

Ministry of Rural Development Ministry of Jal Shakti

WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

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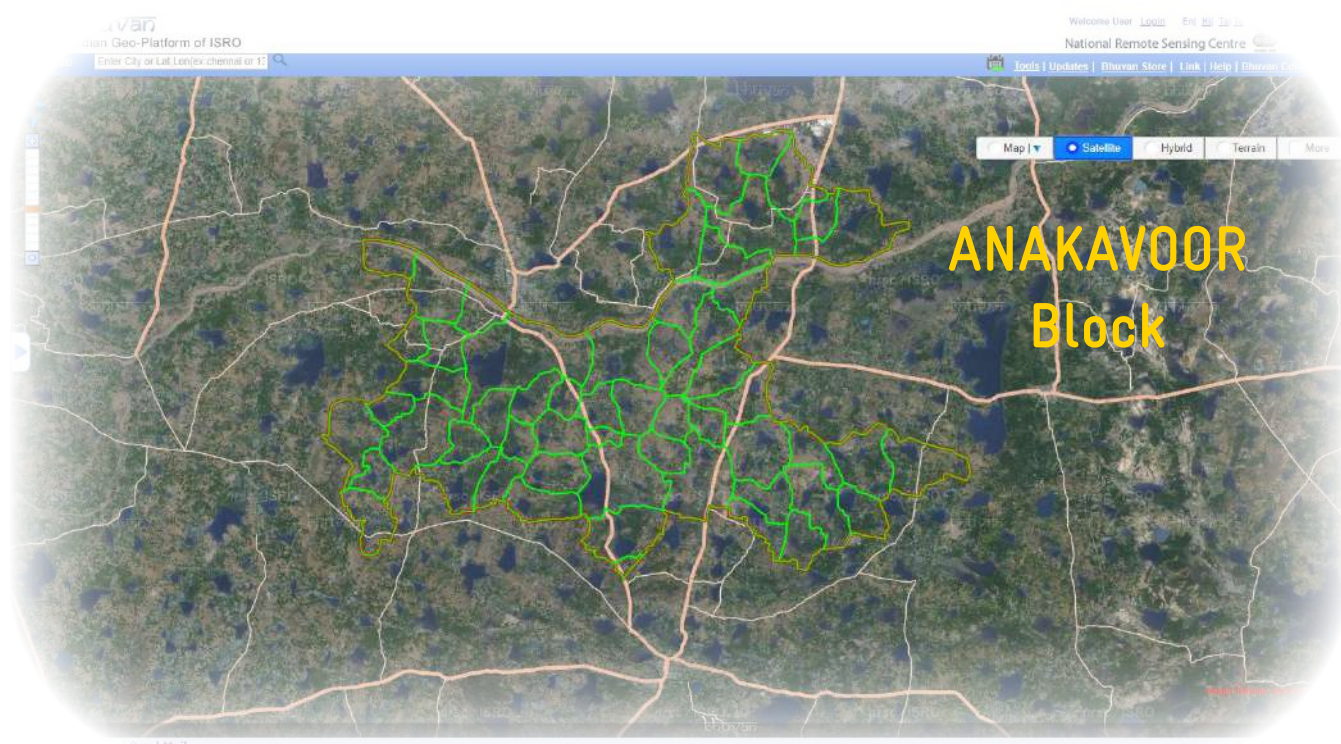
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New Delhi, India, Jan 2022

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Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

FOREWORD



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



Tamil Nadu government is implementing the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGN-REGS) 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.

There will be a reorientation of priority hood promotion and poverty alleviation. Resource Management, asset creation. 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 co-operation project GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH) In 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) framework 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 Panchayat. 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.

“
**Close to 10 lakh
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”

ities under MGNREGS with livelihood as goals in addition to Natural Resource Management will be on a saturation mode with GIS based planning. The impact of each intervention will be maximised through convergence.

Water Security and Climate Adaptation project GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH) In project in Tamil Nadu is of paramount importance. WASCA is being implemented in Tiruvannamalai and Ramanathapuram district.

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

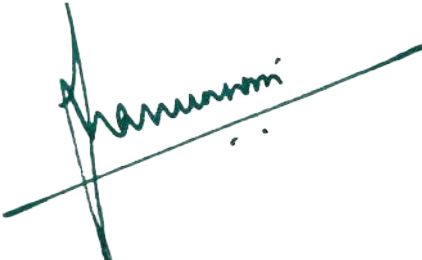
1.	Development of Public and Common lands
2.	Development of Agriculture and allied activities
3.	Development of Rural Infrastructure Management
4.	Development of Climate Resilience Measures

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 plan-
ning, 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.

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 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 driven a scenario projection, to respond with their inherent strategies and result-into a plan that will work to change this possible reality.

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

As humans, we have to plan to avert the 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 providing unskilled wage employment, ginal. The district has implemented farm pond construction.

To enhance scientific works identification support of GIZ under WASCA bilateral Resource Management (CWRM) various parameters including spatial technique to provide solution for water, Surface water, Rain water

Through GIS based planning in 860 are verified, approved at Gram Sab-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 climate 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

is key scheme in the district, pro-asset creation for poor and mar-campaign mode in convergence,

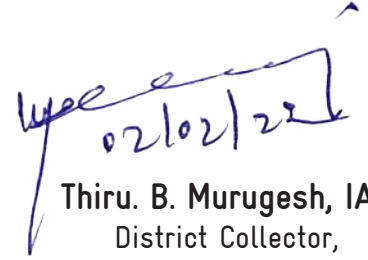
“
**GIS based
planning in 860 GPs,
works identified under
CWRM are verified,
approved at
Gram Sabha**
”

fication in MGNREGS, with technical eral project, the Composite Water proach is used for analyzing var-and temporal changes and also improving the four water (Ground and Soil Moisture).

GPs, works identified under CWRM ha. These works would potentially

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.


02/02/22

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 quality and 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 the district has completed the CWRM plans assessed both the budget at GP level. The suitable development of public and community activities and rural infrastructure 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. The expected outcome of 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
”

district. It also supported in building GIS based planning adopting. The support of WASCA Resource center CWRM plans for all the GPs. The supply and demand prepared a water key actions are identified for the monsoon land, agriculture and allied GP level through scientific process and socio economic perspectives. ground level by the Block and GP dated at Block and district levels planning. The expected outcome of will form a major chunk of DRDA of the works related to cascade tank

M. Prathap
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 districts is an example of holistic GP plans considering the land, water, soil, geology and social aspects.

Through District level GIS resource RF build capacity of Block, GP level development Department in completion of GP level plans, Nationally ap-Management (CWRMP) frame works ISRO GIS platform.

Total 3,00,000 works identified NREGA Soft. The works focused on lines, rejuvenation of traditional cutting, gully plugs, recharge-shaft, 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.

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

centres, GIZ with the partners MSS-technical officers of Rural Development of 1,289 GP plans. In preparation proved Composite Water Resources is adopted along with Bhuvan NRSC

through CWRM are uploaded in treatment of all-natural drainage waterbodies, afforestation, trench farm ponds, check dams, farm

through CWRM are uploaded in treatment of all-natural drainage waterbodies, afforestation, trench farm ponds, check dams, farm

Thiru. S.S Kumar

Additional Director (MGNREGS),
RD&PR, Government of Tamil Nadu

MESSAGES



Thiru R. Harikrishnan
Chief 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 Vulnerable agriculture, water and climate vulnerable two districts for project are Tiruvannamalai in Northern Tamil Nadu and Ramanathapuram in South coastal aspirational district. Composite Water Resource Man-

The CWRM plans assessed both the data pertaining to land resources, areas, soil, surface runoff, agriculture lands, it has identified a set of key features of public and common land, agricultural infrastructure. The whole planning approach in identifying appropriate

I consider such decentralized level of planning is necessary in ensuring water security in the context of increasing climate change impacts.

“ Whole planning process followed a bottom-up approach in identifying appropriate actions based on scientific analysis ”

bility parameters (Socio-economic, parameters) and identified the most suitable for implementation. The two districts Tamil Nadu and Ramanathapuram For implementing WASCA project management (CWRM) Plan is used.

supply and demand for water using climate parameters, catchment area and prepared a water budget. Water actions for the development of agriculture and allied activities and running process followed a bottom-up approach in identifying appropriate actions based on scientific analysis.


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



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ABBREVIATIONS AND ACRONYMS

A - D

% Percentage
°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

MC

Mid Century

MCM

Million Cubic Meter

Mahatma Gandhi NREGAMahatma Gandhi Rural Employment
Guarantee Act**Mahatma Gandhi NREGS**Mahatma Gandhi Rural Employment
Guarantee Scheme**Min**

Minimum

mm

Millimeter

MoEFCCMinistry of Environment, Forest and
Climate Change**MoJS**

Ministry of Jal Shakti

MoRD

Ministry of Rural Development

m

Meters

NAPCCNational Action Plan on Climate
Change

N - S

NARPNational Agricultural Research
Project**NADEP**

Nadepkaka

NDC

Nationally Determined Contributions

NEM

North-East monsoon

NGO

Non-Governmental Organization

NITINational Institution for Transforming
India**No.**

Number

NRM

Natural Resource Management

NRSC

National Remote Sensing Centre

NWC

National Water Commission

PWD

Public Works Department

Rabi cropSown in winter and harvested in
monsoon

S - U

RDPR

Rural Development & Panchayat Raj

RTRWHSRoof 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

SDMRISuganthi Devadasan Marine
Resources Institute**SECC**

Socio Economic and Caste Census

SHG

Self Help Group

SLSC

State Level Steering Committee

ST

Scheduled Tribe





S - W

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



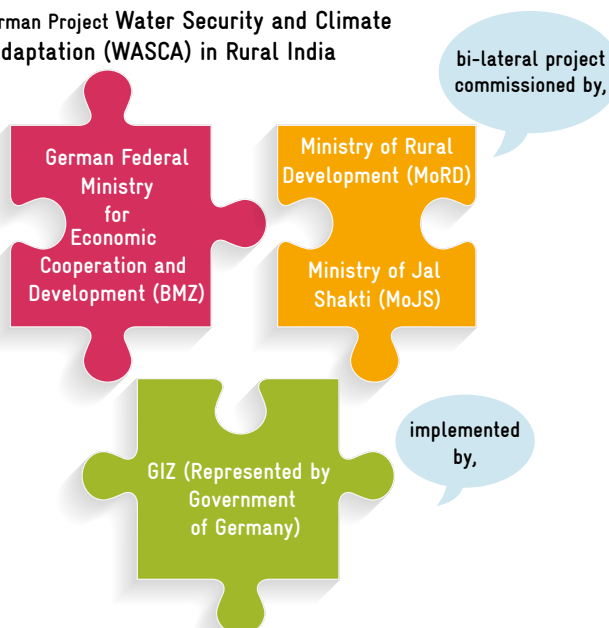
“Aims to improve water resource management with respect to water security and climate adaptation”



Water security is an alarming issue and one of the key challenge of the world under climate change scenario. While, the rural areas are in particular are of prime concern due to its scarce resources and high natural resource dependency which 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.

Indo-German Project Water Security and Climate Adaptation (WASCA) in Rural India



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 viz., climate extremities, water resources, agriculture and socio-economic at the District level. Based on the assessment, Tiruvannamalai and Ramanathapuram Districts were 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 were further explored at Gram Panchayat (GP) level through Composite Water Resource Management (CWRM) approach focusing on MGNREGA/S approach to identify the key problems and propose the key actions for implementation in each Districts.

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 NREGA 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 has been structured under 9 complete chapters

1

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

2

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

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

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

5

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

7

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

6

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 particularly at GP level

8

Eighth 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

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

ABOUT THE BLOCK



1 ABOUT THE BLOCK

Anakavoor, a rural Block of Tiruvannamalai District lies between 12°32'56.454"N to 12°43'9.644"N latitude and 79°28'42.192"E to 79°41'41.064"E longitude (Figure 1.1). The Block is surrounded by Vembakkam, Cheyyar, Pernamallur and Vandavasi Blocks. The total geographical area of this flat terrain Block is 26090.30 ha (260.42 sq.km). Administratively, this Block comes under Cheyyar taluk, and it has 55 village panchayats and 202 habitations in it.

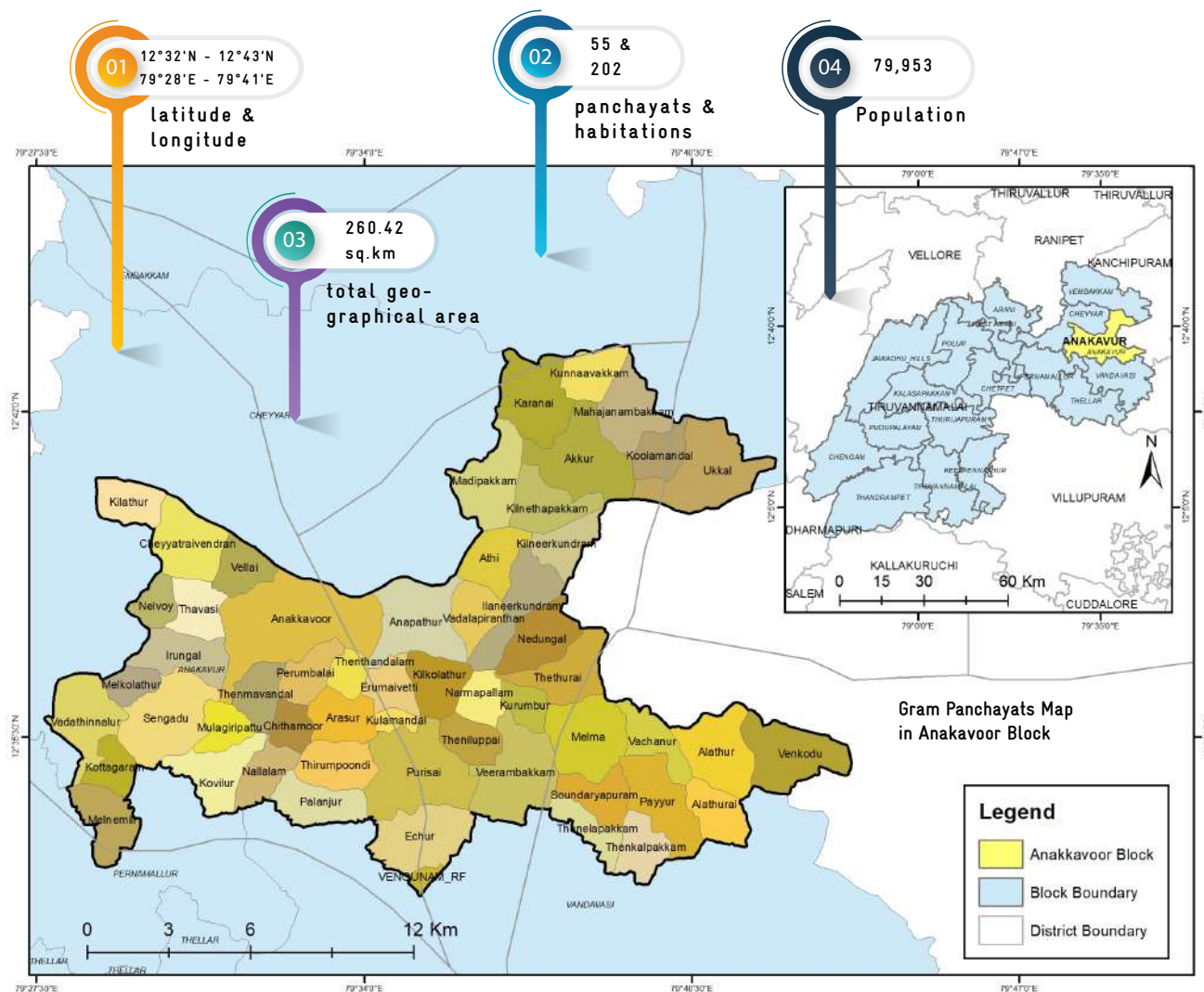


Figure 1.1. Location map of Anakavoor Block

According to Census 2011, the population of the Block is 79,953. The population density of the Block is 307 per sq. km which is much lower than the district population density (473 per sq. km) and State's density (555 per sq.km). There is 5.93% increase in population observed since 2001. The proportion of sex ratio is 981 females per 1000 males, which is lower compared to the district average (994 females per 1,000 males).

The average literacy rate of the Block is higher (74.06%) than national average (72.98%). Scheduled Castes and Scheduled Tribes accounted for 26.45% of the to-

tal population (Tiruvannamalai district profile 2020).

Economically, Anakavoor Block is backward and it is 2nd lowest revenue earning Block of the Tiruvannamalai district. Agriculture and allied activities, are the primary occupation followed by livestock rearing and weaving.

Paddy is the major crop, nearly 71% of irrigated area are cultivated with paddy. The other major crops grown in the Block area are sugarcane, pulses, ragi, mango, red chilli and red gram. Pulses, red gram are cultivated both under irrigated and rainfed conditions. The sericulture

“
 The proportion of sex ratio is 981 females per 1000 males, which is lower compared to the district average (994 females per 1,000 males)
 ”

“
 average literacy rate of the Block is higher (74.06%) than national average (72.98%)
 ”

is marginally practiced in Anakavoor Block, the area under mulberry is 12.25 (Acres). Around 65 families are engaged in weaving through handlooms. A prominent livestock (1,69,228) and poultry (56,750) population are recorded during 2019-20. There are 8 milk societies in the Block and 2,170 liters of milk is produced per day.

“
 nearly 71% of irrigated area are cultivated with paddy
 ”

Hydrologically, Cheyyar and Kiliyar watersheds of Palar basin covers Anakavoor Block. There are 77 micro and mini watersheds subsists in this Block (Figure 1.2).

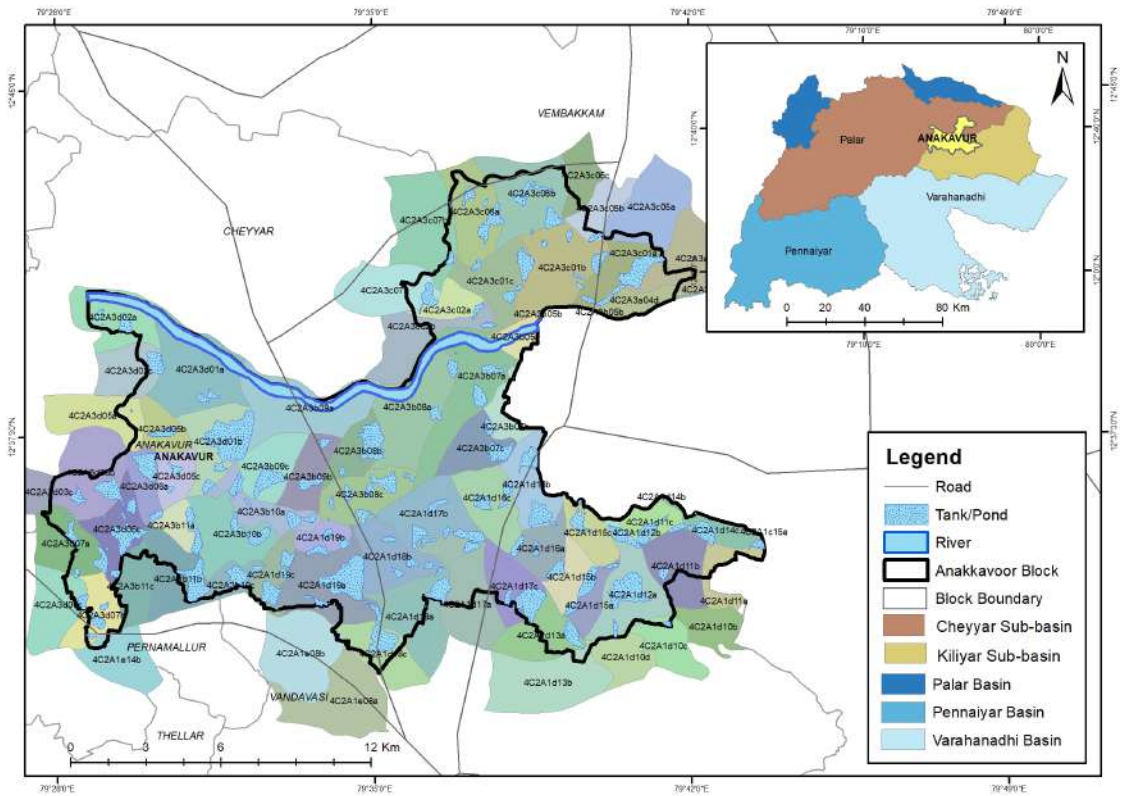


Figure 1.2. Watersheds - Anakavoor Block

Cheyar, Nandiyar-Palar, Kamandalar, K.N. Rivers flows through this Block with 7 canals (Figure 1.3). There are 116 tanks exists in this Block. The largest tank exist in this Block is Anakavoor tank of about 335.49 ayuhat ha. The other important tanks which exceeds 150 ha area are Ukkal tank, Purasai tank, and Anaputhur tank. The ground water level of this Block has been seriously depleted. The Thethurai and Anakavoor firkas are in critical (>90% and < 100%) stage of ground water development.

GROUND WATER LEVEL OF THIS BLOCK

CRITICAL- > 90% & <= 100% Thethurai, Anakavoor

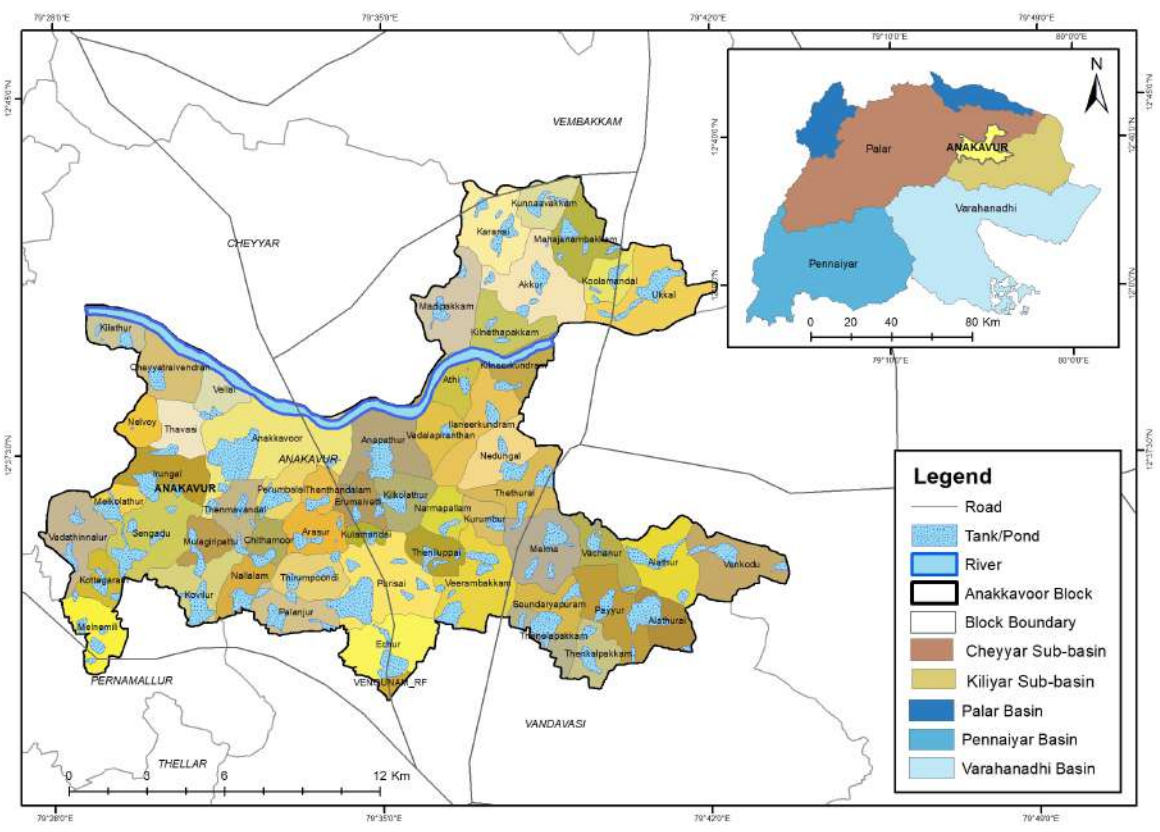
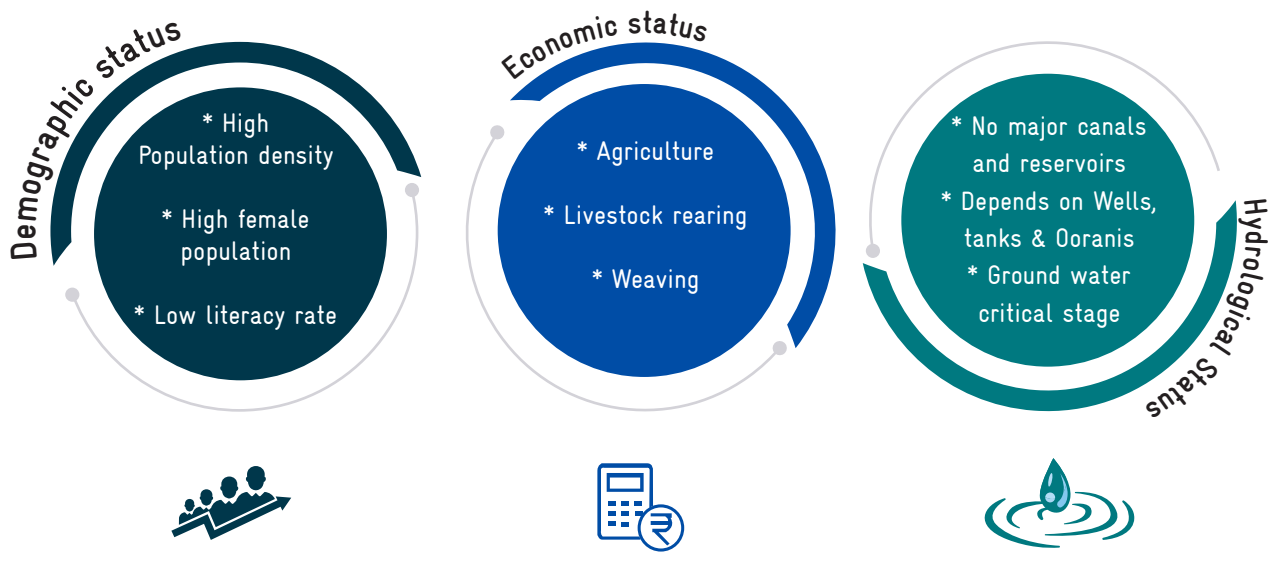


Figure 1.3. Spatial distribution of waterbodies



விண்ணின்று பொய்ப்பின் விரிநீர் வியனலகத்து
உள்நின்று உடற்றும் பசி

குறள் - 13

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

Thirukkural - 13

CHAPTER 2

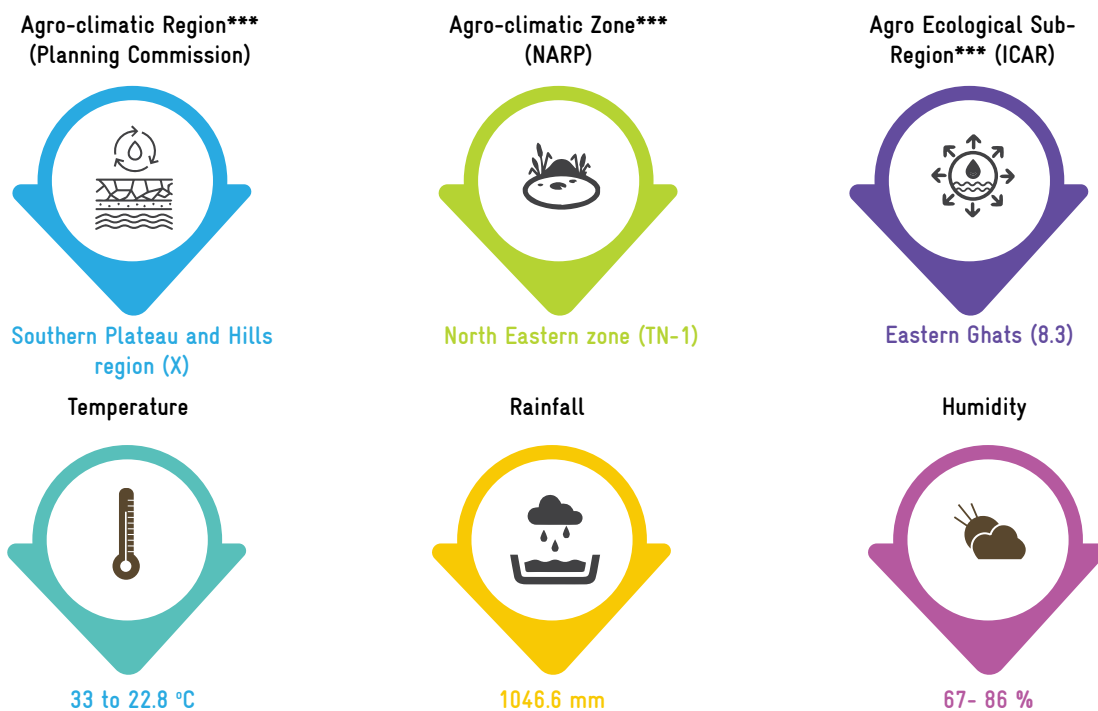
CLIMATE AND WATER SECURITY



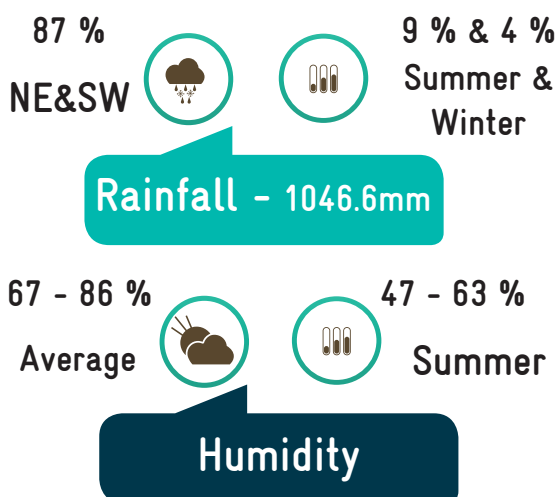
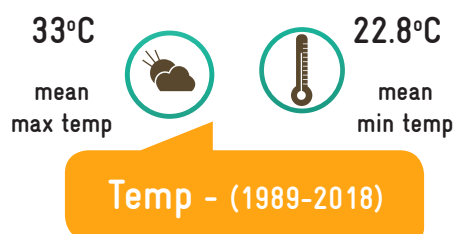
2 | CLIMATE AND WATER SECURITY

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

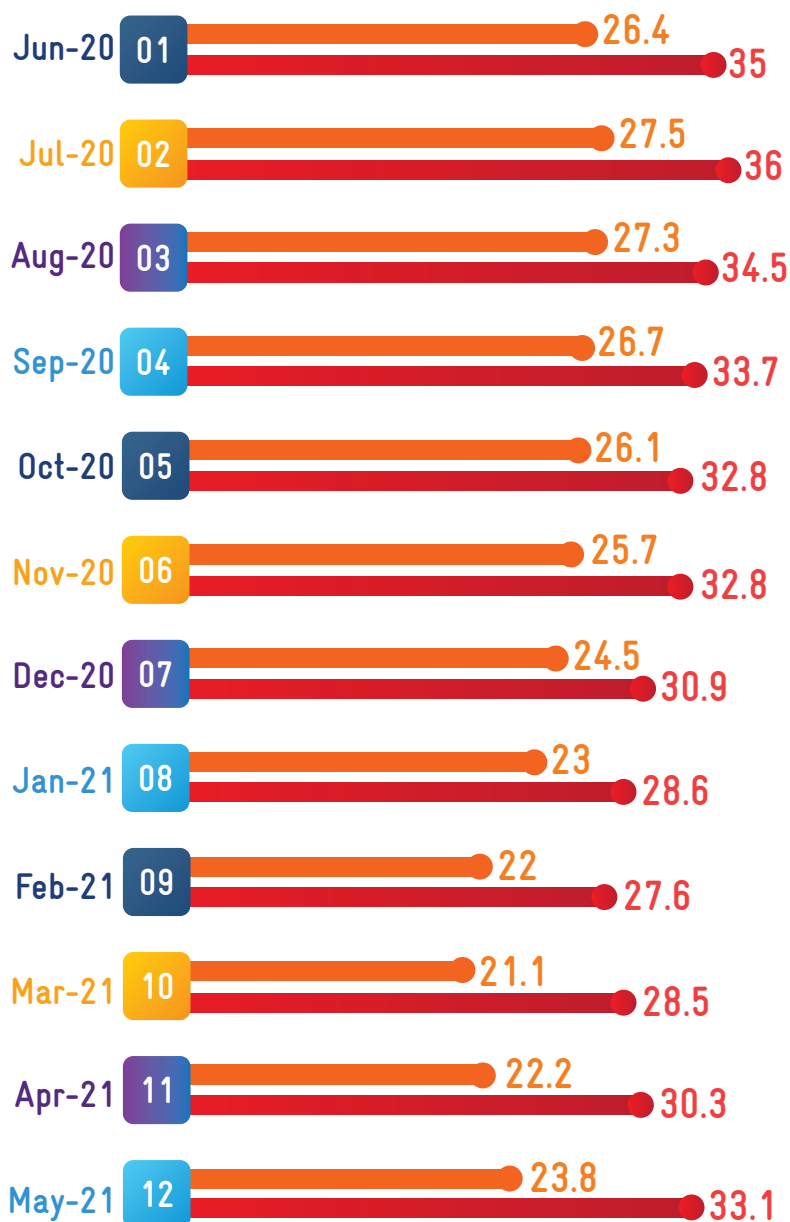
TABLE 1. GENERAL CLIMATE DESCRIPTION OF THE BLOCK



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



Normally this region receives major rainfall from North-East Monsoon (NEM) (October to December) and South-West Monsoon (SWM) (June to September). Average annual rainfall of this region is 1,046.6mm (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) months has low contribution (4%) to the annual rainfall (Figure 2.2). The average relative humidity is 67- 86 percent and during summer it ranges between 47-63 percent.



Monthly Temperature

in degree celsius (°C)

Minimum temperature

Maximum temperature

Figure 2.1. Average monthly temperature during 2020

The average annual rainfall days are 172 days in which 72 days are from NEM and 82 days are from SWM months. Onset of SWM rainfall starts in the 1st week of June and cessation would be in the 1st week of Oc-

tober. 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 are slightly lesser than SWM, the intensity is more in NEM.

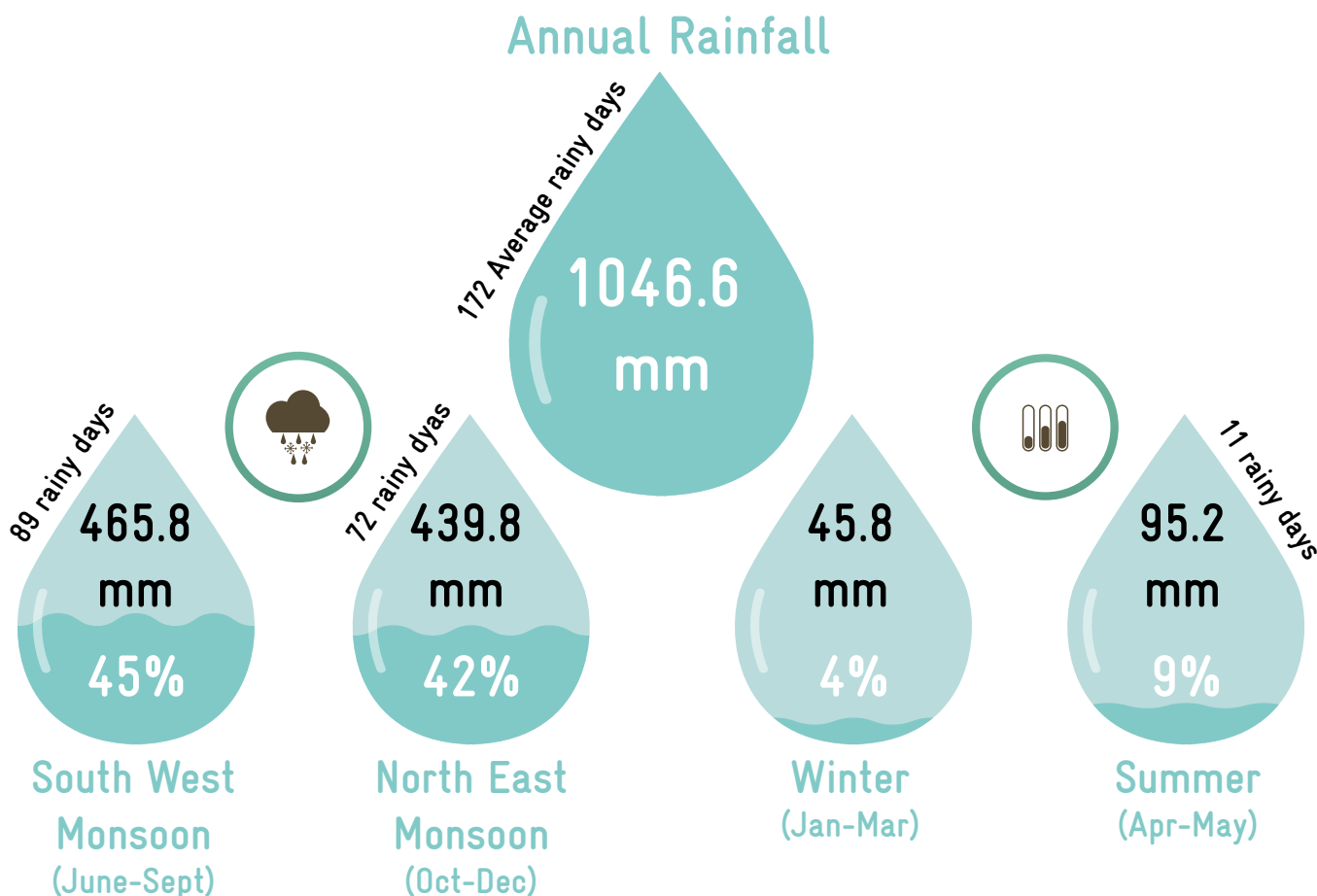


Figure 2.2 Season wise distribution to annual rainfall

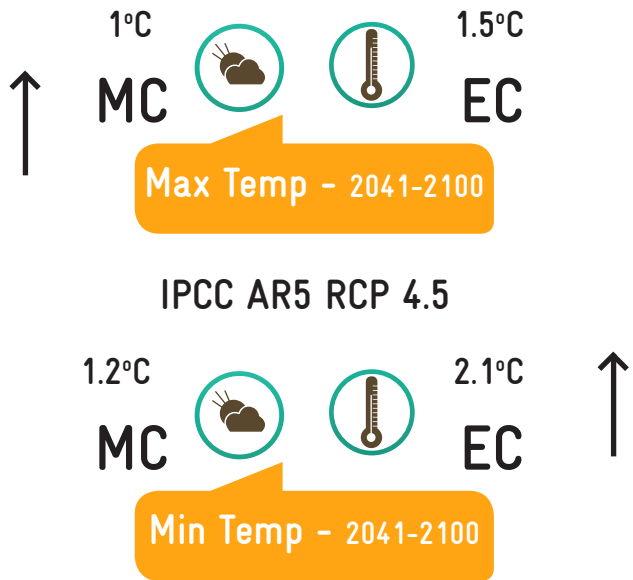
In recent decades, the world has been witnessing significant changes in its climate and weather conditions. These changes include increase in average temperature, variations of rainfall intensity and frequency. This region is also no exception, and 1.2°C and 0.5°C increase in max and min temperature was observed during 1951 to 2015 (IMD). The rainfall variability is also noticed. 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, heat-waves, and tropical cyclones, which are all likely to increase in the future also.

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

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



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



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



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



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

2.1 | CLIMATE RISKS

Increasing temperatures, fluctuating rainfall patterns and its extremities create 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

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. Out of this 8 locations in 6 GPs are in Anakavoor Block



Flood



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.

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.



Heat Wave

2.2 | WASCA CLIMATE VULNERABILITY INDICATORS

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 (°C)	C1	Goal 13
	Changes in min temperature (°C)	C2	Goal 13
	Changes in rainfall (%)	C3	Goal 13
	Excess rainfall years	C4	Goal 13
Water	Deficient rainfall years	C5	Goal 13
	Ground water extraction (%)	W1	Goal 6
	Ground water Recharge (m3)	W2	Goal 6
	Surface water availability (mm)	W3	Goal 6
	Water gap (mcm)	W4	Goal 6
	% of contamination	W5	Goal 6
Agriculture	Rainfed area (%)	A1	Goal 15
	Cropping intensity (%)	A2	Goal 2
	Soil moisture (Kg/m2)	A3	Goal 15
	Evapotranspiration (Kg/m2)	A4	Goal 15
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

The 18 bio-physical and socio-economic indicators data was 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 Com-

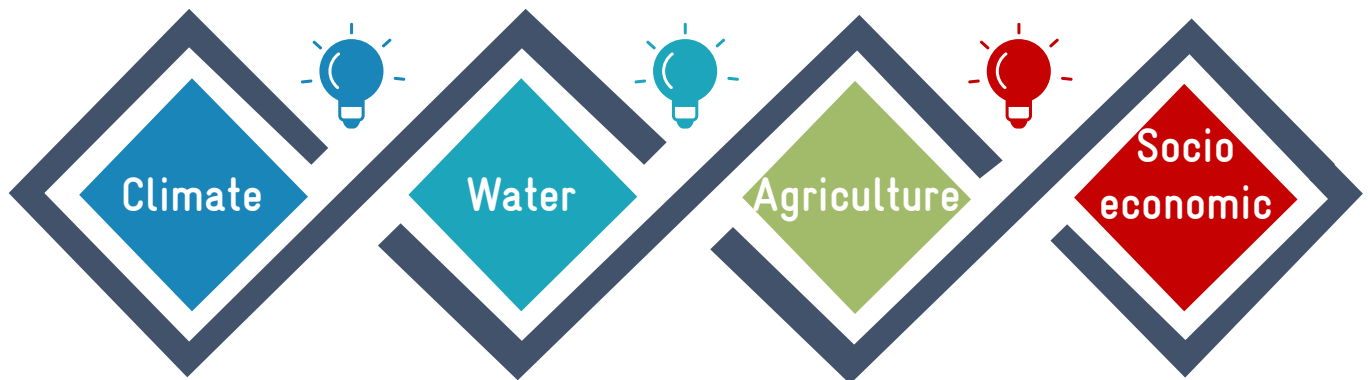
mittee headed by the Secretary RD&PR in Nov 2019 for implementing the WASCA. Subsequently, all the key water actions, CWRM planning and implementation works are envisaged for the above Districts through these influencing indicators collectively under four CWRM areas viz. climate, water, agriculture and 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 socio-economic are further explored at GP level through Composite Water Resource Management (CWRM) approach by GIZ, Department of Rural Development (Mahatma Gandhi NREGS), National Water Mission, Tamil Nadu along with technical partners of WASCA project 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 TN 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



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 MGNREGA job seekers, drinking water sources and grey water generation



ஏரின் உழாஅர் உழவர் புயலென்னும்
வாரி வளங்குன்றிக் கால்

குறள் - 14

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

Thirukkural - 14

CHAPTER 3



CONVERGENCE OF WASCA AND
MAHATMA GANDHI NREGA

3 | CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA

GIZ has evolved a GP based CWRM planning approach for facilitating convergent planning under MGNREGA for water security and climate adaptation. 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 Khet ko 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 has been given to vulnerable households and communities while preparing estimates for anticipated demand, list of works on individual land, and list of other works that provide direct individual benefits. The convergent planning exercise 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.



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 and allied works

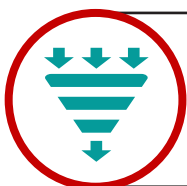


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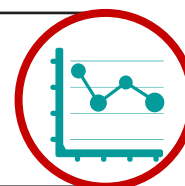
Water related works out of NRM

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, it should typically change 'relief works mode' to an integrated NRM perspective. Planned and systematic development of land and harnessing of rain-water following watershed principles should become the central focus of Mahatma Gandhi NREGS work across the country to sustainably enhance farm produc-

tivity and income of poor people. Even the works on private lands should be taken up following the principles of watershed management in an integrated manner. To facilitate evidence based scientific NRM planning process, Technological support shall be taken from National Remote Sensing Centre, ISRO for identification and holistic planning of permissible works in the watersheds using web-GIS platform (Bhuvan Geoportal). The Geographical Information System (GIS) plans shall be comprehensive ones incorporating all eligible works under Mahatma Gandhi NREGS and the same shall be implemented in a phased manner. Section 22 of annual master circular provides the key steps for GIS based planning.



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

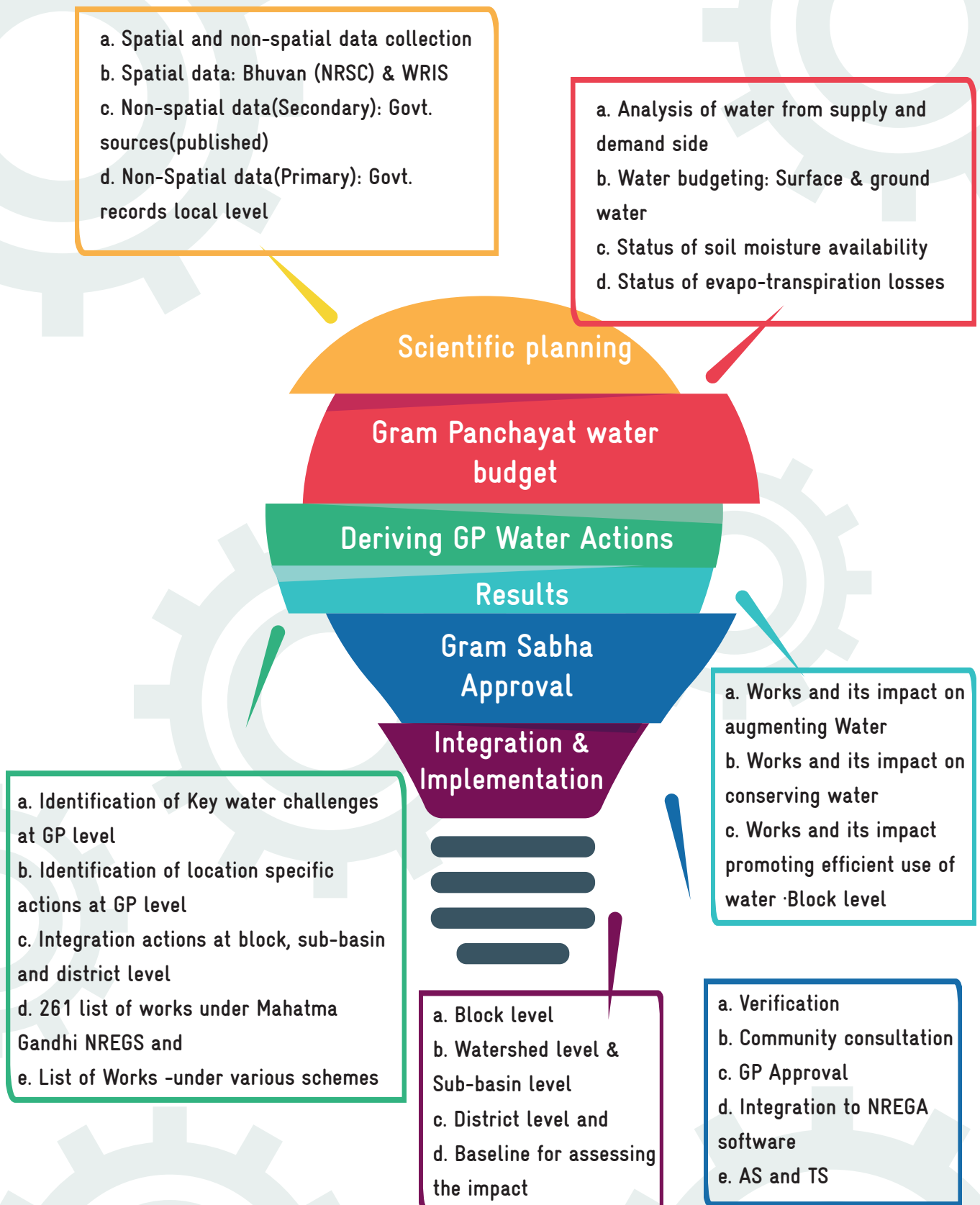


3.1 | COMPOSITE WATER RESOURCE MANAGEMENT APPROACH

CWRM approach for WASCA uses simple scientific tools that can help Block or GP level officer to organize, analyze and prepare a developmental draft plan for participatory discussion at GP level. This approach involves analyzing key water challenges using both non-spatial and geo-spatial data in GIS, coupled with extensive ground truth verification. The non-spatial data includes the socio-economic, climatic, hydrological, edaphic and agricultural areas which are concurrently used for analysis along with the spatial data obtained from remote sensing in GIS platform. It starts with mapping of the administrative (habitations/panchayat/revenue village, Block/taluk), agro-ecological (regional and sub-regional, climatic and agricultural zonation's) and hydrological (drainage points/watersheds/sub basin) units keep-

ing 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 INVOLVED IN CWRM PLANNING WORKOUTS

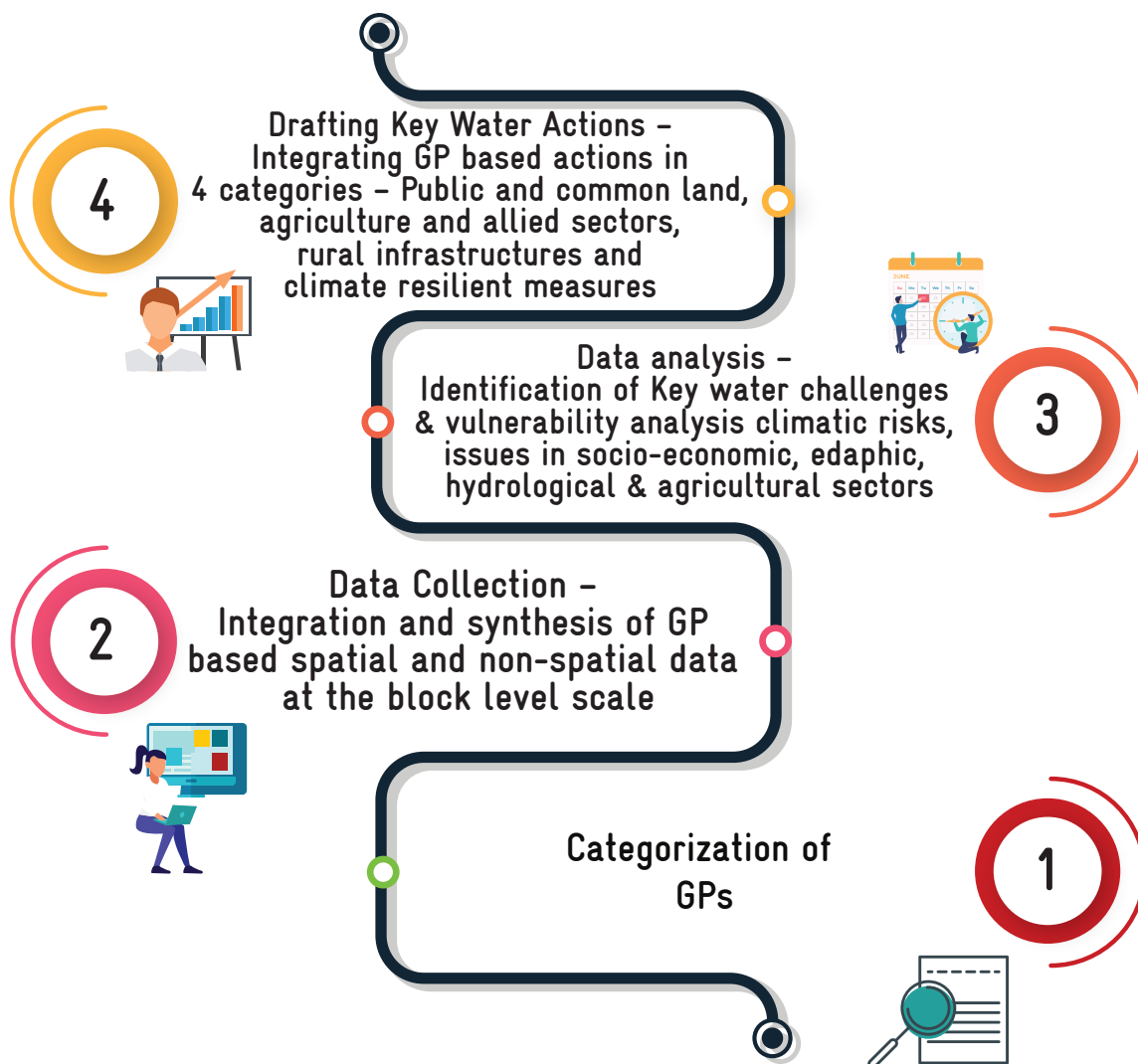


Such a comprehensive analysis in preparing the water budget integrating ground water, surface water through runoff from rainfall, evapotranspiration and soil moisture helps to identify potential areas of action to augment the water resources in public and common land, agriculture and allied sectors and rural infrastructure dimensions. Also the analysis 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, serve as shelf of projects. These shelf of projects are again mapped with 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 plan-

ning, 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 tangible outcomes in both natural resource management 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 Nationally and by State and District level steering committees headed by additional Chief Secretary RD&PR and District collectors respectively in the project area of TN State government as a comprehensive and climate adapted planning approach for water security under Mahatma Gandhi NREGA and National Water Mission.

BOX 2. MAIN STAGES OF CWRM PLANNING PROCESS

PRE-PLANNING STAGE

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

PLANNING STAGE

1. Collection on Non-Spatial statistical data as per MoRD guidelines and CWRMP
2. Collection of Spatial as per MoRD guidelines and CWRMP
3. Water Budget Estimation (CWRMP)
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

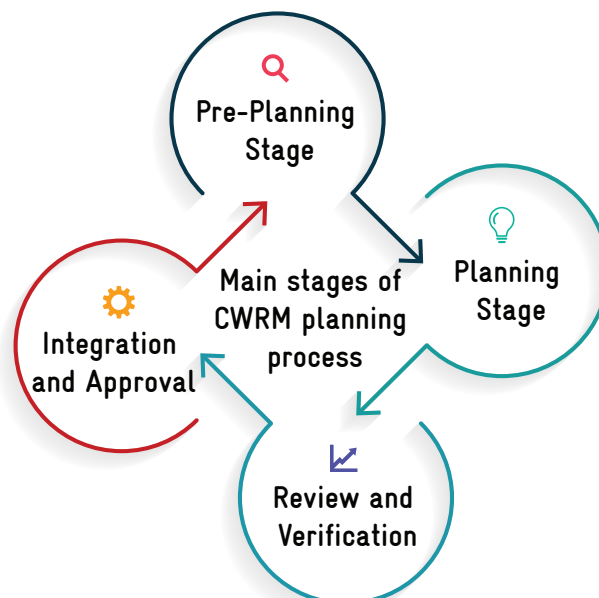
1. DEVELOPING PLANS AT LOWEST ADMINISTRATIVE LEVEL: GP LEVEL PLANS

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



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

INTEGRATION AND APPROVAL

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 NREGS in the project area
4. Integrating verified, approved works into NREGA soft (MORD NIC Portal) for mainstreaming WASCA
5. Regular review on progress at all levels

REVIEW AND VERIFICATION

3.2 | CATEGORIZATION OF GPS

The CWRM uses both spatial and non-spatial data for developing GP level plans. Most of the non-spatial data are available at the revenue village level. To synchronize planning at GP, keeping data availability and administrative boundary for GIS planning, various GP's are categorized based on revenue village boundaries, for collecting

and organizing the datasets. Based on the above factors, five different types of GPs are classified as Type I, II, III, IV and V. The description on categorization of GP's is annexed (Annexure 1). The type, number, and name of the GP's in Anakkavoor Block is tabulated in Table 4.

TABLE 4. CATEGORISATION OF ANAKKAVOOR BLOCK GPS

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
47	GP and revenue village data and boundary match	Alathur, Alathurai, Anakkavoor, Anappathur, Arasur, Athi, Cheyyatraivendran, Chithamur, Echur, Elaneerkundram, Irungal, Kizhneethapakkam, Kizhathur, Kizhkolathur, Kizhneerkundrum, Koozh- amandal, Kottakoram, Kovilur, Kunnavakkam, Kurumbur, Madipak- kam, Mahajanampakkam, Mel Kolathur, Mel Nemili, Mulagiripattu, Nallallam, Narmapallam, Nedungal, Nelvoy, Pazhanjur, Perumpalai, Purisai, Sengadu, Soundariyapuram, Thavasi, Thenelapakkam, Then- eluppai, Thenkalpakkam, Thenthandalam, Thethurai, Thirumpoondi, Ukkal, Vachanur, Vadalapiranthan, Vadathinallur, Veerampakkam, Vengodu
2	having more than one GPs in one Revenue Village	Erumaivetti, Kulamandai
6	Newly formed GP after 2011 census publication	Akkur, Karanai, Melma, Payyur, Thenmavandal, Vellai

3.3 | DATA COLLECTION

The CWRM planning framework has four vulnerability areas and integrated both non-spatial and spatial parameters with 18 indicators based on the IWRM and climate adaptation principles. The planning pro-







cess comprised of the following dimensions in a scientific and organized manner to prepare a meaningful plan at the lowest administrative unit i.e. GP plans.

SPATIAL DATA

The spatial data is supportive evidence to understand the issues in the areas of Land Use and Land Cover (LULC), wasteland, salt and erosion affected lands, drainage lines, ground water potential, lineament, geomorphology and

slope for science-based decision on water actions. The use of different spatial data to assess and confirm the key water challenges along with the non-spatial data given below.

NON SPATIAL DATA

- 
 Characterization of catchment landscapes based on the ten-fold land use classification to know available land area in both public and individual land ownership and its current position in terms of available area and use, its links with surface runoff as good, average and bad runoff.
- 
 Watershed analysis to understand the hydrological and administrative boundaries, know the vulnerable and good micro-watersheds, its location, distribution of different land use within the micro-watersheds for planning relevant water actions
- 
 Soil characteristics including the macro and micro nutrient status, physical quality of the land using pH values and textural soil quality to understand its permeability, infiltration and water holding capacity which are crucial for soil moisture content
- 
 The agriculture and livestock datasets help in understanding the quantum of water requirement of the key crops and type of cropping systems adopted, number and type of different livestock resources and its water requirement vis-a-vis its linkage to livelihoods of the vulnerable population in the village
- 
 Grey water generation at GP level to understand the quantum of grey water available and existing methods of its use. This information is essential to plan the effective strategies for recycle and reuse
- 
 Water budgeting at GP level to demonstrate the sector wise water demand and available water through the traditional water harvesting and storage bodies and the potential runoff that can be conserved through appropriate actions on the supply side. The difference between demand and supply at the GP level helps the communities to understand the gap and practice the necessary water actions.

Over all, data from 99 parameters were collected, out of which 13 parameters are primary and collected at GP level by GP level officers. 65 parameters are secondary collected from authentic Government sources and its websites; 21 requisite parameters for water budgeting

and grey water are calculated using standard and suitable methods and formula. CWRM parameters and its sources are annexed as (Annexure 3.1, 3.2, 3.3). The methods, and formulas used for water budgeting is attached in Annexure 3.4 and for grey water generation in Annexure 3.5.

3.4 | CWRM PLANNING ANALYSIS - CLIMATE

All the CWRM parameters are intended at 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, past hydro- meteorological disaster as recorded by State Disaster Management Agency (SDMA 2020) is considered to denote Block's change in climate (temperature, rainfall) extremities and its risks (Table.5)

TABLE 5. CLIMATE RISKS AND VULNERABLE LOCATIONS

Flood

Elaneerkundram, Anakavoor, Nedungal, Alathurai, Paiyur, Kineerkundram, Sowndaryapuram, Kunnavakkam

Drought

All GPs

Heat Wave

All GPs

3.5 | CWRM PLANNING ANALYSIS - WATER

For effective planning, the available traditional water storage and conveyance structures along with its supply and demand status for different sectors at Block level are necessary. Both spatial and non-spatial data including details and status on watershed and drainage network, canal network, irrigation facilities, catchments area

wise available runoff, conserved runoff, present ground water extraction, water demand for domestic, agriculture and livestock, ground water utilization domestic, agriculture and livestock are collected from authorized open sources and analyzed at Block level are as follows:

3.5.1 SPATIAL DATA

Spatial data on watershed, drainage and surface water-bodies, ground water potential, lineament, geomorphology, terrain, slope are collected to understand the site specific problems and take decisions to draft

scientific key water actions together with non-spatial data. The spatial Block level maps downloaded from NRSC, BHUVAN, GoI website are used.

3.5.1.1 Geomorphology: Geomorphology deals with the scientific study of “landforms and landscapes, including their description, type, and genesis”. Landform is the end product resulting from the interactions of the natural surface genesis and the type of rock. The scope of geomorphology was further expanded with landform maps, which were widely used in various fields of hydrology, pedology, geoscience, urban and regional planning etc. The Denudation origin – Pediment- Peditplain complex category landform unit witnessed in the Block (Figure 3.1). GPs and area wise landform covered shown in the below illustration.

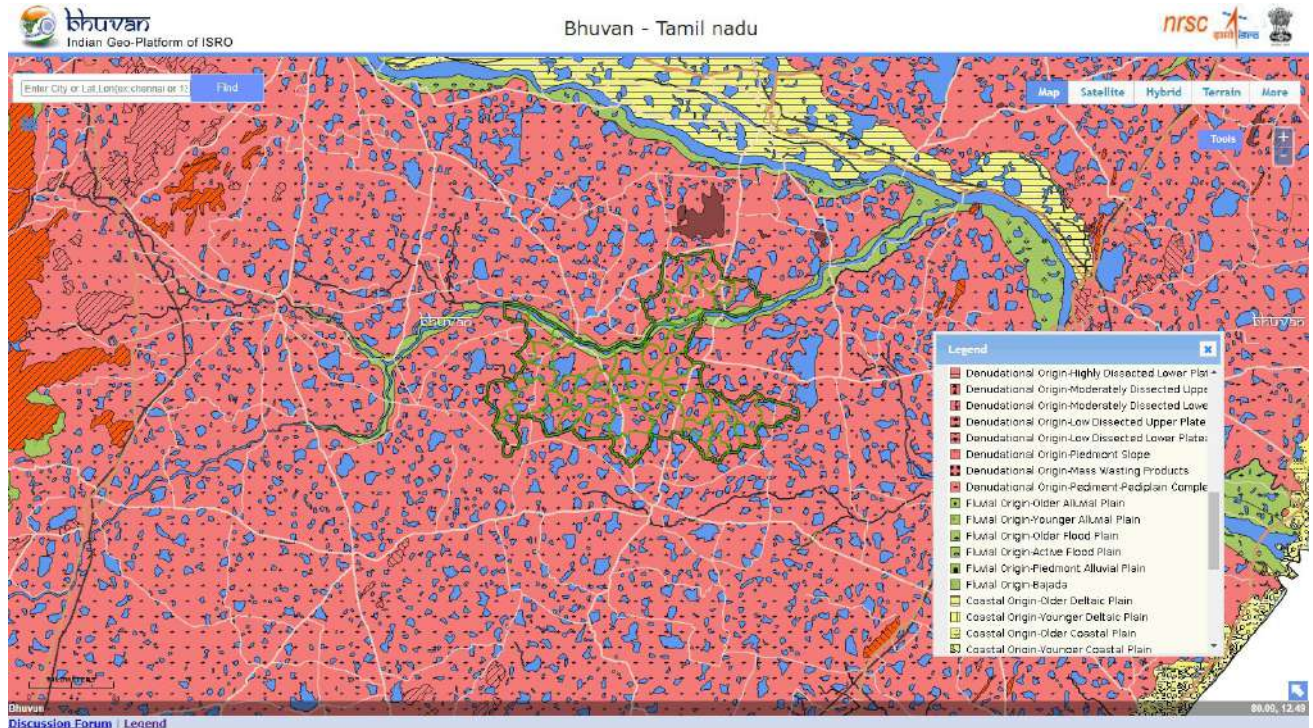


Figure 3.1 Geomorphology map

Landform unit	Area in %	Gram Panchayat
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Active Flood plain with Fluvial



Vellai - 50%
 Anakavoor, Athi, Kilneerkundram -30%
 Anapathur, Cheyyatrivendhan, Kilathur,
 Kil-Nethapakkam, Ukkal - 20%

Denudational Origin-Pediment- Peditplain Complex



Alathurai, Kottagaram, Kovilur, Kurambur,
 Mel-kolathur, Mulagiripattu, Payyur, Purisai,
 Sengadu, Thenillupai, Thenkalpakkam, Thethurai,
 Vadalapirandhan, Thirumpoondi

3.5.1.2 Lineament: The lineament map shows the linear feature in a landscape that is an expression of an underlying geological structure such as a fault, dyke, structural lineaments and drainage parallel in the Block (Figure 3.2). Structural lineaments and Faults are seen in Cheyyatrivendhan, Karanai, Kilathur and Kunnavakkam GPs. Geomorphic lineaments with parallel drainage are noticed in Alathurai, Anakkavoor, Anapathur, Athi, Irungal, Kilathur, Kilneerkundram, Nelvoy and Ukkal GPs. Structural lineaments, dyke is noticed in Mulagiripattu, Sengadu, Then illupai, Then-mavandal, Veerambakkam and Athimalaipattu GP. These observations are widely used to locate points of high water flow especially in groundwater exploration.

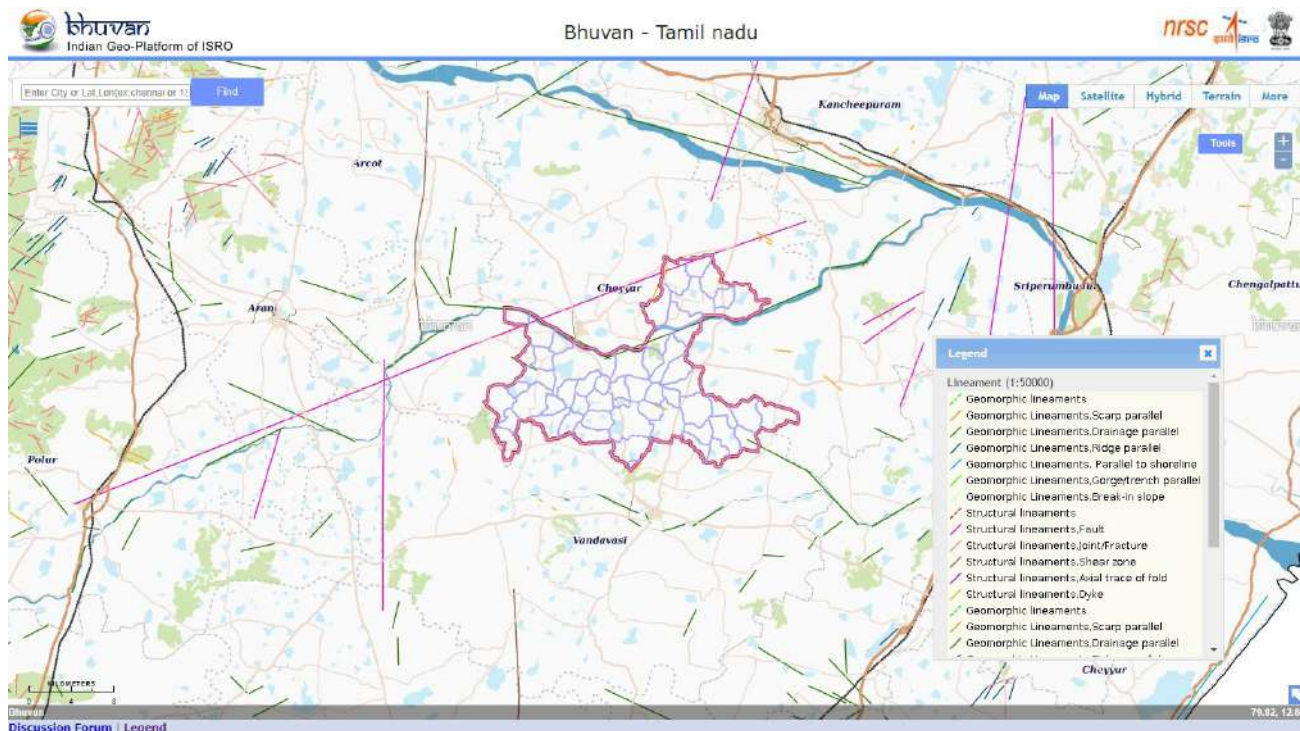


Figure 3.2. Lineament map

Lineament type	Gram Panchayat
Structural lineaments, Fault	Cheyyatrivendhan, Karanai, Kilathur, Kunnavakkam
Geomorphic lineaments, Drainage parallel	Alathurai, Anakkavoor, Anapathur, Athi, Irungal, Kilathur, Kilneerkundram, Nelvoy, Ukkal
Structural lineaments, Dyke	Mulagiripattu, Sengadu, Then-illupai, Then-mavandal, Veerambakkam

3.5.1.3 Terrain: The terrain map is a detailed record of the elevation profile of the area. This map will aid in the understanding the nature of terrain to identify the water and soil conservation measures (Figure 3.3).

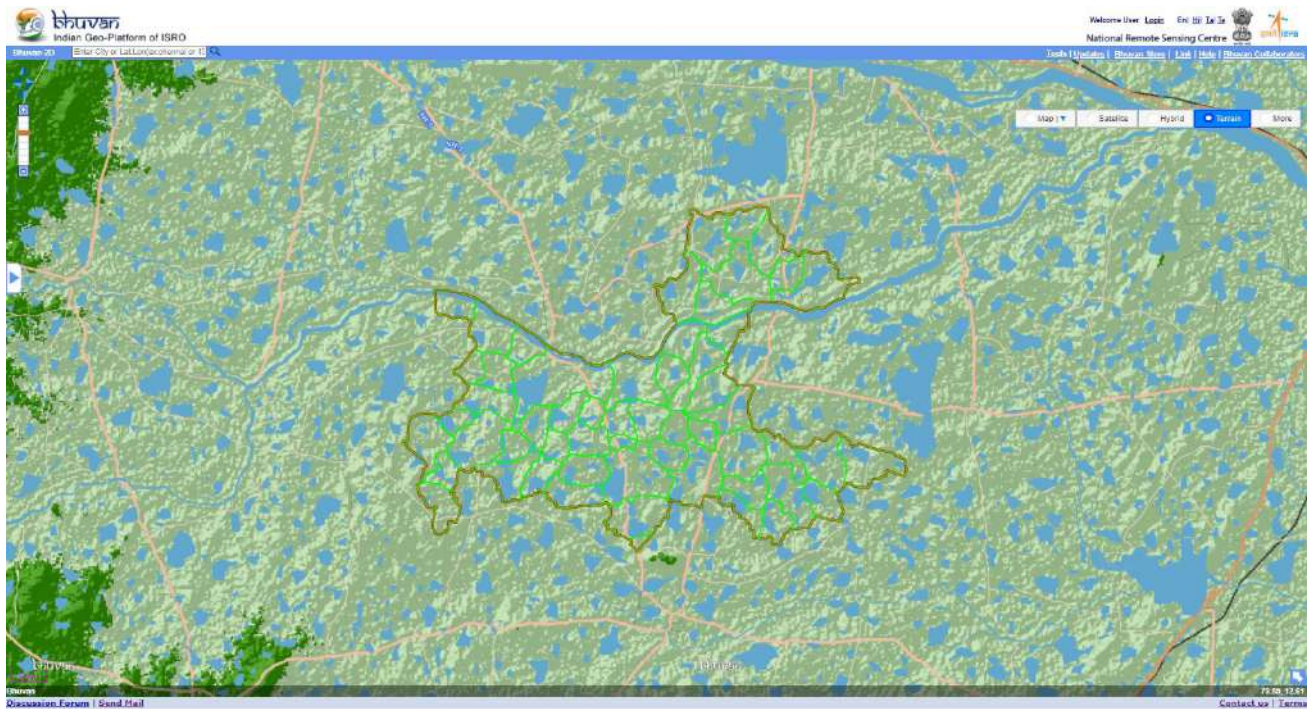


Figure 3.3. Terrain map

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 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).

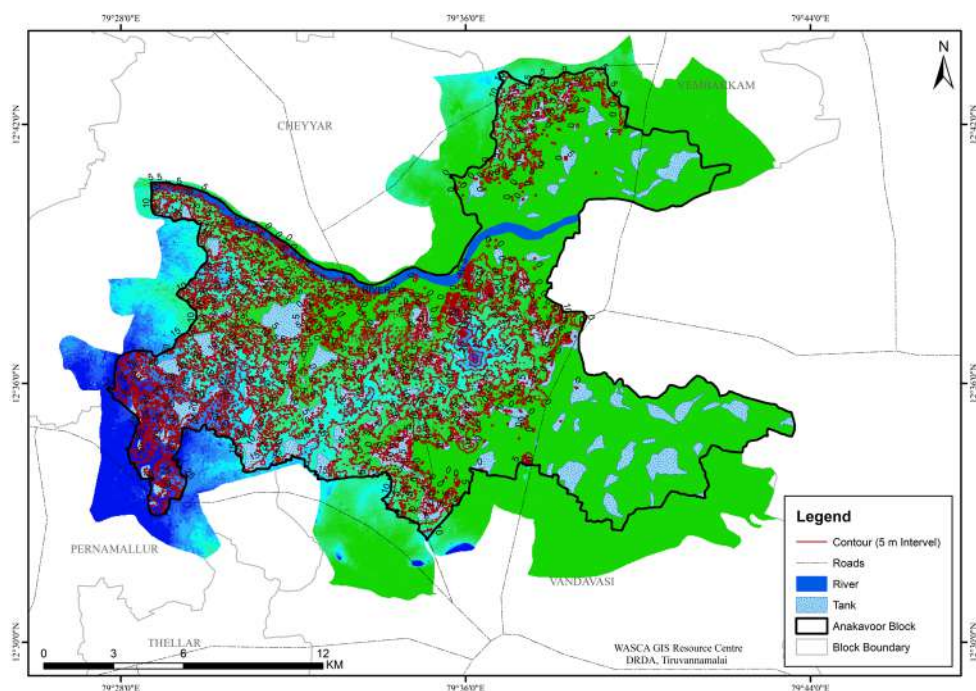


Figure 3.4. Contour map

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 as a percentage, an angle, or a ratio. Slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. 90% of area in Alathurai, Arasur, Chithamur, Irungal, Kulamandai, Mahajanambakkam, Mel-Nemili, Mulagiripattu, Nallam, Paiyur, Perumpalai, Purisai, Then-mavandal, Thenthandalam, Ukkal and Vengodu GPs are very flat (0-1%). 60% of the Cheyyatrivendhan, Vellai, Tavasi, Vadathinnalur, Kovilur, Kilkolathur, Vadalapirandhan and Thenkalpakkam are flat with 1-3% slope. A part of (10%) Anapathur have steep 10-35% slope (Figure 3.5). This information's are used in analyzing the soil conservation measures and construction of the water recharge structures such as check dam, farm ponds etc.,

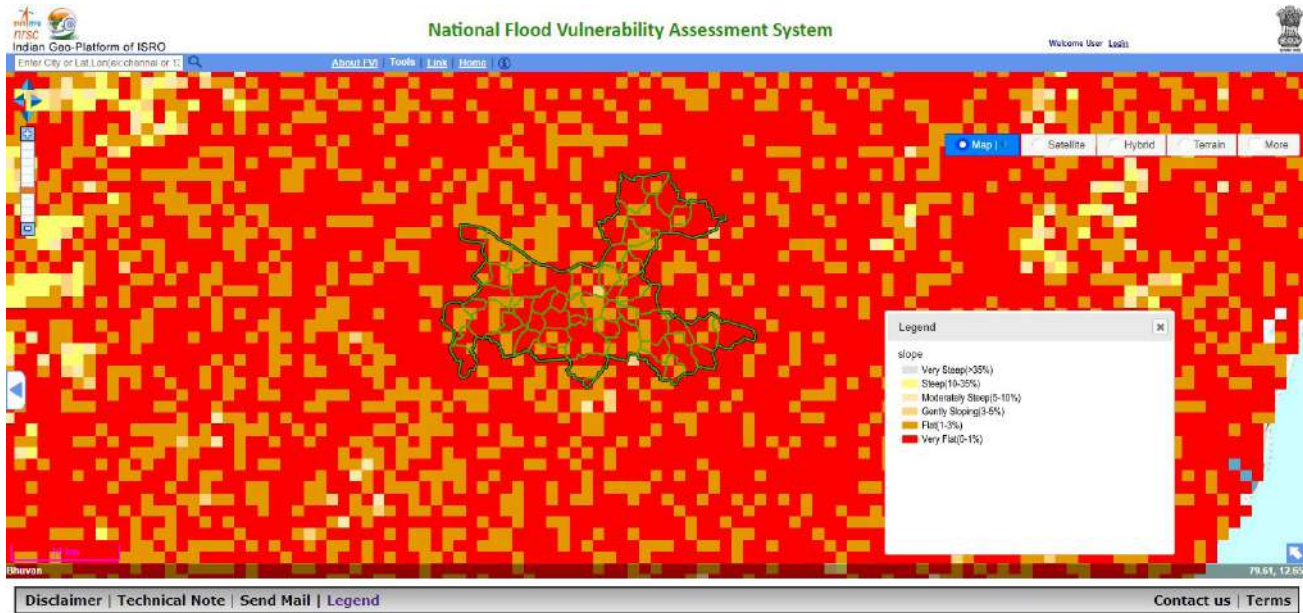
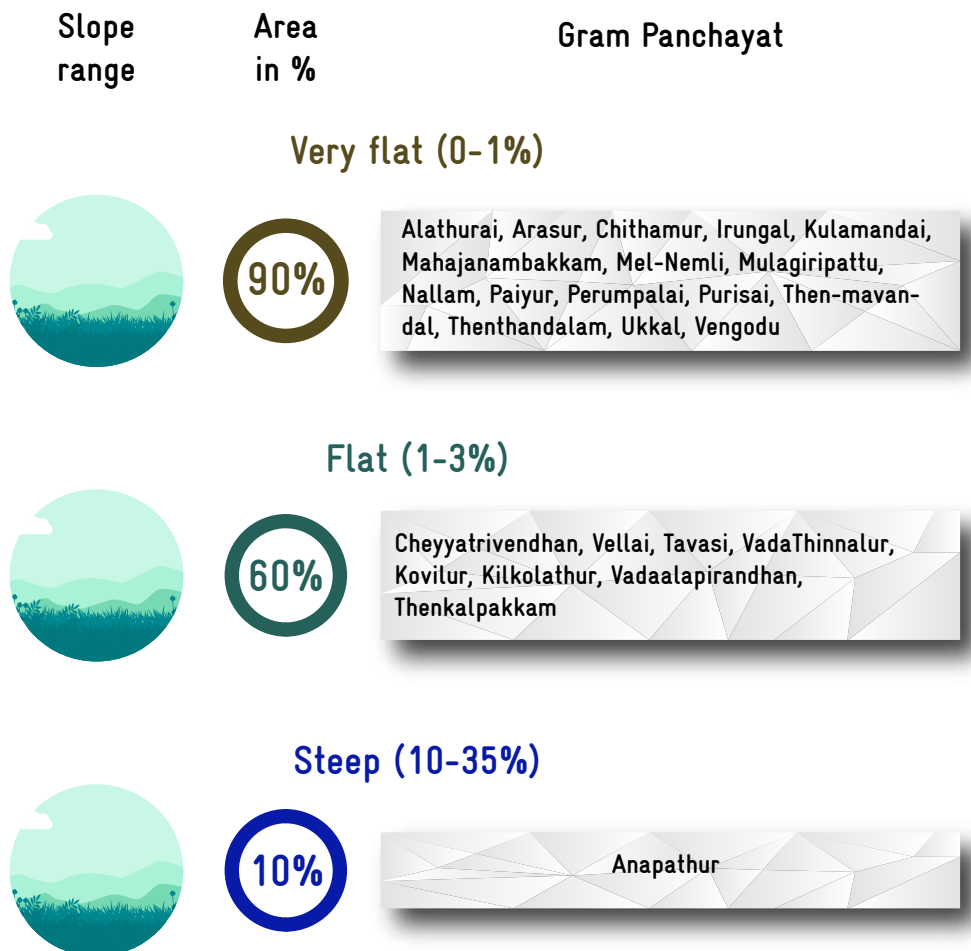


Figure 3.5. Slope map



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

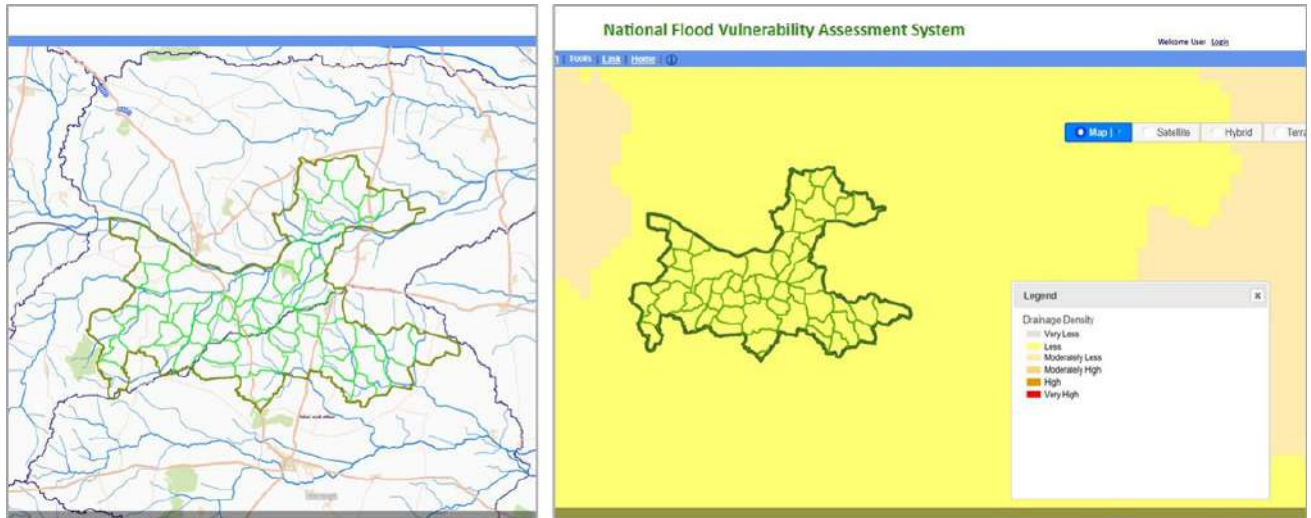


Figure 3.6. Drainage network and density map

3.5.1.7 Watershed: Implementation of any water management measure requires a suitable hydrological unit. A properly delineated watershed forms a convenient hydrological unit for computation of water balance parameters and thus implementation of water management schemes. A watershed map is the area of land where all of the water that falls in it and drains off goes into the common outlet. The watershed map has become a pre requisite for any developmental programme such as soil and water conservation, flood control, soil erosion control, because land and water resources have maximum interaction and synergic effect, when developed on watershed basis. This map is used for the interventions based on ridge to valley concept and sequencing the plan accordingly (Figure 3.7).

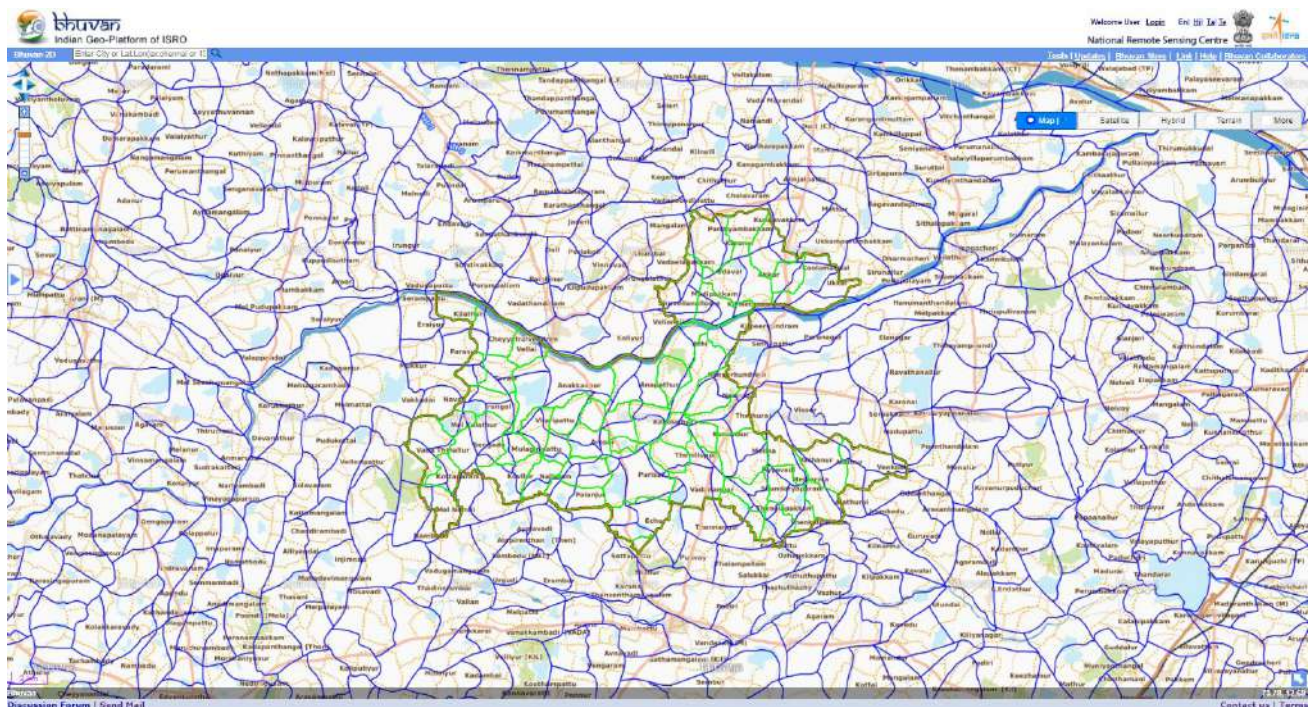


Figure 3.7. Watershed map

3.5.1.8 Ground water perspectives: The ground water perspectives map provides the required information on geological parameters connected to ground water exploration and the probable ground water prospects (Figure 3.8). All parts of Alathurai, Vadalapiranthan, Kovilur, Kurambur, Mel-Kolathur, Mulagiripattu, Payyur, Purisai, Sengadu, The-nillupai, Thenkalpakkam, Thethurai and Thirumpoondi GPs have > 80 m Deep Well- 50 to 100 LPM Yield. These GP specific information's are accounted in identification of sites for planning recharge structures to address water scarcity in a more effective manner for the Block.

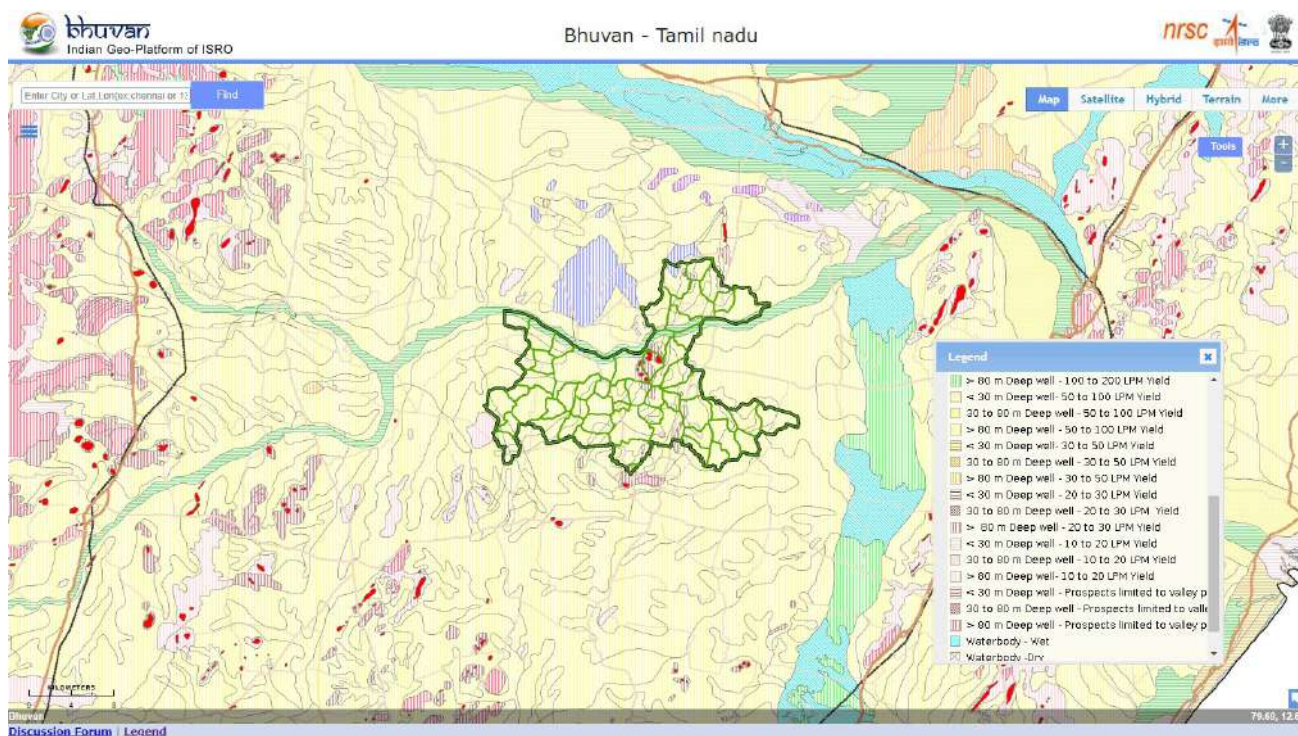


Figure 3.8. Ground water perspective map



Groundwater Prospects

Area in %

Gram Panchayat

> 80 m Deep Well- 400 to 800 LPM Yield



Karanai

> 80 m Deep well - Prospect limited to valley



Vadalapirandhan, Vengunam - 50%, Narmapallam - 40%, Anapathur, Athi, Kilkolathur - 30%, Ilaneerkundram, Verambakkam - 20%, Melma - 10%

> 80 m Deep Well- 50 to 100 LPM Yield



Alathurai, KottVadalapiranthan, Kovilur, Kurambur, Melkolathur, Mulagiripattu, Payyur, Purisai, Sengadu, Thenillupai, Thenkalpakkam, Thethurai, Thirumpoondi

No Yield



Anapathur - 10%, Vadalapirandhan - 20%

3.3.2 NON SPATIAL DATA

Apart from geo-spatial maps, the data regarding, status of watershed and drainage network, canal, traditional waterbodies, details on irrigation facilities are collected from Govt. sources. The runoff and water demands are calculated. Table 6 provides the snapshot of the

non-spatial data used to capture current water resources state and its supply and demand side of Anakka-voor Block. 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	65,975
2	Length of Minor Canal	22,800
3	Length of Distributaries	0
4	Water Courses (Field Channels)	63,944
	Traditional Waterbodies in No.	
5	No. of Tanks (PWD & Union)	109
6	No. of Ooranis	305
7	Other Surface Waterbodies	3
	Irrigation Facilities in ha	
8	Area under Tank Irrigation	2,604.9
9	Area under Canal Irrigation	Nil
10	Area under Open & Tube Well Irrigation	2,901.3
	Catchment Area wise Available Runoff in ha.m	
11	Good Catchment Area	3,166.9
12	Average Catchment Area	203.64
13	Bad Catchment Area	3,045.4
	Watershed and Drainage Networks	
14	Length of Natural Drainage Lines in m	1,78,151
15	No. of Natural Drainage Lines	172
16	No. of Micro-watersheds	210
	Water Demand in ha.m	
17	Water Demand For Humans	213.38
18	Water Demand for Livestock	121.09
19	Water Demand For Agriculture	7,591.3
20	% GW Utilization for Drinking	77
21	% GW Utilization for Livestock	95
22	% GW Utilization for Agriculture	85
23	% SW Utilization for Drinking	23
24	% SW Utilization for Livestock	5
25	% SW Utilization for Agriculture	15

3.5.2.1 Existing Water Structures

The Block has structured traditional water storage units as tanks, ponds and Ooranis which are the life line of local communities for their lives and livelihoods. The Block has 109 tanks, 305 Ooranis and 3 other surface waterbodies and (Figure 3.9).

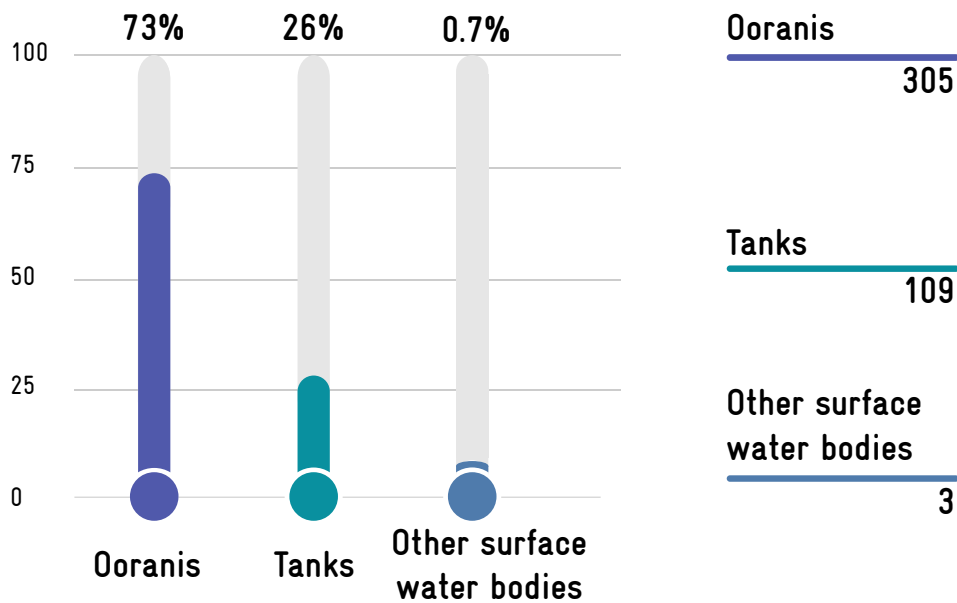


Figure 3.9. Traditional water bodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the District is 5,506 ha, of which 52.69% (2,901.3 ha) is irrigated through ground water stored in open/tube wells while remaining 47.3% (2,604.9 ha) area are irrigated through tanks (Figure 3.10).

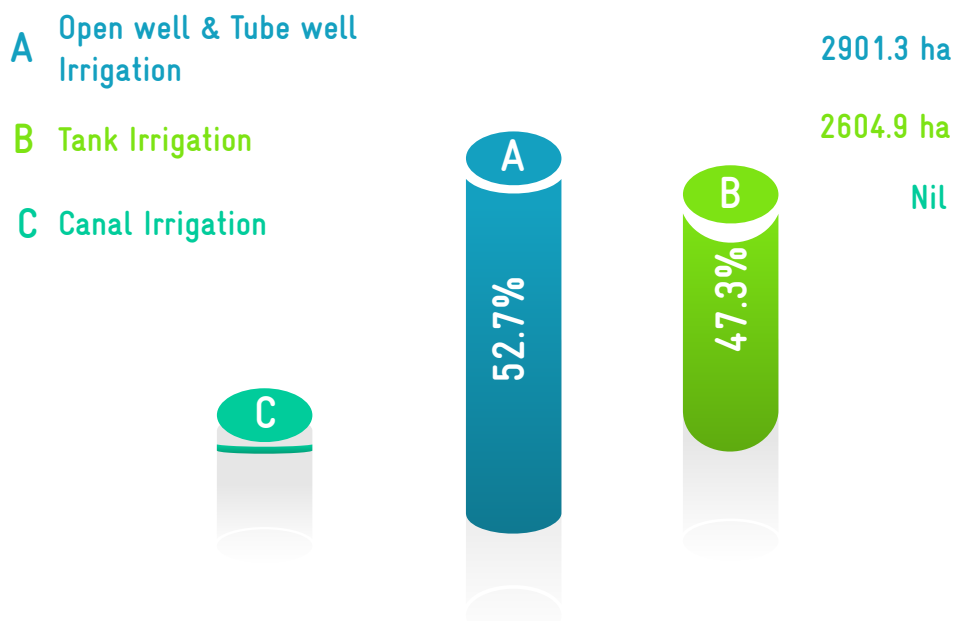


Figure 3.10. Irrigation source

3.5.2.3 Available Run off

The available runoff in catchment area is 6415.9 ha.m. and in that 49.36% comes under good catchment area, 3.17% comes under average catchment area and 47.46% comes under bad catchment area (Figure 3.11).

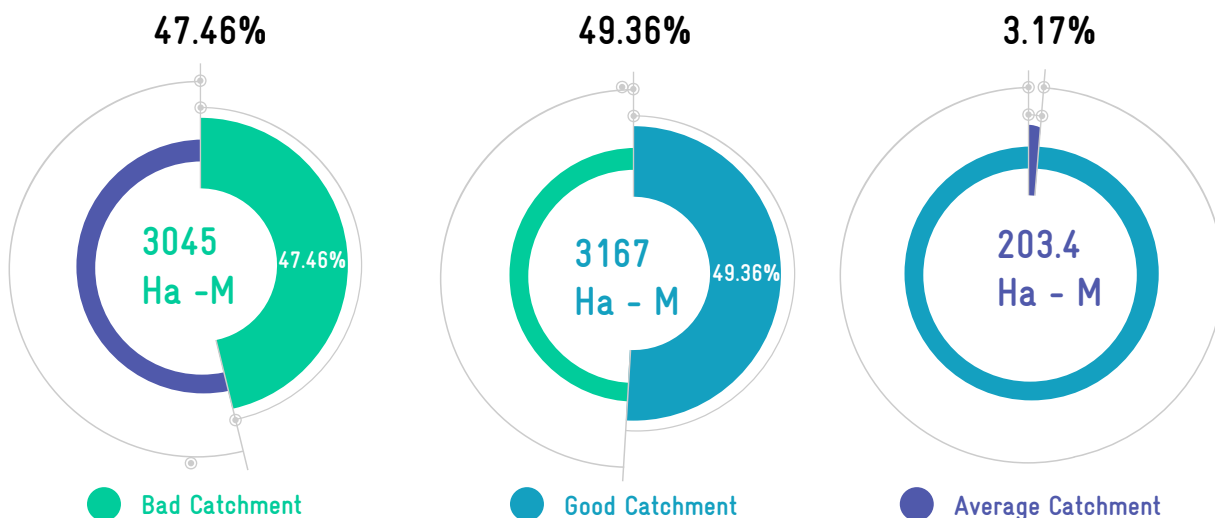
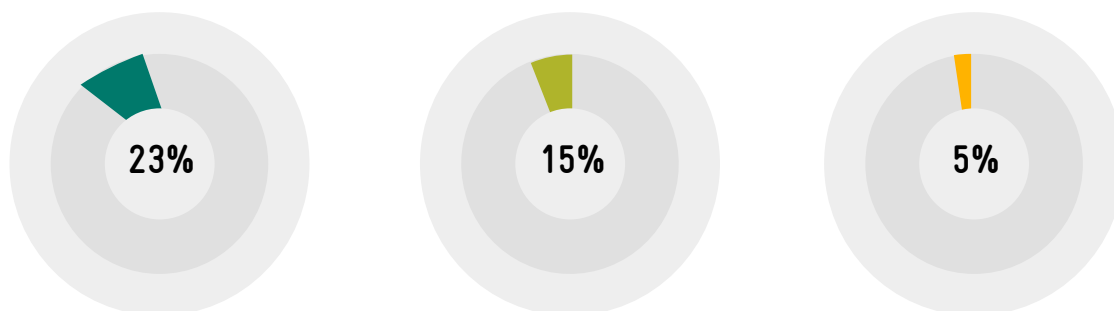
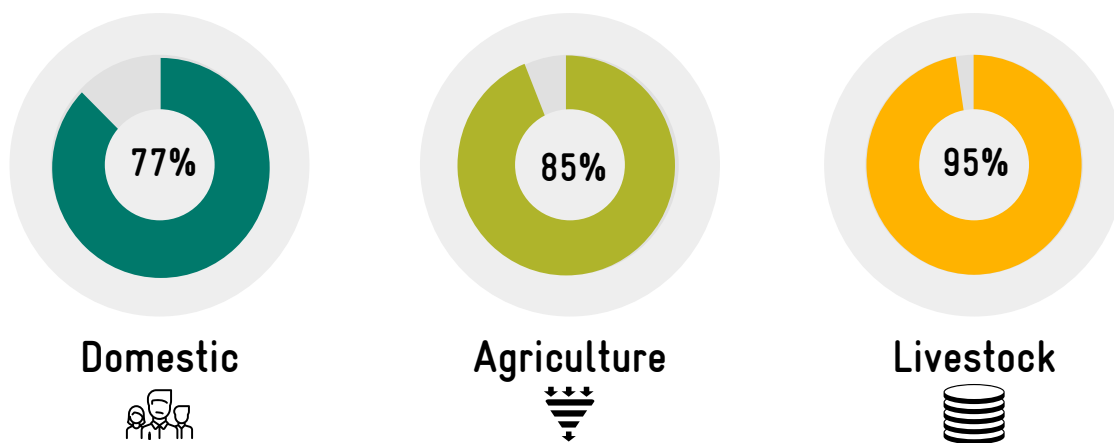


Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 7,925.8 ha.m. The demand is more for agriculture (7,591.3 ha.m), followed by human (213.38 ha.m) and livestock 121.09 (ha.m) demands. More groundwater is utilized for agriculture (85%), humans (77%) and livestock (95%). At the same time, utilization of surface water is more for drinking purposes (23%) when compared to ground water usage for other purpose. For livestock, ground water utilization (95%) is more than surface water (5%) (Figure 3.12).

% OF GROUND WATER UTILIZATION



% OF SURFACE WATER UTILIZATION

Figure 3.12. Sectoral-wise water utilization

3.6 | CWRM PLANNING ANALYSIS- AGRICULTURE

Agriculture is the primary livelihood of the households in this Block followed by livestock resources. Considering water and monsoon patterns, the key ag-

riculture factors such as soil, land, crop and livestock related parameters are employed in CWRM planning.

3.6.1 SPATIAL DATA

Bhuvan base spatial data on LULC, waste land, salt and erosion affected lands and soil texture

were collected to understand the site specific problems in order to draft scientific key water actions.

3.6.1.2 Soil texture: The District has diverse soil types and predominant in vertisol and alfisol, with reference to soil texture the proportion of fine type is higher followed by loamy and coarse types (Figure 3.13).

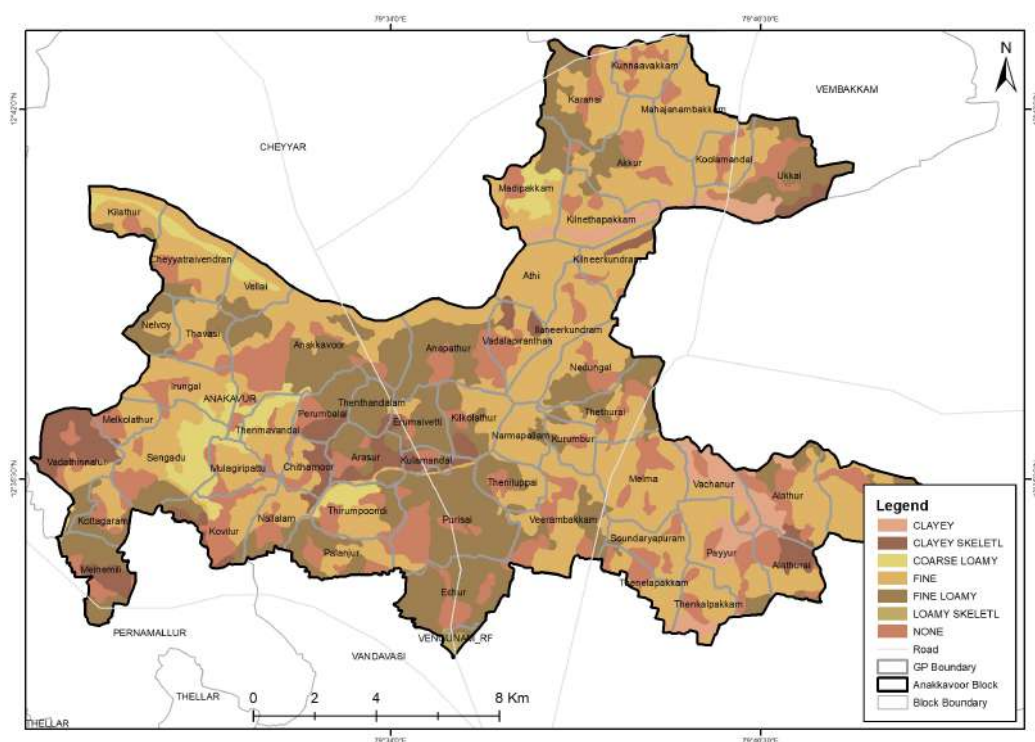


Figure 3.13. Soil texture

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. water, air, plants and humans. The erosion map shows the soil erosion capacity with respect to rainfall, soil physical properties, terrain slope, land cover in the Block. The soil erosion map used to identify and propose soil conservation activities. In this Block, sheet erosion is majorly observed in 17 GPs (Figure 3.14).

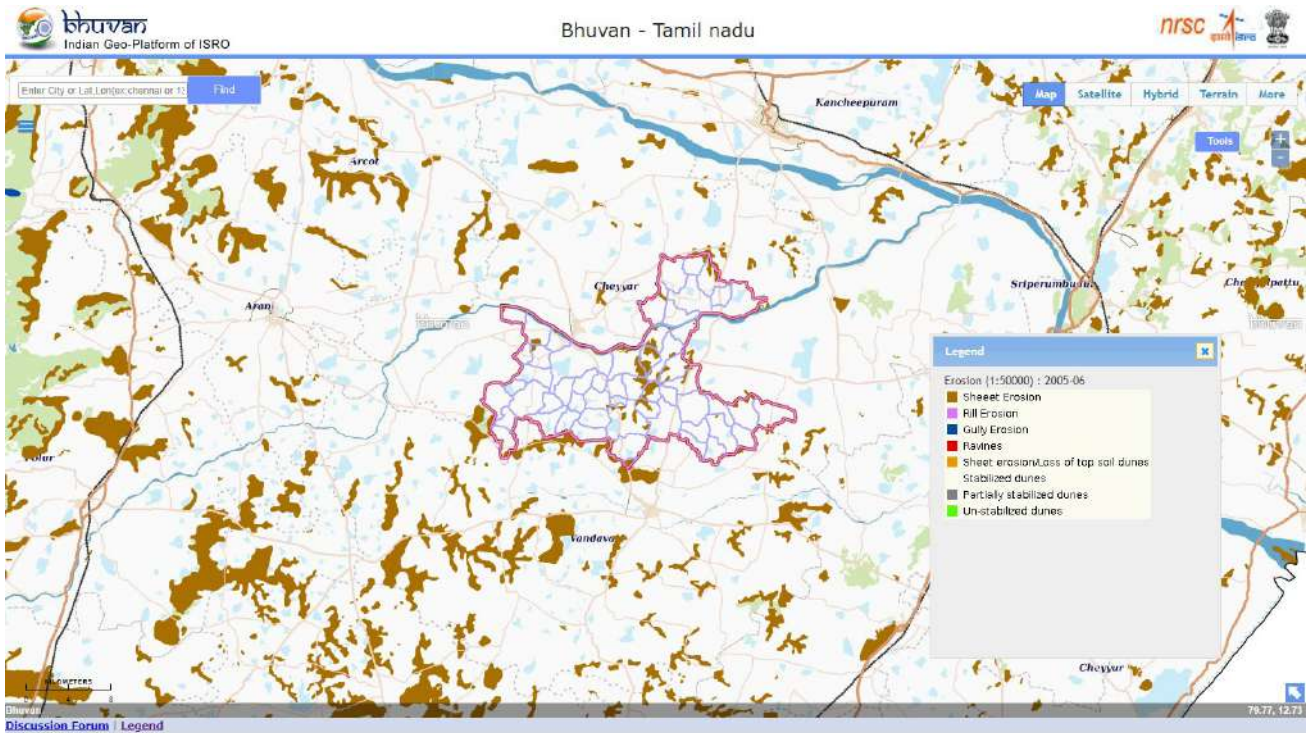
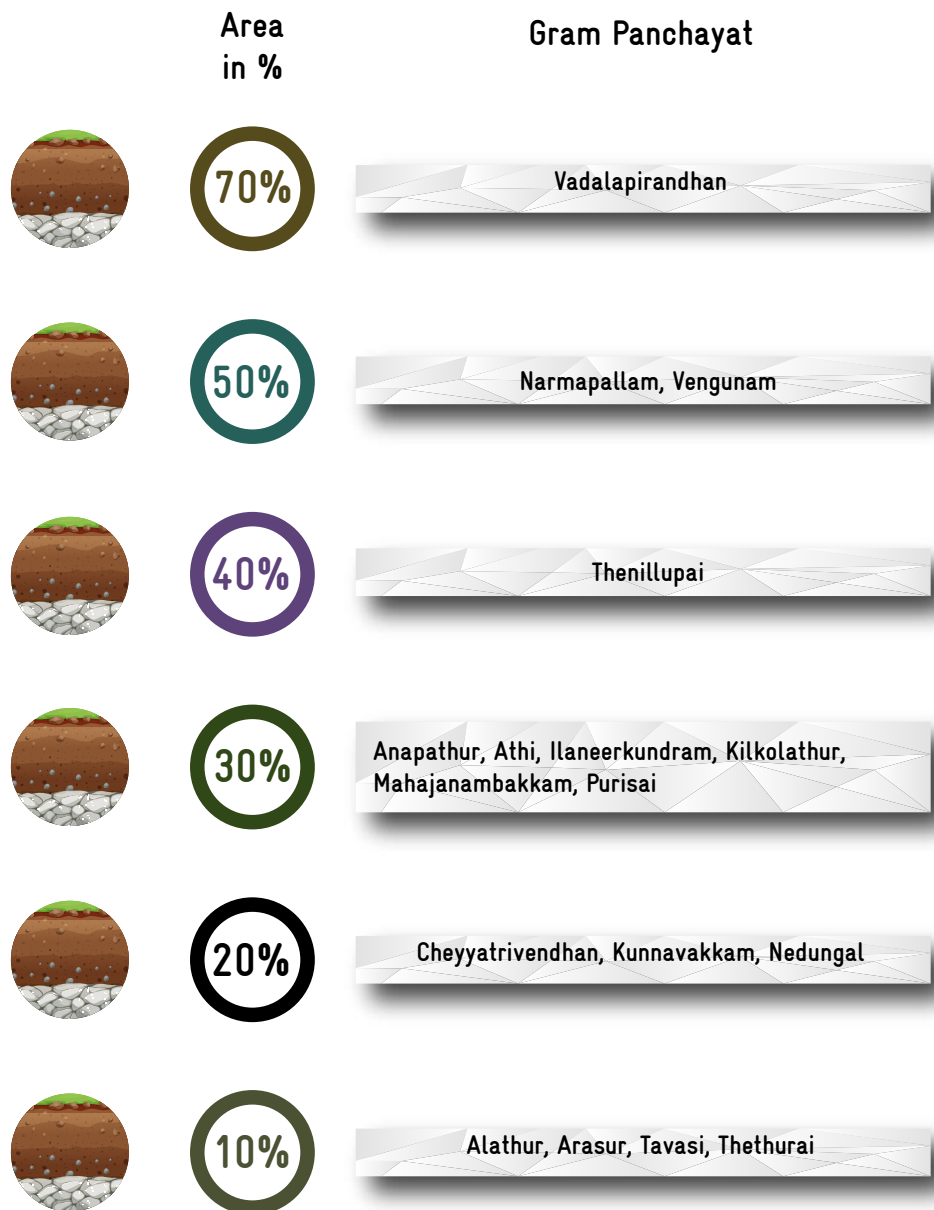


Figure 3.14. Soil erosion map



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

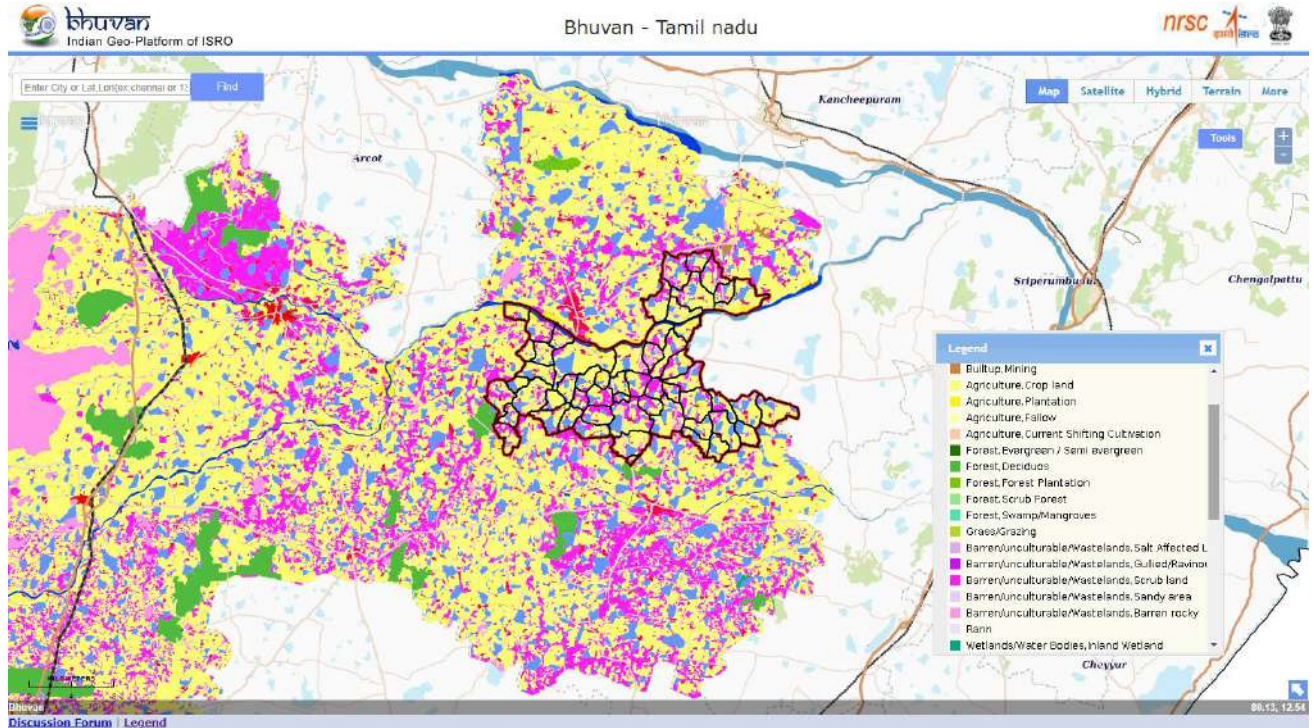
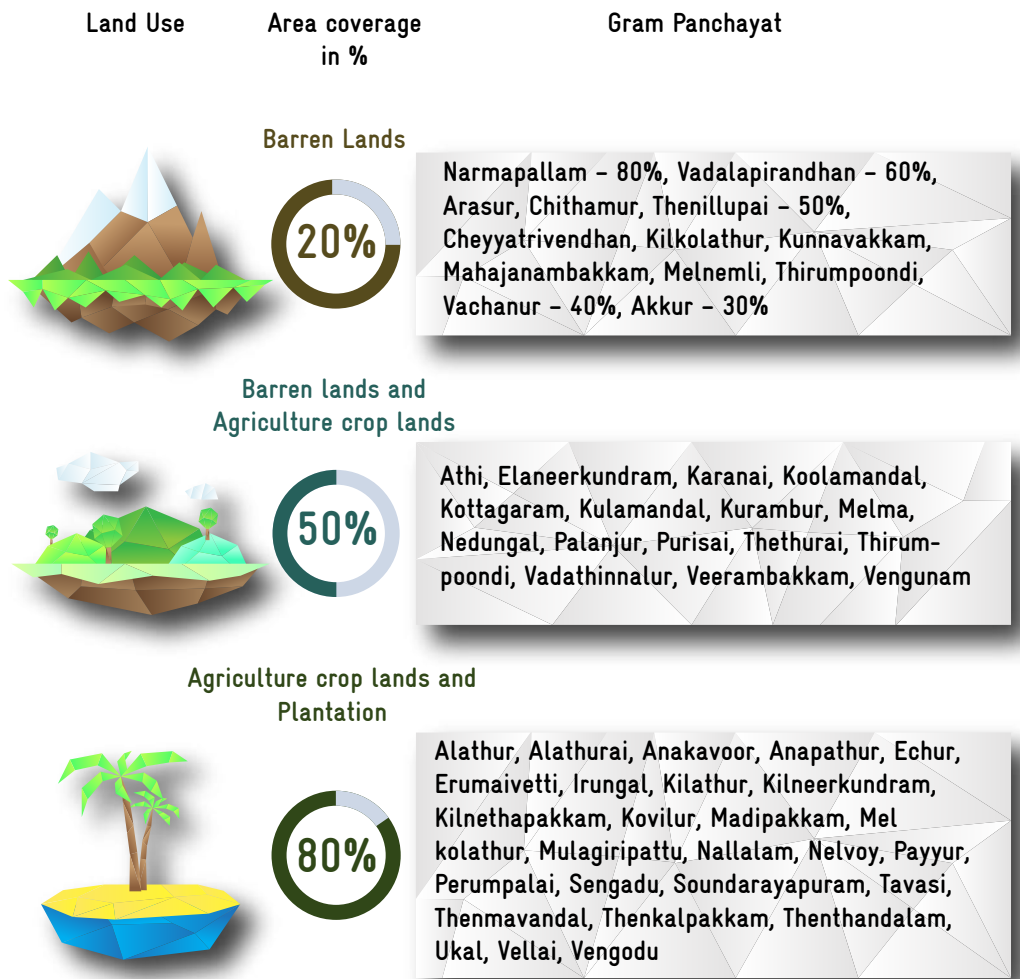


Figure 3.15. Land use land cover map





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 under barren rocky area were noticed in the Anakkavoor Block (Figure 3.16). Approximately 20% of Mahajanambakkam, Narmapallam, Purisai and Thenellupai GPs and 10% of Kilkolathur, Echur, Verambakkam and Kunnavakkam GPs have barren rocky area. During planning the GPs, the measures have been taken up to convert into productive land.

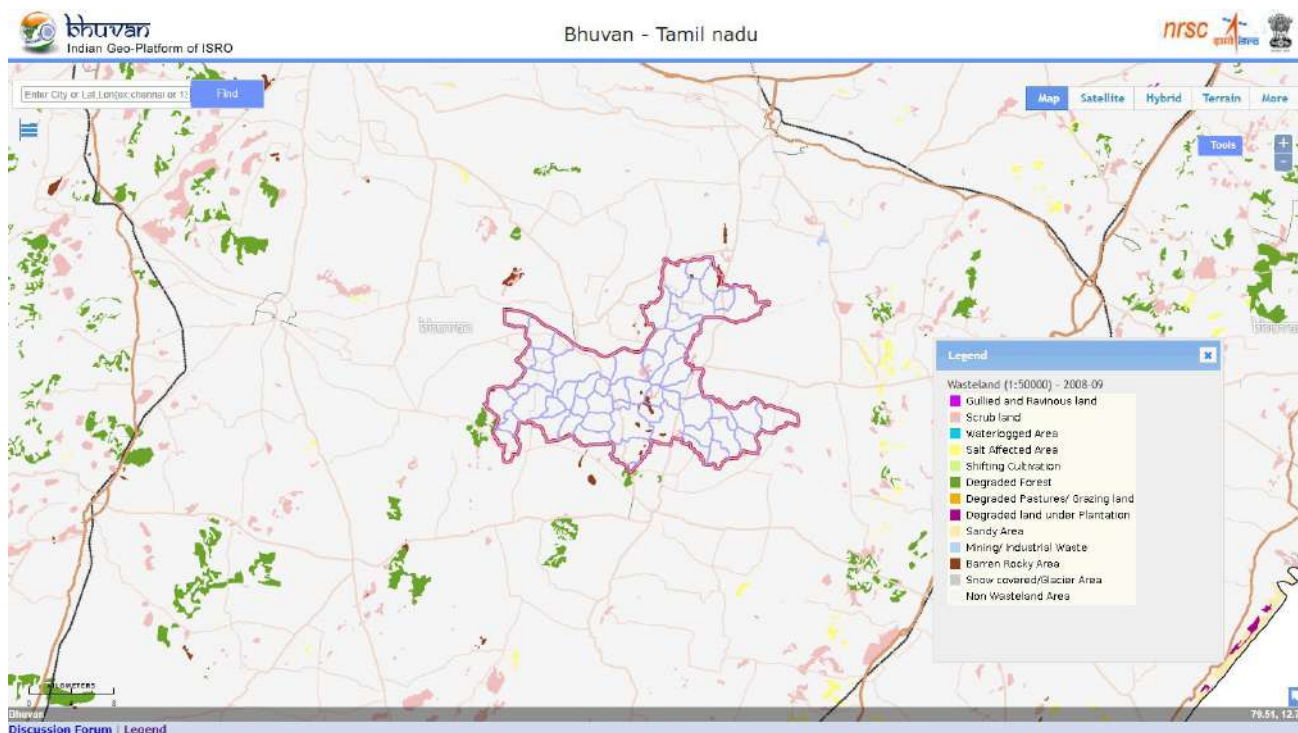


Figure 3.16. Wasteland map

Wasteland type

Area in %

Gram Panchayat

Barren Rocky Area



Mahajanambakkam, Narmapallam, Purisai, Thenillupai



Echur, Kilkolathur, Kunnavakkam, Verambakkam

3.6.1.5 Salt affected area: In the Block, no part is salt affected area (Figure 3.17).

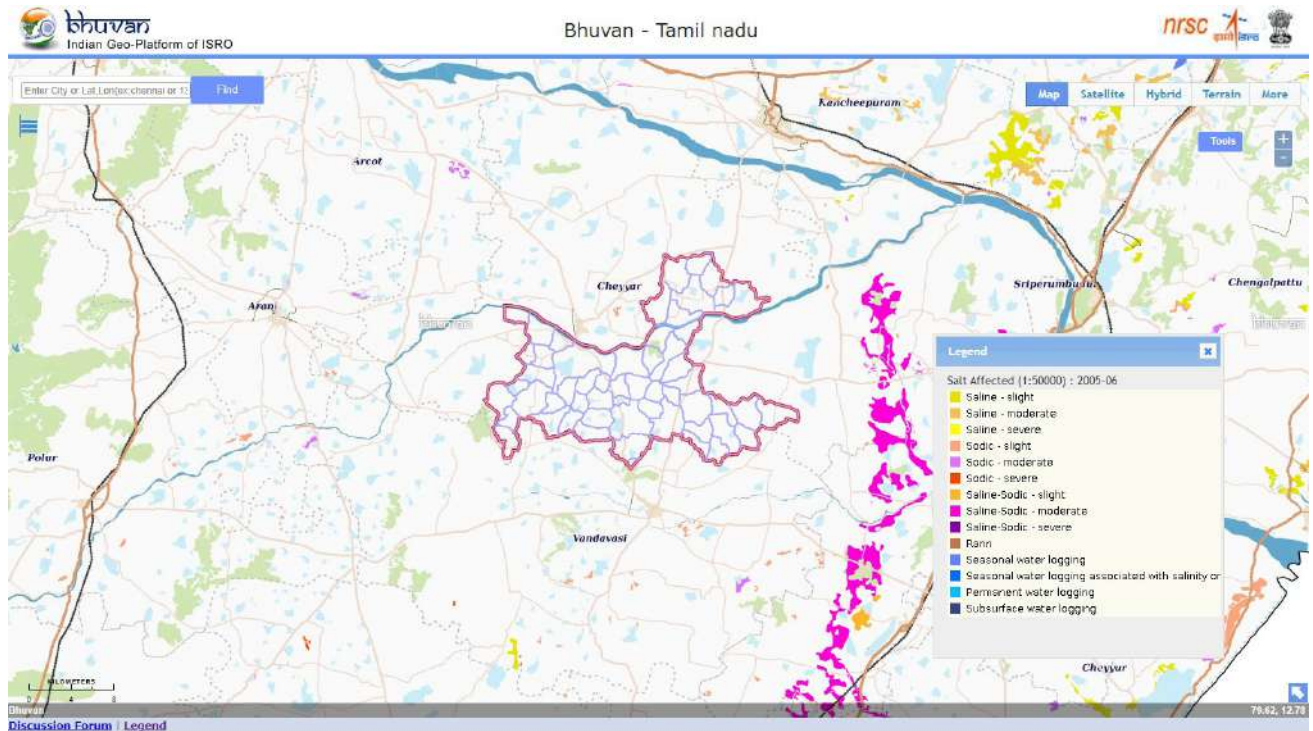


Figure 3.17. Salt affected area

3.6.2 NON SPATIAL DATA

Apart from geo-spatial maps, the data regarding status of land resources, catchment area, crop details, soil texture, and status of macro and micro nutrients, live-stock are collected from recognized sources. The run-off and water demands are calculated. Table 7 provides

the snapshot of the non-spatial data used to capture current agriculture and allied related resources state of Anakkavoor Block. The key CWRM parameters of agriculture area for all GPs are tabulated in Annexure 3.7.

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

S No	Key CWRM Parameter	Total
	Area Under Land Resources in ha	
1	Forest land	723.1
2	Non-agricultural uses	7,830.6
3	Barren & un-cultivable Land	81.54
4	Permanent pastures and other grazing land	307.79
5	Land under miscellaneous tree crops etc.	224.78
6	Cultivable wasteland	192.67
7	Fallows land other than current fallows	1,107.5
8	Current fallow land	7,361.1
9	Unirrigated land	2,622.8
10	Area irrigated by source	5,366.6
	Catchment Area in ha	
11	Good catchment	8,635.2
12	Average catchment	725.203
13	Bad catchment	16,434.85
	Crop details	
14	Irrigated area (ha)	5,697.8
15	Rain fed area (ha)	257.33
16	Area under paddy cultivation (ha)	3,688.6
17	Crop water requirement - Irrigated condition (ha.m)	7,486.2
18	Crop water requirement – Rain fed condition (ha.m)	105.54
	Soil Resources: Status of available Nitrogen in %	
19	Very low	31
20	Low	71
	Status of Organic Carbon in %	
29	Very low	23
30	Low	65
26	Medium	11
	Status of soil micro-nutrients in %	
27	Sufficient	63
28	Deficient	37
	Status of physical condition of the soil in %	
29	Moderately acidic	2
30	Slightly acidic	3
31	Neutral	1
32	Moderately alkaline	94

	Soil Texture in %	
33	Clay soil	10
34	Fine soil	69
35	Coarse loamy	3
36	Soil water permeability	Moderate
	Soil moisture and ET	
37	Volumetric Soil Moisture %	23
38	Estimated Soil Moisture (ha.m)	4,074.9
39	ET Losses (ha.m)	7,144.3
	Means of water extraction (%)	
40	Gravity	7
41	Lifting	93
	Irrigation methods (%)	
42	Wild flooding	49
43	Control flooding	51
	Livestock (No.)	
44	Cattle population	27,050
45	Sheep population	11,021
46	Goat population	21,311

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.

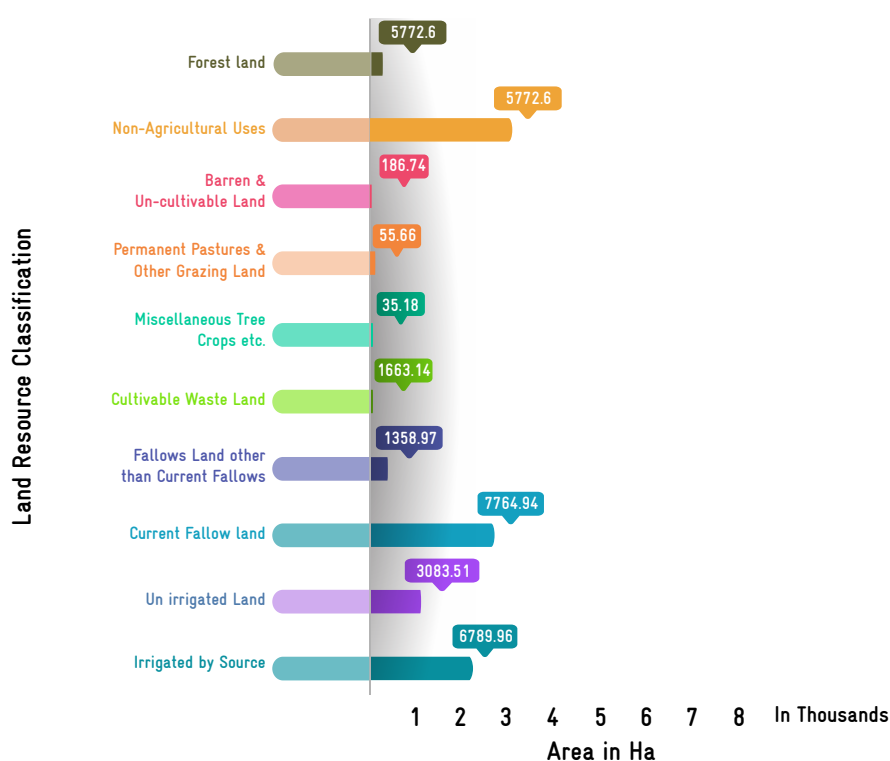


Figure 3.18. Land utilization

3.6.2.2 Catchment Area

The land use types in each of the GPs are categorized into three different types of runoff types; Good Catchment area, Average Catchment area and Bad Catchment area. Out of total catchment area of the Block is 52,795 ha, about 63.7 % percent is bad catchment, 33.47% is good catchment, area and 2.8 % is under average catchment area. This analysis helps to focus on prioritizing the works in the land use systems under the good and bad catchment areas (Figure 3.19).

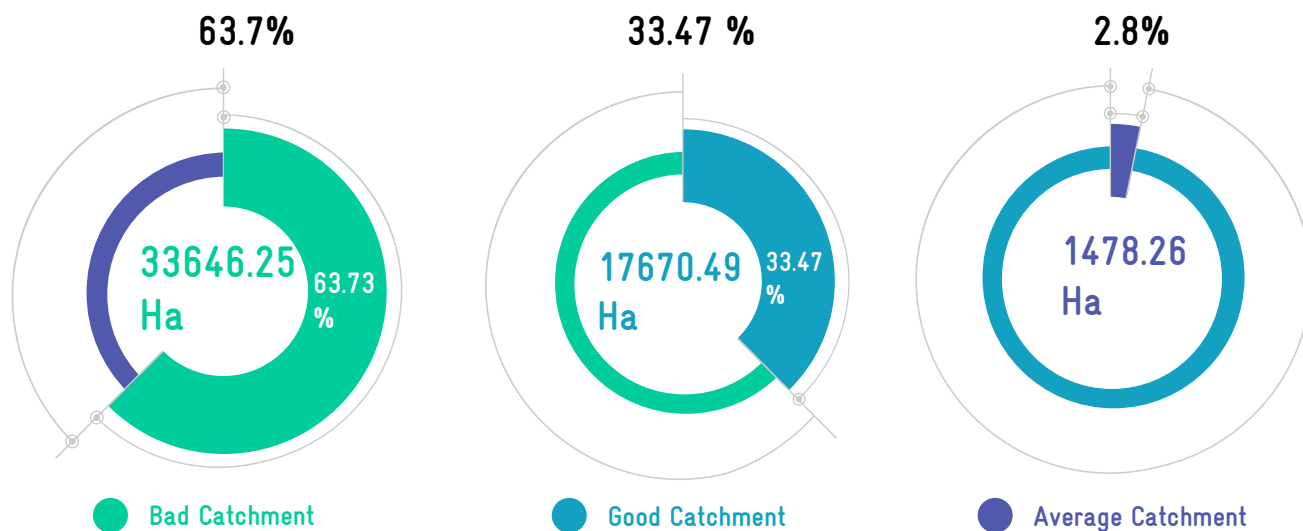


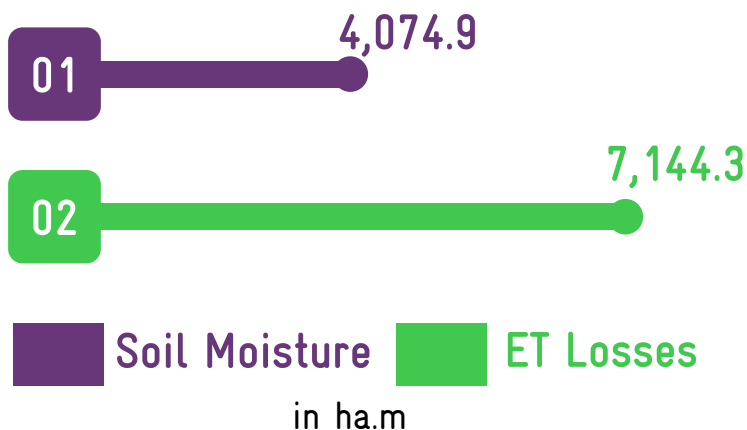
Figure 3.19. Catchment Area

3.6.2.3 Soil moisture

The soil is an important medium to store the available water and the storage capacity vary 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 rainfed 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 4,074.9 ha.m.

3.6.2.4 ET losses

The loss of water through evapo-transpiration is important in the water budgeting. The annual total ET loss during 2018-19 was 804 mm with monthly average of 67.08 mm. The average percentage area influences the water loss through ET in the Block is 23% and the total annual losses due to ET alone 7,144.3 ha.m.



3.6.2.5 Macro nutrients

The macro soil nutrients such as nitrogen and organic carbon is 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 71 % are under low category (Figure 3.20). According to soil resource map, this Block is identified as one of the most nitrogen deficient Block (Tiruvannamalai District profile 2020).

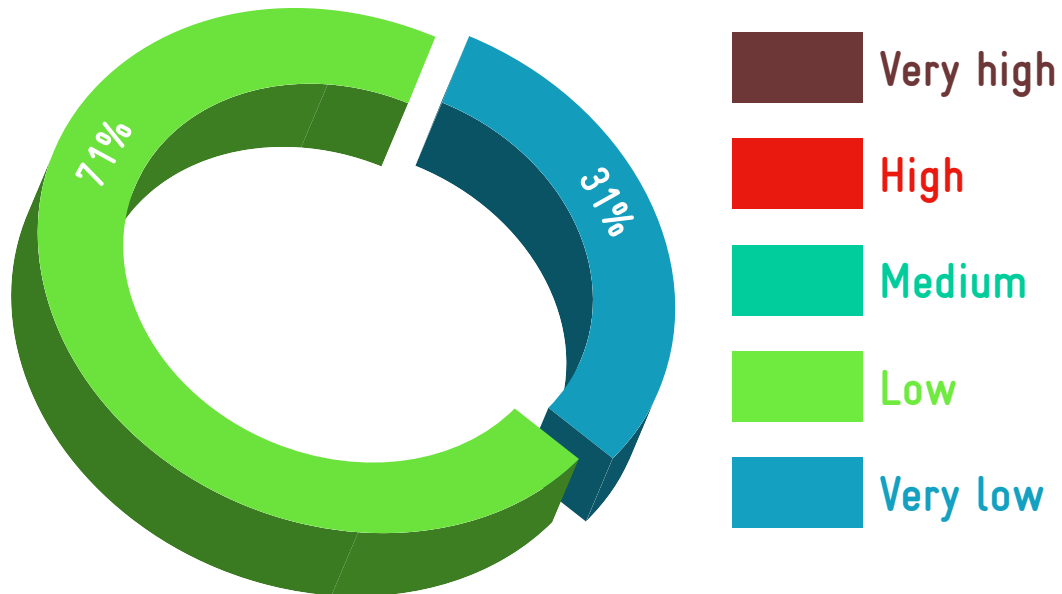


Figure 3.20. Status of available Nitrogen

Similar trend recorded for soil organic carbon too. Majority of the soil in this Block have low soil organic carbon. Nearly 23% of the soil samples tested are under very low category, 65% under low category and 11 % under medium (Figure 3.21). This indicates that the soil fertility is very poor and further intensive practices make soil more vulnerable to degradation over a period of time.

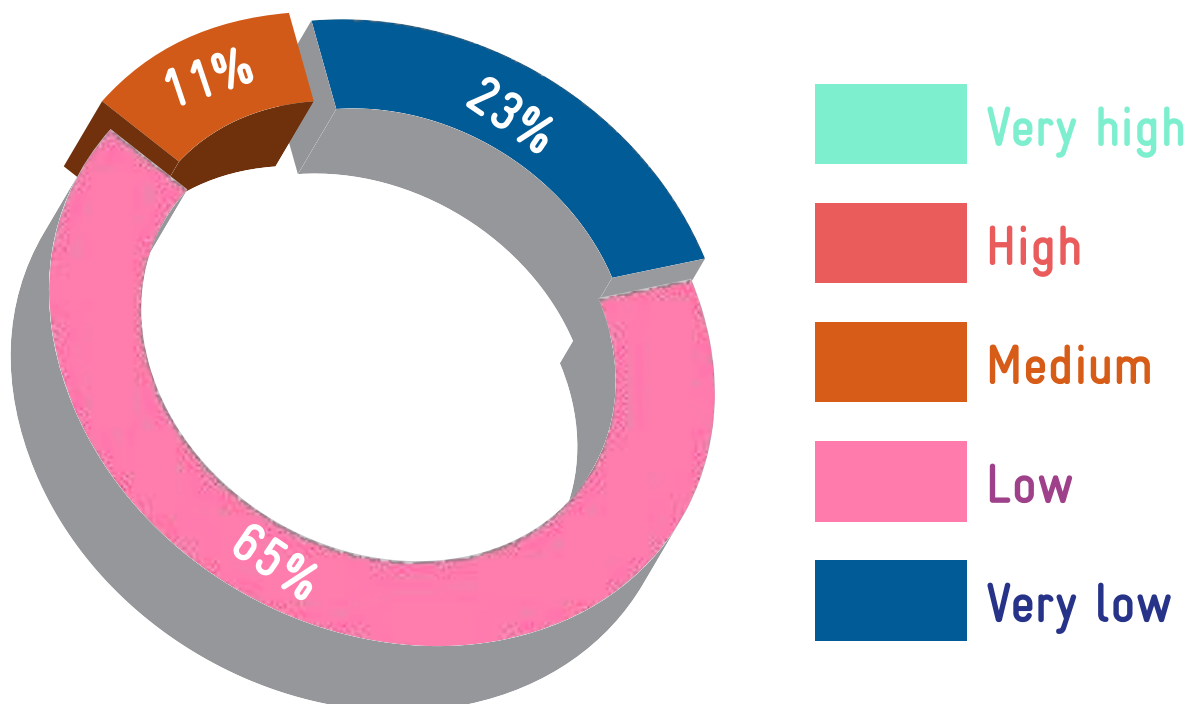


Figure 3.21. Status of soil Organic Carbon

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 63% sufficient and 37% deficient in the soils tested. (Figure 3.22)

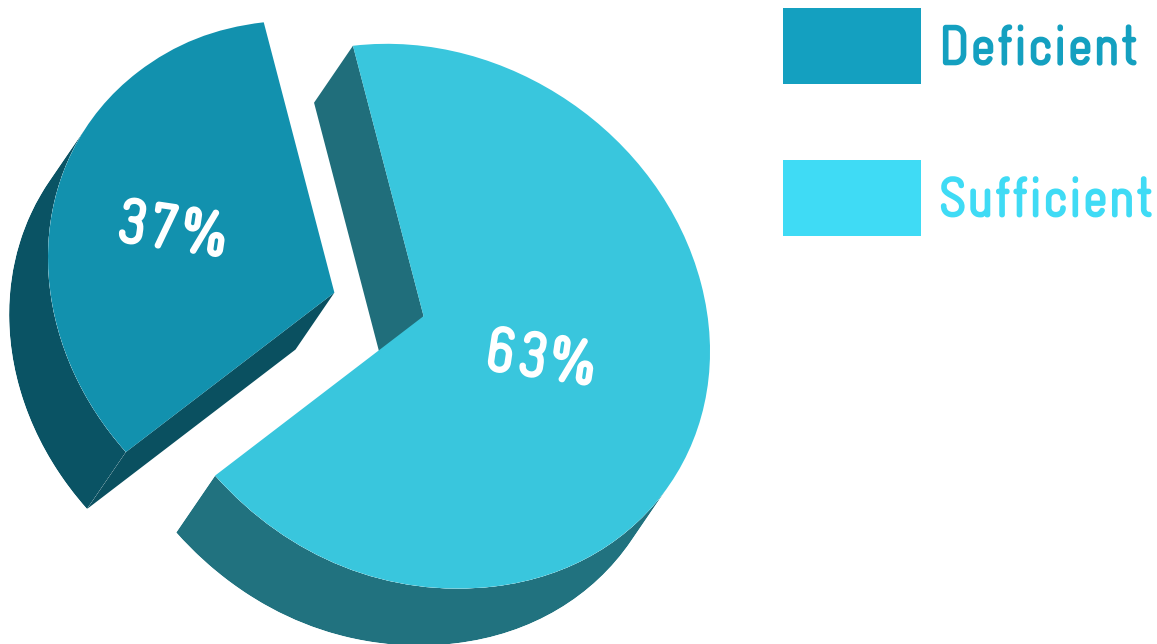


Figure 3.22. Status of soil micro nutrients

3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 94 % of the soils are moderately alkaline in nature, 3% is slightly acidic, 2% is moderately acidic and 1% is neutral in nature as shown in Figure 3.23.

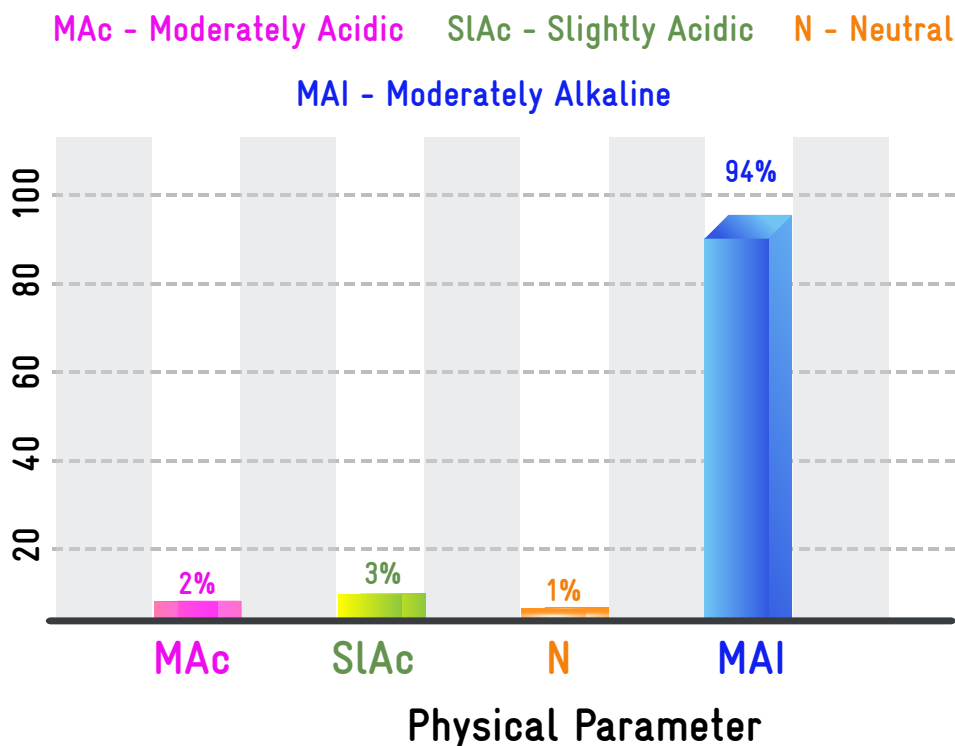


Figure 3.23. Status of pH of soil

3.6.2.8 Cropping pattern and the irrigation

Of the total area under cultivation, 94.6% is under irrigation and the remaining 5.4 % is under rainfed cultivation. Among the crops cultivated under irrigation, paddy is predominantly cultivated accounts to about 71.5% (Figure 3.24). Sugarcane and other pulses are the second most cultivated crops of about 14.2% each in sugar cane cultivated under irrigated condition and majority of other pulses are cultivated under rain-fed (95.9 %) condition. Other crops such as ragi is cultivated around 1.6% followed by mango (1.1%), red chilli (0.6 %) and other crops (0.8%). Other crops include red gram (0.19%), brinjal (0.17 %), water melon (0.12%), ladies finger (0.1 %).

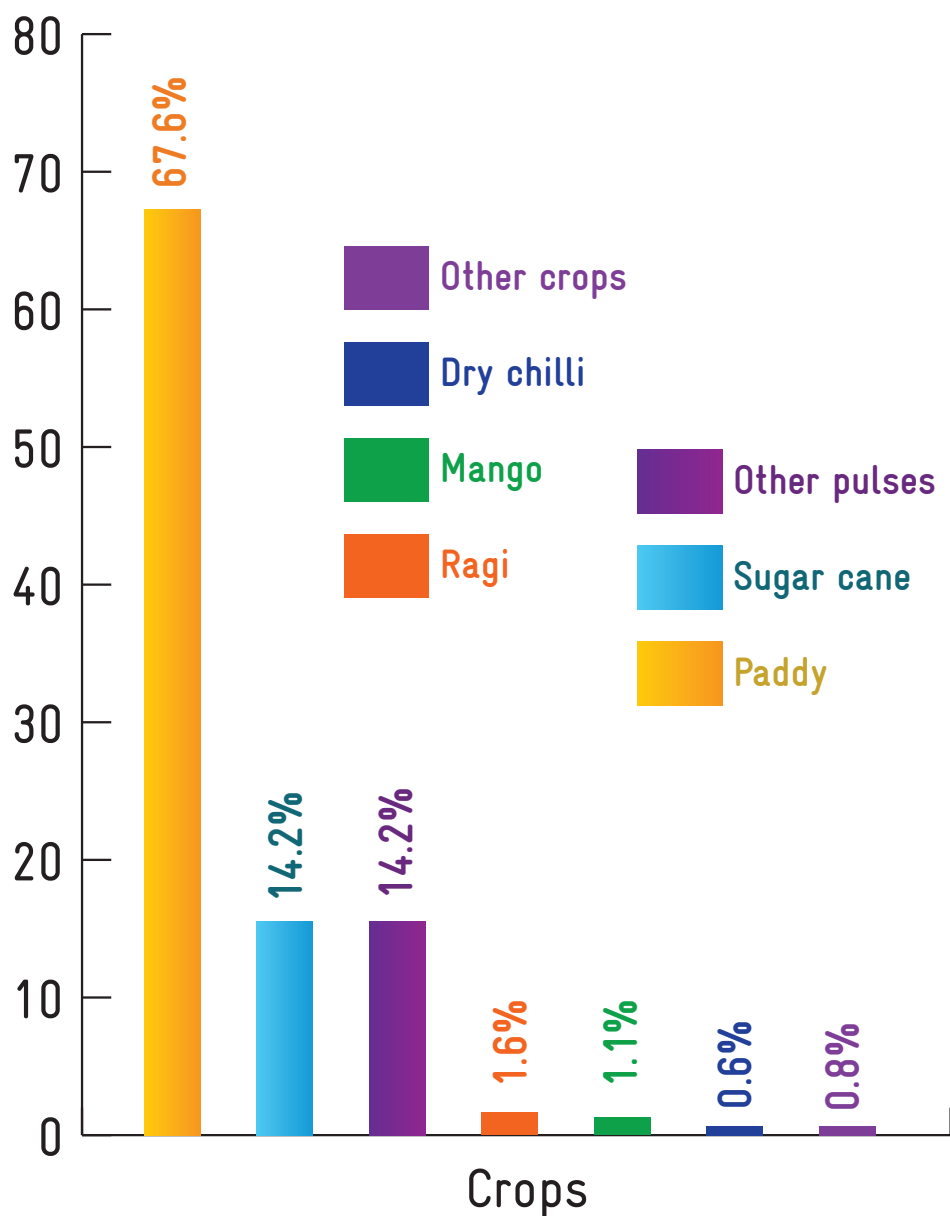


Figure 3.24. Cropping patterns

3.6.2.9 Irrigation Methods

In case of the surface water resources, the 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, 51% of the irrigation is done by control flooding and 49% of the irrigation is done by wild flooding (Figure 3.25).

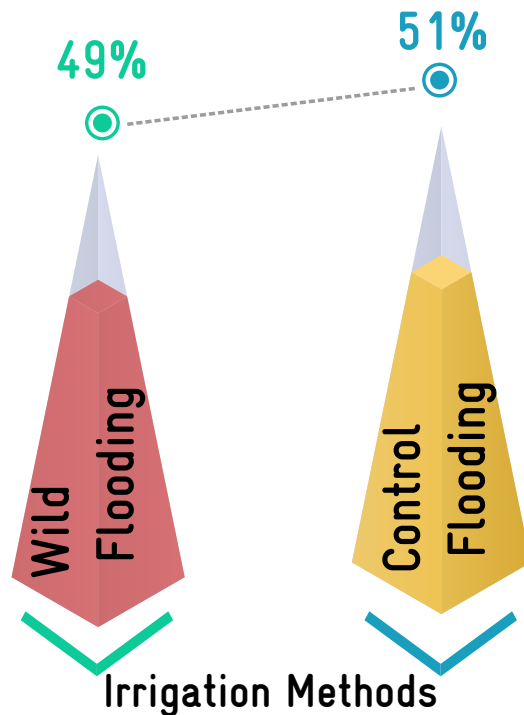


Figure 3.25. Irrigation methods

3.6.2.10 Means of Water Extraction

The water is extracted by two ways, one is 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 are more, 93 percent of the water extraction methods are under lifting means of extraction and only 7 percent comes under gravity means of water extraction (Figure 3.26).

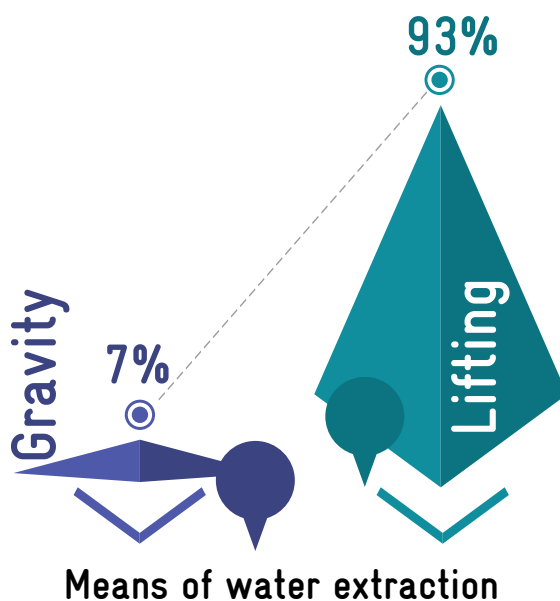


Figure 3.26. Means of water extraction

3.6.2.11 Livestock Details

This Block has considerable proportion of livestock resources of which small ruminants such as sheep and goat constitute 18.56% and 35.89 % of the total livestock. While cattle population is higher in this Block (45.55%) (Figure 3.27). The total water requirement for livestock is 121.09 ha.m. Of the total water demand, 95% is met through surface water and remaining 5% is met through surface water resources.

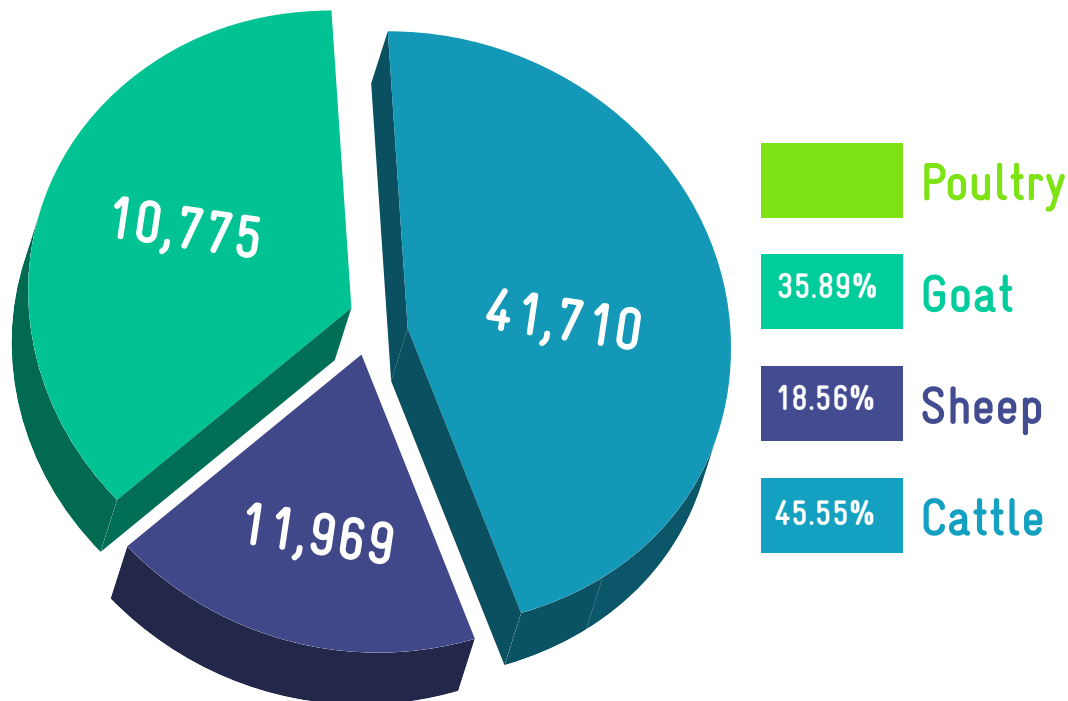


Figure 3.27. Livestock details

3.7 | CWRM PLANNING ANALYSIS- SOCIO ECONOMIC

The demographic details such as population, gender, vulnerable population/households, MGNREGA job holders, drinking and grey water details are collected from authentic primary and secondary sources and ana-

lyzed. Table 8 lists demographic and socio-economic status of Anakkavoor Block. GP wise demographic and socio-economic status are attached in Annexure 3.8.

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

S No	Key CWRM Parameter	Total
1	Geographical Area (ha)	25,843
2	Male population	39,703
3	Female population	38,936
4	Total population	78,639
5	SC population	20,864
6	ST population	1,289
7	Vulnerable population	22,153
8	Households (HH's)	20,108
9	Only one room HH's (SECC)	2,908
10	Female Headed HH's (SECC)	3,704

11	Vulnerable Households (SECC)	3,150
12	% of Vulnerable Households	16
13	Registered MGNREGA Job cards (persons)	62,911
14	Active persons working in MGNREGA job Cards (persons)	25,327
15	Drinking Water Sources	760
16	HH's have tap water connection for drinking water	16,898
17	HH's dependent on other sources for drinking water	3,113
18	Annual Greywater Generation (ha.m)	141.65

3.5.1 Population

The total population of this Block is seventy-eight thousand, of which the male proportion is higher than female. In the CWRM planning process due attention is given for the intersecting variables such as gender, class, caste and marital status and availability safe drinking water resources. In the Block, about 28.4% of the total population are under vulnerable category due to caste variable (Figure 3.28).

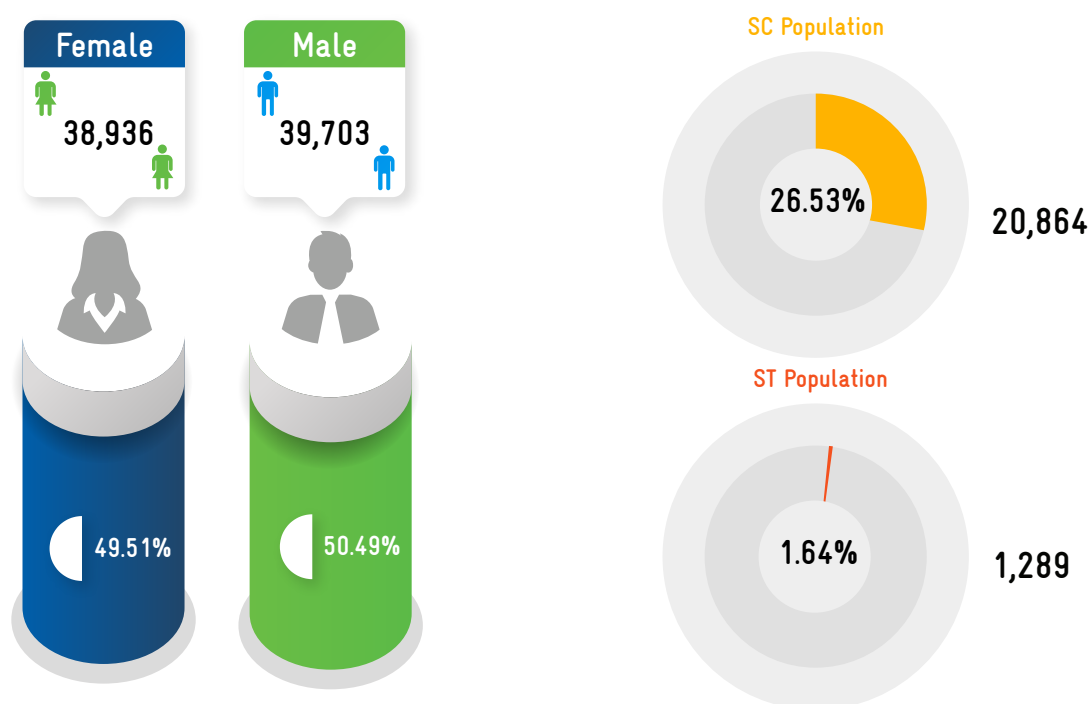


Figure 3.28. Population details

*population figures slightly vary from Census 2011 due to categorization of GP Type (Annexure1)

3.7.2 Households

There are total 20,108 households in which 14.46% households have only one room. Nearly 18.42% households are headed by women and 15.66% are vulnerable households (Figure.3.29).

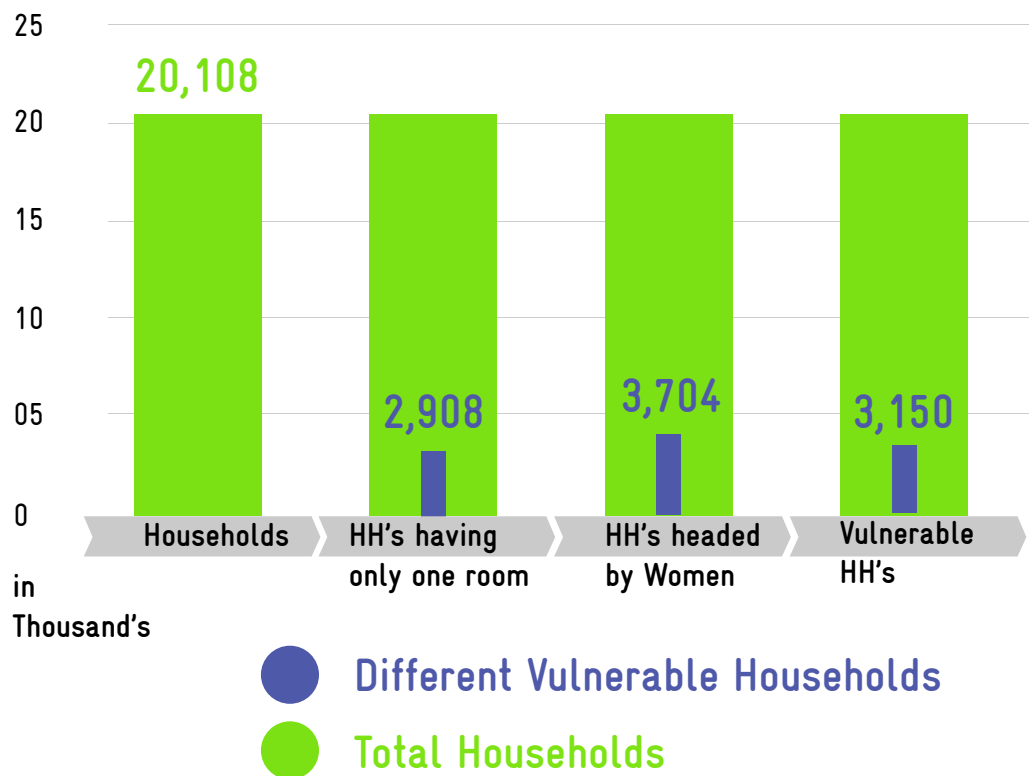


Figure 3.29. Details of households

3.7.3 Status of Mahatma Gandhi NREGA job card status

In this Block, about 80% of the total population are registered for job cards in Mahatma Gandhi NREGA scheme. Among the registered job card holders, 40.25 % of the job cards are in active category (Figure 3.30).

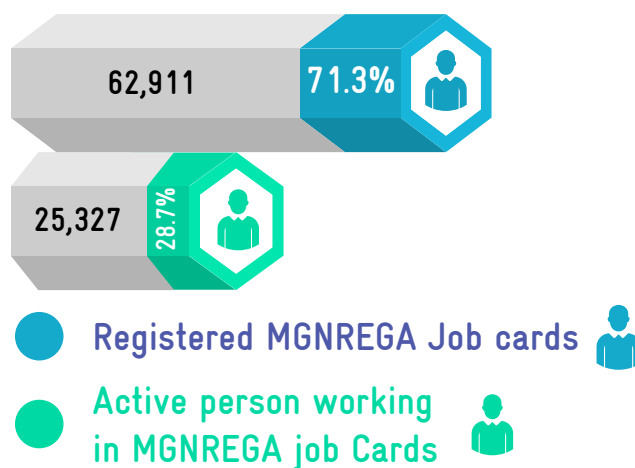


Figure 3.30. Status of MGNREGA job cards

3.7.4 Drinking Water Sources

Nearly 16,869 (84 %) households have tap water connection and 3113 households (15.5) depend on other sources. The other sources include RTRWHS (roof rain water harvesting systems, hand pump, open well, bore well, tank/ pond/ oorani, springs and river/ streams).



Tap water connection

16,869
Households



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

3,113
Households

3.7.5 Annual Greywater Generation

The grey water generation estimated across this Block is 141.65 ha.m which is available for reuse or recycle.

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



Morphology

Alathurai, Kottagaram, Cheyyatrivendhan, Karanai, Vellai, Anakkavoor



Wasteland

Narmapallam, Vadalapirandhan, Mahajanambakkam, Narmapallam, Athi



Soil erosion

Vadalapirandhan, Narmapallam, Vengunam, Thenillupai



Upland/Slope

Anapathur, Cheyyatrivendhan, Alathurai, Arasur, Chithamur



Ground water prosperity

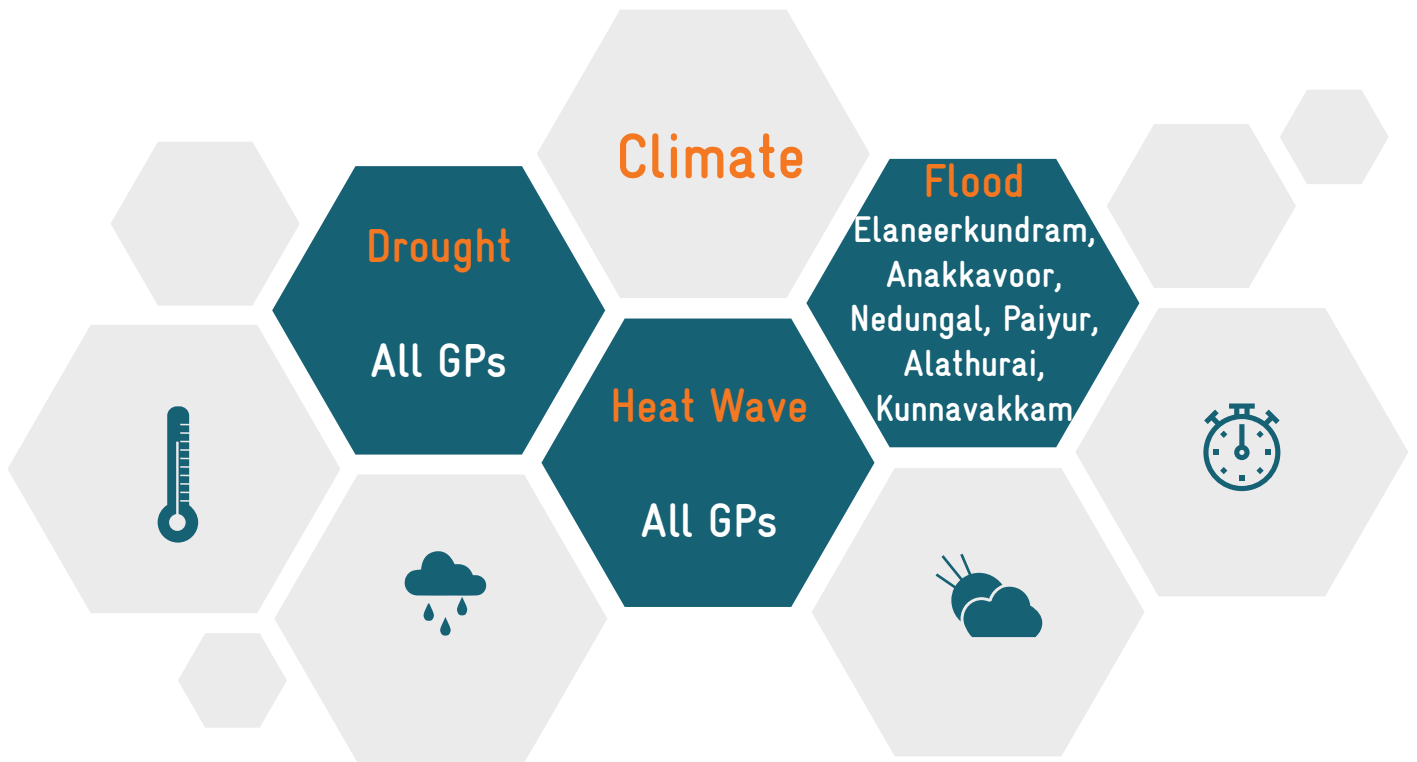
Anapathur, Vadalapirandhan, Ilaneerkundram, Karanai, Verambakkam



Drainage network

Anapathur, Anapathur, Vellai, Anakkavoor





Socio economic



Water

No distributaries in all GPs

No Minor Canals in majority of GPs



Very less surface waterbodies

All GPs Depends on tank and well irrigation

High GW utilization in many GPs

High GW utilization for agriculture

Agriculture

Low Organic Carbon

Soil water permeability is medium

More area under non agriculture use and Current fallow land

More GW extraction by lifting



Nitrogen availability is very low

More irrigated area

More bad catchment area

Moderately alkaline soil

More ET loss





கெடுப்பதூஉம் கெட்டார்க்குச் சார்வாய்மற் றாங்கே
எடுப்பதூஉம் எல்லாம் மழை

குறள் - 15

Destruction it may sometimes pour
But only rain can life restore

Thirukkural - 15

CHAPTER 4

VULNERABILITY RANKING OF GP



4 | VULNERABILITY RANKING OF GP

The vulnerability assessment has been carried out using IPCC methodology. IPCC defined vulnerability as ‘the propensity or predisposition to be adversely affected’ (IPCC 2014). Vulnerability encom-

passes 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).

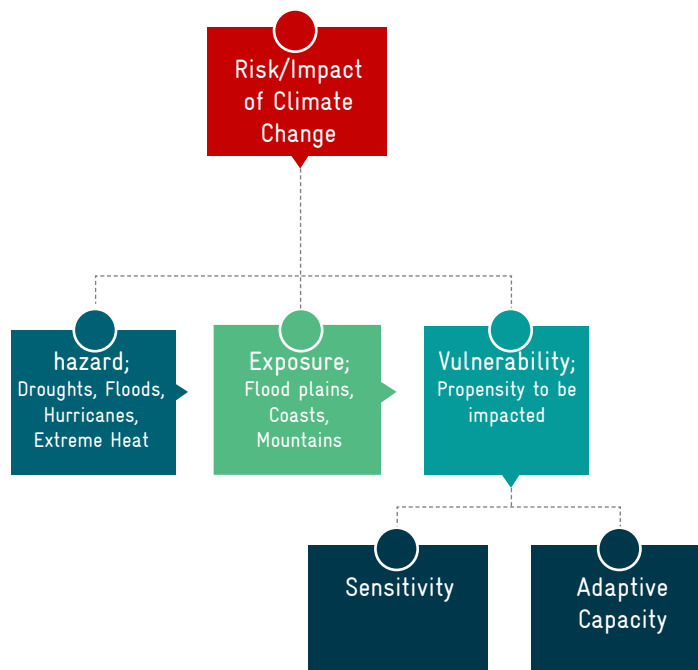


Figure 4.1. Vulnerability of the system as defined by IPCC

Generally, vulnerability assessments are made to identify

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

The CWRM parameters which been explored through rigorous study were considered here to address the key water challenges at GP level. About 70 spatial and non-spatial parameters/ indicators under 4 dimensions via climate (3), water (25), agriculture (31) and socio-

demographic (11) are categorized into adaptive capacity, sensitivity and exposure indicators for vulnerability analysis as per IPCC norms. Table 9 lists CWRM parameters/ indicators, its rationale to vulnerability, source of data and its linkage with WASCA TN’s primary 18 indicators.

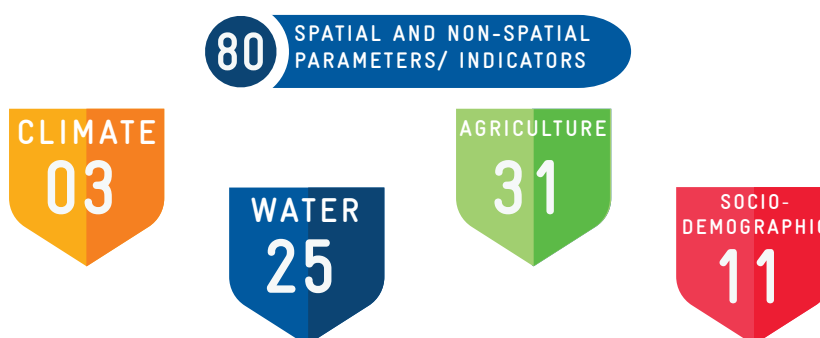


TABLE 9. CWRM PARAMETERS SELECTED FOR BLOCK LEVEL VULNERABILITY

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

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 as very high, high, medium, low and very low. The methodology for vulnerability assessment is given in Annexure 4. The vulnerable GPs are ranked based on vulnerability scores. The cumulative vulnerability scores of all GPs in Anakkavoor Block is depicted in Figure 4.2. Vadathinallur, Kulamandai, Thavasi, GPs have very high vulnerability towards rural water security under climate risks followed by Ukkal, Purasai, Sengadu, Mel Nemili, Vachanur, Echur, Akkur and Alathurai GPs. Soundariyapuram, Vellai, Thenmavandal, Kizhneerkundrum, Thenkalpakkam, Kovilur, Veerampakkam GPS have low vulnerability and Thenelapakkam GP has very low vulnerability.

Upto	Category	Color range
0.579	Very High	Red
0.549	High	Light Red
0.520	Medium	Yellow
0.490	Low	Orange
0.461	Very low	Green



Cumulative Vulnerability Scores

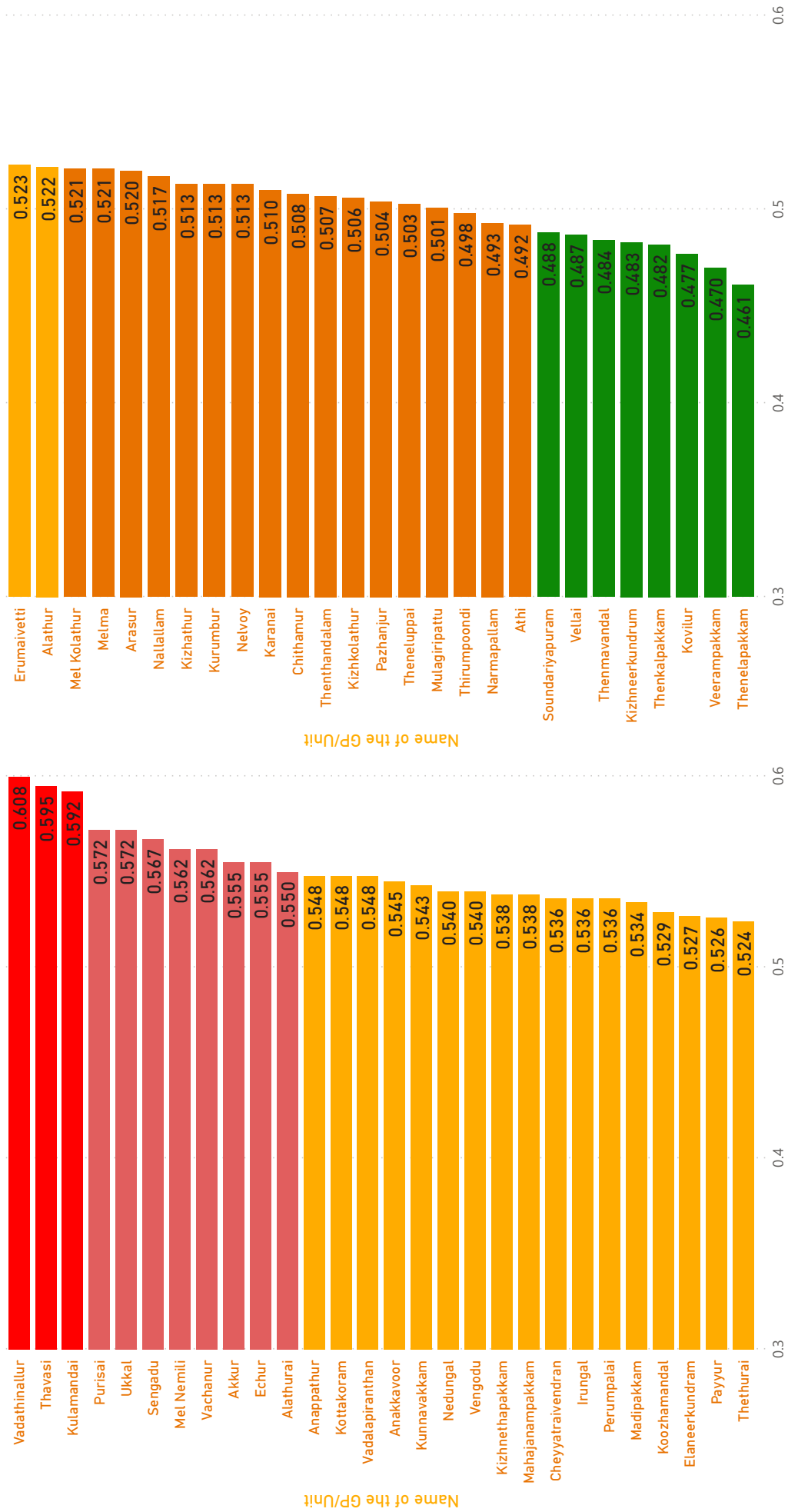


Figure 4.2. Final cumulative vulnerability scores

Sectoral vulnerability

The vulnerability indices were calculated within climate risks, water resource, agriculture and socio-economic dimensions and are shown in Figure 4.3.

Climate risks vulnerability

The climate risk vulnerability index shows that all villages in this Block are affected droughts and heat waves in last decades. While 6 GPs namely, Alathurai, Anakkavoor, Elaneerkundram, Kunnavakkam, Nedungal, and Payyur are flood vulnerable areas

ALATHURAI, ANAKKAVOOR, ELANEERKUNDRAM, KUNNAVAKKAM, NEDUNGAL, PAYYUR

Water resource vulnerability

The water resources vulnerability scores shows that Ukkal and Purasai have very high vulnerability in terms of water recourses followed by Anakkavoor, Anapathur, Echur, Akkur, Kunnavakkam, Cheyyatraivendran, Vengadu, Elaneerkundram and Erumaivetti GPs

UKKAL, PURASAI, ANAKKAVOOR, ANAPPATHUR, ECHUR, AKKUR, KUNNAVAKKAM, CHEYYATRAIVENDRAN, VENGADU, ELANEERKUNDRAM, ERUMAIVETTI

Agriculture resources vulnerability

In agriculture and allied sectors, Kulamandai, Vadathinallur, Vachanur have high vulnerability followed by Thavasi, Mel Nemili, Nelvoy and Akkur GPs

KULAMANDAI, VADATHINALLUR, VACHANUR, THAVASI, MEL NEMILI, NELVOY, AKKUR

Socio-economic vulnerability

Kulamandai, Alathurai and Thavasi GPs have high socio-economic vulnerability followed by Vadathinallur, Kunnavakkam, Vadalapiranthan, and Sengadu GPs

KULAMANDAI, ALATHURAI, VADATHINALLUR, KUNNAVAKKAM, VADALAPIRANTHAN, SENGADU

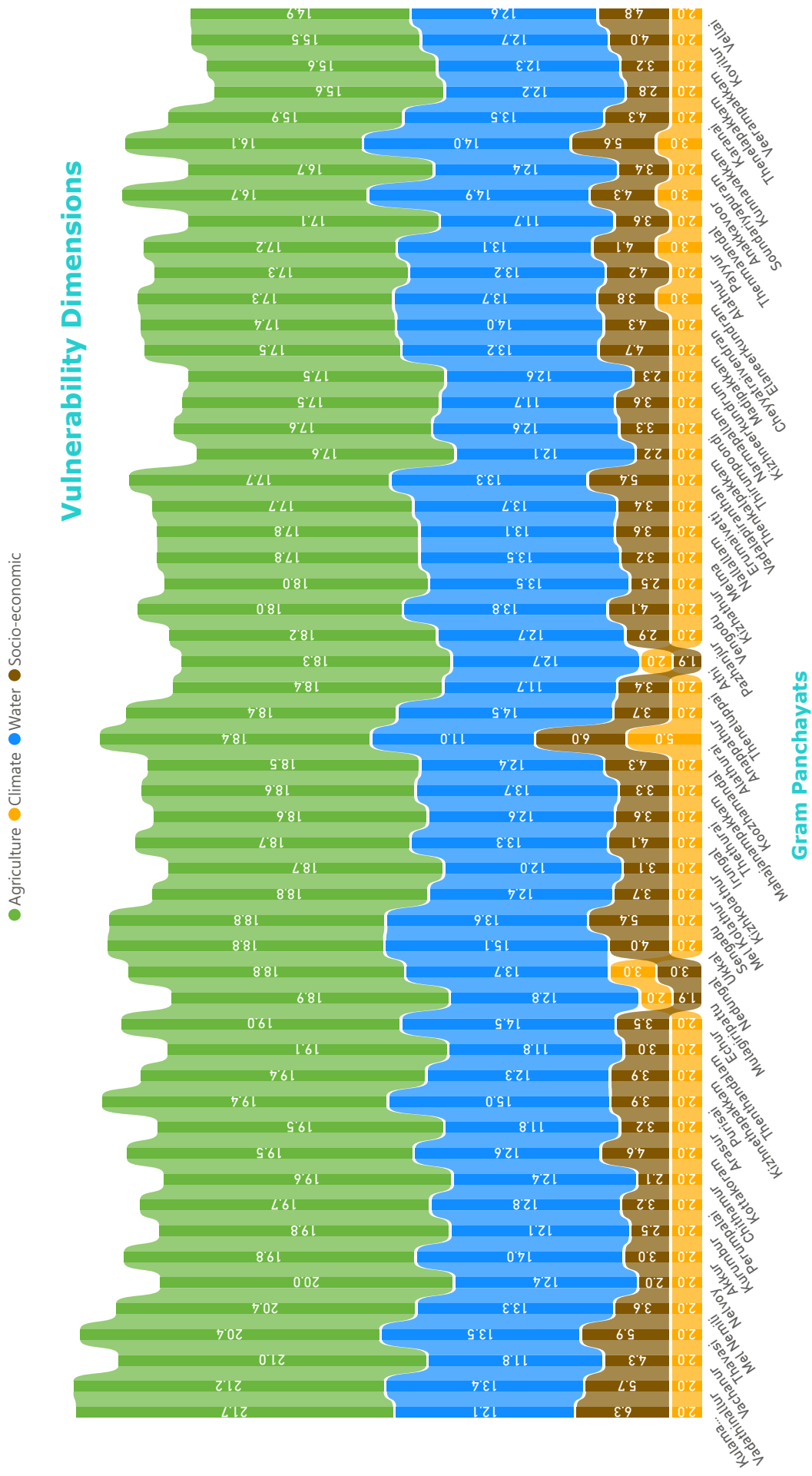
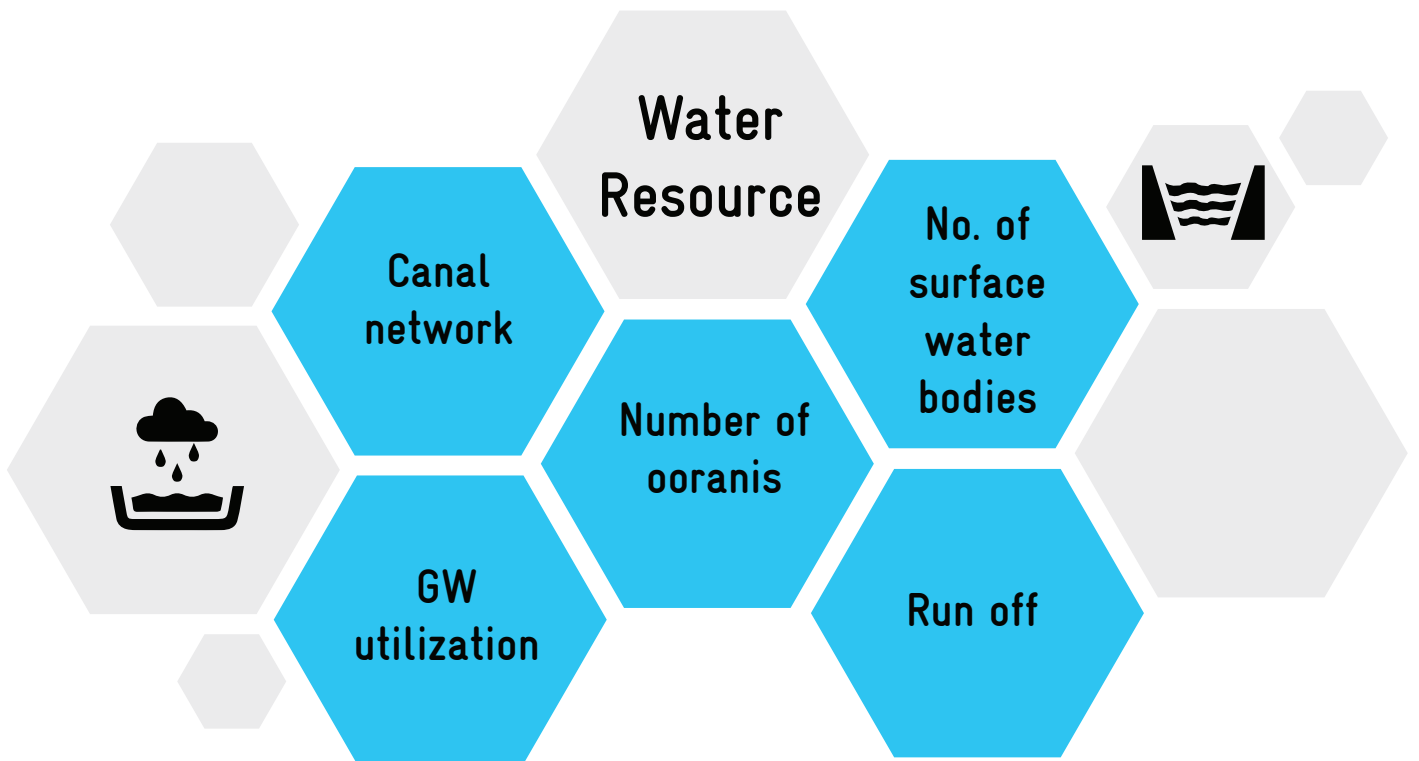
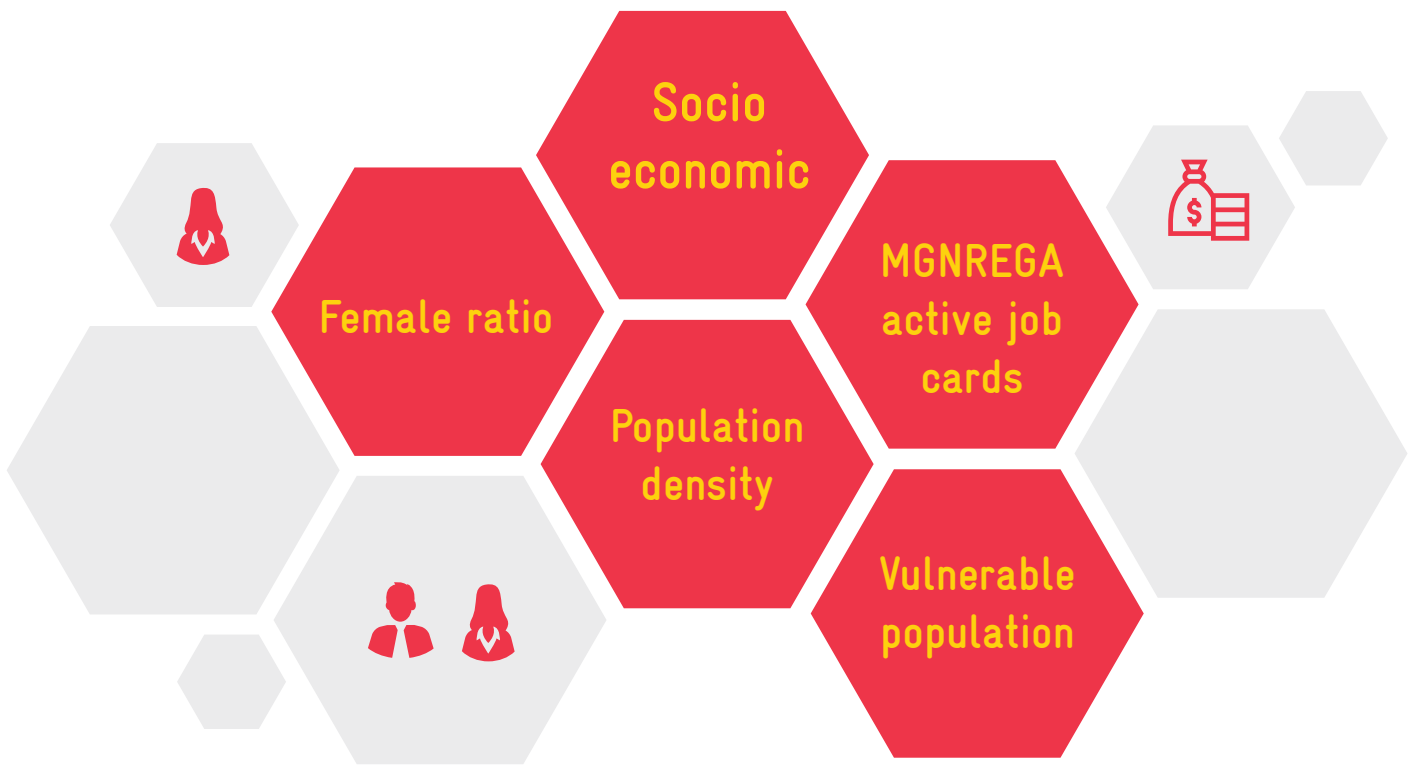
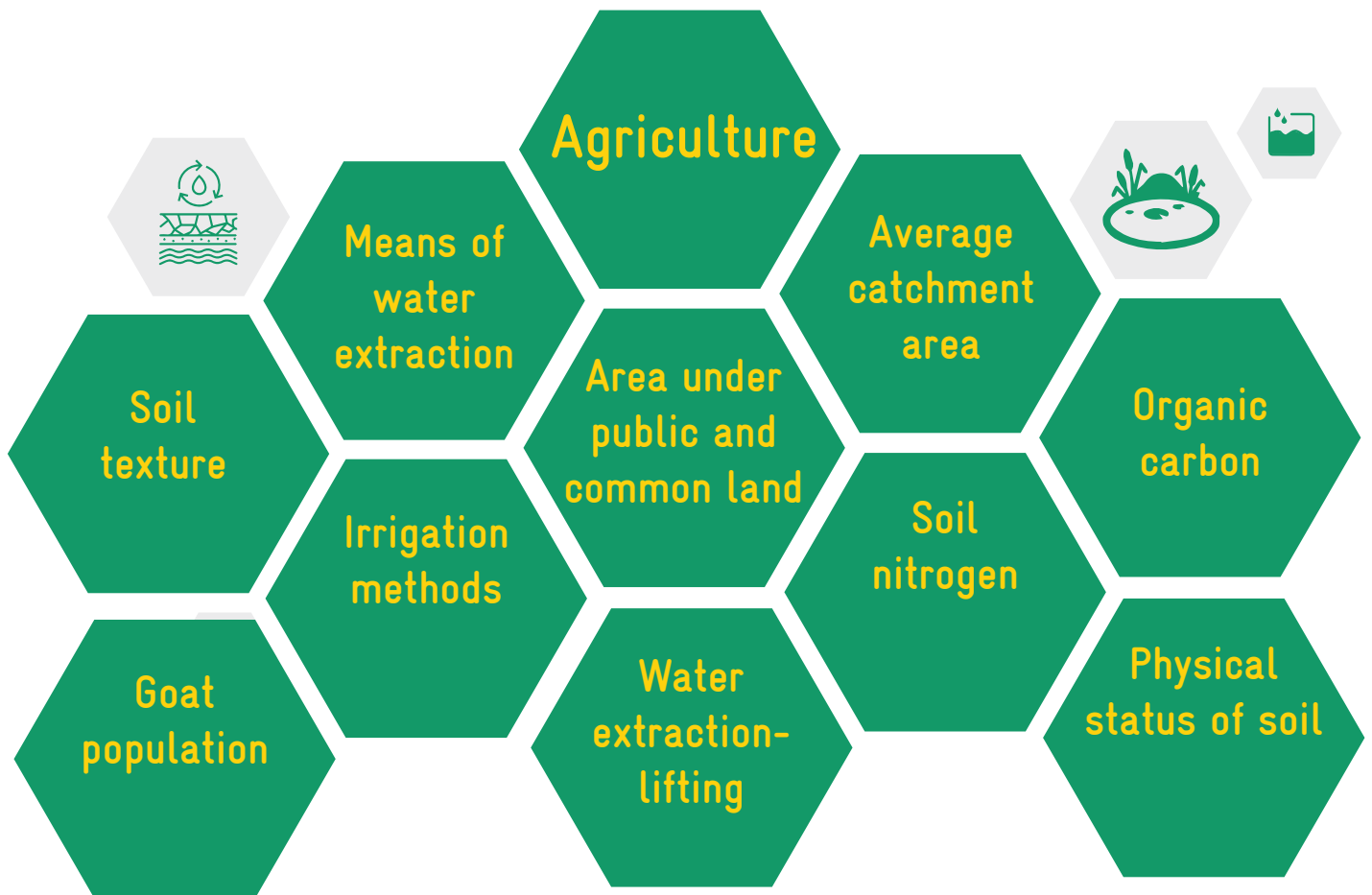
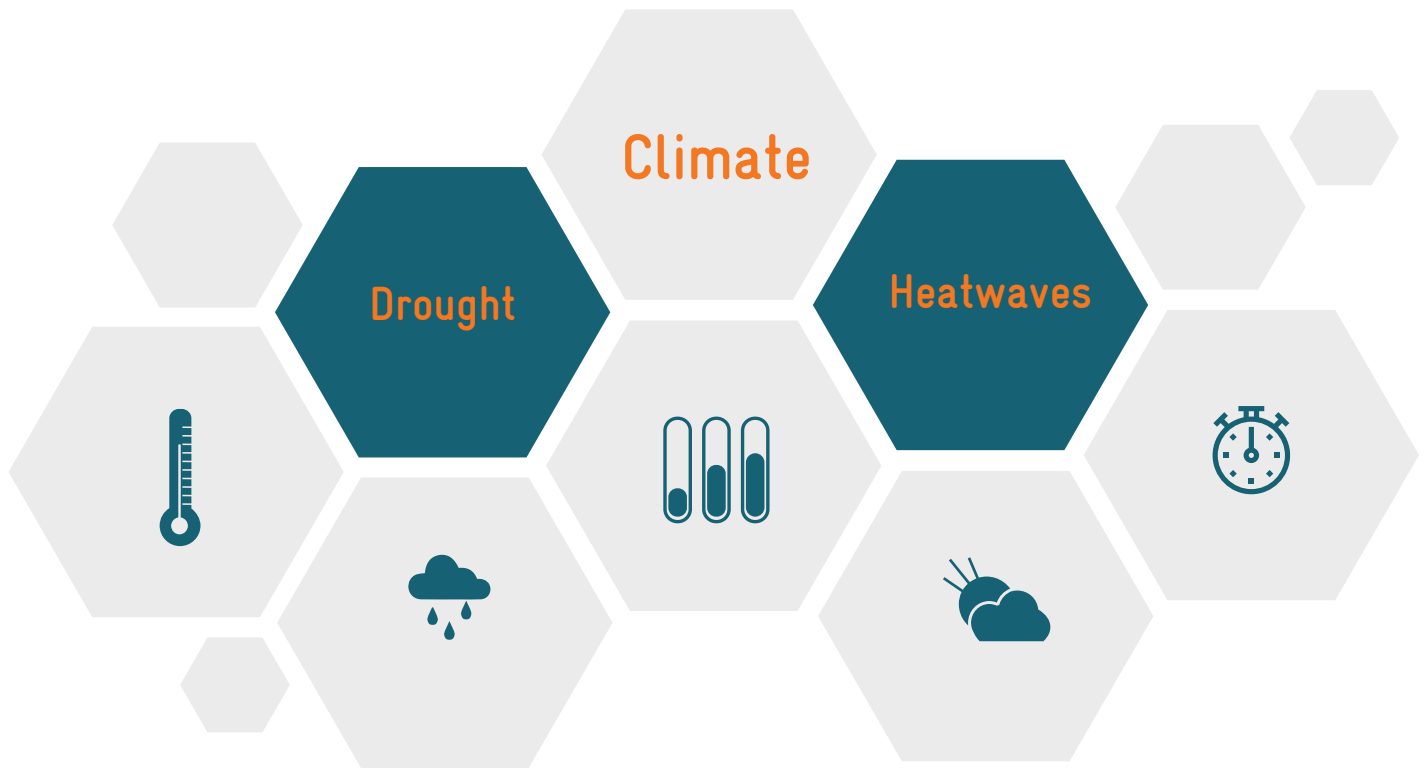


Figure 4.3. GP wise vulnerability dimensions

Contributing indicators to the total vulnerability





Based on the vulnerability assessment, high attention has been provided 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.

விசம்பின் 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 are proposed. The comprehensive and holistic understanding of the key water challenges adopting the eco-system approach enable to identify water action works in public and common land (afforestation, soil

and water conservation, improving the traditional water storage and catchment assets etc.), agriculture and allied sector (farm ponds, artificial recharge structures, on-farm plantation, irrigation methods, livestock - fodder development etc.) and rural infrastructure (on safe drinking water and efficient handling of grey water).

5.1 | PROPOSED AREA UNDER WASCA TREATMENT

Out of 25,818 ha available land in Anakkavoor Block, 7585 ha (29.37 %) area is proposed for treatment under WASCA TN- CWRM planning. Major portion of key water actions area proposed in the area under common and public uses. A small amount of land under individual ownership is also proposed for significant pilot treatments. The detailed land wise proposal for WASCA treatments are given in the Table 10. GP wise proposed area for treatment is also attached in Annexure 5.1.

TABLE 10. THE PROPOSED AREA FOR WASCA TREATMENT

Land Use	Proposed Area (ha)	Total area (ha)
Forest Land	289.24	723.1
Non-Agricultural Uses	1,090.9	7,830.6
Barren & Un-cultivable Land	61.17	81.54
Permanent Pastures and Other Grazing Land	230.88	307.79
Land under miscellaneous tree, crops etc.	168.6	224.78
Cultivable Waste Land	1,44.51	192.67
Fallows Land other than Current Fallows	703.18	1,107.5
Current Fallow land	1,924.7	7,361.1
Unirrigated Land	1,310.8	2,622.8
Irrigated by Source	1,661	5,366.6

Nearly 75 % of the barren and uncultivable land, permanent pastures and other grazing lands, land under miscellaneous tree crops, area under cultivable waste land are proposed for suitable treatment followed by 63.49% fallow lands other than current fallows, 49 % of land under unirrigated land, 40% of the forest area, 30 % of the area irrigated by source, 26 % of the current follow land and 13.9% of the area under non agriculture uses (Figure 5.1).

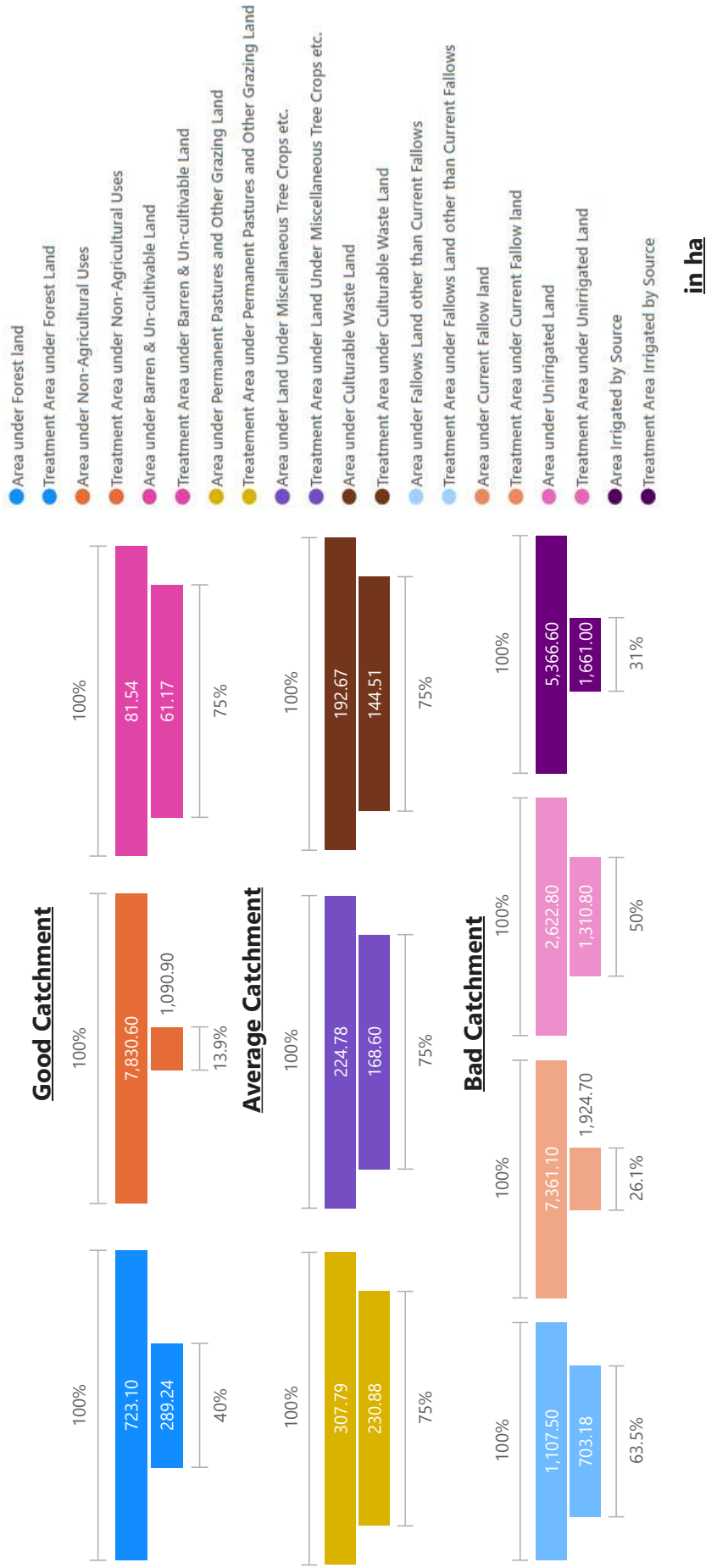


Figure 5.1. WASC-A treatment area

Expected Runoff Conservation after WASCA treatment

The productive developmental activities are designated as key water actions in WASCA proposed area. With the above proposed treatment area, the expected runoff harvested due to WASCA intervention would be around 2,224.34 ha.m which is 34.66% of the total runoff. Of the expected runoff conservation, 48.3% comes from bad catchment area, 44.6% from good catchment area and 7.1% from average catchment area (Figure 5.2).

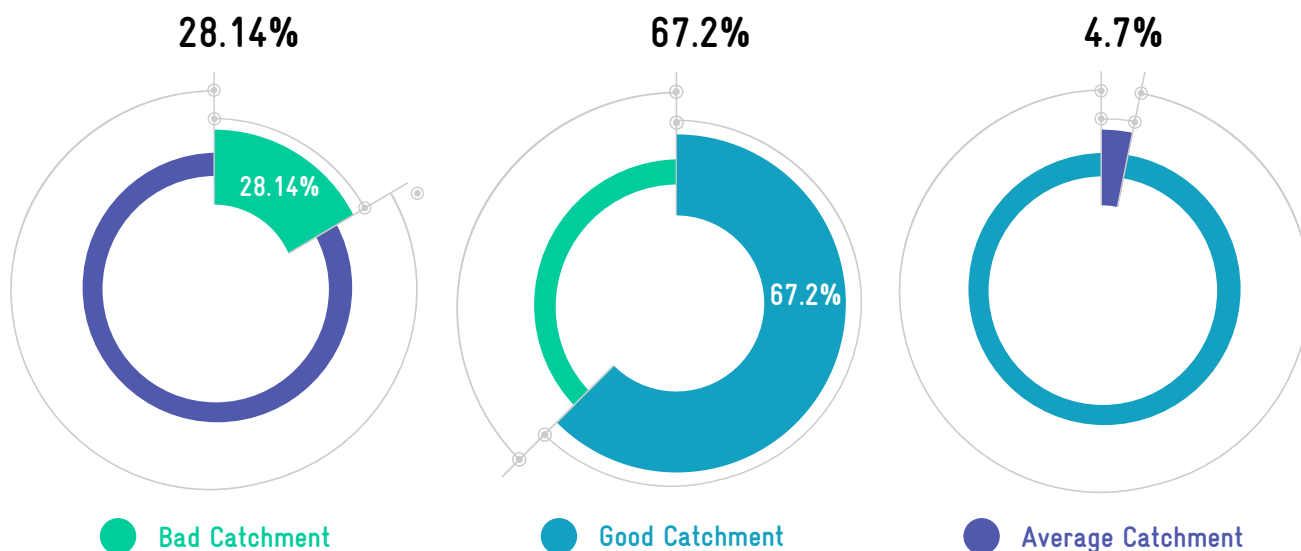


Figure 5.2. Expected conservation after WASCA treatment

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	No.	Extent
Afforestation in Public/common lands (ha)	864,466	1,081
Artificial Recharge Structure (No.)	52	-
Avenue plantation (m)	2,341	199,310
Azolla units - Individual (No.)	3,028	-
Block Plantation (Community) (ha)	267,788	349
Canal Bund Plantation(ha)	12,719	63,596
Cattle Shelters (No.)	3,041	-
Cattle Trough (No.)	3,041	-
Composting (No.)	684	166
Construction of Farm Ponds - Individual (No.)	1,091	-
Construction of new open wells & Recharge Shafts (No.)	1,041	-
Contour Continuous Bunds for Afforestation area (m)	447,365	3,637
Drainage Line Treatment (m)	3,501	16,268
Dry land Horticulture/Agro-forestry - Individual (ha)	245,871	1,237
Farm Bunding with Boundary Trenches - Individual (ha)	462	1,039
Fodder development - Community & Individual	3,034	-

Goat Sheep Shelters (No.)	2,145	-
Irrigation Channel Plantation (m)	15,840	79,209
Land development - Individual (ha)	359	897
Linear Plantation (m)	50,728	248,022
Micro Irrigation (ha)	12	28
NADEP Vermi compost (No.)	3,028	-
Nursery Development (No.)	98,185	19,637
Poultry Shed (No.)	-	-
Restoration of water bodies:a.PWD and Tanks (Number)	109	-
Restoration of water bodies:b. Ooranis (Number)	3	-
Restoration of water bodies:c. Ponds (Number)	305	-
Roof Rain Water harvesting (No.)	219	-
Silvi-pasture Development (ha)	184,084	333
Soak Pits (Community) (No.)	197	-
Soak Pits (Individual) (No.)	3,162	-
Water Course - Irrigation Channels - Desilting (m)	-	79,209
Total	2,217,901	



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

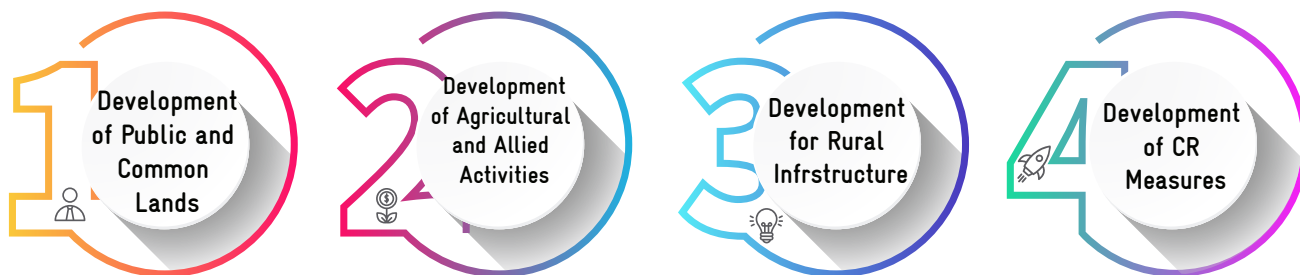
Planning and design of works under Mahatma Gandhi NREGS should take into account, impacts of climate change in order to ensure resilience of vulnerable rural communities and make the benefits sustainable in the long run. Specifically, the following things should be ensured:

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 four categories through Mahatma Gandhi NREGA convergence of considering its models under Right to Plan and Prepare a Shelf of Projects (Clause 6) are

Water Actions








5.2 | DEVELOPMENT OF PUBLIC & COMMON LANDS

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

DEVELOPMENT OF PUBLIC AND COMMON LANDS

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

	 NO. OF WORKS	 PERSON DAYS PER UNIT	 UNIT COST IN INR (LAKHS)	 ESTIMATED COST IN INR (LAKHS)	 ESTIMATED PERSON DAYS
CONTOUR CONTINUOUS BUNDS (CCB) FOR AFFORESTATION AREA(M)	8,931	10	0.025	223.29	89,314
COMPOSTING(NUMBER OF UNITS)	56	15	0.17	9.51	839
AFFORESTATION IN PUBLIC/ COMMON LANDS(HA)	1,073	3,344	8.6	9,225.56	35,87,243
BLOCK PLANTATION (COMMUNITY)(HA)	270	4,320	11.1	2,993.89	11,65,190
SILVI-PASTURE DEVELOPMENT(HA)	333	6,664	17.1	5,696.69	22,20,045
LINEAR PLANTATION(KM)	6	703	1.8	10.15	3,965
CANAL BUND PLANTATION(HA)	450	2,930	7.5	2,311.00	8,63,370
IRRIGATION CHANNEL PLANTATION (M)	79	6	0.015	1.19	475
AVENUE PLANTATION(KM)	2	703	1.8	3.45	1,348
NURSERY DEVELOPMENT (NUMBER OF UNITS)	327	2,344	15	4,909.25	7,67,152
RESTOTARATION OF WATER BODIES: A) PWD AND TANKS (NUMBER)	116	800	5	580	92,800
RESTORATION OF WATER BODIES: B.OORANIS (NUMBER)	0	200	2	0	0
RESTORATION OF WATER BODIES: C) PONDS (NUMBER)	304	200	1	608	60,800
ARTIFICIAL RECHARGE STRUCTURE (NUMBER OF UNITS)	20	391	2.5	50.00	7,820
WATER COURSE - IRRIGATION CHANNELS - DESILTING (MTRS)	79	3	0.0075	0.59	238
DRAINAGE LINE TREATMENT (M)	428	5	0.03	12.84	2,140

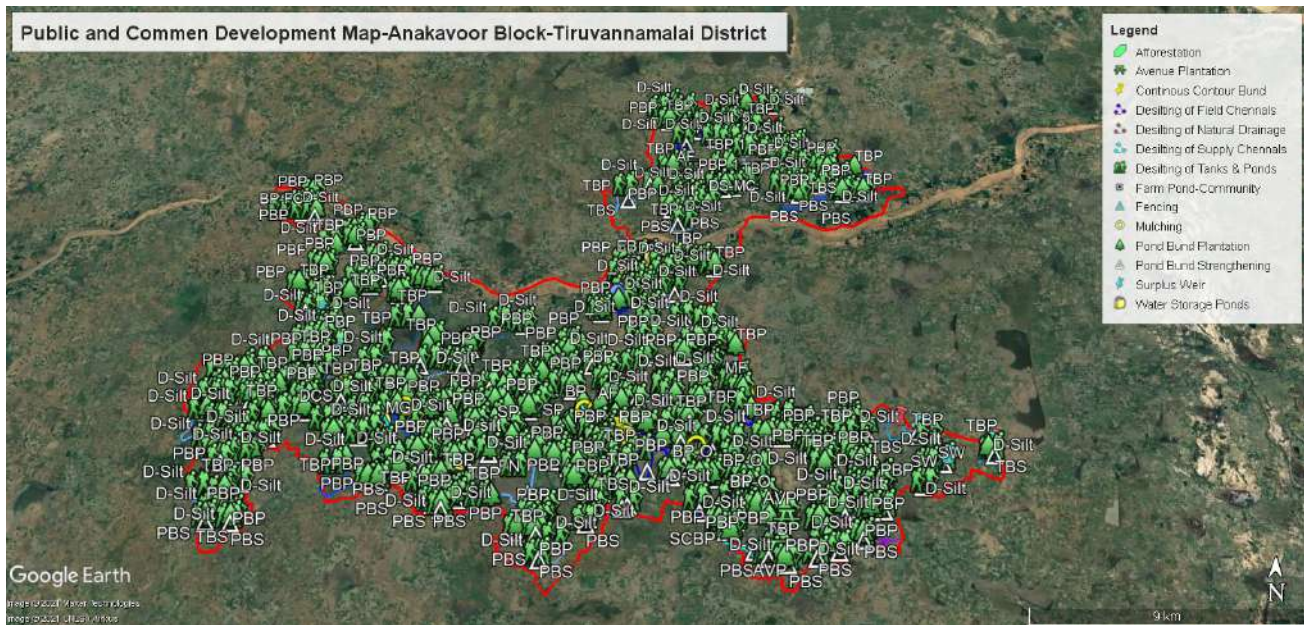


Figure 5.4. Proposed development activities in public and common land








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 12). The proposed agriculture and allied activities developments are shown in Figure 5.5.

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

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

	 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)	962	586	1.5	1,443.00	5,63,732
MICRO IRRIGATION (ha)	265	0	1	265.00	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	1,091	781	2	2,182.00	8,52,071
LAND DEVELOPMENT - INDIVIDUAL (ha)	734	3,906	10	7,340.00	28,67,004
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	458	3,321	8.5	3,893.00	15,21,018
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	3,028	23	0.15	454.20	69,644
NADEP VERMI-COMPOST (NUMBER OF UNITS)	3,028	27	0.18	545.04	81756
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	3,034	2,344	1.48	4,490.32	71,11,696
CATTLE SHELTERS (NUMBER OF UNITS)	3,041	331	2.12	6,446.92	10,06,571
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	2,145	355	2.27	4,869.15	7,61,475
CATTLE TROUGH (NUMBER OF UNITS)	3,034	6	0.5	151.70	38,204
POULTRY SHED (NUMBER OF UNITS)	6,547	10	0.09	589.23	65,470
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	1,041	0	5	5,205.00	9,63,966

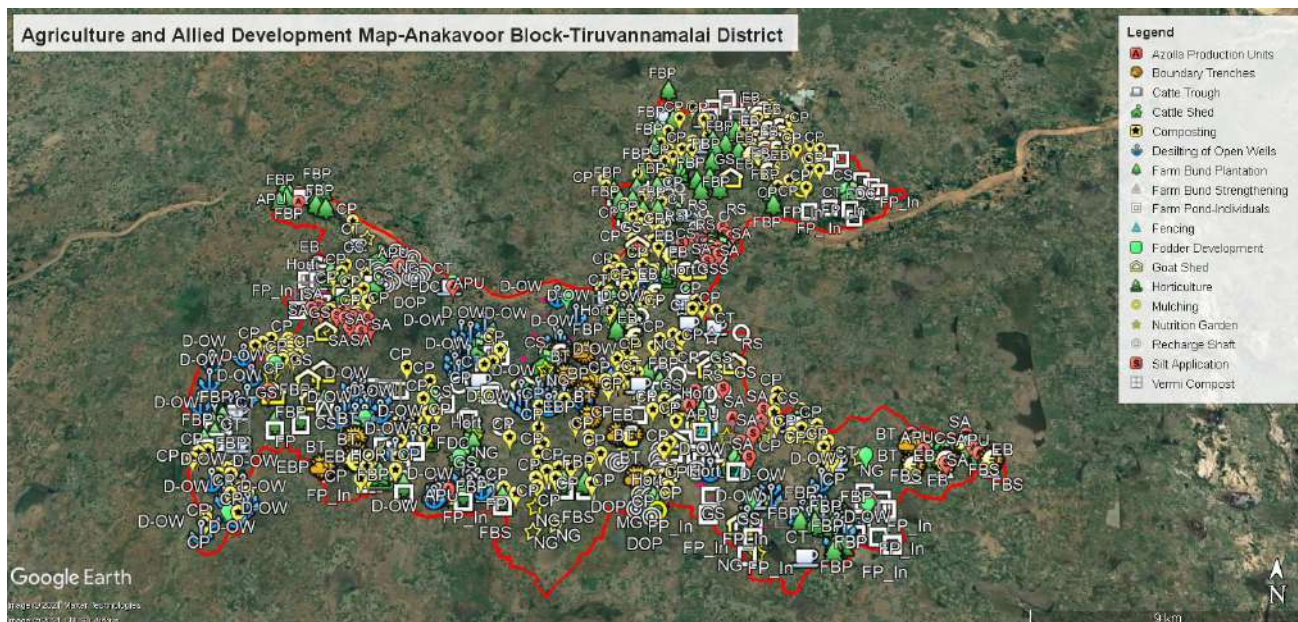


Figure 5.5. Proposed Development activities in Agriculture and allied sector

5.4 | DEVELOPMENT OF RURAL INFRASTRUCTURE

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

DEVELOPMENT OF RURAL INFRASTRUCTURE

TABLE 13. DETAILS OF WORK PROPOSED TO DEVELOP RURAL INFRASTRUCTURE






	 NO. OF WORKS	 PERSON DAYS PER UNIT	 UNIT COST IN INR	 ESTIMATED COST IN INR (LAKHS)	 ESTIMATED PERSON DAYS
SOAK PITS (COMMUNITY) (NUMBER OF UNITS)	197	20	0.13	25.61	3,940
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	3,162	16	0.1	316.20	50,592
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	109	625	4	436.00	68,125



Figure 5.6. Proposed rural infrastructure activities

5.5 | DEVELOPMENT OF CLIMATE RESILIENCE MEASURES

Climate resilient measures are proposed to cope up the system with future climate risks such as droughts, heatwaves and floods. As Tiruvannamalai District is one of the drought prone area and frequently exposed to severe droughts, more measures are proposed to manage droughts and its subsequent impacts. As Anakkavoor Block is also affected by droughts

and heat waves, the climate resilient measures are proposed to cover-up maximum of GPs (Table 14, Figure 5.7). CRM such as farm ponds, mini forest, silvi-pasture, bamboo plantation, developments are proposed in this Block in saturation mode. The proposed activities and its details are given in tables 15, 16, 17, and 18.

TABLE 14. GP WISE PROPOSED CRM

GP	Public and common land	Agriculture and allied activities	Rural infrastructures
Akkur		Farm pond	-
Alathur	Mini forest	Farm pond	-
Anakkavoor		Farm pond	-
Anapathur		Farm pond	-
Arasur		Farm pond	-
Erumaivetti		Farm land	-
Irungal		Farm pond	
Karanai		Farm pond - Fish cultivation	
Kilneerkundram		Farm pond	-
Vadalapiranthan		Farm pond	-
Melma	Mini forest	Farm pond	-
Melnemili		Farm land	-
Mulagiripattu		Farm pond	
Nedungal		Farm pond	-

Narmapallam	Silvi-pasture development, Bamboo plantation		-
Perumbalai		Farm pond	-
Purisai		Farm pond	-
Sengadu		Farm land	-
Sengadu		Farm pond	-
Soundaryapuram		Farm pond	-
Thavasi	Silvi-pasture development	Fallow land development	-
Thenmavandal		Farm land	
Thenthandalam	Bamboo plantation	Farm land	-
Thethurai		Farm pond	
Ukkal		Farm pond	-
Vatchanur	Mini forest		

TABLE 15. DETAILS OF PROPOSED SILVI PASTURE ACTIVITY UNDER CRM

GP	Details
Narmapallam	800 plants in 1 ha

TABLE 16. DETAILS OF PROPOSED BAMBOO PLANTATION ACTIVITIES UNDER CRM

GP	Survey No.	Area of plantation	Total no. of Plants	Classification of Land
Narmapallam	18	4.89	12,225	Mandhaveli
	25	2.05	5,125	Mandhaveli
	31	1.96	4,900	Meyccal nilam
	39	1.79	4,475	Mandhaveli
	40/1	3.15	7,875	Mandhaveli
	52	2.92	7,300	Neer Pidippu

**mandhaveli- cattle pen; Neer pidippu -water catchment area*

TABLE 17. PROPOSED MINI FOREST DEVELOPMENT UNDER CRM

GP	Survey No.	Area of plantation	Total no. of Plants	Classification of Land
Vachanur	195	1.21	12,100	Neerpidipu
	198	3.85	38,500	Neerpidipu
Alathur	89	2.86	28,600	Kallanguthu
Melma	270	2.98	29,800	Thoppu

**Thoppu- grove; Meyccal nilam-grazing land; Neer Pidippu- water catchment area*

TABLE 18. DETAILS OF PROPOSED FARM PONDS ACTIVITIES UNDER CRM

GP	Name of habitation	GP	Name of habitation
Akkur	Akkur	Thavasi	Thavasi
Alathur	Alathur	Thenmavandal	Thenmavandal
Anakkavoor	Anakkavoor	Thenmavandal	Thenmavandal
Anapathur	Anapathur	Thenthandalam	Thenthandalam
Arasur	Arasur	Thethurai	Thethurai
Erumaivetti	Vadasenthamangalam	Thethurai	Thethurai
Irungal	Irungal	Thethurai	Thethurai
Kilneerkundram	Kilneerkundram	Ukkal	Ukkal
Vadalapiranthan	Vadalapiranthan	Ukkal	Ukkal
Melma	Ayyavadi	Vachanoor	Vachanoor
Melnemili	Melnemili ADC	Vadalapiranthan	Vadalapiranthan ADC
Mulagiripattu	Mulagiripattu	Vadalapiranthan	Vadalapiranthan ADC
Nedungal	Nedungal	Vadathinnalur	Vadathinnalur
	Nedungal ADC	Vadathinnalur	Vadathinnalur
Perumbalai	Perumbalai	Veerambakkam	Veerambakkam ADC
Purisai	Purisai	Veerambakkam	Veerambakkam Puthur
Sengadu	Ammapalayam	Vengodu	Vengodu
	Sengadu	Vengodu	Ponnakulam
Soundaryapuram	Chinna thuraiyur		

INTERESTED BENEFICIARY LIST OF TNIAMP FARM POND (2020-2021) FOR FISH CULTIVATION

Village	Name of Farmers	Survey No.
Karanai	Munusamy s/o Kathavarayan	16/1A

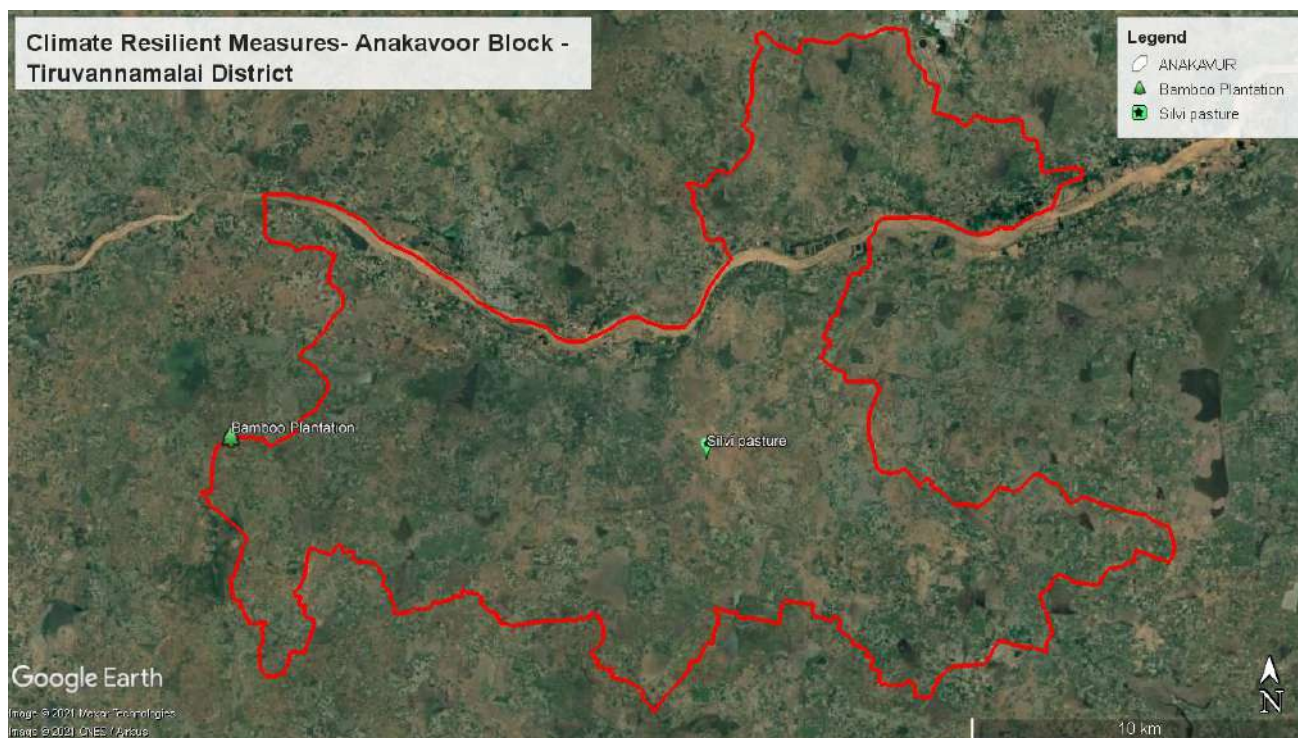


Figure 5.7. Proposed climate resilient measures

நெடுங்கடலும் தன்நீர்மை குன்றும் தடிந்தெழிலி
தான்நல்கா தாகி விடின

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 THREE YEAR PERSPECTIVE PLAN

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	1	7,585 ha (29 %) of the total area treated under WASCA
2	Percentage reduction of run off	2	2,224.34 ha.m i.e. 34.6% of the total runoff harvested due to WASCA interventions
3	No. of waterbodies restored	3	420 waterbodies restored
4	Area under afforestation	4	1,072 ha area under afforestation
5	Area under silvi-pasture development	5	333 ha under Silvi-pasture plantation
6	Length of drainage line treated	6	856 km length of drainage line treated

7,585 ha
AREA TREATED

2,224.34 ha.m
TOTAL RUNOFF
HARVESTED

420
WATER BODIES
RESTORED

1072 ha
AREA
AFFORESTATION

333 ha
SILVI-PASTURE
PLANTATION

856 km
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	Assessment of sources of water for livestock and agriculture demand No of structures established for on-farm (<i>in-situ</i>) water harvesting in dry lands	1	1,091 farm ponds established which target the harvest of 381.85 ha.m of water which has the potential to irrigate 134 ha area in both kharif and rabi seasons
2	Improvement in soil health	2	3,028 compost units for soil health improvement
3	Changes in the irrigation practices	3	962 ha Farm bunding with trenches
4	Dry land development with agro-forestry	4	458 ha under dry land horticulture
5	Households established fodder plots	5	147 vulnerable households established fodder plots

1,091
FARM PONDS

3,028
COMPOST UNITS

962 ha
FARM BUNDING

458 ha
DRY LAND
HORTICULTURE

147
FODDER PLOTS

6.3 | OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

INDICATOR		OUTCOMES/ IMPACT	
1	No. of villages having liquid waste management systems	1	197 common and 3,126 individual soak pits established for recycle of grey water benefiting 20,108 households
2	Roof rain water harvesting measures	2	109 common roof rainwater harvesting and storage structures with a target to harvest and store 0.136 ha m of rainwater for use
3	Nutri-garden	3	20,108 Households established nutri-gardens in homesteads and planted 1,00,540 saplings

197 COMMON &
3,126 INDIVIDUAL
SOAK PITS

109
COMMON ROOF
RAINWATER HARVESTING

20,108
NUTRI-GARDENS

1,00,540
SAPLINGS

6.4 | OUTCOMES OF CLIMATE RESILIENCE MEASURES

OUTCOMES OF CLIMATE RESILIENCE MEASURES

INDICATOR		OUTCOMES/ IMPACT	
1	Climate resilient measures are identified for climate risks	1	5 models are identified via., Farm ponds, fish cultivation, bamboo plantation, mini forest hillocks and Silvi pasture 40 farm ponds in 30 villages 1 Farm pond for fish cultivation 1 ha under Silvi pasture 10.9 ha under mini forest with 1,09,000 saplings 16.76 ha under bamboo plantation with 41,900 plants
		40	1 ha
		FARM PONDS	SILVI PASTURE
		10.9 ha	1,09,000
		MINI FOREST	SAPLINGS
		16.76 ha	41,900
		BAMBOO PLANTATION	PLANTS

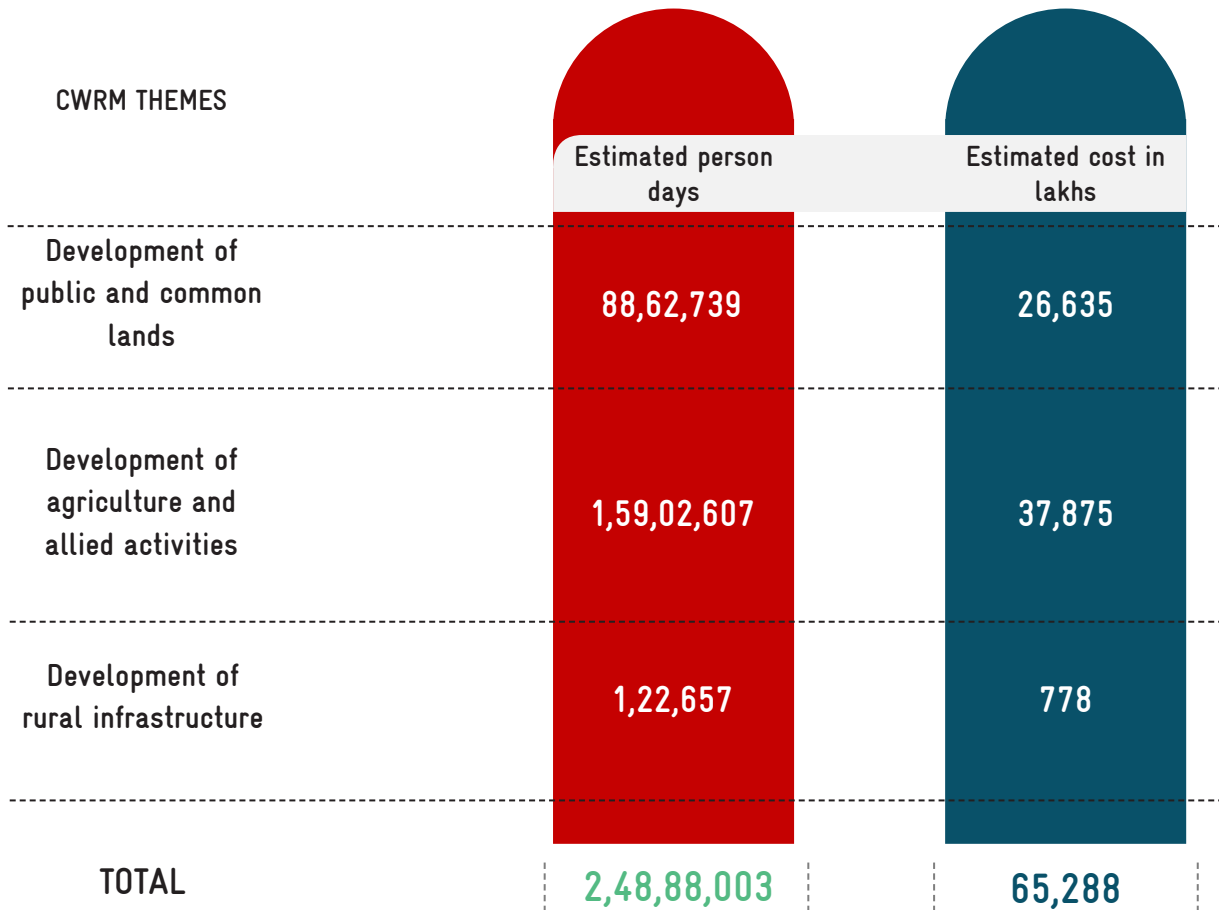


Estimated person days

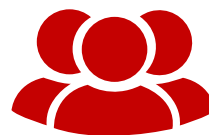
The total estimated person days required for the above propose activities are 2,48,88,003 as specified below figure 6.1

Estimated Cost

The total estimated cost budgeted for the above propose activities is Rs. 65,288 Lakhs as specified below figure 6.2.



ANAKKAVOOR



ESTIMATED PERSON DAYS

2,48,88,003



ESTIMATED COST IN LAKHS

65,288

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 Par-

is Agreement countries are committed to reduce greenhouse gas emissions through Nationally Determined Contribution (NDC)s 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 are 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.



India's NDC

India's NDC emphasis Sustainable Development, Climate Justice, and Lifestyles

Activities

Activities includes Adaptation, Mitigation, requirement for Finance, Technology transfer, Capacity Building





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"

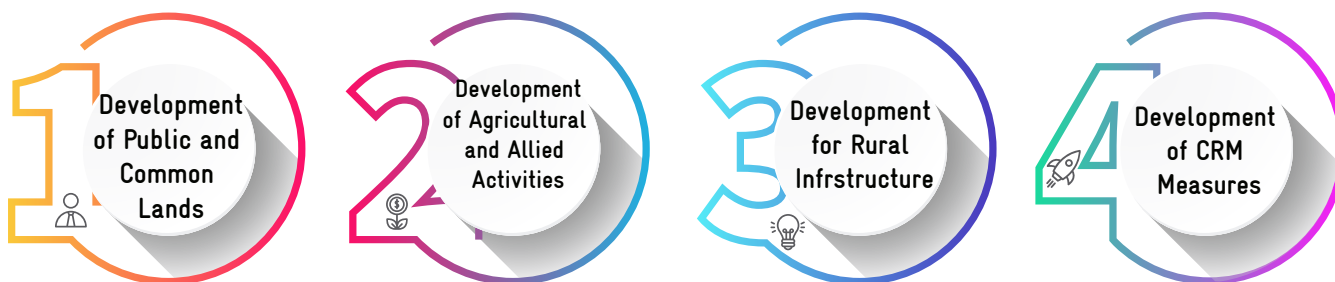
4

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.

"Climate Resilience for Future Livelihoods"



TN WASCA achieve the above actions closely with Mahatma Gandhi NREGA programme of Ministry of Rural Development and National Water Mission programme of Ministry of Jal Shakti (MoJS). These two ministries are key stakeholders for WASCA. Apart from these two ministries, the works under WASCA TN are closely linked with Ministry of Agriculture and Ministry

of Environment Forest and Climate Change (MoEFCC). The commitments of the above mentioned four ministries towards SDG goals achievements are mapped in connection with the interventions under WASCA Tamil Nadu. The intervention under WASCA TN has direct and indirect contribution to the SDGs and its national targets set as per NITI Aayog.



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



SDG GOAL 6

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



6.1

Achieve universal and equitable access to safe and affordable drinking water for all

6.2

Achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3

Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.4

Increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.5

Implement integrated water resources management at all levels (6.5.1)

6.6

Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.A

Expand international cooperation and capacity-building support to developing countries in water-and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

6.B

Support and strengthen the participation of local communities in improving water and sanitation management

Indicators performed in District and Block level vulnerability assessment of WASCA TN also used in SDG India 2020-21 report (Table 19)

TABLE 19. COMMON VULNERABILITY INDICATORS IN WASCA & SDG INDIA 2020-21

Head count ratio as per the Multidimensional Poverty Index



Persons provided employment as a percentage of persons who demanded employment under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

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

Percentage of rural population having improved source of drinking water

Percentage of ground water withdrawal against availability



Percentage of Blocks/mandals/talukas over-exploited



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

Percentage of degraded land over total land area

Percentage increase in area of desertification

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

TABLE 20. 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 for afforestation area (m)	8,931	W3	SDG 1,2, 6,13&15
Composting (No. of units)	56	W1	SDG1& 6
Afforestation in Public/common lands (ha)	1073	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community)(ha)	270	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	333	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (km)	6	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation (m)	450	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	79	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation(km)	2	C1,C2,C3,W3,S2	SDG 1, 6&13
Nursery Development (No. of units)	327	C1,S2,S4	SDG 1,2 &6

Restoration of waterbodies :PWD and Tanks (No.)	116	S2, S1	SDG 6, 1, 13
Restoration of waterbodies : Ooranis (No.)	0	S2, S1	SDG 6,1, 13
Restoration of waterbodies : Ponds (No.)	304		
Artificial Recharge Structure (No. of units)	20	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	79	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (DLT) (m)	428	W1,W3,W4	SDG1 & 6

TABLE 21. WATER ACTIONS ON DEVELOPMENT OF AGRICULTURAL AND ALLIED SECTOR & IT'S LINKED SDG

Name of the Work	Number of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	962	A1,A3,W1,W3	SDG 1,2&6
Micro Irrigation(ha)	265	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	1,091	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	734	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)	458	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	3,028	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (No. of units)	3,028	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	3,034	A3, S4	SDG 1& 2, 15
Cattle Shelters (No. of units)	3,041	S4	SDG 1& 2
Goat Sheep Shelters (No. of units)	2,145	S4	SDG 1& 2
Cattle Trough (No. of units)	3,034	W5,S4	SDG 1& 2
Poultry Shed (No. of units)	6,547	S2,S4	SDG 1& 2
Construction of new open wells & Recharge Shafts (N0. of units)	1,041	S3,W5,W1	SDG 1,2 & 6

TABLE 22. WATER ACTIONS ON RURAL WATER MANAGEMENT & IT'S LINKED SDG

Name of the work	No. of CWRM works	CVI	Linking SDG
Soak Pits (Community) (No. of units)	197	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	3,162	W3,S2	SDG 1& 6
Roof Rain Water harvesting (No. of units)	109	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

IMPLEMENTATION OF GP PLANS



7 | IMPLEMENTATION OF GP PLANS

Execution of GP plans includes integrating all verified, approved works in MORD’s web enabled application NREGA Soft (<https://nrega.nic.in>) for mainstreaming WASCA. The target GPs are identified

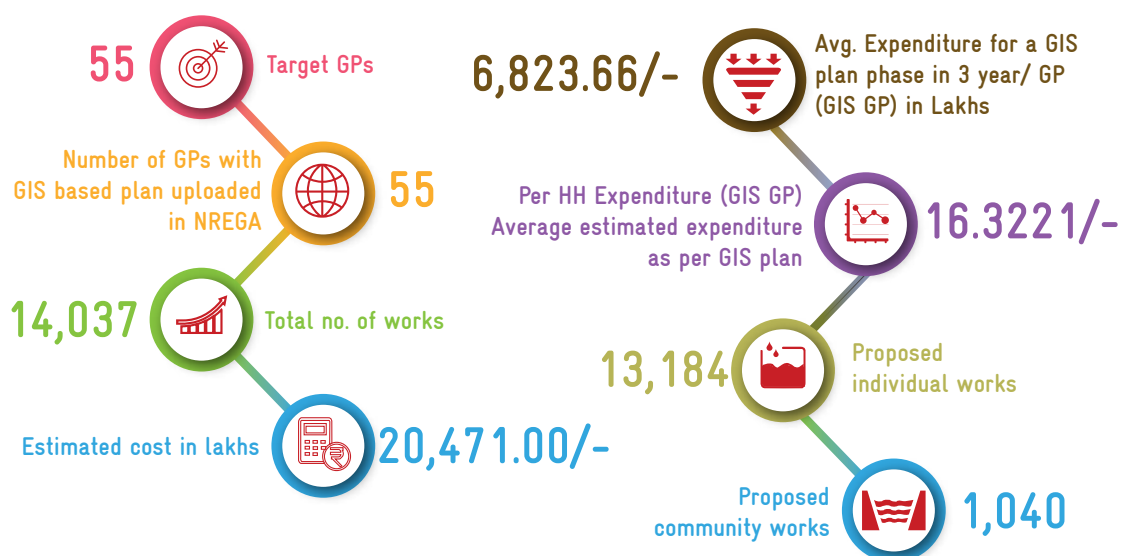
first, the status of GIS based plans and total works along with its expenditure and category wise estimation cost of works as per GIS Plan, GIS based planning cumulative report are uploaded as given below

7.1 | INTEGRATION INTO NREGA PORTAL

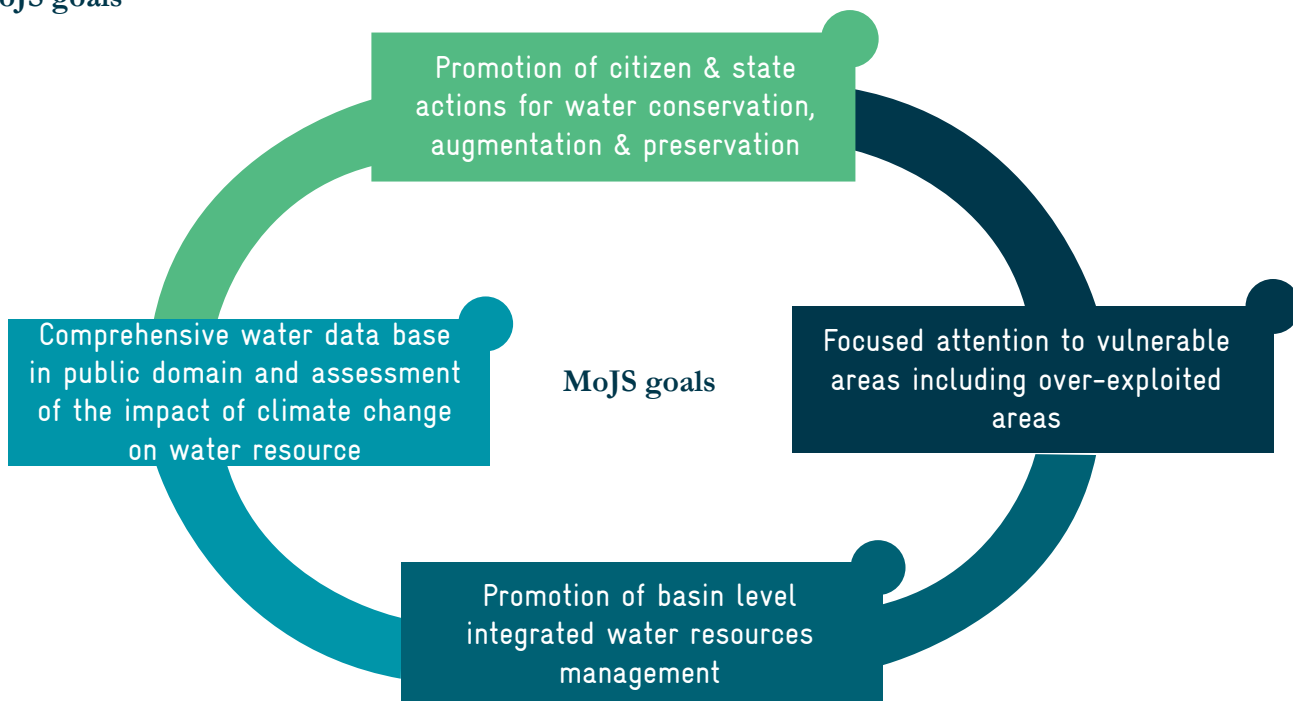
WASCA is progressing towards digitizing and integrating GP level GIS based plans, NRM and Non NRM in to MNREGA portal. The performance and implementation of GP plans of Anakkavoor Block is listed in Table 23. The work progress and expenditure

during past 3 financial years, GP wise total, completed and ongoing GIS works are shown in Figure 7.1 to 7.3. GP wise WASCA recommendations and works uploaded in NREGA soft are attached in Annexure 7.

TABLE 23. GIS PLAN IMPLEMENTATION- KEY PARAMETERS PERFORMANCE IN ANAKKAVOOR BLOCK



MoJS goals



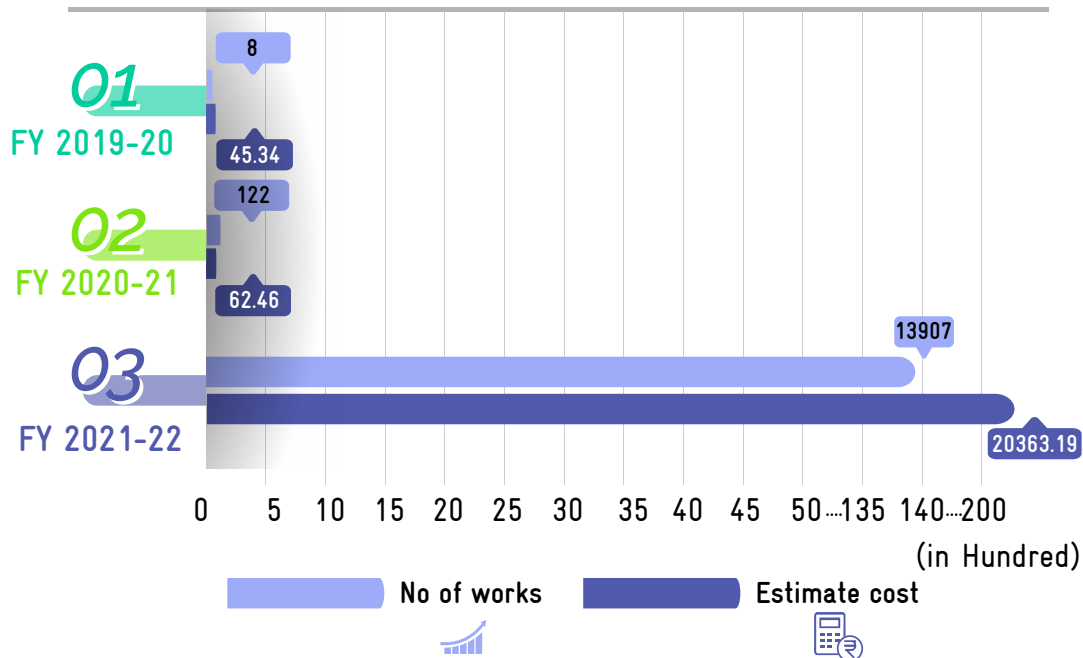


Figure 7.1. Work progress in last three years

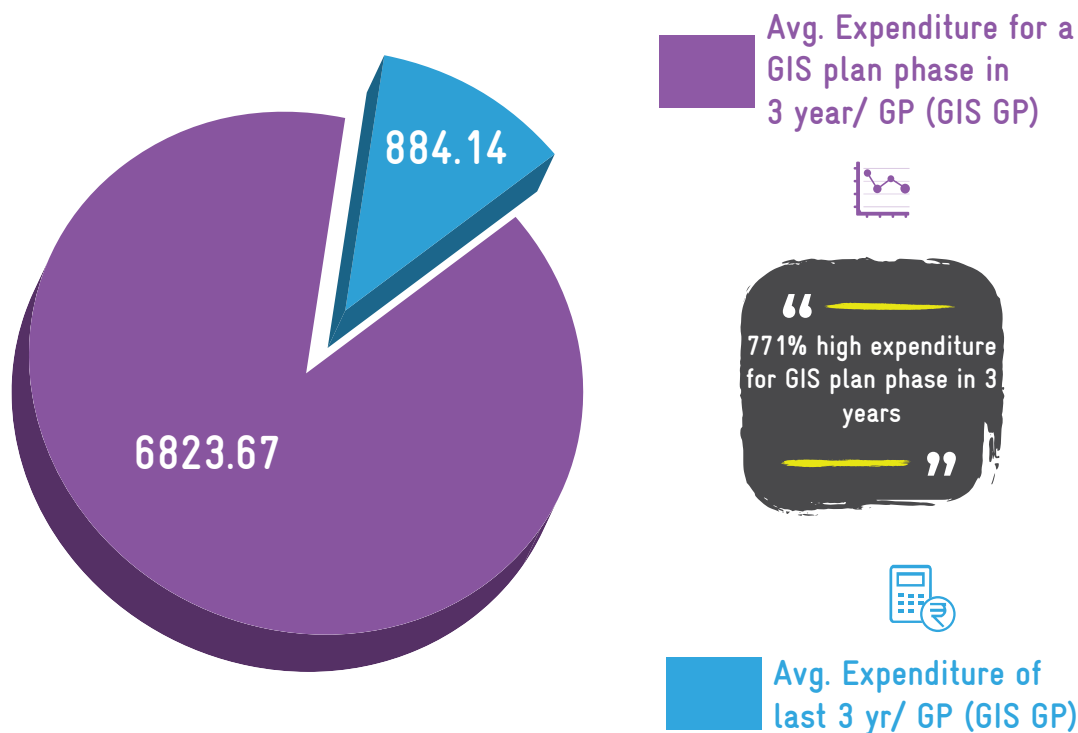
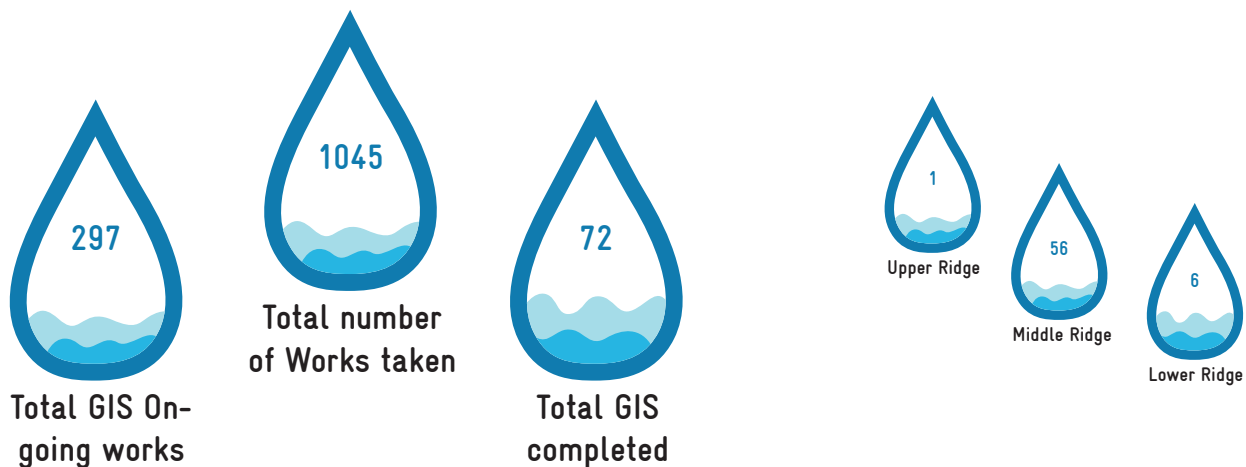


Figure 7.2. Average Expenditure for GIS plan in last three years



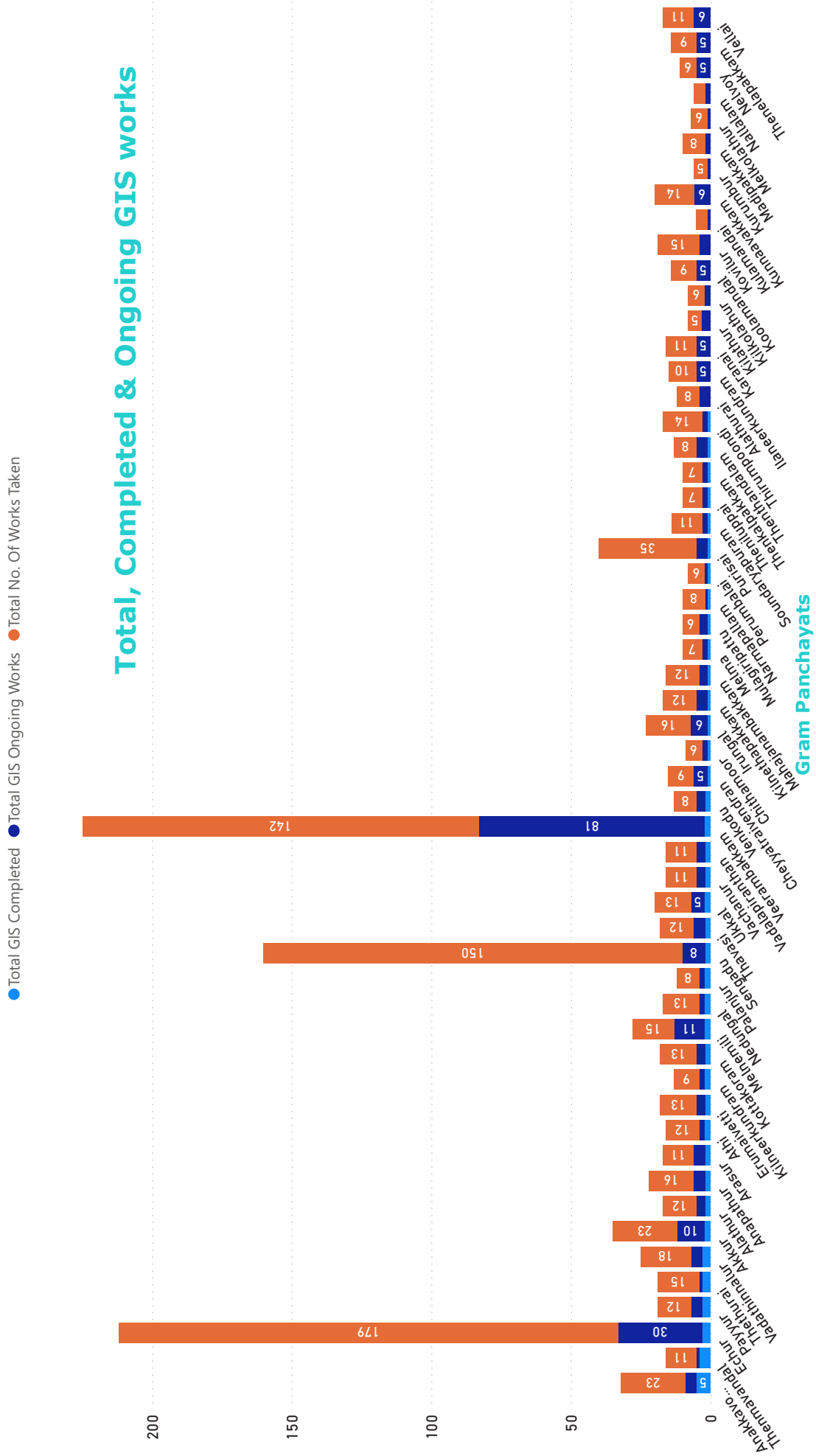
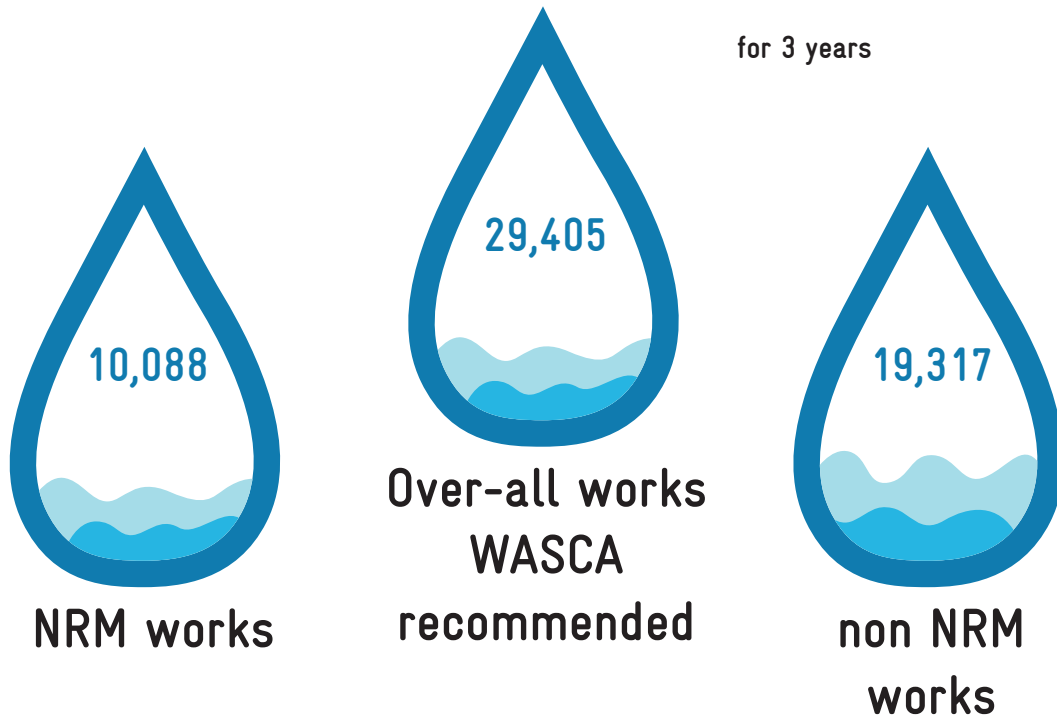


Figure 7.3. GP wise total, completed and ongoing GIS works

7.2 | NRM AND NON NRM WORKS

Over-all works WASCA recommended for 3 years are 29,405 out of that 10,088 are NRM works and 19,317

are non NMRM works (Figure 7.4). A total of 13,904 works are uploaded so far for the financial year 2021-22.



7.3 | ONGOING WORKS

A total of 93 works are ongoing in the block, including Anganwadi/Other Rural Infrastructure, Drought Proofing, Rural Connectivity, Rural Sanitation, WCWH, Works on Individuals Land (Category IV). Among ongoing works, WCWH shares the highest of 81 % followed by drought-proofing works of 5 % while rural connectivity works are in less numbers (Figure 7.5). The GPs and work category-wise details of works are tabulated in Annexure 7.2.

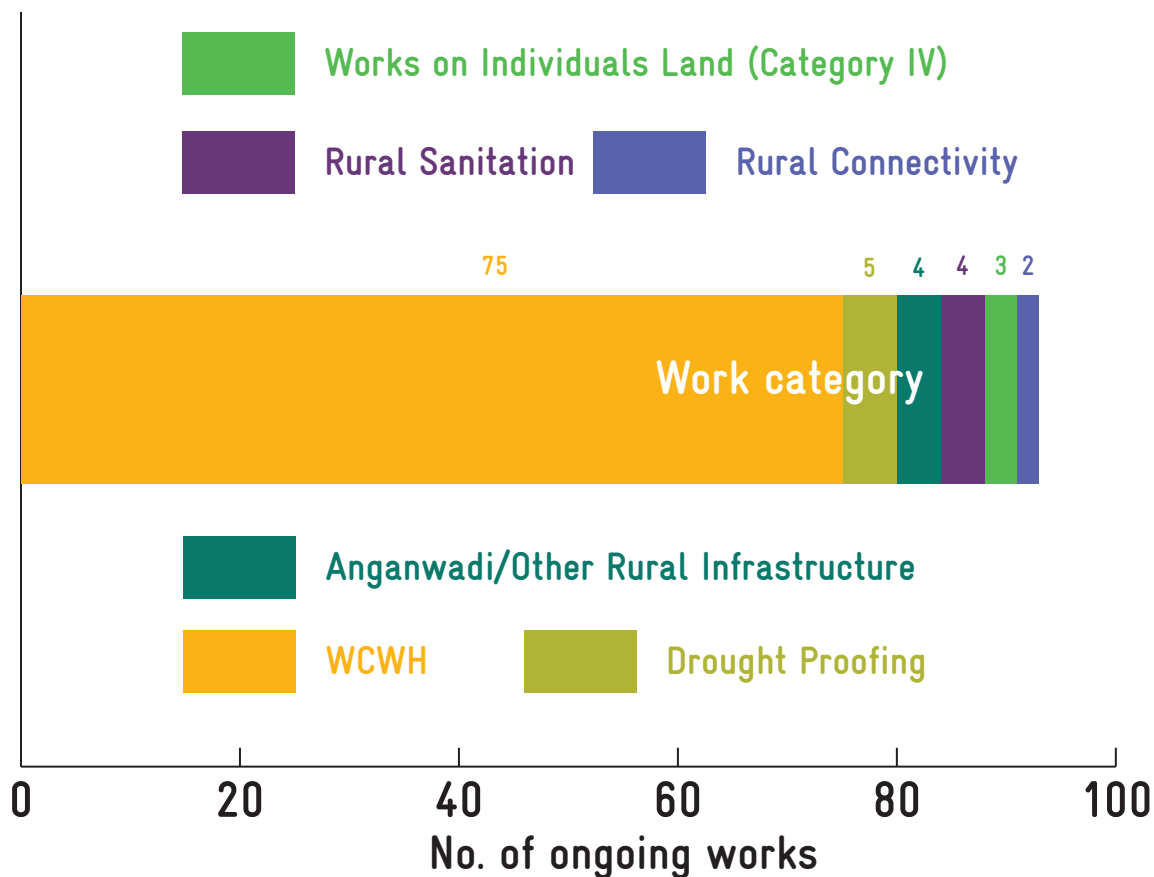


Figure 7.5. Category-wise ongoing works in Anakavoor Block





7.4 | CATCH THE RAIN

The NWM’s campaign “Catch The Rain” with the tag-line “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 Anakkavoor Block is shown in Figure 7.5.

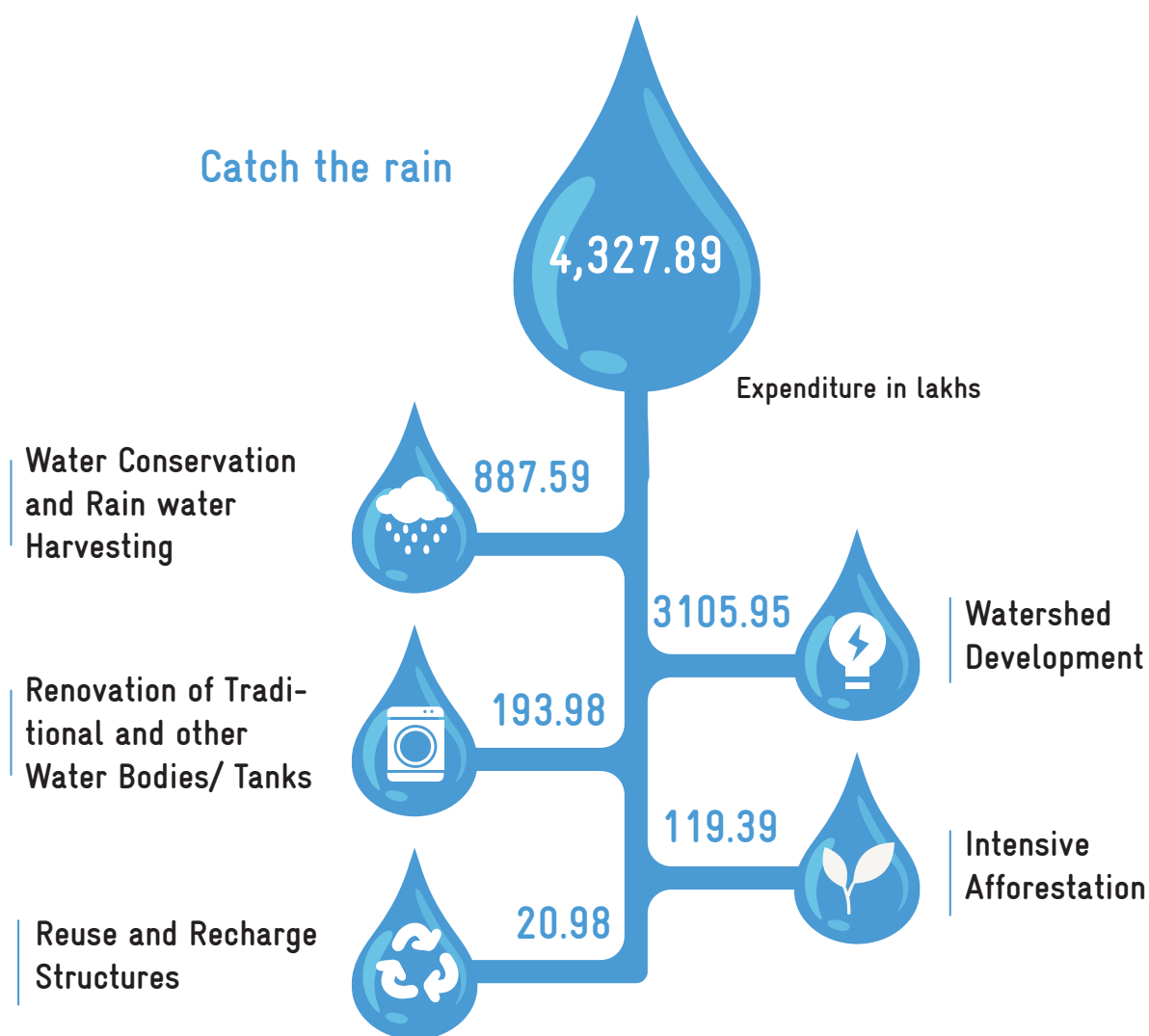


Figure 7.6. Catch the rain in Anakkavoor Block



W
A
S
C
A



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

CASE STUDY



8 | CASE STUDY

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

8.1 | MACRO-WATERSHEDS IN ANAKAVOOR BLOCK

Anakkavoor Block has two river sub-basins Cheyyar and Kiliyar Watersheds. Under Cheyyar watershed (4C2A3) consists of 46 micro-watersheds covering an area of 24,584 ha. Under Kiliyar watershed (4C2A1) consists of 31 Micro-watersheds covering an area of 15,067 ha (Table 25). Out of 55 GPs in the Block, 37 GPs fall under Cheyyar (4C2A3) Watershed, 18 GPs under Kiliyar Watershed (4C2A1) (Table 26).

TABLE 24. GENERAL DESCRIPTION OF MACRO-WATERSHEDS COVERING ANAKKAVOOR BLOCK

Macro-watershed	Area in ha	No. of Micro watershed
Cheyyar	24,584	46
Kiliyar	15,067	31

TABLE 25. WATERSHED COVERING NUMBER OF GPs IN ANAKKAVOOR BLOCK

Watershed Name	No. of GPs
Cheyyar	37
Kiliyar	18

The map below shows the boundary of Cheyyar and Kiliyar Watershed boundaries on Anakkavoor Block boundary (Figure 8.1, 8.2). The ridge map of macro-watershed and GPs in Anakkavoor Block are shown in Figure 8.3 and 8.4.

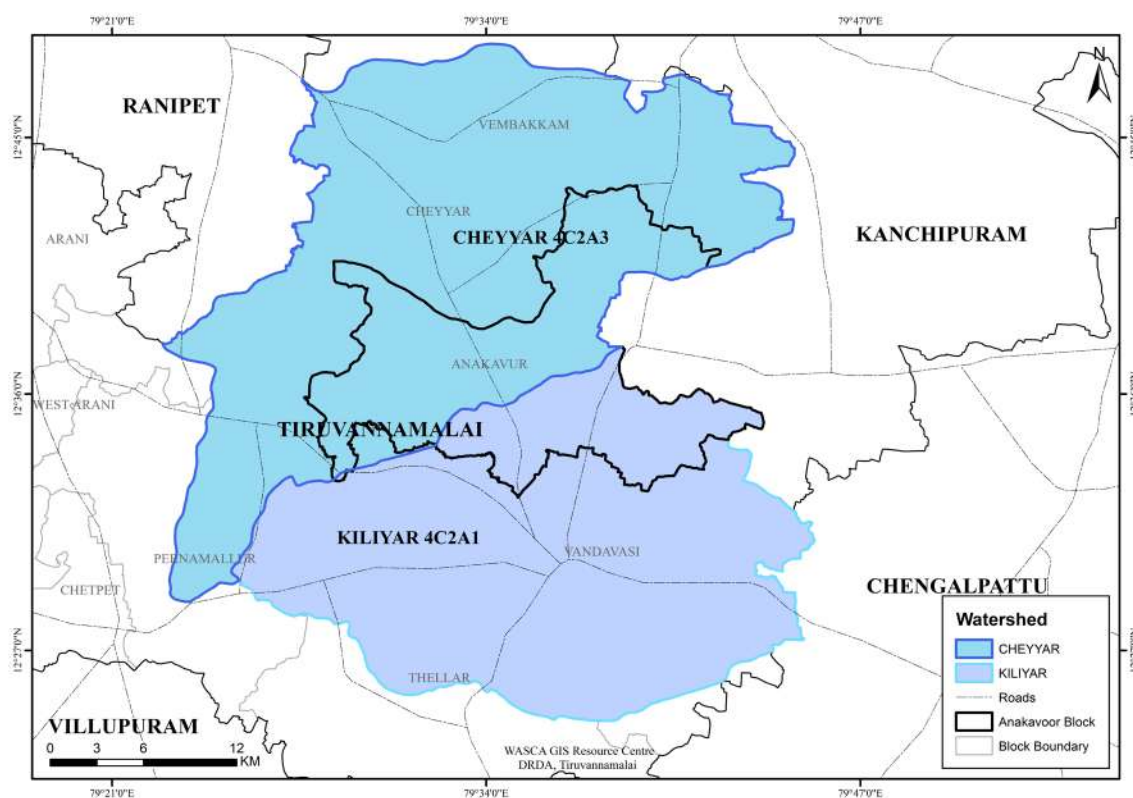


Figure 8.1. Macro-watershed map - Anakkavoor Block

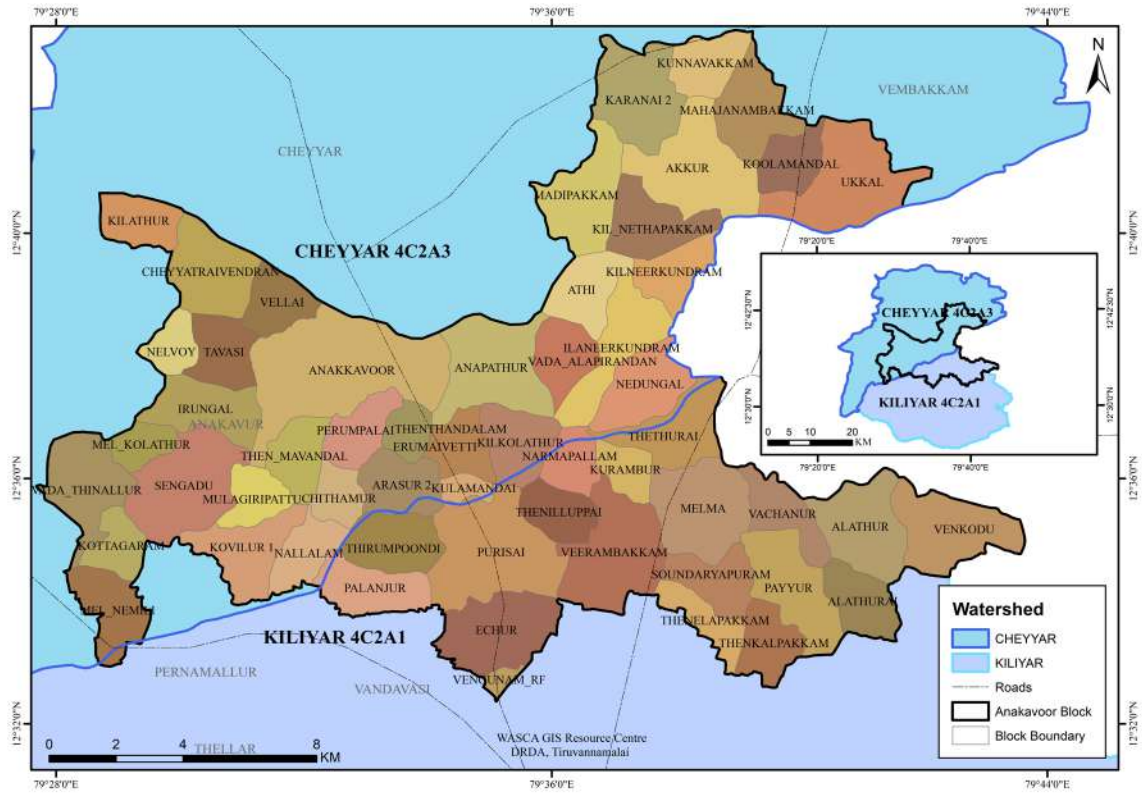


Figure 8.2. Macro-watershed with GPs -Anakkavoor Block



Figure 8.3. Macro-watershed ridge map- Anakkavoor Block

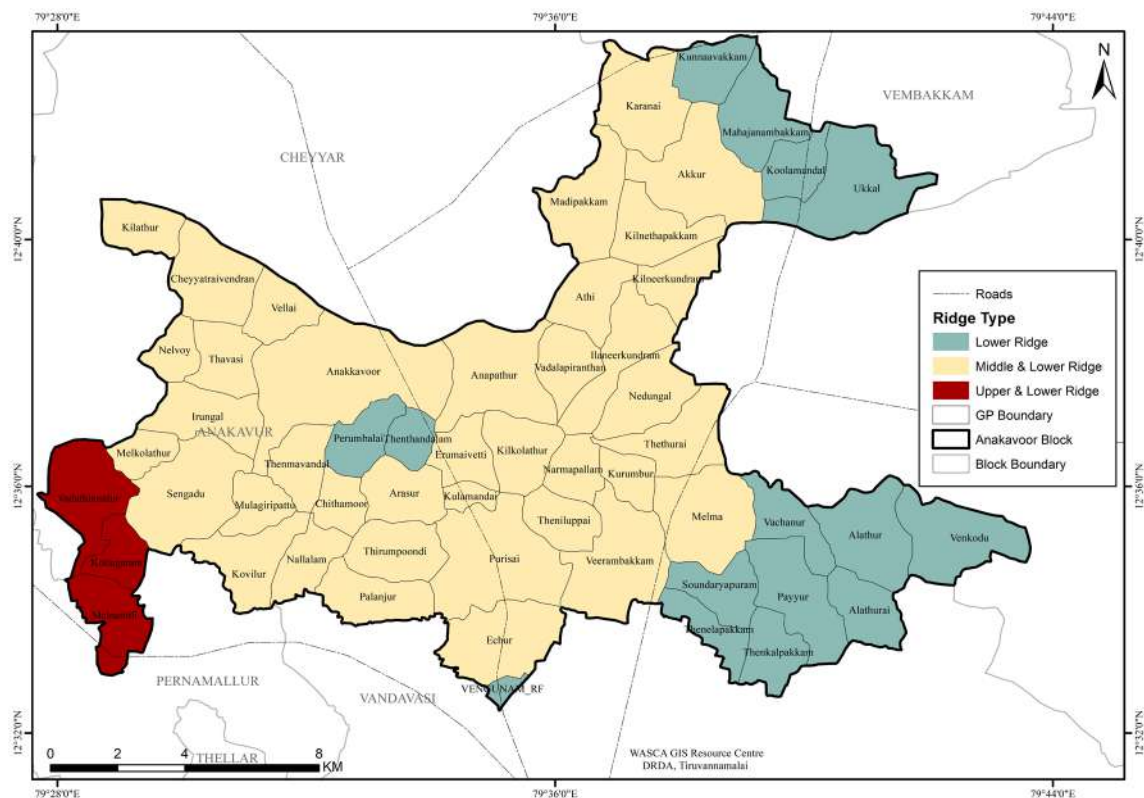


Figure 8.4. GP level ridge map- Anakkavoor Block

All the proposed based 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 Anakkavoor Block are listed in Table 27 to 32.

TABLE 26. RIDGE DETAILS OF MICRO-WATERSHED FALLING UNDER CHEYYAR MACRO-WATERSHED

Sl. No	Micro-watershed Code	Area in ha	Ridge type
1	4C2A3b08a	1,023.79	Upper, Middle & Lower
2	4C2A3d06b	850.13	Upper & Middle
3	4C2A3d06c	496.45	
4	4C2A3b11b	615.80	
5	4C2A3d03c	385.32	
6	4C2A3d07a	573.32	Upper
7	4C2A3b11c	385.37	
8	4C2A3d07c	584.50	
9	4C2A3d07b	409.27	
10	4C2A3c06a	684.31	Middle & Lower
11	4C2A3d02a	680.68	
12	4C2A3d01a	1,055.39	
13	4C2A3b07a	981.27	
14	4C2A3d05b	300.62	
15	4C2A3d01b	660.14	
16	4C2A3b07c	446.76	
17	4C2A3b10a	434.63	
18	4C2A3b08c	594.07	Middle
19	4C2A3d02c	480.94	
20	4C2A3d05a	602.36	
21	4C2A3d05c	296.83	

22	4C2A3d06a	286.98	Middle
23	4C2A3b10b	675.56	
24	4C2A3b11a	241.26	
25	4C2A3b10c	228.74	
26	4C2A3c06c	321.83	
27	4C2A3c05a	778.80	Lower
28	4C2A3c06b	848.15	
29	4C2A3c07b	940.19	
30	4C2A3c05b	326.54	
31	4C2A3a04c	766.35	
32	4C2A3c01b	885.65	
33	4C2A3c01c	603.71	
34	4C2A3c01a	459.46	
35	4C2A3c07a	692.46	
36	4C2A3b05a	56.64	
37	4C2A3c02a	258.63	
38	4C2A3a04d	259.90	
39	4C2A3c02b	584.79	
40	4C2A3b05b	27.58	
41	4C2A3b05c	192.15	
42	4C2A3b09a	1,072.82	
43	4C2A3b07b	211.61	
44	4C2A3b08b	384.65	
45	4C2A3b09c	510.21	
46	4C2A3b09b	427.81	

TABLE 27. GPs FALLING UNDER CHEYYAR MACRO-WATERSHED

Sl.No	GP	Ridge type
1	Kottakoram	Upper & Lower
2	Melnemili	
3	Vadathinallur	
4	Akkur	Middle & Lower
5	Anakkavoor	
6	Anapathur	
7	Arasur	
8	Athi	
9	Cheyatraivendran	
10	Chithamur	
11	Erumaivetti	
12	Ilaneerkundram	
13	Irungal	
14	Karanai	
15	Kilathur	
16	Kilkolathur	
17	Kilneerkundram	
18	Kilnethapakkam	

19	Kovilur	Middle & Lower
20	Kulamandai	
21	Madipakkam	
22	Melkolathur	
23	Mulagiripattu	
24	Nallalam	
25	Nedungal	
26	Nelvoy	
27	Sengadu	
28	Tavasi	
29	Thenmavandal	
30	Vadaalampirandan	
31	Vellai	
32	Koolamandal	
33	Kunnavakkam	
34	Mahajanambakkam	
35	Perumpalai	
36	Thenthandalam	
37	Ukkal	

TABLE 28. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPES FALLING UNDER CHEYYAR MACRO-WATERSHED

Work wise Details of Cheyyar in Anakkavoor Block			
Sl. No.	Proposed work	Ridge type	Extent
1	Contour Continuous Bunds for Afforestation area (m)	Upper	4,41,443
2	Afforestation in Public/common lands (ha)		667.07
3	Drainage Line Treatment (m)		5722
4	CC Check dams (No.)	Middle	27
5	Block Plantation (Community) (ha)		272.33
6	Silvi-pasture Development (ha)		175.16
7	Avenue plantation (m)		1,16129
8	Composting (No.)	Lower	468
9	Canal Bund Plantation (m)		9,190
10	Restoration of waterbodies: Tanks and Ooranis (No.)		228
11	Artificial Recharge Structure (No.)		682
12	Farm Bunding with Boundary Trenches - Individual (ha)		593
13	Construction of Farm Ponds – Individual (No.)		719
14	Land development – Individual (ha)		478
15	Azolla units – Individual (No.)		1,927
17	NADEP Vermi compost (No.)		1,927
18	Fodder development – Individual (No.)		1,927
19	Cattle Shelters (No.)		1,927
20	Goat Sheep Shelters (No.)		1,413
21	Cattle Trough (No.)		1,933
22	Construction of new open wells & Recharge Shafts (No.)		659
23	Soak Pits (Community) (No.)		424
24	Soak Pits (Individual) (No.)		1637
25	Roof Rain Water harvesting (No.)		73

26	Agro Forestry (ha)	Middle	4
27	Nutri Garden (No.)	Lower	64,995
28	Silt application (No.)		200
29	Mini Forest (ha)	Middle	71.57

TABLE 29. MICRO-WATERSHED AND RIDGE DETAILS OF KILIYAR MACRO-WATERSHED

Sl.No	Micro-watershed Code	Area in ha	Type of Ridge
1	4C2A1d17a	884.08	Upper & Lower
2	4C2A1e14b	553.10	Upper
3	4C2A1d16c	592.35	Middle & Lower
4	4C2A1d17b	694.38	
5	4C2A1d18b	605.04	
6	4C2A1d19a	916.39	
7	4C2A1d19b	217.12	
8	4C2A1d19c	326.67	Middle
9	4C2A1d14b	0.82	Lower
10	4C2A1d16b	513.22	
11	4C2A1d14c	272.80	
12	4C2A1d12b	73.51	
13	4C2A1c15a	10.42	
14	4C2A1d15c	345.79	
15	4C2A1d11c	263.49	
16	4C2A1d16a	383.07	
17	4C2A1d11b	601.41	
18	4C2A1d15b	333.72	
19	4C2A1d12a	697.23	
20	4C2A1d17c	502.24	
21	4C2A1d11a	259.46	
22	4C2A1d15a	236.84	
23	4C2A1d18a	760.02	
24	4C2A1d13a	545.04	
25	4C2A1d10b	361.43	
26	4C2A1e08b	905.35	
27	4C2A1d10c	420.91	
28	4C2A1d18c	547.00	
29	4C2A1d10d	387.13	
30	4C2A1e08a	885.67	
31	4C2A1d13b	971.32	

TABLE 30. LIST OF GPs WITH RIDGE TYPE OF FALLING UNDER KILIYAR MACRO-WATERSHED

S No	GP Name	Ridge type
1	Echur	Middle & Lower
2	Kurambur	
3	Melma	
4	Narmapallam	
5	Palanjur	

6	Purisai	Middle & Lower
7	Thenilluppai	
8	Thethurai	
9	Thirumpoondi	
10	Veerambakkam	
11	Alathur	Lower
12	Alathurai	
13	Payyur	
14	Soundaryapuram	
15	Thenelapakkam	
16	Thenkalpakkam	
17	Vachanur	
18	Venkodu	

TABLE 31. LIST OF WORKS PROPOSED UNDER CWRM - WASCA WITH TYPE OF FALLING UNDER KILIYAR MACRO-WATERSHED

Sl. No.	Proposed work	Ridge type	Extent
1	Contour Continuous Bunds for Afforestation area (m)	Upper	2,99,176
2	Afforestation in Public/common lands (ha)		414
3	Drainage Line Treatment (m)		10,546
4	CC Check dams (No.)	Middle	12
5	Block Plantation (Community) (ha)		60
6	Silvi-pasture Development (ha)		146
7	Avenue plantation (m)		77,407
8	Mini Forest (ha)	Lower	20
9	Composting (No.)		216
10	Canal Bund Plantation (m)		4,229
11	Restoration of waterbodies: Tanks and Ooranis (No.)		154
12	Artificial Recharge Structure (No.)		419
13	Farm Bunding with Boundary Trenches - Individual (ha)		369
14	Construction of Farm Ponds - Individual (No.)		372
15	Land development - Individual (ha)		291
16	Azolla units - Individual (No.)		1,101
17	NADEP Vermi compost (No.)		1,101
18	Fodder development - Individual (No.)		1,101
19	Cattle Shelters (No.)		1,101
20	Goat Sheep Shelters (No.)		732
21	Cattle Trough (No.)		1,101
22	Construction of new open wells & Recharge Shafts (No.)		382
23	Soak Pits (Community) (No.)		131
24	Soak Pits (Individual) (No.)		970
25	Roof Rain Water harvesting (No.)	36	
26	Nutri Garden (No.)	31,200	
27	Silt application (No.)	101	

8.2 | MODEL MICRO-WATERSHED - AKKUR MICRO-WATERSHED, ANAKAVOOR BLOCK, TIRUVANNAMALAI DISTRICT



Figure 8.5. Akkur micro-watershed over satellite image

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 holistic development and management to ensure long-term benefits. The micro-watershed plan sequenced from top to valley for proper implementation of different development programs. This includes coor-

dination of various natural components like groundwater, surface water, geology, hydrogeology, catchment, land use, soil, population, salt affected 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.

AKKUR MICRO-WATERSHED

Akkur micro-watershed covers Akkur, Karanai, Kilnethakkam and Madipakkam Gram Panchayats, Anakkavoor Block in Tiruvannamalai District (Figure 8.5 & 8.6). This micro-watershed is the part of Cheyyar macro-watershed in Cheyyar sub-basin. The general information, geology, hydrogeology, natural drainage line, catchment area,

ground water status, water budget of Akkur micro-watershed is given below in separate sections followed by proposed works, wise proposed treatment area, key outcomes, estimated cost and required person days from Table 33 to 46. The key CWRM parameters for the GPs falling in this micro-watershed is annexed in Annexure 8.

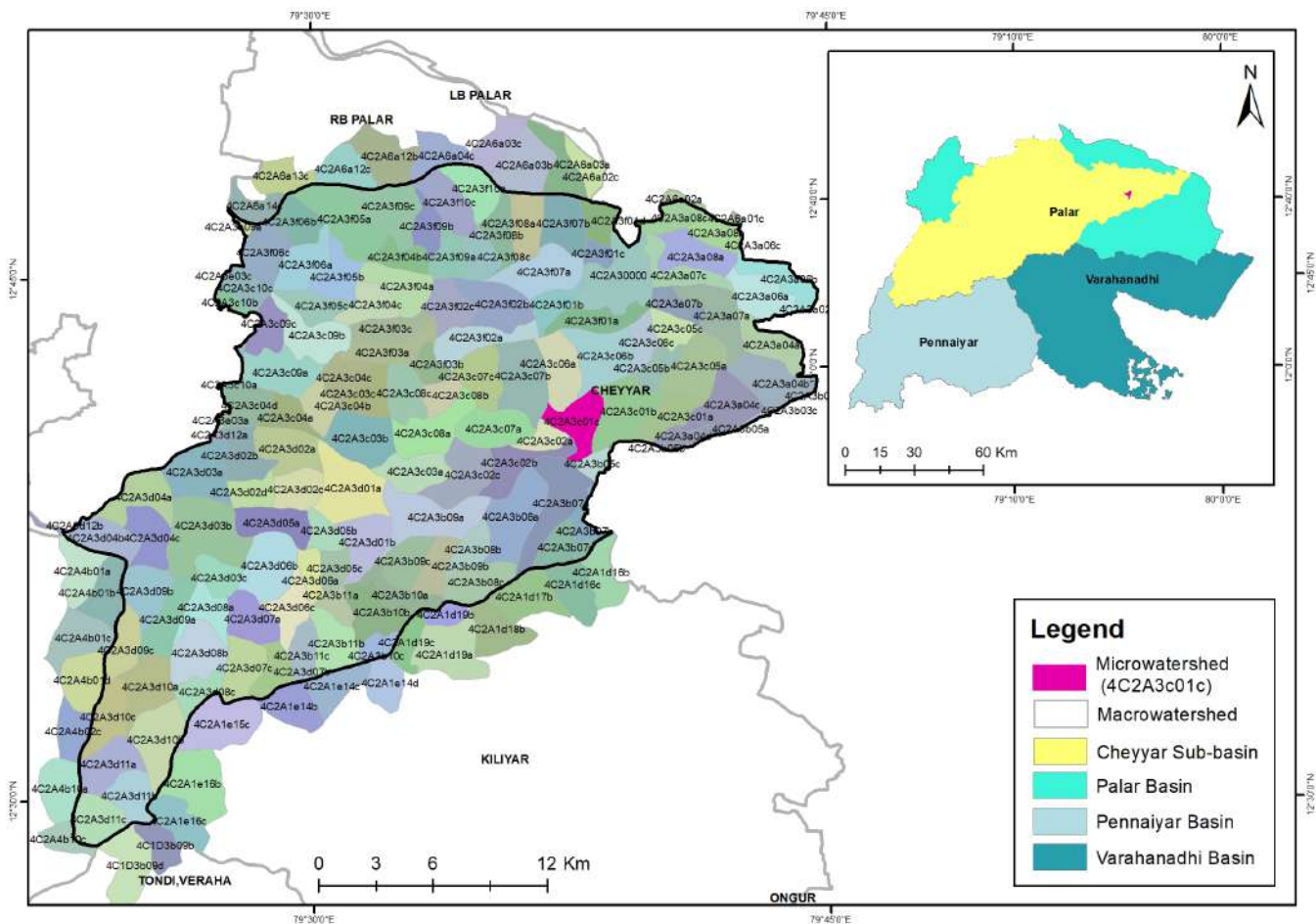


Figure 8.6. Location map of micro-watershed

TABLE 32. GENERAL INFORMATION OF AKKUR MICRO-WATERSHED

Description	Name/ No./ Quantity/ Status
Name of the micro-watershed	Akkur
Micro-watershed No.	4C2A3c01c
Name of the basin	Palar Basin
Name of the sub basin	Cheyyar Sub Basin
Name of the macro- watershed	Cheyyar
No. of GPs covered under the micro-watershed	4
Name of the GPs	Akkur, Karanai , Kilnethapakkam, Madipakkam
Latitude of micro-watershed (From To)	12°39'43.72"N to 12°41'23.96"N
Longitude of micro-watershed (From To)	79°36'38.51"E to 79°38'21.58"E
Total area of the micro-watershed in ha	604
Area in Akkur GP in ha (%)	352 (58)
Area in Karanai GP in ha (%)	17 (3)
Area in Kilnethapakkam GP in ha (%)	176 (29)
Area in Madipakkam GP in ha (%)	60 (10)
Total population of Akkur GP	2,896
Total population of Karanai GP	1,614
Total population of Kilnethapakkam GP	1,314
Total population of Madipakkam GP	1,262
Annual average rainfall (mm)	1,047
Annual maximum temperature (°C)	33°C
Annual Minimum temperature (°C)	22.8

Evapo-transpiration Losses of Akkur GP (ha.m)	26.06
Evapo-transpiration Losses of Karanai GP (ha.m)	13.38
Evapo-transpiration Losses of Kilnethapakkam GP (ha.m)	13.03
Evapo-transpiration Losses of Madipakkam GP (ha.m)	8.73
Volumetric soil moisture availability (%)	23
Climate Risk	Drought and heat waves
CVI Index Value for Akkur GP (Based on WASCA Climate study)	0.555 (High Vulnerable)
CVI Index Value for Karanai GP (Based on WASCA Climate study)	0.510 (Low vulnerable)
CVI Index Value for Kilnethapakkam GP (Based on WASCA Climate study)	0.538 (Medium vulnerable)
CVI Index Value for Madipakkam GP (Based on WASCA Climate study)	0.534 (Medium Vulnerable)
Agro-Climatic Zone	North eastern zone (TN-1)
Agro Ecological Sub-Region (ICAR)	Eastern Ghats
Status of Ground water in Akkur GP	Critical
Status of Ground water in Karanai GP	
Status of Ground water in Kilnethapakkam GP	
Status of Ground water in Madipakkam GP	

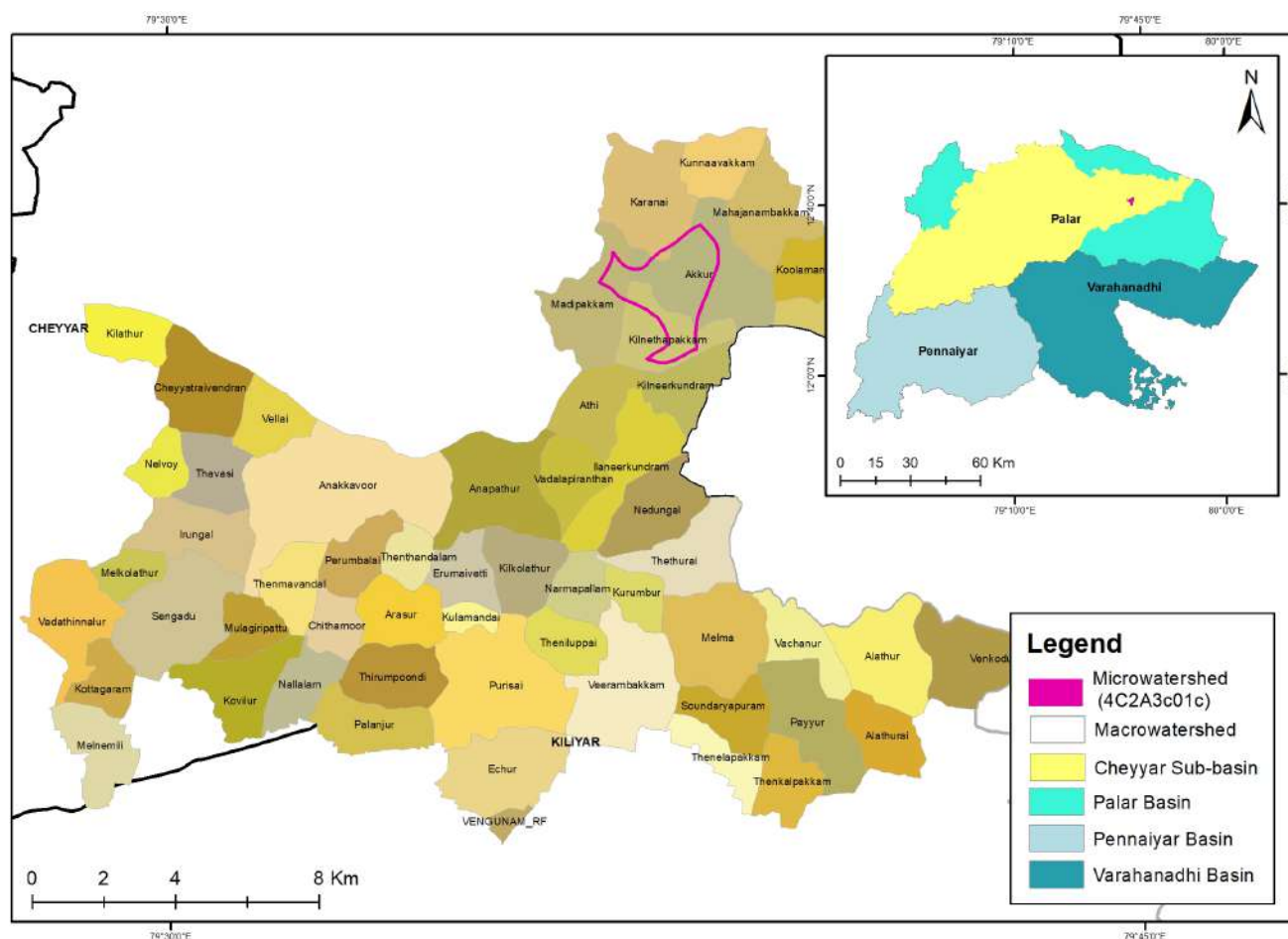


Figure 8.7. GPs and Akkur micro-watershed map

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

Geology Occurrence in % (hard rock)	100
Geology Quality	Moderate
Depth of weathered zone and/or maximum depth of fractures in hard Rock area in m	30 to 60
Bottom of the unconfined aquifer in soft rock areas in m	20 to 40
Sheet Erosion (ha)	23 ha (middle and lower)

TABLE 34. NATURAL DRAINAGE LINES IN AKKUR MICRO-WATERSHED

No. of 2nd Order drains	1
Total length of natural drainage line (m)	1,320
Drainage density (ha.m)	2.18

TABLE 35. GP -WISE CATCHMENT AREA PROFILE IN THE AKKUR MICRO-WATERSHED

Catchment Area in ha	Akkur GP	Karanai GP	Kilnethapakkam GP	Madipakkam GP
Good catchment area	206.14	217.79	155.43	173.3
Average catchment area	18.87	31.17	7.16	4.2
Bad catchment area	619.66	434.52	312.96	425

TABLE 36. GROUND WATER STATUS IN AKKUR MICRO-WATERSHED

Firka assessment Unit for Akkur, Karanai, Kilnethapakkam, Madipakkam in ha.m	
Name of the Firka (Assessment unit) falling under micro-watershed	Thethurai
Net annual ground water availability	1,983.98
Existing gross ground water draft for irrigation	2,110.8
Existing gross ground water draft for domestic and industrial water supply	53.61
Existing gross ground water draft for all uses	2,164.41
Provision for domestic and industrial requirement supply to 2025	60.93
Net ground water availability for future irrigation development	-187.75

TABLE 37. GP WATER BUDGET

Water Budget in ha.m	Akkur GP	Karanai GP	Kilnethapakkam GP	Madipakkam GP
Water for human	7.93	4.42	3.6	3.45
Water for agriculture	154.6	67.4	48.4	91.7
Water for animal	3.36	2.97	1.74	1.99
Village wise water required	165.9	74.8	53.7	97.14
Available run-off from rain water (derived from strange method)	198.5	171.7	118.8	145.6
harvested runoff from water harvesting activities	0.8	0.2	7.4	0.4
Potential harvesting from proposed interventions	31.7	42.9	26.9	25.1
Total water harvested	32.5	43.1	34.3	25.5

Water demand and supply difference	-133.4	-31.7	-19.4	-71.7
Water demand supply gap status	Deficient	Deficient	Deficient	Deficient
Per capita water availability in cum	685.42	1,063.81	904.10	1,153.72
International standard per capita water availability in cum	1,700	1,700	1,700	1,700
Water availability gap	-1,014.58	-636.19	-795.9	-546.28
Water security status	Water stress			

TABLE 38. GP WISE PROPOSED MICRO-WATERSHED WORKS CONCERN TO RIDGE TYPE

Proposed works in Ridge type	Akkur GP	Karanai GP	Kilnethapakkam GP	Madipakkam GP
Upper	0	0	0	0
Middle	3	3	1	5
Lower	72	17	70	35
Total	75	20	71	40

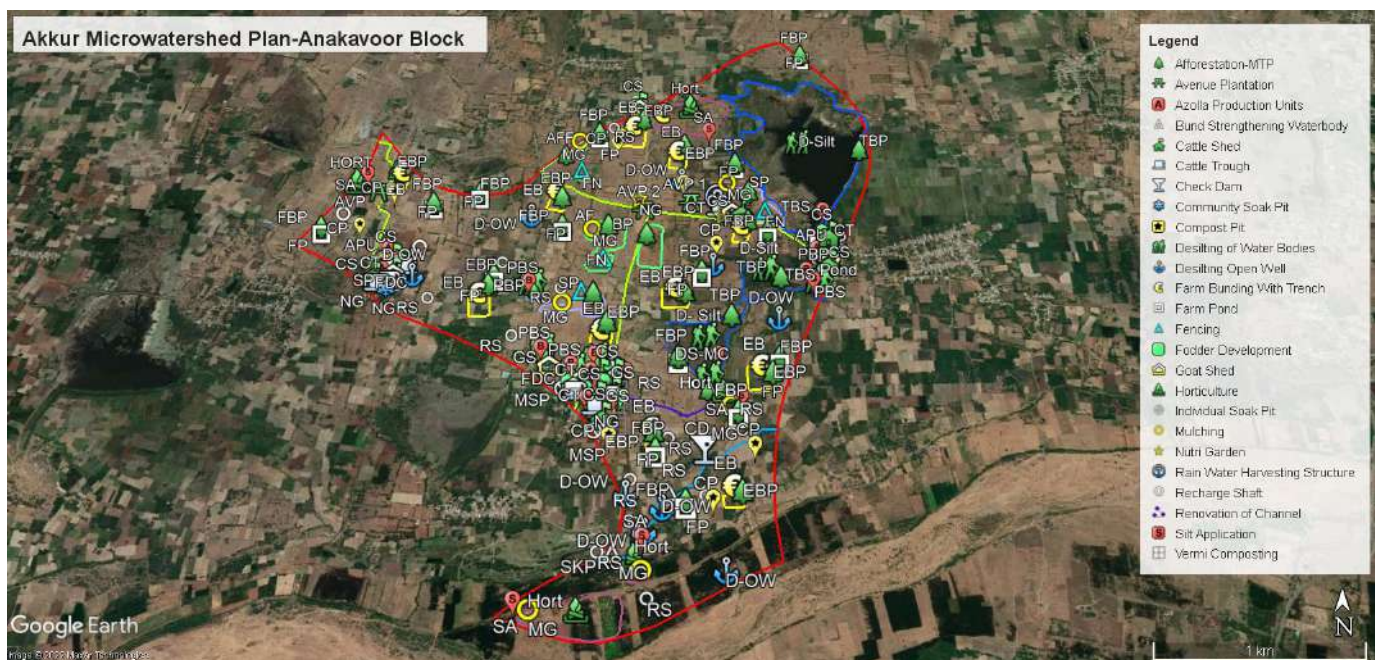


Figure 8.8. Proposed plan in Akkur micro-watersbed

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

	Akkur GP	Karanai GP	Kilnethapakkam GP	Madipakkam GP
Upper Ridge				
No Upper falling in the GP				
Middle Ridge				
Estimated cost (INR in Lakhs)	4.95	10.27	2.5	10.51
Total area (ha)	23.8	5.43	2	40.4
Treatment cost (Lakhs/ha)	0.2	1.89	1.25	0.26
Estimated person days	1,937	3,945	391	3,952
Lower Ridge				
Estimated cost (INR in Lakhs)	132.01	9.49	102.66	27.46
Total area (ha)	324.19	13.07	175	20
Treatment cost (Lakhs/ha)	0.4	0.72	0.58	1.37
Estimated person days	52,359	4,275	36,889	14,741

Akkur GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	0.2 lakh/ha	1,937
Lower Ridge	0.4 lakh/ha	52,359
TOTAL	0.6 lakh/ha	54,296

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Karanai GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	1.89 lakh/ha	3,945
Lower Ridge	0.72 lakh/ha	4,275
TOTAL	2.61 lakh/ha	8,220

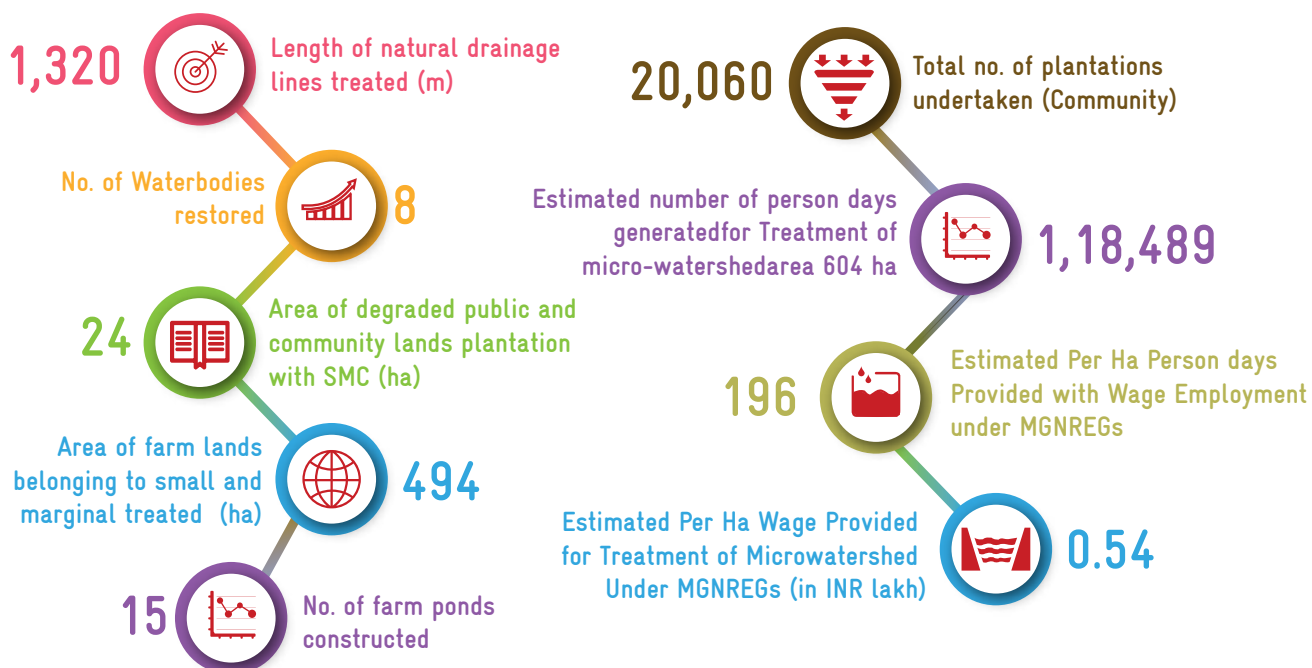
Kilnethapakkam GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	1.25 lakh/ha	391
Lower Ridge	0.58 lakh/ha	36,889
TOTAL	1.83 lakh/ha	37,280

Karanai GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	0.26 lakh/ha	3,952
Lower Ridge	1.37 lakh/ha	14,741
TOTAL	1.63 lakh/ha	18,693

TABLE 40. DETAILS OF WORKS IN THE MICRO-WATERSHED

Description	No.
Arable, non-arable & DLT livelihood activities	138
Rural greywater management activities	42
	26

TABLE 41. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)



Akkur GP

71.18 lakh

Karanai GP

58.88 lakh

Kilnethapakkam GP

46.73 lakh

Madipakkam GP

42.42 lakh

TABLE 42. ESTIMATES OF AKKUR MICRO-WATERSHED IN AKKUR GP

Sl. No	Proposed work	Ridge type	Work status	Quantity (Area or No.)	No. of works as per KML	Estimate cost in Lakhs	Person days
NRM works in Public and Community Lands							
1	Tank bund plantation (No.)	Lower	Not commenced	3	3	1.8	73
2	MTP (Block Plantation)			3.5	1	11.1	4,320
3	Silvi pasture			9.67	2	34.2	13,328
4	MTP (Afforestation)			5.66	1	8.6	3,344
5	Compost pit (No.)			2	2	0.34	30
6	Restoration of traditional water-bodies: Tanks (No.)		Commenced	3	3	15	2,400
7	Restoration of traditional water-bodies: Ponds (No.)			1	1	1	200
8	Avenue plantation		Middle & Lower		2,944	2	5.3
Sub total					15	76.34	25,564
Works in Individual Farmer lands (Agriculture and Allied Activities)							
9	Artificial recharge structure for bore well farmers (No.)	Lower	Not commenced	2	2	5	782
10	Dryland horticulture (No. and ha)			9.1			
11	Silt application (No.)			1	1	8.5	3,321
12	Fodder development - Individual (No.)			2	2		
13	Azolla production units - Individual (No.)		Commenced	5	5	7.4	11,720
14	NADEP vermi compost (No.)			5	5	0.75	115
15	Construction of farm ponds - Individual (No.)		Ongoing	5	5	0.9	135
16	Farm bunding with boundary trenches - Individual (No. and ha)		Middle & Lower	Not commenced	8	8	16
		15			6	9	3,516
Sub total					34	47.55	25,837
Livelihood enhancement activities for Individual Farmers (dryland)							
17	Cattle shelters (No.)	Lower	Commenced	5	5	6.95	1,655
18	Goat/sheep shelters (No.)			3	3	4.89	1,065
19	Cattle trough (No.)		Not commenced	5	5	0.25	30
Sub total					13	12.09	2,750
Rural Greywater and Roof rainwater Management							
20	Roof top rainwater structure (No.)	Lower	Not commenced	1	1	4	625
21	Soak pits (Individual) (No.)		Ongoing	9	9	0.972	144
22	Nutri garden (No.)	Middle & Lower	Not commenced	4	4	0.004	1
Sub total					13	0.976	145
Grand total					75	136.96	54,296

TABLE 43. ESTIMATES OF AKKUR MICRO-WATERSHED IN KARANAI GP

Sl. No	Proposed work	Ridge type	Work status	Quantity (Area or No.)	No. of works as per KML	Estimate cost in Lakhs	Person days
NRM works in Public and Community Lands							
1	MTP (Afforestation)	Middle	Not commenced	4.39	1	8.6	3,344
2	Compost pit (No.)			1	1	0.17	15
3	Farm Bunding with Boundary Trenches - Individual			2.5	1	1.5	586
4	Artificial recharge structure for bore well farmers (No.)	Lower	Commenced	1	1	2.5	391
5	Fodder development - Individual (No.)			1	1	1.48	2,344
6	Silt application (No.)			7	7		
7	Azolla production units - Individual (No.)			1	1	0.15	23
8	NADEP vermi compost (No.)			1	1	0.18	27
9	Construction of farm ponds - Individual (No.)		Ongoing	1	1	2	781
Sub total					15	16.58	7,511
Livelihood enhancement activities for Individual Farmers (dryland)							
10	Cattle shelters (No.)	Lower	Commenced	1	1	1.39	331
11	Goat/sheep shelters (No.)			1	1	1.63	355
12	Cattle trough (No.)		Not commenced	1	1	0.05	6
Sub total					3	3.07	692
Rural Greywater Management							
13	Soak pits - Individual (No.)	Lower	Ongoing	1	1	0.108	16
14	Nutri garden (No.)		Not commenced	1	1	0.001	1
Sub total					2	0.109	17
Grand total					20	19.76	8,220

TABLE 44. ESTIMATES OF AKKUR MICRO-WATERSHED IN KIL NETHAPAKKAM GP

Sl. No	Proposed work	Ridge type	Work status	No. of works as per KML	Estimate cost in Lakhs	Person days
NRM works in Public and Community Lands						
1	Sunken pit in 1st order drain (No.)	Lower	Ongoing	2	3.08	766
2	CC check dams (No.)		1	4.97	420	
3	Avenue plantation (km)		359	0.64	253	
4	Restoration of traditional waterbodies: Ponds (No.)		3	0.51	45	
5	Fodder development - Individual (No.)		4	4	800	
Sub total				369	13.2	2,284




6	Artificial Recharge Structure for bore well farmers (No.)	Middle & Lower	Not commenced	11			
7	Farm bunding with boundary trenches – Individual (ha, No.)	Lower		7.5	27.5	4,301	
8	Fodder development - Individual (No.)			3	4.5	1,758	
9	Dryland horticulture (ha, No.)			5	7.4	11,720	
10	Silt application (No.)			11.18			
11	Azolla production units - Individual (No.)			3	25.5	9,963	
12	NADEP vermi compost (No.)			3			
13	Construction of farm ponds - Individual (No.)			5	0.75	115	
				5	0.9	135	
				4	8	3,124	
	Sub total				57.68	87.75	33,400
Livelihood enhancement activities for Individual Farmers (dryland)							
14	Cattle shelters (No.)	Lower		Commenced	5	6.95	1,655
15	Goat/sheep shelters (No.)		6	9.78	2,130		
16	Cattle trough (No.)		Not commenced	5	0.25	30	
	Sub total			16	16.98	3,815	
Rural Greywater Management							
17	Soak pits - Individual (No.)	Lower	Ongoing	4	0.432	64	
18	Nutri garden (No.)		Not commenced	1	0.001	1	
	Sub total			5	0.433	65	
	Grand total			447.68	105.16	3,780	

TABLE 45. ESTIMATES OF AKKUR MICRO-WATERSHED IN MADIPAKKAM GP

Sl. No	Proposed work	Ridge type	Work status	Quantity (Area or No.)	No. of works as per KML	Estimate cost in Lakhs	Person days	
NRM works in Public and Community Lands								
1	Avenue plantation (km)	Lower	Commenced	1,000	1	2	703	
2	Compost pit (No.)	Middle	Not commenced	3	3	1	45	
	Sub total				4	2	748	
3	Farm Bunding with Boundary Trenches - Individual (No./ha)	Middle	Not commenced	2.5				
				1	1	2	586	
4	Dryland Horticulture (No./ha)	1.61						
		1		1	2	3,321		
5	Artificial Recharge Structure for bore well farmers (No.)	Lower		2	2	5	782	
6	Fodder development - Individual (No.)			4	4	6	9,376	
7	Silt application (No.)			1	1			
8	Azolla Production units - Individual (No.)			Commenced	4	4	1	92
9	NADEP Vermi compost (No.)			5	5	1	135	

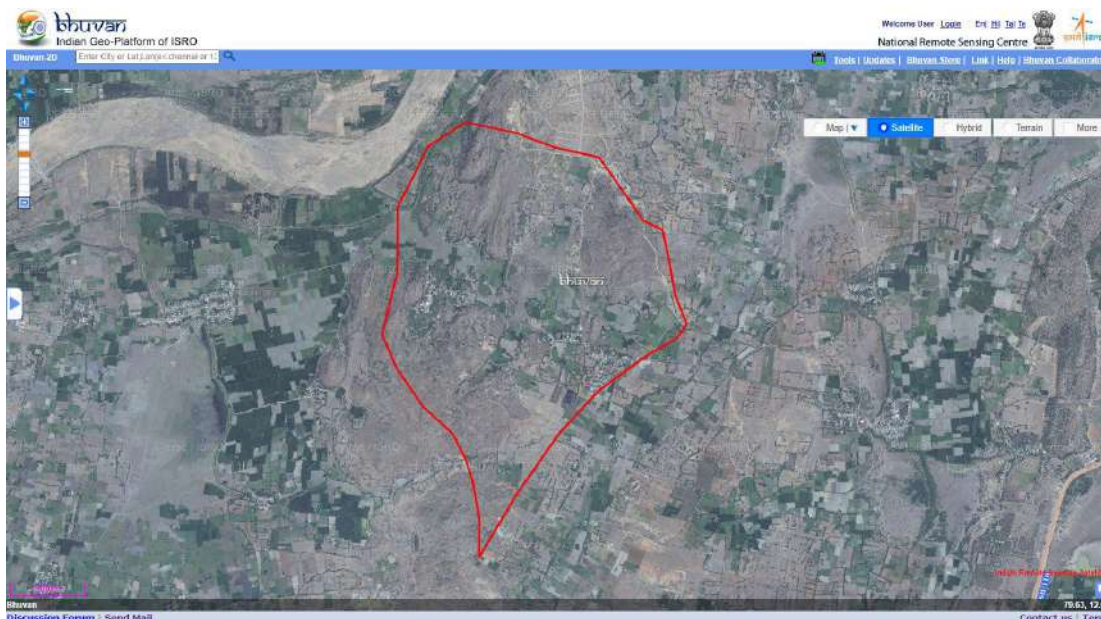
10	Construction of Farm Ponds - Individual (No.)	Lower	Ongoing	2	2	4	1,562
Sub total					20	26	15,854
Total					24	29	16,602
Livelihood enhancement activities for Individual Farmers (dryland)							
11	Cattle shelters (No.)	Lower	Commenced	4	4	6	1,324
12	Goat/sheep shelters (No.)		Not commenced	2	2	3	710
13	Cattle trough (No.)		4	4	0.2	24	
Sub total					10	9	2,058
Rural Greywater Management							
14	Soak pits (Individual) (No.)	Lower	Ongoing	2	2	0.2	32
15	Nutri garden (No.)		Not commenced	4	4	0	1
Sub total					6	0.2	33
Grand total					40	38	18,693

AKKUR MICRO-WATERSHED DEVELOPMENT (GP WISE)

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
			
Akkur GP	75	136.96	54,296
Karanai GP	20	19.76	8,220
Kil Nethapakkam GP	447.68	105.16	3,780
Madipakkam GP	40	38	18,693

8.3 | MODEL GP

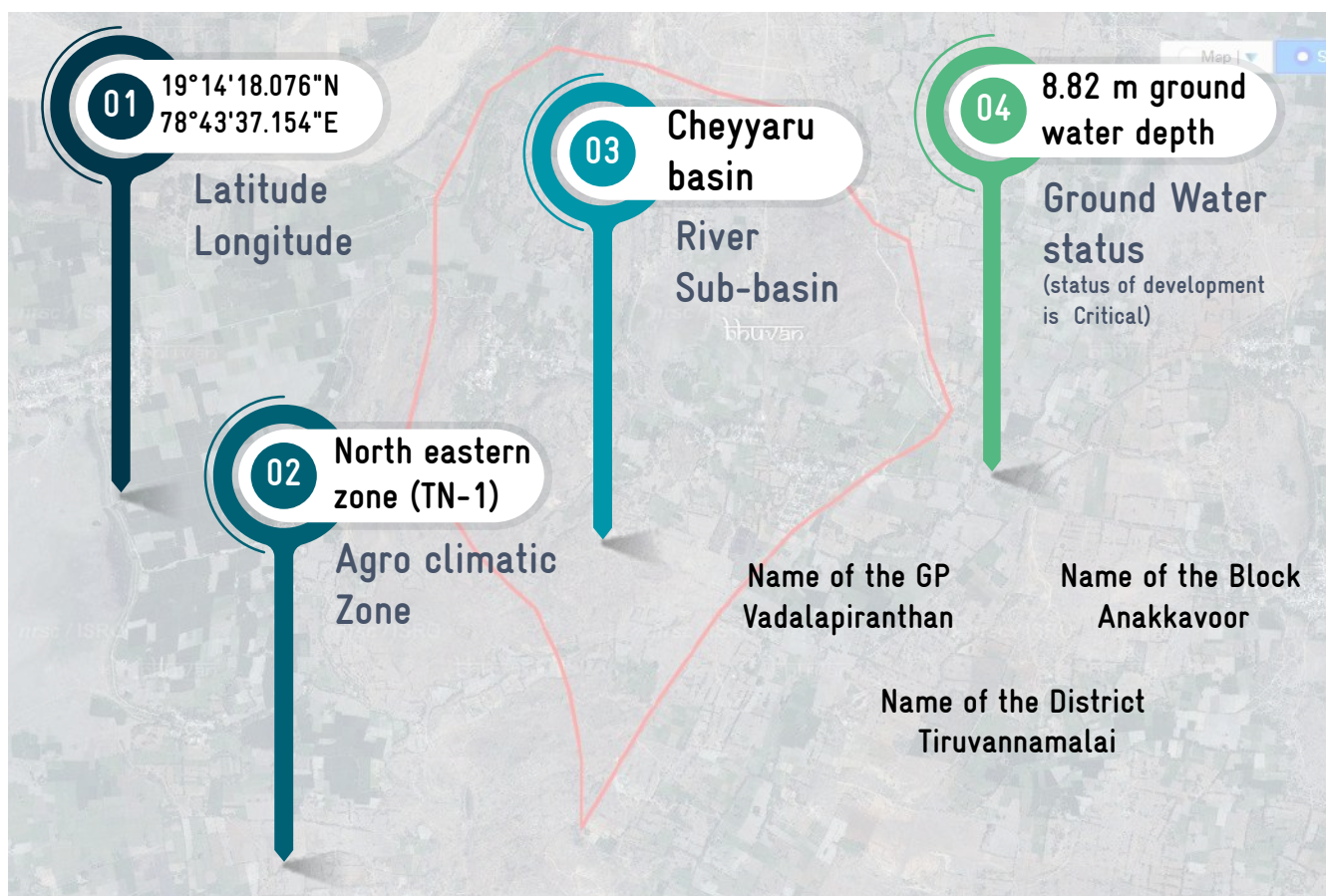
VADALAPIRANTHAN GP, ANAKKAVOOR BLOCK



The Vadalapiranthan GP is located in Anakkavoor Block of Tiruvannamalai District, Tamil Nadu. The general description of this GP is given in Table 47. The total population is 764 of which 375 are males while 389 are

females as per population Census 2011. The total number of households is 212. The scheduled tribe constitutes 0.39 % of total population in Vadalapiranthan village. There is no Schedule Caste population in the village.

TABLE 46. GENERAL DESCRIPTION OF VADALAPIRANTHAN GP



8.3.1 | 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 Vadalapiranthan GP are discussed below:



8.3.1.1 Geomorphology:

The Vadalapiranthan GP covers under the denudation origin – pediment- pedi plain complex category (Figure 8.9). The geomorphic characters are helpful to undertake appropriate work in particular locations to get maximum benefits.

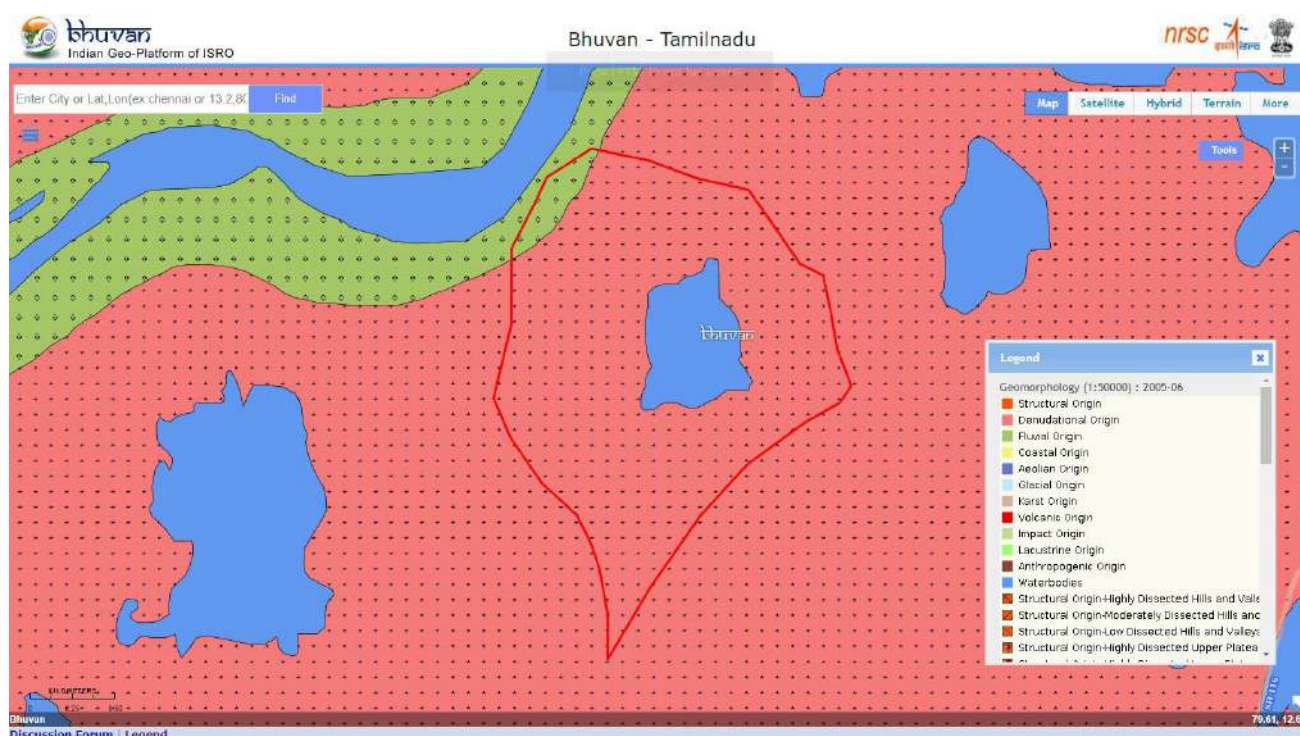


Figure 8.9. Geomorphology map of Vadalapiranthan GP

8.3.1.2 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 lineament present in the Vadalapiranthan GP (Figure 8.10).

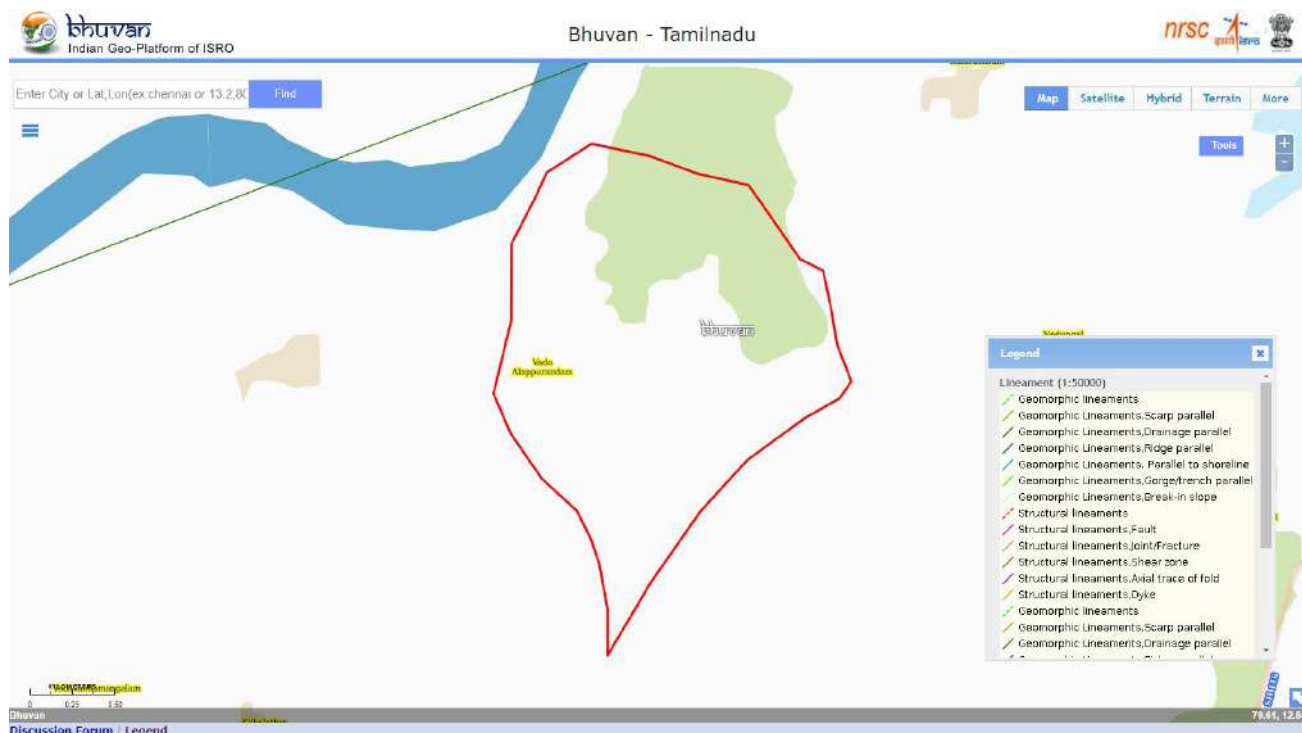


Figure 8.10. Lineament map of Vadalapiranthan GP

8.3.1.3 Ground water prospectus:

It is observed that the groundwater prospectus is greater than 80m deep with 20 to 30 liter per minute capacity in the Vadalapiranthan GP (Figure 8.11).

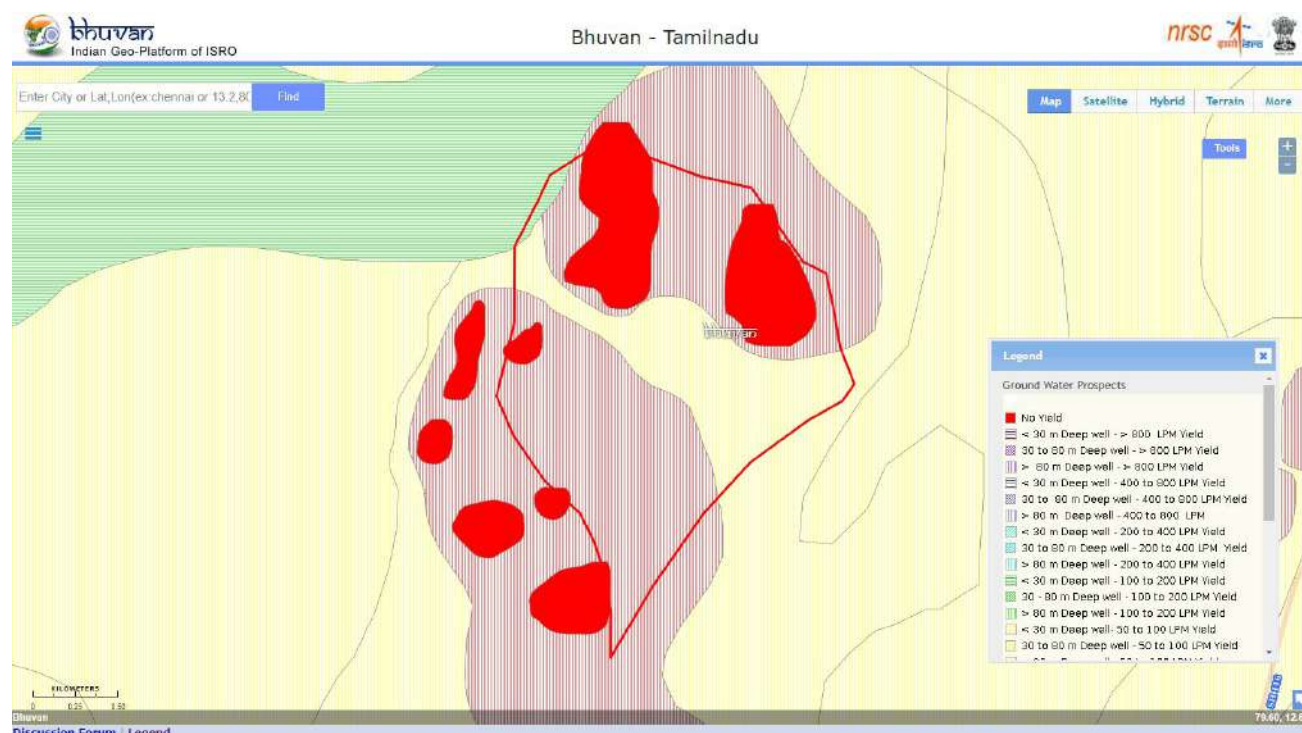


Figure 8.11. Ground water map of Vadalapiranthan GP

8.3.1.4 Slope:

Very flat slope of 0 to 1 % & flat slope 1 to 3% is witnessed in the Vadalapiranthan GP (Figure 8.12). Here the slope is useful for planning the soil conservation measures and construction of the water recharge structures such as check dams, farm ponds etc.

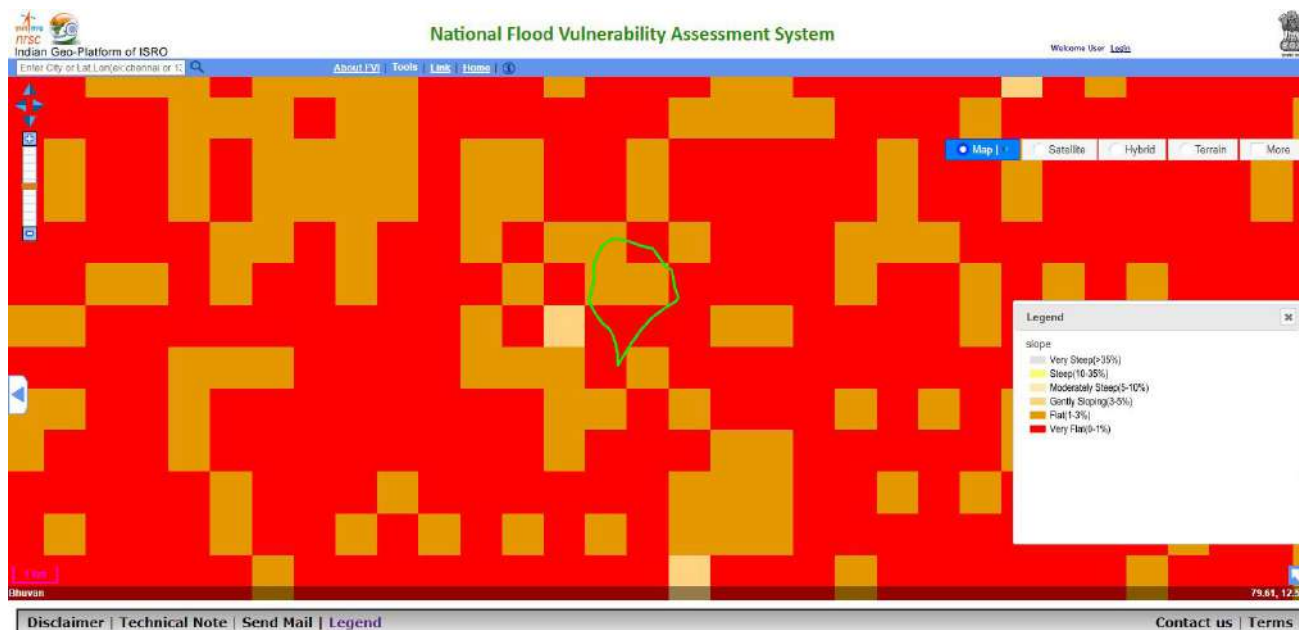


Figure 8.12. Slope map of Vadalapiranthan GP

8.3.1.5 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. The map is used for the interventions in the Vadalapiranthan GP (Figure 8.13) based onto valley concept and to develop relevant soil and water conservation plans accordingly. There are two micro-watersheds in the village

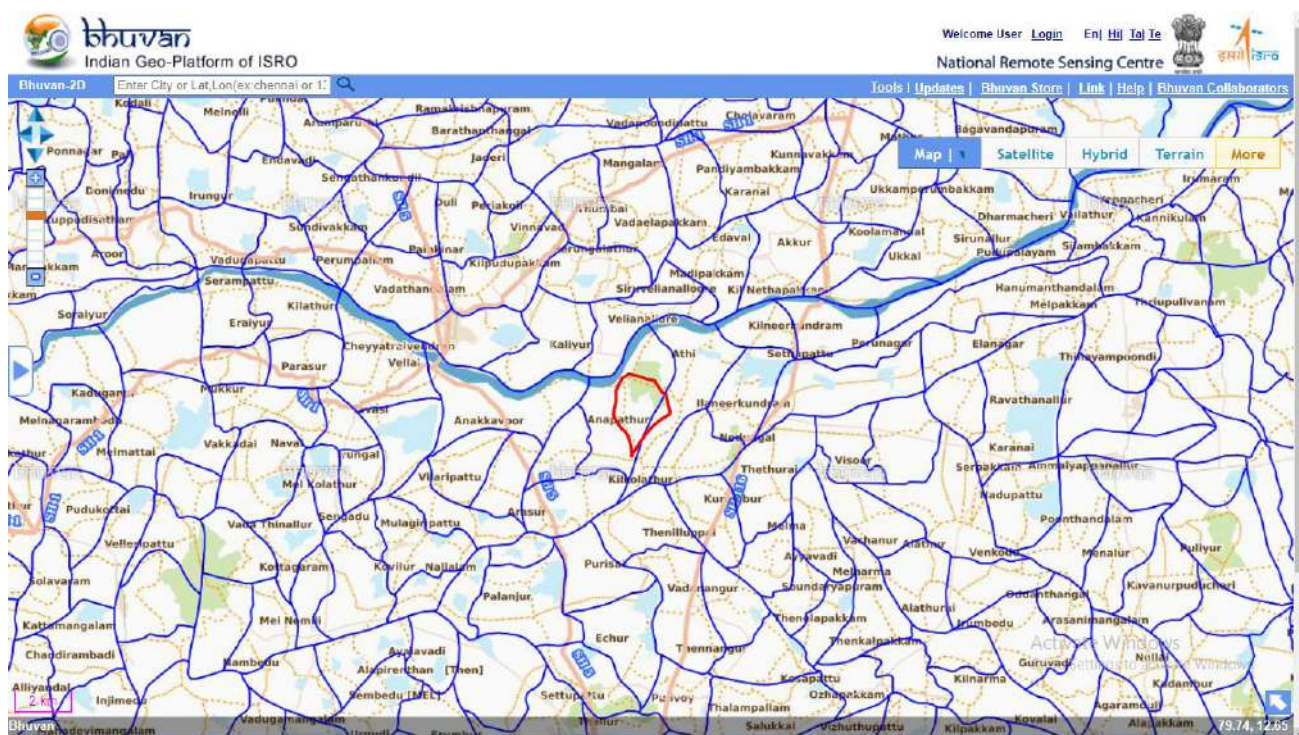


Figure 8.13. Watershed map of Vadalapiranthan GP

8.3.1.6 Area under erosion:

The erosion map shows the soil erosion extent and type of soil erosion prevailing in the village. The soil erosion map is helpful to make decisions on planning for appropriate soil conservation measures adopting watershed principles. In Vadalapiranthan GP (Figure 8.14), it is observed that area under sheet erosion in the lands on the upper slope.

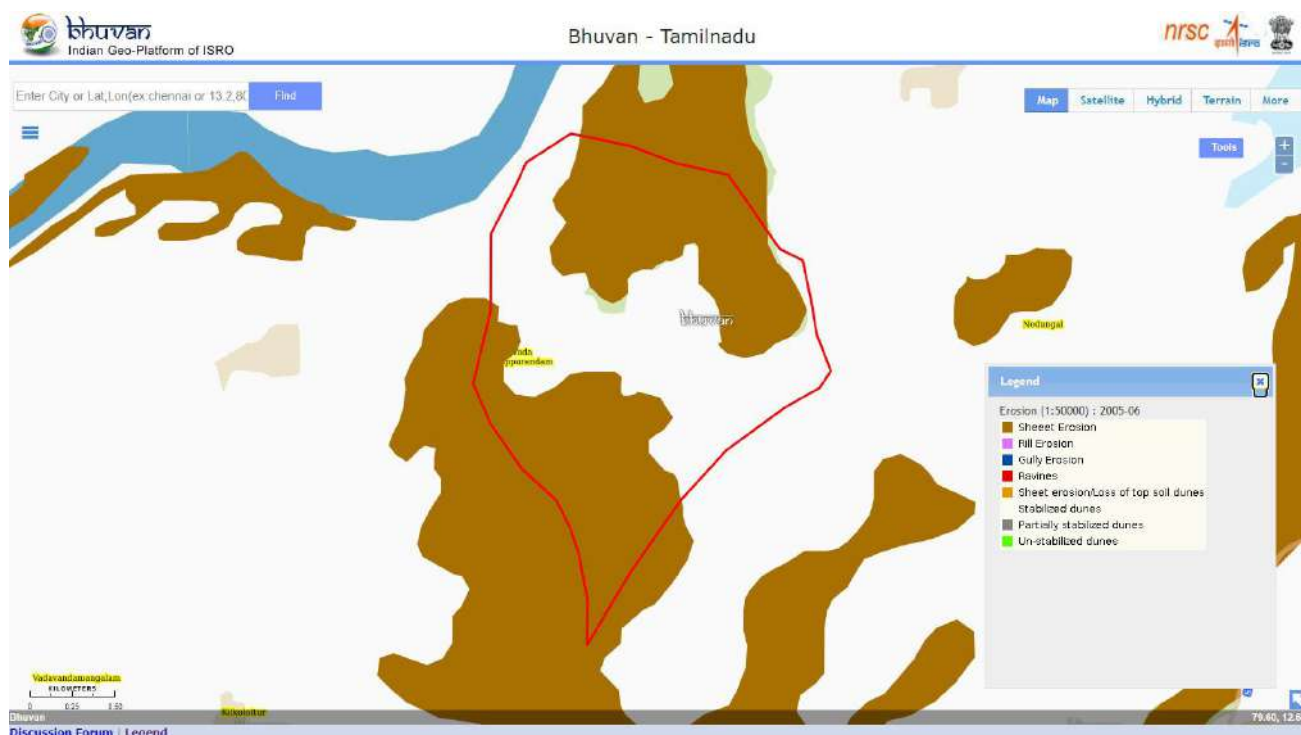


Figure 8.14. Soil erosion map of Vadalapiranthan GP

8.3.1.7 Salt affected area:

The salt affected areas are one of the most important degraded land types where soil productivity is reduced due to either salinization or sodicity or both. In this GP (Figure 8.15), currently there is no salt affected area.

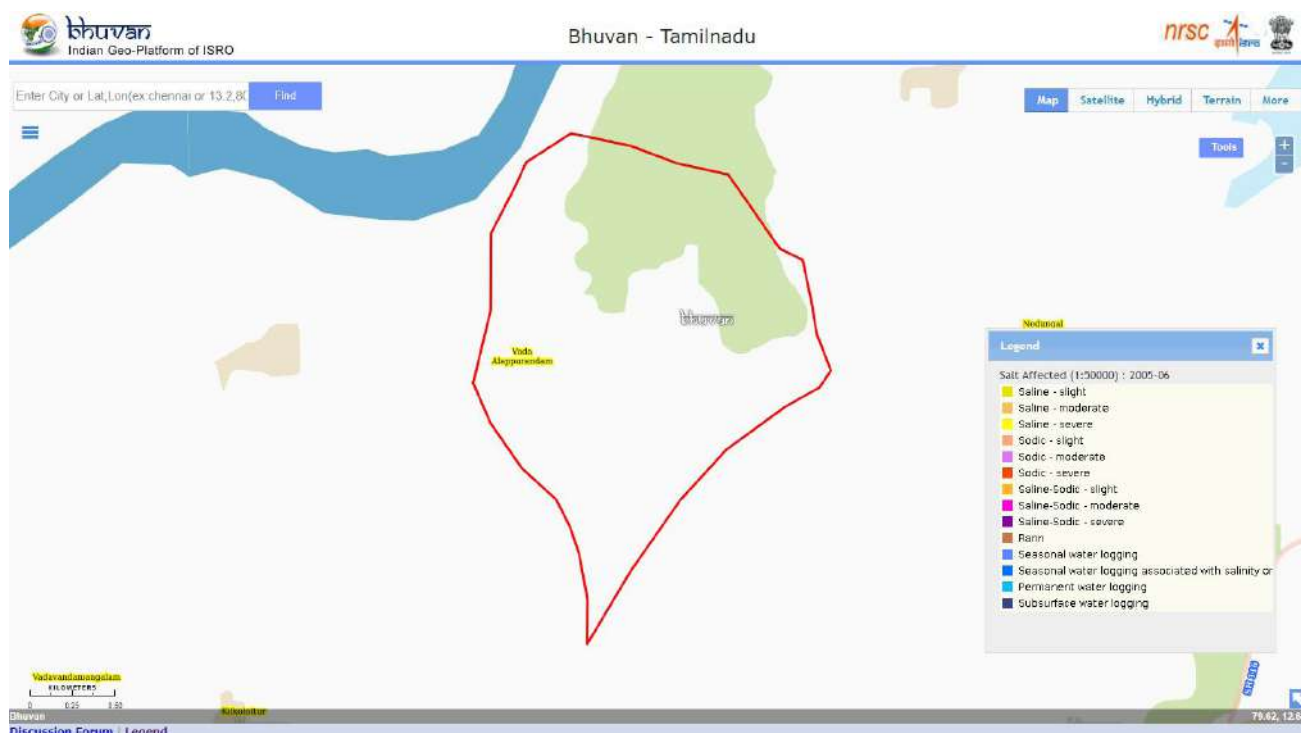


Figure 8.15. Salt affected area map of Vadalapiranthan GP

8.3.1.8 Land Use and Land Cover Map:

The land use and land cover (LULC) map provides the information about the land use pattern. The map clearly shows this GP is covered by the agriculture crops, fallow lands and barren lands (Figure 8.16). The fallow land development and converting the barren land to productive land are the key activities planned using the CWRM.

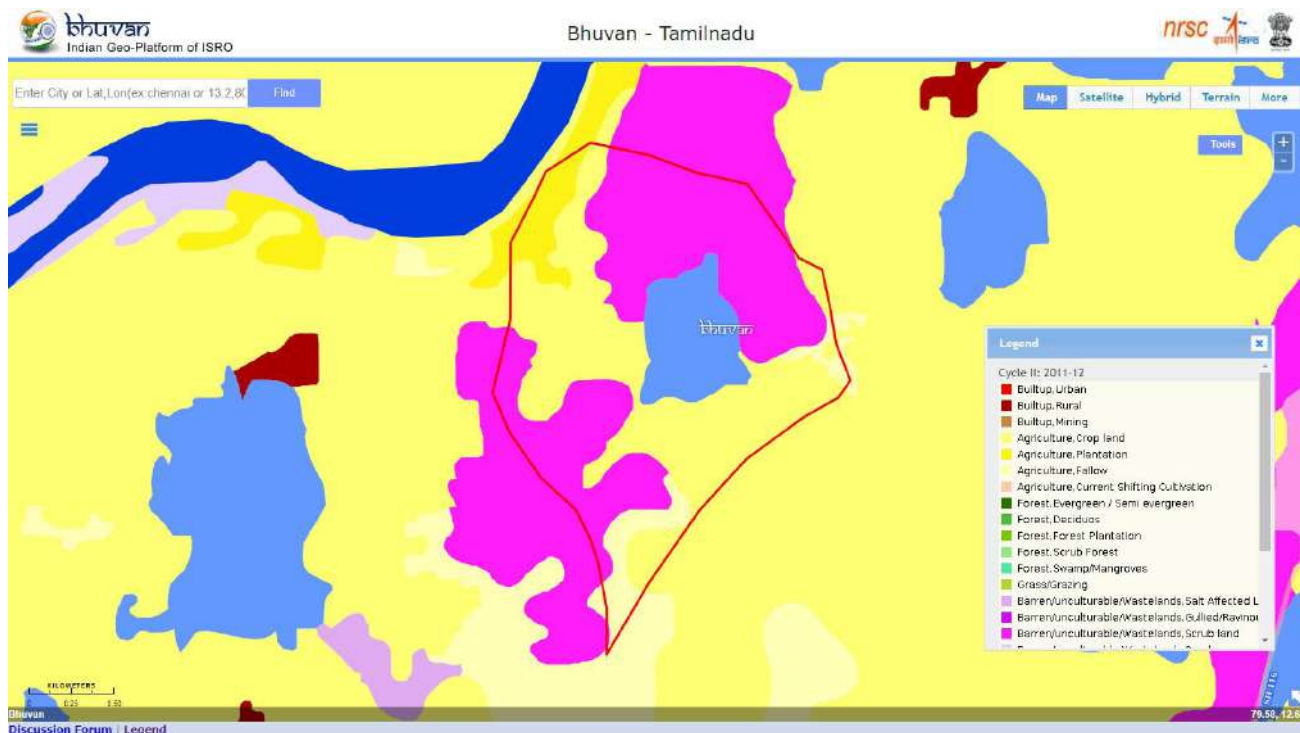


Figure 8.16. Land use and land cover map of Vadalapiranthan GP

8.3.1.9 Wasteland:

The wasteland map illustrates the availability of the wasteland such as the scrub land in the south western side of the GP (Figure 8.17). This map helps to identify such land use and take measures related to plantation and soil and water conservation works in the identified wastelands to convert into productive land.

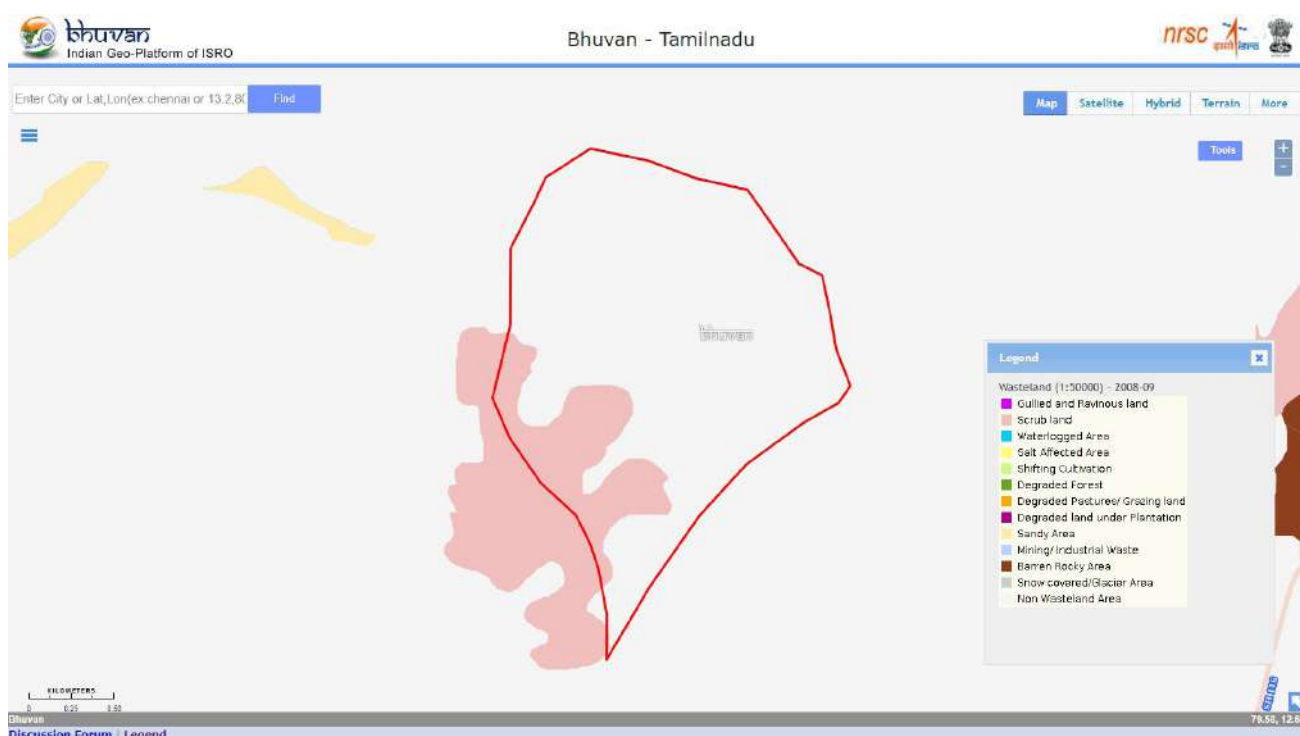


Figure 8.17. Wasteland map of Vadalapiranthan GP

8.3.2 | CWRM PLANNING- NON-SPATIAL DATA

The non-spatial data covered four important themes – socio-economic, climate, water and agriculture shown in Table 48. These non-spatial data are concurrently used for analysis along with the spatial data mentioned above to identify the key water challenges, prepare water budget by understanding the supply and demand and develop water actions to the different land use and

slope categories. The process started with mapping of the administrative (habitations/panchayat/revenue village, Block/taluk), agro-ecological (regional and sub-regional, climatic and agricultural zonation) and hydrological (drainage points/watersheds/sub basin) units keeping GP as the lowest unit of planning and execution.

TABLE 47. CWRM- NON-SPATIAL PARAMETERS OF VADALAPIRANTHAN GP

Key CWRM Parameter	Count
Climate Vulnerability Area - 1 : Socio-Economic	
Geographical Area (ha)	345
Male population	375
Female population	389
Total population	764
SC population	0
ST population	3
Vulnerable population	3
Households (HH's)	206
Only one room HH's	7
Female Headed HH's	140
Vulnerable Households	47
% of Vulnerable Households	23
Registered Mahatma Gandhi NREGA Job cards	611
Active person working in Mahatma Gandhi NREGA job Cards	214
Drinking Water Sources	15
Ground Water - Drinking source	4
Surface water - Drinking source	1
Sum of drinking water sources	5
HH's have tap water connection for drinking water	23
HH's dependent on other sources for drinking water	183
Annual Greywater Generation (ha.m)	1.39
Climate Vulnerability Area 2: Climate	
Average Annual Rainfall (mm)	1047
Average Annual Temperature (oC)	27.9
Climate Vulnerability Area 3: Water Resources	
Canal Network in meters	
Length of Main Canal	1
Water Courses (Field Channels)	2

Traditional waterbodies in numbers	
No. of Tanks (PWD & Union)	1
No. of Ooranis	5
Irrigation Facilities in ha	
Area under Tank Irrigation	24.13
Area under Canal Irrigation	0
Area under Open & Tube Well Irrigation	19.96
Catchment Area wise Available Runoff in ha.m	
Good Catchment Area	0.72
Average Catchment Area	0
Bad Catchment Area	0.29
Watershed and Drainage Networks	
Length of Natural Drainage Lines in meter	1960
No. of Natural Drainage Lines	2
No. of Micro-watersheds	2
Water Demand in ha.m	
Water demand for Humans	0.02
Water demand for Livestock	0.01
Water demand for Agriculture	0.68
% GW utilization for Drinking	47
% GW utilization for Livestock	87
% GW utilization for Agriculture.	100
% SW utilization for Drinking	53
% SW utilization for Livestock	13
% SW utilization for Agriculture	0
Climate Vulnerability Area 3: Agriculture	
Area under Land Resources in ha	
Forest land	151.62
Non-Agricultural Uses	39.51
Barren & Un-cultivable Land	0
Permanent Pastures and Other Grazing Land	0
Land Under Miscellaneous Tree Crops etc.	0
Cultivable Waste Land	0
Fallows Land other than Current Fallows	0
Current Fallow land	100.12
Unirrigated Land	9.72
Area Irrigated by Source	44.09
Land under Catchment Area in ha	
Good Catchment	191.13
Average Catchment	0
Bad Catchment	153.93

Crop Details in ha	
Irrigated Area	48.7
Rainfed area	0
Area under Paddy Cultivation	41
Crop Water Requirement - Irrigated condition in ha.m	0.68
Crop Water Requirement - Rainfed condition in ha.m	0
Soil Resources: Status of Available Nitrogen in %	
Very Low	0
Low	100
Medium	0
High	0
Very High	0
Status of Organic Carbon in %	
Very Low	0
Low	100
Medium	0
High	0
Very High	0
Status of Soil Micro Nutrients in %	
Sufficient	63
Deficient	37
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 Soil	19
Fine Soil	49
Coarse loamy	0
Soil Water Permeability	Moderate
Soil moisture and ET	
Volumetric Soil Moisture in %	23
Estimated Soil Moisture in ha.m	4.87
ET Losses in ha.m	1.66
Means of Water Extraction in %	
Gravity	5
Lifting	95

Irrigation Methods in %	
Wild Flooding	55
Control Flooding	45
Livestock in No.	
Cattle population	337
Sheep population	224
Goat population	178
Poultry	0.00

8.3.3 | KEY WATER CHALLENGES

Socio-Economic



1. Female population is slightly higher than male population,
2. 23% of the households are vulnerable
3. 68% HH are female headed
4. Access to safe disposal of domestic grey water is limited

Water



1. No minor canals, distributaries in this GP
2. 5 ooranis in the GP
3. dependence on ground water is high:
 - 47% for domestic,
 - 87% for livestock and
 - 100 % for agriculture
4. 1.01 MCM is available as run off in the village and currently harvested only 0.01 MCM in the traditional waterbodies. Hence dependence on ground water is more across the sectors.
5. No land area left in common land which has average catchment

Agriculture and Allied Sector



1. 55% of the total geographical area is under common land of which 44% is predominantly under forest area while the remaining 45% is under individual land.
2. Considerable portion under current fallow (29 %)
3. Area under cultivation is only 16 % of total geographical area which 3 % under rain fed and remaining 13 % irrigation.
4. Low soil nitrogen and carbon
5. Alkaline soil
6. Means of extraction by lifting

8.3.4 | PROPOSED WASCA TREATMENT AND EXPECTED CONSERVATION

The appropriate and site-specific works are identified for the development of public and common land, agriculture and allied activities, rural infrastructures and climate resilient measures to reduce the vulnerability in the GP. About 40.6% of the total land area is taken for WASCA activities

like plantation, conservation works. The total proposed area for treatment is 140.39 ha (Figure 8.18) and expected run off conservation due to these proposed treatment is 0.38 ha.m (Figure 8.19). About 61% of the proposed work is under public and common land development.

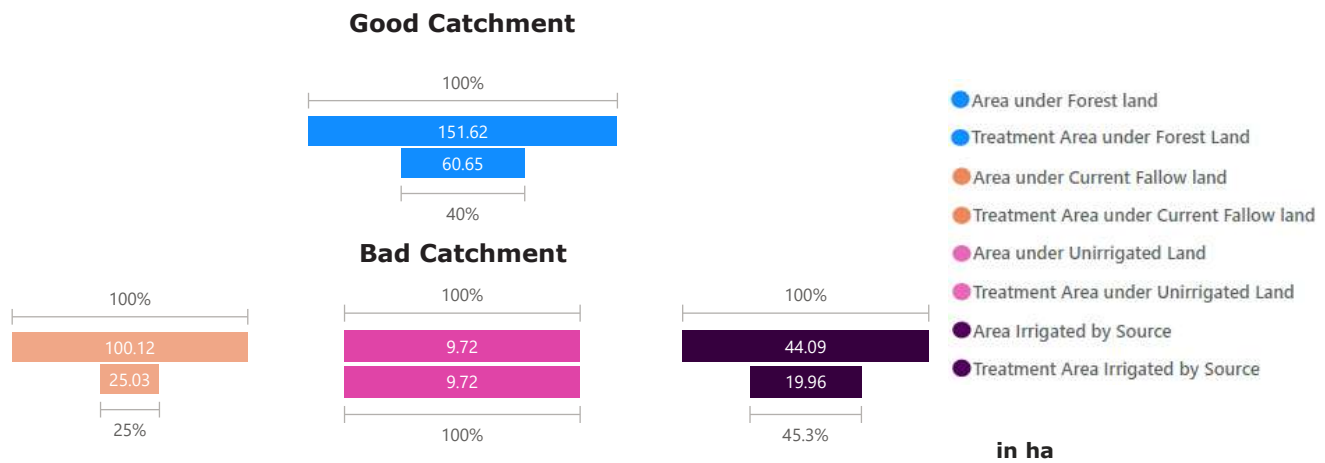


Figure 8.18. Proposed land resource treatment under WASCA in Vadalapiranthan GP

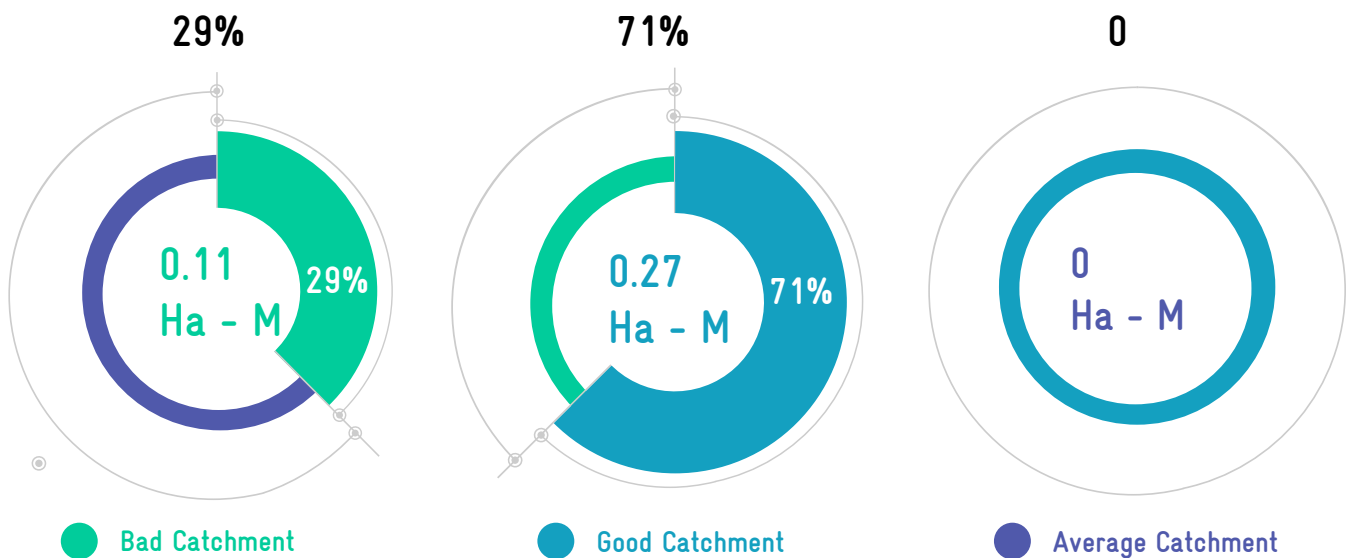


Figure 8.19. Expected runoff conservation after treatment

8.3.5 | PERSPECTIVE PLAN - WORKS PROPOSED: WATER ACTIONS

The detailed perspective plan and estimates of the work, budget and personal days for three years from 2021-2022 to 2023-2024 in the Vadalapiranthan GP are shown in Ta-

ble 49. Since it is an undulating terrain village, attention was given to include appropriate works to improve the common and public land development (Figure 8.20 to 8.23).




TABLE 48. PERSPECTIVE PLAN OF VADALAPIRAIKNTHAN GP FY (2021-2024)

CWRM Water Action 1: Improvement of Public & Common Lands Development							
Name of the work	CVI Impacting (WASCA TN)	SDG Goal	Ridge type	No. of Works	Estimated cost (INR in Lakhs)	Estimated Person Days	
Contour Continuous Bunds for Afforestation area (m)	W3	SDG 1,2,6,13&15	Upper	2	0.05	20	
Afforestation in Public/common lands (ha)	C1,C2,C3,W3	SDG 1,2,6,13&15		0	0	0	
Drainage Line Treatment (m)	W1,W3,W4	SDG1 & 6		2	0.06	10	
Block Plantation (Community)-(ha)	C1,C2,C3, W3,S2	SDG 1,6&13	Middle	4	40	15,624	
Silvi-pasture Development (ha)	C1,C2,C3, W3,	SDG 6,12&13		2	32	12,500	
Linear Plantation (km)	C1,C2,C3, W3,S2	SDG 1,2,6,12&13		6	10.8	4,218	
Avenue plantation (km)	C1,C2,C3, W3,S2	SDG 1,6&13		1	1.8	703	
Composting (No. of units)	W1	SDG1& 6	Lower	14	2.38	210	
Canal Bund Plantation (m)	C1,C2,C3, W3,S2	SDG 1,6&13		1	7.5	2,930	
Irrigation Channel Plantation (m)	W4,W5,S2	SDG 1,2&6		1	0.02	6	
Nursery Development (No. of units)	C1,S2,S4	SDG 1,2&6		206	3,090	4,82,864	
Restoration of waterbodies: a. PWD and Union Tanks (No.)	S2, S1	SDG 1, 13 &14		1	5	800	
Restoration of waterbodies: b. Ponds (No.)	S2, S1	SDG 1, 13 &14		5	5	1,000	
Artificial Recharge Structure (No. of units)	W3	SDG 1,2&6		8	20	3,128	
Water Course - Irrigation Channels - Desilting (m)	C1,C2,C3, W3,S2	SDG 1,6&13		1	0.02	6	
Subtotal				254	3,214.63	5,24,019	
CWRM Water Action 2: Agricultural and allied Sector development							
Farm Bunding with Boundary Trenches - Individual (ha)	A1,A3, W1,W3	SDG 1,2&6	Lower	7	10.5	4,102	
Construction of Farm Ponds - Individual (No. of units)	A1,A3, W5,W1, W3	SDG 2& 6		31	62	24,211	
Land development - Individual (ha)	W1,W5,A1, A3,S2,S4	SDG 2,6&13		27	270	1,05,462	
Dry land Horticulture/Agro-forestry - Individual (ha)	A1,A3,A4, W1,S4,S2,C1	SDG 1& 2		2	17	6,642	
Azolla units - Individual (No. of units)	A3,A4,S4	SDG 1& 2		47	7.05	1,081	
NADEP Vermi compost (No. of units)	A3, W1, S4	SDG 1& 2		47	8.46	1,269	
Fodder development - Community & Individual	A3, S4	SDG 1& 2		47	69.56	1,10,168	

Cattle Shelters (No. of units)	S4	SDG 1& 2	Lower	47	99.64	15,557
Goat Sheep Shelters (No. of units)	S4	SDG 1& 2		14	31.78	4,970
Cattle Trough (No. of units)	W5,S4	SDG 1& 2		47	2.35	282
Construction of new well	S2,S4	SDG 1& 2		8	40	7,408
Subtotal				324	618.34	2,81,152
CWRM Water Action 3: Rural Water Management						
Soak Pits (Community) (No. of units)	W3,S2	SDG 1& 6	Lower	2	0.26	40
Soak Pits (Individual) (No. of units)	W3,S2	SDG 1& 6		47	4.7	752
Roof Rain Water harvesting (No. of units)	W3,S1,S3	SDG 1& 6		2	8	1,250
Subtotal				51	12.96	2,042
Grand total				629	3,846	8,07,213

Regarding CWRM themes of the total No. of projects identified, 52 % works are in agriculture and allied sector while 40% works are in public and common land, and 8% in rural water management. Table 50 provides the summary of the estimates of the work budget, and personal days for three years from 2021-2024 in Vadalapiranthan GP.

TABLE 49. SUMMARY OF WORKS IDENTIFIED, ESTIMATED PERSON-DAYS FOR 2021-22 TO 2023-2024 FOR VADALAPIRANTHAN GP

CWRM themes	No of works 	Estimated budget (INR in lakhs) 	Estimated person days 
Public and common land development	254	3214.63	5,24,019
Agriculture and Allied sector development	324	618.34	2,81,152
Rural water management	51	12.96	2,042
TOTAL	629	3,846	8,07,213

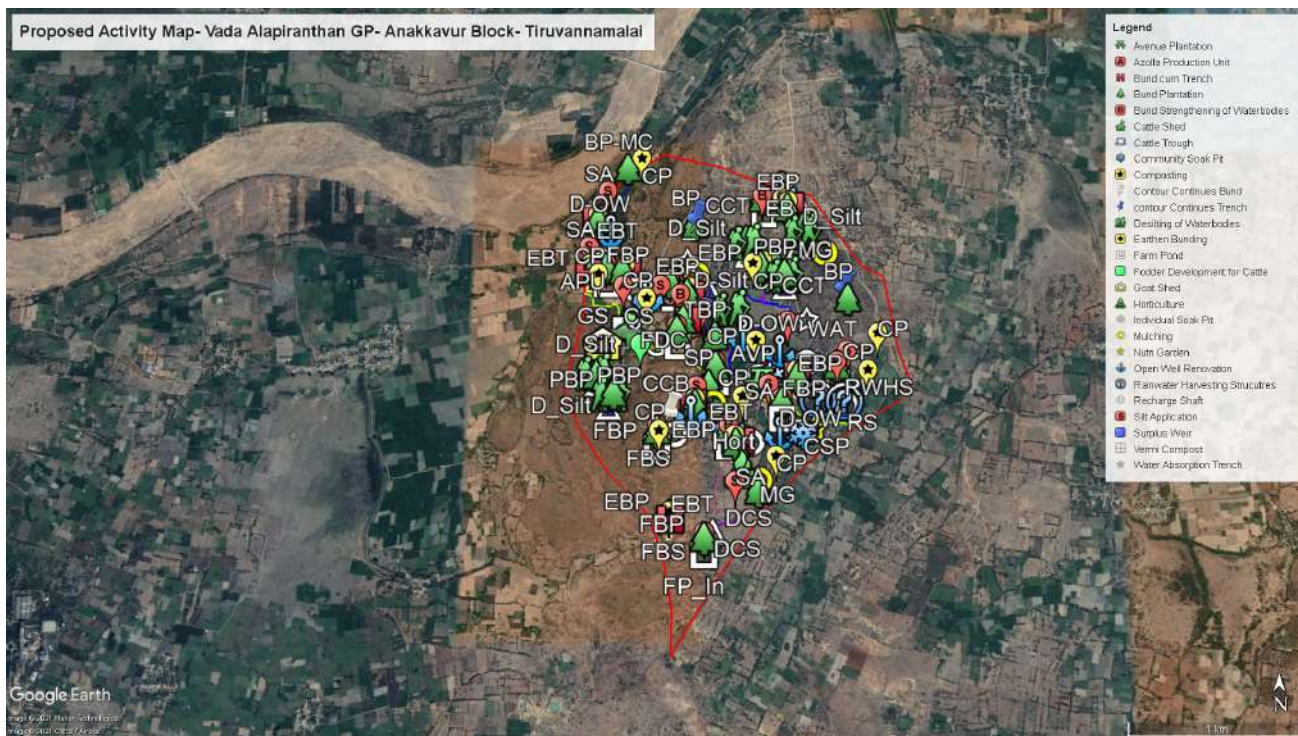


Figure 8.20. Proposed action plan of Vadalapiranthan GP

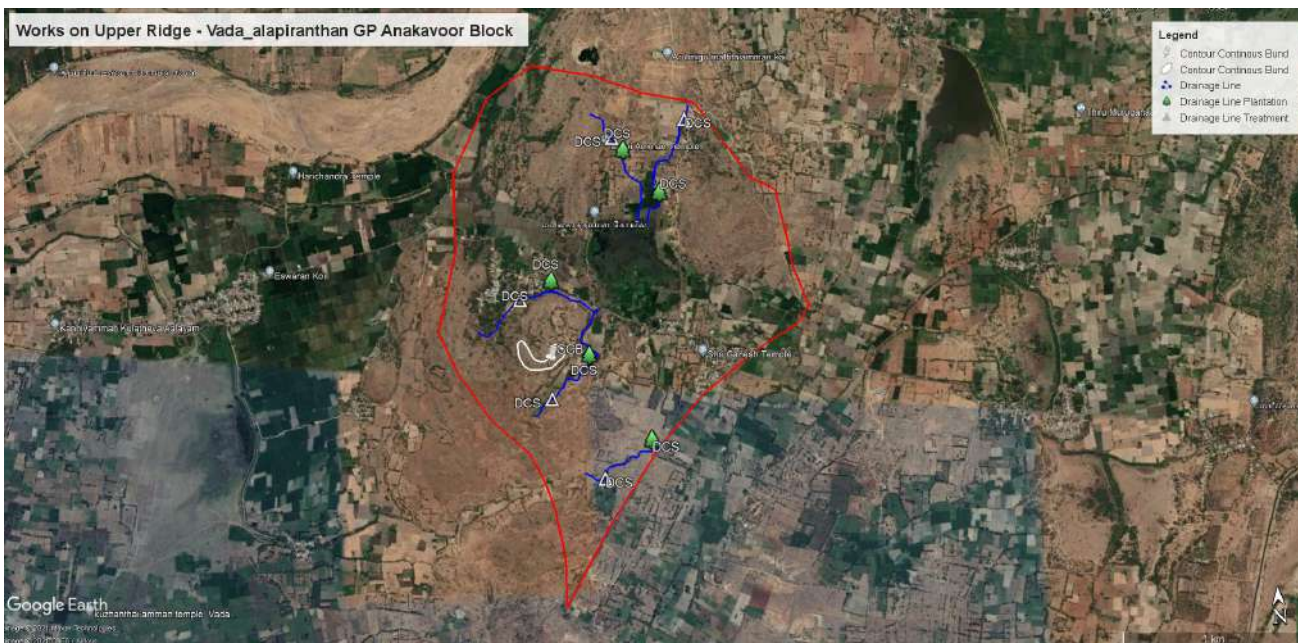


Figure 8.21. Proposed works on upper ridge of Vadalapiranthan GP

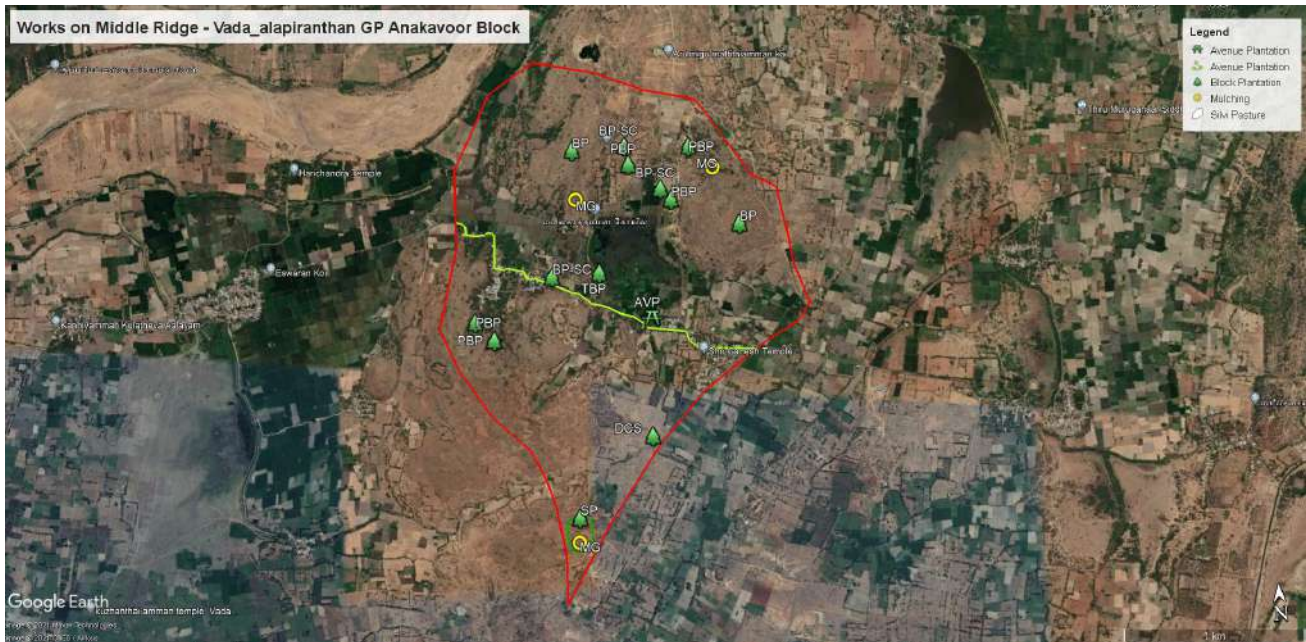


Figure 8.22. Proposed works on middle ridge of Vadalapiranthan GP

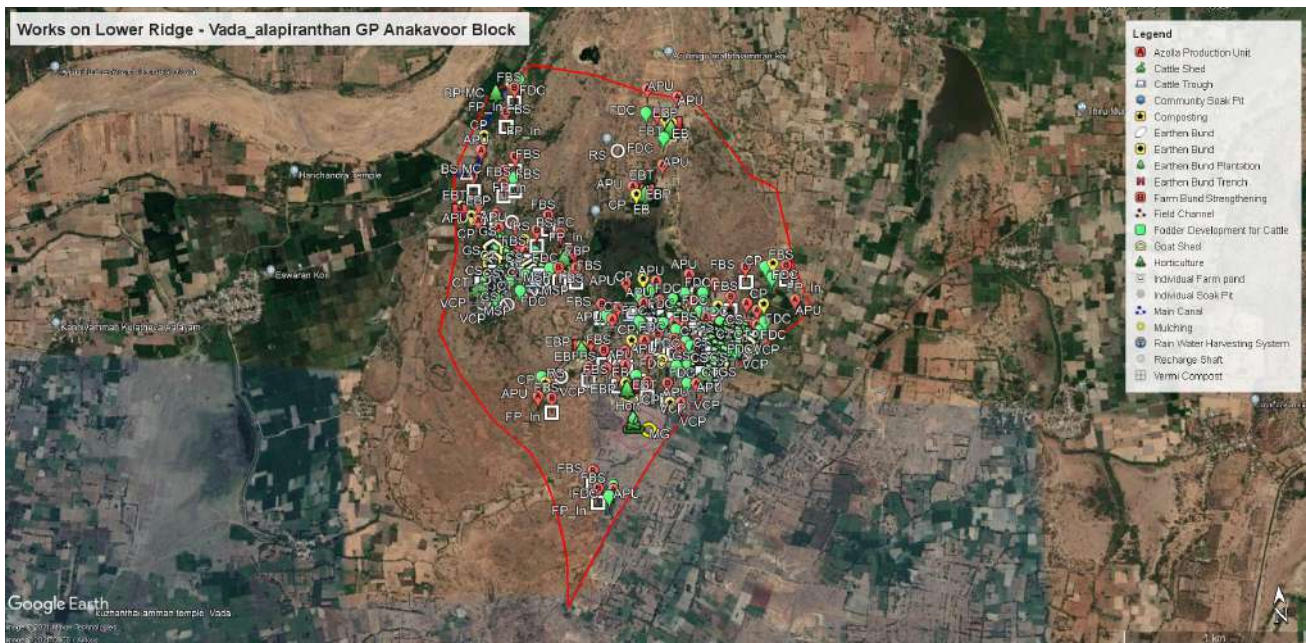


Figure 8.23. Proposed works on lower ridge of Vadalapiranthan GP

8.3.6 | IMPACTS

The proposed water actions based on the above key water challenges covers a three years' period from 2021-2022 to 2023-2024, similar to Vadalapiranthan GP, Anakkavoor Block. At the end of the implementation period i.e. on the year 2024, the following im-

pacts are envisaged (Table 51). It is expected that the impacts have potentially reduced the vulnerability and improved the resilience of the system to the projected climatic change events and ensure water security.

TABLE 50. WASCA – WATER ACTION INDICATORS AND 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	60.65 ha under afforestation
3	Percentage reduction in the annual surface runoff	3	45.16 ha.m surface runoff harvested and stored
4	The proportion of land treated under WASCA	4	41% of the total geographical area of the village treated under WASCA in three years
5	Drainage line treatment	5	2 km length of drainage lines treated

6
TRADITIONAL WATER
BODIES RESTORED

60.65 ha
AFFORESTATION

45.16 ha.m
SURFACE RUNOFF
HARVESTED

41%
AREA OF THE VILLAGE
TREATED

2 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.	14 farm ponds established
2.	Reducing area under fallow lands	2.	100 ha under fallow land restored for cultivation
3.	Improvement in soil health	3.	47 units of vermicompost established
4.	No of artificial recharge structures proposed	4.	8 artificial recharge structures were established to replenish groundwater flow

14
FARM PONDS

100 ha
FALLOW LAND RESTORED

47
VERMI COMPOST

8
ARTIFICIAL RECHARGE
STRUCTURES

WASCA CWRM ACTION PLAN
DEVELOPMENT OF RURAL INFRASTRUCTURE

INDICATOR	OUTCOMES/ IMPACT
1. Number of villages having complete solid and liquid waste management systems	1. Two community level and 47 individual level soak pits were constructed for grey water management to maintain hygiene in the village
2. Roof rainwater harvesting measures	2. Two units of roof rainwater harvesting and storing established
3. Nutri gardens	3. 206 households established Nutri-gardens in homesteads

2 COMMUNITY & **47**
INDIVIDUAL SOAK PITS





2
COMMON ROOF
RAINWATER HARVESTING

206
NUTRI-GARDENS

8.3.7 | MAHATMA GANDHI NREGS PROPOSALS

The table 52 provides both the prospective plan for a three years' period and annual plan for the one-year period from 2021-2022 on the shelf of projects/number of works and number of person days.

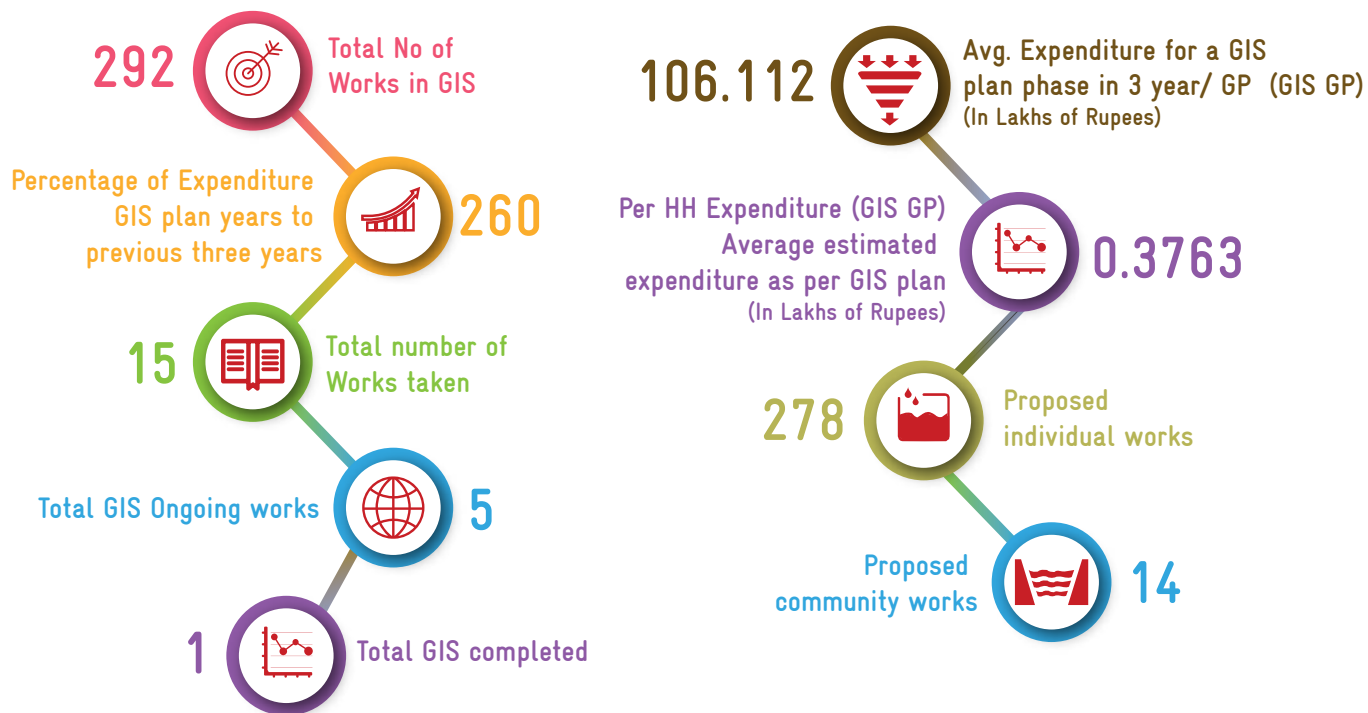
TABLE 51. PROPOSAL FOR THE MAHATMA GANDHI NREGS, VADALAPIRATHAN GP

	No of works	No of person days
 Perspective plan	 629	 18,18,702
 Annual plan	568	72,74,81

8.3.7 | GIS PLAN IMPLEMENTATION AND KEY PARAMETERS

The GIS plan implementation and key parameters performance in Vadalapiranthan Block is represented in Table 53.

TABLE 52. GIS PLAN IMPLEMENTATION AND KEY PARAMETERS PERFORMANCE IN VADALAPIRANTHAN 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 initiative to address the problem holistically through comprehensive vulnerability assessment at district and block level to identify the vulnerable area and its key problems”

In recent decades, the water demand is increasing at a fast rate due to rapid surge of population, industrial and economic growth. The evident changes in climate change and its extremities are bringing more threats to water security. Frequent monsoon failures lead to acute water scarcity and severe droughts. Thus, dependency on ground water has increased many folds during recent years that has resulted in lowering of ground water levels and even drying up of wells. WASCA TN took an initiative to address the problem holistically through comprehensive vulnerability assessment at District and Block level to identify the vulnerable areas via water, agricultural and socio-economic parameters used at District level and further expanded to 110 parameters at Block level. The spatial and non-spatial CWRM parameters for interrelated areas are used to assess the adaptive capacity of the rural water security. Blocks are identified and options ‘key water actions’ are implemented in public and allied sector, rural indicators/parameters and key areas along with climate resilient measures building the resilience of the local communities 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 outcomes are,

01

Participatory Rural Appraisal
at village level



Preference of key water actions
based on water demand and budget

02



Convergence along with interdisciplinary line
departments such as agriculture, horticulture,
animal husbandry, water resources

03



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/dccb/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	http://mnregaweb4.nic.in/netnrega/app_issue.aspx?page=s&flag=eng&state_name=TAMIL%20NADU&state_code=29&fin_year=2020-2021&source=national&Digest=3ics8+9Z9fEQ8yzi5E3qcQ
Registered MGNREGA Job cards	
Active person working in MGNREGA job Cards	
Water Resources	
Irrigation Facilities	Census-2011, MoHA, GOI https://censusindia.gov.in/2011census/dccb/DCHB.html
Area under Tank Irrigation	
Area under Canal Irrigation	
Area under Open & Tube Well Irrigation	https://ejalsbakti.gov.in/IMISReports/Reports/WaterQuality/WQ/rpt_WQ_DistrictProfile_S.aspx?Rep=0&RP=Y
Water Quality	
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	Census-2011, MoHA, GOI https://censusindia.gov.in/2011census/dccb/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	
Area under Unirrigated Land	
Area Irrigated by Source	

Soil Resources: Status of Available Nitrogen	
Very Low (VL)	
Low (L)	
Medium (M)	
High (H)	
Very High (VH)	
Status of Organic Carbon	
Very Low (VL)	https://soilhealth.dac.gov.in/NewHomePage/NutriPage
Low (L)	
Medium (M)	
High (H)	
Very High (VH)	
Status of Soil Micro Nutrients	
Sufficient	
Deficient	
Status of Physical condition of the soil	
Acidic Sulphate	https://soilhealth.dac.gov.in/NewHomePage/NutriPage
Strongly Acidic	
Highly Acidic	
Moderately Acidic	
Slightly Acidic	
Neutral	
Moderately Alkaline	
Strongly Alkaline	
Soil Texture	
% of Clay Soil	NRSC
% of Fine Soil	
% of Coarse loamy	
Soil Water Permeability	standard table
Soil moisture and ET	
Volumetric Soil Moisture	https://indiawris.gov.in/wris/#/
Livestock	
Cattle Population	https://farmer.gov.in/livestockcensus.aspx
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 (haM)
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 classification of catchments.

Good catchment area: It consists of the runoff generated from sloping 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, with moderate slopes 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 haM	Annual Grey water in Cum/10000

ANNEXURE 3.6

GP WISE STATUS OF WATER RESOURCE AND ITS SUPPLY AND DEMAND

S No	Key CWRM Parameter	Gram Panchayat	Canal network		Water Courses (Field Channels) in m	Tradational Water bodies		
			Main Canal in m	Minor Canal in m		No. of Tanks (PWD & Union)	No. of Ooranis	Other Surface Water Bodies
		Alathur	2,000	1,500	-	3	9	-
		Alathurai	2,200	1,000	-	1	6	3
		Anakkavoor	3,000	1,800	-	3	5	-
		Anappathur	1,500	-	1,800	2	2	-
		Arasur	1,230	-	1,530	3	4	-
		Athi	1,320	-	1,436	1	6	-
		Cheyayatraivendran	900	-	1,150	1	3	-
		Chithamur	1,020	-	1,125	1	4	-
		Echur	980	-	1,200	2	7	-
		Elaneerkundram	1,020	-	1,300	1	6	-
		Irungal	1,100	-	1,400	1	4	-
		Kizhmethapakkam	980	-	1,500	2	7	-
		Kizhathur	850	-	1,200	1	4	-
		Kizhkolathur	940	-	1,800	2	4	-
		Kizhneerkundrum	1,023	-	1,400	2	2	-
		Koozhamandal	1,020	-	1,750	2	20	-
		Kottakoram	1,015	-	1,800	2	5	-
		Kovilur	980	-	1,650	3	6	-
		Kunnavakkam	800	-	1,350	2	2	-
		Kurumbur	1,020	-	1,750	1	3	-
		Madipakkam	1,220	-	1,947	2	6	-
		Mahajanampakkam	860	-	1,058	2	8	-
		Mel Kolathur	905	-	1,157	1	-	-
		Mel Nemili	942	-	1,268	2	4	-
		Mulagiripattu	760	-	1,298	2	4	-

Type 1

S No	Gram Panchayat	Canal network			Tradational Water bodies		
		Main Canal in m	Minor Canal in m	Water Courses (Field Channels) in m	No. of Tanks (PWD & Union)	No. of Ooranis	Other Surface Water Bodies
Type 1	Nallallam	987	-	1,380	1	5	-
	Narmapallam	752	-	1,129	2	6	-
	Nedungal	964	-	1,450	2	4	-
	Nelvoy	1,014	-	1,647	2	3	-
	Pazhanjur	852	-	1,125	2	6	-
	Perumpalai	1,050	-	1,847	2	5	-
	Purisai	745	-	1,325	2	13	-
	Sengadu	985	-	1,952	2	14	-
	Soundariyapuram	961	-	1,267	2	11	-
	Thavasi	862	-	1,269	2	2	-
	Thenelapakkam	860	-	1,356	2	3	-
	Theneluppai	985	-	1,369	2	8	-
	Thenkalpakkam	1,012	-	1,560	2	3	-
	Thenthandalam	985	-	1,347	2	1	-
	Thethurai	1,120	-	1,957	2	10	-
	Thirumpoondi	1,045	-	1,589	2	4	-
	Ukkal	994	-	1,590	2	4	-
	Vachanur	1,100	-	1,687	2	10	-
	Vadalapiranthan	1	-	2	1	5	-
	Vadathinallur	1,045	-	1,598	2	10	-
Veerampakkam	951	-	1,687	2	4	-	
Vengodu	950	-	1,942	2	7	-	
Type 2	Erumaivetti	1,500	2,000	-	2	2	-
	Kulamandai	1,850	2,350	-	1	2	-
	Akkur	3,500	1,930	-	5	5	-
	Karanai	2,200	2,620	-	4	3	-
Type 3	Melma	1,200	1,850	-	3	6	-
	Payyur	1,920	2,550	-	2	10	-
	Thenmavandal	1,950	2,600	-	2	6	-
	Vellai	2,050	2,600	-	3	2	-

S No	Key CWRM Parameter	Gram Panchayat		Area under Irrigation Facilities		Catchment Area wise Available Runoff			Watershed and Drainage Networks		
		Tank Irrigation	Open & Tube Well Irrigation	Good Catchment Area	Average Catchment Area	Bad Catchment Area	Length of Natural Drainage Lines	Number of Natural Drainage Lines	Number of Micro-Watersheds		
		81	80	89	8	69	4,116	4	5		
	Alathur	89	27	52	-	37	8,080	7	3		
	Alathurai	57	31	228	1	174	19,090	5	5		
	Anakkavoor	109	75	107	1	91	7,444	4	3		
	Anappathur	42	44	48	-	50	7,042	6	4		
	Arasur	45	64	55	-	46	8,045	4	2		
	Athi	49	54	70	2	71	3,230	4	3		
	Cheyraivendran	23	10	22	1	28	1,439	1	3		
	Chithamur	72	87	76	13	89	4,950	4	4		
	Echur	50	40	46	8	47	4,171	3	3		
	Elanerkundram	94	58	50	2	61	5,781	6	6		
	Irungal	40	41	58	2	59	6,157	3	6		
	Kizhnethapakkam	30	45	41	-	39	2,538	1	1		
	Kizhathur	41	37	72	0	39	3,587	6	5		
	Kizhkolathur	40	66	107	9	41	1,913	2	3		
	Kizhneerkundrum	30	34	32	1	39	555	1	3		
	Koozhamandal	10	17	24	1	33	-	-	3		
	Kottakoram	80	77	64	41	34	1,853	2	4		
	Kovilur	25	31	41	2	45	-	-	1		
	Kunnavakkam	21	29	22	0	29	2,367	3	2		
	Kurumbur	25	46	65	1	80	1,116	1	7		
	Madipakkam	51	38	48	1	76	1,253	1	4		
	Mahajanampakkam	25	35	31	2	22	1,311	2	3		
	Mel Kolathur	30	32	37	-	54	1,169	1	4		
	Mel Nemili	50	35	39	-	34	2,185	3	2		
	Mulagripattu	-	43	44	1	31	815	1	2		
	Nallallam	19	30	28	3	33	2,122	5	3		
	Narmapallam	54	29	51	3	65	2,008	2	2		
	Nedungal										

Type 1

S No	Key CWRM Parameter	Gram Panchayat	Area under Irrigation Facilities		Catchment Area wise Available Runoff			Watershed and Drainage Networks		
			Tank Irrigation	Open & Tube Well Irrigation	Good Catchment Area	Average Catchment Area	Bad Catchment Area	Length of Natural Drainage Lines	Number of Natural Drainage Lines	Number of Micro-Watersheds
Type 1		Nelvoy	25	49	13	0	34	426	1	4
		Pazhanjur	35	32	59	-	43	2,385	5	4
		Perumpalai	20	17	34	-	43	988	1	2
		Purisai	50	274	122	3	122	3,472	7	7
		Sengadu	60	38	90	5	102	4,890	7	9
		Soundariyapuram	51	40	36	16	37	1,546	2	4
		Thavasi	20	51	27	2	53	1,300	3	4
		Thenelapakkam	44	43	38	9	20	2,740	5	3
		Theneluppai	30	18	36	-	40	3,570	5	3
		Thenkalpakkam	52	45	51	1	38	2,210	3	6
		Thenthandalam	15	22	17	-	28	1,326	2	3
		Thethurai	54	69	57	2	70	4,581	6	4
		Thirumpoondi	53	37	74	-	44	7,704	5	5
		Ukkal	160	160	101	3	108	6,719	4	4
		Vachanur	30	42	32	2	48	2,688	2	7
	Type 2		Vadalapiranthan	24	20	1	-	0	1,960	2
		Vadathinallur	70	141	106	2	92	3,654	6	3
		Veerampakkam	18	31	98	16	45	4,931	4	5
		Vengodu	20	55	59	1	87	2,842	1	4
		Erumaivetti	75	44	34	6	35	1,281	2	2
Type 3		Kulamandai	75	44	11	2	12	1,030	2	2
		Akkur	85	103	77	5	116	1,003	1	5
		Karanai	28	65	82	9	81	-	-	4
		Melma	119	109	74	5	96	4,045	4	4
		Payyur	63	56	108	1	62	2,120	3	7
		Thenmavandal	28	15	40	2	39	2,012	4	5
		Vellai	18	49	44	8	37	2,392	3	2

S No	Key CWRM Parameter	Gram Panchayat	Water Demand								
			For Humans	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
Type 1		Alathur	5	210	3	17	96	94	83	4	6
	Alathurai	4	32	2	92	100	78	8	-	22	
	Anakkavoor	12	369	8	97	97	79	3	3	21	
	Anappathur	7	420	3	86	95	86	14	5	14	
	Arasur	3	103	2	80	98	87	20	2	13	
	Athi	2	130	2	83	99	70	17	1	30	
	Cheyyatraivendran	5	129	2	80	96	90	20	4	10	
	Chithampur	1	101	1	75	100	96	25	-	4	
	Echur	10	199	6	91	91	87	9	9	13	
	Elaneerkundram	4	241	3	89	96	82	11	4	18	
	Irungal	5	245	3	87	95	90	13	5	11	
	Kizhneathapakkam	4	48	2	89	94	60	11	6	40	
	Kizhathur	3	64	1	86	97	92	14	3	8	
	Kizhkolathur	2	224	1	57	97	90	43	3	10	
	Kizhneerkundrum	2	137	1	71	96	78	29	4	22	
	Koozhamandal	5	53	3	93	96	66	7	4	34	
	Kottakoram	3	106	1	82	94	94	18	6	6	
	Kovilur	5	284	3	90	98	78	10	2	22	
	Kunnavakkam	3	59	2	82	99	55	18	1	45	
	Kurumbur	3	102	2	78	92	94	22	8	6	
Madipakkam	3	92	2	78	91	82	22	9	18		
Mahajanampakkam	5	53	2	80	98	80	20	2	20		
Mel Kolathur	1	79	1	80	89	85	20	11	15		
Mel Nemili	4	99	1	78	93	95	22	7	5		
Mulagripattu	2	132	1	89	97	74	11	3	26		
Nallallam	2	87	1	85	86	84	15	14	16		
Narmapallam	2	65	2	78	97	83	22	3	17		

S No	Gram Panchayat	Water Demand									
		For Humans	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	
Type 1	Nedungal	5	70	2	75	99	89	25	1	11	
	Nelvoy	2	96	1	75	95	90	25	5	10	
	Pazhanjur	2	183	1	60	92	95	40	8	5	
	Perumpalai	3	91	1	85	98	97	15	2	3	
	Purisai	7	526	5	85	89	63	15	11	37	
	Sengadu	7	632	2	91	99	92	9	1	8	
	Soundariyapuram	3	86	2	91	91	87	9	9	13	
	Thavasi	5	136	2	89	99	86	11	1	14	
	Thenelapakkam	4	69	3	88	86	92	12	14	8	
	Theneluppai	3	79	1	80	97	75	20	3	25	
	Thenkalpakkam	2	0	2	88	100	90	12	-	10	
	Thenthandalam	2	64	1	67	98	94	33	2	6	
	Thethurai	3	79	2	83	93	94	17	7	6	
	Thirumpondi	4	191	4	38	93	82	62	7	18	
	Ukkal	7	104	8	92	88	71	8	12	29	
Type 2	Vachanur	3	62	2	85	88	96	15	12	4	
	Vadalapiranthan	0	0	1	47	87	100	53	13	-	
	Vadathinallur	4	87	1	82	95	97	18	5	3	
	Veerampakkam	6	59	2	89	95	93	11	5	7	
	Vengodu	4	152	3	42	95	87	58	5	13	
	Erumaivetti	3	186	3	33	98	89	67	2	11	
	Kulamandai	2	186	1	37	98	89	63	2	11	
	Akkur	8	155	3	55	99	69	45	1	31	
	Karanai	4	67	3	70	84	83	30	16	17	
	Melma	4	105	1	47	99	84	53	1	16	
Type 3	Payyur	5	84	4	100	97	79	-	3	21	
	Thenmavandal	2	129	1	100	96	93	-	4	7	
	Vellai	5	50	1	73	99	87	27	1	13	

ANNEXURE 3.7

4.2 GP WISE STATUS OF AGRICULTURE RESOURCE

S No	Key CWRM Parameter	Gram Panchayat	Land Resources											
			Forest land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source		
Unit			ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1		Alathur	3	234	-	19	11	-	38	166	6	161	ha	
		Alathurai	-	140	-	-	-	-	-	1	82	117	ha	
		Anakkavoor	-	608	-	-	3	-	145	608	91	89	ha	
		Anappathur	-	284	-	4	-	-	52	201	50	183	ha	
		Arasur	-	127	-	-	-	-	-	118	63	86	ha	
		Athi	-	139	7	-	-	-	47	82	8	109	ha	
		Cheyyatraivendran	-	186	-	6	-	-	-	262	13	103	ha	
		Chithamur	-	59	-	3	-	-	3	111	23	33	ha	
		Echur	29	175	-	16	11	20	63	104	148	159	ha	
		Elaneerkundram	-	122	-	4	-	23	2	103	27	119	ha	
		Irungal	-	134	-	-	8	-	-	152	24	152	ha	
		Kizhmethapakkam	-	155	-	5	2	-	53	73	107	81	ha	
		Kizhathur	-	109	-	-	-	-	10	114	12	75	ha	
		Kizhkolathur	108	84	-	0	-	0	6	55	68	78	ha	
		Kizhneerkundrum	225	61	-	2	6	25	13	58	40	106	ha	
		Koozhmandal	-	86	-	4	-	-	17	79	47	64	ha	
		Kottakoram	-	65	-	4	-	-	-	92	59	27	ha	
	Kovilur	-	172	-	-	59	88	-	-	25	157	ha		
	Kunnavakkam	-	91	18	-	5	1	-	165	17	56	ha		
	Kurumbur	-	58	-	1	-	-	-	56	49	50	ha		
	Madipakkam	8	158	8	-	4	-	110	196	48	71	ha		
	Mahajanampakkam	-	129	-	5	-	-	82	195	40	89	ha		
	Mel Kolathur	-	82	-	-	8	-	-	19	37	60	ha		

S No	Gram Panchayat	Land Resources									
		Forest land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Unit		ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
	Mel Nemili	-	100	-	-	-	-	-	100	104	62
	Mulagripattu	-	104	-	0	-	-	-	104	19	85
	Nallalam	-	117	-	0	2	-	-	117	21	43
	Narmapallam	-	74	-	10	1	-	-	74	12	49
	Nedungal	-	136	-	0	11	-	-	136	75	83
	Nelvoy	-	36	-	1	-	-	-	36	93	74
	Pazhanjur	-	158	-	-	-	-	-	158	92	67
	Perumpalai	-	90	-	-	-	-	-	90	13	37
	Purisai	-	320	5	9	1	-	-	320	23	324
	Sengadu	-	239	-	15	2	-	-	239	-	98
	Soundariyapuram	-	97	-	55	-	-	-	97	-	90
	Thavasi	-	72	-	5	-	-	-	72	10	71
	Thenelapakkam	-	101	-	1	30	-	-	101	-	37
	Theneluppai	-	95	-	-	0	-	-	95	16	48
	Thenkalpakkam	-	121	16	3	2	-	-	121	-	97
	Thenthandalam	-	46	-	-	-	-	-	46	6	37
	Thethurai	-	153	-	5	-	-	-	153	-	123
	Thirumpoondi	-	196	-	-	-	-	-	196	39	90
	Ukkal	-	265	5	-	9	-	-	265	-	320
	Vachanur	-	84	-	8	-	-	-	84	26	72
	Vadalapiranthan	152	40	-	-	-	-	-	40	-	44
	Vadathinallur	173	103	7	6	-	-	-	103	25	211
	Veerampakkam	-	261	-	56	2	-	-	261	20	49
	Vengodu	-	158	-	5	-	-	-	158	-	75

Type 1

S No	Key CWRM Parameter	Gram Panchayat	Land Resources											
			Forest land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source		
Unit			ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 2	Erumaivetti		-	92	-	6	-	17	2	77	20	89		
	Kulamandai		-	31	-	1	-	6	0	26	7	30		
Type 3	Akkur		-	206	-	16	3	-	5	244	182	188		
	Karanai		6	198	14	19	13	-	-	272	70	92		
	Melma		1	196	-	7	-	10	21	125	140	228		
	Payyur		20	265	2	3	-	-	2	123	89	119		
	Thenmavandal		-	105	-	2	4	-	10	103	52	43		
Vellai		-	117	-	-	29	-	28	100	2	67			

S No	Key CWRM Parameter	Gram Panchayat	Catchment Area			Crop Details							
			Good Catchment	Average Catchment	Bad Catchment	Irrigated Area	Rainfed area	Paddy Cultivation	Criticalop Water Requirement - Irrigated condition	Criticalop Water Requirement - Rainfed condition			
		Unit	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
		Alathur	236	29	371	138	5	72	209	2			
		Alathurai	140	-	200	21	-	21	32	-			
		Anakkavoor	608	3	933	265	8	222	366	3			
		Anappathur	284	4	486	263	13	191	416	5			
		Arasur	127	-	267	73	1	32	102	0			
		Athi	146	-	247	88	1	80	130	0			
		Cheyatraivendran	186	6	378	90	4	75	127	2			
		Chithamur	59	3	147	68	-	67	101	-			
		Echur	203	47	474	142	15	109	193	6			
		Elaneerkundram	122	27	251	160	8	110	238	3			
		Irungal	134	8	329	161	6	152	243	2			
		Kizhneathapakkam	155	7	313	34	2	31	48	1			
		Kizhathur	109	-	211	47	2	32	63	1			
		Kizhkolathur	191	0	207	139	4	65	223	1			
		Kizhneerkundrum	286	33	218	120	5	79	135	2			
		Kooshamandal	86	4	207	40	2	33	52	1			
		Kottakoram	65	4	178	84	6	56	104	2			
		Kovilur	172	147	182	185	4	167	283	2			
		Kunnavakkam	108	5	238	38	1	33	59	0			
		Kurumbur	58	1	156	70	6	58	99	2			
		Madipakkam	173	4	425	53	5	44	83	9			
		Mahajanampakkam	129	5	406	39	1	30	53	0			
		Mel Kolathur	82	8	116	53	4	48	77	2			
		Mel Nemili	100	-	286	78	6	45	97	2			
		Mulagripattu	104	0	181	95	3	67	130	2			
		Nallallam	117	3	166	63	1	54	87	0			
		Narmapallam	74	10	178	50	2	37	64	1			
		Nedungal	136	11	347	49	0	46	70	0			

Type 1

S No	Key CWRM Parameter	Gram Panchayat	Catchment Area			Crop Details					
			Good Catchment	Average Catchment	Bad Catchment	Irrigated Area	Rainfed area	Paddy Cultivation	Critical Water Requirement - Irrigated condition	Critical Water Requirement - Rainfed condition	
		Unit	ha	ha	ha	ha	ha	ha	ha	ha.m	ha.m
Type 1		Nelvoy	36	1	184	63	3	52	94	1	1
		Pazhanjur	158	-	232	130	11	96	179	4	4
		Perumpalai	90	-	228	84	2	52	90	1	1
		Purisai	325	10	654	391	47	256	507	19	19
		Sengadu	239	17	543	824	8	145	629	3	3
		Soundariyapuram	97	55	196	55	6	34	84	2	2
		Thavasi	72	5	282	93	1	88	136	1	1
		Thenelapakkam	101	31	108	44	7	27	67	2	2
		Theneluppai	95	0	212	56	2	39	78	1	1
		Thenkalpakkam	137	5	204	0	-	-	0	-	-
		Thenthandalam	46	-	148	47	1	31	64	0	0
		Thethurai	153	5	375	57	4	49	77	1	1
		Thirumpoondi	196	-	237	139	11	108	187	4	4
	Type 2		Ukkal	270	9	576	71	5	67	102	2
		Vachanur	84	8	256	36	5	15	60	2	2
		Vadalapiranthan	191	-	154	49	-	41	1	-	-
		Vadathinallur	284	9	491	59	3	50	86	1	1
		Veerampakkam	261	58	241	41	2	31	59	1	1
		Vengodu	158	5	462	102	5	66	150	2	2
		Erumaivetti	92	23	189	123	2	52	185	1	1
		Kulamandai	31	7	63	123	2	52	185	1	1
		Akkur	206	19	620	103	1	77	154	0	0
		Karanai	218	31	435	49	9	41	64	3	3
Type 3		Melma	197	17	514	64	1	43	104	0	0
		Payyur	287	3	332	64	2	26	83	1	1
		Thenmavandal	105	6	208	97	4	78	127	1	1
		Vellai	117	29	197	31	0	19	50	0	0

S No	Gram Panchayat	Soil Resources: Status of Available Nitrogen					Status of Organic Carbon				
		Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
	Unit	%	%	%	%	%	%	%	%	%	%
	Alathur	0.2	0.8	-	-	-	0.0	0.3	0.7	-	-
	Alathurai	0.0	1.0	-	-	-	0.0	0.1	0.9	-	-
	Anakkavoor	0.4	0.6	0.0	-	-	0.1	0.5	0.5	-	-
	Anappathur	0.5	0.5	0.0	-	-	-	0.4	0.6	-	-
	Arasur	0.8	0.2	-	-	-	0.5	0.5	-	-	-
	Athi	-	1.0	-	-	-	0.1	0.9	-	-	-
	Cheyraivendran	0.3	0.7	-	-	-	-	0.3	0.7	-	-
	Chithampur	-	1.0	-	-	-	0.1	0.9	-	-	-
	Echur	0.0	1.0	-	-	-	0.3	0.7	-	-	-
	Elaneerkundram	-	1.0	-	-	-	0.2	0.3	0.3	0.3	-
	Irungal	-	1.0	-	-	-	0.3	0.7	-	-	-
	Kizhmathapakkam	-	1.0	-	-	-	0.2	0.8	-	-	-
	Kizhathur	-	1.0	-	-	-	0.3	0.7	-	-	-
	Kizhkolathur	0.9	0.1	-	-	-	0.5	0.5	-	-	-
	Kizhneerkundrum	-	1.0	-	-	-	-	1.0	-	-	-
	Koozhmandal	-	1.0	-	-	-	0.2	0.8	-	-	-
	Kottakoram	-	1.0	-	-	-	0.2	0.8	-	-	-
	Kovilur	0.8	0.2	-	-	-	0.5	0.5	-	-	-
	Kunnavakkam	-	1.0	-	-	-	0.0	0.9	0.0	-	-
	Kurumbur	-	1.0	-	-	-	0.1	0.9	-	-	-
	Madipakkam	-	1.0	-	-	-	0.2	0.8	-	-	-
	Mahajanampakkam	0.0	1.0	-	-	-	0.2	0.8	-	-	-
	Mel Kolathur	-	1.0	-	-	-	0.5	0.5	-	-	-
	Mel Nemili	-	1.0	-	-	-	0.3	0.7	-	-	-
	Mulagripattu	0.8	0.2	-	-	-	0.4	0.6	-	-	-
	Nallalam	-	1.0	-	-	-	0.1	0.9	-	-	-
	Narmapallam	0.4	0.6	0.0	-	-	0.5	0.4	0.0	-	-
	Nedungal	-	1.0	-	-	-	0.0	1.0	-	-	-
	Nelvoy	0.9	0.1	-	-	-	0.6	0.4	-	-	-

Type 1

S No	Key CWRM Parameter	Gram Panchayat	Soil Resources: Status of Available Nitrogen					Status of Organic Carbon					
			Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)	
		Unit	%	%	%	%	%	%	%	%	%	%	%
Type 1		Pazhanjur	0.8	0.2	-	-	-	0.4	0.6	-	-	-	-
		Perumpalai	0.9	0.1	-	-	-	0.5	0.5	-	-	-	-
		Purisai	0.8	0.2	-	-	-	0.4	0.6	-	-	-	-
		Sengadu	0.8	0.2	-	-	-	0.5	0.5	-	-	-	-
		Soundariyapuram	-	1.0	-	-	-	0.0	1.0	-	-	-	-
		Thavasi	0.8	0.2	-	-	-	0.5	0.5	-	-	-	-
		Thenelapakkam	0.8	0.2	-	-	-	0.2	0.8	-	-	-	0.0
		Theneluppai	-	1.0	-	-	-	0.3	0.7	-	-	-	-
		Thenkalpakkam	-	1.0	-	-	-	0.2	0.8	-	-	-	-
		Thenthandalam	0.8	0.2	-	-	-	0.3	0.7	-	-	-	-
		Thethurai	-	1.0	-	-	-	0.0	1.0	-	-	-	0.0
		Thirumpoondi	0.8	0.2	-	-	-	0.5	0.5	0.0	-	-	-
		Ukkal	0.1	0.9	-	-	-	0.5	0.5	-	-	-	-
		Vachanur	-	1.0	-	-	-	0.0	1.0	-	-	-	-
	Type 2		Vadalapiranthan	-	1.0	-	-	-	-	1.0	-	-	-
		Vadathinallur	0.7	0.3	-	-	-	0.5	0.5	-	-	-	-
		Veerampakkam	-	1.0	-	-	-	0.0	1.0	-	-	-	-
		Vengodu	-	1.0	-	-	-	0.1	0.9	-	-	-	-
		Erumaivetti	75	25	-	-	-	49	51	-	-	-	-
		Kulamandai	75	25	-	-	-	49	51	-	-	-	-
		Akkur	97	99	-	-	-	4	96	-	-	-	-
Type 3		Karanai	43	57	-	-	-	-	70	30	-	-	-
		Melma	-	100	-	-	-	-	4	96	-	-	-
		Payyur	-	100	-	-	-	21	79	-	-	-	-
		Thenmavandal	40	60	-	-	-	-	29	71	-	-	-
		Vellai	44	56	-	-	-	-	44	56	-	-	-

S No	Key CWRM Parameter	Gram Panchayat	Status of Soil Micro Nutrients		Status of Physical condition of the soil								
			Sufficient	Deficient	Acidic Sulphate	Strongly Acidic	Highly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline	
		Unit	%	%	%	%	%	%	%	%	%	%	%
Type 1		Alathur	0.7	0.3	-	-	0.0	0.1	0.0	0.9	-	-	
		Alathurai	0.7	0.3	-	-	-	-	-	1.0	-	-	
		Anakkavoor	0.7	0.3	-	-	-	-	-	1.0	-	-	
		Anappathur	0.7	0.3	-	-	-	-	0.0	1.0	0.0	0.0	
		Arasur	0.6	0.4	-	-	-	-	-	1.0	-	-	
		Athi	0.5	0.5	-	-	-	-	-	1.0	-	-	
		Cheyatraivendran	0.6	0.4	-	-	-	-	-	1.0	-	-	
		Chithamur	0.6	0.4	-	-	-	0.4	0.0	0.6	-	-	
		Echur	0.6	0.4	-	-	-	-	-	1.0	-	-	
		Elaneerkundram	0.6	0.4	-	-	-	-	-	1.0	-	-	
		Irungal	0.5	0.5	-	-	-	-	-	1.0	-	-	
		Kizhneathapakkam	0.6	0.4	-	-	-	0.0	-	1.0	-	-	
		Kizhathur	0.6	0.4	-	-	-	-	-	1.0	-	-	
		Kizhkolathur	0.7	0.3	-	-	-	-	-	1.0	-	-	
		Kizhneerkundrum	0.5	0.5	-	-	-	-	-	1.0	-	-	
		Koohamandal	0.6	0.4	-	-	-	-	-	1.0	-	-	
		Kottakoram	0.5	0.5	-	-	-	-	-	1.0	-	-	
		Kovilur	0.7	0.3	-	-	-	0.0	-	1.0	-	-	
		Kunnavakkam	0.7	0.3	-	-	-	0.2	-	0.8	-	-	
		Kurumbur	0.5	0.5	-	-	-	-	-	1.0	-	-	
	Madipakkam	0.6	0.4	-	-	-	0.1	0.1	0.9	-	-		
	Mahajanampakkam	0.6	0.4	-	-	-	0.1	-	0.9	-	-		
	Mel Kolathur	0.4	0.6	-	-	-	-	-	1.0	-	-		
	Mel Nemili	0.6	0.4	-	-	-	-	-	1.0	-	-		
	Mulagripattu	0.8	0.2	-	-	-	-	-	0.1	0.9	-		
	Nallalam	0.7	0.3	-	-	0.1	0.1	-	0.8	-	-		
	Narmapallam	0.3	0.7	-	-	0.8	0.2	0.0	0.0	-	-		
	Nedungal	0.7	0.3	-	-	-	0.0	-	1.0	-	-		

S No	Gram Panchayat	Soil Texture				Soil moisture and ET		
		% 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
	Alathur	0.2	0.5	-	Moderate	23	93	161
	Alathurai	0.3	0.4	-	Moderate	23	46	161
	Anakkavoor	-	0.7	0.0	Moderate	23	215	148
	Anappathur	-	0.8	-	Moderate	23	113	193
	Arasur	0.3	0.5	0.0	Moderate	23	62	121
	Athi	0.0	1.0	-	Moderate	23	58	95
	Cheyraivendran	-	0.8	0.1	Moderate	23	88	100
	Chithamur	0.4	0.4	-	Moderate	23	40	48
	Echur	-	0.8	-	Moderate	23	126	293
	Elaneerkundram	-	0.9	-	Moderate	23	64	122
	Irungal	-	0.7	0.1	Moderate	23	77	148
	Kizhneathapakkam	0.3	0.6	-	Moderate	23	74	157
	Kizhathur	-	0.8	0.2	Moderate	23	48	71
	Kizhkolathur	0.1	0.8	-	Moderate	23	73	205
	Kizhneerkundrum	0.1	0.8	-	Moderate	23	109	132
	Koozhamandal	-	0.8	-	Moderate	23	48	93
	Kottakoram	-	0.8	-	Moderate	23	42	73
	Kovilur	0.1	0.5	0.1	Moderate	23	76	194
	Kunnavakkam	-	0.7	-	Moderate	23	60	63
	Kurumbur	-	0.9	-	Moderate	23	36	82
	Madipakkam	0.1	0.6	0.3	Moderate	23	102	105
	Mahajanampakkam	-	0.9	-	Moderate	23	94	108
	Mel Kolathur	0.1	0.6	-	Moderate	23	29	85
	Mel Nemili	0.3	0.5	0.0	Moderate	23	66	134
	Mulagripattu	0.2	0.6	-	Moderate	23	42	84
	Nallallam	0.0	0.8	-	Moderate	23	39	38
	Narmapallam	-	1.0	-	Moderate	23	44	83
	Nedungal	-	0.8	-	Moderate	23	82	137
	Nelvoy	-	1.0	-	Moderate	23	43	74

Type 1

S No	Key CWRM Parameter	Gram Panchayat	Soil Texture				Soil moisture and ET		
			% 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		Pazhanjur	-	0.7	-	Moderate	23	53	81
		Perumpalai	0.3	0.5	0.0	Moderate	23	52	56
		Purisai	0.0	0.7	-	Moderate	23	154	274
		Sengadu	-	0.5	0.3	Moderate	23	129	182
		Soundariyapuram	-	0.8	-	Moderate	23	59	141
		Thavasi	0.2	0.6	-	Moderate	23	67	103
		Thenelapakkam	0.0	0.7	-	Moderate	23	32	81
		Theneluppai	-	0.8	-	Moderate	23	49	44
		Thenkalpakkam	0.2	0.6	-	Moderate	23	52	123
		Thenthandalam	0.1	0.9	-	Moderate	23	34	56
		Thethurai	0.0	0.8	-	Moderate	23	88	147
		Thirumpoondi	0.0	0.5	0.2	Moderate	23	55	141
		Ukkal	0.3	0.6	-	Moderate	23	136	316
		Vachanur	0.6	0.3	-	moderately slow	23	61	93
Type 2		Vadalapiranthan	0.2	0.5	-	Moderate	23	5	2
		Vadathinallur	0.6	0.2	0.0	moderately slow	23	156	363
		Veerampakkam	-	0.8	-	Moderate	23	69	95
		Vengodu	-	0.9	-	Moderate	23	107	85
		Erumaivetti	8	83	-	Moderate	23	49	94
		Kulamandai	40	28	-	moderately slow	23	16	30
Type 3		Akkur	3	82	-	Moderate	23	147	315
		Karanai	-	88	-	Moderate	23	112	162
		Melma	1	81	-	Moderate	23	122	304
		Payyur	18	63	-	Moderate	23	82	186
		Thenmavandal	-	56	31	Moderate	23	49	81
		Vellai	-	84	16	Moderate	0	52	79

S No	Key CWRM Parameter	Gram Panchayat	Means of Water Extraction		Irrigation Methods		Livestock		
			Gravity	Lifting	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population
			%	%	%	%	No.	No.	No.
		Unit							
		Alathur	8	92	50	50	765	184	325
		Alathurai	4	96	77	23	515	219	338
		Anakkavoor	9	91	65	35	1687	1331	830
		Anappathur	5	95	59	41	720	132	53
		Arasur	7	93	72	28	524	224	536
		Athi	3	97	42	58	320	105	388
		Cheyraivendran	3	97	45	55	534	153	322
		Chithamur	9	91	70	30	195	50	22
		Echur	3	97	45	55	1352	487	1313
		Elaneerkundram	4	96	45	55	592	217	593
		Irungal	15	85	38	62	468	277	214
		Kizhmethapakkam	6	94	50	50	289	294	514
		Kizhathur	4	96	40	60	247	87	137
		Kizhkolathur	8	92	52	48	300	25	102
		Kizhneerkundrum	6	94	38	62	249	133	225
		Koozhamandal	5	95	47	53	476	345	539
		Kottakoram	11	89	37	63	304	53	153
		Kovilur	5	95	51	49	590	148	335
		Kunnavakkam	9	91	45	55	370	220	712
		Kurumbur	10	90	43	57	454	111	181
		Madipakkam	7	93	35	65	448	153	267
		Mahajanampakkam	8	92	57	43	419	166	713
		Mel Kolathur	8	92	42	58	186	141	103
		Mel Nemili	9	91	48	52	340	57	112
		Mulagripattu	6	94	59	41	247	60	185
		Nallallam	3	97	62	38	273	61	155
		Narmapallam	10	90	39	61	395	254	400
		Nedungal	10	90	65	35	481	65	110
		Nelvoy	7	93	34	66	166	54	131

Type 1

S No	Key CWRM Parameter	Gram Panchayat		Means of Water Extraction		Irrigation Methods		Livestock		
		Gravity	Lifting	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population		
	Unit	%	%	%	%	No.	No.	No.	No.	No.
Type 1	Pazhanjur	11	89	52	48	329	89	84		
	Perumpalai	10	90	54	46	170	3	35		
	Purisai	2	98	15	85	921	360	622		
	Sengadu	5	95	61	39	575	103	394		
	Soundariyapuram	4	96	56	44	595	184	371		
	Thavasi	2	98	50	50	487	216	327		
	Thenelapakkam	6	94	50	50	648	90	254		
	Theneluppai	12	88	62	38	253	15	515		
	Thenkalpakkam	6	94	54	46	424	74	170		
	Thenthandalam	14	86	41	59	203	4	129		
	Thethurai	5	95	44	56	423	52	175		
	Thirumpoondi	9	91	59	41	921	369	863		
	Ukkal	2	98	50	50	1604	1079	1795		
	Vachanur	7	93	42	58	336	118	723		
Type 2	Vadalapiranthan	5	95	55	45	337	224	178		
	Vadathinallur	3	97	33	67	302	21	67		
	Veerampakkam	6	94	37	63	428	79	452		
	Vengodu	6	94	27	73	687	151	550		
	Erumaivetti	10	90	63	37	638	243	549		
	Kulamandai	5	95	63	37	213	81	183		
	Akkur	11	89	45	55	631	795	941		
	Karanai	13	87	30	70	675	251	963		
	Melma	11	89	53	47	127	35	93		
	Payyur	8	92	53	47	815	427	598		
Type 3	Thenmavandal	22	78	65	35	207	-	148		
	Vellai	13	87	27	73	195	152	124		

ANNEXURE 3.8

GP WISE DEMOGRAPHIC AND SOCIO-ECONOMIC STATUS

S No	Key CWRM Parameter	Geo-graphical Area (ha)	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable population (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)
	Alathur	637	926	914	1,840	571	10	581	476	129	170
	Alathurai	339	745	692	1,437	432	11	443	344	129	134
	Anakkavoor	1,544	2,229	2,172	4,401	1,172	47	1,219	1,073	94	145
	Anappathur	775	1,338	1,254	2,592	541	25	566	665	129	129
	Arasur	394	490	494	984	517	0	517	232	26	12
	Athi	393	425	371	796	0	19	19	192	1	94
	Cheyayatraivendran	571	834	885	1,719	823	52	875	399	96	18
	Chithampur	233	223	214	437	0	47	47	137	6	20
	Echur	724	1,773	1,728	3,501	763	11	774	875	40	112
	Elaneerkundram	542	796	767	1,563	519	9	528	386	4	114
	Irungal	470	861	798	1,659	609	4	613	395	72	97
	Kizhneathapakkam	476	656	658	1,314	574	4	578	315	56	24
	Kizhathur	320	474	444	918	371	0	371	221	20	16
	Kizhkolathur	399	295	326	621	273	19	292	136	12	4
	Kizhneerkundrum	312	312	337	649	94	17	111	170	14	13
	Koozhamandal	297	882	868	1,750	99	0	99	408	42	79
	Kottakoram	247	500	519	1,019	0	2	2	275	38	137
	Kovilur	501	845	854	1,699	395	9	404	395	72	97
	Kunnavakkam	352	643	616	1,259	670	18	688	329	76	137
	Kurumbur	215	484	471	955	0	0	0	221	16	9
	Madipakkam	602	625	637	1,262	841	58	899	296	41	77
	Mahajanampakkam	540	892	815	1,707	745	0	745	406	62	13
	Mel Kolathur	206	265	231	496	107	0	107	154	53	15
	Mel Nemili	386	761	696	1,457	9	0	9	377	72	26
	Mulagiripattu	285	385	383	768	9	16	25	158	15	12
	Nallallam	285	396	410	806	242	11	253	229	55	32

Type 1

S No	Key CWRM Parameter	Geographical Area (ha)	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable population (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)
Type 1	Narmappallam	262	295	310	605	0	16	16	157	36	15
	Nedungal	495	987	940	1,927	511	0	511	460	50	22
	Nelvoy	220	315	306	621	37	8	45	172	6	13
	Pazhanjur	441	314	312	626	0	35	35	160	31	17
	Perumpalai	318	601	590	1,191	4	63	67	351	41	24
	Purisai	989	1,172	1,202	2,374	599	250	849	658	58	175
	Sengadu	800	1,323	1,351	2,674	864	8	872	712	132	175
	Soundariyapuram	348	523	517	1,040	243	0	243	278	21	16
	Thavasi	360	1,034	970	2,004	533	30	563	493	71	235
	Thenelappakkam	289	693	631	1,324	7	15	22	324	73	22
	Theneluppai	307	492	482	974	388	38	426	226	21	22
	Thenkalpakkam	345	340	327	667	109	0	109	184	36	6
	Thenthandalam	194	398	389	787	249	20	269	195	20	9
	Thethurai	533	612	614	1,226	447	44	491	318	54	28
	Thirumpondi	433	840	790	1,630	527	18	545	418	93	26
	Ukkal	855	1,209	1,225	2,434	384	33	417	628	82	64
Vachanur	348	623	584	1,207	531	6	537	294	57	82	
Vadalapiranthan	345	375	389	764	0	3	3	206	7	140	
Vadathinallur	784	713	732	1,445	531	46	577	391	108	145	
Veerampakkam	559	1,006	1,033	2,039	489	45	534	507	66	34	
Vengodu	625	785	741	1,526	256	12	268	395	72	97	
Type 2	Erumaivetti	303	521	530	1,051	16	1	17	337	20	92
	Kulamandai	108	269	289	558	327	12	339	337	20	92
Type 3	Akkur	845	1,454	1,442	2,896	583	96	679	759	55	46
	Karanai	683	835	779	1,614	1,022	7	1,029	401	71	141
	Melma	728	735	707	1,442	230	45	275	382	69	37
	Payyur	621	833	813	1,646	567	4	571	418	79	143
	Thenmavandal	319	437	447	884	69	45	114	216	11	18
Vellai	342	914	940	1,854	965	0	965	467	78	32	

S No	Key CWRM Parameter	Vulnerable Households (SECC) (No.)	% of Vulnerable Households (%)	Registered MGNREGA Job cards (No.)	Active person working in MGNREGA job Cards (No.)	Drinking Water Sources (No.)	HH's have tap water connection for drinking water (No.)	HH's dependent on other sources for drinking water (No.)	Annual Grey-water Generation (ha - m)
Type 1	Alathur	141	30	1,472	677	6	464	12	3
	Alathurai	131	38	1,150	425	12	317	27	3
	Anakkavoor	109	10	3,521	1,479	60	702	371	8
	Anappathur	129	19	2,074	829	14	683	-18	5
	Arasur	22	9	787	315	10	224	8	2
	Athi	29	15	637	255	12	186	6	1
	Cheyyaivaivendran	73	18	1,375	564	10	375	24	3
	Chithampur	10	7	350	143	8	129	8	1
	Echur	62	7	2,801	1,176	23	849	26	6
	Elaneerkundram	37	10	1,250	463	58	215	171	3
	Irungal	80	20	1,327	531	15	353	42	3
	Kizhneathapakkam	46	15	1,051	420	16	263	52	2
	Kizhathur	19	9	734	286	7	197	24	2
	Kizhkolathur	10	7	497	204	14	131	5	1
	Kizhneerkundrum	14	8	519	208	7	163	7	1
	Koozhamandal	53	13	1,400	546	29	301	107	3
	Kottakoram	68	25	815	302	11	256	19	2
	Kovilur	80	20	1,359	625	29	308	87	3
	Kunnavakkam	94	29	1,007	353	11	263	66	2
	Kurumbur	14	6	764	306	9	217	4	2
Madipakkam	52	18	1,010	394	9	227	69	2	
Mahajanampakkam	47	12	1,366	519	10	402	4	3	
Mel Kolathur	42	27	397	139	10	150	4	1	
Mel Nemili	58	15	1,166	455	9	346	31	3	
Mulagripattu	14	9	614	258	18	148	10	1	
Nallallam	48	21	645	251	13	212	17	1	
Narmapallam	30	19	484	218	9	101	56	1	
Nedungal	42	9	1,542	709	8	388	72	4	
Nelvoy	8	5	497	209	8	164	8	1	

S No	Key CWRM Parameter	Vulnerable Households (SECC) (No.)	% of Vulnerable Households (%)	Registered MGNREGA Job cards (No.)	Active person working in MGNREGA job Cards (No.)	Drinking Water Sources (No.)	HH's have tap water connection for drinking water (No.)	HH's dependent on other sources for drinking water (No.)	Annual Grey-water Generation (ha - m)
Type 1	Pazhanjur	27	17	501	210	5	134	26	1
	Perumpalai	36	10	953	400	13	266	85	2
	Purisai	93	14	1,899	760	13	613	45	4
	Sengadu	145	20	2,139	727	22	689	23	5
	Soundariyapuram	20	7	832	349	63	168	110	2
	Thavasi	120	24	1,603	577	19	278	215	4
	Thenelapakkam	58	18	1,059	487	16	307	17	2
	Theneluppai	21	9	779	343	10	159	67	2
	Thenkalpakkam	27	15	534	245	17	184	0	1
	Thenthandalam	17	9	630	277	6	174	21	1
	Thethurai	46	15	981	383	12	301	17	2
	Thirumpoondi	73	17	1,304	587	8	408	10	3
	Ukkal	77	12	1,947	720	18	510	118	4
	Vachanur	65	22	966	348	13	288	6	2
Type 2	Vadalapiranthan	47	23	611	214	15	23	183	1
	Vadathinallur	119	30	1,156	416	11	208	86	3
	Veerampakkam	56	11	1,631	685	19	485	22	2
	Vengodu	80	20	1,221	439	12	319	76	3
	Erumaivetti	42	12	841	353	3	248	89	2
	Kulamandai	42	12	446	147	4	119	218	1
	Akkur	52	7	2,317	857	1	754	5	5
	Karanai	92	23	1,291	581	1	306	95	3
	Melma	59	16	1,154	508	1	372	10	3
	Payyur	98	23	1,317	606	1	314	104	3
Type 3	Thenmavandal	13	6	707	240	1	153	63	2
	Vellai	64	14	1,483	608	1	384	83	3

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

$$x_{ij}^p = \frac{X_{ij} - \text{Min } i \{X_{ij}\}}{(\text{Max } i \{X_{ij}\} - \text{Min } i \{X_{ij}\})}$$

- for indicators with negative relationship with vulnerability

$$x_{ij}^n = \frac{\text{Max } i \{X_{ij}\} - X_{ij}}{\text{Max } i \{X_{ij}\} - \text{Min } i \{X_{ij}\}}$$

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_{ij}^p is the normalized value

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

ANNEXURE 5.1

GP WISE WASCA PROPOSED TREATMENT AREA

Type of GP	GP Name	Treatment Area under Forest Land	Treatment Area under Non-Agricultural Uses	Treatment Area under Barren & Uncultivable Land	Treatment Area under Permanent Pastures and Other Grazing Land	Treatment Area under Land Under Miscellaneous Tree Crops 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	Alathur	1.14	38.96	-	14.09	7.97	-	38	41.46	5.63	40.34
	Alathurai	-	29.51	-	-	-	-	-	0.23	20.53	29.2
	Anakkavoor	-	117.89	-	-	2.29	-	145.09	151.88	91.22	88.82
	Anappathur	-	47.41	-	3.32	-	-	51.9	50.24	50.07	45.84
	Arasur	-	15.62	-	-	-	-	-	10.61	15.87	21.45
	Athi	-	21.41	5.04	-	-	-	11.84	20.61	8.15	27.23
	Cheyyatraivendran	-	23.42	-	4.66	-	-	-	65.44	13.18	25.87
	Chithamur	-	3.28	-	2.48	-	-	-	27.79	22.98	8.25
	Echur	11.52	7.17	-	12.26	7.92	15.12	17.14	104.23	147.71	158.66
	Elaneerkundram	-	12.91	-	2.82	-	-	-	25.65	27.25	29.77
	Irungal	-	10.71	-	-	6.03	-	-	38	24	38
	Kizhneathapakkam	-	19.72	-	3.64	1.73	-	-	18.26	26.64	20.13
	Kizhathur	-	15.47	-	-	-	-	-	28.38	12.44	18.7
	Kizhkolathur	43.09	0.79	-	0.04	-	0.12	-	6.03	16.88	19.59
	Kizhneerkundrum	90.152	1.39	-	1.58	4.31	18.98	-	13.38	40.28	26.51
	Koozhamandal	-	7.87	-	2.97	-	-	-	17.03	11.73	16.07
Kottakoram	-	4.07	-	3.32	-	-	-	22.97	14.68	6.81	
Kovilar	-	24.45	-	-	-	44.62	65.93	-	25.11	76.66	
Kunnakkam	-	5.21	13.32	-	-	3.65	0.47	-	17.25	13.97	
Kurumbur	-	4.09	-	0.82	-	-	-	-	12.34	12.56	
Madipakkam	3	9.83	5.85	-	-	3.12	-	27.5	49.1	47.97	

Type of GP	GP Name	Treatment Area under Forest Land	Treatment Area under Non-Agricultural Uses	Treatment Area under Barren & Uncultivable Land	Treatment Area under Permanent Pastures and Other Grazing Land	Treatment Area under Land Under Miscellaneous Tree Crops 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	Mahajanampakkam	-	5.07	-	3.83	-	-	20.61	48.64	39.87	22.19
	Mel Kolathur	-	16.24	-	-	5.98	-	-	18.63	9.35	34.98
	Mel Nemili	-	5.78	-	-	-	-	-	30.02	25.95	32.25
	Mulagiripattu	-	17.05	-	0.11	-	-	19.37	14.39	18.74	21.28
	Nallallam	-	24.66	-	0.1	1.82	-	20.74	25.05	2.09	10.68
	Narmapallam	-	5.94	-	7.37	0.4	-	12.45	14	10.91	12.14
	Nedungal	-	10.32	-	0.02	8.42	-	18.75	28.6	18.56	20.8
	Nelvoy	-	17.78	-	0.67	-	-	-	23.3	16.57	18.46
	Pazhanjur	-	32.51	-	-	-	-	23.07	10.09	32.17	16.87
	Perumpalai	-	7.62	-	-	-	-	13.26	36.22	8.23	9.18
	Purisai	-	39.47	4.06	6.77	0.82	-	22.83	75.83	4.02	80.89
	Sengadu	-	23.67	-	11.48	1.58	-	-	83.82	27.42	24.53
	Soundariyapuram	-	7.48	-	41.52	-	-	-	19.56	27.68	22.62
	Thavasi	-	35.94	-	4.07	-	-	-	36.21	12.75	17.77
	Thenelapakkam	-	22.16	-	0.45	22.74	-	-	9.67	8.04	9.26
	Theneluppai	-	10.26	-	-	0.08	-	-	35.32	6.7	12.02
Thenkalpakkam	-	18.18	11.89	2.09	1.4	-	-	14.17	12.43	24.36	
Thenthandalam	-	1.7	-	-	-	-	-	18.09	8.23	9.18	
Thethurai	-	13.22	-	3.98	-	-	-	49.76	13.38	30.67	
Thirumpoondi	-	49.4	-	-	-	-	-	22.92	21.47	36.7	
Ukkal	-	29.33	3.58	-	-	6.7	-	48.75	60.6	80.02	
Vachanur	-	3.46	-	5.78	-	-	-	30.78	8.86	17.89	
Vadalapiranthan	60.65	-	-	-	-	-	-	25.03	9.72	19.96	

Type of GP	GP Name	Treatment Area under Forest Land	Treatment Area under Non-Agricultural Uses	Treatment Area under Barren & Uncultivable Land	Treatment Area under Permanent Pastures and Other Grazing Land	Treatment Area under Land Under Miscellaneous Tree Crops 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	Vadathinallur	69.14	51.68	5.51	4.73	-	1.8	24.52	49.44	57.85	52.82
	Veerampakkam	-	69.27	-	42.35	1.28	-	20	40.3	10.86	48.51
Type 2	Vengodu	-	8.31	-	3.65	-	-	-	90.68	24.27	18.84
	Erumaivetti	-	9.31	-	4.31	-	12.85	2.25	19.24	20.44	22.32
	Kulamandai	-	3.23	-	0.71	-	4.28	0.4	6.41	6.81	7.44
Type 3	Akkur	-	9.08	-	12.2	1.95	-	5.44	61.04	45.4	47.11
	Karanai	2.43	17.58	10.64	13.89	9.49	-	-	68.01	17.52	23.1
	Melma	0.24	13.66	-	5.2	-	7.82	21	31.2	34.98	57.01
	Payyur	7.88	60.22	1.28	1.99	-	-	1.86	30.69	22.16	29.67
	Thenmavandal	-	13.74	-	1.61	2.83	-	10	25.87	12.95	10.64
	Vellai	-	16.42	-	-	21.47	-	28.27	24.98	1.95	16.78

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
Type 1	Alathur	37.72	6.49	24.56
	Alathurai	25.24	0	9.78
	Anakkavoor	49.08	0.67	93.39
	Anappathur	23.19	0.98	38.77
	Arasur	11.37	0	9.38
	Athi	13.67	0	13.28
	Cheyvatraivendran	9.99	1.37	20.46
	Chithamur	5.5	0.73	12.13
	Echur	8.35	10.39	83.48
	Elaneerkundram	5.79	5.87	16.5
	Irungal	4.01	1.69	11.64
	Kizhnethapakkam	15.37	1.58	15.32
	Kizhathur	6.46	0	13.6
	Kizhkolathur	18.55	0.05	11.04
	Kizhneerkundrum	43.16	5.6	18.53
	Koozhamandal	7.33	0.87	12.62
	Kottakoram	2.08	0.98	8.71
	Kovilur	11	32.5	16.2
	Kunnavakkam	7.67	1.21	14.18
	Kurumbur	2.04	0.24	7.61
	Madipakkam	8.01	0.92	27.84
	Mahajanampakkam	2.97	1.13	25.71
	Mel Kolathur	6.56	1.76	12.33
	Mel Nemili	2.94	0	17.27
	Mulagiripattu	21.96	0	14.45
	Nallallam	17.24	0.56	11.47
	Narmapallam	11.43	2.29	9.69
	Nedungal	5.25	2.48	16.98
	Nelvoy	9.75	0.2	11.42
	Pazhanjur	19.04	0	16.09
	Perumpalai	25.6	0	13.1
	Purisai	110.39	2.23	35.94
	Sengadu	73.21	3.84	26.58
	Soundariyapuram	21.11	12.22	13.68
	Thavasi	19.69	1.2	14.93
	Thenelapakkam	11.68	6.82	5.28
Theneluppai	9.11	0	11.36	
Thenkalpakkam	13.86	1.03	9.98	
Thenthandalam	5.17	0	8.11	
Thethurai	16.61	1.17	18.37	
Thirumpoondi	20.3	0	23.45	
Ukkal	21.2	1.97	37.08	

GP type	GP name	Good Catchment Area ha.m	Average Catchment Area ha.m	Bad Catchment Area ha.m
Type 1	Vachanur	30.5	1.7	16.35
	Vadalapiranthan	0.27	0	0.11
	Vadathinallur	57.47	1.92	36.15
	Veerampakkam	33.5	12.8	23.4
	Vengodu	4.29	1.07	26.19
Type 2	Erumaivetti	5.49	5.05	12.58
	Kulamandai	3.92	1.47	4.12
Type 3	Akkur	17.07	4.16	31.13
	Karanai	15.22	6.88	21.27
	Melma	7.11	3.83	28.23
	Payyur	34.45	0.58	16.52
	Thenmavandal	12.21	1.3	11.64
	Vellai	10	6.32	14.09

ANNEXURE 5.3

GP-WISE PROPOSED WORKS BASED ON WATERSHED AND LIVELIHOOD APPROACH (area in ha / length in m)

Gram Panchayat	Aff		ARS		AVP		AZ		BP		CBP		CS	
	No.	Area	No.	Area	No.	Length	No.	Area	No.	Area	No.	Area	No.	Area
Akkur	7,264	9	41	1,184	5,920	52	1,560	2	-	-	-	-	52	-
Alalthur	31,165	39	-	-	6,595	141	6,372	8	300	1,500	300	1,500	141	-
Alathur	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alathurai	23,605	30	11	-	2,315	131	-	-	640	3,200	640	3,200	131	-
Anakkavoor	94,309	118	-	-	9,475	109	1,830	2	960	4,800	960	4,800	109	-
Anappathur	37,932	47	-	-	4,900	129	-	-	300	1,500	300	1,500	129	-
Arasur	12,500	16	-	-	2,590	22	-	-	246	1,230	246	1,230	22	-
Athi	17,128	21	-	-	3,860	29	4,032	5	264	1,320	264	1,320	29	-
Cheyyatraivendran	18,739	23	-	-	4,540	73	-	-	180	900	180	900	73	-
Chithamur	2,625	3	-	-	1,530	10	-	-	204	1,020	204	1,020	10	-
Echur	5,735	7	-	-	6,425	62	18,432	23	196	980	196	980	62	-
Elaneerkundram	10,326	13	-	-	4,691	37	13,710	17	260	1,300	260	1,300	37	-
Erumaivetti	10,326	13	-	257	1,285	42	13,710	17	300	1,500	300	1,500	42	-
Irungal	-	-	-	800	4,000	-	1,600	2	-	-	-	-	13	-
Karanai	14,065	18	-	-	5,940	92	16,017	20	440	2,200	440	2,200	92	-
Kizhathur	12,373	15	-	-	2,156	19	-	-	170	850	170	850	19	-
Kizhkolathur	632	1	-	-	1,935	10	96	0	188	940	188	940	10	-
Kizhneerkundrum	1,112	1	-	-	1,755	14	7,239	23	205	1,025	205	1,025	14	-
Kizhneathapakkam	15,772	20	-	-	4,709	46	1,386	2	196	980	196	980	46	-
Koozhamandal	6,293	8	-	-	3,583	53	-	-	204	1,020	204	1,020	53	-
Kottakoram	3,254	4	-	-	3,485	68	-	-	203	1,015	203	1,015	68	-
Kovilar	19,560	24	-	-	415	80	19,560	25	330	1,650	330	1,650	80	-
Kulamandai	-	-	-	100	500	-	-	-	-	-	-	-	-	-
Kunnavakkam	4,168	5	-	-	3,068	93	13,950	17	160	800	160	800	93	-
Kurumbur	3,276	4	-	-	3,256	14	-	-	204	1,020	204	1,020	14	-
Madipakkam	7,868	10	-	-	3,045	52	7,176	9	244	1,220	244	1,220	52	-
Mahajanampakkam	4,054	5	-	-	4,390	47	-	-	172	860	172	860	47	-
Mel Kolathur	12,992	16	-	-	745	42	12,992	16	181	905	181	905	42	-

Gram Panchayat	Aff		ARS		AVP		AZ		BP		CBP		CS	
	No.	Area	No.	Area	No.	Length	No.	Area	No.	Area	No.	Area	No.	Area
Mel Nemili	4,624		6		-	1,475	58	13,446	17	188	942	58		
Melma	10,925		14		-	5,530	59	6,252	8	240	1,200	59		
Mulagripattu	13,639		17		-	1,890	14	-	-	152	760	14		
Nallallam	19,725		25		-	2,125	48	1,458	2	197	985	48		
Narmapallam	4,755		6		-	3,035	30	318	0	150	750	30		
Nedungal	8,259		10		-	7,115	42	6,732	8	193	964	42		
Nelvoy	14,220		18		-	2,225	8	-	-	203	1,014	8		
Payyur	48,173		60		-	3,850	98	1,026	1	384	1,920	98		
Pazhanjur	26,012		33		-	3,000	27	-	-	170	850	27		
Perumpalai	6,093		8		-	2,375	36	-	-	210	1,050	36		
Purisai	15,789		20		-	6,505	93	3,900	5	149	745	93		
Sengadu	18,934		24		-	8,839	145	1,260	2	197	985	145		
Soundariyapuram	5,983		7		-	4,490	20	-	-	192	960	20		
Thavasi	28,748		36		-	3,905	120	-	-	172	860	120		
Then Mavandal	10,993		14		-	1,970	13	2,262	3	390	1,950	13		
Thenelapakkam	17,728		22		-	2,525	58	-	-	172	860	58		
Theneluppai	8,207		10		-	2,278	21	60	0	197	985	21		
Thenkalpakkam	14,543		18		-	2,719	27	10,626	13	202	1,010	27		
Thenmavandal	-		-		-	-	-	-	-	-	-	-		
Thenthandalam	1,359		2		-	1,595	17	-	-	197	985	17		
Thethurai	10,579		13		-	5,530	46	-	-	224	1,120	46		
Thirumpoondi	39,519		49		-	2,050	73	-	-	209	1,045	73		
Ukkal	23,467		29		-	1,990	77	8,220	10	199	995	77		
Vachanur	2,769		3		-	3,031	65	-	-	220	1,100	65		
Vadalapiranthan	15,804		20		-	2,050	47	48,518	61	166	830	47		
Vadathinallur	41,344		52		-	4,145	119	5,844	7	209	1,045	119		
Veerampakkam	55,418		69		-	8,600	56	1,026	1	190	951	56		
Vellai	13,140		16		-	1,695	64	17,178	21	410	2,050	64		
Vengodu	6,644		8		-	5,665	80	-	-	190	950	80		

Gram Panchayat	CT		CO		FP		CROW		CCB		DLT		DHAFI	
	No.	No.	No.	Area	No.	No.	No.	No.	No.	Length	No.	Length	No.	Area
Akkur	52	13	-	18	41	7,706	67	-	-	-	4,337	-	22	
Alalthur	141	25	-	39	32	18,452	172	-	-	-	11,007	-	55	
Alathur	-	-	-	-	-	-	-	-	-	-	-	-	-	
Alathurai	131	13	-	19	11	9,061	105	-	-	-	7,579	-	38	
Anakkavoor	109	34	-	60	13	32,643	215	-	-	-	9,500	-	48	
Anappathur	129	24	-	34	30	16,053	145	-	-	-	9,433	-	47	
Arasur	22	7	-	9	18	4,775	40	-	-	-	2,405	-	12	
Athi	29	9	-	26	25	7,392	64	-	-	-	3,716	-	19	
Cheyyatraivendran	73	10	-	16	22	8,112	62	-	-	-	3,406	-	17	
Chithamur	10	5	-	7	4	2,176	18	-	-	-	1,266	-	6	
Echur	62	9	-	18	35	8,444	-	-	-	-	3,335	-	17	
Elaneerkundram	37	5	-	13	18	7,905	58	-	-	-	2,505	-	13	
Erumaivetti	42	7	-	11	18	8,168	63	-	-	-	3,006	-	15	
Irungal	13	3	-	21	3	2,200	10	-	-	-	-	-	-	
Karanai	92	31	-	43	26	17,728	152	-	-	-	9,994	-	50	
Kizhathur	19	6	-	9	18	4,334	34	-	-	-	1,896	-	9	
Kizhkolathur	10	5	-	17	15	1,108	15	-	-	-	1,452	-	7	
Kizhneerkundrum	14	11	-	29	-	5,852	134	383	1,913	-	1,740	-	9	
Kizhneathapakkam	46	14	-	19	16	8,520	72	-	-	-	4,690	-	23	
Koozhamandal	53	7	-	10	14	4,034	38	-	-	-	2,689	-	13	
Kottakoram	68	15	-	17	7	5,250	52	-	-	-	4,446	-	22	
Kovilur	80	17	-	12	31	14,472	28	618	1,853	-	8,294	-	41	
Kulamandai	-	-	-	-	-	-	-	-	-	-	-	-	-	
Kunnavakkam	93	21	26	28	12	9,761	91	-	-	-	6,820	-	34	
Kurumbur	14	3	-	4	12	1,057	6	-	-	-	93	-	0	
Madipakkam	52	-	26	30	18	10,158	95	-	-	-	7,649	-	38	
Mahajanampakkam	47	15	-	17	15	5,596	58	-	-	-	4,867	-	24	
Mel Kolathur	42	20	-	11	14	700	7	-	-	-	4,899	-	25	
Mel Nemili	58	35	-	24	13	94	0	-	-	-	8,822	-	44	
Melma	59	18	-	25	22	9,880	109	-	-	-	8,219	-	41	

Gram Panchayat	CT		CO		FP		CROW		CCB		DLT		DHAFI	
	No.	No.	No.	Area	No.	No.	No.	No.	No.	Length	No.	Length	No.	Area
Mulagripattu	14	3	-	-	7	14	14	33	4,306	-	-	-	1,627	8
Niallallam	48	11	-	-	18	17	17	61	7,917	-	-	-	3,481	17
Narmapallam	30	10	-	-	14	12	12	48	5,220	-	-	-	3,389	17
Nedungal	42	9	24	-	14	12	12	50	6,137	-	-	-	3,122	16
Nelvoy	8	3	-	-	8	20	20	27	4,225	-	-	-	865	4
Payyur	98	20	-	-	36	22	22	140	16,047	-	-	-	7,634	38
Pazhanjur	27	11	-	-	18	13	13	72	9,317	-	-	-	3,948	20
Perumpalai	36	-	-	-	10	7	7	30	3,441	-	-	-	2,278	11
Purisai	93	20	-	-	30	109	109	20	3,948	-	-	-	9,152	46
Sengadu	145	36	-	-	34	15	15	145	16,258	-	-	-	10,861	54
Soundariyapuram	20	3	-	-	12	16	16	63	10,559	-	-	-	1,378	7
Thavasi	120	20	-	-	30	20	20	108	13,095	-	-	-	6,779	34
Then Mavandal	13	4	-	-	9	6	6	31	4,632	-	-	-	1,247	6
Thenelapakkam	58	5	-	-	12	17	17	22	17,728	-	-	-	1,942	10
Theneluppai	21	7	-	-	8	7	7	29	3,550	-	-	-	1,909	10
Thenkalpakkam	27	6	-	-	14	18	18	64	8,325	-	-	-	3,058	15
Thenmavandal	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thenhandalam	17	5	-	-	6	9	9	15	1,349	-	-	-	1,330	7
Thethurai	46	15	-	-	19	27	27	73	7,256	-	-	-	5,629	28
Thirumpoondi	73	11	-	-	21	-	-	49	9,880	1,541	7,704	4,717	31	31
Ukkal	77	12	-	-	21	64	64	110	11,103	-	-	-	7,022	35
Vachanur	65	16	-	-	18	17	17	66	5,924	-	-	-	5,635	28
Vadalapiranthan	47	10	13	-	26	8	8	-	-	391	1,956	4,522	23	23
Vadathinallur	119	34	-	-	43	56	56	211	7,375	-	-	-	1,627	8
Veerampakkam	56	9	-	-	32	12	12	139	24,705	-	-	-	2,646	13
Vellai	64	7	-	-	12	20	20	16	3,284	-	-	-	2,762	14
Vengodu	80	15	77	-	33	-	-	104	10,153	568	2,842	9,246	46	46

Gram Panchayat	FBBT		FD		GSS		ICP		LDI		LP		MI	
	No.	Area	No.	No.	No.	No.	Length	No.	Area	No.	Length	No.	Area	
Akkur	6	15	52	127	386	1,930	6	15	1,271	6,354	-	-		
Alalthur	12	31	141	35	-	-	12	31	763	3,817	-	-		
Alathur	-	-	-	-	-	-	-	-	-	-	-	-		
Alathurai	6	16	131	39	-	-	6	16	367	1,833	-	-		
Anakkavoor	17	43	109	175	-	-	17	43	1,203	6,017	-	-		
Anappathur	12	29	129	32	360	1,800	12	29	558	2,791	-	-		
Arasur	3	8	22	49	306	1,530	3	8	1,760	8,800	-	-		
Athi	4	10	29	30	287	1,436	4	10	460	2,301	-	-		
Cheyraivendran	5	12	73	31	230	1,150	5	12	649	3,243	-	-		
Chithamur	2	5	10	6	225	1,125	2	5	455	2,276	-	-		
Echur	9	11	62	114	240	1,200	4	11	1,761	8,807	-	-		
Elaneerkundram	9	7	37	51	260	1,300	3	7	1,052	5,258	-	-		
Erumaivetti	3	8	42	69	400	2,000	3	8	-	-	-	-		
Irungal	18	44	6	10	-	-	-	-	200	1,000	12	28		
Karanai	16	39	92	73	524	2,620	16	39	1,098	5,492	-	-		
Kizhathur	7	15	19	16	240	1,200	2	6	597	2,983	-	-		
Kizhkolathur	15	5	10	8	360	1,800	2	5	1,078	5,389	-	-		
Kizhneerkundrum	4	9	14	24	280	1,400	6	14	80	3,252	-	-		
Kizhneathapakkam	7	17	46	55	300	1,500	7	17	-	-	-	-		
Koozhamandal	8	9	53	61	350	1,750	4	9	1,455	7,273	-	-		
Kottakoram	10	18	68	13	360	1,800	8	19	1,074	5,368	-	-		
Kovilur	13	33	80	32	330	1,650	-	-	482	35	-	-		
Kulamandai	-	-	-	-	-	-	-	-	-	-	-	-		
Kunnavakkam	17	26	93	58	270	1,350	10	26	1,229	50	-	-		
Kurumbur	1	0	14	20	350	1,750	-	0	570	2,852	-	-		
Madipakkam	18	32	52	28	389	1,947	13	32	1,270	6,350	-	-		
Mahajanampakkam	9	19	47	52	212	1,058	8	19	1,038	5,189	-	-		
Mel Kolathur	10	24	42	19	231	1,157	10	24	229	1,144	-	-		
Mel Nemili	11	28	58	20	254	1,268	11	28	397	1,985	-	-		
Melma	9	23	59	8	370	1,850	9	23	1,201	6,005	-	-		

Gram Panchayat	FBBT		FD	GSS		ICP		LDI		LP		MI	
	No.	Area		No.	No.	No.	Length	No.	Area	No.	Length	No.	Area
Mulagiriipattu	2	4	14	15	260	1,298	2	4	1,269	6,346	-	-	
Niallallam	5	13	48	14	276	1,380	5	13	293	1,465	-	-	
Narmapallam	5	12	30	45	226	1,129	5	12	958	4,792	-	-	
Nedungal	5	12	42	12	290	1,450	5	12	1,187	5,936	-	-	
Nelvoy	1	3	8	12	329	1,647	1	3	271	1,357	-	-	
Payyur	10	25	98	73	510	2,550	10	25	757	3,783	-	-	
Pazhanjur	6	14	27	13	225	1,125	6	14	1,753	8,765	-	-	
Perumpalai	4	10	36	2	369	1,847	4	10	1,217	6,085	-	-	
Purisai	9	23	93	67	265	1,325	9	23	3,222	16,110	-	-	
Sengadu	18	45	145	30	390	1,952	18	45	2,738	13,690	-	-	
Soundariyapuram	1	4	20	37	253	1,267	1	4	549	2,747	-	-	
Thavasi	10	25	120	38	254	1,269	10	25	843	4,213	-	-	
Then Mavandal	2	5	13	7	520	2,600	2	5	572	2,859	-	-	
Thenelapakkam	3	6	58	22	271	1,356	3	6	1,477	7,387	-	-	
Theneluppai	3	7	21	27	274	1,369	3	7	1,558	7,791	-	-	
Thenkalpakkam	13	34	27	16	312	1,560	13	34	1,245	6,225	-	-	
Thenmavandal	-	-	-	-	-	-	-	-	-	-	-	-	
Thenhandalam	2	5	17	6	269	1,347	2	5	655	3,273	-	-	
Thethurai	8	19	46	14	391	1,957	8	19	1,619	8,093	-	-	
Thirumpoondi	30	74	73	80	318	1,589	5	13	80	400	-	-	
Ukkal	6	16	77	198	199	994	6	16	1,194	5,969	-	-	
Vachanur	8	20	65	48	337	1,687	8	20	1,231	6,155	-	-	
Vadalapiranthan	10	25	47	14	317	1,584	10	25	40	200	-	-	
Vadathinallur	17	42	119	5	320	1,598	17	42	1,575	7,875	-	-	
Veerampakkam	4	11	56	31	337	1,687	4	11	1,650	8,248	-	-	
Vellai	4	9	64	21	426	2,129	4	9	399	1,995	-	-	
Vengodu	15	39	80	43	388	1,942	15	39	80	400	-	-	

Gram Panchayat	NADEP		ND		RWBT		RWBO		RWBP		RRWH		SPD		SP		SPI		WCIC	
	No.		No.	Area	No.		No.		No.		No.		No.	Area	No.		No.		No.	Length
Akkur	52		3,795	759	5		-		5		4		9,762	12	8		52		1,930	
Alalthur	141		2,380	476	-		-		-		4		11,274	14	5		141		-	
Alathur	-		-	-	3		-		9		-		-	-	-		-		-	
Alathurai	131		1,720	344	1		3		6		4		-	-	3		131		-	
Anakkavoor	109		5,365	1,073	3		-		5		4		-	-	11		109		-	
Anappathur	129		3,325	665	2		-		2		4		2,658	3	7		129		1,800	
Arasur	22		1,160	232	3		-		4		4		-	-	2		22		1,530	
Athi	29		960	192	1		-		6		4		-	-	2		29		1,436	
Cheyyatraivendran	73		1,995	399	1		-		3		4		3,726	5	4		-		1,150	
Chithamur	10		685	137	1		-		4		4		1,980	2	1		10		1,125	
Echur	62		4,375	875	2		-		7		4		9,810	12	9		62		1,200	
Elaneerkundram	37		1,930	386	1		-		6		4		2,256	3	4		37		1,300	
Erumaivetti	42		1,685	337	2		-		2		3		2,256	3	3		42		2,000	
Irungal	-		1,340	268	1		-		4		4		3,200	4	2		268		-	
Karanai	92		2,005	401	4		-		3		4		11,112	14	4		92		2,620	
Kizhathur	19		1,080	216	1		-		4		4		-	-	2		19		1,200	
Kizhkolathur	10		680	136	2		-		4		4		30	0	1		-		1,800	
Kizhneerkundrum	14		825	165	2		-		2		4		1,266	2	2		14		1,400	
Kizhneathapakkam	46		1,575	315	2		-		7		4		2,910	4	3		46		1,500	
Koozhamandal	53		2,040	408	2		-		20		4		2,376	3	4		53		1,750	
Kottakoram	68		1,375	275	2		-		5		4		2,658	3	3		68		1,800	
Kovilur	80		1,975	395	3		-		6		4		-	-	3		80		1,650	
Kulamandai	-		-	-	1		-		2		4		-	-	-		-		-	
Kunnavakkam	93		1,645	329	2		-		2		4		-	-	3		94		1,350	
Kurumbur	14		1,105	221	1		-		3		4		654	1	2		14		1,750	
Madipakkam	52		1,480	296	2		-		6		4		-	-	3		-		1,947	
Mahajanampakkam	47		2,030	406	2		-		8		4		3,060	4	4		47		1,058	
Mel Kolathur	42		770	154	1		-		-		4		-	-	2		42		1,157	
Mel Nemili	58		1,885	377	2		-		4		4		-	-	4		58		1,268	
Melma	59		1,910	382	3		-		6		4		4,158	5	4		59		1,850	

Gram Panchayat	NADEP		ND		RWBT		RWBO		RWBP		RRWH		SPD		SP		SPI		WCIC	
	No.	No.	No.	Area	No.	No.	No.	No.	No.	No.	No.	No.	No.	Area	No.	No.	No.	No.	Length	Length
Mulagiripattu	14	790	158	2	-	4	84	0	2	4	4	2	14	1,298						
Niallallam	48	1,145	229	1	-	5	78	0	2	4	4	2	48	1,380						
Narmapallam	30	785	157	2	-	6	5,898	7	2	4	4	2	30	1,129						
Nedungal	42	2,300	460	2	-	4	20	0	5	4	4	2	42	1,450						
Nelvoy	8	860	172	2	-	3	534	1	2	4	4	2	8	1,647						
Payyur	98	2,090	418	2	-	10	1,590	2	4	4	4	2	98	2,550						
Pazhanjur	27	800	160	2	-	6	-	-	2	4	4	2	27	1,125						
Perumpalai	36	1,755	351	2	-	5	-	-	4	4	4	2	36	1,847						
Purisai	93	3,290	658	2	-	13	5,418	7	7	4	4	2	93	1,325						
Sengadu	145	3,560	712	2	-	14	9,180	114	7	4	4	2	145	1,952						
Soundariyapuram	20	1,390	278	2	-	11	33,216	42	3	4	4	2	20	1,267						
Thavasi	120	2,465	493	2	-	2	3,258	4	5	4	4	2	120	1,269						
Then Mavandal	13	1,080	216	-	-	-	1,284	2	2	4	4	2	13	2,600						
Thenelapakkam	58	1,620	324	2	-	3	-	-	3	4	4	2	58	1,356						
Theneluppai	21	1,130	226	2	-	8	-	-	2	4	4	2	21	1,369						
Thenkalpakkam	27	920	184	2	-	3	-	-	2	4	4	2	27	1,560						
Thenmavandal	-	-	-	2	-	6	-	-	-	-	-	-	-	-						
Thenthandalam	17	975	195	2	-	1	-	-	2	4	4	2	17	1,347						
Thethurai	46	1,590	318	2	-	10	3,180	4	3	4	4	2	46	1,957						
Thirumpoondi	73	2,090	418	2	-	4	-	-	4	4	4	2	73	1,589						
Ukkal	77	3,140	628	2	-	4	-	-	6	4	4	2	77	994						
Vachanur	65	1,470	294	2	-	10	4,620	6	3	4	4	2	65	1,687						
Vadalapiranthan	47	1,030	206	1	-	5	-	-	2	4	4	2	47	1,584						
Vadathinallur	119	1,955	391	2	-	10	3,780	5	4	4	4	2	119	1,598						
Veerampakkam	56	2,535	507	2	-	4	33,876	42	5	4	4	2	56	1,687						
Vellai	64	2,335	467	3	-	2	-	-	5	4	4	2	64	2,129						
Vengodu	80	1,990	398	2	-	7	2,922	4	4	4	4	2	80	1,942						

Theme	Work	Abbrivation	No.	Extent
Water	Restotaratation of water bodies:a.PWD and Tanks (Number)	RWBT	109	-
	Restotaratation of water bodies:b. Ooranis (Number)	RWBO	3	-
	Restotaratation of water bodies:c. Ponds (Number)	RWBP	305	-
	Roof Rain Water harvesting (No.)	RRWH	219	-
	Water Course - Irrigation Channels - Desilting (m)	WCIC	-	79,209
	Artificial Recharge Structure (No.)	ARS	52	-
	Construction of Farm Ponds - Individual (No.)	FP	1,091	-
	Construction of new open wells & Recharge Shafts (No.)	CROW	1,041	-
Sub total			2,820	
Livelihood	Composting (No.)	CO	684	166
	Azolla units - Individual (No.)	AZIND	3,028	-
	Cattle Shelters (No.)	CSN	3,041	-
	Cattle Trough (No.)	CT	3,041	-
	Drainage Line Treatment (m)	DLT	3,501	16,268
	Fodder development - Community & Individual	FD	3,034	-
	Goat Sheep Shelters (No.)	GSS	2,145	-
	Micro Irrigation (ha)	MI	12	28
	NADEP Vermi compost (No.)	NADEP	3,028	-
	Poultry Shed (No.)	PS	-	-
	Soak Pits (Community) (No.)	SP	197	-
Soak Pits (Individual) (No.)	SPI	3,162	-	
Sub total			24,873	
LD	Contour Continous Bunds for Afforestation area (m)	CCB	447,365	3,637
	Farm Bunding with Boundary Trenches - Individual (ha)	FBBT	462	1,039
	Land development - Individual (ha)	LD	359	897
Sub total			5,573	
Green	Afforestation in Public/common lands (ha)	Aff	864,466	1,081
	Block Plantation (Community) (ha)	BP	267,788	349
	Canal Bund Plantation(ha)	CBP	12,719	63,596
	Dry land Horticulture/Agro-forestry - Individual (ha)	DHAFL	245,871	1,237
	Nursery Development (No.)	ND	98,185	19,637
	Silvi-pasture Development (ha)	SPD	184,084	333
	Avenue plantation (m)	AVP	2,341	199,310
	Irrigation Channel Plantation (m)	ICP	15,840	79,209
	Linear Plantation (m)	LP	50,728	248,022
Sub total			17,42,022	

ANNEXURE 7.1

GP WISE WASCA RECOMMENDATION AND WORKS UPLOADED

Name of the GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 16/11/21
Akkur	592	445
Alathur	1,073	511
Alathurai	955	632
Anakkavoor	1,144	266
Anapathur	1,084	340
Arasur	347	219
Athi	345	405
Cheyyatraivendran	635	242
Chithamoor	131	34
Echur	638	678
Ilaneerkundram	442	300
Erumaivetti	413	185
Irungal	242	166
Karanai	713	163
Kilathur	236	409
Kilkolathur	269	120
Kilneerkundram	254	142
Kilnethapakkam	535	123
Koolamandal	545	176
Kottagaram	547	128
Kovilur	746	192
Kulamandai	353	64
Kunnaavakkam	811	265
Kurumbur	167	40
Madipakkam	422	335
Mahajanambakkam	554	164
Melkolathur	438	418
Melma	486	138
Melnemili	758	142
Mulagripattu	242	83
Nallalam	460	111
Narmapallam	437	161
Nedungal	382	579
Nelvoy	189	58
Payyur	792	757
Palanjur	400	206
Perumbalai	331	177
Purisai	1,092	544
Sengadu	1,172	502
Soundaryapuram	342	109
Thavasi	624	242
Thenelapakkam	380	138
Theniluppai	259	132

Name of the GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 16/11/21
Thenkalpakkam	308	165
Thenmavandal	170	69
Thenthandalam	202	87
Thethurai	524	218
Thirumpoondi	460	316
Ukkal	867	205
Vachanur	674	221
Vadalapiranthan	664	292
Vadathinnalur	900	46
Veerambakkam	551	630
Vellai	504	147
Venkodu	604	267

ANNEXURE 7.2

GPS AND WORK CATEGORIES WISE ONGOING WORKS COUNTS IN ANAKAVOOR BLOCK

Name of the GP	Work Category	No. of Ongoing works
Akkur	Works on Individuals Land (Category IV)	2
Alathur	WCWG	2
Alathurai	WCWG	1
Anapathur	WCWG	2
Arasur	WCWG	1
	Works on Individuals Land (Category IV)	1
Athi	WCWG	1
Cheyyatraivendran	Drought Proofing	1
	WCWG	1
Chithamoor	WCWG	1
Echur	WCWG	3
Erumaivetti	WCWG	2
Ilaneerkundram	WCWG	1
Irungal	Anganwadi/Other Rural Infrastructure	1
	WCWG	2
Karanai	WCWG	2
Kilathur	WCWG	2
Kilkolathur	WCWG	2
Kilneerkundram	WCWG	3
Koolamandal	WCWG	2
Kottagaram	Drought Proofing	1
	WCWG	1
Kovilur	Rural Sanitation	4
	WCWG	2
Kulamandai	WCWG	1
Kunnaavakkam	WCWG	2
Kurumbur	WCWG	2
Melkolathur	WCWG	2
Melma	WCWG	1
Melnemili	Rural Connectivity	1
Mulagiripattu	WCWG	1
Nallalam	WCWG	1
Narmapallam	Anganwadi/Other Rural Infrastructure	1
	WCWG	1
Nedungal	WCWG	2
Nelvoy	WCWG	2
Palanjur	WCWG	1
Payyur	WCWG	3
Perumbalai	WCWG	1
Purisai	WCWG	2
Sengadu	Drought Proofing	2
	WCWG	2

Soundaryapuram	WCWG	2
Thavasi	WCWG	1
Thenelapakkam	WCWG	1
Theniluppai	WCWG	1
Thenkalpakkam	WCWG	1
Thenmavandal	WCWG	1
Thenthandalam	Rural Connectivity	1
	WCWG	1
Thethurai	Anganwadi/Other Rural Infrastructure	1
	WCWG	1
Thirumpoondi	WCWG	1
Ukkal	Anganwadi/Other Rural Infrastructure	1
	WCWG	2
Vachanur	WCWG	3
Vadathinnalur	Drought Proofing	1
	WCWG	1
Veerambakkam	WCWG	2
Vellai	WCWG	2

ANNEXURE 8

KEY CWRM PARAMETERS OF GPS IN AKKUR MICRO-WATERSHED

Sl.No	Description	GPs in Akkur Micro watershed			
		Akkur	Karanai	Kilnethapakkam	Madipakkam
Soil Resources: Status of Available Nitrogen in %					
1	Very Low	97	43	0	0
2	Low	99	57	100	100
Status of Organic Carbon in %					
3	Very Low	4	0	19	15
4	Low	96	70	81	85
5	Medium	0	30	0	0
Status of Soil Micro Nutrients in %					
6	Sufficient	54	61	57	57
7	Deficient	46	39	43	43
Status of Physical condition of the soil in %					
8	Slightly Acidic	0	17	3	8
9	Moderately Alkaline	100	83	97	85
Soil Texture in %					
10	Clay Soil	3	0	26	5
11	Fine Soil	82	88	61	58
12	Coarse loamy	0	0	0	25
	Soil Water Permeability	Moderate	Moderate	Moderate	Moderate
Means of Water Extraction in %					
13	Gravity	11	13	6	7
14	Lifting	89	87	94	93
Irrigation Methods in %					
15	Wild Flooding	45	30	50	35
16	Control Flooding	55	70	50	65
Livestock					
17	Cattle Population	631	675	289	448
18	Sheep Population	795	251	294	153
19	Goat Population	941	963	514	267
Land Resources (in ha)					
20	Area under Forest land	0	6.08	0	7.5
21	Area under Non-Agricultural Uses	206.14	197.53	155.43	158
22	Area under Barren & Uncultivable Land	0	14.18	0	7.8
23	Area under Permanent Pastures and Other Grazing Land	16.27	18.52	4.85	0
24	Area under Land Under Miscellaneous Tree Crops etc.	2.6	12.65	2.31	4.2
25	Area under Cultivable Waste Land	0	0	0	0
27	Area under Fallows Land other than Current Fallows	5.44	0	52.85	110
26	Area under Current Fallow land	244.16	272.04	73.04	196.4
27	Area under Unirrigated Land	181.61	70.08	106.54	48
28	Area Irrigated by Source	188.45	92.4	80.53	70.6







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