Ministry of Rural Development Ministry of Jal Shakthi

WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA

Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

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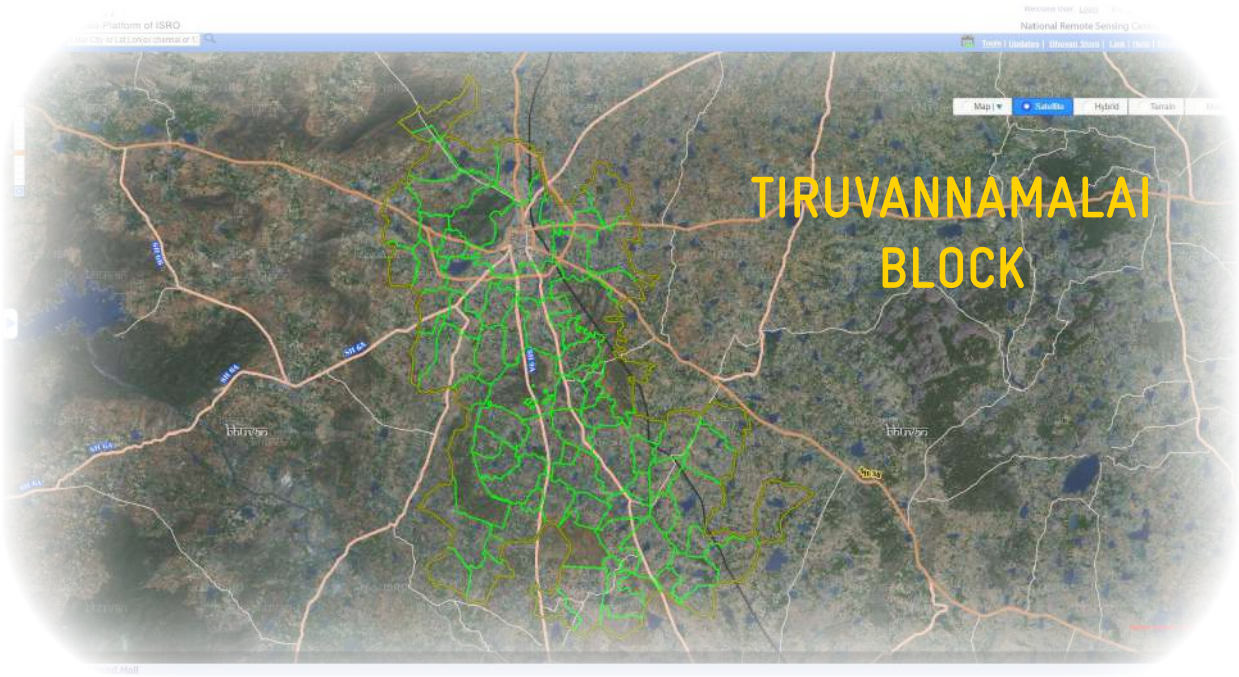
WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

FOREWORD

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

FOREWORD

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

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

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

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

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

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

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

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

We look forward to its success!

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

FOREWORD

Thiru. B. Murugesh, IAS
District Collector,
Tiruvannamalai

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

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

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

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

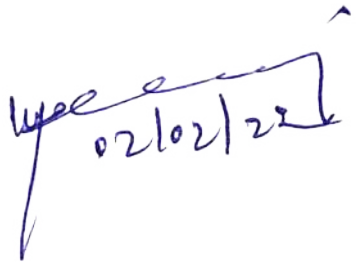
Through GIS based planning in 860 GPs, works identified under CWRM are verified, approved at Gram Sabha. These works would potentially reduce 38% surface runoff to be harvested or recharged by various interventions through ridge to valley watershed approach.

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

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

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

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



Thiru. B. Murugesh, IAS
District Collector,
Tiruvannamalai

MESSAGES

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

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

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

M. P—

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

MESSAGES

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

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

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

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

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

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

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

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

MESSAGES

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

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

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

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

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

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

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ANNEXURE

ABBREVIATIONS AND ACRONYMS

A - D

%
Percentage

^{0}C
Degree Celsius

AR
Assessment Report

CCB
Contour Continuous Bunds

CCCDM
Centre for Climate Change and Disaster Management

CRM
Climate Resilient Measures

CuM
Cubic Meter

CVI
Climate Vulnerability Index

CWRM
Composite Water Resource Management

CWRMP
Composite Water Resource Management Plan

DEM
Digital Elevation Model

D - H

DLSC
District Level Steering Committee

DLT
Drainage Line Treatment

DRD&PR
Department of Rural Development & Panchayat Raj

ET
Evapo-transpiration

FPO
Farmer Producer Organization

FY
Financial Year

GIS
Geographical Information System

GIZ
Deutsche Gesellschaft für Internationale

Govt.
Government

GP
Gram Panchayat

GW
Ground Water

ha
Hectare

I - M

ha.m
Hectare Meter

HH
Households

ICAR
Indian Council for Agriculture Research

IMD
Indian Meteorological Department

INR
Indian Rupees

IPCC
Intergovernmental Panel on Climate Change

IWRM
Integrated Water Resources Management

Kharif crop
Sown in Monsoon and harvested close to Autumn

Km
Kilometer

KML
Keyhole Markup Language

LULC
Land use and land cover

M - N

Max
Maximum

MCM
Million Cubic Meter

MC
Mid Century

MCM
Million Cubic Meter

Mahatma Gandhi NREGA
Mahatma Gandhi Rural Employment Guarantee Act

Mahatma Gandhi NRGES
Mahatma Gandhi Rural Employment Guarantee Scheme

Min
Minimum

mm
Millimeter

MoEFCC
Ministry of Environment, Forest and Climate Change

MoJS
Ministry of Jal Shakti

MoRD
Ministry of Rural Development

M
Meters

N - S

NAPCC
National Action on Climate Change

NARP
National Agricultural Research Project

NADEP
Nadepkaka

NDC
Nationally Determined Contributions

NEM
North-East monsoon

NGO
Non-Governmental Organization

NITI
National Institution for Transforming India

No.
Number

NRM
Natural Resource Management

NRSC
National Remote Sensing Centre

NWC
National Water Commission

PWD
Public Works Department

S - U

Rabi crop
Sown in winter and harvested in monsoon

RDPR
Rural Development & Panchayat Raj

RF
Reserve Forest

RTRWHS
Roof top rain water harvesting structures

RWHS
Rain Water Harvesting System

SAPCC
State Action Plan on Climate Change

SC
Scheduled Caste

SDG
Sustainable Development Goal

SDMA
State Disaster Management Authority

SDMRI
Suganthi Devadasan Marine Resources Institute

SECC
Socio Economic and Caste Census

S - W

SHG
Self Help Group

SLSC
State Level Steering Committee

ST
Scheduled Tribe

SWM
South-West monsoon

UN
United Nations

SW
Surface Water

TN
Tamil Nadu

WASCA
Water Security and Climate Adaptation

WCWH
Water Conservation and Water Harvesting

வான்நின்று உலகம் வழங்கி வருதலால்
தான்அமிழ்தம் என்றுணரற் பாற்று

குறள் - 11

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

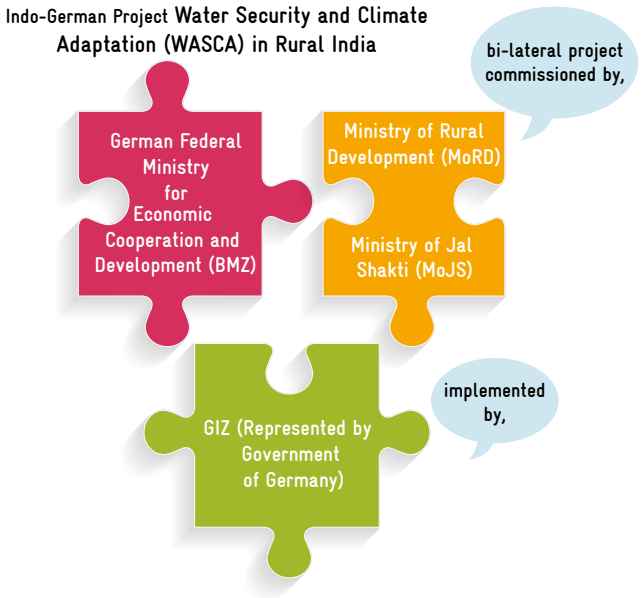
Thirukkural - 11

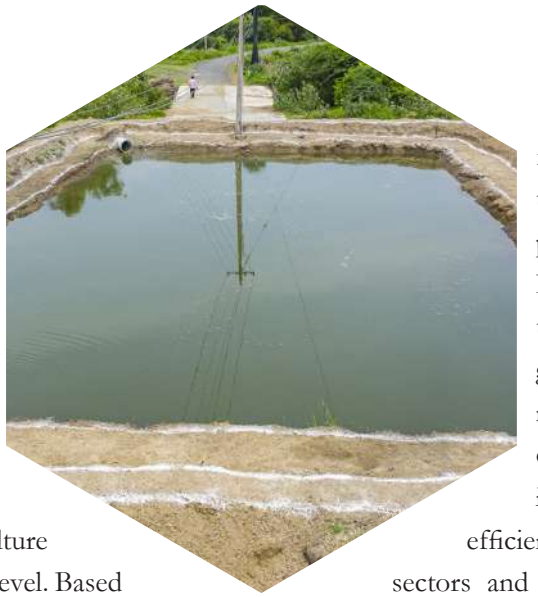
EXECUTIVE SUMMARY

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

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

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





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

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

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

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

This report was structured with nine chapters

1

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

2

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

3

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

4

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

5

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

6

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

7

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

8

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

9

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

துப்பார்க்குத் துப்பாய துப்பாக்கித் துப்பார்க்குத்
துப்பாய தூஉம் மழை

குறள் - 12

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

Thirukkural - 12

CHAPTER 1

1 ABOUT THE BLOCK

Tiruvannamalai is a revenue Block in Tiruvannamalai District of Tamil Nadu India. Tiruvannamalai lies between 12°2'45.108"N to 12°17'45.667"N latitude and 79°0'52.139"E to 79°6'52.421"E longitude and is surrounded by Kilpennathur, Thurinjapuram, Pudupalayam, Chengam and Thandrampet (Figure 1.1). The total geographical area of this flat terrain Block is 30,460.25 ha (304.60 Km2). Administratively, this Block comes under Tiruvannamalai taluk, with 69 village panchayats and 234 habitations in it.

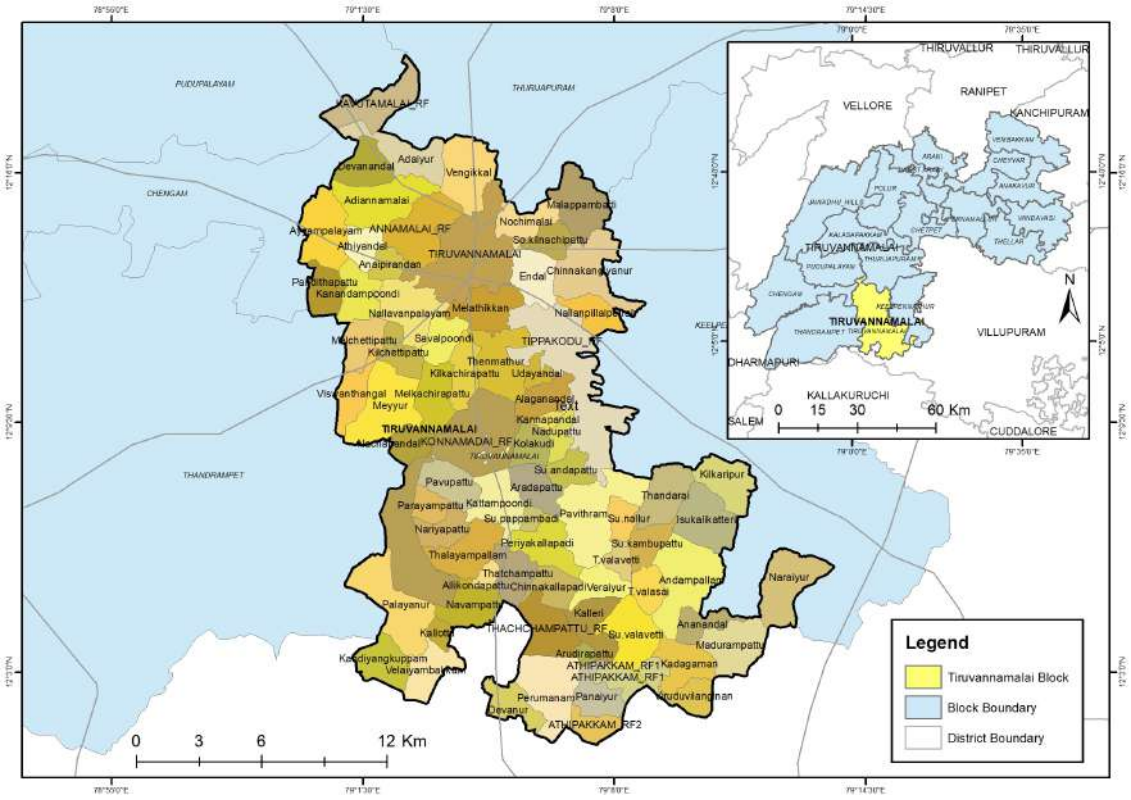


Figure 1.1. Tiruvannamalai Block and it's environ

According to Census 2011, the population of Tiruvannamalai Block is 3,25,726. The population density of the Block is 550 per Km2 which is higher than the District population density (473 per Km2) and almost on par with the State's density (555 per Km2). There is 28.92% increase in the population observed since 2001 in this densely populated rural Block. The percentage of male population is slightly higher (50.15 %) than the female population (49.8%). The proportion of sex ratio is 984 females per 1,000 males, which is equal to the District average sex-ratio (984 females per 1,000 males). The literacy rate of female population is lower (44.37%) than male literacy (55.63%). At 80.79%, the average literacy rate of the Block is much higher than the national average (72.98%). Scheduled Castes and Scheduled Tribes accounted for 28% of the total population. (Tiruvannamalai District profile 2020).

Economically, Tiruvannamalai is the top revenue earning Block of the Tiruvannamalai District. Agriculture and allied activities are the primary occupation followed by livestock rearing. Sugarcane is the predominant irrigation crop followed by paddy. The other major crops are Pulses and horticulture. Significant cultivated areas of banana, turmeric, dry chilli, maize and ragi cultivation can also be seen. Groundnut and pulses are cultivated both under irrigated and rainfed conditions. A livestock count of 77,347 was recorded during 2019-20. The cattle count is 49,234. Block has notable 64 milk societies with 40,803 litres of milk (2nd largest milk

> The proportion of sex ratio is 984 females per 1,000 males, which is equal to the District average sex-ratio (984 females per 1,000 males)

> At 80.79%, the average literacy rate of the Block is much higher than the national average (72.98%)

producer in the District) being produced per day. The famous 'Arulmigu Annamalaiyar' temple, many Saints Ashramams which attract toursits through out the world are located in this Block.

> Block has notable 64 milk societies with 40,803 litres of milk (2nd largest milk producer in the District) being produced per day

Thiruvannamalai Block comes under Thurinjalar and Pambar to Thirukovilur sub basin/Palar basin and has 111 micro-watersheds (Figure 1.2). There are around 123 tanks in the Block with the largest tank being the peraikalambadi tank with an area of 149.74 ayacut ha. Other important tanks are Samuthram (131.17 ha), Adaiyur tank (98.1ha), Meyur tank (71 ha), Andampallam and Naraiyur tanks (70 ha), Pavithram (68 ayacut ha) and Kattampoondi tank (65 ha) (Figure 1.3). The ground water levels in Thiruvannamalai Block are seriously

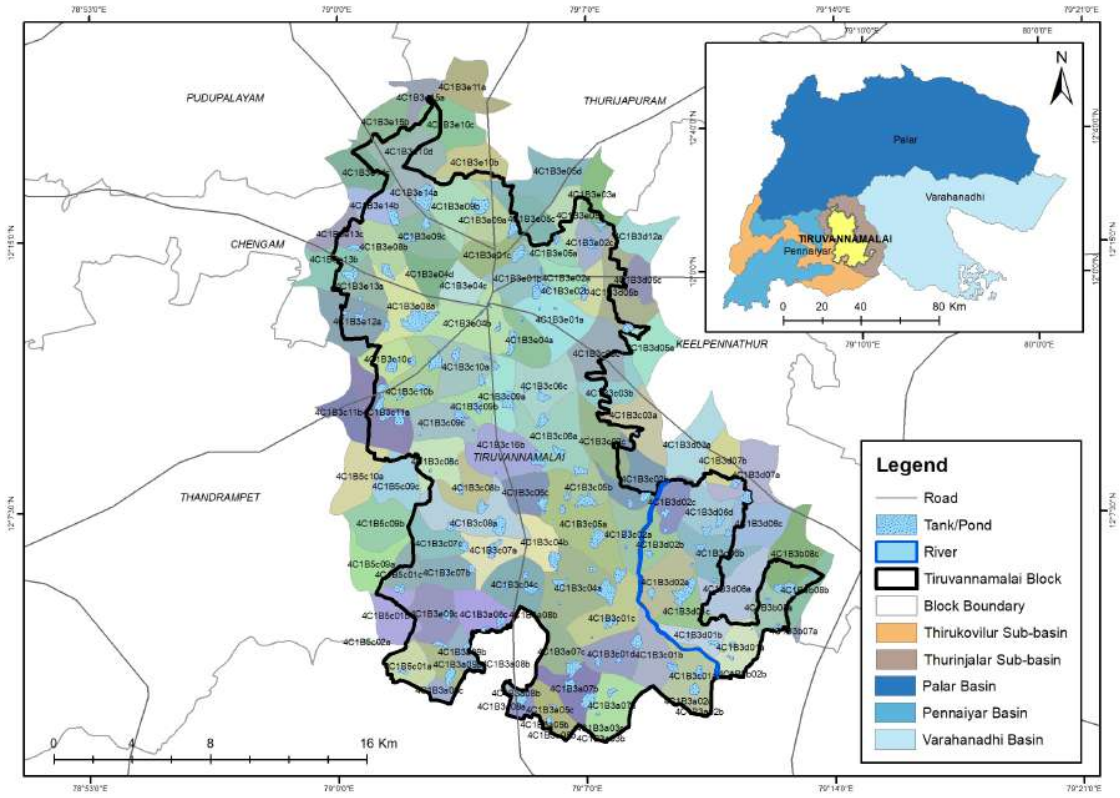


Figure 1.2. Watersheds- Thiruvannamalai Block

depleted and are at over exploitation stage of ground water development. T.V.Malai (North), T.V.Malai (South), Veraiyur, and Thatchampattu firkas cover the Block. Veraiyur and Thatchampattu firkas are over exploited, T.V.Malai (North) firka is in critical and T.V.Malai (South) firka is in semi critical stage.

GROUND WATER LEVEL OF THIS BLOCK

OVER EXPLOITED- › 100%	Veraiyur, Thatchampattu
CRITICAL- › 90% & ‹=100%	T.V.Malai (North)
SEMI CRITICAL->70%&‹90%	T.V.Malai (South)

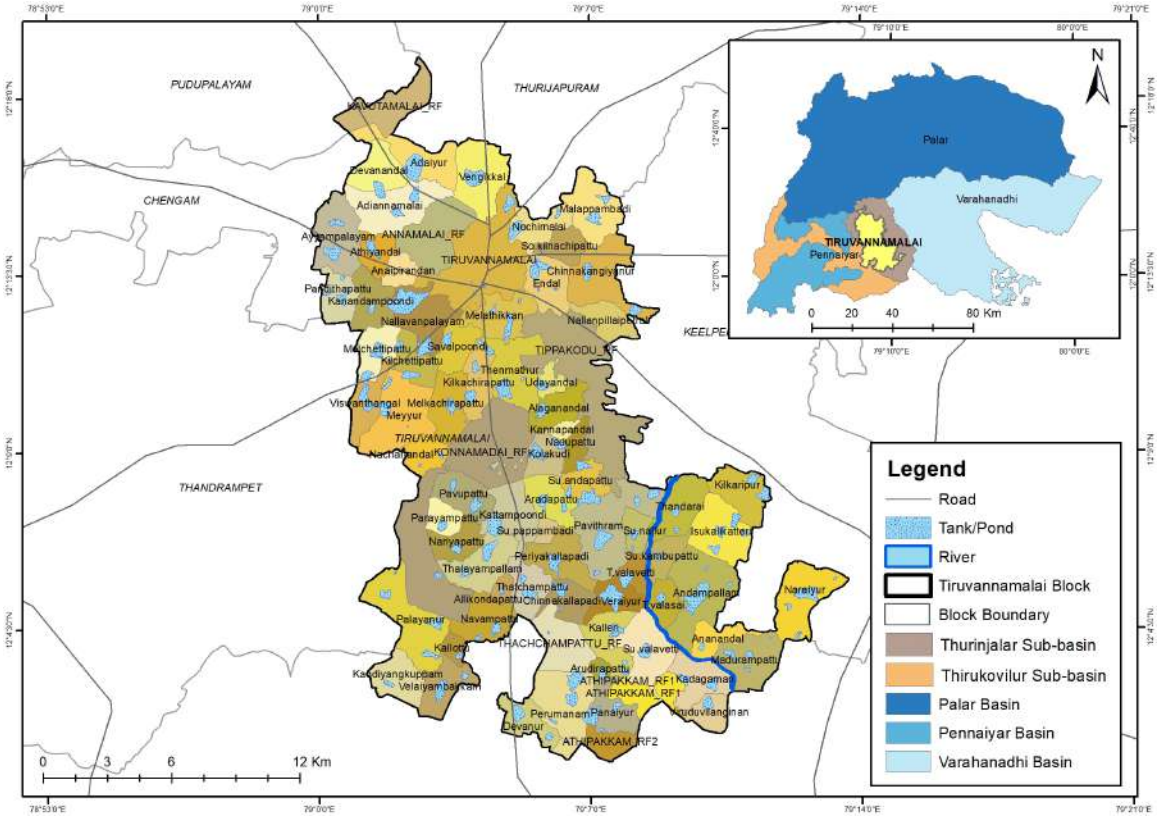
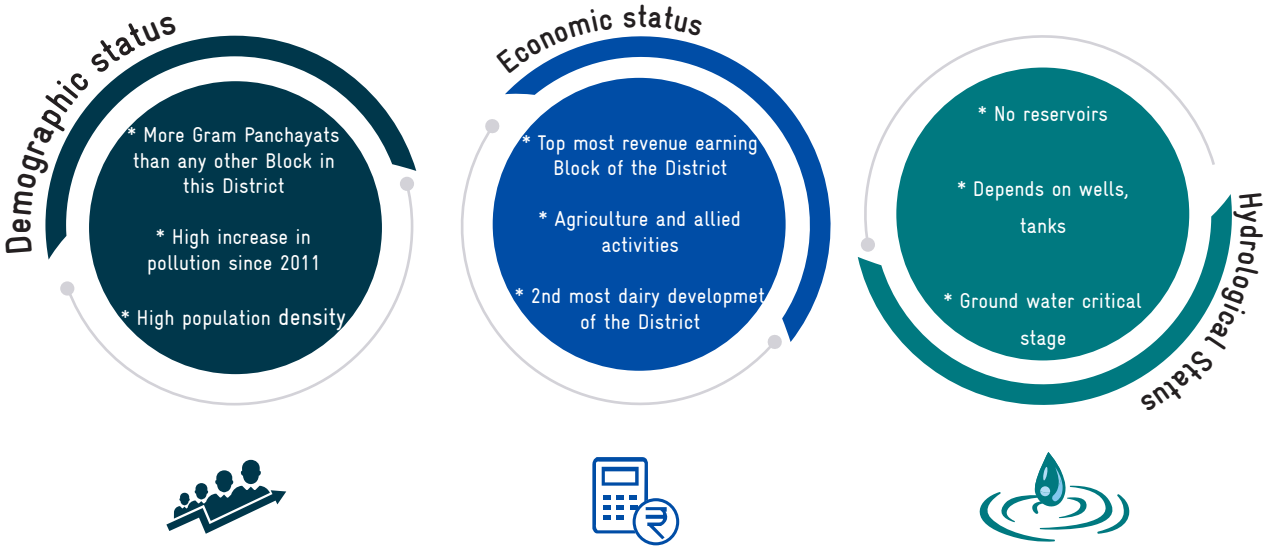


Figure 1.3. Spatial distribution of waterbodies



வின்இன்று பொய்ப்பின் விரிநீர் வியனுலகத்து
உள்நின்று உடற்றும் பசி

குறள் - 13

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

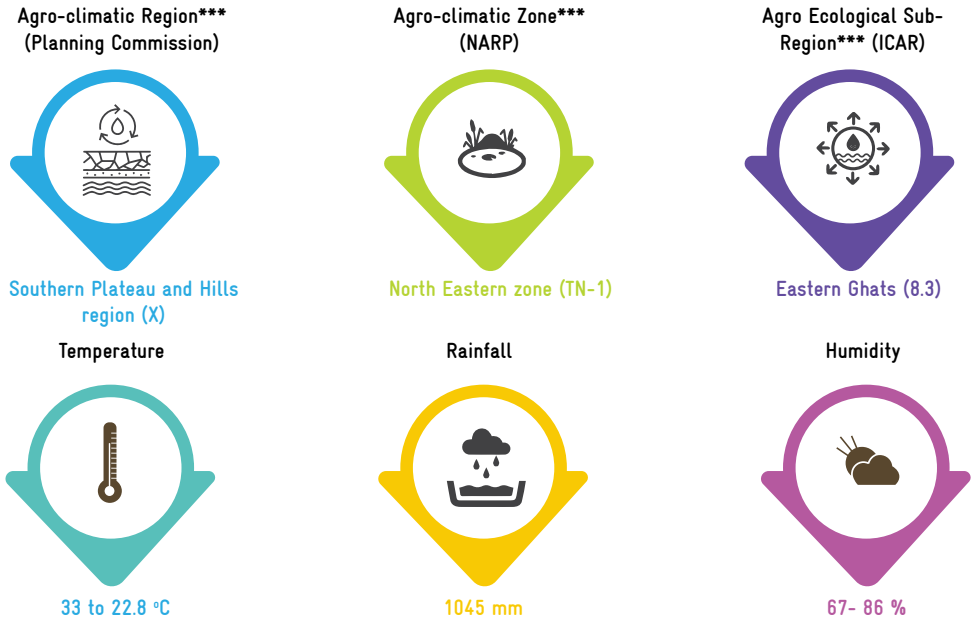
Thirukkural - 13

CHAPTER 2

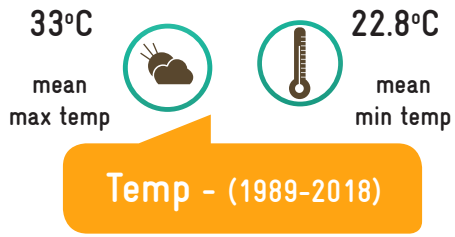
2 CLIMATE AND WATER SECURITY

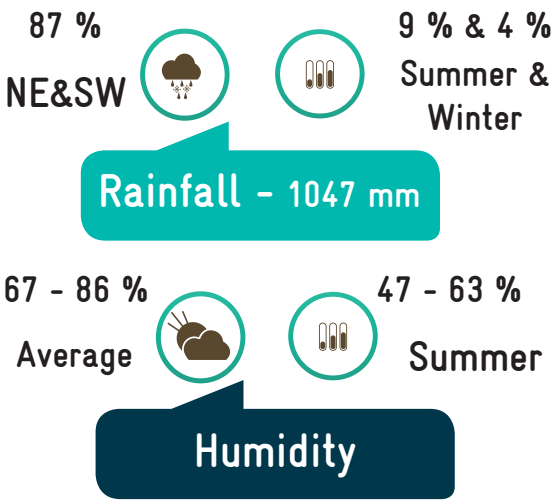
This region has typical tropical climate, located in the North Eastern agro-climatic zone of State and Southern Plateau and Hills region according to the agro climatic regional classification of planning commission. The general climate description of this region is given below (Table 1).

TABLE 1. GENERAL CLIMATE DESCRIPTION OF THE BLOCK



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 45oC for few days. The average monthly temperature characteristic during 2020 is shown in figure 2.1





Normally this region receives major rainfall from North-East Monsoon (NEM) (October to December) and South-West Monsoons (SWM) (June to September). Past records show the annual average rainfall of this region is 1,047 mm (WRIS, GoI). Both North-East and South-West Monsoons contribute nearly 87 % of the annual rainfall in which SWM is slightly stronger. While summer (March to May) rainfall accounts 9 % of the total rainfall and winter (January, February) season has low contribution (4%) to the annual rainfall (Figure 2.2). The average relative humidity is 67- 86 % and during summer it ranges between 47-63 %.

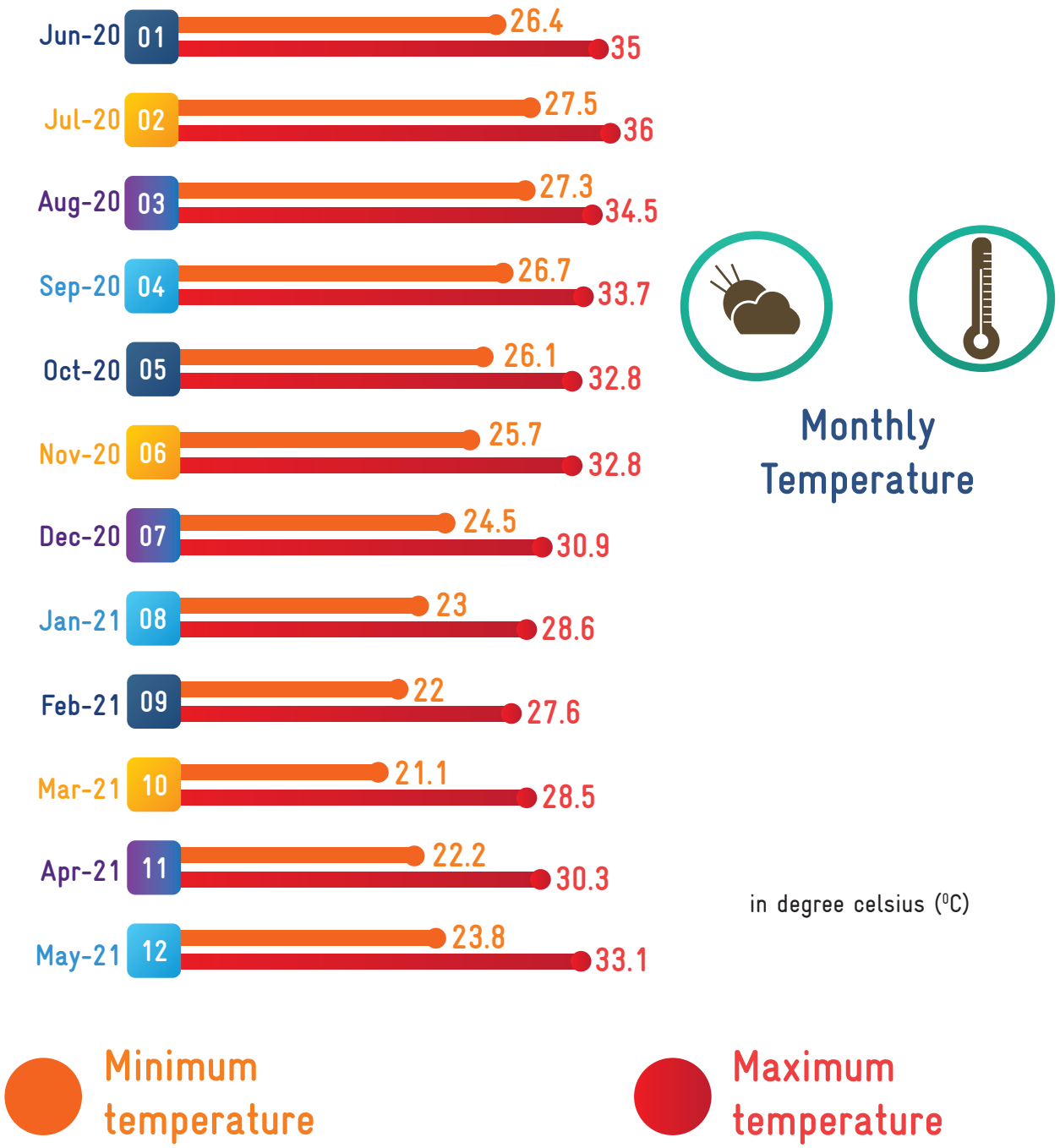


Figure 2.1. Average monthly temperature

The average annual rainfall days are 172 days in which 72 days are from North East Monsoon (NEM) and 82 days are from South West Monsoon (SWM) months. Onset of SW Monsoon rainfall starts in the 1st week of June and cessation would be in the 1st week of October. Onset of NEM rainfall starts in the 2nd week of October and cessation would be in the 4th week of December. Though the number of rainy days is slightly lesser than SWM, the intensity is more in NEM.

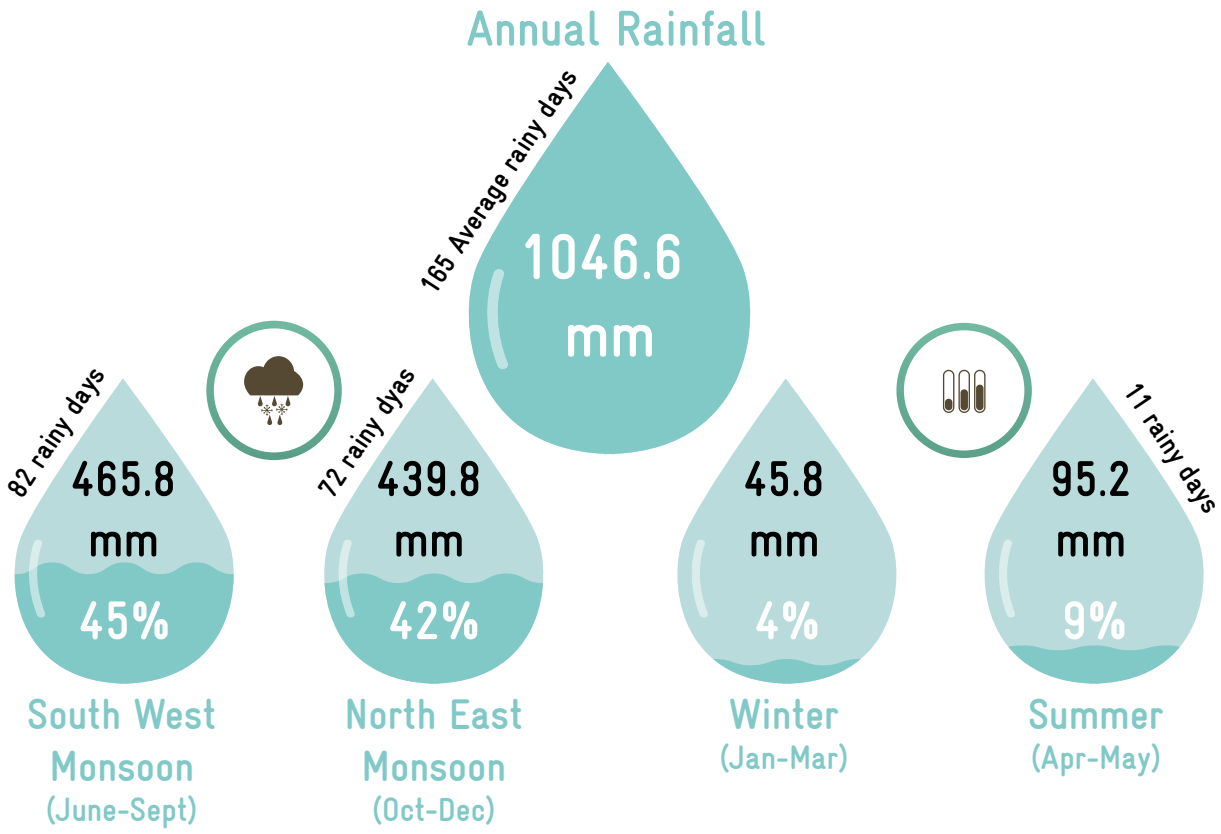


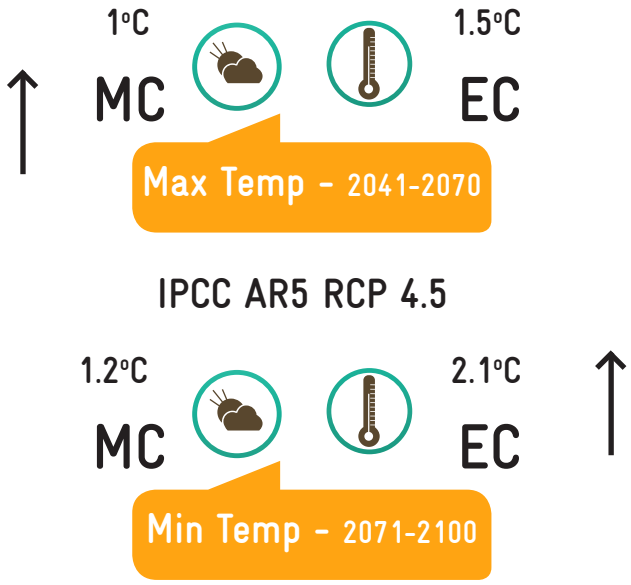
Figure 2.2. Season-wise distribution of annual rainfall

In recent decades, the world is witnessing significant changes in its climate. These changes include increase in average temperature, variations in the rainfall intensity and its frequency. This region is also no exception, and an increase in maximum and minimum temperature of 1.2^{0}C and 0.5^{0}C was observed during 1951 to 2015 (IMD). The rainfall variability is also well observed. During 1951 to 2015, there were 15 excess rainfall years (above normal rainfall) and 15 deficient rainfall years (below normal rainfall) recorded. The consecutive excess and deficient rainfall leads to rainfall variability and its extremities. Since this region is heavily dependent on monsoon rains, it is prone to droughts when the monsoons fail. As rainfall is the major source for determining water storage, existing water resources such as rivers, dams and major and minor tanks fail along with deficient rainfall years.

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

Recent IPCC Assessment Report 6 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 1.50 ◦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 1.20 ◦C and 2.10◦C during MC and EC periods. Average annual rainfall for IPCC AR5 RCP4.5 scenarios is projected to increase about 13 percent towards MC and increase by about 21 per cent towards EC period.



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

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

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

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

2.1 CLIMATE RISKS

Increasing temperature, fluctuating rainfall patterns and its extremities create shorter rainy seasons and longer dry seasons making river basins more vulnerable. This District experiences climate hazards in the past such as floods, drought and heat waves.

* Flood
* Drought
* Heat waves

Flood

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

Drought

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

Heat Wave

A heat wave is a period of abnormal high temperatures, more than the normal maximum temperatu-re that occurs during the (hot weather) summer season. Heat waves typically occur between March and June. The extreme temperatures and resultant atmospheric conditions adversely affect people living in these regions as they cause physiological stress, sometimes resulting in death. Normally, all parts of this District witnesses heat waves. All GPs in Thiruvannamalai Block are prone to Heatwaves.

2.2 WASCA CLIMATE VULNERABILITY INDICATORS

During 2019, 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 viz., climate extremities, water resources, agriculture and socio-economic to assess climate-water vulnerability at the District level (Table 2).

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

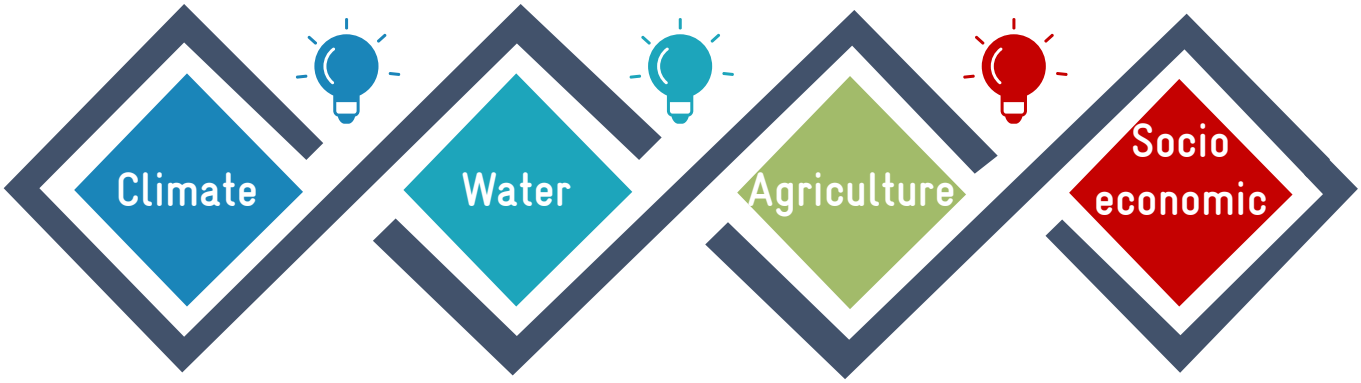
CWRM Area	Indicators of Rural water security vulnerability	Indicators label	Linked SDG
Climate	Changes in max temperature (°C)	C1	Goal 13
	Changes in min temperature (°C)	C2	
	Changes in rainfall (%)	C3	
	Excess rainfall years	C4	
Water	Deficient rainfall years	C5	
	Ground water extraction (%)	W1	Goal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

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

2.3 COMPRESSIVE ANALYSIS OF BLOCK LEVEL VULNERABILITY

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

TABLE 3. MAJOR PARAMETERS IDENTIFIED FOR BLOCK LEVEL VULNERABILITY ASSESSMENT



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

ஏரின் உழாஅர் உழவர் புயலென்னும்
வாரி வளங்குன்றிக் கால்

குறள் - 14

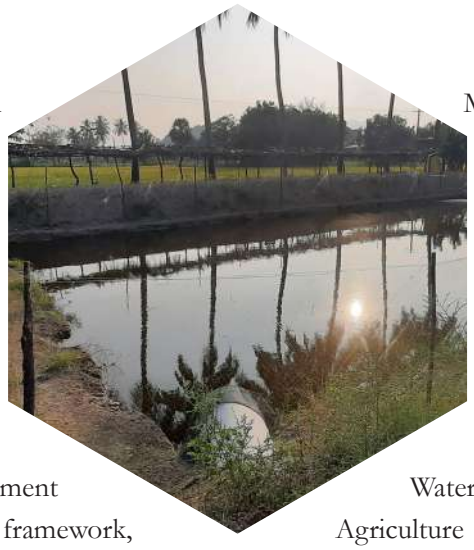
Unless the fruitful shower descend
The ploughman's sacred toil must end

Thirukkural - 14

CHAPTER 3

CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA

3 CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA



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

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

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

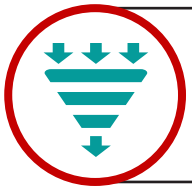
262 Total Kinds of works in Schedule-I of Mahatma Gandhi NREGA

182 Kinds of works relate to NRM alone

164 Kinds of works related to Agriculture & allied works

85 Water related works out of NRM

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



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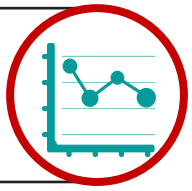


3.1 COMPOSITE WATER RESOURCE MANAGEMENT APPROACH FOR WASCA

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

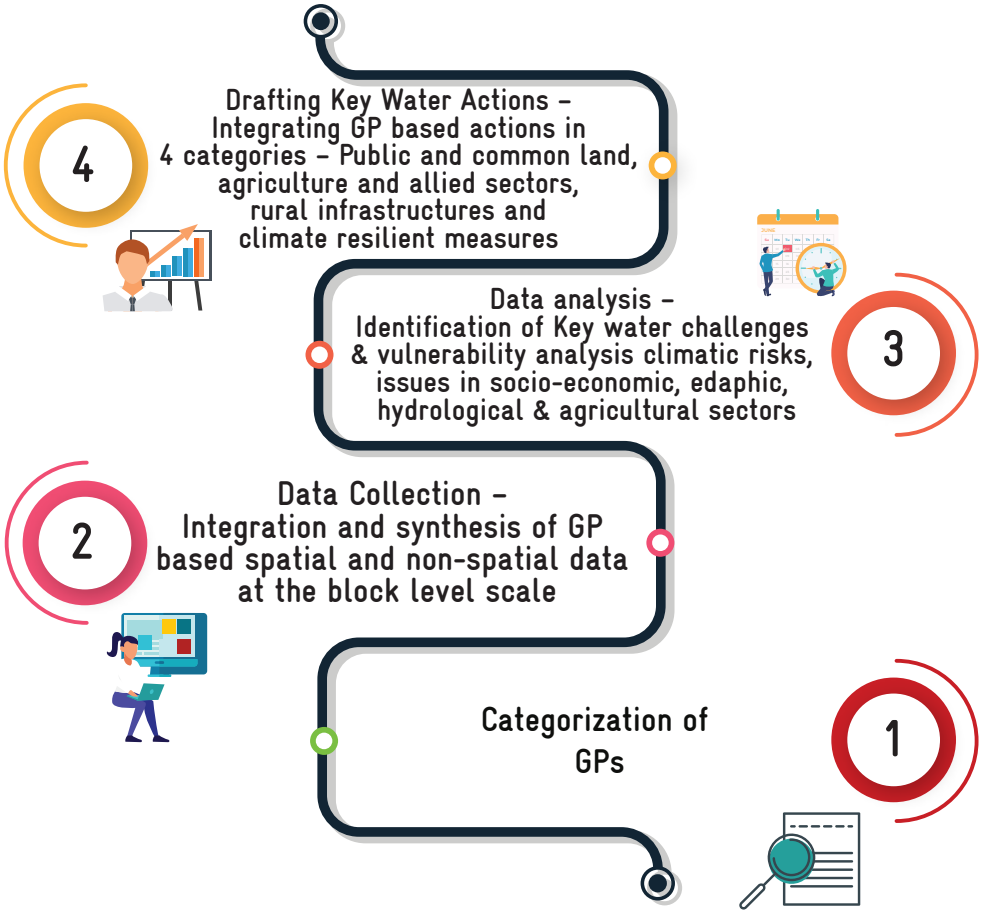
and soil moisture are used to understand the climate related issues. The next step is to assess land use, watersheds, drainage networks and surface runoff, existing water supply and storage systems, water management for the key sectors and water demand and prepare the water budget for the GP (Box 1).

BOX 1. MAJOR COMPONENTS INVOLVE IN CWRM PLANNING WORKOUTS

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

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

STEPS INVOLVED IN BLOCK LEVEL ANALYSIS THROUGH CWRM APPROACH



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

BOX 2. MAIN STAGES OF CWRM PLANNING PROCESS

PRE-PLANNING STAGE

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

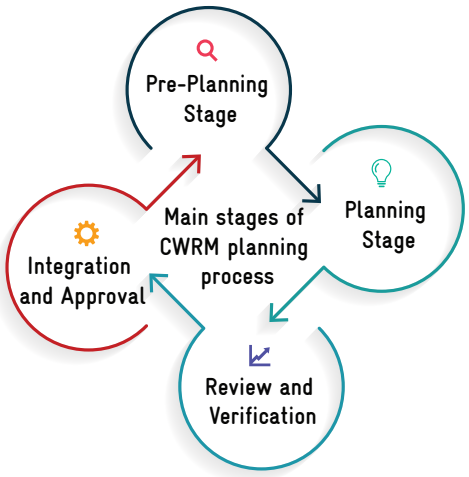
PLANNING STAGE

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

FOUR LEVELS OF CWRM PLANNING UNDER WASCA

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

2. INTEGRATING GP LEVEL PLANS AT BLOCK LEVEL



FOUR LEVELS OF CWRM PLANNING UNDER WASCA

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

4. INTEGRATING GP PLANS TO DEVELOP WASCA DISTRICTS CWRM PLANS

INTEGRATION AND APPROVAL

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

REVIEW AND VERIFICATION

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

3.2 CATEGORIZATION OF GPS

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

TABLE 4. CATEGORIZATION OF TIRUVANNAMALAI BLOCK GPS

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
48	GP and revenue village data and boundary match (Type-I)	Adaiyur, Alaganandal, Ananandal, Allikondapattu, Anaipirandan, Andampallam, Aradapattu, Aruthirapattu, Athiyandal, Ayyam Palayam, Chinnakkallapadi, Devanandal, Su.Kinachipattu, Devanur, Endal, Melkachirapattu, Meyyur, Nallanpillaipetral, Savalpoondi, Udayanandal, Viswanthangal, Isukkalikatteri, Kallottu, KandiyanNadupattu, Kannapandal, Kattampoondi, Kolakkudi, Madurampattu, Nachanandal, Nadupattu, Naraiyur, Navampattu, Nariapattu, Panaiyur, Pandithapattu, Parayampattu, Pavupattu, Periakallapadi, Perumanam, Su.Andapattu, Su.Pappambadi, Su.Valavetti, Thandarai, Thatchampattu, Thiruvanaimugam Valasai, Velayambakkam, Veraiyur, Viruthuvilanginan
2	Having more than one GPs in one Revenue Village (Type-II)	Su.Kambupattu, Su.Nallur
18	One GP is falling under more than Type 1 one Revenue Village (Type-III)	Adiannamalai, T.Kalleri, Kanandampoondi, Chinnakangianur, Kikachirapattu, Kilchettipattu, Melathikan, Melchettipattu, Nallavanpallyam, Thenmathur, Kilkaripur, Malappambadi, Nochimalai, Thalayampallam, Palaiyanur, Pavithiram, Kadagaman, Thiruvarangam Valavetti
1	Newly formed GP after 2011 census publication (Type-V)	Vengikkal

3.3 DATA COLLECTION

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

SPATIAL DATA

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

NON SPATIAL DATA

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

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

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

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

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

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

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

3.4 CWRM PLANNING ANALYSIS – CLIMATE

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

TABLE 5. CLIMATE RISKS AND VULNERABLE LOCATIONS

3.5 CWRM PLANNING ANALYSIS – WATER

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

3.5.1 SPATIAL DATA

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

3.5.1.1 Geomorphology: Geomorphology deals with scientific study of "landforms and landscapes, including their description, type, and genesis". Landform is the end product resulting from the interactions of the natural surface genesis and the type of rock. The scope of geomorphology has further expended with landform maps, were widely used in various fields of hydrology, pedology, geoscience, urban and regional planning etc. Tiruvannamalai Block majorly engrossed with Denudation origin – Pediment- Pediplain complex and northern minute area witnessed Structural origin land form (Figure 3.1). The Pediment-Pedipain complex is the result of weathering and cross cut eroded area by drainage systems with gentle slope or a low relief plain. Fundamental information of landform by its units will act as critical input in the identification of suitable sites for NRM activates under CWRM plan preparation.

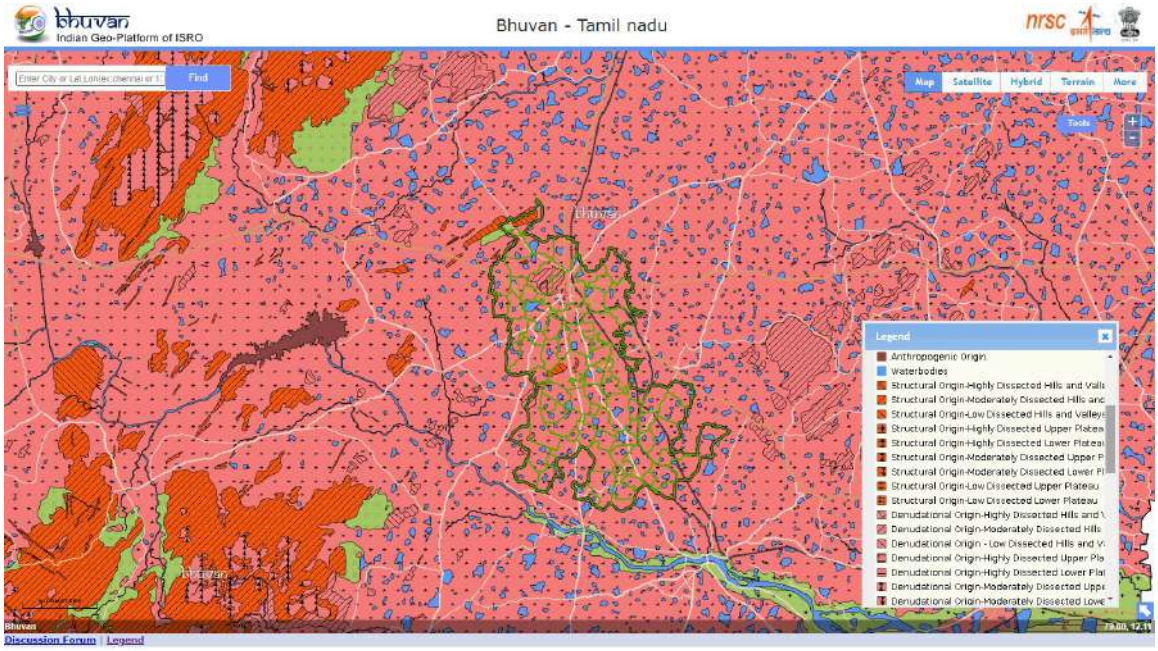


Figure 3.1. Geomorphology map

3.5.1.2 Lineament: The lineament is also a lithological unit, reveals the hidden architecture of rock basement, representation of an underlying geological structure such as a fault, fracture (Figure 3.2). Lineament is represented with linear feature where two different landform converges or diverges. This site allows water to percolate at high rate. Structural, Dyke, Fault Geomorphic, Parallel Ridge Geomorphic and Drainage parallel origin lineaments were noticed in the Block. Dyke based lineaments were observed in T.valasai, T.valavetti, Aradapattu, Meyyur, and Viswathangal GPs. While structural faults lineaments in Pandithampattu, Kanandampoondi, Adiannamalai, and Athiyandal GPs. Geomorphic Lineaments parallel to ridge are noticed in Endal, Nallanpillaipetral, Malappambadi, Nochimalai, and Vengikkal GPs, while Drainage parallel in Adayur, Devanandal, Nallavanpalayam, Melathikkan, Chinnakangiyanur, Devanur, Panaiyur, and Naraiyur GPs.

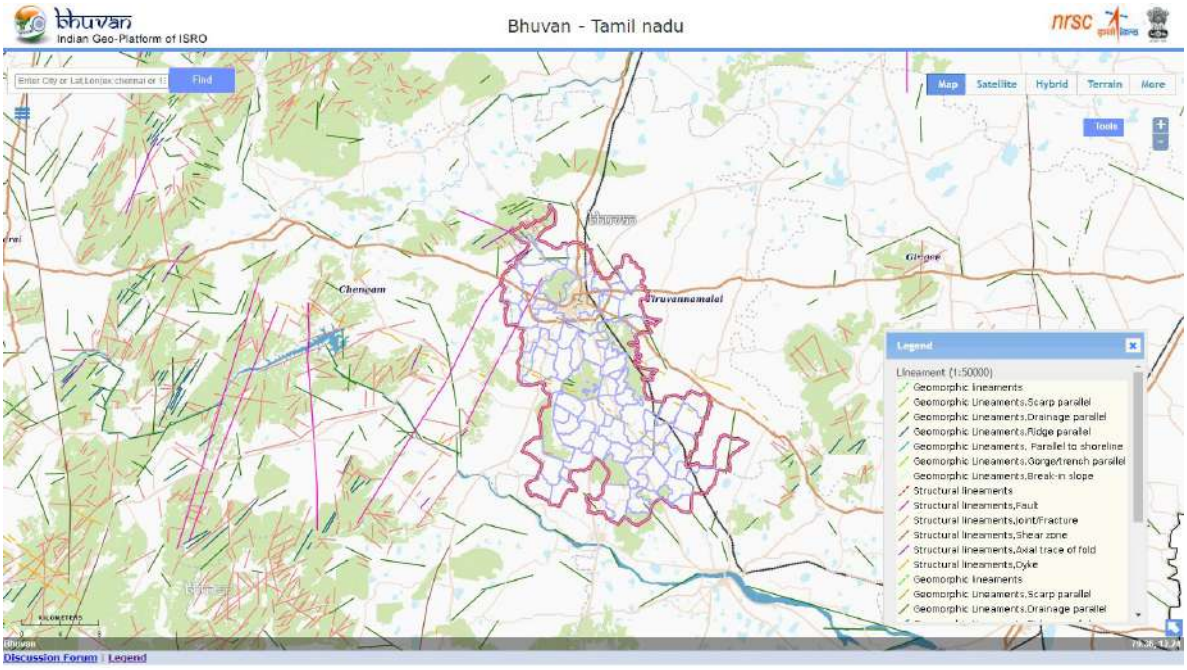


Figure 3.2. Lineament map

Lineament type	Gram Panchayat
Structural lineaments, Dyke	
	Aradapattu, Meyyur, T.valasai, T.valavetti, Viswathangal
Structural lineaments, Fault	
	Adiannamalai, Athiyandal, Kanandampoondi, Pandithampattu
Geomorphic Lineaments, Parallel Ridge	
	Endal, Malappambadi, Nallanpillaipetral, Nochimalai, Vengikkal
Geomorphic lineaments, Drainage parallel	
	Adayur, Chinnakangiyanur, Devanandal, Devanur, Melathikkan, Nallavanpal-ayam, Naraiyur, Panaiyur

3.5.1.3 Terrain: The terrain map is product of digital elevation model and gives information related to elevation of the area from above sea level used to represent the relief features. This map plays a key role in preparation of Ridge to Valley (R2V) orientated plans. Tiruvannamalai Block's terrain map is shown in Figure 3.3.

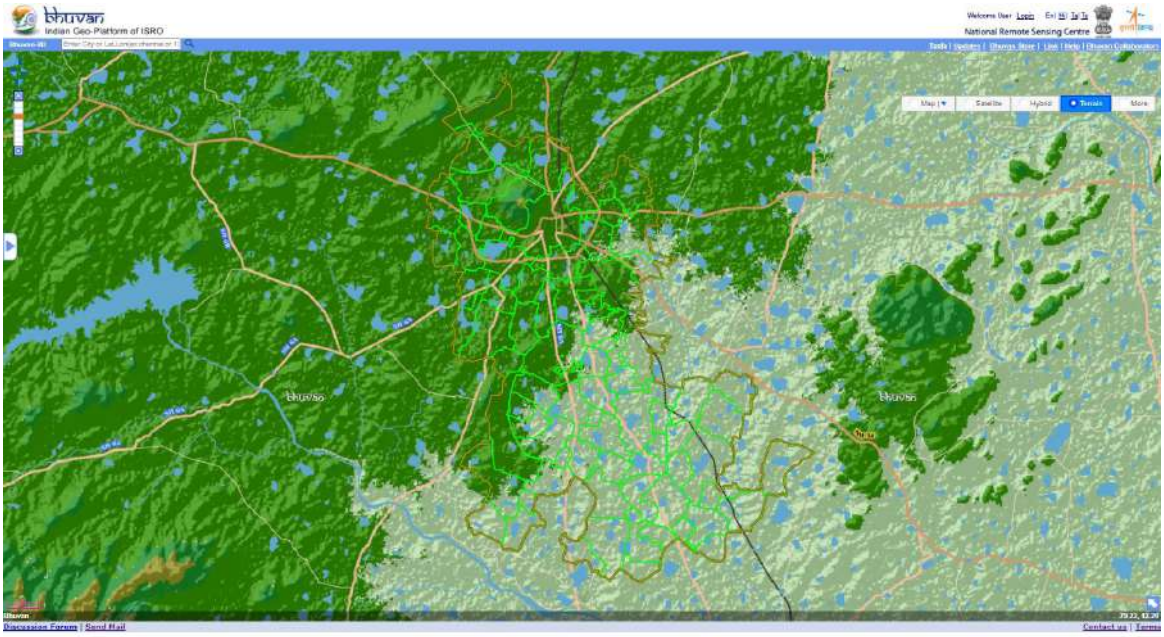


Figure 3.3. Terrain map

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

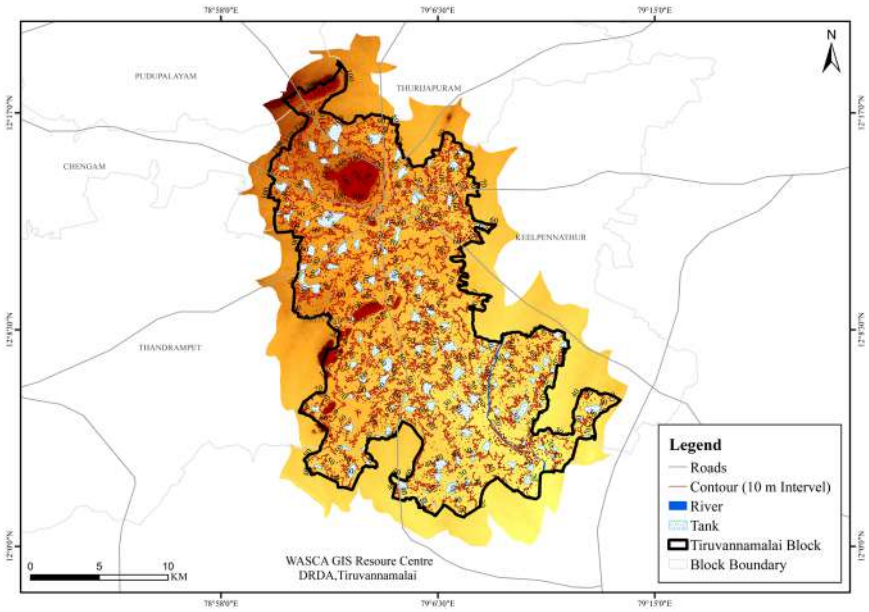


Figure 3.4. Contour map

3.5.1.5 Slope: The average slope of a terrain feature is calculated from contour lines on a topo map or DEM. Slope is typically expressed in percentage or angle, or in ratio. Slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. It is noticed that respect to the landform units the slope get varies in the Block (Figure 3.5). 100 % of area in Meyyur and 90 % area of GPs Kilchettipattu, So.Kilnachipattu, T.Valasai, and Su.Valavetti area witnessed Very Flat (0-1%). Whereas 90 % of area in Vengikkal & 80 % of GPs Tandarai, Kandiyangkuppam, Nadupattu, Viruvilanginan, & Nadupattu of Flat slope (1-3%) and 20 % of GP Tiruvannamalai with steep slope (10 -35 %). Slope information plays a significant role in identification of soil eroded sites, depth profiles, also used in analyzing / proposing the soil conservation measures such as check dam, farm ponds etc.

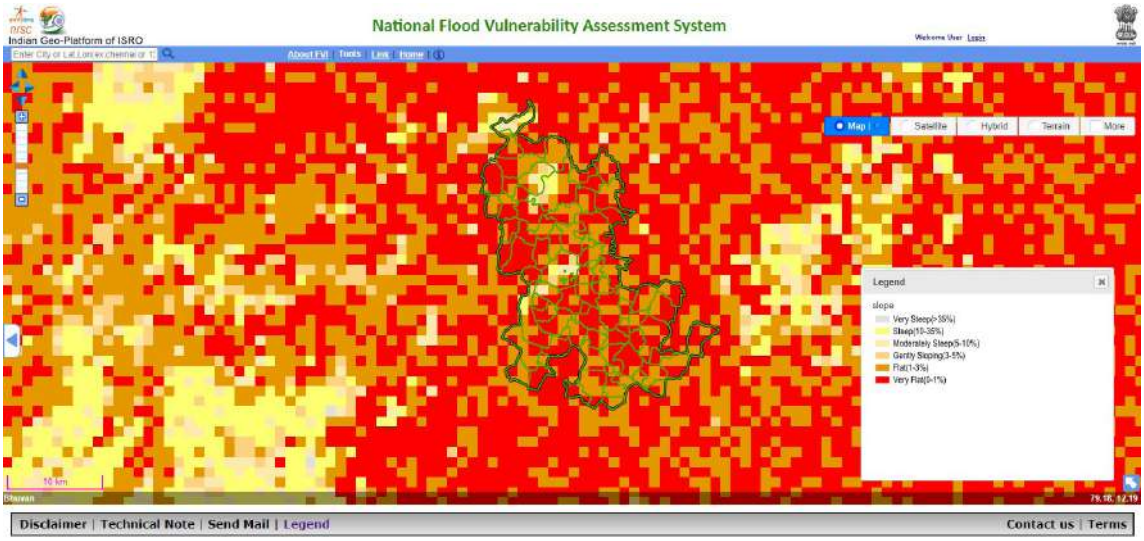


Figure 3.5. Slope map

Slope range	Area in %	Gram Panchayat
Very flat (0-1%)	92%	Kilchettipattu - 100%, Meyyur, So.Kilnachipattu, Su.Valavetti, T.Valasai - 90%
Flat (1-3%)	82%	Vengikkal - 90%, Kandiyangkuppam, Nadupattu, Tandarai, Viruvilanginan - 80%
Steep (10-35%)	20%	Tiruvannamalai

3.5.1.6 Drainage and surface waterbodies: Drainage network pattern of a region is particularly dependent on the lithological characteristics, regional slope, structural control, climate condition etc. Dendritic or tree pattern drainage system was observed in the Tiruvannamalai Block. Block area is drained with moderate to less dense drainage network while southern west area with moderate to high dense network (Figure 3.6). The dendritic pattern is characterized by irregular branching of tributary streams in all directions. Drainage network is referred in identifying the suitable sites for soil and water conservation measurements such as dams, ponds, bunding, restoration of gullied region etc.

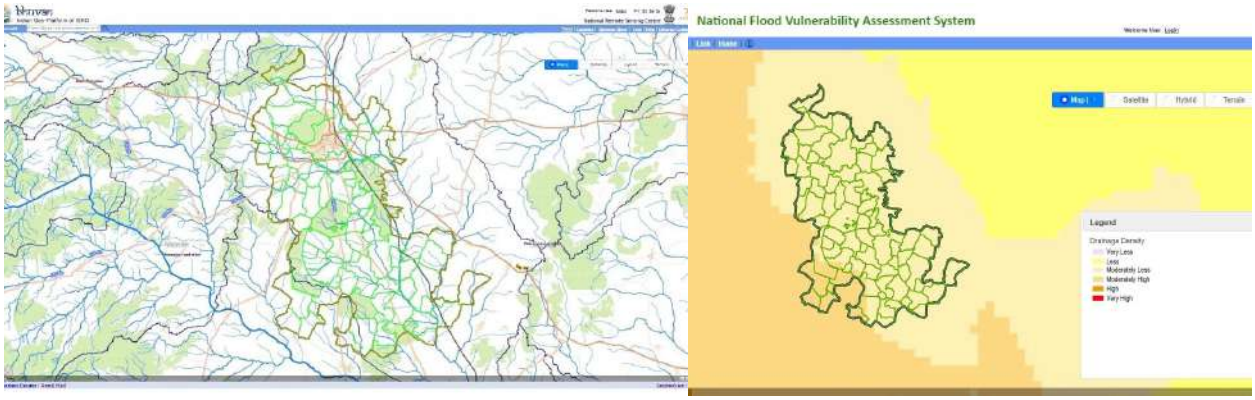


Figure 3.6. Drainage network and density map

3.5.1.7 Watershed: Implementation of any water management measure requires a suitable hydrological unit. A properly delineated watershed forms a convenient hydrological unit for computation of water balance parameters and thus implementation of water management schemes. Also, in achieving a better sustainability in development mainly NRM at the grass root level, watersheds are recognized as viable and effective management units and adopted in most of developmental programmers such as IWMP, MGNREGA etc. A watershed is the area/region of land where all of the water that falls in it and drains off goes into the common outlet. Tiruvannamalai Block watershed map is illustrated as figure 3.7 and figure 1.2 gives quantitative view at finite scale. Watersheds used for the interventions based on R2V concept and sequencing the plan accordingly. R2V approach intends to conserve each drop of rainfall water from ridge to a reasonable extent and it ensures the better surface water flow management also aids in strengthening the durability of land, soil and water conservation structures of the downstream.

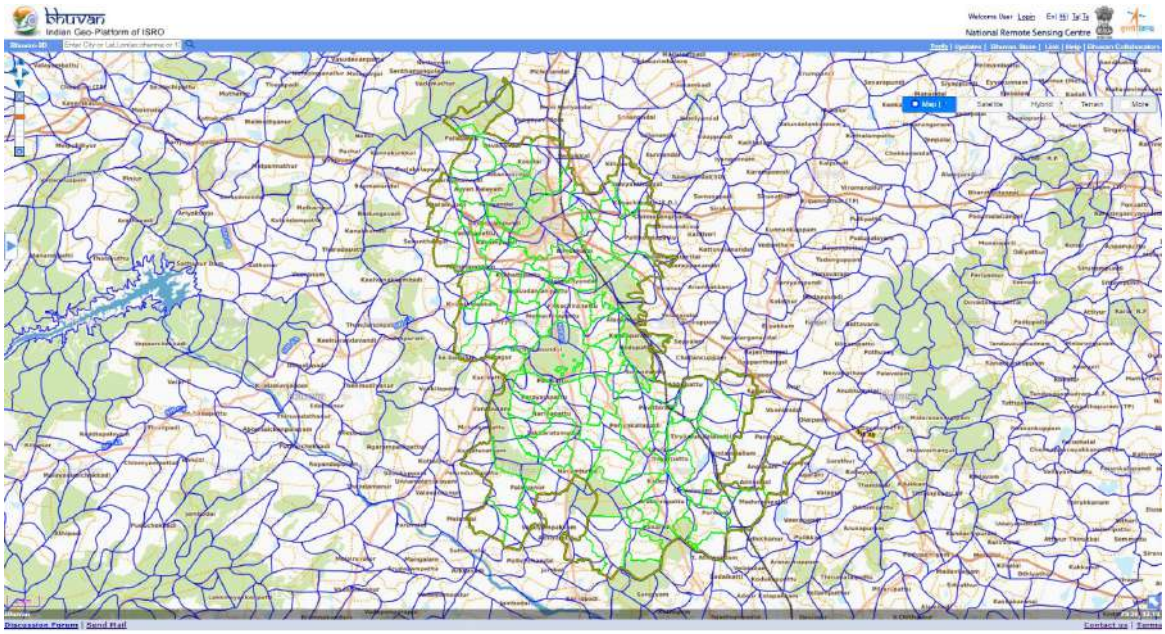


Figure 3.7. Watershed map

3.5.1.8 Ground water perspectives: The ground water perspectives map is the integration of lithology, geomorphology, geological structures, hydro geomorphic datasets, which provides the required information related to ground water exploration and the probable ground water prospects (Figure 3.8). This map helps in identification of tentative locations for construction of recharge structures. All GPs of the Block witnessed the ground water range between > 80 m Deep Well - 50 to 100 LPM. This information is taken into account while identifying sites for ground water recharge structures and percolation tank activities.

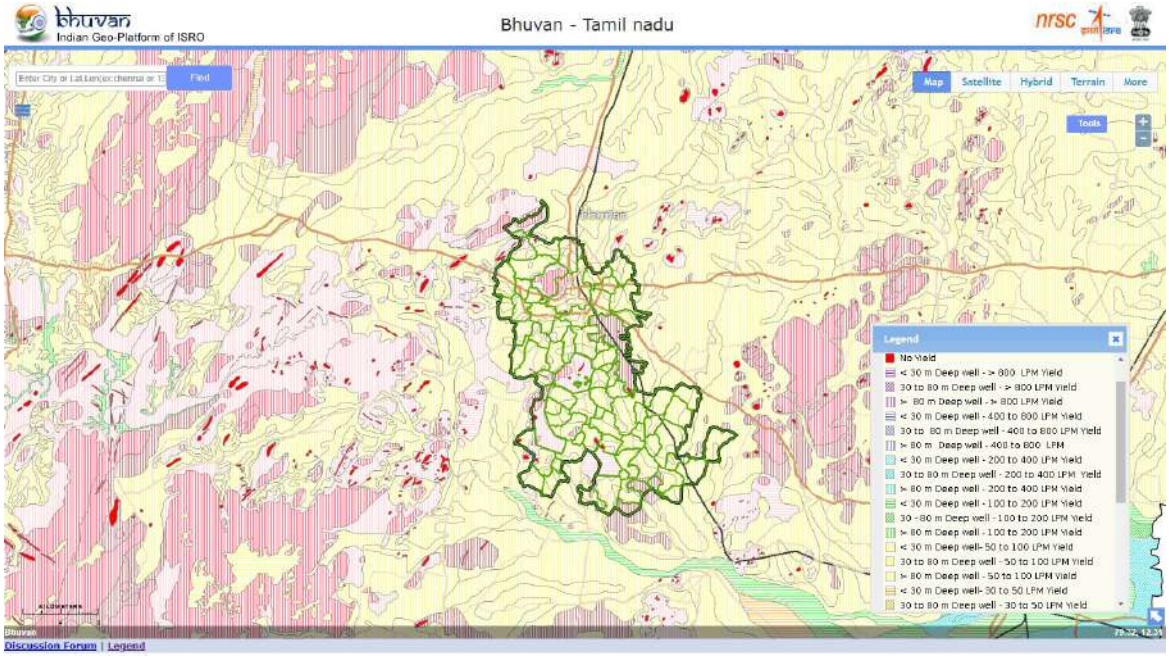


Figure 3.8. Ground water perspective map

3.3.2 NON SPATIAL DATA

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

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

S No	Key CWRM Parameter	Total
	Canal Network (in m)	
1	Length of Main Canal (m)	97,400
2	Length of Distributaries (m)	8,000
3	Water Courses (Field Channels) (m)	1,46,450
	Traditional Waterbodies in No.	
4	No. of Tanks (PWD & Union)	98
5	No. of Ooranis	224
6	Other surface waterbodies (no.)	36
	Area under Irrigation Facilities (ha)	
7	Tank irrigation	1,243
8	Canal irrigation	159
9	Open & tube well irrigation	9,764

	Catchment Area wise Available Runoff (ha.m)	
10	Good catchment area	2,152
11	Average catchment area	194
12	Bad catchment area	4,574
	Watershed and Drainage Networks	
13	Length of Natural Drainage Lines (m)	2,96,400
14	No. of Natural Drainage Lines	343
15	No. of micro-watersheds	242
	Water Demand in ha.m	
16	For Humans (ha.m)	477
17	For Livestock (ha.m)	194
18	For Agriculture (ha.m)	15,155
19	% GW utilization for Drinking	22
20	% GW utilization for Livestock	91
21	% GW utilization for Agriculture.	94
22	% SW utilization for Drinking	78
23	% SW utilization for Livestock	9
24	% SW utilization for Agriculture	6

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 for their lives and livelihoods. The Block has 98 tanks and 224 Ooranis (Figure 3.9).

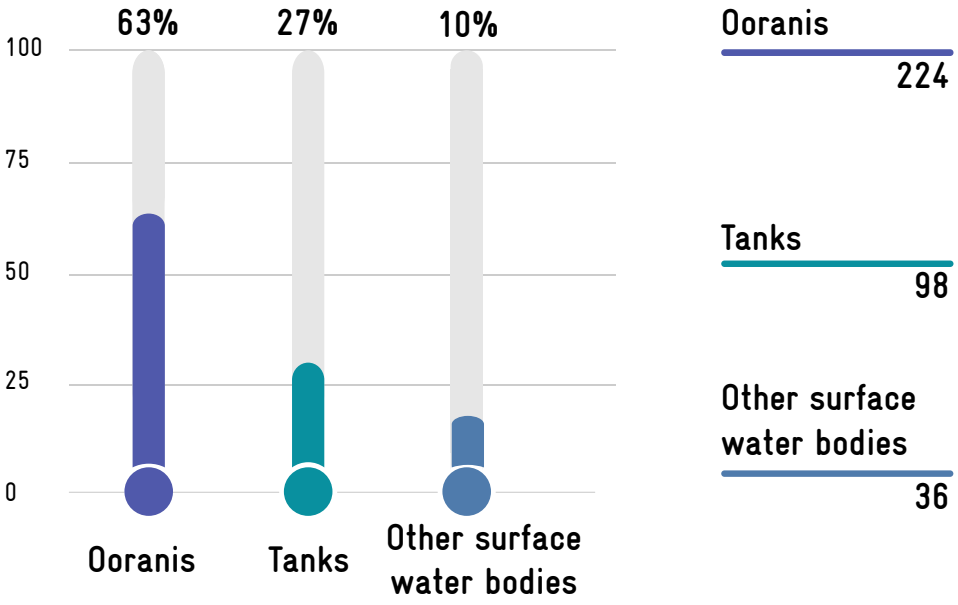


Figure 3.9. Traditional water bodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the Block is 11,166 ha, of which 87 % (9,764 ha) is irrigated through ground water, while 11 % (1,243 ha) area is tank based and 1 % (159 ha) from canal-based irrigation is practiced (Figure 3.10).

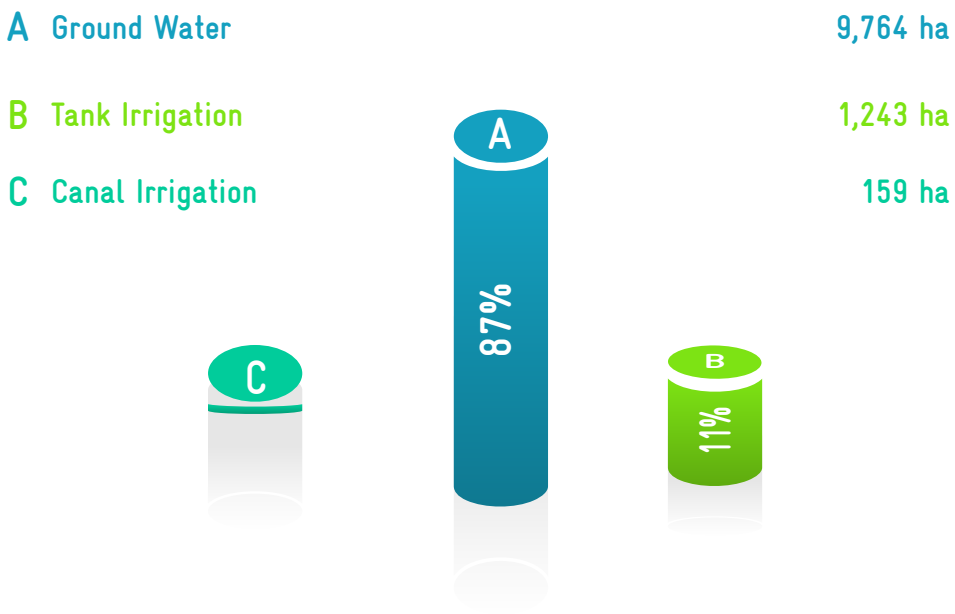


Figure 3.10. Irrigation Source

3.5.2.3 Available Run off

The available runoff in catchment area is 6,920 ha.m. out of which 31.1 % (2,152 ha.m) comes under good catchment area, 2.80 % (194 ha.m) comes under average catchment area and 66.1 % (4,574 ha.m) comes under bad catchment area. As the area has more bad catchment area (twice that of good catchment area), the runoff generated is more. The amount of runoff generated in bad catchment area is 3.1 times higher in good catchment and more than 23.5 times in average catchment areas (Figure 3.11).

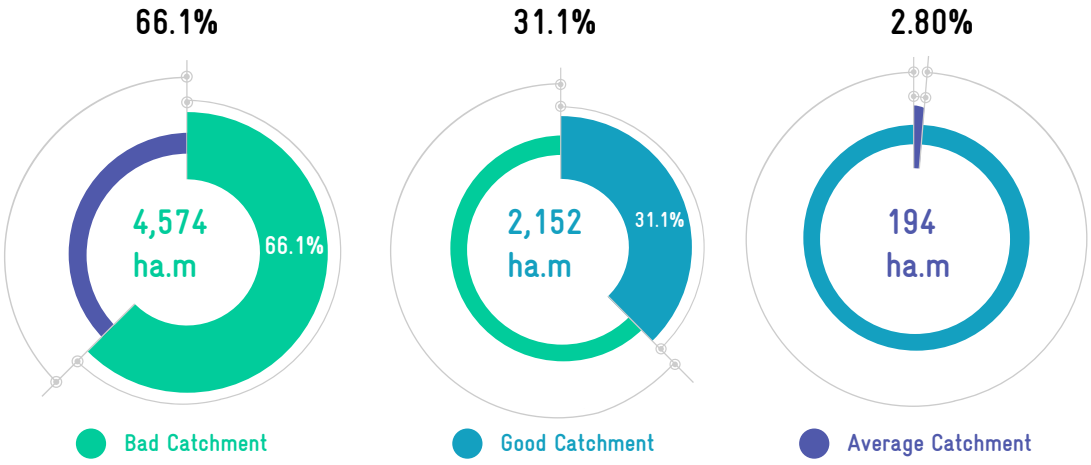


Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 15,826 ha.m. In which 477 ha.m for drinking, 194 ha.m for livestock and 15,155 ha.m for agriculture sector. Utilization of ground water is more than ground water. About 94 % of the agriculture purpose is met through groundwater and 6% from surface water. At the same time, utilization of surface water is more for domestic purposes (78 %). For livestock also ground water utilization (91%) is more than surface water (9%) (Figure 3.12).

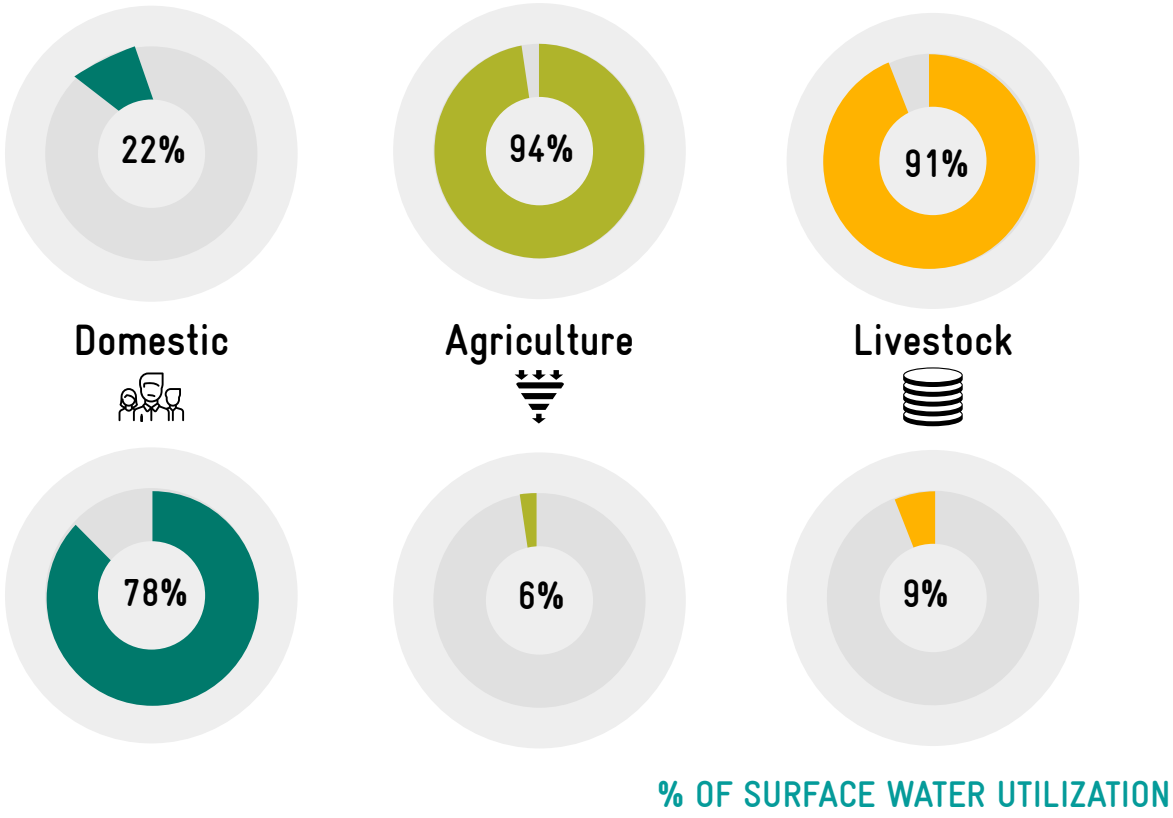


Figure 3.12. Sectoral-wise water utilization

3.6 CWRM PLANNING ANALYSIS-AGRICULTURE

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

3.6.1 SPATIAL DATA

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

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

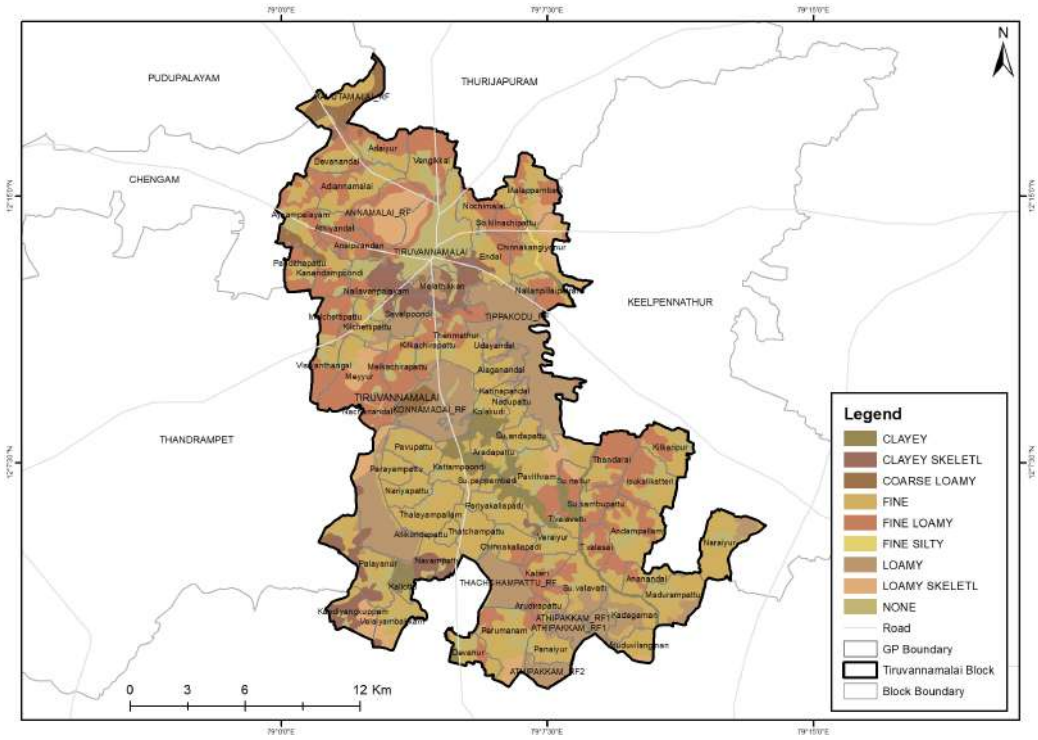


Figure 3.13. Soil texture

3.6.1.2 Soil erosion: Soil erosion is a natural process of displacement of upper layer of soil caused by dynamic erosion agents that is, water, air, plants and humans. Soil sheet erosion was witnessed in all areas of the GPs (Figure 3.14) whereas areas of the south western and central GPs soil is affected by sheet erosion. 60 % of T.Valasai GP is affected by soil erosion which is the highest, followed by 50 % in Su.Kambupattu, Perumanam, Kallottu, and Kandiyangkuppam, Nadupattua GPs and 5% in Devanandal, Ayyampalayam, Kanandampoondi, Chinnakangiyanur, Su.Nallur, and Melchettipattu GPs. The soil eroded units will act as a direct input while preparing plans for soil conservation and watershed management activities.

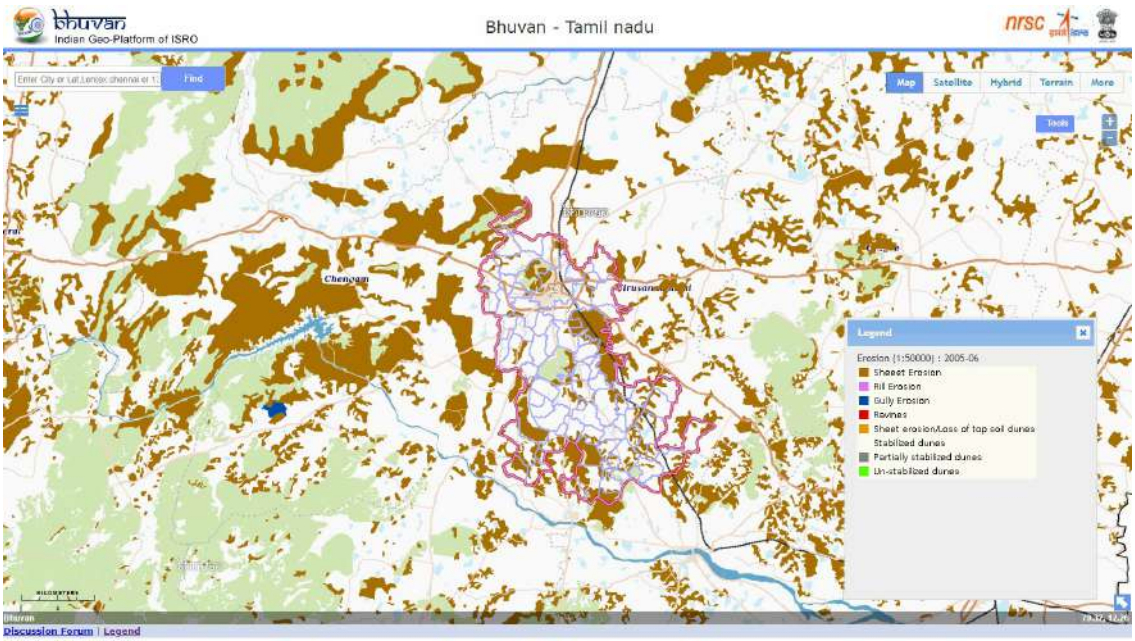
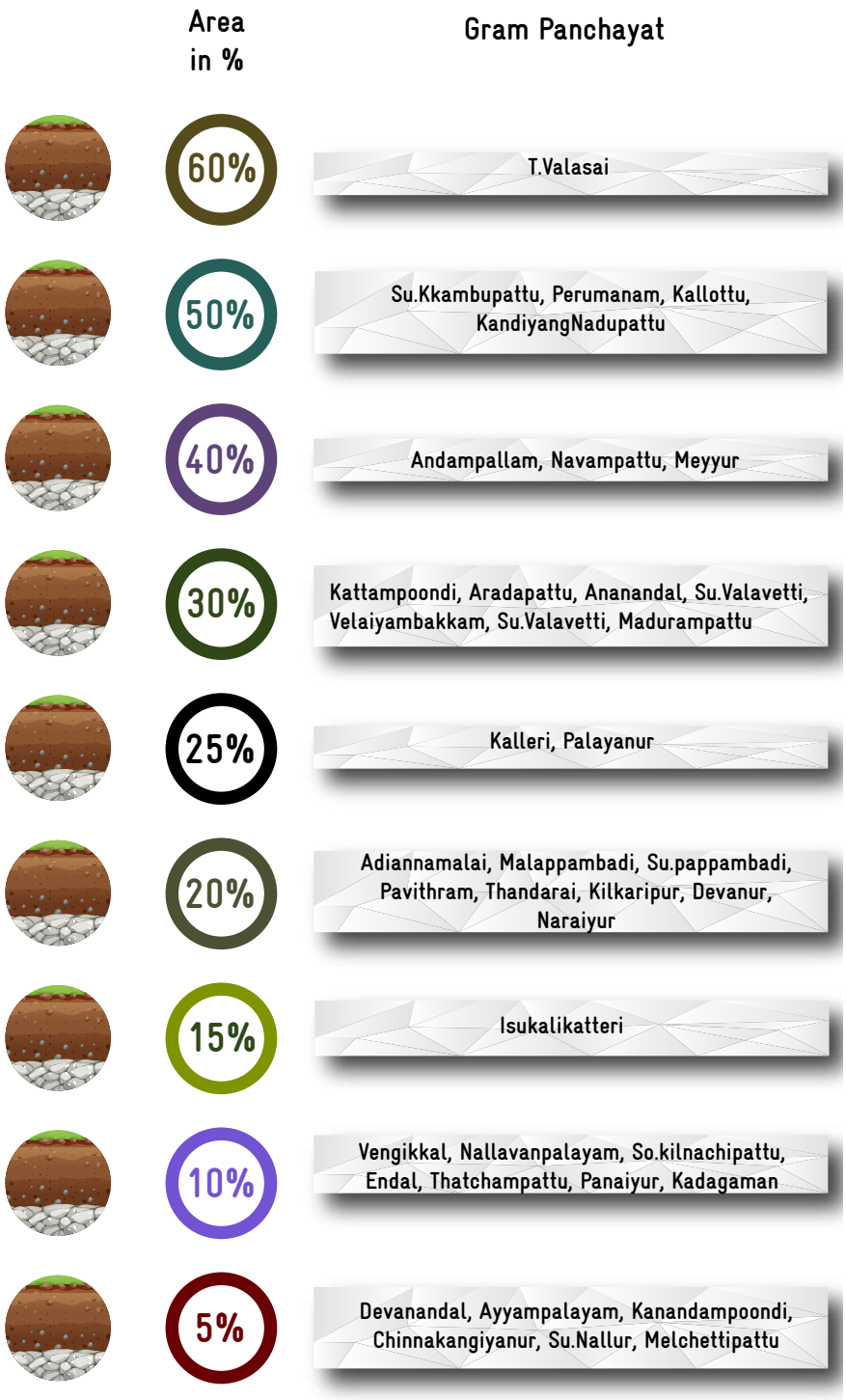


Figure 3.14. Soil erosion map



3.6.1.3 Land Use and Land Cover: LULC is two separate terminologies which are often used interchangeably. In general, land cover is defined as "the observed biophysical cover on the Earth's surface", It includes vegetation and man-made features as well as bare rock, bare soil, and inland water surfaces; while land use refers to "the way in which land has been used by humans and their habitat, usually with the accent on the functional role of land for economic activities". LULC have become increasingly important as which, in turn, underlie many environment-development policies. A major area of Tiruvannamalai Block is agricultural land followed by forest area and wasteland (Figure 3.15). 90% area of Alaganandhal, Kilkachirapattu, Meyyur, Su.Papampadi, Thandarai, Udayanandhal, and Viswathangal GPs is agriculture land. 70% of barren land is in Adaiyur GP, 50 % of Su.Valavetti GP is barren and agriculture land (Table 7). LULC map helps the decision makers and planners in focusing on the fallow land development activities. During the CWRM planning of GPs, activities for fallow lands have been proposed based on the data.

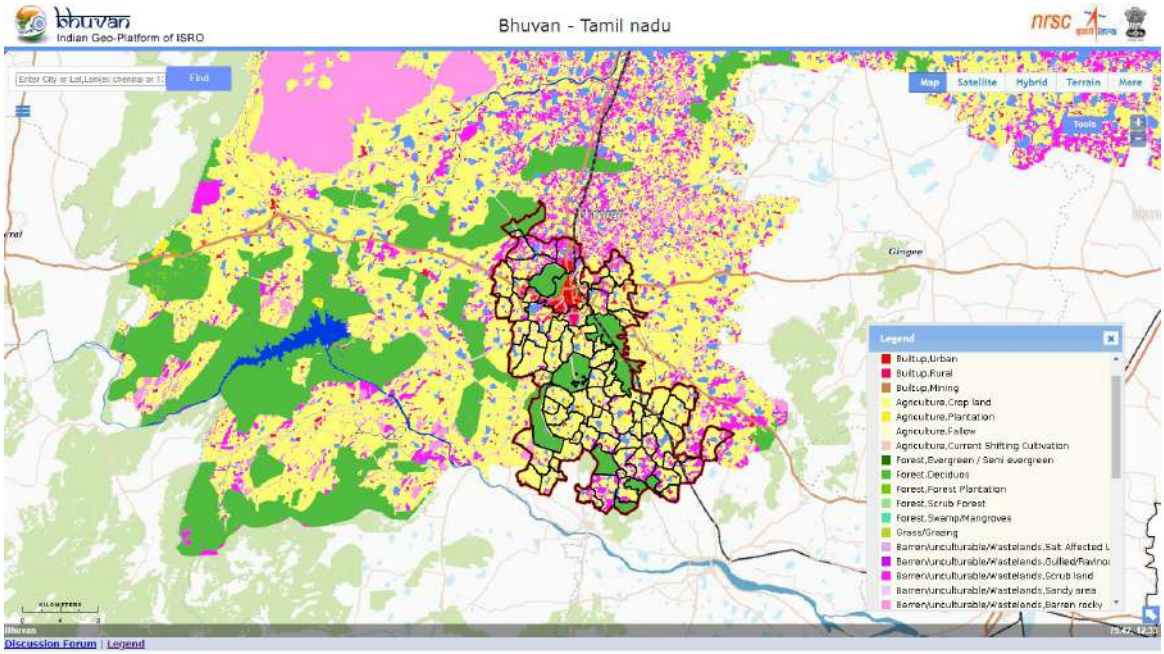


Figure 3.15. Land use land cover map

Land Use	Area coverage in %	Gram Panchayat
Barren Lands	16%	Adaiyur - 70%, Devanandal, So.kilnachipattu - 40%, T.valasai - 30%, Andampallam, Devanur, Vengikkal - 20%, Madurampattu, Palayanur - 15%, Adiannamalai, Chinnakallapadi, Kadagaman, Nochimalai, Panaiyur - 10%, Kalleri, Kanandampoondi, Nallavanpalayam, Naraiyur, Thatchampattu, Velaiyambakkam, Viruduvilanginan - 5%, Pavithram - 2%
Barren lands and Agriculture crop lands	38%	Devanur, Perumanam - 40%, Panaiyur - 5%, Anandandal - 30%, Endhal, Malappambadi, Su.Valavetti - 50%
Agriculture crop lands and Plantation	90%	Alaganandhal, Kilkachirapattu, Meyyur, Su.Papampadi, Thandarai, Udayanandhal, Viswathangal - 90%

3.6.1.4 Waste land: A parcel of land which is not suitable for any agricultural activity and mostly covered with dense or open scrub is called as wasteland. Data on wastelands acts as a direct input in the preparation of plans for land development activities or greenery. Wasteland parcels of degraded forest and scrub land are noticed in the Block (Figure 3.16). The degraded forest is observed in the GPs Adiannamalai, Athiyandal, and Palayanur GPs have degraded forest lands and Palayanur, Su.Valavetti, Adiannamalai, Devanandal GPs have scrub land.

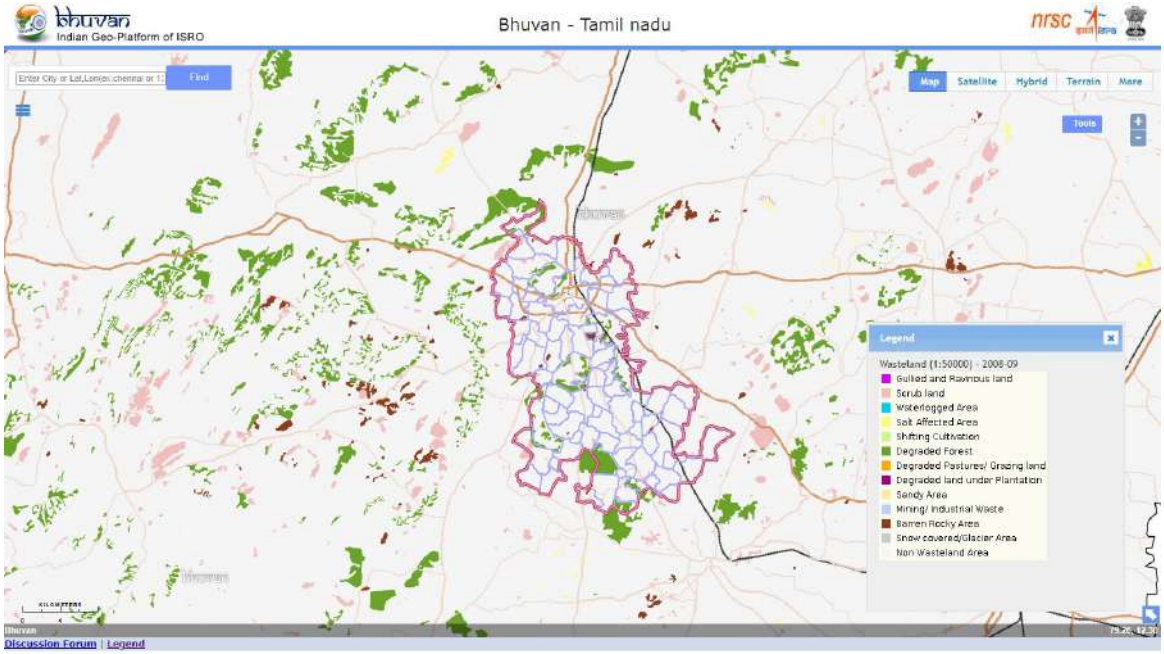
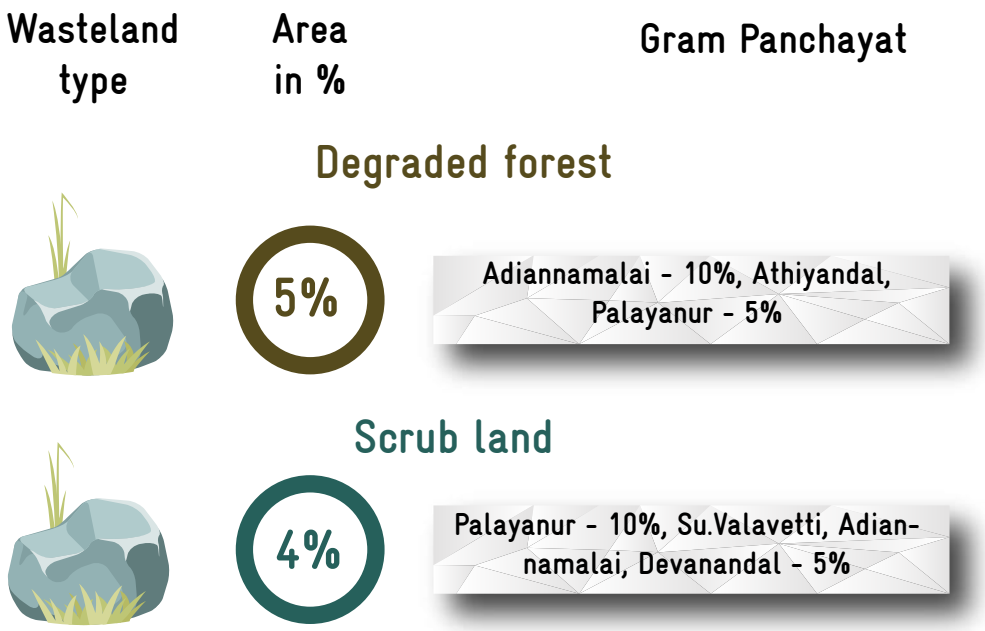


Figure 3.16. Wasteland map



3.6.1.5 Salt affected area: Saline and sodic types of salt affected area is noticed in Kandiyang, Nadupattu, Velaiyambakkam, Kadagaman, and Viruduvilanginan GPs (Figure 3.17). This data helps in making plans on soil conservation measures, mainly reducing salinization activities and suggest alternative cropping.

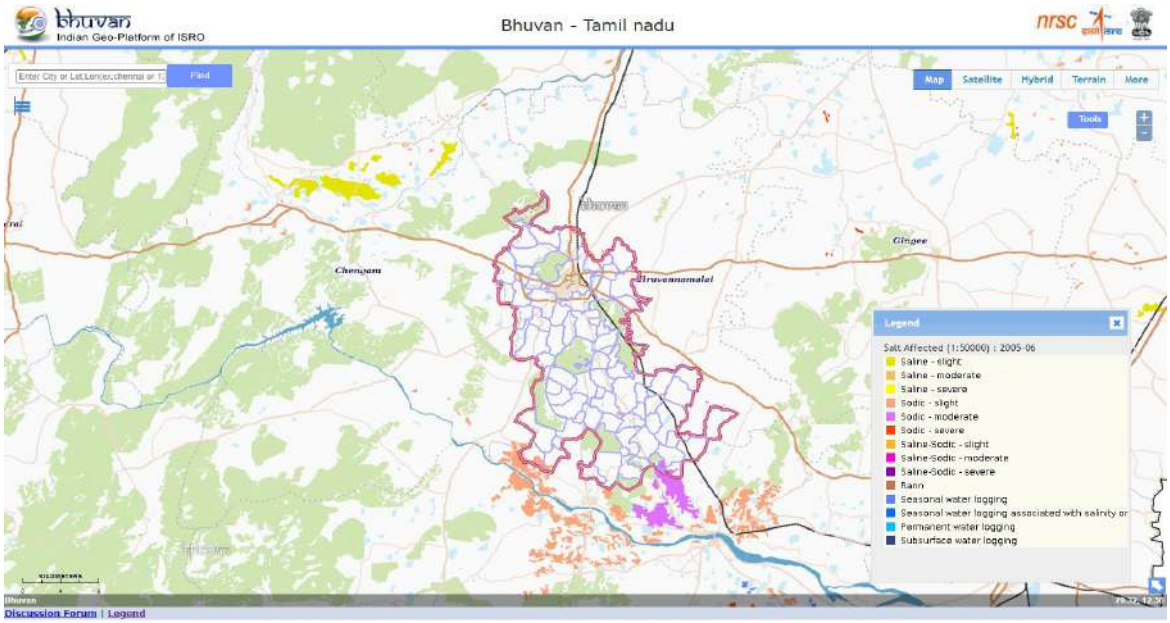
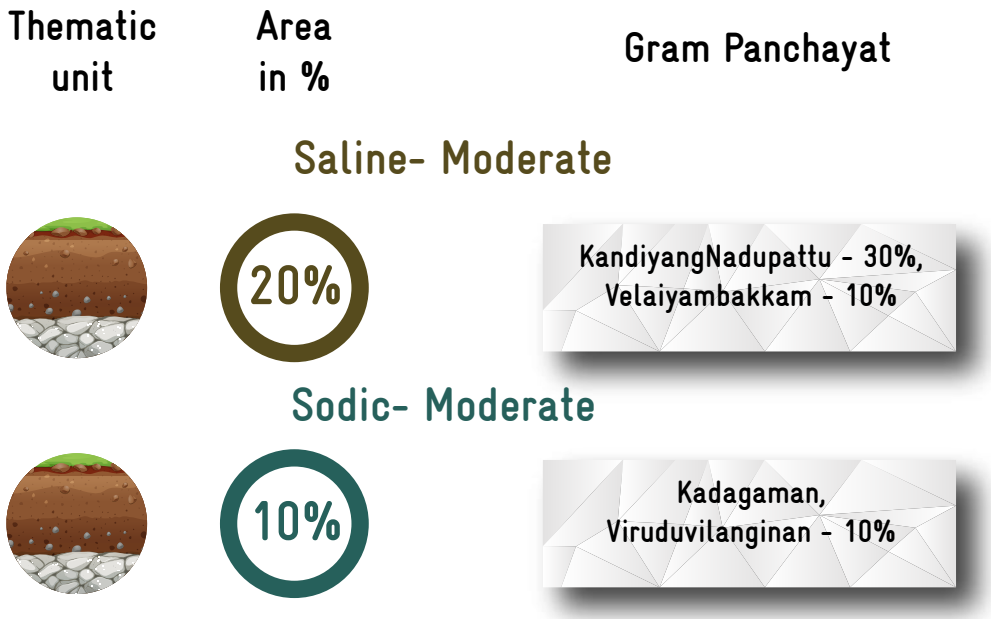


Figure 3.17. Salt affected area



3.6.2 NON SPATIAL DATA

Agriculture based non-spatial secondary data related land resources, catchment, crop type, soil micro-macro nutrient, moisture, ET and livestock data were collected from govt. sources Table 7. The key CWRM parameters of agriculture area for all GPs are tabulated in Annexure 3.7.

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

S No	Key CWRM Parameter	Total
	Area under Land Resources (in ha)	
1	Forest land	5
2	Non-Agricultural Uses	4,594
3	Barren & Un-cultivable Land	1,140
4	Permanent Pastures and Other Grazing Land	213
5	Area under Land Under Miscellaneous Tree Crops etc.	55
6	Cultivatable Waste Land	421
7	Fallow Land other than Current Fallows	625
8	Current Fallow land	9,753
9	Unirrigated Land	2,812
10	Area Irrigated by Source	11,267
	Land under Catchment Area (in ha)	
11	Good Catchment	5,739
12	Average Catchment	689
13	Bad Catchment	24,458
	Crop details	
14	Irrigated Area (in ha)	10,020
15	Rainfed area (in ha)	2,318
16	Area under Paddy Cultivation (in ha)	3,534
17	Crop Water Requirement - Irrigated condition (in ha.m)	14,299
18	Crop Water Requirement - Rainfed condition (in ha.m)	856
	Soil Resources: Status of Available Nitrogen (in %)	
19	Very Low	30
20	Low	42
21	Medium	5
	Status of Organic Carbon (in %)	
22	Very Low	51
23	Low	35
24	Medium	5
25	Very High	3
	Status of Soil Micro Nutrients (in %)	
26	Sufficient	52
27	Deficient	48
	Status of Physical condition of the soil (in %)	
28	Moderately Acidic	1
29	Slightly Acidic	3
30	Neutral	4
31	Moderately Alkaline	91
	Soil Texture (in %)	
32	Clay Soil	10
33	Fine Soil	72
34	Coarse loamy	6
35	Soil Water Permeability	Moderate

	Soil moisture and ET	
36	Volumetric Soil Moisture (in %)	23
37	Estimated Soil Moisture (in ha.m)	6,047
38	ET Losses (in ha.m)	11,376
	Means of Water Extraction (in %)	
39	Gravity	6
40	Lifting	94
	Irrigation Methods (in %)	
41	Wild Flooding	12
42	Control Flooding	87
	Livestock Population	
43	Cattle	49,234
44	Sheep	15,366
45	Goat	12,747

3.6.2.1 Land Use

The standard land use classification helps to understand the distribution and extent of different land use categories. As the runoff and water harvesting actions are linked to the land use systems, its distribution across the geographical boundary of the Block is necessary to take decisions. Of the total land area of 30,886 ha, 36.5 % of land is irrigated by source irrigation, followed by 31.5 % area is current fallow land and the least of less than percent area is forest land resource is available in the Block (Figure 3.18).

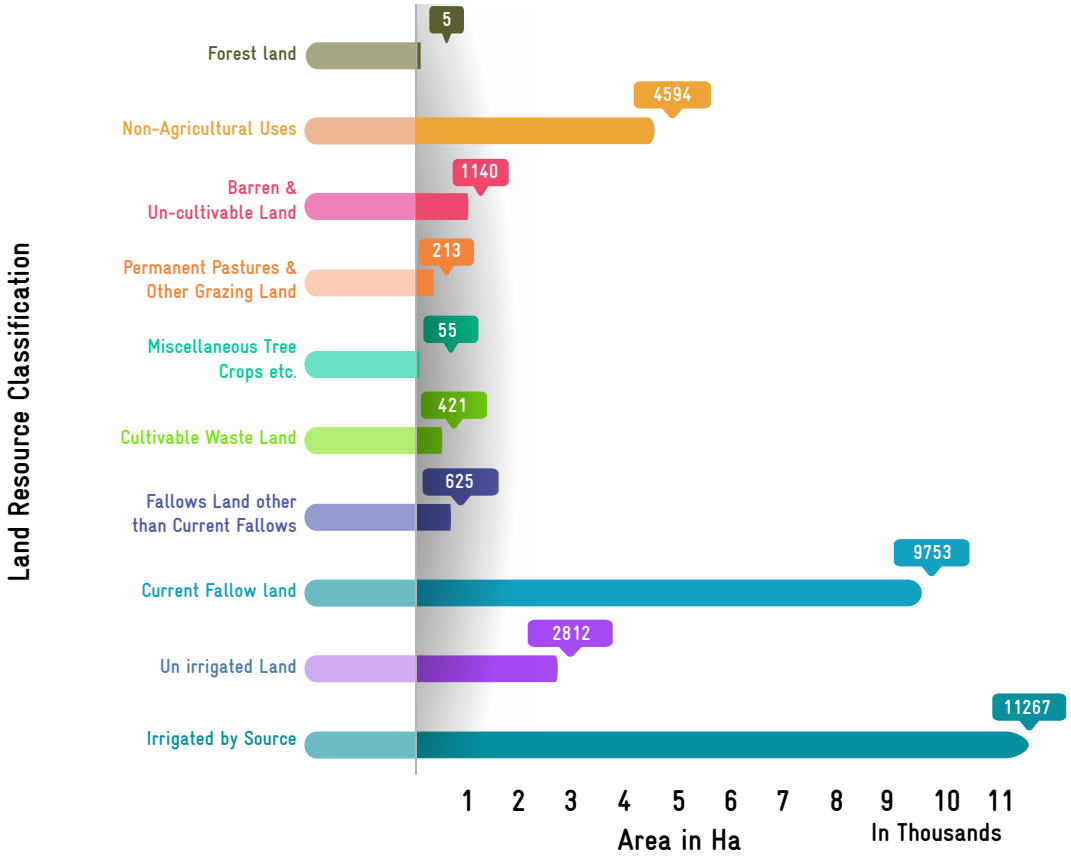


Figure 3.18. Land resource utilization (Area in %)

3.6.2.2 Catchment Area

The land use types in each of the GPs are categorized into three different types of runoff: Good, Average and Bad Catchment area. Out of total catchment area (30,886 ha), the highest of 79.19 % area is bad catchment area followed by 18.58 % is good and rest is average type of catchment area (Figure 3.20). This information helps to prioritize and propose treatment activities.

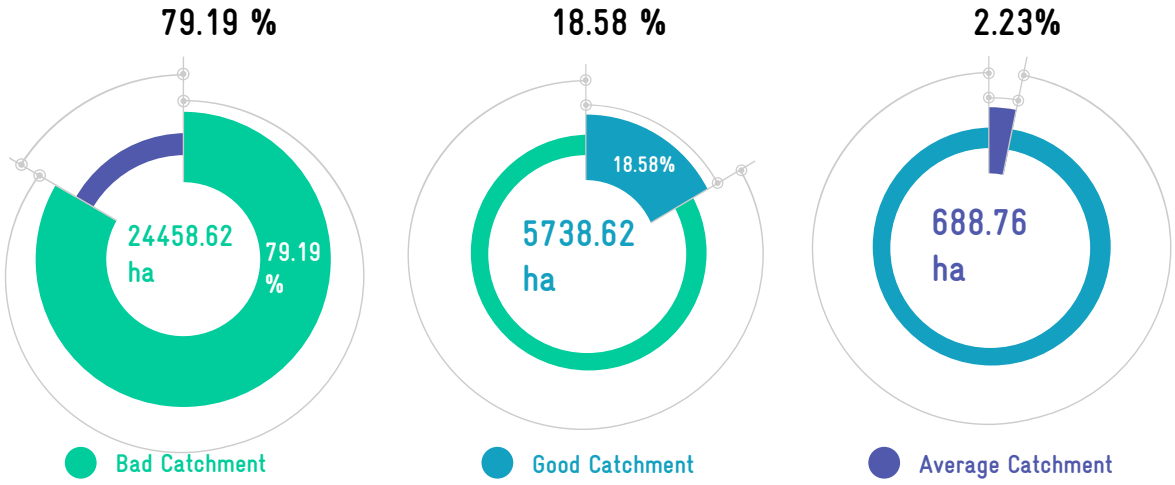


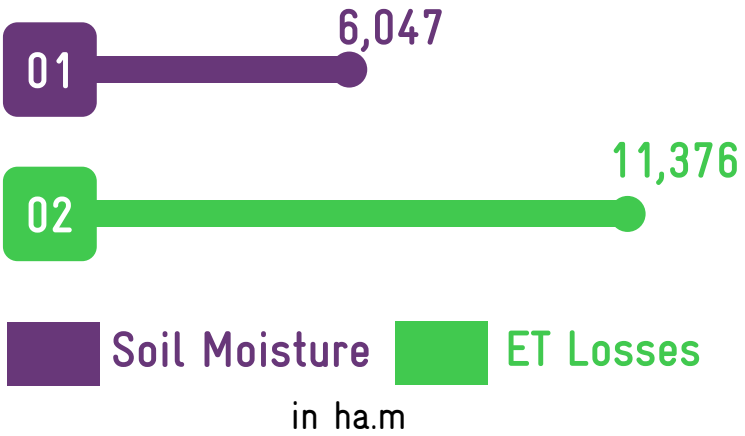
Figure 3.19. Catchment Area

3.6.2.3 Soil moisture

Soil is an important medium to store the available water and the storage capacity varies with the type of soil especially its textural composition. In overall composite water budgeting, estimation of stored water in the soil assumes greater significance in this Block because of its significant proportion of area under rain-fed cultivation. The annual average volumetric soil moisture of this Block (23%), is taken for estimating the amount of water stored as soil moisture which accounts to 6,047 ha.m.

3.6.2.4 ET losses

The loss of water through ET is important in water budgeting. The annual total ET loss during 2018-19 was 804 mm with monthly average of 67.08 mm. The average percentage of water loss through ET in the Block is 23% and the total annual losses due to ET alone is 11,376 ha.m.



3.6.2.5 Macro nutrients

Nitrogen Status

The macro soil nutrients such as nitrogen and organic carbon falls under very low to low category in the total number of soil samples tested. The available nitrogen is very low in 44.6 % of the samples tested while it was 44.3 % under low category (Figure 3.20). According to soil resource map, this Block is identified as one of the nitrogen deficient Block (Tiruvannamalai District profile 2020).

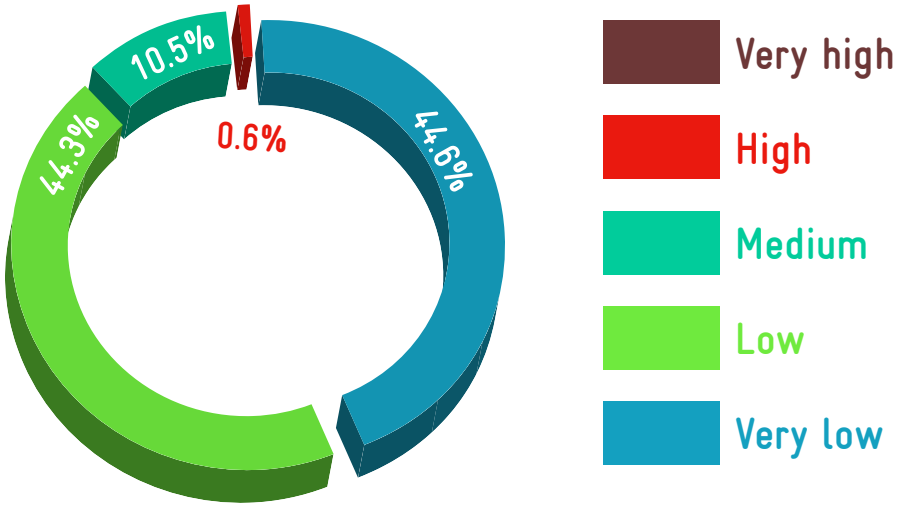


Figure 3.20. Status of available Nitrogen

Organic Carbon Status

A similar trend has been recorded for soil organic carbon. Soil organic carbon is very low in this Block. Nearly 53 % of the soil samples tested are under very low category and 38 % under low category (Figure 3.21). This indicates that the soil fertility is very poor and further intensive practices make soil more vulnerable to degradation over a period of time.

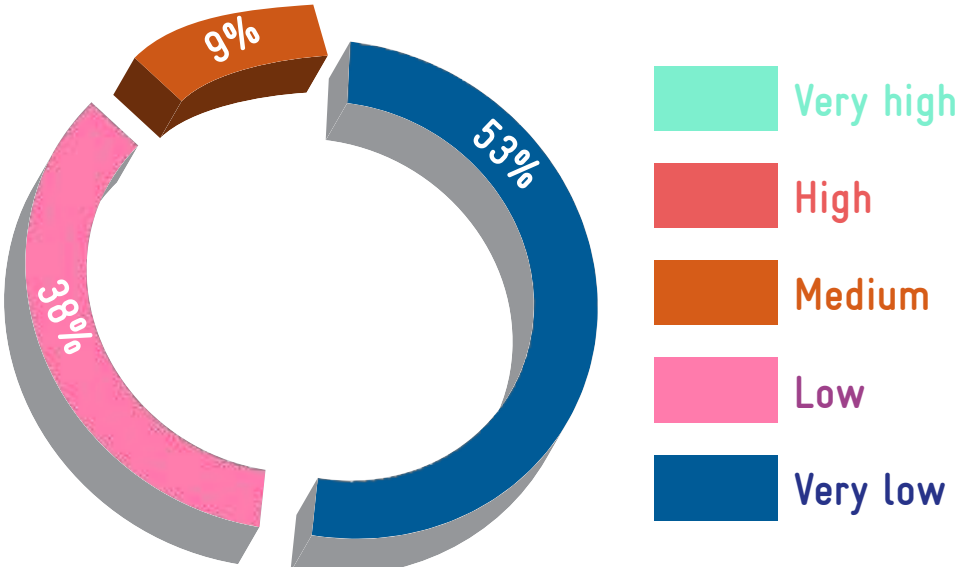


Figure 3.21. Status of soil Organic Carbon

3.6.2.6 Status of the soil micro nutrients

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

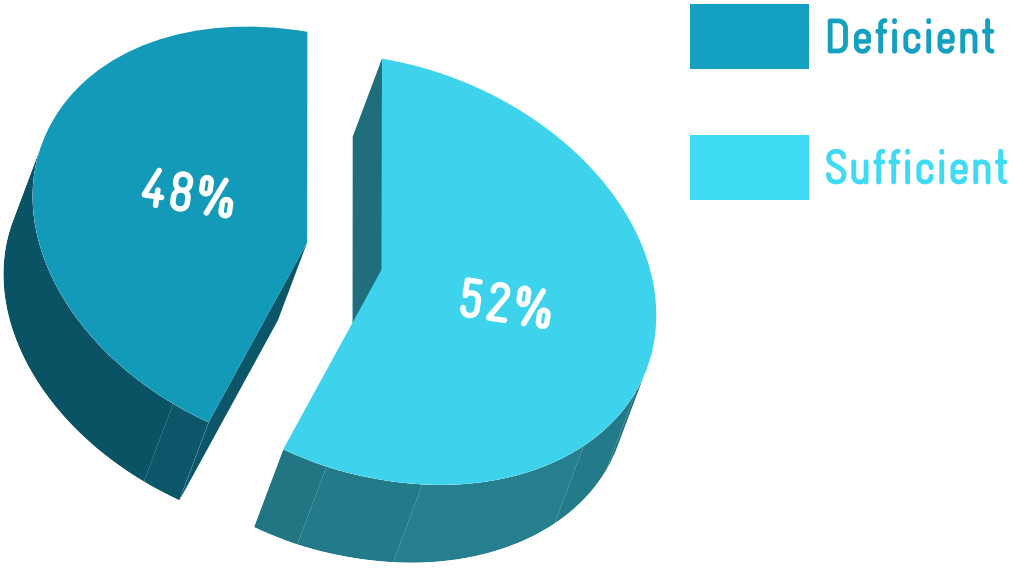


Figure 3.22. Status of soil micro nutrients

3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 91 % of the soils are moderately alkaline in nature, 4% is neutral, 3% is slightly acidic, and 1 % is moderately acidic in nature (Figure 3.23).

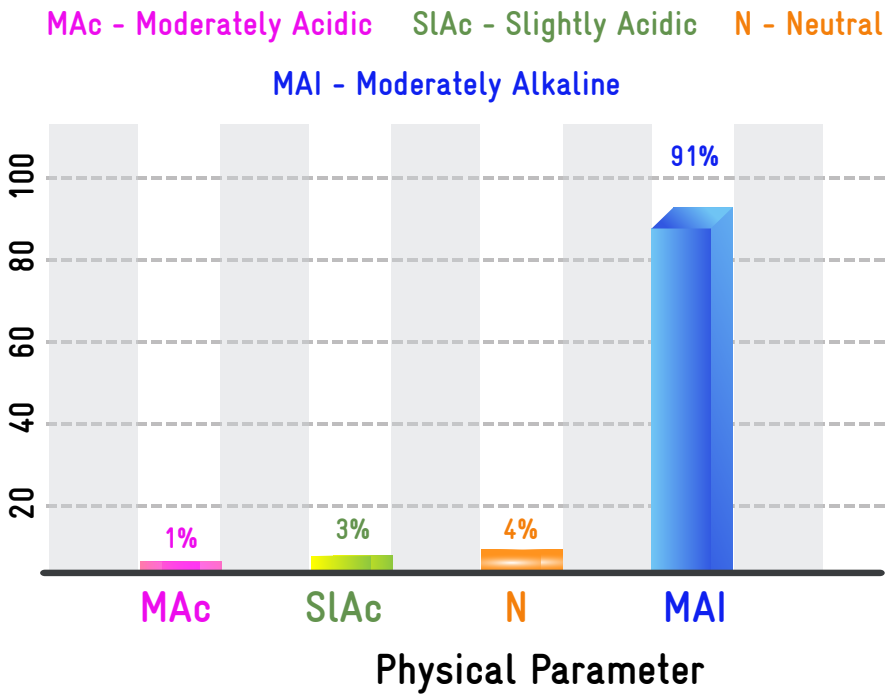


Figure 3.23. Status of pH of soil

3.6.2.8 Cropping pattern and the irrigation

Of the total area under cultivation, 78 % is under irrigation and the remaining 21 % is under rain-fed cultivation. Among the crops cultivated under irrigation, sugar cane is predominantly cultivated accounts to about 31 % followed by paddy (28 %) while Pulses are rain-fed predominate crops with 62 % followed by ground nut of 33 %. Also horticulture, vegetables irrigated (Figure 3.24).

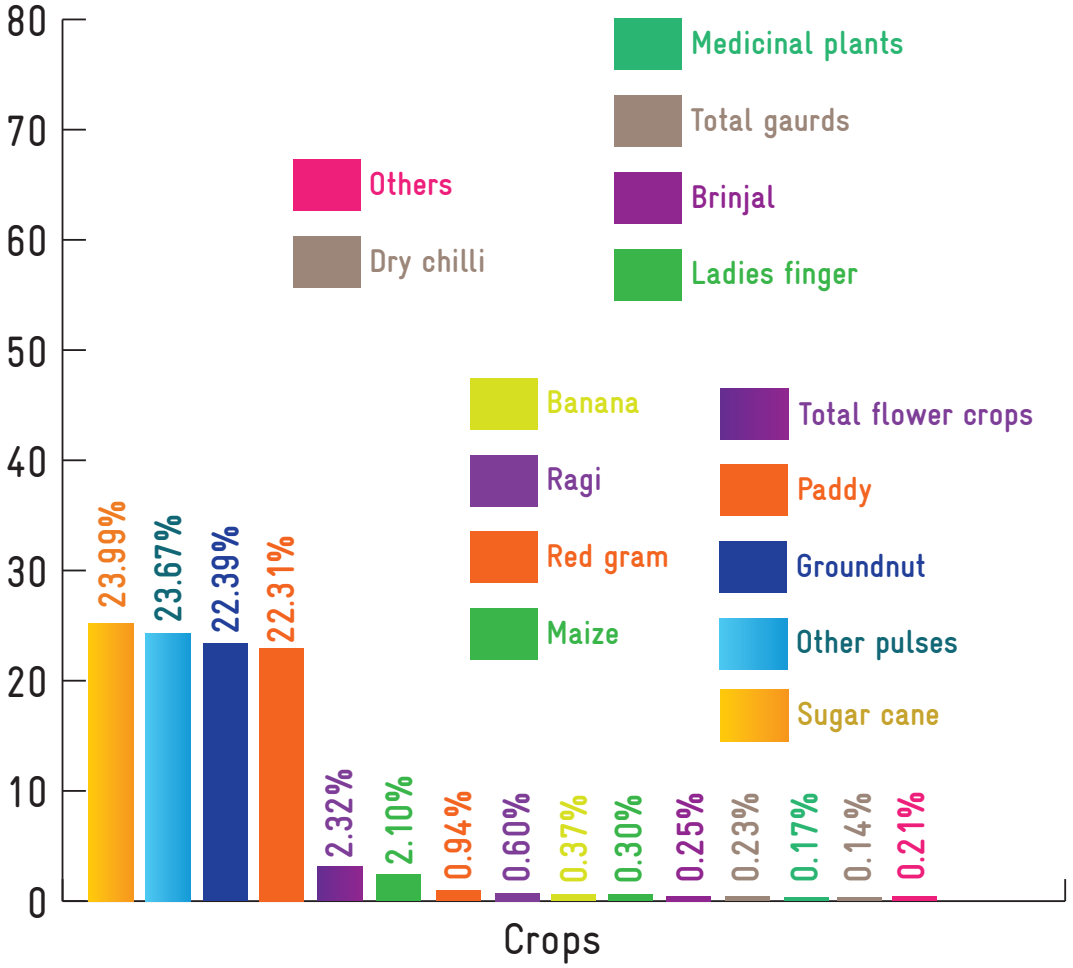


Figure 3.24. Cropping pattern

3.6.2.9 Irrigation Methods

In case of surface water resources, wild flooding is the primary method of irrigation. But in case of ground water resources, the predominant type of irrigation is controlled flooding. In the Block, 87 % of the irrigation is done by control flooding and rest is of wild flooding irrigation (Figure 3.25).

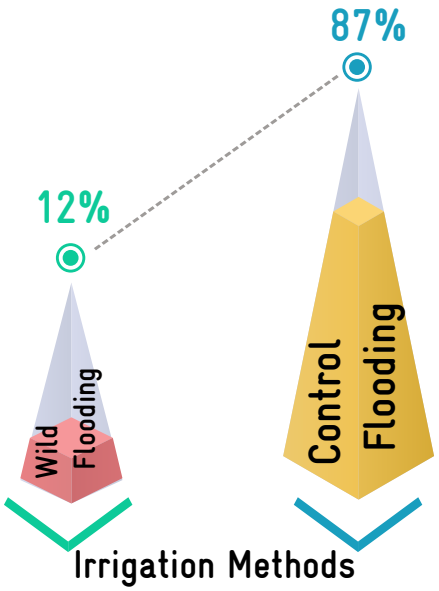


Figure 3.25. Irrigation methods

3.6.2.10 Means of Water Extraction

Water is extracted by two ways: gravity and 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, 94% of the water extraction methods are under lifting means of extraction and only 6 % comes under gravity means of water extraction (Figure 3.26).

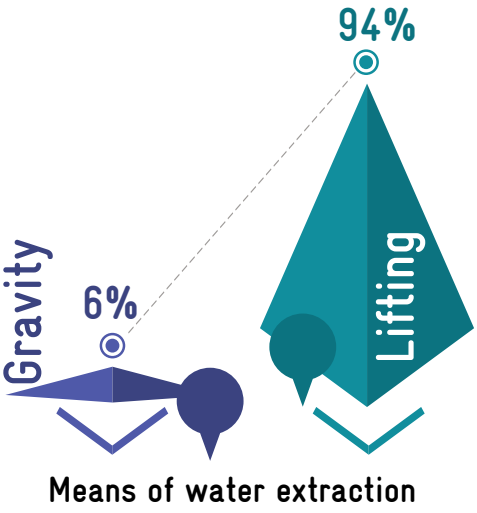


Figure 3.26. Means of water extraction

3.6.2.11 Livestock Details

This Block has considerable proportion of livestock resources of which small ruminants such as sheep and goat constitute 9.52 % and 20.68 % of the total livestock. While cattle population is higher in this Block at 69.8 % (Figure 3.27) The total water requirement for livestock is 188 ha.m. Of the total water demand, 93 % is met through ground water and remaining 7 % is from surface water resources.

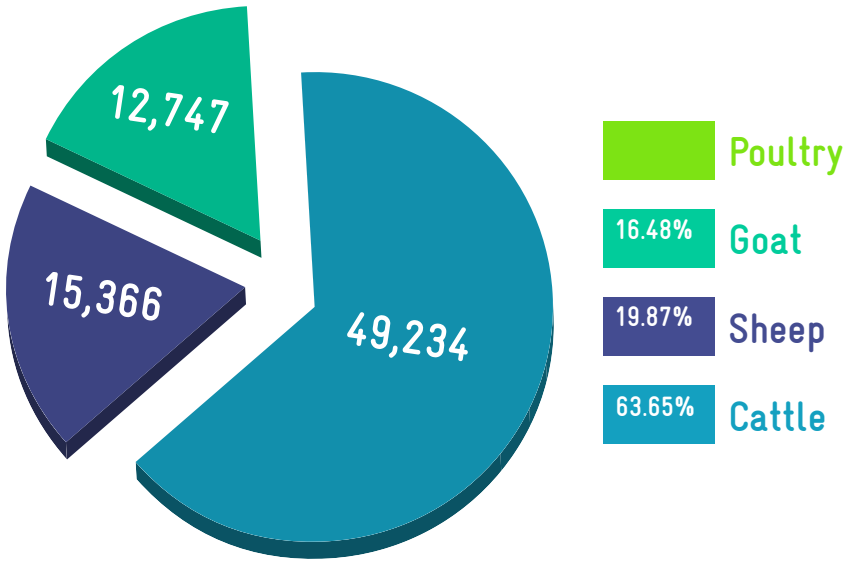


Figure 3.27. Livestock details

3.7 CWRM PLANNING ANALYSIS- SOCIO ECONOMIC

The demographic details such as population, gender, vulnerable population/ households, drinking and grey water details are collected from authentic primary and secondary sources and analyzed. Data of number of MGNREGA job holders is also analyzed. Table 8 lists demographic and socio-economic status of Tiruvannamalai Block. GP wise demographic and socio-economic status are attached in Annexure 3.8.

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

Sl. No	Socio-economic Parameter	Total
1	Geographical Area (ha.)	30,492
2	Male Population	89,710
3	Female Population	84,655
4	Total Population	1,74,365
5	SC Population	2,811
6	ST Population	360
7	Vulnerable population	43,340
8	Households	42,715
9	Only one room HH's	4,118
10	Female Headed HH's	1,941
11	Vulnerable Households	3,470
12	% of Vulnerable Households	8%
13	Registered MGNREGA Job cards (persons)	61,201
14	Active person working in MGNREGA job Cards (persons)	40,978
15	Drinking Water Sources	16,064
16	Ground Water - Drinking source	242
17	Surface water - Drinking source	55
18	sum of drinking water sources	297
19	HH's have tap water connection for drinking water	1,178
20	HH's dependent on other sources for drinking water	1,462
21	Annual Greywater Generation (ha. m)	288

3.5.1 Population

The total population of the Block is 1.74 Lakhs*, of which the proportion of men is slightly higher than women (Figure 3.28). In the CWRM planning process due attention is given for the intersecting variables such as gender, class, caste and marital status and availability of safe drinking water resources. In the Block, about 24 % of the total population constitute vulnerable population.

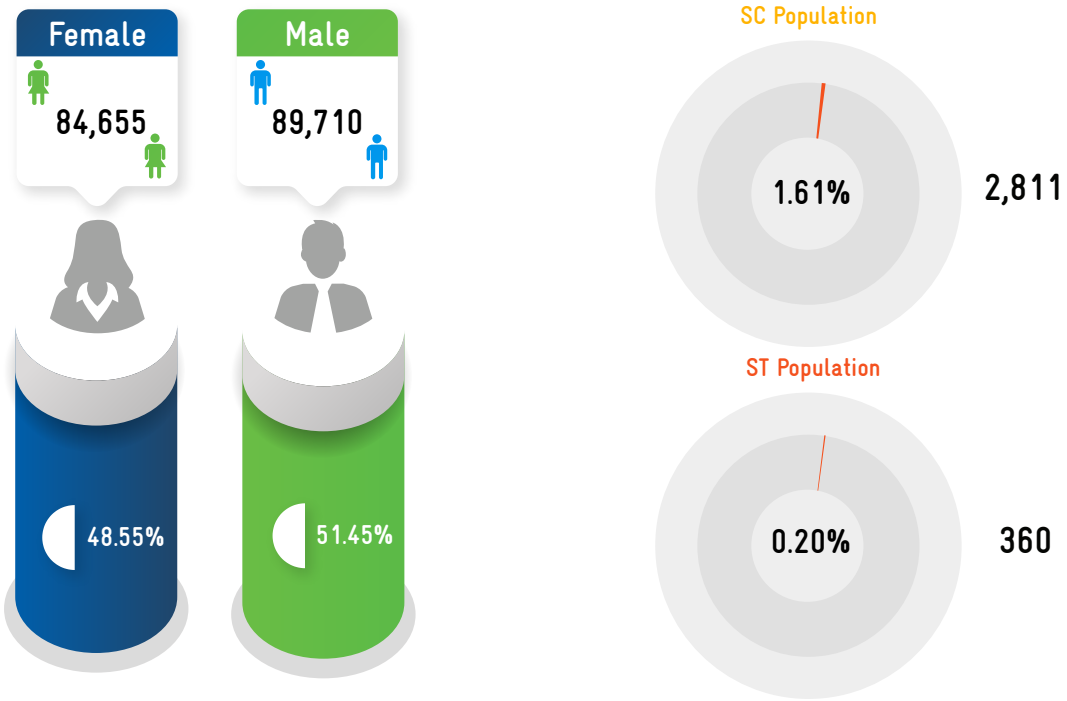


Figure 3.28. Population details

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

3.7.2 Households

There are a total of 42,715 households in which 9 % households have only one room, 4.5 % households are headed by women and 8 % are vulnerable households (Figure.3.29)

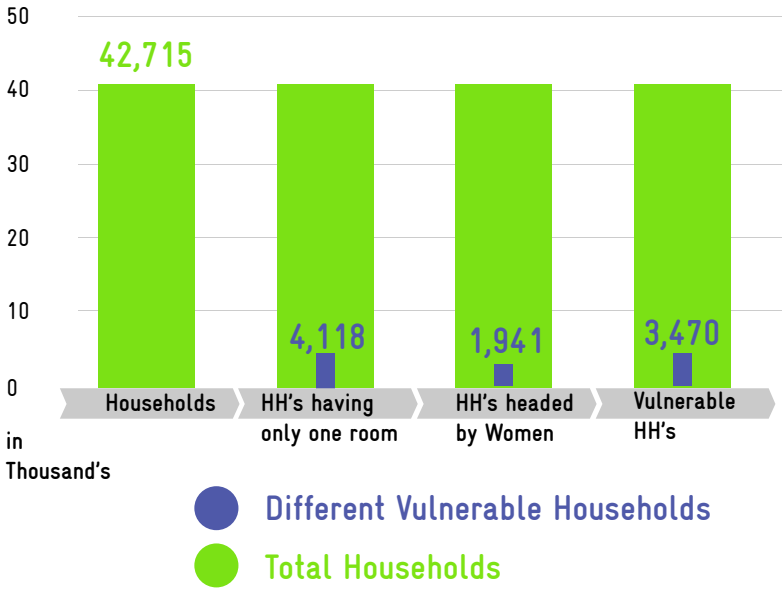


Figure 3.29. Details of households

3.7.3 Status of Mahatma Gandhi NREGA job card status

In the Block, of the total population of 1.74 Lakhs, 35 % are registered for job cards in Mahatma Gandhi NREGA scheme, in which 23.5 % of the job cards are in active category (Figure 3.33)

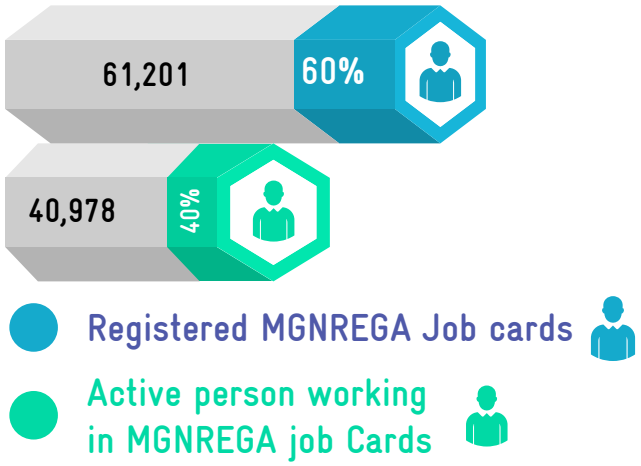
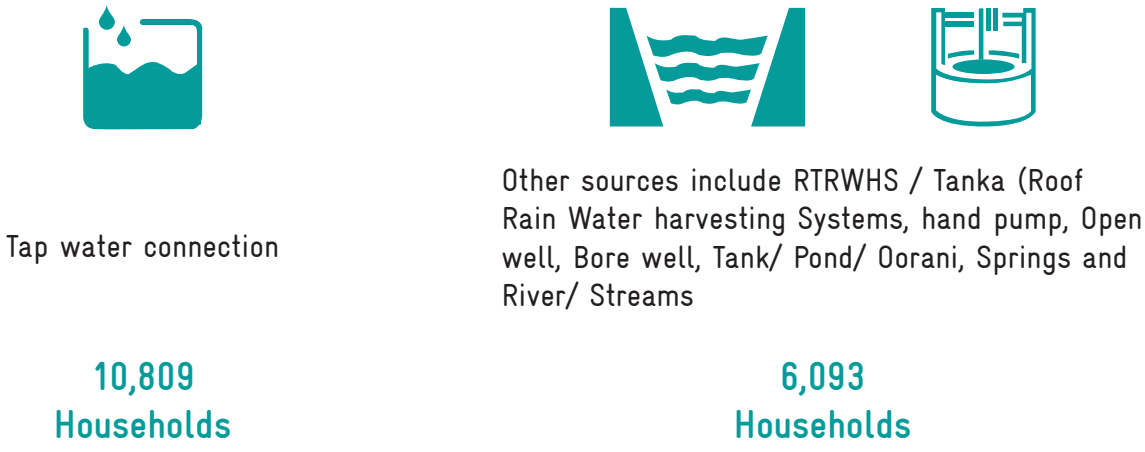


Figure 3.30. Status of MGNERGA job cards

3.7.4 Drinking Water Sources

Nearly 10,809 households have tap water connection and 6,093 households depend on other water sources for domestic use, where other sources included RTRWHS / Tanka (Roof Rain water harvesting systems, hand pump, open wells, bore wells, tank/ pond/ oorani, springs and river/ streams.



3.7.5 Annual Greywater Generation

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

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

Morphology

T. Valasai, Pandithampattu, Endal, Adayur

Soil erosion

T. Valasai, Su.kambupattu, Perumanam, Kallottu, Kandiyangkuppam

Ground water prosperity

Adaiyur, Endhal, Malappambadi

Wasteland

Adaiyur, Adiannamalai, Palayanur

Upland/Slope

Meyyur, Kilchettipattu, So.kilnachipattu, Vengikkal

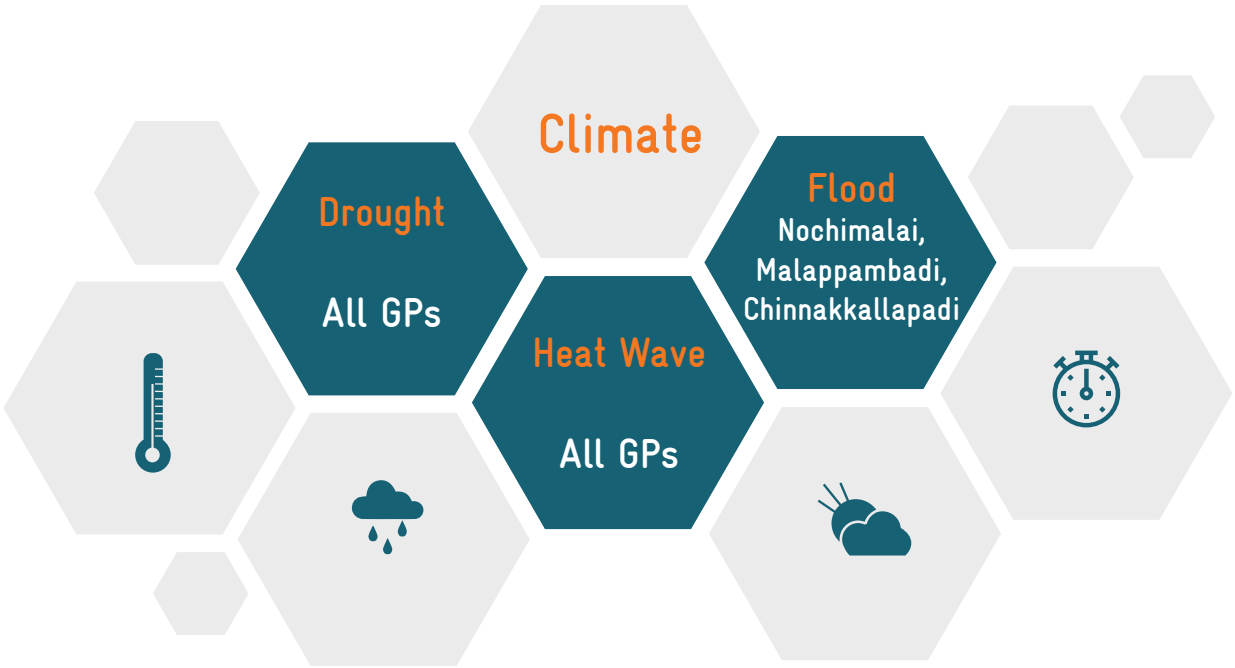
Drainage network

Vengikkal, Tandarai, Meyyur

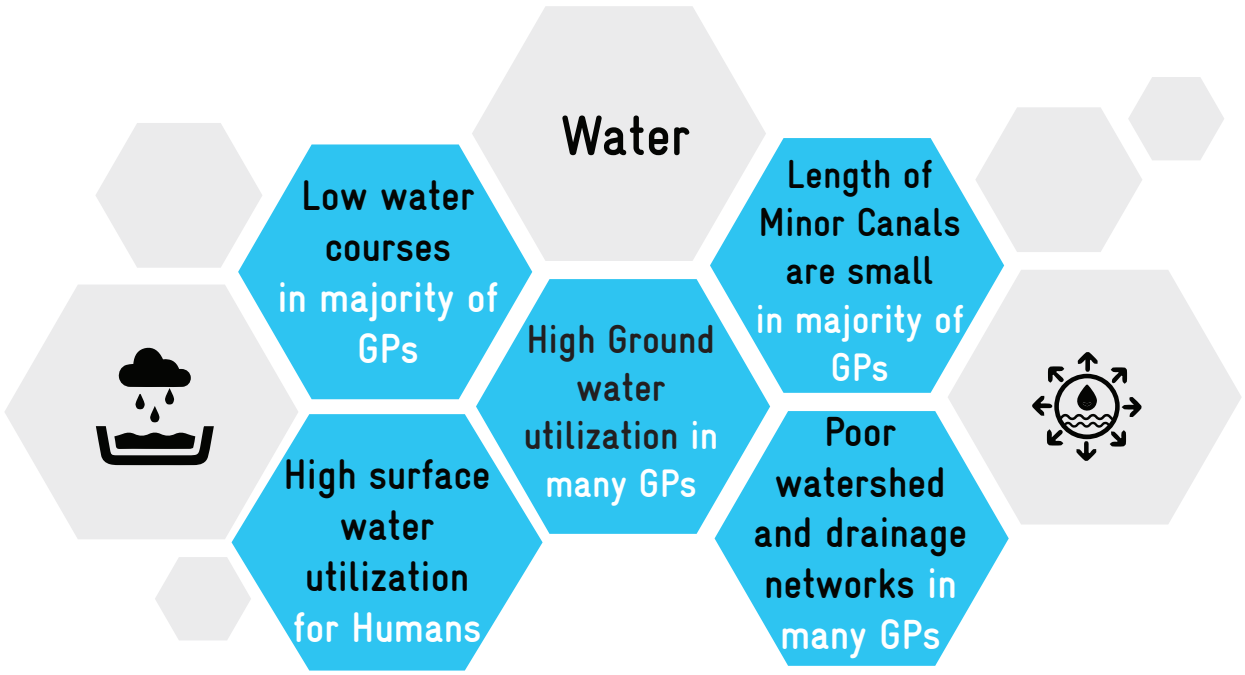
Salt affected area

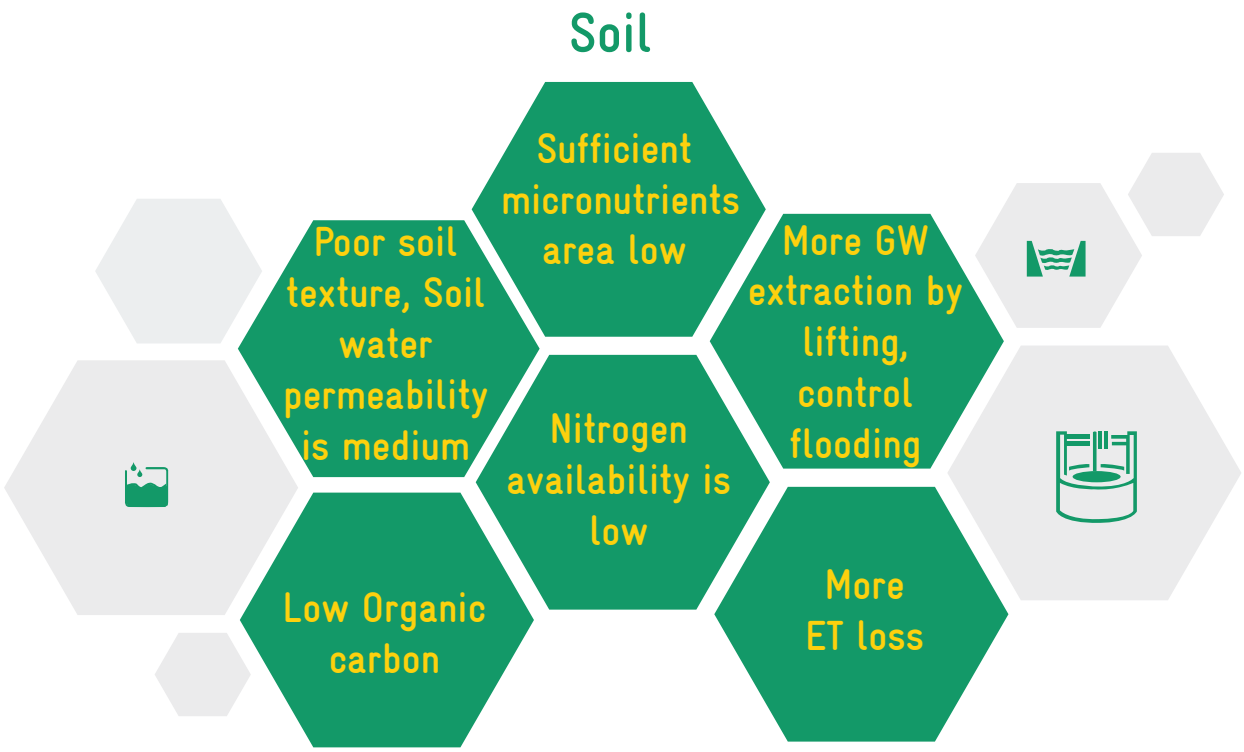
Kandiyang, Kuppam, Velai-yambakkam, Kadagaman, Virudvilanginan

Each spatial thematic information indicates the scope for treatment activities in the relevant GPs for land or water based measures


Climate
Drought
All GPs
Flood
Nochimalai, Malappambadi, Chinnakkallapadi
Heat Wave
All GPs


Socio economic
Population density high in Vengikkal
Total population, Female population, Only one room households high in Nallavanpallam, Thenmathur, Pavithiram, Perumannam, Meyyur
No. of households and female headed households high in Vengikkal, Thenmathur, Allikondapattu, Andampallam, Pavithiram
Vulnerable population high in Adaiyur, Ayyampalayam, Isokkalikatteri, Thenmather, Vengikkal
Most of GP HH's have tap water connection for drinking water, Grey water generation more in Padavedu, Tindivanam, Sandhavasal and less in Nallavanpallyam, Pavithiram, Thenmathur, Adaiyur
% of vulnerable households high in Anandandal, Perumanam, Su.Andapattu, Su.Kambupattu, Su.Nallur low in Nariapattu, Viswanthangal Vengikkal
Registered MGNERGA job cards and active persons working are low in Anaipirandan, Andampallam, Athiyandal, Ayyam Palayam, Udayanandal, Viswanthangal, KandiyanNadupattu, Naraiyur, Pandithapattu, Su.Nallur, Adiannamalai, & Vengikkal


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


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

கெடுப்பதூஉம் கெட்டார்க்குச் சார்வாய்மற் றாங்கே
எடுப்பதூஉம் எல்லாம் மழை

குறள் - 15

Destruction it may sometimes pour
But only rain can life restore

Thirukkural - 15

CHAPTER 4

4 VULNERABILITY RANKING OF GP

The vulnerability assessment has been carried out using IPCC methodology. Intergovernmental Panel on Climate Change (IPCC) defined Vulnerability as 'the propensity or predisposition to be adversely affected' (IPCC 2014). Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and the lack of capacity to cope and adapt. It is determined by sensitivity and adaptive capacity of the system (Figure 4.1).

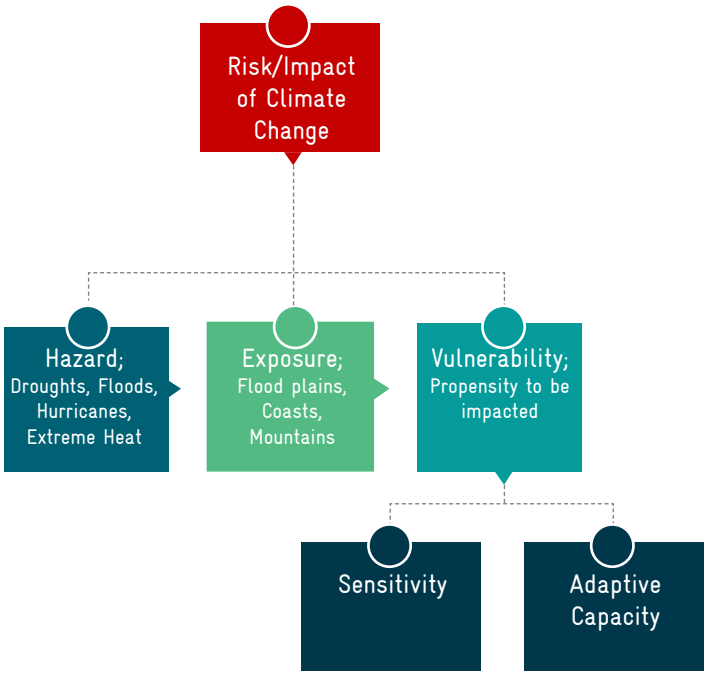


Figure 4.1. Vulnerability of the system as defined by IPCC

Generally, vulnerability assessments are made to identify.

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

The CWRM parameters which been explored through rigorous study were considered here to address the key water challenges at GP level. About 70 spatial and non-spatial parameters/ indicators under 4 dimensions via Climate (3), Water (25), Agriculture (31) and Sociodemographic (11) are categorized into adaptive capacity, sensitivity and exposure indicators for vulnerability analysis as per IPCC norms. Table 9 lists CWRM parameters/indicators, its rationale to vulnerability, source of data and its linkage with WASCA TN's primary 18 indicators.

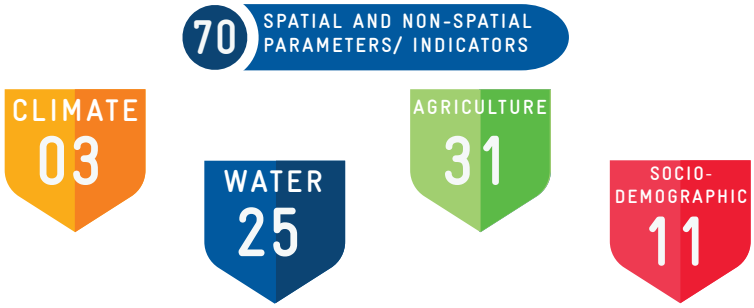


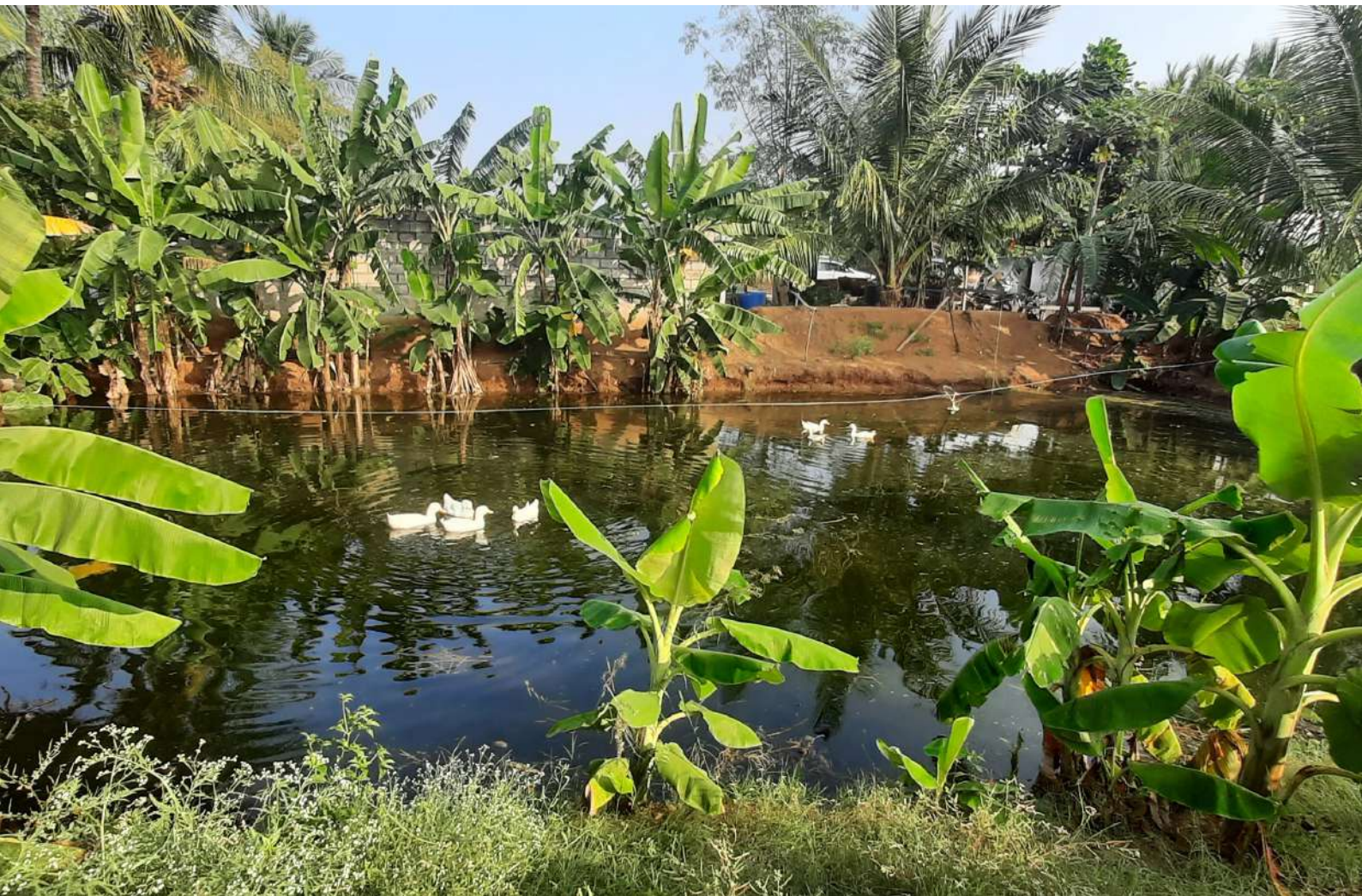
TABLE 9. CWRM PARAMETERS SELECTED FOR BLOCK LEVEL VULNERABILITY

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

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

The identified indicators are from different sources and measured in different units. As the vulnerability assessment is about ranking, the indicators have to be in common units. This is done through normalization. The normalized indicators are aggregated and categorized to different vulnerability level as very high, high, medium, low and very low. The vulnerability assessment methodology is given in Annexure 4.1. The normalized indicators are aggregated and categorized to different vulnerability level. The vulnerable GPs are ranked based on vulnerability scores (Figure 4.2). Su.Nallur, Nallavanpallyam, Navampattu, Su.Kambupattu, T. Kalleri Thandarai, Perumanam, Kallottu, Andampallam, Ananandal, Su.Valavetti, Nariapattu, Kilchettipattu, Kadagaman, Kandiyankuppam, Aradapattu, Kilkaripur GPs have very high vulnerability.

Upto	Category	Color range
0.555	Very High	
0.529	High	
0.504	Medium	
0.474	Low	
0.453	Very low	



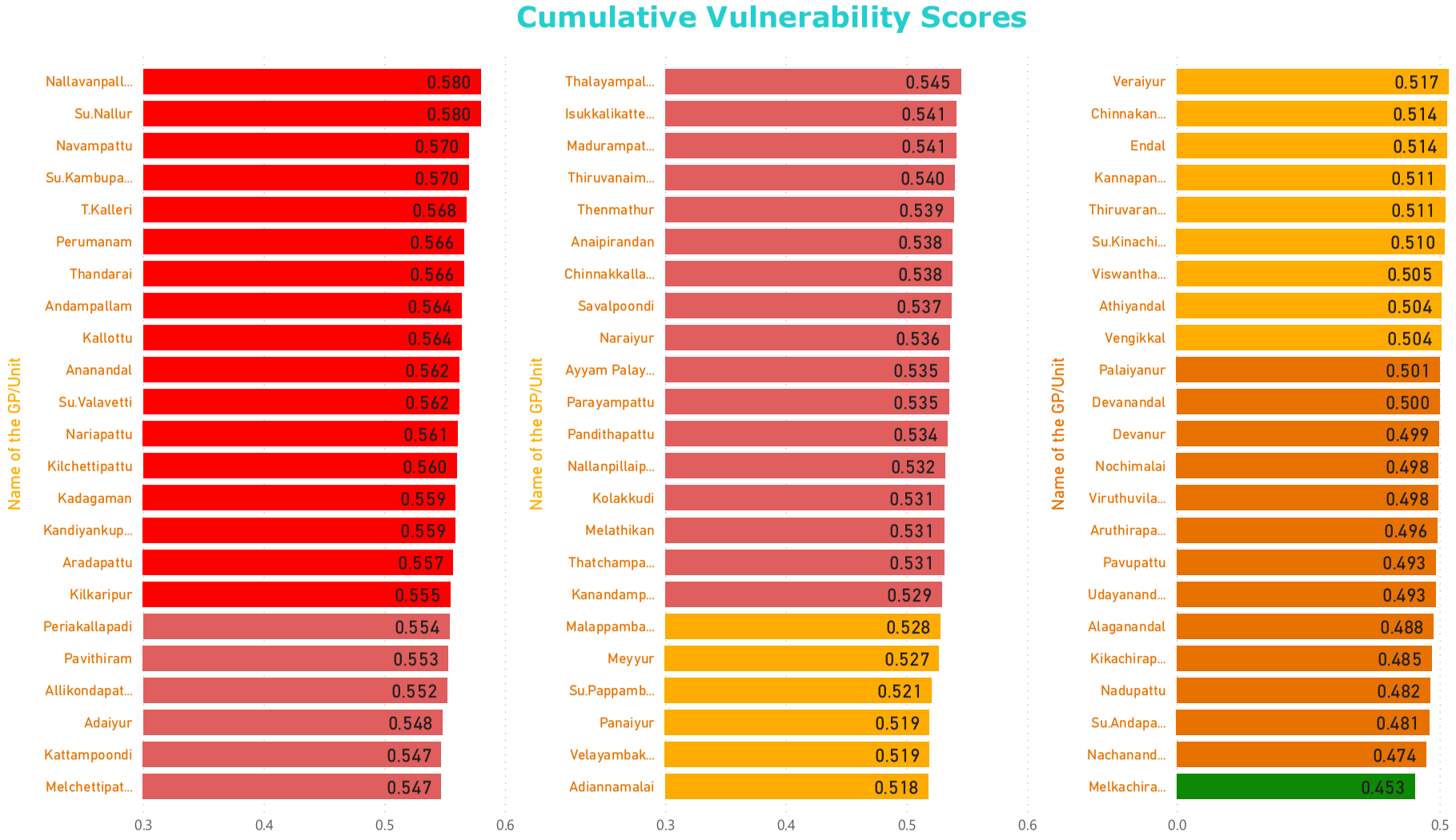


Figure 4.2. Final cumulative vulnerability scores

Sectoral vulnerability

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

Climate risks vulnerability

All GPs of Block are affected by climate risks such as droughts and heat waves in the last decade. Nochimalai, Malappambadi, Thandarai and Chinnakkallapadi GPs are identified as flood vulnerable areas

NOCHIMALAI, MALAPPAMBADI, THANDARAI, CHINNAKKALLAPADI

Water resource vulnerability

The water resources vulnerability index shows that Andampallam GP is highly vulnerable followed by Pavithiram, Su.Nallur, T.Kalleri, Kattampoondi, Kilkaripur, Perumanam, and Nariapattu GPs

ANDAMPALLAM, PAVITHIRAM, SU.NALLUR, T.KALLERI, KATTAMPOONDI, KILKARIPUR, PERUMANAM, NARIAPATTU

Agriculture resources vulnerability

In agriculture and allied sectors, Kallottu GP has highest vulnerable score followed by Navampattu, Nallavanpallyam, Kilchettipattu, Nariapattu, Kandiyankuppam, Melathikan, Su.Valavetti and Su.Nallur GPs

KALLOTTU, NAVAMPATTU, NALLAVANPALLYAM, KILCHETTIPATTU, NARIAPATTU, KANDIYANKUPPAM, MELATHIKAN, SU.VALAVETTI, SU.NALLUR

Socio-economic vulnerability

Ananandal has very high vulnerability followed by Aradapattu, Adaiyur, Su.Kambupattu, Perumanam, Meyyur, Parayampattu, Kadagaman, Su.Andapattu, and Thenmathur GPs

ANANANDAL, ARADAPATTU, ADAIYUR, SU.KAMBUPATTU, PERUMANAM, MEYYUR, PARAYAMPATTU, KADAGAMAN, SU.ANDAPATTU, THENMATHUR

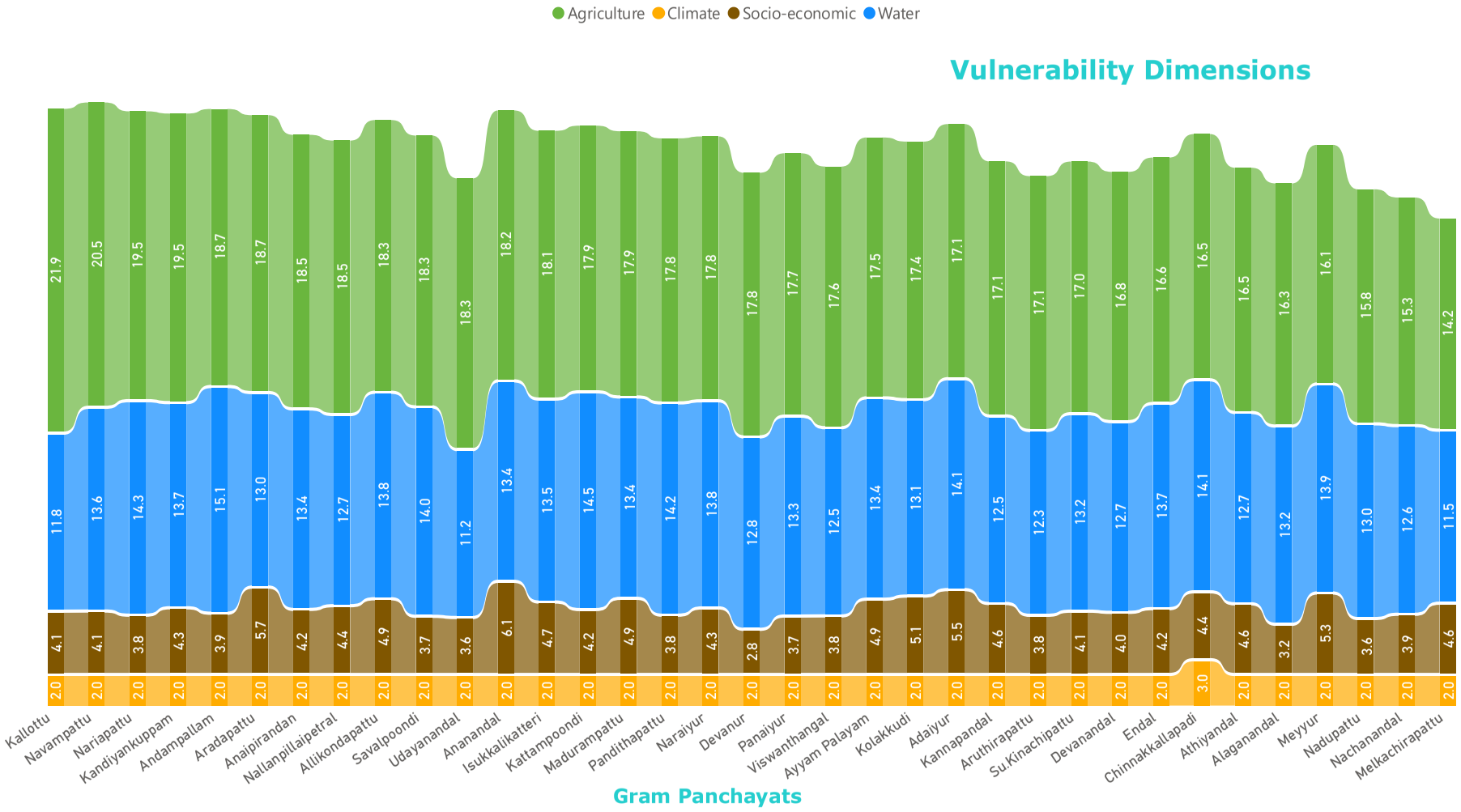


Figure 4.3. GP wise vulnerability dimensions

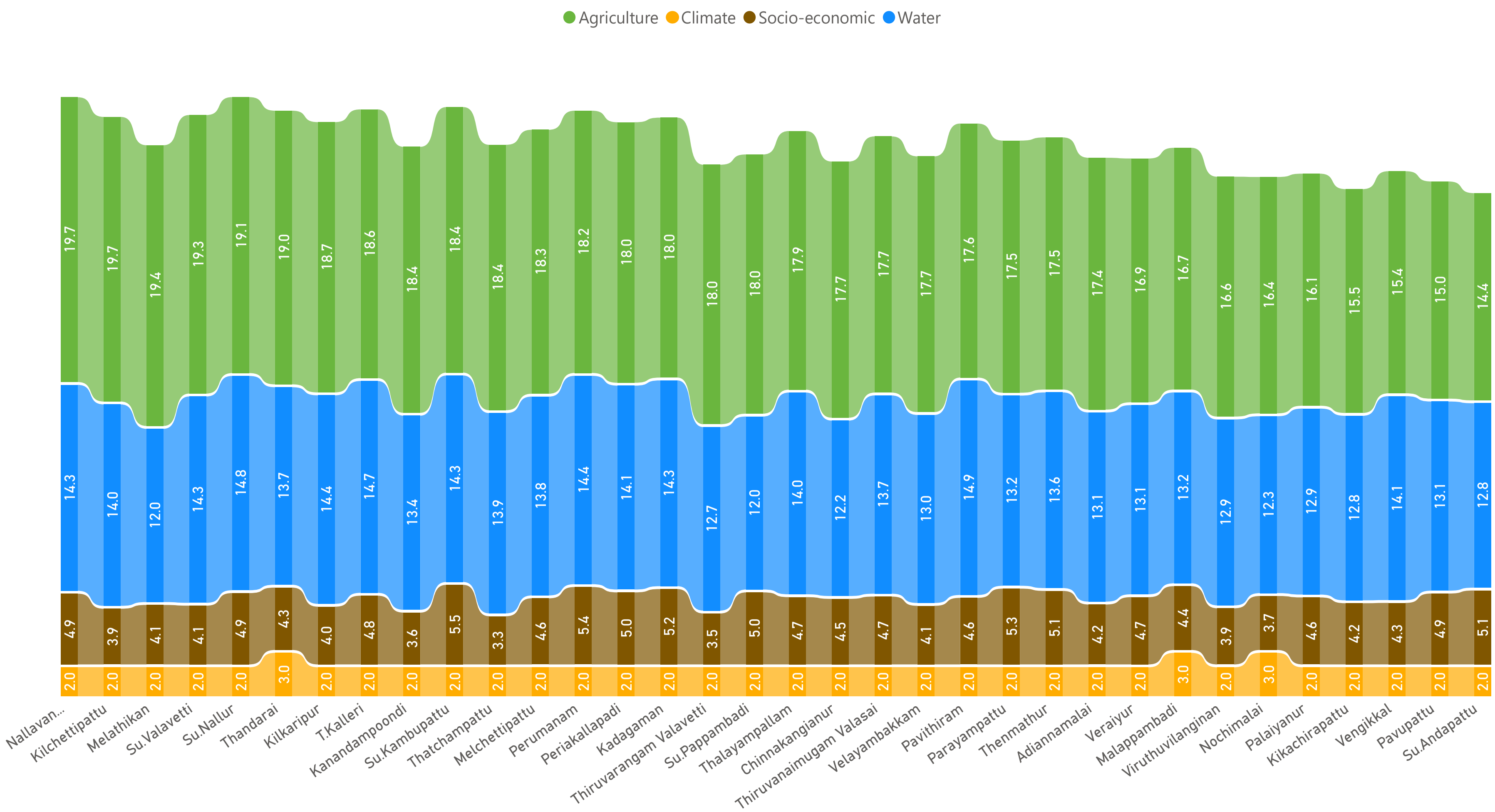
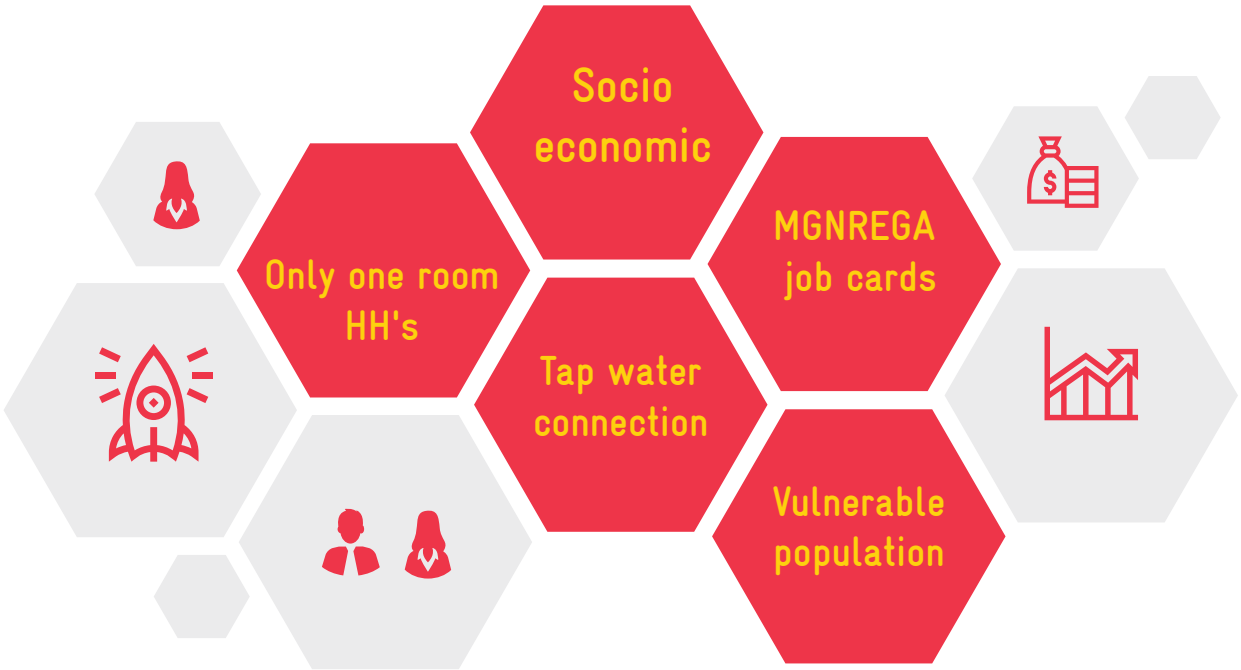
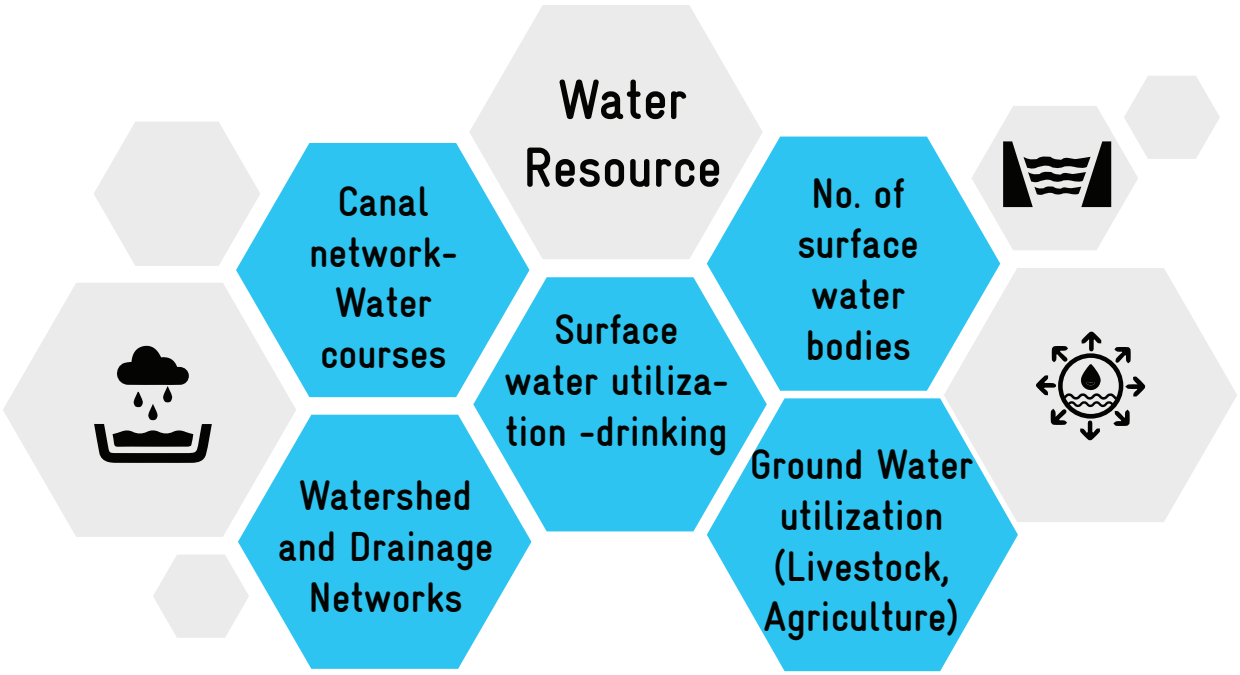
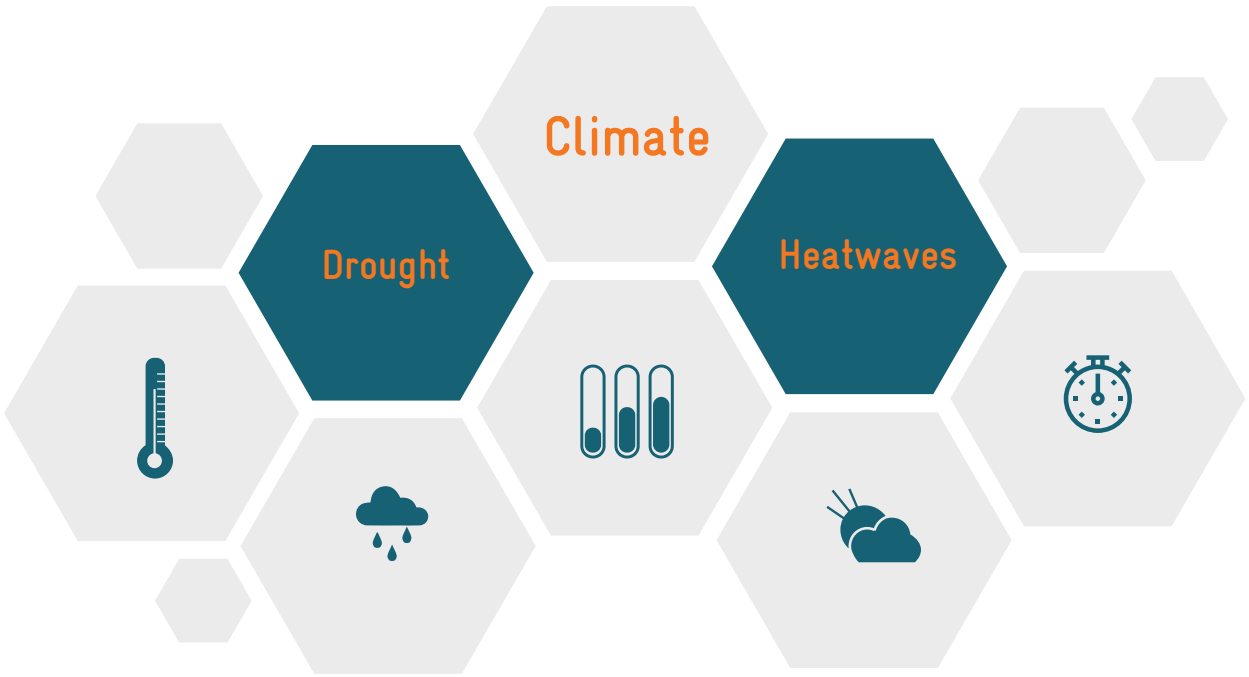


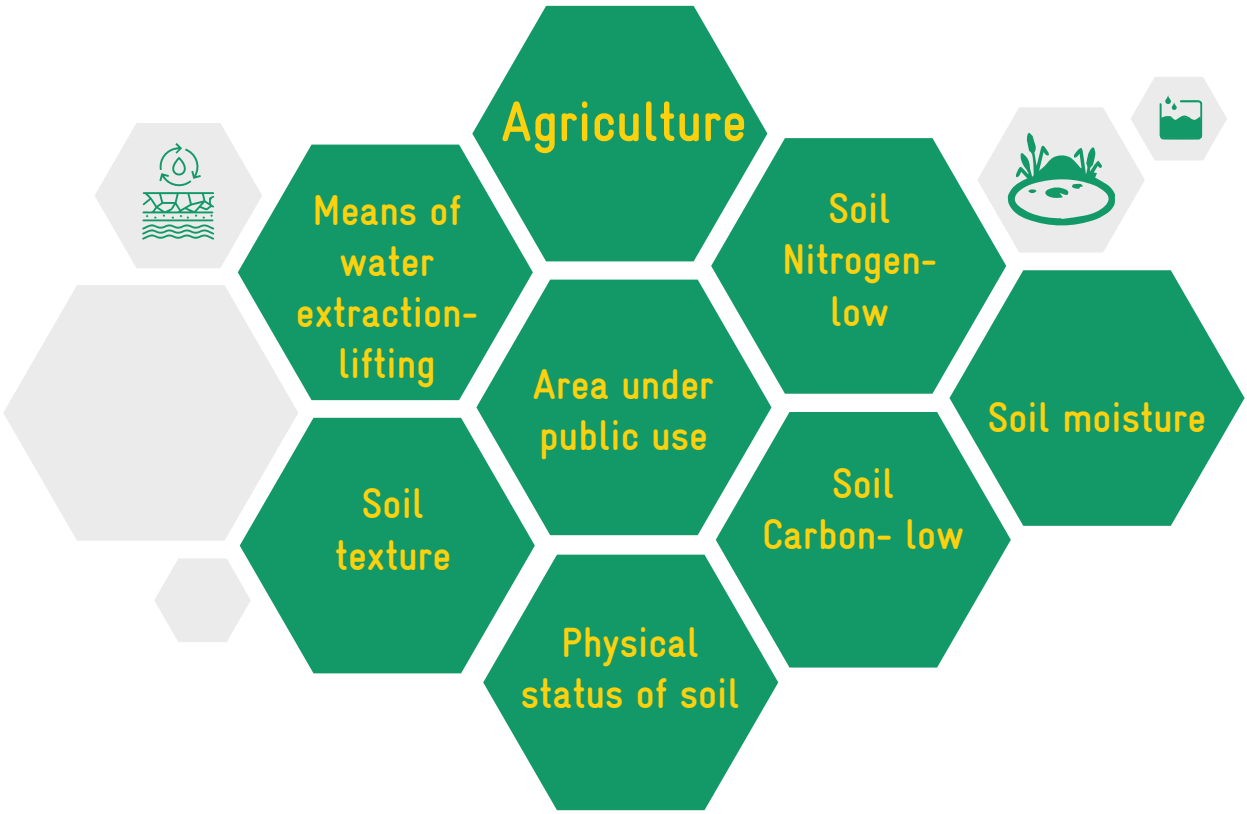
Figure 4.3. GP wise vulnerability dimensions

Contributing indicators to the total vulnerability









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

விசும்பின் துளிவீழின் அல்லால்மற் றாங்கே
பசும்புல் தலைகாண்பு அரிது

குறள் - 16

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

Thirukkural - 16

CHAPTER 5

PROPOSED KEY WATER ACTIONS UNDER MAHATMA GANDHI NREGS CONVERGENCE

5 PROPOSED KEY WATER ACTIONS UNDER MAHATMA GANDHI CONVERGENCE

After identifying the key water issues at GP level through vulnerability analysis, the areas for key water action treatments were proposed. The comprehensive and holistic understanding of the key water challenges adopting the eco-system approach enables 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). This chapter discusses the proposed treatment actions under WASCA, CWRM and CRM.

5.1 PROPOSED AREA UNDER WASCA TREATMENT

Out of 30,886 ha available land in Tiruvannamalai Block, 4,529 ha (14 %) area is proposed for treatment under WASCA TN– CWRM planning. A large portion of key water actions area proposed is in irrigated land and few proposals for unirrigated land. The detailed land wise proposal for WASCA treatments is given in Table 10. GP wise proposed area for treatment is also attached in Annexure 5.1.

TABLE 10. THE PROPOSED AREA FOR WASCA TREATMENT

Land Use	Total area (ha)	Proposed Area (ha)
Forest Land	5	2
Non-Agricultural Uses	4,594	901
Barren & Un-cultivable Land	1,140	855
Permanent Pastures and Other Grazing Land	213	160
Land Under Miscellaneous Tree, Crops etc.	55	41
Cultivable Waste Land	421	316
Fallows Land other than Current Fallows	625	49
Current Fallow land	9,753	849
Unirrigated Land	2,812	242
Area Irrigated by Source	11,267	1,114

More than 75 % of Barren, Un-cultivable, Permanent Pastures, Land Under Miscellaneous Tree Crops, and Cultivable Waste Land were proposed for treatment measures. Very little area of fallow and unirrigated area was considered in the treatment measures (Figure 5.1).

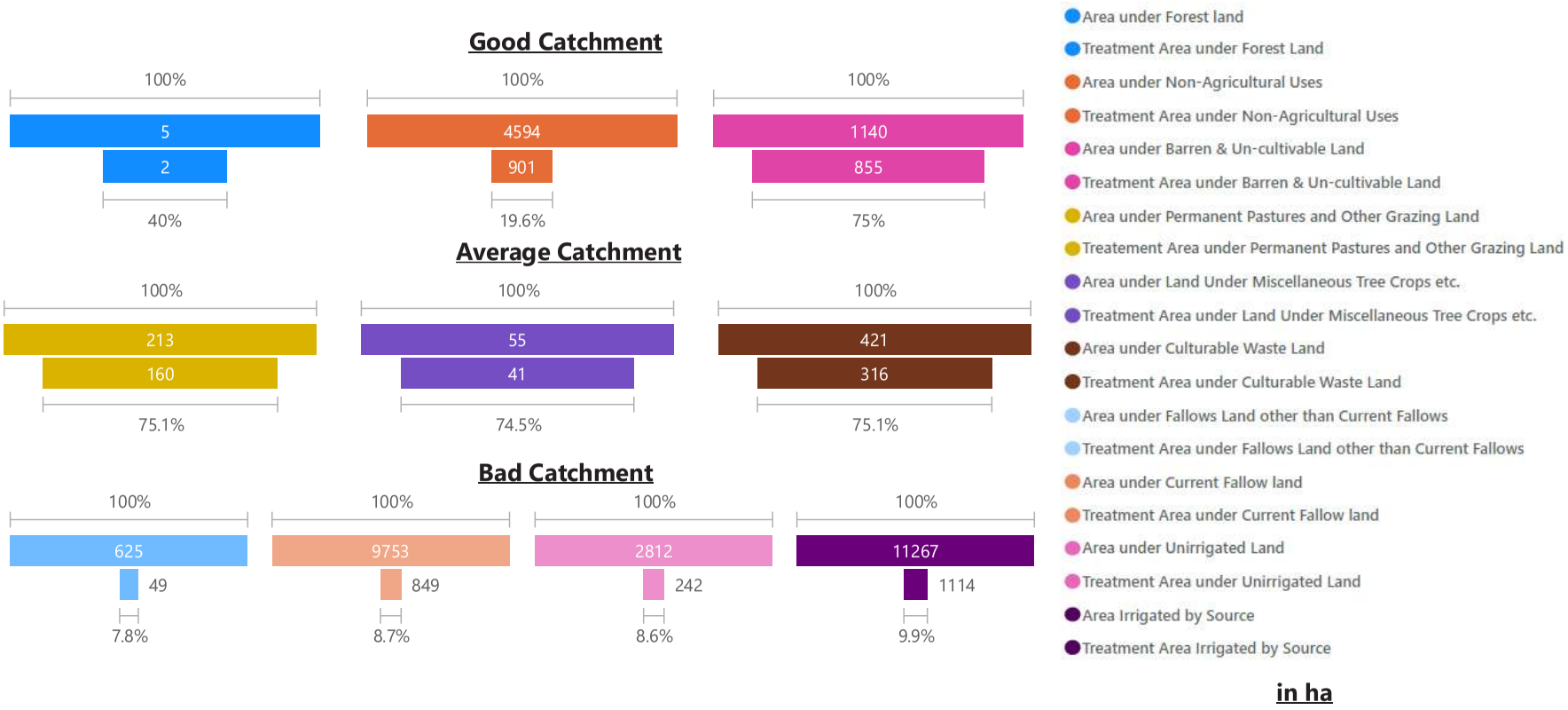


Figure 5.1. WASCA treatment area

Expected Runoff Conservation after WASCA treatment

The productive developmental activities are designated as key water actions in WASCA proposed area. With the above proposed treatment area, the expected runoff harvested due to WASCA intervention would be around 1,486 ha.m which is 25 % of the total runoff. Of which the expected runoff conservation of 49% comes from good catchment area followed by 26% from average catchment area and rest is under bad catchment area (Figure 5.2).

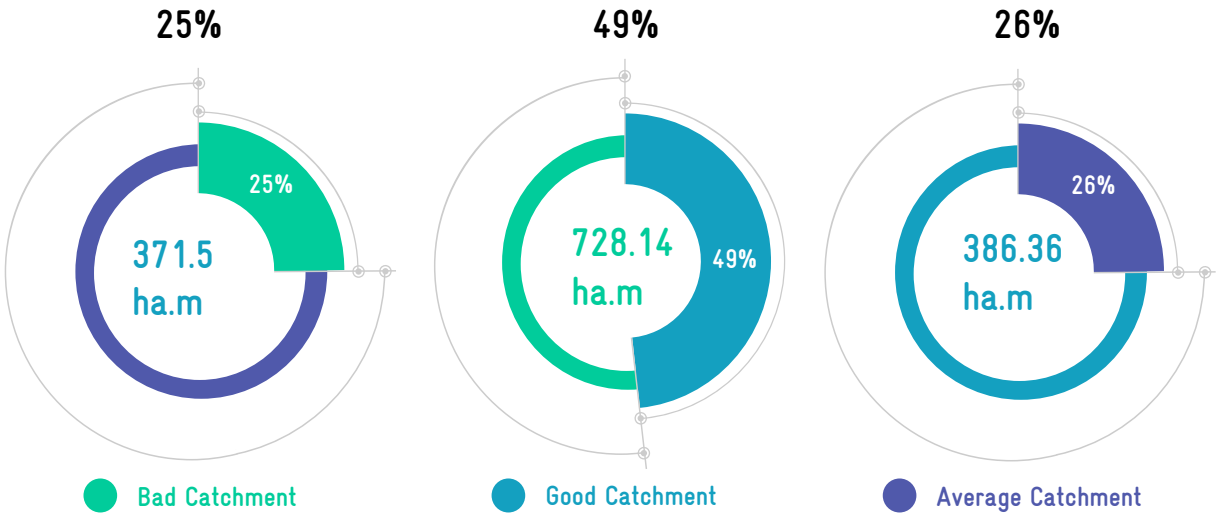


Figure 5.2. Expected conservation after WASCA treatment

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

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

Work	Abbreviation	No.	Extent
Artificial Recharge Structure(Number of units)	ARS	-	885
Construction of Farm Ponds - Individual (Number of units)	FP	422	
Construction of new open wells & Recharge Shafts (Number of units)	COWRS	1,823	
Restotaration of water bodies:a.PWD and Tanks(Number)	RPWDT	98	
Restotaration of water bodies:b. Ooranis(Number)	Roo	36	
Restotaration of water bodies:c. Ponds(Number)	RP	224	
Roof Rain Water Harvesting (Number of units)	RRWH	138	
Water Course - Irrigation Channels - Desilting (Mtrs)	WCICD		17,016
Azolla units - Individual (Number of units)	Az	3,066	
Cattle Shelters (Number of units)	CS	3,268	
Cattle Trough(Number of units)	CT	3,268	
Fodder development - Community & Individual	FD	3,066	
Goat Sheep Shelters (Number of units)	GSS	902	
Poultry Shed (Number of units)	PS	7,983	31,931

Silvi-pasture Development(Ha)	SPD	34,210	43
Soak Pits (Community) (Number of units)	SPC	289	
Soak Pits (Individual) (Number of units)	SPI	2,970	
Afforestation in Public/common lands(Ha)	Aff	705,547	782
Avenue plantation(Km)	AVP	77,357	311,601
Block Plantation (Community)(Ha)	BP	156,485	208
Canal Bund Plantation(Ha)	CBP	9,936	49,680
Contour Continous Bunds (CCB) for Afforestaion area(Mtrs)	CCBF	7,980	40
Drainage Line Treatment (DLT)(Mtrs)	DLT	29,794	148,985
Dry land Horticulture/Agro-forestry - Individual (Ha)	DLHAI	290,666	363
Irrigation Channel Plantation (Mtrs)	ICP	3,402	17,016
Linear Plantation(Km)	LP	76,008	304,533
Micro Irrigation(Ha)	MI	110	272
Nursery Development(Number of units)	ND	58,572	11,713
Composting (Number of units)	Co	277	774
Farm Bunding with Boundary Trenches - Individual (Ha)	FBBTI	495	1,444
Land development - Individual (Ha)	LDI	382	948
NADEP Vermi compost (Number of units)	NADEP	3,118	

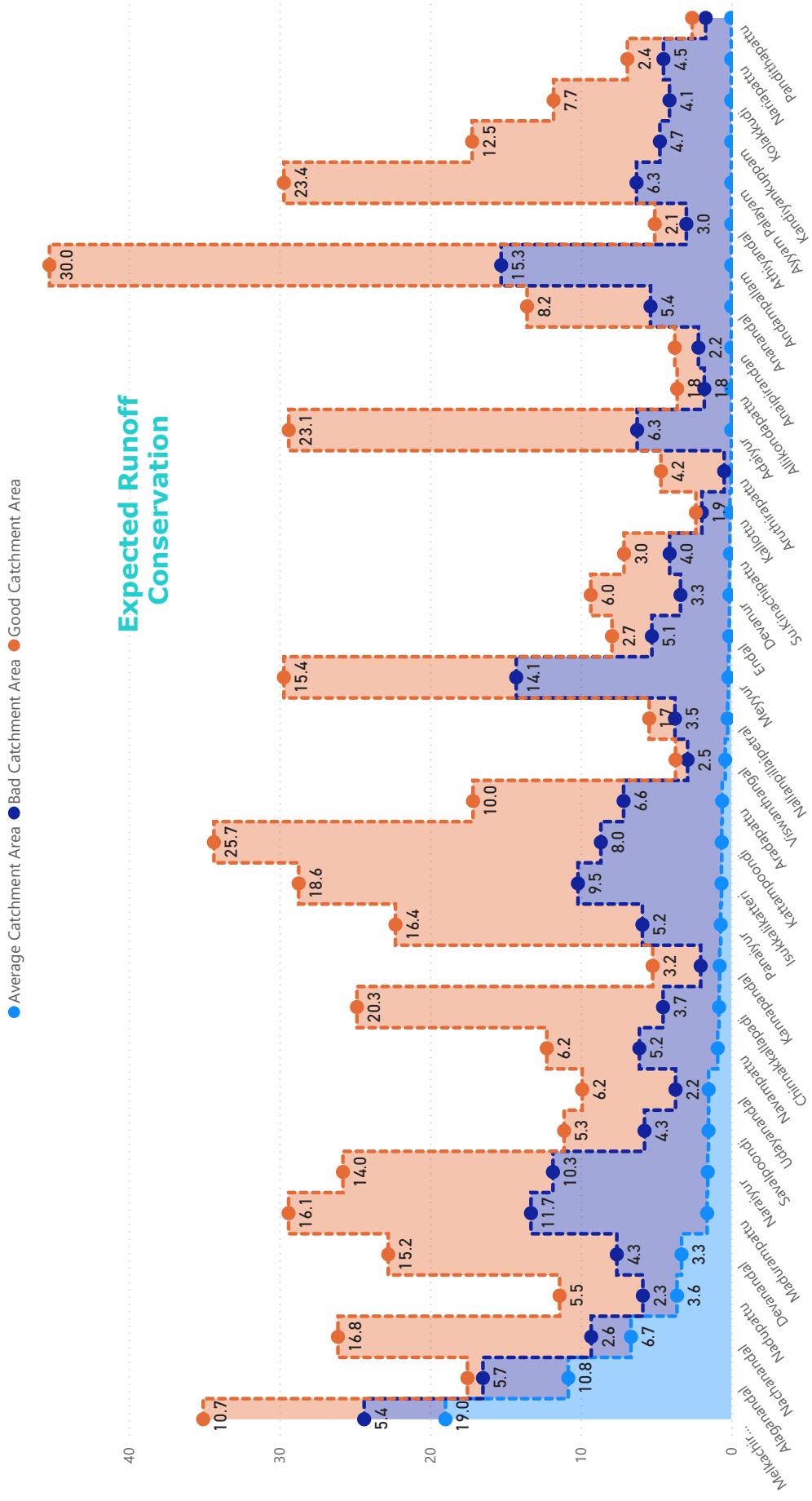


Figure 5.3. Expected GP wise runoff conservation after WASCA treatment

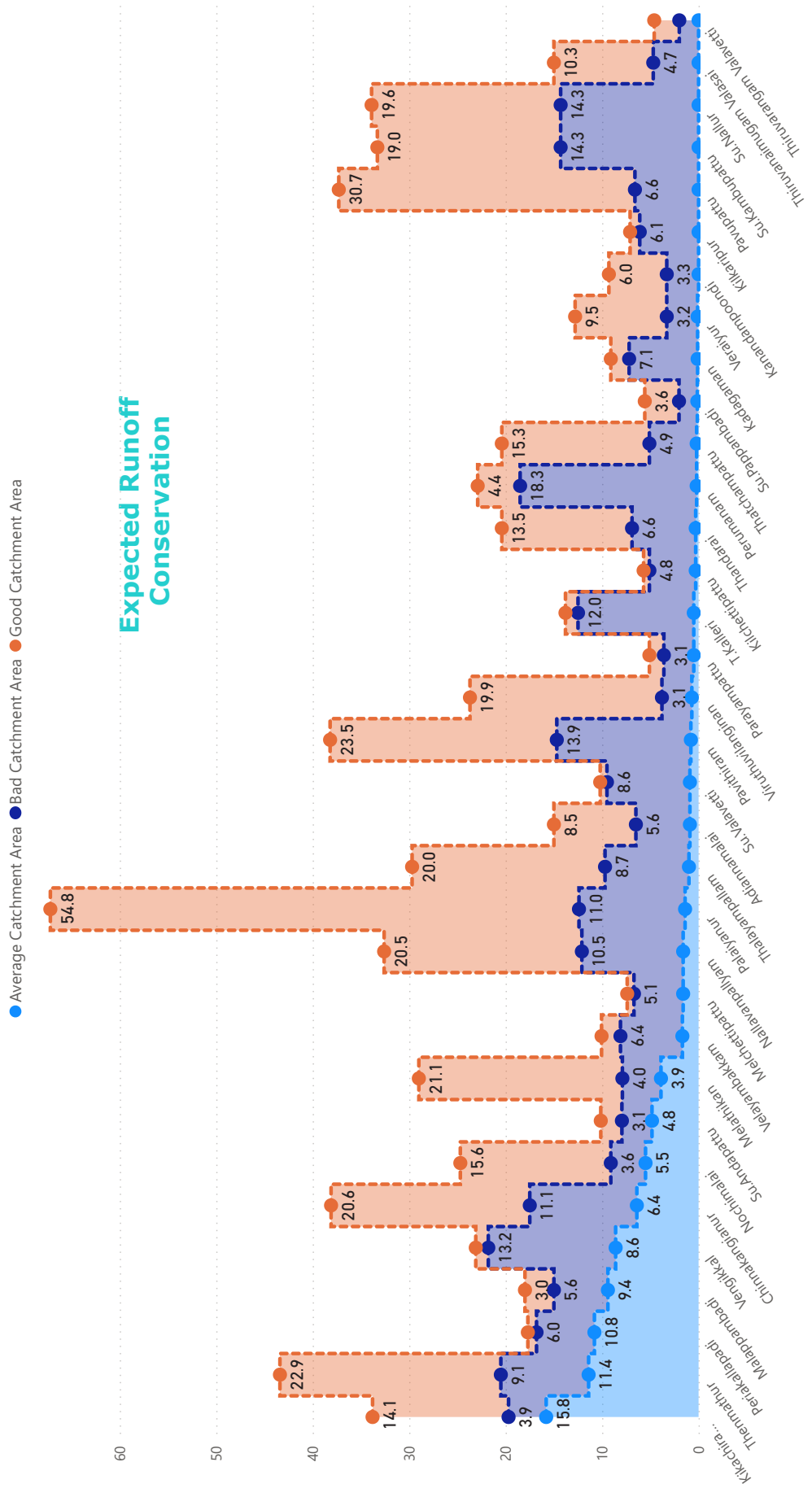


Figure 5.3. Expected GP wise runoff conservation after WASCA treatment

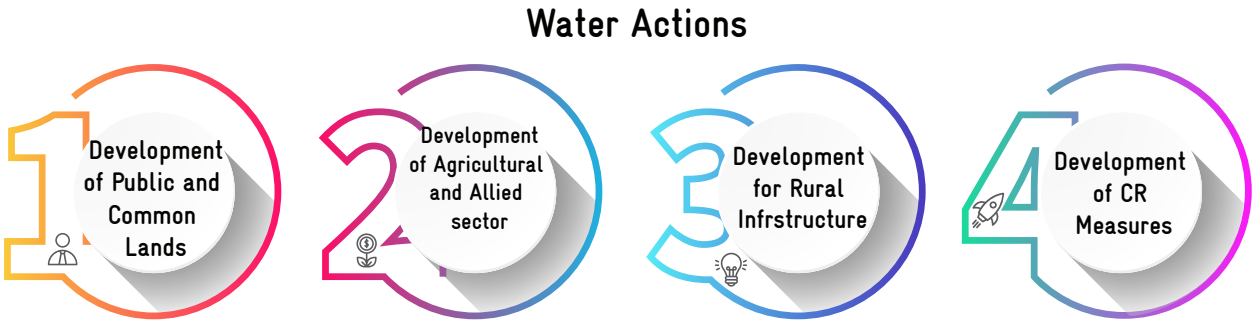
Mahatma Gandhi NREGS Annual circular 2020-21 (Clause 6.3)

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

I. Historical and projected climate change data, especially incidence of droughts and floods, along with vulnerability assessment at the district, Block or gram panchayat level should be used in the planning and design of Mahatma Gandhi NREGS works.

II. Different kinds of complementary Natural Resource Management (NRM) works such as land development with plantation on the bunds, farm ponds, and compost pits should be combined, in order to ensure durability of assets and resilience of communities that depend on such assets.

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



5.2 DEVELOPMENT OF PUBLIC & COMMON LANDS

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

DEVELOPMENT OF PUBLIC AND COMMON LANDS

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

	NO. OF WORKS	PERSON DAYS PER UNIT	UNIT COST IN INR (LAKHS)	ESTIMATED COST IN INR (LAKHS)	ESTIMATED PERSON DAYS
CONTOUR CONTINOUS BUNDS (CCB) FOR AFFORESTATION AREA(M)	133	10	0.025	3.33	1,331
COMPOSTING(NUMBER OF UNITS)	277	15	0.17	47.09	4,155
AFFORESTATION IN PUBLIC/ COMMON LANDS(HA)	776	3,344	8.6	6,673.17	25,94,777
BLOCK PLANTATION (COMMUNITY)(HA)	208	4,320	11.1	2,306.14	8,97,523
SILVI-PASTURE DEVELOPMENT(HA)	43	6,664	17.1	742.14	2,89,218
LINEAR PLANTATION(KM)	2	703	1.8	3.47	1357
CANAL BUND PLANTATION(HA)	879	2,930	7.5	6,592.50	21,20,340
IRRIGATION CHANNEL PLANTATION (M)	559	6	0.015	8.38	3,353
AVENUE PLANTATION(KM)	7	703	1.8	12.29	4,800
NURSERY DEVELOPMENT (NUMBER OF UNITS)	230	2,344	15	3,450.83	5,39249
RESTOTARATION OF WATER BODIES: A) PWD AND TANKS (NUMBER)	123	800	5	615	98,400
RESTORATION OF WATER BODIES: B.OORANIS (NUMBER)	0	200	2	0	0
RESTORATION OF WATER BODIES: C) PONDS (NUMBER)	226	200	1	226	45,200
ARTIFICIAL RECHARGE STRUCTURE (NUMBER OF UNITS)	1,692	391	2.5	3,166.00	6,61,572
WATER COURSE - IRRIGATION CHANNELS - DESILTING (M)	559	3	0.0075	4.19	1676
DRAINAGE LINE TREATMENT (m)	3,552	5	0.03	106.56	17,761

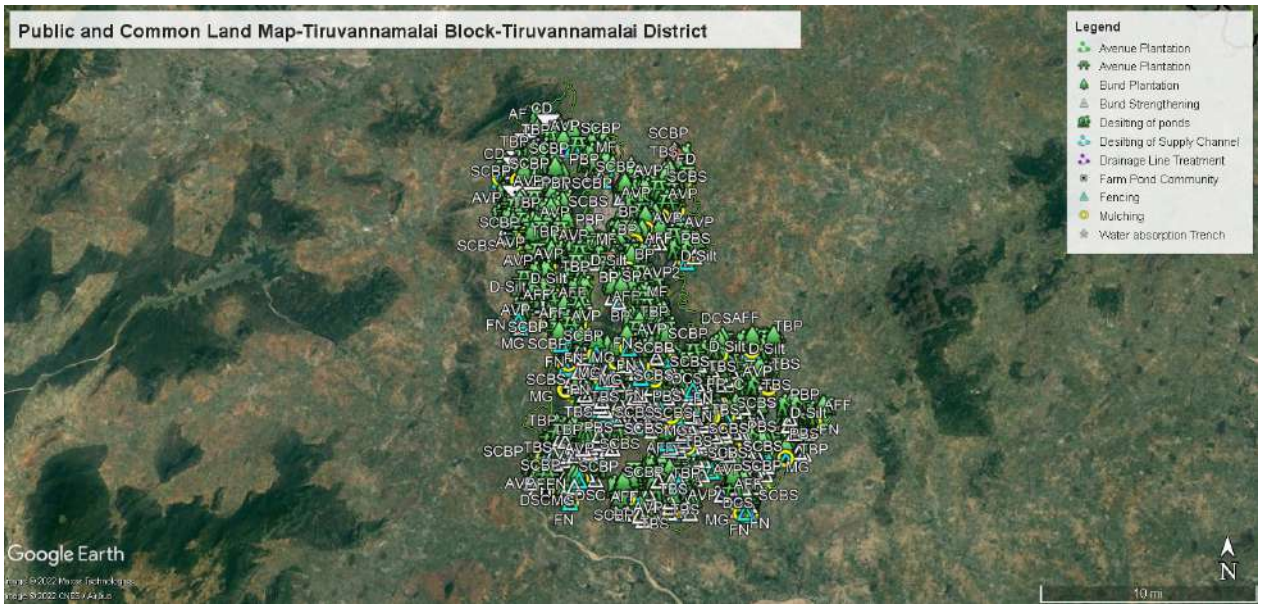


Figure 5.4. Proposed development activities in Public and Common Land

5.2.2 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 12).

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

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

	NO. OF WORKS	PERSON DAYS PER UNIT	UNIT COST IN INR (LAKHS)	ESTIMATED COST IN INR (LAKHS)	ESTIMATED PERSON DAYS
FARM BUNDING WITH BOUNDARY TRENCHES - INDIVIDUAL (ha)	1,866	586	1.5	2,799	10,93,476
MICRO IRRIGATION (ha)	110	0	1	110	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	340	781	2	680	2,65,540
LAND DEVELOPMENT - INDIVIDUAL (ha)	860	3,906	10	8,602	33,59,941
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	43	3,321	8.5	362	1,41,475
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	1,379	23	0.15	207	31,717
NADEP VERMI-COMPOST (NUMBER OF UNITS)	1,496	27	0.18	269	40,392
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	1,379	2,344	1.48	2,041	32,32,376
CATTLE SHELTERS (NUMBER OF UNITS)	1,616	331	2.12	3,426	5,34,896
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	457	355	2.27	1,037	1,62,235
CATTLE TROUGH (NUMBER OF UNITS)	1,616	6	0.5	81	29,696
POULTRY SHED (NUMBER OF UNITS)	1,522	10	0.09	137	15,220
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	1,609	926	5	8,045	14,89,934

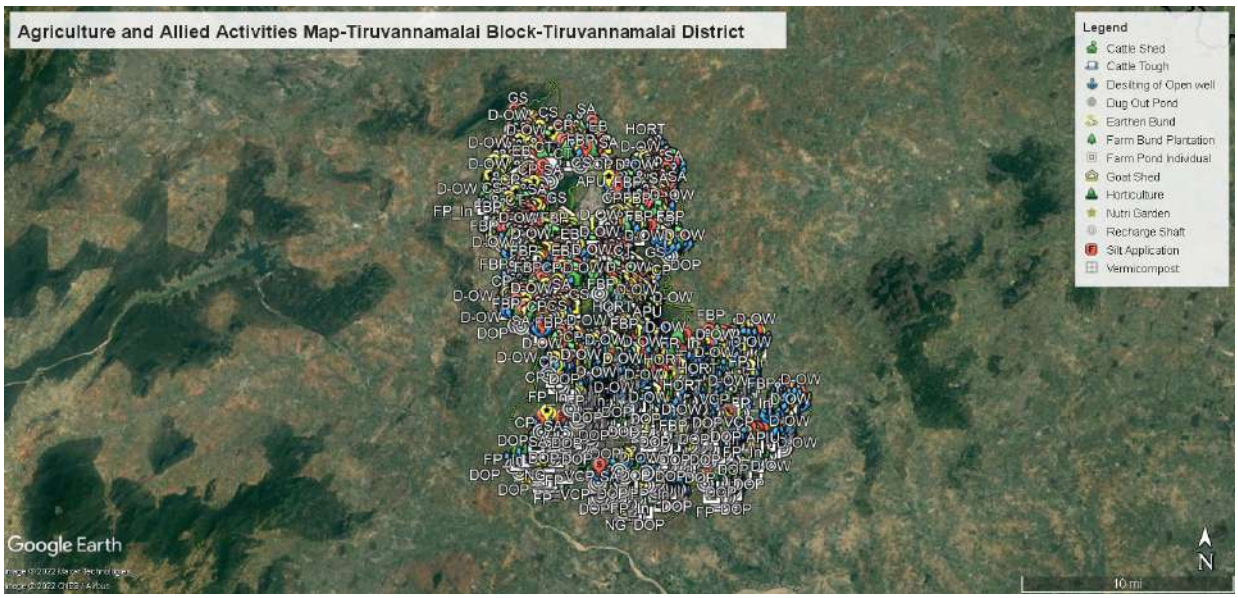


Figure 5.5. Proposed development activities in Agriculture and allied Sectors

5.2.3 DEVELOPMENT OF RURAL INFRASTRUCTURE

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

DEVELOPMENT OF RURAL INFRASTRUCTURE

TABLE 13. DETAILS OF WORK PROPOSED TO DEVELOP RURAL INFRASTRUCTURE

	NO. OF WORKS	PERSON DAYS PER UNIT	UNIT COST IN INR	ESTIMATED COST IN INR (LAKHS)	ESTIMATED PERSON DAYS
SOAK PITS (COMMUNITY) (NUMBER OF UNITS)	87	20	0.13	11.31	1,740
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	892	16	0.1	89	14,272
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	138	625	4	552	86,250

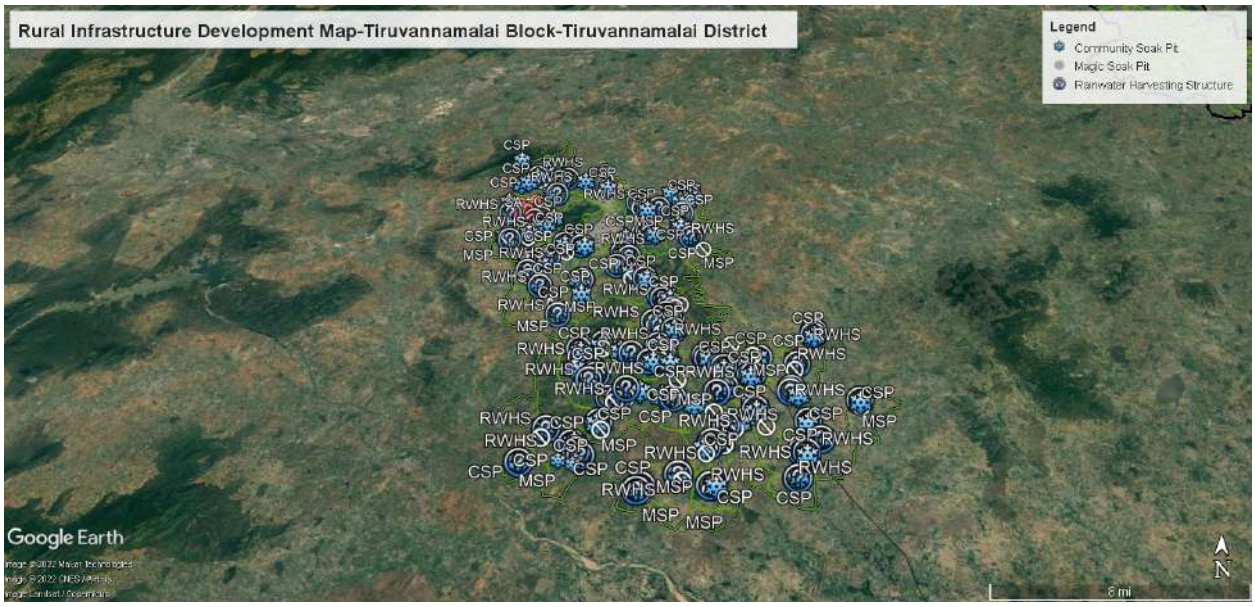


Figure 5.6. Proposed rural infrastructure activities

5.3 PROPOSED CLIMATE RESILIENCE MEASURES (CRM)

Climate resilient measures are proposed to cope up the system with future climate risks such as droughts, heatwaves and floods. As Tiruvannamalai District is one of the drought prone area and frequently exposed to severe droughts, more measures are proposed to manage droughts and its subsequent impacts. As Tiruvannamalai Block is also affected by droughts and heat waves, climate resilient measures are proposed to cover-up maximum of GPs (Table 14). CRM such as greening of hillocks, cascade of tanks, silvipasture and farm ponds are proposed in this Block in saturation mode. The proposed activities and its details are given in Tables 15 to 18.

TABLE 14. GP WISE PROPOSED CRM

GP	Public and common land	Agriculture and allied activities	Rural infrastructures
Adiannamalai		Farm Pond	
Alaganandal	Cascade of Tanks		
Anandandal		Farm Pond	
Andampallam		Farm Pond	
Annamalai RF	Greening of Hillocks		
Aruthirapattu		Farm Pond	
Ayyampalayam		Farm Pond	
Boothamangalam	Silvi pasture development		
Chinnakallapadi		Farm Pond	
Chinnakangiyanur	Cascade of Tanks		
Chinnakankeyanur		Farm Pond	
Devananthal		Farm Pond	
Endal	Cascade of Tanks, Silvi pasture development	Farm Pond	
Kalleri		Farm Pond	

Kallottu		Farm Pond	
KandiyanNadupattu		Farm Pond	
Kannamadai RF	Greening of Hillocks		
Kannapanndal		Farm Pond	
Kattampoondi		Farm Pond	
Kilchettipattu	Cascade of Tanks		
Kilkachirapattu	Cascade of Tanks	Farm Pond	
Kilkaripur		Farm Pond	
Madurampattu		Farm Pond	
Melathikkan	Cascade of Tanks		
Melchettipattu	Cascade of Tanks	Farm Pond	
Melkachirapattu	Cascade of Tanks		
Meyyur	Cascade of Tanks	Farm Pond	
Nadupattu		Farm Pond	
Nallavanpalayam	Cascade of Tanks		
Nariyapattu		Farm Pond	
Palayanur	Greening of Hillocks	Farm Pond	
Pandithapattu		Farm Pond	
Parayampattu		Farm Pond	
Pavupattu		Farm Pond	
Periyakallapadi		Farm Pond	
Randam	Silvi pasture development		
Savalpoondi	Cascade of Tanks		
Su.Papampadi		Farm Pond	
Sukambupattu		Farm Pond	
T.Vaalavetti		Farm Pond	
Thalayampallam		Farm Pond	
Thandarai		Farm Pond	
Thenmathur	Cascade of Tanks, Silvi pasture development	Farm Pond	
Tiruvannamalai_	Cascade of Tanks		
Udaiyananthal		Farm Pond	
Udayanandal	Cascade of Tanks		
Veraiyur		Farm Pond	
Virudhuvilanginan		Farm Pond	

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

Name of the GP	Area in ha	Classification of land
Annamalai RF	600	Reserve forest
Kannamadai RF	58	Reserve forest
Palaiyanur	8	Malai/Hill

TABLE 16. DETAILS OF PROPOSED ACTIVITIES ON SILVIPASTURE UNDER CRM

Name of the Panchayat	Name of the Habitation	Survey Number	Area for Silvi pasture Plantation	Total Number of Plants
Endal	Venugopalapuram	4	0.38	305
Thenmathur	Thenmathur	106	0.4	320
Boothamangalam	Boothamangalam	253/2	2.895	5600
Randam	Randam	56.6	0.38	304
	V.Nammiyandhal	56.2A	0.11	88

TABLE 17. DETAILS OF PROPOSED FARM PONDS ACTIVITIES UNDER CRM

GP	Habitation	Count
Adiannamalai	Adiannamalai	4
Ananandal	Ananandal	2
Andampallam	Andampallam	16
Aruthirapattu	Aruthirapattu	2
Ayyampalayam	Ayyampalayam	1
	Pudhur	1
Chinnakallapadi	Chinnakallapadi	2
Chinnakankeyanur	Sambathanur	1
Devananthal	Devanandal	1
	Devananthal	1
Endal	Endal	3
Kalleri	Kalleri	2
	T-Kalleri	1
Kallottu	Kallottu	1
KandiyanNadupattu	KandiyanNadupattu	4
Kannapanndal	Kannapanndal	1
Kattampoondi	Kattampoondi	4
	Pudhur	2
Kilkachirapattu	Kilkachirapattu	4
Kilkaripur	Kilkaripur	2
Madurampattu	Madurampattu	2
Melchettipattu	Melchettipattu	5
Meyyur	Meyyur	3
Nadupattu	Nadupattu	1
Nariyapattu	Nariyappatu	1
Palayanur	Palayanur	2
	Pazhaiyanur	3
Pandithapattu	Pandithapattu	1
Parayampattu	Parayampattu	7
Pavupattu	Pavupattu	3
Periyakallapadi	Periyakallapadi	3
Su.papampadi	Su.papampadi	2
SuKambupattu	SuKambupattu	2
T.Vaalavetti	T.Vaalavetti	1
Thalayampallam	Thalayampallam	5

Thandarai	Thandarai	1
Thenmathur	Thenmathur	13
Udaiyananthal	Udaiyanandal	1
	Udayanandal	3
Veraiyur	Veraiyur	1
Virudhuvilanginan	Virudhuvilanginan	1
Total		**116**

TABLE 18. DETAILS OF CASCADE OF TANKS UNDER CRM

GP	Name of the Tank
Viswanthangal, Meyyur	Visvanthangal Eri Chitheri
Melchettipattu	Melchittipattu Eri, Manjampoondi Eri
Kilchettipattu	Kilchittipattu Eri, Asudaiyampattu Eri, Kilkachirapattu Eri
Nallavanpalayam	Nallavanpalayam PWD Eri,, PeriyaEri. Nallavanpalayam Eri
Savalpoondi	Savalpoondi Eri
Tiruvannamalai_M1	
Melathikkan	Karaiyanchetti Eri, Vennamalai Eri
Melkachirapattu	Karaiyanchetti Eri
Kilkachirapattu	Vennamalai Eri
Thenmathur	Chitheri, Su.Kilnachipattu Eri
Udayanandal	Udaiyanandal Eri
Alaganandal	Alaganandal Eri
Eandal	Kumban Eri

நெடுங்கடலும் தன்நீர்மை குன்றும் தடிந்தெழிலி
தான்நல்கா தாகி விடின்

குறள் - 17

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

Thirukkural - 17

CHAPTER 6

PROJECTED OUTCOMES OF PLANNING

6 PROJECTED OUTCOMES OF PLANNING

In view of Mahatma Gandhi NREGS guidelines, key water actions are proposed based on climate vulnerability assessment and challenges at GP level for three years period from 2021- 2022 to 2023-2024. At the end of the implementation period during 2024, the following productive outcomes are envisaged on successful accomplishment of all proposed key water actions. The anticipated outcome will reduce the water security vulnerability and increase the resilience of the GPs under current and projected climatic change scenarios.

6.1 OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS WASCA-CWRM

OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

	INDICATOR		OUTCOMES
1	Proportion of Land development under WASCA treatment	1	4,530 ha (14.6 %) of the total area treated under WASCA
2	Percentage reduction of run off	2	1,301 ha.m i.e. 19.% of the total runoff harvested due to WASCA interventions
3	No. of waterbodies restored	3	349 waterbodies restored
4	Area under afforestation	4	775.95 ha area under afforestation
5	Area under silvi-pasture development	5	43.4 ha under Silvi-pasture plantation
6	Length of drainage line treated	6	1.404 Km length of drainage line treated

4,530 ha
AREA TREATED

1,301 ha.m
TOTAL RUNOFF HARVESTED

349
WATER BODIES RESTORED

775.95 ha
AREA AFFORESTATION

43.4 ha
SILVI-PASTURE PLANTATION

1.404 m
DRAINAGE LINE TREATED

6.2 OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED SECTOR WASCA-CWRM

OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

	INDICATOR	OUTCOMES
1	Assessment of sources of water for live-stock and agriculture demand No of structures established for on-farm *(in-situ)* water harvesting in dry lands	340 farm ponds established which target the harvest of 59.8 ha.m of water which has the potential to irrigate 119 ha area in both kharif and rabi seasons
2	Improvement in soil health	1,496 NADEP compost units for soil health improvement
3	Changes in the irrigation practices	1,866 ha Farm bunding with trenches
4	Dry land development with agro-forestry	42.6 ha under dry land horticulture
5	Households established fodder plots	3,244 vulnerable households established fodder plots

340 FARM PONDS

1,496 COMPOST UNITS

1,866 ha FARM BUNDING

42.6 ha DRY LAND HORTICULTURE

3,244 FODDER PLOTS

6.3 OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

	INDICATOR	OUTCOMES
1	No. of villages having liquid waste management systems	87 common and 892 individual soak pits established for recycle of grey water bene-fiting 42,715 households
2	Roof rain water harvesting measures	138 common roof rainwater harvesting and storage structures with a target to harvest and store 0.17 ha.m of rainwater for use
3	Nutri-garden	20,108 Households established nutri-gar-dens in homesteads and planted 1,00,540 saplings

87 COMMON & **892** INDIVIDUAL SOAK PITS

138 COMMON ROOF RAINWATER HARVESTING

42,715 NUTRI-GARDENS

2,13,575 SAPLINGS

6.4 OUTCOMES OF CLIMATE RESILIENCE MEASURES

OUTCOMES OF CLIMATE RESILIENCE MEASURES

	INDICATOR	OUTCOMES
1	Vulnerable GPs are identified for key water actions	All GPs are vulnerable for drought and heatwaves, whereas 4 GP are flood vulnerable
2	Climate resilient measures are identified for climate risks	4 models are identified via., Greening of Hillocks, Cascade of Tanks, Silvi-pasture Development, Farm Pond 116 farm ponds in 35 villages/habitation 4.165 ha under silvi-pasture with 6617 plants 666 ha under greening of hillocks Cascade of 21 Tanks in 14 villages

116
FARM PONDS

4.165 ha
SILVI PASTURE

666 ha
GREENING OF HILLOCKS

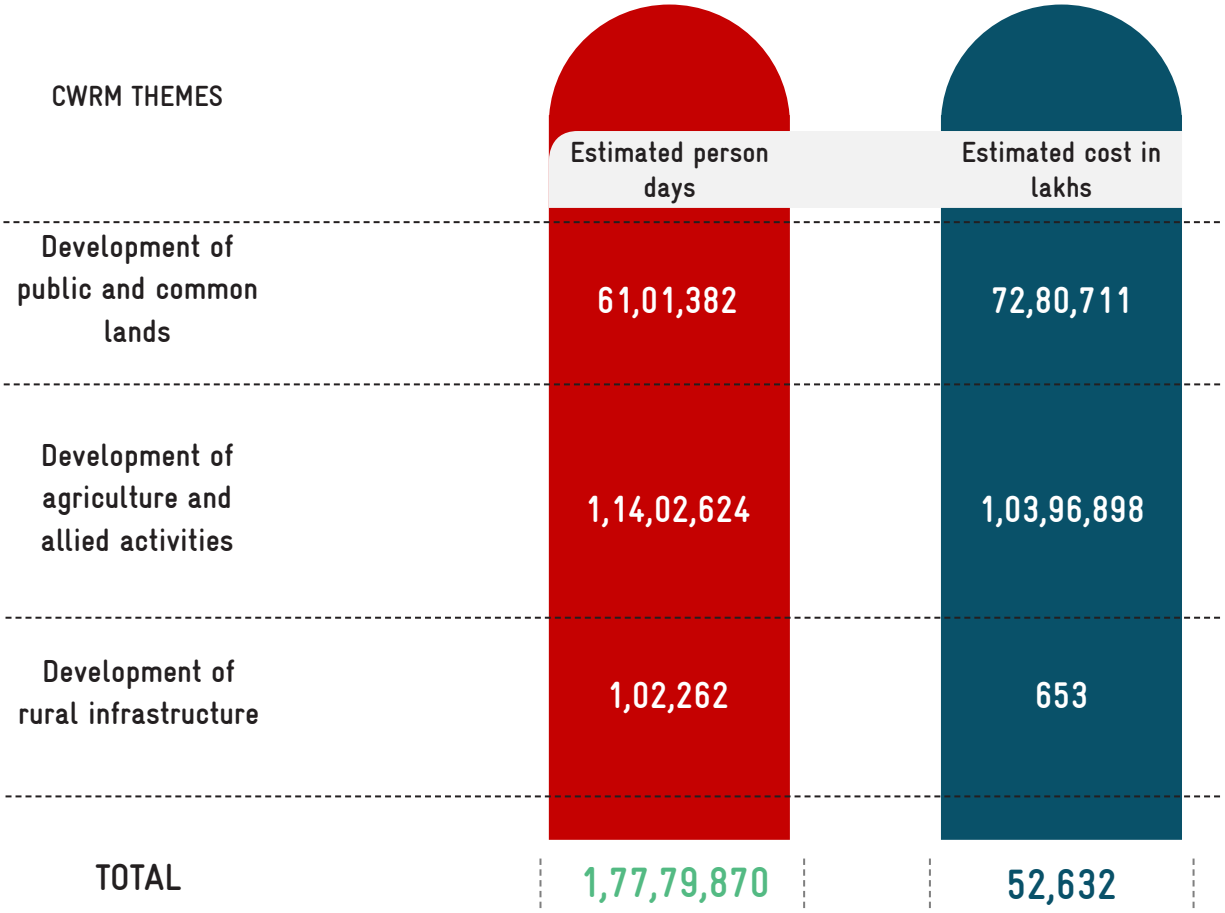
21
CASCADE OF TANKS

Estimated person days

The total estimated person days required for the above propose activities are 1,77,79,870 as specified below

Estimated Cost

The total estimated cost budgeted for the above proposed activities is Rs 52,632 Lakhs as specified below



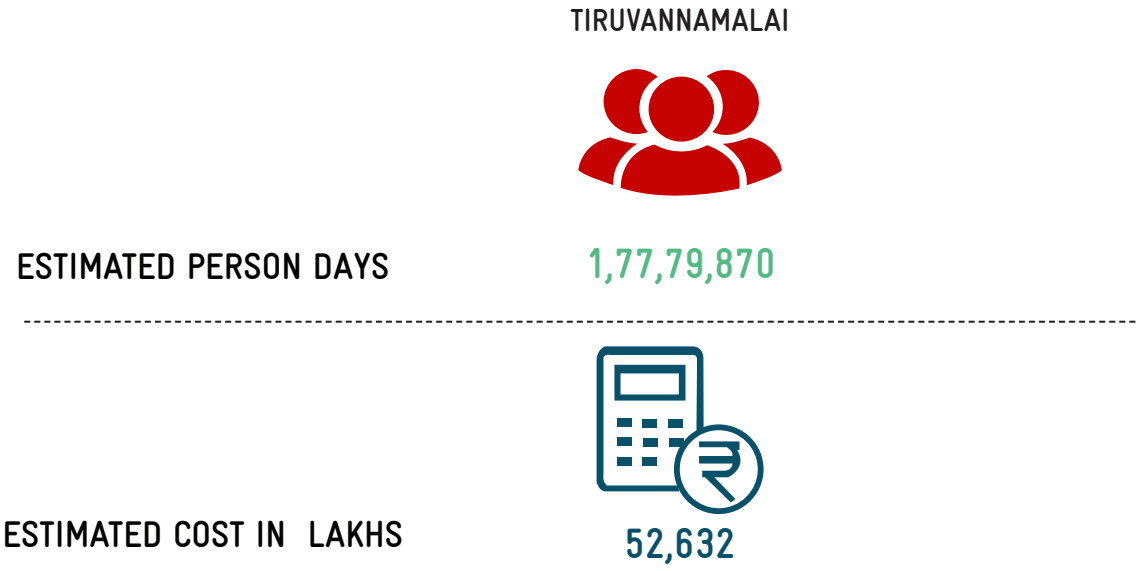


Figure 6.1 & 6.2. Estimated person days & cost for all water actions

6.5 LINKAGES TO SDGS, NDCS

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

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

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

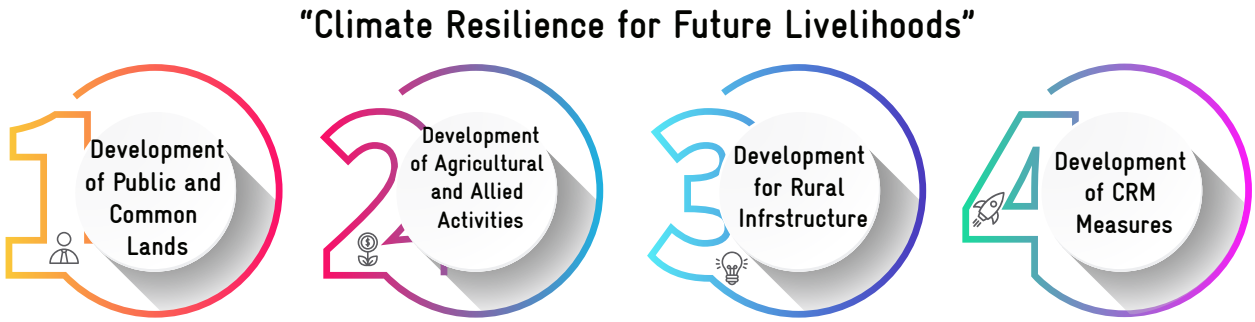
Internationally, the recent process on NDC Enhancement (2020) significantly acknowledge the climate change vulnerability on national sectors including agriculture, energy, and urban areas, especially through impacts on water resources. The role that water and water-related activities play in national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

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

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

6.5.2 WASCA TN SUPPORTS SDG

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



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

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

SDG GOAL 6

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

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

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

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

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

Head count ratio as per the Multidimensional Poverty Index	
	Persons provided employment as a percentage of persons who demanded employment under Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

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

Percentage of rural population having improved source of drinking water

Percentage of ground water withdrawal against availability

Percentage of Blocks/mandals/talukas over-exploited

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

Percentage of degraded land over total land area

Percentage increase in area of desertification

The indicators used District level vulnerability assessment along with its linked SDGs are already tabulated in (Table 2). The detailed proposed water actions in CWRM assessed based on the vulnerability dimensions are linked with climate vulnerability index, SGDs are tabulated in Table 20, 21 & 22.

TABLE 20. WATER ACTIONS ON DEVELOPMENT OF PUBLIC & COMMON LANDS & ITS LINKED SDG

Name of the work	No. of CWRM works	CVI Impacting (WASCA TN)	Linked SDG Goal
Contour Continuous Bunds (CCB) for Afforestation area (m)	133	W3	SDG 1,2, 6,13&15
Composting (No. of units)	277	W1	SDG1& 6
Afforestation in Public/common lands (ha)	776	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community) (ha)	208	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	43	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (Km)	2	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation (ha)	879	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	559	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (Km)	7	C1,C2,C3,W3,S2	SDG 1, 6&13

Nursery Development (No. of units)	230	C1,S2,S4	SDG 1,2 &6
Restoration of waterbodies: a.PWD and Tanks (count)	123	S2, S1	SDG 6, 1, 13
Restoration of waterbodies: b. Ponds (count)	226	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	1692	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	559	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (m)	3552	W1,W3,W4	SDG1 & 6
Drainage Line Treatment (DLT) (m)	428	W1,W3,W4	SDG1 & 6

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

Name of the Work	Number of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	1,866	A1,A3,W1,W3	SDG 1,2&6
Micro Irrigation (ha)	110	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	340	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	860	W1,W5,A1,A3,S2,S4	SDG 2, 6&
15	458	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Dry land Horticulture/Agro-forestry - Individual (ha)	43	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	1,379	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (No. of units)	1,496	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	1,379	A3, S4	SDG 1& 2, 15
Cattle Shelters (No. of units)	1,616	S4	SDG 1& 2
Goat Sheep Shelters (No. of units)	457	S4	SDG 1& 2
Cattle Trough (No. of units)	1,616	W5,S4	SDG 1& 2
Poultry Shed (No. of units)	1,522	S2,S4	SDG 1& 2
Construction of new open wells & Recharge Shafts (No. of units)	1,609	S3,W5,W1	SDG 1,2 & 6

TABLE 22. WATER ACTIONS ON RURAL WATER MANAGEMENT & ITS LINKED SDG

Name of the work	No. of CWRM works	CVI	Linking SDG
Soak Pits (Community) (No. of units)	87	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	892	W3,S2	SDG 1& 6
Roof Rain Water Harvesting (No. of units)	138	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

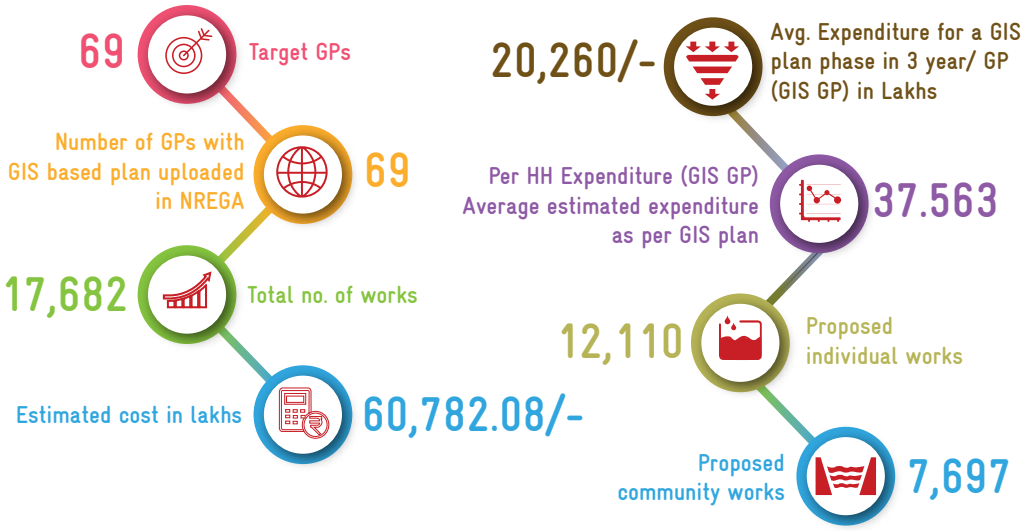
7 IMPLEMENTATION OF GP PLANS

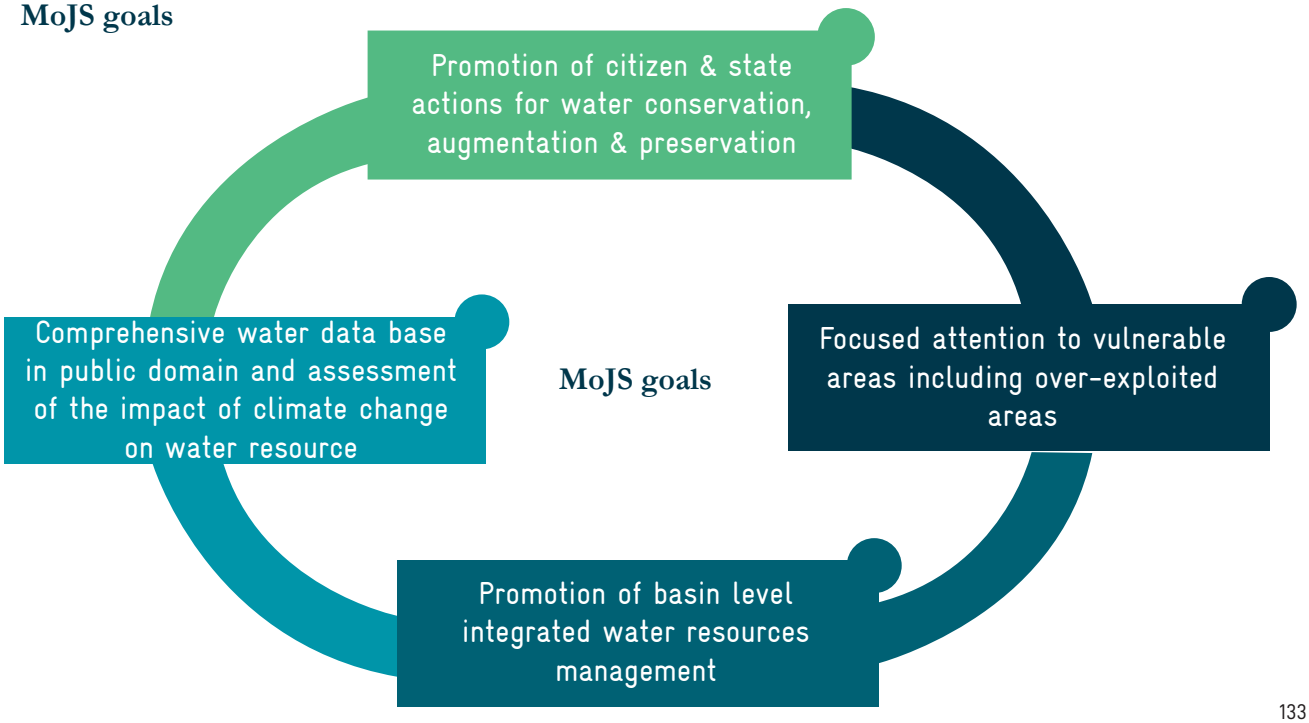
Execution of GP plans includes integrating all verified, approved works in MORD's web enabled application NREGA Soft (https://nrega.nic.in) for mainstreaming WASCA. The target GPs are identified first, the status of GIS based plans and total works along with its expenditure and category wise estimation 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, both NRM and Non NRM into Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of Tiruvannamalai Block is listed in Table 23. The work progress and expenditure during past 3 financial years, GP wise total, completed and ongoing GIS works are shown in Figure 7.1 to 7.3. GP wise WASCA recommendations and works uploaded in NREGA soft are attached in Annexure 7.1.

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





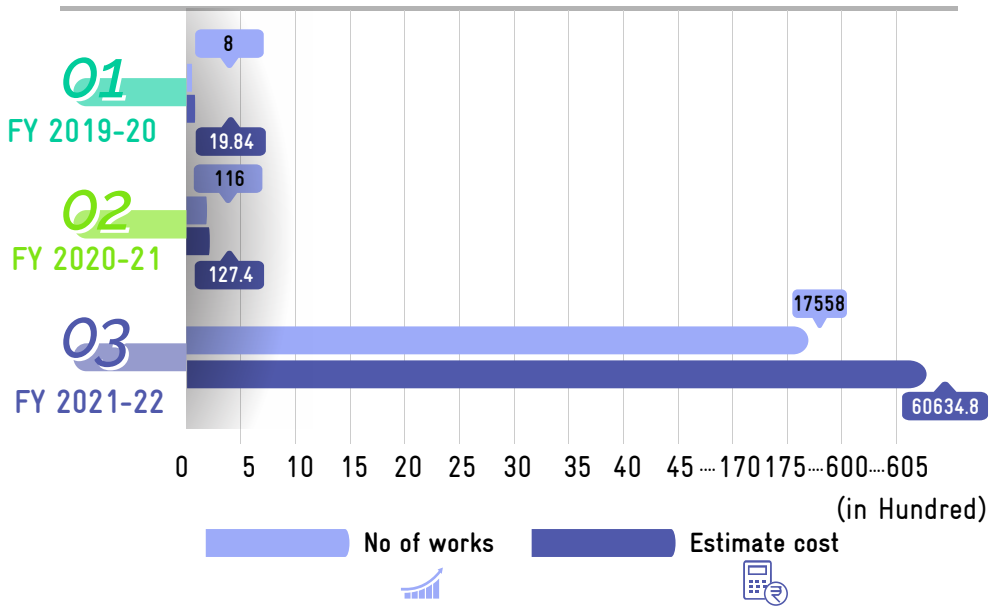


Figure 7.1. Work progress in last 3 years

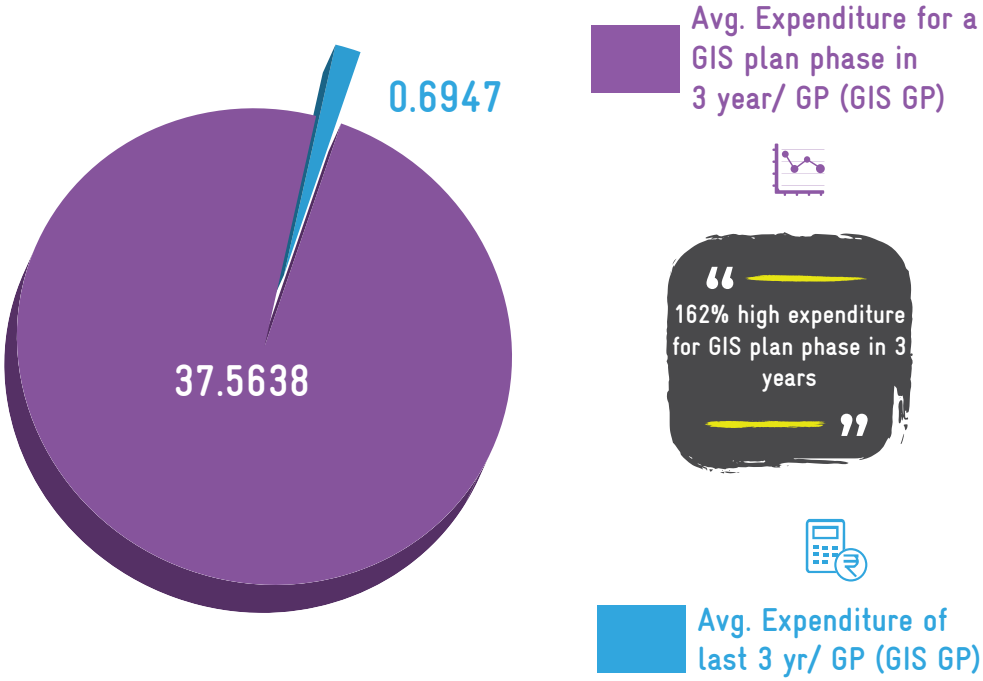


Figure 7.2. Average Expenditure for GIS plan in last 3 years

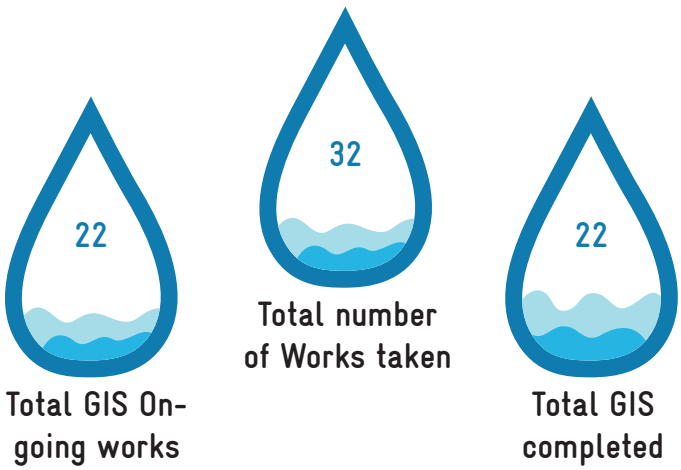
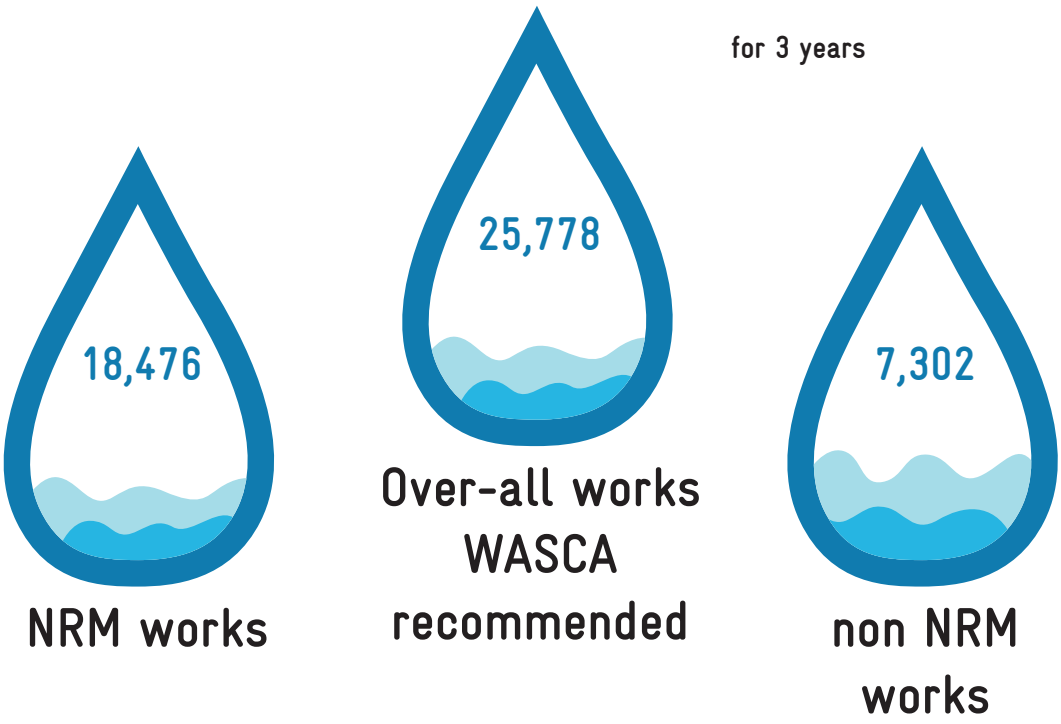


Figure 7.3. GP wise total, completed and ongoing GIS works

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

7.2 WASCA RECOMMENDED NRM AND NON-NRM WORKS

WASCA recommended 25,778 works for a period of 3 years, out of which 18,476 are NRM works and 7,302 are non NRM works (Figure 7.4). A total of 17,559 works has been uploaded so far for the financial year 2021-22 as on 07/01/2011.



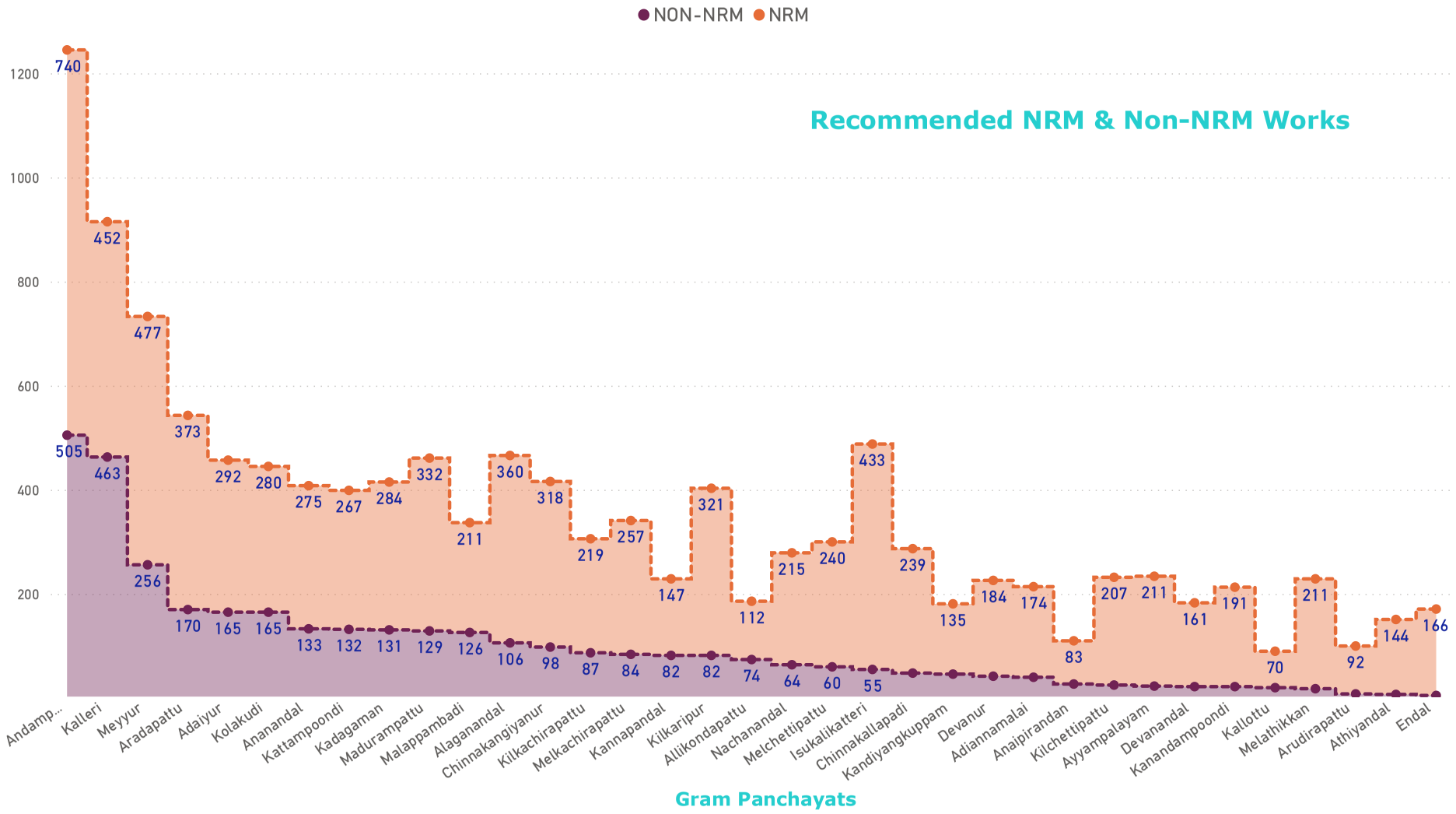


Figure 7.4. GP wise recommended NRM and Non-NRM works

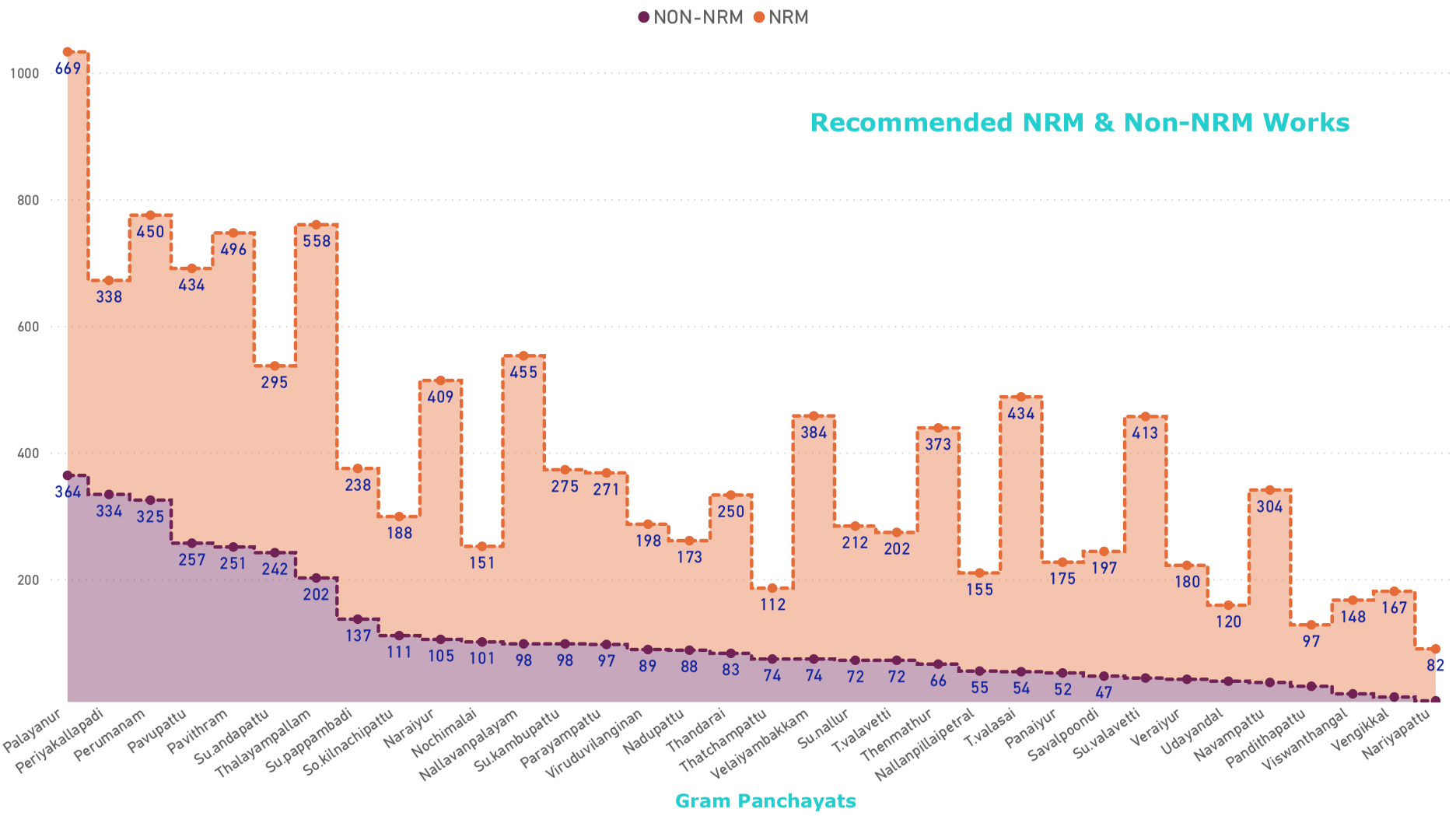


Figure 7.4. GP wise recommended NRM and Non-NRM works

7.3 ONGOING WORKS

The ongoing works in Tiruvannamalai Block includes water conservation and water harvesting (WCWH), drought proofing, works on individual category, rural sanitation, rural connectivity, rural sanitation, rural infrastructure and land development as shown in Figure 7.4. WCWH works are priorized now to improve water augumentaton followed rural connectivity. The GP wise on going works list is attached in Annexure 7.2

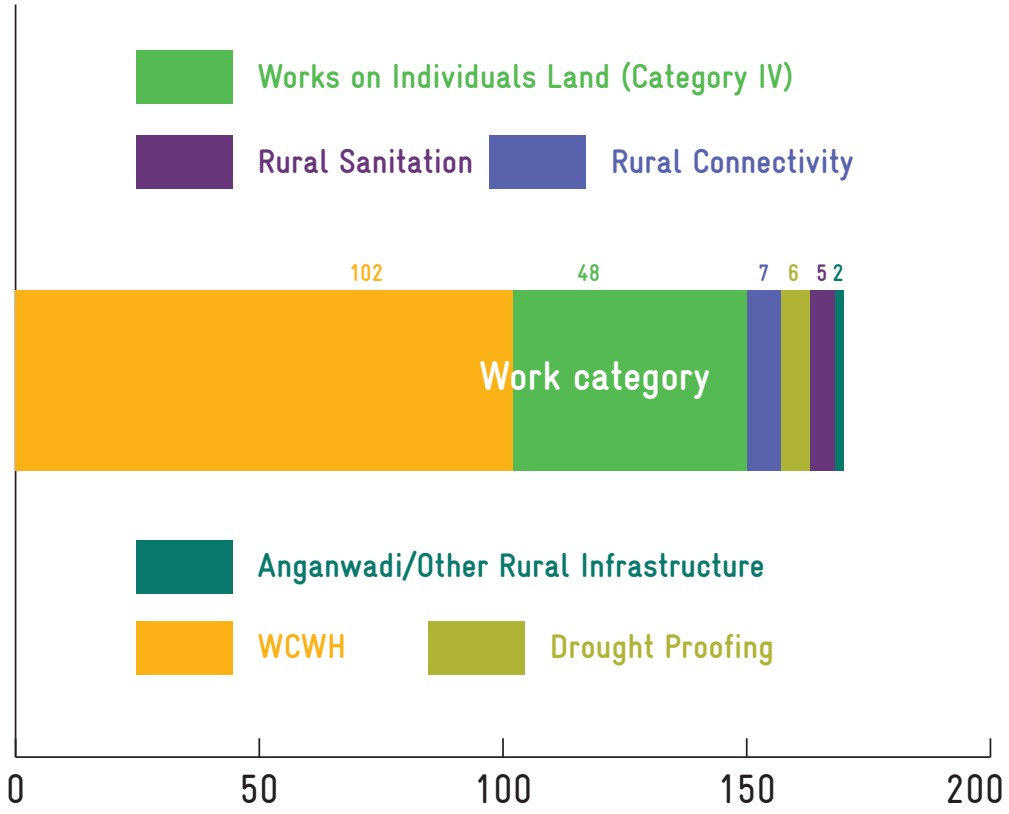


Figure 7.5. Category wise on-going works in Thiruvannamalai Block

7.4 CATCH THE RAIN

The NWM's campaign "Catch The Rain" with the tagline "Catch the rain, where it falls, when it falls" is to nudge the states and stakeholders to create appropriate Rain Water Harvesting Structures (RWHS) suitable to the climatic conditions and sub-soil strata before monsoon season. Under this campaign, drives to make check dams, water harvesting pits, rooftop RWHS, 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, 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 total expenditure towards progressive works on Catch the Rain campaign of Tiruvannamalai Block is Rs. 3689.08 Lakhs and nearly 66% of the expenditure utilized for renovation for water bodies and tanks (Figure 7.5).

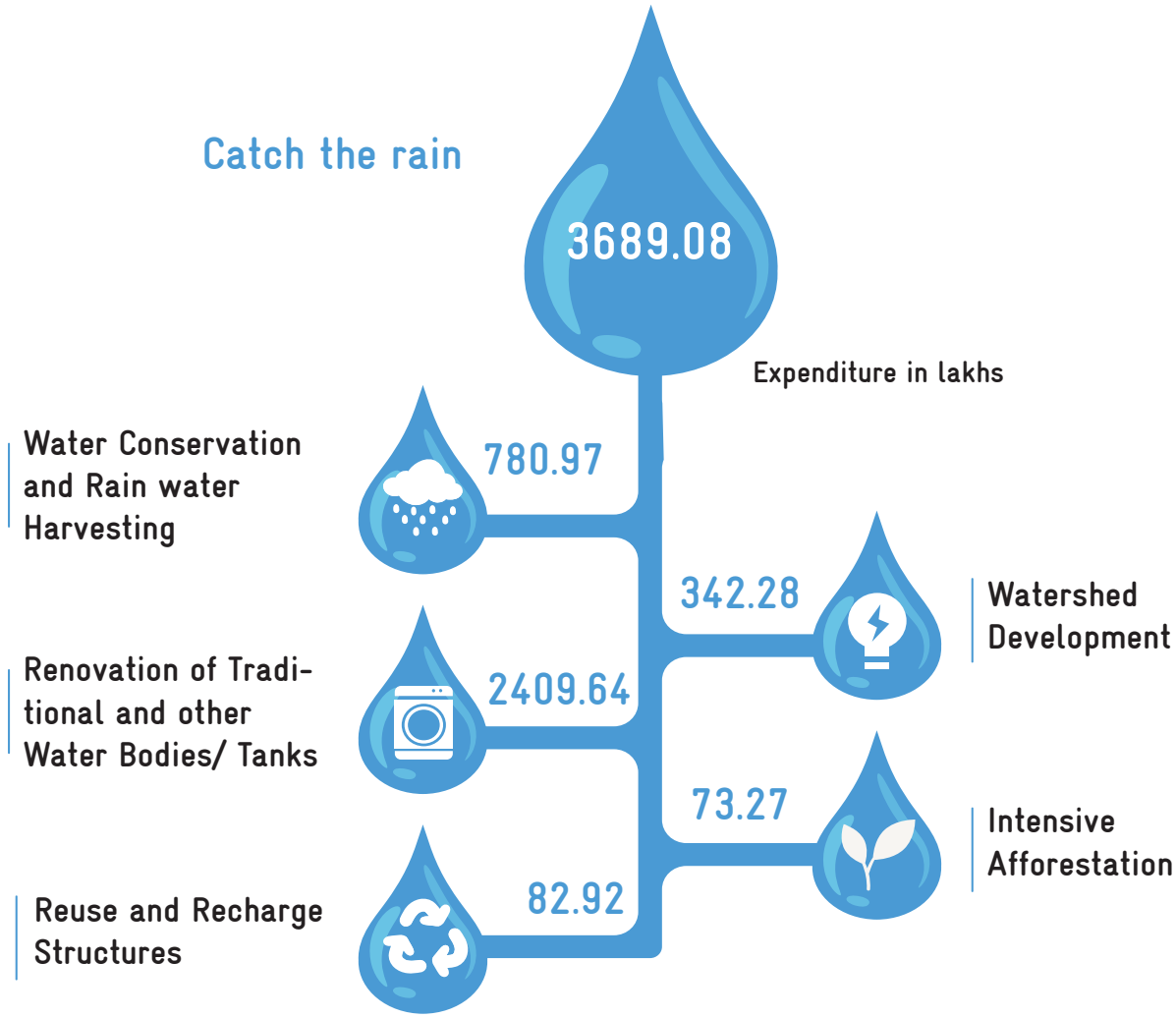
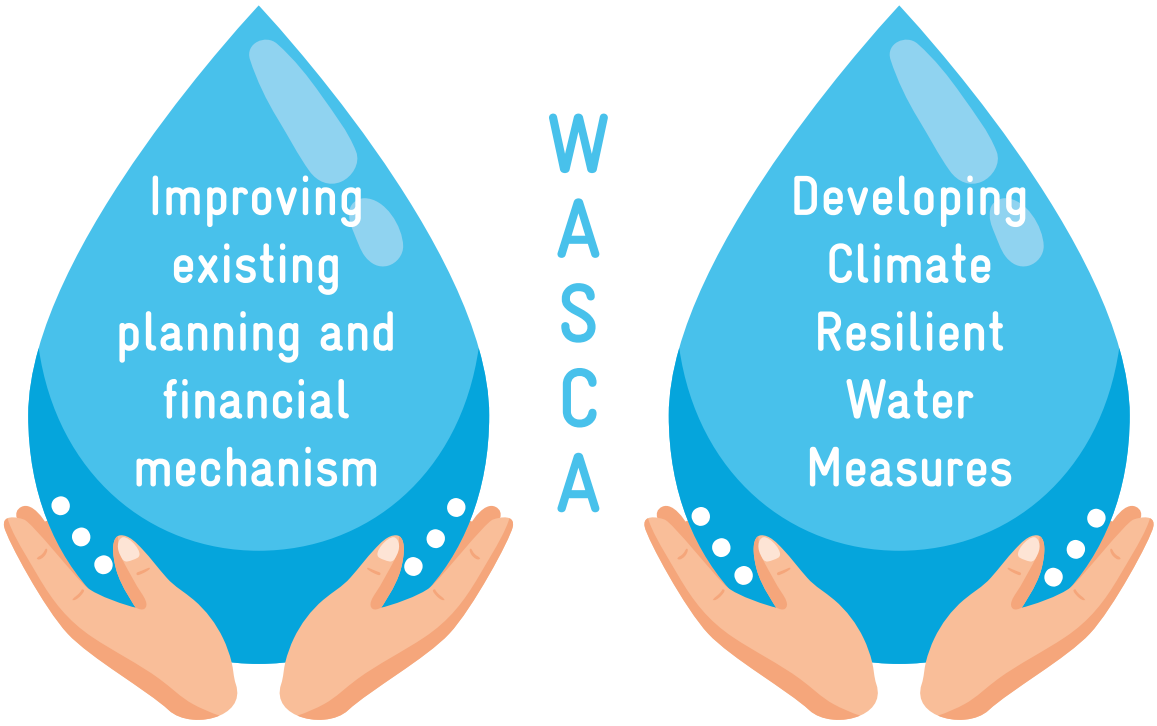


Figure 7.6. Expenditure for Catch the Rain campaign in Tiruvannamalai Block



தானம் தவம்இரண்டும் தங்கா வியன்உலகம்
வானம் வழங்கா தெனின்

குறள் - 19

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

Thirukkural - 19

CHAPTER 8

8 CASE STUDY

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

8.1 MACRO-WATERSHEDS OF TIRUVANNAMALAI BLOCK

Tiruvannamalai Block has two river sub-basins Pamban and Thurinjalar Watersheds. Under Pamban watershed (4C1B5) consists of 7 micro-watersheds covering an area of 876 ha. Under Thurinjalar watershed (4C1B3) consists of 104 Micro-watersheds covering an area of 37,494 ha. Out of 69 GPs in the Block, 65 GPs fall under Thurinjalar (4C1B3) Watershed and four GPs having both watershed boundaries passing through them. (Tables 24 & 25). Figure 8.1 and 8.2 show the boundary of Pamban and Thurinjalar watersheds on Tiruvannamalai Block boundary. The micro-watershed based works are identified using Basin, Sub-basin, and Micro-watershed with GP administrative boundaries through Composite Water Resources Management plan approach. The ridge map of macro-watershed and GPs in Tiruvannamalai Block are shown in Figure 8.3 and 8.4.

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

Macro-watershed	Area in ha	No. of Micro-watershed
Pamban	876	7
Thurinjalar	37,494	104

TABLE 25. NO. OF GPS COVERED UNDER WATERSHEDS IN TIRUVANNAMALAI BLOCK

Name of watershed	No. of GPs
Pamban & Thurinjalar	4
Thurinjalar	69

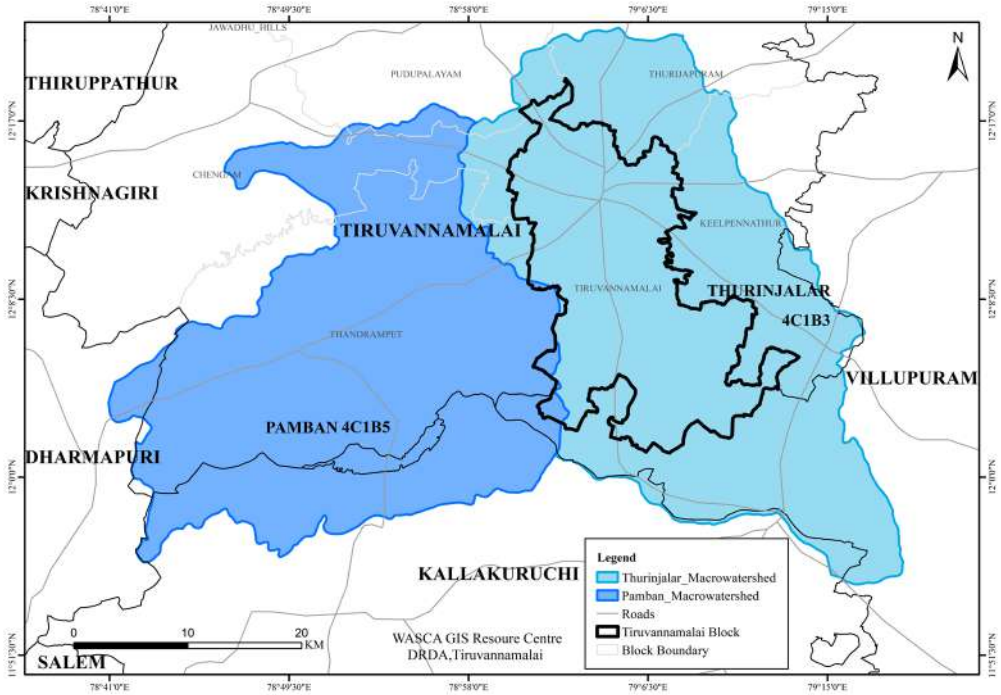


Figure 8.1. Macro-watershed Map of Tiruvannamalai Block

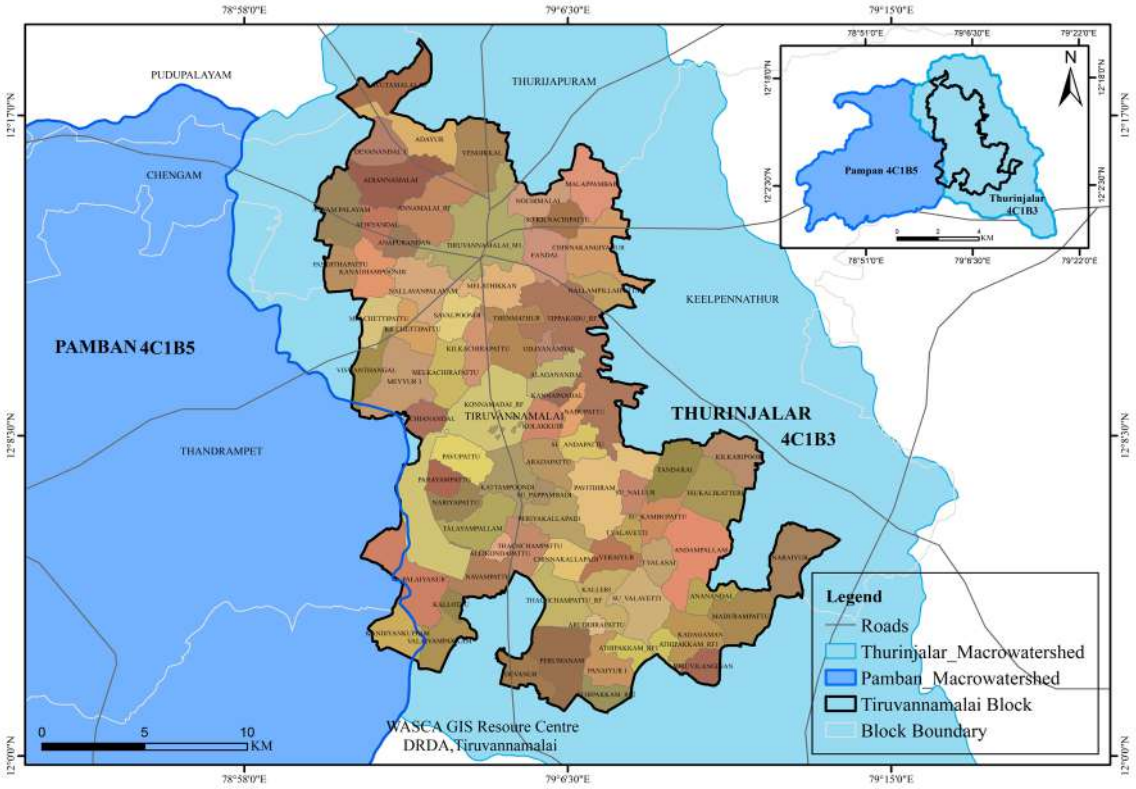


Figure 8.2. Macro-watershed with GPs- Tiruvannamalai Block

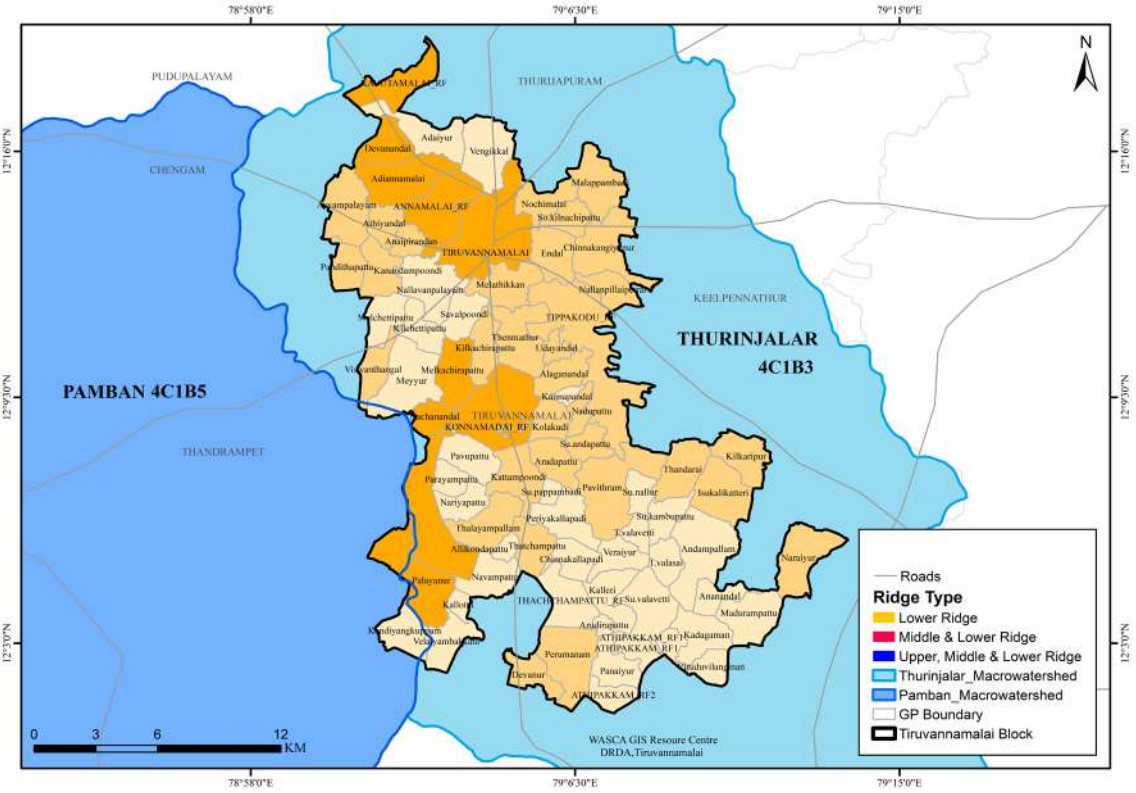


Figure 8.3. Macro-watershed Ridge Map- Tiruvannamalai Block

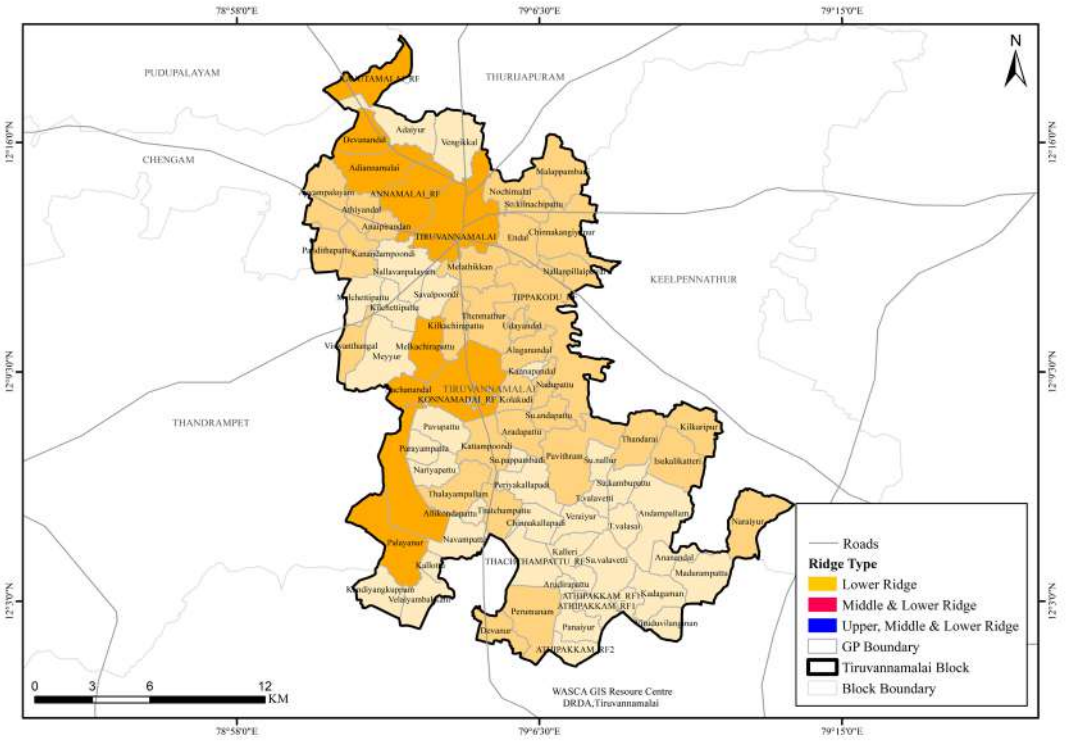


Figure 8.4. GP level Ridge Map- Tiruvannamalai Block

All the proposed works are identified using basin, sub-basin, and Micro-watershed with GP administrative boundaries through Composite Water Resources Management plan approach. The ridge details, GPs proposed works in all Macro watersheds in Thiruvanamali Block are listed in Tables 26 to 31.

TABLE 26. MICRO-WATERSHED IN TIRUVANNAMALAI BLOCK FALLING UNDER THURINJALAR MACRO-WATERSHED

Sl. No	Micro-watershed Code	Area in ha	Ridge type
1	4C1B3e11a	1.23	Lower
2	4C1B3e15a	3.38	
3	4C1B3e10b	70.3	
4	4C1B3e05d	80.13	
5	4C1B3e14a	379.92	
6	4C1B3e05c	109.12	
7	4C1B3e13c	141.86	
8	4C1B3d12a	7.81	
9	4C1B3e08b	451.35	
10	4C1B3e13b	219.16	
11	4C1B3e01b	531.66	
12	4C1B3d05c	0.24	
13	4C1B3e13a	345.09	
14	4C1B3e08a	693.94	
15	4C1B3e12a	417.23	
16	4C1B3e04a	460.81	
17	4C1B3d05a	29.39	
18	4C1B3c10a	665.51	
19	4C1B3c10b	697.95	
20	4C1B3c10c	323.87	
21	4C1B3c03b	161.04	

22	4C1B3c09a	430.09	Lower
23	4C1B3c11a	534.48	
24	4C1B3c03a	65.32	
25	4C1B3c09b	314.4	
26	4C1B3c11b	10.68	
27	4C1B3d03a	14.82	
28	4C1B3c02c	522.81	
29	4C1B3c09c	553.06	
30	4C1B3d07b	78.75	
31	4C1B3c02b	287.6	
32	4C1B3d07a	162.94	
33	4C1B3c05b	310.9	
34	4C1B3c05a	1152.2	
35	4C1B3c05c	412.66	
36	4C1B3d02c	371.03	
37	4C1B3d06d	477.45	
38	4C1B3d02b	387.64	
39	4C1B3c02a	421.79	
40	4C1B3d06c	103.02	
41	4C1B3b08c	257.81	
42	4C1B3c04b	378.88	
43	4C1B3d06b	476.43	
44	4C1B3c07a	501.33	
45	4C1B3c04a	1068.36	
46	4C1B3d02a	706	
47	4C1B3d06a	99.79	
48	4C1B3b08b	94.86	
49	4C1B3c07b	407.53	
50	4C1B3c04c	657.84	
51	4C1B3d01c	315.67	
52	4C1B3c01c	726.13	
53	4C1B3b08a	336.12	
54	4C1B3a08c	514.4	
55	4C1B3c01b	553.6	
56	4C1B3a08b	99.46	
57	4C1B3d01b	362.01	
58	4C1B3b07a	7.66	
59	4C1B3d01a	417.64	
60	4C1B3a07c	393.49	
61	4C1B3a09b	213.77	
62	4C1B3c01d	531.72	
63	4C1B3c01a	709.38	
64	4C1B3a09a	297.55	
65	4C1B3a07b	526.54	
66	4C1B3b02b	38.11	
67	4C1B3a07a	656.19	

68	4C1B3a06c	122.06	Lower
69	4C1B3a05c	374.04	
70	4C1B3a08a	127.79	
71	4C1B3a02c	12.32	
72	4C1B3a02b	28.36	
73	4C1B3a05b	9.17	
74	4C1B3a03c	5.99	
75	4C1B3a03b	10.32	
76	4C1B3e03a	105.97	Middle & Lower
77	4C1B3e05b	160.77	
78	4C1B3e02c	318.19	
79	4C1B3e05a	205.63	
80	4C1B3d05b	329.61	
81	4C1B3e02a	343.48	
82	4C1B3e02b	250.71	
83	4C1B3e01a	778.42	
84	4C1B3c03c	532.66	
85	4C1B3c06c	700.71	
86	4C1B3c06a	961.15	
87	4C1B3e15b	68.45	Upper, Middle & Lower
88	4C1B3e10c	116.34	
89	4C1B3e10d	374.12	
90	4C1B3e14c	134.38	
91	4C1B3e09b	672.73	
92	4C1B3e09a	433.84	
93	4C1B3e14b	242.63	
94	4C1B3e09c	538.21	
95	4C1B3e01c	438.7	
96	4C1B3e04d	378.95	
97	4C1B3e04c	340.18	
98	4C1B3e04b	993.63	
99	4C1B3c16b	775.19	
100	4C1B3c08c	514.4	
101	4C1B3c08b	429.7	
102	4C1B3c08a	882.7	
103	4C1B3c07c	428.22	
104	4C1B3a09c	603.65	

TABLE 27. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER THURINJALAR MACRO-WATERSHED IN TIRUVANNAMALAI BLOCK

Sl.No	GP	Ridge type
1	Adayur	Lower
2	Allikondapattu	
3	Ananandal	
4	Andampallam	
5	Aruddirapattu	
6	Chinnakallapadi	
7	Kadagaman	
8	Kalleri	
9	Kallottu	
10	Kannapandal	
11	Kilchettipattu	
12	Madurampattu	
13	Melchettipattu	
14	Nallavanpalayam	
15	Nariyapattu	
16	Navampattu	
17	Panaiyur	
18	Parayampattu	
19	Pavupattu	
20	Periyakallapadi	
21	Savalpoondi	
22	Su.Kambupattu	
23	Su.Nallur	
24	Su.Pappambadi	
25	Su.Valavetti	
26	T.Valasai	
27	T.Valavetti	
28	Valaiyampakkam	
29	Vengikkal	
30	Veraiyur	
31	Viruvilanginan	
32	Alaganandal	Middle & Lower
33	Anapurandan	
34	Aradapattu	
35	Athiyandal	
36	Ayyam palayam	
37	Chinnakangiyanur	
38	Devanur	
39	Eandal	
40	Isukalikatteri	
41	Kanadhampoondi	
42	Kattampoondi	
43	Kilkachirapattu	

44	Kilkaripoor	Middle & Lower
45	Kolakkudi	
46	Malappambadi	
47	Melathikkan	
48	Nadupattu	
49	Nallampillaipettai	
50	Naraiyur	
51	Nochimalai	
52	Pandithapattu	
53	Pavithiram	
54	Perumanam	
55	So kilnachipattu	
56	Su.Andapattu	
57	Talayampallam	
58	Tandarai	
59	Thachchampattu	
60	Thenmathur	
61	Udayanandal	
62	Adiannamalai	Upper, Middle & Lower
63	Melkachirapattu	
64	Nachianandal	
65	Devanandal	

TABLE 28. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER THURINJALAR MACRO-WATERSHED IN TIRUVANNAMALAI BLOCK

Work wise Details of Cheyyar in Anakkavoor Block			
Sl. No.	**Proposed work**	**Ridge type**	**Extent**
1	Afforestation in Public/common lands (ha)	Upper	740
2	Drainage Line Treatment (m)		1,31,781
3	CC Check dams (No.)	Middle	48
4	Block Plantation (Community) (ha)		180
5	Silvi-pasture Development (ha)		43.4
6	Avenue plantation (m)		66,561
7	Composting (No.)	Lower	259
8	Canal Bund Plantation (m)		41,400
9	Restoration of waterbodies: Tanks and Ooranis (No.)		190
10	Artificial Recharge Structure (No.)		1,681
11	Farm Bunding with Boundary Trenches - Individual (ha)		76
12	Construction of Farm Ponds - Individual (No.)		441
13	Land development - Individual (ha)		81
14	Azolla units - Individual (No.)		2,873
15	NADEP Vermi compost (No.)		2,879
16	Cattle Shelters (No.)		3,074
17	Goat Sheep Shelters (No.)		694
18	Cattle Trough (No.)		3,074

19	Construction of new open wells & Recharge Shafts (No.)	Lower	1,660
20	Soak Pits (Community) (No.)		302
21	Soak Pits (Individual) (No.)		1,197
22	Roof Rain Water Harvesting (No.)		81
23	Agro Forestry (ha)	Middle	24
24	Mini Forest (ha)		11.65
25	Nutri Garden (No.)	Lower	43,835
26	Silt application (No.)		172

TABLE 29. MICRO-WATERSHED IN TIRUVANNAMALAI BLOCK FALLING UNDER PAMBAN MACRO-WATERSHED

Sl.No	Micro-watershed Code	Area in ha	Type of Ridge
1	4C1B5c10a	53.74	Lower
2	4C1B5c01a	400.68	
3	4C1B5c09c	32.43	Upper, Middle & Lower
4	4C1B5c09b	2.37	
5	4C1B5c09a	15.01	
6	4C1B5c01c	210.26	
7	4C1B5c01b	162.06	

TABLE 30. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER THURINJALAR & PAMBAN MACRO-WATERSHED IN TIRUVANNAMALAI BLOCK

S No	GP Name	Ridge type
1	KandiyanNadupattu	Lower
2	Meyyur	Lower
3	Viswanthangal	Middle & Lower
4	Palaiyanur	Upper, Middle & Lower

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

Sl. No.	Proposed work	Ridge type	Extent
1	Afforestation in Public/common lands (ha.)	Upper	37
2	Drainage Line Treatment (m)		14,416
3	CC Check dams (No.)	Middle	1
4	Block Plantation (Community) (ha.)		9.6
5	Avenue plantation (m)		5,864
6	Agro Forestry (ha.)		2
7	Composting (No.)	Lower	18
8	Canal Bund Plantation(m)		2,500
9	Restoration of waterbodies: Tanks and Ooranis (No.)		4
10	Artificial Recharge Structure (No.)		11
11	Farm Bunding with Boundary Trenches – Individual (ha.)		4
12	Construction of Farm Ponds – Individual (No.)		33
13	Land development – Individual (ha.)		84
14	Azolla units – Individual (No.)		163

15	NADEP Vermi compost (No.)	Lower	197
16	Cattle Shelters (No.)		194
17	Goat Sheep Shelters (No.)		25
18	Cattle Trough (No.)		194
19	Construction of new open wells & Recharge Shafts (No.)		64
20	Soak Pits (Community) (No.)		4
21	Soak Pits (Individual) (No.)		73
23	Roof Rain Water Harvesting (No.)		8
24	Nutri Garden (No.)		3,174
25	Silt application (No.)		2

8.2 DEVANANDAL MICRO-WATERSHED TIRUVANNAMALAI BLOCK, TIRUVANNAMALAI DISTRICT

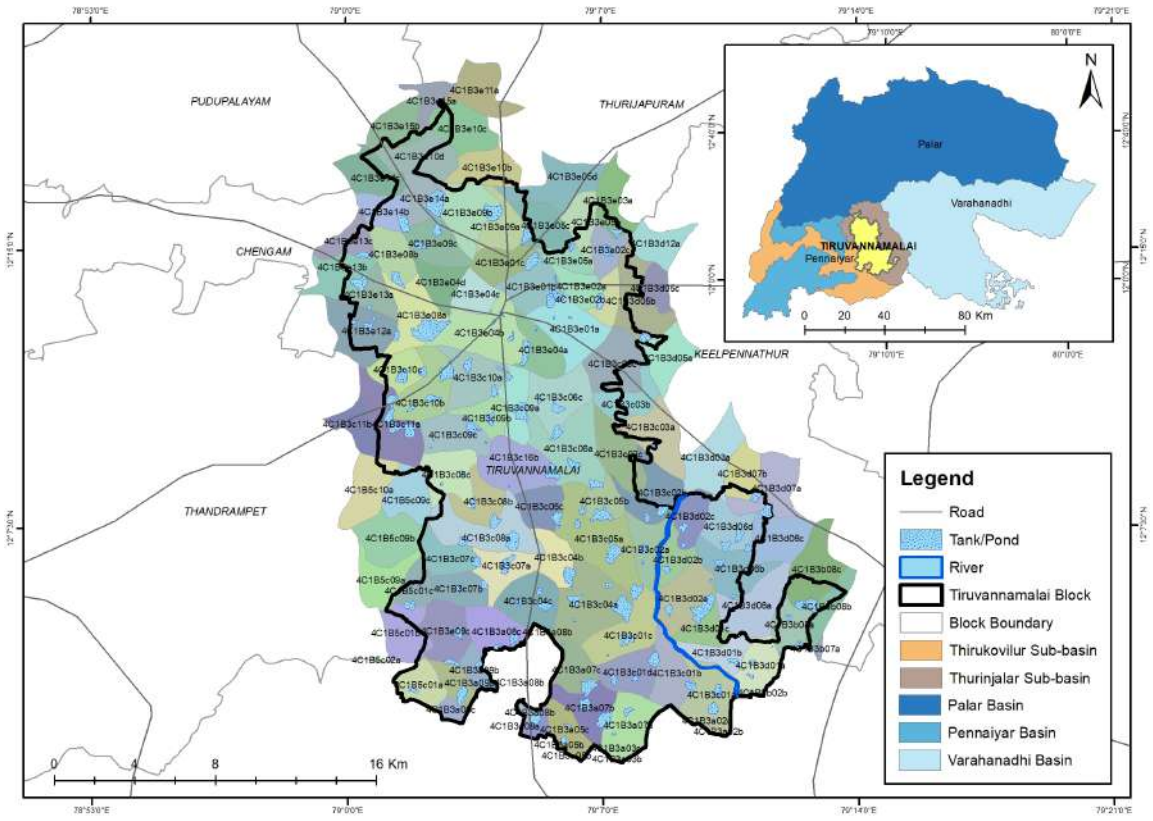


Figure 8.5. Micro-watershed map of Tiruvannamalai Block

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

DEVANANDAL MICRO-WATERSHED

Devanandal Micro-watershed falls under Devanandal and Adaiyur GPs, Tiruvannamalai Block in Tiruvannamalai District. This Micro-watershed is a part of Thurinjalar macro-watershed in Thurinjalar sub-basin. The general information, geology, hydrogeology, natural drainage line, catchment area, ground water status, water budget of Devanandal Micro-watershed is given below in separate sections followed by proposed works, ridge wise proposed treatment area, estimated cost and required person days and key outcomes (Table 32 to 41). The key CWRM parameters for the GPs falling in this micro-watershed is Annexure 8.

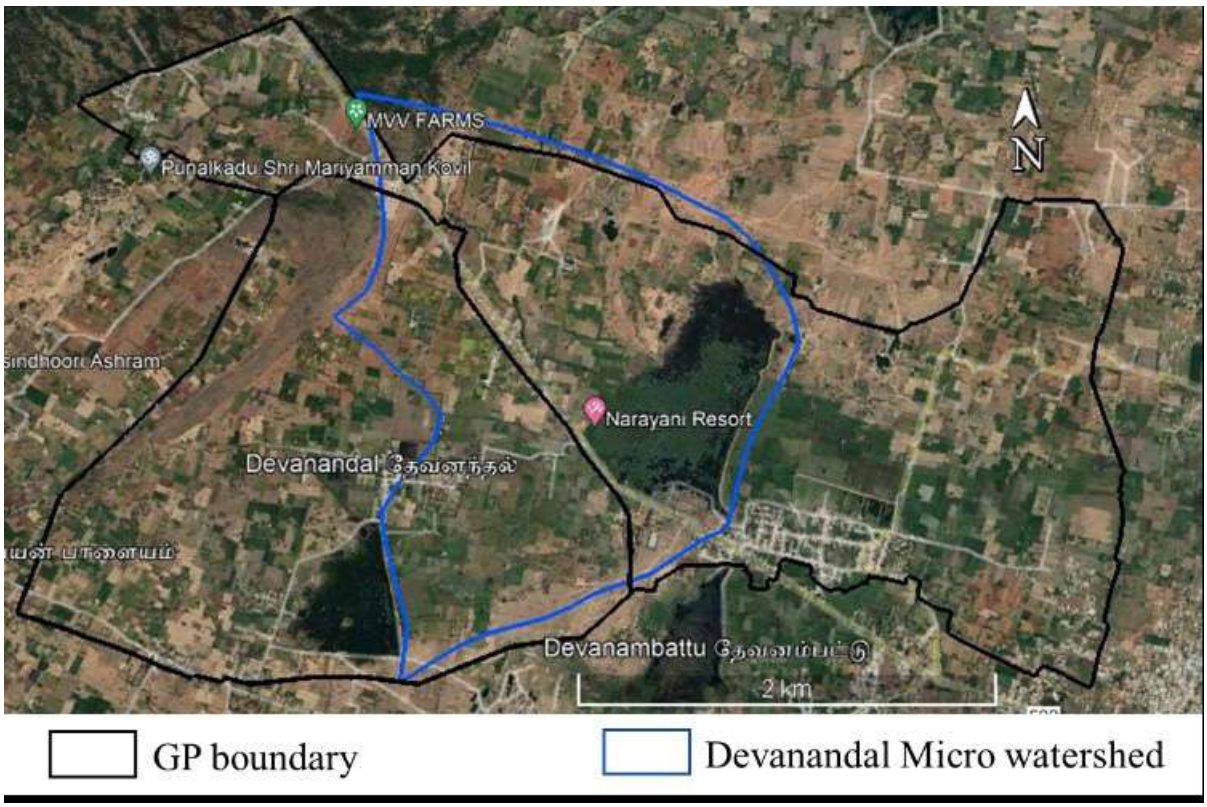


Figure 8.6. Devanandal micro-watershed over satellite image

TABLE 32. GENERAL INFORMATION OF THE MICRO-WATERSHED

Description	Name/ No./ Quantity/ Status
Name of the Micro-watershed	**Devanandal**
Micro-watershed No.	**4C1B3e14a**
Name of the Basin	Pennaiyar Basin
Name of the Sub-basin	Thurinjalar Sub- basin
Name of the macro-watershed	Thurinjalar
No. of GPs covered under the Micro-watershed	2
Name of the GPs	Devanandal
Adaiyur	12°39'43.72"N to 12°41'23.96"N
Latitude of Micro-watershed (From To)	12°15'33.04"N to 12°17'4.40"N
Longitude of Micro-watershed (From To)	79° 1'29.34"E to 79° 2'42.74"E
Total area of the Micro-watershed in (ha.)	380
Percentage of Micro-watershed area in Devanandal GP	51
Percentage of Micro-watershed area in Adaiyur GP	49
Area of Micro-watershed falling in Devanandal GP (ha)	194
Area of Micro-watershed falling in Adaiyur GP (ha.)	186
Total Population of Devanandal GP	1,647
Total Population of Adaiyur GP	4,236
Annual Average Rainfall (mm)	1,047
Annual maximum Temperature (°C)	33
Annual Minimum Temperature (°C)	22.8
Evapo-Transporation Losses of Devanandal GP (ha.m)	7.63
Evapo-Transporation Losses of Adaiyur GP (ha.m)	11.68
Volumetric soil moisture availability (%)	23

Climate Risk	Drought and heat waves
CVI Index Value for Devanandal GP (Based on WASCA Climate study)	0.500
CVI Index Value for Adaiyur GP (Based on WASCA Climate study)	0.552
Agro-Climatic Zone	North eastern zone (TN-1)
Agro Ecological Sub-Region (ICAR)	Eastern Ghats
Status of Ground water in Devanandal GP	Critical
Status of Ground water in Adaiyur GP	Critical

TABLE 33. GEOLOGY, HYDROGEOLOGY OTHER CHARACTERISTICS IN MICRO-WATERSHED

Geology Occurrence in % (Hard rock)	100
Geology Quality	Moderate
Depth of weathered zone and/or maximum depth of fractures in Hard Rock area in m	30 to 60
Bottom of the unconfined aquifer in soft rock areas in m	20 to 40
No of lineaments passing through the Micro-watershed	3
Type of lineaments passing through the Micro-watershed	Three lineaments in Lower ridge, Two lineaments are parallel to drainage line & One lineament is parallel to ridge line.
Sheet Erosion	13 ha (lower ridge)
Barren & waste lands	39 ha (Middle & Lower ridges)

TABLE 34.NATURAL DRAINAGE LINES IN DEVANANDAL MICRO-WATERSHED

No. of 1st Order drains	1
Total length of natural drainage line (m)	1,687
Drainage density (ha.m)	4.43

TABLE 35. GP –WISE CATCHMENT AREA PROFILE IN DEVANANDAL MICRO -WATER SHED

Catchment Area in ha	Devanandal GP	Adaiyur GP
Good catchment area	36.06	45.70
Average catchment area	4.40	0
Bad catchment area	60.10	81.50

TABLE 36. GROUND WATER STATUS OF DEVANANDAL MICRO-WATERSHED

Firka Assessment Unit for Devanandal, Adaiyur in ha.m	
Name of the Firka (Assessment Unit) falling under Micro-watershed	Tiruvannamalai North
Net Annual Ground Water Availability	1,517
Existing Gross Ground Water Draft for Irrigation	1,507.80
Existing Gross Ground Water Draft for domestic and industrial water supply	428.40
Existing Gross Ground Water Draft for All uses	1,936.20
Provision for domestic and industrial requirement supply to 2025	486.92
Net Ground Water Availability for future irrigation development	-477.72

TABLE 37. GP WATER BUDGET

Water Budget in ha.m	Akkur GP	Karanai GP
Water for Human	4.51	11.6
Water for Agriculture	186.4	225.2
Water for Animal	0.77	5.81
Village wise water required	191.7	242.6
Available run-off from rain water (derived from Strange method)	100.70	127.2
Harvested Runoff from Water Harvesting Activities	0.4	7.4
Potential Harvesting from proposed Interventions	25.1	26.9
Total Water harvested	25.5	34.3
Water demand and Supply Difference	-166.2	-208.3
Water demand Supply Gap Status	Deficient	Deficient
Per capita Water Availability in Cum	611.41	300.28
International Standard per capita water Availability in Cum	1,700	1,700
Water Availability Gap	-,1088.59	-13,99.72
Water security status	Water Stress	Water Stress

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

Proposed works in Ridge type	Devanandal GP	Adaiyur GP
Upper	-	1
Middle	3	2
Lower	87	86
Total	90	89

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

	Devanandal GP	Adaiyur GP
Upper Ridge		
Estimated cost for Upper Ridge area (INR in Lakhs)	-	49
Total area in ha of Upper Ridge	No Upper Ridge falling in the GP	5
Treatment cost of Upper Ridge Lakhs per ha	**-**	**9.8**
Estimated Persondays generated for Treatment of Upper Ridge	**-**	**19,224**
Middle Ridge		
Estimated cost for Middle Ridge area (INR in Lakhs)	4.5	3
Total area in ha of Middle Ridge	20	25
Treatment cost of Middle Ridge Lakhs per ha	**0.23**	**0.12**
Estimated Person days generated for Treatment of Middle Ridge	**1,728**	**1,172**
Lower Ridge		
Estimated cost for Lower Ridge area (INR in Lakhs)	82.7	88.32
Total area in ha of Lower Ridge	174	156
Treatment cost of Lower Ridge (INR in Lakhs per ha)	**0.48**	**0.57**
Estimated Person days generated for Treatment of Lower Ridge	**31,362**	**27,730**

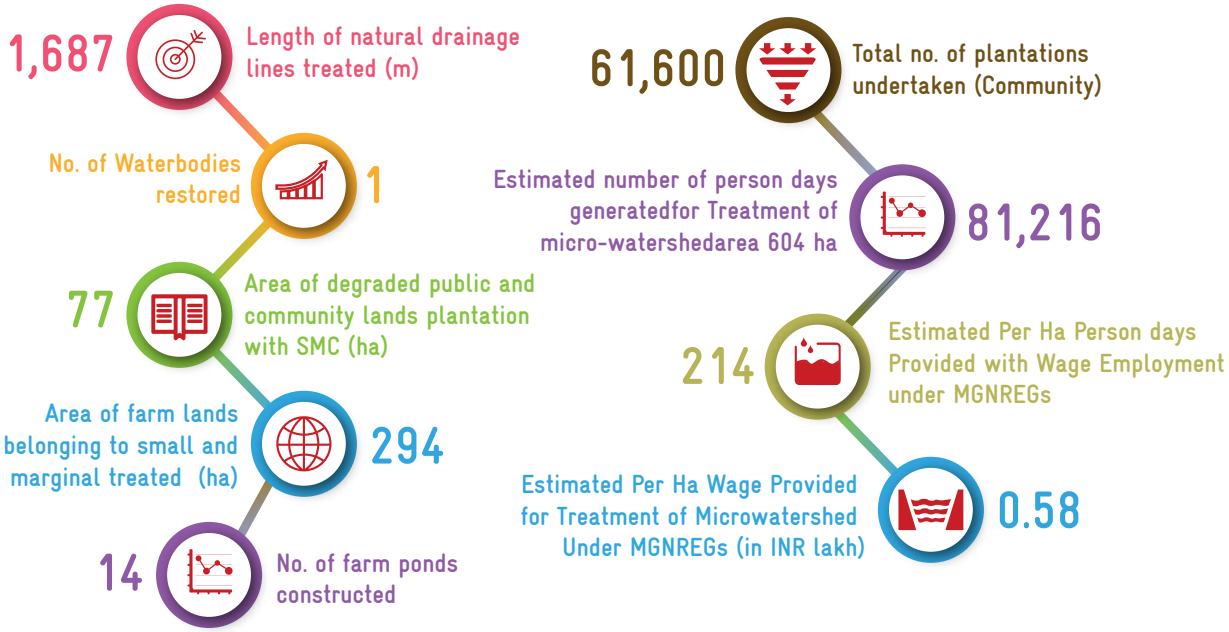
Devanandal GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	0.23 lakh/ha	1,728
Lower Ridge	0.48 lakh/ha	31,362
TOTAL	0.71 lakh/ha	33,090

Karanai GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	9.8 lakh/ha	19,224
Middle Ridge	0.12 lakh/ha	1,172
Lower Ridge	0.57 lakh/ha	27,730
TOTAL	10.49 lakh/ha	48,126

TABLE 40. DETAILS OF WORKS IN THE MICRO-WATERSHED

Description	No.
Arable, Non arable & DLT	87
Livelihood Activities	25
Rural Greywater Management Activities	67

TABLE 41. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)

Devanandal GP	88.69 lakh
Adaiyur GP	39.11 lakh

TABLE 42. ESTIMATES OF MICRO-WATERSHED IN DEVANANDAL GP

Sl. No	Proposed work	Ridge type	Work status	Quantity (Area or No.)	No. of works as per KML	Estimate cost in Lakhs	Person days
NRM works in Public and Community Lands							
1	Compost Pit	Lower	Not commenced	6	6	1.02	90
Sub total					**6**	**1.02**	**90**
Works in Individual Farmer lands (Agriculture and Allied Activities)							
2	Farm Bunding with Boundary Trenches - Individual	Middle & Lower	Not commenced	7.5			
				3	3	4.5	1,728
3	Artificial Recharge Structure for borewell farmers	Lower		12	12	30	4,692
4	NADEP Vermi compost			5	5	0.9	135
5	Fodder development - Individual			7	7	10.36	16,408
6	Construction of Farm Ponds - Individual		Ongoing	8	8	16	6,248
7	Azolla Production units - Individual		Commenced	7	7	1.05	161
Sub total					**42**	**62.81**	**29,372**
Livelihood enhancement activites for Individual Farmers (dryland)							
8	Cattle Shelters	Lower	Commenced	7	7	14.84	2,317
9	Goat Sheep Shelters			3	3	6.81	1,065
10	Cattle Trough		Not commenced	6	6	0.3	36
Sub total					**16**	**21.95**	**3,418**
Rural Greywater and Roof rainwater Management							
11	Soak Pits (Individual)	Lower	Ongoing	13	13	1.404	208
12	Nutri Garden		Not commenced	13	13	0.02	2
Sub total					**26**	**1.424**	**210**
Grand total					**90**	**87.2**	**33,090**

TABLE 43. ESTIMATES OF MICRO-WATERSHED IN ADAIYUR GP

Sl. No	Proposed work	Ridge type	Work status	Quantity (Area or No.)	No. of works as per KML	Estimate cost in Lakhs	Person days
NRM works in Public and Community Lands							
1	Loose Boulder Check dam (No.)	Lower	Not commenced	1	1	0.85	42
2	Sunken Pit (No.)			1	1	1.54	383
3	Tank bund Plantation (No.)			1	1	1.8	73
4	Avenue plantation (m)			2,516	1	4.5	1,768
5	MTP (Block Plantation) (ha.)	Upper & Middle		4.45	1	49	19,224
6	MTP (Afforestation) (ha.)	Lower		8.25	1	8.6	3,344
7	Compost Pit (No.)			5	5	0.85	75
8	Restoration of Traditional water-bodies: Tanks (No.)		Commenced	1	1	5	800
Sub total					**10**	**69.75**	**25,284**
Works in Individual Farmer Lands (Agriculture and Allied Activities)							
9	Artificial Recharge Structure for borewell farmers (No.)	Lower	Not commenced	8	8	20	3,128
10	Farm Bunding with Boundary Trenches - Individual (ha.)	Middle & Lower	Not commenced	5			
				2	2	3	1,172
11	Construction of Farm Ponds - Individual (No.)	Lower	Ongoing	6	6	12	4,686
12	Dryland Horticulture		Not commenced	1.83			
				1	1	8.5	3,321
13	Silt application			1	1		
14	NADEP Vermi compost (No.)			5	5	0.9	135
15	Fodder development - Individual (No.)			3	3	4.44	7,032
16	Azolla Production units - Individual (No.)		Commenced	3	3	0.45	69
Sub total					**29**	**49.29**	**19,543**
Total					**39**	**119.04**	**44,827**
Livelihood enhancement activities for Individual Farmers (dryland)							
17	Cattle Shelters (No.)	Lower	Commenced	3	3	6.36	993
18	Goat Sheep Shelters (No.)			2	2	4.54	710
19	Cattle Trough (No.)		Not commenced	4	4	0.2	24
Sub total					**9**	**11.1**	**1,727**

Rural Greywater and Roof rainwater Management							
20	Roof Top Rainwater Structure (No.)	Lower	Not com-menced	2	2	8	1,250
21	Soak Pits (Individual) (No.)		Ongoing	20	20	2.16	320
22	Nutri Garden (No.)		Not com-menced	19	19	0.02	2
Sub total					41	10.18	1,572
Grand total					89	140.32	48,126

DEVANANDAL MICRO-WATERSHED DEVELOPMENT (GP WISE)

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Devanandal GP	90	87.2	33,090
Adaiyur GP	89	140.32	48,126

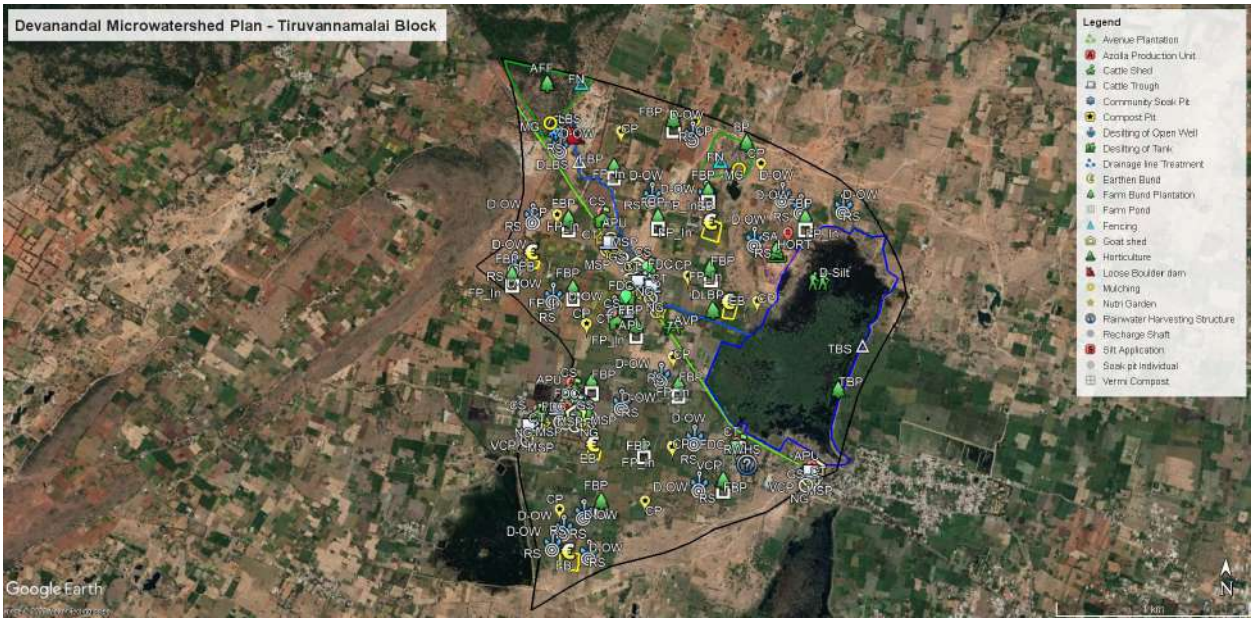


Figure 8.7. Proposed plan in Devanandal Micro-watershed


Proposed Non-NRM activities for community
Write a description for your map.
Legend
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Google Earth
Image © 2022 Maxar Technologies
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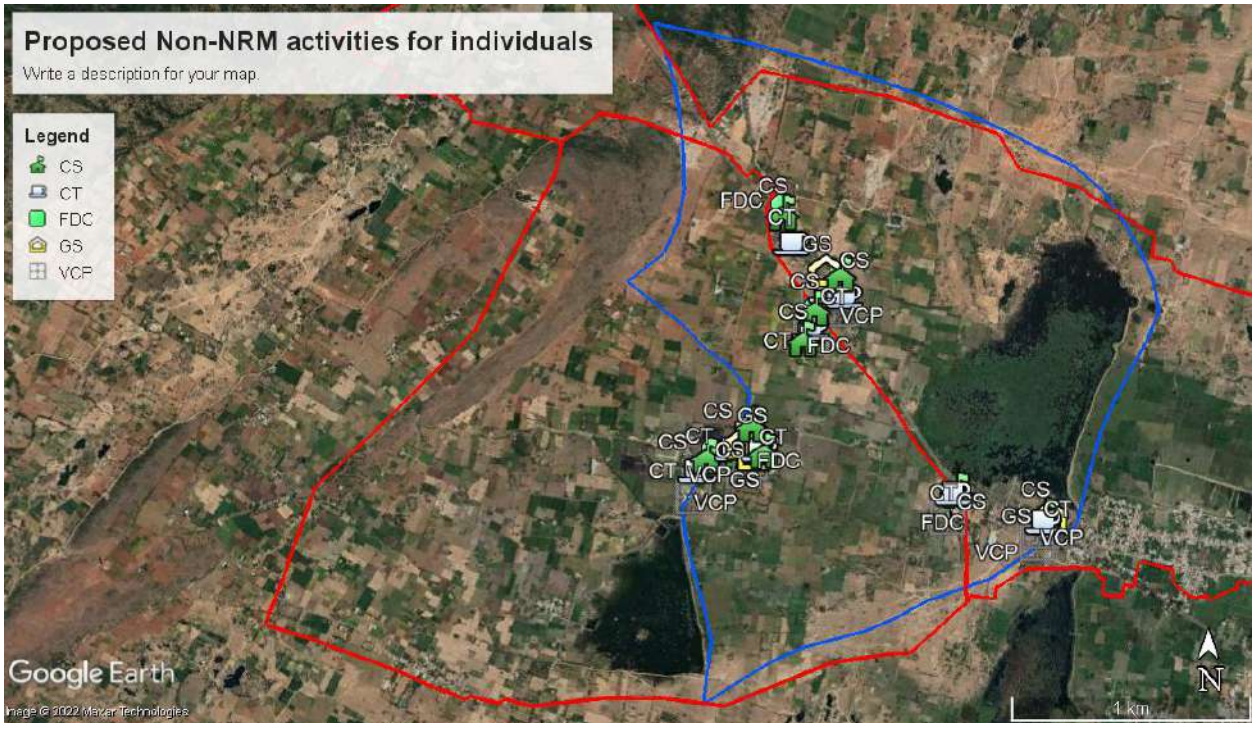
Proposed Non-NRM activities for individuals
Write a description for your map.
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GS
VCP
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Image © 2022 Maxar Technologies
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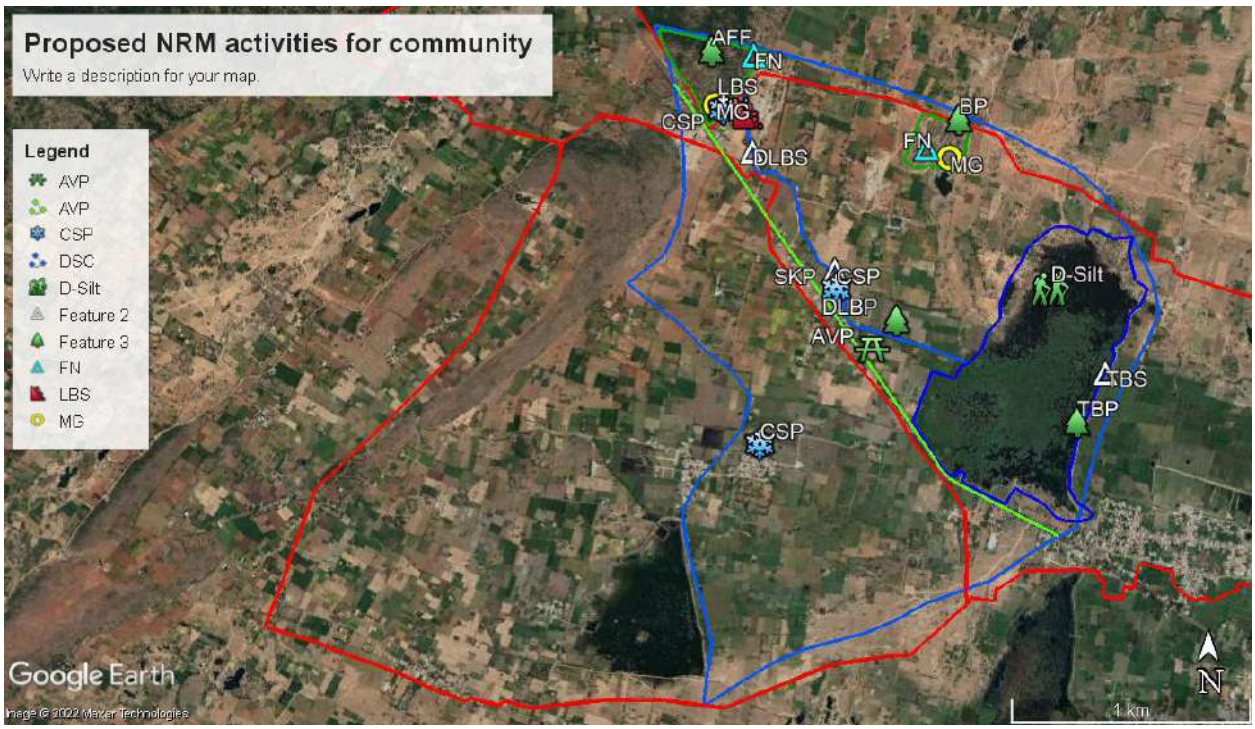


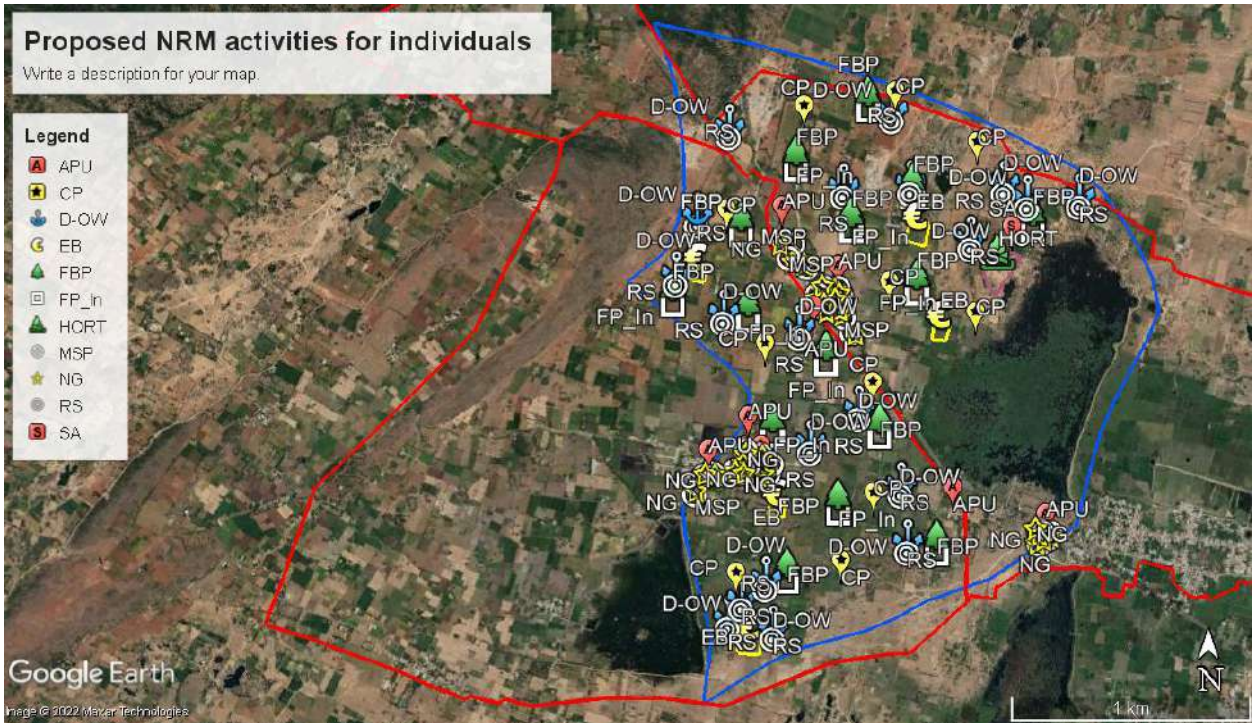
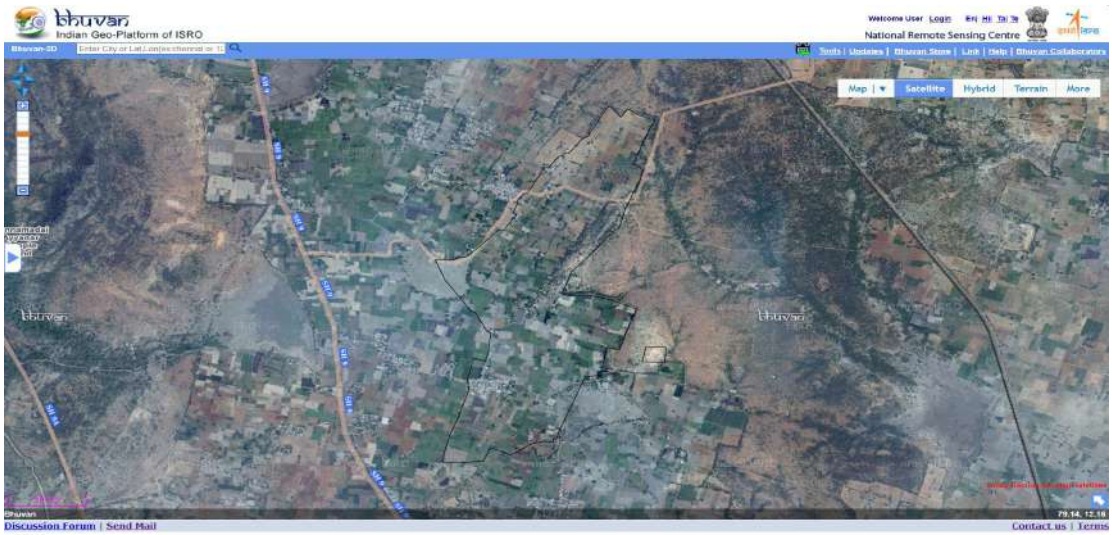


Figure 8.8. A:Proposed NoN-NRM activities for community. B: Proposed Non-NRM activities for Individuals. C: Proposed NRM activities for Community. D: Proposed NRM activities for Individuals. (APU: Azolla Production unit, AVP: Avenue Plantations, CP: Compost pit, CS: Cattle Shed, D-silt: Desilting, D-OW: Desilting open well, CT: Cattle through, EB: Farm Bunding with Boundary Trenches - Individual, FBP: Farm Bund Plantations, FDC: Fodder Development, FP_in: Farm Pond for Individuals, FN: Fencing, GS: Goat shed, Horti: Horticulture, LBS: Loose Boulder Structure, MSP: Soak pits for Individual, NG: Nutrition garden, RS: Artificial Recharge Structure, RWHS: Rain Water Harvesting Structure, SA: Silt Application, VCP: Vermi compost pit

8.3 MODEL GP PLAN

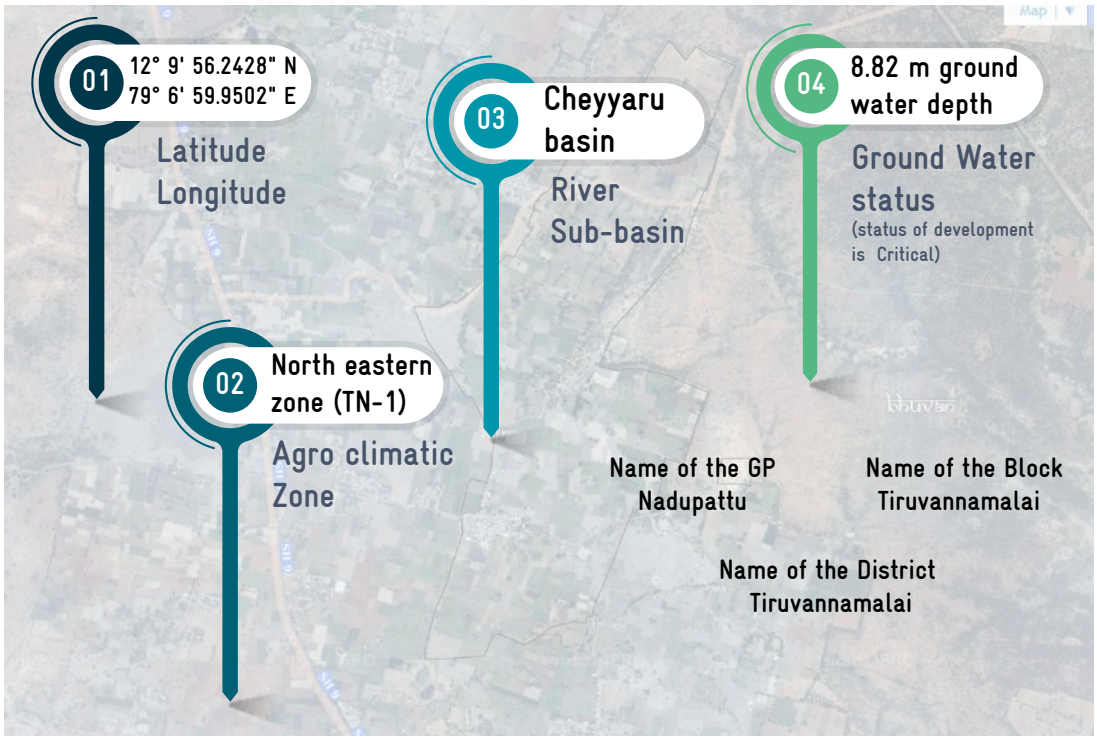
NADUPATTU GP, TIRUVANNAMALAI BLOCK

8.3.1 BACKGROUND OF GRAM PANCHAYAT – NADUPATTU



Nadupattu GP is located in Tiruvannamalai Block of Tiruvannamalai District, Tamil Nadu. Geographically it is located between 12° 9' 56.2428" N to 12° 8' 26.7864" N & 79° 6' 15.3504" "E to 79° 6' 59.9502" E. The total geographical area of GP is 191 ha The total population is1013 of which 510 are males while 503 are females as per Population Census 2011. The total number of households is 259. The Schedule Tribe population is 487and Schedule Caste population is 17 in the Nadupattu village (Table 44). The average annual temperature of GP is 28 °C, and receives annual average rainfall of 1,047 mm.

TABLE 44. GENERAL DESCRIPTION OF NADUPATTU GP, TIRUVANNAMALAI BLOCK



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

8.3.2 CWRM PLANNING - SPATIAL DATA

CWRM adapted the geospatial technologies in its process of plan preparation towards climate-resilient infrastructure, Water Conservation and Water Harvesting (WCWH) etc. at cadastral levels. Geospatial datasets allow players to understand the study area in terms of geomorphology, lineaments, salt-affected area, erosion, watershed, LULC, and wasteland. In some cases, spatial data will serve as a direct input for a particular activity to implement towards conservation of resources. Various thematic datasets for Nadupattu GP are discussed below:

8.3.2.1 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 Nadupattu GP covers under the denudation origin – pediment- pediplain complex category (Figure 8.9).

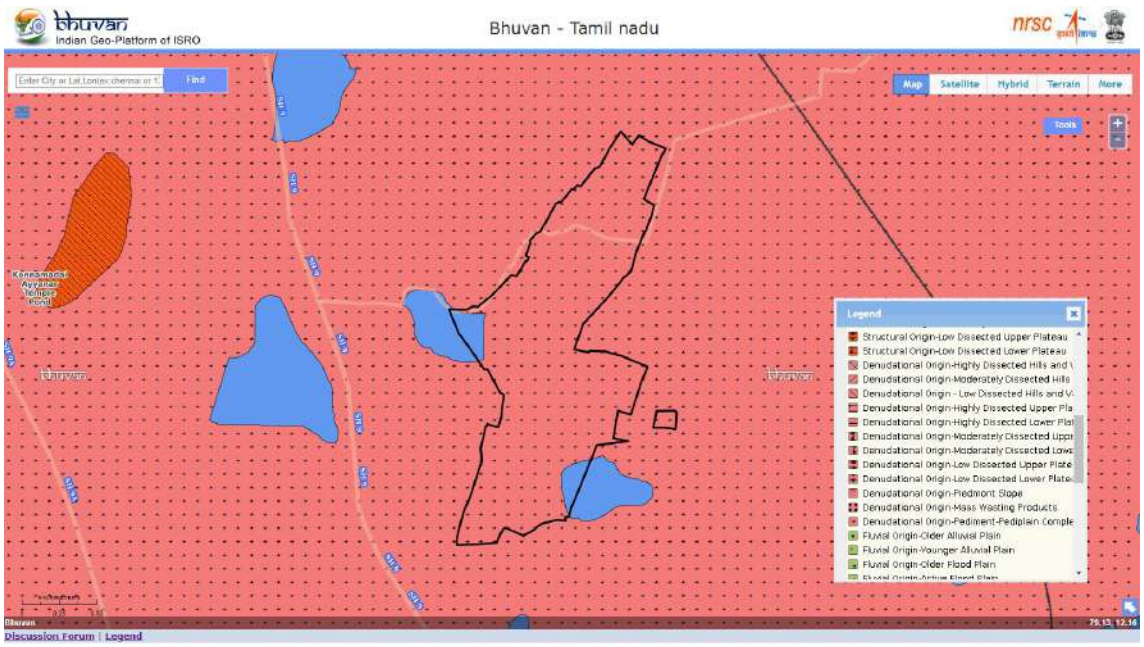


Figure 8.9. Geomorphology map of Nadupattu GP

8.3.2.2 Lineament:

A lineament map shows the linear feature in a landscape that is an expression of an underlying geological structure such as a fault, fracture, or joint. There are no observable Structural lineament present in the Nadupattu GP (Figure 8.10).

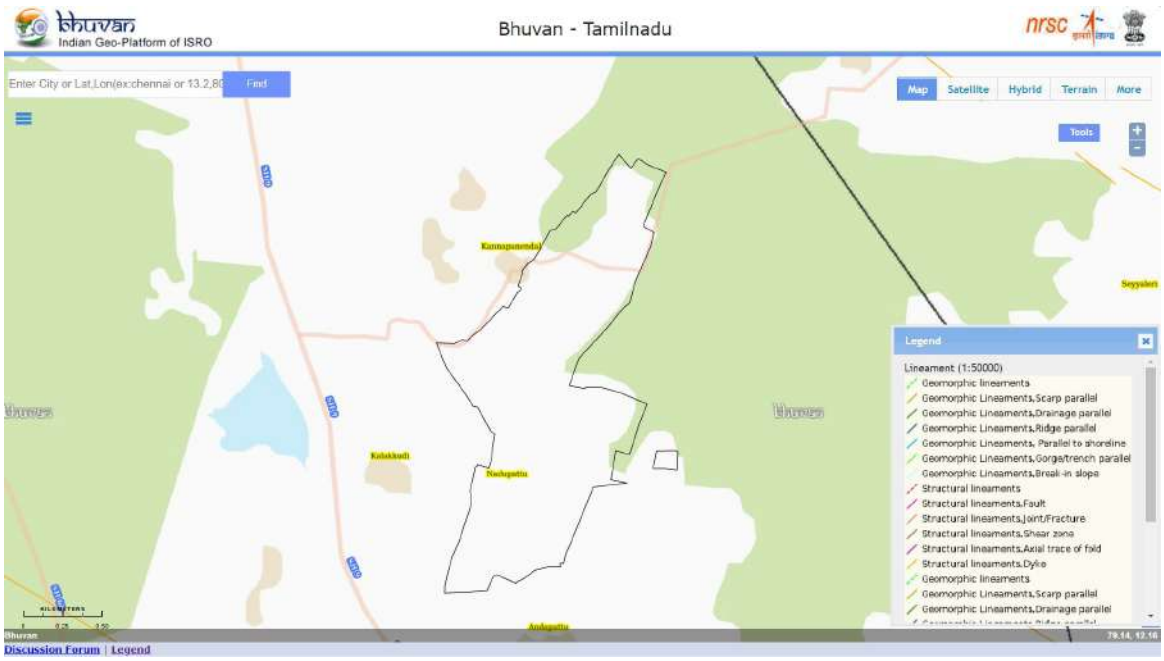


Figure 8.10. Lineament map of Nadupattu GP

8.3.2.3 Ground water prospect:

The map provides the required information on geological parameters connected to ground water exploration and the probable ground water prospects and helps in identification of sites for planning recharge structures to address water scarcity in a more effective manner. It is observed that the groundwater is less than 30m deep well with 50 to 100 litre per minute capacity (Figure 8.11).

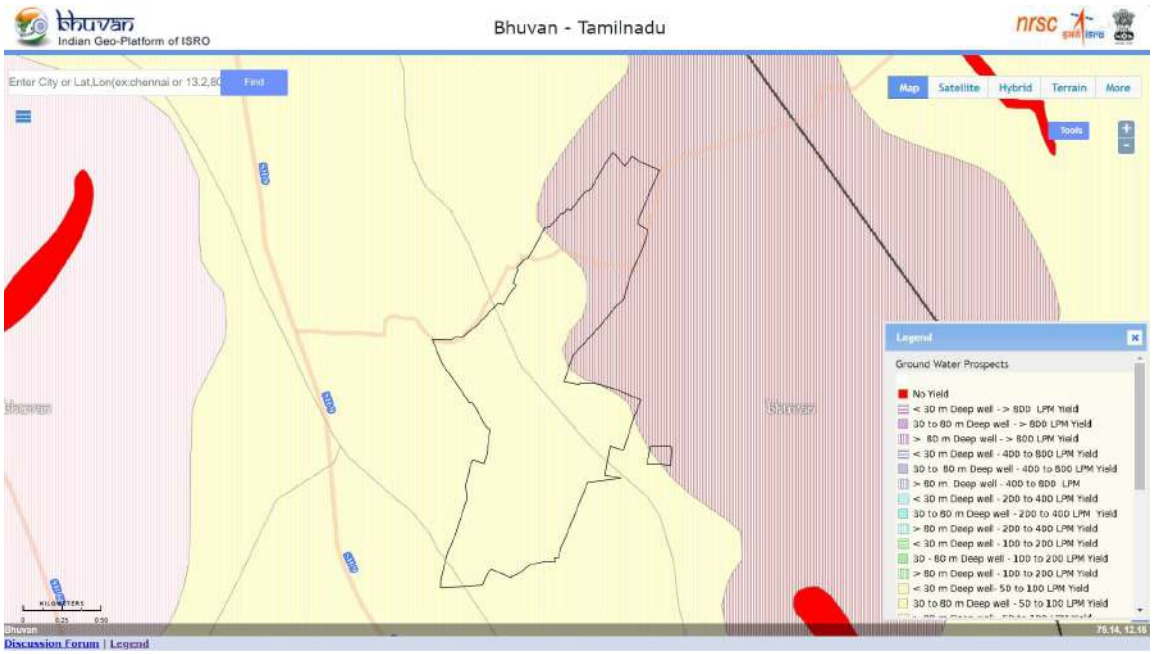


Figure 8.11. Ground water map of Nadupattu GP

8.3.2.4 Slope:

The slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. Slope is typically expressed as a percentage, an angle, or a ratio. The average slope of a terrain feature is calculated from contour lines on a topo map or DEM. For Nadupattu GP, it clearly shows a flat slope of 1 to 3% &very flat slope 0 to 1%. 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 8.12).

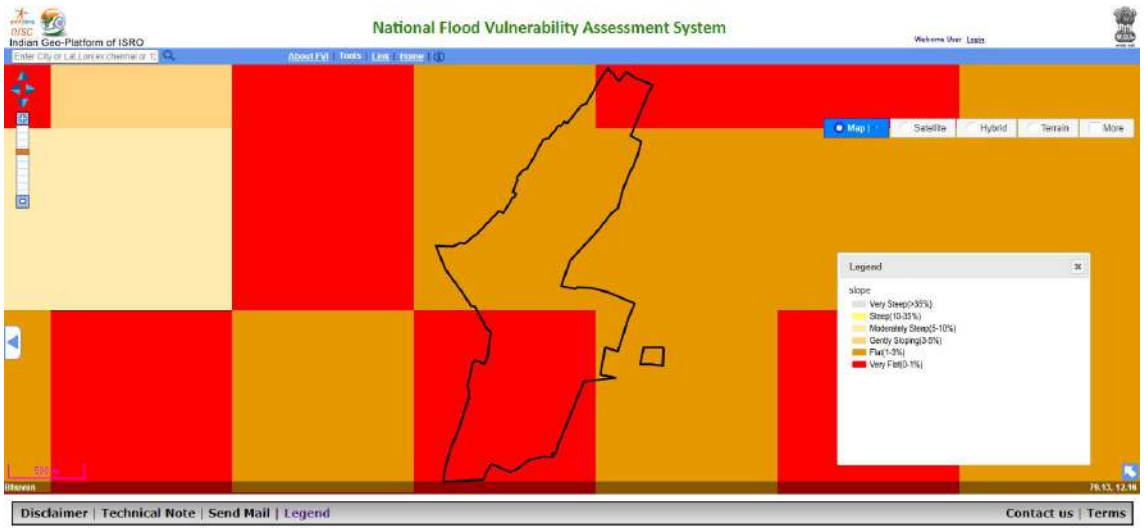


Figure 8.12. Slope map of Nadupattu GP

8.3.2.5 Watershed:

A watershed map is the area of land where all of the water that falls in it and drains off of it goes into the common outlet. The map is used for the interventions in the Nadupattu GP based on ridge to valley concept and develop relevant soil and water conservation plan accordingly. There are Three micro-watersheds in the village. (Figure 8.13).

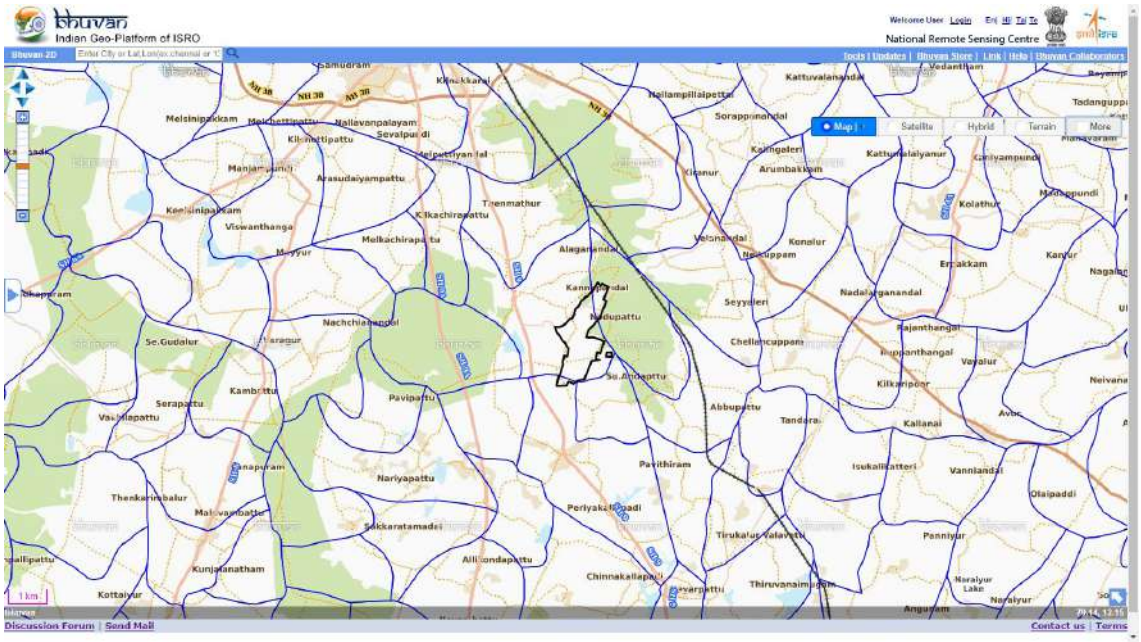


Figure 8.13. Watershed map of Nadupattu GP

8.3.2.6 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 Nadupattu GP, it is observed that area under sheet erosion in the GP (Figure 8.14).

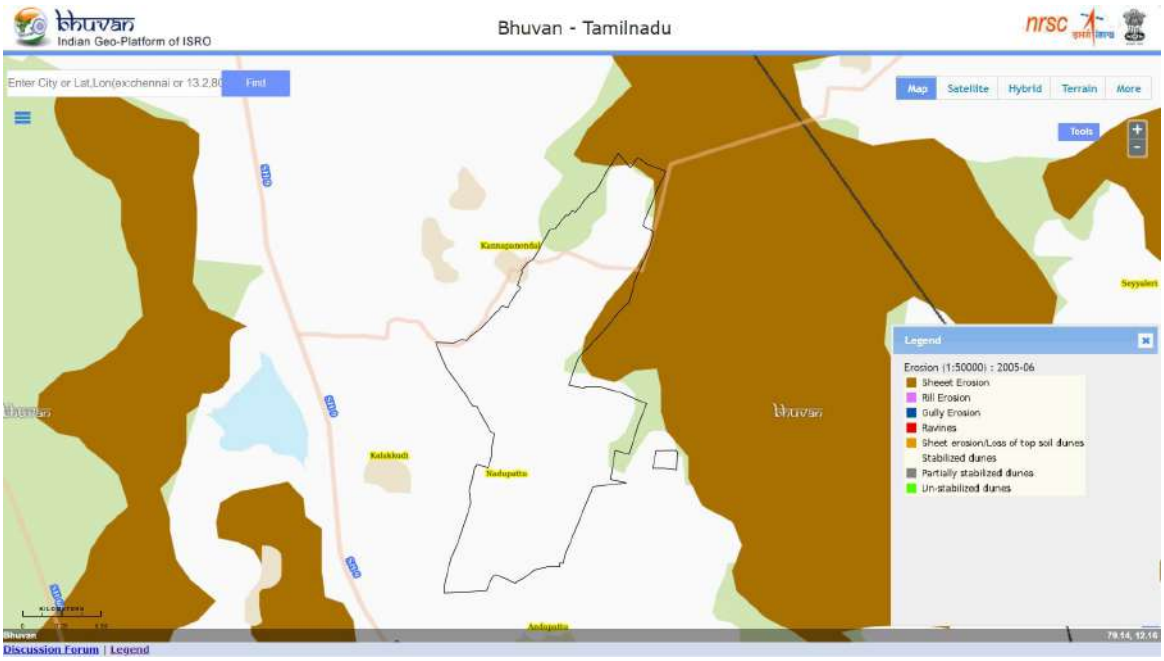


Figure 8.14. Soil erosion map of Nadupattu GP

8.3.2.7 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 8.15).

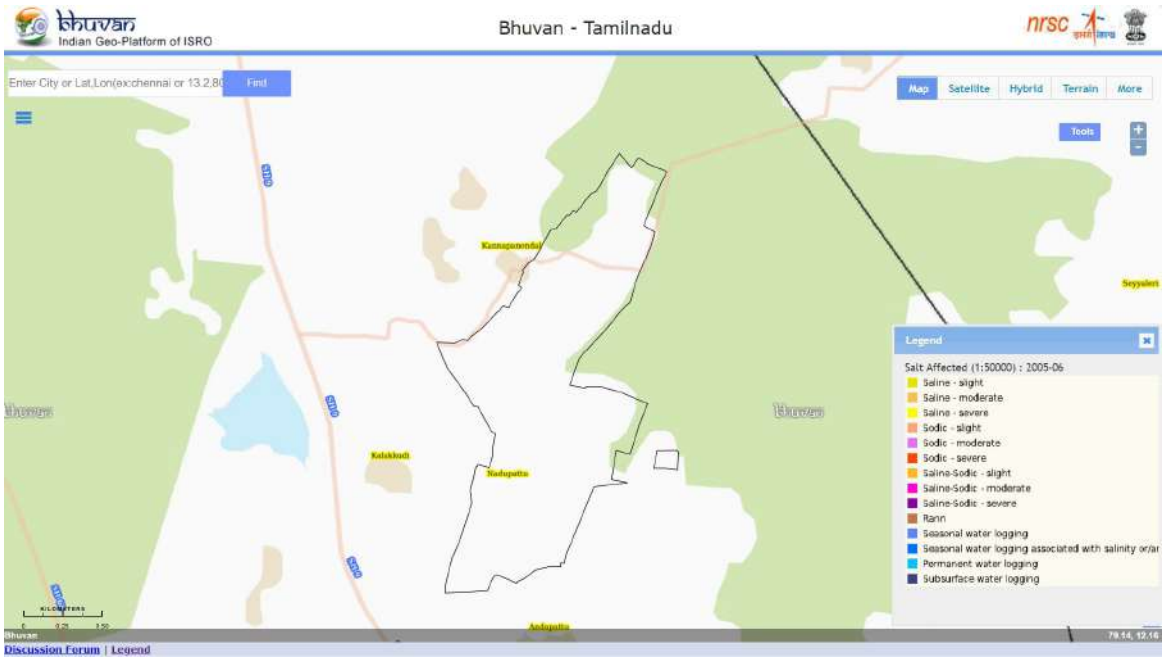


Figure 8.15. Salt affected area map of Nadupattu GP

8.3.2.8 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 8.16).

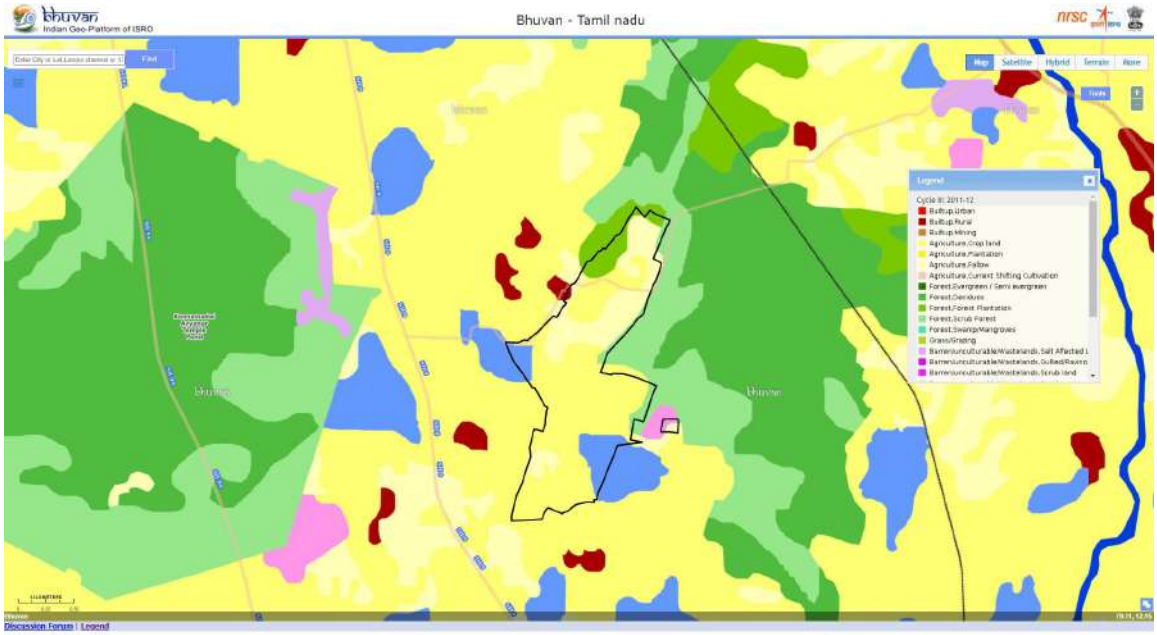


Figure 8.16. Land use and land cover map of Nadupattu GP

8.3.2.9 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 8.17).

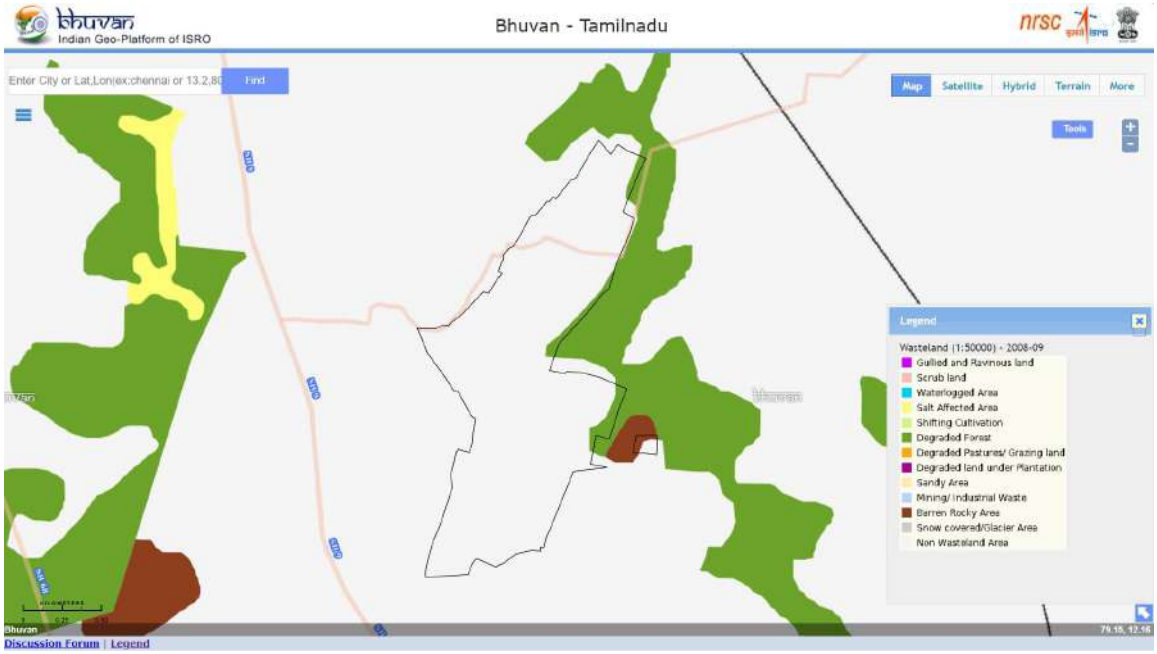


Figure 8.17. Wasteland map of Nadupattu GP

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 45). 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 45. NON-SPATIAL DATA- NADUPATTU GP

Key CWRM Parameter	Details
Climate Vulnerability Area 1: Socio-Economic	
Geographical Area (ha.)	191
Male Population	561
Female Population	552
Total Population	1,113
SC Population	0
ST Population	0
Vulnerable population	0
Households (HH's)	266
Only one room HH's (SECC)	12
Female-Headed HH's (SECC)	7
Vulnerable Households (SECC)	11
% of Vulnerable Households	4
Registered MGNREGA Job cards	518
Active person working in job Cards	271
Drinking-Water Sources (No.)	32
Groundwater sources - Drinking water (No.)	0
Surface water sources - Drinking water (No.)	0
Annual Grey water Generation (ha.m)	2.03
Climate Vulnerability Area 2: Climate	
Average Annual Rainfall	1,047
Average Annual Temperature	27.9
Ground Water(G.W) Status	Critical
Climate vulnerability Area 3. Water	
Canal Network (m)	
Length of Main Canal	0
Length of Minor Canal	0
Length of Distributaries	0
Water Courses (Field Channels)	1,500

No. of Tanks (PWD & Union)	2
No. of Ooranis	0
Other Surface Water Bodies	0
Irrigation Facilities (ha.)	
Area under Tank Irrigation	0
Area under Canal Irrigation	0
Area under Open & Tube Well Irrigation	106
Water Quality (No.)	
Chemical Contaminants	0
Bacterial and Other Contaminants	0
Catchment Area wise Available Runoff (ha.m)	
Good Catchment Area	10.6
Average Catchment Area	4.8
Bad Catchment Area	27.2
Run-Off Conserved (Existing) (ha.m)	
Good Catchment Area	5.53
Average Catchment Area	3.6
Bad Catchment Area	2.27
Watershed and Drainage Networks	
Length of Natural Drainage Lines (m)	1,840
No. of Natural Drainage Lines (No.)	2
No. of micro-atersheds (No.)	3
Water demand (ha.m)	
Water demand for Humans	3.05
Water demand for Livestock	2.39
Water demand for Agriculture	153
% GW utilization for Drinking	59
% GW utilization for Livestock	93
% GW utilization for Agriculture.	100
% SW utilization for Drinking	41
% SW utilization for Livestock	7
% SW utilization for Agriculture	0
Climate vulnerability Arae 4. Agriculture	
Area Under Land Resources (ha.)	
Forest land	151.62
Non-Agricultural Uses	39.51
Barren & Un-cultivable Land	0
Permanent Pastures and Other Grazing Land	0
Land Under Miscellaneous Tree Crops etc.	0
Cultivable Waste Land	0

Fallows Land other than Current Fallows	0
Current Fallow land	28.49
Unirrigated Land	0.46
Area Irrigated by Source	106.25
Land under Catchment Area in ha	
Good Catchment	28.38
Average Catchment	1,706
Bad Catchment	145.26
Crop Details in ha	
Irrigated Area	123.2
Rainfed area	0.8
The area under Paddy Cultivation	56.3
Crop Water Requirement - The irrigated condition	153.15
Crop Water Requirement - Rainfed condition	0.28
Soil Resources: Status of Available Nitrogen in %	
Very Low	60%
Low	40%
Medium	0%
High	0%
Very High	0%
Status of Organic Carbon in %	
Very Low	75
Low	25
Medium	0
High	0
Very High	0
Status of Soil Micro Nutrients in %	
Sufficient	57
Deficient	43
Status of Physical condition of the soil in %	
Acidic Sulphate	0
Strongly Acidic	0
Highly Acidic	0
Moderately Acidic	0
Slightly Acidic	0
Neutral	0
Moderately Alkaline	100
Strongly Alkaline	0
Soil Texture in %	
% of Clay Soil	0

% of Fine Soil	69
% of Coarse loamy	24
Soil Water Permeability	Moderate
Soil moisture and ET	
Volumetric Soil Moisture	23
Estimated Soil Moisture	37.33
ET Losses	99.51
Means of Water Extraction in %	
Gravity	4
Lifting	96
Irrigation Methods in %	
Wild Flooding	0
Control Flooding	100
Livestock in No.	
Cattle population	611
Sheep population	145
Goat population	276
Poultry	0

8.3.4 KEY WATER CHALLENGES

Socio-Economic

1. According to SECC data, 4% of the households are vulnerable in the village
2. 12 one room households, and 7 female headed households.
3. Access to drinking water through tap water connections is very low
4. Grey water generation is 2.03 ha.m; Handling of grey water from households needs attention

Water

1. Ground water staus -critical
2. Two traditional waterbodies in the GP
3. Irrigation depends 100 % on open and tube well
4. 95 % drining and 93% livestock need met through groundwater
5. 42.6 ha.m of water is an available runoff -Runoff bad catchment area is mores

Agriculture and Allied Sector

1. 24 % of the land covers the common area
2. 76% of the land covers an individual land area
3. Main crop in the GP is paddy which is cultivated about 56.3 ha of land
4. Crop water requirement for irrigated condition is more
5. 98% of the water is given to paddy fields by lifting methods of irrigation
6. Remaining water is extracted by gravity method of irrigation.
7. Soil Nitrogen, organic carbon is low
8. Alkaline soil
9. Fine soil is predominant in the GP
10. High ET loss 99.51 ha.m

8.3.5 PERSPECTIVE PLAN - WORKS PROPOSED: WATER ACTIONS

The appropriate and site-specific works are identified for the development of public and common land, agriculture and allied activities, rural infrastructures, and climate-resilient to reduce the vulnerability of the GP. About 49 % the total land area is taken for WASCA treatment activities like plantation and conservation works. The total proposed area for treatment is 27.39 ha, more attention is given for non-agriculture land followed by miscellaneous Tree crops and area under irrigated by source (Figure 8.18). Through the proposed conservation activities, 11.40 ha.m run off would be harvested in which, about 48% of the runoff from the good catchment, 31% of the runoff from the average catchment and 20% of the conservation from the bad catchment area (Figure 8.19).

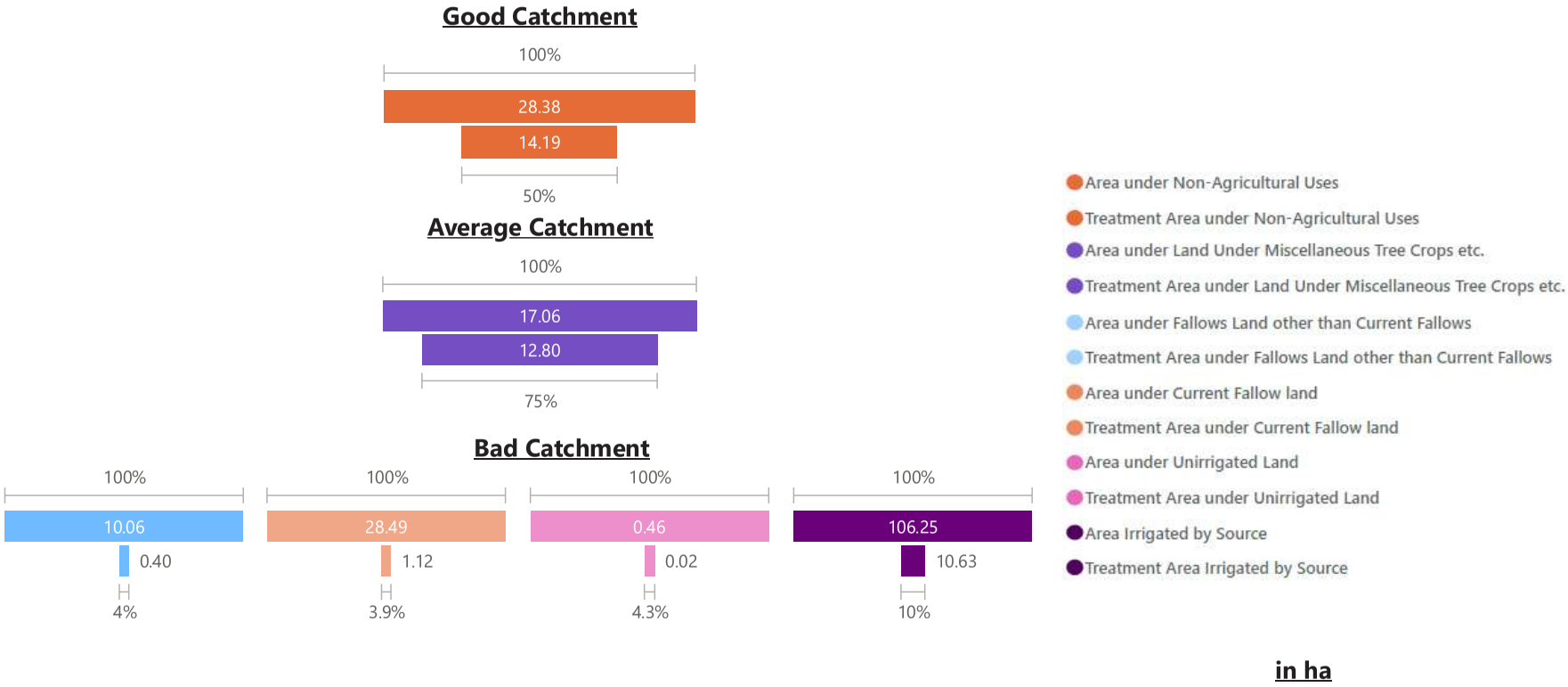


Figure 8.18. Proposed land resource treatment area in Nadupattu GP

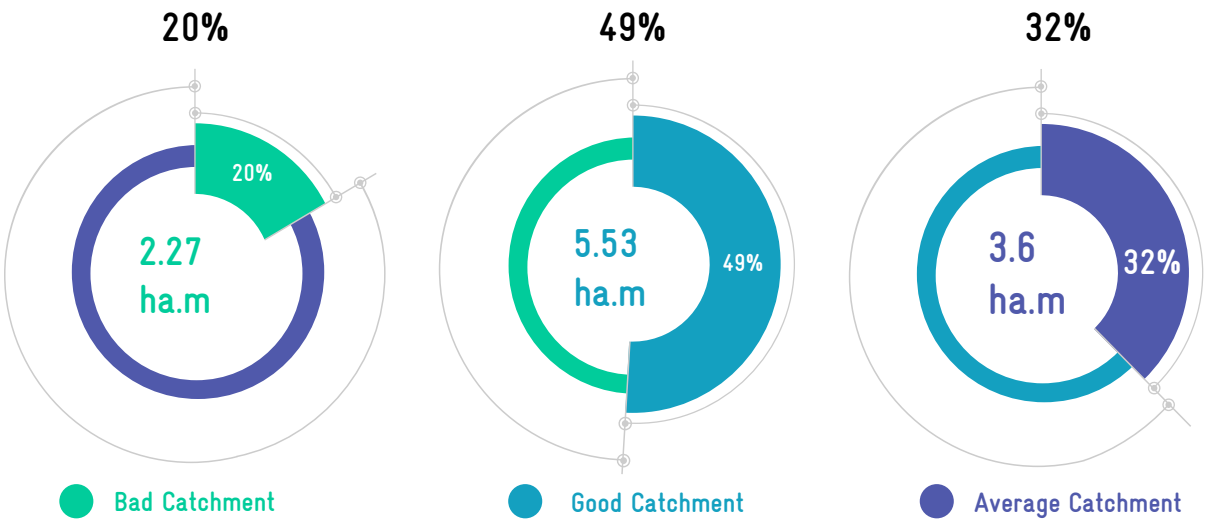


Figure 8.19. Expected run off conservation after treatment

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

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

CWRM Water Action 1: Improvement of Public & Common Lands Development				
Name of the work	Ridge type	No. of Works	Estimated cost (INR in Lakhs)	Estimated Person Days
Contour Continuous Bunds for Afforestation area (m)	Upper	2	0.05	20
Drainage Line Treatment (m)		1	0.03	5
Afforestation in Public/common lands (ha)		2	17.20	6,688
Block Plantation (Community) (ha)	Middle	2	22.20	8,640
Linear Plantation (Km)		2	3.60	1,406
Avenue plantation (Km)		2	3.60	1,406
Nursery Development (No. of units)	Lower	4	66.50	10,392
Restoration of waterbodies: PWD and Tanks (No.)		2	10.00	1,600
Artificial Recharge Structure (No. of units)		43	107.50	16,813
Composting (No. of units)		4	0.68	60
Subtotal		**64**	**231**	**47,030**
CWRM Water Action 2: Agricultural and allied Sector development				
Farm Bunding with Boundary Trenches - Individual (ha)	Lower	2	3.00	1,172
Micro Irrigation (ha)		11	11.00	0
Construction of Farm Ponds - Individual (No. of units)		2	4.00	1562

Land development - Individual (ha)	Lower	2	20.00	7812
Dryland Horticulture/Agroforestry - Individual (ha)		3	25.50	9,963
Azolla units - Individual (No. of units)		17	2.55	391
NADEP Vermi compost (No. of units)		17	3.06	459
Fodder development - Community & Individual		17	25.16	39,848
Cattle Shelters (No. of units)		17	36.04	5,627
Goat Sheep Shelters (No. of units)		35	79.45	12,425
Cattle Trough(No. of units)		17	0.85	102
Construction of new open wells & Recharge Shafts (No. of units)		43	215.00	39,818
Sub Total Water Action -2		**183**	**426**	**1,19,179**
CWRM Water Action 3: Rural Water Management				
Soak Pits (Community) (No. of units)	Lower	3	0.39	60
Soak Pits (Individual) (No. of units)		27	2.70	432
Roof Rain Water Harvesting (No. of units)		2	8.00	1,250
Subtotal		**32**	**11**	**1,742**
Grand total		**279**	**668**	**1,67,951**

Regarding CWRM themes of the total number of projects identified, 66 % works are in agriculture and allied sector while 23% and 12 % works are in public and common land, and rural infrastructure respectively. Table 47 provides the estimates of the work budget, and personal days for three years from 2021-2024 in the Nadupattu GP.

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

CWRM themes	No of works	Estimated budget (INR in lakhs)	Estimated person days
Public and common land development	64	231	47,030
Agriculture and Allied sector development	183	426	1,19,179
Rural water management	32	11	1,742
TOTAL	279	668	1,67,951

8.3.6 IMPACTS

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

TABLE 48. 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	Two traditional waterbodies restored
2	Area under afforestation	2	14.19 ha under afforestation
3	Percentage reduction in the annual surface runoff	3	16.87 ha.m surface runoff harvested and stored
4	The proportion of land treated under WASCA	4	34% of the total geographical area of the village treated under WASCA in three years
5	Drainage line treatment	5	1.8 Km length of drainage lines treated

2 TRADITIONAL WATER BODIES RESTORED

14.19 ha AFFORESTATION

16.87 ha.m SURFACE RUNOFF HARVESTED

34 % AREA OF THE VILLAGE TREATED

1.8 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.	7 farm ponds established
2.	Reducing area under fallow lands	2.	9.64 ha under fallow land restored for cultivation
3.	Improvement in soil health	3.	17 units of vermicompost established
4.	No of artificial recharge structures proposed	4.	43 artificial recharge structures were established to replenish groundwater flow

7 FARM PONDS

9.64 ha FALLOW LAND RESTORED

17 VERMI COMPOST

43 ARTIFICIAL RECHARGE STRUCTURES

WASCA CWRM ACTION PLAN

DEVELOPMENT OF RURAL INFRASTRUCTURE

INDICATOR	
1.	Number of villages having complete solid and liquid waste management systems
2.	Roof rainwater harvesting measures
3.	Nutri gardens

OUTCOMES/ IMPACT	
1.	Three community level and 27 individual level soak pits were constructed for grey water management to maintain hygiene in the village
2.	Two units of roof rainwater harvesting and storing established
3.	266 households established Nutri-gardens in homesteads

3 COMMUNITY & **27** INDIVIDUAL SOAK PITS

2 COMMON ROOF RAINWATER HARVESTING

206 NUTRI-GARDENS

Table 49 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 49. PROPOSALS FOR THE MGNREGS, NADUPATTU GP, TIRUVANNAMALAI DISTRICT

	No of works	No of person days
Perspective plan	279	1,67,951
Annual plan	120	75,591

8.3.7 PROPOSED ACTIVITY MAP

The proposed activity map for Nadupattu GP, Tiruvannamalai Block shows a shelf of projects for all three year works from 2021-2024 (Figure 8.20 to 8.23).

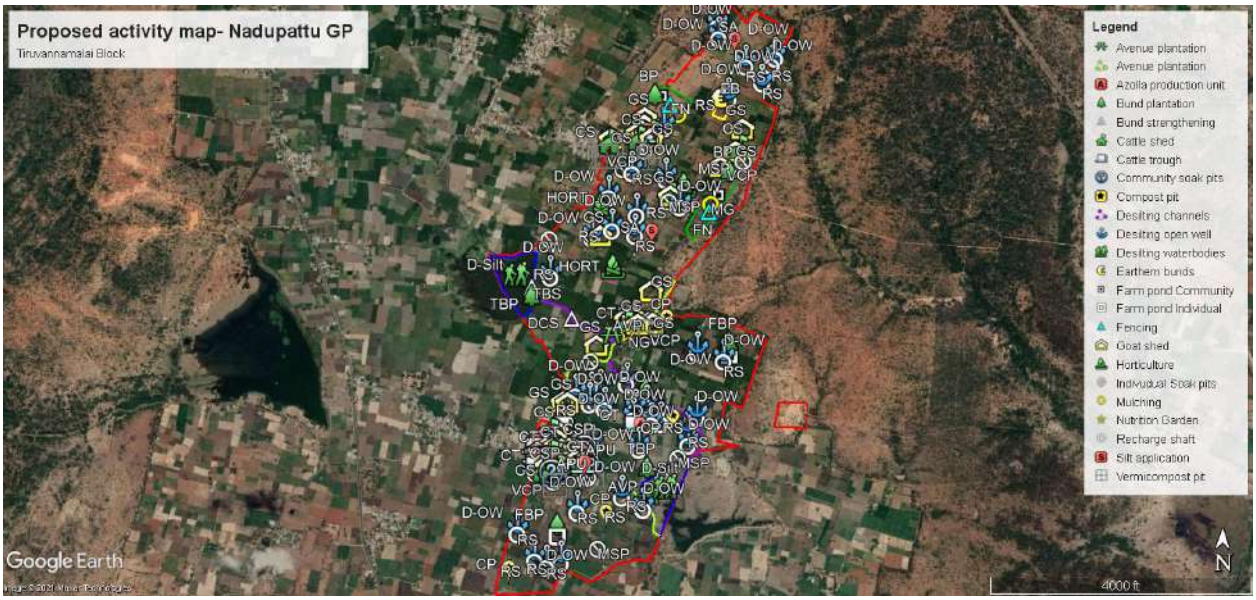


Figure 8.20. Propoed action plan of Nadupattu GP

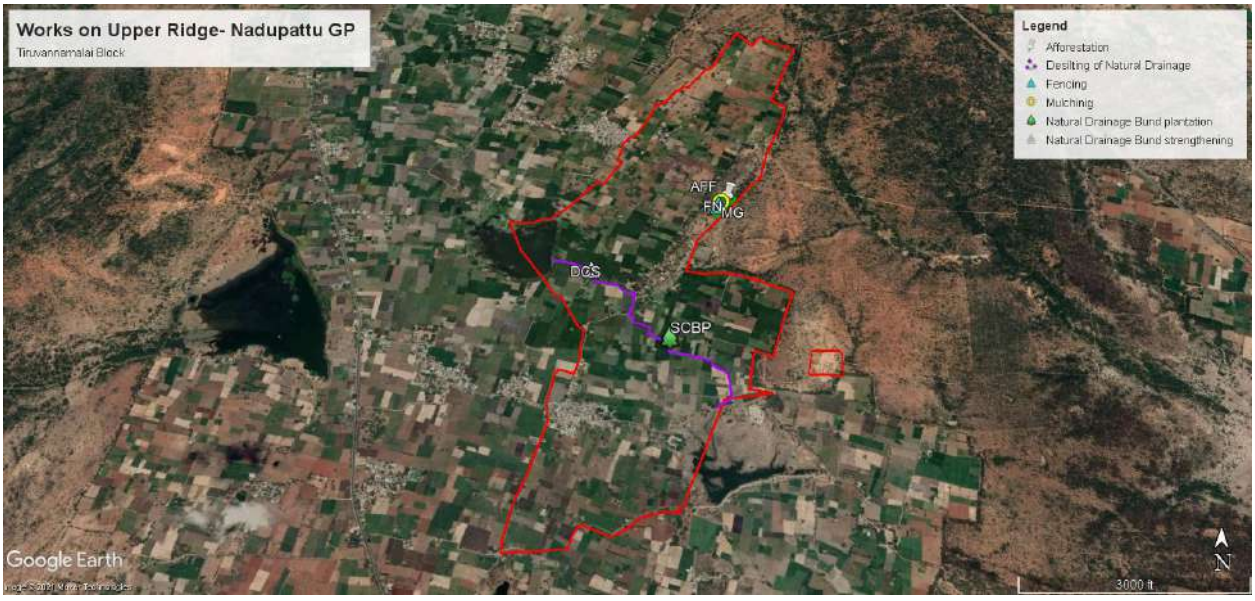


Figure 8.21. Works on Upper Ridge of Nadupattu GP

Figure 8.22. Works on Middle Ridge of Nadupattu GP

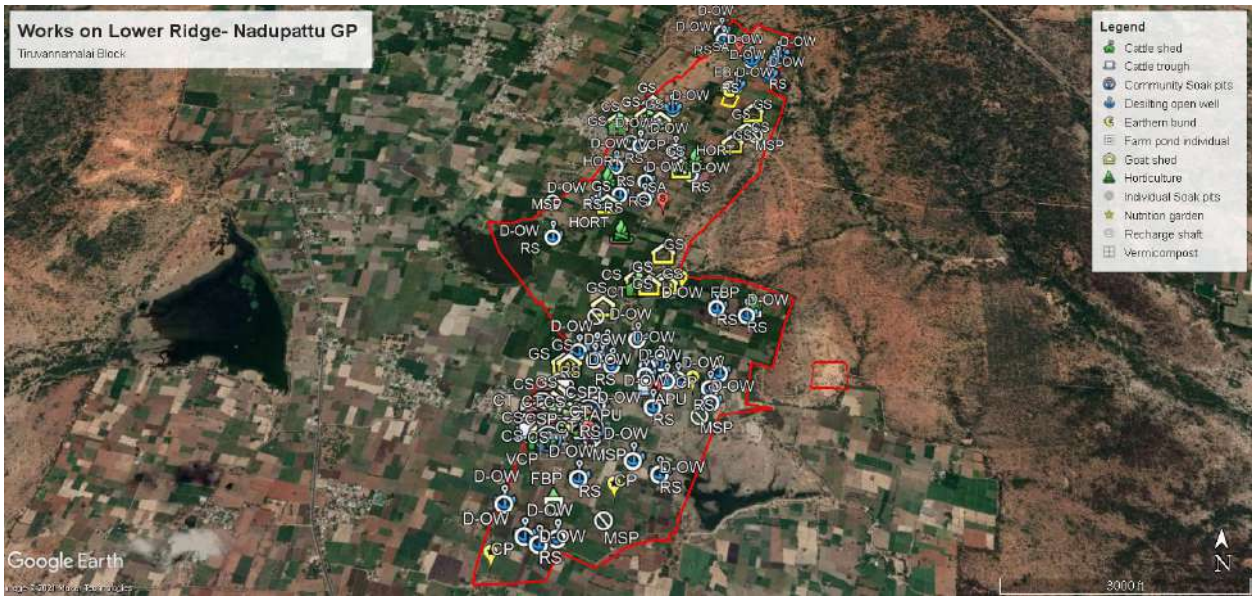
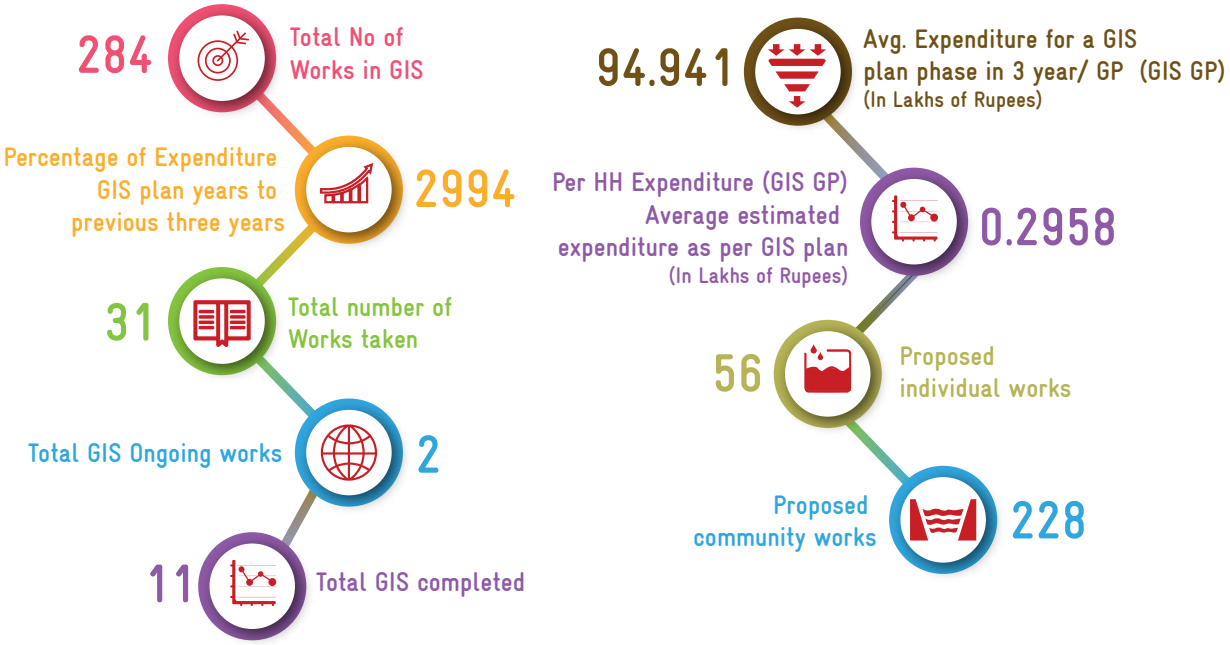


Figure 8.23. Works on Lower Ridge of Nadupattu GP

8.3.8 GIS PLAN IMPLEMENTATION, KEY PARAMETERS

The GIS plan implementation and performance of Naduppatu Block is represented in Table 50.

TABLE 50. KEY PARAMETERS PERFORMANCE IN NADUPATTU GP -TIRUVANNAMALAI BLOCK



நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு

குறள் - 20

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

Thirukkural - 20

CHAPTER 9

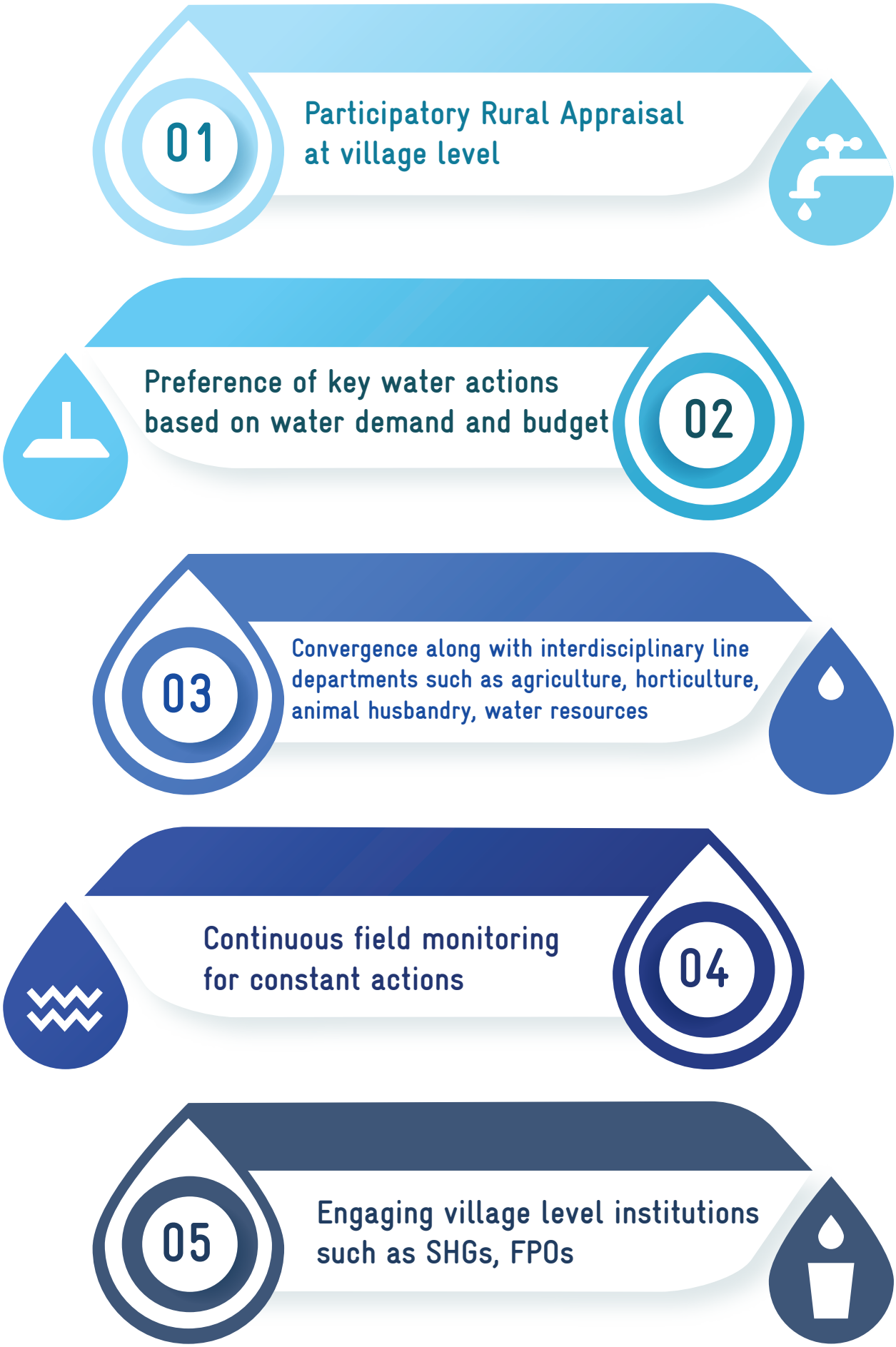
CONCLUSION

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 initiate to address the problem holistically through comprehensive vulnerability assessment at District and Block level to identify the vulnerable area and its key problems. The 18 biophysical and socio-economic indicator of four interrelated areas via water, agriculture, socio-economic and climate used at District level are further expanded to 110 parameters at Block level. The spatial and non-spatial CWRM parameters for four 4 above mentioned interrelated areas are used to represent risk, sensitivity and adaptive capacity of the GPs, which eventually reflects rural water security. The key problems of the Blocks are identified and the best possible adaptation options 'key water actions' are intended under WASCA initiatives in public and common land, agriculture and allied sector, rural infrastructure areas. All the indicators/parameters and key water action are accompanied with appropriate SDG and India's NDC. The developmental activities in the 3 areas along with climate resilient measures will contribute in reducing the vulnerability and building the resilience of the local communities at the GP level. The GP based planning and integration at the Block level enables to adopt ecosystem approach in promoting nature based solutions. The productive impacts are visualized through convergence approach by mobilizing necessary finance, knowledge and technologies at the end of the three years of implementation. This integrated Block level approach will be more effective with Block level climate information which is not currently available.

Recommendations towards stable development and its progressive outcome are,


01
Participatory Rural Appraisal at village level
Preference of key water actions based on water demand and budget
02
03
Convergence along with interdisciplinary line departments such as agriculture, horticulture, animal husbandry, water resources
Continuous field monitoring for constant actions
04
05
Engaging village level institutions such as SHGs, FPOs

ANNEXURES

ANNEXURE 1

TYPES OF GPS

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

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

ANNEXURE 3.1

KEY CWRM PARAMETER FROM SECONDARY SOURCES

Key CWRM Parameter	Secondary Source
Socio economic	
Geographical Area	Census-2011, MoHA, GOI *https://censusindia.gov.in/2011census/dchb/DCHB.html*
Male Population	
Female Population	
Total Population	
SC Population	
ST Population	
Vulnerable population	
Households (HH's)	Socio-economic caste census (SECC) 2011 *https://secc.gov.in/homePageLgd.htm*
Only one room HH's	
Female Headed HH's	
Vulnerable Households	
% of Vulnerable Households	
Registered MGNREGA Job cards	*http://mnregaweb4.nic.in/netnrega/app_issue.aspx?page=s&lflag=eng&state_name=TAMIL%20NADU&state_code=29&fin_year=2020-2021&source=national&Digest=3ics8+9Z9fEQ8yzj5E3qcQ*
Active person working in MGNREGA job Cards	
Water Resources	
Irrigation Facilities	Census-2011, MoHA, GOI *https://censusindia.gov.in/2011census/dchb/DCHB.html*
Area under Tank Irrigation	
Area under Canal Irrigation	
Area under Open & Tube Well Irrigation	
Water Quality	*https://ejalshakti.gov.in/IMISReports/Reports/WaterQuality/WQ/rpt_WQ_DistrictProfile_S.aspx?Rep=0&RP=Y*
Chemical Contaminants	
Bacterial and Other Contaminants	
Watershed and Drainage Networks	NRSC, ISRO, GoI
Length of Natural Drainage Lines	
Number of Natural Drainage Lines	
Number of Micro-watersheds	
Agriculture	
Land Resources	*https://censusindia.gov.in/2011census/dchb/DCHB.html*
Area under Forest land	
Area under Non-Agricultural Uses	
Area under Barren & Un-cultivable Land	
Area under Permanent Pastures and Other Grazing Land	
Area under Land Under Miscellaneous Tree Crops etc.	
Area under Cultivable Waste Land	
Area under Fallows Land other than Current Fallows	

Area under Current Fallow land	*https://censusindia.gov.in/2011census/dchb/DCHB.html*
Area under Unirrigated Land	
Area Irrigated by Source	
Soil Resources: Status of Available Nitrogen	*https://soilhealth.dac.gov.in/NewHomePage/NutriPage*
Very Low (VL)	
Low (L)	
Medium (M)	
High (H)	
Very High (VH)	
Status of Organic Carbon	
Very Low (VL)	
Low (L)	
Medium (M)	
High (H)	
Very High (VH)	
Status of Soil Micro Nutrients	
Sufficient	
Deficient	
Status of Physical condition of the soil	*https://soilhealth.dac.gov.in/NewHomePage/NutriPage*
Acidic Sulphate	
Strongly Acidic	
Highly Acidic	
Moderately Acidic	
Slightly Acidic	
Neutral	
Moderately Alkaline	
Strongly Alkaline	
Soil Texture	NRSC
% of Clay Soil	
% of Fine Soil	
% of Coarse loamy	
Soil Water Permeability	standard table
Soil moisture and ET	*https://indiawris.gov.in/wris/#/*
Volumetric Soil Moisture	
Livestock	*https://farmer.gov.in/livestockcensus.aspx*
Cattle Population	
Sheep Population	
Goat Population	
Poultry	

ANNEXURE 3.2

KEY CWRM PARAMETERS FROM PRIMARY SOURCES

Key CWRM Parameter	Primary Data
Water sources	
Drinking Water Sources	Block level officer/ GP level assistants
HH's have tap water connection for drinking water	
HH's dependent on other sources for drinking water	
Canal network	
Length of Main Canal	Block level officer/ GP level assistants
Length of Minor Canal	
Length of Distributaries	
Water Courses (Field Channels)	
Traditional water bodies	
Number of Tanks (PWD & Union)	Block level officer/ GP level assistants
Number of Ooranis	
Other Surface Water Bodies	
Crop details	
Irrigated Area	Village G return data
Rainfed area	
Area under Paddy Cultivation/irrigated	

ANNEXURE 3.3

KEY CWRM PARAMETER GENERATED -PRIMARY DATA

Key CWRM Parameter	Methods/Formulas Used
Water Demand	Standard Norms are in Annexure 3.4
Water Demand For Drinking	
Water Demand for Livestock	
Water Demand For Agriculture	
% G.W Utilization for Drinking	
% G.W Utilization for Livestock	
% G.W Utilization for Agriculture.	
% SW Utilization for Drinking	
% SW Utilization for Livestock	
% SW Utilization for Agriculture	
Annual Greywater Generation	Standard Norms are in Annexure 3.5
Available Runoff	Strange table method (based on rainfall, land area)
Run Off Conserved	Formula (based on tank storage, built up, linear measurement)
Estimated Soil Moisture	calculation & formula
ET Losses	calculation & formula
Means of Water Extraction (Gravity/ Lifting)	(Number of Gravity or lifting /Total number of extraction)*100
Irrigation Methods (Wild/Control)	(corresponding irrigation area/ total irrigation area)*100

ANNEXURE 3.4

STANDARD NORMS FOR CALCULATING WATER DEMAND

	Water Users	Total Annual Requirement (ha.m)
1	Human	population*0.0027375
2	Animals	Total water requirement for animals
3	Agriculture	Total volume of water in agriculture (Both irrigated and rainfed)
4	Others (Industrial)	
	Total water De-mand	Addition of all 4 category
	Water Users	**Requirement met by Ground Water**
1	Human	water demand for human* Ground water percentage (coming from drinking water sources)
2	Animals	water demand for animals* Ground water percentage (coming from Livestock table)
3	Agriculture	Total volume of water in irrigated source
4	Others (Industrial)	
	Total water De-mand	Addition of all 4 category
	Water Users	**Requirement met by Surface Water**
1	Human	water demand for human* Surface water percentage (coming from drinking water sources)
2	Animals	water demand for animals* surface water percentage (coming from Livestock table)
3	Agriculture	Total volume of water in rainfed source
4	Others (Industrial)	
	Total water De-mand	Addition of all 4 category
	Water Users	**% of Ground Water**
1	Human	Ground water percentage (coming from drinking water sources)
2	Animals	Ground water percentage (coming from Livestock table)
3	Agriculture	(Total volume of water in irrigated source/Total ground water requirement)*100
4	Others (Industrial)	
	Total water De-mand	Addition of all 4 category
	Water Users	**Requirement met by Surface Water**
1	Human	Surface water percentage (coming from drinking water sources)
2	Animals	surface water percentage (coming from Livestock table)
3	Agriculture	(Total volume of water in rainfed source/Total surface water requirement)*100
4	Others (Industrial)	
	Total water De-mand	Addition of all 4 category

* Based on the land use, slope, and soil type, the catchments are classified as good, average and bad. In the CWRM framework, we used land use as a key factor for the classicization of catchments.

Good catchment area: It consists of the runoff generated from sloppy lands with dense forest cover and areas where the ground is covered with a reduced rate of infiltration. It includes area under forest, area under non-agricultural use, barren and un-cultivable lands, and area under permanent pastures and other grazing land areas.

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

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

ANNEXURE 3.5

STANDARD NORMS FOR GREY WATER GENERATION CALCULATION

	Waste water generation Source	Per day/unit waste water generation in L (Standard Value)
1	Bathing	15
2	Washing	10
3	Toilet	10
4	Cleaning	5
5	Cooking and cleaning Utensils	5
6	Others	5
	Total	**50**
	Waste water generation Source	**Daily volume of Grey water in L**
1	Bathing	Bathing water requirement in litres * Total population
2	Washing	washing water requirement in litres * Total population
3	Toilet	Toilet water requirement in litres * Total population
4	Cleaning	Cleaning water requirement in litres * Total population
5	Cooking and cleaning Utensils	cooking and cleaning utensils water requirement in litres * Total population
6	Others	other purpose water requirement in litres * Total population
	Total	**50*total population**
	Waste water generation Source	**Annual Grey water in CuM**
1	Bathing	(Daily volume of grey water for bathing in litres *365) / 1000
2	Washing	(Daily volume of grey water for washing in litres *365) / 1001
3	Toilet	(Daily volume of grey water for toilet in litres *365) / 1002
4	Cleaning	(Daily volume of grey water for cleaning in litres *365) / 1003
5	Cooking and cleaning Utensils	(Daily volume of grey water for cooking and washing utensils in litres *365) / 1004
6	Others	(Daily volume of grey water for other purposes in litres *365) / 1005
	Total	**(Total daily volume of grey water in litres *365)/ 1000**
	Annual Grey water generated in ha.m	**Annual Grey water in Cum/10000**

ANNEXURE 3.6

GP WISE STATUS OF WATER RESOURCE AND ITS SUPPLY AND DEMAND

GP Type	Key CWRM Parameter	Canal Network						Irrigation Facilities		
		Length of Main Canal	Length of Distributaries	Water Courses (Field Channels)	No. of Tanks (PWD & Union)	No. of Ooranis	Other Surface Water Bodies	Area under Tank Irrigation	Area under Canal Irrigation	Area under Open & Tube Well Irrigation
Unit		m	m	m	No.	No.	No.	ha	ha	ha
Type 1	Adaiyur	2,200		2,000	1	4				125
	Alaganandal			3,050	1	3				234
	Ananandal			2,000	1	4				133
	Allikondapattu			1,000	1	3		6		57
	Anaipirandan	2,000				8				25
	Andampallam			3,000	1	7				388
	Aradapattu	2,000		6,000	2	13				212
	Aruthirapattu		500		1	2				18
	Athiyandal	4,500			2	5		27		70
	Ayyam Palayam				3					101
	Chinnakkallapadi				1	2		22		151
	Devanandal	3,500		850	1	3		16		81
	Su.Kinachipattu			6,000		1				84
	Devanur			1,400	2	7		19		82
	Endal			7,000		3	4	52		86
	Melkachirapattu	2,900		2,800	1		7			147
	Meyyur				2					246
	Nallanpillaipetral			40,000		3	1			95
	Savalpoondi	2,000		1,000	1		1			149
	Udayanandal			3,000	3		3	3		84

GP Type	Key CWRM Parameter	Canal Network						Irrigation Facilities		
		Length of Main Canal	Length of Distributaries	Water Courses (Field Channels)	No. of Tanks (PWD & Union)	No. of Ooranis	Other Surface Water Bodies	Area under Tank Irrigation	Area under Canal Irrigation	Area under Open & Tube Well Irrigation
Unit		m	m	m	No.	No.	No.	ha	ha	ha
Type 1	Isukkalikatteri			5,000	4	4		38		327
	Kallottu	1,000	2,500		1	2		51		13
	Kandiyankuppam			2,500	1	2		191		15
	Kannapandal			2,000		3				59
	Kattampoondi	3,000			1	1		167		56
	Kolakkudi			4,000	2	6				153
	Madurampattu			6,000	3	2				185
	Nachanandal	1,500		700	2	3				110
	Nadupattu			1,500	2	2				106
	Naraiyur			3,500	3	3				261
	Navampattu			4,100	3	4		15		225
	Nariapattu				1	3		218		13
	Panaiyur			4,000	2	4				83
	Pandithapattu	2,000			2	3				51
	Parayampattu				1	5				158
	Pavupattu	3,500			2	3				218
	Periakallapadi				1	3		212		32
	Perumanam		400		2	4		47		34
	Su.Andapattu	10,000			2	3			139	
	Su.Pappambadi					3				38
	Su.Valavetti				1	5		44		161
	Thandarai			6,000	2	3				146
	Thatchampattu	1,500		1,500	2	2		15		219
	Thiruvanaimugam Valasai			4,000	1	3				137

GP Type	Key CWRM Parameter	Canal Network						Irrigation Facilities		
		Length of Main Canal	Length of Distributaries	Water Courses (Field Channels)	No. of Tanks (PWD & Union)	No. of Ooranis	Other Surface Water Bodies	Area under Tank Irrigation	Area under Canal Irrigation	Area under Open & Tube Well Irrigation
Unit		m	m	m	No.	No.	No.	ha	ha	ha
Type 1	Veraiyur			5,050	1	2		30		93
	Viruthuvilanginan			6,000	1	6				98
Type 2	Su.Kambupattu			1,500	1	3				214
	Su.Nallur				1	3				214
Type 3	Adiannamalai	1,200	200		1	12				102
	T.Kalleri				2	5		27		227
	Kanandampoondi	3,000	1,500		1	4				144
	Chinnakangianur	6,000			1	6	1			200
	Kikachirapattu	2,000		500	1		3	7		107
	Kilchettipattu	600	400		1		1			167
	Melathikan	30,000			2	7	3			156
	Melchettipattu	3,000		500	1		1			181
	Nallavanpallyam	1,000		2,000	2		3			309
	Thenmathur	3,000				5	2	11		236
	Kilkaripur				1	2				263
	Malappambadi				2	2				97
	Nochimalai	5,000			1	2				94
	Thalayampallam				2	6				349
	Palaiyanur				2	5		2	20	324
	Pavithiram			3,000	2			23		259
	Kadagaman				1	3				169
	Thiruvarangam Valavetti			2,000	1	1				83
Type 5	Vengikkal				1	3				

GP Type	Key CWRM Parameter	Catchment Area wise Available Runoff			Run Off Conserved (Exisiting)			Watershed and Drainage Networks		
		Good	Average	Bad	Good Catchment Area	Average Catchment Area	Bad Catchment Area	Length of Natural Drainage Lines	No. of Natural Drainage Lines	No. of MiCriticalo Watersheds
Unit		ha.m	ha.m	ha.m	ha.m	ha.m	ha.m	m	No.	No.
Type 1	Adaiyur	46		82	23		6	4,769	4	4
	Alaganandal	16	14	54	1	11	6	5,005	5	3
	Ananandal	13		45	8		5	2,111	3	4
	Allikondapattu	7		17	2		2	470	1	1
	Anaipirandan	10		35	2		2			2
	Andampallam	66		143	30		15	3,817	6	7
	Aradapattu	30	1	63	10	1	7	4,021	6	2
	Aruthirapattu	9		11	4	0	0	709	2	1
	Athiyandal	25		39	2		3	1,594	3	2
	Ayyam Palayam	47		93	23		6	6,133	6	5
	Chinnakkallapadi	35	1	51	20	1	4	4,577	4	1
	Devanandal	36	4	60	15	3	4	7,115	7	3
	Su.Kinachipattu	8	0	48	3	0	4	3,862	4	5
	Devanur	33	0	44	6	0	3	4,292	3	3
	Endal	46	0	67	3	0	5	1,550	4	3
	Melkachirapattu	33	25	57	11	19	5	4,756	7	4
	Meyyur	97	0	112	15	0	14	7,272	7	6
	Nallanpillaipetral	16	0	53	2	0	4	2,905	3	3
	Savalpoondi	23	2	52	5	2	4	2,131	2	2
	Udayanandal	11	2	23	6	2	2	3,730	7	2
	Viswanthangal	30	1	47	1	0	3	3,320	3	3
	Isukkalikatteri	30	1	106	19	1	10	5,248	7	3
	Kallottu	8	0	22	0	0	2	1,356	2	3

GP Type	Key CWRM Parameter	Catchment Area wise Available Runoff			Run Off Conserved (Exisiting)			Watershed and Drainage Networks		
		Good	Average	Bad	Good Catchment Area	Average Catchment Area	Bad Catchment Area	Length of Natural Drainage Lines	No. of Natural Drainage Lines	No. of MiCriticalo Watersheds
Unit		ha.m	ha.m	ha.m	ha.m	ha.m	ha.m	m	No.	No.
Type 1	Kannapandal	6	1	13	3	1	1	2,229	3	1
	Kattampoondi	45	1	82	26	1	8	5,524	5	5
	Kolakkudi	39		40	8		4	1,620	3	4
	Madurampattu	34	2	102	16	2	12	7,542	7	3
	Nachanandal	29	9	32	17	7	3	4,331	5	1
	Nadupattu	11	5	27	6	4	2	1,840	2	3
	Naraiyur	30	2	116	14	2	10	7,908	8	3
	Navampattu	23	1	80	6	1	5	6,831	6	4
	Nariapattu	17		54	2		5	6,007	6	3
	Panaiyur	32	1	61	16	1	5	2,917	4	3
	Pandithapattu	14		50	1		2			2
	Parayampattu	20	1	31	2	1	3	5,070	5	2
	Pavupattu	52		58	31		7	8,863	6	3
	Periakallapadi	16	14	54	1	11	6	7,133	7	3
	Perumanam	47	0	127	4	0	18	5,399	6	3
	Su.Andapattu	27	6	35	2	5	3	2,497	3	3
	Su.Pappambadi	6	0	16	4	0	2	2,765	3	2
	Su.Valavetti	12	1	110	1	1	9	7,367	6	3
	Thandarai	30	0	86	14	0	7	5,401	5	2
	Thatchampattu	35	0	59	15	0	5	6,051	6	2
	Thiruvanaimugam Valasai	21		43	10		5	1,515	2	1
	Velayambakkam	38	2	63	2	2	6	6,109	6	3
	Veraiyur	44	0	32	10	0	3	2,727	3	3
	Viruthuvilanginan	31	1	38	20	1	3	3,014	4	2

GP Type	Key CWRM Parameter	Catchment Area wise Available Runoff			Run Off Conserved (Exisiting)			Watershed and Drainage Networks		
		Good	Average	Bad	Good Catchment Area	Average Catchment Area	Bad Catchment Area	Length of Natural Drainage Lines	No. of Natural Drainage Lines	No. of MiCriticalo Watersheds
Unit		ha.m	ha.m	ha.m	ha.m	ha.m	ha.m	m	No.	No.
Type 2	Su.Kambupattu	37		83	19		14	1,855	3	2
	Su.Nallur	37		83	20		14	1,150	1	1
Type 3	Adiannamalai	39	1	121	9	1	6	6,039	12	6
	T.Kalleri	9	1	92	1	1	12	3,286	6	3
	Kanandampoondi	25		70	6		3	3,377	2	5
	Chinnakangianur	42	9	86	21	6	11	11,292	11	8
	Kikachirapattu	28	21	43	14	16	4	78	1	5
	Kilchettipattu	10	0	59	1	0	5	1,008	1	4
	Melathikan	43	5	82	21	4	4	2,597	3	4
	Melchettipattu	12	2	60	1	2	5	1,299	3	4
	Nallavanpallyam	51	2	134	21	2	11	2,979	4	6
	Thenmathur	47	15	102	23	11	9	6,004	7	6
	Kilkaripur	16		80	1		6	3,950	7	5
	Malappambadi	35	13	83	3	9	6	3,806	6	6
	Nochimalai	27	7	54	16	6	4	5,528	12	6
	Thalayampallam	47	1	85	20	1	9	13,581	8	4
	Palaiyanur	116	2	99	55	1	11	16,004	21	8
	Pavithiram	85	1	161	24	1	14	7,109	8	7
	Kadagaman	23	0	81	2	0	7	2,473	5	2
	Thiruvarangam Valavetti	21		23	3		2	1,432	3	4
Type 5	Vengikkal	40	11	104	1	9	13	4,001	5	7

GP Type	Key CWRM Parameter	Water Demand								
		For Humans	For Livestock	For Agriculture	GW Utilization for Drinking	GW Utilization for Livestock	GW Utilzation for Agriculture	SW Utilization for Drinking	SW Utilization for Livestock	SW Utilization for Agriculture
Unit		ha.m	ha.m	ha.m	%	%	%	%	%	%
Type 1	Adaiyur	12	6	225	14.0	97.0	100.0	86.0	3.0	
	Alaganandal	3	2	205	7.0	95.0	99.0	93.0	5.0	1.0
	Ananandal	6	2	116	4.3	92.0	84.5	95.7	8.0	15.5
	Allikondapattu	4	2	112	3.0	95.0	100.0	97.0	5.0	
	Anaipirandan	4	1	79	6.0	97.0	100.0	94.0	3.0	
	Andampallam	10	11	369	16.0	96.0	99.0	84.0	4.0	1.0
	Aradapattu	8	3	255	27.0	88.0	83.0	73.0	12.0	17.0
	Aruthirapattu	2	1	40	5.0	96.0	84.0	95.0	4.0	16.0
	Athiyandal	5		96	25.0		100.0	75.0	100.0	
	Ayyam Palayam	10	1	286		91.0	99.0	100.0	9.0	1.0
	Chinnakkallapadi	6	4	171	7.0	90.0	100.0	93.0	10.0	
	Devanandal	5	1	186	12.0	94.0	100.0	88.0	6.0	
	Su.Kinachipattu	7	3	52	8.0	96.0	100.0	92.0	4.0	
	Devanur	6	2	238	16.0	99.0	89.0	84.0	1.0	11.0
	Endal	7		419	54.0		98.0	46.0	100.0	2.0
	Melkachirapattu	4	2	169	20.0	87.0	81.0	80.0	13.0	19.0
	Meyyur	11	4	285		95.0	100.0	100.0	5.0	
	Nallanpillaipetral	5	3	117	28.0	95.0	93.0	72.0	5.0	7.0
	Savalpoondi	3	3	141	10.0	97.0	100.0	90.0	3.0	
	Udayanandal	2	1	160	6.0	97.0	100.0	94.0	3.0	
	Viswanthangal	4	3	158	5.0	96.0	100.0	95.0	4.0	
	Isukkalikatteri	9	2	149	8.0	88.0	95.0	92.0	12.0	5.0
	Kallottu	2	1	190	4.0	97.0	98.0	96.0	3.0	2.0
	Kandiyankuppam	5	2	172	2.0	98.0	99.0	98.0	2.0	1.0

GP Type	Key CWRM Parameter	Water Demand								
		For Humans	For Livestock	For Agriculture	GW Utilization for Drinking	GW Utilization for Livestock	GW Utilzation for Agriculture	SW Utilization for Drinking	SW Utilization for Livestock	SW Utilization for Agriculture
Unit		ha.m	ha.m	ha.m	%	%	%	%	%	%
Type 1	Kannapandal	3	2	128	7.0	96.0	99.0	93.0	4.0	1.0
	Kattampoondi	10	4	408	4.0	95.0	100.0	96.0	5.0	
	Kolakkudi	6	4	169	42.0	94.0	100.0	58.0	6.0	
	Madurampattu	7	2	183	19.0	94.0	82.0	81.0	6.0	18.0
	Nachanandal	5	3	87	8.0	94.0	91.0	92.0	6.0	9.0
	Nadupattu	3	2	153	59.0	93.0	100.0	41.0	7.0	
	Naraiyur	10	3	247	90.0	90.0	95.0	10.0	10.0	5.0
	Navampattu	7	4	330	77.0	98.0	96.0	23.0	2.0	4.0
	Nariapattu	4	1	543		98.0	100.0	100.0	2.0	
	Panaiyur	3	1	337	51.0	94.0	89.0	49.0	6.0	11.0
	Pandithapattu	6	5	177	3.0	98.0	99.0	97.0	2.0	1.0
	Parayampattu	5	2	325		97.0	100.0	100.0	3.0	
	Pavupattu	9	4	186	1.0	97.0	100.0	99.0	3.0	
	Periakallapadi	7	5	461	7.0	94.0	100.0	93.0	6.0	
	Perumanam	9	3	485	1.0	97.0	100.0	99.0	3.0	
	Su.Andapattu	3	2	135	59.0	94.0	99.0	41.0	6.0	1.0
	Su.Pappambadi	4	2	55	16.0	92.0	100.0	84.0	8.0	
	Su.Valavetti	6	2	332	88.0	99.0	76.0	12.0	1.0	24.0
	Thandarai	6	2	182	92.0	89.0	75.0	8.0	11.0	25.0
	Thatchampattu	6	4	308	35.0	92.0	91.0	65.0	8.0	9.0
	Thiruvanaimugam Valasai	4	1	10	8.0	92.0	100.0	92.0	8.0	
	Velayambakkam	5	2	273	3.0	98.0	70.0	97.0	2.0	30.0
	Veraiyur	3	1	157	2.0	93.0	95.0	98.0	7.0	5.0
	Viruthuvilanginan	6	2	63	85.0	85.0	74.0	15.0	15.0	26.0

GP Type	Key CWRM Parameter	Water Demand								
		For Humans	For Livestock	For Agriculture	GW Utilization for Drinking	GW Utilization for Livestock	GW Utilzation for Agriculture	SW Utilization for Drinking	SW Utilization for Livestock	SW Utilization for Agriculture
Unit		ha.m	ha.m	ha.m	%	%	%	%	%	%
Type 2	Su.Kambupattu	4	2	223	25.0	88.0	84.0	75.0	12.0	16.0
	Su.Nallur	2	2	223		88.0	84.0	100.0	12.0	16.0
Type 3	Adiannamalai	11	3	177		97.0	100.0	100.0	3.0	
	T.Kalleri	8	6	297	67.0	95.0	80.0	33.0	5.0	20.0
	Kanandampoondi	4	3	141	7.0	94.0	99.0	93.0	6.0	1.0
	Chinnakangianur	10	3	130	79.0	96.0	99.0	21.0	4.0	1.0
	Kikachirapattu	5	2	248	6.0	94.0	91.0	94.0	6.0	9.0
	Kilchettipattu	4	1	116	4.0	95.0	100.0	96.0	5.0	
	Melathikan	9	2	295	53.0	95.0	100.0	47.0	5.0	
	Melchettipattu	5	1	165	7.0	92.0	99.0	93.0	8.0	1.0
	Nallavanpallyam	16	4	218	3.0	96.0	99.0	97.0	4.0	1.0
	Thenmathur	12	3	422	81.0	89.0	95.0	19.0	11.0	5.0
	Kilkaripur	8	5	241		96.0	97.0	100.0	4.0	3.0
	Malappambadi	7	5	178	33.3	94.6	100.0	66.7	5.4	
	Nochimalai	5	4	167	60.0	97.0	100.0	40.0	3.0	
	Thalayampallam	11	4	655		97.0	97.0	100.0	3.0	3.0
	Palaiyanur	11	6	409		93.0	98.0	100.0	7.0	2.0
	Pavithiram	13	7	380	59.0	91.0	85.0	41.0	9.0	15.0
	Kadagaman	7	2	157		93.0	78.0	100.0	7.0	22.0
	Thiruvarangam Valavetti	2	2	89	5.7	93.9	82.8	94.3	6.1	17.2
Type 5	Vengikkal	50	4	102		97.0	100.0	100.0	3.0	

ANNEXURE 3.7

4.2 GP WISE STATUS OF AGRICULTURE RESOURCE

GP Type	Key CWRM Parameter	Area unde Land Resources									
		Forest land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Unit		ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1	Adaiyur		111	11				12	250	49	125
	Alaganandal		41		30		21	22	26	9	234
	Ananandal		25	9					71	34	133
	Allikondapattu		15	4					20	8	63
	Anaipirandan		24	2				2	99	60	25
	Andampallam		171	5				40	12	326	388
	Aradapattu		76	4		0.4	2		117	6	212
	Aruthirapattu		23				0		43		18
	Athiyandal		62	5					107	5	96
	Ayyam Palayam		122	5				50	301	43	101
	Chinnakkallapadi		64	29			4		94	3	176
	Devanandal		42	55			16		207	16	98
	Su.Kinachipattu		20				0		159	13	84
	Devanur		69	18			1		128	8	100
	Endal		123			1		1	214	3	138
	Melkachirapattu		49	38			90	6	125	29	147
	Meyyur		231	29			1	8	301	46	246
	Nallanpillaipetral		42	1			1		105	85	95
	Savalpoondi		42	19			7		103	28	149
	Udayanandal		28		7				28	7	86
	Viswanthangal		79				2		119	18	114

GP Type	Key CWRM Parameter	Area unde Land Resources									
		Forest land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Unit		ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1	Isukkalikatteri		13	68	1		2		117	88	364
	Kallottu		20	1			0		31	20	64
	Kandiyankuppam		70	17					94		212
	Kannapandal		15				4	0	8		59
	Kattampoondi		98	21			3	35	104	22	279
	Kolakkudi		84	20					56	4	153
	Madurampattu		32	58			8	40	296	23	185
	Nachanandal		53	23			32		49	10	110
	Nadupattu		28			17		10	28	0	106
	Naraiyur		29	50			7	7	286	66	261
	Navampattu		44	17			4	30	117	37	240
	Nariapattu		38	7				7	49		231
	Panaiyur		86				3	1	220	20	83
	Pandithapattu		38	0					112	105	51
	Parayampattu		53	1			2		7		158
	Pavupattu		89	50					61	28	218
	Periakallapadi		41		30		21	22	26	9	234
	Perumanam		117	8			1		453	146	82
	Su.Andapattu		72				23		38	8	139
	Su.Pappambadi		3	12		1			5	42	38
	Su.Valavetti		33				4	56	311	19	205
	Thandarai		33	48		1	1		86	226	146
	Thatchampattu		57	35			1	29	28	26	234
	Thiruvanaimugam Valasai		53	2					73	20	137

GP Type	Key CWRM Parameter	Area unde Land Resources									
		Forest land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Unit		ha	ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1	Velayambakkam		97	3			8		105	32	198
	Veraiyur		118	0			0		44	2	124
	Viruthuvilanginan		32	51		0	3	13	56	36	98
Type 2	Su.Kambupattu		89	11					222	7	214
	Su.Nallur		89	11					222	7	214
Type 3	Adiannamalai		83	21			4		509	35	102
	T.Kalleri		24	1			2	15	178	42	254
	Kanandampoondi		47	21				33	90	108	144
	Chinnakangianur		111	0			30		152	109	200
	Kikachirapattu		74		19	14	41		112	4	114
	Kilchettipattu		26	0			1	45	58	43	167
	Melathikan		113	2		18	0		271	10	156
	Melchettipattu		31				8		121	20	181
	Nallavanpallyam		86	51			7	7	304	98	309
	Thenmathur		126		18		37		279	19	247
	Kilkaripur		41	2					113	53	263
	Malappambadi		84	10	44		1		191	155	97
	Nochimalai		72		24	1	1		176	19	94
	Thalayampallam		120	6		1	4	8	98	1	349
	Palaiyanur		112	196			7	4	173	9	346
	Pavithiram		153	75		0	3	78	497	5	282
	Kadagaman		56	6			1	42	145	78	169
	Thiruvarangam Valavetti		53	2					32	10	83
Type 5	Vengikkal	5	101		40	1			315	195	45

GP Type	Key CWRM Parameter	Land under Catchment Area			Crop Details				
		Good	Average	Bad	Irrigated Area	Rainfed area	Paddy Cultivation	Crop Water Requirement - Irrigated condition	Crop Water Requirement - Rainfed condition
Unit		ha	ha	ha	ha	ha	ha	ha.m	ha.m
Type 1	Adaiyur	122	0	436	152	1	131	225	0
	Alaganandal	41	51	291	128	4	87	203	2
	Ananandal	34	0	238	53	51	4	98	18
	Allikondapattu	19	0	92	105		22	112	
	Anaipirandan	26	0	186	76	1	43	79	0
	Andampallam	176	0	766	392	13	22	364	5
	Aradapattu	79	3	335	147	65	63	213	42
	Aruthirapattu	23	0	61	18	18	6	33	6
	Athiyandal	67	0	209	90		47	96	
	Ayyam Palayam	126	0	496	209	5	180	284	2
	Chinnakkallapadi	93	4	273	133		16	171	
	Devanandal	97	16	321	134		69	186	
	Su.Kinachipattu	20	0	256	43		20	52	
	Devanur	87	1	237	135	73	51	213	26
	Endal	123	1	357	250	28	127	409	10
	Melkachirapattu	88	90	307	96	90	53	137	31
	Meyyur	260	1	600	276	2	74	285	1
	Nallanpillaipetral	44	1	285	85	24	38	108	9
	Savalpoondi	61	7	280	108		61	141	
	Udayanandal	28	7	121	124	2	64	159	1
	Viswanthangal	79	2	251	161	1	60	158	0
	Isukkalikatteri	80	3	569	90	21	26	142	7
	Kallottu	20	0	116	102	9	23	187	3
	Kandiyankuppam	87	0	306	121	5	21	170	2

GP Type	Key CWRM Parameter	Land under Catchment Area			Crop Details				
		Good	Average	Bad	Irrigated Area	Rainfed area	Paddy Cultivation	Crop Water Requirement - Irrigated condition	Crop Water Requirement - Rainfed condition
Unit		ha	ha	ha	ha	ha	ha	ha.m	ha.m
Type 1	Kannapandal	15	4	68	81	2	63	127	1
	Kattampoondi	119	3	440	277		96	408	
	Kolakkudi	104	0	214	139		79	169	
	Madurampattu	90	8	545	88	96	37	150	34
	Nachanandal	76	32	168	67	21	23	79	7
	Nadupattu	28	17	145	123	1	56	153	0
	Naraiyur	79	7	619	137	38	71	233	13
	Navampattu	61	4	425	187	40	45	316	14
	Nariapattu	46	0	287	296		22	543	
	Panaiyur	86	3	325	164	110	56	299	38
	Pandithapattu	38	0	268	163	5	75	176	2
	Parayampattu	55	2	166	187		27	325	
	Pavupattu	139	0	308	120		38	186	
	Periakallapadi	41	51	291	282		12	461	
	Perumanam	125	1	681	482	3	66	484	1
	Su.Andapattu	72	23	185	85	5	56	133	2
	Su.Pappambadi	16	1	85	40		10	55	
	Su.Valavetti	33	4	591	133	224	17	254	78
	Thandarai	81	1	458	101	127	33	137	45
	Thatchampattu	93	1	317	154	80	50	280	28
	Thiruvanaimugam Valasai	55	0	231	21			10	
	Velayambakkam	100	8	335	120	162	33	192	81
	Veraiyur	118	0	169	78	24	6	149	9
	Viruthuvilanginan	83	3	203	25	47	6	46	16

GP Type	Key CWRM Parameter	Land under Catchment Area			Crop Details				
		Good	Average	Bad	Irrigated Area	Rainfed area	Paddy Cultivation	Crop Water Requirement - Irrigated condition	Crop Water Requirement - Rainfed condition
Unit		ha	ha	ha	ha	ha	ha	ha.m	ha.m
Type 2	Su.Kambupattu	100	0	443	112	102	32	187	36
	Su.Nallur	100	0	443	112	102	32	187	36
Type 3	Adiannamalai	104	4	647	165		81	177	
	T.Kalleri	24	2	490	126	168	12	238	59
	Kanandampoondi	68	0	375	130	4	74	139	1
	Chinnakangianur	112	30	462	71	3	10	129	1
	Kikachirapattu	74	75	229	144	67	65	225	23
	Kilchettipattu	26	1	313	101	1	50	116	0
	Melathikan	115	19	438	195	1	122	294	0
	Melchettipattu	31	8	321	188	4	49	163	1
	Nallavanpallyam	137	7	718	140	8	87	215	3
	Thenmathur	126	54	545	247	56	143	403	19
	Kilkaripur	43	0	428	168	17	34	235	6
	Malappambadi	93	45	443	182		73	178	
	Nochimalai	72	26	289	142	0	72	167	0
	Thalayampallam	126	5	456	352	57	72	635	20
	Palaiyanur	308	7	531	262	18	92	403	6
	Pavithiram	228	4	861	223	168	78	321	59
	Kadagaman	61	1	434	76	99	17	123	35
	Thiruvarangam Valavetti	55	0	125	44	44	17	74	15
Type 5	Vengikkal	106	41	555	60		36	102	

GP Type	Key CWRM Parameter	Soil Resources: Status of Available Nitrogen					Status of Organic Carbon				
		Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High
Unit		%	%	%	%	%	%	%	%	%	%
Type 1	Adaiyur	33	46				67	20			
	Alaganandal	7	39	2			74	26			
	Ananandal	7	39	2			74	26			
	Allikondapattu	36	50	14			64	50	6		
	Anaipirandan	38	53	4			63	47	2		
	Andampallam	49	20				45	24			
	Aradapattu	40	41	10			58	40	4		
	Aruthirapattu	58	11				42	21	7		
	Athiyandal		35	16			100	43	6		
	Ayyam Palayam	48	29				47	17	17		
	Chinnakkallapadi	33	44	6			46	47			
	Devanandal	20	39	7			53	40			
	Su.Kinachipattu	43	39	3			23	44			
	Devanur	41	44	7			59	36	3	3	
	Endal		36					36			
	Melkachirapattu	38	34	4			24	39			
	Meyyur	43	39	3			23	44			
	Nallanpillaipetral		44				100	36			
	Savalpoondi										
	Udayanandal	36	48	13			64	48	5		
	Viswanthangal	28	48	4			57	37			
	Isukkalikatteri	41	33	1			49	27	3	100	

GP Type	Key CWRM Parameter	Soil Resources: Status of Available Nitrogen					Status of Organic Carbon				
		Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High
	Unit	%	%	%	%	%	%	%	%	%	%
Type 1	Kallottu	43	47	10			57	47	2		
	Kandiyankuppam	58	17				41	37			
	Kannapandal	49	19				50	18	1		
	Kattampoondi	42	42				16	44			
	Kolakkudi	28	70	10			70	28	3	5	
	Madurampattu	49	19				50	18	1		
	Nachanandal	28	38	7			42	38			
	Nadupattu		40					40			
	Naraiyur	63	42				13	46			
	Navampattu	74	28	5				47			
	Nariapattu	28	38	7			42	38			
	Panaiyur	22	42	9			39	46			
	Pandithapattu		40					40			
	Parayampattu	19	49				81	29			
	Pavupattu	50	43	1				45			
	Periakallapadi	60	39				40	54			
	Perumanam	43	38				35	40	3		
	Su.Andapattu	19	32	18				2	82	100	
	Su.Pappambadi		47				100	26			
	Su.Valavetti	18	42				35	38	2		
	Thandarai		43				100	41			
	Thatchampattu		43				100	41			
	Thiruvanaimugam Valasai	30	49	14			70	46	5		
	Velayambakkam	25	44	5			52	40			
	Veraiyur	50	50				50		50		
	Viruthuvilanginan	20	43				40	30	14		

GP Type	Key CWRM Parameter	Soil Resources: Status of Available Nitrogen					Status of Organic Carbon				
		Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High
Unit		%	%	%	%	%	%	%	%	%	%
Type 2	Su.Kambupattu		63				50		33		
	Su.Nallur		63				50		33		
Type 3	Adiannamalai	26	51	12			74	42	5		
	T.Kalleri	54	40	1			38	42	1		
	Kanandampoondi	29	66				71	25			
	Chinnakangianur	50	41	3			50	44	2		
	Kikachirapattu	30	49	13			70	39	4		
	Kilchettipattu	30	46	14			70	46	8		
	Melathikan	47	44	2			53	44			
	Melchettipattu	7	34	18			13	49			
	Nallavanpallyam	42	50	7			58	42	6		
	Thenmathur	31	48	17			69	44	5		
	Kilkaripur	58	46				42	51			
	Malappambadi		43	7			100	42			
	Nochimalai	31	49	14			69	49	6		
	Thalayampallam	15	54	2			73	42	2		
	Palaiyanur	13	77	7			73	1			
	Pavithiram	48	39	10	3		40	50	2		
	Kadagaman	21	33	17			74	35	7		
	Thiruvarangam Valavetti	27	45				40	15	24		
Type 5	Vengikkal	36	42	14			55	53			

GP Type	Key CWRM Parameter	Status of Soil Micro Nutrients		Status of Physical condition of the soil							
		Sufficient	Deficient	Acidic Sulphate	Strongly Acidic	Highly Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline
Unit		%	%	%	%	%	%	%	%	%	%
Type 1	Adaiyur	61	39							100	
	Alaganandal	49	51						4.65	95.35	
	Ananandal	49	51						4.65	95.35	
	Allikondapattu	49	51						11.54	88.46	
	Anaipirandan	55	45						12.5	87.5	
	Andampallam	40	60						0.84	99.16	
	Aradapattu	54	46						9.88	90.12	
	Aruthirapattu	35	65							100	
	Athiyandal	61	39				4	36	20	40	
	Ayyam Palayam	39	61					39.06	1.56	59.38	
	Chinnakkallapadi	49	51						14.61	85.39	
	Devanandal	60	40					3.64		96.36	
	Su.Kinachipattu	54	46				10.88	0.68	4.76	83.67	
	Devanur	51	49	1.22			3.66	14.63	8.54	71.95	
	Endal	61	39				10	37		53	
	Melkachirapattu	51	49				11		21	68	
	Meyyur	54	46				11	1	5	84	
	Nallanpillaipetral	59	41							100	
	Savalpoondi	42	58							100	
	Udayanandal	41	59					5	2	93	
	Viswanthangal	49	51					3		97	
	Isukkalikatteri	43	57						1.38	98.62	
	Kallottu	49	51						10.34	89.66	
	Kandiyankuppam	39	61				1.19	4.76	1.19	92.86	

GP Type	Key CWRM Parameter	Status of Soil Micro Nutrients		Status of Physical condition of the soil							
		Sufficient	Deficient	Acidic Sulphate	Strongly Acidic	Highly Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline
Unit		%	%	%	%	%	%	%	%	%	%
Type 1	Kannapandal	36	64					0.88	4.42	94.69	
	Kattampoondi	56	44				11.86	0.85	22.88	64.41	
	Kolakkudi	82	18							100	
	Madurampattu	36	64					0.88	4.42	94.69	
	Nachanandal	49	51						5.95	94.05	
	Nadupattu	57	43							100	
	Naraiyur	58	42							100	
	Navampattu	42	58	1.05						98.95	
	Nariapattu	49	51						5.95	94.05	
	Panaiyur	46	54						11.76	88.24	
	Pandithapattu	57	43							100	
	Parayampattu	73	27							100	
	Pavupattu	62	38				12.9	16.13	3.23	67.74	
	Periakallapadi	58	42					23.4	7.45	69.15	
	Perumanam	52	48				4.62	0.58	1.16	93.64	
	Su.Andapattu	53	47						3.85	96.15	
	Su.Pappambadi	80	20							100	
	Su.Valavetti	56	44						2.22	97.78	
	Thandarai	43	57							100	
	Thatchampattu	43	57							100	
	Thiruvanaimugam Valasai	51	49						4.84	95.16	
	Velayambakkam	58	42						10.99	89.01	
	Veraiyur	50	50						7	90	3
	Viruthuvilanginan	48	52						5.56	94.44	
Type 2	Su.Kambupattu	50	50							100	
	Su.Nallur	50	50							100	

GP Type	Key CWRM Parameter	Status of Soil Micro Nutrients		Status of Physical condition of the soil							
		Sufficient	Deficient	Acidic Sulphate	Strongly Acidic	Highly Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline
Unit		%	%	%	%	%	%	%	%	%	%
Type 3	Adiannamalai	50	50						8.33	91.67	
	T.Kalleri	57	43				7.61	20.65	3.26	67.39	1.09
	Kanandampoondi	65	35					4.88		95.12	
	Chinnakangianur	44	56							100	
	Kikachirapattu	49	51							100	
	Kilchettipattu	52	48						14	86	
	Melathikan	50	50							100	
	Melchettipattu	43	57						2	98	
	Nallavanpallyam	49	51							100	
	Thenmathur	28	72						8	92	
	Kilkaripur	48	52						8.33	91.67	
	Malappambadi	48	52						8.82	91.18	
	Nochimalai	54	46						7.32	92.68	
	Thalayampallam	55	45					3.09	6.19	90.72	
	Palaiyanur	61	39		1.19		1.19	14.29	3.57	79.76	
	Pavithiram	55	45							100	
	Kadagaman	53	47						2.94	97.06	
	Thiruvarangam Valavetti	49	51							100	
Type 5	Vengikkal	58	42				1.54			98.46	

GP Type	Key CWRM Parameter	Soil Texture				Soil moisture and ET		
		% of Clay Soil	% of Fine Soil	Coarse loamy	Soil Water Permeability	Volumetric Soil Moisture	Estimated Soil Moisture	ET Losses
Unit		%	%	%	Low, Moderate, high	%	ha.m	ha.m
Type 1	Adaiyur	8.78	80	9	Moderate	23	103	91
	Alaganandal		93		Moderate	23	79	220
	Ananandal	5	94		Moderate	23	57	135
	Allikondapattu		100		Moderate	23	22	58
	Anaipirandan		100		Moderate	23	43	68
	Andampallam	1	87		Moderate	23	177	574
	Aradapattu	42	43		Moderate	23	78	175
	Aruthirapattu		100		Moderate	23	14	14
	Athiyandal		90		Moderate	23	49	81
	Ayyam Palayam		82	14	Moderate	23	115	116
	Chinnakkallapadi		84	1	Moderate	23	70	144
	Devanandal	5.07	78		Moderate	23	90	92
	Su.Kinachipattu		100		Moderate	23	59	51
	Devanur	13	73		Moderate	23	59	88
	Endal	12	76		Moderate	23	82	114
	Melkachirapattu		78	2	Moderate	23	100	141
	Meyyur		66		Moderate	23	145	234
	Nallanpillaipetral	10	89		Moderate	23	66	145
	Savalpoondi	39	2		Low	23	70	142
	Udayanandal		52		Moderate	23	29	81
	Viswanthangal		83		Moderate	23	58	106
	Isukkalikatteri		100		Moderate	23	147	364
	Kallottu	68	13		Low	23	27	68
	Kandiyankuppam	46	17	36	Low	23	74	170

GP Type	Key CWRM Parameter	Soil Texture				Soil moisture and ET		
		% of Clay Soil	% of Fine Soil	Coarse loamy	Soil Water Permeability	Volumetric Soil Moisture	Estimated Soil Moisture	ET Losses
Unit		%	%	%	Low, Moderate, high	%	ha.m	ha.m
Type 1	Kannapandal		77	23	Moderate	23	16	31
	Kattampoondi	34	55	5	Moderate	23	107	242
	Kolakkudi	40	41		Moderate	23	54	127
	Madurampattu		65	17	Moderate	23	140	167
	Nachanandal	8	74	7	Moderate	23	51	96
	Nadupattu		69	24	Moderate	23	37	100
	Naraiyur		100		Moderate	23	156	263
	Navampattu	48	36	4	Low	23	103	223
	Nariapattu		100		Moderate	23	68	186
	Panaiyur		73	12	Moderate	23	75	83
	Pandithapattu		90		Moderate	23	62	126
	Parayampattu		100		Moderate	23	39	127
	Pavupattu		82	9	Moderate	23	82	129
	Periakallapadi	23	64		Moderate	23	79	220
	Perumanam		68	16	Moderate	23	159	183
	Su.Andapattu	3	78	4	Moderate	23	48	118
	Su.Pappambadi	40.2	59		Moderate	23	23	65
	Su.Valavetti	4	62	30	Moderate	23	137	180
	Thandarai	2.04	91		Moderate	23	117	300
	Thatchampattu		94		Moderate	23	81	209
	Thiruvanaimugam Valasai	3	90		Moderate	23	53	127
	Velayambakkam	4	57	21	Moderate	23	79	184
	Veraiyur	14	76		Moderate	23	39	101
	Viruthuvilanginan	2	70	4	Moderate	23	59	108
Type 2	Su.Kambupattu	3	88		Moderate	23	104	178
	Su.Nallur	20	52	27	Moderate	23	104	178

GP Type	Key CWRM Parameter	Soil Texture				Soil moisture and ET		
		% of Clay Soil	% of Fine Soil	Coarse loamy	Soil Water Permeability	Volumetric Soil Moisture	Estimated Soil Moisture	ET Losses
Unit		%	%	%	Low, Moderate, high	%	ha.m	ha.m
Type 3	Adiannamalai		92	1	Moderate	23	155	111
	T.Kalleri		86	4	Moderate	23	113	238
	Kanandampoondi		83	7	Moderate	23	91	202
	Chinnakangianur	1	64		Moderate	23	113	249
	Kikachirapattu		71		Moderate	23	70	122
	Kilchettipattu		61		Moderate	23	72	169
	Melathikan	58	2	1	Low	23	105	149
	Melchettipattu		83		Moderate	23	76	161
	Nallavanpallyam	42	19		Low	23	179	328
	Thenmathur		72		Moderate	23	138	228
	Kilkaripur		86		Moderate	23	99	253
	Malappambadi	14	74		Moderate	23	115	238
	Nochimalai		88		Moderate	23	72	110
	Thalayampallam		91		Moderate	23	107	282
	Palaiyanur	30	55	2	Moderate	23	169	285
	Pavithiram	17	55	28	Moderate	23	216	231
	Kadagaman	5	42	49	High	23	101	198
	Thiruvarangam Valavetti	42	45		Moderate	23	29	75
Type 5	Vengikkal		75	25	Moderate	23	138	230

GP Type	Key CWRM Parameter	Means of Water Extraction		Irrigation Methods		Livestock Population		
		Gravity	Lifting	Wild Flooding	Control Flooding	Cattle	Sheep	Goat
Unit		%	%	%	%	No.	No.	No.
Type 1	Adaiyur	2.0	98.0		100.0	1,548	201	230
	Alaganandal	1.1	98.9		100.0	521	90	164
	Ananandal	1.8	98.2		100.0	526	136	319
	Allikondapattu	4.2	95.8	9.1	90.9	392	77	129
	Anaipirandan		100.0		100.0	285		78
	Andampallam	0.6	99.4		100.0	2,794	166	845
	Aradapattu	2.3	97.7		100.0	814	688	374
	Aruthirapattu	12.3	87.7		100.0	264	20	92
	Athiyandal	6.7	93.3	27.6	72.4			
	Ayyam Palayam	6.9	93.1		100.0	210	201	
	Chinnakkallapadi	1.6	98.4	12.8	87.2	1,096	743	358
	Devanandal	3.0	97.0	16.7	83.3	198		111
	Su.Kinachipattu		100.0		100.0	903	276	81
	Devanur	5.8	94.2	18.7	81.3	471		62
	Endal		100.0	37.7	62.3			
	Melkachirapattu	1.7	98.3		100.0	492	627	74
	Meyyur	2.0	98.0		100.0	1,125	168	130
	Nallanpillaipetral		100.0		100.0	666	67	295
	Savalpoondi	1.7	98.3		100.0	790	66	197
	Udayanandal	8.2	91.8	2.9	97.1	295	35	60
	Viswanthangal	4.2	95.8		100.0	668	135	153
	Isukkalikatteri	3.0	97.0	10.3	89.7	411	275	199
	Kallottu	16.0	84.0	79.6	20.4	174		46
	Kandiyankuppam	14.3	85.7	92.7	7.3	614		144
	Kannapandal		100.0		100.0	519	49	156

GP Type	Key CWRM Parameter	Means of Water Extraction		Irrigation Methods		Livestock Population		
		Gravity	Lifting	Wild Flooding	Control Flooding	Cattle	Sheep	Goat
Unit		%	%	%	%	No.	No.	No.
Type 1	Kattampoondi	4.3	95.7	74.8	25.2	1,091	29	568
	Kolakkudi	3.2	96.8		100.0	902	189	406
	Madurampattu	3.9	96.1		100.0	616	122	304
	Nachanandal	4.3	95.7		100.0	716		406
	Nadupattu	4.5	95.5		100.0	611	145	276
	Naraiyur	2.8	97.2		100.0	659	408	274
	Navampattu	3.2	96.8	6.3	93.7	1,101	142	104
	Nariapattu	16.3	83.7	94.4	5.6	257	2	43
	Panaiyur	5.7	94.3		100.0	336	166	49
	Pandithapattu	9.0	91.0		100.0	953	220	98
	Parayampattu	1.6	98.4		100.0	483	81	28
	Pavupattu	2.2	97.8		100.0	1,111	31	309
	Periakallapadi	7.4	92.6	87.1	12.9	1,169	436	225
	Perumanam	12.7	87.3	58.0	42.0	867	213	20
	Su.Andapattu	100.0				628	293	74
	Su.Pappambadi		100.0		100.0	549	281	167
	Su.Valavetti	1.5	98.5	21.5	78.5	409	12	3
	Thandarai	3.3	96.7		100.0	603	595	52
	Thatchampattu	2.2	97.8	6.3	93.7	1,034	602	273
	Thiruvanaimugam Valasai	1.8	98.2		100.0	234	125	84
	Velayambakkam	2.5	97.5		100.0	427	43	42
	Veraiyur	2.6	97.4	24.5	75.5	234		180
	Viruthuvilanginan	2.5	97.5		100.0	570	880	88
Type 2	Su.Kambupattu	1.2	98.8		100.0	383	390	122
	Su.Nallur	1.2	98.8		100.0	383	390	122

GP Type	Key CWRM Parameter	Means of Water Extraction		Irrigation Methods		Livestock Population		
		Gravity	Lifting	Wild Flooding	Control Flooding	Cattle	Sheep	Goat
Unit		%	%	%	%	No.	No.	No.
Type 3	Adiannamalai	2.4	97.6		100.0	651	24	233
	T.Kalleri	2.2	97.8	10.7	89.3	1,661	445	397
	Kanandampoondi	1.7	98.3		100.0	875	404	191
	Chinnakangianur	1.2	98.8		100.0	793	53	266
	Kikachirapattu	2.3	97.7	6.2	93.8	626	287	67
	Kilchettipattu	1.5	98.5		100.0	218	92	29
	Melathikan	3.1	96.9		100.0	456	87	136
	Melchettipattu	1.4	98.6		100.0	172	54	93
	Nallavanpallyam	1.6	98.4		100.0	973	170	224
	Thenmathur		100.0	4.6	95.4	627	416	262
	Kilkaripur	0.9	99.1		100.0	1,266	343	208
	Malappambadi	4.9	95.1		100.0	1,303	287	424
	Nochimalai	2.6	97.4		100.0	947	158	168
	Thalayampallam	1.4	98.6		100.0	1,179	99	307
	Palaiyanur	1.5	98.5	0.5	99.0	1,587	801	337
	Pavithiram	1.9	98.1	8.0	92.0	1,701	1,022	533
	Kadagaman	1.5	98.5		100.0	534	334	56
	Thiruvarangam Valavetti	2.9	97.1		100.0	610	255	131
Type 5	Vengikkal	100.0		100.0		953	220	71

ANNEXURE 3.8

GP WISE DEMOGRAPHIC AND SOCIO-ECONOMIC STATUS

GP Type	Key CWRM Parameter	Geographical Area	Male Population	Female Population	Total Population	SC Population	ST Population	Vulnerable popupation	Households (HH's)	Only one room HH's (SECC)	Female Headed HH's (SECC)
		ha	No.	No.	No.	No.	No.	No.	No.	No.	No.
Type 1	Adaiyur	558	2,170	2,066	4,236			2,118	928	72	40
	Alaganandal	383	931		931			327	439	71	13
	Ananandal	272	1,063	987	2,050			744	414	81	12
	Allikondapattu	111	697	674	1,371				1,398	191	83
	Anaipirandan	212	742	747	1,489			71	351	23	13
	Andampallam	942	3,186	310	3,496			707	1,398	191	83
	Aradapattu	417	1,402	1,379	2,781			1,576	606	83	34
	Aruthirapattu	84	319	338	657			311	191		10
	Athiyandal	275	955	875	1,830			760	403	23	22
	Ayyam Palayam	622	1,933	1,890	3,823			2,314	825	55	36
	Chinnakkallapadi	367	1,117	1,073	2,190			1,456	454	13	6
	Devanandal	434	863	784	1,647			549	396	27	15
	Su.Kinachipattu	277	1,217	1,158	2,375			224	503	41	31
	Devanur	324	1,035	1,076	2,111				440	27	16
	Endal	481	1,292	1,193	2,485	618	83	701	541	38	24
	Melkachirapattu	485	776	778	1,554	541	182	723	407	45	15
	Meyyur	861	1,926	1,959	3,885	786		786	866	149	66
	Nallanpillaipetral	330	928	976	1,904	352	52	404	437	22	19
	Savalpoondi	348	537	539	1,076	514	43	557	251	8	11
	Udayanandal	157	343	354	697				143	16	3
	Viswanthangal	332	728	705	1,433			482	315	1	13
	Isukkalikatteri	652	1,747	1,659	3,406			2,270	606	47	34
	Kallottu	136	361	329	690			346	140	10	9
	Kandiyankuppam	393	885	838	1,723			757	392	18	16

GP Type	Key CWRM Parameter	Geographical Area	Male Population	Female Population	Total Population	SC Population	ST Population	Vulnerable popupation	Households (HH's)	Only one room HH's (SECC)	Female Headed HH's (SECC)
		ha	No.	No.	No.	No.	No.	No.	No.	No.	No.
Type 1	Kannapandal	86	624	623	1,247			157	300	32	20
	Kattampoondi	562	1,873	1,852	3,725			204	884	107	26
	Kolakkudi	319	1,024	1,042	2,066			929	482	66	21
	Madurampattu	642	1,247	1,266	2,513			636	515	80	24
	Nachanandal	276	909	818	1,727			287	424	24	20
	Nadupattu	191	561	552	1,113				266	12	7
	Naraiyur	706	1,787	1,710	3,497			984	730	70	33
	Navampattu	491	1,213	1,213	2,426			530	558		38
	Nariapattu	333	663	648	1,311			458	714	5	23
	Panaiyur	414	563	545	1,108			161	240	23	11
	Pandithapattu	307	1,058	1,058	2,116			379	497		30
	Parayampattu	223	990	963	1,953			1,142	497	76	27
	Pavupattu	447	1,620	1,534	3,154			843	745	137	42
	Periakallapadi	530	1,294	1,349	2,643			750	592	136	23
	Perumanam	806	1,686	1,663	3,349			316	761	244	33
	Su.Andapattu	279	580	601	1,181			27	283	79	20
	Su.Pappambadi	102	734	712	1,446			615	333	58	13
	Su.Valavetti	628	1,117	1,142	2,259			876	799	63	30
	Thandarai	540	1,072	1,046	2,118			867	460	37	16
	Thatchampattu	411	1,081	1,042	2,123				493	14	19
	Thiruvanaimugam Valasai	286	707	731	1,438			483	302	45	19
	Velayambakkam	443	1,023	965	1,988			243	884	117	40
	Veraiyur	288	524	533	1,057			540	255	32	10
	Viruthuvilanginan	289	1,168	1,114	2,282			467	459	36	16
Type 2	Su.Kambupattu	315	686	626	1,312			480	593	190	25
	Su.Nallur	229	458	445	903			254	593	190	25

GP Type	Key CWRM Parameter	Geographical Area	Male Population	Female Population	Total Population	SC Population	ST Population	Vulnerable popupation	Households (HH's)	Only one room HH's (SECC)	Female Headed HH's (SECC)
		ha	No.	No.	No.	No.	No.	No.	No.	No.	No.
Type 3	Adiannamalai	755	2,086	1,980	4,066			493	947	30	45
	T.Kalleri	517	1,440	1,395	2,835				159	35	5
	Kanandampoondi	443	826	729	1,555			458	354		17
	Chinnakangianur	604	2,054	1,610	3,664			710	805	63	53
	Kikachirapattu	378	932	886	1,818			450	420	40	22
	Kilchettipattu	340	739	693	1,432			55	361	21	27
	Melathikan	572	1,703	1,692	3,395			1,271	675	17	8
	Melchettipattu	360	830	861	1,691			425	372	3	75
	Nallavanpallyam	862	2,858	2,993	5,851			1,144	1,310	94	48
	Thenmathur	725	1,939	2,603	4,542			1,771	1,726	100	93
	Kilkaripur	471	1,446	1,342	2,788			738	575	21	26
	Malappambadi	581	1,269	1,315	2,584			983	613	40	27
	Nochimalai	386	971	1,017	1,988			40	447	25	18
	Thalayampallam	587	1,908	1,967	3,875			32	884	117	40
	Palaiyanur	846	1,908	1,967	3,875			32	1,078	188	50
	Pavithiram	1,093	2,294	2,439	4,733			718	1,048	98	68
	Kadagaman	496	1,356	1,276	2,632			772	330	57	25
	Thiruvarangam Valavetti	180	458	444	902				228	19	8
Type 5	Vengikkal	701	9,278	8,966	18,244			2,437	3,880	25	51

GP Type	Key CWRM Parameter	Vulnerable Households (SECC)	% of Vulnerable Households	Registered MGNREGA Job cards	Active person working in MGNREGA job Cards	Drinking Water Sources	Ground Water - Drinking source	Surface water - Drinking source	sum of drinking water sources	HH's have tap water connection for drinking water	HH's dependent on other sources for drinking water	Annual Greywater Generation
		No.	%	Persons	Persons	No.	No.	No.	No.	No.	No.	ha.m
Type 1	Adaiyur	62	6.72	732	434	233	4	1	5			8
	Alaganandal	54	12.21	741	483	135	4	1	5			2
	Ananandal	60	14.57	800	500	161	4	1	5	60	710	4
	Allikondapattu	159	11.34	665	311	368	4	1	5		340	3
	Anaipirandan	20	5.7	519	259	222	4	1	5			3
	Andampallam	159	11.34	1,946	1,290	144	4	1	5			6
	Aradapattu	68	11.27	1,382	601	153	4	1	5			5
	Aruthirapattu	3	1.57	420	256	257	4		4			1
	Athiyandal	23	5.63	556	347	97	4	1	5			3
	Ayyam Palayam	49	5.98	1,140	902							7
	Chinnakkallapadi	11	2.4	1,164	666	135	4	1	5			4
	Devanandal	23	5.91	1,094	566	104	5	1	6			3
	Su.Kinachipattu	38	7.55	629	527	382	3	1	4			4
	Devanur	24	5.39	1,140	628	202	4	1	5	1,118		4
	Endal	34	6	731	527	50	4	1	5			5
	Melkachirapattu	36	9	668	401	76	4	1	5			3
	Meyyur	124	14	1,610	1,016							7
	Nallanpillaipetral	21	5	740	356	39	4	1	5			3
	Savalpoondi	9	4	323	283	176	5	1	6			2
	Udayanandal	12	8	297	187	97	4	1	5			1
	Viswanthangal	5	1	559	349	386	5	1	6			3
	Isukkalikatteri	43	7.11	1,605	1,309	206	4	1	5			6
	Kallottu	10	6.93	371	260	158	4	1	5			1
	Kandiyankuppam	17	4.44	1,012	756	433	4	1	5		412	3
	Kannapandal	28	9.47	610	370	91	4	1	5			2

GP Type	Key CWRM Parameter	Vulnerable Households (SECC)	% of Vulnerable Households	Registered MGNREGA Job cards	Active person working in MGNREGA job Cards	Drinking Water Sources	Ground Water - Drinking source	Surface water - Drinking source	sum of drinking water sources	HH's have tap water connection for drinking water	HH's dependent on other sources for drinking water	Annual Greywater Generation
		No.	%	Persons	Persons	No.	No.	No.	No.	No.	No.	ha.m
Type 1	Kattampoondi	83	9.36	1,006	868	952	5	1	6			7
	Kolakkudi	53	10.89	1,084	563	48	4	1	5			4
	Madurampattu	63	12.27	870	534	63	4	1	5			5
	Nachanandal	23	5.38	763	490	177	5	1	6			3
	Nadupattu	11	3.95	518	271	32	4	1	5			2
	Naraiyur	59	8.07	1,474	1,165	130	4	1	5			6
	Navampattu	11	2.04	1,245	641	22	3	1	4			4
	Nariapattu	10	1.46	603	331							2
	Panaiyur	19	8.08	429	310	76	4	1	5			2
	Pandithapattu	9	1.81	1,088	650	560	4	1	5			4
	Parayampattu	61	12.33	1,075	660							4
	Pavupattu	109	14.56	1,323	1,044	885	5	1	6			6
	Periakallapadi	102	17.25	935	771	135	4	1	5			5
	Perumanam	181	23.75	1,040	883	929	4	1	5			6
	Su.Andapattu	61	21.66	465	306	22	4	1	5			2
	Su.Pappambadi	45	13.36	507	413	83	4		4			3
	Su.Valavetti	53	6.65	670	574	143	4	1	5			4
	Thandarai	31	6.67	682	490	142	4	1	5			4
	Thatchampattu	16	3.14	1,178	738	51	3	1	4			4
	Thiruvanaimugam Valasai	37	12.32	601	416	152	4	1	5			3
	Velayambakkam	94	10.62	Person	Person	477	4	1	5			4
	Veraiyur	25	9.96	539	310	2,318	5	1	6			2
	Viruthuvilanginan	30	6.54	663	575	531	4	1	5			4

GP Type	Key CWRM Parameter	Vulnerable Households (SECC)	% of Vulnerable Households	Registered MGNREGA Job cards	Active person working in MGNREGA job Cards	Drinking Water Sources	Ground Water - Drinking source	Surface water - Drinking source	sum of drinking water sources	HH's have tap water connection for drinking water	HH's dependent on other sources for drinking water	Annual Greywater Generation
		No.	%	Persons	Persons	No.	No.	No.	No.	No.	No.	ha.m
Type 2	Su.Kambupattu	141	23.69	378	293	258	5	1	6			2
	Su.Nallur	141	23.69	437	364							2
Type 3	Adiannamalai	35	3.64	1,211	854	1,036	4	1	5			7
	T.Kalleri	26	16.35	1,176	772	15	3	1	4			5
	Kanandampoondi	5	1.44	908	489	386	5	1	6			3
	Chinnakangianur	60	7	1,162	774	58	3	1	4			7
	Kikachirapattu	35	8	669	461	370	5	1	6			3
	Kilchettipattu	23	6	545	341	207	5	1	6			3
	Melathikan	14	2	849	645	15	2		2			6
	Melchettipattu	25	7	470	385	57	5	1	6			3
	Nallavanpallyam	80	6	908	723	539	5	1	6			11
	Thenmathur	98	6	1,151	896	87	4	1	5			8
	Kilkaripur	23	3.91	1,085	774							5
	Malappambadi	36	5.89	1,342	794	12	2		2			5
	Nochimalai	23	5.12	798	522	43	4	1	5			4
	Thalayampallam	94	10.62	1,686	1,052							7
	Palaiyanur	147	13.6	2,415	1,452							7
	Pavithiram	89	8.49	1,002	871	574	5	1	6			9
	Kadagaman	47	14.36	1,390	765							5
	Thiruvarangam Valavetti	16	6.89	200	156	174	5	1	6			2
Type 5	Vengikkal	33	0.85	1,207	1,008							3

ANNEXURE 4

IPCC VULNERABILITY ASSESSMENT METHODOLOGY

Normalization of Indicators:

In order to make the indicators free from the units, normalization has done. The normalization process varies depending on the nature of relationship of that particular indicator with the vulnerability. The following formula are used,

- for indicators with positive relationship with vulnerability

$$x_{ij}^{P} = \frac{Xij - Min\, i\{Xij\}}{(Max\, i\{Xij\} - Min\, i\{Xij\}}$$

- for indicators with negative relationship with vulnerability

$$x_{ij}^{n} = \frac{Max\, i\{Xij\} - Xij}{Max\, i\{Xij\} - Min\{Xij\}}$$

Aggregation and categorization of Indicators

The normalized values of indicator sets are aggregated to obtain the vulnerability index and categorized in to high, medium and low vulnerability classes.

$$VI = \frac{\sum_{i}^{N} K_i S_i}{K_i}$$

X_{ij} is the value of j^{th} indicator for i^{th} GP and X^{P}_{ij} is the normalized value

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

ANNEXURE 5.1

GP WISE WASCA PROPOSED TREATMENT AREA

GP Type	Key CWRM Parameter	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
		ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1	Adaiyur	55.39	8.25	-	-	-	0.78	16.82	3.29	-
	Alaganandal	-	-	22.58	-	15.92	2.71	3.13	1.12	23.39
	Ananandal	-	6.44	-	-	-	-	10.36	5.02	13.29
	Allikondapattu	-	2.99	-	-	-	-	2.3	0.96	6.32
	Anaipirandan	-	1.64	-	-	-	0.12	5.67	3.41	2.47
	Andampallam	5.29	3.9	-	-	-	4.59	1.33	37.03	38.78
	Aradapattu	2.42	2.63	-	0.3	1.82	-	13.15	0.68	21.19
	Aruthirapattu	1.67	-	-	-	0.03	-	0.68	-	1.79
	Athiyandal	1.55	3.72	-	-	-	-	6.05	0.28	9.61
	Ayyam Palayam	60.76	3.61	-	-	-	3	18.01	2.6	10.05
	Chinnakkallapadi	32.22	21.53	-	-	2.88	-	2.26	0.07	17.58
	Devanandal	-	41.12	-	-	11.75	-	12.26	0.96	9.76
	Su.Kinachipattu	-	-	-	-	0.32	-	12.03	1	8.38
	Devanur	0.92	13.27	-	-	0.43	-	6.88	0.46	10.04
	Endal	6.95	-	-	0.45	-	0.09	13.39	0.17	13.84
	Melkachirapattu	-	28.77	-	-	67.54	0.54	11.09	2.53	14.7
	Meyyur	15.86	21.41	-	-	0.68	1.09	43.14	6.57	24.55
	Nallanpillaipetral	-	1.01	-	-	0.84	-	5.07	4.09	9.54
	Savalpoondi	-	14.18	-	-	5.36	-	6.19	1.7	14.86
	Udayanandal	14.21	-	5.32	-	-	-	2.37	0.58	8.62
	Viswanthangal	1.57	-	-	-	1.55	-	1.74	0.26	11.45
	Isukkalikatteri	-	50.75	0.79	-	1.52	-	8.31	6.25	36.42
	Kallottu	-	0.44	-	-	0.29	-	2.17	1.37	6.45

GP Type	Key CWRM Parameter	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
		ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 1	Kandiyankuppam	34.98	12.89	-	-	-	-	4.19	-	21.17
	Kannapandal	7.59	-	-	-	2.72	-	0.78	-	5.93
	Kattampoondi	48.99	15.71	-	-	2.25	3.3	9.71	2.03	27.9
	Kolakkudi	5.43	15.08	-	-	-	-	6.15	0.46	15.34
	Madurampattu	-	43.51	-	-	5.77	4.95	36.38	2.79	18.54
	Nachanandal	26.59	17.41	-	-	23.72	-	2.61	0.54	11
	Nadupattu	14.19	-	-	12.8	-	0.4	1.12	0.02	10.63
	Naraiyur	-	37.28	-	-	5.55	0.55	23.04	5.32	26.07
	Navampattu	-	12.75	-	-	3.2	0.62	2.4	0.75	24.02
	Nariapattu	-	5.33	-	-	-	0.1	0.71	-	23.12
	Panaiyur	42.85	-	-	-	2.6	0.06	17.82	1.65	8.29
	Pandithapattu	-	0.14	-	-	-	-	2.03	1.91	5.08
	Parayampattu	2.14	0.83	-	-	1.76	-	0.97	-	15.84
	Pavupattu	44.29	37.5	-	-	-	-	9.22	4.23	21.84
	Periakallapadi	-	-	22.58	-	15.92	3.33	3.84	1.37	23.39
	Perumanam	-	5.88	-	-	0.63	-	68.01	21.86	8.15
	Su.Andapattu	3.99	-	-	-	17.19	-	2.28	0.47	13.93
	Su.Pappambadi	-	9.35	-	0.45	-	-	0.68	5.65	3.81
	Su.Valavetti	-	-	-	-	3.05	3.7	20.68	1.23	20.51
	Thandarai	-	36.15	-	0.57	0.44	-	5.72	15.1	14.57
	Thatchampattu	-	26.33	-	-	0.83	0.92	0.89	0.81	23.39
	Thiruvanaimugam Valasai	26.61	1.32	-	-	-	-	8.76	2.44	13.74
	Velayambakkam	1.95	1.98	-	-	5.98	-	11.19	3.39	19.75
	Veraiyur	24.76	0.17	-	-	0.31	-	4.36	0.19	12.36
	Viruthuvilanginan	15.8	38.21	-	0.17	2.39	0.88	3.65	2.36	9.8

GP Type	Key CWRM Parameter	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Culturable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
		ha	ha	ha	ha	ha	ha	ha	ha	ha
Type 2	Su.Kambupattu	44.29	8.24	-	-	-	-	53.3	1.68	21.41
	Su.Nallur	44.29	8.24	-	-	-	-	53.3	1.68	21.41
Type 3	Adiannamalai	-	16.03	-	-	3.03	-	18.56	1.29	10.21
	T.Kalleri	-	0.47	-	-	1.76	2.48	29.19	6.9	25.41
	Kanandampoondi	-	15.71	-	-	-	0.48	1.29	1.56	14.35
	Chinnakangianur	55.63	0.28	-	-	22.63	-	22.8	16.42	20.04
	Kikachirapattu	37.02	-	14.43	10.85	30.85	-	9.19	0.33	11.36
	Kilchettipattu	-	0.05	-	-	1.03	2.82	3.69	2.7	16.68
	Melathikan	56.64	1.64	-	13.76	0.29	-	5.75	0.22	15.64
	Melchettipattu	-	-	-	-	5.71	-	7.99	1.29	18.07
	Nallavanpallyam	-	37.98	-	-	5.55	0.42	18.6	6.01	30.93
	Thenmathur	62.84	-	13.26	-	27.39	-	22.34	1.51	24.72
	Kilkaripur	-	1.85	-	-	-	-	4.4	2.06	26.27
	Malappambadi	-	7.39	33.03	-	0.51	-	11.27	9.11	9.73
	Nochimalai	35.97	-	17.81	0.6	1.02	-	9.02	0.95	9.38
	Thalayampallam	59.99	4.42	-	0.44	3.25	0.87	10.42	0.09	34.88
	Palaiyanur	-	146.86	-	-	5.04	0.55	22.44	1.15	34.57
	Pavithiram	-	56.33	-	0.32	2.36	6.25	39.75	0.36	28.19
	Kadagaman	-	4.39	-	-	0.42	3.34	11.64	6.23	16.89
	Thiruvarangam Valavetti	5.18	1.48	-	-	-	-	1.91	0.59	8.29
Type 5	Vengikkal	-	-	30	0.54	-	-	40.91	25.38	4.46

Land Resources - WASCA Treatment Proposed Area	logic
Treatment Area under Forest Land	40% of the total Area (area after removal of potential voids)
Treatment Area under Non-Agricultural Uses	Identifying Additional Area available for recharge & plantation(if area is above 20 %: consider all the additional area for treatment(ex 24.86 %, 4.86 % is proposed): if the % area is between 15-20 % only, consider 50 % of additional area)
Treatment Area under Barren & Un-cultivable Land	75% of the total Area (area after removal of potential voids)
Treatment Area under Permanent Pastures and Other Grazing Land	75% of the total Area (potential area for treatment after removal of voids)
Treatment Area under Land Under Miscellaneous Tree Crops etc.	75% of the total Area (non- voids area)
Treatment Area under Cultivable Waste Land	75% of the total Area (non- voids area)
Treatment Area under Fallows Land other than Current Fallows	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
Treatment Area under Current Fallow land	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
Treatment Area under Unirrigated Land	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
Treatment Area Irrigated by Source	Bore Well Farmer Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF

ANNEXURE 5.2

GP WISE EXPECTED RUNOFF CONSERVATION AFTER WASCA TREATMENT

GP type	GP name	Good Catchment Area ha.m	Average Catchment Area ha.m	Bad Catchment Area ha.m
Type 1	Adaiyur	23.14	0	6.25
	Alaganandal	1.03	10.82	5.67
	Ananandal	8.2	0	5.36
	Allikondapattu	1.8	0	1.79
	Anaipirandan	1.57	0	2.18
	Andampallam	30	0	15.28
	Aradapattu	10	0.6	6.55
	Aruthirapattu	4.2	0.01	0.46
	Athiyandal	2.1	0	2.98
	Ayyam Palayam	23.42	0	6.29
	Chinnakkallapadi	20.33	0.81	3.72
	Devanandal	15.18	3.3	4.3
	Su.Kinachipattu	3.03	0.09	4
	Devanur	5.96	0.12	3.25
	Endal	2.65	0.13	5.14
	Melkachirapattu	10.69	18.98	5.4
	Meyyur	15.43	0.19	14.09
	Nallanpillaipetral	1.71	0.24	3.5
	Savalpoondi	5.34	1.51	4.25
	Udayanandal	6.2	1.5	2.2
	Viswanthangal	0.8	0.4	2.5
	Isukkalikatteri	18.55	0.65	9.53
	Kallottu	0.4	0.08	1.87
	Kandiyankuppam	12.47	0	4.74
	Kannapandal	3.19	0.77	1.26
	Kattampoondi	25.7	0.63	8.03
	Kolakkudi	7.7	0	4.1
	Madurampattu	16.1	1.6	11.7
	Nachanandal	16.82	6.66	2.64
	Nadupattu	5.53	3.6	2.27
	Naraiyur	13.95	1.56	10.28
	Navampattu	6.15	0.9	5.2
	Nariapattu	2.4	0	4.5
	Panaiyur	16.4	0.7	5.2
	Pandithapattu	0.9	0	1.7
	Parayampattu	1.5	0.5	3.1
	Pavupattu	30.7	0	6.6
	Periakallapadi	0.9	10.8	6
	Perumanam	4.4	0.2	18.3
	Su.Andapattu	2.19	4.83	3.12
	Su.Pappambadi	3.55	0.13	1.9
	Su.Valavetti	0.7	0.9	8.6
	Thandarai	13.5	0.3	6.6

GP type	GP name	Good Catchment Area ha.m	Average Catchment Area ha.m	Bad Catchment Area ha.m
Type 1	Thatchampattu	15.3	0.2	4.9
	Thiruvanaimugam Valasai	10.3	0	4.7
	Velayambakkam	1.96	1.68	6.42
	Veraiyur	9.5	0.1	3.2
	Viruthuvilanginan	19.9	0.7	3.1
Type 2	Su.Kambupattu	19	0	14.3
	Su.Nallur	19.6	0	14.3
Type 3	Adiannamalai	8.5	0.9	5.6
	T.Kalleri	1.3	0.5	12
	Kanandampoondi	6	0	3.3
	Chinnakangianur	20.6	6.4	11.1
	Kikachirapattu	14.1	15.8	3.9
	Kilchettipattu	0.6	0.3	4.8
	Melathikan	21.1	3.9	4
	Melchettipattu	0.7	1.6	5.1
	Nallavanpallyam	20.5	1.6	10.5
	Thenmathur	22.9	11.4	9.1
	Kilkaripur	1	0	6.1
	Malappambadi	3	9.4	5.6
	Nochimalai	15.6	5.5	3.6
	Thalayampallam	20	1	8.7
	Palaiyanur	54.8	1.4	11
	Pavithiram	23.5	0.8	13.9
	Kadagaman	1.9	0.1	7.1
	Thiruvarangam Valavetti	2.6	0	2
Type 5	Vengikkal	1.3	8.6	13.2

ANNEXURE 5.3

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

Gram Panchayat	Aff (ha)		ARS	AVP (m)		Az	BP (ha)		CBP (ha)		CS (No.)
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Area	No.
Adaiyur	6,400	8	-	-	3	155	-	-	-	-	155
Adiannamalai	15,200	19	-	-	3	65	-	-	-	-	65
Alaganandal	-	-	-	-	2,202	52	-	-	-	-	52
Allikondapattu	2,394	3	-	-	-	10	177	-	200	1,000	10
Anaipirandan	1,600	2	-	-	-	29	-	-	-	-	29
Ananandal	5,154	6	-	-	-	13	300	-	400	2,000	132
Andampallam	3,120	4	-	-	-	70	2,050	3	600	3,000	70
Aradapattu	3,558	4	-	-	-	20	1,150	1	1,600	8,000	20
Aruthirapattu	-	-	-	111	555	27	-	-	-	-	27
Athiyandal	3,200	4	-	-	-		-	-	-	-	
Ayyam Palayam	32,800	4	-	-	-	21	-	-	-	-	21
Chinnakallapadi	19,530	24				27	774	1	-	-	27
Chinnakallapadi			-	-	-						
Chinnakangianur	-	-	-	-	-	79	-	-	-	-	79
Chinnakkallapadi											
Devanandal	42,400	53	-	-	-	20	-	-	700	3,500	20
Devanur	10,956	14	-	-	-	12	830	1	280	1,400	12
Endal	3,200	4	-	-	-		-	-	-	-	
Isukkalikatteri	41,820	52	-	-	-	10	152	-	1,000	5,000	10
Kadagaman	4,000	5	-	-	3,720	47	12,000	15	-	-	38
Kallottu	-	-	-	465	1,163	40	-	-	-	-	40
Kanandampoondi	4,800	6	25	-	5,475	37	14,240	18	-	-	88
Kandiyankuppam	10,314	13	-	-	-	15	841	1	500	2,500	15
Kannapandal	-	-	-	-	-	52	-	-	-	-	52
Kattampoondi	14,370	18	-	-	-	109	-	-	-	-	109
Kikachirapattu											
Kilchettipattu	-	-	-	-	1,470	20	-	-	-	-	23

Gram Panchayat	Aff (ha)		ARS	AVP (m)		Az	BP (ha)		CBP (ha)		CS (No.)
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Area	No.
Kilkachirapattu	13,360	17	25	-	795	35	17,920	22	-	-	63
Kilkaripur	1,600	2	263	-	4,305	23	8,000	10	-	-	127
Kolakkudi	12,066	15	-	-	-	90	-	-	-	-	90
Madurampattu	1,600	2	-	-	-		-	-	-	-	
Malappambadi	-	-	-	-	-	130	-	-	-	-	130
Melathikan	1,308	2				45	-	-	-	-	45
Melathikan			-	-	-						
Melchettipattu	4,800	6	-	-	3,005	25	6,400	8	-	-	17
Melkachirapattu	77,600	97	-	-	-	49	-	-	-	-	49
Meyyur	17,600	22	-	-	-	112	-	-	-	-	112
Nachanandal	16,032	20	28	-	-	40	-	-	-	-	72
Nadupattu	-	-	-	-	-	61	10,236	13	-	-	61
Nallanpillaipetral	1,482	2	-	-	-	66	-	-	-	-	66
Nallavanpalayam	-		-	-	-	80	-	-	-	-	97
Nallavanpallyam											
Naraiyur	34,264	43	-	-	-	58	400	1	-	-	16
Nariapattu	-	-	-	-	-	10	-	-	-	-	27
Navampattu	12,762	16	-	-	-	28	533	1	820	4,100	28
Nochimalai	1,632	1				95	-	-	-	-	95
Nochimalai			-	-	-						
Palaiyanur	-	-	-	-	-		-	-	-	-	
Panaiyur	2,082	3	-	-	-	8	1,167	1	800	4,000	8
Pandithapattu	-	-	-	-	-	95	-	-	-	-	95
Parayampattu	2,080	3	-	-	-	61	-	-	-	-	30
Pavithiram	-	-	-	-	-		-	-	-	-	
Pavupattu	30,000	38	218	-	-	109	26,574	33	-	-	81
Periakallapadi	12,732	16	-	-	-	29	495	1	-	-	29
Perumanam	5,208	7	-	-	-	22	1,402	2	80	400	22
Savalpoondi	5,208	7	-	-	-	34	-	-	-	-	79
Su. Pappambadi	7,200	9	-	-	-	55	-	-	-	-	55

Gram Panchayat	Aff (ha)		ARS	AVP (m)		Az	BP (ha)		CBP (ha)		CS (No.)
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Area	No.
Su.Andapattu	13,752	17	-	-	-	16	858	1	2,000	10,000	16
Su.Kambupattu	960	1	-	-	1,765	172	12,000	15	-	-	38
Su.Kilnachipattu	-	-	-	-	-	90	-	-	-	-	90
Su.Kinachipattu											
Su.Nallur	5,600	7	-	-	1,900	141	12,800	16	-	-	45
Su.Pappambadi											
Su.Valavetti	2,436	3	-	-	-	14	-	12	-	-	14
T.Kalleri	1,920	2	228	-	-	35	14,192	18	-	-	167
Thalayampallam	6,132	8	-	-	-	29	1,988	2	-	-	29
Thandarai	29,268	37	-	-	-	20	-	-	-	-	20
Thatchampattu	21,720	27	-	-	-	16	-	-	-	-	16
Thenmathur	-	-	-	-	-	62	-	-	-	-	62
Thiruvanaimugam Valasai	56,000	7	-	-	-	37	800	1	456	2,280	14
Thiruvarangam Valavetti	41,883	52	88	-	-	25	-	-	-	-	19
Udayanandal	-	-	-	-	-	30	-	-	-	-	30
Velayambakkam	6,366	8	-	-	-	11	1,326	2	500	2,500	11
Vengikkal	-	-	-	-	-		-	-	-	-	
Veraiyur	-	-	-	-	220	23	-	-	-	-	23
Viruthuvilanginan	32,478	41	-	-	-	19	-	-	-	-	19
Viswanthangal	1,600	2	13	-	-	36	6,880	9	-	-	67

Gram Panchayat	CT (No.)	CO (No,)		FP (No.)	COWRS (No.)	CCB (m)		DLT (m)		DLHA (ha)	
	No.	No.	Area	No.	No.	No.	Length	No.	Length	No.	Area
Adaiyur	155	-	-	12	10	-	-	954	4,769		
Adiannamalai	65	-	-	20	10	-	-	-	-		
Alaganandal	52	-	-	10	10	-	-	1,001	5,005		
Allikondapattu	10	6	6	10	-	-	-	94	470	2,572	3
Anaipirandan	29	-	-	4	3	-	-	-	-		
Anandandal	132	6	17	10	-	-	-	422	2,111	6,678	8
Andampallam	70	6	54	10	-	-	-	763	3,817	21,460	27
Aradapattu	20	6	37	10	-	-	-	804	4,021	14,720	18
Aruthirapattu	27	-	-	2	4	-	-	142	709		
Athiyandal		-	-	5	7	-	-	319	1,594		
Ayyam Palayam	21	-	-	15	10	-	-	245	1,226		
Chinnakallapadi	27	6	7	10	60	-	-	915	4,577	2,620	3
Chinnakallapadi											
Chinnakangianur	79	6	-	-	-	-	-	-	-		
Chinnakkallapadi											
Devanandal	20	-	-	10	10	-	-	1,423	7,115		
Devanur	12	6	12	10	-	-	-	858	4,292	4,731	6
Endal		-	-	-	-	-	-	310	1,550		
Isukkalikatteri	10	6	40	10	-	-	-	1,050	5,248	15,933	20
Kadagaman	38	5	-	6	68	-	-	177	886		
Kallottu	40	-	-	3	110	-	-	271	1,356		
Kanandampoondi	88	8	-	14	57	3,500	18	356	1,781	12,640	16
Kandiyankuppam	15	6	21	10	-	-	-	1,230	6,148	8,571	11
Kannapandal	52	6	37	-	-	-	-	-	-		
Kattampoondi	109	6	37	-	-	-	-	1,105	5,524		
Kikachirapattu											
Kilchettipattu	23	5	-	11	67	-	-	-	-	10,240	13
Kilkachirapattu	63	2	-	7	43	4,480	22	323	1,617		
Kilkaripur	127	3	-	6	105	-	-	-	-		

Gram Panchayat	CT (No.)	CO (No,)		FP (No.)	COWRS (No.)	CCB (m)		DLT (m)		DLHA (ha)	
	No.	No.	Area	No.	No.	No.	Length	No.	Length	No.	Area
Kolakkudi	90	6	37	-	-	-	-	324	1,620		
Madurampattu		-	-	10	7	-	-	-	-		
Malappambadi	130	6	-	-	-	-	-	-	-		
Melathikan	45	6	-	-	-	-	-	-	-		
Melathikan											
Melchettipattu	17	5	-	7	72	-	-	-	-		
Melkachirapattu	49	-	-	10	15	-	-	951	4,756		
Meyyur	112	-	-	10	20	-	-	1,454	7,272		
Nachanandal	72	7	-	7	46	-	-	-	-	11,200	14
Nadupattu	61	-	-	-	-	-	-	-	-		
Nallanpillaipetral	66	-	-	-	-	-	-	-	-		
Nallavanpalayam	97	-	-	-	-	-	-	-	-		
Nallavanpallyam											
Naraiyur	16	6	50	11	-	-	-	-	-	11,464	14
Nariapattu	27	8	-	7	26	-	-	-	-		
Navampattu	28	6	8	10	90	-	-	1,366	6,831	3,399	4
Nochimalai	95	6	-	-	-	-	-	-	-		
Nochimalai											
Palaiyanur		-	-	-	-	-	-	-	-		
Panaiyur	8	6	26	10	33	-	-	583	2,917	10,386	13
Pandithapattu	95	-	-	10	5	-	-	212	1,060		
Parayampattu	30	3	-	4	63	-	-	-	-		
Pavithiram		-	-	-	-	-	-	-	-		
Pavupattu	81	7	-	7	87	-	-	-	-		
Periakallapadi	29	6	49	10	20	-	-	1,427	7,133	19,779	25
Perumanam	22	6	163	10	-	-	-	1,080	5,399	65,346	82
Savalpoondi	79	8	-	10	56	-	-	179	894		
Su. Pappambadi	55	-	-	6	10	-	-	-	-		
Su.Andapattu	16	6	40	10	-	-	-	860	4,299	16,033	20

Gram Panchayat	CT (No.)	CO (No,)		FP (No.)	COWRS (No.)	CCB (m)		DLT (m)		DLHA (ha)	
	No.	No.	Area	No.	No.	No.	Length	No.	Length	No.	Area
Su.Kambupattu	38	4	-	6	43	-	-	160	800		
Su.Kilnachipattu	90	6	37	-	-	-	-	772	3,862		
Su.Kinachipattu											
Su.Nallur	45	3	13	6	43	-	-	160	800		
Su.Pappambadi											
Su.Valavetti	14	9	-	11	64	-	-	1,473	7,367		
T.Kalleri	167	17	-	18	91	-	-	-	-	19,368	24
Thalayampallam	29	6	48	10	140	-	-	860	4,299	19,333	24
Thandarai	20	7	-	-	58	-	-	1,080	5,401		
Thatchampattu	16	5	-	-	-	-	-	1,210	6,051		
Thenmathur	62	6	-	-	-	-	-	-	-		
Thiruvanaimugam Valasai	14	4	-	5	55	-	-	60	302		
Thiruvarangam Valavetti	19	2	-	2	33	-	-	286	1,432		
Udayanandal	30	-	-	-	-	-	-	328	1,638		
Velayambakkam	11	6	35	10	79	-	-	860	4,299	14,193	18
Vengikkal		-	-	-	-	-	-	-	-		
Veraiyur	23	-	-	-	10	-	-	545	2,727		
Viruthuvilanginan	19	3	-	-	39	-	-	603	3,014		
Viswanthangal	67	12	-	-	44	-	-	199	996		

Gram Panchayat	FBBT (ha)		FD (No.)	GSS (No.)	ICP (m)		LD (ha)		LP (m)		Mi (ha)	
	No.	Area	No.	No.	No.	Length	No.	Area	No.	Length (m)	No.	Area
Adaiyur	29	72	155	12	-	-	28	69	-	-	-	-
Adiannamalai	33	132	65	12	-	-	53	132	-	-	-	-
Alaganandal	3	8	52	8	-	-	9	22	-	-	-	-
Allikondapattu	1	2	10	5	-	-	-	1	-	-	2	4
Anaipirandan	-	-	29		-	-	14	34	-	-	-	-
Ananandal	3	7	13	52	-	-	1	4	-	-	4	9
Andampallam	11	27	70	16	600	3,000	5	13	-	-	11	27
Aradapattu	6	15	20	38	-	-	3	7	-	-	9	23
Aruthirapattu	3	11	27	5	-	-	4	11	-	-	-	-
Athiyandal	10	25			-	-	11	28	-	-	-	-
Ayyam Palayam	6	14	21	11	-	-	32	81	-	-	-	-
Chinnakallapadi	2	5	27	41	-	-	-	1	-	-	2	4
Chinnakallapadi												
Chinnakangianur	-	-	79	13	-	-	-	-	-	-	-	-
Chinnakkallapadi												
Devanandal	22	54	20	6	-	-	22	54	-	-	-	-
Devanur	3	7	12	1	-	-	1	3	-	-	2	5
Endal	-	-		-	-	-	-	-	-	-	-	-
Isukkalikatteri	6	16	10	16	-	-	3	7	-	-	10	25
Kadagaman	6	-	47	14	-	-	1	5	-	-	-	-
Kallottu	-	-	40	2	-	-	-	-	-	-	-	-
Kanandampoondi	6	120	37	30	-	-	-	-	519	2,595	-	-
Kandiyankuppam	3	7	15	1	-	-	1	3	-	-	6	15
Kannapandal	-	-	52	8	-	-	-	-	-	-	-	-
Kattampoondi	-	-	109	28	-	-	-	-	-	-	-	-
Kikachirapattu												
Kilchettipattu	5	100	20	6	59	294	-	-	221	1,105	-	-
Kilkachirapattu	2	5	35	17	159	794	-	-	645	3,225	-	-
Kilkaripur	-	-	23	27	-	-	1	2	222	1,110	-	-
Kolakkudi	-	-	90	20	-	-	-	-	-	-	-	-

Gram Panchayat	FBBT (ha)		FD (No.)	GSS (No.)	ICP (m)		LD (ha)		LP (m)		Mi (ha)	
	No.	Area	No.	No.	No.	Length	No.	Area	No.	Length (m)	No.	Area
Madurampattu	1	2			-	-	14	34	-	-	-	-
Malappambadi	-	-	130	21	-	-	-	-	-	-	-	-
Melathikan	-	-	45	7	-	-	-	-	-	-	-	-
Melathikan												
Melchettipattu	-	-	25	8	-	-	2	6	146	730	-	-
Melkachirapattu	15	37	49	4	-	-	15	37	-	-	-	-
Meyyur	24	60	112	7	-	-	32	81	-	-	-	-
Nachanandal	-	-	40	20	-	-	-	-	153	765	-	-
Nadupattu	10	25	61	14	-	-	-	-	-	-	-	-
Nallanpillaipetral	-	-	66	14	-	-	-	-	-	-	-	-
Nallavanpalayam	-	-	80	20	-	-	-	-	-	-	-	-
Nallavanpallyam												
Naraiyur			58	5	457	2,291	2		379	1,895	-	-
Nariapattu	4	10	10	-	-	-	-	-	176	880	-	-
Navampattu	3	7	28	8	-	-	1	2	-	-	2	5
Nochimalai	-	-	95	8	-	-	-	-	-	-	-	-
Nochimalai												
Palaiyanur	-	-			-	-	-	-	-	-	-	-
Panaiyur	9	22	8	8	-	-	4	10	-	-	3	7
Pandithapattu	10	25	95	5	-	-	16	41	-	-	-	-
Parayampattu	3	8	61	3	1,027	5,135	-	-	1,168	5,840	-	-
Pavithiram	-	-			-	-	-	-	-	-	-	-
Pavupattu	-	-	109	12	1,100	5,502	-	-	1,371	6,855	-	-
Periakallapadi	10	26	29	24	-	-	2	5	-	-	16	40
Perumanam	58	144	22	11	-	-	29	72	-	-	8	20
Savalpoondi	8	20	34	17	-	-	-	-	456	2,280	-	-
Su. Pappambadi	1	3	55	14	-	-	-	-	-	-	-	-
Su.Andapattu	11	27	16	15	-	-	2	5	-	-	12	30
Su.Kambupattu	6	-	172	26	-	-	1	1	-	-	-	-
Su.Kilnachipattu	-	-	90	4	-	-	-	-	-	-	-	-

Gram Panchayat	FBBT (ha)		FD (No.)	GSS (No.)	ICP (m)		LD (ha)		LP (m)		Mi (ha)	
	No.	Area	No.	No.	No.	Length	No.	Area	No.	Length (m)	No.	Area
Su.Kinachipattu												
Su.Nallur	6	-	141	30	-	-	1	-	-	-	-	-
Su.Pappambadi												
Su.Valavetti	10	25	14	-	-	-	5	12	-	-	-	-
T.Kalleri	-	-	35	65	-	-	-	-	-	-	-	-
Thalayampallam	6	15	29	8	-	-	2	6	-	-	15	37
Thandarai	43	108	20	21	-	-	17	44	-	-	-	-
Thatchampattu	32	80	16	2	-	-	16	40	-	-	-	-
Thenmathur	-	-	62	13	-	-	-	-	-	-	-	-
Thiruvanaimugam Valasai	5	13	37	10	-	-	2	-	-	-	-	-
Thiruvarangam Valavetti	4	10	25	17	-	-	1	4	-	-	-	-
Udayanandal	5	12	30	5	-	-	4	9	-	-	-	-
Velayambakkam	8	21	11	2	-	-	3	7	-	-	8	21
Vengikkal	-	-			-	-	-	-	-	-	-	-
Veraiyur		11	23	18	-	-	4	11	-	-	-	-
Viruthuvilanginan	42	105	19	30	-	-	18	44	-	-	-	-
Viswanthangal	1	3	36	17	-	-	-	-	527	2,635	-	-

Gram Panchayat	NADEP (No.)	ND (No.)		RWBPT (No.)	RWBO (No.)	RWBP (No.)	RRWH (No.)	SPD (ha)		SP (No.)	SPI (No.)	WCICD (m)
	No.	No.	Area	No.	No.	No.	No.	No.	Area	No.	No.	Length
Adaiyur	155	662	132	1	-	4	2	-	-	5	4	-
Adiannamalai	65	346	69	1	-	12	2	-	-	7		-
Alaganandal	52	120	24	1	-	3	2	-	-	10		-
Allikondapattu	10	3,060	612	1	-	3	2	-	-	3	34	-
Anaipirandan	29	106	21	-	-	8	2	-	-	-		-
Ananandal	-	3,060	612	1	-	4	2	-	-	4	39	-
Andampallam	70	3,060	612	1	-	7	2	-	-	14	141	3,000
Aradapattu	20	3,060	612	2	-	13	2	-	-	6	58	-
Aruthirapattu	27	99	20	1	-	2	2	-	-			-
Athiyandal				2	-	5	2	-	-	-		-
Ayyam Palayam	21	672	134	3	-	-	2	-	-	-		-
Chinnakallapadi	27	3,060	612				2	-	-	5	46	-
Chinnakallapadi												
Chinnakangianur	79	330	66	1	1	6	2	-	-	-		-
Chinnakkallapadi				1	-	2						
Devanandal	20	1,025	205	1	-	3	2	-	-	-		-
Devanur	12	3,060	612	2	-	7	2	-	-	5	45	-
Endal	-	286	57	-	4	3	2	-	-	-		-
Isukkalikatteri	10	3,060	612	4	-	4	2	630	1	6	65	-
Kadagaman	38	235	47	1	-	3	2	-	-	2	309	-
Kallottu	40	495	99	1	-	2	2	-	-			-
Kanandampoondi	88	185	37	1	-	4	2	-	-	18		-
Kandiyankuppam	15	3,060	612	1	-	2	2	-	-	4	35	-
Kannapandal	52	107	21	-	-	3	2	-	-	-		-
Kattampoondi	109	270	54	1	-	1	2	-	-			-
Kikachirapattu				1	3	-						
Kilchettipattu	23	100	20	1	1	-	2	-	-	1		294
Kilkachirapattu	63	175	35				2	11,520	14	2		794
Kilkaripur	127	115	23	1	-	2	2	-	-	2	578	-

Gram Panchayat	NADEP (No.)	ND (No.)		RWBPT (No.)	RWBO (No.)	RWBP (No.)	RRWH (No.)	SPD (ha)		SP (No.)	SPI (No.)	WCICD (m)
	No.	No.	Area	No.	No.	No.	No.	No.	Area	No.	No.	Length
Kolakkudi	90	101	20	2	-	6	2	-	-			-
Madurampattu				3	-	2	2	-	-	1		-
Malappambadi	130	106	21	2	-	2	2	-	-	-		-
Melathikan	45	34	7	2	3	7	2	-	-	-		-
Melathikan												
Melchettipattu	20	125	25	1	1	-	2	-	-	2	185	-
Melkachirapattu	49	233	47	1	7	-	2	-	-	-		-
Meyyur	112	390	78	2	-	-	2	-	-	-		-
Nachanandal	72	200	40	2	-	3	2	-	-	40		-
Nadupattu	61	345	69	2	-	2	2	-	-	-		-
Nallanpillaipetral	66	365	73	-	1	3	2	-	-	-		-
Nallavanpalayam	97	400	80				2	-	-	2		-
Nallavanpallyam				2	3	-						
Naraiyur	16	612	122	3	-	3	2	-	-	2	58	2,291
Nariapattu	27	50	10	1	-	3	2	-	-	2		-
Navampattu	28	3,060	612	3	-	4	2	-	-	6	55	-
Nochimalai	95	210	42	1	-	2	2	-	-	-		-
Nochimalai												
Palaiyanur				2	-	5	2	-	-	-		-
Panaiyur	8	3,060	612	2	-	4	2	-	-	2	23	-
Pandithapattu	95	205	41	2	-	3	2	-	-	4		-
Parayampattu	30	305	61	1	-	5	2	-	-	2		5,135
Pavithiram				2	-	-	2	-	-	-		-
Pavupattu	81	545	109	2	-	3	2	-	-	2		5,502
Periakallapadi	29	3,060	612	1	-	3	2	18,060	23	6	58	-
Perumanam	22	3,060	612	2	-	4	2	-	-	8	76	-
Savalpoondi	79	170	34	1	1	-	2	-	-	2		-
Su. Pappambadi	55	70	14				2	-	-	-		-
Su.Andapattu	16	1,390	278	2	-	3	2	-	-	3	28	-

Gram Panchayat	NADEP (No.)	ND (No.)		RWBPT (No.)	RWBO (No.)	RWBP (No.)	RRWH (No.)	SPD (ha)		SP (No.)	SPI (No.)	WCICD (m)
	No.	No.	Area	No.	No.	No.	No.	No.	Area	No.	No.	Length
Su.Kambupattu	38	172	34	1	-	3	2	-	-	3	172	-
Su.Kilnachipattu	90	190	38				2	-	-			-
Su.Kinachipattu				-	-	1						
Su.Nallur	45	260	52	1	-	3	2	-	-	3	104	-
Su.Pappambadi				-	-	3						
Su.Valavetti	14	799	160	1	-	5	2	-	-	8	53	-
T.Kalleri	167	175	35	2	-	5	2	-	-	17		-
Thalayampallam	29	4,325	865	2	-	6	2	-	-	9	87	-
Thandarai	20	460	92	2	-	3	2	-	-	5	31	-
Thatchampattu	16	493	99	2	-	2	2	-	-	5	16	-
Thenmathur	62	65	13	-	2	5	2	-	-	-		-
Thiruvanaimugam Valasai	14	290	58	1	-	3	2	-	-	3	180	-
Thiruvarangam Valavetti	25	228	46	1	-	1	2	-	-	1	416	-
Udayanandal	-	215	43	3	3	-	2	4,000	5	10		-
Velayambakkam	11	2,190	438	2	-	3	2	-	-	4	44	-
Vengikkal				1	-	3	2	-	-	-		-
Veraiyur	23	167	33	1	-	2	2	-	-	-	-	-
Viruthuvilanginan	19	459	92	1	-	6	2	-	-	5	30	-
Viswanthangal	70	180	36	2	6	-	2	-	-	38		-

ANNEXURE 7.1

GP WISE WASCA RECOMMENDATION AND WORKS UPLOADED

Name of the GP	WASCA Recom-mendation for 3 Years	Works uploaded for FY-2021-22 as on 16/11/21
Adaiyur	457	271
Adiannamalai	214	197
Alaganandal	466	191
Allikondapattu	186	265
Anaipirandan	110	122
Ananandal	408	628
Andampallam	1245	476
Aradapattu	543	462
Arudirapattu	100	127
Athiyandal	151	290
Ayyampalayam	234	181
Chinnakallapadi	287	247
Chinnakangiyanur	416	313
Devanandal	183	260
Devanur	226	326
Endal	171	555
Isukalikatteri	488	156
Kadagaman	415	191
Kalleri	915	227
Kallottu	90	115
Kanandampoondi	213	214
Kandiyangkuppam	181	316
Kannapandal	229	237
Kattampoondi	399	123
Kilchettipattu	232	292
Kilkachirapattu	306	186
Kilkaripur	403	622
Kolakudi	445	125
Madurampattu	461	172
Malappambadi	337	372
Melathikkan	229	208
Melchettipattu	300	229
Melkachirapattu	341	246
Meyyur	733	326
Nachanandal	279	434
Nadupattu	261	284
Nallanpillaipetral	210	391
Nallavanpalayam	553	193
Naraiyur	514	138
Nariyapattu	90	209
Navampattu	341	195
Nochimalai	252	552

Name of the GP	WASCA Recom-mendation for 3 Years	Works uploaded for FY-2021-22 as on 16/11/21
Palayanur	1033	302
Panaiyur	227	230
Pandithapattu	128	120
Parayampattu	368	260
Pavithram	747	183
Pavupattu	691	250
Periyakallapadi	672	221
Perumanam	775	222
Savalpoondi	244	333
So.kilnachipattu	299	327
Su.andapattu	537	178
Su.kambupattu	373	437
Su.nallur	284	158
Su.pappambadi	375	363
Su.valavetti	457	250
T.valasai	488	82
T.valavetti	274	182
Thalayampallam	760	237
Thandarai	333	115
Thatchampattu	186	191
Thenmathur	439	324
Udayandal	159	86
Velaiyambakkam	458	160
Vengikkal	181	303
Veraiyur	222	82
Viruduvilanginan	287	75
Viswanthangal	167	224

ANNEXURE 7.2

GP AND WORK CATEGORY WISE ONGOING WORKS IN TIRUVANNAMALAI BLOCK

Name of the GP	Work Category	No. of Ongoing works
Adaiyur	WCWH	1
	Works on Individuals Land (Category IV)	1
Adiannamalai	Rural Connectivity	2
	WCWH	2
	Works on Individuals Land (Category IV)	1
Alaganandal	WCWH	2
Allikondapattu	WCWH	1
Anaipirandan	WCWH	1
Ananandal	WCWH	1
	Works on Individuals Land (Category IV)	4
Andampallam	Rural Sanitation	1
	WCWH	1
Aradapattu	WCWH	1
Arudirapattu	WCWH	1
	Works on Individuals Land (Category IV)	1
Athiyandal	WCWH	1
	Works on Individuals Land (Category IV)	7
Ayyampalayam	Anganwadi/Other Rural Infrastructure	1
	WCWH	2
Chinnakallapadi	WCWH	1
Chinnakangiyanur	WCWH	2
Devanandal	WCWH	1
Devanur	WCWH	2
	Works on Individuals Land (Category IV)	1
Endal	WCWH	2
Isukalikatteri	WCWH	2
	Works on Individuals Land (Category IV)	1
Kadagaman	WCWH	2
	Works on Individuals Land (Category IV)	2
Kalleri	Rural Sanitation	1
	WCWH	2
	Works on Individuals Land (Category IV)	1
Kallottu	WCWH	1
Kandiankuppam	Rural Connectivity	1
	WCWH	1
	Works on Individuals Land (Category IV)	1

Name of the GP	Work Category	No. of Ongoing works
Kannandampoondi	WCWH	2
Kannapanndal	WCWH	2
Kattampoondi	Drought Proofing	1
	WCWH	3
	Works on Individuals Land (Category IV)	4
Kilchettipattu	WCWH	1
Kilkachirapattu	WCWH	1
Kilkaripur	Anganwadi/Other Rural Infrastructure	1
	Rural Connectivity	1
	WCWH	2
Kolakudi	WCWH	1
Madurampattu	WCWH	1
	Works on Individuals Land (Category IV)	1
Malappambadi	WCWH	2
Melathikkan	WCWH	1
	Works on Individuals Land (Category IV)	1
Melchettipattu	WCWH	1
	Works on Individuals Land (Category IV)	1
Melkachirapattu	WCWH	1
Meyyur	WCWH	1
	Works on Individuals Land (Category IV)	8
Nachanandal	WCWH	1
	Works on Individuals Land (Category IV)	1
Nadupattu	WCWH	1
	Works on Individuals Land (Category IV)	1
Nallampillaipetral	WCWH	1
Nallavanpalayam	WCWH	1
Naraiyur	WCWH	1
Nariyapattu	WCWH	7
Navambattu	Drought Proofing	1
	WCWH	1
Nochimalai	WCWH	1
Palayanur	Rural Sanitation	1
	WCWH	3
	Works on Individuals Land (Category IV)	1
	Rural Sanitation	1
	WCWH	3
Pandithapattu	WCWH	1
Parayampattu	WCWH	2
Pavithram	WCWH	2

Name of the GP	Work Category	No. of Ongoing works
Pavupattu	WCWH	1
	Works on Individuals Land (Category IV)	2
Periyakallapadi	WCWH	1
	Works on Individuals Land (Category IV)	2
Perumanam	Drought Proofing	1
	WCWH	2
	Works on Individuals Land (Category IV)	1
Savalpoondi	WCWH	1
So.Kilnachipattu	Drought Proofing	1
	WCWH	1
Su.Andapattu	WCWH	1
Su.Kambupattu	WCWH	1
Su.Nallur	Drought Proofing	1
	WCWH	1
	Works on Individuals Land (Category IV)	2
Su.Pappambadi	WCWH	1
Su.Valavetti	Drought Proofing	1
	WCWH	1
T. Valasai	WCWH	1
T. Valavetti	WCWH	1
Thandarai	Rural Connectivity	1
	Rural Sanitation	1
	WCWH	1
Thatchampattu	WCWH	3
	Works on Individuals Land (Category IV)	2
Thenmathur	WCWH	2
Udayandal	WCWH	1
Velaiyambakkam	WCWH	1
Vengikkal	Rural Connectivity	2
	WCWH	2
	Works on Individuals Land (Category IV)	1
Veraiyur	WCWH	2
Viruduvilanginan	WCWH	1
Viswanthangal	WCWH	2

*WCWH -Water conservation and WaterHarvesting

ANNEXURE 8

KEY CWRM PARAMETERS FOR THE GPS FALLING UNDER DEVANANDAL AND ADAIYUR MICRO-WATERSHED

Sl.No	Description	GPs in Micro-watershed	
		Devanandal GP	Adaiyur GP
Soil Resources: Status of Available Nitrogen in %			
1	Very Low (VL)	20%	33%
2	Low (L)	39%	46%
3	Medium (M)	7%	0%
4	High (H)	0%	0%
5	Very High (VH)	0%	0%
Status of Organic Carbon in %			
6	Very Low (VL)	53%	67%
7	Low (L)	40%	20%
8	Medium (M)	0%	0%
9	High (H)	0%	0%
10	Very High (VH)	0%	0%
Status of Soil Micro Nutrients in %			
11	Sufficient	60%	61%
12	Deficient	40%	39%
Status of Physical condition of the soil in %			
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	Slighly Acidic (SlAc)	4%	0%
18	Neutral (N)	0%	0%
19	Moderately Alkaline (MAI)	96%	100%
20	Strongly Alkaline (SIAI)	0%	0%
Soil Texture in %			
21	% of Clay Soil	5%	9%
22	% of Fine Soil	78%	80%
23	% of Coarse loamy	0%	9%
24	Soil Water Permeability	Moderate	Moderate
Means of Water Extraction in %			
25	Gravity	3%	2%
26	Lifting	97%	98%
Irrigation Methods in %			
27	Wild Flooding	17%	0%
28	Control Flooding	83%	100%
Livestock			
29	Cattle Population	198	1548
30	Sheep Population	0	201
31	Goat Population	111	230
32	Poultry	0	0

Land Resources (in ha)			
33	Area under Forest land	0	0
34	Area under Non-Agricultural Uses	41.74	110.78
35	Area under Barren & Un-cultivable Land	54.82	11
Land Resources (in ha)			
36	Area under Permanent Pastures and Other Grazing Land	0	0
37	Area under Land Under Miscellaneous Tree Crops etc.	0	0
38	Area under Culturable Waste Land	15.67	0
39	Area under Fallows Land other than Current Fallows	0	11.55
40	Area under Current Fallow land	207.42	250.08
41	Area under Unirrigated Land	16.3	48.89
42	Area Irrigated by Source	97.62	125.47

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