment Area wise Available Runoff (ha.m)	
10	Good Catchment Area	2,644.37
11	Average Catchment Area	245.43
12	Bad Catchment Area	4,671.8
	Watershed and Drainage Networks	
13	Length of Natural Drainage Lines (m)	24,864
14	Number of Natural Drainage Lines (No.)	343
15	Number of critical Watersheds (No.)	301
	Water Demand	
16	For Humans (ha.m)	266
17	For Livestock (ha.m)	119
18	For Agriculture (ha.m)	8,197
19	GW utilization for Drinking (%)	31
20	GW utilization for Livestock (%)	87
21	GW utilization for Agriculture. (%)	94
22	SW utilization for Drinking (%)	69
23	SW utilization for Livestock (%)	13
24	SW utilization for Agriculture (%)	6

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. In the Block, it is noticed that the Ooranis are more in number than tanks (Figure 3.9).

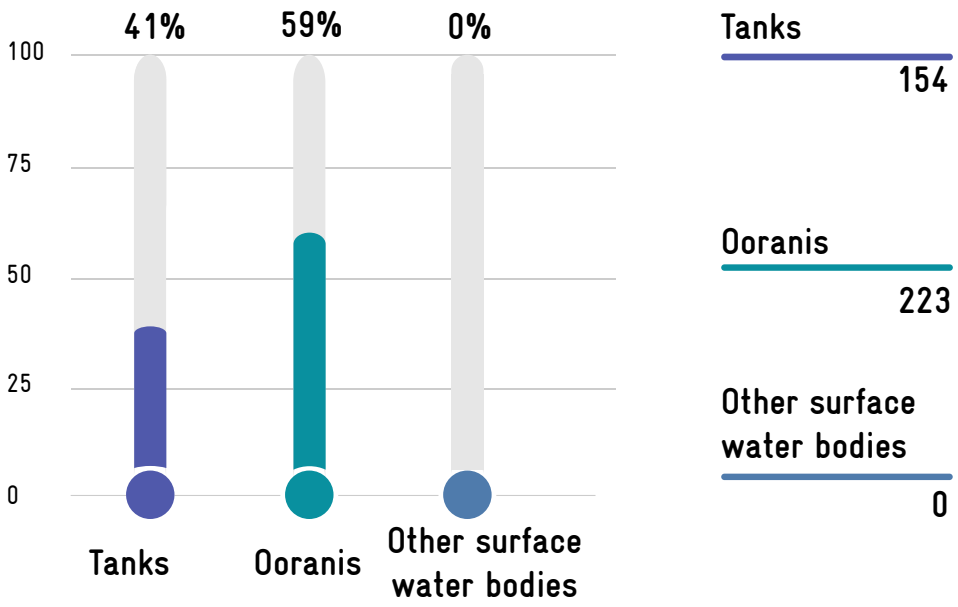


Figure 3.9. Traditional Waterbodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the Block is 7,422.55 ha, of which 72.54 % (5,384 ha) is irrigated through ground water stored in open/tube wells followed by 26.8 % (1,990.29 ha) through tanks and the remaining 0.65 % (48.25 ha) area is through canal based irrigation (Figure 3.10).

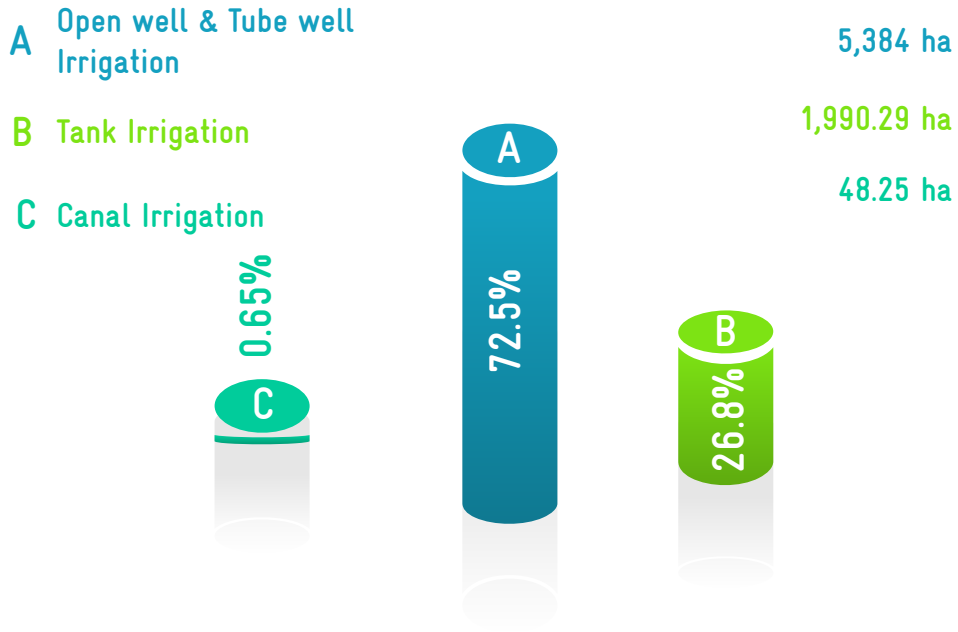


Figure 3.10. Irrigation sources

3.5.2.3 Available Run off

The total available runoff in the catchment area is 7,561.6 ha.m, out of which 61.78 % is from bad catchment area followed by 34.97 % from good catchment area and the remaining 3.25 % is from average catchment area. As the area is dominated with bad catchment zone which indicates that the rainfall is not being conserved properly, there is a strong requirement for construction of water conservation structures. From the table, it is evident that more than half of the total rainwater is flowing as runoff which can be well managed with the increase of some water conservative structures (Figure 3.11).

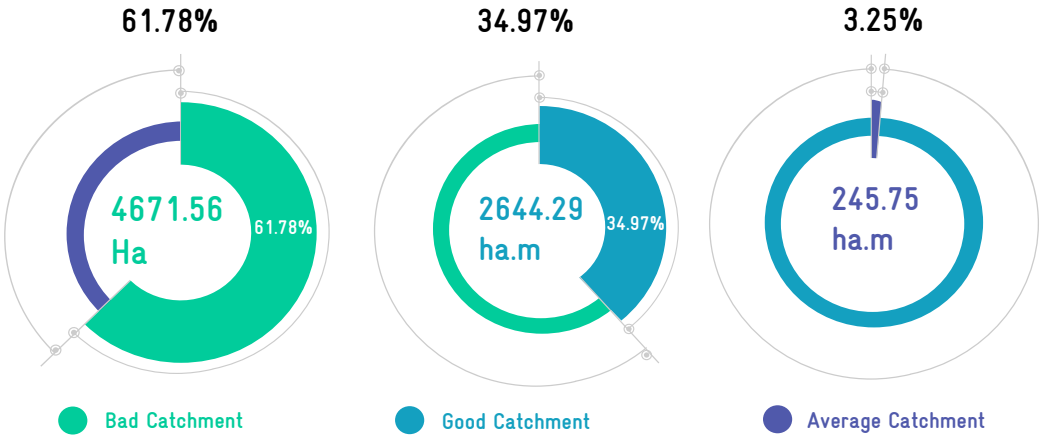
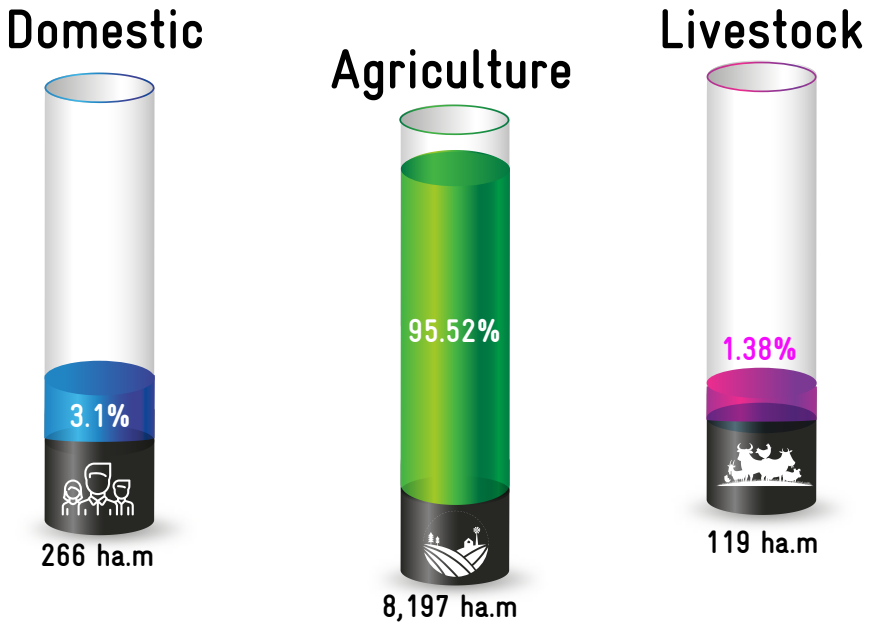


Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 8,582 ha.m. The highest demand is from the agriculture sector of 8,197 ha.m (95.52 %) followed by domestic use demand of 266 ha.m (3.1 %) and rest is from livestock. Out of the total water demand, 31 % for domestic purpose usage is met through ground water while the remaining 69 % from surface water resources. Utilization of 94 % for agriculture and 87 % for livestock is met by ground water (Figure 3.12).



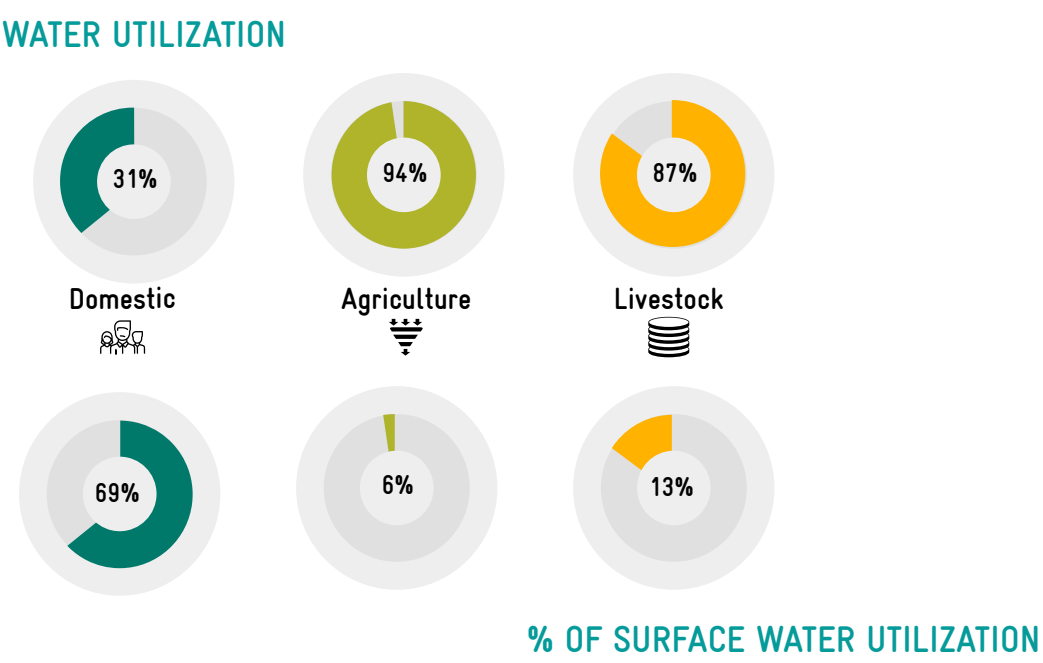


Figure 3.12. Sector-wise water utilization

3.6 CWRM PLANNING ANALYSIS-AGRICULTURE

Agriculture and livestock are the livelihood resources of the households in Thellar 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 Thellar Block's problems in order to draft scientific key water actions.

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

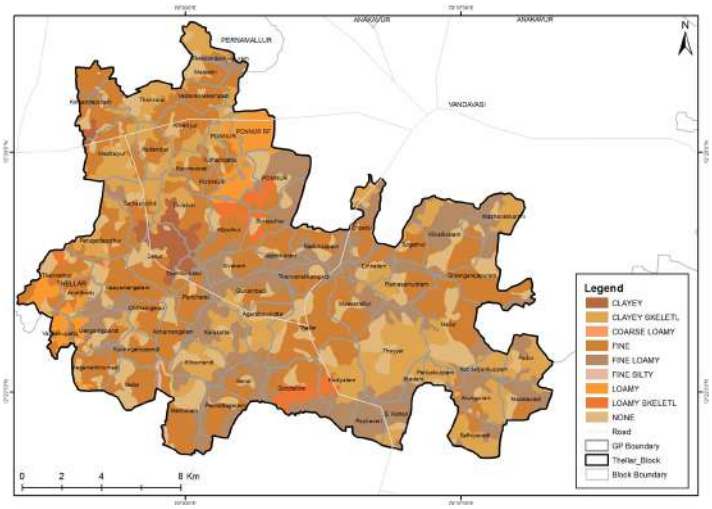


Figure 3.13. Soil texture map

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. GP and area-wise details of sheet erosion in the Block is illustrated in the table below and Figure 3.14. Soil eroded sites are the challenging tasks in implementation of various measures to conserve soil and watershed management.

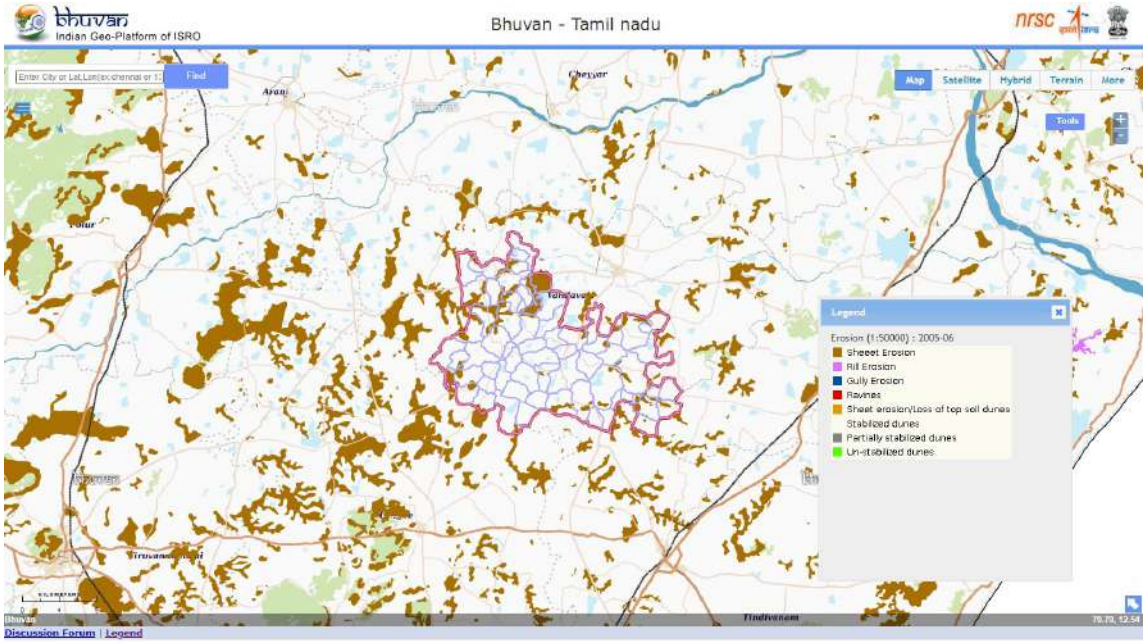


Figure 3.14. Soil Erosion map

Gram Panchayat	Area in %
Sheet Erosion	
Vadakkupattu - 100%, Ponnur - 90%,Sathapoondi, Malaiyur, Vada Vanakkambadi - 80%,Perugadaputhur, Tirakoil - 70%, Arunkunam - 30%, Kil villivalam - 20%, Mahamaithirumani, Gengampoondi, Goodalur, Kodiyalam, Mavalavadi, Nallur - 10%, Sogathur, Nadukuppam - 5%	41%

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. Thellar Block is dominated with agriculture land use followed by barren land and forest area (Figure 3.15). The GP wise LULC is tabulated in the illustration. LULC map helps the decision makers and planners to focus on the developmental activities in the fallow land.

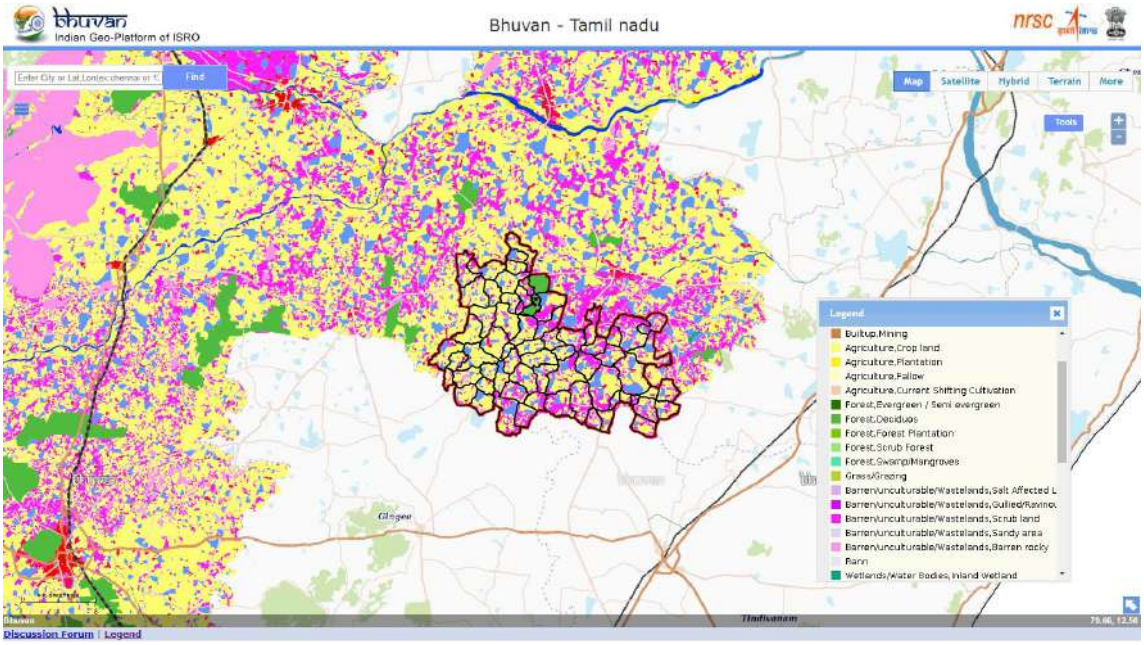
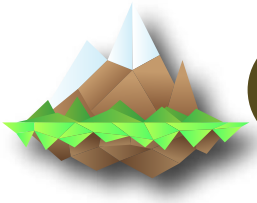


Figure 3.15. Land Use Land Cover map

Land Use	Area coverage in %	Gram Panchayat

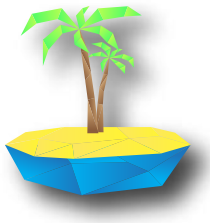
Barren Lands



63%

Goodalur, Kodiyalam, Meesanallur - 80%, Theyyar, Kil villivalam, Thellar, Arunkunam - 70%, Pennattagaram, Nerkunam, Ponnur - 60%, Mazhavankaranai, Kil puthur, Kothandapuram - 40%

Agriculture crop lands and Plantation



70%

Mahamai_thirumani, Vedal, Seeyamangalam, Kunnagampundi, Chitharugavoor, Arunthodu, Thennathur, Perugadaputhur - 90%, Sathapoondi, Malaiyur - 80%, Goonambadi, Sivanam, Tirakoil, Melpathi, Thakkandarayapuram - 70%, Kil velliyur, Vada vanakkambadi, Thenkkarai, Nadukuppam - 60%, Theyyar, Nallur, Sri rangarajapuram - 40%, Ponnur - 30%

3.6.1.4 Waste land: A Parcel of land that is not suitable for any agriculture activity and mostly covered with dense or open scrub is called as wasteland. The extent of wasteland will act as a direct input for preparation of plans for land development activities or greenery. Degraded forest is clearly observed in the northern part of the Block (Figure 3.16). Measures to arrest forest degradation by implementing deforestation activities such as horticulture plantation have to be taken up.

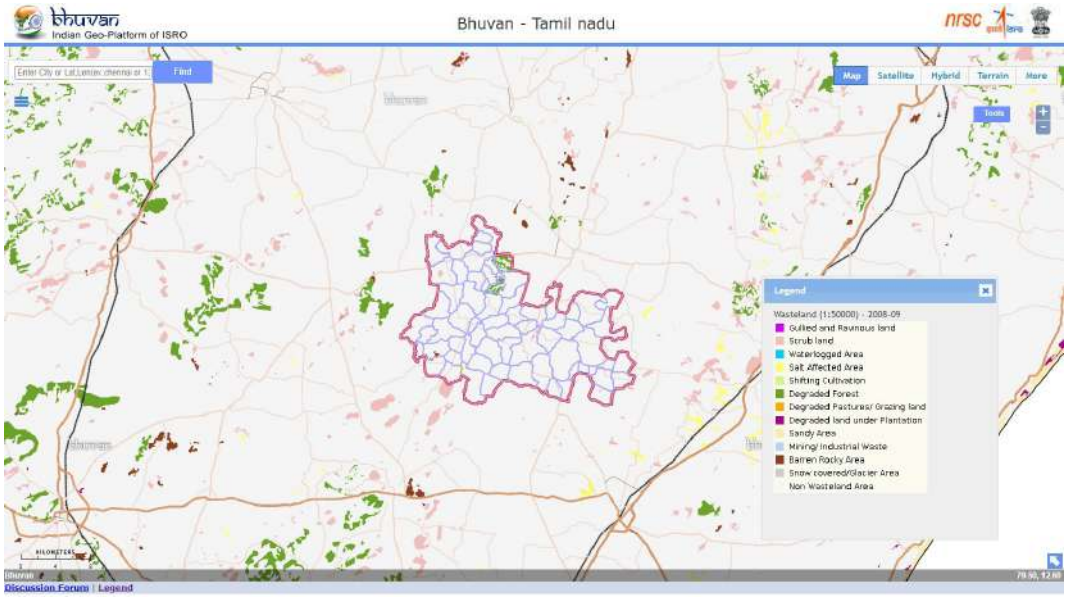
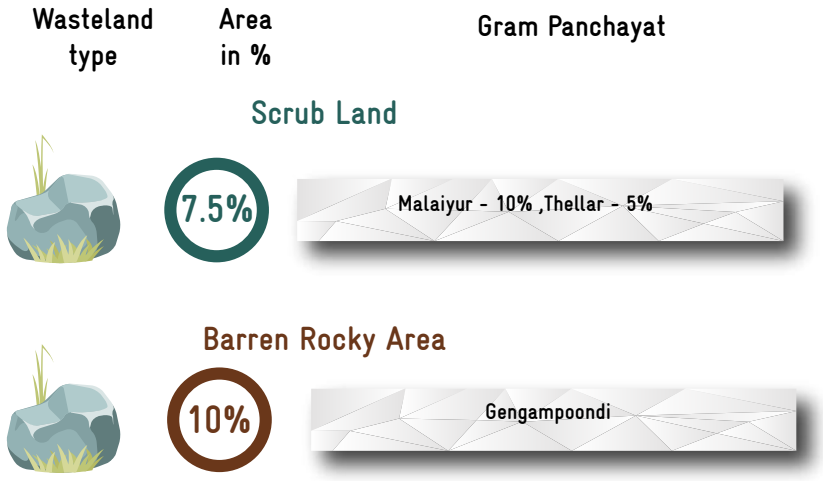


Figure 3.16. Wasteland map



3.6.1.5 Salt affected area: Salt affected area is observed in the northwest part of Thellar Block and one tenth of Nerkunam and Vedal Gram panchayats are covered with salinity (Figure 3.17). These parcels will act as a direct input during planning process to propose soil conservation measures, mainly activities to reduce salinization and suggestions for alternative cropping.

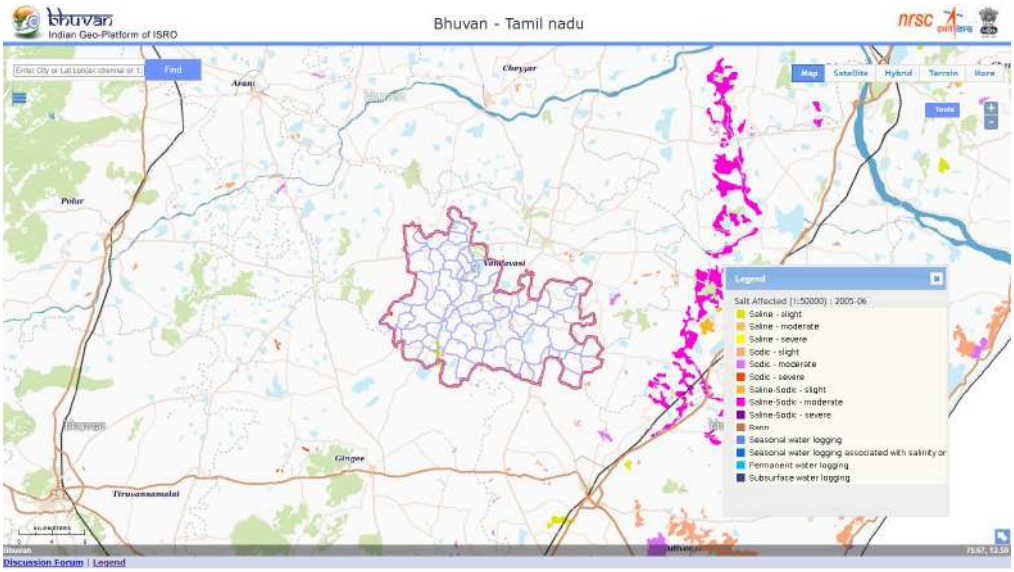
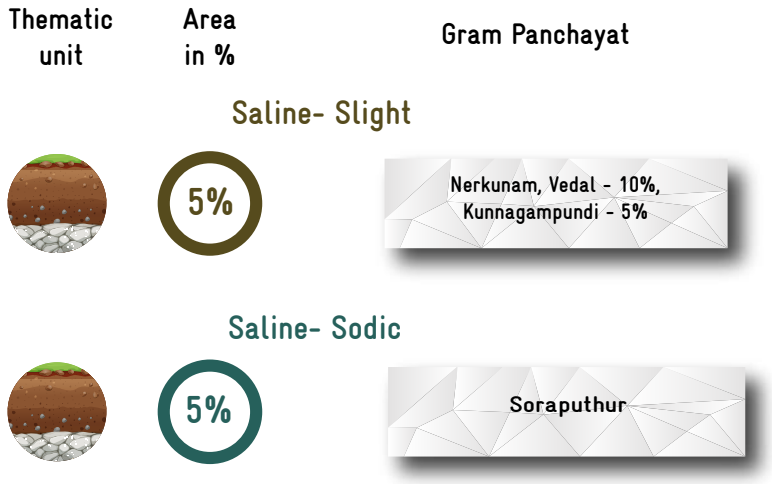


Figure 3.17. Salt Affected Area map



3.6.2 NON SPATIAL DATA

Agriculture based non-spatial secondary data related to land resources, catchment, crop type, soil micro-macro nutrient, moisture, ET and livestock data were collected from govt. sources (Table7). The key CWRM parameters of agriculture area for all GPs are tabulated in Annexure 3.7.

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

Sl. No.	Key parameter	Extent
	Area under Land Resources (ha.)	
1	Current Fallow land	8,064
2	Area Irrigated by Source	7,824
3	Non-Agricultural Uses	6,013
4	Unirrigated Land	5,449
5	Fallow Land other than Current Fallows	1,478
6	Barren & Un-cultivable Land	694
7	Cultivable Waste Land	438
8	Permanent Pastures and Other Grazing Land Tree Crops etc.	312
9	Land Under Miscellaneous	101
10	Forest land	25
	Land under Catchment Area (ha)	
11	Good Catchment	6,740
12	Average Catchment	865
13	Bad Catchment	22,794
	Crop Details	
14	Irrigated Area (ha)	5,186
15	Rainfed area (ha)	1,743
16	Paddy Cultivation (ha)	3,588
17	Crop Water Requirement - Irrigated condition (ha.m)	7,481
18	Crop Water Requirement - Rainfed condition (ha.m)	716
	Soil Resources: Status of Available Nitrogen (%)	
19	Very Low	22
20	Low	72
21	Medium	4

	Status of Organic Carbon (%)	
22	Very Low	22
23	Low	72
24	Medium	4
	Status of Soil Micro Nutrients (%)	
25	Sufficient	55
26	Deficient	44
	Status of Physical condition of the soil (%)	
27	Highly Acidic	1
28	Moderately Acidic	2
29	Slightly Acidic	3
30	Neutral	17
31	Moderately Alkaline	66
32	Strongly Alkaline	7
	Soil Texture (%)	
33	% of Clay Soil	21
34	% of Fine Soil	58
35	Soil Water Permeability (Low, Moderate, high)	Moderate
	Soil moisture and ET	
36	Volumetric Soil Moisture (%)	23
37	Estimated Soil Moisture (ha.m)	5,653
38	ET Losses (ha.m)	10,610
	Means of Water Extraction (%)	
39	Gravity	10
40	Lifting	90
	Irrigation Methods (%)	
41	Wild Flooding	30
42	Control Flooding	70
	Livestock (No.)	
43	Cattle population	30,462
44	Sheep population	13,966
45	Goat population	7,574

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 30,398.79 ha, the highest of 26.53 % land is used for current fallow, followed by 25.74 % area irrigated by source, while less than 5 % of land is other than current fallow, Barren & Un-cultivable, cultivable waste land and Permanent Pastures and other grazing land, forest land etc., (Figure 3.18).

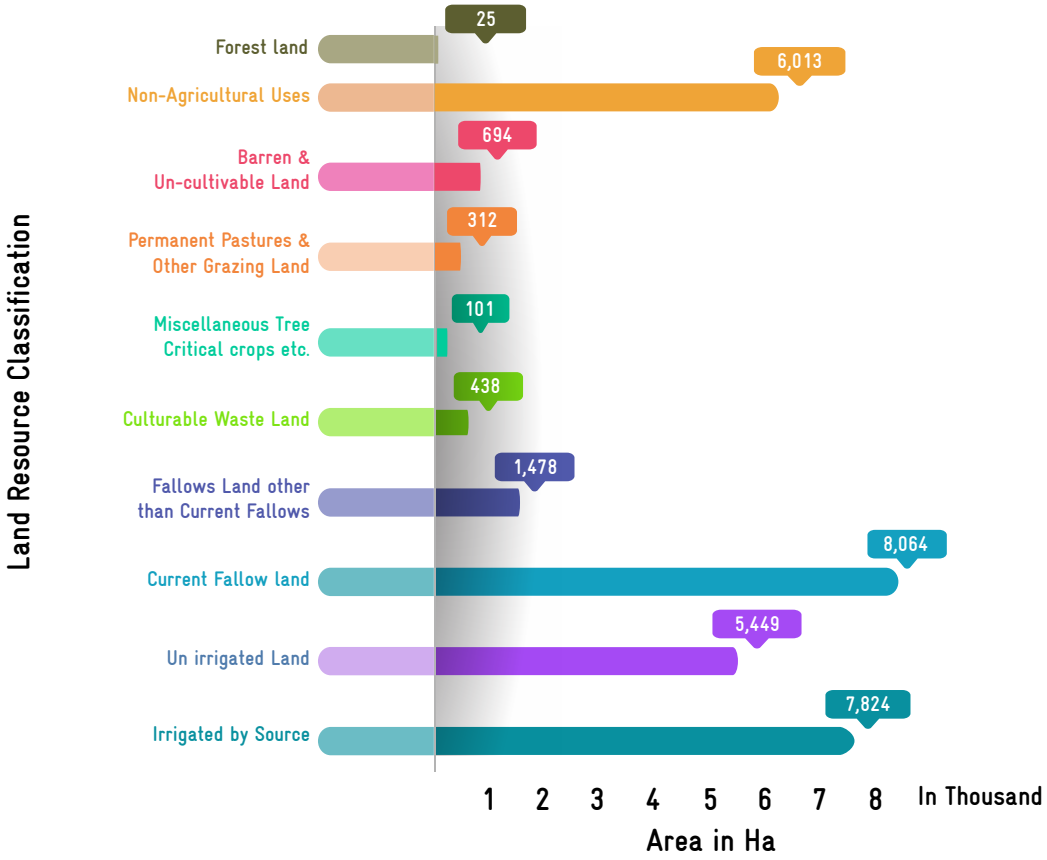


Figure 3.18. Land utilization

3.6.2.2 Catchment Area

The land use types in each of the GPs are categorized into three different types of runoff; good, average and bad catchment area. Out of total catchment area of 30,398.8 ha, of the Block, the highest of about 75 % is from bad catchment area followed by 22.2 % from good catchment area and the remaining is from average catchment area. This analysis helps to focus on prioritizing the works in the land use systems under the good and bad catchment areas (Figure 3.19).

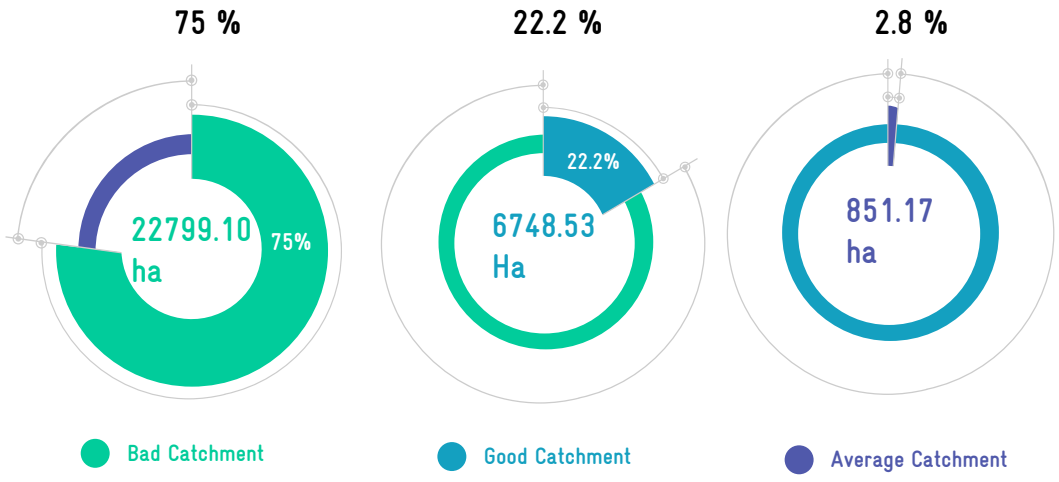


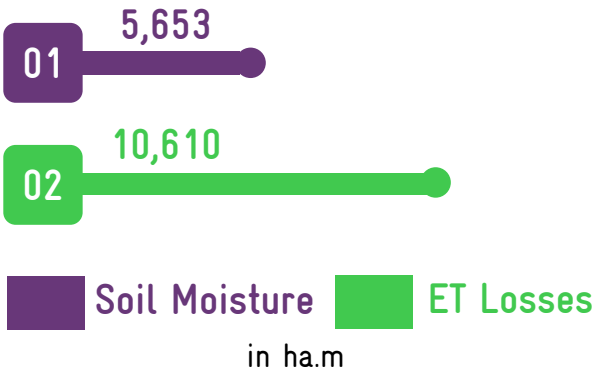
Figure 3.19. Catchment area

3.6.2.3 Soil moisture

Soil is an important medium to store the available water and the storage capacity varies with the type of soil especially its textural composition. In overall composite water budgeting, estimation of stored water in the soil assumes greater significance in this Block because of its significant proportion of area under rain-fed cultivation. The annual average volumetric soil moisture of this Block (23%), is taken for estimating the amount of water stored as soil moisture which accounts to 5,653 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 10,610 ha.m.



3.6.2.5 Macro soil nutrients
Nitrogen

The macro soil nutrients such as nitrogen and organic carbon falls under very low to moderate category in all the soil samples tested. The available nitrogen is very low in 17 % of the samples tested while it was 62 % under low category and remaining is moderate Nitrogen (Figure 3.20). According to soil resource map, this Block is identified as one of the nitrogen deficient Blocks (Tiruvannamalai district profile 2020).

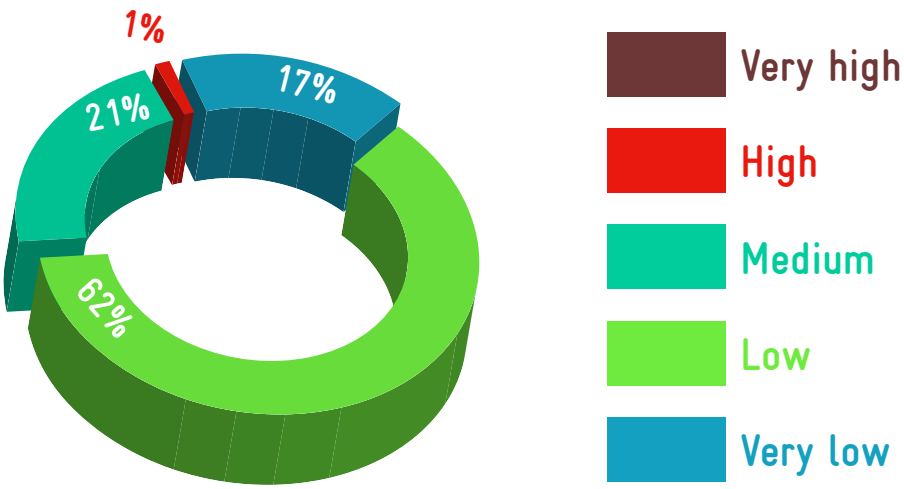


Figure 3.20. Status of available Nitrogen

Organic Carbon Status

A similar trend was recorded for soil organic carbon. Soil organic carbon also ranges between very low and low in the Block. Nearly 72 % of the soil samples tested fall under low category followed by 22 % under very low category while less than 5 % under medium category (Figure 3.21). This indicates that the soil fertility is very poor and further r intensive practices will make the soil more vulnerable to degradation over a period of time.

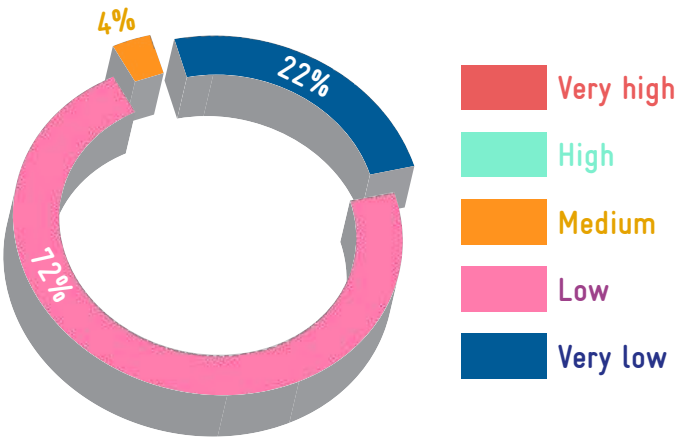


Figure 3.21. Status of soil Organic Carbon

3.6.2.6 Status of the soil micro-nutrients

This Block is one of the Nitrogen, zinc and ferrous deficient Blocks of Tiruvannamalai District. The micro-nutrient status of the soil with specific reference to Manganese, Boron and Zinc, Ferrous, Copper, and Sulphate are deficient in 44 % and 55 % sufficient in the soils tested. (Figure 3.22)

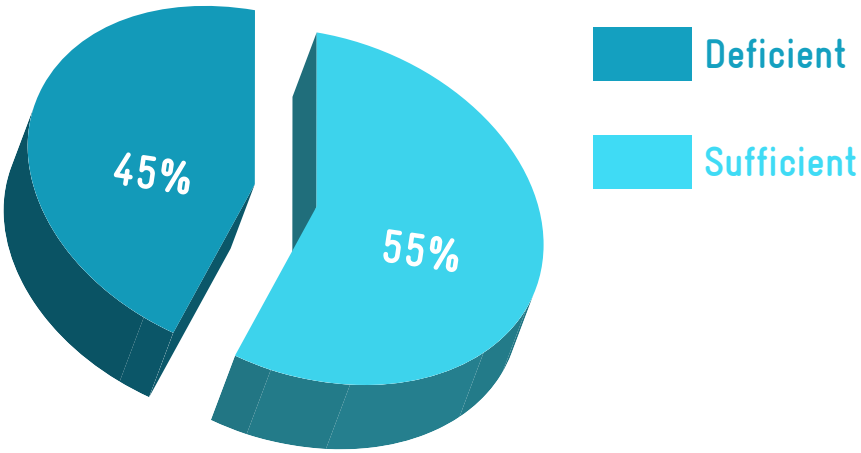


Figure 3.22. Status of soil micro-nutrients

3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 65.59 % of the soil is moderately alkaline in nature followed by 17.09 % which is neutral in nature, 6.62 % is strongly alkaline, 3.14 % slightly acidic and 2.02% is moderately acidic in nature (Figure 3.23).

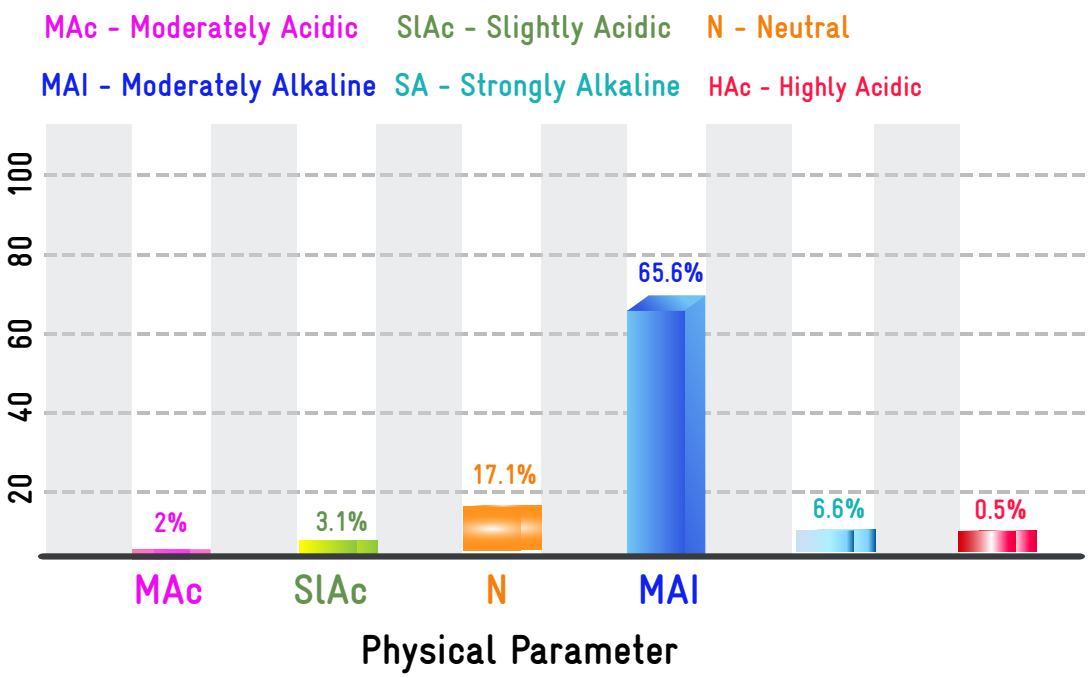


Figure 3.23. Status of pH of soil

3.6.2.8 Cropping pattern and the irrigation

A total of 7,331 ha area is used for crop cultivation in which irrigation shares the highest area of 75.4 % (5,525 ha) and rest is rain-fed irrigation (1,805 ha). In irrigated area of 5,526 ha, paddy crop is the dominant crop of about 3,211 ha (58.1 %) followed by Groundnut (17.8 %), sugar cane (33.6 %), other pulses (4.90%) dry chilli, mango, etc,. In rain fed area, groundnut is dominant and covers an area of 82.2 % followed by other pulses of 17.48 % (Figure 3.24). While red gram, ragi, brinjal, water melon, ladies finger, gourds, banana, guava, medicinal plants, lemon, tomato, coconut are cultivated in less than one percent of the area.

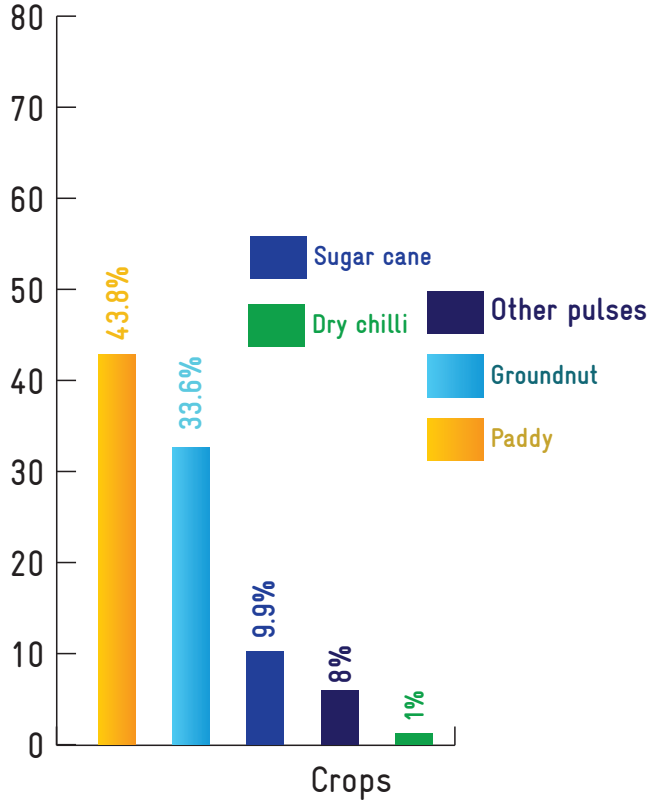


Figure 3.24. Cropping pattern

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, 70 % of the irrigation is done by control flooding and only 30 % of the irrigation is done by wild flooding (Figure 3.25).

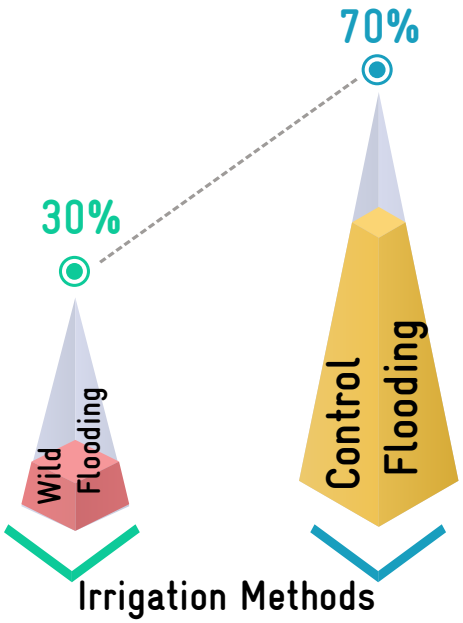


Figure 3.25. Irrigation methods

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, 90 % of the water extraction is through lifting means of extraction and only 10 % comes under gravity means of water extraction (Figure 3.26).

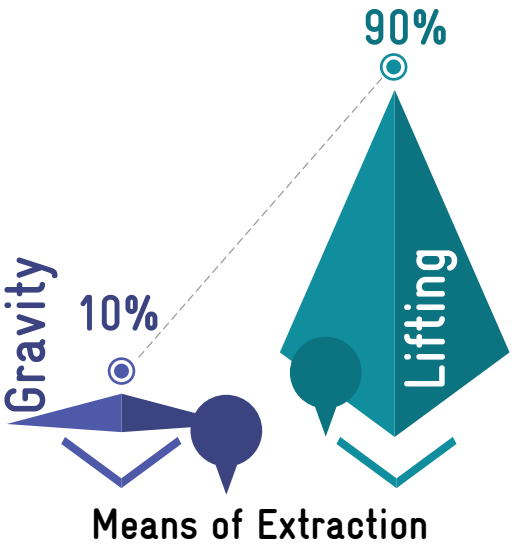


Figure 3.26. Means of water extraction

3.6.2.11 Livestock details

This Block has considerable proportion of livestock resources of which small ruminants such as goat and sheep constitute 41.4 % (21,540) and remaining 58.6 % (30,462) covers cattle population (Figure 3.27). The total water requirement for livestock is 119 ha.m. Of the total water demand of 87 % is met through ground water and remaining is from surface water resources.

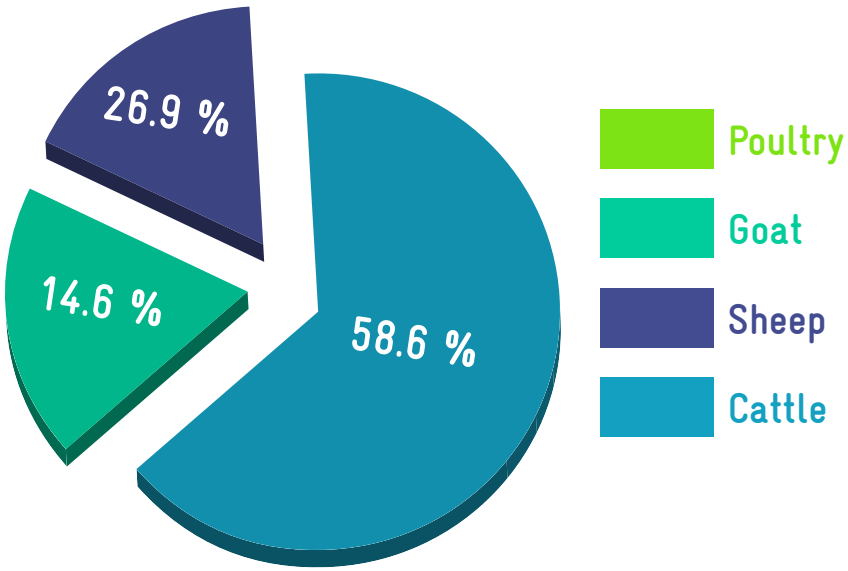


Figure 3.27. Livestock details

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 Thellar 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	Socio-economic Parameter	Total
1	Geographical Area (ha)	29,093
2	Male population (No.)	48,613
3	Female population (No.)	48,511
4	Total population (No.)	97,124
5	SC population (No.)	29,586
6	ST population (No.)	2,134
7	Vulnerable population (No.)	31,720
8	Households (HH's) (No.)	29,855
9	Only one room HH's (SECC) (No.)	7,464
10	Female Headed HH's (SECC) (No.)	2,056
11	Vulnerable Households (SECC) (No.)	5,193
12	% of Vulnerable Households (%)	17

13	Registered MGNREGA Job cards (Persons)	40,954
14	Active person working in MGNREGA job Cards (Persons)	28,748
15	Drinking Water Sources (No.)	15,407
16	Ground Water - Drinking source (No.)	255
17	Surface water - Drinking source (No.)	39
18	Sum of drinking water sources (No.)	294
19	HH's have tap water connection for drinking water (No.)	21,495
20	HH's dependent on other sources for drinking water (No.)	13,956
21	Annual Greywater Generation (ha - m)	439

3.7.1 Population:

The total population of this Block is 97,000* of which male and female population are balanced almost 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 32.6 % of the total population are under vulnerable population (Figure 3.28).

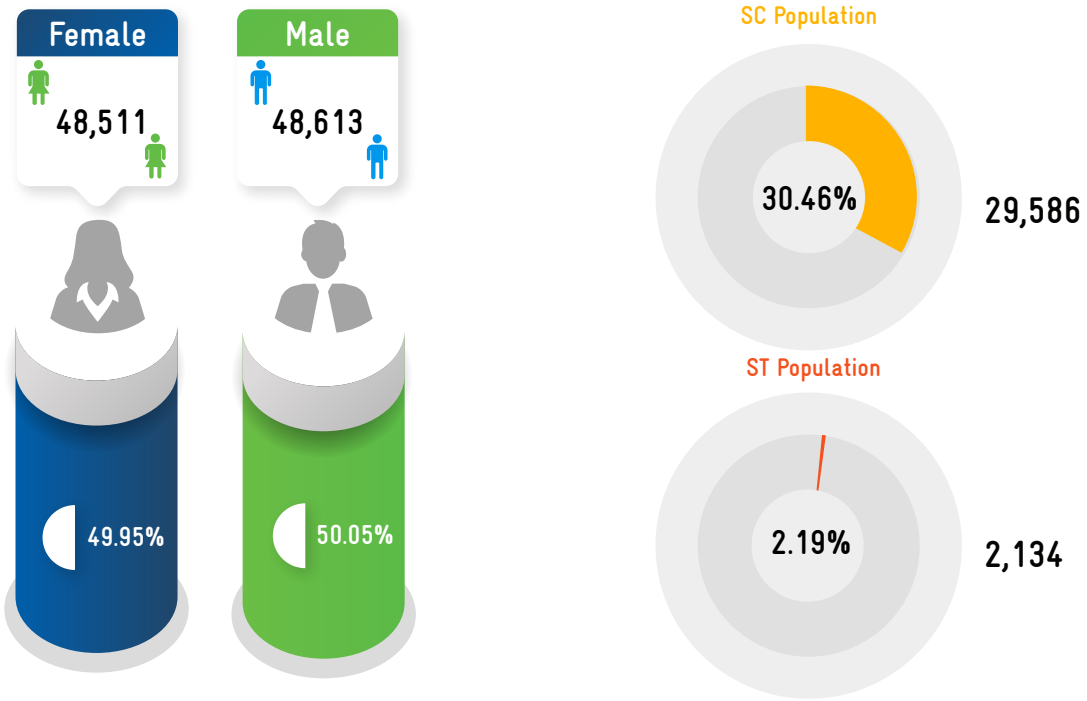


Figure 3.28. Population details

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

3.7.2 Details of households

There are a total of 29,855 households in which 25 % households have only one room, 6.89 % households are headed by women and 17.39 % are vulnerable households (Figure 3.29).

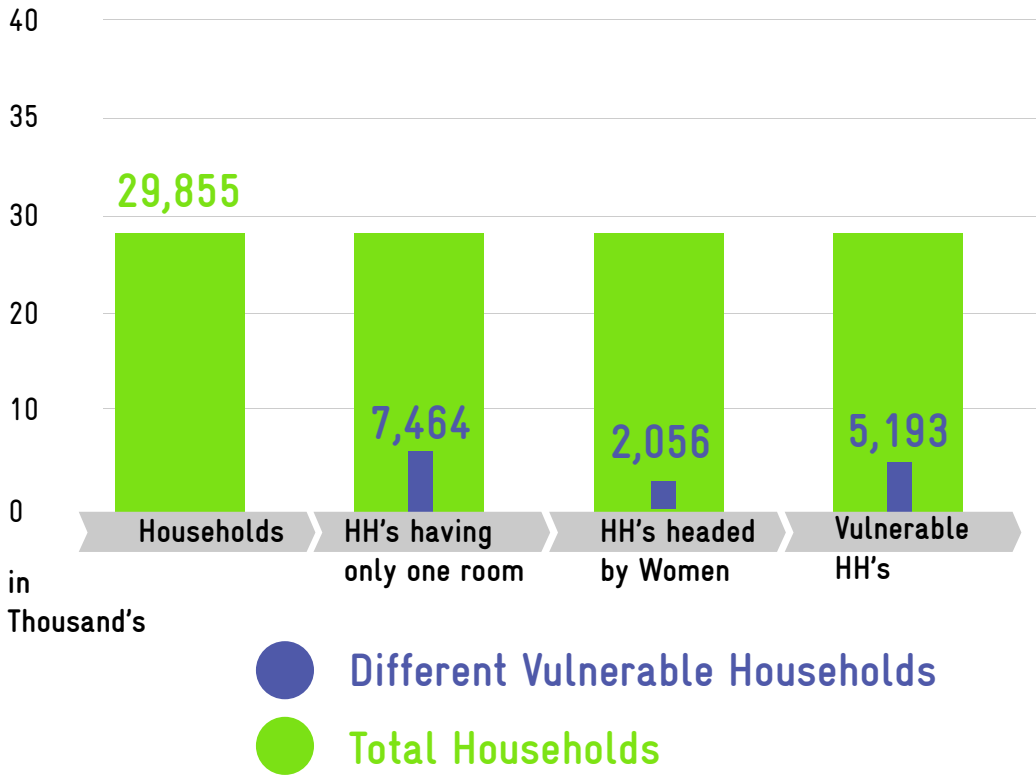


Figure 3.29. Details of Households

3.7.3 Status of Mahatma Gandhi NREGA - job card status

In the Block of the total population of 97 thousand, 40,954 are registered for job cards in Mahatma Gandhi NREGA scheme in which 70.2 % of the job cards are in active category (Figure 3.30).

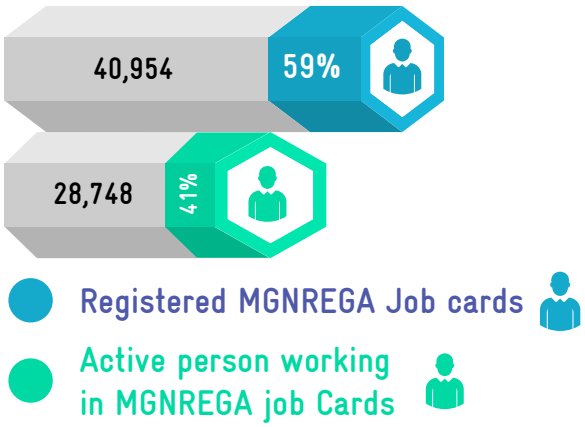


Figure 3.30. Status of MGNREGA job cards

3.7.4 Drinking Water Sources

Nearly 21,495 households have tap water connection and 13,956 households depend on other water sources for domestic use, where other sources included RTRWHS / Tanka (roof rain water harvesting systems, hand pump, open wells, bore wells, tank/ pond/ oorani, springs and river/ streams.

Tap water connection

21,495
Households

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

13,956
Households

3.7.5 Annual Greywater Generation

The grey water generation estimated across this Block is 439 ha.m which is available for reuse or recycle.

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

Morphology

Seeyamangalam, Chitharugavoor, Achamangalam

Wasteland

Malaiyur, Gengampoondi, Goodalur, Kodiyalam

Soil erosion

Vadakkupattu, Ponnur, Sathapoondi, Malaiyur

Upland/Slope

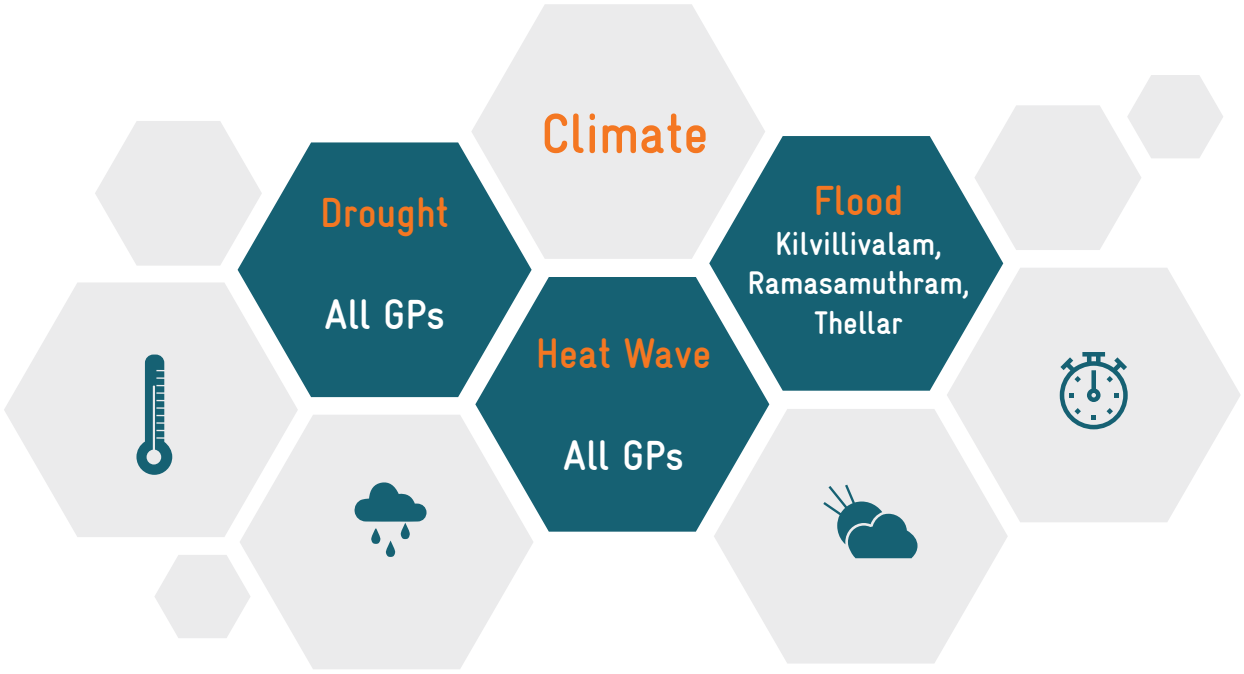
Vanakkambadi, Sivanam, Theyyar

Ground water prosperity

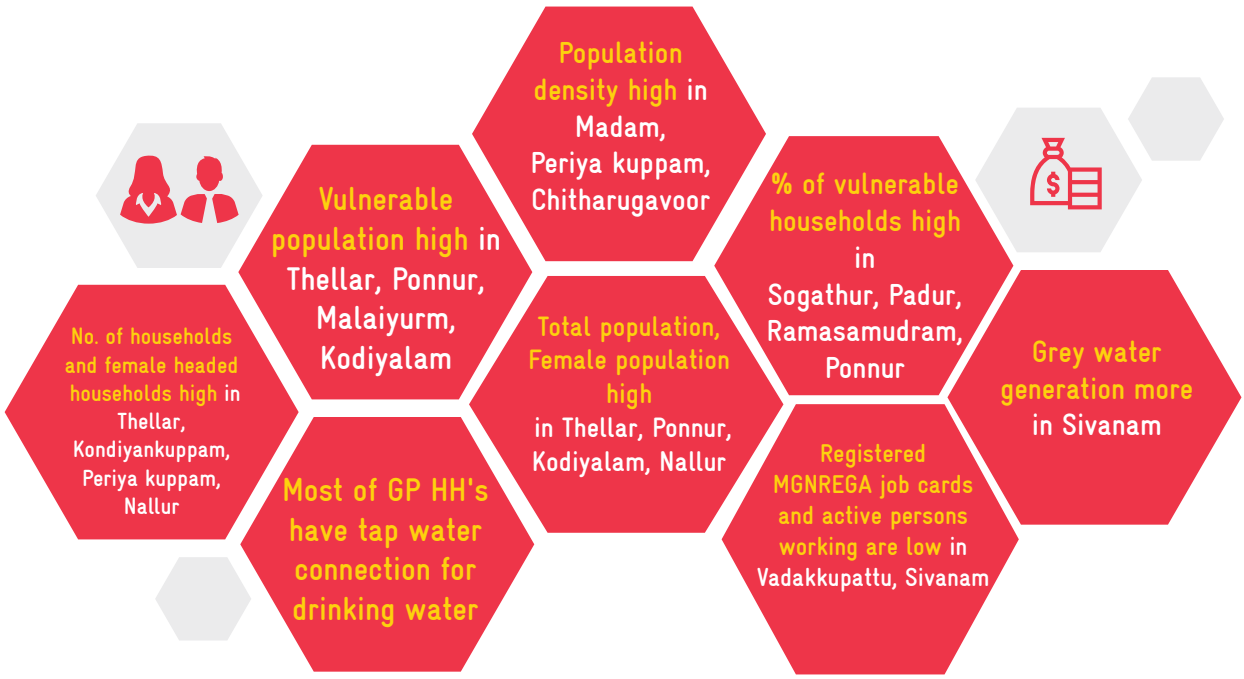
Gengampoondi, Arunkunam, Mahamai_thirumani

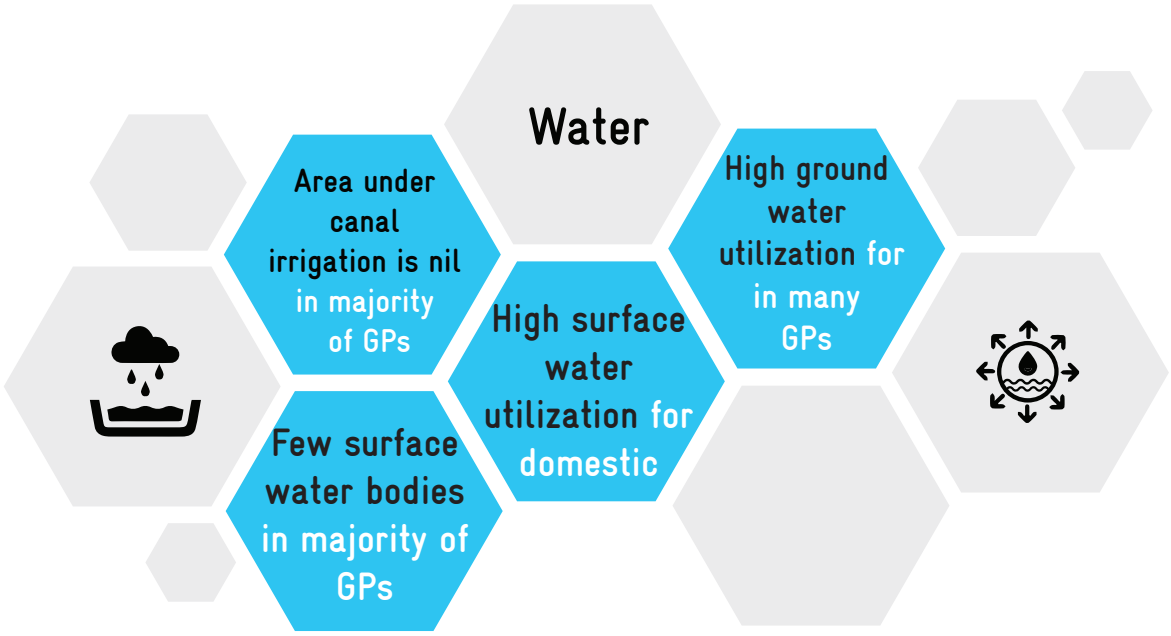
Salt affected area

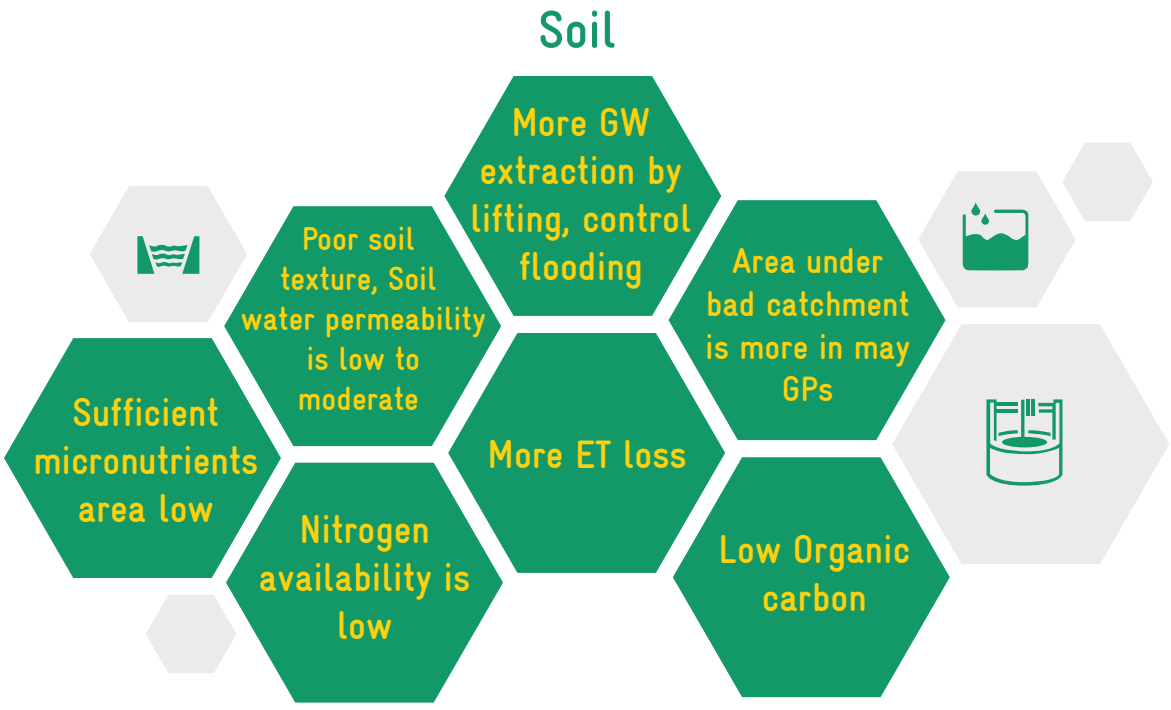
Nerkunam, Vedal, Kunnagampundi



Socio economic




Water
Area under canal irrigation is nil in majority of GPs
High ground water utilization for in many GPs
High surface water utilization for domestic
Few surface water bodies in majority of GPs


Soil
More GW extraction by lifting, control flooding
Poor soil texture, Soil water permeability is low to moderate
Area under bad catchment is more in may GPs
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).

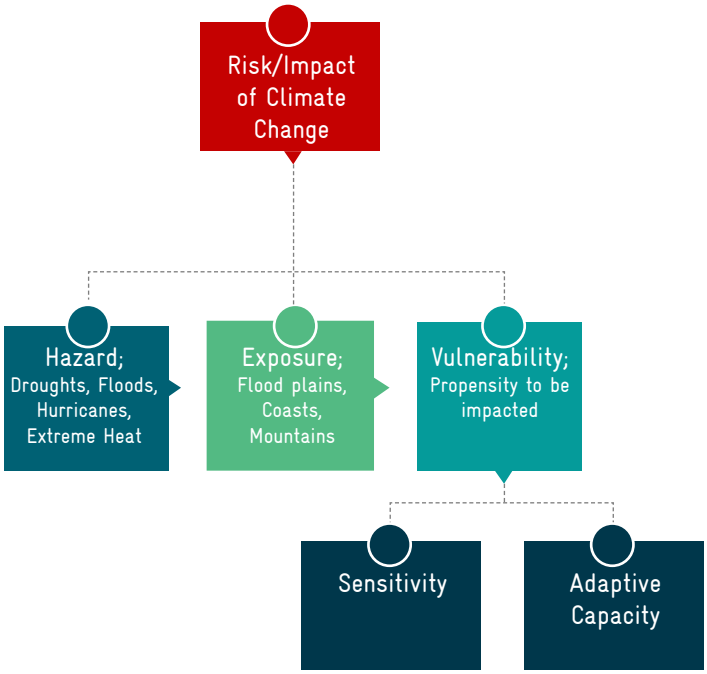


Figure 4.1. Vulnerability of the system as defined by IPCC

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.

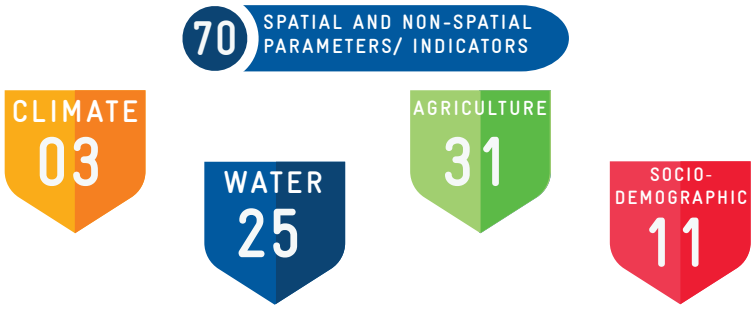


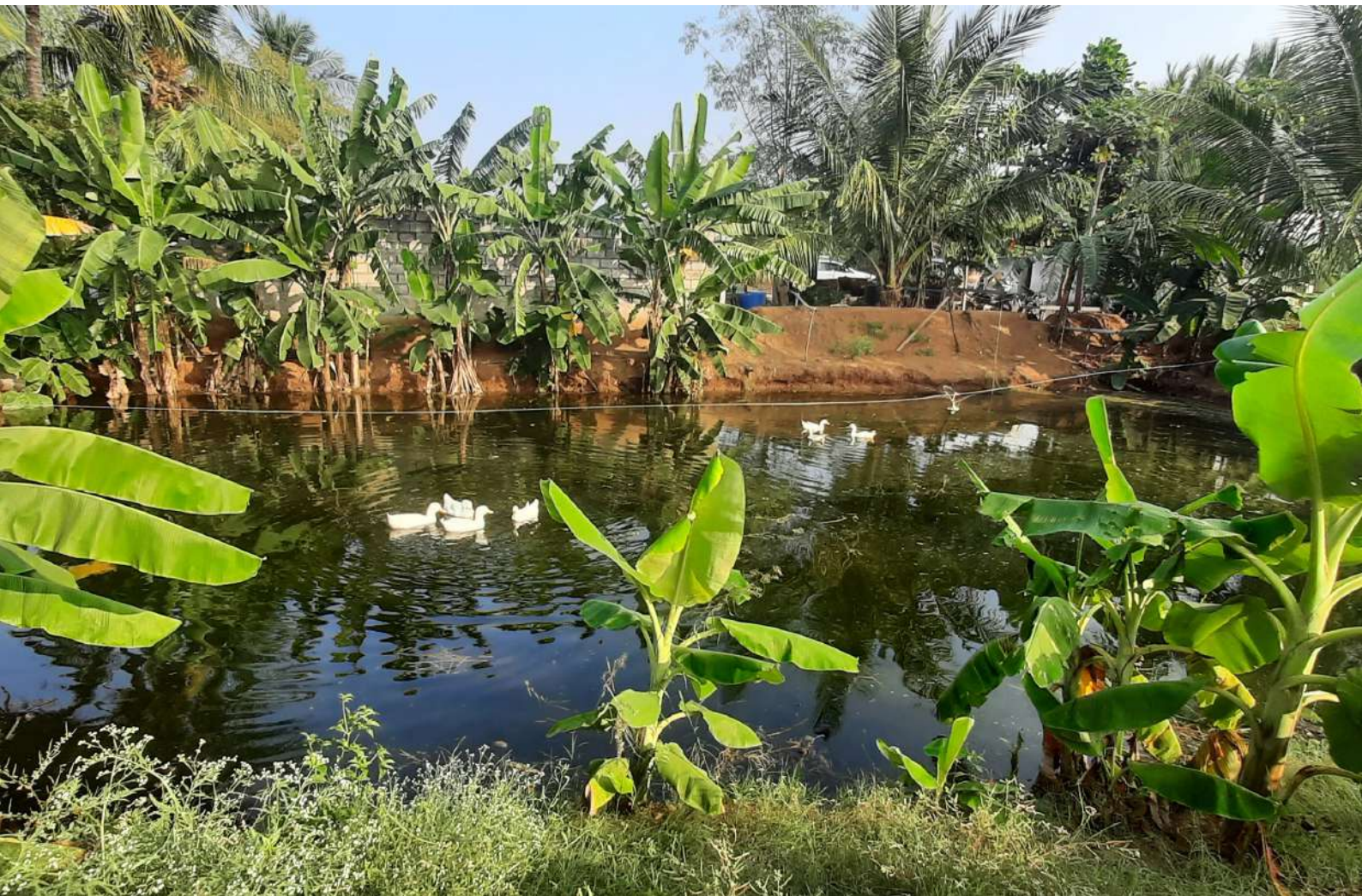
TABLE 9. CWRM PARAMETERS SELECTED FOR BLOCK LEVEL VULNERABILITY

	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. In Thellar Block, Periyakuppam GP has very high overall vulnerability with higher CVI value followed by Padur, Sathapoondi and kadambai GPs. While Mahamai-Thirumani GP with low CVI value (Figure 4.2).

Upto	Category	Color range
0.581	Very High	
0.552	High	
0.523	Medium	
0.494	Low	
0.465	Very low	



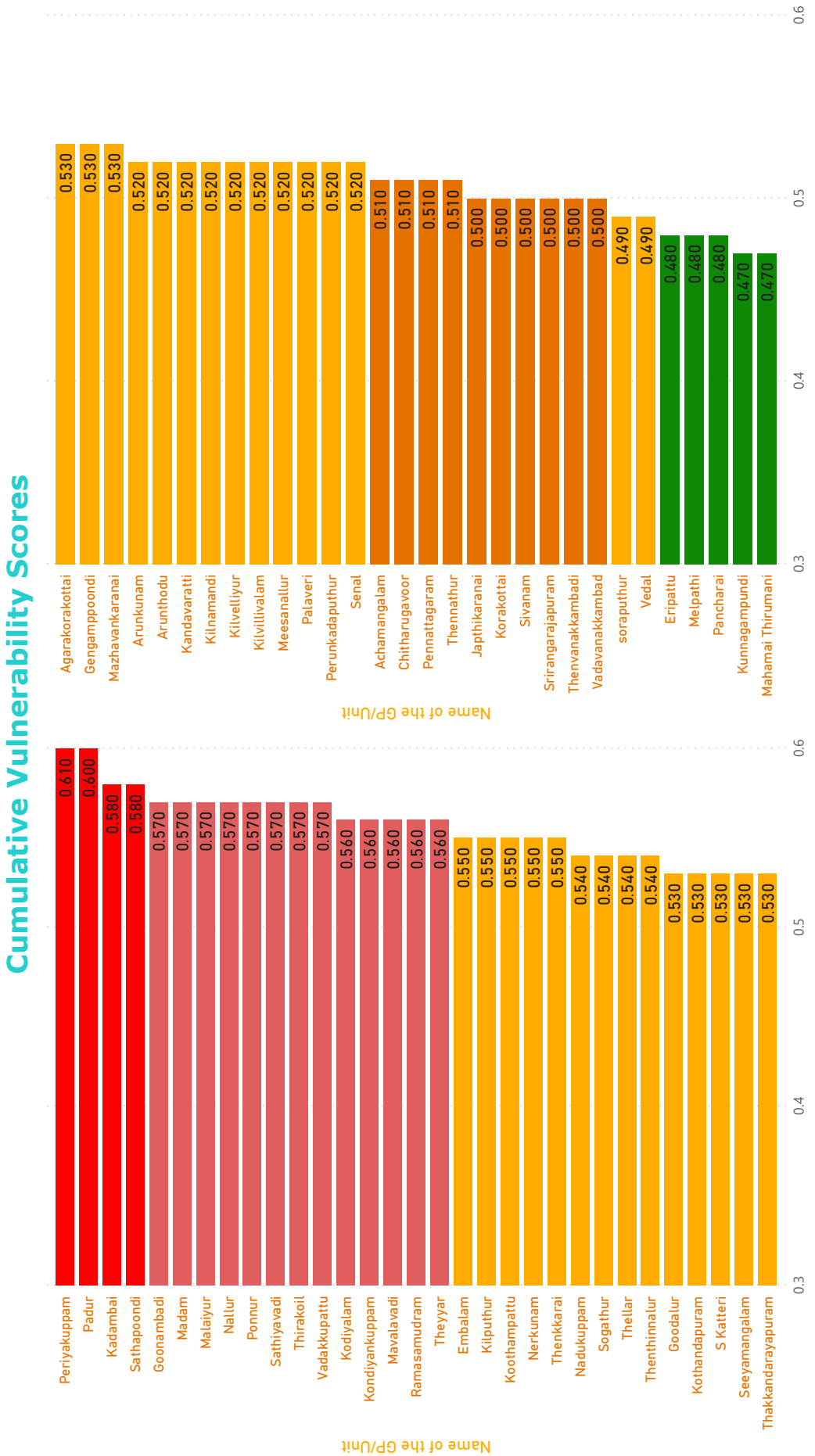


Figure 4.2. Final cumulative vulnerability scores

Sectoral vulnerability

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

Climate risks vulnerability

The climate risk vulnerability index shows that all villages in this Block are affected with droughts and heat waves in last decades while Kilvillivalam, Ramasamudram, Thellar, Achamangalam and Agarakorakottai GPs have prone to moderate flood vulnerability.

KILVILLIVALAM, RAMASAMUDRAM, THELLAR, ACHAMANGALAM, AGARAKORAKOTTAI

Water resource vulnerability

The water resources vulnerability index shows that Nallur GP has high vulnerability followed by Padur, Ponnur, Agarakorakottai, Sathiyavadi, Mavalavadi GPs.

NALLUR, PADUR, PONNUR, AGARAKORAKOTTAI, SATHIYAVADI, MAVALAVADI

Agriculture resources vulnerability

In agriculture and allied sectors, Periya kuppam GP has highest vulnerable score followed by Kondiyankuppam, Theyyar Gps.

PERIYA KUPPAM, KONDIYANKUPPAM, THEYYAR

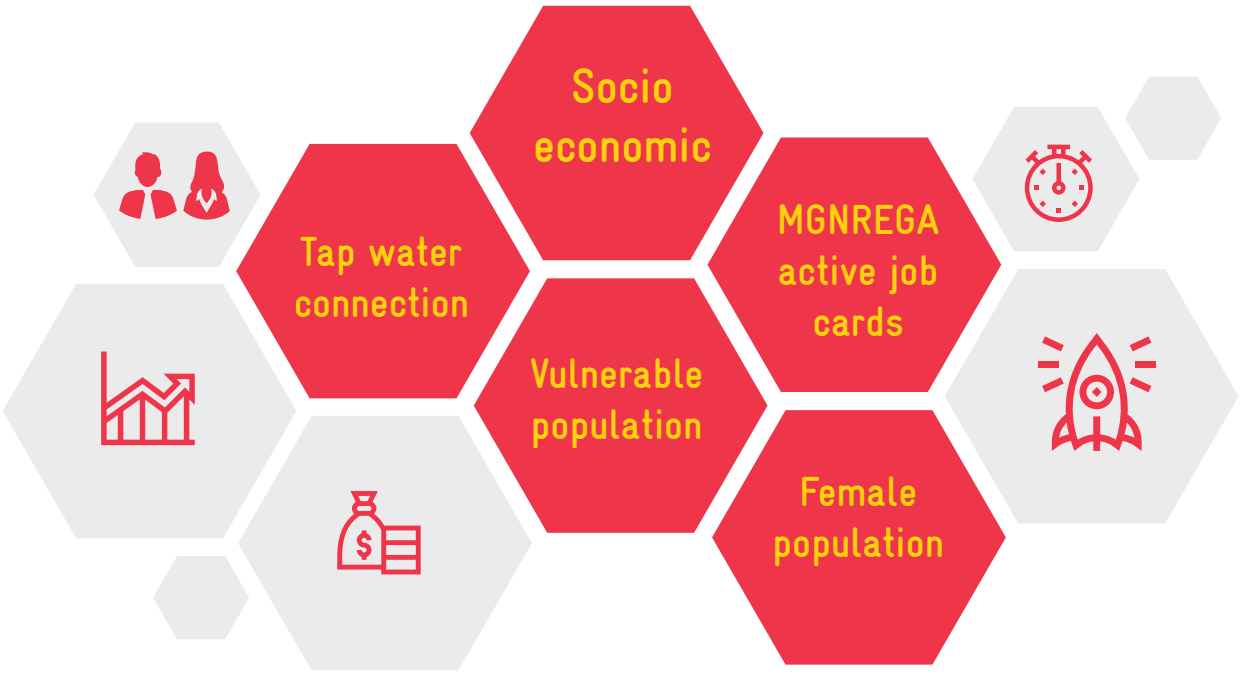
Socio-economic vulnerability

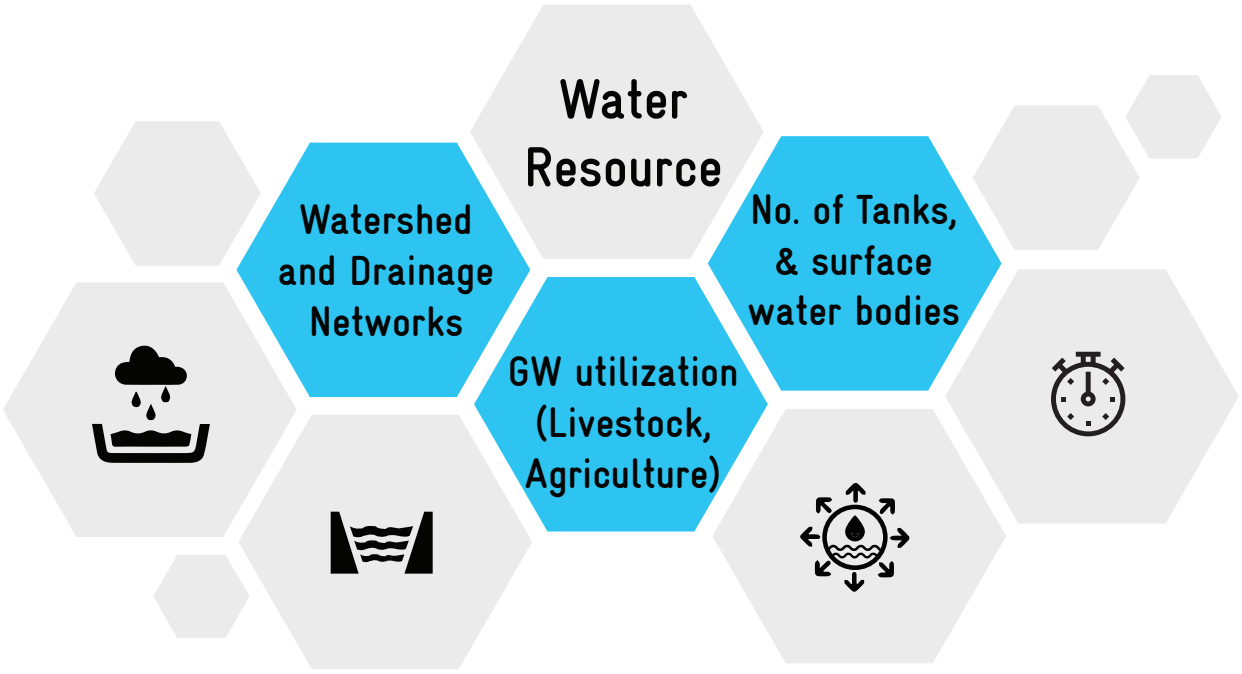
Chitharugavoor GP has high CVI value followed by Padur, Sathapoondi, Mavalavadi, Vadakkupattu GPs

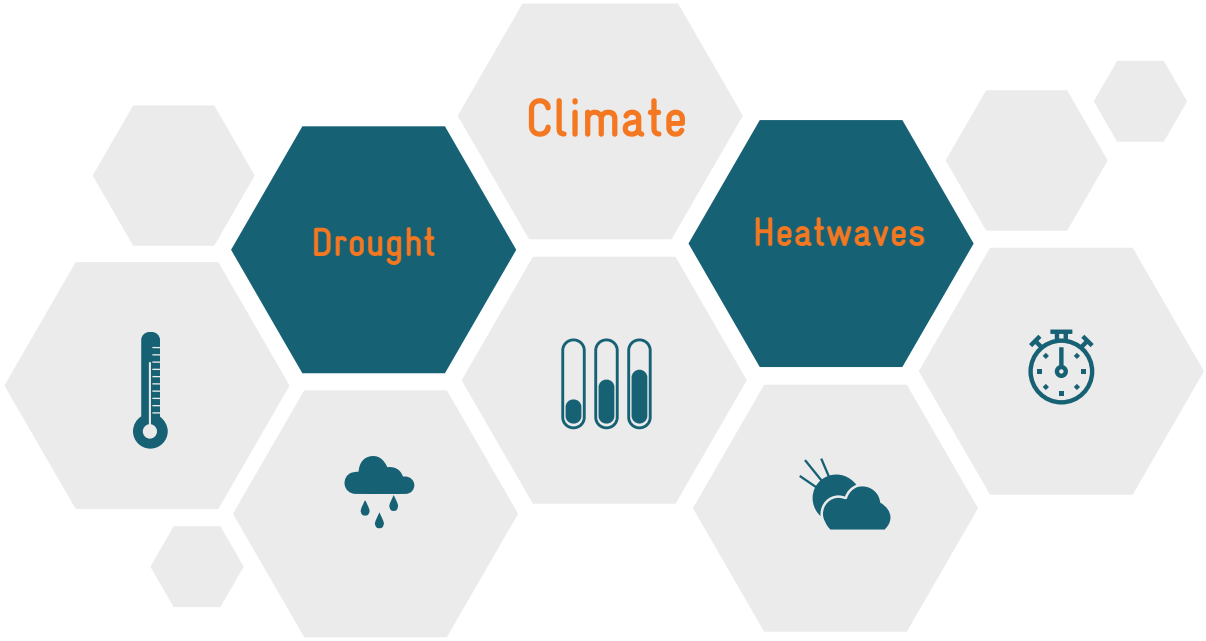
CHITHARUGAVOOR, PADUR, SATHAPOONDI, MAVALAVADI, VADAKKUPATTU

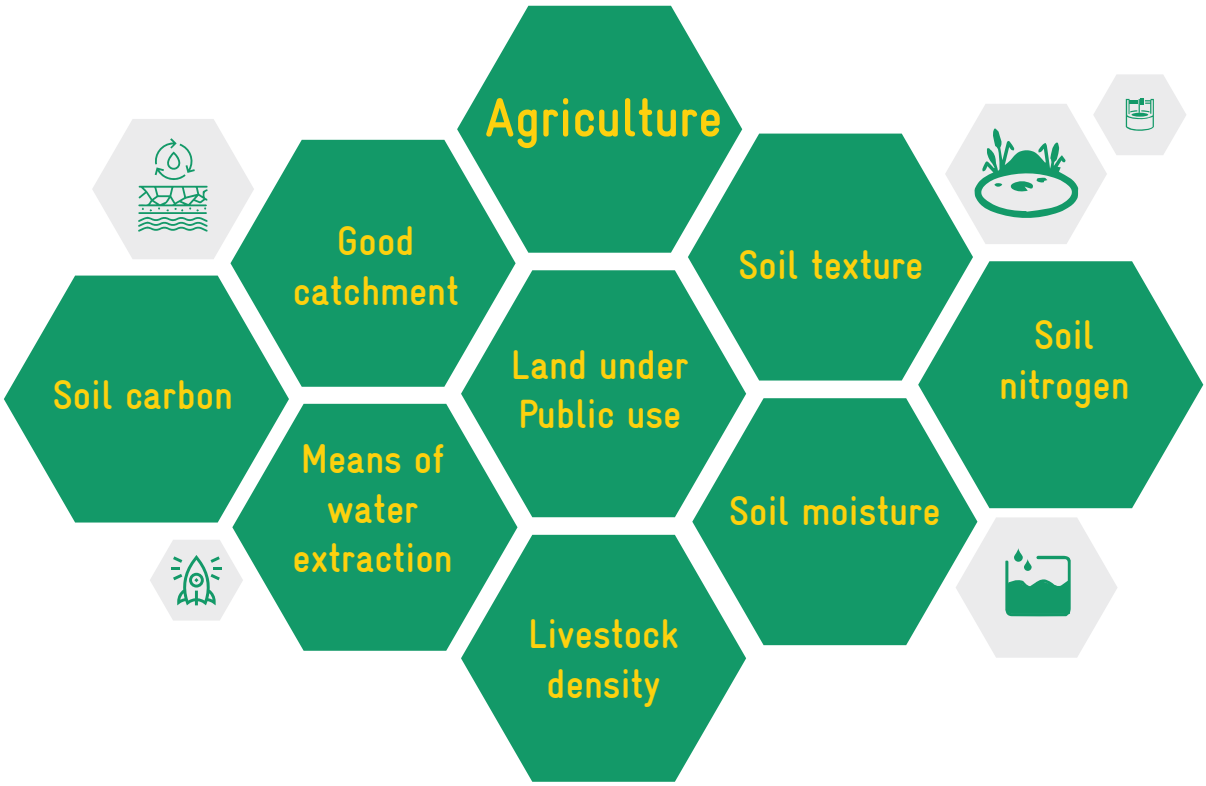
Figure 4.3. GP wise vulnerability dimensions

Contributing indicators to the total vulnerability









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

விசும்பின் துளிவீழின் அல்லால்மற் றாங்கே
பசும்புல் தலைகாண்பு அரிது

குறள் - 16

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

Thirukkural - 16

CHAPTER 5

PROPOSED KEY WATER ACTIONS UNDER MAHATMA GANDHI NREGS CONVERGENCE

5 PROPOSED KEY WATER ACTIONS UNDER MAHATMA GANDHI NREGS CONVERGENCE

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

5.1 THE PROPOSED AREA UNDER WASCA TREATMENT

Out of 30,398.7 ha available land in Thellar Block, 5514.4 ha (18.14 %) area is proposed for treatment under WASCA TN– CWRM planning. A major portion of key water actions is proposed in current fallow land i.e. 1,345 ha (24.39 %) followed by unirrigated land in 944 ha (17.12 %) while less than five percent of permanent pastures and other grazing land, fallow land other than current fallow, forest land, miscellaneous tree crops etc. land area is proposed for water actions.

TABLE 10. THE PROPOSED AREA FOR WASCA TREATMENT

Land use	Total available land (ha)	WASCA proposed treatment area (ha)
Current Fallow land	8,064.4	1,345.2
Area Irrigated by Source	7,824.1	910.2
Non-Agricultural Uses	6,013.3	932.0
Unirrigated Land	5,449.1	944.4
Fallows Land other than Current Fallows	1,477.8	263.3
Barren & Un-cultivable Land	694.0	483.8
Cultivable Waste Land	438.0	326.0
Permanent Pastures and Other Grazing Land	312.1	225.0
Land Under Miscellaneous Tree Crops etc.	101.4	74.9
Forest land	24.6	9.8

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

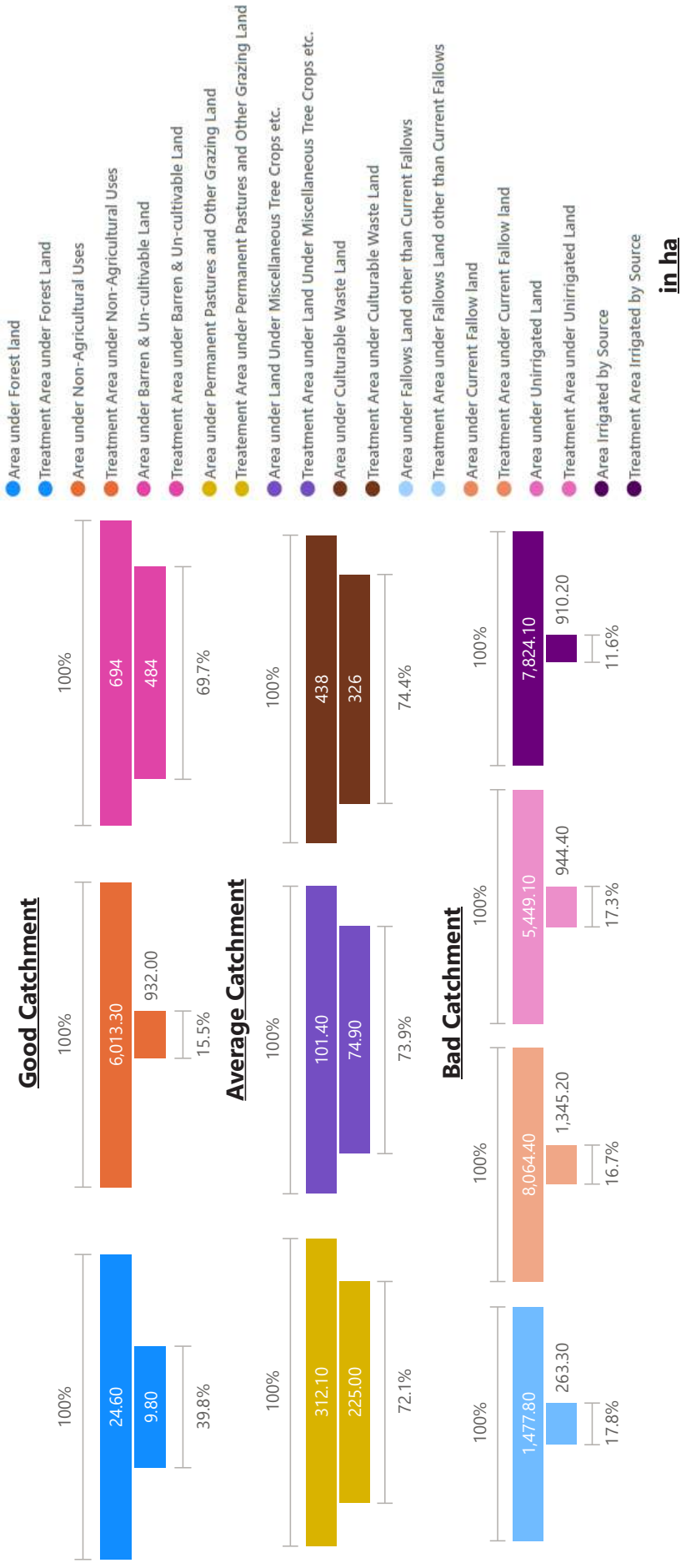


Figure 5.1. WASCA treatment area in percentage

Expected Runoff Conservation after WASCA treatment

The productive developmental activities that were taken up in the WASCA proposed areas are termed as key water actions. With the above proposed treatment area, the expected runoff harvested due to WASCA intervention would be around 1,748.5 ha.m which is 23.1 % of the total runoff. Of the expected runoff conservation, 43.74 % comes from good catchment area, 9.94 % comes from average catchment area and 46.31 % comes from bad catchment area (Figure 5.2).

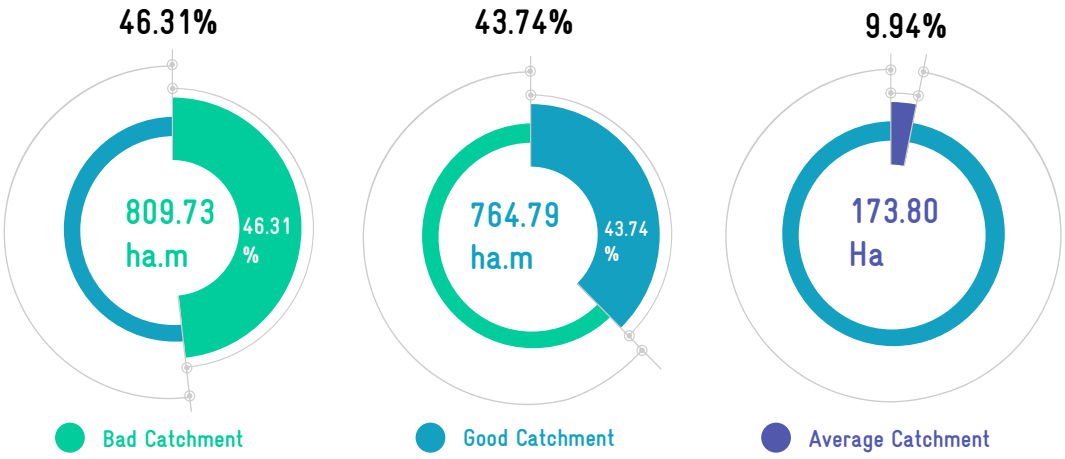


Figure 5.2. Expected conservation after WASCA treatment

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. GP wise works are annexed in annexed in Annexure 5.3.

Work (unit)	Abbreviation (unit)	No.	Extent (area in ha or length in m)
Azolla units - Individual (Number of units)	Az	3,696	
Cattle Shelters (Number of units)	CS	2,757	
Cattle Trough(Number of units)	CT	2,757	
Fodder development - Community & Individual	FD	1,515	
Goat Sheep Shelters (Number of units)	GSS	581	
Poultry Shed (Number of units)	PS	2,757	
Silvi-pasture Development(ha)	SPD	1,16,949	151.27
Soak Pits (Community) (Number of units)	SPC	244	
Soak Pits (Individual) (Number of units)	SPI	1,063	
Artificial Recharge Structure(Number of units)	ARS	23	1,305
Construction of Farm Ponds - Individual (Number of units)	FP	704	

Construction of new open wells & Recharge Shafts (Number of units)	COWRS	1,373	
Restotaration of water bodies:a.PWD and Tanks(Number)	RPWDT	154	
Restotaration of water bodies:b. Ooran-is(Number)	Ro	16	
Restotaration of water bodies:c. Ponds(Num-ber)	RP	223	
Roof Rain Water Harvesting (Number of units)	RRWH	122	
Water Course - Irrigation Channels - Desilt-ing (Mtrs)	WCICD		1,30,895
Afforestation in Public/common lands(ha)	Aff	2,37,513	280.39
Avenue plantation(km)	AVP	71,575	286,271.10
Block Plantation (Community)(ha)	BP	3,58,037	445.44
Canal Bund Plantation(ha)	CBP	7,801	39,005
Contour Continous Bunds (CCB) for Affor-estaion area(Mtrs)	CCBF	1,09,259	1,062.09
Drainage Line Treatment (DLT)(Mtrs)	DLT	8,726	43,630
Dry land Horticulture/Agro-forestry - Indi-vidual (ha)	DLHAI	2,20,792	560
Irrigation Channel Plantation (Mtrs)	ICP	26,179	1,30,895
Linear Plantation(km)	LP	24,094	1,02,250
Micro Irrigation(ha)	MI	20	50
Nursery Development(Number of units)	ND	54,863	10,973
Composting (Number of units)	Co	478	67.35
Farm Bunding with Boundary Trenches - Individual (ha)	FBBTI	419	906
Land development - Individual (ha)	LDI	291	765
NADEP Vermi compost (Number of units)	NADEP	3,032	


Proposed works are included the drought proofing, livelihood, land development and WCWH, measures
Land development works over 1,730 ha area
More than 11 Lakhs plants planting
2,600 sites for WCWH
More than 15,000 livelihood works

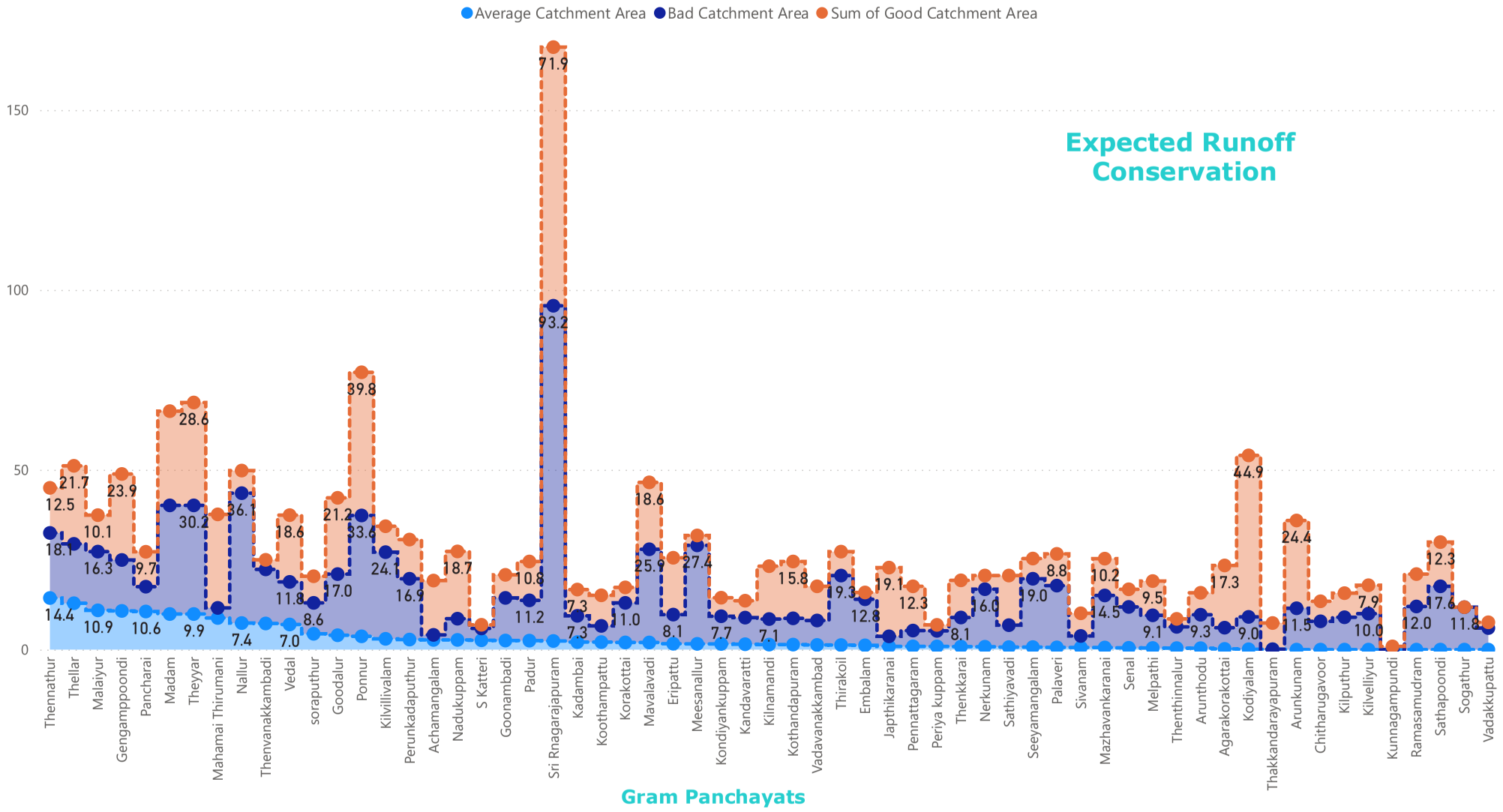


Figure 5.3. Expected GP wise runoff conservation after WASCA treatment

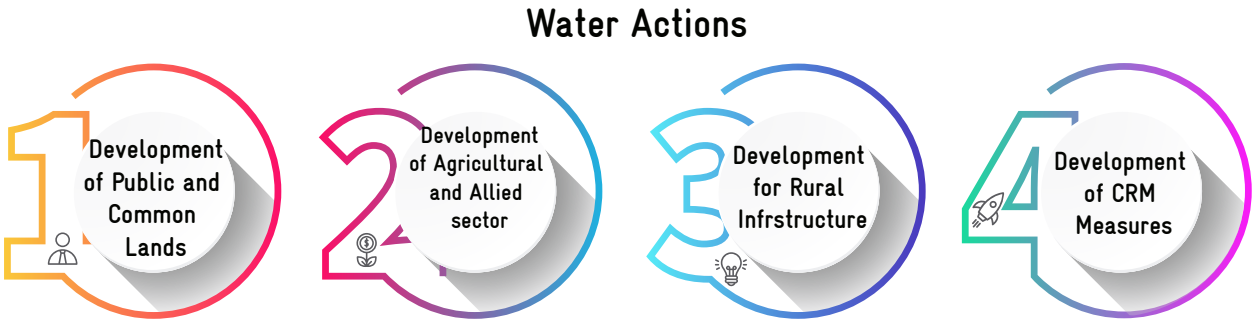
MAHATMA GANDHI NREGS Annual circular 2020-21 (Clause 6.3)

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)	216.3	10	-	5.4	2,163
COMPOSTING(NUMBER OF UNITS)	424	15	0.2	72.1	6,360
AFFORESTATION IN PUBLIC/ COMMON LANDS(ha)	280.4	3,344	8.6	2,411.4	9,37,624.2
BLOCK PLANTATION (COMMUNITY)(ha)	441.4	4,320	11.1	4,900	1,907,020.8
SILVI-PASTURE DEVELOPMENT(ha)	146.8	6,664	17.1	2,509.8	9,78,075.3
LINEAR PLANTATION(km)	6.8	703	1.8	12.3	4,784.6
CANAL BUND PLANTATION(ha)	569.0	2,930	7.5	3,203	1,212,040
IRRIGATION CHANNEL PLANTATION (m)	24.5	6	-	0.4	147
AVENUE PLANTATION(km)	9.3	703	1.8	16.8	6,569.5
NURSERY DEVELOPMENT (NUMBER OF UNITS)	19.8	2,344	15	296.8	46,376
RESTOTARATION OF WATER BODIES: A) PWD AND TANKS (NUMBER)	149	800	5	745	1,19,200
RESTORATION OF WATER BODIES: B.PONDS (NUMBER)	-	200	2	-	0
RESTORATION OF WATER-BODIES: C. PONDS (NO.)	294	200	1	588	58,800
ARTIFICIAL RECHARGE STRUCTURE (NUMBER OF UNITS)	612	391	2.5	1,530	2,39,292
WATER COURSE - IRRIGATION CHANNELS - DESILTING (m)	24.5	3	-	0.2	73.5
DRAINAGE LINE TREATMENT (m)	228.8	5	-	6.9	1,144

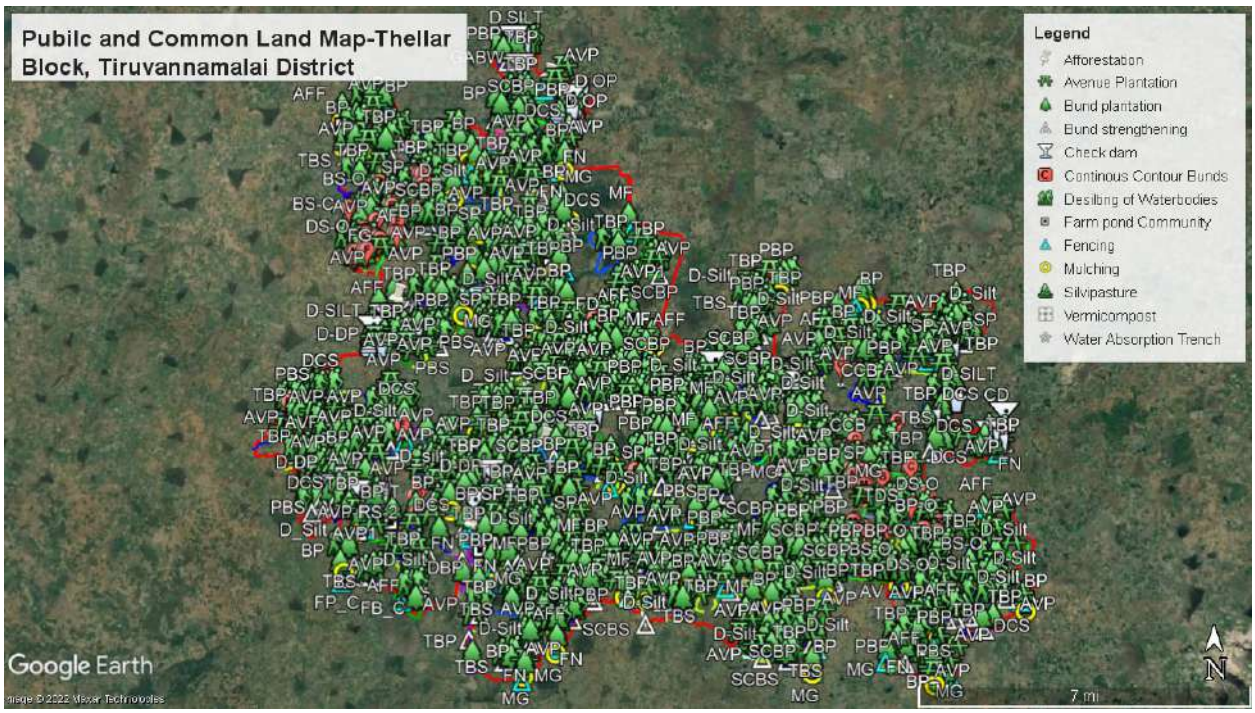


Figure 5.4. Proposed development activities in public and common land

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 livestocks 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)	1,045.7	586	1.5	1,568.6	6,12,803.6
MICRO IRRIGATION (ha)	25	0	1	25	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	636	781	2	1,272	4,96,716
LAND DEVELOPMENT - INDIVIDUAL (ha)	475.1	3,906	10	4,751.2	18,55,818.7
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	3,309	3,321	8.5	28,126.5	1,09,89,189
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	2,656	23	0.2	398.4	61,088
NADEP VERMI-COMPOST (NUMBER OF UNITS)	2,612	27	0.2	470.2	70,524
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	1,515	2,344	1.5	2,242.2	35,51,160
CATTLE SHELTERS (NUMBER OF UNITS)	2,446	331	2.1	5,185.5	8,09,626
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	687	355	2.3	1,559.5	2,43,885
CATTLE TROUGH (NUMBER OF UNITS)	2,476	6	0.1	123.8	34,856
POULTRY SHED (NUMBER OF UNITS)	2,344	10	0.1	211	23,440
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	1,318	926	5	6,590	12,20,468

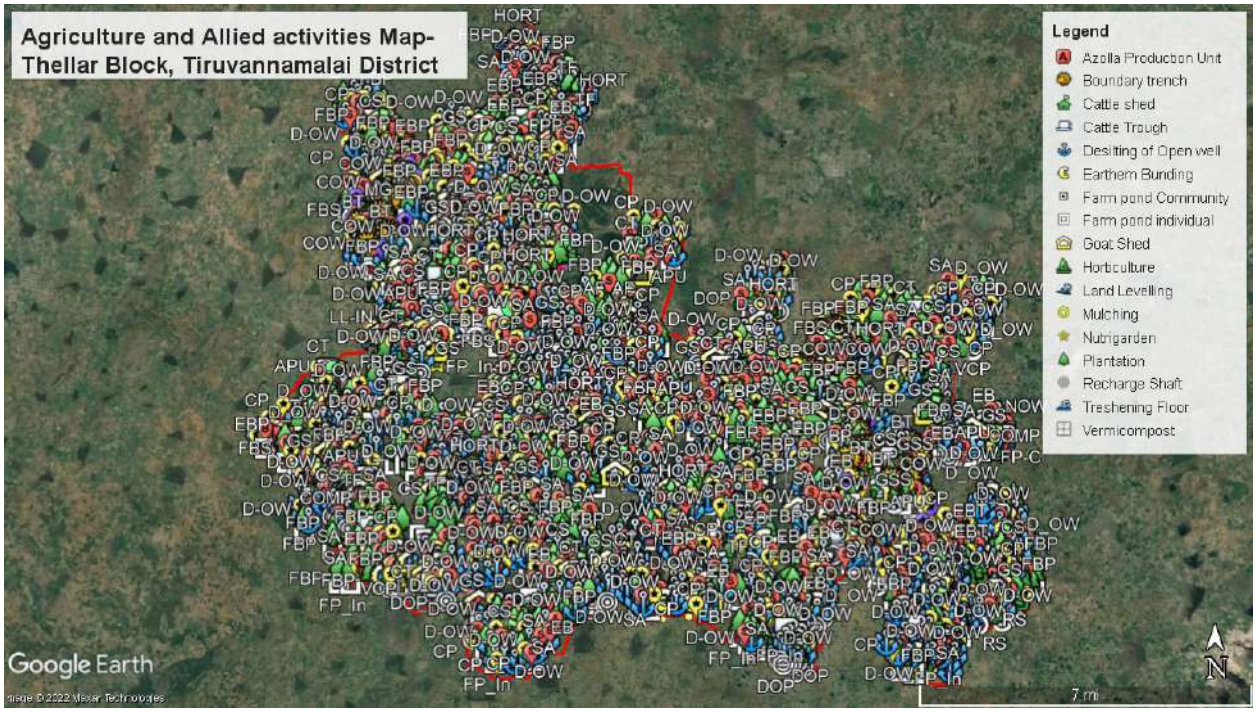


Figure 5.5. Proposed development activities in Agriculture and allied Sectors

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)	719	20	0.1	93.5	14,380
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	4,653	16	0.1	465.3	74,448
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	122	625	4	488	76,250

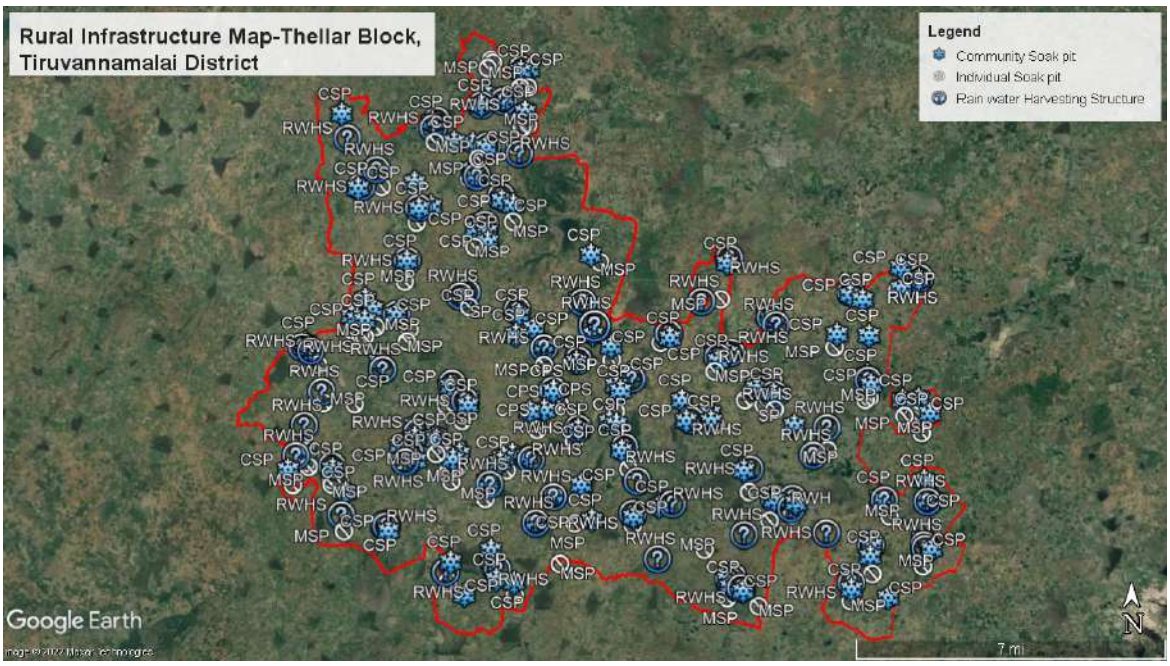


Figure 5.6. Proposed rural infrastructure activities

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 Thellar Block is a drought prone area and frequently exposed to severe droughts, more measures are proposed to manage droughts and its subsequent impacts (Table 14). CRM such as farm ponds (Table 15), Silvi-pasture (Table 16), Mini Forestry (Table 17), Fallow Land Development (Table 18) and Greening of Hills (Table 19) are proposed in this Block in saturation mode.

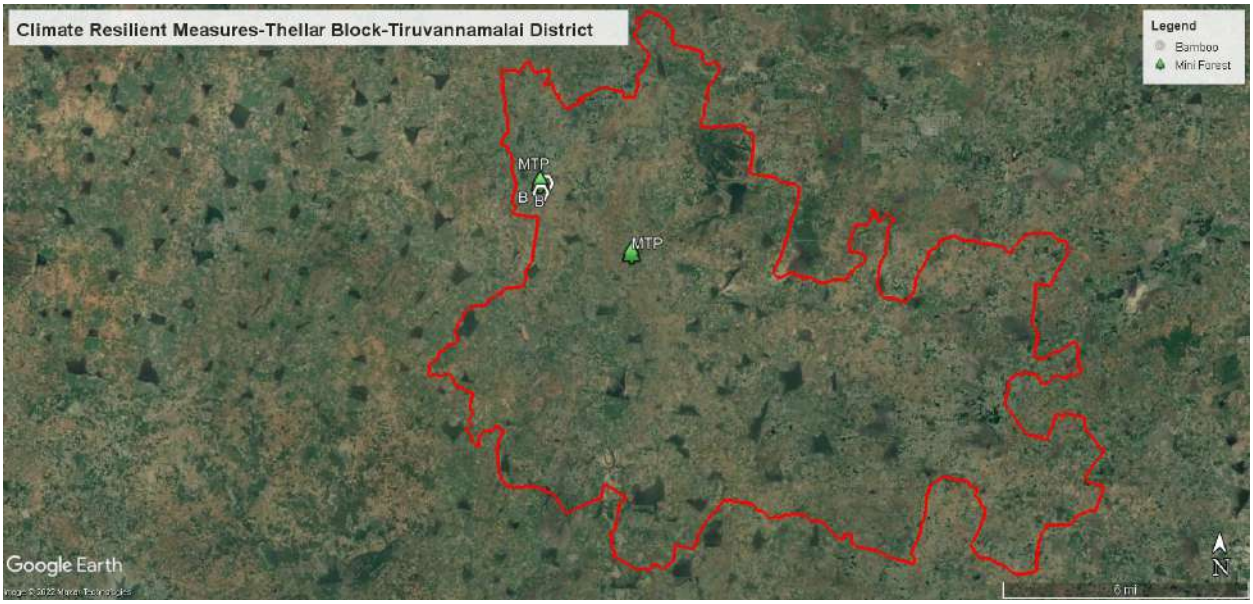


Figure 5.7. Proposed climate resilient measures

TABLE 14. GP WISE PROPOSED CRM

GP	Agriculture and allied activities	Public and common land
Agarakorakottai	Farm pond	
Arungunam	Farm pond	
Arunthodu	Farm pond	

Embalam	Farm pond	
Eripattu	Farm pond	
Gunambadi	Farm pond	
Japthikarani	Farm pond	
Kadambai	Farm pond	
Kandavaratti	Farm pond	
Kilnamandi	Farm pond	
Kilvellivalam	Farm pond	
Kilvelliyur	Farm pond	
Kodiyalam	Farm pond	
Kondaiyankuppam	Farm pond	
Korakottai	Farm pond	
Kothandapuram	Farm pond	
Kunnagampoondi	Farm pond	
Kuthampattu	Farm pond	
Madam	Farm pond	
Magamaithirumani	Farm pond	
Mallavadi		Silvi-pasture
Mavalavadi	Farm pond	
Mazhaiyur	Farm pond	
Mazhavankarani	Farm pond	
Meesanallur	Farm pond	Mini Forest
Melpathi	Farm pond	
Nadukuppam	Farm pond	
Padur	Farm pond	
Pazhaveri	Farm pond	
Pennattagaram	Farm pond	
Periyakuppam	Farm pond	
Ponnur	Farm pond	
Ponnur RF		Greening of Hillocks
Ramasamudram	Farm pond	
S. Katteri	Farm pond	
Sathapoondi	Farm pond	
Sathiyavadi	Farm pond	
Seeyamangalam		Fallow Land Development
Senal	Farm pond	
Sogathur	Farm pond	
Srirangarajapuram	Farm pond	
Thakkandarayapuram	Farm pond	
Thellar	Farm pond	
Thenkarai	Farm pond	
Thenthinnalur	Farm pond	
Theyyar	Farm pond	
Thirakoil	Farm pond	
Vadakkupattu	Farm pond	
Vadavanakkampadi	Farm pond	

TABLE 15. DETAILS OF PROPOSED FARM PONDS ACTIVITIES UNDER CRM

GP	Habitation	No of farm ponds
Agarakorakottai	Agarakorakottai	1
Arunthodu	Arunthodu	1
Kadambai	Kadambai	1
Kilnamandi	Kilnamandi	1
Kilvelliyur	Kilvelliyur	2
Kunnagampoondi	Kunnagampoondi	2
Magamaithirumani	Magamaithirumani	2
Mazhaiyur	Mazhaiyur	1
Melpathi	Melpathi	1
Sathapoondi	Sathapoondi	2
Srirangarajapuram	Srirangarajapuram	1
Thakkandarayapuram	Thakkandarayapuram	2
Thellar	Thellar	4
Thenkarai	Thenkarai	1
Kodiyalam	Kodiyalam	1
Thenthinnalur	Thenthinnalur	1
Thirakoil	Thirakoil	1
Vadakkupattu	Vadakkupattu	1
Arungunam	Arungunam	1
Embalam	Embalam	1
Eripattu	Eripattu	1
Gunambadi	Gunambadi	3
Japthikarani	ADC	2
Kandavaratti	Kandavaratti	1
Kilvellivalam	Kilvellivalam	2
Kodiyalam	Kodiyalam	3
Kondaiyankuppam	Kondaiyankuppam	1
Korakottai	Korakottai	2
Kothandapuram	Kothandapuram	1
Kuthampattu	Kuthampattu	1
Madam	Madam	2
Mavalavadi	Mavalavadi	1
Mazhavankarani	Mazhavankarani	1
Meesanallur	Meesanallur	2
Nadukuppam	Nadukuppam	1
Padur	Padur	1
Pazhaveri	Pazhaveri	1
Pennattagaram	Pennattagaram	1
Periyakuppam	Periyakuppam	1
Ponnur	Ponnur	1
Ramasamudram	Ramasamudram	1
S. Katteri	S. Katteri	1
Sathapoondi	Sathapoondi	1
Sathiyavadi	Sathiyavadi	2
Senal	Senal	1

Sogathur	Sogathur	1
SriRangarajapuram	Kandayanallur	1
Theyyar	Theyyar	2

TABLE 16. DETAILS OF PROPOSED SILVI-PASTURE ACTIVITY UNDER CRM

GP	Area for Plantation In ha	Total Number of Plants
Mallavadi	1.01	808

TABLE 17. DETAILS OF PROPOSED MINI FOREST ACTIVITY UNDER CRM

Sl. No	GP	Area for Plantation (In ha)	Total No. of Plants(1 ha - 10000 saplings)	Classification of land
1	Meesanallur	9.83	98,300	others
		4.62	46,200	others
Total		**14.45**	**1,45,000**	

TABLE 18. DETAILS OF PROPOSED FALLOW LAND DEVELOPMENT ACTIVITY UNDER CRM

GP	Total fallow land (ha.)
Seeyamangalam	192.32

TABLE 19. DETAILS OF PROPOSED GREENING OF HILLOCKS ACTIVITY UNDER CRM

GP	Recommended Area in ha	Classification of land
Ponnur RF	27	RF

All the above works are proposed for all GPs based on watershed and livelihood approach and detailed 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	20,660 ha (64.04 %) of the total area treated under WASCA
2	Percentage reduction of run off	1,748.5 ha.m i.e. 23.12 % of the total runoff harvested due to WASCA interventions
3	No. of waterbodies restored	377 waterbodies (tanks/pond and ooranis) restored
4	Area under afforestation	280.39 ha area under afforestation
5	Area under silvi-pasture development	146.77 ha under Silvi-pasture plantation
6	Length of drainage line treated	189 m length of drainage line treated
7	Canal Bund Plantation	4,145 number of plants through 569 works
8	Nursery development	20 units

20,660 ha AREA TREATED

1,748.5 ha.m TOTAL RUNOFF HARVESTED

377 WATER BODIES RESTORED

280.39 ha AREA AFFORESTATION

146.77 ha SILVI-PASTURE PLANTATION

189 m DRAINAGE LINE TREATED

4,145 PLANTS

20 UNITS NURSERY DEVELOPMENT

6.2 OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED SECTOR

OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

	INDICATOR	OUTCOMES/ IMPACT
1	Assessment of sources of water for live-stock and agriculture demand No of structures established for on-farm (in-situ) water harvesting in dry lands	636 farm ponds established which target the harvest of 11,19,360 cu.m of water which has the potential to irrigate 222.6 ha area in both kharif and rabi seasons
2	Improvement in soil health	2,612 NADEP vermi compost units for soil health improvement
3	Farm bunding with boundary trenches	1,045.74 m in 1046 works
4	Dry land development with agro-forestry	3,309 ha under dry land horticulture
5	Households established fodder plots	1,515 vulnerable households established fodder plots

636 FARM PONDS

2,612 COMPOST UNITS

1,045.74 m FARM BUNDING WITH TRENCHES

1,515 FODDER PLOTS

3,309 ha DRY LAND DEVELOPMENT WITH AGRO-FORESTRY

6.3 OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

	INDICATOR	OUTCOMES/ IMPACT
1	No. of villages having liquid waste management systems	4,653 individual and 719 community level soak pits established for recycle of grey water benefiting 29,855 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	29,855 HHs established nutri-gardens in homesteads and planted 1,49,275 sap-lings

719 COMMON & **4,653** INDIVIDUAL SOAK PITS

122 COMMON ROOF RAINWATER HARVESTING

29,855 NUTRI-GARDENS

1,49,275 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	5 models are identified via., Farm ponds, Silvi pasture, Fallow Land Development, Mini Forest and Greening of Hillocks 68 farm ponds in 47 GPs 1.01 ha under silvi-pasture with 808 plants 14.45 ha under Mini-forest activity with 1,45,000 plants 192.32 ha of fallow land is developed under CRM Greening of hillocks in 27 ha area

68
FARM PONDS

1.01 ha
SILVI PASTURE

14.45 ha
MINI FOREST

27 ha
GREENING OF HILLOCKS

Estimated person days

The total estimated person days required for the above propose activities are 2,56,54,322 as specified below Figure 6.1,

Estimated Cost

The total estimated cost budgeted for the above propose activities is Rs 69,868 Lakhs as specified below Figure 6.2,

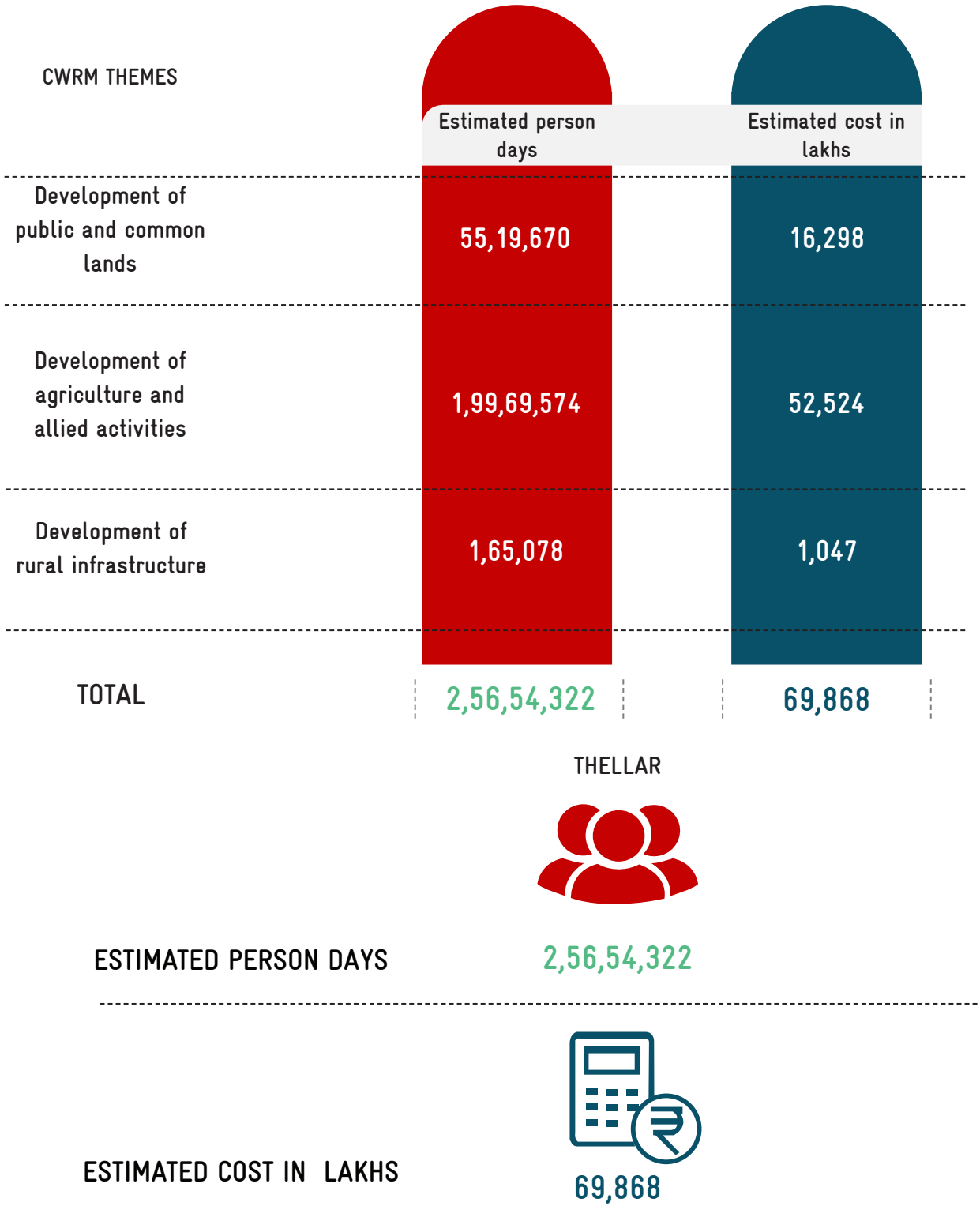


Figure 6.1 & 6.2. Estimated person days & cost for all water actions

6.5 LINKAGES TO SDGS, NDCS

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

6.5.1 NATIONALLY DETERMINED CONTRIBUTION GOALS AND WASCA TN PROGRESS THROUGH NDC

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

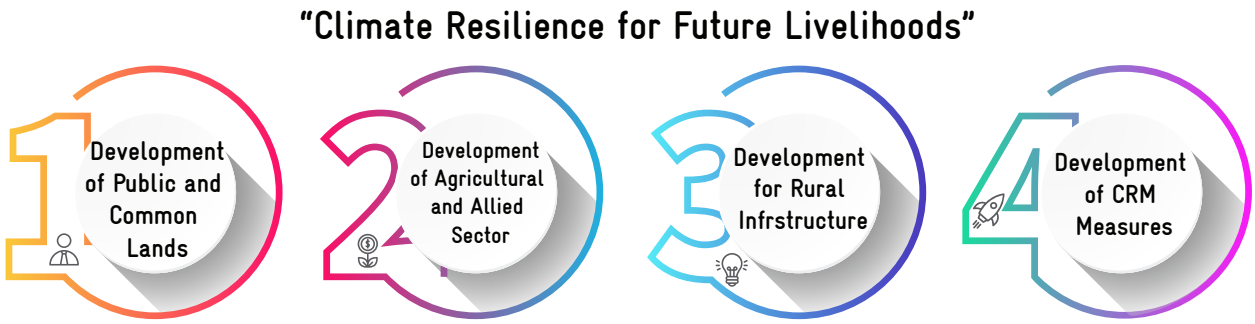
Internationally, the recent process on NDC Enhancement (2020) significantly acknowledge the climate change vulnerability on national sectors including agriculture, energy, and urban areas, especially through impacts on water resources. The role that water and water-related activities play in national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

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

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

6.5.2 WASCA TN SUPPORTS SDG

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



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

SDG GOAL 6

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

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

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

Indicators performed in District and Block level vulnerability assessment of WASCA TN also used in SDG India 2020-21 report (Table 21).

TABLE 20. COMMON VULNERABILITY INDICATORS USED IN WASCA TN & SDG INDIA 2020-21

Head count ratio as per the multidimensional poverty index (%)	
	Persons provided employment as a percentage of persons who demanded employment under MGNREGA

Percentage of rural population getting safe and adequate drinking water within premises through piped water supply

Percentage of rural population having improved source of drinking water

Percentage of ground water withdrawal against availability

Percentage of Blocks/Mandals/Talukas over-exploited

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

Percentage of degraded land over total land area

Percentage increase in area of desertification

The indicators used for district level vulnerability assessment along with its linked SDGs are already tabulated in (Table 2). The detailed proposed water actions in CWRM which was assessed based on the vulnerability dimensions are linked with climate vulnerability index and SGDs are tabulated in Table 21 to 23.

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

Name of the work	No. of CWRM works	Climate Vulnerability Index Impacting (WASCA TN)	Linked SDG Goal
Contour Continuous Bunds for Afforestation area (m)	216	W3	SDG 1,2, 6,13&15
Composting (No. of units)	424	W1	SDG1& 6
Afforestation in Public/common lands (ha)	280	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community) (ha)	441	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	147	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (km)	7	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation (ha)	569	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	25	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (km)	9	C1,C2,C3,W3,S2	SDG 1, 6&13

Nursery Development (No. of units)	20	C1,S2,S4	SDG 1,2 &6
Restoration of waterbodies :PWD and Tanks (No.)	149	S2, S1	SDG 6, 1, 13
Restoration of water bodies : Ooranis (No.)	0	S2, S1	SDG 6, 1, 13
Restoration of waterbodies :Ponds (No.)	294	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	612	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	25	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (m)	229	W1,W3,W4	SDG1 & 6

TABLE 22. WATER ACTIONS ON DEVELOPMENT OF AGRICULTURAL AND ALLIED SECTORS & IT'S LINKED SDG

Name of the Work	No. of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	1,046	A1,A3,W1,W3	SDG 1,2&6
Micro Irrigation(ha)	25	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	636	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	475	W1,W5,A1,A3,S2,S4	SDG 2, 6& 15
Dry land Horticulture/Agro-forestry - Individual (ha)	3,309	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	2,656	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (No. of units)	2,612	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	1,515	A3, S4	SDG 1& 2, 15
Cattle shelters (No. of units)	2,446	S4	SDG 1& 2
Goat/sheep shelters (No. of units)	687	S4	SDG 1& 2
Cattle trough(No. of units)	2,476	W5,S4	SDG 1& 2
Poultry Shed (No. of units)	2,344	S2,S4	SDG 1& 2
Construction of new open wells & Recharge Shafts (No. of units)	1,318	S3,W5,W1	SDG 1,2 & 6

TABLE 23. WATER ACTIONS ON RURAL WATER MANAGEMENT & IT'S LINKED SDG

Name of the work	No. of CWRM works	CVI	Linking SDG
Soak Pits (Community) (No. of units)	719	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	4,653	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

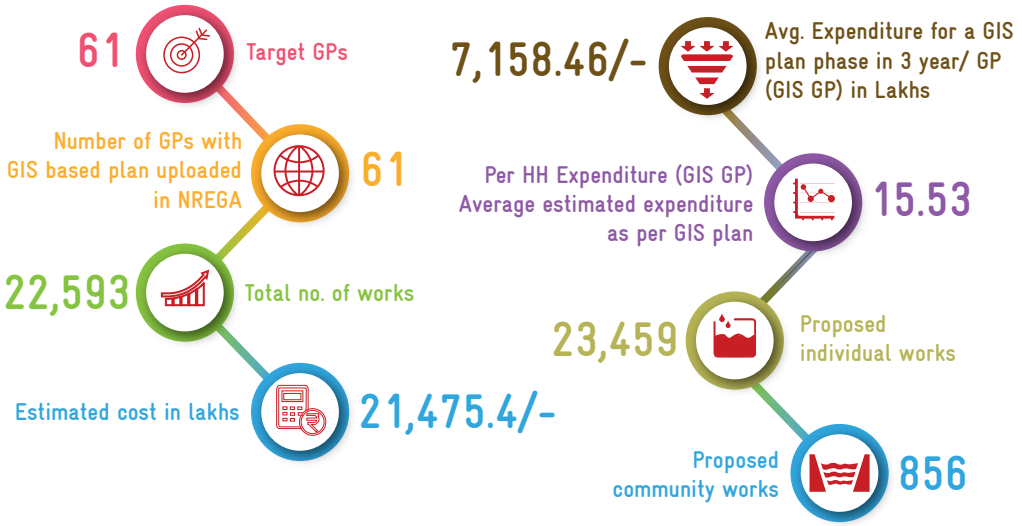
7 IMPLEMENTATION OF GP PLANS

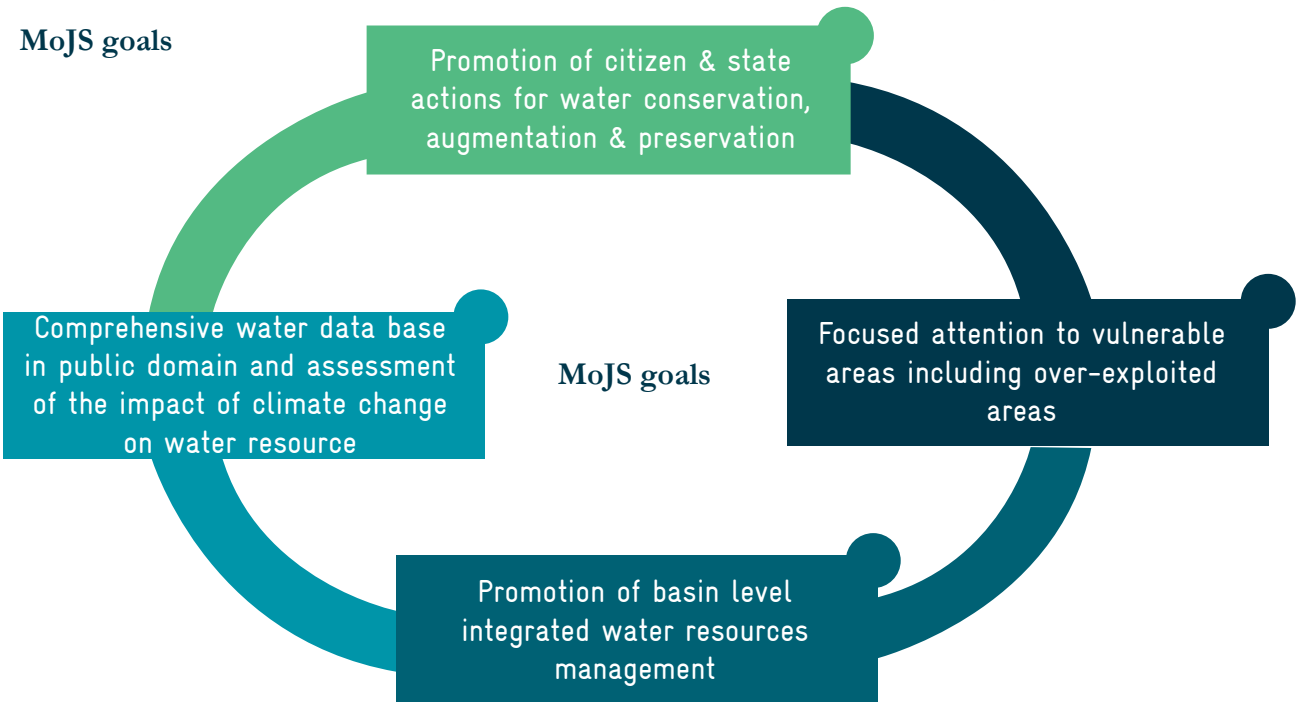
Execution of GP plans includes integrating all verified, approved works in MORD's web enabled ap-plication NREGA Soft (https://nrega.nic.in) for mainstreaming WASCA. The target GPs are iden-tified first, the status of GIS based plans and to-tal works along with its expenditure and category wise esti-mation 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 inte-grating GP level GIS based plans, both NRM and Non NRM activities into Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of Thellar Bock is listed in Table 24 and the details of work progress, expenditure during the past 3 financial years are shown in Figure 7.1 and 7.2. The Total No. of works, ongoing and complet-ed GIS works are shown in Figure 7.3. The GP wise recommendations and works uploaded are given in Annexure 7.1.

TABLE 24. GIS PLAN IMPLEMENTATION- KEY PARAMETERS PERFORMANCE IN THELLAR BLOCK





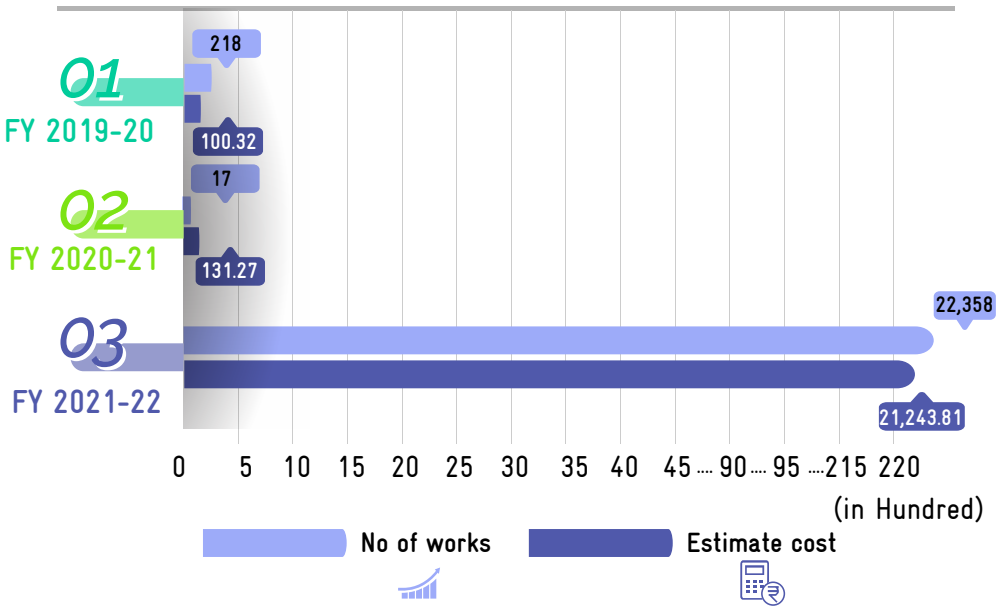


Figure 7.1. Work progress in last three years

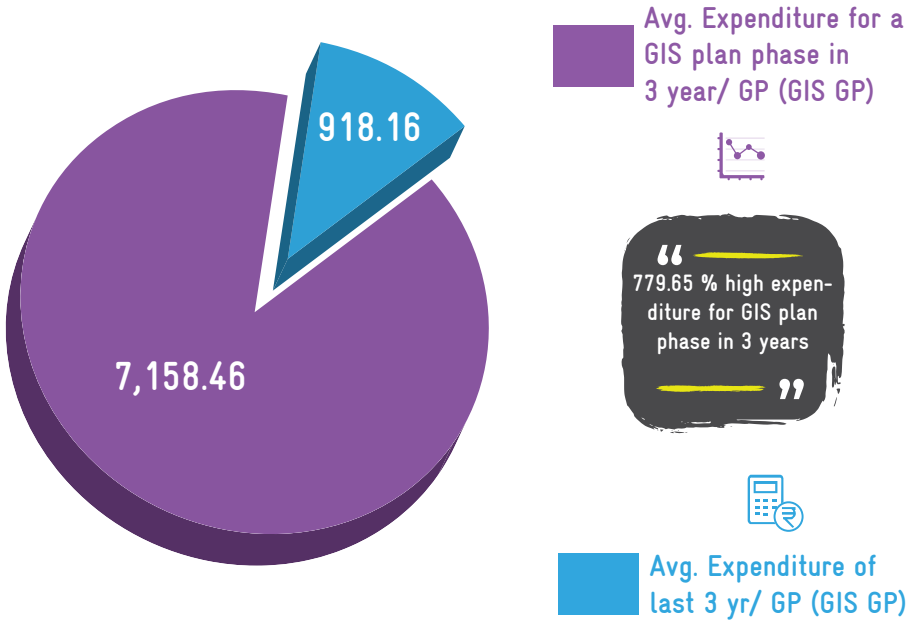
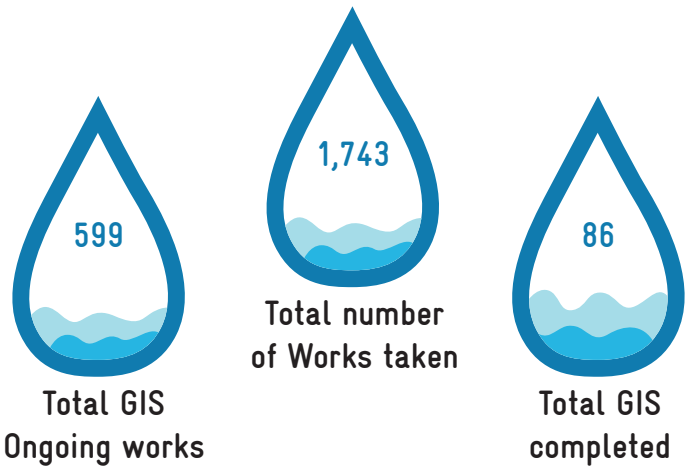


Figure 7.2. Average Expenditure for GIS plan in last 3 years



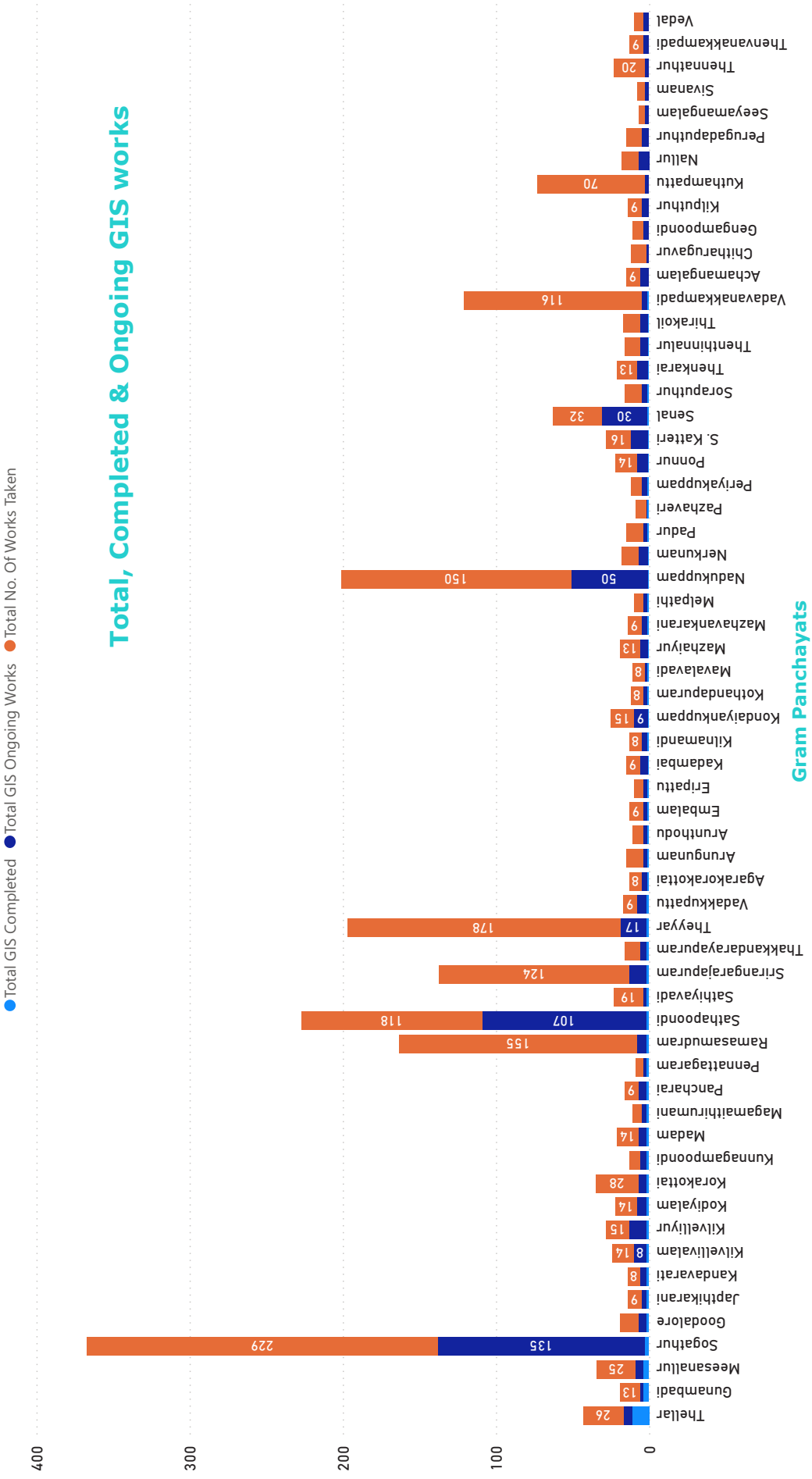
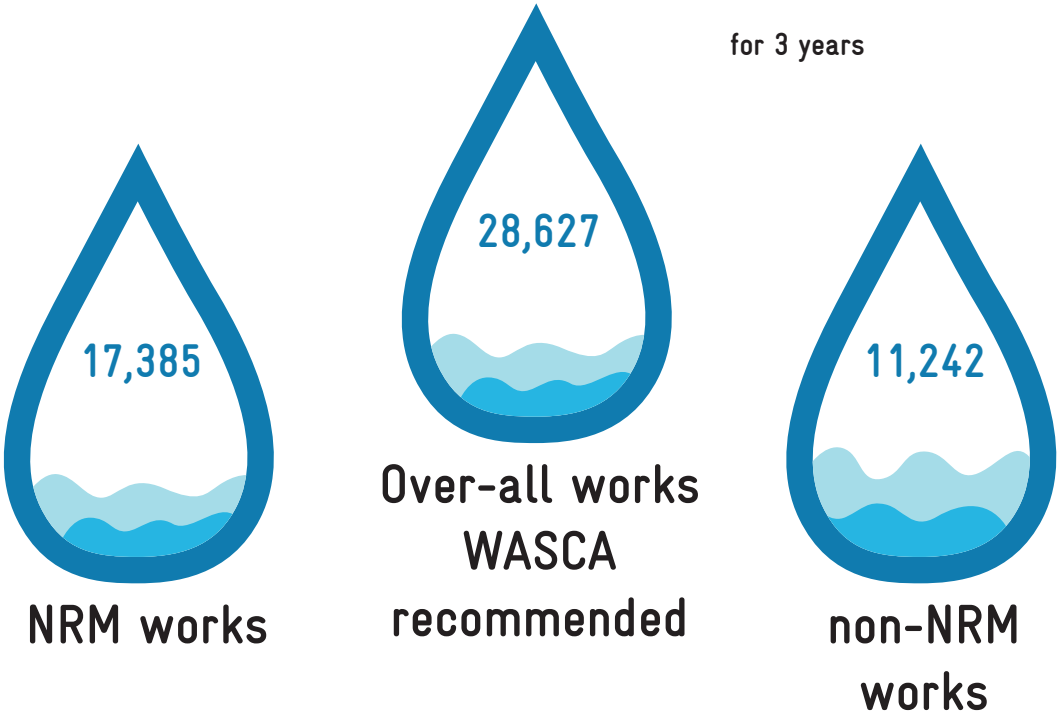


Figure 7.3. GP wise total, completed and ongoing GIS works

7.2 WASCA RECOMMENDED NRM AND NON-NRM WORKS

WASCA recommended 28,627 works for a period of 3 years, out of which 17,385 are NRM works and 11,242 are non NRM works (Figure 7.4). A total of 22,360 works has been uploaded so far for the financial year 2021-22 as on 04/02/2022.



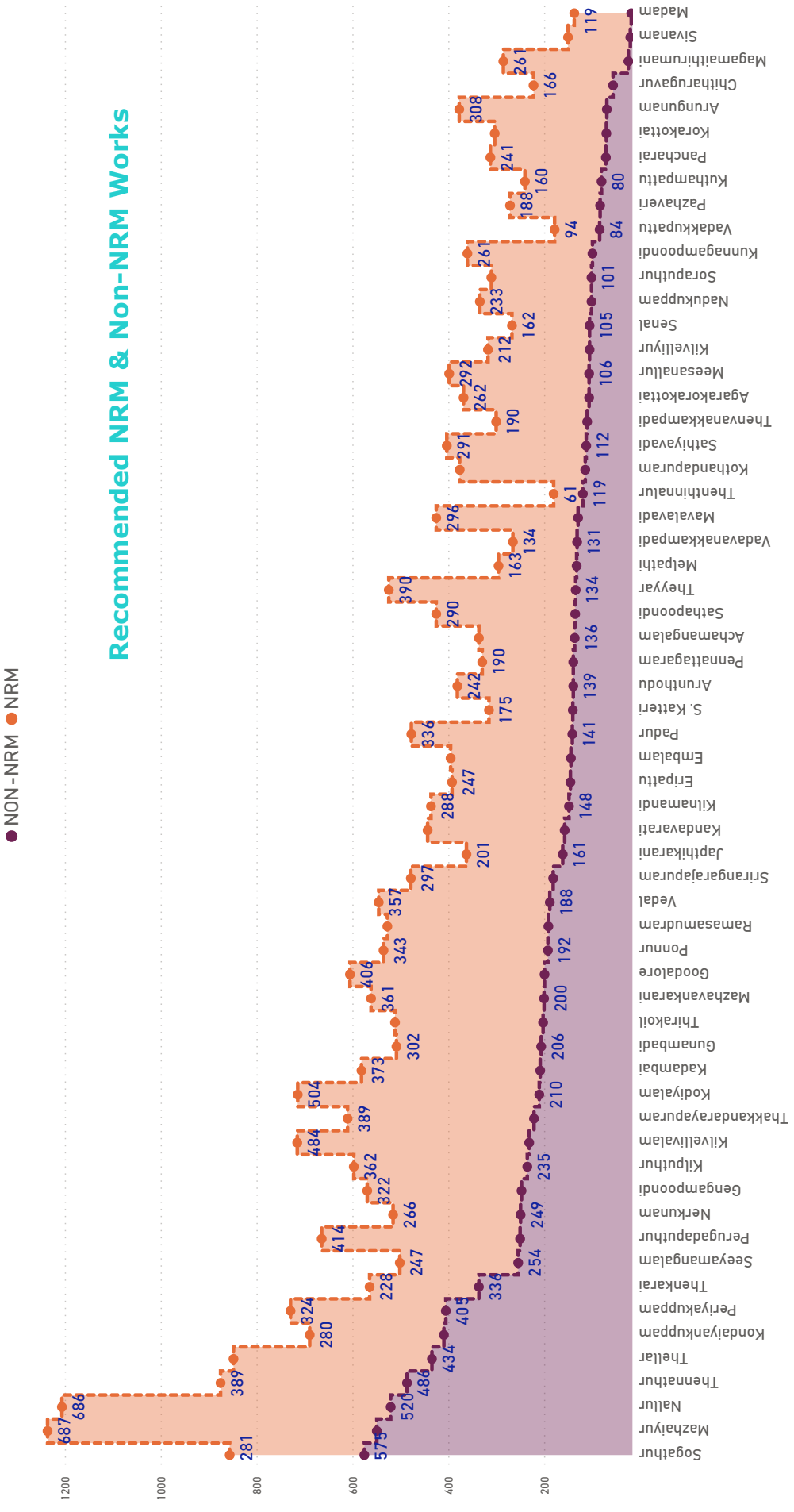


Figure 7.4. GP wise recommended NRM and non-NRM works

7.3 ONGOING WORKS

The ongoing works in Thellar Block includes Drought Proofing, Rural Connectivity, Rural Sanitation, WCWH and Works on Individuals Land (Category IV). A total of 122 works are ongoing in the Block, in which WCWH works are more (73 %) followed by individual beneficiary orientated (14.8 %) while rural infrastructure works are less in number (< 5 %) (Figure 7.5). Detailed GP and work category wise ongoing works are tabulated in Annexure 7.2.

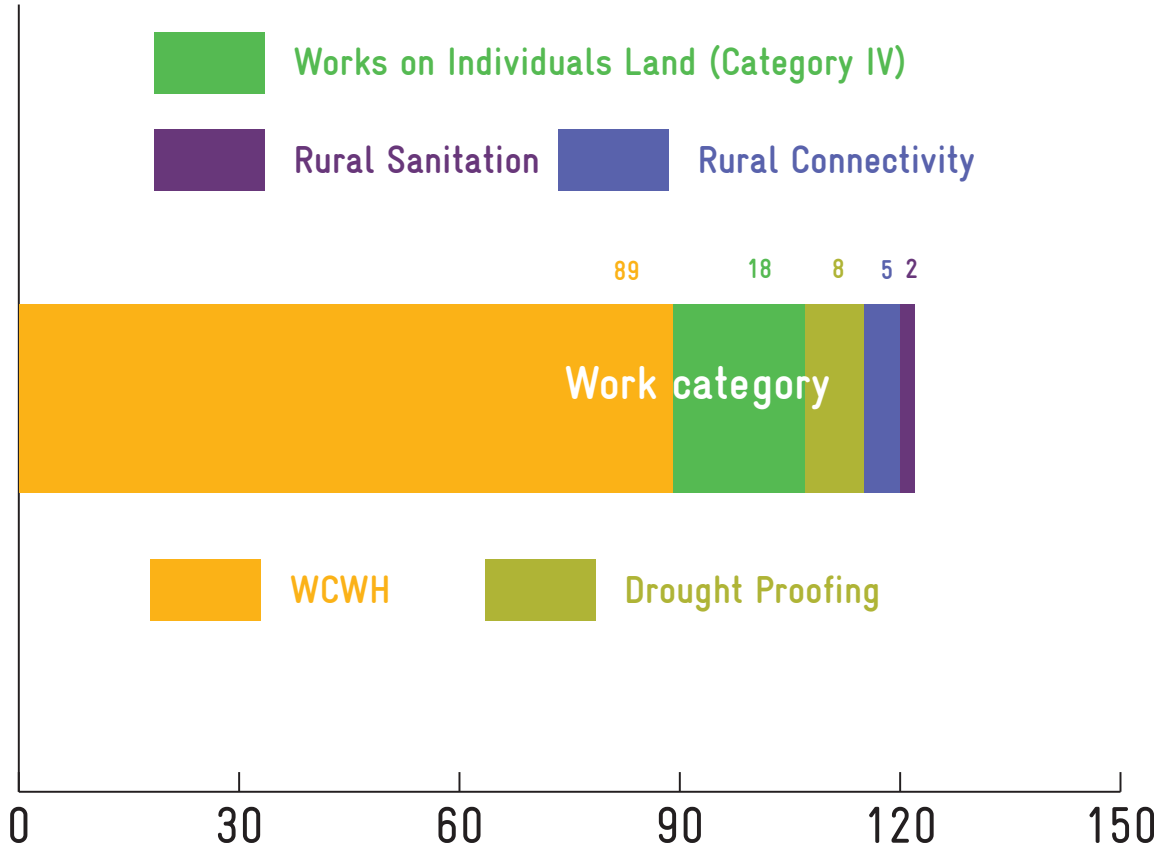


Figure 7.5. Category-wise ongoing works in Thellar Block

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

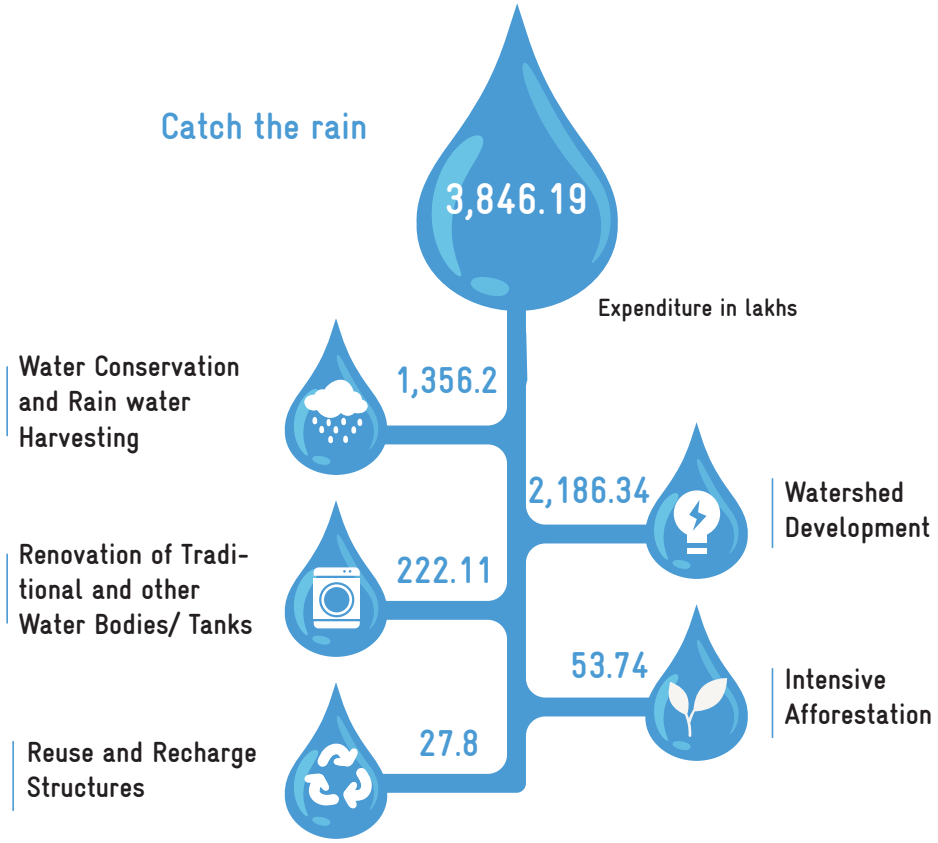
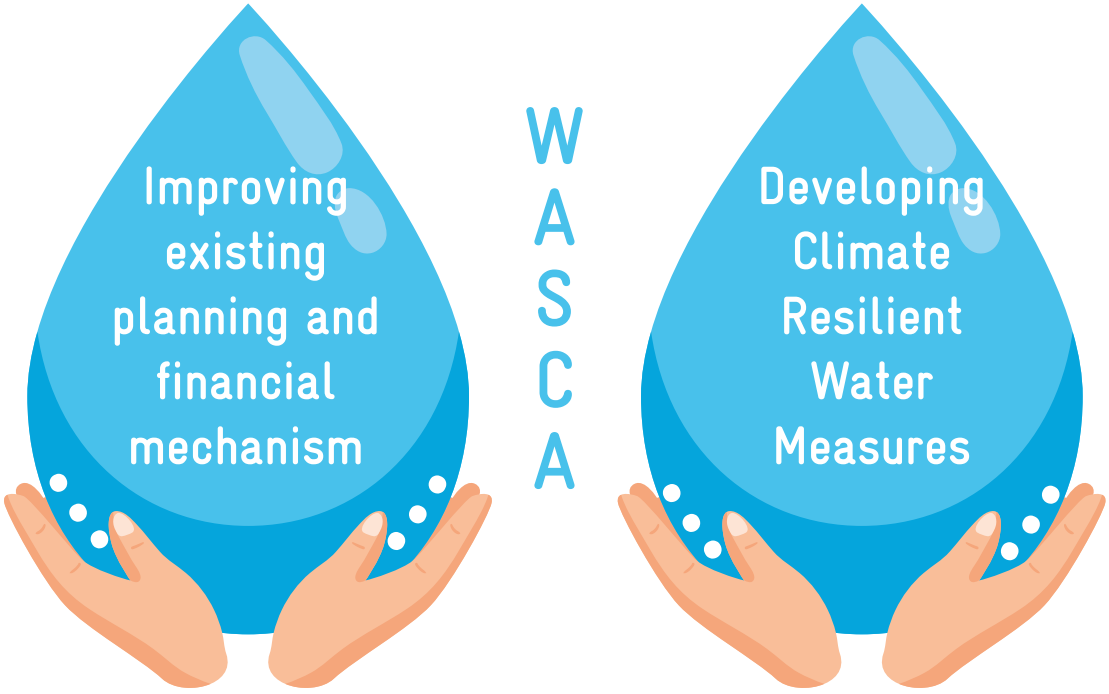


Figure 7.6. Catch the rain campaign in Thellar Block



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 ON WATERSHED BASED GP PLAN

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

8.1 MACRO-WATERSHEDS IN THELLAR BLOCK

Thellar Block has three river sub-basins Kiliyar, Ongur and Tondi Veraha Watersheds. The Kiliyar watershed (4C2A1) consists of 30 micro-watersheds covering an area of 20123.58 ha. The Ongur watershed (4C1D5) consists of 24 Micro-watersheds covering an area of 11543.39 ha. The Tondi Veraha watershed (4C1D3) consists of 26 Micro-watersheds covering an area of 12239.54 ha. Out of 61 GPs in the Block, 22 GPs fall under Kiliyar (4C2A1) Watershed, 11 GPs fall under Ongur (4C1D5) Watershed,15 GPs fall under Tondi Veraha (4C1D3) Watershed. 5 GPs have watershed boundaries passing through Kiliyar and Ongur, 5 GPs have watershed boundaries passing through Kiliyar and Tondi Veraha and Three GPs have watershed boundaries passing through Tondi Veraha and Ongur. (Table 25 & 26). Figure 8.1 & 8.2 depict spatial representation of macro-watershed and Thellar Block's GPs. The micro-watershed-based works are identified using Basin, Sub-basin, and micro-Watershed with GP administrative boundaries through Composite Water Resources Management plan approach.

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

Macro-watershed	Area in ha	No. of micro-watersheds
Kiliyar	20,123.58	30
Ongur	11,543.39	24
Tondi Veraha	12,239.54	26

TABLE 26 NUMBER OF GPs COVERED UNDER WATERSHEDS IN THELLAR BLOCK

Macro-watershed	No. of GPs
Kiliyar	22
Ongur	11
Tondi Veraha	15
Kiliyar & Ongur	5
Kiliyar & Tondi Veraha	5
Tondi Veraha & Ongur	3

Understanding the Block area with respect to its nature of terrain aids in treating the area with appropriate measures at the right place and also ensures that the watershed is well managed (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 the ridge range types such as high, middle and lower and inter variations Block area is distinguished into 4 kinds of ridge zones.

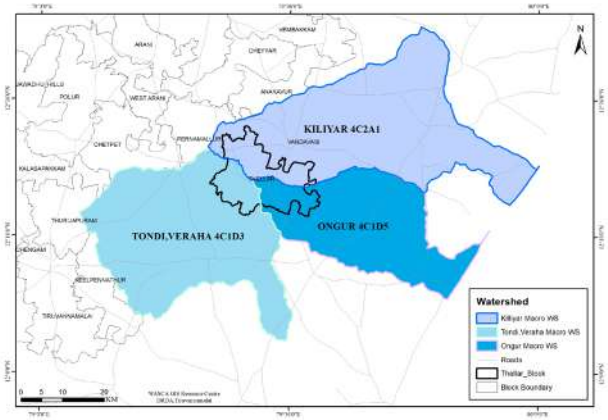


Figure 8.1. Macro-watershed Map- Thellar Block

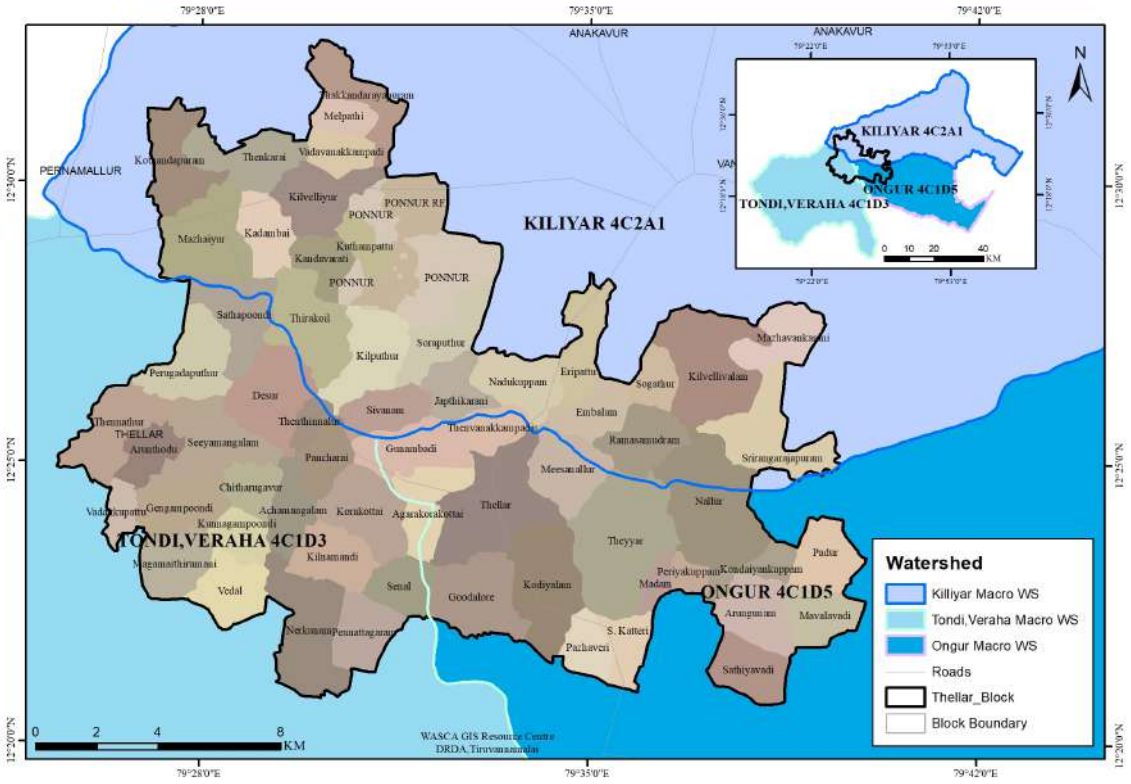


Figure 8.2. Macro-watershed with Gram Panchayat Map- Thellar Block

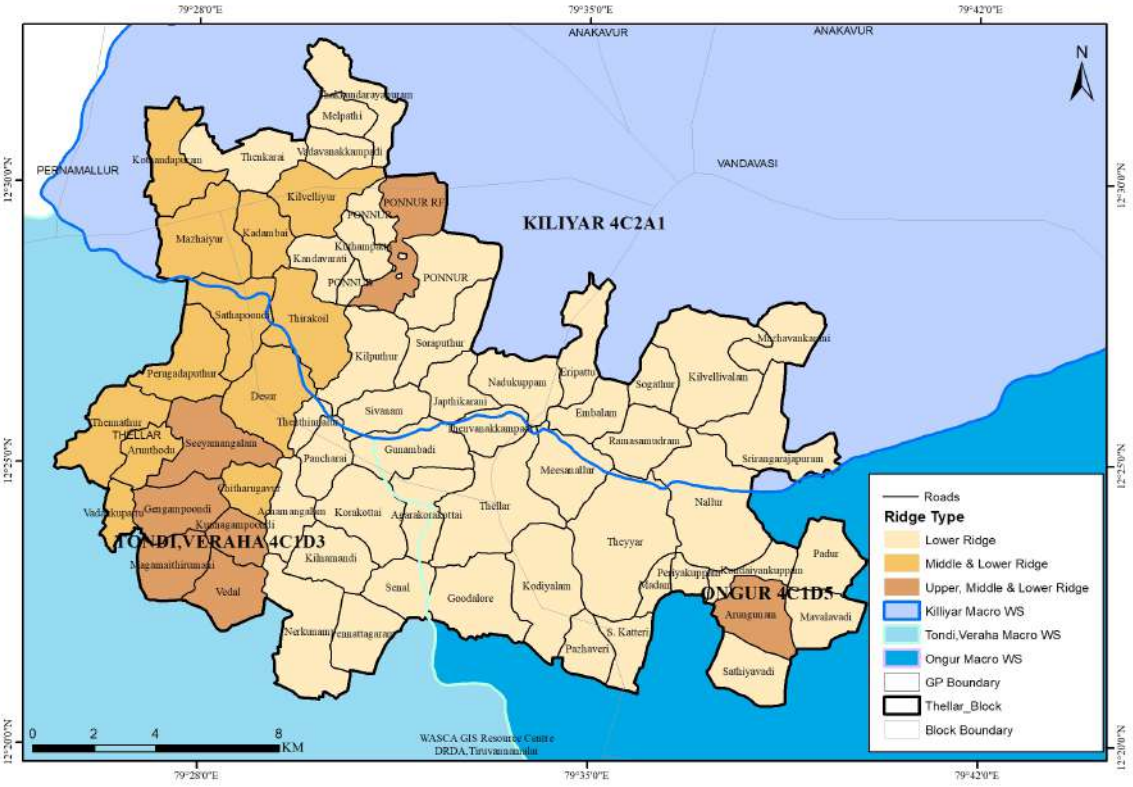


Figure 8.3. Macro-watershed ridge map-Thellar Block

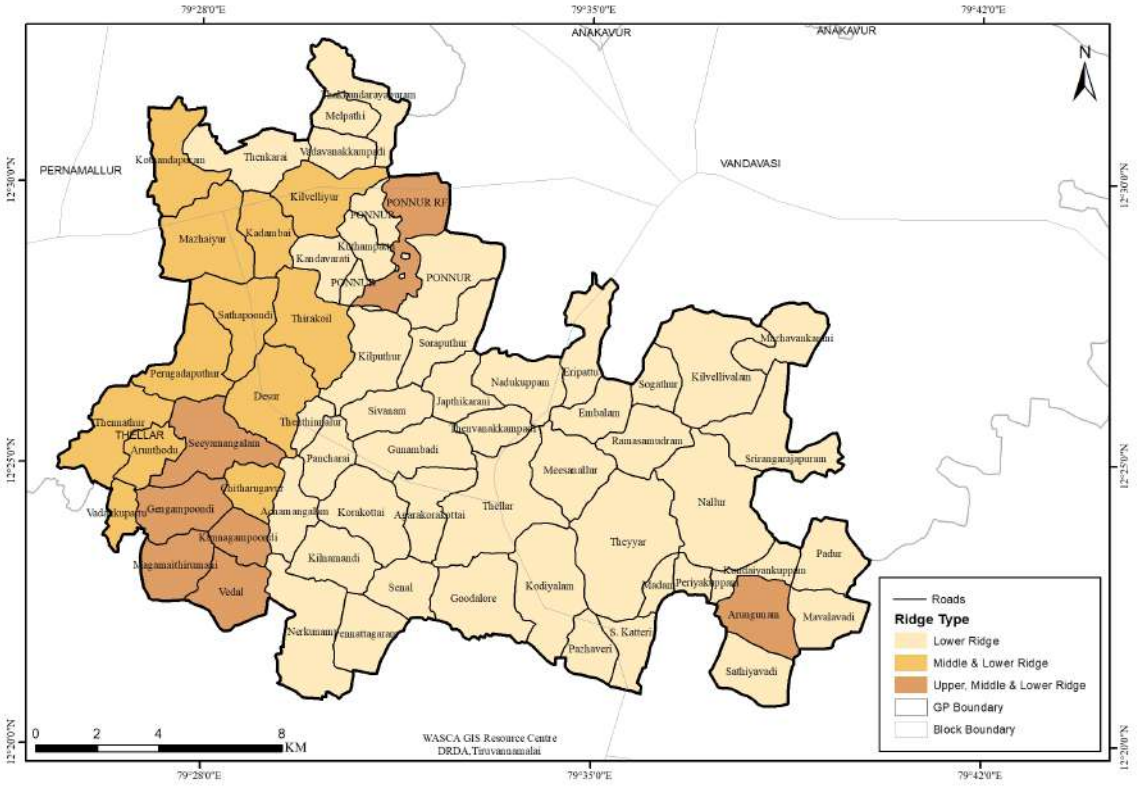


Figure 8.4. GP level ridge map

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 Thellar Block are listed in Table 27 to Table 41.

TABLE 27. MICRO-WATERSHED IN THELLAR BLOCK FALLING UNDER KILIYAR MACRO-WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C2A1e11b	1053.73	Upper, Middle & Lower
2	4C2A1e15a	977.09	Middle & Lower
3	4C2A1e11a	523.18	
4	4C2A1e16b	940.39	
5	4C2A1e16a	1,209.38	
6	4C2A1e11c	416.19	
7	4C2A1e12b	558.69	
8	4C2A1e12c	644.84	
9	4C2A1e10b	581.99	
10	4C2A1e14b	553.1	Lower
11	4C2A1e14a	579.62	
12	4C2A1e15b	525	
13	4C2A1e09b	525.49	
14	4C2A1e12a	882.77	
15	4C2A1e07a	1,068.53	
16	4C2A1e09c	800.82	

17	4C2A1e07b	618.13	Lower
18	4C2A1d05c	645.15	
19	4C2A1e07c	695.03	
20	4C2A1e13b	570.76	
21	4C2A1d06a	338.99	
22	4C2A1e10a	739.41	
23	4C2A1e13a	622.13	
24	4C2A1d06b	603.63	
25	4C2A1d06c	662.4	
26	4C2A1d07b	473.42	
27	4C2A1e10c	529.26	
28	4C2A1d08b	613.62	
29	4C2A1d08a	523.69	
30	4C2A1d07c	647.16	

TABLE 28. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER KILIYAR MACRO-WATERSHED IN THELLAR BLOCK

Sl.No	Name of the GP	Ridge Type
1	Kilvelliyur	Middle & Lower
2	Kadambai	
3	Mazhaiyur	
4	Kothandapuram	
5	Melpathi	Lower
6	Thenkarai	
7	Ponnur	
8	Sogathur	
9	Embalam	
10	Ramasamudram	
11	Nadukuppam	
12	Thakkandarayapuram	
13	Vadavanakkampadi	
14	Japthikarani	
15	Kuthampattu	
16	Kandavarati	
17	Soraputhur	
18	Kilputhur	
19	Eripattu	
20	Mazhavankarani	
21	Kilvellivalam	
22	Srirangarajapuram	

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

Ridge falling under Kiliyar macro-watershed in Thellar Block			
Sl.No	**Proposed Work**	**Ridge Type**	**Extent**
1	Afforestation in Public/common lands (ha)	Upper	44.1
2	Drainage Line Treatment (m)		15,898.07
3	CC Check dams (No.)	Middle	17
4	Block Plantation (Community) (ha)		70.43
5	Silvi-pasture Development (ha)		49.6
6	Avenue plantation (m)		47,805
7	Agro Forestry (ha)		25.99
8	Mini Forest (ha)		3.06
9	Composting (No.)	Lower	49
10	Canal Bund Plantation (m)		2,835
11	Restoration of water bodies: Tanks and Ooranis (No.)		80
12	Artificial Recharge Structure (No.)		181
13	Farm Bunding with Boundary Trenches - Individual (ha)		43.66
14	Construction of Farm Ponds - Individual (No.)		164
15	Land development - Individual (ha)		94.78
16	Azolla units - Individual (No.)		1,040
17	NADEP Vermi compost (No.)		699
18	Cattle Shelters (No.)		781
19	Goat Sheep Shelters (No.)		253
20	Cattle Trough (No.)		808
21	Construction of new open wells & Recharge Shafts (No.)		373
22	Soak Pits (Community) (No.)		37
23	Soak Pits (Individual) (No.)		1,976
24	Roof Rain Water Harvesting (No.)		26
25	Nutri Garden (No.)		2,547
26	Silt application (No.)		64

TABLE 30. MICRO-WATERSHED IN THELLAR BLOCK FALLING UNDER ONGUR MACRO-WATERSHED

Sl.No	**Micro-watershed Code**	**Micro-watershed Area in ha**	**Ridge Type**
1	4C1D5d13c	594.83	Upper, Middle & Lower
2	4C1D5d16b	565.56	
3	4C1D5d19b	390.81	Middle & Lower
4	4C1D5d20a	459.93	Lower
5	4C1D5d20c	237.12	
6	4C1D5d20b	607.2	
7	4C1D5d19a	789.67	
8	4C1D5d17c	357.89	
9	4C1D5d14b	735.75	
10	4C1D5d17a	944.48	
11	4C1D5d19c	472.96	
12	4C1D5d14c	201.32	

13	4C1D5d14a	583.32	Lower
14	4C1D5d17d	438.67	
15	4C1D5d19d	428.5	
16	4C1D5d17b	391.67	
17	4C1D5d18d	388.4	
18	4C1D5d13a	603.47	
19	4C1D5d16a	399.15	
20	4C1D5d16c	335.11	
21	4C1D5d18c	462.08	
22	4C1D5d18b	319.65	
23	4C1D5d13b	397.02	
24	4C1D5d15a	438.83	

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

Sl.No	Name of the GP	Ridge Type
1	Arungunam	Upper, Middle & Lower
2	S. Katteri	Lower
3	Mavalavadi	
4	Sathiyavadi	
5	Pazhaveri	
6	Kodiyalam	
7	Madam	
8	Kondaiyankuppam	
9	Goodalore	
10	Periyakuppam	
11	Padur	

TABLE 32. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER ONGUR MACRO-WATERSHED IN THELLAR BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	42.1
2	Drainage Line Treatment (m)		2,315.28
3	CC Check dams (No.)	Middle	5
4	Block Plantation (Community) (ha)		132.16
5	Avenue plantation (m)		28,308
6	Agro Forestry (ha)		22.05
7	Composting (No.)	Lower	72
8	Canal Bund Plantation (m)		2,229
9	Restoration of water bodies: Tanks and Ooranis (No.)		46
10	Artificial Recharge Structure (No.)		107
11	Farm Bunding with Boundary Trenches - Individual (ha)		39.29
12	Construction of Farm Ponds - Individual (No.)		100
13	Land development - Individual (ha)		142.19
14	Azolla units - Individual (No.)		927
15	NADEP Vermi compost (No.)		947
16	Cattle Shelters (No.)		821

17	Goat Sheep Shelters (No.)	Lower	127
18	Cattle Trough (No.)		933
19	Construction of new open wells & Recharge Shafts (No.)		273
20	Soak Pits (Community) (No.)		46
21	Soak Pits (Individual) (No.)		1,540
22	Roof Rain Water Harvesting (No.)		19
23	Nutri Garden (No.)		3,696
24	Silt application (No.)		920

TABLE 33. MICRO-WATERSHED IN THELLAR BLOCK FALLING UNDER TONDI VERAHA RIVER MACRO-WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C1D3b07a	535.71	Upper, Middle & Lower
2	4C1D3b02c	540.3	
3	4C1D3b06b	888.58	
4	4C1D3b06a	429.49	
5	4C1D3b01b	567.2	
6	4C1D3b05c	539.99	Middle & Lower
7	4C1D3b05b	793.36	
8	4C1D3b05a	502.19	
9	4C1D3b08b	584.79	
10	4C1D3b04a	812.19	
11	4C1D3b07b	338.42	
12	4C1D3b08a	420.88	Lower
13	4C1D3b04c	473.38	
14	4C1D3b04b	285.4	
15	4C1D3b06c	745.8	
16	4C1D3b03c	259.84	
17	4C1D3b02a	596.28	
18	4C1D3b02d	374.4	
19	4C1D3b03d	387.59	
20	4C1D3b03b	292.09	
21	4C1D3b02b	196.96	
22	4C1D3b03a	348.75	
23	4C1D3a16d	260.19	
24	4C1D3b01c	356.39	
25	4C1D3b01a	390.47	
26	4C1D3a16c	318.91	

TABLE 34. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER TONDI VERAHA MACRO-WATERSHED IN THELLAR BLOCK

S.No	Name of the GP	Ridge Type
1	Kunnagampoondi	Upper, Middle & Lower
2	Magamaithirumani	
3	Seeyamangalam	
4	Vedal	
5	Gengampoondi	
6	Chitharugavur	Middle & Lower
7	Thennathur	
8	Arunthodu	
9	Vadakkupattu	
10	Perugadaputhur	
11	Pennattagaram	Lower
12	Kilnamandi	
13	Korakottai	
14	Achamangalam	
15	Nerkunam	

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

S.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	126.82
2	Drainage Line Treatment (m)		21,311
3	CC Check dams (No.)	Middle	9
4	Block Plantation (Community) (ha)		24.34
5	Avenue plantation (m)		21,637.23
6	Agro Forestry (ha)		35.85
7	Composting (No.)	Lower	130
8	Canal Bund Plantation (m)		3,830
9	Restoration of water bodies: Tanks and Ooranis (No.)		54
10	Artificial Recharge Structure (No.)		136
11	Farm Bunding with Boundary Trenches - Individual (ha)		59.02
12	Construction of Farm Ponds - Individual (No.)		224
13	Land development - Individual (ha)		59.02
14	Azolla units - Individual (No.)		734
15	NADEP Vermi compost (No.)		542
16	Cattle Shelters (No.)		525
17	Goat Sheep Shelters (No.)		270
18	Cattle Trough (No.)		415
19	Construction of new open wells & Recharge Shafts (No.)		319
20	Soak Pits (Community) (No.)		25
21	Soak Pits (Individual) (No.)		1,433
22	Roof Rain Water Harvesting (No.)		25
23	Nutri Garden (No.)		3,578
24	Silt application (No.)		115

TABLE 36. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER KILIYAR & ONGUR MACRO-WATERSHED IN THELLAR BLOCK

S.No	Name of the GP	Ridge Type
1	Nallur	Lower
2	Meesanallur	
3	Thenvanakkampadi	
4	Theyyar	
5	Thellar	

TABLE 37. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER KILIYAR & ONGUR MACRO-WATERSHED IN THELLAR BLOCK

S.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	30
2	CC Check dams (No.)	Middle	3
3	Block Plantation (Community) (ha)		7.32
4	Avenue plantation (m)		16,336
5	Agro Forestry (ha)		6.3
6	Composting (No.)	Lower	65
7	Canal Bund Plantation (m)		500
8	Restoration of water bodies: Tanks and Ooranis (No.)		18
9	Artificial Recharge Structure (No.)		116
10	Farm Bunding with Boundary Trenches - Individual (ha)		55.72
11	Construction of Farm Ponds - Individual (No.)		75
12	Land development - Individual (ha)		55.72
13	Azolla units - Individual (No.)		693
14	NADEP Vermi compost (No.)		429
15	Cattle Shelters (No.)		429
16	Goat Sheep Shelters (No.)		51
17	Cattle Trough (No.)		429
18	Construction of new open wells & Recharge Shafts (No.)		213
19	Soak Pits (Community) (No.)		23
20	Soak Pits (Individual) (No.)		693
21	Roof Rain Water Harvesting (No.)		6
22	Nutri Garden (No.)		1,953
23	Silt application (No.)		27

TABLE 38. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER KILIYAR & TONDI VERAHA MACRO-WATERSHED IN THELLAR BLOCK

S.No	Name of the GP	Ridge Type
1	Thenthinnalur	Lower
2	Pancharai	
3	Sivanam	
4	Thirakoil	Middle & Lower
5	Sathapoondi	

TABLE 39. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER KILIYAR & TONDI VERAHA MACRO-WATERSHED IN THELLAR BLOCK

S.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	40.46
2	Drainage Line Treatment (m)		4,106.38
3	CC Check dams (No.)	Middle	1
4	Block Plantation (Community) (ha)		4.82
5	Avenue plantation (m)		13,315
6	Composting (No.)	Lower	66
7	Canal Bund Plantation (m)		868
8	Restoration of water bodies: Tanks and Ooranis (No.)		28
9	Artificial Recharge Structure (No.)		32
10	Farm Bunding with Boundary Trenches - Individual (ha)		45.93
11	Construction of Farm Ponds - Individual (No.)		99
12	Land development - Individual (ha)		62.93
13	Azolla units - Individual (No.)		84
14	NADEP Vermi compost (No.)		120
15	Cattle Shelters (No.)		96
16	Goat Sheep Shelters (No.)		85
17	Cattle Trough (No.)		119
18	Construction of new open wells & Recharge Shafts (No.)		81
19	Soak Pits (Community) (No.)		7
20	Soak Pits (Individual) (No.)		462
21	Roof Rain Water Harvesting (No.)		10
22	Nutri Garden (No.)		391
23	Silt application (No.)		34

TABLE 40. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER TONDI VERAHA & ONGUR MACRO-WATERSHED IN THELLAR BLOCK

S.No	Name of the GP	Ridge Type
1	Gunambadi	Lower
2	Senal	
3	Agarakorakottai	

TABLE 41. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER TONDI VERAHA & ONGUR MACRO-WATERSHED IN THELLAR BLOCK

S.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	1.91
2	CC Check dams (No.)	Middle	1
3	Block Plantation (Community) (ha)		28.37
4	Avenue plantation (m)		10,199
5	Agro Forestry (ha)		3.3
6	Composting (No.)	Lower	23
7	Canal Bund Plantation (m)		560
8	Restoration of water bodies: Tanks and Ooranis (No.)		16
9	Artificial Recharge Structure (No.)		63
10	Farm Bunding with Boundary Trenches - Individual (ha)		17.13
11	Construction of Farm Ponds - Individual (No.)		32
12	Land development - Individual (ha)		60.48
13	Azolla units - Individual (No.)		118
14	NADEP Vermi compost (No.)		105
15	Cattle Shelters (No.)		105
16	Goat Sheep Shelters (No.)		36
17	Cattle Trough (No.)		105
18	Construction of new open wells & Recharge Shafts (No.)		114
19	Soak Pits (Community) (No.)		8
20	Soak Pits (Individual) (No.)		220
21	Roof Rain Water Harvesting (No.)		6
22	Nutri Garden (No.)		439
23	Silt application (No.)		16

8.2 MODEL MICRO-WATERSHED- THIRAKOIL

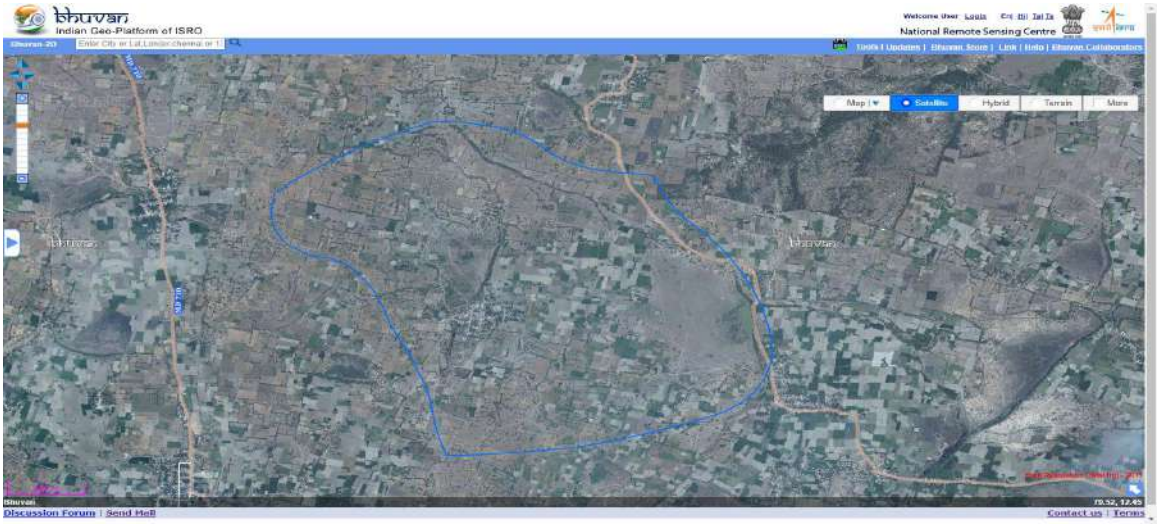


Figure 8.5. Satellite image of Thirakoil micro-watershed

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

THIRAKOIL MICRO-WATERSHED

Thirakoil micro-watershed falls under Thirakoil, Thellar Block (Figure 8.5 and 8.6). This micro-watershed is a part of Kiliyar macro-watershed in Kiliyar sub-basin. The general information, geology, hydrogeology, natural drainage line, catchment area, ground water status, water budget of Thirakoil micro-watershed is given below in separate sections followed by proposed works, ridge wise proposed treatment area, estimated cost and required person days and key outcomes (Table 42 to 53) Proposed activities shown in Figure 8.7 and 8.8. The key CWRM parameters for the GPs falling in this micro-watershed is Annexed in 8.

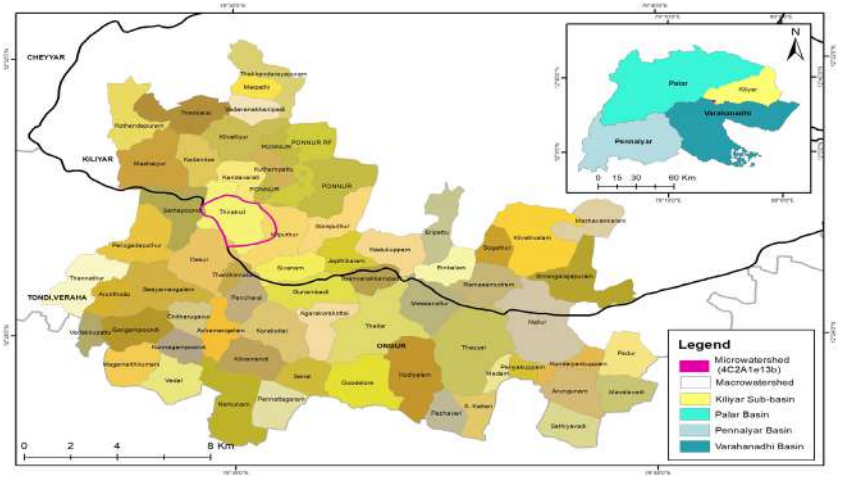


Figure 8.6. Thirakoil micro-watershed with GPs

TABLE 42. GENERAL INFORMATION OF THE MICRO-WATERSHED

Description	Name/ Number/ Quantity/ Status
Name of the micro-watershed	**Thirakoil**
Micro-watershed Number	**4C2A1e13b**
Name of the Basin	Palar Basin
Name of the subbasin	Kiliyar Sub Basin
Name of the Macro-watershed	Kiliyar
Number of GPs covered under the micro-watershed	2
Name of the GPs	1. Thirakoil
	2. Kilputhur
Latitude of micro-watershed (From To)	12°26'33.33"N to 12°28'0.77"N
Longitude of micro-watershed (From To)	79°29'12.81"E to 79°30'59.16"E
Total area of the micro-watershed (ha)	571
Percentage of micro-watershed area in Thirakoil GP	88%
Percentage of micro-watershed area in Kilputhur GP	12%
Area of micro-watershed falling in Thirakoil GP (ha)	500
Area of micro-watershed falling in Kilputhur GP (ha)	71
Total Population of Thirakoil GP	1,013
Total Population of Kilputhur GP	3,022
Annual Average Rainfall (mm)	1047
Annual maximum Temperature (◦C)	33
Annual Minimum Temperature (◦C)	22.8
Evapo-Transpiration Losses of Thirakoil GP (ha.m)	18.84
Evapo-Transpiration Losses of Kilputhur GP (ha.m)	17.31
Volumetric soil moisture availability	23%
Climate Risk	Drought and heat waves
CVI Index Value for Thirakoil GP (Based on WASCA Climate Study)	0.565
CVI Index Value for Kilputhur GP (Based on WASCA Climate Study)	0.546
Agro-Climatic Zone	North eastern zone (TN-1)
Agro Ecological Sub-Region (ICAR)	Eastern Ghats
Status of Ground water in Thirakoil GP	Critical
Status of Ground water in Kilputhurr GP	Critical

TABLE 43. GEOLOGY, HYDROGEOLOGY OTHER CHARACTERISTICS OF THIRAKOIL 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	91.8 ha (Middle and Lower ridge)

TABLE 44. NATURAL DRAINAGE LINES IN THIRAKOIL MICRO-WATERSHED

No. of 1st Order drains	1
Total length of natural drainage line (m)	2,265
Drainage density (ha.m)	3.97

TABLE 45. CATCHMENT AREA (STRANGE METHODOLOGY- CGWB)

Catchment Area (ha)	Thirakoil GP	Kilputhur GP
Good catchment area	73.96	154.42
Average catchment area	5.75	0
Bad catchment area	616.72	419.13

TABLE 46. GROUND WATER STATUS OF MICRO- WATERSHED

Firka Assessment Unit for Thirakoil GP in ha.m	
Name of the Firka (Assessment Unit) falling under micro-watershed	Mazaiyur
Net Annual Ground Water Availability	1,534.64
Existing Gross Ground Water Draft for Irrigation	1,961.96
Existing Gross Ground Water Draft for domestic and industrial water supply	862.98
Existing Gross Ground Water Draft for All uses	2,824.94
Provision for domestic and industrial requirement supply up to 2025	980.86
Net Ground Water Availability for future irrigation development	-1,408

TABLE 47. GP WISE WATER BUDGET OF MICRO -WATERSHED

Water Budget	Thirakoil GP	Kilputhur GP
Water for Human (ha.m)	2.77	8.27
Water for Agriculture (ha.m)	183.4	126.6
Water for Animal (ha.m)	1.46	4.6
Village wise water required (ha.m)	187.6	139.5
Available run-off from rain water (derived from strange method) (ha.m)	144.7	136.3
Harvested Runoff from Water Harvesting Activities (ha.m)	10.7	5
Potential Harvesting from proposed Interventions (ha.m)	27.2	22.8
Total Water harvested (ha.m)	37.9	27.8
Water demand and Supply Difference (ha.m)	-149.7	-111.7
Water Demand Supply Gap Status	Deficient	Deficient
Per capita Water Availability (cum)	1,428.43	451.02
International Standard per capita water Availability (cum)	1,700	1,700
Water Availability Gap (cum)	-271.57	-1,248.98
Water security status	Water Stress	Water Stress

TABLE 48. GP WISE PROPOSED MICRO-WATERSHED WORKS

Ridge wise Proposed Work	Thirakoil GP	Kilputhur GP
Upper Ridge	No works falling in Upper Ridge	No works falling in Upper Ridge
Middle Ridge	6	No works falling in Middle Ridge
Lower Ridge	134	6
Total	140	6

TABLE 49. RIDGE WISE TREATMENT AREA, ESTIMATED COST AND PERSON DAYS REQUIRED -THIRAKOIL & KILPUTHUR

	Thirakoil GP	Kilputhur GP
Upper Ridge		
Estimated cost for Upper Ridge area (INR in Lakhs)	No Upper Ridge falling in the GP	No Upper Ridge falling in the GP
Total area in ha of Upper Ridge		
Treatment cost of Upper Ridge Lakhs per ha		
Estimated Persondays generated for Treatment of Upper Ridge		
Middle Ridge		
Estimated cost for Middle Ridge area (INR in Lakhs)	36.6	No Middle Ridge falling in the GP
Total area in ha of Middle Ridge	30	
Treatment cost of Middle Ridge Lakhs per ha	**1.22**	
Estimated Person days generated for Treatment of Middle Ridge	**14,283**	
Lower Ridge		
Estimated cost for Lower Ridge area (INR in Lakhs)	130.3	12.14
Total area in ha of Lower Ridge	470	71
Treatment cost of Lower Ridge (INR in Lakhs per ha)	**0.28**	**0.17**
Estimated Person days generated for Treatment of Lower Ridge	**46,856**	**2,315**

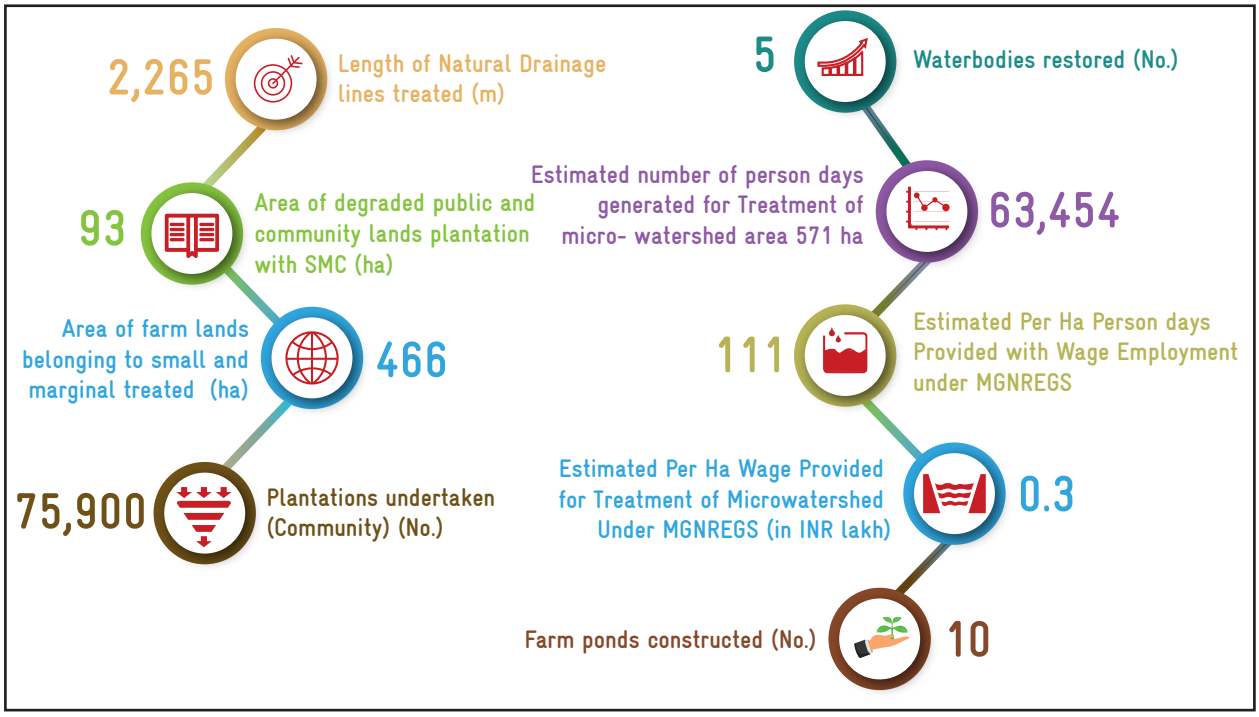
Thirakoil GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	1.22 lakh/ha	14,283
Lower Ridge	0.28 lakh/ha	46,856
	1.5 lakh/ha	61,139

Kilputhur GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	NA	NA
Lower Ridge	0.17 lakh/ha	2,315
	0.17 lakh/ha	2,315

TABLE 50. NATURE AND NUMBER OF WORKS IN MICRO- WATERSHED

Description	Number
Total No. of works in micro- watershed area (Arable, Non arable & DLT)	83
Total No. of works in micro- watershed including livelihood Activities	21
Total No. of works in micro-watershed including Rural Greywater Management Activities	42

TABLE 51. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)

Thirakoil GP	38.24 lakh
Kilputhur GP	64.72 lakh

TABLE 52. ESTIMATES OF MICRO-WATERSHED IN THIRAKOIL 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						
Restoration of Traditional water bodies: (Pond) (No.)	Lower	Commenced	2	2	2	400
Restoration of Traditional water bodies: (Union Tank) (No.)			3	3	15	2,400
Avenue plantation (km)			3.727	3	6.7	2,620
Sunken Pit in 1st order drain (No.)		Ongoing	2	2	3.08	766

Loose boulder check dam (No.)	Lower	Not commenced	2	2	1.7	84
Tank bund Plantation (No.)			3	3	5.4	2,109
Compost Pit (No.)			13	13	2.21	195
Block Plantation (m)	Middle	Not commenced	3	1	11.1	4,320
Sub total				**29**	**47.19**	**12,894**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Fodder development - Individual (No.)	Lower	Not commenced	8	8	11.84	18,752
Artificial Recharge Structure for borewell farmers (No.)			5	5	12.5	1,955
Farm Bunding with Boundary Trenches - Individual (ha & No.)			7			
			3	3	4.5	1,758
Silt application (No.)			3	3		
Azolla Production units - Individual (No.)		Commenced	8	8	1.2	184
NADEP Vermi compost (No.)			8	8	1.44	216
Construction of Farm Ponds - Individual (No.)		Ongoing	10	10	24	9,372
Dryland Horticulture (ha &No.)	Middle	Not commenced	9			
			3	3	25.5	9,963
Sub total				**48**	**80.98**	**42,200**
Total				**77**	**128.17**	**55,094**
Livelihood enhancement activities for Individual Farmers (dryland)						
Cattle Shelters (No.)	Lower	Commenced	8	8	16.96	2,648
Goat Sheep Shelters (No.)			5	5	11.35	1,775
Cattle Trough (No.)		Not commenced	8	8	0.4	48
Sub total				**21**	**28.71**	**4,471**
Rural Greywater Management						
Rooftop Rainwater Harvesting Structure (No.)	Lower	Not commenced	2	2	8	1,250
Nutri Garden (No.)			20	20	0.02	4
Soak Pits (Individual) (No.)		Ongoing	20	20	2	320
Sub total				**42**	**10.02**	**1,574**
Total				**140**	**166.9**	**61,139**

TOTAL ESTIMATES OF MICRO-WATERSHED IN THIRAKOIL GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
			
Thirakoil GP	140	166.9	61,139

TABLE 53. ESTIMATES OF MICRO-WATERSHED IN KILPUTHUR GP

Proposed Work	Ridge Type	Status of Work	Extent	No. of works as per KML	Estimate cost in Lakhs	Person days
NRM works in Public and Community Lands						
Tank bund Plantation (No.)	Lower	Not commenced	1	1	1.8	703
Compost Pit (No.)			2	2	0.34	30
Restoration of Traditional water bodies: (Union Tank) (No.)		Commenced	1	1	5	800
Sub total				**4**	**7.14**	**1,533**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Artificial Recharge Structure for borewell farmers (No.)	Lower	Not commenced	2	2	5	782
				2	5	782
Total				**6**	**12.14**	**2,315**

TOTAL ESTIMATES OF MICRO-WATERSHED IN KILPUTHUR GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
			
Kilputhur GP	6	12.14	2,315

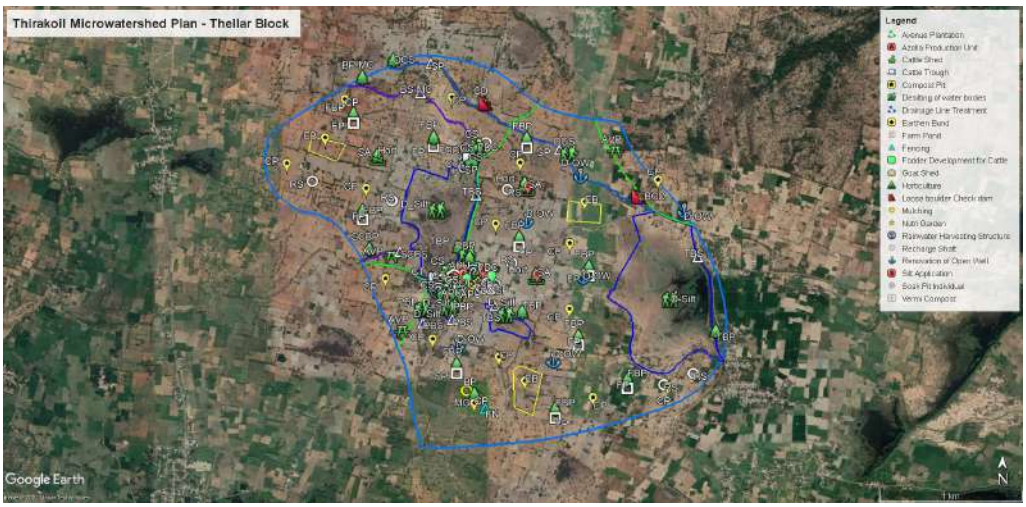


Figure 8.7. Proposed activities in Thirakoil micro-watershed

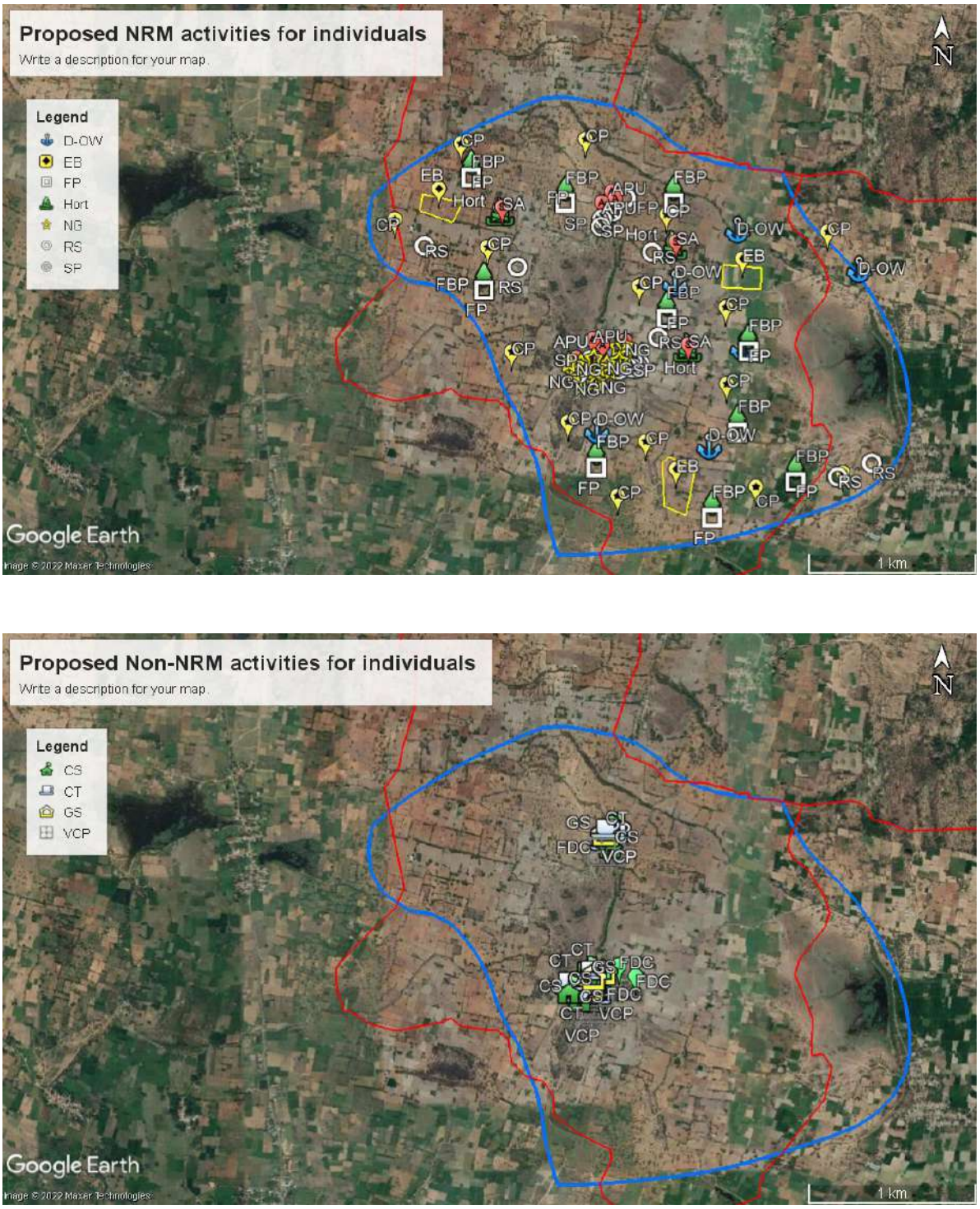


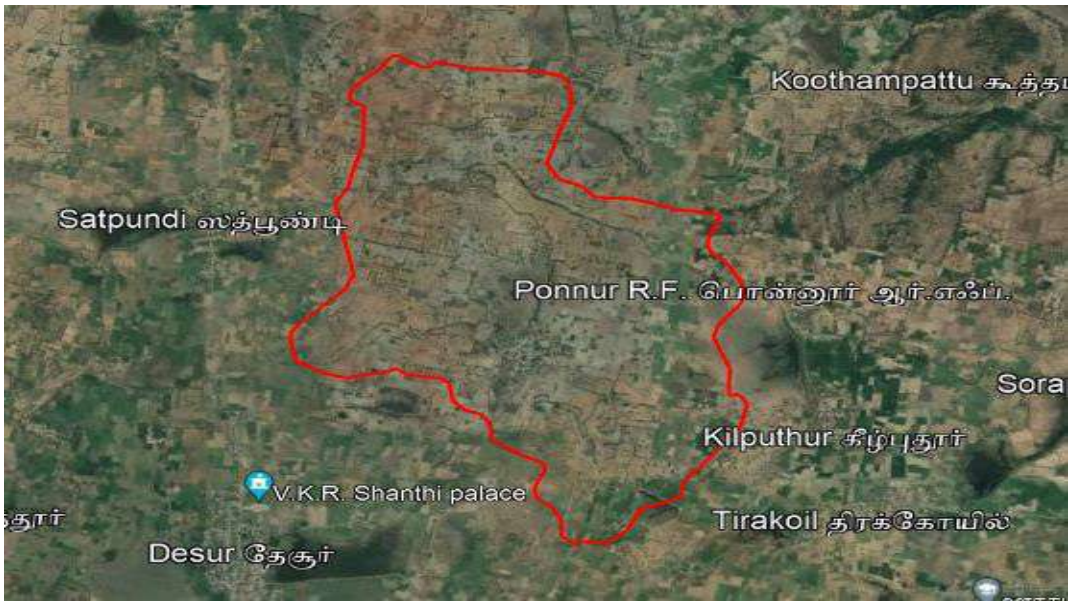
Figure 8.8. Proposed plan in Thirakoil micro-watershed, A. NRM activities for community, B. NRM activities for individuals, C. Non-NRM activities for community, B. Nom-NRM activities for individuals

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

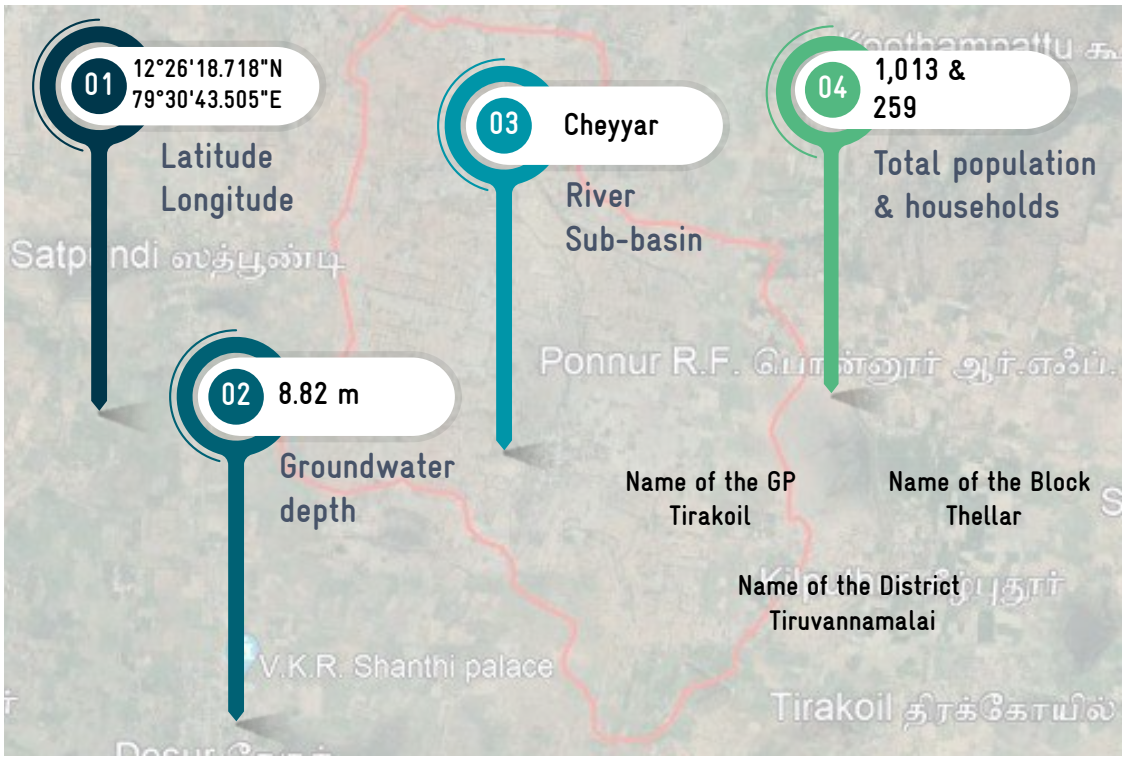
8.3 MODEL GP -TIRAKOIL GP

TIRAKOIL GP

8.3.1 BACKGROUND OF TIRAKOIL GP

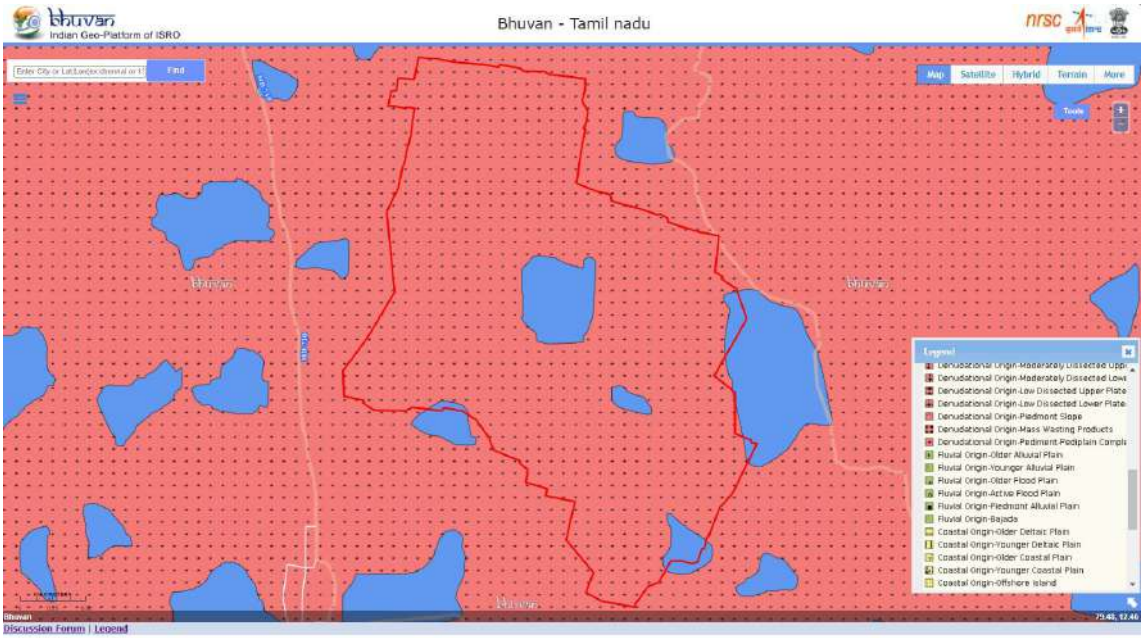


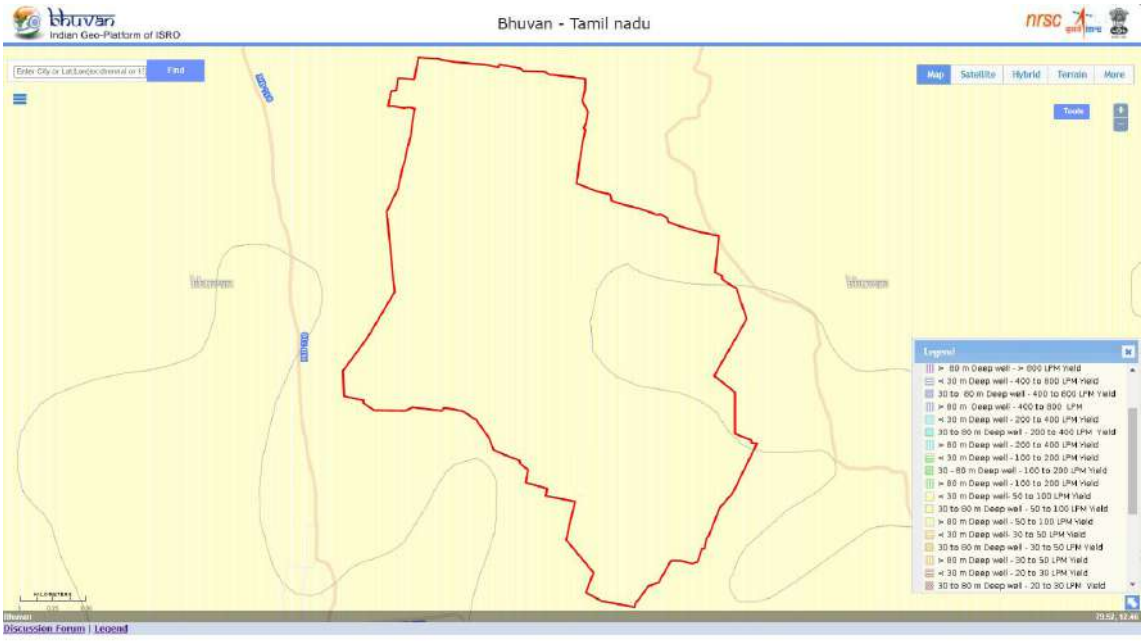
The Tirakoil GP is located in Thellar Block of Tiruvannamalai district, Tamil Nadu. The total population is 1,013 of which 510 are males and 503 are females as per Population Census 2011. The total number of households is 259. The Schedule Tribe population is 487 and Schedule Caste population is 17 in the Tirakoil GP. The general description of this GP is given in Table 54.

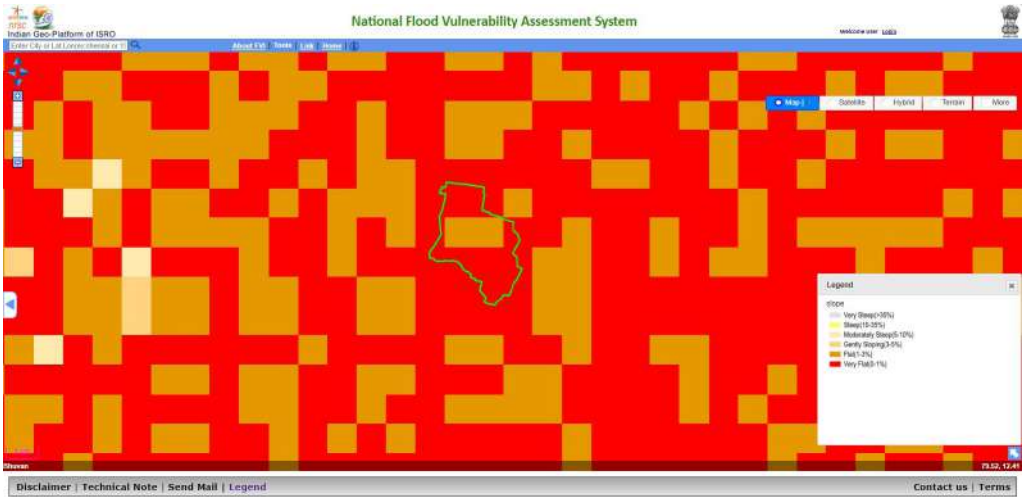


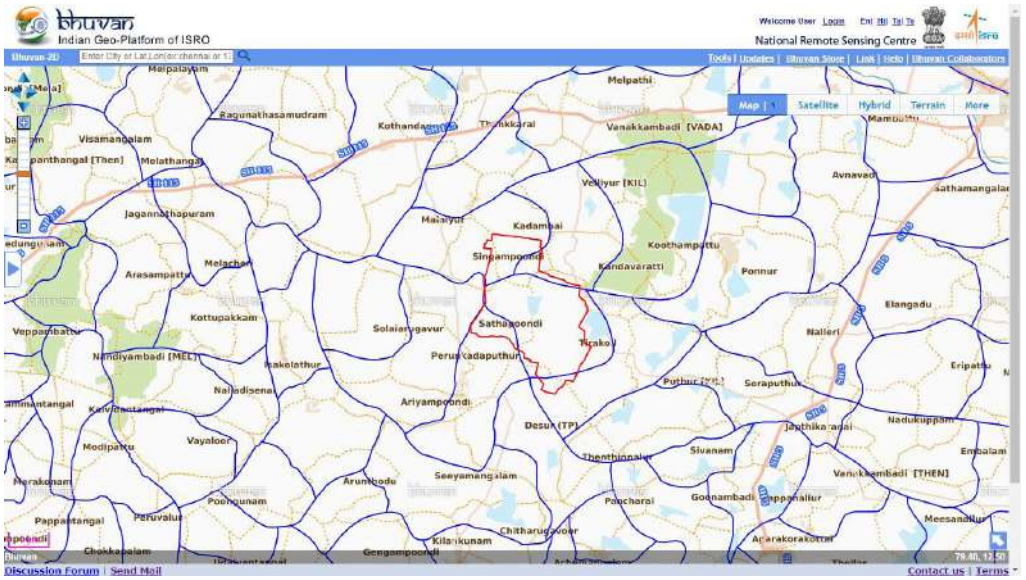
8.3.2 CWRM PLANNING - SPATIAL DATA

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









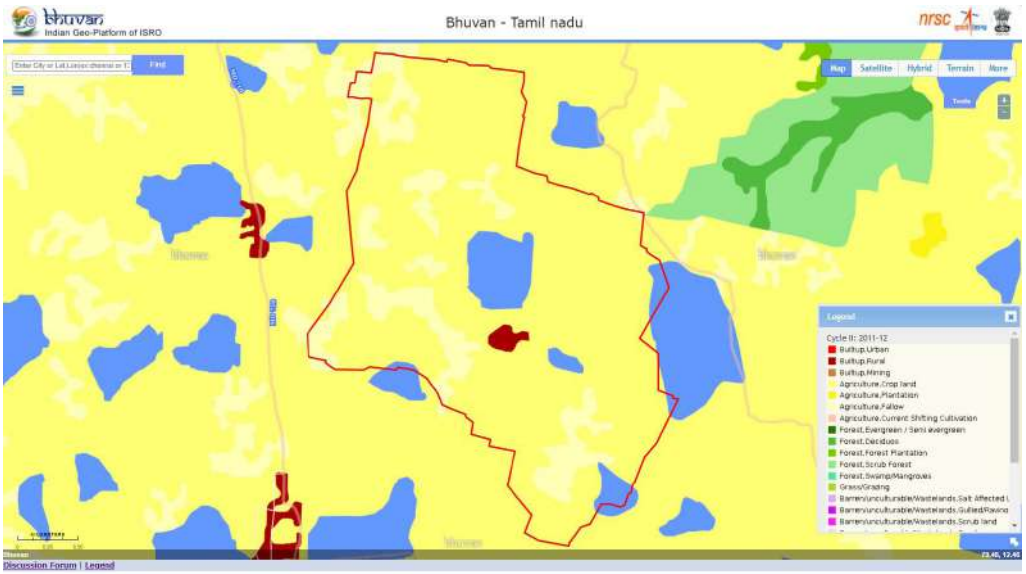


Figure 8.9 Spatial thematic maps of Tirakoil GP. A. Geomorphology, B. GW prosperity, C. Slope, D. Watershed, E.LULC

Tirakoil GP is engrossed with denudation origin pediment complex landform unit (A). It is observed that the groundwater prosperity is less than 30 m deep well with 50 to 100 LPM capacity (B). Very flat (0 to 1 %) terrain is dominant in the GP (C), GP area falls under three micro-watershed units (D). Land is used for crop cultivation (E).

8.3.3 CWRM PLANNING- NON-SPATIAL DATA

Tirakoil GP is engrossed with denudation origin pediment complex landform unit (A). It is observed that the groundwater prosperity is less than 30 m deep well with 50 to 100 LPM capacity (B). Very flat (0 to 1 %) terrain is dominant in the GP (C), GP area falls under three micro-watershed units (D). Land is used for crop cultivation (E).

TABLE 55. NON SPATIAL DATA-TIRAKOIL GP

Key CWRM Parameter	Details
Climate Vulnerability Area (CVA) 1: Socio-Economic	
Geographical Area (ha)	475
Male Population	1,204
Female Population	1,151
Total Population	2,355
SC Population	513
Vulnerable population	513
Households (HH's)	609
Only one room HH's	64
Female-Headed HH's	31
Vulnerable Households	54
% of Vulnerable Households	9
Registered MGNREGA Job cards	1,259
active person working in job Cards	935
Drinking-Water Sources	562
Groundwater sources - Drinking water	5
Surface water sources - Drinking water	1
Annual Grey water Generation (ha.m)	4.3
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)	
Number of Tanks (PWD & Union) (No.)	1
Other Surface Water Bodies (No.)	9

Irrigation Facilities (ha)	
Area under Open & Tube Well Irrigation	152.9
Catchment Area wise Available Runoff (ha.m)	
Good Catchment Area	47.7
Average Catchment Area	5.7
Bad Catchment Area	61.2
Watershed and Drainage Networks	
Length of Natural Drainage Lines (m)	4,538
No.of Natural Drainage Lines	6
No.of micro-watersheds	3
Water Demand (ha.m)	
Water Demand For Humans (ha.m)	6.45
Water Demand for Livestock (ha.m)	2.73
Water Demand For Agriculture (ha.m)	199.07
% G.W Utilization for Drinking	2
% G.W Utilization for Livestock	87
% G.W Utilization for Agriculture.	76
% SW Utilization for Drinking	98
% SW Utilization for Livestock	13
% SW Utilization for Agriculture	24
Climate Vulnerability Area 4: Agriculture	
Area Under Land Resources (ha)	
Area under Non-Agricultural Uses	62.16
Area under Barren & Un-cultivable Land	65
Area under Cultivable Waste Land	20.24
Area under Fallows Land other than Current Fallows	47.06
Area under Current Fallow land	120.98
Area under Unirrigated Land	6.23
Area Irrigated by Source	152.9
Catchment Area (ha)	
Land under Good Catchment	127.16
Land under Average Catchment	20.24
Land under Bad Catchment	327.17
Crop Details (ha)	
Irrigated Area (ha)	113.77
Rainfed area (ha)	129.09
The area under Paddy Cultivation (ha)	92.09
Crop Water Requirement - The irrigated condition (ha.m)	151.03
Crop Water Requirement - Rainfed condition (ha.m)	48.04

Soil Resources: Status of Available Nitrogen (%)	
Very Low	54
Low	46
Status of Organic Carbon (%)	
Very Low	37
Low	63
Status of Soil Micro Nutrients (%)	
Sufficient	58
Deficient	42
Status of Physical condition of the soil (%)	
Slightly Acidic	23
Neutral	7
Moderately Alkaline	69
Soil Texture	
Clay Soil	1
Fine Soil	39
Soil Water Permeability	Moderate
Soil moisture and ET	
Volumetric Soil Moisture (%)	23
Estimated Soil Moisture (ha.m)	412.41
ET Losses (ha.m)	83.07
Means of Water Extraction (%)	
Gravity	1
Lifting	99
Irrigation Methods (%)	
Control Flooding	100
Livestock (No)	
Cattle Population	652
Sheep Population	754
Goat Population	213

8.3.4 KEY WATER CHALLENGES

Socio-Economic

1. According to SECC data, 16 % of the households are vulnerable in the GP
2. 50 one room households, and 18 female headed households
3. 49.7 % SC/ST population
4. Access to drinking water through tap water connections inadequate
5. Grey water generation of 1.85 ha.m needs attention

Water

1. Ground water status – critical
2. 9 traditional waterbodies in the GP
3. Irrigation depends on open and tube well and Tank Irrigation
4. 83% livestock needs and 95% Agriculture needs met through ground water
5. 115.30 ha.m of water is available runoff, from bad catchment area

Agriculture and Allied Sector

1. 11.44 % of the land covers the common area
2. 88.55 % of the land covers an individual land area
3. Main crop in the GP is paddy which is cultivated about 118.10 ha of land
4. Crop water requirement for irrigated condition is more 180.73 (ha.m)
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 low
8. 51% Clay and 41 % Fine soil in GP
9. Very high ET loss 226.20 ha.m-

8.3.5 PERSPECTIVE PLAN - WORKS PROPOSED: WATER ACTIONS

The appropriate and site-specific works are identified for the development of public and common land, agriculture and allied activities, rural infrastructures, and climate-resilient measures to reduce the vulnerability in the GP. About 79 % of the total land area is taken for WASCA treatment activities like plantation and conservation works. The total proposed area for treatment is 167.88 ha. More attention is given for current fallow land and unirrigated land, followed by Fallows land other than current fallows and area irrigated by source (Figure 8.10). Through the proposed conservation activities 34.14 ha.m run off would be harvested in which about 88.42 % of the run off is from bad catchment and the rest is from good and average catchment area (Figure 8.11)

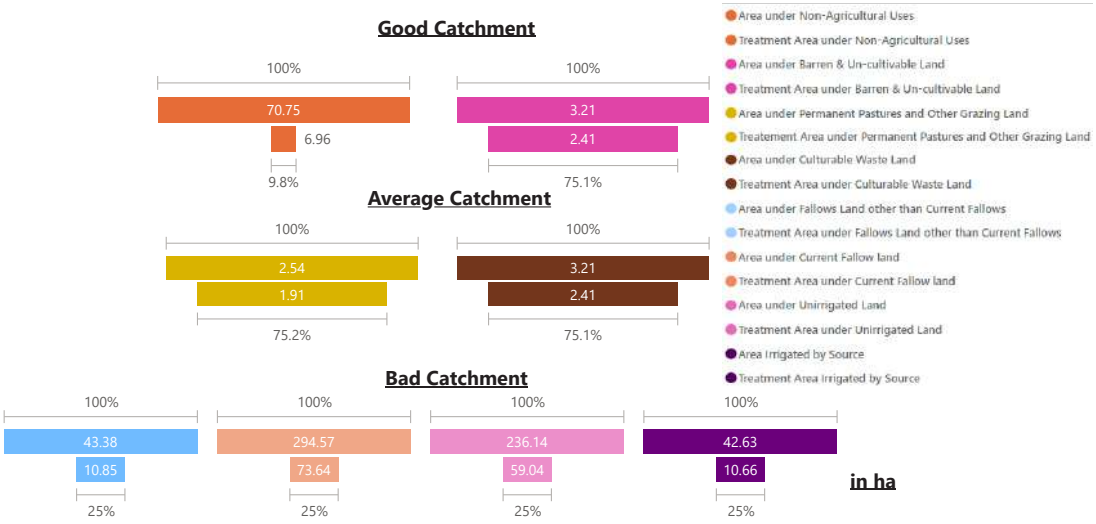


Figure 8.10. Proposed land resource treatment area in Tirakoil GP

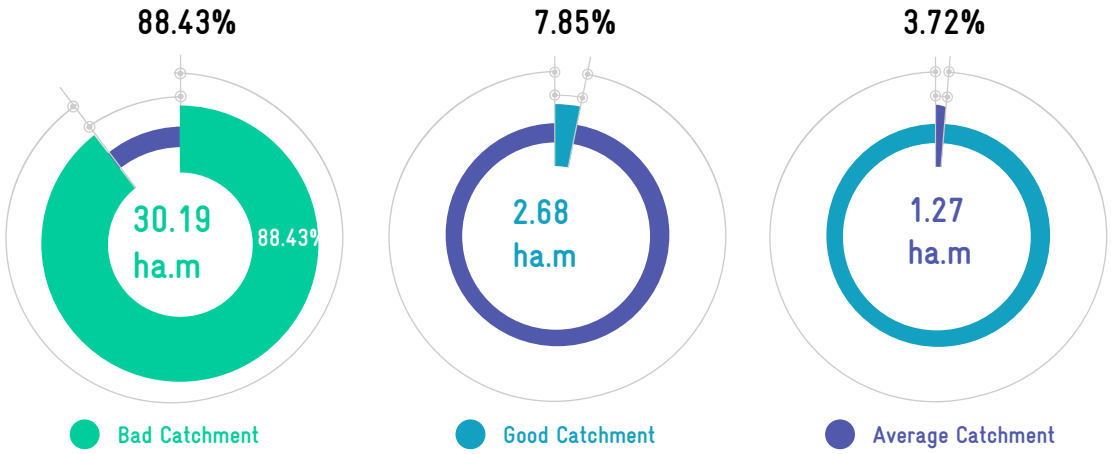


Figure 8.11. Expected run off conservation after treatment

The appropriate and site-specific works have been identified for the development of public and common land, agriculture and allied activities, rural infrastructures, and climate-resilient measures to reduce the vulnerability in the GP. Table 56 shows the detailed perspective plan and estimates of the work, budget, and person-days for three years from 2021-2022 to 2023-2024 in Tirakoil GP. Since it is a vulnerable village, more attention was given to include appropriate works to improve the common and public land development.

TABLE 56. PERSPECTIVE PLAN – WORKS PROPOSED – WATER ACTIONS OF TIRAKOIL GP - FY (2021-2024)

Name of the Work	Ridge Type	No of Works	Estimated cost (INR in Lakhs)	Estimated Person Days
CWRM Water Action 1. Improvement of Public & Common lands development				
Contour Continuous Bunds (CCB) for Afforestation area(m)	Upper	1	0.03	10
Composting (No. of units)	Lower	57	9.69	855
Block Plantation (Community) (ha)	Middle	1	11.1	4,320
Silvi-pasture Development (ha)		1	17.1	6,664
Linear Plantation (km)		9	16.2	6,327
Canal Bund Plantation (km)	Lower	2	15	5,860
Avenue plantation (km)	Middle	2	3.6	1,406
Nursery Development (No.of units)	Lower	6	90	14,064
Restoration of waterbodies :a.PWD and Tanks (No.)		3	15	2,400
Restoration of waterbodies :c. Ponds (No.)		6	6	1,200
Artificial Recharge Structure (No. of units)		6	15	2,346
Drainage Line Treatment (m)	Upper	7	0.21	35
Sub total		**101**	**199**	**45,487**
CWRM Water Action 2: Agricultural and allied Sector development				
CWRM Water Action 2: Works in Lower Ridge				
Farm Bunding with Boundary Trenches - Individual (ha)	Lower	29	43.5	16,994
Micro Irrigation (ha)		4	4	0
Construction of Farm Ponds - Individual (No. of units)		29	58	22,649
Land development - Individual (ha)		2	20	7,812
Dry land Horticulture/Agro-for-estry - Individual (ha)		3	25.5	9,963
Azolla units - Individual (No.of units)		4	0.6	92
NADEP Vermi compost (No. of units)		4	0.72	108
Fodder development - Community & Individual (No.)		4	5.92	9,376
Cattle Shelters (No. of units)		4	8.48	1,324
Goat Sheep Shelters (No.of units)		10	22.7	3,550
Cattle Trough (No.of units)		4	0.2	24
Construction of new open wells & Recharge Shafts (No.of units)		3	15	2,778
Sub Total Water Action -2		**100**	**205**	**74,670**

CWRM Water Action 3: Rural Water Management				
CWRM Water Action 3: Works in Lower Ridge				
Soak Pits (Community) (No.of units)	Lower	3	0.39	60
Soak Pits (Individual) (No.of units)		26	2.6	416
Roof Rain Water Harvesting (No. of units)		2	8	1,250
Sub Total Water Action -3		**31**	**11**	**1,726**
District Total		**232**	**415**	**1,21,883**

Regarding CWRM themes of the total number of projects identified, 44.83 % works are in agriculture and allied sector while 38.53 % works are in public and common land, and 16.62% works are in rural infrastructure respectively. Table 57 provides the estimates of the work budget, and personal days for three years from 2021-2024 in Tirakoil GP.

TABLE 57. 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	101	199	45,487
Agriculture and Allied sector development	100	205	74,670
Rural water management	31	11	1,726
TOTAL	232	415	1,21,883

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

TABLE 58. WASCA- WATER ACTIONS, INDICATORS AND IMPACTS

WASCA CWRM ACTION PLAN

DEVELOPMENT OF PUBLIC AND COMMON LAND

	INDICATOR		OUTCOMES/ IMPACT
1	Number of water bodies restored in the village	1	Nine traditional water bodies restored
2	Area under Block Plantation	2	5 ha under Block Plantation
3	Percentage reduction in the annual surface runoff	3	37.3 ha.m surface runoff harvested and stored
4	The proportion of land treated under WASCA	4	23% of the total geographical area of the village treated under WASCA in three years
5	Drainage line treatment	5	7 km length of drainage lines treated

9 TRADITIONAL WATER BODIES RESTORED

5 ha.m BLOCK PLANTATION

23 % AREA OF THE VILLAGE TREATED

7 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	32 farm ponds established
2	The reducing area under fallow lands	2	84.49 ha under fallow land restored for cultivation
3	Improvement in soil health	3	4 units of vermi compost established
4	No of artificial recharge structures proposed	4	6 artificial recharge structures were established to replenish groundwater flow

32 FARM PONDS

4 VERMI COMPOST

6 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.	Three community level and 26 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.	259 households established Nutri-gardens in homesteads

3 COMMUNITY & **26** INDIVIDUAL SOAK PITS

2 COMMON ROOF RAINWATER HARVESTING

259 NUTRI-GARDENS

The following table provides both the perspective plan for three years period and the annual plan for one year period from 2021-2022 on the shelf of projects/number of works and number of person-days (Table 59).

TABLE 59. PROPOSALS FOR THE MGNREGS, TIRAKOIL GP

	No of works	No of person days
Perspective plan	232	1,21,883
Annual plan	101	58,050

8.3.7 PROPOSED ACTIVITY MAP

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

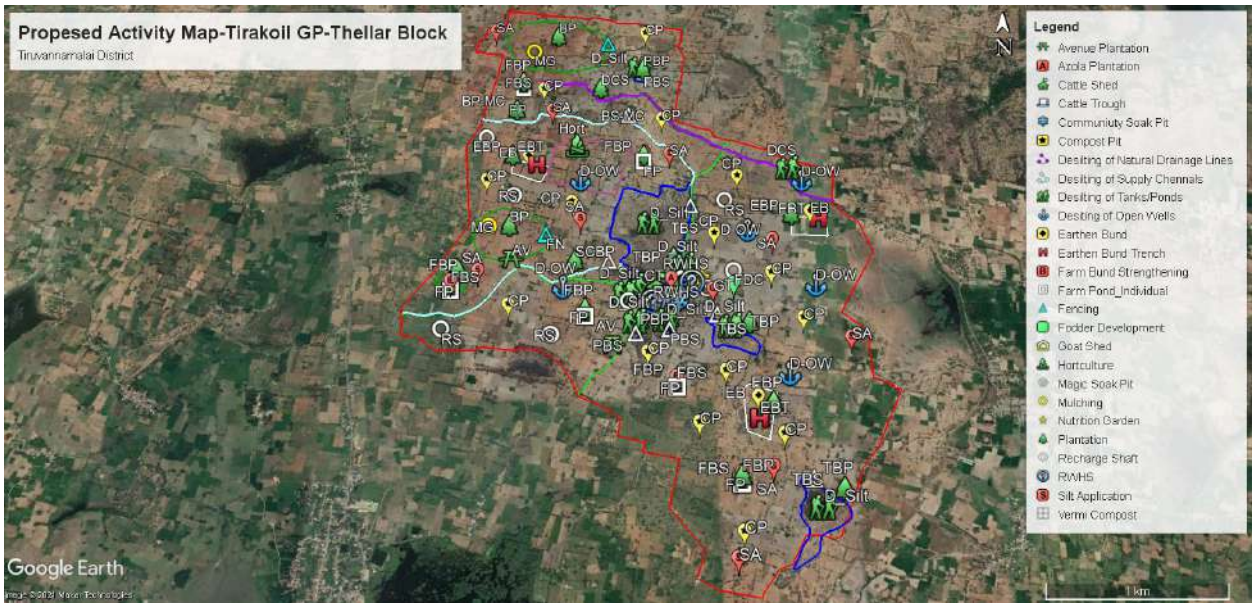


Figure 8.12. Action plan of Tirakoil GP, Thellar Block

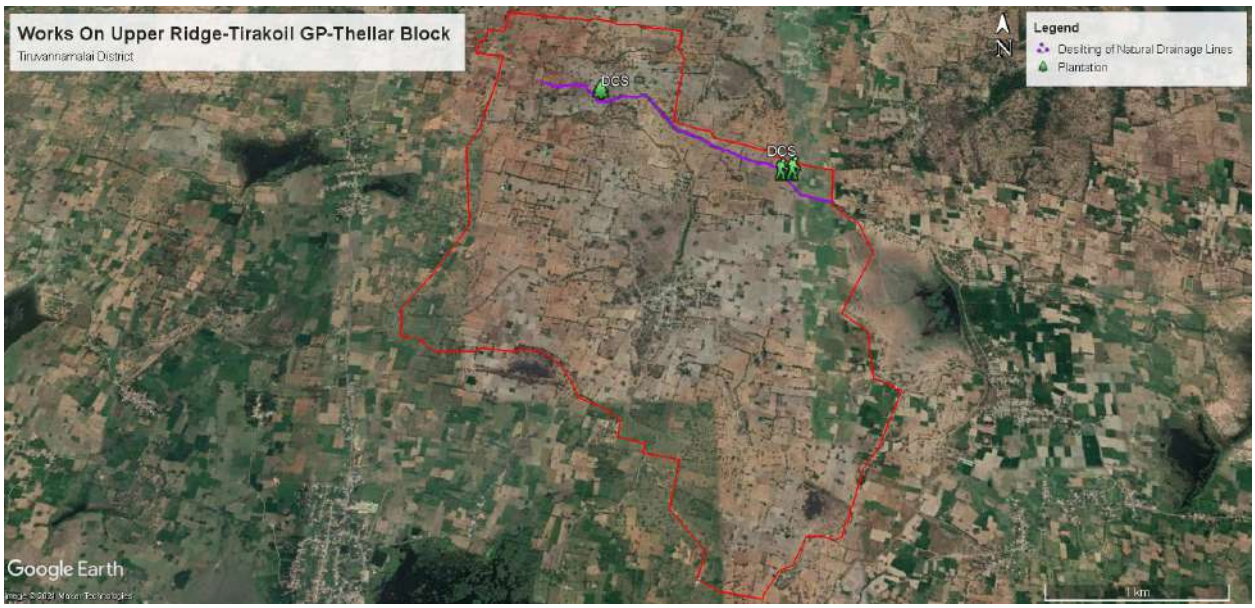


Figure 8.13. Works on Upper Ridge of Tirakoil GP, Thellar Block

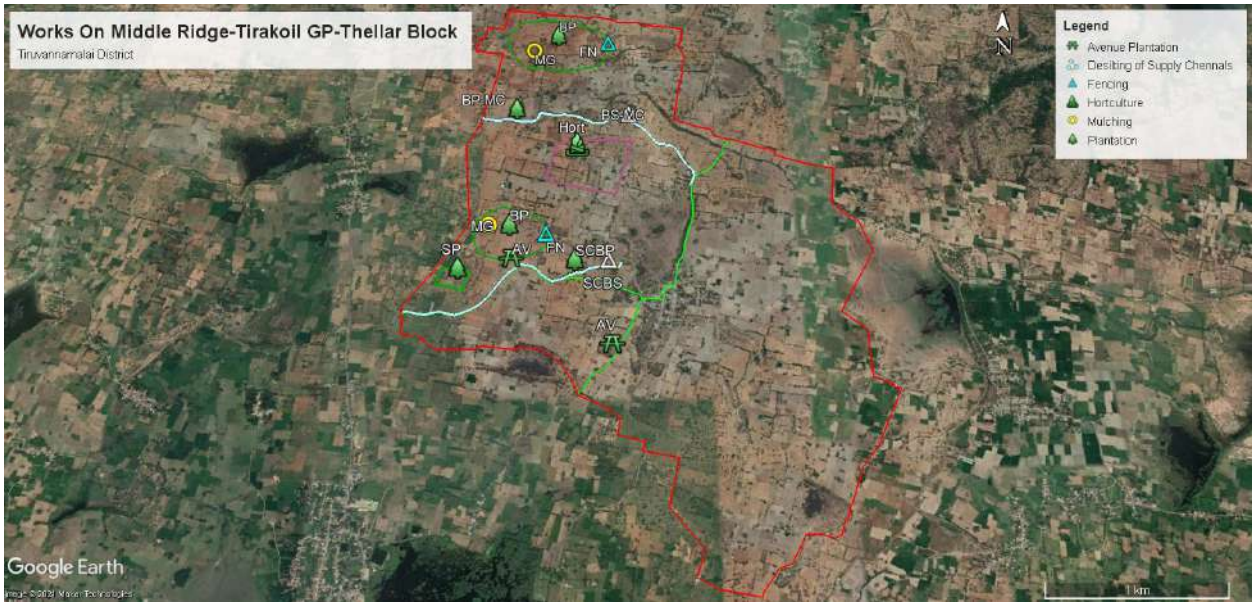


Figure 8.14. Works on Middle Ridge of Tirakoil GP

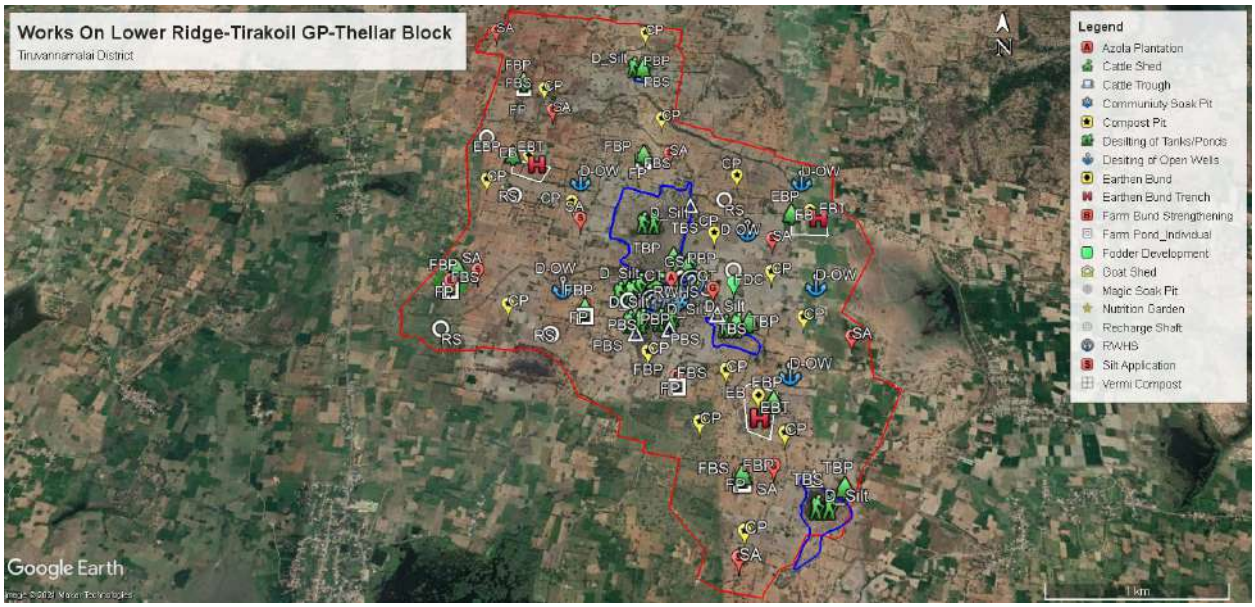
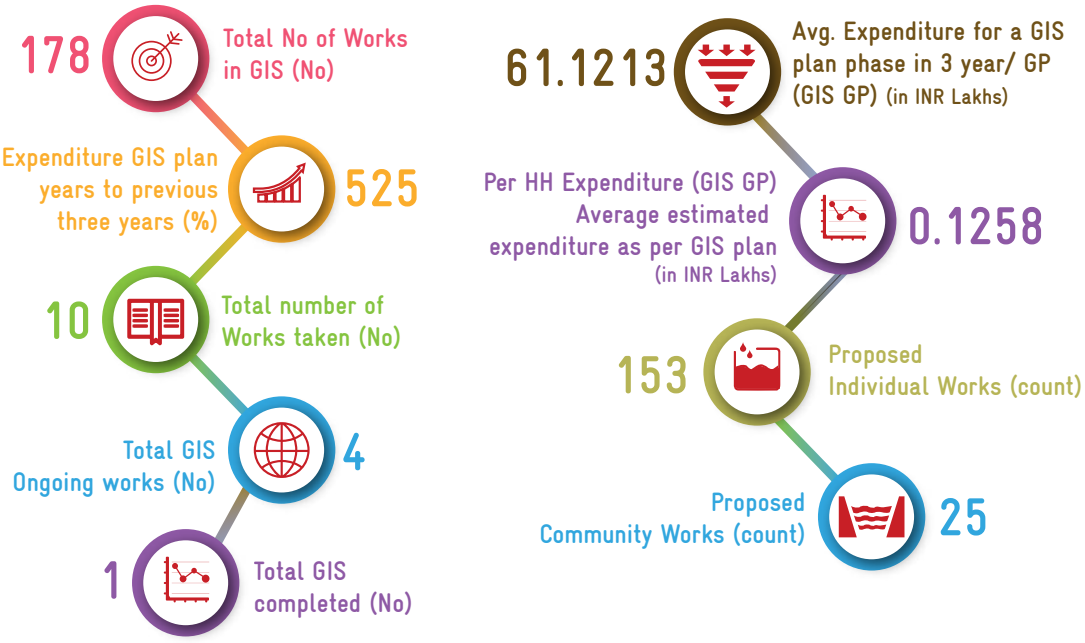


Figure 8.15. Works on Lower Ridge of Tirakoil GP, Thellar Block

8.3.8 GIS PLAN IMPLEMENTATION, KEY PARAMETERS

The GIS plan implementation and performance in Thellar Block is represented in table 60.

TABLE 60. GIS PLAN IMPLEMENTATION, KEY PARAMETERS PERFORMANCE OF TIRAKOIL GP



நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு

குறள் - 20

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

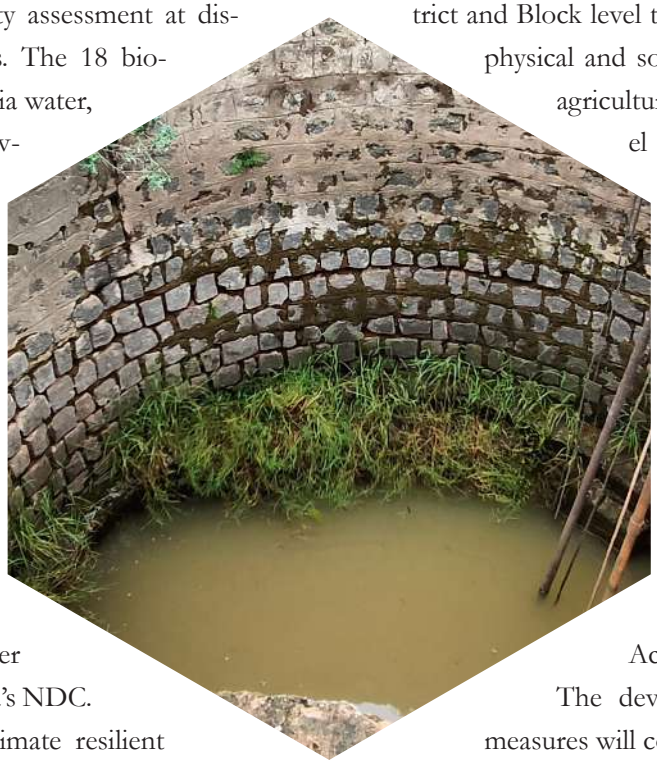
Thirukkural - 20

CHAPTER 9

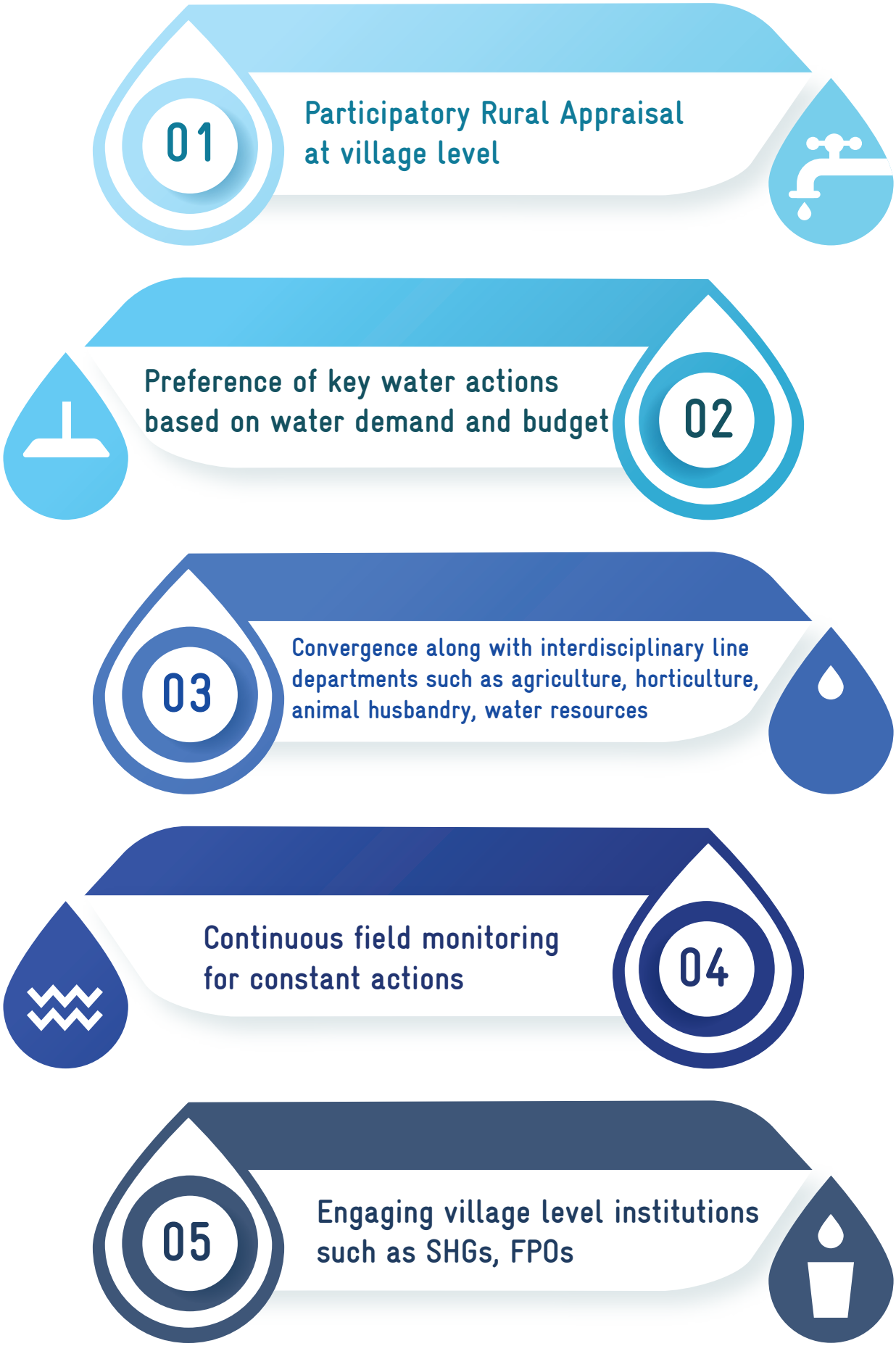
CONCLUSION

> **"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.)
Achamangalam	-	498.00	2,950.00	2,988.00	5.00	-	-
Arunkunam	-	348.00	6,740.00	1,854.00	5.00	4.00	-
Arunthodu	-	375.00	2,460.00	1,543.00	3.00	1.00	-
Chitharugavoor	-	452.00	5,360.00	1,125.00	1.00	4.00	-
Embalam	-	-	1,450.00	1,100.00	2.00	3.00	-
Eripattu	-	472.00	6,490.00	3,225.00	4.00	4.00	-
Goodalur	-	393.00	4,170.00	1,102.00	3.00	3.00	-
Japthikaranai	-	-	-	3,885.00	1.00	4.00	-
Kadambai	-	-	-	1,880.00	2.00	6.00	-
Kandavaratti	-	-	-	3,724.00	4.00	3.00	2.00
Kilnamandi	-	-	6,140.00	988.00	3.00	6.00	2.00
Kilputhur	-	-	-	1,900.00	2.00	9.00	-
Mavalavadi	-	-	-	1,128.00	1.00	6.00	1.00
Kilvillivalam	-	422.00	9,890.00	2,400.00	3.00	5.00	1.00
Kilvelliyur	-	-	-	954.00	2.00	8.00	1.00
Koothampattu	-	-	-	1,724.00	2.00	5.00	-
Korakottai	-	457.00	8,440.00	1,200.00	1.00	4.00	2.00
Kothandapuram	-	-	-	2,600.00	4.00	5.00	1.00
Kunnagampundi	-	427.00	5,300.00	1,445.00	3.00	3.00	1.00
Mahamai Thirumani	-	-	-	2,800.00	2.00	5.00	1.00
Mazhavankaranai	-	-	-	2,683.00	4.00	7.00	4.00
Meesanallur	-	352.00	7,230.00	1,400.00	2.00	-	-
Melpathi	-	327.00	2,755.00	1,200.00	1.00	-	-

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.)
Nerkunam	-	386.00	9,100.00	1,400.00	2.00	-	-
Padur	-	389.00	1,500.00	1,500.00	2.00	-	-
Palaveri	-	386.00	1,680.00	1,600.00	1.00	2.00	-
Pancharai		437.00	3,730.00	2,800.00	2.00	1.00	-
Pennattagaram	-	-	-	1,850.00	2.00	3.00	-
Ponnur		374.00	7,390.00	1,500.00	1.00	-	-
Ramasamudram	-	348.00	2,150.00	2,300.00	2.00	3.00	-
S Katteri	-	388.00	3,470.00	1,900.00	2.00	2.00	-
Sathapoondi	-	468.00	4,888.00	5,200.00	3.00	3.00	-
Sathiyavadi	-	368.00	530.00	1,000.00	1.00	4.00	-
Seeyamangalam	-	394.00	7,885.00	4,500.00	2.00	2.00	-
Senal	-	472.00	350.00	2,800.00	3.00	3.00	-
Sivanam	-	457.00	1,580.00	2,754.00	2.00	6.00	-
Sogathur	-	452.00	2,854.00	2,200.00	1.00	3.00	-
Thellar	-	437.00	5,874.00	3,800.00	4.00	2.00	-
Thenkkarai	-	384.00	5,230.00	1,800.00	4.00	3.00	-
Thennathur	-	487.00	3,857.00	1,600.00	2.00	2.00	-
Thenthinnalur	-	458.00	1,155.00	1,875.00	1.00	1.00	-
Thenvanakkambadi	-	-	-	1,830.00	2.00	6.00	-
Thirakoil	-	398.00	2,590.00	1,795.00	3.00	6.00	-
Vadakkupattu	-	487.00	1,510.00	320.00	-	3.00	-
Vadavanakkambad	-	489.00	5,980.00	5,435.00	3.00	2.00	-
Vedal	3.81	498.00	2,950.00	2,988.00	1.00	2.00	-
Kondiyankuppam	-	-	-	2,300.00	2.00	8.00	-
Periya kuppam	-	-	-	1,800.00	1.00	3.00	-
Nallur	-	-	-	2,400.00	3.00	5.00	-
Madam	-	-	-	1,800.00	1.00	5.00	-

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.)
Theyyar	-	-	-	2,300.00	2.00	11.00	-
Agarakorakottai	-	-	-	2,600.00	2.00	1.00	-
Gengamppoondi	-	-	-	1,500.00	1.00	6.00	-
Goonambadi	-	-	-	2,800.00	2.00	5.00	-
Kodiyalam	-	-	-	1,700.00	2.00	7.00	-
Malaiyur	-	-	-	2,500.00	2.00	11.00	-
Nadukuppam	-	-	-	1,800.00	2.00	1.00	-
Perunkadaputhur	-	-	-	2,800.00	7.00	1.00	-
Soraputhur	-	-	-	1,600.00	2.00	3.00	-
Thakkandarayapuram	-	-	-	1,600.00	8.00	1.00	-
Sri Rnagarajapuram	-	-	-	1,800.00	11.00	1.00	-

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
Achamangalam	-	-	117.00	-	-	50.50	3.60	36.10
Arunkunam	50.00	-	149.52	-	-	42.50	-	68.30
Arunthodu	-	-	54.63	-	-	8.60	0.60	48.30
Chitharugavoor	-	-	67.51	-	-	33.10	-	35.20
Embalam	37.09	-	6.10	-	-	1.90	1.60	64.70
Eripattu	-	-	49.04	-	-	25.00	2.20	69.40
Goodalur	39.31	-	119.18	-	-	36.30	5.30	101.80
Japthikaranai	40.46	-	60.70	-	-	33.50	1.20	44.60
Kadambai	65.05	-	110.88	-	-	34.10	2.80	50.20
Kandavaratti	34.87	-	67.77	-	-	6.10	2.00	53.50
Kilnamandi	25.20	-	111.40	-	-	53.30	1.90	54.40
Kilputhur	65.00	-	100.17	-	-	57.90	-	78.40
Mavalavadi	50.15	-	96.72	-	-	27.10	4.30	54.80
Kilvillivalam	-	-	144.75	-	-	86.40	4.00	128.80
Kilvelliyur	40.00	-	41.23	-	-	41.80	-	78.50
Koothampattu	26.00	-	30.69	-	-	12.80	2.80	30.30
Korakottai	50.00	-	56.32	-	-	48.10	2.60	88.00
Kothandapuram	97.56	-	77.81	-	-	72.40	1.90	62.50
Kunnagampundi	36.50	-	16.26	-	-	24.30	1.70	35.60
Mahamai Thirumani	45.63	-	78.85	-	-	41.50	11.70	51.00
Mazhavankaranai	40.00	-	200.95	-	-	36.30	5.30	57.70
Meesanallur	20.00	-	62.31	-	-	48.40	2.80	74.80
Melpathi		-	51.90	-	-	35.40	0.80	23.50
Nerkunam	80.00	-	180.81	-	-	73.10	1.10	118.10
Padur	86.94	-	108.11	-	-	19.30	3.40	66.80
Palaveri	19.47	-	58.86	-	-	13.80	0.90	43.50

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
Pancharai	20.10	-	52.17	-	-	11.40	14.20	46.60
Pennattagaram	20.57	-	40.45	-	-	33.30	1.10	55.40
Ponnur	116.12	-	48.40	-	-	78.70	5.00	141.20
Ramasamudram	-	-	-	-	-	48.90	-	62.10
S Katteri	24.30	-	45.31	-	-	24.40	3.40	40.20
Sathapoondi	30.00	-	65.29	-	-	17.30	-	96.40
Sathiyavadi	39.00	-	109.72	-	-	21.60	0.90	70.60
Seeyamangalam	39.00	-	101.32	-	-	7.10	1.00	117.80
Senal	20.00	-	78.41	-	-	33.00	0.70	50.60
Sivanam	47.43	-	57.10	-	-	31.00	0.90	54.30
Sogathur	45.00	-	68.26	-	-	25.40	-	35.60
Thellar	100.00	-	243.64	-	-	107.40	17.30	112.30
Thenkkarai	20.00	-	74.54	-	-	56.50	1.10	70.30
Thennathur	20.00	-	78.71	-	-	19.60	18.30	91.00
Thenthinnalur	19.78	-	12.03	-	-	2.60	0.70	24.00
Thenvanakkambadi	43.45	-	23.18	-	-	5.50	9.10	42.30
Thirakoil	28.00	-	14.63	-	-	27.70	1.60	115.30
Vadakkupattu	-	-	46.67	-	-	2.60	-	30.70
Vadavanakkambad	-	-	43.24	-	-	12.90	1.80	41.70
Vedal	-	-	117.00	-	-	55.10	8.90	51.40
Kondiyankuppam	16.00	-	61.87	-	-	10.00	2.00	36.80
Periya kuppam	9.00	-	34.80	-	-	5.60	1.10	20.70
Nallur	75.00	-	290.02	-	-	46.70	9.40	172.50
Madam	-	48.25	22.68	-	-	154.70	13.30	163.80
Theyyar	25.70	-	48.56	-	-	154.70	13.30	163.80
Agarakorakottai	-	-	126.58	-	-	68.00	0.30	50.30

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
Gengamppoondi	15.00	-	106.61	-	-	51.20	13.70	58.80
Goonambadi	54.87	-	120.32	-	-	47.20	3.20	75.40
Kodiyalam	12.24	-	189.58	-	-	81.00	0.10	102.50
Malaiyur	60.35	-	268.15	-	-	66.90	13.90	97.50
Nadukuppam	38.40	-	96.90	-	-	37.30	3.60	66.90
Perunkadaputhur	20.00	-	149.41	-	-	43.30	3.80	86.90
Soraputhur	15.00	-	68.28	-	-	51.80	5.90	54.40
Thakkandarayapuram	-	-	139.74	-	-	48.70	2.80	54.50
Sri Rnagarajapuram	66.75	-	120.97	-	-	191.77	8.53	498.40

Gram Panchayat	Watershed and Drainage Networks		
	Length of Natural Drainage Lines (m)	Number of Natural Drainage Lines (No.)	Number of Micro Watersheds (No.)
Achamangalam	5,373.69	7.00	2.00
Arunkunam	1,863.28	3.00	5.00
Arunthodu	2,082.35	6.00	9.00
Chitharugavoor	2,535.91	5.00	3.00
Embalam	3,932.73	7.00	5.00
Eripattu	4,408.00	7.00	5.00
Goodalur	4,413.00	7.00	4.00
Japthikaranai	5,979.00	6.00	6.00
Kadambai	4,461.00	6.00	2.00
Kandavaratti	3,376.00	6.00	3.00
Kilnamandi	4,704.00	5.00	8.00
Kilputhur	7,810.00	5.00	2.00
Mavalavadi	-	-	6.00
Kilvillivalam	5,515.00	4.00	4.00
Kilvelliyur	6,920.00	7.00	9.00
Koothampattu	1,793.00	5.00	1.00
Korakottai	6,323.00	5.00	2.00
Kothandapuram	4,391.00	4.00	6.00
Kunnagampundi	2,741.00	3.00	4.00
Mahamai Thirumani	4,646.00	7.00	5.00
Mazhavankaranai	889.24	4.00	4.00
Meesanallur	3,724.31	7.00	6.00
Melpathi	1,583.38	6.00	2.00
Nerkunam	9,038.00	5.00	3.00
Padur	1,349.73	3.00	8.00
Palaveri	452.00	1.00	9.00
Pancharai	2,268.00	4.00	2.00

Gram Panchayat	Watershed and Drainage Networks		
	Length of Natural Drainage Lines (m)	Number of Natural Drainage Lines (No.)	Number of Micro Watersheds (No.)
Pennattagaram	4,810.00	3.00	3.00
Ponnur	8,358.00	6.00	4.00
Ramasamudram	3,642.00	4.00	6.00
S Katteri	-	-	7.00
Sathapoondi	4,106.38	7.00	8.00
Sathiyavadi	2,004.70	7.00	6.00
Seeyamangalam	7,101.42	7.00	4.00
Senal	3,063.97	3.00	5.00
Sivanam	4,643.90	8.00	5.00
Sogathur	2,387.56	4.00	1.00
Thellar	10,389.25	12.00	6.00
Thenkkarai	1,894.52	2.00	5.00
Thennathur	3,696.16	6.00	7.00
Thenthinnalur	417.20	2.00	9.00
Thenvanakkambadi	4,195.00	4.00	5.00
Thirakoil	7,021.35	7.00	5.00
Vadakkupattu	1,353.31	2.00	5.00
Vadavanakkambad	2,218.07	5.00	4.00
Vedal	5,373.69	7.00	5.00
Kondiyankuppam	1,905.35	3.00	5.00
Periya kuppam	157.62	1.00	2.00
Nallur	7,900.05	7.00	6.00
Madam	922.24	2.00	4.00
Theyyar	8,374.05	8.00	9.00
Agarakorakottai	-	-	4.00
Gengamppoondi	2,399.55	4.00	6.00
Goonambadi	3,755.63	12.00	6.00

Gram Panchayat	Watershed and Drainage Networks		
	Length of Natural Drainage Lines (m)	Number of Natural Drainage Lines (No.)	Number of Micro Watersheds (No.)
Kodiyalam	6,347.61	10.00	7.00
Malaiyur	7,135.13	12.00	5.00
Nadukuppam	7,278.48	12.00	4.00
Perunkadaputhur	6,691.60	18.00	4.00
Soraputhur	5,140.81	7.00	-
Thakkandarayapuram	3,380.72	6.00	6.00
Sri Rnagarajapuram	7,975.70	10.00	8.00

Gram Panchayat	Water Demand								
	For Humans (ha.m)	For Livestock (ha.m)	For Agriculture (ha.m)	% GW Utilization for Drinking (%)	% GW Utilization for Livestock (%)	% GW Utilization for Agriculture. (%)	% SW Utilization for Drinking (%)	% SW Utilization for Livestock (%)	% SW Utilization for Agriculture (%)
Achamangalam	2.16	1.23	91.96	-	-	58.00	100.00	100.00	42.00
Arunkunam	2.72	1.54	145.12	44.00	95.00	97.00	56.00	5.00	3.00
Arunthodu	2.86	1.58	67.59	-	91.00	95.00	100.00	9.00	5.00
Chitharugavoor	5.69	0.85	75.26	24.00	53.00	98.00	76.00	47.00	2.00
Embalam	3.25	1.67	188.31	13.00	94.00	100.00	87.00	6.00	-
Eripattu	2.55	1.69	133.72	-	94.00	99.00	100.00	6.00	1.00
Goodalur	4.42	2.41	68.94	7.00	96.00	96.00	93.00	4.00	4.00
Japthikaranai	3.17	2.07	95.16	-	89.00	97.00	100.00	11.00	3.00
Kadambai	5.60	2.46	84.01	40.00	97.00	98.00	60.00	3.00	2.00
Kandavaratti	3.88	2.33	120.52	35.00	95.00	99.00	65.00	5.00	1.00
Kilnamandi	3.21	1.66	47.20	32.00	88.00	96.00	68.00	12.00	4.00
Kilputhur	8.27	4.60	126.63	73.00	93.00	97.00	27.00	7.00	3.00
Mavalavadi	2.38	1.25	101.94	59.00	93.00	99.00	41.00	7.00	1.00
Kilvillivalam	5.97	2.55	199.25	-	95.00	97.00	100.00	5.00	3.00
Kilvelliyur	3.92	1.85	161.95	42.00	98.00	99.00	58.00	2.00	1.00
Koothampattu	2.30	1.16	45.12	48.00	92.00	99.00	52.00	8.00	1.00
Korakottai	4.27	1.18	62.59	55.00	92.00	98.00	45.00	8.00	2.00
Kothandapuram	4.82	1.96	106.37	69.00	92.00	99.00	31.00	8.00	1.00
Kunnagampundi	3.39	2.88	56.73	-	-	96.00	100.00	100.00	4.00
Mahamai Thirumani	3.22	2.71	72.52	3.00	87.00	63.00	97.00	13.00	37.00
Mazhavankaranai	3.53	2.20	84.69	59.00	86.00	98.00	41.00	14.00	2.00
Meesanallur	4.29	1.24	104.21	-	94.00	99.00	100.00	6.00	1.00
Melpathi	2.86	1.59	104.73	9.00	99.00	99.00	91.00	1.00	1.00
Nerkunam	6.64	2.99	89.01	6.00	98.00	96.00	94.00	2.00	4.00
Padur	2.89	1.64	78.54	3.00	92.00	99.00	97.00	8.00	1.00
Palaveri	1.81	1.01	42.71	-	95.00	99.00	100.00	5.00	1.00

Gram Panchayat	Water Demand								
	For Humans (ha.m)	For Livestock (ha.m)	For Agriculture (ha.m)	% GW Utilization for Drinking (%)	% GW Utilization for Livestock (%)	% GW Utilzation for Agriculture. (%)	% SW Utilization for Drinking (%)	% SW Utilization for Livestock (%)	% SW Utilization for Agriculture (%)
Pancharai	2.40	0.86	46.39	44.00	99.00	96.00	56.00	1.00	4.00
Pennattagaram	2.91	1.60	43.15	20.00	94.00	97.00	80.00	6.00	3.00
Ponnur	12.37	2.33	239.92	-	97.00	98.00	100.00	3.00	2.00
Ramasamudram	4.38	2.41	161.29	4.00	94.00	100.00	96.00	6.00	-
S Katteri	4.15	1.67	53.99	-	98.00	96.00	100.00	2.00	4.00
Sathapoondi	3.52	1.54	30.15	4.00	88.00	91.00	96.00	12.00	9.00
Sathiyavadi	3.59	3.31	193.76	37.00	90.00	99.00	63.00	10.00	1.00
Seeyamangalam	4.62	2.40	104.89	2.00	90.00	100.00	98.00	10.00	-
Senal	3.28	1.33	58.60	65.00	90.00	98.00	35.00	10.00	2.00
Sivanam	2.02	0.66	82.80	6.00	100.00	97.00	94.00	-	3.00
Sogathur	3.51	0.09	148.33	79.00	6.00	100.00	21.00	94.00	-
Thellar	19.46	3.90	137.14	8.00	97.00	99.00	92.00	3.00	1.00
Thenkkarai	5.95	2.58	93.92	79.00	95.00	98.00	21.00	5.00	2.00
Thennathur	5.01	0.70	47.90	76.00	100.00	86.00	24.00	-	14.00
Thenthinnalur	2.43	0.95	31.99	7.00	98.00	96.00	93.00	2.00	4.00
Thenvanakkambadi	3.03	1.94	71.46	64.00	97.00	96.00	36.00	3.00	4.00
Thirakoil	2.77	1.46	183.40	72.00	83.00	99.00	28.00	17.00	1.00
Vadakkupattu	2.42	0.33	34.85	5.00	98.00	89.00	95.00	2.00	11.00
Vadavanakkambad	2.94	1.31	65.91	3.00	99.00	92.00	97.00	1.00	8.00
Vedal	5.73	0.35	53.22	3.00	63.00	20.00	97.00	37.00	80.00
Kondiyankuppam	2.71	1.18	371.63	80.00	97.00	100.00	20.00	3.00	-
Periya kuppam	2.71	0.66	371.63	85.00	97.00	100.00	15.00	3.00	-
Nallur	8.71	5.52	371.63	82.00	97.00	100.00	18.00	3.00	-
Madam	3.27	1.74	295.57	5.00	96.00	100.00	95.00	4.00	-
Theyyar	6.03	1.74	295.57	2.00	96.00	100.00	98.00	4.00	-

Gram Panchayat	Water Demand								
	For Humans (ha.m)	For Livestock (ha.m)	For Agriculture (ha.m)	% GW Utilization for Drinking (%)	% GW Utilization for Livestock (%)	% GW Utilzation for Agriculture. (%)	% SW Utilization for Drinking (%)	% SW Utilization for Livestock (%)	% SW Utilization for Agriculture (%)
Agarakorakottai	3.39	2.32	49.84	79.00	94.00	96.00	21.00	6.00	4.00
Gengamppoondi	3.30	1.57	83.75	76.00	90.00	95.00	24.00	10.00	5.00
Goonambadi	3.96	1.77	738.86	84.00	95.00	25.00	16.00	5.00	75.00
Kodiyalam	8.33	2.48	173.27	5.00	95.00	97.00	95.00	5.00	3.00
Malaiyur	7.42	4.87	216.69	87.00	92.00	99.00	13.00	8.00	1.00
Nadukuppam	3.67	1.76	184.11	6.00	92.00	99.00	94.00	8.00	1.00
Perunkadaputhur	4.17	2.26	88.81	3.00	96.00	95.00	97.00	4.00	5.00
Soraputhur	3.02	3.00	82.92	5.00	94.00	96.00	95.00	6.00	4.00
Thakkandarayapuram	5.21	3.22	145.11	-	-	99.00	100.00	100.00	1.00
Sri Rnagarajapuram	3.44	2.69	290.11	100.00	92.00	100.00	-	8.00	-

ANNEXURE 3.7

GP WISE STATUS OF AGRICULTURE RESOURCE

Gram Panchayat	Area under Land Resources (ha)									
	Area under Forest land	Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Area under Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Achamangalam	-	122.81	11.89	-	2.74	10.20	-	81.36	37.61	74.00
Arunkunam	-	93.03	20.23	-	-	-	21.92	71.89	71.90	199.52
Arunthodu	-	22.97	-	2.10	-	-	49.03	73.18	81.65	54.63
Chitharugavoor	-	88.25	0.09	-	-	-	22.74	53.75	44.19	67.51
Embalam	-	3.40	1.70	3.66	1.70	0.30	92.07	84.05	126.50	43.19
Eripattu	-	63.43	3.17	-	1.62	6.15	-	312.04	9.79	49.04
Goodalur	-	95.47	1.30	-	1.70	17.10	3.41	239.51	143.14	158.49
Japthikaranai	-	86.99	2.21	-	4.31	-	-	94.21	43.38	101.16
Kadambai	-	89.75	1.06	5.98	0.75	3.40	-	51.26	41.22	175.93
Kandavaratti	-	16.39	-	-	3.85	3.23	40.35	112.62	30.65	102.64
Kilnamandi	-	103.24	38.98	6.83	-	-	-	69.56	84.97	136.60
Kilputhur	-	154.42	-	-	-	-	15.00	145.71	93.25	165.17
Mavalavadi	-	72.32	-	15.20	-	-	30.10	79.73	36.38	146.87
Kilvillivalam	21.12	208.79	0.60	7.69	6.45	-	85.00	433.29	25.78	144.75
Kilvelliyur	-	108.28	3.20	-	-	-	21.43	266.02	50.88	81.23
Koothampattu	-	32.90	1.20	-	-	10.10	30.00	22.54	52.74	56.69
Korakottai	-	128.29	-	9.31	-	-	11.80	274.98	77.58	106.32
Kothandapuram	-	174.79	18.20	6.05	0.72	-	-	101.78	57.14	175.37
Kunnagampundi	-	37.26	27.60	6.11	-	-	-	73.21	64.66	52.76
Mahamai Thirumani	-	63.36	47.40	19.36	-	22.42	20.00	59.10	69.40	124.48
Mazhavankaranai	-	96.67	-	18.94	-	-	20.00	27.73	19.70	240.95
Meesanallur	-	129.19	-	-	-	9.82	84.03	217.47	15.93	82.31

Gram Panchayat	Area under Land Resources (ha)									
	Area under Forest land	Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Area under Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Melpathi	-	93.63	0.70	-	-	3.00	12.13	28.83	32.79	51.90
Nerkunam	-	194.83	-	0.61	3.28	-	87.36	164.67	118.87	260.81
Padur	-	51.57	-	-	-	12.06	30.15	70.51	61.50	195.05
Palaveri	-	33.20	3.70	0.11	0.80	2.15	-	59.64	94.42	78.33
Pancharai	-	19.97	10.37	6.79	-	43.57	-	91.48	85.42	72.17
Pennattagaram	-	88.87	-	-	-	4.04	20.00	165.11	50.10	61.02
Ponnur	3.44	206.18	0.25	-	6.29	11.39	-	388.79	201.81	164.52
Ramasamudram	-	127.05	3.32	-	-	-	12.64	94.69	50.14	174.55
S Katteri	-	63.01	1.94	-	12.27	-	30.00	54.87	60.24	69.61
Sathapoondi	-	46.26	-	-	-	-	38.47	256.83	124.46	95.69
Sathiyavadi	-	46.76	10.77	3.38	-	-	33.00	76.75	118.20	149.72
Seeyamangalam	-	2.68	16.15	3.50	-	-	192.32	176.29	121.06	140.32
Senal	-	88.05	-	-	2.35	-	-	112.54	59.74	98.41
Sivanam	-	80.95	1.60	3.07	-	-	-	141.11	44.69	104.83
Sogathur	-	66.50	1.11	-	-	0.03	-	44.75	32.63	113.26
Thellar	-	242.51	43.78	43.78	17.62	-	-	196.76	60.32	343.64
Thenkkarai	-	149.00	1.73	-	-	3.79	28.19	154.10	98.90	94.54
Thennathur	-	22.56	29.60	4.93	-	60.12	78.25	202.91	106.50	98.71
Thenthinnalur	-	6.90	-	-	2.13	0.28	36.25	19.62	40.45	31.81
Thenvanakkambadi	-	14.56	-	7.84	2.32	22.14	55.71	76.05	27.89	66.63
Thirakoil	-	70.75	3.21	2.54	-	3.21	43.38	294.57	236.14	42.63
Vadakkupattu	-	4.75	2.22	-	-	-	-	71.70	45.86	46.67
Vadavanakkambad	-	33.58	0.74	3.18	-	3.20	23.74	86.38	69.51	43.24
Vedal	-	91.76	55.10	-	-	31.70	34.34	98.34	25.15	117.00

Gram Panchayat	Area under Land Resources (ha)									
	Area under Forest land	Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Area under Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Kondiyankuppam	-	25.87	0.68	5.75	1.26	0.14	-	74.96	43.92	77.87
Periya kuppam	-	14.55	0.38	3.23	0.71	0.08	-	42.16	24.71	43.80
Nallur	-	121.26	3.20	26.93	5.92	0.65	-	351.35	205.89	365.02
Madam	-	352.53	60.12	1.20	5.85	40.15	60.97	129.84	478.08	206.81
Theyyar	-	352.53	60.12	1.20	5.85	40.15	60.97	129.84	478.08	206.81
Agarakorakottai	-	152.06	29.34	-	0.92	-	-	91.92	50.67	126.58
Gengamppoondi	-	63.81	72.76	0.90	-	47.86	-	49.62	143.32	121.61
Goonambadi	-	117.00	8.99	2.49	4.49	4.49	-	132.75	95.53	175.19
Kodiyalam	-	153.32	62.57	-	0.52	-	17.40	109.17	219.51	201.82
Malaiyur	-	168.08	10.20	39.14	2.14	8.20	-	132.40	60.30	328.50
Nadukuppam	-	96.06	3.46	-	-	12.92	2.24	184.05	35.94	135.30
Perunkadaputhur	-	114.10	1.45	10.77	2.73	-	7.31	205.94	82.02	169.41
Soraputhur	-	138.12	-	20.95	0.10	-	-	79.83	127.92	83.28
Thakkandarayapuram	-	114.36	15.60	10.05	-	-	4.35	57.03	90.29	139.74
Sri Rnagarajapuram	-	191.77	-	8.53	-	-	21.74	221.26	67.68	187.72

Gram Panchayat	Land under Catchment Area (ha)			Crop Details				
	Good Catchment	Average Catchment	Bad Catchment	Irrigated Area (ha)	Rainfed area (ha)	Paddy Cultivation (ha)	Crop Water Requirement - Irrigated condition (ha.m)	Crop Water Requirement - Rainfed condition (ha.m)
Achamangalam	134.70	12.94	192.97	40.25	42.00	70.60	53.21	38.75
Arunkunam	113.26	-	365.23	96.96	6.65	57.00	141.13	3.99
Arunthodu	22.97	2.10	258.49	46.92	10.27	39.80	63.99	3.59
Chitharugavoor	88.34	-	188.19	55.01	4.00	44.00	73.86	1.40
Embalam	5.10	5.66	345.81	117.08	1.04	71.00	187.95	0.36
Eripattu	66.60	7.77	370.87	85.28	4.10	53.00	132.28	1.44
Goodalur	96.77	18.80	544.55	45.31	6.36	41.50	65.91	3.03
Japthikaranai	89.20	4.31	238.75	60.70	6.35	57.30	92.75	2.41
Kadambai	90.81	10.13	268.41	57.23	5.18	53.44	82.02	1.99
Kandavaratti	16.39	7.08	286.26	78.94	2.97	60.65	119.27	1.25
Kilnamandi	142.22	6.83	291.13	33.46	5.22	28.80	45.37	1.83
Kilputhur	154.42	-	419.13	82.48	9.52	71.40	123.30	3.33
Mavalavadi	72.32	15.20	293.08	71.99	3.54	49.00	100.56	1.37
Kilvillivalam	230.51	14.14	688.82	126.71	10.54	72.50	193.49	5.76
Kilvelliyur	111.48	-	419.56	106.01	5.24	80.70	159.88	2.07
Koothampattu	34.10	10.10	161.97	31.76	1.27	28.80	44.57	0.55
Korakottai	128.29	9.31	470.68	43.85	3.08	37.00	61.51	1.08
Kothandapuram	192.99	6.77	334.29	78.11	2.50	63.70	105.44	0.94
Kunnagampundi	64.86	6.11	190.63	48.02	6.54	31.00	54.31	2.42
Mahamai Thirumani	110.76	41.78	272.98	55.21	7.00	37.80	70.07	2.45
Mazhavankaranai	96.67	18.94	308.38	55.45	3.40	44.00	82.58	2.11
Meesanallur	129.19	9.82	399.74	61.38	2.37	31.00	103.38	0.83
Melpathi	94.33	3.00	125.65	65.29	3.28	43.80	103.58	1.15
Nerkunam	194.83	3.89	631.71	67.88	10.35	51.20	85.39	3.62
Padur	51.57	12.06	357.21	52.10	3.20	15.00	77.42	1.12
Palaveri	36.90	3.06	232.39	28.24	1.20	24.00	42.23	0.48

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)
Pancharai	30.34	50.36	249.07	39.56	5.00	25.20	44.64	1.75
Pennattagaram	88.87	4.04	296.23	34.09	3.16	21.00	42.05	1.11
Ponnur	209.87	17.68	755.12	155.84	10.16	123.02	236.22	3.71
Ramasamudram	130.37	-	332.02	93.77	2.00	48.00	160.59	0.70
S Katteri	64.95	12.27	214.72	36.95	5.70	19.80	52.00	1.99
Sathapoondi	46.26	-	515.45	19.99	7.40	17.40	27.57	2.59
Sathiyavadi	57.53	3.38	377.67	129.34	3.26	70.00	192.59	1.17
Seeyamangalam	18.83	3.50	629.99	76.35	-	66.00	104.89	-
Senal	88.05	2.35	270.69	39.63	3.05	27.00	57.53	1.07
Sivanam	82.55	3.07	290.63	54.22	6.40	43.40	80.41	2.39
Sogathur	67.61	0.03	190.64	92.18	-	42.00	148.33	-
Thellar	286.29	61.40	600.72	88.47	2.66	78.00	136.21	0.93
Thenkkarai	150.73	3.79	375.73	63.92	5.56	49.50	91.93	1.99
Thennathur	52.16	65.05	486.37	35.60	11.00	23.20	41.30	6.60
Thenthinnalur	6.90	2.41	128.13	28.91	4.00	17.00	30.59	1.40
Thenvanakkambadi	14.56	32.30	226.28	43.55	7.38	29.00	68.84	2.63
Thirakoil	73.96	5.75	616.72	125.92	6.30	118.10	180.73	2.67
Vadakkupattu	6.97	-	164.23	21.50	11.20	20.10	30.93	3.92
Vadavanakkambad	34.32	6.38	222.87	41.97	9.83	39.90	60.79	5.12
Vedal	146.86	31.70	274.83	52.65	-	25.92	53.22	-
Kondiyankuppam	26.55	7.15	196.75	260.28	3.26	155.00	370.50	1.14
Periya kuppam	14.93	4.02	110.67	260.28	3.26	155.00	370.50	1.14
Nallur	124.46	33.50	922.26	260.28	3.26	155.00	370.50	1.14
Madam	412.65	47.20	875.70	232.74	-	128.00	295.57	-
Theyyar	412.65	47.20	875.70	232.74	-	128.00	295.57	-
Agarakorakottai	181.40	0.92	269.17	32.74	5.09	30.90	48.06	1.78

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)
Gengamppoondi	136.57	48.76	314.55	54.80	11.10	52.30	79.81	3.94
Goonambadi	125.99	11.47	403.47	128.84	1,392.23	114.50	182.23	556.63
Kodiyalam	215.89	0.52	547.90	119.95	11.31	69.50	168.67	4.60
Malaiyur	178.28	49.48	521.20	147.02	6.31	132.57	214.48	2.21
Nadukuppam	99.52	12.92	357.53	112.32	5.25	70.00	182.27	1.84
Perunkadaputhur	115.55	13.50	464.68	61.60	13.43	50.80	84.11	4.70
Soraputhur	138.12	21.05	291.03	58.78	8.55	46.00	79.88	3.04
Thakkandarayapuram	129.96	10.05	291.41	92.95	4.85	64.45	143.41	1.70
Sri Rnagarajapuram	200.30	21.74	476.66	164.51	3.78	74.50	288.78	1.32

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)					Status of Organic Carbon (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High	Sufficient	Deficient
Achamangalam	9.09	72.73	18.18	-	-	33.33	54.55	12.12	-	-	49.00	51.00
Arunkunam	27.27	72.73	-	-	-	29.09	70.91	-	-	-	44.00	56.00
Arunthodu	13.46	61.54	25.00	-	-	21.15	65.38	13.46	-	-	46.00	54.00
Chitharugavoor	5.41	18.92	75.68	-	-	2.70	67.57	29.73	-	-	64.00	36.00
Embalam	50.00	50.00	-	-	-	63.64	27.27	9.09	-	-	49.00	51.00
Eripattu	96.00	4.00	-	-	-	96.00	4.00	-	-	-	78.00	22.00
Goodalur	30.16	68.25	1.59	-	-	28.57	69.84	1.59	-	-	43.00	57.00
Japthikaranai	-	65.71	34.29	-	-	2.86	97.14	-	-	-	56.00	44.00
Kadambai	12.07	60.34	27.59	-	-	24.14	58.62	17.24	-	-	49.00	51.00
Kandavaratti	15.38	58.97	25.64	-	-	28.21	66.67	5.13	-	-	57.00	43.00
Kilnamandi	-	76.47	23.53	-	-	11.76	86.76	1.47	-	-	63.00	37.00
Kilputhur	-	67.00	33.00	-	-	2.86	97.14	-	-	-	62.00	38.00
Mavalavadi	21.88	50.00	28.13	-	-	31.25	54.69	14.06	-	-	48.00	52.00
Kilvillivalam	23.08	76.92	-	-	-	33.33	66.67	-	-	-	41.00	59.00
Kilvelliyur	-	38.46	61.54	-	-	23.08	76.92	-	-	-	72.00	28.00
Koothampattu	33.33	66.67	-	-	-	69.44	30.56	-	-	-	58.00	42.00
Korakottai	-	33.33	66.67	-	-	3.70	96.30	-	-	-	60.00	40.00
Kothandapuram	52.46	31.15	16.39	-	-	40.98	52.46	6.56	-	-	42.00	58.00
Kunnagampundi	5.17	86.21	8.62	-	-	1.72	98.28	-	-	-	58.00	42.00
Mahamai Thirumani	3.77	77.36	18.87	-	-	7.55	92.45	-	-	-	58.00	42.00
Mazhavankaranai	1.61	85.48	12.90	-	-	33.87	66.13	-	-	-	61.00	39.00
Meesanallur	10.42	87.50	2.08	-	-	18.75	79.17	2.08	-	-	43.00	57.00
Melpathi	-	66.67	33.33	-	-	-	100.00	-	-	-	51.00	49.00
Nerkunam	32.97	62.64	4.40	-	-	29.67	68.13	2.20	-	-	46.00	54.00
Padur	7.32	81.71	10.98	-	-	18.29	80.49	1.22	-	-	60.00	40.00
Palaveri	38.10	61.90	-	-	-	35.71	64.29	-	-	-	37.00	63.00

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)					Status of Organic Carbon (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High	Sufficient	Deficient
Pancharai	21.43	53.57	25.00	-	-	35.71	57.14	7.14	-	-	48.00	52.00
Pennattagaram	10.91	83.64	5.45	-	-	7.27	92.73	-	-	-	62.00	38.00
Ponnur	25.93	61.11	12.96	-	-	-	98.15	1.85	-	-	53.00	47.00
Ramasamudram	45.65	52.17	2.17	-	-	18.48	81.52	-	-	-	47.00	53.00
S Katteri	38.62	60.69	0.69	-	-	46.21	49.66	3.45	0.69	-	50.00	50.00
Sathapoondi	50.00	50.00	-	-	-	75.00	25.00	-	-	-	42.00	58.00
Sathiyavadi	2.13	76.60	21.28	-	-	12.77	87.23	-	-	-	55.00	45.00
Seeyamangalam	11.67	78.33	10.00	-	-	31.67	68.33	-	-	-	60.00	40.00
Senal	5.56	64.81	29.63	-	-	5.56	94.44	-	-	-	58.00	42.00
Sivanam	-	44.44	55.56	-	-	-	84.44	15.56	-	-	51.00	49.00
Sogathur	21.95	56.10	21.95	-	-	26.83	56.10	17.07	-	-	47.00	53.00
Thellar	2.82	87.32	9.86	-	-	2.82	95.77	1.41	-	-	56.00	44.00
Thenkkarai	8.51	61.70	29.79	-	-	25.53	61.70	12.77	-	-	45.00	55.00
Thennathur	22.78	62.03	15.19	-	-	31.65	65.82	2.53	-	-	55.00	45.00
Thenthinnalur	-	94.74	5.26	-	-	10.53	89.47	-	-	-	54.00	46.00
Thenvanakkambadi	5.88	76.47	17.65	-	-	2.94	95.59	-	1.47	-	59.00	41.00
Thirakoil	3.40	63.95	32.65	-	-	12.24	86.39	0.68	-	0.68	-	-
Vadakkupattu	-	74.19	25.81	-	-	25.81	54.84	19.35	-	-	47.00	53.00
Vadavanakkambad	12.50	87.50	-	-	-	5.00	95.00	-	-	-	68.00	33.00
Vedal	10.53	59.65	29.82	-	-	-	98.25	-	1.75	-	65.00	35.00
Kondiyankuppam	1.66	55.25	33.70	8.84	0.55	39.23	59.67	1.10	-	-	46.00	54.00
Periya kuppam	1.66	55.25	33.70	8.84	0.55	39.23	59.67	1.10	-	-	46.00	54.00
Nallur	1.66	55.25	33.70	8.84	0.55	39.23	59.67	1.10	-	-	46.00	54.00
Madam	1.44	76.08	22.49	-	-	7.66	92.34	-	-	-	70.00	30.00
Theyyar	1.44	76.08	22.49	-	-	7.66	92.34	-	-	-	70.00	30.00
Agarakorakottai	-	33.33	66.67	-	-	3.70	96.30	-	-	-	72.00	28.00

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)					Status of Organic Carbon (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High	Sufficient	Deficient
Gengamppoondi	3.70	75.93	20.37	-	-	-	88.89	9.26	1.85	-	73.00	27.00
Goonambadi	-	82.14	17.86	-	-	-	82.14	17.86	-	-	67.00	33.00
Kodiyalam	57.78	42.22	-	-	-	48.89	51.11	-	-	-	52.00	48.00
Malaiyur	35.62	45.21	19.18	-	-	31.51	60.27	8.22	-	-	54.00	46.00
Nadukuppam	14.04	85.09	0.88	-	-	40.35	58.77	0.88	-	-	65.00	35.00
Perunkadaputhur	22.81	52.63	24.56	-	-	31.58	52.63	15.79	-	-	54.00	46.00
Soraputhur	6.45	61.29	32.26	-	-	9.68	90.32	-	-	-	66.00	34.00
Thakkandarayapuram	-	60.00	40.00	-	-	2.50	95.00	-	-	2.50	59.00	41.00
Sri Rnagarajapuram	75.00	16.00	36.00	56.00	-	-	-	-	-	-	69.00	31.00

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
Achamangalam	3.03	-	-	-	-	3.03	93.94	-
Arunkunam	-	-	-	-	5.45	1.82	92.73	-
Arunthodu	-	-	-	-	5.77	1.92	92.31	-
Chitharugavoor	-	-	-	-	-	-	100.00	-
Embalam	-	-	-	-	2.27	25.00	72.73	-
Eripattu	-	-	-	12.00	32.00	4.00	52.00	-
Goodalur	-	-	-	-	3.17	15.87	80.95	-
Japthikaranai	-	-	-	8.57	40.00	20.00	31.43	-
Kadambai	-	-	-	-	-	-	100.00	-
Kandavaratti	-	-	-	-	2.56	-	97.44	-
Kilnamandi	-	-	-	-	-	-	100.00	-
Kilputhur	-	-	-	-	-	-	-	-
Mavalavadi	-	-	-	-	-	-	100.00	-
Kilvillivalam	-	-	-	-	5.13	-	94.87	-
Kilvelliyur	-	-	-	-	-	-	100.00	-
Koothampattu	-	-	-	-	-	-	-	-
Korakottai	-	-	-	-	7.41	7.41	85.19	-
Kothandapuram	-	-	-	-	-	-	100.00	-
Kunnagampundi	-	-	-	5.17	6.90	-	87.93	-
Mahamai Thirumani	-	-	18.87	3.77	-	1.89	75.47	-
Mazhavankaranai	-	-	-	-	-	-	100.00	-
Meesanallur	-	-	-	2.08	-	4.17	93.75	-
Melpathi	-	-	-	25.93	7.41	-	62.96	3.70
Nerkunam	-	-	-	-	-	-	100.00	-
Padur	-	-	-	-	-	-	100.00	-
Palaveri	-	-	-	2.33	9.30	11.63	76.74	-

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
Pancharai	-	-	-	-	-	-	100.00	-
Pennattagaram	-	-	-	-	-	-	100.00	-
Ponnur	-	-	-	-	-	-	100.00	-
Ramasamudram	-	-	-	-	4.35	5.43	90.22	-
S Katteri	-	-	-	-	-	1.38	98.62	-
Sathapoondi	-	-	-	-	-	25.00	75.00	-
Sathiyavadi	-	-	-	-	-	-	100.00	-
Seeyamangalam	-	-	-	1.67	-	-	98.33	-
Senal	-	-	-	-	5.56	1.85	92.59	-
Sivanam	-	-	2.22	20.00	-	-	77.78	-
Sogathur	-	-	-	-	-	-	100.00	-
Thellar	-	-	-	-	-	-	100.00	-
Thenkkarai	-	-	-	-	-	2.13	97.87	-
Thennathur	-	-	-	-	1.27	3.80	94.94	-
Thenthinnalur	-	-	-	-	-	-	100.00	-
Thenvanakkambadi	-	-	-	-	-	-	100.00	-
Thirakoil	-	-	-	-	-	-	-	-
Vadakkupattu	-	-	-	-	-	-	100.00	-
Vadavanakkambad	-	-	-	2.50	-	-	97.50	-
Vedal	-	-	-	-	-	-	100.00	-
Kondiyankuppam	-	-	-	1.10	0.28	48.62	-	50.00
Periya kuppam	-	-	-	1.10	0.28	48.62	-	50.00
Nallur	-	-	-	1.10	0.28	48.62	-	50.00
Madam	-	-	0.48	1.91	0.72	46.89	-	50.00
Theyyar	-	-	0.48	1.91	0.72	46.89	-	50.00
Agarakorakottai	-	-	-	7.41	7.41	85.19	-	-
Gengamppoondi	-	-	-	7.41	0.93	41.67	-	50.00

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
Goonambadi	-	-	-	-	-	48.21	1.79	50.00
Kodiyalam	-	-	-	-	-	100.00	-	-
Malaiyur	-	-	-	1.37	0.68	47.95	-	50.00
Nadukuppam	-	-	-	-	-	100.00	-	-
Perunkadaputhur	-	-	-	3.51	-	96.49	-	-
Soraputhur	-	3.23	9.68	9.68	32.26	45.16	-	-
Thakkandarayapuram	-	-	-	-	-	97.50	2.50	-
Sri Rnagarajapuram	-	-	-	2.74	9.59	4.11	83.56	-

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
Achamangalam	-	72.30	-	Moderate	23.00	50.09	59.69	9.65	90.35
Arunkunam	37.99	54.62	2.05	Moderate	23.00	88.66	218.22	7.72	92.28
Arunthodu	-	48.00	-	Moderate	23.00	59.94	111.26	12.07	87.93
Chitharugavoor	5.88	73.00	-	Moderate	23.00	43.30	89.81	3.57	96.43
Embalam	26.30	54.91	-	Moderate	23.00	81.23	140.74	45.05	54.95
Eripattu	16.00	70.00	-	Moderate	23.00	87.82	48.60	16.94	83.06
Goodalur	-	63.94	-	Moderate	23.00	129.87	243.88	5.92	94.08
Japthikaranai	8.00	88.00	-	Moderate	23.00	56.41	119.68	3.96	96.04
Kadambai	50.00	39.30	-	Low	23.00	64.31	180.00	4.31	95.69
Kandavaratti	19.00	63.55	-	Moderate	23.00	67.47	110.26	12.86	87.14
Kilnamandi	45.00	27.30	-	Low	23.00	77.50	183.63	6.31	93.69
Kilputhur	1.74	64.46	-	Moderate	23.00	96.40	207.77	4.75	95.25
Mavalavadi	15.00	69.30	-	Moderate	23.00	70.90	103.59	2.52	97.48
Kilvillivalam	10.50	72.70	-	Moderate	23.00	166.68	165.46	4.93	95.07
Kilvelliyur	24.00	63.00	-	Moderate	23.00	97.23	106.22	10.82	89.18
Koothampattu	20.00	51.00	-	Moderate	23.00	39.85	87.98	14.01	85.99
Korakottai	34.70	57.80	-	Moderate	23.00	110.40	155.34	4.25	95.75
Kothandapuram	13.80	73.60	-	Moderate	23.00	82.63	192.38	11.39	88.61
Kunnagampundi	14.00	73.30	-	Moderate	23.00	51.60	99.32	31.57	68.43
Mahamai Thirumani	-	71.80	-	Moderate	23.00	83.30	171.44	5.96	94.04
Mazhavankaranai	43.10	42.00	-	Low	23.00	75.28	224.79	4.74	95.26
Meesanallur	6.00	79.70	-	Moderate	23.00	94.20	78.98	7.43	92.57
Melpathi	5.43	55.00	-	Moderate	23.00	29.75	68.09	4.60	95.40
Nerkunam	6.75	64.78	-	Moderate	23.00	146.19	308.39	2.69	97.31
Padur	59.14	29.00	-	Low	23.00	84.93	133.92	4.42	95.58

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
Palaveri	6.34	93.66	-	Moderate	23.00	55.00	139.62	4.07	95.93
Pancharai	-	91.52	-	Moderate	23.00	71.25	132.16	8.75	91.25
Pennattagaram	-	96.00	-	Moderate	23.00	69.06	89.34	11.00	89.00
Ponnur	5.80	48.00	-	Moderate	23.00	178.59	302.35	4.91	95.09
Ramasamudram	20.00	58.00	-	Moderate	23.00	77.13	180.65	100.00	0
S Katteri	22.00	67.00	-	Moderate	23.00	52.65	114.26	9.94	90.06
Sathapoondi	55.00	36.48	-	Low	23.00	118.55	177.00	10.30	89.70
Sathiyavadi	61.90	36.50	-	Low	23.00	90.12	218.13	2.23	97.77
Seeyamangalam	0.45	77.95	1.51	Moderate	23.00	149.42	212.96	4.70	95.30
Senal	-	89.60	-	Moderate	23.00	62.80	129.04	8.73	91.27
Sivanam	-	58.35	-	Moderate	23.00	67.92	122.68	8.05	91.95
Sogathur	17.00	72.00	-	Moderate	23.00	44.11	76.15	3.53	96.47
Thellar	4.49	71.80	-	Moderate	23.00	162.36	374.15	3.94	96.06
Thenkkarai	37.92	40.30	-	Moderate	23.00	87.69	155.53	11.83	88.17
Thennathur	0.67	42.00	1.00	Moderate	23.00	133.63	168.95	5.97	94.03
Thenthinnalur	38.52	39.90	-	Moderate	23.00	30.02	59.81	17.21	82.79
Thenvanakkambadi	-	86.70	-	Moderate	23.00	59.47	84.16	17.74	82.26
Thirakoil	51.00	41.02	-	Low	23.00	143.91	226.17	33.89	66.11
Vadakkupattu	33.71	-	-	Low	23.00	38.28	74.39	0	100.00
Vadavanakkambad	7.58	84.47	-	Moderate	23.00	52.90	93.21	14.78	85.22
Vedal	-	61.60	-	Moderate	23.00	83.17	114.29	2.09	97.91
Kondiyankuppam	63.00	32.00	-	Low	23.00	47.05	103.56	7.48	92.52
Periya kuppam	82.00	4.00	-	Low	23.00	26.47	58.25	6.70	93.30
Nallur	14.00	57.00	-	Moderate	23.00	220.56	485.42	2.52	97.48
Madam	44.00	38.00	-	Low	23.00	226.09	556.32	9.93	90.07
Theyyar	56.00	21.00	-	Low	23.00	226.09	556.32	9.34	90.66

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
Agarakorakottai	36.00	39.00	-	Moderate	23.00	68.87	143.25	3.80	96.20
Gengamppoondi	7.80	57.00	-	Moderate	23.00	100.30	213.73	2.29	97.71
Goonambadi	11.00	78.00	-	Moderate	23.00	97.50	223.27	3.99	96.01
Kodiyalam	34.00	45.00	-	Moderate	23.00	140.53	339.17	2.57	97.43
Malaiyur	46.13	40.00	-	Low	23.00	133.60	345.78	1.83	98.17
Nadukuppam	-	81.00	-	Moderate	23.00	86.00	137.68	4.91	95.09
Perunkadaputhur	34.00	52.00	0.17	Moderate	23.00	110.31	213.00	10.48	89.52
Soraputhur	-	71.00	-	Moderate	23.00	71.78	186.73	6.82	93.18
Thakkandarayapuram	51.00	37.00	-	Low	23.00	72.92	193.02	12.52	87.48
Sri Rnagarajapuram	-	81.94	-	Moderate	23.00	160.70	212.20	15.00	85.00

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)			
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population	Poultry
Achamangalam	-	100.00	294.00	200.00	224.00	-
Arunkunam	25.06	74.94	400.00	104.00	123.00	-
Arunthodu	-	100.00	393.00	124.00	249.00	-
Chitharugavoor	-	100.00	124.00	907.00	175.00	-
Embalam	85.88	14.12	431.00	145.00	106.00	-
Eripattu	-	100.00	433.00	160.00	121.00	-
Goodalur	24.80	75.20	636.00	186.00	51.00	-
Japthikaranai	40.00	60.00	506.00	501.00	117.00	-
Kadambai	36.97	63.03	651.00	17.00	215.00	-
Kandavaratti	33.97	66.03	601.00	218.00	131.00	-
Kilnamandi	18.45	81.55	399.00	383.00	139.00	-
Kilputhur	39.35	60.65	1,096.00	634.00	306.00	-
Mavalavadi	34.15	65.85	320.00	75.00	148.00	-
Kilvillivalam	-	100.00	662.00	254.00	104.00	-
Kilvelliyur	49.24	50.76	494.00	59.00	55.00	-
Koothampattu	45.86	54.14	292.00	176.00	79.00	-
Korakottai	47.03	52.97	299.00	183.00	66.00	-
Kothandapuram	55.63	44.37	493.00	170.00	269.00	-
Kunnagampundi	69.18	30.82	709.00	666.00	134.00	-
Mahamai Thirumani	36.66	63.34	648.00	748.00	186.00	-
Mazhavankaranai	16.60	83.40	519.00	553.00	277.00	-
Meesanallur	24.30	75.70	319.00	160.00	45.00	-
Melpathi	-	100.00	432.00		24.00	-
Nerkunam	30.67	69.33	800.00	76.00	57.00	-
Padur	44.57	55.43	400.00	275.00	66.00	-
Palaveri	24.86	75.14	264.00	79.00	53.00	-
Pancharai	27.81	72.19	230.00		9.00	-

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)			
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population	Poultry
Pennattagaram	33.71	66.29	410.00		285.00	-
Ponnur	70.58	29.42	615.00	84.00	88.00	-
Ramasamudram	100.00	-	618.00	312.00	68.00	-
S Katteri	34.91	65.09	446.00	39.00	53.00	-
Sathapoondi	31.48	68.52	373.00	353.00	81.00	-
Sathiyavadi	26.22	73.78	818.00	546.00	356.00	-
Seeyamangalam	27.79	72.21	592.00	405.00	257.00	-
Senal	20.32	79.68	329.00	285.00	67.00	-
Sivanam	45.37	54.63	182.00	-	-	-
Sogathur	39.73	60.27	387.00	119.00	91.00	-
Thellar	29.10	70.90	1,031.00	160.00	176.00	-
Thenkkarai	21.16	78.84	675.00	247.00	69.00	-
Thennathur	20.26	79.74	192.00	-	-	-
Thenthinnalur	62.18	37.82	256.00		43.00	-
Thenvanakkambadi	65.21	34.79	514.00	96.00	8.00	-
Thirakoil	65.68	34.32	334.00	523.00	137.00	-
Vadakkupattu	-	100.00	89.00	10.00	5.00	-
Vadavanakkambad	-	100.00	288.00	45.00	-	-
Vedal	-	100.00	68.00	12.00	52.00	-
Kondiyankuppam	20.55	79.45	313.12	43.20	51.04	-
Periya kuppam	20.55	79.45	176.13	24.30	28.71	-
Nallur	20.55	79.45	1,467.75	202.50	239.25	-
Madam	67.00	33.00	433.00	91.00	109.00	-
Theyyar	34.61	65.39	433.00	91.00	109.00	-
Agarakorakottai	-	100.00	594.00	116.00	282.00	-
Gengamppoondi	12.33	87.67	387.00	213.00	213.00	-
Goonambadi	31.32	68.68	458.00	139.00	116.00	-
Kodiyalam	6.06	93.94	631.00	283.00	78.00	-

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)			
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population	Poultry
Malaiyur	18.37	81.63	1,234.00	578.00	420.00	-
Nadukuppam	28.38	71.62	444.00	311.00	58.00	-
Perunkadaputhur	11.81	88.19	586.00	180.00	61.00	-
Soraputhur	18.01	81.99	765.00	337.00	146.00	-
Thakkandarayapuram	-	100.00	799.00	618.00	205.00	-
Sri Rnagarajapuram	19.00	81.00	679.00	450.00	93.00	-

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.)
Achamangalam	341	389	400	789	265	9	274	220	53	26	45
Arunkunam	478	513	479	992	485	46	531	273	34	8	26
Arunthodu	284	527	518	1045	68	4	72	297	80	28	64
Chitharugavoor	277	1025	1055	2080	523	0	523	580	217	60	170
Embalam	357	591	596	1187	468	59	527	341	93	24	72
Eripattu	445	453	480	933	87	30	117	248	35	17	30
Goodalur	660	824	792	1616	745	12	757	403	104	18	78
Japthikaranai	332	578	581	1159	448	93	541	313	5	24	11
Kadambai	369	993	1051	2044	786	0	786	447	135	29	103
Kandavaratti	310	726	690	1416	597	36	633	359	71	22	56
Kilnamandi	440	591	581	1172	203	43	246	339	65	25	53
Kilputhur	574	1502	1520	3022	722	41	763	735	108	52	91
Mavalavadi	381	435	436	871	436	81	517	238	70	23	56
Kilvillivalam	934	1125	1054	2179	675	100	775	488	133	32	103
Kilvelliyur	531	698	734	1432	576	41	617	391	60	34	52
Koothampattu	206	419	422	841	474	53	527	205	46	12	36
Korakottai	608	779	779	1558	499	11	510	398	64	26	53
Kothandapuram	534 ha	898	864	1762	695	16	711	425	69	32	58
Kunnagampundi	262	633	605	1238	260	24	284	292	24	19	23
Mahamai Thirumani	426	597	580	1177	393	95	488	308	0	18	5
Mazhavankaranai	424	649	641	1290	364	139	503	460	64	12	48
Meesanallur	539	817	751	1568	841	11	852	352	102	15	76
Melpathi	223	524	519	1043	43	0	43	244	31	17	27
Nerkunam	830	1210	1215	2425	718	27	745	604	115	46	94

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.)
Padur	421	506	549	1055	605	2	607	269	114	14	84
Palaveri	272	333	328	661	46	0	46	169	38	11	30
Pancharai	330	448	428	876	170	30	200	236	46	25	40
Pennattagaram	389	539	524	1063	287	37	324	512	44	25	38
Ponnur	983	2281	2237	4518	1481	63	1544	1025	363	97	283
Ramasamudram	462	779	820	1599	570	76	646	412	162	31	123
S Katteri	292	734	782	1516	438	0	438	344	26	22	25
Sathapoondi	561	618	667	1285	624	36	660	333	83	30	67
Sathiyavadi	439	635	677	1312	765	36	801	737	74	15	56
Seeyamangalam	652	834	852	1686	529	17	546	436	95	38	78
Senal	361	612	585	1197	678	16	694	302	35	23	31
Sivanam	376	388	350	738	364	42	406	178	6	8	7
Sogathur	258	662	619	1281	289	0	289	334	148	26	111
Thellar	948	3493	3614	7107	2470	173	2643	1775	475	130	372
Thenkkarai	530	1053	1119	2172	488	33	521	694	302	35	23
Thennathur	604	913	916	1829	565	31	596	438	344	26	22
Thenthinnalur	137	435	453	888	230	0	230	223	33	18	29
Thenvanakkambadi	273	574	532	1106	347	1	348	306	50	21	41
Thirakoil	696	510	503	1013	487	17	504	438	344	26	22
Vadakkupattu	171	441	444	885	179	4	183	213	60	25	50
Vadavanakkambad	264	532	542	1074	508	14	522	270	58	24	48
Vedal	453	1036	1056	2092	359	102	461	467	128	31	99
Kondiyankuppam	239	523	467	990	186	0	186	1581	415	100	321
Periya kuppam	131	523	467	990	186	0	186	1581	415	100	321
Nallur	1105	1626	1556	3182	220	80	300	1581	415	100	321
Madam	136	590	606	1196	145	11	156	917	251	58	193

Key CWRM Parameter\ GP	Geographical Area	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable popupation (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vulnerable Households (SECC) (No.)
Theyyar	1196	1101	1100	2201	696	0	696	917	251	58	193
Agarakorakottai	451	618	621	1239	220	8	228	319	49	25	42
Gengamppoondi	500	595	609	1204	56	0	56	289	86	19	66
Goonambadi	541	735	712	1447	414	0	414	380	72	27	59
Kodiyalam	764	1512	1532	3044	879	78	957	719	184	41	141
Malaiyur	749	1324	1387	2711	929	67	996	723	135	80	119
Nadukuppam	470	665	675	1340	774	28	802	343	56	20	45
Perunkadaputhur	594	780	743	1523	176	55	231	317	100	29	79
Soraputhur	450	557	547	1104	167	17	184	281	61	26	51
Thakkandarayapuram	431	974	929	1903	376	86	462	479	104	21	79
Sri Rnagarajapuram	699	638	620	1258	312	3	315	357	64	32	54

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 dependent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Achamangalam	20.41	373	261	564	5	0	5	463	581	3.81
Arunkunam	9.60	354	229	43	5	1	6	488	0	1.81
Arunthodu	21.68	540	326	4	0	1	1	0	0	1.91
Chitharugavoor	29.29	813	587	98	5	1	6	150	0	3.80
Embalam	21.20	453	368	92	5	1	6	297	0	2.17
Eripattu	11.94	413	343	139	1	1	2	0	0	1.70
Goodalur	19.40	553	440	185	4	1	5	620	0	2.95
Japthikaranai	3.42	437	340	113	5	0	5	180	108	2.12
Kadambai	23.09	742	533	25	4	1	5	375	0	3.73
Kandavaratti	15.68	497	379	62	5	1	6	300	0	2.58
Kilnamandi	15.63	532	387	37	5	1	6	303	56	2.14
Kilputhur	12.41	1542	1306	33	3	1	4	0	0	0.00
Mavalavadi	23.49	344	206	27	5	1	6	0	0	1.59
Kilvillivalam	21.05	833	634	0	0	0	0	0	0	3.97
Kilvelliyur	13.35	640	375	31	5	1	6	357	0	2.61
Koothampattu	17.56	279	193	25	5	0	5	240	0	1.53
Korakottai	13.22	698	483	20	5	1	6	580	0	2.84
Kothandapuram	13.62	703	454	39	3	1	4	24	0	3.22
Kunnagampundi	7.71	457	328	216	4	1	5	445	0	2.26
Mahamai Thirumani	1.75	584	449	357	3	0	3	311	0	2.15
Mazhavankaranai	10.52	735	377	34	5	1	6	0	0	2.35
Meesanallur	21.56	508	432	0	0	0	0	0	0	0.00
Melpathi	10.98	406	311	132	6	1	7	0	0	0.00
Nerkunam	15.61	1208	671	541	5	0	5	484	534	4.43
Padur	31.23	515	276	347	5	0	5	715	359	1.93

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 dependent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Palaveri	17.69	318	182	6	1	6	7	6	6	12.00
Pancharai	16.82	437	321	32	5	1	6	0	0	1.60
Pennattagaram	7.48	522	349	44	4	0	4	233	53	1.94
Ponnur	27.63	1598	1123	308	1	0	1	0	0	8.25
Ramasamudram	29.78	763	569	338	5	0	5	360	358	2.92
S Katteri	7.21	508	368	0	0	0	0	0	0	2.77
Sathapoondi	20.15	729	366	444	5	0	5	517	465	2.35
Sathiyavadi	7.64	417	346	38	3	1	4	438	0	2.39
Seeyamangalam	17.87	726	510	550	5	0	5	599	588	3.08
Senal	10.40	600	409	23	3	1	4	0	0	2.18
Sivanam	3.71	273	187	260	5	0	5	575	311	264.00
Sogathur	33.00	589	378	364	5	1	6	416	394	2.34
Thellar	20.93	2249	1820	828	5	0	5	2662	1295	12.97
Thenkkarai	10.40	1086	631	24	3	1	4	0	0	0.00
Thennathur	7.21	923	581	67	5	1	6	786	13	3.34
Thenthinnalur	12.78	285	197	266	5	0	5	273	274	1.62
Thenvanakkambadi	13.50	554	360	107	5	0	5	213	71	2.02
Thirakoil	7.00	390	258	203	4	1	5	160	106	1.85
Vadakkupattu	23.24	337	220	274	5	0	5	253	290	1.62
Vadavanakkambad	17.70	416	283	394	5	0	5	386	403	1.96
Vedal	21.20	687	535	564	5	0	5	463	581	3.82
Kondiyankuppam	20.00	876	622	582	5	1	6	565	604	1.80
Periya kuppam	20.00	428	289	303	5	1	6	268	311	1.80
Nallur	20.00	1306	946	490	5	1	6	355	483	5.81
Madam	21.10	569	402	395	5	0	5	438	398	2.81

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 dependent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Theyyar	21.10	857	604	609	5	0	5	584	617	4.02
Agarakorakottai	13.10	633	414	424	5	2	7	376	390	2.26
Gengamppoondi	23.00	426	294	417	5	1	6	398	418	2.20
Goonambadi	15.00	690	569	480	5	1	6	469	471	2.64
Kodiyalam	19.60	1184	805	918	5	0	5	909	901	5.56
Malaiyur	16.00	1048	816	53	3	1	4	0	0	4.95
Nadukuppam	13.20	563	367	398	5	0	5	404	403	2.45
Perunkadaputhur	24.83	706	491	694	5	0	5	659	694	2.78
Soraputhur	18.00	441	327	324	5	1	6	402	319	2.01
Thakkandarayapuram	16.51	980	676	670	5	0	5	640	671	3.47
Sri Rnagarajapuram	15.24	681	445	352	5	0	5	356	430	2.30

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
Achamangalam	-	61.41	5.95	-	1.37	5.10	0	8.14	3.76	7.40
Arunkunam	-	46.52	15.17	-	-	-	5.48	17.97	17.98	19.95
Arunthodu	-	11.49	-	1.58	-	-	10.63	15.87	17.70	5.46
Chitharugavoor	-	10.59	0.07	-	-	-	6.66	15.75	12.94	6.75
Embalam	-	1.70	1.28	2.75	1.28	0.23	19.52	17.82	26.82	4.32
Eripattu	-	31.72	2.38	-	1.22	4.61	-	37.24	1.17	4.90
Goodalur	-	47.74	0.98	-	1.28	12.83	0.66	46.48	27.78	15.85
Japthikaranai	-	5.22	1.66	-	3.23	-	-	3.22	1.48	10.12
Kadambai	-	3.59	0.80	4.49	0.56	2.55	-	11.83	9.52	17.59
Kandavaratti	-	8.20	-	-	2.89	2.42	6.46	18.02	4.90	10.26
Kilnamandi	-	3.10	29.24	5.12	-	-	-	10.88	13.28	13.66
Kilputhur	-	10.81	-	-	-	-	1.86	18.08	11.57	16.52
Mavalavadi	-	36.16	-	11.40	-	-	7.07	18.73	8.54	14.69
Kilvillivalam	8.45	4.18	0.45	5.77	4.84	-	17.89	91.19	5.43	14.48
Kilvelliyur	-	7.58	2.40	-	-	-	2.86	35.51	6.79	8.12
Koothampattu	-	16.45	0.90	-	-	7.58	5.24	3.94	9.21	5.67
Korakottai	-	1.28	-	6.98	-	-	1.56	36.34	10.25	10.63
Kothandapuram	-	20.60	0.53	-	-	-	-	3.17	3.60	5.19
Kunnagampundi	-	-	-	-	-	-	-	-	-	-
Mahamai Thirumani	-	31.68	35.55	14.52	-	16.82	0.35	1.04	1.22	12.45
Mazhavankaranai	-	2.90	-	14.21	-	-	2.10	2.92	2.07	24.10
Meesanallur	-	3.88	-	-	-	7.37	18.12	46.89	3.43	8.23

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
Melpathi	-	20.60	0.53	-	-	2.25	1.33	3.17	3.60	5.19
Nerkunam	-	5.84	-	0.46	2.46	-	13.98	26.35	19.02	26.08
Padur	-	25.79	-	-	-	9.05	7.54	17.63	15.38	19.51
Palaveri	-	16.60	2.78	0.08	0.60	1.61	-	10.55	16.71	7.83
Pancharai	-	9.99	7.78	5.09	-	32.68	-	15.39	14.37	7.22
Pennattagaram	-	2.67	-	-	-	3.03	1.50	12.35	3.75	6.10
Ponnur	1.38	103.09	0.19	-	4.72	8.54	-	107.42	55.76	16.45
Ramasamudram	-	8.89	2.49	-	-	-	3.76	28.20	14.93	17.46
S Katteri	-	0.95	1.46	-	9.20	-	2.16	3.96	4.34	6.96
Sathapoondi	-	23.13	-	-	-	-	7.75	51.75	25.08	9.57
Sathiyavadi	-	23.38	8.08	2.54	-	-	2.52	5.86	9.03	14.97
Seeyamangalam	-	1.34	12.11	2.63	-	-	34.36	31.50	21.63	14.03
Senal	-	3.52	-	-	1.76	-	-	11.70	6.21	9.84
Sivanam	-	12.14	1.20	2.30	-	-	-	5.23	1.66	10.48
Sogathur	-	3.82	0.83	-	-	0.02	-	14.77	10.77	37.38
Thellar	-	12.13	32.84	32.84	13.22	-	-	41.18	12.62	34.36
Thenkkarai	-	12.07	1.30	-	-	2.84	3.10	16.95	10.88	10.40
Thennathur	-	-	22.20	3.70	-	45.09	14.87	38.55	20.24	18.75
Thenthinnalur	-	3.45	-	-	1.60	0.21	4.63	2.51	5.17	3.18
Thenvanakkambadi	-	7.28	-	5.88	1.74	16.61	7.52	10.26	3.76	6.66
Thirakoil	-	-	2.41	1.91	-	2.41	6.94	47.13	37.78	6.82
Vadakkupattu	-	2.38	1.67	-	-	-	-	16.66	10.66	4.67
Vadavanakkambad	-	16.79	0.56	2.39	-	2.40	4.20	15.29	12.31	4.32
Vedal	-	0.22	41.33	-	-	23.78	7.55	21.63	5.53	25.74
Kondiyankuppam	-	-	0.51	4.31	0.95	0.10	-	14.99	8.78	15.57

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
Periya kuppam	-	-	0.29	2.42	0.53	0.06	-	8.43	4.94	8.76
Nallur	-	-	2.40	20.20	4.44	0.49	-	70.27	41.18	73.00
Madam	-	22.56	45.09	0.90	4.39	30.11	12.84	27.34	100.67	20.68
Theyyar	-	22.56	45.09	0.90	4.39	30.11	12.84	27.34	100.67	20.68
Agarakorakottai	-	21.29	22.01	-	0.69	-	-	12.04	6.64	12.66
Gengamppoondi	-	-	54.57	0.68	-	35.90	-	11.41	32.96	27.97
Goonambadi	-	1.91	6.74	1.87	3.37	3.37	-	19.91	14.33	26.28
Kodiyalam	-	76.66	46.93	-	0.39	-	1.39	8.73	17.56	20.18
Malaiyur	-	4.10	7.65	29.36	1.61	6.15	-	21.18	9.65	52.56
Nadukuppam	-	48.03	2.60	-	-	9.69	0.18	14.72	2.88	13.53
Perunkadaputhur	-	15.97	1.09	8.08	2.05	-	1.81	51.13	20.36	16.94
Soraputhur	-	14.64	-	15.71	0.08	-	-	14.37	23.03	8.33
Thakkandarayapuram	-	8.01	11.70	7.54	-	-	0.72	9.42	14.91	13.97
Sri Rnagarajapuram	-	13.42	-	6.40	-	-	3.31	16.86	5.16	18.77

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
Achamangalam	15.10	2.70	1.40
Arunkunam	24.40	-	11.50
Arunthodu	6.10	0.40	9.30
Chitharugavoor	5.57	-	7.87
Embalam	1.89	1.19	12.81
Eripattu	15.80	1.64	8.10
Goodalur	21.20	4.00	17.00
Japthikaranai	19.10	0.90	2.80
Kadambai	7.30	2.10	7.30
Kandavaratti	4.70	1.50	7.40
Kilnamandi	14.70	1.40	7.10
Kilputhur	6.70	-	9.00
Mavalavadi	18.60	1.99	25.91
Kilvillivalam	7.20	3.00	24.10
Kilvelliyur	7.90	-	10.00
Koothampattu	8.50	2.10	4.50
Korakottai	4.30	2.00	11.00
Kothandapuram	15.80	1.40	7.30
Kunnagampundi	0.90	-	-
Mahamai Thirumani	26.00	8.80	2.80
Mazhavankaranai	10.23	0.59	14.47
Meesanallur	2.75	1.60	27.39
Melpathi	9.52	0.45	9.09
Nerkunam	3.80	0.80	16.00
Padur	10.80	2.50	11.20
Palaveri	8.82	0.62	17.18
Pancharai	9.70	10.60	6.90
Pennattagaram	12.30	0.90	4.40
Ponnur	39.80	3.70	33.60
Ramasamudram	9.00	-	12.00
S Katteri	1.00	2.60	3.30
Sathapoondi	12.30	-	17.60
Sathiyavadi	13.80	0.70	6.10
Seeyamangalam	5.62	0.70	19.00
Senal	4.90	0.50	11.37
Sivanam	6.30	0.60	3.20
Sogathur	-	-	11.80
Thellar	21.70	12.90	16.50
Thenkkarai	10.33	0.84	8.09
Thennathur	12.53	14.35	18.09
Thenthinnalur	2.22	0.42	5.91
Thenvanakkambadi	2.65	7.27	15.04

Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Thirakoil	6.65	1.27	19.32
Vadakkupattu	1.60	-	6.00
Vadavanakkambad	9.50	1.30	6.80
Vedal	18.56	6.99	11.84
Kondiyankuppam	5.15	1.58	7.70
Periya kuppam	1.66	0.89	4.33
Nallur	6.28	7.39	36.11
Madam	26.20	9.90	30.20
Theyyar	28.60	9.90	30.20
Agarakorakottai	17.30	0.20	5.90
Gengamppoondi	23.91	10.76	14.16
Goonambadi	6.41	2.53	11.85
Kodiyalam	44.90	0.10	9.00
Malaiyur	10.14	10.92	16.33
Nadukuppam	18.70	2.70	5.90
Perunkadaputhur	10.90	2.80	16.90
Soraputhur	7.40	4.40	8.60
Thakkandarayapuram	7.30	0.10	-
Sri Rnagarajapuram	71.90	2.40	93.20

ANNEXURE 5.3

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

Gram Panchayat	Aff		ARS	AVP		Az	BP		CBP		CS
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Length	No.
Achamangalam	4,000	-	-	1,259	5,036		1,600	-	1,000	5,000	
Agarakorakottai	-	-	-	1,650	6,601	42	9,600	12	-	-	29
Arunkunam	12,138	15	-	928	3,710	19	27,909	35	190	950	19
Arunthodu	13,784	17	-	3,139	12,554	79	-	-	403	2,015	39
Chitharugavoor	6,560	8	-	760	3,041	228	-	-	279	1,395	12
Embalam	1,200	2	-	945	3,779	173	-	-	207	1,035	43
Eripattu	5,352	7	-	649	2,597	80	-	-	360	1,800	43
Gengamppoondi	-	-	-	-	-	66	72,372	90	-	-	66
Goodalur	10,400	13	-	560	2,241	243	20,000	25	-	-	64
Goonambadi	1,525	2	-	1,066	4,263	59	10,782	13	-	-	59
Japthikaranai	-	-	-	1,288	5,151		-	-	1,000	5,000	
Kadambai	2,640	3	-	2,710	10,838	275	2,312	3	-	-	65
Kandavaratti	1,936	2	-	1,465	5,860		9,840	12	-	-	47
Kilnamandi	12,000	15	-	1,115	4,459	119	-	-	-	-	46
Kilputhur	-	-		351	1,405		6,408	8	-	-	71
Kilvelliyur	1,920	2		1,352	5,406	52	4,496	6	-	-	33
Kilvillivalam	-	-		1,288	5,151		-	-	-	-	
Kodiyalam	-	-	-	2,140	8,560		-	-	-	-	
Kondiyankuppam	-	-				321	1,250	2	-	-	321
Koothanpattu	-	-	-	2,150	8,598		-	-	-	-	
Korakottai	-	-	-			100	-	-	-	-	100
Kothandapuram	-	-	-	643	2,570		-	-	-	-	
Kunnagampundi	1,600	2	-	857	3,426		3,200	4	-	-	-
Madam	-	-	-	994	3,975		-	-	-	-	
Mahamai Thirumani	-	-	-			10	-	-	-	-	10

Gram Panchayat	Aff		ARS	AVP		Az	BP		CBP		CS
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Length	No.
Malaiyur	3,283	4	-	373	1,493	119	12,324	15	-	-	119
Mavalavadi	-	-	8	1,402	5,609		864	1	73	365	
Mazhavankaranai	1,840	2	-	1,463	5,851		-	-	-	-	
Meesanallur	-	-	-	994	3,975		-	-	-	-	
Melpathi	-	-	-	1,124	4,497		-	-	-	-	
Nadukuppam	-	-	-	2,307	9,228		-	-	-	-	
Nallur	-	-		914	3,657	321	5,859	7	-	-	321
Nerkunam	-	-	-	1,029	4,115	46	31,040	39	-	-	80
Padur	-	-	-	1,315	5,258		30,944	39	-	-	
Palaveri	3,152	4	-	694	2,774	23	-	-	183	915	23
Pancharai	42,368	40	-	1,170	4,680		-	-	-	-	
Pennattagaram	2	1	-	90	359		-	-	-	-	
Periya kuppam	-	-	-	1,123	4,492	321	703	1	-	-	321
Perunkadaputhur	-	-	-	945	3,779		-	-	-	-	
Ponnur	-	-	-	1,208	4,831		-	-	-	-	
Ramasamudram	1,992	3	-	1,894	7,574	92	5,702	7	-	-	92
S Katteri	1,168	1	-	1,786	7,145		-	-	-	-	
Sathapoondi	-	-	-	748	2,991	38	-	-	174	870	38
Sathiyavadi	6,464	8	-	1,029	4,116		24,056	30	-	-	73
Seeyamangalam	9,688	12	-	1,064	4,257	33	-	-	-	-	59
Senal	-	-	15	1,088	4,353	17	2,312	3	181	905	17
Sivanam	-	-	-	914	3,657	6	-	-	-	-	18
Sogathur	3,058	4	-	994	3,975	111	684	1	661	3,305	111
Soraputhur	-	-	-	2,325	9,298	51	11,360	14	-	-	70
Sri Rangarajapuram	-	-	-	569	2,275		-	-	-	-	
Thakkandarayapu-ram	-	-	-	2,072	8,289		-	-	-	-	
Thellar	24,000	30	-	610	2,439	372	-	-	-	-	108
Thenkkarai	9,655	12	-	819	3,275	62	3,312	4	1,123	5,615	62

Gram Panchayat	Aff		ARS	AVP		Az	BP		CBP		CS
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Length	No.
Thennathur	-	-	-	857	3,426	95	53,832	67	869	4,345	95
Thenthinnalur	-	-	-	1,543	6,173		-	-	-	-	
Thenvanakkambadi	-	-		2,042	8,168		-	-	500	2,500	
Theyyar	-	-		1,239	4,956		-	-	-	-	
Thirakoil	-	-	-	4,909	19,634	40	3,852	5	598	2,990	40
Vadakkupattu	1,424	2	-	-	-	50	1,424	2	-	-	10
Vadavanakkambad	2,364	3	-	1,613	6,451	25	-	-	-	-	25
Vedal	52,000	65	-	-	-	8	-	-	-	-	8

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Length	No.	Length	No.	Area	No.	Area
Achamangalam				19	-	1,200	5	-	-			59	148
Agarakorakottai	29	6	-	6	51	-	-	-	-			3	8
Arunkunam	19	16	-	19	60	-	-	373	1,863			31	21
Arunthodu	39	13	-	15	22	-	-	-	-			-	-
Chitharugavoor	12	6	-	6	-	-	-	-	-			-	-
Embalam	43	10	-	15	2	-	-	787	3,933			-	-
Eripattu	43	10	-	11	20	-	-	882	4,408			-	-
Gengamppoondi	66	18	-	37	43	22,708	163	-	-	7,235	36	9	22
Goodalur	64	5	-	16	55	-	-	-	-	24,000	30	7	18
Goonambadi	59	14	-	19	48	6,923	78	-	-	6,052	30	7	17
Japthikaranai		10	-	5	2	-	-	-	-			22	55
Kadambai	65	5	11	14	34	-	-	-	-	5,120	6	6	15
Kandavaratti	47	8	-	15	30	-	-	-	-	15,264	19	6	15
Kilnamandi	46	7	-	13	39	-	-	-	-	6,960	9	5	13
Kilputhur	71	5	15	13	40	-	-	-	-	7,680	10	7	18
Kilvelliyur	33	20	-	12	16	-	-	-	-	17,592	22	31	78
Kilvillivalam		-	-	-	-	-	-	-	-			-	-
Kodiyalam		-	-	-	-	-	-	-	-			-	-
Kondiyankuppam	321	10	-	13	25	3,577	45	-	-	3,935	20	5	12
Koothanpattu		-	-	-	-	-	-	-	-			-	-
Korakottai	100	-	-	10	-	300	3	752	3,762			14	34
Kothandapuram		-	-	-	-	-	-	-	-			-	-
Kunnagampundi	-	8	-	8	-	800	4	458	2,288	-	-	34	
Madam		-	-	-	-	-	-	-	-			-	-
Mahamai Thirumani	10	-	-	5	5	-	-	-	-			5	13
Malaiyur	119	5	-	23	107	12,963	132	-	-	8,339	42	6	15
Mavalavadi		6	-	11	8	-	-	-	-			-	-

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Length	No.	Length	No.	Area	No.	Area
Mazhavankaranai		1	-	-	21	-	-	-	-			-	-
Meesanallur		-	-	-	-	-	-	-	-			-	-
Melpathi		-	-	-	-	-	-	-	-			-	-
Nadukuppam		-	-	-	-	-	-	-	-			-	-
Nallur	321	45	-	51	116	16,765	212	-	-	18,445	92	22	56
Nerkunam	80	12	-	18	72	-	-	1,163	5,815	16,080	20	4	10
Padur		14	-	18	43	-	-	-	-			-	-
Palaveri	23	5	-	9	5	-	-	90	452			-	-
Pancharai		7	-	21	21	-	-	-	-			-	-
Pennattagaram		2	-	5	-	-	-	-	-			15	38
Periya kuppam	321	5	-	9	14	2,012	25	-	-	2,213	11	3	7
Perunkadaputhur		-	-	-	-	-	-	-	-			-	-
Ponnur		-	-	-	-	-	-	-	-			-	-
Ramasamudram	92	13	-	17	-	-	-	728	3,642			15	38
S Katteri		4	-	4	18	-	-	-	-			-	-
Sathapoondi	38	19	-	23	26	-	-	821	4,106			-	-
Sathiyavadi	73	7	41	11	45	-	-	-	-	7,440	9	5	13
Seeyamangalam	59	15	-	20	41	-	-	814	4,072	22,400	28	8	20
Senal	17	3	-	7	15	-	-	-	-			-	-
Sivanam	18	-	-	11	23	-	-	-	-			-	-
Sogathur	111	10	-	12	27	3,516	68	-	-	6,291	31	5	13
Soraputhur	70	11	-	9	27	-	-	339	1,697			1	3
Sri Rangarajapuram		-	-	-	-	-	-	-	-			-	-
Thakkandarayapuram		-	-	-	-	-	-	-	-			-	-
Thellar	108	10	-	19	97	-	-	-	-	16,480	21	5	13
Thenkkarai	62	12	-	16	30	6,365	58	-	-	4,133	21	6	15
Thennathur	95	29	-	44	31	21,595	163	-	-	9,241	46	15	37
Thenthinnalur		3	-	4	5	-	-	-	-			-	-

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Length	No.	Length	No.	Area	No.	Area
Thenvanakkambadi		10	-	5	-	-	-	-	-			22	55
Theyyar		-	-	-	-	-	-	-	-			-	-
Thirakoil	40	37	-	40	6	10,535	105	-	-	9,868	49	18	46
Vadakkupattu	10	6	-	6	19	-	-	-	-	6,024	8	1	3
Vadavanakkambad	25	2	-	2	17	-	-	444	2,218			-	-
Vedal	8	14	-	18	47	-	-	1,075	5,374			17	43

Gram Panchayat	FD	GSS		ICP		LDI		LP		MI		NADEP
	No.	No.	Extent	No.	Length	No.	Area	No.	Length	No.	Area	No.
Achamangalam				598	2,988	40	100	141	564	-	-	19
Agarakorakottai		13		520	2,600	-	-	-	-	-	-	29
Arunkunam		5		371	1,854	27	66	182	727	-	-	19
Arunthodu		18		309	1,543	2	3	288	1,151	-	-	57
Chitharugavoor		109		225	1,125	-	-	-	-	-	-	121
Embalam		26		220	1,100	3	6	164	656	-	-	69
Eripattu		28		645	3,225	2	8	-	-	-	-	71
Gengamppoondi	66			300	1,500	9	22	-	-	-	-	66
Goodalur		12		220	1,102	-	-	217	868	-	-	64
Goonambadi	59			560	2,800	7	17	244	977	-	-	59
Japthikaranai				777	3,885	20	50	687	2,746	20	50	
Kadambai		12		376	1,880	-	-	213	850	-	-	65
Kandavaratti		14		745	3,724	-	-	-	-	-	-	47
Kilnamandi		29		198	988	-	-	-	-	-	-	46
Kilputhur		29		380	1,900	-	-	-	-	-	-	71
Kilvelliyur		4		191	954	2	8	687	2,748	-	-	37
Kilvillivalam				480	2,400	-	-	-	-	-	-	
Kodiyalam				340	1,700	-	-	49	194	-	-	
Kondiyankuppam	321			460	2,300	5	12	559	2,795	-	-	321
Koothanpattu				345	1,724	-	-	412	1,646	-	-	
Korakottai				240	1,200	-	-	538	2,150	-	-	
Kothandapuram				520	2,600	-	-	205	819	-	-	
Kunnagampundi				289	1,445	18	45	793	3,170	-	-	
Madam				360	1,800	-	-	-	-	-	-	
Mahamai Thirumani		10		560	2,800	-	-	125	500	-	-	
Malaiyur	119			500	2,500	6	15	193	770	-	-	119
Mavalavadi		8		226	1,128	5	12	-	-	-	-	40

Gram Panchayat	FD	GSS		ICP		LDI		LP		MI		NADEP
	No.	No.	Extent	No.	Length	No.	Area	No.	Length	No.	Area	No.
Mazhavankaranai		4		537	2,683	5	12	49	194	-	-	31
Meesanallur				280	1,400	-	-	723	2,893	-	-	
Melpathi				240	1,200	-	-	-	-	-	-	
Nadukuppam				360	1,800	-	-	60	240	-	-	
Nallur	321			480	2,400	22	56	235	940	-	-	321
Nerkunam		7		280	1,400	-	-	250	1,000	-	-	80
Padur		40		300	1,500	15	39	250	1,000	-	-	40
Palaveri		6		320	1,600	2	5	398	1,592	-	-	29
Pancharai		1		560	2,800	-	-	388	1,551	-	-	20
Pennattagaram				370	1,850	15	38	-	-	-	-	
Periya kuppam	321			360	1,800	3	7	280	1,120	-	-	321
Perunkadaputhur				560	2,800	-	-	750	3,000	-	-	
Ponnur				300	1,500	-	-	60	240	-	-	
Ramasamudram		5		460	2,300	6	15	235	940	-	-	92
S Katteri		5		380	1,900	1	1	250	1,000	-	-	40
Sathapoondi		40		1,040	5,200	7	17	250	1,000	-	-	38
Sathiyavadi		40		200	1,000	-	-	398	1,592	-	-	73
Seeyamangalam		33		900	4,500	-	-	388	1,551	-	-	59
Senal		4		560	2,800	2	43	-	-	-	-	17
Sivanam				551	2,754	-	-	132	527	-	-	18
Sogathur	111			440	2,200	5	13	1,250	5,000	-	-	111
Soraputhur		22		320	1,600	-	-	1,323	6,615	-	-	70
Sri Rangarajapuram				360	1,800	-	-	518	2,073	-	-	
Thakkandarayapu-ram				320	1,600	-	-	298	1,193	-	-	
Thellar		17		760	3,800	-	-	375	1,500	-	-	108
Thenkkarai	62			360	1,800	6	15	4,000	16,000	-	-	62
Thennathur	95			320	1,600	15	37	1,062	4,246	-	-	95

Gram Panchayat	FD	GSS		ICP		LDI		LP		MI		NADEP
	No.	No.	Extent	No.	Length	No.	Area	No.	Length	No.	Area	No.
Thenthinnalur		4		375	1,875	-	-	462	1,849	-	-	4
Thenvanakkambadi				366	1,830	5	13	1,830	9,150	-	-	
Theyyar				460	2,300	-	-	-	-	-	-	
Thirakoil	40			359	1,795	18	46	710	3,550	-	-	40
Vadakkupattu		2		64	320	-	-	369	1,843	-	-	10
Vadavanakkambad		4		1,087	5,435	1	2	552	2,760	-	-	25
Vedal		30		598	2,988	17	43	552	2,760	-	-	8

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	Area	No.	No.	No.	Length
Achamangalam	1,640	328		5	-	-	2	3,200	4	-		2,988
Agarakorakottai	210	42	29	2	-	1	2	-	-	2		2,600
Arunkunam	275	55	19	5	-	4	2	-	-	3	26	1,854
Arunthodu	395	79	39	3	-	1	2	-	-	7		1,543
Chitharugavoor	228	46	12	1	-	4	2	-	-	28		1,125
Embalam	865	173	43	2	-	3	2	550	3	1	173	1,100
Eripattu	400	80	43	4	-	4	2	-		1	80	3,225
Gengamppoondi	1,445	289	66	1	-	6	2	540	1	3		1,500
Goodalur	1,215	243	64	3	-	3	2	-	-	2		1,102
Goonambadi	1,900	380	59	2	-	5	2	1,494	2	4		2,800
Japthikaranai				1	-	4	2	-	-	5		3,885
Kadambai	1,375	275	65	2	-	6	2	3,592	4	2		1,880
Kandavaratti			47	4	2	3	2	-	-	1		3,724
Kilnamandi	595	119	46	3	2	6	2	4,096	5	1		988
Kilputhur			71	2	-	9	2	-	-	3		1,900
Kilvelliyur	260	52	33	2	1	8	2	-	-	20		954
Kilvillivalam				3	1	5	2	-	-	-		2,400
Kodiyalam				2	-	7	2	-	-	-		1,700
Kondiyankuppam	7,905	1,581	321	2	-	8	2	3,447	4	16		2,300
Koothanpattu				2		5	2	-	-	-		1,724
Korakottai	1,010	202	100	1	2	4	2	-	-	1		1,200
Kothandapuram				4	1	5	2	-	-	-		2,600
Kunnagampundi	740	148	-	3	1	3	2	1,600	2	2		1,445
Madam				1	-	5	2	-	-	-		1,800
Mahamai Thirumani	125	25	10	2	1	5	2	400	1	1	10	2,800
Malaiyur	3,615	723	119	2	-	11	2	23,484	29	7		2,500
Mavalavadi	150	30		1	1	6	2	9,120	11	2	30	1,128
Mazhavankaranai	875	175		4	4	7	2	-	-		175	2,683

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	Area	No.	No.	No.	Length
Meesanallur				2	-	-	2	-	-	-		1,400
Melpathi				1	-	-	2	-	-	-		1,200
Nadukuppam				2	-	1	2	-	-	-		1,800
Nallur	7,905	1,581	321	3	-	5	2	16,160	20	16		2,400
Nerkunam	230	46	80	2	-	-	2	-	-	2		1,400
Padur	420	84		2	-	-	2	-	-	18		1,500
Palaveri	115	23	23	1	-	2	2	-	-	3	10	1,600
Pancharai	460	92		2	-	1	2	4,072	5	9	92	2,800
Pennattagaram				2	-	3	2	400	1	3		1,850
Periya kuppam	7,905	1,581	321	1	-	3	2	1,936	2	16		1,800
Perunkadaputhur				7	-	1	2	-	-	-		2,800
Ponnur				1	-	-	2	-	-	-		1,500
Ramasamudram	410	82	92	2	-	3	2	-	-	4	123	2,300
S Katteri	125	25		2	-	2	2	-	-		177	1,900
Sathapoondi	30	6	38	3	-	3	2	-	-	2	17	5,200
Sathiyavadi	365	73	73	1	-	4	2	2,032	3	2		1,000
Seeyamangalam	165	33	59	2	-	2	2	2,104	3	2		4,500
Senal	85	17	17	3	-	3	2	-	-	2	41	2,800
Sivanam	30	6	18	2	-	6	2	-	-	12		2,754
Sogathur	1,670	334	111	1	-	3	2	-	-	3		2,200
Soraputhur	255	51	70	2	-	3	2	8,000	10	2		1,600
Sri Rangarajapuram				11		1	2	-	-	-		1,800
Thakkandarayapuram				8	-	1	2	-	-	-		1,600
Thellar	1,860	372	108	4	-	2	2	26,240	33	3		3,800
Thenkkarai	2,740	548	62	4	-	3	2	-	-	5		1,800
Thennathur	2,450	490	95	2	-	2	2	2,958	4	5		1,600
Thenthinnalur	140	28		1	-	1	2	-	-	9		1,875
Thenvanakkambadi				2	-	6	2	-	-	4		1,830

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	Area	No.	No.	No.	Length
Theyyar				2	-	11	2	-	-	-		2,300
Thirakoil	1,295	259	40	3	-	6	2	1,524	2	3		1,795
Vadakkupattu	250	50	10	-	-	3	2	-	-	2		320
Vadavanakkambad	270	54	25	3	-	2	2	-	3	2	10	5,435
Vedal	465	93	8	1	-	2	2	-	-	3	99	2,988

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	Achamangalam	336	110
2	Agarakorakottai	368	647
3	Arungunam	377	522
4	Arunthodu	381	522
5	Chitharugavur	222	646
6	Embalam	395	190
7	Eripattu	392	95
8	Gengampoondi	569	245
9	Goodalore	605	117
10	Gunambadi	508	318
11	Japthikarani	362	167
12	Kadambai	581	202
13	Kandavarati	443	104
14	S. Katteri	315	127
15	Kilnamandi	436	270
16	Kilputhur	597	1245
17	Kilvellivalam	715	429
18	Kilvelliyur	317	265
19	Kodiyalam	714	730
20	Kondaiyankuppam	689	60
21	Korakottai	303	166
22	Kuthampattu	240	133
23	Kothandapuram	376	55
24	Kunnagampoondi	360	167
25	Madam	137	61
26	Magamaithirumani	285	255
27	Mazhaiyur	1236	375
28	Mazhavankarani	561	247
29	Mavalavadi	425	57
30	Meesanallur	398	61
31	Melpathi	295	56
32	Nadukuppam	334	297
33	Nallur	1206	15
34	Nerkunam	515	643
35	Padur	477	474
36	Pazhaveri	271	169
37	Pancharai	312	242
38	Pennattagaram	329	69
39	Periyakuppam	729	437
40	Perugadaputhur	664	227
41	Ponnur	535	1247

S. No	GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 02/02/2022
42	**Ramasamudram**	527	1546
43	**Sathapoondi**	425	459
44	**Sathiyavadi**	403	464
45	**Seeyamangalam**	501	294
46	**Senal**	267	71
47	**Sivanam**	150	59
48	**Sogathur**	856	240
49	**Soraputhur**	310	519
50	**Srirangarajapuram**	478	595
51	**Thakkandarayapuram**	610	383
52	**Thellar**	848	3154
53	**Thenkarai**	564	338
54	**Thennathur**	875	379
55	**Thenthinnalur**	180	285
56	**Thenvanakkampadi**	300	53
57	**Theyyar**	524	233
58	**Thirakoil**	511	65
59	**Vadakkupattu**	178	107
60	**Vadavanakkampadi**	265	146
61	**Vedal**	545	506

ANNEXURE 7.2

GP AND WORK CATEGORY -WISE ONGOING WORKS IN THURINJAPURAM BLOCK

GP	Work Category	No of ongoin works
Achamangalam	Water Conservation and Water Harvesting	1
Agarakorakottai	Rural Connectivity	1
	Water Conservation and Water Harvesting	2
Arungunam	Drought Proofing	1
Arunthodu	Drought Proofing	1
	Water Conservation and Water Harvesting	1
Chitharugavur	Water Conservation and Water Harvesting	2
Embalam	Water Conservation and Water Harvesting	1
Eripattu	Water Conservation and Water Harvesting	1
Gengampoondi	Water Conservation and Water Harvesting	1
Goodalore	Rural Connectivity	1
	Water Conservation and Water Harvesting	2
Gunambadi	Drought Proofing	1
	Water Conservation and Water Harvesting	2
Japthikarani	Water Conservation and Water Harvesting	1
Kadambai	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	2
Kandavarati	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	3
Kilnamandi	Drought Proofing	1
	Water Conservation and Water Harvesting	1
Kilputhur	Water Conservation and Water Harvesting	2
Kilvellivalam	Rural Connectivity	1
	Water Conservation and Water Harvesting	2
Kilvelliyur	Water Conservation and Water Harvesting	1
Kodiyalam	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	2
Kondaiyankuppam	Water Conservation and Water Harvesting	2
Korakottai	Drought Proofing	1
	Water Conservation and Water Harvesting	1
Kothandapuram	Water Conservation and Water Harvesting	1
Kunnagampoondi	Water Conservation and Water Harvesting	1
Kuthampattu	Water Conservation and Water Harvesting	1
Madam	Water Conservation and Water Harvesting	1
Magamaithirumani	Water Conservation and Water Harvesting	1
Mavalavadi	Water Conservation and Water Harvesting	1
Mazhaiyur	Water Conservation and Water Harvesting	2
Mazhavankarani	Water Conservation and Water Harvesting	1
Meesanallur	Water Conservation and Water Harvesting	1
Melpathi	Water Conservation and Water Harvesting	1
Nadukuppam	Water Conservation and Water Harvesting	2

GP	Work Category	No of ongoin works
Nallur	Water Conservation and Water Harvesting	3
Nerkunam	Water Conservation and Water Harvesting	2
Padur	Drought Proofing	1
	Water Conservation and Water Harvesting	2
Pancharai	Water Conservation and Water Harvesting	1
Pazhaveri	Water Conservation and Water Harvesting	1
Pennattagaram	Water Conservation and Water Harvesting	2
Periyakuppam	Water Conservation and Water Harvesting	1
Perugadaputhur	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	7
Ponnur	Drought Proofing	1
	Rural Sanitation	1
	Water Conservation and Water Harvesting	3
Ramasamudram	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
S. Katteri	Water Conservation and Water Harvesting	1
Sathapoondi	Rural Sanitation	1
	Water Conservation and Water Harvesting	1
Sathiyavadi	Drought Proofing	1
Seeyamangalam	Water Conservation and Water Harvesting	1
Senal	Rural Connectivity	1
	Water Conservation and Water Harvesting	1
Sivanam	Rural Connectivity	1
	Water Conservation and Water Harvesting	1
Sogathur	Water Conservation and Water Harvesting	2
Soraputhur	Water Conservation and Water Harvesting	2
Srirangarajapuram	Water Conservation and Water Harvesting	2
Thakkandarayapuram	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	3
Thellar	Water Conservation and Water Harvesting	2
Thenkarai	Water Conservation and Water Harvesting	2
Thennathur	Water Conservation and Water Harvesting	2
Thenthinnalur	Water Conservation and Water Harvesting	2
Thenvanakkampadi	Water Conservation and Water Harvesting	1
Theyyar	Water Conservation and Water Harvesting	2
Thirakoil	Water Conservation and Water Harvesting	2
Vadakkupattu	Water Conservation and Water Harvesting	1
Vadavanakkampadi	Water Conservation and Water Harvesting	2
Vedal	Water Conservation and Water Harvesting	2

ANNEXURE 8

KEY CWRM PARAMETERS FOR THE GPs FALLING UNDER THIRAKOIL GP MICRO-WATERSHED

CWRM Parameter	Thirakoil
Soil Resources: Status of Available Nitrogen (%)	
Very Low	2.82
Low	87.32
Medium	9.86
Status of Organic Carbon (%)	
Very Low	2.82
Low	95.77
Medium	1.41
Status of Soil Micro Nutrients (%)	
Sufficient	56
Deficient	44
Status of Physical condition of the soil (%)	
Moderately Acidic	100
Soil Texture (%)	
Clay soil	4
Fine soil	71.80
Soil moisture and ET	
Volumetric Soil Moisture (%)	23
Estimated Soil Moisture (ha.m)	162.36
ET Losses (ha.m)	374.15
Means of Water Extraction (%)	
Gravity	4
Lifting	96
Irrigation Methods (%)	
Wild Flooding	29
Control Flooding	71
Livestock (No.)	
Cattle Population	1031
Sheep Population	160
Goat Population	176
Land Resources (ha)	
Non-Agricultural Uses	242.51
Area under Barren & Un-cultivable Land	43.78
Area under Permanent Pastures and Other Grazing Land	43.78
Land Under Miscellaneous Tree Criticalops etc.	17.62
Current Fallow land	196.76
Unirrigated Land	60.32
Area Irrigated by Source	343.64

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