



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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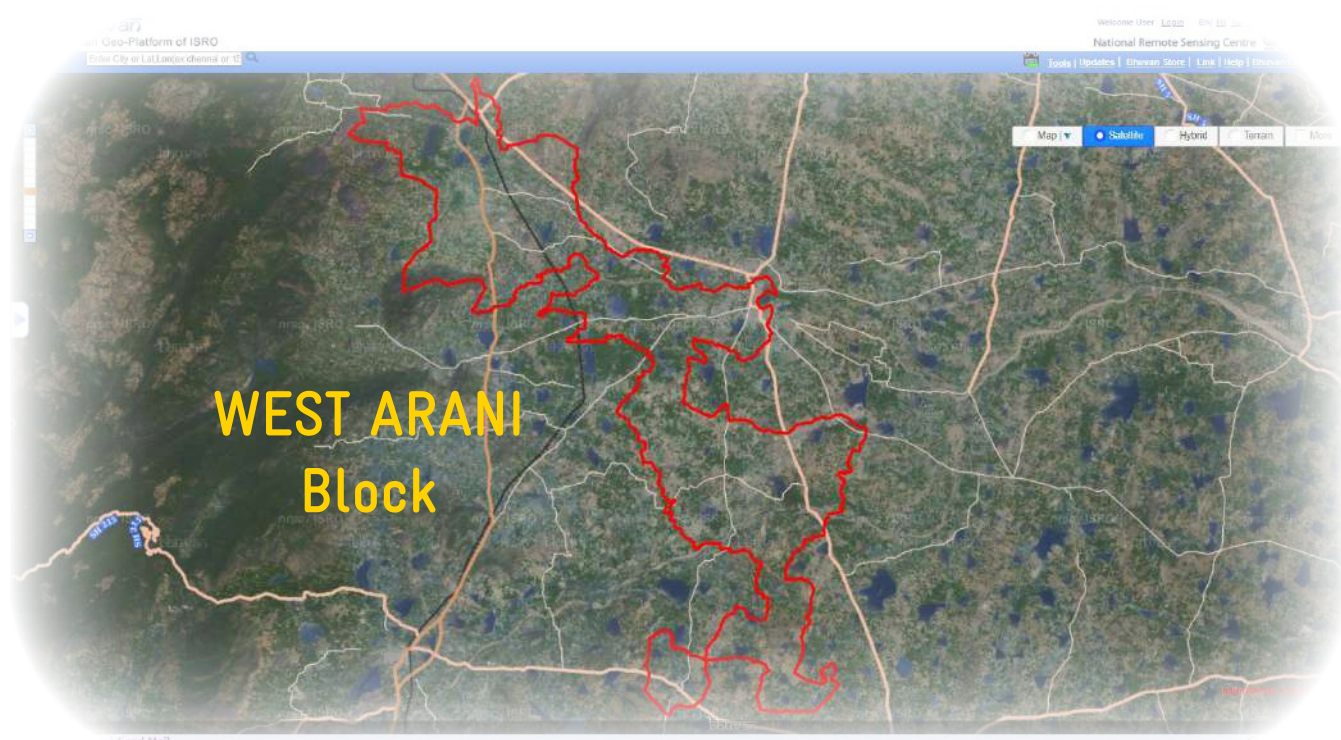
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# **WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA**



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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  
NRM and Non- NRM  
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Gram Panchayat**  
”

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.

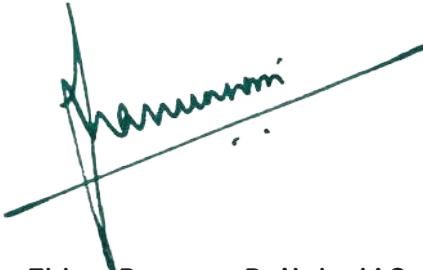
1.	Development of Public and Common lands
2.	Development of Agriculture and allied activities
3.	Development of Rural Infrastructure Management
4.	Development of Climate Resilience Measures

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 a 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 Sabha 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 status 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 (Natural 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 margin 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



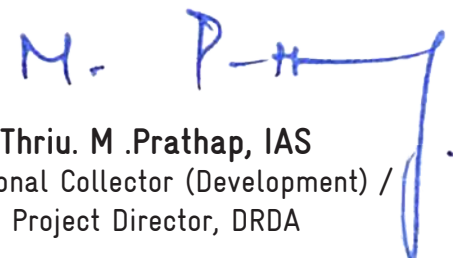
**Thriu. M .Prathap, IAS**  
Additional Collector (Development) /  
Project Director, DRDA



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 allied GP level through scientific process 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 planning. 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 mon land, agriculture and allied 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

  
**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

<b>%</b> Percentage
<b>°C</b> Degree Celsius
<b>AR</b> Assessment Report
<b>CCB</b> Contour Continuous Bunds
<b>CCCDM</b> Centre for Climate Change and Disaster Management
<b>CRM</b> Climate Resilient Measures
<b>CuM</b> Cubic Meter
<b>CVI</b> Climate Vulnerability Index
<b>CWRM</b> Composite Water Resource Management
<b>CWRMP</b> Composite Water Resource Management Plan
<b>DEM</b> Digital Elevation Model

## D - H

<b>DLSC</b> District Level Steering Committee
<b>DRD&amp;PR</b> Department of Rural Development & Panchayat Raj
<b>ET</b> Evapo-transpiration
<b>FPO</b> Farmer Producer Organization
<b>FY</b> Financial Year
<b>GIS</b> Geographical Information System
<b>GIZ</b> Deutsche Gesellschaft für Internationale
<b>GP</b> Gram Panchayat
<b>ha</b> Hectare
<b>Ha - M</b> Hectare Meter
<b>HH</b> Households
<b>ICAR</b> Indian Council for Agriculture Research

## I - M

<b>IMD</b> Indian Meteorological Department
<b>INR</b> Indian Rupees
<b>IPCC</b> Intergovernmental Panel on Climate Change
<b>IWRM</b> Integrated Water Resources Management
<b>Kharif crop</b> Sown in Monsoon and harvested close to Autumn
<b>Km</b> Kilometer
<b>LULC</b> Land use and land cover
<b>Max</b> Maximum
<b>MCM</b> Million Cubic Meter
<b>MGNREGA</b> Mahatma Gandhi Rural Employment Guarantee Act
<b>Mahatma Gandhi NREGS</b> Mahatma Gandhi Rural Employment Guarantee Scheme





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## M - N

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**Min**  
Minimum

**mm**  
Millimeter

**MoEFCC**  
Ministry of Environment, Forest and Climate Change

**MoJS**  
Ministry of Jal Shakti

**MoRD**  
Ministry of Rural Development

**Mtrs**  
Meters

**NAPCC**  
National Action on Climate Change

**NARP**  
National Agricultural Research Project

**NDC**  
Nationally Determined Contributions

**NEM**  
North-East monsoon

**NGO**  
Non-Governmental Organization

**NITI Aayog**  
National Institution for Transforming India

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## N - S

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**NRM**  
Natural Resource Management

**NRSC**  
National Remote Sensing Centre

**NWC**  
National Water Commission

**PWD**  
Public Works Department

**Rabi crop**  
Sown in winter and harvested in monsoon

**RDPR**  
Rural Development & Panchayat Raj

**RTRWHS**  
Roof top rain water harvesting structures

**RWHS**  
Rain Water Harvesting System

**SAPCC**  
State Action Plan on Climate Change

**SC**  
Scheduled Caste

**SDG**  
Sustainable Development Goal

**SDMA**  
State Disaster Management Authority

**SDMRI**  
Suganthi Devadasan Marine Resources Institute

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## S - W

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**SECC**  
Socio Economic and Caste Census

**SHG**  
Self Help Group

**SLSC**  
State Level Steering Committee

**ST**  
Scheduled Tribe

**SWM**  
South-West monsoon

**UN**  
United Nations

**WASCA**  
Water Security and Climate Adaptation

**WASCA TN**  
WASCA Tamil Nadu

**WRIS**  
Water Resource Information system







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



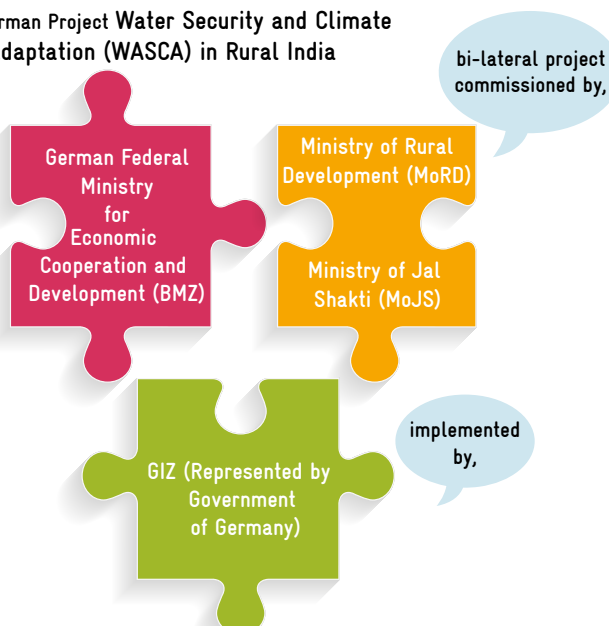
**“Aims to improve water resource management with respect to water security and climate adaptation”**



Water security is an alarming issue and one of the key challenge of the world under climate change scenario. The rural areas in particular are in prime concern due to its scarce resources and high natural resource dependency which requires a 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”** (WASCA), is a bi-lateral project commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) in partnership with the Ministry of Rural Development (MoRD) and Ministry of Jal Shakti (MoJS) and implemented by GIZ (Represented by Government of Germany). This project aims to improve water resource management with respect to water security and climate adaptation 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 and 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 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 Mahatma Gandhi NREGA/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 NREGS 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 with 9 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

5

Fifth chapter explores key water actions under Mahatma Gandhi NREGS 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 NREGS 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

8

Eighth chapter provides case study on one Micro-watershed and GP from the Block to illustrate how CWRM planning processes unfolds analysis and its consequence from Macro-watershed to the lowest planning unit- GP

9

Ninth chapter concludes with significance of the report 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

West Arani, a rural Block of Tiruvannamalai District lies between **12°29'12.847" to 12°45'34.813"N** latitude and **79°7'41.148" to 79°20'13.51"E** longitude and surrounded by Arani, Cheyyur, Pernamallur, Chetput and Polur Blocks (Figure 1.1). The total geographical area of this flat terrain Block is 19,537.76 ha (200.95 sq.km). Administratively, this Block comes under Arani taluk, and it has two town panchayats and 26 village panchayats and 198 habitations in it.

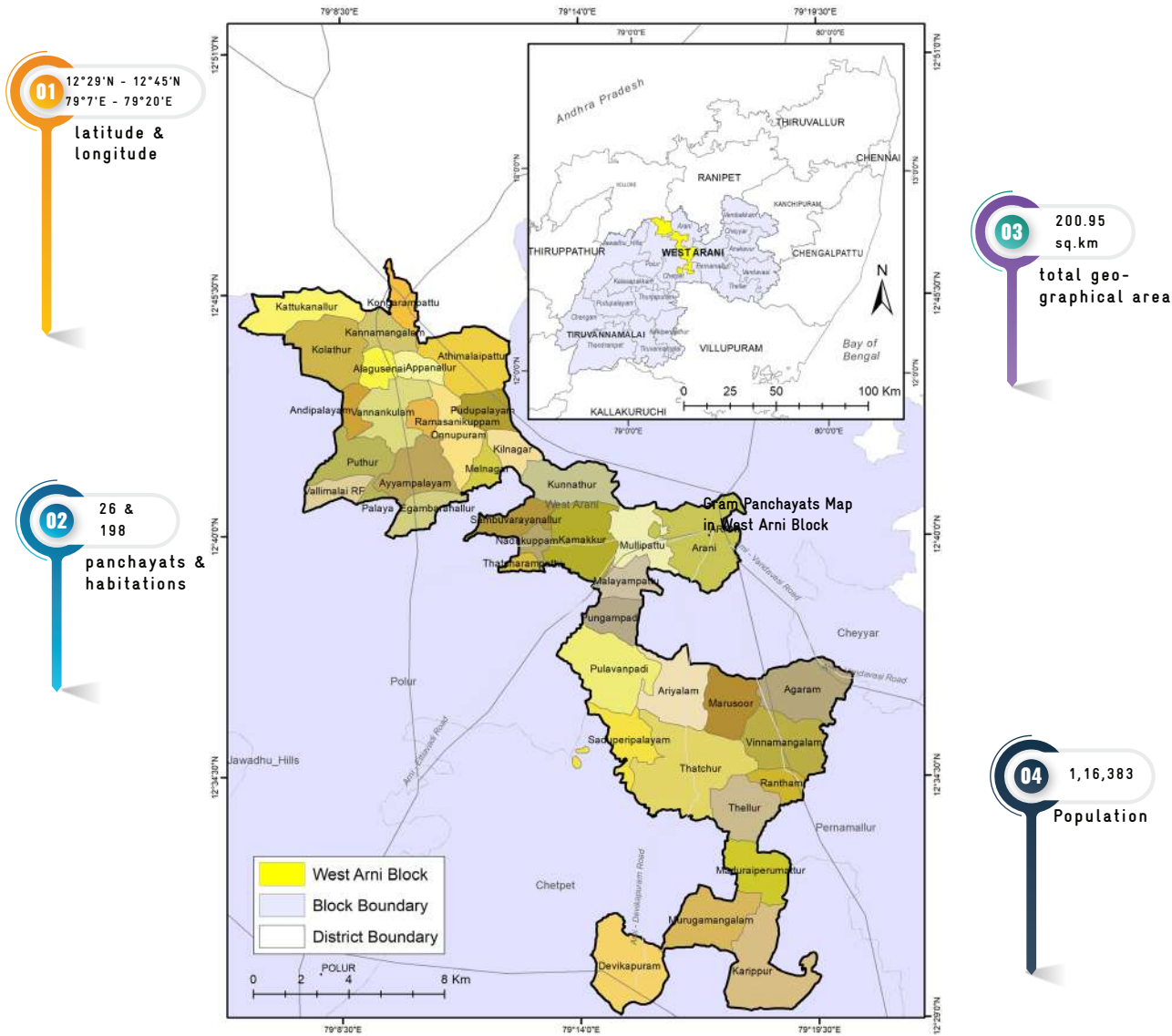


Figure 1.1 Location of West Arani Block

According to Census 2011, the population of the Block is 1,16,383. The population density of the Block is 579 persons per sq.km which is higher than the district population density (473 persons per sq.km) and State's density (555 per sq.km). There is 12.84% increase in population observed since 2001 in this densely populated rural Block. It is interesting to know that female population is higher (50.05 %) than the male population (49.94%). The proportion of sex ratio is 1,004 females per 1000 males, which is higher compared to the district average sex-ratio (994 females per 1,000 males). Even though there is high female proportion, litera-

cy rate of female is lower (44.15 %) than male literacy. The average literacy rate of the Block is lower (69.91%) than national average (72.98%). Scheduled Castes and Scheduled Tribes accounted for 15.99% of the total population (Thiruvannamalai district profile 2020).

Economically, West Arani is the 3<sup>rd</sup> most revenue earning Block of the Tiruvannamalai district next to Tiruvannamalai and Peranamallur Blocks. Agriculture and allied activities, are the primary occupation followed by livestock rearing and weaving. Paddy is the prominent crop, nearly 75% of irrigated area are cultivated with

“ female population is higher (50.05 %) than the male population (49.94%) ”

“ average literacy rate of the block is lower (69.91%) than national average (72.98%) ”

paddy. The other major crops grown in the Block area are ground nut, pulses, and red gram. Significant cultivated areas of banana, turmeric, dry chilli, sugarcane, maize and ragi cultivation is there. Groundnut and pulses are cultivated both under irrigated and rainfed conditions. The sericulture practice is also noticeable in West Arani Block as the district has a large population of weavers who are specialized in making famous “Arani silk sarees”. The area under mulberry is 111.35 (Acres) and the Block accounts nearly 7.5 % of the overall sericulture area of the district and its production of cocoons. Handlooms are often engaged for weaving, nearly 445

families in this Block are engaged in weaving. A prominent livestock (80,889) and poultry (25,175) population are recorded during 2019-20. There are 21 milk societies in the Block and 8,753 liters of milk is produced per day.

“ 75% of irrigated area are cultivated with paddy ”

Hydrologically, Cheyyar and Naganathi watersheds of Cheyyar subbasin/ Palar basin covers West Arani Block. There are 90 micro and mini watersheds subsists in this Block (Figure 1.2).

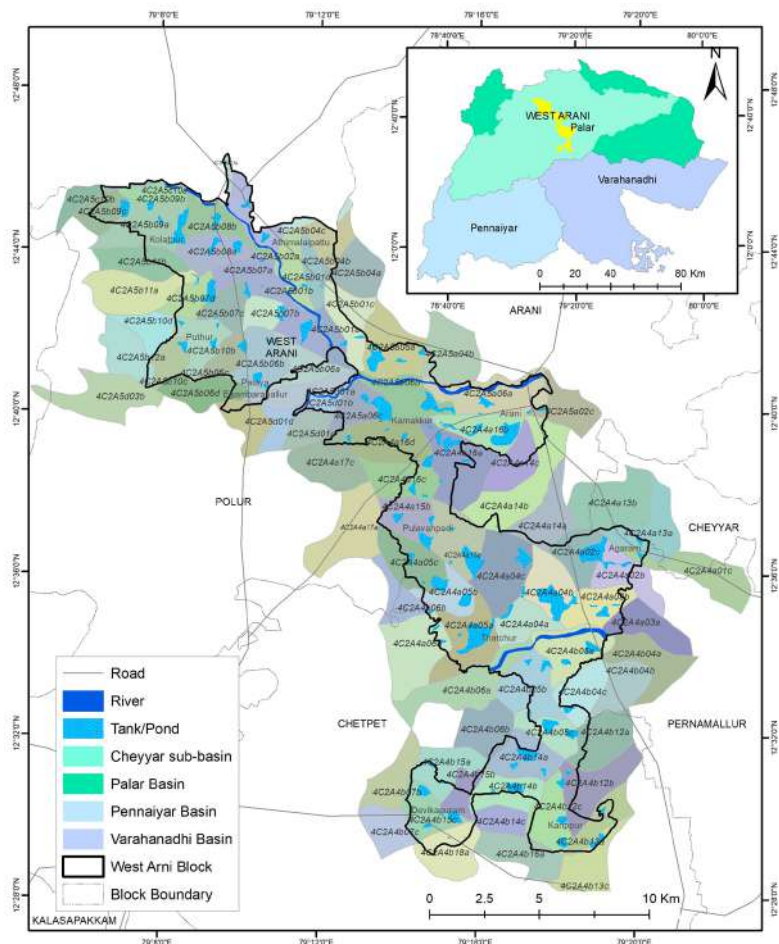


Figure 1.2 Micro-watershed map. West Arani Block

Though, part of Cheyyar, Nandiyar-Palar, Kamandalar, K.N. Rivers flows through this Block, no major canals and reservoir be existent. Thus, all water requirements for domestic, agriculture, livestock, industrial purpose depend on wells, tanks, and ooranis (Figure 1.3). The large tanks exist in this Block are Thatchur tank of about 269.39 ayuhat ha and Kolathur tank of about 252.5 ha The other important tanks which exceeds 100 ha area are Kamakkur tank, Vazhiyur big Tank, Ariyalam peria eri, Melnagar tank, Kannamangalam tank,

Alagusenai tank. The ground water level of this Block has been seriously depleted and are in critical (Kannamangalam firka)/over exploited (Mullipattu and Vinnamangalam firkas) stage of ground water development.

### GROUND WATER LEVEL OF THIS BLOCK

<b>OVER EXPLOITED- &gt; 100%</b>	Mullipattu & Vinnamangalam
<b>CRITICAL- &gt; 90% &amp; &lt;=100%</b>	Kannamangalam

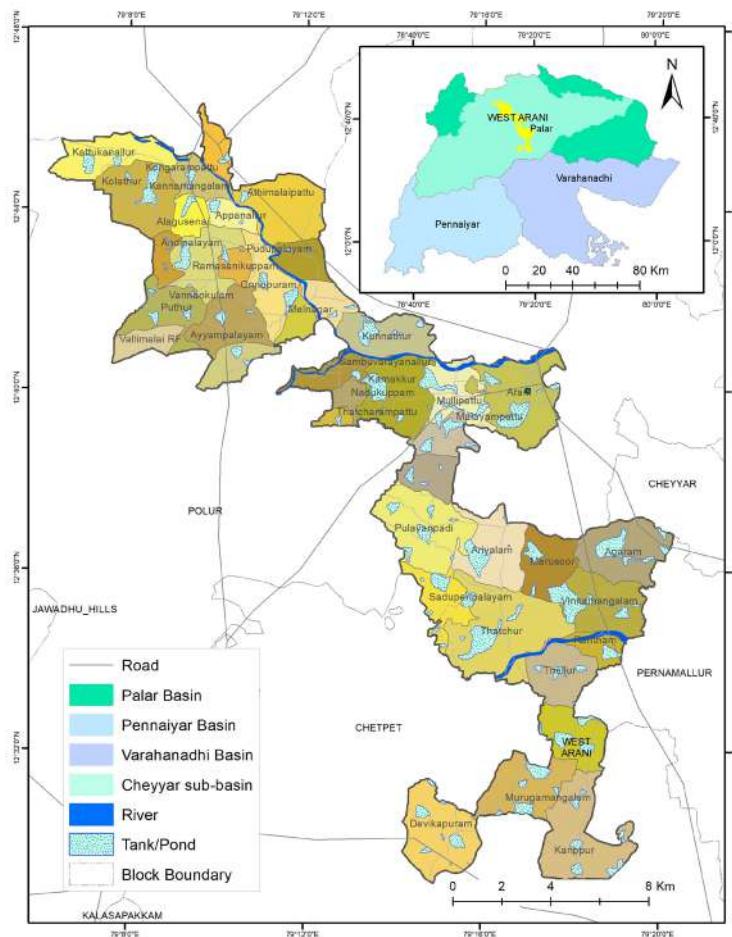
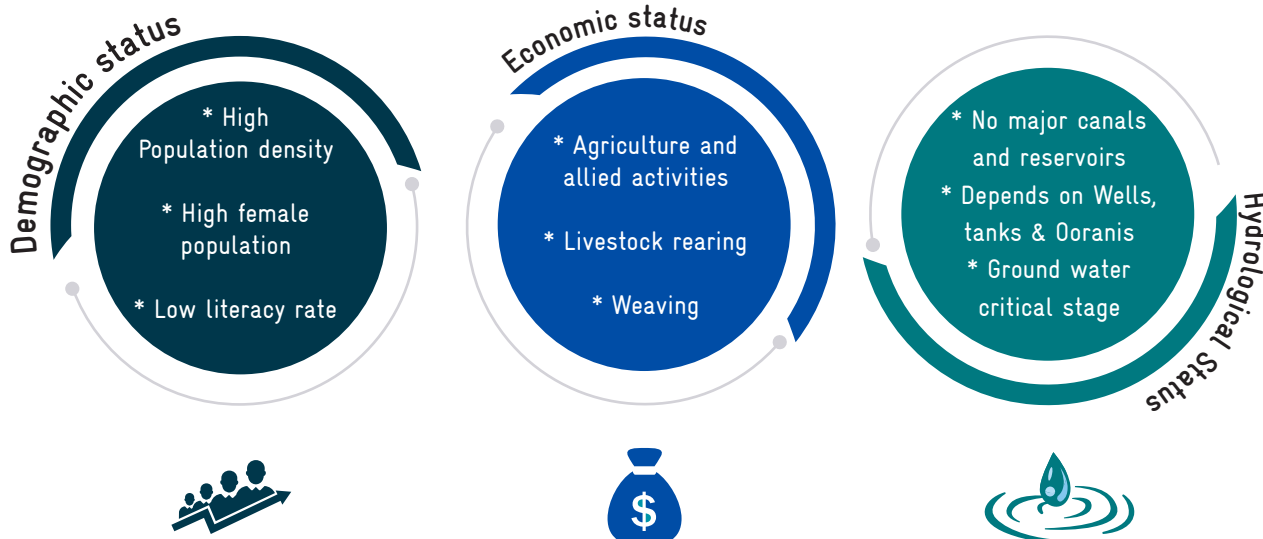


Figure 1.3 Spatial distribution of waterbodies



விண்இன்று 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

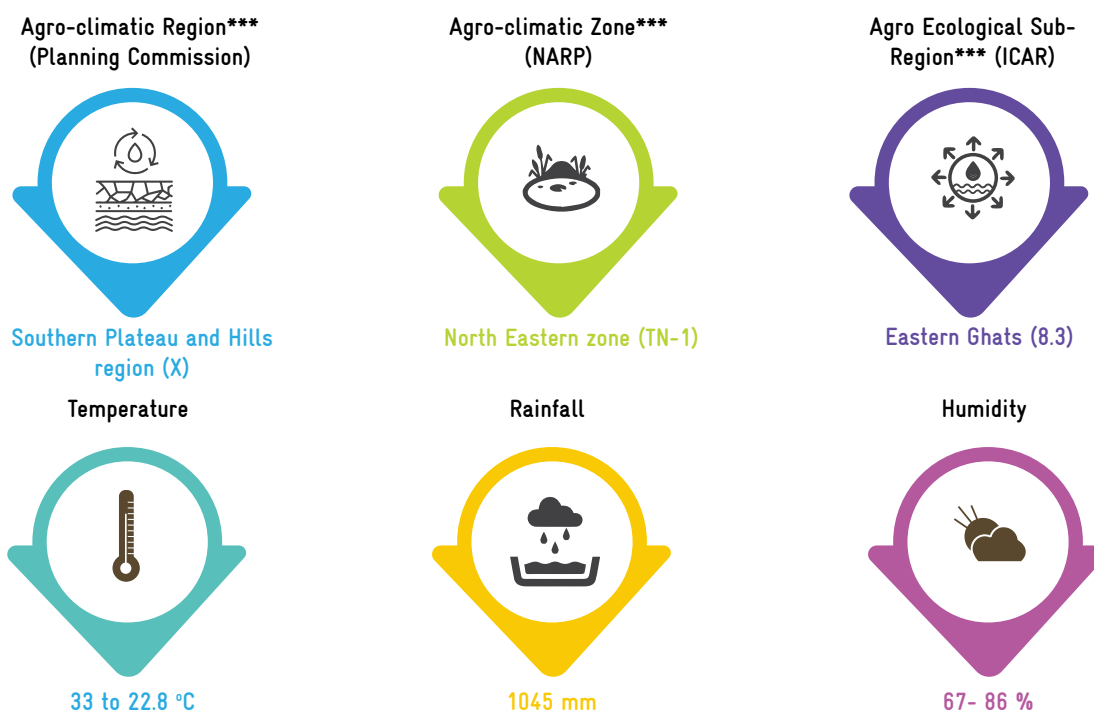




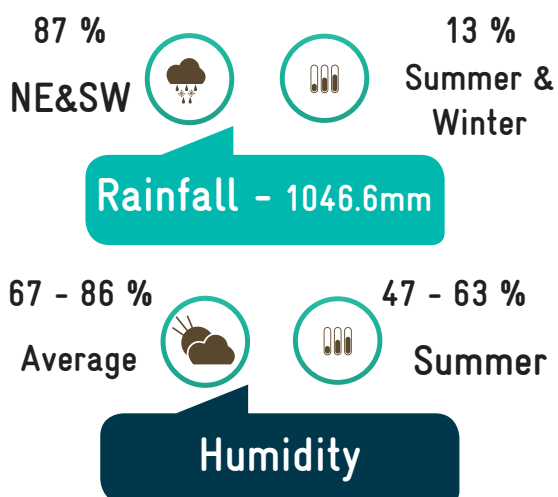
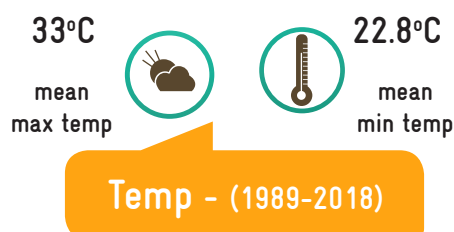
## 2 | CLIMATE AND WATER SECURITY

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 Planning Commission. The general climate description of this region is given below (Table 1).

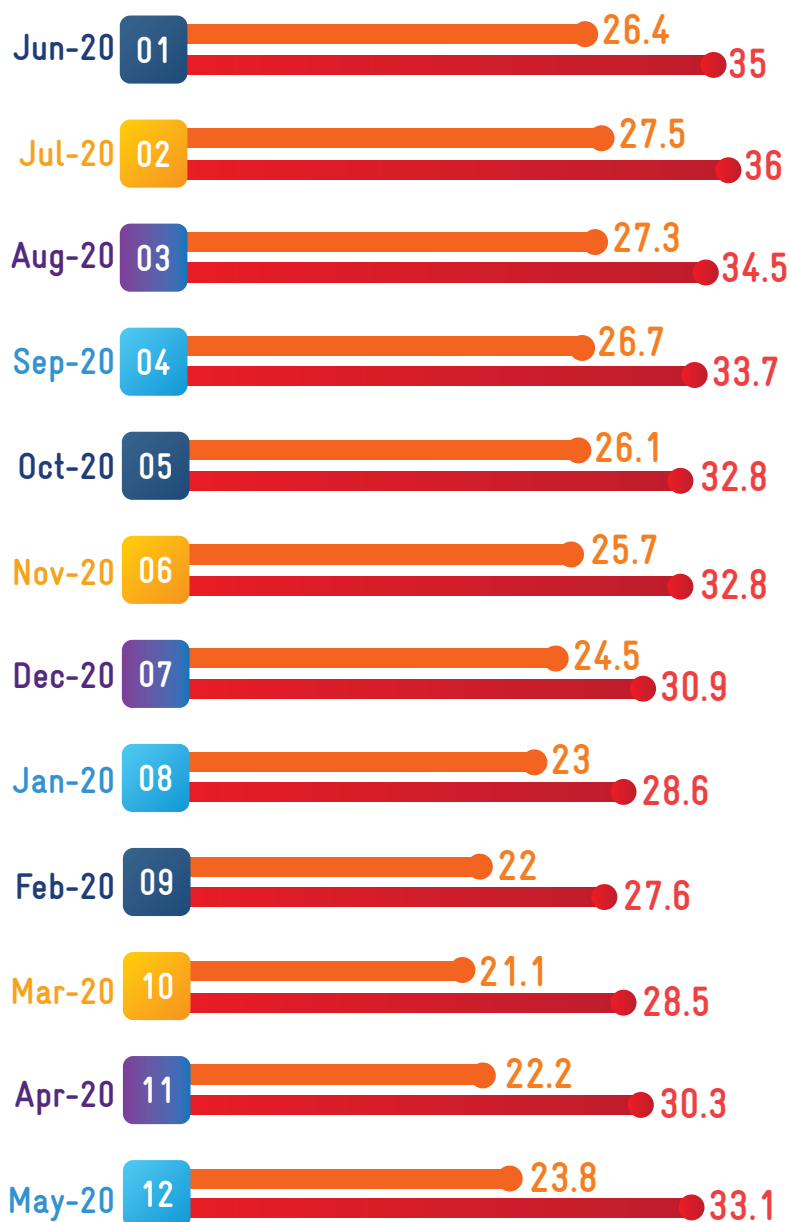
TABLE 1. GENERAL CLIMATE DESCRIPTION



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



Normally this region receives major rainfall from North East Monsoon (October to December) and South West Monsoons (June to September). Past record shows the annual average rainfall of this region is 1046.6mm (WRIS, GoI). Both North East and South West monsoons contribute nearly 87 % of the annual rainfall in which South west monsoon is slightly stronger. While Summer (March to May) rainfall accounts 9 % of the total rainfall and winter (January, February) season has low contribution (4%) to the annual rainfall (Figure 2.2). The average relative humidity is 67- 86 % and during summer it ranges between 47-63 %.



### Monthly Temperature

in degree celsius (°C)

**Minimum temperature**

**Maximum temperature**

Figure 2.1 Monthly average maximum and minimum temperature

The average annual rainfall days are 172 days in which 72 days are from North East Monsoon (NEM) and 82 days are from South West Monsoon (SWM) months. Onset of SW Monsoon rainfall starts in the 1st week of June and cessation would be in the 1<sup>st</sup> week of October.

Onset of NEM rainfall starts in the 2<sup>nd</sup> week of October and cessation would be in the 4<sup>th</sup> week of December. Though the number of rainy days are slightly lesser than SWM, the intensity is more in North East monsoon.



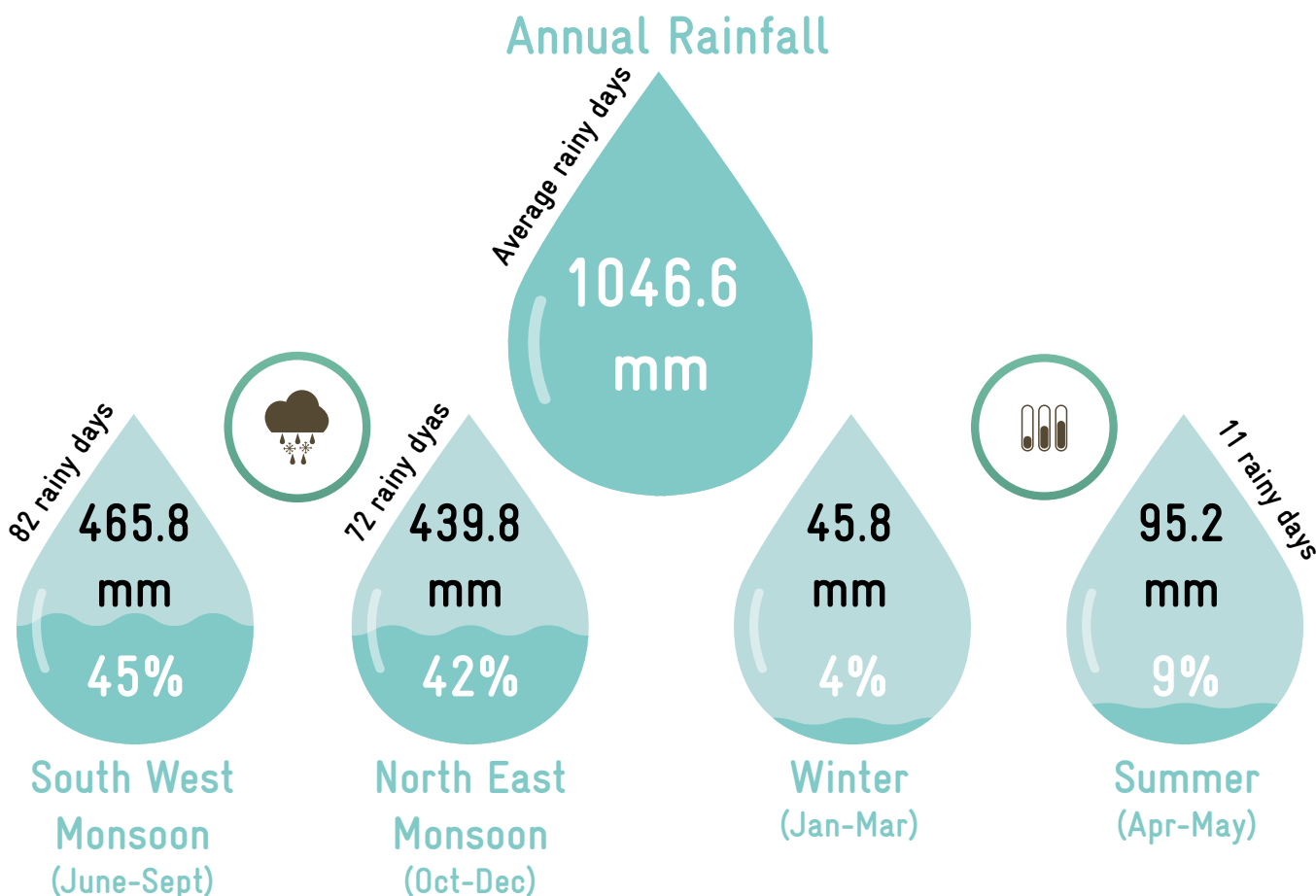


Figure 2.2 Season wise distribution to annual rainfall

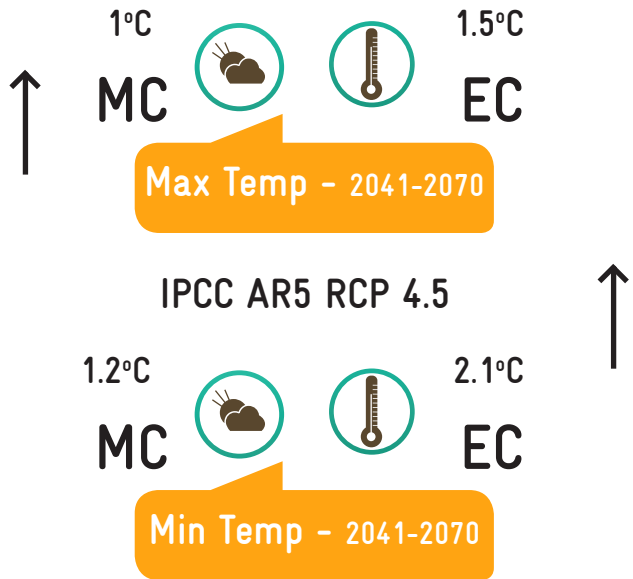
In recent decades, the world is witnessing significant changes in its climate. These changes include increase in average temperature, variations in the rainfall intensity and its frequency. This region is also no exception, and 1.2°C and 0.5°C increase in maximum and minimum temperature was observed during 1951 to 2015 (IMD). The rainfall variability is also well observed. During 1951 to 2015, there were 15 excess rainfall years (above normal rainfall) and 15 deficient rainfall years (below normal rainfall) recorded. The consecutive excess and deficient rainfall leads to rainfall variability and its extremities. Since this region is heavily dependent on monsoon rains, and

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

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



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



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



- \* 1.20°C increase in maximum temperature during 1951-2015
- \* 0.5°C increase in minimum temperature during 1951-2015
- \* 1°C increase in max temp during 2041-2070 (RCP4.5)
- \* 1.5°C increase in max temp during 2071-2100 (RCP 4.5)



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

## 2.1 | CLIMATE RISKS

Increasing temperature, fluctuating rainfall patterns and its extremities creates shorter rainy seasons and longer dry seasons making river basins more vulnerable. This district experiences 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 75 locations five locations are in West Arani 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

Prior, WASCA TN conducted preliminary State level scoping study on State's rural water security under climate lens and identified climate and water security hotspots/potential geographical areas for project demonstration through scientific criteria jointly with Centre for Climate Change and Disaster management (CCCDM), Anna University. 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	Unit	Linked SDG
Climate	Changes in maximum temperature	C1	Degree Celsius	Goal 13
	Changes in minimum temperature	C2	Degree Celsius	Goal 13
	Changes in rainfall	C3	%	Goal 13
	Excess rainfall years	C4	No. of Years	Goal 13
Water Resource	Deficient rainfall years	C5	No. of Years	Goal 13
	Ground water extraction	W1	%	Goal 6
	Ground water Recharge	W2	in cubic meter	Goal 6
	Surface water availability	W3	mm	Goal 6
	Water gap	W4	MCM	Goal 6
	% of contamination	W5	%	Goal 6
Agriculture	Rainfed area	A1	%	Goal 15
	Cropping intensity	A2	%	Goal 2
	Soil moisture	A3	kg/m <sup>2</sup>	Goal 15
	Evapo-transpiration	A4	kg/m <sup>2</sup> /s	Goal 15
Socio-economic	Rural proportion	S1	%	Goal 2
	Multidimensional poverty index	S2	Index Value	Goal 1
	Source of drinking water within premises in rural	S3	%	Goal 6
	Marginal farmers landholdings	S4	%	Goal 1

These 18 biophysical and socio economic indicators data were collected at district level and categorized into exposure, sensitivity and adaptive capacity for the analysis. The vulnerability ranking was given based on IPCC protocol of vulnerability assessment methodology. Based on the analysis, Ramanathapuram and Tiruvannamalai districts were selected by the State Level Steering Com-

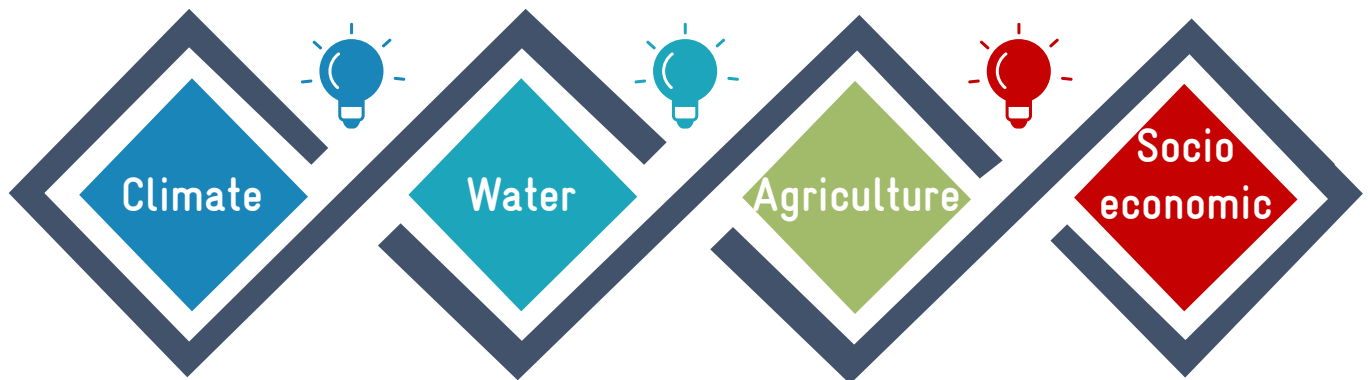
mittee headed by the Secretary RD&PR in Nov 2019 for implementing the WASCA. Subsequently, all the key water actions, CWRM planning and implementation works are envisaged for the above districts through these influencing indicators collectively under four CWRM areas viz. climate, water, agriculture and 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 socioeconomic 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 Tamil Nadu State's conditions, including climate vulnerability as per the scoping study recommendations, Major CWRM parameters are thus identified under four areas via climate, water, agriculture and socio-economic for advancements towards actions. The major parameters identified at Block level (Table 3) are collected both from primary and secondary sources and analyzed statistically and geospatially.

TABLE 3. MAJOR PARAMETERS IDENTIFIED FOR BLOCK LEVEL VULNERABILITY ASSESSMENT



Changes in temperature, rainfall and its extremities

Watershed, Micro-watershed, and drainage network, traditional water bodies, canal networks, irrigation facilities, catchments area wise available runoff, ground water and surface water utilization, ground water status, ground water availability, evapo-transpiration losses, and water demand for drinking, agriculture and livestock

Land resources, land use under different categories, catchment area, means of water extraction, irrigation methods, crop details, status of soil resources including macro and micro nutrients, soil physical condition, soil moisture, and livestock details

Area, population, gender, vulnerable population and household, details of MGNEGRA job seekers, drinking water sources and grey water generation



ஏரின் உழாஅர் உழவர் புயலென்னும்  
வாரி வளங்குன்றிக் கால்

குறள் - 14

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

Thirukkural - 14

# CHAPTER 3

GP PLANNING IN MAHATMA GANDHI NREGS



GRAM PANCHAYAT PLANNING  
IN MAHATMA GANDHI NREGS





### 3 | GRAM PANCHAYAT PLANNING IN MAHATMA GANDHI NREGS

WASCA, GIZ has evolved a GP based CWRM planning approach for facilitating convergent planning under Mahatma Gandhi NREGA as per recommendation of National Level Workshop organized by MoRD, MoJS, GIZ along with State rural development department of WASCA implementing states in February 2020. Inputs from all the relevant stakeholders including communities, public institutions, civil society, research organizations, and private agencies, were captured while developing the framework. Both Annual Master Circular issued by MoRD during 2021-22 and annual planning circular issued in September 2020 are focussed on developing GIS based planning in all Gram Panchayats. 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 and allied activities and livelihood related works on individual's land leading to sustainable livelihoods as well as provisioning of livestock shelters for the individual households. The NRM related works under Mahatma Gandhi NREGS shall be taken up in convergence with 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. Technical inputs for planning shall be drawn from the technical resources available in the district under Mahatma Gandhi NREGS, Civil Society Organization (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, Water Resource Department and the Agriculture Department. The technical inputs relating to Excavation, Renovation & Modernization (ERM)/water bodies may also be sought from Regional Office of Central Ground Water Commission (CWC). The Gram Panchayats, while deliberating and finalizing prioritization of shelf of projects, will keep Macro and Micro-watersheds of 500-1000 hectares that often comprise 1-10 Gram Panchayats, in perspective.

The special focus on vulnerable households and communities are considered 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 simultaneously improving the livelihoods of the poor. Mahatma Gandhi NREGA, particularly the Category A activities, which are public works relating to natural resource management. 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 relate to Agriculture and allied works

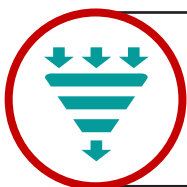


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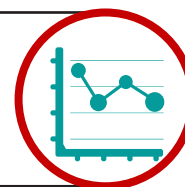
Water related works out of NRM

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 relate to NRM alone and out of the 182 NRM works, 85 are water related. 164 of the total works are related to Agriculture and allied works. The works taken up under Mahatma Gandhi NREGS should change from taking up individual, standalone works in a typical 'relief works mode' to an INRM perspective. Planned and systematic development of land and harnessing of rainwater following watershed principles should become the central focus of Mahatma Gandhi NREGS work across the country to sustainably enhance farm productivity and income

of poor people. Even the works on private lands should be taken up following the principles of watershed management in an integrated manner. To facilitate evidence based scientific NRM planning process, Technological support will be taken from National Remote Sensing Centre, ISRO for identification and holistic. planning of permissible works to be taken up in the watersheds using GIS Technology (BHUVAN). The GIS plans will be comprehensive ones incorporating all eligible works under Mahatma Gandhi NREGS and the same will be implemented in a phased manner. Section 22 of Annual Master Circular provides the key steps for GIS based planning.



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

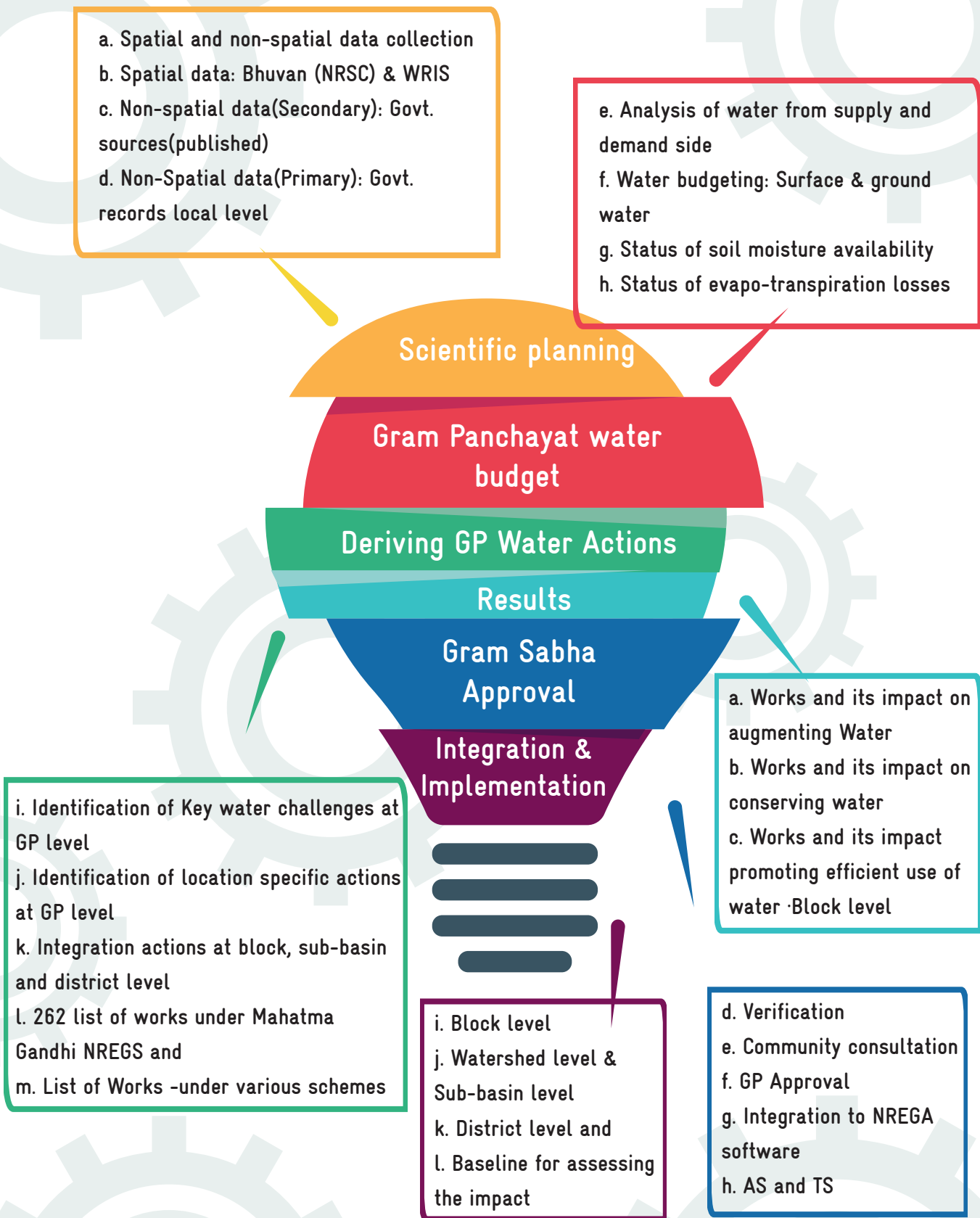


### 3.1 | CWRM APPROACH

CWRM approach for Water Security and Climate Adaptation uses simple scientific tools that can help Block or GP level officer to organize, analyze and prepare draft plan for participatory discussion at Gram Panchayat level. This approach involves analyzing key water challenges using both non spatial and geo spatial data in GIS (Geographical Information System) coupled with extensive ground truth verification. The non-spatial data includes 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 (drain-

age points/watersheds/sub basin) units keeping Gram Panchayat 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, evapo-transpiration and soil moisture are used to understand the climate related issues. Then land use, watersheds, drainage networks and surface runoff, existing water supply and storage systems, water management for the key sectors and water demand are assessed and prepare the water budget for the GP (Box 1).

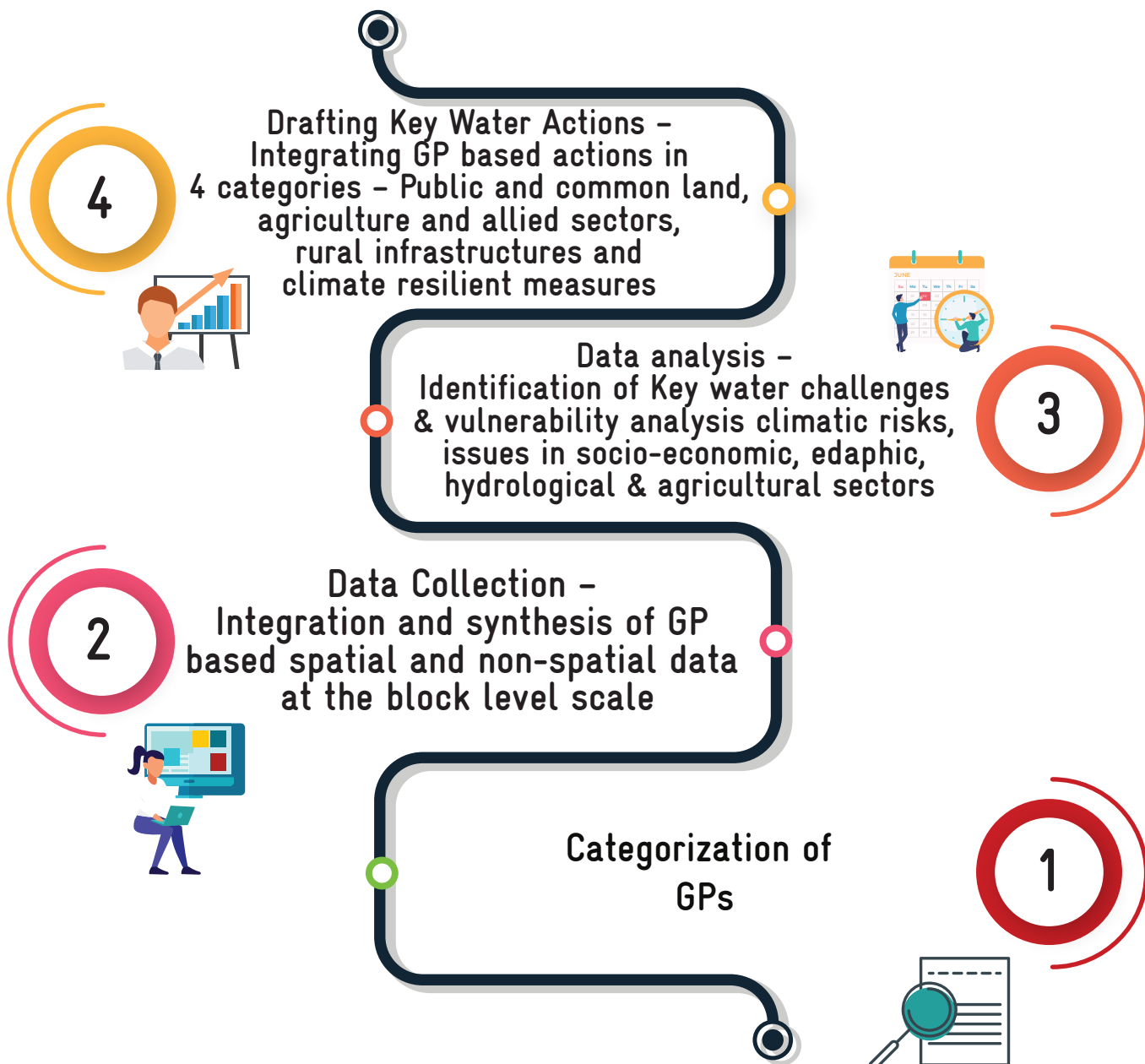
**BOX 1. MAJOR COMPONENTS INVOLVED IN CWRM PLANNING WORKOUTS**



Such a comprehensive analysis in preparing the water budget integrating ground water, surface water through runoff from rainfall, evapo-transpiration and soil moisture helps to identify potential areas of action to augment the water resources in public and common land, agriculture and allied sectors and rural infrastructure dimensions. The analysis also helps to understand the areas of interest and 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 dis-

trict level technical and administrative teams are involved in planning, monitoring and evaluation in terms of outcome/impact mapping. In the execution stage, the approach of saturation of works, planning at watershed approach (ridge to valley), convergence is some of the key aspects needs attention for a tangible outcome 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 in to four stages – pre planning, planning, review and verification and integration and approval (Box 2).

**STEPS INVOLVED IN BLOCK LEVEL ANALYSIS THROUGH CWRM APPROACH**

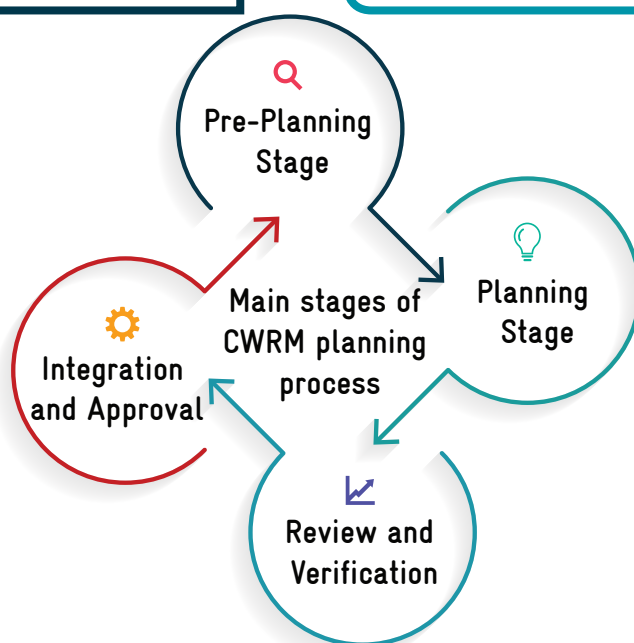


**PRE-PLANNING STAGE**

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



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**

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**

## 3.2 | CATEGORIZATION OF GPS

The CWRM uses both spatial and non-spatial data for developing Gram Panchayat GP level plans. Most of the available non-spatial data are at 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 GP's in West Arani Block is tabulated in Table 4.

TABLE 4: GPS IN WEST ARANI BLOCK

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
14	GP and revenue village data and boundary match	Arayalam, Athimalaipattu, Agaram, Kolathur, Kamakur, Karipur, Murugamangalam, Marusoor, Kattukanallur, Muduraiperumattur, Pulavanpadi, Puthur, Sadupperipalayam and Thatchur
19	Having more than one GPs in one Revenue Village	Andipalayam, Vannankulam, Pungampadi, Malayampattu, Kilnagar, Palayaekambaranallur, Iyyampalayam, Kongarampattu, Appanallur, Alagusenai, Melnagar, Onnupuram, Ramasanikuppam, Thacharampattu, Sambuvarayanallur, Thellur, Pudupalayam, Rantham, and Nadukuppam
14	Newly formed GP after 2011 census publication	Kunnathur, Mullipattu, Devikapuram, Vinnamangalam

## 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), waste land, 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 99 data are collected, 13 parameters are primary and are collected at GP level by GP level officers. 65 parameters are secondary 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, and 3.3). The methods, and formulas used for water budgeting is attached in Annexure 3.4 and 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. However 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	Drought	Heat Wave
Mullipattu, Konga-rampattu, Melnagar, Puthur, Kolathur	All villages	All villages

### 3.5 | CWRM PLANNING ANALYSIS - WATER

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

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

#### 3.5.1 SPATIAL DATA

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

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



**3.5.1.1 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 3.1).

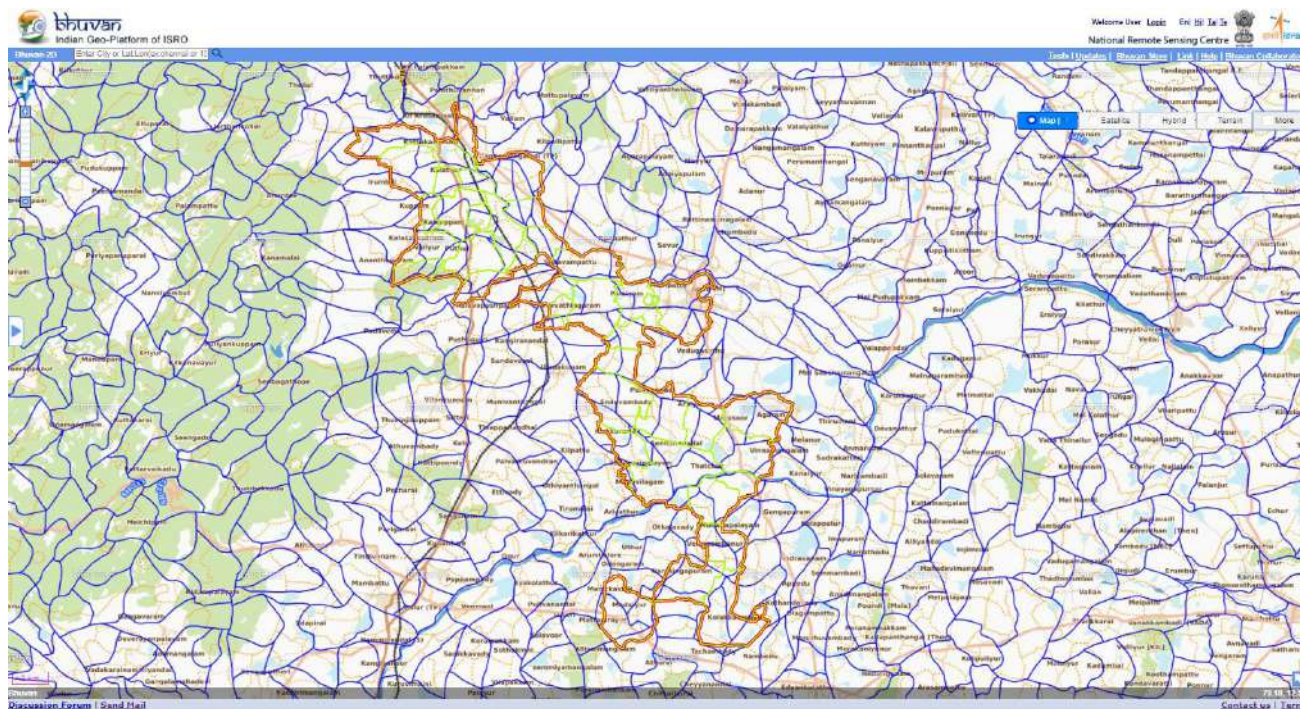


Figure 3.1 Watershed map of West Arani Block

**3.5.1.2 Drainage and surface water bodies:** The drainage map shows the drainage order, pattern and destiny. Also, it shows the spread and extent of surface water bodies in the Block (Figure 3.2) This map is widely used to identify the suitable locations for water conservation assets such as check dams on the drainage, gabion structures and desilting the drains.

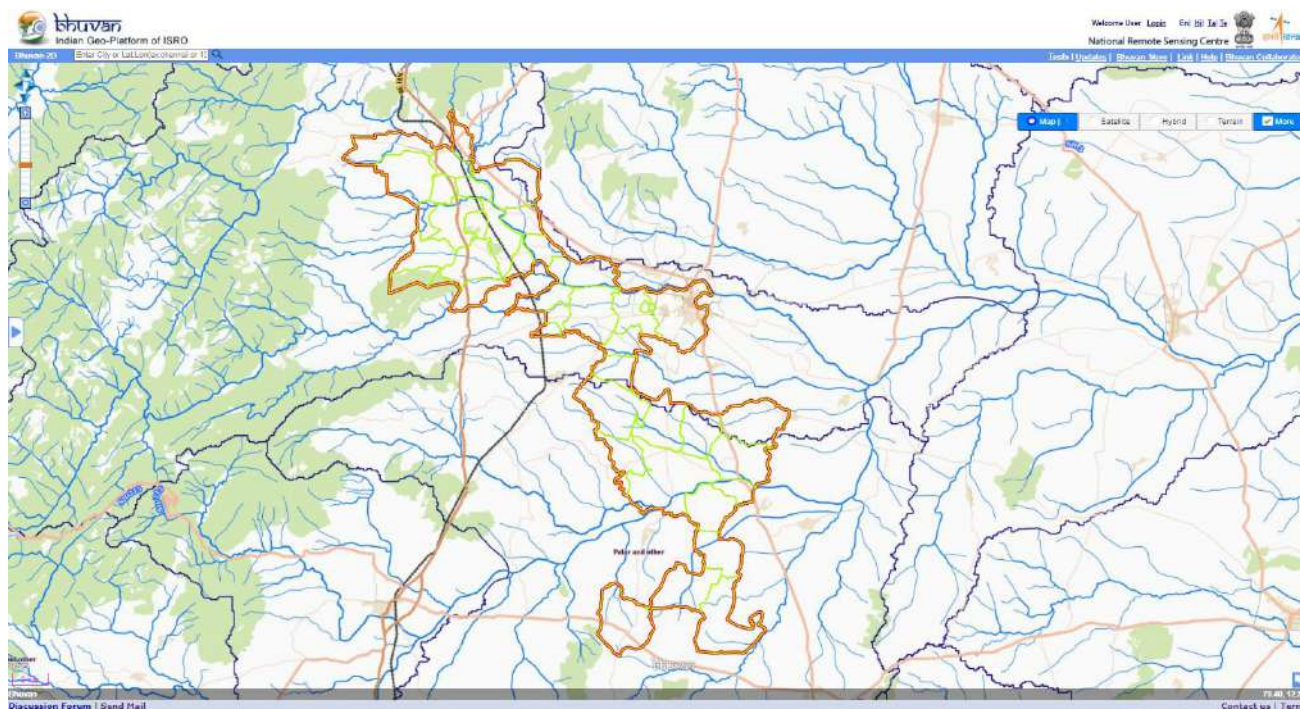


Figure 3.2 Drainage map

**3.5.1.3 Geomorphology:** Geomorphological maps are considered for representing graphical inventories of a landscape depicting landforms and surface as well as subsurface materials. The major part of this Block is under the Denudation origin – Pediment- Pediplain complex category (Figure 3.3). Structural Origin- Moderately Dissected Hills and Valleys are seen in Athimalaipattu. The knowledge of GP specific geomorphic and geologic conditions helps to undertake appropriate work in particular location to reap maximum benefits.

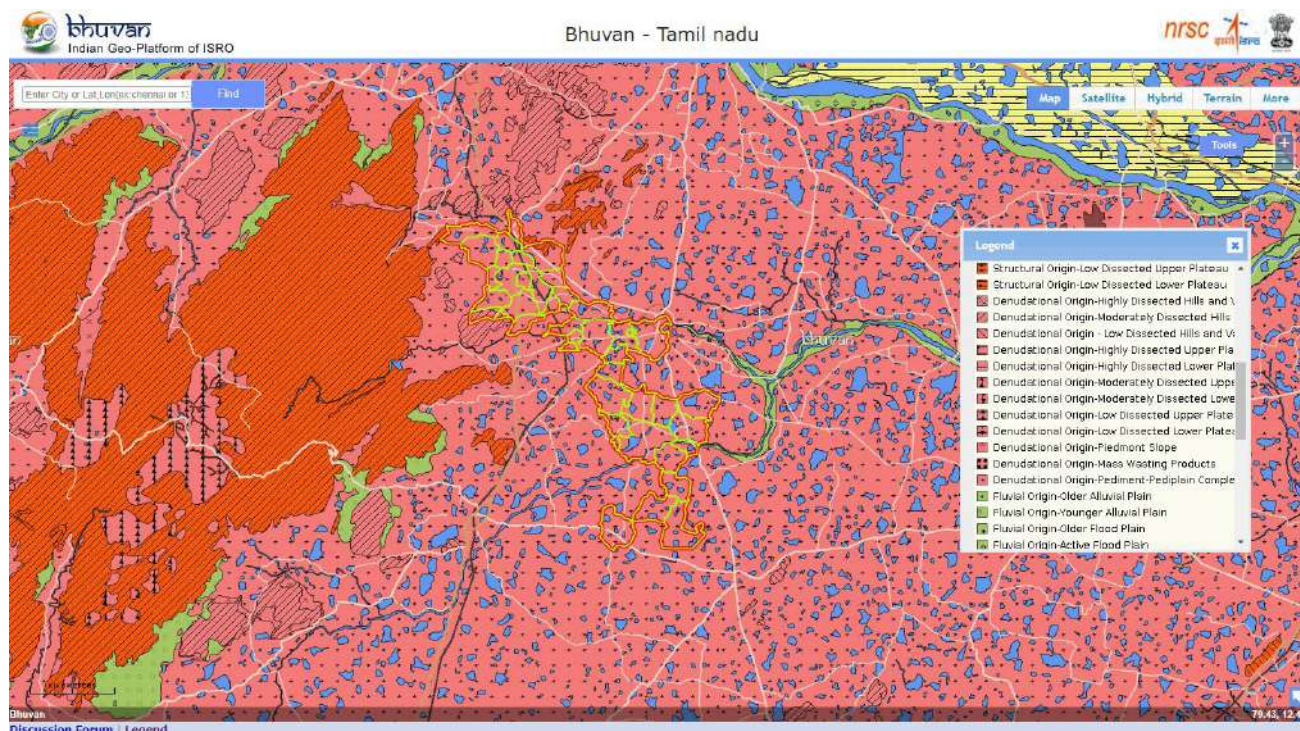


Figure 3.3 Geomorphology map

**3.5.1.4 Lineament:** The lineament map shows the linear feature in a landscape that is an expression of an underlying geological structure such as a fault, fracture, or joints in the Block (Figure 3.4). Structural lineaments and Faults are seen in Thatcur, Vinnamangalam, Thellur, Murugamangalam GPs. Geomorphic lineaments with parallel drainage are noticed in Pudupalayam, Kilnagar, Athimalaipattu, Pulavanpadi, Araiyalam, Marusoor, Vinnamangalam and Thatchur GPs. Structural lineaments, joint/ fracture is noticed in Athimalaipattu GP. These observations are widely used to locate points of high water flow especially in groundwater exploration.

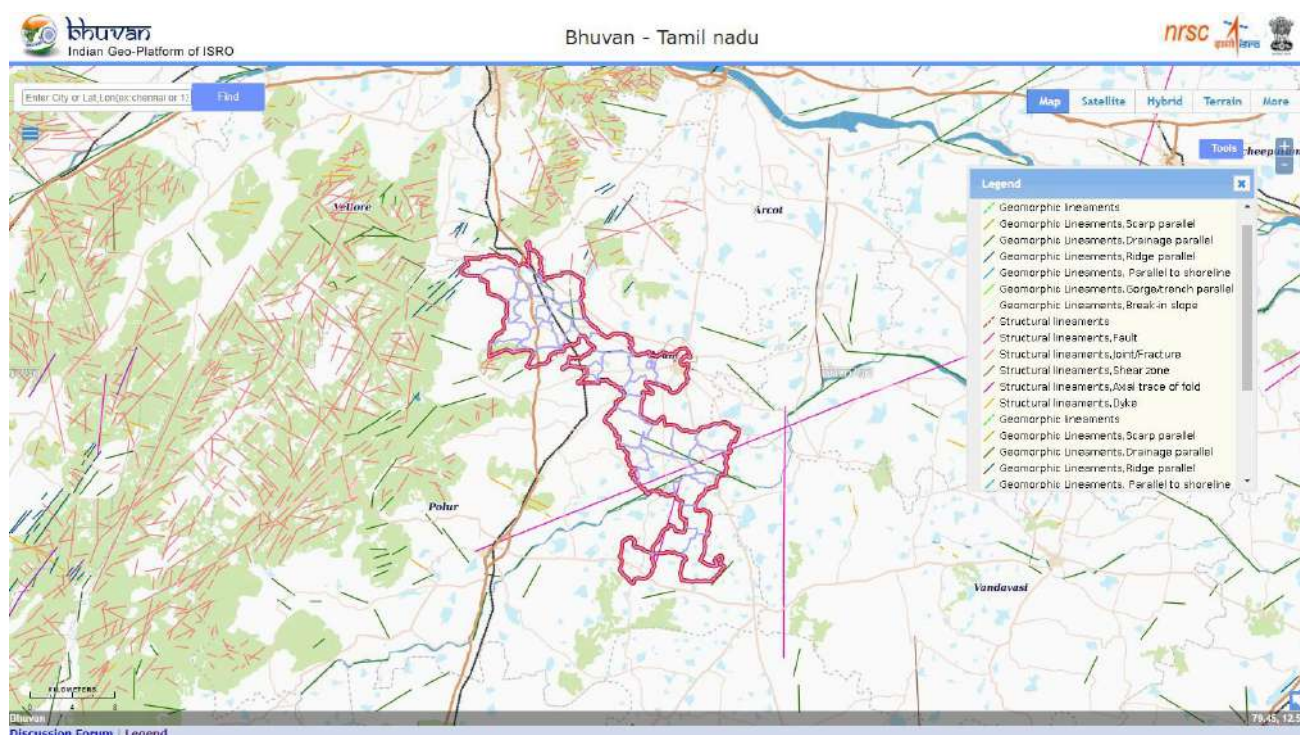


Figure 3.4 Lineament map

**3.5.1.5 Ground water perspectives:** The ground water perspectives map provides the required information on Hydro-geological parameters connected to ground water exploration and the probable ground water prospects (Figure 3.5). All parts of Kattukanallur, Alagusanai, Vannankulam, Kamakkur, Mullipattu, Kunnathur, Malayampattu, Pulavanpadi, hellur, Marusoor, Thatchur Maduraiperumattur and 90% of the Kolathur GP have > 80 m Deep Well- 50 to 100 LPM Yield. While part of Devikapuram, Karipur, Athimalaipattu (30%), Murugamangalam (20%), Ayyampalayam (10%) GPs have > 80 m Deep Well- > 800 LPM Yield. At the same time 10% area of Ramasanikuppam, Onnupuram, Kolathur, Karipur, and Murugamangalam GPs have no 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.

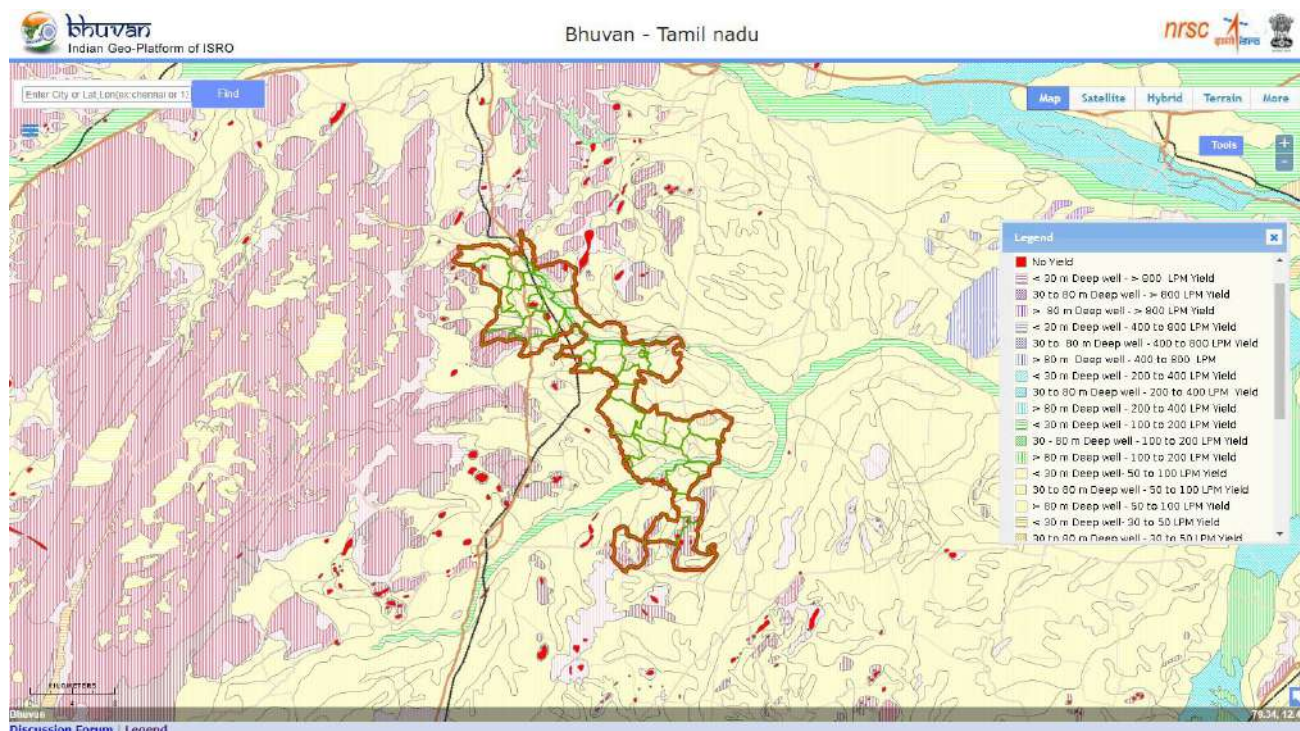


Figure 3.5 Ground water perspective map

**3.5.1.6 Terrain:** The terrain map shows an area of land divided into terrain map units defined by similar elevation, slope, landform. This map will be useful to understand the terrain to identify the water and soil conservation related activities at GP level (Figure 3.6).

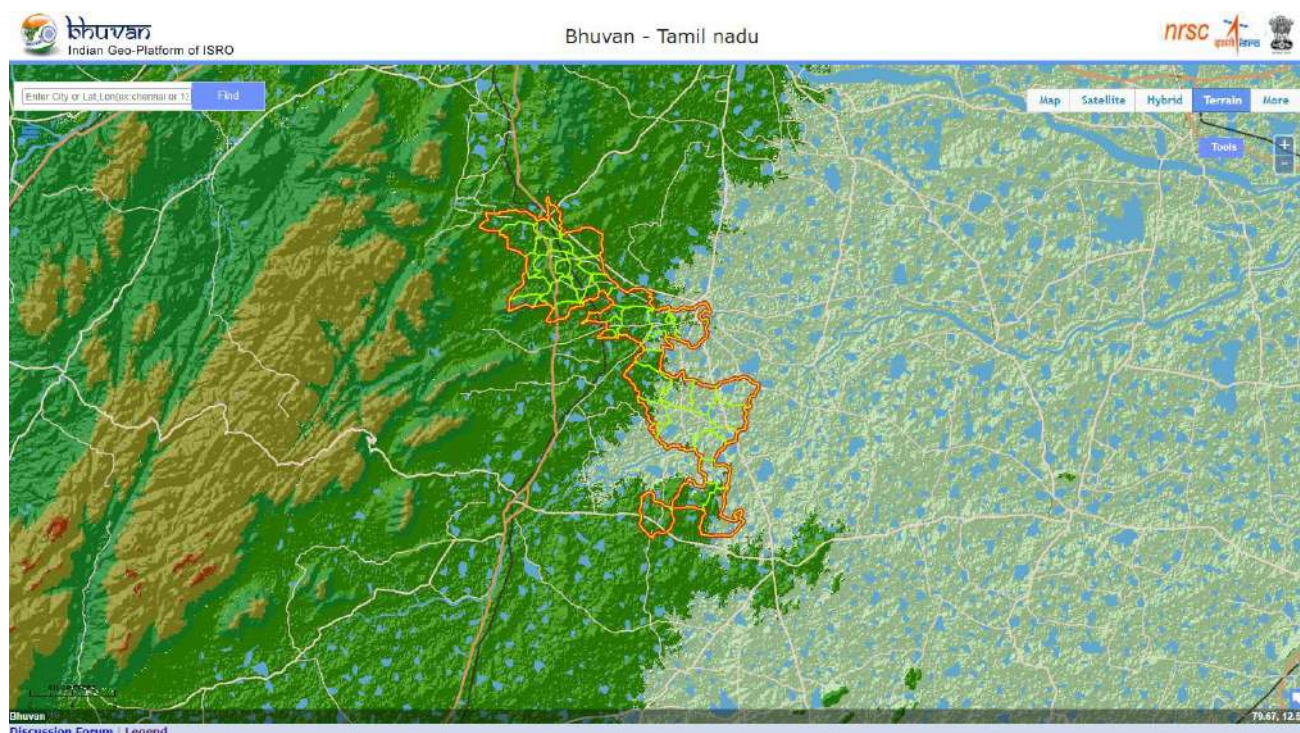


Figure 3.6 Terrain map

**3.5.1.7 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 Kolathur, Kamakkur, Kilnagar, Kunnathur, Thatchur, Thellur, Pulavanpadi, Agaram, Malayampattu, Pungampadi, Pulavanpadi, Samburayanallur GPs are very flat. 60% of the Ayyampalayam, Melnagar, Onnupuram, Mullipattu, Araiyaalam, Vinnamangalam, Devikapuram, Karipur, Murugamangalam, Thellur, Maduraiperumattur, Puthur, Ramasanikuppam are flat with 1-3% slope. A part of (10%) Athimalaipattu, Onnupuram, Vannankulam, Ramasanikuppam have steep 10-35% slope (Figure 3.7). This information's are used for analyzing the soil conservation measures and construction of the water recharge structures such as check dam, farm ponds etc.,

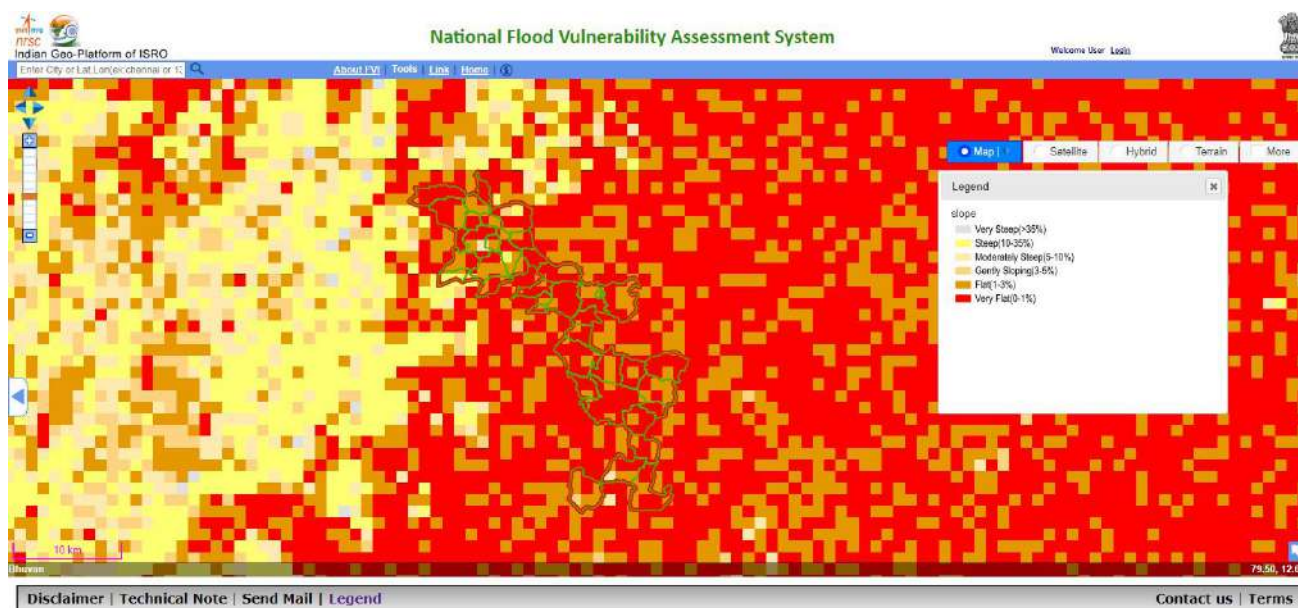


Figure 3.7 Slope map

**3.5.1.8 Contour map:** A contour map is illustrated with contour lines which shows valleys and hills, and the steepness or gentleness of slopes. The contour map plays a vital role in planning and identifying the recharge structures, farm ponds and construction of grey water drain network etc., (Figure 3.8).

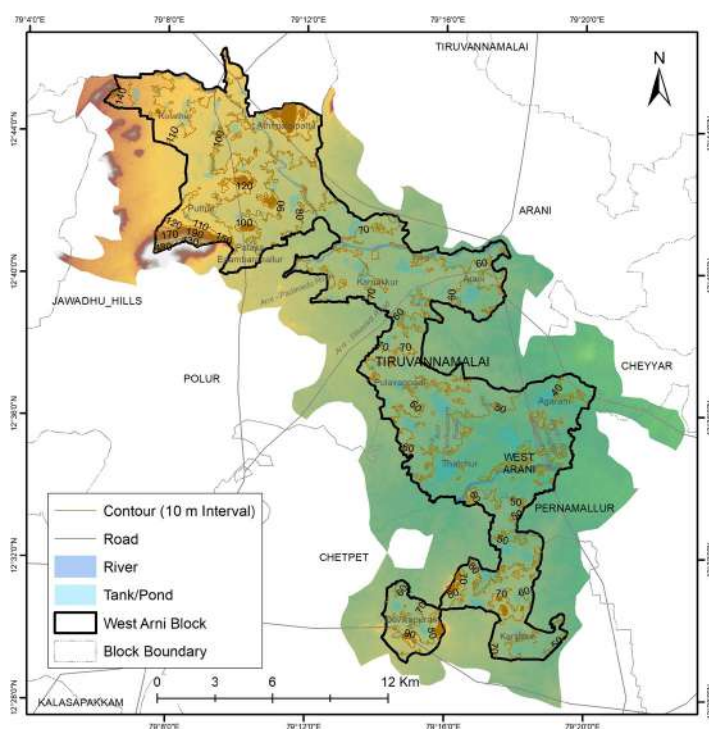


Figure 3.8 Contour map

### 3.5.2 NON SPATIAL DATA

Apart from geo-spatial maps, the data regarding, status of watershed and drainage network, canal, traditional water bodies, details on irrigation facilities are collected from recognized 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 West Arani Block. GP wise current water resources state and its supply and demand side are shown in Annexure 3.6.

**TABLE 6. WATER RESOURCES STATUS**

S No	Key CWRM Parameter	Unit	Total
<b>Canal Network</b>			
1	Length of Main Canal	meter	Nil
2	Length of Minor Canal	meter	77,046
3	Length of Distributaries	meter	68,851
4	Water Courses (Field Channels)	meter	3,345
<b>Traditional water bodies</b>			
5	Number of Tanks (PWD & Union)	Number	93
6	Number of Ooranis	Number	29
7	Other Surface Water Bodies	Number	212
<b>Irrigation Facilities</b>			
8	Area under Tank Irrigation	ha	894
9	Area under Canal Irrigation	ha	Nil
10	Area under Open & Tube Well Irrigation	ha	6,350
<b>Water Quality</b>			
11	Chemical Contaminants	Sample number	-
12	Bacterial and Other Contaminants	Sample number	-
<b>Catchment Area wise Available Runoff</b>			
13	Good Catchment Area	Ha - M	2,094
14	Average Catchment Area	Ha - M	93.9
15	Bad Catchment Area	Ha - M	3,820
<b>Watershed and Drainage Networks</b>			
17	Length of Natural Drainage Lines	meter	1,93,994.2
18	Number of Natural Drainage Lines	Number	212
19	Number of Micro-watersheds	Number	183
<b>Water Demand</b>			
20	Water Demand for Humans	Ha - M	301.11
21	Water Demand for Livestock	Ha - M	165.31
22	Water Demand for Agriculture	Ha - M	11,255
23	G.W Utilization for Drinking	%	44
24	G.W Utilization for Livestock	%	79
25	G.W Utilization for Agriculture.	%	97
26	S.W Utilization for Drinking	%	57
27	S.W Utilization for Livestock	%	21
28	S.W Utilization for Agriculture	%	3

### 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 93 tanks and 212 other surface water bodies and 29 Ooranis (Figure 3.9)

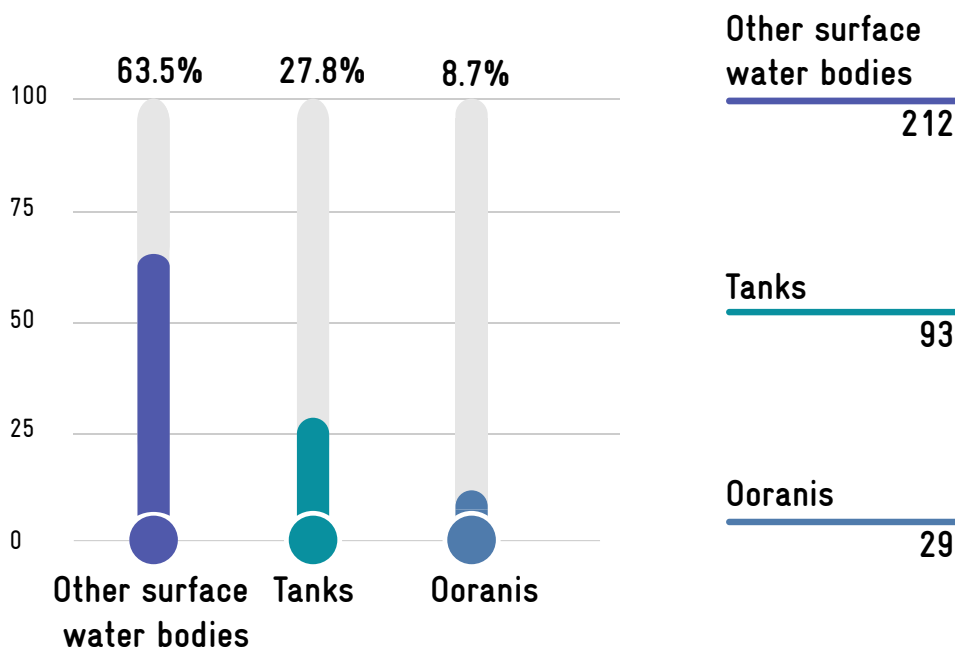


Figure 3.9 Traditional water bodies

### 3.5.2.2 Sources of Irrigation

The total area under irrigation in the district is 7243 ha, of which 87.7% (6349.55 ha) is irrigated through ground water stored in open/tube wells while remaining 12.3% (894.41 ha) area are irrigated through tank Tanks (Figure 3.10)

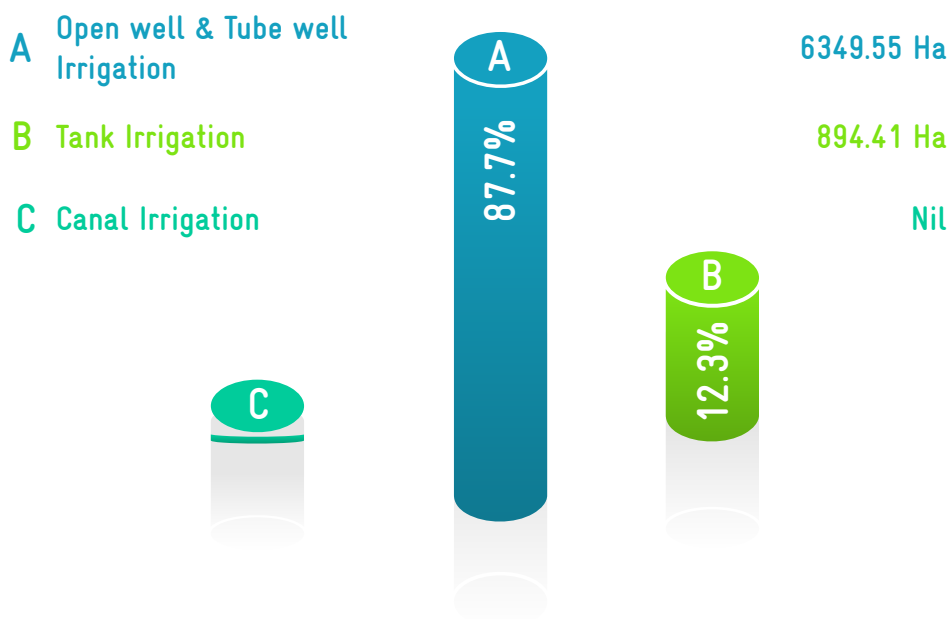


Figure 3.10 Source of irrigation

### 3.5.2.3 Available Run off

The available runoff in catchment area is 6008.2 Ha - M. and in that 34.85% comes under good catchment area, 1.56% comes under average catchment area and 63.58% comes under bad catchment area. As the area has more bad catchment area (twice that of good catchment area), the runoff generated more. The amount of runoff generated in bad catchment area is 1.8 times higher in good catchment and more than 40 time in average catchment areas (Figure 3.11) (refer annexure 3.1 for definition of good, bad catchment)

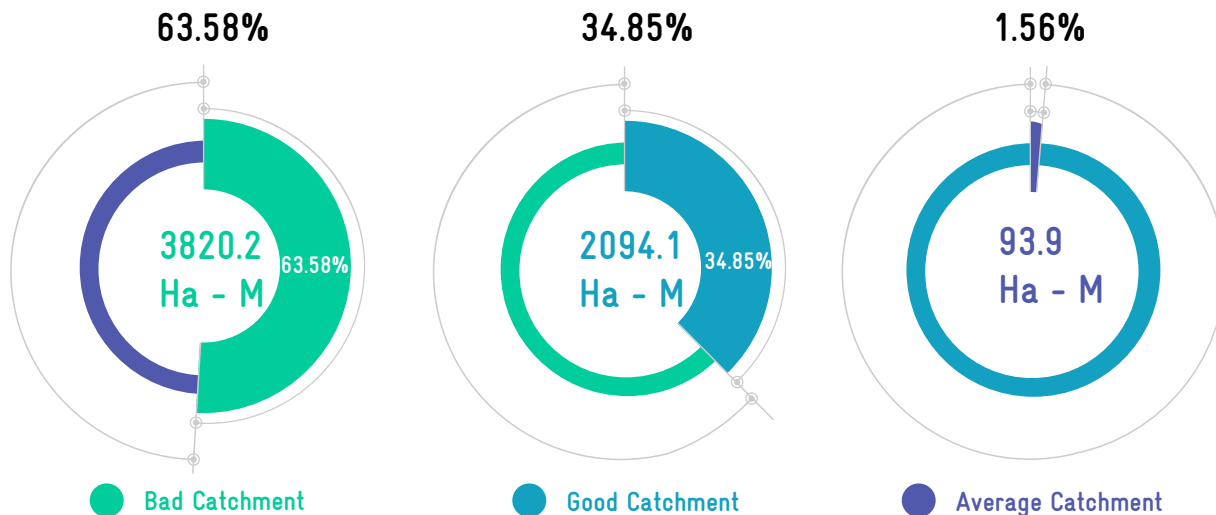
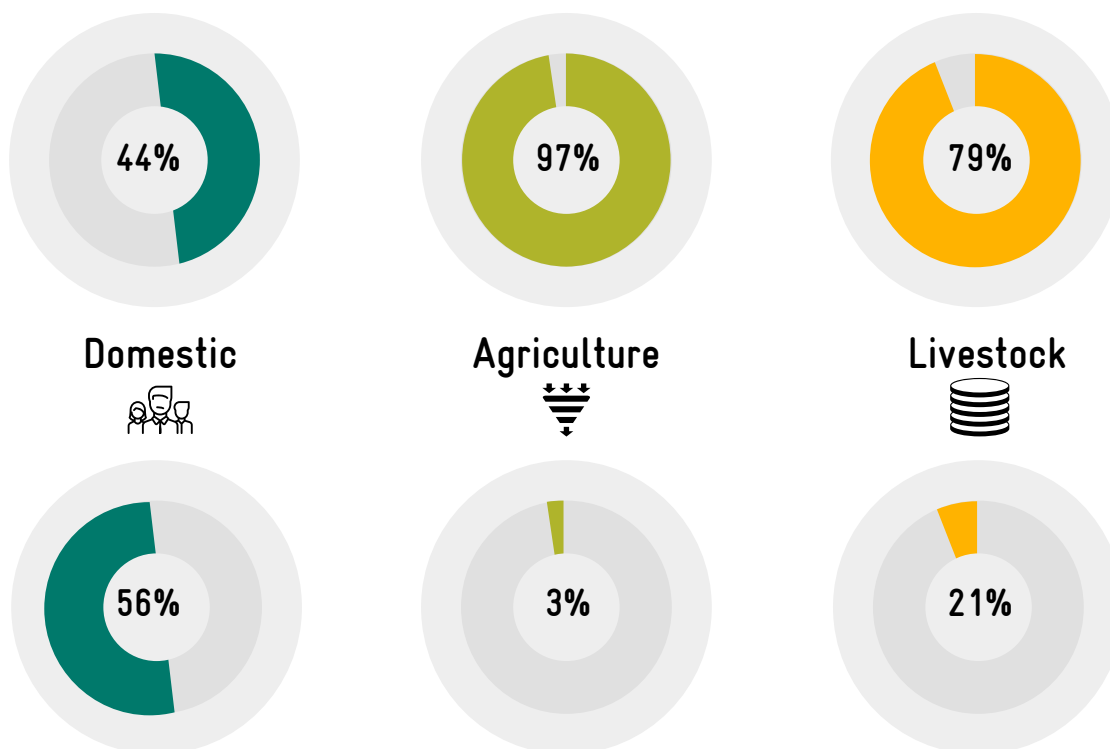


Figure 3.11 Runoff from catchments

### 3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 11721.25 Ha - M and in that 79% is met through surface water while the balance proportion of 21% is met by ground water resources. While, more groundwater is utilized for agriculture purpose (97%), only 3 % of surface water is utilized for agriculture. At the same time, utilization of surface water is more for domestic purposes (56%). For livestock, ground water utilization (79%) is more than surface water (21%) (Figure 3.12)

#### % OF GROUND WATER UTILIZATION



#### % OF SURFACE WATER UTILIZATION

Figure 3.12 Sectoral 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

Spatial data on land use and land cover (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.

**3.6.1.1 Land Use and Land Cover (LULC):** LULC map shows the land use patterns of the Block. This Block is majorly covered by the agricultural crop land and fallow lands (Figure 3.13). The GP wise land use cover is listed below. This LULC map helps the decision makers and planners to concentrate on the fallow land development activities. During the CWRM planning of GPs, the more fallow land activities has been proposed.

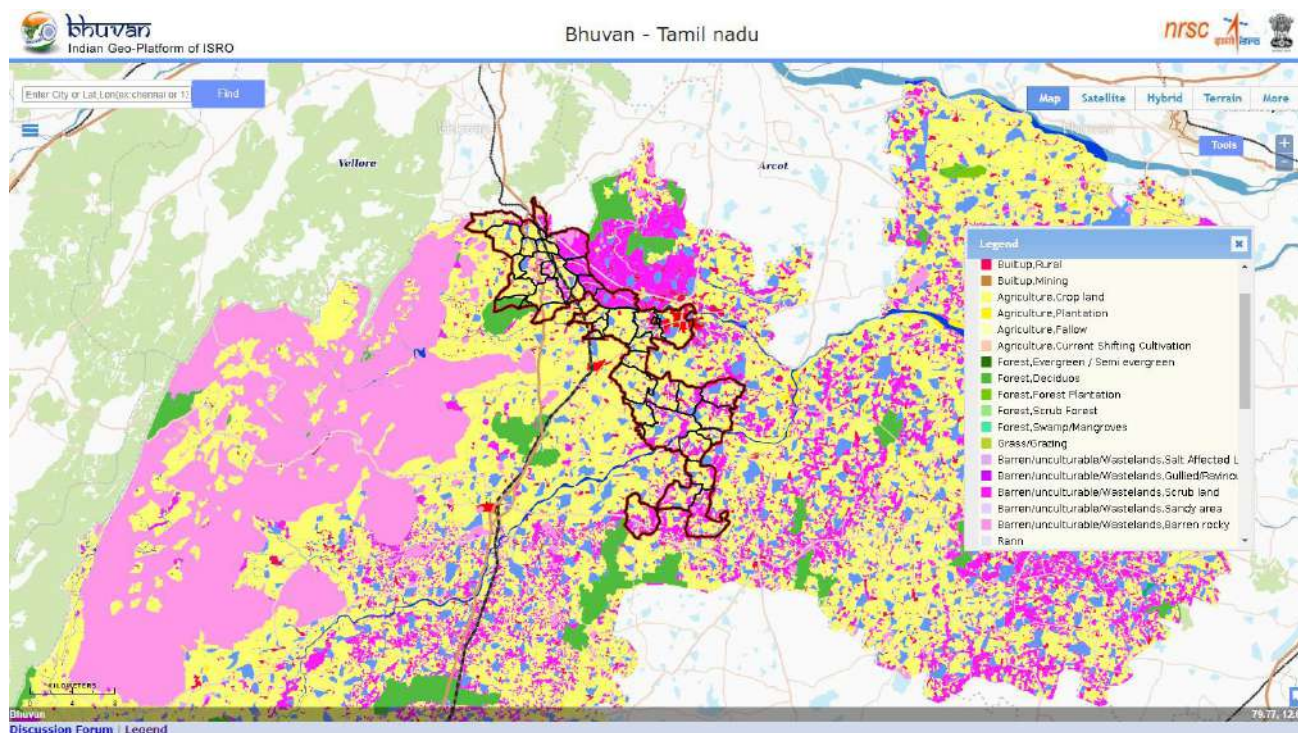
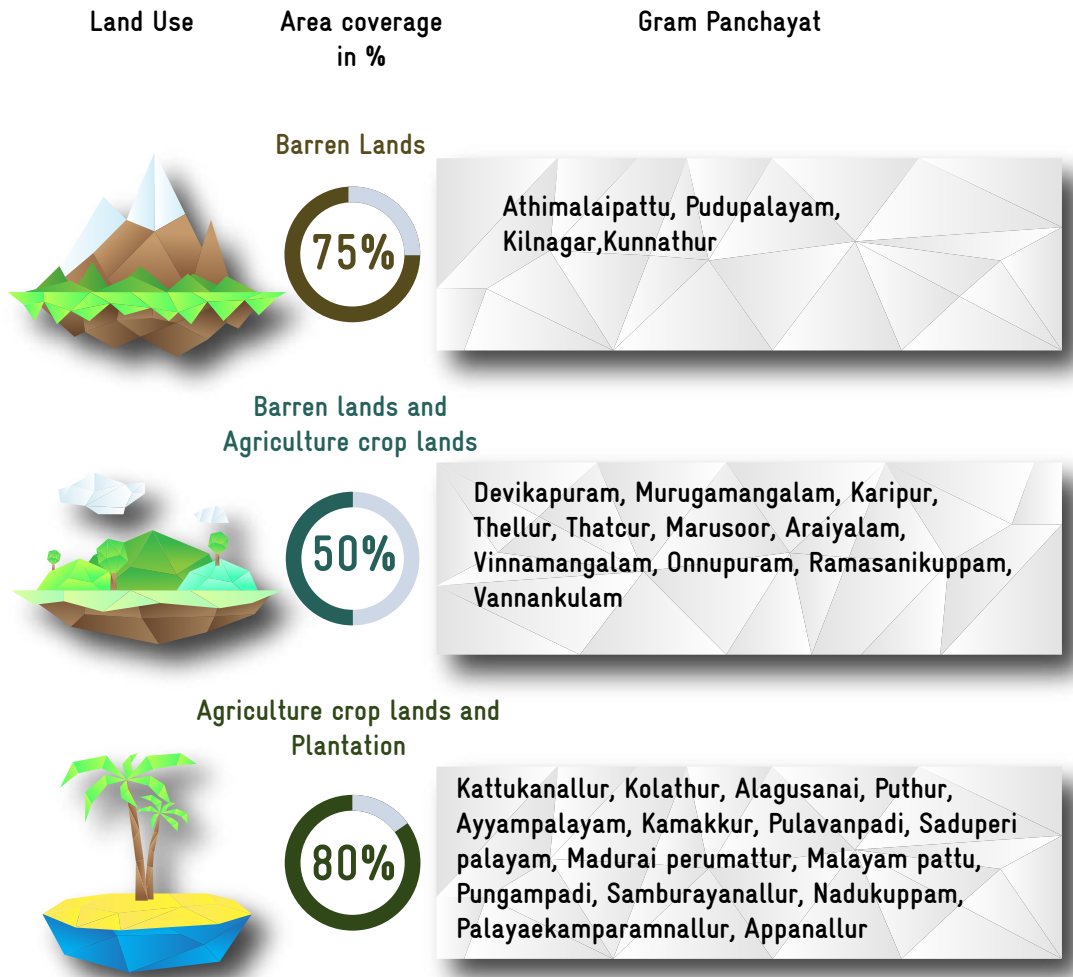


Figure 3.13 Land use land cover map





**3.6.1.2 Waste land:** There are patches under degraded forest and scrub land which are identified (Figure 3.14). Approximately 20% of the Ramasanikuppam and Onnupuram GP have degraded forest. The Scrub land was noticed in part of Athimalaipattu (20%), and Karipur (10%) GPs. During planning the GPs, the plantation measures have been taken up in the identified portions to convert into productive land.

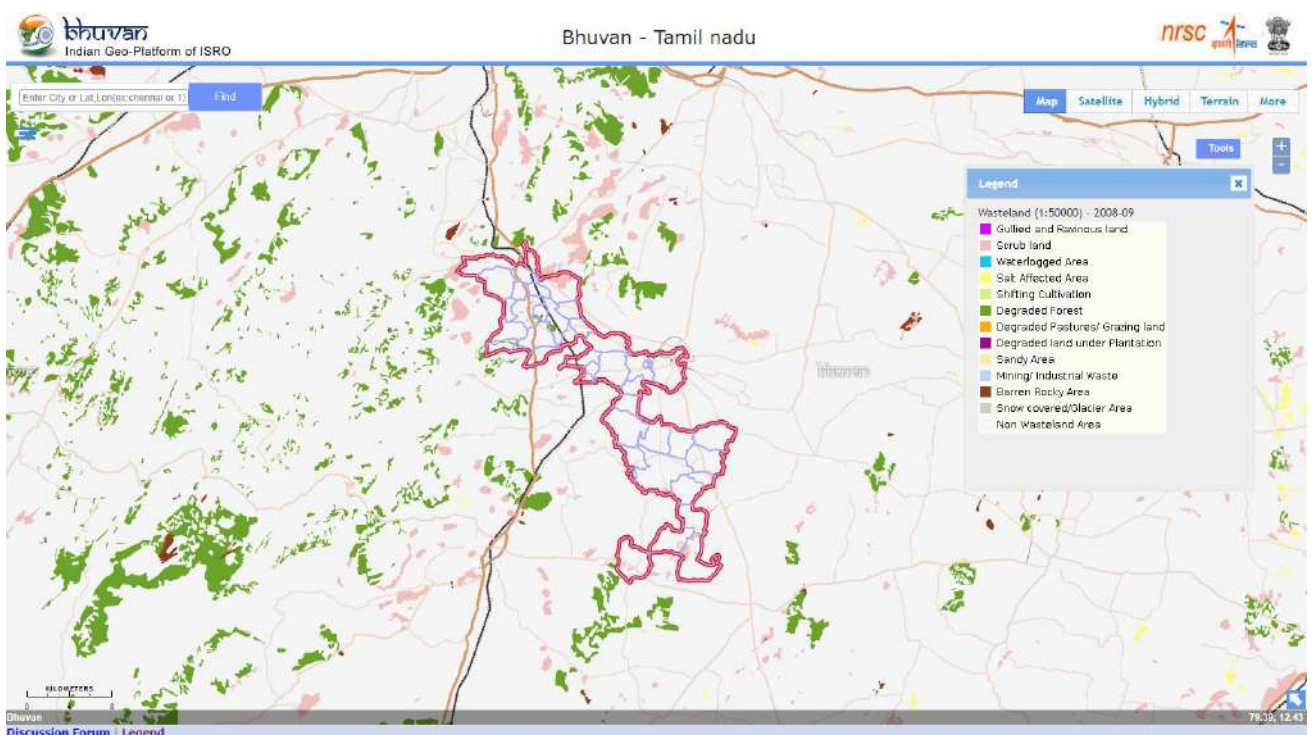


Figure 3.14 Waste land map

**3.6.1.3 Salt affected area:** In the Block, part of (10%) Thatcur and Rantham GPs are moderately saline. While planning the GP actions, these areas have been treated specially and given alternative cropping and other any other steps are suggested to reduce the salinization (Figure 3.15).

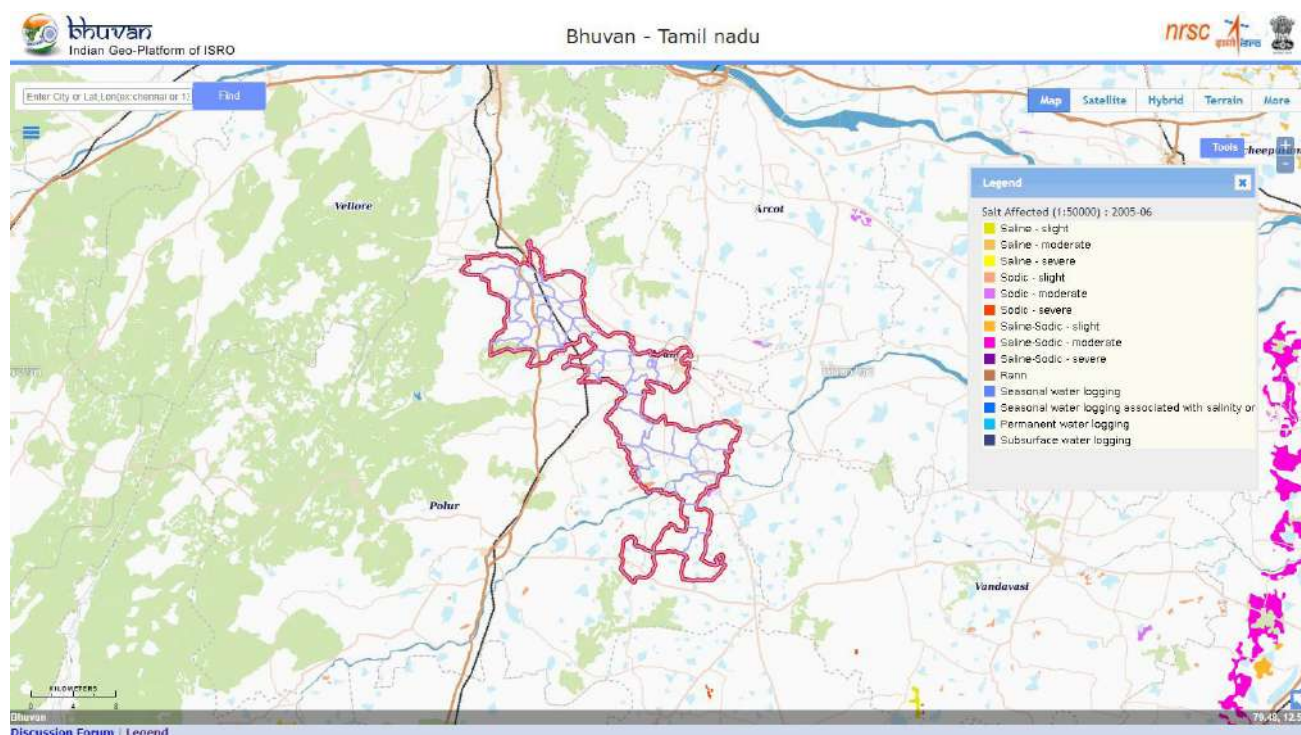


Figure 3.15 Map of Salt affected area

**3.6.1.4 Soil erosion:** The erosion map shows the soil erosion capacity with respect to rainfall, soil physical properties, terrain slope, land cover of this Block. The soil erosion map is used for soil conservation and regional planning and watershed management. In this Block, sheet erosion is observed in Athimalaipattu (50%), Devikapuram, Karipur, Murugamangalam (10%), Vinnamangalam, Marusoor, Agaram, Pungampadi, Ramasnikuppam, Onnupuram and Kolathur (10%) (Figure 3.16). Based on this information, suitable measures are proposed to arrest further erosion.

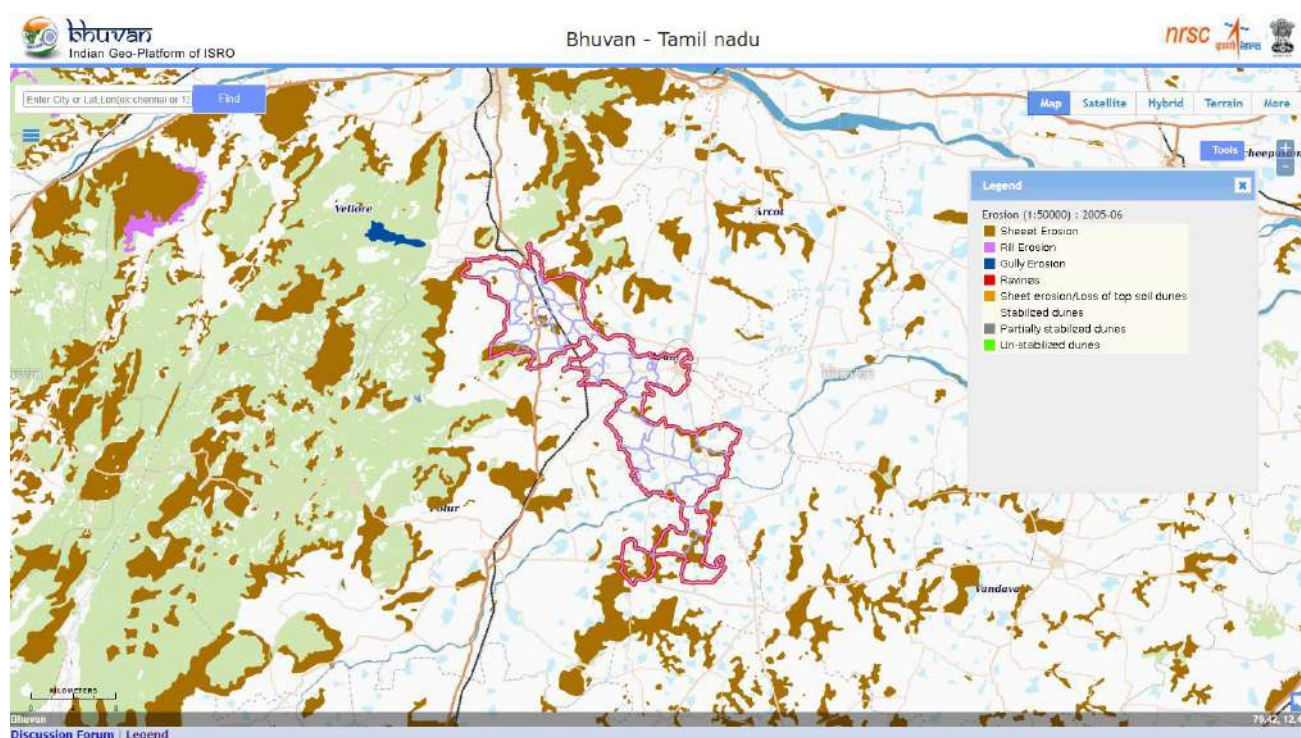


Figure 3.16 Soil erosion map

**3.6.1.5 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 3.17)

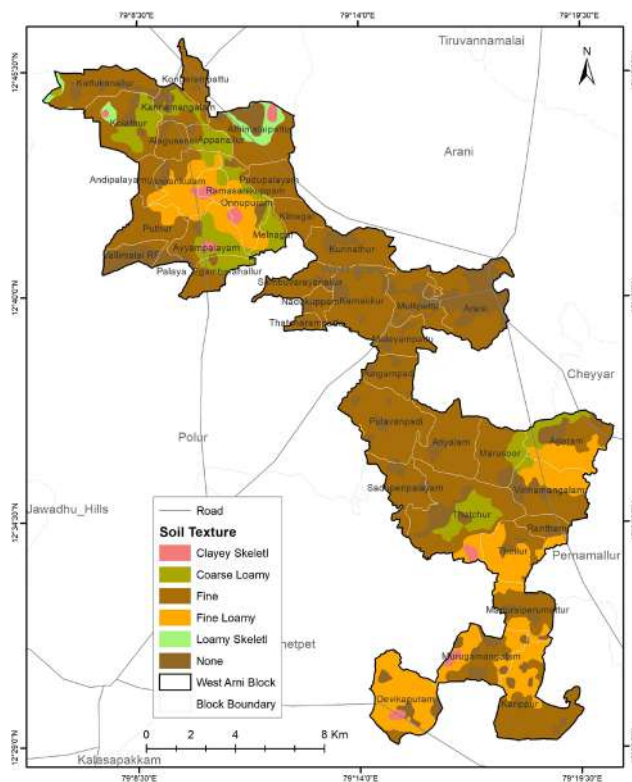


Figure 3.17 Distribution of soil types - textural classification

### 3.6.2 NON SPATIAL DATA

Apart from geo-spatial maps, the data regarding, status of land resources, catchment area, crop details, soil texture, status of macro and micro nutrients, livestock are collected from recognized sources. The runoff 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 West Arani Block. The key CWRM parameters of agriculture area for all GPs are tabulated in Annexure (Annexure 3.2)

TABLE 7: AGRICULTURE AND ALLIED PROFILE: RAMANATHAPURAM DISTRICT

S No	Key CWRM Parameter	Unit	Total
	<b>Land Resources</b>		
1	Area under Forest land	ha	0
2	Area under Non-Agricultural Uses	ha	5,773
3	Area under Barren & Un-cultivable Land	ha	187
4	Area under Permanent Pastures and Other Grazing Land	ha	55.66
5	Area under Land Under Miscellaneous Tree Cops etc.	ha	35.18
6	Area under Culturable Waste Land	ha	1,663
7	Area under Fallows Land other than Current Fallows	ha	1,359
8	Area under Current Fallow land	ha	7,765
9	Area under Unirrigated Land	ha	3,084
10	Area Irrigated by Source	ha	6,790

<b>Catchment Area</b>			
11	Good Catchment	ha	5,959
12	Average Catchment	ha	1,754
13	Bad Catchment	ha	18,997
<b>Crop Details</b>			
14	Irrigated Area	ha	7,582
15	Rain fed area	ha	612.21
16	Area under Paddy Cultivation	ha	5,672
17	Crop Water Requirement - Irrigated condition	Ha - M	10,273
18	Crop Water Requirement – Rain fed condition	Ha - M	273.56
<b>Soil Resources: Status of available Nitrogen</b>			
19	Very Low	%	4
20	Low	%	92
21	Medium	%	3
22	High	%	0
23	Very High	%	0
<b>Status of Organic Carbon</b>			
24	Very Low	%	25
25	Low	%	72
26	Medium	%	3
27	High	%	0
28	Very High	%	0
<b>Status of Soil Micro Nutrients</b>			
29	Sufficient	%	56
30	Deficient	%	44
<b>Status of Physical condition of the soil</b>			
31	Acidic Sulphate	%	0
32	Strongly Acidic	%	0
33	Highly Acidic	%	0
34	Moderately Acidic	%	4
35	Slightly Acidic	%	6
36	Neutral	%	2
37	Moderately Alkaline	%	85
38	Strongly Alkaline	%	0
<b>Soil Texture</b>			
39	Clay Soil	%	2
40	Fine Soil	%	74
41	Coarse loamy	%	15
42	Soil Water Permeability	Low, Moderate, high	Moderate
<b>Soil moisture and ET</b>			
43	Volumetric Soil Moisture	%	23
44	Estimated Soil Moisture	Ha - M	4,816
45	ET Losses	Ha - M	7,907
<b>Means of Water Extraction</b>			
46	Gravity	%	4
47	Lifting	%	96

Irrigation Methods			
48	Wild Flooding	%	11
49	Control Flooding	%	89
Livestock			
50	Cattle Population	Number	41,710
51	Sheep Population	Number	11,969
52	Goat Population	Number	10,775
53	Poultry	Number	0

### 3.6.2.1 Land Use

The standard land use classification helps to understand the distribution and the extend 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 26710.7 ha, nearly 29.07% of the land is area under current fallow land; 25.42% of the land is irrigated by source irrigation; 21.61% of the land is for non-agricultural uses. Nearly 11.54 % is un-irrigated land, 6.2 % is under cultivable waste land, 8.1% is fallow. Barren and uncultivable land accounts 0.69% of the total area, the Block has small patches of area under permanent pastures, and no area under forest (Figure 3.18). Of the total land area of 26710.7 ha, nearly 22.7% are under public and common land and 77.3% are under individual ownership.

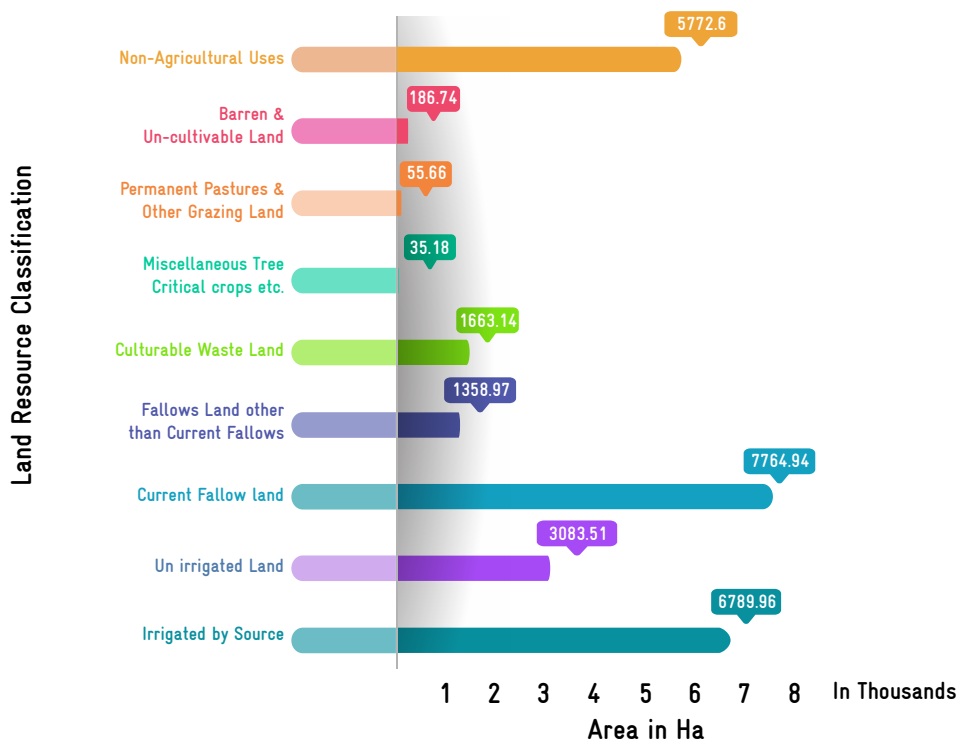


Figure 3.18 Land Utilization

### 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 26,710 ha, about 22.3 % is good catchment, 71.2 % is bad catchment area and only 6.6 % 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).

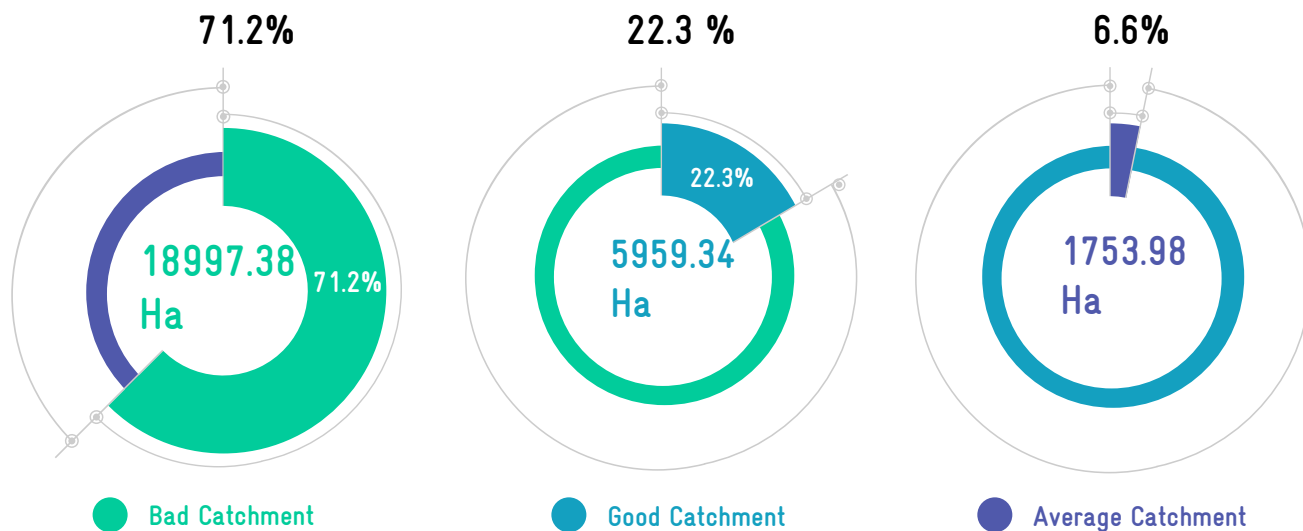


Figure 3.19. Catchment Area

### 3.6.2.3 Soil moisture

Soil is an important medium to store the available water and the storage capacity varies with the type of soil especially its textural composition. In overall composite water budgeting estimation of stored water in the soil assumes greater significance in this Block because of its significant proportion of area under 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 4815.76 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 is 7906.9 Ha.M.

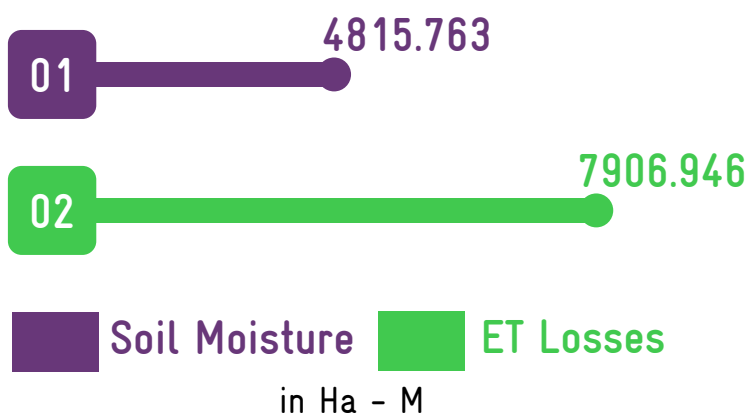


Figure 3.20 Soil Moisture & ET Losses

### 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 92.1 % of the samples tested while it was 4.1 % 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).

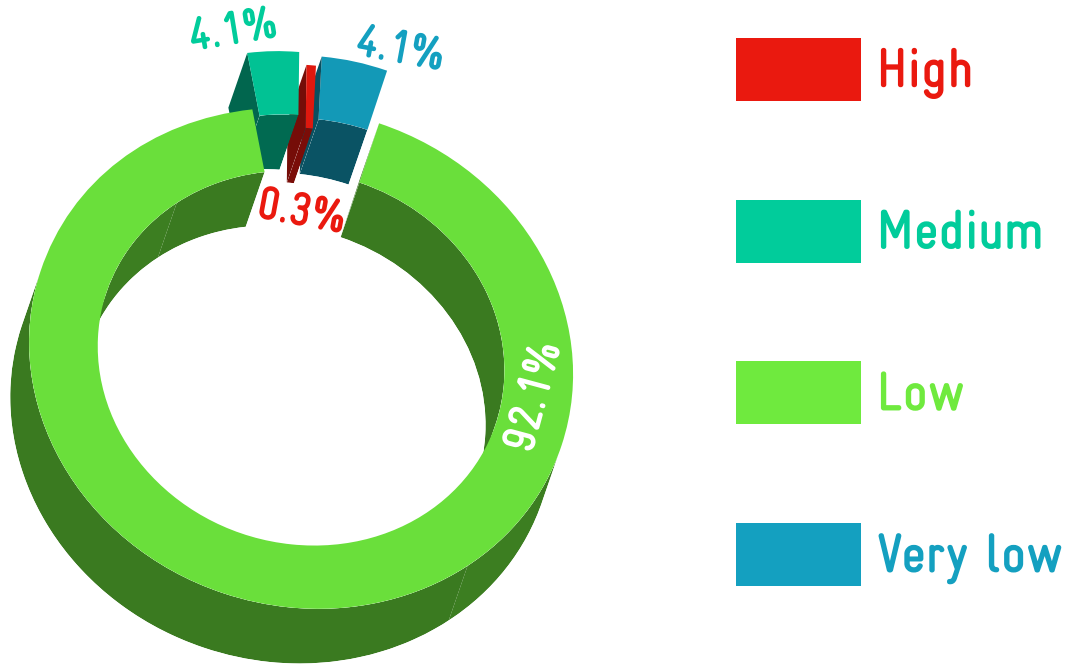


Figure 3.21. Status of available Nitrogen

Similar trend recorded for soil organic carbon too. The soil organic carbon is also very low in this Block. Nearly 23 % of the soil samples tested are under very low category and 73% under low category (Figure 3.21). This indicates that the soil fertility is very poor and further intensive practices makes the soil more vulnerable to degradation over a period of time.

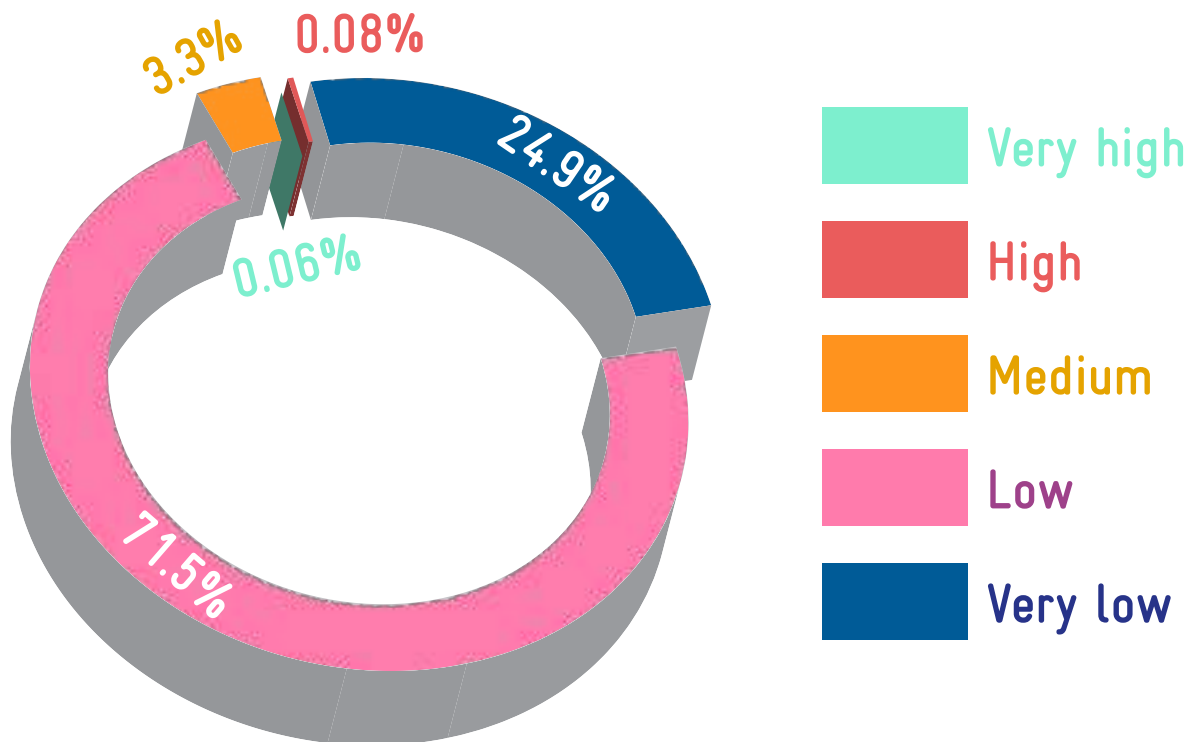


Figure 3.22. Status of soil Organic Carbon

### 3.6.2.6 Status of the soil micro nutrients

This Block is one of the zinc deficient Block of Tiruvannamalai district. The micro nutrient status of the soil with specific reference to Manganese, Boron and Zinc, Ferrous, Copper, and Sulphate are deficient in 44% and 56% sufficient of the soils tested.

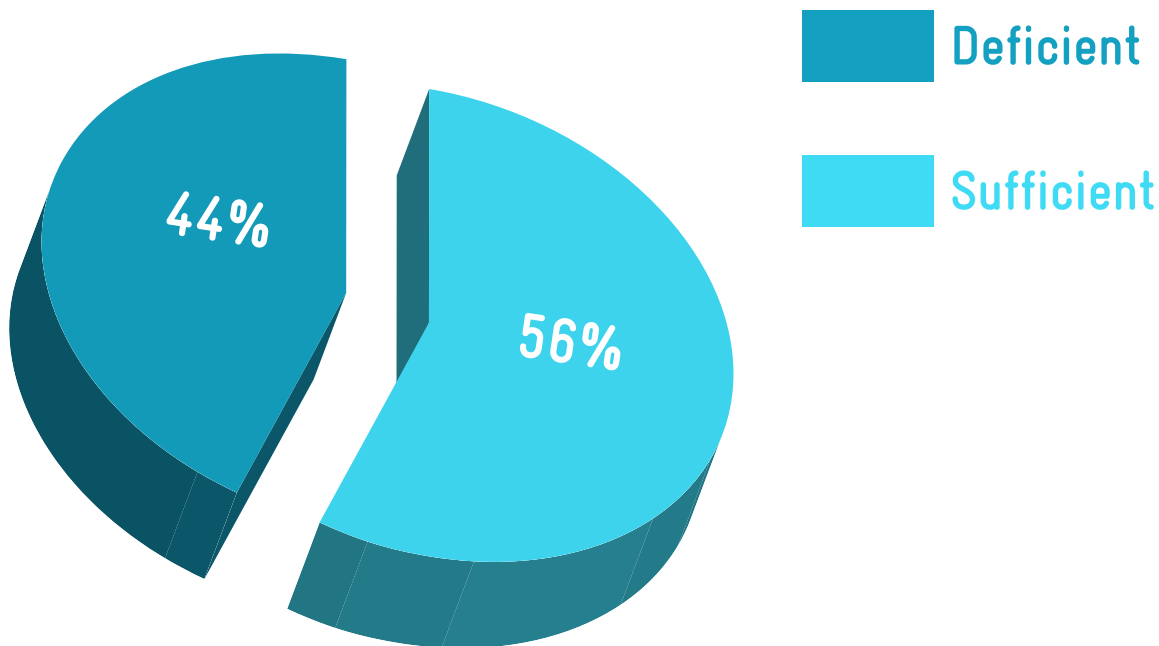


Figure 3.23. Status of soil micro nutrients

### 3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 85.25% of the soil is moderately alkaline in nature, 5.6% is slightly acidic, 4% is moderately acidic, 2.1% is neutral and 0.18% is strongly alkaline in nature as shown in Figure 3.23.

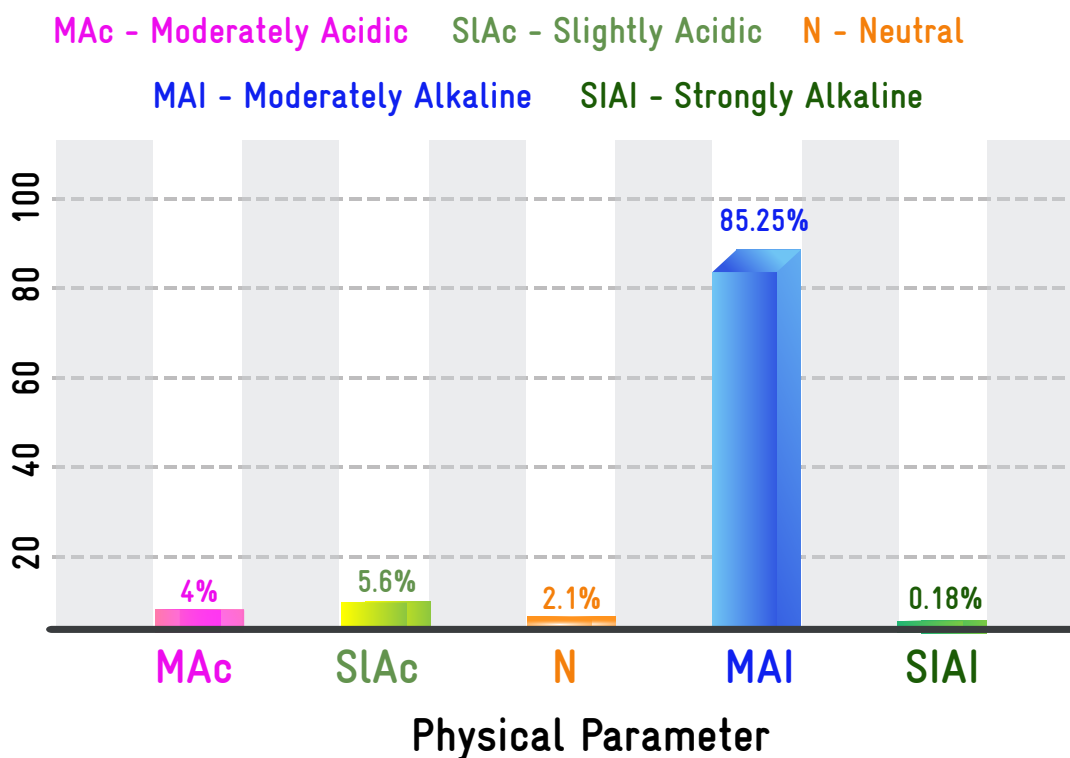


Figure 3.24. Status of pH of soil



### 3.6.2.8 Cropping pattern and the irrigation

Of the total area under cultivation, 92.48% is under irrigation and the remaining 7.5 % is under rainfed cultivation. Among the crops cultivated under irrigation, paddy is predominantly cultivated and accounts to about 75% (Figure 3.24). Ground nut is the second most cultivated crop under both irrigated (7.8%) and rainfed (4%) condition. Paddy is the primary crop cultivated in 69.34% of the total area cultivated, groundnut (11.8%), pulses (7.8%), turmeric (2.2%) banana (2.1%), sugarcane (1.7 %), red gram (1.3%) and other crops in 3.8% of the total cultivated area.

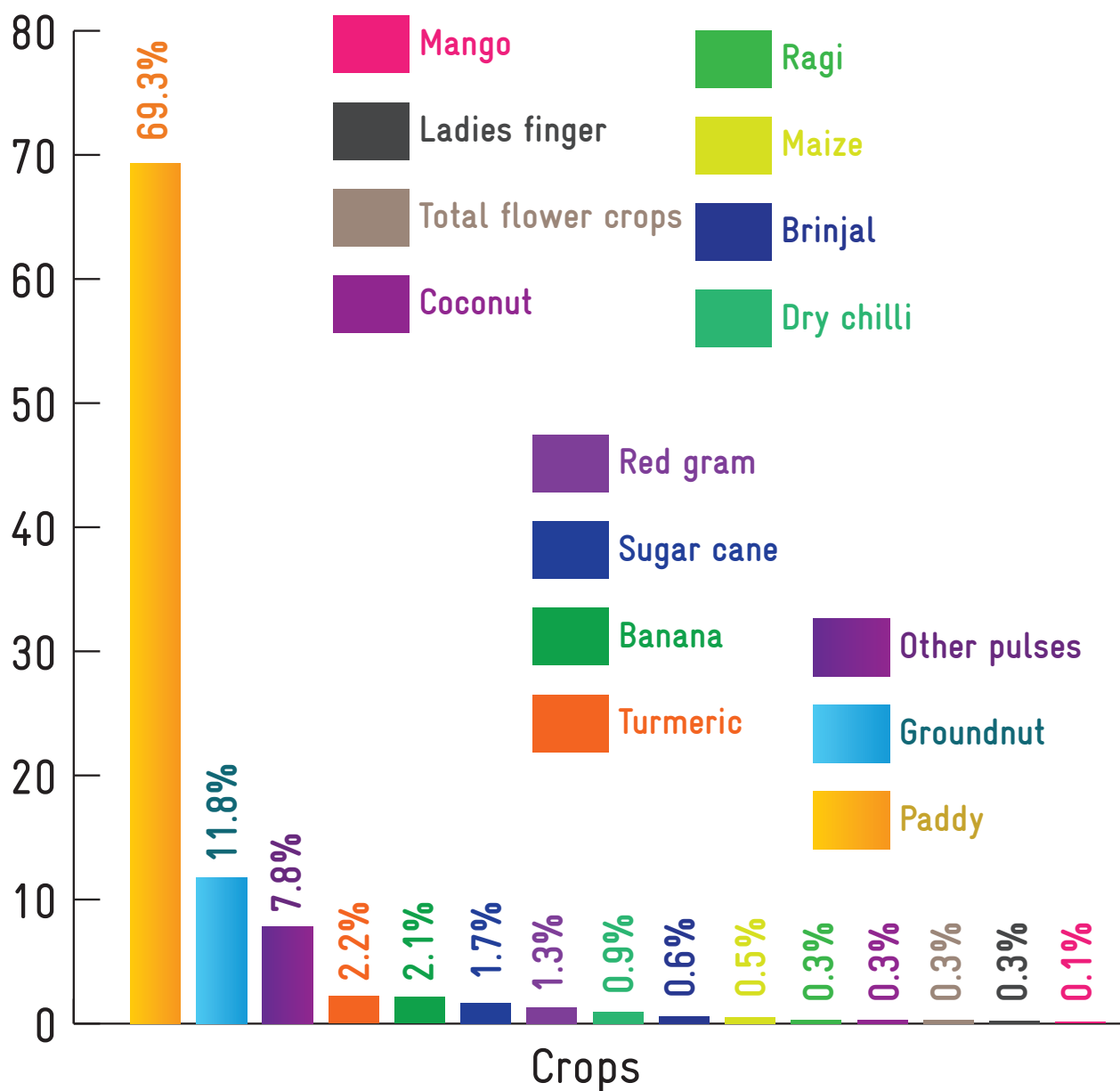


Figure 3.25. Cropping pattern

### 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, 89% of the irrigation is done by control flooding and only 11% of the irrigation is done by wild flooding (Figure 3.25).

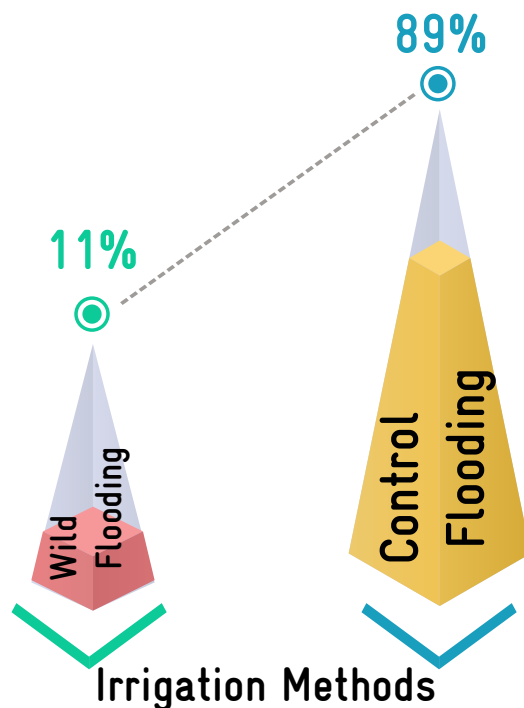


Figure 3.26. Irrigation methods

### 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, 96 % of the water extraction methods are under lifting means of extraction and only 4 % comes under gravity means of water extraction (Figure 3.26).

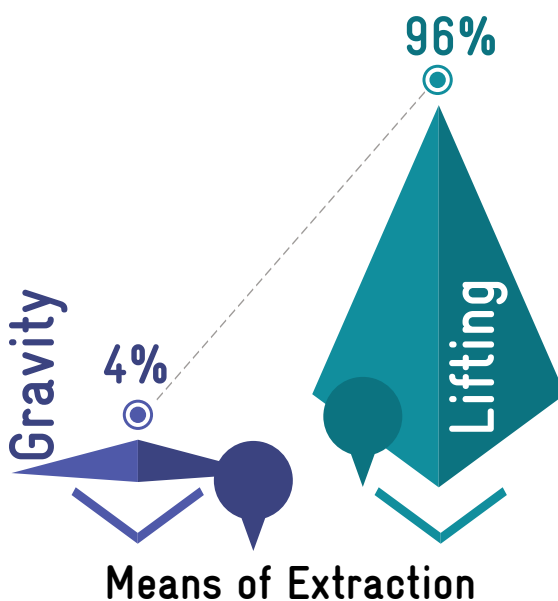


Figure 3.27. Means of water extraction

### 3.6.2.11 Livestock Details

This Block has considerable proportion of livestock resources of which small ruminants such as sheep and goat constitute 18.6% and 16.7 % of the total livestock, while cattle population is higher in this Block (64.7%) (Figure 3.27) The total water requirement for livestock is 165.31 Ha - M. Of the total water demand, 21% is met through surface water and remaining 79% is met through surface water resources.

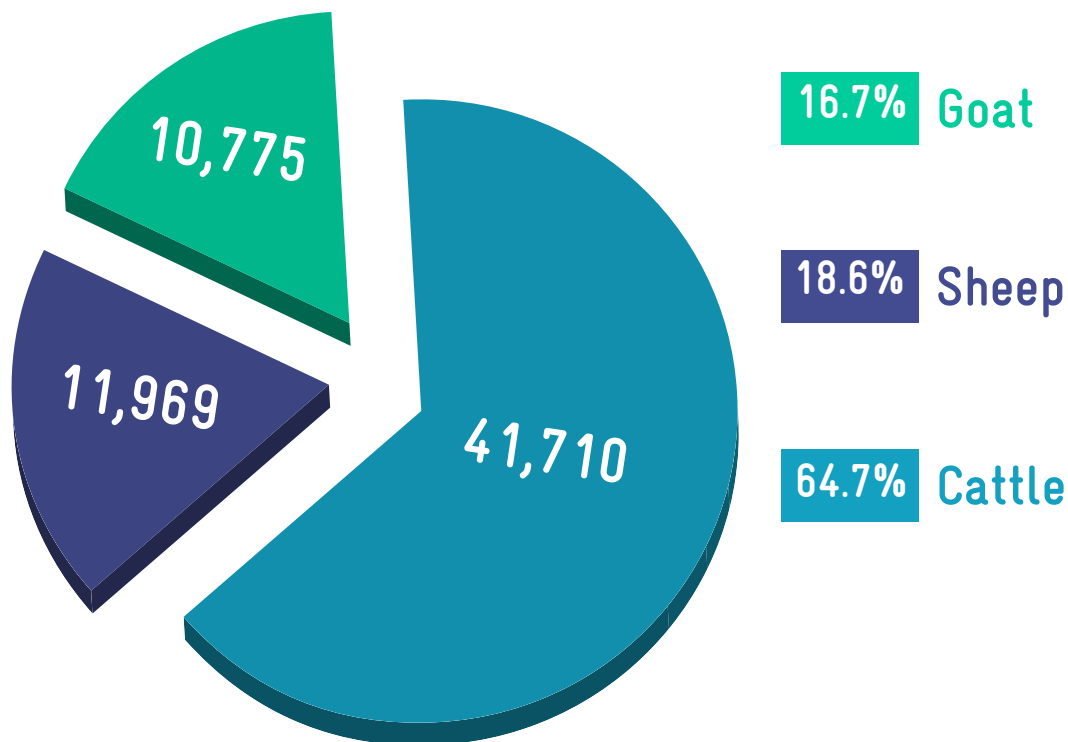


Figure 3.28. Livestock details

## 3.7 | CWRM PLANNING ANALYSIS- SOCIO ECONOMIC

The demographic details such as population, gender, vulnerable population/households, MGNERGA 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 West Arani Block. GP wise demographic and socio economic status are attached in Annexure 3.7.

TABLE 8. SOCIO ECONOMIC STATUS OF WEST ARANI BLOCK

S No	Key CWRM Parameter	Unit	Total
1	Geographical Area	ha	19,607
2	Male Population	Number	53,982
3	Female Population	Number	54,070
4	Total Population	Number	1,08,052
5	SC Population	Number	18,330
6	ST Population	Number	508
7	Vulnerable population	Number	18,838
8	Households	Number	44,383
9	Only one room HH's	Number	3,273

10	Female Headed HH's	Number	2,761
11	Vulnerable Households	Number	3,118
12	Registered MGNREGA Job cards	Persons	30,874
13	Active person working in MGNREGA Job Cards	Persons	23,444
14	Drinking Water Sources	Number	31,380
15	HH's have tap water connection for drinking water	Number	1,372
16	HH's dependent on other sources for drinking water	Number	20,182
17	Annual Greywater Generation	Ha - M	197.49

### 3.7.1 Population

The total population of this Block is 1.1 lakhs, of which the women proportion is slightly higher than men. In the CWRM planning process due attention is given for the intersecting variables such as gender, class, caste and marital status and availability safe drinking water resources. In the Block, about 17.4% of the total population are under vulnerable category due to caste variable (Figure 3.28).

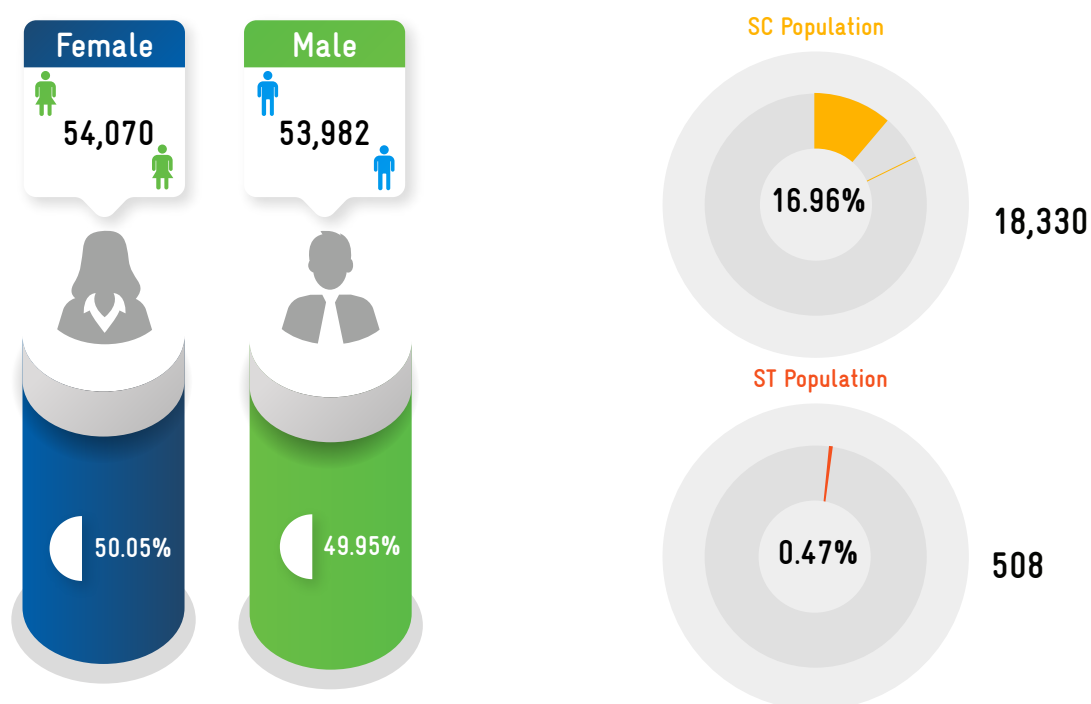


Figure 3.29. Population details

### 3.7.2 Households

There are total 44383 households in which 7.37% households have only one room. Nearly 6.22% households are headed by women and 7.03% are vulnerable households (Figure.3.29)

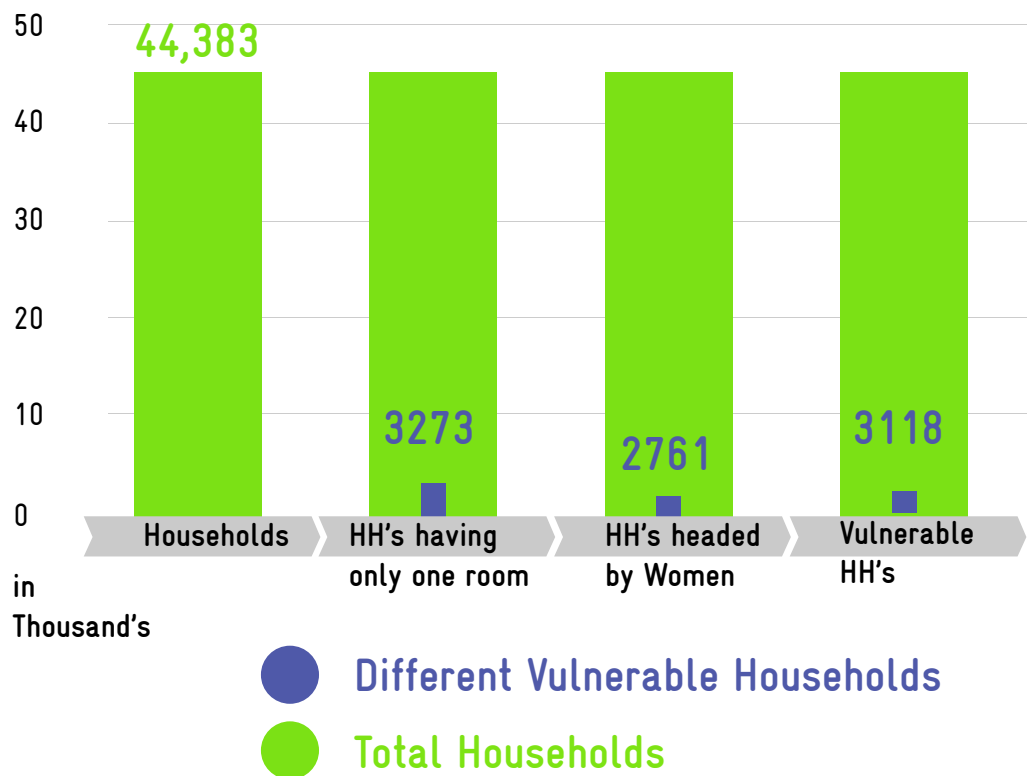


Figure 3.30. Details of Households

### 3.7.3 Status of Mahatma Gandhi NREGA - Job card status

In the Block of the total population of 1.1 lakhs of persons, 30,874 are registered for job cards in Mahatma Gandhi NREGA scheme. Among the registered job card holders, 75.93% of the job cards are in active category (Figure 3.30)

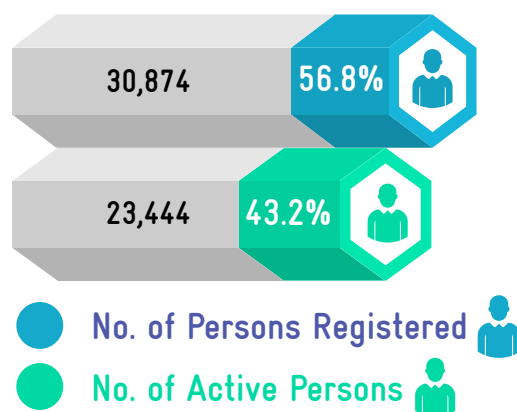


Figure 3.31. Status of MGNERGA job cards

### 3.7.4 Drinking Water Sources

Nearly 1372 households have tap water connection and nearly 20182 households depend on other sources. The other sources include RTRWHS / Tanka (Roof Rain Water Harvesting Systems, Hand pump, Open well, Bore well, Tank/ Pond/ Oorani, Springs and River/ Streams.



Tap water connection

**1372**  
**Households**



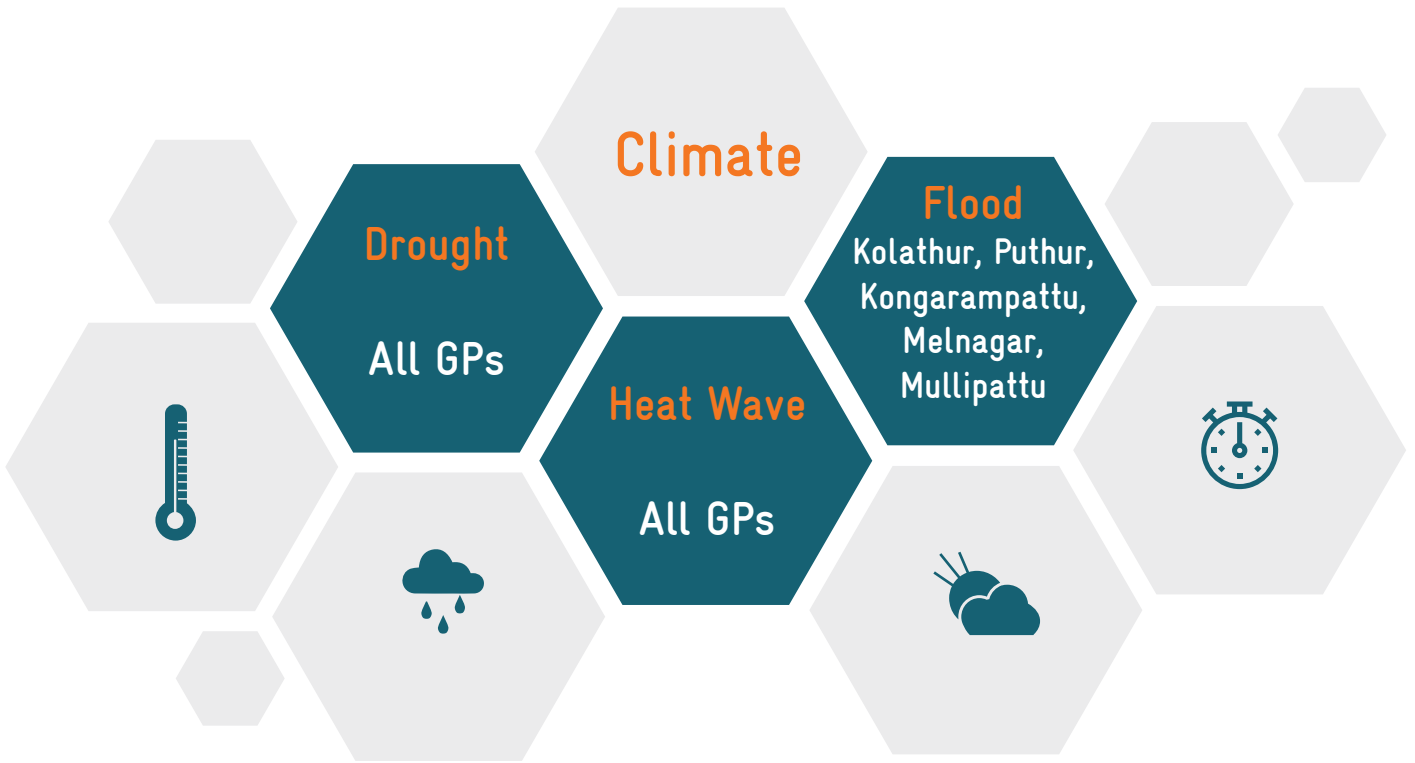
Other sources include RTRWHS / Tanka (Roof Rain Water Harvesting Systems, Hand pump, Open well, Bore well, Tank/ Pond/ Oorani, Springs and River/ Streams

**20182**  
**Households**

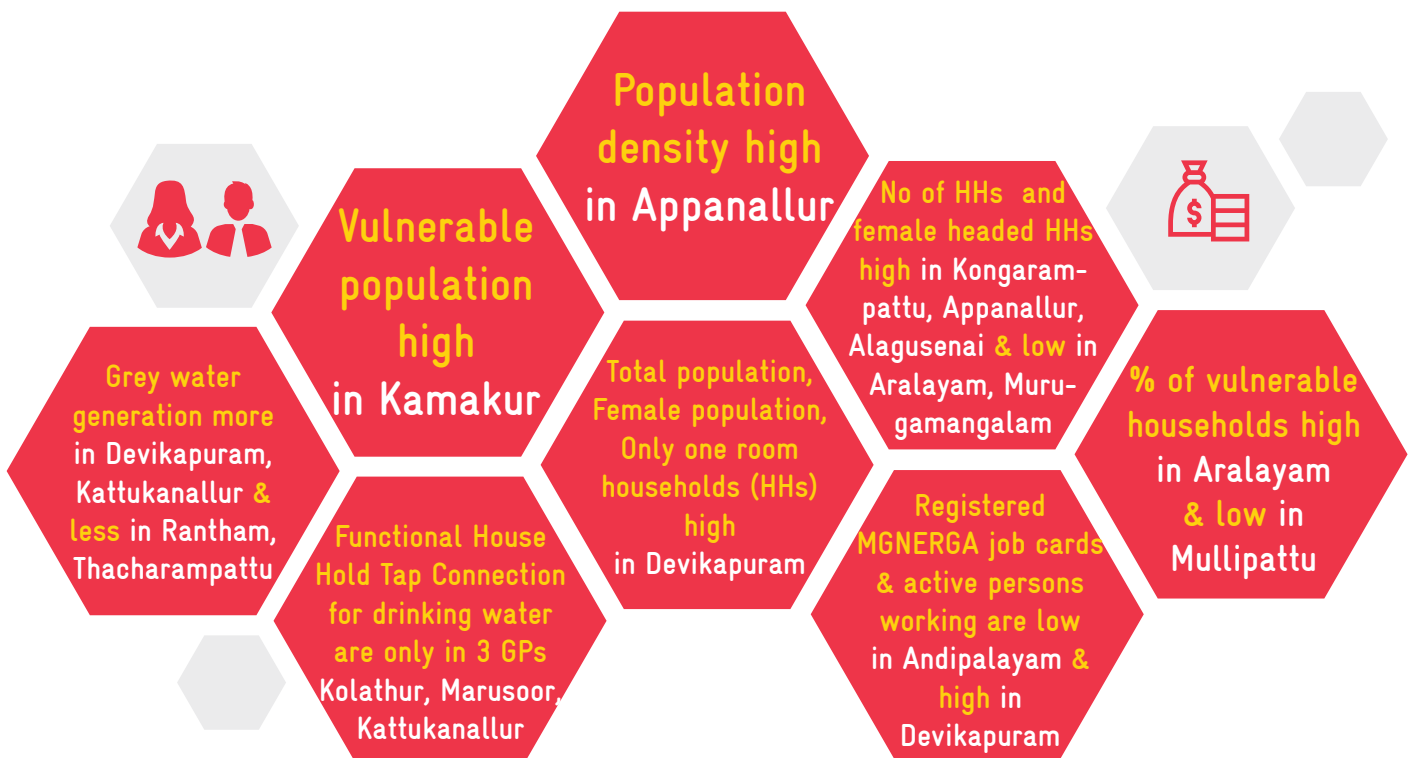
### 3.7.5 Annual Greywater Generation

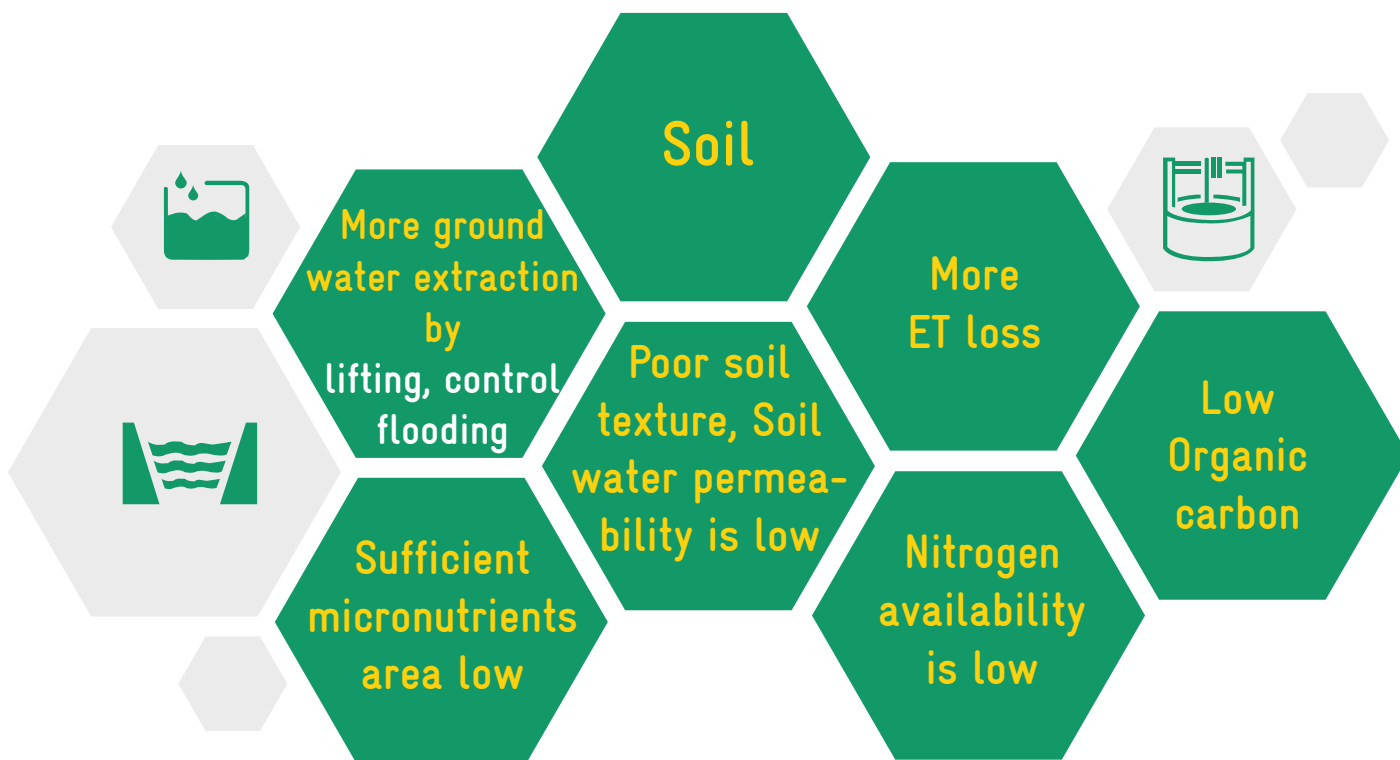
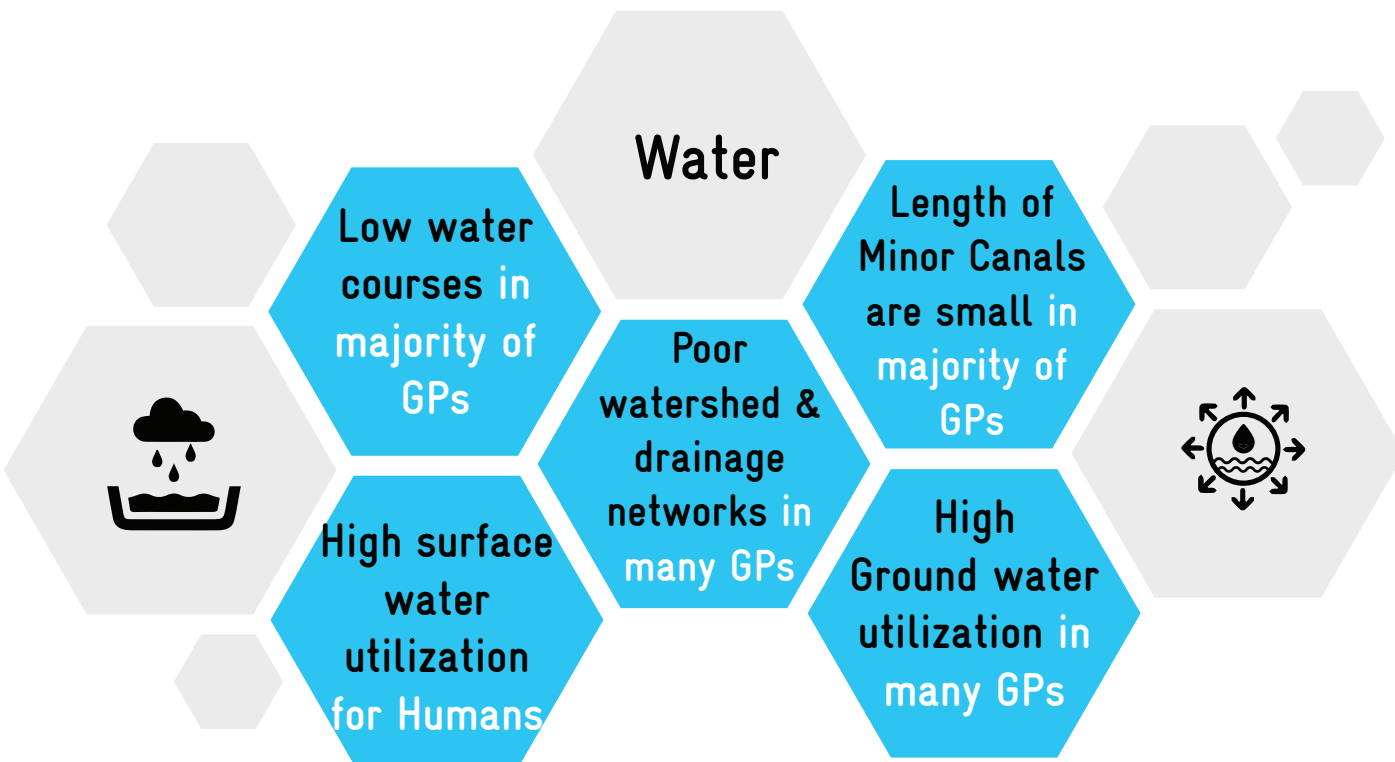
The grey water generation estimated across this Block is 197.49 Ha - M which is available for reuse or recycle.





## Socio economic









கெடுப்பதா஁ம் கெட்டார்க்குச் சார்வாய்மற் றாங்கே  
எடுப்பதா஁ம் 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 Intergovernmental panel on Climate Change (IPCC) methodology. IPCC defined Vulnerability as ‘the propensity or predisposition to be adversely affected’ (IPCC 2014).

Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and the lack of capacity to cope and adapt. It is determined by sensitivity and adaptive capacity of the system (Figure 4.1).

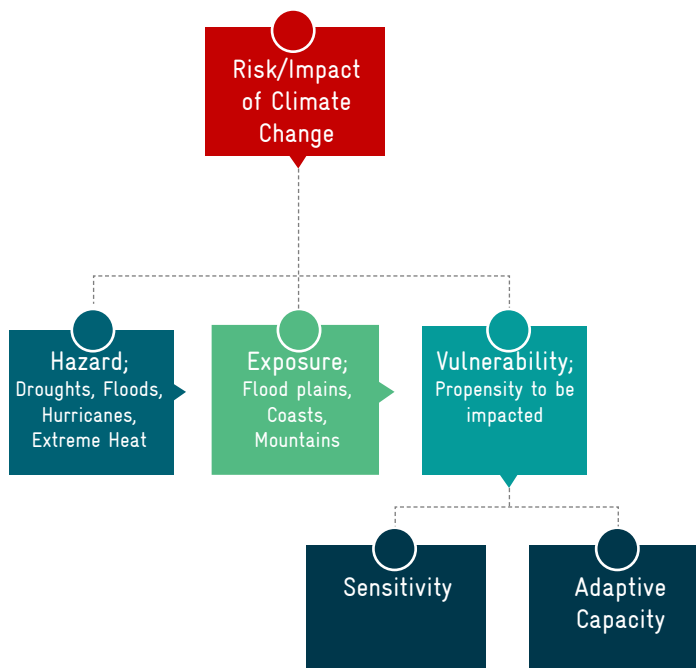


Figure 4.1 Vulnerability of the system as defined by IPCC

Generally, vulnerability assessments are made to identify

- current and potential hotspots
- 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 81 spatial and non-spatial parameters/ indicators under 4 dimensions via climate (3), water (27), agriculture (40) 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.

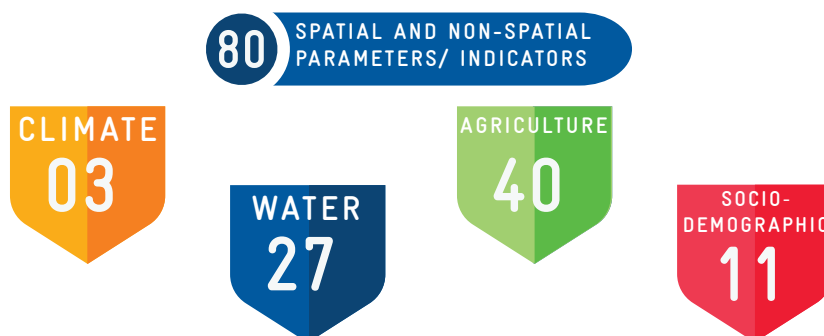


TABLE 9. CWRM PARAMETERS SELECTED FOR BLOCK LEVEL VULNERABILITY

	Key CWRM Parameter	Unit	Vulnerability component	Linked CVI	Source
Climate	Drought	Number	Climate risk/exposure	C1, C2, C3,C5	SDMA, Govt. of Tamil Nadu
	Flood	Number	Climate risk/sensitivity	C3,C4	SDMA, Govt. of Tamil Nadu
	Heat Wave	Number	Climate risk/sensitivity	C1, C2,	SDMA, Govt. of Tamil Nadu
Water	<b>Canal Network</b>				
	Length of Main Canal	meter	Adaptive capacity	W3	Primary data - Block level officer/ GP level assistants
	Length of Minor Canal	meter	Adaptive capacity	W3	Primary data - Block level officer/ GP level assistants
	Length of Distributaries	meter	Adaptive capacity	W3	Primary data - Block level officer/ GP level assistants
	Water Courses (Field Channels)	meter	Adaptive capacity	W3	Primary data - Block level officer/ GP level assistants
	<b>Traditional water bodies</b>				
	Number of Tanks (PWD & Union)	Number	Adaptive capacity	W3, W2,S4	Primary data - Block level officer/ GP level assistants
	Number of Ooranis	Number	Adaptive capacity	W3,W2, S3, S4, A3	Primary data - Block level officer/ GP level assistants
	Other Surface Water Bodies	Number	Adaptive capacity	W3, W2, S4, S3, A2	Primary data - Block level officer/ GP level assistants
	<b>Irrigation Facilities</b>				
	Area under Tank Irrigation	ha	Sensitivity	W3,W5, A4,	Census 2011, Govt. of India
	Area under Canal Irrigation	ha	Sensitivity	W3, W5, A4	Census 2011, Govt. of India
	Area under Open & Tube Well Irrigation	ha	Sensitivity	W1, W2,	Census 2011, Govt. of India
	<b>Catchment Area wise Available Runoff</b>				
	Good Catchment Area	Ha - M	Adaptive capacity	C3, C4, C5,W2, W3	Calculated
	Average Catchment Area	Ha - M	Adaptive capacity	C3, C4, C5, W2, W3	Calculated
	Bad Catchment Area	Ha - M	Sensitivity	C3, C4, C5, W2, W3	Calculated

Water	<b>Watershed and Drainage Networks</b>				
	Length of Natural Drainage Lines	meter	Adaptive capacity	C4, W2	NRSC, WRIS
	Number of Natural Drainage Lines	Number	Adaptive capacity	C4, W2	NRSC, WRIS
	Number of Micro-watersheds	Number	Adaptive capacity	C3, W2,W3	NRSC, WRIS
	<b>Water Demand</b>				
	Water Demand for Humans	Ha - M	Sensitivity	W4	Calculated
	Water Demand for Livestock	Ha - M	Sensitivity	W4	Calculated
	Water Demand for Agriculture	Ha - M	Sensitivity	W4	Calculated
	G.W Utilization for Drinking	%	Sensitivity	W1,W4	Calculated
	G.W Utilization for Livestock	%	Sensitivity	W1,W4	Calculated
	G.W Utilization for Agriculture.	%	Sensitivity	W1,W4	Calculated
	S.W Utilization for Drinking	%	Sensitivity	W3,W4	Calculated
	S.W Utilization for Livestock	%	Sensitivity	W3,W4	Calculated
	S.W Utilization for Agriculture	%	Sensitivity	W3, W4	Calculated
	Agriculture	<b>Land Resources</b>			
Area under Forest land		ha	Adaptive capacity	C1,C2, C3, C4,C5,W3	Census 2011, Govt. of India
Area under Non-Agricultural Uses		ha	Adaptive capacity	C1,C2, C3, C4,C5,W3	Census 2011, Govt. of India
Area under Barren & Un-cultivable Land		ha	Adaptive capacity	C1,C2, C3, C4,C5,W3	Census 2011, Govt. of India
Area under Permanent Pastures and Other Grazing Land		ha	Adaptive capacity	C1,C2, C3, C4,C5,W3	Census 2011, Govt. of India
Area under Land Under Miscellaneous Tree Crops etc.		ha	Adaptive capacity	C1,C2, C3, C4,C5,W3	Census 2011, Govt. of India
Area under Cultivable Waste Land		ha	Adaptive capacity	C1,C2, C3, C4,C5,W3,W2	Census 2011, Govt. of India
Area under Fallows Land other than Current Fallows		ha	Sensitivity	W1,W3,W4,A2	Census 2011, Govt. of India
Area under Current Fallow land		ha	Sensitivity	W1,W3,W4,A2	Census 2011, Govt. of India
Area under Unirrigated Land		ha	Sensitivity	A2	Census 2011, Govt. of India
Area Irrigated by Source		ha	Sensitivity	A2	Census 2011, Govt. of India
<b>Catchment Area</b>					
Land under Good Catchment		ha	Adaptive capacity	C3,W2, W3	addition of first 3 land classes

Agriculture	Land under Average Catchment	ha	Adaptive capacity	C3,W2, W3	addition of next 3 land classes
	Land under Bad Catchment	ha	Sensitivity	C3,W2, W3	addition of last 4 land classes
	<b>Crop Details</b>				
	Irrigated Area	ha	Sensitivity	A2,W1,W3	Primary data
	Rainfed area	ha	Sensitivity	A1, C3, C4, C5	Primary data
	Area under Paddy Cultivation	ha	Sensitivity	A2, W1, W3	Primary data
	<b>Soil Resources: Status of Available Nitrogen</b>				
	Very Low to Low	%	Sensitivity	C1,C2,A2,A3	Soil health portal, Ministry of Agriculture & Farmers Welfare, Govt. of India
	Medium to high	%	Adaptive capacity	C1,C2,A2,A3	Soil health portal, Ministry of Agriculture & Farmers Welfare, Govt. of India
	<b>Status of Organic Carbon</b>				
	Very Low to Low	%	Sensitivity	A2, A3	Soil health portal, Ministry of Agriculture & Farmers Welfare, Govt. of India
	Medium to high	%	Adaptive capacity	A2, A3	Soil health portal, Ministry of Agriculture & Farmers Welfare, Govt. of India
	<b>Status of Soil Micro Nutrients</b>				
	Deficient	%	Sensitivity	A2, A3	Soil health portal, Ministry of Agriculture & Farmers Welfare, Govt. of India
	<b>Status of Physical condition of the soil</b>				
	Moderately Acidic	%	Sensitivity	A2	Soil health portal, Ministry of Agriculture & Farmers Welfare, Govt. of India
	Slightly Acidic	%	Adaptive capacity	A2	Soil health portal, Ministry of Agriculture & Farmers Welfare, Govt. of India
Neutral	%	Adaptive capacity	A2	Soil health portal, Ministry of Agriculture & Farmers Welfare, Govt. of India	



Agriculture	Moderately Alkaline	%	Adaptive capacity	A2	Soil health portal, Ministry of Agriculture & Farmers Welfare, Govt. of India
	Strongly Alkaline (SIAl)	%	Sensitivity	A2	Soil health portal, Ministry of Agriculture & Farmers Welfare, Govt. of India
	<b>Soil Texture</b>				
	Clay Soil	%	Sensitivity	C3, W3,A3,S4	NRSC, WRIS
	Fine Soil	%	Adaptive capacity	C3, W3,A3,S4	NRSC, WRIS
	Coarse loamy	%	Adaptive capacity	C3, W3,A3,S4	NRSC, WRIS
	Soil Water Permeability	Low, Moderate, high	Adaptive capacity	C3, W3,A3,S4	Standard table
	<b>Soil moisture and ET</b>				
	Estimated Soil Moisture	Ha - M	Adaptive capacity	A3, C1, C2, C3, C4, C5	Calculated
	ET Losses	Ha - M	Sensitivity	A4, C1, C2, C3	Calculated
	<b>Means of Water Extraction</b>				
	Gravity	%	Sensitivity	W1, W3	Calculated
	Lifting	%	Sensitivity	W2	Calculated
	<b>Irrigation Methods</b>				
	Wild Flooding	%	Sensitivity	W4, A3	Calculated
	Control Flooding	%	Adaptive capacity	W4	Calculated
	<b>Livestock</b>				
	Cattle Population	Number	Sensitivity	S2, S4	Farmers portal, Ministry of Agriculture & Farmers Welfare, Govt. India
	Sheep Population	Number	Sensitivity	A1,S2, S4	Farmers portal, Ministry of Agriculture & Farmers Welfare, Govt. India
	Goat Population	Number	Sensitivity	A1, S2, S4	Farmers portal, Ministry of Agriculture & Farmers Welfare, Govt. India
Socio economic	<b>Demographic</b>				
	Population density	ha	Sensitivity	S1	Census 2011, Govt. of India
	Female proportion	Number	Sensitivity	SI	Census 2011, Govt. of India
	SC Population	Number	Sensitivity	S1, S2	Census 2011, Govt. of India
	ST Population	Number	Sensitivity	S1, S2	Census 2011, Govt. of India

<b>Socio economic</b>	<b>Economic</b>				
	Only one room HH's	Number	Sensitivity	S2	SECC 2011 , Govt. of India
	Female Headed HH's	Number	Sensitivity	S2	SECC 2011 , Govt. of India
	Vulnerable Households	%	Sensitivity	S2	SECC 2011 , Govt. of India
	<b>MGNREGA</b>				
	Registered MGNREGA Job cards	Persons	Adaptive capacity	S2	MGNREGA portal
	Active person working in MGNREGA job Cards	Persons	Adaptive capacity	S2	MGNREGA portal
	<b>Water accessibility</b>				
	Drinking Water Sources	Number	Adaptive capacity	S3	Primary data - Block level officer/ GP level assistants
	HH's have tap water connection for drinking water	Number	Adaptive capacity	S3	Primary data - Block level officer/ GP level assistants
	HH's dependent on oth- er sources for drinking water	Number	Sensitivity	S3	Primary data - Block level officer/ GP level assistants
	Annual Greywater Gen- eration	Ha - M	Sensitivity	S2, S3	Primary data - calculated

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 into very high, high, medium, low, and very low vulnerability level. The vulnerability assessment methodology is given in Annexure 4. The vulnerable GPs are ranked based on vulnerability scores. Devikapuram, Kongarampattu, Vinnamangalam, Kolathur, Andipalayam, Alagusenai, Iyyampalayam and Palayaekambaranalur GPs have very high vulnerability followed by Thatchur, Sambuvarayanallur, Agaram, Vannankulam, Arayalam and Kamakur GPs. The least vulnerable (very low) GPs are Nadukuppam, Marusoor and Rantham GPs. (Figure 4.2).

## Cumulative Vulnerability Scores

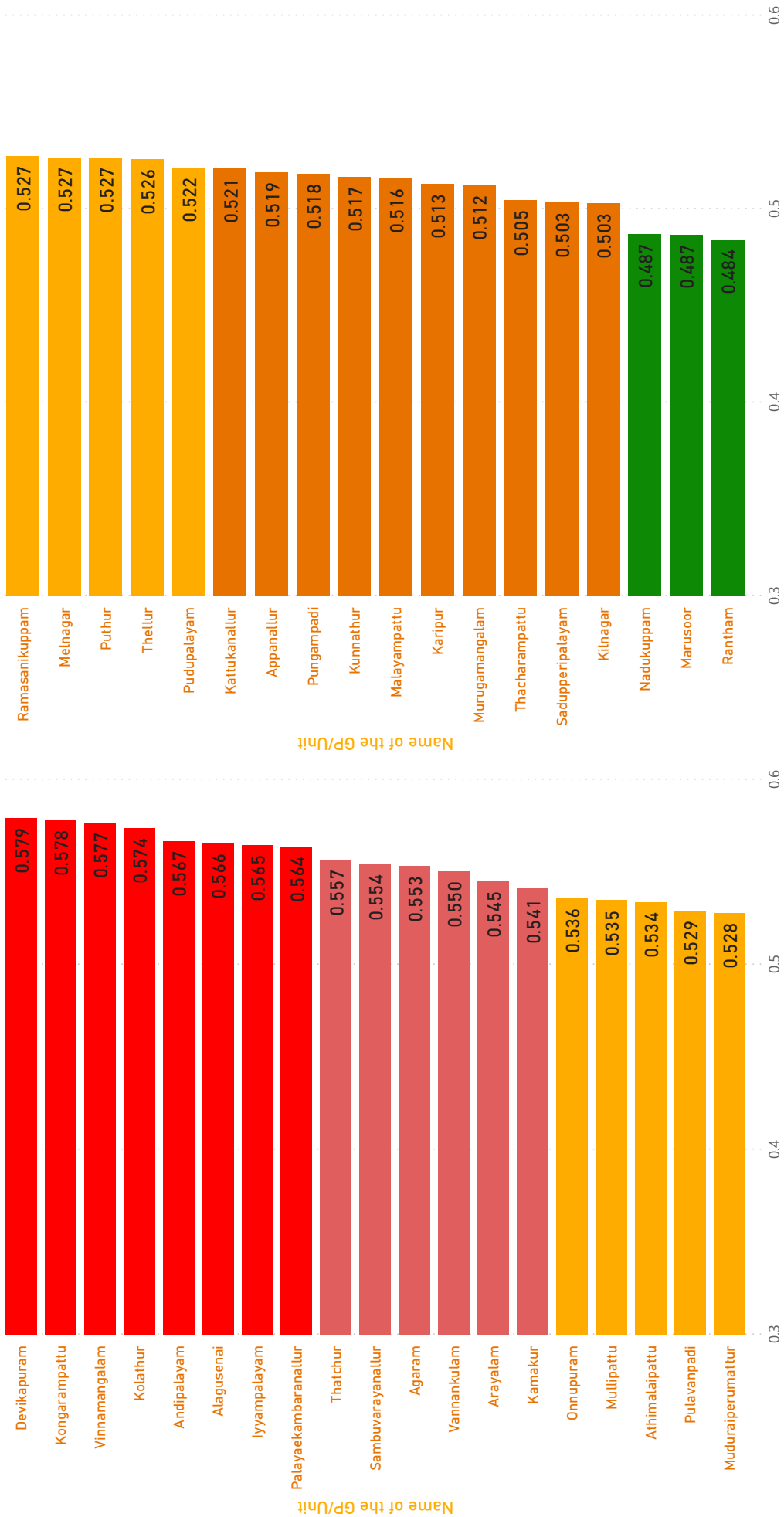


Figure 4.2 - Final cumulative vulnerability scores

## Sectoral vulnerability

The vulnerability indices were calculated with in climate risks, water resource, agriculture and socio economic dimensions and are shown in Figure 4.3 and tabulated in Table 10 to identify area wise vulnerable GPs.

### 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 5 locations namely, Mullipattu, Kongarampattu, Melnagar, Puthur and Kolathur are identified as flood vulnerable areas

KOLATHUR	PUTHUR
KONGARAMPATTU	
MELNAGAR	MULLIPATTU

### Water resource vulnerability

The water resources vulnerability index shows that Kongarampattu, Kolathur, Alagusenai, Appanallur, Thatchur, Kilnagar, Vinnamangalam and Devikapuram GPs are highly vulnerable

KONGARAMPATTU	KOLATHUR
ALAGUSENAI	APPANALLUR
THATCHUR	KILNAGAR
VINNAMANGALAM	DEVIKAPURAM

### Agriculture resources vulnerability

In agriculture and allied sectors, Palayaekambaranallur, Iyyampalayam, Andipalayam, Agaram, Devikapuram, Thatchur, Murugamangalam, Vinnamangalam, Ramasanikuppam and Alagusenai GPs shows high vulnerability

PALAYAEKAMBARANALLUR	
IYYAMPALAYAM	ANDIPALAYAM
AGARAM	DEVIKAPURAM
THATCHUR	MURUGAMANGALAM
VINNAMANGALAM	RAMASANIKUPPAM
ALAGUSENAI	

### Socio-economic vulnerability

Arayalam, Kattukanallur, Kunnathur, Vinnamangalam, Devikapuram, Puthur, Sambuvarayanallur and Palayaekambaranallur GPs have high socio economic vulnerability

ARAYALAM	KATTUKANALLUR
KUNNATHUR	VINNAMANGALAM
DEVIKAPURAM	PUTHUR
SAMBUVARAYANALLUR	
PALAYAEKAMBARANALLUR	

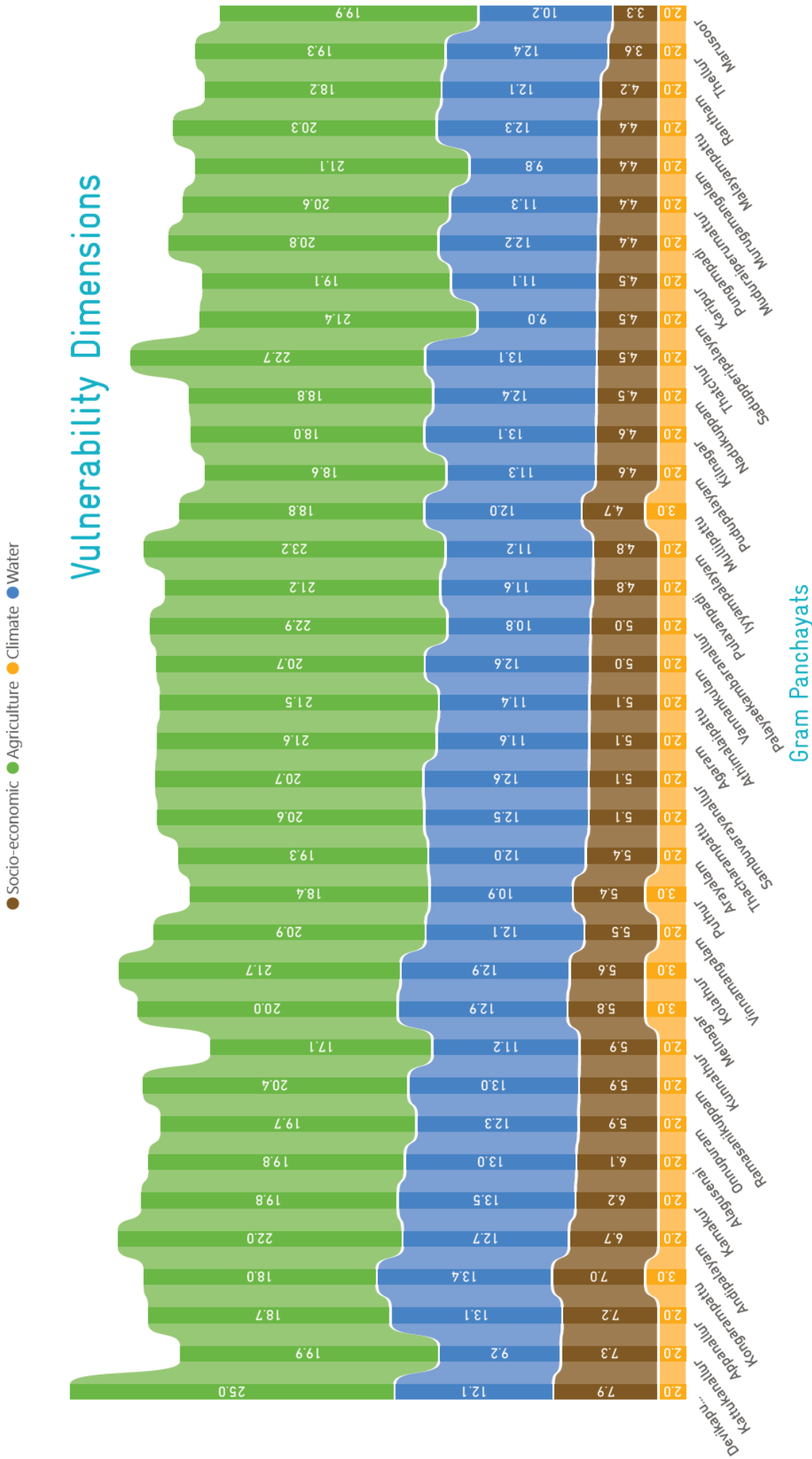


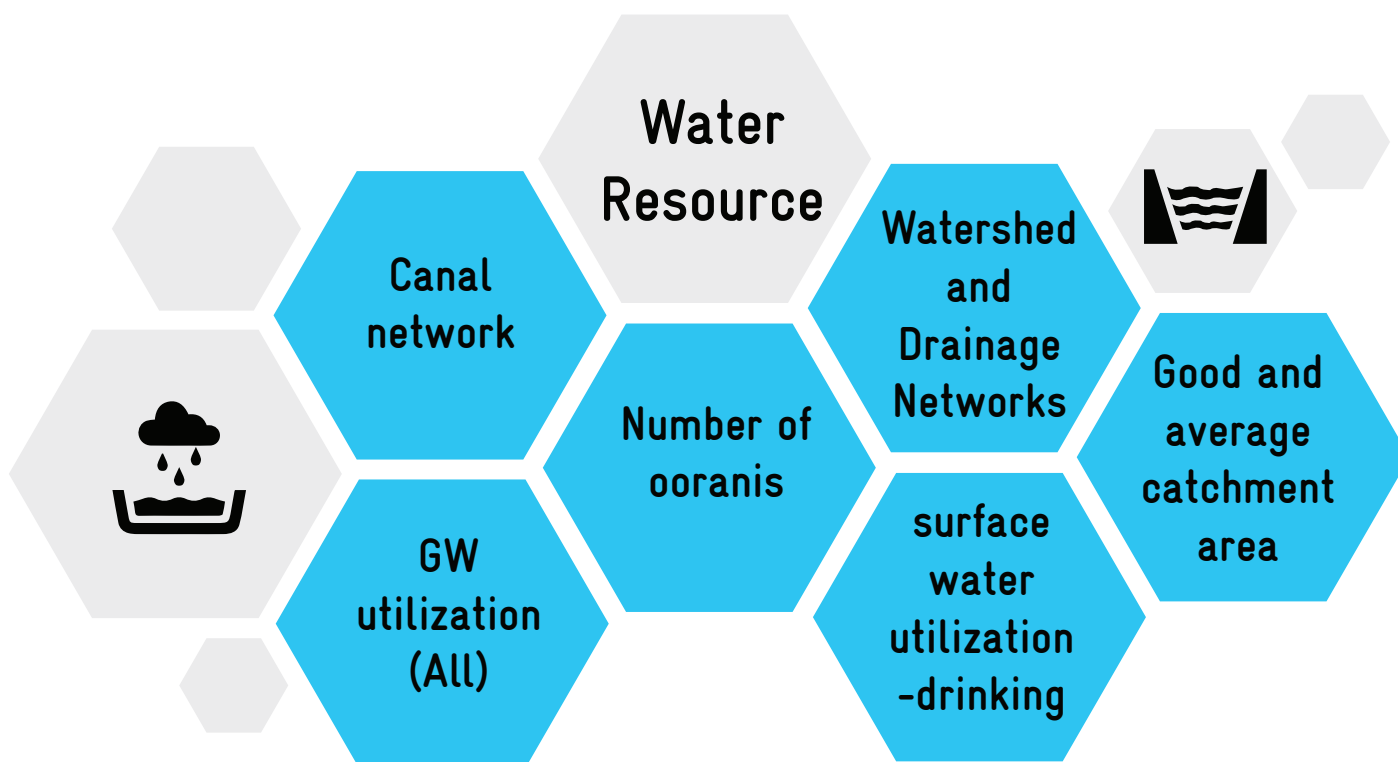
Figure 4.3 GP wise vulnerability dimensions



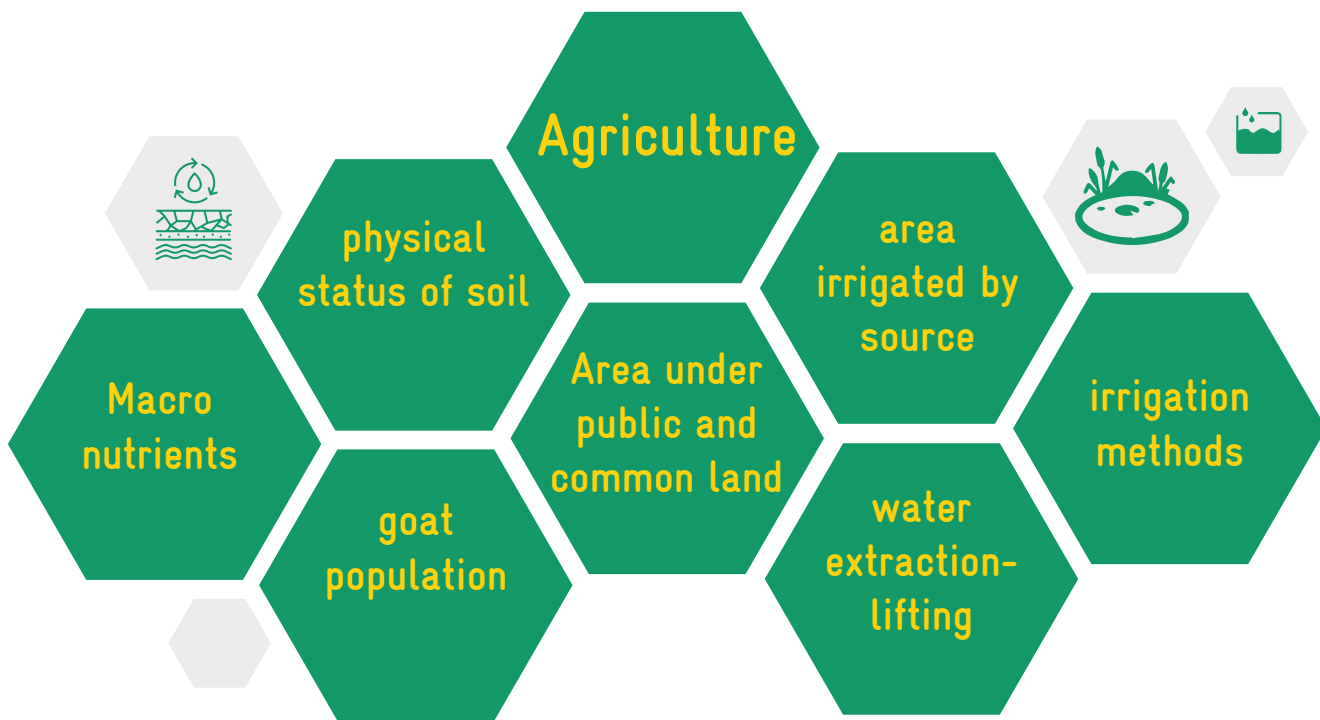
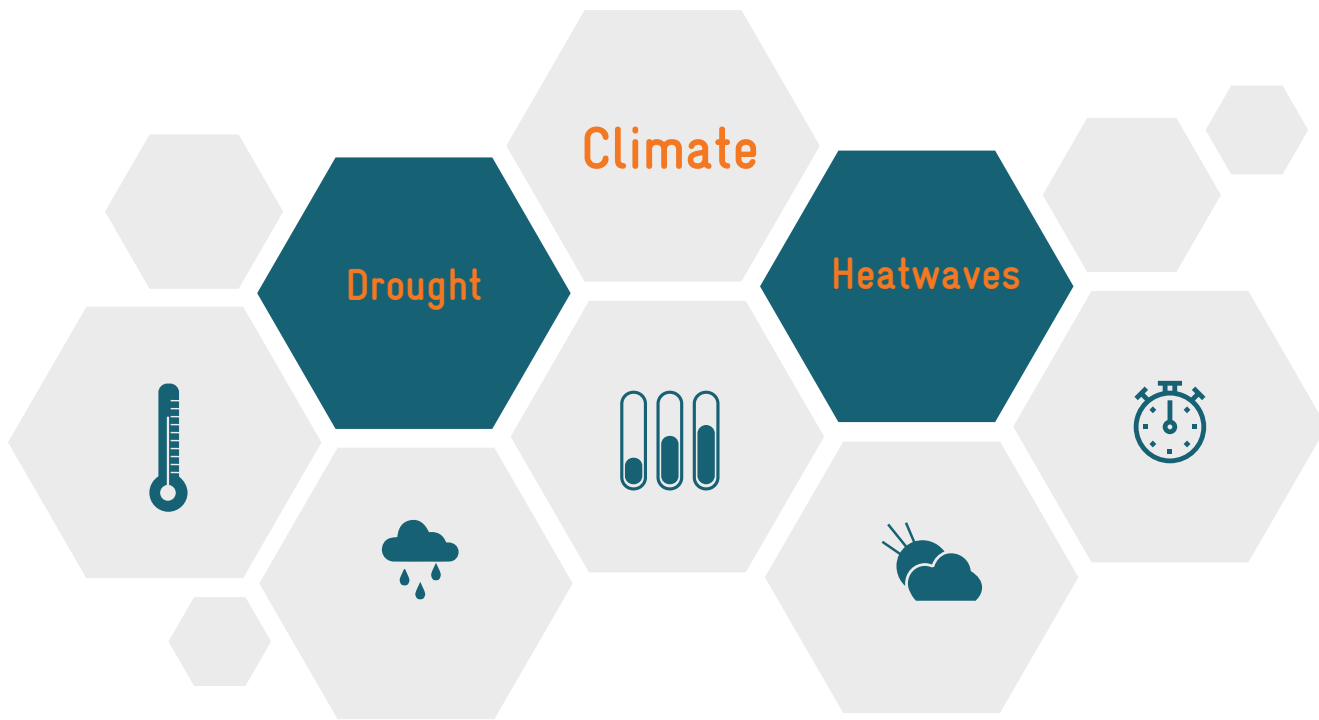
TABLE 10. VULNERABILITY SCORES OF GPs

GP	Climate	Socio economic	Water	Agriculture
Arayalam	2	6.3	13.6	16.0
Athimalaipattu	2	4.1	13.5	17.6
Agaram	2	4.8	12.8	18.9
Kolathur	3	4.8	14.8	17.3
Kamakur	2	4.8	13.7	17.3
Karipur	2	3.3	12.9	17.7
Murugamangalam	2	3.5	12.1	18.3
Marusoor	2	2.9	12.3	17.0
Kattukanallur	2	6.2	11.5	16.6
Muduraiperumattur	2	4.9	13.2	16.8
Pulavanpadi	2	4.9	13.0	17.0
Puthur	3	5.4	11.9	16.4
Sadupperipalayam	2	3.9	11.3	18.0
Thatchur	2	4.0	14.4	18.3
Andipalayam	2	5.0	13.4	19.1
Vannankulam	2	5.0	13.9	17.4
Pungampadi	2	4.5	13.1	16.6
Malayampattu	2	3.9	13.2	17.0
Kilnagar	2	4.0	14.1	15.1
Palayaekambaranallur	2	5.1	12.8	19.4
Iyyampalayam	2	4.3	13.8	19.2
Kongarampattu	3	4.8	15.2	17.1
Appanallur	2	4.6	14.7	15.0
Alagusenai	2	4.5	14.8	18.0
Melnagar	3	4.7	12.8	16.3
Onnupuram	2	4.4	13.5	17.5
Ramasanikuppam	2	4.0	12.7	18.1
Thacharampattu	2	4.4	10.8	18.0
Sambuvarayanallur	2	5.1	13.8	17.7
Thellur	2	3.8	13.9	17.0
Pudupalayam	2	4.5	12.6	17.3
Rantham	2	3.2	12.8	15.9
Nadukuppam	2	3.6	12.2	16.4
Kunnathur	2	5.9	13.1	15.2
Mullipattu	3	3.3	13.7	17.3
Devikapuram	2	5.5	14.1	18.6
Vinnamangalam	2	5.7	14.1	18.2

### 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  
பசும்பல் தலைகாண்பு அரிது

குறள் - 16

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

Thirukkural - 16

# CHAPTER 5

KEY WATER ACTIONS UNDER MGNREGS, CONVERGENCE



KEY WATER ACTIONS UNDER  
MAHATMA GANDHI NREGS,  
CONVERGENCE



## 5 | KEY WATER ACTIONS UNDER MAHATMA GANDHI NREGS, CONVERGENCE

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). Out of 26710 ha available land in West Arani Block, 3455.76 ha (29 %) area are proposed for treatment under WASCA TN- CWRM planning. Major portion of key water actions area proposed is in the area under common and public uses. A smaller amount land under individual ownership is also proposed for significant pilot treatments. The detailed land wise proposal for WASCA treatments is given in the Table 11. GP wise proposed area for treatment is also attached in Annexure 5.

**TABLE 11. THE PROPOSED AREA FOR WASCA TREATMENT**

Land Use	WASCA proposed Treatment Area (ha)	Total available land (ha)
Forest Land	0	0
Non-Agricultural Uses	1416.898	5772.6
Barren & Un-cultivable Land	129.255	186.74
Permanent Pastures and Other Grazing Land	41.75	55.66
Land under miscellaneous tree, crops etc.	22.33	35.18
Cultivable Waste Land	140.1525	1663.14
Fallows Land other than Current Fallows	96.595	1358.97
Current Fallow land	765.3397	7764.94
Unirrigated Land	273.8719	3083.51
Irrigated by Source	569.5705	6789.96

Nearly 75 % of the permanent pastures and other grazing lands are prioritized for treatment followed by 69.12% barren and uncultivable land, 63 % of land under miscellaneous tree, crops etc. Next to that 24.5 % of the area under non agriculture uses are considered for treatment. Nearly 9% of the current fallow land and 8 % of land under each cultivable waste land, unirrigated land and area under irrigated by source are proposed considerable treatments. (Figure 5.1).



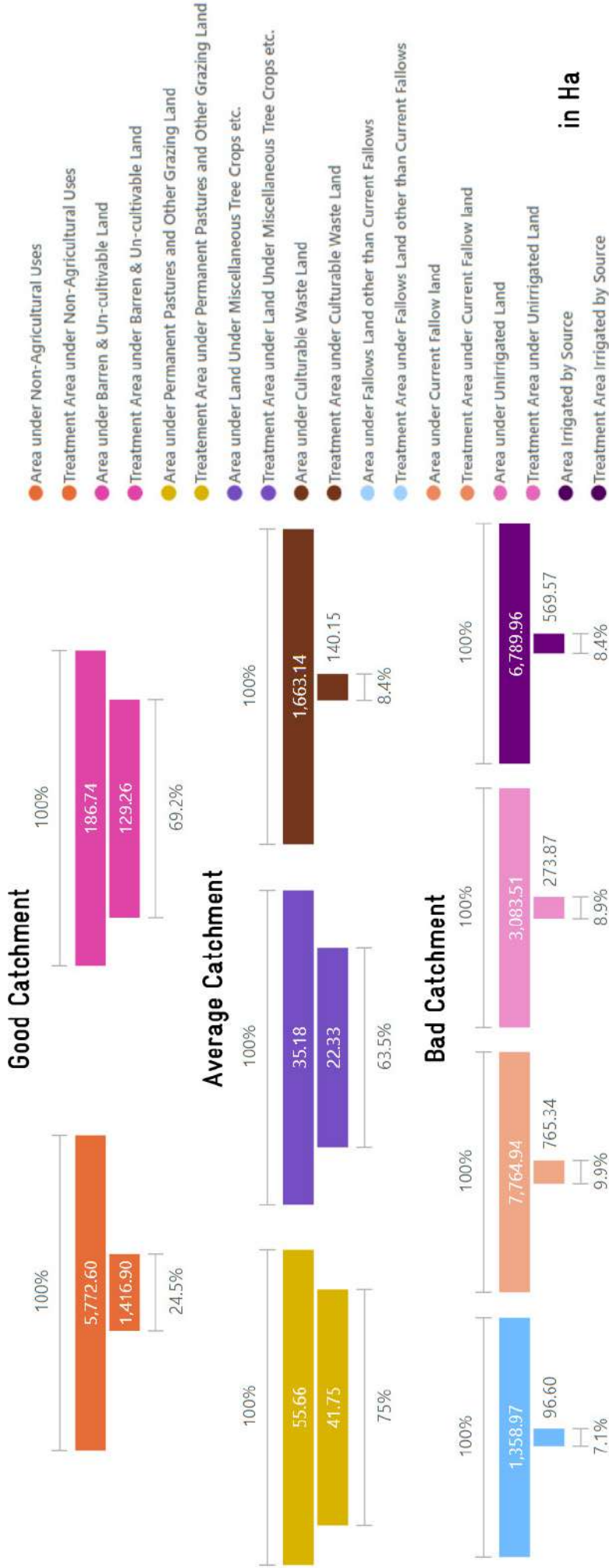


Figure 5.1 % of area under W/ASC.A treatment

### 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 1486.14 Ha - M which is 24.7 % of the total runoff. Of the expected runoff conservation, 67.2% comes from good catchment area, 4.7 % comes under average catchment area and 28.14% comes under bad catchment area.

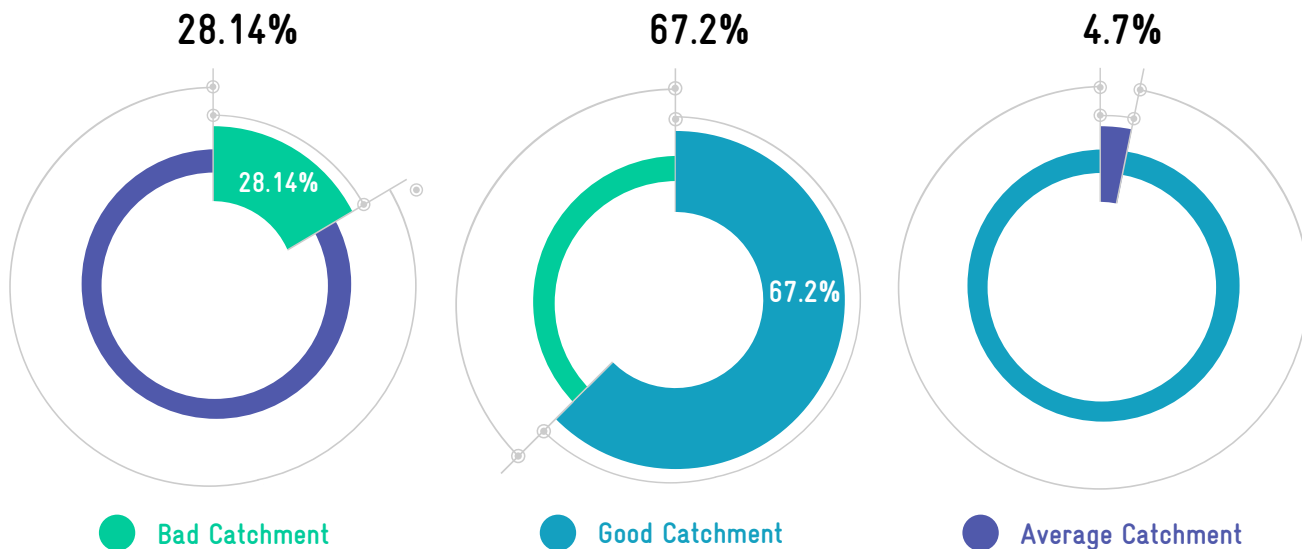


Figure 5.2 Expected conservation after WASCA treatment

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



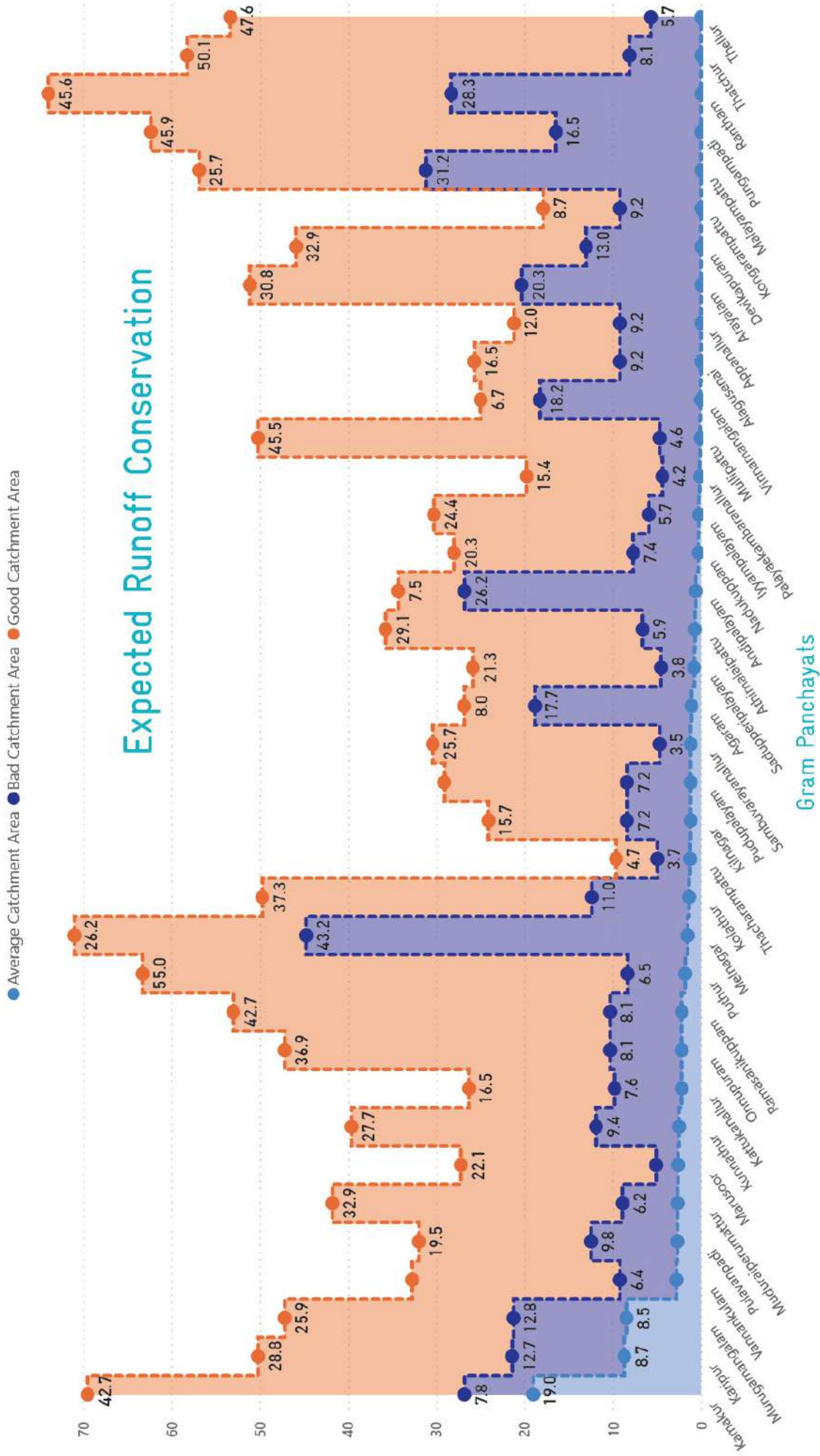
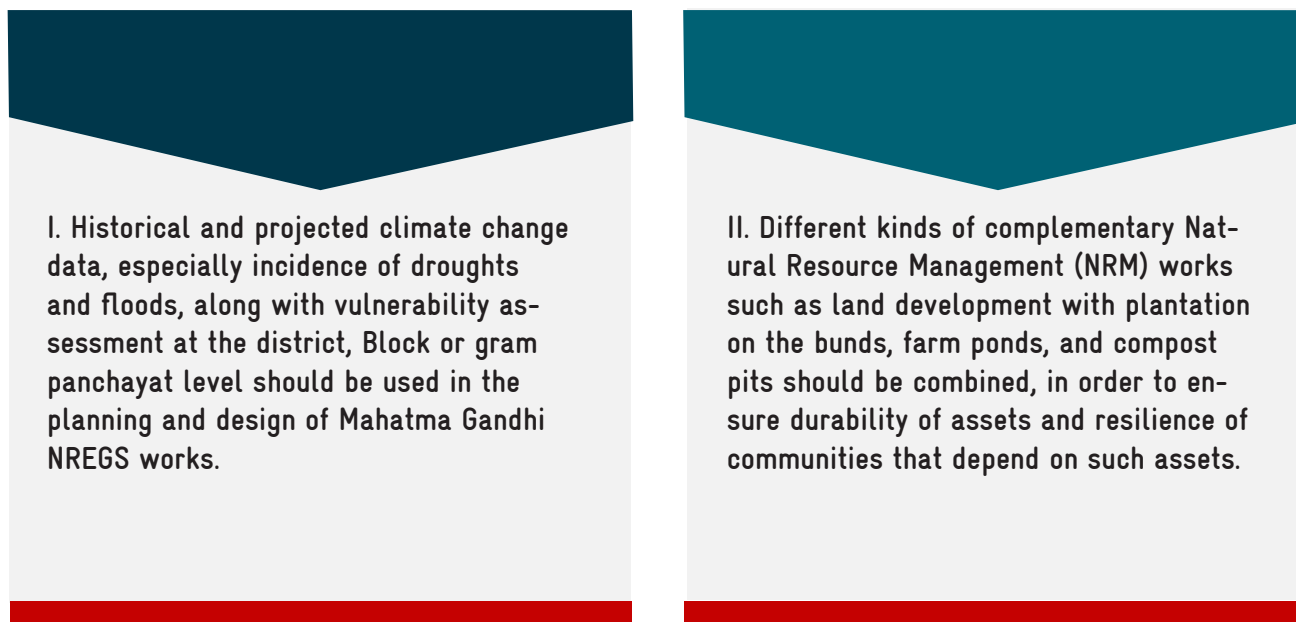


Figure 5.3 Expected GP wise runoff conservation after W/ASCA treatment

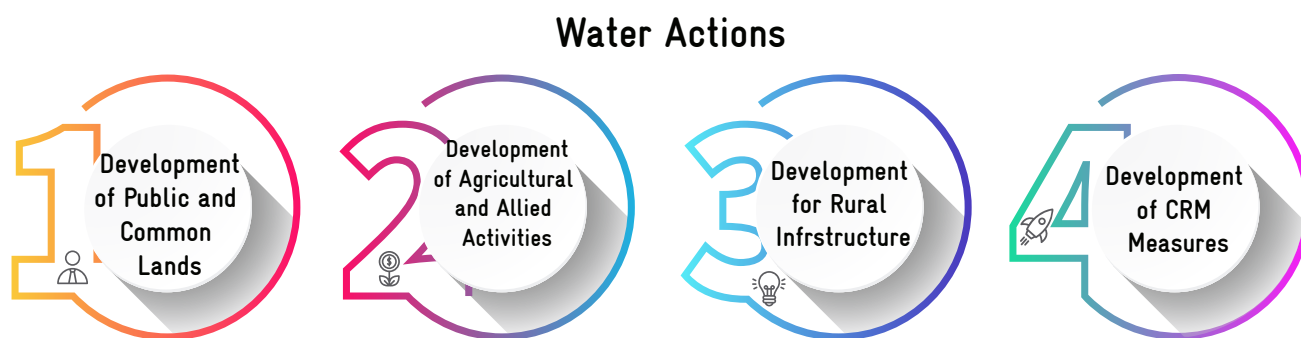


## Mahatma Gandhi NREGS Annual circular 2020-21 (Clause 6.3)

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



The key water actions proposed under 4 categories through Mahatma Gandhi NREGS convergence of considering its models under Right to Plan and Prepare a Shelf of Projects (Clause 6) are








The watershed and livelihood approaches are also considered for key water action prioritization. The GP wise key water actions based on watershed and livelihood approach are attached in Annexure 5.3.

## 5.1 | DEVELOPMENT OF PUBLIC & COMMON LANDS

The effective water augmentation measures are proposed in public and common lands via massive tree plantation, restoration of water bodies etc., are listed in Table 12.

## DEVELOPMENT OF PUBLIC AND COMMON LANDS

TABLE 12. DETAILS OF WORK PROPOSED TO DEVELOP PUBLIC AND COMMON LANDS






	 NO. OF WORKS	 PERSON DAYS PER UNIT	 UNIT COST IN INR (LAKHS)	 ESTIMATED COST IN INR (LAKHS)	 ESTIMATED PERSON DAYS
CONTOUR CONTINUOUS BUNDS (CCB) FOR AFFORESTATION AREA(MTRS)	3,635	10	0.025	90.87	36,349
COMPOSTING(NUMBER OF UNITS)	394	15	0.17	66.98	5,910
AFFORESTATION IN PUBLIC/Common LANDS(ha)	816	3,344	8.6	7,017.60	27,28,704
BLOCK PLANTATION (COMMUNITY) (ha)	230	4,320	11.1	2,553	9,93,600
SILVI-PASTURE DEVELOPMENT (ha)	178	6,664	17.1	3,043.80	1,186,192
LINEAR PLANTATION (KM)	1	703	1.8	1.56	609
CANAL BUND PLANTATION (ha)	345	2,930	7.5	2,587.50	5,55,719
IRRIGATION CHANNEL PLANTATION (MTRS)	162	6	0.015	2.43	974
AVENUE PLANTATION (KM)	0	703	1.8	0.28	109
NURSERY DEVELOPMENT (NUMBER OF UNITS)	333	2,344	15	5,002.13	7,81,665
RESTOTARATION OF WATER BODIES: A) PWD AND TANKS (NUMBER) (NUMBER)	109	800	5	545	87,200
RESTORATION OF WATER BODIES: C) PONDS (NUMBER)	186	200	2	372	37,200
ARTIFICIAL RECHARGE STRUCTURE (NUMBER OF UNITS)	1,592	391	2.5	2,919	6,22,472
WATER COURSE - IRRIGATION CHANNELS - DESILTING (MTRS)	162	3	0.0075	1.22	487
DRAINAGE LINE TREATMENT (DLT) (MTRS)	220	5	0.03	6.60	1,101

## 5.2 | DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

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

### DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

TABLE 13. DETAILS OF WORKS PROPOSED TO DEVELOP AGRICULTURE AND ALLIED ACTIVITIES






	 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)	370	586	1.5	555	2,16,820
MICRO IRRIGATION (ha)	0	0	1	0	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	647	781	2	1,294	5,05,307
LAND DEVELOPMENT - INDIVIDUAL (ha)	543	3,906	10	5,430	21,20,958
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	249	3,321	8.5	2,065.50	8,26,929
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	2,350	23	0.15	352.50	54,050
NADEP VERMI-COMPOST (NUMBER OF UNITS)	3,543	27	0.18	637.74	95,661
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	1,068	2,344	1.48	1,580.64	25,03,392
CATTLE SHELTERS (NUMBER OF UNITS)	3,539	331	2.12	7,502.68	11,71,409
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	1,014	355	2.27	2,301.78	3,59,970
CATTLE TROUGH (NUMBER OF UNITS)	2,300	6	0.5	115	53,375
POULTRY SHED (NUMBER OF UNITS)	2,290	10	0.09	206.10	22,900
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	2,343	0	5	11,715	21,69,618

## 5.3 | DEVELOPMENT OF RURAL INFRASTRUCTURE

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

### DEVELOPMENT OF RURAL INFRASTRUCTURE

TABLE 14 . DETAILS OF WORK PROPOSED TO DEVELOP RURAL INFRASTRUCTURE

	 NO. OF WORKS	 PERSON DAYS PER UNIT	 UNIT COST IN INR	 ESTIMATED COST IN INR (LAKHS)	 ESTIMATED PERSON DAYS
SOAK PITS (COMMUNITY) (NUMBER OF UNITS)	144	20	0.13	18.72	2,880
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	2,432	16	0.1	243.20	38,904
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	74	625	4	296	46,250

## 5.4 | DEVELOPMENT OF CLIMATE RESILIENCE MEASURES

Climate resilient measures are proposed to cope up the system with future climate risks such as droughts, heat-waves 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. This Block also affected by droughts and heat waves, the climate resilient

measures are proposed to cover-up maximum of GPs (Table 15). CRM such as farm ponds, greening of hillocks, bamboo plantation, fallow land developments are proposed in this Block in saturation mode. The proposed activities and its details are given in tables 16, 17, 18, and 19.

TABLE 15. GP WISE PROPOSED CRM

Name of the GPs	CRM	
	Public and common land	Agriculture and allied activities
Agaram		Farm pond
Alagusenai		Farm pond
Andipalayam		Farm pond
Devikapuram		Farm pond
Kamakur		Farm pond
Karipur		Farm pond
Kattukanallur		Farm pond

Kilnagar		Fallow land development
Kolathur	Silvi-pasture development	Fallow land development
Kunnathur		Farm pond
Malayampattu		Farm pond
Marusoor		Farm pond
Muduraiperumattur		Fallow land development
Murugamangalam	Greening of Hillocks	Farm pond
Nadukuppam		Fallow land development
Onnupuram		Farm pond
Palayaekambaranallur		Farm pond
Pudupalayam		Fallow land development
Ramasanikuppam	Greening of Hillocks	Farm pond
Pungampadi		Farm pond
Puthur	Silvi-pasture development	Fallow land development
Ramasanikuppam	Greening of Hillocks	Farm pond
Sadupperipalayam	Bamboo plantation	Fallow land development
Thatchur	Greening of Hillocks	Farm pond
Thellur		Farm pond
Vannankulam	Silvi-pasture development	-
Vinnamangalam		Farm pond

TABLE 16. DETAILS OF PROPOSED FALLOW LAND DEVELOPMENTS UNDER CRM

Name of the Village Panchayat Selected	Cultivable Waste land (ha.)	Other Fallow Land (ha.)	Total fallow land (ha.)
Sathupperipalayam	0.7	2.995	3.695
Kattukanalur	5.1	14.12	19.22
Nadukuppam	4.75	20.305	25.055
Maduraperumattur	0.5	44.17	44.67
Kilnagar	0	49.965	49.965
Puthur	0	50.12	50.12
Kolathur	0	52.89	52.89

TABLE 17. DETAILS OF PROPOSED BAMBOO PLANTATION ACTIVITIES UNDER CRM

Name of the Panchayat	Survey Number	Area of plantation (in ha)	Total no. of Plants	Classification of Land
Sathupperi palayam	1/1	3.9	9750	Meyccal nilam
	4/6	4.05	10125	Meyccal nilam
	5/10	2.35	5875	Meyccal nilam
	9/2	2.94	7350	Meyccal nilam
	18	1.15	2875	Neer Pidippu
	410	1.35	3375	Thoppu
	447/1	7.68	19200	Others
	514/1	2.35	5875	Others

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

TABLE 18. DETAILS OF PROPOSED ACTIVITIES ON GREENING OF HILLOCKS

Name of the GP	Category	Recommended Area in ha	Survey number	Area in ha	Classification of land
Ramasanikuppam	High	50	29	41.11	Malai
Thatchur	Very High	27	630	36.44	Others
Murugamangalam (Chetpet GLR)	High	50	36	57.54	Kuttai

\*malai-hill; kuttai-puddle

TABLE 19. DETAILS OF PROPOSED FARM PONDS ACTIVITIES UNDER CRM

Name of the Panchayat	Name of the Habitation	Name of the Panchayat	Name of the Habitation
5 Puthur	Chinnaputhur	Kollathur	Kollaivedu
	Kunjanthangal	Kunnathur	Agasthiyapuram
	5-Puthur	Maduraipermattur	Maduraipermattur
Agaram	Agaram	Malayampattu	Malayampattu
	Agaram	Marusur	Marusur
Andipalayam	Vellerimedu	Murugamangalam	Gurukulanthangal
Azhagusenai	Azhagusenai	Murugamangalam	ADC
Devigapuram	Devigapuram	Onnupuram	Onnupuram
Kamakkur	Kamakkurpalayam	Palaya Egambaranallur	Egambaranallur
Karipur	Karipur	Pungambadi	Pungambadi
	Karipur	Ramasanikuppam	Ramasanikuppam
	Karipur	Sadhuperipalayam	Sadhuperipalayam
	Karipur	Thatchur	Samathuvapuram
	Karipur	Thellur	Gandhi Nagar
Kattukanallur	Vinayapuram	Vinnamangalam	Vinnamangalam

CWRM KEY ACTIONS GP PLANS

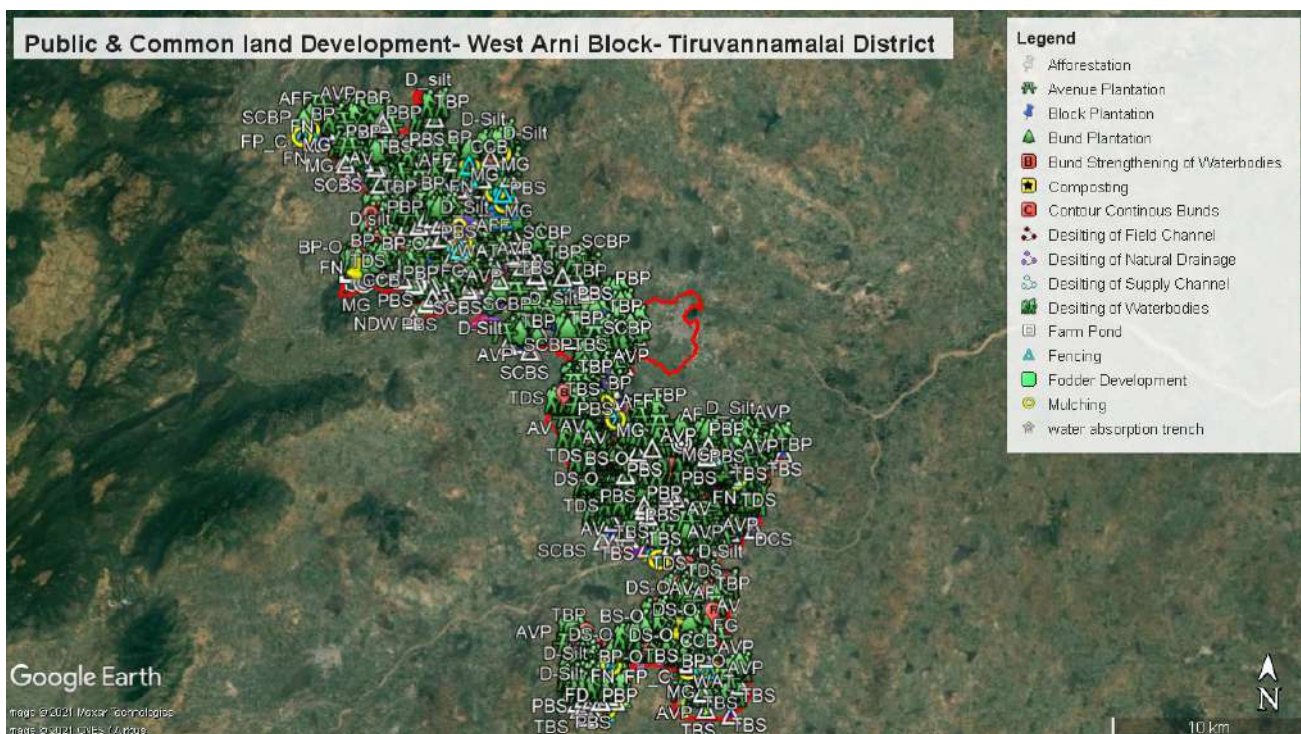


Figure 5.4 Map of proposed Developments in Public and Common Land

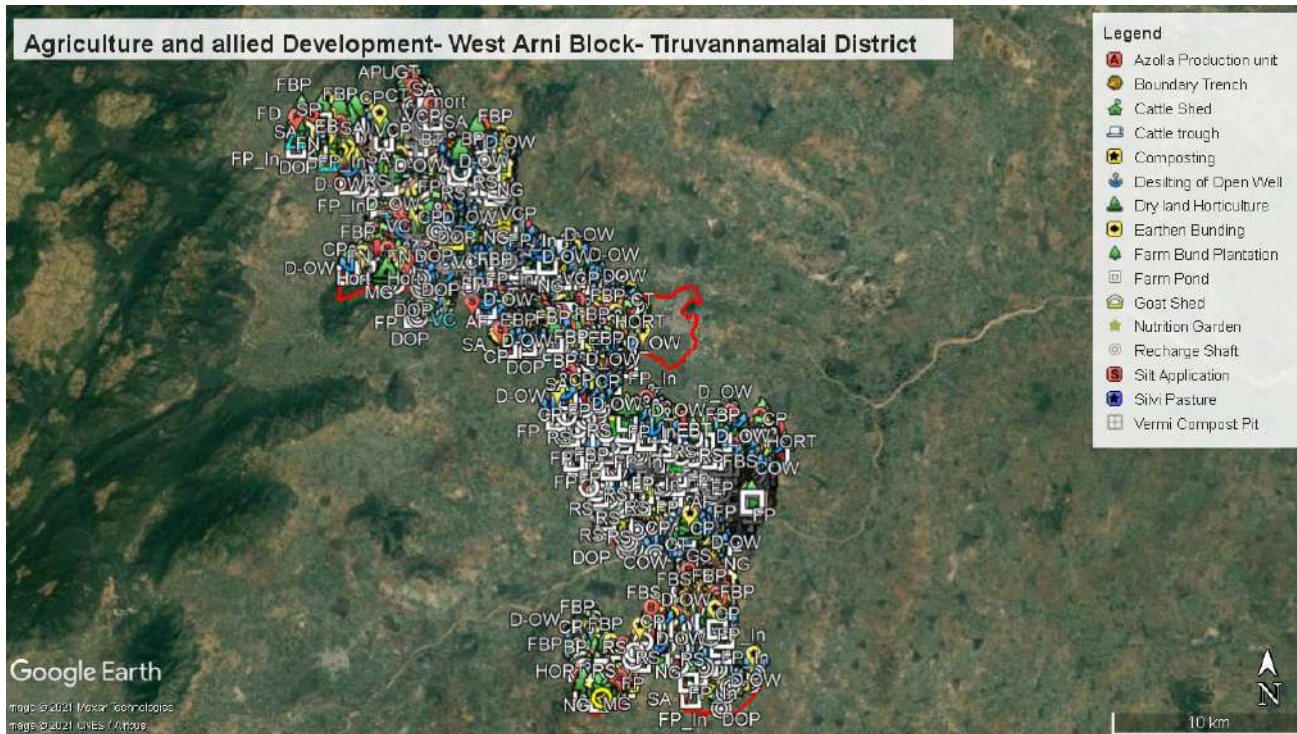


Figure 5.5 Map of proposed Developments in Agriculture and allied Sectors

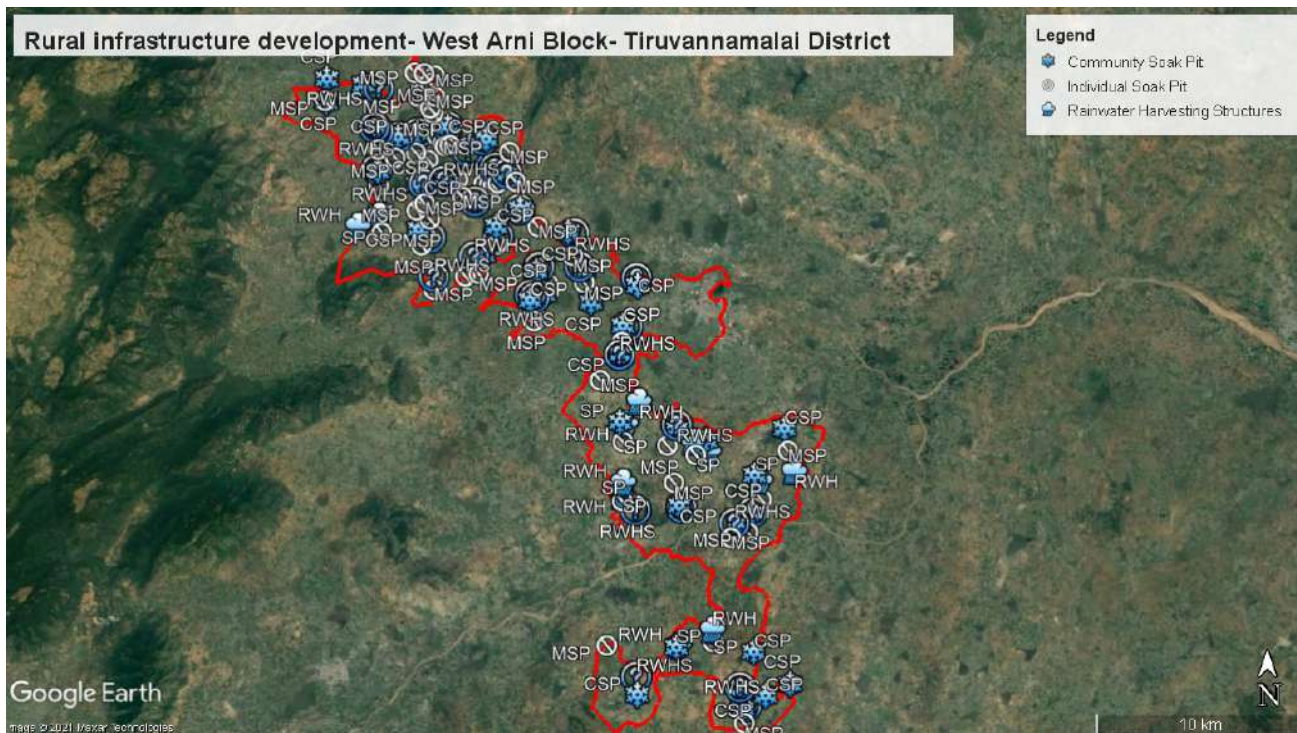


Figure 5.6 Map of Proposed Developments in Rural Infrastructure

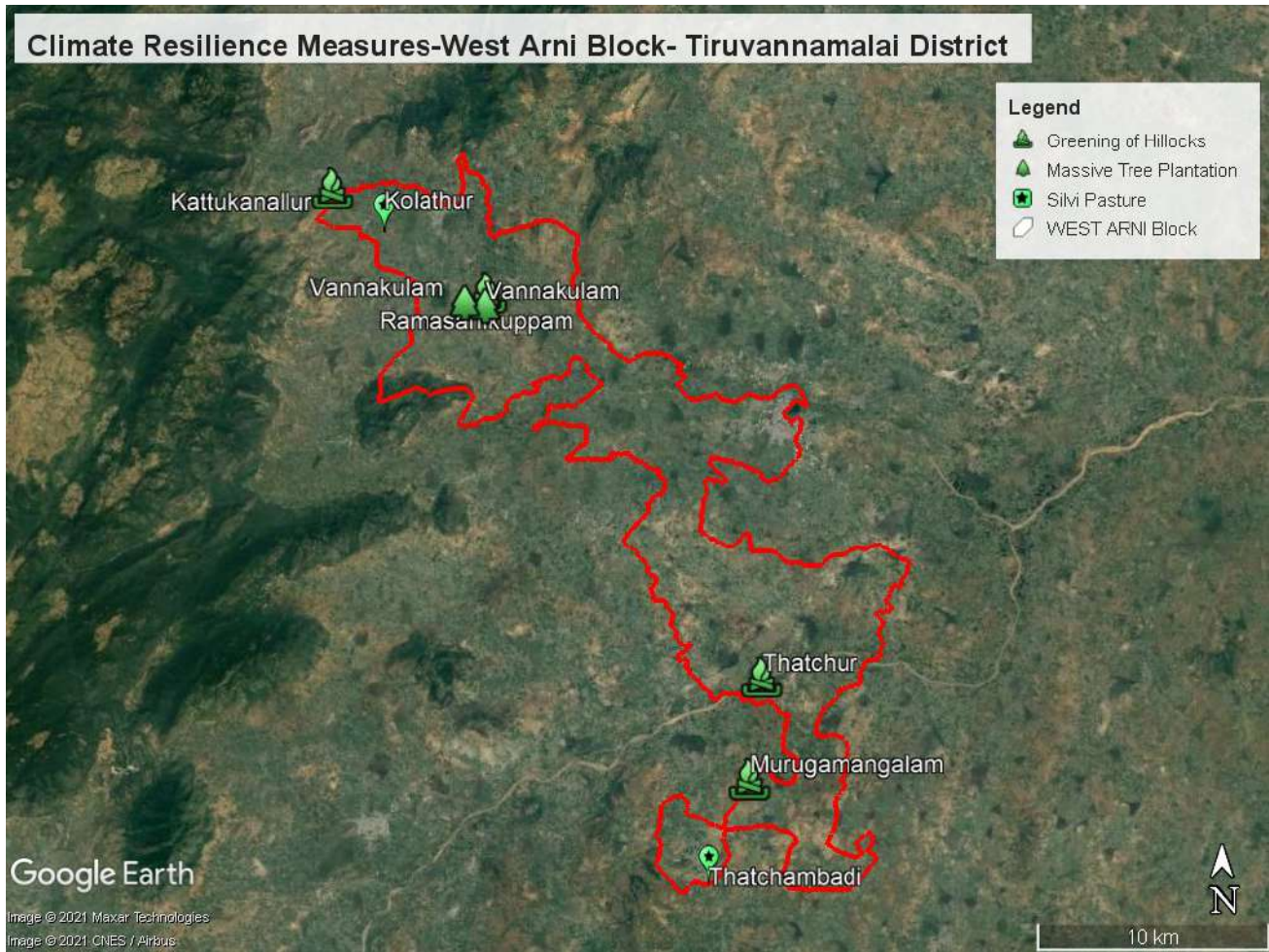


Figure 5.7 Map of proposed Climate Resilient Measures







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 THREE YEAR  
PERSPECTIVE PLAN



## 6 | PROJECTED OUTCOMES OF THREE YEAR PERSPECTIVE PLAN

In view of Mahatma Gandhi NREGS's guidelines, key water actions are proposed based on climate vulnerability assessment and challenges at GP level for three years period from 2021- 2022 to 2023-2024. At the end of the implementation period during 2024, the fol-

lowing productive outcomes are envisaged on successful accomplishment of all proposed key water actions. The anticipated outcome will reduce the water security vulnerability and increase the resilience of the GPs under current and projected climatic change scenarios.

### 6.1 | OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

#### OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

INDICATOR		OUTCOMES/ IMPACT	
1	Proportion of Land development under WASCA treatment	1	3455.76 ha (29 %) of the total area treated under WASCA
2	Percentage reduction of run off	2	1486.14 Ha - M i.e 24.7 % of the total runoff harvested due to WASCA interventions
3	Number of water bodies restored	3	295 water bodies restored
4	Area under afforestation	4	1046 ha area under afforestation
5	Area under silvi-pasture development	5	178 ha under Silvi-pasture plantation
6	Length of drainage line treated	6	220 km length of drainage line treated

**3455.76 ha**  
AREA TREATED

**1486.14 Ha - M**  
TOTAL RUNOFF  
HARVESTED

**295**  
WATER BODIES  
RESTORED

**1046 ha**  
AREA  
AFFORESTATION

**178 ha**  
SILVI-PASTURE  
PLANTATION

**220 km**  
DRAINAGE LINE TREATED



## 6.2 | OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

### OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

#### INDICATOR

1.	Assessment of sources of water for livestock and agriculture demand
2.	No of structures established for on-farm ( <i>in-situ</i> ) water harvesting in dry lands
3.	Improvement in soil health
4.	Changes in the irrigation practices
5.	Dry land development with agro-forestry
6.	Households established fodder plots

#### OUTCOMES/ IMPACT

1.	647 farm ponds established which target the harvest of 56.95 Ha - M of water which has the potential to irrigate 226.45 ha area in both kharif and rabi seasons
2.	3543 compost units for soil health improvement
3.	370 ha Farm bunding with trenches
4.	249 ha under dry land horticulture
5.	1068 vulnerable households established fodder plots

**647**  
FARM PONDS

**3543**  
COMPOST UNITS

**370 ha**  
FARM BUNDING

**249 ha**  
DRY LAND  
HORTICULTURE

**1068**  
FODDER PLOTS

## 6.3 | OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

### OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

#### INDICATOR

1.	Number of units having complete liquid waste management systems
2.	Roof rainwater harvesting measures
3.	Nutri garden

#### OUTCOMES/ IMPACT

1.	144 common and 2432 individual soak pits established for recycle of grey water benefiting 44383 households
2.	74 common roof rainwater harvesting and storage structures with a target to harvest and store 0.1 Ha - M of rainwater for use
3.	44383 Households established nutri-gardens in homesteads and planted 221915 saplings

**144** COMMON &  
**2432** INDIVIDUAL  
SOAK PITS

**74**  
COMMON ROOF  
RAINWATER HARVESTING

**44383**  
NUTRI-GARDENS

**221915**  
SAPLINGS

# 6.4 | OUTCOMES OF CLIMATE RESILIENCE MEASURES

## OUTCOMES OF CLIMATE RESILIENCE MEASURES

### INDICATOR

1.	Vulnerable GPs are identified for key water actions
2.	Climate resilient measures are identified for climate risks

### OUTCOMES/ IMPACT

1.	All GPs (37) are vulnerable for drought, heat-waves and 5 GPs area for flood vulnerability
2.	5 models are identified via., Farm ponds, fallow land development, greening of hillocks, Silvi pasture and bamboo plantation 30 farm ponds in 23 villages 20.29 ha under silvi pasture 245.6 ha under fallow land developments 135.09 ha under greening of hillocks 25.77 ha under bamboo plantation

**30**  
FARM PONDS

**20.29 ha**  
SILVI PASTURE

**245.6 ha**  
FALLOW LAND DEVELOPMENT

**135.09 ha**  
GREENING OF HILLOCKS

**25.77 ha**  
BAMBOO PLANTATION

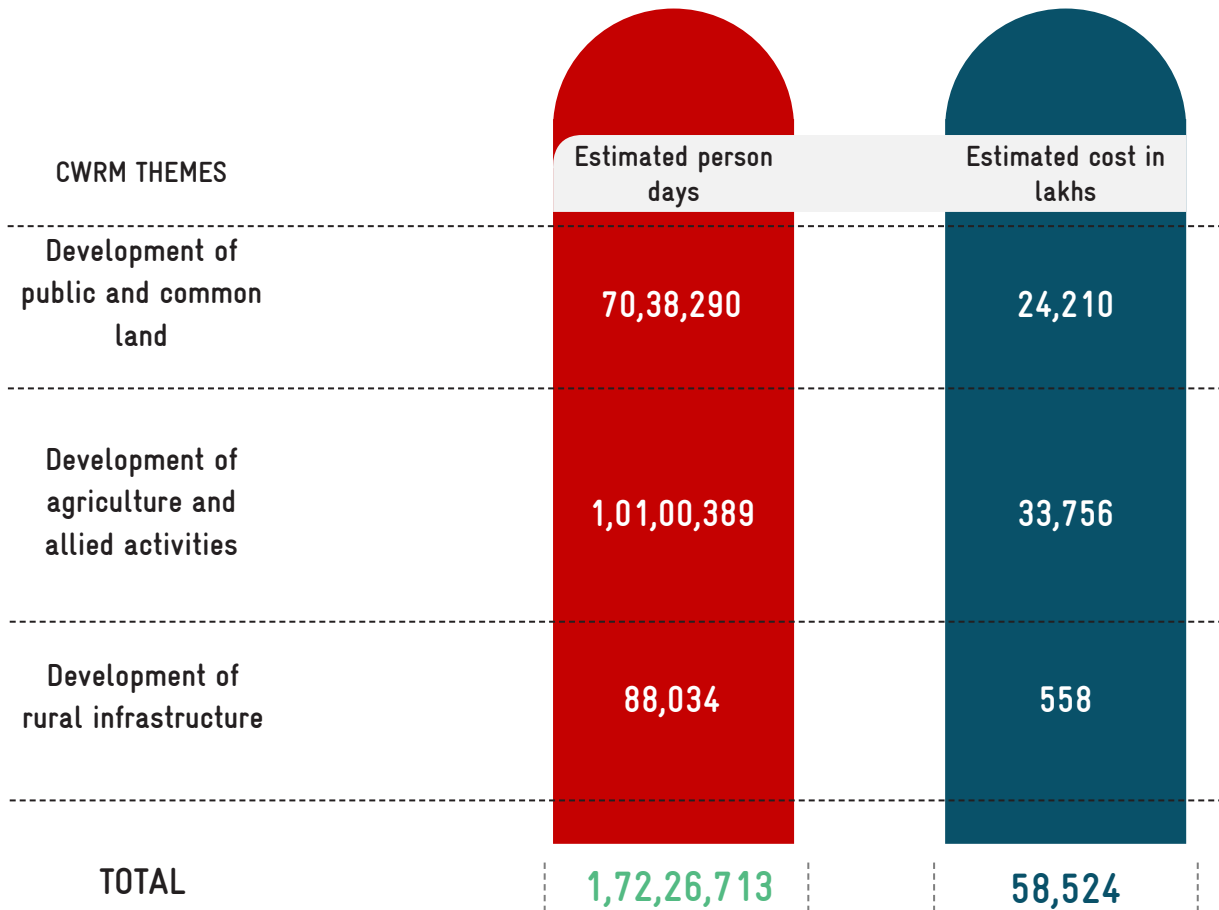


### Estimated person days

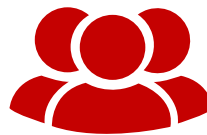
The total estimated person days required for the above propose activities are 1,72,26,713 as specified below

### Estimated Cost

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



#### WEST ARNI



ESTIMATED PERSON DAYS

1,72,26,713



ESTIMATED COST IN LAKHS

58,524

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 im-

pacts 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"

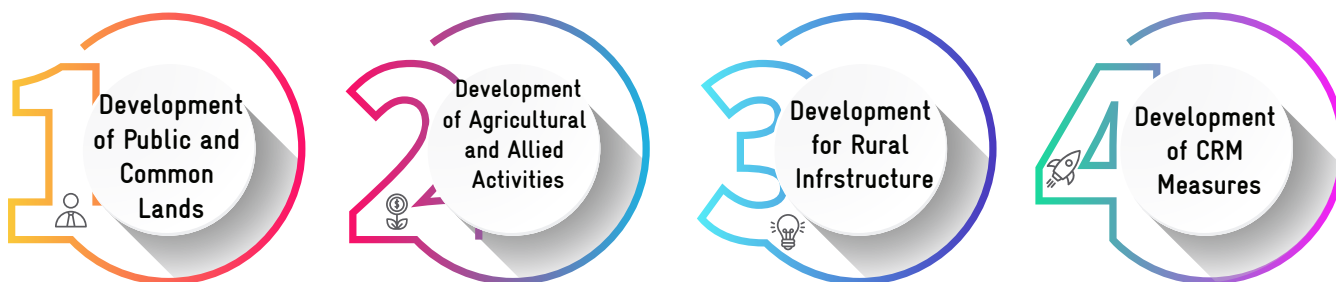
4

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. The water actions,

### "Climate Resilience for Future Livelihoods"



TN WASCA achieves 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 the key stakeholders for WASCA. Apart from these two ministries, the works under WASCA TN are closely linked with Ministry of Agriculture and Ministry of En-

vironment 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

6.5.1

Degree of integrated water resources management implementation

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 20-21 report (Table 20)

TABLE 20. COMMON VULNERABILITY INDICATORS WASCA TN & SDG INDIA 2020-2021

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 20). 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 21. WATER ACTIONS ON DEVELOPMENT OF PUBLIC & COMMON LANDS & ITS LINKED SDG**

Name of the work	Number of CWRM works	Climate Vulnerability Index Impacting (WASCA TN)	Linked SDG Goal
Contour Continuous Bunds (CCB) for Afforestation area(Mtrs)	3635	W3	SDG 1,2, 6,13&15
Composting(Number of units)	394	W1	SDG1& 6
Afforestation in Public/common lands(ha)	816	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community)(ha)	230	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development(ha)	178	C1,C2,C3,W3	SGG 12 &15
Linear Plantation(Km)	1	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation(ha)	345	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (Mtrs)	162	W4,W5,S2	SDG 1,2& 6, 15

Avenue plantation(Km)	0	C1,C2,C3,W3,S2	SDG 1, 6&13
Nursery Development(Number of units)	333	C1,S2,S4	SDG 1,2 &6
Restoration of water bodies :PWD and Tanks(Number)	109	S2, S1	SDG 6, 1, 13
Restoration of water bodies :Ponds(Number)	186	S2, S1	SDG 6,1, 13
Artificial Recharge Structure(- Number of units)	1592	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (Mtrs)	162	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (DLT) (Mtrs)	220	W1,W3,W4	SDG1 & 6

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

Name of the Work	Number of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	370	A1,A3,W1,W3	SDG 1,2&6
Micro Irrigation(ha)	0	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (Number of units)	647	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	543	W1,W5,A1,A3,S2,S4	SDG 2, 6& 15
Dry land Horticulture/Agro-forestry - Individual (ha)	249	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (Number of units)	2350	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (Number of units)	3543	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	1068	A3, S4	SDG 1& 2, 15
Cattle Shelters (Number of units)	3539	S4	SDG 1& 2
Goat Sheep Shelters (Number of units)	1014	S4	SDG 1& 2
Cattle Trough(Number of units)	2300	W5,S4	SDG 1& 2
Poultry Shed (Number of units)	2290	S2,S4	SDG 1& 2
Construction of new open wells & Recharge Shafts (Number of units)	2343	S3,W5,W1	SDG 1,2 & 6

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

Name of the Work	Number of CWRM works	CVI	SDG
Soak Pits (Community) (Number of units)	144	W3,S2	SDG 1& 6
Soak Pits (Individual) (Number of units)	2432	W3,S2	SDG 1& 6
Roof Rain Water Harvesting (Number of units)	74	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 SOFT

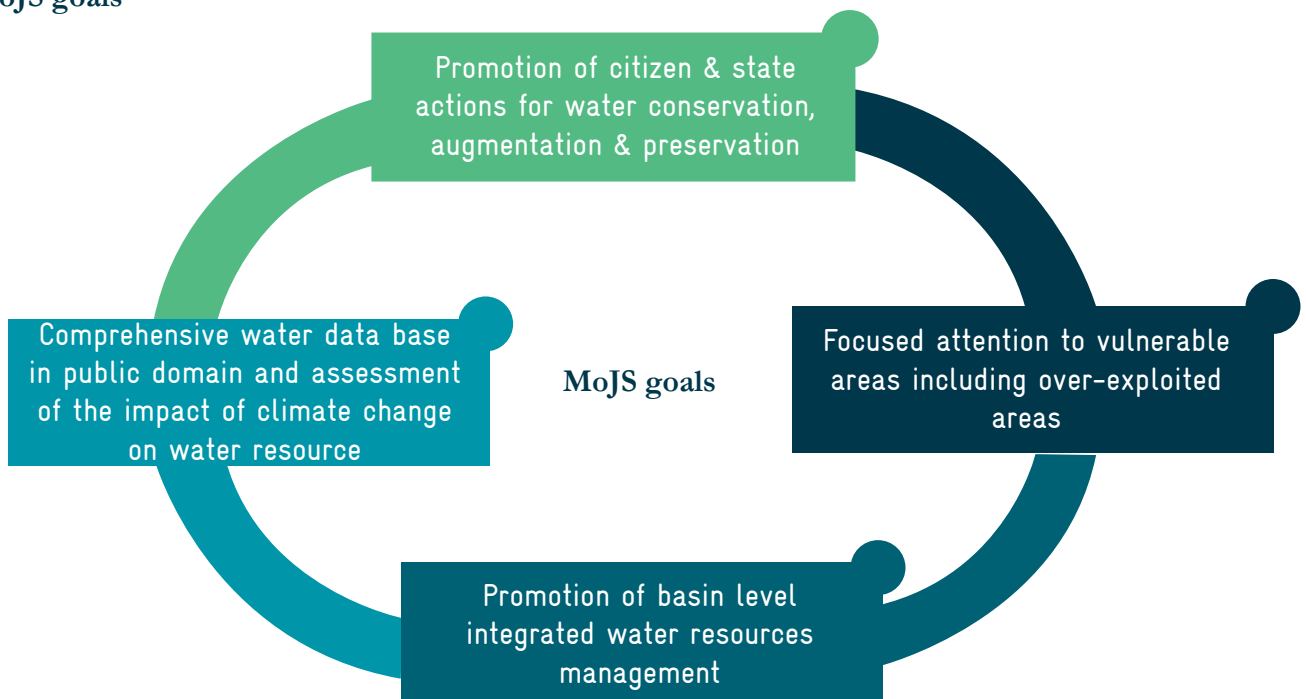
WASCA is progressing towards digitizing and integrating GP level GIS based plans, NRM and Non NRM in to Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of West Arani Block is list-

ed in Table 24 and work progress during the 3 financial years are shown in Figure 7.1 to 7.4. GP wise WASCA recommendations and works uploaded in Annexure 7.

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



### MoJS goals



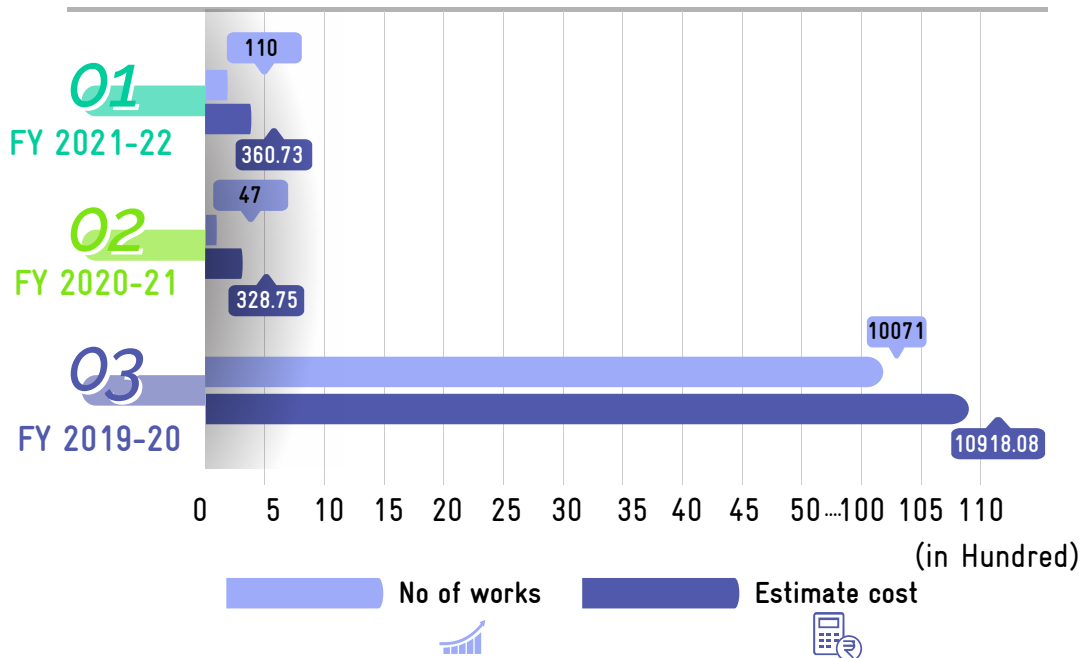


Figure 7.1 Work progress in last 3 years

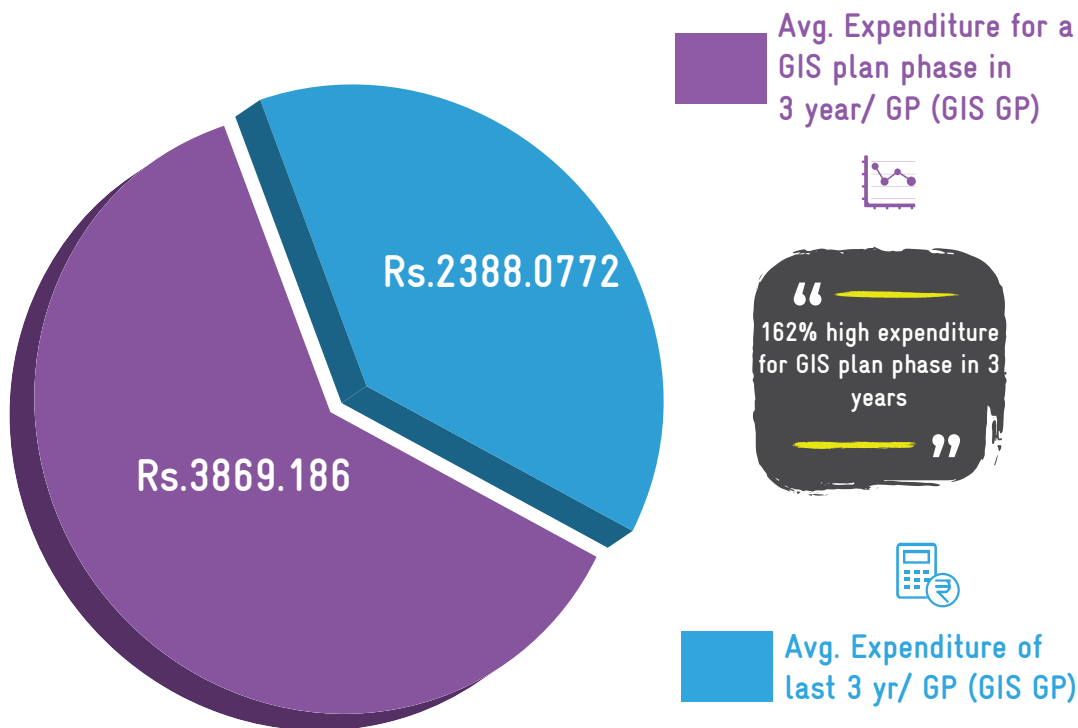
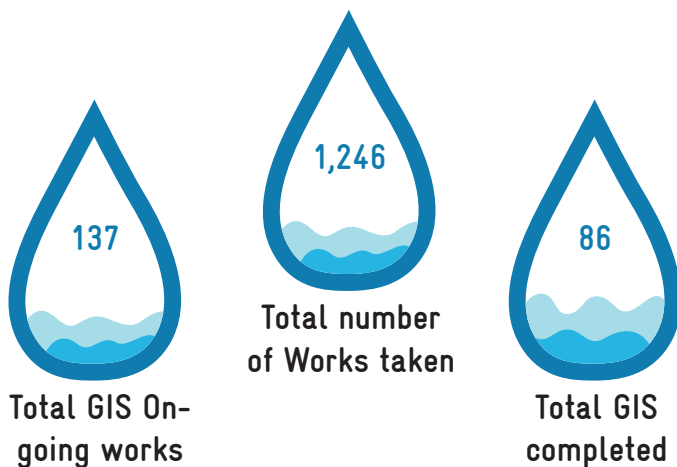


Figure 7.2 Average Expenditure for GIS plan in last 3 years



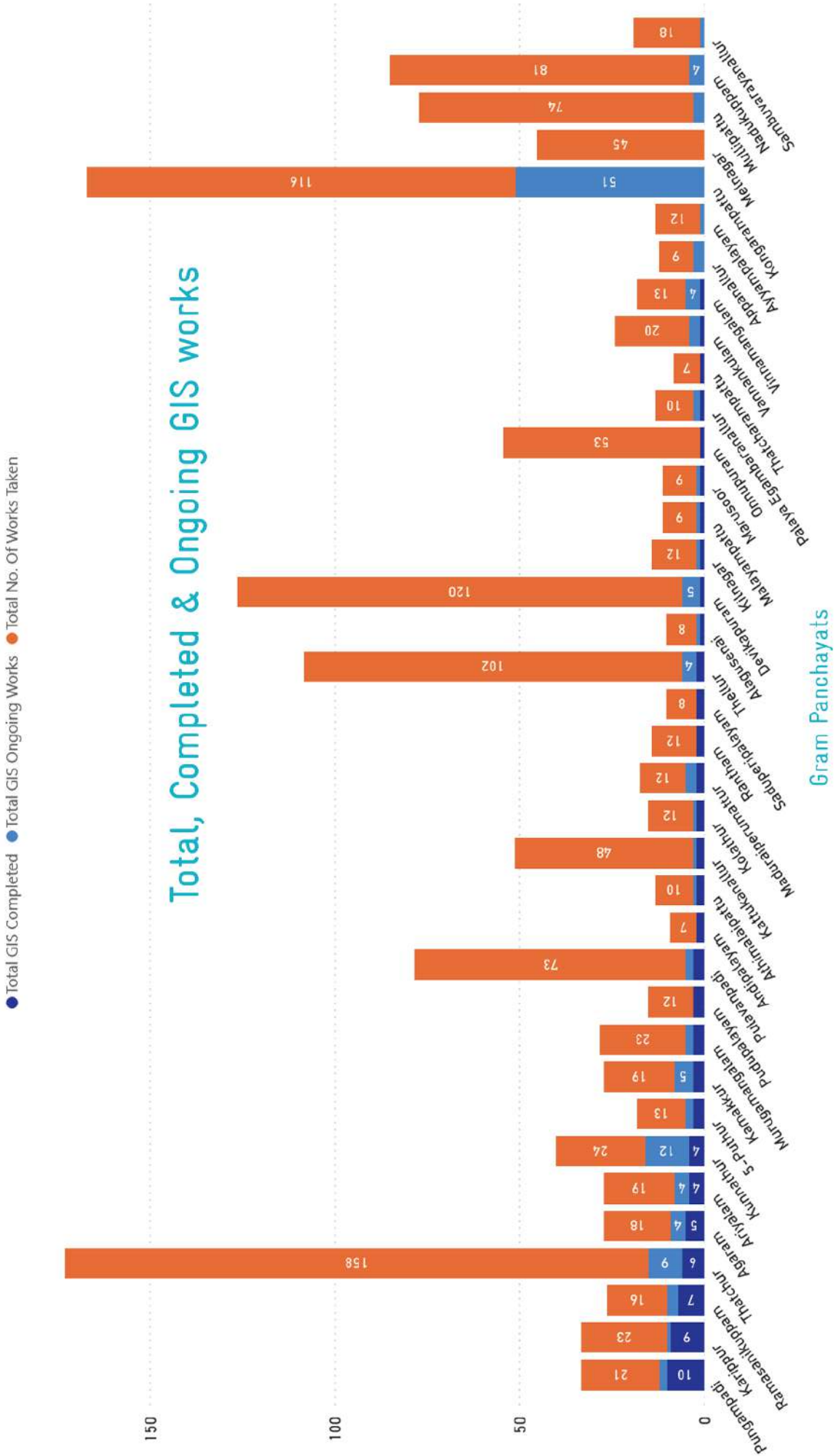
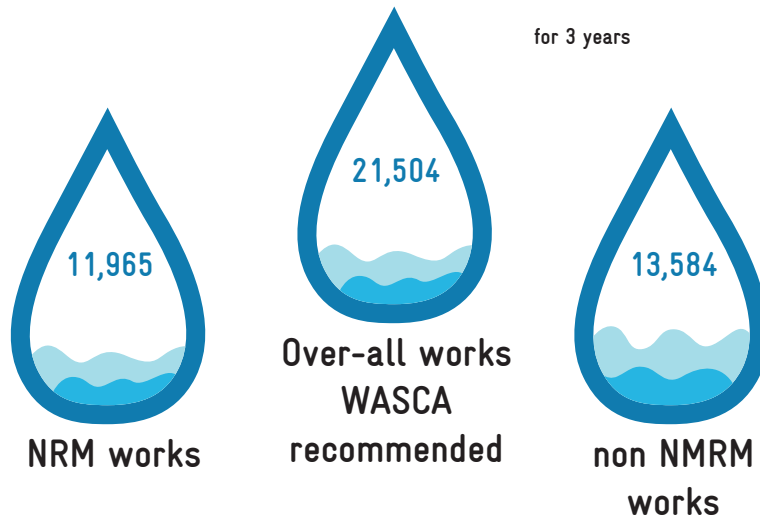


Figure 7.3 GP wise total, completed and ongoing GIS works

## 7.2 | NRM AND NON NRM WORKS

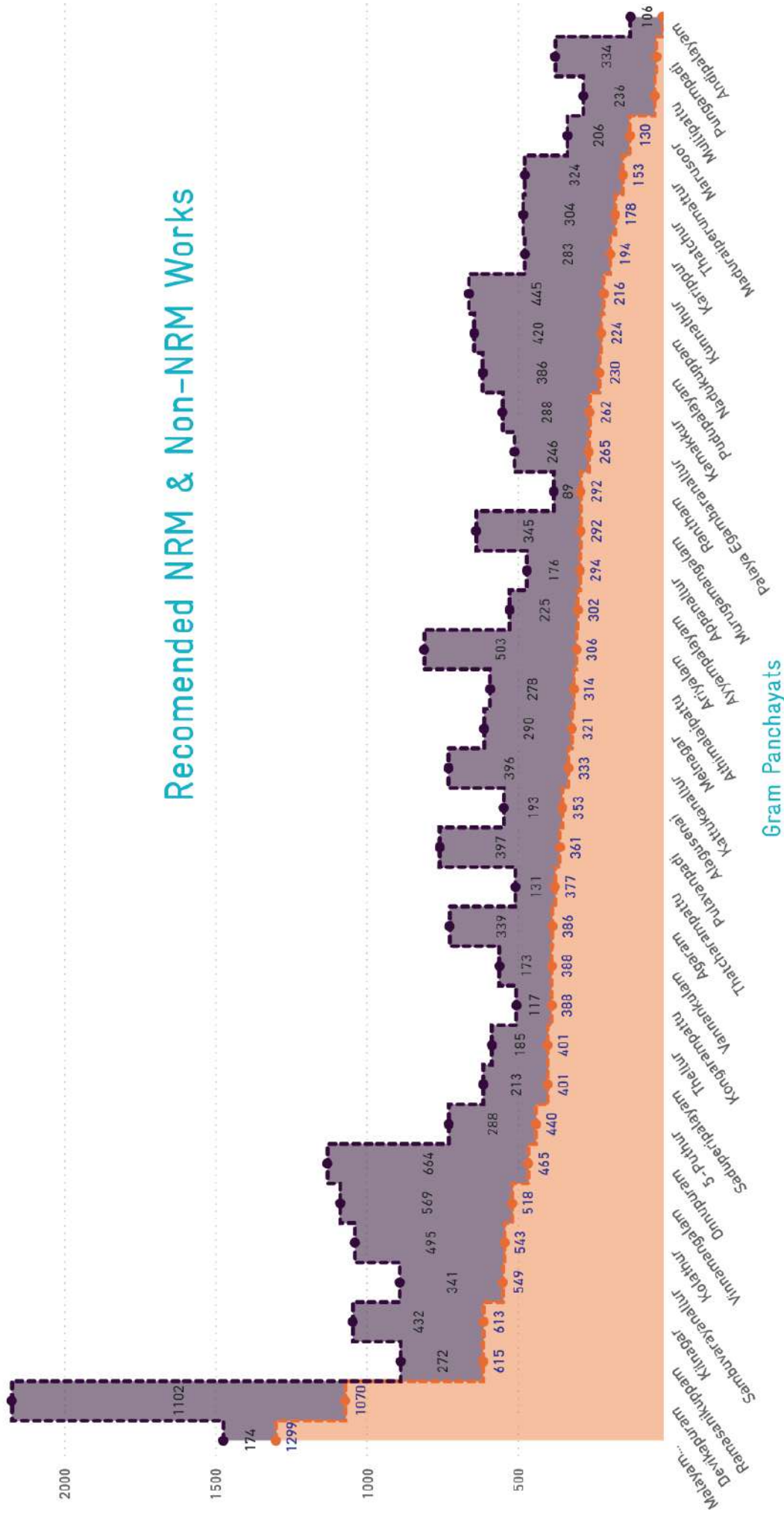
Over-all works WASCA recommended for 3 years are 21,504, out of that 11965 are NRM works and

13584 are non NMRM works. A total of 10,071 works are uploaded so far for the financial year 2021-22.



● NON-NRM ● NRM

### Recommended NRM & Non-NRM Works



### Gram Panchayats

Figure 7.4 GP wise recommended NRM and non NRM works

## 7.3 | ONGOING WORKS

TABLE 25. DETAILS OF ONGOING WORKS IN WEST ARANI BLOCK

SI. No	Type of structure	Name of The Panchayat	Name of The Work	Number of works	Progress
1	Individual Soak Pit	Kattukanallur	Construction Of Individual Soak Pit In Kattukanallur Panchayat	35	Ongoing
2	Individual Soak Pit	Devikapuram	Construction Of Individual Soak Pit In Devikapuram Panchayat	100	Ongoing
3	Individual Soak Pit	Thatchur	Construction Of Individual Soak Pit In Thatchur Panchayat	100	Ongoing
4	Individual Soak Pit	Mullipattu	Construction Of Individual Soak Pit In Mullipattu Panchayat	50	Ongoing
5	Individual Soak Pit	Nadukuppam	Construction Of Individual Soak Pit In Nadukuppam Panchayat	50	Material Supplying
6	Massive Tree Plantation Greening of Hillocks	Kattukanallur	Providing Of Massive Tree Plantation in Kattukanallur Panchayat	36 ha	15,000 - Plants Completed
7	Massive Tree Plantation	Agaram	MTP near Kamaraj nagar Road Line	4 ha	Ongoing
8	Supply channel	Agaram	Supply Channel Sunkat Pit - Karikathangal Eri	400 Mts	Ongoing
9	Supply channel	Agaram	Supply Channel Sunkat Pit - Karikathangal Eri (North Side)	320 Mts	Ongoing
10	Community dug well	Agaram	Community dug well – JJ Nagar		Ongoing

## 7.4 | CATCH THE RAIN

The NWM's campaign "Catch The Rain" with the tagline "Catch the rain, where it falls, when it falls" is to nudge the states and stakeholders to create appropriate Rain Water Harvesting Structures (RWHS) suitable to the climatic conditions and sub-soil strata before monsoon season. Under this campaign, drives to make check dams, water harvesting pits, rooftop RWHS etc., removal of encroachments and de-silting of tanks to increase their

storage capacity; removal of obstructions in the channels which bring water to them from the catchment areas etc., repairs to step-wells and using defunct bore wells and unused wells to put water back to aquifers etc., are to be taken up with the active participation of people. The expenditure towards progressive works on Catch the rain campaign of West Arani Block is shown in figure 7.5



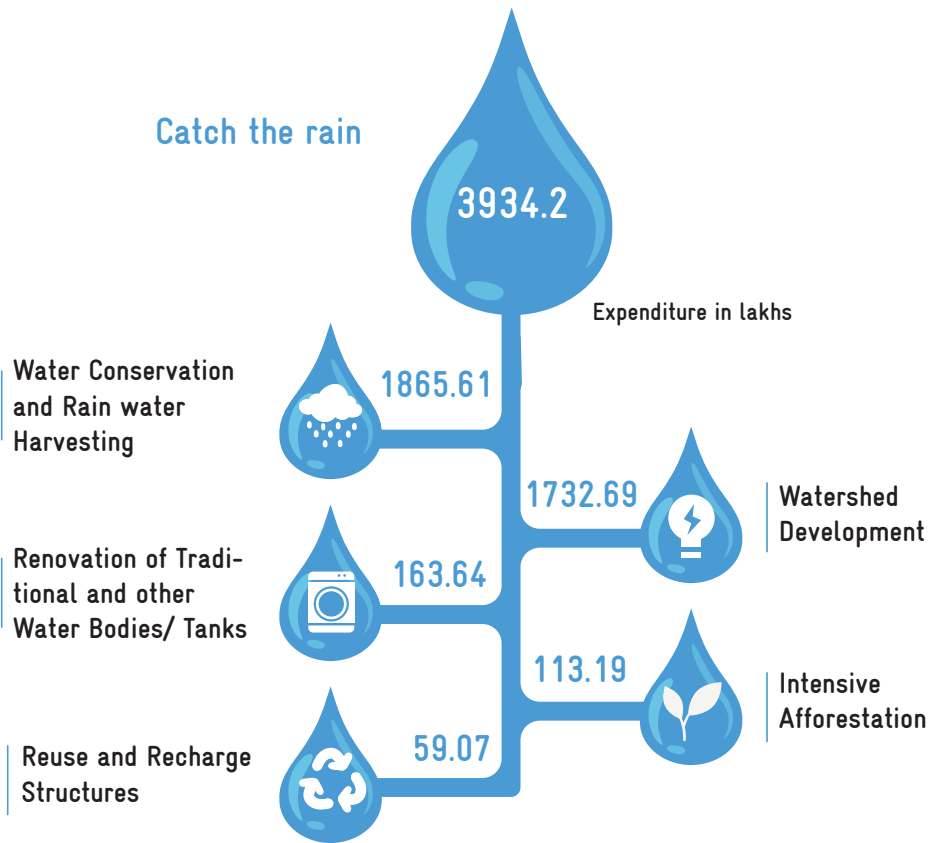


Figure 7.5: Catch the Rain in West Arani



**MASSIVE  
TREE PLANTATION**



**SOAK PITS**





SUPPLY CHANNEL



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

## 8.1 | MACRO-WATERSHEDS IN WEST ARANI BLOCK

West Arni Block has two river sub-basins Naganadi and Cheyyar Watersheds. Under Naganadi watershed (4C2A4) consists of 41 micro-watershed covering an area of 16,306 ha. Under Cheyyar watershed (4C2A5) with 49 Micro-watersheds covering an area of 26,331 ha. Out of 37 GPs in the Block, 18 GPs fall under Naganadi (4C2A4) Watershed, 16 GPs under Cheyyar Watershed (4C2A5) and three GPs having both watershed boundaries passing through them. The map below shows the boundary of Naganadi and

Cheyyar Watershed boundaries on West Arni Block boundary (Figure 8.1) and GPs boundary (Figure 8.2). The Micro-watershed based works are identified using Basin, Sub-basin, Micro-watershed with GP administrative boundaries through Composite Water Resources Management plan approach. The GP wise ridge details along with proposed works are listed in tables 26 to 33. The ridge map of Micro-watershed and GPs in West Arni Block are shown in figure 8.3 and 8.4.

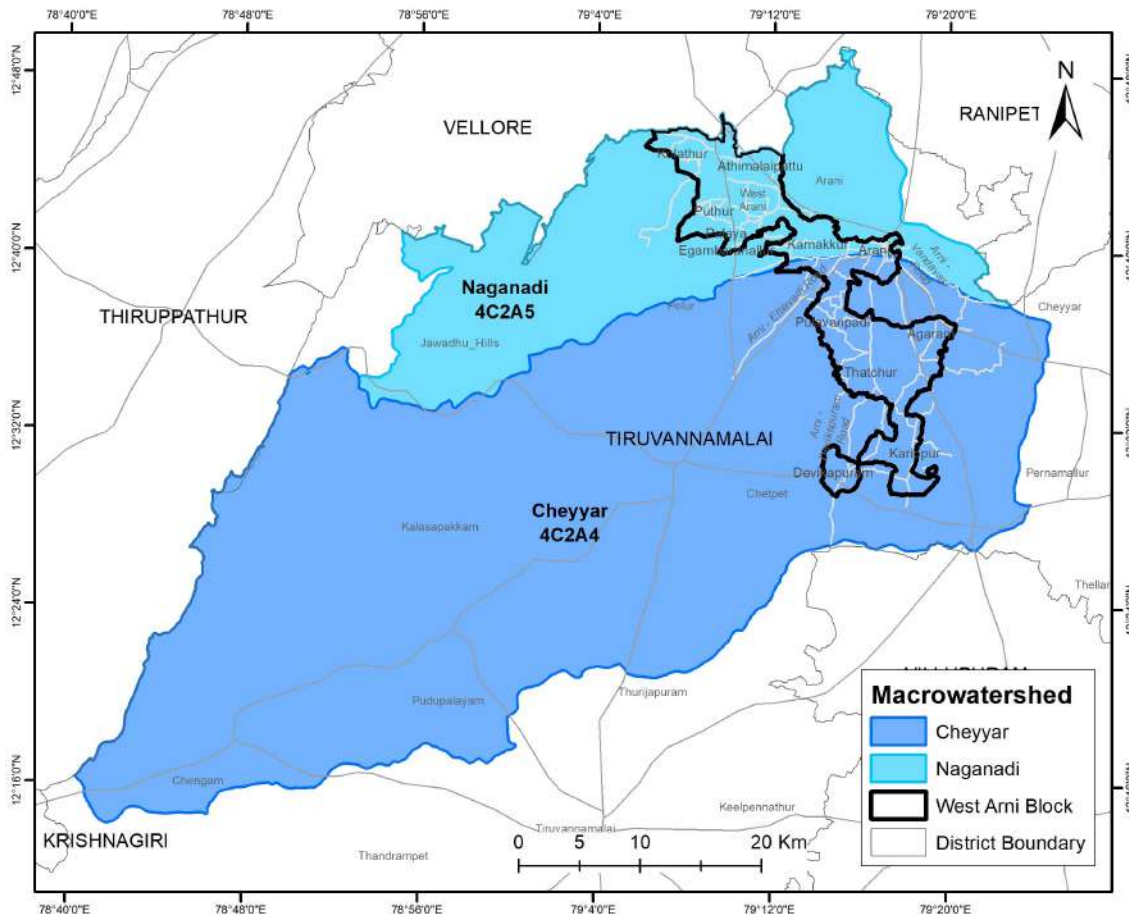


Figure 8.1. Macro-watershed Map - West Arni Block – Tiruvannamalai District

TABLE 26. MICRO-WATERSHED IN WEST ARANI BLOCK FALLING UNDER NAGANADHI MACRO-WATERSHED

Naganadi Macro-watershed – Ridge Details: West Arni Block			
S No	Micro-watershed Code	Micro-watershed Area in ha	Type of Ridge
1	4C2A5b04c	56.8803	Upper & Middle Ridge
2	4C2A5b04b	200.5654	Upper & Middle Ridge
3	4C2A5b01b	367.6228	Upper Ridge
4	4C2A5d03b	711.2212	Upper Ridge
5	4C2A5b10b	407.9510	Upper & Middle Ridge
6	4C2A5b12a	30.1146	Upper & Middle Ridge
7	4C2A5b06c	249.5653	Upper & Middle Ridge
8	4C2A5b10c	248.4540	Upper & Middle Ridge
9	4C2A5b03a	87.2072	Middle Ridge
10	4C2A5c10a	28.6720	Middle Ridge
11	4C2A5c10b	2.5845	Middle Ridge
12	4C2A5b02a	343.4368	Middle Ridge
13	4C2A5b09b	237.9302	Middle Ridge
14	4C2A5b08b	427.4593	Middle Ridge
15	4C2A5b09c	165.6990	Middle Ridge
16	4C2A5b09a	463.8131	Middle Ridge
17	4C2A5b01d	235.2634	Middle Ridge
18	4C2A5b08a	456.8790	Middle Ridge
19	4C2A5b04a	31.0063	Middle Ridge
20	4C2A5b11b	141.0788	Middle Ridge
21	4C2A5b07a	751.9484	Middle Ridge
22	4C2A5b11a	36.8827	Middle Ridge
23	4C2A5b07d	223.5782	Middle Ridge
24	4C2A5b01c	286.2542	Middle & Lower Ridge
25	4C2A5b07c	324.3298	Middle Ridge
26	4C2A5b07b	230.8539	Middle Ridge
27	4C2A5b10d	11.5345	Middle Ridge
28	4C2A5b06b	536.9355	Middle Ridge
29	4C2A5b06a	191.9701	Middle Ridge
30	4C2A5d01a	21.3141	Middle Ridge
31	4C2A5b06d	54.4260	Middle Ridge
32	4C2A5d01d	50.1156	Middle Ridge
33	4C2A5a05a	380.6318	Lower Ridge
34	4C2A5b01a	177.7982	Lower Ridge
35	4C2A5a04b	51.4644	Lower Ridge
36	4C2A5a06a	628.7748	Lower Ridge
37	4C2A5a02c	45.1689	Lower Ridge
38	4C2A5a06b	507.2697	Lower Ridge
39	4C2A5d01b	158.5681	Lower Ridge
40	4C2A5a06c	352.4409	Lower Ridge
41	4C2A5d01c	0.6435	Lower Ridge



TABLE 27. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER MACRO-WATERSHED NAGANDHI UNDER WEST ARANI BLOCK

Gram Panchayats falling under Naganadi Watershed in West Arni Block		
S No	Gram Panchayat	Type of Ridge
1	Athimalaipattu	Upper, Middle & Lower Ridge
2	Pudupalayam	Upper, Middle & Lower Ridge
3	Appanallur	Upper & Middle Ridge
4	Ayyampalayam	Upper & Middle Ridge
5	Onnupuram	Upper & Middle Ridge
6	Puthur	Upper & Middle Ridge
7	Vannankulam	Upper & Middle Ridge
8	Alagusanai	Middle Ridge
9	Andipalayam	Middle Ridge
10	Kattukanallur	Middle Ridge
11	Kolathur	Middle Ridge
12	Kongarampattu	Middle Ridge
13	Kunnathur	Middle Ridge
14	Palayaekamparamnallur	Middle Ridge
15	Ramasanikuppam	Middle Ridge
16	Kilnagar	Middle & Lower Ridge
17	Melnagar	Middle & Lower Ridge
18	Samburayanallur	Lower Ridge

TABLE 28. LIST OF WORKS PROPOSED UNDER CWRM - WASCA WITH TYPE OF RIDGE FALLING UNDER MACRO-WATERSHED NAGANDHI UNDER WEST ARANI BLOCK

Work wise Ridge Details of Naganadi in West Arni Block				
S No	Name of the Work Proposed	Type of Ridge	Units	Extent
1	Contour Continuous Bunds (CCB) for Afforestation area	Upper	Mtrs	36108
2	Afforestation in Public/common lands	Upper	ha	267.93
3	Drainage Line Treatment (DLT)	Upper	Mtrs	35671.65
4	CC Check dams	Middle	Number	13
5	Block Plantation (Community)	Middle	ha	83.84
6	Silvi-pasture Development	Middle	ha	13.07
7	Linear Plantation	Middle	Km	22963.4
8	Avenue plantation	Middle	Km	51429
9	Composting	Lower	Number	138
10	Canal Bund Plantation	Lower	Km	11192
11	Restoration of water bodies: Tanks and Ooranis	Lower	Number	69
12	Artificial Recharge Structure	Lower	Number	560
13	Farm Bunding with Boundary Trenches - Individual	Lower	ha	83.18
14	Construction of Farm Ponds - Individual	Lower	Number	203
15	Land development - Individual	Lower	ha	152.35
16	Azolla units - Individual	Lower	Number	1086
17	NADEP Vermi compost	Lower	Number	2065
18	Fodder development - Community & Individual	Lower		304
19	Cattle Shelters	Lower	Number	2065
20	Goat Sheep Shelters	Lower	Number	359

21	Cattle Trough	Lower	Number	1364
22	Construction of new open wells & Recharge Shafts	Lower	Number	910
23	Soak Pits (Community)	Lower	Number	1263
24	Soak Pits (Individual)	Lower	Number	1776
25	Roof Rain Water Harvesting	Lower	Number	30
26	Agro Forestry	Middle	ha	19.52
27	Nutri Garden	Lower	Number	1882
28	Silt application	Lower	Number	106
29	Mini Forest	Middle	ha	1.9

TABLE 29. MICRO-WATERSHED IN WEST ARANI BLOCK FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED

Cheyyar river Macro-watershed – Ridge Details: West Arni Block			
S No	Micro-watershed Code	Micro-watershed Area in ha	Type of Ridge
1	4C2A4b06b	34.5139	Middle & Lower Ridge
2	4C2A4b14a	421.2362	Middle & Lower Ridge
3	4C2A4b15b	153.2521	Middle & Lower Ridge
4	4C2A4b12c	437.7711	Middle & Lower Ridge
5	4C2A4b14b	264.2127	Middle & Lower Ridge
6	4C2A4b15c	384.1859	Middle & Lower Ridge
7	4C2A4b14c	7.7161	Middle Ridge
8	4C2A4b07c	4.1453	Middle Ridge
9	4C2A4b18a	167.9624	Middle & Lower Ridge
10	4C2A4a16b	488.2985	Lower Ridge
11	4C2A4a14b	119.5164	Lower Ridge
12	4C2A4a16a	440.0513	Lower Ridge
13	4C2A4a14c	158.7818	Lower Ridge
14	4C2A4a16d	435.7876	Lower Ridge
15	4C2A4a17c	55.4641	Lower Ridge
16	4C2A4a14a	42.2506	Lower Ridge
17	4C2A4a16c	201.0591	Lower Ridge
18	4C2A4a13b	7.0677	Lower Ridge
19	4C2A4a13a	131.4712	Lower Ridge
20	4C2A4a17a	1.3405	Lower Ridge
21	4C2A4a15b	377.6583	Lower Ridge
22	4C2A4a15a	575.3533	Lower Ridge
23	4C2A4a05c	357.1002	Lower Ridge
24	4C2A4a02c	380.1437	Lower Ridge
25	4C2A4a04c	752.6639	Lower Ridge
26	4C2A4a02b	288.9787	Lower Ridge
27	4C2A4a04b	515.2745	Lower Ridge
28	4C2A4a01c	55.5348	Lower Ridge
29	4C2A4a06b	10.3279	Lower Ridge
30	4C2A4a05b	312.7176	Lower Ridge
31	4C2A4a03b	395.9148	Lower Ridge
32	4C2A4a05a	568.3488	Lower Ridge

33	4C2A4a03a	66.1536	Lower Ridge
34	4C2A4a04a	382.5299	Lower Ridge
35	4C2A4a06a	88.4254	Lower Ridge
36	4C2A4b05a	576.1796	Lower Ridge
37	4C2A4b04a	0.7976	Lower Ridge
38	4C2A4b06a	179.3508	Lower Ridge
39	4C2A4b05b	394.5086	Lower Ridge
40	4C2A4b04c	120.3835	Lower Ridge
41	4C2A4b04b	4.4797	Lower Ridge
42	4C2A4b12a	86.4183	Lower Ridge
43	4C2A4b05c	262.3535	Lower Ridge
44	4C2A4b07b	0.7293	Lower Ridge
45	4C2A4b12b	199.3384	Lower Ridge
46	4C2A4b15a	168.1214	Lower Ridge
47	4C2A4b13a	199.6821	Lower Ridge
48	4C2A4b13c	35.4940	Lower Ridge
49	4C2A4b16a	31.0414	Lower Ridge

TABLE 30. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER MACRO-WATERSHED CHEYYAR UNDER WEST ARANI BLOCK

Gram Panchayats falling under Cheyyar river Watershed in West Arni Block		
S No	Gram Panchayat	Type of Ridge
1	Devikapuram	Middle & Lower Ridge
2	Karipur	Middle & Lower Ridge
3	Murugamangalam	Middle & Lower Ridge
4	Agaram	Lower Ridge
5	Araiyalam	Lower Ridge
6	Madurai perumattur	Lower Ridge
7	Malayampattu	Lower Ridge
8	Marusoor	Lower Ridge
9	Pulavanpadi	Lower Ridge
10	Pungampadi	Lower Ridge
11	Rantham	Lower Ridge
12	Saduperipalayam	Lower Ridge
13	Thatcharampattu	Lower Ridge
14	Thatchur	Lower Ridge
15	Thellur	Lower Ridge
16	Vinnamangalam	Lower Ridge

TABLE 31. LIST OF WORKS PROPOSED UNDER CWRM - WASCA WITH TYPE OF RIDGE FALLING UNDER MACRO-WATERSHED NAGANDHI UNDER WEST ARANI BLOCK

Work wise Ridge Details of Cheyyar in West Arni Block				
S No	Name of the Work Proposed	Type of Ridge	Units	Extent
1	Contour Continuous Bunds (CCB) for Afforestation area	Upper	Mtrs	11012
2	Afforestation in Public/common lands	Upper	ha	349.2
3	Drainage Line Treatment (DLT)	Upper	Mtrs	13918
4	Block Plantation (Community)	Middle	ha	62.35

5	CC Check dams	Middle	Number	8
6	Silvi-pasture Development	Middle	ha	33.74
7	Linear Plantation	Middle	Km	47966.3
8	Avenue plantation	Middle	Km	83421
9	Composting	Lower	Number	225
10	Canal Bund Plantation	Lower	Km	5050
11	Nursery Development	Lower	Number	1
12	Restoration of water bodies: Tanks and Ooranis	Lower	Number	140
13	Artificial Recharge Structure	Lower	Number	735
14	Farm Bunding with Boundary Trenches - Individual	Lower	ha	148
15	Construction of Farm Ponds - Individual	Lower	Number	333
16	Land development - Individual	Lower	ha	229
17	Dryland Horticulture/Agroforestry - Individual	Lower	ha	59.7
18	Azolla units - Individual	Lower	Number	1010
19	NADEP Vermi compost	Lower	Number	1214
20	Fodder development - Community & Individual	Lower	Number	644
21	Cattle Shelters	Lower	Number	1496
22	Goat Sheep Shelters	Lower	Number	490
23	Cattle Trough	Lower	Number	1241
24	Construction of new open wells & Recharge Shafts	Lower	Number	1134
25	Soak Pits (Community)	Lower	Number	84
26	Soak Pits (Individual)	Lower	Number	1384
27	Roof Rain Water Harvesting	Lower	Number	32
28	Agro Forestry	Middle	ha	29.5
29	Fencing	Upper	Km	5590
30	Nutri Garden	Lower	Number	614
31	Silt application	Lower	Number	107
32	Mini Forest	Middle	ha	2.78

TABLE 32. GRAM PANCHYATS FALLING UNDER CHEYYAR &amp; NANANADHI MACRO-WATERSHED IN WEST ARANI

Gram Panchayats Falling under Cheyyar River & Naganadi Watershed: West Arni Block		
S No	Gram Panchayat	Type of Ridge
1	Kamakkur	Lower Ridge
2	Mullipattu	Lower Ridge
3	Nadu kuppam	Lower Ridge

TABLE 33. WORK WISE RIDGE DETAILS OF NAGANDHI AND CHEYYAR IN WEST ARNI BLOCK

Work wise Ridge Details of Cheyyar in West Arni Block				
S No	Name of the Work Proposed	Type of Ridge	Units	Extent
1	Afforestation in Public/common lands	Upper	ha	72
2	Drainage Line Treatment (DLT)	Upper	Mtrs	9341
3	CC Check dams	Middle	Number	1
4	Block Plantation (Community)	Middle	ha	61
5	Silvi-pasture Development	Middle	ha	123

6	Linear Plantation	Middle	Km	8223
7	Avenue plantation	Middle	Km	8213
8	Composting	Lower	Number	16
9	Restoration of water bodies: Tanks and Ooranis	Lower	Number	11
10	Artificial Recharge Structure	Lower	Number	147
11	Farm Bunding with Boundary Trenches - Individual	Lower	ha	81.62
12	Construction of Farm Ponds - Individual	Lower	Number	34
13	Land development - Individual	Lower	ha	148
14	Azolla units - Individual	Lower	Number	134
15	NADEP Vermi compost	Lower	Number	77
16	Cattle Shelters	Lower	Number	77
17	Goat Sheep Shelters	Lower	Number	34
18	Cattle Trough	Lower	Number	77
19	Construction of new open wells & Recharge Shafts	Lower	Number	149
20	Soak Pits (Community)	Lower	Number	13
21	Soak Pits (Individual)	Lower	Number	122
22	Roof Rain Water Harvesting	Lower	Number	6
23	Fencing	Upper	Km	1159
24	Nutri Garden	Lower	Number	292
25	Silt application	Lower	Number	66
26	Mini Forest	Middle	ha	0.4

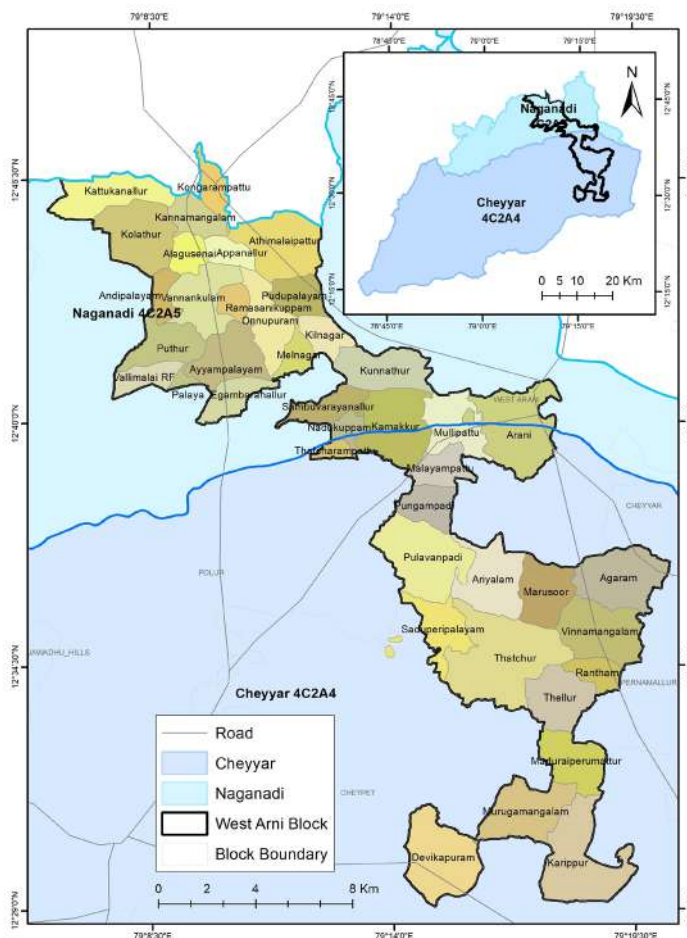


Figure 8.2. GP's level Macro-watershed Map - West Arni Block – Tiruvannamalai District

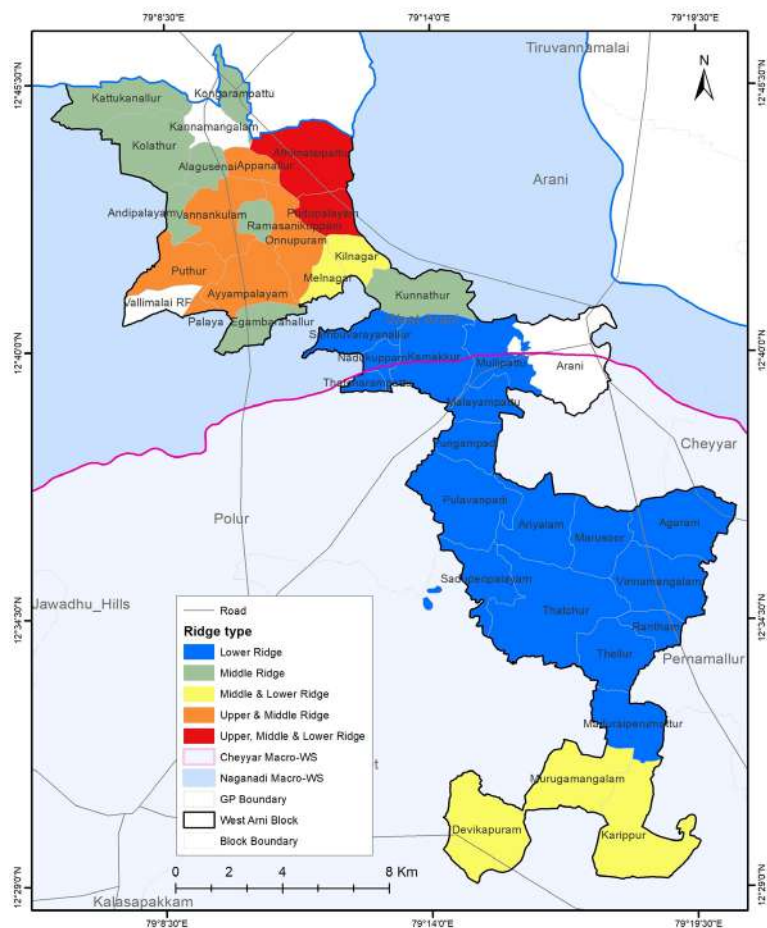


Figure 8.3. Block level Macro-watershed Ridge Map - West Arni Block – Tiruvannamalai District

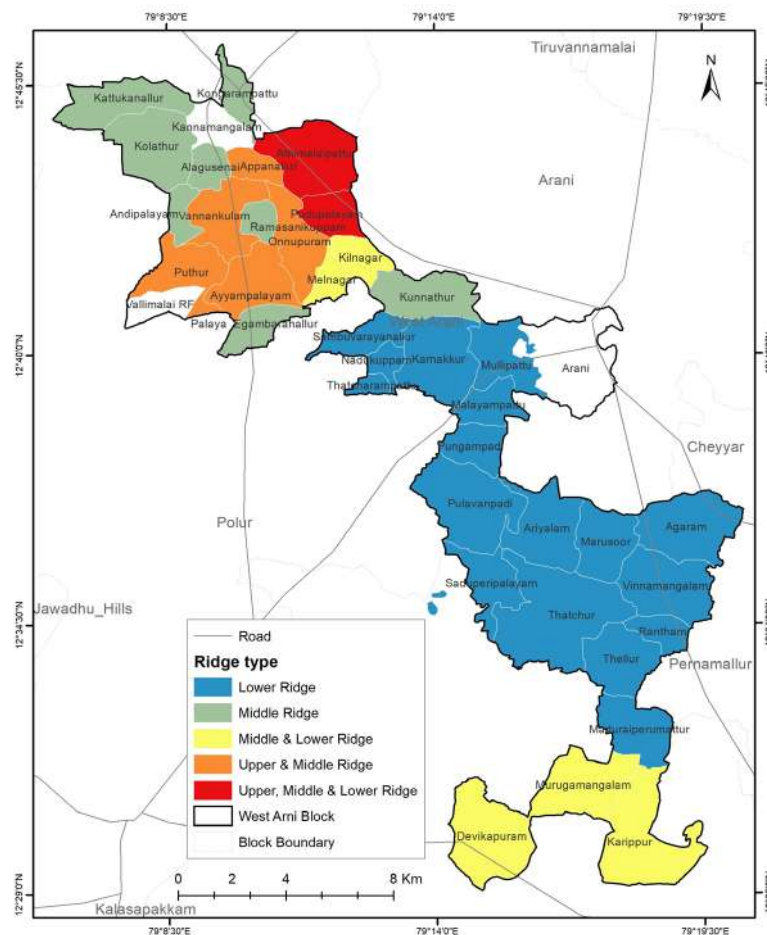


Figure 8.4. Gram Panchayat Level Ridge Map - West Arni Block – Tiruvannamalai District



## 8.2 | MODEL MICRO-WATERSHED - REDDIYARPALAYAM MICRO-WATERSHED, WEST ARANII BLOCK



Figure 8.5. Satellite image of Reddiyarpalayam Micro-watershed

The Micro-watershed case study addresses the issues of water conservation and climate change through integrated approach. The decentralized Micro-watershed planning has been conceived holistic development and management to ensure long-term benefits. The micro-watershed plan will help to justify multi-tier approach, sequenced from ridge to valley for proper implementation of different development programs. This includes

coordination of various natural components like groundwater, surface water, geology, hydrogeology, catchment, land use, soil, population, along with various water resource supply and demand component. This framework will help in assessment, management and monitoring of implementation projects efficiently. The ultimate goal is to achieve and maintain a balance between resources development to increase the welfare of the population.

### REDDIYARPALAYAM MICRO-WATERSHED

This micro water shed falls under Kattukanallur Gram Panchayat of West Arni Block and Kalpattu Gram Panchayat of Polur Block in Tiruvannamalai District (Figure 8.5 & 8.6). This Micro-watershed is part of Naganadhi Macro-watershed in Cheyyar river sub-basin. The general information, geology, hydrogeology, natural drainage line, catchment area, ground water status, water

budget of are Reddiyarpalayam Micro-watershed is given below in separate sections followed by proposed works, ridge wise proposed treatment area, estimated cost and required person days and key outcomes in Tables 34 to 45 and Figures 8.7 to 8.17. The key CWRM parameters of GPs falling in this micro-watershed are in Annexure 8.



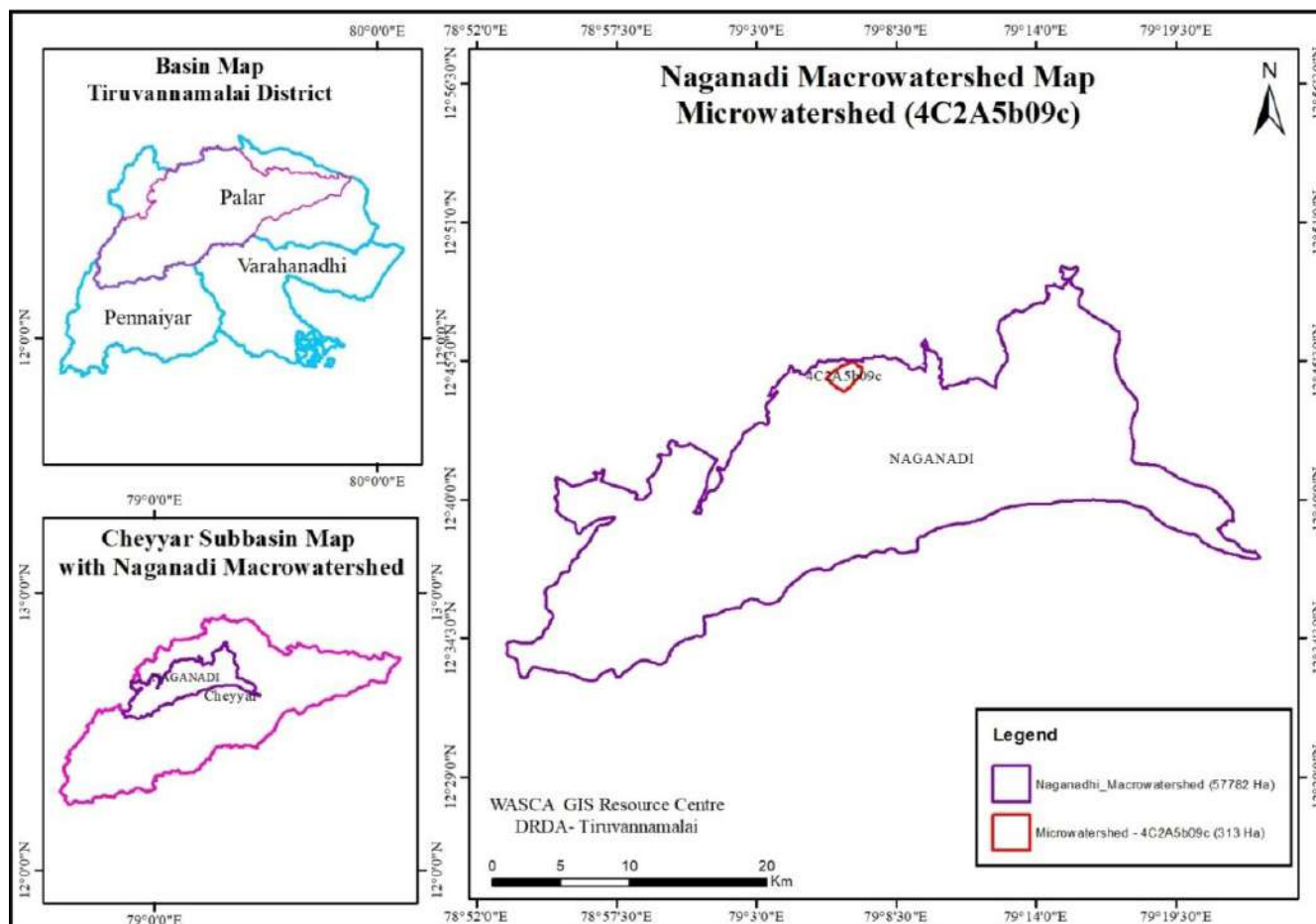


Figure 8.6. Location map of Micro-watershed

TABLE 34. GENERAL INFORMATION OF THE MICRO-WATERSHED

S No	Description	Name/ Number/ Quantity/ Status
1.1	Name of the Micro-watershed	Reddiyarpalayam mw
1.2	Micro-watershed Number	4C2A5b09c
1.3	Name of the Basin	Palar Basin
1.4	Name of the subbasin	Cheyyar Sub Basin
1.5	Name of the Macro-watershed	Naganadhi
1.6	Latitude of Micro-watershed (From To)	12°44'16.80"N to 12°45'27.43"N
	Longitude of Micro-watershed (From To)	79° 5'44.29"E to 79° 7'9.44"E
1.7	Total area of the Micro-watershed in ha	313 ha
1.8	Agro-Climatic Zone	North eastern zone (TN-1)
1.9	Agro Ecological Sub-Region (ICAR)	Eastern Ghats
1.10	Annual Average Rainfall	1047 mm
1.11	Annual maximum temperature	33°C
1.12	Annual minimum temperature	22.8 °C
1.13	Climate risk	Drought, heat wave
1.14	Number of GPs covered by Micro-watershed	2
1.15	Name of the GPs	1. Kattukkanallur
		2. Kalpattu
1.16	Area of Micro-watershed falling in Kattukkanallur GP	165 ha
1.17	Area of Micro-watershed falling in Kalpattu GP	148 ha
1.18	Micro-watershed area in Kattukkanallur GP	52%
1.19	Micro-watershed area in Kalpattu GP	48%

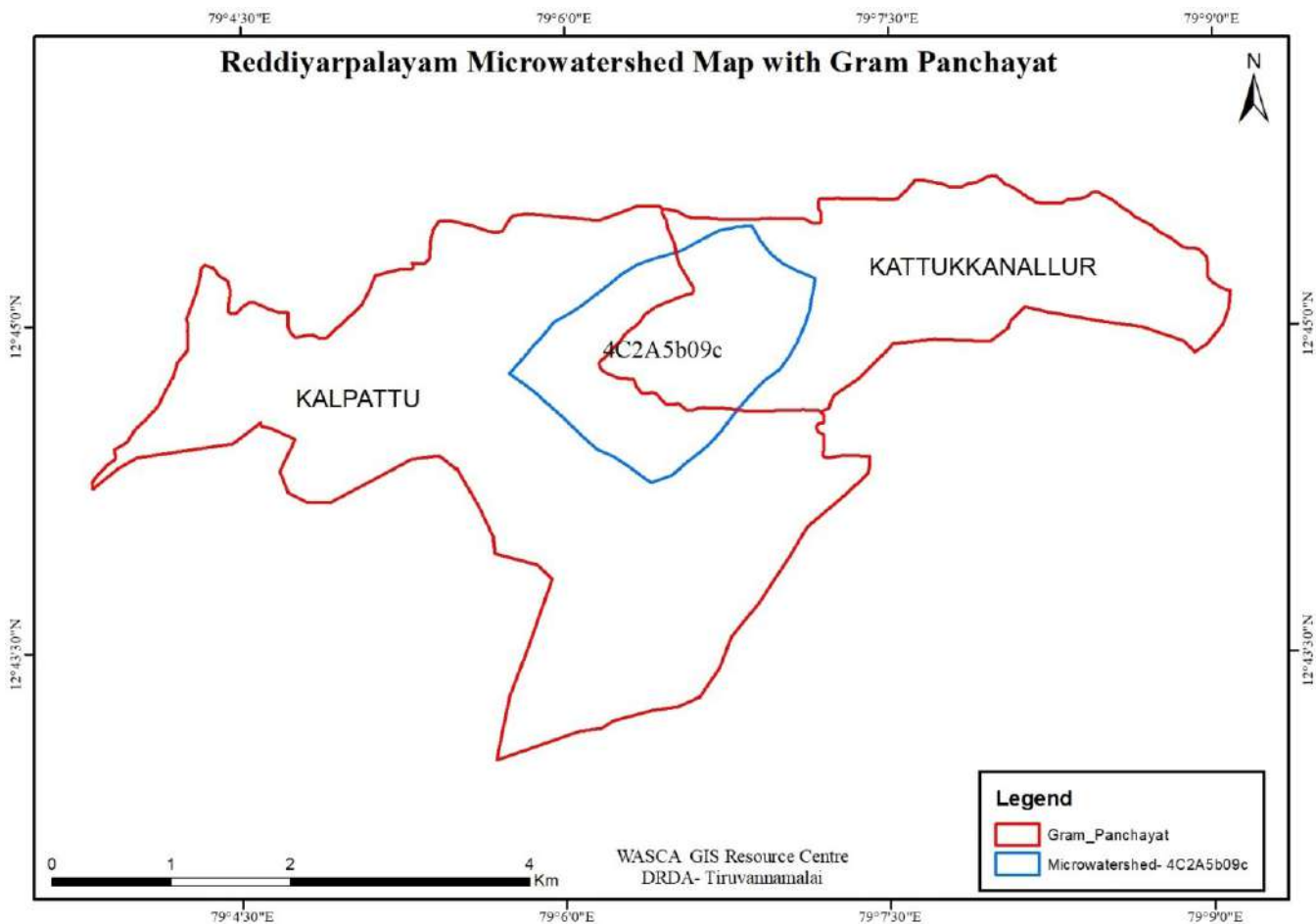


Figure 8.7. Macro-watershed Ridge Map - West Arni Block – Tiruvannamalai District

TABLE 35. GEOLOGY, HYDROGEOLOGY OTHER CHARACTERISTICS OF MICRO-WATERSHED

S No	Description	Name/ Number/ Quantity/ Status
2.1	Geology occurrence in % (Hard rock)	100%
2.2	Geology Quality	Moderate
2.3	Depth of weathered zone and/or maximum depth of fractures in Hard Rock area in meters	30 to 60 mt
2.4	Bottom of the unconfined aquifer in soft rock areas in meters	20 to 40 mt
2.5	No of lineaments passing through the Micro-watershed	Two
2.6	Type of lineaments passing through the Micro-watershed	Both Lineaments in upper ridge, both are parallel to ridge line
2.7	Sheet Erosion	130 ha (upper and middle ridge)
2.8	Barren & waste lands	103 ha (upper & middle ridges of Hills ; part of above)

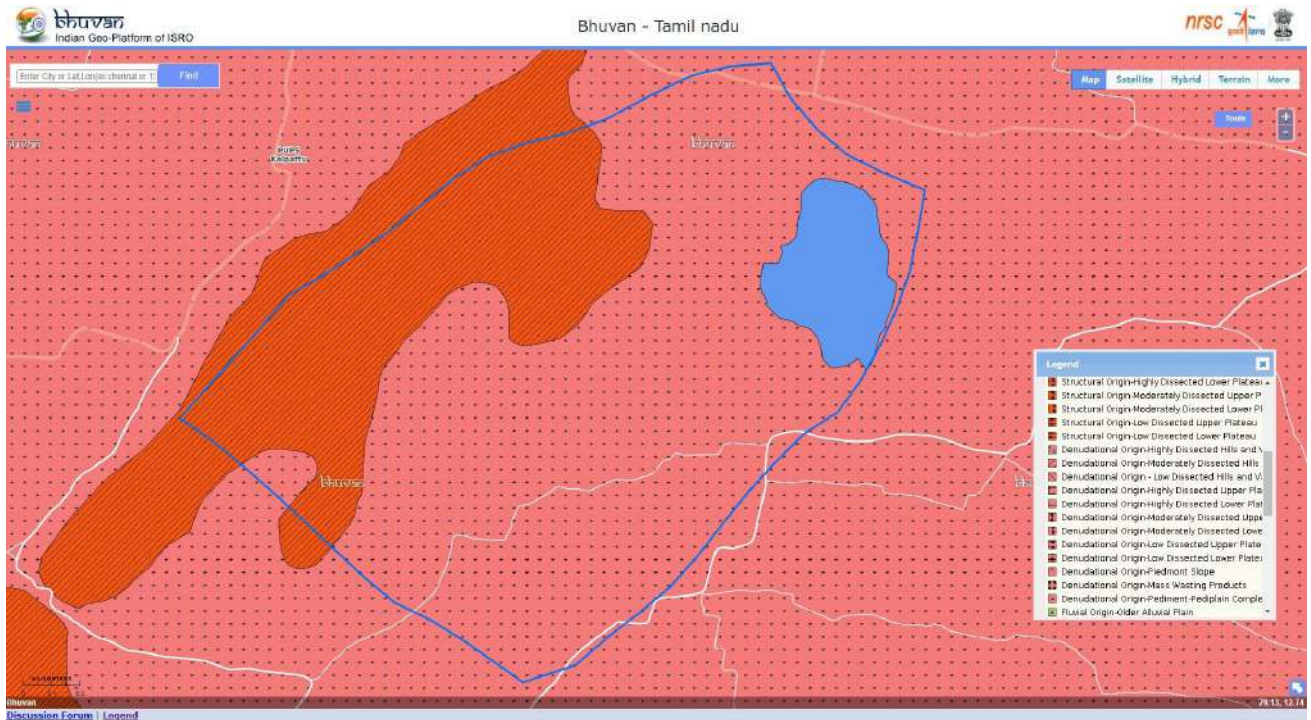


Figure 8.8. Geomorphology Map

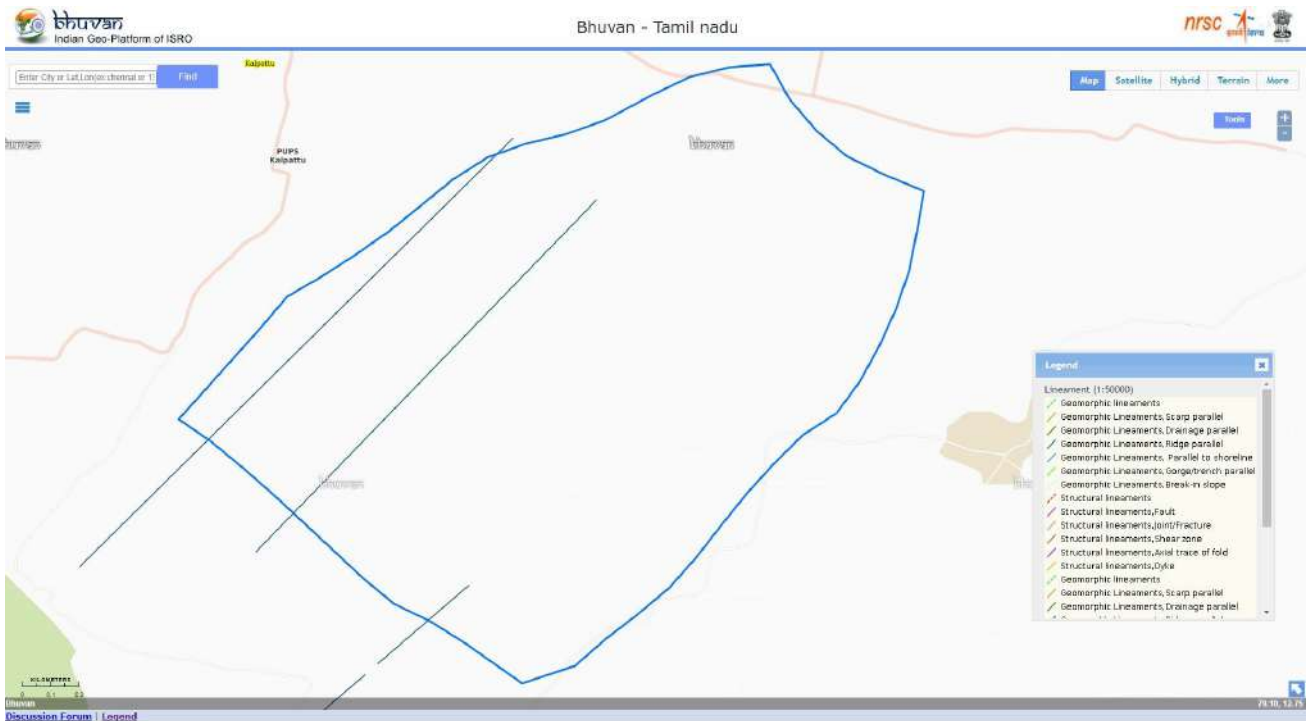


Figure 8.9. Lineament Map

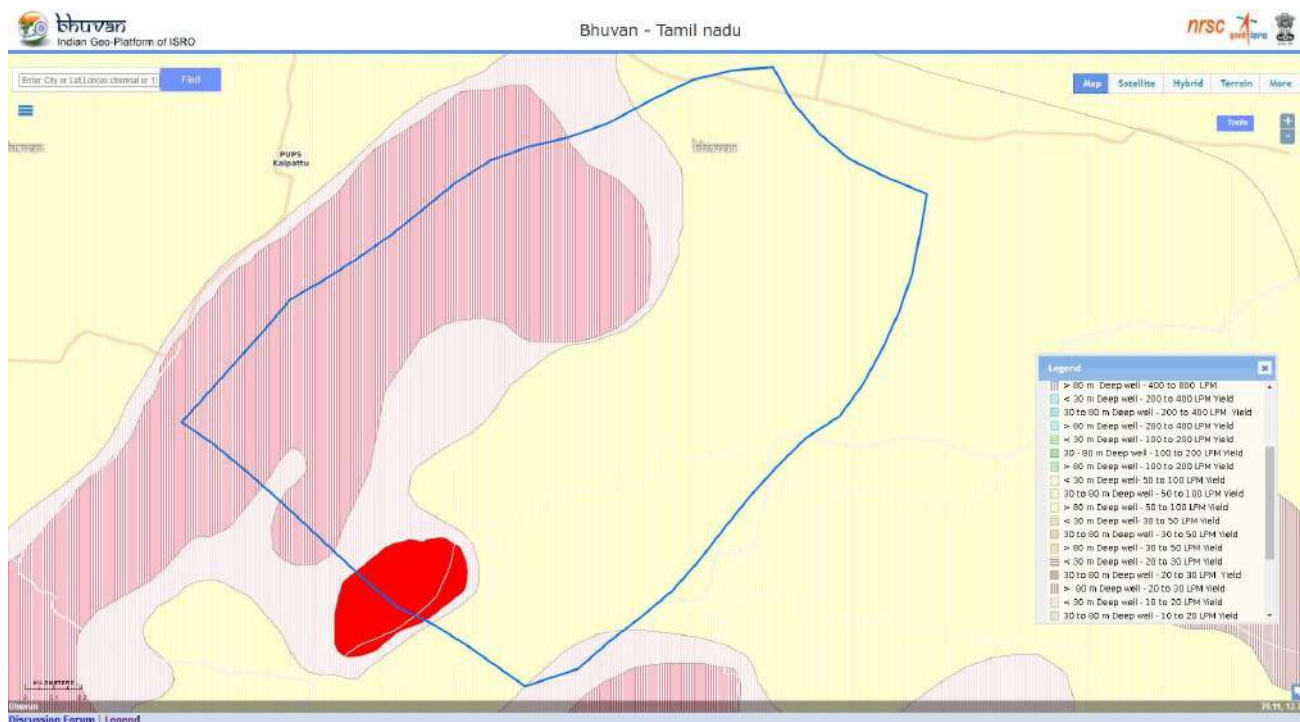


Figure 8.10. Groundwater prospects Map

TABLE 36. NATURAL DRAINAGE LINES IN MICRO-WATERSHED

S No	Description	Name/ Number/ Quantity/ Status
3.1	No. of 1st Order drains	4 Nos.
3.2	No. of 2nd Order drains	3 Nos.
3.3	Total length of natural drainage line (Meter)	3991 m
3.4	Drainage density (Ha - M)	12.75 Ha - M
3.5	No. of Hillocks/hills surrounding the Micro-watershed	3 Nos.
3.6	Type of Hillocks / hills	Highly degraded

TABLE 37. CATCHMENT AREA PROFILE

	Name of the GP	Kattukkanallu GP	Kalpattu GP
4.1	Good catchment area	164.26 ha	55.26 in ha
4.2	Average catchment area	10.65 ha	0 in ha
4.3	Bad catchment area	441.23 ha	1054.78 in ha

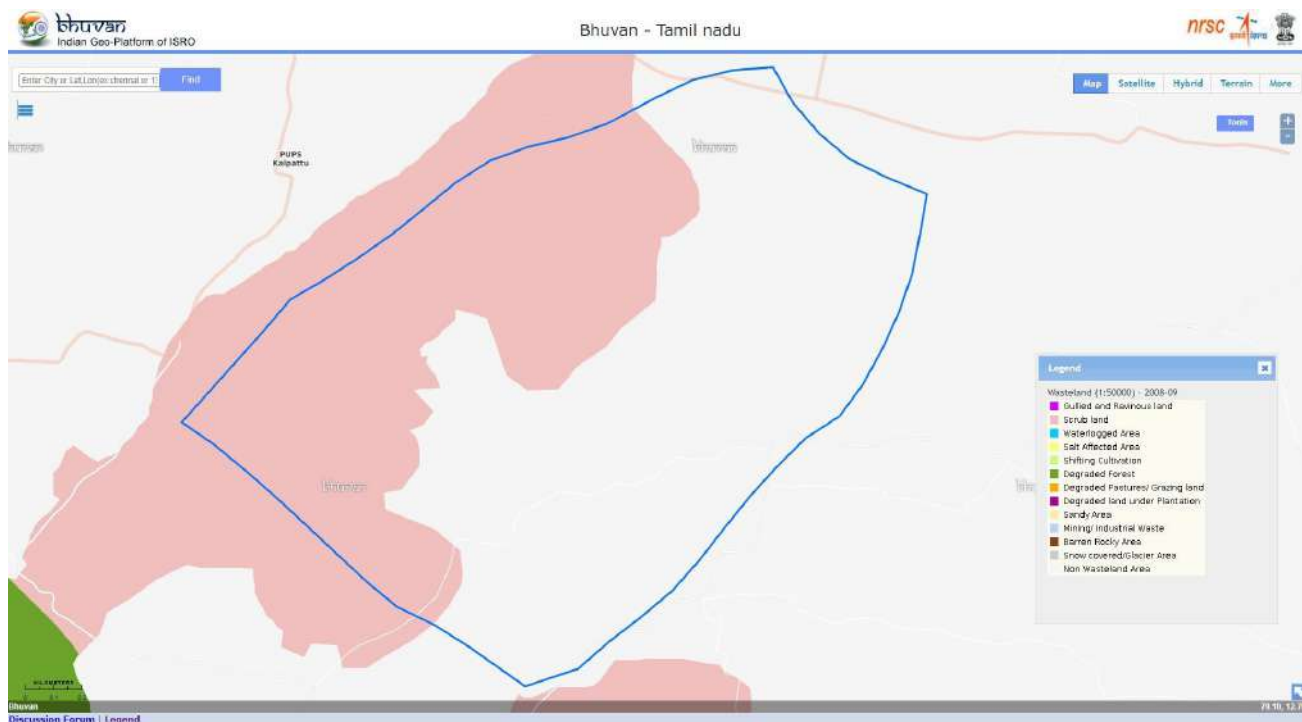


Figure 8.11. Wasteland Map

TABLE 38. GROUND WATER STATUS

Name of the GP		Kattukkanallu GP	Kalpattu GP
5.1	Name of the Firka(Assessment Unit) falling under Micro-watershed	Kannamangalam	Polur
5.2	Net Annual Ground Water Availability	1295.93 Ha - M	2290.89 Ha - M
5.3	Existing Gross Ground Water Draft for Irrigation	1624.8 Ha - M	1687.6 Ha - M
5.4	Existing Gross Ground Water Draft for domestic and industrial water supply	63.92 Ha - M	75.58 Ha - M
5.5	Existing Gross Ground Water Draft for All uses	1688.73 Ha - M	1763.19 Ha - M
5.6	Provision for domestic and industrial requirement supply to 2025	72.66 Ha - M	85.91 Ha - M
5.7	Net Ground Water Availability for future irrigation development	-401.53 Ha - M	517.38 Ha - M

TABLE 39. WATER BUDGET

Name of the GP		Kattukkanallu GP	Kalpattu GP
6.1	Water for Human	23.15 Ha - M	11.68 Ha - M
6.2	Water for Agriculture	257.9 Ha - M	656.8 Ha - M
6.3	Water for Animal	5.58 Ha - M	7.75 Ha - M
6.4	Village wise water required	286.6 Ha - M	676.3 Ha - M
6.5	Available run-off from rain water (derived from Strange method)	147.1 Ha - M	218 Ha - M
6.6	Harvested Runoff from Water Harvesting Activities	31.9 Ha - M	5.3 Ha - M
6.7	Potential Harvesting from proposed Interventions	26.3 Ha - M	29.5 Ha - M

6.8	Total Water harvested	58.2 Ha - M	5.3 Ha - M
6.9	Water deficiency/Surplus	-228.4	-671 Ha - M
6.10	Water Demand Supply Gap Status	Deficient	Deficient
6.11	Per capita Water availability in cum	173.91 Cum	511.01 Cum
6.12	International Standard per capita water Availability in cum	1700 Cum	1700 Cum
6.13	Water Availability Gap	-1526.09 Cum	-1188.99 Cum
6.14	Water Security status	Water Stress	Water Stress

TABLE 40. PROPOSED WORKS IN MICRO-WATERSHED GP WISE

	Name of the GP	Kattukkanallu GP	Kalpattu GP
7.1	Proposed works in Upper Ridge	1 Nos	2 Nos
7.2	Proposed works in Middle Ridge	2 Nos	5 Nos
7.3	Proposed works in Lower Ridge	103 Nos	56 Nos
7.4	Total works	106 Nos	63 Nos

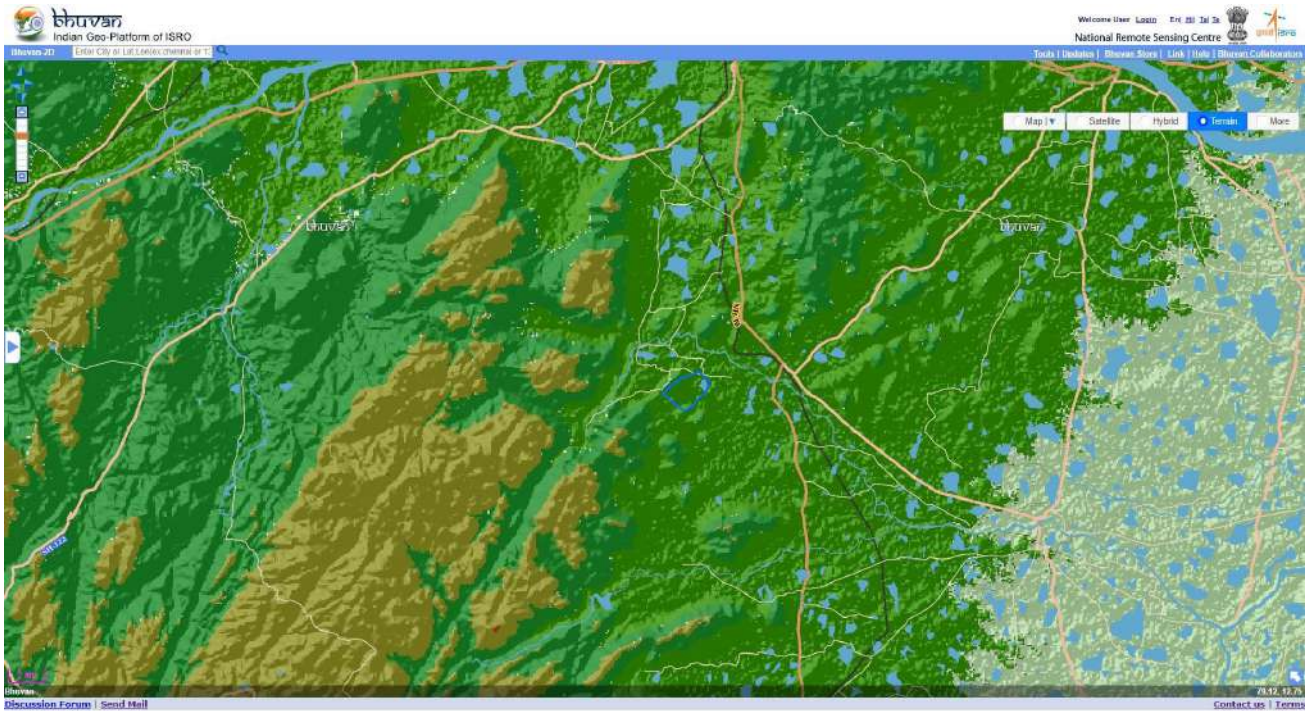


Figure 8.12. Terrain Map

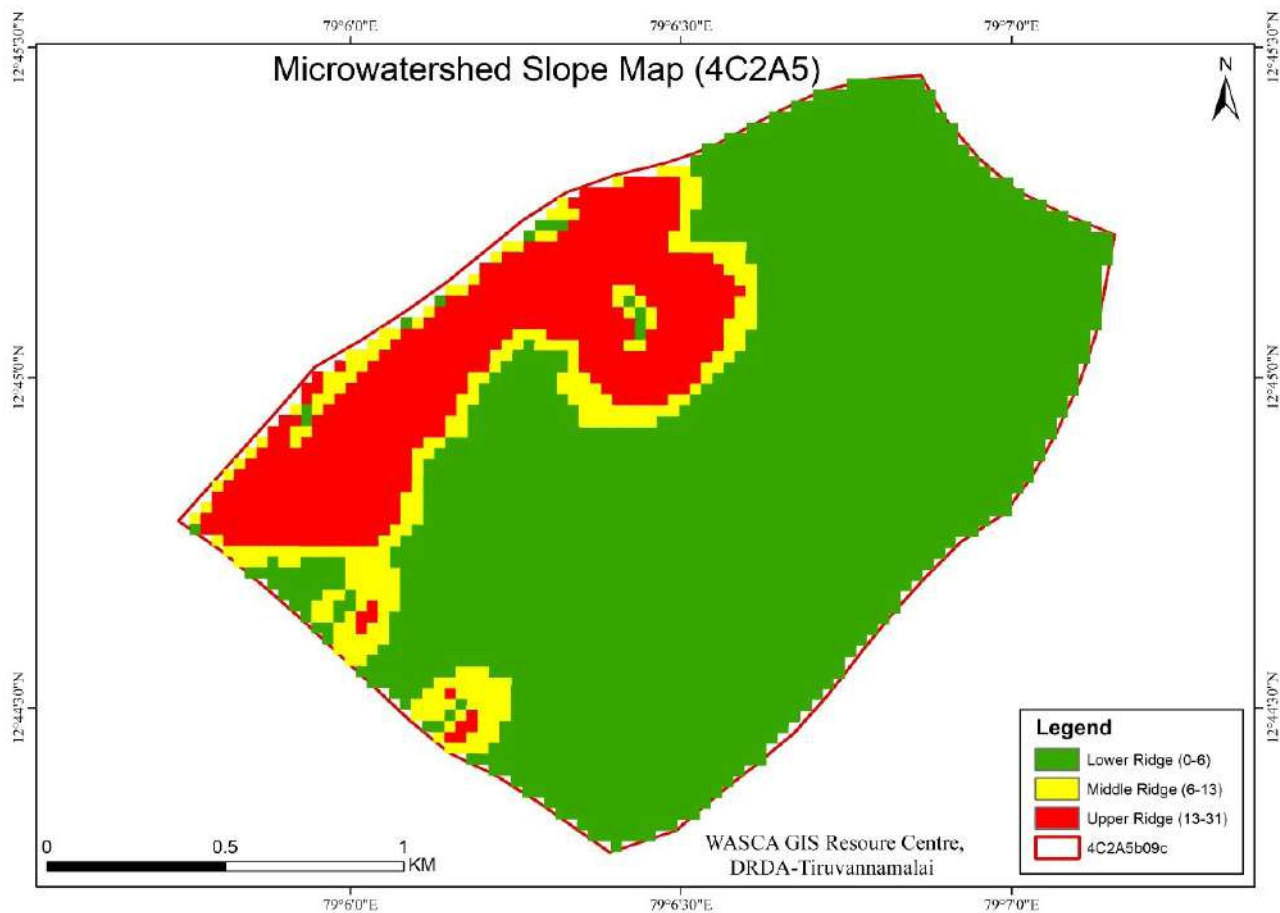


Figure 8.13. Slope and Ridge Map

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

Name of the GP	Kattukkanallur GP	Kalpattu GP
<b>Upper Ridge</b>		
Estimated cost	40.68 Lakhs	178.29 lakh
Total area in ha	8.95 ha	43 ha
<b>Treatment cost of Upper ridge per ha (In INR Lakhs)</b>	<b>4.54 lakh/ha</b>	<b>4.14 lakh/ha</b>
<b>Middle Ridge</b>		
Estimated cost for Middle ridge area	1.54 lakhs	2.72 lakhs
Total area in ha of Middle ridge	4.97 ha	19.34 ha
<b>Treatment cost of Middle ridge per ha</b>	<b>0.30 lakh/ha</b>	<b>0.14 lakh/ha</b>
<b>Estimated Person days generated for Treatment of Upper and Middle Ridge in Kattukkanallur GP</b>	<b>7,961</b>	<b>33,498</b>
<b>Lower Ridge</b>		
Estimated cost for Lower ridge area in Kattukkanallur GP	204.45 lakhs	104.84 lakhs
Total area in ha of Lower ridge in Kattukkanallur GP	150.34 ha	84.66 ha
<b>Estimated Person days generated for Treatment of Lower Ridge in Kattukkanallur GP</b>	<b>68734</b>	<b>24741</b>
<b>Treatment cost of Lower ridge per ha</b>	<b>1.35 lakh/ha</b>	<b>1.23 lakh/ha</b>

Kattukkanallur GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	4.54 lakh/ha	7,961 (Upper + Middle)
Middle Ridge	0.30 lakh/ha	
Lower Ridge	1.35 lakh/ha	68734
<b>TOTAL</b>	<b>6.19 lakh/ha</b>	<b>76695</b>

Kalpattu GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	4.14 lakh/ha	33,498 (Upper + Middle)
Middle Ridge	0.14 lakh/ha	
Lower Ridge	1.23 lakh/ha	24741
<b>TOTAL</b>	<b>5.51 lakh/ha</b>	<b>58239</b>

TABLE 42. DETAILS OF THE WORK IN THE MICRO-WATERSHED

Details of the work in the micro watershed		Total no. of works
10.1	Arable, Non arable & DLT works	106 Nos
10.2	Livelihood Activites	26 Nos
10.3	Rural Greywater Management Activities	37 Nos



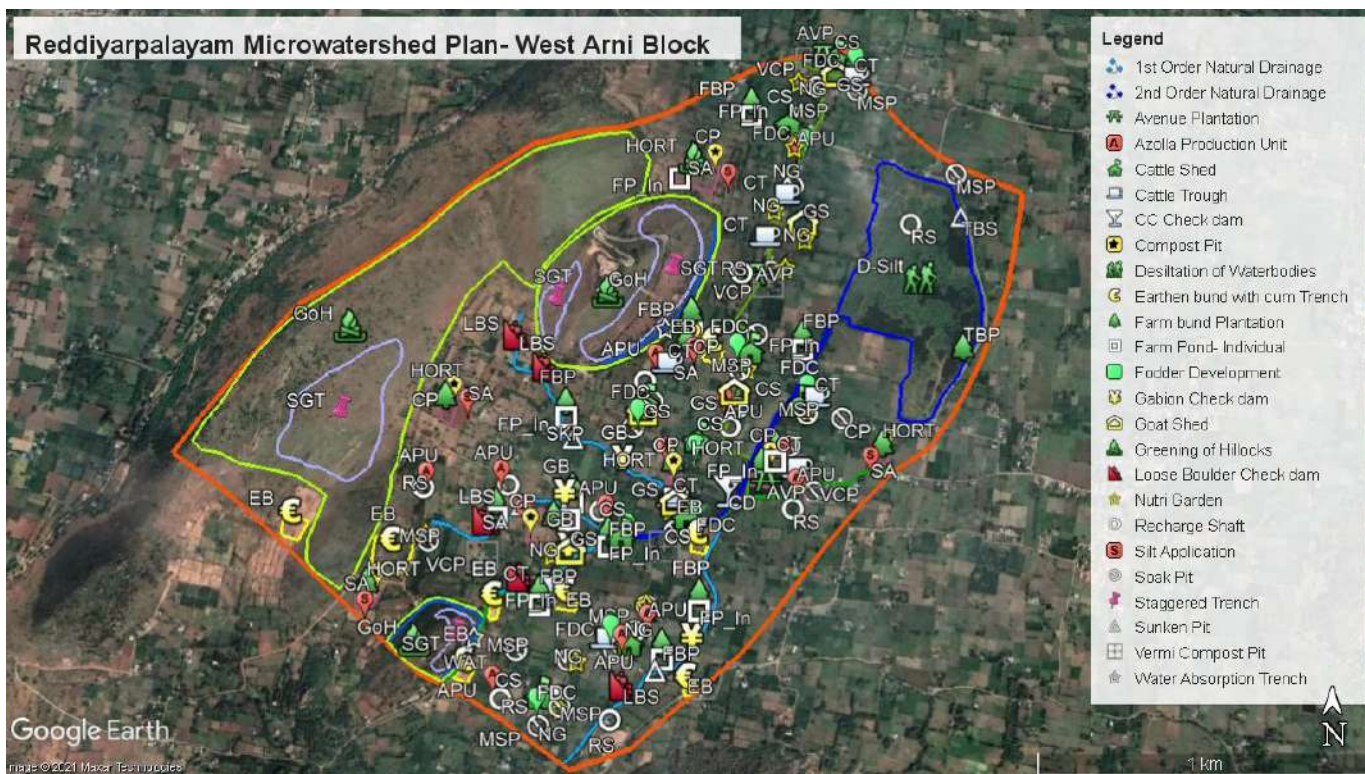
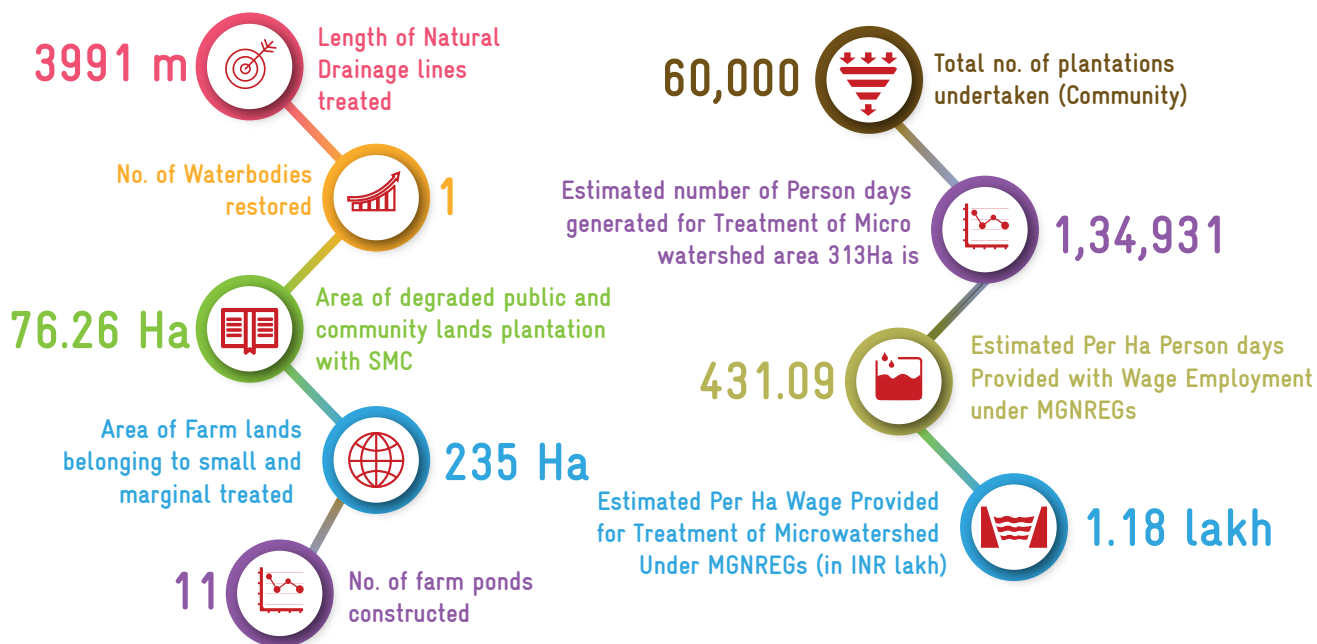


Figure 8.14. Proposed developments in Reddiyarpalayam Micro-watershed

TABLE 43. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)



Kattukanallur GP

126.15 lakh

Kalpattu GP

109.3 lakh

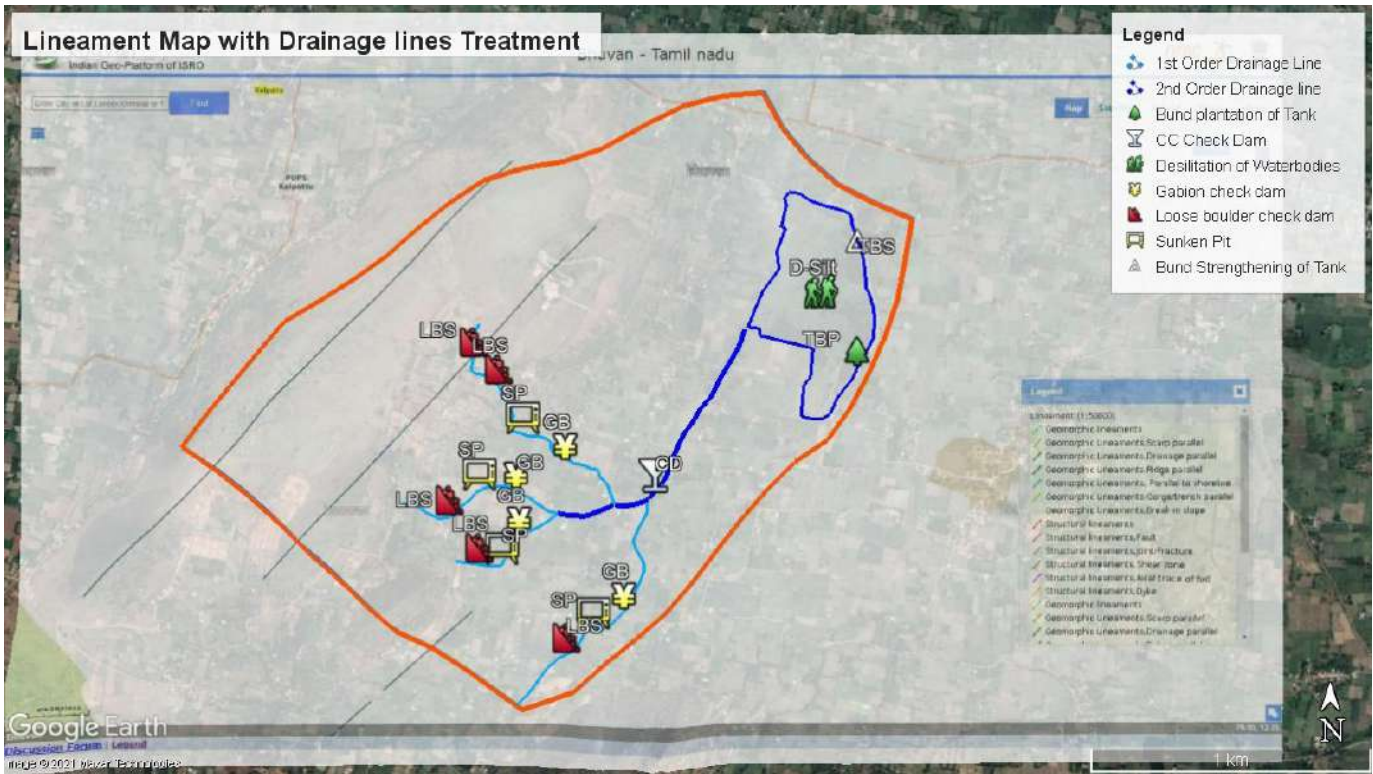


Figure 8.15. Lineament with drainage line treatment

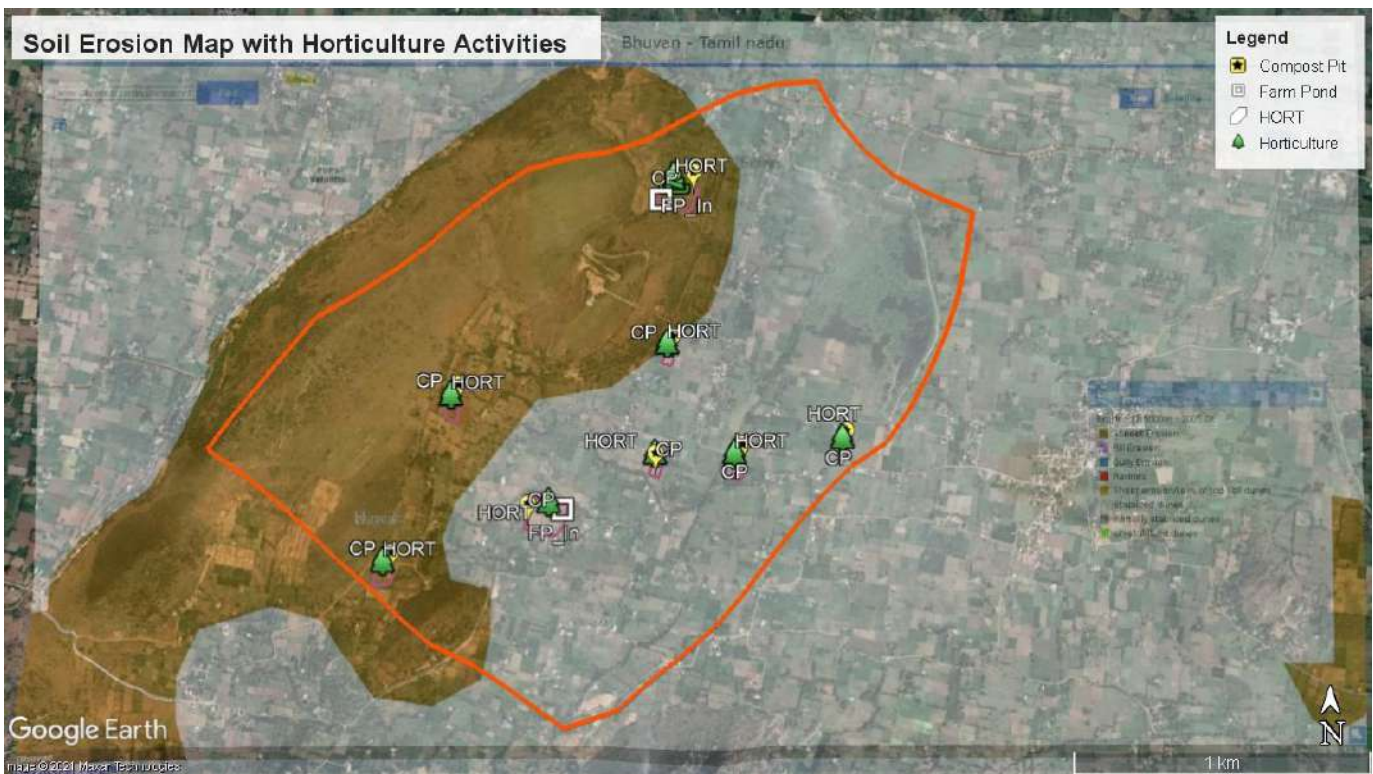


Figure 8.16. Proposed Horticulture activities in Reddiarpalayam Micro-watershed

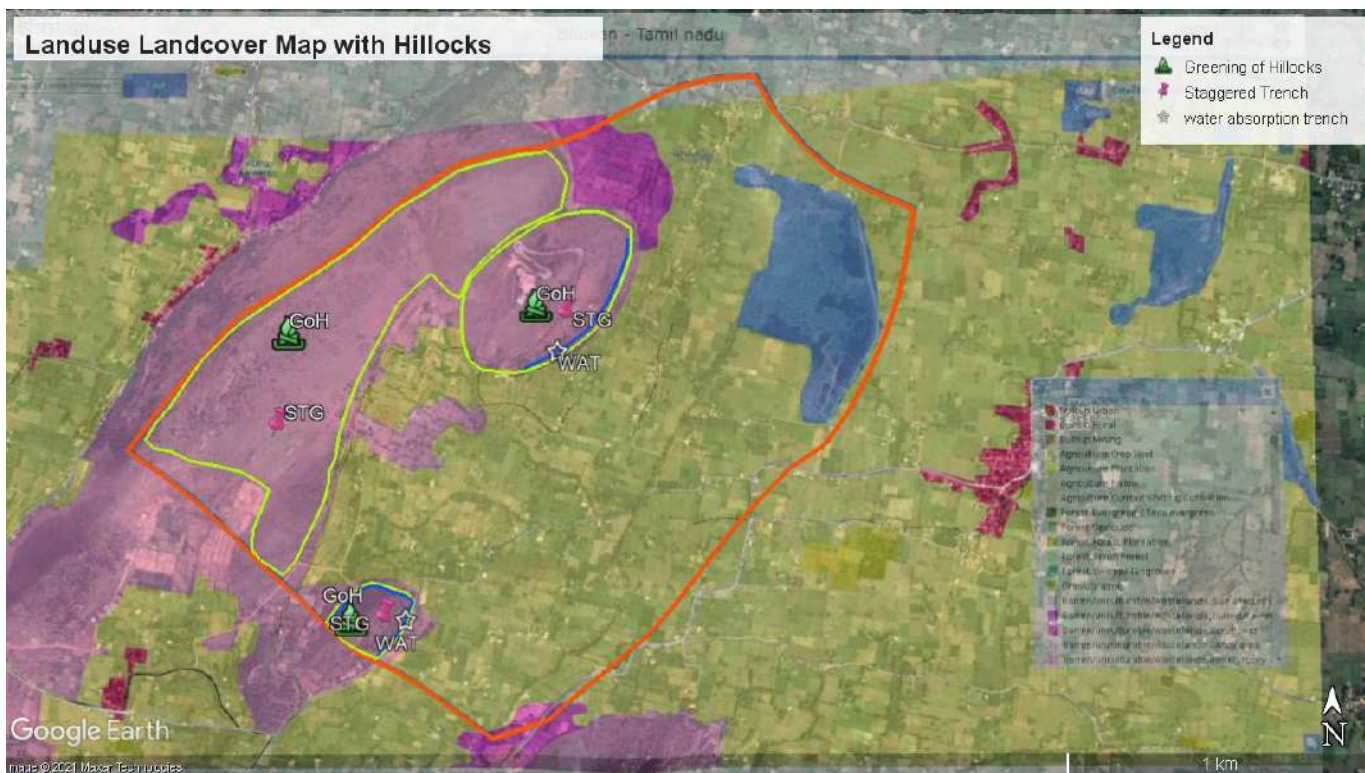


Figure 8.17. Proposed Hillocks activities in Reddiarpalayam Micro-watershed

TABLE 44. ESTIMATES OF REDDIYARPALAYAM MICRO-WATERSHED IN KATTUKKANALLUR GRAM PANCHAYAT

NRM works in Public and Community Lands									
Sl. No	Name of the Work Proposed	Type of Ridge	Status of Work	Units	Quantity (Area or number)	No. of works as per KML	Estimate cost in Lakhs	Person days	
1	Staggered Trench	Upper & Middle	Completed	Number	10,400	1	10.93	3328	
2	Greening of Hillocks Plantation and Maintenance	Upper & Middle	Completed	Number	10,400	1	29.75	4,250	
3	Water Absorption Trench	Lower	Not commenced	Mtr	578	1	49	3,150	
3	Loose boulder check dam	Lower	Not commenced	Number	2	2	1.7	84	
4	Sunken Pit in 1st order drain	Middle	Ongoing	Number	1	1	1.54	383	
5	Gabion Check Dam	Lower	Commenced	Number	2	2	3.2	320	
6	CC Check dams	Lower	Commenced	Number	1	1	8.35	420	
7	Tank bund Plantation	Lower	Not commenced	1Number	1	1	1.8	73	
8	Avenue plantation	Lower	Commenced	Km	2,675	2	4.815	1880	
9	Compost Pit	Lower	Not commenced	Number	6	6	1.02	90	
10	Restoration of Tradational water bodies: (Union Tank)	Lower	Commenced	Number	1	1	43.2	16000	
<b>Sub total</b>							<b>19</b>	<b>154.86</b>	<b>29978</b>

Works in Individual Farmer lands (Agriculture and Allied Activities)								
11	Artificial Recharge Structure for borewell farmers	Lower	Not commenced	Number	6	6	12.5	1955
12	Farm Bunding with Boundary Trenches - Individual	Lower	Not commenced	ha	5			
				Number	2	2	3	1172
13	Construction of Farm Ponds - Individual	Lower	Ongoing	Number	6	6	12	4686
14	Dryland Horticulture	Lower	Not commenced	ha	17			
				Number	6	6	51	19926
15	Silt application	Lower	Not commenced	Number	6	6		
16	Azolla Production units - Individual	Lower	Commenced	Number	5	5	0.75	115
	NADEP Vermi compost	Lower	Commenced	Number	4	4	0.72	108
17	Fodder development - Individual	Lower	Not commenced	Number	8	8	11.84	18752
<b>Sub total</b>						<b>43</b>	<b>91.81</b>	<b>46714</b>
<b>Total no. of works for treatment of Micro-watershed (Arable, Non arable &amp; DLT)</b>						<b>62</b>	<b>246.67</b>	<b>76692</b>
Livelihood enhancement activities for Individual Farmers (dryland)								
18	Cattle Shelters	Lower	Commenced	Number	7	7	14.84	2317
	Goat Sheep Shelters	Lower	Commenced	Number	5	5	11.35	1775
19	Cattle Trough	Lower	Not commenced	Number	7	7	0.35	42
<b>Sub total</b>						<b>19</b>	<b>26.54</b>	<b>4134</b>
Rural Greywater Management								
21	Soak Pits (Individual)	Lower	Ongoing	Number	15	15	1.5	240
22	Nutri Garden	Lower	Not commenced	Number	10	10	0.01	2
<b>Sub total</b>						<b>25</b>	<b>1.51</b>	<b>242</b>
<b>Total no. of works under Kattukkanallur GP for Micro-watershed development (IWRM)</b>						<b>106</b>	<b>274.72</b>	<b>81068</b>

TABLE 45. ESTIMATES OF REDDIYARPALAYAM MICRO-WATERSHED IN KALPATTU GRAM PANCHAYAT

NRM works in Public and Community Lands								
Sl. No	Name of the Work Proposed	Type of Ridge	Status of Work	Units	Quantity (Area or number)	No. of works as per KML	Estimate cost in Lakhs	Person days
1	Staggered Trench	Upper & Middle	Not commenced	Number	45,600	2	47.88	14400
2	Greening of Hillocks Plantation and Maintenance"	Upper & Middle	Not commenced	ha	45,600	2	130.41	18390
3	Water Absorption Trench	Lower	Not commenced	Mtr	536	1	45.02	2893
4	Loose boulder check dam	Lower	Not commenced	Number	3	3	2.55	126
5	Sunken Pit in 1st order drain	Middle	commenced	Number	3	3	2.72	708
6	Gabion Check Dam	Lower	commenced	Number	2	2	3.2	320
7	Avenue plantation	Lower	commenced	Km	0.745	1	1.341	524

8	Compost Pit	Lower	Not commenced	Number	2	2	0.34	30
<b>Sub total</b>						<b>16</b>	<b>233.46</b>	<b>37391</b>
<b>Works in Individual Farmer lands (Agriculture and Allied Activities)</b>								
11	Artificial Recharge Structure for borewell farmers	Lower	Not commenced	Number	5	5	12.5	1955
12	Farm Bunding with Boundary Trenches - Individual	Lower	Not commenced	ha	17			
				Number	6	6	9	3516
13	Construction of Farm Ponds - Individual	Lower	Ongoing	Number	5	5	10	3905
14	Dryland Horticulture	Lower	Not commenced	ha	5			
				Number	2	2	17	6642
15	Silt application	Lower	Not commenced	Number	2	2		
16	Azolla Production units - Individual	Lower	commenced	Number	5	5	0.75	115
	NADEP Vermi compost	Lower	commenced	Number	1	1	0.18	27
17	Fodder development - Individual	Lower	Not commenced	Number	2	2	2.96	4688
<b>Sub total</b>						<b>28</b>	<b>52.39</b>	<b>20848</b>
<b>Total no. of works for treatment of Micro-watershed (Arable, Non arable &amp; DLT)</b>						<b>44</b>	<b>285.85</b>	<b>58239</b>
<b>Livelihood enhancement activities for Individual Farmers (dryland)</b>								
18	Cattle Shelters	Lower	commenced	Number	3	3	6.36	993
	Goat Sheep Shelters	Lower	commenced	Number	1	1	2.27	355
19	Cattle Trough	Lower	Not commenced	Number	3	3	0.15	18
<b>Sub total</b>						<b>7</b>	<b>8.78</b>	<b>1366</b>
<b>Rural Greywater and Roof rainwater Management</b>								
21	Soak Pits (Individual)	Lower	commenced	Number	7	7	0.7	112
22	Nutri Garden	Lower	Not commenced	Number	5	5	0.005	1
<b>Sub total</b>						<b>12</b>	<b>0.705</b>	<b>113</b>
<b>Total no. of works under Kalpattu GP for Micro-watershed development (IWRM)</b>						<b>63</b>	<b>295.34</b>	<b>59718</b>

### TOTAL NO. OF WORKS FOR MICRO-WATERSHED DEVELOPMENT (IWRM)

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Kattukanallur GP	106	274.72	81068
<b>Kalpattu GP</b>	<b>63</b>	<b>295.34</b>	<b>59718</b>

# 8.3 | MODEL GP

## AGARAM GP, WEST ARNI BLOCK, TIRUVANNAMALAI DISTRICT

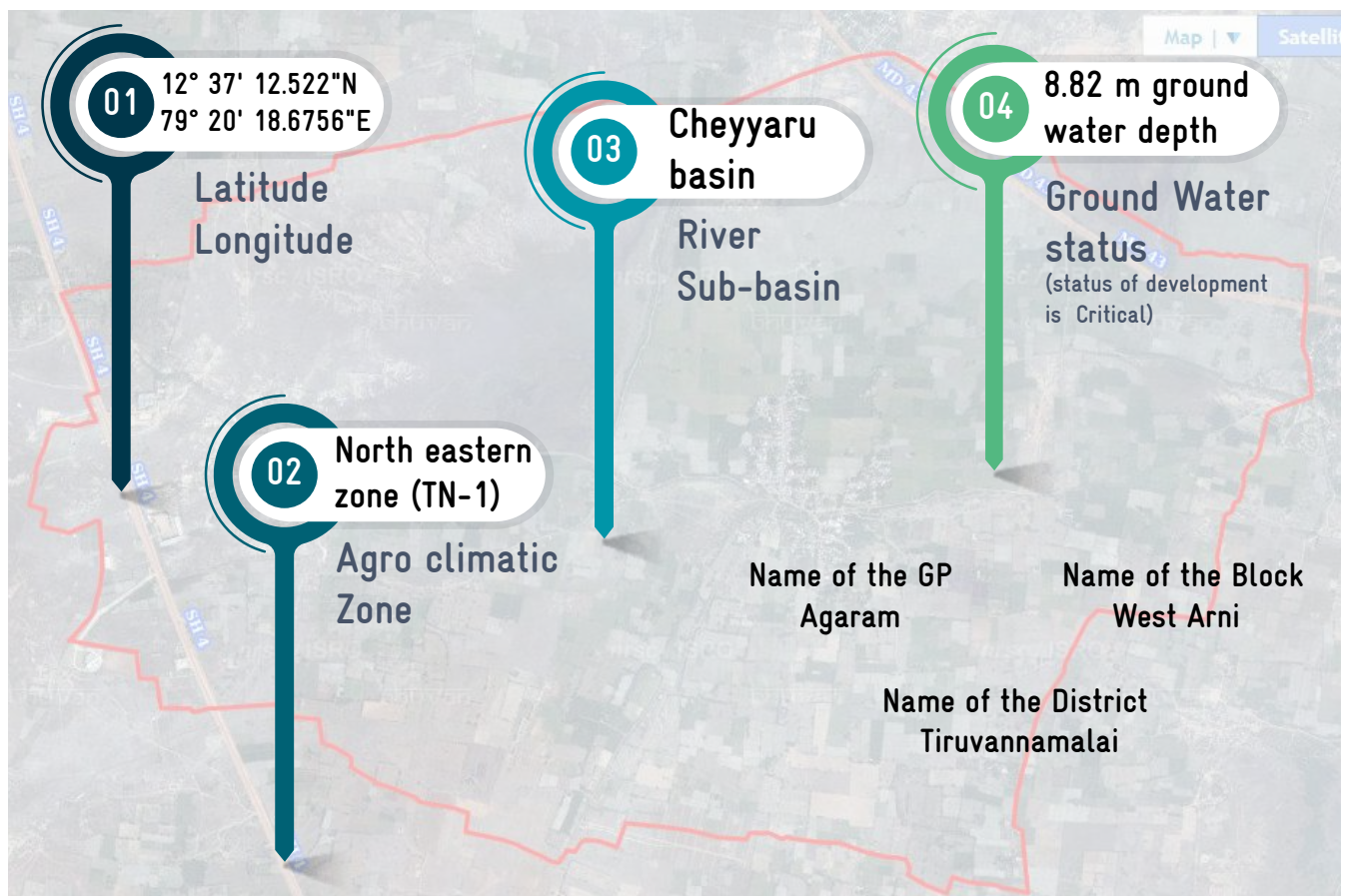


### 8.3.1 | BACKGROUND OF GRAM PANCHAYAT - AGARAM

The Agaram GP is located in West Arni Block of Tiruvannamalai district, Tamil Nadu. The total population is 2268 of which 1143 are males while 1125 are females as per

Population Census 2011. The total number of households is 563. The Schedule Tribe population is 2 and Schedule Caste population is 345 in the Agaram village (Table 46).

#### SOCIO-ECONOMIC PROFILE OF AGARAM, TIRUVANNAMALAI DISTRICT



The spatial and non-spatial data employed in identifying the key water challenges are given in Figure 8.18 to 8.26 and Table 46.

## 8.3.2 | CWRM PLANNING - SPATIAL DATA

**8.3.2.1 Land Use and Land Cover Map:** The land use land cover (LuLc) map provides the information about the current landscape and the existing land use pattern. The map clearly shows this GP is covered by the agricultural fallow land, croplands, and barren lands. The fallow land development activities and barren land to productive land activities has been planned using the CWRM.

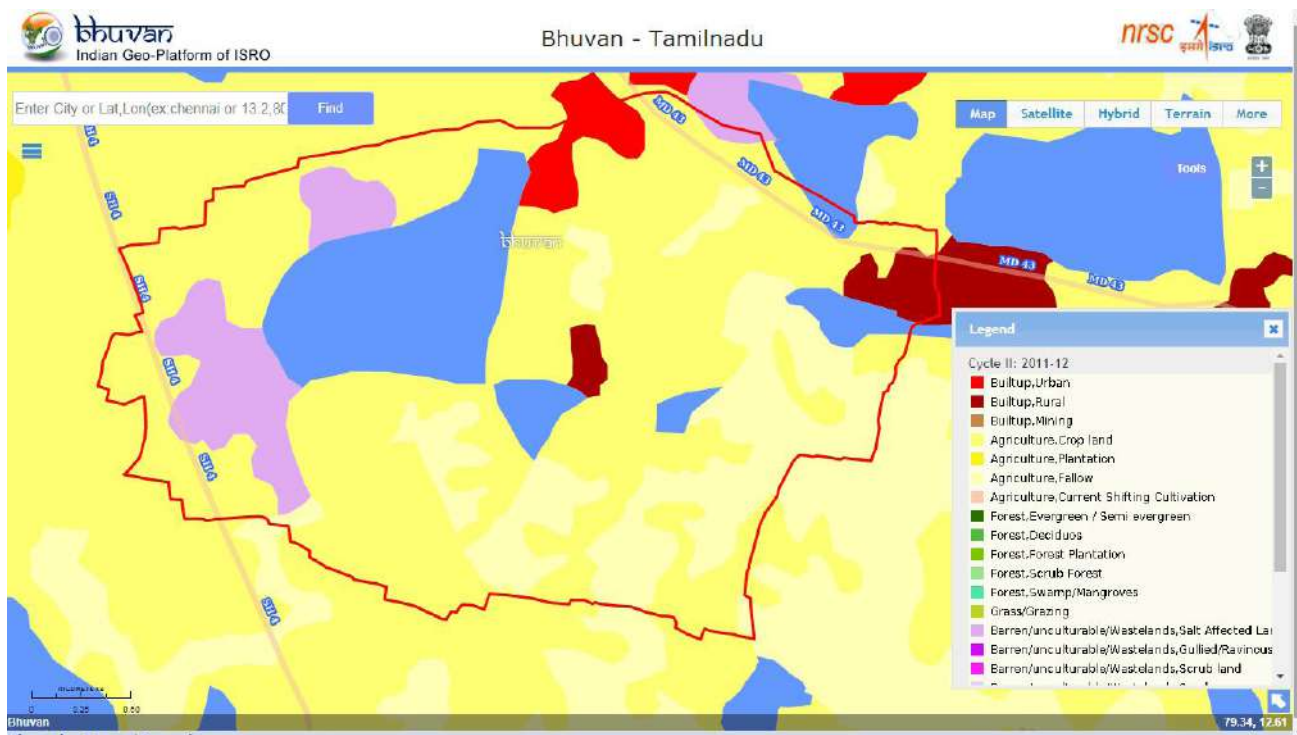


Figure 8.18. Land use and land cover map of Agaram GP, West Arni Block, Tiruvannamalai district

**8.3.2.2 Area under erosion:** The erosion map shows the soil erosion capacity with respect to rainfall, soil physical properties, terrain slope, land cover of Tiruvannamalai district. The soil erosion map is used for soil conservation and regional planning and watershed management. In Agaram GP, it is observed that area under sheet erosion in the GP.

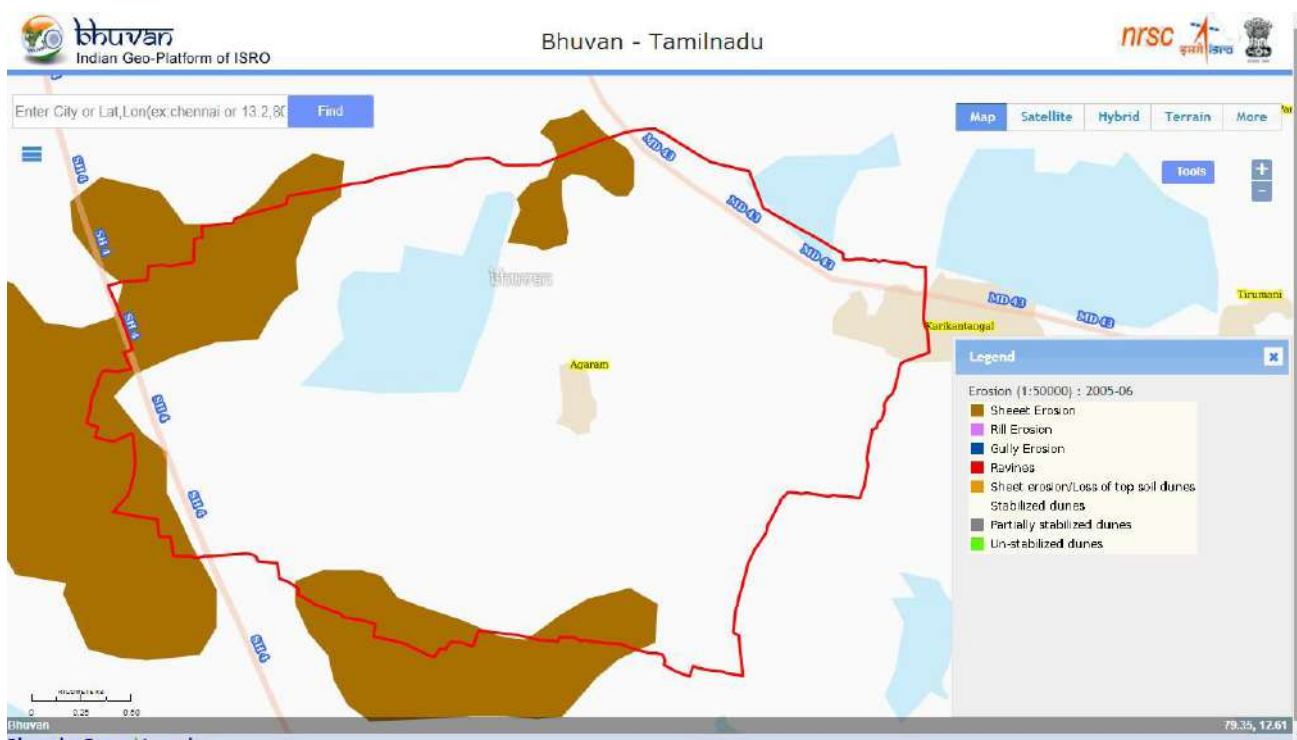


Figure 8.19. Soil erosion map of Agaram GP, West Arni Block, Tiruvannamalai district

**8.3.2.3 Salt affected area:** Salt affected areas are one of the most important degraded areas where soil productivity is reduced due to either salinization or sodicity or both. There is no Salt affected area present in the village

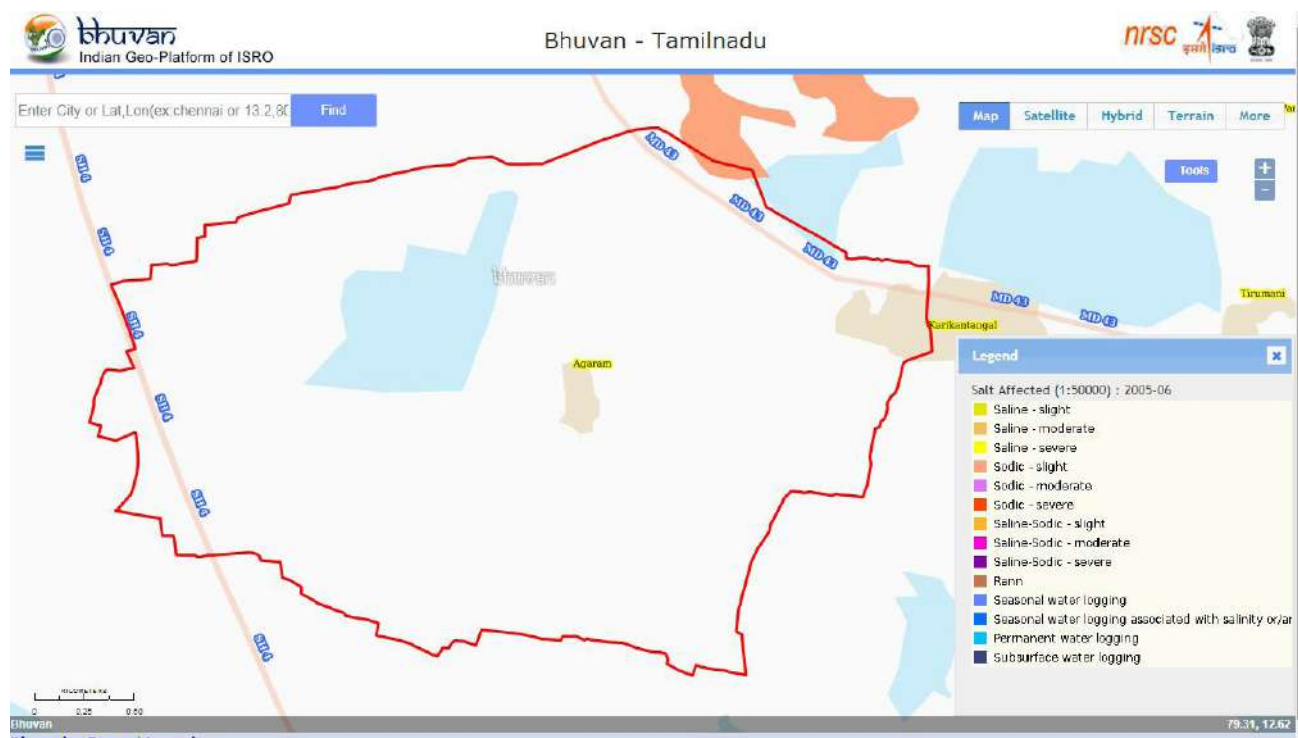


Figure 8.20. Salt affected area map of Agaram GP, West Arni Block, Tiruvannamalai district

**8.3.2.4 Geomorphology:** The geomorphology map is the graphical inventories of a landscape depicting landforms and surface as well as subsurface materials. It determines the character of soil, vegetation, water percolation and land cover. The Agaram GP covers under the denudation origin – pediment- pediplain complex category. The geomorphic is guided us to undertake appropriate work in particular location to reap maximum benefits.

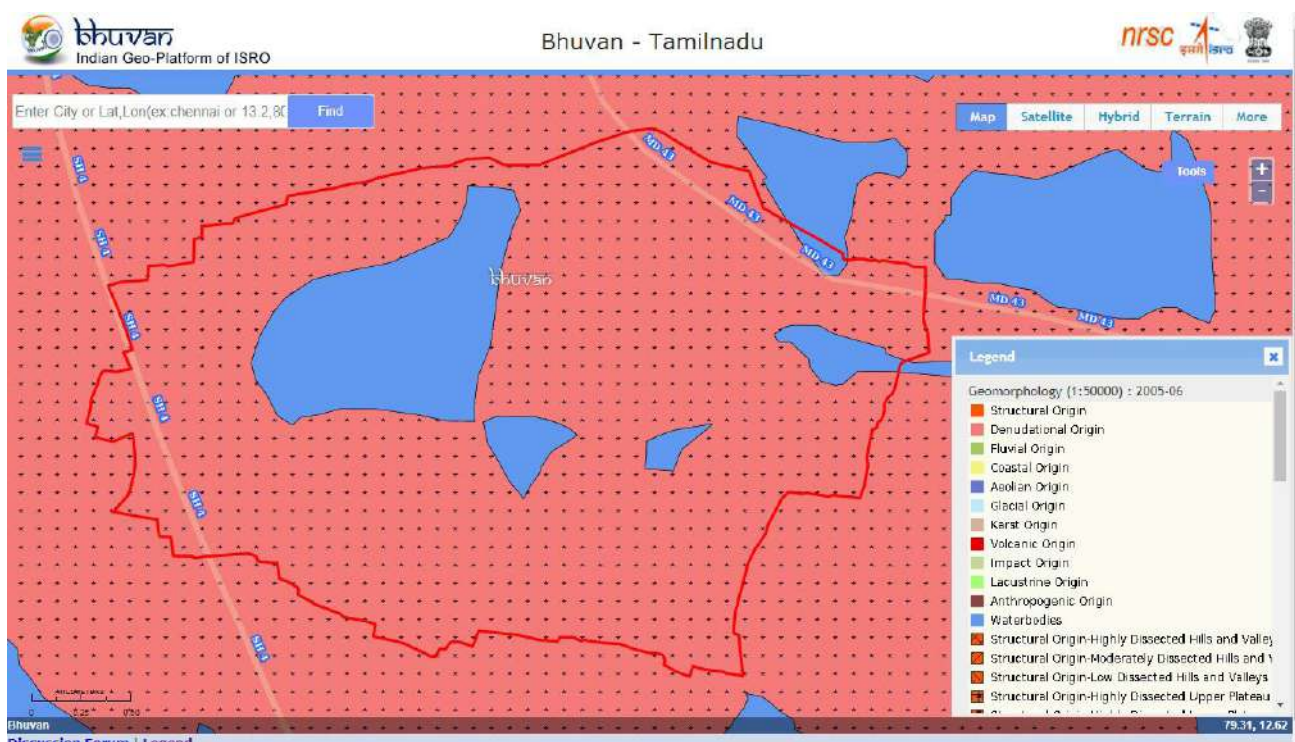


Figure 8.21. Geomorphology map of Agaram GP, West Arni Block, Tiruvannamalai district



**8.3.2.5 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 a Structural lineament axial trace of fold present in the village

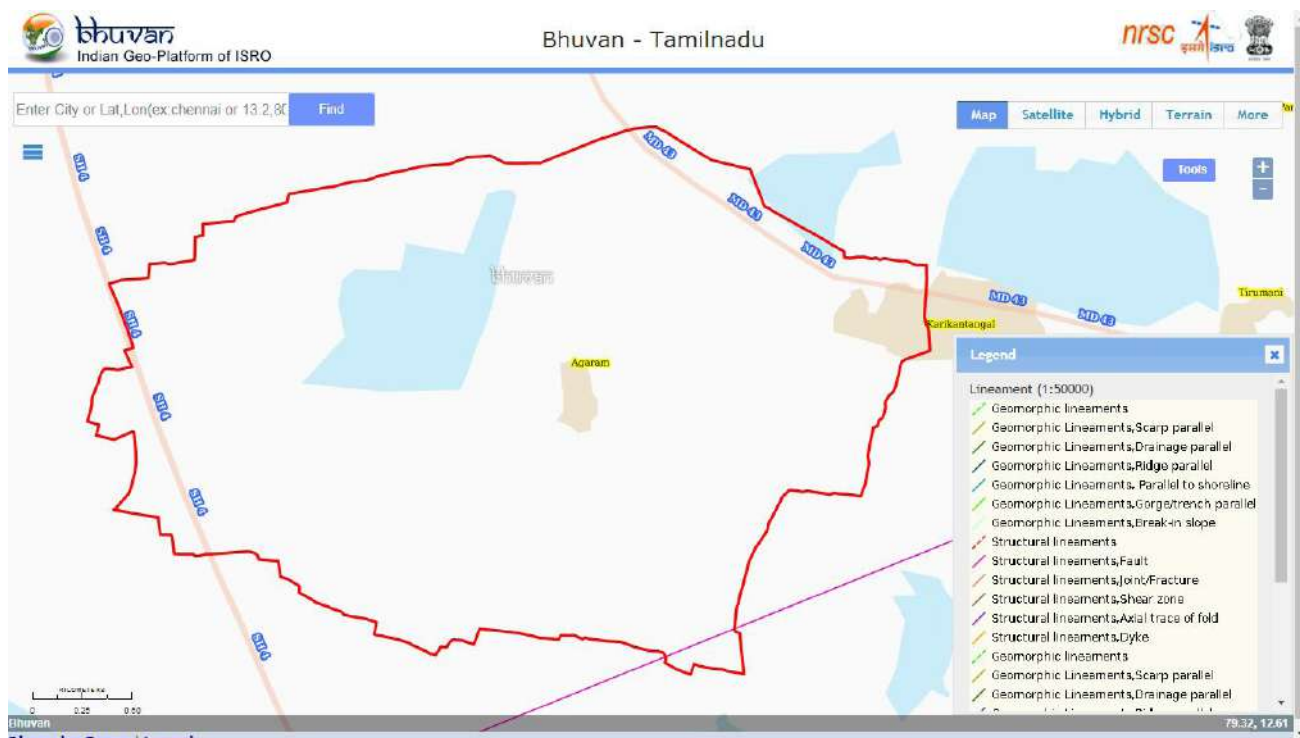


Figure 8.22. Lineament map of Agaram GP, West Arni Block, Tiruvannamalai district

**8.3.2.6 Ground water prospect:** The map provides the required information on geological parameters connected to ground water exploration and the probable ground water prospects and helps in identification of sites for planning recharge structures to address water scarcity in a more effective manner. It is observed that the groundwater is less than 30m deep well with 50 to 100 liter per minute capacity.

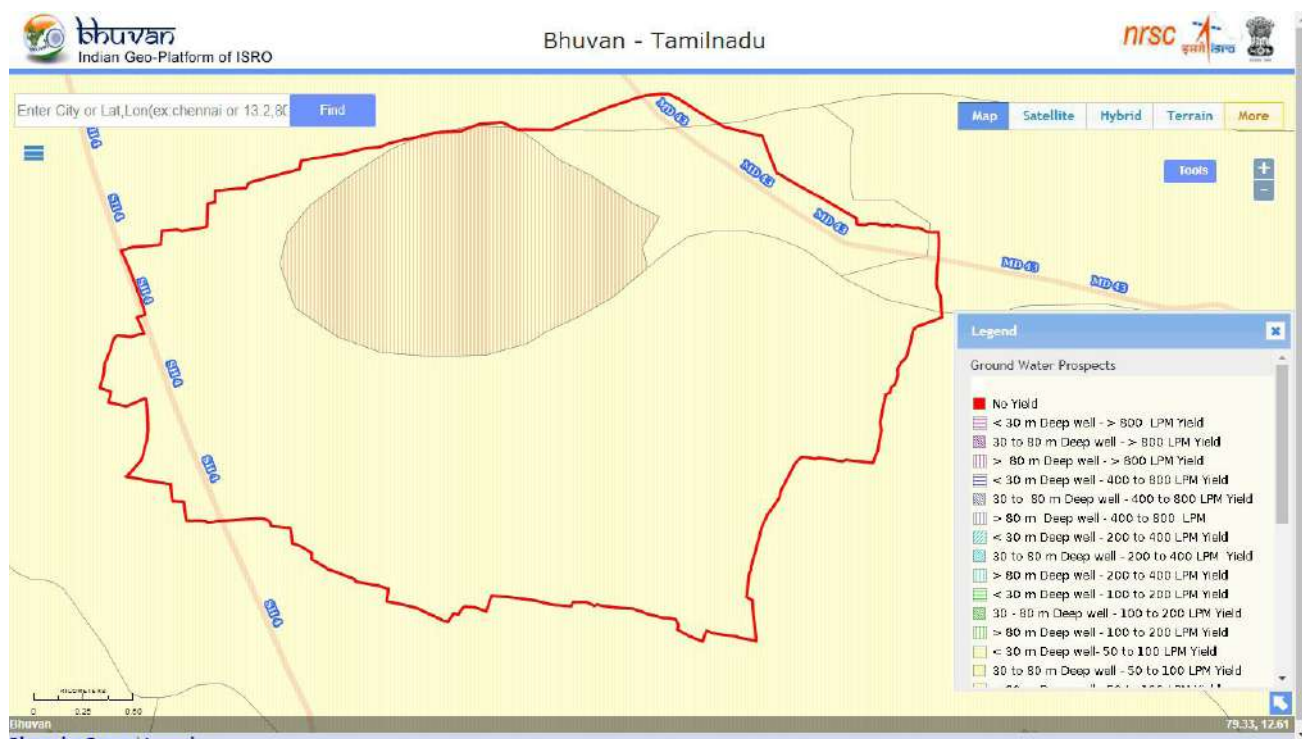


Figure 8.23. Ground water map of Agaram GP, West Arni Block, Tiruvannamalai district

**8.3.2.7 Wasteland:** It is noticed that there are no wasteland areas in this particular GP. During planning the GPs, the plantation measures have been taken up in the identified wastelands to convert into productive land.

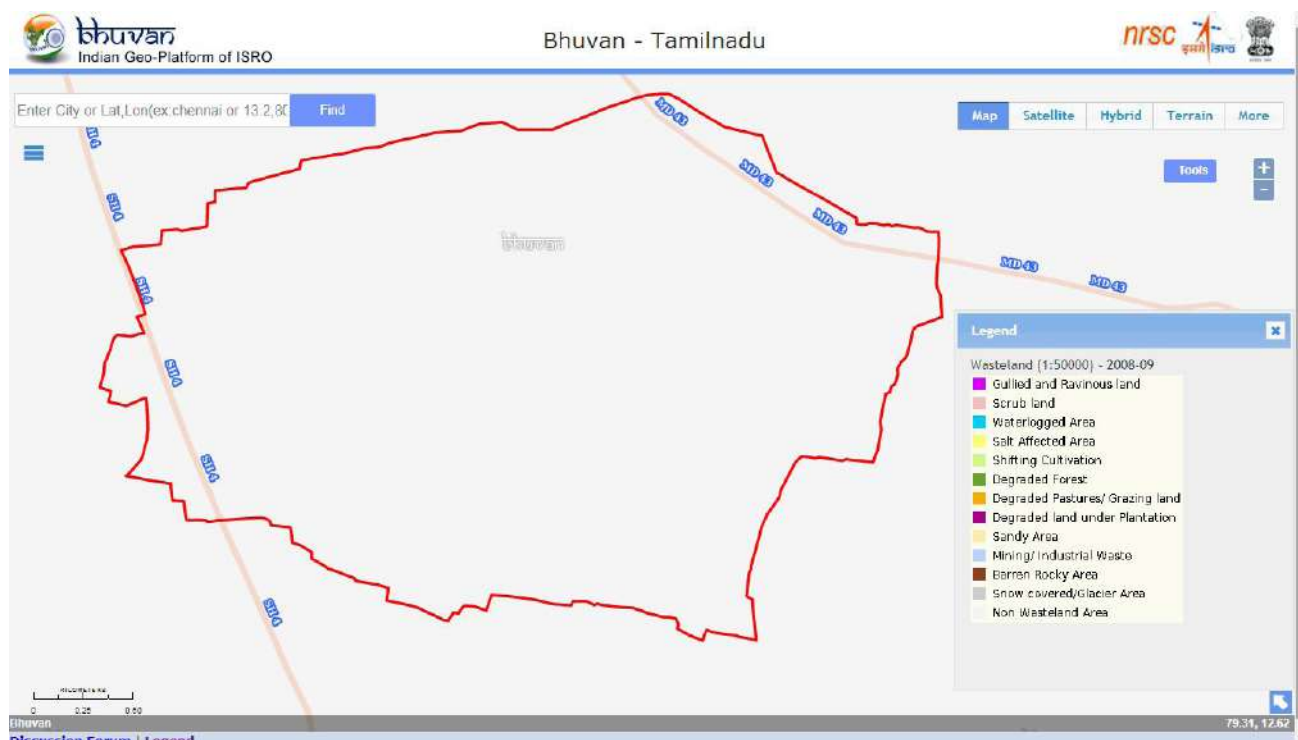


Figure 8.24. Wasteland map of Agaram GP, West Arni Block, Tiruvannamalai district

**8.3.2.8 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 Agaram GP based on ridge to valley concept and develop relevant soil and water conservation plan accordingly. There are five Micro-watersheds in the village

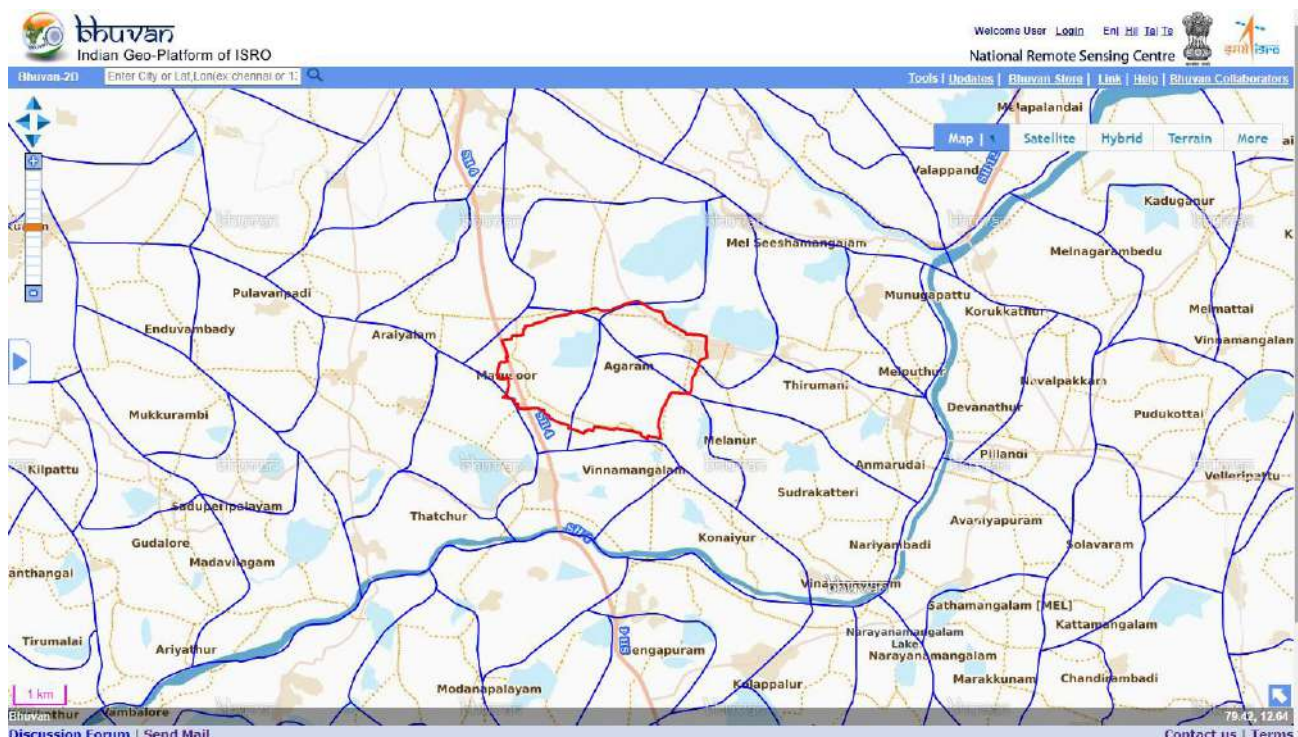


Figure 8.25. Watershed map of Agaram GP, West Arni Block, Tiruvannamalai district

**8.3.2.9 Slope:** The slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. Slope is typically expressed as a %, an angle, or a ratio. The average slope of a terrain feature is calculated from contour lines on a topo map or DEM. For Agaram GP, it clearly shows a very flat slope of 0 to 1 % & Flat slope 1 to 3%. Hence the slope is considered for planning the soil conservation measures and construction of the water recharge structures such as check dam, farm ponds etc.

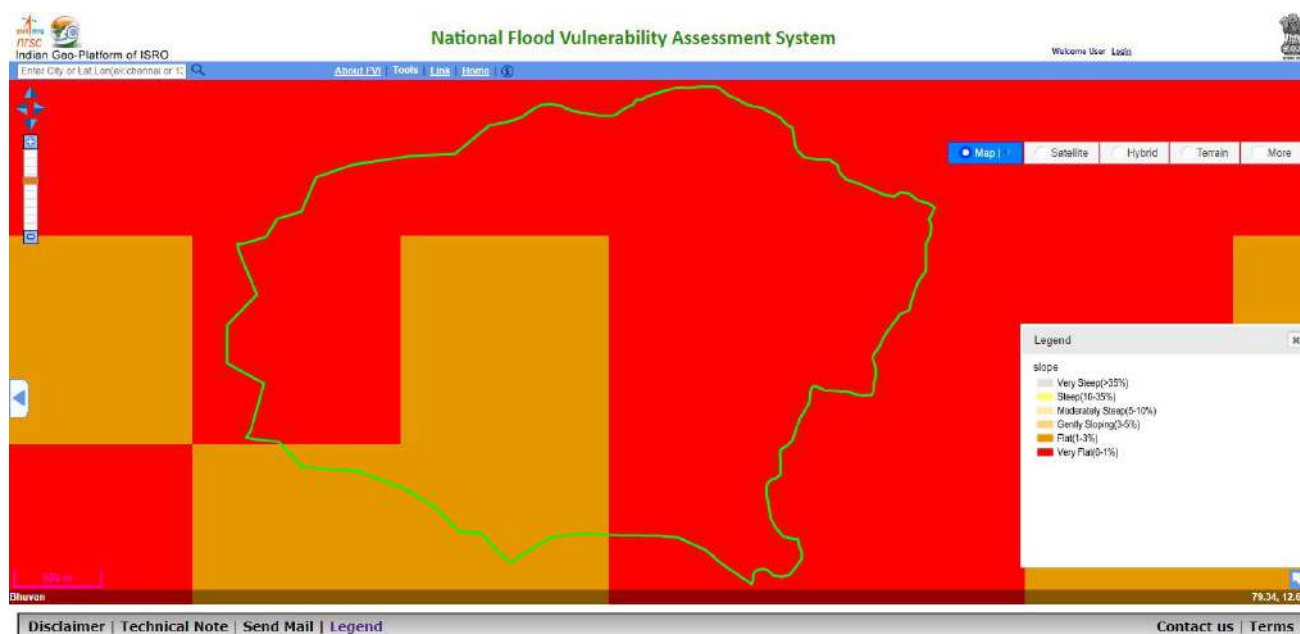


Figure 8.26. Slope map of Agaram GP, West Arni Block, Tiruvannamalai district

### 8.3.3 | CWRM PLANNING- NON-SPATIAL DATA

The non-spatial data covered four important themes – socio economic, climate, water and agriculture with 116 parameters (Table 34). These non-spatial data are concurrently used for analysis along with the spatial data mentioned above to identify the key water challenges, prepare water budget by understanding the supply and demand and develop water actions to the different land

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

TABLE 46. NON SPATIAL DATA- AGARAM GP

S No	Key CWRM Parameter	Unit	Climate Vulnerability Indicator	Details
<b>Climate Vulnerability Area (CVA) 1: Socio-Economic</b>				
1	Geographical Area	ha	S1	765
2	Male Population	Number	S2	1143
3	Female Population	Number	S2	1125
4	Total Population	Number	S2, S4	2268
5	SC Population	Number	S2, S4	345
6	ST Population	Number	S2, S4	2
7	Vulnerable population	Number	S2,S3,S4	347
8	Households (HH's)	Number	S2	563
9	Only one room HH's	Number	S2	107

10	Female-Headed HH's	Number	S2	42
11	Vulnerable Households	Number	S2	88
12	Vulnerable Households	%	S2	16%
13	Registered MGNREGA Job cards	Persons	S2	845
14	active person working in job Cards	Persons	S2	658
15	Drinking-Water Sources	Number	S3	1240
16	Groundwater sources - Drinking water	Number	S3	4
17	Surface water sources - Drinking water	Number	S3	1
18	Annual Grey water Generation	Ha - M	S2, S3	4.14
<b>Climate Vulnerability Area (CVA) 2: Climate</b>				
1	Average Annual Rainfall	mm	C3,C4,W1	1047
2	Average Annual Temperature	°C	C1,C2	27.9 °C
3	Ground Water(G.W) Status	OE, Critical, SC, Safe, Saline	W2, W3	Over -Exploited
<b>Climate Vulnerability Area (CVA) 3: Water Resources</b>				
<b>Canal Network</b>				
1	Length of Main Canal	meter	W4, C1	0
2	Length of Minor Canal	meter	W4, C1	0
3	Length of Distributaries	meter	W4, C1	0
4	Water Courses (Field Channels)	meter	W4, W5	1250
5	Number of Tanks (PWD & Union)	Number	W3	4
6	Number of Ooranis	Number	W3	3
7	Other Surface Water Bodies	Number	W3	6
<b>Irrigation Facilities</b>				
8	Area under Tank Irrigation	ha	W4, W5, S2	83.72
9	Area under Canal Irrigation	ha	W4, C1	0.00
10	Area under Open & Tube Well Irrigation	ha	W5, S2, S4, C1	80.68
<b>Water Quality</b>				
11	Chemical Contaminants	Number of Samples	W6	0
12	Bacterial and Other Contaminants	Number of Samples	W6	0
<b>Catchment Area wise Available Runoff</b>				
13	Good Catchment Area	Ha - M	C3, W4	72.80
14	Average Catchment Area	Ha - M	C3, W4	1.40
15	Bad Catchment Area	Ha - M	C3, W4	105.80
<b>Run-Off Conserved (Existing)</b>				
16	Good Catchment Area	Ha - M	C3, W4	8.02
17	Average Catchment Area	Ha - M	C3, W4	1.10
18	Bad Catchment Area	Ha - M	C3, W4	17.72
<b>Watershed and Drainage Networks</b>				
19	Length of Natural Drainage Lines	meter	W4	3043
20	Number of Natural Drainage Lines	Number	W5	3
21	Number of Micro-watersheds	Number	C3, W3, W4	4

<b>Water Demand</b>				
22	Water Demand for Humans	Ha - M	W5	6.21
23	Water Demand for Livestock	Ha - M	W5	1.80
24	Water Demand for Agriculture	Ha - M	W5	234.14
25	G.W Utilization for Drinking	%	W2,W3	76%
26	G.W Utilization for Livestock	%	W2,W3	94%
27	G.W Utilization for Agriculture.	%	W2,W3	97%
28	S.W Utilization for Drinking	%	W4	24%
29	S.W Utilization for Livestock	%	W4	6%
30	S.W Utilization for Agriculture	%	W4	3%
<b>Climate Vulnerability Area (CVA) 4: Agriculture</b>				
<b>Land Resources</b>				
1	Area under Forest land	ha	C1,C2,C3,W3	0.00
2	Area under Non-Agricultural Uses	ha	C1,C2,C3,W3	186.75
3	Area under Barren & Un-cultivable Land	ha	C1,C2,C3,W3,S2	7.50
4	Area under Permanent Pastures and Other Grazing Land	ha	C1,C2,C3, W3	5.00
5	Area under Land Under Miscellaneous Tree Crops etc.	ha	C1,C2,C3,W3,S2	0.00
6	Area under Culturable Waste Land	ha	C1,C2,C3, W3,S2	0.00
7	Area under Fallows Land other than Current Fallows	ha	W5, S4	0.00
8	Area under Current Fallow land	ha	W5, S4	418.75
9	Area under Unirrigated Land	ha	W5, S4	66.10
10	Area Irrigated by Source	ha	W5, S4	80.68
<b>Land Resources - WASCA Treatment Proposed Area</b>				
11	Treatment Area under Forest Land	ha	C1,C2,C3,W3	0.00
12	Treatment Area under Non-Agricultural Uses	ha	C1,C2,C3,W3	8.25
13	Treatment Area under Barren & Un-cultivable Land	ha	C1,C2,C3,W3,S2	5.63
14	Treatment Area under Permanent Pastures and Other Grazing Land	ha	C1,C2,C3, W3	3.75
15	Treatment Area under Land Under Miscellaneous Tree Crops etc.	ha	C1,C2,C3,W3,S2	0.00
16	Treatment Area under Cultivable Waste Land	ha	C1,C2,C3, W3,S2	0.00
17	Treatment Area under Fallows Land other than Current Fallows	ha	W5, S4	0.00
18	Treatment Area under Current Fallow land	ha	W5, S4	67.00
19	Treatment Area under Unirrigated Land	ha	W5, S4	10.58
20	Treatment Area Irrigated by Source	ha	W5, S4	12.91
<b>Catchment Area</b>				
21	Land under Good Catchment	ha	C3, W4	194.25
22	Land under Average Catchment	ha	C3, W4	5.00
23	Land under Bad Catchment	ha	C3, W4	565.53
<b>Crop Details</b>				
24	Irrigated Area	ha	A2	174.57
25	Rainfed area	ha	A1	16.79
26	The area under Paddy Cultivation	ha	A2	134.49

27	Crop Water Requirement - The irrigated condition	Ha - M	A2, A4	227.55
28	Crop Water Requirement - Rainfed condition	Ha - M	A1, A3	6.59
<b>Soil Resources: Status of Available Nitrogen</b>				
29	Very Low (VL)	%	C1,C2,A2,A3	1%
30	Low (L)	%	C1,C2,A2,A3	99%
31	Medium (M)	%	C1,C2,A2,A3	0%
32	High (H)	%	C1,C2,A2,A3	0%
33	Very High (VH)	%	C1,C2,A2,A3	0%
<b>Status of Organic Carbon</b>				
34	Very Low (VL)	%	A2, A3	23%
35	Low (L)	%	A2, A3	77%
36	Medium (M)	%	A2, A3	0%
37	High (H)	%	A2, A3	0%
38	Very High (VH)	%	A2, A3	0%
<b>Status of Soil Micro Nutrients</b>				
39	Sufficient	%	A2, A3	62%
40	Deficient	%	A2, A3	38%
<b>Status of Physical condition of the soil</b>				
41	Acidic Sulphate (AS)	%	A2	0%
42	Strongly Acidic (SrAc)	%	A2	0%
43	Highly Acidic (HAc)	%	A2	0%
44	Moderately Acidic (MAc)	%	A2	0%
45	Slightly Acidic (SlAc)	%	A2	0%
46	Neutral (N)	%	A2	0%
47	Moderately Alkaline (MAI)	%	A2	100%
48	Strongly Alkaline (SIAI)	%	A2	0%
<b>Soil Texture</b>				
49	Clay Soil	%	C3, W3,A3,S4	19%
50	Fine Soil	%	C3, W3,A3,S4	66%
51	Coarse loamy	%	C3, W3,A3,S4	0%
52	Soil Water Permeability	Low, Moderate, high	C3, W3,A3,S4	Moderate
<b>Soil moisture and ET</b>				
53	Volumetric Soil Moisture	%	A3	23%
54	Estimated Soil Moisture	Ha - M	A3	132.95
55	ET Losses	Ha - M	A4	122.03
<b>Means of Water Extraction</b>				
56	Gravity	%	W4	9%
57	Lifting	%	W2	91%
<b>Irrigation Methods</b>				
58	Wild Flooding	%	W4	51%
59	Control Flooding	%	W2	49%

Livestock				
60	Cattle Population	Number	W1,S4	462
61	Sheep Population	Number	C1,S2,S4	94
62	Goat Population	Number	A3,A4,S4	203
63	Poultry	Number	A3,A4,S4	0

## 8.3.4 | KEY WATER CHALLENGES

### Socio-Economic



The geographical area is about 765 ha and the male and female population is almost equal to 50 % and out of the total population, 15 % of the population belongs to the SC category and according to SECC data, 16% of the households are vulnerable in the village. Access to drinking water through tap water connections is very low. Handling of grey water from the 88 households living on the coast needs attention

### Climate



The groundwater development status is over-exploited, evapo-transpiration is high and soil moisture is low during five months in a year.

### Agriculture and Allied Sector



27% of the land area is taken for WASCA activities like plantation, conservation works. The total treated area is 208.58 ha in the GP. 26 % of the land covers the common area and 74% of the land covers an individual land area. That means, more activities should be given in individual land areas. The main crop in the GP is paddy which is cultivated about 134.49 ha of land. The main source for paddy cultivation is groundwater. 90% of the water is given to paddy fields by lifting methods of irrigation. Remaining water is extracted by gravity method of irrigation. Fine soil is predominant in the GP.

### Water



There are ten traditional water bodies in the GP. 49% of groundwater is taken for agriculture, 94% of groundwater is taken for livestock and 100% of groundwater is used for humans. 51% of surface water is used for agriculture, 6% of surface water is used for livestock. 180 Ha - M of water is an available runoff, 45.58 Ha - M is the harvested runoff by various water conservation activities. From conserved runoff, 16% of the runoff is from the good catchment, 2% of the runoff is from the average catchment and 82% of the conservation is from the bad catchment.

## 8.3.5 | PERSPECTIVE PLAN - WORKS PROPOSED: WATER ACTIONS

The appropriate and site-specific works are identified for the development of public and common land, agriculture and allied activities, rural infrastructures, and climate-resilient measures to reduce the vulnerability in the GP. The table shows the detailed perspective plan

and estimates of the work, budget, and person-days for three years from 2021-2022 to 2023-2024 in the Agaram GP (Table 47 and Table 48). Since it is a vulnerable village, attention was given to include appropriate works to improve the common and public land development.

TABLE 47. PERSPECTIVE PLAN OF AGARAM GP - FY (2021-2024)

<b>CWRM Water Action 1: Improvement of Public &amp; Common Lands Development</b>					
S.No	Name of the Work	Type of Ridge	No. of Works	Estimated cost in lakhs of Rupees (INR)	Estimated Person Days
1	Contour Continuous Bunds (CCB) for Afforestation area(Mtrs)	Upper ridge	2	0.83	330
2	Composting(Number of units)	Lower ridge	68	11.56	1020
3	Afforestation in Public/common lands(ha)	Upper ridge	1	70.95	27588
4	Block Plantation (Community)(ha)	Middle ridge	2	62.49	24322
5	Silvi-pasture Development(ha)	Middle ridge	2	64.13	24990
6	Linear Plantation(Km)	Middle ridge	10	6.72	2626
7	Canal Bund Plantation(Km)	Lower ridge	2	9.38	3663
8	Avenue plantation(Km)	Middle ridge	10	8.51	3323
9	Nursery Development(Number of units)	Lower ridge	563	140.75	21995
10	Restoration of water bodies:a.PWD and Tanks(Number)	Lower ridge	5	25.00	4000
11	Restoration of water bodies:b.Ooranis (Number)	Lower ridge	5	10.00	1000
12	Artificial Recharge Structure(Number of units)	Lower ridge	32	80.00	12512
13	Drainage Line Treatment (DLT) (Mtrs)	Upper ridge	1	1.83	305
<b>Sub Total Water Action -1</b>			<b>703</b>	<b>703</b>	<b>127672</b>
<b>CWRM Water Action 2: Agricultural and allied Sector development</b>					
1	Farm Bunding with Boundary Trenches - Individual (ha)	Lower ridge	34	128.09	50039
2	Micro Irrigation(ha)	Lower ridge	8	8.00	0
3	Construction of Farm Ponds - Individual (Number of units)	Lower ridge	34	68.00	26554
4	Land development - Individual (ha)	Lower ridge	3	853.90	333533
5	Dryland Horticulture/Agroforestry - Individual (ha)	Lower ridge	3	811.58	317089
6	Azolla units - Individual (Number of units)	Lower ridge	88	13.20	2024
7	NADEP Vermi compost (Number of units)	Lower ridge	88	15.84	2376
8	Fodder development - Community & Individual	Lower ridge	88	130.24	206272
9	Cattle Shelters (Number of units)	Lower ridge	88	186.56	29128
10	Goat Sheep Shelters (Number of units)	Lower ridge	25	56.75	8875
11	Cattle Trough(Number of units)	Lower ridge	88	4.40	528



12	Construction of new open wells & Recharge Shafts (Number of units)	Lower ridge	32	160.00	29632
<b>Sub Total Water Action -2</b>			<b>579</b>	<b>579</b>	<b>1006050</b>
<b>CWRM Water Action 3: Rural Water Management</b>					
1	Soak Pits (Community) (Number of units)	Lower ridge	6	0.78	120
2	Soak Pits (Individual) (Number of units)	Lower ridge	56	5.60	896
3	Roof Rain Water Harvesting (Number of units)	Lower ridge	2	8.00	1250
<b>Sub Total Water Action -3</b>			<b>64</b>	<b>64</b>	<b>2266</b>
<b>GP- Total</b>			<b>1346</b>	<b>2943.07</b>	<b>1135988</b>

TABLE 48. PERSPECTIVE PLAN OF AGARAM GP - FY (2021-2022)

<b>CWRM Water Action 1: Improvement of Public &amp; Common Lands Development</b>					
S.No	Name of the Work	Type of Ridge	No. of Works	Estimated cost in lakhs of Rupees (INR)	Estimated Person Days
1	Contour Continuous Bunds (CCB) for Afforestation area (Mtrs)	Upper ridge	1	0.33	132
2	Composting(Number of units)	Lower ridge	27	4.59	405
3	Afforestation in Public/common lands (ha)	Upper ridge	1	28.38	11035
4	Block Plantation (Community) (ha)	Middle ridge	1	24.98	9720
5	Silvi-pasture Development(ha)	Middle ridge	1	25.65	9996
6	Linear Plantation(Km)	Middle ridge	4	2.69	1050
7	Canal Bund Plantation(Km)	Lower ridge	1	3.75	1465
8	Irrigation Channel Plantation (Mtrs)	Lower ridge	0	0.00	0
9	Avenue plantation(Km)	Middle ridge	4	3.40	1329
10	Nursery Development(Number of units)	Lower ridge	225	56.25	8790
11	Restoration of water bodies:a.PWD and Tanks(Number)	Lower ridge	4	20.00	3200
12	Restoration of water bodies:b. Ooranis(Number)	Lower ridge	0	0.00	0
13	Restoration of water bodies:c. Ponds(Number)	Lower ridge	0	0.00	0
14	Artificial Recharge Structure(Number of units)	Lower ridge	13	32.50	5083
15	Water Course - Irrigation Channels - Desilting (Mtrs)	Lower ridge	0	0.00	0
16	Drainage Line Treatment (DLT)(Mtrs)	Upper ridge	1	1.83	305
<b>Sub Total Water Action -1</b>			<b>283</b>	<b>204.35</b>	<b>52510</b>
<b>CWRM Water Action 2: Agricultural and allied Sector development</b>					
1	Farm Bunding with Boundary Trenches - Individual (ha)	Lower ridge	14	51.24	20018
2	Micro Irrigation(ha)	Lower ridge	3	3.00	0
3	Construction of Farm Ponds - Individual (Number of units)	Lower ridge	14	28.00	10934
4	Land development - Individual (ha)	Lower ridge	1	341.60	133429

5	Dryland Horticulture/Agroforestry - Individual (ha)	Lower ridge	1	324.36	126729
6	Azolla units - Individual (Number of units)	Lower ridge	35	5.25	805
7	NADEP Vermicompost (Number of units)	Lower ridge	35	6.30	945
8	Fodder development - Community & Individual	Lower ridge	35	51.80	82040
9	Cattle Shelters (Number of units)	Lower ridge	35	74.20	11585
10	Goat Sheep Shelters (Number of units)	Lower ridge	10	22.70	3550
11	Cattle Trough (Number of units)	Lower ridge	35	1.75	210
12	Poultry Shed (Number of units)	Lower ridge	0	0.00	0
13	Construction of new open wells & Recharge Shafts (Number of units)	Lower ridge	13	65.00	12038
<b>Sub Total Water Action -2</b>			<b>231</b>	<b>975.20</b>	<b>402283</b>
<b>CWRM Water Action 3: Rural Water Management</b>					
1	Soak Pits (Community) (Number of units)	Lower ridge	2	0.26	40
2	Soak Pits (Individual) (Number of units)	Lower ridge	23	2.30	368
3	Roof Rain Water Harvesting (Number of units)	Lower ridge	2	8.00	1250
<b>Sub Total Water Action -3</b>			<b>27</b>	<b>10.56</b>	<b>1658</b>
<b>GP- Total</b>			<b>541</b>	<b>1190.11</b>	<b>456451</b>

## 8.3.6 | SUMMARY OF WORKS IDENTIFIED AND ESTIMATED PERSON-DAYS FOR 2021-2024

CWRM themes	No of works	Estimated budget (INR in lakhs)	Estimated person days
Public and common land development	703	492.14	127672
Agriculture and Allied sector development	579	2436.56	1006050
Rural water management	64	14.38	2266
<b>TOTAL</b>	<b>1346</b>	<b>2943.07</b>	<b>1135988</b>

## 8.3.7 | IMPACTS

The proposed water actions based on the above key water challenges cover three years period from 2021-2022 to 2023-2024, At the end of the implementation period i.e. in the year 2024, the following impacts

are envisaged (Table 49). It is expected that the impacts have potentially reduced the vulnerability and improved the resilience of the system to the projected climatic change events and ensured water security.

TABLE 49. WASCA- WATER ACTIONS AND INDICATORS

### WASCA CWRM ACTION PLAN DEVELOPMENT OF PUBLIC AND COMMON LAND

INDICATOR		OUTCOMES/ IMPACT	
1	Number of water bodies restored in the village	1	Ten traditional water bodies restored
2	Area under afforestation	2	8 ha under afforestation
3	Percentage reduction in the annual surface runoff	3	45.58 Ha - M surface runoff harvested and stored
4	The proportion of land treated under WASCA	4	27% of the total geographical area of the village treated under WASCA in three years
5	Drainage line treatment	5	3 Km length of drainage lines treated

**10**  
TRADITIONAL WATER  
BODIES RESTORED

**8 ha**  
AFFORESTATION

**45.58 Ha - M**  
SURFACE RUNOFF  
HARVESTED

**27%**  
AREA OF THE VILLAGE  
TREATED

**3 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.	34 farm ponds established
2.	The reducing area under fallow lands	2.	104.69 ha under fallow land restored for cultivation
3.	Improvement in soil health	3.	88 units of vermicompost established
4.	No of artificial recharge structures proposed	4.	32 artificial recharge structures were established to replenish groundwater flow

**34**  
FARM PONDS

**104.69 ha**  
FALLOW LAND RESTORED

**88**  
VERMI COMPOST

**32**  
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. Six community level and 56 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. 563 households established Nutri-gardens in homesteads





**6** COMMUNITY & **56**  
INDIVIDUAL SOAK PITS

**2**  
COMMON ROOF  
RAINWATER HARVESTING

**563**  
NUTRI-GARDENS

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

**TABLE 50. PROPOSALS FOR THE MAHATMA GANDHI NREGS, AGARAM GP, TIRUVANNAMALAI DISTRICT**

	No of works	No of person days
 Perspective plan	 1346	 1135988
 Annual plan	541	456451

# 8.3.8 | PROPOSED ACTIVITY MAP

The proposed activity map for Agaram GP, West arni Block shows a shelf of projects for all three year works from 2021-2024 (Figure 8.27 to 8.30).

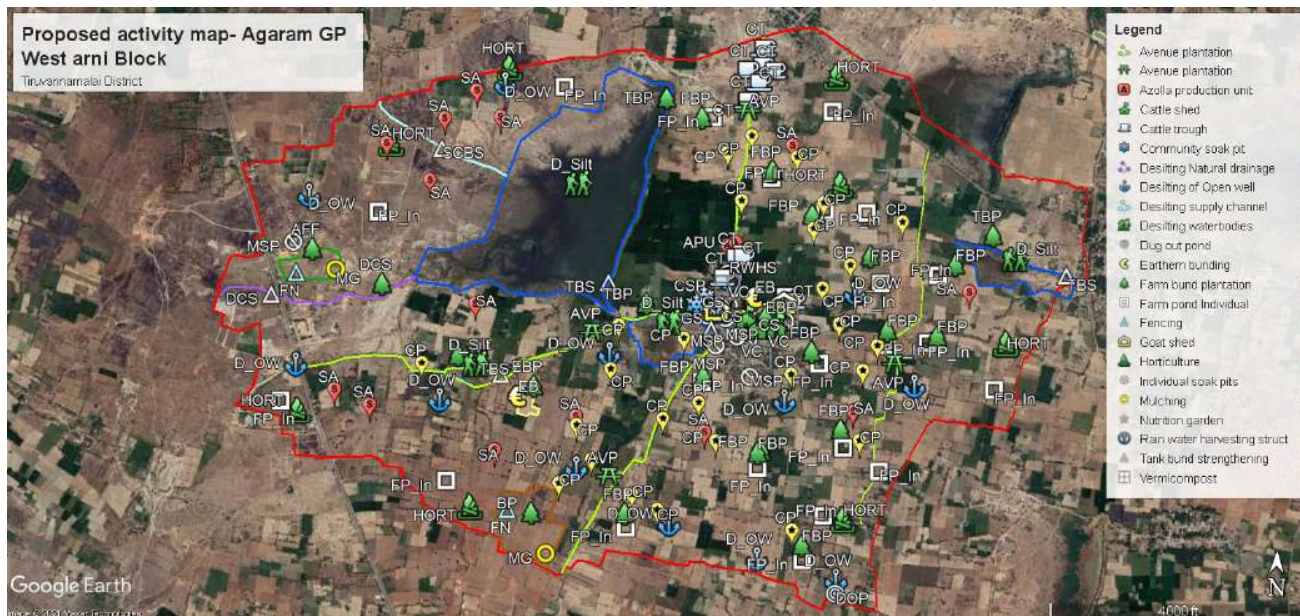


Figure 8.27. Action plan of Agaram GP, West Arni Block, Tiruvannamalai District

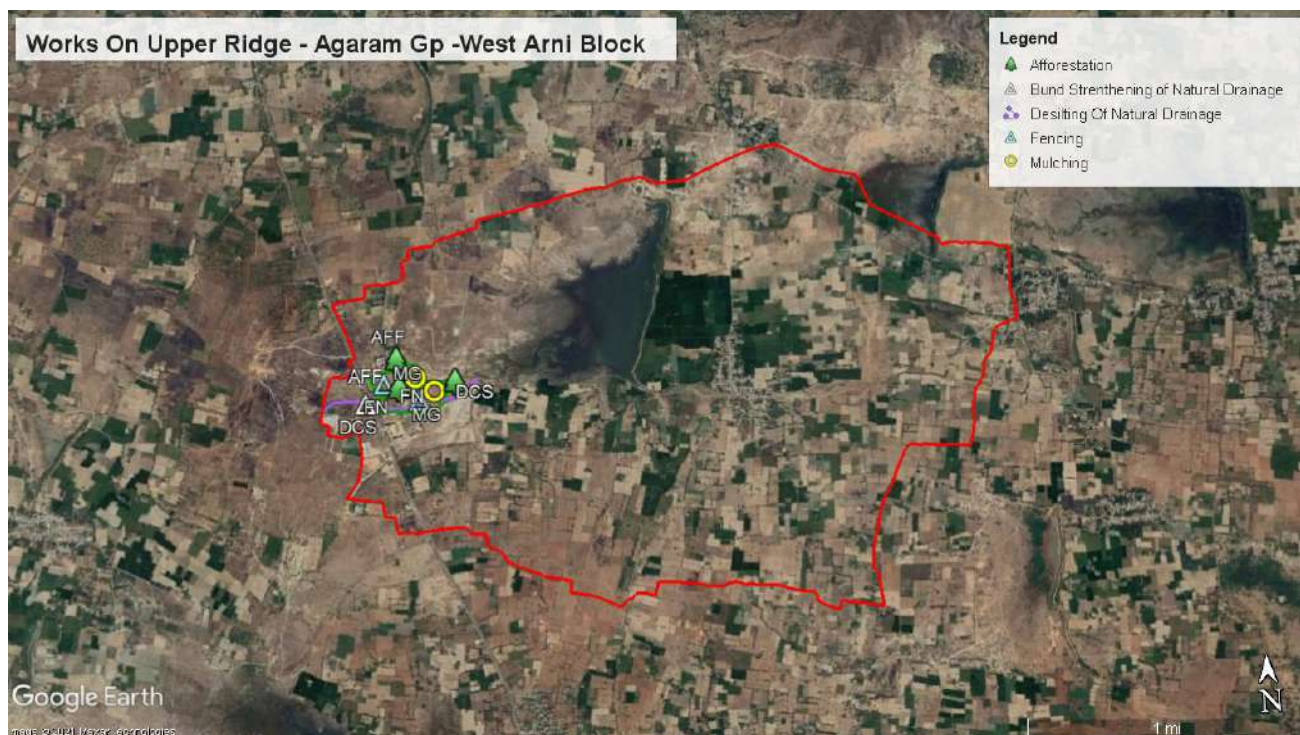


Figure 8.28. Works on Upper Ridge of Agaram GP, West Arni Block, Tiruvannamalai District



Figure 8.29. Works on Middle Ridge of Agaram GP, West Arni Block, Tiruvannamalai District

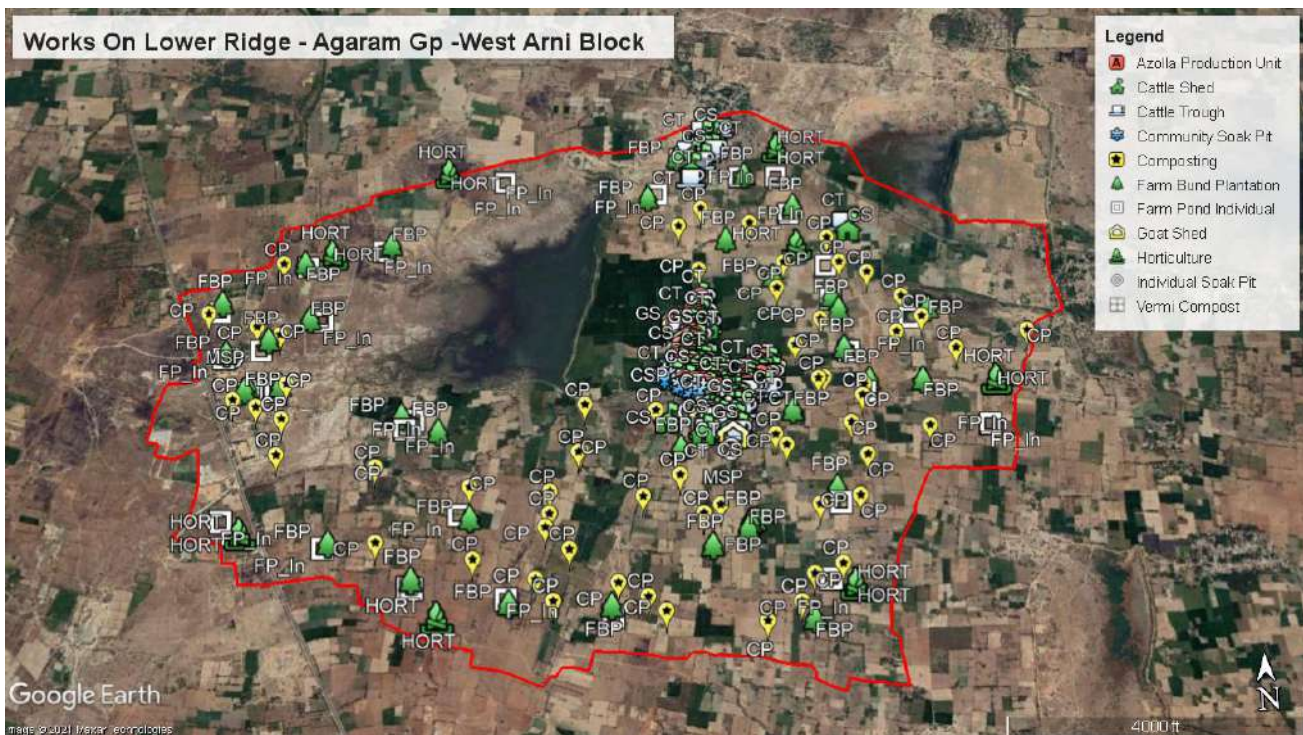
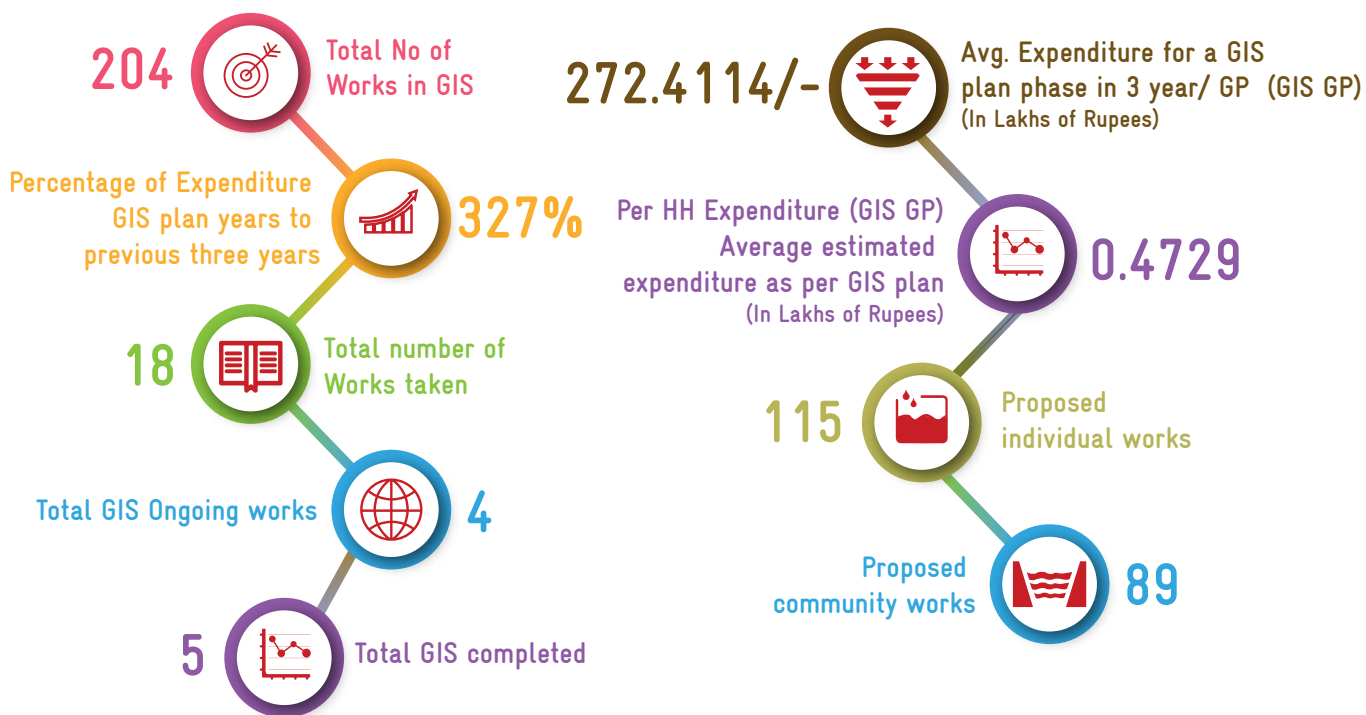


Figure 8.30. Works on Lower Ridge of Agaram GP, West Arni Block, Tiruvannamalai District

# 8.3.9 | GIS PLAN IMPLEMENTATION, KEY PARAMETERS

GIS PLAN IMPLEMENTATION, KEY PARAMETERS PERFORMANCE IN NUMBERS (WEST ARNI BLOCK-AGARAM 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 area and its key problems. The 18 biophysical and socio-economic indicator of four interrelated areas via water, agriculture, socio economic and climate used at district level are further expanded to 110 parameters at Block level. The spatial and non-spatial CWRM parameters for four above mentioned interrelated areas are used to represent risk, sensitivity and adaptive capacity of the GPs, which eventually reflects rural water security. The key problems of the Blocks are identified and the best possible adaptation options ‘key water actions’ are intended under WASCA initiatives in public and common land, agriculture and allied sector, rural infrastructure areas. All the indicators/parameters and key water action are aligned to the appropriate SDG and India’s NDC. The developmental activities in the 3 areas along with climate resilient measures will contribute in reducing the vulnerability and building the resilience of the local communities at the GP level. The GP based planning and integration at the Block level based on macro and watershed enables to adopt ecosystem approach in promoting nature based solutions. The productive impacts are visualized through convergence approach by mobilizing necessary finance, knowledge and technologies at the end of the three years of implementation. This integrated Block level approach will be more effective with Block level climate information which is not currently available.



Recommendations towards stable development and its progressive outcome are,

01

Participatory Rural Appraisal  
at village level



Preference of key water actions  
based on water demand and budget

02



03

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



Continuous field monitoring  
for constant actions

04



05

Engaging village level institutions  
such as SHGs, FPOs





# ANNEXURES

## ANNEXURE 1

### TYPES OF GPS

Type of GP	Description
I	Both GP and revenue village data and boundary match
II	Having more than one GPs in one Revenue Village
III	One GP is falling under more than Type 1 one Revenue Village
IV	GPs having more than one GP, one Revenue Villages data, boundary
V	Newly formed GP after 2011 census publication

\* Note: The CWRM uses spatial and non-spatial data for developing Gram Panchayat level plans. Most of the data for non-spatial are available at revenue village level in the project area. To synchronize planning at GP keeping data availability and administrative boundary for GIS planning, various GP's are categorized based on revenue village boundaries, for collecting and organizing the datasets. Based on the above factors, five different types of GPs are classified as above.

## ANNEXURE 3.1

## KEY CWRM PARAMETER FROM SECONDARY SOURCES

Key CWRM Parameter	Secondary Source
<b>Socio economic</b>	
Geographical Area	Census-2011, MoHA, GOI <a href="https://censusindia.gov.in/2011census/dccb/DCHB.html">https://censusindia.gov.in/2011census/dccb/DCHB.html</a>
Male Population	
Female Population	
Total Population	
SC Population	
ST Population	
Vulnerable population	
Households (HH's)	Socio-economic caste census (SECC) 2011 <a href="https://secc.gov.in/homePageLgd.htm">https://secc.gov.in/homePageLgd.htm</a>
Only one room HH's	
Female Headed HH's	
Vulnerable Households	
% of Vulnerable Households	<a href="http://mnregaweb4.nic.in/netnrega/app_issue.aspx?page=s&amp;flag=eng&amp;state_name=TAMIL%20NADU&amp;state_code=29&amp;fin_year=2020-2021&amp;source=national&amp;Digest=3ics8+9Z9fEQ8yzi5E3qcQ">http://mnregaweb4.nic.in/netnrega/app_issue.aspx?page=s&amp;flag=eng&amp;state_name=TAMIL%20NADU&amp;state_code=29&amp;fin_year=2020-2021&amp;source=national&amp;Digest=3ics8+9Z9fEQ8yzi5E3qcQ</a>
Registered MGNREGA Job cards	
Active person working in MGNREGA job Cards	
<b>Water Resources</b>	
<b>Irrigation Facilities</b>	Census-2011, MoHA, GOI <a href="https://censusindia.gov.in/2011census/dccb/DCHB.html">https://censusindia.gov.in/2011census/dccb/DCHB.html</a>
Area under Tank Irrigation	
Area under Canal Irrigation	
Area under Open & Tube Well Irrigation	<a href="https://ejalsbakti.gov.in/IMISReports/Reports/WaterQuality/WQ/rpt_WQ_DistrictProfile_S.aspx?Rep=0&amp;RP=Y">https://ejalsbakti.gov.in/IMISReports/Reports/WaterQuality/WQ/rpt_WQ_DistrictProfile_S.aspx?Rep=0&amp;RP=Y</a>
<b>Water Quality</b>	
Chemical Contaminants	
Bacterial and Other Contaminants	NRSC, ISRO, GoI
<b>Watershed and Drainage Networks</b>	
Length of Natural Drainage Lines	
Number of Natural Drainage Lines	
Number of Micro-watersheds	
<b>Agriculture</b>	
<b>Land Resources</b>	<a href="https://censusindia.gov.in/2011census/dccb/DCHB.html">https://censusindia.gov.in/2011census/dccb/DCHB.html</a>
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	



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



## ANNEXURE 3.2

### KEY CWRM PARAMETERS FROM PRIMARY SOURCES

Key CWRM Parameter	Primary Data
<b>Water sources</b>	
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	
<b>Canal network</b>	
Length of Main Canal	Block level officer/ GP level assistants
Length of Minor Canal	
Length of Distributaries	
Water Courses (Field Channels)	
<b>Traditional water bodies</b>	
Number of Tanks (PWD & Union)	Block level officer/ GP level assistants
Number of Ooranis	
Other Surface Water Bodies	
<b>Crop details</b>	
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
<b>Water Demand</b>	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	
<b>Annual Greywater Generation</b>	Standard Norms are in Annexure 3.5
<b>Available Runoff</b>	Strange table method (based on rainfall, land area)
<b>Run Off Conserved</b>	Formula (based on tank storage, built up, linear measurement)
Estimated Soil Moisture	calculation & formula
ET Losses	calculation & formula
<b>Means of Water Extraction (Gravity/Lifting)</b>	(Number of Gravity or lifting /Total number of extraction)*100
<b>Irrigation Methods (Wild/Control)</b>	(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 sloppy lands with dense forest cover and areas where the ground is covered with a reduced rate of infiltration. It includes area under forest, area under non-agricultural use, barren and un-cultivable lands, and area under permanent pastures and other grazing land areas.

**Average catchment area:** It denotes the land uses related to the types of land under miscellaneous tree crops, culturable waste, and fallow land other than current fallow areas where the land surfaces are undulated terrain, moderately sloppy along with a medium infiltration rate.

**Bad catchment area:** It covers the area where the terrain is flat with very less vegetative cover, the land use categories under current fallow, total unirrigated and irrigated area with less surface runoff

## ANNEXURE 3.5

## STANDARD NORMS FOR GREY WATER GENERATION CALCULATION

	Waste water generation Source	Per day/unit waste water generation in L (Standard Value)
1	Bathing	15
2	Washing	10
3	Toilet	10
4	Cleaning	5
5	Cooking and cleaning Utensils	5
6	Others	5
	<b>Total</b>	<b>50</b>
	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
	<b>Total</b>	<b>50*total population</b>
	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
	<b>Total</b>	<b>(Total daily volume of grey water in litres *365)/ 1000</b>
	<b>Annual Grey water generated in HaM</b>	<b>Annual Grey water in Cum/10000</b>

## 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)	Tradational Water bodies		
			Length of Main Canal	Length of Minor Canal	Length of Distributaries	Number of Tanks (PWD & Union)		Number of Ooranis	Other Surface Water Bodies	
			metre	metre	metre	metre	Number	Number	Number	
Type 1		Unit								
		Arayalam	0	2209	2009	0	2	0	3	
		Athimalaipattu	0	1541	4165	0	2	0	4	
		Agaram	0	0	0	1250	4	3	6	
		Kolathur	0	3353	2203	0	0	3	7	
		Kamakur	0	6998	1691	0	0	0	8	
		Karipur	0	2022	2960	0	5	0	7	
		Murugamangalam	0	1734	3447	0	4	0	12	
		Marusoor	0	565	2757	0	2	5	7	
		Kattukanallur	0	11240	2245	0	2	8	8	
		Muduraiperumattur	0	735	1727	0	2	0	4	
		Pulavanpadi	0	2489	3227	0	5	0	12	
		Puthur	0	1734	3447	0	3	0	12	
		Sadupperipalayam	0	3704	1548	2095	5	0	6	
	Type 2		Thatchur	0	0	3500	0	3	5	6
		Andipalayam	0	1750	796	0	2	0	4	
		Vannankulam	0	1056	0	0	2	0	8	
		Pungampadi	0	0	842	0	2	3	6	
		Malayampattu	0	819	925	0	2	0	4	
		Kilnagar	0	0	0	0	2	0	4	
		Palayaekambaranallur	0	1962	1479	0	2	0	6	
		Iyyampalayam	0	1910	2140	0	2	0	5	
		Kongarampattu	0	2209	2009	0	2	0	4	

S No	Key CWRM Parameter	Gram Panchayat	Canal network				Tradational Water bodies		
			Length of Main Canal	Length of Minor Canal	Length of Distributaries	Water Courses (Field Channels)	Number of Tanks (PWD & Union)	Number of Ooranis	Other Surface Water Bodies
	Unit		metre	metre	metre	metre	Number	Number	Number
Type 2	Appanallur		0	2209	2009	0	2	0	4
	Alagusenai		0	2209	2009	0	2	0	4
	Melnagar		0	2209	2009	0	2	0	4
	Onnupuram		0	2009	2009	0	2	0	4
	Ramasanikuppam		0	2209	2009	0	2	0	4
	Thacharampattu		0	2209	2009	0	2	0	4
	Sambuvarayanallur		0	2209	2009	0	2	0	4
	Thellur		0	2209	2009	0	2	0	4
	Pudupalayam		0	2209	2009	0	2	2	4
	Rantham		0	2209	2009	0	2	0	4
Type 5	Nadukuppam		0	2209	2009	0	2	0	4
	Kunnathur		0	1265	654	0	5	0	0
	Mullipattu		0	652	316	0	4	0	8
	Devikapuram		0	0	300	0	4	0	12
	Vinnamangalam		0	3000	2365	0	3	0	5

S No	Key CWRM Parameter	Gram Panchayat	Irrigation Facilities			Water Quality	
			Area under Tank Irrigation	Area under Canal Irrigation	Area under Open & Tube Well Irrigation	Chemical Contaminants	Bacterial and Other Contaminants
		Unit	ha	ha	ha	Number of Sample	Number of Sample
Type 1		Arayalam	0	0	250.3	0	0
		Athimalaipattu	10	0	62.66	0	0
		Agaram	83.72	0	80.68	0	0
		Kolathur	68.65	0	155.95	0	0
		Kamakur	0	0	209.15	0	0
		Karipur	0	0	223	0	0
		Murugamangalam	41.73	0	193.55	0	0
		Marusoor	20.9	0	106.15	0	0
		Kattukanallur	0	0	329.37	0	0
		Muduraiperumattur	43.51	0	145.16	0	0
		Pulavanpadi	67	0	260.02	0	0
		Puthur	16.43	0	193.55	0	0
		Sadupperipalayam	65.96	0	92.9	0	0
		Thatchur	78.8	0	160.85	0	0
		Andipalayam	0	0	278.78	0	0
	Type 2		Vannankulam	63.3	0	182.11	0
		Pungampadi	0	0	205.37	0	0
		Malayampattu	0	0	205.37	0	0
		Kilnagar	0	0	203.26	0	0
		Palayackambaranallur	18.96	0	94.63	0	0
		Iyyampalayam	45.35	0	92.05	0	0
		Kongarampattu	45.35	0	92.05	0	0
		Appanallur	45.35	0	92.05	0	0
		Alagusenai	45.35	0	92.05	0	0
		Melnagar	0	0	154.01	0	0



S No	Key CWRM Parameter	Gram Panchayat	Irrigation Facilities			Water Quality	
			Area under Tank Irrigation	Area under Canal Irrigation	Area under Open & Tube Well Irrigation	Chemical Contaminants	Bacterial and Other Contaminants
		Unit	ha	ha	ha	Number of Sample	Number of Sample
Type 2		Onnupuram	0	0	154.01	0	0
		Ramasanikuppam	0	0	154.01	0	0
		Thacharampattu	0	0	214.95	0	0
		Sambuvarayanallur	0	0	214.95	0	0
		Theellur	0	0	250.5	0	0
		Pudupalayam	0	0	203.26	0	0
		Rantham	0	0	94.63	0	0
		Nadukuppam	0	0	214.95	0	0
		Kunnathur	0	0	178	0	0
		Mullipattu	0	0	158.38	0	0
Type 5		Devikapuram	38.38	0	247.41	0	0
		Vinnamangalam	95.67	0	109.48	0	0

S No	Key CWRM Parameter	Gram Panchayat	Available Runoff		Bad Catchment Area	Length of Natural Drainage Lines	Watershed and Drainage Networks	
			Good Catchment Area	Average Catchment Area			Natural Drainage Lines	Micro-watersheds
		Unit	Ha - M	Ha - M	Area	metre	Number	Number
Type 1		Arayalam	53.2	0	102.2	4218	4	3
		Athimalaipattu	123	0.9	94.5	5706	7	6
		Agaram	72.8	1.4	105.8	3043	3	4
		Kolathur	53.2	1.7	116.9	5555.92	6	5
		Kamakur	62.9	25.3	95.1	8689	7	4
		Karipur	61.2	11.6	145.7	4982	7	8
		Murugamangalam	36.3	10.8	110.9	9086.56	17	6
		Marusoor	36.8	3.3	79.1	3322	5	5
		Kattukanallur	61.6	3	82.5	18207	14	8
		Muduraiperumattur	37.5	3.4	74.5	2462	4	8
		Pulavanpadi	78.2	3.4	133.5	5715.21	5	6
		Puthur	134.6	2.3	77.8	5180.31	7	6
		Sadupperipalayam	35.6	1	71.7	7346.3	11	5
		Thatchur	143.1	0	193.7	6774.47	7	8
		Andipalayam	12	1.2	29.2	6204	5	3
	Type 2		Vannankulam	36.1	3.5	87.5	3838.57	2
		Pungampadi	67.8	0	99.6	2167.96	4	4
		Malayampattu	67.8	0	99.6	5069.28	5	4
		Kilnagar	34.7	1.6	86.5	2808.55	3	3
		Palayaekambaranallur	21.8	0.2	50.6	4672.07	5	5
		Iyyampalayam	38.8	0.3	90	7844.1	7	6
		Kongarampattu	20.6	0	131.3	2936.56	5	2
		Appanallur	20.6	0	131.3	2253.8	3	5
		Alagusenai	20.6	0	131.3	4095	4	3
		Melnagar	86.2	3	120.7	87.46	3	3

S No	Key CWRM Parameter	Gram Panchayat	Available Runoff		Bad Catchment Area	Length of Natural Drainage Lines	Watershed and Drainage Networks	
			Good Catchment Area	Average Catchment Area			Natural Drainage Lines	Micro-watersheds
		Unit	Ha - M	Ha - M	Ha - M	metre	Number	Number
Type 2		Onnupuram	86.2	3	120.7	3907.96	5	6
		Ramasanikuppam	86.2	3	120.7	154.81	2	3
		Thacharampattu	39.1	1.6	88	4629	7	2
		Sambuvarayanallur	39.1	1.6	88	4629	1	4
		The llur	65.2	0	124	5624.81	6	4
		Pudupalayam	34.7	1.6	86.5	7539	4	6
		Rantham	65.2	0	124	1695.13	3	4
		Nadukuppam	39.1	1.6	88	4629	7	3
		Kunnathur	48.6	3.3	80.1	12199.65	7	7
		Mullipattu	63	0.2	111.8	6279.33	7	4
Type 5		Devikapuram	44.7	0	138.2	7390.29	7	8
		Vinnamangalam	66	0.1	108.7	3051.11	6	7

S No	Key CWRM Parameter	Gram Panchayat			Water Demand			GW utilization			SW utilization		
		Drinking	Livestock	Agriculture	Drinking	Livestock	Agriculture	Drinking	Livestock	Agriculture	Drinking	Livestock	Agriculture
	Unit	Ha - M	Ha - M	Ha - M	%	%	%	%	%	%	%	%	
Type 1	Arayalam	0	3.83	143.44	2	7	100	98	93	0	0	0	
	Athimalaipattu	9.38	3.69	383.06	80	96	96	20	4	4	4	4	
	Agaram	6.21	1.8	234.14	76	94	97	24	6	3	3	3	
	Kolathur	13.54	3.56	555.23	91	98	96	9	2	4	4	4	
	Kamakur	13.42	4.87	596.57	0	0	100	100	100	0	0	0	
	Karipur	6.34	3.24	381.43	77	97	99	23	3	1	1	1	
	Murugamangalam	4.72	3.54	201.68	94	92	99	6	8	1	1	1	
	Marusoor	5.24	2.02	165.31	83	92	99	17	8	1	1	1	
	Kattukanallur	23.15	5.58	257.9	15	96	96	85	4	4	4	4	
	Muduraiperumattur	5.76	2.33	150.91	74	93	99	26	7	1	1	1	
	Pulavanpadi	9.37	3.58	306.23	75	98	98	25	2	2	2	2	
	Puthur	9.2	3.54	162.59	84	92	93	16	8	7	7	7	
	Sadupperipalayam	4.25	1.27	262.14	40	87	98	60	13	2	2	2	
	Thatthur	12.36	6.1	590.23	81	93	99	19	7	1	1	1	
Type 2	Andipalayam	14.67	5.03	360.15	0	0	95	100	100	5	5	5	
	Vannankulam	10.65	2.89	153.05	68	93	94	32	7	6	6	6	
	Pungampadi	5.71	1.89	391.86	54	98	100	46	2	0	0	0	
	Malayampattu	4.43	1.89	391.86	2	98	100	98	2	0	0	0	
	Kilnagar	5.5	7.2	124.23	1	94	97	99	6	3	3	3	
	Palayaekambaranallur	5.69	1.86	330.75	73	95	96	27	5	4	4	4	
	Iyyampalayam	7.37	3.3	330.75	83	95	96	17	5	4	4	4	
	Kongarampattu	7.38	7.73	422.46	80	95	97	20	5	3	3	3	
	Appanallur	9.12	7.73	422.46	80	95	97	20	5	3	3	3	
	Alagusenai	3.6	7.73	422.46	80	95	97	20	5	3	3	3	
	Melnagar	4.65	5.61	217.8	0	97	94	100	3	6	6	6	
	Onnupuram	10.06	5.61	217.8	1	97	94	99	3	6	6	6	
	Ramasanikuppam	5.18	5.61	217.8	1	97	94	99	3	6	6	6	

S No	Key CWRM Parameter	Gram Panchayat	Water Demand			GW utilization			SW utilization		
			Drinking	Livestock	Agriculture	Drinking	Livestock	Agriculture	Drinking	Livestock	Agriculture
	Unit		Ha - M	Ha - M	Ha - M	%	%	%	%	%	%
Type 2	Thacharampattu		2.86	6.67	319.49	1	0	100	99	100	0
	Sambuvarayanallur		4.26	6.67	319.49	1	92	100	99	8	0
	Thellur		4.97	4.61	279.85	1	96	99	99	4	1
	Pudupalayam		5.83	7.2	124.23	0.80	0.94	0.97	0.20	0.06	0.03
	Rantham		2.88	4.61	279.85	0.01	0.96	0.99	0.99	0.04	0.01
Type 5	Nadukuppam		4.38	6.67	319.49	0.00	0.00	1.00	1.00	1.00	0.00
	Kunnathur		10.56	3.7	306.68	0.01	0.97	0.99	0.99	0.03	0.01
	Mullipattu		13.57	4.93	268.12	0.00	0.00	0.95	1.00	1.00	0.05
	Devikapuram		26.83	3.19	313.1	0.62	0.82	0.94	0.38	0.18	0.06
	Vinnamangalam		8.02	4.03	330.24	0.68	0.94	1.00	0.32	0.06	0.00

## ANNEXURE 3.7

## GP WISE STATUS OF AGRICULTURE RESOURCE

S No	Key CWRM Parameter	Gram Panchayat	Land Resources											
			Area under Forest land	Area under Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Area under Permanent Pastures and Other Grazing Land	Area under Land Under Miscellaneous Tree Criticalops etc.	Area under Culturable Waste Land	Area under Fallows Land other than Current Fallows	Area under Current Fallow land	Area under Unirrigated Land	Area Irrigated by Source		
		Unit	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1		Arayalam	0	124.49	17.46	0	0	0	0	0	193.59	102.83	250.3	
		Athimalaipattu	0	324.37	3.75	3.01	0	0	0.18	0	117.83	324.58	62.86	
		Agaram	0	186.75	7.5	5	0	0	0	0	418.75	66.1	80.68	
		Kolathur	0	131.87	10	6.2	0	0	0	0	356.67	62.3	155.93	
		Kamakur	0	163.52	4.3	0	0.54	0	89.64	50	179.54	69.84	209.15	
		Karipur	0	163.52	4.3	0	0.54	0	89.64	50	179.54	69.84	209.15	
		Murugamangalam	0	95.91	0.94	0	0.89	0	37.41	100.54	312.58	28.09	152.1	
		Marusoor	0	98.24	0	11.82	0	0	0	0	307.01	9.64	106.15	
		Kattukanallur	0	163.52	4.3	0	0.54	0	89.64	50	179.54	69.84	209.15	
		Muduraiperumattur	0	100.02	0	11.55	0	0	0.5	0	205.59	47.69	145.16	
		Pulavanpadi	0	203.55	5.01	0	11.15	0	1.01	40	398.56	15.33	260.02	
		Puthur	0	339.88	19	2	6.15	0	0	0	80.87	101.31	233.82	
		Sadupperipalayam	0	94.92	0	2.82	0	0	0.75	0	188.66	101.63	92.9	
		Thatchur	0	381.65	0	0	0	0	0	0	624.64	171.31	239.65	
Type 2		Andipalayam	0	31.44	0.61	2.84	1.37	0	0	20	49.72	40.8	45.53	
		Vannankulam	0	94.32	1.82	8.52	4.1	0	0	60	149.16	122.41	136.58	
		Pungampadi	0	163.52	4.3	0	0.54	0	89.64	50	179.54	69.84	209.15	
		Malayampattu	0	163.52	4.3	0	0.54	0	89.64	50	179.54	69.84	209.15	
		Kilnagar	0	163.52	4.3	0	0.54	0	89.64	50	179.54	69.84	209.15	
		Palayaekambaranallur	0	54.6	3.6	0	0.65	0	0	22.83	58.82	89.5	99.64	
		Iyyampalayam	0	97.08	6.4	0	1.15	0	0	40.59	104.58	159.1	177.14	

S No	Key CWRM Parameter	Gram Panchayat	Land Resources											
			Area under Forest land	Area under Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Area under Permanent Pastures and Other Grazing Land	Area under Land Under Miscellaneous Tree Criticalops etc.	Area under Culturable Waste Land	Area under Fallows Land other than Current Fallows	Area under Current Fallow land	Area under Unirrigated Land	Area Irrigated by Source		
		<b>Unit</b>	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
<b>Type 2</b>		<b>Kongarampattu</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Appanallur</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Alagusenai</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Melnagar</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Onnupuram</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Ramasanikuppam</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Thacharampattu</b>	0	87.95	16.21	0.95	0	4.75	0	99.56	156.14	214.95		
		<b>Sambuvarayanallur</b>	0	87.95	16.21	0.95	0	4.75	0	99.56	156.14	214.95		
		<b>Thellur</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Pudupalayam</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
<b>Type 5</b>		<b>Rantham</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Nadukuppam</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Kunnathur</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Mullipattu</b>	0	163.52	4.3	0	0.54	89.64	50	179.54	69.84	209.15		
		<b>Devikapuram</b>	0	119.1	0	0	0	0	125.01	355.3	11.51	247.41		
		<b>Vinnamangalam</b>	0	175.15	0.83	0	0	0.27	0	411.77	59.98	109.49		

S No	Key CWRM Parameter	Gram Panchayat	Catchment Area			Crop Details				
			Land under Good Catchment	Land under Average Catchment	Land under Bad Catchment	Irrigated Area	Rainfed area	Area under Paddy Cultivation/ Irrigated	Crop Water Requirement - Irrigated condition	Crop Water Requirement - Rainfed condition
		<b>Unit</b>	ha	ha	ha	ha	ha	ha	Ha - M	Ha - M
<b>Type 1</b>		Arayalam	141.95	0	546.72	96.73	0.19	91	143.374	0.0665
		Athimalaipattu	328.12	3.19	505.27	261.9	33.21	178	366.96	16.1025
		Agaram	194.25	5	565.53	174.565	16.785	134.485	227.54625	6.5925
		Kolathur	141.87	6.2	624.9	381.48	51.425	320.325	533.179	22.0495
		Kamakur	167.82	90.18	508.53	404.89	4.005	389.845	594.74525	1.82475
		Karipur	167.82	90.18	508.53	6.99	0	1.5	0	2.4465
		Murugamangalam	96.85	38.3	593.31	145.735	2	122.36	200.4845	1.2
		Marusoor	98.24	11.82	422.8	116.255	4.045	106	163.819	1.49075
		Kattukanallur	167.82	90.18	508.53	185.18	20.46	93.625	248.55025	9.351
		Muduraiperumattur	100.02	12.05	398.44	105.2	2.6	77	149.7	1.21
		Pulavanpadi	208.56	12.16	713.91	228.8	17	184	298.775	7.45
		Puthur	358.88	8.15	416	112.8	22.53	56.44	151.3195	11.274
		Sadupperipalayam	94.92	3.57	383.19	200.45	12	155	256.435	5.7
		Thatchur	381.65	0	1035.6	428.68	17.405	367.43	583.5705	6.663
<b>Type 2</b>		Andipalayam	32.05	4.21	156.05	22	43	1.5	9.8	20.7
		Vannankulam	96.14	12.62	468.15	112.5	22	81	143.25	9.8
		Pungampadi	167.82	90.18	508.53	262.59	1.31	260	391.072	0.786
		Malayampattu	167.82	90.18	508.53	262.59	1.31	260	391.072	0.786
		Kilnagar	167.82	90.18	508.53	85.545	12.38	48	119.89925	4.333
		Palayaekambaranallur	58.2	0.65	270.79	231.505	34.735	178	318.4655	12.28225
		Iyyampalayam	103.48	1.15	481.41	231.505	34.735	178	318.4655	12.28225
		Kongarampattu	167.82	90.18	508.53	318.905	23.41	150.99	411.8645	10.5965
		Appanallur	167.82	90.18	508.53	318.905	23.41	150.99	411.8645	10.5965
		Alagusenai	167.82	90.18	508.53	318.905	23.41	150.99	411.8645	10.5965
		Melnagar	167.82	90.18	508.53	152.16	26.325	100.24	205.272	12.53175
		Onnupuram	167.82	90.18	508.53	152.16	26.325	100.24	205.272	12.53175



S No	Key CWRM Parameter	Gram Panchayat	Catchment Area			Crop Details				
			Land under Good Catchment	Land under Average Catchment	Land under Bad Catchment	Irrigated Area	Rainfed area	Area under Paddy Cultivation/ Irrigated	Crop Water Requirement - Irrigated condition	Crop Water Requirement - Rainfed condition
		Unit	ha	ha	ha	ha	ha	ha	Ha - M	Ha - M
Type 2		Ramasanikuppam	167.82	90.18	508.53	152.16	26.325	100.24	205.272	12.53175
		Thacharampattu	104.16	5.7	470.65	228.95	2.185	203.07	318.7265	0.76475
		Sambuvarayanallur	104.16	5.7	470.65	228.95	2.185	203.07	318.7265	0.76475
		The llur	167.82	90.18	508.53	225.415	8.075	152.425	276.626	3.2275
		Pudupalayam	167.82	90.18	508.53	85.545	12.38	48	119.89925	4.333
		Rantham	167.82	90.18	508.53	225.415	8.075	152.425	276.626	3.2275
Type 5		Nadukuppam	167.82	90.18	508.53	228.95	2.185	203.07	318.7265	0.76475
		Kunnathur	167.82	90.18	508.53	230.23	3.79	180.19	304.8755	1.8005
		Mullipattu	167.82	90.18	508.53	191.57	30.175	108.79	253.379	14.74175
		Devikapuram	119.1	0	739.23	245.878	40.835	164	292.9307	20.16775
		Vinnamangalam	175.98	0.27	581.24	220.16	0	220.16	330.24	0

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		Arayalam	4	91	3	1	0	28	72	0	0	0	0	0	
		Athimalaipattu	1	99	0	0	0	12	88	0	0	0	0	0	
		Agaram	1	99	0	0	0	23	77	0	0	0	0	0	
		Kolathur	0	100	0	0	0	23	77	0	0	0	0	0	
		Kamakur	3	98	0	0	0	30	69	1	0	0	0	0	
		Karipur	2	98	0	0	0	25	75	0	0	0	0	0	
		Murugamangalam	4	96	0	0	0	19	81	0	0	0	0	0	
		Marusoor	2	98	0	0	0	33	67	0	0	0	0	0	
		Kattukanallur	3	97	0	0	0	44	56	0	0	0	0	0	
		Muduraiperumattur	0	100	0	0	0	12	88	0	0	0	0	0	
		Pulavanpadi	2	98	0	0	0	8	92	0	0	0	0	0	
		Puthur	18	82	0	0	0	55	45	0	0	0	0	0	
		Sadupperipalayam	0	100	0	0	0	50	50	0	0	0	0	0	
		Thatchur	1	99	0	0	0	24	76	0	0	0	0	0	
	Type 2		Andipalayam	0	95	3	2	0	0	75	25	0	0	0	0
			Vannankulam	1	99	0	0	0	16	84	0	0	0	0	0
		Pungampadi	1	99	0	0	0	15	85	0	0	0	0	0	
		Malayampattu	4	91	3	1	0	28	72	0	0	0	0	0	
		Kilnagar	0	100	0	0	0	31	69	0	0	0	0	0	
		Palayaekambaranallur	4	91	3	1	0	28	72	0	0	0	0	0	
		Iyyampalayam	0	100	0	0	0	28	72	0	0	0	0	0	
		Kongarampattu	28	72	0	0	0	0	16	81	3	0	0	0	
		Appanallur	10	55	36	0	0	29	62	7	0	0	2	0	
		Alagusenai	4	91	3	1	0	28	72	0	0	0	0	0	
		Melnagar	0	100	0	0	0	19	81	0	0	0	0	0	
		Omnipuram	4	91	3	1	0	28	72	0	0	0	0	0	
		Ramasanikuppam	4	91	3	1	0	28	72	0	0	0	0	0	
		Thacharampattu	4	91	3	1	0	28	72	0	0	0	0	0	
	Sambuvarayanallur	4	91	3	1	0	28	72	0	0	0	0	0		

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 2		Thellur	10	86	3	0	0	41	59	0	0	0	0
		Pudupalayam	17	83	0	0	0	66	34	0	0	0	0
		Ranham	0	89	11	0	0	0	94	6	0	0	0
		Nadukuppam	7	90	2	0	0	45	55	0	0	0	0
Type 5		Kunnathur	0	56	44	0	0	0	95	5	0	0	0
		Mullipattu	3	97	0	0	0	21	79	0	0	0	0
		Devikapuram	3	97	0	0	0	16	84	0	0	0	0
		Vinnamangalam	0	100	0	0	0	13	87	0	0	0	0

S No	Key CWRM Parameter	Gram Panchayat	Status of Soil Micro Nutrients		Status of Physical condition of the soil									
			Sufficient	Deficient	Acidic Sulphate (AS)	Strongly Acidic (SrAc)	Highly Acidic (HAc)	Moderately Acidic (MAc)	Slightly Acidic (SlAc)	Neutral (N)	Moderately Alkaline (MAI)	Strongly Alkaline (SIAl)		
			%	%	%	%	%	%	%	%	%	%	%	%
Type 1		Unit												
		Arayalam	61	39	0	0	0	0	10	12	78	0	0	0
		Athimalaipattu	63	37	0	0	0	0	0	0	100	0	0	0
		Agaram	62	38	0	0	0	0	0	0	100	0	0	0
		Kolathur	62	38	0	0	0	0	65	19	16	0	0	0
		Kamakur	49	51	0	0	0	0	25	3	72	0	0	0
		Karipur	28	72	0	0	0	0	0	0	100	0	0	0
		Murugamangalam	63	37	0	0	0	0	0	1	99	0	0	0
		Marusoor	50	50	0	0	0	0	0	0	100	0	0	0
		Kattukanallur	61	39	0	0	0	0	0	0	100	0	0	0
		Muduraiperumattur	61	39	0	0	0	32	41	0	26	0	0	0
		Pulavanpadi	59	41	0	0	0	0	0	0	100	0	0	0
		Puthur	67	33	0	0	0	0	0	1	99	0	0	0
		Sadupperipalayam	75	25	0	0	0	0	0	0	100	0	0	0
		Thatchur	63	37	0	0	0	0	0	0	100	0	0	0
	Type 2		Andipalayam	0	100	0	0	0	0	0	0	98	0	2
		Vannankulam	64	36	0	0	0	5	11	0	84	0	0	0
		Pungampadi	62	38	0	0	0	0	1	0	99	0	0	0
		Malayampattu	58	42	0	0	0	0	0	0	100	0	0	0
		Kilnagar	61	39	0	0	0	0	24	8	69	0	0	0
		Palayaekambaranallur	58	42	0	0	0	0	0	0	98	0	2	0
		Iyyampalayam	64	36	0	0	0	0	0	0	100	0	0	0
		Kongarampattu	58	42	0	0	0	0	0	0	0	0	0	0
		Appanallur	55	45	0	0	0	33	5	0	62	0	0	0
		Alagusenai	58	42	0	0	0	0	0	0	97	0	3	0
		Melnagar	41	59	0	0	0	0	0	3	97	0	0	0
		Onnupuram	58	42	0	0	0	0	0	0	100	0	0	0
	Ramasanikuppam	58	42	0	0	0	0	0	0	100	0	0	0	

S No	Key CWRM Parameter	Gram Panchayat	Status of Soil Micro Nutrients		Status of Physical condition of the soil								
			Sufficient	Deficient	Acidic Sulphate (AS)	Strongly Acidic (SrAc)	Highly Acidic (HAc)	Moderately Acidic (MAc)	Slightly Acidic (SIAc)	Neutral (N)	Moderately Alkaline (MAI)	Strongly Alkaline (SLAI)	
			%	%	%	%	%	%	%	%	%	%	%
Type 2	Unit												
	Thacharampattu		58	42	0	0	0	0	0	0	0	100	0
	Sambuvarayanallur		58	42	0	0	0	0	0	0	0	100	0
	The llur		60	40	0	0	0	0	0	7	0	93	0
	Pudupalayam		52	48	0	0	0	0	0	0	0	100	0
	Rantham		56	44	0	0	0	0	0	0	17	83	0
	Nadukuppam		54	46	0	0	0	0	0	0	0	100	0
	Kunnathur		53	47	0	0	0	0	0	2	11	71	0
Type 5	Mullipattu		56	44	0	0	0	0	0	0	0	100	0
	Devikapuram		44	56	0	0	0	0	0	77	9	14	0
	Vinnamangalam		61	39	0	0	0	0	0	0	0	100	0

S No	Key CWRM Parameter	Gram Panchayat	Soil Texture				Soil moisture and ET				Means of Water Extraction	
			% of Clay Soil	% of Fine Soil	% of Coarse loamy	Soil Water Permeability	Volumetric Soil Moisture	Estimated Soil Moisture	ET Losses	Gravity	Lifting	
		Unit	%	%	%	Low, Moderate, high	%	Ha - M	Ha - M	%	%	
Type 1		Arayalam	0	100	0	Moderate	23	129.7614	283.91652	20	80	
		Athimalaipattu	0	98	0	Moderate	23	117.8083	313.9218	4	96	
		Agram	19	66	0	Moderate	23	132.9469	122.03112	9	91	
		Kolathur	1	53	33	Moderate	23	147.453	180.44172	2	98	
		Kamakur	0	88	0	Moderate	23	138.6923	224.74212	0	100	
		Karipur	0	95	0	Moderate	23	138.6923	224.74212	0	100	
		Murugamangalam	5	74	0	Moderate	23	145.4865	145.58832	3	97	
		Marusoor	0	69	21	Moderate	23	99.9626	102.59844	3	97	
		Kattukanallur	3	5	75	high	23	138.6923	224.74212	0	100	
		Muduraiperumattur	0	86	0	Moderate	23	94.4127	164.3376	4	96	
		Pulavanpadi	0	91	0	Moderate	23	168.1484	230.346	4	96	
		Puthur	0	89	0	Moderate	23	101.9245	275.99712	3	97	
		Sadupperipalayam	0	84	0	Moderate	23	88.9548	158.6694	10	90	
		Thatchur	3	61	21	Moderate	23	238.188	330.41184	3	97	
Type 2		Andipalayam	0	38	0	Moderate	23	37.0001	47.26188	3	97	
		Vannankulam	3	82	7	Moderate	23	110.9957	218.37444	3	97	
		Pungampadi	0	100	0	Moderate	23	138.6923	224.74212	22	88	
		Malayampattu	0	100	0	Moderate	23	138.6923	224.74212	2	98	
		Kilnagar	0	1	99	High	23	138.6923	224.74212	3	97	
		Palayaeambaranallur	1	55	39	Moderate	23	63.2592	152.59116	3	97	
		Iyyampalayam	7	46	39	Moderate	23	112.4608	271.26156	3	97	
		Kongarampattu	0	93	0	Moderate	23	138.6923	224.74212	4	96	
		Appanallur	0	27	73	high	23	138.6923	224.74212	5	95	
		Alagusenai	0	100	0	Moderate	23	138.6923	224.74212	3	97	
	Melnagar	0	26	72	high	23	138.6923	224.74212	0	100		
	Onnupuram	6	56	27	Moderate	23	138.6923	224.74212	4	96		

S No	Gram Panchayat	Soil Texture				Soil moisture and ET			Means of Water Extrac- tion	
		% of Clay Soil	% of Fine Soil	% of Coarse loamy	Soil Water Permeability	Volumetric Soil Moisture	Estimated Soil Moisture	ET Losses	Gravity	Lifting
	Unit	%	%	%	Low, Moderate, high	%	Ha - M	Ha - M	%	%
Type 2	Ramasanikuppam	20	60	20	Moderate	23	138.6923	224.74212	2	98
	Thacharampattu	0	100	0	Moderate	23	113.2888	299.12016	2	98
	Sambuvarayanallur	0	90	1	Moderate	23	113.2888	299.12016	5	95
	Thellur	0	100	0	Moderate	23	138.6923	224.74212	2	98
	Pudupalayam	8	55	32	Moderate	23	138.6923	224.74212	3	97
Type 5	Rantham	0	100	0	Moderate	23	138.6923	224.74212	2	98
	Nadukuppam	0	100	0	Moderate	23	138.6923	224.74212	2	98
	Kunnathur	0	100	0	Moderate	23	138.6923	145.91466	0	100
	Mullipattu	0	100	0	Moderate	23	138.6923	224.74212	2	98
	Devikapuram	3	81	0	Moderate	23	170.0229	208.17168	4	96
	Vinnamangalam	0	79	4	Moderate	23	133.9382	136.25388	6	94

S No	Key CWRM Parameter	Gram Panchayat	Irrigation Methods		Livestock				
			Wild Flooding	Control Flooding	Cattle	Sheep	Goat	Poultry	
		Unit	%	%	Number	Number	Number	Number	
Type 1		Arayalam	0	100	907	606	560	0	
		Athimalaipattu	14	86	971	63	269	0	
		Agaram	51	49	462	94	203	0	
		Kolathur	31	69	952	79	92	0	
		Kamakur	0	100	1156	785	380	0	
		Karipur	0	100	860	60	227	0	
		Murugamangalam	18	82	895	127	405	0	
		Marusoor	16	84	510	290	137	0	
		Kattukanallur	0	100	1468	106	432	0	
		Muduraiperumattur	23	77	593	389	36	0	
		Pulavanpadi	20	80	959	122	36	0	
		Puthur	8	92	895	127	495	0	
		Sadupperipalayam	42	58	302	336	105	0	
		Thatchur	33	67	1556	634	394	0	
		Andipalayam	0	100	326	81	149	0	
	Type 2		Vannankulam	26	74	971	242	446	0
			Pungampadi	0	100	510	0	37	0
		Malayampattu	0	100	510	0	37	0	
		Kilnagar	0	100	1862	608	432	0	
		Palayaekambaranallur	17	83	483	92	118	0	
		Iyyampalayam	33	67	858	164	209	0	
		Kongarampattu	0	100	2013	222	732	0	
		Appanallur	0	100	2013	222	732	0	
		Alagusenai	0	100	2013	222	732	0	
		Melnagar	0	100	1476	228	147	0	
	Onnupuram	0	100	1476	228	147	0		



S No	Key CWRM Parameter	Gram Panchayat	Irrigation Methods		Livestock			
			Wild Flooding	Control Flooding	Cattle	Sheep	Goat	Poultry
		Unit	%	%	Number	Number	Number	Number
Type 2		Ramasanikuppam	0	100	1476	228	147	0
		Thacharampattu	0	100	1680	514	312	0
		Sambuvarayanallur	0	100	1680	514	312	0
		Thehellur	0	100	1209	466	40	0
		Pudupalayam	0	100	1862	608	432	0
		Rantham	0	100	1209	466	40	0
		Nadukuppam	0	100	1680	514	312	0
		Kunnathur	0	100	979	342	0	0
		Mullipattu	0	100	1179	1336	270	0
		Devikapuram	13	87	715	618	869	0
Type 5		Vinnamangalam	47	53	1044	236	352	0



S No	Key CWRM Parameter	Geographical Area	Male Population	Female Population	Total Population	Population density	SC Population	ST Population	Vulnerable population	Households (HH's)	Only one room HH's
	Unit	ha	Number	Number	Number	Number	Number	Number	Number	Number	Number
Type 2	Onnupuram	509	1849	1825	3674	722	645	0	645	1726	100
	Ramasanikuppam	170	945	948	1893	1114	16	49	65	1726	100
	Thacharampattu	93	523	523	1046	1125	179	0	179	1061	83
	Sambuvarayanallur	335	760	797	1557	465	676	11	687	1192	54
	Thellur	570	889	928	1817	319	117	0	117	697	16
	Pudupalayam	314	1043	1088	2131	679	324	0	324	994	74
	Ranatham	234	539	512	1051	449	160	21	181	697	16
	Nadukuppam	155	820	780	1600	1032	0	0	0	1061	83
	Kunnathur	570	1888	1969	3857	677	663	1	664	1115	184
	Mullipattu	767	2537	2419	4956	646	675	6	681	1052	14
Type 5	Devikapuram	858	4926	4874	9800	1142	1195	41	1236	2197	248
	Vinnamangalam	757	1483	1448	2931	387	369	0	369	719	131

S No	Key CWRM Parameter	Female Headed HH's	Vulnerable Households	% of Vulnerable Households	Registered MGNREGA Job cards	Active person working in MGNREGA job Cards	Sources of Drinking Water	HH's have tap water connection for drinking water	HH's dependent on other sources for drinking water	Annual Greywater Generation
	Unit	Number	Number	%	Number	Number	Number	Number	Number	Ha - M
Type 1	Arayalam	18	51	0.19	1186	868	1239	0	667	4.98
	Athimalaipattu	43	49	0.06	817	684	817	0	816	6.26
	Agaram	42	88	0.16	845	658	1240	0	667	4.14
	Kolathur	66	103	0.09	1126	854	539	542	1052	9.03
	Kamakur	62	69	0.0694	1410	1159	1211	0	1153	8.94
	Karipur	46	47	0.0816	907	712	619	0	578	4.22
	Murugamangalam	18	40	0.11	511	407	156	0	506	3.14
	Marusoor	26	16	0.03	804	611	524	22	501	3.49
	Kattukanallur	97	126	0.0695	1607	948	624	808	1266	15.44
	Muduraiperumattur	28	32	0.08	721	548	453	0	481	3.84
	Pulavanpadi	60	57	0.07	1236	814	549	0	796	6.25
	Puthur	60	64	0.08	908	689	164	0	815	6.14
	Sadupperipalayam	99	60	0.05	446	333	335	0	357	2.83
	Thatthur	49	26	0.04	1352	1095	141	0	80	8.24
Type 2	Andipalayam	66	103	0.187273	158	80.91	1239	0	667	2.37
	Vannankulam	59	56	0.07	855	666	142	0	111	7.1
	Pungampadi	62	47	0.0525	609	493	247	0	116	3.8
	Malayampattu	62	70	0.0708	453	347	357	0	172	2.95
	Kilnagar	62	70	0.0708	878	647	1239	0	667	3.66
	Palayaekambaranallur	80	82	0.08	738	512	1249	0	667	3.79
	Iyyampalayam	108	70	0.06	1058	825	1260	0	667	4.91
	Kongarampattu	175	214	0.0624	504	397	1259	0	667	4.92
	Appanallur	175	214	0.0624	1023	728	1259	0	667	6.08
	Alagusenai	175	214	0.0624	435	309	1259	0	667	2.4
	Melnagar	93	98	0.0567	451	352	0	0	0	3.1
	Onnupuram	93	98	0.0567	666	542	1239	0	667	6.7

S No	Key CWRM Parameter	Female Headed HH's	Vulnerable Households	% of Vulnerable Households	Registered MGNREGA Job cards	Active person working in MGN-REGA job Cards	Sources of Drinking Water	HH's have tap water connection for drinking water	HH's dependent on other sources for drinking water	Annual Greywater Generation
	Unit	Number	Number	%	Number	Number	Number	Number	Number	Ha - M
Type 2	Ramasanikuppam	93	98	0.0567	415	368	1239	0	667	3.45
	Thacharampattu	80	82	0.08	644	448	1239	0	667	1.91
	Sambuvarayanallur	108	70	0.06	618	515	1239	0	667	2.84
	The llur	49	26	0.0372	996	695	1239	0	667	3.32
	Pudupalayam	62	70	0.0708	821	657	1259	0	667	3.09
	Rantham	49	26	0.0372	483	364	1239	0	667	1.92
	Nadukuppam	80	82	0.0774	660	503	760	0	0	2.92
Type 5	Kunnathur	80	153	0.137	867	678	956	0	0	7.04
	Mullipattu	40	22	0.0207	756	631	1046	0	0	9.04
	Devikapuram	113	208	0.09	1770	1455	1047	0	0	17.89
	Vinnamangalam	83	117	0.16	1140	851	757	0	710	5.35

## 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  $j^{\text{th}}$  indicator for  $i^{\text{th}}$  GP and  $X_{ij}^p$  is the normalized value

$X_{ij}$  is the value of  $j^{\text{th}}$  indicator for  $i^{\text{th}}$  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 & Un-cultivable 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 Falls Land other than Current Falls	Treatment Area under Current Fallow land	Treatment Area under Unirrigated Land	Treatment Area Irrigated by Source
Type 1	Arayalam	0	62.25	13.1	0	0	0	0	36.78	19.54	47.56
	Athimalaipattu	0	60.9	2.81	2.26	0	0.14	0	7.07	19.47	3.77
	Agaram	0	8.25	5.63	3.75	0	0	0	67	10.58	12.91
	Kolathur	0	65.94	7.5	4.65	0	0	4.5	32.1	5.61	14.03
	Kamakur	0	81.76	3.23	0	0.41	67.23	3.5	12.57	4.89	20.92
	Karipur	0	0	3.225	0	0.405	17.72	0.7	36.75	7.93	22.3
	Murugamangalam	0	47.96	0.71	0	0.67	28.06	11.06	34.38	3.09	16.73
	Marusoor	0	49.12	0	8.87	0	0	0	9.21	0.29	3.18
	Kattukanallur	0	9.71	1.88	0	0	3.83	0	0.47	7.36	32.94
	Muduraiperumattur	0	50.01	0	8.66	0	0.38	0	16.45	3.82	11.61
	Pulavanpadi	0	3.62	3.76	0	8.36	0.76	2.8	27.9	1.07	18.2
	Puthur	0	79.55	14.25	1.5	4.61	0	0	6.47	8.1	18.71
	Sadupperipalayam	0	47.46	0	2.12	0	0.56	0	9.43	5.08	4.65
	Thatchur	0	26.44	0	0	0	0	0	24.99	6.85	9.59
Type 2	Andipalayam	0	15.72	0.46	2.13	1.02	0	1.8	4.47	3.67	4.1
	Vannankulam	0	47.16	1.37	6.39	3.07	0	4.2	10.44	8.57	9.56
	Pungampadi	0	6.66	3.225	0	0	0	0	16.29	0.07	20.54
	Malayampattu	0	85.42	3.225	0	0	0	0	16.29	0.07	20.54
	Kilnagar	0	44.02	3.32	0	0.405	0	0	5.54	12.62	20.33
	Palayaeambaranallur	0	27.3	2.7	0	0.49	0	1.83	4.71	7.16	7.97
	Iyyampalayam	0	48.54	4.8	0	0.86	0	2.44	6.27	9.55	10.63
	Kongarampattu	0	0	0	0	0	0	9.75	15.23	10.26	13.74

Type of GP	GP Name	Treatment Area under Forest Land	Treatment Area under Non-Agricultural Uses	Treatment Area under Barren & Un-cultivable 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
Type 2	Appanallur	0	0	0	0	0	0	9.75	15.23	10.26	13.74
	Alagusenai	0	0	0	0	0	0	9.75	15.23	10.26	13.74
	Melnagar	0	72.18	3.225	0	0.405	1.67	3	18.67	7.81	15.4
	Onnupuram	0	72.18	3.225	0	0.405	1.67	2.84	17.65	7.38	15.4
	Ramasanikuppam	0	72.18	3.225	0	0.405	1.67	2.84	17.65	7.38	15.4
	Thacharampattu	0	4.27	12.16	0.71	0	3.56	0	3.98	6.25	8.6
	Sambuvarayanallur	0	17.59	12.16	0.71	0	3.56	0	3.98	6.25	8.6
	Thellur	0	83.44	3.225	0	0	0	0	17.77	3.35	9.46
	Pudupalayam	0	22.32	3.32	0	0.405	0	0	5.6	12.77	20.33
	Rantham	0	83.44	3.225	0	0	0	0	119.56	22.55	9.46
Type 5	Nadukuppam	0	1.32	3.225	0	0	0.33	0	6.97	10.93	21.5
	Kunnathur	0	53.0175	3.225	0	0	8.8125	11.765	20.18965	0.6019	17.8005
	Mullipattu	0	2.15	3.225	0	0.41	0	2.82	4.19	1.79	15.84
	Devikapuram	0	59.55	0	0	0	0	11.25	31.98	1.04	22.27
	Vinnamangalam	0	5.47	0.62	0	0	0.2	0	65.88	9.6	17.52



Land Resources - WASCA Treatment Proposed Area	logic
<b>Treatment Area under Forest Land</b>	40% of the total Area (area after removal of potential voids)
<b>Treatment Area under Non-Agricultural Uses</b>	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)
<b>Treatment Area under Barren &amp; Un-cultivable Land</b>	75% of the total Area (area after removal of potential voids)
<b>Treatment Area under Permanent Pastures and Other Grazing Land</b>	75% of the total Area (potential area for treatment after removal of voids)
<b>Treatment Area under Land Under Miscellaneous Tree Crops etc.</b>	75% of the total Area (non- voids area)
<b>Treatment Area under Cultivable Waste Land</b>	75% of the total Area (non- voids area)
<b>Treatment Area under Fallows Land other than Current Fallows</b>	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
<b>Treatment Area under Current Fallow land</b>	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
<b>Treatment Area under Unirrigated Land</b>	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
<b>Treatment Area Irrigated by Source</b>	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	Arayalam	30.78	0	20.34
	Athimalaipattu	29.11	0.7	5.94
	Agaram	8.02	1.1	17.72
	Kolathur	37.33	1.37	11.01
	Kamakur	42.7	19	7.8
	Karipur	28.8	8.7	12.7
	Murugamangalam	25.93	8.45	12.78
	Marusoor	22.13	2.61	2.48
	Kattukanallur	16.5	2.2	7.6
	Muduraiperumattur	32.86	2.66	6.24
	Pulavanpadi	19.51	2.68	9.78
	Puthur	54.95	1.8	6.52
	Sadupperipalayam	21.32	0.79	3.75
	Thatchur	50.1	0	8.11
Type 2	Andipalayam	7.5	0.6	26.2
	Vannankulam	23.54	2.78	6.42
	Pungampadi	45.87	0	16.46
	Malayampattu	25.67	0	31.18
	Kilnagar	15.69	1.2	7.2
	Palayaekambaranallur	15.38	0.14	4.24
	Iyyampalayam	24.36	0.25	5.66
	Kongarampattu	8.69	0	9.2
	Appanallur	11.98	0	9.2
	Alagusenai	16.48	0	9.2
	Melnagar	26.24	1.54	43.21
	Onnupuram	36.87	2.2	8.1
	Ramasanikuppam	42.69	2.2	8.1
	Thacharampattu	4.69318	1.257735	3.685924
	Sambuvarayanallur	25.69	1.2	3.5
	Thellur	47.63	0	5.7
	Pudupalayam	20.69	1.2	7.2
	Rantham	45.63	0	28.3
	Nadukuppam	20.3	0.3	7.4
Type 5	Kunnathur	27.7	2.5	9.4
	Mullipattu	45.5	0.1	4.6
	Devikapuram	32.85	0	13.03
	Vinnamangalam	6.71	0.06	18.21

## ANNEXURE 5.3

### GP WISE PROPOSED WORKS BASED ON WATERSHED AND LIVELIHOOD APPROACH

Activity	Agaram		Alagusenai		Andipalayam		Appanallur		Arayalam	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures of upper slopes</b>										
Afforestation	6602	8.25	0	0	0	0	0	0	0	0
Continuous contour trenches (CCI)	0	0	0	0	0	0	0	0	0	0
Water point	0	0	0	0	0	0	0	0	0	0
Gabion	0	0	0	0	0	0	0	0	0	0
Contour Continuous Bunds (CCB)	11315	108.11	0	0	0	0	0	0	0	0
Drainage Line Treatment (DLT)	0	1019	102	512	0	0	0	0	0	0
Gully Plugs	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of middle slopes</b>										
Loose Stone Check Dam (LSCD)	0	0	0	0	0	0	0	0	0	0
Mini Percolation Tank (MPT)	0	0	0	0	0	0	0	0	0	0
Staggered Contour Trenches (SgCT)	0	0	0	0	0	0	0	0	0	0
Water Absorption Trench (WAT)	0	0	0	0	0	0	0	0	0	0
Water Harvesting Structure (WHS)	0	0	0	0	0	0	0	0	0	0
Silvi-pasture Development	3000	3.75	0	0	0	0	0	0	0	0
Linear Plantation	747	3735	376	1880	0	0	386	1930	451	2269
Avenue plantation	945	4727	324	1620	0	0	384	1920	610	3059
Block Plantation	4500	5.63	0	0	0	0	0	0	1639	8.47
Mini Forest	0	0	0	0.0	0	0	0	0.0	0	8.47
Fencing	3	17.63	0	0	0	0	0	0	0	0
Grass seeding	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of gentle slopes</b>										
Deepening of waterbodies	10	83.83	4	9.41	0	0	3	9.22	5	36.64
Desiltation of waterbodies	10	83.83	4	9.41	0	0	3	9.22	5	36.64
Waterbody Bund strengthening	10	83.83	4	9.41	0	0	3	9.22	5	36.64
Inlet development with silt trap of Waterbodies	10	83.83	4	9.41	0	0	3	9.22	0	0



Activity	Agaram		Alagusenai		Andipalayam		Appanallur		Arayalam	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
Wastewater drains	0	0	0	0	0	0	0	0	0	0
Community Soak Pits	6	0	0	0	0	0	0	0	2	0
Individual Soak pits	88	0	0	0	0	0	0	0	131	0
<b>Livelihood measures</b>										
Cattle Shelters	88	0	63	0	0	0	63	0	91	0
Cattle Trough	88	0	63	0	0	0	63	0	91	0
Goat and Sheep Shelters	25	0	18	0	0	0	18	0	34	0
Goat Trough	0	0	18	0	0	0	18	0	0	0
Vermicompost	88	0	63	0	0	0	63	0	91	0
Nutrition garden	2815	0	0	0	4 per HH	0	0	0	51	0
Azolla production unit	88	0	63	0	0	0	63	0	22528	28.16
Horticulture plantation -Individual	9048	45.24	14096	18	0	0	14096	18	0	0
Farm Bund Plantation	0	0	0	0	0	0	0	0	360	18
Fodder development for cattle	88	0	0	0	0	0	0	0	0	0
Agroforestry	0	0	0	0	0	0	0	0	0	0
Dry land horticulture	0	0	0	0	0	0	0	0	0	0

Activity	Athimalaipattu		Devikapuram		Iyyampalayam		Kamakur		Karippur	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures of upper slopes</b>										
Afforestation	48716	60.90	47638	59.55	38830	48.54	56364	70	35208	44.01
Continuous contour trenches (CCT)	0	0	0	0	0	0	0	0	0	0
Water point	0	0	0	0	0	0	0	0	0	0
Gabion	0	0	0	0	0	0	0	0	0	0
Contour Continuous Bunds (CCB)	15900	96.42	16435	126.08	12703	83.09	0	0	0	0
Drainage Line Treatment (DLT)	0	0	0	0	0	0	0	8689	0	4982.00
Gully Plugs	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of middle slopes</b>										
Loose Stone Check Dam (LSCD)	0	0	0	0	0	0	0	0	0	0
Mini Percolation Tank (MPT)	0	0	0	0	0	0	0	0	0	0
Staggered Contour Trenches (SgCT)	0	0	0	0	0	0	0	0	0	0
Water Absorption Trench (WAT)	0	0	0	0	0	0	0	0	8802	44
Water Harvesting Structure (WHS)	0	0	0	0	0	0	0	0	0	0
Silvi-pasture Development	1806	2.26	0	0.00	0	0.00	0	0	0	10.34
Linear Plantation	325	1622.6	1355	6774.3	428	2138.5	519	2595	559	2795
Avenue plantation	2231	11155	2560.6	12803	1262	6309	798	3989	1871	9355
Block Plantation	2358	2.95	0	0	4531	5.66	49056	61	0	0.00
Mini Forest	0	0	0	0	0	0	6075	0.405	41625	2.78
Fencing	3	66.10	1	59.55	2	54.20	0	132	0	57
Grass seeding	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of gentle slopes</b>										
Deepening of waterbodies	0	0	21	44.74	0	0	2	70.2	5	51.36
Desiltation of waterbodies	6	0	21	44.74	7	0	2	70.2	5	51.36
Waterbody Bund strengthening	6	0	21	44.74	7	0	2	70.2	5	51.36
Inlet development with silt trap of Waterbodies	0	0	0	0	0	0	2	70.2	5	51.36
Surplus/waste weir	0	0	0	0	0	0	0	0	0	0
Sub surface barriers	0	0	0	0	0	0	0	0	0	0
Artificial recharge structure	25	0	99	0	37	0	84	209	89	223

Activity	Athimalaipattu		Devikapuram		Iyyampalayam		Kamakur		Karippur	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures for canal network</b>										
Repairing outlets, gates & regulators of Canal	0	0	0	0	0	0	0	0	0	0
Minor repair of cracks in canals	0	0	0	0	0	0	0	0	0	0
Canal Bed levelling	0	0	0	300	0	4050	1	0	0	0
Canal Bund Plantation	0	0	60	0	810	0	0	0	0	0
Irrigation channels	0	0	0	0	0	0	0	0	0	0
Canal side plantation	0	0	0	0	0	0	0	0	0	0
Sunken pit	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures for farm lands</b>										
Composting	11	0	18	0	7	0	13	0	14	0
Earthen Bund plantation	0	0	0	0	0	0	6217	77.71	3233	40.41
Farm Bunding	5	13.27	9	22.13	4	9.13	43	77.71	47	40.41
Micro Irrigation	0	0	0	0	0	0	0	0	0	0
Construction of farm ponds	26	0	31	0	20	0	20	0	20	0
Construction/renovation open well	25	0	99	0	37	0	0	209	89	223
Nursery development	0	0	0	0	0	0	0	0	0	0
Silt application	5	0	9	0	4	0	58	145	28	71
Mulching	60465	81.26	58590	92.81	49970	68.64	105744	132	37428	46.79
Land development	0	13.27	0	22.13	0	9.13	58	145	28	71
Field terracing	0	0	0	0	0	0	0	0	0	0
Drinking water measures	0	0	0	0	0	0	0	0	0	0
Rooftop Rainwater Harvesting	2	0	2	0	2	0	25000	2	25000	2
Drinking Water Scheme Panghat	0	0	0	0	0	0	0	0	0	0
Grey water management	0	0	0	0	0	0	0	0	0	0
Drain for Regulating Domestic waste water flow	0	0	0	0	0	0	0	0	0	0
Wastewater drains	0	0	0	0	0	0	0	0	0	0
Community Soak Pits	8	0	22	0	12	0	10	994	6	581
Individual Soak pits	49	0	208	0	70	0	69	994	47	581





Activity	Kattukanallur		Kilnagar		Kolathur		Kongarampattu		Kunnathur	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures of upper slopes</b>										
Afforestation	4560	5.70	0	0	52748	65.94	0	0	21180	26.48
Continuous contour trenches (CCT)	0	0	0	0	0	0	0	0	0	0
Water point	0	0	0	0	0	0	0	0	0	0
Gabion	0	0	0	0	0	0	0	0	0	0
Contour Continuous Bunds (CCB)	0	0	0	0	0	0.00	0	0	0	0
Drainage Line Treatment (DLT)	0	1939.00	0	2240	0	0	587	2937	0	12199.65
Gully Plugs	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of middle slopes</b>										
Loose Stone Check Dam (LSCD)	0	0	0	0	0	0	0	0	0	0
Mini Percolation Tank (MPT)	0	0	0	0	0	0	0	0	0	0
Staggered Contour Trenches (SgCT)	0	0	0	0	0	0	0	0	0	0
Water Absorption Trench (WAT)	0	0	0	0	0	0	0	0	0	0
Water Harvesting Structure (WHS)	0	0	0	0	0	0	0	0	0	0
Silvi-pasture Development	0	4.16	0	0	3720	4.65	0	0	0	0.00
Linear Plantation	444	2220	239	1200	889	4444	296	1484	583	2915
Avenue plantation	572	2861	397	1992	1866	9329	264	1319	944	4719
Block Plantation	5823	7.28	0	0	6000	7.50	0	0	31811	39.76
Mini Forest	0	0.00	0	0	0	0	0	0.0	0	0.00
Fencing	0	17	0	0	3	78.09	0	0	0	66
Grass seeding	0	0	0	0	0	0.00	0	0	0	0
<b>Treatment measures of gentle slopes</b>										
Deepening of waterbodies	5	29.49	6	10.51	0	0	3	9.29	6	36.42
Desiltation of waterbodies	5	29.49	6	10.51	8	0	3	9.29	6	36.42
Waterbody Bund strengthening	5	29.49	6	10.51	8	0	3	9.29	6	36.42
Inlet development with silt trap of Waterbodies	5	29.49	0	0	0	0	3	9.29	6	36.42
Surplus/waste weir	0	0	0	0	0	0	0	0	0	0
Sub surface barriers	0	0	0	0	0	0	0	0	0	0
Artificial recharge structure	132	329.37	0	0	62	0	37	92	71	178.055

Activity	Kattukanallur		Kilnagar		Kolathur		Kongarampattu		Kunnathur	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures for canal network</b>										
Repairing outlets, gates & regulators of Canal	0	0	0	0	0	0	0	0	0	0
Minor repair of cracks in canals	0	0	0	0	0	0	0	0	0	0
Canal Bed levelling	3	4936	0	0	0	3352.6	1	0	3	6256
Canal Bund Plantation	987	4936	0	0	671	0	0	0	1251	6256
Irrigation channels	0	0	539	2701	0	0	0	0	0	0
Canal side plantation	0	0	0	0	0	0	0	0	0	0
Sunken pit	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures for farm lands</b>										
Composting	15	0	8	0	17	0	10	0	14	0
Earthen Bund plantation	619	7.74	0	0	0	0	0	0	2007	25.09
Farm Bunding	18	7.74	80	0	8	21.10	10	0	35	25.09
Micro Irrigation	0	0	0	0	0	0	0	0	0	0
Construction of farm ponds	18	0	8	0	26	0	14	0	20	0
Construction/renovation open well	132	329	81	0	62	0	37	92	71	178
Nursery development	0	0	0	0	0	0	0	0	0	0
Silt application	13	32	5	0	8	0	3	8	32	80
Mulching	10383	12.98	0	0	72300	106.21	0	0	52991	66.24
Land development	0	0	0	0	0	21.10	3	8	32	80
Field terracing	0	0	0	0	0	0	0	0	0	0
Drinking water measures	0	0	0	0	0	0	0	0	0	0
Rooftop Rainwater Harvesting	25000	2	2	0	2	0	25000	2	25000	2
Drinking Water Scheme Panghat	0	0	0	0	0	0	0	0	0	0
Grey water management	0	0	0	0	0	0	0	0	0	0
Drain for Regulating Domestic waste water flow	0	0	0	0	0	0	0	0	0	0
Wastewater drains	0	0	0	0	0	0	0	0	0	0
Community Soak Pits	18	1819	2	0	11	0	34	3434	11	1115
Individual Soak pits	126	1819	127	0	103	0	214	3434	153	1115

Activity	Kattukanallur		Kilnagar		Kolathur		Kongarampattu		Kunnathur	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Livelihood measures</b>										
Cattle Shelters	51	0	186	0	103	0	63	0	67	0
Cattle Trough	51	0	186	0	103	0	63	0	67	0
Goat and Sheep Shelters	9	0	52	0	13	0	18	0	12	0
Goat Trough	9	0	0	0	0	0	18	0	12	0
Vermicompost	51	0	186	0	103	0	63	0	67	0
Nutrition garden	364	1819	70	0	5745	0	687	3434	223	1115
Azolla production unit	51	0	70	0	103	0	63	0	67	0
Horticulture plantation -Individual	3132	3.92	7264	9.08	5624	28.12	14096	18	13023	16.28
Farm Bund Plantation	280	14	0	0	103	0	0	0	160	8
Fodder development for cattle	0	0	0	0	0	0	0	0	0	0
Agroforestry	0	0	0	0	0	0	0	0	0	0
Dry land horticulture	0	0	0	0	0	0	0	0	0	0

Activity	Malayampattu		Marusoor		Melnagar		Muduraiperumattur		Mullipattu	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures of upper slopes</b>										
Afforestation	0	0	39296	49.12	8720	10.9	40008	50.01	1619	2
Continuous contour trenches (CCT)	0	0	0	0	0	0	0	0	0	0
Water point	0	0	0	0	0	0	0	0	0	0
Gabion	0	0	0	0	0	0	0	0	0	0
Contour Continuous Bunds (CCB)	0	0	12589	70.67	0	0	13894	90.92	0	0
Drainage Line Treatment (DLT)	0	0	0	0	0	0	0	0	0	652
Gully Plugs	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of middle slopes</b>										
Loose Stone Check Dam (LSCD)	0	0	0	0	0	0	0	0	0	0
Mini Percolation Tank (MPT)	0	0	0	0	0	0	0	0	0	0
Staggered Contour Trenches (SgCT)	0	0	0	0	0	0	0	0	0	0
Water Absorption Trench (WAT)	0	0	0	0	0	0	0	0	0	0
Water Harvesting Structure (WHS)	0	0	0	0	0	0	0	0	0	0
Silvi-pasture Development	0	0	7092	8.87	0	0	6930	8.66	0	123
Linear Plantation	557	3367	721	3604.5	48	0.44	673	3365	982	4908
Avenue plantation	407	2046	831	4154	231	1157	1116	5581	803	4013
Block Plantation	0	0	0	0.00	0	0	300	0.38	0	0
Mini Forest	0	0	0	0	0	0	0	0	0	0
Fencing	0	0	2	57.99	0	10.9	3	59.05	0	0
Grass seeding	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of gentle slopes</b>										
Deepening of waterbodies	4	33.05	0	0	1	0.44	7	44.91	7	57.56
Desiltation of waterbodies	4	33.05	9	0	1	0.44	7	44.91	7	57.56
Waterbody Bund strengthening	4	33.05	9	0	1	0.44	7	44.91	7	57.56
Inlet development with silt trap of Waterbodies	0	0	0	0	0	0	7	44.91	7	57.56
Surplus/waste weir	0	0	0	0	0	0	0	0	0	0
Sub surface barriers	0	0	0	0	0	0	0	0	0	0
Artificial recharge structure	0	0	42	0	0	0	58	0	63	158

Activity	Malayampattu		Marusoor		Melnagar		Muduraiperumattur		Mullipattu	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures for canal network</b>										
Repairing outlets, gates & regulators of Canal	0	0	0	0	0	0	0	0	0	0
Minor repair of cracks in canals	0	0	0	0	0	0	0	0	0	0
Canal Bed levelling	0	0	0	3322	0	0	0	1560	0	0
Canal Bund Plantation	0	0	664.4	0	0	0	312	0	0	0
Irrigation channels	502	2455	0	0	411	2340	0	0	0	0
Canal side plantation	0	0	0	0	0	0	0	0	0	0
Sunken pit	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures for farm lands</b>										
Composting	7	0	5	0	9	0	8	0	3	0
Earthen Bund plantation	490	2459	0	0	0	0	30	0.31	313	3.91
Farm Bunding	140	0	2	4.75	80	0	4	10.13	3	3.91
Micro Irrigation	0	0	0	0	0	0	0	0	0	0
Construction of farm ponds	7	0	17	0	9	0	22	0	3	0
Construction/renovation open well	82	0	42	0	62	0	58	0	63	158
Nursery development	0	0	0	0	0	0	0	0	0	0
Silt application	9	0	2	0	7	0	4	0	1	3
Mulching	0	0	49896	64.33	8720	10.9	52647	74.99	1619	2
Land development	0	0	0	4.75	1	0	0	10.13	1	3
Field terracing	0	0	0	0	0	0	0	0	0	0
Drinking water measures	0	0	0	0	0	0	0	0	0	0
Rooftop Rainwater Harvesting	2	0	2	0	2	0	2	0	25000	2
Drinking Water Scheme Panghat	0	0	0	0	0	0	0	0	0	0
Grey water management	0	0	0	0	0	0	0	0	0	0
Drain for Regulating Domestic waste water flow	0	0	0	0	0	0	0	0	0	0
Wastewater drains	0	0	0	0	0	0	0	0	0	0
Community Soak Pits	0	0	5	0	2	0	4	0	11	1052
Individual Soak pits	143	0	16	0	182	0	32	0	22	1052



Activity	Murugamangalam		Nadukuppam		Onnupuram		Palayakambaranallur		Pudupalayam	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures of upper slopes</b>										
Afforestation	38364	47.96	0	0	15360	19.2	21842	27.30	2658	3
Continuous contour trenches (CCT)	0	0	0	0	0	0	0	0	0	0
Water point	0	0	0	0	0	0	0	0	0	0
Gabion	0	0	0	0	0	0	0	0	0	0
Contour Continuous Bunds (CCB)	20408	142.65	0	0	0	0	7505	52.15	0	0
Drainage Line Treatment (DLT)	0	0	0	0	0	0	0	0	1508	7539
Gully Plugs	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of middle slopes</b>										
Loose Stone Check Dam (LSCD)	0	0	0	0	0	0	0	0	0	0
Mini Percolation Tank (MPT)	0	0	0	0	0	0	0	0	0	0
Staggered Contour Trenches (SgCT)	0	0	0	0	5598	27.99	0	0	0	0
Water Absorption Trench (WAT)	0	0	0	0	0	0	0	0	0	0
Water Harvesting Structure (WHS)	0	0	0	0	0	0	0	0	0	0
Silvi-pasture Development	0	0.00	0	0	0	0	0	0.00	0	2
Linear Plantation	1118	5590.5	144	8.39	506	0	337	1685.9	387	1437
Avenue plantation	1510	7550	42	211	467	0	1055	5275	473	2364
Block Plantation	23544	29.43	0	0	7032	0	2549	3.19	13391	17
Mini Forest	0	0	0	0	0	0	0	0	28125	1.9
Fencing	2	0.00	0	0	0	27.99	2	30.49	0	24
Grass seeding	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of gentle slopes</b>										
Deepening of waterbodies	0	0	2	8.39	5	55.05	0	0	4	9.25
Desiltation of waterbodies	16	0	2	8.39	5	55.05	5	0	4	9.25
Waterbody Bund strengthening	16	0	2	8.39	5	55.05	5	0	4	9.25
Inlet development with silt trap of Waterbodies	1	0	0	0	0	0	0	0	4	9.25
Surplus/waste weir	0	0	0	0	0	0	0	0	0	0
Sub surface barriers	0	0	0	0	0	0	0	0	0	0
Artificial recharge structure	77	0	0	0	0	0	38	0	81	203

Activity	Murugamangalam		Nadukuppam		Ommuram		Palayaekambaranallur		Pudupalayam	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures for canal network</b>										
Repairing outlets, gates & regulators of Canal	0	0	0	0	0	0	0	0	0	0
Minor repair of cracks in canals	0	0	0	0	0	0	0	0	0	0
Canal Bed levelling	0	1733.61	0	0	0	0	0	3441	1	0
Canal Bund Plantation	346.722	0	181	907	0	0	688	0	0	0
Irrigation channels	0	1250	0	0	549	2748	0	0	0	0
Canal side plantation	250	0	0	0	0	0	0	0	0	0
Sunken pit	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures for farm lands</b>										
Composting	19	0	0	0	9	0	5	0	8	0
Earthen Bund plantation	0	0	0	0	0	0	0	0	0	0
Farm Bunding	10	24.27	160	0	80	0	3	6.85	11	0
Micro Irrigation	0	0	0	0	0	0	0	0	0	0
Construction of farm ponds	36	0	11	0	9	0	13	0	12	0
Construction/renovation open well	77	0	86	0	62	0	38	0	81	203
Nursery development	0	0	0	0	0	0	0	0	0	0
Silt application	10	0	7	0	7	0	3	0	4	11
Mulching	72958	110.02	0	0	22392	0	29315	41.32	17549	22
Land development	0	24.27	0	0	2	0	0	6.85	4	11
Field terracing	0	0	0	0	0	0	0	0	0	0
Drinking water measures	0	0	0	0	0	0	0	0	0	0
Rooftop Rainwater Harvesting	2	0	2	0	2	0	2	0	25000	2
Drinking Water Scheme Panghat	0	0	0	0	0	0	0	0	0	0
Grey water management	0	0	0	0	0	0	0	0	0	0
Drain for Regulating Domestic waste water flow	0	0	0	0	0	0	0	0	0	0
Wastewater drains	0	0	0	0	0	0	0	0	0	0
Community Soak Pits	4	0	2	0	2	0	11	0	10	994
Individual Soak pits	40	0	100	0	351	0	82	0	70	994



Activity	Murugamangalam		Nadukuppam		Onnupuram		Palayaekambaranallur		Pudupalayam	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Livelihood measures</b>										
Cattle Shelters	40	0	65	0	148	0	82	0	66	0
Cattle Trough	40	0	65	0	148	0	82	0	66	0
Goat and Sheep Shelters	47	0	26	0	18	0	16	0	29	0
Goat Trough	0	0	26	0	0	0	0	0	29	0
Vermicompost	40	0	65	0	148	0	82	0	66	0
Nutrition garden	1920	0	82	0	98	0	5305	0	199	994
Azolla production unit	40	0	82	0	98	0	82	0	66	0
Horticulture plantation -Individual	6526	32.63	7200	9	12000	15	2166	10.83	7348	9
Farm Bund Plantation	0	0	0	0	0	0	0	0	0	0
Fodder development for cattle	40	0	0	0	0	0	82	0	0	0
Agroforestry	0	0	0	0	0	0	0	0	0	0
Dry land horticulture	0	0	0	0	0	0	0	0	0	0

Activity	Pulavanpadi		Pungampadi		Puthur		Ramasanikuppam		Rantham	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures of upper slopes</b>										
Afforestation	2896	3.62	6024	7.53	63641	79.55	0	0	0	0
Continuous contour trenches (CCT)	0	0	0	0	0	0	0	0	0	0
Water point	0	0	0	0	0	0	0	0	0	0
Gabion	0	0	0	0	0	0	0	0	0	0
Contour Continuous Bunds (CCB)	6581	66.47	0	0	21518	133.19	0	0	0	0
Drainage Line Treatment (DLT)	0	0	0	2167.96	0	0	0	0	1	2875 m
Gully Plugs	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of middle slopes</b>										
Loose Stone Check Dam (LSCD)	0	0	0	0	0	0	0	0	0	0
Mini Percolation Tank (MPT)	0	0	0	0	0	0	0	0	0	0
Staggered Contour Trenches (SgCT)	0	0	0	0	0	0	0	0	0	0
Water Absorption Trench (WAT)	0	0	0	0	0	0	0	0	0	0
Water Harvesting Structure (WHS)	0	0	0	0	0	0	0	0	0	0
Silvi-pasture Development	0	0.00	0	0.00	1200	1.50	0	0	0	0
Linear Plantation	649	3246	814	4070	775	3875.6	98	6	735	0
Avenue plantation	2347	11737	809	4044	1082	5409	293	1409	241	0
Block Plantation	10302	12.88	3998	5.00	15090	18.86	0	0	0	0
Mini Forest	0	0	0	0.00	0	0	0	0	0	0
Fencing	2	16.50	0	13	2	99.91	0	0	0	0
Grass seeding	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of gentle slopes</b>										
Deepening of waterbodies	17	57.54	7	27.13	16	18.61	4	7.08	1	0
Desiltation of waterbodies	17	57.54	7	27.13	16	18.61	4	7.08	1	0
Waterbody Bund strengthening	17	57.54	7	27.13	16	18.61	4	7.08	1	0
Inlet development with silt trap of Waterbodies	1	0	7	27.13	0	0	0	0	0	0
Surplus/waste weir	0	0	0	0	0	0	0	0	0	0
Sub surface barriers	0	0	0	0	0	0	0	0	0	0
Artificial recharge structure	104	0	82	205.37	77	0	0	0	0	0

Activity	Pulavanpadi		Pungampadi		Puthur		Ramasanikuppam		Rantham	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures for canal network</b>										
Repairing outlets, gates & regulators of Canal	0	0	0	0	0	0	0	0	0	0
Minor repair of cracks in canals	0	0	0	0	0	0	0	0	0	0
Canal Bed levelling	0	5715.21	4	2004	0	5180.31	0	0	0	0
Canal Bund Plantation	1143.042	0	401	2004	1036	0	0	0	0	0
Irrigation channels	0	0	0	0	0	0	97	489	0	0
Canal side plantation	0	0	0	0	0	0	0	0	0	0
Sunken pit	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures for farm lands</b>										
Composting	13	0	7	0	6	0	10	0	6	0
Earthen Bund plantation	0	0	655	8.18	0	0	0	0	0	0
Farm Bunding	6	15.89	15	8.18	3	7.29	40	0	2	0
Micro Irrigation	0	0	0	0	0	0	0	0	0	0
Construction of farm ponds	18	0	9	0	27	0	9	0	8	0
Construction/renovation open well	104	0	82	205	77	0	62	0	38	0
Nursery development	0	0	0	0	0	0	0	0	0	0
Silt application	6	0.00	8	20	3	0.00	7	0	0	0
Mulching	23029	41.48	10022	12.53	86573	116.55	0	0	0	0
Land development	0	15.89	8	20	0	7.29	0	0	0	0
Field terracing	0	0	0	0	0	0	0	0	0	0
Drinking water measures	0	0	0	0	0	0	0	0	0	0
Rooftop Rainwater Harvesting	2	0	25000	2	2	0	2	0	2	0
Drinking Water Scheme Panghat	0	0	0	0	0	0	0	0	0	0
Grey water management	0	0	0	0	0	0	0	0	0	0
Drain for Regulating Domestic waste water flow	0	0	0	0	0	0	0	0	0	0
Wastewater drains	0	0	0	0	0	0	0	0	0	0
Community Soak Pits	8	0	9	901	8	0	2	0	2	0
Individual Soak pits	57	0	47	901	64	0	131	0	100	0



Activity	Sadupperipalayam		Sambuvarayanallur		Thacharampattu		Thatthur		Theelur	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures of upper slopes</b>										
Afforestation	37968	47.46	0	0	0	0	21155	26.44	0	0
Continuous contour trenches (CCT)	0	0	0	0	0	0	0	0	0	0
Water point	0	0	0	0	0	0	0	0	0	0
Gabion	0	0	0	0	0	0	0	0	0	0
Contour Continuous Bunds (CCB)	11516	69.30	0	0	0	0	8537	67.87	0	0
Drainage Line Treatment (DLT)	0	0	2	8305 m	0	0	0	0	1	2875 m
Gully Plugs	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of middle slopes</b>										
Loose Stone Check Dam (LSCD)	0	0	0	0	0	0	0	0	0	0
Mini Percolation Tank (MPT)	0	0	0	0	0	0	0	0	0	0
Staggered Contour Trenches (SgCT)	0	0	0	0	0	0	0	0	0	0
Water Absorption Trench (WAT)	0	0	0	0	0	0	0	0	0	0
Water Harvesting Structure (WHS)	0	0	0	0	0	0	0	0	0	0
Silvi-pasture Development	1692	2.12	0	0	0	0	0	0.00	0	0
Linear Plantation	911	3246	2070	0	345	0	39	194	1159	0
Avenue plantation	1194	5969	183	0	288	0	2293	11463	1801	0
Block Plantation	450	0.56	0	0	0	0	0	0.00	0	0
Mini Forest	0	0	0	0	0	0	0	0	0	0
Fencing	3	50.14	0	0	0	0	2	26.44	0	0
Grass seeding	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures of gentle slopes</b>										
Deepening of waterbodies	11	66.88	2	0	1	0	0	0	6	0
Desiltation of waterbodies	11	66.88	2	0	1	0	11	0	6	0
Waterbody Bund strengthening	11	66.88	2	0	1	0	11	0	6	0
Inlet development with silt trap of Waterbodies	11	66.88	0	0	0	0	0	0	0	0
Surplus/waste weir	0	0	0	0	0	0	0	0	0	0
Sub surface barriers	0	0	0	0	0	0	0	0	0	0
Artificial recharge structure	37	0	3	0	0	0	64	0	7	0

Activity	Sadupperipalayam		Sambuvarayanallur		Thacharampattu		Thatthur		Thealur	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures for canal network</b>										
Repairing outlets, gates & regulators of Canal	0	0	0	0	0	0	0	0	0	0
Minor repair of cracks in canals	0	0	0	0	0	0	0	0	0	0
Canal Bed levelling	0	5251.3	0	0	0	0	0	0	0	0
Canal Bund Plantation	1050.26	0	0	0	0	0	0	0	0	0
Irrigation channels	0	2095	2	915 m	2	1230 m	0	0	0	0
Canal side plantation	419	0	0	0	0	0	0	0	0	0
Sunken pit	0	0	0	0	0	0	0	0	0	0
<b>Treatment measures for farm lands</b>										
Composting	6	0	10	0	11	0	13	0	29	0
Earthen Bund plantation	0	0	0	0	5	0	0	0	0	0
Farm Bunding	3	7.26	4	0	0	0	6	15.92	4	0
Micro Irrigation	0	0	0	0	0	0	0	0	0	0
Construction of farm ponds	17	0	14	0	11	0	18	0	33	0
Construction/renovation open well	37	0	86	0	86	0	64	0	100	0
Nursery development	0	0	0	0	0	0	0	0	0	0
Silt application	3	0.00	7	0	7	0	6	0	0	0
Mulching	46358	59.72	0	0	0	0	29066	47.16	0	0
Land development	0	7.26	0	0	0	0	0	15.92	0	0
Field terracing	0	0	0	0	0	0	0	0	0	0
Drinking water measures	0	0	0	0	0	0	0	0	0	0
Rooftop Rainwater Harvesting	2	0	2	0	2	0	2	0	2	0
Drinking Water Scheme Panghat	0	0	0	0	0	0	0	0	0	0
Grey water management	0	0	0	0	0	0	0	0	0	0
Drain for Regulating Domestic waste water flow	0	0	0	0	0	0	0	0	0	0
Wastewater drains	0	0	0	0	0	0	0	0	0	0
Community Soak Pits	13	0	2	0	2	0	7	0	2	0
Individual Soak pits	60	0	45(226)	0	99	0	26	0	138	0

Activity	Sadupperipalayam		Sambuvarayanallur		Thacharampattu		Thatchur		Thellur	
	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha	Numbers	Area In ha
<b>Livelihood measures</b>										
Cattle Shelters	60	0	168	0	84	0	26	0	60	0
Cattle Trough	60	0	168	0	84	0	26	0	60	0
Goat and Sheep Shelters	27	0	42	0	21	0	71	0	15	0
Goat Trough	0	0	0	0	0	0	0	0	0	0
Vermicompost	60	0	168	0	84	0	26	0	60	0
Nutrition garden	6300	0	45	0	99	0	3485	0	49	0
Azolla production unit	60	0	45	0	99	0	26	0	49	0
Horticulture plantation -Individual	1916	9.58	10000	12.5	9960	12.45	4142	20.71	0	0
Farm Bund Plantation	0	0	0	0	0	0	0	0	0	0
Fodder development for cattle	60	0	0	0	0	0	26	0	0	0
Agroforestry	0	0	3904	19.52	2800	14	0	0	2260	11.3
Dry land horticulture	0	0	0	0	0	0	0	0	47760	59.7

Activity	Vannankulam		Vinnamangalam	
	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures of upper slopes</b>				
Afforestation	37728	47.16	4375	5.47
Continuous contour trenches (CCT)	0	0	0	0
Water point	0	0	0	0
Gabion	0	0	0	0
Contour Continuous Bunds (CCB)	13991	90.76	8851	99.29
Drainage Line Treatment (DLT)	0	0	0	0
Gully Plugs	0	0	0	0
<b>Treatment measures of middle slopes</b>				
Loose Stone Check Dam (LSCD)	0	0	0	0
Mini Percolation Tank (MPT)	0	0	0	0
Staggered Contour Trenches (SgCT)	0	0	0	0
Water Absorption Trench (WAT)	0	0	0	0
Water Harvesting Structure (WHS)	0	0	0	0
Silvi-pasture Development	5112	6.39	0	0.00
Linear Plantation	797	3982.6	1142	5710
Avenue plantation	1414	7069	187	933
Block Plantation	3551	4.44	660	0.83
Mini Forest	0	0	0	0
Fencing	3	57.99	3	6.29
Grass seeding	0	0	0	0
<b>Treatment measures of gentle slopes</b>				
Deepening of waterbodies	0	0	0	0
Desiltation of waterbodies	9	0	9	0
Waterbody Bund strengthening	9	0	9	0
Inlet development with silt trap of Waterbodies	1	0	0	0
Surplus/waste weir	0	0	0	0
Sub surface barriers	0	0	0	0
Artificial recharge structure	73	0	44	0



Activity	Vannankulam		Vinnamangalam	
	Numbers	Area In ha	Numbers	Area In ha
<b>Treatment measures for canal network</b>				
Repairing outlets, gates & regulators of Canal	0	0	0	0
Minor repair of cracks in canals	0	0	0	0
Canal Bed levelling	0	0	0	5366
Canal Bund Plantation	0	0	1073	0
Irrigation channels	0	0	0	0
Canal side plantation	0	0	0	0
Sunken pit	0	0	0	0
<b>Treatment measures for farm lands</b>				
Composting	9	0	30	0
Earthen Bund plantation	0	0	0	0
Farm Bunding	5	11.60	15	37.74
Micro Irrigation	0	0	0	0
Construction of farm ponds	21	0	33	0
Construction/renovation open well	73	0	44	0
Nursery development	0	0	0	0
Silt application	5	0	15	0
Mulching	52100	74.37	16365	52.79
Land development	0	11.60	0	37.74
Field terracing	0	0	0	0
Drinking water measures	0	0	0	0
Rooftop Rainwater Harvesting	2	0	2	0
Drinking Water Scheme Panghat	0	0	0	0
Grey water management	0	0	0	0
Drain for Regulating Domestic waste water flow	0	0	0	0
Wastewater drains	0	0	0	0
Community Soak Pits	8	0	7	0
Individual Soak pits	56	0	117	0

Activity	Vannankulam		Vimmamangalam	
	Numbers	Area In ha	Numbers	Area In ha
<b>Livelihood measures</b>				
Cattle Shelters	56	0	117	0
Cattle Trough	56	0	117	0
Goat and Sheep Shelters	57	0	47	0
Goat Trough	0	0	0	0
Vermicompost	56	0	117	0
Nutrition garden	4150	0	3595	0
Azolla production unit	56	0	117	0
Horticulture plantation -Individual	3277	16.39	9300	46.50
Farm Bund Plantation	0	0	0	0
Fodder development for cattle	56	0	117	0
Agroforestry	0	0	0	0
Dry land horticulture	0	0	0	0

## ANNEXURE 7

## GP WISE WASCA RECOMMENDATION AND WORKS UPLOADED

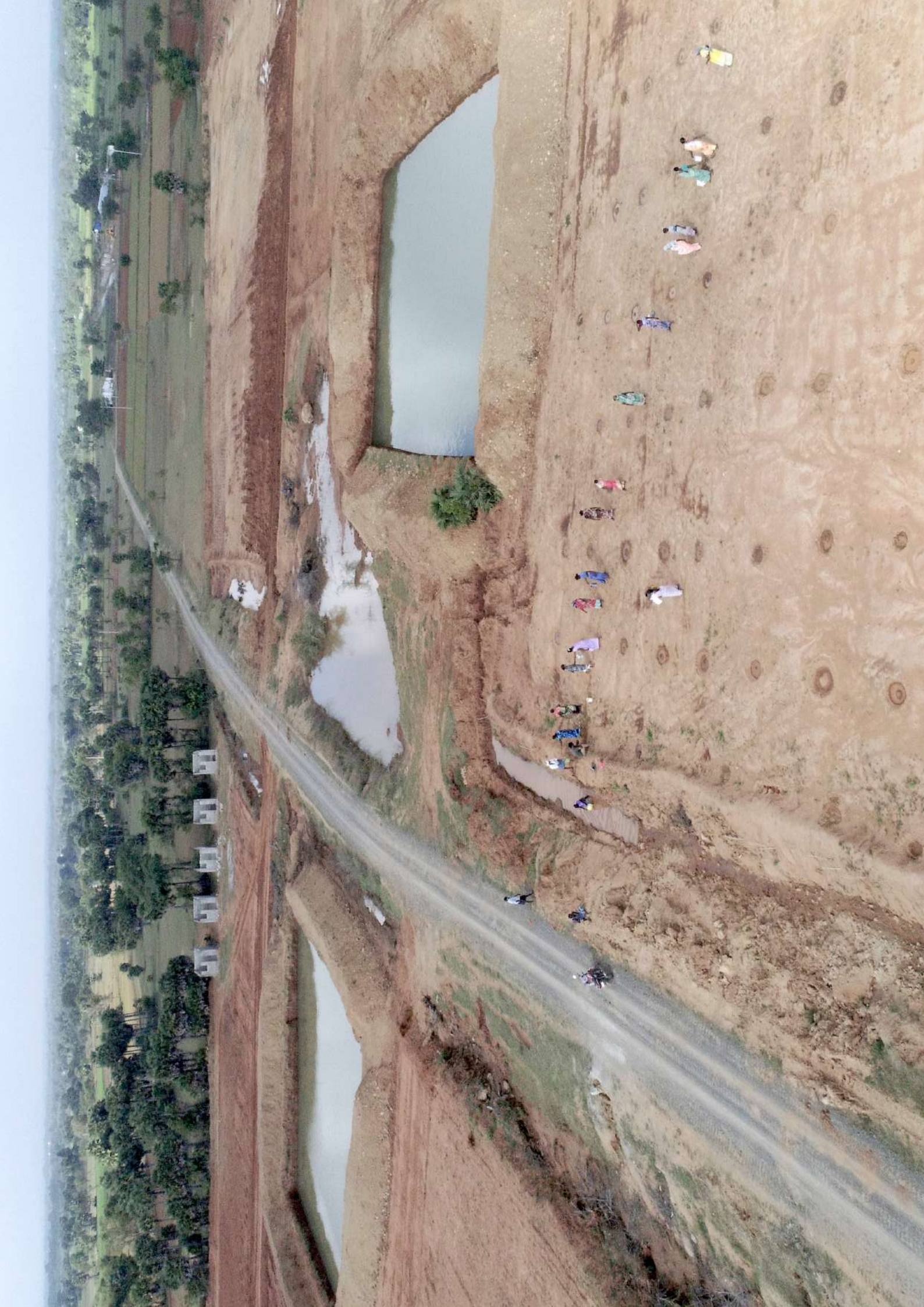
S. No	Name of the GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 16/11/21
1	5-Puthur	727	211
2	Agaram	723	153
3	Alagusenai	546	157
4	Andipalayam	297	160
5	Appanallur	450	269
6	Ariyalam	488	159
7	Athimalaipattu	851	152
8	Ayyampalayam	525	143
9	Devikapuram	506	205
10	Kamakkur	469	469
11	Karippur	407	436
12	Kattukanallur	421	225
13	Kilnagar	611	155
14	Kolathur	932	332
15	Kongarampattu	503	268
16	Kunnathur	362	153
17	Maduraiperumattur	475	370
18	Malayampattu	472	160
19	Marusoor	338	487
20	Melnagar	610	163
21	Mullipattu	281	241
22	Murugamangalam	635	188
23	Nadukuppam	642	224
24	Onnupuram	980	249
24	Onnupuram	980	249
25	Palaya Egambaranallur	509	166
26	Pudupalayam	860	131
27	Pulavanpadi	756	173
28	Pungampadi	374	309
29	Ramasanikuppam	885	267
30	Rantham	379	407
31	Saduperipalayam	617	407
32	Sambuvarayanallur	888	460
33	Thatcharampattu	507	575
34	Thatchur	480	377
35	Thellur	584	313
36	Vannankulam	509	400
37	Vinnamangalam	905	357

## ANNEXURE 8

## CWRM KEY PARAMETERS FOR GP'S IN MODEL MICRO-WATERSHED

Sl.No	Description	Kattukkanllur GP	Kalpattu GP
<b>Soil Resources: Status of Available Nitrogen</b>			
1	Very Low (VL)	3	9
2	Low (L)	97	38
3	Medium (M)	0	8
4	High (H)	0	0
5	Very High (VH)	0	0
<b>Status of Organic Carbon</b>			
6	Very Low (VL)	44	64
7	Low (L)	56	35
8	Medium (M)	0	3
9	High (H)	0	0
10	Very High (VH)	0	0
<b>Status of Soil Micro Nutrients</b>			
11	Sufficient	61	55
12	Deficient	39	45
<b>Status of Physical condition of the soil</b>			
13	Acidic Sulphate (AS)	0	0
14	Strongly Acidic (SrAc)	0	0
15	Highly Acidic (HAc)	0	0
16	Moderately Acidic (MAc)	0	0
17	Slightly Acidic (SlAc)	0	21
18	Neutral (N)	0	23
19	Moderately Alkaline (MAI)	100	56
20	Strongly Alkaline (SIAI)	0	0
<b>Soil Texture</b>			
21	% of Clay Soil	3	4
22	% of Fine Soil	5	46
23	% of Coarse loamy	75	15
24	Soil Water Permeability	Moderate	Moderate
<b>Means of Water Extraction</b>			
25	Gravity	0	0
26	Lifting	100	100
<b>Irrigation Methods</b>			
27	Wild Flooding	0	5
28	Control Flooding	100	95
<b>Livestock</b>			
29	Cattle Population	1468	2050
30	Sheep Population	106	
31	Goat Population	432	599
32	Poultry	0	0

Sl.No	Description	Kattukkanllur GP	Kalpattu GP
<b>Land Resources (in ha)</b>			
33	Area under Forest land	0	0
34	Area under Non-Agricultural Uses	163.52	55.26
35	Area under Barren & Uncultivable Land	4.3	0
36	Area under Permanent Pastures and Other Grazing Land	0	0
37	Area under Land Under Miscellaneous Tree Crops etc.	0.54	0
38	Area under Cultivable Waste Land	89.64	0
39	Area under Fallows Land other than Current Fallows	50	325.43
40	Area under Current Fallow land	179.54	130.47
41	Area under Unirrigated Land	69.84	201.69
42	Area Irrigated by Source	209.15	397.19







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