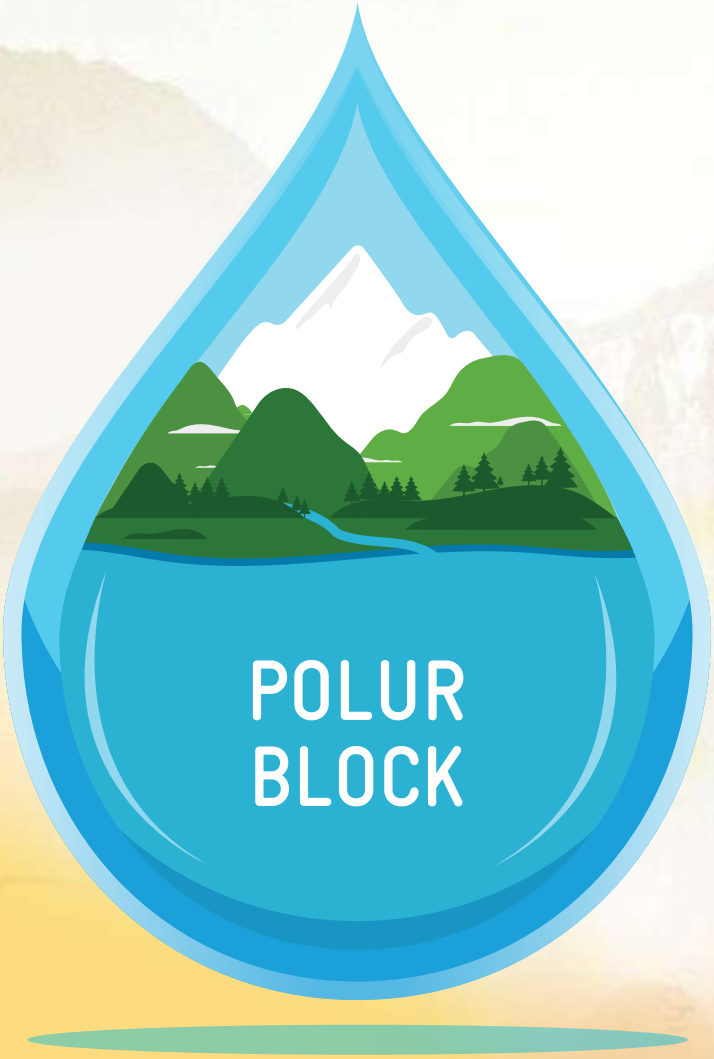
Ministry of Rural Development Ministry of Jal Shakthi

WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

Published by:
Department of Rural Development & Panchayat Raj,
Government of Tamil Nadu, Chennai

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

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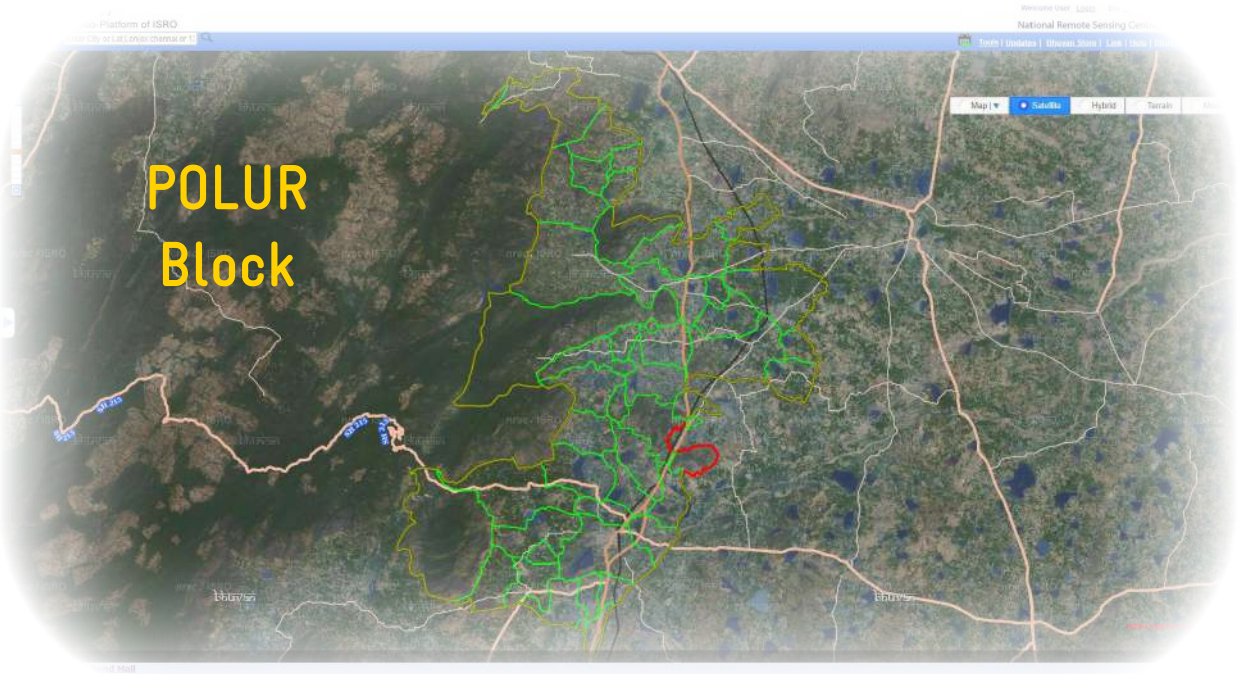
Image Credits: RD & PR, DRDA and GIZ India

On behalf of
German Federal Ministry for Economic Cooperation and Development (BMZ)
GIZ is responsible for the content of this publication.
New Delhi, India, Jan 2022

WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

FOREWORD

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

FOREWORD

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

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

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

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

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

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

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

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

We look forward to its success!

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

FOREWORD

Thiru. B. Murugesh, IAS
District Collector,
Tiruvannamalai

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

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

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

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

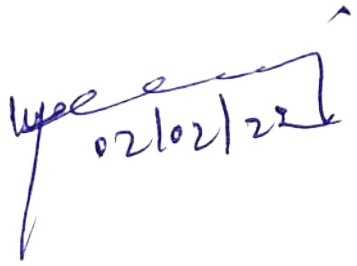
Through GIS based planning in 860 GPs, works identified under CWRM are verified, approved at Gram Sabha. These works would potentially reduce 38% surface runoff to be harvested or recharged by various interventions through ridge to valley watershed approach.

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

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

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

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



Thiru. B. Murugesh, IAS
District Collector,
Tiruvannamalai

MESSAGES

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

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

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

M. P—

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

MESSAGES

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

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

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

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

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

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

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

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

MESSAGES

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

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

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

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

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

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

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ABBREVIATIONS AND ACRONYMS

A - D

%
Percentage

^{0}C
Degree Celsius

AR
Assessment Report

CCB
Contour Continuous Bunds

CCCDM
Centre for Climate Change and Disaster Management

CRM
Climate Resilient Measures

CuM
Cubic Meter

CVI
Climate Vulnerability Index

CWRM
Composite Water Resource Management

CWRMP
Composite Water Resource Management Plan

DEM
Digital Elevation Model

D - H

DLSC
District Level Steering Committee

DLT
Drainage Line Treatment

DRD&PR
Department of Rural Development & Panchayat Raj

ET
Evapo-transpiration

FPO
Farmer Producer Organization

FY
Financial Year

GIS
Geographical Information System

GIZ
Deutsche Gesellschaft für Internationale

Govt.
Government

GP
Gram Panchayat

GW
Ground Water

ha
Hectare

I - M

ha.m
Hectare Meter

HH
Households

ICAR
Indian Council for Agriculture Research

IMD
Indian Meteorological Department

INR
Indian Rupees

IPCC
Intergovernmental Panel on Climate Change

IWRM
Integrated Water Resources Management

Kharif crop
Sown in Monsoon and harvested close to Autumn

Km
Kilometer

KML
Keyhole Markup Language

LULC
Land use and land cover

M - N

Max
Maximum

MCM
Million Cubic Meter

MC
Mid Century

MCM
Million Cubic Meter

Mahatma Gandhi NREGA
Mahatma Gandhi Rural Employment Guarantee Act

Mahatma Gandhi NRGES
Mahatma Gandhi Rural Employment Guarantee Scheme

Min
Minimum

mm
Millimeter

MoEFCC
Ministry of Environment, Forest and Climate Change

MoJS
Ministry of Jal Shakti

MoRD
Ministry of Rural Development

M
Meters

N - S

NAPCC
National Action on Climate Change

NARP
National Agricultural Research Project

NADEP
Nadepkaka

NDC
Nationally Determined Contributions

NEM
North-East monsoon

NGO
Non-Governmental Organization

NITI
National Institution for Transforming India

No.
Number

NRM
Natural Resource Management

NRSC
National Remote Sensing Centre

NWC
National Water Commission

PWD
Public Works Department

S - U

Rabi crop
Sown in winter and harvested in monsoon

RDPR
Rural Development & Panchayat Raj

RF
Reserve Forest

RTRWHS
Roof top rain water harvesting structures

RWHS
Rain Water Harvesting System

SAPCC
State Action Plan on Climate Change

SC
Scheduled Caste

SDG
Sustainable Development Goal

SDMA
State Disaster Management Authority

SDMRI
Suganthi Devadasan Marine Resources Institute

SECC
Socio Economic and Caste Census

S - W

SHG
Self Help Group

SLSC
State Level Steering Committee

ST
Scheduled Tribe

SWM
South-West monsoon

UN
United Nations

SW
Surface Water

TN
Tamil Nadu

WASCA
Water Security and Climate Adaptation

WCWH
Water Conservation and Water Harvesting

வான்நின்று உலகம் வழங்கி வருதலால்
தான்அமிழ்தம் என்றுணரற் பாற்று

குறள் - 11

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

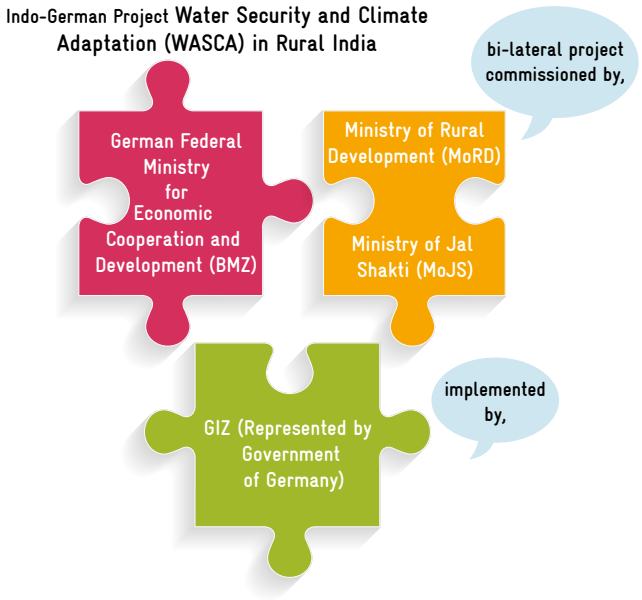
Thirukkural - 11

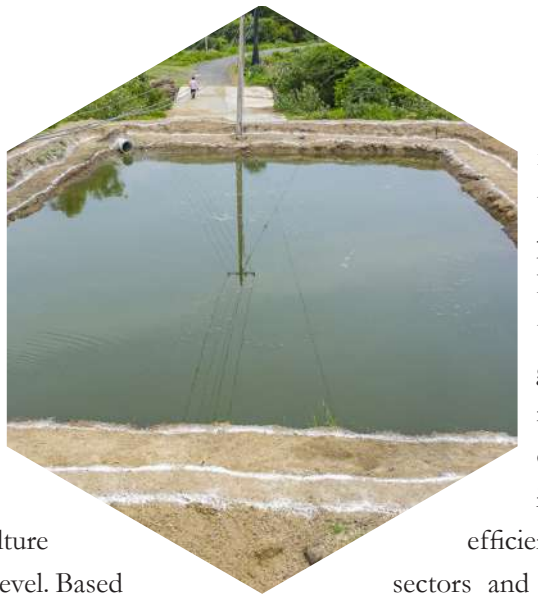
EXECUTIVE SUMMARY

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

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

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





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

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

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

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

This report was structured with nine chapters

1

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

2

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

3

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

4

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

5

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

6

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

7

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

8

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

9

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

துப்பார்க்குத் துப்பாய துப்பாக்கித் துப்பார்க்குத்
துப்பாய தூஉம் மழை

குறள் - 12

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

Thirukkural - 12

CHAPTER 1

1 ABOUT THE BLOCK

Polur, a rural Block of Tiruvannamalai District lies between 12°27'0.374"N to 12°45'27.338"N latitude and 79°2'35.357"E to 79°14'19.138"E longitude. Located at the foothills of Jawadhu Hills, the Block is surrounded by West Arani, Chetput, Kalasapakkam, and Jawadhu Hills Blocks (Figure 1.1). The total geographical area of this flat terrain Block is 27,900 ha (279 Km2). Administratively, this Block comes under Polur taluk, with 40 village panchayats and 253 habitations.

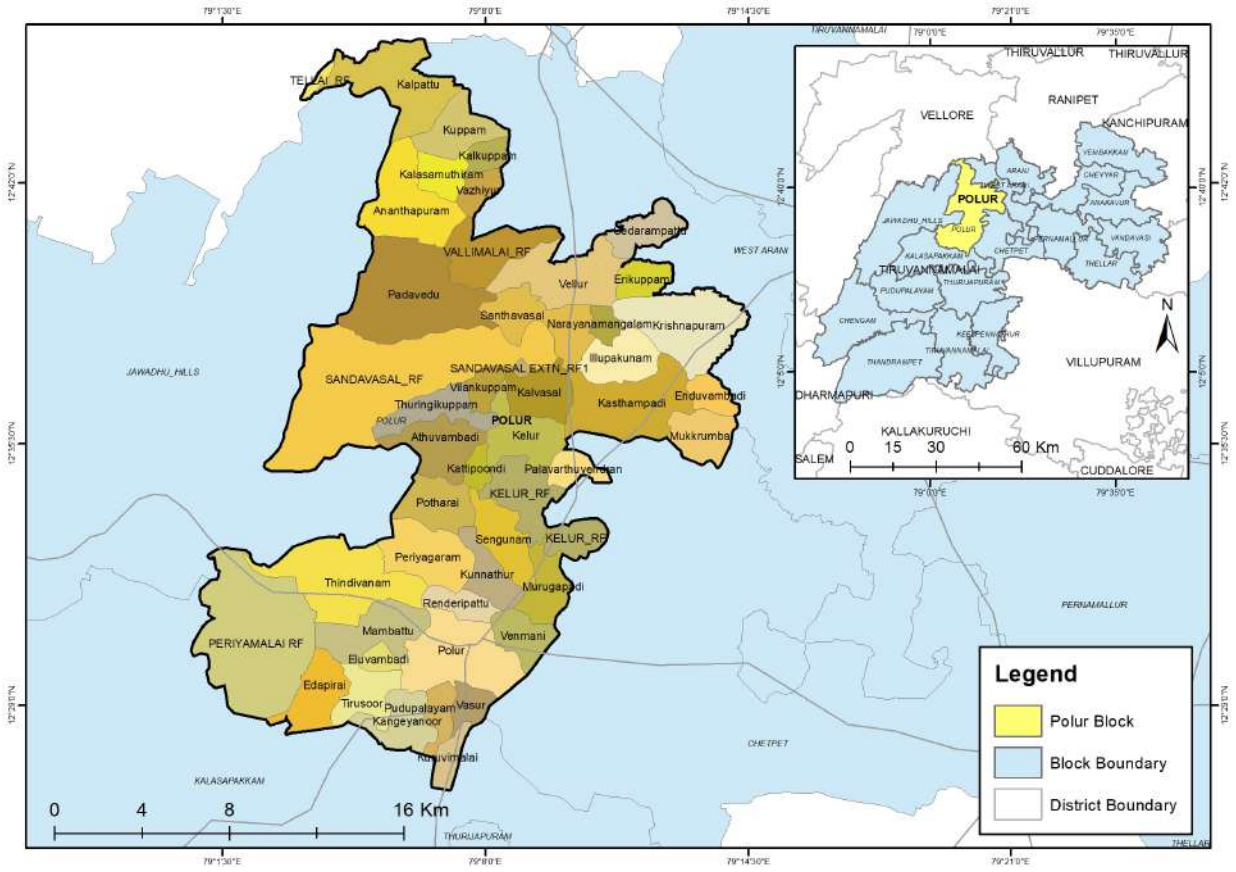


Figure 1.1. Location of Polur Block

According to Census 2011, the population of Polur Block is 1,77,772. The population density of the Block is 637 per Km2 which is higher than the district population density (473 per Km2) and State's density (555 per Km2). There is 13.27% increase in the population observed since 2001 in this densely populated rural Block. It is interesting to know that female population is higher (50.05 %) than the male population (49.94%). The proportion of sex ratio is 1,006 females per 1000 males, which is higher compared to the district average sex-ratio (994 females per 1,000 males). Even though there is high female proportion, literacy rate of female is lower (44.2 %) than male literacy (55.8%). The average literacy rate of the Block is lower (67.41%) than national average (72.98%). Scheduled Castes and Scheduled Tribes accounted for 18.06% of the total population (Thiruvannamalai district profile 2020).

Economically, Polur is the 3rd highest revenue earning Block of the Tiruvannamalai district next to Tiruvannamalai and Peranamallur Blocks. Agriculture and allied activities, are the primary occupation followed by livestock rearing. Paddy tops as the predominant crop, with 64.22% of the irrigated area cultivated with paddy. The other major crops grown

> The proportion of sex ratio is 1,006 females per 1000 males, which is higher compared to the district average (994 females per 1,000 males)

> average literacy rate of the block is lower (67.41%) than national average (72.98%)

in the Block area are sugarcane, ground nut, pulses, and red gram. Significant cultivated areas of banana, turmeric, dry chilli, maize and ragi cultivation can also be seen. Groundnut and pulses are cultivated both under irrigated and rainfed conditions. The sericulture practice is also noticeable in Polur Block with 210 acres under mulberry cultivation and 68 families are engaged in weaving. A livestock count of 78,632 and poultry count of 94,500 was recorded during 2019-20. The Block has 69 milk societies with 43,838 liters of milk being produced per day.

> 64.22% of the irrigated area cultivated with paddy.

Hydrologically, Cheyyar and Naganadi macro-watersheds of Cheyyar sub basin/Palar basin covers Polur Block. There are 110 micro-watersheds subsist in this Block Figure 1.2).

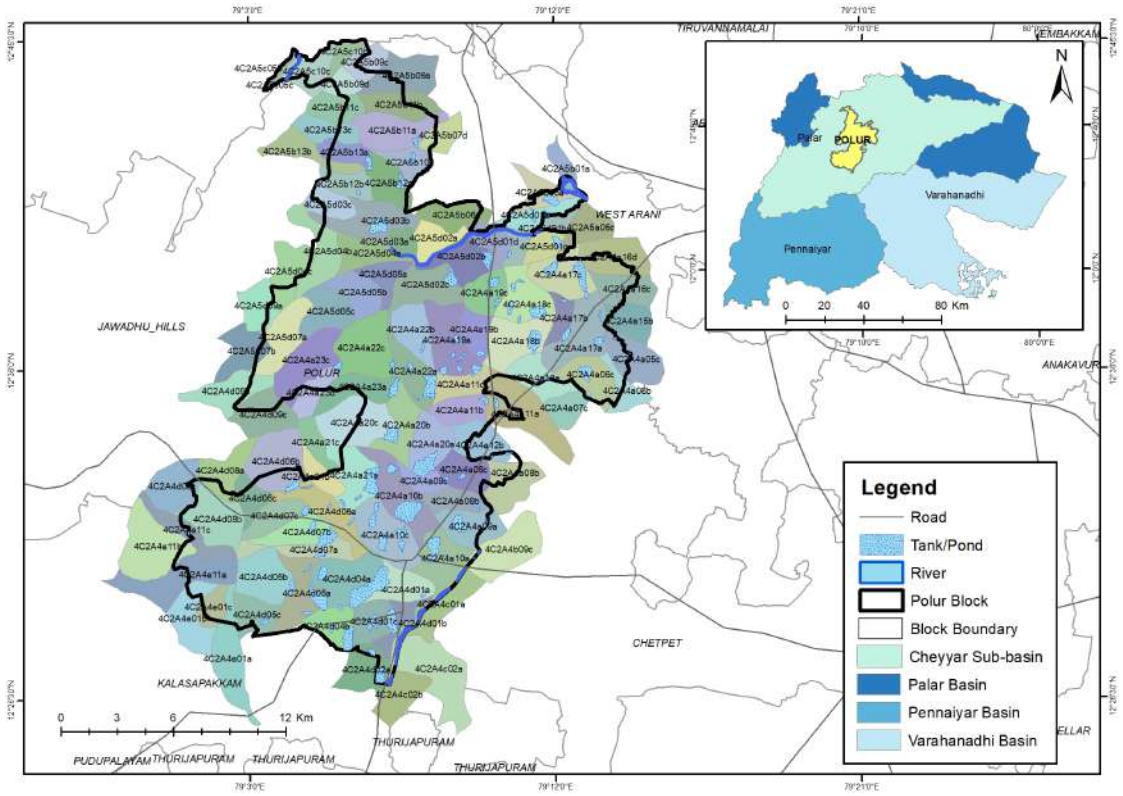


Figure 1.2. Micro-watersheds- Polur Block

There are around 73 tanks in the Block, Polur tank with an area of 444 ha is the largest tank. Other important tanks are Aliayabad Big tank (273.68 ha), Mukkurumbai tank (159 ha), Vellore Big tank (152.63 ha), Kasthampadi Big tank (146.55 ha), Kunnathur tank (129.14 ha), Periyagaram tank (123.88 ha), Kelur tank (110.88 ha) and Ogur Big tank (100.8 ha) (Fig 1.3). Three firkas -Polur, Santhavasal and Kelur firkas cover the Block. The ground water in all the 3 firkas are seriously depleted and at over exploitation stage.

GROUND WATER LEVEL OF THIS BLOCK

OVER EXPLOITED- › 100%	Polur, Santhavasal, Kelur

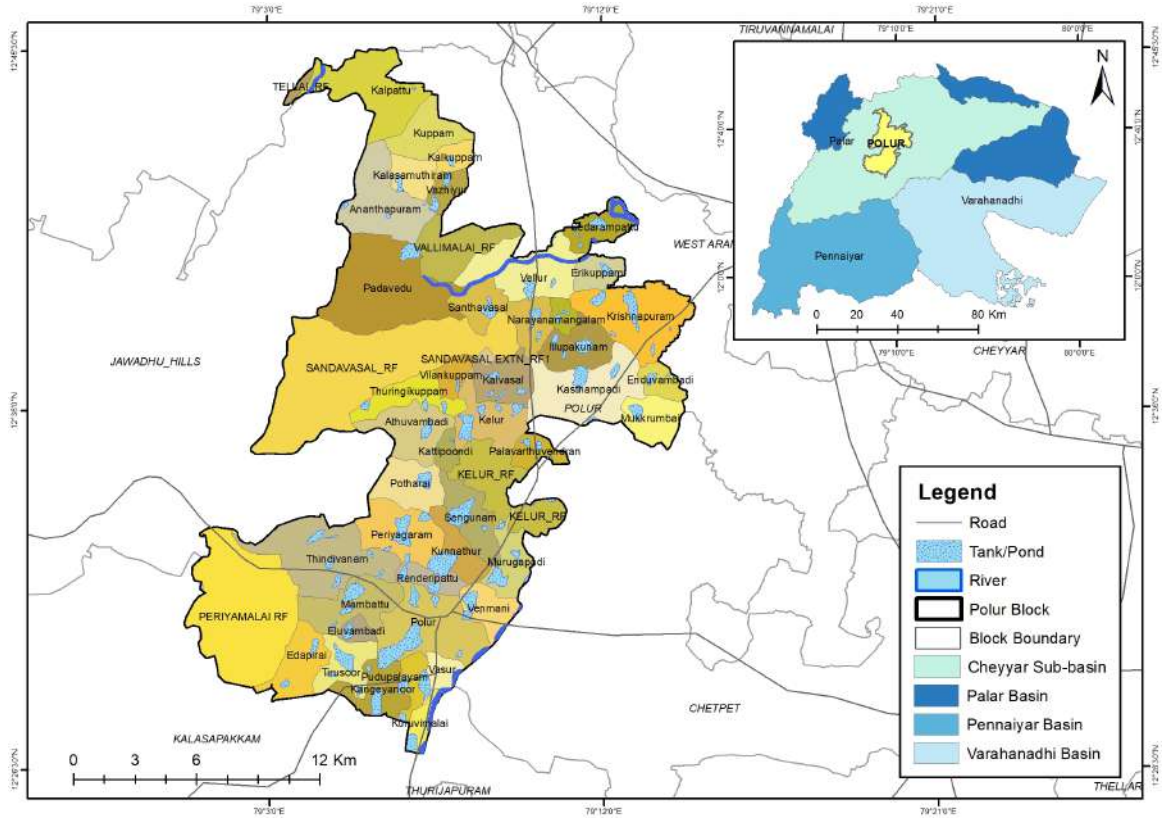
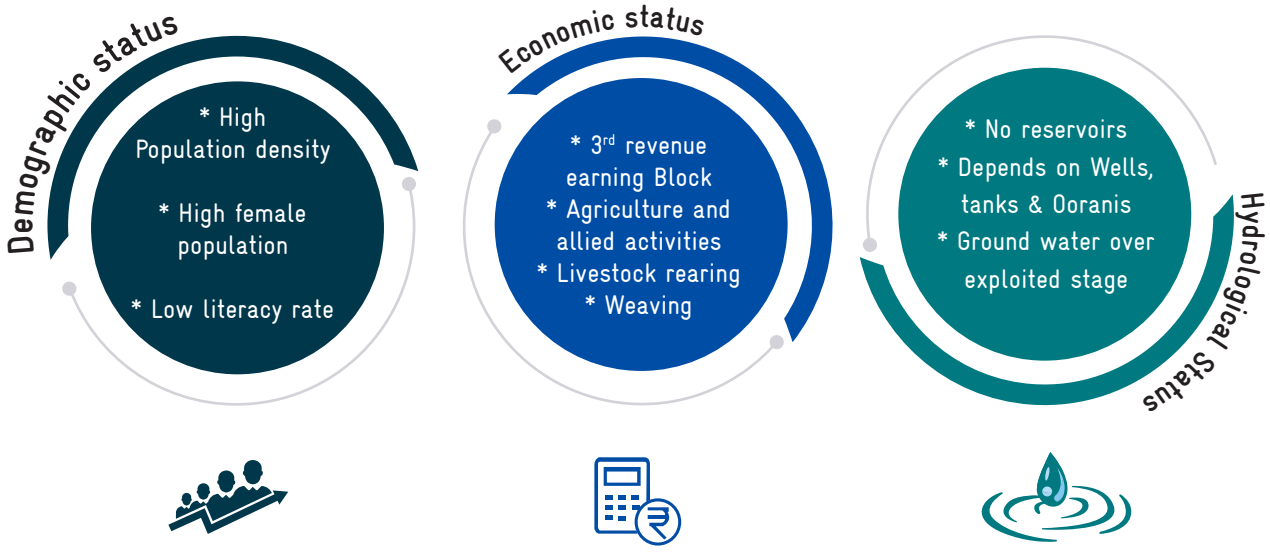


Figure 1.3. Spatial distribution of waterbodies



விண்இன்று பொய்ப்பின் விரிநீர் வியனுலகத்து
உள்நின்று உடற்றும் பசி

குறள் - 13

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

Thirukkural - 13

CHAPTER 2

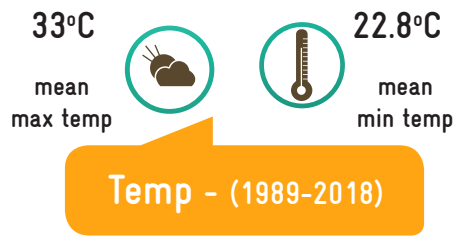
2 CLIMATE AND WATER SECURITY

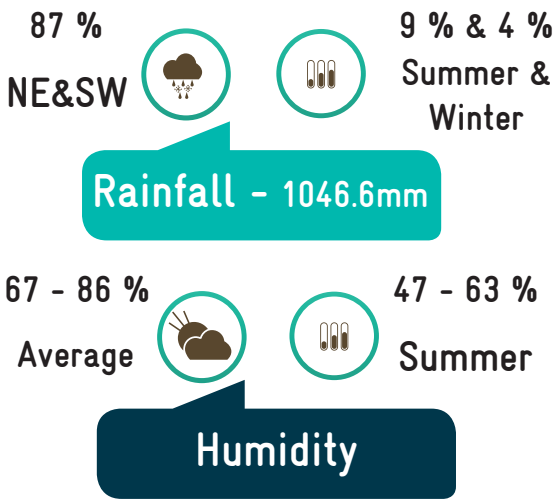
This region has typical tropical climate, located in the North Eastern agro-climatic zone of State and Southern Plateau and Hills region according to the agro climatic regional classification of planning commission. The general climate description of this region is given below (Table 1).

TABLE 1. GENERAL CLIMATE DESCRIPTION OF THE BLOCK

Agro-climatic Region*** (Planning Commission)	Agro-climatic Zone*** (NARP)	Agro Ecological Sub-Region*** (ICAR)
Southern Plateau and Hills region (X)	North Eastern zone (TN-1)	Eastern Ghats (8.3)
Temperature	**Rainfall**	**Humidity**
33 to 22.8 °C	1045 mm	67- 86 %

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 fewer days. The monthly average tem-perature characteristic during 2020 are shown in figure 2.1.





Normally this region receives major rainfall from North East Monsoon (October to December) and South West Monsoons (June to September). Past record shows the annual average rainfall of this region is 1046.6mm (WRIS, GoI). Both North East and South West monsoons contribute nearly 87% of the annual rainfall in which South west monsoon 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 %.

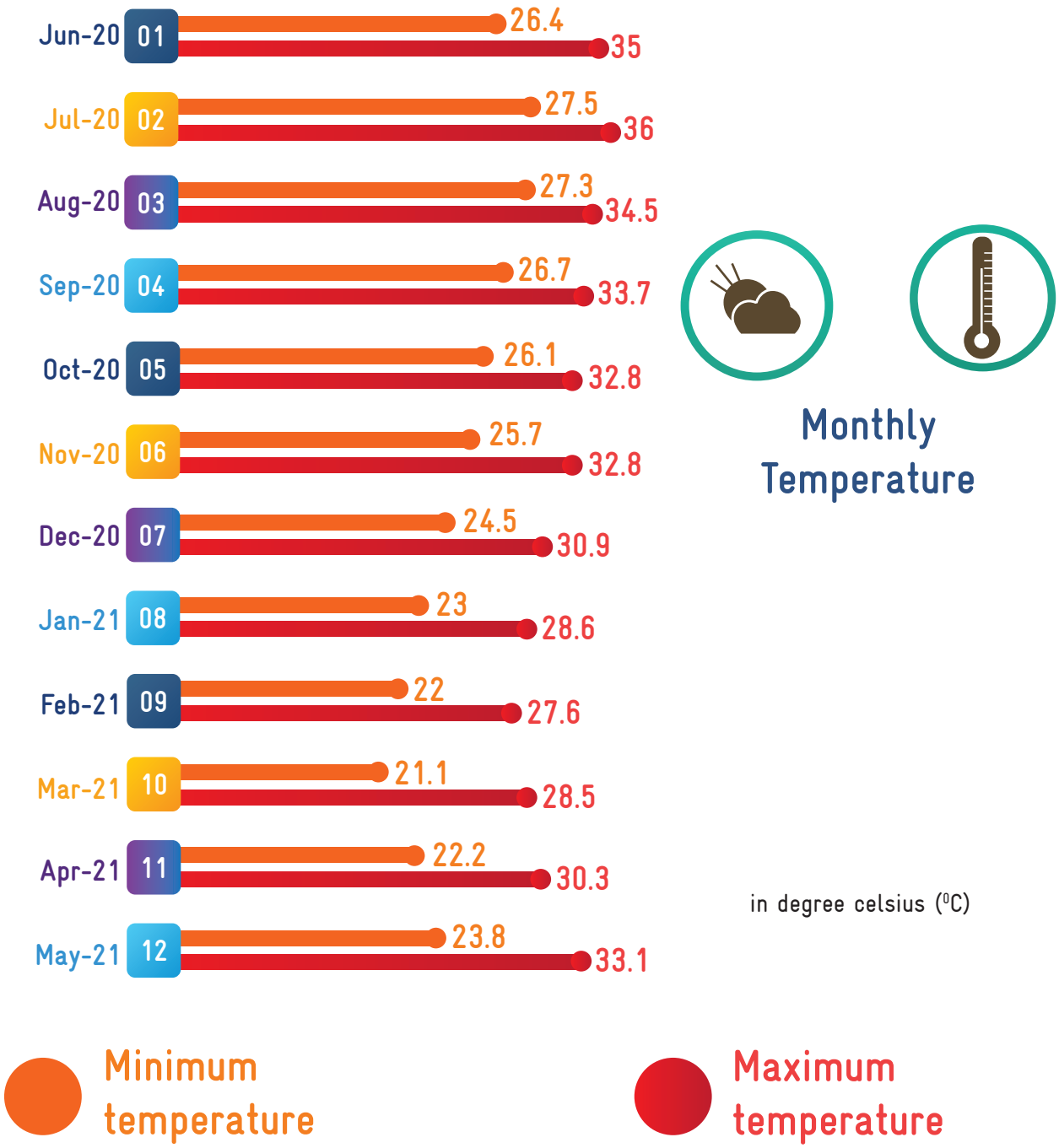


Figure 2.1. Average monthly temperature

The average annual rainfall days are 172 days in which 72 days are form North East Monsoon (NEM) and 82 days are from South West Monsoon (SWM) months. Onset of SW Monsoon 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 North East monsoon.

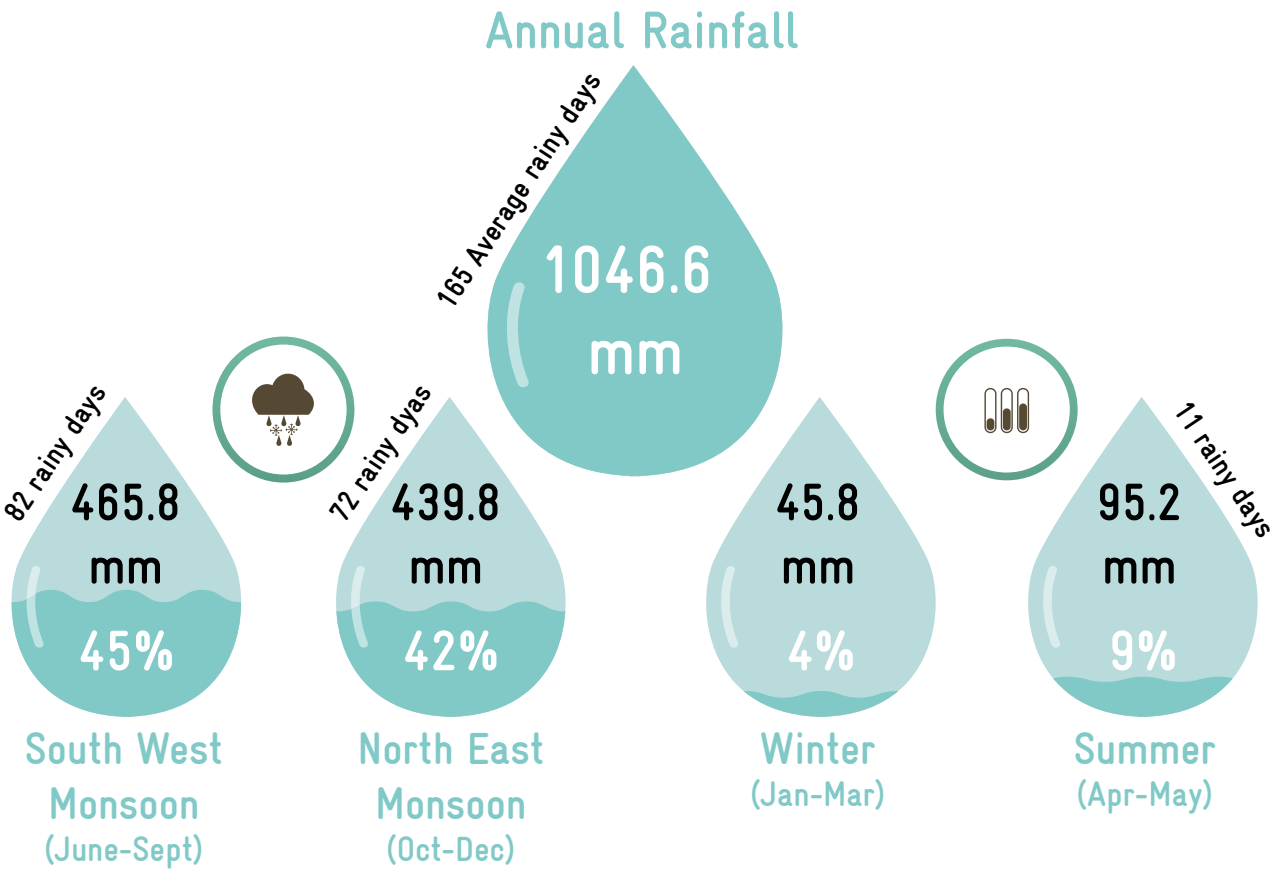


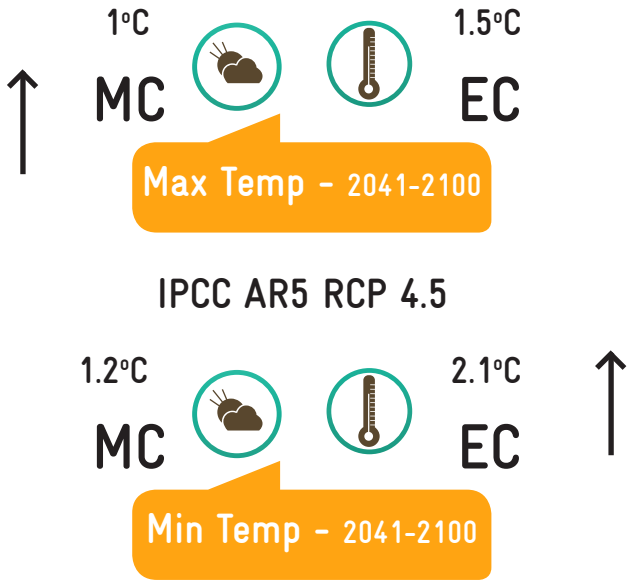
Figure 2.2. Season-wise distribution of annual rainfall

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 1.2^{0}C and 0.5^{0}C increase in maximum and minimum temperature was observed during 1951 to 2015 (IMD). The rainfall variability is also well observed. During 1951 to 2015, there were 15 excess rainfall years (above normal rainfall) and 15 deficient rainfall years (below normal rainfall) recorded. The consecutive excess and deficient rainfall leads to rainfall variability and its extremities. Since this region is heavily dependent on monsoon rains, it is prone to droughts when the monsoons fail. As rainfall is the major source for determining water storage, existing water resources such as rivers, dams and major and minor tanks fail along with deficient rainfall years.

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

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

Climate projection based on global climate models indicated that there would be 1°C increase in maximum temperature in mid-century (MC) period (2041-2070) and 1.5°C increase in end-century (EC) period (2071-2100) from the baseline scenario under RCP 4.5 climate scenario in this region. The minimum temperature would increase nearly 1.2°C and 2.1°C during MC and EC periods. Average annual rainfall for IPCC AR5 RCP4.5 scenarios is projected to increase about 13 % towards MC and increase by about 21 % towards EC period.



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

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

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

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

2.1 CLIMATE RISKS

Increasing temperature, fluctuating rainfall patterns and its extremities creates shorter rainy seasons and longer dry seasons making river basins more vulnerable. This district experienced 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 Polur Block, Vasur GP has moderate flood vulnerability.

Drought

Low rainfall coupled with the erratic behavior of the monsoon in the state makes Tamil Nadu the most vulnerable to drought. This district is coming under drought vulnerable area when received less than 40% of normal rainfall and experienced frequent drought in the past years particularly in the year 2003, 2009. But severe drought is experienced in the year 2016- 2017. All parts are affected by drought and its consequences; there are large area crop losses and drinking water scarcity. In Polur 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 Polur Block are prone to Heatwaves

2.2 WASCA CLIMATE VULNERABILITY INDICATORS

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

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

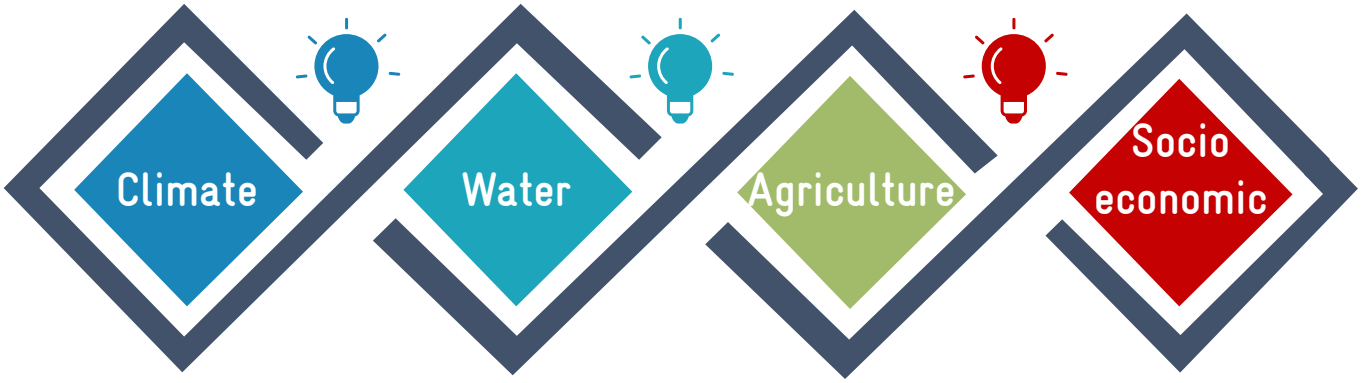
CWRM Area	Indicators of Rural water security vulnerability	Indicators label	Linked SDG
Climate	Changes in max temperature (^{O}C)	C1	Goal 13
	Changes in min temperature (^{O}C)	C2	
	Changes in rainfall (%)	C3	
	Excess rainfall years	C4	
Water	Deficient rainfall years	C5	
	Ground water extraction (%)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

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

2.3 COMPRESSIVE ANALYSIS OF BLOCK LEVEL VULNERABILITY

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

TABLE 3. MAJOR PARAMETERS IDENTIFIED FOR BLOCK LEVEL VULNERABILITY ASSESSMENT



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

ஏரின் உழாஅர் உழவர் புயலென்னும்
வாரி வளங்குன்றிக் கால்

குறள் - 14

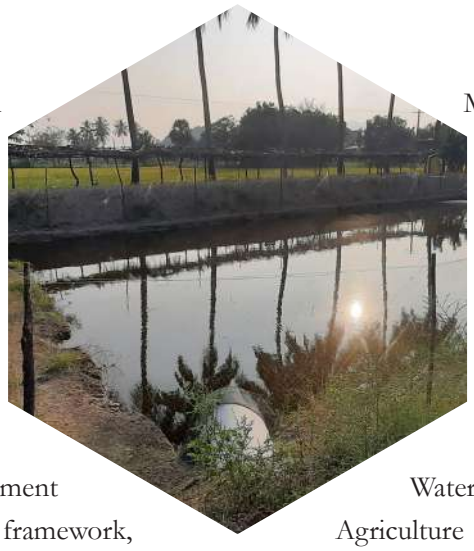
Unless the fruitful shower descend
The ploughman's sacred toil must end

Thirukkural - 14

CHAPTER 3

CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA

3 CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA



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

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

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

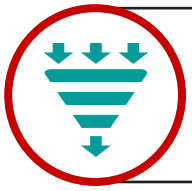
262 Total Kinds of works in Schedule-I of Mahatma Gandhi NREGA

182 Kinds of works relate to NRM alone

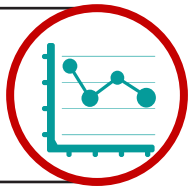
164 Kinds of works related to Agriculture & allied works

85 Water related works out of NRM

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



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

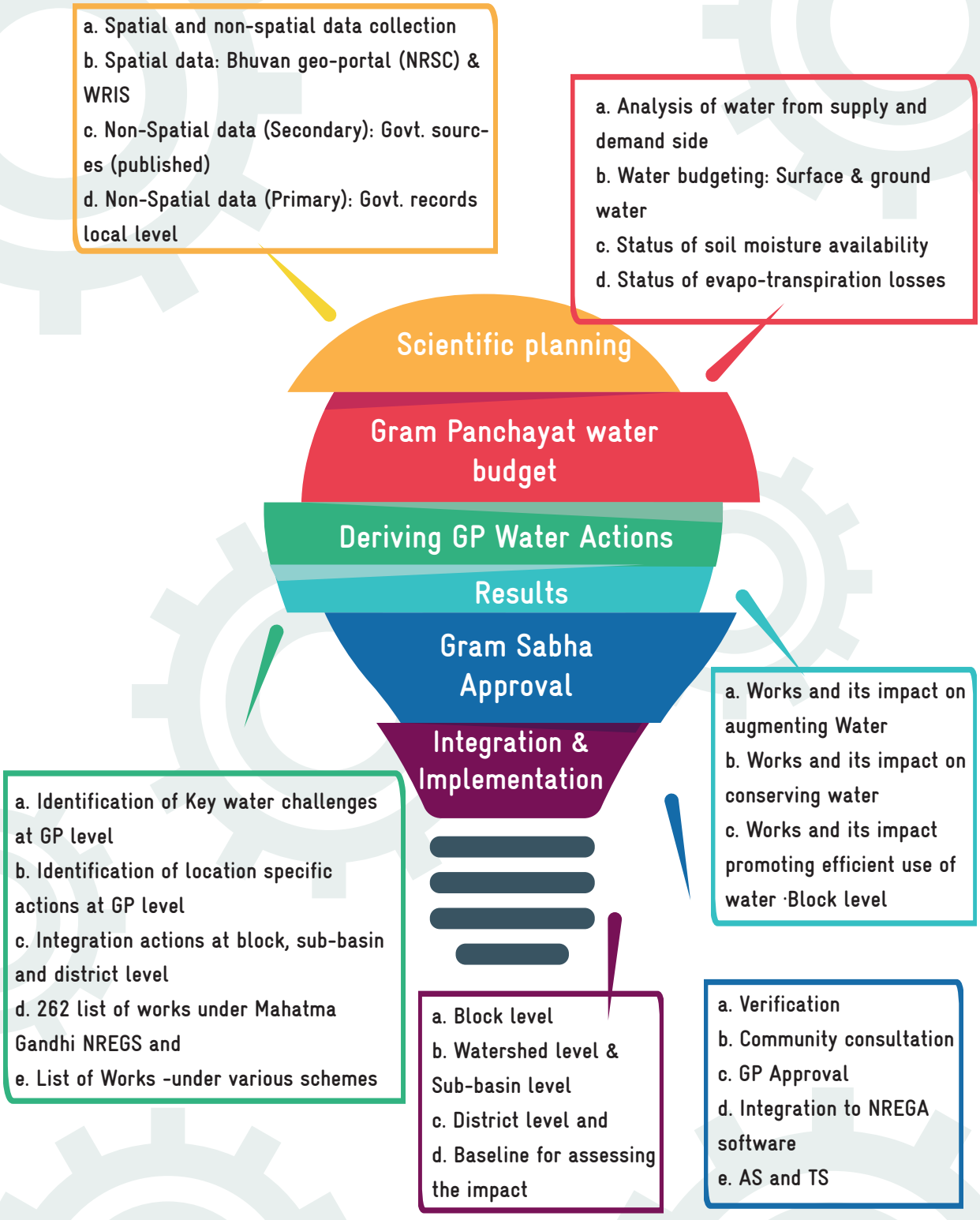


3.1 COMPOSITE WATER RESOURCE MANAGEMENT APPROACH FOR WASCA

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

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

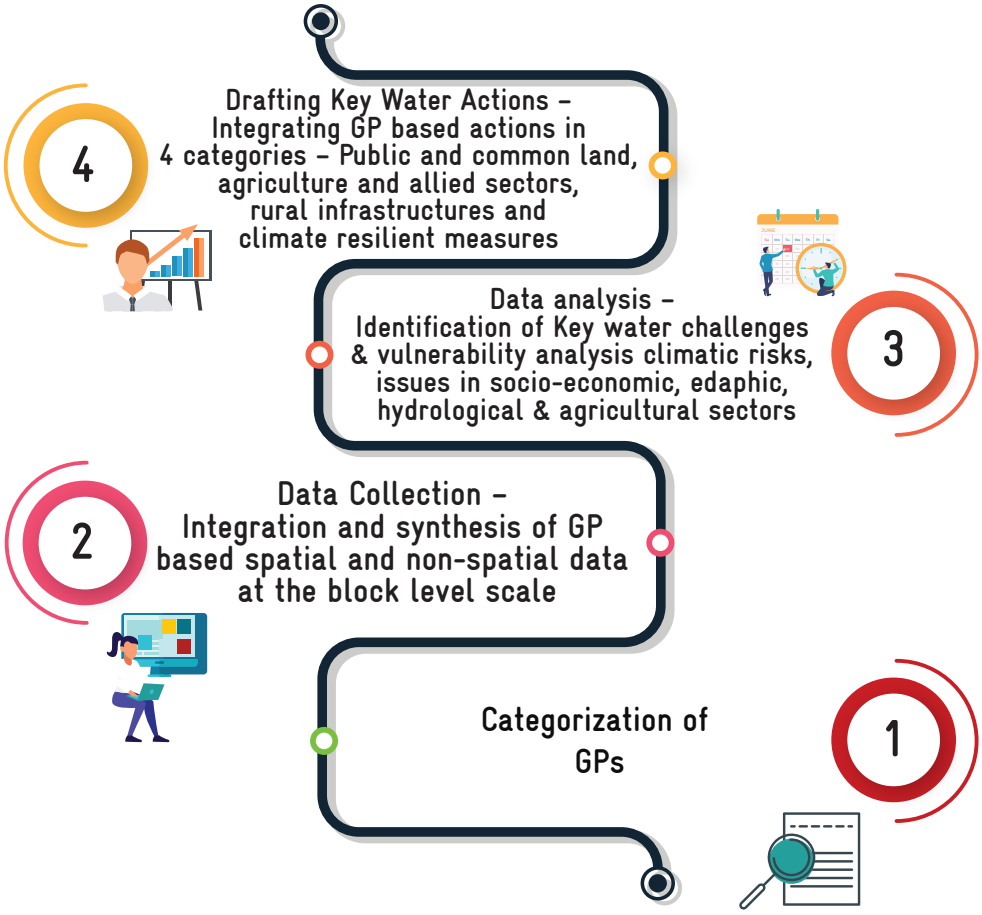
BOX 1. MAJOR COMPONENTS INVOLVE IN CWRM PLANNING WORKOUTS



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

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

STEPS INVOLVED IN BLOCK LEVEL ANALYSIS THROUGH CWRM APPROACH



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

BOX 2. MAIN STAGES OF CWRM PLANNING PROCESS

PRE-PLANNING STAGE

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

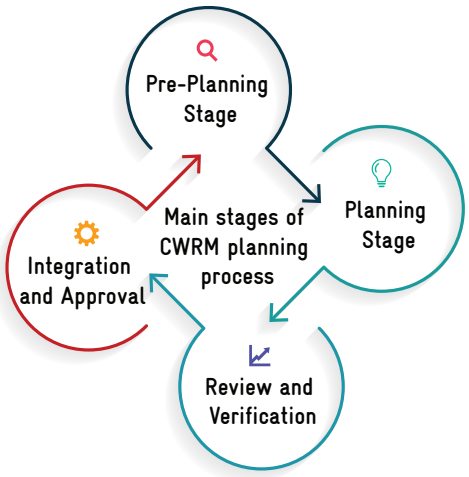
PLANNING STAGE

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

FOUR LEVELS OF CWRM PLANNING UNDER WASCA

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

2. INTEGRATING GP LEVEL PLANS AT BLOCK LEVEL



FOUR LEVELS OF CWRM PLANNING UNDER WASCA

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

4. INTEGRATING GP PLANS TO DEVELOP WASCA DISTRICTS CWRM PLANS

INTEGRATION AND APPROVAL

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

REVIEW AND VERIFICATION

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

3.2 CATEGORIZATION OF GPS

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

TABLE 4. CATEGORIZATION OF POLUR BLOCK GPS

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
27	GP and revenue village data and boundary match (Type-I)	Ananthapuram, Athuvambady, Enduvambady, Illupakunam, Kalasamudram, Kalkuppam, Kangiyanoor, Kattipoondy, Kunnanthur, Kuppam, Kuruvimalai, Murugapady, Mukkurambai, Naranamangalam, Palvathuvendran, Eluvambady, Padavedu, Periagaram, Potharai, Pudupalayam, Renderipattu, Sedavampattu, Sengunam, Thuvinjikuppam, Vasur, VIlankuppam, Vaziur
2	Having more than one GPs in one Revenue Village (Type-II)	Kasthambady, Krishnapuram
11	Newly formed GP after 2011 census publication (Type-III)	Edapirai, Erikuppam, Kalpattu, Kalvasal, Kelur, Mambattu, Sandhavasal, Tindivanam, Tirusoor, Venmani, Vellur,

3.3 DATA COLLECTION

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

SPATIAL DATA

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

NON SPATIAL DATA

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

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

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

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

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

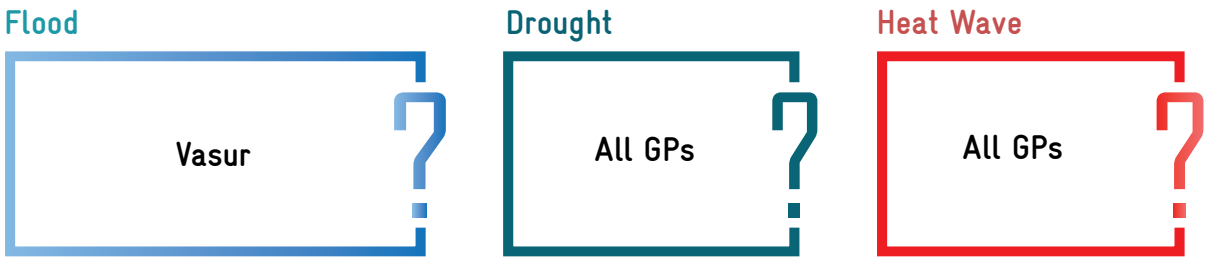
- Water budgeting at GP level to demonstrate the sector wise water demand and available water through the traditional water harvesting and storage bodies and the potential runoff that can be conserved through appropriate actions on the supply side. The difference between demand and supply at the GP level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

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

3.4 CWRM PLANNING ANALYSIS – CLIMATE

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

TABLE 5. CLIMATE RISKS AND VULNERABLE GP'S



3.5 CWRM PLANNING ANALYSIS – WATER

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

3.5.1 SPATIAL DATA

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

3.5.1.1 Geomorphology: Geomorphology deals with the scientific study of "landforms and landscapes, including their description, type, and genesis". Landform is the end product resulting from the interactions of the natural surface genesis and the type of rock. The scope of geomorphology was ha further expended with landform maps, which were widely used in various fields of hydrology, pedology, geoscience, urban and regional planning etc. Broadly, Polur Block is engrossed with structural, denudational, and fluvial origin landform units (Figure 3.1). Structural origin- Moderately Dissected Hills and Valleys witnessed in the western region of the Block. Sandavasal and Kelluru GP's of Polur Blocks witnessed the structural origin landforms, generally it is a mountain ridge system of long, narrow and high hills with steep to moderate slope and covered with dense to open scrub. Fluvial landforms are formed by influences of water flow, which can be found in the foot of the denudational landforms. GP Periyamali area is engrossed with fluvial landform while southern part of the Block witnessed dense and noticeable size traditional waterbody. Fundamental information of landform by its units will act as critical input in the identification of suitable sites for NRM activates under CWRM plan preparation.

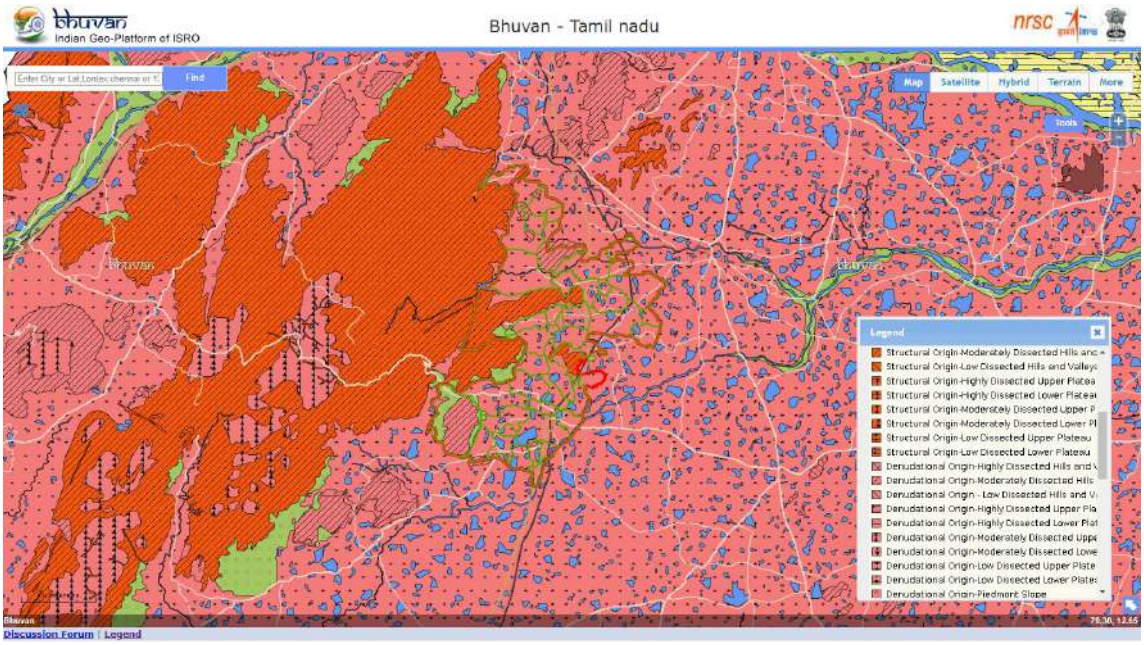


Figure 3.1. Geomorphology map

Landform unit	Area in %	Gram Panchayat
Denudational Origin-Pediment- Pediplain Complex		
	100%	All GPs (Except Polur GP)
Structural Origin - Moderately Dissected Hills		
	70%	Polur

3.5.1.2 Lineament: The lineament is also a lithological unit which reveals the hidden architecture of rock basement, representation of an underlying geological structure such as a fault, fracture (Figure 3.2). Lineament plays a significant role in identification of ground water and oil exploration sources. Lineament is represented with linear feature where two different landform converges or diverges. This site allows water to percolate at a high rate. Generally dense lineament found in the structural origin landform, same was observed in the Block area, while dispersed lineament between two landform zones. Geomorphic lineaments with parallel drainage was noticed in Kalputtu GP, Geomorphic lineaments, Drainage parallel in Ananthapuram, Padavedu, Vellur, Tindivanam, Mampattu, Edaipirai, Periyamalai R GPs, structural lineaments, joint/ fracture in Athimalaipattu GP, fault in Sandavasal RF , Valimalai RF and Polur GPs with dyke is noticed. These observations are widely used to locate points of high-water flow especially in groundwater exploration.

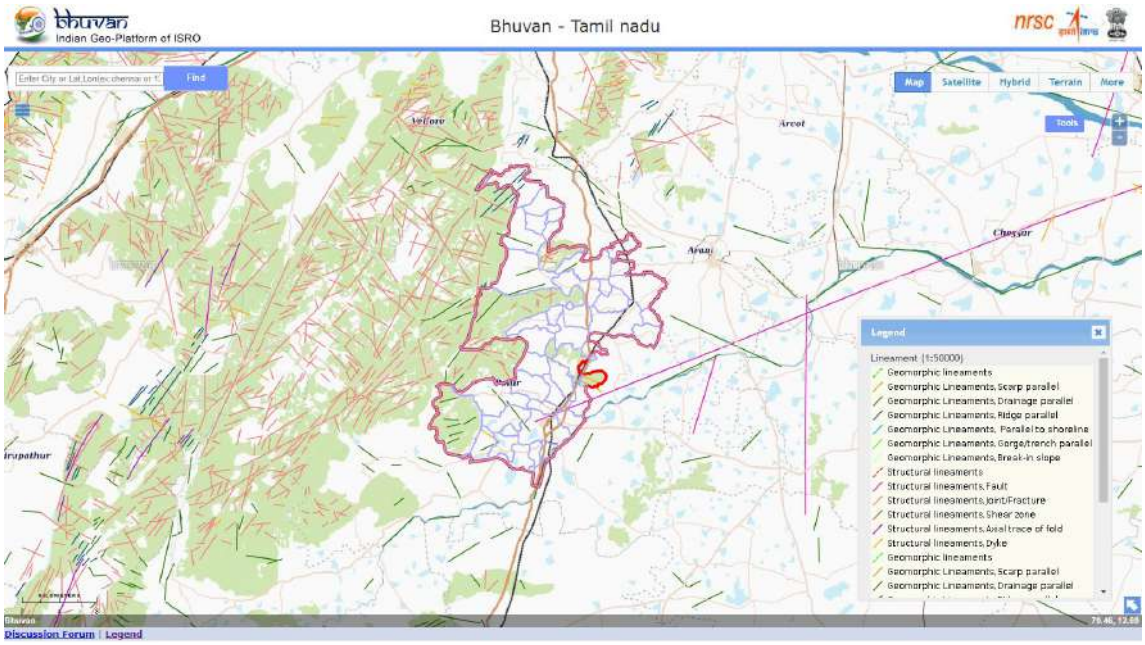


Figure 3.2. Lineament map

Lineament type	Gram Panchayat
Geomorphic lineaments, Ridge parallel	Kalpattu
Geomorphic lineaments, Drainage parallel	Ananthapuram, Padavedu, Vellur, Tindivanam, Mampattu, Edaipirai, Periyamalai RF
Structural lineaments, Fault	Sandavasal RF, Valimalai RF
Structural lineaments, Dyke	Polur, Edaipirai
Structural lineaments, Joint/ Fracture	Athimalaipattu

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

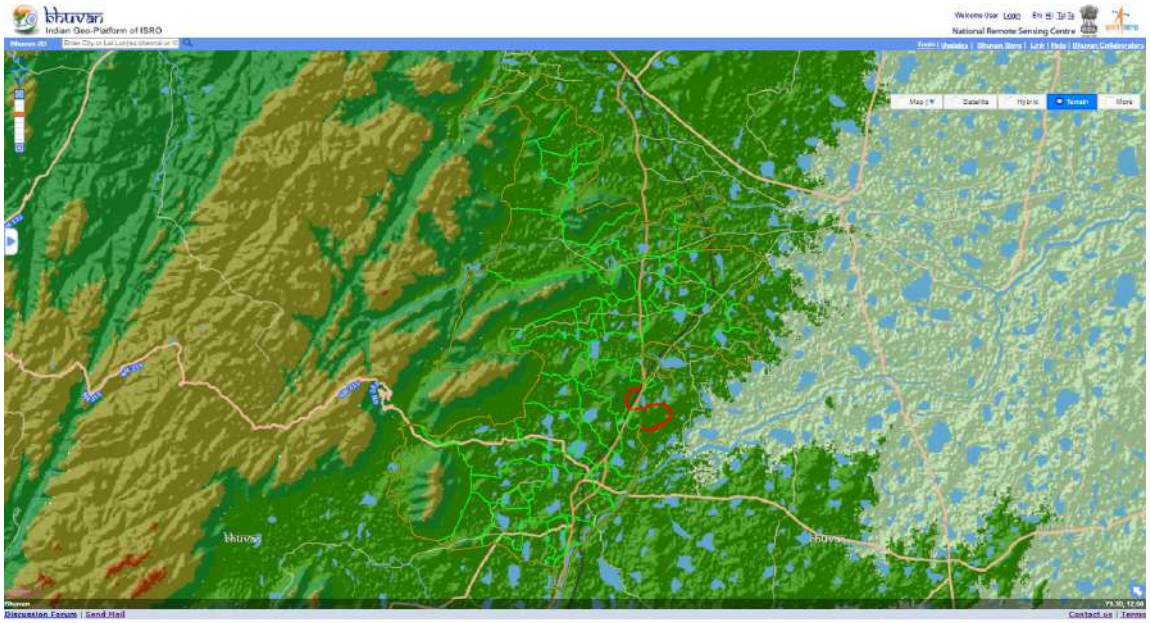


Figure 3.3. Terrain map

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

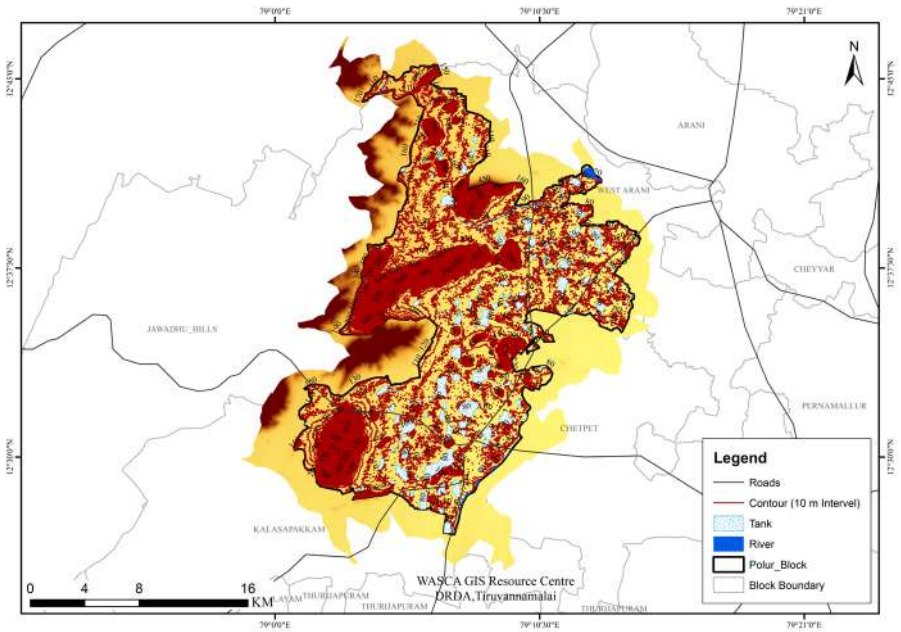


Figure 3.4. Contour map

3.5.1.5 Slope: The average slope of a terrain feature is calculated from contour lines on a topo 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). 90% of area in Sandavasal RF and Valimalai RF, 70 % of area in Periyamalai RF, and 40 % area witnessed the steep slope of range from 10 to 30 %. Whereas 80 % of area in Kalkuppam & Enduvambadi, 70 % of Murugapadi, 60% of Mampattu & Eluvambadi, 50% of Kuruvimalai and 40 % of Polur & Kalpattu witnessed the flat slope of range from 1 to 3 %. While 90 % of Sedarampattu, Mukkurambai, Narayanamangalam, Erikuppam, Pallavarthuvendran, Periyagaram, Venmani, Renderipattu, Tirusur, 80 % of Kunnathur & Kashtampadi, and 60 % of Vazhiyur, Padavedu GP witnessed the very flat slope of range between 0 to 1 %. Slope information plays a significant role in identification of soil eroded sites, depth profiles, also used in analyzing / proposing the soil conservation measures such as check dam, farm ponds etc.

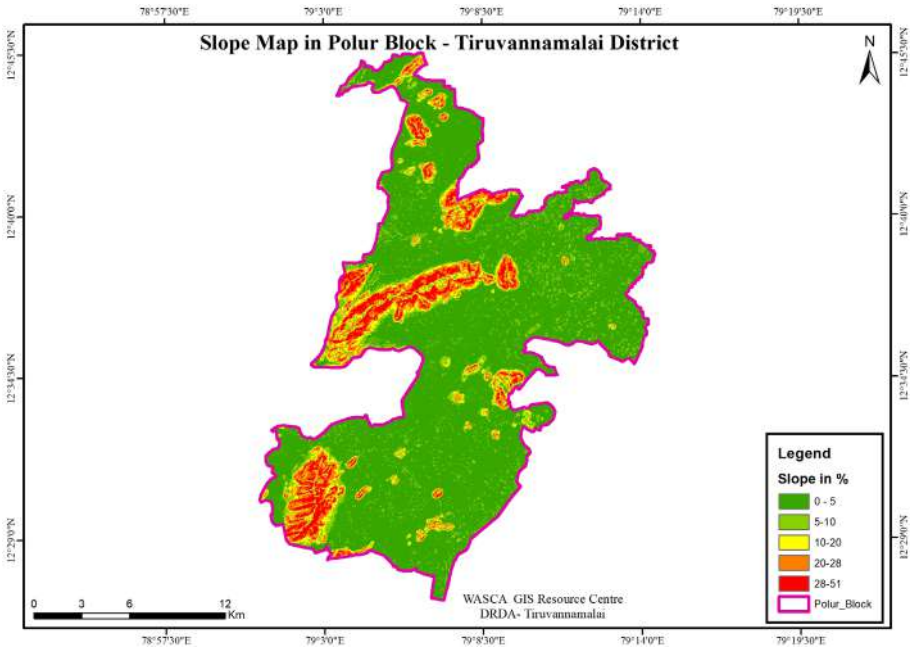


Figure 3.5. Slope map

Slope range	Area in %	Gram Panchayat
Very flat (0-1%)	85.8%	Sedarampattu, Mukkurambai, Narayanamangalam, Erikuppam, Pallavarthuvendran, Periyagaram, Venmani, Renderipattu,Tirusur - 90%, Kunnathur, Kashtampadi - 80%, Vazhiyur - 60%
Flat (1-3%)	65.7%	Padavedu, Mampattu, Eluvambadi - 60%, Kalkuppam, Enduvambadi - 80%, Murugapadi - 70%, Kuruvimalai - 50%
Steep (10-35%)	66%	Polur, Kalpattu - 40%, Periyamalai RF - 70%, Sandavasal RF, Valimalai RF - 90%

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 Polur Block (Figure 3.6). The dendritic pattern is characterized by irregular branching of tributary streams in all directions. Drainage network is referred to while identifying suitable sites for soil and water conservation measurements such as dams, ponds, bunding, restoration of gullied region etc.

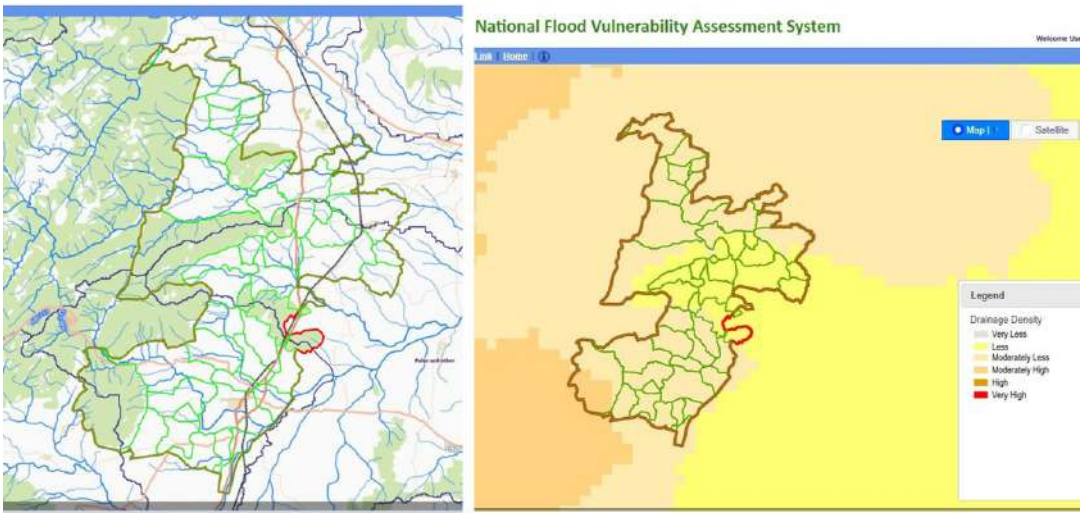


Figure 3.6. Drainage network and density

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. Polur Block watershed map is illustrated in figure 3. 7. Watershed is used for the interventions based on Ridge to Valley (R2V) concept and sequencing the plan accordingly. R2V approach intends to conserve each drop of rain water from ridge to a reasonable extent and it ensures the better surface water flow management also aids in strengthening the durability of land, soil and water conservation structures of the downstream.

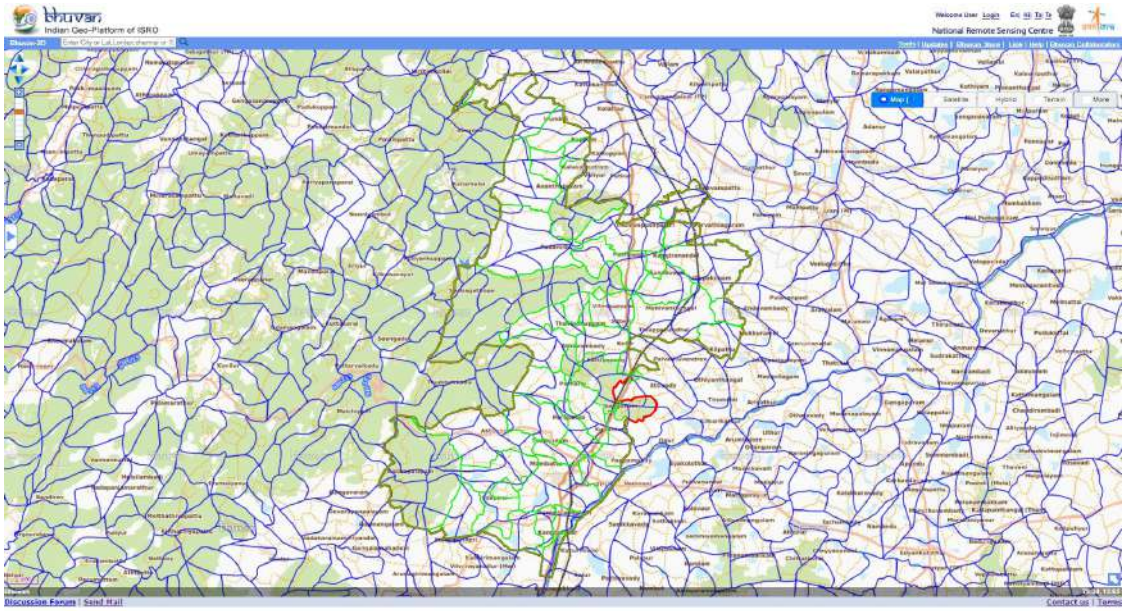


Figure 3.7. Watershed map of Polur Block

3.5.1.8 Ground water perspectives: The ground water perspectives map is the integration of lithology, geomorphology, geological structures, hydro geomorphic datasets, which provides the required information related to ground water exploration and the probable ground water prospects (Figure 3. 8). This map will help in identification of tentative locations for construction of recharge structures. All parts of Eluvambadi, Murugabadi, Renderipattu, Kuruvimalai, Murugapadi, Periyagaram, kelur, VIlankuppam, Illupakkunam, Enduvambadi, Krishnapuram , Mukkurambai, Erikuppam, Vellur, Vazhiyur , Kalasamuthiram, Kalkuppam, Kunnathur, Vasur, and 90% of the Venmani, and Padavedu, GP have > 80 m Deep Well- 50 to 100 LPM Yield. While part of Polur (80 %), Kattipondi (50 %), Pallavarthuvendran (50 %), Kalpattu (50 %), Ananthapuram (40 %), Murugamangalam (20 %), Mampattu (20 %), Tindivanam (20 %), Edaipirai (20 %), have > 80 m Deep Well- > 800 LPM Yield. At the same time 10% area of Mampattu, Tindivanam, Potharai, Athuvambadi, Sengunam, Padavedu GPs have no yield. These GP specific information is taken into account while identifying sites for planning recharge structures to address water scarcity in a more effective manner for the Block.

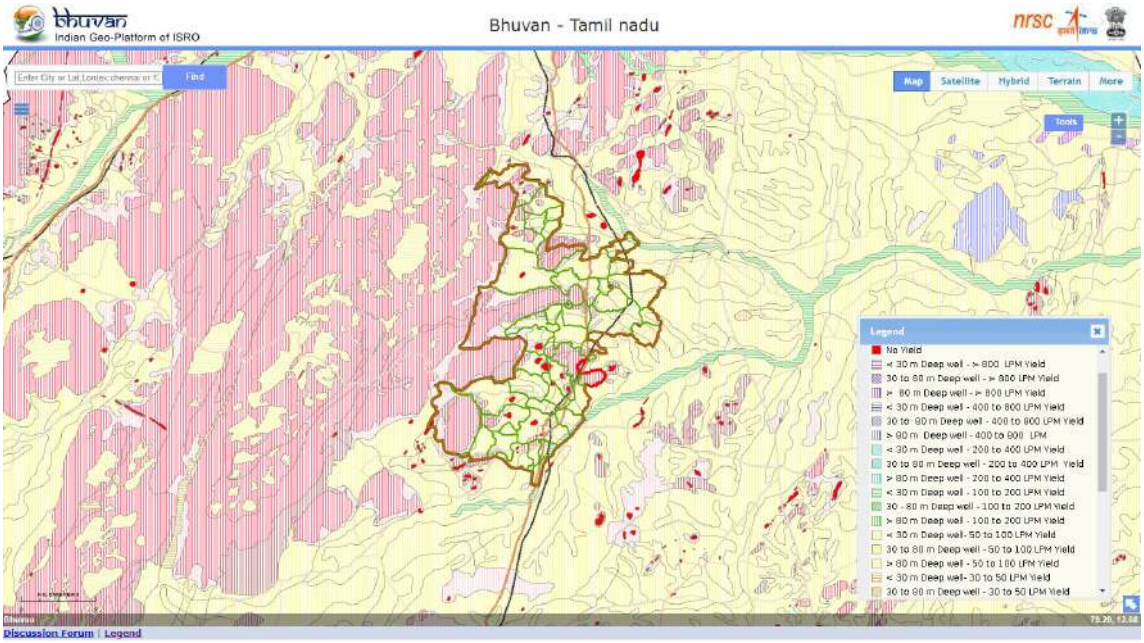


Figure 3.8. Ground water perspective map

Groundwater Prospects	Area in %	Gram Panchayat

› 80 m deep Well- 400 to 800 LPM yield

80%

Polur

› 80 m deep well - prospect limited to valley

33.7%

Kalpattu, Kattipondi, Pallavarthuvendran - 50%, Ananthapuram - 40%, Murugamangalam, Mampattu, Tindivanam, Edaipirai - 20%

› 80 m deep well- 50 to 100 LPM yield

99%

Eluvambadi, Murugabadi,Renderipattu,Kuruvimalai, Murugapadi, Periyagaram, Kelur, Vilankuppam, Illupakkunam, Enduvambadi, Krishnapuram , Mukkurambai, Erikuppam, Vellur, Vazhiyur , Kalasamuthiram, Kalkuppam, Kunnathur, Vasur - 100%, Venmani, Padavedu - 90%

No yield

10%

Mampattu, Tindivanam, Potharai, Athuvambadi, Sengunam, Padavedu - 10%

3.5.2 NON SPATIAL DATA

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

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

S No	Key CWRM Parameter	Total
	Canal Network (in m)	
1	Length of Main Canal	1,03,120
2	Length of Minor Canal	39,995
3	Length of Distributaries	29,341
4	Water Courses (Field Channels)	5,600
	Traditional Waterbodies (in no.)	
5	No. of Tanks (PWD & Union)	73
6	No. of Ooranis	89
7	Other Surface Waterbodies	0
	Area under Irrigation facilities (ha.)	
8	Area under Tank Irrigation	737
9	Area under Canal Irrigation	0
10	Area under Open & Tube Well Irrigation	9,629
	Water quality	
11	Chemical contaminants	-
12	Bacterial and other contaminants	-
	Catchment Area wise Available Runoff (in ha.m)	
13	Good Catchment Area	2,405
14	Average Catchment Area	522
15	Bad Catchment Area	3,400
	Watershed and Drainage Networks	
16	Length of Natural Drainage Lines (in m)	2,99,036
17	No. of Natural Drainage Lines	323
18	No. of Micro-watersheds	189
	Water Demand in ha.m	
19	Water demand for Humans (in ha.m)	370
20	Water demand for Livestock (in ha.m)	188
21	Water demand for Agriculture (in ha.m)	23,214
22	% GW utilization for Drinking	11
23	% GW utilization for Livestock	93
24	% GW utilization for Agriculture.	99
25	% SW utilization for Drinking	89
26	% SW utilization for Livestock	7
27	% SW utilization for Agriculture	1

3.5.2.1 Existing Water Structures

The Block has structured traditional water storage units as tanks, and ooranis which are the life line of local communities for their lives and livelihoods. The Block has 73 tanks and 89 ooranis (Figure 3.9).

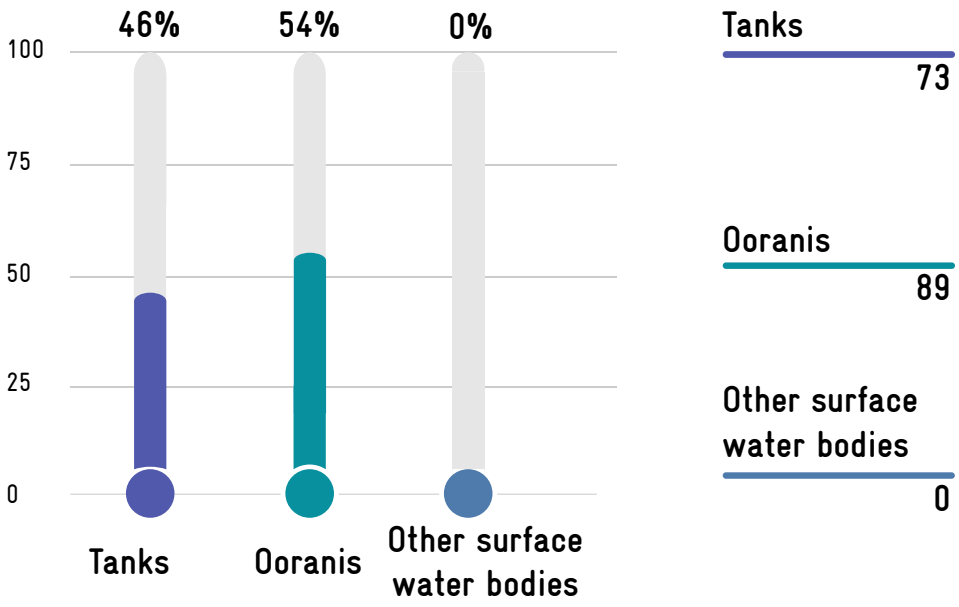


Figure 3.9. Traditional waterbodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the district is 10,366 ha, of which 93 % (9,629 ha) is irrigated through ground water stored in open/tube wells while remaining 7 % (737 ha) area are irrigated through tank Tanks (Figure 3.10).

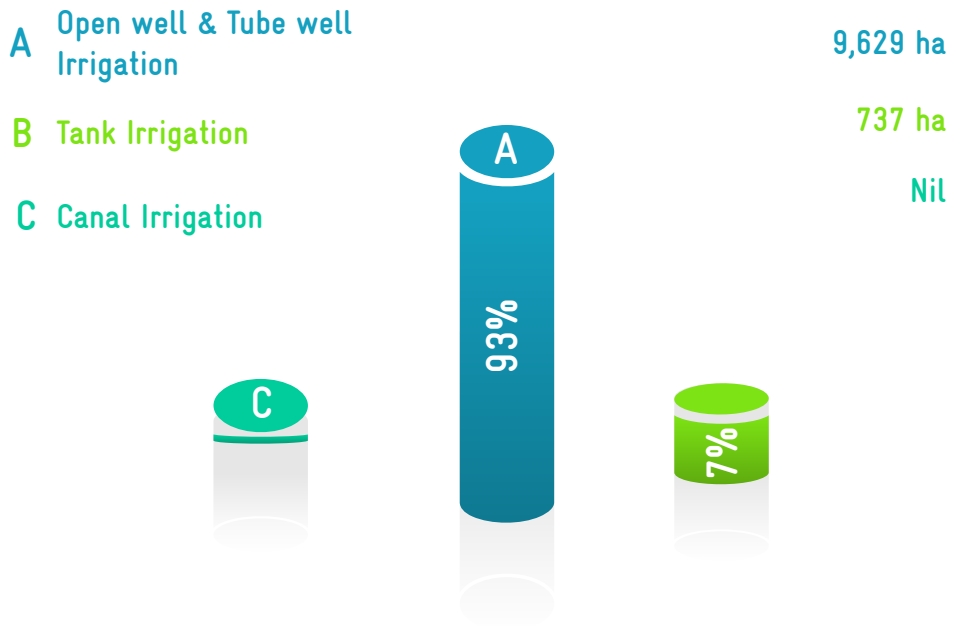


Figure 3.10. Irrigation source

3.5.2.3 Available Run off

The available runoff in catchment area is 6,327 ha.m and in that 38 % (2,405 ha.m) comes under good catchment area, 8.26 % (522 ha.m) comes under average catchment area and 53.74% (3,400 ha.m) comes under bad catchment area. As the area has more bad catchment area (twice that of good catchment area), the runoff generated is more. The amount of runoff generated in bad catchment area is 1.8 times higher than good catchment area and more than 40 times in average catchment areas (Figure 3.11).

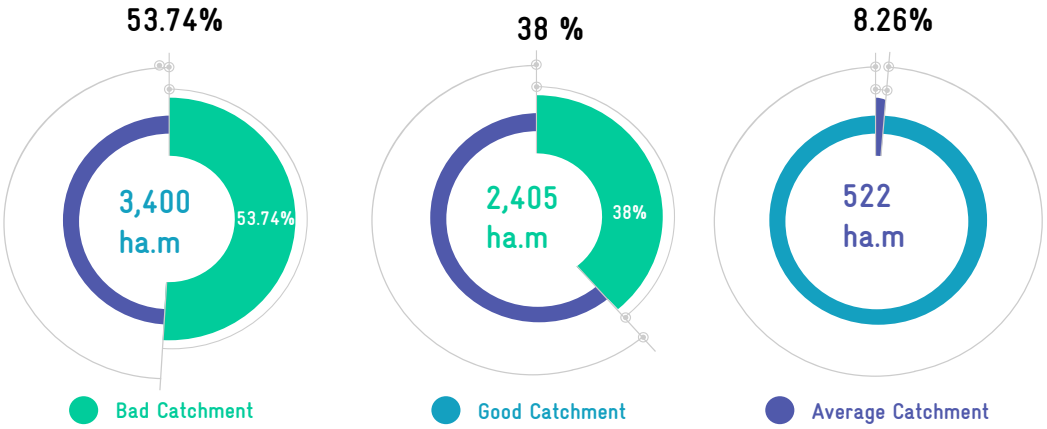
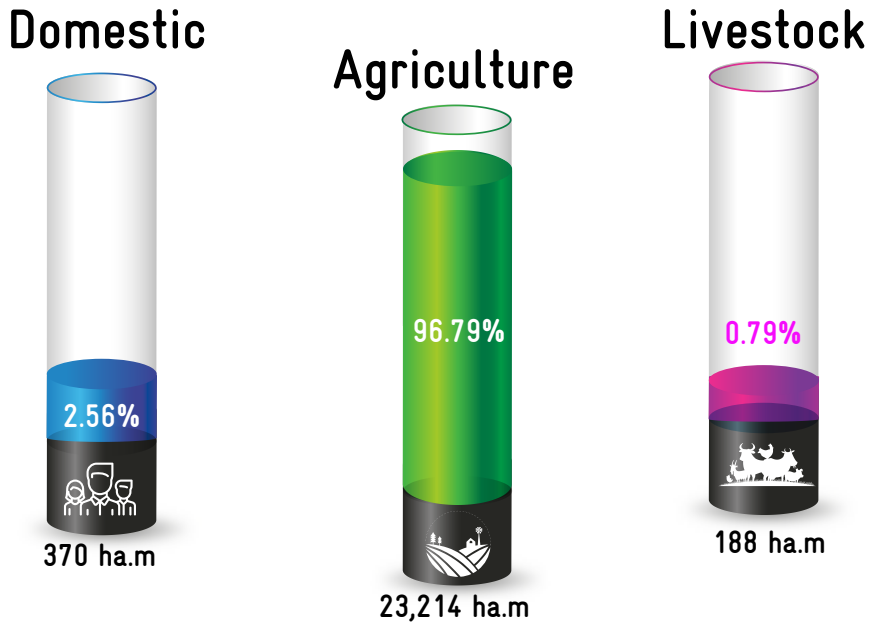


Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 23,772 ha.m in this 89% of the domestic purpose usage is met through surface water while the remaining 11% demand is met through ground water resources. 99% of the water resources utilized for agriculture and 93% of water resources utilized for livestock is met by ground water. More groundwater is used for agriculture and livestock purposes. (Figure 3.12).



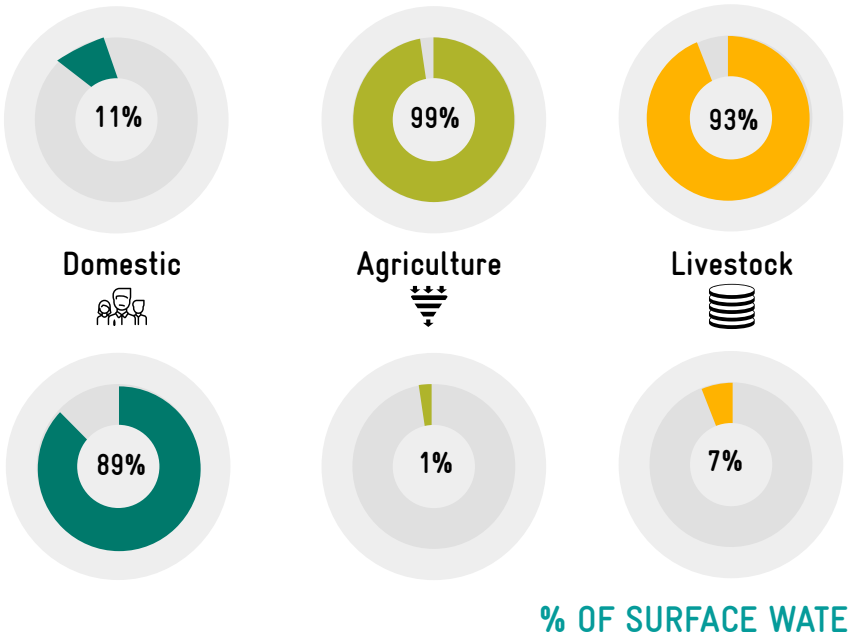


Figure 3.12. Sector wise water utilization

3.6 CWRM PLANNING ANALYSIS-AGRICULTURE

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

3.6.1 SPATIAL DATA

Bhuvan based spatial data to LULC, waste land, salt affected land, soil erosion and soil texture was referred to understand the Polur Block's problems in order to draft scientific key water actions.

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

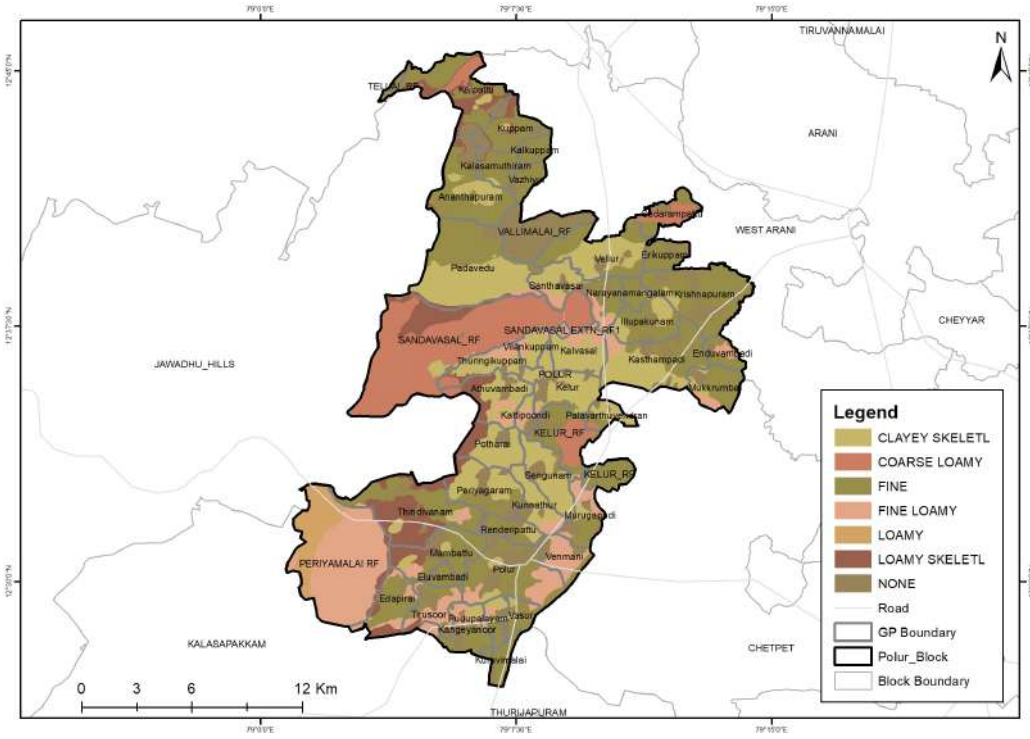


Figure 3.13. Distribution of soil types - textural classification

3.6.1.4 Soil erosion: Soil erosion is a natural process of displacement of upper layer of soil caused by dynamic erosion agents i.e ha, water, air, plants and humans. The complete area of GP Polur, 50 % Kattipondi, 30 % Athuvambadi, 20 % of Kangeyanoor, Mampattu Pudupalayam & Kashtampadi, 10 % area of Tindivanam, Kalpattu, Padavedu,Tirusur and Edapirai GPs witnessed erosion parcels. (Figure 3.14) The data on soil eroded units will give direct input in preparation of plans, to suggest soil conservation and watershed management activities.

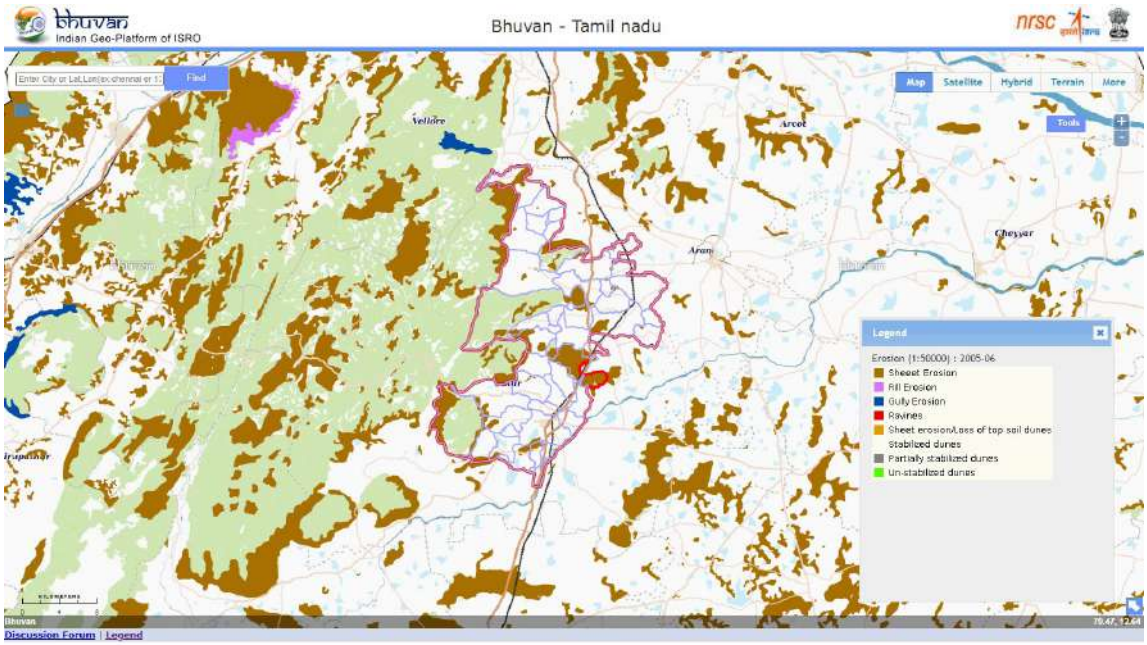
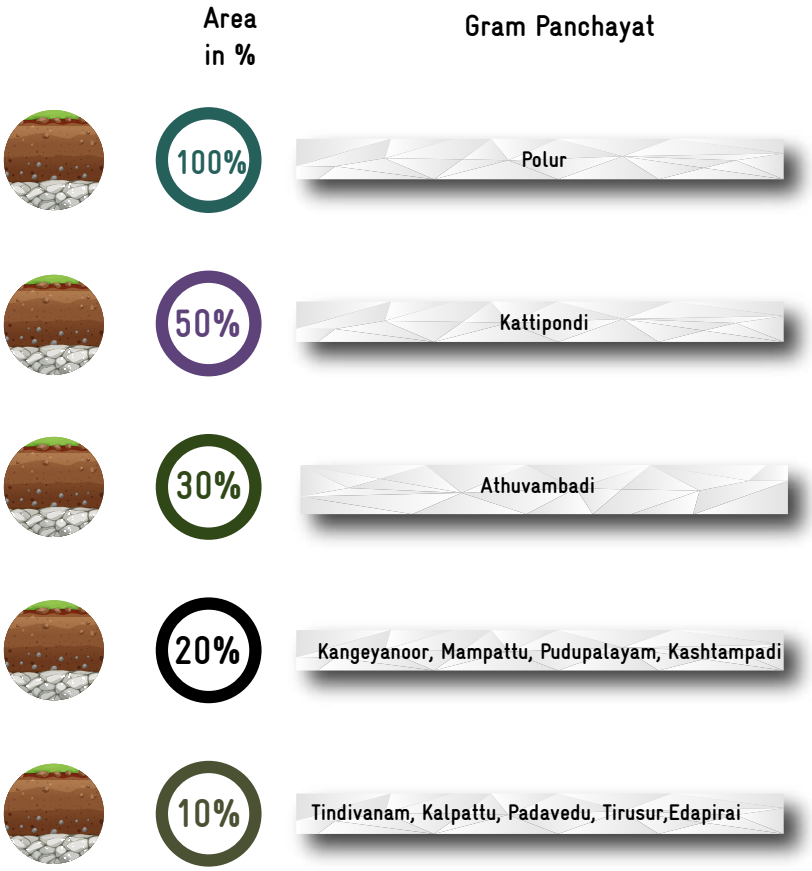


Figure 3.14. Soil erosion map



3.6.1.3 Land Use & 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. Polur Block is majorly covered by the agricultural crop and fallow lands classes of wasteland (Figure 3.15). The detailed LULC of Polur Block at GP level is listed below (Table 7). LULC map helps the decision makers and planners to focus on the fallow land development activities.

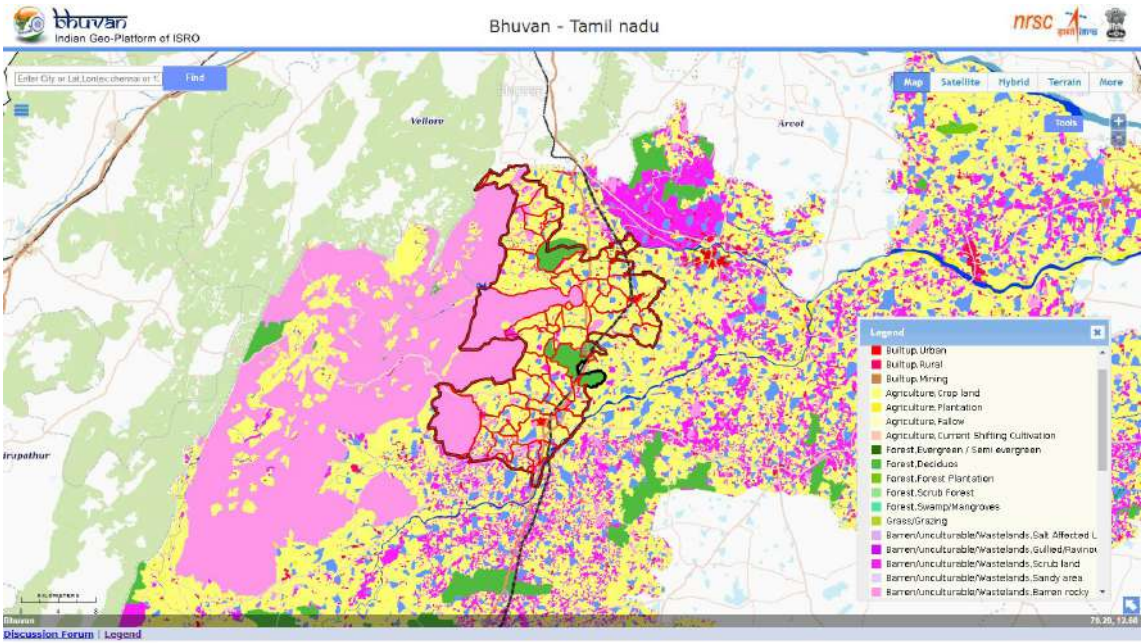
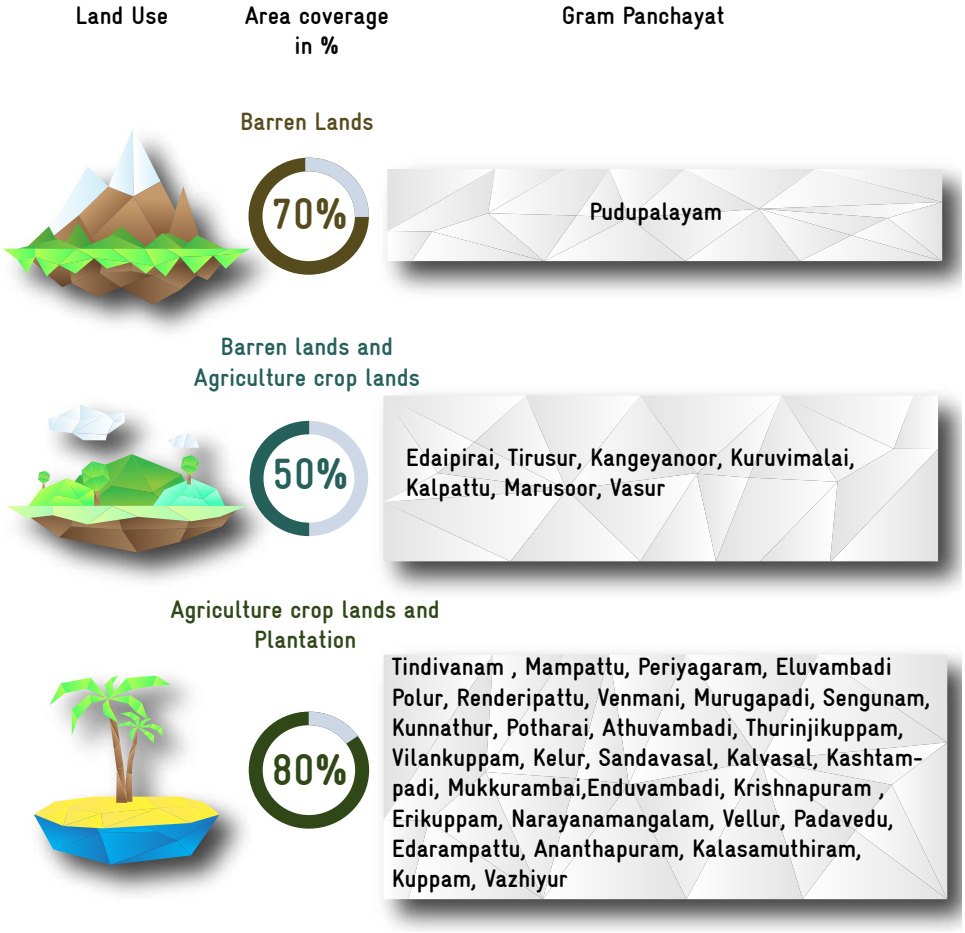


Figure 3.15. Land use land cover map



3.6.1.4 Waste land: A Parcel of land that is not suitable for any agriculture activity and mostly covered with dense or open scrub is called as wasteland. The extent of Wasteland will act as a direct input for preparation of plans for land development activities or greenery. Minute patches of wasteland parcels with degraded forest and scrub land were noticed in the Polur Block (Figure 3.16). Approximately 80 % of Kattipondi and 70% of Polur GP area is covered with degraded forest while 40% of Kalapattu and 30% of Ananthpuram area is covered with scrub land. During planning for the GPs, plantation measures have been taken up in the identified portions to convert the wasteland into productive land.

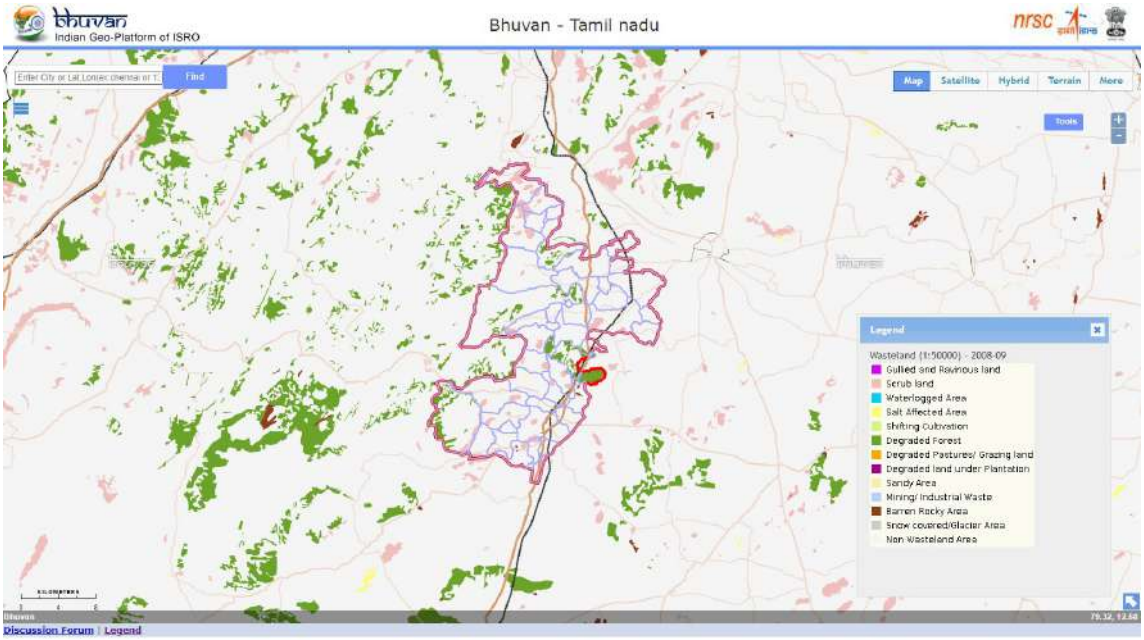
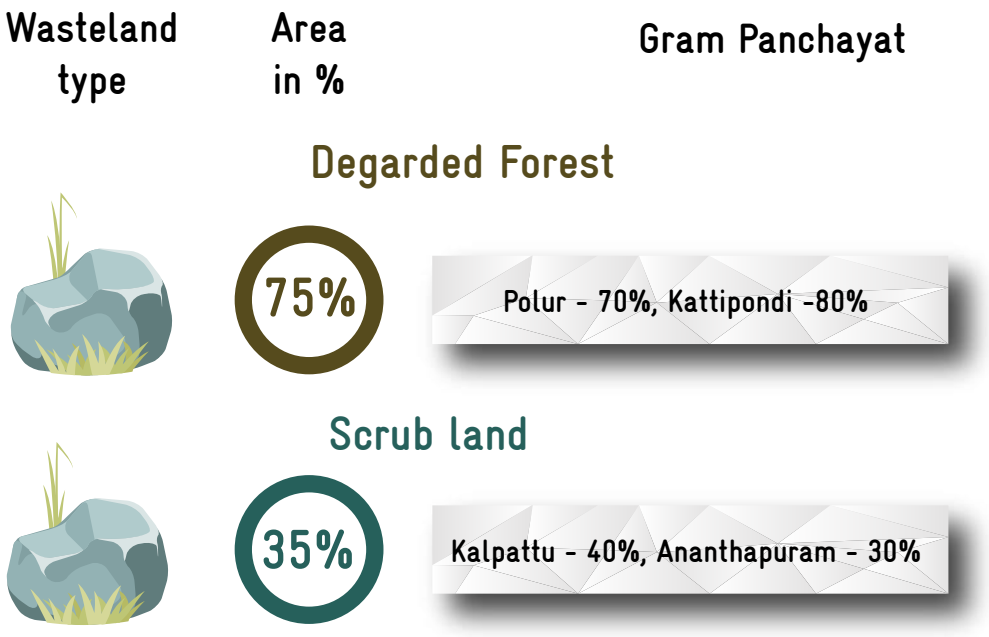


Figure 3.16. Wasteland map



3.6.1.5 Salt affected area: North-East part of Kalasapakkam and Solankuppam GPs witnessed saline parcels in the Polur Block (Figure 3.17). These parcels will act as a direct input while planning process to propose soil conservation measures, mainly activities to reduce salinization and suggestions for alternative cropping.

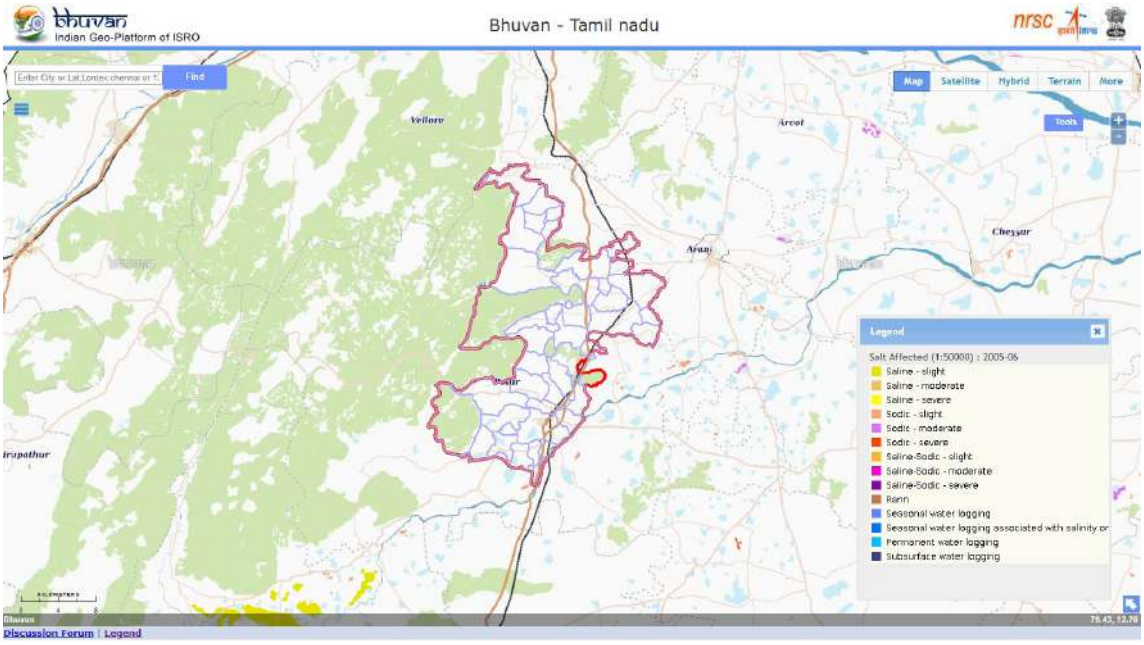


Figure 3.17. Salt affected area

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 live-stock data were collected from govt. sources Table 8. The key CWRM parameters of agriculture area for all GPs are tabulated in Annexure 3.7.

TABLE 8. CWRM PARAMETER BASED AGRICULTURE RESOURCES STATUS IN THE BLOCK

S No	Key CWRM Parameter	Total
	Area under land resources (in ha.)	
1	Forest land	0
2	Non-Agricultural uses	5,258
3	Barren & uncultivable land	1,154
4	Permanent pastures and other grazing land	77
5	Land under miscellaneous tree crops etc.	44
6	Cultivable wasteland	1,738
7	Fallows land other than current fallows	1,027
8	Current fallow land	4,280
9	Unirrigated land	2,226
10	Area Irrigated by source	10,647
	Catchment area (in ha.)	
11	Good catchment	6,413
12	Average catchment	1,859
13	Bad catchment	18,180
	Crop details	
14	Irrigated area (ha.)	14,956
15	Rainfed area (ha.)	780
16	Area under Paddy cultivation (ha.)	10,649
17	Crop water requirement - irrigated condition (ha. m)	22,913
18	Crop water requirement - Rainfed condition (ha. m)	301
	Soil Resources: status of available Nitrogen (%)	
19	Very low	31
20	Low	62
21	Medium	7
22	High	0
23	Very high	0
	Status of Organic Carbon (%)	
24	Very low	41
25	Low	48
26	Medium	10
27	High	1
28	Very high	0
	Status of Soil micro-nutrients (%)	
29	Sufficient	48
30	Deficient	52

	Status of physical condition of the soil (%)	
31	Acidic sulphate	0
32	Strongly acidic	0
33	Highly acidic	0
34	Moderately acidic	1
35	Slightly acidic	5
36	Neutral	5
37	Moderately alkaline	89
38	Strongly alkaline	0
	Soil Texture (%)	
39	Clay Soil	26
40	Fine Soil	55
41	Coarse loamy	3
42	Soil water permeability (low, moderate, high)	Moderate
	Soil moisture and ET	
43	Volumetric Soil moisture (%)	23
44	Estimated Soil moisture (ha.m)	5,247
45	ET losses (ha.m)	10,643
	Means of water extraction (%)	
46	Gravity	5
47	Lifting	95
	Irrigation methods (%)	
48	Wild flooding	7
49	Control flooding	93
	Livestock (No.)	
50	Cattle population	47,488
51	Sheep population	6,479
52	Goat population	14,069
53	Poultry	0

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 distributions across the geographical boundary of the Block are necessary to take the decisions. Of the total land area of 25,818 ha, about 30.2 % of the land is under non-agricultural uses, 28.5% of the land is area under current fallow land and 20.78% of the land is irrigated by source irrigation. About 10.16 % is un-irrigated land, 4.2 % is under fallow lands other than current fallow lands. Barren and uncultivable land accounts 0.31% of the total area, the Block has 1.19% area under permanent pastures. (Figure 3.18). Of the total land area 25,818 ha, nearly 35% are under public and common land and 65% are under individual ownership. (Figure 3.18)

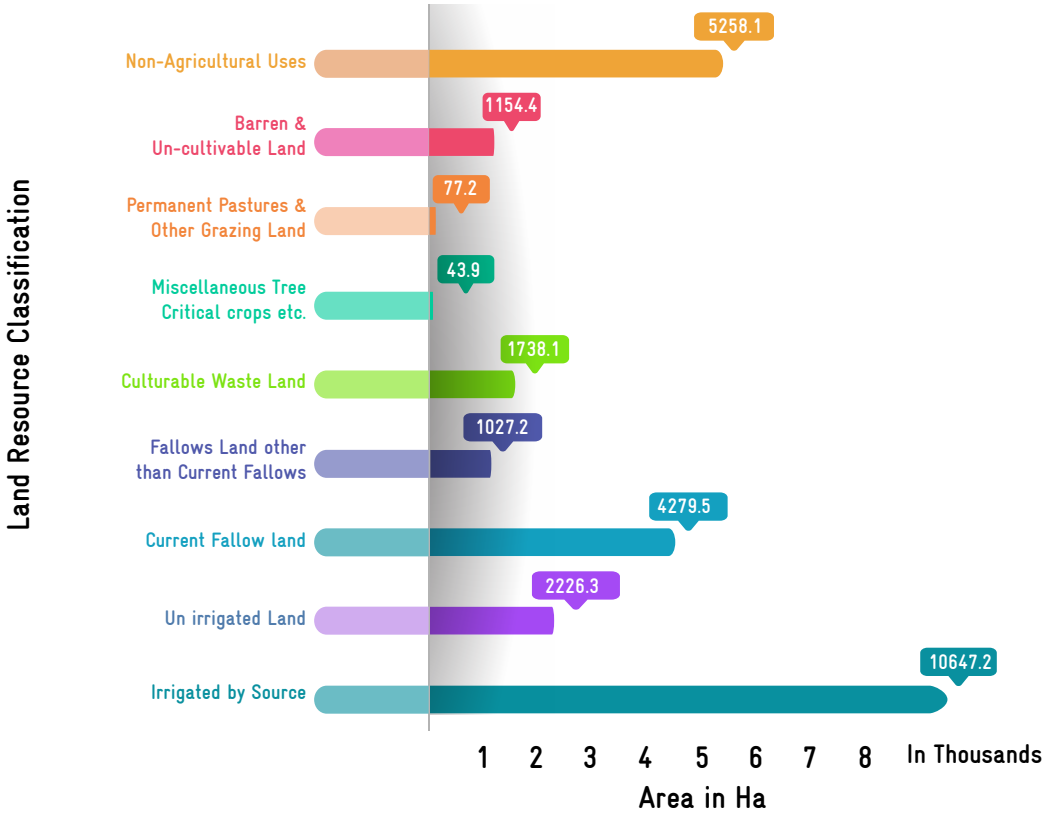


Figure 3.18. Land utilization

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 26,451 ha, of the Block, about 24.24 % is good catchment area, 68.73 % is bad catchment area and only 7 % is under average catchment area. This analysis helps to focus on prioritizing the works in the land use systems under the good and bad catchment areas (Fig 3.19).

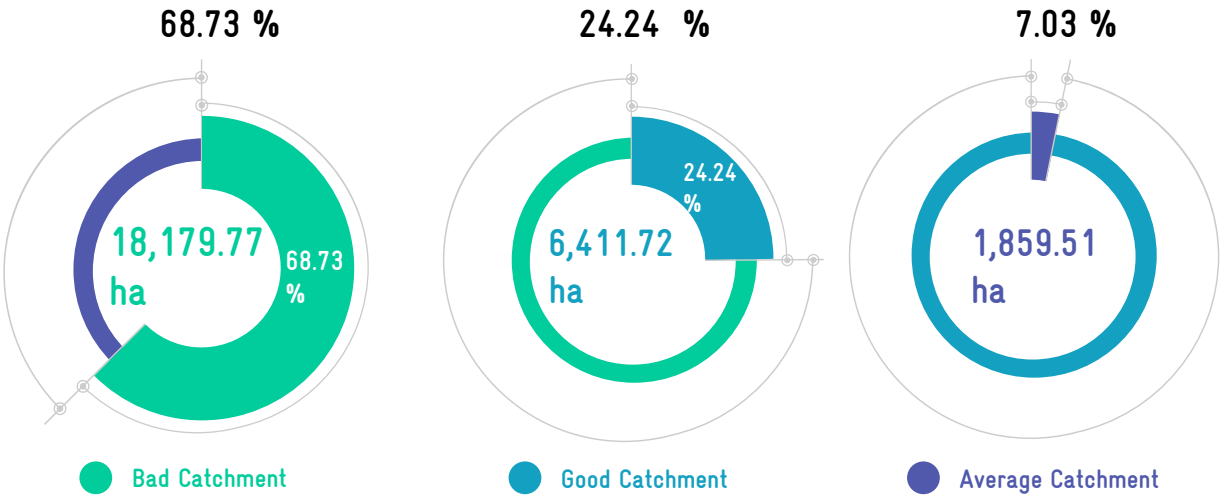


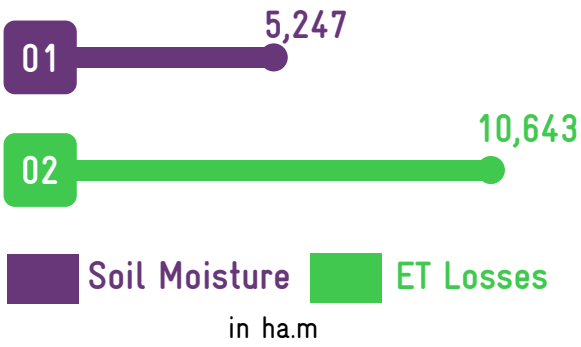
Figure 3.19. Catchment Area

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 5,247 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 804 mm with monthly average of 67.08 mm. The average percentage of water loss through ET in the Block is 23% and the total annual losses due to ET alone is 10,643 ha.m.



3.6.2.5 Macro nutrients

The macro soil nutrients such as nitrogen and organic carbon falls under very low to low category in the total number of soil samples tested. The available nitrogen is very low in 31 % of the samples tested while it was 62 % under low category (Figure 3.20). According to soil resource map, this Block is identified as one of the nitrogen deficient Block (Tiruvannamalai district profile 2020).

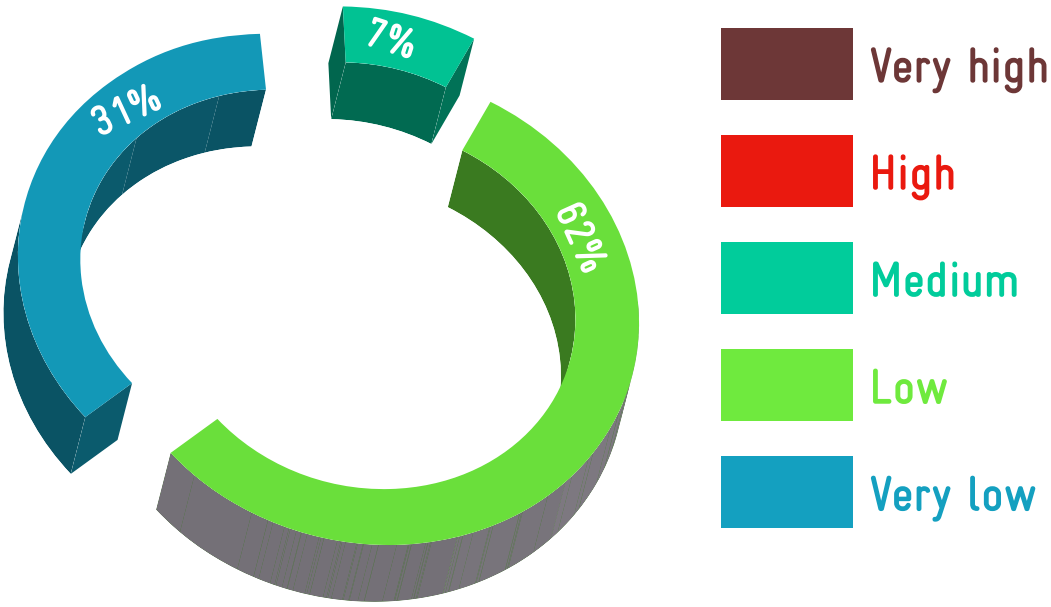


Figure 3.20. Status of available Nitrogen

Similar trend was recorded for soil organic carbon. Soil organic carbon is also very low in this Block. Nearly 41 % of the soil samples tested are under very low category and 48 % under low category (Figure 3.21). This indicates that the soil fertility is very poor and further intensive practices will make the soil more vulnerable to degradation over a period of time.

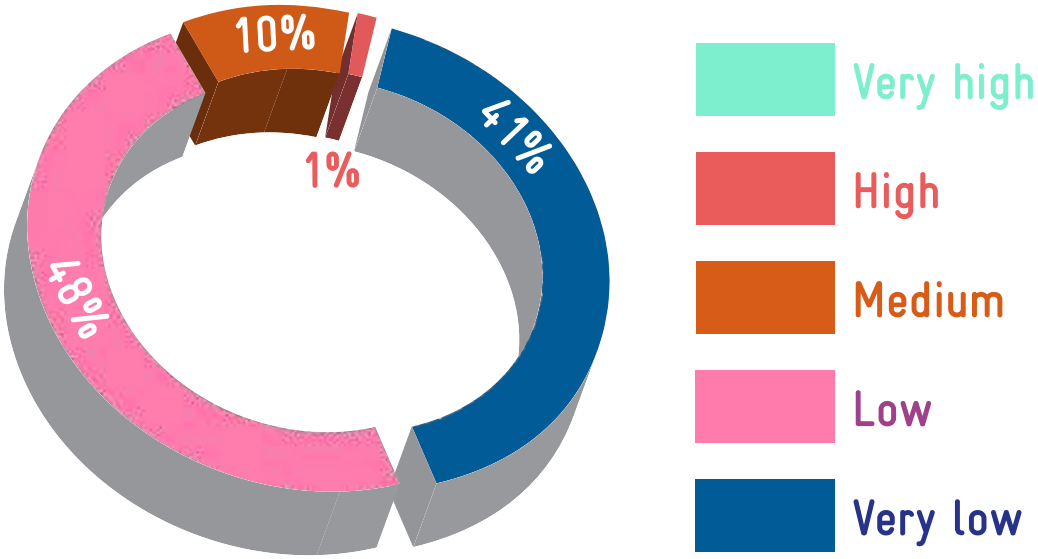


Figure 3.21. Status of soil Organic Carbon

3.6.2.6 Status of the soil micro nutrients

This Block is one of the zinc and ferrous deficient Block of Tiruvannamalai district. The micro nutrient status of the soil with specific reference to Manganese, Boron and Zinc, Ferrous, Copper, and Sulphate are deficient in 52 % and 48 % sufficient of the soils tested. (Figure 3.22)

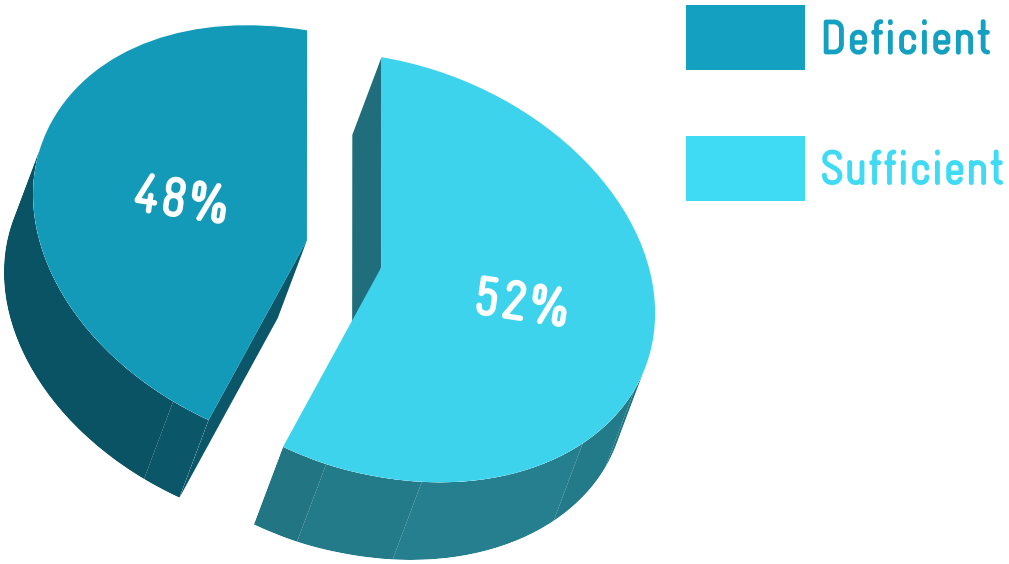


Figure 3.22. Status of soil micro-nutrients

3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 89 % of the soil is moderately alkaline in nature, 5% is slightly acidic, 1% is moderately acidic, and 5 % is neutral in nature as shown in Figure 3.23.

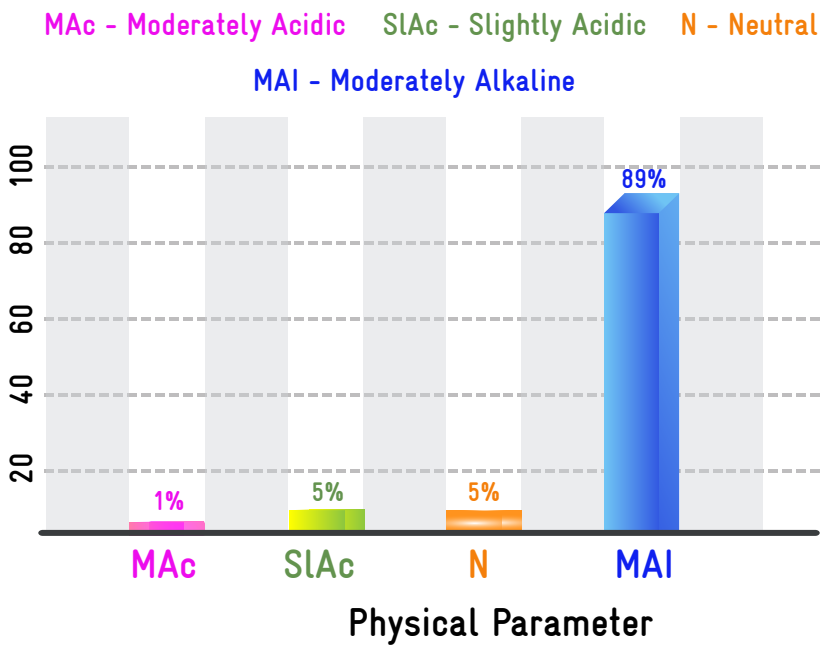


Figure 3.23. Status of pH of soil

3.6.2.8 Cropping pattern and the irrigation

Of the total area under cultivation, 56 % is under irrigation and the remaining 3 % is under rainfed cultivation. Among the crops cultivated under irrigation, paddy is predominantly cultivated and accounts to about 56.7 % (Figure 3.24) followed by ground nut (16.4 %) while it is the rain-fed predominate crop with 73% rain-fed area. Also horticulture crops such as sugarcane (8.94 %), banana (7.2 %), pulses (5.76 %), ragi (1.87 %) and turmeric (1%) is cultivated in the irrigated area.

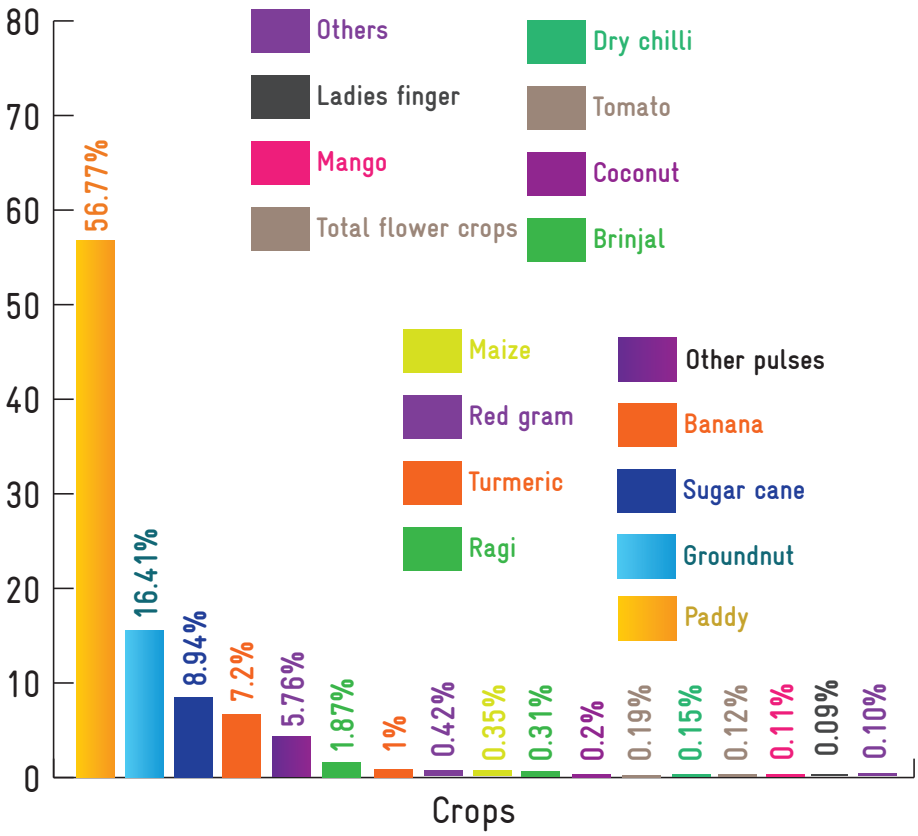


Figure 3.24. Cropping patterns

3.6.2.9 Irrigation Methods

In case of the surface water resources, wild flooding is the primary method of irrigation. But in case of ground water resources, the predominant type of irrigation is controlled flooding. In the Block, 93 % of the irrigation is done by control flooding and only 7% of the irrigation is done by wild flooding (Figure 3.25).

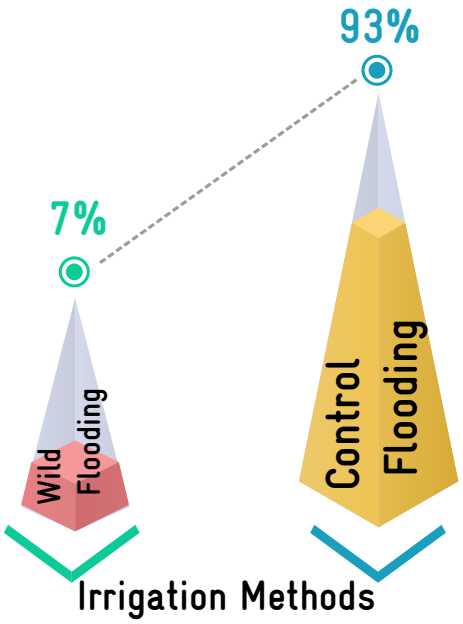


Figure 3.25. Irrigation methods

3.6.2.10 Means of Water Extraction

Water is extracted in two ways, one by gravity and another is by lifting. The 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 district, since the dependence on ground water sources is more, 95% of the water extraction methods are under lifting means of extraction and only 5 % comes under gravity means of water extraction (Fig 3.26).

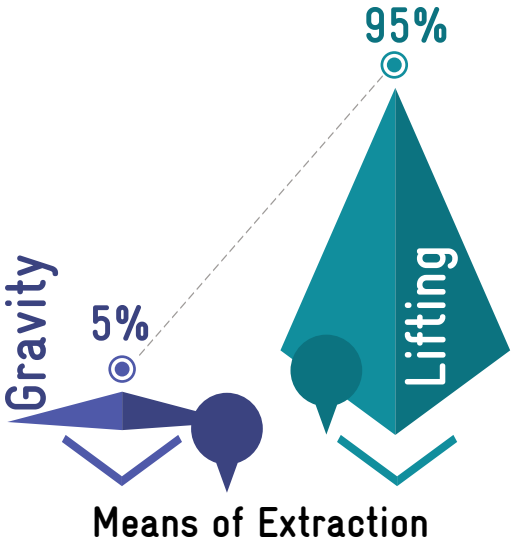


Figure 3.26. Means of water extraction

3.6.2.11 Livestock Details

This Block has considerable proportion of livestock resources of which small ruminants such as sheep and goat constitute 9 % and 20.68 % of the total livestock. While cattle population is higher in this Block (69.80 %) (Figure 3.27) The total water requirement for livestock is 188 ha.m. Of the total water demand of 188 ha.m, 93 % is met through ground water and remaining 7 % is from surface water resources.

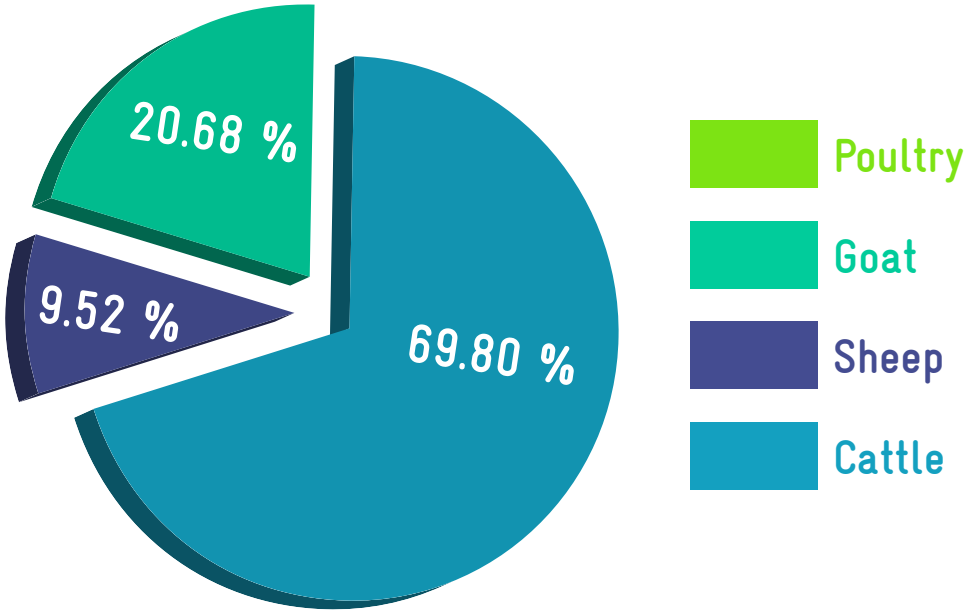


Figure 3.27. Livestock details

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 analysis. Table 9 lists the demographic and socio economic status of Polur Block. GP wise demographic and socio economic status are attached in Annexure 3.8.

TABLE 9. CWRM PARAMETER BASED SOCIO-ECONOMIC STATUS IN THE BLOCK

S No	Key CWRM Parameter	Total
1	Geographical area (ha.)	27,563
2	Male population	67,609
3	Female population	67,736
4	Total population	1,35,345
5	SC population	27,332
6	ST population	476
7	Vulnerable population	27,808
8	Households	30,304
9	Only one room HH's	3,924
10	Female Headed HH's	1,855
11	Vulnerable HH's	3,307
12	Registered MGNREGA job cards (persons)	48,839
13	Active person working in MGNREGA job Cards (persons)	33,171

14	Drinking water sources	12,855
15	Ground water - Drinking source	198
16	Surface water - Drinking source	37
17	Sum of drinking water sources	235
18	HH's have tap water connection for drinking water	10,801
19	HH's dependent on other sources for drinking water	6,893
20	Annual greywater generation (ha. m)	243

3.7.1 Population

The total population of this Block is 1.35 Lakhs, of which the women proportion is slightly higher than men. In the CWRM planning process due attention is given for the intersecting variables such as gender, class, caste and marital status and availability of safe drinking water resources. In the Block, about 20.2 % of the total population are under vulnerable population (Figure 3.28).

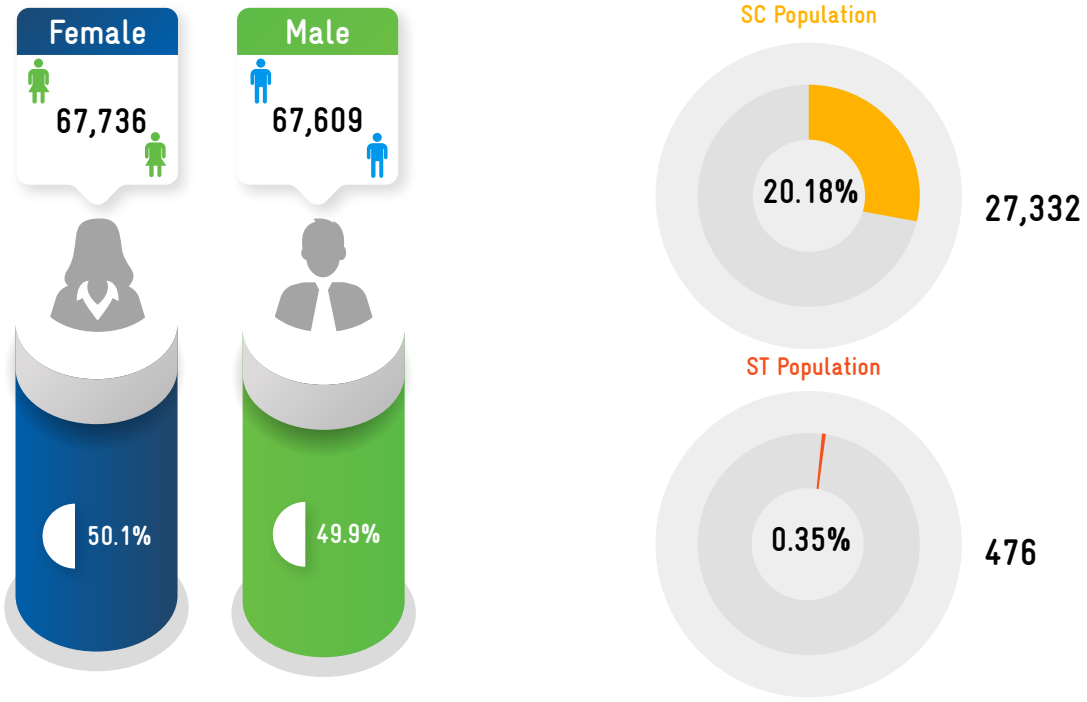


Figure 3.28. Population details

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

3.7.2 Details of Households

There are total 30,304 households in which 13 % households have only one room, 6.1 % households are headed by women and 11 % are vulnerable households (Figure.3.29)

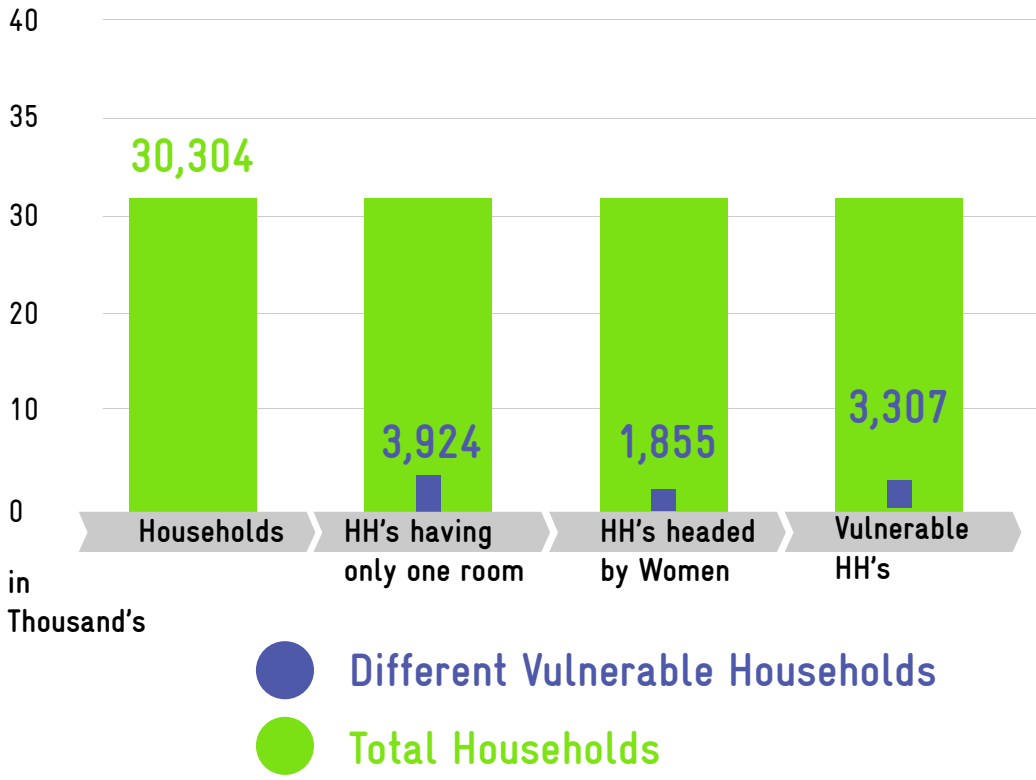


Figure 3.29. Details of households

3.7.3 Status of Mahatma Gandhi NREGA job card status

In the Block of the total population of 1.35 Lakhs, 48,839 are registered for job cards in Mahatma Gandhi NREGA scheme in which 70 % (67.9) of the job cards are in active category (Figure 3.30)

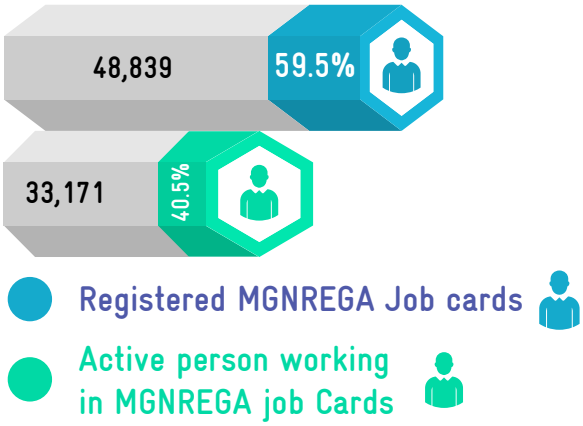


Figure 3.30. Status of MGNREGA job cards

3.7.4 Drinking Water Sources

Nearly 10,809 households have tap water connection and 6,093 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

10,809
Households

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

6,093
Households

3.7.5 Annual Greywater Generation

The grey water generation estimated across this Block is 243 ha.m which is available for reuse or recycle.

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

Morphology

Sandavasal, Kelluru, Kalputtu Ananthapuram

Ground water prosperity

Mampattu, Tindivanam, Potharai, Athuvambadi, Sengunam, Padavedu

Soil erosion

Polur, Kattipondi, Athu-vambadi & Kangeyanoor

Wasteland

Kattipondi, Polur, Kalapat-tu, & Ananthpuram

Salt affected area

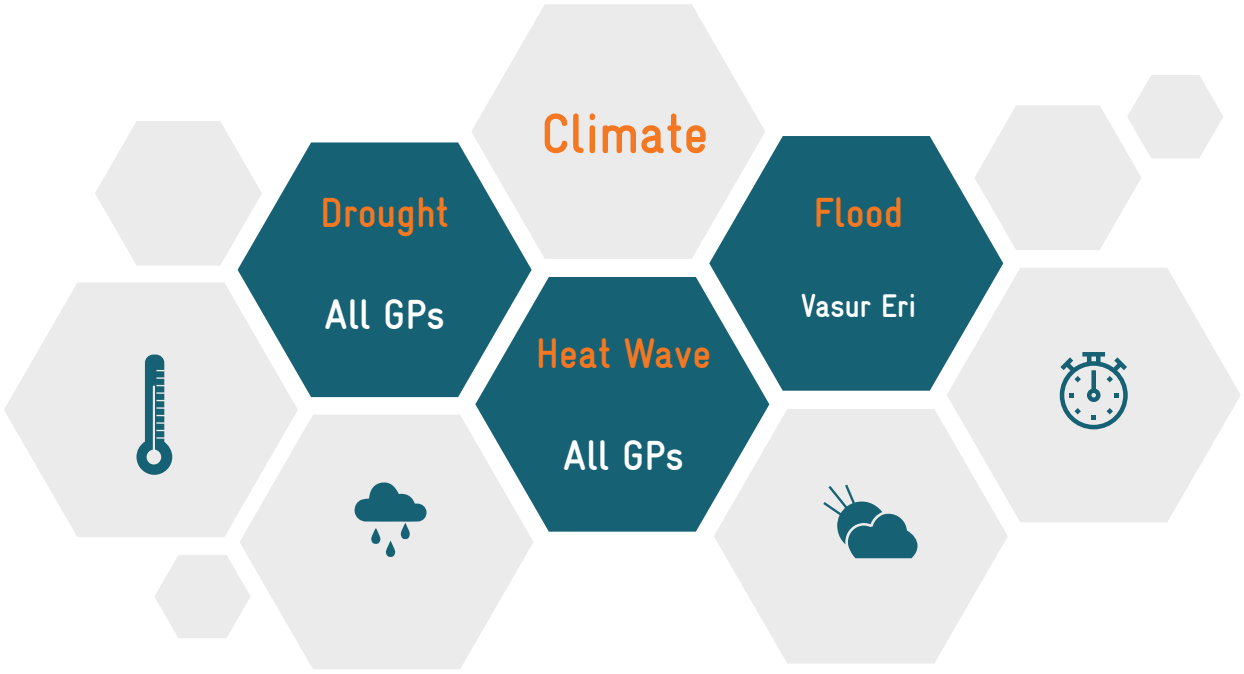
Kalasapakkam and solankuppam

Drainage network

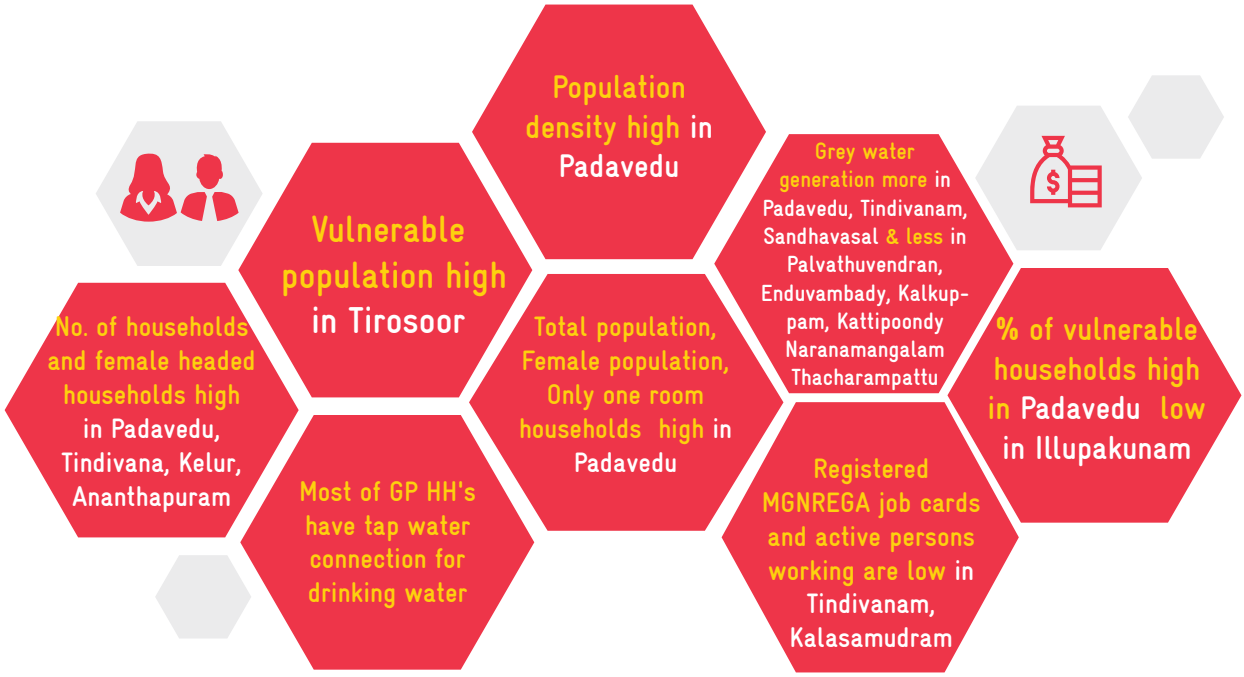
Tindivanam, Polur, Enman, Padavedu and Kalpattu

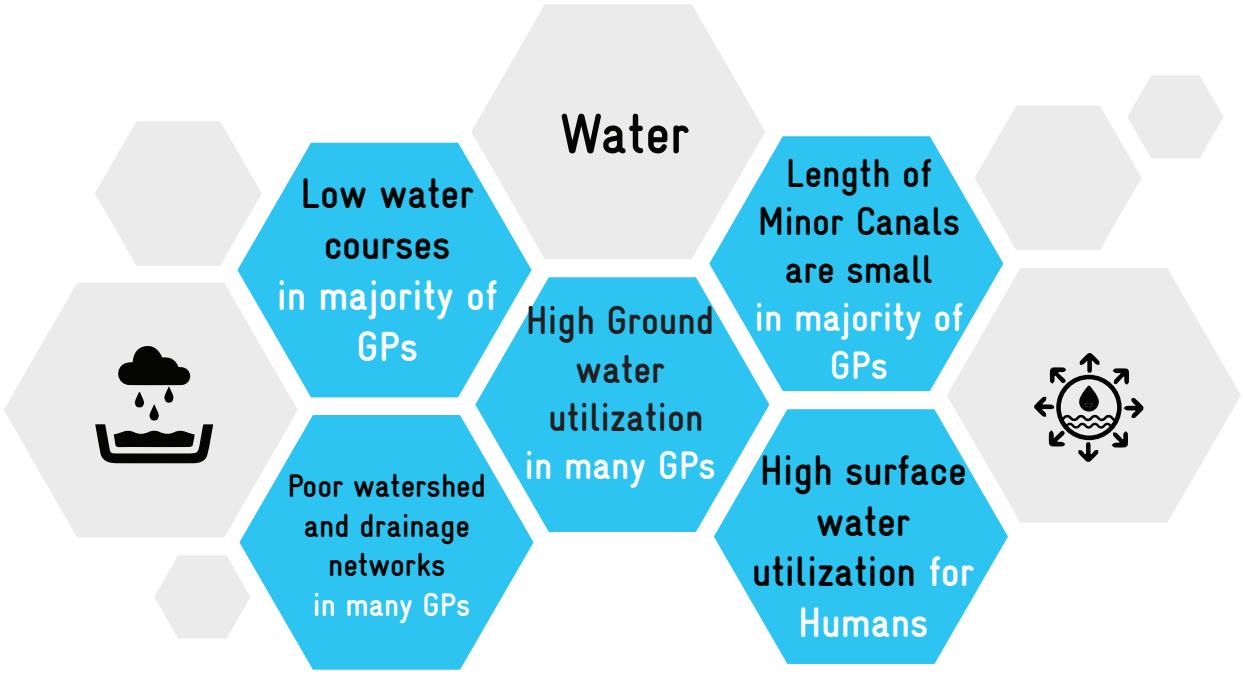
Upland/Slope

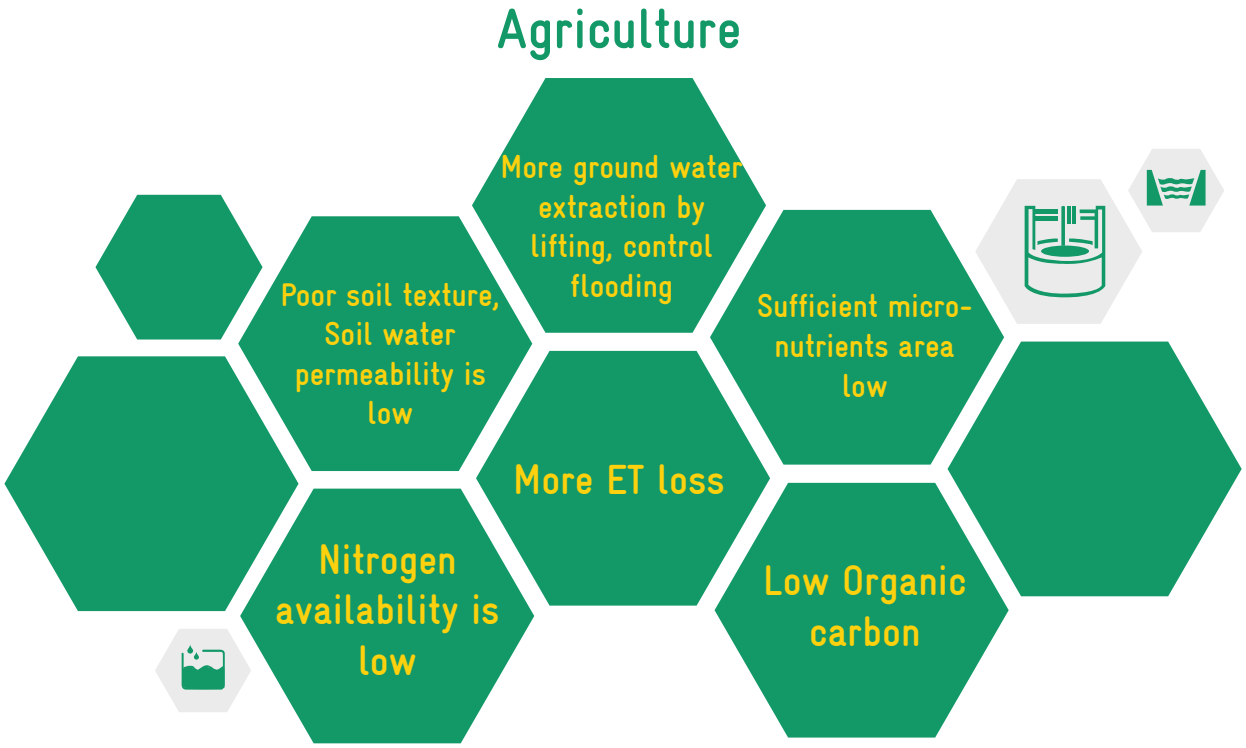
Sandavasal. Periyamalai , Pudupalayam, Edaipirai, & Kalkuppam



Socio economic




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


Agriculture
More ground water extraction by lifting, control flooding
Poor soil texture, Soil water permeability is low
Sufficient micro-nutrients 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).

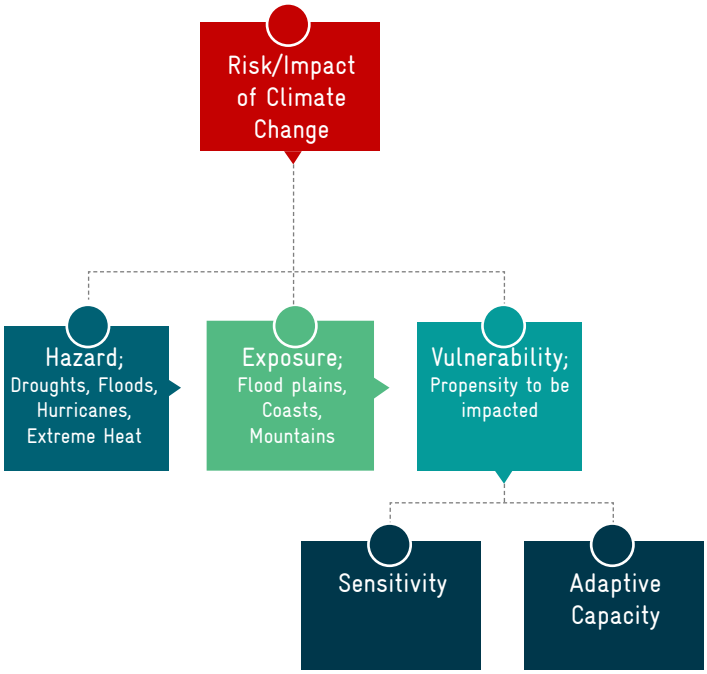


Figure 4.1. Vulnerability of the system as defined by IPCC

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 10 lists CWRM parameters/indicators, its rationale to vulnerability, source of data and its linkage with WASCA TN's primary 18 indicators.

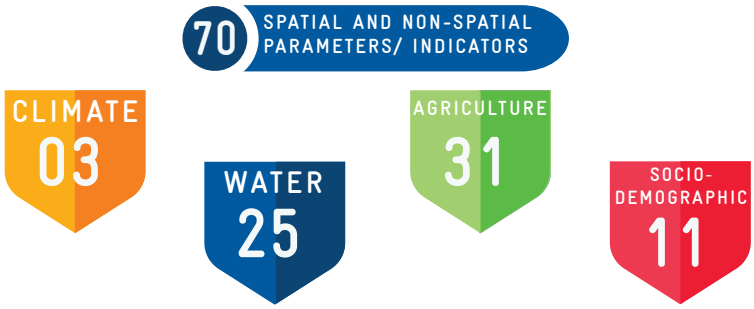


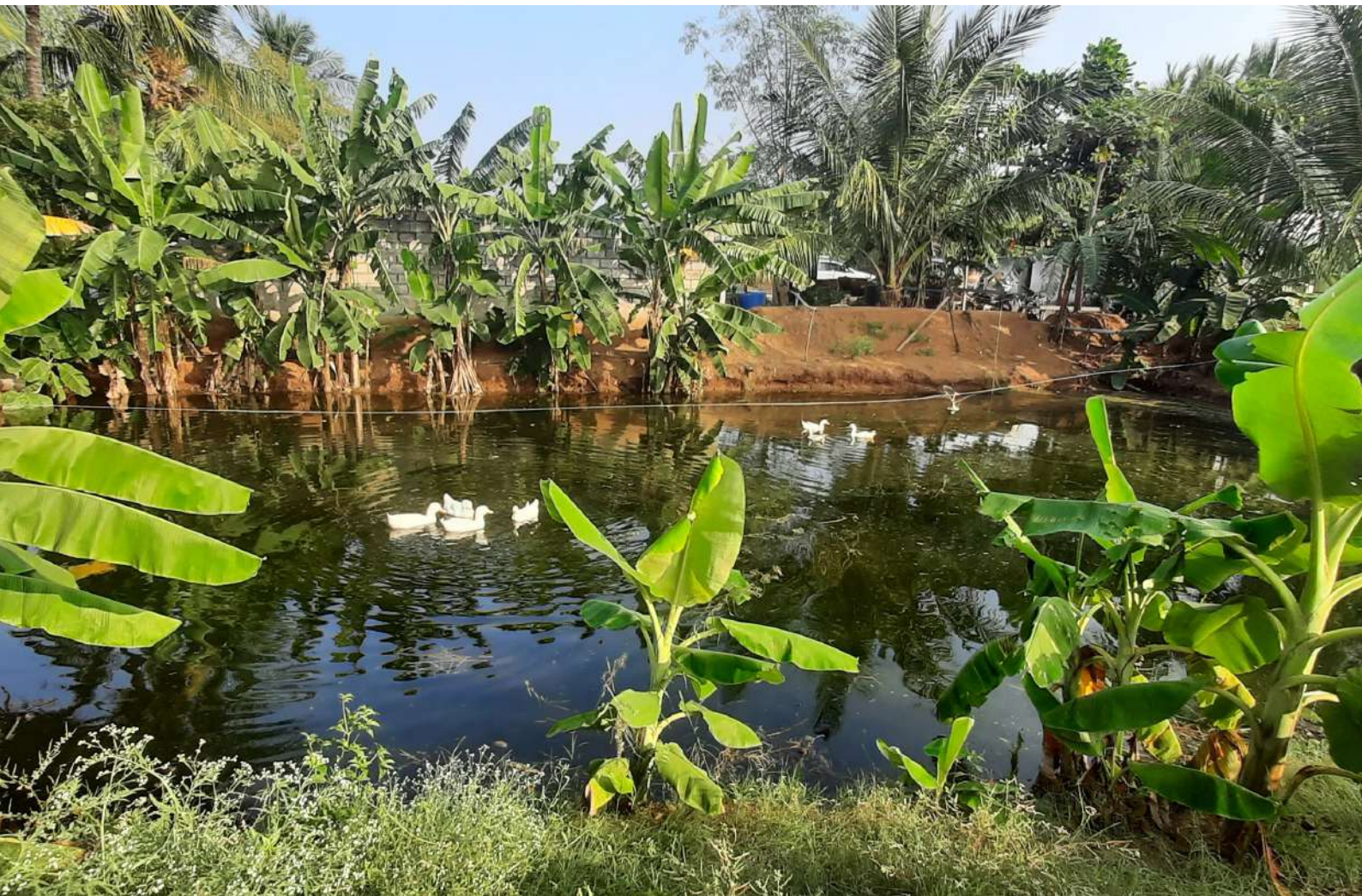
TABLE 10. CWRM PARAMETERS/INDICATORS SELECTED FOR BLOCK LEVEL VULNERABILITY

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

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

The identified indicators are from different sources and measured in different units. As the vulnerability assessment is about ranking, the indicators have to be in common units. This is done through normalization. The normalized indicators are aggregated and categorized to different vulnerability level. The methodology vulnerability assessment is given in Annexure 4.1. The GPs are categorized based on vulnerability scores as shown in Figure 4.2. Padavedu GP has very high rural water security vulnerability to climate risks followed by Sandhavasal, Kunnanthur,Vellur, Kalvasal GPs. Murugapady, Illupakunam, Palvathuvendran, Kangiyanoor and Krishnapuram GPs have very low vulnerability (Figure 4.2).

Upto	Category	Color range
0.633	Very High	
0.563	High	
0.528	Medium	
0.500	Low	
0.457	Very low	



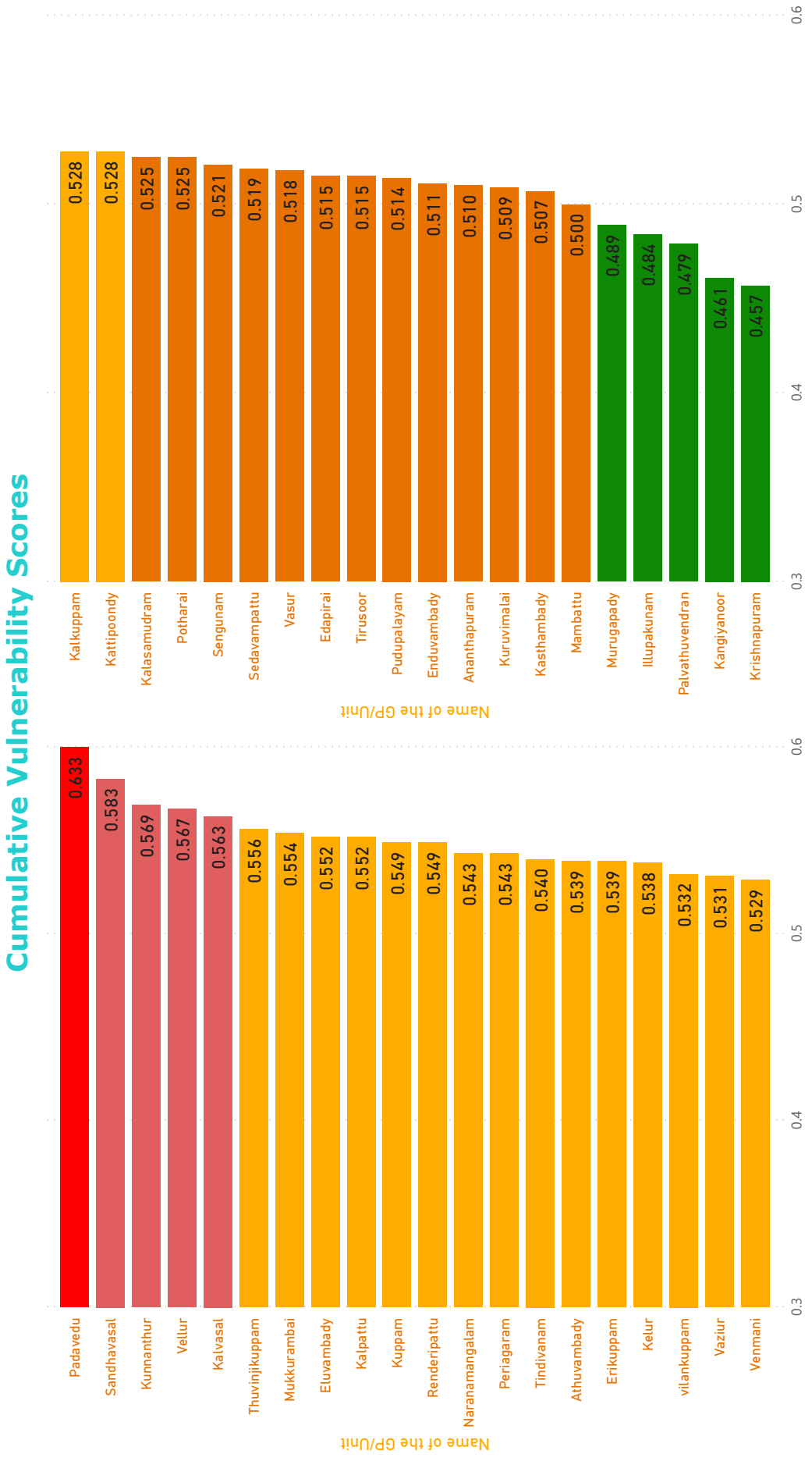


Figure 4.2. Final cumulative vulnerability scores

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. Vasur GP is identified as flood vulnerable area.

DROUGHTS & HEAT WAVES - ALL VILLAGES, VASUR GP - FLOOD VULNERABLE AREA

Water resource vulnerability

The water resources vulnerability index shows that Padavedu GP is highly vulnerable followed by Erikuppam, Naranamangalam, Tindivanam, Mukkurambai, and Eluvambady GPs

PADAVEDU, ERIKUPPAM, NARAN-AMANGALAM, TINDIVANAM, MUKKURAMBAI, ELUVAMBADY

Agriculture resources vulnerability

In agriculture and allied sectors, Kavasal GP has highest vulner-able score followed by Kun-nanthur, Vellur, Thuvinjikuppam, Kalpattu and Edapparai GPs

KAVASAL, KUNNANTHUR, VELLUR, THUVINJIKUPPAM, KALPATTU, EDAPPARAI

Socio-economic vulnerability

Sandhavasal, Padavedu have very high socio economic vulnerability , Vaziur, Tirusoor, Kuppam and Pudupalayam GPs

SANDHAVASAL, PADAVEDU, VAZIUR, TIRUSOOR, KUPPAM, PUDUPALAYAM

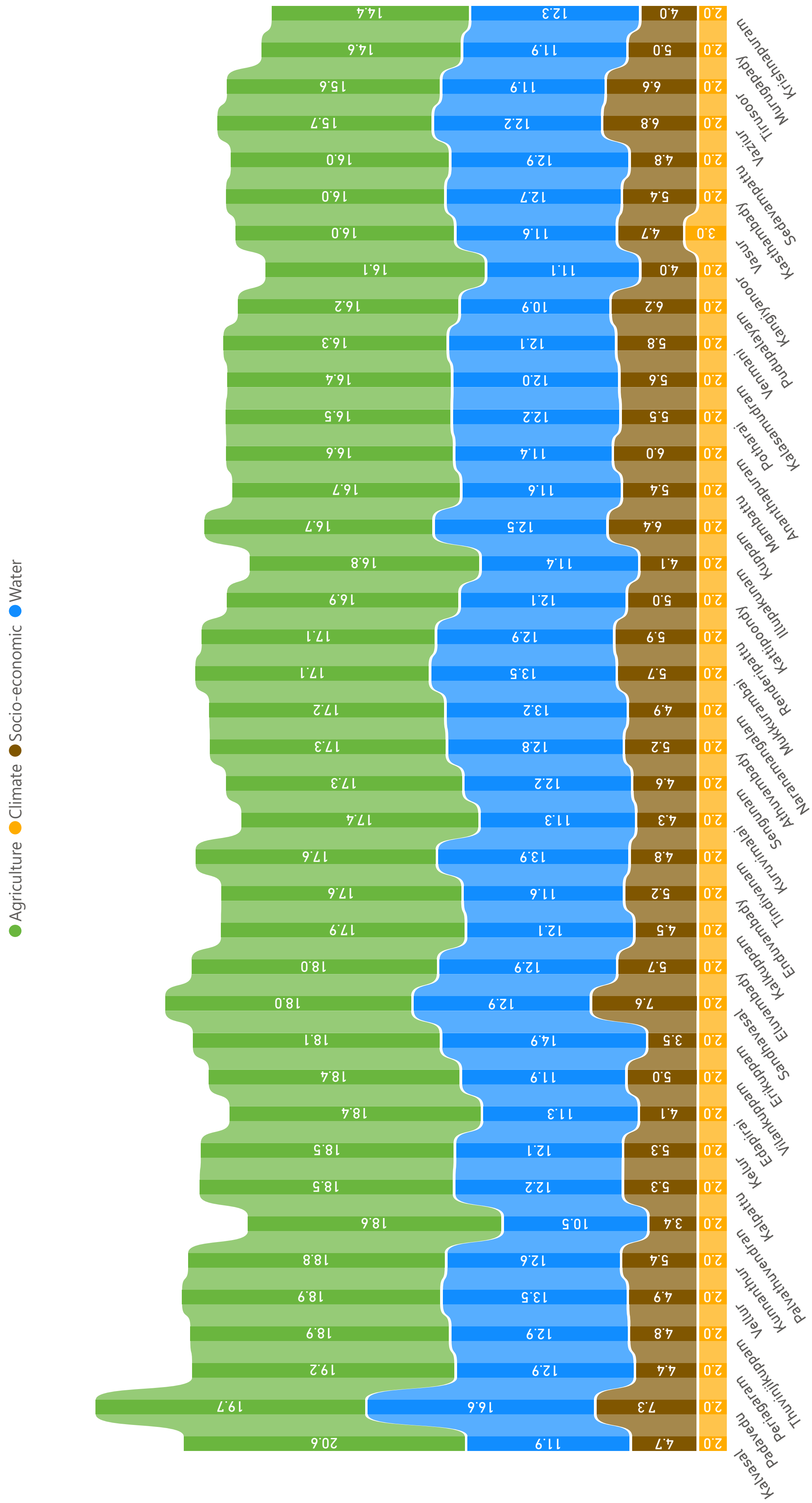
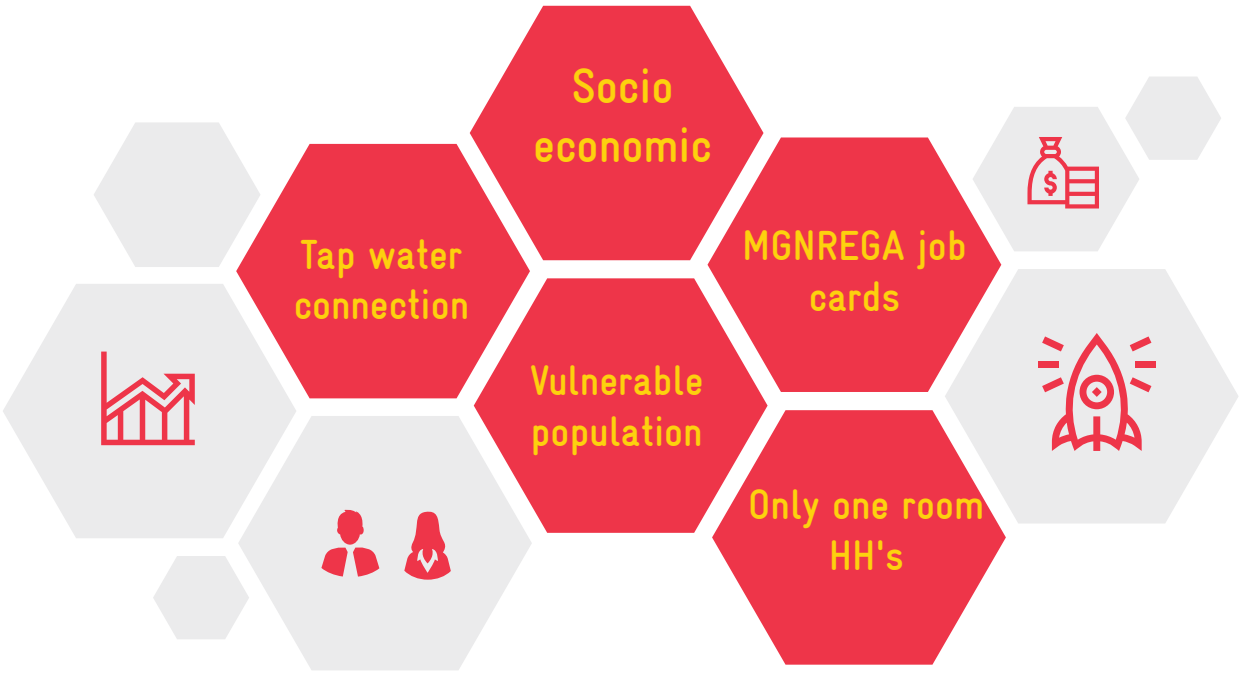
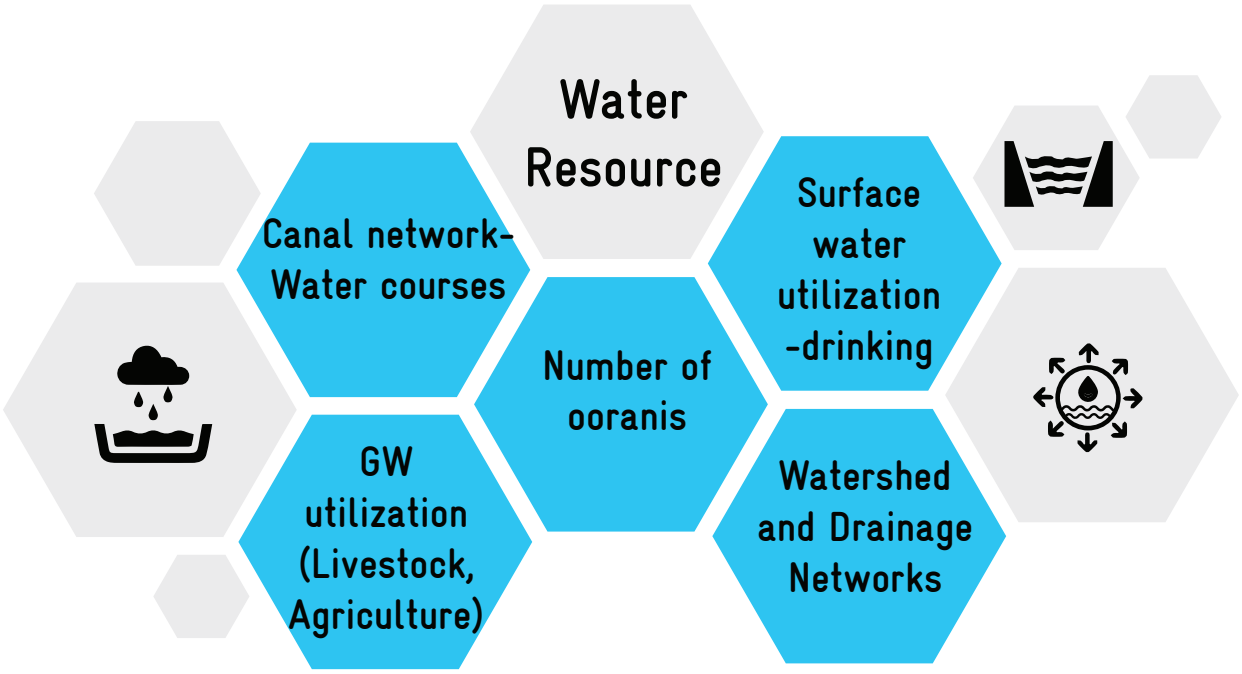
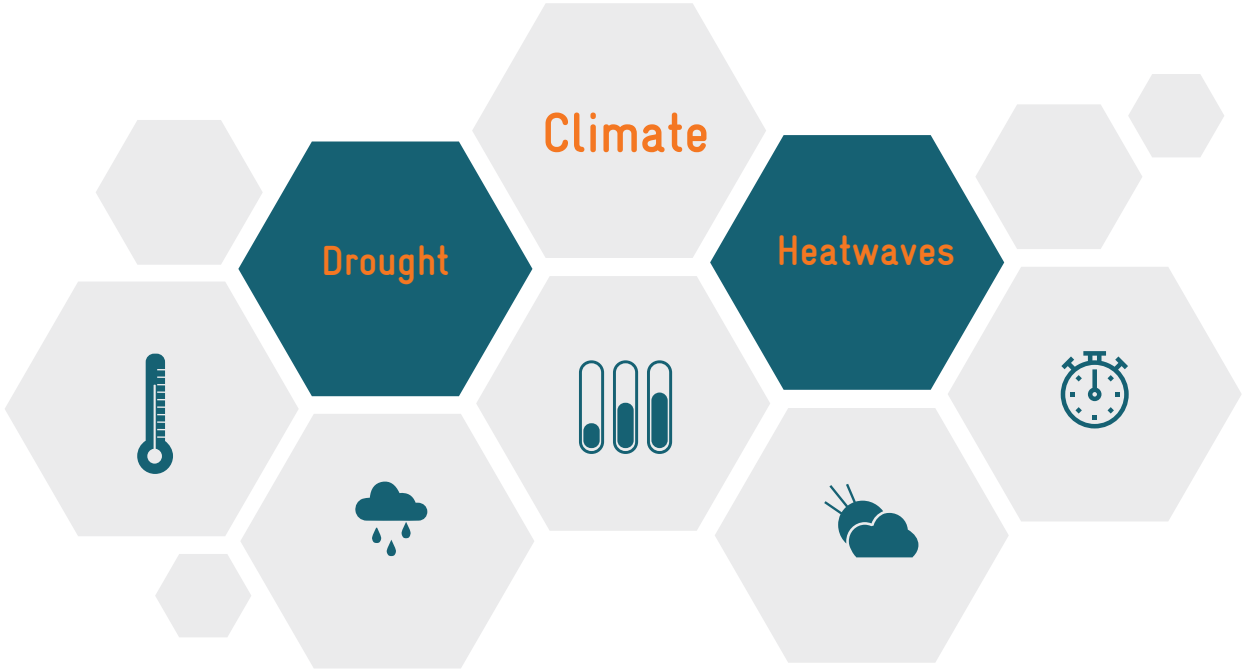


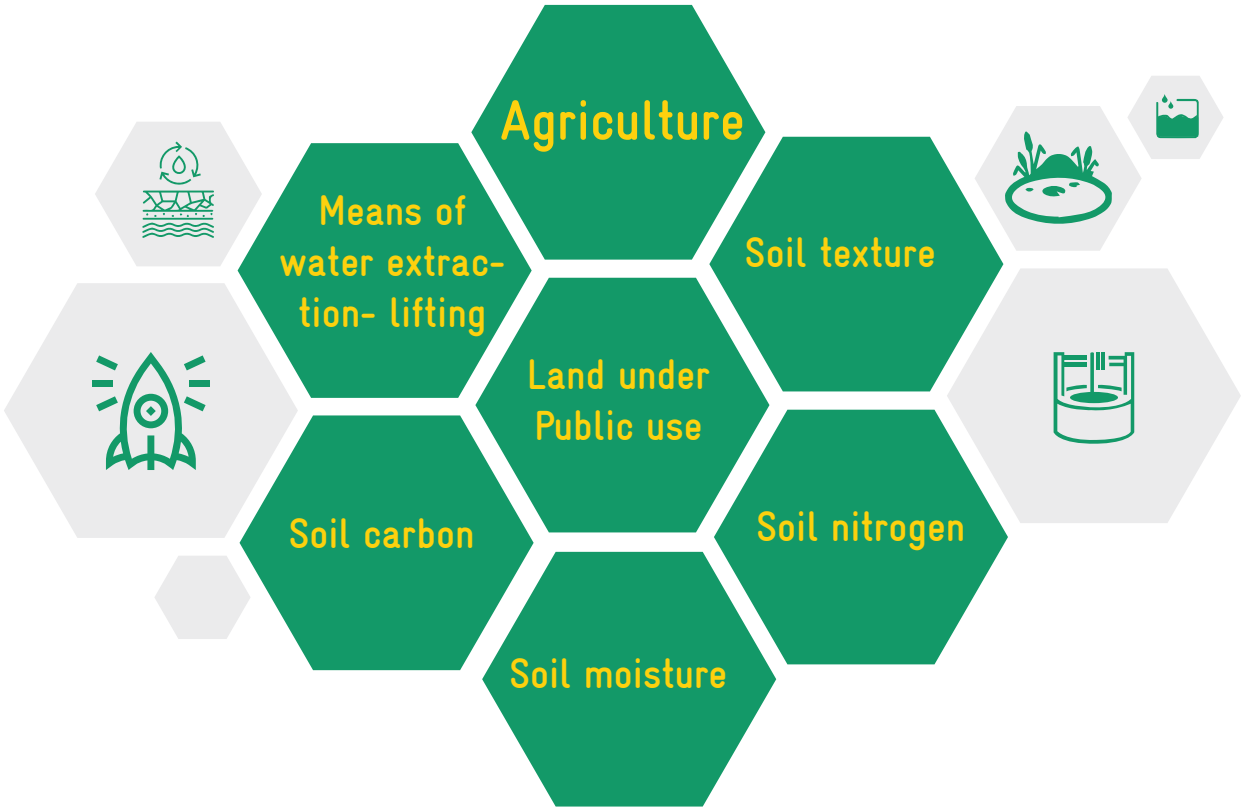
Figure 4.3. GP wise vulnerability dimensions

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 TREATMENT ACTIONS UNDER WASCA, CWRM AND CRM IN THE BLOCK

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

5.1 PROPOSED AREA UNDER WASCA TREATMENT

Out of 27,563 ha available land in Polur Block, 5,012 ha (19 %) area is proposed for treatment under WASCA TN– CWRM planning. A major portion of Key Water Actions is proposed in the area falling under wasteland. A small amount of land under individual ownership has also been proposed for significant pilot treatments. The detailed land wise proposal for WASCA treatments is given in the Table 11. GP wise proposed area for treatment is also attached in Annexure 5.1.

TABLE 11. THE PROPOSED AREA FOR WASCA TREATMENT

Land Use	WASCA proposed treatment area (ha)	Total available land (ha)
Forest land	0	0
Non-Agricultural uses	753	5,258
Barren & un-cultivable land	866	1,154
Permanent pastures and other Grazing land	58	77
Land under miscellaneous tree, crops etc.	33	44
Cultivable wasteland	1,304	1,738
Fallows Land other than current Fallows	122	1,027
Current Fallowl and	464	4,280
Unirrigated land	301	2,226
Irrigated by source	1,112	10,647
Total	**5,013**	**26,451**

Nearly 75 % of the permanent pastures, other grazing land and land under miscellaneous tree, crops were prioritized for treatment followed by 14 % of the land used for non-agricultural uses and unirrigated land was considered for WASCA treatment (Figure 5.1).

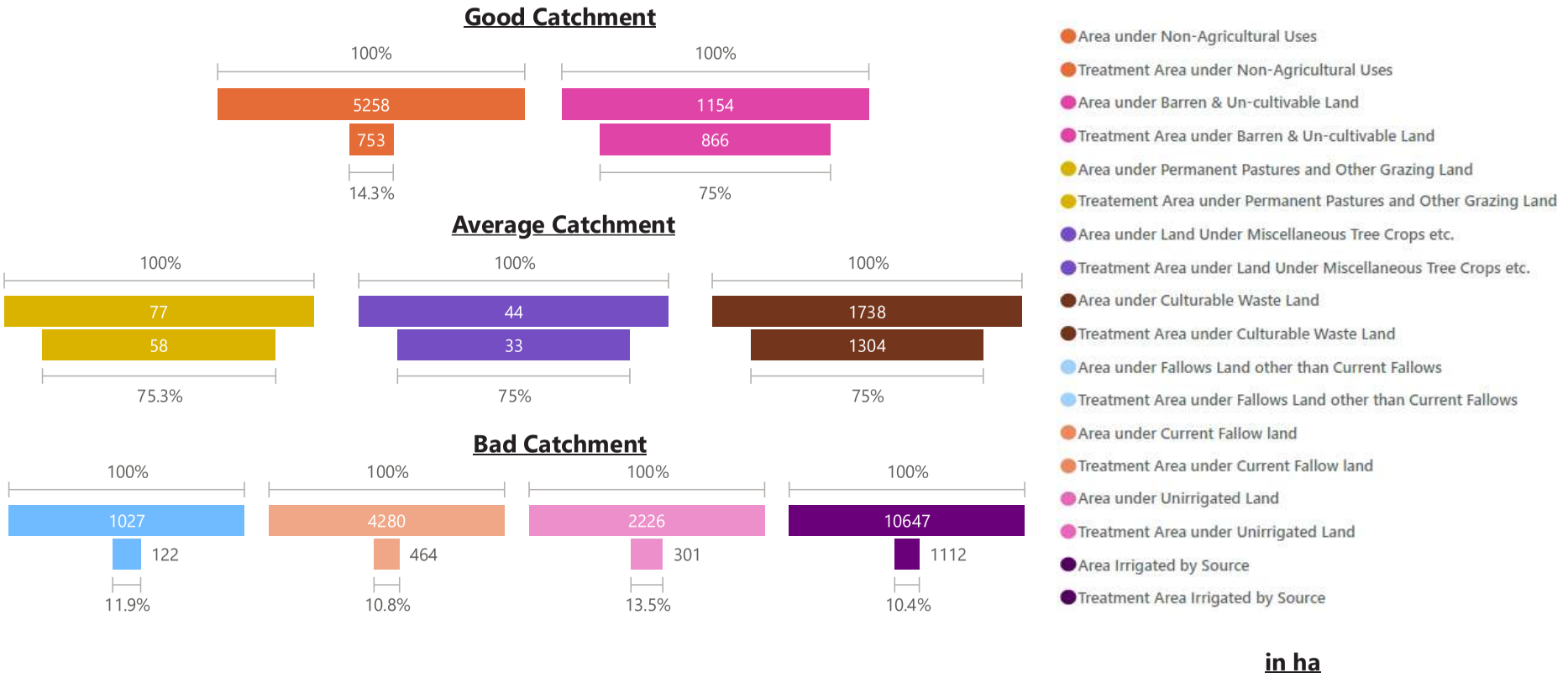


Figure 5.1. WASCA treatment area in %

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 1464 ha.m which is 23.1 % of the total runoff. Of the expected runoff conservation, 49% comes from good catchment area, 26% comes under average catchment area and 25 % comes from bad catchment area (figure 5.2).

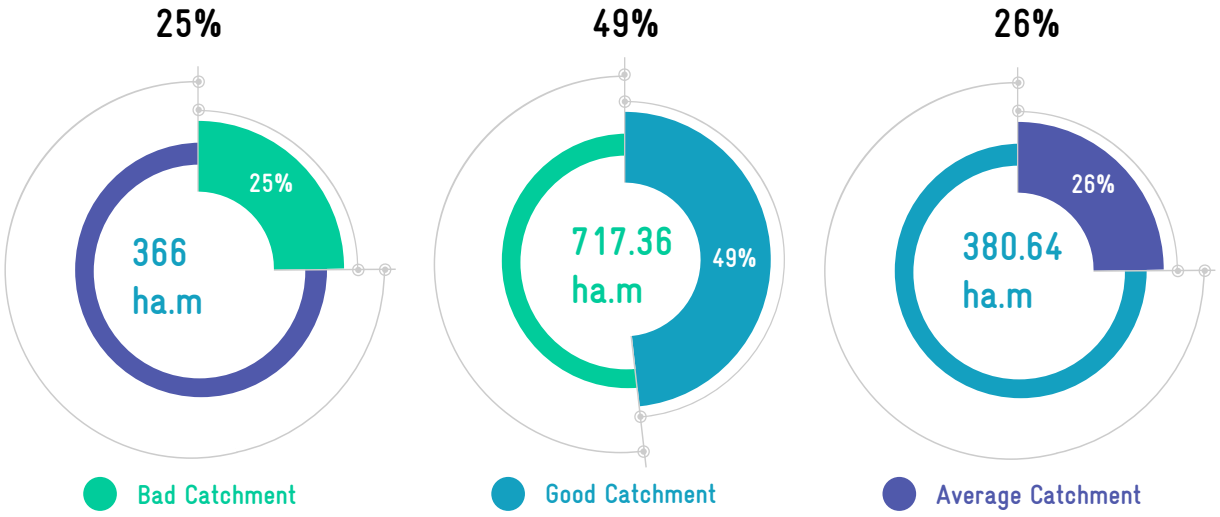


Figure 5.2. Expected conservation after WASCA treatment

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

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

Work (unit)	Abbreviation (unit)	No.	Extent (area in ha or length in m)
Composting (Number of units)	Co	437	-
Farm Bunding with Boundary Trenches - Individual (Ha)	FBBTI	1,561	1,365
Land development - Individual (Ha)	LDI	1,430	3,574
NADEP Vermi compost (Number of units)	NADEP	3,514	
Azolla units - Individual (Number of units)	Az	3,514	
Cattle Shelters (Number of units)	CS	3,514	
Cattle Trough(Number of units)	CT	3,514	
Fodder development - Community & Individual	FD	3,514	
Goat Sheep Shelters (Number of units)	GSS	819	
Poultry Shed (Number of units)	PS	-	
Silvi-pasture Development(Ha)	SPD	46,248	58

Soak Pits (Community) (Number of units)	SPC	320	
Soak Pits (Individual) (Number of units)	SPI	3,447	
Artificial Recharge Structure(Number of units)	ARS	-	-
Construction of Farm Ponds - Individual (Number of units)	FP	699	
Construction of new open wells & Recharge Shafts (Number of units)	COWRS	4,089	
Restotaration of water bodies:a.PWD and Tanks(Number)	RPWDT	73	
Restotaration of water bodies:c. Ooran-is(Number)	Roo	-	
Restotaration of water bodies:c. Ponds(Num-ber)	RP	89	
Roof Rain Water Harvesting (Number of units)	RRWH	80	
Water Course - Irrigation Channels - Desilt-ing (Mtrs)	WCICD		5,600
Afforestation in Public/common lands(Ha)	Aff	1,982,124	2,478
Avenue plantation(Km)	AVP	1,326	6,631
Block Plantation (Community)(Ha)	BP	462,508	578
Canal Bund Plantation(Ha)	CBP	10,532	52,662
Contour Continous Bunds (CCB) for Affor-estaion area(Mtrs)	CCBF	-	-
Drainage Line Treatment (DLT)(Mtrs)	DLT	49,857	249,274
Dry land Horticulture/Agro-forestry - Indi-vidual (Ha)	DLHAI	151,520	30,304
Irrigation Channel Plantation (Mtrs)	ICP	1,120	5,600
Linear Plantation(Km)	LP	16,465	67,772
Micro Irrigation(Ha)	MI	-	-
Nursery Development(Number of units)	ND	32,245	6,446


Proposed works are included the drought proofing, livelihood, land development and WCWH, measures
Land development works over 5,000 ha area
More than 2 Lakhs plants planting
5,000 sites for WCWH
64,000 livelihood works

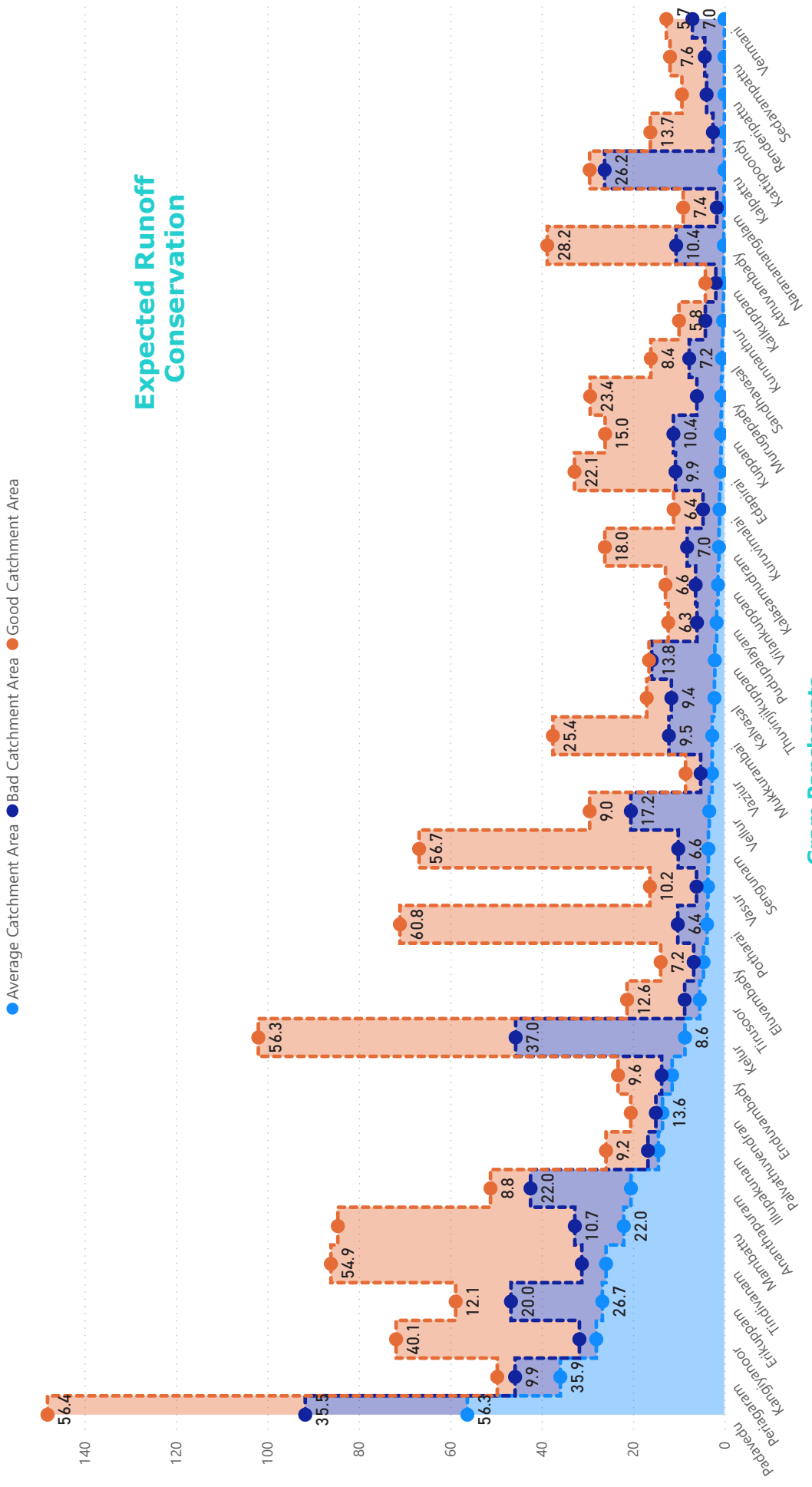


Figure 5.3. Expected GP wise runoff conservation after WASCA treatment

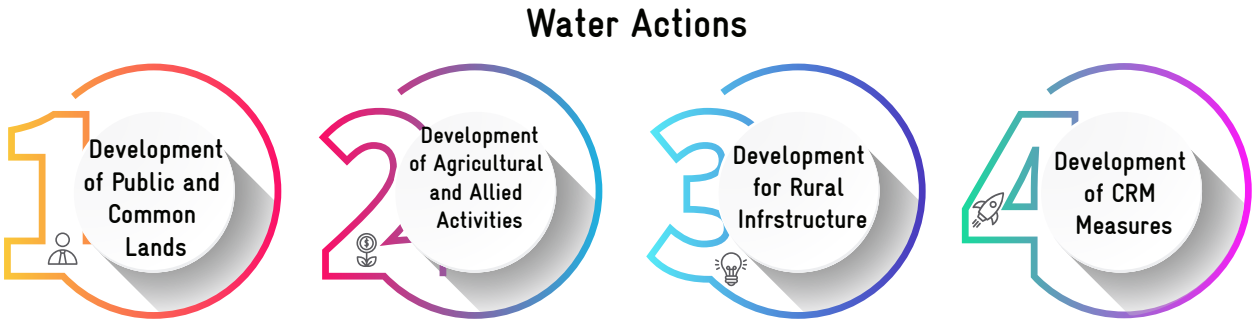
Mahatma Gandhi NREGS Annual circular 2020-21 (Clause 6.3)

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 water bodies etc., as listed in Table 12 and Figure 5.4

DEVELOPMENT OF PUBLIC AND COMMON LANDS

TABLE 12. 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)	341	10	0.025	8.53	3,411
COMPOSTING(NUMBER OF UNITS)	411	15	0.17	69.87	6,165
AFFORESTATION IN PUBLIC/ COMMON LANDS(HA)	412	3,344	8.6	3,547.16	13,79,266
BLOCK PLANTATION (COMMUNITY)(HA)	306	4,320	11.1	3,393.49	13,20,710
SILVI-PASTURE DEVELOPMENT(HA)	115	6,664	17.1	1,966.50	7,66,360
LINEAR PLANTATION(KM)	8	703	1.8	13.93	5441
CANAL BUND PLANTATION(HA)	764	2,930	7.5	4,666.00	17,83,390
IRRIGATION CHANNEL PLANTATION (M)	72	6	0.015	1.08	434
AVENUE PLANTATION(KM)	10	703	1.8	17.19	6,713
NURSERY DEVELOPMENT (NUMBER OF UNITS)	38	2,344	15	568.13	88,779
RESTOTARATION OF WATER BODIES: A) PWD AND TANKS (NUMBER)	121	800	5	605	96,800
RESTORATION OF WATER BODIES: B.OORANIS (NUMBER)	0	200	2	0	0
RESTORATION OF WATER BODIES: C) PONDS (NUMBER)	217	200	1	434	43,400
ARTIFICIAL RECHARGE STRUCTURE (NUMBER OF UNITS)	1,529	391	2.5	3,822.50	5,97,839
WATER COURSE - IRRIGATION CHANNELS - DESILTING (MTRS)	72	3	0.0075	0.54	217
DRAINAGE LINE TREATMENT (M)	491	5	0.03	14.74	2,457

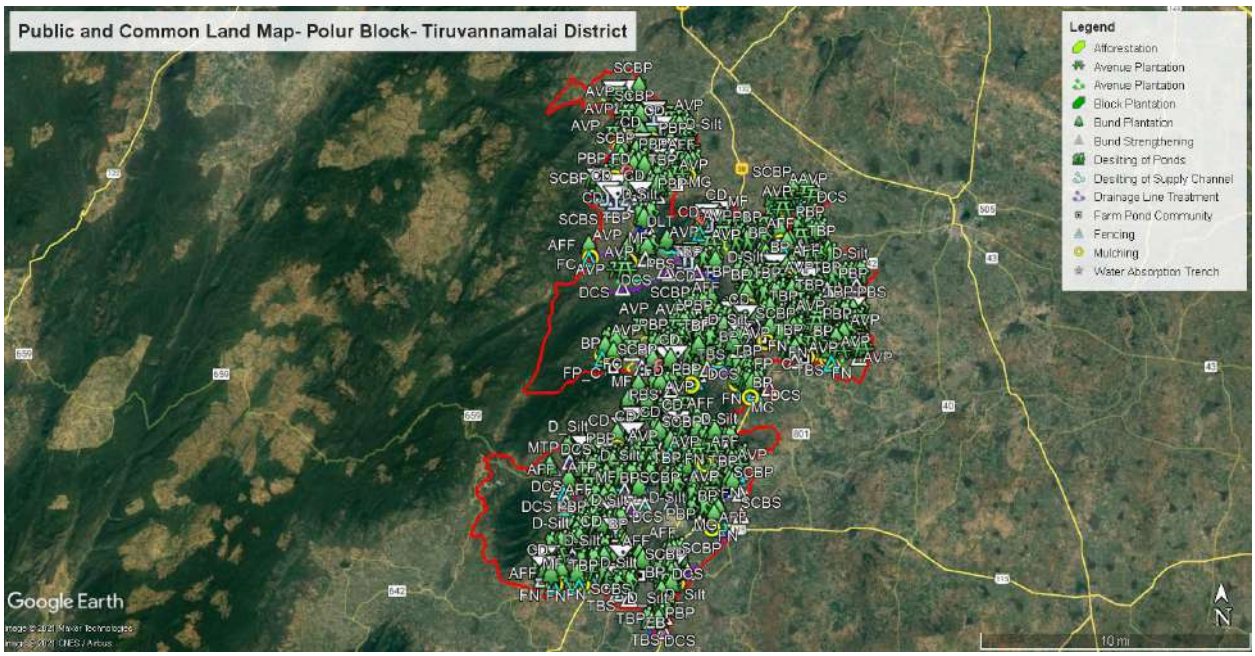


Figure 5.4. Proposed development activities in public and common land

5.3 DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

Based on the assessment, the works which enhance the agriculture and allied sectors particularly for irrigation, soil and live stocks are proposed in the lands under individual ownership (Table 13 & Figure 5.5).

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

TABLE 13. 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)	376	586	2	565	2,20,611
MICRO IRRIGATION (ha)	47	0	1	47	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	524	781	2	1,048	4,09,244
LAND DEVELOPMENT - INDIVIDUAL (ha)	1,271	3,906	10	12,715	49,66,323
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	2,120	3,321	9	18,020	70,40,520
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	1,525	23	0	229	35,075
NADEP VERMI-COMPOST (NUMBER OF UNITS)	1,545	27	0	278	41,715
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	149	2,344	1	221	3,49,256
CATTLE SHELTERS (NUMBER OF UNITS)	1,698	331	2	3,600	5,62,038
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	986	355	2	2,238	3,50,030
CATTLE TROUGH (NUMBER OF UNITS)	1,525	6	0	76	29,150
POULTRY SHED (NUMBER OF UNITS)	1,244	10	0	112	12,440
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	1,497	926	5	7,485	13,86,222

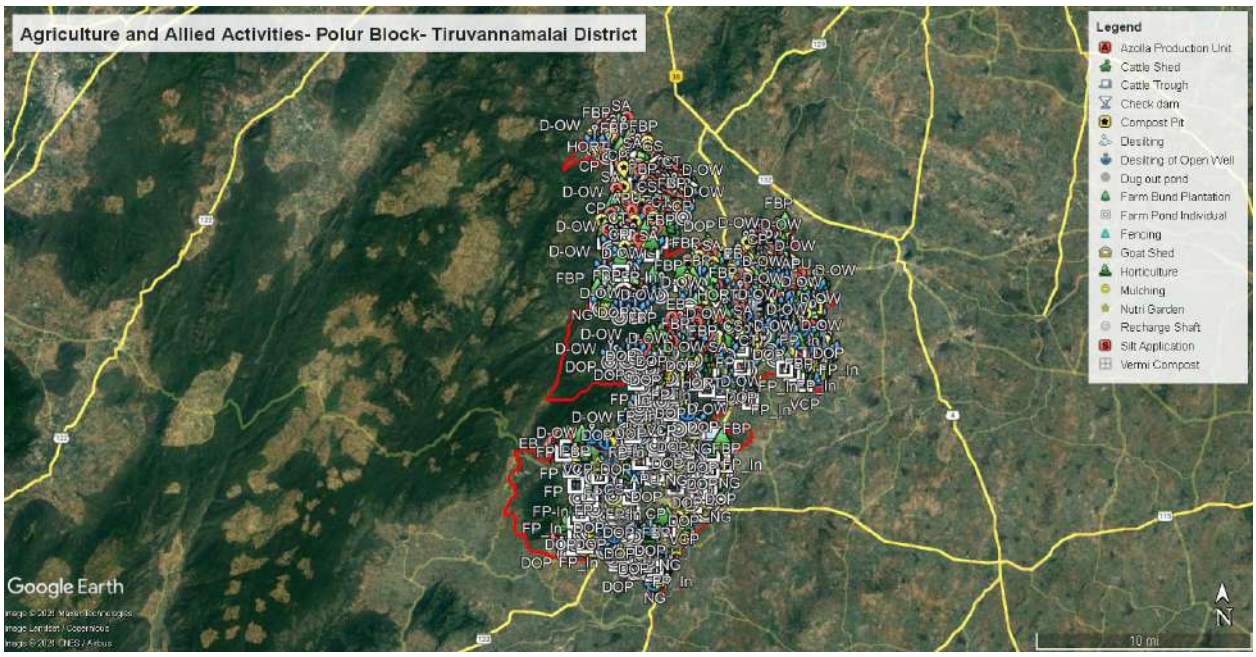


Figure 5.5. Proposed development activities in Agriculture and allied Sectors

5.4 DEVELOPMENT OF RURAL INFRASTRUCTURE

The prominent works on constructing structures for water harvesting and grey water management are proposed as in Table 14 and Figure 5.6.

DEVELOPMENT OF RURAL INFRASTRUCTURE

TABLE 14. 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)	150	20	0.13	20	3,000
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	2,866	16	0.1	287	45,856
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	925	625	4	3,700	5,78,125

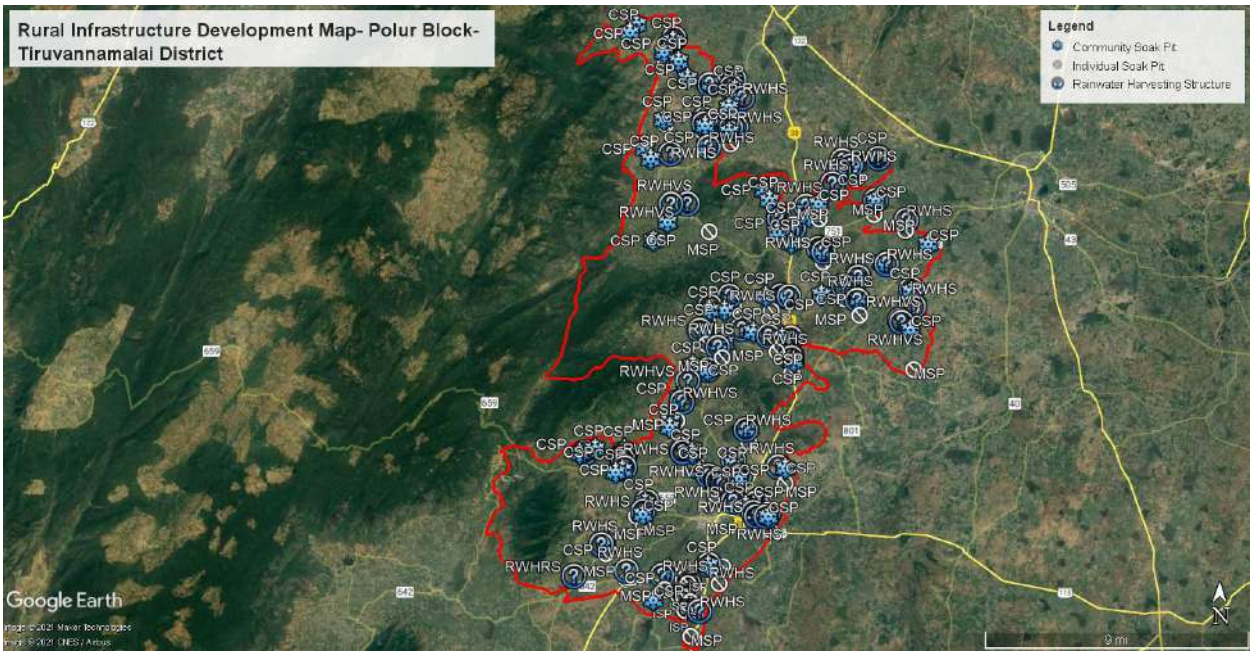


Figure 5.6. Proposed rural infrastructure activities

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. As Tiruvannamalai district is a drought prone area and frequently exposed to severe droughts, more measures are proposed to manage droughts and its subsequent impacts. As Polur Block is also affected by droughts and heat waves, the climate resilient measures are proposed to cover-up maximum of GPs (Table 15). CRM such as farm ponds, greening of hillocks, bamboo plantation, fallow land developments are proposed in this Block in saturation mode. The proposed activities and its details are given in Table 16, 17, 18, and 19.

TABLE 15. GP WISE PROPOSED CRM

Name of the GPs	Public and common land	Agriculture and allied activities
Ananthapuram	Greening of Hillock (2 Hillocks)	Farm pond
	Silvipasture	
Athuvambadi		Farm pond
Enduvambadi	Fallow Land Development	
Jadatharikuppam		Horticulture
Kalasamuthiram	Fallow Land Development	Farm pond
Kalkuppam	Fallow Land Development	Farm land
Kalvasal		Farm pond
Kasthambadi		Farm pond
Kattipoondi		Farm pond
Kelur		Farm pond
Kuppam	Nursery	Farm pond
	Silvipasture	
Mambattu	Fallow Land Development	Farm land

Mukkurumbai		Farm pond
Murugapadi		Farm pond
Naranamangalam	Fallow Land Development	
Padavedu	Bamboo Plantation	Farm pond
	Mini Forest	
	Silvipasture	
	Hillock Gap filling (2000 Tamarind Plants)	
Palvarthuvendran	Fallow Land Development	
Potharai		Farm pond
Santhavasal		Farm pond
Sedarambattu	Bamboo plantation	Farm pond
Sengunam	Silvipasture	Farm pond
Thindivanam	Silvipasture (2)	Farm pond
	Bamboo plantation	
Thurinjikuppam		Farm pond
Valiyur	Fallow Land Development	Farm pond
Vellur		Farm pond
VIlankuppam		Farm pond

TABLE 16. DETAILS OF PROPOSED FALLOW LAND DEVELOPMENTS UNDER CRM

Name of the Village Panchayat Selected	Cultivable Waste Land (ha.)	Other Fallow Land (ha.)	Total fallow land (ha.)
Enduvambadi	1.24	0.75	1.99
kalkuppam	0.00	5.80	5.80
Palvarthuvendran	3.66	10.96	14.62
Valiyur	8.61	6.32	14.93
Naranamangalam	0.48	14.98	15.46
Kalasamuthiram	0.21	17.51	17.72
Mambattu	19.31	1.65	20.96

TABLE 17. DETAILS OF PROPOSED BAMBOO PLANTATION ACTIVITIES UNDER CRM

Name of the Panchayat	Survey No.	Area of plantation (in ha)	Total no. of Plants	Classification of Land
Tindivanam	103	0.73	1813	Meyccal nilam *
	81/1	62.56	1,56,400	Meyccal nilam
	56	8.21	20,525	Others

**Meyccal nilam-grazing land*

TABLE 18. DETAILS OF PROPOSED ACTIVITIES ON GREENING OF HILLOCKS

Name of the GP	Category	Recommended Area in ha	Survey No.	Area in ha	Classification of land
Padavedu	High	28.00	459/2B	13.76	Malai
			459/2C	0.60	Malai
			748/5	0.42	Natham
			748/93	0.70	Others
			748	15.43	Unresolved Barren (Theeravai Erpada-tha Tharisu)

**malai- hillock, Natham- bare and unutilised land with no record,*

TABLE 19. DETAILS OF PROPOSED FARM PONDS ACTIVITIES UNDER CRM

Name of the Panchayat	Name of Habitation
Ananthapuram	Gandhi Nagar
Athuvambadi	Athuvambadi
Kalasamuthiram	Renugapuram
	Kalasamuthiram
Kalvasal	Kalvasal
Kasthambadi	Kasthambadi
	Gandhi Nagar
Kattipoondi	Kattipoondi
Kelur	Kelur
Kuppam	Kumbalkotta
Mambattu	Mambattu
Mukkurumbai	Mukkurumbai
Murugapadi	Bakmarpettai
Murugapadi	Bakmarpettai
Vazhiyur	Vazhiyur
Potharai	MGR Nagar
Santhavasal	Kankarananthal
Sedarambattu	Chettiyandal

Name of the Panchayat	Name of Habitation
Sengunam	Sengunam
	Old Colony
Thindivanam	Kamatchipuram
	Ganesapuram
	Athimoor
	Thindivanam
	Kamatchipuram
	Thambukottanparai
	Kaliyam Gandhi Nagar
	Athimoor
Thurinjikuppam	Periya Eri
Vellur	Vellur
	Thuluvapushpagiri
	Vellur
	Vellur
VIlankuppam	VIlankuppam

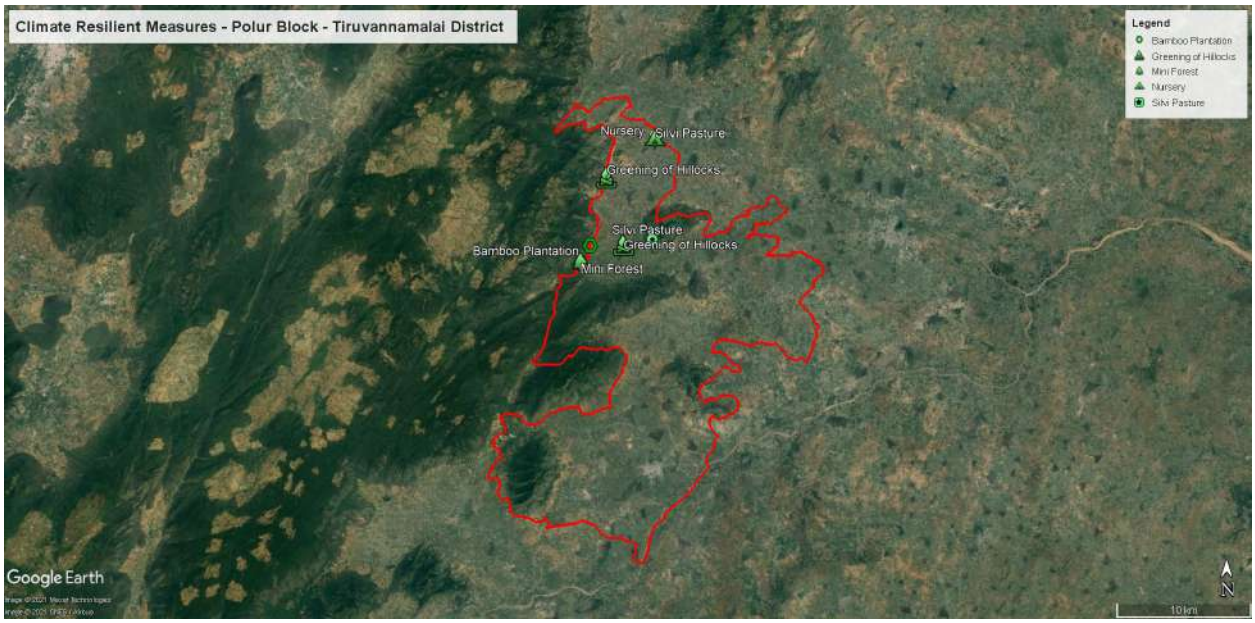


Figure 5.7. Proposed climate resilient measures

நெடுங்கடலும் தன்நீர்மை குன்றும் தடிந்தெழிலி
தான்நல்கா தாகி விடின்

குறள் - 17

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

Thirukkural - 17

CHAPTER 6

PROJECTED OUTCOMES OF PLANNING

6 PROJECTED OUTCOMES OF PLANNING

Keeping in view the guidelines of Mahatma Gandhi NREGS, Key Water Actions are proposed based on climate vulnerability assessment and challenges at GP level for a period of three years: 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 outcomes 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	5,012 ha (19 %) of the total area treated under WASCA
2	Percentage reduction of run off	1446.14 ha.m i.e 23.13 % of the total runoff harvested due to WASCA interventions
3	No. of waterbodies restored	180 water bodies restored
4	Area under afforestation	2477.72 ha area under afforestation
5	Area under Silvi-pasture development	26 ha under Silvi-pasture plantation
6	Length of drainage line treated	274 m length of drainage line treated

5,012 ha
AREA TREATED

1446.14 ha.m
TOTAL RUNOFF HARVESTED

180
WATER BODIES RESTORED

2477.72 ha
AREA AFFORESTATION

26 ha
SILVI-PASTURE PLANTATION

274 m
DRAINAGE LINE TREATED

6.2 OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

	INDICATOR	OUTCOMES/ IMPACT
1	No. of structures established for on-farm (in-situ) water harvesting in dry lands Assessment of sources of water for live-stock and agriculture demand	699 farm ponds established which target the harvest of 56.95 ha.m of water which has the potential to irrigate 226.45 ha area in both kharif and rabi seasons
2	Improvement in soil health	3514 compost units for soil health improvement
3	Changes in the irrigation practices	1365 ha Farm bunding with trenches
4	Dry land development with Agro-forestry	3514 ha under dry land horticulture
5	Households established fodder plots	3514 vulnerable households established fodder plots

699 FARM PONDS

3514 COMPOST UNITS

1365 ha FARM BUNDING

3514 ha DRY LAND HORTICULTURE

3514 FODDER PLOTS

6.3 OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

	INDICATOR	OUTCOMES/ IMPACT
1	No. of villages having liquid waste management systems	33 common and 3447 individual soak pits established for recycle of grey water bene-fiting 1,51,520 households
2	Roof rain water harvesting measures	820 common roof rainwater harvesting and storage structures with a target to harvest and store 1.025 ha.m of rainwater for use
3	Nutri-garden	30,304 Households established nutri-gar-dens in homesteads and planted 1,51,520 saplings

33 COMMON & **3,447** INDIVIDUAL SOAK PITS

820 COMMON ROOF RAINWATER HARVESTING

30,304 NUTRI-GARDENS

1,51,520 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	All GPs are vulnerable for drought, heat-waves and 1 GP area for flood vulnerability
2	Climate resilient measures are identified for climate risks	7 models are identified via., Farm ponds, fallow land development, greening of hillocks, Silvi pasture, bamboo plantation , Nursery and mini forest 34 farm ponds in 18 Gram Panchayats 66.05 ha under Silvi pasture with 1,28,300 saplings 91.46 ha under fallow land developments in 7 villages 30.91 ha under greening of hillocks 71.50 ha under bamboo plantation with 1,78,738 plants 8 ha under Nursery 2.3 ha under Mini forest

34 FARM PONDS

66.05 ha SILVI PASTURE

91.46 ha FALLOW LAND DEVELOPMENT

30.91 ha GREENING OF HILLOCKS

71.50 ha BAMBOO PLANTATION

8 ha NURSERY

2.3 ha MINI FOREST

Estimated person days

The total estimated person days required for the above proposed activities are 1,72,26,713 as specified below

Estimated Cost

The total estimated cost budgeted for the above proposed activities is Rs 58,524 Lakhs as specified below

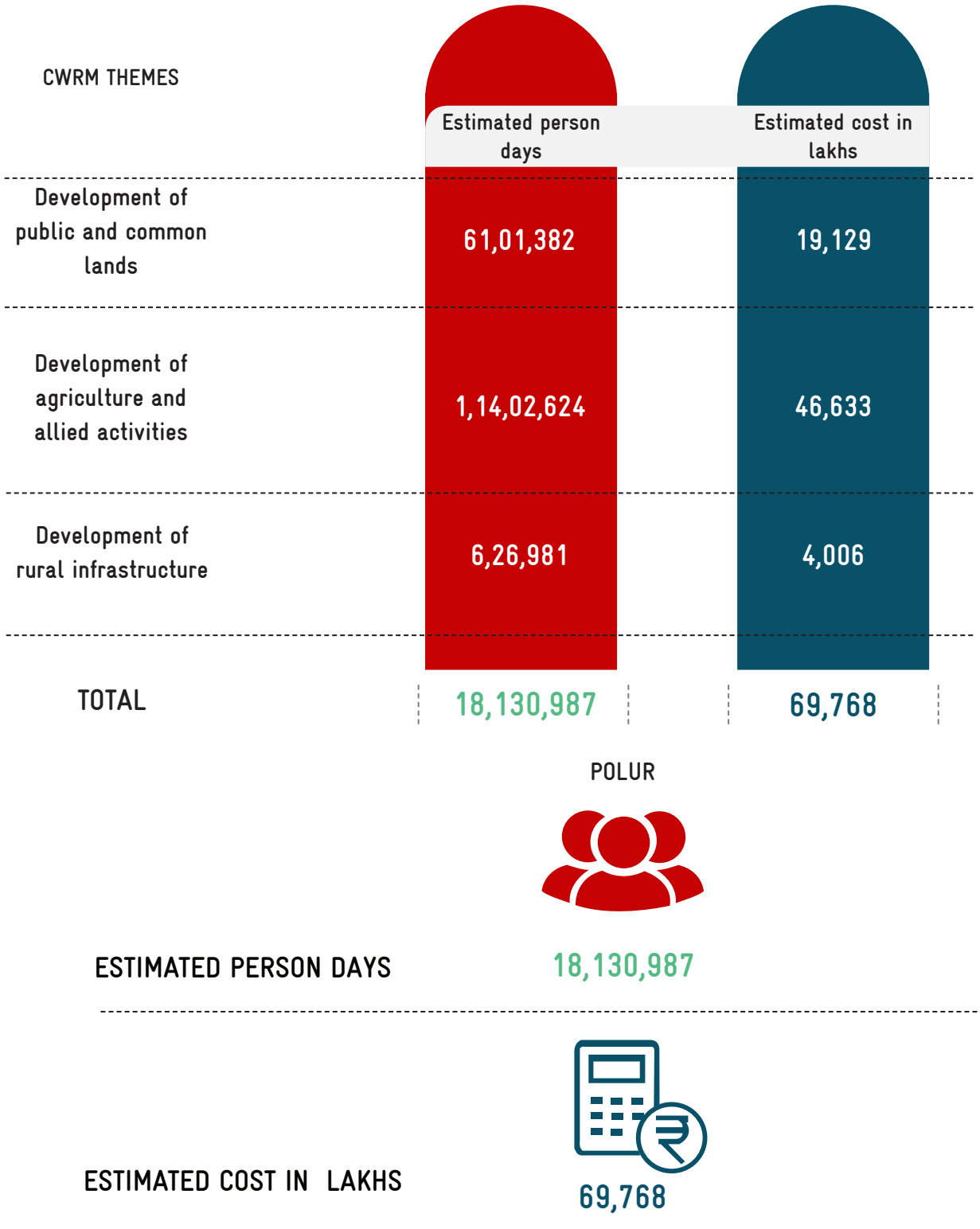


Figure 6.1 & 6.2. Estimated person days & cost for all water actions

6.5 LINKAGES TO SDGS, NDCS

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

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

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

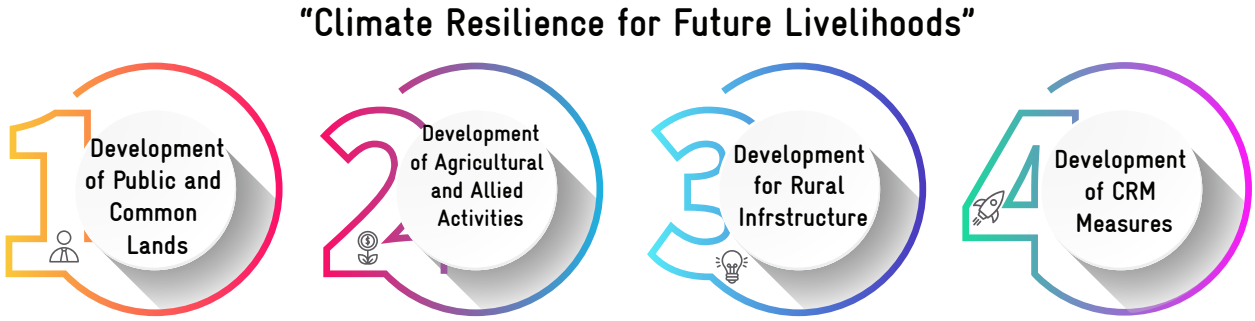
Internationally, the recent process on NDC Enhancement (2020) significantly acknowledge the climate change vulnerability on national sectors including agriculture, energy, and urban areas, especially through impacts on water resources. The role that water and water-related activities play in national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

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

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

6.5.2 WASCA TN SUPPORTS SDG

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



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

SDG GOAL 6

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

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

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

Indicators considered for district and Block level vulnerability assessment of WASCA TN which is also used in SDG India 2020-21 report (Table 20)

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

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

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

Percentage of rural population having improved source of drinking water

Percentage of ground water withdrawal against availability

Percentage of Blocks/Mandals/Talukas over-exploited

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

Percentage of degraded land over total land area

Percentage increase in area of desertification

The indicators used for district level vulnerability assessment along with its linked SDGs are already tabulated in (Table 2). The detailed proposed water actions in CWRM which was assessed based on the vulnerability dimensions are linked with climate vulnerability index and SGDs are tabulated in Table 21, 22, & 23.

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

Name of the work	No. of CWRM works	CVI Impacting (WASCA TN)	Linked SDG Goal
Contour Continuous Bunds (CCB) for Afforestation area (m)	341	W3	SDG 1,2, 6,13&15
Composting (No. of units)	411	W1	SDG1& 6
Afforestation in Public/common lands (ha)	412	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community) (ha)	306	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	115	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (Km)	8	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation (ha)	764	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	72	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (Km)	10	C1,C2,C3,W3,S2	SDG 1, 6&13
Nursery Development (No. of units)	38	C1,S2,S4	SDG 1,2 &6

Restoration of water bodies: PWD and Tanks (No.)	121	S2, S1	SDG 6, 1, 13
Restoration of water bodies: Ponds (No.)	0	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	217	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	1,529	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (DLT) (m)	72	W1,W3,W4	SDG1 & 6

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

Name of the Work	Number of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	376	A1,A3,W1,W3	SDG 1,2&6
Micro-irrigation (ha)	47	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	524	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	1,271	W1,W5,A1,A3,S2,S4	SDG 2, 6&
15	458	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Dry land horticulture/Agro-forestry Individual (ha)	2,120	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	1,525	A3,A4,S4	SDG 1& 2
NADEP vermi compost (No. of units)	1,545	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	149	A3, S4	SDG 1& 2, 15
Cattle shelters (No. of units)	1,698	S4	SDG 1& 2
Goat/sheep shelters (No. of units)	986	S4	SDG 1& 2
Cattle trough (No. of units)	1,525	W5,S4	SDG 1& 2
Poultry shed (No. of units)	1,244	S2,S4	SDG 1& 2
Construction of new open wells & recharge shafts (No. of units)	1,497	S3,W5,W1	SDG 1,2 & 6

TABLE 23. WATER ACTIONS ON RURAL WATER MANAGEMENT & ITS LINKED SDG

Name of the work	No. of CWRM works	CVI	Linking SDG
Soak Pits (Community) (No. of units)	150	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	2,866	W3,S2	SDG 1& 6
Roof Rain Water Harvesting (No. of units)	925	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

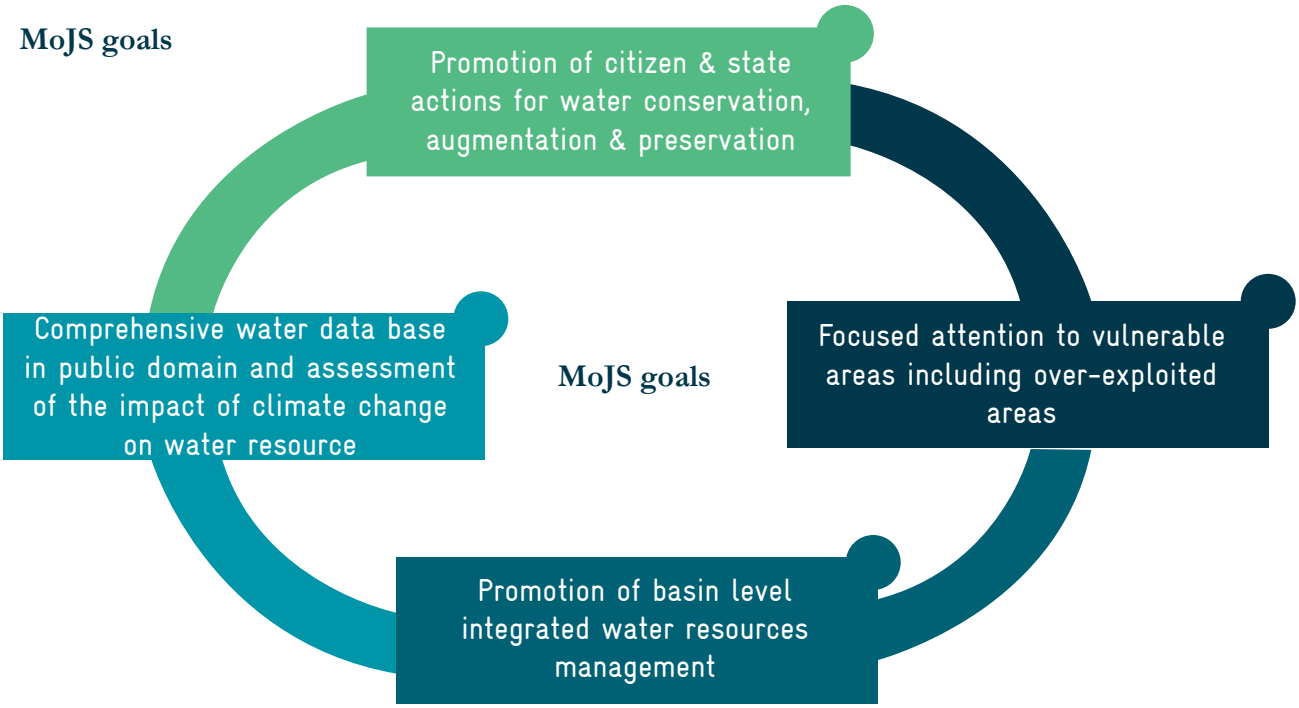
7 IMPLEMENTATION OF GP PLANS

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 identified first, the status of GIS based plans and total 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 integrating GP level GIS based plans, both NRM and Non NRM into Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of Polur Block is listed in Table 24 and work progress, expenditure during the past 3 financial years are shown in Figure 7.1 and 7.2. The Total No. of works, ongoing and completed GIS works are shown in Figure 7.3. The GP wise recommendations and works uploaded are given in Annexure 7.1.

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



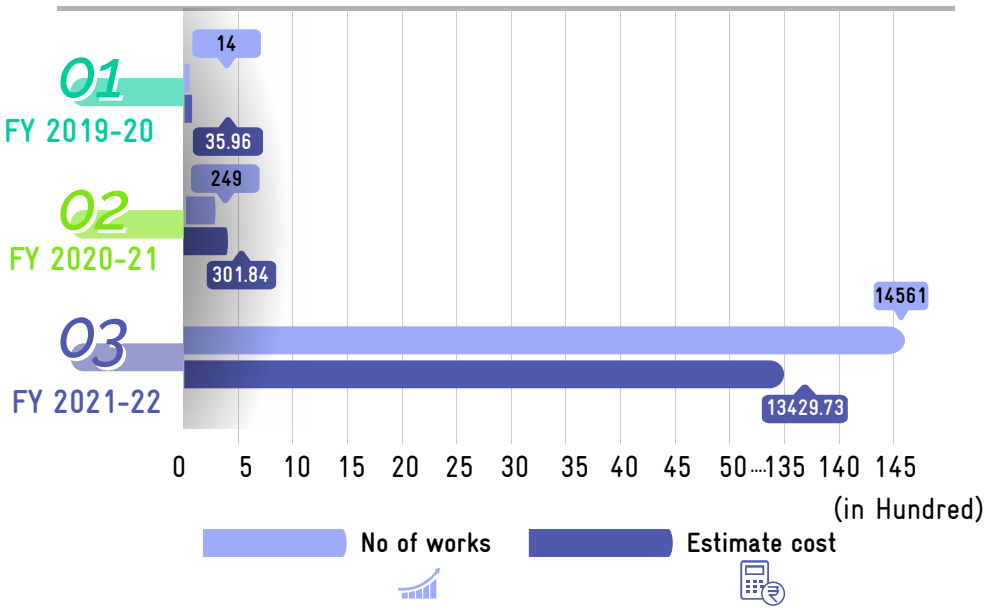


Figure 7.1. Work progress in last three years

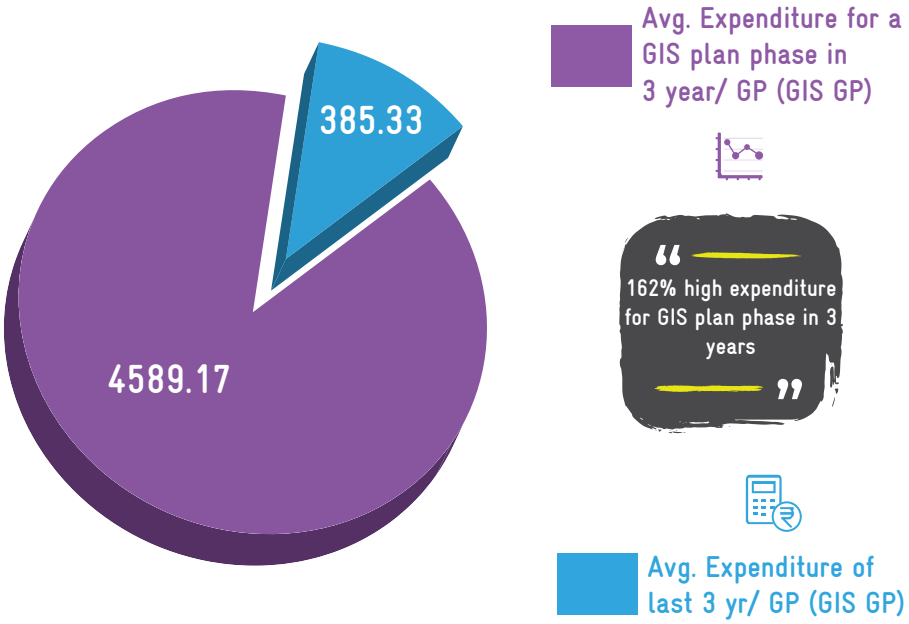
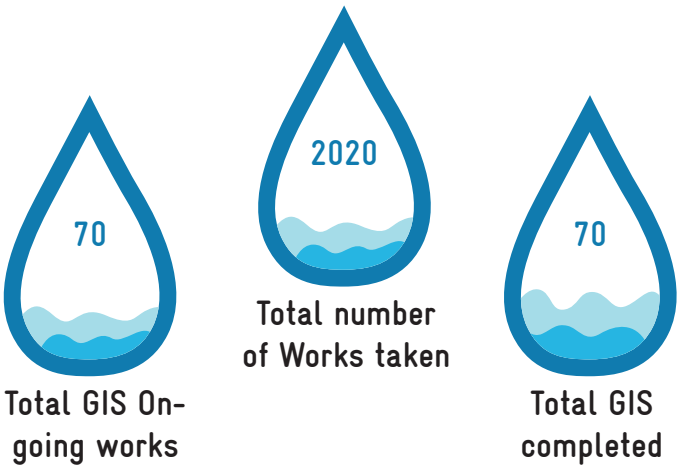


Figure 7.2. Average Expenditure for GIS plan in last three years



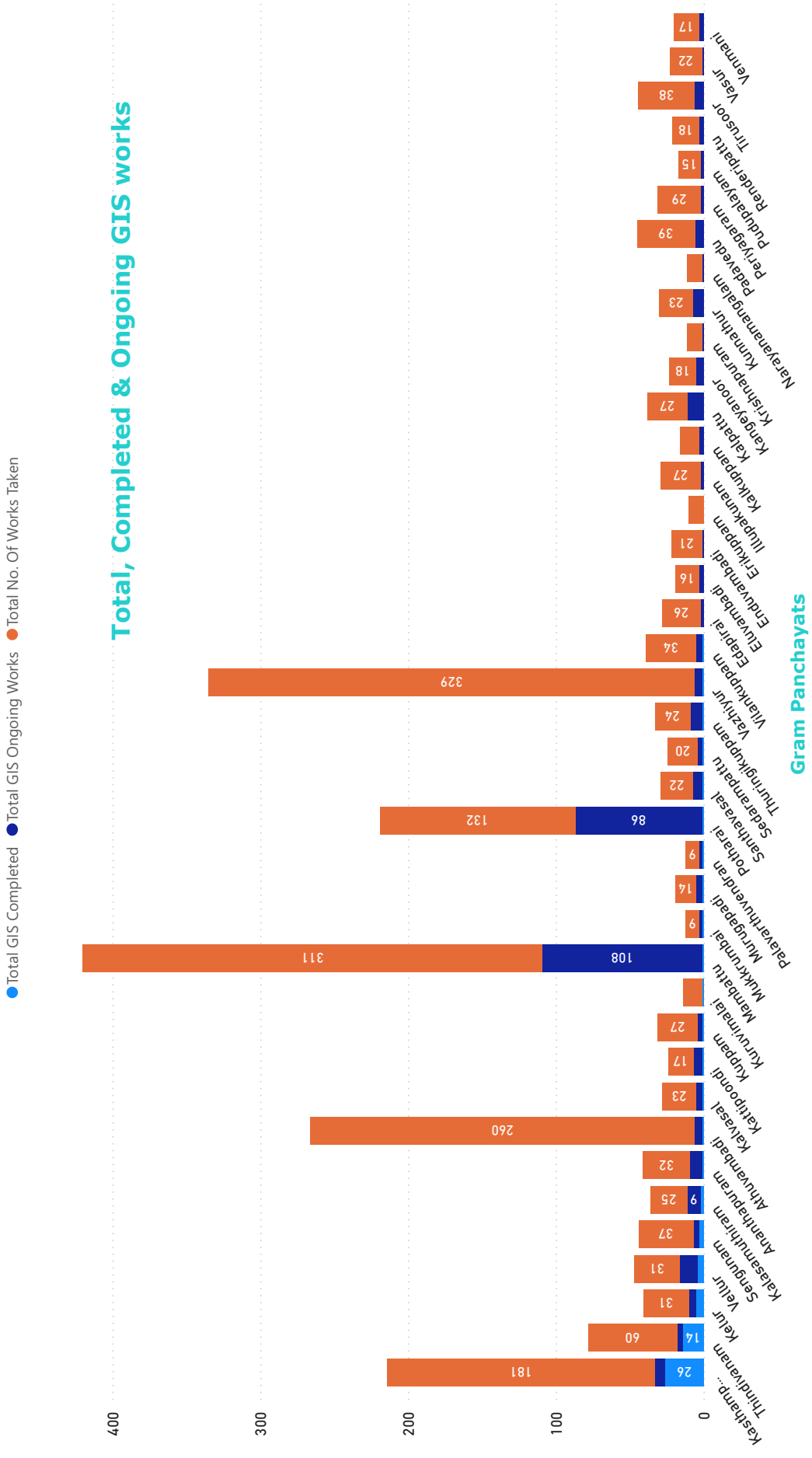
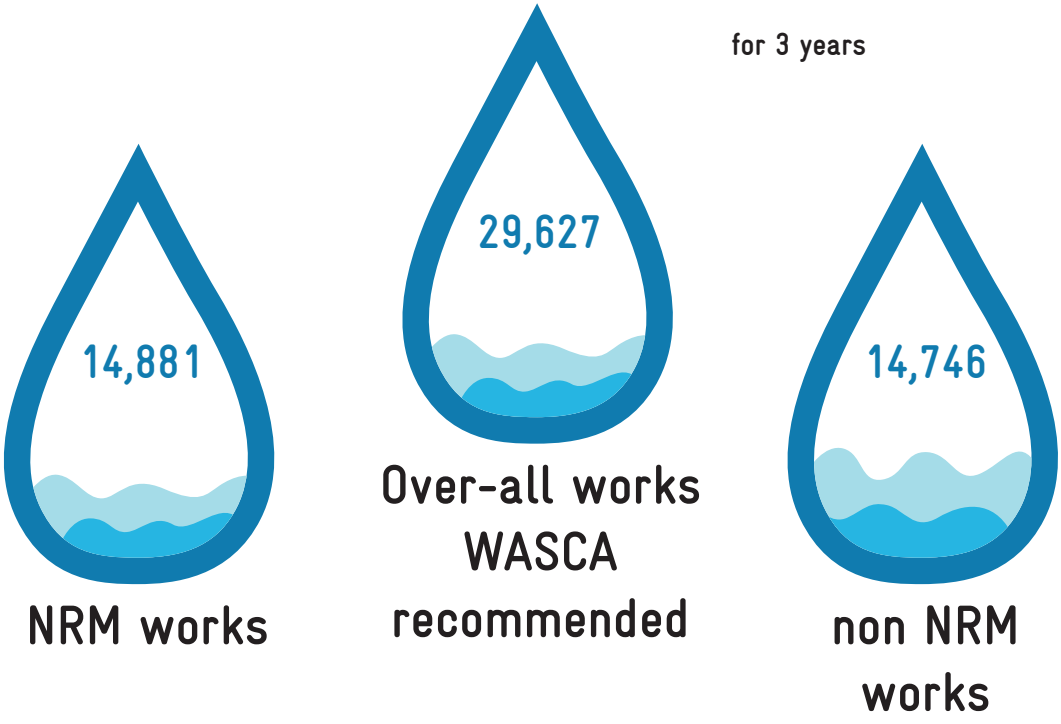


Figure 7.3. GP wise total, completed and ongoing GIS works

7.2 WASCA RECOMMENDED NRM AND NON-NRM WORKS

WASCA recommended 29,627 works for a period of 3 years, out of which 14,881 are NRM works and 14,746 are non NRM works (Figure 7.4). A total of 14,561 works has been uploaded so far for the financial year 2021-22 as on 07/01/2011.



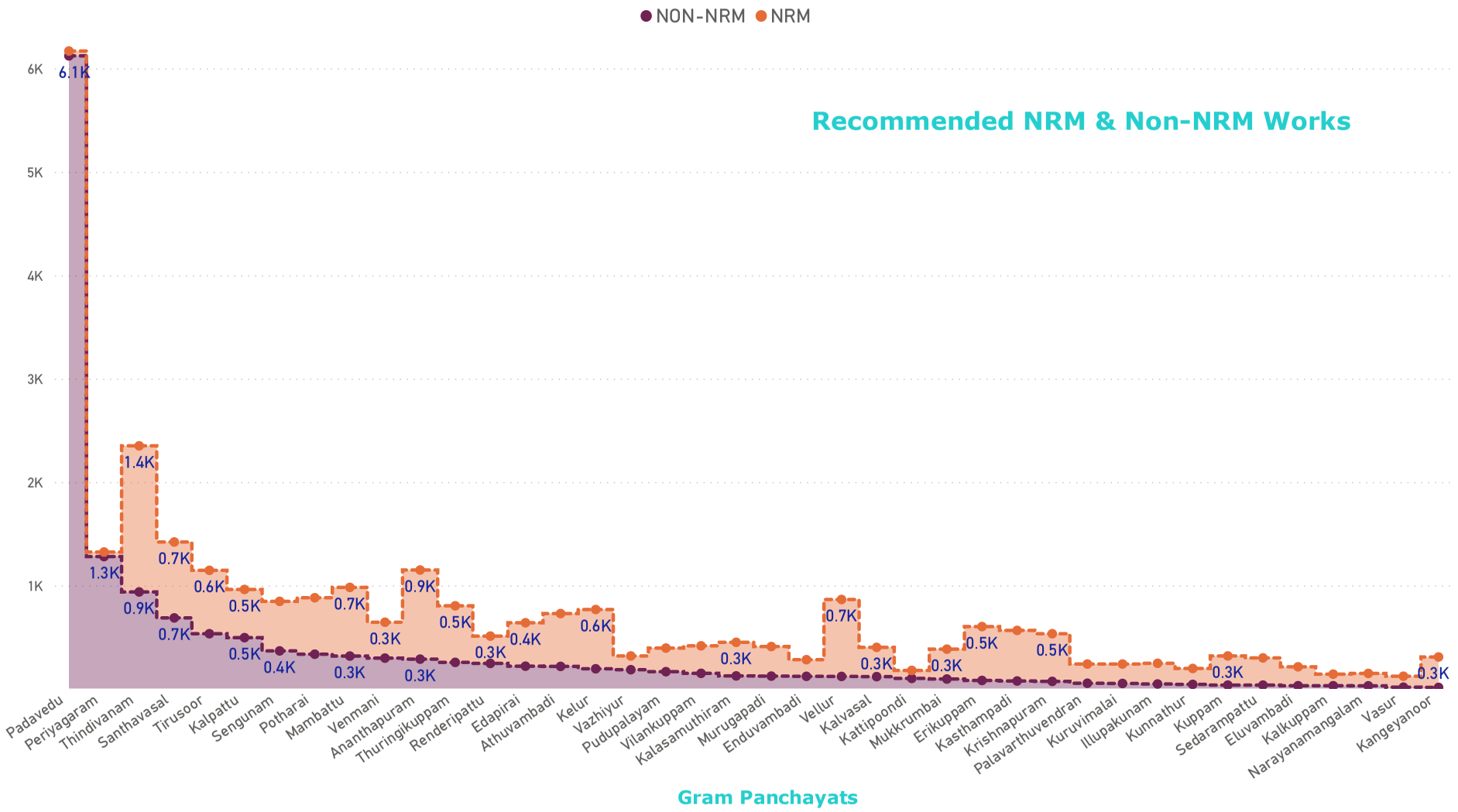


Figure 7.4. GP wise recommended NRM and non-NRM works

7.3 ONGOING WORKS

The ongoing works in Cheyyar Block include Anganwadi/Other Rural Infrastructure, Drought Proofing, Rural Connectivity, Rural Sanitation, WCWH, Works on Individuals Land (Category IV). A total of 47 works are ongoing, whereas WCWH shares the highest of 66 % followed by rural connectivity works of 17 %, while Individual beneficiary's category and land development s are less in number (Figure 7.5). The GPs and work category-wise details of works are tabulated in the Annexure 7.2.

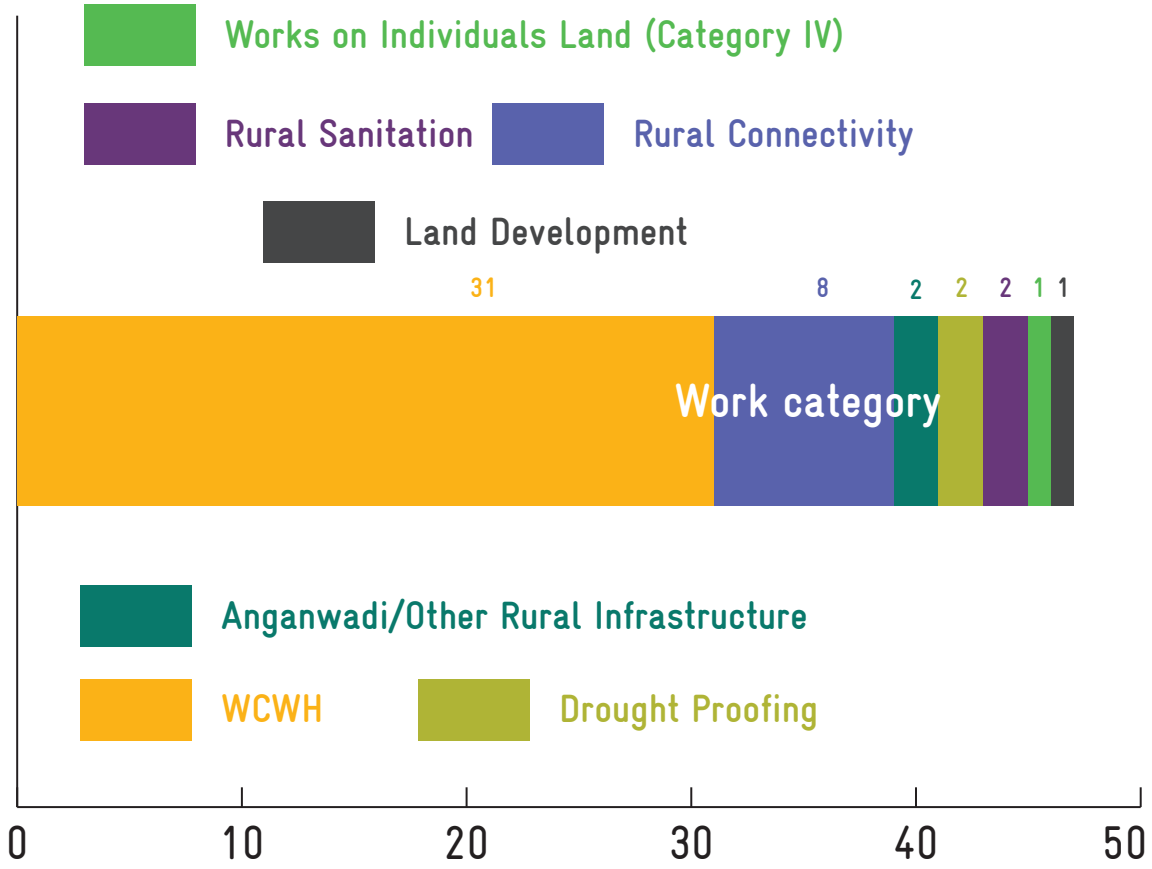


Figure 7.5. Work category-wise ongoing works in Polur Block

7.4 CATCH THE RAIN

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

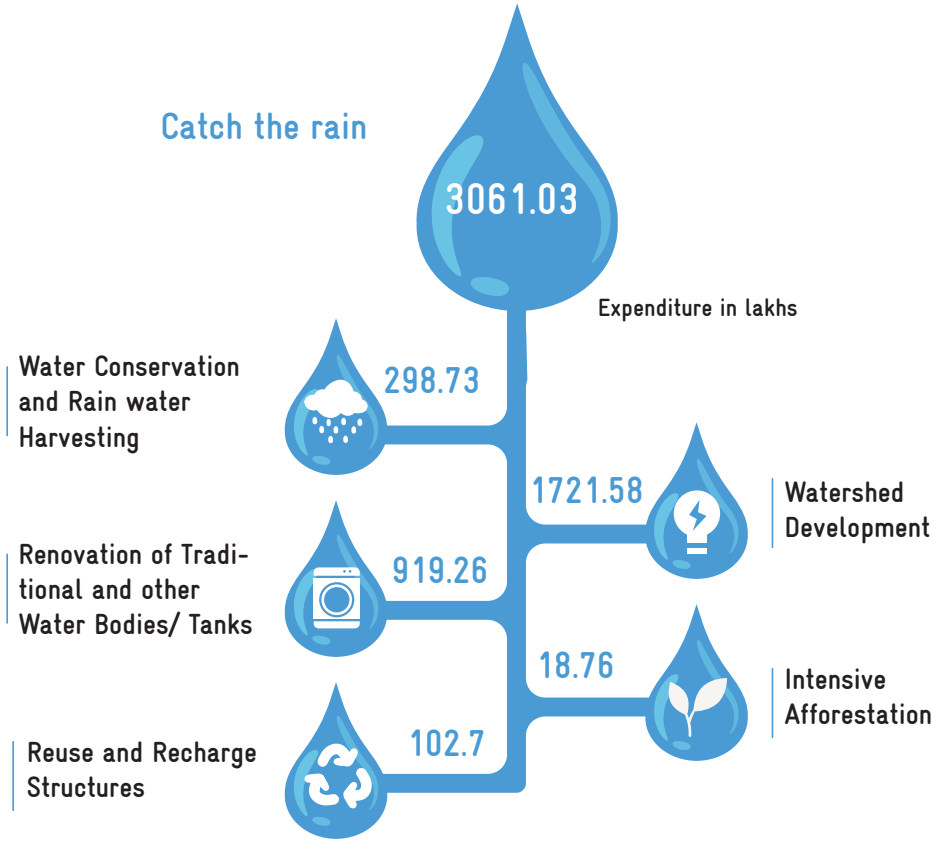
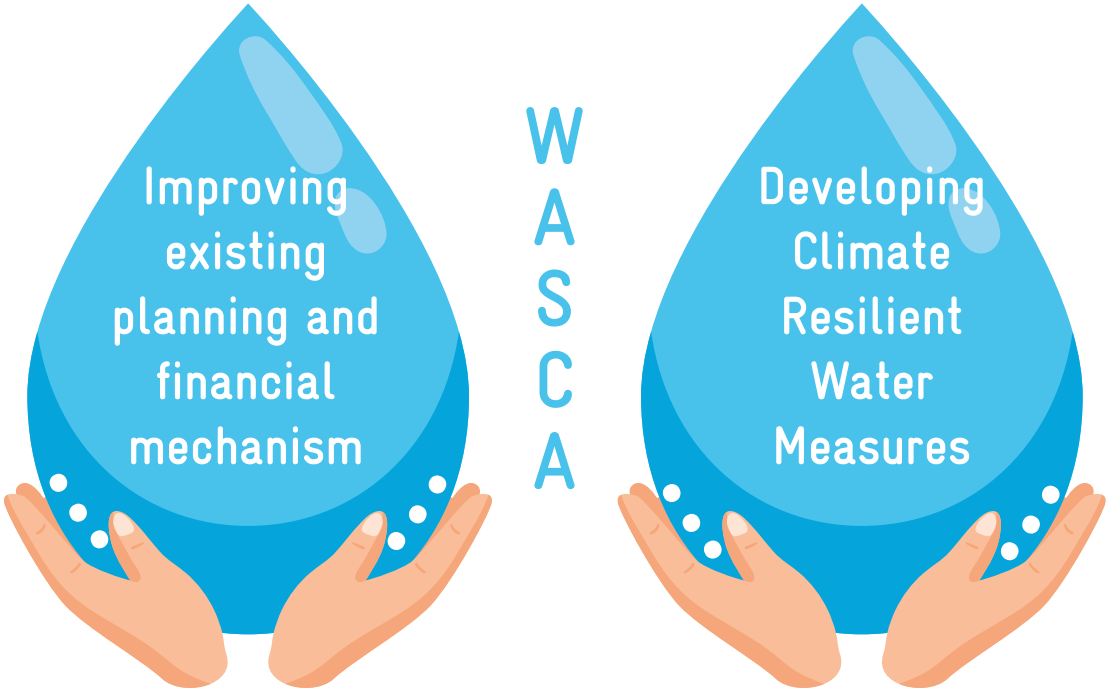


Figure 7.6. Catch the rain campaign in Polur



தானம் தவம்இரண்டும் தங்கா வியன்உலகம்
வானம் வழங்கா தெனின்

குறள் - 19

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

Thirukkural - 19

CHAPTER 8

8 CASE STUDY

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

8.1 MACRO-WATERSHEDS IN POLUR BLOCK

Polur Block area is drained by two rivers with two sub-basins namely Cheyyar and Naganadi Watersheds. The Cheyyar River watershed (4C2A4) consists of 70 micro-watersheds covering an area of 39,433 ha. The Naganadi watershed (4C2A5) consists of 40 micro-watersheds covering an area of 15,926 ha (Table 25). Out of the 40 GPs in the Block, 29 GPs fall under Cheyyar River (4C2A4) Watershed, 10 GPs under Naganadi Watershed (4C2A5) and one GP having both watershed boundaries passing through them (Table 26).

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

Macro-watershed	Area in ha	No. of Micro-watershed
Cheyyar	39,433	70
Naganadi	15,926	40

TABLE 27. WATERSHED COVERING NUMBER OF GPS IN ANAKAVOOR BLOCK

Watershed Name	No. of GPs
Cheyyar	29
Naganadi	10
Cheyyar and Naganadi	1

The map below shows the boundary of Cheyyar River and Naganadi Watershed boundaries on Polur Block boundary (Figure 8.1, 8.2). The micro-watershed-based works are identified using Basin, Sub-basin, and Micro-watershed with GP administrative boundaries through Composite Water Resources Management plan approach. The ridge map of Macro-watershed and GPs in Polur Block are shown in Figures 8.3 and 8.4.

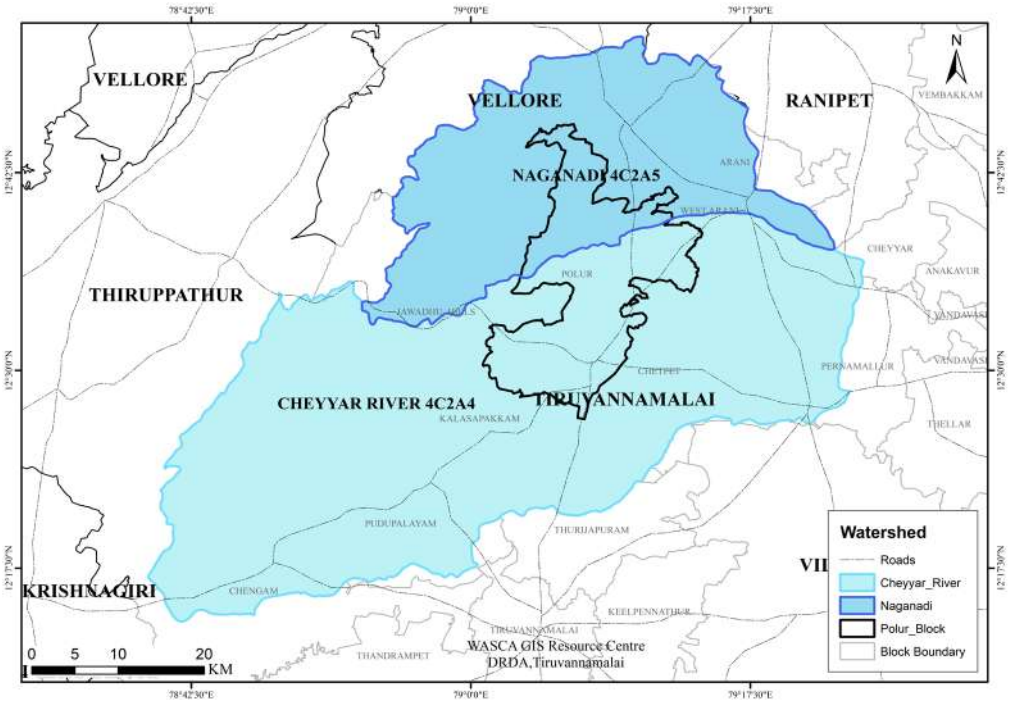


Figure 8.1. Macro-watershed map - Polur Block

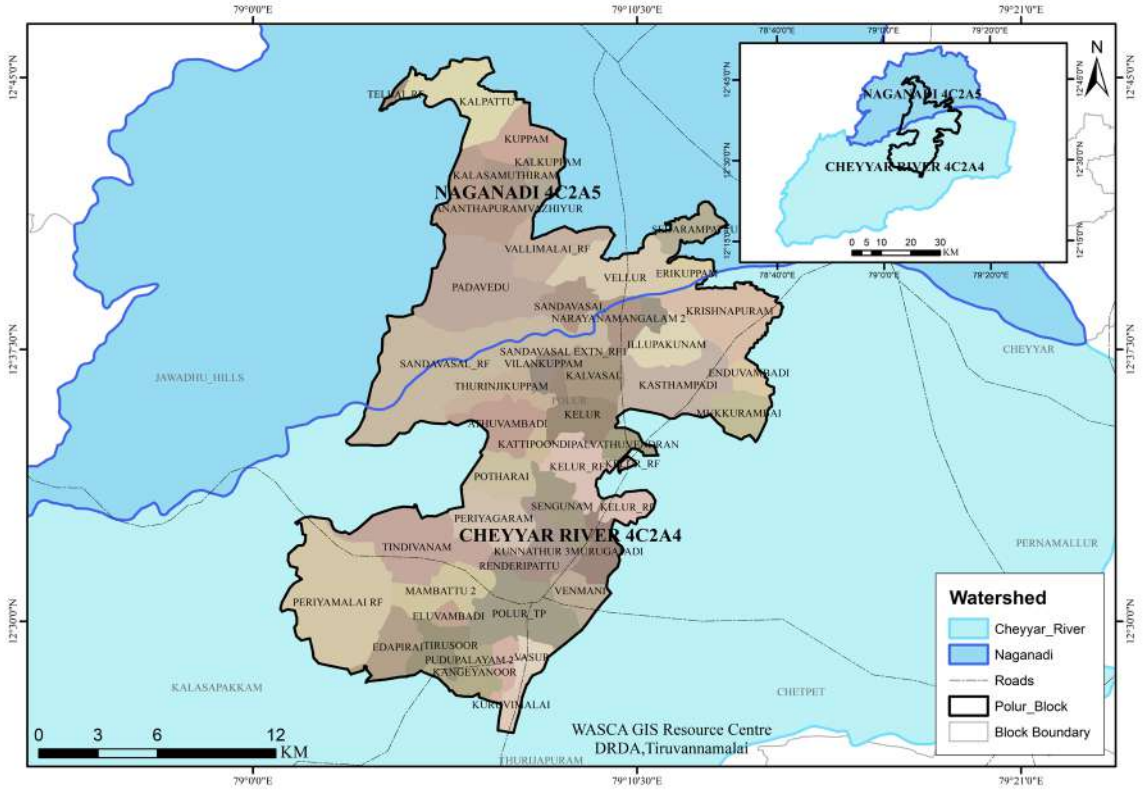


Figure 8.2. Macro-watershed with GPs -Polur Block

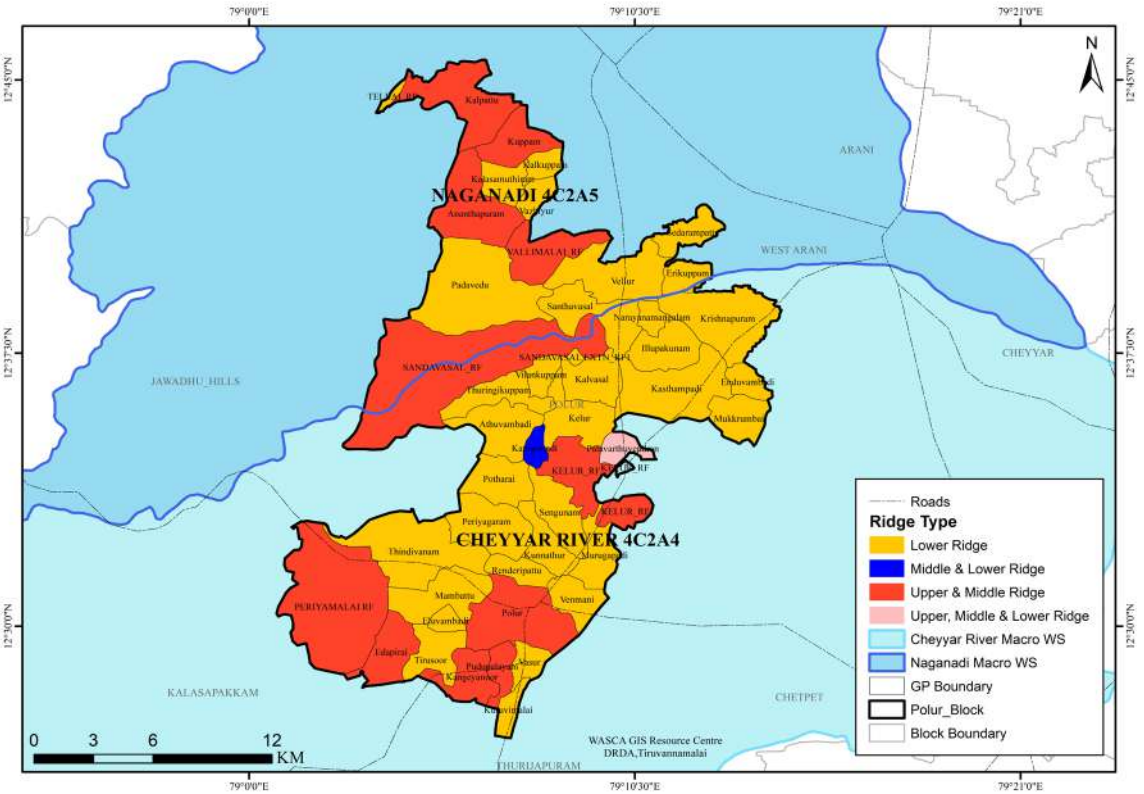


Figure 8.3. Macro-watershed ridge map-Polur Block

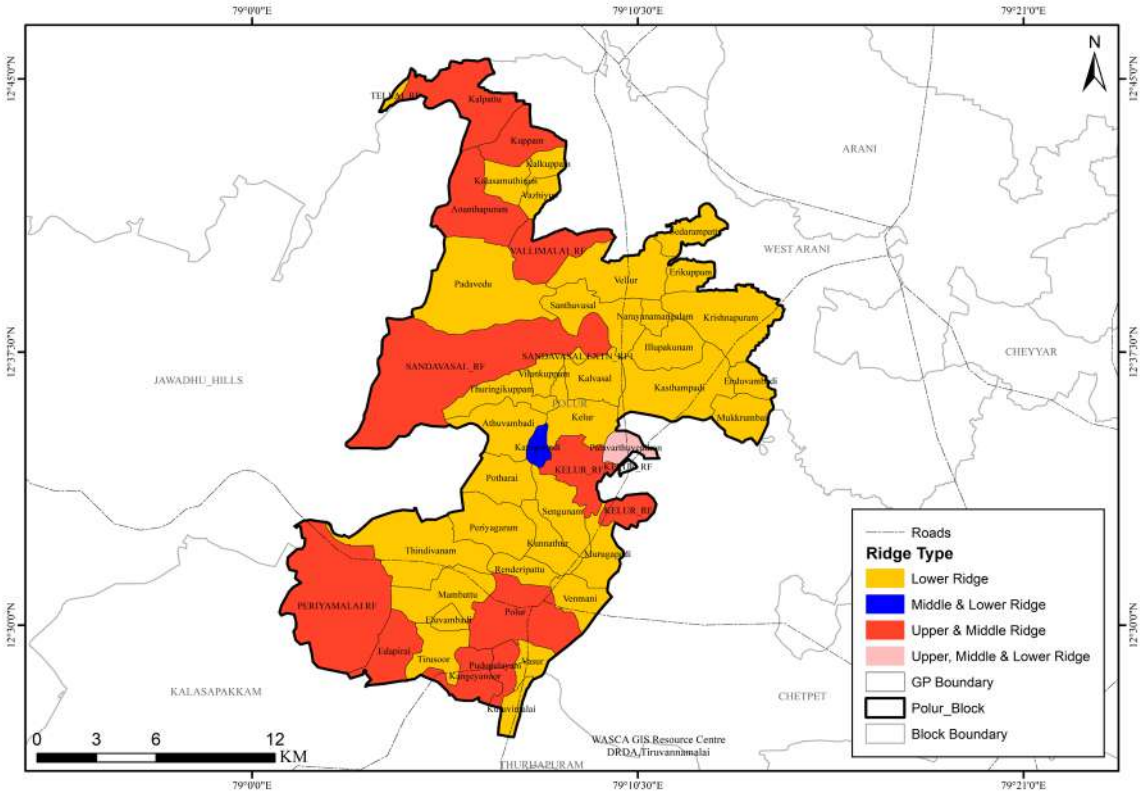


Figure 8.4. GP level ridge map- Polur Block

All the proposed works are identified using basin, sub-basin, and micro-watershed with GP administrative boundaries through Composite Water Resources Management plan approach. The ridge details, GPs proposed works in all macro-watersheds in Polur Block are listed in Table 27 to Table 34.

TABLE 27. RIDGE DETAILS OF MICRO-WATERSHED IN POLUR BLOCK FALLING UNDER NAGANADI MACRO-WATERSHED

Sl. No	Micro-watershed Code	Area in ha	Ridge type
1	4C2A5c10b	181.17	Upper, Middle & Lower
2	4C2A5b09c	313.01	
3	4C2A5b09a	646.55	
4	4C2A5b11c	383.29	
5	4C2A5b11b	482.91	
6	4C2A5b11a	698.13	
7	4C2A5b13c	364.79	
8	4C2A5b12a	461.1	
9	4C2A5b12b	348.04	
10	4C2A5d03b	711.22	
11	4C2A5b06d	434.32	
12	4C2A5d02a	340.07	
13	4C2A5d03a	198.69	
14	4C2A5d02b	542.87	
15	4C2A5d05a	319.63	
16	4C2A5d02c	657.1	
17	4C2A5d05b	450.59	
18	4C2A5d05c	544.89	

19	4C2A5d04c	507.69	Upper, Middle Ridge
20	4C2A5d09a	420.67	
21	4C2A5d07a	614.9	
22	4C2A5d07b	489.08	Upper, Middle Ridge
23	4C2A5c05c	16.19	Lower
24	4C2A5c10c	439.88	
25	4C2A5c05b	60.32	
26	4C2A5b09d	204.16	
27	4C2A5b07d	297.31	
28	4C2A5b13b	445.17	
29	4C2A5b01a	245.65	
30	4C2A5b13a	291.63	
31	4C2A5b10d	319.95	
32	4C2A5b06a	365.61	
33	4C2A5d03c	332.68	
34	4C2A5d01a	298.06	
35	4C2A5d01b	407.12	
36	4C2A5a06c	405.86	
37	4C2A5d04b	621.42	
38	4C2A5d01d	359.18	
39	4C2A5d01c	262.05	
40	4C2A5d04a	443.44	

TABLE 28 GPs FALLING UNDER CHEYYAR MACRO-WATERSHED

Sl.No	GP	Ridge type
1	Ananthapuram	Upper & Middle
2	Kuppam	
3	Kalpattu	
4	Vallimalai_ RF	
5	Kalkuppam	Lower
6	Kalasamuthiram	
7	Padavedu	
8	Vazhiyur	
9	Sedarampattu	
10	Vellur	
11	Erikuppam	
12	Tellai_ RF	

LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER NAGANADI MACRO-WATERSHED IN POLUR BLOCK

Work wise Details of Cheyyar in Anakkavoor Block			
Sl. No.	**Proposed work**	**Ridge type**	**Extent**
1	Afforestation in Public/common lands (ha.)	Upper	477
2	Drainage Line Treatment (m)		1,06,221

3	CC Check dams (No.)	Middle	22
4	Block Plantation (Community) (ha.)		154
5	Silvi-pasture Development (ha.)		7
6	Avenue plantation (m)		25,693
7	Mini Forest (ha.)		20
8	Composting (No.)	Lower	185
9	Canal Bund Plantation (m)		22,304
10	Restoration of water bodies: Tanks and Ooranis (No.)		24
11	Artificial Recharge Structure (No.)		1,311
12	Farm Bunding with Boundary Trenches - Individual (ha.)		332
13	Construction of Farm Ponds - Individual (No.)		221
14	Land development - Individual (ha.)		846
15	Azolla units - Individual (No.)		1,494
16	NADEP Vermi compost (No.)		1,494
17	Cattle Shelters (No.)		1,494
18	Goat Sheep Shelters (No.)		371
19	Cattle Trough (No.)		1,494
20	Soak Pits (Community) (No.)		116
21	Soak Pits (Individual) (No.)		1,603
22	Roof Rain Water Harvesting (No.)		20
23	Nutri Garden (No.)		2,313
24	Silt application (No.)		339

TABLE 30. MICRO-WATERSHED IN POLUR BLOCK FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED

Sl.No	Micro-watershed Code	Area in ha	Type of Ridge
1	4C2A4a19c	424.85	Upper, Middle,& Lower
2	4C2A4a19a	757.84	
3	4C2A4a22b	504.71	
4	4C2A4a19b	317.48	
5	4C2A4a22c	837.58	
6	4C2A4a23c	754.96	
7	4C2A4a11b	388.94	
8	4C2A4a20a	568.75	
9	4C2A4a12b	510.68	
10	4C2A4a08c	468.34	
11	4C2A4a09c	231.71	
12	4C2A4d06c	307.15	
13	4C2A4d08b	720.98	
14	4C2A4e11c	430.83	
15	4C2A4d07c	404.93	
16	4C2A4d07b	489.4	
17	4C2A4d07a	411.35	

18	4C2A4d05b	679.18	Upper, Middle,& Lower
19	4C2A4e11a	874.53	
20	4C2A4d01a	478.71	
21	4C2A4e01b	604.08	
22	4C2A4e01a	771.24	
23	4C2A4e01c	276.05	
24	4C2A4d05c	399.96	
25	4C2A4d01c	447.73	
26	4C2A4d09b	581.45	Upper, Middle
27	4C2A4d09c	604.1	
28	4C2A4a20b	511.94	Middle, Lower
29	4C2A4e11b	980.78	
30	4C2A1e08a	885.67	Lower
31	4C2A1d13b	971.32	
30	4C2A4a17c	654	
31	4C2A4a18c	618.32	
32	4C2A4a16c	482.36	
33	4C2A4a17a	797.48	
34	4C2A4a17b	246.69	
35	4C2A4a15b	411.13	
36	4C2A4a22a	546.88	
37	4C2A4a18b	722.44	
38	4C2A4a05c	594.74	
39	4C2A4a06b	302.28	
40	4C2A4a18a	503.33	
41	4C2A4a06c	502.04	
42	4C2A4a11c	393.41	
43	4C2A4a23d	308.42	
44	4C2A4a11a	988.17	
45	4C2A4a23a	541.42	
46	4C2A4a07c	342.13	
47	4C2A4a20c	864.04	
48	4C2A4a21c	282.82	
49	4C2A4d06b	836.72	
50	4C2A4d08a	497.1	
51	4C2A4a21b	268.83	Lower
52	4C2A4a21a	617.83	
53	4C2A4a10b	817.64	
54	4C2A4d08c	611.21	
55	4C2A4a08b	590.8	
56	4C2A4d06a	627.17	
57	4C2A4a09b	353.33	
58	4C2A4a10c	822.2	
59	4C2A4a09a	562.93	
60	4C2A4b09c	812.09	
61	4C2A4a10a	576.61	

62	4C2A4d05a	633.87	Lower
63	4C2A4d04a	813.94	
64	4C2A4c01a	644.56	
65	4C2A4d01b	281.01	
66	4C2A4d04b	432.85	
67	4C2A4c02a	1080.84	
68	4C2A4d02a	540.45	
69	4C2A4c02b	517.21	
70	4C2A4a16d	651.04	

TABLE 31. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED IN POLUR BLOCK

S No	GP Name	Ridge type
1	Palvathuvendran	Upper, Middle & Lower
2	Edapirai	Upper & Middle
3	Pudupalayam	
4	Periyamalai RF	
5	Kangeyanoor	
6	Polur_TP	
7	Kelur_ RF	
8	Kattipoondi	Middle & Lower
9	Sandavasal_RF	Lower
10	Narayanamangalam	
11	Renderipattu	
12	Athuvambadi	
13	Eluvambadi	
14	Venmani	
15	Kelur	
16	Sengunam	
17	Tirusoor	
18	Kunnathur	
19	Kuruvimalai	
20	Murugapadi	
21	Illupakunam	Lower
22	Vasur	
23	Kasthampadi	
24	Kalvasal	
25	Potharai	
26	Periyagaram	
27	Mambattu	
28	Mukkurambai	
29	VIlankuppam	
30	Krishnapuram	
31	Thurinjikuppam	
32	Enduvambadi	
33	Tindivanam	

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

Sl. No.	Proposed work	Ridge type	Extent
1	Afforestation in Public/common lands (ha.)	Upper	1,998
2	Drainage line treatment (m)		1,25,649
3	CC Check dams (No.)	Middle	25
4	Block Plantation (Community) (ha.)		418
5	Silvi-pasture Development (ha.)		50
6	Avenue plantation (m)		34,408
7	Mini Forest (ha.)		12.33
8	Composting (No.)	Lower	236
9	Canal Bund Plantation (m)		30,358
10	Restoration of water bodies: Tanks and Ooranis (No.)		93
11	Artificial Recharge Structure (No.)		2,596
12	Farm Bunding with Boundary Trenches - Individual (ha.)		1,014
13	Construction of Farm Ponds - Individual (No.)		460
14	Land development - Individual (ha.)		2,703
15	Azolla units - Individual (No.)		1,808
16	NADEP Vermi compost (No.)		1,808
17	Cattle Shelters (No.)		1,808
18	Goat Sheep Shelters (No.)		399
19	Cattle Trough (No.)		1,808
20	Soak Pits (Community) (No.)		201
21	Soak Pits (Individual) (No.)		1,783
22	Roof Rain Water Harvesting (No.)		58
23	Nutri Garden (No.)		4,064
24	Silt application (No.)		1,081

TABLE 33. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER NAGANADI AND CHEYYAR RIVER MACRO-WATERSHED IN POLUR BLOCK

Sl.No	Gram Panchayat	Ridge Type
1	Sandavasal	Lower
2	Sandavasal_ RF	Upper & Middle

TABLE 34. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER NAGANADI AND CHEYYAR RIVER MACRO-WATERSHED IN POLUR BLOCK

Sl. No.	Proposed work	Ridge type	Extent
1	Afforestation in Public/common lands (ha)	Upper	2
2	Drainage Line Treatment (m)		15,755
3	CC Check dams (No.)	Middle	2
4	Block Plantation (Community) (ha.)		6
5	Avenue plantation (m)		5,528

6	Composting (No.)	Lower	16
7	Restoration of water bodies: Tanks and Ooranis (No.)		4
8	Artificial Recharge Structure (No.)		182
9	Farm Bunding with Boundary Trenches - Individual (ha.)		18.42
10	Construction of Farm Ponds - Individual (No.)		18
11	Land development - Individual (ha.)		25
12	Azolla units - Individual (No.)		212
13	NADEP Vermi compost (No.)		212
14	Cattle Shelters (No.)		212
15	Goat Sheep Shelters (No.)		49
16	Cattle Trough (No.)		212
17	Soak Pits (Community) (No.)		3
18	Soak Pits (Individual) (No.)		61
19	Roof Rain Water Harvesting (No.)		2
20	Nutri Garden (No.)		69
21	Silt application (No.)		10

8.2 KALPATTU MICRO-WATERSHED POLUR BLOCK, TIRUVANNAMALAI DISTRICT

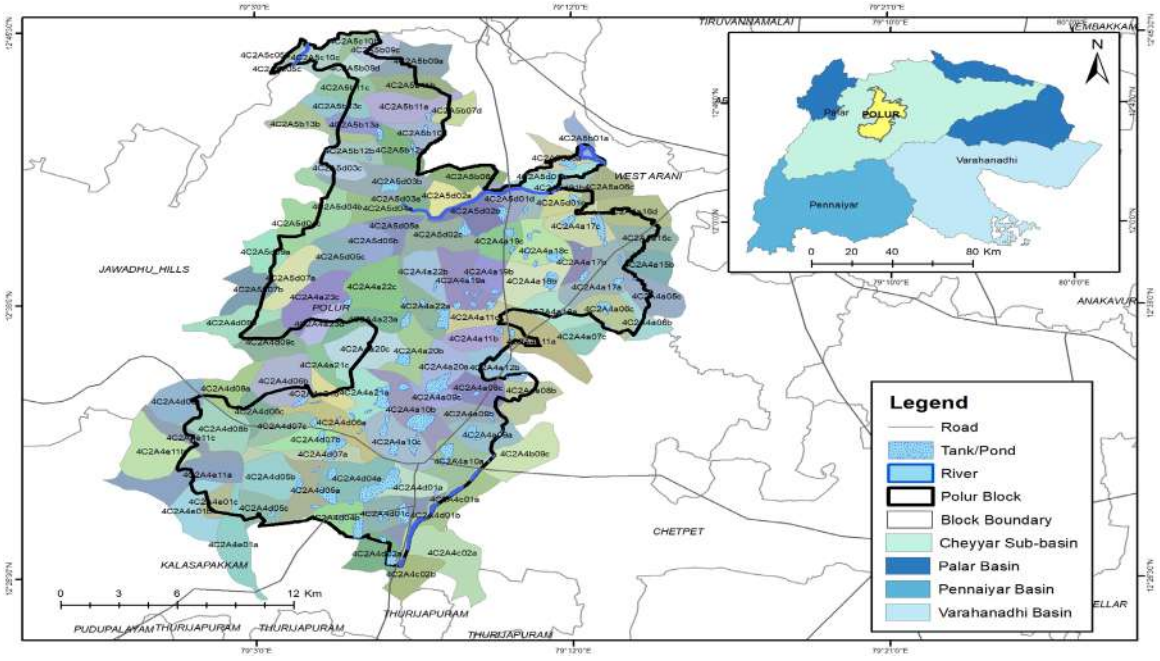


Figure 8.5. Micro-watershed map- Polur Block

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.

KALPATTU MICRO-WATERSHED

Kalpattu Micro-watershed falls under Kalpattu and Kattukkanallur GP of Polur Block Tiruvannamalai District (Figure 8.6). This Micro-watershed is the part of Naganadhi Macro-watershed in Cheyyar sub-basin. The general information, geology, hydrogeology, natural drainage line, catchment area, ground water status, water budget of Kalpattu Micro-watershed is given below in separate sections followed by proposed works, ridge wise proposed treatment area, estimated cost, required person days and key outcomes from Table 35 to 45 and in Figure 8.7. The key CWRM parameters for the GPs falling in this micro-watershed is annexure 8.

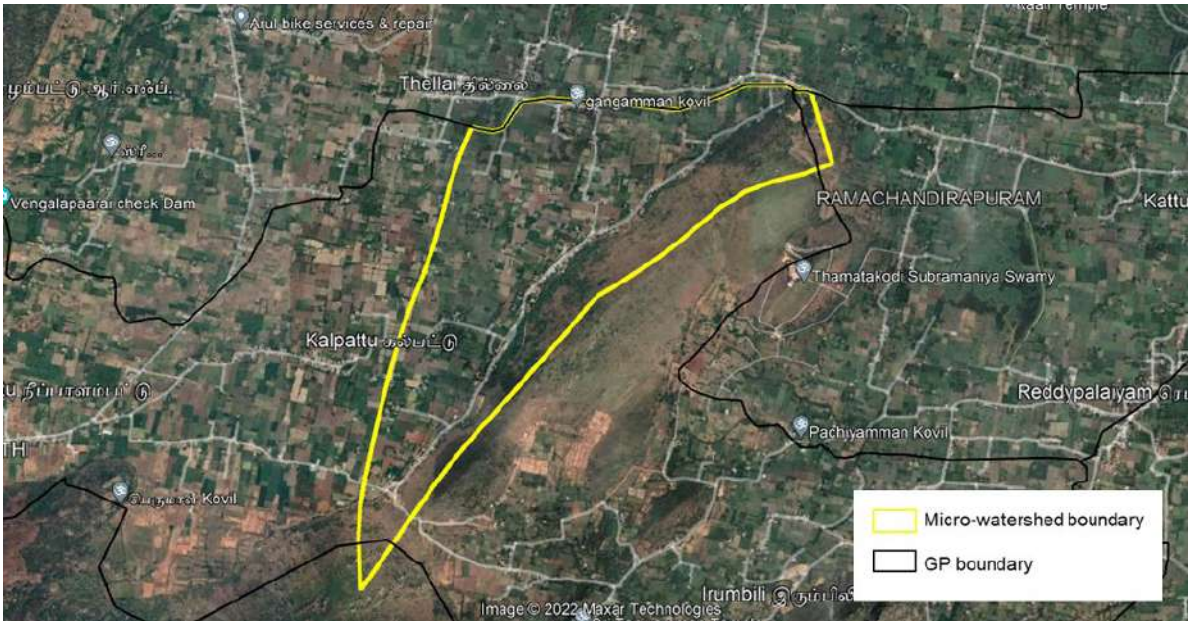


Figure 8.6. Kalpattu micro-watershed shed

TABLE 35. GENERAL INFORMATION OF THE MICRO-WATERSHED

Description	Name/ No./ Quantity/ Status
Name of the micro-watershed	**Kalpattu watershed**
Micro-watershed No.	**4C2A5c10b**
Name of the Basin	Palar Basin
Name of the Sub-Basin	Cheyyar Sub-Basin
Name of the macro-watershed	Naganadhi
No. of GPs covered under the micro-watershed	2
Name of the GPs	Kattukkanallur & Kalpattu
Latitude of micro-watershed (From To)	12°44'42.17"N to 12°45'20.80"N
Longitude of micro-watershed (From To)	79° 5'21.07"E to 79° 6'28.45"E
Total area of the micro-watershed in ha	181.32
Percentage of micro-watershed area in Kalpattu GP	98.5
Percentage of Micro-watershed area in Kattukkanallur GP	1.5
Area of micro-watershed falling in Kalpattu GP in ha	178.69
Area of micro-watershed falling in Kattukkanallur GP in ha	2.63
Total population of Kattukkanallur GP	8,458
Total population of Kalpattu GP	4,266
Annual average rainfall in mm	1,047
Annual maximum Temperature in °C	33
Annual Minimum Temperature in °C	22.8
Annual maximum temperature (°C)	33°C
Annual Minimum temperature (°C)	22.8
Evapo-Transporation losses of Kattukkanallur GP (ha.m)	29.48
Evapo-Transporation losses of Kalpattu GP (ha.m)	40.12
Volumetric soil moisture availability (%)	23
Climate risk	Drought and heat waves

CVI value for Kattukkanallur (Based on WASCA climate study)	35.38 (High socio-economic vulnerability)
Agro-Climatic Zone	North eastern zone (TN-1)
Agro Ecological Sub-Region (ICAR)	Eastern Ghats
Status of Ground water in Kattukkanallur GP	Over Exploited
Status of Ground water in Kalpattur GP	Over Exploited

TABLE 36. GEOLOGY, HYDROGEOLOGY OTHER CHARACTERISTICS OF AKKUR MICRO-WATERSHED

Geology occurrence in % (Hard rock)	100%
Geology Quality	Moderate
Depth of weathered zone and/or maximum depth of fractures in Hard Rock area in meters	30 to 60
Bottom of the unconfined aquifer in soft rock areas in meters	20 to 40
Sheet Erosion	61 ha (Upper and Middle Ridge)

TABLE 37. GP WISE CATCHMENT AREA OF MICRO-WATERSHED

Catchment Area in ha	Kattukkanallur GP	Kalpattu GP
Good catchment area	164.26	55.26
Average catchment area	10.65	0
Bad catchment area	441.23	1,054.78

TABLE 38. GROUND WATER STATUS OF MICRO-WATERSHED

Firka Assessment Unit in ha.m	Kattukkanallur	Kalpattu
Name of the Firka (Assessment unit) falling under micro-watershed	Kannamangalam	Polur
Net annual ground water availability	1,295.93	2,290.89
Existing gross ground water draft for irrigation	1,624.8	1,687.6
Existing gross ground water draft for domestic and industrial water supply	63.92	75.58
Existing gross ground water draft for all uses	1,688.73	1,763.19
Provision for domestic and industrial requirement supply to 2025	72.66	85.91
Net ground water availability for future irrigation development	-401.53	517.38

TABLE 39. GP WISE WATER BUDGET OF MICRO-WATERSHED

Water Budget in ha.m Akkur GP	Kattukkanallur GP	Kalpattu GP
Water for Human	23.15	11.68
Water for Agriculture	257.9	656.8
Water for Animal	5.58	7.75
Village wise water required	286.6	676.3

Available run-off from rain water (derived from Strange method)	147.1	218
Harvested Runoff from Water Harvesting Activities	31.9	5.3
Potential harvesting from proposed Interventions	26.3	29.5
Total Water harvested	58.2	5.3
Water demand and Supply Difference	-228.4	-671
Water demand supply gap status	Deficient	Deficient
Per capita water availability in Cum	173.91	511.01
International Standard per capita water Availability in Cum	1,700	1,700
Water availability gap	-1,526.09	-1,188.99
Water security status	Water stress	Water stress

TABLE 40. GP WISE PROPOSED MICRO-WATERSHED WORKS CONCERN TO RIDGE TYPE

Proposed works in Ridge type	Kalpattu
Upper ridge	2
Middle ridge	1
Lower ridge	121
Total No. of works	124

TABLE 41. RIDGE-WISE TREATMENT AREA, ESTIMATED COST AND REQUIRED PERSON DAYS

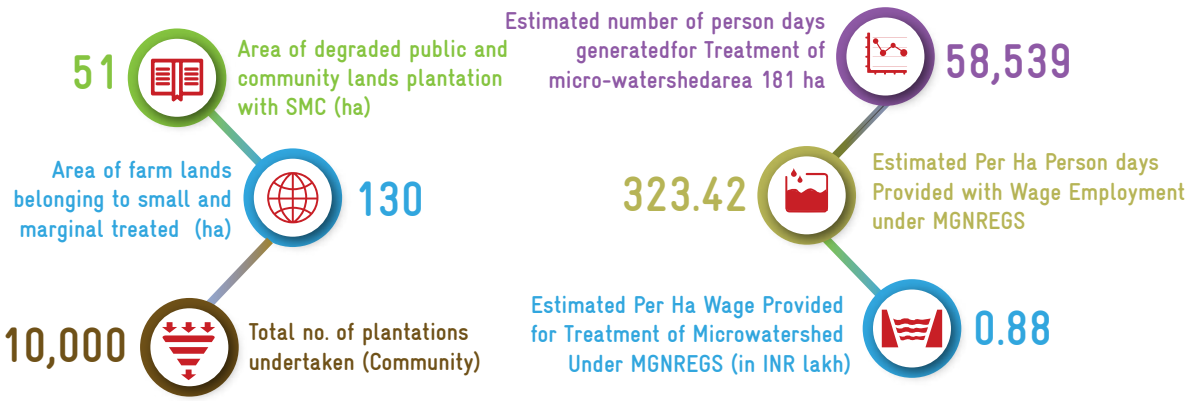
	Kalpattu GP
Upper Ridge	
Estimated cost in Kalpattu gp (inr in Lakhs)	35.97
Total area in ha	26
Treatment cost in (Lakhs/ha)	**1.38**
Estimated person days generated for treatment	**1**
Middle Ridge	
Estimated cost (INR in Lakhs)	49
Total area in ha	31
Treatment cost (INR in Lakhs)	**1.58**
Estimated Person days generated for treatment	**1**
Lower ridge	
Estimated cost (INR in Lakhs)	117
Total area in ha	124
Treatment cost (INR in Lakhs)	**0.94**
Estimated Person days generated for treatment	**48,463**

Kalpattu GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	1.38 lakh/ha	1
Middle Ridge	1.58 lakh/ha	1
Lower Ridge	0.94 lakh/ha	48,463
	3.9 lakh/ha	48,298

TABLE 42. NATURE AND NO. OF WORKS IN MICRO-WATERSHED

Description	No.
Arable, non-arable & DLT	69
livelihood activities	25
Rural greywater management activities	30

TABLE 43. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)

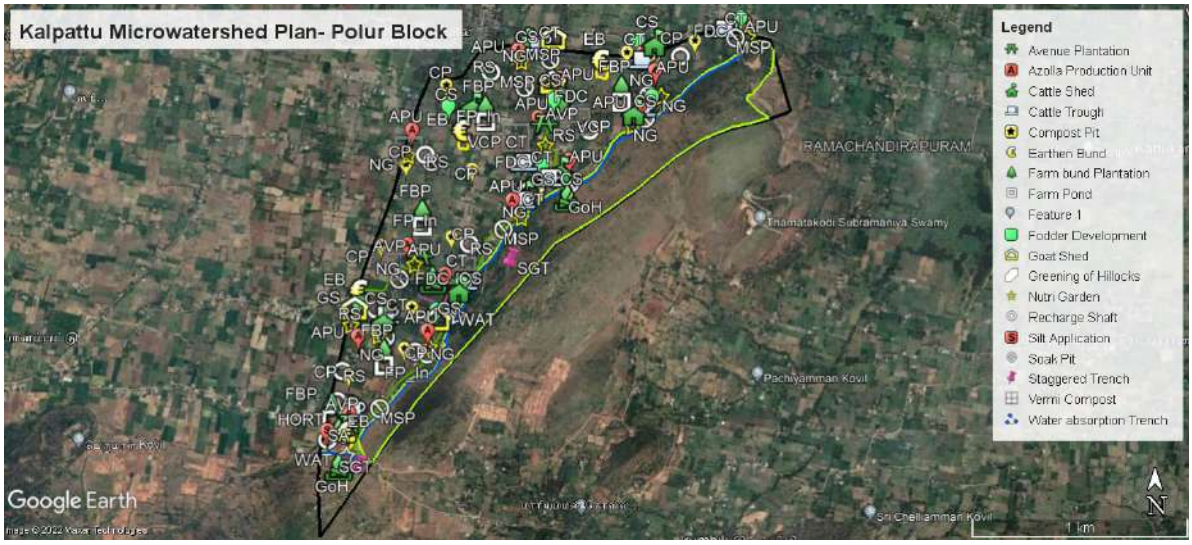
Kalpattu GP	109.3 lakh

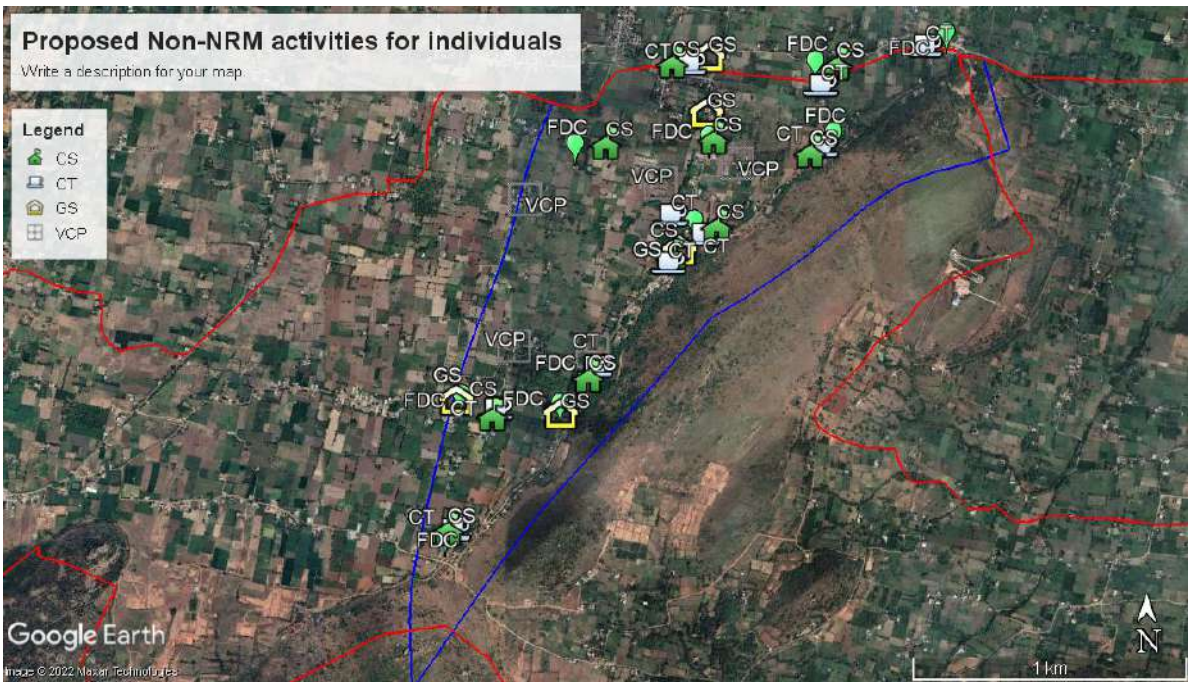
TABLE 44. ESTIMATES OF MICRO-WATERSHED IN KALPATTU GP

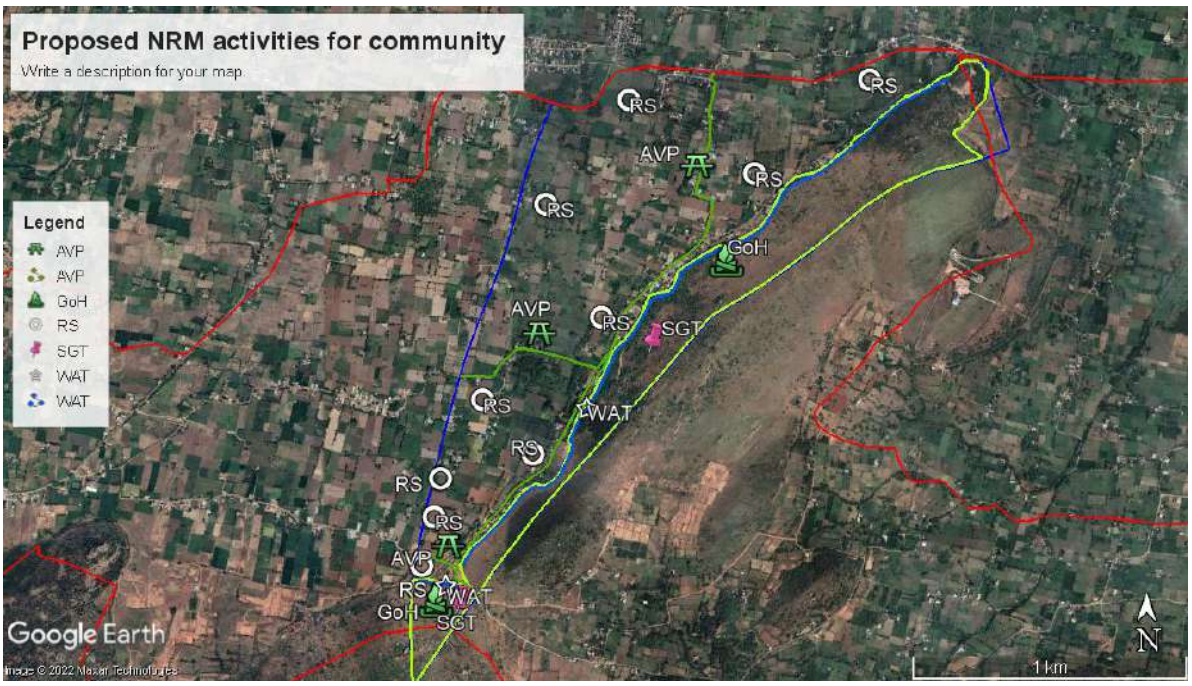
Name of the Work Proposed	Type of ridge	Status of work	Quantity (Area or No.)	No. of works as per KML	Estimate cost in Lakhs	Person days
NRM works in Public and Community Lands						
Staggered trench (No.)	Upper & middle	Not commenced	9,200	1	9.66	3168
Greening of Hillocks plantation and maintenance (No.)			9,200	1	26.31	3,758
Water absorption trench (m)	Middle		2,642	1	49	3,150
Avenue plantation (m)	Lower		3,135	3	5.643	2204
Compost pit (No.)			10	10	1.7	150
Sub total				16	91.86	12,430
Works in Individual farmer lands (Agriculture and allied activities) (No.)						
Azolla production units - Individual	Lower	Commenced	15	15	2.25	345
NADEP Vermi compost			5	5	0.9	135
Construction of farm ponds - Individual		Ongoing	5	5	10	3,905
Dryland Horticulture		Not commenced	5 2	2	17	6,642
Silt application			2	2		
Artificial recharge structure for borewell farmers			10	10	25	3,910
Farm bunding with boundary trenches - Individual (ha)			10 4	4	6	2,344
Fodder development – Individual			10	10	14.8	23,440
Sub total				53	75.95	40,721
Livelihood enhancement activities for Individual farmers (dryland) (No.)						
Cattle shelters (No.)	Lower	Commenced	10	10	21.2	3,310
Goat/sheep shelters (No.)			5	5	11.35	1,775
Cattle trough (No.)		Not commenced	10	10	0.5	60
Sub total				25	33.05	5,145
Rural greywater management (No.)						
Soak pits (Individual) (No.)	Lower	Ongoing	15	15	1.5	240
Nutri garden (No.)		Not commenced	15	15	0.15	3
Sub total				30	1.65	243
Grand Total				124	202.51	58,539

TOTAL NO. OF WORKS FOR AKKUR MICRO-WATERSHED DEVELOPMENT (GP WISE)

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Kalpattu GP	124	202.51	243







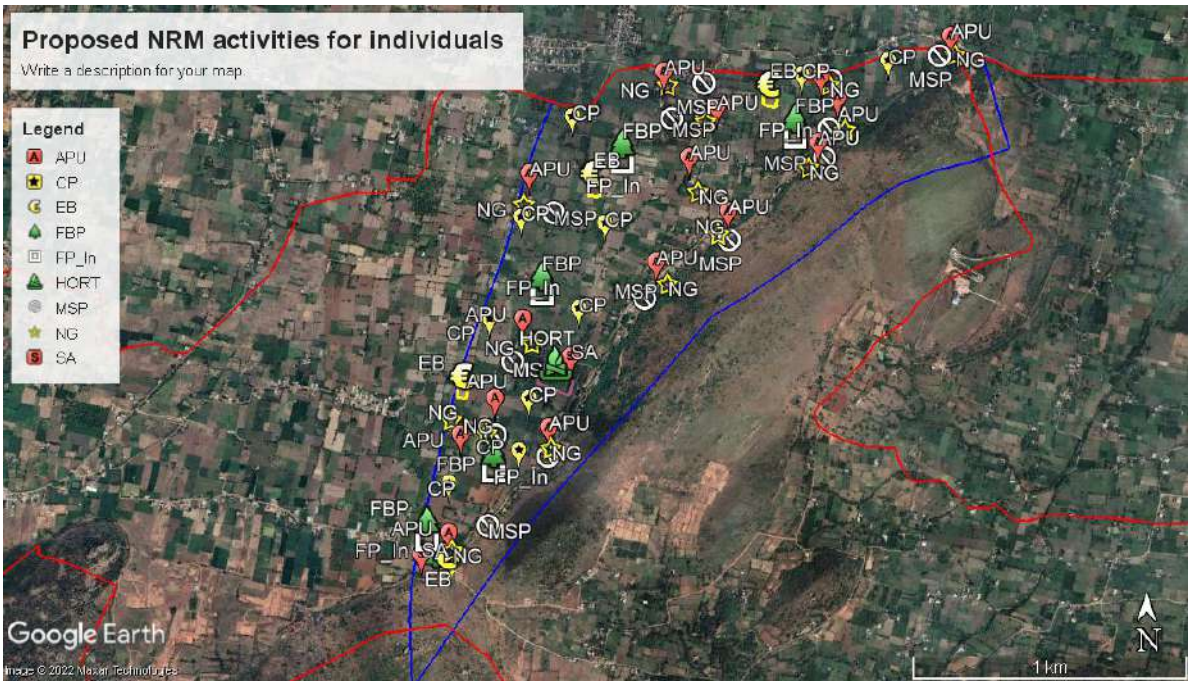


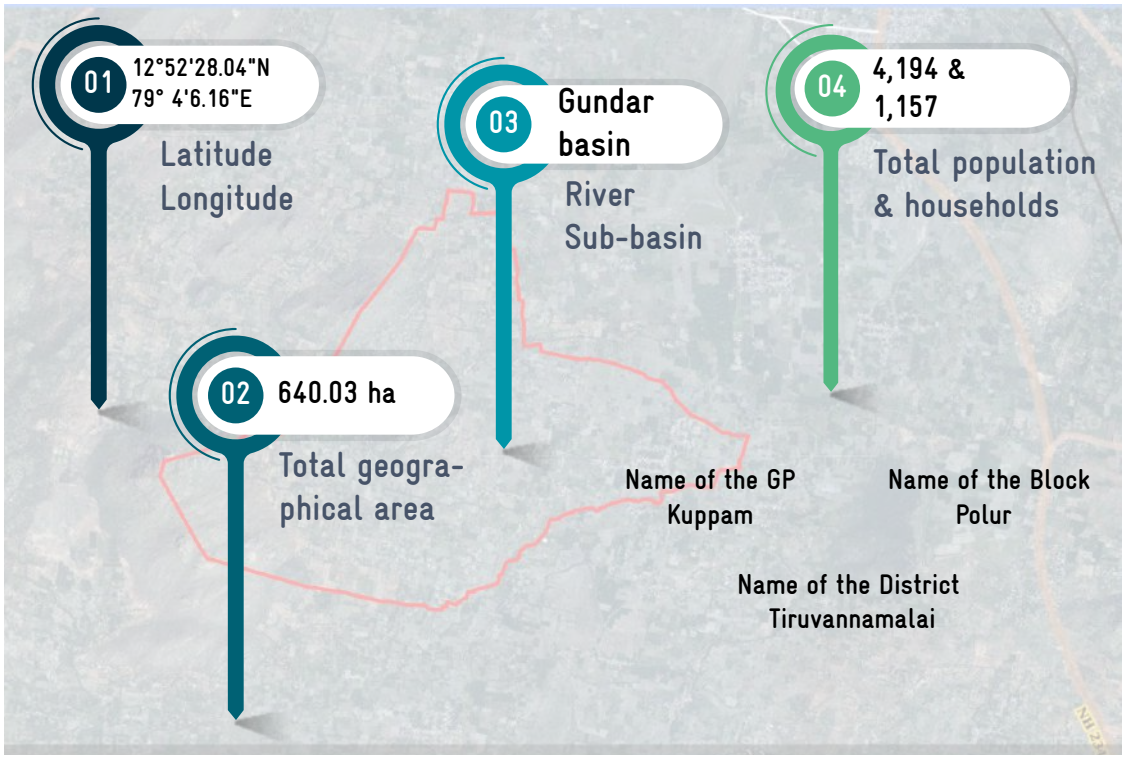
Figure 8.7, A: Proposed plan in Kalpattu micro-watershed. B: Proposed Non-NRM activities for Individuals. C: Proposed NRM activities for Individuals. D : Proposed NRM activities for community (APU: Azolla Production unit, AVP: Avenue Plantations, CP: Compost pit, CT: Cattle through, EB: Farm Bunding with Boundary Trenches - Individual, FBP: Farm Bund Plantations, FDC: Fodder Development, FP_in: Farm Pond for Individuals, GoH/WAT: Greening of Hillocks, GS: Goat shed , MSP: Soak pits- Individual, NG: Nutrition garden, RS: Artificial Recharge Structure, SA: Silt Application, SGT: , VCP: Vermi compost pit

8.3 MODEL GP PLAN

KUPPAM GP, POLUR BLOCK TIRUVANNAMALAI DISTRICT

8.3.1 BACKGROUND OF – KUPPAM GP

Kuppam GP is geographically situated between 12°52'28.04"N, 12°53'21.97"N & 79°4'48.90"E, 79°4'6.16"E and 13 Km away from Vellore town which is situated North-East to the GP. The total geographical area of GP is 640.03 ha with total population of 4,194 and about 1,157 households. GP area is drained by Gundar River, the average annual temperature is 28-29 °C, varies from 22 to 43 °C in cold and hot months respectively. North-East and South-West monsoon are the major precipitation source and receives on annual average rainfall of 1,074 mm. Paddy is the dominant crop also, horticulture crops are practiced in cultivation. The detailed spatial and non-spatial data considered in the process of preparation of climate resilient under CWRM for Kuppam GP is illustrated as follows:



8.3.2 CWRM planning - Spatial Data:

CWRM adapted the geospatial technologies in its process of plan preparation towards climate-resilient infrastructure, Water Conservation 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 implement towards conservation of resources. Various thematic datasets for Kuppam GP are discussed below:

8.3.2.1 Geomorphology:

The Kuppam GP engrossed with denudation origin – pediment- pediplain complex land units (Figure 8.8). Pediment area witness the gently slope weather rock surface area, erosional bed rock, existence of numerous fracture and joints area which could be considered for ground water storage. Pediplain is witnesses the gently inclined sloping surface with thick weathered rock. This landform is also good for water storage structures.

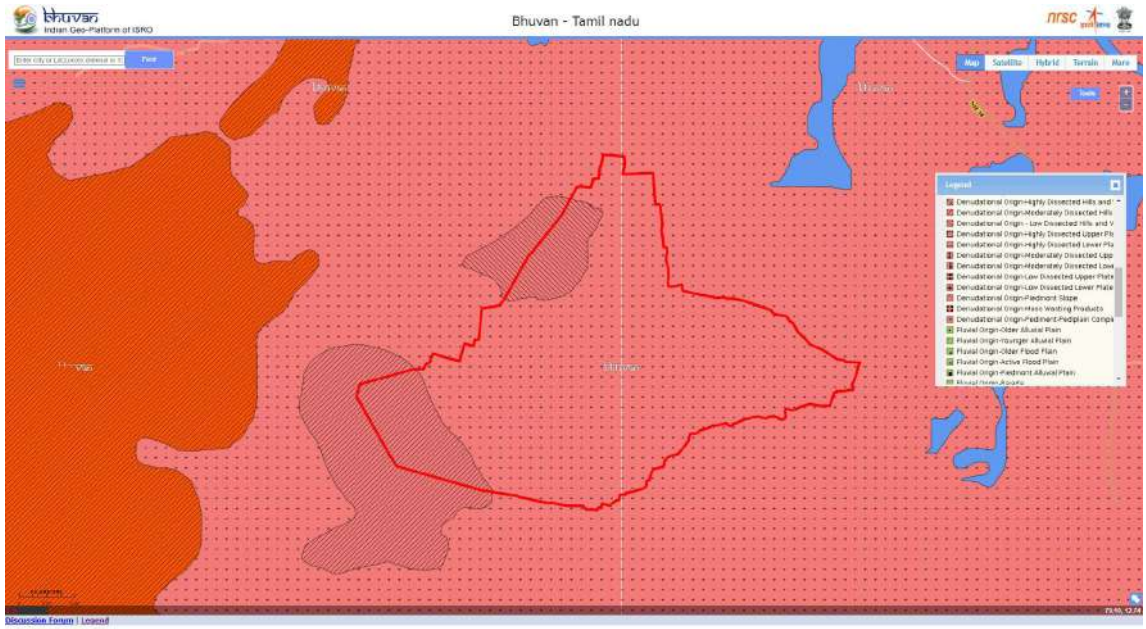


Figure 8.8. Geomorphology map of Kuppam GP

8.3.2.2 Lineament:

A lineament map shows the linear feature in a landscape that is an expression of an underlying geological structure such as a fault, fracture, or joint. There is no observable Structural lineament present in the GP (Figure 8.9)

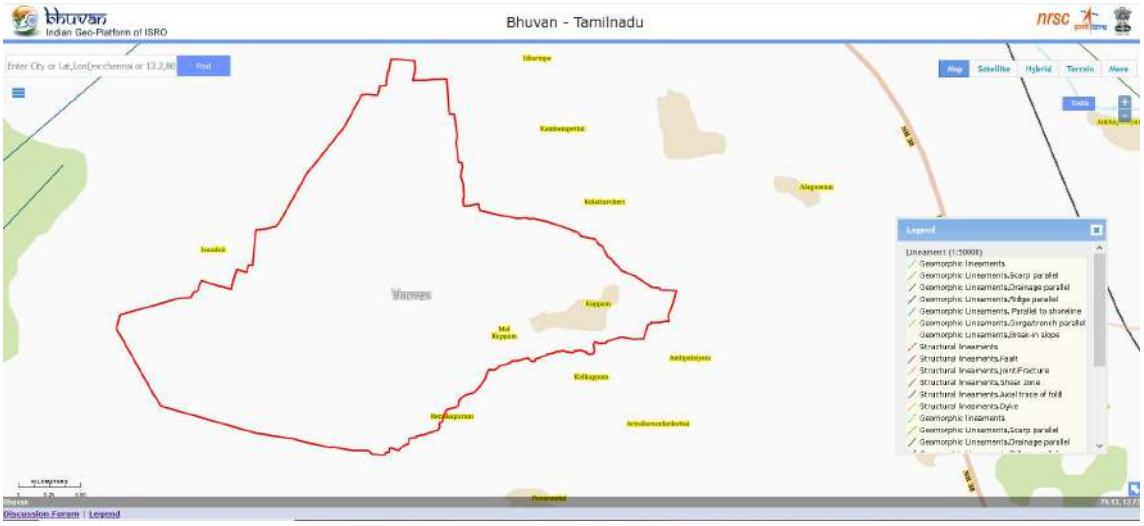


Figure 8.9. Lineament map of Kuppam GP

8.3.2.3 Ground water prospect:

The map provides the required information on geological parameters connected to ground water exploration and the probable ground water prospects and helps in identification of sites for planning recharge structures to address water scarcity in a more effective manner. Kuppam GP engrossed with Charnockite-Gneiss - Granitoid / Charnockite Khondalite / Migmatite Complex rock, denudational landform and observed that the availability of groundwater in less than 30 m deep well is 50 to 100 litre per minute (Figure 8.10).

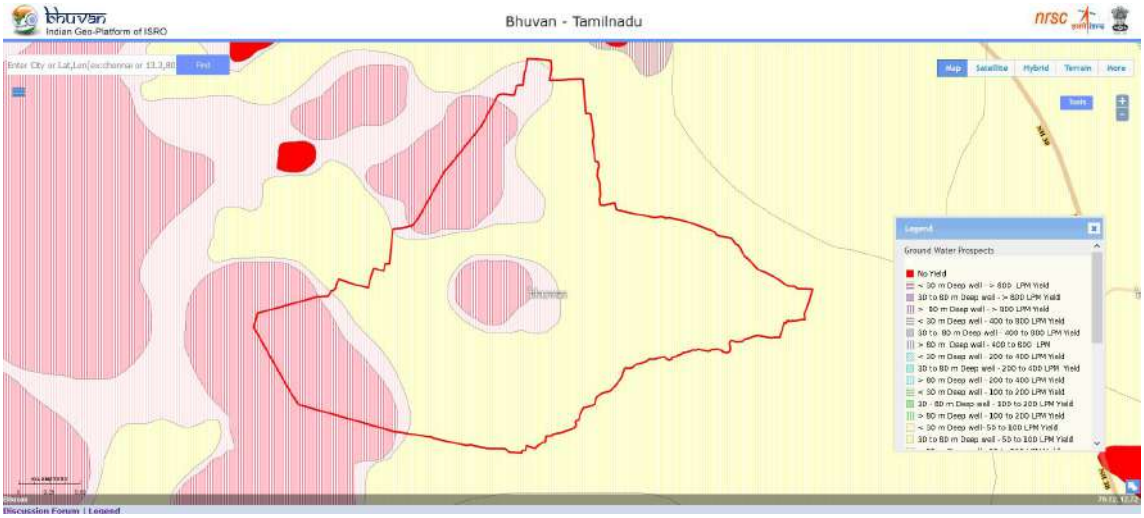


Figure 8.10. Ground water map of Kuppam GP

8.3.2.4 Slope:

The slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. Flat slope of 1 to 3% & very flat slope 0 to 1% is observed in Kuppam GP (Figure 8.11). Slope layer plays a significant role in identification of gullied or eroded or sudden change land area to propose the conservation activity such as land development, plantation, stop dam or earthen dam etc.

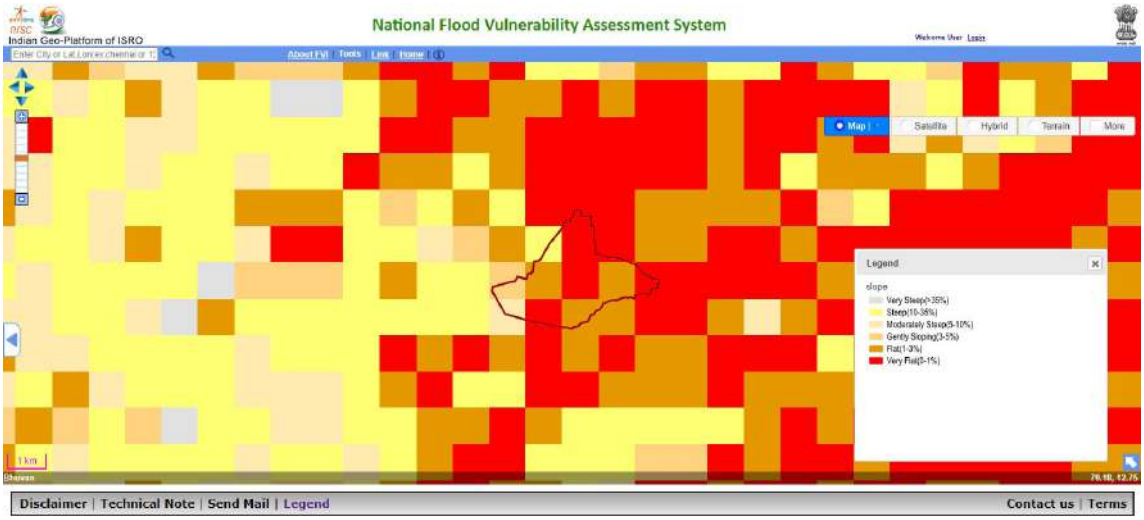


Figure 8.11. Slope map of Kuppam GP

8.3.2.5 Watershed:

A watershed map is the area of land where all of the water that falls in it and drains off of it goes into the common outlet. It is observed that Kuppam GP area shares three micro-watersheds (Figure 8.12). This layer will be one of the significant inputs in planning, where layers give synoptic view irrespective of the administrative boundary and its crucial role in proposing the water conservation activates at suitable sites will be remarkable. However, coordination and collaboration with neighbor GP stakeholders or plans will ensure that the proposed plan implementation outcomes are better.

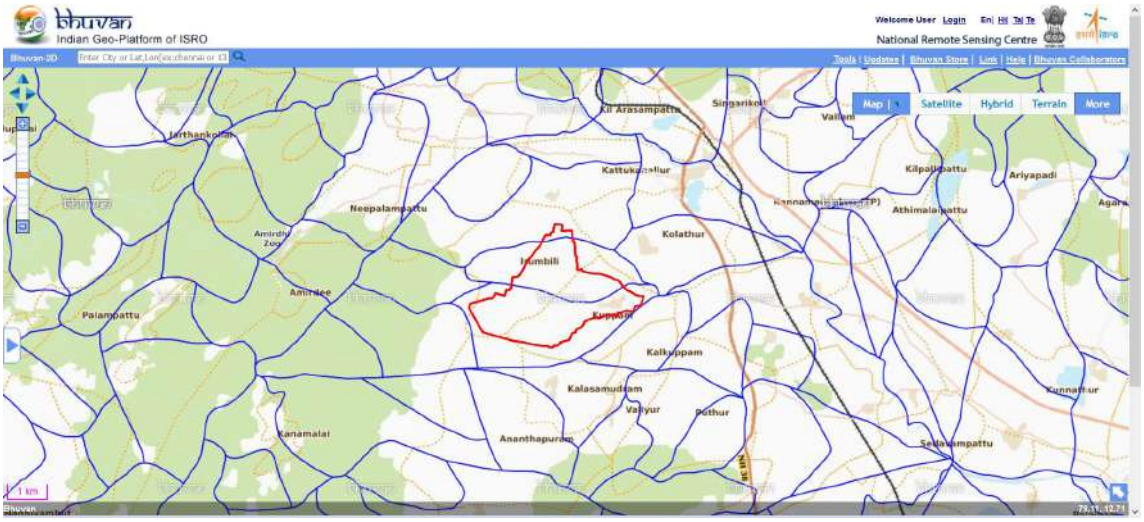


Figure 8.12. Watershed map of Kuppam GP

8.3.2.6 Area under erosion:

The erosion map shows the eroded soil sites with respect to reason such as rainfall, soil physical properties, terrain slope, and land cover. It is observed that small areas are under sheet erosion in the GP (Figure 8.13). This layer will act as a direct input in proposing plan preparation for the soil, land and greenery activities implementation.

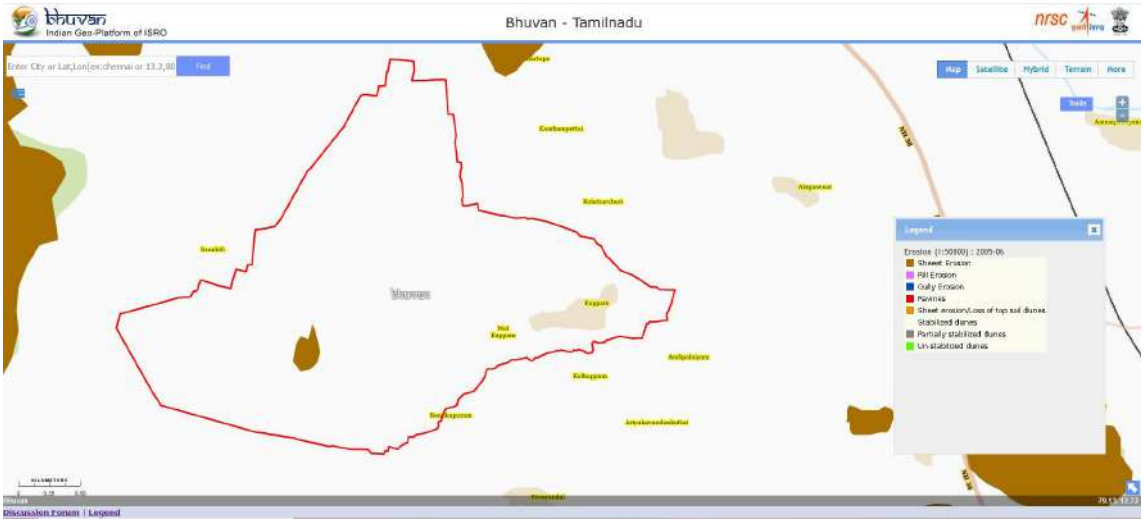


Figure 8.13. Soil erosion map of Kuppam GP

8.3.2.7 Salt affected area:

There is no Salt affected area present in the GP (Figure 8.14).

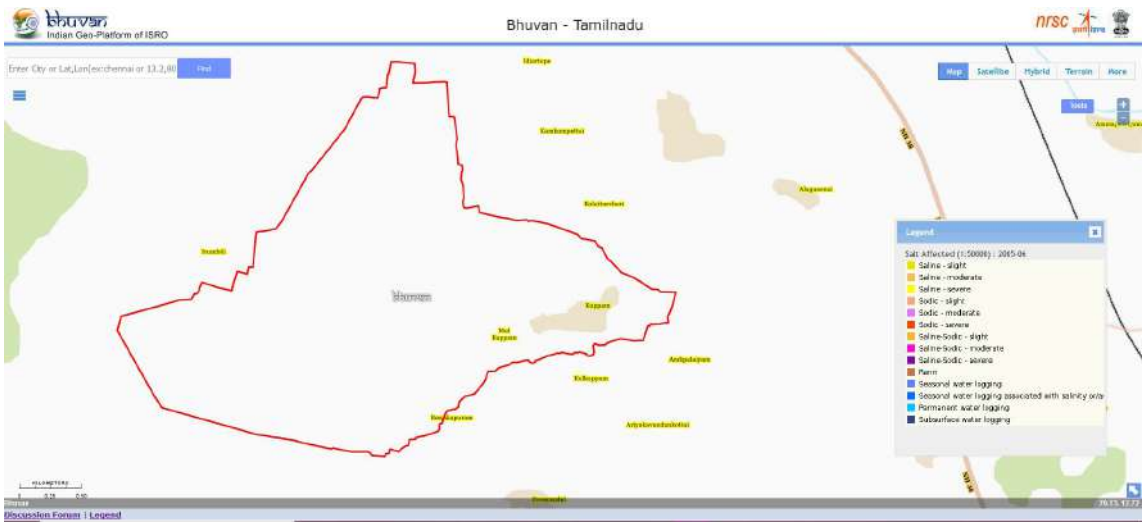


Figure 8.14. Salt affected area map of Kuppam GP

8.3.2.8 Land Use and Land Cover Map:

The LULC map provides the information about the existing land use pattern. More than 80% of the Kuppam GP area is used for agriculture and the remaining area is covered with scrub or rocky or barren wasteland (Figure 8.15). Major agriculture practices in the GP indicates that the soil is fertile in nature. Wasteland will act as the direct input for land development activities, whereas peripheral bund of the agriculture parcels facilitates for bund plantation preferably for commercial orientated plans such as teak, neem, sapota, mango, coconut, bamboo etc.

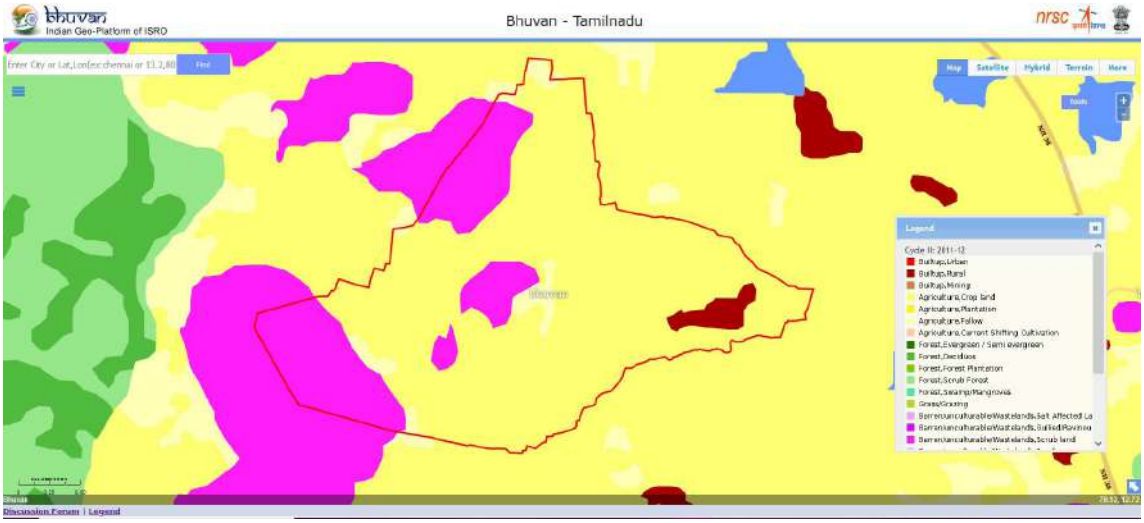


Figure 8.15. Land Use and Land Cover map of Kuppam GP

8.3.2.9 Wasteland:

It is noticed that there are parcels of wasteland areas in the GP (Figure 8.16). During planning, these sites will act as a direct input for proposing the development of wasteland activities.

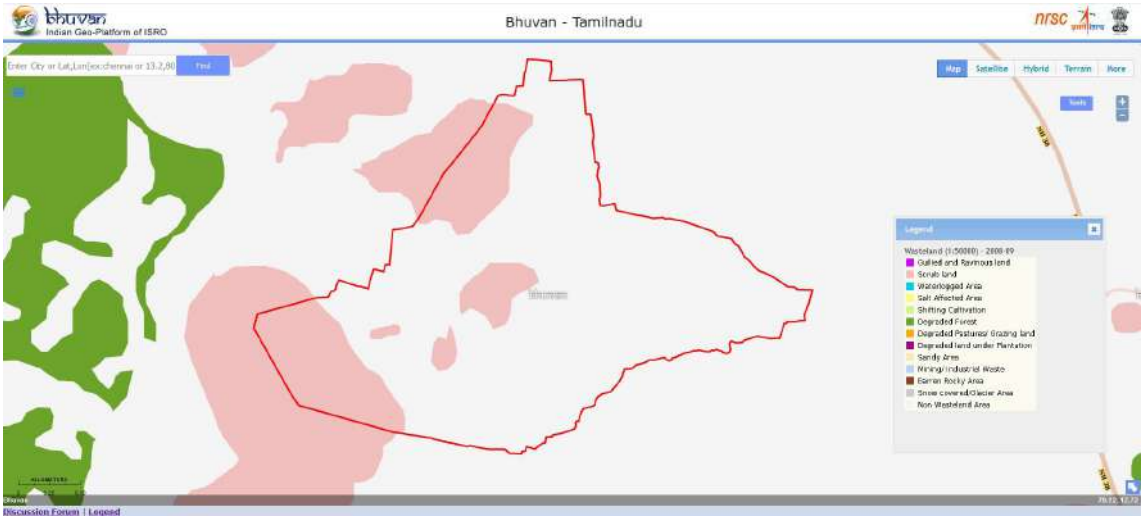


Figure 8.16. Wasteland map of Kuppam GP

8.3.3 CWRM PLANNING - NON-SPATIAL DATA

The non-spatial datasets includes four major themes related to the 116 parameters – socio economic, climate, water and agriculture (Table 45). This data will be used for analysis along with the spatial data in identifying the key water challenges, by estimating the water budgeting and for proposing water actions at the most suitable sites in the GP.

The non-spatial data analysis started with mapping of the administrative, agro-ecological and hydrological units considering GP as the lowest administrative unit of action plan and implementation of proposed developmental activities.

TABLE 45. CWRM NON-SPATIAL PARAMETERS OF KUPPAM GP

Key CWRM Parameter	Count
Climate Vulnerability Area - 1 : Socio-Economic	
Geographical area (ha)	640
Male population	2,050
Female population	2,144
Total population	4,194
SC population	839
ST population	0
Vulnerable population	839
Households	1,157
Only one room HH's	223
Female-Headed HH's	56
Vulnerable HH's	173
% of vulnerable HH's	15
Registered MGNREGA job cards (persons)	1,110
Active person working in job Cards (persons)	831
Drinking-water sources	428
Groundwater sources - Drinking water	481
Surface water sources - Drinking water	346
Annual grey water generation	7.65
Climate Vulnerability Area 2: Climate	
Average Annual Rainfall (in mm)	1,047
Average Annual Temperature (°C)	27.9
Ground Water Status (OE, Critical, SC, Safe, Saline)	Over-Exploited
Climate Vulnerability Area 3: Water Resources	
Canal Network in meters	
Length of main canal (in m)	11,000
Length of minor canal (in m)	0
Length of distributaries (in m)	0
Water courses (Field channels) (in m)	0
No. of Tanks (PWD & Union) (in No.)	0
No. of Ooranis (in No.)	2
Other surface waterbodies (in No.)	0
Area under Irrigation facilities (in ha)	
Tank irrigation	0
Canal irrigation	0
Open & Tube well irrigation	113.19
Water quality (in No.)	
Chemical contaminants	0

Bacterial and other contaminants	0
Catchment Area wise Available Runoff in ha.m	
Good catchment	84.6
Average catchment	1
Bad catchment	76.8
Watershed and Drainage Networks	
Length of natural drainage lines	9,856
No. of natural drainage lines	13
No. of micro-watershed	3
Water Demand in ha.m	
Water demand for Humans (ha.m)	11.48
Water demand for Livestock (ha.m)	8.24
Water demand for Agriculture (ha.m)	403
% GW utilization for Drinking	6
% GW utilization for Livestock	98
% GW utilization for Agriculture	98
% SW utilization for Drinking	94
% SW utilization for Livestock	2
% SW utilization for Agriculture	2
Climate vulnerability area 4: Agriculture (in ha)	
Area under Land Resources in ha	
Forest land	0
Non-Agricultural uses	219.4
Barren & un-cultivable Land	6.31
Permanent pastures and other grazing land	0
Land under miscellaneous tree crops etc.	3.44
Cultivable wasteland	0
Fallows land other than current fallows	0
Current fallow land	67.9
Unirrigated land	229.83
Area Irrigated by source	113.19
Land under Catchment Area in ha	
Good catchment	225.71
Average catchment	3.44
Bad catchment	410.92
Crop Details in ha	
Irrigated area (in ha)	299.89
Rainfed area (in ha)	12.42
The area under Paddy cultivation (in ha)	180.95
Crop water requirement - The irrigated condition (in ha.m)	396.41

Crop water requirement - Rainfed condition (in ha.m)	6.77
Soil resources: Status of available Nitrogen (in %)	
Very low	18
Low	72
Medium	11
High	0
Very high	0
Status of Organic Carbon (in %)	
Very low	24
Low	76
Medium	0
High	0
Very high	0
Status of Soil micro-nutrients (in %)	
Sufficient	20
Deficient	80
Status of Physical condition of the soil (in %)	
Acidic sulphate	0
Strongly acidic	0
Highly acidic	0
Moderately acidic	0
Slightly acidic	0
Neutral	0
Moderately alkaline	100
Strongly alkaline	0
Soil texture (in %)	
Clay	4
Fine	58
Coarse loamy	0
Soil water permeability (Low, Moderate, high)	Moderate
Soil moisture and ET	
Volumetric Soil Moisture (in %)	23
Estimated Soil Moisture (in)	96.75
ET Losses (in)	278.55
Means of Water Extraction (in %)	
Gravity	0
Lifting	100
Irrigation Methods (in %)	
Wild Flooding	0
Control Flooding	100

Livestock (in No.)	
Cattle population	2169
Sheep population	63
Goat population	251
Poultry	0

8.3.4 KEY WATER CHALLENGES

Socio-Economic

1. Higher female population
2. 20 % are vulnerable population
3. 19% of the HH have only one room
4. 15% of the households are vulnerable
5. Access to drinking water through tap water connections is very low
6. Handling of grey water from households needs attention.

Water

1. No tanks and surface water bodies except two Ooranis
2. Depends on open and tube well irrigation
3. More ground water utilized for agriculture and livestock
4. 98 % drinking water met through surface water
5. 62.4 of water is an available runoff

Agriculture and Allied Sector

1. 36 % of the land covers the common area
2. 64% of the land covers individual lands
3. More area under bad catchment
4. More crop water requirement under irrigated
5. The main crop in the GP is paddy which is cultivated in 180.95 ha of land
6. The main source for paddy cultivation is groundwater
7. 100% lifting for irrigation
8. Poor soil quality with low nitrogen and organic carbon content
9. Very less micronutrients
10. 100% moderately alkaline soil

8.3.5 PERSPECTIVE PLAN - WORKS PROPOSED: WATER ACTIONS

The appropriate and site-specific works are identified for the development of public and common land, agriculture and allied activities, rural infrastructures, and climate-resilient to reduce the vulnerability of the GP. About 14.7% the total land area is taken for WASCA treatment activities like plantation and conservation works. The total proposed area for treatment is 93.85 ha, more attention is for non-agriculture land and un irrigated land (Figure 8.17). Through the proposed conservation activities, 37.45 run off would be harvested in which, about 44% of the run-off from the good catchment, 2% of the runoff from the average catchment and 54% of the conservation from the bad catchment area (Figure 8.18).

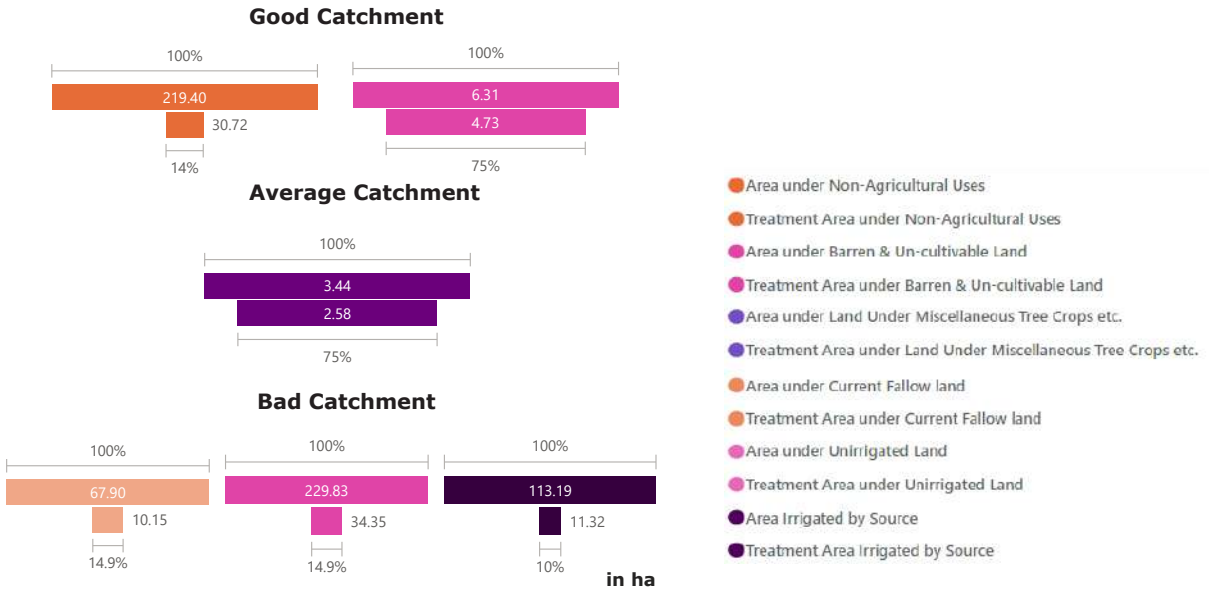


Figure 8.17. Proposed land resource treatment area in Kuppam GP

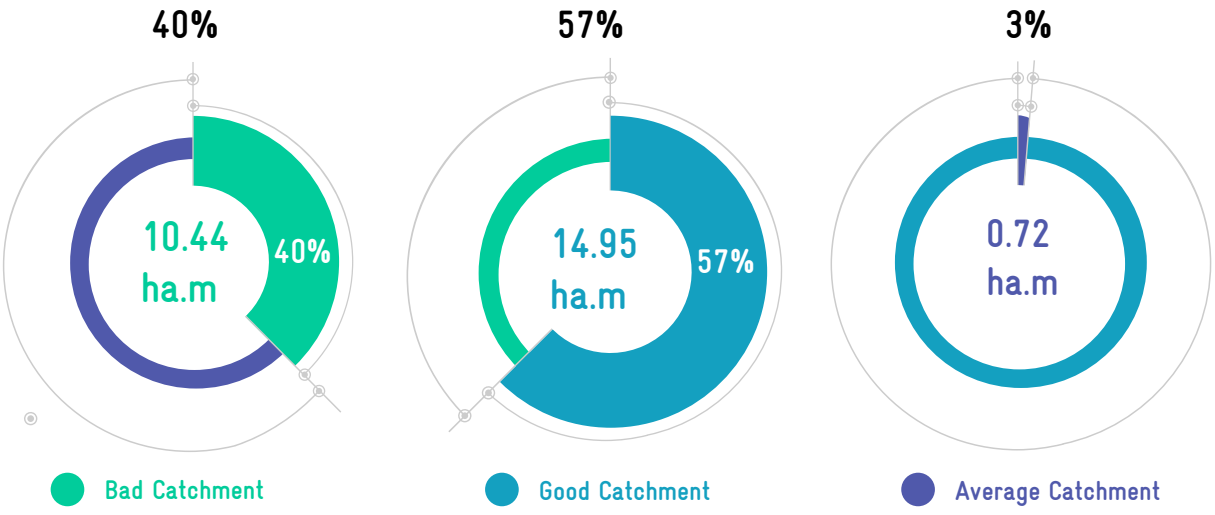


Figure 8.18. Expected run off conservation after treatment

The detailed proposed activities along with silent parameters are showed in the Table 46 for 2021-2024. More attention towards common and public land developments are given with appropriate works to improve the resilience of the GP.

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

CWRM Water Action 1: Improvement of Public & Common Lands Development				
Name of the work	**Ridge type**	**No. of Works**	**Estimated cost (INR in Lakhs)**	**Estimated Person Days**
Contour continuous bunds for afforestation area (m)	Upper	2	0.05	20
Drainage line treatment (m)		2	0.06	10
Afforestation in public/common lands(ha)		2	17.2	6,688
Block plantation (Community)(ha)	Middle	2	22.2	8,640
Linear plantation (Km)		4	7.2	2,812
Avenue plantation (Km)		3	5.4	2,109
Canal Bund plantation (Km)	Lower	2	15	5,860
Nursery development (No. of units)		19	289.25	45,200
Restoration of waterbodies: Ponds (No.)		4	4	800
Artificial recharge structure (No. of units)		45	112.5	17,595
Composting (No. of units)		30	5.1	450
Subtotal		**115**	**478**	**90,184**
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	15	22.5	8,790
Micrpo-irrigation (ha)		11	11	0
Construction of farm ponds - Individual (No. of units)		15	30	11,715
Land development - Individual (ha)		2	20	7,812
Dryland horticulture/agroforestry - Individual (ha)		3	25.5	9,963
Azolla units - Individual (No. of units)		173	25.95	3,979
NADEP Vermi compost (No. of units)		173	31.14	4,671
Fodder development - Community & Individual		173	256.04	4,05,512
Cattle shelters (No. of units)		173	366.76	57,263
Goat/sheep shelters (No. of units)		173	392.71	61,415
Cattle trough (No. of units)		173	8.65	1,038
Construction of new open wells & recharge Shafts (No. of units)	Lower	45	225	41,670
Cattle trough (No. of units)		8	40	7,408
Sub total		**1,129**	**1,415**	**6,13,828**

CWRM Water Action 3: Rural Water Management				
CWRM water action 3: Works in Lower Ridge				
Soak Pits (Community) (No. of units)	Lower	12	1.56	240
Soak Pits (Individual) (No. of units)		116	11.6	1,856
Roof Rain Water Harvesting (No. of units)		2	8	1,250
Subtotal		**130**	**21**	**3,346**
Grand total		**1,374**	**1,914**	**7,07,358**

Regarding CWRM themes of the total No. of projects identified, 82 % works are in agriculture and allied sector while 8 and 9 % works are in public and common land, and rural infrastructure respectively. Table 47 provides the estimates of the work budget, and personal days for three years from 2021-2024 in the Polur GP.

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

CWRM themes	No of works	Estimated budget (INR in lakhs)	Estimated person days
Public and common land development	115	478	90,184
Agriculture and Allied sector development	1,129	1,415	6,13,828
Rural water management	130	21	3,346
TOTAL	1,374	1,914	7,07,358

8.3.6 IMPACTS

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

TABLE 48. WASCA- WATER ACTIONS INDICATORS AND ITS OUTCOMES

WASCA CWRM ACTION PLAN

DEVELOPMENT OF PUBLIC AND COMMON LAND

	INDICATOR		OUTCOMES/ IMPACT
1	Number of water bodies restored in the village	1	Six traditional water bodies restored
2	Area under afforestation	2	31.32 ha under afforestation
3	Percentage reduction in the annual surface runoff	3	37.45 ha.m surface runoff harvested and stored
4	The proportion of land treated under WASCA	4	22% of the total geographical area of the village treated under WASCA in three years
5	Drainage line treatment	5	14.4 Km length of drainage lines treated

4 TRADITIONAL WATER BODIES RESTORED

31.32 ha AFFORESTATION

37.45 ha.m SURFACE RUNOFF HARVESTED

22% AREA OF THE VILLAGE TREATED

14.4 KM DRAINAGE LINES TREATED

WASCA CWRM ACTION PLAN

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

	INDICATOR		OUTCOMES/ IMPACT
1.	No of structures were established for on-farm (in-situ) water harvesting in drylands	1.	23 farm ponds established
2.	Reducing area under fallow lands	2.	16.98 ha under fallow land restored for cultivation
3.	Improvement in soil health	3.	173 units of vermicompost established
4.	No of artificial recharge structures proposed	4.	45 artificial recharge structures were established to replenish groundwater flow

23 FARM PONDS

16.98 ha FALLOW LAND RESTORED

173 VERMI COMPOST

45 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.	Twelve community level and 116 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.	1157 households established Nutri-gardens in homesteads

12 COMMUNITY & **116** INDIVIDUAL SOAK PITS

2 COMMON ROOF RAINWATER HARVESTING

1157 NUTRI-GARDENS

8.3.7 MAHATMA GANDHI NREGS PROPOSALS

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

TABLE 49 . PROPOSALS FOR THE MGNREGS, KUPPAM GP

	No of works	No of person days
Perspective plan	1,374	7,07,358
Annual plan	494	2,66,151

8.3.7 PROPOSED ACTIVITY MAP

The proposed activity map for Kuppam GP, Polur Block shows a shelf of projects for all three year works from 2021-2024 (Figures 8.19 to 8.22).

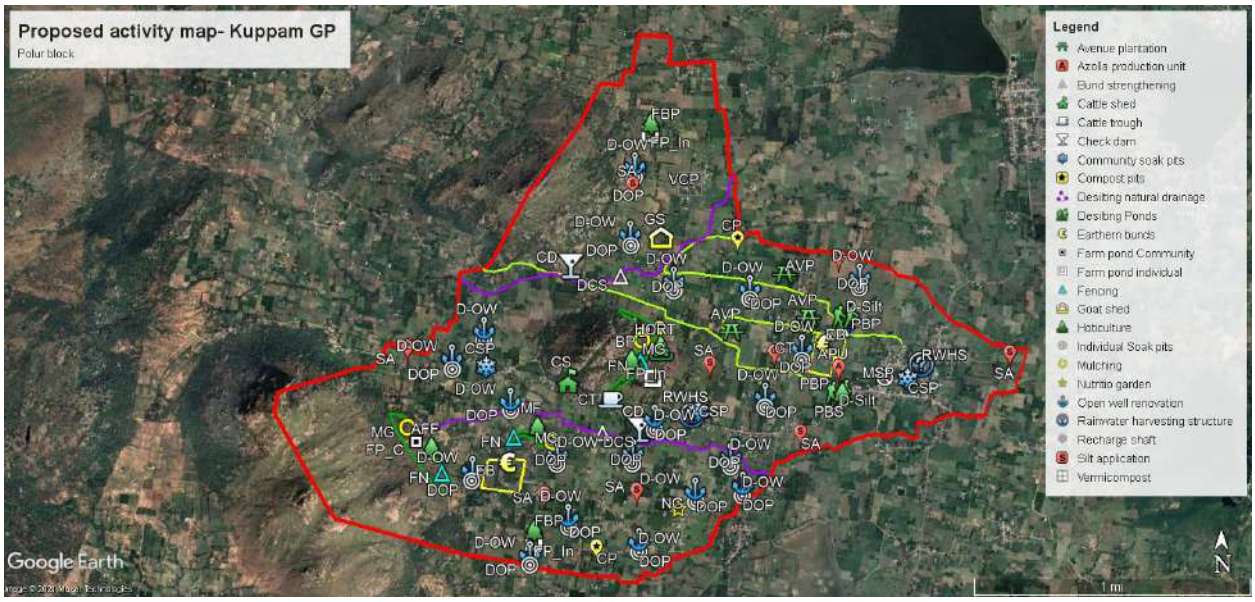


Figure 8.19. Action plan of Kuppam GP, Polur Block

Figure 8.20. Works on Upper Ridge of Kuppam GP, Polur Block

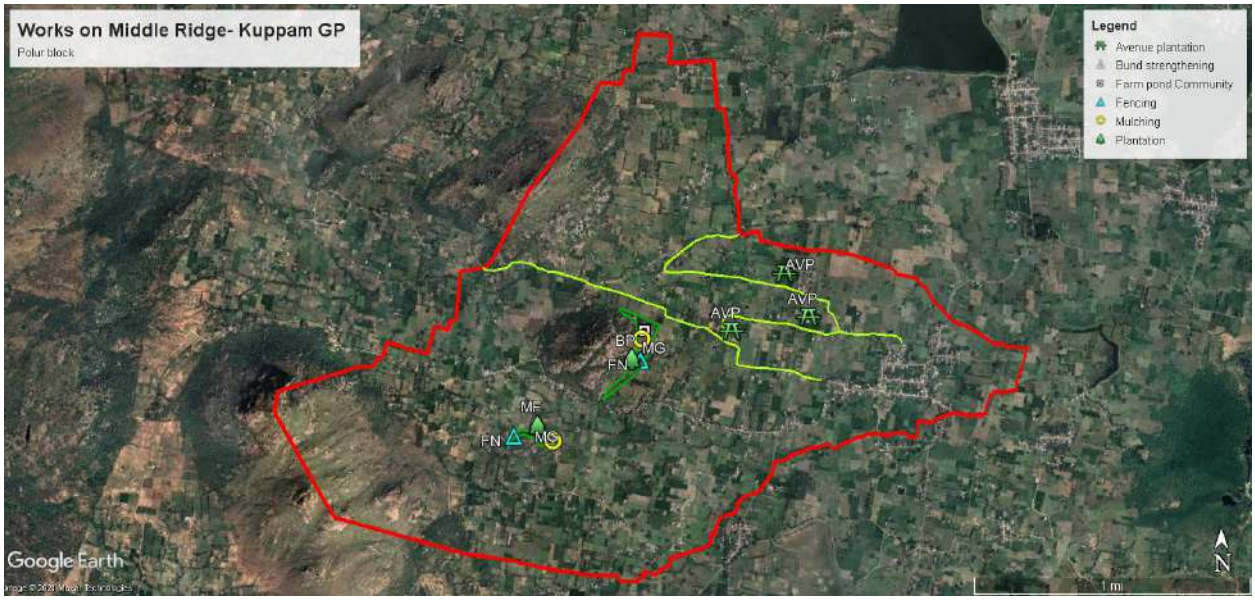


Figure 8.21. Works on Middle Ridge of Kuppam GP, Polur Block

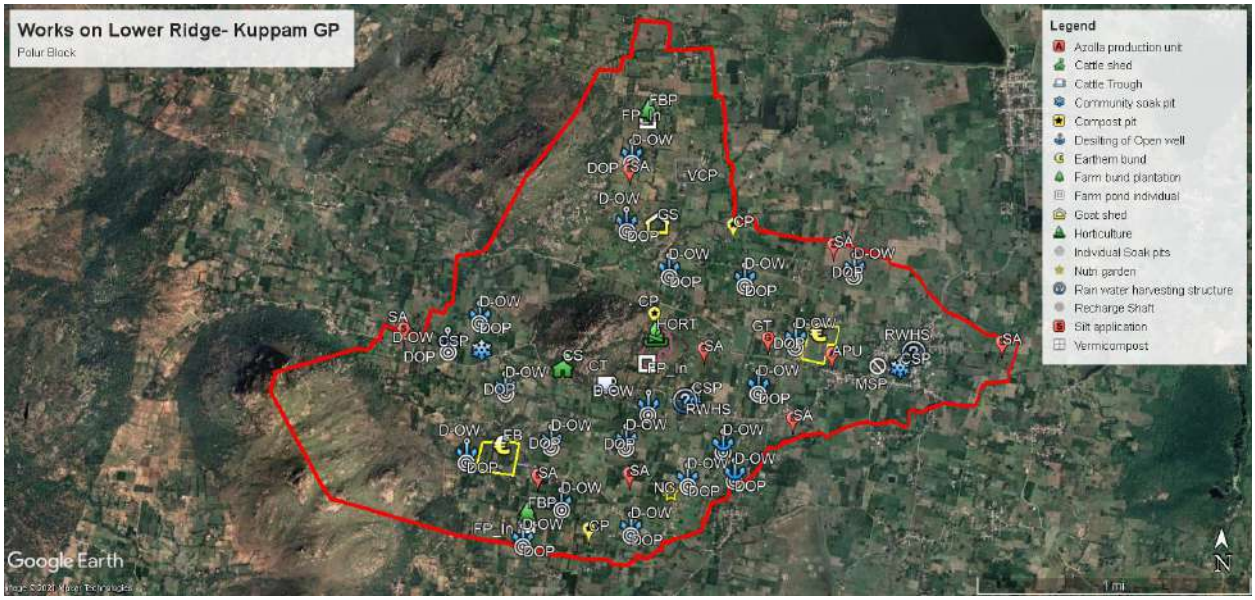
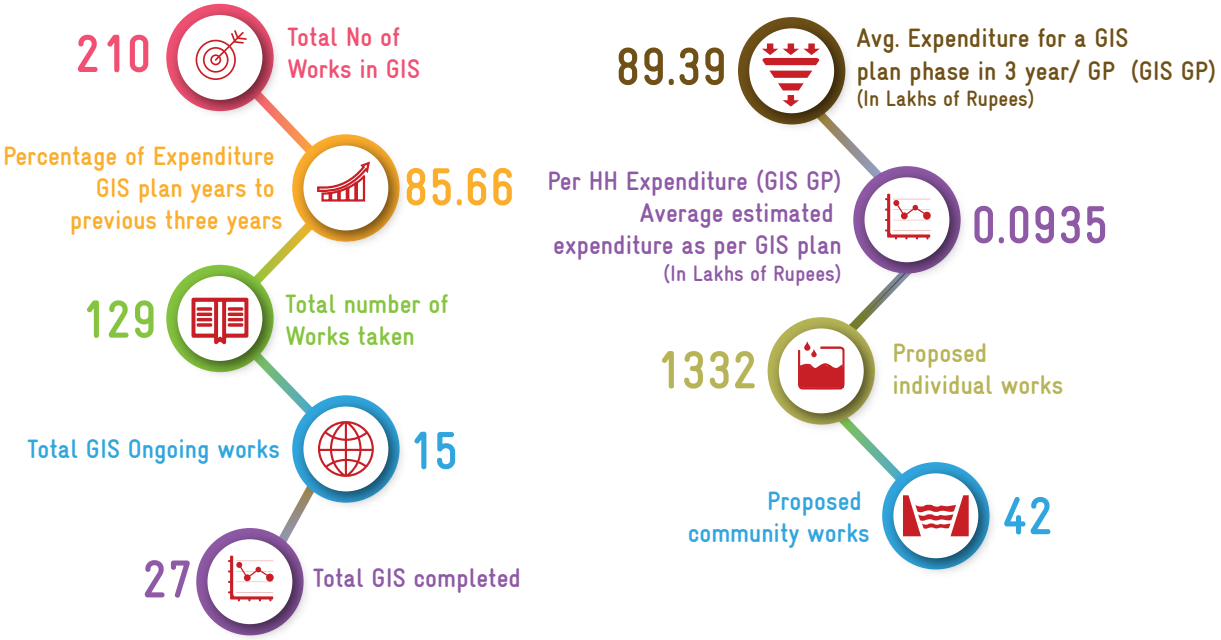


Figure 8.22. Works on Lower Ridge of Kuppam GP, Polur Block

8.3.8 GIS PLAN IMPLEMENTATION AND KEY PARAMETERS

The GIS plan implementation and key parameters performance in Polur Block is represented in Table 50.

TABLE 50. GIS PLAN IMPLEMENTATION, KEY PARAMETERS PERFORMANCE IN KUPPAM 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

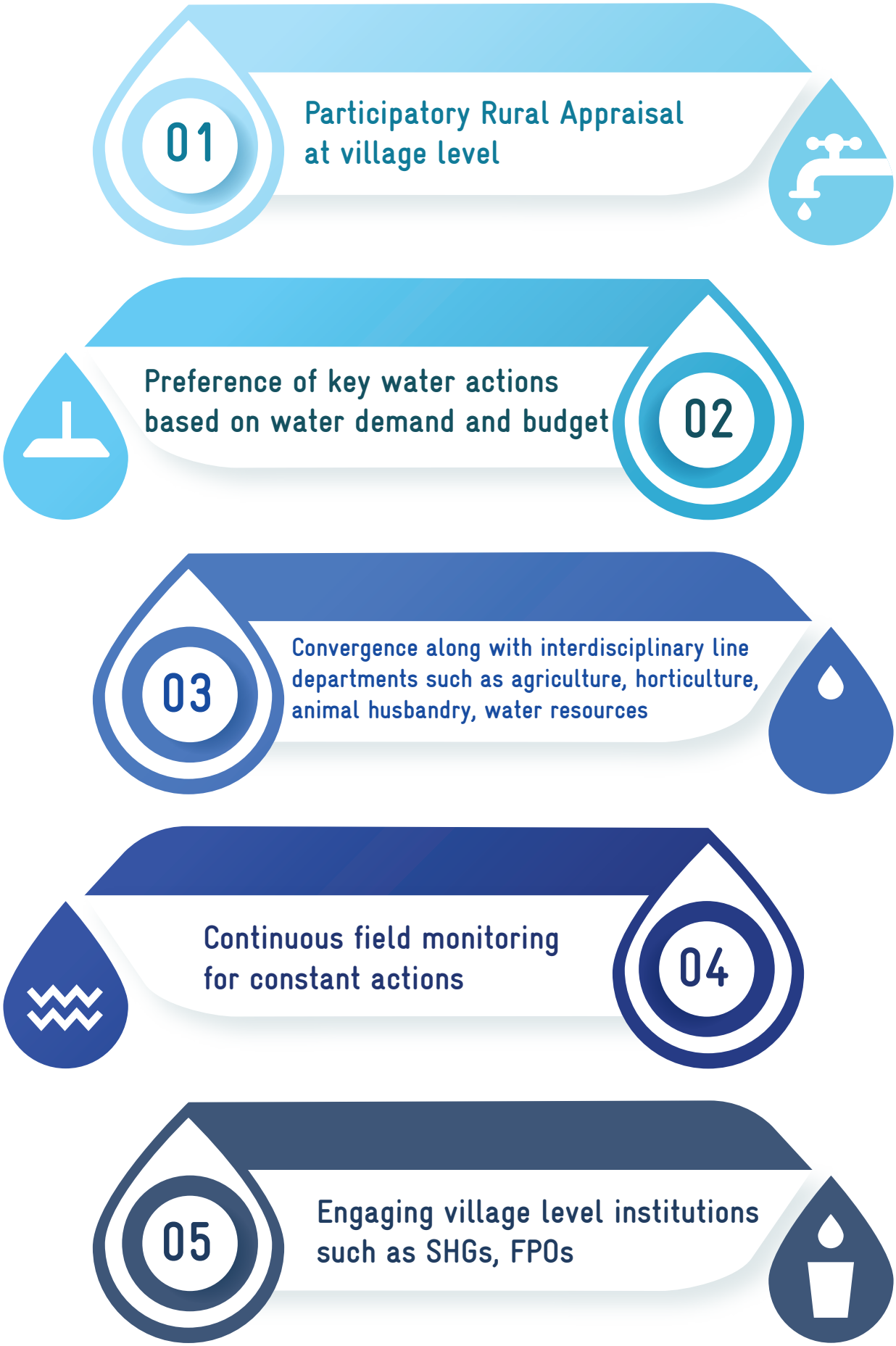
CHAPTER 9

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

Recommendations towards stable development and its progressive outcome are,


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

Key CWRM Parameter	Gram Panchayat	Canal Irrigation			Tradational Water bodies			
		Length of Main Canal	Length of Minor Canal	Length of Distributaries	Water Courses (Field Channels)	No. of Tanks (PWD & Union)	No. of Ooranis	Other Surface Water Bodies
Unit		m	m	m	m	No.	No.	No.
Type 1	Ananthapuram	13,000	4,000	1,000	4,000	1	1	-
	Athuvambady	6,200	600	200	-	1	1	-
	Enduvambady	3,200	650	260	-	2	2	-
	Illupakunam	6,200	320	450	-	1	1	-
	Kalasamudram	2,000	-	600	200	1	1	-
	Kalkuppam	1,500	-	-	300	1	1	-
	Kangiyanoor	-	2,310	420	-	2	2	-
	Kattipoondy	6,300	-	-	-	1	1	-
	Kunnanthur	-	3,100	640	-	1	1	-
	Kuppam	11,000	-	-	-	-	-	-
	Kuruvimalai	-	1,820	320	-	1	1	-
	Murugapady	-	2,120	550	-	3	3	-
	Mukkurambai	6,300	600	200	-	-	-	-
	Naranamangalam	1,800	-	-	-	1	1	-
	Palvathuvendran	6,300	200	-	-	4	4	-
	Eluvambady	420	1,530	-	-	1	1	-
	Padavedu	12,000	6,000	-	-	1	1	-
	Periagaram	4,200	200	-	-	4	4	-
	Potharai	3,200	600	200	-	1	1	-
	Pudupalayam	-	2,340	410	-	3	3	-
	Renderipattu	3,200	740	410	-	2	2	-

Key CWRM Parameter	Gram Panchayat	Canal Irrigation			Tradational Water bodies			
		Length of Main Canal	Length of Minor Canal	Length of Distributaries	Water Courses (Field Channels)	No. of Tanks (PWD & Union)	No. of Ooranis	Other Surface Water Bodies
Unit		m	m	m	m	No.	No.	No.
Type 1	Sedavampattu	2,000	600	-	-	3	2	-
	Sengunam	2,300	1,200	600	-	4	2	-
	Thuvinjikuppam	6,300	1,200	-	-	3	4	-
	Vasur	-	1,620	310	100	1	2	-
	Vilankuppam	2,400	-	200	-	1	6	-
	Vaziur	3,000	500	300	-	3	3	-
Type 2	Kasthambady	300	-	2,100	-	1	4	-
	Krishnapuram	-	2,345	325	-	2	2	-
Type 3	Edapirai	-	-	2,300	-	2	3	-
	Erikuppam	-	-	2,350	-	1	2	-
	Kalpattu	-	2,500	240	-	-	8	-
	Kalvasal	-	-	2,400	-	4	3	-
	Kelur	-	2,300	256	-	4	3	-
	Mambattu	-	-	2,500	-	3	2	-
	Sandhavasal	-	600	1,500	500	1	4	-
	Tindivanam	-	-	1,500	500	1	3	-
	Tirusoor	-	-	2,500	-	3	3	-
	Venmani	-	-	1,800	-	2	2	-
	Vellur	-	-	2,500	-	2	2	-

Key CWRM Parameter	Gram Panchayat	Irrigation Facilities			Water Quality		Catchment Area wise Available Runoff		
		Area under Tank Irrigation	Area under Canal Irrigation	Area under Open & Tube Well Irrigation	Chemical Contaminants	Bacterial and Other Contaminants	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Unit		ha	ha	ha	Sample	Sample	ha.m	ha.m	ha.m
Type 1	Ananthapuram	-	-	441	-	-	118	27	160
	Athuvambady	-	-	280	-	-	102	0	97
	Enduvambady	-	-	75	-	-	19	15	26
	Illupakunam	-	-	95	-	-	52	19	39
	Kalasamudram	-	-	131	-	-	59	2	43
	Kalkuppam	-	-	64	-	-	21	0	30
	Kangiyanoor	31	-	160	-	-	64	37	40
	Kattipoondy	19	-	19	-	-	25	-	22
	Kunnanthur	-	-	63	-	-	49	0	66
	Kuppam	-	-	113	-	-	85	1	77
	Kuruvimalai	-	-	131	-	-	35	1	29
	Murugapady	-	-	145	-	-	89	1	53
	Mukkurambai	-	-	105	-	-	47	4	77
	Naranamangalam	-	-	63	-	-	28	0	21
	Palvathuvendran	-	-	115	-	-	34	18	22
	Eluvambady	3	-	112	-	-	14	6	22
	Padavedu	-	-	1,312	-	-	108	75	304
	Periagaram	-	-	441	-	-	82	48	103
	Potharai	-	-	228	-	-	96	5	68
	Pudupalayam	-	-	108	-	-	39	2	34
	Renderipattu	13	-	94	-	-	41	-	44
	Sedavampattu	-	-	187	-	-	49	-	53
	Sengunam	-	-	234	-	-	90	5	79
	Thuvinjikuppam	-	-	340	-	-	30	3	117
	Vasur	108	-	-	-	-	44	5	28

Key CWRM Parameter	Gram Panchayat	Irrigation Facilities			Water Quality		Catchment Area wise Available Runoff		
		Area under Tank Irrigation	Area under Canal Irrigation	Area under Open & Tube Well Irrigation	Chemical Contaminants	Bacterial and Other Contaminants	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Unit		ha	ha	ha	Sample	Sample	ha.m	ha.m	ha.m
Type 1	Vilankuppam	-	-	124	-	-	11	2	43
	Vaziur	-	-	90	-	-	28	4	31
Type 2	Kasthambady	-	-	291	-	-	94	46	83
	Krishnapuram	-	-	285	-	-	92	45	82
Type 3	Edapirai	33	-	222	-	-	37	1	96
	Erikuppam	434	-	401	-	-	100	36	232
	Kalpattu	-	-	-	-	-	21	-	197
	Kalvasal	26	-	109	-	-	50	3	102
	Kelur	-	-	279	-	-	73	22	93
	Mambattu	11	-	409	-	-	111	29	95
	Sandhavasal	-	-	455	-	-	93	-	124
	Tindivanam	58	-	922	-	-	82	37	248
	Tirusoor	-	-	313	-	-	68	18	77
	Venmani	-	-	137	-	-	56	0	63
	Vellur	-	-	538	-	-	71	4	183

Key CWRM Parameter	Gram Panchayat	Watershed and Drainage Networks			Water Demand								
		Length of Natural Drainage Lines	No. of Natural Drainage Lines	No. of MiC-riticalo Watersheds	Water Demand For Humans	Water Demand for Livestock	Water Demand For Agriculture	% G.W Utilization for Drinking	% G.W Utilization for Livestock	% G.W Utilzation for Agriculture.	% SW Utilization for Drinking	% SW Utilization for Livestock	% SW Utilization for Agriculture
Unit		m	No.	No.	ha.m	ha.m	ha.m	%	%	%	%	%	%
Type 1	Ananthapuram	25,788	14	7	15	4	926	0.4	0.9	0.9	0.6	0.1	0.1
	Athuvambady	9,688	9	5	9	4	477	0.1	1.0	1.0	0.9	0.1	-
	Enduvambady	-	-	3	4	3	228	0.1	1.0	1.0	1.0	0.1	0.0
	Illupakunam	3,483	4	3	5	5	379	0.0	1.0	1.0	1.0	0.1	-
	Kalasamudram	4,674	4	4	8	3	302	0.1	1.0	1.0	0.9	0.0	0.0
	Kalkuppam	2,500	3	3	3	3	228	0.0	1.0	1.0	1.0	0.1	0.0
	Kangiyanoor	3,887	3	5	5	1	438	0.0	1.0	1.0	1.0	0.0	0.0
	Kattipoondy	-	-	3	4	2	122	0.2	1.0	1.0	0.8	0.0	0.0
	Kunnanthur	-	-	5	8	2	136	0.1	1.0	1.0	1.0	0.0	0.0
	Kuppam	9,856	13	3	11	8	403	0.1	1.0	1.0	0.9	0.0	0.0
	Kuruvimalai	3,151	2	5	4	1	185	0.1	1.0	1.0	1.0	0.1	-
	Murugapady	1,843	1	3	5	1	240	0.0	0.9	1.0	1.0	0.1	-
	Mukkurambai	1,734	1	3	6	-	381	0.0	-	1.0	1.0	1.0	0.0
	Naranamangalam	1,033	1	1	3	2	204	0.0	1.0	1.0	1.0	0.0	0.0
	Palvathuvendran	3,342	4	2	2	1	424	0.1	1.0	1.0	0.9	0.0	0.0
	Eluvambady	502	1	1	4	1	201	0.0	1.0	1.0	1.0	0.0	-
	Padavedu	14,610	13	9	42	38	2,780	0.1	0.9	1.0	0.9	0.1	0.0
	Periagaram	9,373	9	4	14	6	1,149	0.0	1.0	1.0	1.0	0.0	-
	Potharai	8,503	9	4	9	4	467	0.0	1.0	1.0	1.0	0.0	0.0
	Pudupalayam	1,996	3	4	4	1	156	0.0	0.9	1.0	1.0	0.1	-
	Renderipattu	1,825	1	2	8	3	390	0.0	1.0	1.0	1.0	0.0	-
	Sedavampattu	1,577	3	3	7	2	352	0.1	1.0	1.0	1.0	0.0	0.0

Key CWRM Parameter	Gram Panchayat	Watershed and Drainage Networks			Water Demand								
		Length of Natural Drainage Lines	No. of Natural Drainage Lines	No. of MiCriticalo Watersheds	Water Demand For Humans	Water Demand for Livestock	Water Demand For Agriculture	% G.W Utilization for Drinking	% G.W Utilization for Livestock	% G.W Utilzation for Agriculture.	% SW Utilization for Drinking	% SW Utilization for Livestock	% SW Utilization for Agriculture
Unit		m	No.	No.	ha.m	ha.m	ha.m	%	%	%	%	%	%
Type 1	Sengunam	3,223	4	5	8	4	555	0.1	0.9	1.0	1.0	0.1	0.0
	Thuvinjikuppam	12,994	11	3	8	4	482	0.1	1.0	1.0	0.9	0.0	0.0
	Vasur	1,653	2	4	5	1	143	0.0	0.9	1.0	1.0	0.1	-
	Vilankuppam	6,197	7	3	5	3	222	0.1	1.0	1.0	1.0	0.0	0.0
	Vaziur	-	-	2	6	5	313	0.1	1.0	1.0	0.9	0.0	0.0
Type 2	Kasthambady	4,091	4	6	16	5	462	1.0	1.0	1.0	-	0.1	-
	Krishnapuram	13,088	7	6	4	5	452	1.0	1.0	1.0	-	0.1	-
Type 3	Edapirai	16,084	22	6	7	5	399	0.0	1.0	1.0	1.0	0.0	0.0
	Erikuppam	4,512	3	4	5	3	1,673	0.0	1.0	1.0	1.0	0.0	-
	Kalpattu	23,401	35	12	12	8	657	0.1	1.0	1.0	0.9	0.0	0.0
	Kalvasal	7,743	9	4	8	3	717	0.0	0.9	0.9	1.0	0.1	0.1
	Kelur	7,113	8	6	14	7	619	0.1	0.9	1.0	1.0	0.1	-
	Mambattu	11,961	16	7	12	4	801	0.1	0.9	1.0	1.0	0.1	0.0
	Sandhavasal	15,755	20	9	23	9	1,098	0.0	1.0	1.0	1.0	0.0	-
	Tindivanam	38,292	48	11	23	11	2,141	0.0	1.0	1.0	1.0	0.0	0.0
	Tirusoor	5,890	9	4	11	7	644	0.0	1.0	1.0	1.0	0.0	-
	Venmani	2,914	2	5	6	5	201	0.0	1.0	1.0	1.0	0.0	-
	Vellur	14,760	18	10	17	3	1,066	0.1	1.0	1.0	1.0	0.0	0.0

ANNEXURE 3.7

GP WISE STATUS OF AGRICULTURE RESOURCE

Key CWRM Parameter	Gram Panchayat	Land Resources									
		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 Criticalops etc.	Area under Culturable Waste Land	Area under Fallows Land other than Current Fallows	Area under Current Fallow land	Area under Unirrigated Land	Area Irrigated by Source
Unit		ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1	Ananthapuram	-	312.20	3.01	5.53	6.48	85.02	16.04	309.40	87.62	441.36
	Athuvambady	-	184.40	87.08	0.61	-	-	-	153.56	85.43	279.92
	Enduvambady	-	51.15	-	-	-	54.26	-	59.75	5.32	74.72
	Illupakunam	-	118.10	19.35	-	-	68.50	-	93.14	19.89	95.05
	Kalasamudram	-	108.80	48.34	-	0.55	5.10	12.05	9.21	75.54	130.94
	Kalkuppam	-	55.29	-	-	0.90	-	-	9.73	87.53	64.46
	Kangiyanoor	-	105.70	65.50	-	0.60	132.40	-	15.17	5.36	191.62
	Kattipoondy	-	18.64	49.06	-	-	-	-	63.25	13.00	38.62
	Kunnanthur	-	129.60	-	-	1.37	-	16.48	268.75	6.23	63.48
	Kuppam	-	219.40	6.31	-	3.44	-	-	67.90	229.83	113.19
	Kuruvimalai	-	93.39	-	-	-	5.10	-	22.54	2.02	131.46
	Murugapady	-	238.50	-	-	0.40	2.63	-	131.60	5.02	145.00
	Mukkurambai	-	101.90	22.11	7.71	-	4.90	-	295.32	10.58	104.56
	Naranamangalam	-	57.76	15.87	-	-	0.48	-	36.16	15.43	62.85
	Palvathuvendran	-	90.45	-	-	-	64.30	3.45	115.48	-	-
	Eluvambady	-	36.01	-	-	-	21.75	-	-	0.65	114.14
	Padavedu	-	260.70	28.11	-	6.62	260.30	-	21.07	290.34	1,311.57
	Periagaram	-	218.90	0.56	-	-	170.50	-	99.49	11.07	440.78
	Potharai	-	95.64	160.09	-	5.93	12.02	-	69.64	64.89	228.04
	Pudupalayam	-	104.99	-	-	-	8.30	-	67.00	9.58	107.51

Key CWRM Parameter	Gram Panchayat	Land Resources									
		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 Criticalops etc.	Area under Culturable Waste Land	Area under Fallows Land other than Current Fallows	Area under Current Fallow land	Area under Unirrigated Land	Area Irrigated by Source
Unit		ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1	Renderipattu	-	108.30	-	-	-	-	28.65	99.76	0.80	106.91
	Sedavampattu	-	127.80	3.74	-	-	-	86.72	10.50	1.90	186.63
	Sengunam	-	33.49	206.61	2.76	0.41	13.45	-	155.38	30.96	234.21
	Thuvinjikuppam	-	80.27	-	-	-	10.00	97.58	106.49	83.52	339.90
	Vasur	-	116.10	-	-	-	17.15	-	24.44	15.14	107.76
	Vilankuppam	-	15.09	14.46	-	-	6.70	-	78.45	27.88	123.73
	Vaziur	-	71.03	4.05	-	4.40	8.61	-	28.19	45.40	89.73
Type 2	Kasthambady	-	210.87	38.59	-	-	164.90	-	53.09	102.28	290.87
	Krishnapuram	-	206.65	37.81	-	-	161.60	-	52.03	100.23	285.05
Type 3	Edapirai	-	96.53	1.20	0.90	-	2.70	151.77	89.16	16.99	255.24
	Erikuppam	-	235.65	31.60	-	-	126.76	-	339.08	64.24	834.42
	Kalpattu	-	55.26	-	-	-	-	325.43	130.47	201.69	397.19
	Kalvasal	-	125.36	7.84	8.54	0.79	1.02	-	246.43	162.61	135.13
	Kelur	-	186.38	7.90	0.78	2.07	73.92	28.43	170.05	17.80	278.75
	Mambattu	-	111.85	183.74	-	0.86	103.64	-	40.58	45.82	420.02
	Sandhavasal	-	246.04	2.13	-	-	0.12	50.70	96.75	60.17	454.87
	Tindivanam	-	150.13	68.72	46.76	1.94	83.67	76.74	199.02	67.50	980.04
	Tirusoor	-	159.43	22.13	-	2.53	60.15	6.44	54.63	35.65	312.74
	Venmani	-	148.45	-	-	-	0.59	-	197.75	4.94	136.50
	Vellur	-	171.92	18.49	3.56	4.59	7.58	126.69	199.11	115.44	538.26

Key CWRM Parameter	Gram Panchayat	Catchment Area			Crop Details				
		Land under Good Catchment	Land under Average Catchment	Land under Bad Catchment	Irrigated Area	Rainfed area	Area under Paddy Cultivation	Crop Water Requirement - Irrigated condition	Crop Water Requirement - Rainfed condition
Unit		ha	ha	ha	ha	ha	ha	ha.m	ha.m
Type 1	Ananthapuram	315.21	97.03	854.42	600.30	134.70	387.37	872.45	53.44
	Athuvambady	271.48	0.61	518.91	318.32	5.44	282.24	475.08	2.04
	Enduvambady	51.15	54.26	139.79	159.01	19.55	141.54	220.97	6.98
	Illupakunam	137.45	68.50	208.08	259.04	4.28	247.32	376.93	1.87
	Kalasamudram	157.14	5.65	227.74	218.11	16.48	165.05	294.24	7.59
	Kalkuppam	55.29	0.90	161.72	150.87	22.22	102.00	218.91	8.71
	Kangiyanoor	171.20	133.00	212.15	304.17	10.34	242.10	434.20	3.66
	Kattipoondy	67.70	-	114.87	85.63	3.17	76.22	121.24	1.11
	Kunnanthur	129.60	1.37	354.94	88.55	9.63	62.20	132.41	3.61
	Kuppam	225.71	3.44	410.92	299.89	12.42	180.95	396.41	6.77
	Kuruvimalai	93.39	5.10	156.02	122.41	-	112.79	185.48	-
	Murugapady	238.50	3.03	281.62	156.51	0.65	146.24	239.58	0.23
	Mukkurambai	124.01	12.61	410.46	287.32	15.74	221.69	374.89	6.21
	Naranamangalam	73.63	0.48	114.44	143.26	3.22	129.22	203.16	1.30
	Palvathuvendran	90.45	64.30	118.93	282.90	6.00	275.90	422.10	2.25
	Eluvambady	36.01	21.75	114.79	140.97	-	85.41	201.36	-
	Padavedu	288.81	266.92	1,622.98	1,470.44	42.88	325.05	2,763.75	16.72
	Periagaram	219.46	170.50	551.34	627.49	1.67	165.50	1,148.20	0.58
	Potharai	255.73	17.95	362.57	316.57	11.71	174.92	463.31	4.15
	Pudupalayam	104.99	8.30	184.09	104.89	0.03	93.64	156.43	0.01
	Renderipattu	108.30	-	236.12	266.46	1.00	185.58	389.87	0.35
	Sedavampattu	131.54	-	285.75	228.25	11.35	157.44	347.13	4.62
	Sengunam	240.10	16.62	420.55	345.67	13.33	263.05	550.40	4.67
	Thuvinjikuppam	80.27	10.00	627.49	328.17	15.08	308.64	477.06	5.28
	Vasur	116.10	17.15	147.34	94.75	-	78.97	143.12	-

Key CWRM Parameter	Gram Panchayat	Catchment Area			Crop Details				
		Land under Good Catchment	Land under Average Catchment	Land under Bad Catchment	Irrigated Area	Rainfed area	Area under Paddy Cultivation	Crop Water Requirement - Irrigated condition	Crop Water Requirement - Rainfed condition
Unit		ha	ha	ha	ha	ha	ha	ha.m	ha.m
Type 1	Vilankuppam	29.55	6.70	230.06	161.05	5.13	138.30	220.49	1.80
	Vaziur	75.08	13.01	163.32	198.85	13.35	140.85	306.83	5.67
Type 2	Kasthambady	249.45	164.90	446.24	327.28	6.44	285.43	459.28	2.25
	Krishnapuram	244.46	161.60	437.31	320.73	6.31	279.72	450.09	2.21
Type 3	Edapirai	97.73	3.60	513.16	258.76	38.44	208.41	384.93	13.74
	Erikuppam	267.25	126.76	1,237.74	1,137.03	10.10	1,077.82	1,669.49	3.54
	Kalpattu	55.26	-	1,054.78	405.81	61.23	208.73	629.78	27.05
	Kalvasal	133.20	10.35	544.17	496.69	131.52	427.05	670.50	46.03
	Kelur	194.28	76.77	495.03	413.40	8.00	360.00	615.90	2.80
	Mambattu	295.59	104.50	506.42	557.71	46.58	465.05	784.13	17.03
	Sandhavasal	248.17	0.12	662.49	692.77	5.62	550.47	1,095.15	2.66
	Tindivanam	218.85	132.37	1,323.30	1,427.64	44.15	1,140.57	2,126.04	15.45
	Tirusoor	181.56	62.68	409.46	389.31	6.25	184.04	641.47	2.19
	Venmani	148.45	0.59	339.19	126.48	0.47	102.58	200.38	0.16
	Vellur	190.41	15.73	979.50	642.62	35.32	469.26	1,049.73	16.10

Key CWRM Parameter	Gram Panchayat	Soil Resources: Status of Available Nitrogen					Status of Organic Carbon				
		Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High
Unit		%	%	%	%	%	%	%	%	%	%
Type 1	Ananthapuram	0.20	0.73	0.07	-	-	0.29	0.70	0.01	-	0.00
	Athuvambady	0.16	0.76	0.08	-	-	0.29	0.69	0.00	0.01	-
	Enduvambady	0.94	0.06	-	-	-	0.44	0.56	-	-	-
	Illupakunam	0.25	0.73	0.02	-	-	0.23	0.72	0.04	-	0.01
	Kalasamudram	0.16	0.81	0.04	-	-	0.35	0.59	0.06	-	0.01
	Kalkuppam	0.42	0.58	-	-	-	0.79	0.21	-	0.00	-
	Kangiyanoor	0.46	0.54	-	-	-	0.48	0.36	0.15	-	0.01
	Kattipoondy	0.21	0.75	0.04	-	-	0.61	0.39	-	-	-
	Kunnanthur	0.38	0.62	-	-	-	0.53	0.47	-	-	-
	Kuppam	0.18	0.72	0.11	-	-	0.24	0.76	-	-	-
	Kuruvimalai	0.67	0.33	-	-	-	0.84	0.16	-	-	-
	Murugapady	0.32	0.56	0.12	-	-	0.30	0.61	0.07	0.01	0.01
	Mukkurambai	0.47	0.51	0.02	-	-	0.43	0.28	0.30	-	-
	Naranamangalam	0.20	0.80	-	-	-	0.57	0.43	-	-	-
	Palvathuvendran	0.09	0.82	0.10	-	-	0.18	0.82	-	-	-
	Eluvambady	0.61	0.39	-	-	-	0.74	0.25	0.01	-	-
	Padavedu	0.38	0.60	0.01	-	0.00	0.43	0.56	0.00	0.00	-
	Periagaram	0.12	0.78	0.10	-	0.00	0.27	0.72	0.01	0.00	-
	Potharai	0.21	0.65	0.14	-	-	0.20	0.37	0.44	-	-
	Pudupalayam	0.05	0.89	0.06	-	-	0.20	0.80	-	-	-
	Renderipattu	0.23	0.64	0.13	-	-	0.31	0.62	0.05	0.02	-
	Sedavampattu	0.35	0.65	-	-	-	0.32	0.36	0.32	-	-
	Sengunam	0.15	0.76	0.09	-	-	0.30	0.68	0.01	-	0.00
	Thuvinjikuppam	0.15	0.73	0.13	-	-	0.31	0.66	0.02	0.01	-
	Vasur	0.60	0.40	-	-	-	0.81	0.19	-	-	-

Key CWRM Parameter	Gram Panchayat	Soil Resources: Status of Available Nitrogen					Status of Organic Carbon				
		Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High
Unit		%	%	%	%	%	%	%	%	%	%
Type 1	Vilankuppam	0.15	0.66	0.19	-	-	0.30	0.65	0.05	-	-
	Vaziur	0.26	0.64	0.11	-	-	0.38	0.48	0.14	-	-
Type 2	Kasthambady	0.02	0.98	-	-	-	0.01	0.01	0.86	0.12	-
	Krishnapuram	0.21	0.67	0.12	-	-	-	-	0.67	0.33	-
Type 3	Edapirai	0.41	0.46	0.14	-	-	0.63	0.31	0.06	-	-
	Erikuppam	0.18	0.72	0.11	-	-	0.53	0.47	-	-	-
	Kalpattu	0.16	0.76	0.09	-	-	0.27	0.70	0.03	-	-
	Kalvasal	0.21	0.72	0.08	-	-	0.33	0.37	0.30	0.00	-
	Kelur	0.13	0.76	0.10	-	0.00	0.39	0.61	-	-	-
	Mambattu	0.28	0.70	0.02	-	-	0.45	0.54	0.01	-	-
	Sandhavasal	0.51	0.47	0.02	-	-	0.59	0.39	0.02	-	-
	Tindivanam	0.25	0.69	0.05	-	0.01	0.44	0.56	-	-	-
	Tirusoor	0.49	0.26	0.25	-	-	0.53	0.38	0.10	-	-
	Venmani	0.80	0.19	0.02	-	-	0.84	0.16	-	-	-
	Vellur	0.36	0.46	0.18	-	-	0.17	0.61	0.15	0.01	0.06

Key CWRM Parameter	Gram Panchayat	Status of Soil Micro Nutrients		Status of Physical condition of the soil							
		Sufficient	Deficient	Acidic Sulphate (AS)	Strongly Acidic (SrAc)	Highly Acidic (HAc)	Moderate-ly Acidic (MAc)	Slighly Acidic (SlAc)	Neutral (N)	Moderately Alkaline (MAI)	Strongly Alkaline (SIAI)
Unit		%	%	%	%	%	%	%	%	%	%
Type 1	Ananthapuram	0.55	0.45	-	-	-	0.05	0.03	0.07	0.85	0.00
	Athuvambady	0.51	0.49	-	-	-	0.02	0.14	0.13	0.71	-
	Enduvambady	0.34	0.66	-	-	-	-	0.02	-	0.98	-
	Illupakunam	0.53	0.47	-	-	-	-	-	-	1.00	-
	Kalasamudram	0.53	0.47	-	-	-	-	-	-	1.00	-
	Kalkuppam	0.48	0.52	-	-	-	-	-	0.02	0.98	-
	Kangiyanoor	0.46	0.54	-	-	-	0.02	0.05	0.06	0.87	-
	Kattipoondy	0.52	0.48	-	-	-	-	-	0.11	0.89	-
	Kunnanthur	0.40	0.60	-	-	-	-	-	-	1.00	-
	Kuppam	0.20	0.80	-	-	-	-	-	-	1.00	-
	Kuruvimalai	0.37	0.63	-	-	-	-	-	-	0.97	0.03
	Murugapady	0.45	0.55	-	-	-	0.06	0.36	0.05	0.52	0.02
	Mukkurambai	0.48	0.52	-	-	-	0.01	0.02	0.03	0.94	-
	Naranamangalam	0.34	0.66	-	-	-	-	-	-	1.00	-
	Palvathuvendran	0.53	0.47	-	-	-	0.02	-	0.03	0.95	-
	Eluvambady	0.36	0.64	-	-	-	-	0.04	-	0.96	-
	Padavedu	0.42	0.58	0.01	-	-	0.01	0.03	0.03	0.92	0.00
	Periagaram	0.53	0.47	-	-	-	-	0.02	0.03	0.88	0.08
	Potharai	0.52	0.48	-	-	-	-	-	-	1.00	-
	Pudupalayam	0.57	0.43	-	-	-	-	0.06	0.10	0.84	-
	Renderipattu	0.52	0.48	-	-	-	-	-	0.17	0.83	-
	Sedavampattu	0.58	0.42	-	-	-	-	-	-	1.00	-
	Sengunam	0.66	0.34	-	-	-	-	0.11	0.08	0.81	-
	Thuvinjikuppam	0.45	0.55	-	-	-	0.08	0.22	0.10	0.60	-

Key CWRM Parameter	Gram Panchayat	Status of Soil Micro Nutrients		Status of Physical condition of the soil							
		Sufficient	Deficient	Acidic Sulphate (AS)	Strongly Acidic (SrAc)	Highly Acidic (HAc)	Moderate-ly Acidic (MAc)	Slighly Acidic (SlAc)	Neutral (N)	Moderately Alkaline (MAI)	Strongly Alkaline (SIAI)
Unit		%	%	%	%	%	%	%	%	%	%
Type 1	Vasur	0.39	0.61	-	-	-	-	0.08	-	0.92	-
	Vilankuppam	0.64	0.36	-	-	-	0.09	0.23	0.08	0.60	-
	Vaziur	0.52	0.48	-	-	-	-	0.02	-	0.98	-
Type 2	Kasthambady	0.53	0.47	-	-	-	-	-	-	1.00	-
	Krishnapuram	0.47	0.53	-	-	-	-	-	-	1.00	-
Type 3	Edapirai	0.33	0.67	-	-	-	-	-	-	1.00	-
	Erikuppam	0.80	0.20	-	-	-	-	-	-	1.00	-
	Kalpattu	0.55	0.45	-	-	-	-	0.21	0.23	0.56	-
	Kalvasal	0.41	0.59	-	-	-	-	0.01	0.05	0.94	-
	Kelur	0.52	0.48	-	-	-	-	-	-	1.00	-
	Mambattu	0.45	0.55	-	-	-	-	0.09	0.10	0.81	-
	Sandhavasal	0.42	0.58	-	-	-	-	0.08	0.20	0.71	-
	Tindivanam	0.49	0.51	-	-	-	-	-	0.22	0.78	-
	Tirusoor	0.36	0.64	-	-	-	-	-	0.04	0.96	-
	Venmani	0.52	0.48	-	-	-	-	-	-	1.00	-
	Vellur	0.42	0.58	-	-	-	-	-	-	1.00	-

Key CWRM Parameter	Gram Panchayat	Soil Texture						
		% of Clay Soil	% of Fine Soil	% of Coarse loamy	Soil Water Permeability	Volumetric Soil Moisture	Estimated Soil Moisture	ET Losses
Unit		%	%	%	Low, Moderate, high	%	ha.m	ha.m
Type 1	Ananthapuram	0.19	0.64	-	Moderate	0.23	219.53	282.40
	Athuvambady	0.48	0.12	0.07	Low	0.23	139.52	294.23
	Enduvambady	-	0.98	-	Moderate	0.23	44.63	64.35
	Illupakunam	0.35	0.65	-	Moderate	0.23	68.06	92.41
	Kalasamudram	0.05	0.71	-	Moderate	0.23	64.80	166.45
	Kalkuppam	-	0.98	-	Moderate	0.23	37.40	122.92
	Kangiyanoor	0.13	0.82	-	Moderate	0.23	94.45	158.85
	Kattipoondy	0.32	0.44	-	Moderate	0.23	37.70	41.50
	Kunnanthur	0.65	0.19	-	Low	0.23	81.95	57.15
	Kuppam	0.04	0.58	-	Moderate	0.23	96.75	278.55
	Kuruvimalai	-	0.86	-	Moderate	0.23	37.06	107.32
	Murugapady	0.14	0.68	-	Moderate	0.23	65.47	120.94
	Mukkurambai	0.13	0.80	-	Moderate	0.23	102.39	64.13
	Naranamangalam	0.06	0.87	-	Moderate	0.23	30.08	62.94
	Palvathuvendran	0.61	0.26	0.09	Low	0.23	42.14	-
	Eluvambady	-	0.78	-	Moderate	0.23	31.40	92.29
	Padavedu	0.53	0.38	0.01	Low	0.23	441.14	1,293.26
	Periagaram	0.54	0.26	-	Low	0.23	166.15	363.29
	Potharai	0.70	-	-	Low	0.23	124.34	240.28
	Pudupalayam	0.22	0.64	-	Moderate	0.23	44.25	94.14
	Renderipattu	0.22	0.55	-	Moderate	0.23	54.31	86.60
	Sedavampattu	-	0.42	0.56	High	0.23	66.58	151.58
	Sengunam	0.81	0.08	0.01	Low	0.23	148.07	215.75
	Thuvinjikuppam	0.49	0.17	0.09	Low	0.23	146.62	340.43
	Vasur	0.07	0.86	-	Moderate	0.23	37.83	64.15

Key CWRM Parameter	Gram Panchayat	Soil Texture						
		% of Clay Soil	% of Fine Soil	% of Coarse loamy	Soil Water Permeability	Volumetric Soil Moisture	Estimated Soil Moisture	ET Losses
Unit		%	%	%	Low, Moderate, high	%	ha.m	ha.m
Type 1	Vilankuppam	0.64	0.36	-	Low	0.23	57.78	121.89
	Vaziur	-	0.81	-	Moderate	0.23	41.49	112.18
Type 2	Kasthambady	0.45	0.45	-	Moderate	0.23	272.70	636.89
	Krishnapuram	0.04	0.76	-	Moderate	0.23	395.87	636.89
Type 3	Edapirai	-	0.77	-	Moderate	0.23	119.13	219.60
	Erikuppam	0.01	0.88	-	Moderate	0.23	321.10	722.52
	Kalpattu	0.04	0.46	0.15	Moderate	0.23	242.60	481.50
	Kalvasal	0.74	0.23	0.00	Low	0.23	129.34	246.88
	Kelur	0.73	0.10	-	Low	0.23	133.33	240.72
	Mambattu	0.08	0.57	-	Moderate	0.23	182.77	243.62
	Sandhavasal	0.36	0.46	0.06	Moderate	0.23	152.89	414.09
	Tindivanam	0.04	0.43	0.00	Moderate	0.23	350.61	881.38
	Tirusoor	-	0.77	-	Moderate	0.23	113.68	183.18
	Venmani	0.02	0.84	-	Moderate	0.23	78.15	113.72
	Vellur	0.47	0.46	0.01	Low	0.23	233.16	532.13

ANNEXURE 3.8

GP WISE DEMOGRAPHIC AND SOCIO ECONOMIC STATUS

Key CWRM Parameter	Gram Panchayat	Geographical Area	Male Population	Female Population	Total Population	SC Population	ST Population	Vulnerable popupation	Households (HH's)	Only one room HH's (SECC)	Female Headed HH's (SECC)
Unit		ha	No.	No.	No.	No.	No.	No.	No.	No.	No.
Type 1	Ananthapuram	1,267	2,770	2,755	5,525	129	32	161	1,445	325	97
	Athuvambady	791	1,704	1,695	3,399	326	-	326	863	109	80
	Enduvambady	245	645	658	1,303	524	-	524	312	25	18
	Illupakunam	414	1,018	984	2,002	701	-	701	448	12	8
	Kalasamudram	390	1,478	1,579	3,057	279	80	359	770	78	52
	Kalkuppam	218	571	604	1,175	309	-	309	292	6	12
	Kangiyanoor	516	853	904	1,757	824	-	824	448	9	23
	Kattipoondy	183	706	660	1,366	282	-	282	312	47	21
	Kunnanthur	486	1,437	1,475	2,912	779	-	779	760	36	41
	Kuppam	640	2,050	2,144	4,194	839	-	839	1,157	223	56
	Kuruvimalai	254	688	683	1,371	611	-	611	353	7	17
	Murugapady	525	873	904	1,777	68	-	68	444	51	36
	Mukkurambai	547	1,050	1,030	2,080	729	-	729	529	84	36
	Naranamangalam	189	502	522	1,024	175	6	181	262	3	28
	Palvathuvendran	274	400	398	798	93	-	93	277	19	16
	Eluvambady	173	786	840	1,626	259	-	259	415	16	31
	Padavedu	2,179	7,576	7,587	15,163	1,559	4	1,563	3,808	899	288
	Periagaram	941	2,520	2,499	5,019	352	-	352	1,206	118	50
	Potharai	636	1,584	1,532	3,116	1,290	-	1,290	747	75	38
	Pudupalayam	297	753	810	1,563	469	-	469	393	81	19
	Renderipattu	344	1,452	1,461	2,913	1,262	-	1,262	666	60	31
	Sedavampattu	417	1,196	1,189	2,385	509	-	509	535	21	27
	Sengunam	677	1,412	1,391	2,803	492	-	492	691	47	40

Key CWRM Parameter	Gram Panchayat	Geographical Area	Male Population	Female Population	Total Population	SC Population	ST Population	Vulnerable popupation	Households (HH's)	Only one room HH's (SECC)	Female Headed HH's (SECC)
Unit		ha	No.	No.	No.	No.	No.	No.	No.	No.	No.
Type 1	Thuvinjikuppam	718	1,536	1,457	2,993	26	35	61	694	123	32
	Vasur	281	963	948	1,911	753	-	753	470	28	30
	Vilankuppam	266	1,009	951	1,960	466	8	474	502	79	35
	Vaziur	251	997	1,030	2,027	941	-	941	475	22	47
Type 2	Kasthambady	1,420	2,889	2,906	5,795	1,360	28	1,388	961	68	72
	Krishnapuram	1,393	800	788	1,588	5	-	5	942	67	70
Type 3	Edapirai	614	1,250	1,193	2,443	389	43	432	605	76	35
	Erikuppam	1,632	944	943	1,887	18	7	25	460	23	35
	Kalpattu	1,110	2,151	2,115	4,266	248	17	265	1,101	215	59
	Kalvasal	688	1,520	1,490	3,010	635	-	635	705	75	37
	Kelur	766	2,584	2,671	5,255	1,415	5	1,420	1,337	140	94
	Mambattu	907	2,271	2,204	4,475	510	-	510	346	80	17
	Sandhavasal	911	4,061	4,244	8,305	2,121	14	2,135	346	80	17
	Tindivanam	1,675	4,253	4,228	8,481	2,315	139	2,454	2,009	188	87
	Tirusoor	654	2,113	2,086	4,199	1,657	-	1,657	346	80	17
	Venmani	488	1,108	1,100	2,208	567	49	616	346	80	17
	Vellur	1,186	3,136	3,078	6,214	1,046	9	1,055	1,526	149	89

Key CWRM Parameter	Gram Panchayat	Vulnerable Households (SECC)	% of Vulnerable Households	Registered MGNREGA Job cards	Active person working in MGNREGA job Cards	Drinking Water Sources	Ground Water - Drinking source	Surface water - Drinking source	Sum of drinking water sources	HH's have tap water connection for drinking water	HH's dependent on other sources for drinking water	Annual Greywater Generation
Unit		No.	%	No.	No.	No.	No.	No.	No.	No.	No.	ha.m
Type 1	Ananthapuram	257	0.18	1,480	1,273	136	5	1	6	560	748	10
	Athuvambady	100	0.12	1,689	1,076	302	5	1	6	211	119	6
	Enduvambady	23	0.07	621	456	347	5	1	6	251	184	2
	Illupakunam	11	0.02	1,249	631	519	5	-	5	503	350	4
	Kalasamudram	70	0.09	801	603	256	5	1	6	580	129	6
	Kalkuppam	8	0.03	300	224	389	5	1	6	493	198	2
	Kangiyanoor	13	0.03	865	707	292	5	1	6	379	87	3
	Kattipoondy	39	0.13	644	389	105	5	1	6	272	63	2
	Kunnanthur	38	0.05	1,069	608	438	5	1	6	372	297	5
	Kuppam	173	0.15	1,110	831	428	5	1	6	481	346	8
	Kuruvimalai	10	0.03	694	444	254	5	1	6	352	145	3
	Murugapady	47	0.11	762	604	475	5	1	6	307	264	3
	Mukkurambai	70	0.13	1,035	654	483	4	1	5	350	273	4
	Naranamangalam	11	0.04	310	271	190	4	1	5	196	154	2
	Palvathuvendran	18	0.07	377	279	181	5	1	6	267	63	1
	Eluvambady	21	0.05	788	436	447	5	1	6	442	237	3
	Padavedu	716	0.19	4,187	3,103	1,219	5	1	6	1,057	645	28
	Periagaram	98	0.08	1,785	1,491	496	5	1	6	252	341	9
	Potharai	64	0.09	1,309	755	405	5	1	6	281	242	6
	Pudupalayam	62	0.16	954	499	235	5	1	6	295	82	3
	Renderipattu	51	0.08	597	456	359	5	1	6	333	216	5
	Sedavampattu	23	0.04	1,091	594	369	5	1	6	336	259	4

Key CWRM Parameter	Gram Panchayat	Vulnerable Households (SECC)	% of Vulnerable Households	Registered MGNREGA Job cards	Active person working in MGNREGA job Cards	Drinking Water Sources	Ground Water - Drinking source	Surface water - Drinking source	Sum of drinking water sources	HH's have tap water connection for drinking water	HH's dependent on other sources for drinking water	Annual Greywater Generation
Unit		No.	%	No.	No.	No.	No.	No.	No.	No.	No.	ha.m
Type 1	Sengunam	45	0.07	1,600	831	399	5	1	6	288	226	5
	Thuvinjikuppam	96	0.14	1,541	873	422	5	1	6	255	224	5
	Vasur	29	0.06	844	640	333	5	1	6	277	107	3
	Vilankuppam	66	0.13	948	688	194	5	1	6	-	-	-
	Vaziur	30	0.06	450	247	278	5	1	6	410	188	4
Type 2	Kasthambady	69	0.04	1,650	1,242	346	5	-	5	206	288	11
	Krishnapuram	68	0.04	948	536	233	5	-	5	82	295	3
Type 3	Edapirai	64	0.11	1,676	944	261	5	1	6	363	72	4
	Erikuppam	27	0.06	874	531	243	5	1	6	350	51	3
	Kalpattu	168	0.15	1,644	1,086	202	5	1	6	-	-	8
	Kalvasal	64	0.09	1,399	872	182	5	1	6	-	-	5
	Kelur	126	0.09	2,489	2,093	221	5	1	6	-	-	10
	Mambattu	61	0.18	1,570	1,278	202	5	1	6	-	-	8
	Sandhavasal	61	0.18	2,338	1,447	207	5	1	6	-	-	15
	Tindivanam	158	0.08	-	-	189	5	1	6	-	-	15
	Tirusoor	61	0.18	1,951	1,198	226	5	1	6	-	-	8
	Venmani	61	0.18	986	694	195	5	1	6	-	-	4
	Vellur	131	0.09	2,214	1,587	197	5	1	6	-	-	11

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	Gram Panchayat	Treatment Area under Forest Land	Treatment Area under Non-Agricultural Uses	Treatment Area under Barren & Un-cultivable Land	Treatement Area under Permanent Pastures and Other Grazing Land	Treatment Area under Land Under Miscellaneous Tree Criticalops etc.	Treatment Area under Culturable Waste Land	Treatment Area under Fallows Land other than Current Fallows	Treatment Area under Current Fallow land	Treatment Area under Unirrigated Land	Treatment Area Irrigated by Source
Unit		ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1	Ananthapuram	0.0	14.5	2.3	4.2	4.9	63.8	2.9	54.9	15.6	44.1
	Athuvambady	0.0	6.1	65.3	0.5	0.0	0.0	0.0	17.9	9.9	28.0
	Enduvambady	0.0	25.6	0.0	0.0	0.0	40.7	0.0	4.4	0.4	7.5
	Illupakunam	0.0	10.0	14.5	0.0	0.0	51.4	0.0	2.3	0.5	9.5
	Kalasamudram	0.0	8.5	36.3	0.0	0.4	3.8	3.0	2.3	18.9	13.1
	Kalkuppam	0.0	3.0	0.0	0.0	0.7	0.0	0.0	0.3	2.3	6.5
	Kangiyanoor	0.0	52.9	49.1	0.0	0.5	99.3	0.0	0.5	0.2	19.2
	Kattipoondy	0.0	0.0	36.8	0.0	0.0	0.0	0.0	8.0	1.6	3.9
	Kunnanthur	0.0	8.7	0.0	0.0	1.0	0.0	0.8	13.3	0.3	6.4
	Kuppam	0.0	30.7	4.7	0.0	2.6	0.0	0.0	10.2	34.4	11.3
	Kuruvimalai	0.0	14.9	0.0	0.0	0.0	3.8	0.0	5.6	0.5	13.2
	Murugapady	0.0	62.0	0.0	0.0	0.3	2.0	0.0	13.8	0.5	14.5
	Mukkurambai	0.0	51.0	16.6	5.8	0.0	3.7	0.0	38.9	1.4	10.5
	Naranamangalam	0.0	6.1	11.9	0.0	0.0	0.4	0.0	1.5	0.6	6.3
	Palvathuvendran	0.0	11.8	0.0	0.0	0.0	48.2	0.2	7.6	0.0	0.0
	Eluvambady	0.0	18.0	0.0	0.0	0.0	16.3	0.0	0.0	0.0	11.4
	Padavedu	0.0	130.4	21.1	0.0	5.0	195.2	0.0	4.0	54.6	131.2
	Periagaram	0.0	7.7	0.4	0.0	0.0	127.9	0.0	8.1	0.9	44.1
	Potharai	0.0	47.8	120.1	0.0	4.5	9.0	0.0	6.0	5.6	22.8

Key CWRM Parameter	Gram Panchayat	Treatment Area under Forest Land	Treatment Area under Non-Agricultural Uses	Treatment Area under Barren & Un-cultivable Land	Treatement Area under Permanent Pastures and Other Grazing Land	Treatment Area under Land Under Miscellaneous Tree Criticalops etc.	Treatment Area under Cultivable Waste Land	Treatment Area under Fallows Land other than Current Fallows	Treatment Area under Current Fallow land	Treatment Area under Unirrigated Land	Treatment Area Irrigated by Source
Unit		ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1	Pudupalayam	0.0	15.8	0.0	0.0	0.0	6.2	0.0	10.6	1.5	10.8
	Renderipattu	0.0	11.9	0.0	0.0	0.0	0.0	2.2	7.7	0.1	10.7
	Sedavampattu	0.0	13.6	2.8	0.0	0.0	0.0	3.7	0.5	0.1	18.7
	Sengunam	0.0	1.2	155.0	2.1	0.3	10.1	0.0	10.1	2.0	23.4
	Thuvinjikuppam	0.0	0.0	0.0	0.0	0.0	7.5	13.5	14.7	11.5	34.0
	Vasur	0.0	24.8	0.0	0.0	0.0	12.9	0.0	1.5	0.9	10.8
	Ilankuppam	0.0	0.0	10.9	0.0	0.0	5.0	0.0	10.3	3.7	12.4
	Vaziur	0.0	5.9	3.0	0.0	3.3	6.5	0.0	1.8	2.8	9.0
Type 2	Kasthambady	0.0	9.5	28.9	0.0	0.0	123.7	0.0	3.7	7.2	20.4
	Krishnapuram	0.0	9.3	28.4	0.0	0.0	121.2	0.0	15.4	29.8	84.6
Type 3	Edapirai	0.0	48.3	0.9	0.7	0.0	2.0	16.0	9.4	1.8	25.5
	Erikuppam	0.0	0.0	23.7	0.0	0.0	95.1	0.0	19.6	3.7	83.4
	Kalpattu	0.0	0.0	0.0	0.0	0.0	0.0	49.7	19.9	30.8	39.7
	Kalvasal	0.0	0.0	5.9	6.4	0.6	0.8	0.0	22.2	14.7	13.5
	Kelur	0.0	7.5	5.9	0.6	1.6	55.4	2.7	16.1	1.7	27.9
	Mambattu	0.0	0.0	137.8	0.0	0.7	77.7	0.0	7.2	8.1	42.0
	Sandhavasal	0.0	8.6	1.6	0.0	0.0	0.1	9.0	17.1	10.6	45.5
	Tindivanam	0.0	75.1	51.5	35.1	1.5	62.8	6.0	15.6	5.3	98.0
	Tirusoor	0.0	6.4	16.6	0.0	1.9	45.1	1.1	9.7	6.3	31.3
	Venmani	0.0	5.2	0.0	0.0	0.0	0.4	0.0	34.9	0.9	13.7
	Vellur	0.0	0.0	13.9	2.7	3.4	5.7	10.9	17.1	9.9	53.8

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

GP type	GP name	Good Catchment Area ha.m	Average Catchment Area ha.m	Bad Catchment Area ha.m
Unit		ha.m	ha.m	ha.m
Type 1	Ananthapuram	9	20	22
	Athuvambady	28	0	10
	Enduvambady	10	11	2
	Illupakunam	9	14	2
	Kalasamudram	18	1	7
	Kalkuppam	2	0	2
	Kangiyanoor	40	28	4
	Kattipoondy	14	0	3
	Kunnanthur	6	0	4
	Kuppam	15	1	10
	Kuruvimalai	6	1	4
	Murugapady	23	1	5
	Mukkurambai	25	3	9
	Naranamangalam	7	0	2
	Palvathuvendran	5	14	1
	Eluvambady	7	5	2
	Padavedu	56	56	35
	Periagaram	4	36	10
	Potharai	61	4	6
	Pudupalayam	6	2	4
	Renderipattu	5	0	4
	Sedavampattu	8	0	4
	Sengunam	57	4	7
	Thuvinjikuppam	1	2	14
	Vasur	10	4	3
	Vilankuppam	7	1	5
	Vaziur	3	3	3
Type 2	Kasthambady	16	36	6
	Krishnapuram	15	36	25
Type 3	Edapirai	22	1	10
	Erikuppam	12	27	20
	Kalpattu	3	0	26
	Kalvasal	5	2	9
	Kelur	56	9	37
	Mambattu	52	22	11
	Sandhavasal	8	1	7
	Tindivanam	55	26	5
	Tirusoor	13	5	3
	Venmani	6	0	7
	Vellur	9	3	17

ANNEXURE 5.3

GP WISE PROPOSED WORKS BASED ON WATERSHED AND LIVELIHOOD APPROACH

Gram Panchayat	Aff		ARS		AVP		AZ	BP		CBL	
	No.	Area	No.	Area	No.	Area	No.	No.	Area	No.	Area
Ananthapuram	52,818	66	177	441	549	2,747	80	8,710	11	3	8,299
Athuvambady	52,248	65	112	280	415	2,075	66	3,651	5	2	3,117
Edapirai	2,340	3	89	222	406	2,031	68	28,959	36	3	1,686
Eluvambady	13,050	16	45	112	-	-	9	10,803	14	2	985
Enduvambady	32,556	41	30	-	484	2,421	30	15,345	19	1	599
Erikuppam	95,016	119	160	401	124	618	26	-	-	1	1,247
Illupakunam	52,710	66	38	95	687	3,437	14	6,023	8	1	1,099
Kalasamudram	32,064	40	52	131	335	1,677	40	5,092	6	3	2,225
Kalkuppam	-	-	26	64	303	1,513	9	1,791	2	-	-
Kalpattu	-	-	-	-	1,333	6,666	157	-	-	3	5,638
Kalvasal	5,316	7	44	109	333	1,664	35	-	-	2	2,226
Kangiyanoor	118,740	148	64	160	396	1,979	4	31,710	40	1	2,893
Kasthambady	244,176	305	233	582	1,054	5,268	47	11,387	14	2	1,628
Kattipoondy	29,436	37	8	19	-	-	31	-	-	3	2,197
Kelur	49,092	61	112	279	648	0	82	4,473	6	1	-
Krishnapuram	244,176	305	233	582	407	2,033	47	11,387	14	-	-
Kunnanthur	-	-	25	63	137	684	13	5,210	7	1	833
Kuppam	3,786	5	45	113	1,033	5,166	162	18,430	23	-	-
Kuruvimalai	3,060	4	53	131	111	0	16	8,965	11	1	-
Mambattu	172,428	216	164	409	390	1,948	92	-	-	2	-
Mukkurambai	16,206	20	42	105	943	0	26	30,570	38	1	-
Murugapady	1,578	2	58	145	434	0	36	37,206	47	1	-
Naranamangalam	9,810	12	25	63	308	1,538	8	3,684	5	1	1,132
Padavedu	173,046	216	525	1,312	-	-	932	78,210	98	2	-
Palvathuvendran	38,580	48	46	115	-	-	10	7,082	9	-	-

Gram Panchayat	Aff		ARS		AVP		AZ	BP		CBL	
	No.	Area	No.	Area	No.	Area	No.	No.	Area	No.	Area
Periagaram	102,636	128	176	441	105	523	164	4,597	6	2	2,341
Potharai	103,266	129	91	228	243	1,217	104	28,692	36	1	820
Pudupalayam	4,980	6	43	108	419	0	28	9,449	12	1	-
Renderipattu	-	-	37	94	-	-	77	7,148	9	1	-
Sandhavasal	1,350	2	182	455	1,106	5,528	212	5,167	6	-	-
Sedavampattu	2,244	3	75	187	667	3,337	10	8,151	10	1	772
Sengunam	132,036	165	94	234	201	1,005	105	703	1	2	2,536
Thurinjikuppam	6,000	8	136	340	550	2,749	81	-	-	1	2,051
Tindivanam	91,434	114	369	922	-	-	295	45,039	56	1	-
Tirusoor	49,368	62	125	313	168	842	175	3,348	4	1	888
Vasur	10,290	13	-	-	125	626	4	14,893	19	1	1,457
Vaziur	7,596	9	36	90	64	318	40	3,516	4	1	1,964
Vellur	15,642	20	215	538	730	3,651	38	-	-	1	2,159
Venmani	354	0	55	137	366	1,831	93	3,117	4	-	-
Vilankuppam	12,696	16	49	124	107	536	48	-	-	2	1,870

Gram Panchayat	CBP		CS	CT	CD	CO	FP	CEOW		DW	
	No.	Area	No.	No.	No.	No.	No.	No.	Area	No.	Area
Ananthapuram	1,660	8,299	80	80	5	23	29	177	441	3	4
Athuvambady	623	3,117	66	66	3	11	15	112	280	4	30
Edapirai	337	1,686	68	68	2	11	14	89	222	5	26
Eluvambady	197	985	9	9	2	5	9	45	112	2	24
Enduvambady	120	599	30	30	1	2	7	30	-	3	24
Erikuppam	249	1,247	26	26	-	21	26	160	401	3	30
Illupakunam	220	1,099	14	14	2	4	10	38	95	3	28
Kalasamudram	445	2,225	40	40	2	10	15	52	131	2	16
Kalkuppam	-	-	9	9	-	2	3	26	64	3	13
Kalpattu	1,128	5,638	157	157	8	28	28	-	-	-	-
Kalvasal	445	2,226	35	35	5	10	11	44	109	6	51
Kangiyanoor	579	2,893	4	4	2	4	13	64	160	3	65
Kasthambady	326	1,628	47	47	-	16	23	233	582	8	113
Kattipoondy	439	2,197	31	31	4	3	6	8	19	2	3
Kelur	-	-	82	82	-	10	17	112	279	3	-
Krishnapuram	-	-	47	47	-	16	23	233	582	5	56
Kunnanthur	167	833	13	13	2	4	5	25	63	2	79
Kuppam	-	-	162	162	2	11	14	45	113	2	0
Kuruvimalai	-	-	16	16	-	4	5	53	131	2	-
Mambattu	-	-	92	92	-	11	17	164	409	3	63
Mukkurambai	-	-	26	26	-	10	17	42	105	2	-
Murugapady	-	-	36	36	-	6	15	58	145	3	-
Naranamangalam	226	1,132	8	8	-	2	5	25	63	1	20
Padavedu	-	-	932	932	2	64	73	525	1,312	2	48
Palvathuvendran	-	-	10	10	-	2	13	46	115	4	11
Periagaram	468	2,341	164	164	-	11	37	176	441	4	122
Potharai	164	820	104	104	-	11	40	91	228	1	45
Pudupalayam	-	-	28	28	-	5	6	43	108	3	-

Gram Panchayat	CBP		CS	CT	CD	CO	FP	CEOW		DW	
	No.	Area	No.	No.	No.	No.	No.	No.	Area	No.	Area
Renderipattu	-	-	77	77	-	4	5	37	94	3	-
Sandhavasal	-	-	212	212	2	16	18	182	455	4	69
Sedavampattu	154	772	10	10	-	5	7	75	187	3	14
Sengunam	507	2,536	105	105	-	7	41	94	234	2	85
Thurinjikuppam	410	2,051	81	81	2	15	15	136	340	3	40
Tindivanam	-	-	295	295	-	25	41	369	922	3	-
Tirusoor	178	888	175	175	-	9	23	125	313	4	78
Vasur	291	1,457	4	4	-	3	9	-	-	2	37
Vaziur	393	1,964	40	40	-	3	6	36	90	2	1
Vellur	432	2,159	38	38	3	18	20	215	538	4	37
Venmani	-	-	93	93	-	10	11	55	137	3	64
Vilankuppam	374	1,870	48	48	-	5	7	49	124	4	7

Gram Panchayat	DEW		DLT		EB		EBP		FB	
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area
Ananthapuram	3	4	-	25,788	-	-	8,035	100	51	100
Athuvambady	4	30	-	9,688	-	-	1,111	14	76	14
Edapirai	5	26	-	16,084	-	-	1,248	16	12	16
Eluvambady	2	24	-	502	-	-	1,306	16	11	16
Enduvambady	3	24	-	-	-	-	3,447	43	19	43
Erikuppam	3	30	-	4,512	-	-	8,538	107	83	107
Illupakunam	3	28	-	3,483	-	-	4,219	53	39	53
Kalasamudram	2	16	-	4,674	-	-	1,274	16	48	16
Kalkuppam	3	13	-	2,500	-	-	104	1	2	1
Kalpattu	-	-	-	23,401	-	-	4,018	50	28	50
Kalvasal	6	51	-	7,743	-	-	1,537	19	16	19
Kangiyanoor	3	65	-	3,887	-	-	7,968	100	93	100
Kasthambady	8	113	-	4,091	-	-	20,680	259	173	259
Kattipoondy	2	3	-	-	-	-	383	5	39	5
Kelur	3	-	1,071	1	-	-	5,252	66	38	66
Krishnapuram	5	56	-	13,088	-	-	20,680	259	173	259
Kunnanthur	2	79	-	-	-	-	575	7	4	7
Kuppam	2	0	-	14,400	-	-	1,780	22	16	22
Kuruvimalai	2	-	578	0	-	-	552	7	5	7
Mambattu	3	63	-	11,961	-	-	-	-	-	-
Mukkurambai	2	-	-	-	-	-	1,904	24	28	24
Murugapady	3	-	-	-	-	-	730	9	7	9
Naranamangalam	1	20	-	1,033	-	-	-	-	-	-
Padavedu	2	48	-	14,610	-	-	-	-	-	-
Palvathuvendran	4	11	-	3,342	-	-	-	-	-	-
Periagaram	4	122	-	9,373	-	-	-	-	-	-
Potharai	1	45	-	8,503	-	-	-	-	-	-
Pudupalayam	3	-	-	-	-	-	984	12	7	12

Gram Panchayat	DEW		DLT		EB		EBP		FB	
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area
Renderipattu	3	-	318	0	-	-	4	5	398	5
Sandhavasal	4	69	-	15,755	-	-	1,474	18	18	18
Sedavampattu	3	14	-	1,577	-	-	169	2	7	2
Sengunam	2	85	-	3,223	-	-	-	-	-	-
Thurinjikuppam	3	40	-	12,994	-	-	-	-	-	-
Tindivanam	3	-	-	-	6,098	76	-	-	102	76
Tirusoor	4	78	-	5,890	-	-	-	-	-	-
Vasur	2	37	-	1,653	-	-	1,125	14	8	14
Vaziur	2	1	-	-	-	-	699	9	8	9
Vellur	4	37	-	14,760	-	-	1,970	25	34	25
Venmani	3	64	-	2,914	-	-	-	-	-	-
Vilankuppam	4	7	-	6,197	-	-	959	12	18	12

Gram Panchayat	FBP		F	GS	GT	HORTI		SPI		IDW	
	No.	Area	Area	No.	No.	No.	Area	No.	Area	No.	Area
Ananthapuram	200	10	86	46	46	29,340	37	257	1,445	3	4
Athuvambady	40	2	70	18	18	11,110	14	100	863	4	30
Edapirai	120	6	39	14	14	10,862	14	64	605	5	26
Eluvambady	100	5	30	2	2	13	0	21	415	2	24
Enduvambady	20	1	60	7	7	1,910	2	23	312	3	24
Erikuppam	320	16	119	2	2	9,329	12	27	460	3	30
Illupakunam	120	6	73	4	4	1,090	1	11	448	3	28
Kalasamudram	120	6	47	4	4	9,680	12	70	770	2	16
Kalkuppam	20	1	3	2	2	1,039	1	8	292	3	13
Kalpattu	160	8	-	23	23	40,184	50	168	1,101	-	-
Kalvasal	60	3	7	12	12	14,760	18	64	705	6	51
Kangiyanoor	140	7	189	1	1	242	0	13	448	3	65
Kasthambady	120	6	319	5	5	8,931	11	138	1,922	8	113
Kattipoondy	40	2	37	7	7	3,832	5	39	312	2	3
Kelur	331	17	69	29	29	8,166	10	126	1,337	3	-
Krishnapuram	100	5	319	5	5	8,931	11	138	1,922	5	56
Kunnanthur	20	1	8	3	3	5,753	7	38	760	2	79
Kuppam	40	2	30	12	12	17,797	22	173	1,157	2	0
Kuruvimalai	107	5	15	3	3	2,456	3	10	353	2	-
Mambattu	340	17	216	40	40	6,103	8	61	346	3	63
Mukkurambai	331	17	58	16	16	16,099	20	70	529	2	-
Murugapady	295	15	49	14	14	5,723	7	47	444	3	-
Naranamangalam	101	5	17	2	2	827	1	11	262	1	20
Padavedu	100	5	319	273	273	23,411	29	716	3,808	2	48
Palvathuvendran	259	13	57	2	2	3,108	4	18	277	4	11
Periagaram	748	37	134	29	29	3,579	4	98	1,206	4	122
Potharai	807	40	169	22	22	4,603	6	64	747	1	45
Pudupalayam	128	6	18	11	11	4,864	6	62	393	3	-

Gram Panchayat	FBP		F	GS	GT	HORTI		SPI		IDW	
	No.	Area	Area	No.	No.	No.	Area	No.	Area	No.	Area
Renderipattu	100	5	9	14	14	3,981	5	51	666	3	-
Sandhavasal	361	18	8	49	49	14,665	18	61	346	4	69
Sedavampattu	144	7	13	2	2	1,690	2	23	535	3	14
Sengunam	815	41	166	51	51	4,843	6	45	691	2	85
Thurinjikuppam	295	15	8	12	12	15,863	20	96	694	3	40
Tindivanam	820	41	172	47	47	10,778	13	158	2,009	3	-
Tirusoor	460	23	68	9	9	6,832	9	61	346	4	78
Vasur	179	9	31	3	3	963	1	29	470	2	37
Vaziur	123	6	17	2	2	1,828	2	30	475	2	1
Vellur	200	10	26	5	5	15,151	19	131	1,526	4	37
Venmani	215	11	4	12	12	14,317	18	61	346	3	64
Vilankuppam	40	2	16	5	5	5,575	7	66	502	4	7

Gram Panchayat	IRRC		LD		LP		MF		MU	
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area
Ananthapuram	-	-	44	109	153	765	72,900	5	65,416	82
Athuvambady	-	-	33	81	375	1,875	-	-	55,899	70
Edapirai	-	-	20	50	492	2,460	-	-	31,299	39
Eluvambady	-	-	14	34	356	1,780	-	-	23,853	30
Enduvambady	-	-	25	62	236	1,180	-	-	47,901	60
Erikuppam	-	-	56	140	412	2,060	-	-	95,016	119
Illupakunam	-	-	31	78	261	1,305	-	-	58,733	73
Kalasamudram	-	-	23	57	268	1,340	6,188	0	37,486	47
Kalkuppam	-	-	2	5	277	1,385	10,125	1	2,331	3
Kalpattu	-	-	11	28	-	-	-	-	-	-
Kalvasal	-	-	9	24	821	4,105	8,888	1	5,790	7
Kangiyanoor	-	-	77	192	590	2,950	6,750	0	150,810	189
Kasthambady	-	-	134	336	964	4,820	-	-	255,563	319
Kattipoondy	-	-	16	39	152	760	-	-	29,436	37
Kelur	-	-	32	79	733	0	23,288	2	-	-
Krishnapuram	-	-	134	336	606	3,030	-	-	255,563	319
Kunnanthur	-	-	5	12	480	2,400	15,413	1	6,032	8
Kuppam	-	-	17	42	70	350	38,700	3	24,280	30
Kuruvimalai	-	-	3	8	412	0	-	-	12,025	15
Mambattu	-	-	91	228	603	3,017	9,675	1	172,944	216
Mukkurambai	-	-	30	74	248	0	-	-	46,776	58
Murugapady	-	-	22	55	562	0	4,500	0	39,024	49
Naranamangalam	-	-	7	19	327	1,633	-	-	13,494	17
Padavedu	-	-	153	383	251	1,256	74,475	5	255,228	319
Palvathuvendran	-	-	23	59	386	1,932	-	-	45,662	57
Periagaram	-	-	58	145	791	3,954	-	-	107,233	134
Potharai	1,315	6,573	72	181	79	395	66,713	4	135,516	169
Pudupalayam	-	-	9	23	449	0	-	-	14,429	18

Gram Panchayat	IRRC		LD		LP		MF		MU	
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area
Renderipattu	-	-	5	13	506	0	-	-	7,148	9
Sandhavasal	-	-	10	25	579	2,894	-	-	6,517	8
Sedavampattu	-	-	7	18	297	1,484	-	-	10,395	13
Sengunam	-	-	70	175	242	1,208	4,613	0	132,985	166
Thurinjikuppam	-	-	9	22	389	1,947	-	-	6,000	8
Tindivanam	-	-	93	232	-	-	21,825	1	-	-
Tirusoor	-	-	31	77	953	4,763	28,463	2	54,234	68
Vasur	-	-	14	34	406	2,028	-	-	25,183	31
Vaziur	-	-	8	20	79	395	49,500	3	13,752	17
Vellur	-	-	18	44	503	2,515	51,638	3	18,396	23
Venmani	-	-	6	14	568	2,840	-	-	3,471	4
Vilankuppam	-	-	8	21	257	1,285	-	-	12,696	16

Gram Panchayat	MUC		NG		RP	RRWH		SA		SPD
	No.	Area	No.	Area	No.	No.	Area	No.	Area	Area
Ananthapuram	-	-	289	1,445	-	25,000	2	44	109	4
Athuvambady	-	-	173	863	-	25,000	2	33	81	0
Edapirai	-	-	121	605	-	25,000	2	20	50	1
Eluvambady	-	-	83	415	1	5,000	10	14	34	-
Enduvambady	-	-	62	312	-	25,000	2	25	62	-
Erikuppam	-	-	92	460	-	25,000	2	56	140	-
Illupakunam	-	-	90	448	5	25,000	2	31	78	-
Kalasamudram	-	-	154	770	-	25,000	2	23	57	-
Kalkuppam	-	-	58	292	-	25,000	2	2	5	-
Kalpattu	-	-	220	1,101	-	25,000	2	11	28	-
Kalvasal	-	-	141	705	-	25,000	2	9	24	6
Kangiyanoor	-	-	90	448	-	25,000	2	77	192	-
Kasthambady	-	-	384	1,922	-	25,000	2	134	336	-
Kattipoondy	-	-	62	312	-	25,000	2	16	39	-
Kelur	54,807	69	267	1,337	-	5,000	10	32	79	1
Krishnapuram	-	-	384	1,922	-	25,000	2	134	336	-
Kunnanthur	-	-	152	760	2	25,000	2	5	12	-
Kuppam	-	-	231	1,157	-	25,000	2	17	42	-
Kuruvimalai	-	-	71	353	-	5,000	10	3	8	-
Mambattu	-	-	69	346	2	25,000	2	91	228	-
Mukkurambai	-	-	106	529	-	5,000	10	30	74	6
Murugapady	-	-	89	444	-	5,000	10	22	55	-
Naranamangalam	-	-	52	262	-	25,000	2	7	19	-
Padavedu	-	-	762	3,808	1	5,000	10	153	383	-
Palvathuvendran	-	-	55	277	-	25,000	2	23	59	-
Periagaram	-	-	241	1,206	-	25,000	2	58	145	-
Potharai	-	-	149	747	-	25,000	2	72	181	-
Pudupalayam	-	-	79	393	-	5,000	10	9	23	-

Gram Panchayat	MUC		NG		RP	RRWH		SA		SPD
	No.	Area	No.	Area	No.	No.	Area	No.	Area	Area
Renderipattu	-	-	133	666	-	5,000	10	5	13	-
Sandhavasal	-	-	69	346	-	25,000	2	10	25	-
Sedavampattu	-	-	107	535	-	25,000	2	7	18	-
Sengunam	-	-	138	691	-	25,000	2	70	175	2
Thurinjikuppam	-	-	139	694	-	25,000	2	9	22	-
Tindivanam	137,637	172	402	2,009	-	5,000	10	93	232	35
Tirusoor	-	-	69	346	-	25,000	2	31	77	-
Vasur	-	-	94	470	-	25,000	2	14	34	-
Vaziur	-	-	95	475	-	25,000	2	8	20	-
Vellur	-	-	305	1,526	-	25,000	2	18	44	3
Venmani	-	-	69	346	-	25,000	2	6	14	-
Vilankuppam	-	-	100	502	2	25,000	2	8	21	-

Gram Panchayat	SP		SPC		VC	WBS	
	No.	Area	No.	Area	No.	No.	Area
Ananthapuram	14	1,445	-	-	80	3	4
Athuvambady	9	863	-	-	66	4	30
Edapirai	6	605	-	-	68	5	26
Eluvambady	4	415	-	-	9	2	24
Enduvambady	3	312	-	-	30	3	24
Erikuppam	5	460	-	-	26	3	30
Illupakunam	4	448	-	-	14	3	28
Kalasamudram	8	770	-	-	40	2	16
Kalkuppam	3	292	-	-	9	3	13
Kalpattu	11	1,101	-	-	157	-	-
Kalvasal	7	705	-	-	35	6	51
Kangiyanoor	4	448	-	-	4	3	65
Kasthambady	19	1,922	-	-	47	8	113
Kattipoondy	3	312	-	-	31	2	3
Kelur	-	-	13	1,337	82	3	-
Krishnapuram	19	1,922	-	-	47	5	56
Kunnanthur	8	760	-	-	13	2	79
Kuppam	12	1,157	-	-	162	2	0
Kuruvimalai	4	353	-	-	16	2	-
Mambattu	3	346	-	-	92	3	63
Mukkurambai	5	529	-	-	26	2	-
Murugapady	4	444	-	-	36	3	-
Naranamangalam	3	262	-	-	8	1	20
Padavedu	38	3,808	-	-	932	2	48
Palvathuvendran	3	277	-	-	10	4	11
Periagaram	12	1,206	-	-	164	4	122
Potharai	7	747	-	-	104	1	45
Pudupalayam	4	393	-	-	28	3	-

Gram Panchayat	SP		SPC		VC	WBS	
	No.	Area	No.	Area	No.	No.	Area
Renderipattu	7	666	-	-	77	3	-
Sandhavasal	3	346	-	-	212	4	69
Sedavampattu	5	535	-	-	10	3	14
Sengunam	7	691	-	-	105	2	85
Thurinjikuppam	7	694	-	-	81	3	40
Tindivanam	-	-	20	2,009	295	3	-
Tirusoor	3	346	-	-	175	4	78
Vasur	5	470	-	-	4	2	37
Vaziur	5	475	-	-	40	2	1
Vellur	15	1,526	-	-	38	4	37
Venmani	3	346	-	-	93	3	64
Vilankuppam	5	502	-	-	48	4	7

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 16/11/21
1	Ananthapuram	1,150	214
2	Athuvambadi	729	446
3	Edapirai	640	326
4	Eluvambadi	214	106
5	Enduvambadi	283	183
6	Erikuppam	603	466
7	Illupakunam	248	204
8	Kalasamuthiram	451	144
9	Kalkuppam	143	202
10	Kalpattu	962	159
11	Kalvasal	402	183
12	Kangeyanoor	309	271
13	Kasthampadi	566	169
14	Kattipoondi	179	447
15	Kelur	768	1,014
16	Krishnapuram	534	268
17	Kunnathur	198	81
18	Kuppam	319	210
19	Kuruvimalai	241	107
20	Mambattu	982	854
21	Mukkrumbai	385	592
22	Murugapadi	410	153
23	Narayanamangalam	150	731
24	Padavedu	6,169	353
25	Palavarthuvendran	241	165
26	Periyagaram	1,324	528
27	Potharai	882	214
28	Pudupalayam	395	360
29	Renderipattu	511	115
30	Santhavasal	1,421	278
31	Sedarampattu	300	309
32	Sengunam	847	63
33	Thindivanam	2,351	222
34	Thuringikuppam	804	1,046
35	Tirusoor	1,147	897
36	Vasur	123	329
37	Vazhiyur	319	486
38	Vellur	865	929
39	Venmani	645	239
40	Vilankuppam	417	498
	Total	29,627	14,561

ANNEXURE 7.2

GP AND WORK CATEGORY -WISE ONGOING WORKS IN POLUR BLOCK

GP	Work Category	No. of ongoing works
Ananthapuram	Anganwadi/Other Rural Infrastructure	2
Ananthapuram	Drought Proofing	1
Ananthapuram	Water Conservation and Water Harvesting	3
Athuvambadi	Works on Individuals Land (Category IV)	1
Edapirai	Rural Connectivity	1
Edapirai	Water Conservation and Water Harvesting	3
Eluvambadi	Water Conservation and Water Harvesting	1
Enduvambadi	Water Conservation and Water Harvesting	2
Erikuppam	Water Conservation and Water Harvesting	2
Illupakunam	Rural Connectivity	1
Illupakunam	Water Conservation and Water Harvesting	1
Kalasamuthiram	Rural Connectivity	1
Kalkuppam	Rural Sanitation	1
Kalkuppam	Water Conservation and Water Harvesting	1
Kalpattu	Anganwadi/Other Rural Infrastructure	1
Kalpattu	Rural Connectivity	1
Kangeyanoor	Water Conservation and Water Harvesting	1
Kasthampadi	Rural Connectivity	1
Kasthampadi	Water Conservation and Water Harvesting	2
Kattipoondi	Water Conservation and Water Harvesting	2
Kelur	Water Conservation and Water Harvesting	3
Krishnapuram	Water Conservation and Water Harvesting	1
Kunnathur	Water Conservation and Water Harvesting	2
Kuppam	Water Conservation and Water Harvesting	1
Kuruvimalai	Water Conservation and Water Harvesting	1
Mambattu	Land Development	1
Mukkrumbai	Water Conservation and Water Harvesting	3
Murugapadi	Water Conservation and Water Harvesting	2
Padavedu	Water Conservation and Water Harvesting	4
Palavarthuvendran	Water Conservation and Water Harvesting	1
Periyagaram	Rural Connectivity	2
Periyagaram	Rural Sanitation	1
Periyagaram	Water Conservation and Water Harvesting	2
Potharai	Water Conservation and Water Harvesting	2
Pudupalayam	Water Conservation and Water Harvesting	2
Renderipattu	Water Conservation and Water Harvesting	1
Santhavasal	Water Conservation and Water Harvesting	4
Sedarampattu	Water Conservation and Water Harvesting	2
Thindivanam	Water Conservation and Water Harvesting	1
Thuringikuppam	Drought Proofing	1
Thuringikuppam	Water Conservation and Water Harvesting	2

GP	Work Category	No. of ongoing works
Tirusoor	Water Conservation and Water Harvesting	2
Vazhiyur	Rural Connectivity	1
Vellur	Rural Connectivity	1
Vellur	Water Conservation and Water Harvesting	1
Venmani	Water Conservation and Water Harvesting	2
Vilankuppam	Water Conservation and Water Harvesting	2
Grand Total		**77**

ANNEXURE 8

KEY CWRM PARAMETERS FOR THE GP'S FALLING IN KALPATTU MICRO-WATERSHED

Key CWRM Parameter	Details
Climate Vulnerability Area 1: Socio-Economic	
Geographical Area (ha.)	1,110
Male Population (No.)	2,151
Female Population (No.)	2,115
Total Population (No.)	4,266
SC Population (No.)	248
ST Population (No.)	17
Vulnerable population (No.)	265
Households (No.)	1,101
Only one room HH's (No.)	215
Female Headed HH's (No.)	59
Vulnerable Households (No.)	168
% of Vulnerable Households	0.15
Registered MGNREGA Job cards (Persons)	1,644
Active person working in MGNREGA job Cards (Persons)	1,086
Drinking Water Sources (No.)	202
Ground Water - Drinking source (No.)	5
Surface water - Drinking source (No.)	1
Sum of drinking water sources (No.)	6
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)	8
Climate Vulnerability Area 2: Climate	
Average Annual Rainfall (mm)	1,047
Average Annual Temperature (°C)	28
Ground Water Status (OE,Critical,SC)	Over -Exploited
Climate Vulnerability Area 3: Water Resources	
Average Annual Rainfall (mm)	**1,047**
Average Annual Temperature (oC)	28
Ground Water Status (OE,Critical,SC)	Over -Exploited
Climate Vulnerability Area 3: Water Resources	
Canal Network	
Length of Main Canal (m)	-
Length of Minor Canal (m)	2,500
Length of Distributaries (m)	**240**
Water Courses (Field Channels) (m)	-
No. of Tanks (PWD & Union)	-
No. of Ooranis	**8**
Other Surface Water Bodies	-
Area under Irrigation Facilities (ha.)	
Tank Irrigation	-
Canal Irrigation	-

Open & Tube Well Irrigation	-
Water Quality (No.)	
Chemical Contaminants	-
Bacterial and Other Contaminants	-
Catchment Area wise Available Runoff (ha.m)	
Good Catchment Area	21
Average Catchment Area	-
Bad Catchment Area	197
Watershed and Drainage Networks	
Length of Natural Drainage Lines (m)	23,401
No. of Natural Drainage Lines	35
No. of MiCriticalo Watersheds	12
Watershed and Drainage Networks	
Length of Natural Drainage Lines (m)	**23,401**
No. of Natural Drainage Lines	**35**
No. of MiCriticalo Watersheds	12
Watershed and Drainage Networks	
Water Demand For Humans	12
Water Demand for Livestock	8
Water Demand For Agriculture	657
% GW Utilization for Drinking	11
% GW Utilization for Livestock	97
% GW Utilzation for Agriculture.	96
% SW Utilization for Drinking	89
% SW Utilization for Livestock	3
% SW Utilization for Agriculture	4
Climate Vulnerability Area 4 : Agriculture	
Area under Land Resources (ha.)	
Forest land	-
Non-Agricultural Uses	55
Barren & Un-cultivable Land	-
Permanent Pastures and Other Grazing Land	-
Land Under Miscellaneous Tree Criticalops etc.	-
Culturable Waste Land	-
Fallows Land other than Current Fallows	325
Current Fallow land	130
Unirrigated Land	202
Area Irrigated by Source	397
Land under Catchment Area (ha.)	
Good Catchment	55
Average Catchment	-
Bad Catchment	1,055
Crop Details	
Irrigated Area (ha.)	406
Rainfed area (ha.)	61
Area under Paddy Cultivation (ha.)	209
Crop Water Requirement - Irrigated condition (ha.m)	630

Crop Water Requirement - Rainfed condition (ha.m)	27
Soil Resources: Status of Available Nitrogen (%)	
Very Low	16
Low	76
Medium	9
High	-
Very High	-
Status of Organic Carbon (%)	
Very Low	27
Low	70
Medium	3
High	-
Very High	-
Status of Soil Micro Nutrients (%)	
Sufficient	55
Deficient	45
Status of Physical condition of the soil (%)	
Acidic Sulphate	-
Strongly Acidic	-
Highly Acidic	-
Moderately Acidic	-
Slighly Acidic	21
Neutral	23
Moderately Alkaline	56
Strongly Alkaline	-
Soil Texture (%)	
Clay Soil	4
Fine Soil	46
Coarse loamy	15
Soil Water Permeability	Moderate
Soil moisture and ET	
Volumetric Soil Moisture (%)	23
Estimated Soil Moisture (ha.m)	243
ET Losses (ha.m)	482
Means of Water Extraction (%)	
Gravity	-
Lifting	100
Irrigation Methods (%)	
Wild Flooding	5
Control Flooding	95
Livestock (No.)	
Cattle Population	2,050
Sheep Population	-
Goat Population	599
Poultry	-

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