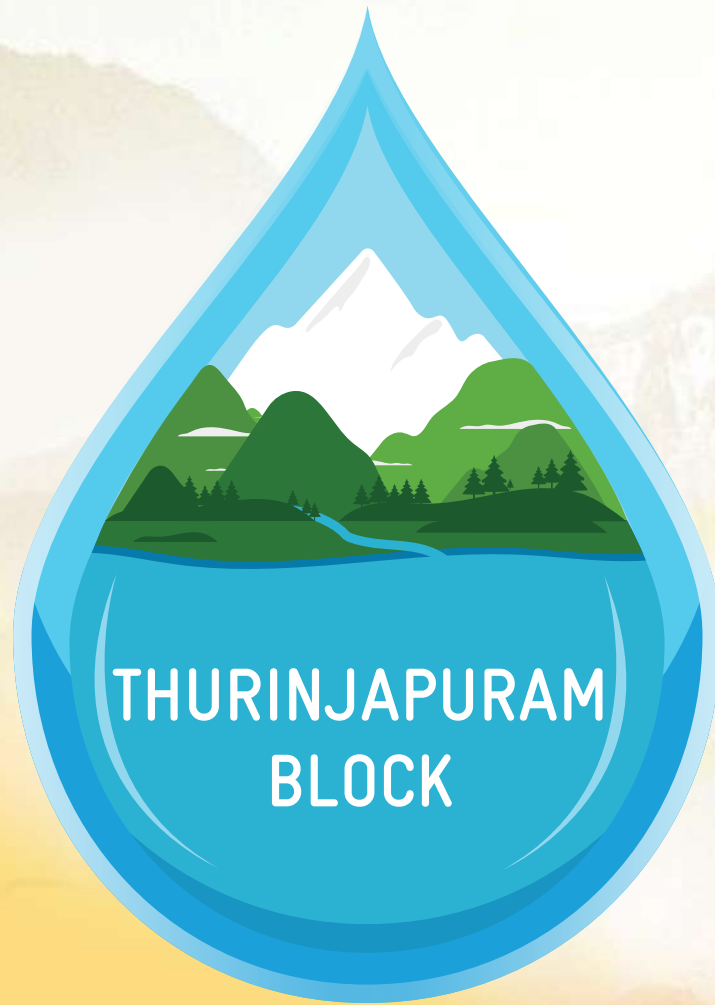


Ministry of Rural Development Ministry of Jal Shakti

WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

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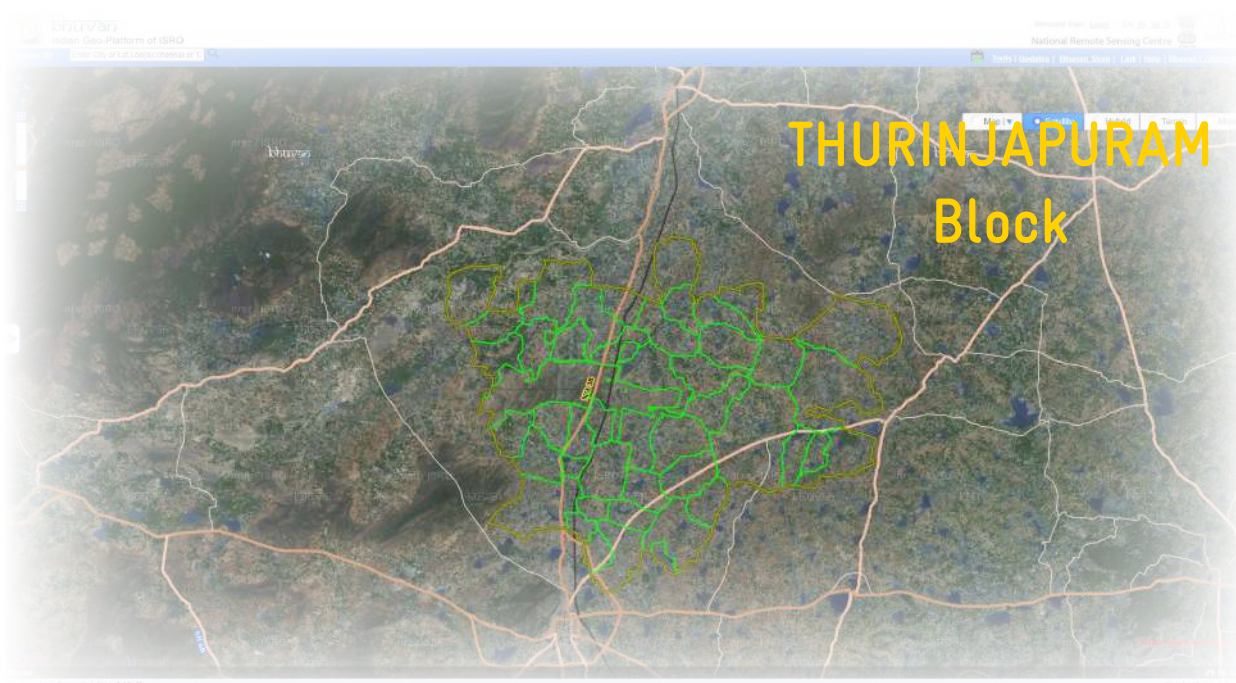
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New Delhi, India, Jan 2022

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 convergence model.

There will be a reorientation with livelihood promotion goals in addition to Natural Resource Management with GIS based plan-vention will be maximised

In this context, implementation of Climate Adaptation (WASCA) 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) framework is adopted. The GP level works thus identified are mapped to climate vulnerabilities, SDG goals and its Indicators, Intended Nationally Determined Contributions (INDC) for climate Change. This mapping exercise is unique and first of its kind in the country for a plan at GP level.

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

“
**Close to 10 lakh
NRM and Non- NRM
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verified, approved by
Gram Panchayat**
”

of priorities under MGNREGS and poverty alleviation as Resource Management, asset development. The approach to ment will be on a saturation ning. The impact of each inter-through convergence.

tation of Water Security and CA) a technical cooperation

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.

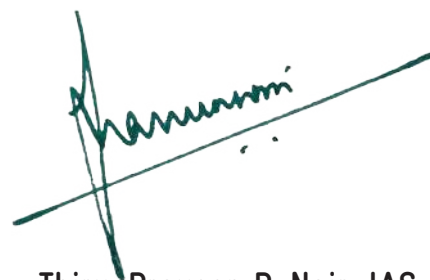
1.	Development of Public and Common lands
2.	Development of Agriculture and allied activities
3.	Development of Rural Infrastructure Management
4.	Development of Climate Resilience Measures

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 plan-
ning, implementing works in holistic manner,
reducing water scarcity in the district
”



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

FOREWORD



Rajeev Ahal

Director,
NRM & Agroecology, GIZ India



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

The state government of Tamil Nadu, with core support from Director Thiru. Praveen Nair I.A.S., Department of Rural Development of Rural Development-related departments, under District Collector, Thiru. B.Murugesh, I.A.S., has embarked on this strategic response to the strong crisis affected by climate change 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.

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

Tamil Nadu, with core support from Director Thiru. Praveen Nair I.A.S., Department of Rural Development of Rural Development-related departments, under District Collector, Thiru. B.Murugesh, I.A.S., has embarked on this strategic response to the strong crisis affected by climate change 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!

A handwritten signature in black ink that reads "Rajeev Ahal". The signature is written in a cursive style with a long horizontal stroke underneath the name.

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

FOREWORD



Thiru. B. Muruges, 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 district has implemented in cam-farm pond construction.

To enhance scientific works with technical support of GIZ project, the Composite Water (CWRM) approach is used for various parameters including spatial and technique to provide solution water (Ground water, Surface 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 status of Water, Socio Economic, Climate, and Agricultural parameters in the district. The developed GP level plan by using CWRM is an integrated approach covering NRM (Natural Resource Management) and non NRM works.

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

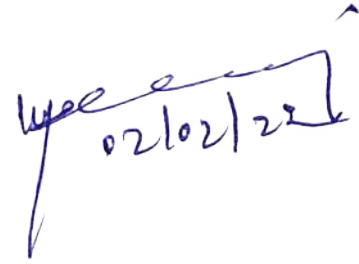
“
**GIS based
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”

identification in MGNREGS, under WASCA bilateral water Resource Management analyzing various parameters temporal changes and also solution for improving the four water, Rain water and Soil

860 GPs, works identified

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 quality and threatens sustainable development, biodiversity and enjoyment of the human rights to safe drinking water and sanitation. Building resilience towards Water Security and Climate Adaptation is inevitable for an integrated water resource management which WASCA is targeting. WASCA pilot study started in the district during January 2019 with developing inclusive Composite Water Resources Management (CWRM) plans for all GPs in this district. It also supported in building the case-based planning adopting. The dis-support of WASCA Resource center the CWRM plans for all the GPs. the supply and demand prepared suitable key actions are identified and common land, agriculture infrastructure at GP level through hydrological, agricultural and so- These GP plans are verified at the GP officials of DRDA and are con-levels for prioritizing the actions 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
”

capacity of the Engineers in GIS district officials with the technical in the district has completed The CWRM plans assessed both a water budget at GP level. The for the development of public and allied activities and rural scientific process including cio economic perspectives. ground level by the Block and solidated at Block and district and planning. The expected

M. Prathap

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

MESSAGES



Thiru. S.S. Kumar

Additional Director (MGNREGS),
RD&PR



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

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

Through District level GIS partners MSSRF build technical officers of Rural Depletion of 1,289 GP plans. In Nationally approved Commitment (CWRMP) framework Bhuvan NRSC ISRO GIS

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

resource centres, GIZ with the capacity of Block, GP level development Department in preparation of GP level plans, composite Water Resources Management is adopted along with platform.

Total 3,00,000 works identified in NREGA Soft. The 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 overcoming 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
Chief Engineer,
MGNREGS, RD&PR



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

In our state, Centre for Climate Change and Disaster Management (CCCDM-Anna University) has conducted the scoping study based on (Socio-economic, agriculture, etc.) and identified the most for project implementation. vannamalai in Northern Tamil South coastal aspirational WASCA project Composite Water Resource Management (CWRM) Plan is used.

The CWRM plans assessed both water using data pertaining parameters, catchment agriculture and prepared a water identified a set of key water 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.

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

18 Vulnerability parameters water and climate parameters vulnerable two districts The two districts are Tirunadu and Ramanathapuram district. For implementing Water Resource Management

the supply and demand for to land resources, climate as, soil, surface runoff, agriculture budget. Besides, it has actions for the development

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



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ABBREVIATIONS AND ACRONYMS

A - D	D - H	I - M
% Percentage	DLSC District Level Steering Committee	ha.m Hectare Meter
°C Degree Celsius	DLT Drainage Line Treatment	HH Households
AR Assessment Report	DRD&PR Department of Rural Development & Panchayat Raj	ICAR Indian Council for Agriculture Research
CCB Contour Continuous Bunds	ET Evapo-transpiration	IMD Indian Meteorological Department
CCCDM Centre for Climate Change and Disaster Management	FPO Farmer Producer Organization	INR Indian Rupees
CRM Climate Resilient Measures	FY Financial Year	IPCC Intergovernmental Panel on Climate Change
CuM Cubic Meter	GIS Geographical Information System	IWRM Integrated Water Resources Management
CVI Climate Vulnerability Index	GIZ Deutsche Gesellschaft für Internationale	Kharif crop Sown in Monsoon and harvested close to Autumn
CWRM Composite Water Resource Management	Govt. Government	Km Kilometer
CWRMP Composite Water Resource Management Plan	GP Gram Panchayat	KML Keyhole Markup Language
DEM Digital Elevation Model	GW Ground Water	LULC Land use and land cover
	ha Hectare	





M - N

Max
Maximum

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

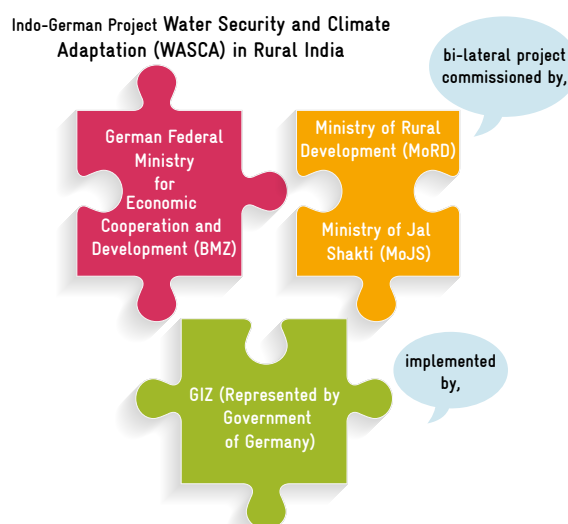
Thirukkural - 11

EXECUTIVE SUMMARY

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

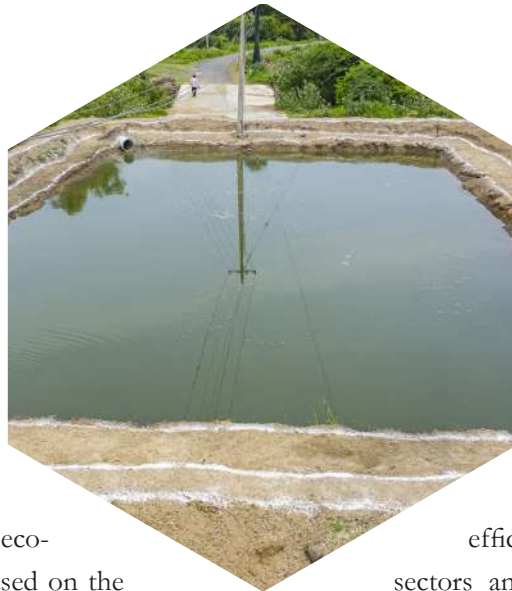
Water security is one of the most alarming issues and key challenges that the world is facing today given the rapid changes in climate. India is not an exception and is facing a similar challenge. Water security is of prime concern especially in the rural areas due to scarce resources and a high dependency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

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



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

With focus on water-related climate action and integrated water resource management (IWRM) principles, the project WASCA aims to significantly contribute towards Sustainable Development Goals for ensuring efficient, sustainable, and inclusive water outcomes. Implementation of key water actions also support the National Water Mission, one of the eight missions under the National Action Plan



for Climate Change (NAPCC) to achieve their objective of promoting basin level IWRM. It also explored possible contributions towards the larger goals of Nationally Determined Contribution's (NDC) of climate adaptation through its work on improving water efficiency in agriculture and allied sectors and ecosystem development. The State and District Steering Committee approved the process during May 2020 and the whole progress was jointly accomplished with research organizations and key sectoral experts in February 2021.

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



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



This report is structured with nine chapters

1

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

2

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

3

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

4

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

5

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

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

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

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

ABOUT THE BLOCK



1 | ABOUT THE BLOCK

Thurinjapuram Block of Thiruvannamalai District, Tamil Nadu, India lies between 12°14'53.013"N to 12°26'7.072"N latitude and 79°0'33.404"E to 79°14'4.535"E longitude. The Block is surrounded by Chetput, Kalsapakkam, Pudupalayam, Thiruvannamalai, Chengam and Keelpennathur Blocks (Figure 1.1) The total geographical area of the Block is 28,453.80 ha (284.50 Sq.Km). Administratively, this Block comes under Thiruvannamalai taluk, with 47 Gram Panchayats and 274 habitations in it.

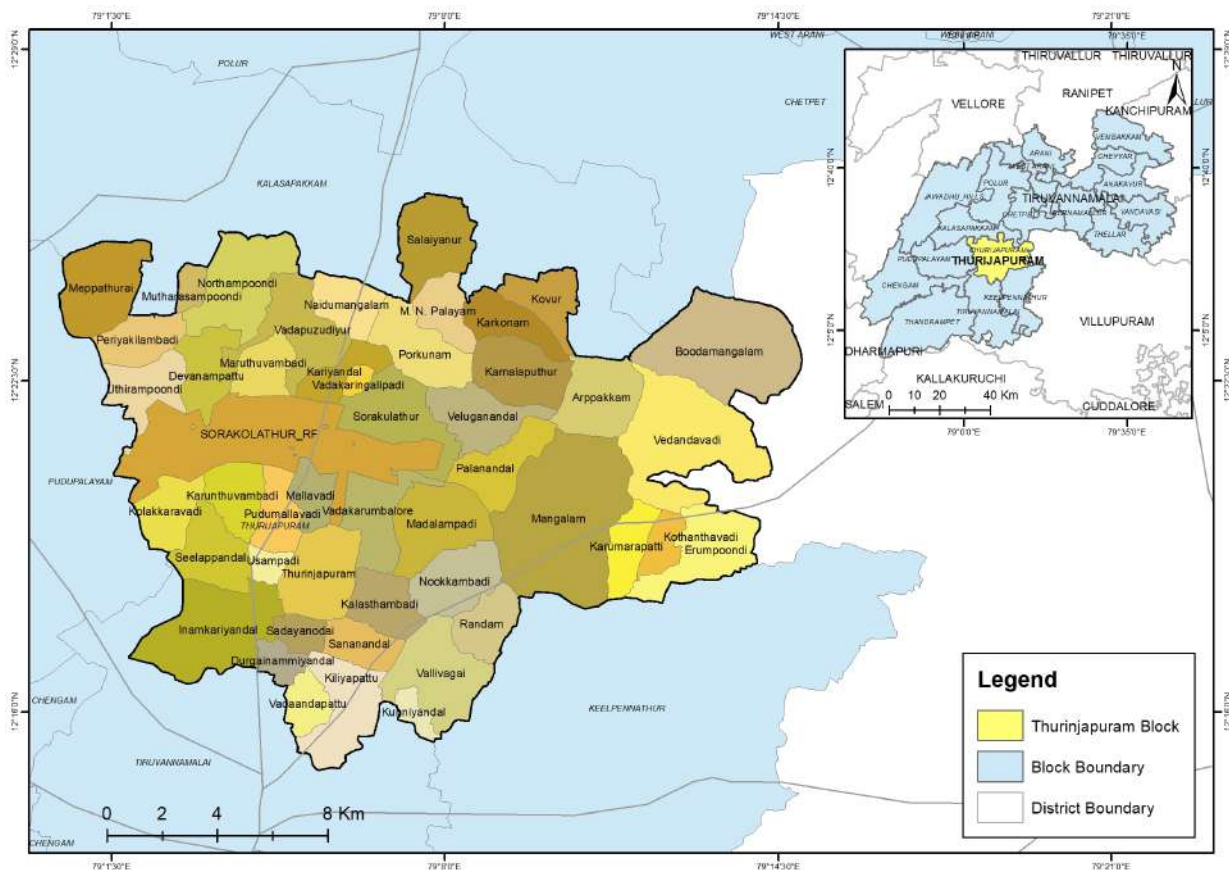


Figure 1.1. Thurinjapuram Block and its environ

According to Census 2011, the population of Thurinjapuram Block is 1,23,213. The population density of the Block is 433 per Sq. Km which is lower than the district population density (473 per Sq. Km) and State's density (555 per Sq.Km). There is a 10.36% increase in the population observed since 2001 in this densely populated rural Block. The percentage of male population is negligibly higher (50.25 %) than the female population (49.74%). The proportion of sex ratio is 990 females per 1000 males, which is slightly lower compared to the district average sex-ratio (994 females per 1,000 males). The literacy rate of female population is lower

(43.04%) than male literacy (56.96%). At 50%, the average literacy rate of the Block is much lower than national average (72.98%). Scheduled Castes and Scheduled Tribes accounted for 22.75% of the total population (Thiruvannamalai district profile 2020).

Economically, Thurinjapuram is the least revenue earning Blocks of the Tiruvannamalai district. Agriculture and allied activities, are the primary occupation followed by livestock rearing. Paddy tops as the predominant crop, with 31% of the irrigated area cultivated with paddy. The other major crops grown in the Block area are other pulses, ground-

“
 The proportion of sex ratio is 990 females per 1000 males, which is slightly lower compared to the district average sex-ratio (994 females per 1,000 males)
 ”

“
 At 50%, the average literacy rate of the Block is much lower than national average (72.98%)
 ”

nut, sugarcane, ragi, and red gram. Under rainfed crops groundnut cultivation tops the list followed by other pulses. Significant cultivated areas of banana, turmeric, dry chilli, other fruits and vegetables can also be seen. Groundnut and pulses are cultivated both under irrigated and rainfed conditions. A small patch of sericulture also practised, 36.5 ha is under sericulture. A livestock count of 47,701 was recorded during 2019-20. The cattle count is 33,819 and the Block has highest milk societies (63) next to Tiruvannamalai Block with 32,960 litres of milk being produced per day.

“
 31% of the irrigated area cultivated with paddy
 ”

Thurinjapuram Block comes under Cheyyar River, Thurinjalar and Tondi Veraha sub-basins of Palar, Pennaiyar, Varahanathi Basins respectively. This Block has 78 micro watersheds (Figure 1.2).

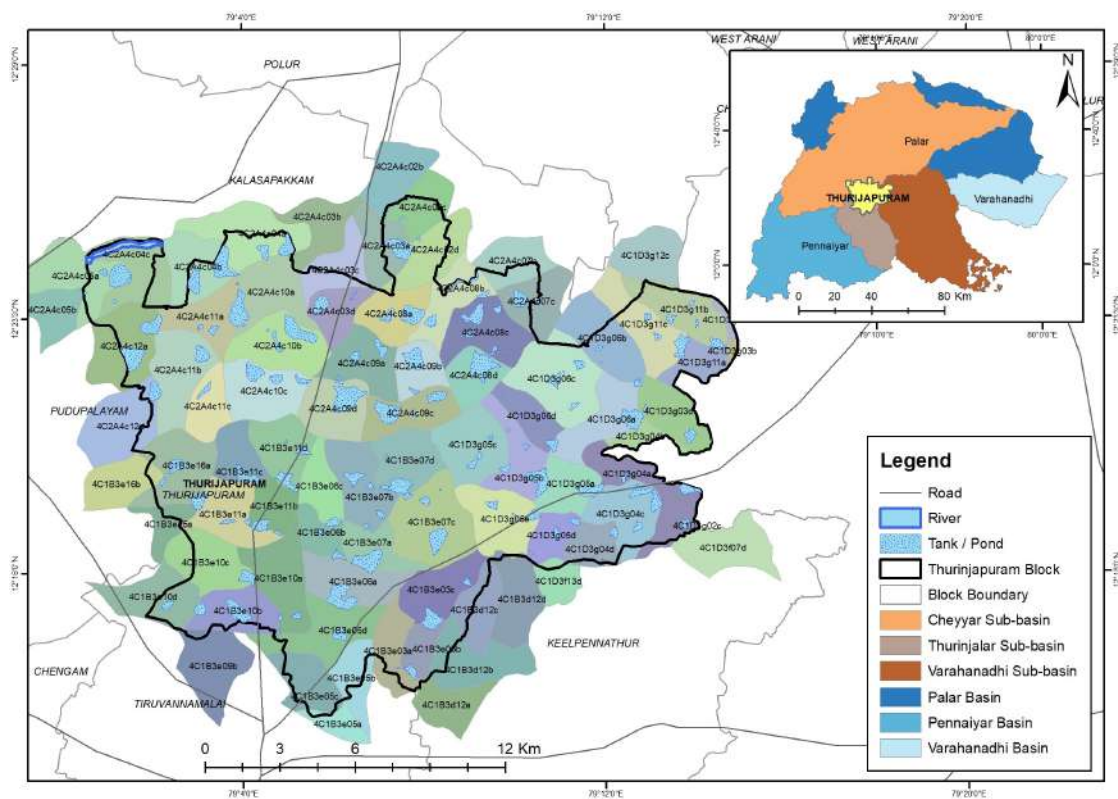


Figure 1.2. Watersheds- Thurinjapuram Block

There are 104 tanks in the Block with the largest tank being the Narthampoondi tank with an area of 170 ha. Other important tanks are C. Andapattu tank (114.57 ha), Sorakolathur big tank (108.86 ha) and Melpathurai tank (107.68 ha). The spatial distribution of waterbodies are shown in Figure 1.3. The ground water levels in Thuringapuram Block is in a critical state of depletion and are at over exploitation stage of ground water development. Mangalam, Nayadumangalam and Thuringapuram firkas cover the Block and all these three firkas are in an over exploited stage.

GROUND WATER LEVEL OF THIS BLOCK

OVER EXPLOITED- > 100% Mangalam, Nayadumangalam, Thuringapuram

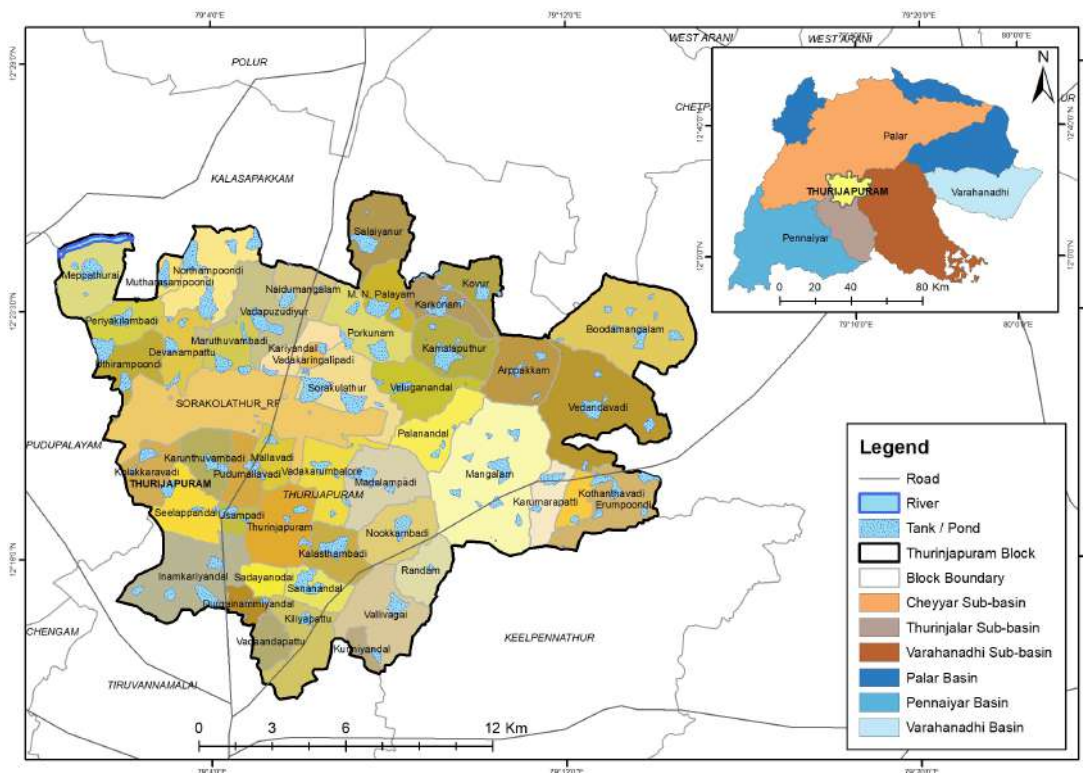
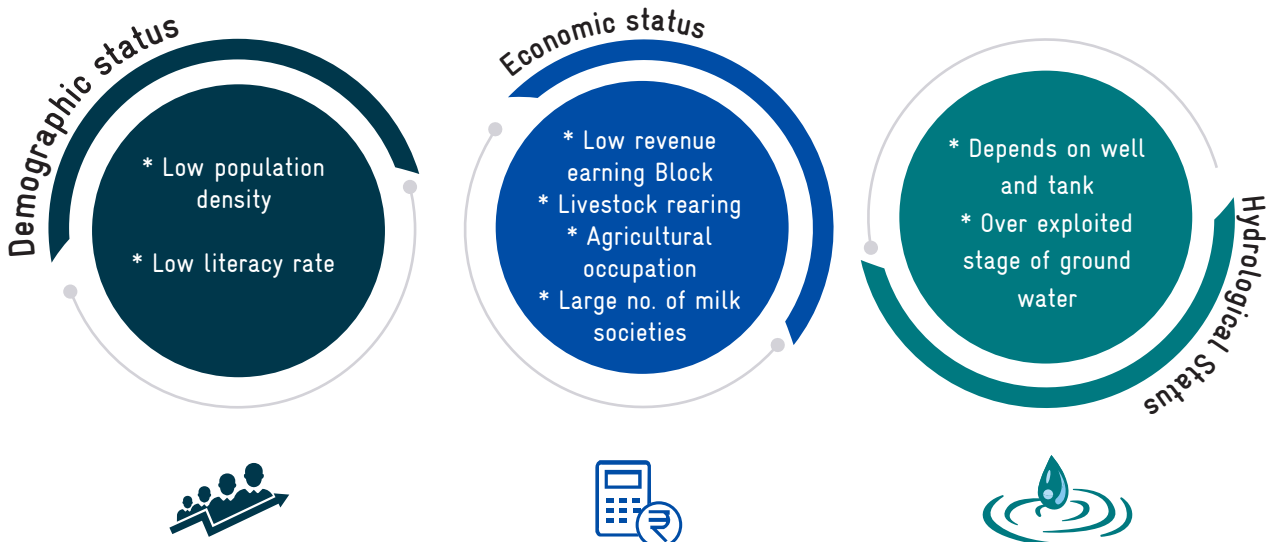


Figure 1.3. Spatial distribution of waterbodies



விண்இன்று பொய்ப்பின் விரிநீர் வியனுலகத்து
உள்நின்று உடற்றும் பசி

குறள் - 13

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

Thirukkural - 13

CHAPTER 2

CLIMATE AND WATER SECURITY



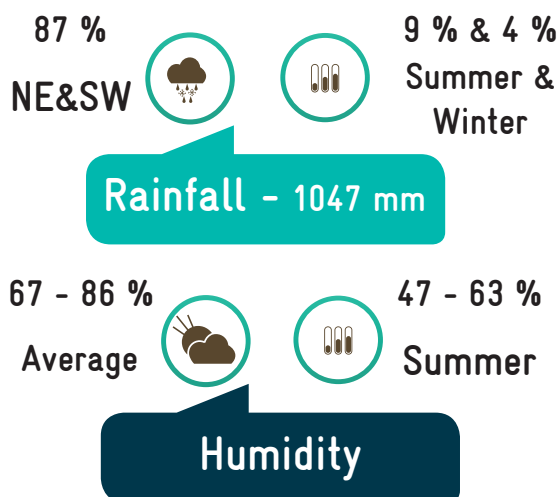
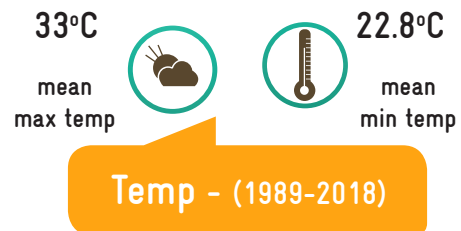
2 | CLIMATE AND WATER SECURITY

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

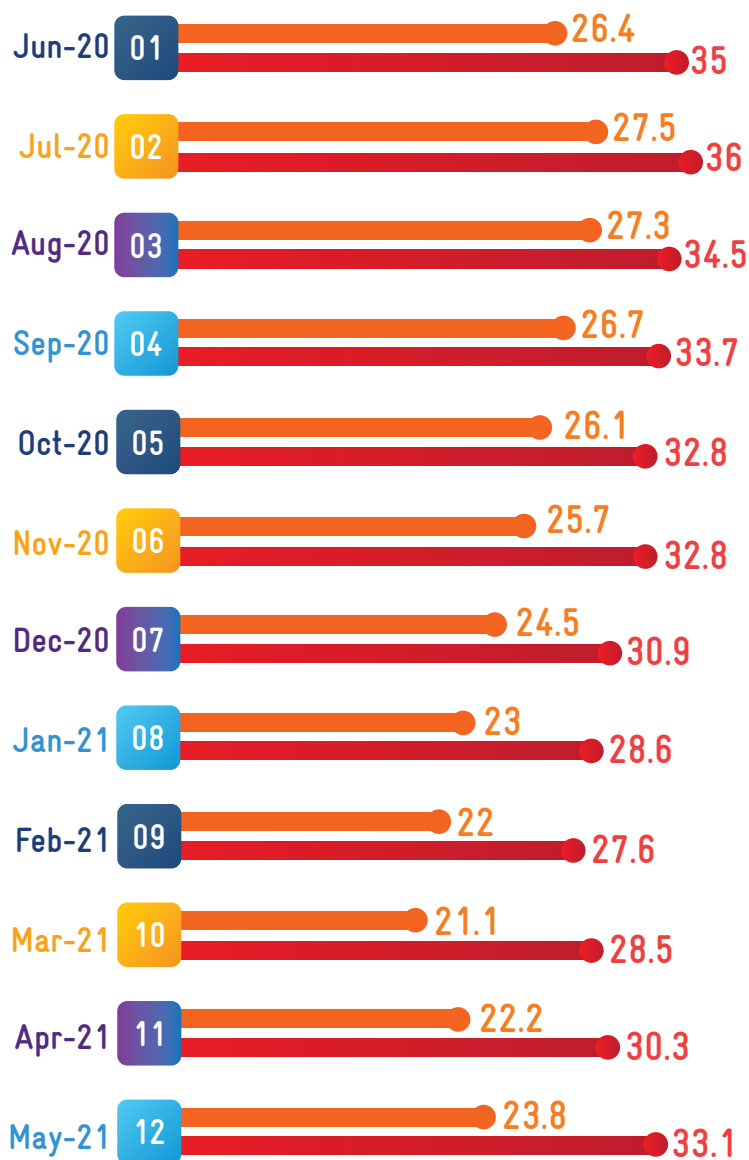
TABLE 1. GENERAL CLIMATE DESCRIPTION



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



Normally this region receives major rainfall from North-East Monsoon (NEM) (October to December) and South-West Monsoons (SWM) (June to September). Past records show the annual average rainfall of this region is 1,047 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 for 9 % of the total rainfall and winter (January, February) season has low contribution (4%) to the annual rainfall (Figure 2.2). The average relative humidity is 67- 86 % and during summer it ranges between 47-63 %.



Monthly Temperature

in degree celsius (°C)

Minimum temperature

Maximum temperature

Figure 2.1. Average monthly temperatures

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

fall starts in the 2nd week of October and cessation would be in the 4th week of December. Though the number of rainy days is slightly lesser than SWM, the intensity is more in NEM.

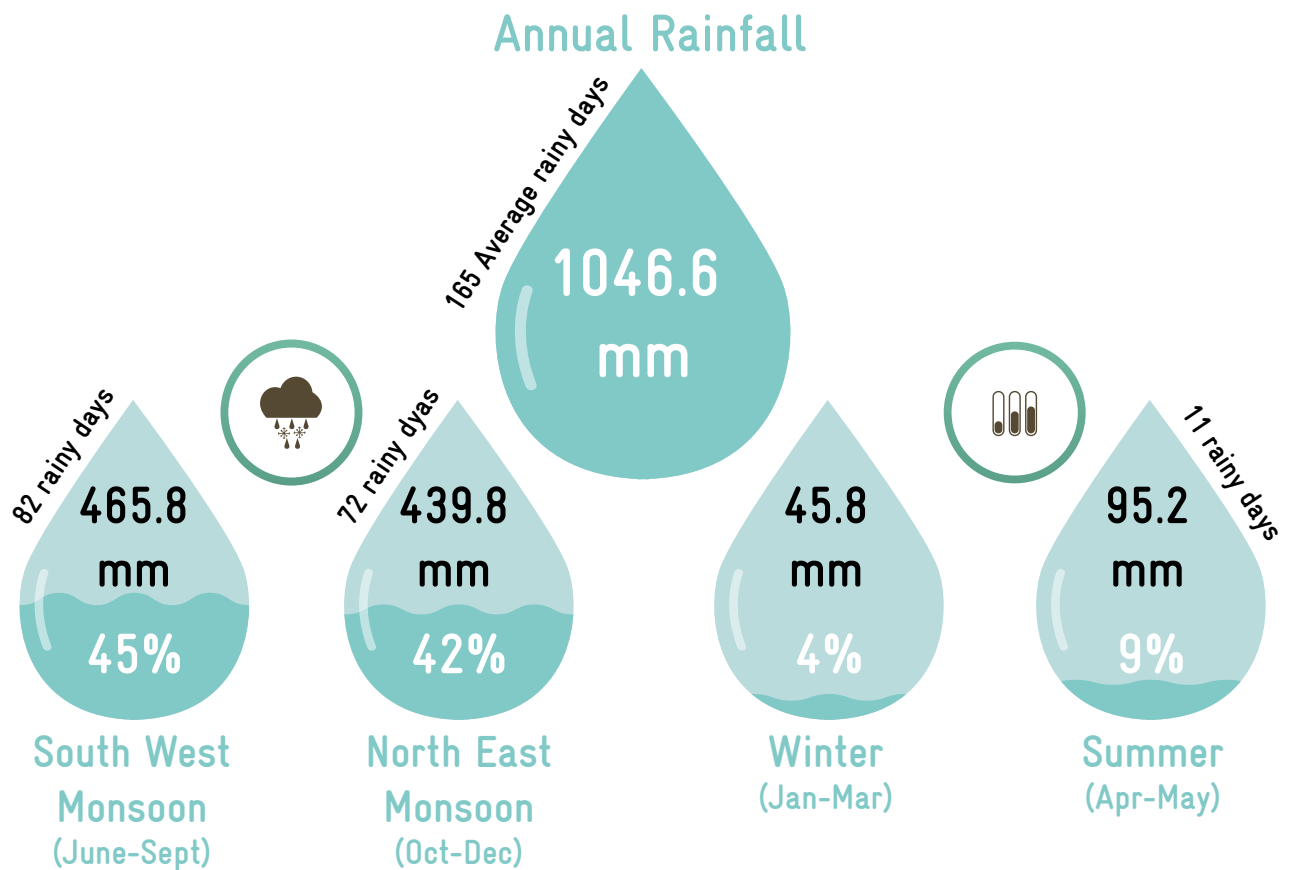


Figure 2.2. Season-wise distribution of annual rainfall

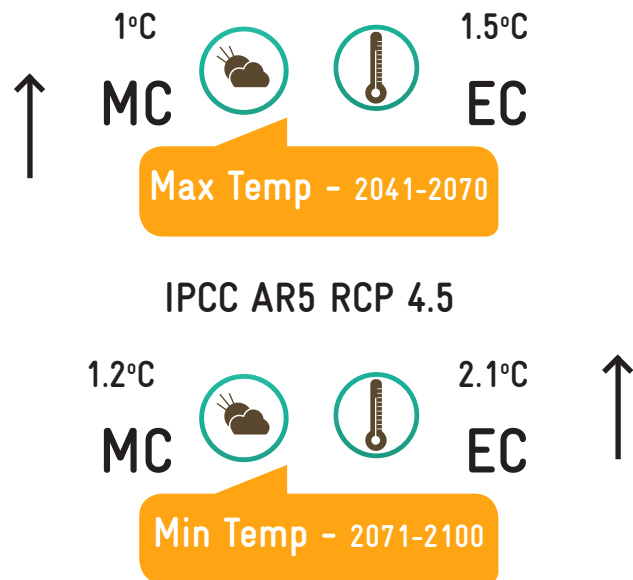
In recent decades, the world is witnessing significant changes in its climate. These changes include increase in average temperature, variations in the rainfall intensity and its frequency. This region is also no exception, and an increase in maximum and minimum temperature of 1.2°C and 0.5°C was observed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

rains, it is prone to droughts when the monsoons fail. As rainfall is the major source for determining water storage, existing water resources such as rivers, dams and major and minor tanks fail along with deficient rainfall years.

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

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

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



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



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



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



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

2.1 | CLIMATE RISKS

Increasing temperature, fluctuating rainfall patterns and its extremities 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

Being situated approximately 150 – 200 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 Thiruvannamalai District as flood vulnerability spots. In Thurinapuram Block Andapattu (V) and Kliyapattu GPs are moderately vulnerable to floods.

Flood

Drought

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

A heatwave is a period of abnormal high temperatures, more than the normal maximum temperature that occurs during the (hot weather) summer season. Heatwaves 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 Thurinapuram Block are prone to Heatwaves

Heat Wave

2.2 | WASCA CLIMATE VULNERABILITY INDICATORS

During 2019, WASCA TN conducted a preliminary State level scoping study on the State's rural water security through the climate lens and identified climate and water security hotspots/potential geographical areas for project demonstration through scientific criteria jointly with 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 observations, WASCA TN study proposed 18 indicators to reflect the State's rural water security through four interconnected CWRM areas viz., climate extremities, water resources, agriculture and socio-economic to assess climate-water vulnerability at the District level (Table 2).

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

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

Data from these 18 bio-physical and socio-economic indicators was collected at the District level and categorized into exposure, sensitivity and adaptive capacity for the analysis. The vulnerability ranking was given based on IPCC protocol of vulnerability assessment methodology. Based on the analysis, Ramanathapuram and Tiruvannamalai Districts were selected by the State Level Steer-

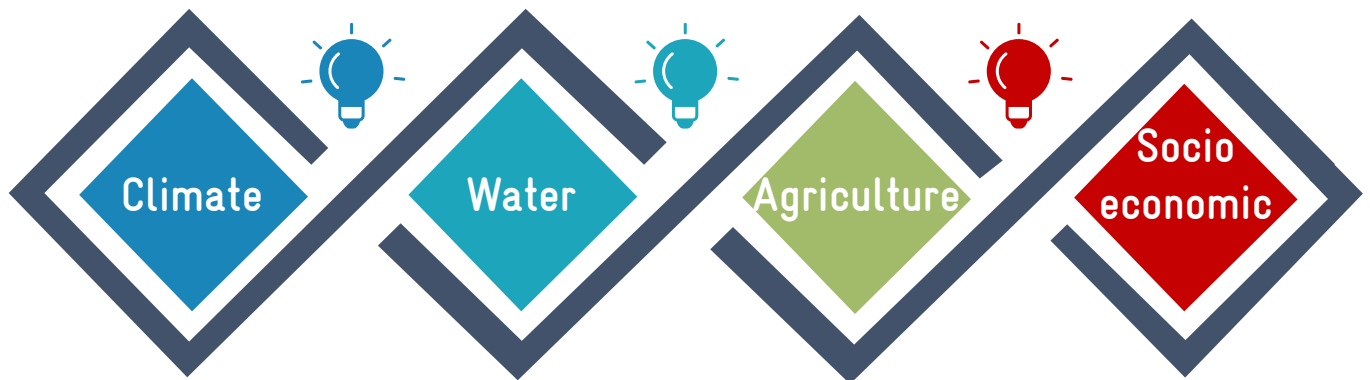
ing Committee headed by the Secretary RD&PR in Nov 2019 for implementing the WASCA. Subsequently, all the key water actions, CWRM planning and implementation works are envisaged for the above Districts through these influencing indicators collectively under four CWRM areas viz. climate, water, agriculture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

experts. Based on national level workshop on WASCA for GIS based planning using IWRM principles, a Composite Water Resources Management plan framework was customized to suit to Tamil Nadu State's conditions, including climate vulnerability as per the scoping study recommendations. Major CWRM parameters are thus identified under four areas via climate, water, agriculture and socio-economic for advancements towards actions. The major parameters identified at Block level (Table 3) are collected both from primary and secondary sources and analyzed statistically and geospatially.

TABLE 3. MAJOR PARAMETERS IDENTIFIED FOR BLOCK LEVEL VULNERABILITY ASSESSMENT



Changes in temperature, rainfall and its extremities

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

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

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



ஏரின் உழாஅர் உழவர் புயலென்னும்
வாரி வளங்குன்றிக் கால்

குறள் - 14

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

Thirukkural - 14

CHAPTER 3

CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA



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.



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.

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 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

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 will 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

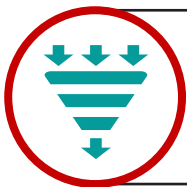


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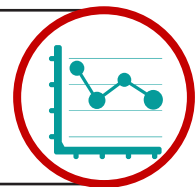
Water related works out of NRM

In pursuance of Schedule-I of Mahatma Gandhi NREGA, 262 kinds of works/ activities have been identified as permissible works, of which 182 kinds of works are related to NRM alone. Among NRM works, 85 activities focus on water conservation and harvesting while 164 works are related to Agriculture and Allied works. As MGNREGA activities benefit both the community and individuals, 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 productiv-

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



The GIS (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



3.1 | COMPOSITE WATER RESOURCE MANAGEMENT APPROACH

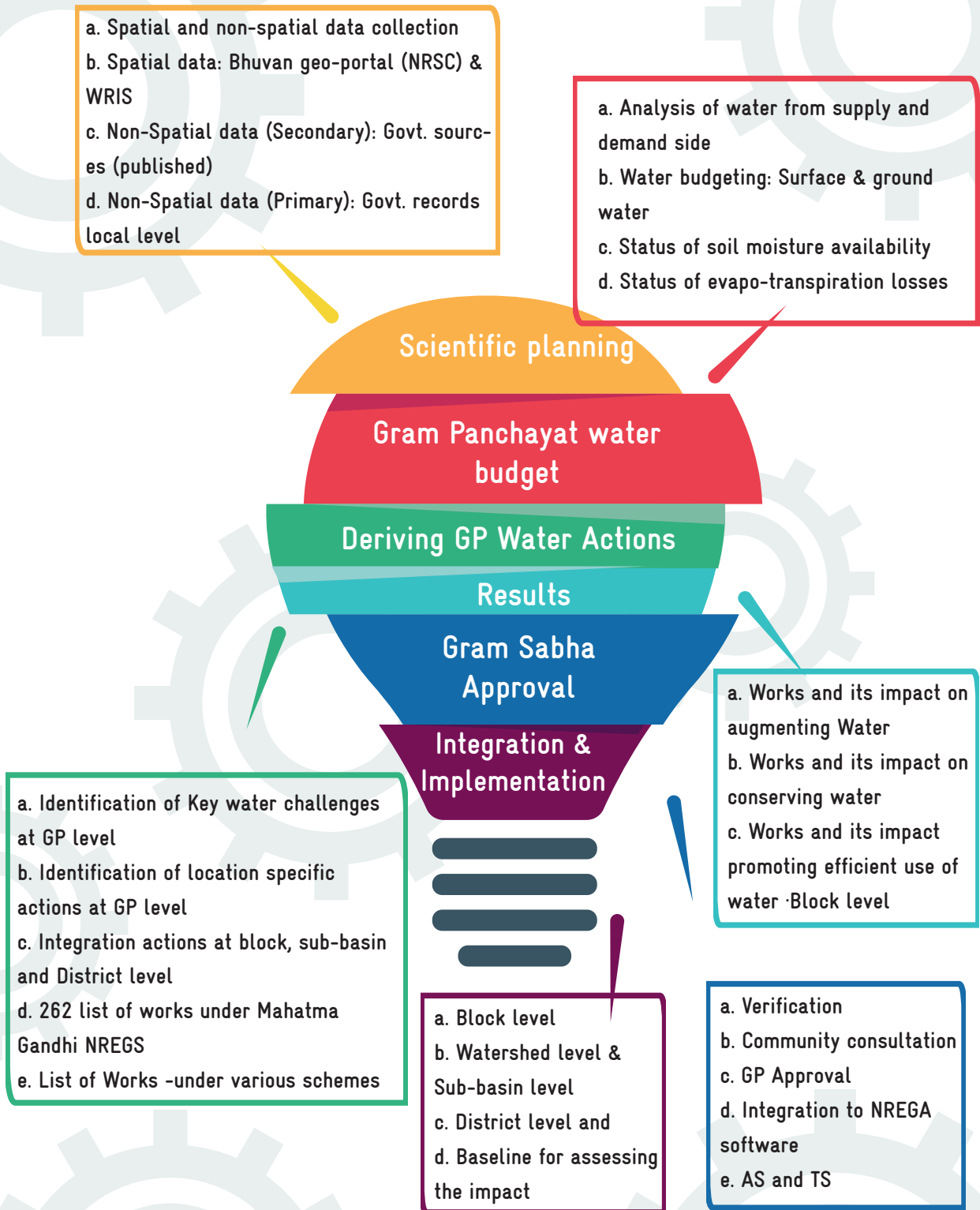
CWRM approach for WASCA uses simple scientific tools that can help Block or GP level officer to organize, analyze and prepare a developmental draft plan for participatory discussion at GP level. This approach involves analyzing key water challenges using both non-spatial and geo-spatial data in GIS,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

taluk), agro-ecological (regional and sub-regional, climatic and agricultural zonation's) and hydrological (drainage points/watersheds/sub basin) units keeping GP as the lowest unit for planning and execution. Following this, a detailed socio-economic profile was mapped covering male/female population, proportion of SC and ST population, vulnerable households, access to employment in Mahatma Gandhi NREGS and proportion of works carried out in the village through amount of budget utilized as well as actual works completed. The climatic parameters including maximum and minimum temperature, season-wise rainfall and rainy days, evapo-transpiration

and soil moisture are used to understand the climate related issues. The next step is to assess land use, watersheds, drainage networks and surface runoff,

existing water supply and storage systems, water management for the key sectors and water demand and prepare the water budget for the GP (Box 1).

BOX 1. MAJOR COMPONENTS INVOLVED IN CWRM PLANNING

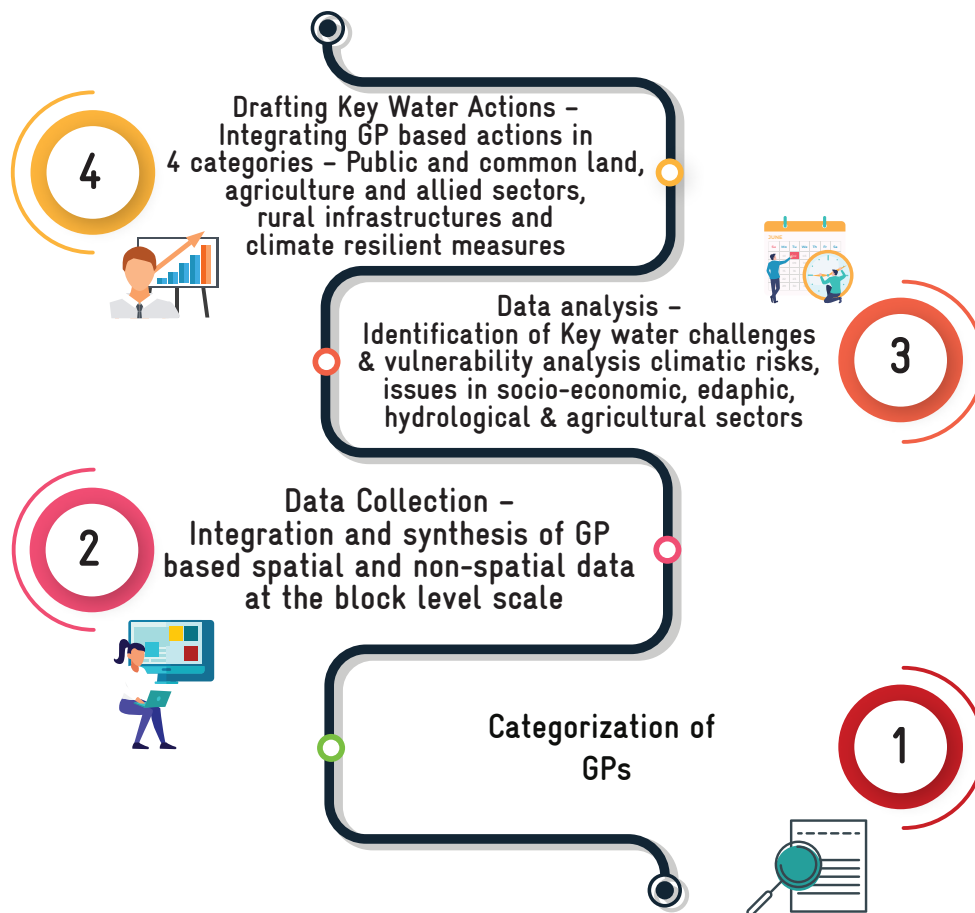


Such a comprehensive analysis helps in preparing the water budget integrating ground water, surface water through runoff from rainfall, evapo-transpiration and soil moisture which further helps to identify potential areas of action to augment the water resources in public /common land, agriculture and 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. This shelf of projects is again mapped with the schemes available 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 centres established in the project area, facilitates this whole process for planning and implementation. This comprehensive and integrated approach has been accepted nationally and by state governments as a comprehensive and climate adapted planning approach for water security. The whole process has been categorized 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 the National, State, and District Level Steering Committees headed by the Additional Chief Secretary RD&PR and the District Collector respectively in the project area of Tamil Nadu government as a comprehensive and climate adapted planning approach for water security under the Mahatma Gandhi NRGES 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 SLSC as per DLSC and SLSC

PLANNING STAGE

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

FOUR LEVELS OF CWRM PLANNING UNDER WASCA

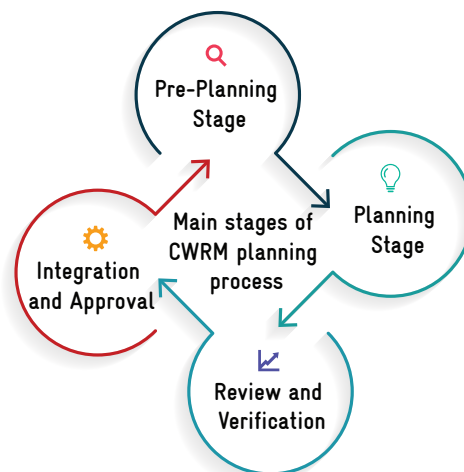
1. DEVELOPING PLANS AT LOWEST ADMINISTRATIVE LEVEL: GP LEVEL PLANS

2. INTEGRATING GP LEVEL PLANS AT BLOCK LEVEL

FOUR LEVELS OF CWRM PLANNING UNDER WASCA

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

4. INTEGRATING GP PLANS TO DEVELOP WASCA DISTRICTS CWRM PLANS



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

INTEGRATION AND APPROVAL

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

REVIEW AND VERIFICATION

3.2 | CATEGORIZATION OF GPS

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

lage boundaries, for collecting and organizing the datasets. Based on the above factors, five different types of GPs are classified as Type I, II, III, IV and V. The description on categorization of GP's is annexed (Annexure 1). Details of categorization of GPS in Thurinjapuram Block is tabulated in Table 4.

TABLE 4. CATEGORIZATION OF THURINJAPURAM BLOCK GPS

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
29	GP and revenue village data and boundary match (Type-I)	Andapattu, Arpakkam, Boodamangalam, Durginammiandal, Erumpoondi, Kalasthambadi, Kamalaputhur, Karkonnam, Karunthuvambadi, Kolakkaravadi, Kovur, Kunniyandal, Madalambadi, Mallappa Nayakkam Palayam, Mangalam, Maruthuvambadi, Mutharasampundi, Nookkambadi, Palanandal, Porkunam, Sadayanodai, Salayanur, Sananandal, Thurinjapuram, Usambadi, Uthirampoondi, Vada Karingalipadi, Vada Pulidiyur, Velunganandal
4	Having more than one GPs in one Revenue Village (Type-II)	Kariyandal, Karumarapatti, Kothantavadi, Sorakolathur
12	One GP is falling under more than Type 1 one Revenue Village (Type-III)	Devanampattu, Inam Karianadal, Kiliapattu, Meppathurai, Naidumangalam, Narthampoondi, Periyakilambadi, Randam, Seelappandal, Vadakarimbalur, Vallivagai, Vedanthavadi
2	GPs having more than one GP, one Revenue Villages data, boundary (IV)	Mallavadi, Pudumallavadi

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 pro-

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 role in contrib-

cess 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.

uting to preparation of the most appropriate and suitable science-based decision plans 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 based analysis is to understand the hydrological and administrative boundaries. This aids in understanding the profile and condition of the watershed at macro or micro level for planning and relevant water actions
- Soil characteristics including the macro and micro nutrient status, physical quality of the land using pH values and textural soil quality to understand its permeability, infiltration and water holding capacity which are crucial for soil moisture content
- The agriculture and livestock datasets help in understanding the quantum of water requirement of the key crops and type of cropping systems adopted, number and type of different livestock resources and its water requirement vis-a-vis its linkage to livelihoods of the vulnerable population in the village
- Grey water generation at GP level to understand the quantum of grey water available and existing methods of its use. This information is essential to plan effective strategies for recycle and reuse
- Water budgeting at GP level to demonstrate the sector wise water demand and available water through the traditional water harvesting and storage bodies and the potential runoff that can be conserved through appropriate actions on the supply side. The difference between demand and supply at the GP level helps the communities to understand the gap and practice the necessary water actions.

Data from a total of 99 parameters were collected, out of which 13 parameters are primary source data and were 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. Current data at the Block level is not available at present. Hence, previous hydro-me-

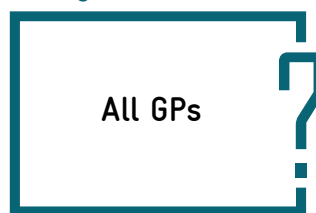
teorological disasters are considered to denote Block's change in climate (temperature, rainfall) extremities and its risks, which was recorded by State Disaster Management Agency, 2020 (Table 5).

TABLE 5. CLIMATE RISKS AND VULNERABLE GP'S

Flood



Drought



Heat Wave



3.5 | CWRM PLANNING ANALYSIS - WATER

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

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

3.5.1 SPATIAL DATA

Spatial data of geomorphology, lineament, terrain, slope drainage network, surface water bodies, ground water potential, and watershed were collected to understand the site-specific problems and together with non-spatial data, take deci-

sions to draft scientific key water actions. Available Bhuvan source thematic spatial maps/web-site view was referred to understand, interpret and analyze the spatial parameters of the Block.

3.5.1.1 Geomorphology: Geomorphology deals with the scientific study of “landforms and landscapes, including their description, type, and genesis”. Landform is the end product resulting from the interactions of the natural surface genesis and the type of rock. The scope of geomorphology was further expended with landform maps, which are widely used in various fields of hydrology, pedology, geoscience, urban and regional planning etc. Thuringapuram Block is engrossed with denudational, and fluvial origin landform units (Figure 3.1). Majorly denudational origin Pediment and Pediplain Complex is witnessed in the area, Pediment is the low relied or plain with gently slope area close to the mountains at their foot with or without debris whereas pediplain is relatively flat rock surface formed by joining of several pediments. 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.

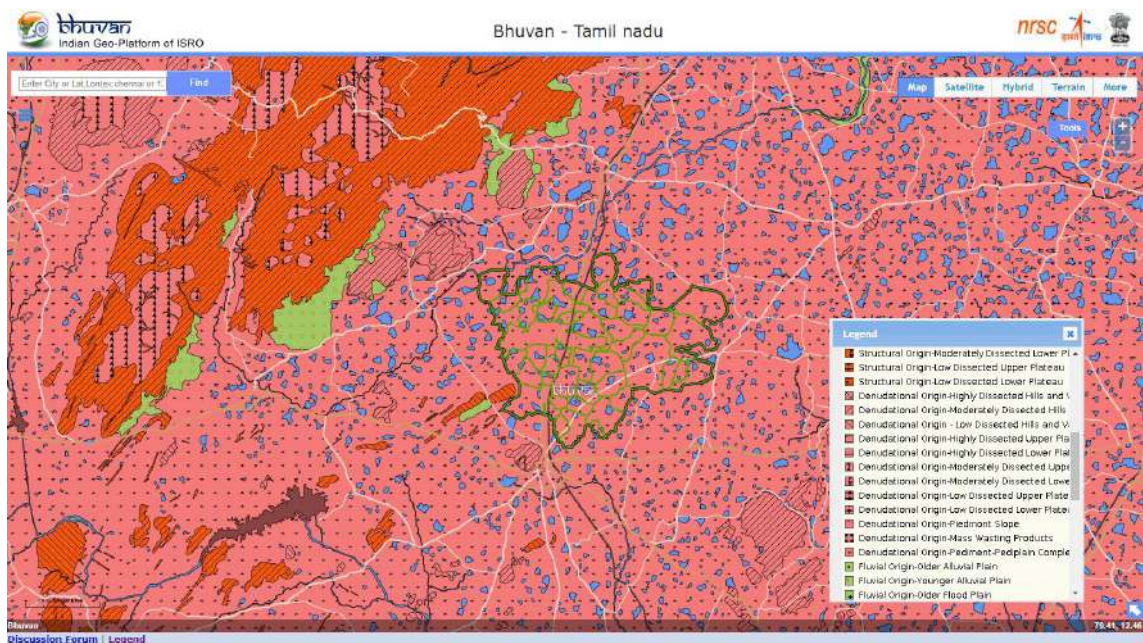
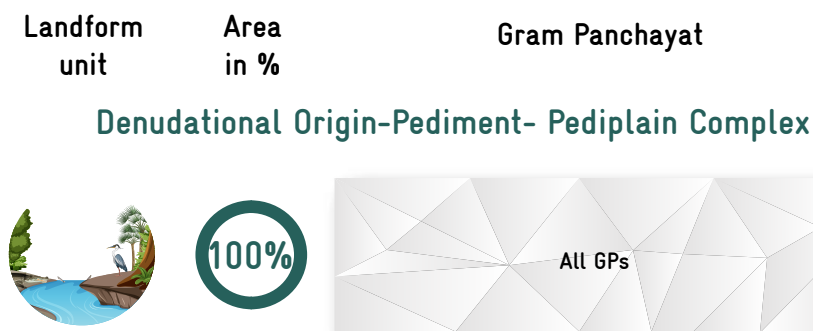


Figure 3.1. Geomorphology map



3.5.1.2 Lineament: The lineament is also a lithological unit which reveals the hidden architecture of rock basement, representation of an underlying geological structure such as a fault, fracture (Figure 3.2). Lineament plays a significant role in identification of ground water and oil exploration sources. Lineament is represented with linear feature where two different landform converges or diverges. This site allows water to percolate at a high rate. GP wise lineament type is illustrated in the table below. These observations are widely used to locate points of high-water flow especially in groundwater exploration.

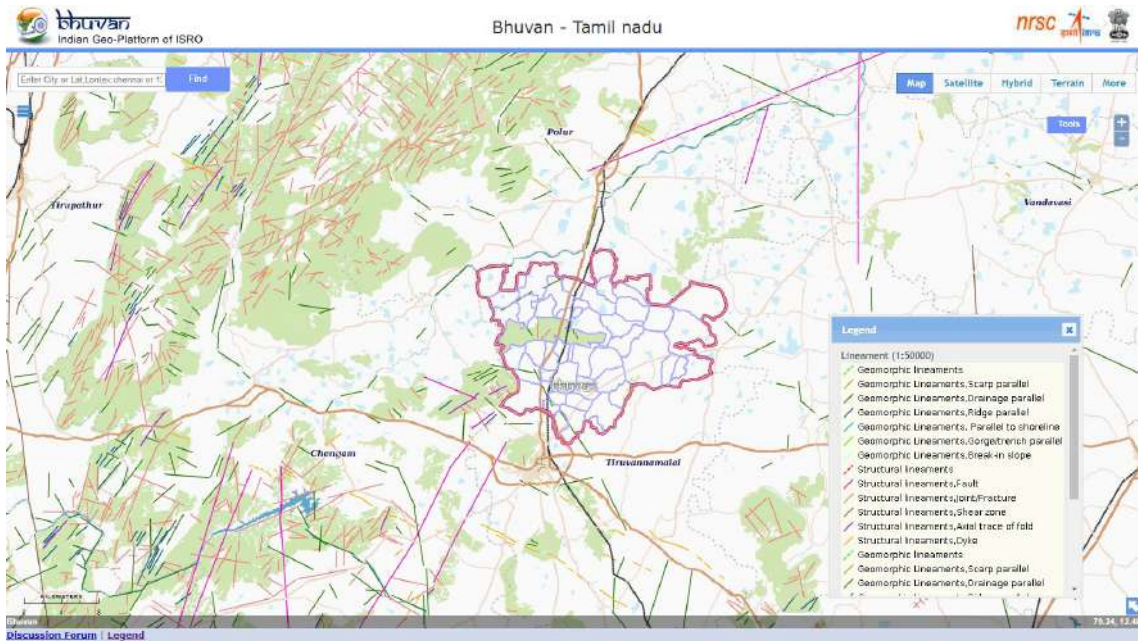


Figure 3.2. Lineament map

Lineament type	Gram Panchayat
Geomorphic lineaments, Drainage parallel	Devanampattu, Inam Kariyandhal, Kiliapattu, Seelapandhal, Uthirampoondi, Vadaandapattu, Vadapuluthiyur

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

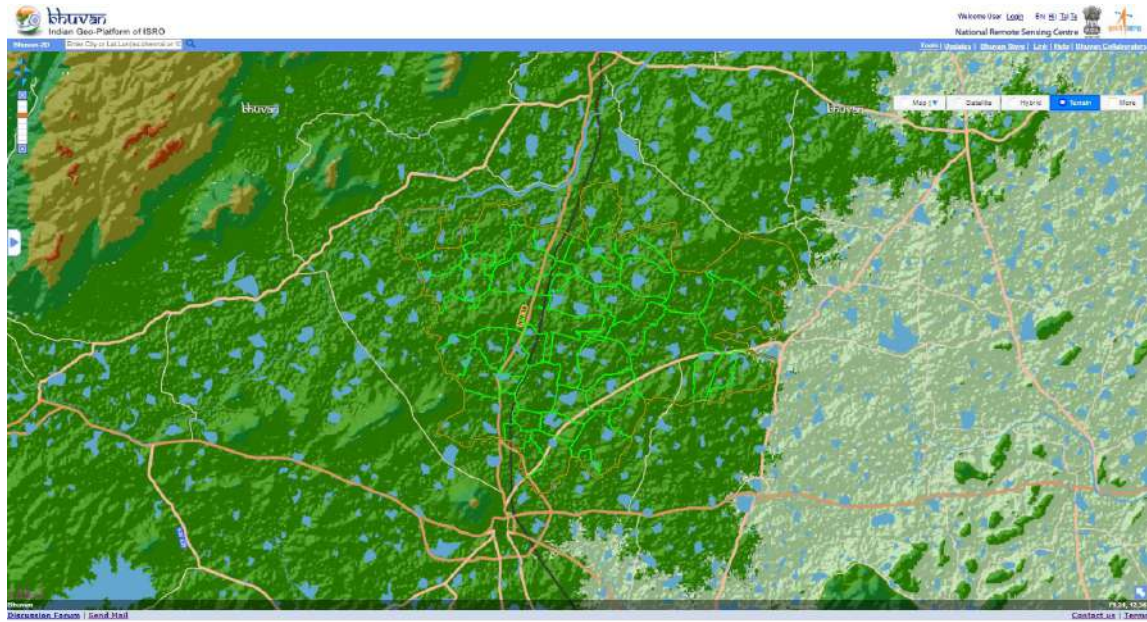


Figure 3.3. Terrain map

3.5.1.4 Contour map: The contour is the most important element in the cartographic representation of the terrain and only one which determines relief forms such as valleys and hills, and the steepness or gentleness of slopes in geometrically. A contour map is illustrated with contour lines which shows the elevation of that earth surface from above sea level. The constant vertical distance between two consecutive contours, i.e. their height difference, is called contour interval. Density of the contour lines are related to the geomorphologic units. It is noticed that towards East from West of middle region of Block shows higher ground elevation value of 110 m, while East and South-West regions are noticed with lower values. The contour map also plays a vital role in delineation of watershed & its units, used in planning and identifying the recharge structures, farm ponds and construction of grey water drain network etc., (Figure 3.4).

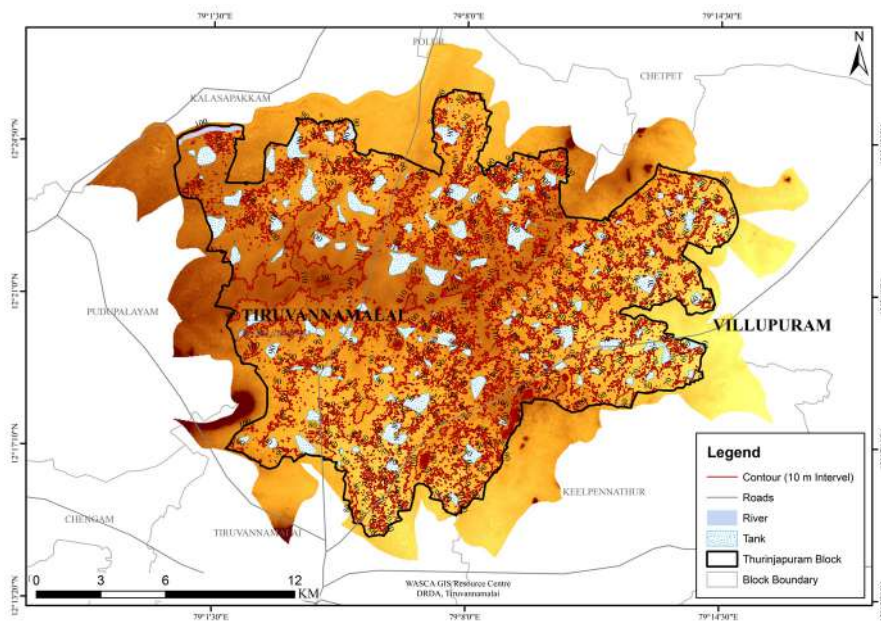


Figure 3.4. Contour map

3.5.1.5 Slope: The average slope of a terrain feature is calculated from contour lines on a topo map or DEM. Slope is typically expressed in percentage, angle, or in ratio. Slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. It is noticed that with respect to the land-form units the slope varies in the Block (Figure 3.5). Flat and very flat slope ranges were noticed in the Block, GP wise details is shown in the illustration below. 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.

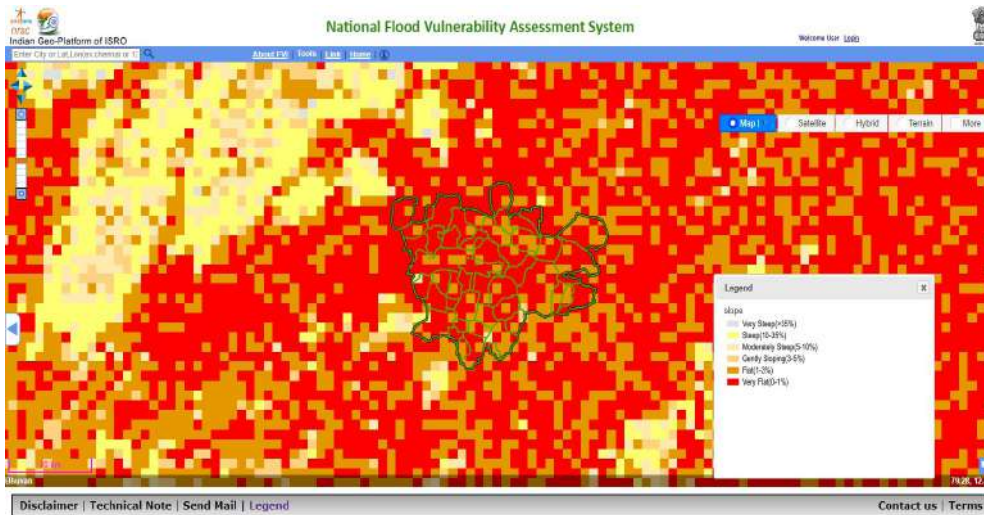
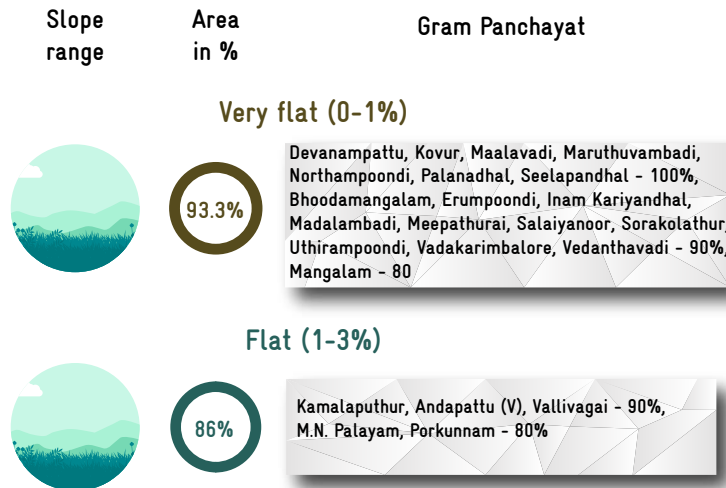


Figure 3.5. Slope map



3.5.1.6 Drainage Network : The Drainage network pattern of a region is particularly dependent on the lithological characteristics, regional slope, structural control, climate condition etc. Dendritic or tree pattern drainage system was observed in the Thurinjapuram Block (Figure 3.6). Moderately less dense drainage network covered more area followed by less while moderate high witnessed in a GP which is situated in North–East side. The dendritic pattern is characterized by irregular branching of tributary streams in all directions. Drainage network is referred to while identifying suitable sites for soil and water conservation measurements such as dams, ponds, bunding, restoration of gullied region etc.

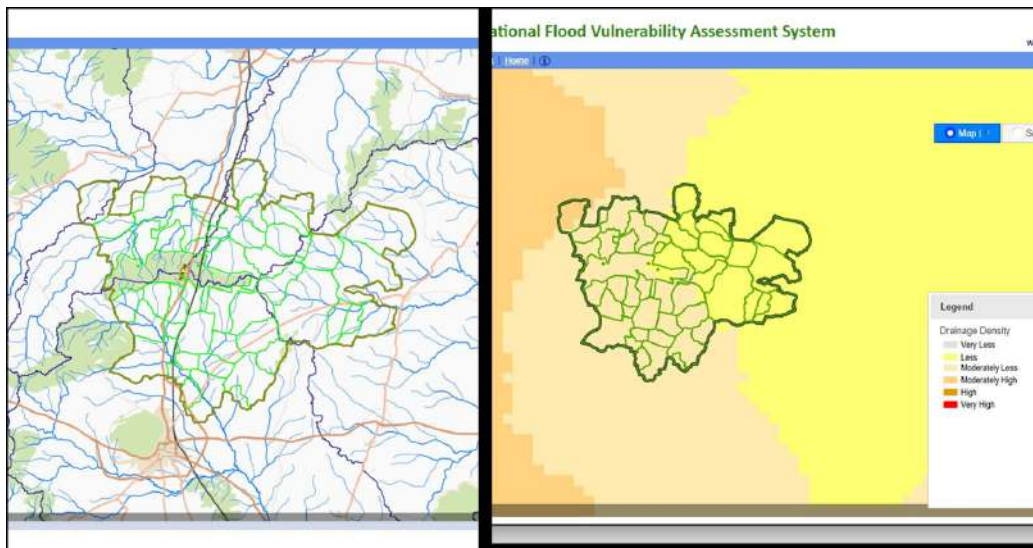


Figure 3.6. Drainage network and density

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

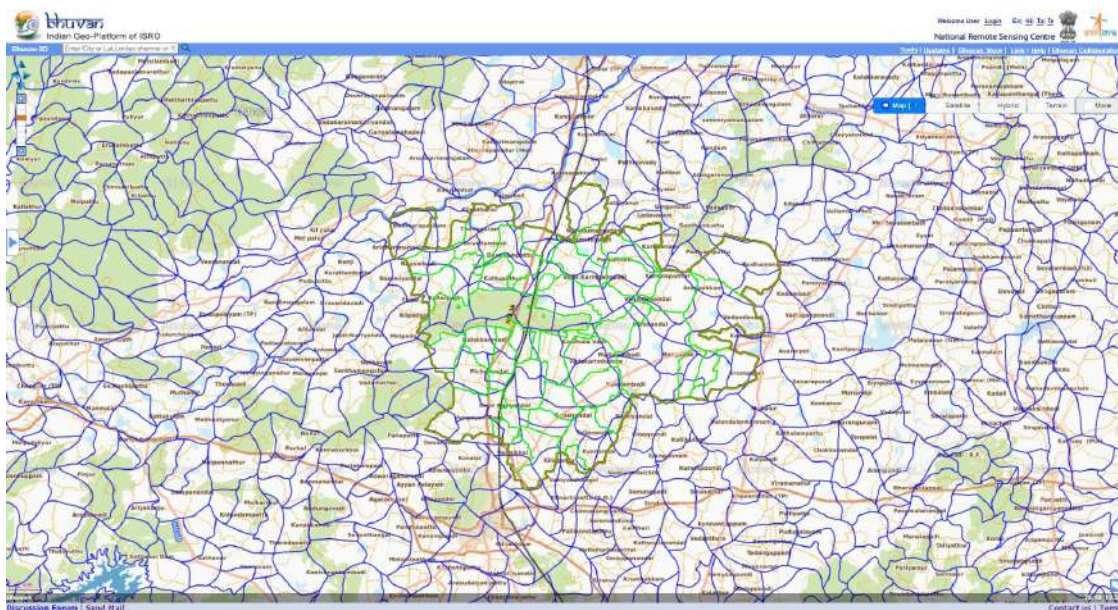


Figure 3.7. Watershed map

3.5.1.8 Ground water perspectives: Ground water is one of the important natural resources in semi-arid region like Thuringapuram Block. The ground water perspectives map is the integration of lithology, geomorphology, geological structures, hydro geomorphic datasets, which provides the required information related to ground water exploration and the probable ground water prospects. This map will help in identification of tentative locations for construction of recharge structures. Most of GPs area witnessed the enriched yield of 50-100 LPM in above 80 m deep well, whereas some GPs with no yield (Figure 3.8). The GPs wise details of Ground Water (GW) prosperity is shown in the illustration below. This specific information is will play crucial role in identifying sites for recharge structures in order to address water scarcity issues in the Block.

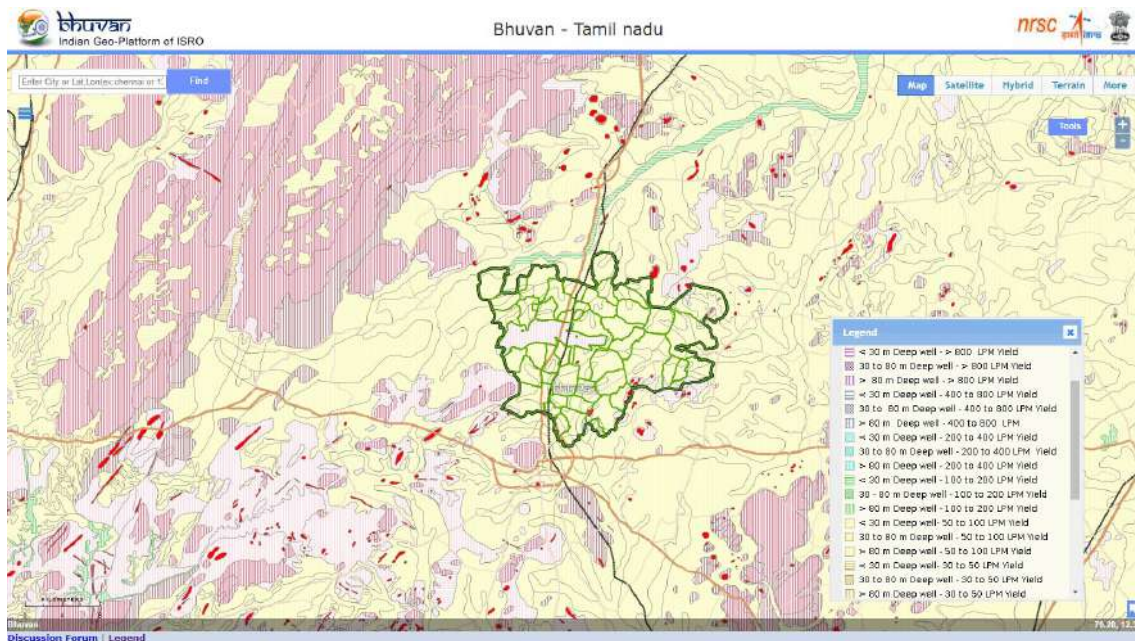
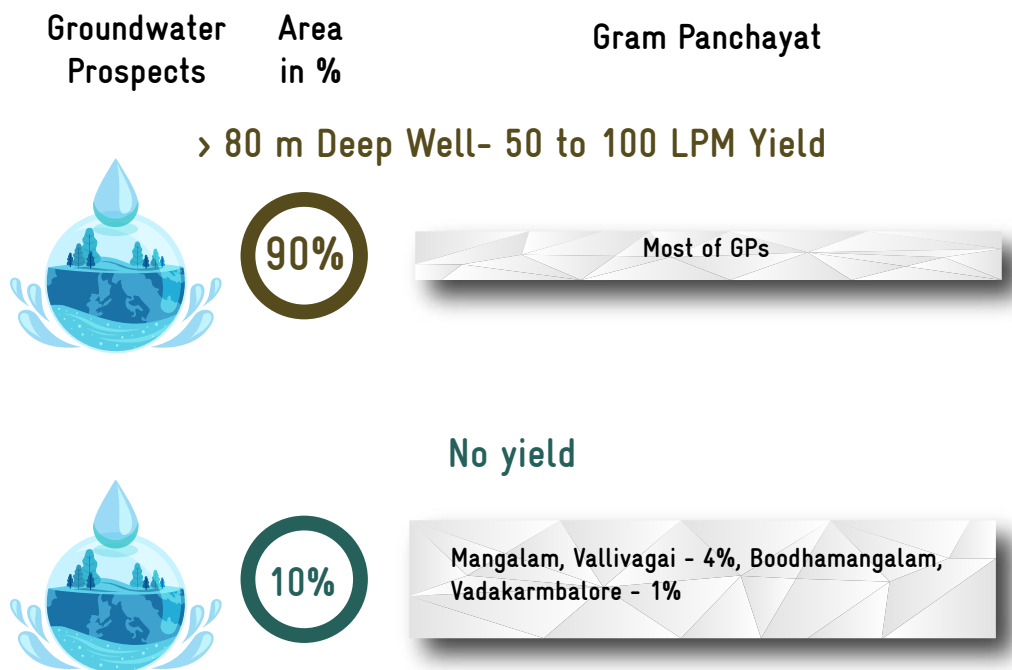


Figure 3.8. Ground water perspective map



3.5.2 NON SPATIAL DATA

Water resource based non-spatial secondary data related to irrigation facilities such as canal, traditional water bodies, water quality, demand and sup-

ply were collected from Govt. sources (Table 6). GP wise current water resources state and its supply and demand side are shown in Annexure 3.6.

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

S No	Key CWRM Parameter	Total
	Canal Network (in m)	
1	Length of Main Canal (m)	13,400
2	Length of Minor Canal (m)	2,000
3	Length of Distributaries (m)	30,200
4	Water Courses (Field Channels) (m)	52,000
5	Number of Tanks (PWD & Union) (No.)	101
6	Number of Ooranis (No.)	326
	Irrigation Facilities (ha)	
7	Tank Irrigation	1,233.74
8	Open & Tube Well Irrigation	8,490.21
	Catchment Area wise Available Runoff (ha.m)	
9	Good Catchment Area	2,147.80
10	Average Catchment Area	99.50
11	Bad Catchment Area	4,537.40
	Watershed and Drainage Networks	
12	Length of Natural Drainage Lines (m)	231,528.24
13	Number of Natural Drainage Lines (No.)	337.00
14	Number of micro-watersheds (No.)	236.00
	Water Demand	
15	For Humans (ha.m)	337.48
16	For Livestock (ha.m)	172.23
17	For Agriculture (ha.m)	11,144.88
18	% GW Utilization for Drinking (%)	11.96
19	% GW Utilization for Livestock (%)	91.66
20	% GW Utilization for Agriculture. (%)	83.23
21	% SW Utilization for Drinking (%)	88.04
22	% SW Utilization for Livestock (%)	8.34
23	% SW Utilization for Agriculture (%)	16.77

3.5.2.1 Existing Water Structures

The Block has structured traditional water storage units such as tanks, and ooranis which are the life line of local communities for their lives and livelihoods. The Block has 101 tanks and 326 Ooranis (Figure 3.9).

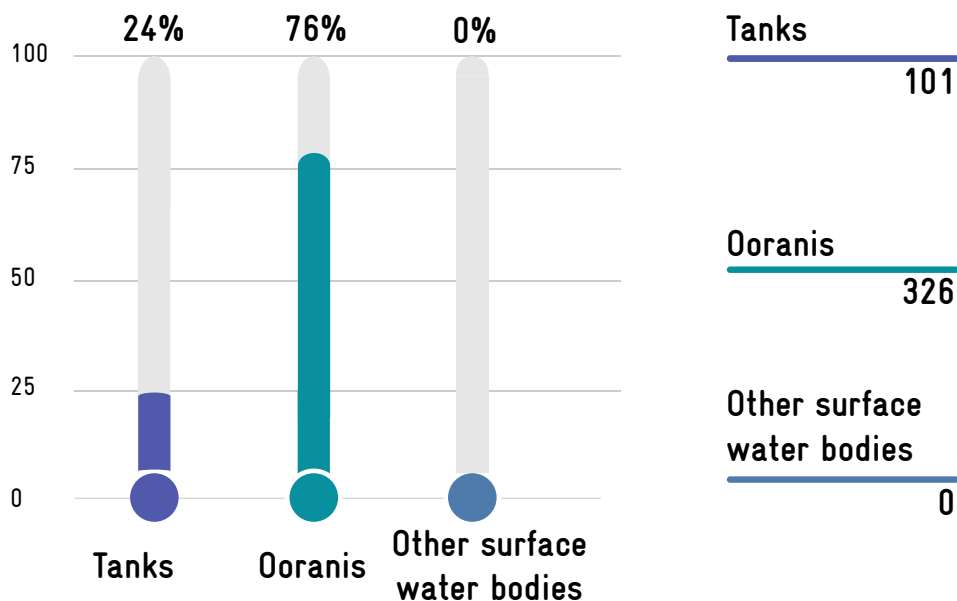


Figure 3.9. Traditional waterbodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the Block is 9,724 ha, of which 87.3 % (8,490.21 ha) is irrigated through ground water stored in open/tube wells. 12.7% (1,233.74 ha) is irrigated through water source of tanks (Figure 3.10).

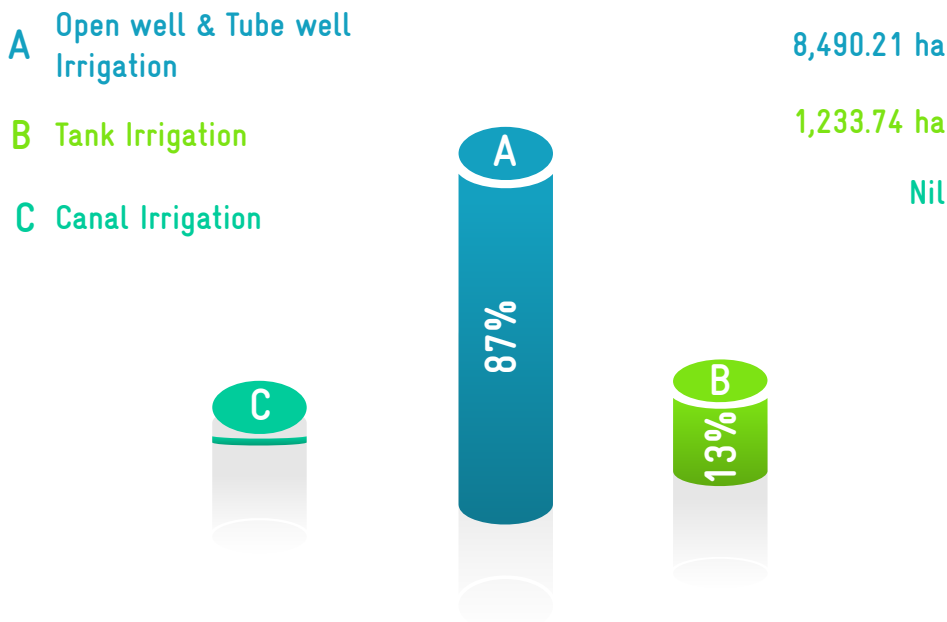


Figure 3.10. Irrigation source

3.5.2.3 Available Run off

The total available runoff in the catchment area is 6,784.70 ha.m and in that 66.88 % (4,537.40 ha.m) comes under bad catchment area followed by 31.66 % (2,174.80 ha.m) comes under good catchment area and rest 99.50 ha.m is average 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 2.11 times higher than good catchment area and more than 46 times in average catchment areas (Figure 3.11).

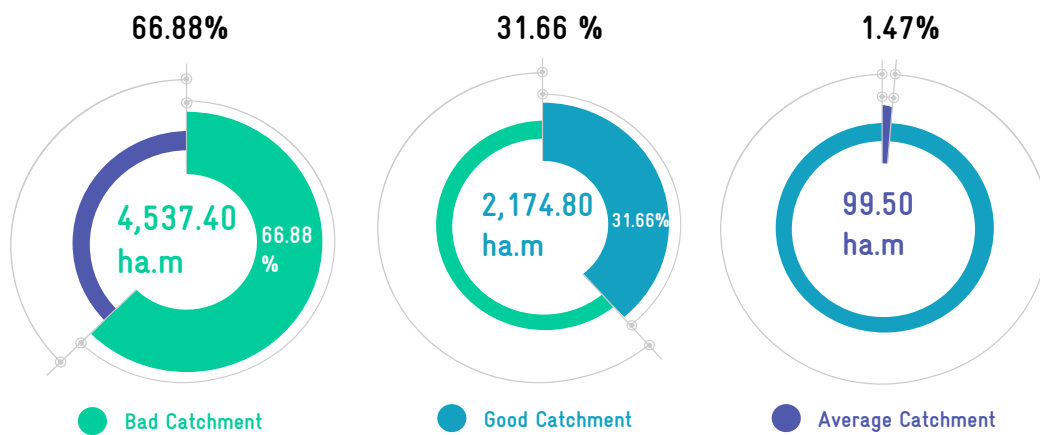
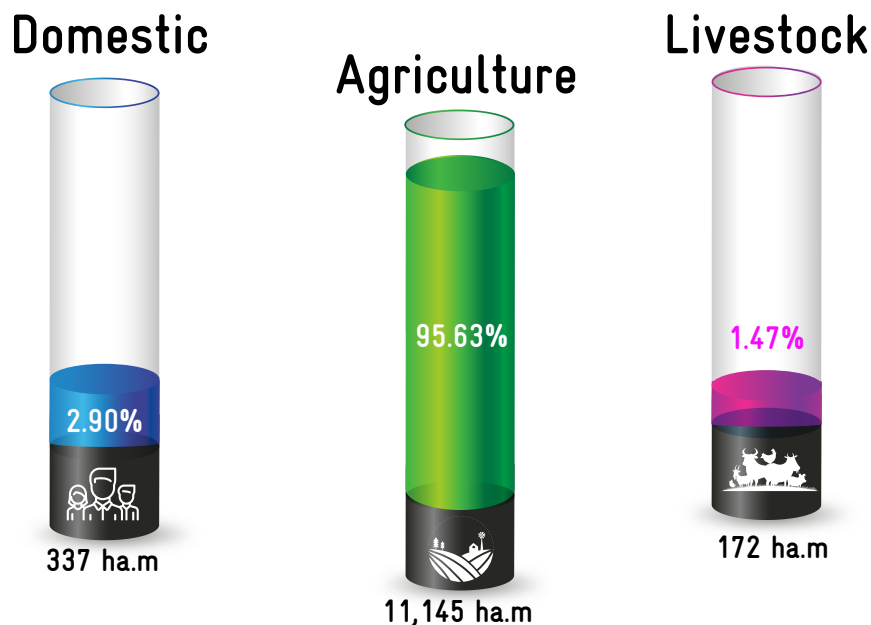


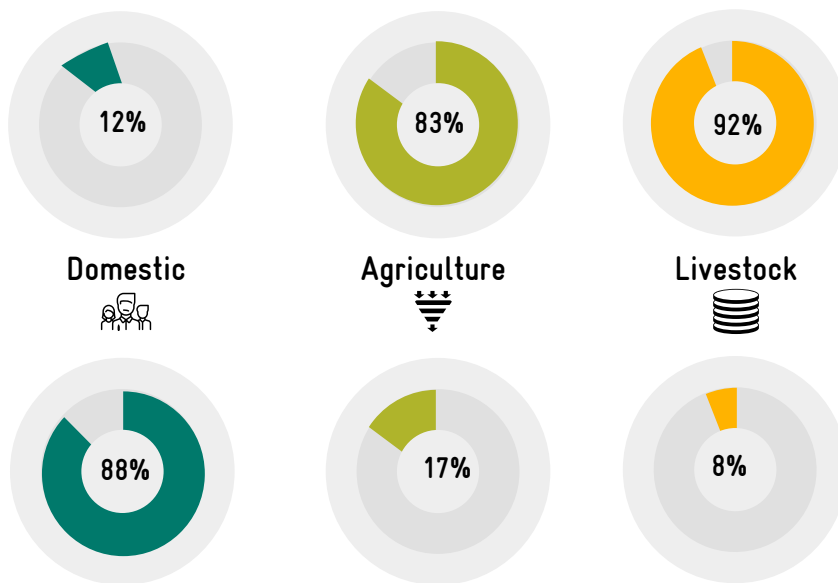
Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 11,654.59 ha.m Out of the total water demand, the more of 95.63 % demand is from agriculture activities followed by 2.90 % from domestic sector rest is of livestock's. Since water is supplied from two sources, more groundwater is used for agriculture (83.26 %) and livestock (91.66 %) purposes. 11.96% of the ground water is used for domestic purpose, while 88.04 % of surface water is utilised for domestic purpose (Figure 3.12).



% OF GROUND WATER UTILIZATION



% OF SURFACE WATER UTILIZATION

Figure 3.12. Sectoral-wise water utilization

3.6 | CWRM PLANNING ANALYSIS- AGRICULTURE

Agriculture is the primary livelihood of the households in Thurinjapuram Block followed by livestock resources. Considering water and monsoon pat-

terns, the key agriculture factors such as soil, land, crop and livestock related parameters are employed in CWRM planning.

3.6.1 SPATIAL DATA

Bhuvan based spatial data for LULC, waste land, salt affected land, soil erosion and soil texture were taken into consideration to understand Thurinjapu-

ram Block’s problems in order to draft scientific key water actions.

3.6.1.1 Soil texture: The soil consistency of particle size is distinguished through soil texture types, especially it is determined by amount of sand, silt or clay. The Block has diverse soil types and predominant in vertisol and alfisol, with reference to soil texture, the proportion of fine and fine loamy texture type is dominated across the Block (Figure 3.13). Soil texture devise the details about the soil properties such as water holding capacity, permeability, soil workability also the ability of plant to grow and this will help in proposing the relevant conservation measures for natural resources.

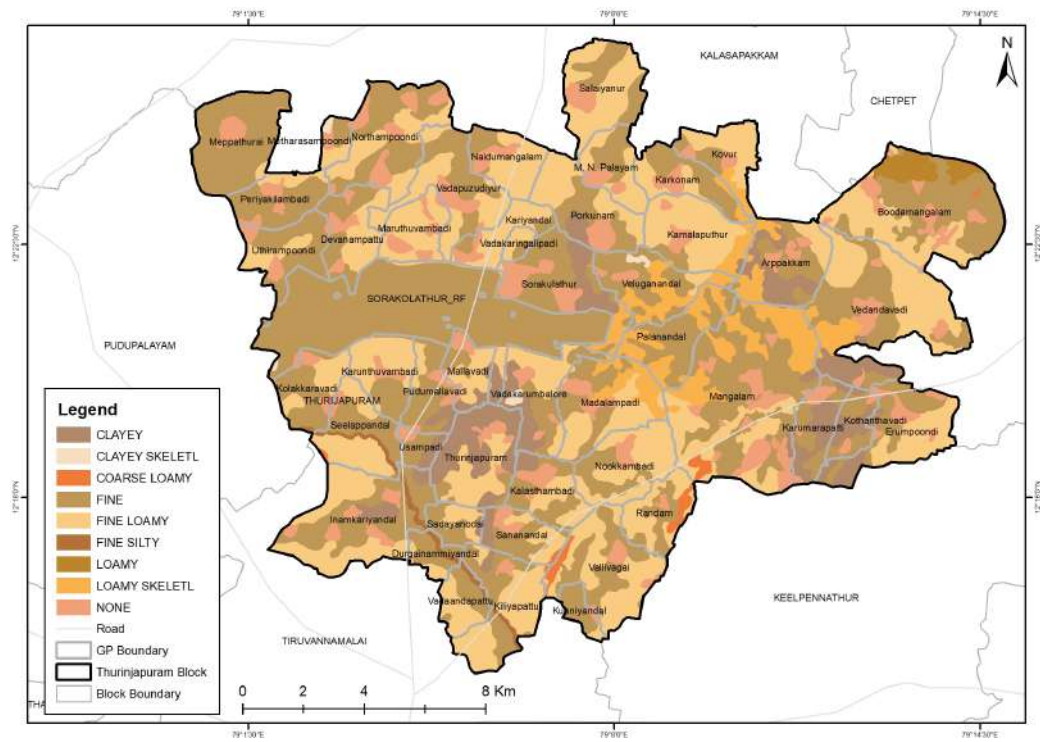


Figure 3.13. Soil texture

3.6.1.4 Soil erosion: Soil erosion is a natural process of displacement of upper layer of soil caused by dynamic erosion agents i.e. water, air, plants and humans. Sorakolathur GP with a Reserve Forest witnessed sheet erosion while small patches of land are affected with sheet erosion in some GPs (Figure 3.14). The details sheet erosion respect to GP is illustrated below. This soil eroded sites will act as direct input in preparation of plan, to suggest soil conservation and watershed management activities.

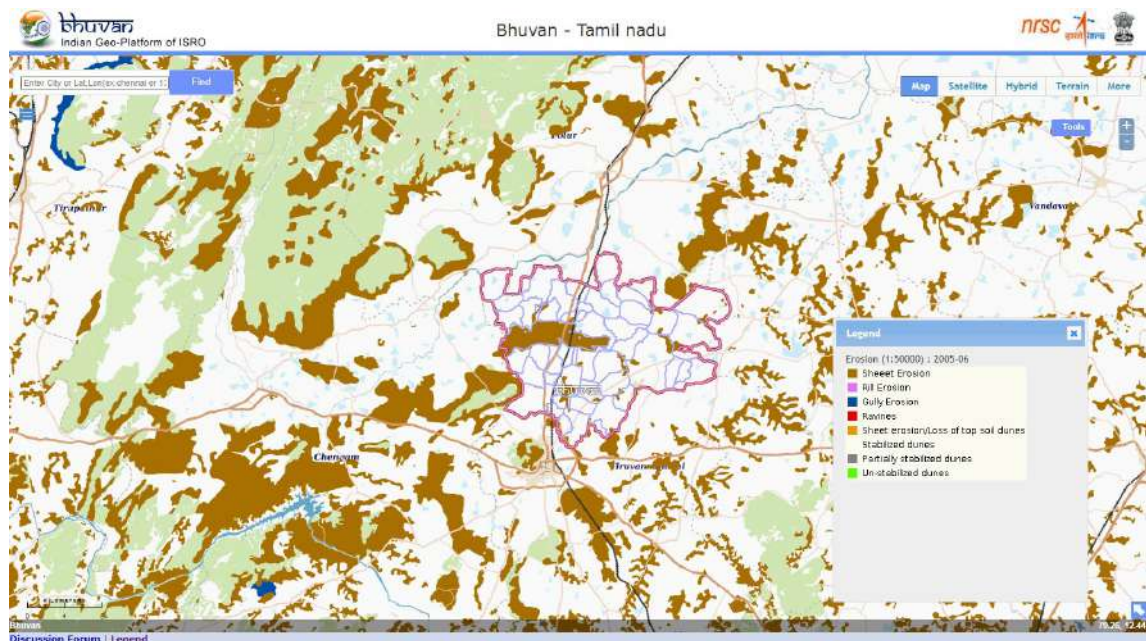
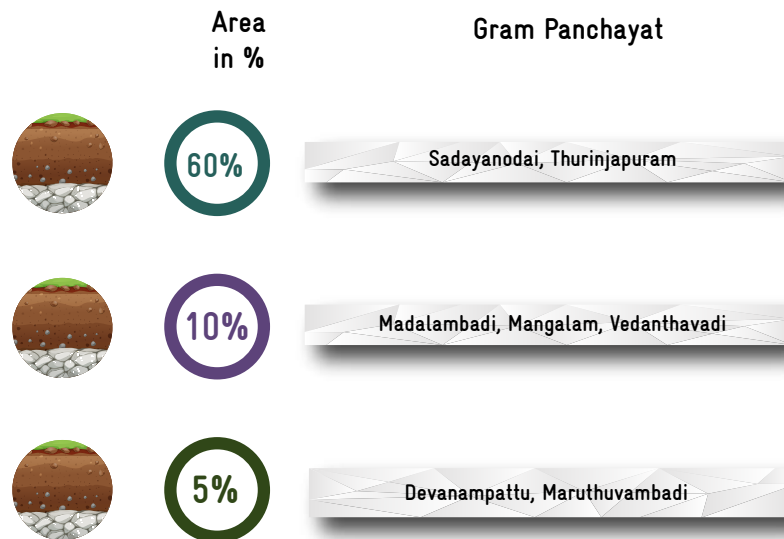


Figure 3.14. Soil erosion map



3.6.1.3 Land Use & Land Cover (LULC): LULC are two separate terminologies which are often used interchangeably. In general, land cover is defined as ‘the observed biophysical cover on the Earth’s surface’. It includes vegetation and man-made features as well as bare rock, bare soil, and inland water surfaces; while land use refers to ‘the way in which land has been used by humans and their habitat, usually with the accent on the functional role of land for economic activities’. LULC has become increasingly important which, in turn, underlines many environment-development policies. Thuringapuram Block is dominated with barren and uncultivable land while agriculture practices are more in Eastern region GPs (Figure 3.15). LULC map helps the decision makers and planners to focus on the fallow land development activities.

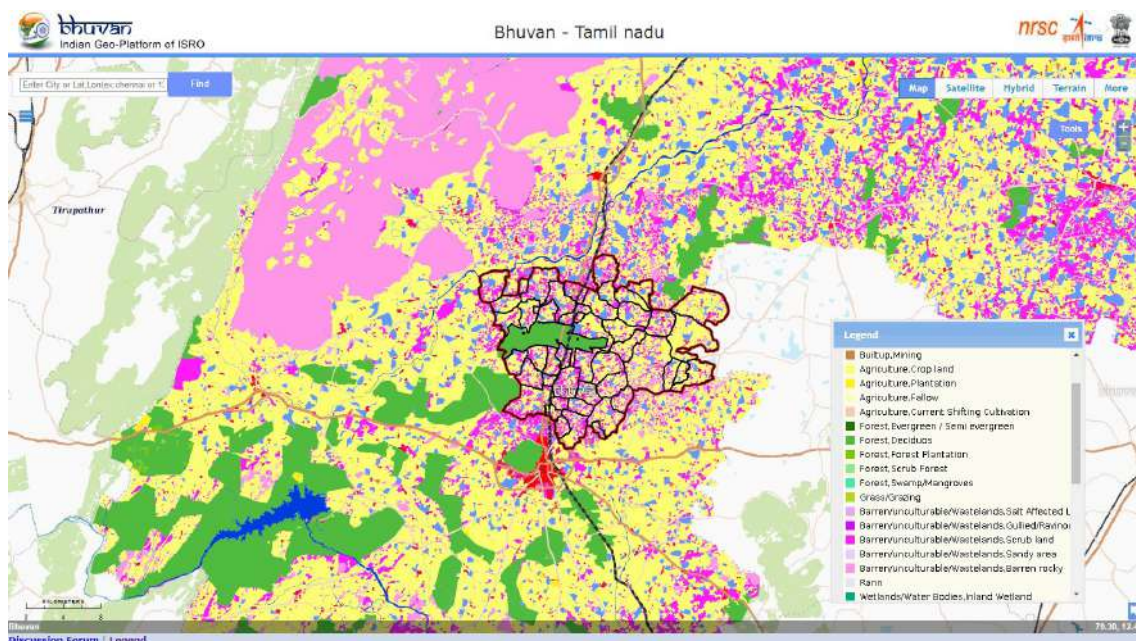
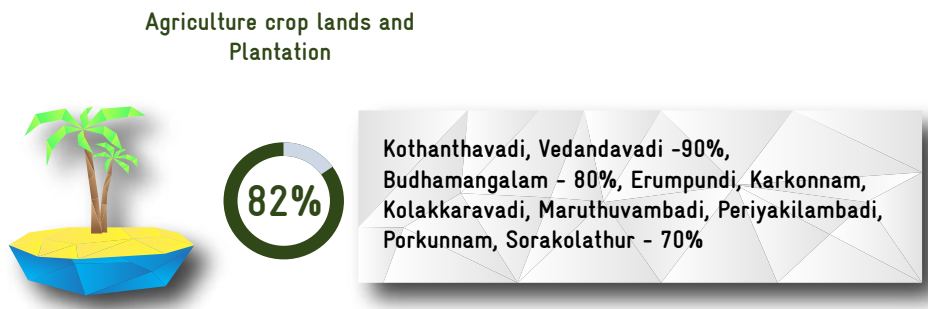
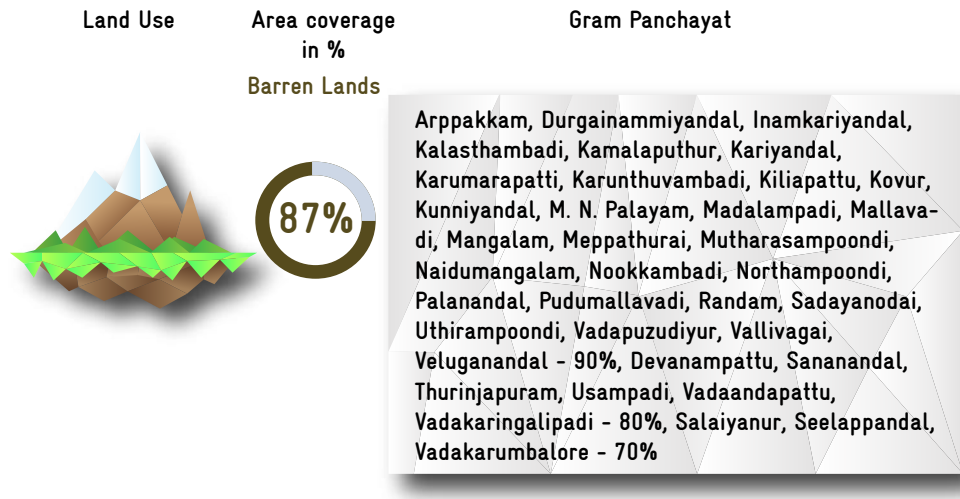


Figure 3.15. Land use land cover map



3.6.1.4 Waste land: A Parcel of land that is not suitable for any agriculture activity and mostly covered with dense or open scrub is called as wasteland. The extent of Wasteland will act as a direct input for preparation of plans for land development activities or greenery. Small patches of wasteland parcels are noticed along the block boundary periphery of southern GPs and one parcel in a GP which is situated in East. Almost 60 % area of Sorakolathur reserve forest is degraded (Figure 3.16). During planning for the GPs, plantation measures have been taken up in the identified portions to convert the wasteland into productive land.

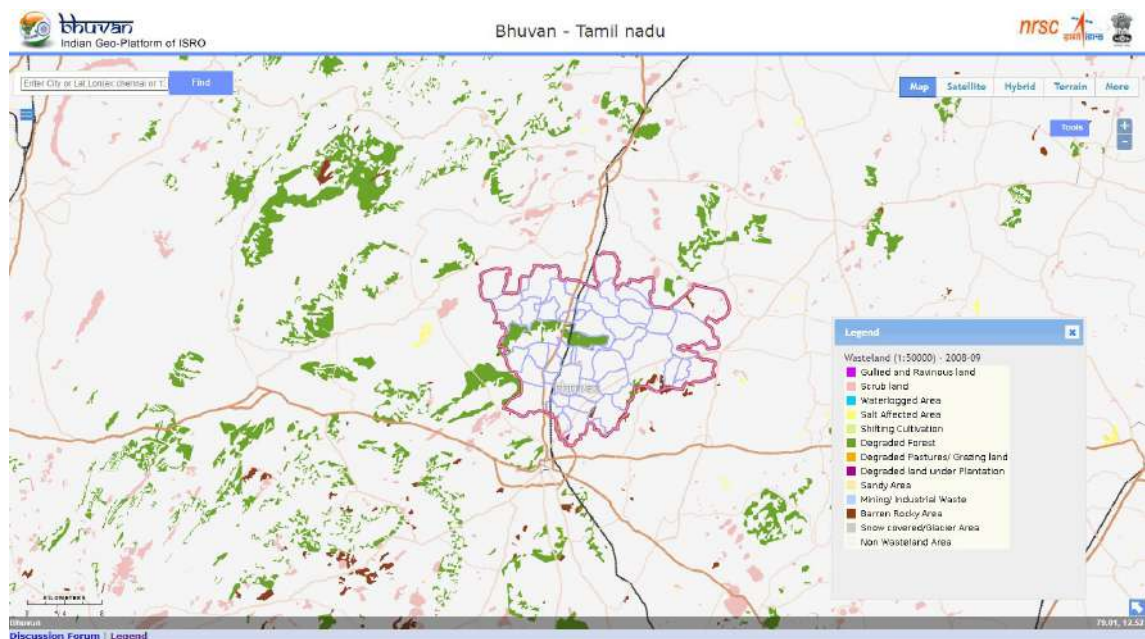


Figure 3.16. Wasteland map

Wasteland type	Area in %	Gram Panchayat
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Barren rocks



Mangalam - 20%, Bhoodamangalam - 10%,
Vallivagai - 5%

Scrub land



Bhoodamangalam, Vadakarimbalore

3.6.1.5 Salt affected area: Ten percent of Kiliyapattu and Katumarapatti GP area is noticed as salt affected area in the Block (Figure 3.17). These parcels will act as a direct input while planning process to propose soil conservation measures, mainly activities to reduce salinization and suggestions for alternative cropping.

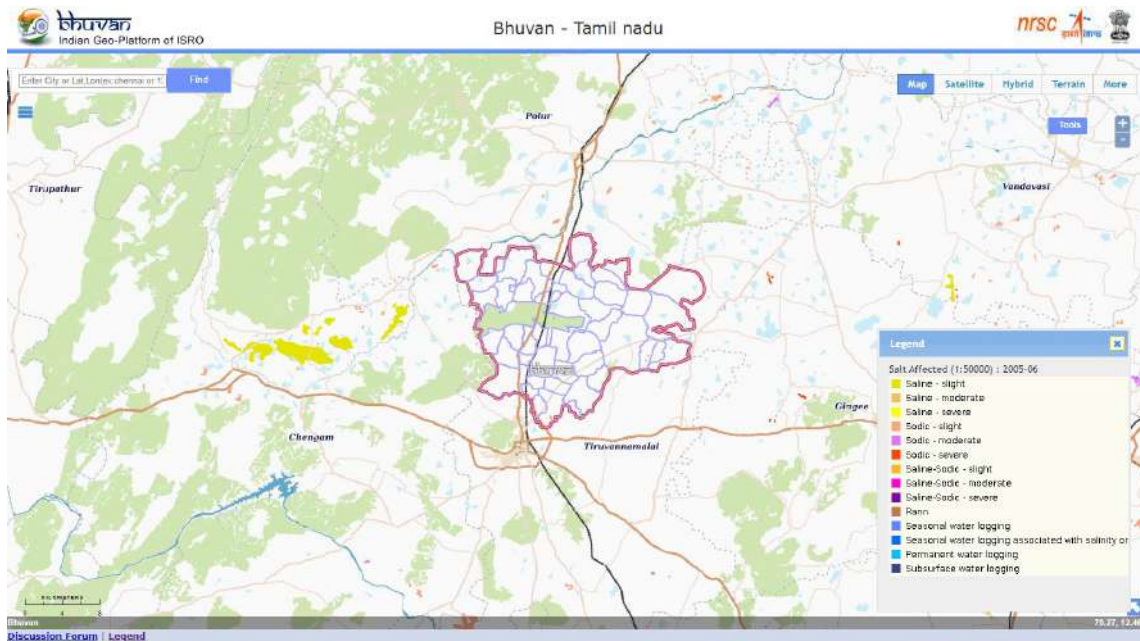


Figure 3.17. Salt affected area

Thematic unit	Area in %	Gram Panchayat
---------------	-----------	----------------

Saline



Kiliyapattu, Karumarapatti

3.6.2 NON SPATIAL DATA

Agriculture based non-spatial secondary data related to land resources, catchment, crop type, soil micro-macro nutrient, moisture, ET and livestock data

were collected from govt. sources (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	Area under Forest land	112.88
2	Non-Agricultural Uses	5,286.14
3	Area under Barren & Un-cultivable Land	376.53
4	Area under Permanent Pastures and Other Grazing Land	69.08
5	Land Under Miscellaneous Tree Crops etc.	65.12
6	Cultivable Waste Land	208.07
7	Fallows Land other than Current Fallows	1,006.03
8	Current Fallow land	6,716.01
9	Unirrigated Land	6,611.34
10	Area Irrigated by Source	10,270.21
	Land under Catchment Area (ha)	
11	Good Catchment	5,775.55
12	Average Catchment	342.27
13	Bad Catchment	24,603.59
	Crop details	
14	Irrigated Area (ha)	9,212.04
15	Rainfed area (ha)	3,208.38
16	Paddy Cultivation (ha)	4,091.68
17	Crop Water Requirement - Irrigated condition (ha-m)	10,011.89
18	Crop Water Requirement - Rainfed condition (ha-m)	1,133.00
	Soil Resources: status of available Nitrogen (%)	
19	Very Low	25.43
20	Low	38.17
21	Medium	4.38
	Status of Organic Carbon (%)	
22	Very Low	49.00
23	Low	34.34
24	Medium	1.34
25	High	4.66
	Status of Soil micro-nutrients (%)	
26	Sufficient	54.19
27	Deficient	45.81
	Status of physical condition of the soil (%)	
28	Moderately Acidic	0.11
29	Strongly Acidic	0.00

30	Highly Acidic	0.53
31	Moderately Acidic	1.37
32	Slightly Acidic	2.96
33	Neutral	4.63
34	Moderately Alkaline	81.89
Soil Texture (%)		
35	Clay soil	8.79
36	Fine Soil	75.72
37	Coarse loamy	0.46
38	Soil Water Permeability (Low, Moderate, high)	Moderate
Soil moisture and ET		
39	Volumetric Soil Moisture (%)	0.23
40	Estimated Soil Moisture (ha.m)	5,850.11
41	ET Losses (ha.m)	13,560.49
Means of water extraction (%)		
42	Gravity	8.14
43	Lifting	91.86
Irrigation methods (%)		
44	Wild Flooding	15.57
45	Control Flooding	84.43
Livestock (No.)		
46	Cattle Population	43,562
47	Sheep Population	16,166
48	Goat Population	19,401

3.6.2.1 Land utilization

The standard land use classification helps to understand the distribution and the extent of different land use categories. As the runoff and water harvesting actions are linked to the land use systems, its distribution across the geographical boundary of the Block is necessary to take decisions. Of the total land area of 30,721.41 ha, the highest of 33.43 % land area is under irrigation, followed by 21.86 % land is current fellow land, while cultivable wasteland, forest land, permanent pastures and other grazing miscellaneous tree crop etc. area is less than one percent (Figure 3.18).

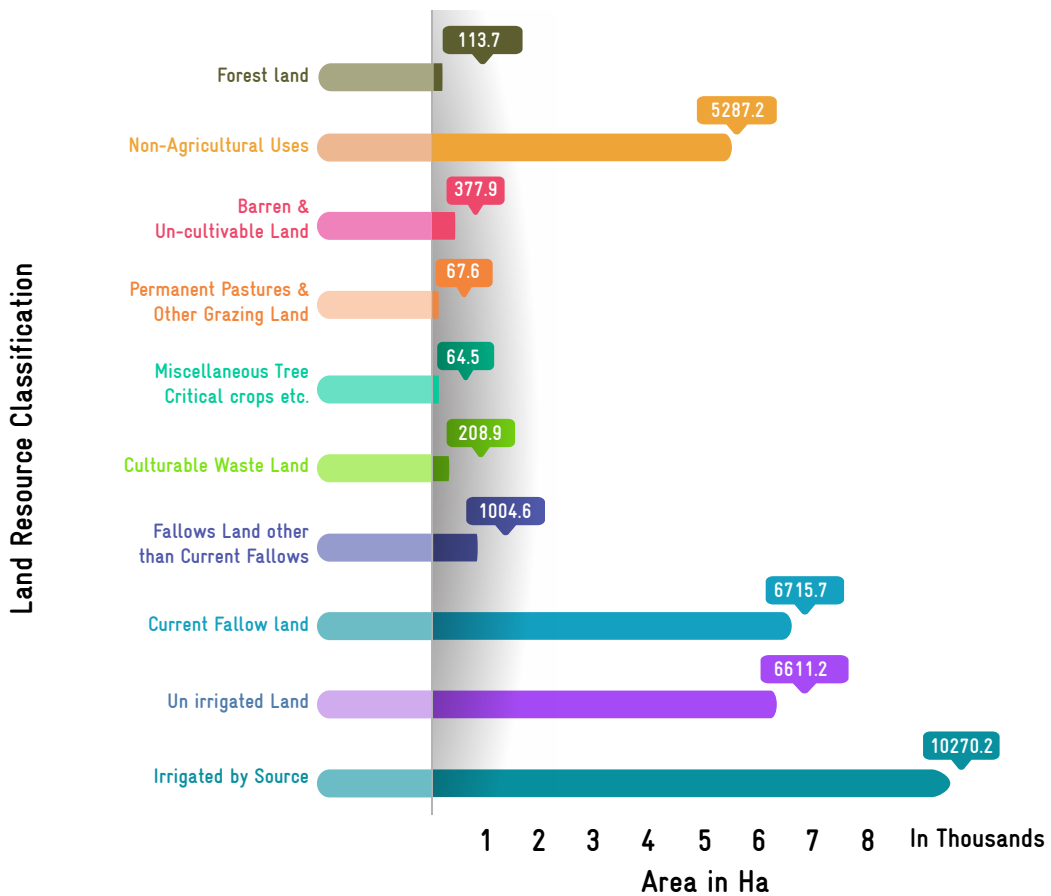


Figure 3.18. Land utilization

3.6.2.2 Catchment Area

The land use types in each of the GPs are categorized into three different types of runoff; good, average and bad catchment area. Total catchment area of the Block is 30,721.41 ha, about 80 % is bad catchment area followed by 18.8 % is good catchment area and remaining is under average catchment area (Figure 3.19). This analysis helps to focus on prioritizing the works in the land use systems under the good and bad catchment areas.

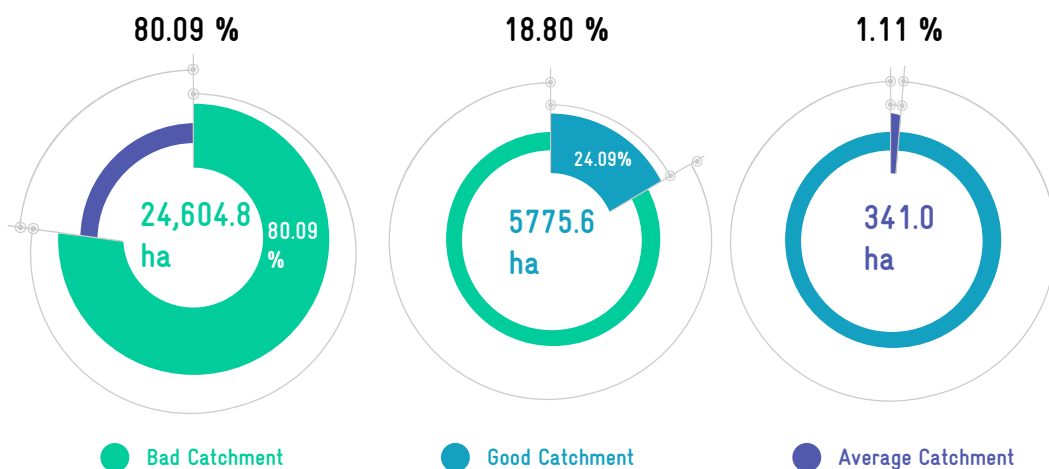


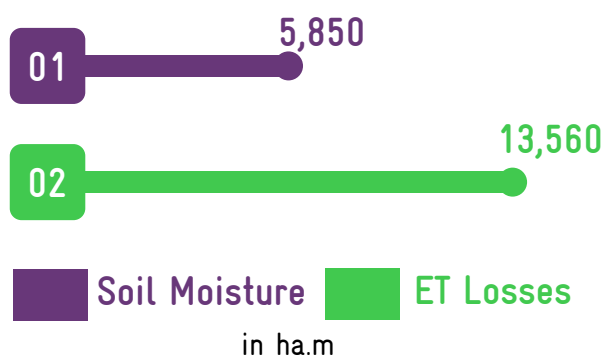
Figure 3.19. Catchment Area

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 is 23%, is taken for estimating the amount of water stored as soil moisture which accounts to 5850.11 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 13560.48 ha.m.



3.6.2.5 Macro soil nutrients Nitrogen

The macro soil nutrients such as nitrogen and organic carbon falls under very low to moderate category in all the soil samples tested. The available nitrogen is very low in 25 % of the samples tested while it was 38 % under low category and four percent under medium (Figure 3.20). According to soil resource map, this Block is identified as one of the nitrogen deficient Block (Tiruvannamalai district profile 2020).nitrogen deficient Block (Tiruvannamalai district profile 2020).

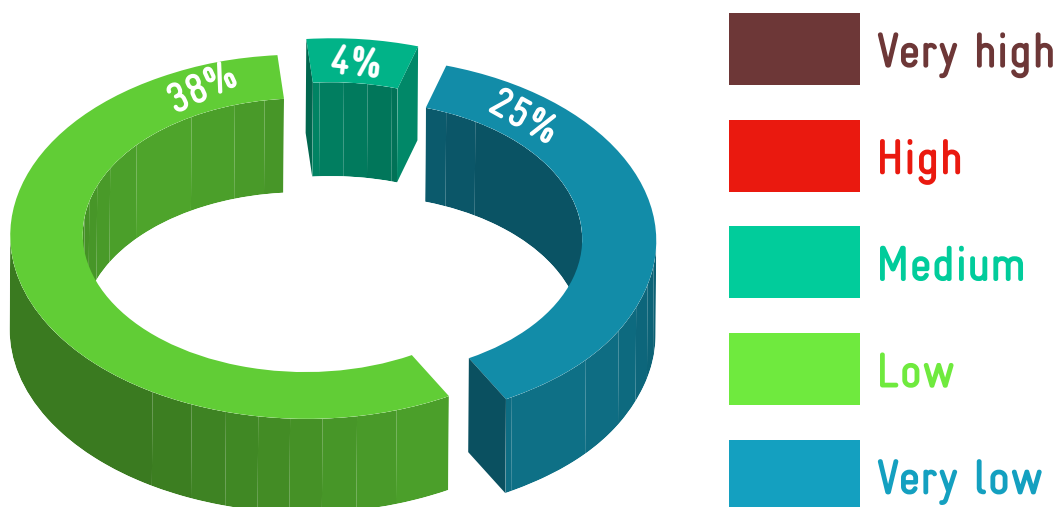


Figure 3.20. Status of available Nitrogen

Macro soil nutrients Nitrogen

A similar trend was recorded for soil organic carbon. Soil organic carbon is also ranges between very low and high in the Block. Nearly 49 % of the soil samples tested fall under very low category followed by 39 % are falls under low category while less five percent under high (Figure 3.21). This indicates that the soil fertility is very poor and further intensive practices will make the soil more vulnerable to degradation over a period of time.

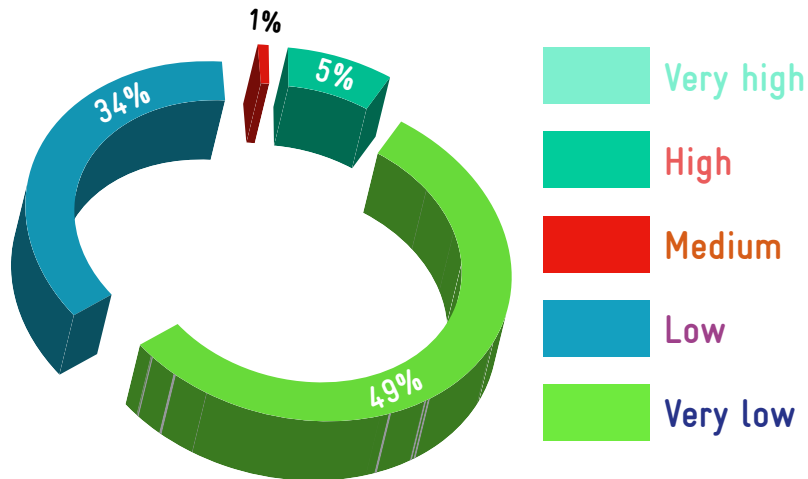


Figure 3.21. Status of soil Organic Carbon

Status of the soil micro nutrients

This Block is one of the Nitrogen, zinc and ferrous deficient Block of Tiruvannamalai district. The micro nutrient status of the soil with specific reference to Manganese, Boron and Zinc, Ferrous, Copper, and Sulphate are deficient in 46 % and 54 % sufficient in the soils tested. (Figure 3.22)

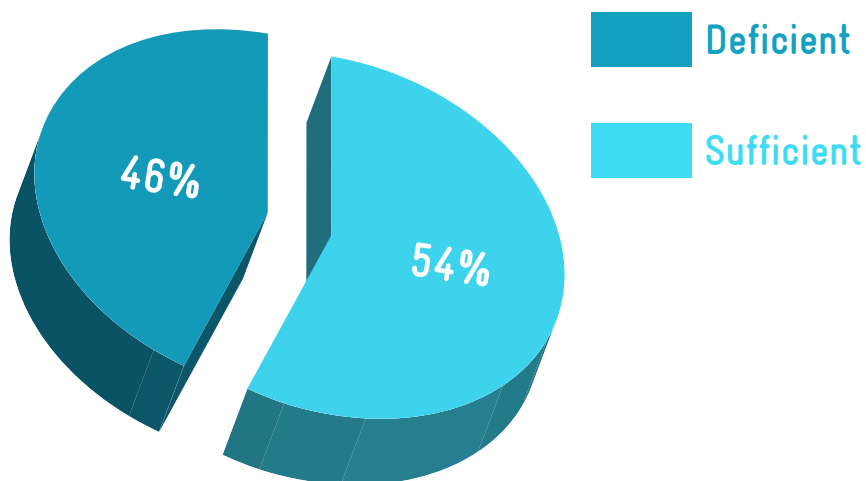


Figure 3.22. Status of soil micro-nutrients

3.6.2.6 Physical parameters – pH status

With reference to the physical parameters, 81.89 % of the soil is moderately alkaline in nature followed by 4.63 % is neutral, 2.96 % is slightly acidic, 1.37 % is moderately acidic, and 0.53 % is highly acidic in nature (Figure 3.23).

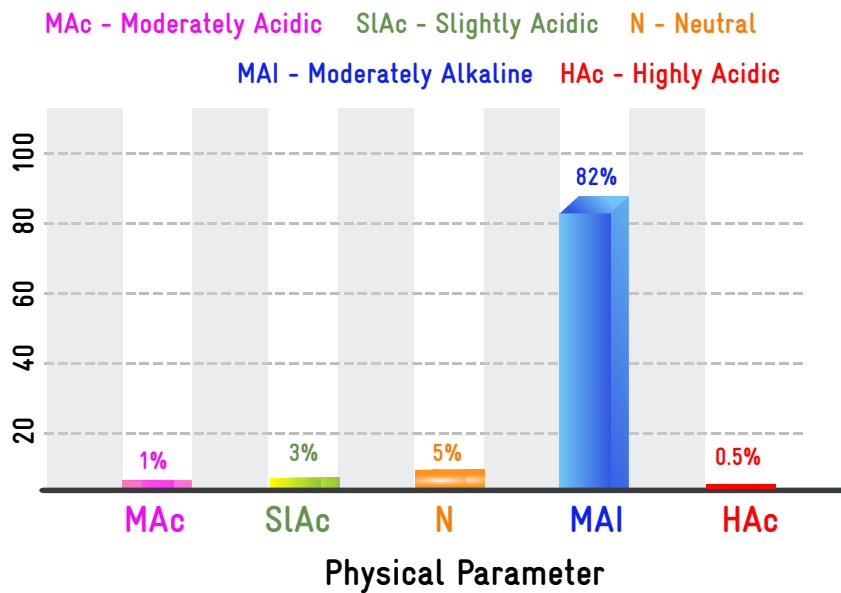


Figure 3.23. Status of pH of soil

3.6.2.7 Cropping pattern

Irrigation source and rain-fed source crop cultivated area in the block is 20,663 ha. In which 57 % (11,766 ha) area is irrigated through water sources and rest of 43 % is rain-fed area. Groundnut, Paddy and pulses area the dominated crops in the Block (Figure 3.24). Paddy is the predominated crop of irrigation area (31 %) followed by ground nut (27 %). Whereas ground nut is predominant in rainfed area (54 %) followed by pulses (44 %). Horticulture crops such as sugarcane, banana, medicine plants and turmeric are cultivated in the irrigated area.

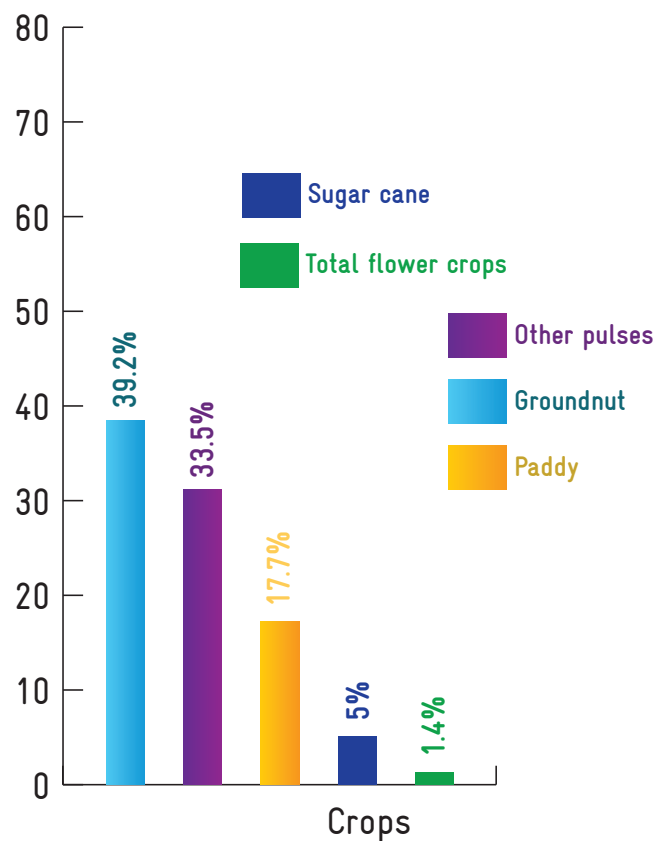


Figure 3.24. Cropping patterns

3.6.2.8 Irrigation methods

In case of the surface water resources, wild flooding is the primary method of irrigation. But in case of ground water resources, the predominant type of irrigation is controlled flooding. In the Block, 84.43 % of the irrigation is done by control flooding and only 15.57 % of the irrigation is done by wild flooding (Figure 3.25).

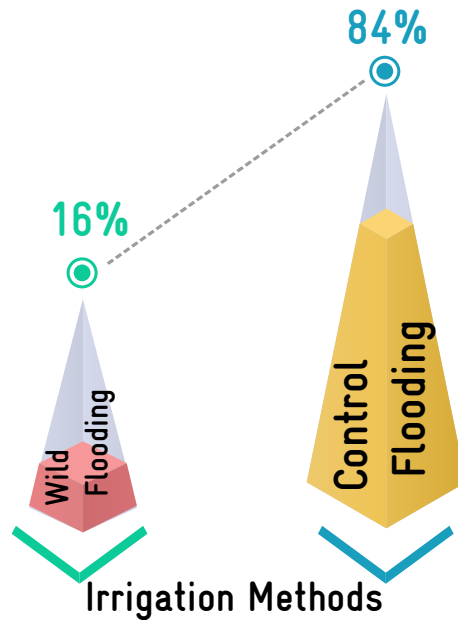


Figure 3.25. Irrigation methods

3.6.2.9 Means of water extraction

Water is extracted in two ways, one by gravity and another is by lifting. Water is drawn from surface water sources such as tanks, ponds etc., by using gravity method and that of ground water sources such as open well, hand pump, bore well by using lifting method. In the Block, since the dependence on ground water sources is more, 91.86 % of the water extraction methods are under lifting means of extraction and only 8.14 % comes under gravity means of water extraction (Figure 3.26).

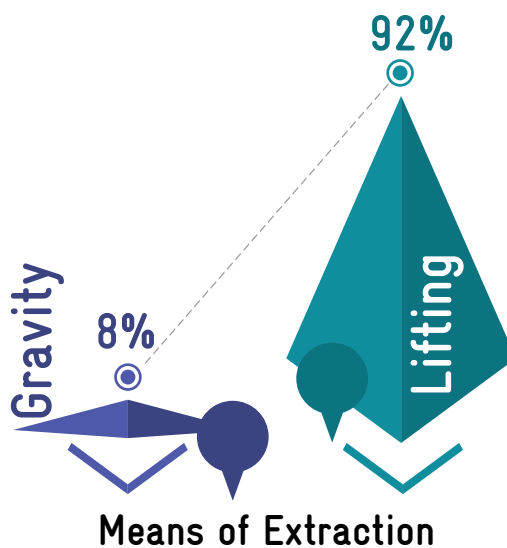


Figure 3.26. Means of water extraction

3.6.2.10 Livestock Details

This Block has considerable proportion of livestock resources of which small ruminants such as sheep and goat constitute 20.43 % and 24.52 % of the total livestock. While cattle population is higher in Block (55.05 %) (Figure 3.27) The total water requirement for livestock is 172.23 ha.m. Of which, 91.66 % is met through ground water and remaining is from surface water resources.

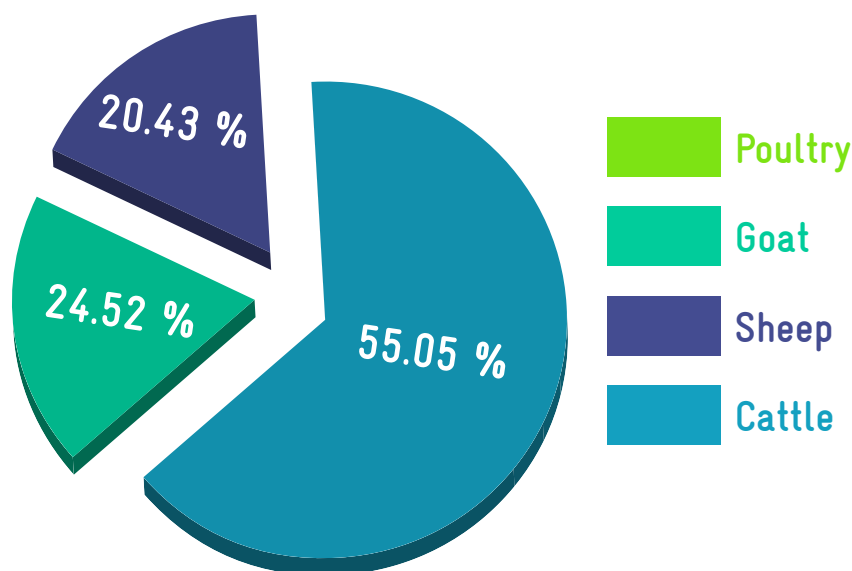


Figure 3.27. Livestock details

3.7 | CWRM PLANNING ANALYSIS- SOCIO ECONOMIC

The demographic details such as population, gender, vulnerable population/ households, drinking and grey water details are collected from authentic primary and secondary sources and analyzed. Data of MGNREGA job holders is also taken for

the analysis. Table 8 lists the demographic and socio-economic status of Thurinjapuram Block. GP wise demographic and socio-economic status are attached in Annexure 3.8.

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

S No	Key CWRM Parameter	Total
1	Geographical Area	28,341
2	Male Population (No.)	61,935
3	Female Population (No.)	61,346
4	Total Population (No.)	1,23,281
5	SC Population (No.)	27,258
6	ST Population (No.)	1,965
7	Vulnerable population (No.)	28,981
8	Households (HH's) (No.)	34,597
9	Only one room HH's (SECC) (No.)	2,937
10	Female Headed HH's (SECC) (No.)	2,278
11	Vulnerable Households (SECC) (No.)	2,742
12	% of Vulnerable Households (%)	7.93
13	Registered MGNREGA Job cards (Persons)	50,766

14	Active person working in MGNREGA job Cards (Persons)	38,299
15	Drinking Water Sources (No.)	10,611
16	Ground Water - Drinking source (No.)	244
17	Surface water - Drinking source (No.)	47
18	Sum of drinking water sources (No.)	291
19	HH's have tap water connection for drinking water (No.)	559
20	HH's dependent on other sources for drinking water (No.)	5,669
21	Annual Greywater Generation (ha - m)	226.786

3.7.1 Population

The total population of this Block is 1.23 Lakhs of which the women proportion is almost equal to proportion of men. In the CWRM planning process due attention is given for the intersecting variables such as gender, class, caste and marital status and availability of safe drinking water resources. In the Block, about 23.5 % of the total population are under vulnerable population (SC & ST population) (Figure 3.28).

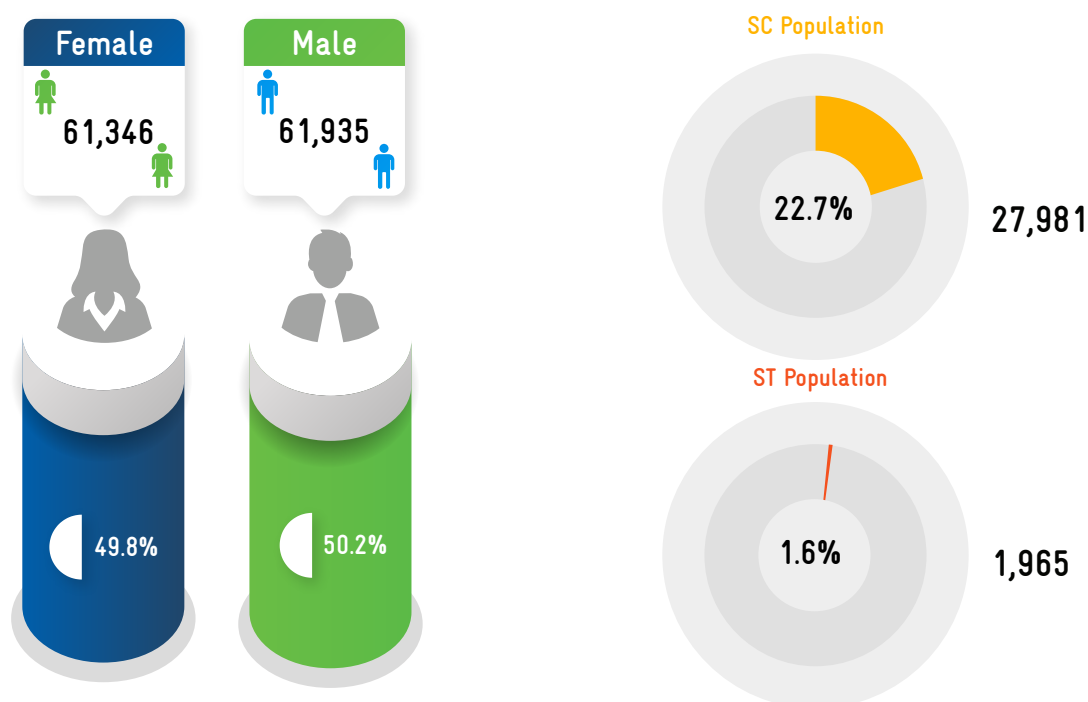


Figure 3.28. Population details

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

3.7.2 Details of Households

There are a total of 34,597 households in which 8.49 % households have only one room, 6.58 % households are headed by women and 7.93 % are vulnerable households (Figure 3.29)

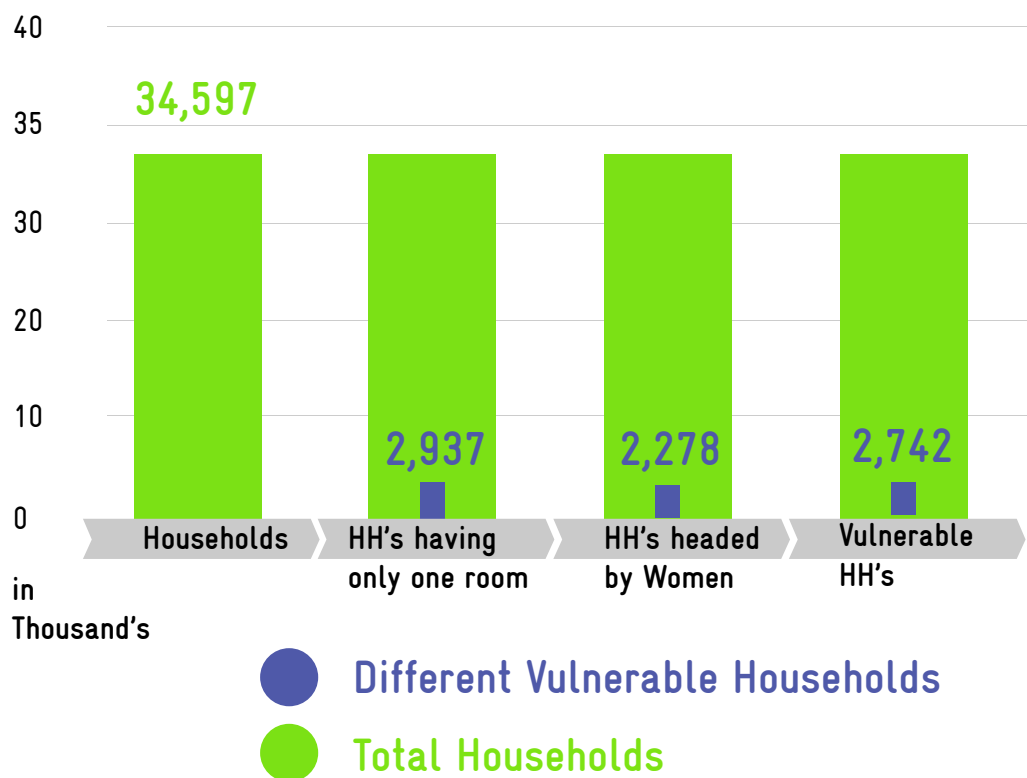


Figure 3.29. Details of Households

3.7.3 Status of Mahatma Gandhi NREGA job card status

In the Block of the total population of 1.23 Lakhs, 50,766 are registered for job cards in Mahatma Gandhi NREGA scheme in which 75.4 % (38,299) of the job cards are in active category (Figure 3.30)

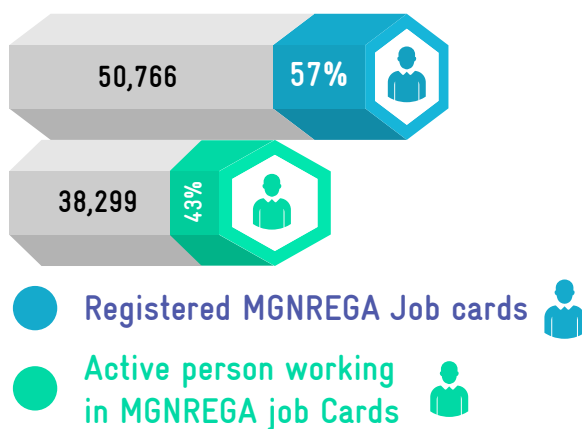


Figure 3.30. Status of MGNREGA job cards

3.7.4 Drinking Water Sources

Only of 559 households have tap water connection while 5,669 households depend on other water sources for domestic use, where other sources included RTRWHS / Tanka (Roof Rain Water Harvesting Systems, Hand pump, Open wells, Bore wells, Tank/ Pond/ Oorani, Springs and River/ Streams.



Tap water connection

599
Households



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

5,669
Households

3.7.5 Annual Greywater Generation

The grey water generation estimated across this Block is 226.78 ha.m which is available for reuse or recycle.

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



Devanampattu, Inam kariyandhal, Sorakilather RF, Arppakkam



Wasteland

Mangalam, Bhidamangalam, Vadakarumbalore



Soil erosion

Sadyanodai, Thurinhapuram



Upland/Slope

Devanampattu, Kivur, Bhoodamangalam, Erumpondi



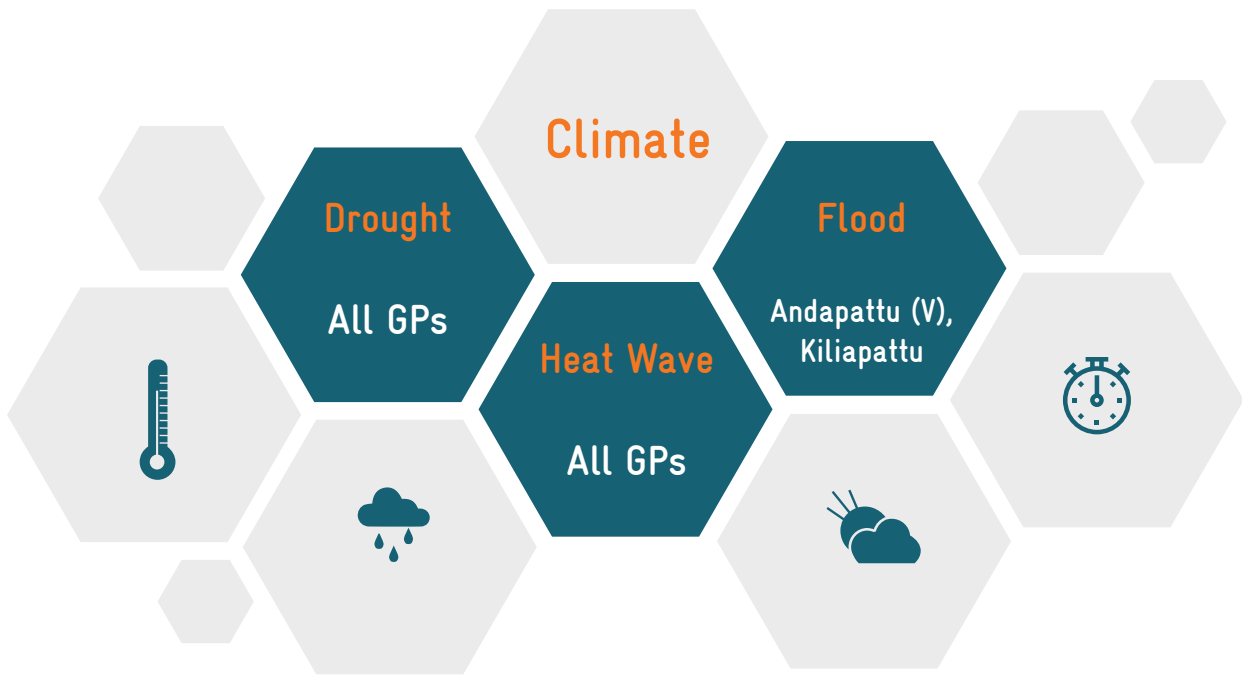
Ground water prosperity

Magalam, Vallivagi, Boodhamangalam, Vadakarmbalore

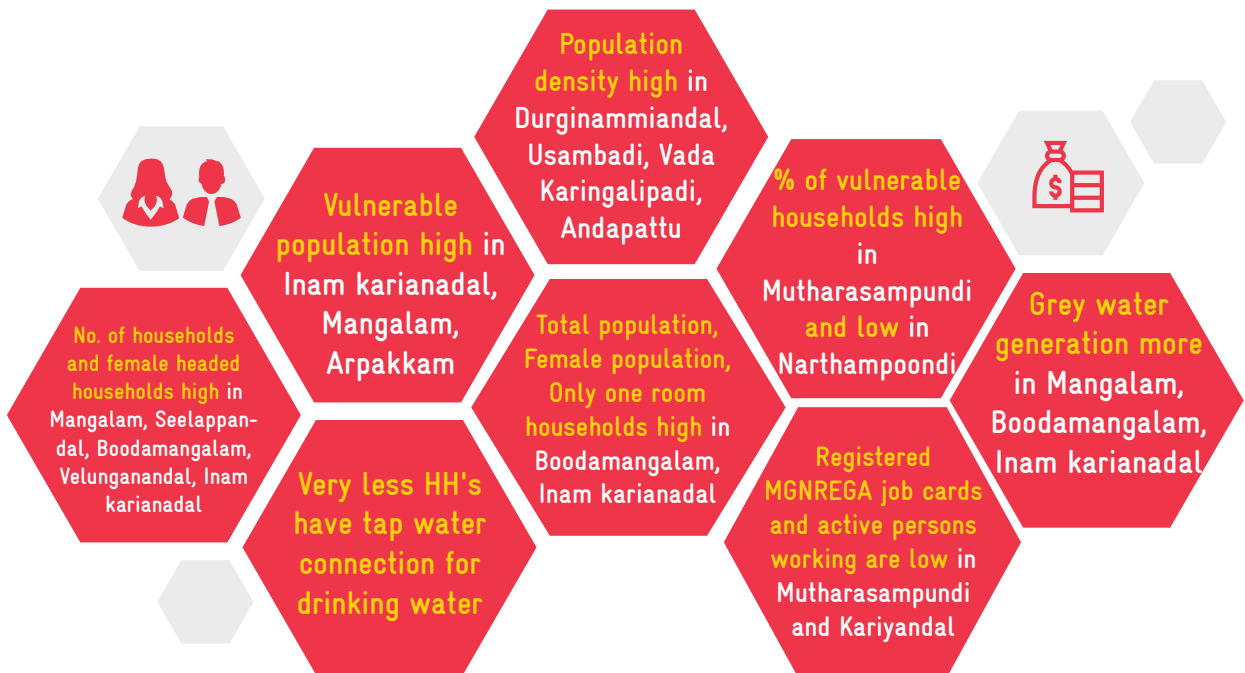


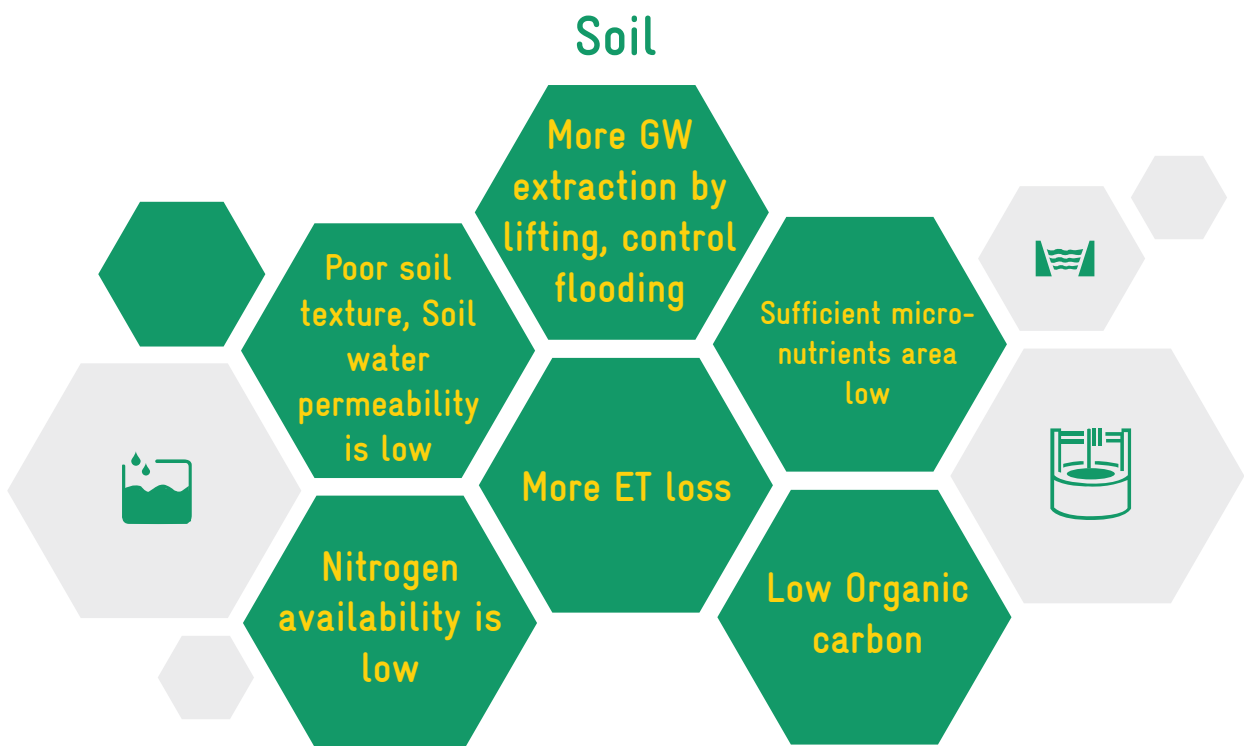
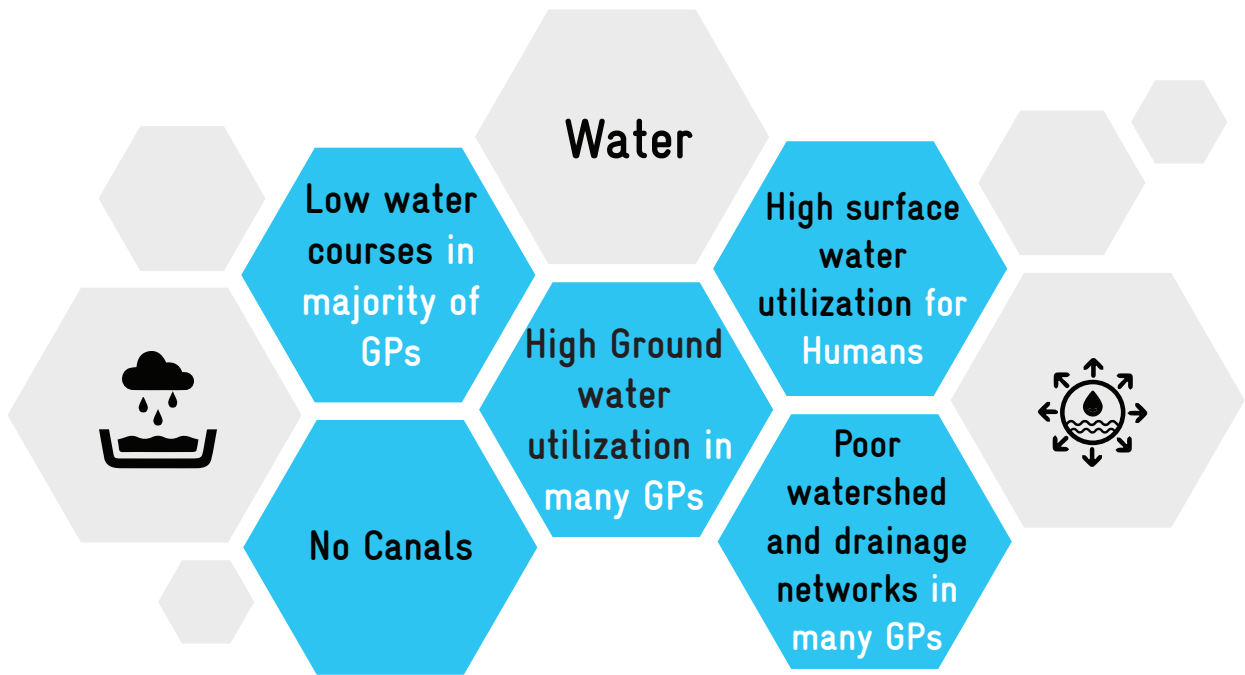
Salt affected area

Kiliyapattu, Karumarapatti



Socio economic





கெடுப்பதூஉம் கெட்டார்க்குச் சார்வாய்மற் றாங்கே
எடுப்பதூஉம் எல்லாம் மழை

குறள் - 15

Destruction it may sometimes pour
But only rain can life restore

Thirukkural - 15

CHAPTER 4

VULNERABILITY RANKING OF GP



4 | VULNERABILITY RANKING OF GP

The vulnerability assessment has been carried out using IPCC methodology. 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).

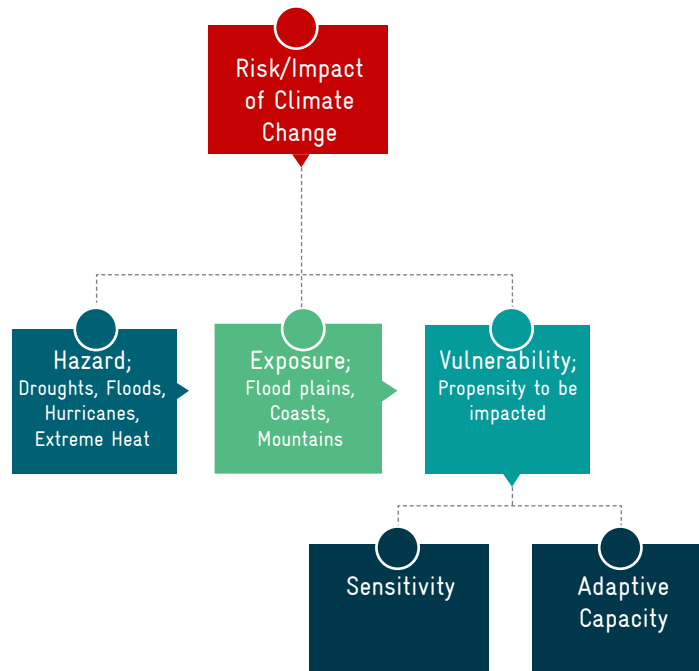


Figure 4.1. Vulnerability of the system as defined by IPCC

Generally, vulnerability assessments are made to identify.

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

The CWRM parameters which been explored through rigorous study were considered here to address the key water challenges at GP level. About 70 spatial and non-spatial parameters/ indicators under 4 dimensions via Climate (3), Water (25), Agriculture (31) and Socio-demographic (11) are cate-

gorized 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.

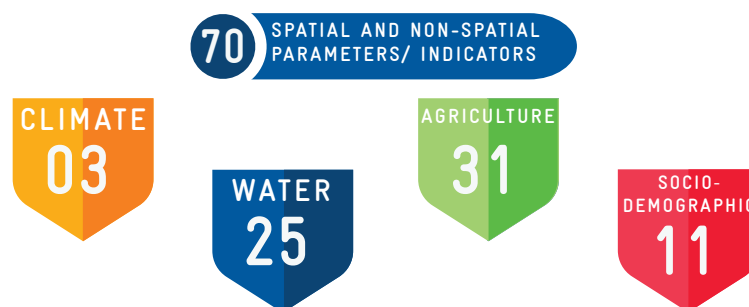


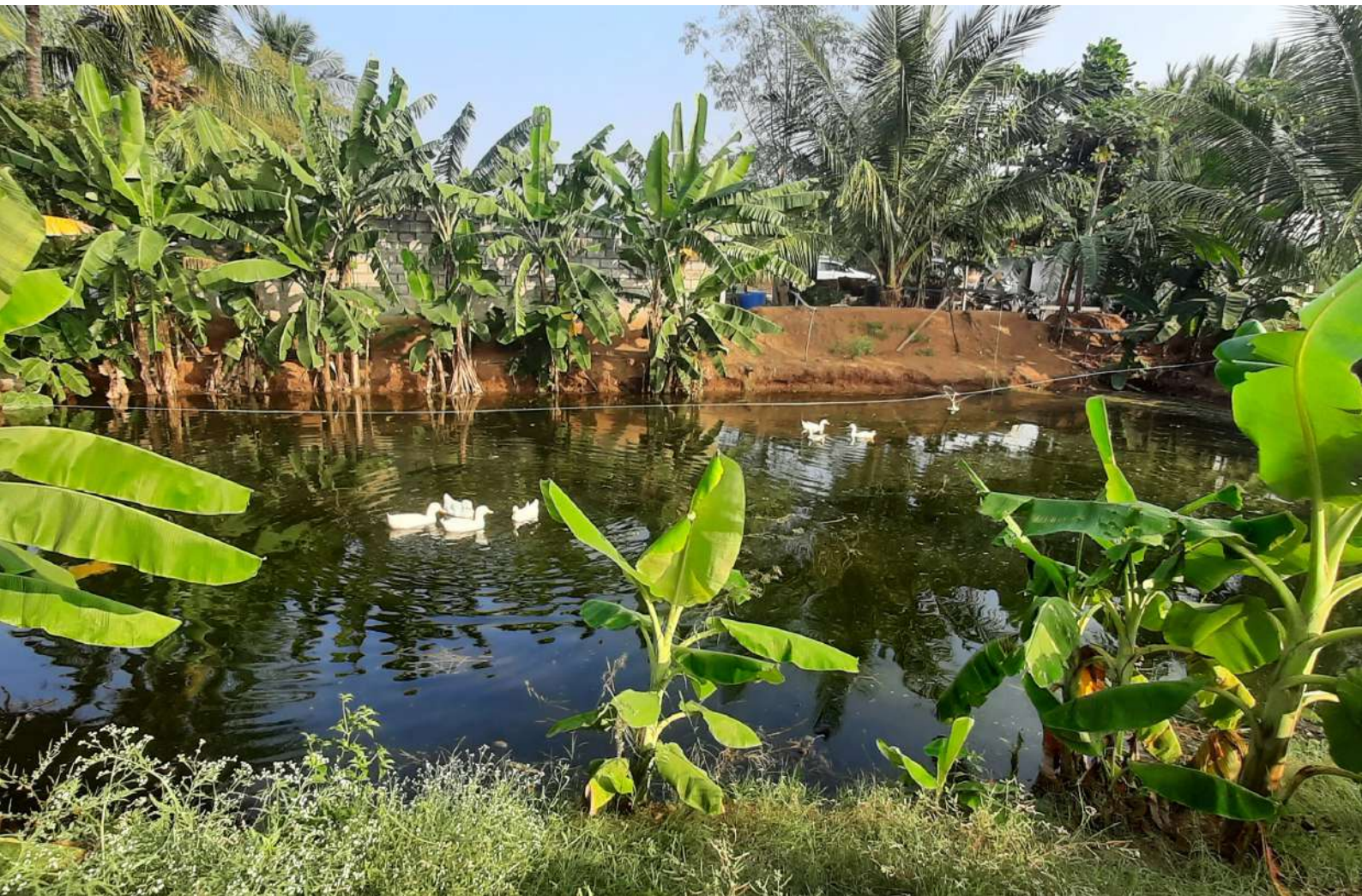
TABLE 9. CWRM PARAMETERS/INDICATORS SELECTED FOR BLOCK LEVEL VULNERABILITY

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

Agriculture	Land under catchment area (ha)	
	Good Catchment	Adaptive capacity
	Average Catchment	
	Bad Catchment	Sensitivity
	Crop Area details (in ha)	
	Irrigated Area	Sensitivity
	Rainfed area	
	Soil Resources: Status of available Nitrogen (in %)	
	Very low to low	Sensitivity
	Status of Organic Carbon (in %)	
	Very low to low	Sensitivity
	Status of Soil Micro Nutrients (in %)	
	Deficient	Sensitivity
	Status of Physical condition of the soil (in %)	
	Highly acidic/alkaline	Sensitivity
	Slightly acidic	Adaptive capacity
	Neutral	
	Moderately alkaline	
	Soil Texture (in %)	
	Clay	Sensitivity
	Fine	Adaptive capacity
	Coarse loamy	
	Soil Water Permeability (Low, Moderate, high)	
	Soil moisture and ET (in ha.m)	
	Estimated soil moisture	Adaptive capacity
	ET losses	Sensitivity
	Means of Water Extraction (in %)	
	Lifting	Sensitivity
	Irrigation Methods (in %)	
	Wild flooding	Sensitivity
Livestock (in No.)		
Livestock density (cattle, sheep, Goat, poultry)	Sensitivity	
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. The GPs are categorized based on vulnerability scores as shown in Figure 4.2. Mangalam, Kothantavadi, Kariyandal, Vedanthavadi and Sorakolathur were found with very high rural water security vulnerable GPs to climate risks while Random GP is least vulnerable.

Upto	Category	Color range
0.550	Very high	Red
0.524	High	Light Red
0.497	Medium	Yellow
0.471	Low	Orange
0.445	Very low	Green



Cumulative Vulnerability Scores

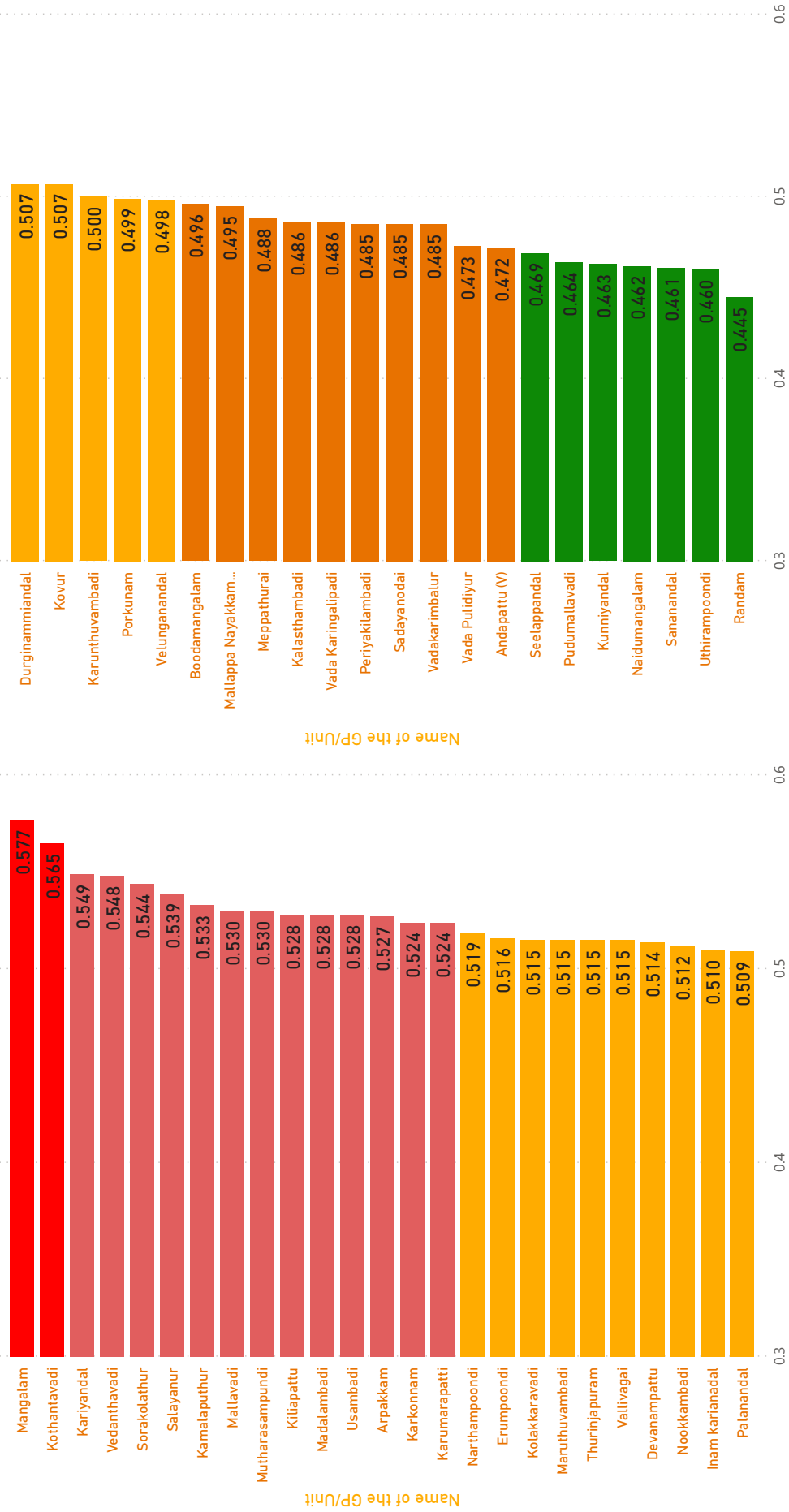


Figure 4.2. Final cumulative vulnerability scores

Sectoral vulnerability

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

Climate risks vulnerability

The climate risk vulnerability index shows that all villages in this Block are affected with droughts and heat waves in last decades. Andapattu(V) and Kiliapattu GPs are identified as flood vulnerable area.

ANDAPATTU(V), KILIAPATTU

Water resource vulnerability

The water resources vulnerability index shows that Mangalam GP is highly vulnerable followed by Madalambadi, Sorakolathur, Vedanthavadi, and Kariyandal while Pudumallavadi is least vulnerable.

MANGALAM, MADALAMBADI, SORAKOLATHUR, VEDANTHAVADI, KARIYANDAL, PUDUMALLAVADI

Agriculture resources vulnerability

In agriculture and allied sectors, Karumarapatti GP has highest vulnerable followed by Kothantavadi, Thurinjapuram, Kariyandal, Mangalam while Randam is least vulnerable.

KARUMARAPATTI, KOTHANTAVADI, THURINJAPURAM, KARIYANDAL, MANGALAM, RANDAM

Socio-economic vulnerability

Usambadi GP is highly vulnerable in socio-economic nature, followed by Arpakkam, Kothantavadi, Salayanur whereas Sananandal is least vulnerable.

USAMBADI, ARPAKKAM, KOTHANTAVADI, SALAYANUR, SANANANDAL

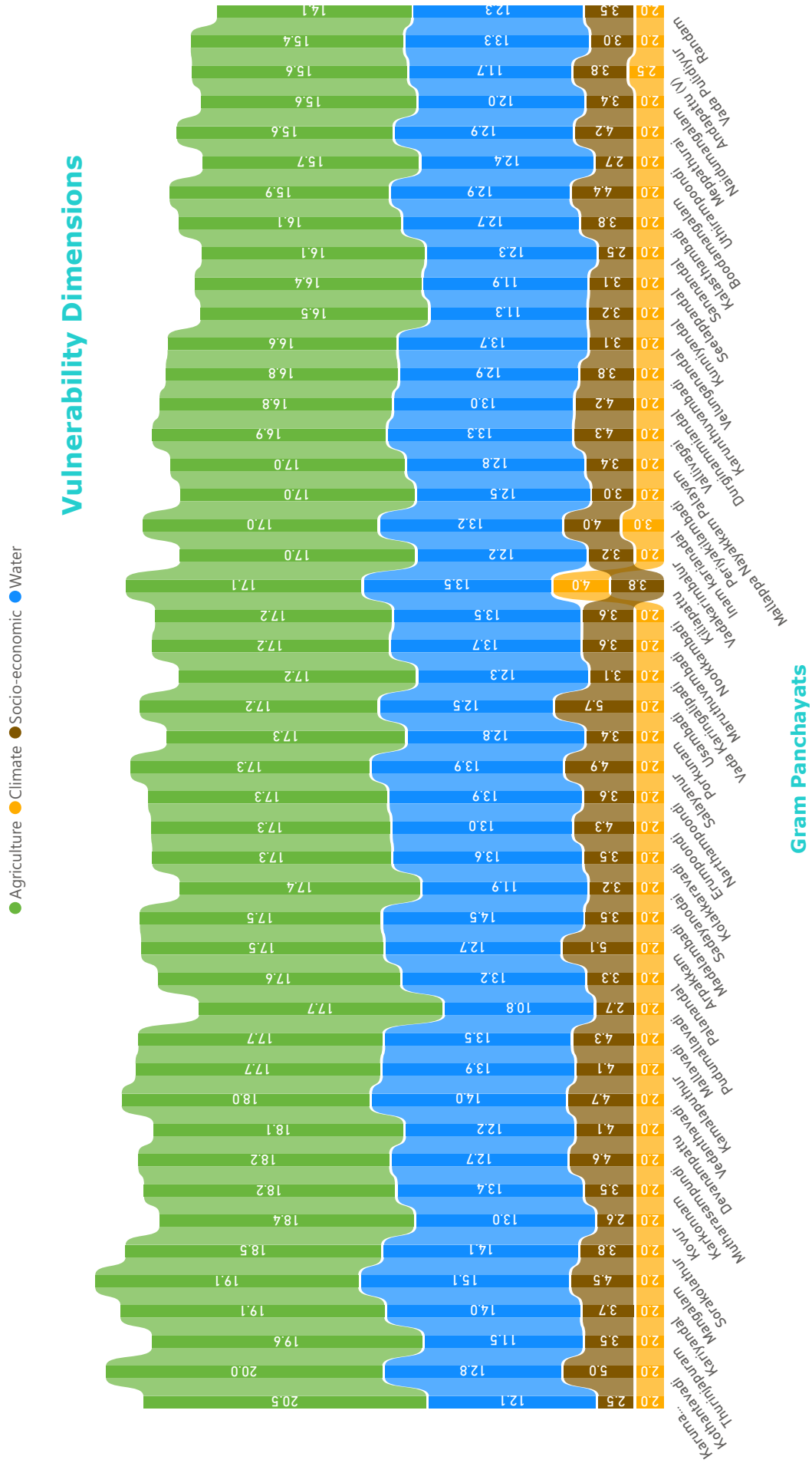
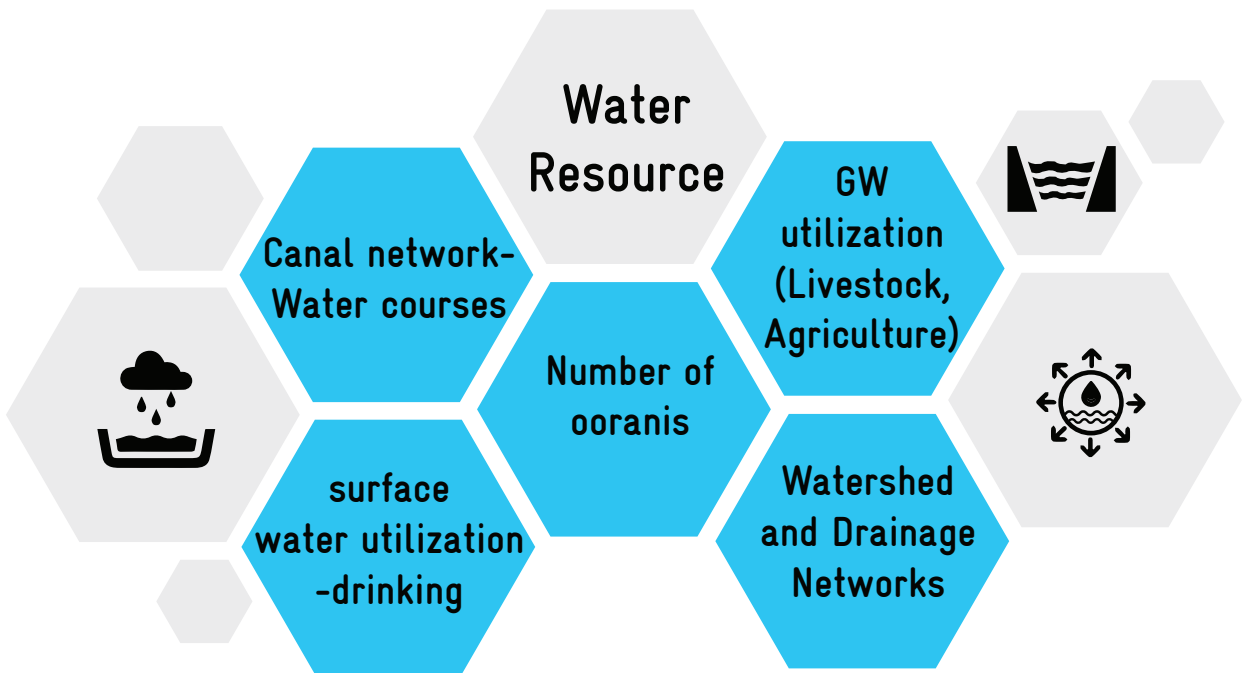
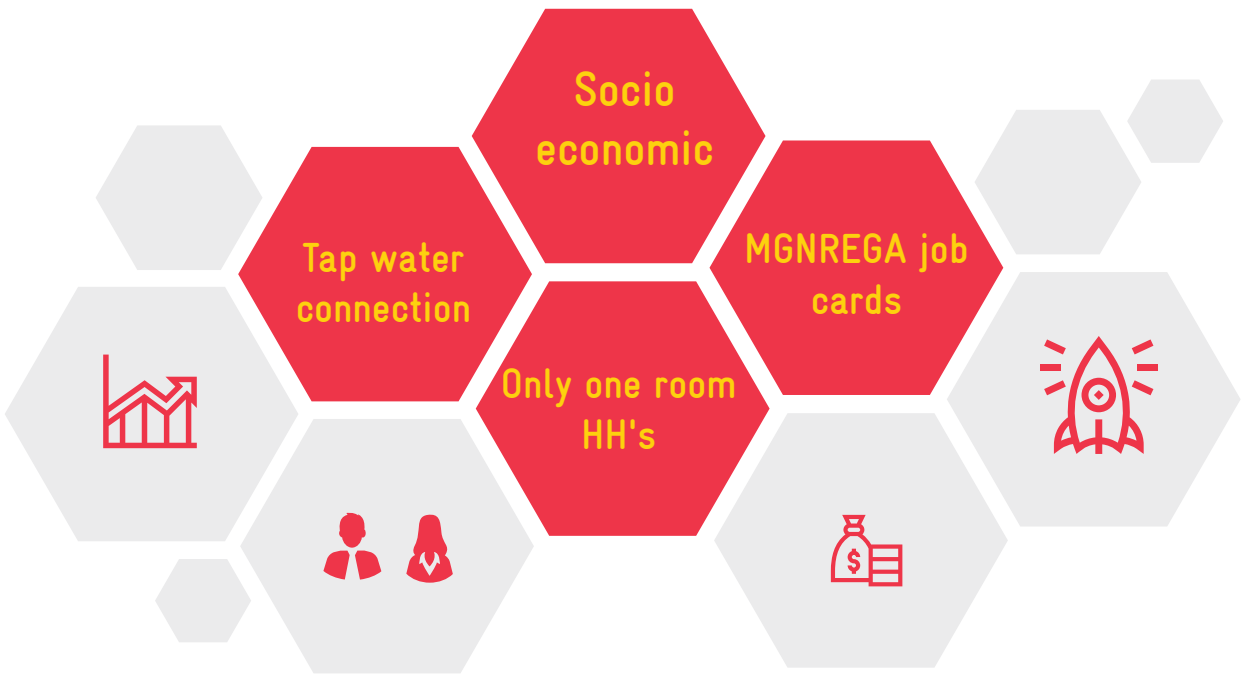
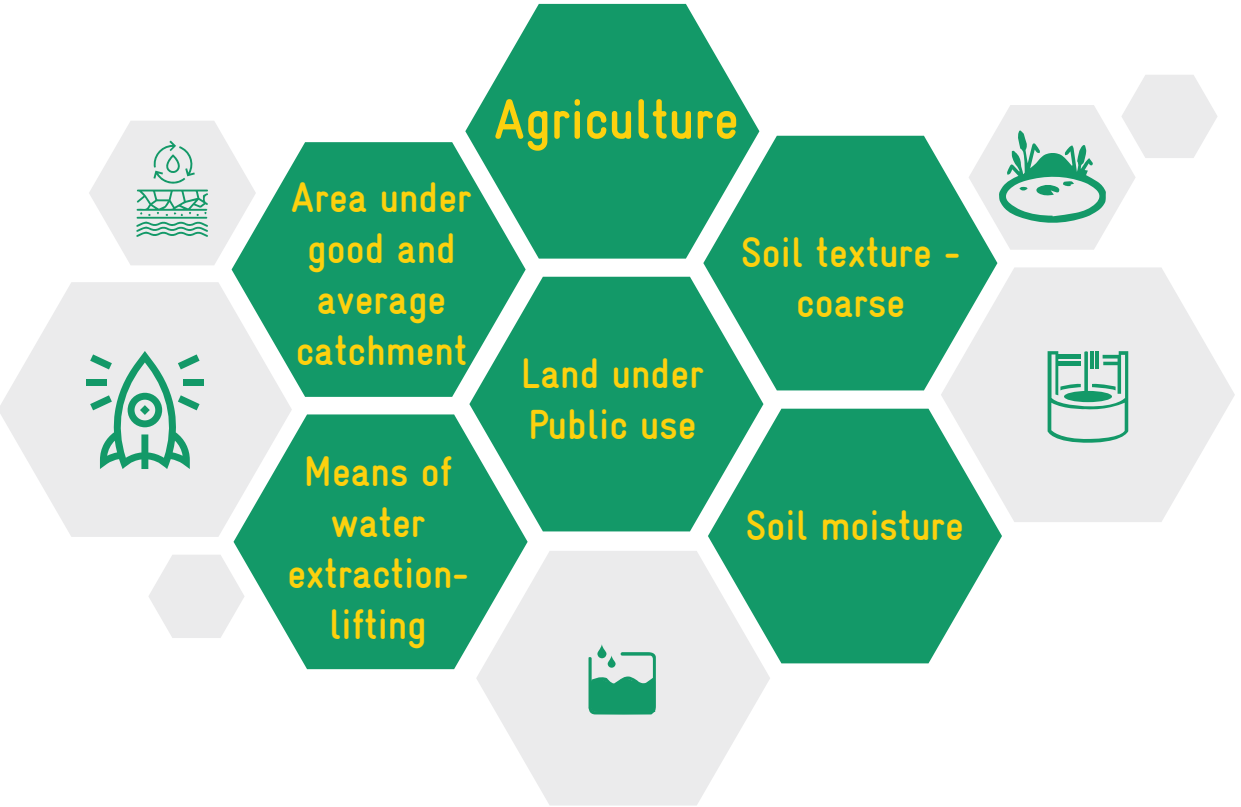
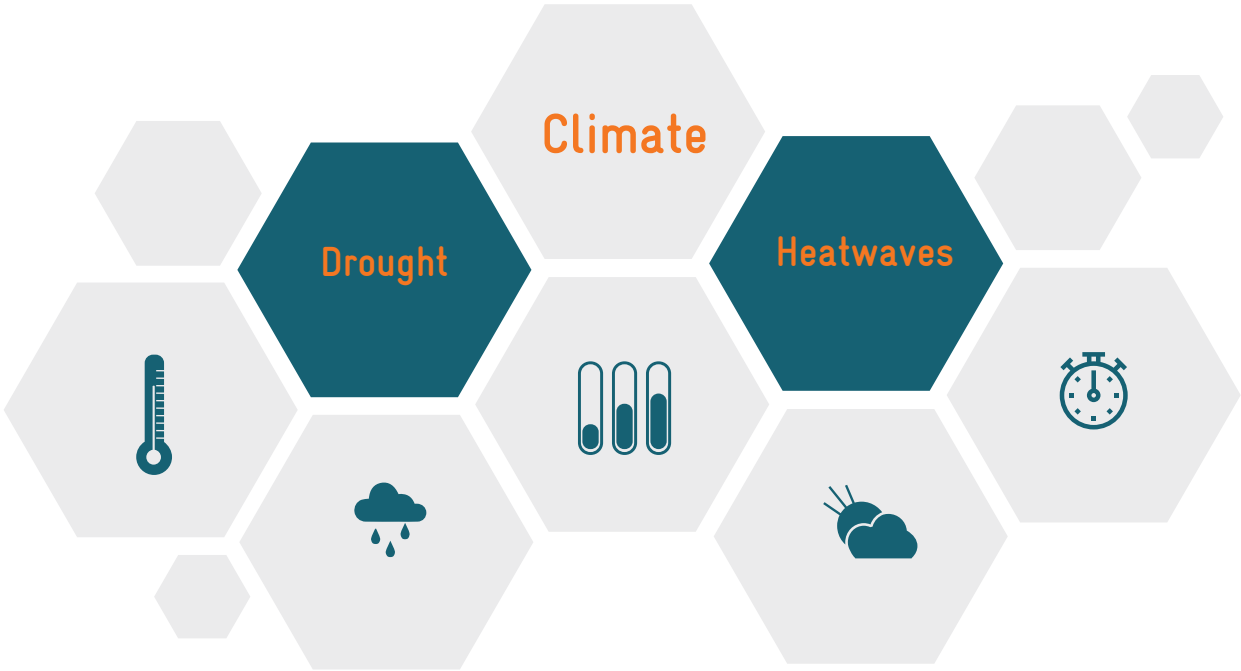


Figure 4.3. GP wise vulnerability dimensions

Contributing indicators to the total vulnerability





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

விசம்பின் துளிவீழின் அல்லால்மற் றாங்கே
பசும்புல் தலைகாண்பு அரிது

குறள் - 16

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

Thirukkural - 16

CHAPTER 5



**PROPOSED KEY WATER ACTIONS
UNDER MAHATMA GANDHI
NREGS CONVERGENCE**

5 | PROPOSED TREATMENT ACTIONS UNDER WASCA, CWRM AND CRM IN THE BLOCK

After identifying the key water issues at GP level through vulnerability analysis, the area for key water action treatments were proposed. The comprehensive and holistic understanding of the key water challenges adopting the eco-system approach enable to identify water action works in public and common land (afforestation, soil and water conser-

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

5.1 | THE PROPOSED AREA UNDER WASCA TREATMENT

Out of 30,721.41ha available land in Thuringapuram Block, 6,288.2 ha (20.4 %) area is proposed for treatment under WASCA TN- CWRM planning. A major portion of Key Water Actions is proposed in the area falling under non agriculture land use while small amount of forest land was considered for significant pilot treatments (Table 10). GP wise proposed area for treatment is also attached in Annexure 5.1.

TABLE 10. PROPOSED AREA FOR WASCA TREATMENT

Land Use	WASCA proposed treatment area (ha)	Total available land (ha)
Non-Agricultural Uses	1,696.07	5,286.14
Unirrigated Land	1,427.51	6,611.34
Current Fallow land	1,383.05	6716.01
Area Irrigated by Source	1,076.43	10,270.21
Barren & Un-cultivable Land	282.42	376.53
Fallows Land other than Current Fallows	197.88	1,006.03
Cultivable Waste Land	156.8	208.07
Permanent Pastures and Other Grazing Land	51.82	69.08
Land Under Miscellaneous Tree Crops etc.	13.05	65.12
Forest land	3.148	112.88
Total	6,288.178	30,721.41

Nearly 27 % of the non-agriculture land was prioritized for treatment followed by 23 % of the un-irrigated land while less than one percent of miscellaneous tree crops land was considered for WASCA treatment (Figure 5.1).

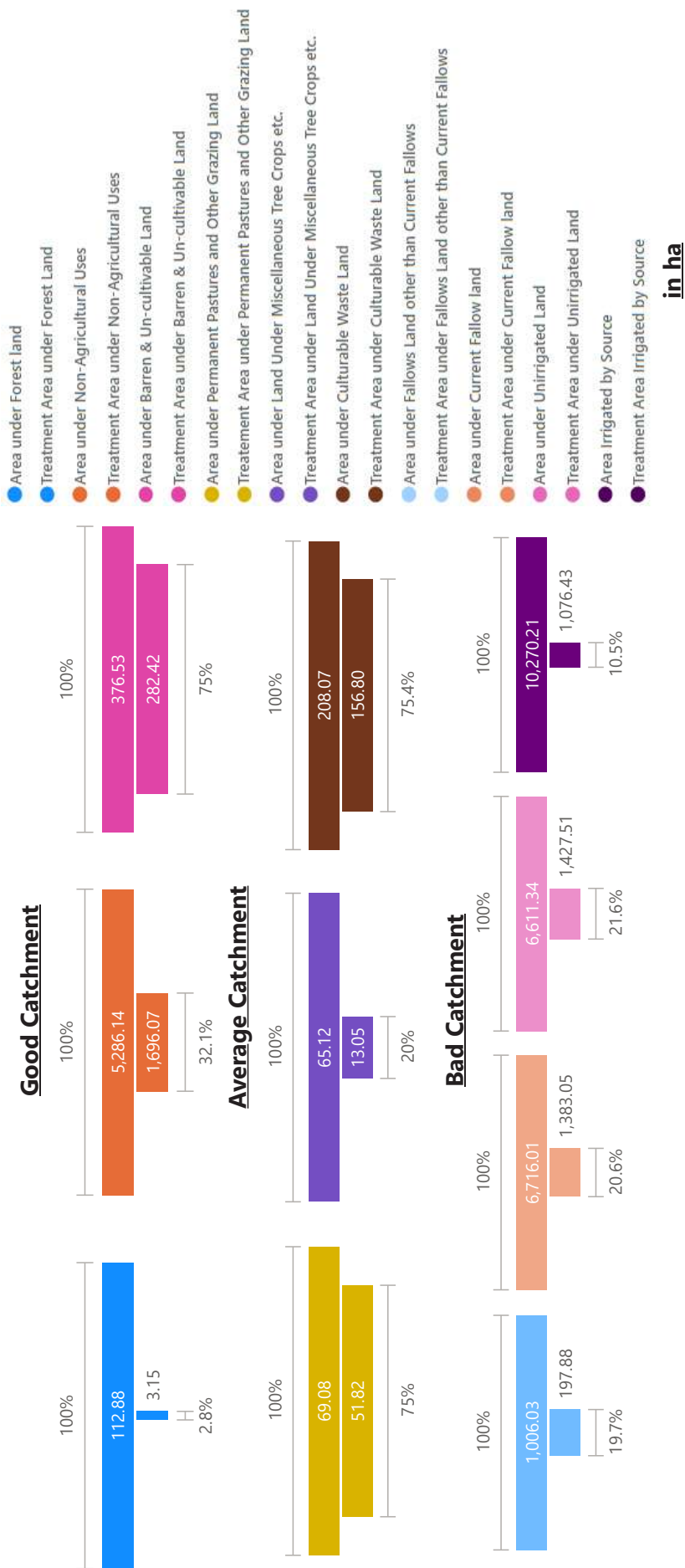


Figure 5.1. W/ASCA treatment area

Expected runoff conservation after WASCA treatment

The productive developmental activities that were taken up in the WASCA proposed areas are termed as Key Water Actions. With the above proposed treatment area, the expected runoff harvested due to WASCA intervention would be around 1,696.35 ha.m which is 25 % of the total runoff. Of the expected runoff conservation, 52% comes from good catchment area, 4% comes under average catchment area and 44 % comes from bad catchment area (Figure 5.2).

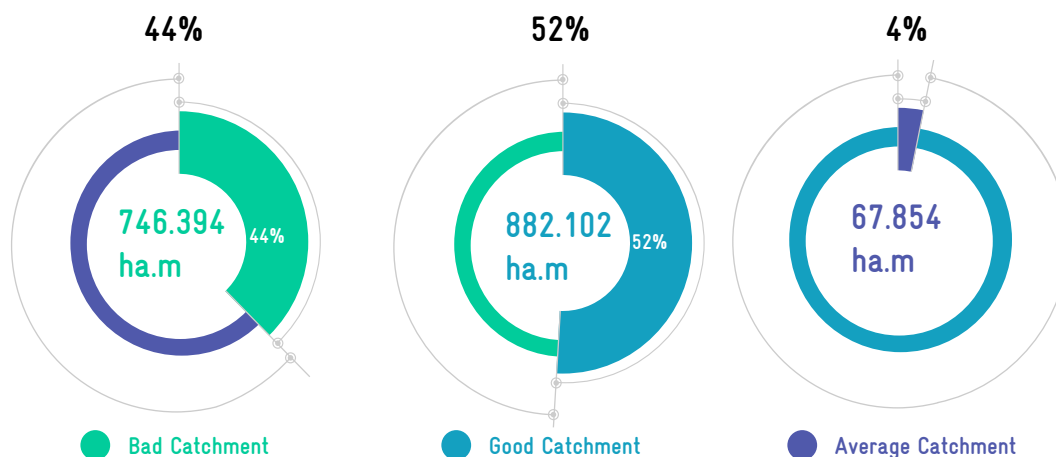


Figure 5.2. Expected conservation after WASCA treatment

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

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

Work (unit)	Abbreviation (unit)	No.	Extent (area in ha or length in m)
Cattle Shelters (No. of units)	CS	11,769	46,086
Cattle Trough(No. of units)	CT	4,048	37,330
Fodder development - Community & Individual	FD	4,048	
Goat Sheep Shelters (No. of units)	GSS	990	
Silvi-pasture Development(Ha)	SPD	38,124	
Soak Pits (Community) (No. of units)	SPC	72	
Soak Pits (Individual) (No. of units)	SPI	207	
Azolla units - Individual (No. of units)	Az	2,088	
Artificial Recharge Structure(No. of units)	ARS	96	
Construction of Farm Ponds - Individual (No. of units)	FP	227	
Construction of new open wells & Recharge Shafts (No. of units)	COWRS	7,477	
Restoration of water bodies:a.PWD and Tanks(No.)	RPWDT	101	

Restoration of water bodies:c. Ponds(No.)	RP	326	
Roof Rain Water Harvesting (No. of units)	RRWH	94	
Water Course - Irrigation Channels - Desilting (Mtrs)	WCICD		61,076
Afforestation in Public/common lands (ha)	Aff	7,906	97
Avenue plantation (Km)	AVP	18,242	42,631
Block Plantation (Community)(ha)	BP	50,349	64
Canal Bund Plantation(Ha)	CBP	3,485	5,809
Contour Continuous Bunds (CCB) for Afforestation area(Mtrs)	CCBF	1,578	9
Drainage Line Treatment (DLT)(Mtrs)	DLT	30,407	1,52,024
Dry land Horticulture/Agro-forestry - Individual (Ha)	DLHAI	3,400	17
Irrigation Channel Plantation (Mtrs)	ICP	12,215	61,076
Linear Plantation(m)	LP	17,271	16,453
Micro Irrigation(Ha)	MI	6	16
Nursery Development(No. of units)	ND	6,178	1,236
Composting (No. of units)	Co	851	83,097
Farm Bunding with Boundary Trenches - Individual (Ha)	FBBTI	308	763
Land development - Individual (Ha)	LDI	25	53
NADEP Vermi compost (No. of units)	NADEP	73	

Proposed works are included the drought proofing, livelihood, land development and WCWH, measures



Land development works over 816 ha area



More than 39,000 Lakhs plants planting



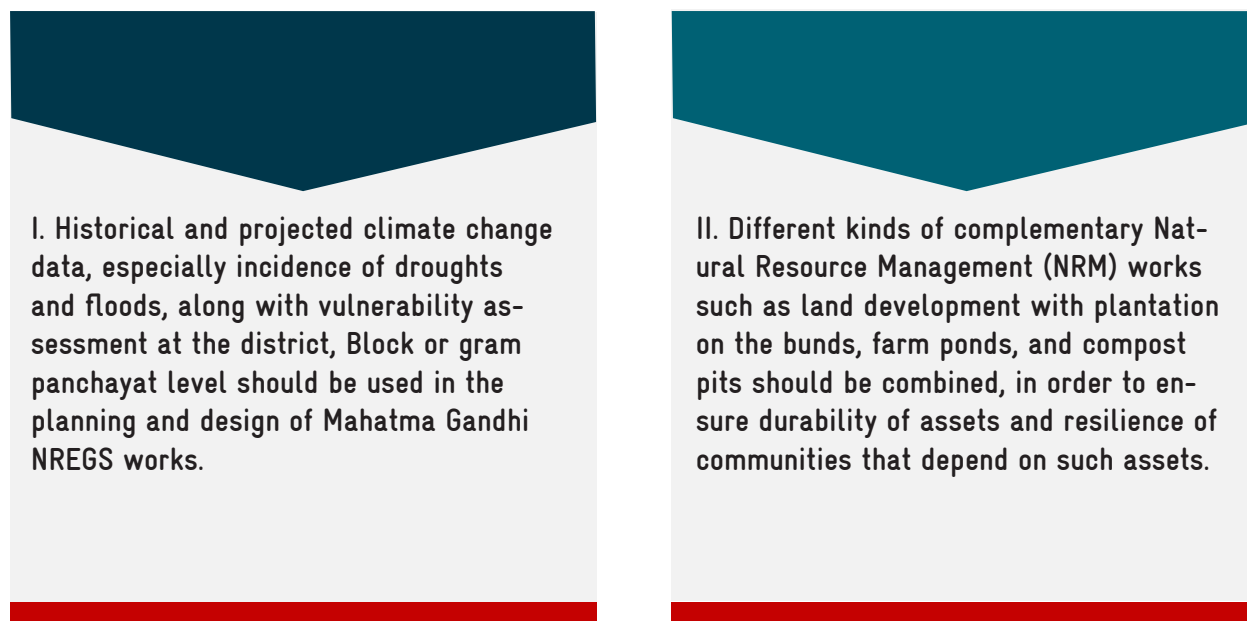
8,000 sites for WCWH



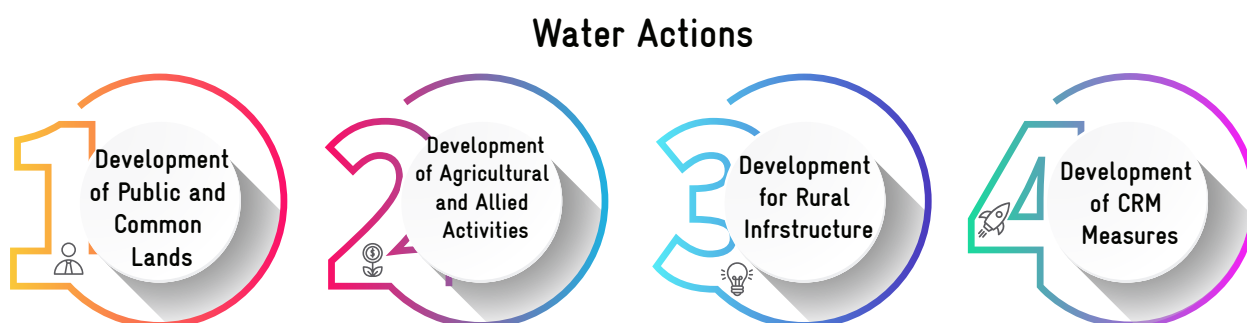
60,000 livelihood works

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

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



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








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 CONTINUOUS BUNDS (CCB) FOR AFFORESTATION AREA(M)	28	10	0.025	0.71	283
COMPOSTING(NUMBER OF UNITS)	1,059	15	0.17	180.03	15,885
AFFORESTATION IN PUBLIC/ COMMON LANDS(HA)	50	3,344	8.6	430.00	167,200
BLOCK PLANTATION (COMMUNITY)(HA)	678	4,320	11.1	6461.00	2,928,960
SILVI-PASTURE DEVELOPMENT(HA)	366	6,664	17.1	6258.60	2,439,024
LINEAR PLANTATION(KM)	5	703	1.8	8.22	3,211
CANAL BUND PLANTATION(HA)	268	2,930	7.5	2010.00	330,110
IRRIGATION CHANNEL PLANTATION (M)	151	6	0.015	2.27	908
AVENUE PLANTATION(KM)	2	703	1.8	3.36	1,313
NURSERY DEVELOPMENT (NUMBER OF UNITS)	17	2,344	15	261.23	40,821
RESTOTARATION OF WATER BODIES: A) PWD AND TANKS (NUMBER)	104	800	5	520.00	83,200
RESTORATION OF WATER BODIES: B.OORANIS (NUMBER)	0	200	2	0.00	0
RESTORATION OF WATER BODIES: C) PONDS (NUMBER)	277	200	1	554.00	55,400
ARTIFICIAL RECHARGE STRUCTURE (NUMBER OF UNITS)	94	391	2.5	235.00	36,754
WATER COURSE - IRRIGATION CHANNELS - DESILTING (MTRS)	151	3	0.0075	1.13	454
DRAINAGE LINE TREATMENT (M)	69	5	0.03	2.07	345

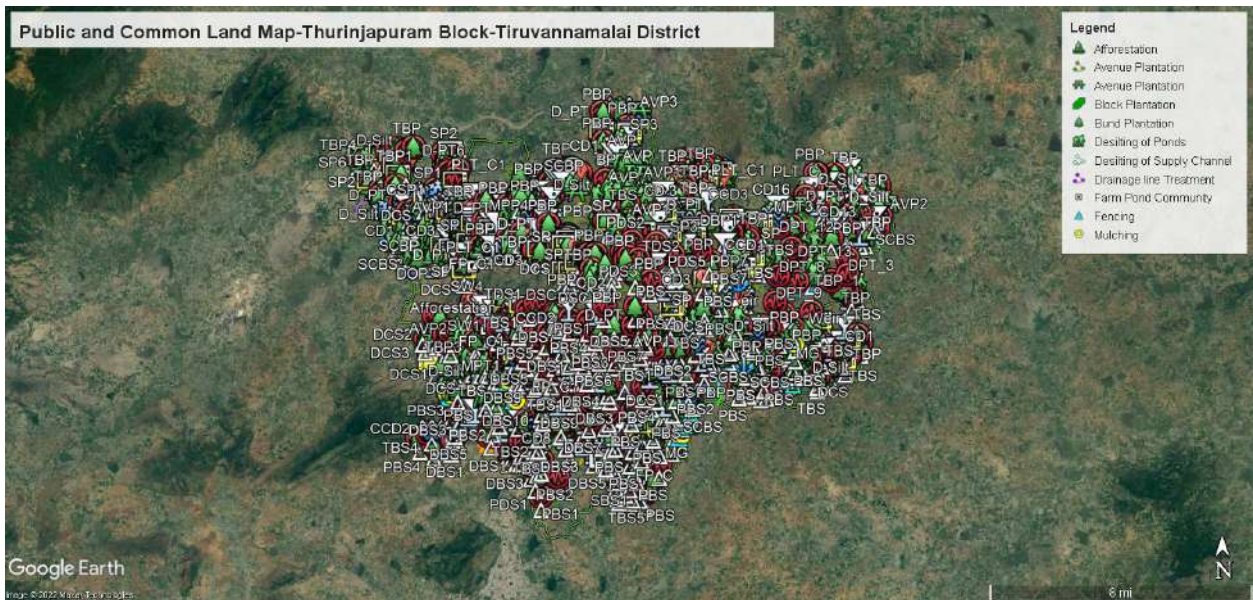


Figure 5.4. Proposed development activities in public and common land








5.3 | DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

Based on the assessment, the works which enhance the agriculture and allied sectors particularly for irrigation, soil and live stocks are proposed in the lands under individual ownership (Table 12 & Figure 5.5).

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

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

	 NO. OF WORKS	 PERSON DAYS PER UNIT	 UNIT COST IN INR (LAKHS)	 ESTIMATED COST IN INR (LAKHS)	 ESTIMATED PERSON DAYS
FARM BUNDING WITH BOUNDARY TRENCHES - INDIVIDUAL (ha)	25	586	1.5	38.12	14,890
MICRO IRRIGATION (ha)	322	0	1	322.00	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	186	781	2	372.00	145,266
LAND DEVELOPMENT - INDIVIDUAL (ha)	284	3,906	10	2,840.00	1,109,304
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	563	3,321	8.5	4,785.50	1,869,723
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	2,043	23	0.15	306.45	46,989
NADEP VERMI-COMPOST (NUMBER OF UNITS)	690	27	0.18	124.20	18,630
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	3,483	2,344	1.48	5,154.84	8,164,152
CATTLE SHELTERS (NUMBER OF UNITS)	3,780	331	2.12	8,013.60	1,251,180
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	815	355	2.27	1,850.05	289,325
CATTLE TROUGH (NUMBER OF UNITS)	175	6	0.05	8.75	21,050
POULTRY SHED (NUMBER OF UNITS)	143	10	0.09	12.87	1,430
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	160	926	5	800.00	148,160

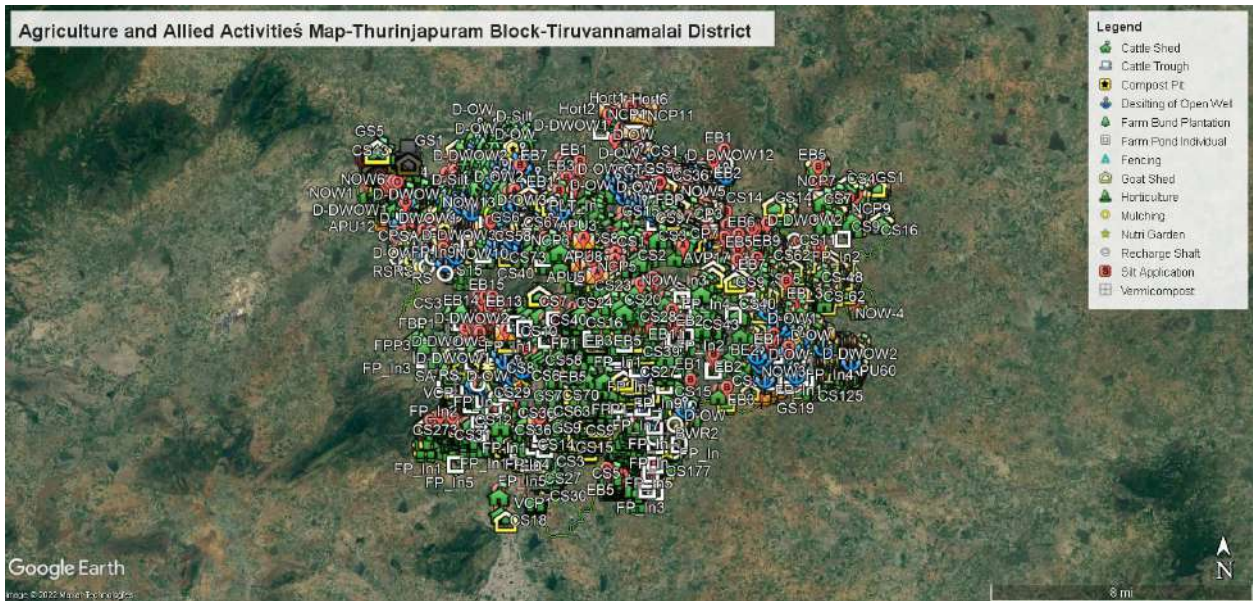







Figure 5.5. Proposed development activities in Agriculture and allied Sectors

5.4 | DEVELOPMENT OF RURAL INFRASTRUCTURE

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

DEVELOPMENT OF RURAL INFRASTRUCTURE

TABLE 13. DETAILS OF WORK PROPOSED TO DEVELOP RURAL INFRASTRUCTURE

	 NO. OF WORKS	 PERSON DAYS PER UNIT	 UNIT COST IN INR	 ESTIMATED COST IN INR (LAKHS)	 ESTIMATED PERSON DAYS
SOAK PITS (COMMUNITY) (NUMBER OF UNITS)	896	20	0.13	116.48	17,920
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	4059	16	0.1	405.9	64,944
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	92	625	4	368	57,500

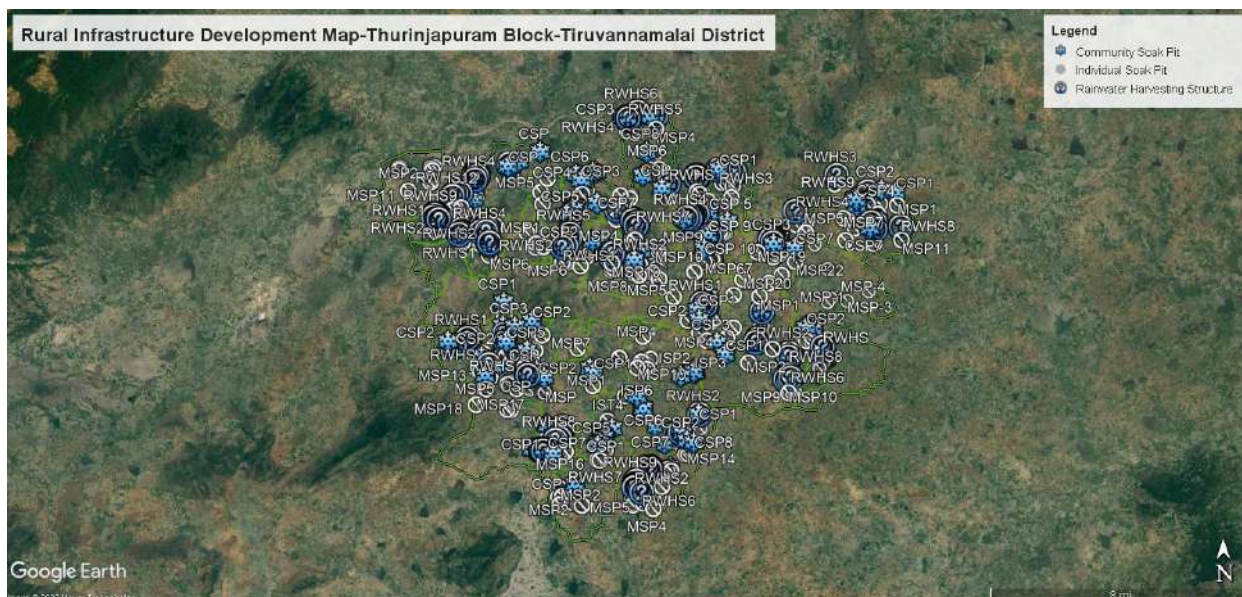


Figure 5.6. Proposed rural infrastructure activities

5.5 | PROPOSED CLIMATE RESILIENCE MEASURES

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

droughts and heat waves, the climate resilient measures are proposed to cover-up maximum of GPs to cope with drought and heat wave (Figure 5.7 & Table 14). CRM such as, silvi-pature (Table 15), bamboo plantation (Table 16), mini forest (Table 17), farm ponds (Table 18), and fallow land developments (Table 19) are proposed in this Block in saturation mode.

TABLE 14. GP WISE PROPOSED CRM

Name of the GPs	Public and common land	Agriculture and allied activities
Arpakkam		Farm pond
Boothamangalam	Silvi-pasture Development	Silvi-pasture Development
Devanampattu		Farm pond
Durgainammiyandal		Farm pond
Erumpoondi		Farm pond
Inamkariyandal		Farm pond
Kalasthambadi		Farm pond
Kamalaputhur		Farm pond
Kariyandhal		Farm pond
Karkonam		Farm pond
Karumarapatti		Farm pond
Karuthuvampadi	Mini forest	
Kiliapattu		Farm pond
Kothanthavadi		Farm pond

Kunniyanthal	Fallow Land Development	
M N.Palayam	Fallow Land Development	Farm pond
Madhalampadi		Farm pond
Mallavadi		Farm pond
Mangalam		Farm pond
Maruthuvambadi	Bamboo Plantation	
Meppathurai	Fallow Land Development	Farm pond
Mutharasampoondi	Fallow Land Development	
Nookkampadi		Farm pond
Northampoondi		Farm pond
Perikilampady	Fallow Land Development	
Pudhumallavadi		Farm pond
Randam	Silvi-pasture Development	Farm pond
Sadaiyanodai		Farm pond
Salaiyanur		Farm pond
Sananandhal		Farm pond
Seelappandhal		Farm pond
Sorakulathur		Farm pond
Thurinjapuram		Farm pond
Uthirampoondi	Mini forest	
Vadakarimbalore		Farm pond
Vadakarimbalur		Farm pond
Vadakarungalipady	Fallow Land Development	
Vadapuluthiyur		Farm pond
Vallivagai		Farm pond
Vedandhavadi		Farm pond

TABLE 15. DETAILS OF PROPOSED SILVI-PATURE DEVELOPMENTS UNDER CRM

Name of the Panchayat	Name of the Habitation	Area for Plantation	Total fallow land (ha.)
Boothamangalam	Boothamangalam	2.895	5600
Randam	Randam	0.38	304
Randam	V.Nammiyandhal	0.11	88

TABLE 16. DETAILS OF PROPOSED BAMBOO PLANTATION ACTIVITIES UNDER CRM

Name of the Panchayat	Area of plantation (in ha)	Total No. of Plants	Classification of Land
Maruthuvambadi	0.16	400	Mandhaveli

TABLE 17. DETAILS OF PROPOSED ACTIVITIES ON MINI FOREST

Name of the GP	Area for Plantation (In Ha)	Total No. of Plants (1 Ha - 10000 saplings)	Classification of land
Karuthuvampadi	0.77	7,700	Others
Uthirampoondi	0.71	7,100	Sudugadu-Mayanam

**Sudugadu-Mayanam :Cemetery*

TABLE 18. DETAILS OF PROPOSED FARM PONDS ACTIVITIES UNDER CRM

GP	Habitation	No of Farm Ponds
Devanampattu	Devanampattu	1
Vadakarimbalore	Vadakarimbalore	1
Erumpoondi	Erumpoondi	1
Inamkariyandal	Inamkariyandal	1
Kamalaputhur	Kamalaputhur	1
Kariyandhal	Kariyandhal	1
Nookkampadi	Nookkampadi	2
Kiliapattu	Kiliapattu	1
M.N.Palayam	M.N.Palayam	1
Madhalampadi	Madhalampadi	2
Mangalam	Mangalam	5
Meppathurai	Meppathurai	6
Northampoondi	Northampoondi	2
Sananandhal	Sananandhal	3
Meppathurai	Meppathurai	1
Salaiyanur	Salaiyanur	6
Pudhumallavadi	Pudhumallavadi	1
Randham	Randham	1
Sadaiyanodai	Sadaiyanodai	1
Salaiyanur	Salaiyanur	1
Kalasthambadi	Kalasthambadi	1
Seelappandhal	Seelappandhal	3
Sorakulathur	Sorakulathur	1
Thurinjapuram	Thurinjapuram	1
Vadapuluthiyur	Vadapuluthiyur	1
Vallivagai	Vallivagai	1
Vedandhavadi	Vedandhavadi	2
Arpakkam	Arpakkam	2
Durgainammiyandal	Durgainammiyandal	1
Karkonam	Karkonam	1
Karumarapatti	Karumarapatti	1
Kothanthavadi	Kothanthavadi	1
Mallavadi	Mallavadi	1

TABLE 19. DETAILS OF PROPOSED FALLOW LAND DEVELOPMENT ACTIVITIES UNDER CRM

GP	Area in ha.
Perikilampady	3.35
Vadakarungalipady	7.98
Meppathurai	8.06
M N.Palayam	8.53
Kunniyanthal	10.03
Mutharasampoondi	16.49



Figure 5.7. Proposed Climate Resilient Measures

All works are proposed based on watershed and livelihood approach as specified below. The detailed GP wise works are shown in Annexure 5.3.

நெடுங்கடலும் தன்நீர்மை குன்றும் தடிந்தெழிலி
தான்நல்கா தாகி விடின

குறள் - 17

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

Thirukkural - 17

CHAPTER 6

PROJECTED OUT COMES OF PLANNING



PROJECTED OUTCOMES
OF PLANNING

6 | PROJECTED OUTCOMES OF PLANNING

Keeping in view the guidelines of Mahatma Gandhi NREGS, Key Water Actions are proposed based on climate vulnerability assessment and challenges at GP level for a period of three years: from 2021-2022 to 2023-2024. At the end of the implementation period during 2024, the following productive out-

comes are envisaged on successful accomplishment of all proposed Key Water Actions. The anticipated outcomes will reduce the water security vulnerability and increase the resilience of the GPs under current and projected climatic change scenarios.

6.1 | OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

INDICATOR		OUTCOMES/ IMPACT	
1	Proportion of Land development under WASCA treatment	1	6,288 ha (20.5 %) of the total area treated under WASCA
2	Percentage reduction of run off	2	1,696 ha.m i.e 25 % of the total runoff harvested due to WASCA interventions
3	No. of waterbodies restored	3	384 waterbodies (tanks/pond and ooranis) restored
4	Area under afforestation	4	50 ha area under afforestation
5	Area under silvi-pasture development	5	366 ha under Silvi-pasture plantation
6	Length of drainage line treated	6	3,447 m length of drainage line treated
7	Nursery development	7	70 units

6,288 ha
AREA TREATED

1,696 ha.m
TOTAL RUNOFF
HARVESTED

384
WATER BODIES
RESTORED

50 ha
AREA
AFFORESTATION

366 ha
SILVI-PASTURE
PLANTATION

3,447 m
DRAINAGE LINE TREATED

70
UNITS

6.2 | OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED SECTORS

OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

INDICATOR		OUTCOMES/ IMPACT	
1	Assessment of sources of water for live-stock and agriculture demand No of structures established for on-farm (in-situ) water harvesting in dry lands	1	186 farm ponds established which target the harvest of 164 cu.m of water which has the potential to irrigate 65.1 ha area in both kharif and rabi seasons
2	Improvement in soil health	2	690 NADEP vermi compost units for soil health improvement
3	Dry land development with agro-forestry	3	563 works
4	Households established fodder plots	4	2,742 vulnerable households established fodder plots

186
FARM PONDS

690
COMPOST UNITS

563
DRY LAND HORTICULTURE

2,742
FODDER PLOTS

6.3 | OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

INDICATOR		OUTCOMES/ IMPACT	
1	No. of villages having liquid waste management systems	1	4,059 individual and 896 community level soak pits established for recycle of grey water benefiting 34,597 HHs
2	Roof rain water harvesting measures	2	92 common roof rainwater harvesting and storage structures with a target to harvest and store 0.11 ha.m of rainwater for use
3	Nutri-garden	3	34,597 HHs established nutri-gardens in homesteads and planted 1,72,985 saplings

896 COMMON &
4,059 INDIVIDUAL
SOAK PITS

92
COMMON ROOF
RAINWATER HARVESTING

34,597
NUTRI-GARDENS

1,72,985
SAPLINGS

6.4 | OUTCOMES OF CLIMATE RESILIENCE MEASURES

OUTCOMES OF CLIMATE RESILIENCE MEASURES

INDICATOR

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

OUTCOMES/ IMPACT

1	All GPs (47) are vulnerable for drought, heatwaves vulnerability
2	<p>5 models are identified via., silvi pasture, bamboo plantation, mini forest, farm ponds, and fallow land development</p> <p>55 farm ponds in 32 GPs</p> <p>3.385 ha under silvi-pasture with 5.992 plants</p> <p>Bamboo plantation in 0.16 ha area with 400 plants</p> <p>Mini forest with 14,800 plants in 1.48 ha area</p> <p>54.44 ha fallow land development</p>

55
FARM PONDS

3.385 ha
SILVI PASTURE

54.44 ha
FALLOW LAND DEVELOPMENT

1.48 ha
MINI FOREST

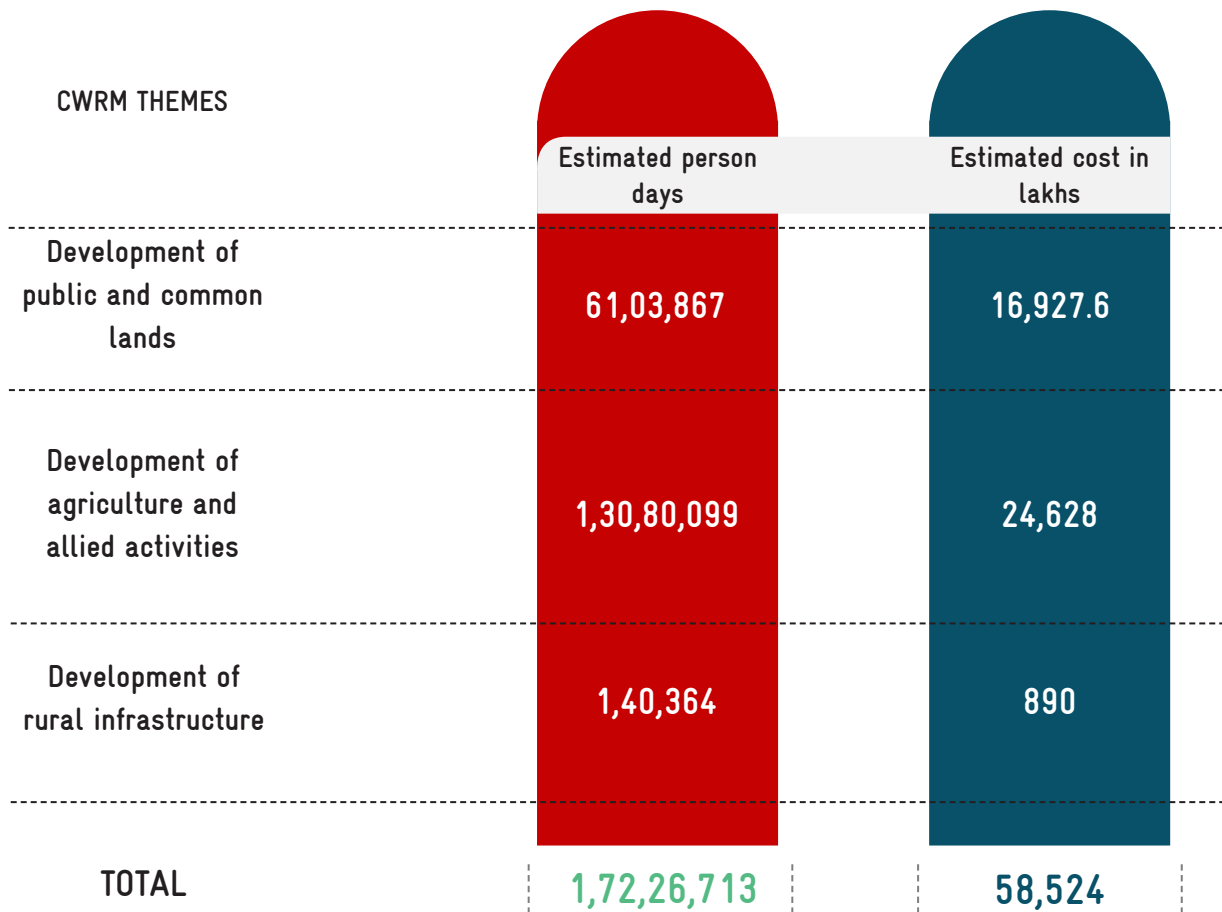
0.16 ha
BAMBOO PLANTATION

Estimated person days

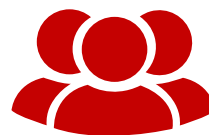
The total estimated person days required for the above proposed activities are 1,72,26,713 as specified below Figure 6.1.

Estimated Cost

The total estimated cost budgeted for the above proposed activities is Rs 58,524 Lakhs as specified below Figure 6.2.



THURINJAPURAM



ESTIMATED PERSON DAYS

1,72,26,713



ESTIMATED COST IN LAKHS

58,524

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

6.5 | LINKAGES TO SDGS, NDCS

The 2030 Agenda and the Paris Agreement put forth an innovative and complementary framework for accelerating action and achieving ambitious sustainable development objectives. Under the 2030 Agenda, a series of 17 global Sustainable Development Goals (SDG) have been agreed that are to be universally achieved. Under the 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.



India's NDC

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

Activities

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



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

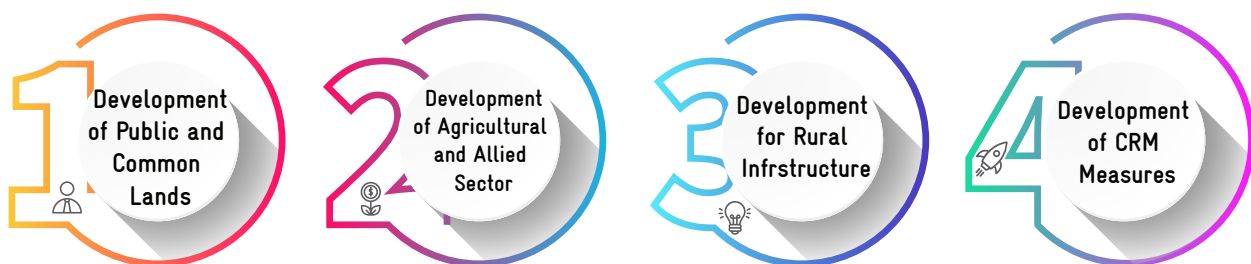


- 1 Supporting creation of an additional carbon sink of 2.5–3 billion tonnes through additional forest and tree cover
- 2 Enhancing investments in development programs for climate change adaptation in vulnerable sectors
- 3 Implementing programs to achieve the sustainable natural resource management 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.

“Climate Resilience for Future Livelihoods”



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

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

Head count ratio as per the multidimensional poverty index (%)



Persons provided employment as a percentage of persons who demanded employment under MGNREGA

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

Percentage of rural population having improved source of drinking water

Percentage of ground water withdrawal against availability



Percentage of Blocks/Mandals/Talukas over-exploited



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

Percentage of degraded land over total land area

Percentage increase in area of desertification

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

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

Name of the work	No. of CWRM works	Climate Vulnerability Index Impacting (WASCA TN)	Linked SDG Goal
Contour Continuous Bunds (CCB) for Afforestation area (m)	28	W3	SDG 1,2, 6,13&15
Composting (No. of units)	1059	W1	SDG1& 6
Afforestation in Public/common lands (ha)	50	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community) (ha)	678	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	366	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (Km)	5	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation (ha)	268	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	151	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (Km)	2	C1,C2,C3,W3,S2	SDG 1, 6&13

Nursery Development (No. of units)	17	C1,S2,S4	SDG 1,2 &6
Restoration of water bodies: PWD Tanks (No.)	104	S2, S1	SDG 6, 1, 13
Restoration of water bodies: Ooranis (No.)	0		
Restoration of water bodies: Ponds (No.)	277	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	94	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	151	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (DLT) (m)	69	W1,W3,W4	SDG1 & 6

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

Name of the Work	No. of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	25	A1,A3,W1,W3	SDG 1,2&6
Micro-irrigation (ha)	322	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	186	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	284	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)	563	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	2,043	A3,A4,S4	SDG 1& 2
NADEP vermi compost (No. of units)	690	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	3,483	A3, S4	SDG 1& 2, 15
Cattle shelters (No. of units)	3,780	S4	SDG 1& 2
Goat/sheep shelters (No. of units)	815	S4	SDG 1& 2
Cattle trough (No. of units)	175	W5,S4	SDG 1& 2
Poultry shed (No. of units)	143	S2,S4	SDG 1& 2
Construction of new open wells & recharge shafts (No. of units)	160	S3,W5,W1	SDG 1,2 & 6

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

Name of the work	No. of CWRM works	CVI	Linking SDG
Soak Pits (Community) (No. of units)	896	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	4059	W3,S2	SDG 1& 6
Roof Rain Water Harvesting (No. of units)	92	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 ap-plication NREGA Soft (<https://nrega.nic.in>) for mainstreaming WASCA. The target GPs are identified first, the status of GIS based plans and to-

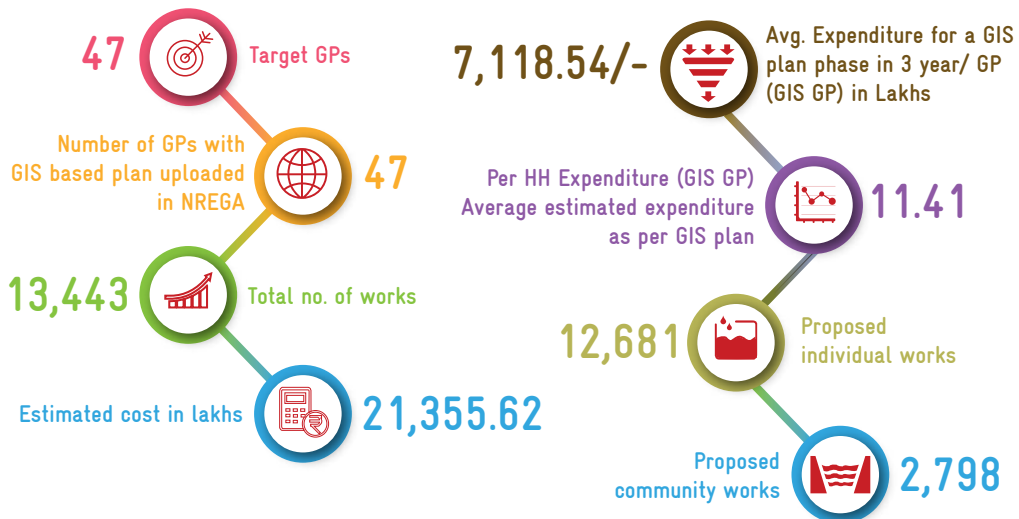
tal works along with its expenditure and category wise estimation cost of works as per GIS Plan, GIS based planning cumulative report are uploaded as given below

7.1 | INTEGRATION INTO NREGA SOFT

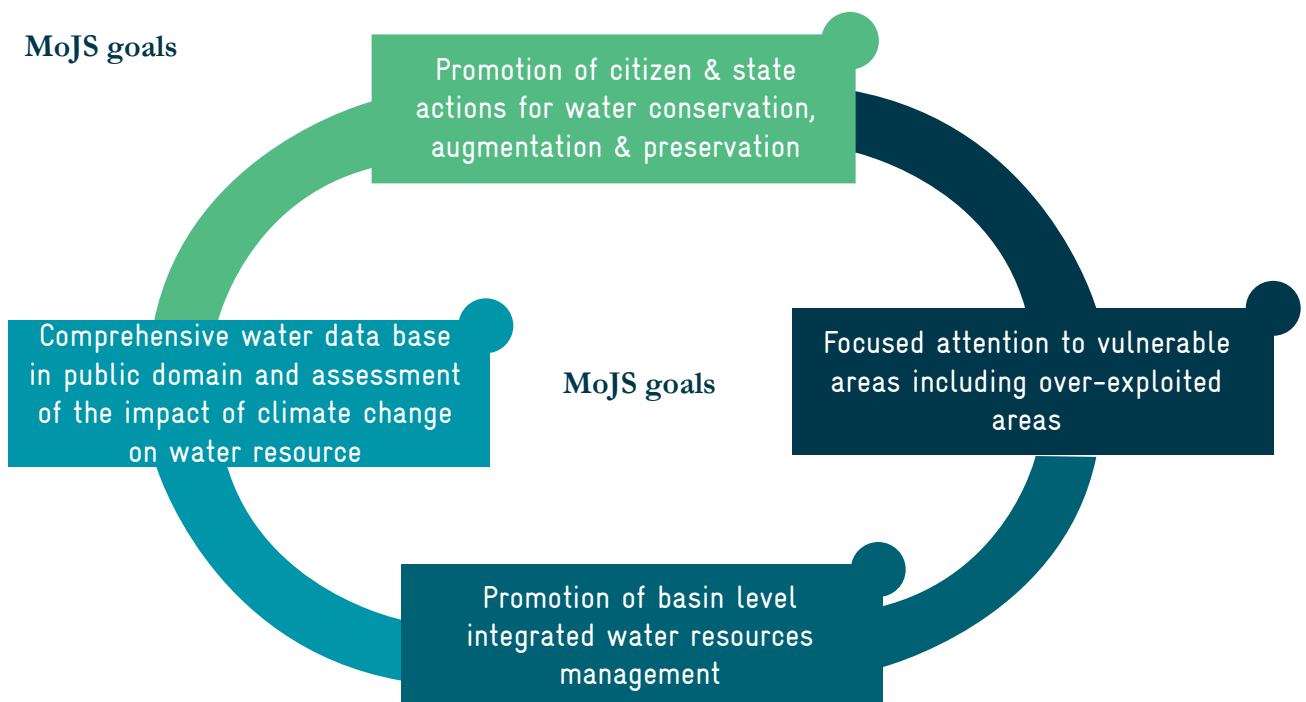
WASCA is progressing towards digitizing and integrating GP level GIS based plans, both NRM and Non NRM into Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of Thurinjapuram Block is listed in Table 24 and

work progress, expenditure during the past 3 financial years are shown in Figure 7.1 and 7.2. The Total No. of works, ongoing and completed GIS works are shown in Figure 7.3. The GP wise recommendations and works uploaded are given in Annexure 7.1.

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



MoJS goals



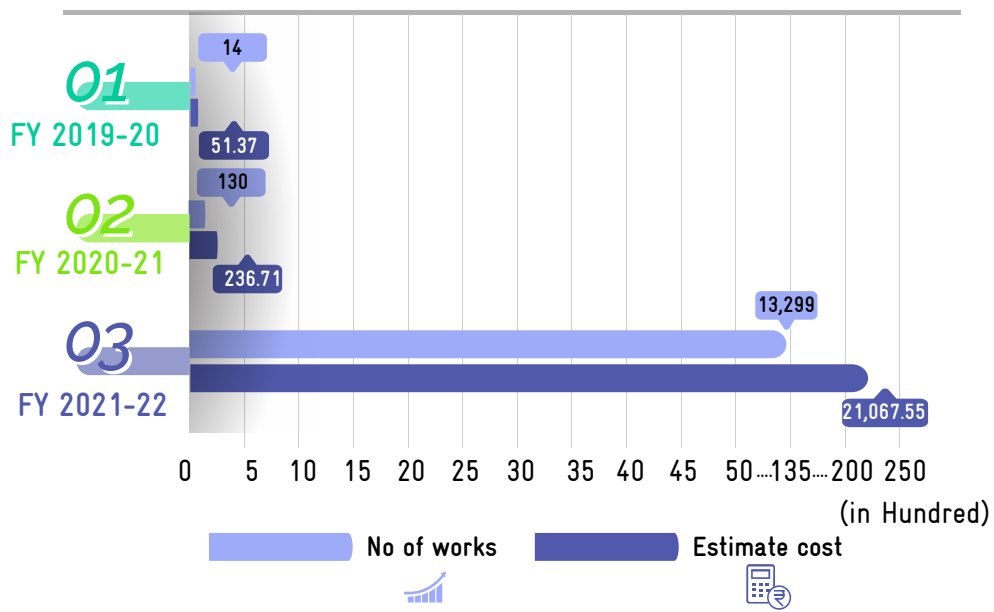


Figure 7.1. Work progress in last 3 years

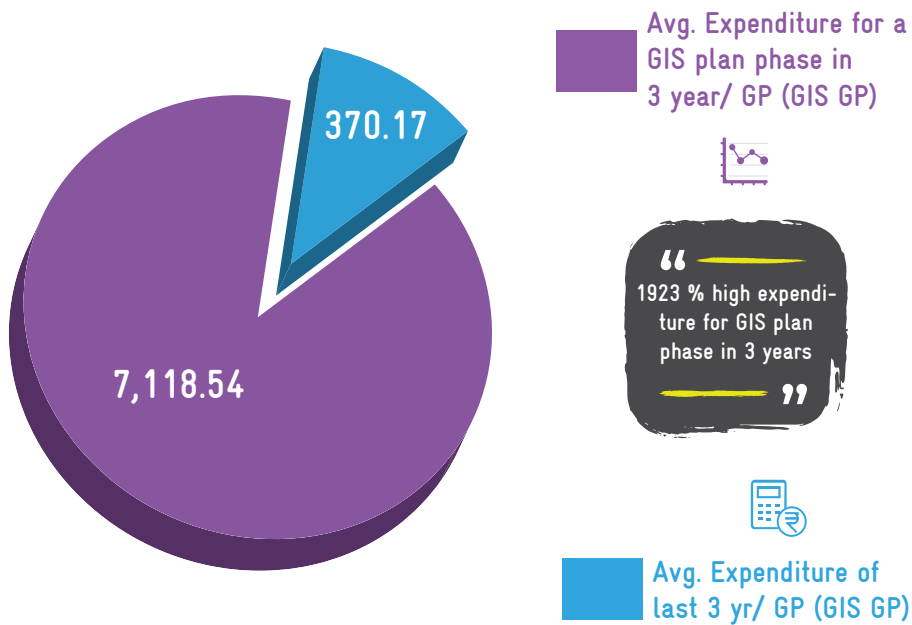
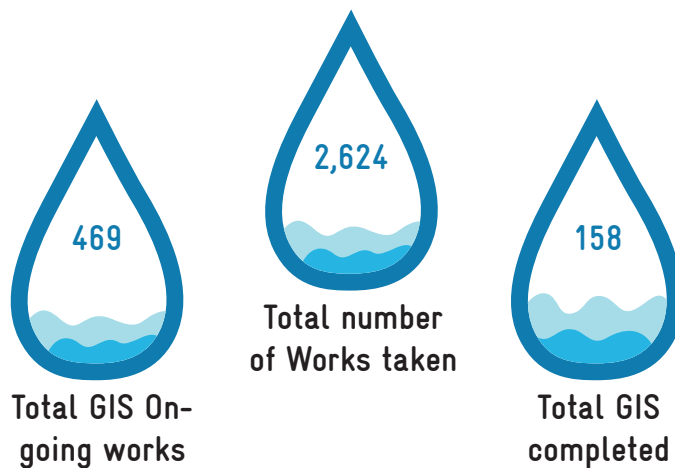


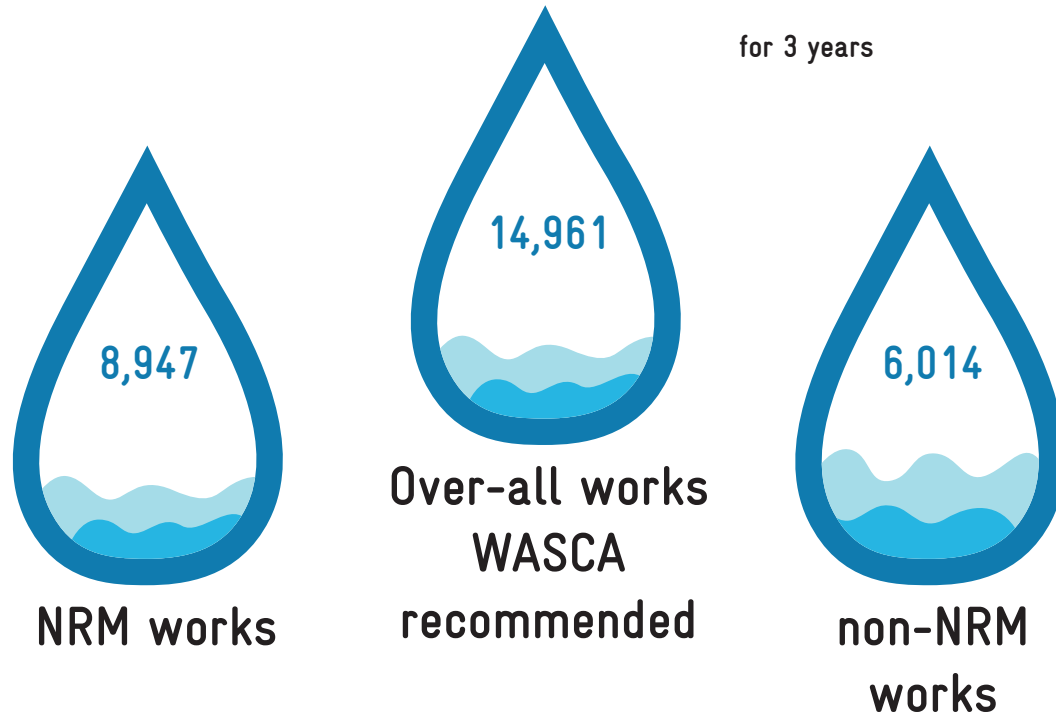
Figure 7.2. Average Expenditure for GIS plan in last 3 years



7.2 | WASCA RECOMMENDED NRM AND NON-NRM WORKS

WASCA recommended 14,961 works for a period of 3 years, out of which 8,947 are NRM works and 6,014 are non NRM works (Figure 7.4). A total of

12,702 works has been uploaded so far for the financial year 2021-22 as on 02/02/2022.



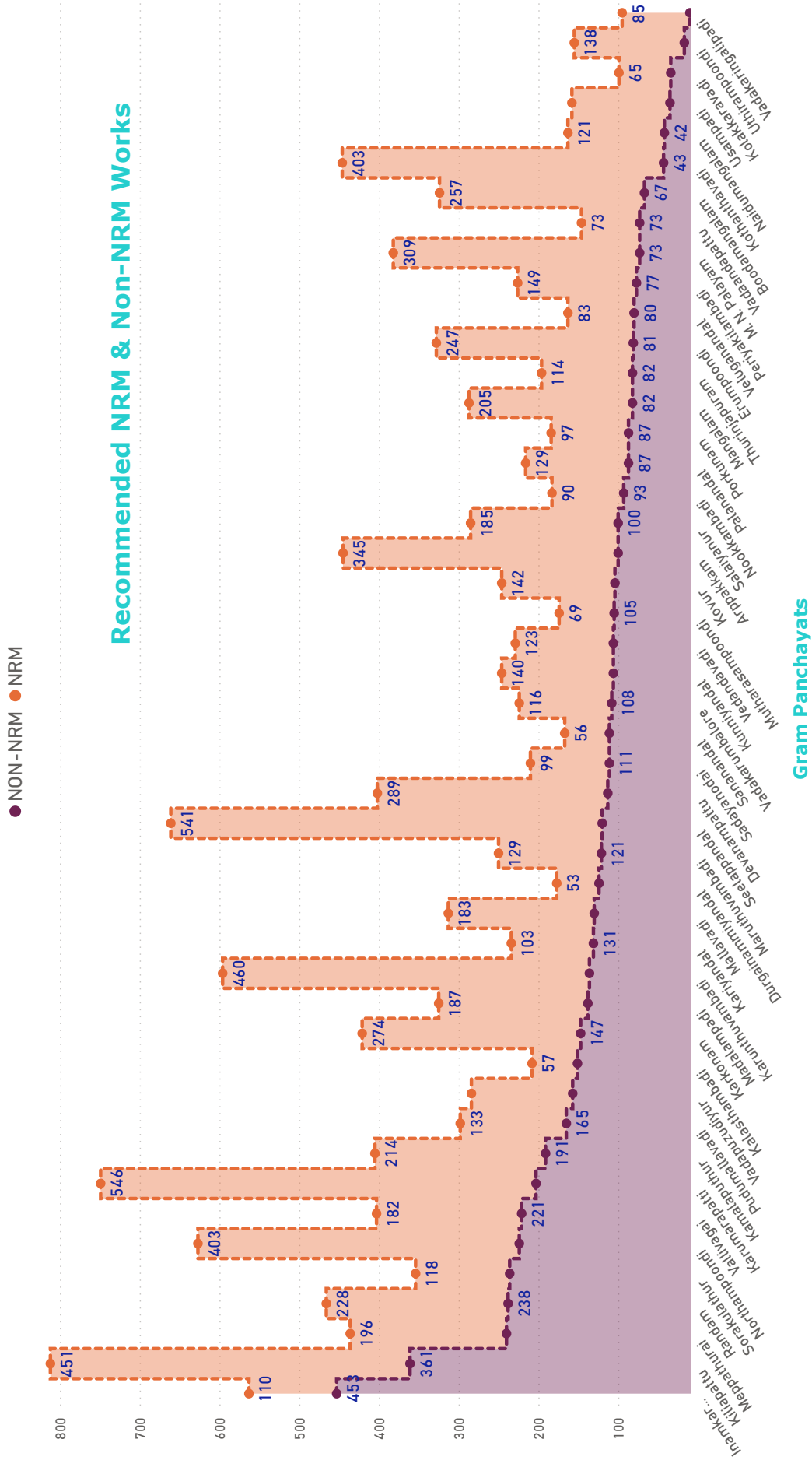


Figure 7.4. GP wise recommended NRM and non-NRM works

7.3 | ONGOING WORKS

The ongoing works in Thurinjapuram Block includes Anganwadi/Other Rural Infrastructure, Drought Proofing, Rural Connectivity, Rural Sanitation, WCWH, Works on Individuals Land (Category IV). A total of 136 works are ongoing in the Block, in which WCWH works are more (59.5 %) followed by individual beneficiary orientated works (29.4 %) while rural connectivity and Anganawadi/other rural infrastructure works are less in number (< 3 %) (Figure 7.5). GP and work category wise ongoing works are tabulated in Annexure 7.2.

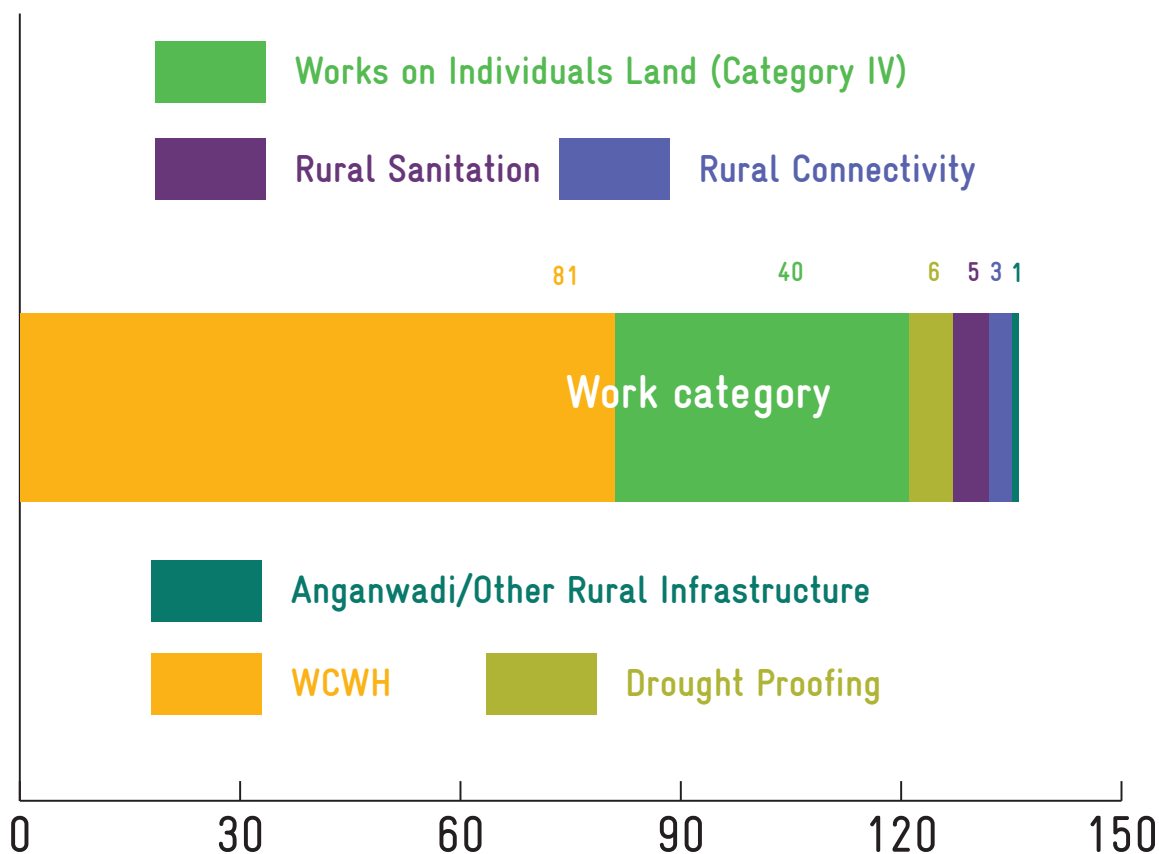


Figure 7.5. Work category-wise ongoing works in Thurinjapuram Block

7.4 | CATCH THE RAIN

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

their storage capacity; removal of obstructions in the channels which bring water to them from the catchment areas etc., repairs to step-wells and using defunct bore wells and unused wells to put water back to aquifers etc., are to be taken up with the active participation of people. The expenditure towards progressive works on Catch the rain campaign of Thurinjapuram Block is shown in Figure 7.6.

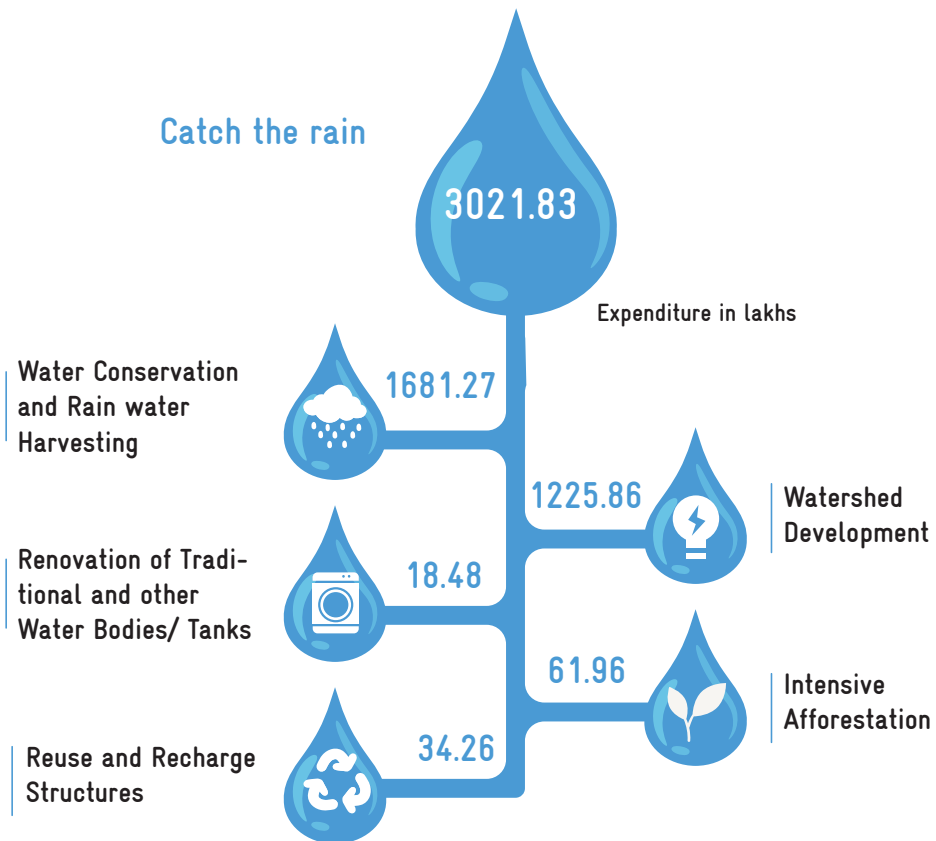
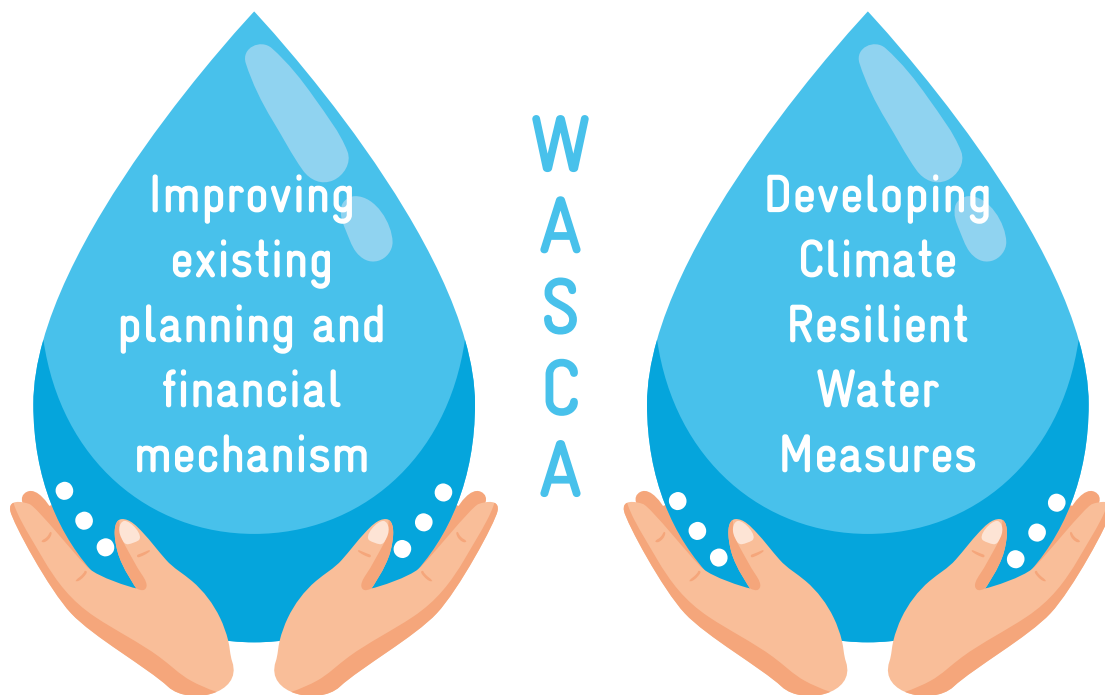


Figure 7.6. Catch the rain campaign in Thuringapuram



தானம் தவம்இரண்டும் தங்கா வியன்உலகம்
வானம் வழங்கா தெனின்

குறள் - 19

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

Thirukkural - 19

CHAPTER 8

CASE STUDY



8 | CASE STUDY

This chapter illustrates how CWRM planning processes unfolds the analysis, results and impacts from macro-watershed to the lowest planning unit, 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- WATERSHED IN THURINJAPURAM BLOCK

Thurinjapuram Block area is covered under three sub-basins Cheyyar River, Thurinjalar and Tondi Veraha Watersheds (Figure 8.1). Cheyyar River watershed (4C2A4) has 29 Micro-watersheds covering an area of 16,333.83 ha. Thurinjalar watershed (4C1B3) has 29 Micro-watersheds covering an area of 15,030.63Ha. Tondi Veraha watershed (4C1D3) has 20 Micro-watersheds covering an area of 11,071.43 ha (Table 25). Out of 47 GPs in the Block, 17 GPs fall under Cheyyar River (4C2A4) Watershed, 8 GPs fall under Tondi Veraha (4C1D3) Watershed, 20 GPs fall under Thurinjalar (4C1B3) Watershed and Two GPs having watershed boundaries passing through Cheyyar River and Tondi Veraha (Table 26). Figure 8.2 shows the Gram Panchayats in lies in Macro-watershed.

TABLE 25. GENERAL DESCRIPTION OF MACRO WATERSHEDS COVERING THURINJAPURAM BLOCK

Macro Watershed	Area in ha	No. of Micro-watersheds
Cheyyar River	16,333.83	29
Thurinjalar	15,030.63	29
Tondi Veraha	11,071.43	20

TABLE 26. NUMBER OF GPs COVERED UNDER WATERSHEDS IN THURINJAPURAM BLOCK

Name of watershed	No. of GPs covered in Thurinjapuram Block
Cheyyar River	17
Thurinjalar	20
Tondi Veraha	8
Cheyyar River and Tondi Veraha	2

Understanding the Block area respect to its terrain nature aid in treating area with appropriate measurement at right place also ensures the well management of the watershed (micro or macro). Ridge-based Block area is mapped (zoning) by referring the spatial thematic datasets and showcased with macro-watershed (Table 27 & Figure 8.3) and GPs boundaries (Table 28 & Figure 8.4). Based on ridge range types such as high, median, lower and inter variations Block area is distinguished into 4 kind of ridge zones.

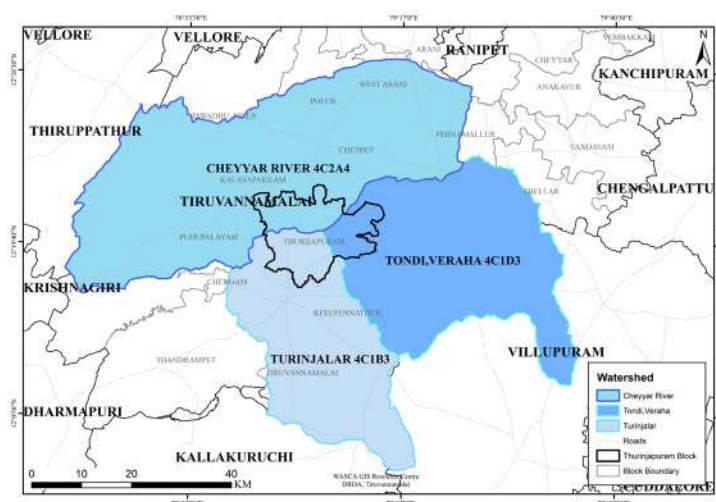


Figure 8.1. Macro-watershed Map- Thurinjapuram Block

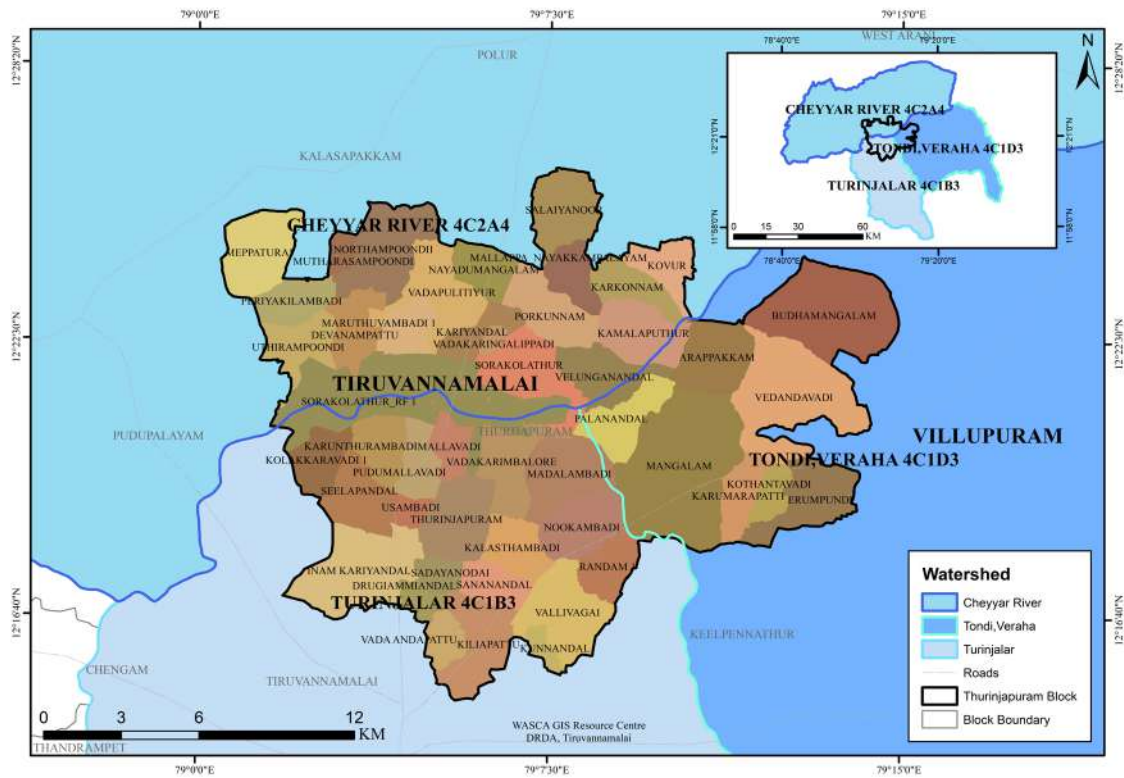


Figure 8.2. Macro-watershed with Gram Panchayat Map- Thuringapuram Block

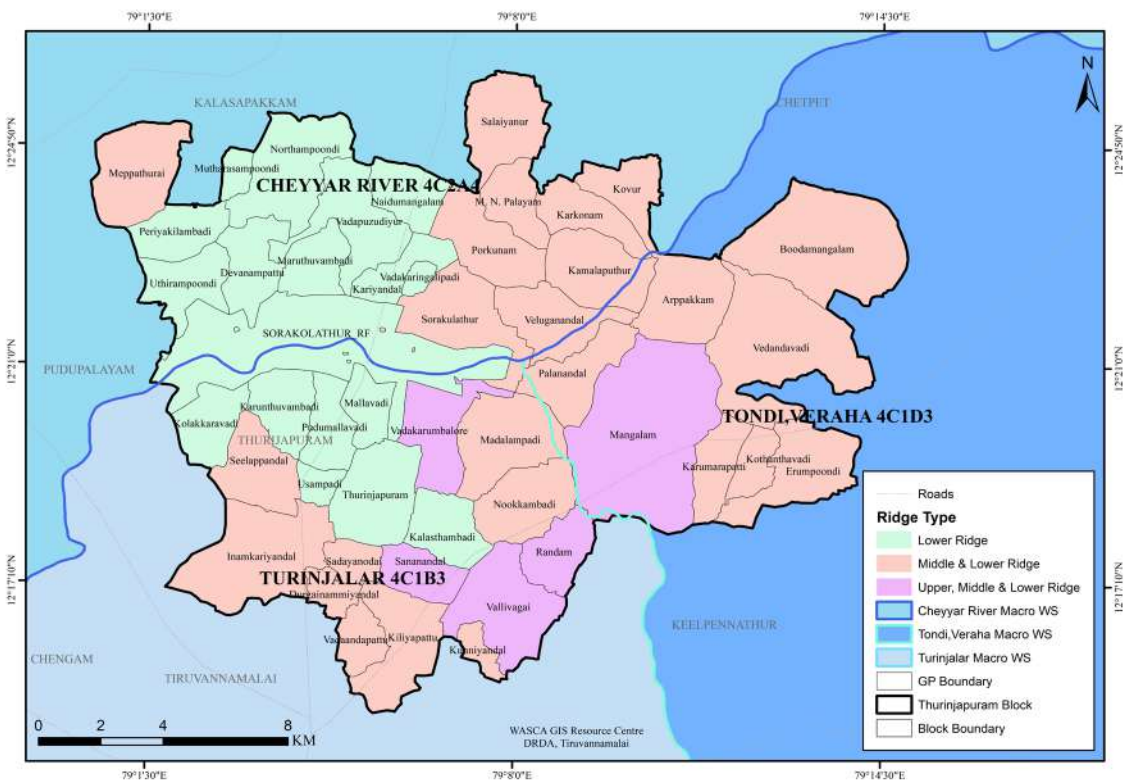


Figure 8.3. Macro-watershed ridge map-Thuringapuram Block

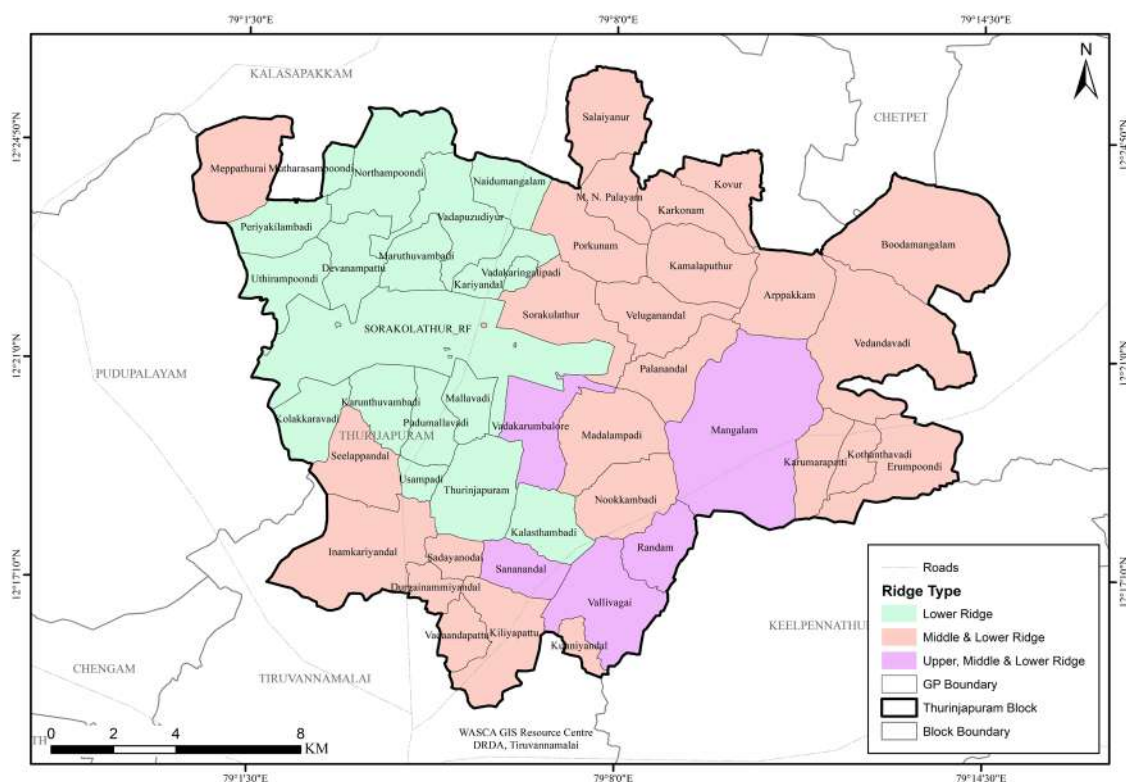


Figure 8.4. GP level ridge map

All the proposed works are identified using basin, sub-basin, and micro watershed with GP administrative boundaries through Composite Water Resources Management plan approach. The ridge details, GPs proposed works in all macro watersheds in Thuringapuram Block are listed in Table 27 to Table 35.

TABLE 27. MICRO-WATERSHED IN THURINJAPURAM BLOCK FALLING UNDER THURINJALAR MACRO-WATERSHED

Sl. No	Micro-watershed Code	Area in ha	Ridge type
1	4C1B3e07b	640.08	Upper, Middle & Lower
2	4C1B3d12c	442.19	
3	4C1B3e05d	698.67	
4	4C1B3e03a	456.38	
5	4C1B3e07d	561.17	Middle & Lower
6	4C1B3e06c	375.25	
7	4C1B3e07c	937.80	
8	4C1B3e10a	706.77	
9	4C1B3e07a	405.45	
10	4C1B3e03c	572.46	
11	4C1B3e06a	617.85	
12	4C1B3d12b	664.53	
13	4C1B3e03b	261.34	
14	4C1B3e05b	394.95	
15	4C1B3e05c	480.43	
16	4C1B3e05a	222.24	
17	4C1B3e11d	521.55	Lower
18	4C1B3e11c	377.48	

19	4C1B3e16a	695.20	Lower
20	4C1B3e16b	476.85	
21	4C1B3e11a	586.43	
22	4C1B3e11b	343.32	
23	4C1B3e06b	271.86	
24	4C1B3e15a	266.23	
25	4C1B3e10c	608.68	
26	4C1B3d12d	576.37	
27	4C1B3e10d	644.29	
28	4C1B3e10b	523.18	
29	4C1B3e09b	701.62	

TABLE 28. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER THURINJALAR MACRO WATERSHED IN THURINJAPURAM BLOCK

Sl.No	GP	Ridge type
1	Randam	Upper, Middle & Lower
2	Vadakarimbalore	
3	Sananandal	
4	Vallivagai	
5	Kunnandal	Middle & Lower
6	Drugiammiandal	
7	Sadayanodai	
8	Kiliapattu	
9	Vada Andapattu	
10	Madalambadi	
11	Nookambadi	
12	Seelapandal	
13	Inam kariyandal	Lower
14	Usambadi	
15	Karunthurambadi	
16	Kalasthambadi	
17	Kolakkaravadi	
18	Pudumallavadi	
19	Thurinjapuram	
20	Mallavadi	

TABLE 29. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER THURINJALAR MACRO WATERSHED IN THURINJAPURAM BLOCK

Work wise Details of Cheyyar in Anakkavoor Block			
Sl. No.	Proposed work	Ridge type	Extent
1	Afforestation in Public/common lands (ha)	Upper	7.24
2	Drainage Line Treatment (m)		37,137

3	CC Check dams (No.)	Middle	17
4	Block Plantation (Community) (ha)		26,054
5	Silvi-pasture Development (ha)		36
6	Avenue plantation (m)		10,596
7	Composting (No.)		402
8	Restoration of water bodies: Tanks and Ooranis (No.)		103
9	Artificial Recharge Structure (No.)	Lower	12
10	Farm Bunding with Boundary Trenches - Individual (ha)		24
11	Construction of Farm Ponds - Individual (No.)		83
12	Land development - Individual (ha)		24
13	Azolla units - Individual (No.)		821
14	NADEP Vermi compost (No.)		1
15	Cattle Shelters (No.)		1,841
16	Goat Sheep Shelters (No.)		446
17	Construction of new open wells & Recharge Shafts (No.)		41
18	Soak Pits (Community) (No.)		41
19	Soak Pits (Individual) (No.)		1,767
20	Roof Rain Water Harvesting (No.)		67
21	Nutri Garden (No.)		531
22	Silt application (No.)		18

TABLE 30. MICRO-WATERSHED IN THURINJAPURAM BLOCK FALLING UNDER TONDI VERAHA MACRO WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C1D3g05e	660.09	Upper, Middle,& Lower
2	4C1D3g05d	296.89	
3	4C1D3g11c	630.27	
4	4C1D3g11b	614.62	Middle & Lower
5	4C1D3g06b	685.59	
6	4C1D3g06c	930.94	
7	4C1D3g11a	461.13	
8	4C1D3g06a	582.94	
9	4C1D3g03d	623.78	
10	4C1D3g06d	351.88	
11	4C1D3g05b	515.80	
12	4C1D3g05c	688.99	
13	4C1D3g04b	380.49	
14	4C1D3g04a	889.91	
15	4C1D3g05a	425.53	
16	4C1D3g04c	613.62	
17	4C1D3g04d	334.53	
18	4C1D3g08c	585.06	Lower
19	4C1D3g03b	529.54	
20	4C1D3f13d	269.83	

TABLE 31. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER TONDI VERAHA MACRO WATERSHED IN THURINJAPURAM BLOCK

S No	GP Name	Ridge type
1	Mangalam	Upper, Middle & Lower
2	Karumarapatti	Middle & Lower
3	Arappakkam	
4	Kothantavadi	
5	Palanandal	
6	Budhamangalam	
7	Vedandavadi	
8	Erumpundi	

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

Sl. No.	Proposed work	Ridge type	Extent
1	Afforestation in Public/common lands (ha)	Upper	1.07
2	Drainage Line Treatment (m)		60,414
3	CC Check dams (No.)	Middle	8
4	Block Plantation (Community) (ha)		10.22
5	Avenue plantation (m)		9,312
6	Composting (No.)	Lower	455
7	Restoration of water bodies: Tanks and Ooranis (No.)		85
8	Artificial Recharge Structure (No.)		16
9	Farm Bunding with Boundary Trenches - Individual (ha)		46
10	Construction of Farm Ponds - Individual (No.)		26
11	Azolla units - Individual (No.)		524
12	Cattle Shelters (No.)		571
13	Goat Sheep Shelters (No.)		232
14	Construction of new open wells & Recharge Shafts (No.)		33
15	Soak Pits (Community) (No.)		38
16	Soak Pits (Individual) (No.)		1,813
17	Roof Rain Water Harvesting (No.)		39
18	Nutri Garden (No.)		304
19	Silt application (No.)	8	

TABLE 33. MICRO-WATERSHED IN THURINJAPURAM BLOCK FALLING UNDER CHEYYAR RIVER MACRO-WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C2A4c02c	430.54	Middle & Lower
2	4C2A4c02d	551.93	
3	4C2A4c07b	462.20	
4	4C2A4c08b	518.93	
5	4C2A4c07c	516.44	
6	4C2A4c08a	494.96	

7	4C2A4c08c	657.17	Middle & Lower
8	4C2A4c09a	565.93	
9	4C2A4c09b	363.89	
10	4C2A4c08d	399.65	
11	4C2A4c09c	539.74	
12	4C2A4c02b	517.21	Lower
13	4C2A4c03b	474.71	
14	4C2A4c04a	797.79	
15	4C2A4c03a	489.78	
16	4C2A4c03c	447.09	
17	4C2A4c04b	602.42	
18	4C2A4c04c	648.25	
19	4C2A4c05a	749.41	
20	4C2A4c10a	600.52	
21	4C2A4c11a	548.15	
22	4C2A4c03d	386.55	
23	4C2A4c12a	774.95	
24	4C2A4c10b	687.08	
25	4C2A4c11b	717.36	
26	4C2A4c10c	665.47	
27	4C2A4c11c	380.48	
28	4C2A4c12d	758.30	
29	4C2A4c09d	586.92	

TABLE 34. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER MACRO WATERSHED IN THURINJAPURAM BLOCK

Sl. No.	Proposed work	Ridge type
1	Porkunnam	Middle & Lower
2	Mallappa_Nayakkampalayam	
3	Karkonnam	
4	Meppaturai	
5	Kovur	
6	Salaiyanoor	
7	Sorakolathur	
8	Maruthuvambadi	Lower
9	Mutharasampoondi	Lower
10	Devanampattu	
11	Vadapulitiyur	
12	Nayadumangalam	
13	Vadakarinalippadi	
14	Kariyandal	
15	Periyakilambadi	
16	Northampoondi	
17	Uthirampoondi	

TABLE 35. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER MACRO WATERSHED IN THURINJAPURAM BLOCK

Sl.No	Proposed work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	88.91
2	Drainage Line Treatment (m)		39,388
3	CC Check dams (Nos)	Middle	8
4	Block Plantation (Community) (ha)		41.805
5	Avenue plantation (m)		20,203
6	Composting (No.)	Lower	419
7	Restoration of water bodies: Tanks and Ooranis (No.)		73
8	Artificial Recharge Structure (No.)		65
9	Farm Bunding with Boundary Trenches - Individual (ha)		1.42
10	Construction of Farm Ponds - Individual (No.)		112
11	Land development - Individual (ha)		26.4
12	Azolla units - Individual (No.)		669
13	NADEP Vermi compost (No.)		69
14	Cattle Shelters (No.)		1,265
15	Goat Sheep Shelters (No.)		230
16	Cattle Trough (No.)		17
17	Construction of new open wells & Recharge Shafts (No.)		98
18	Soak Pits (Community) (No.)		62
19	Soak Pits (Individual) (No.)		1,994
20	Roof Rain Water Harvesting (No.)	108	
21	Agro Forestry (ha)	Middle	2
22	Nutri Garden (No.)	Lower	2,678
23	Silt application (No.)		2

TABLE NO 36. LIST OF GPS WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER & TONDI VERAHA MACRO WATERSHED IN THURINJAPURAM BLOCK

Sl. No	Name of the GP	Ridge Type
1	Kamalaputhur	Middle & Lower
2	Velunganandal	

TABLE NO 37. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER MACRO WATERSHED IN THURINJAPURAM BLOCK

Sl.No	Proposed work	Ridge Type	Extent
1	Drainage Line Treatment (m)	Upper	3,112
2	CC Check dams (No.)	Middle	1
3	Block Plantation (Community) (ha)		1.17
4	Avenue plantation (m)		675

5	Composting (No.)	Lower	3
6	Restoration of water bodies: Tanks and Ooranis (No)		6
7	Farm Bunding with Boundary Trenches - Individual (ha)		5
8	Construction of Farm Ponds - Individual (No.)		1
9	Azolla units - Individual (No.)		99
10	NADEP Vermi compost (No.)		3
11	Cattle Shelters (No.)		223
12	Goat Sheep Shelters (No.)		37
13	Construction of new open wells & Recharge Shafts (No.)		10
14	Soak Pits (Community) (Nos)		10
15	Soak Pits (Individual) (No.)		301
16	Roof Rain Water Harvesting (No).		2
17	Nutri Garden (No.)		1
18	Silt application (No.)		2



8.2 | MODEL MICRO-WATERSHED VADAPULIDIYUR MICRO-WATERSHED

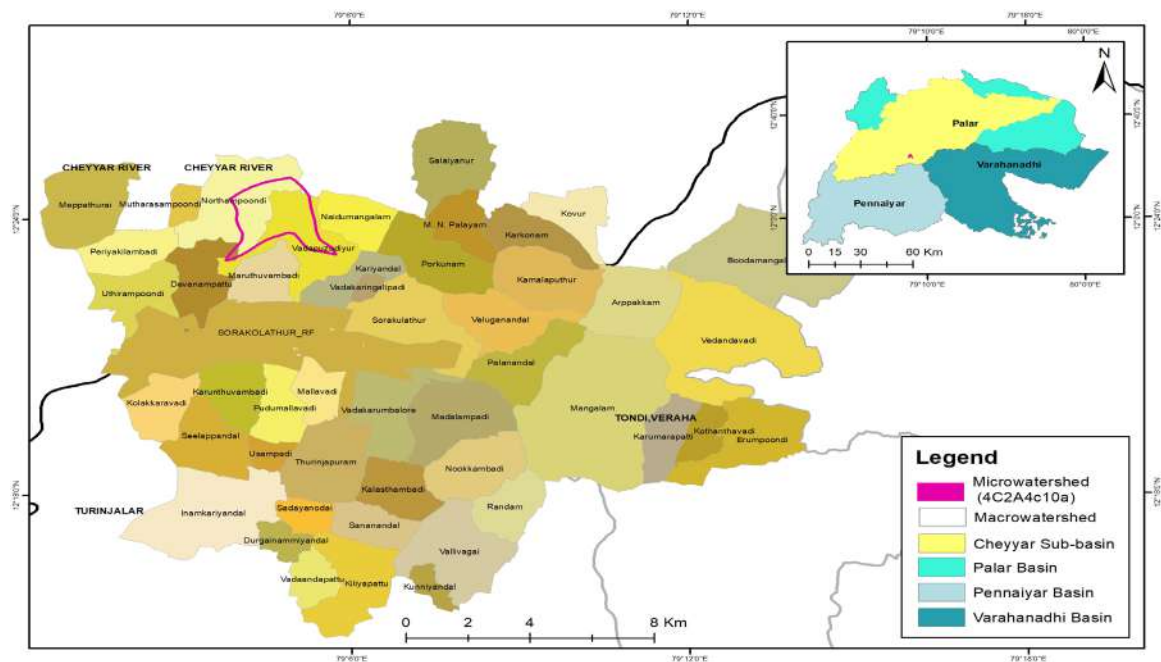


Figure 8.5. Vadapulidiyur micro-watershed

The micro-watershed case study addresses the issues of water conservation and climate change through integrated approach. The decentralized micro watershed planning has been conceived for holistic development and management to ensure sustainable long-term benefits. The micro-watershed plan has been sequenced from ridge to valley for proper implementation of different de-

velopment 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.

VADAPULIDIYUR MICRO-WATERSHED

Vadapulidiyur micro-watershed falls under Vadapulidiyur and Northampoundi GPs, Thuringapuram Block (Figure 8.5). This Micro-watershed is a part of Cheyyar River macro watershed in Cheyyar sub-basin. The general information, geology, hydrogeology, natural drainage line, catchment area, ground water status, water budget of

Vadapulidiyur 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 38 to 48). Proposed activities shown in Figure 8.6 and 8.7. The key CWRM parameters for the GPs falling in this micro-watershed is Annexed in 8.

TABLE 38. GENERAL INFORMATION OF THE MICRO-WATERSHED

Description	Name/ Number/ Quantity/ Status
Name of the micro-watershed	Vadapulidiyur
Micro-watershed Number	4C2A4c10a
Name of the Basin	Palar Basin
Name of the sub-basin	Cheyar Sub Basin
Name of the macro-watershed	Cheyar River
Number of GPs covered under the micro-watershed	Two
Name of the GPs	1. Vadapulidiyur
2. Northampoondi	12°44'42.17"N to 12°45'20.80"N
Latitude of micro-watershed (From To)	12°23'6.06"N to 12°24'53.45"N
Longitude of micro-watershed (From To)	79° 3'51.60"E to 79° 5'26.87"E
Total area of the micro-watershed (ha)	601
Micro-watershed area in Vadapulidiyur GP (%)	50%
Micro-watershed area in Northampoondi GP (%)	50%
Micro-watershed falling in Vadapulidiyur GP (ha)	301
Micro-watershed falling in Northampoondi GP (ha)	300
Total Population of Vadapulidiyur GP	2,408
Total Population of Northampoondi GP	3,926
Annual average rainfall (mm)	1047
Annual maximum Temperature	33°C
Annual Minimum Temperature	22.8 °C
Evapo-Transpiration Losses of Vadapulidiyur GP (ha.m)	22.51
Evapo-Transpiration Losses of Northampoondi GP (ha.m)	28.55
Volumetric soil moisture availability	23%
Climate Risk	Drought and heat waves
CVI Index Value for Vadapulidiyur GP	0.473
CVI Index Value for Northampoondi GP	0.519
Agro-Climatic Zone	North eastern zone (TN-1)
Agro Ecological Sub-Region (ICAR)	Eastern Ghats
Status of Ground water in Vadapulidiyur GP	Over Exploited
Status of Ground water in Northampoondir GP	Over Exploited

TABLE 39. GEOLOGY, HYDROGEOLOGY OTHER CHARACTERISTICS OF VADAPULIDIYUR 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	One
Type of lineaments passing through the Micro watershed	Geomorphic Lineaments, Drainage Parallel
Sheet Erosion (ha)	1.25 Lower Ridge

TABLE 40. NATURAL DRAINAGE LINES IN VADAPULIDIYUR MICRO-WATERSHED

No. of 2nd Order drains	1
No. of 3rd Order drains	1
Total length of natural drainage line (m)	3,386 m
Drainage density (ha.m)	5.63

TABLE 41. CATCHMENT AREA (STRANGE METHODOLOGY- CGWB)

Catchment Area (in ha)	Vadapulidiyur	Northamboondi GP
Good catchment area	141.96	256.1
Average catchment area	22.01	1.72
Bad catchment area	594.72	708.22

TABLE 42. GROUND WATER STATUS OF MICRO- WATERSHED

Name of the Firka (Assesment Unit) falling under micro- watershed	Naidumangalam
Net Annual Ground Water Availability	2,537.69
Existing Gross Ground Water Draft for Irrigation	2,463.30
Existing Gross Ground Water Draft for domestic and industrial water supply	50.87
Existing Gross Ground Water Draft for All uses	2,514.17
Provision for domestic and industrial requirement supply to 2025	57.81
Net Ground Water Availability for future irrigation development	16.58

TABLE 43. GP WISE WATER BUDGET OF MICRO -WATERSHED



Water Budget in ha.m	Vadapulidiyur	Northamboondi
Akkur GP		
Water for Human (ha.m)	6.59	10.75
Water for Agriculture (ha.m)	256.1	257.1
Water for Animal (ha.m)	3.25	9.69
Village wise water required (ha.m)	265.9	277.5
Available run-off from rain water (derived from Strange method) (ha.m)	170.6	229
Harvested Runoff from Water Harvesting Activities (ha.m)	3.7	5.7
Potential Harvesting from proposed Interventions (ha.m)	67.5	40.9
Total Water harvested (ha.m)	71.2	46.6
Water demand and Supply Difference (ha.m)	-194.8	-230.9
Water Demand Supply Gap Status (ha.m)	Deficient	Deficient
Per capita Water Availability in cum (ha.m)	708.47	583.29
International Standard per capita water Availability in cum (ha.m)	1,700	1,700
Water Availability Gap (ha.m)	-991.52	-1116.71
Water security status	Water Stress	Water Stress

TABLE 44. GP WISE PROPOSED MICRO -WATERSHED WORKS

Ridge-wise Proposed works	Vadapulidiyur	Northamboondi
Upper Ridge	-	-
Middle Ridge	7	10
Lower Ridge	179	225
Total	186	235

TABLE 45. RIDGE WISE TREATMENT AREA, ESTIMATED COST AND PERSON DAYS REQUIRED

	Vadapulidiyur GP	Northamboondi GP
Middle Ridge		
Estimated cost for Middle Ridge area (in INR lakhs)	31	50
Total area of Middle Ridge (ha)	20	30
Treatment cost of Middle Ridge (Lakh/ha)	1.55	1.66
Estimated Person days generated for Treatment of Middle Ridge	12,307	19,535
Lower ridge		
Estimated cost for Lower Ridge area (in INR lakhs)	151	209
Total area of Lower Ridge (ha)	281	270
Estimated Person days generated for Treatment of Lower Ridge	58,724	71,643
Treatment cost of Lower Ridge (Lakh/ha)	0.54	0.77

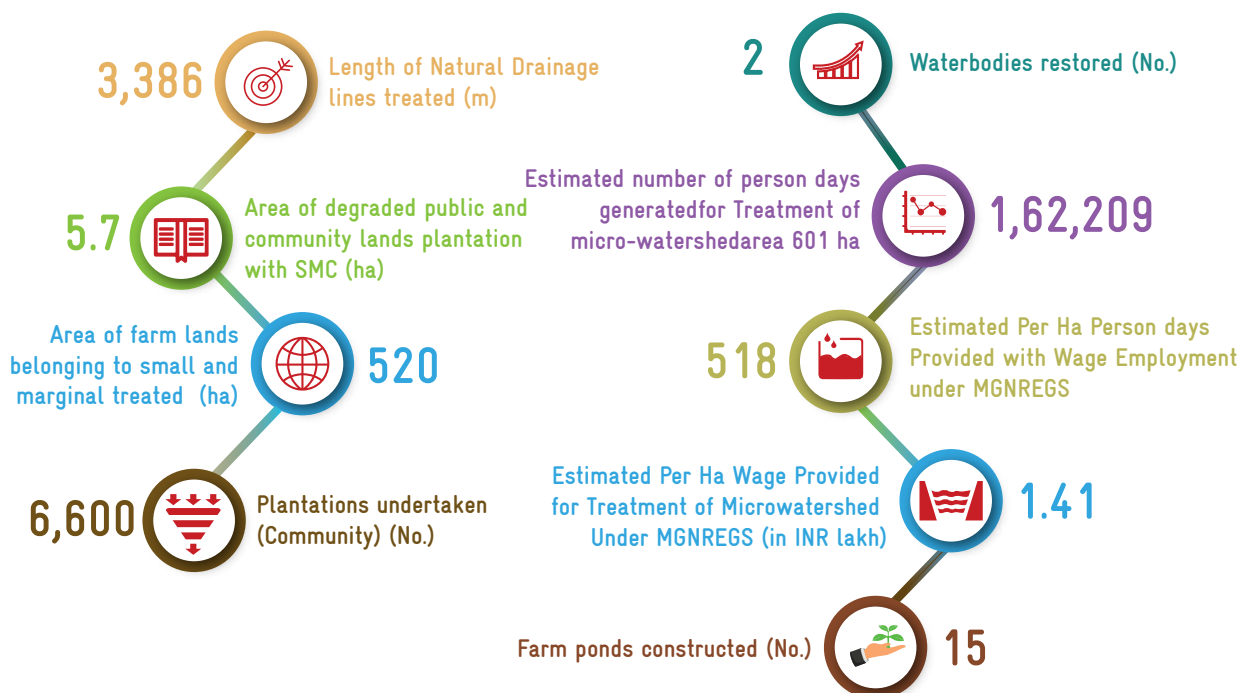
Vadapulidiyur GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	 NA	 NA
Middle Ridge	1.55 lakh/ha	12,307
Lower Ridge	0.54 lakh/ha	58,724
2.09 lakh/ha		71,031

Northamboondi GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	1.66 lakh/ha	19,535
Lower Ridge	0.77 lakh/ha	71,643
	2.43 lakh/ha	91,178

TABLE 46. NATURE AND NUMBER OF WORKS IN MICRO- WATERSHED

Description	Number
Total No. of works in micro- watershed area (Ar-able, Non arable & DLT)	179
Total No. of works in micro- watershed including livelihood Activities	80
Total No. of works in micro-watershed including Rural Greywater Management Activities	162

TABLE 47. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)



Vadapulidiyur GP 68.76 lakh

Northampoondi GP 77.89 lakh

TABLE 48. ESTIMATES OF MICRO-WATERSHED IN VADAPULIDIYUR GP

Proposed Work	Ridge Type	Status of Work	Extent	No. of works as per KML	Estimate cost in Lakhs	Person days
NRM works in Public and Community Lands						
CC Check Dam (No.)	Lower	commenced	2	2	16.7	840
Avenue plantation (Km)			2.62	2	4.7	1,841
Compost Pit (No.)		Not commenced	6	6	1.02	90
Sub total				10	22.42	2,771
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Farm Bunding with Boundary Trenches - Individual (ha, No.)	Middle	Not commenced	10	4	6	2,344
			4			
Dryland Horticulture (ha, No.)			7	3	25	9,963
			3			
Construction of Farm Ponds - Individual (No.)	Lower	Ongoing	9	9	18	7,029
Artificial Recharge Structure for borewell farmers (No.)		Not commenced	10	10	25	3,910
Silt application (No.)			3	3		
Fodder development - Individual (No.)			15	15	22.2	35,160
Azolla Production units - Individual (No.)			15	15	2.25	345
NADEP Vermi compost (No.)			commenced	15	15	2.7
Sub total				74	101.15	59,156
Total				84	123.57	61,927
Livelihood enhancement activities for Individual Farmers (dryland)						
Cattle Shelters (No.)	Lower	commenced	15	15	31.8	4,965
Goat Sheep Shelters (No.)			10	10	22.7	3,550
Cattle Trough (No.)		Not commenced	15	15	0.75	90
Sub total				40	55.25	8,605
Rural Greywater Management						
Soak Pits (Individual) (No.)	Lower	commenced	31	31	3.1	496
Nutri Garden (No.)		Not commenced	31	31	0.3	3
Sub total				62	3.4	499
Total				186	182.22	71,031

TOTAL ESTIMATES OF MICRO-WATERSHED IN VADAPULIDIYUR GP




	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
			
Vadapulidiyur GP	186	182.22	71,031

TABLE 49. ESTIMATES OF MICRO-WATERSHED IN NORTHAMPOONDI GP

Proposed Work	Ridge Type	Status of Work	Extent	No. of works as per KML	Estimate cost in Lakhs	Person days	
NRM works in Public and Community Lands							
CC Check dams (No.)	Lower	Commenced	3	3	25.05	1,260	
Avenue plantation (Km)			2.595	2	4.68	1,827	
Restoration of Traditional water bodies: (Pond) (No.)			2	2	2	400	
Canal bund Plantation (Km)		Not commenced	0.968	1	7.26	2,836	
Block Plantation (ha)			2.1	1	22.2	4,680	
Afforestation (ha)			1.6	1	13.76	5,350	
Compost Pit (No.)			9	9	1.53	135	
Sub total				19	76.48	16,488	
Works in Individual Farmer lands (Agriculture and Allied Activities)							
Farm Bunding with Boundary Trenches - Individual (ha, No.)	Middle	Not commenced	12	5	7.5	2,930	
			5				
Dryland Horticulture (ha, No.)	5		5	15	5	42.5	16,605
				5			
Construction of Farm Ponds - Individual (No.)	Lower	Ongoing	6	6	12	4,686	
Artificial Recharge Structure for borewell farmers (No.)		Not commenced	10	10	25	3,910	
Silt application (No.)			5	5			
Fodder development - Individual (No.)			15	15	22.2	35,160	
Azolla Production units - Individual (No.)		Commenced	15	15	2.25	345	
NADEP Vermi compost (No.)			15	15	2.7	405	
Sub total					76	114.15	64,041
Total				95	190.63	80,529	

Livelihood enhancement activities for Individual Farmers (dryland)						
Cattle Shelters (No.)	Lower	Commenced	15	15	31.8	4,965
Goat Sheep Shelters (No.)			10	10	22.7	3,550
Cattle Trough (No.)		Not commenced	15	15	0.75	90
Sub total				40	55.25	8,605
Roof rainwater and Rural Greywater Management						
Rainwater Harvesting Structure (No.)	Lower	Not commenced	2	2	8	1,250
Nutri Garden (No.)			49	49	0.5	10
Soak Pits (Individual) (No.)		Ongoing	49	49	4.9	784
Sub total				100	13.4	2,044
Total				235	259.28	91,178

TOTAL ESTIMATES OF MICRO-WATERSHED IN NORTHAMPOONDI GP

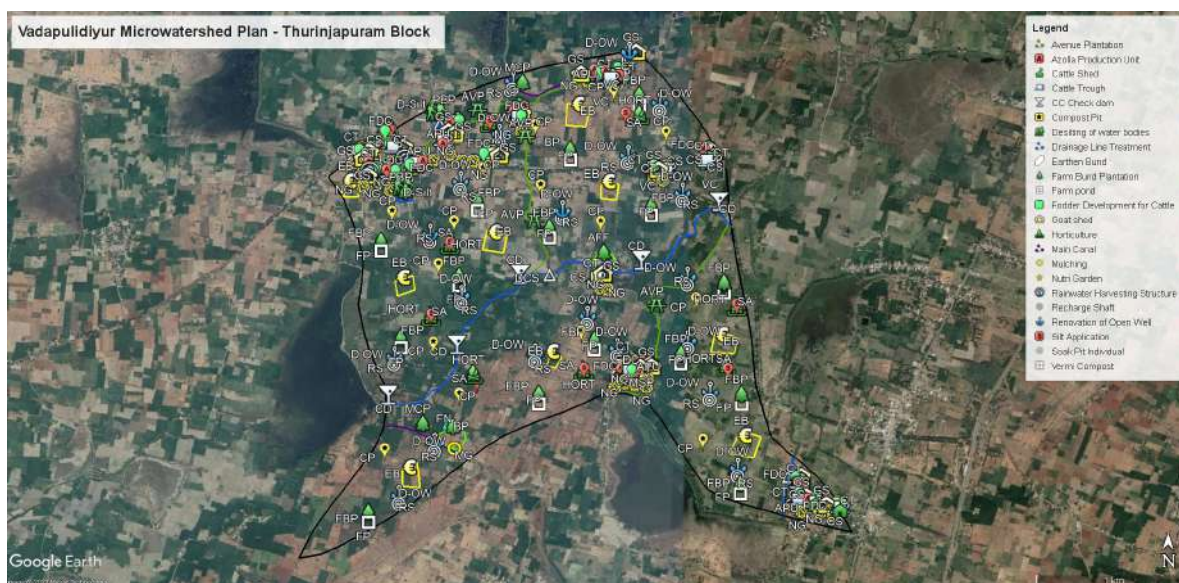
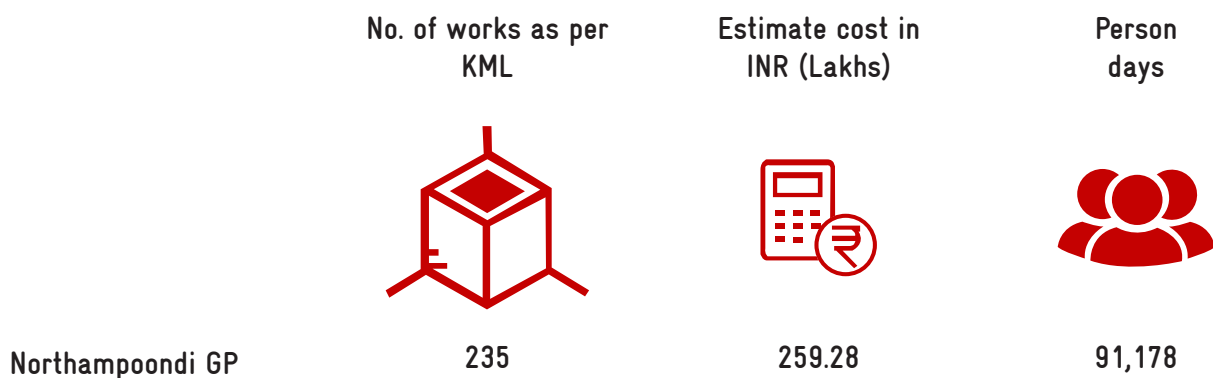
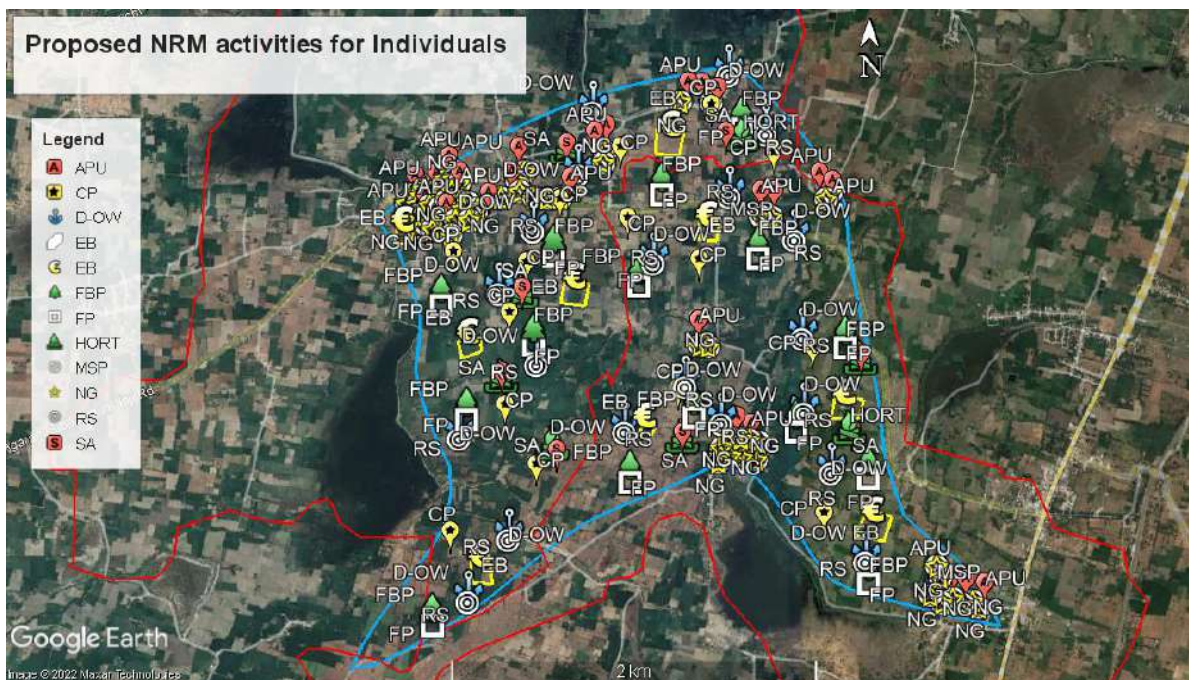


Figure 8.6. Proposed plan in Vadapulidiyur micro-watershed



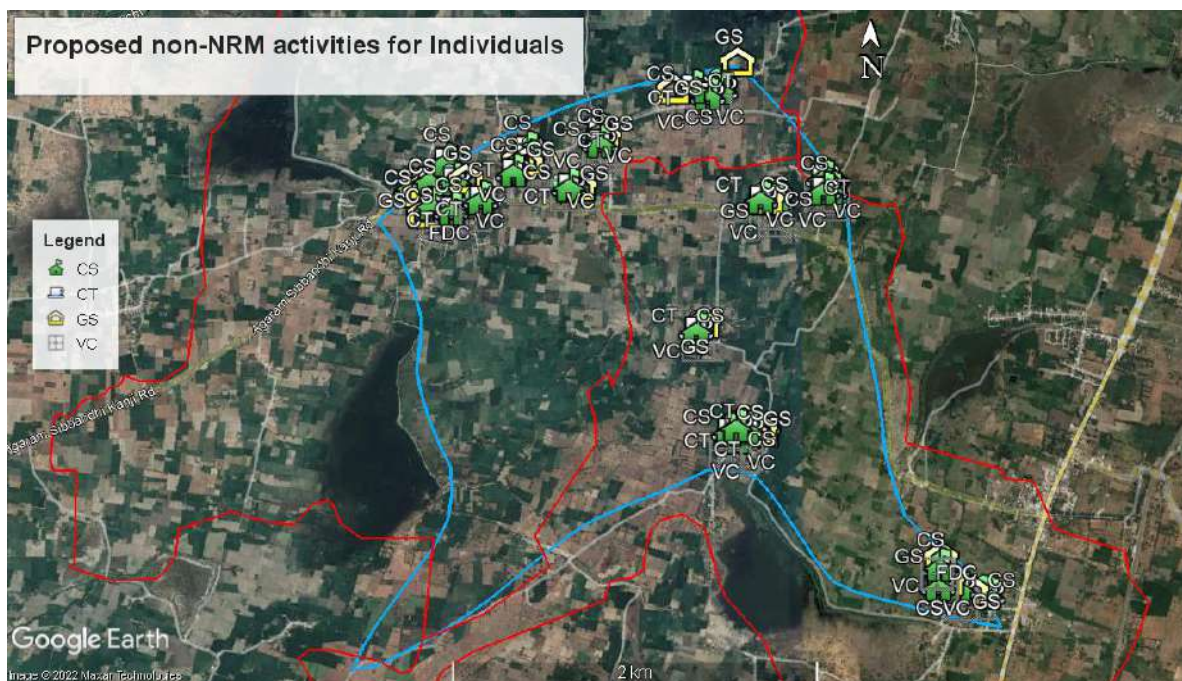
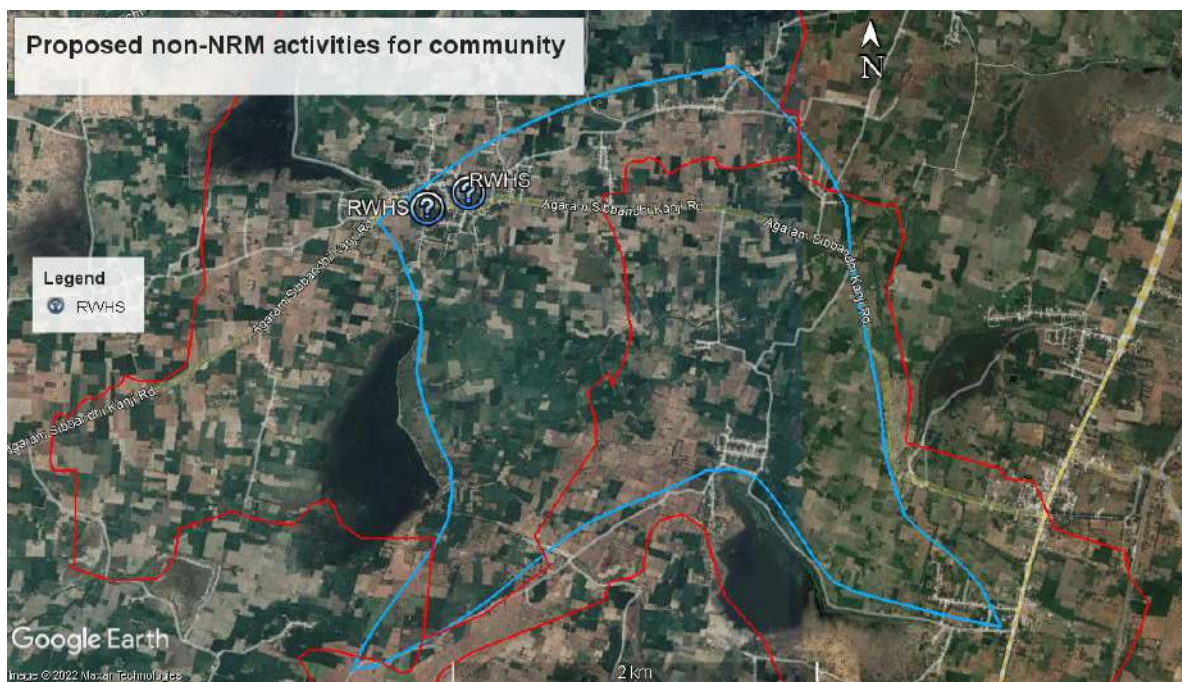


Figure 8.7. Proposed plan in Vadapulidiyur micro-watershed, A. NRM activities for community, B. NRM activities for individuals, C. Non-NRM activities for community, B. Non-NRM activities for individuals (APU: Azolla Production unit, AVP: Avenue Plantations, CP: Compost pit, CS: Cattle Shed, D-silt: Desilting, 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 GRAM PANCHAYAT

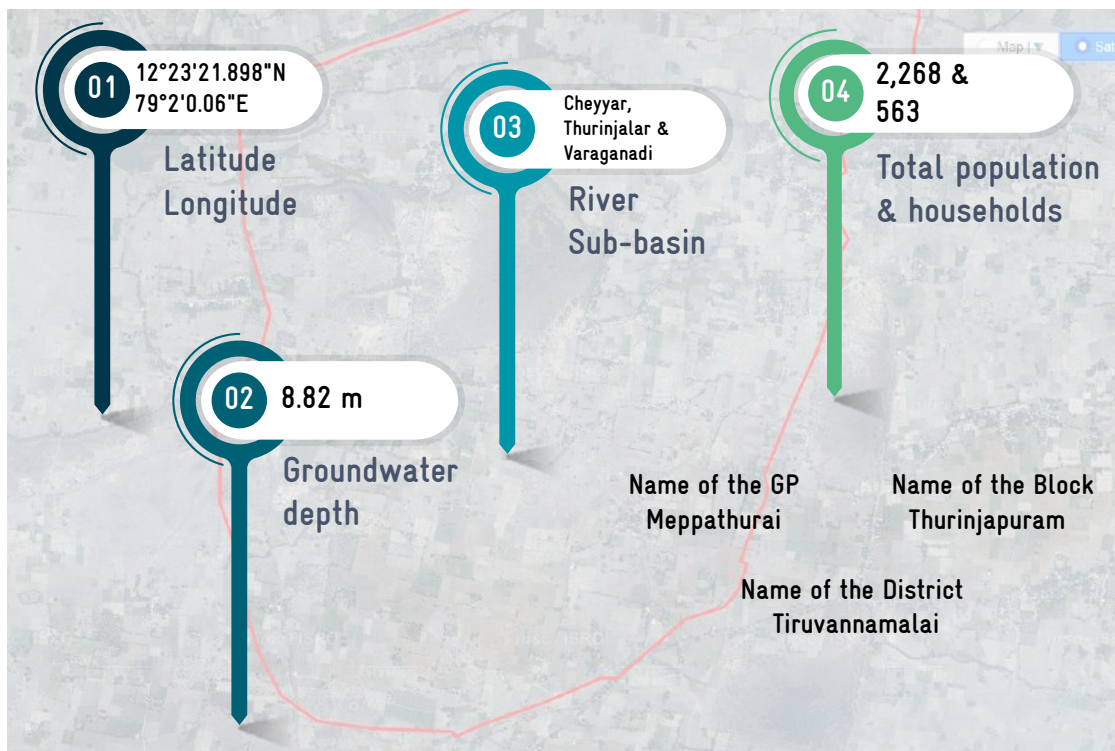
MEPPATHURAI GP

8.3.1 | BACKGROUND OF MEPPATHURAI GP



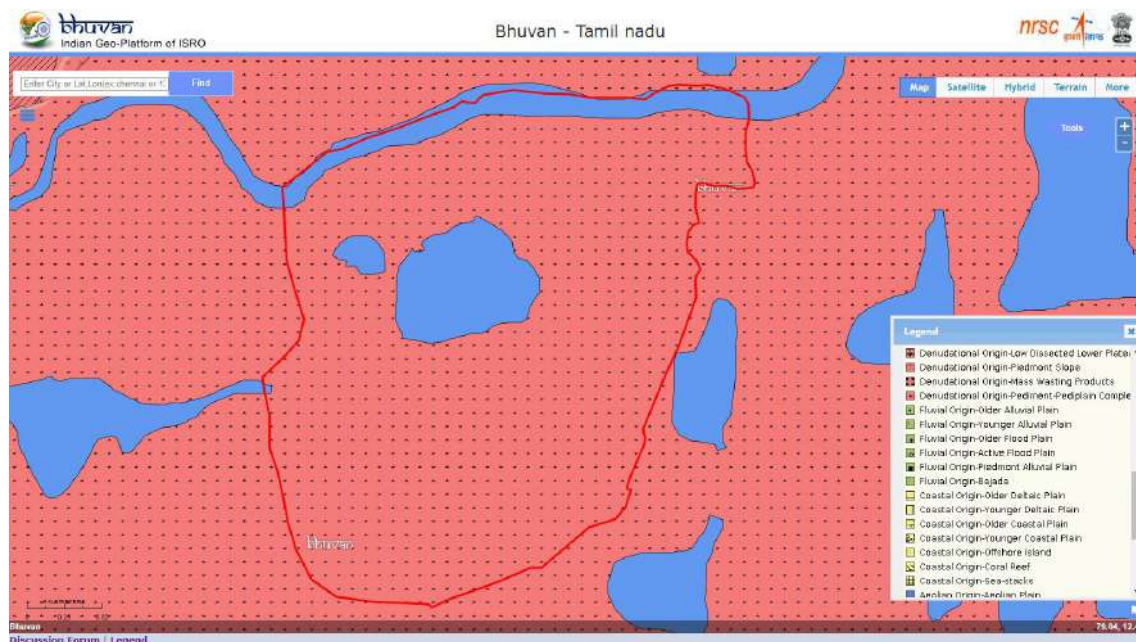
The Meppathurai GP is located in Thurinjapuram Block of Tiruvannamalai district, Tamil Nadu (Figure 8.8). The total population is 2268 of which 1143 are males while 1125 are females as per Population Census 2011. The total number of households is 563. The Schedule Tribe population is 2 and Sched-

ule Caste population is 345 in the GP. The general description of this GP is given in Table 50. The detailed spatial and non-spatial data considered in the process of identifying key water challenges and preparation of climate resilient plans under CWRM for Meppathurai GP is given Table 51.



8.3.2 CWRM planning - Spatial Data:

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



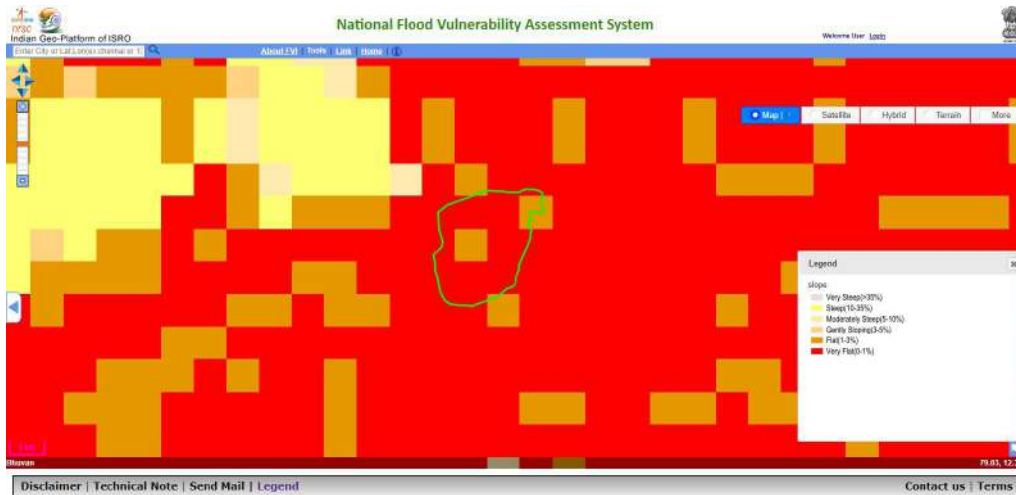


Figure 8.9. Spatial thematic maps of Meppathurai GP. A. Geomorphology, B. GE prosperity, C. Slope, D. Watershed, E.LULC

Meppathurai GP engrossed with denudation origin pediment complex (A) landform unit. It is observed that the groundwater prosperity is less than 30 m deep well with 50 to 100 LPM capacity (B). Very flat terrain is dominated in the GP (C), Whereas GP area is falls under three micro-watershed units (D). Most of land used for crop cultivation and two large land parcels were indicating the plantation crops (E).

8.3.3 | CWRM PLANNING - NON-SPATIAL DATA

The non-spatial datasets covers four major themes related to the 116 parameters – socio economic, climate, water and agriculture (Table 52). This data will be used for analysis along with the spatial data in identifying the key water challenges, by estimating the water budgeting and for proposing

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

TABLE 51. NON SPATIAL DATA-MEPPATHURAI GP

Key CWRM Parameter	Details
Climate Vulnerability Area (CVA) 1: Socio-Economic	
Geographical Area (ha)	796
Male Population	795
Female Population	766
Total Population	1,561
SC Population	521
ST Population	12
Vulnerable population	533
Households (HH's)	376
Only one room HH's (SECC)	78
Female-Headed HH's (SECC)	27
Vulnerable Households (SECC)	63
Vulnerable Households (%)	17
Registered MGNREGA Job cards	928
active person working in job Cards	553
Drinking-Water Sources	213
Groundwater sources - Drinking water	201
Surface water sources - Drinking water	12
Annual Grey water Generation (ha.m)	2.85
Climate Vulnerability Area (CVA) 2: Climate	
Average Annual Rainfall (mm)	1047
Average Annual Temperature (°C)	27.9 °C
Ground Water (G.W) Status	Over-Exploited

Climate Vulnerability Area (CVA) 3: Water	
Canal Network (m)	
Length of Distributaries	3,000
No. of Tanks (PWD & Union)	2
No. of Ooranis	10
Other Surface Water Bodies	1
Irrigation Facilities (ha)	
Open & Tube Well Irrigation	205.48
Catchment Area wise Available Runoff (ha.m)	
Good Catchment Area	155.80
Bad Catchment Area	71.10
Watershed and Drainage Networks	
Length of Natural Drainage Lines (m)	4,837.96
No. of Natural Drainage Lines	6
No. of Micro-watersheds	4
Water Demand (ha.m)	
Water Demand for Humans	4.27
Water Demand for Livestock	3.52
Water Demand for Agriculture	530.20
% GW Utilization for Drinking	33%
% GW Utilization for Livestock	96%
% GW Utilization for Agriculture.	88%
% SW Utilization for Drinking	35%
% SW Utilization for Livestock	4%
% SW Utilization for Agriculture	27%
Climate Vulnerability Area (CVA) 4: Agriculture	
Area Under Land Resources (ha)	
Non-Agricultural Uses	415.53
Fallows Land other than Current Fallows	10.14
Current Fallow land	84.52
Unirrigated Land	79.92
Irrigated by Source	205.48
Catchment Area (ha)	
Land under Good Catchment	415.53
Land under Average Catchment	0.00
Land under Bad Catchment	380.06
Crop Details (ha)	
Irrigated Area	324.97
Rainfed area	123.10
Area under Paddy Cultivation	314.27

Crop Water Requirement - The irrigated condition	486.98
Crop Water Requirement - Rainfed condition	43.23
Soil Resources: Status of Available Nitrogen (%)	
Very Low	37%
Low	43%
Medium	20%
Status of Organic Carbon (%)	
Very Low	31%
Low	65%
Medium	4%
Status of Soil Micro Nutrients (%)	
Sufficient	58%
Deficient	42%
Status of Physical condition of the soil (%)	
Moderately Acidic	6%
Slightly Acidic	47%
Neutral	0%
Moderately Alkaline	47%
Soil Texture	
% of Clay Soil	0%
% of Fine Soil	91.11%
Soil Water Permeability	Moderate
Soil moisture and ET	
Volumetric Soil Moisture	23
Estimated Soil Moisture	88.36
ET Losses	229.46
Means of Water Extraction (%)	
Gravity	2%
Lifting	98%
Irrigation Methods (%)	
Control Flooding	100%
Livestock (No)	
Cattle Population	920
Sheep Population	195
Goat Population	251

8.3.4 | KEY WATER CHALLENGES

Socio-Economic



1. 17% of the households are vulnerable in the GP
2. 78 one room households, and 27 female headed households
3. 34% SC/ST population
4. Access to drinking water through tap water connections inadequate
5. Grey water generation of 2.85 ha.m needs attention

Water



1. Ground water status – over exploited
2. 13 traditional waterbodies in the GP
3. Irrigation depends 100% on open and tubewell
4. 96% livestock and 88% Agriculture needs met through ground water
5. 155.80 ha.m of water is available runoff, from good catchment area

Agriculture and Allied Sector



1. 52.22 % of the land covers the common area
2. 47.76% of the land covers an individual land area
3. Main crop in the GP is paddy which is cultivated about 314.27 ha of land
4. Crop water requirement for irrigated condition is more 486.98 (ha.m)
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 to very low
8. Predominant Fine soil in GP Very less micronutrients
9. Very high ET loss 229.46 ha.m

8.3.5 | PERSPECTIVE PLAN - WORKS PROPOSED: WATER ACTIONS

The appropriate and site-specific works are identified for the development of public and common land, agriculture and allied activities, rural infrastructures, and climate-resilient measures to reduce the vulnerability in the GP. About 28.53% of the total land area is taken for WASCA treatment activities like plantation and conservation works. The total proposed area for treatment is

227.99 ha. More attention is given for non-agriculture land followed by area under irrigated by source, area under current fallow land and unirrigated land. (Figure 8.10). Through the proposed conservation activities 61.50 ha.m run off would be harvested in which about 49.50% of the run off from good catchment and 12% of the conservation is from the bad catchment area (Figure 8.11).

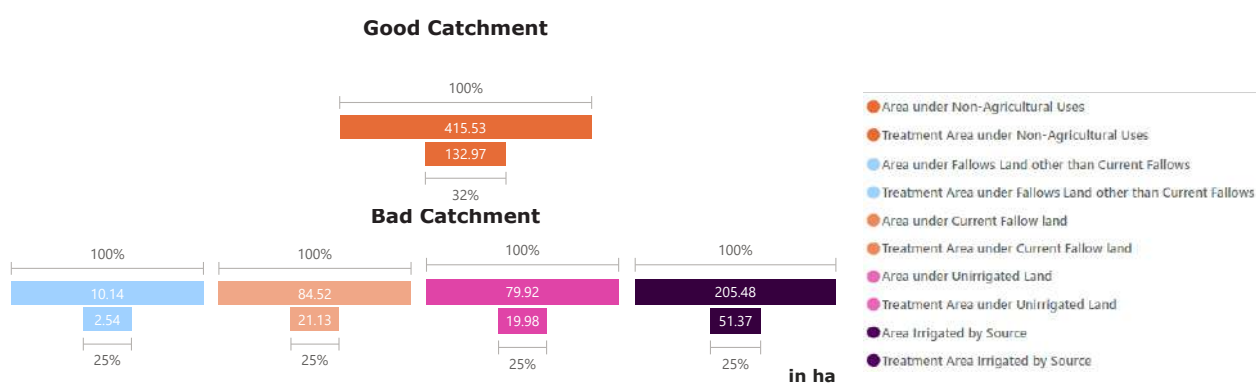


Figure 8.10. Proposed land resource treatment area in Meppathurai GP

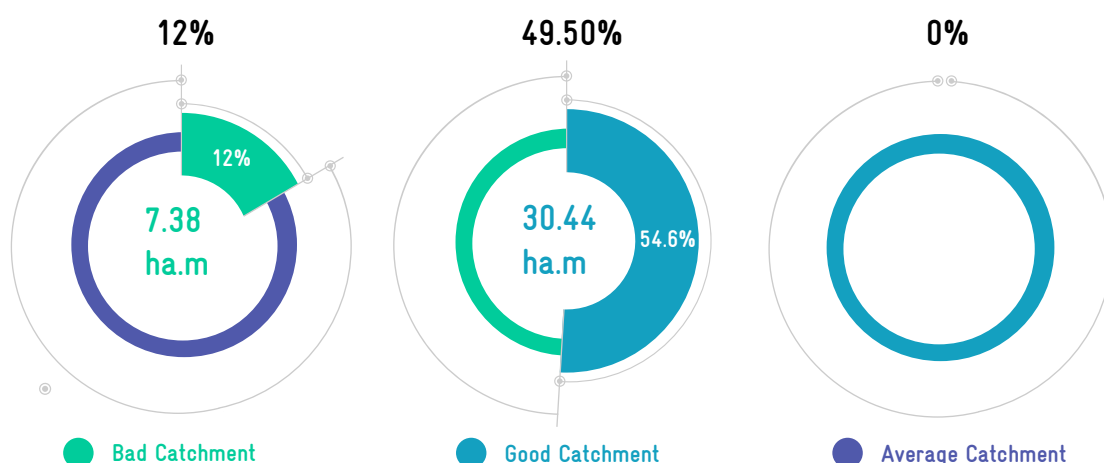


Figure 8.11. Expected run off conservation after treatment

The appropriate and site-specific works have been identified for the development of public and common land, agriculture and allied activities, rural infrastructures, and climate-resilient measures to reduce the vulnerability in the GP. Table 52 shows

the detailed perspective plan and estimates of the work, budget, and person-days for three years from 2021-2022 to 2023-2024 in Meppathurai GP. More attention was given to include appropriate works to improve the common and public land development.




TABLE 52. PERSPECTIVE PLAN – WORKS PROPOSED – WATER ACTIONS OF MEPPATHURAI GP - FY (2021-2024)

CWRM Water Action 1: Public and Common Land					
Name of the Work	Type of Ridge	No of Works	Estimated cost (in INR lakhs)	Estimated Person Days	
Contour Continuous Bunds (CCB) for Afforestation area (m)	Upper	2	0.05	20	
Composting (No. of units)	Lower	19	3.23	285	
Afforestation in Public/common lands (ha)	Upper	2	17.2	6,688	
Linear Plantation (Km)	Middle	10	18	7,030	
Avenue plantation (Km)		3	5.4	2,109	
Nursery Development (No. of units)	Lower	6	94	14,689	
Restoration of water bodies: a.PWD and Tanks (No.)		2	10	1,600	
Restoration of water bodies. Ponds (No.)		7	7	1,400	
Artificial Recharge Structure (No. of units)		82	205	32,062	
Drainage Line Treatment (DLT) (m)	Upper	2	0.06	10	
Sub Total Water Action -1		135	360	65,893	
CWRM Water Action 2: Agricultural and allied Sector development					
CWRM water action 2: Works in lower ridge					
Farm Bunding with Boundary Trenches - Individual (ha)	Lower	8	12	4,688	
Micro Irrigation (ha)		21	21	0	
Construction of Farm Ponds - Individual (No. of units)		19	38	14,839	
Land development - Individual (ha)		17	170	66,402	
Dry land Horticulture/Agro-forestry - Individual (ha)		3	25.5	9,963	
Azolla units - Individual (No. of units)		63	9.45	1,449	
NADEP Vermi compost (No. of units)		63	11.34	1,701	
Fodder development - Community & Individual		63	93.24	1,47,672	
Cattle Shelters (No. of units)		63	133.56	20,853	
Goat Sheep Shelters (No. of units)		35	79.45	12,425	
Cattle Trough (No. of units)		63	3.15	378	
Construction of new open wells & Recharge Shafts (No. of units)		82	410	75,932	
Cattle trough (No. of units)		8	40	7,408	
Sub Total Water Action -2		500	1007	3,56,302	

CWRM Water Action 3: Rural Water Management				
CWRM water action 3: Works in Lower Ridge				
Soak Pits (Community) (No. of units)	Lower Ridge	4	0.52	80
Soak Pits (Individual) (No. of units)		38	3.8	608
Roof Rain Water Harvesting (No. of units)		2	8	1,250
Sub Total Water Action -3		44	12	1,938
District Total		679	1,379	4,24,133

Regarding CWRM themes of the total number of projects identified, 75 % works are in agriculture and allied sector while 17 % works are in public and common land, and 8% works are in rural infrastructure respectively. Table 53 provides the estimates of the work budget, and personal days for three years from 2021-2024 in Meppathurai GP.

TABLE 53. SUMMARY OF WORKS IDENTIFIED AND ESTIMATED PERSON-DAYS FOR 2021-2024

CWRM themes	No of works 	Estimated budget (INR in lakhs) 	Estimated person days 
Public and common land development	135	360	65,893
Agriculture and Allied sector development	500	1,007	3,56,302
Rural water management	44	12	1,938
TOTAL	679	1,379	4,24,133

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 (Ta-

ble 54). It is expected that these impacts will potentially reduce the vulnerability and improve the resilience of the system to the projected climatic change events and ensured water security.

TABLE 54. WASCA- WATER ACTIONS, INDICATORS AND IMPACTS

WASCA CWRM ACTION PLAN

DEVELOPMENT OF PUBLIC AND COMMON LAND

INDICATOR

1	No. of water bodies restored in the village
2	Area under afforestation (ha)
3	Reduction in the annual surface runoff (ha.m)
4	The proportion of land treated under WASCA (%)
5	Drainage line treatment (Km)

OUTCOMES/ IMPACT

1	10
2	99
3	67.3
4	28
5	4.8

10TRADITIONAL WATER
BODIES RESTORED**99 ha**

AFFORESTATION

67.3 ha.mSURFACE RUNOFF
HARVESTED**28%**AREA OF THE VILLAGE
TREATED**4.8 KM**DRAINAGE LINES
TREATED

WASCA CWRM ACTION PLAN

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

INDICATOR

1.	No of structures established for on-farm (in-situ) water harvesting in drylands
2.	Reducing area under fallow lands (ha)
3.	Improvement in soil health (No)
4.	No. of artificial recharge structures proposed

OUTCOMES/ IMPACT

1.	19
2.	23.67
3.	63
4.	82

19

FARM PONDS

23.67 ha

FALLOW LAND RESTORED

63

VERMI COMPOST

82ARTIFICIAL RECHARGE
STRUCTURES

WASCA CWRM ACTION PLAN
DEVELOPMENT OF RURAL INFRASTRUCTURE

INDICATOR

1.	No. of villages having complete solid and liquid waste management systems
2.	Roof rainwater harvesting measures
3.	Nutri gardens

OUTCOMES/ IMPACT

1.	Four community level and 38 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.	376 households established Nutri-gardens in homesteads





4 COMMUNITY & **38**
INDIVIDUAL SOAK PITS

2
COMMON ROOF
RAINWATER HARVESTING

376
NUTRI-GARDENS

The following table provides both the perspective plan for three years period and the annual plan for one year period from 2021-2022 on the shelf of projects/number of works and number of person-days (Table 55).

TABLE 55. PROPOSALS FOR THE MGNREGS, MEPPATHURAI GP, TIRUVANNAMALAI DISTRICT

	No of works	No of person days
 Perspective plan	 679	 4,24,133
 Annual plan	272	1,69,803

8.3.7 | PROPOSED ACTIVITY MAP

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

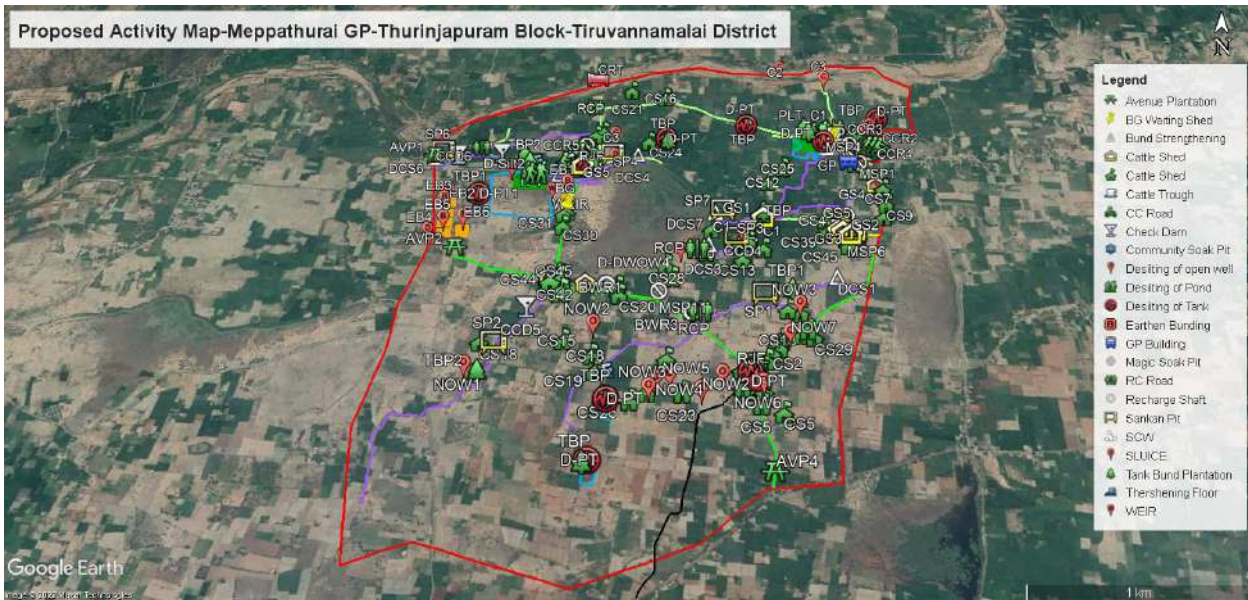


Figure 8.12. Action plan of Meppathurai GP, Thuringapuram Block

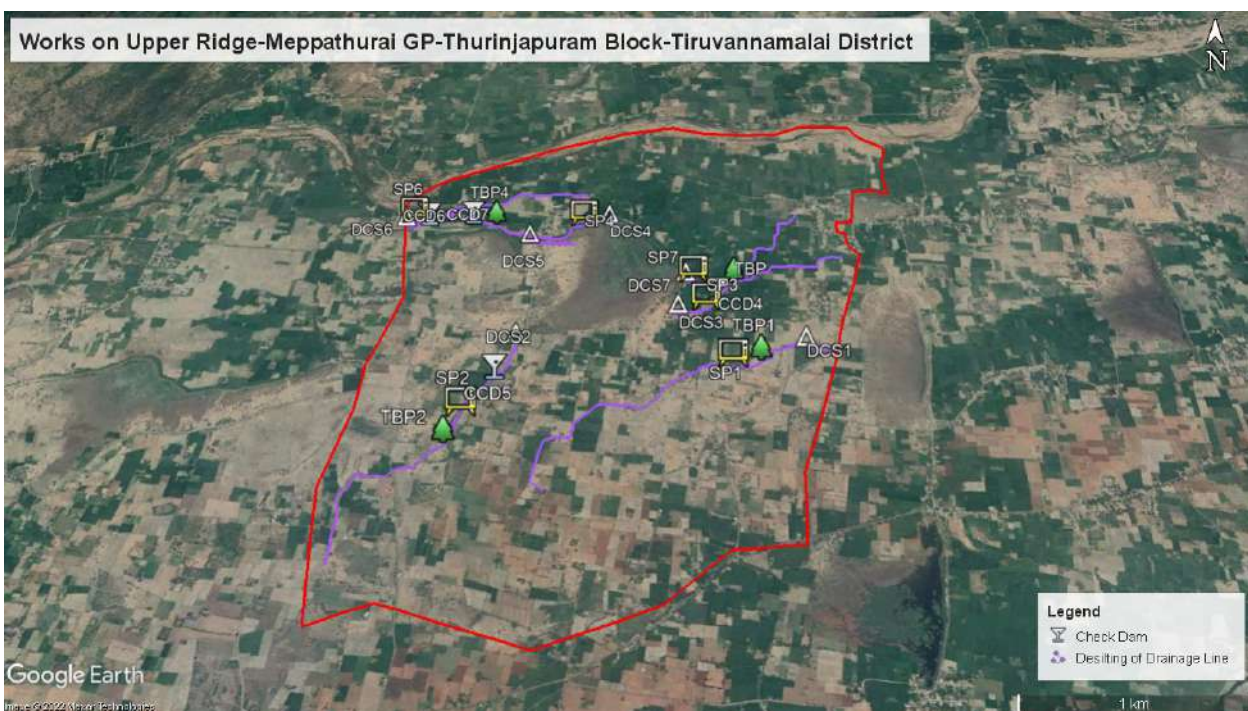


Figure 8.13. Works on Upper Ridge of Meppathurai GP, Thuringapuram Block



Figure 8.14. Works on Middle Ridge of Meppathurai GP

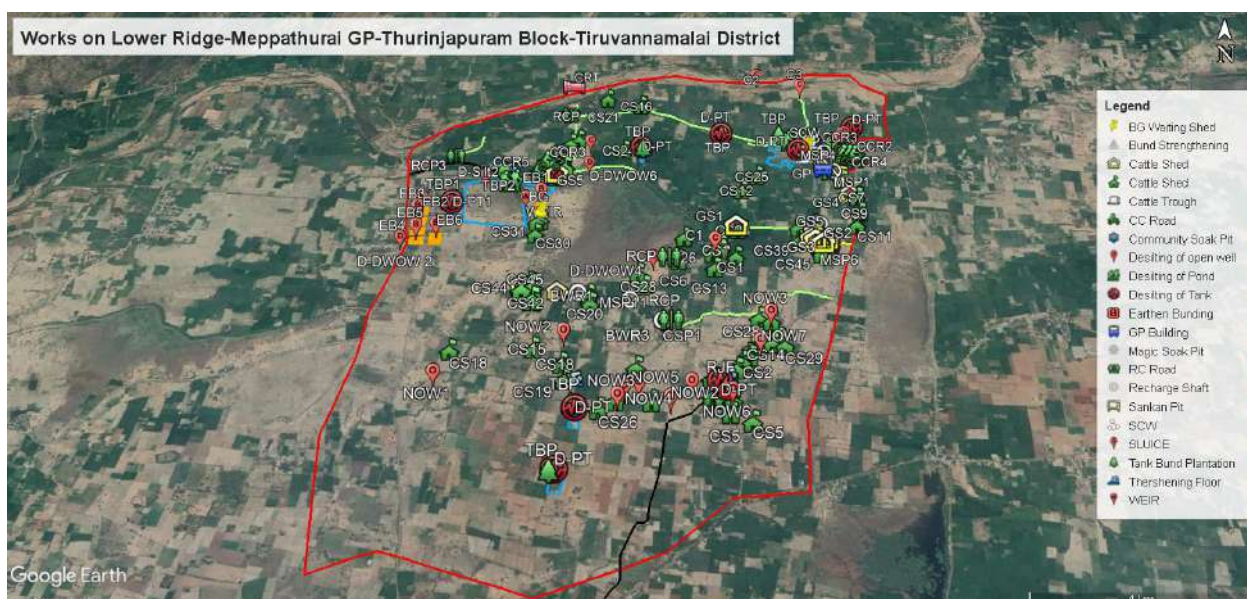
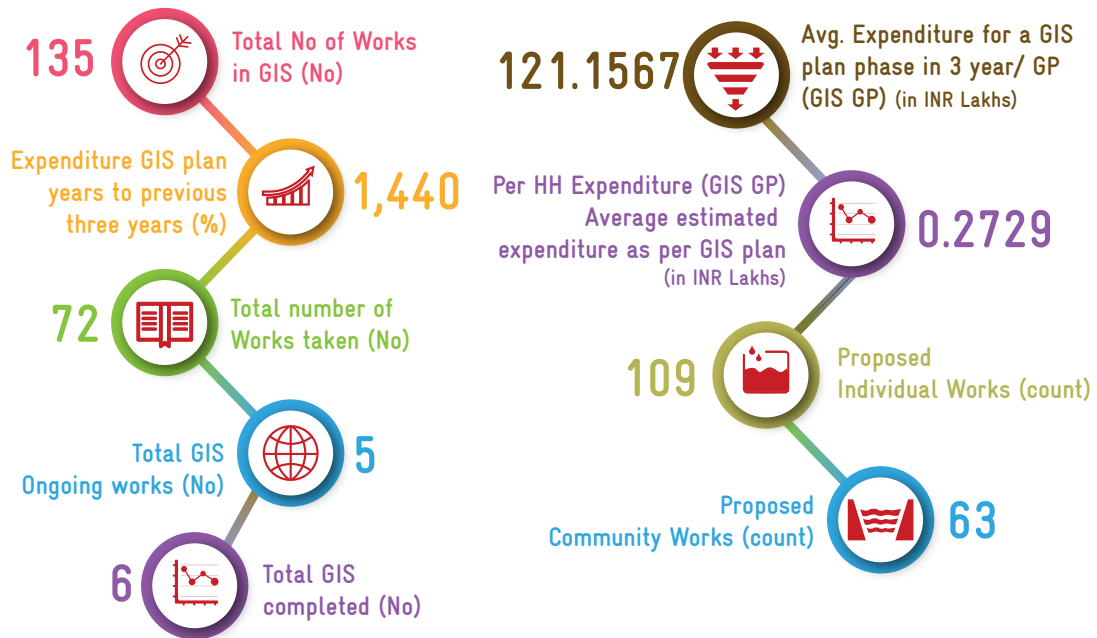


Figure 8.15. Works on Lower Ridge of Meppathurai GP, Thurinjapuram Block

8.3.8 | GIS PLAN IMPLEMENTATION AND KEY PARAMETERS

The GIS plan implementation and performance in Thuringapuram Block is represented in table 56.

TABLE 56. GIS PLAN IMPLEMENTATION, KEY PARAMETERS PERFORMANCE OF MEPPATHURAI GP



நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு

குறள் - 20

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

Thirukkural - 20

CHAPTER 9



CONCLUSION

“WASCA TN took an initiative to address the problem holistically through comprehensive vulnerability assessment at district and block level to identify the vulnerable area and its key problems”

In recent decades, the water demand is increasing at a fast rate due to rapid surge of population, industrial and economic growth. The evident changes in climate change and its extremities are bringing more threats to water security. Frequent monsoon failures lead to acute water scarcity and severe droughts. Thus, dependency on ground water has increased many folds during recent years that has resulted in lowering of ground water levels and even drying up of wells. WASCA TN took an initiative to address the problem holistically through comprehensive vulnerability assessment at District and Block level to identify the vulnerable area and its key problems. The 18 biophysical and socio-economic indicators of four interrelated areas via water, agricultural 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, agricultural 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



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

03



Continuous field monitoring
for constant actions

04



05

Engaging village level institutions
such as SHGs, FPOs



ANNEXURES

ANNEXURE 1

TYPES OF GPS





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

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

ANNEXURE 3.1

KEY CWRM PARAMETER FROM SECONDARY SOURCES

Key CWRM Parameter	Secondary Source
Socio economic	
Geographical Area	Census-2011, MoHA, GOI https://censusindia.gov.in/2011census/dccb/DCHB.html
Male Population	
Female Population	
Total Population	
SC Population	
ST Population	
Vulnerable population	
Households (HH's)	Socio-economic caste census (SECC) 2011 https://secc.gov.in/homePageLgd.htm
Only one room HH's	
Female Headed HH's	
Vulnerable Households	
% of Vulnerable Households	
Registered MGNREGA Job cards	http://mnregaweb4.nic.in/netnrega/app_issue.aspx?page=s&flag=eng&state_name=TAMIL%20NADU&state_code=29&fin_year=2020-2021&source=national&Digest=3ics8+9Z9fEQ8y7j5E3qcQ
Active person working in MGNREGA job Cards	
Water Resources	
Irrigation Facilities	Census-2011, MoHA, GOI https://censusindia.gov.in/2011census/dccb/DCHB.html
Area under Tank Irrigation	
Area under Canal Irrigation	
Area under Open & Tube Well Irrigation	
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/dccb/DCHB.html
Area under Forest land	
Area under Non-Agricultural Uses	
Area under Barren & Un-cultivable Land	
Area under Permanent Pastures and Other Grazing Land	
Area under Land Under Miscellaneous Tree Crops etc.	
Area under Cultivable Waste Land	
Area under Fallows Land other than Current Fallows	

Area under Current Fallow land	https://censusindia.gov.in/2011census/dccb/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	standard table
Soil Water Permeability	
Soil moisture and ET	https://indianwris.gov.in/wris/#/ 
Volumetric Soil Moisture	
Livestock	https://farmer.gov.in/livestockcensus.aspx 
Cattle Population	
Sheep Population	
Goat Population	
Poultry	

ANNEXURE 3.2

KEY CWRM PARAMETERS FROM PRIMARY SOURCES

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

ANNEXURE 3.3

KEY CWRM PARAMETER GENERATED -PRIMARY DATA

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

ANNEXURE 3.4

STANDARD NORMS FOR CALCULATING WATER DEMAND

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

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

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

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

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

ANNEXURE 3.5

STANDARD NORMS FOR GREY WATER GENERATION CALCULATION

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

ANNEXURE 3.6

GP WISE STATUS OF WATER RESOURCE AND ITS SUPPLY AND DEMAND

Gram Panchayat	Canal Irrigation			Tradational Water bodies			
	Length of Main Canal (m)	Length of Minor Canal (m)	Length of Dis-tributaries (m)	Water Courses (Field Channels) (m)	Number of Tanks (PWD & Union) (No.)	Number of Ooranis (No.)	Other Surface Water Bodies (No.)
Andapattu	-	-	-	-	-	4	-
Arpakkam	-	-	-	4,000	3	9	-
Boodamangalam	-	-	-	-	10	14	-
Durginammiandal	-	-	-	-	2	1	-
Erumpoondi	-	-	-	30,000	3	8	-
Kalasthambadi	-	-	-	-	1	5	-
Kamalaputhur	-	-	2,500	-	2	6	-
Karkonnam	-	-	3,000	-	2	4	-
Karunthuvambadi	-	-	-	3,000	2	5	-
Kolakkaravadi	-	-	2,500	-	-	9	-
Kovur	-	-	2,500	-	3	6	-
Kunniyandal	-	-	2,500	-	2	2	-
Madalambadi	-	-	-	-	1	5	-
Mallappa Nayakkam Palayam	-	-	-	-	2	7	-
Mangalam	-	-	-	-	7	12	-
Maruthuvambadi	-	-	-	-	3	6	-
Mutharasampundi	-	-	-	3,000	1	6	-
Nookkambadi	-	-	-	-	-	6	-
Palanandal	-	-	-	-	3	3	-
Porkunam	-	-	-	2,500	3	6	-
Sadayanodai	-	-	-	2,500	1	2	-
Salayanur	-	-	-	-	1	4	-

Gram Panchayat	Canal Irrigation			Tradational Water bodies			
	Length of Main Canal (m)	Length of Minor Canal (m)	Length of Dis-tributaries (m)	Water Courses (Field Channels) (m)	Number of Tanks (PWD & Union) (No.)	Number of Ooranis (No.)	Other Surface Water Bodies (No.)
Sananandal	-	-	-	-	-	5	-
Thurinjapuram	1,800	1,700	600	-	3	9	-
Usambadi	-	-	-	-	2	4	-
Uthirampoondi	-	-	3,000	-	2	5	-
Vada Karingalipadi	-	-	-	2,000	1	3	-
Vada Pulidiyur	-	-	-	-	1	9	-
Velunganandal	-	-	-	-	-	6	-
Kariyandal	-	-	-	-	1	5	-
Karumarapatti	3,100	-	800	-	2	2	-
Kothantavadi	-	-	-	2,500	1	6	-
Sorakolathur	-	-	3,000	-	3	11	-
Devanamattu	-	-	-	-	1	14	-
Inam karianadal	-	-	-	-	4	9	-
Kiliapattu	-	-	-	-	1	3	-
Meppathurai	-	-	3,000	-	3	10	-
Naidumangalam	3,000	-	500	-	1	7	-
Narthampoondi	-	-	-	-	5	15	-
Periyakilambadi	3,500	-	3,000	-	2	4	-
Randam	-	-	-	2,500	1	6	-
Seelappandal	2,000	300	1,800	-	2	6	-
Vadakarimbalur	-	-	-	-	4	5	-
Vallivagai	-	-	-	-	1	10	-
Vedanthavadi	-	-	-	-	5	17	-
Mallavadi	-	-	-	-	1	13	-
Pudumallavadi	-	-	1,500	-	2	12	-

Gram Panchayat	Irrigation Facilities (ha)			Catchment Area wise Available Runoff (ha.m)			Watershed and Drainage Networks		
	Tank Irrigation	Canal Irrigation	Open & Tube Well Irrigation	Good Catchment Area	Average Catchment Area	Bad Catchment Area	Length of Natural Drainage Lines (m)	Number of Natural Drainage Lines (No.)	Number of MiCriticalo Watersheds (No.)
Andapattu	-	-	109.52	8.20	13.60	38.90	4,241.0	5	3
Arpakkam	92.93	-	10.90	39.40	13.40	104.20	9,133.0	7	5
Boodamangalam	91.06	-	553.63	126.20	14.70	218.80	4,749.9	6	7
Durginammiandal	31.34	-	48.96	10.50	-	26.10	1,855.1	3	3
Erumpoondi	-	-	434.39	55.30	-	118.00	4,032.5	9	4
Kalasthambadi	-	-	135.72	35.30	1.60	70.10	3,600.6	7	5
Kamalaputhur	55.00	-	151.92	14.40	1.70	119.70	4,069.7	7	4
Karkonnam	45.00	-	82.44	12.10	0.20	75.20	4,085.5	5	4
Karunthuvambadi	-	-	144.83	24.30	0.40	74.30	4,858.4	7	5
Kolakkaravadi	122.62	-	204.77	38.00	1.40	60.60	4,557.5	7	4
Kovur	30.00	-	96.81	5.40	0.30	77.80	3,409.3	7	5
Kunniyandal	-	-	91.30	9.10	-	23.60	1,830.4	4	2
Madalambadi	-	-	343.77	50.60	0.80	130.50	396.2	7	6
Mallappa Nayakkam Palayam	-	-	107.47	39.40	0.60	49.20	3,237.2	3	4
Mangalam	225.96	-	484.32	145.80	3.70	339.20	4,905.8	7	10
Maruthuvambadi	57.02	-	92.66	39.70	0.40	54.10	2,142.7	4	2
Mutharasampundi	-	-	44.18	20.80	0.60	17.10	-	-	2
Nookkambadi	17.85	-	111.26	33.60	3.40	98.60	7,490.0	7	5
Palanandal	25.68	-	169.07	21.40	1.30	97.00	9,908.2	7	5
Porkunam	-	-	115.50	53.80	0.50	98.30	4,299.6	9	8
Sadayanodai	-	-	107.14	11.10	-	38.50	3,203.6	6	3
Salayanur	-	-	-	68.80	1.30	100.50	5,368.8	6	5
Sananandal	-	-	-	35.10	3.00	51.60	4,358.7	7	3
Thurinjapuram	-	-	-	34.40	-	130.40	7,925.2	7	8

Gram Panchayat	Irrigation Facilities (ha)			Catchment Area wise Available Runoff (ha.m)			Watershed and Drainage Networks		
	Tank Irrigation	Canal Irrigation	Open & Tube Well Irrigation	Good Catchment Area	Average Catchment Area	Bad Catchment Area	Length of Natural Drainage Lines (m)	Number of Natural Drainage Lines (No.)	Number of Micro Watersheds (No.)
Usambadi	-	-	86.00	16.30	-	20.90	814.8	2	3
Uthirampoondi	-	-	256.56	37.70	0.10	70.10	6,301.3	7	4
Vada Karingalipadi	-	-	30.22	2.40	-	14.60	432.1	1	1
Vada Pulidiyur	55.00	-	149.53	53.20	6.20	111.20	4,774.5	5	7
Velunganandal	44.12	-	137.15	31.80	2.60	98.60	4,130.9	7	8
Kariyandal	-	-	301.25	110.90	-	176.60	2,409.8	5	5
Karumarapatti	-	-	346.53	47.90	0.60	97.30	3,195.7	5	5
Kothantavadi	-	-	346.53	47.90	0.60	97.30	2,152.3	4	4
Sorakolathur	-	-	301.25	110.90	-	176.60	1,906.9	6	6
Devanampattu	-	-	162.48	37.70	5.30	73.30	5,801.2	14	6
Inam karianadal	-	-	270.37	80.70	2.60	188.40	19,663.7	24	6
Kiliapattu	33.53	-	262.39	30.10	0.90	119.80	12,228.2	15	5
Meppathurai	-	-	205.48	155.80	-	71.10	4,838.0	6	4
Naidumangalam	10.00	-	126.48	34.40	2.10	59.80	2,649.6	4	5
Narthampoondi	136.07	-	162.85	96.00	0.50	132.40	6,535.9	7	6
Periyakilambadi	29.00	-	69.20	56.40	0.40	57.40	1,940.7	4	5
Randam	4.06	-	115.14	37.10	1.40	60.70	4,392.1	11	6
Seelappandal	-	-	295.54	35.00	1.40	90.30	7,500.0	8	7
Vadakarimbalur	-	-	200.51	50.90	5.10	88.70	5,354.7	13	4
Vallivagai	-	-	309.12	55.70	0.70	137.80	8,401.6	16	9
Vedanthavadi	127.50	-	485.63	24.00	5.90	280.80	17,502.4	21	9
Mallavadi	-	-	130.32	31.50	0.20	57.00	64.2	1	4
Pudumallavadi	-	-	99.12	30.80	-	44.40	4,878.7	7	5

Gram Panchayat	Water Demand									
	For Humans (ha.m)	For Livestock (ha.m)	For Agriculture (ha.m)	% GW Utilization for Drinking (%)	% GW Utilization for Livestock (%)	% GW Utilization for Agriculture (%)	% SW Utilization for Drinking (%)	% SW Utilization for Livestock (%)	% SW Utilization for Agriculture (%)	
Andapattu	5.85	2.47	86	3	94	60	97	6	40	
Arpakkam	9.48	7.61	153	14	92	55	86	8	45	
Boodamangalam	20.58	3.36	430	15	80	98	85	20	2	
Durginammiandal	5.03	3.46	56	19	82	99	81	18	1	
Erumpoondi	9.42	5.93	144	10	86	98	90	14	2	
Kalasthambadi	6.41	1.92	52	4	85	89	96	15	11	
Kamalaputhur	4.39	1.20	433	4	91	92	96	9	8	
Karkonnam	4.69	4.60	219	19	97	91	81	3	9	
Karunthuvambadi	4.13	2.96	304	33	84	100	67	16	-	
Kolakkaravadi	7.55	3.64	190	4	78	71	96	22	29	
Kovur	3.75	2.97	355	22	95	95	78	5	5	
Kunniyandal	3.30	2.87	71	3	97	100	97	3	-	
Madalambadi	9.83	6.32	85	10	98	36	90	2	64	
Mallappa Nayakkam Palayam	4.07	1.83	237	34	99	93	66	1	7	
Mangalam	25.75	9.90	252	15	95	81	85	5	19	
Maruthuvambadi	5.72	0.72	220	7	92	62	93	8	38	
Mutharasampundi	1.70	0.49	142	8	95	99	92	5	1	
Nookkambadi	9.04	5.14	197	18	96	95	82	4	5	
Palanandal	7.67	4.56	188	10	97	96	90	3	4	
Porkunam	7.66	2.63	254	20	97	84	80	3	16	
Sadayanodai	4.17	1.96	45	3	97	50	97	3	50	
Salayanur	6.82	2.49	551	40	93	95	60	7	5	
Sananandal	4.39	2.79	62	17	99	37	83	1	63	
Thurinjapuram	7.88	2.66	172	18	76	48	82	24	52	
Usambadi	4.52	1.74	75	4	85	74	96	15	26	

Gram Panchayat	Water Demand									
	For Humans (ha.m)	For Live- stock (ha.m)	For Agricul- ture (ha.m)	% GW Uti- lization for Drinking (%)	% GW Uti- lization for Livestock (%)	% GW Util- ization for Agriculture, (%)	% SW Uti- lization for Drinking (%)	% SW Uti- lization for Livestock (%)	% SW Uti- lization for Agriculture (%)	
Uthirampoondi	3.00	0.79	286	4	89	100	96	11	-	
Vada Karingalipadi	1.96	1.33	26	5	99	100	95	1	-	
Vada Pulidiyur	6.59	3.25	256	15	97	94	85	3	6	
Velunganandal	5.62	4.16	331	28	98	92	72	2	8	
Kariyandal	4.29	4.86	632	-	97	100	100	3	-	
Karumarapatti	5.27	0.75	175	8	92	57	92	8	43	
Kothantavadi	3.64	0.75	175	8	92	57	92	8	43	
Sorakolathur	9.27	4.86	632	21	97	100	79	3	-	
Devanampattu	8.64	3.63	526	16	85	97	84	15	3	
Inam karianadal	16.24	6.29	339	11	80	99	89	20	1	
Kiliapattu	10.03	5.00	230	10	95	86	90	5	14	
Meppathurai	4.27	3.52	530	3	95	92	97	5	8	
Naidumangalam	5.89	1.61	197	10	95	100	90	5	-	
Narthampoondi	10.75	9.69	257	4	96	98	96	4	2	
Periyakilambadi	5.34	3.48	467	17	99	96	83	1	4	
Randam	5.05	6.86	109	12	96	93	88	4	7	
Seelappandal	7.28	3.48	115	8	76	67	92	24	33	
Vadakarimbalur	5.63	1.74	125	5	84	27	95	16	73	
Vallivagai	9.10	6.30	261	6	98	92	94	2	8	
Vedanthavadi	13.98	9.82	307	4	94	98	96	6	2	
Mallavadi	7.74	2.58	119	8	87	100	92	13	-	
Pudumallavadi	4.10	1.26	74	5	87	69	95	13	31	

ANNEXURE 3.7

GP WISE STATUS OF AGRICULTURE RESOURCE

Gram Panchayat	Area under Land Resources (ha)										
	Area under Forest land	Area under Non-Agricultural Uses	Area under Barren & Uncultivable Land	Area under Permanent Pastures and Other Grazing Land	Area under Land Under Miscellaneous Tree Crops etc.	Area under Culturable Waste Land	Area under Fallows other than Current Fallows	Area under Current Fallow land	Area under Unirrigated Land	Area Irrigated by Source	
Andapattu	-	21.92	-	48.42	-	-	35.96	12.47	49.81	109.52	
Arpakkam	105.01	-	-	-	47.74	4.44	194.82	254.32	103.83	-	
Boodamangalam	-	336.57	-	-	-	52.42	18.52	72.81	433.81	644.69	
Durginammiandal	-	28.06	-	-	-	-	-	18.11	41.17	80.30	
Erumpoondi	-	147.43	-	-	-	-	32.24	19.59	144.60	434.39	
Kalasthambadi	-	94.06	-	-	-	5.86	-	137.41	101.82	135.72	
Kamalapurthur	-	38.30	-	-	-	5.91	40.00	251.31	142.00	206.92	
Karkonnam	-	32.39	-	-	-	0.85	59.96	106.45	108.31	127.44	
Karunthuvambadi	5.90	57.64	1.34	0.90	0.50	-	8.09	171.66	72.91	144.83	
Kolakkavadi	-	101.12	0.34	-	-	5.00	-	8.58	110.94	204.77	
Kovur	-	14.32	-	-	-	1.05	76.61	157.81	54.60	126.81	
Kunniyandal	-	24.36	-	-	-	-	-	5.29	29.52	91.30	
Madalambadi	-	134.90	-	1.09	1.80	-	-	267.50	86.57	343.77	
Mallappa Nayakkam Palayam	-	105.01	-	-	-	2.27	10.02	17.43	99.10	136.47	
Mangalam	-	257.70	130.99	-	-	13.27	0.77	343.32	759.40	710.28	
Maruthuvambadi	-	105.96	-	-	-	1.58	-	79.78	60.11	149.68	
Mutharasampundi	-	55.47	-	-	-	2.00	-	11.41	36.00	44.18	
Nookkambadi	-	87.20	2.38	-	1.06	11.00	4.03	104.05	290.24	129.11	
Palanandal	-	45.42	11.66	-	-	4.66	1.94	114.48	207.50	194.75	
Porkunam	-	143.58	-	-	-	1.61	60.85	232.16	117.21	115.50	
Sadayanodai	-	29.53	-	-	-	-	2.43	72.50	23.64	107.14	
Salayanur	-	183.36	-	-	-	4.70	60.00	165.42	85.67	226.16	

Gram Panchayat	Area under Land Resources (ha)									
	Area under Forest land	Area under Non-Agricultural Uses	Area under Barren & Uncultivable Land	Area under Permanent Pastures and Other Grazing Land	Area under Land Under Miscellaneous Tree Crops etc.	Area under Culturable Waste Land	Area under Fallows other than Current Fallows	Area under Current Fallow land	Area under Unirrigated Land	Area Irrigated by Source
Sananandal	-	78.56	15.07	-	-	10.50	12.54	7.77	108.26	147.13
Thurinjapuram	-	91.72	-	-	-	-	-	392.44	81.25	223.78
Usambadi	-	43.39	-	-	-	-	-	4.80	21.01	86.00
Uthirampoondi	-	1.47	99.00	-	0.50	-	24.97	43.53	49.82	256.56
Vada Karingalipadi	-	6.46	-	-	-	-	-	19.65	28.04	30.22
Vada Pulidiyur	-	141.96	-	17.24	4.77	-	-	280.71	109.48	204.53
Velunganandal	-	77.61	7.17	-	7.15	2.26	-	222.19	123.85	181.27
Kariyandal	-	295.75	-	-	-	-	-	423.78	219.32	301.25
Karumarapatti	-	127.83	-	-	-	2.08	-	74.00	99.97	346.53
Kothantavadi	-	127.83	-	-	-	2.08	-	74.00	99.97	346.53
Sorakolathur	-	295.75	-	-	-	-	-	423.78	219.32	301.25
Devanampattu	-	148.62	-	-	-	2.39	17.45	116.02	294.21	309.12
Inam karianadal	-	197.82	17.30	-	-	9.40	102.22	347.94	286.72	270.37
Kiliapattu	-	80.14	-	-	-	3.22	-	251.16	93.51	295.92
Meppathurai	-	415.53	-	-	-	-	10.14	84.52	79.92	205.48
Naidumangalam	-	91.67	-	-	-	7.62	-	71.78	111.56	136.48
Narthampoondi	-	256.10	-	0.63	-	1.09	40.54	242.15	126.61	298.92
Periyakilambadi	-	150.36	-	-	-	1.50	-	137.13	71.71	98.20
Randam	-	48.77	50.20	-	1.07	3.93	6.01	23.20	176.02	119.20
Seelappandal	-	92.54	0.71	-	0.53	4.36	-	68.81	118.41	295.54
Vadakarimbalur	1.97	98.57	35.17	0.80	-	17.25	-	163.53	110.03	200.51
Vallivagai	-	148.62	-	-	-	2.39	17.45	116.02	294.21	309.12
Vedanthavadi	-	58.76	5.20	-	-	20.82	168.47	305.57	414.24	613.13
Mallavadi	-	83.90	-	-	-	0.56	-	123.60	51.01	130.32
Pudumallavadi	-	82.11	-	-	-	-	-	74.07	64.13	99.12

Gram Panchayat	Land under Catchment Area (ha)				Crop Details				
	Good Catchment	Average Catchment	Bad Catchment	Bad Catchment	Irrigated Area (ha)	Rainfed area (ha)	Paddy Cultivation (ha)	Crop Water Requirement - Irrigated condition (ha-m)	Crop Water Requirement - Rainfed condition (ha-m)
Andapattu	21.92	48.42	207.76	35.77	98.34	16.47	51.23	34.71	
Arpakkam	105.01	52.18	552.97	79.67	194.25	21.40	84.57	68.29	
Boodamangalam	336.57	52.42	1,169.83	657.35	25.00	75.03	419.13	10.40	
Durginammiandal	28.06	-	139.58	50.60	1.98	23.20	54.84	0.69	
Erumpoondi	147.43	-	630.82	275.51	4.49	8.83	142.02	2.24	
Kalasthambadi	94.06	5.86	374.95	83.18	15.66	11.00	46.41	5.48	
Kamalaputhur	38.30	5.91	640.23	245.35	93.57	155.27	400.22	32.75	
Karkonnam	32.39	0.85	402.16	116.91	53.26	42.36	200.63	18.64	
Karunthuvambadi	64.88	1.40	397.49	219.64	-	85.80	304.37	-	
Kolakkaravadi	101.46	5.00	324.29	87.56	159.75	78.46	134.03	55.91	
Kovur	14.32	1.05	415.83	186.09	52.76	55.53	336.28	18.47	
Kunniyandal	24.36	-	126.11	57.89	0.23	10.68	70.81	0.08	
Madalambadi	134.90	2.89	697.84	28.11	154.92	9.48	30.64	54.22	
Mallappa Nayakkam Palayam	105.01	2.27	263.02	131.91	49.17	64.32	220.02	17.21	
Mangalam	388.69	13.27	1,813.77	134.70	129.00	59.00	203.56	48.00	
Maruthuvambadi	105.96	1.58	289.57	142.98	18.41	140.64	213.54	6.44	
Mutharasampundi	55.47	2.00	91.59	95.07	4.78	93.36	140.72	1.74	
Nookkambadi	89.58	12.06	527.43	334.29	23.02	24.38	188.41	8.99	
Palanandal	57.08	4.66	518.67	316.60	22.00	12.60	179.59	8.45	
Porkunam	143.58	1.61	525.72	136.84	119.82	98.51	212.27	41.94	
Sadayanodai	29.53	-	205.71	21.38	63.12	8.08	22.59	22.24	
Salayanur	183.36	4.70	537.25	374.19	71.70	206.34	525.88	25.19	
Sananandal	93.63	10.50	275.70	20.40	111.00	10.00	22.93	39.00	
Thurinjapuram	91.72	-	697.47	60.05	253.00	40.05	83.36	88.85	
Usambadi	43.39	-	111.81	37.34	55.00	29.50	56.05	19.25	

Gram Panchayat	Land under Catchment Area (ha)				Crop Details				
	Good Catchment	Average Catchment	Bad Catchment		Irrigated Area (ha)	Rainfed area (ha)	Paddy Cultivation (ha)	Crop Water Requirement - Irrigated condition (ha-m)	Crop Water Requirement - Rainfed condition (ha-m)
Uthirampoondi	100.47	0.50	374.88		245.43	0.51	160.23	286.25	0.18
Vada Karingalipadi	6.46	-	77.91		34.80	-	10.00	25.91	-
Vada Pulidiyur	141.96	22.01	594.72		163.07	44.63	154.14	240.48	15.62
Velunganandal	84.78	9.41	527.31		295.97	78.25	129.40	304.10	27.39
Kariyandal	295.75	-	944.35		709.85	5.00	312.00	630.38	1.75
Karumarapatti	127.83	2.08	520.50		65.76	216.54	28.18	99.49	75.79
Kothantavadi	127.83	2.08	520.50		65.76	216.54	28.18	99.49	75.79
Sorakolathur	295.75	-	944.35		709.85	5.00	312.00	630.38	1.75
Devanamattu	148.62	2.39	736.80		367.00	37.74	325.23	512.82	13.35
Inam karianadal	215.12	9.40	1,007.25		273.50	6.96	89.81	336.33	2.44
Kiliapattu	80.14	3.22	640.59		144.15	90.68	57.65	198.35	31.96
Meppathurai	415.53	-	380.06		324.98	123.10	314.28	486.99	43.24
Naidumangalam	91.67	7.62	319.82		130.79	-	120.61	197.31	-
Narthampoondi	256.10	1.72	708.22		207.95	17.20	132.00	250.74	6.32
Periyakilambadi	150.36	1.50	307.04		310.62	53.74	290.85	447.84	19.02
Randam	98.97	5.00	324.43		156.22	20.19	26.25	100.78	7.82
Seelappandal	93.25	4.89	482.76		56.82	108.21	43.24	77.15	37.87
Vadakarimbalur	135.71	18.05	474.07		38.90	263.04	9.00	33.21	92.06
Vallivagai	148.62	2.39	736.80		294.51	60.72	85.55	239.53	21.34
Vedanthavadi	63.96	20.82	1,501.41		447.02	21.15	38.05	299.95	7.40
Mallavadi	83.90	0.56	304.93		202.97	-	21.50	119.45	-
Pudumallavadi	82.11	-	237.32		36.80	65.00	23.30	50.86	22.75

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)			Status of Organic Carbon (%)				Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	Very Low	Low	Medium	High	Sufficient	Deficient
Andapattu	58.00	36.00	1.00	42.00	40.00	-	-	60.00	40.00
Arpakkam	-	-	-	-	-	-	-	20.00	80.00
Boodamangalam	-	-	-	-	-	-	-	75.00	25.00
Durginammiandal	-	-	-	-	-	-	-	35.00	65.00
Erumpoondi	26.00	38.00	3.00	39.00	31.00	11.00	20.00	54.00	46.00
Kalasthambadi	29.00	30.00	6.00	25.00	32.00	-	-	58.00	42.00
Kamalapurthur	27.00	39.00	6.00	14.00	50.00	1.00	-	49.00	51.00
Karkonnam	21.00	43.00	10.00	56.00	42.00	1.00	-	57.00	43.00
Karunthuvambadi	51.00	38.00	6.00	49.00	33.00	11.00	-	54.00	46.00
Kolakkavadi	53.00	34.00	-	44.00	36.00	-	-	43.00	57.00
Kovur	-	-	-	-	-	-	-	43.00	57.00
Kunniyandal	25.00	44.00	8.00	75.00	44.00	-	-	65.00	35.00
Madalambadi	26.00	51.00	3.00	66.00	45.00	-	-	58.00	42.00
Mallappa Nayakkam Palayam	-	52.00	6.00	88.00	38.00	-	-	54.00	46.00
Mangalam	25.00	47.00	3.00	75.00	36.00	-	-	49.00	51.00
Maruthuvambadi	11.00	47.00	2.00	78.00	44.00	-	-	57.00	43.00
Mutharasampundi	27.00	87.00	4.00	73.00	13.00	-	-	52.00	48.00
Nookkambadi	55.00	40.00	3.00	45.00	43.00	-	-	52.00	48.00
Palanandal	19.00	43.00	4.00	76.00	40.00	1.00	-	58.00	42.00
Porkunam	50.00	28.00	1.00	46.00	33.00	-	-	47.00	53.00
Sadayanodai	-	50.00	-	-	50.00	-	-	33.00	67.00
Salayanur	35.00	57.00	1.00	65.00	35.00	-	41.00	52.00	48.00
Sananandal	23.00	30.00	19.00	77.00	31.00	5.00	-	62.00	38.00
Thurinjapuram	36.00	51.00	-	62.00	34.00	2.00	-	55.00	45.00
Usambadi	40.00	50.00	-	60.00	43.00	-	-	70.00	30.00
Uthirampoondi	43.00	27.00	3.00	42.00	27.00	4.00	50.00	54.00	46.00

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)			Status of Organic Carbon (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	Very Low	Low	Medium	High	Sufficient	Deficient	
Vada Karingalipadi	-	52.00	7.00	100.00	42.00	-	-	61.00	39.00	
Vada Pulidiyur	-	-	-	-	-	-	-	72.00	28.00	
Velunganandal	-	-	-	-	-	-	-	58.00	42.00	
Kariyandal	32.00	51.00	3.00	66.00	38.00	-	-	58.00	42.00	
Karumarapatti	29.00	41.00	10.00	59.00	44.00	-	-	55.00	45.00	
Kothantavadi	29.00	41.00	10.00	59.00	44.00	-	-	55.00	45.00	
Sorakolathur	32.00	51.00	3.00	66.00	38.00	-	-	58.00	42.00	
Devanampattu	81.00	26.00	17.00	13.00	48.00	3.00	-	55.00	45.00	
Inam karianadal	28.00	41.00	-	31.00	38.00	-	8.00	44.00	56.00	
Kiliapattu	-	47.00	10.00	100.00	49.00	-	-	69.00	31.00	
Meppathurai	55.00	34.00	11.00	45.00	51.00	2.00	-	58.00	42.00	
Naidumangalam	59.00	27.00	-	38.00	27.00	9.00	100.00	58.00	42.00	
Narthampoondi	39.00	43.00	5.00	55.00	43.00	1.00	-	49.00	51.00	
Periyakilambadi	46.00	46.00	-	54.00	37.00	1.00	-	59.00	41.00	
Randam	-	40.00	6.00	-	43.00	3.00	-	56.00	44.00	
Seelappandal	25.00	50.00	-	55.00	46.00	-	-	61.00	39.00	
Vadakarimbalur	22.00	59.00	1.00	68.00	35.00	1.00	-	58.00	42.00	
Vallivagai	18.00	47.00	11.00	71.00	51.00	-	-	60.00	40.00	
Vedanthavadi	20.00	38.00	3.00	50.00	32.00	3.00	-	47.00	53.00	
Mallavadi	-	49.00	10.00	88.00	44.00	2.00	-	45.00	55.00	
Pudumallavadi	-	49.00	10.00	88.00	44.00	2.00	-	45.00	55.00	

Gram Panchayat	Status of Physical condition of the soil (%)									
	Moderately Acidic	Strongly Acidic	Highly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline		
Andapattu	-	-	-	-	-	4.26	95.74	-	-	-
Arpakkam	-	-	-	-	-	-	-	-	-	-
Boodamangalam	-	-	-	-	-	-	-	-	-	-
Durginammiandal	-	-	-	-	-	-	-	-	-	-
Erumpoondi	-	-	-	2.94	2.94	1.96	92.16	-	-	-
Kalasthambadi	-	-	-	-	-	12.24	87.76	-	-	-
Kamalaputhur	-	-	-	6.19	7.22	2.06	84.54	-	-	-
Karkonnam	-	-	-	-	-	2.86	97.14	-	-	-
Karunthuvambadi	-	-	-	-	-	8.16	91.84	-	-	-
Kolakkaravadi	-	-	-	-	1.27	1.27	97.47	-	-	-
Kovur	-	-	-	-	-	-	-	-	-	-
Kunniyandal	-	-	25.00	40.00	-	-	35.00	-	-	-
Madalambadi	0.60	-	-	1.80	2.99	2.40	92.22	-	-	-
Mallappa Nayakkam Palayam	-	-	-	-	4.55	2.27	93.18	-	-	-
Mangalam	-	-	-	-	-	19.23	80.77	-	-	-
Maruthuvambadi	-	-	-	-	3.08	6.15	90.77	-	-	-
Mutharasampundi	4.55	-	-	-	-	-	95.45	-	-	-
Nookkambadi	-	-	-	-	1.75	4.39	93.86	-	-	-
Palanandal	-	-	-	-	-	11.01	88.99	-	-	-
Porkunam	-	-	-	-	5.13	10.26	84.62	-	-	-
Sadayanodai	-	-	-	-	-	-	100.00	-	-	-
Salayanur	-	-	-	-	0.64	-	99.36	-	-	-
Sananandal	-	-	-	-	2.50	5.00	92.50	-	-	-
Thurinjapuram	-	-	-	-	-	20.90	79.10	-	-	-
Usambadi	-	-	-	-	-	17.86	82.14	-	-	-

Gram Panchayat	Status of Physical condition of the soil (%)									
	Moderately Acidic	Strongly Acidic	Highly Acidic	Moderately Acidic	Slightly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline		
Uthirampoondi	-	-	-	-	14.89	13.83	71.28	-		
Vada Karingalipadi	-	-	-	-	-	5.26	94.74	-		
Vada Pulidiyur	-	-	-	-	-	-	100.00	-		
Velunganandal	-	-	-	-	-	-	100.00	-		
Kariyandal	-	-	-	-	-	-	100.00	-		
Karumarapatti	-	-	-	-	3.45	5.17	91.38	-		
Kothantavadi	-	-	-	-	3.45	5.17	91.38	-		
Sorakolathur	-	-	-	-	-	-	100.00	-		
Devanamattu	-	-	-	1.92	3.85	1.92	92.31	-		
Inam karianadal	-	-	-	-	-	-	100.00	-		
Kiliapattu	-	-	-	2.38	-	-	97.62	-		
Meppathurai	-	-	-	6.17	46.91	-	46.91	-		
Naidumangalam	-	-	-	-	19.23	19.23	61.54	-		
Narthampoondi	-	-	-	2.94	-	1.96	95.10	-		
Periyakilambadi	-	-	-	-	9.80	1.96	88.24	-		
Randam	-	-	-	-	-	16.67	83.33	-		
Seelappandal	-	-	-	-	5.41	4.05	90.54	-		
Vadakarimbalur	-	-	-	-	-	1.92	98.08	-		
Vallivagai	-	-	-	-	-	2.46	97.54	-		
Vedanthavadi	-	-	-	-	-	2.76	97.24	-		
Mallavadi	-	-	-	-	-	1.54	98.46	-		
Pudumallavadi	-	-	-	-	-	1.54	98.46	-		

Gram Panchayat	Soil Texture (%)				Soil moisture and ET				Means of Water Extraction (%)	
	Clay soil	Fine Soil	Coarse loamy	Soil Water Permeability (Low, Moderate, high)	Volumetric Soil Moisture (%)	Estimated Soil Moisture (ha.m)	ET Losses (ha.m)	Gravity	Lifting	
Andapattu	-	98.00	-	Moderate	23.00	58.92	108.45	-	100.00	
Arpakkam	30.00	42.00	-	Moderate	23.00	163.34	206.29	40.76	59.24	
Boodamangalam	-	74.00	-	Moderate	23.00	281.12	867.11	4.32	95.68	
Durginammiandal	-	88.24	-	Moderate	23.00	32.10	97.66	9.27	90.73	
Erumpoondi	14.21	73.44	-	Moderate	23.00	145.09	465.51	1.70	98.30	
Kalasthambadi	9.19	75.43	-	Moderate	23.00	87.59	190.98	1.81	98.19	
Kamalaputhur	1.40	76.00	-	Moderate	23.00	148.61	280.53	3.19	96.81	
Karkonnam	-	78.00	-	Moderate	23.00	92.69	189.54	5.72	94.28	
Karunthuvambadi	-	91.00	-	Moderate	23.00	93.41	180.93	3.34	96.66	
Kolakkaravadi	-	87.00	-	Moderate	23.00	75.81	253.83	-	100.00	
Kovur	-	77.00	-	Moderate	23.00	95.88	145.85	7.19	92.81	
Kunniyandal	-	93.00	-	Moderate	23.00	29.01	97.14	5.19	94.81	
Madalambadi	-	66.00	-	Moderate	23.00	161.17	226.15	0.72	99.28	
Mallappa Nayakkam Palayam	-	83.00	-	Moderate	23.00	61.02	189.40	4.45	95.55	
Mangalam	43.00	40.00	2.00	Low	23.00	450.35	1,181.62	3.49	96.51	
Maruthuvambadi	-	75.00	-	Moderate	23.00	66.96	168.67	7.49	92.51	
Mutharasampundi	11.00	71.00	-	Moderate	23.00	21.53	64.46	5.36	94.64	
Nookkambadi	-	91.00	-	Moderate	23.00	124.63	338.01	-	100.00	
Palanandal	-	59.00	-	Moderate	23.00	123.05	323.41	4.25	95.75	
Porkunam	10.00	78.00	-	Moderate	23.00	121.29	187.10	6.10	93.90	
Sadayanodai	7.00	91.00	-	Moderate	23.00	47.31	105.15	2.28	97.72	
Salayanur	-	89.00	-	Moderate	23.00	124.65	250.71	100.00	-	
Sananandal	13.00	71.00	2.00	Moderate	23.00	69.29	205.33	-	100.00	

Gram Panchayat	Soil Texture (%)				Soil moisture and ET			Means of Water Extraction (%)	
	Clay soil	Fine Soil	Coarse loamy	Soil Water Permeability (Low, Moderate, high)	Volumetric Soil Moisture (%)	Estimated Soil Moisture (ha.m)	ET Losses (ha.m)	Gravity	Lifting
Thurinjapuram	54.00	37.00	-	Low	23.00	160.42	245.24	100.00	-
Usambadi	33.00	51.00	-	Moderate	23.00	25.72	55.86	5.49	94.51
Uthirampoondi	-	87.00	-	Moderate	23.00	109.11	246.73	1.91	98.09
Vada Karingalipadi	-	99.00	-	Moderate	23.00	17.92	46.84	7.64	92.36
Vada Pulidiyur	-	88.00	-	Moderate	23.00	141.85	270.16	1.64	98.36
Velunganandal	2.00	57.00	-	Moderate	23.00	125.09	251.07	-	100.00
Kariyandal	-	86.67	-	Moderate	23.00	217.20	418.54	0.82	99.18
Karumarapatti	47.59	38.23	-	Low	23.00	120.19	358.99	1.42	98.58
Kothantavadi	39.92	50.20	-	Moderate	23.00	120.19	358.99	0.72	99.28
Sorakolathur	20.25	48.00	-	Moderate	23.00	217.20	418.54	2.43	97.57
Devanampattu	-	84.94	-	Moderate	23.00	170.01	485.08	1.52	98.48
Inam karianadal	7.22	82.99	0.41	Moderate	23.00	237.81	447.90	3.57	96.43
Kiliapattu	2.82	93.42	0.67	Moderate	23.00	148.08	313.10	0.94	99.06
Meppathurai	-	91.11	-	Moderate	23.00	87.41	229.46	3.52	96.48
Naidumangalam	-	83.90	-	Moderate	23.00	75.31	199.42	1.94	98.06
Narthampoondi	-	80.67	-	Moderate	23.00	163.29	342.63	7.13	92.87
Periyakilambadi	-	84.62	-	Moderate	23.00	70.96	136.61	6.74	93.26
Randam	-	86.08	10.44	Moderate	23.00	87.31	238.22	2.13	97.87
Seelappandal	-	94.69	1.20	Moderate	23.00	112.32	333.24	1.66	98.34
Vadakarimbalur	27.84	63.84	-	Moderate	23.00	121.73	251.90	4.75	95.25
Vallivagai	-	88.69	4.86	Moderate	23.00	170.01	485.08	0.80	99.20
Vedanthavadi	11.35	71.75	-	Moderate	23.00	351.31	826.01	2.51	97.49
Mallavadi	15.84	67.99	-	Moderate	23.00	70.26	145.79	1.88	98.12
Pudumallavadi	12.47	74.81	-	Moderate	23.00	54.58	131.25	4.80	95.20

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)			
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population	
Andapattu	-	100.00	635.00	239.00	163.00	
Arpakkam	89.50	10.50	1,924.00	626.00	979.00	
Boodamangalam	14.12	85.88	734.00	336.00	1,516.00	
Durginammialandal	39.03	60.97	780.00	854.00	819.00	
Erumpoondi	-	100.00	1,392.00	1,276.00	992.00	
Kalasthambadi	-	100.00	446.00	271.00	538.00	
Kamalaputhur	26.58	73.42	299.00	146.00	141.00	
Karkonnam	35.31	64.69	1,218.00	116.00	264.00	
Karunthuvambadi	-	100.00	683.00	538.00	736.00	
Kolakkaravadi	37.45	62.55	782.00	1,039.00	1,116.00	
Kovur	23.66	76.34	771.00	127.00	279.00	
Kunniyandal	-	100.00	766.00	64.00	130.00	
Madalambadi	-	100.00	1,692.00	116.00	280.00	
Mallappa Nayakkam Palayam	-	100.00	496.00	55.00	-	
Mangalam	31.81	68.19	2,587.00	535.00	650.00	
Maruthuvambadi	38.09	61.91	182.00	23.00	131.00	
Mutharasampundi	-	100.00	129.00	-	61.00	
Nookkambadi	13.83	86.17	1,348.00	253.00	293.00	
Palanandal	13.19	86.81	1,210.00	140.00	235.00	
Porkunam	-	100.00	698.00	124.00	110.00	
Sadayanodai	-	100.00	519.00	127.00	48.00	
Salayanur	100.00	-	633.00	180.00	300.00	
Sananandal	-	100.00	755.00	34.00	64.00	
Thurinjapuram	100.00	-	553.00	1,008.00	746.00	
Usambadi	-	100.00	404.00	240.00	478.00	

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)		
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population
Uthirampoondi	-	100.00	215.00	-	26.00
Vada Karingalipadi	-	100.00	361.00		25.00
Vada Pulidiyur	26.89	73.11	859.00	158.00	144.00
Velunganandal	24.34	75.66	1,122.00	42.00	132.00
Kariyandal	-	100.00	1,285.00	176.00	278.00
Karumarapatti	-	100.00	187.00	36.00	108.00
Kothantavadi	-	100.00	187.00	36.00	108.00
Sorakolathur	-	100.00	1,285.00	176.00	278.00
Devanampattu	-	100.00	841.00	748.00	757.00
Inam karianadal	-	100.00	1,380.00	1,519.00	1,907.00
Kiliapattu	11.33	88.67	1,296.00	256.00	463.00
Meppathurai	-	100.00	920.00	195.00	251.00
Naidumangalam	7.33	92.67	422.00	76.00	86.00
Narthampoondi	45.52	54.48	2,544.00	486.00	593.00
Periyakilambadi	29.53	70.47	944.00	-	82.00
Randam	3.41	96.59	1,811.00	280.00	349.00
Seelappandal	-	100.00	727.00	1,285.00	966.00
Vadakarimbalur	-	100.00	399.00	359.00	412.00
Vallivagai	-	100.00	1,687.00	160.00	238.00
Vedanthavadi	20.79	79.21	2,540.00	978.00	492.00
Mallavadi	-	100.00	614.00	490.00	426.00
Pudumallavadi	-	100.00	300.00	243.00	211.00

ANNEXURE 3.8

GP WISE DEMOGRAPHIC AND SOCIO ECONOMIC STATUS

Gram Panchayat	Geographical Area	Male Population	Female Population	Total Population	SC Population	ST Population	Vulnerable population	Households (HH's)	Only one room HH's (SECC)	Female Headed HH's (SECC)	Only one room HH's (SECC)
Andapattu	278	1,050	1,086	2,136	635	-	635	464	28	24	27
Arpakkam	710	1,715	1,749	3,464	1,410	154	1,564	853	152	85	132
Boodamangalam	1,559	3,831	3,688	7,519	776	302	1,078	1,773	291	133	244
Durginammian-dal	168	904	932	1,836	155	-	155	458	28	28	28
Erumpoondi	778	1,716	1,724	3,440	1,163	65	1,228	755	107	39	87
Kalasthambadi	475	1,200	1,140	2,340	552	10	562	577	79	46	69
Kamalaputhur	684	792	811	1,603	792	-	792	399	52	26	44
Karkonnam	435	832	881	1,713	-	9	9	477	61	45	56
Karunthuvambadi	464	756	753	1,509	636	41	677	326	21	14	19
Kolakkaravadi	431	1,411	1,348	2,759	769	27	796	683	17	14	16
Kovur	431	701	670	1,371	-	13	13	351	55	14	43
Kunniyandal	150	596	611	1,207	-	-	-	315	13	26	17
Madalambadi	836	1,815	1,775	3,590	572	24	596	920	52	28	45
Mallappa Nayakkam Palayam	370	750	736	1,486	399	-	399	381	34	19	30
Mangalam	2,216	4,721	4,684	9,405	1,373	208	1,581	2,141	181	138	168
Maruthuvambadi	397	1,039	1,051	2,090	792	17	809	490	13	35	20
Mutharasampundi	149	315	307	622	16	-	16	153	2	138	43
Nookkambadi	629	1,625	1,677	3,302	732	25	757	782	20	50	29
Palanandal	580	1,415	1,388	2,803	45	79	124	726	48	60	52
Porkunam	671	1,426	1,373	2,799	714	-	714	658	57	34	50
Sadayanodai	235	761	762	1,523	296	-	296	359	8	21	12
Salayanur	725	1,263	1,230	2,493	765	1	766	613	91	38	75

Gram Panchayat	Geographical Area	Male Population	Female Population	Total Population	SC Population	ST Population	Vulnerable population	Households (HH's)	Only one room HH's (SECC)	Female Headed HH's (SECC)	Only one room HH's (SECC)
Sanandal	380	811	791	1,602	-	-	-	359	2	13	5
Thurinjapuram	789	1,445	1,435	2,880	1,250	83	1,333	594	16	26	19
Usambadi	155	784	867	1,651	1,087	-	1,087	322	5	21	10
Uthirampoondi	476	547	548	1,095	-	-	-	224	2	10	4
Vada Karingalipadi	84	345	370	715	67	47	114	333	-	13	4
Vada Pulidiyur	759	1,201	1,207	2,408	60	29	89	615	22	44	29
Velunganandal	622	1,045	1,008	2,053	194	-	194	1,655	156	118	145
Kariyandal	329	793	774	1,567	25 %	323	81	1,168	81	85	82
Karumarapatti	396	980	944	1,924	2	-	2	174	2	14	6
Kothantavadi	253	661	668	1,329	1,072	-	1,072	769	120	43	97
Sorakolathur	801	1,698	1,687	3,385	738	13	751	1,168	81	85	82
Devanampattu	511	1,605	1,551	3,156	1,360	-	1,360	760	86	58	78
Inam karianadal	1,232	3,044	2,889	5,933	1,564	20	1,584	1,409	121	89	111
Kiliapattu	724	1,860	1,804	3,664	719	-	719	910	70	58	66
Meppathurai	796	795	766	1,561	521	12	533	376	78	27	63
Naidumangalam	419	1,054	1,099	2,153	45	-	45	1,046	51	69	56
Narthampoondi	966	1,978	1,948	3,926	1,116	58	1,174	823	0	1	-
Periyakilambadi	459	1,011	939	1,950	506	9	515	476	23	28	25
Randam	428	928	915	1,843	1	-	1	483	70	28	57
Seelappandal	581	1,347	1,313	2,660	376	103	479	1,732	127	117	124
Vadakarimbalur	628	1,034	1,024	2,058	710	6	716	316	5	18	9
Vallivagai	888	1,661	1,665	3,326	893	14	907	793	104	48	87
Vedanthavadi	1,586	2,541	2,566	5,107	1,102	12	1,114	1,314	255	80	203
Mallavadi	389	1,378	1,449	2,827	1,222	208	1,430	1,062	25	65	37
Pudumallavadi	319	755	743	1,498	61	53	114	1,062	25	65	37

Gram Panchayat	% of Vulnerable Households (%)	Registered MGNREGA Job Cards (Persons)	Active person working in MGNREGA job Cards (Persons)	Drinking Water Sources (No.)	Ground Water - Drinking source (No.)	Surface water - Drinking source (No.)	sum of drinking water sources (No.)	HH's have tap water connection for drinking water (No.)	HH's dependent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Andapattu	0	969	732	230	6	1	7	20	-	4
Arpakkam	0	1,028	887	204	4	1	5	34	170	6
Boodamangalam	0	3,168	2,331	460	6	1	7	100	210	14
Durginammian-dal	0	653	585	48	5	1	6	6	-	5
Erumpoondi	0	1,372	1,042	181	5	1	6	41	140	6
Kalasthambadi	0	1,070	780	249	4	1	5	6	-	4
Kamalaputhur	0	803	564	225	5	1	6	21	204	3
Karkonnam	0	957	751	43	4	1	5	13	30	3
Karunthuvambadi	0	553	341	57	5	1	6	-	-	3
Kolakkavadi	0	1,248	981	835	5	1	6	35	801	5
Kovur	0	823	641	72	6	1	7	29	43	3
Kunniyandal	0	680	482	645	6	1	7	75	570	2
Madalambadi	0	1,177	953	134	5	1	6	4	-	7
Mallappa Nayakkam Palayam	0	935	802	53	4	1	5	-	427	3
Mangalam	0	2,937	2,342	281	4	1	5	68	213	17
Maruthuvambadi	0	1,047	688	135	6	1	7	-	109	4
Mutharasampundi	0	337	246	165	4	1	5	-	144	1
Nookkambadi	0	1,304	988	157	5	1	6	9	-	6
Palanandal	0	1,153	855	302	6	1	7	44	258	5
Porkunam	0	1,383	996	115	5	1	6	-	-	5
Sadayanodai	0	634	549	374	4	1	5	-	-	3
Salayanur	0	728	150	72	4	1	5	36	36	5
Sananandal	0	742	497	90	5	1	6	3	-	3

Gram Panchayat	% of Vulnerable Households (%)	Registered MGNREGA Job cards (Persons)	Active person working in MGNREGA job Cards (Persons)	Drinking Water Sources (No.)	Ground Water - Drinking source (No.)	Surface water - Drinking source (No.)	sum of drinking water sources (No.)	HH's have tap water connection for drinking water (No.)	HH's dependent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Thurinjapuram	0	1,074	839	119	4	1	5	3	-	5
Usambadi	0	466	368	277	6	1	7	-	254	3
Uthirampoondi	0	530	381	273	5	1	6	12	256	2
Vada Karingalipadi	0	420	333	135	6	1	7	-	-	1
Vada Pulidiyur	0	985	732	84	6	1	7	-	-	4
Velunganandal	0	1,016	699	78	3	1	4	-	-	4
Kariyandal	0	391	279	384	5	1	6	-	-	3
Karumarapatti	0	906	700	116	6	1	7	-	-	4
Kohtantavadi	0	552	401	118	6	1	7	-	89	2
Sorakolathur	0	1,337	898	145	6	1	7	-	-	6
Devanampattu	0	1,605	1,208	113	4	1	5	-	88	6
Inam karianadal	0	1,975	1,668	403	6	1	7	-	-	11
Kiliapattu	0	1,157	960	415	5	1	6	-	-	7
Meppathurai	0	928	553	213	5	1	6	-	188	3
Naidumangalam	0	1,055	719	194	6	1	7	-	-	4
Narthampoondi	0	1,376	1,200	793	6	1	7	-	725	7
Periyakilambadi	0	900	613	156	6	1	7	-	-	4
Randam	0	923	693	107	6	1	7	-	-	3
Seelappandal	0	1,324	1,089	179	6	1	7	-	-	5
Vadakarimbalur	0	783	570	146	6	1	7	-	-	4
Vallivagai	0	1,351	1,085	299	5	1	6	-	273	6
Vedanthavadi	0	2,277	1,741	305	6	1	7	-	260	9
Mallavadi	0	962	784	216	5	1	6	-	-	5
Pudumallavadi	0	772	603	216	6	1	7	-	181	3

ANNEXURE 4

IPCC VULNERABILITY ASSESSMENT METHODOLOGY

Normalization of Indicators:

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

- for indicators with positive relationship with vulnerability

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

- for indicators with negative relationship with vulnerability

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

Aggregation and categorization of Indicators

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

$$VI = \frac{\sum_i^N K_i S_i}{K_i}$$

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

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

ANNEXURE 5.1

GP WISE WASCA PROPOSED TREATMENT AREA

Gram Panchayat	Forest Land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Andapattu	-	10.96	-	36.32	-	-	8.99	3.12	12.45	10.95
Arpakkam	-	-	-	-	-	3.81	1.11	48.71	63.58	-
Boodamangalam	-	39.72	-	-	-	39.32	4.63	18.20	108.45	64.47
Durginammiandal	-	14.03	-	-	-	-	-	4.53	10.29	8.03
Erumpoondi	-	73.72	-	-	-	-	8.06	4.90	36.15	43.44
Kalasthambadi	-	47.03	-	-	-	4.40	-	34.35	25.46	13.57
Kamalapurthur	-	19.15	-	-	-	4.43	10.00	62.83	35.50	20.69
Karkonnam	-	3.89	-	-	-	0.64	14.99	26.61	27.08	12.74
Karunthuvambadi	2.36	6.92	1.01	0.68	0.38	-	2.02	42.92	18.23	14.48
Kolakkavadi	-	12.13	0.26	-	-	3.75	-	2.15	27.74	20.48
Kovur	-	1.72	-	-	-	0.79	19.15	39.45	13.65	12.68
Kunniyandal	-	2.92	-	-	-	-	-	1.32	7.38	9.13
Madalambadi	-	16.19	-	0.82	1.35	-	-	66.88	21.64	34.38
Mallappa Nayakkam Palayam	-	8.82	-	-	-	1.70	0.80	1.39	7.93	13.65
Mangalam	-	128.85	98.24	-	-	9.95	0.05	24.03	53.16	71.03
Maruthuvambadi	-	7.08	-	-	-	1.19	-	3.19	2.40	5.99
Mutharasampundi	-	6.66	-	-	-	1.50	-	2.85	9.00	4.42
Nookkambadi	-	10.46	1.79	-	0.80	8.25	1.01	26.01	72.56	12.91
Palanandal	-	5.45	8.75	-	-	3.50	0.49	28.62	51.88	19.48
Porkunam	-	17.23	-	-	-	1.21	15.21	58.04	29.30	11.55
Sadayanodai	-	3.54	-	-	-	-	0.61	18.13	5.91	10.71
Salayanur	-	22.00	-	-	-	3.53	15.00	41.36	21.42	22.62

Gram Panchayat	Forest Land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Criticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Sananandal	-	9.43	11.30	-	-	7.88	3.14	1.94	27.07	14.71
Thurinjapuram	-	11.01	-	-	-	-	-	98.11	20.31	22.38
Usambadi	-	5.21	-	-	-	-	-	1.20	5.25	8.60
Uthirampoondi	-	-0.29	74.25	-	0.38	-	3.12	21.77	6.23	32.07
Vada Karingalipadi	-	0.78	-	-	-	-	-	4.91	7.01	3.02
Vada Pulidiyur	-	70.98	-	12.93	3.58	-	-	70.18	27.37	20.45
Velunganandal	-	38.81	5.38	-	5.36	1.70	-	55.55	30.96	18.13
Kariyandal	-	34.90	-	-	-	-	-	29.82	15.44	30.13
Karumarapatti	-	63.92	-	-	-	1.56	-	2.22	3.00	34.65
Kothantavadi	-	63.92	-	-	-	1.77	-	18.50	99.97	86.63
Sorakolathur	-	147.88	-	-	-	-	-	29.66	15.35	30.13
Devanampattu	-	74.31	-	-	-	1.79	4.36	29.01	73.55	30.91
Inam karianadal	-	98.91	12.98	-	-	7.05	25.56	86.99	71.68	27.04
Kiliapattu	-	40.07	-	-	-	2.42	-	62.79	23.38	29.59
Meppathurai	-	207.77	-	-	-	-	2.54	21.13	19.98	20.55
Naidumangalam	-	45.84	-	-	-	5.72	-	5.02	7.81	13.65
Narthampoondi	-	15.37	-	0.47	-	0.82	10.14	60.54	31.65	29.89
Periyakilambadi	-	75.18	-	-	-	1.13	-	9.60	5.02	9.82
Randam	-	24.39	37.65	-	0.80	2.95	0.42	1.62	12.32	11.92
Seelappandal	-	46.27	0.53	-	0.40	3.27	-	17.20	29.60	29.55
Vadakarimbalur	0.79	49.29	26.38	0.60	-	12.94	-	40.88	27.51	20.05
Vallivagai	-	74.31	-	-	-	1.79	4.36	29.01	73.55	30.91
Vedanthavadi	-	29.38	3.90	-	-	15.62	42.12	76.39	103.56	61.31
Mallavadi	-	5.03	-	-	-	0.42	-	30.90	12.75	13.03
Pudumallavadi	-	4.93	-	-	-	-	-	18.52	16.03	9.91

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

ANNEXURE 5.2

GP WISE EXPECTED RUNOFF CONSERVATION AFTER WASCA TREATMENT

Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Andapattu	3.90	10.20	6.60
Arpakkam	30.80	10.10	23.10
Boodamangalam	47.90	11.00	36.60
Durginammiandal	5.00	0.00	4.30
Erumpoondi	32.40	0.00	17.30
Kalasthambadi	16.80	1.20	13.70
Kamalaputhur	12.80	1.20	24.10
Karkonnam	1.89	0.18	15.23
Karunthuvambadi	4.27	0.30	14.52
Kolakkaravadi	5.76	1.05	9.42
Kovur	2.65	0.22	15.88
Kunniyandal	7.45	0.00	3.33
Madalambadi	5.80	0.61	22.98
Mallappa Nayakkam Palayam	4.90	0.50	4.40
Mangalam	130.90	2.80	27.70
Maruthuvambadi	4.28	0.35	1.33
Mutharasampundi	3.11	0.42	3.04
Nookkambadi	4.39	2.54	21.04
Palanandal	13.11	0.98	18.79
Porkunam	7.13	0.34	21.34
Sadayanodai	1.27	0.00	6.61
Salayanur	8.06	0.99	18.77
Sananandal	7.42	2.21	8.76
Thurinjapuram	3.94	0.00	26.33
Usambadi	2.59	0.00	2.81
Uthirampoondi	25.41	0.11	24.74
Vada Karingalipadi	0.89	0.00	2.79
Vada Pulidiyur	26.75	4.64	22.07
Velunganandal	15.82	1.98	19.57
Kariyandal	13.30	0.00	14.10
Karumarapatti	32.70	0.40	7.50
Kothantavadi	28.11	0.52	40.14
Sorakolathur	60.41	0.00	14.71
Devanampattu	4.40	4.00	13.80
Inam karianadal	41.40	2.00	39.50
Kiliapattu	15.20	0.70	21.60
Meppathurai	76.30	0.00	12.00
Naidumangalam	17.50	1.60	5.00
Narthampoondi	8.10	0.40	24.70
Periyakilambadi	27.70	0.30	4.60
Randam	23.20	1.10	4.90

Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Seelappandal	17.50	1.00	14.30
Vadakarimbalur	28.70	3.80	16.50
Vallivagai	28.10	0.50	25.80
Vedanthavadi	14.01	4.59	24.80
Mallavadi	3.60	0.10	10.60
Pudumallavadi	3.80	0.00	8.30
Total	881	75	740

ANNEXURE 5.3

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

Gram Panchayat	Aff		ARS		AVP		Az		BP		CBP		CS	
	No.	Area	No.	No.	No.	Length	No.	No.	No.	Area	No.	Area	No.	No.
Andapattu	-	-	-	-	1,833	7,330	-	-	-	-	-	-	-	33
Arpakkam	-	-	1	-	756	3,023	106	-	-	-	-	-	-	106
Boodamangalam	656	0.82	4	-	701	2,805	73	800	1	90	18	90	73	73
Devanampattu	-	-	2	-	722	3,612	59	16,800	21	-	-	-	-	59
Durginammialandal	-	-	-	-	-	1,913	-	-	-	-	-	-	-	429
Erumpoondi	-	-	-	-	677	2,706	134	1,600	2	-	-	-	-	134
Inam karianadal	-	-	-	-	-	3,701	-	-	-	-	-	-	-	1,257
Kalasthambadi	-	-	-	-	-	3,093	-	-	-	-	-	-	-	163
Kamalaputhur	-	-	-	-	1,395	5,579	20	-	-	-	-	-	-	108
Kariyandal	-	-	-	-	25	239	40	1,600	2	-	-	-	-	73
Karkonam	-	-	3	-	319	1,275	76	1,600	2	-	-	-	-	76
Karumarapatti	-	-	1	-	275	1,376	75	3,080	4	-	-	-	-	86
Karunthuvambadi	-	-	4	-	-	2,924	77	-	-	-	-	-	-	180
Kiliapattu	-	-	-	-	-	3,675	87	-	-	-	-	-	-	910
Kolakkavadi	-	-	-	-	-	-	322	-	-	-	140	700	925	925
Kothantavadi	-	-	1	-	136	681	2	480	1	-	-	-	6	6
Kovur	216	0.27	-	-	994	3,976	35	500	1	-	-	-	40	40
Kunniyandal	-	-	-	-	-	1,218	-	-	-	-	400	2,000	1,236	1,236
Madalambadi	-	-	-	-	-	1	7	800	1	-	-	-	463	463
Mallappa Nayak-kam Palayam	1,360	1.70	2	-	1,161	4,645	70	5,296	7	-	-	-	70	70
Mallavadi	-	-	-	-	-	3,038	39	-	-	-	-	-	-	734
Mangalam	1	0.25	3	-	592	2,369	19	800	1	900	180	900	51	51
Maruthuvambadi	5,663	7.08	37	-	657	2,628	37	800	1	-	-	-	47	47
Meppathurai	-	-	3	-	724	3,618	-	1,680	2	400	80	400	45	45

Gram Panchayat	Aff		ARS		AVP		Az		BP		CBP		CS	
	No.	Area	No.	No.	No.	Length	No.	No.	No.	Area	No.	Area	No.	No.
Mutharasampundi	-	-	4	1,189	4,757	14	896	1	-	-	13	-	-	13
Naidumangalam	-	-	-	87	435	60	480	1	100	500	60	-	-	60
Narthampoondi	-	-	5	504	2,522	93	1,912	2	-	-	254	-	-	254
Nookkambadi	-	-	-	-	769	13	-	-	-	-	-	-	-	-
Palanandal	-	-	1	1,805	7,218	50	1,600	2	-	-	50	-	-	50
Periyakilambadi	1	1.10	2	321	1,607	35	480	1	-	-	35	-	-	35
Porkunam	-	-	1	558	2,230	4	800	1	-	-	54	-	-	54
Pudumallavadi	1	0.46	-	-	975	9	1	1	-	-	1,408	-	-	1,408
Randam	3	6.37	3	-	2,660	139	1,072	1	-	-	455	-	-	455
Sadayanodai	-	-	5	-	4,237	10	128	0	-	-	1,059	-	-	1,059
Salayapur	1	0.36	1	434	2,172	65	1,600	2	80	400	65	-	-	65
Sananandal	-	-	-	-	2,903	-	1,600	2	-	-	56	-	-	56
Seelappandal	-	-	-	-	3,079	43	-	-	-	-	83	-	-	83
Sorakolathur	-	-	1	299	1,495	8	480	1	248	1,238	176	-	-	176
Thurinjapuram	-	-	-	-	7,265	8	-	-	984	4,918	51	-	-	51
Usambadi	-	-	-	-	1	-	-	-	291	1,456	10	-	-	10
Uthirampoondi	-	74.00	-	1256	4589	21	-	-	60	300	21	-	-	21
Vada Karingalipadi	2	2.00	1	118.4	592	47	800	1	-	-	47	-	-	47
Vada Pulidiyur	1	2.40	3	252	1260	5	800	1	-	-	130	-	-	130
Vadakarimbalur	-	-	-	-	0.25	7	-	-	-	-	58	-	-	58
Vallivagai	1	0.41	3	-	0.58	35	864	1.08	904.6	4523	200	-	-	200
Vedanthavadi	-	-	5	200	1000	65	1000	1.25	-	-	65	-	-	65
Velunganandal	-	-	-	250	1563	79	-	-	-	-	115	-	-	115

Gram Panchayat	CT		Co		FP		COWRS		CCBF		DLT		DLHAI		FBBTI	
	No.	No.	No.	Area	No.	No.	No.	No.	No.	Area	Plants	Length	No.	Area	No.	Area
Narthampoondi	254	12	19	-	945	-	619	3,095	-	-	-	-	-	-	7	18
Nookkambadi	35	-	11	-	2	-	-	-	-	-	-	-	-	-	2	5
Palanandal	50	-	8	6,642	318	-	1,982	9,908	-	-	-	-	-	-	6	15
Periyakilambadi	35	35	1	-	488	-	-	-	-	200	1	-	-	-	1	3
Porkunam	54	-	5	8,487	515	-	860	4,299	-	-	-	-	-	-	3	8
Pudumallavadi	112	9	20	-	3	-	-	-	-	-	-	-	-	-	22	55
Randam	233	139	6	-	2	-	-	-	-	1,000	5	-	-	-	11	28
Sadayanodai	64	10	5	-	2	-	641	3,203	-	-	-	-	-	-	5	13
Salayanur	65	-	13	7,664	472	-	1,074	5,368	-	-	-	-	-	-	8	20
Sananandal	56	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-
Seelappandal	83	-	-	-	-	-	-	-	-	-	-	-	-	-	48	120
Sorakolathur	176	8	9	-	2	-	381	1,906	-	-	-	-	-	-	2	5
Thurinjapuram	51	-	1	-	2	-	1,986	9,932	-	-	-	-	-	-	-	-
Usambadi	10	-	-	-	3	162	-	-	2	-	-	-	-	-	4	10
Uthirampoondi	21	-	4	5029	487.95	-	1260	6301	-	-	-	-	-	-	2	5
Vada Karingalipadi	47	-	1	1526.32	502.35	-	1136	5680	-	-	-	-	-	-	1	2.5
Vada Pulidiyur	130	-	18	7454	302.4	-	955	4774	-	-	-	-	-	-	5	12.5
Vadakarimbalur	58	-	1	-	1	-	1056	5278	-	-	-	-	-	-	7	17.5
Vallivagai	200	27	7	-	3	-	-	-	-	-	-	-	-	-	5	12.5
Vedanthavadi	65	65	1	-	3	-	-	-	-	-	-	-	-	-	3	7.5
Velunganandal	115	-	-	1570	407.55	-	-	-	-	-	-	-	-	-	-	-

Gram Panchayat	FD		GSS		ICP		LDI		LP			MI		NADEP	
	No.	No.	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.	No.	
Andapattu	33	3	-	10	-	-	24	251	1,256	-	-	-	-	1	
Arpakkam	106	41	-	-	-	-	-	671	2,852	-	-	-	-	-	
Boodamangalam	73	76	360	-	1,800	-	-	531	2,654	-	-	-	-	-	
Devanampattu	59	25	800	-	4,000	-	-	225	1,123	-	-	-	-	-	
Durginammiandal	49	48	-	-	-	-	-	399	1,597	-	-	-	-	-	
Erumpoondi	134	29	1,000	-	5,000	-	-	1,176	5,880	-	-	-	-	-	
Inam karianadal	274	46	-	-	-	-	-	329	1,315	-	-	-	-	-	
Kalasthambadi	84	41	-	-	-	-	-	357	1,429	-	-	-	-	-	
Kamalaputhur	108	37	-	-	-	-	-	364	1,821	6	15	-	3		
Kariyandal	73	8	726	-	3,632	-	-	197	987	-	-	-	-		
Karkonam	76	10	-	-	-	-	-	-	-	-	-	-	-		
Karumarapatti	86	5	577	-	2,884	-	-	898	4,490	-	-	-	-		
Karunthuvambadi	77	17	600	-	3,000	-	-	37	148	-	-	-	-		
Kiliapattu	252	19	-	-	-	-	-	12	49	-	-	-	-		
Kolakkaravadi	150	150	-	-	-	-	-	333	1,330	-	-	-	-		
Kothantavadi	6	4	40	-	200	-	-	204	1,020	-	-	-	-		
Kovur	40	6	-	-	-	-	-	631	3,157	-	-	-	-		
Kunniyandal	38	4	400	-	2,000	-	-	356	1,423	-	-	-	-		
Madalambadi	42	16	-	-	-	-	-	490	1,961	-	-	-	-		
Mallappa Nayak-kam Palayam	70	14	728	1	3,638	-	2	79	395	-	-	-	19		
Mallavadi	88	26	-	-	-	-	-	204	815	-	-	-	-		
Mangalam	51	10	180	-	900	-	-	277	1,384	-	-	-	-		
Maruthuvambadi	47	45	80	-	400	-	3	-	-	-	-	1	-		
Meppathurai	45	6	1,373	-	6,866	-	-	629	3,145	-	-	-	-		
Mutharasampundi	13	1	-	-	-	-	-	908	4,539	-	-	-	-		

Gram Panchayat	FD		GSS		ICP		LDI		LP		MI		NADEP	
	No.	No.	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.	No.
Naidumangalam	60	5	500	2,500	-	-	120	600	-	-	-	-	-	-
Narthampoondi	254	54	634	3,172	-	-	496	2,479	-	-	-	-	-	50
Nookkambadi	35	10	-	-	-	-	503	2,012	-	-	-	-	-	-
Palanandal	50	10	80	400	-	-	-	-	-	-	-	-	-	-
Periyakilambadi	35	2	425	2,125	-	-	853	4,263	-	-	-	-	-	-
Porkunam	54	11	351	1,755	-	-	570	2,849	-	-	-	-	-	-
Pudumallavadi	112	45	600	3,000	-	-	945	3,778	-	-	-	-	-	-
Randam	233	15	160	800	5	2	318	1,271	-	-	-	-	-	-
Sadayanodai	64	4	-	-	-	-	490	1,961	-	-	-	-	-	-
Salayanur	65	10	800	4,000	-	-	540	2,700	-	-	-	-	-	-
Sananandal	56	16	-	-	-	-	472	1,889	-	-	-	-	-	-
Seelappandal	83	-	-	-	-	-	502	2,009	-	-	-	-	-	-
Sorakolathur	176	13	593	2,966	-	-	302	1,210	-	-	-	-	-	-
Thurinjapuram	51	8	-	-	-	-	408	1,630	-	-	-	-	-	-
Usambadi	10	3	-	-	-	-	1	5	-	-	-	-	-	-
Uthirampoondi	21	5	-	-	9	22	552	2,757.5	-	-	-	-	-	-
Vada Karingalipadi	47	2	-	-	-	-	387	1,935	-	-	-	-	-	-
Vada Pulidiyur	130	13	948	4,738	-	-	-	-	-	-	-	-	-	-
Vadakarimbalur	58	10	-	-	-	-	1	5	-	-	-	-	-	-
Vallivagai	200	10	100	500	-	-	1	5	-	-	-	-	-	-
Vedanthavadi	65	57	160	800	-	-	252.2	1261	-	-	-	-	-	-
Velunganandal	115	-	-	-	-	-	-	-	-	-	-	-	-	-

Gram Panchayat	ND		RPWDT	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH				No.	Area			
Andapattu	573	115	-	4	2	28,800	36	-	-	-
Arpakkam	1,076	215	3	9	2	-	-	-	-	-
Boodamangalam	-	-	10	14	2	-	-	-	-	1,800
Devanampattu	-	-	1	14	2	-	-	-	-	4,000
Durginammiandal	-	-	2	1	2	-	-	-	-	-
Erumpoondi	-	-	3	8	2	-	-	-	-	5,000
Inam karianadal	-	-	4	9	2	-	-	-	-	-
Kalasthambadi	-	-	1	5	2	-	-	-	-	-
Kamalaputhur	-	-	2	6	2	-	-	-	-	-
Kariyandal	-	-	1	5	2	-	-	-	-	3,632
Karkonam	-	-	2	4	2	-	-	-	-	-
Karumarapatti	-	-	2	2	2	-	-	-	-	2,884
Karunthuvambadi	-	-	2	5	2	-	-	-	-	3,000
Kiliapattu	-	-	1	3	2	-	-	-	-	-
Kolakkaravadi	322	64	-	9	2	474	1,894	-	-	-
Kothantavadi	444	89	1	6	2	-	-	-	-	200
Kovur	-	-	3	6	2	-	-	-	-	-
Kunniyandal	-	-	2	2	2	1,341	5,365	6	-	2,000
Madalambadi	-	-	1	5	2	1,073	4,290	-	-	-
Mallappa Nayak-kam Palayam	30	6	2	7	2	-	-	2	-	3,638
Mallavadi	-	-	1	13	2	2,729	10,915	-	-	-
Mangalam	-	-	7	12	2	-	-	-	-	900
Maruthuvambadi	2,495	499	3	6	2	-	-	-	-	400
Meppathurai	458	92	3	10	2	-	-	-	-	6,866
Mutharasampundi	-	-	1	6	2	-	-	-	-	-

Gram Panchayat	ND		RPWDT	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH				No.	Area			
Naidumangalam	-	-	1	7	2	-	-	-	-	2,500
Narthampoondi	-	-	5	15	2	-	-	12	-	3,172
Nookkambadi	-	-	-	6	2	1,555	6,221	-	-	-
Palanandal	-	-	3	3	2	-	-	-	-	400
Periyakilambadi	-	-	2	4	2	-	-	-	-	2,125
Porkunam	-	-	3	6	2	-	-	-	-	1,755
Pudumallavadi	-	-	2	12	2	2,152	8,609	-	-	3,000
Random	-	-	1	6	2	-	-	-	-	800
Sadayanodai	-	-	1	2	2	-	-	-	-	-
Salayanur	-	-	1	4	2	-	-	-	-	4,000
Sananandal	-	-	-	5	2	-	-	-	-	-
Seelappandal	-	-	2	6	2	-	-	52	-	-
Sorakolathur	-	-	3	11	2	-	-	-	-	2,966
Thurinjapuram	-	-	3	9	2	-	-	-	-	-
Usambadi	474	95	2	4	2	-	-	-	-	-
Uthirampoondi	306	61	2	5	2	-	-	-	-	-
Vada Karingalipadi	-	-	1	3	2	-	-	-	-	-
Vada Pulidiyur	-	-	1	9	2	-	-	-	-	4738
Vadakarimbalur	-	-	4	5	2	-	-	-	-	-
Vallivagai	-	-	1	10	2	-	-	-	-	500
Vedanthavadi	-	-	5	17	2	-	-	-	-	800
Velunganandal	-	-	-	6	2	-	-	-	207	-

ANNEXURE 7.1

GP WISE WASCA RECOMMENDATION AND WORKS UPLOADED

S. No	GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 02/02/2022
1	Arppakkam	445	413
2	Boodamangalam	324	263
3	Devanampattu	402	460
4	Durgainammiyandal	177	215
5	Erumpoondi	328	505
6	Inamkariyandal	563	605
7	Kalasthambadi	208	352
8	Kamalaputhur	405	147
9	Karkonam	421	295
10	Kariyandal	234	232
11	Karumarapatti	749	164
12	Karunthuvambadi	596	183
13	Kiliapattu	812	304
14	Kolakkaravadi	99	178
15	Kothanthavadi	446	147
16	Kovur	246	174
17	Kunniyandal	246	220
18	Madalampadi	325	341
19	Mallavadi	313	224
20	M. N. Palayam	382	382
21	Mangalam	287	284
22	Maruthuvambadi	250	396
23	Meppathurai	436	135
24	Mutharasampoondi	174	189
25	Naidumangalam	163	240
26	Nookkambadi	183	210
27	Northampoondi	627	413
28	Palanandal	216	244
29	Periyakilambadi	226	195
30	Porkunam	184	297
31	Pudumallavadi	298	303
32	Randam	466	376
33	Sadayanodai	210	267
34	Salaiyanur	285	211
35	Sananandal	167	261
36	Seelappandal	661	296
37	Sorakulathur	354	278
38	Thurinjapuram	196	228
39	Usampadi	158	156
40	Uthirampoondi	155	260
41	Vadaandapattu	146	173

S. No	GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 02/02/2022
42	Vadakarumbalore	224	196
43	Vadakaringalipadi	95	282
44	Vadapuzudiyur	284	187
45	Vallivagai	403	362
46	Vedandavadi	229	210
47	Veluganandal	163	249
	Total	14,961	12,702

ANNEXURE 7.2

GP AND WORK CATEGORY -WISE ONGOING WORKS IN THURINJAPURAM BLOCK

GP	Work Category	No. of ongoing works
Arppakkam	Anganwadi/Other Rural Infrastructure	1
	Drought Proofing	1
Boodamangalam	Drought Proofing	1
	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Devanampattu	Rural Sanitation	1
	Water Conservation and Water Harvesting	2
Drugainammiyandal	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	1
Erumpoondi	Water Conservation and Water Harvesting	3
	Works on Individuals Land (Category IV)	1
Inamkariyandal	Water Conservation and Water Harvesting	2
Kalasthambadi	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Kamalaputhur	Rural Sanitation	2
	Water Conservation and Water Harvesting	2
Kariyandal	Water Conservation and Water Harvesting	1
Karkonam	Water Conservation and Water Harvesting	1
Karumarapatti	Water Conservation and Water Harvesting	2
Karunthuvambadi	Water Conservation and Water Harvesting	1
Kiliapattu	Water Conservation and Water Harvesting	3
Kolakaravadi	Water Conservation and Water Harvesting	2
Kothanthavadi	Water Conservation and Water Harvesting	1
Kovur	Water Conservation and Water Harvesting	2
Kunniyandal	Water Conservation and Water Harvesting	2
M.N.Palayam	Water Conservation and Water Harvesting	2
Madalampadi	Works on Individuals Land (Category IV)	1
Mallavadi	Water Conservation and Water Harvesting	2
Mangalam	Drought Proofing	1
	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Maruthuvambadi	Water Conservation and Water Harvesting	2
Meppathurai	Water Conservation and Water Harvesting	1
Mutharasampoondi	Water Conservation and Water Harvesting	1
Naidumangalam	Water Conservation and Water Harvesting	2
Nookkambadi	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	21
Northampoondi	Works on Individuals Land (Category IV)	2
Palanandal	Water Conservation and Water Harvesting	2
Periakilambadi	Drought Proofing	1
	Water Conservation and Water Harvesting	1

Porkunnam	Water Conservation and Water Harvesting	3
	Works on Individuals Land (Category IV)	1
Pudumallavadi	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Randam	Rural Connectivity	1
	Water Conservation and Water Harvesting	2
Sadayanodai	Water Conservation and Water Harvesting	2
Salaiyanur	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Sananandal	Drought Proofing	1
	Water Conservation and Water Harvesting	2
Seelappandal	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	3
Sorakolathur	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	1
Thurinjapuram	Water Conservation and Water Harvesting	3
Usampadi	Water Conservation and Water Harvesting	1
Uthirampundi	Rural Connectivity	1
	Water Conservation and Water Harvesting	1
Vadakarimbalore	Water Conservation and Water Harvesting	3
	Works on Individuals Land (Category IV)	1
Vadakaringalipadi	Rural Sanitation	2
	Water Conservation and Water Harvesting	1
Vadanadapattu	Water Conservation and Water Harvesting	2
Vadapulidiyur	Water Conservation and Water Harvesting	3
Vallivagai	Drought Proofing	1
	Water Conservation and Water Harvesting	4
	Works on Individuals Land (Category IV)	1
Vedandavadi	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	1
Veluganandal	Rural Connectivity	1
	Works on Individuals Land (Category IV)	1
Grand Total		136

ANNEXURE 8

KEY CWRM PARAMETERS FOR THE GPS FALLING UNDER VADAPULIDIYUR MICRO-WATERSHED

Description	Vada Pulidiyur	Narthampoondi
Soil Resources: Status of Available Nitrogen (%)		
Very Low	-	39
Low	-	43
Medium	-	5
Status of Organic Carbon (%)		
Very Low	-	55
Low	-	43
Medium	-	1
Status of Soil Micro Nutrients (%)		
Sufficient	72	49
Deficient	28	51
Status of Physical condition of the soil (%)		
Moderately Acidic	-	3
Slightly Acidic	-	-
Neutral	-	2
Moderately Alkaline	100	95
Soil Texture (%)		
Fine Soil	88	81
Soil Water Permeability (Low, Moderate, high)	Moderate	Moderate
Soil moisture and ET		
Volumetric Soil Moisture (%)	23	23
Estimated Soil Moisture (ha.m)	141.85	163.29
ET Losses (ha.m)	270.16	342.63
Means of Water Extraction (%)		
Gravity	2	7
Lifting	98	93
Irrigation Methods (%)		
Wild Flooding	27	46
Control Flooding	73	54
Livestock (No.)		
Cattle Population	859.00	2544.00
Sheep Population	158.00	486.00
Goat Population	144.00	593.00
Land Resources (ha)		
Area under Forest land	-	-
Non-Agricultural Uses	141.96	256.10
Area under Barren & Un-cultivable Land	-	-
Area under Permanent Pastures and Other Grazing Land	17.24	0.63
Land Under Miscellaneous Tree Criticalops etc.	4.77	-

Description	Vada Pulidiyur	Narthampoondi
Cultivable Waste Land	-	1.09
Fallows Land other than Current Fallows	-	40.54
Current Fallow land	280.71	242.15
Unirrigated Land	109.48	126.61
Area Irrigated by Source	204.53	298.92







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