Ministry of Rural Development Ministry of Jal Shakthi

WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA

Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

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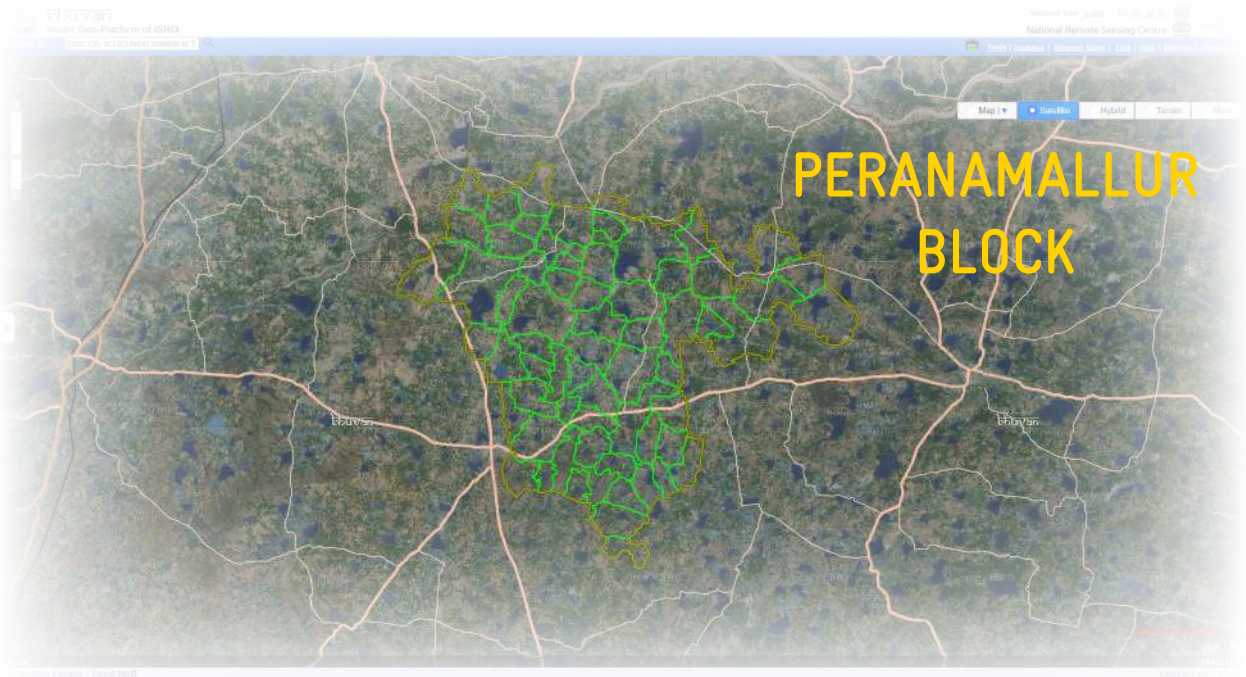


Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

FOREWORD

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

FOREWORD

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

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

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

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

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

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

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

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

We look forward to its success!

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

FOREWORD

Thiru. B. Murugesh, IAS
District Collector,
Tiruvannamalai

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

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

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

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

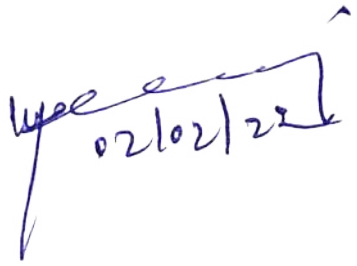
Through GIS based planning in 860 GPs, works identified under CWRM are verified, approved at Gram Sabha. These works would potentially reduce 38% surface runoff to be harvested or recharged by various interventions through ridge to valley watershed approach.

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

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

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

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



Thiru. B. Murugesh, IAS
District Collector,
Tiruvannamalai

MESSAGES

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

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

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

M. P—H

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

MESSAGES

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

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

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

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

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

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

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

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

MESSAGES

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

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

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

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

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

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

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ABBREVIATIONS AND ACRONYMS

A - D

%
Percentage

^{0}C
Degree Celsius

AR
Assessment Report

CCB
Contour Continuous Bunds

CCCDM
Centre for Climate Change and Disaster Management

CRM
Climate Resilient Measures

CuM
Cubic Meter

CVI
Climate Vulnerability Index

CWRM
Composite Water Resource Management

CWRMP
Composite Water Resource Management Plan

DEM
Digital Elevation Model

D - H

DLSC
District Level Steering Committee

DLT
Drainage Line Treatment

DRD&PR
Department of Rural Development & Panchayat Raj

ET
Evapo-transpiration

FPO
Farmer Producer Organization

FY
Financial Year

GIS
Geographical Information System

GIZ
Deutsche Gesellschaft für Internationale

Govt.
Government

GP
Gram Panchayat

GW
Ground Water

ha
Hectare

I - M

ha.m
Hectare Meter

HH
Households

ICAR
Indian Council for Agriculture Research

IMD
Indian Meteorological Department

INR
Indian Rupees

IPCC
Intergovernmental Panel on Climate Change

IWRM
Integrated Water Resources Management

Kharif crop
Sown in Monsoon and harvested close to Autumn

km
Kilometer

KML
Keyhole Markup Language

LULC
Land use and land cover

M - N

Max
Maximum

MCM
Million Cubic Meter

MC
Mid Century

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

NAPCC
National Action on Climate Change

N - S

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

Rabi crop
Sown in winter and harvested in monsoon

S - U

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

SHG
Self Help Group

S - W

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

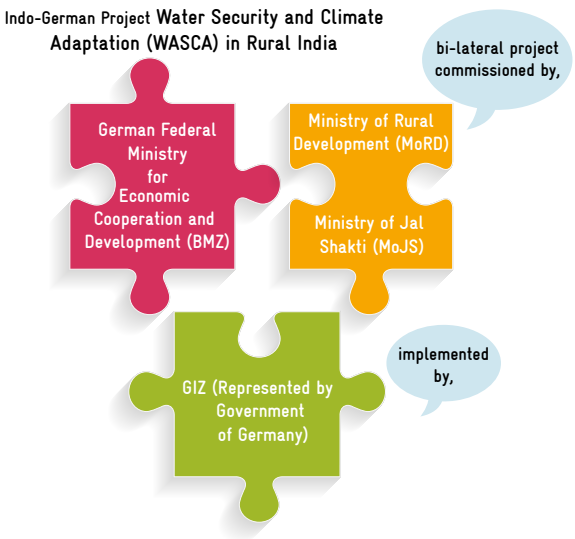
Thirukkural - 11

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

6

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

7

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

8

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

9

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

துப்பார்க்குத் துப்பாய துப்பாக்கித் துப்பார்க்குத்
துப்பாய தூஉம் மழை

குறள் - 12

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

Thirukkural - 12

CHAPTER 1

1 ABOUT THE BLOCK

Peranamallur Block in Thiruvannmalai District lies between 12°24'8.239"N to 12°36'55.001"N latitude 79°18'5.217"E to 79°32'38.651"E longitude and is surrounded by Chetpet,West Arani, Cheyyar, Anakkavur and Thellar Blocks (Figure 1.1). The total geographical area of this Block is 24,419 ha (244 Sq.km). Administratively, this Block comes under Vandavasi taluk, with 57 Gram panchayats and 218 habitations in it.

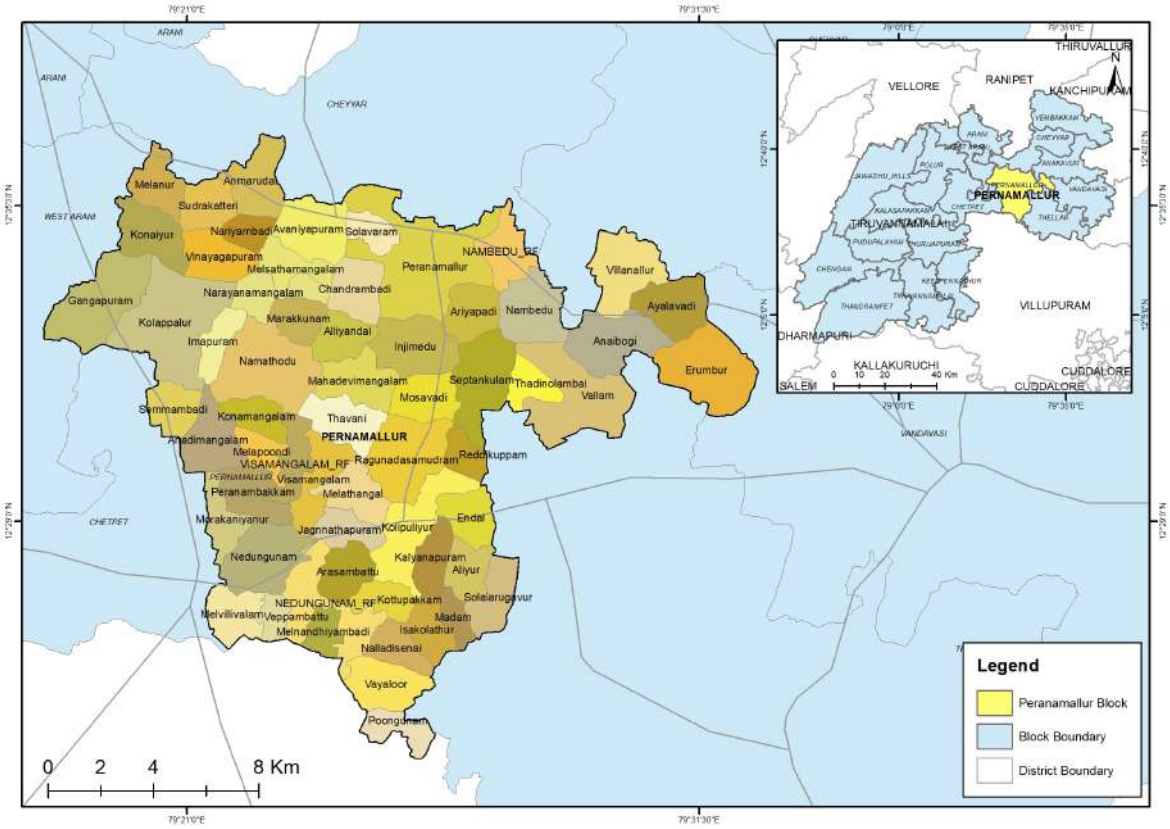


Figure 1.1. Peranamallur Block and it's environ

According to Census 2011, the population of Peranamallur Block is 91,276. The population density of the Block is 324 per Sq. km which is much lower than the District population density (473 per Sq. km) and much lower than the State's density (555 per Sq.km). There is a 6.08 % increase in the population observed since 2001 in this rural Block. The percentage of male population is less than (49.77 %) female population (50.22%). The proportion of sex ratio is 1009 females per 1000 males, which is higher compared to the District average sex-ratio (994 females per 1,000 males). At 74.55 % the literacy rate of the Block is slightly higher than the national average (72.98%). Scheduled Castes and Scheduled Tribes accounted for 20.8% of the total population. (Thiruvannamalai District profile 2020).

Economically, Peranamallur is second top revenue earning Blocks of the Tiruvannamalai District. More than 80% of its inhabitants are farmers, and the primary source of income is agriculture. Paddy tops as the predominant crop, with 55.6 % of the irrigated area cultivated with paddy. The other major crops grown in the Block area are ground nut, other pulses, sugarcane and ragi. Under rainfed crops sugarcane is a predominant crop with 83.93% of the area being cultivated with groundnut. Other crops are groundnut, banana, other pulses and red gram. Significant cultivated areas of banana, dry chilli, coconut and other fruits and vegetables can also be seen. Groundnut and pulses are cultivated both under irrigated and rainfed conditions. The sericulture is practiced in 15 acres. A livestock count of 95,677

> The proportion of sex ratio is 1009 females per 1000 males, which is higher compared to the District average sex-ratio (994 females per 1,000 males).

> At 74.55 % the literacy rate of the Block is slightly higher than the national average (72.98%).

was recorded during 2019-20. The cattle count is 32,966 and the Block has 30 milk societies with 8,076 litres of milk being produced per day. Peranamallur aloso known for some ancient temples- the Valarkiri velmurugan temple, built on the side of Pernamallur big lake and on the big rock (Valarkiri), Thiru-karai-yeswarar temple is another famous temple built by the chola king Kocengannan, a great Shiva devotee, A1000-year-old Samanar temple at ponnur. Avani-yapuram which is near by has a dam built during the British period on the river which is part of Cheyyar.

> 55.6 % of the irrigated area cultivated with paddy

Hydrologically, Peranamallur Block comes under Cheyyar, Killiyar and Varahanadhi sub-basins of Palar and Varahanadhi basins. Cheyyar River flows through the Block. Cheyyar, Cheyyar River, Killiyar and Tondi Veraha Macro-watersheds cover the Block with 70 micro-watersheds. (Figure 1.2).

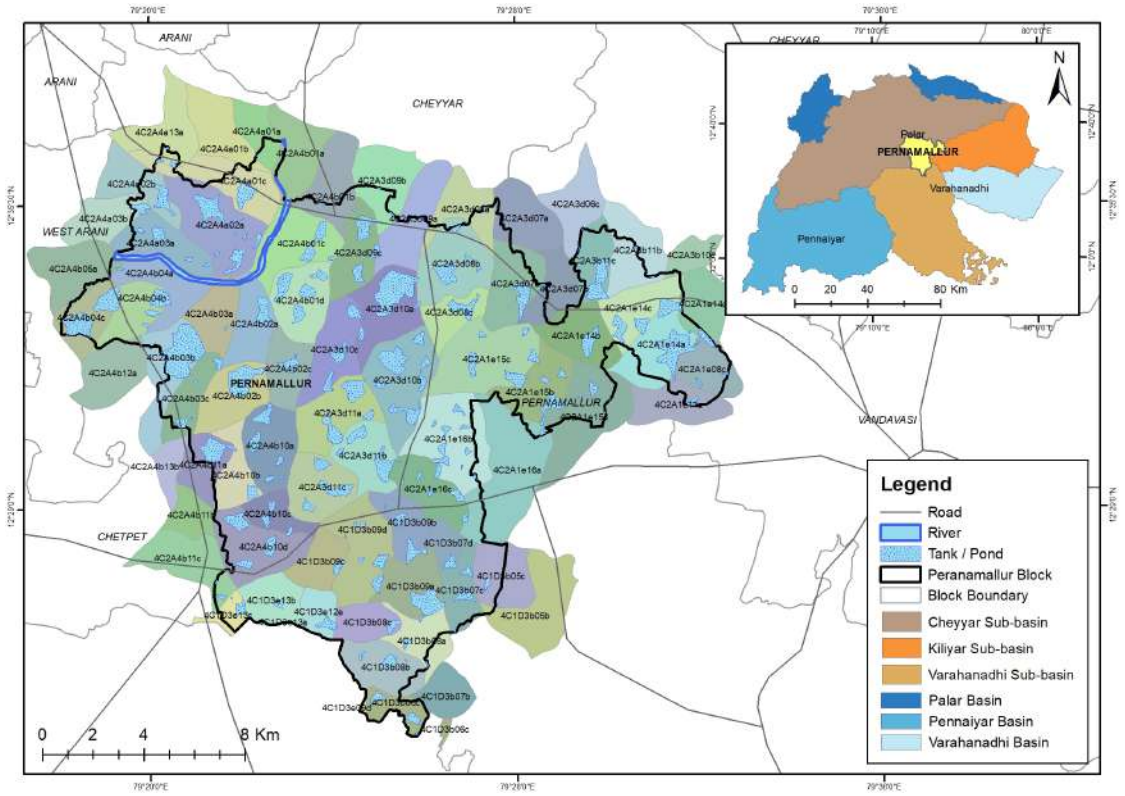


Figure 1.2. Watersheds- Peranamallur Block

There are 129 tanks in the Block with the largest tank being the Periyakozhappalur Big Tank with a area of 204.05 ha. Other important tanks are Pernamallur Big Tank (182.19 ha), Erumbur tank (150.14 ha), Namathodu Tank (129.55 ha), Vallam Big Tank (97.16 ha) and Anmarudhai tank (96.43 ha) (Figure 1.3). The ground water levels in Peranamallur Block is in an over exploited state of depletion stage of ground water development. Kolappalur and Nedungunam firkas cover the Block and both are in an over exploited stage.

GROUND WATER LEVEL OF THIS BLOCK

OVER EXPLOITED- › 100%	Kolappalur, Nedungunam

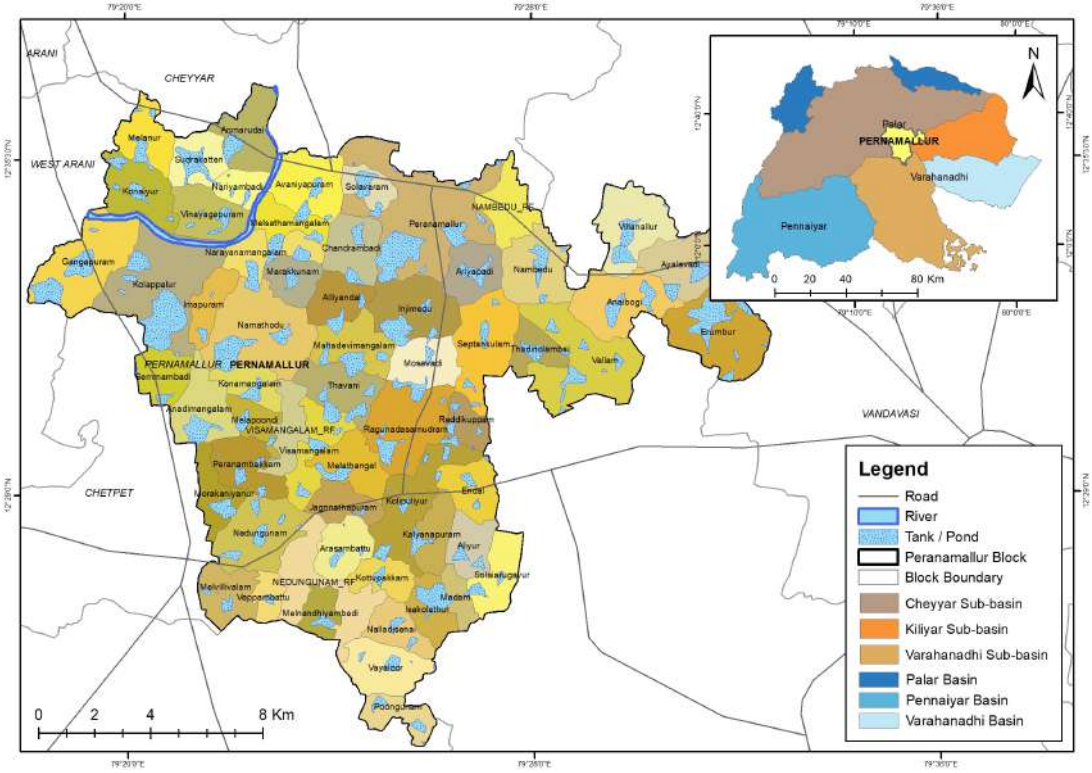
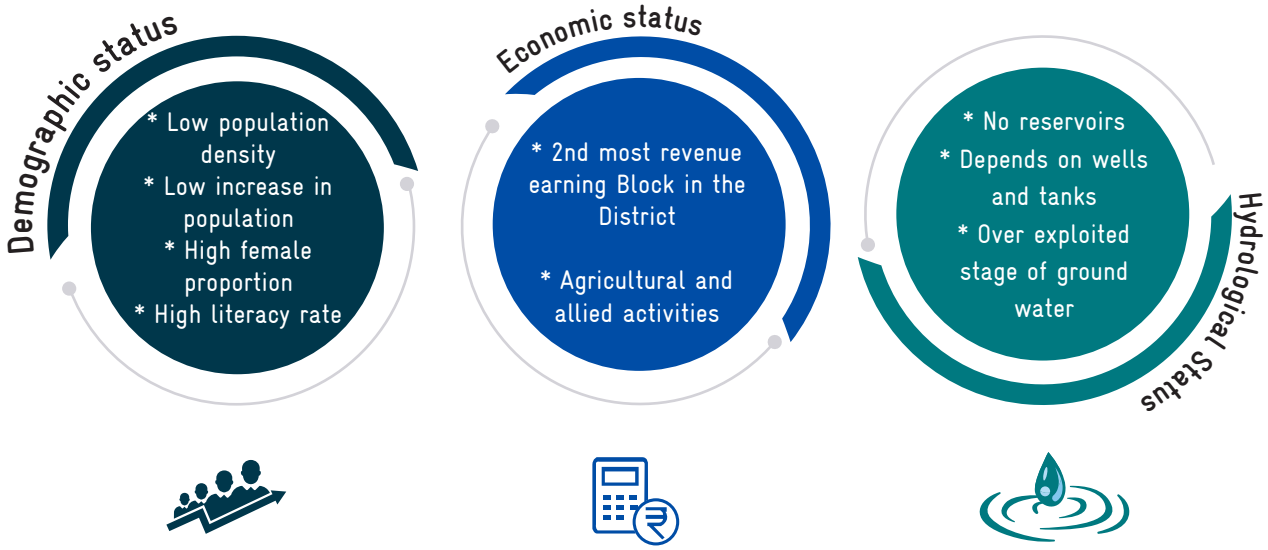


Figure 1.3. Spatial distribution of waterbodies



விண்இன்று பொய்ப்பின் விரிநீர் வியனுலகத்து
உள்நின்று உடற்றும் பசி

குறள் - 13

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

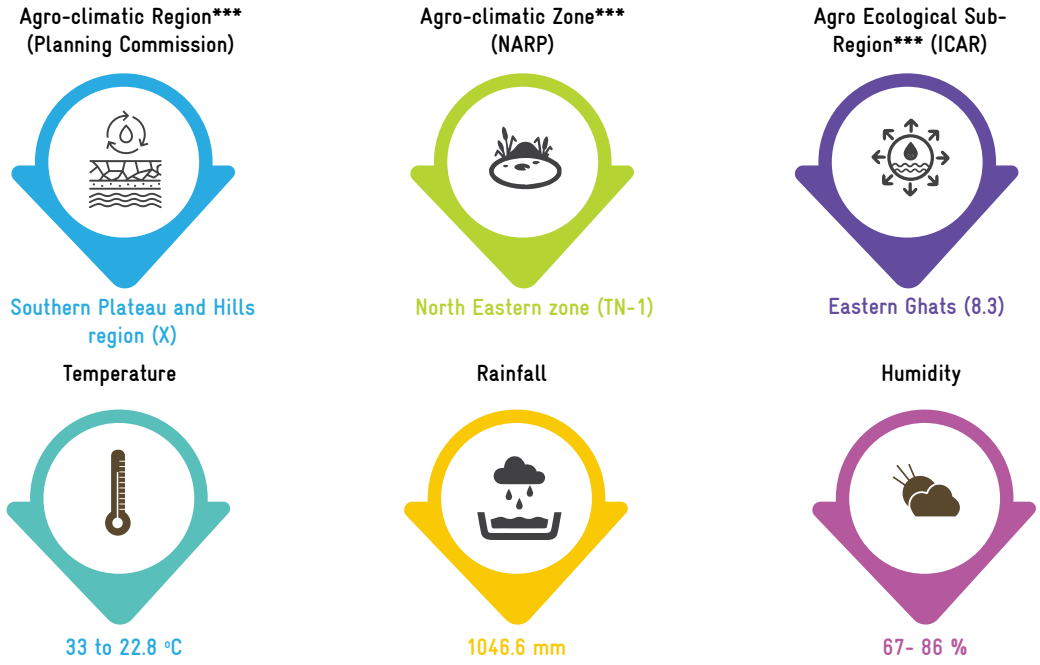
Thirukkural - 13

CHAPTER 2

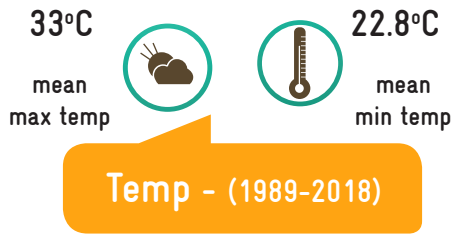
2 CLIMATE AND WATER SECURITY

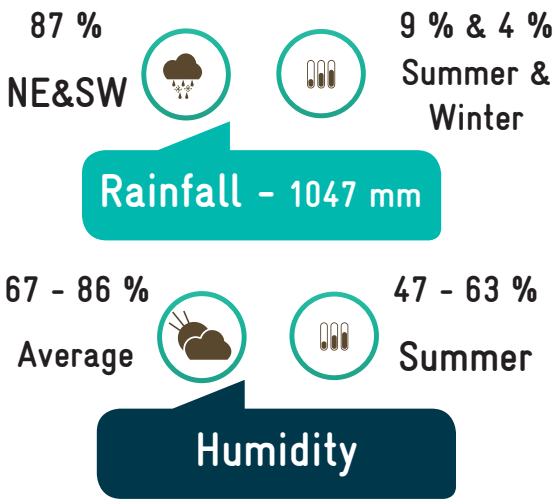
This region has typical tropical climate, located in the North Eastern agro-climatic zone of State and Southern Plateau and Hills region according to the agro climatic regional classification of planning commission. The general climate description of this region is given below (Table 1).

TABLE 1. GENERAL CLIMATE DESCRIPTION



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 %.

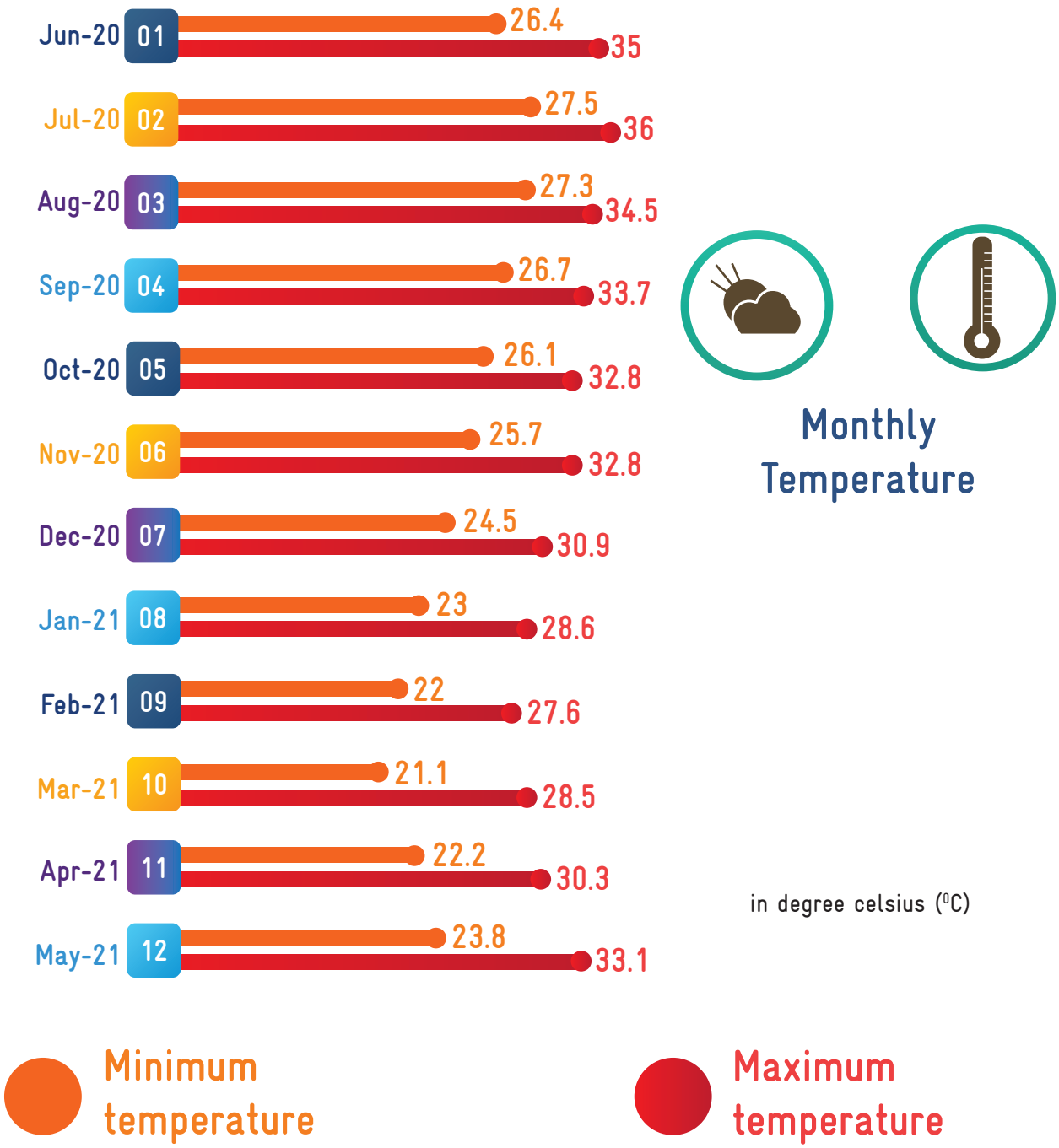


Figure 2.1. Average monthly temperature

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

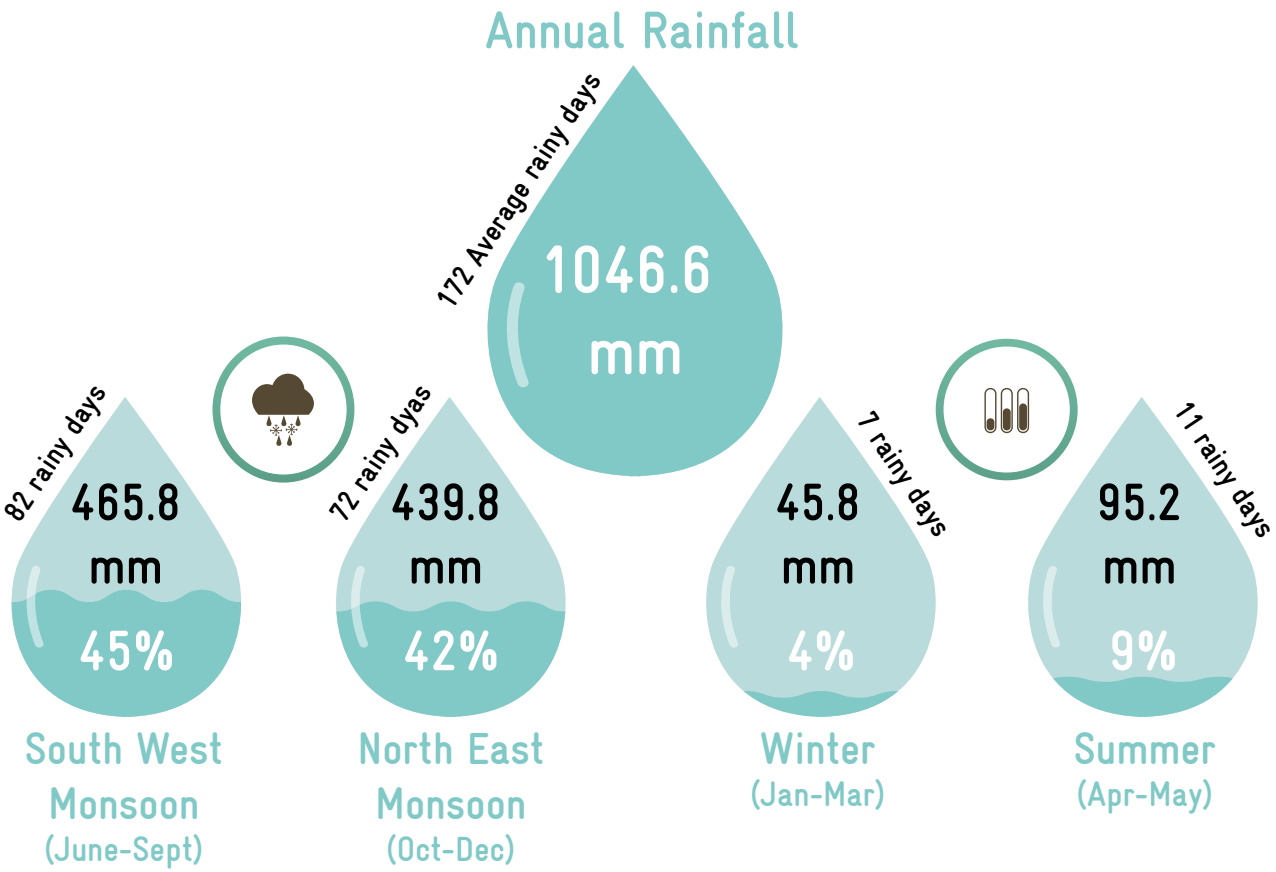


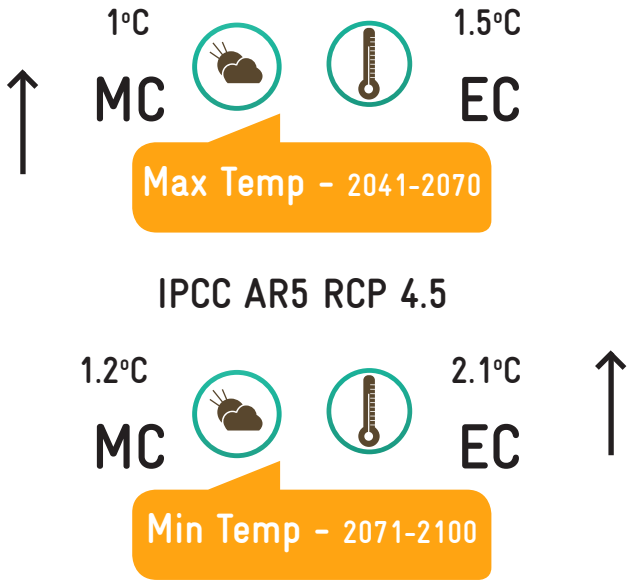
Figure 2.2. Season-wise distribution of annual rainfall

In recent decades, the world is witnessing significant changes in its climate. These changes include increase in average temperature, variations in the rainfall intensity and its frequency. This region is also no exception, and an increase in maximum and minimum temperature of 1.2°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

Flood

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. 3 locations at this Block are moderately vulnerable to floods.

Drought

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

Heat Wave

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 Peranamallur Block are prone to heatwaves.

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 (^{O}C)	C1	Goal 13
	Changes in min temperature (^{O}C)	C2	
	Changes in rainfall (%)	C3	
	Excess rainfall years	C4	
	Deficient rainfall years	C5	
Water	Ground water extraction (%)	W1	Goal 6
	Ground water Recharge (m^3)	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/m^2)	A3	Goal 15
	Evapo-transpiration (Kg/m^2)	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 Steering Committee headed by the Secretary RD&PR in Nov 2019 for implementing the WASCA. Subsequently, all the key water actions, CWRM planning and implementation works are envisaged for the above Districts through these influencing indicators collectively under four CWRM areas viz. climate, water, agriculture and socio-economic.

2.3 COMPREHENSIVE 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. Data for the major parameters identified at Block level (Table 3) are collected both from primary and secondary sources to be analyzed statistically and geospatially.

TABLE 3. MAJOR PARAMETERS IDENTIFIED FOR BLOCK LEVEL VULNERABILITY ASSESSMENT

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

ஏரின் உழாஅர் உழவர் புயலென்னும்
வாரி வளங்குன்றிக் கால்

குறள் - 14

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

Thirukkural - 14

CHAPTER 3

CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA

3 CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA

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

The planning exercise for Mahatma Gandhi NREGS will be a 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 Khet ko Pani and Per Drop More Crop are the four pillars of PMKSY. Technical inputs for planning are to be drawn from the technical resources available in the District under MGNREGS, CSO partners and other line department agencies. In case of planning for NRM works, the technical inputs will be drawn from the joint pool of technical personnel of IWMP in Watershed Cell cum Data Centre (WCDC), Mahatma Gandhi NREGS unit, and Water Resource Department and the Agriculture Department. The technical inputs relating to Excavation, Renovation & Modernization (ERM) of waterbodies may also be sought from the regional office of Central Ground Water Commission (CWC). The GPs will keep in perspective the Macro and Micro-watersheds of 500-100 ha comprising of 1-10 GPs, while deliberating and finalizing prioritization of shelf of projects.

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

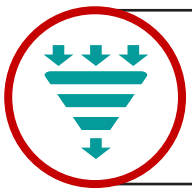
262 Total Kinds of works in Schedule-I of Mahatma Gandhi NREGA

182 Kinds of works relate to NRM alone

164 Kinds of works related to Agriculture & allied works

85 Water related works out of NRM

In pursuance of Schedule-I of Mahatma Gandhi NREGA, 262 kinds of works/ activities have been identified as permissible works, of which 182 kinds of works are related to NRM alone. Among NRM works, 85 activities focus on water conservation and harvesting while 164 works are related to Agriculture and Allied works. As MGNREGA activities benefit both the community and 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 productivity and income of poor people. Even the works on private lands should be taken up following the principles of watershed management in an integrated manner. To facilitate evidence based scientific NRM planning process, technological support shall be taken from National Remote Sensing Centre, ISRO for identification and holistic planning of permissible works in the watersheds using web-GIS platform (Bhuvan Geoportal). The GIS (Geographical Information System) plans shall be comprehensive ones incorporating all eligible works under Mahatma Gandhi NREGS and the same shall be implemented in a phased manner. Section 22 of Annual Master Circular provides the key steps for GIS based planning.



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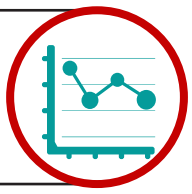
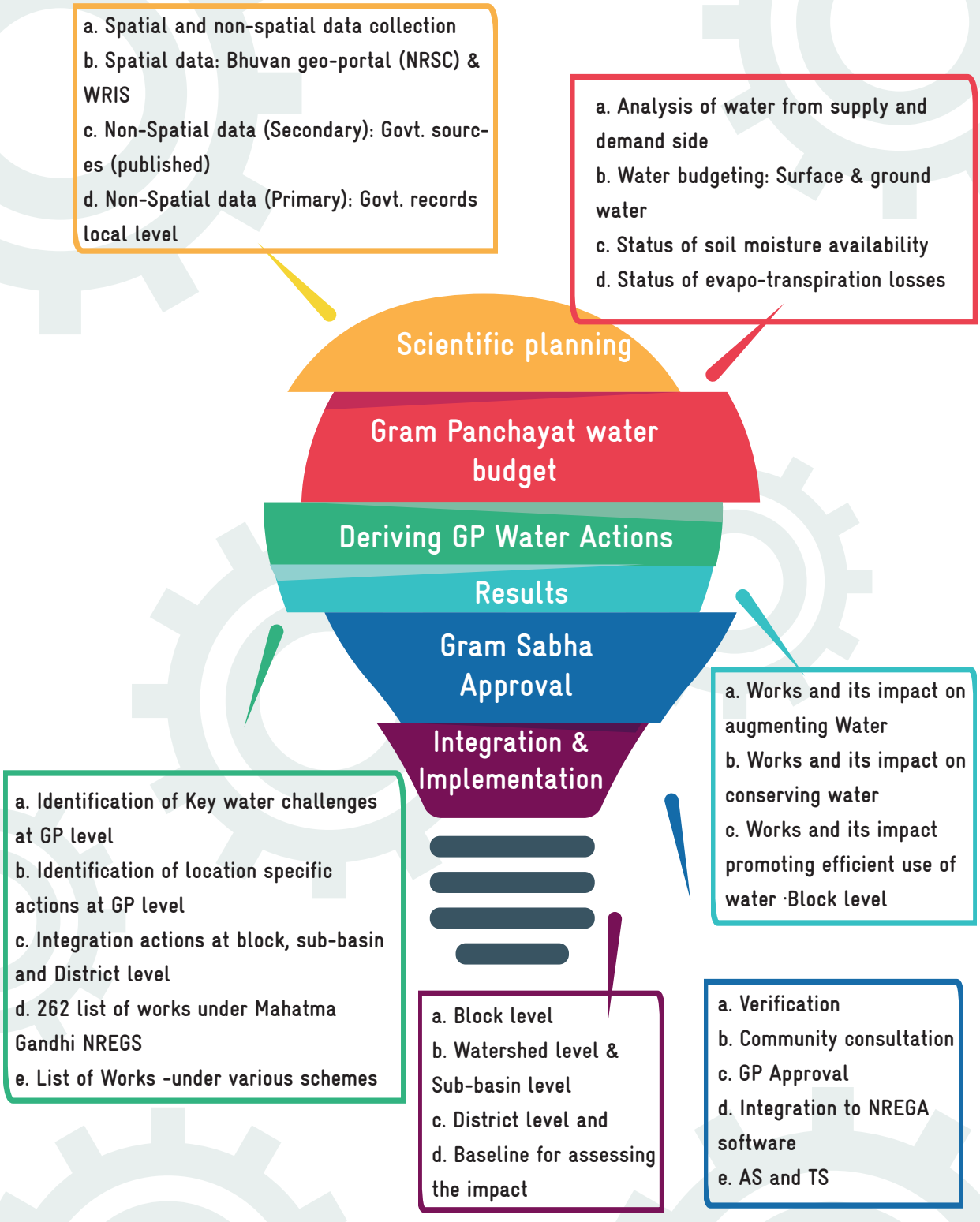


3.1 COMPOSITE WATER RESOURCE MANAGEMENT APPROACH

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

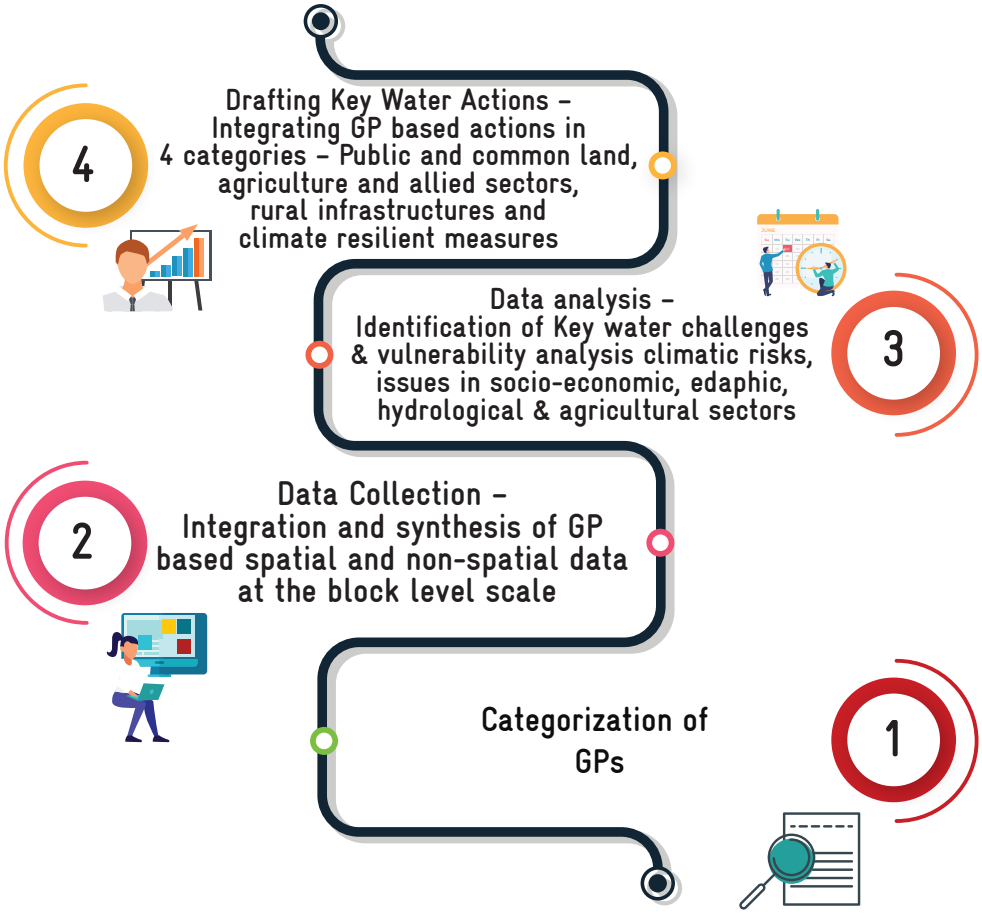
and soil moisture are used to understand the climate related issues. The next step is to assess land use, watersheds, drainage networks and surface runoff, existing water supply and storage systems, water management for the key sectors and water demand and prepare the water budget for the GP (Box 1).

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

STEPS INVOLVED IN BLOCK LEVEL ANALYSIS THROUGH CWRM APPROACH



This integrated approach has been accepted by 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. 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

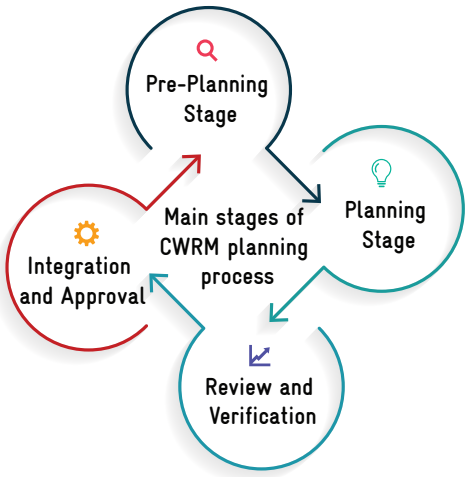
PLANNING STAGE

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

INTEGRATION AND APPROVAL

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

REVIEW AND VERIFICATION

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

3.2 CATEGORIZATION OF GPs

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

TABLE 4. CATEGORIZATION OF PERANAMALLUR BLOCK GPs

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
47	GP and revenue village data and boundary match (Type-I)	Aliyur, Alliyandal, Anmarudai, Anandimangalam, Arasampattu, Ariyapadi, Avaniyapuram, Endal, Erumbur, Gengapuram, Imapuram, Injimedu, Isakolathur, Jagannathapuram, Kalyanapuram, Konaiyur, Kolappalur, Konamangalam, Madam, Mahadevimangalam, Marakkunam, Melanur, Melathangal, Melsathamangalam, Melvillivalam, Morakkaniyanur, Nalladisenai, Peranambakkam, Nambedu, Narayanamangalam, Nariyambadi, Nedungunam, Mosavadi, Poongunam, Raghunathasamudran, Reddikuppam, Semmambadi, Septankulam, Solavaram, Solaiarugavur, Sudrakatteri, Thadinolambai, Vayaloor, Vilanallur, Veppampattu,Visamangalam, Vinayagapuram
1	Having more than one GPs in one Revenue Village (Type-II)	Melnandiyambadi
9	One GP is falling under more than Type 1 one Revenue Village (Type-III)	Namathodu, Thavanai, Vallam, Anaibogi, Ayalavadi, Chandirambadi, Kottupakkam, Kozhipuliyur, Melapoondi

3.3 DATA COLLECTION: SPATIAL & NON-SPATIAL

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

SPATIAL DATA

The spatial datasets are supportive evidence to understand the existing conditions and issues in the area/ region. Considering the spatial datasets such as Land Use and Land Cover (LULC), waste lands, salt and erosion affected lands, drainage lines, ground water potential, lineament, geomorphology, and slope will contribute significantly in the preparation of appropriate and suitable science-based plans for 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 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 and currently, data at Block level is not available. Hence, previous hydro-meteorological disasters are considered to denote the Block's change in climate (temperature, rainfall) extremities and its risks, which was recorded by State Disaster Management Agency, 2020 (Table 5).

TABLE 5. CLIMATE RISKS AND VULNERABLE GP'S

3.5 CWRM PLANNING ANALYSIS – WATER

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

3.5.1 SPATIAL DATA

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

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 has further expanded with landform maps, which were widely used in various fields of hydrology, pedology, geoscience, urban and regional planning etc. Peranamallur Block is majorly engrossed with denudation origin pediment and pediplain complex and (Figure 3.1). Pediment is the low relied or plain with gentle slope area close to the foot of the mountains 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 activities while preparing CWRM plans.

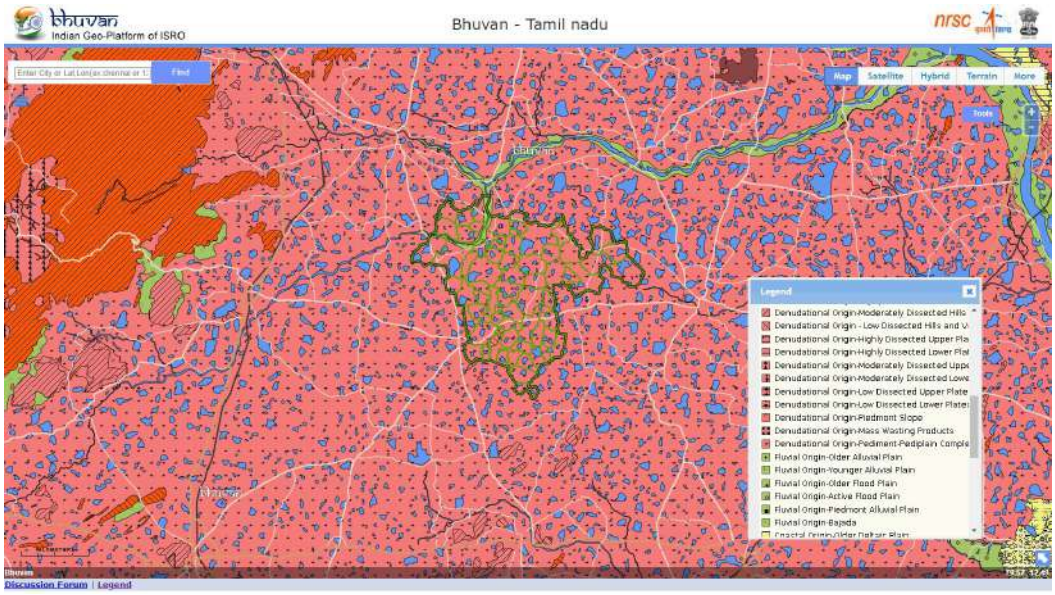


Figure 3.1. Geomorphology map

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 is represented with linear feature where two different landform converges or diverges. Lineament plays a significant role in identification of ground water and oil exploration sources. This site allows water to percolate at a high rate. GP wise lineament type in the Block is illustrated below. These observations are widely used to locate points of high-water flow especially in groundwater exploration.

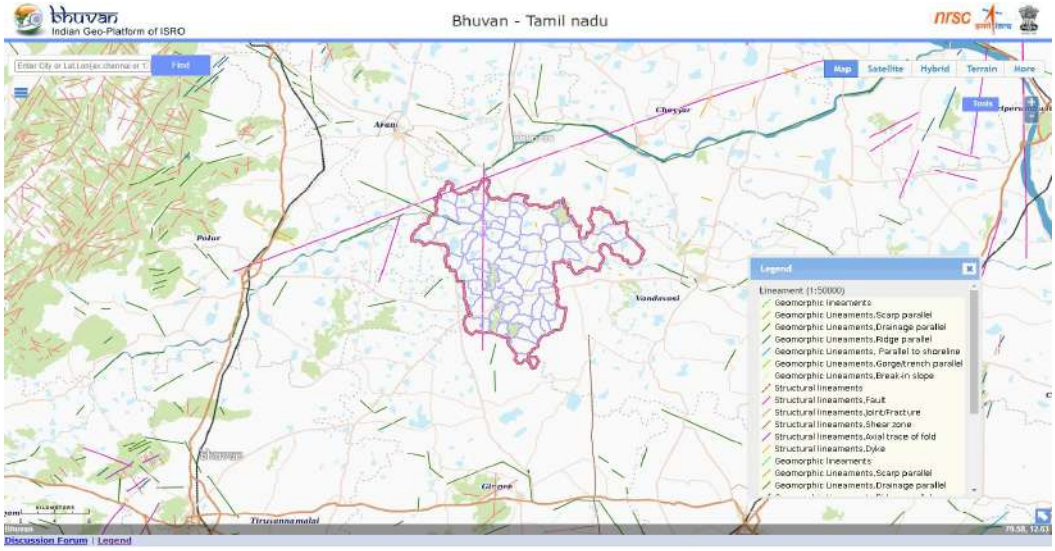


Figure 3.2. Lineament map

Lineament type	Gram Panchayat
eomorphic lineaments, Drainage parallel	Kolappalur, Gengapuram
tructural Lineament, Dykes	Injimedu
tructural lineament, Fault	Veppambattu, Nedungunam, Peranambakkam , Mela poondi, Konamangalam, Namathodu, Narayanamangalam, Mel sathamangalam, Nariyambadi, Anmarudai, Melanur

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. Major area of Block is under lower elevation range (grey color) except southern region (Figure 3.3). This map will be useful in identification of sites suitable for proposing activities related to water and soil conservation.

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

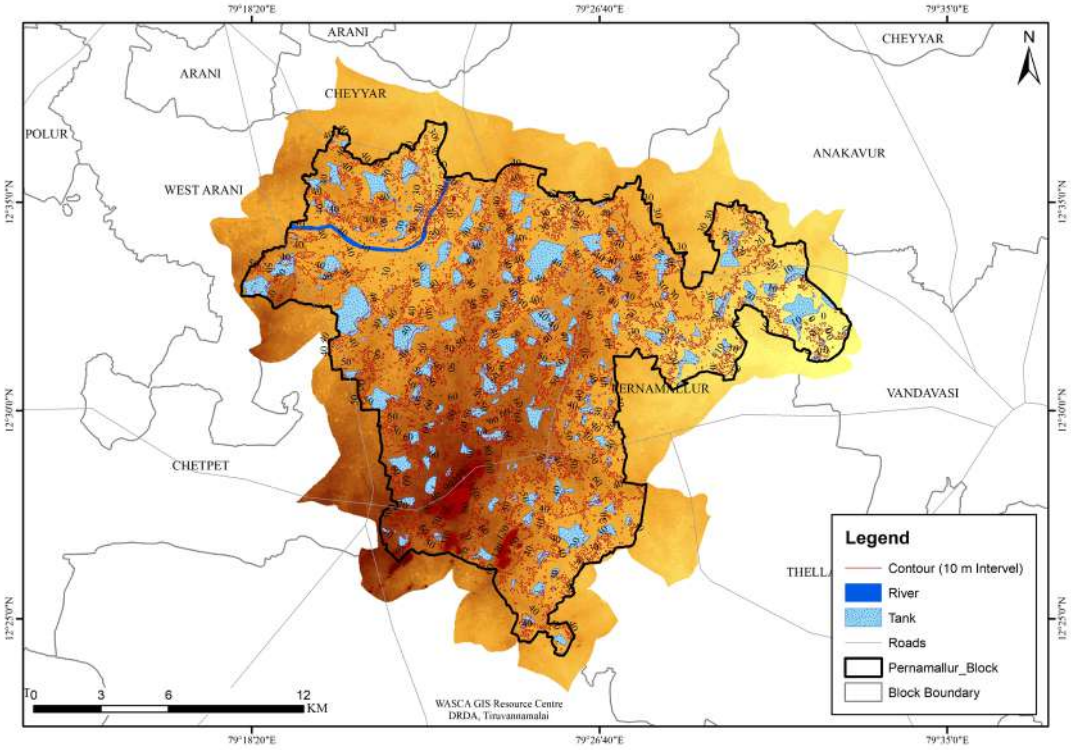


Figure 3.4. Contour map

3.5.1.5 Slope: The average slope of a terrain feature is calculated from contour lines on a topo map or DEM. Slope is typically expressed in percentage or angle, or in ratio. Slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. It is noticed that respect to the landform units the slope get varies in the Block (Figure 3.5). Very flat, flat and steep slope ranges were noticed in the Block. GP wise details are shown in the below illustration. Slope information plays a significant role in identification of soil eroded sites, depth profiles, also used in analyzing / proposing the soil conservation measures such as check dam, farm ponds etc.

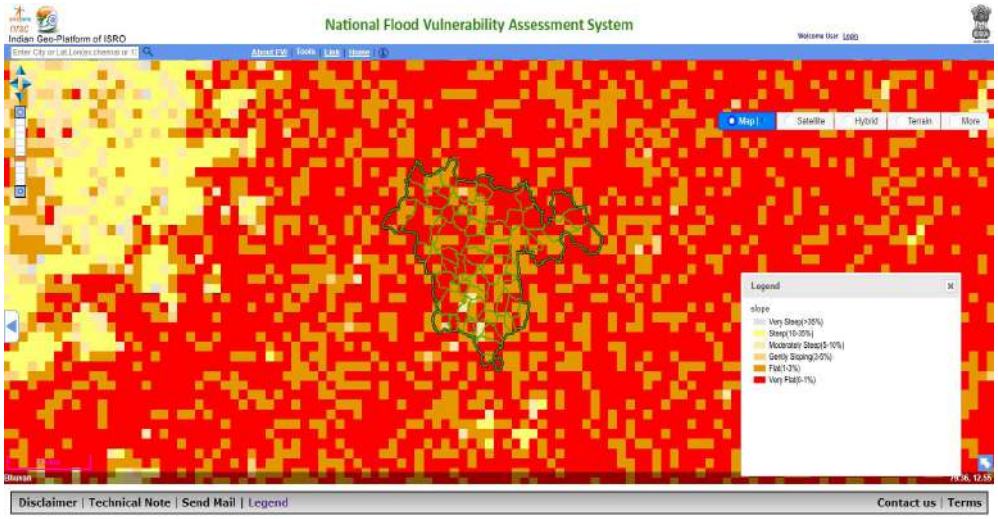


Figure 3.5. Slope map

Slope range	Area in %	Gram Panchayat
Very Flat (0-1%)	85%	Ariyapadi, Nambedu, Vilanallur, Ayalavadi, Marakkunam, Narayanamangalam, Melanur, Mela poondi, Visamangalam - 100%, Vinayagapuram, Nariyambadi, Konaiyur - 90%, Semmambadi, Namathodu, Injimedu - 60%, Kolappalur, Anadimangalam - 50%
Flat (1-3%)	75%	Anmarudai, Sudrakatteri - 90%, Gengapuram, Solaiarugavur, Endal, Kolipuliyur, Chandirambadi - 80%, Septankulam, Namathodu, Vallan, Gengapuram - 70%, Vallan, Injimedu - 60%
Steep (10-35%)	5%	Vayaloor, Avaniyapuram, Jagannathapuram, Mel villivalam

3.5.1.6 Drainage Network : 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 Peranamallur Block. Block area is drained with low dense drainage network (Figure 3.6). The dendritic pattern is characterized by irregular branching of tributary streams in all directions. Drainage network is referred in identifying the suitable sites for soil and water conservation measurements such as dams, ponds, bunding, restoration of gullied region etc.

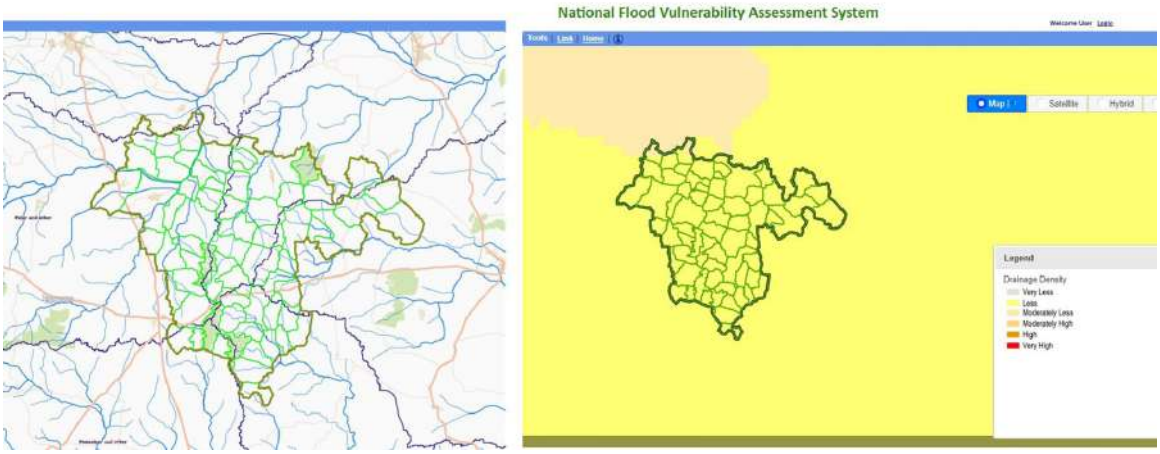


Figure 3.6. Drainage network and density map

3.5.1.7 Watershed: Implementation of any water management measure requires a suitable hydrological unit. A properly delineated watershed forms a convenient hydrological unit for computation of water balance parameters and thus implementation of water management schemes. Also, in achieving a better sustainability in development mainly NRM at the grass root level, watersheds are recognized as viable and effective management units and adopted in most of 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. Peranamallur 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 downstream.

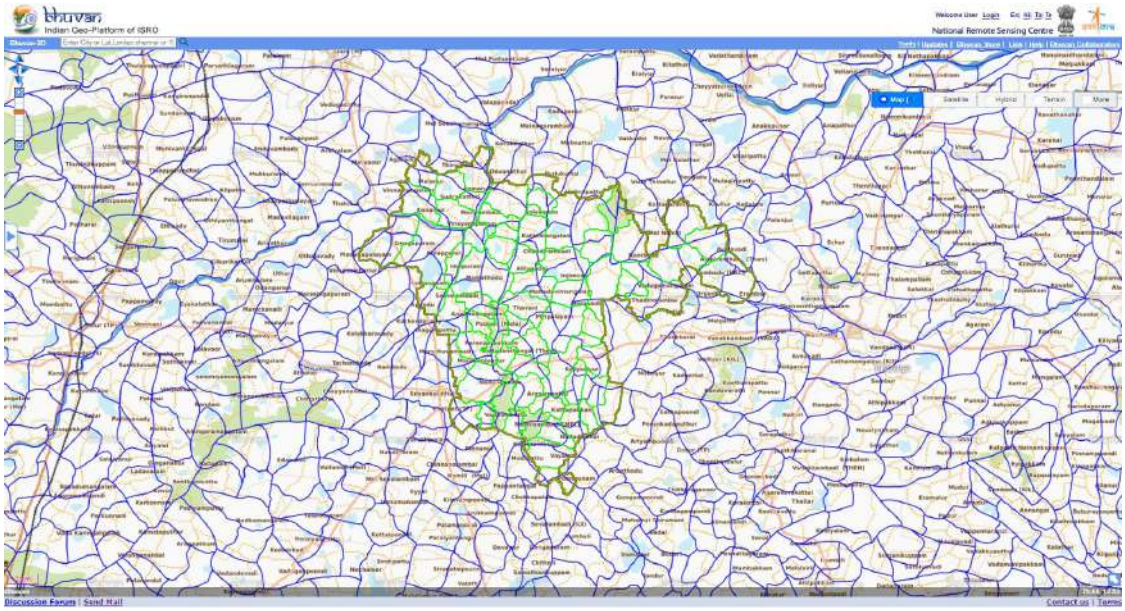


Figure 3.7. Watershed map

3.5.1.8 Ground water perspectives: Ground water (GW) is one of the important natural resources in semi-arid region like Peranamallur 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 is witnessed the enrich yield of 50-100 LPM in above 80 m deep well (Figure 3.8). The GPs wise detail of 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.

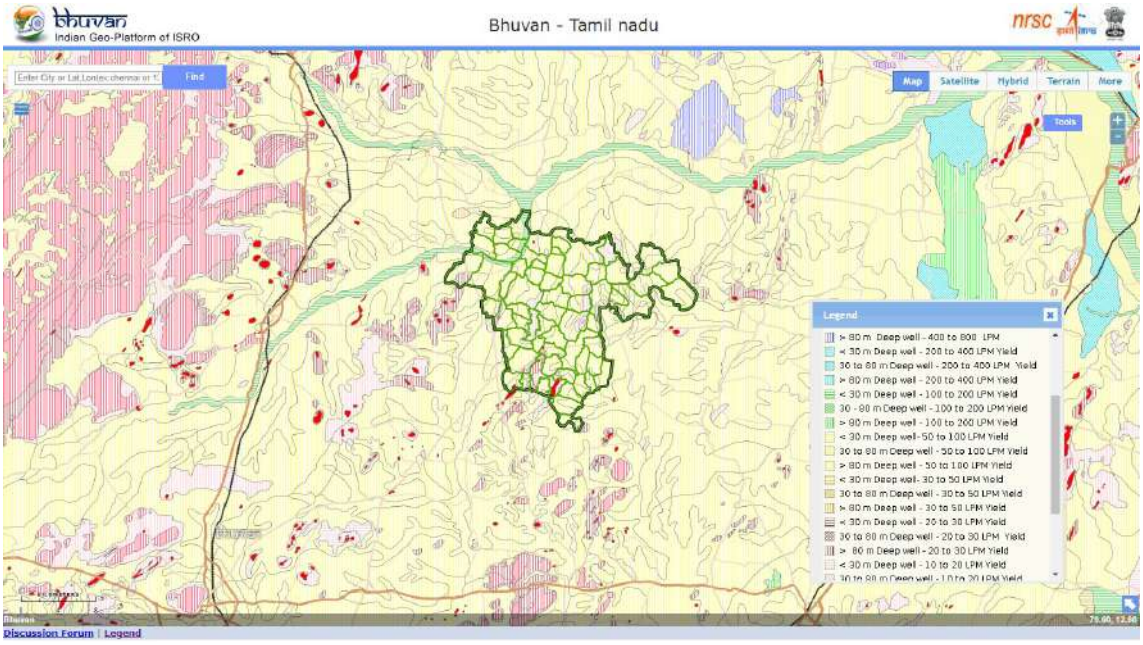


Figure 3.8. Ground water perspective map

Groundwater Prospects	Area in %	Gram Panchayat

› 80 m Deep Well- 50 to 100 LPM Yield

99%

Aliyur, Alliyandal, Anaibogi, Anadimangalam, Arasambattu, Ariyapadi, Avaniyapuram, Ayalavadi, Chandrambadi, Endal, Erumbur, Imapuram, Isakolathur, Jagnnathapuram, Kalyanapuram, Kolipuliyur, Konaiyur, Konamangalam, Kottupakkam, Madam, Mahadevimangalam, Marakkunam, Melanur, Melapoondi, Melathangal, Melnandhiyambadi, Melsathamangalam, Melvillivalam, Morakaniyanur, Nalladisenai, Namathodu, Nambedu, Narayanamangalam, Poongunam, Nedungunam, Pernambakkam, Septankulam, Solaiarugavur, Solavaram, Sudrakatteri, Thadinolambai, Thavani, Vallam, Vayaloor, Veppambattu, Villanallur, Visamangalam - 100%, Kolappalur - 95%, Nariyambadi, Vinayagapuram - 80%, Anmarudai - 70%

› 80 m Deep Well- 100 to 200 LPM Yield

19%

Anmarudai - 30%, Nariyambadi, Vinayagapuram - 20%, Kolappalur - 5%

› 80 m Deep Well- 20 to 30 LPM Yield

30%

Gengapuram, Injimedu - 40%, Mosavadi, Ragunathasamudram - 20%

3.5.2 NON SPATIAL DATA

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

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

Sl. No.	Key CWRM Parameter	Extent
	Canal Network	
1	Length of Main Canal (m)	656
2	Length of Minor Canal (m)	1,747
3	Length of Distributaries (m)	61,531
4	Water Courses (Field Channels) (m)	1,000
	Traditional waterbodies	
5	Number of Tanks (PWD & Union) (No.)	111
6	Number of Ooranis (No.)	240
	Irrigation Facilities (ha)	
7	Tank Irrigation	316.10
8	Open & Tube Well Irrigation	6,605.90
	Catchment Area wise Available Runoff (ha.m)	
9	Good Catchment Area	2,414.10
10	Average Catchment Area	245.80
11	Bad Catchment Area	3,197.80
	Watershed and Drainage Networks	
12	Length of Natural Drainage Lines (m)	1,10,861
13	Number of Natural Drainage Lines (No.)	166
14	Number of Micro Watersheds (No.)	222
	Water Demand	
15	For Humans (ha.m)	231.78
16	For Livestock (ha.m)	124.28
17	For Agriculture (ha.m)	5,168.87
18	GW Utilization for Drinking (%)	67.75
19	GW Utilization for Livestock (%)	86.23
20	GW Utilzation for Agriculture. (%)	97.63
21	SW Utilization for Drinking (%)	32.25
22	SW Utilization for Livestock (%)	13.77
23	SW Utilization for Agriculture (%)	2.37

3.5.2.1 Existing Water Structures

The Block has structured traditional water storage units as tanks, ponds and Ooranis which are the life line for their lives and livelihoods. The Block has 111 tanks and 240 Ooranis (Figure 3.9).

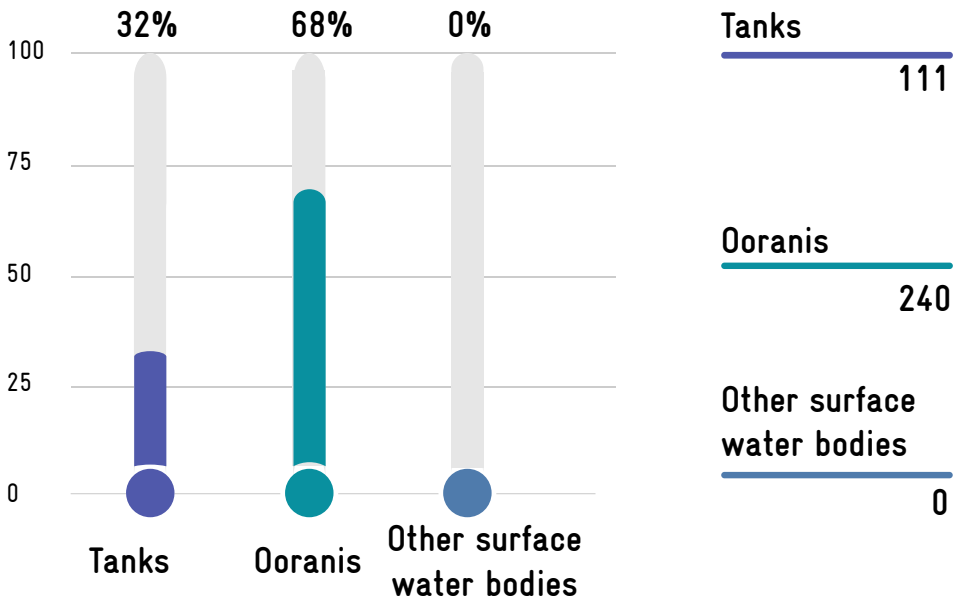


Figure 3.9. Traditional waterbodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the Block is 6,922 ha, of which 95.4 % (6,605.9 ha) is irrigated through open & tube well remaining is from tank-based irrigation (Figure 3.10).

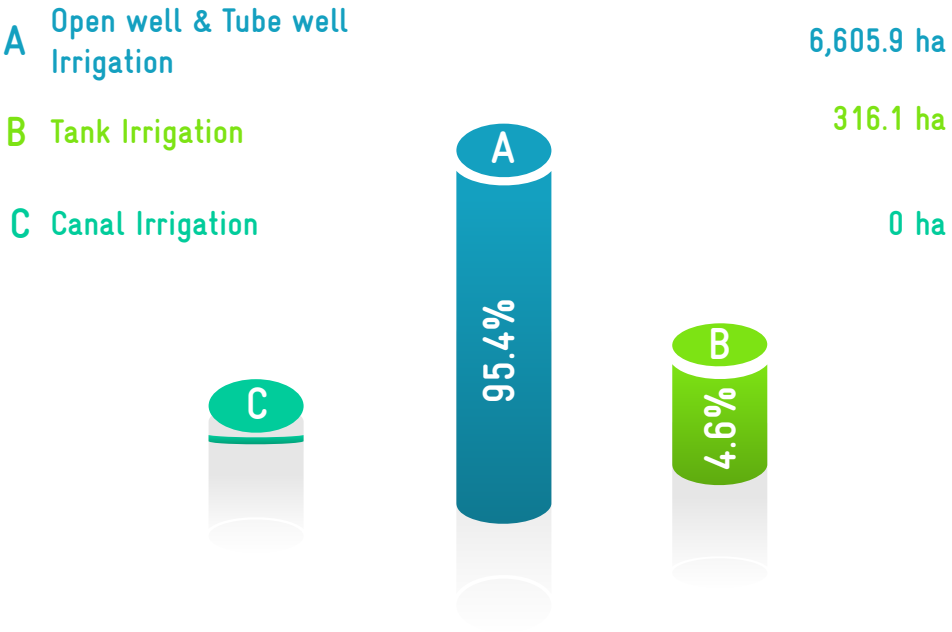


Figure 3.10. Irrigation Sources

3.5.2.3 Available run-off

The available runoff in catchment area is 5,897.7 ha.m, out of which 41.21 % (2,414.1 ha.m) comes fromr good catchment area, 4.2 % (245.8 ha.m) comes from average catchment area and 54.59 % (3,197.8 ha.m) comes from bad catchment area (Figure 3.11).

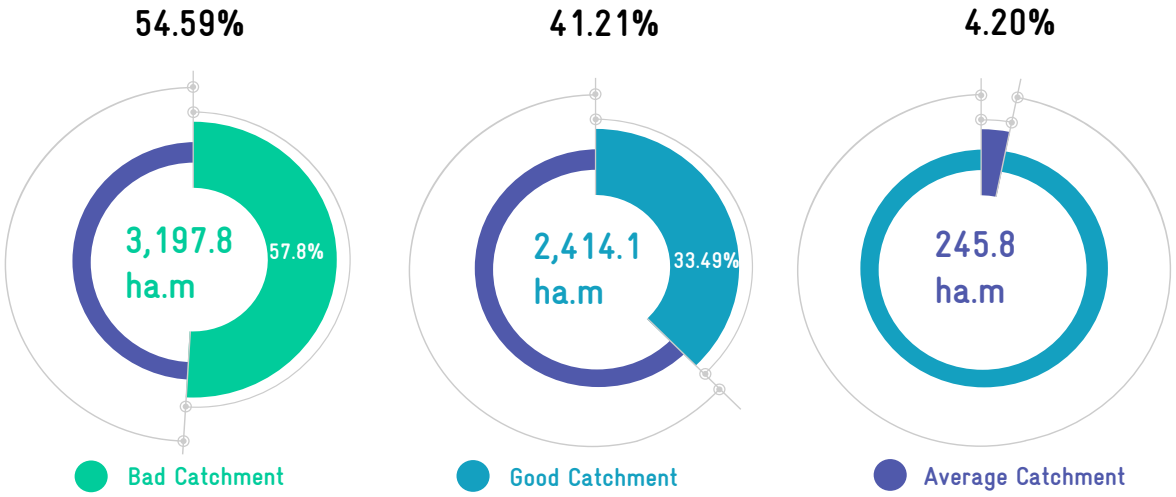
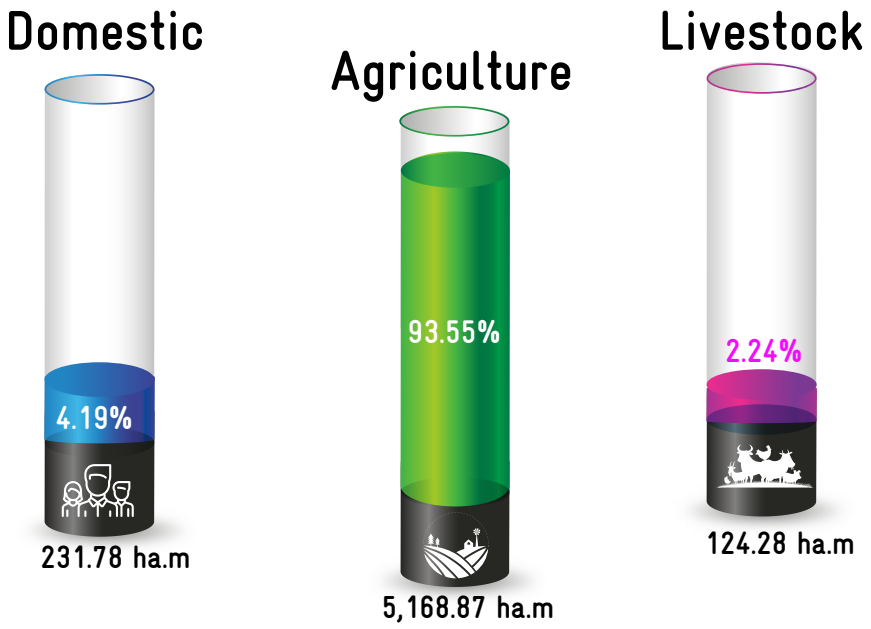


Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 5,524.93 ha.m. In which 231.78 ha.m for domestic, 124.28 ha.m for livestock and 5,168.87 ha.m for agriculture sector.



In the Block, utilization of ground water is more than surface water. About 97.63 % for agriculture purpose, 86.23 % for livestocks and 67.75 % for domestic purpose is met through groundwater (Figure 3.12).

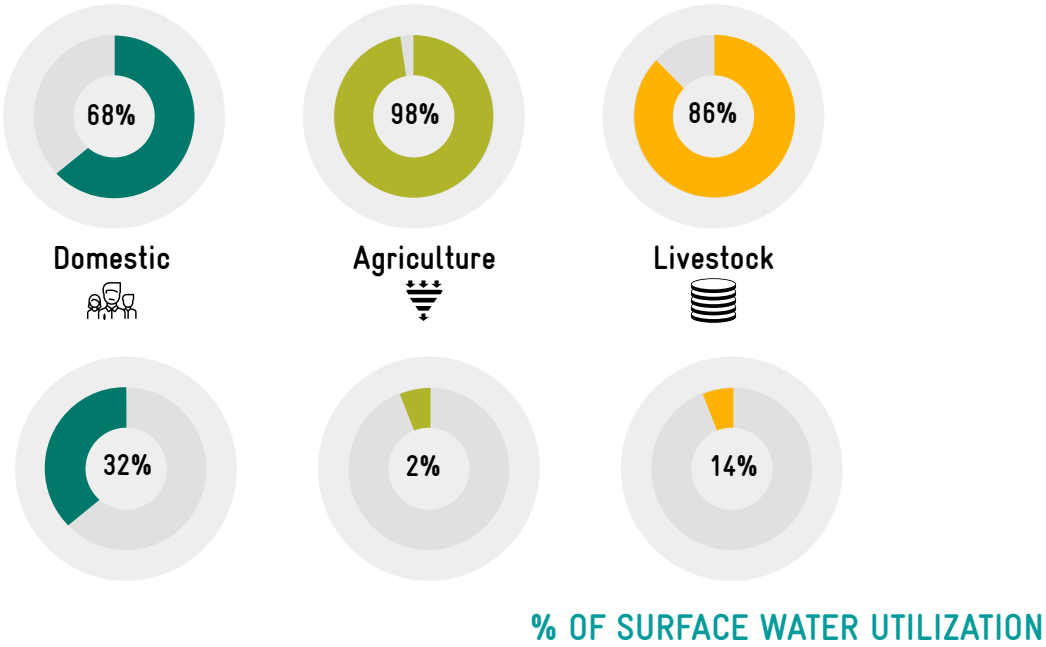


Figure 3.12. Sector wise water utilization

3.6 CWRM PLANNING ANALYSIS-AGRICULTURE

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

3.6.1 SPATIAL DATA

To understand Peranamallur Block's problems, Bhuvan based spatial data of LULC, waste land, salt affected land, soil erosion and soil texture was referred to, for drafting scientific key water actions.

3.6.1.1 Soil texture: The District has diverse soil types and predominant in vertisol and alfisol, with reference to soil texture the proportion of fine loamy texture type soil is dominant in the Block (Figure 3.13).

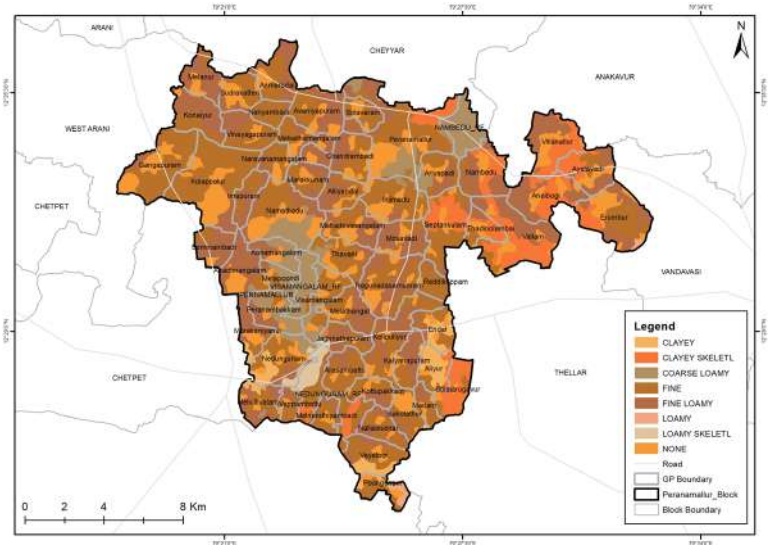


Figure 3.13. Soil texture map

3.6.1.2 Soil erosion: Soil erosion is a natural process of displacement of upper layer of soil caused by dynamic erosion agents that is, water, air, plants and humans. Sheet erosion is witnessed in the Block (Figure 3.14). GP wise detailes of soil sheet erosion area is illustrated in the table below. The soil eroded units will act as a direct input while preparing plans for soil conservation and watershed management activities.

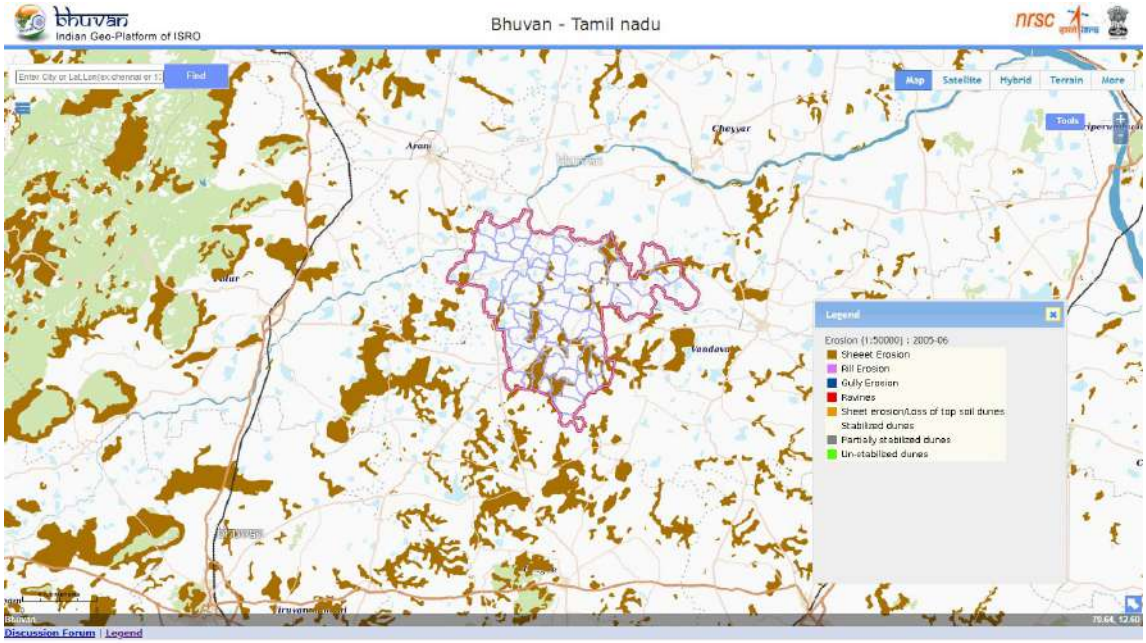


Figure 3.14. Soil erosion map

Area in %	Gram Panchayat
Sheet Erosion	
39%	Kalyanapuram - 90%, Aliyur, Kolipuliyur, Solaiarugavur - 70%, Ayalavadi - 60%, Gengapuram, Namathodu - 30%, Anaibogi, Injimedu, Mosavadi - 20%, Alliyandal, Chandirambadi - 10%, Septankulam - 5%

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

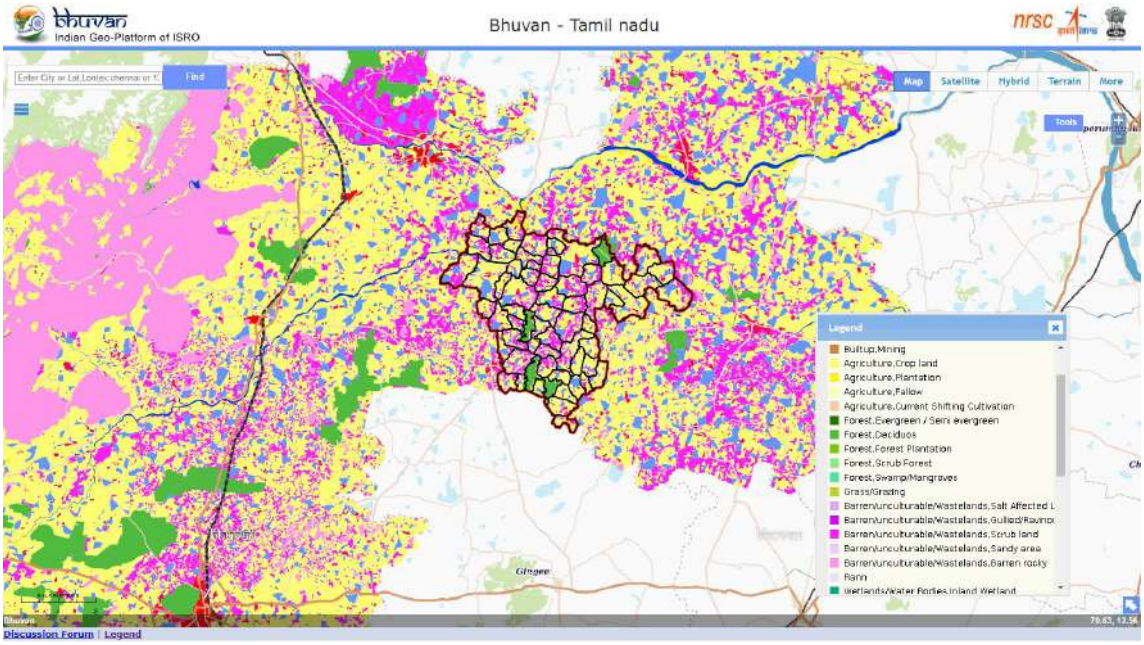
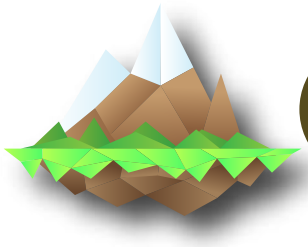


Figure 3.15. Land Use Land Cover map

Land Use	Area coverage in %	Gram Panchayat

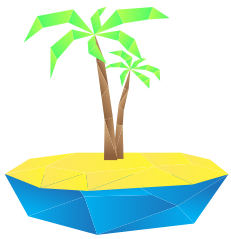
Barren Lands



56%

Jagannathapuram, Melathangal - 90%, Arasampattu - 80%, Nedungunam - 70%, Injimedu, Mosavadi, Gengapuram, Ragunathasamudram - 60%, Chandi-rambadi, Ariyapadi, Avaniyapuram, Konaiyur - 40%, Anmarudai, Anadimangalam - 30%

Agriculture crop lands and Plantation



72%

Poongunam, Vayaloor, Nalladisenai - 90%, Isako-lathur, Kottupakkam, Kalyanapuram, Imapuram, Narayanamangalam - 80%, Kolappalur, Semmambadi, Gengapuram, Aliyur, Solaiarugavur, Endal, Kolipuliyur - 70%, Namathodu, Vallan, Nambedu, Ayalavadi, Nariyambadi - 60%, Vilanallur - 50%

3.6.1.4 Waste land: A parcel of land which is not suitable for any agricultural activity and mostly covered with dense or open scrub is called as wasteland. Data on wastelands acts as a direct input in the preparation of plans for land development activities or greenery. Wasteland parcels of scrub land is noticed in the Block (Figure 3.16).

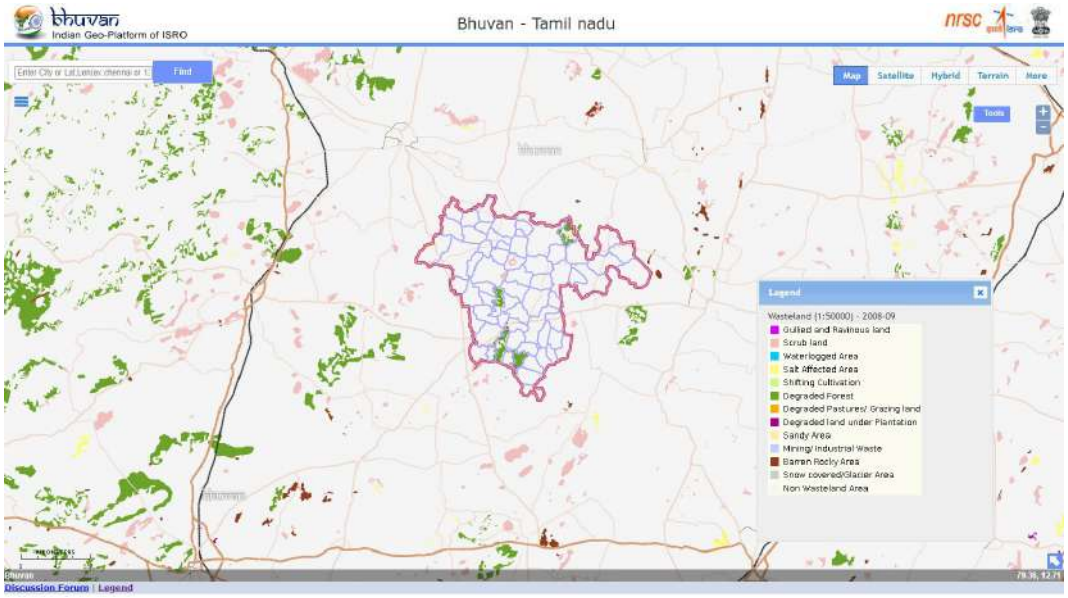


Figure 3.16. Wasteland map

Wasteland type	Area in %	Gram Panchayat
Scrub Land	6%	Namathodu - 10%, Alliyandal , Septankulam, Gengapuram, Nedungunam - 5%

3.6.1.5 Salt affected area: Gengapuram witnessed the moderate sodic affected land of five percent in the Block (Figure 3.17). This data helps in making plans on soil conservation measures, mainly reducing salinization activities and suggest alternative cropping.

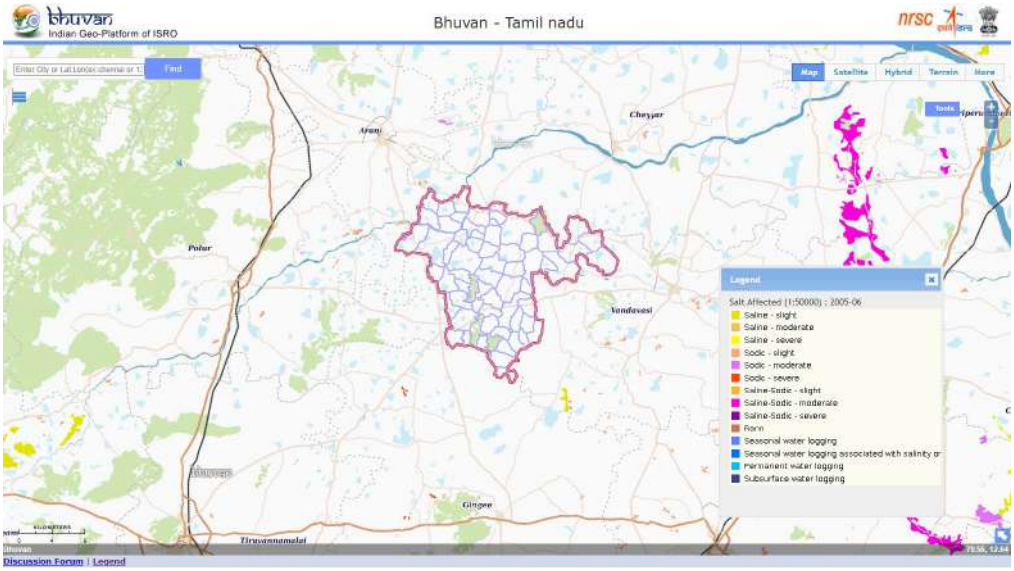


Figure 3.17. Salt affected area map

Thematic unit	Area in %	Gram Panchayat
Sodic-moderate		
	5%	

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 Government sources (Table 7). The key CWRM parameters of agriculture area for all GPs are tabulated in Annexure 3.7.

TABLE 7. CWRM PARAMETERS BASED AGRICULTURE AND ALLIED ACTIVITIES RESOURCES IN THE BLOCK

Sl. No.	Key CWRM Parameter	Extent
	Land Resources (ha)	
1	Non-Agricultural Uses	6,075.86
2	Barren & Un-cultivable Land	361.17
3	Permanent Pastures and Other Grazing Land	292.12
4	Land Under Miscellaneous Tree Crops etc.	185.94
5	Cultivable Waste Land	396.84
6	Fallows Land other than Current Fallows	889.12
7	Current Fallow land	5,498.84
8	Unirrigated Land	4,116.02
9	Area Irrigated by Source	6,595.56
	Land under Catchment Area (ha)	
10	Good Catchment	6,437.03
11	Average Catchment	874.90
12	Bad Catchment	17,099.54
	Crop Details	
13	Irrigated Area (ha)	3,744.67
14	Rain fed area (ha)	298.55
15	Paddy Cultivation (ha)	3,094.05
16	Crop Water Requirement - Irrigated condition (ha.m)	5,056.67
17	Crop Water Requirement - Rain fed condition (ha.m)	112.17
	Soil Resources: Status of Available Nitrogen (%)	
18	Very Low	17.36
19	Low	81.71
20	Medium	0.93
	Status of Organic Carbon (%)	
21	Very Low	16.97
22	Low	80.62
23	Medium	2.09
24	High	0.22

25	Very High	0.10
	Status of Soil Micro Nutrients (%)	
26	Sufficient	62.40
27	Deficient	37.60
	Status of Physical condition of the soil (%)	
28	Moderately Acidic	0.03
29	Highly Acidic	0.06
30	Moderately Acidic	5.42
31	Slightly Acidic	5.89
32	Neutral	2.99
33	Moderately Alkaline	85.61
	Soil Texture (%)	
34	Clay soil	9.60
35	Fine Soil	69.30
36	Coarse loamy	6.32
37	Soil Water Permeability (Low, Moderate, high)	Moderate
	Soil moisture and ET	
38	Volumetric Soil Moisture (%)	23
39	Estimated Soil Moisture (ha.m)	4,217.19
40	ET Losses (ha.m)	8,823.93
	Means of Water Extraction (%)	
41	Gravity	4.61
42	Lifting	95.39
	Irrigation Methods (%)	
43	Wild Flooding	1.31
44	Control Flooding	98.69
	Livestock (No.)	
45	Cattle Population	31,591
46	Sheep Population	9,708
47	Goat Population	7,937

3.6.2.1 Land Use

The standard land use classification helps to understand the distribution and extent of different land use categories. As the runoff and water harvesting actions are linked to the land use systems, its distribution across the geographical boundary of the Block is necessary to take decisions. Of the total land area of 24,411.47 ha, 27.02 % of land is irrigated through sources, followed by 24.89 % area land is under non-agriculture uses and 22.53 % is current fallow land. Less than 1% area is pastures or grazing land and land under miscellaneous tree crops (Figure 3.18).

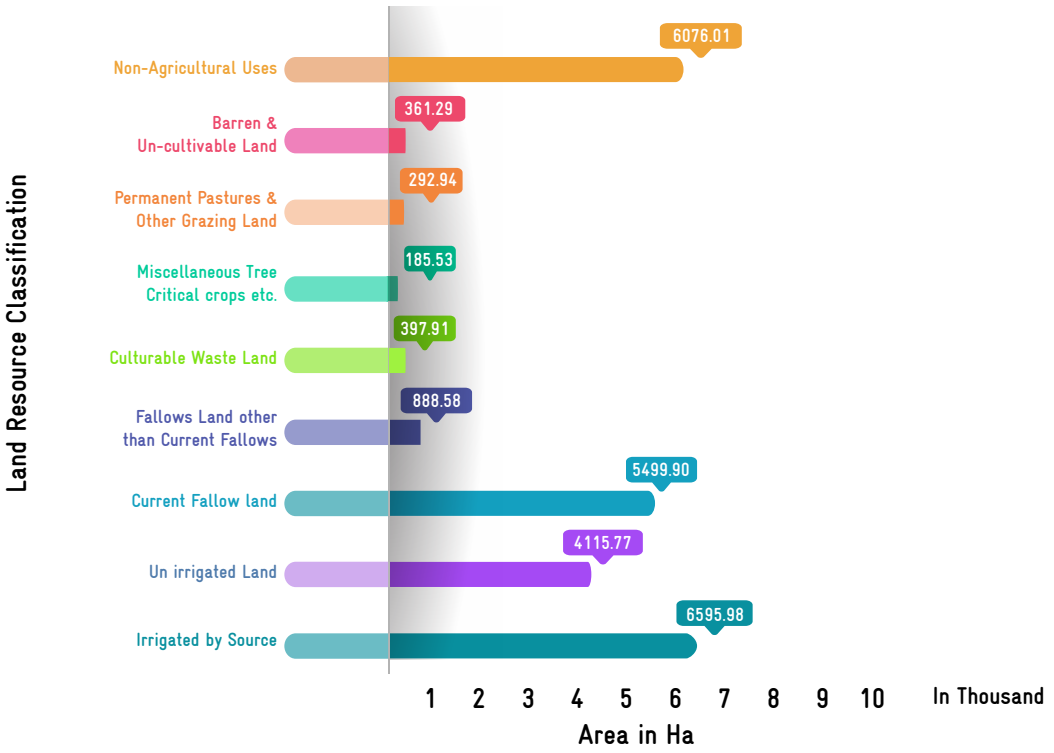


Figure 3.18. Land Utilization

3.6.2.2 Catchment Area

The land use types in each of the GPs are categorized into three different types of runoff: Good, Average and Bad Catchment area. Out of total catchment area (24411.47 ha), the highest of 70.05 % area is from bad catchment area followed by 26.37 % from good catchment area and the rest is from average catchment area (Figure 3.19). The run-off generated through bad catchment is higher than the good catchment. This information helps to prioritize and propose treatment activities.

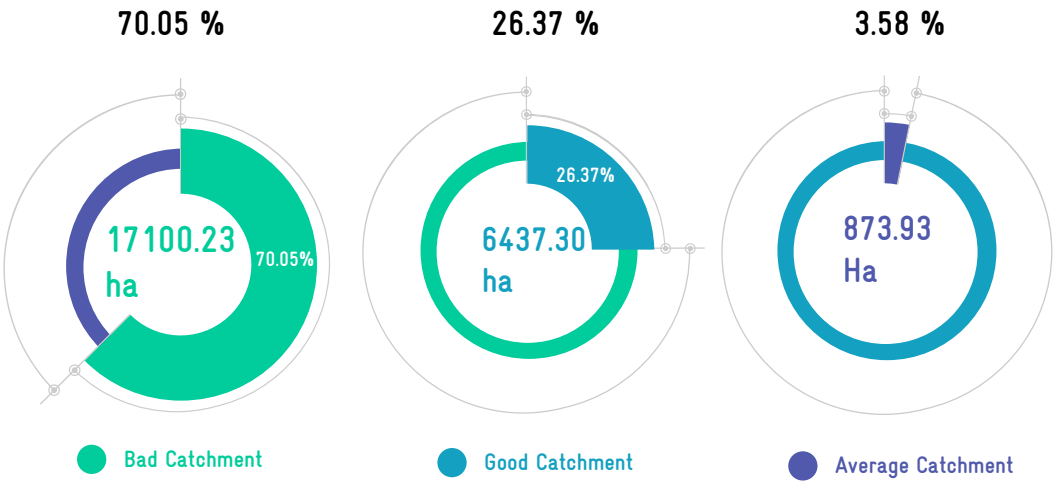


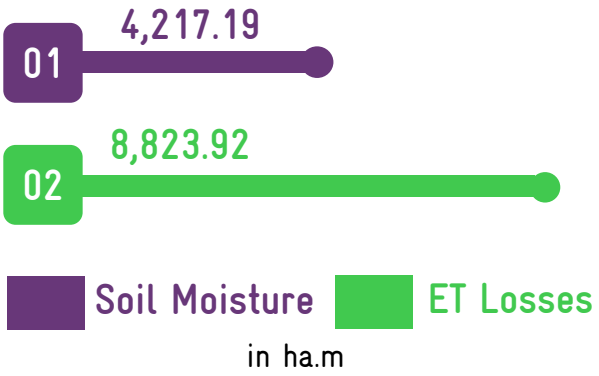
Figure 3.19. Catchment area

3.6.2.3 Soil moisture

Soil is an important medium to store the available water and the storage capacity varies with the type of soil especially its textural composition. In overall composite water budgeting, estimation of stored water in the soil assumes greater significance in this Block because of its significant proportion of area under rain-fed cultivation. The annual average volumetric soil moisture of this Block (23%), is taken for estimating the amount of water stored as soil moisture which accounts to 4,217.19 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 8,823.92ha.m.



3.6.2.5 Macro soil nutrients
Nitrogen Status

The macro soil nutrients such as nitrogen and organic carbon falls under very low to medium category in the total number of soil samples tested. The available nitrogen is very low in 17.36 % of the samples tested while it was 81.71 % under low category and 0.93 % of medium (Figure 3.20). According to soil resource map, this Block is identified as one of the nitrogen deficient Block (Tiruvannamalai District profile 2020).

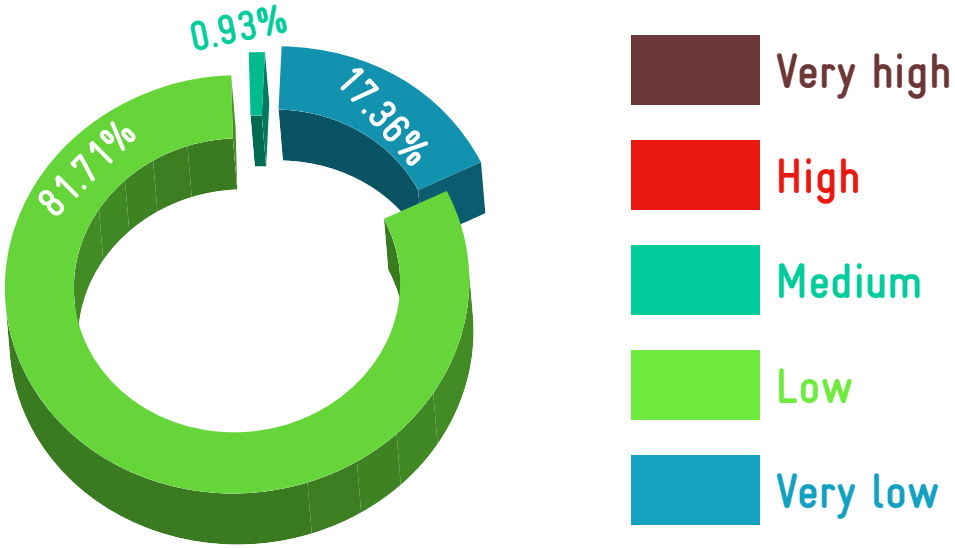


Figure 3.20. Status of available Nitrogen

Organic Carbon Status

A similar trend has been recorded for soil organic carbon. Soil organic carbon varied from very low to medium category in this Block. The highest of samples witnessed a low percentage (80.62 %) of organic carbon content (Figure 3.21). This indicates that the soil fertility is very poor and further intensive practices make soil more vulnerable to degradation over a period of time.

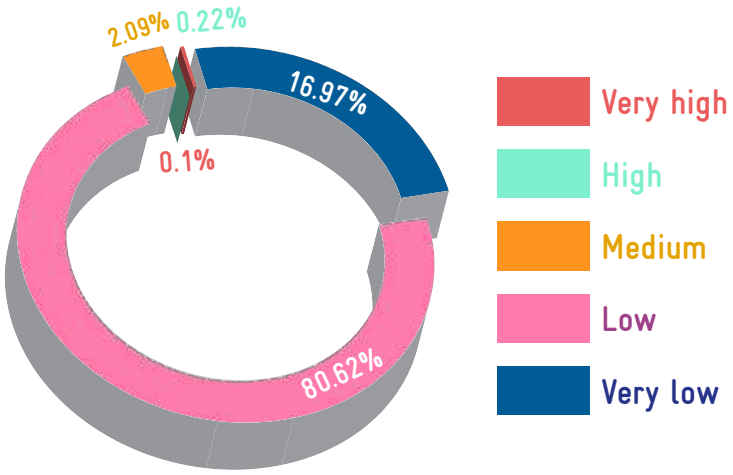


Figure 3.21. Status of soil Organic Carbon

3.6.2.6 Status of the soil micro nutrients

This Block is one of the zinc deficient Blocks of Tiruvannamalai District. Of the soils tested, the micro nutrient status of the soil with specific reference to Manganese, Boron and Zinc, Ferrous, Copper, and Sulphate are deficient in 37.60 % and 62.40 % sufficient (Figure 3.22).

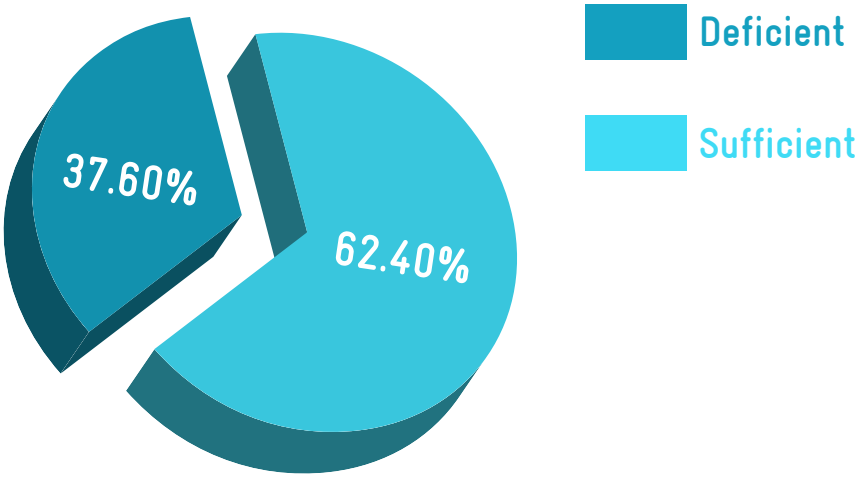


Figure 3.22. Status of soil micro nutrients

3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 85.61% of the soil is moderately alkaline in nature, rest is acidic variations, except 2.99 % is neutral in nature (Figure 3.23).

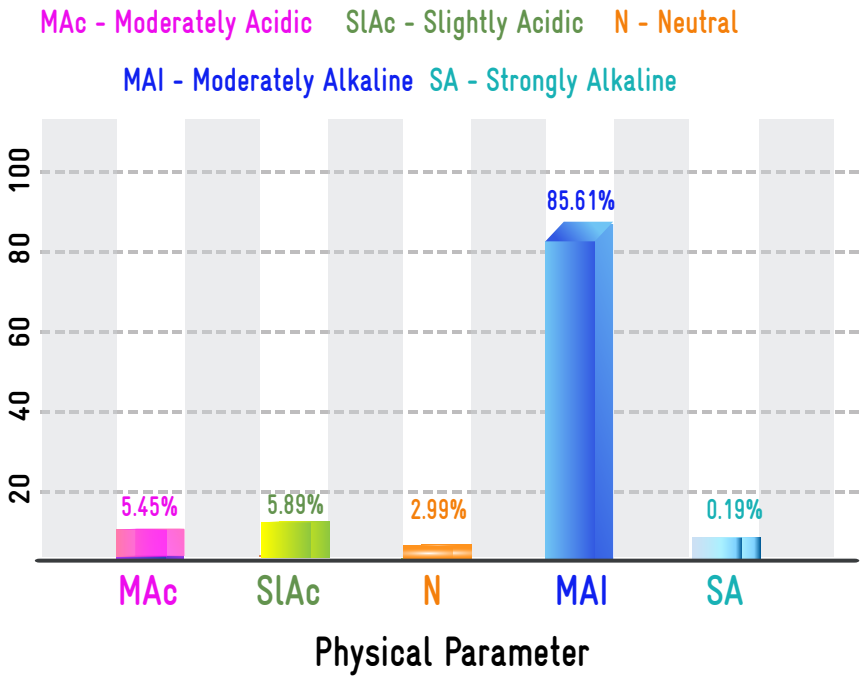


Figure 3.23. Status of pH of soil

3.6.2.8 Cropping pattern and the irrigation

The total of 7,760.94 ha of land is used for crop cultivation, of which 74.05 % area is under irrigation practices and remaining is under rain-fed cultivation. Overall, Paddy crop land shares the highest cultivation area of 41.21 % while other pulses, horticulture crops shares less than a percent of total cultivated area (Figure 3.24). Within irrigation land Paddy is the predominant crop and accounts for about 56 % followed by ground nut (36 %) while ground nut is dominant in rain-fed area (84 %).

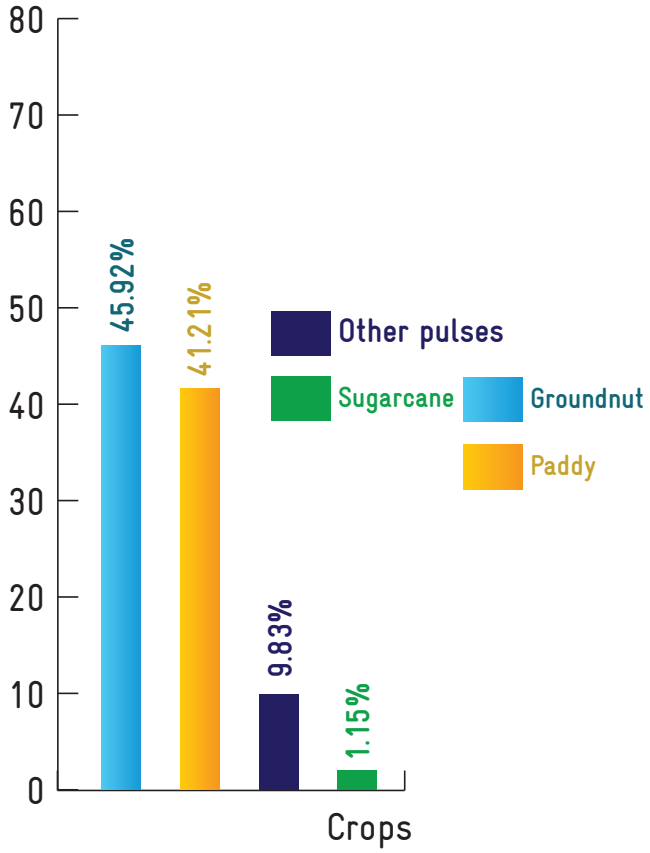


Figure 3.24. Cropping pattern

3.6.2.9 Irrigation methods

In case of surface water resources, wild flooding is the primary method of irrigation. But in case of ground water resources, the predominant type of irrigation is controlled flooding. In the Block, 98.69 % of the irrigation is done by control flooding and rest is of wild flooding irrigation (Figure 3.25).

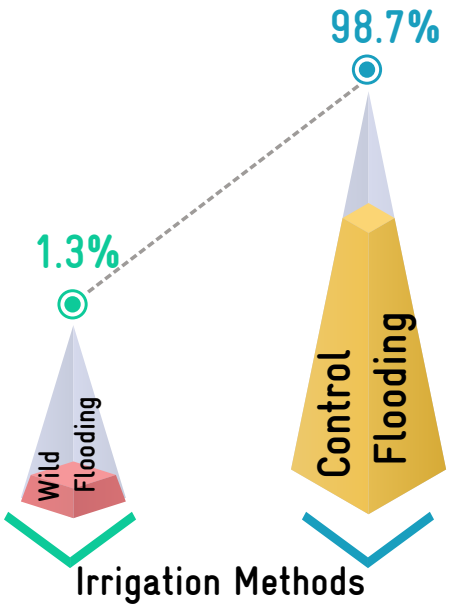


Figure 3.25. Irrigation methods

3.6.2.10 Means of water extraction

In the Block, water is extracted in two ways: gravity and lifting from the sources. The water is drawn from surface water sources such as tanks, ponds etc., by using gravity method and that of ground water sources such as open well, hand pump, bore well by using lifting method. In the District, since the dependence on ground water sources is more, 95.39 % of the water extraction is through lifting means of extraction and only 4.61 % is through gravity means of water extraction (Figure 3.26).

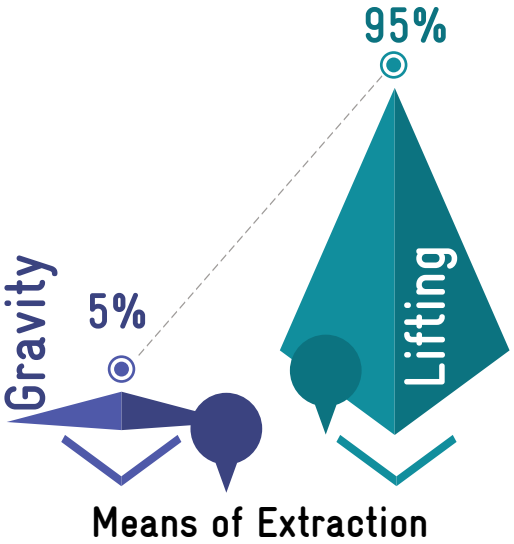


Figure 3.26. Means of water extraction

3.6.2.11 Livestock details

The Block has a total livestock population of 49,239 which includes, cattle, sheep and goats. The small ruminants such as sheep and goat constitute 19.72 % and 16.12 % respectively of the total livestock. Cattle population is higher in this Block at 64.16 % (Figure 3.27). The total water requirement for livestock is 124.28 ha.m. Of the total water demand, 86.23 % is met through ground water and remaining 13.77 % is from surface water resources.

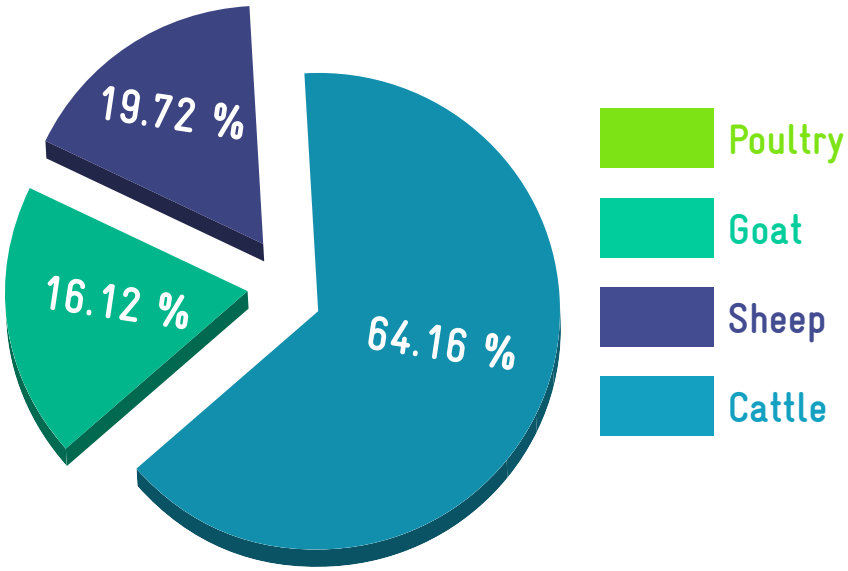


Figure 3.27. Livestock details

3.7 CWRM PLANNING ANALYSIS-SOCIO-ECONOMIC

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

TABLE 8. CWRM PARAMETERS BASE SOCIO-ECONOMIC STATUS IN THE BLOCK

Sl. No	Socio-economic Parameter	Total
1	Geographical Area	24,465
2	Male Population (No.)	42,439
3	Female Population (No.)	42,222
4	Total Population (No.)	84,661
5	SC Population (No.)	18,530
6	ST Population (No.)	1,134
7	Vulnerable population (No.)	19,664
8	Households (HH's) (No.)	23,245
9	Only one room HH's (SECC) (No.)	3,101
10	Female Headed HH's (SECC) (No.)	1,642
11	Vulnerable Households (SECC) (No.)	2,666

12	Vulnerable Households (%)	11.5
13	Registered MGNREGA Job cards (Persons)	35,417
14	Active person working in MGNREGA job Cards (Persons)	24,998
15	Drinking Water Sources (No.)	19,615
16	Ground Water - Drinking source (No.)	226
17	Surface water - Drinking source (No.)	110
18	Sum of drinking water sources (No.)	336
19	HH's have tap water connection for drinking water (No.)	11,425
20	HH's dependent on other sources for drinking water (No.)	4,668
21	Annual Greywater Generation (ha.m)	154

3.7.1 Population:

The total population of the Block is 84,661*, of which the proportion of male are slightly higher than female (Figure 3.28). In the CWRM planning process due attention is given for the intersecting variables such as gender, class, caste and marital status and availability of safe drinking water resources. In the Block, about 23 % of the total population constitute vulnerable population.

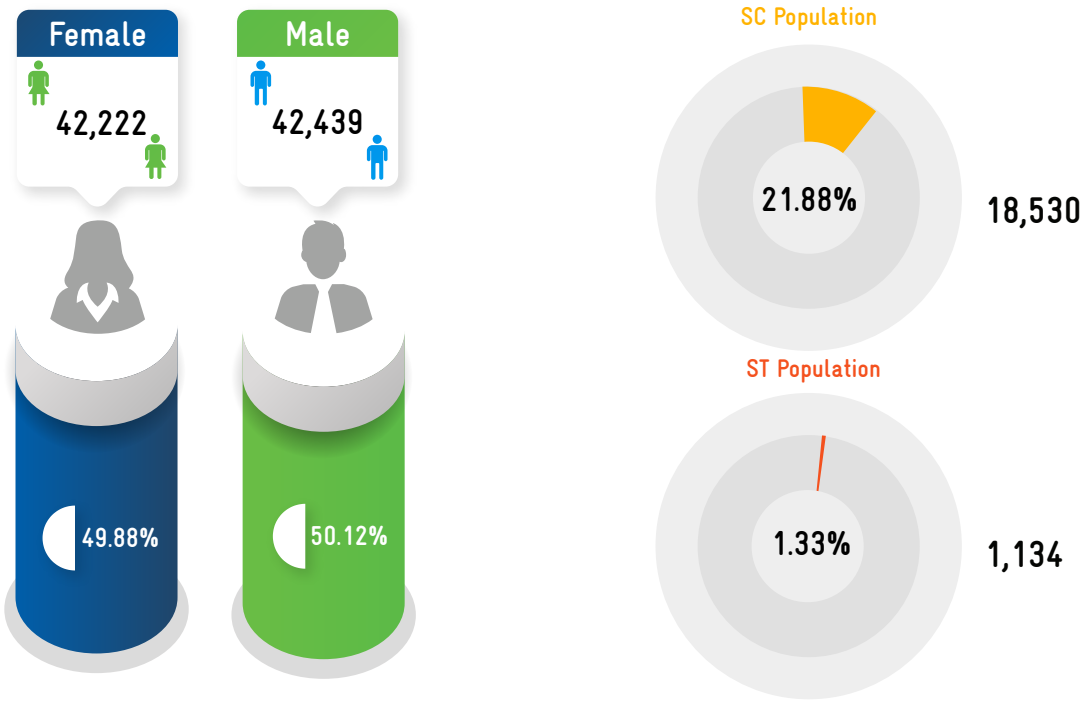


Figure 3.28. Population details

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

3.7.2 Households

There are a total of 23,245 households in which 13.34 % households have only one room, 7.06 % households are headed by women and 11.47 % are vulnerable households (Figure.3.29)

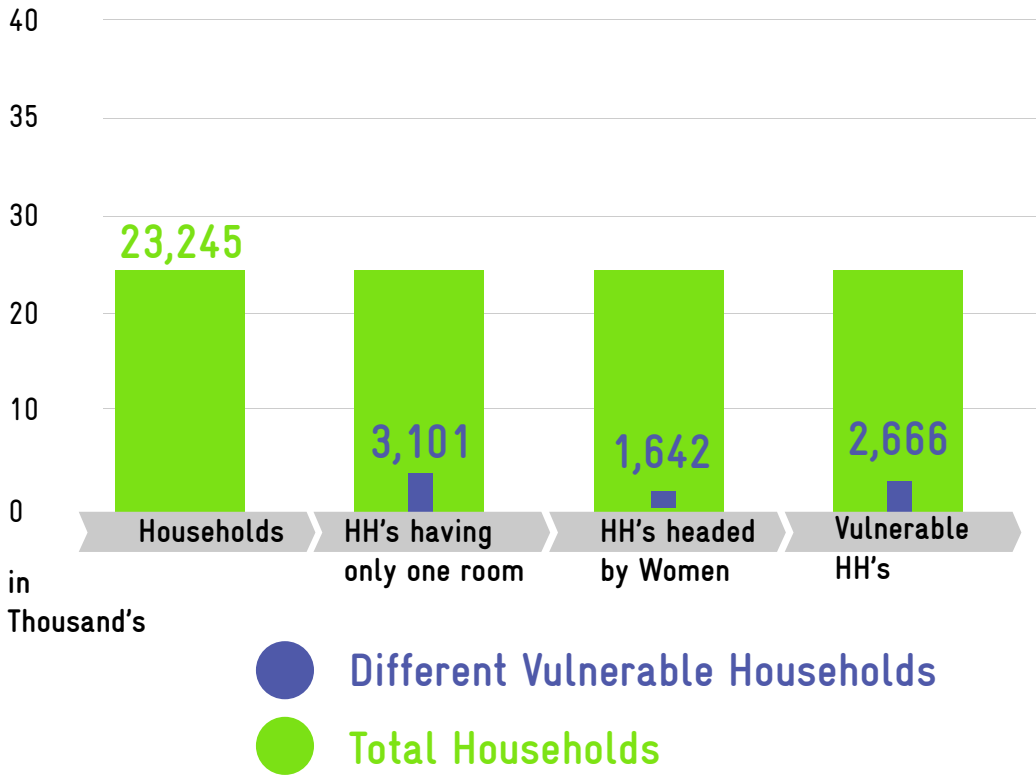


Figure 3.29. Details of Households

3.7.3 Status of Mahatma Gandhi NREGA - job card status

In the Block, of the total population of 84,661, 42 % are registered for job cards in Mahatma Gandhi NREGA scheme, in which 71% of the job cards are in active category (Figure 3.30)

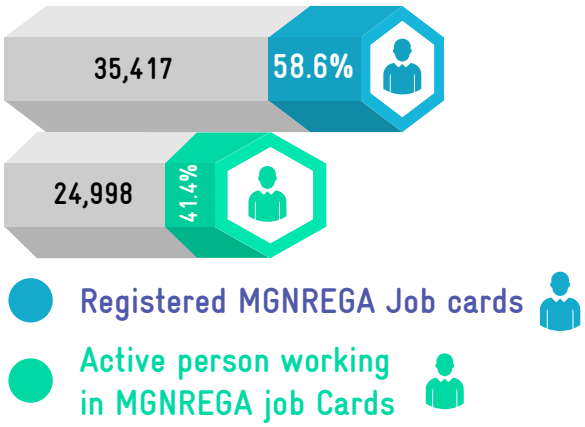


Figure 3.30. Status of MGNERGA job cards

3.7.4 Drinking Water Sources

Only 11,425 households have tap water connection and the rest of the population is dependent on other ground water sources, which include RTRWHS / Tanka (Roof Rain water harvesting systems, hand pump, open wells, bore wells, tank/ pond/ oorani, springs and river/ streams.

Tap water connection

11,425
Households

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

11,820
Households

3.7.5 Annual Greywater Generation

The grey water generation estimated across this Block is 154 ha.m which is available for reuse or recycle.

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

Morphology

Kolappalur, Injimedu, Veppambattu, Nedungunam

Wasteland

Jagannathapuram, Melathangal, Arasampattu, Nedungunam

Soil erosion

Kalyanapuram, Aliyur, Kolipuliyur, Solaiarugavur

Upland/Slope

Vayaloor, Avaniyapuram, Jagannathapuram, Mel-Villivalam

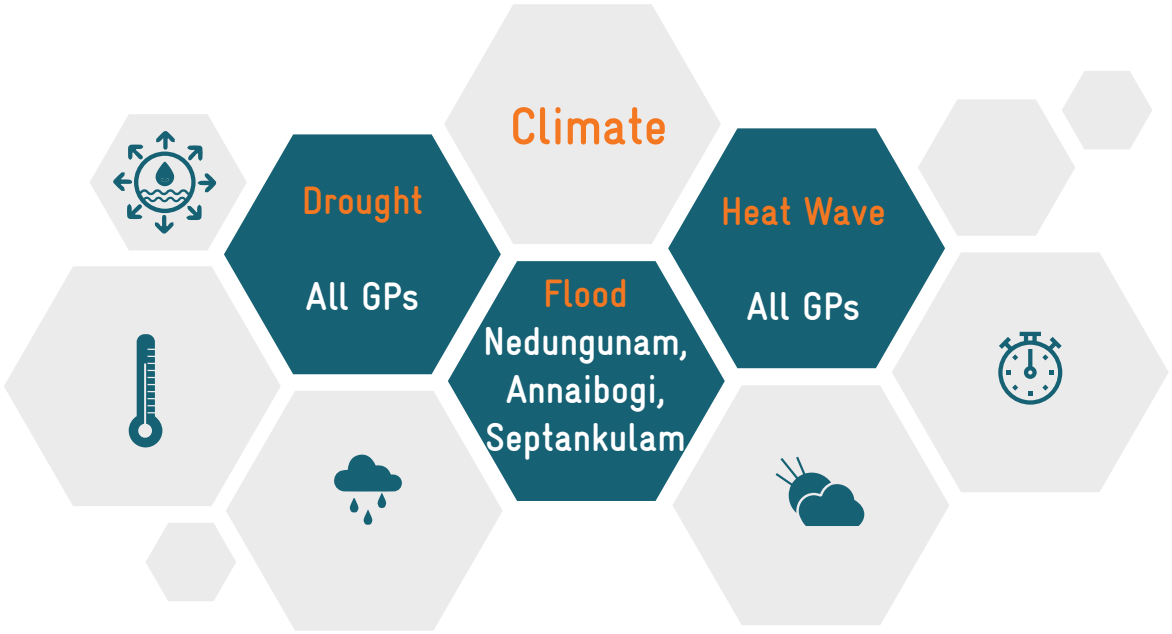
Ground water prosperity

Mosavadi, Ragunathasamudram, Kolappalur, Vinayagapuram, Nariyambadi

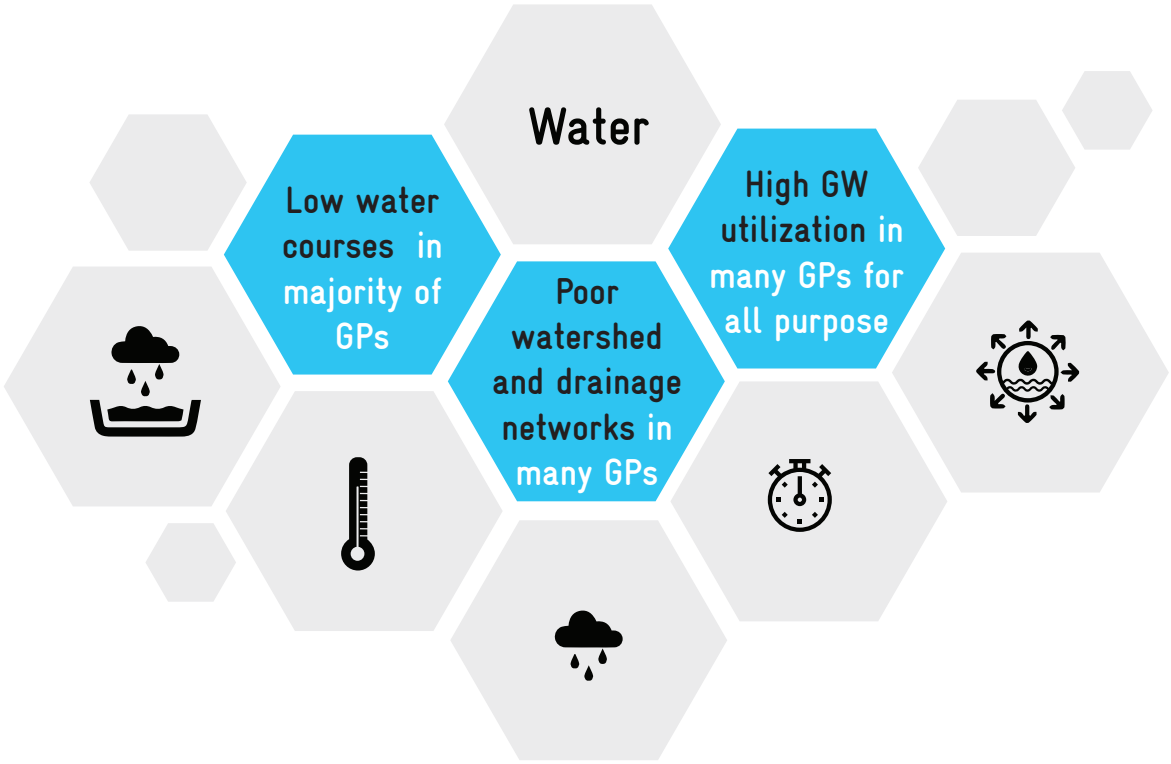
Salt affected area

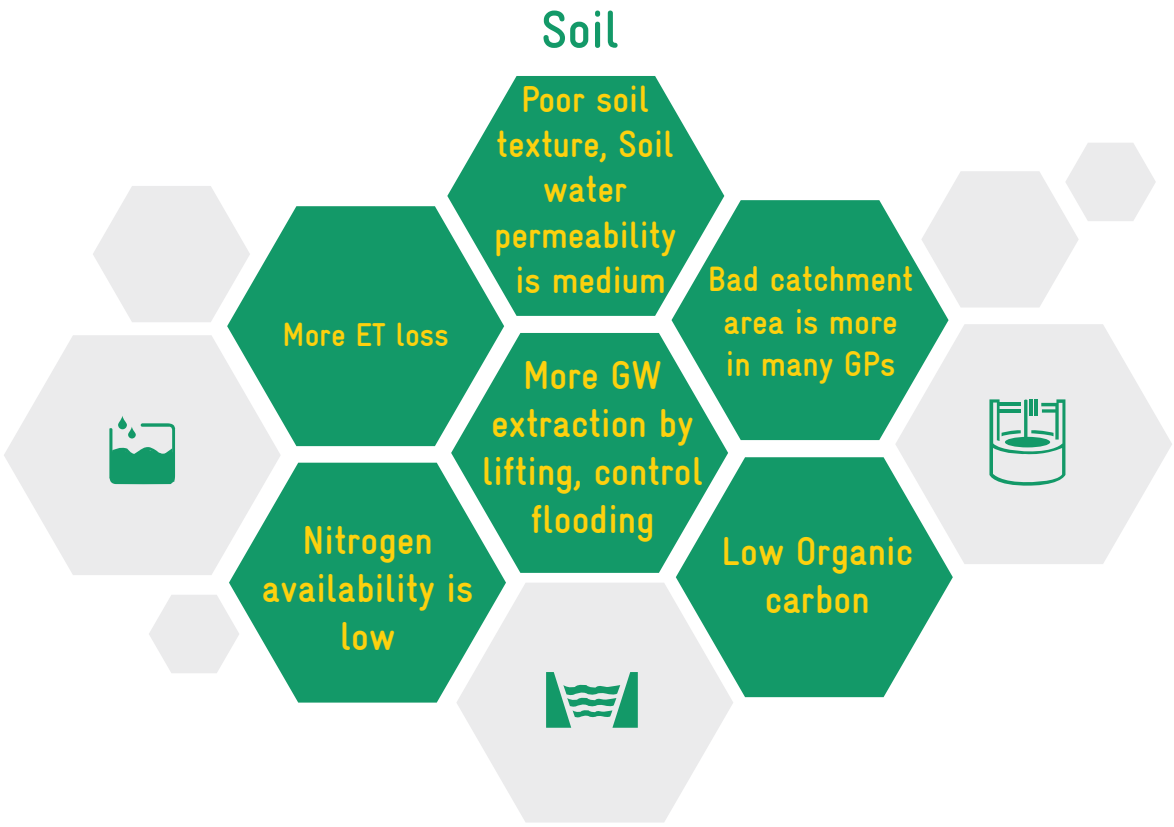
Gengapuram

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


Climate
Drought
All GPs
Heat Wave
All GPs
Flood
Nedungunam,
Annaibogi,
Septankulam


Socio economic
Population density high in Madam, Nariyambadi, Nedungunam
Vulnerable population high in Vallam, Nedungunam
% of vulnerable households high in Konamangalam, Mahadeviman-galam, Kalyanapuram
No. of households and female headed households high in Avaniyapuram, Kolappalur, Nedungunam
Total population, Female population, Only one room households high in Nedungunam, Kolappalur
Grey water generation more in Kolappalur, Nedungunam
Registered MGNREGA job cards and active persons working are low in Kalyanapuram, Morakkaniyanur, Aliyur, Peranambakkam


Water
Low water courses in majority of GPs
Poor watershed and drainage networks in many GPs
High GW utilization in many GPs for all purpose


Soil
Poor soil texture, Soil water permeability is medium
More ET loss
Bad catchment area is more in many GPs
More GW extraction by lifting, control flooding
Nitrogen availability is low
Low Organic carbon

கெடுப்பதூஉம் கெட்டார்க்குச் சார்வாய்மற் றாங்கே
எடுப்பதூஉம் எல்லாம் மழை

குறள் - 15

Destruction it may sometimes pour
But only rain can life restore

Thirukkural - 15

CHAPTER 4

4 VULNERABILITY RANKING OF GPs

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

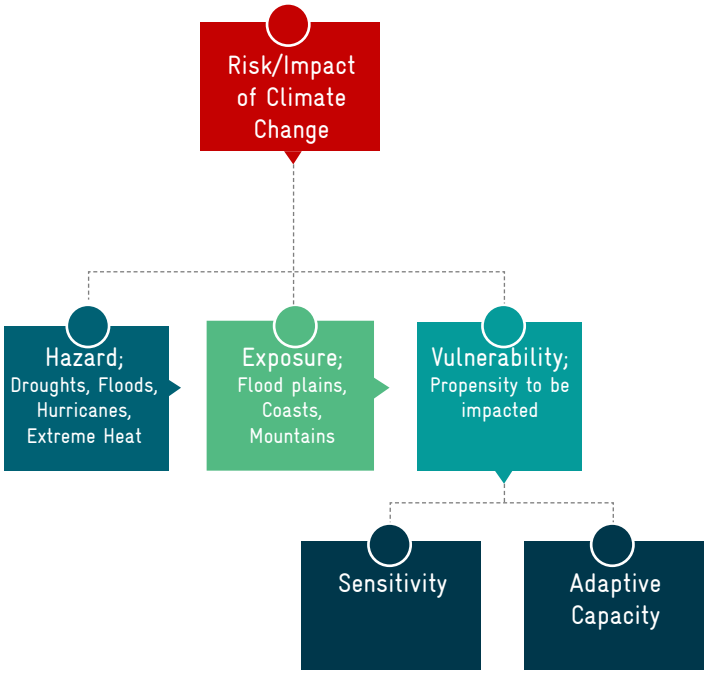


Figure 4.1. Vulnerability of the system as defined by IPCC

Generally, vulnerability assessments are made to identify.

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

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

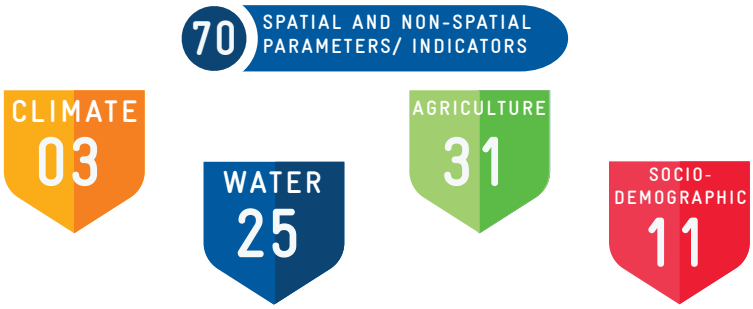


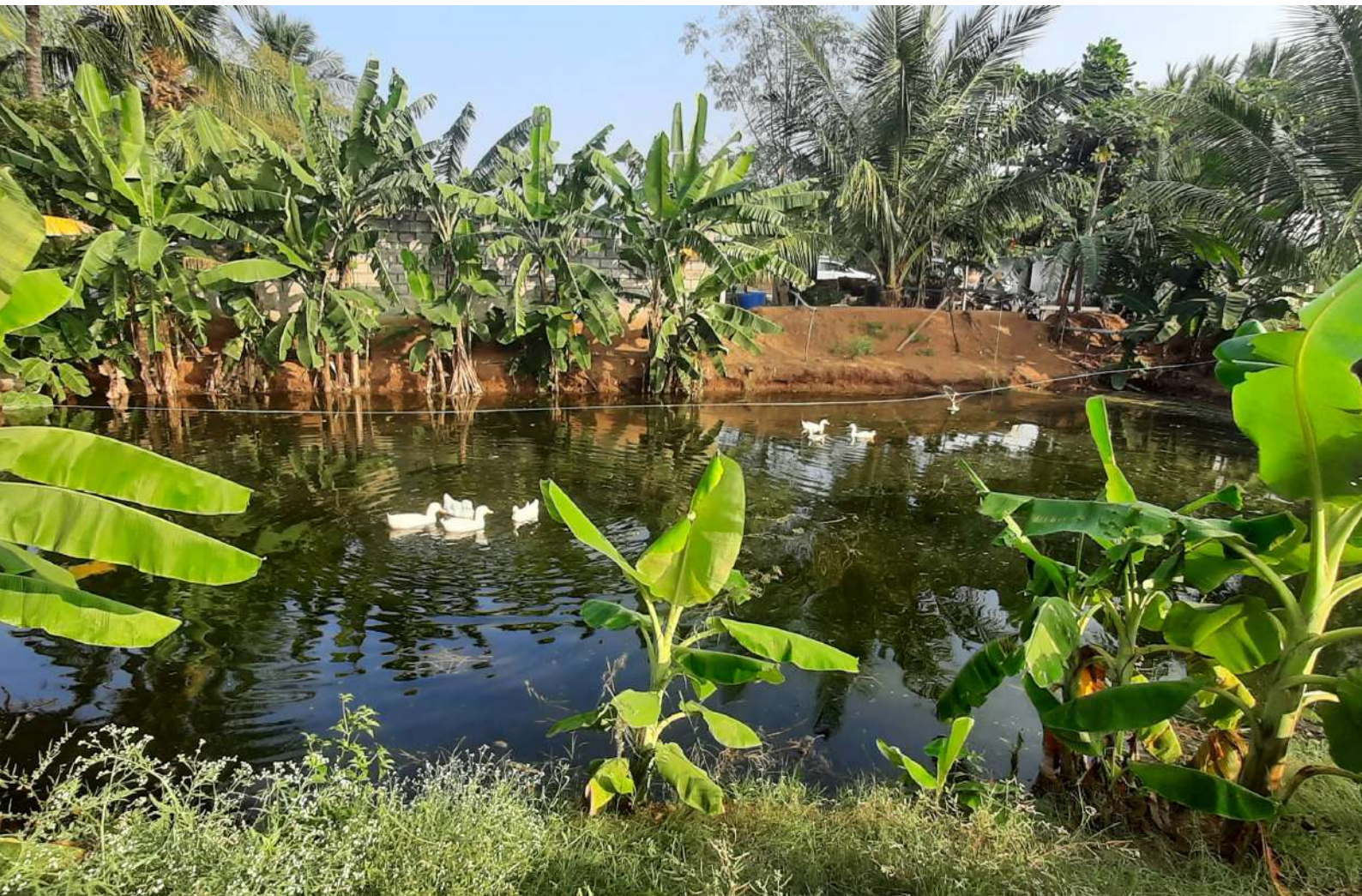
TABLE 9. CWRM PARAMETERS SELECTED FOR BLOCK LEVEL VULNERABILITY

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

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

The identified indicators are from different sources and measured in different units. As the vulnerability assessment is about ranking, the indicators have to be in common units. This is done through normalization. The normalized indicators are aggregated and categorized to different vulnerability level. The vulnerability assessment methodology is given in Annexure 4.. The normalized indicators are aggregated and categorized to different vulnerability level. GP Kolappalur has a high CVI value of 0.615 followed by Septankulam while Mahadevimangalam GP has low CVI (Figure 4.2).

Upto	Category	Color range
0.590	very high	
0.566	high	
0.541	medium	
0.517	low	
0.492	very low	



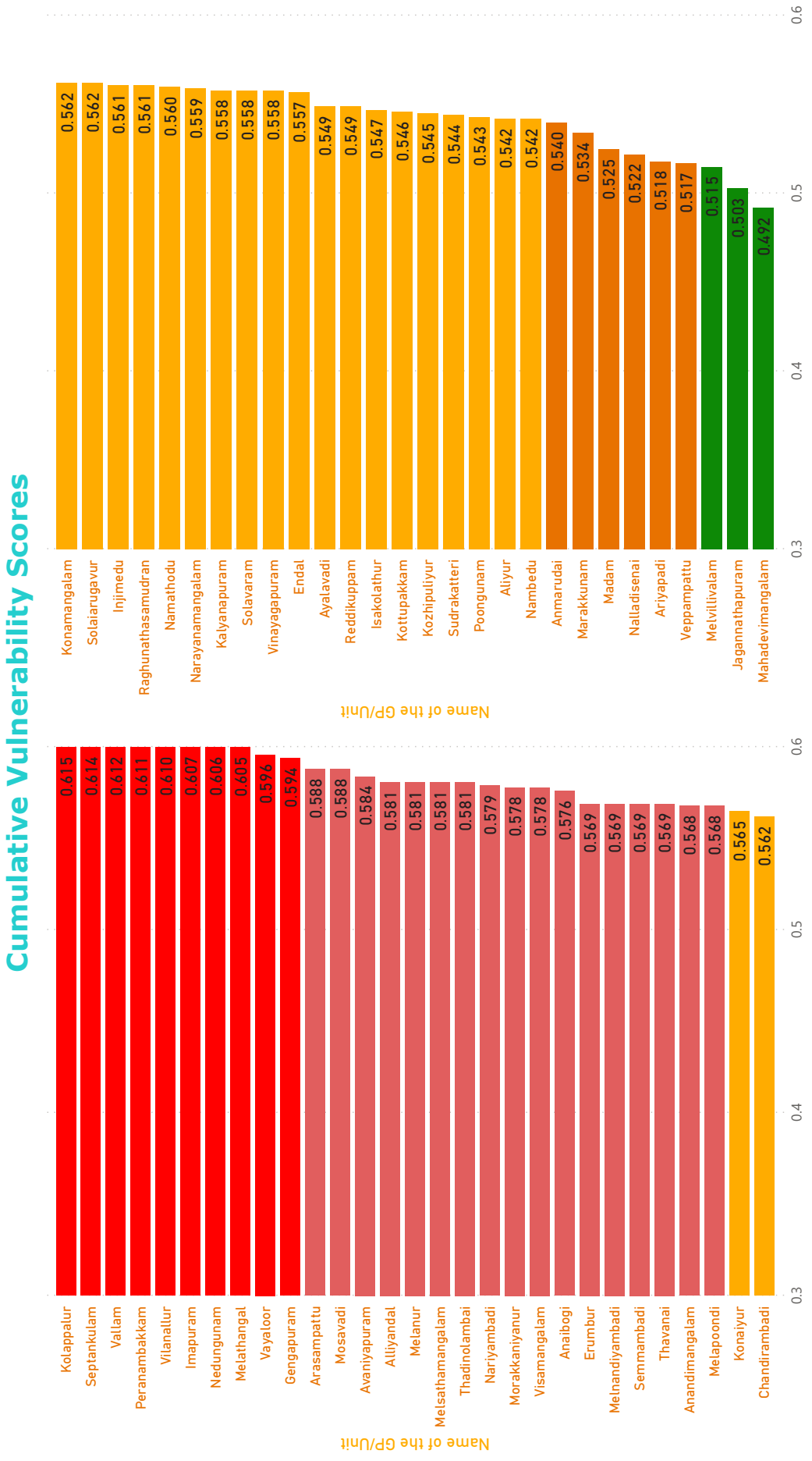


Figure 4.2. Final cumulative vulnerability scores

Sectoral vulnerability

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

Climate risks vulnerability

In the last decade all GPs of the Block are affected by climate risks such as droughts and heat-waves. Nedungunam, Annaibogi, Septankulam GPs are vulnerable to floods.

NEDUNGUNAM, ANNAIBOGI, SEPTANKULAM

Water resource vulnerability

The water resources vulnerability index shows that Kolappalur GP is very high vulnerable followed by Vallam, Gengapuram, Septankulam, Anandimangalam, Raghunathasamudran and Mosavadi GPs. Aliyur GP is least vulnerable.

KOLAPPALUR, VALLAM, GENGAPURAM,SEPTANKULAM, ANANDIMANGALAM, RAGHUNATHASAMUDRAN, MOSAVADI, ALIYUR

Agriculture resources vulnerability

In agriculture and allied sectors, Peranambakkam GP has highest vulnerable score followed by Solaiarugavur, Imapuram GPs while Mahadevimangalam GP is least vulnerable.

PERANAMBAKKAM, SOLAIARUGAVUR, IMAPURAM, MAHADEVIMANGALAM

Socio-economic vulnerability

Nedungunam GP has very high socio economic vulnerable score followed by Kalyanapuram, Erumbur, Arasampattu, Melathangal, Alliyandal and Injimedu GPs. While Nalladisenai GP is least vulnerable.

NEDUNGUNAM, KALYANAPURAM, ERUMBUR, ARASAMPATTU, MELATHANGAL, ALLIYANDAL, INJIMEDU, NALLADISENAI

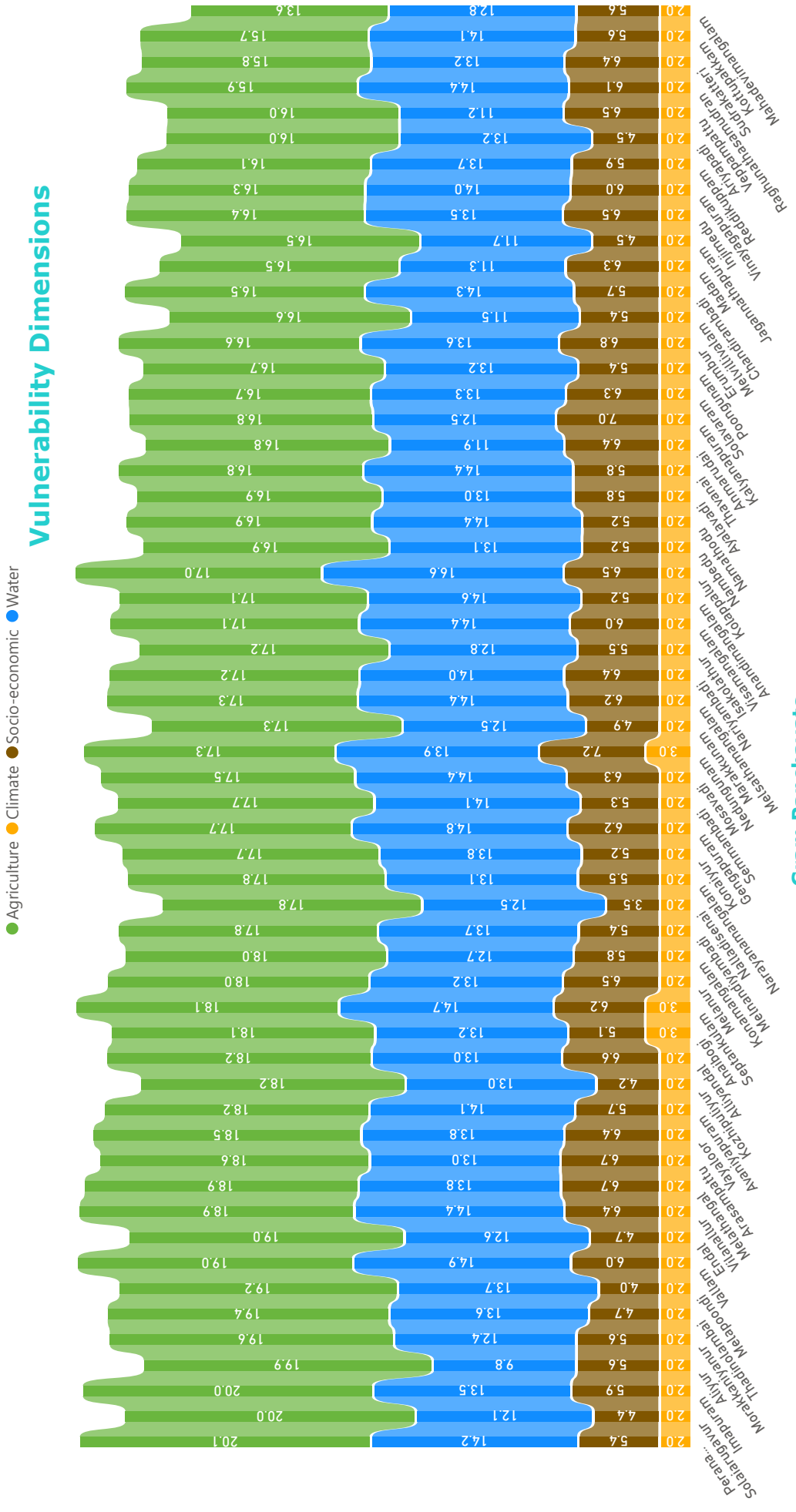
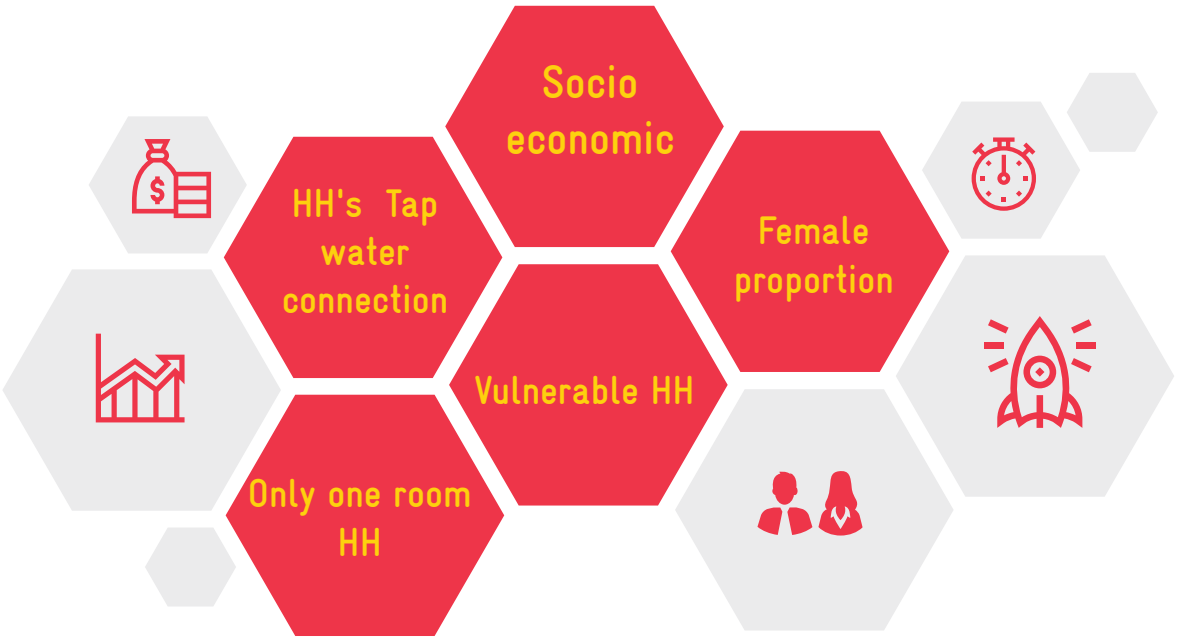
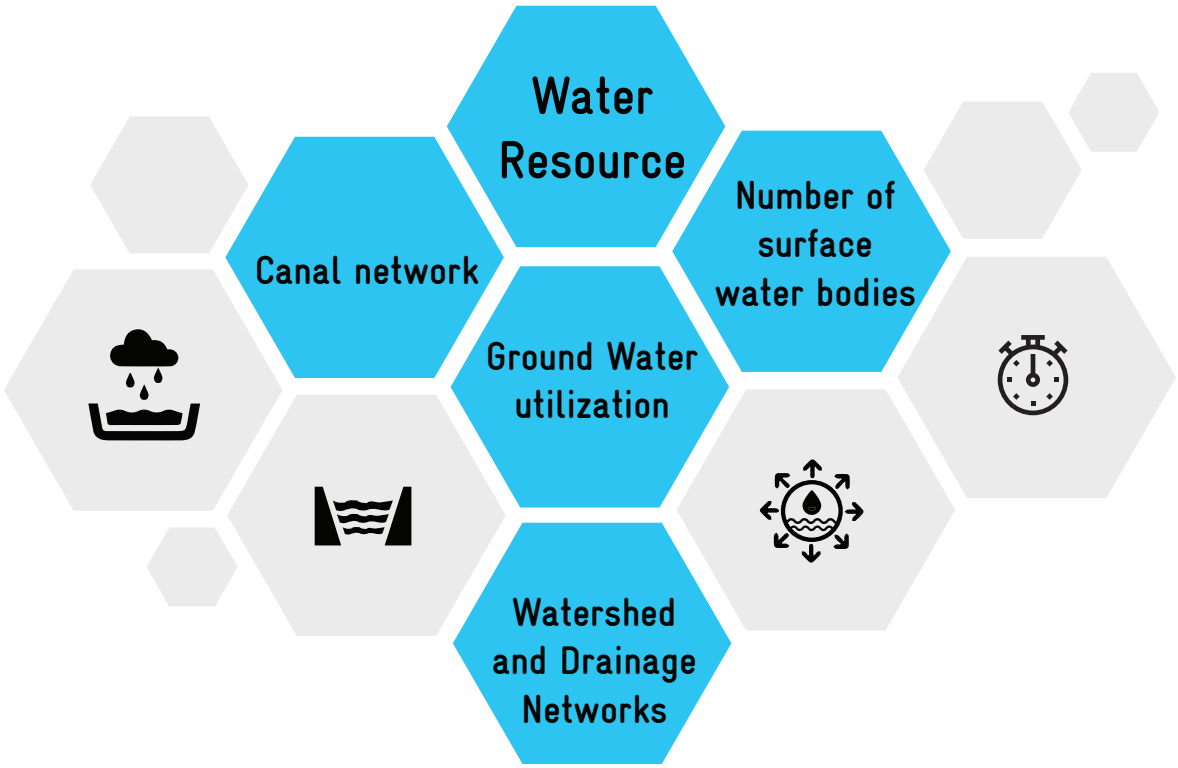
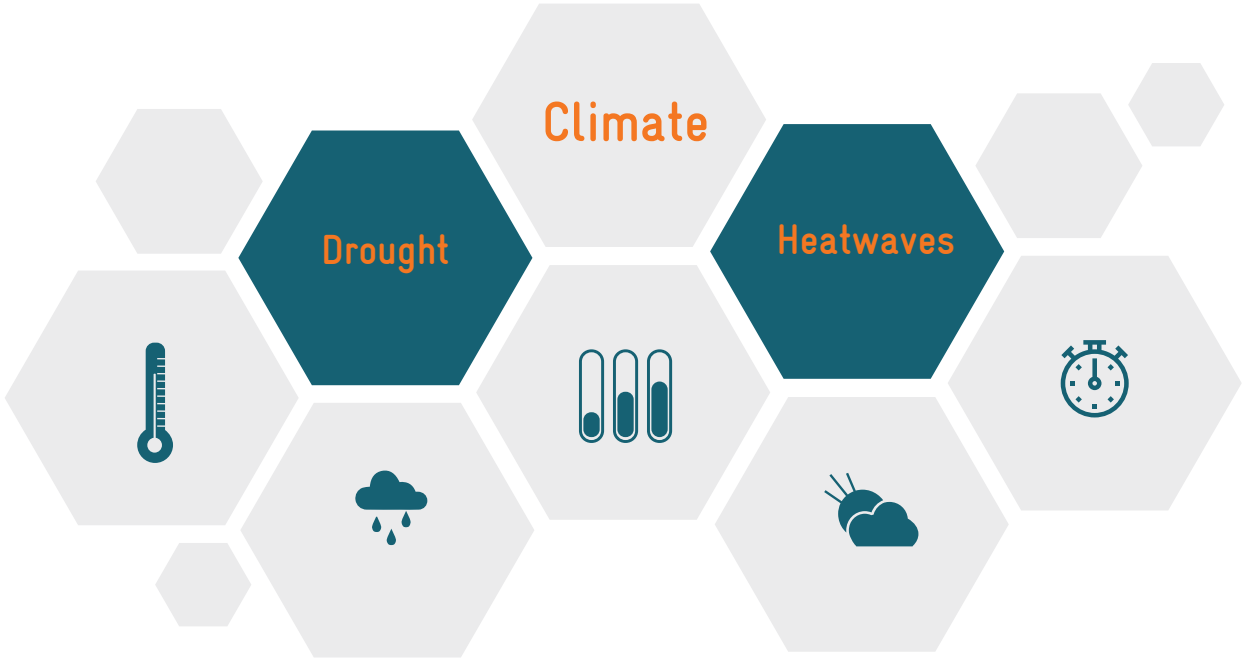


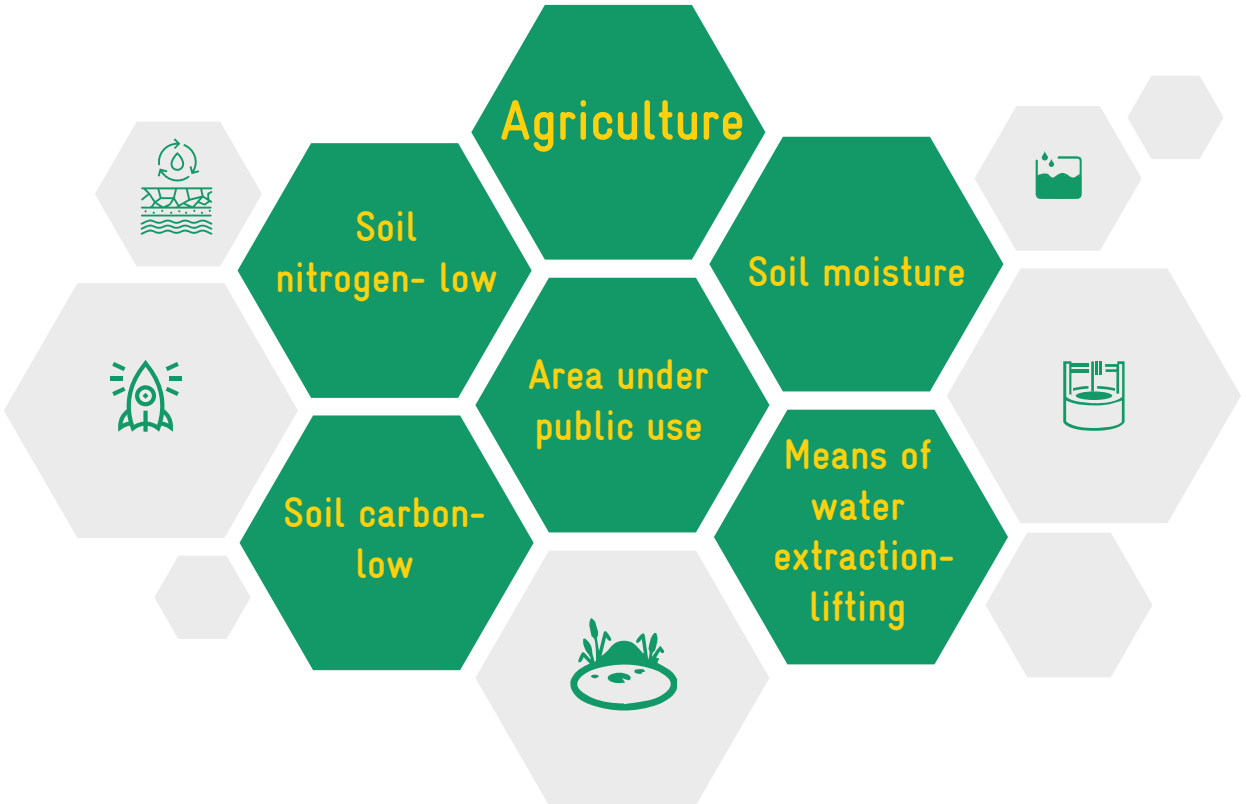
Figure 4.3. GP wise vulnerability dimensions

Contributing indicators to the total vulnerability









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

விசும்பின் துளிவீழின் அல்லால்மற் றாங்கே
பசும்புல் தலைகாண்பு அரிது

குறள் - 16

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

Thirukkural - 16

CHAPTER 5

PROPOSED KEY WATER ACTIONS UNDER MAHATMA GANDHI NREGS CONVERGENCE

5 PROPOSED KEY WATER ACTIONS UNDER MAHATMA GANDHI NREGS CONVERGENCE

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 enables to identify water action works in public and common land (afforestation, soil and water conservation, improving the traditional water storage and catchment assets etc.,), agriculture and allied sector (farm ponds, artificial recharge structures, on-farm plantation, irrigation methods, livestock - fodder development etc.,) and rural infrastructure (on safe drinking water and efficient handling of grey water). This chapter discuss the proposed treatment actions under WASCA, CWRM and CRM.

5.1 THE PROPOSED AREA UNDER WASCA TREATMENT

Out of 30,886 ha available land in Peranamallur Block, 4,236.94 ha (17.36 %) area is proposed for treatment under WASCA TN– CWRM planning. A large portion of key water actions area proposed is in Non-Agricultural Uses land. The detailed land wise proposal for WASCA treatments is given in Table 10. GP wise proposed area for treatment is also attached in Annexure 5.1.

TABLE 10. PROPOSED AREA FOR WASCA TREATMENT

Land Use	Total available land (ha)	WASCA proposed Treatment Area (ha)
Non-Agricultural Uses	6,075.86	1203.7
Barren & Un-cultivable Land	361.17	270.925
Permanent Pastures and Other Grazing Land	292.12	219.16
Land Under Miscellaneous Tree Crops etc.	185.94	139.5125
Cultivable Waste Land	396.84	297.655
Fallows Land other than Current Fallows	889.12	129.8906
Current Fallow land	5,498.84	779.1486
Unirrigated Land	4,116.02	531.0157
Area Irrigated by Source	6,595.56	665.937

The highest of 28.41% of non-agriculture land is considered and proposed for water treatment under WASCA followed by current fallow land of 18.39 % while least land of fallow land other than fallow land area is considered (Figure 5.1).

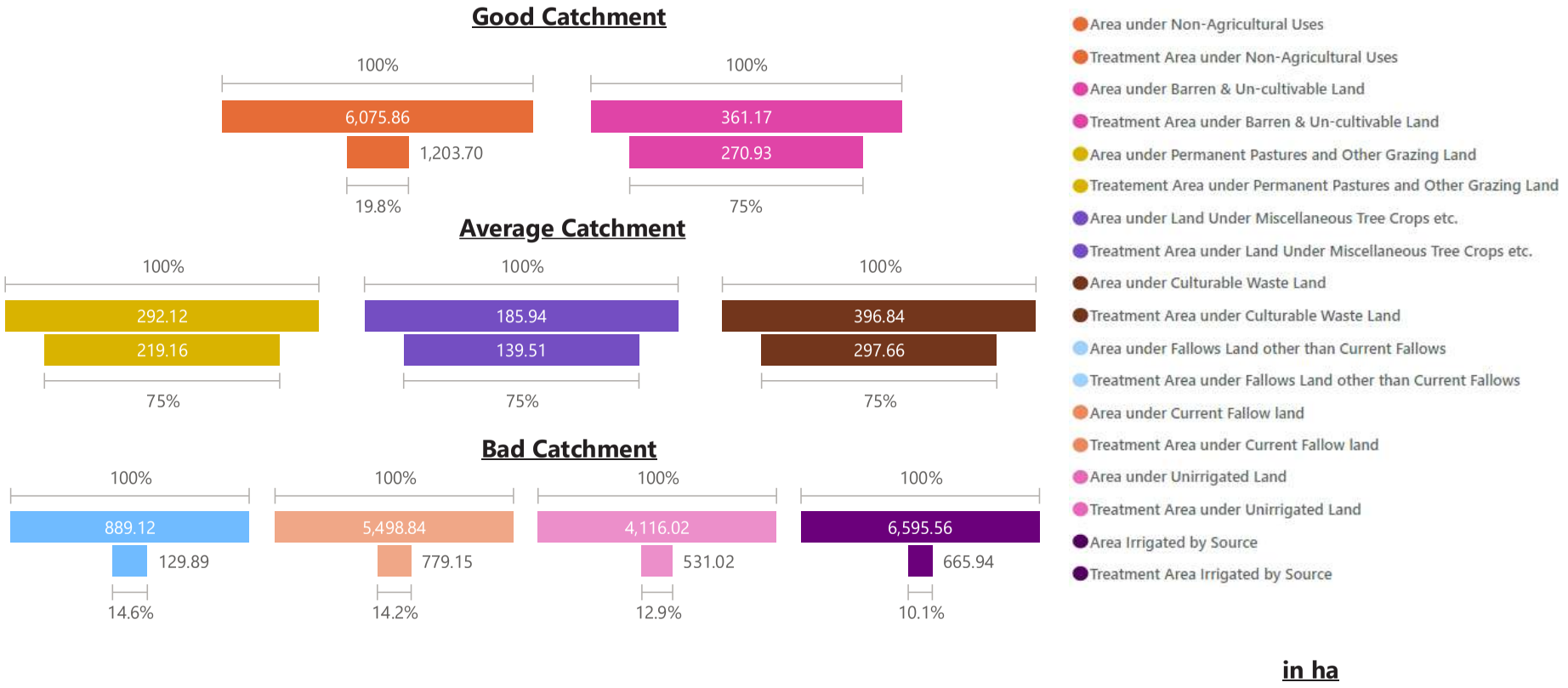


Figure 5.1. WASCA treatment area in percentage

Expected Runoff Conservation after WASCA treatment

The productive developmental activities are designated as key water actions in WASCA proposed area. With the above proposed treatment area, the expected runoff harvested due to WASCA intervention would be around 1,443 ha.m which is 24.63 % of the total runoff. Of which the expected runoff conservation of 59.93 % comes from good catchment area followed by 27.28 % from bad catchment area and rest is from average catchment area (Figure 5.2).

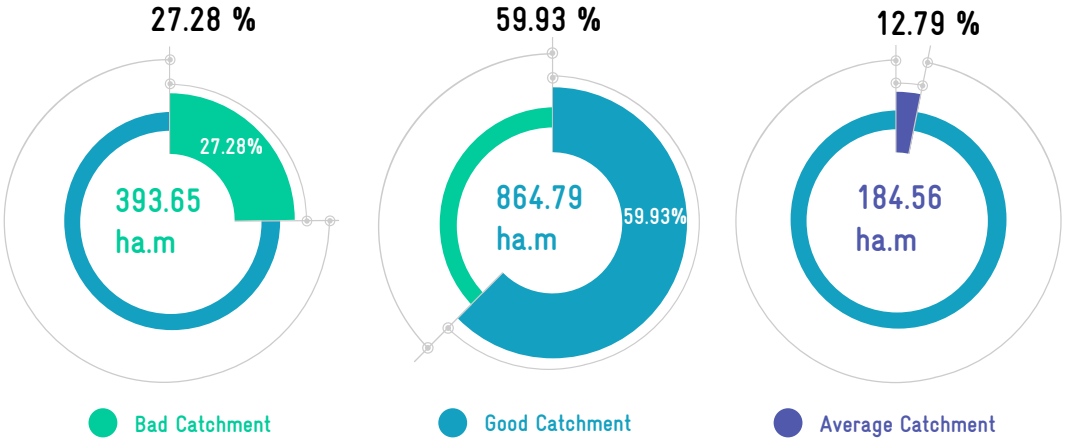


Figure 5.2. Expected conservation after WASCA treatment

The graphical representation of GP wise expected runoff conservation after completion of WASCA treatment is shown in Figure 5.3 and tabulated in Annexure 5.2. All the works are proposed based on watershed and livelihood approach. The GP wise works are tabulated in Annexure 5.3.

Work (unit)	Abbreviation (unit)	No.	Extent (area in ha or length in m)
Azolla units - Individual (Number of units)	Az	656	
Cattle Shelters (Number of units)	CS	3,560	
Cattle Trough(Number of units)	CT	3,560	
Fodder development - Community & Individual	FD	72	
Goat Sheep Shelters (Number of units)	GSS	1,914	
Poultry Shed (Number of units)	PS	-	
Silvi-pasture Development(ha)	SPD	66,800	91.62
Soak Pits (Community) (Number of units)	SPC	152	
Soak Pits (Individual) (Number of units)	SPI	295	
Artificial Recharge Structure(Number of units)	ARS	-	
Construction of Farm Ponds - Individual (Number of units)	FP	770	

Construction of new open wells & Recharge Shafts (Number of units)	COWRS	559	
Restotaration of water bodies:a.PWD and Tanks(Number)	RPWDT	111	
Restotaration of water bodies:b. Ooranis(Number)	Ro	-	
Restotaration of water bodies:c. Ponds(Number)	RP	240	
Roof Rain Water Harvesting (Number of units)	RRWH	114	
Water Course - Irrigation Channels - Desilting (Mtrs)	WCICD		53,494
Afforestation in Public/common lands(ha)	Aff	73,781	98.65
Avenue plantation(km)	AVP	9,192.40	108,567
Block Plantation (Community)(ha)	BP	55,850	2,360.77
Canal Bund Plantation(ha)	CBP	1,439	7,192
Contour Continous Bunds (CCB) for Afforestaion area(Mtrs)	CCBF	5,714	51.95
Drainage Line Treatment (DLT)(Mtrs)	DLT	9,605	48,025
Dry land Horticulture/Agro-forestry - Individual (ha)	DLHAI	32,302	151
Irrigation Channel Plantation (Mtrs)	ICP	10,699	53,494
Linear Plantation(km)	LP	34,045	1,64,302
Micro Irrigation(ha)	MI	254	102
Nursery Development(Number of units)	ND	-	5,000
Composting (Number of units)	Co	436	-
Farm Bunding with Boundary Trenches - Individual (ha)	FBBTI	872	2,036
Land development - Individual (ha)	LDI	285	267
NADEP Vermi compost (Number of units)	NADEP	975	


Proposed works are included the drought proofing, livelihood, land development and WCWH, measures
Land development works over 1,300 ha area
More than 21 Lakhs plants planting
3,500 sites for WCWH
22,000 livelihood works

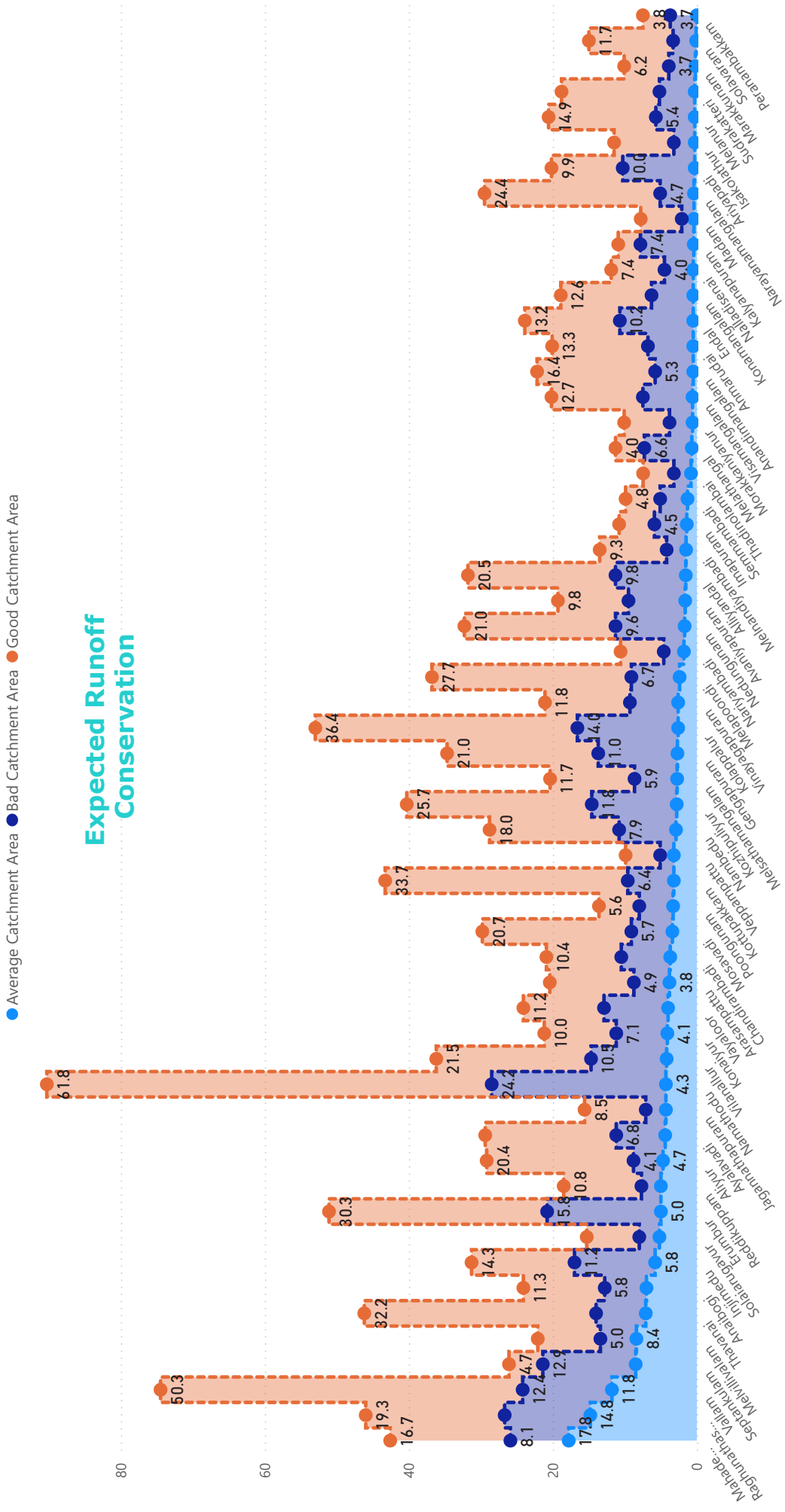


Figure 5.3. Expected GP wise runoff conservation after WASCA treatment

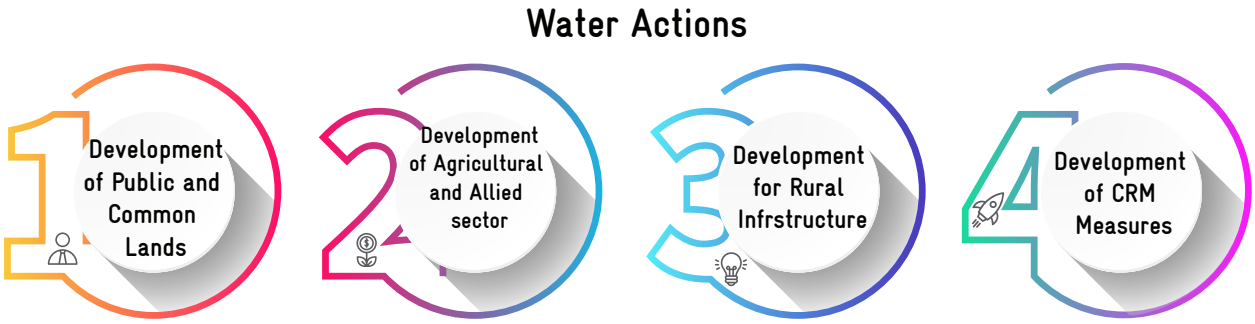
MAHATMA GANDHI NREGS Annual circular 2020-21 (Clause 6.3)

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

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

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

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



5.2 DEVELOPMENT OF PUBLIC & COMMON LANDS

The effective water augmentation measures are proposed in public and common lands via massive land development, tree plantation, restoration of waterbodies etc., which are listed in Table 11 and selected suitable sites can be visualized in Figure 5.4.

DEVELOPMENT OF PUBLIC AND COMMON LANDS

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

	NO. OF WORKS	PERSON DAYS PER UNIT	UNIT COST IN INR (LAKHS)	ESTIMATED COST IN INR (LAKHS)	ESTIMATED PERSON DAYS
CONTOUR CONTINOUS BUNDS (CCB) FOR AFFORESTATION AREA(m)	114	10	0.025	2.86	1,143
COMPOSTING(NUMBER OF UNITS)	422	15	0.17	71.74	6,330
AFFORESTATION IN PUBLIC/ COMMON LANDS(ha)	95	3,344	8.6	816.57	3,17,513
BLOCK PLANTATION (COMMUNITY)(ha)	73	4320	11.1	806.19	3,13,762
SILVI-PASTURE DEVELOPMENT(ha)	26	6,664	17.1	450.24	1,75,463
LINEAR PLANTATION(km)	3	703	1.8	4.64	1,811
CANAL BUND PLANTATION(ha)	5,762	2,930	7.5	42151	1,64,27,530
IRRIGATION CHANNEL PLANTATION (m)	121	6	0.015	1.81	725
AVENUE PLANTATION(km)	10	703	1.8	17.21	6,721
NURSERY DEVELOPMENT (NUMBER OF UNITS)	8	2,344	15	118.13	18,459
RESTORATION OF WATER BODIES:A.PWD AND UNION TANKS (NO.)	129	800	5	645	1,03,200
RESTORATION OF WATER BODIES:B. OORANIS (NO.)	0	200	2.0	-	-
RESTORATION OF WATER BODIES:C. PONDS (NO.)	294	200	1	588	58,800
ARTIFICIAL RECHARGE STRUCTURE (NO.OF UNITS)	223	391	2.5	557.50	87,193
WATER COURSE - IRRIGATION CHANNELS - DESILTING (M)	121	3	0.0075	0.91	363
DRAINAGE LINE TREATMENT (M)	574	5	0.03	17.22	2,870

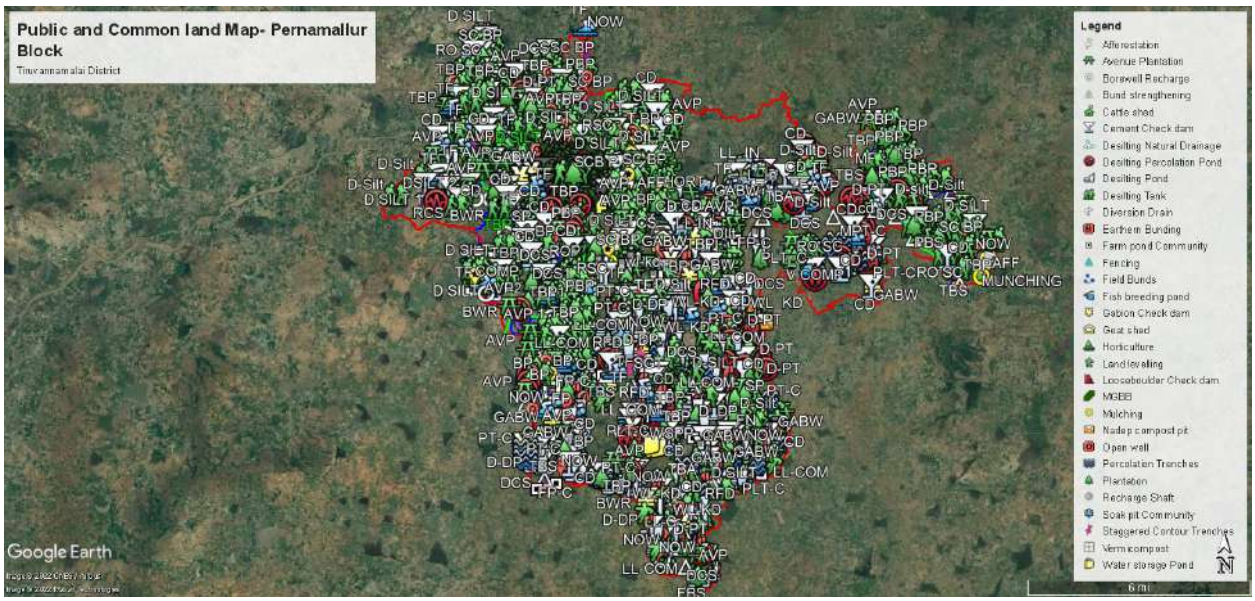


Figure 5.4. Proposed development activities in Public and Common Land

5.3 DEVELOPMENT OF AGRICULTURE AND ALLIED SECTOR

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) and selected sites can be visualized in 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)	112	586	1.5	167.57	65,462
MICRO IRRIGATION (ha)	0	0	1	0	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	558	781	2	1,116	4,35,798
LAND DEVELOPMENT - INDIVIDUAL (ha)	205	3,906	10	2,045.70	7,99,050
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	1,215	3,321	8.5	10,327.50	40,35,015
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	208	23	0.15	31.20	4,784
NADEP VERMI-COMPOST (NUMBER OF UNITS)	2,890	27	0.18	520.20	78,030
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	50	2,344	1.48	74	1,17,200
CATTLE SHELTERS (NUMBER OF UNITS)	1,943	331	2.12	4,119.16	6,43,133
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	801	355	2.27	1,818.27	2,84,355
CATTLE TROUGH (NUMBER OF UNITS)	348	6	0.05	17.40	22,088
POULTRY SHED (NUMBER OF UNITS)	315	10	0.09	28.35	3,150
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	559	926	5	2,795	5,17,634

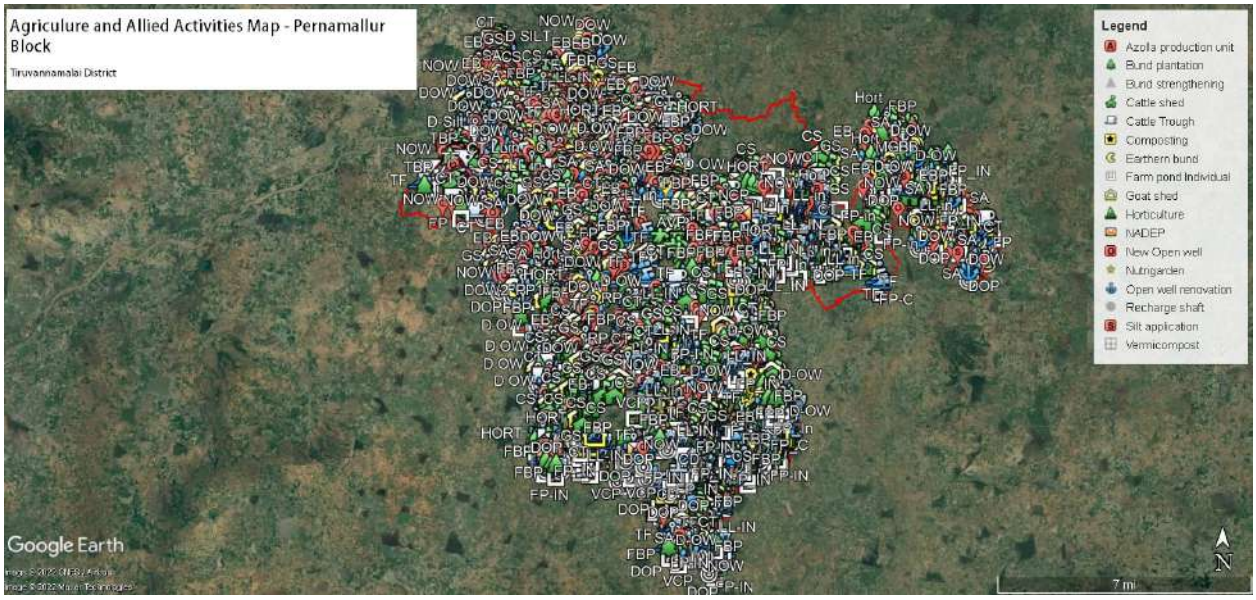


Figure 5.5. Proposed development activities in Agriculture and allied Sectors

5.4 DEVELOPMENT OF RURAL INFRASTRUCTURE

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

DEVELOPMENT OF RURAL INFRASTRUCTURE

TABLE 13. DETAILS OF WORK PROPOSED TO DEVELOP RURAL INFRASTRUCTURE

	NO. OF WORKS	PERSON DAYS PER UNIT	UNIT COST IN INR	ESTIMATED COST IN INR (LAKHS)	ESTIMATED PERSON DAYS
SOAK PITS (COMMUNITY) (NUMBER OF UNITS)	232	20	0.13	30.22	4,649
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	2,325	16	0.1	232.45	37,192
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	105	625	4	420	65,625

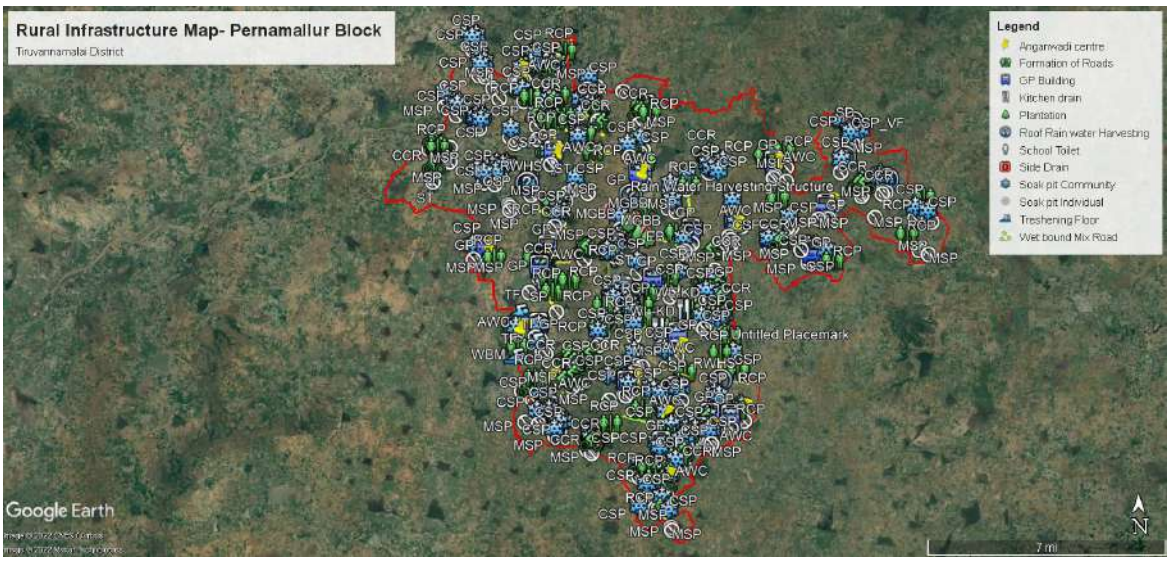


Figure 5.6. Proposed rural infrastructure activities

5.5 PROPOSED CLIMATE RESILIENCE MEASURES

Climate resilient measures are proposed to cope up with the system with future climate risks such as droughts, heatwaves and floods. As Thiruvannamalai District is one of the drought prone areas and frequently exposed to severe droughts, more measures are proposed to manage droughts and its subsequent impacts. As Peranamallur Block is also affected by droughts and heat waves, climate resilient measures are proposed to cover-up maximum of GPs (Table 14). Figure 5.7 shows the proposed CRM. CRM such as greening of hillocks (Table 15), silvi-pasture (Table 16), bamboo plantation (Table 17), farm pond (Table 18), and fallow land development (Table 19) were proposed.

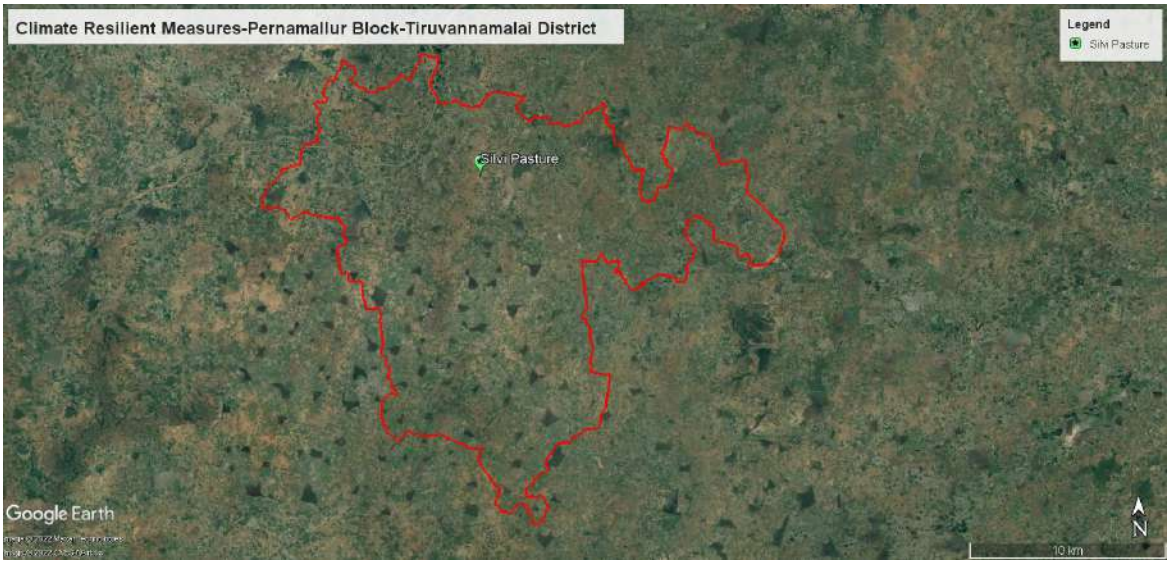


Figure 5.7. Proposed climate resilient measures

TABLE 14. GP WISE PROPOSED CRM

GP	Public and Common land	Agriculture
Aliyur		Farm pond
Alliyandal	Fallow land	
Alliyanthal		Farm pond

Anadimangalam	Fallow land	
Anaibogi		Farm pond
Anathimangalam		Farm pond
Anmarudai		Farm pond
Arasampattu		Farm pond
Ariyapadi		Farm pond
Ayalavadi		Farm pond
Chandirambadi	Silvi-pasture Development	Farm pond
Endal		Farm pond
Erumbur		Farm pond
Gengapuram		Farm pond
Imapuram	Fallow land	Farm pond
Injimedu		Farm pond
Isakolathur		Farm pond
Jaganathapurm		Farm pond
Kalyanapuram		Farm pond
Kollappalur		Farm pond
Konaiyur		Farm pond
Konamangalam		Farm pond
Kottupakkam		Farm pond
Kozhipuliyur		Farm pond
Madam		Farm pond
Magadevimangalam		Farm pond
Marakunam		Farm pond
Melanur		Farm pond
Melapoondi		Farm pond
Melathangal		Farm pond
Melnandiyambadi		Farm pond
Melsathamangalam	Fallow land	
Melvillivalam		Farm pond
Mosavadi		Farm pond
Nalladisenai		Farm pond
Namathodu		Farm pond
Nambedu		Farm pond
Nariyambadi	Fallow land	Farm pond
Nedungunam		Farm pond
Nedungunam RF	Greening of Hillrock	
Pernamallur	Bamboo pllantaion	
Poongunam		Farm pond
Ragunathasamuthiram		Farm pond
Reddikuppam		Farm pond
S.Katteri		Farm pond
Septankulam		Farm pond
Solaiarugavur		Farm pond
Solavaram		Farm pond
Thadinolambai		Farm pond
Thavani		Farm pond

Vallam		Farm pond
Vayalur		Farm pond
Vilanallur		Farm pond
Villanallur	Fallow land	Farm pond
Vinayagapuram		Farm pond
Visamangalam	Fallow land	Farm pond

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

GP	Category	Recommended Area in ha	Classification of land
Nedungunam RF	High	75	RF

TABLE 16. DETAILS OF PROPOSED ACTIVITIES ON SILVI-PASTURE UNDER CRM

GP	Habitation	Survey Number	Area for Plantation	No. of Plants
Chandirambadi	Chandirambadi	92,93,94,96,97	19.91	15,928

TABLE 17. DETAILS OF PROPOSED BAMBOO PLANTATION ACTIVITIES UNDER CRM

GP	Survey Number	Area of plantation (in ha)	No.of Plants	Classification of Land
Veppampattu	5	2.30	5,750	Meyccal nilam

TABLE 18. DETAILS OF PROPOSED FARM PONDS ACTIVITIES UNDER CRM

GP	Habitation	Number of farm ponds
Aliyur	Aliyur	2
Alliyanthal	Alliyanthal	1
Anaibogi	Anaibogi	1
Anathimangalam	Ramapuram	1
Anmarudai	New Colony	1
Arasampattu	Arasambattu Colony	1
Ariyapadi	Ariyapadi	1
Ayalavadi	Thenalapiranthan	1
Chandirambadi	Chandirambadi	1
Endal	Ettithangal	1
Erumbur	Sengalvarayapuram	1
Gengapuram	Samathuvapuram	1
Imapuram	Kinnanur	1
Isakolathur	Mettu Colony	1
Jaganathapurm	Jaganathapurm	1
Kalyanapuram	Kalyanapuram	1
Kollappalur	Kollappalur	1
Konaiyur	Konaiyur	1
Konamangalam	Konamangalam	1

Kottupakkam	Kottupakkam	1
Kozhipuliyur	Kozhipuliyur	1
Madam	Madam	1
Magadevimangalam	Magadevimangalam	1
Marakunam	New Colony	1
Melapoondi	Thenkadapanthangal	1
Melathangal	Melathangal	1
Melnandiyambadi	Melnandiyambadi	1
Melvillivalam	Samanthipuram	1
Mosavadi	Mosavadi Colony	1
Namathodu	Namathodu Colony	2
Nedungunam	Adhithravidar Colony	1
Poongunam	Poongunam	1
Ragunathasamuthiram	Bagavanthapuram	1
Reddikuppam	Chinnaelvanthangal	1
Septankulam	Septankulam	1
Solaiarugavur	Pulimanthangal	2
	Solaiarugavur ADC	
Solavaram	Solavaram Colony	
Thadinolambai	Thadinolambai colony	
Thavani	Thavani	2
	Rettaikuttai	
Vallam	Vallam	1
Vayalur	Vayalur	1
Villanallur	Villanallur	1
Vinayagapuram	Colony	1
Visamangalam	Visamangalam	1
Ayalavadi	Ayalavadi	1
Injimedu	Injimedu	1
Melanur	Melanur	1
Nalladisenai	Nalladisenai	1
Nambedu	Nambedu	1
Nariyambadi	Nariyambadi	1
S.Katteri	S.Katteri	1
Vilanallur	Vilanallur	2

TABLE 19. DETAILS OF FALLOW LAND DEVELOPMENT UNDER CRM

NGP	Cultivable Waste land (ha.)	Other Fallow Land (ha.)	Total fallow land (ha.)
Imapuram	**0.05**	**3.40**	3.45
Melsathaman-galam	**3.70**	**0.00**	3.70
Anadimangalam	**0.78**	**3.38**	4.16
Alliyandal	**0.01**	**5.27**	5.28
Visamangalam	**0.40**	**5.00**	5.40
Villanallur	**0.36**	**9.00**	9.36
Nariyambadi	**0.00**	**10.00**	10.00

நெடுங்கடலும் தன்நீர்மை குன்றும் தடிந்தெழிலி
தான்நல்கா தாகி விடின்

குறள் - 17

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

Thirukkural - 17

CHAPTER 6

PROJECTED OUTCOMES OF PLANNING

6 PROJECTED OUTCOMES OF PLANNING

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

6.1 OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

	INDICATOR		OUTCOMES/ IMPACT
1	Proportion of Land development under WASCA treatment	1	4,237 ha (17.35 % of the total) area considered for treated under WASCA
2	Percentage reduction of run off	2	1,443 ha.m (24.6 % of the total available runoff) runoff harvested due to WASCA interventions
3	No. of waterbodies restored	3	423 waterbodies restored
4	Area under afforestation	4	94.95 ha area under afforestation
5	Area under silvi-pasture development	5	26.33 ha under Silvi-pasture plantation
6	Length of drainage line treated	6	5,739 m length of drainage line treated

4,237 ha
AREA TREATED

1,443 ha.m
TOTAL RUNOFF HARVESTED

423
WATER BODIES RESTORED

94.95 ha
AREA AFFORESTATION

26.33 ha
SILVI-PASTURE PLANTATION

5,739 m
DRAINAGE LINE TREATED

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	558 farm ponds established which target the harvest of 9,82,080 cu.m of water which has the potential to irrigate 195.3 ha area in both kharif and rabi seasons
2	Improvement in soil health	2,890 NADEP compost units for soil health improvement
3	Changes in the irrigation practices	886 ha Farm bunding with trenches
4	Dry land development with Agro-forestry	1,215 No. of works
5	Households established fodder plots	2,665 vulnerable households established fodder plots

558 FARM PONDS

2,890 COMPOST UNITS

2,665 FODDER PLOTS

886 ha FARM BUNDING

1,215 No. DRY LAND DEVELOPMENT

6.3 OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

	INDICATOR	OUTCOMES/ IMPACT
1	No. of villages having liquid waste management systems	232 common and 2,325 individual soak pits established for recycle of grey water benefiting 23,245 households
2	Roof rain water harvesting measures	105 common roof rainwater harvesting and storage structures with a target to harvest and store 0.13 ha.m of rainwater for use
3	Nutri-garden	23,245 Households established nutri-gardens in homesteads and planted 1,16,225 saplings

232 COMMON & **2,325** INDIVIDUAL SOAK PITS

105 COMMON ROOF RAINWATER HARVESTING

23,245 NUTRI-GARDENS

1,16,225 SAPLINGS

6.4 OUTCOMES OF CLIMATE RESILIENCE MEASURES

OUTCOMES OF CLIMATE RESILIENCE MEASURES

	INDICATOR	OUTCOMES/ IMPACT
1	Vulnerable GPs are identified for key water actions	All GPs are vulnerable for drought and heatwaves, whereas three GP are vulnerable to flood
2	Climate resilient measures are identified for climate risks	5 models are identified via., greening of hillocks, silvi-pature, bamboo plantation, farm pond, fallow land development farm pond Greening of hillrocks in 75 ha 57 farm ponds in 51 Villages 19.91 ha under silvi-pasture with 15,928 plants Bamboo plantation in 2.30 ha with 5,750 plants 41.34 ha Fallow land development

57 FARM PONDS

19.91 ha SILVI PASTURE

2.30 ha BAMBOO PLANTATION

75 ha GREENING OF HILLROCKS

41.34 ha FALLOW LAND DEVELOPMENT

Estimated person days

The total estimated person days required for the above propose activities are 2,46,35,047 as specified below Figure 6.1.

Estimated Cost

The total estimated cost budgeted for the above proposed activities is Rs 69,992 Lakhs as specified below Figure 6.2.

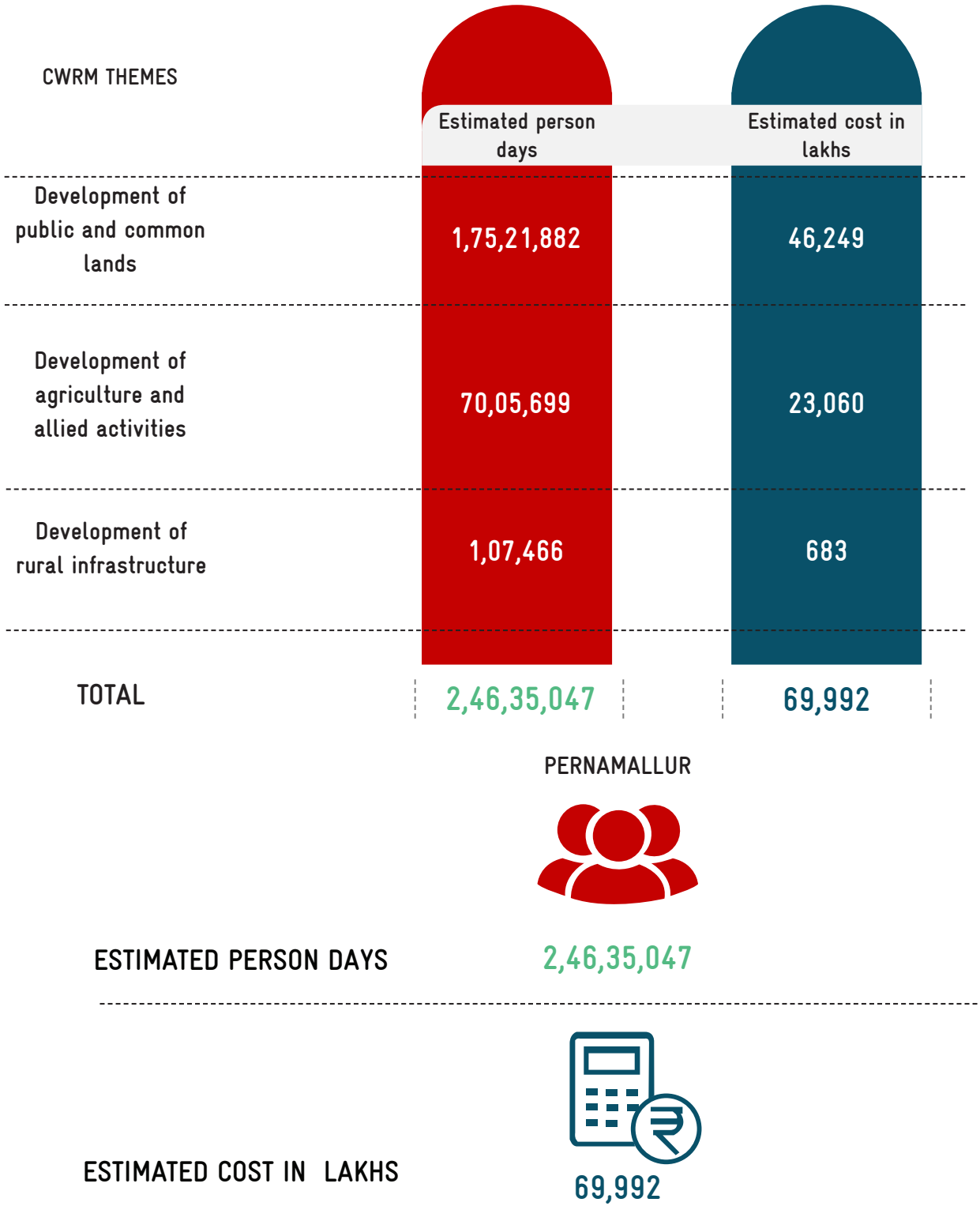


Figure 6.1 & 6.2. Estimated person days & cost for all water actions

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 (NDCs) 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 PROGRESS THROUGH NDC

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

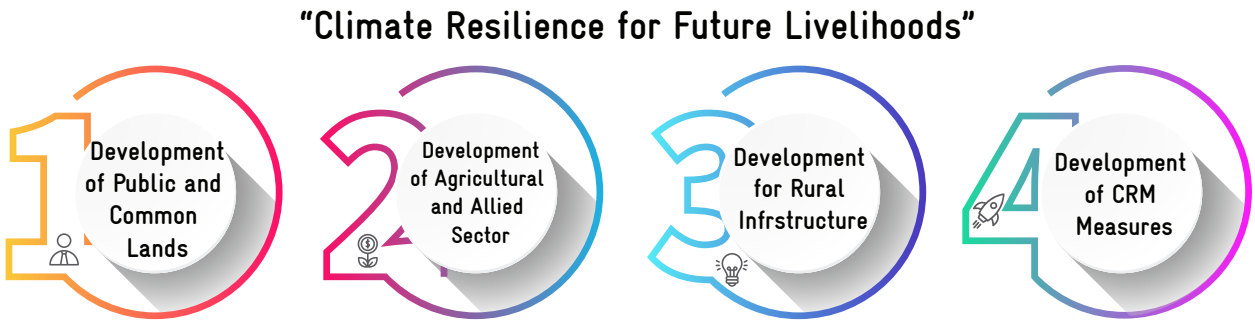
Internationally, the recent process on NDC Enhancement (2020) significantly acknowledge the climate change vulnerability on national sectors including agriculture, energy, and urban areas, especially through impacts on water resources. The role that water and water-related activities play in national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

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

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

6.5.2 WASCA TN SUPPORTS SDG

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



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

SDG GOAL 6

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

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

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

Indicators performed in District and Block level vulnerability assessment of WASCA TN also used in SDG India 2020-21 report (Table 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 District level vulnerability assessment along with its linked SDGs are already tabulated in (Table 2). The detailed proposed water actions in CWRM assessed based on the vulnerability dimensions are linked with climate vulnerability index, SGDs are tabulated in Table 21 to 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)	114	W3	SDG 1,2, 6,13&15
Composting (No. of units)	422	W1	SDG1& 6
Afforestation in Public/common lands (ha)	95	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community) (ha)	73	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	26	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (km)	3	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation (ha)	5,762	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	121	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (km)	10	C1,C2,C3,W3,S2	SDG 1, 6&13
Nursery Development (No. of units)	8	C1,S2,S4	SDG 1,2 &6

Restoration of waterbodies: a.PWD and Tanks (count)	129	S2, S1	SDG 6, 1, 13
Restoration of waterbodies: b. Ponds (count)	294	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	223	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	121	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (m)	574	W1,W3,W4	SDG1 & 6

TABLE 22. WATER ACTIONS ON DEVELOPMENT OF AGRICULTURAL AND ALLIED SECTORS & IT'S LINKED SDG

Name of the Work	No. of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	112	A1,A3,W1,W3	SDG 1,2&6
Micro Irrigation (ha)	0	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	558	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	205	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)	1,215	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	208	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (No. of units)	2,890	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	50	A3, S4	SDG 1& 2, 15
Cattle Shelters (No. of units)	1,943	S4	SDG 1& 2
Goat Sheep Shelters (No. of units)	801	S4	SDG 1& 2
Cattle Trough (No. of units)	348	W5,S4	SDG 1& 2
Poultry Shed (No. of units)	315	S2,S4	SDG 1& 2
Construction of new open wells & Recharge Shafts (No. of units)	559	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)	232	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	2,325	W3,S2	SDG 1& 6
Roof Rain Water Harvesting (No. of units)	105	W3,S1,S3	SDG 1& 6

சிறப்பொடு பூசனை செல்லாது வானம்
வறக்குமேல் வானோர்க்கும் ஈண்டு

குறள் - 18

The earth beneath a barren sky
Would offerings for the gods deny

Thirukkural - 18

CHAPTER 7

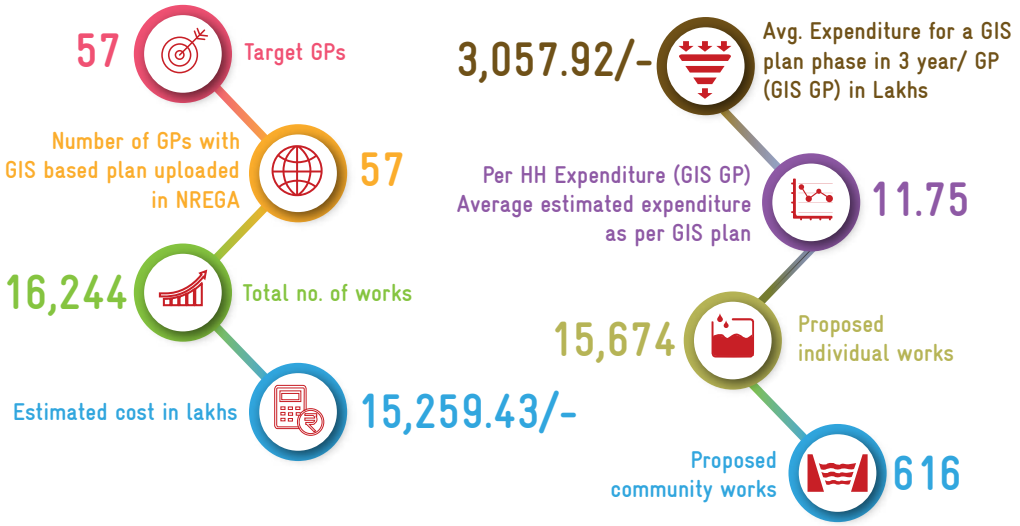
7 IMPLEMENTATION OF GP PLANS

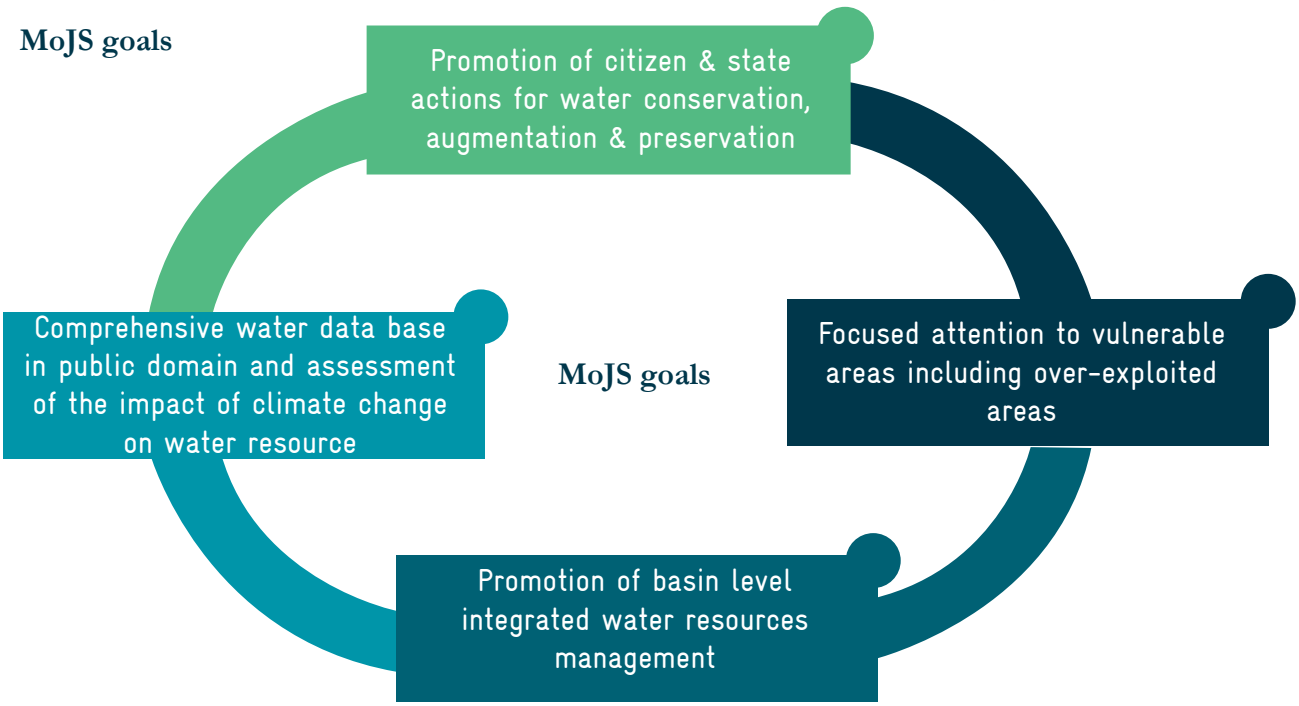
Execution of GP plans includes integrating all verified, approved works in MORD's web enabled ap-plication NREGA Soft (https://nrega.nic.in) for mainstreaming WASCA. The target GPs are iden-tified first, the status of GIS based plans and to-tal works along with its expenditure and category wise esti-mation cost of works as per GIS Plan, GIS based planning cumulative report are uploaded as given below

7.1 INTEGRATION INTO NREGA SOFT

WASCA is progressing towards digitizing and inte-grating GP level GIS based plans, both NRM and Non NRM into Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of Peranamallur Block is listed in Table 24 and work progress, expenditure during the past 3 financial years is 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 recommenda-tions and works uploaded are given in Annexure 7.1.

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





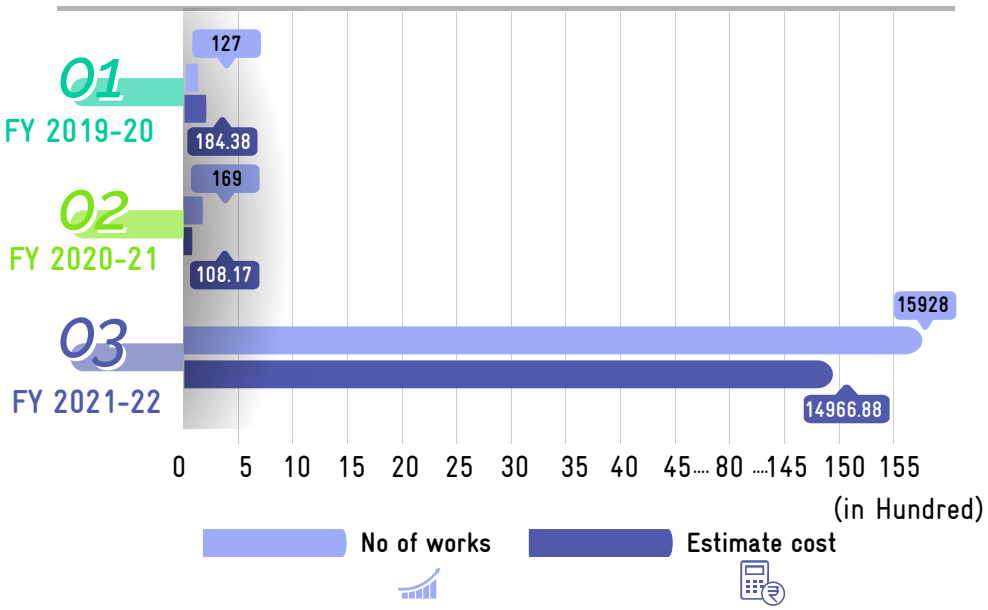


Figure 7.1. Work progress in last 3 years

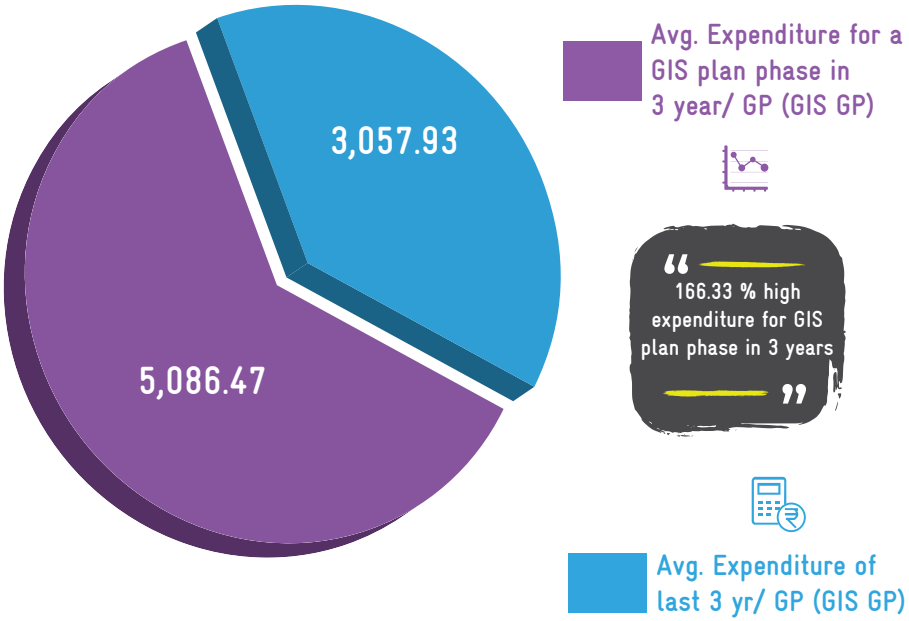
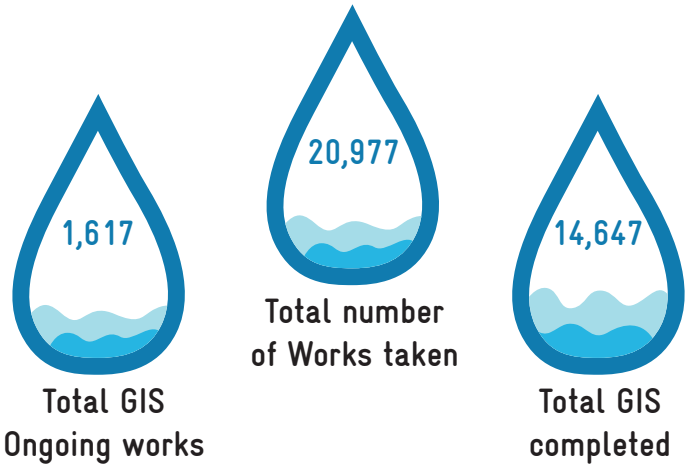


Figure 7.2. Average Expenditure for GIS plan in last 3 years



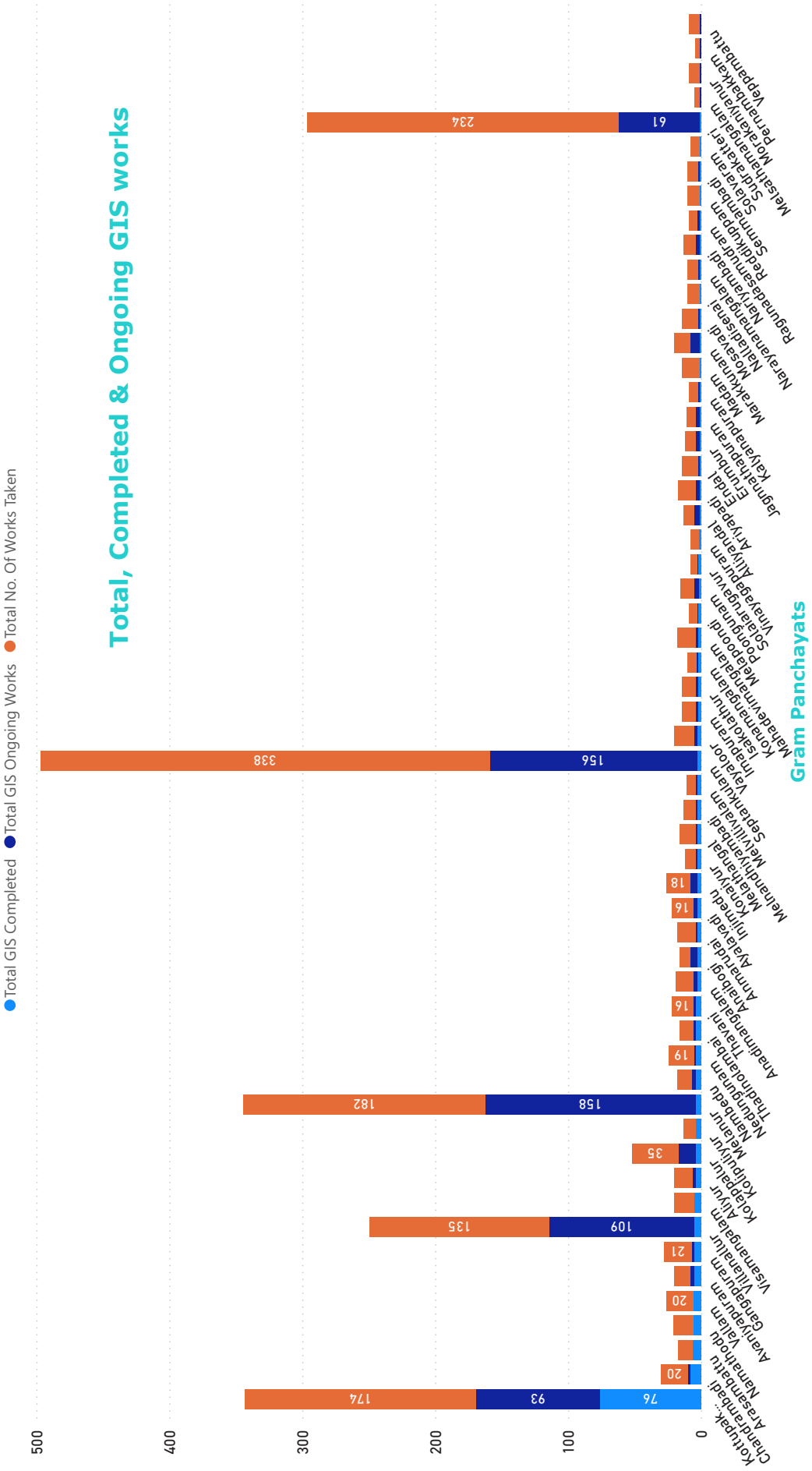
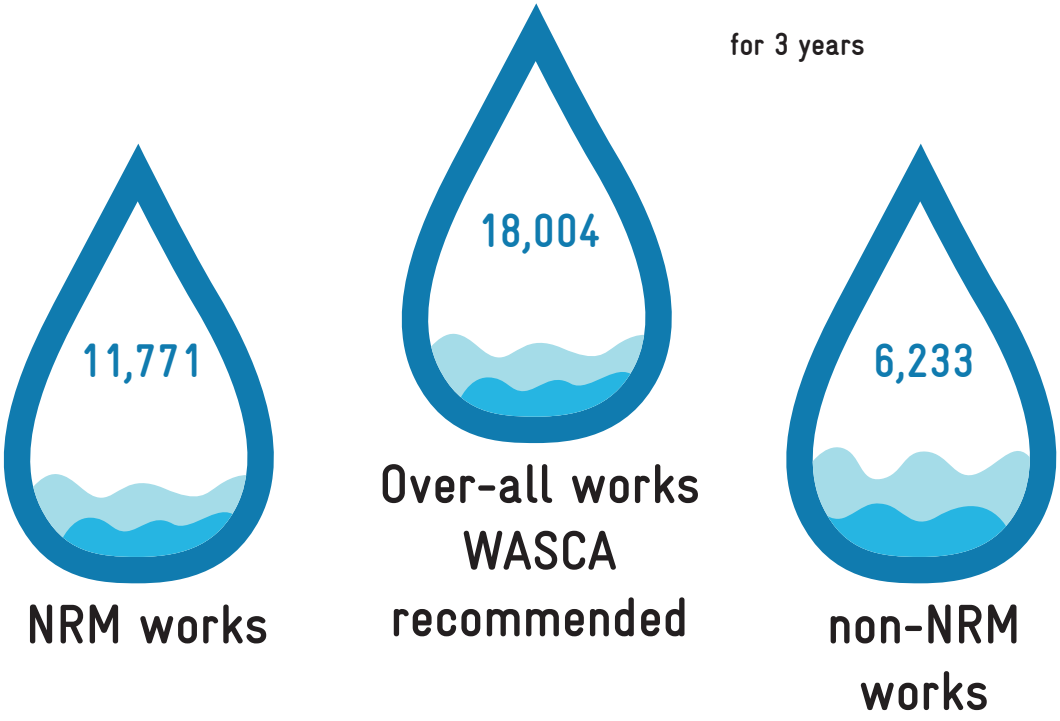


Figure 7.3. GP wise total, completed and ongoing GIS works

7.2 NRM AND NON-NRM WORKS

WASCA recommended 18,004 works for a period of 3 years, out of which 11,771 are NRM works and 6,233 are Non-NRM works (Figure 7.4). A total of 15,439 works has been uploaded so far for the financial year 2021-22 as on 07/01/2011.



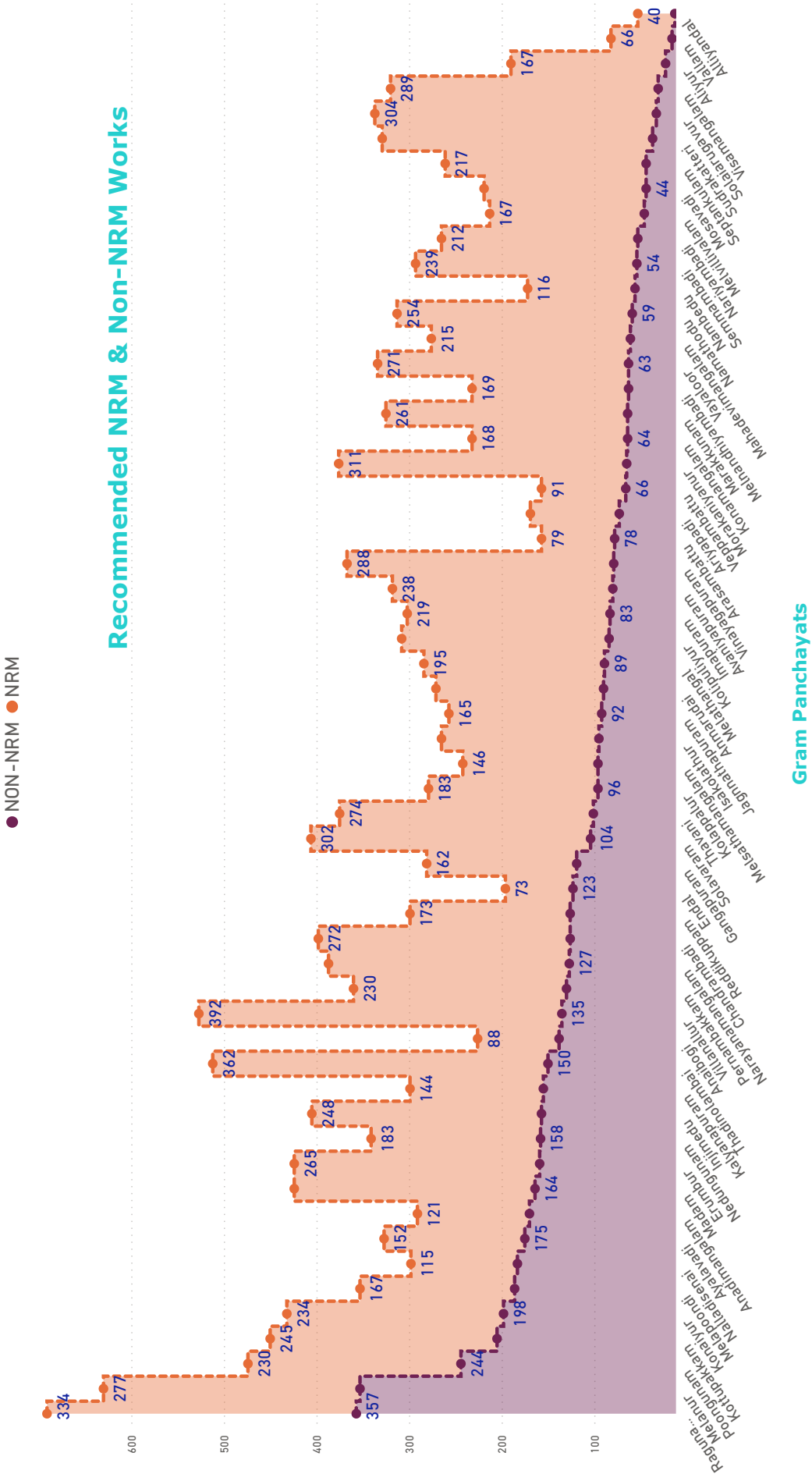


Figure 7.4. GP wise recommended NRM and Non-NRM works

7.3 ONGOING WORKS

The ongoing works in Peranamallur Block includes Anganwadi/Other Rural Infrastructure, Drought Proofing, Rural Sanitation, WCWH, and Works on Individuals Land (Category IV). A total of 62 works are ongoing in the Block, in which individual beneficiary oriented works are more (84 %) followed WCWH (13 %) while drought proofing, rural sanitation works are less in number (Figure 7.5). GP and work category wise ongoing works are tabulated in Annexure 7.2.

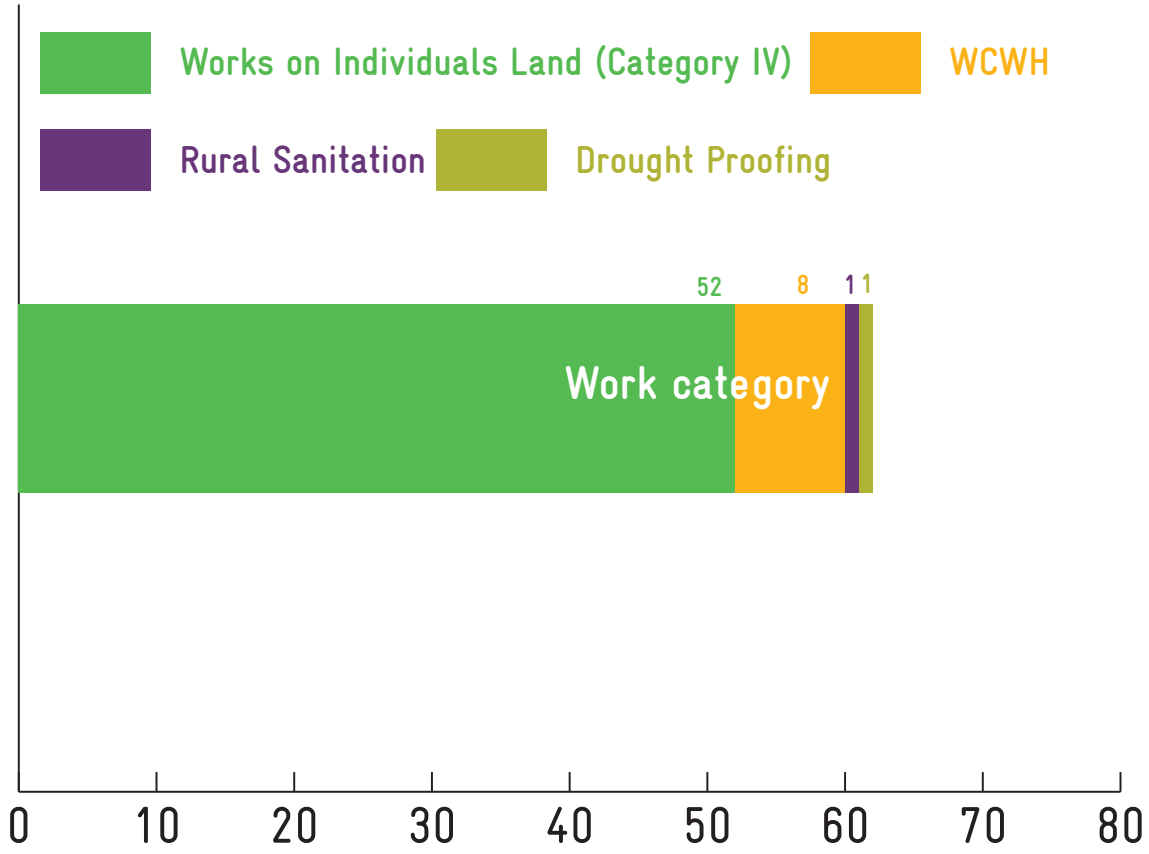


Figure 7.5. Category wise Ongoing works in Peranamallur Block

7.4 CATCH THE RAIN

The NWM's campaign "Catch The Rain" with the tagline "Catch the rain, where it falls, when it falls" is to nudge the states and stakeholders to create appropriate Rain Water Harvesting Structures (RWHS) suitable to the climatic conditions and sub-soil strata before monsoon season. Under this campaign, drives to make check dams, water harvesting pits, rooftop RWHS, removal of encroachments and de-silting of tanks to increase their storage capacity, removal of obstructions in the channels which bring water to them from the catchment areas, repairs to step-wells and using defunct bore wells and unused wells to put water back to aquifers etc., are to be taken up with the active participation of people. The total expenditure towards progressive works on Catch the Rain campaign of Peranamallur Block is Rs. 3,314.52 Lakhs, of it nearly 87 % of the expenditure utilized for watershed development (Figure 7.6).

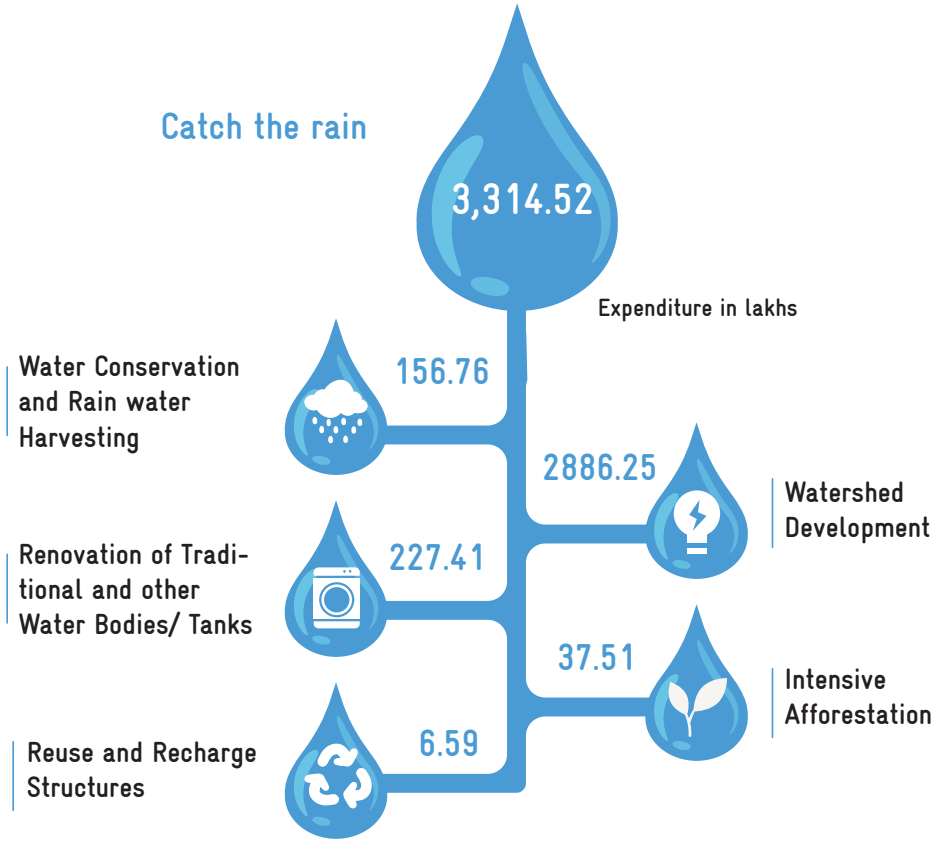
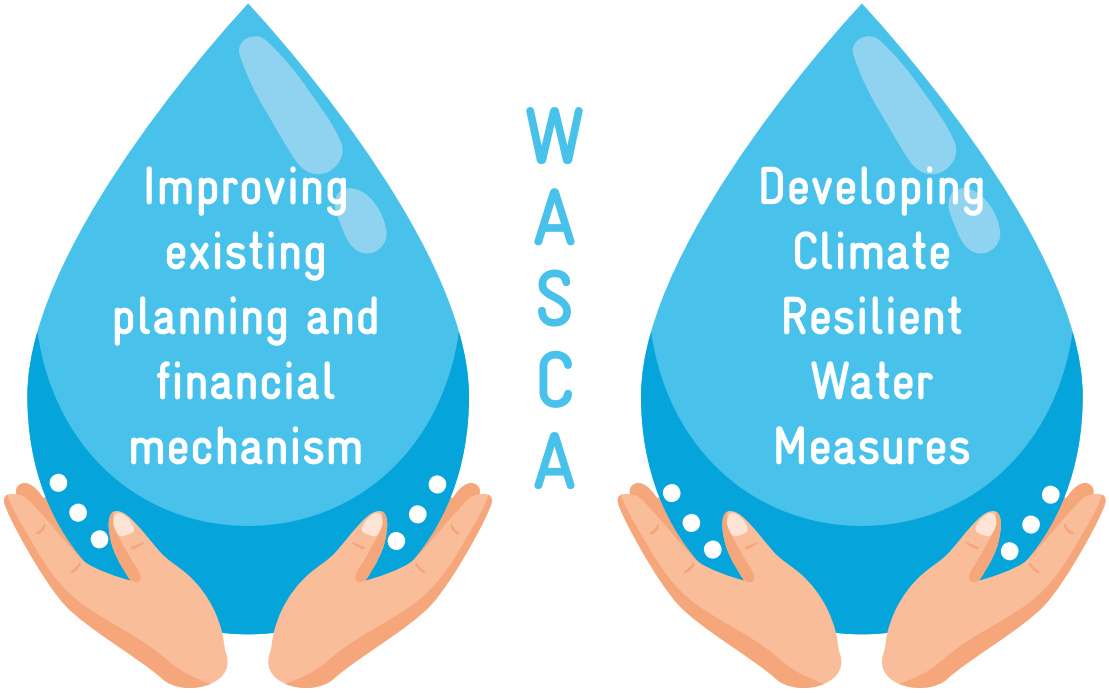


Figure 7.6. Catch the Rain campaign in Peranamallur Block



தானம் தவம்இரண்டும் தங்கா வியன்உலகம்
வானம் வழங்கா தெனின்

குறள் - 19

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

Thirukkural - 19

CHAPTER 8

8 CASE STUDY

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

8.1 MACRO-WATERSHEDS OF PERANAMALLUR BLOCK

Peranamallur Block comes under Cheyyar, Cheyyar River, Tondi Veraha and Killiyar macro-watersheds (Figure 8.1). Cheyyar watershed (4C2A3) has 17 micro-watersheds covering an area of 9,735 ha. Cheyyar River watershed (4C2A4) has 28 micro-watersheds covering an area of 14,788.52 ha. Tondi Veraha watershed (4C1D3) has 14 micro-watersheds covering an area of 6,622.33 ha. Killiyar watershed (4C2A1) has 11 micro-watersheds covering an area of 7,719.969 ha. (Table 25) Out of 57 GPs in the Block, 8 GPs fall under Cheyyar (4C2A3) Watershed, 21 GPs fall under Cheyyar River (4C2A4) Watershed, 11 GPs fall under Tondi Veraha (4C1D3) Watershed and 8 GPs fall under Killiyar (4C2A1) Watershed.

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

Macro-watershed	Area in ha	No. of micro-watersheds
Cheyyar	9,735	17
Cheyyar River	14,788.52	28
Tondi Veraha	6,622.33	14
Killiyar	7,719.969	11

TABLE 26. NO. OF GPs COVERED UNDER WATERSHEDS IN PERANAMALLUR BLOCK

Name of watershed	No. of GPs
Cheyyar	8
Cheyyar River	21
Tondi Veraha	11
Killiyar	8
Cheyyar & Tondi Veraha	2
Cheyyar & Killiyar	4
Cheyyar River & Tondi Veraha	1
Tondi Veraha & Killiyar	2

2 GPs have watershed boundaries passing through Cheyyar and Tondi Veraha, 4 GPs have watershed boundaries passing thpught Cheyyar and Killiar, one GP has watershed boundary passing through Cheyyar River and Tondi Veraha and 2 GPs have watershed boundaries passing through Tondi veraha and Killiyar (Table 26 & Figure 8.2). The micro-watershed-based works are identified using Basin, Sub-basin, and micro-Watershed with GP administrative boundaries through Composite Water Resources Management plan approach.

Understanding the Block area with respect to its nature of terrain aids in treating the area with appropriate measures at the right place which also ensures efficient management of the watershed (micro or macro). Ridge-based Block area is mapped (zoning) by referring to 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, middle, lower and inter variations of the Block area is distinguished into 4 kinds of ridge zones.

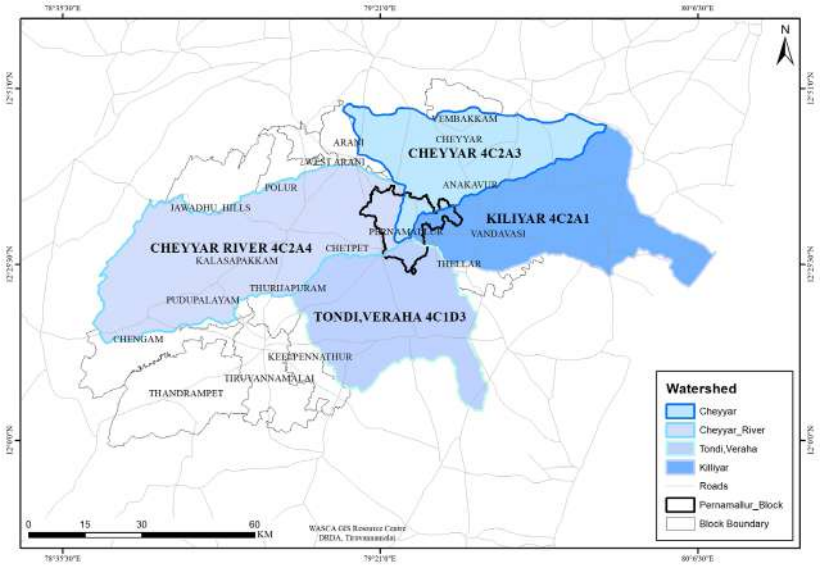


Figure 8.1. Macro-watershed Map of Peranamallur Block

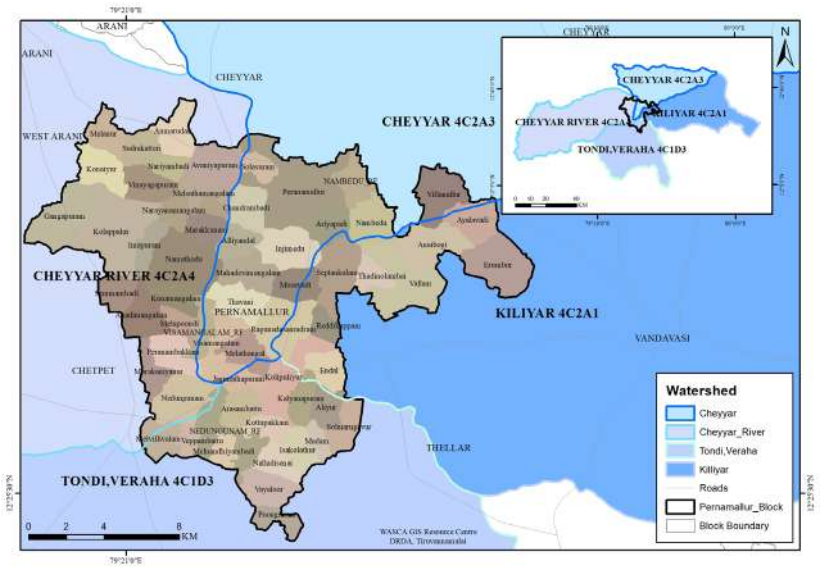


Figure 8.2. Macro-watershed with GPs map

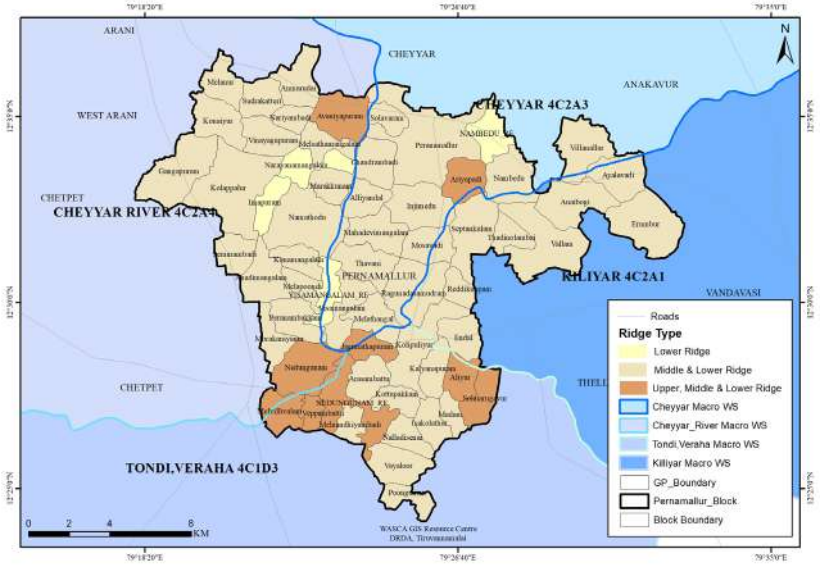


Figure 8.3. Macro-watershed Ridge Map

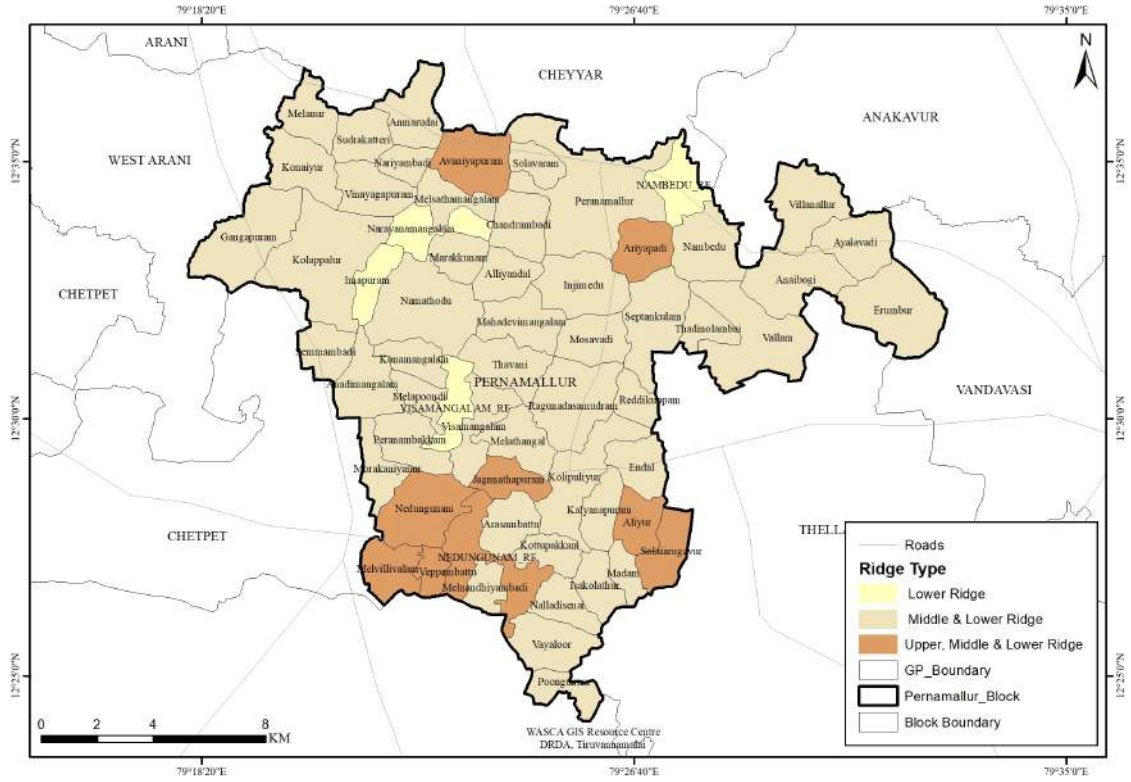


Figure 8.4. GP level Ridge Map

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 Peranamallur Block are listed in Tables 30 to 45.

TABLE 27. MICRO-WATERSHED IN PERANAMALLUR BLOCK FALLING UNDER CHEYYAR MACRO-WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C2A3d08b	738.78	Upper, Middle & Lower
2	4C2A3d11c	589.66	
3	4C2A3d09b	613.87	Middle & Lower
4	4C2A3d09a	620.16	
5	4C2A3d08a	462	
6	4C2A3d09c	492.76	
7	4C2A3d07c	584.5	
8	4C2A3d10a	688.24	
9	4C2A3d08c	356.41	
10	4C2A3d10c	591.82	
11	4C2A3d10b	852.28	
12	4C2A3d11a	649.37	
13	4C2A3d11b	511.38	
14	4C2A3d07a	573.32	Lower
15	4C2A3b11b	615.8	
16	4C2A3b11c	385.37	
17	4C2A3d07b	409.27	

TABLE 28. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER CHEYYAR MACRO-WATERSHED IN PERANAMALLUR BLOCK

Sl.No	Name of the GP	Type of Ridge
1	Ariyapadi	Upper, Middle & Lower
2	Injimedu	Middle & Lower
3	Mahadevimangalam	
4	Thavani	
5	Alliyandal	
6	Visamangalam	
7	Chandrambadi	
8	Solavaram	

TABLE 29. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR MACRO-WATERSHED IN PERANAMALLUR BLOCK

Ridge falling under Thurinjalar macro- watershed in Peranamallur Block			
S. No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	4.2
2	Drainage Line Treatment (m)		6,862
3	CC Check dams (No.)	Middle	6
4	Avenue plantation (m)		33,800
5	Composting (No.)	Lower	73
6	Restoration of water bodies: Tanks and Ooranis (No.)		28
7	Farm Bunding with Boundary Trenches - Individual (ha)		27.62
8	Construction of Farm Ponds - Individual (No.)		87
9	Land development - Individual (ha)		37.27
10	Azolla units - Individual (No.)		91
11	NADEP Vermi compost (No.)		37
12	Cattle Shelters (No.)		490
13	Goat Sheep Shelters (No.)		258
14	Cattle Trough (No.)		490
15	Construction of new open wells & Recharge Shafts (No.)		62
16	Soak Pits (Community) (No.)		30
17	Soak Pits (Individual) (No.)		1,280
18	Roof Rain Water Harvesting (No.)		14
19	Nutri Garden (No.)		50
20	Silt application (No.)		62

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

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C2A4b01c	693.25	Upper, Middle & Lower
2	4C2A4b10c	297.81	
3	4C2A4b10d	723.32	
4	4C2A4b01b	567.26	Middle & Lower
5	4C2A4a01c	653.67	
6	4C2A4a02a	891.76	
7	4C2A4a03a	489.2	
8	4C2A4b04a	565.81	
9	4C2A4b01d	604.62	
10	4C2A4b02a	491.29	
11	4C2A4b03a	430.91	
12	4C2A4b04b	431.11	
13	4C2A4b02c	435.56	
14	4C2A4b03c	394.25	
15	4C2A4b02b	564.13	
16	4C2A4b10a	603.1	
17	4C2A4b10b	359.8	
18	4C2A4a13a	571.76	Lower
19	4C2A4a01b	527.78	
20	4C2A4a01a	305.19	
21	4C2A4b01a	562.34	
22	4C2A4a02b	481.67	
23	4C2A4a03b	438.7	
24	4C2A4b04c	454.61	
25	4C2A4b03b	661.41	
26	4C2A4b12a	565.68	
27	4C2A4b11a	389.29	
28	4C2A4b11c	633.2	

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

Sl.No	Name of the GP	Ridge Type
1	Nedungunam	Upper, Middle & Lower
2	Avaniyapuram	
3	Marakkunam	Middle & Lower
4	Sudrakatteri	
5	Melapoondi	
6	Nariyambadi	
7	Melsathamangalam	
8	Vinayagapuram	
9	Semmambadi	
10	Anadimangalam	

11	Namathodu	Middle & Lower
12	Konamangalam	
13	Morakaniyanur	
14	Peranambakkam	
15	Anmarudai	
16	Kolappalur	
17	Konaiyur	
18	Melanur	
19	Gangapuram	
20	Narayanamangalam	Lower
21	Imapuram	

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

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	53.19
2	Drainage Line Treatment (m)		16,250
3	CC Check dams (No.)	Middle	11
4	Block Plantation (Community) (ha)		51.63
5	Silvi-pasture Development (ha)		35.58
6	Mini Forest (ha)		4
7	Avenue plantation (m)		48,075
8	Composting (No.)	Lower	198
9	Canal Bund Plantation (m)		3,928
10	Restoration of water bodies: Tanks and Ooranis (No.)		109
11	Artificial Recharge Structure (No.)		176
12	Farm Bunding with Boundary Trenches - Individual (ha)		360
13	Construction of Farm Ponds - Individual (No.)		278
14	Land development - Individual (ha)		118
15	Azolla units - Individual (No.)		60
16	NADEP Vermi compost (No.)		412
17	Cattle Shelters (No.)		1,070
18	Goat Sheep Shelters (No.)		590
19	Cattle Trough (No.)		1,070
20	Construction of new open wells & Recharge Shafts (No.)		227
21	Soak Pits (Community) (No.)		53
22	Soak Pits (Individual) (No.)		5,219
23	Roof Rain Water Harvesting (No.)		42
24	Nutri Garden (No.)		208
25	Silt application (No.)		168

TABLE 33. MICRO-WATERSHED IN PERNAMALLUR BLOCK FALLING UNDER TONDI VERAHA MACRO-WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C1D3b09d	754.47	Upper, Middle & Lower
2	4C1D3b07d	179.27	
3	4C1D3b09c	367.53	
4	4C1D3b07c	390.22	
5	4C1D3e13b	454.17	
6	4C1D3e12e	372.15	
7	4C1D3e13c	545.45	
8	4C1D3b08c	333.81	
9	4C1D3b09b	399.4	Middle & Lower
10	4C1D3b05c	539.99	
11	4C1D3b09a	534.4	
12	4C1D3b08a	420.88	
13	4C1D3b08b	584.79	
14	4C1D3b06c	745.8	

TABLE 34. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER TONDI VERAHA MACRO-WATERSHED IN PERNAMALLUR BLOCK

Sl.No	Name of the GP	Type of Ridge
1	Aliyur	Upper, Middle & Lower
2	Solaiarugavur	
3	Veppambattu	
4	Madam	Middle & Lower
5	Nalladisenai	
6	Kottupakkam	
7	Melnandhiyambadi	
8	Isakolathur	
9	Vayaloor	
10	Arasambattu	
11	Poongunam	

TABLE 35. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER TONDI VERAHA MACRO-WATERSHED IN PERNAMALLUR BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	21.5
2	Drainage Line Treatment (m)		7,760
3	CC Check dams (No.)	Middle	7
4	Block Plantation (Community) (ha)		19
5	Avenue plantation (m)		18,365
6	Agro Forestry (ha)		8.94

7	Composting (No.)	Lower	69
8	Canal Bund Plantation (m)		1,964
9	Restoration of water bodies: Tanks and Ooranis (No.)		57
10	Artificial Recharge Structure (No.)		47
11	Farm Bunding with Boundary Trenches - Individual (ha)		18.41
12	Construction of Farm Ponds - Individual (No.)		160
13	Land development - Individual (ha)		40.71
14	Azolla units - Individual (No.)		11
15	NADEP Vermi compost (No.)		253
16	Cattle Shelters (No.)		569
17	Goat Sheep Shelters (No.)		386
18	Cattle Trough (No.)		55
19	Construction of new open wells & Recharge Shafts (No.)		127
20	Soak Pits (Community) (No.)		16
21	Soak Pits (Individual) (No.)		2,543
22	Roof Rain Water Harvesting (No.)		22
23	Nutri Garden (No.)		208
24	Silt application (No.)		75

TABLE 36. MICRO-WATERSHED IN PERNAMALLUR BLOCK FALLING UNDER KILLIYAR MACRO-WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C2A1e14b	553.1	Middle & Lower
2	4C2A1e15c	943	
3	4C2A1e15b	525	
4	4C2A1e15a	977.09	
5	4C2A1e16b	940.39	
6	4C2A1e16a	1209.38	
7	4C2A1e16c	522.67	
8	4C2A1e14c	517.48	Lower
9	4C2A1e14a	579.62	
10	4C2A1e08c	429.08	
11	4C2A1e11a	523.18	

TABLE 37. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER KILLIYAR MACRO-WATERSHED IN PERNAMALLUR BLOCK

Sl.No	Name of the GP	Ridge Type
1	Ayalavadi	Middle & Lower
2	Anaibogi	
3	Thadinolambai	
4	Septankulam	
5	Reddikuppam	
6	Endal	
7	Erumbur	
8	Vallam	

TABLE 38. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER KILLIYAR MACRO-WATERSHED IN PERNAMALLUR BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	8.36
2	Drainage Line Treatment (m)		4,202.10
3	CC Check dams (No.)	Middle	4
4	Block Plantation (Community) (ha)		23
5	Avenue plantation (m)		16,280
6	Agro Forestry (ha)		1.82
7	Composting (No.)	Lower	46
8	Canal Bund Plantation (m)		1,305
9	Restoration of water bodies: Tanks and Ooranis (No.)		166.63
10	Artificial Recharge Structure (No.)		8
11	Farm Bunding with Boundary Trenches - Individual (ha)		12
12	Construction of Farm Ponds - Individual (No.)		84
13	Land development - Individual (ha)		30.97
14	Azolla units - Individual (No.)		37
15	NADEP Vermi compost (No.)		82
16	Cattle Shelters (No.)		857
17	Goat Sheep Shelters (No.)		432
18	Cattle Trough (No.)		23
19	Construction of new open wells & Recharge Shafts (No.)		40
20	Soak Pits (Community) (No.)		60
21	Soak Pits (Individual) (No.)		1,560
22	Roof Rain Water Harvesting (No.)		14
23	Nutri Garden (No.)		8
24	Silt application (No.)		36

TABLE 39. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER CHEYYAR & KILLIYAR MACRO-WATERSHED IN PERNAMALLUR BLOCK

Sl.No	Name of the GP	Ridge Type
1	Ragunadasamudram	Middle & Lower
2	Mosavadi	
3	Villanallur	
4	Nambedu	

TABLE 40. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR & KILLIYAR MACRO-WATERSHED IN PERNAMALLUR BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	11.4
2	Drainage Line Treatment (m)		3,920
3	CC Check dams (No.)	Middle	2
4	Block Plantation (Community) (ha)		2
5	Avenue plantation (m)		6,420
6	Agro Forestry (ha)		2.26

7	Composting (No.)	Lower	12
8	Canal Bund Plantation (m)		480
9	Restoration of water bodies: Tanks and Ooranis (No.)		19
10	Artificial Recharge Structure (No.)		10
11	Farm Bunding with Boundary Trenches - Individual (ha)		15
12	Construction of Farm Ponds - Individual (No.)		53
13	Land development - Individual (ha)		16.21
14	Azolla units - Individual (No.)		102
15	NADEP Vermi compost (No.)		52
16	Cattle Shelters (No.)		178
17	Goat Sheep Shelters (No.)		118
18	Cattle Trough (No.)		13
19	Construction of new open wells & Recharge Shafts (No.)		24
20	Soak Pits (Community) (No.)		52
21	Soak Pits (Individual) (No.)		740
22	Roof Rain Water Harvesting (No.)		8
23	Nutri Garden (No.)		52
24	Silt application (No.)		10

TABLE 41. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER CHEYYAR &TONDI VERAHA MACRO- WATERSHED IN PERNAMALLUR BLOCK

Sl.No	Name of the GP	Ridge Type
1	Jagnnathapuram	Upper, Middle & Lower
2	Melathangal	Middle & Lower

TABLE 42. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR & TONDI VERAHA MACRO- WATERSHED IN PERNAMALLUR BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	6
2	Drainage Line Treatment (m)		1,740
3	CC Check dams (No.)	Middle	1
4	Block Plantation (Community) (ha)		5
5	Avenue plantation (m)		5,240
6	Agro Forestry (ha)		0.87
7	Composting (No.)	Lower	28
8	Canal Bund Plantation (m)		160
9	Restoration of water bodies: Tanks and Ooranis (No.)		17
10	Artificial Recharge Structure (No.)		5
11	Farm Bunding with Boundary Trenches - Individual (ha)		36
12	Construction of Farm Ponds - Individual (No.)		60
13	Land development - Individual (ha)		4.4
14	Azolla units - Individual (No.)		29
15	NADEP Vermi compost (No.)		29
16	Cattle Shelters (No.)		126
17	Goat Sheep Shelters (No.)		65

18	Cattle Trough (No.)	Lower	9
19	Construction of new open wells & Recharge Shafts (No.)		11
20	Soak Pits (Community) (No.)		18
21	Soak Pits (Individual) (No.)		490
22	Roof Rain Water Harvesting (No.)		4
23	Nutri Garden (No.)		2
24	Silt application (No.)		14

TABLE 43. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER &TONDI VERAHA MACRO-WATERSHED IN PERNAMALLUR BLOCK

Sl.No	Name of the GP	Ridge Type
1	Melvillivalam	Upper, Middle & Lower

TABLE 44. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER CHEYYAR RIVER & TONDI VERAHA MACRO-WATERSHED IN PERNAMALLUR BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	1.5
2	Drainage Line Treatment (m)		1,860
3	CC Check dams (No.)	Middle	1
4	Block Plantation (Community) (ha)		2
5	Avenue plantation (m)		2,250
6	Agro Forestry (ha)		1.35
7	Composting (No.)	Lower	4
8	Canal Bund Plantation (m)		140
9	Restoration of water bodies: Tanks and Ooranis (No.)		10
10	Artificial Recharge Structure (No.)		2
11	Farm Bunding with Boundary Trenches - Individual (ha)		16
12	Construction of Farm Ponds - Individual (No.)		12
13	Land development - Individual (ha)		2.3
14	Azolla units - Individual (No.)		3
15	NADEP Vermi compost (No.)		3
16	Cattle Shelters (No.)		30
17	Goat Sheep Shelters (No)		30
18	Cattle Trough (No.)		30
19	Construction of new open wells & Recharge Shafts (No.)		5
20	Soak Pits (Community) (No.)		3
21	Soak Pits (Individual) (No.)		2
22	Roof Rain Water Harvesting (No.)		2
23	Nutri Garden (No.)		1
24	Silt application (No.)		1

8.2 MODEL MICRO-WATERSHED: GENGAPURAM

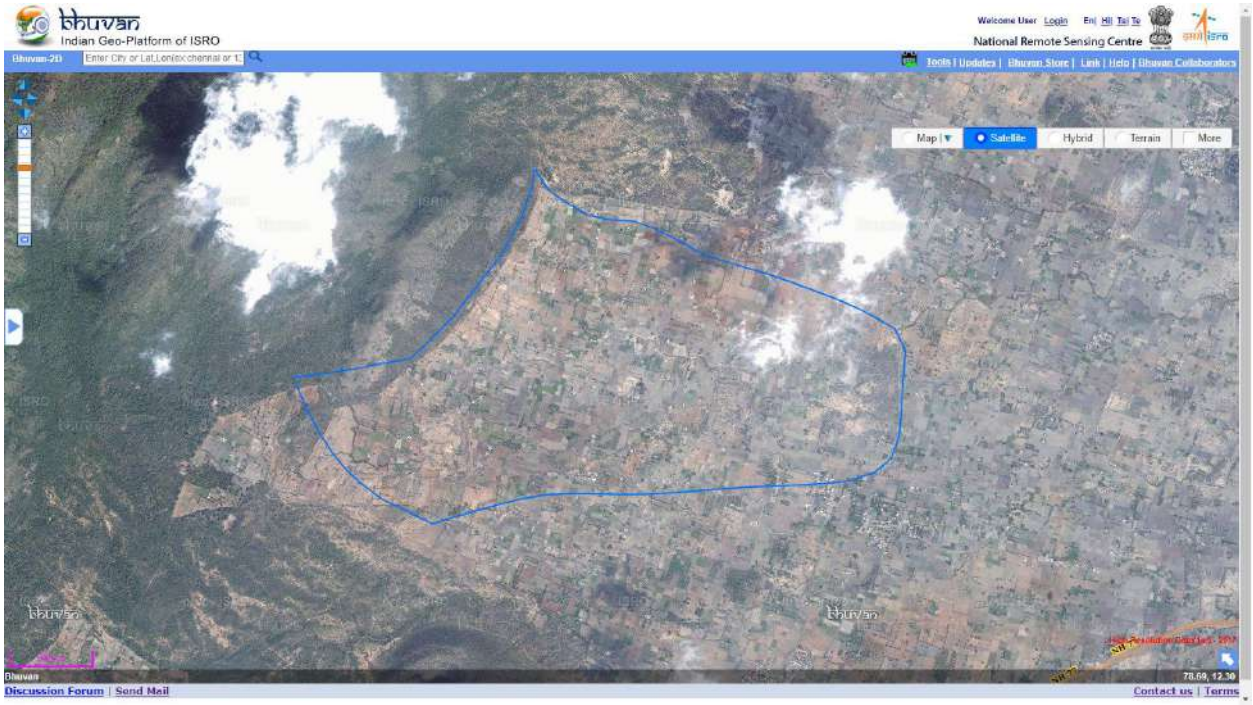


Figure 8.5. Satellite image of Gengapuram micro-watershed

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 development programs. This includes coordination of various natural components like groundwater, surface water, geology, hydrogeology, catchment, land use, soil, population, salt affected water along with various water resource supply and demand component. The ultimate goal is to achieve and maintain a balance between resources development to increase the welfare of the population.

GENGAPURAM MICRO-WATERSHED

Gengapuram micro-watershed falls under Gengapuram and Kolappalur GPs, Peranamallur Block in Thiruvannamalai District (Figure 8.5 and 8.6). 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 Gengapuram micro-watershed is given below in separate sections followed by proposed works (Figure 8.7 and 8.8), ridge wise proposed treatment area, estimated cost and required person days and key outcomes (Table 45 to 55). The key CWRM parameters for the GPs falling in this micro-watershed is Annexed 8.

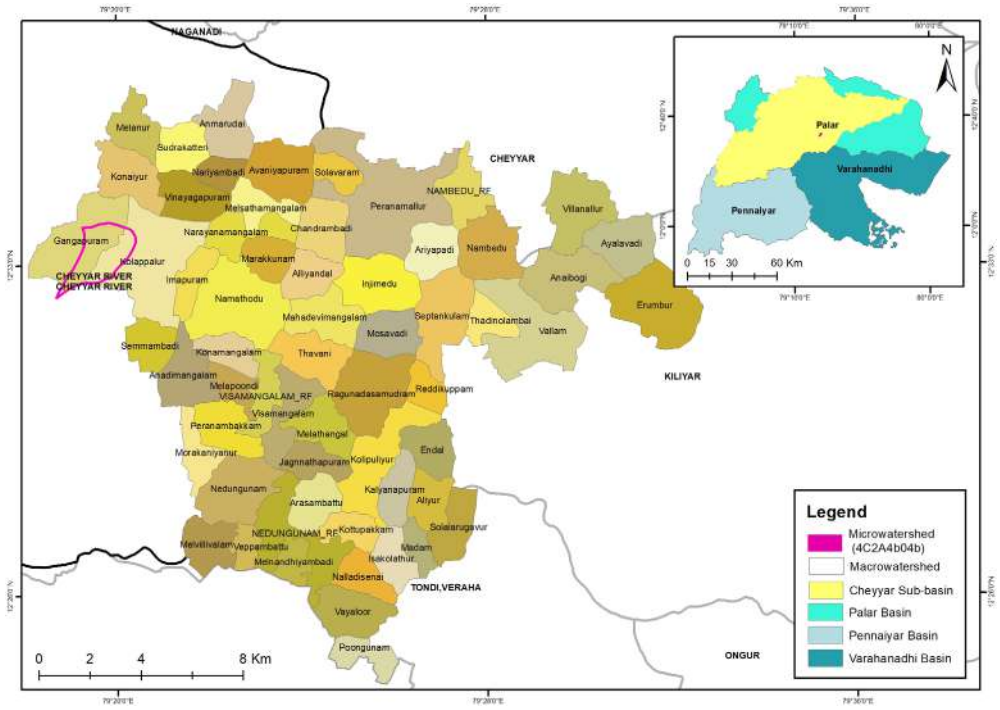


Figure 8.6. Gengapuram micro-watershed with GPs

TABLE 45. GENERAL INFORMATION OF THE MICRO-WATERSHED

Description	Name/ Number/ Quantity/ Status
Name of the Micro-watershed	**Gengapuram**
Micro-watershed Number	**4C2A4b04b**
Name of the Basin	Palar Basin
Name of the sub basin	Cheyyar Sub Basin
Name of the Macro- watershed	Cheyyar River
Number of GPs covered under the Micro-watershed	2
Name of the GPs	1. Gengapuram
	2. Kolappalur
Latitude of Micro-watershed (From To)	12°32'19.75"N to 12°33'50.95"N
Longitude of Micro-watershed (From To)	79°19'11.25"E to 79°20'16.81"E
Total area of the Micro-watershed in ha	431
% Micro-watershed area in Gengapuram GP	58
% Micro-watershed area in Kolappalur GP	42
Area of Micro-watershed falling in Gengapuram GP (ha)	251
Area of Micro-watershed falling in Kolappalur GP (ha)	180
Total Population of Gengapuram GP	2,708
Total Population of Kolappalur GP	5,126
Annual Average Rainfall (mm)	1047
Annual maximum Temperature (°C)	33
Annual Minimum Temperature (°C)	22.8
Evapo-Transpiration Losses of Gengapuram GP (ha.m)	20.63
Evapo-Transpiration Losses of Kolappalur GP (ha.mh	23.02
Volumetric soil moisture availability (%)	23

Climate Risk	Drought and heat waves
CVI Index Value for Gengapuram GP (Based on WASCA Climate study)	0.594
CVI Index Value for Kolappalur GP (Based on WASCA Climate study)	0.615
Agro-Climatic Zone	North eastern zone (TN-1)
Agro Ecological Sub-Region (ICAR)	Eastern Ghats
Status of Ground water in Gengapuram GP	Over Exploited
Status of Ground water in Kolappalurr GP	Over Exploited

TABLE 46. GEOLOGY, HYDROGEOLOGY OTHER CHARACTERISTICS IN MICRO-WATERSHED

Geology occurrence in % (Hard rock)	100
Geology Quality	Moderate
Depth of weathered zone and/or maximum depth of fractures in Hard Rock area (m)	30 to 60
Bottom of the unconfined aquifer in soft rock areas (m)	20 to 40
Sheet Erosion (ha)	78 (lower ridge)
Barren & waste lands (ha)	18 (lower ridge)

TABLE 47. MICRO-WATERSHED'S CATCHMENT AREA (STRANGE METHODOLOGY- CGWB)

Catchment Area in ha	Gengapuram GP	Kolappalur GP
Good catchment area	254.64	433.9
Average catchment area	12.64	12.48
Bad catchment area	491.21	721.76

TABLE 48. GROUND WATER STATUS OF MICRO-WATERSHED

Firka Assessment Unit for Gengapuram and Kolappalur GP in ha.m	
Name of the Firka (Assessment Unit) falling under Micro-watershed	Kolappalur
Net Annual Ground Water Availability (ha.m)	1,471.50
Existing Gross Ground Water Draft for Irrigation (ha.m)	1,821.15
Existing Gross Ground Water Draft for domestic and industrial water supply (ha.m)	1,131.88
Existing Gross Ground Water Draft for All uses (ha.m)	2,953.03
Provision for domestic and industrial requirement supply to 2025 (ha.m)	1,286.49
Net Ground Water Availability for future irrigation development (ha.m)	-1,636.15

TABLE 49. GP WISE WATER BUDGET OF MICRO-WATERSHED- GENGAPURAM & KOLAPPALUR

Water Budget in ha.m	Gengapuram GP	Kolappalur GP
Water for Human	7.41	14.03
Water for Agriculture	68.2	229.3
Water for Animal	3.57	3.4
Village wise water required	79.2	246.8

Available run-off from rain water (derived from strange method)	190.9	301.2
Harvested Runoff from Water Harvesting Activities	23.5	21.8
Potential Harvesting from proposed Interventions	34.7	53
Total Water harvested	58.2	74.8
Water demand and Supply Difference	-21.1	-172
Water Demand Supply Gap Status	Deficient	Deficient
Per capita Water Availability in cum	704.94	587.59
International Standard per capita water Availability in cum	1,700	1,700
Water Availability Gap	-995.05	-1,112.41
Water security status	Water Stress	Water Stress

TABLE 50. GP WISE PROPOSED MICRO-WATERSHED WORKS – GENGAPURAM AND KOLAPPALUR

Ridge type	Gengapuram GP	Kolappalur GP
Upper	No works falling in Upper Ridge	No works falling in Upper Ridge
Middle	8	2
Lower	164	82
Total	172	84

TABLE 51. RIDGE WISE TREATMENT AREA, ESTIMATED COST AND PERSON DAYS REQUIRED - GENGAPURAM AND KOLAPPALUR

	Gengapuram GP	Kolappalur GP
Middle Ridge		
Estimated cost for Middle Ridge area (INR in Lakhs)	21.5	17
Total area in ha of Middle Ridge	3	2
Treatment cost of Middle Ridge (Lakhs/ha)	**7.2**	**8.5**
Estimated Person days generated for Treatment of Middle Ridge	**8,400**	**6,642**
Lower Ridge		
Estimated cost for Lower Ridge area (INR in Lakhs)	137.80	122.81
Total area in ha of Lower Ridge	248	178
Treatment cost of Lower Ridge (INR in Lakhs per ha)	**0.56**	**0.69**
Estimated Person days generated for Treatment of Lower Ridge	**59,615**	**36,212**

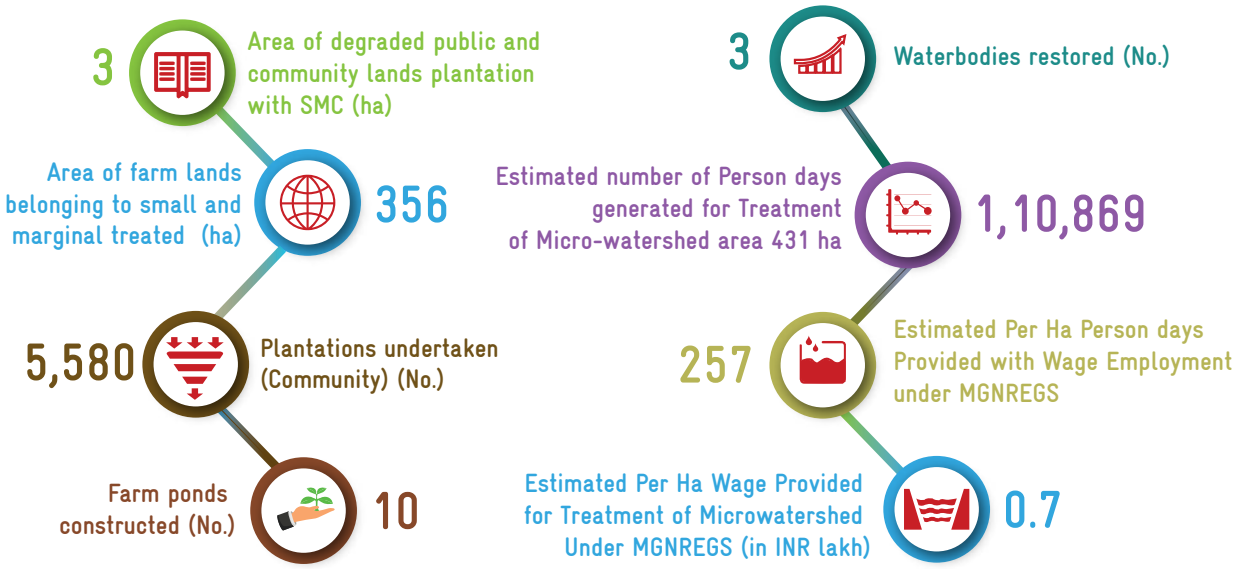
Gengapuram GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	7.2 lakh/ha	8,400
Lower Ridge	0.56 lakh/ha	59,615
	7.76 lakh/ha	68,015

Kolappalur GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	8.5 lakh/ha	6,642
Lower Ridge	0.69 lakh/ha	36,212
	9.19 lakh/ha	42,854

TABLE 52. NATURE AND NO. OF WORKS IN MICRO-WATERSHED

Description	Number
Total No. of works in Micro-watershed area (Arable, non arable & DLT)	130
Total No. of works in Micro-watershed including livelihood Activities	51
Total No. of works in Micro-watershed including Rural Greywater Management Activities	75

TABLE 53. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)

Gengapuram GP	98.14 lakh
Kolappalur GP	103.18 lakh

TABLE 54. ESTIMATES OF MICRO-WATERSHED IN GENGAPURAM GP

Proposed Work	Ridge Type	Status of Work	Quantity (Area or No.)	No. of works as per KML	Estimate cost (INR in Lakhs)	Person days
NRM works in Public and Community Lands						
Block Plantation (ha)	Lower	Not commenced	1	1	11.1	4,320
Afforestation (ha)			1	1	8.6	3,344
Compost Pit (No.)			9	9	1.53	135
Avenue plantation (km)		Commenced	4.12	3	7.416	2,896
Sub total				**14**	**28.65**	**10,695**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Azolla Production units - Individual (No.)	Lower	Commenced	14	14	2.1	322
NADEP Vermi compost (No.)			14	14	2.52	378
Artificial Recharge Structure for borewell farmers (No.)		Not commenced	8	8	20	3,128
Silt application (No.)			2	2		
Fodder development - Individual (No.)			14	14	20.72	32,816
Construction of Farm Ponds - Individual (No.)		Ongoing	5	5	10	3,905
Farm Bunding with Boundary Trenches - Individual (ha & No.)	Middle	Not commenced	15	6	4.5	1,758
			6			
Dryland Horticulture (ha & No.)			5	2	17	6,642
			2			
Sub total				**65**	**76.84**	**48,949**
Total				**79**	**105.49**	**59,644**
Livelihood enhancement activates for Individual Farmers (dryland)						
Cattle Shelters (No.)	Lower	Commenced	14	14	29.68	4,634
Goat Sheep Shelters (No.)			9	9	20.43	3,195
Cattle Trough (No.)		Not commenced	14	14	0.7	84
Sub total				**37**	**50.81**	**7,913**
Rural Greywater Management						
Soak Pits (Individual) (No.)	Lower	Ongoing	28	28	2.8	448
Nutri Garden (No.)		Not commenced	28	28	0.2	10
Sub total				**56**	**3**	**458**
Total				**172**	**159.3**	**68,015**

TOTAL ESTIMATES OF MICRO-WATERSHED IN GENGAPURAM GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
			
Gengapuram GP	172	159.3	68,015

TABLE 55. ESTIMATES OF MICRO-WATERSHED IN KOLAPPALUR GP

Proposed Work	Ridge Type	Status of Work	Extent	No. of works as per KML	Estimate cost (INR in Lakhs)	Person days
NRM works in Public and Community Lands						
Avenue plantation (km)	Lower	Commenced	2.689	3	4.8402	1,890
Canal Bund Plantation (km)			0.693	1	1.035	414
Restoration of Traditional water bodies: (Union Tank) (No.)			3	3	45	7,200
Tank bund Plantation (No.)		Not commenced	3	3	5.4	2,109
Compost Pit (No.)			7	7	1.19	105
Sub total				**17**	**57.47**	**11,718**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Azolla Production units - Individual (No.)	Lower	Commenced	5	5	0.75	115
NADEP Vermi compost (No.)			5	5	0.9	135
Artificial Recharge Structure for borewell farmers (No.)		Not commenced	6	6	15	2,346
Farm Bunding with Boundary Trenches - Individual (ha & No.)			8	4	6	2,344
Farm Bunding with Boundary Trenches - Individual (ha & No.)			4			
Silt application (No.)			2	2		
Fodder development - Individual (No.)			5	5	7.4	11,720
Dryland Horticulture (ha & No.)	Middle		5	2	17	6,642
Dryland Horticulture (ha & No.)			2			
Construction of Farm Ponds - Individual (No.)	Lower	Ongoing	5	5	10	3,905
Sub total				**34**	**57.05**	**27,207**
Total				**51**	**114.52**	**38,925**

Livelihood enhancement activities for Individual Farmers (dryland)						
Cattle Shelters (No.)	Lower	Commenced	5	5	10.6	1,655
Goat Sheep Shelters (No.)			4	4	9.08	1,420
Cattle Trough (No.)		Not commenced	5	5	0.7	84
Sub total				**14**	**20.38**	**3,159**
Rural Greywater and Roof rainwater Management						
Rainwater Harvesting Structure (No.)	Lower	Commenced	1	1	4	625
Soak Pits (Individual) (No.)			9	9	0.9	144
Nutri Garden (No.)		Not commenced	9	9	0.01	1
Sub total				**19**	**4.91**	**770**
Total				**84**	**139.81**	**42,854**

TOTAL ESTIMATES OF MICRO-WATERSHED IN KOLAPPALUR GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Kolappalur GP	84	139.81	42,854

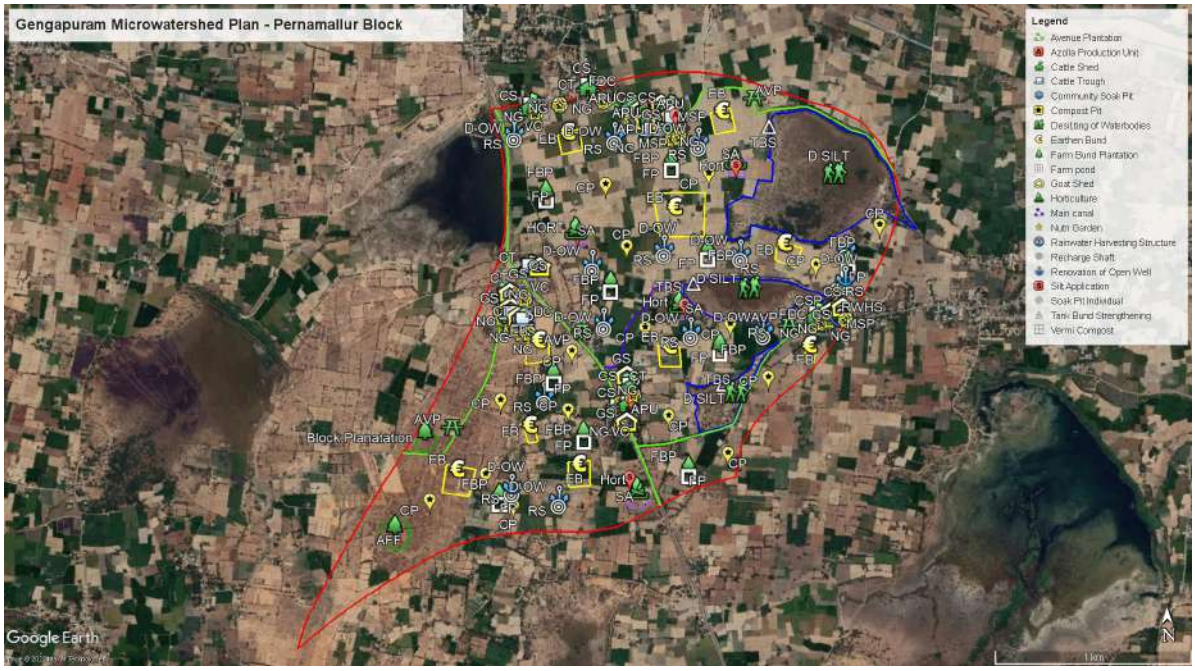
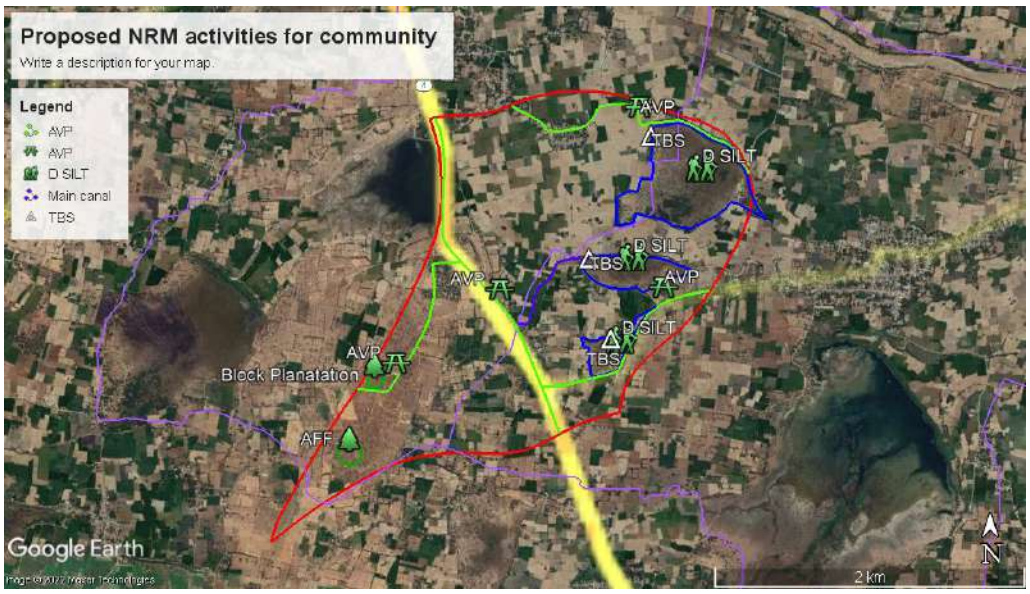


Figure 8.7. Proposed activities in Gengapuram micro-watershed


Proposed NRM activities for community
Write a description for your map.
Legend
AVP
AVP
D SILT
Main canal
TBS
AVP
TBS
D SILT
D SILT
TBS
AVP
AVP
D SILT
TBS
AVP
Block Planatation
AFF
Google Earth
2 km
N


Proposed Non-NRM activities for community
Write a description for your map
Legend
CSP
RWHS
CSP
RWHS
CSP
Google Earth
2 km
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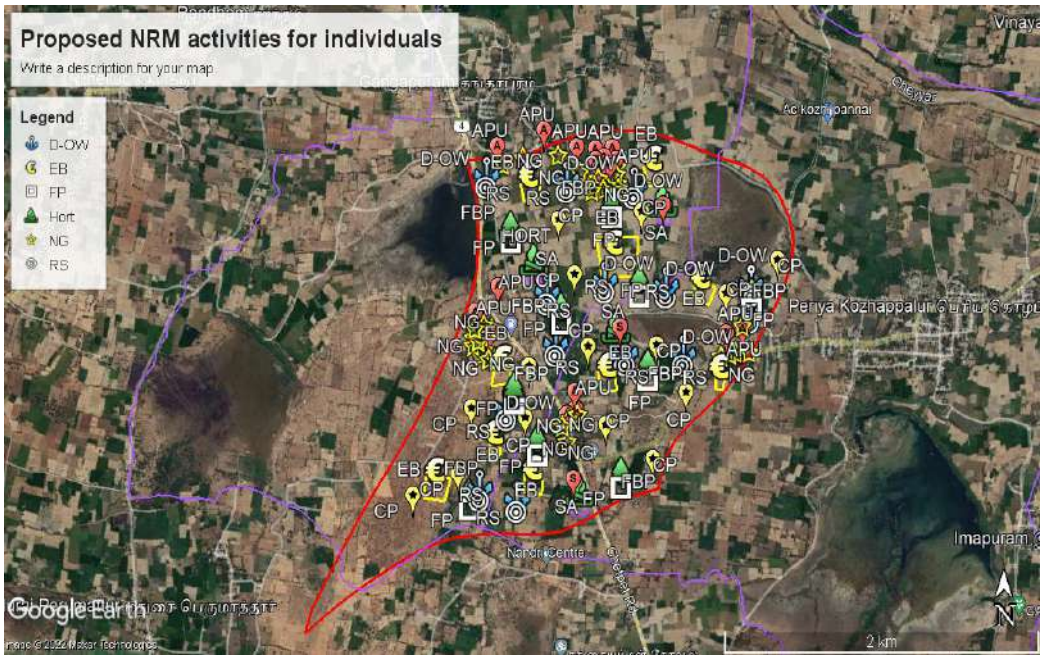
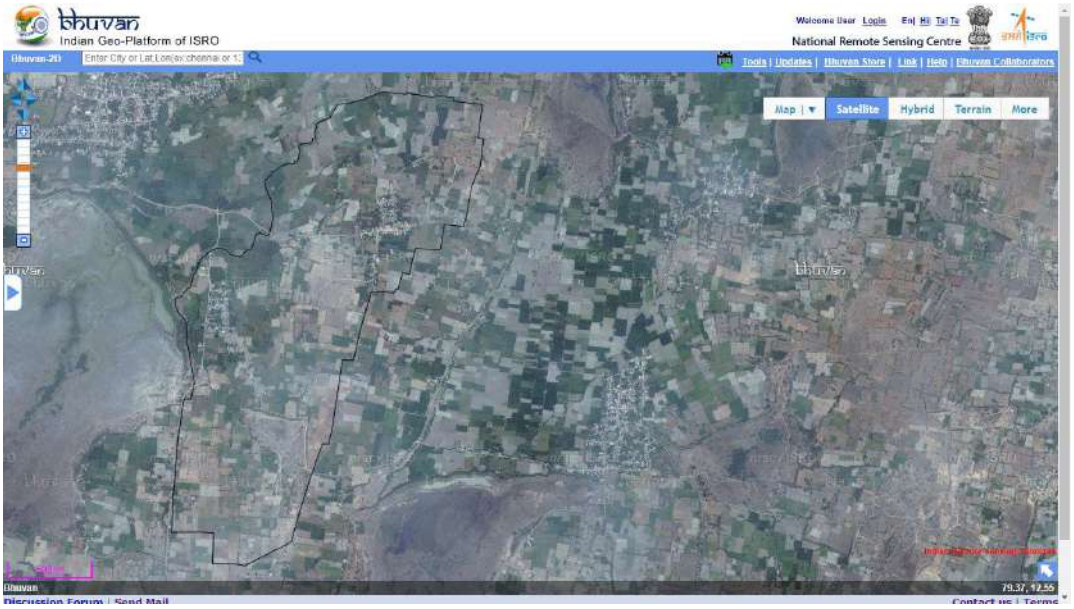

Proposed NRM activities for individuals
Write a description for your map
Legend
D-OW
EB
FP
Hort
NG
RS
Google Earth
2 km
N

Figure 8.8. Proposed activities in Gengapuram micro-watershed A: NRM activities for community. B: Non-NRM activities for community. C: NRM activities for Individuals. D: Non-NRM activities for Individuals

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

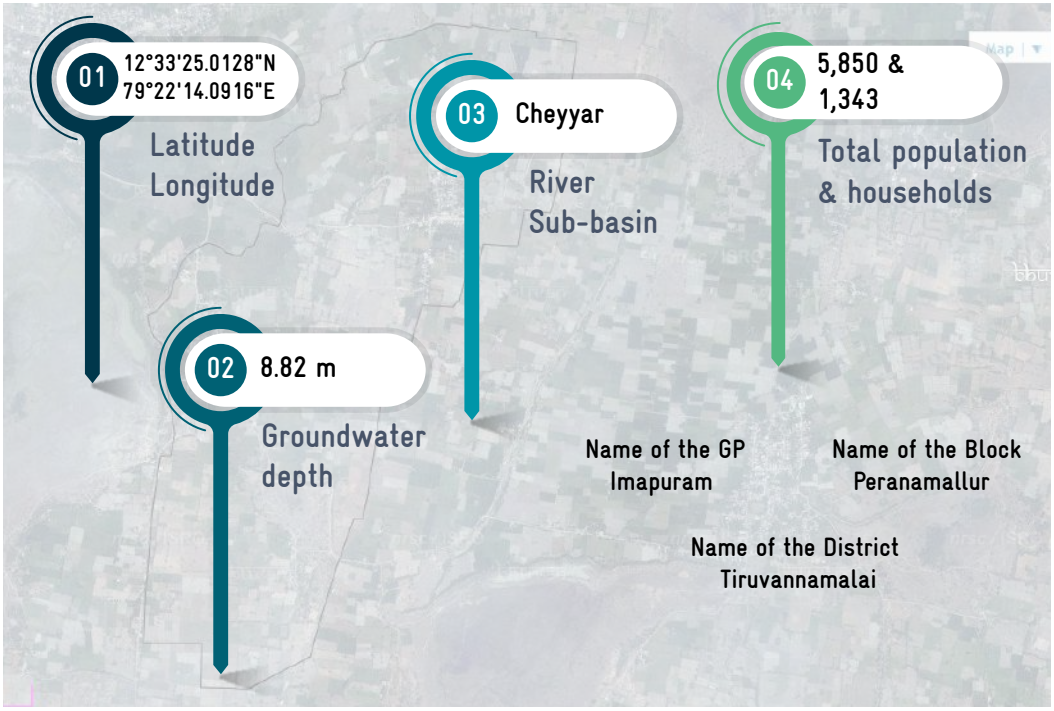
8.3 MODEL GP- IMAPURAM

8.3.1 BACKGROUND OF GRAM PANCHAYAT



Imapuram GP is geographically situated between 12°33'53.067"N to 12°35'45.226"N and 79°9'54.321"E to 79°11'52.858"E located in Peranamallur Block of Tiruvannamalai District. The total geographical area of GP is 691 ha, As per Census 2011, the total population is 5,850 of which 2,895 are males and the female population is 2,955. The total number of households is 1,343. The Schedule Caste constitutes 16% of total population in Imapuram village. There is no Scheduled Tribe population in the village. (Table 56). The average annual temperature of GP is 27.9 °C, and receives annual average rainfall of 1,047 mm.

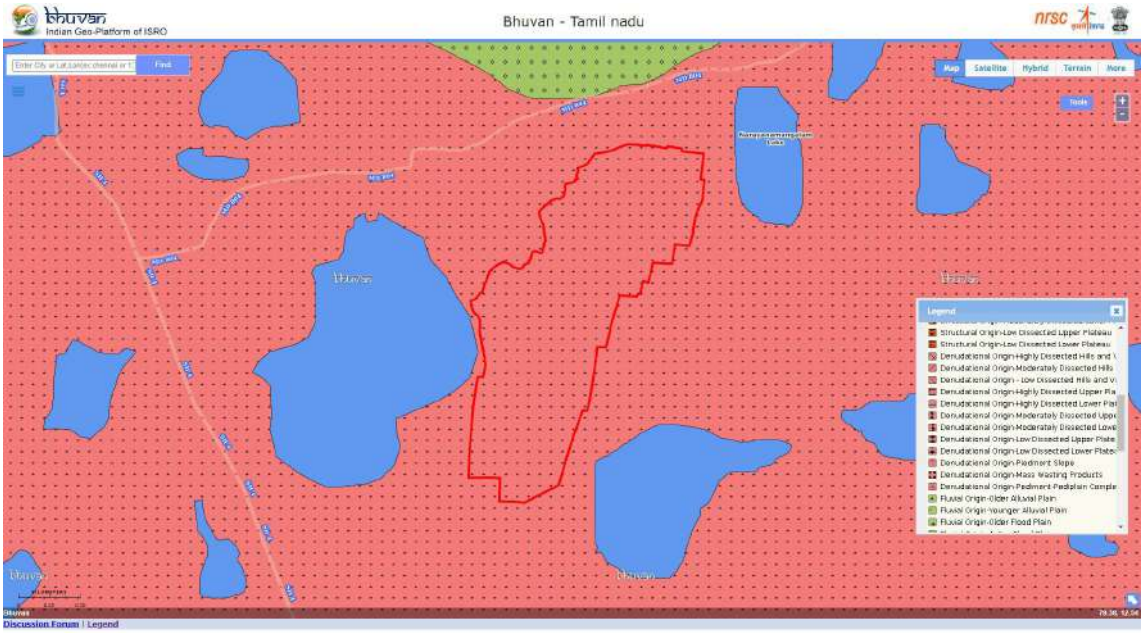
TABLE 56. GENERAL DESCRIPTION OF IMAPURAM GP, PERANAMALLUR BLOCK

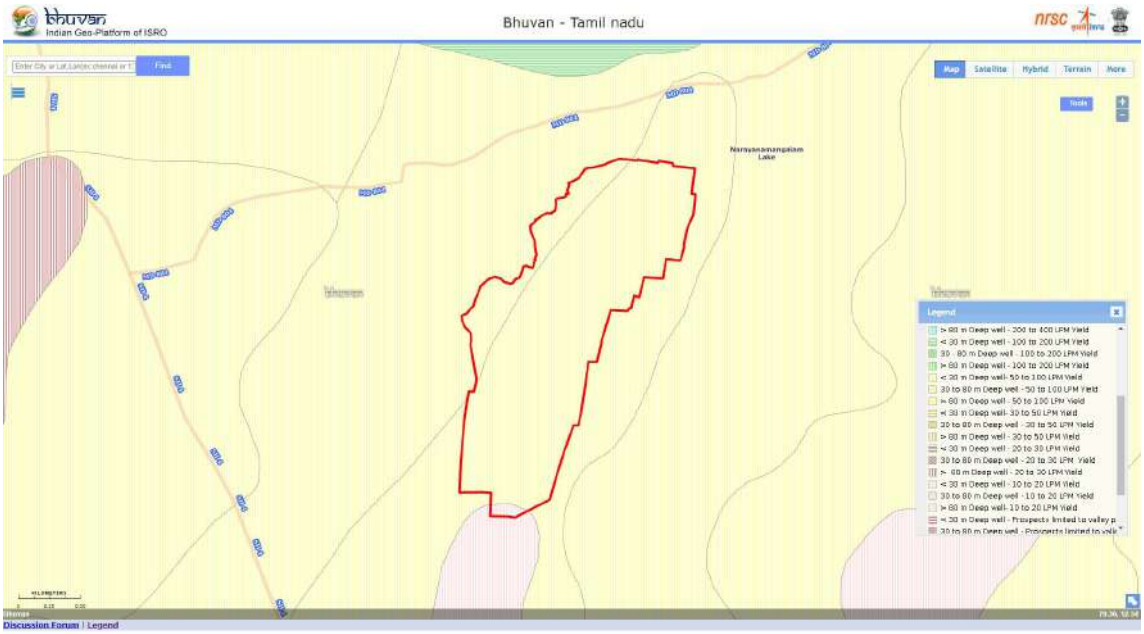


The detailed spatial and non-spatial data considered in the process of preparation of climate resilient measures under CWRM for Imapuram GP is illustrated as follows:

8.3.2 CWRM PLANNING - SPATIAL DATA

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





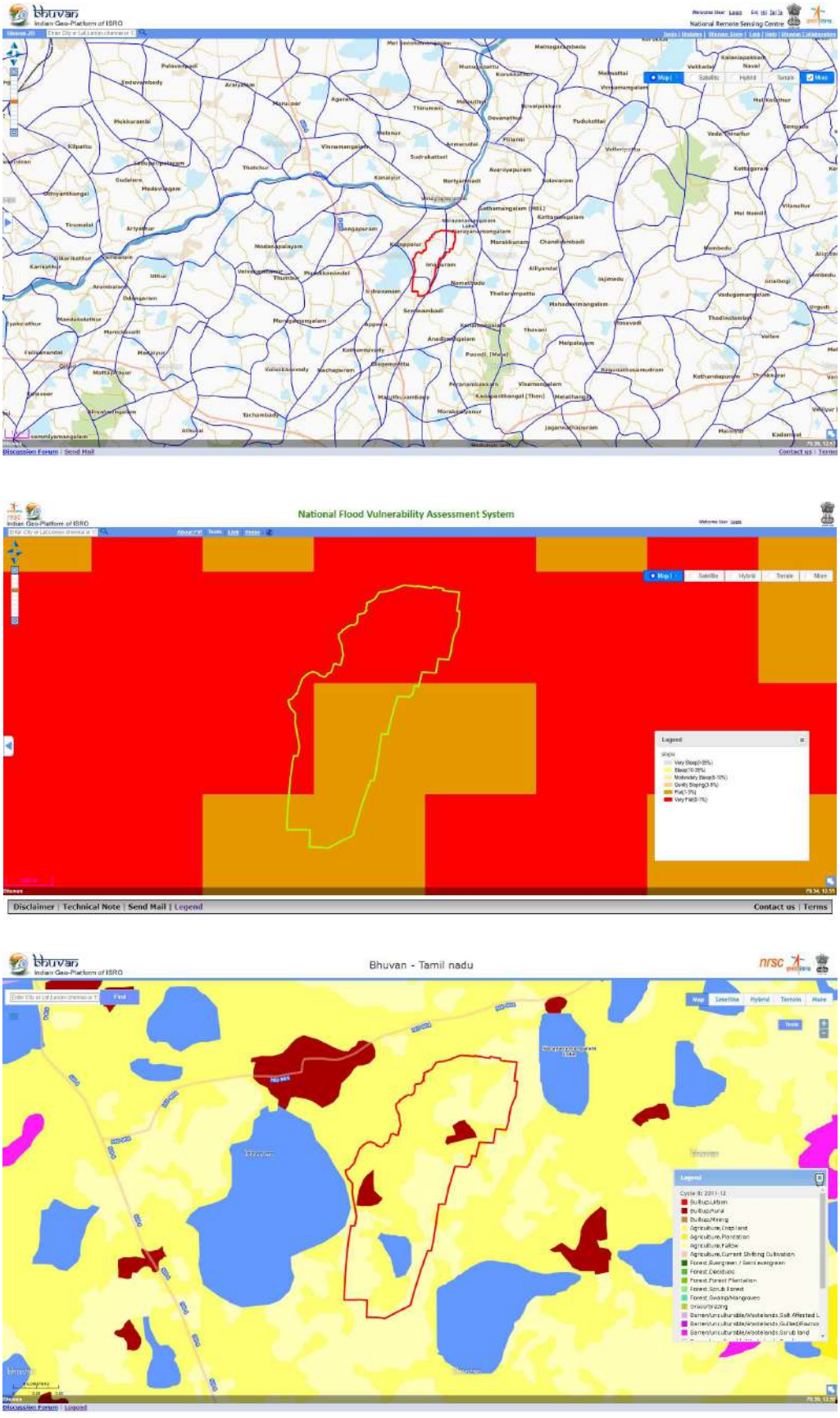


Figure 8.9. Spatial thematic maps of Imapuram GP. A. Geomorphology, B. GW prosperity, C. Watershed, D. Slope, E. LULC

Imapuram GP engrossed with denudation origin pediment complex (Figure 8.9 A). It is observed that the groundwater prosperity is less than 30 m deep well with 50 to 100 LPM capacity (B). Very flat terrain (0-1 %) is dominant in the GP (D), Whereas GP area falls under three micro-watershed units (C). Agriculture plantation is dominated in the GP (E).

8.3.3 CWRM PLANNING - NON-SPATIAL DATA

The non-spatial data covers four important themes: socio- economic, climate, water and agriculture with 116 parameters (Table 57). These non-spatial data is concurrently used for analysis along with the spatial data mentioned above to identify the key water challenges, prepare water budget by understanding the supply and demand and develop water actions to the different land use and slope categories. The process started with mapping of the administrative (habitations/panchayat/revenue village, Block/taluk), agro-ecological (regional and sub-regional, climatic and agricultural zonation's) and hydrological (drainage points/watersheds/sub basin) units keeping GP as the lowest unit of planning and execution.

TABLE 57. NON-SPATIAL DATA - IMAPURAM GP

Key CWRM Parameter	Details
Socio-Economic	
Geographical Area (ha)	268
Male Population	819
Female Population	746
Total Population	1,565
SC Population	29
Vulnerable population	29
Households (HH's)	366
Only one room HH's (SECC)	47
Female-Headed HH's (SECC)	28
Vulnerable Households (SECC)	41
% of Vulnerable Households	11
Registered MGNREGA Job cards	696
Active person working in job Cards	434
Drinking-Water Sources	439
Annual Grey water Generation (ha.m)	2.86
Water Resources	
Canal Network (m)	
Length of Distributaries (m)	1,500
Number of Tanks (PWD & Union) (No.)	1
Number of Ooranis (No.)	2
Irrigation Facilities (ha)	
Area under Open & Tube Well Irrigation (ha)	109.09
Catchment Area wise Available Runoff (ha.m)	
Good Catchment Area	12.80
Average Catchment Area	1.80
Bad Catchment Area	42.60

Watershed and Drainage Networks	
Length of Natural Drainage Lines (m)	1,080
Number of Natural Drainage Lines (No.)	1
Number of Micro Watersheds (No.)	4
Water Demand	
Water Demand For Humans (ha.m)	4.28
Water Demand for Livestock (ha.m)	1.69
Water Demand For Agriculture (ha.m)	72
% G.W Utilization for Drinking	90
% G.W Utilization for Livestock	95
% G.W Utilization for Agriculture.	96
% SW Utilization for Drinking	10
% SW Utilization for Livestock	5
% SW Utilization for Agriculture	4
Agriculture	
Area Under Land Resources (ha)	
Area under Non-Agricultural Uses	34.14
Area under Permanent Pastures and Other Grazing Land	6
Area under Cultivable Waste Land	0.05
Area under Fallows Land other than Current Fallows	3.39
Area under Current Fallow land	49.85
Area under Unirrigated Land	65.37
Area Irrigated by Source	109.09
Catchment Area (ha)	
Land under Good Catchment	34.14
Land under Average Catchment	6.47
Land under Bad Catchment	227.70
Crop Details (ha)	
Irrigated Area (ha)	51.38
Rain fed area (ha)	6.33
The area under Paddy Cultivation (ha)	43.00
Crop Water Requirement - The irrigated condition (ha.m)	69.79
Crop Water Requirement - Rain fed condition (ha.m)	2.56
Soil Resources: Status of Available Nitrogen (%)	
Low (L)	40
Status of Organic Carbon (%)	
Low (L)	40
Status of Soil Micro Nutrients (%)	
Sufficient	57
Deficient	43

Status of Physical condition of the soil (%)	
Slightly Acidic	5
Moderately Alkaline	95
Soil Texture	
% of Fine Soil	98
Soil Water Permeability	Moderate
Soil moisture and ET	
Volumetric Soil Moisture (%)	23
Estimated Soil Moisture (ha.m)	53.86
ET Losses (ha.m)	145.43
Means of Water Extraction (%)	
Gravity	2
Lifting	98
Irrigation Methods (%)	
Control Flooding	100
Livestock (No)	
Cattle Population	442
Sheep Population	132
Goat Population	91

8.3.4 KEY WATER CHALLENGES

Socio-Economic

1. According to SECC data, 11% of the households are vulnerable in the village
2. Female population is less than male population, No ST population
3. 47 one room households, and 28 female headed households
4. Access to drinking water through tap water connections is nil
5. Grey water generation is 2.86 ha.m; Handling of grey water from households needs attention

Water

1. Ground water status -Over exploited
2. 3 traditional waterbodies in the GP
3. Irrigation depends 100 % on open and tube well
4. 96 % Agriculture and 95% livestock 90% drinking needs met through groundwater
5. 57.2 ha.m of water is available runoff -Bad catchment area is more

Agriculture and Allied Sector

1. 15 % of the land covers the common area
2. 85% of the land covers an individual land area
3. Main crop in the GP is paddy which is cultivated about 43 ha of land
4. Crop water requirement for irrigated condition is more
5. 98% of the water is given to paddy fields by lifting methods of irrigation
6. Remaining water is extracted by gravity method of irrigation
7. Soil Nitrogen, organic carbon is low
8. Moderately Alkaline soil
9. 98% fine soil is predominant in the GP
10. Slightly high ET loss at 145.43 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 infrastructure, and climate-resilient measures to reduce the vulnerability of the GP. About 10.8% of the total land area is taken for WASCA treatment activities like plantation and conservation works. The total proposed area for treatment is 29.16 ha with more attention being given for area irrigated by source followed by area under unirrigated land, area under current fallow land. (Figure 8.10). Through the proposed conservation activities, 27.3 ha.m run off would be harvested in which, about 75.8 % of the runoff is from bad catchment, 19% of the run off is from good catchment and negligible amount of conservation is from the average catchment area (Figure 8.11).

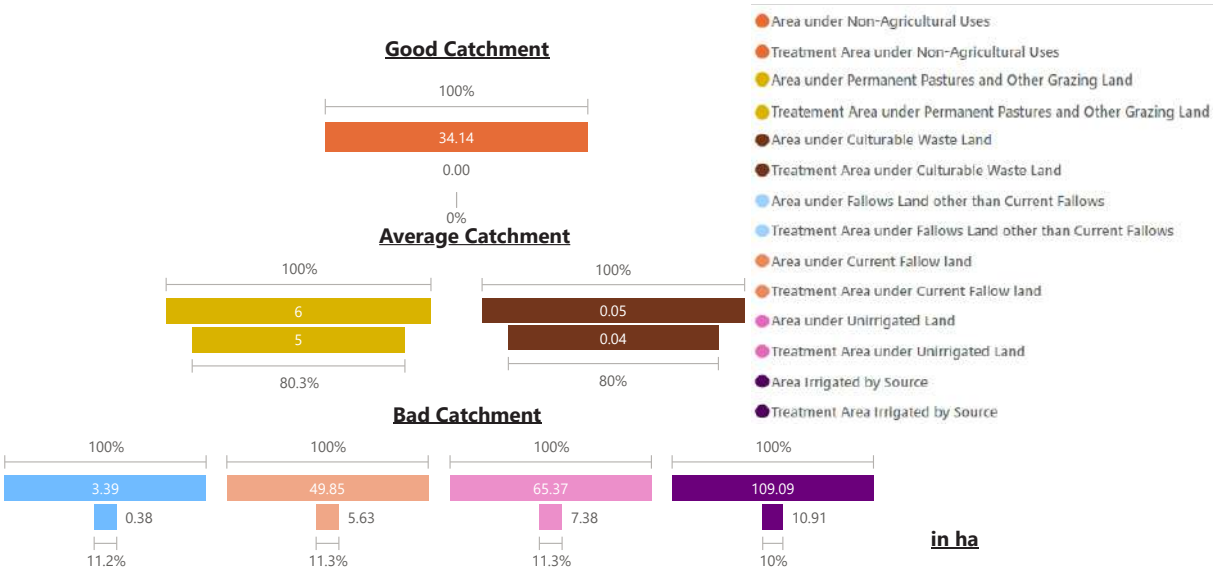


Figure 8.10. Proposed land resource treatment area in Imapuram GP

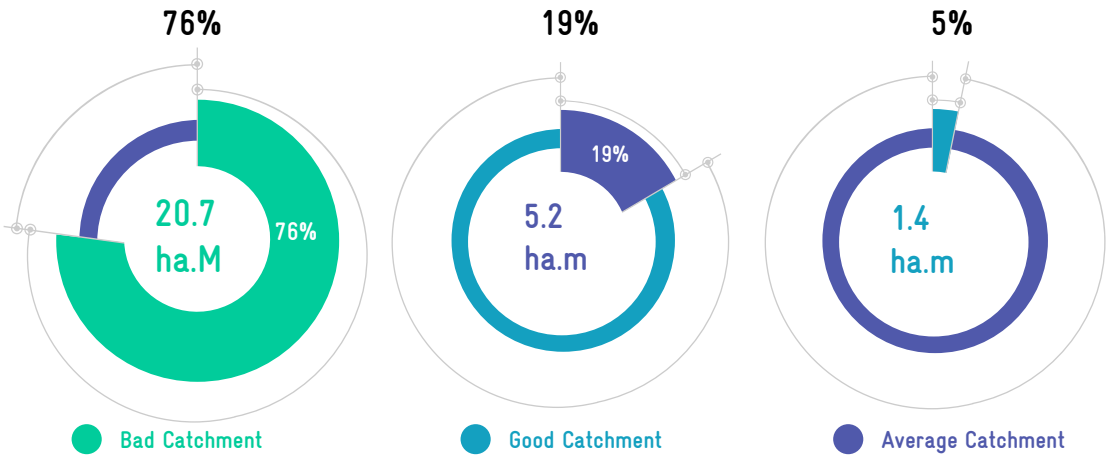


Figure 8.11. Expected run off conservation after treatment in Imapuram GP

The detailed proposed activities along with salient parameters are showed in the Table 59 for 2021-2024. More attention towards common and public land developments are given with appropriate works to improve the resilience of the GP.

TABLE 58. PERSPECTIVE PLAN OF IMAPURAM GP - FY (2021-2024)

CWRM Water Action 1: Improvement of Public & Common Lands Development				
CWRM Water Action 1: Works in Upper, Middle & Lower Ridge				
Name of the Work	**Ridge Type**	**No of Works**	**Estimated cost (in INR lakhs)**	**Estimated Person Days**
Composting (No.)	Lower	31	5.27	465
Afforestation in Public/common lands (ha)	Upper	1	8.60	3,344
Silvi-pasture Development (ha)	Middle	5	85.50	33,320
Linear Plantation (km)		1	1.48	579
Canal Bund Plantation (km)	Lower	1	8.25	3,223
Avenue plantation (km)	Middle	2	3.02	1,180
Nursery Development (No.)	Lower	1	15.00	2,344
Restoration of water bodies:a. PWD and Tanks (No.)		1	5.00	800
Restoration of water bodies:b. Ooranis (No.)		2	2.00	400
Artificial Recharge Structure (No.)		44	110.00	17,204
Sub Total Water Action -1		**89**	**244**	**62,859**
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	16	24.00	9,376
Micro Irrigation (ha)		11	11.00	0
Construction of Farm Ponds - Individual (No.)		16	32.00	12,496
Land development - Individual (ha)		1	10.00	3,906
Dryland Horticulture/Agroforestry - Individual (ha)		4	34.00	13,284
Azolla units - Individual (No.)		41	6.15	943
NADEP Vermi compost (No.)		41	7.38	1,107
Fodder development - Community & Individual		41	60.68	96,104
Cattle Shelters (No.)		41	86.92	13,571
Goat Sheep Shelters (No.)		16	36.32	5,680
Cattle Trough (No.)		41	2.05	246
Construction of new open wells & Recharge Shafts (No.)		44	220.00	40,744
Sub Total Water Action - 2		**313**	**530.50**	**1,97,457**

CWRM Water Action 3: Rural Water Management				
CWRM Water Action 3: Works in Lower Ridge				
Soakpits (Community) (No.)	Lower	4	0.52	80
Soakpits (Individual) (No.)		37	3.70	592
Roof Rain Water Harvesting (No.)		2	8.00	1,250
Sub Total Water Action -3		**43**	**12.22**	**1,922**
GP- Total		**445**	**786.72**	**2,62,238**

Of the total number of projects identified under CWRM themes, 60.48 % works are in agriculture and allied sector while 29.87% works are in rural water management and 9.64 % works are in public and common land. Table 59 provides the estimates of the work budget, and person days for three years from 2021-2024 in Imapuram GP.

TABLE 59. 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	89	244	62,860
Agriculture and Allied sector development	313	530.5	1,97,457
Rural water management	43	12.22	1,922
TOTAL	445	786.72	2,62,238

8.3.6 IMPACTS

The proposed water actions based on the above key water challenges cover a period of three years from 2021- 2022 to 2023-2024, At the end of the implementation period i.e. in the year 2024, the following impacts are envisaged (Table 60). It is expected that the impacts will potentially reduce the vulnerability and improve the resilience of the system to the projected climatic change events and ensured water security.

TABLE 60. WASCA- WATER ACTIONS AND INDICATORS

WASCA CWRM ACTION PLAN

DEVELOPMENT OF PUBLIC AND COMMON LAND

	INDICATOR		OUTCOMES/ IMPACT
1	Number of water bodies restored in the village	1	Three traditional water bodies restored
2	afforestation	2	2 ha under afforestation
3	Percentage reduction in the annual surface runoff	3	57 ha.m surface runoff harvested and stored
4	The proportion of land treated under WASCA	4	41 % of the total geographical area of the village treated under WASCA in three years

3
TRADITIONAL WATER BODIES RESTORED

2 ha
UNDER AFFORESTATION

41 %
AREA OF THE VILLAGE TREATED

57 ha.m
RUNOFF HARVESTED

WASCA CWRM ACTION PLAN

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

	INDICATOR		OUTCOMES/ IMPACT
1	No of structures were established for on-farm (in-situ) water harvesting in dry lands	1	16 farm ponds established
2	Reducing area under fallow lands	2	115 ha under fallow land restored for cultivation
3	Improvement in soil health	3	41 units of vermi compost established
4	No of artificial recharge structures proposed	4	44 artificial recharge structures were established to replenish groundwater flow

16
FARM PONDS

41
VERMI COMPOST

44
ARTIFICIAL RECHARGE STRUCTURES

115 ha
FALLOW LAND RESTORED

WASCA CWRM ACTION PLAN

DEVELOPMENT OF RURAL INFRASTRUCTURE

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

OUTCOMES/ IMPACT	
1.	4 community level and 37 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.	336 households established Nutri-gardens in homesteads

4 COMMUNITY & **37** INDIVIDUAL SOAK PITS

2 COMMON ROOF RAINWATER HARVESTING

336 NUTRI-GARDENS

Table 61 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 61. PROPOSALS FOR THE MGNREGS, IMAPURAM GP

	No of works	No of person days
Perspective plan	445	2,62,239
Annual plan	178	1,04,895

8.3.7 PROPOSED ACTIVITY MAP

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

Figure 8.12. Proposed action plan of Imapuram GP

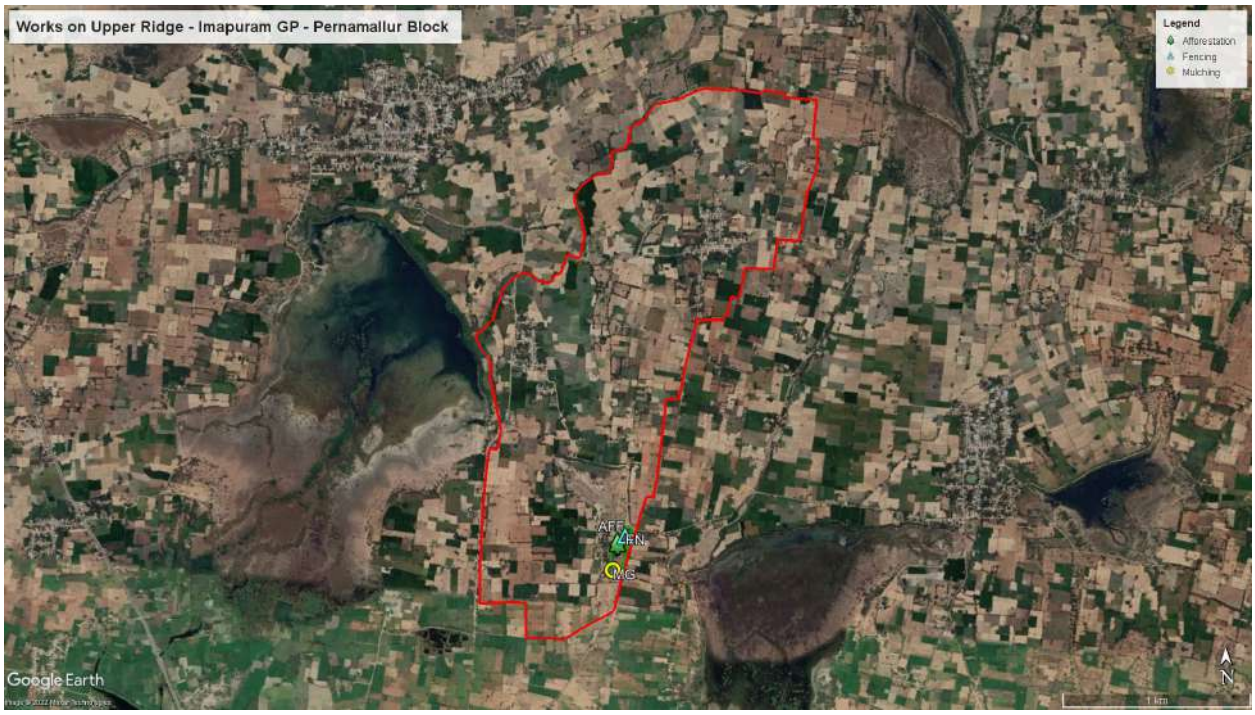


Figure 8.13. Works on Upper Ridge of Imapuram GP

Figure 8.14. Works on Middle Ridge of Imapuram GP

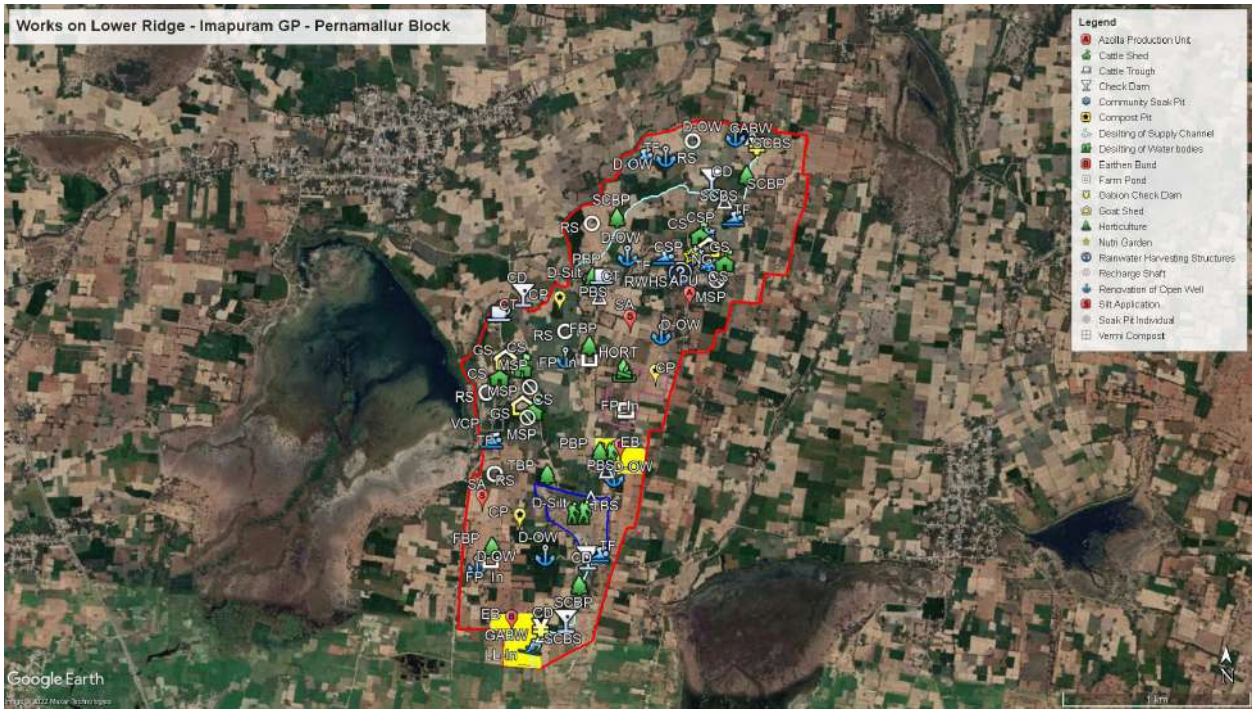
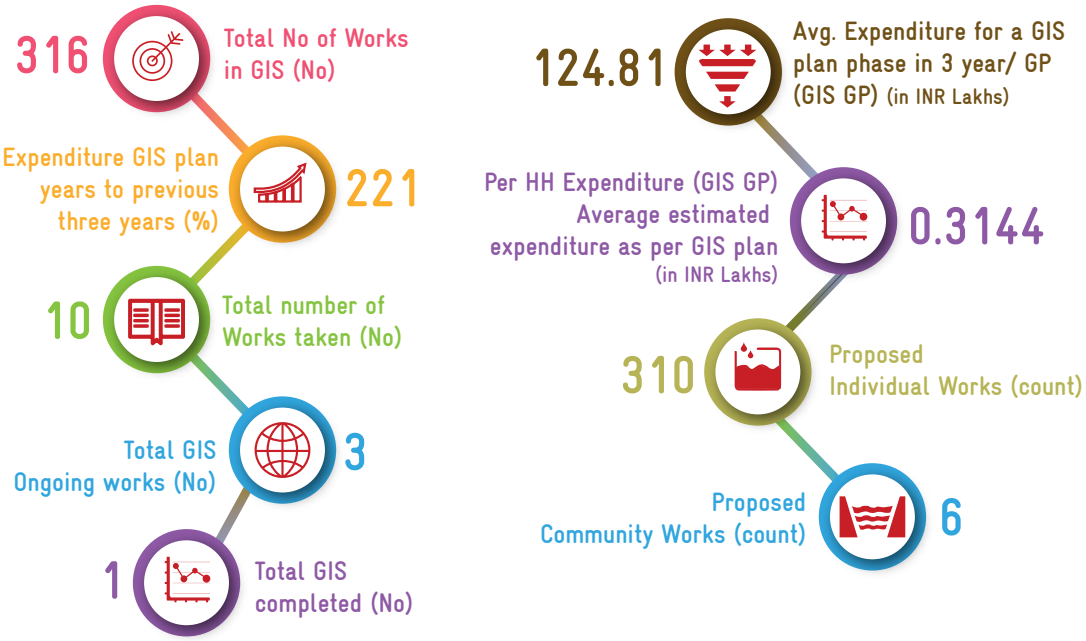


Figure 8.15. Works on Lower Ridge of Imapuram GP

8.3.8 GIS PLAN IMPLEMENTATION, KEY PARAMETERS

The GIS plan implementation and performance of Imapuram GP, Peranamallur Block is represented in Table 62.

TABLE 62. KEY PARAMETERS PERFORMANCE IN IMAPURAM GP -PERANAMALLUR BLOCK



நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு

குறள் - 20

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

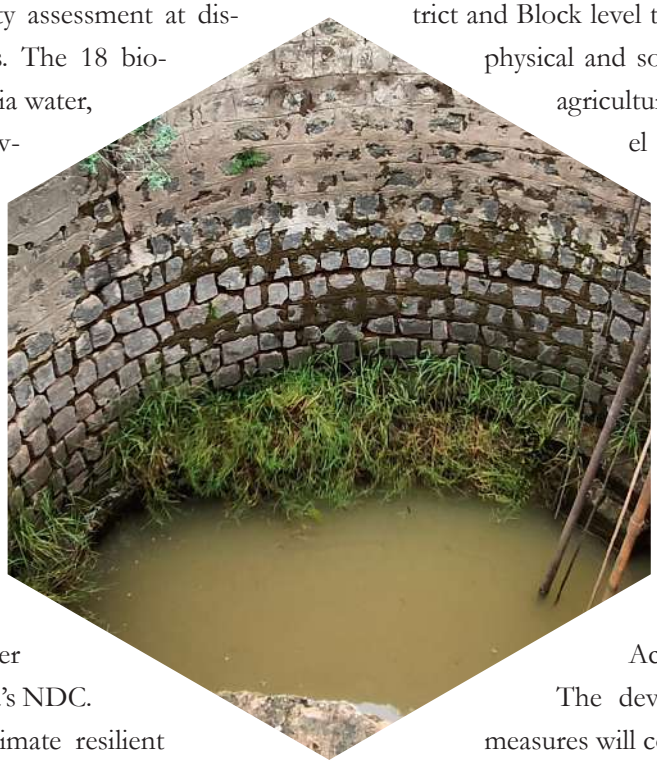
Thirukkural - 20

CHAPTER 9

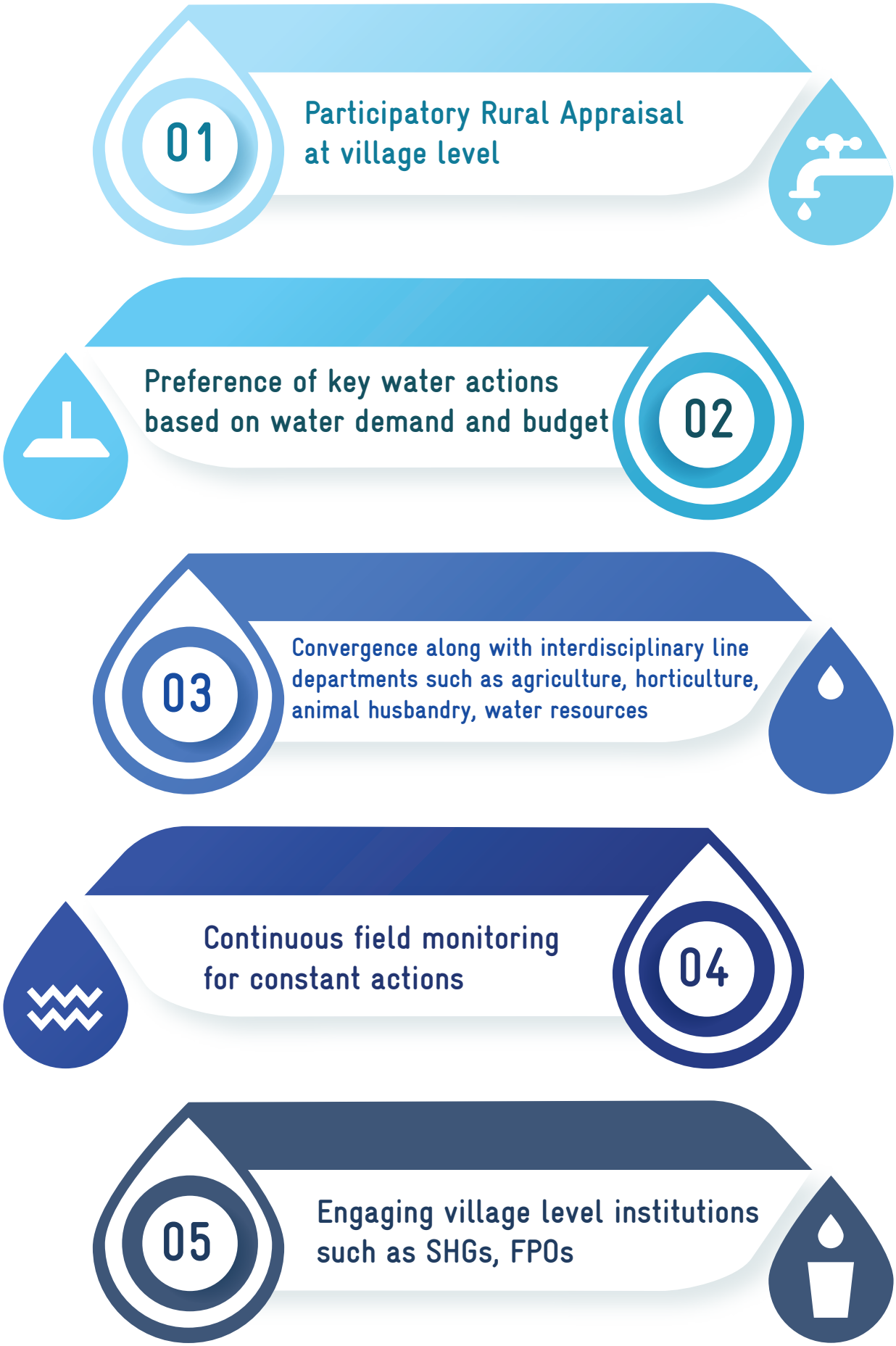
CONCLUSION

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

In recent decades, the demand for water is increasing at a fast rate due to rapid increase in population, industrial and economic growth. The evident changes in climate 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 which 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 bio-physical and socio-economic indicators of four interrelated areas via water, agriculture, socio economic and climate used at district level are further expanded to 110 parameters at Block level. The spatial and non-spatial CWRM parameters for the above mentioned four 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 drawn up under WASCA initiatives in public and common land, agriculture and allied sector, rural infrastructure areas. All the indicators/parameters and Key Water Action are aligned to the appropriate SDG and India's NDC. The developmental activities in the 3 areas along with climate resilient measures will contribute in reducing the vulnerability and building the resilience of the local communities at the GP level. The GP based planning and integration at the Block level based on macro and micro-watershed enables to adopt an ecosystem approach in promoting nature-based solutions. The productive impacts are visualized through a convergence approach by mobilizing necessary finance, knowledge and technologies at the end of the three years of implementation. This integrated Block level approach will be more effective with Block level climate information which is not currently available.



Recommendations towards stable development and its progressive outcome are:


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

ANNEXURES

ANNEXURE 1

TYPES OF GPs

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

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

ANNEXURE 3.1

KEY CWRM PARAMETER FROM SECONDARY SOURCES

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

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

ANNEXURE 3.2

KEY CWRM PARAMETERS FROM PRIMARY SOURCES

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

ANNEXURE 3.3

KEY CWRM PARAMETER GENERATED -PRIMARY DATA

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

ANNEXURE 3.4

STANDARD NORMS FOR CALCULATING WATER DEMAND

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

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

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

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

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

ANNEXURE 3.5

STANDARD NORMS FOR GREY WATER GENERATION CALCULATION

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

ANNEXURE 3.6

GP WISE STATUS OF WATER RESOURCE AND ITS SUPPLY AND DEMAND

Gram Panchayat	Canal Irrigation				Tradational Water bodies		
	Length of Main Canal (m)	Length of Minor Canal (m)	Length of Distributaries (m)	Water Courses (Field Channels) (m)	Number of Tanks (PWD & Union) (No.)	Number of Ooranis (No.)	Other Surface Water Bodies (No.)
Aliyur	656.00	447.00	251.00	500.00	2.00	-	-
Alliyandal	-	-	2,100.00	-	1.00	7.00	-
Anmarudai	-	1,300.00	-	500.00	4.00	-	-
Anandimangalam	-	-	-	-	1.00	2.00	-
Arasampattu	-	-	1,200.00	-	-	5.00	-
Ariyapadi	-	-	1,600.00	-	1.00	2.00	-
Avaniyapuram	-	-	1,600.00	-	8.00	-	-
Endal	-	-	1,300.00	-	-	4.00	-
Erumbur	-	-	1,200.00	-	4.00	4.00	-
Gengapuram	-	-	1,500.00	-	3.00	4.00	-
Imapuram	-	-	1,500.00	-	1.00	2.00	-
Injimedu	-	-	1,700.00	-	2.00	5.00	-
Isakolathur	-	-	1,500.00	-	1.00	5.00	-
Jagannathapuram	-	-	1,200.00	-	1.00	5.00	-
Kalyanapuram	-	-	1,200.00	-	2.00	5.00	-
Konaiyur	-	-	800.00	-	5.00	3.00	-
Kolappalur	-	-	1,600.00	-	2.00	2.00	-
Konamangalam	-	-	1,300.00	-	2.00	2.00	-
Madam	-	-	1,200.00	-	2.00	5.00	-
Mahadevimangalam	-	-	1,000.00	-	2.00	4.00	-
Marakkunam	-	-	1,600.00	-	1.00	2.00	-
Melanur	-	-	1,800.00	-	2.00	3.00	-
Melathangal	-	-	1,500.00	-	2.00	6.00	-

Gram Panchayat	Canal Irrigation				Tradational Water bodies		
	Length of Main Canal (m)	Length of Minor Canal (m)	Length of Distributaries (m)	Water Courses (Field Channels) (m)	Number of Tanks (PWD & Union) (No.)	Number of Ooranis (No.)	Other Surface Water Bodies (No.)
Melsathamangalam	-	-	1,300.00	-	4.00	4.00	-
Melvillivalam	-	-	1,600.00	-	2.00	8.00	-
Morakkaniyanur	-	-	850.00	-	2.00	5.00	-
Nalladisenai	-	-	1,300.00	-	2.00	3.00	-
Peranambakkam	-	-	1,200.00	-	2.00	3.00	-
Nambedu	-	-	1,500.00	-	2.00	9.00	-
Narayanamangalam	-	-	100.00	-	1.00	6.00	-
Nariyambadi	-	-	-	-	2.00	4.00	-
Nedungunam	-	-	1,500.00	-	4.00	16.00	-
Mosavadi	-	-	-	-	1.00	4.00	-
Poongunam	-	-	-	-	2.00	3.00	-
Raghunathasamudran	-	-	1,500.00	-	1.00	4.00	-
Reddikuppam	-	-	1,400.00	-	1.00	3.00	-
Semmambadi	-	-	-	-	1.00	3.00	-
Septankulam	-	-	1,300.00	-	2.00	3.00	-
Solavaram	-	-	500.00	-	1.00	5.00	-
Solaiarugavur	-	-	1,600.00	-	2.00	3.00	-
Sudrakatteri	-	-	2,100.00	-	1.00	3.00	-
Thadinolambai	-	-	1,500.00	-	1.00	3.00	-
Vayaloor	-	-	-	-	2.00	5.00	-
Vilanallur	-	-	-	-	1.00	4.00	-
Veppampattu	-	-	1,200.00	-	1.00	7.00	-
Visamangalam	-	-	-	-	3.00	3.00	-
Vinayagapuram	-	-	-	-	2.00	5.00	-
Melnandiyambadi	-	-	1,100.00	-	2.00	3.00	-
Namathodu	-	-	1,800.00	-	1.00	12.00	-
Thavanai	-	-	1,000.00	-	2.00	3.00	-

Gram Panchayat	Canal Irrigation				Tradational Water bodies		
	Length of Main Canal (m)	Length of Minor Canal (m)	Length of Distributaries (m)	Water Courses (Field Channels) (m)	Number of Tanks (PWD & Union) (No.)	Number of Ooranis (No.)	Other Surface Water Bodies (No.)
Vallam	-	-	1,400.00	-	2.00	3.00	-
Anaibogi	-	-	1,100.00	-	2.00	3.00	-
Ayalavadi	-	-	1,250.00	-	2.00	4.00	-
Chandirambadi	-	-	980.00	-	2.00	4.00	-
Kottupakkam	-	-	1,600.00	-	2.00	6.00	-
Kozhipuliyur	-	-	1,300.00	-	2.00	6.00	-
Melapoondi	-	-	900.00	-	2.00	3.00	-

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.)
Aliyur	-	-	116.25	22.10	6.20	44.20	4,203.00	7.00	6.00
Alliyandal	-	-	73.75	27.50	2.10	47.30	198.00	1.00	4.00
Anmarudai	-	-	122.89	67.10	0.60	52.80	2,243.00	4.00	6.00
Anandimangalam	-	-	169.69	57.90	0.70	55.10	2,640.00	3.00	6.00
Arasampattu	-	-	126.03	18.70	5.10	48.80	5,734.00	7.00	2.00
Ariyapadi	-	-	54.19	47.90	0.40	46.10	783.00	-	4.00
Avaniyapuram	-	-	166.87	43.10	2.20	80.20	2,697.00	3.00	5.00
Endal	-	-	72.98	33.60	0.70	49.20	3,482.00	7.00	4.00
Erumbur	-	-	46.91	89.90	6.60	103.40	3,059.00	5.00	4.00
Gengapuram	-	-	212.05	95.50	3.60	91.90	-	-	4.00
Imapuram	-	-	109.09	12.80	1.80	42.60	1,080.00	1.00	4.00
Injimedu	-	-	90.13	64.40	7.70	77.20	583.00	1.00	4.00
Isakolathur	-	-	116.04	40.20	0.30	33.90	1,735.00	4.00	3.00
Jagannathapuram	-	-	108.13	34.10	5.80	35.80	5,538.00	7.00	4.00
Kalyanapuram	-	-	67.61	28.10	0.60	46.30	2,941.00	5.00	4.00
Konaiyur	-	-	138.79	41.00	5.50	59.70	432.00	1.00	5.00
Kolappalur	-	-	312.91	162.70	3.50	135.00	-	-	-
Konamangalam	-	-	61.46	25.20	0.70	37.90	1,298.00	2.00	4.00
Madam	-	-	40.84	20.80	0.50	21.00	1,880.00	4.00	3.00
Mahadevimangalam	-	-	73.01	37.80	23.70	50.30	116.00	1.00	4.00
Marakkunam	-	-	83.99	27.80	0.30	39.80	2,247.00	4.00	3.00
Melanur	-	-	122.57	39.60	0.40	44.10	1,205.00	3.00	5.00
Melathangal	-	-	109.74	30.00	0.90	58.00	781.00	4.00	4.00
Melsathamangalam	316.10	-	106.07	36.70	3.50	35.40	1,442.00	1.00	3.00
Melvillivalam	-	-	69.05	18.10	11.20	48.90	2,026.00	5.00	4.00

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.)
Morakkaniyanur	-	-	79.17	22.80	0.80	39.30	1,709.00	4.00	5.00
Nalladisenai	-	-	144.78	23.90	0.70	42.40	5,041.00	7.00	4.00
Peranambakkam	-	-	78.07	12.90	0.10	36.20	-	-	-
Nambedu	-	-	52.77	48.00	3.80	79.70	1,487.00	2.00	6.00
Narayanamangalam	-	-	96.72	46.50	0.50	42.40	633.00	2.00	5.00
Nariyambadi	-	-	66.74	19.90	2.40	24.70	294.00	1.00	3.00
Nedungunam	-	-	316.95	72.30	2.20	86.60	5,615.00	7.00	5.00
Mosavadi	-	-	156.45	35.40	4.60	52.30	-	-	3.00
Poongunam	-	-	96.99	25.20	4.30	35.60	605.00	2.00	4.00
Raghunathasamudran	-	-	173.39	68.80	19.70	90.70	387.00	1.00	6.00
Reddikuppam	-	-	75.94	20.30	6.60	27.40	-	-	1.00
Semmambadi	-	-	112.27	26.80	1.70	41.10	1,992.00	2.00	3.00
Septankulam	-	-	100.96	46.00	11.30	90.00	-	-	6.00
Solavaram	-	-	73.04	32.30	0.10	25.30	-	-	4.00
Solaiarugavur	-	-	78.69	23.40	7.00	52.00	3,979.00	7.00	4.00
Sudrakatteri	-	-	64.19	53.80	0.40	38.80	807.00	1.00	2.00
Thadinolambai	-	-	73.80	21.40	1.10	35.10	-	-	2.00
Vayaloor	-	-	162.10	33.00	5.40	65.80	3,787.00	3.00	4.00
Vilanallur	-	-	147.38	60.00	5.60	76.50	70.00	-	6.00
Veppampattu	-	-	60.71	14.00	4.30	20.30	1,708.00	5.00	2.00
Visamangalam	-	-	168.05	38.00	0.80	55.00	3,309.00	6.00	4.00
Vinayagapuram	-	-	93.33	37.80	3.40	55.90	-	-	6.00
Melnandiyambadi	-	-	64.71	15.70	2.10	29.30	-	-	-
Namathodu	-	-	203.31	103.10	5.70	119.60	4,952.00	4.00	4.00
Thavanai	-	-	169.00	39.60	9.50	56.70	3,920.00	-	3.00

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.)
Vallam	-	-	158.00	80.80	15.80	124.00	2,343.00	-	4.00
Anaibogi	-	-	99.36	55.90	9.30	80.50	3,596.47	5.00	6.00
Ayalavadi	-	-	49.37	55.30	5.90	59.10	4,368.50	4.00	5.00
Chandirambadi	-	-	145.19	42.60	4.90	52.20	278.28	1.00	5.00
Kottupakkam	-	-	130.86	49.00	4.30	66.30	3,477.50	7.00	2.00
Kozhipuliyur	-	-	224.19	30.10	3.70	62.00	6,621.29	11.00	6.00
Melapoondi	-	-	118.38	36.90	3.20	50.10	1,538.01	4.00	3.00

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 (%)
Aliyur	2.25	1.00	89.28	83.00	91.00	98.00	17.00	9.00	2.00
Alliyandal	4.16	1.94	59.42	75.00	94.00	98.00	25.00	6.00	2.00
Anmarudai	4.65	2.03	77.00	71.00	-	95.00	29.00	100.00	5.00
Anandimangalam	4.54	3.21	107.83	78.00	93.00	98.00	22.00	7.00	2.00
Arasampattu	4.73	2.60	69.54	68.00	96.00	100.00	32.00	4.00	-
Ariyapadi	2.87	1.47	46.44	-	-	98.00	100.00	100.00	2.00
Avaniyapuram	7.22	3.74	78.16	-	-	95.00	100.00	100.00	5.00
Endal	2.91	1.91	72.03	-	-	99.00	100.00	100.00	1.00
Erumbur	3.70	1.42	186.73	-	-	98.00	100.00	100.00	2.00
Gengapuram	7.41	3.57	68.24	80.00	98.00	90.00	20.00	2.00	10.00
Imapuram	4.28	1.69	72.35	90.00	95.00	96.00	10.00	5.00	4.00
Injimedu	4.12	2.27	65.95	67.00	94.00	98.00	33.00	6.00	2.00
Isakolathur	2.85	1.45	73.51	67.00	96.00	99.00	33.00	4.00	1.00
Jagannathapuram	2.00	1.23	125.72	80.00	98.00	99.00	20.00	2.00	1.00
Kalyanapuram	2.76	1.11	123.67	50.00	99.00	100.00	50.00	1.00	-
Konaiyur	4.23	2.46	95.61	50.00	98.00	93.00	50.00	2.00	7.00
Kolappalur	14.03	3.40	229.33	57.00	96.00	98.00	43.00	4.00	2.00
Konamangalam	2.55	1.51	79.14	80.00	97.00	98.00	20.00	3.00	2.00
Madam	3.51	1.86	69.80	88.00	94.00	99.00	12.00	6.00	1.00
Mahadevimangalam	2.64	2.32	73.74	45.00	98.00	99.00	55.00	2.00	1.00
Marakkunam	2.08	1.07	59.17	67.00	92.00	99.00	33.00	8.00	1.00
Melanur	5.27	2.05	69.88	63.00	99.00	98.00	37.00	1.00	2.00
Melathangal	5.46	2.85	88.32	82.00	97.00	99.00	18.00	3.00	1.00
Melsathamangalam	3.36	3.06	79.24	60.00	74.00	98.00	40.00	26.00	2.00
Melvillivalam	2.95	0.54	41.61	80.00	79.00	98.00	20.00	21.00	2.00
Morakkaniyanur	2.99	1.20	87.79	78.00	97.00	99.00	22.00	3.00	1.00

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 (%)
Nalladisenai	1.20	3.80	41.10	70.00	93.00	99.00	30.00	7.00	1.00
Peranambakkam	2.27	1.32	84.21	83.00	95.00	98.00	17.00	5.00	2.00
Nambedu	4.74	2.78	30.60	86.00	96.00	95.00	14.00	4.00	5.00
Narayanamangalam	2.57	0.65	56.19	50.00	97.00	96.00	50.00	3.00	4.00
Nariyambadi	3.50	2.96	59.71	60.00	97.00	94.00	40.00	3.00	6.00
Nedungunam	11.44	3.23	105.33	63.00	88.00	99.00	37.00	12.00	1.00
Mosavadi	2.25	0.95	95.79	75.00	95.00	99.00	25.00	5.00	1.00
Poongunam	1.77	1.09	38.23	57.00	97.00	98.00	43.00	3.00	2.00
Raghunathasamudran	4.81	4.09	131.63	71.00	94.00	98.00	29.00	6.00	2.00
Reddikuppam	2.84	1.85	80.48	77.00	95.00	100.00	23.00	5.00	-
Semmambadi	3.21	1.73	94.33	83.00	96.00	100.00	17.00	4.00	-
Septankulam	4.89	3.86	136.29	69.00	100.00	99.00	31.00	-	1.00
Solavaram	2.14	1.50	62.34	78.00	94.00	95.00	22.00	6.00	5.00
Solaiarugavur	2.22	1.10	113.63	78.00	91.00	98.00	22.00	9.00	2.00
Sudrakatteri	2.94	2.13	46.10	89.00	94.00	96.00	11.00	6.00	4.00
Thadinolambai	2.92	1.41	77.81	82.00	94.00	99.00	18.00	6.00	1.00
Vayaloor	5.57	2.04	47.17	2.00	99.00	98.00	98.00	1.00	2.00
Vilanallur	5.39	1.97	67.22	82.00	97.00	97.00	18.00	3.00	3.00
Veppampattu	2.27	1.61	44.54	50.00	97.00	99.00	50.00	3.00	1.00
Visamangalam	4.52	3.94	91.51	86.00	97.00	98.00	14.00	3.00	2.00
Vinayagapuram	3.64	2.57	74.20	83.00	97.00	96.00	17.00	3.00	4.00
Melnandiyambadi	3.10	1.20	27.92	60.00	92.00	97.00	40.00	8.00	3.00
Namathodu	6.70	3.67	121.76	90.00	96.00	97.00	10.00	4.00	3.00
Thavanai	4.07	2.35	182.06	100.00	95.00	98.00	-	5.00	2.00
Vallam	7.48	2.24	205.06	89.00	85.00	98.00	11.00	15.00	2.00
Anaibogi	4.83	2.00	66.82	78.00	93.00	96.00	22.00	7.00	4.00

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 Utilzation for Agriculture. (%)	% SW Utilization for Drinking (%)	% SW Utilization for Livestock (%)	% SW Utilization for Agriculture (%)
Ayalavadi	3.79	2.54	129.76	78.00	90.00	98.00	22.00	10.00	2.00
Chandirambadi	3.87	2.84	129.15	86.00	95.00	95.00	14.00	5.00	5.00
Kottupakkam	5.92	3.34	156.13	82.00	94.00	99.00	18.00	6.00	1.00
Kozhipuliyur	4.11	2.83	131.75	78.00	99.00	99.00	22.00	1.00	1.00
Melapoondi	1.29	1.73	150.55	88.00	98.00	98.00	12.00	2.00	2.00

ANNEXURE 3.7

GP WISE STATUS OF AGRICULTURE RESOURCE

Gram Panchayat	Area under Land Resources (ha)									
	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
Aliyur	-	51.51	7.53	3.36	1.25	17.53	0.85	57.83	61.50	116.25
Alliyandal	-	73.20	-	7.04	0.25	0.01	5.27	148.50	25.61	73.75
Anmarudai	-	177.91	0.95	-	2.28	-	0.69	48.77	63.34	169.69
Anandimangalam	-	140.08	14.22	1.58	-	0.86	3.46	80.01	98.16	112.89
Arasampattu	-	49.79	-	0.01	-	18.05	7.00	57.64	70.23	126.03
Ariyapadi	-	107.61	20.25	1.17	-	0.27	14.19	126.57	51.46	54.19
Avaniyapuram	-	99.42	15.41	-	-	7.71	-	115.81	145.98	166.87
Endal	-	89.48		1.00	0.50	1.00	49.00	119.23	21.73	72.98
Erumbur	-	211.36	28.45	1.82	0.40	21.42	54.72	246.65	204.40	46.91
Gengapuram	-	254.64	-	-	5.17	7.47	21.12	167.42	90.62	212.05
Imapuram	-	34.14	-	6.42	-	0.05	3.39	49.85	65.37	109.09
Injimedu	-	161.15	10.66	25.30	-	2.00	55.00	192.34	75.17	90.13
Isakolathur	-	107.28	-	-	-	1.24	9.30	47.67	7.47	116.84
Jagannathapuram	-	88.20	2.60	-	-	20.60	11.50	31.44	40.31	108.13
Kalyanapuram	-	69.54	5.29	0.90	1.14		12.42	106.70	60.93	67.61
Konaiyur	-	109.40	-	10.60	8.83	0.10	2.33	87.35	90.72	138.79
Kolappalur	-	433.85	0.05	-	0.35	12.13	40.52	337.97	30.36	312.91
Konamangalam	-	67.03	0.06	1.32	0.04	1.24	12.50	82.24	46.56	61.46
Madam	-	55.50	-	-	0.38	1.41	5.00	51.81	14.71	40.84
Mahadevimangalam	-	92.73	8.14	28.39	34.76	21.15	28.03	120.80	46.88	73.01
Marakkunam	-	73.24	1.00	-	0.71	0.26	11.00	90.84	26.78	83.99
Melanur	-	105.69	-	-	1.13	0.15	-	41.21	72.22	122.57
Melathangal	-	80.02	-	-	-	3.36	1.00	74.14	125.03	109.74

Gram Panchayat	Area under Land Resources (ha)									
	Forest land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Crictalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Melsathamangalam	-	97.88	-	8.73	-	3.69	-	41.29	42.03	106.07
Melvillivalam	-	48.28	-	3.07	1.96	35.00	15.34	94.09	83.19	69.06
Morakkaniyanur	-	60.81	-	-	2.00	1.00	4.61	62.59	63.57	79.17
Nalladisenai	-	63.84	-	-	-	2.33	24.78	52.56	4.74	144.78
Peranambakkam	-	34.27	-	-	-	0.23	8.06	70.79	36.60	78.07
Nambedu	-	109.78	18.20	6.18	3.22	4.13	60.76	154.99	157.65	52.77
Narayanamangalam	-	123.32	0.63	1.87	-	0.07	4.01	67.36	58.65	96.72
Nariyambadi	-	52.99	0.14	8.62	-	-	-	28.01	37.46	66.74
Nedungunam	-	176.66	16.10	6.06	1.85	-	10.00	97.32	38.83	316.95
Mosavadi	-	90.20	4.10	8.72	2.55	5.02	3.17	58.99	61.19	156.45
Poongunam	-	54.90	12.40	4.41	6.70	4.35	22.20	48.09	23.23	96.99
Raghunathasamudran	-	155.92	27.47	16.15	30.10	24.00	39.00	224.57	47.98	173.39
Reddikuppam	-	49.38	4.71	4.30	9.10	10.17	11.25	27.79	31.49	75.94
Semmambadi	-	70.47	0.96	-	0.69	5.50	2.77	69.76	34.95	112.27
Septankulam	-	118.54	4.20	14.74	3.00	22.50	11.00	248.91	120.55	100.96
Solavaram	-	85.65	0.39	-	-	0.39	-	12.95	49.33	73.04
Solaiarugavur	-	56.97	5.36	4.10	1.40	19.30	24.76	160.39	14.26	78.69
Sudrakatteri	-	143.55	-	-	-	1.26	3.69	89.88	49.52	64.19
Thadinolambai	-	48.51	8.50	2.12	1.74		14.50	66.67	32.81	73.80
Vayaloor	-	88.05	-	7.86	9.60	1.73	80.91	73.23	35.88	162.10
Vilanallur	-	144.02	16.00	5.00	14.50	0.36	9.00	33.39	219.08	147.38
Veppampattu	-	35.20	2.14	4.05	-	11.21	0.73	18.94	28.08	60.71
Visamangalam	-	94.18	7.05	1.73	0.73	0.42	2.00	22.63	101.62	168.05
Vinayagapuram	-	100.83	-	9.17	0.99	2.11	4.36	131.46	69.60	93.33
Melnandiyambadi	-	41.94	-	-	-	7.33	9.37	36.68	46.11	64.71

Gram Panchayat	Area under Land Resources (ha)									
	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
Namathodu	-	262.99	11.81	17.55	2.90	-	59.43	347.04	29.93	203.31
Thavanai	-	100.45	5.18	16.54	6.18	11.15	0.73	62.86	70.86	169.00
Vallam	-	193.17	22.20	6.00	9.89	40.32	57.34	219.51	229.22	156.85
Anaibogi	-	133.17	15.87	9.40	10.63	13.01	12.96	56.05	262.34	99.36
Ayalavadi	-	117.37	30.00	6.29	5.09	9.64	14.79	76.67	175.30	49.37
Chandirambadi	-	113.72	-	12.84	0.26	4.28	-	40.61	93.32	145.19
Kottupakkam	-	99.76	30.84	2.32	2.23	10.70	1.00	72.77	56.59	224.19
Kozhipuliyur	-	78.11	2.20	6.54	0.65	5.90	24.35	101.92	74.20	130.86
Melapoondi	-	98.21	0.11	8.85	0.79	1.73	3.96	45.29	100.32	118.38

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)
Aliyur	59.04	22.14	236.43	58.62	3.85	55.50	87.47	1.81
Alliyandal	73.20	7.30	253.13	41.39	2.05	38.00	58.48	0.94
Anmarudai	178.86	2.28	282.49	53.97	11.91	46.50	72.79	4.21
Anandimangalam	154.30	2.44	294.52	84.18	5.83	65.00	105.49	2.34
Arasampattu	49.79	18.06	260.90	45.03	0.10	41.00	69.51	0.03
Ariyapadi	127.86	1.44	246.41	33.94	2.62	29.00	45.52	0.92
Avaniyapuram	114.83	7.71	428.66	52.99	10.70	48.00	74.31	3.85
Endal	89.48	2.50	262.94	47.85	2.12	47.40	71.29	0.74
Erumbur	239.81	23.64	552.68	124.80	8.50	107.00	183.75	2.98
Gengapuram	254.64	12.64	491.21	45.34	18.78	32.00	61.62	6.62
Imapuram	34.14	6.47	227.70	51.38	6.33	43.00	69.79	2.56
Injimedu	171.81	27.30	412.64	48.10	4.50	41.00	64.37	1.58
Isakolathur	107.28	1.24	181.28	50.82	1.11	47.00	72.92	0.59
Jagannathapuram	90.80	20.60	191.38	87.33	2.62	78.50	124.55	1.17
Kalyanapuram	74.83	2.04	247.66	83.71	0.56	81.00	123.31	0.36
Konaiyur	109.40	19.53	319.19	70.80	19.07	51.00	88.78	6.83
Kolappalur	433.90	12.48	721.76	181.71	8.42	132.50	225.64	3.69
Konamangalam	67.09	2.60	202.76	69.46	4.03	45.00	77.58	1.56
Madam	55.50	1.79	112.36	49.13	2.51	44.50	68.79	1.02
Mahadevimangalam	100.87	84.30	268.72	53.00	2.40	47.00	72.90	0.84
Marakkunam	74.24	0.97	212.61	43.96	2.07	37.00	58.34	0.83
Melanur	105.69	1.28	236.00	54.02	2.93	33.00	68.58	1.30
Melathangal	80.02	3.36	309.91	63.14	2.50	52.00	87.42	0.90
Melsathamangalam	97.88	12.42	189.39	62.49	4.08	44.30	77.42	1.82
Melvillivalam	48.28	40.03	261.68	36.25	2.06	22.00	40.90	0.72
Morakkaniyanur	60.81	3.00	209.94	69.25	3.13	53.00	86.65	1.14

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)
Nalladisenai	63.84	2.33	226.86	28.09	1.34	26.50	40.59	0.51
Peranambakkam	34.27	0.23	193.52	65.68	3.44	51.00	82.70	1.51
Nambedu	127.98	13.53	426.17	25.54	4.34	17.05	29.08	1.52
Narayanamangalam	123.95	1.94	226.74	46.84	5.29	32.00	54.04	2.15
Nariyambadi	53.13	8.62	132.21	38.83	9.38	36.50	56.29	3.42
Nedungunam	192.76	7.91	463.10	75.26	3.54	63.50	103.87	1.46
Mosavadi	94.30	16.29	279.80	65.78	2.81	62.00	94.74	1.04
Poongunam	67.30	15.46	190.51	27.96	1.66	21.00	37.59	0.65
Raghunathasamudran	183.39	70.25	484.94	96.80	6.00	78.00	129.47	2.15
Reddikuppam	54.09	23.57	146.47	57.08	1.09	52.00	80.10	0.38
Semmambadi	71.43	6.19	219.75	76.20	0.61	57.00	94.06	0.27
Septankulam	122.74	40.24	481.42	98.65	4.30	81.90	134.58	1.71
Solavaram	86.04	0.39	135.32	44.33	9.24	37.50	59.00	3.33
Solaiarugavur	62.33	24.80	278.10	72.28	4.83	67.00	111.06	2.57
Sudrakatteri	143.55	1.26	207.28	39.23	5.09	26.00	44.29	1.81
Thadinolambai	57.01	3.86	187.78	57.10	2.70	30.10	76.82	0.99
Vayaloor	88.05	19.19	352.12	39.65	1.65	26.00	46.44	0.73
Vilanallur	160.02	19.86	408.85	42.72	6.31	29.00	65.01	2.21
Veppampattu	37.34	15.26	108.46	32.69	1.69	27.00	43.95	0.59
Visamangalam	101.23	2.88	294.30	59.69	3.88	58.50	90.12	1.39
Vinayagapuram	100.83	12.27	298.75	59.39	8.20	43.00	71.09	3.10
Melnandiyambadi	41.94	7.33	156.87	27.06	2.02	14.00	27.21	0.71
Namathodu	274.80	20.45	639.71	90.50	9.49	74.50	118.44	3.32
Thavanai	105.63	33.87	303.45	124.56	8.72	117.50	179.02	3.05
Vallam	215.37	56.21	662.92	145.57	10.77	125.00	201.29	3.77
Anaibogi	149.04	33.04	430.71	49.62	6.90	39.50	64.40	2.42
Ayalavadi	147.37	21.02	316.13	87.50	7.00	83.70	127.31	2.45

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)
Chandirambadi	113.72	17.38	279.12	93.03	18.28	77.00	122.18	6.97
Kottupakkam	130.60	15.25	354.55	108.87	3.01	101.30	155.07	1.05
Kozhipuliyur	80.31	13.09	331.33	90.84	3.64	85.50	130.48	1.27
Melapoondi	98.32	11.37	267.95	114.78	6.66	92.30	148.22	2.33

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	Very High	Sufficient	Deficient
Aliyur	-	100.00	-	-	100.00	-	-	-	62.00	38.00
Alliyandal	-	100.00	-	14.71	85.29	-	-	-	57.00	43.00
Anmarudai	-	100.00	-	12.07	87.93	-	-	-	51.00	49.00
Anandimangalam	-	100.00	-	15.38	83.08	1.54	-	-	57.00	43.00
Arasampattu	-	100.00	-	12.07	87.93	-	-	-	51.00	49.00
Ariyapadi	74.00	26.00	-	33.00	67.00	-	-	-	59.00	41.00
Avaniyapuram	-	100.00	-	-	100.00	-	-	-	49.00	51.00
Endal	-	100.00	-	-	100.00	-	-	-	61.00	39.00
Erumbur	86.60	13.40	-	43.30	56.70	-	-	-	69.00	31.00
Gengapuram	-	100.00	-	-	100.00	-	-	-	54.00	46.00
Imapuram	-	100.00	-	-	100.00	-	-	-	57.00	43.00
Injimedu	23.42	75.68	0.90	42.98	56.14	-	0.88	-	60.00	40.00
Isakolathur	7.69	92.31	-	13.85	86.15	-	-	-	60.00	40.00
Jagannathapuram	41.05	58.95	-	7.37	84.21	8.42	-	-	75.00	25.00
Kalyanapuram	54.95	32.97	12.09	36.26	54.95	6.59	2.20	-	66.00	34.00
Konaiyur	45.31	54.69	-	12.20	79.27	8.54	-	-	57.00	43.00
Kolappalur	76.86	23.14	-	25.21	74.79	-	-	-	55.00	45.00
Konamangalam	51.58	45.26	3.16	51.58	48.42	-	-	-	57.00	43.00
Madam	62.50	33.33	4.17	47.92	52.08	-	-	-	59.00	41.00
Mahadevimangalam	13.10	83.33	3.57	28.57	66.67	3.57	-	1.19	61.00	39.00
Marakkunam	18.46	75.38	6.15	23.08	73.85	-	-	3.08	81.00	19.00
Melanur	19.28	77.11	3.61	25.30	74.70	-	-	-	46.00	54.00
Melathangal	-	100.00	-	1.82	98.18	-	-	-	52.00	48.00
Melsathamangalam	-	100.00	-	2.70	97.30	-	-	-	56.00	44.00
Melvillivalam	6.45	93.55	-	25.81	67.74	6.45	-	-	61.00	39.00
Morakkaniyanur	-	100.00	-	-	100.00	-	-	-	58.00	42.00
Nalladisenai	-	100.00	-	18.33	81.67	-	-	-	66.00	34.00

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	Very High	Sufficient	Deficient
Peranambakkam	-	100.00	-	-	100.00	-	-	-	69.00	31.00
Nambedu	3.03	96.97	-	28.79	71.21	-	-	-	63.00	37.00
Narayanamangalam	-	100.00	-	-	100.00	-	-	-	53.00	47.00
Nariyambadi	-	100.00	-	-	100.00	-	-	-	53.00	47.00
Nedungunam	1.54	98.46	-	1.54	98.46	-	-	-	76.00	24.00
Mosavadi	5.88	94.12	-	32.35	67.65	-	-	-	58.00	42.00
Poongunam	-	100.00	-	-	100.00	-	-	-	66.00	34.00
Raghunathasamudran	-	100.00	-	27.94	72.06	-	-	-	58.00	42.00
Reddikuppam	-	100.00	-	23.68	76.32	-	-	-	61.00	39.00
Semmambadi	-	100.00	-	-	100.00	-	-	-	79.00	21.00
Septankulam	1.54	98.46	-	32.31	67.69	-	-	-	58.00	42.00
Solavaram	-	100.00	-	-	100.00	-	-	-	74.00	26.00
Solaiarugavur	-	100.00	-	3.33	96.67	-	-	-	82.00	18.00
Sudrakatteri	-	100.00	-	-	100.00	-	-	-	81.00	19.00
Thadinolambai	42.86	57.14	-	9.52	76.19	9.52	4.76	-	67.00	33.00
Vayaloor	-	100.00	-	1.12	98.88	-	-	-	79.00	21.00
Vilanallur	-	100.00	-	13.64	86.36	-	-	-	60.00	40.00
Veppampattu	70.00	30.00	-	30.00	70.00	-	-	-	62.00	38.00
Visamangalam	21.79	74.36	3.85	26.92	69.23	1.28	1.28	1.28	78.00	22.00
Vinayagapuram	25.89	74.11	-	19.64	53.57	26.79	-	-	84.00	16.00
Melnandiyambadi	-	100.00	-	1.45	98.55	-	-	-	67.00	33.00
Namathodu	-	100.00	-	1.45	98.55	-	-	-	67.00	33.00
Thavanai	6.06	93.94	-	21.21	78.79	-	-	-	59.00	41.00
Vallam	-	100.00	-	27.03	72.97	-	-	-	63.06	36.94
Anaibogi	75.00	25.00	-	50.00	50.00	-	-	-	64.00	36.00
Ayalavadi	28.00	72.00	-	52.00	48.00	-	-	-	58.00	42.00
Chandirambadi	12.28	71.93	15.79	21.05	64.91	10.53	3.51	-	61.00	39.00
Kottupakkam	80.90	19.10	-	38.20	46.07	15.73	-	-	68.00	32.00

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	Very High	Sufficient	Deficient
Kozhipuliyur	33.33	66.67	-	10.67	69.33	20.00	-	-	51.00	49.00
Melapoondi	-	100.00	-	-	100.00	-	-	-	41.00	59.00

Gram Panchayat	Status of Physical condition of the soil (%)							
	Moderately Acidic	Strongly Acidic	Highly Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline
Aliyur	-	-	-	-	-	-	100.00	-
Alliyandal	-	-	-	-	2.94	-	97.06	-
Anmarudai	-	-	-	1.69	11.86	-	86.44	-
Anandimangalam	-	-	-	-	-	-	100.00	-
Arasampattu	-	-	-	1.69	11.86	-	86.44	-
Ariyapadi	-	-	-	6.00	17.00	-	77.00	-
Avaniyapuram	-	-	-	-	3.57	1.79	94.64	-
Endal	-	-	-	10.00	36.67	-	53.33	-
Erumbur	-	-	-	-	-	1.03	98.97	-
Gengapuram	-	-	-	-	1.69	-	98.31	-
Imapuram	-	-	-	-	4.88	-	95.12	-
Injimedu	-	-	-	-	-	6.52	93.48	-
Isakolathur	-	-	-	-	-	-	100.00	-
Jagannathapuram	-	-	-	21.57	27.45	-	50.98	-
Kalyanapuram	-	-	-	-	14.58	20.83	64.58	-
Konaiyur	-	-	-	-	2.13	2.13	95.74	-
Kolappalur	-	-	-	-	-	-	100.00	-
Konamangalam	-	-	-	-	-	-	100.00	-
Madam	-	-	-	-	12.00	-	88.00	-
Mahadevimangalam	-	-	-	-	-	2.78	97.22	-
Marakkunam	-	-	-	-	18.18	-	81.82	-
Melanur	-	-	-	-	-	-	100.00	-
Melathangal	-	-	-	-	7.41	-	92.59	-
Melsathamangalam	-	-	-	-	5.41	-	94.59	-
Melvillivalam	-	-	-	-	6.45	12.90	80.65	-
Morakkaniyanur	-	-	-	-	-	-	100.00	-
Nalladisenai	-	-	-	-	6.67	-	93.33	-

Gram Panchayat	Status of Physical condition of the soil (%)							
	Moderately Acidic	Strongly Acidic	Highly Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline
Peranambakkam	-	-	-	86.49	5.41	-	8.11	-
Nambedu	-	-	-	-	-	21.21	78.79	-
Narayanamangalam	-	-	-	-	2.63	-	97.37	-
Nariyambadi	-	-	-	-	-	-	100.00	-
Nedungunam	-	-	-	-	3.08	1.54	95.38	-
Mosavadi	-	-	-	-	-	17.65	82.35	-
Poongunam	-	-	-	71.43	17.14	-	11.43	-
Raghunathasamudran	-	-	-	-	-	-	100.00	-
Reddikuppam	-	-	-	-	-	-	100.00	-
Semmambadi	-	-	-	21.43	12.86	-	65.71	-
Septankulam	-	-	-	-	-	15.38	84.62	-
Solavaram	-	-	-	30.00	36.67	-	33.33	-
Solaiarugavur	-	-	3.33	25.00	1.67	-	70.00	-
Sudrakatteri	1.82	-	-	1.82	18.18	-	78.18	-
Thadinolambai	-	-	-	-	-	-	100.00	-
Vayaloor	-	-	-	15.73	14.61	1.12	68.54	-
Vilanallur	-	-	-	-	-	7.58	92.42	-
Veppampattu	-	-	-	-	3.33	10.00	86.67	-
Visamangalam	-	-	-	-	-	-	100.00	-
Vinayagapuram	-	-	-	1.82	5.45	-	92.73	-
Melnandiyambadi	-	-	-	7.25	7.25	-	85.51	-
Namathodu	-	-	-	7.25	7.25	-	85.51	-
Thavanai	-	-	-	-	-	21.21	78.79	-
Vallam	-	-	-	-	-	2.70	97.30	-
Anaibogi	-	-	-	-	-	-	100.00	-
Ayalavadi	-	-	-	-	-	-	100.00	-
Chandirambadi	-	-	-	-	-	-	100.00	-

Gram Panchayat	Status of Physical condition of the soil (%)							
	Moderately Acidic	Strongly Acidic	Highly Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline
Kottupakkam	-	-	-	-	9.43	15.09	75.47	-
Kozhipuliyur	-	-	-	-	-	5.41	94.59	-
Melapoondi	-	-	-	-	-	3.57	96.43	-

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
Aliyur	72.00	19.00	-	Low	23.00	61.20	95.19	4.12	95.88
Alliyandal	-	80.00	-	Moderate	23.00	59.90	85.75	3.28	96.72
Anmarudai	-	87.00	-	Moderate	23.00	65.72	189.19	7.53	92.47
Anandimangalam	-	77.00	3.00	Moderate	23.00	71.57	170.95	1.45	98.55
Arasampattu	-	93.00	-	Moderate	23.00	64.16	157.80	-	100.00
Ariyapadi	-	64.00	18.00	Moderate	23.00	61.66	85.88	4.41	95.59
Avaniyapuram	-	78.22	-	Moderate	23.00	103.91	251.53	10.70	89.30
Endal	36.00	49.00	-	Moderate	23.00	61.05	77.35	-	100.00
Erumbur	13.00	62.00	2.00	Moderate	23.00	139.10	203.84	17.57	82.43
Gengapuram	-	63.00	-	Moderate	23.00	115.89	247.50	3.42	96.58
Imapuram	-	98.00	-	Moderate	23.00	53.86	145.43	2.24	97.76
Injimedu	-	65.00	6.00	Moderate	23.00	103.64	153.24	5.26	94.74
Isakolathur	-	66.00	-	Moderate	23.00	41.98	64.89	2.11	97.89
Jagannathapuram	2.00	33.00	49.17	Low	23.00	49.35	119.35	2.26	97.74
Kalyanapuram	4.00	80.00	-	Moderate	23.00	58.65	104.99	6.89	93.11
Konaiyur	-	98.00	-	Moderate	23.00	77.91	200.15	8.26	91.74
Kolappalur	-	93.00	2.00	Moderate	23.00	168.89	276.27	1.57	98.43
Konamangalam	-	29.00	55.00	High	23.00	47.25	87.94	7.52	92.48
Madam	-	82.00	11.00	Moderate	23.00	26.25	44.97	10.91	89.09
Mahadevimangalam	-	73.00	-	Moderate	23.00	83.07	147.16	6.41	93.59
Marakkunam	-	82.00	-	Moderate	23.00	49.35	89.63	2.89	97.11
Melanur	-	84.00	-	Moderate	23.00	54.57	157.52	3.92	96.08
Melathangal	-	82.00	16.00	Moderate	23.00	72.05	188.76	4.36	95.64
Melsathamangalam	-	77.00	-	Moderate	23.00	46.42	126.09	8.62	91.38
Melvillivalam	11.00	82.00	-	Moderate	23.00	69.39	82.10	6.75	93.25

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
Morakkaniyanur	12.00	72.00	-	Moderate	23.00	48.98	116.37	5.94	94.06
Nalladisenai	-	91.00	-	Moderate	23.00	52.71	120.21	3.34	96.66
Peranambakkam	-	92.00	-	Moderate	23.00	44.56	92.19	6.02	93.98
Nambedu	28.00	53.00	31.00	Moderate	23.00	105.32	176.74	8.66	91.34
Narayanamangalam	-	81.00	-	Moderate	23.00	52.74	126.42	2.52	97.48
Nariyambadi	-	100.00	-	Moderate	23.00	32.42	90.71	6.97	93.03
Nedungunam	18.00	53.00	10.00	Moderate	23.00	112.04	292.41	3.06	96.94
Mosavadi	-	82.00	-	Moderate	23.00	69.04	184.04	1.57	98.43
Poongunam	15.00	45.00	18.00	Moderate	23.00	50.23	105.59	4.90	95.10
Raghunathasamudran	-	79.00	-	Moderate	23.00	134.01	215.17	1.42	98.58
Reddikuppam	-	92.00	-	Moderate	23.00	40.19	97.15	3.19	96.81
Semmambadi	-	98.00	-	Moderate	23.00	52.19	77.21	2.18	97.82
Septankulam	37.00	53.00	-	Moderate	23.00	120.95	192.36	4.72	95.28
Solavaram	-	74.00	-	Moderate	23.00	31.30	98.39	3.31	96.69
Solaiarugavur	74.00	13.00	-	Low	23.00	70.90	79.15	5.97	94.03
Sudrakatteri	-	60.00	-	Moderate	23.00	47.96	91.42	3.75	96.25
Thadinolambai	40.00	36.00	-	Low	23.00	46.03	88.82	3.28	96.72
Vayaloor	22.00	70.00	-	Moderate	23.00	85.40	173.21	2.99	97.01
Vilanallur	42.00	37.00	-	Low	23.00	102.28	310.31	1.67	98.33
Veppampattu	4.00	78.00	6.00	Moderate	23.00	28.95	74.64	3.96	96.04
Visamangalam	-	51.00	32.00	Moderate	23.00	69.97	218.79	4.27	95.73
Vinayagapuram	-	92.00	-	Moderate	23.00	71.53	139.16	5.08	94.92
Melnandiyambadi	-	92.00	-	Moderate	23.00	37.77	89.10	7.17	92.83
Namathodu	-	46.00	26.00	Moderate	23.00	154.55	203.97	1.21	98.79
Thavanai	-	65.00	13.00	Moderate	23.00	78.78	211.11	2.87	97.13
Vallam	45.00	43.00	-	Low	23.00	170.51	323.18	3.07	96.93

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
Anaibogi	38.00	46.00	-	Moderate	23.00	110.31	306.91	4.79	95.21
Ayalavadi	32.00	49.00	-	Moderate	23.00	84.44	189.78	9.20	90.80
Chandirambadi	-	100.00	-	Moderate	23.00	68.20	202.29	3.33	96.67
Kottupakkam	2.00	82.00	-	Moderate	23.00	92.15	229.41	3.68	96.32
Kozhipuliyur	-	100.00	-	Moderate	23.00	79.72	170.65	2.18	97.82
Melapoondi	-	29.00	62.00	Low	23.00	64.27	183.59	4.05	95.95

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)			
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population	Poultry
Aliyur	-	100.00	248	198	53	-
Alliyandal	-	100.00	496	69	260	-
Anmarudai	-	100.00	512	37	398	-
Anandimangalam	-	100.00	820	370	210	-
Arasampattu	-	100.00	680	118	202	-
Ariyapadi	-	100.00	370	154	172	-
Avaniyapuram	-	100.00	922	489	326	-
Endal	-	100.00	481	295	130	-
Erumbur	-	100.00	372	112	59	-
Gengapuram	-	100.00	946	141	87	-
Imapuram	-	100.00	442	132	91	-
Injimedu	-	100.00	587	269	80	-
Isakolathur	-	100.00	380	113	52	-
Jagannathapuram	-	100.00	332	-	52	-
Kalyanapuram	-	100.00	300	15	16	-
Konaiyur	-	100.00	661	3	122	-
Kolappalur	-	100.00	893	286	104	-
Konamangalam	-	100.00	401	27	90	-
Madam	-	100.00	459	185	123	-
Mahadevimangalam	-	100.00	626	82	23	-
Marakkunam	-	100.00	269	163	78	-
Melanur	-	100.00	556	13	53	-
Melathangal	-	100.00	749	172	95	-
Melsathamangalam	74.88	25.12	616	111	550	-
Melvillivalam	-	100.00	116	41	264	-
Morakkaniyanur	-	100.00	318	17	86	-
Nalladisenai	-	100.00	485	320	750	-
Peranambakkam	-	100.00	343	32	141	-

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)			
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population	Poultry
Nambedu	-	100.00	725	178	96	-
Narayanamangalam	-	100.00	173	30	17	-
Nariyambadi	-	100.00	788	64	166	-
Nedungunam	-	100.00	775	934	158	-
Mosavadi	-	100.00	247	96	33	-
Poongunam	-	100.00	289	85	13	-
Raghunathasamudran	-	100.00	1055	530	122	-
Reddikuppam	-	100.00	483	143	109	-
Semmambadi	-	100.00	455	87	94	-
Septankulam	-	100.00	1055	10	26	-
Solavaram	-	100.00	388	160	74	-
Solaiarugavur	-	100.00	272	263	-	-
Sudrakatteri	-	100.00	546	286	87	-
Thadinolambai	-	100.00	363	191	35	-
Vayaloor	-	100.00	555	-	31	-
Vilanallur	-	100.00	527	42	95	-
Veppampattu	-	100.00	426	81	64	-
Visamangalam	-	100.00	1045	132	200	-
Vinayagapuram	-	100.00	681	35	184	-
Melnandiyambadi	-	100.00	302	116	156	-
Namathodu	-	100.00	959	167	281	-
Thavanai	-	100.00	610	261	55	-
Vallam	-	100.00	522	743	166	-
Anaibogi	-	100.00	511	308	70	-
Ayalavadi	-	100.00	625	121	575	-
Chandirambadi	-	100.00	741	244	120	-
Kottupakkam	-	100.00	861	350	182	-
Kozhipuliyur	-	100.00	770	27	39	-
Melapoondi	-	100.00	462	60	22	-

ANNEXURE 3.8

GP WISE DEMOGRAPHIC AND SOCIO ECONOMIC STATUS

Key CWRM Parameter\ GP	Geographical Area	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable population (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vulnerable Households (SECC) (No.)
Aliyur	318	421	402	823	333	83	416	208	20	14	18
Alliyandal	334	772	747	1,519	588	28	616	393	80	37	67
Anmarudai	464	824	874	1,698	313	19	332	412	75	28	61
Anandimangalam	461	810	850	1,660	280	-	280	387	43	20	36
Arasampattu	329	860	867	1,727	349	5	354	420	46	36	43
Ariyapadi	376	531	518	1,049	145	-	145	265	11	23	15
Avaniyapuram	551	1,322	1,316	2,638	426	4	430	2,638	325	97	257
Endal	355	518	546	1,064	15	8	23	286	23	17	21
Erumbur	816	680	672	1,352	713	92	805	368	63	46	58
Gengapuram	758	1,350	1,358	2,708	729	43	772	655	105	51	89
Imapuram	268	819	746	1,565	29	-	29	366	47	28	41
Injimedu	612	742	762	1,504	349	-	349	406	65	61	64
Isakolathur	290	494	546	1,040	484	55	539	239	15	13	14
Jagannathapuram	303	354	376	730	98	15	113	286	11	21	14
Kalyanapuram	324	504	503	1,007	438	19	457	206	49	11	38
Konaiyur	448	787	757	1,544	79	-	79	406	67	26	55
Kolappalur	1,168	2,494	2,632	5,126	810	89	899	1,229	149	91	132
Konamangalam	272	459	474	933	71	-	71	225	48	21	40
Madam	170	617	666	1,283	436	1	437	350	20	38	25
Mahadevimangalam	454	489	474	963	10	-	10	266	57	29	49
Marakkunam	288	369	390	759	244	23	267	206	20	14	18
Melanur	343	966	958	1,924	528	5	533	412	75	28	61
Melathangal	393	1,025	970	1,995	664	10	674	488	71	33	60
Melsathamangalam	300	603	626	1,229	86	2	88	315	59	30	50

Key CWRM Parameter\ GP	Geographical Area	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable population (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vulnerable Households (SECC) (No.)
Melvillivalam	350	545	531	1,076	-	219	219	264	35	8	27
Morakkaniyanur	274	530	563	1,093	521	-	521	215	13	20	15
Nalladisenai	293	232	206	438	2	-	2	411	40	24	35
Peranambakkam	228	416	415	831	-	-	-	187	23	12	20
Nambedu	568	845	887	1,732	222	42	264	460	55	24	46
Narayanamangalam	353	479	459	938	175	10	185	197	28	14	24
Nariyambadi	194	604	673	1,277	-	-	-	313	42	36	40
Nedungunam	664	2,068	2,110	4,178	870	45	915	996	166	57	133
Mosavadi	390	389	434	823	305	10	315	214	29	19	26
Poongunam	273	319	329	648	71	26	97	167	34	14	28
Raghunathasamudran	738	887	871	1,758	325	-	325	387	71	25	57
Reddikuppam	224	529	507	1,036	282	23	305	229	26	15	23
Semmambadi	297	592	581	1,173	70	-	70	290	25	25	25
Septankulam	644	898	887	1,785	139	1	140	417	78	34	65
Solavaram	222	379	403	782	227	32	259	218	43	14	34
Solaiarugavur	365	410	400	810	-	-	-	198	8	4	7
Sudrakatteri	352	542	533	1,075	242	-	242	280	45	24	39
Thadinolambai	249	530	538	1,068	208	31	239	302	7	31	14
Vayaloor	459	1,007	1,026	2,033	202	5	207	510	102	42	84
Vilanallur	589	982	986	1,968	742	2	744	498	100	30	79
Veppampattu	161	393	435	828	303	-	303	204	19	15	18
Visamangalam	398	817	834	1,651	8	18	26	421	84	30	68
Vinayagapuram	412	693	635	1,328	288	16	304	335	50	27	43
Melnandiyambadi	206	566	565	1,131	101	9	110	301	29	17	25
Namathodu	956	1,224	1,222	2,446	499	10	509	548	37	42	39
Thavanai	456	756	729	1,485	410	15	425	359	62	37	55

Key CWRM Parameter\ GP	Geographical Area	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable popupation (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vulnerable Households (SECC) (No.)
Vallam	944	1,381	1,350	2,731	1,719	11	1,730	629	69	43	61
Anaibogi	613	894	869	1,763	659	45	704	447	25	37	29
Ayalavadi	485	722	663	1,385	683	43	726	345	45	31	41
Chandirambadi	410	705	708	1,413	215	5	220	347	69	26	56
Kottupakkam	500	1,091	1,073	2,164	439	8	447	563	58	39	52
Kozhipuliyur	425	733	770	1,503	335	7	342	361	-	-	-
Melapoondi	378	471	-	471	51	-	51	200	40	13	32

Key CWRM Parameter\ GP	% 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.)
Aliyur	8.80	329	226	220	4	2	6	-	-
Alliyandal	17.10	702	541	144	4	2	6	-	-
Anmarudai	14.80	782	556	129	4	3	7	-	349
Anandimangalam	9.30	748	542	510	4	2	6	-	-
Arasampattu	10.20	724	453	99	4	2	6	-	441
Ariyapadi	5.50	567	390	309	4	1	5	1,664	416
Avaniyapuram	9.70	1,109	784	740	4	2	6	-	-
Endal	7.40	467	334	392	3	1	4	-	-
Erumbur	15.70	541	372	436	4	1	5	2,800	800
Gengapuram	13.60	1,133	845	424	4	3	7	-	-
Imapuram	11.30	696	434	439	4	2	6	-	-
Injimedu	15.70	623	428	504	4	2	6	-	-
Isakolathur	6.00	419	289	302	4	2	6	-	-
Jagannathapuram	4.90	332	236	241	4	2	6	-	-
Kalyanapuram	18.30	279	200	141	4	2	6	-	107
Konaiyur	13.50	696	551	446	4	2	6	-	-
Kolappalur	10.70	1,644	1,248	852	4	2	6	-	-
Konamangalam	17.70	348	292	274	4	2	6	-	-
Madam	7.30	428	307	493	4	2	6	-	-
Mahadevimangalam	18.30	480	372	317	4	2	6	-	-
Marakkunam	8.80	361	277	179	4	2	6	1,336	334
Melanur	14.80	695	518	258	4	2	6	-	-
Melathangal	12.20	790	475	277	4	2	6	1,645	470
Melsathamangalam	16.00	539	372	241	4	1	5	-	-
Melvillivalam	10.20	346	237	282	4	2	6	-	-

Key CWRM Parameter\ GP	% 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.)
Morakkaniyanur	7.00	253	210	293	4	2	6	-	-
Nalladisenai	8.60	376	272	157	4	2	6	-	-
Peranambakkam	10.50	348	210	218	4	2	6	-	-
Nambedu	9.90	1,016	679	434	4	2	6	-	-
Narayanamangalam	12.10	347	246	257	4	2	6	-	-
Nariyambadi	12.80	606	381	395	4	2	6	-	-
Nedungunam	13.40	1,771	1,071	532	4	2	6	3,760	940
Mosavadi	12.10	298	182	226	3	2	5	-	-
Poongunam	16.80	361	279	208	4	2	6	-	-
Raghunathasamudran	14.80	679	439	396	4	2	6	-	-
Reddikuppam	9.90	425	270	95	4	2	6	-	-
Semmambadi	8.60	451	311	350	4	2	6	-	-
Septankulam	15.50	776	584	714	5	2	7	-	401
Solavaram	15.70	410	260	295	4	2	6	-	-
Solaiarugavur	3.40	289	163	239	4	2	6	-	-
Sudrakatteri	13.80	540	329	228	4	2	6	-	210
Thadinolambai	4.70	584	441	307	4	2	6	-	-
Vayaloor	16.50	839	587	330	4	1	5	-	-
Vilanallur	15.90	844	589	196	4	2	6	220	-
Veppampattu	8.70	391	245	270	3	2	5	-	200
Visamangalam	16.10	860	567	263	4	2	6	-	-
Vinayagapuram	12.90	646	395	284	4	2	6	-	-
Melnandiyambadi	8.40	405	283	304	4	2	6	-	-
Namathodu	7.00	980	716	362	4	2	6	-	-
Thavanai	15.20	698	571	425	4	1	5	-	-

Key CWRM Parameter\ GP	% 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.)
Vallam	9.70	1,048	841	632	4	2	6	-	-
Anaibogi	6.40	683	536	545	4	2	6	-	-
Ayalavadi	11.80	558	442	413	4	2	6	-	-
Chandirambadi	16.20	654	515	361	4	2	6	-	-
Kottupakkam	9.30	632	484	524	4	2	6	-	-
Kozhipuliyur	-	574	398	457	4	2	6	-	-
Melapoondi	16.00	297	223	256	4	2	6	-	-

ANNEXURE 4

IPCC VULNERABILITY ASSESSMENT METHODOLOGY

Normalization of Indicators:

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

- for indicators with positive relationship with vulnerability

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

- for indicators with negative relationship with vulnerability

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

Aggregation and categorization of Indicators

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

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

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

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

ANNEXURE 5.1

GP WISE WASCA PROPOSED TREATMENT AREA

Key CWRM Parameter	Forest Land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Critica-lops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
Aliyur	-	25.76	5.65	2.52	0.94	13.15	0.07	5.06	5.38	11.63
Alliyandal	-	13.45	-	5.28	0.19	0.01	1.32	37.13	6.40	7.38
Anmarudai	-	32.68	0.71	-	1.71	-	0.10	7.21	9.36	16.97
Anandimangalam	-	15.41	10.67	1.19	-	0.65	0.32	7.46	9.16	11.29
Arasampattu	-	3.80	-	-	-	13.50	0.70	5.90	7.20	12.60
Ariyapadi	-	8.31	15.19	0.88	-	0.20	3.55	31.64	12.87	5.42
Avaniyapuram	-	4.62	11.56	-	-	5.78	-	11.26	14.20	16.69
Endal	-	6.91	-	0.75	0.38	0.75	12.25	29.81	5.43	7.30
Erumbur	-	38.83	21.34	1.37	0.30	16.07	8.61	38.81	32.16	4.69
Gengapuram	-	33.10	-	-	3.88	5.60	2.86	22.70	12.29	21.21
Imapuram	-	-	-	4.82	-	0.04	0.38	5.63	7.38	10.91
Injimedu	-	2.71	8.00	18.98	-	1.50	8.64	30.22	11.81	9.01
Isakolathur	-	19.71	-	-	-	0.93	0.56	2.87	0.45	11.68
Jagannathapuram	-	8.05	1.95	-	-	15.45	0.56	1.54	1.97	10.81
Kalyanapuram	-	0.97	3.97	0.68	0.86	-	2.27	19.48	11.12	6.76
Konaiyur	-	4.82	-	7.95	6.62	0.08	0.31	11.77	12.22	13.88
Kolappalur	-	79.70	0.04	-	0.26	9.10	4.34	36.19	3.25	31.29
Konamangalam	-	12.31	0.05	0.99	0.03	0.93	2.22	14.58	8.26	6.15
Madam	-	10.20	-	-	0.29	1.06	0.36	3.76	1.07	4.08
Mahadevimangalam	-	17.03	6.11	21.29	26.07	15.86	5.12	22.07	8.57	7.30
Marakkunam	-	13.45	0.75	-	0.53	0.20	0.97	8.03	2.37	8.40
Melanur	-	19.42	-	-	0.85	0.11	-	6.09	10.68	12.26
Melathangal	-	0.28	-	-	-	2.52	0.12	9.05	15.27	10.97
Melsathamangalam	-	12.39	-	6.55	-	2.77	-	6.59	6.71	16.94

Key CWRM Parameter	Forest Land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Critica-lops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
Melvillivalam	-	8.87	-	2.30	1.47	26.25	1.56	9.59	8.48	6.91
Morakkaniyanur	-	11.17	-	-	1.50	0.75	0.32	4.40	4.46	7.92
Nalladisenai	-	11.73	-	-	-	1.75	2.12	4.50	0.41	14.48
Peranambakkam	-	6.30	-	-	-	0.17	0.85	7.46	3.86	7.81
Nambedu	-	20.17	13.65	4.64	2.42	3.10	6.04	15.40	15.66	5.28
Narayanamangalam	-	61.66	0.47	1.40	-	0.05	0.48	8.14	7.09	9.67
Nariyambadi	-	9.73	0.11	6.47	-	-	-	3.60	4.81	6.67
Nedungunam	-	32.45	12.08	4.55	1.39	-	1.34	13.02	5.20	31.70
Mosavadi	-	48.71	3.08	6.54	1.91	3.77	0.38	7.08	7.34	15.65
Poongunam	-	0.19	9.30	3.31	5.03	3.26	3.72	8.06	3.89	9.70
Raghunathasamudran	-	28.64	20.60	12.11	22.58	18.00	5.76	33.19	7.09	17.34
Reddikuppam	-	9.07	3.53	3.23	6.83	7.63	1.12	2.75	3.12	7.59
Semmambadi	-	2.61	0.72	-	0.52	4.13	0.24	6.01	3.01	11.23
Septankulam	-	4.39	3.15	11.06	2.25	16.88	1.71	38.68	18.73	10.10
Solavaram	-	15.73	0.29	-	-	0.29	-	2.04	7.76	7.30
Solaiarugavur	-	10.47	4.02	3.08	1.05	14.48	0.85	5.51	0.49	7.87
Sudrakatteri	-	26.37	-	-	-	0.95	0.51	12.42	6.84	6.42
Thadinolambai	-	1.21	6.38	1.59	1.31	-	0.68	3.13	1.54	7.38
Vayaloor	-	16.17	-	5.90	7.20	1.30	13.33	12.06	5.91	16.21
Vilanallur	-	5.76	12.00	3.75	10.88	0.27	1.43	5.30	34.75	14.74
Veppampattu	-	6.47	1.61	3.04	-	8.41	0.06	1.65	2.45	6.07
Visamangalam	-	17.30	5.29	1.30	0.55	0.32	0.32	3.64	16.37	16.81
Vinayagapuram	-	18.52	-	6.88	0.74	1.58	0.56	16.91	8.95	9.33
Melnandiyambadi	-	0.15	-	-	-	5.50	0.79	3.10	3.89	6.47
Namathodu	-	142.01	8.86	13.16	2.18	-	14.86	86.76	7.48	20.33
Thavanai	-	54.24	3.89	12.41	4.64	8.36	0.11	9.43	10.63	16.90

Key CWRM Parameter	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	Treatment Area Irrigated by Source
Vallam	-	96.59	16.65	4.50	7.42	30.24	5.73	21.95	22.92	15.69
Anaibogi	-	1.33	11.90	7.05	7.97	9.76	0.83	3.59	16.79	9.94
Ayalavadi	-	4.95	22.50	4.72	3.82	7.23	1.75	9.07	20.73	4.94
Chandirambadi	-	8.78	-	9.63	0.20	3.21	-	6.57	15.09	14.52
Kottupakkam	-	49.88	23.13	1.74	1.67	8.03	0.09	6.55	5.09	22.42
Kozhipuliyur	-	39.06	1.65	4.91	0.49	4.43	6.09	25.48	18.55	13.09
Melapoondi	-	49.11	0.08	6.64	0.59	1.30	0.63	7.25	16.05	11.84

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

ANNEXURE 5.2

GP WISE EXPECTED RUNOFF CONSERVATION AFTER WASCA TREATMENT

GP/Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Aliyur	20.40	4.70	4.10
Alliyandal	20.50	1.54	9.77
Anmarudai	13.30	0.50	6.30
Anandimangalam	16.40	0.50	5.30
Arasampattu	11.68	3.81	4.94
Ariyapadi	9.90	0.30	10.00
Avaniyapuram	9.80	1.62	7.88
Endal	13.20	0.50	10.20
Erumbur	30.30	5.00	15.80
Gengapuram	21.00	2.70	11.00
Imapuram	4.90	1.40	4.50
Injimedu	14.30	5.80	11.20
Isakolathur	8.30	0.30	2.90
Jagannathapuram	8.50	4.30	2.80
Kalyanapuram	3.09	0.43	7.41
Konaiyur	10.00	4.10	7.10
Kolappalur	36.40	2.60	14.00
Konamangalam	12.60	0.50	5.80
Madam	5.70	0.40	1.70
Mahadevimangalam	16.70	17.80	8.10
Marakkunam	6.20	0.20	3.70
Melanur	14.90	0.30	5.40
Melathangal	4.00	0.70	6.60
Melsathamangalam	11.73	2.74	5.92
Melvillivalam	8.70	8.40	5.00
Morakkaniyanur	6.30	0.60	3.20
Nalladisenai	7.40	0.50	4.00
Peranambakkam	3.80	-	3.70
Nambedu	18.00	2.90	7.90
Narayanamangalam	24.40	0.40	4.70
Nariyambadi	6.00	1.80	2.80
Nedungunam	21.00	1.70	9.60
Mosavadi	20.70	3.40	5.70
Poongunam	5.60	3.30	4.70
Raghunathasamudran	19.30	14.80	11.90
Reddikuppam	10.80	5.00	2.70
Semmambadi	4.80	1.30	3.80
Septankulam	4.70	8.50	12.90
Solavaram	11.70	0.10	3.20
Solaiarugavur	7.30	5.20	2.80
Sudrakatteri	13.60	0.30	4.90
Thadinolambai	4.27	0.81	2.38
Vayaloor	11.20	4.00	8.90

GP/Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Vilanallur	21.50	4.20	10.50
Veppampattu	4.80	3.20	1.90
Visamangalam	12.70	0.60	6.90
Vinayagapuram	11.80	2.60	6.70
Melnandiyambadi	9.30	1.50	2.70
Namathodu	61.80	4.30	24.20
Thavanai	32.20	7.10	6.90
Vallam	50.30	11.80	12.40
Anaibogi	11.30	7.00	5.80
Ayalavadi	18.20	4.40	6.80
Chandirambadi	10.40	3.70	6.80
Kottupakkam	33.70	3.20	6.40
Kozhipuliyur	25.70	2.80	11.80
Melapoondi	27.70	2.40	6.70

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.	Length	No.	No.	Area	No.	Length	No.
Aliyur	15,036	19	-	97	485	11	15,453	19	393	1,964	11
Alliyandal	-	-	-	-	-	50	-		-	-	50
Anadimangalam	9,048	11	-	-	-	38	9,245	12	393	1,964	38
Anaibogi	-	-	-	-	-		-	-	-	-	180
Anmarudai	-	-	-	-	-	10	-	-	-	-	50
Arasampattu	4,000	3	-	-	-		-	-	-	-	50
Ariyapadi	-	-	-	-	-		-	-	-	-	50
Avaniyapuram	-	-	-	-	-		4,076	2,300	-	-	38
Ayalavadi	-	-	-	-	-		-	-	-	-	210
Chandirambadi	-	-	-	-	-		-	-	-	-	70
Endal	-	-	-	-	-		-	-	-	-	25
Erumbur	6,500	8	-	440	2,200	5	-	-	-	-	100
Gengapuram	4,482	6	-	97	-	64	19,862	25	393	1,964	64
Imapuram	-	-	-	97	600		-	-	-	-	50
Injimedu	4,000	4	-	97	2,800		-	-	-	-	25
Isakolathur	-	-	-	410	2,050		-	-	-	-	32
Jagannathapuram	-	-	-	97	1,800		-	-	-	-	95
Kalyanapuram	-	-	-	97	1,250	-	-	-	-	-	-
Kolappalur	9,600	12	-	680	3,400	31	-	-	-	-	54
Konaiyur	-	-	-	97	2,600	32	-	-	-	-	125
Konamangalam	-	-	-	97	2,600	50	-	-	-	-	50
Kottupakkam	-	-	-	420	2,100		-	-	-	-	120
Kozhipuliyur	-	-	-	500	2,500		-	-	-	-	150
Madam	-	-	-	97	3,150		-	-	-	-	50
Mahadevimangalam	-	-	-	97	2,550		-	-	-	-	30

Gram Panchayat	Aff		ARS	AVP		Az	BP		CBP		CS
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Length	No.
Marakkunam	-	-	-	97	1,900	25	-	-	-	-	25
Melanur	-	-	-	97	2,200	10	-	-	-	-	50
Melapoondi	-	-		97	3,650		-	-	-	-	80
Melathangal	-	-	-	640	3,200		-	-	-	-	31
Melnandiyambadi	-	-	-	97	8,000		-	-	-	-	90
Melsathamangalam	9,914	12	-	517	2,587	50	2,214	3	260	1,300	50
Melvillivalam	-	-		97	2,250		-	-	-	-	30
Morakkaniyanur	-	-	-	440	2,200	21	-	-	-	-	26
Mosavadi	-	-	-	97	1,950		-	-	-	-	26
Nalladisenai	-	-	-	97	1,250		-	-	-	-	52
Namathodu	1	8	-	630	3,150	10	-	-	-	-	120
Nambedu	8,000	10	-	97	1,200	50	5,000	2	-	-	50
Narayanamangalam	-	-	-	97	2,550	31	-	-	-	-	31
Nariyambadi	-	-	-	97	2,800	31	-	-	-	-	31
Nedungunam	-	-	-	97	2,325		-	-	-	-	50
Peranambakkam	-	-	-	97	7,500		-	-	-	-	120
Poongunam	-	-	-	97	2,050		-	-	-	-	31
Raghunathasamudram	2,000	1	-	97	1,050		-	-	-	-	50
Reddikuppam	-	-	-	97	1,300		-	-	-	-	50
Semmambadi	-	-	-	97	2,100		-	-	-	-	52
Septankulam	-	-	-	97	1,300		-	-	-	-	50
Solaiarugavur	-	-	-	97	2,050		-	-	-	-	50
Solavaram	-	-	-	97	2,050	31	-	-	-	-	31
Sudrakatteri	-	-	-	97	1,900		-	-	-	-	31
Thadinolambai	-	-	-	97	2,050	32	-	-	-	-	32
Thavani	-	-	-	600	3,000	10	-	-	-	-	180
Vallam	-	-	-	520	2,600		-	-	-	-	210

Gram Panchayat	Aff		ARS	AVP		Az	BP		CBP		CS
	No.	Area	No.	No.	Length	No.	No.	Area	No.	Length	No.
Vayaloor	-	-	-	97	1,600		-	-	-	-	31
Veppampattu	-	-	-	97	1,050		-	-	-	-	52
Vilanallur	-	-	-	-	-	52	-	-		-	52
Vinayagapuram	1,200	4	-	97	3,170	12	-	-	-	-	25
Visamangalam	-	-	-	97	2,500		-	-	-	-	54

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Area	Plants	Length	No.	Area	No.	Area
Aliyur	11	4	-	8	47	-	-	27	133			7	18
Alliyandal	50	-	-	10	-	-	-	-	-			-	-
Anadimangalam	38	6	-	8	49	-	-	-	-			17	9
Anaibogi	180	4	-	6	3	-	-	130	650	374	2	4	10
Anmarudai	50	14	-	8	5	-	-	449	2,243	4,248	21	6	15
Arasampattu	50	-	-	15	3	-	-	180	900	240	1	18	45
Ariyapadi	50	-	-	10	4	-	-	-	-	1,400	7	1	2
Avaniyapuram	38	32	-	31	-	-	-	-	-	4,400	22	77	193
Ayalavadi	210	10	-	7	10	-	-	-	-	400	2	3	8
Chandirambadi	70	13	-	12	18	-	-	-	-	174	1	3	8
Endal	25	12	-	26	-	-	-	420	2,100	600	3	25	12
Erumbur	100	5	-	6	4	-	-	204	1,020	288	1	16	40
Gengapuram	64	12	-	16	85	-	-	-	-			14	25
Imapuram	50	-	-	6	2	-	-	96	480			16	40
Injimedu	25	18	-	14	2	-	-	704	3,520	304	2	24	26
Isakolathur	32	12	-	10	10	-	-	176	880	248	1	25	63
Jagannathapuram	95	16	-	24	5	-	-	170	850	174	1	26	65
Kalyanapuram	-	-	-	18	6	-	-	520	2,600			8	20
Kolappalur	54	4	-	10	8	-	-	517	2,583	2,400	12	12	30
Konaiyur	125	16	-	10	10	-	-	380	1,902	760	4	20	50
Konamangalam	50	10	-	10	6	-	-	100	500	464	2	22	55
Kottupakkam	120	4	-	10	12	-	-	170	850	410	2	12	30
Kozhipuliyur	150	6	-	16	8	-	-	120	600			6	15
Madam	50	15	-	10	10	-	-	126	630	304	2	44	110
Mahadevimangalam	30	20	-	10	6	-	-	104	520	348	2	22	55
Marakkunam	25	12	-	10	5	-	-	210	1,050	1,000	5	20	50
Melanur	50	14	-	10	5	-	-	138	690	1,424	2	20	50

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Area	Plants	Length	No.	Area	No.	Area
Melapoondi	80	11	-	11	3	-	-	-	-	364	2	4	10
Melathangal	31	12	-	36	6	-	-	178	890	400	2	10	25
Melnandiyambadi	90	4	-	12	12	-	-	224	1,120			16	40
Melsathamangalam	50	5	-	10	42	5,714	52	-	-	3,024	15	3	7
Melvillivalam	30	4	-	12	5	-	-	372	1,860	270	1	16	40
Morakkaniyanur	26	-	-	-	6	-	-	-	-	310	2	8	20
Mosavadi	26	10	-	12	5	-	-	166	830	452	2	16	40
Nalladisenai	52	-	-	10	4	-	-	20	100			23	58
Namathodu	120	-	-	7	2	-	-	60	300			12	30
Nambedu	50	-	-	7	4	-	-	400	2,000			12	15
Narayanamangalam	31	12	-	20	6	-	-	156	780	640	3	18	45
Nariyambadi	31	12	-	21	6	-	-	230	1,150	432	2	14	35
Nedungunam	50	-	-	10	10	-	-	240	1,200			6	15
Peranambakkam	120	4	-	7	8	-	-	-	-	2,460	12	10	25
Poongunam	31	10	-	21	5	-	-	186	930	344	2	16	40
Raghunathasamudram	50	2	-	24	5	-	-	204	1,020			16	40
Reddikuppam	50	-	-	12	6	-	-	142	710			16	40
Semmambadi	52	12	-	21	6	-	-	144	720	268	1	18	45
Septankulam	50	-	-	8	5	-	-	104	520			36	90
Solaiarugavur	50	10	-	36	8	-	-	94	470	352	2	25	63
Solavaram	31	11	-	14	5	-	-	100	500	1,000	5	13	33
Sudrakatteri	31	12	-	42	8	-	-	36	180	270	1	35	88
Thadinolambai	32	12	-	18	5	-	-	170	850	1,456	2	14	35
Thavani	180	5	-	7	22	-	-	84	420			7	18
Vallam	210	3	-	3	7	-	-	90	450			5	13
Vayaloor	31	10	-	18	6	-	-	300	1,500	300	2	6	15
Veppampattu	52	-	-	10	10	-	-	76	380			16	40
Vilanallur	52	-	-	10	10	-	-	14	70			-	-

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Area	Plants	Length	No.	Area	No.	Area
Vinayagapuram	25	10	-	10	4	-	-	494	2,472			8	20
Visamangalam	54	6	-	10	5	-	-	380	1,902			5	13

Gram Panchayat	FD	GSS	ICP		LDI		LP		MI		NADEP
	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.
Aliyur		10	-	-	9	23	262	0	-	-	11
Alliyandal			-	-	-	-	235	1,235	-	-	
Anadimangalam		22	-	-	7	17	251	1,268	-	-	38
Anaibogi		60	320	1,600	6	2	560		-	-	6
Anmarudai		35	-	-	-	-	-	-	-	-	14
Arasampattu		20	320	1,600	5	2	780	3,900	-	-	6
Ariyapadi		50	-	-	-	-	315	1,682	-	-	
Avaniyapuram	12		-	-	14	6	-	-	32	13	
Ayalavadi		70	480	2,400	6	2	600	3,000	-	-	6
Chandirambadi		50	720	3,600	4	2	100	500	-	-	4
Endal		50	-	-	14	10	-	-	16	6	
Erumbur		50	210	1,050	14	12	820	4,100	-	-	8
Gengapuram		13	-	-	7	17	423	2,658	-	-	64
Imapuram		50	70	350	5	1	630	3,150	-	-	50
Injimedu		13	-	-	2	6	630	3,150	12	5	
Isakolathur		32	122	610	6	2	750	3,750	10	4	32
Jagannathapuram		40	-	-	5	2	450	2,250	13	5	4
Kalyanapuram		-	116	580	6	1	560	2,800	-	-	-
Kolappalur		31	-	-	12	30	980	4,900	10	4	31
Konaiyur		45	-	-	-	2	870	4,350	12	5	15
Konamangalam		50	-	-	5	2	800	4,000	6	2	
Kottupakkam		40	380	1,900	4	1	600	3,000	-	-	9
Kozhipuliyur		60	400	2,000	5	2	800	4,000	3	1	10
Madam		25	170	850	5	2	770	3,850	10	4	50
Mahadevimangalam		25	-	-	1	1	660	3,300	10	4	30
Marakkunam		25	100	500	2	2	670	3,350	6	2	31
Melanur		22	-		4	2	820	4,100	6	2	6

Gram Panchayat	FD	GSS	ICP		LDI		LP		MI		NADEP
	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.
Melapoondi		50	640	3,200	5	2	200	1,000	-	-	2
Melathangal		25	-		4	2	890	4,450	12	5	25
Melnandiyambadi		48	296	1,480	4	2	550	2,750	-	-	3
Melsathamangalam	50		-	-	3	7	1,713	8,565	-	-	50
Melvillivalam		30	120	600	6	2	1,150	5,750	2	1	3
Morakkaniyanur		26	-	-	3	2	980	4,900	-	-	3
Mosavadi		26	-	-	-	2	900	4,500	5	2	26
Nalladisenai		52	-	-	6	1	365	1,825	-	-	4
Namathodu		50	1,680	8,400	4	1	300	1,500	-	-	15
Nambedu		20	74	370	4	10	480	2,400	-	-	4
Narayanamangalam		25	-	-	1	2	730	3,650	8	3	41
Nariyambadi		25	370	1,850	1	2	810	4,050	6	2	31
Nedungunam		18	260	1,300	8	1	720	3,600	-	-	10
Peranambakkam		15	720	3,600	3	2	880	4,400	-	-	3
Poongunam		31	300	1,500	7	2	800	4,000	7	3	31
Raghunathasamudram		20	138	690	12	2	580	2,900	8	3	
Reddikuppam		50	146	730	5	1	350	1,750	-	-	54
Semmambadi	10		144	720	1	2	750	3,750	10	4	
Septankulam		50	164	820	6	1	490	2,450	-	-	
Solaiarugavur		50	144	720	7	2	530	2,650	6	2	50
Solavaram		31	122	610	4	2	810	4,050	8	3	22
Sudrakatteri		31	122	610	5	2	580	2,900	15	6	31
Thadinolambai		32	-	-	4	2	680	3,400	5	2	5
Thavani		60	655	3,274	5	3	500	2,500	-	-	10
Vallam		70	480	2,400	3	8	400	2,000	-	-	3
Vayaloor		29	240	1,200	4	2	770	3,850	5	2	5
Veppampattu		52	104	520	1	2	370	1,850	-	-	52

Gram Panchayat	FD	GSS	ICP		LDI		LP		MI		NADEP
	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.
Vilanallur		52	-	-	1	2	251	1,469	-	-	52
Vinayagapuram		29	168	840	10	24	630	3,150	5	2	12
Visamangalam		29	204	1,020	10	24	550		6	2	3

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	No.	Area	No.	No.	Length
Aliyur	-	-	-	2	-	-	2	2,400	3	2	18	-
Alliyandal	-	-	-	1	-	7	2	-	-	2		-
Anadimangalam	-	-	-	1		2	2	800	1	4	36	-
Anaibogi	-	-	-	2	-	3	2	-	-	2		1,600
Anmarudai	-	-	-	4	-	-	2	-	-	3		-
Arasampattu	-	-	-	-	-	5	2	400	1	3		1,600
Ariyapadi	-	-	-	1	-	2	2	-	-	3	50	-
Avaniyapuram	-	4,000	-	8	-	-	2	3,000	6	3		-
Ayalavadi	-	-	-	2	-	4	2	-	-	2		2,400
Chandirambadi	-	-	-	2	-	4	2	-	-	2		3,600
Endal	-	1,000	-	-	-	4	2	800	2	3	50	-
Erumbur	-	-	-	4	-	4	2	-	-	2		1,050
Gengapuram	-	-	-	3	-	4	2	-	-	7	89	-
Imapuram	-	-	-	1	-	2	2	-	-	2		350
Injimedu	-	-	-	2	-	5	2	1,200	3	2		-
Isakolathur	-	-	-	1	-	5	2	1,500	4	2		610
Jagannathapuram	-	-	-	1	-	5	2	1,500	4	3		-
Kalyanapuram	-	-	-	2	-	5	2	-	-	3	-	580
Kolappalur	-	-	-	2	-	2	2	1,000	1	12		-
Konaiyur	-	-	-	5	-	3	2	1,800	2	3		-
Konamangalam	-	-	-	2	-	2	2	2,200	3	2		-
Kottupakkam	-	-	-	2	-	6	2	-	-	4		1,900
Kozhipuliyur	-	-	-	2	-	6	2	-	-	4		2,000
Madam	-	-	-	2	-	5	2	2,520	3	2		850
Mahadevimangalam	-	-	-	2	-	4	2	1,720	2	2		-
Marakkunam	-	-	-	1	-	2	2	2,000	3	2		500
Melanur	-	-	-	2	-	3	2	1,840	2	2		
Melapoondi				2	-	3	2	-	-	1		3,200

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	No.	Area	No.	No.	Length
Melathangal	-	-	-	2	-	6	2	1,800	2	2		
Melnandiyambadi	-	-	-	2	-	3	2	-	-	2		1,480
Melsathamangalam	-	-	-	4	-	4	2	5,240	7	3		-
Melvillivalam				2	-	8	2	2,200	3	2		600
Morakkaniyanur	-	-	-	2	-	5	2	2,200	3	2		-
Mosavadi	-	-	-	1	-	4	2	1,200	2	3		-
Nalladisenai	-	-	-	2	-	3	2	1,400	2	3		-
Namathodu	-	-	-	1	-	12	2	-	-	3		8,400
Nambedu	-	-	-	2	-	9	2	1,808	2	3		370
Narayanamangalam	-	-	-	1	-	6	2	1,800	2	2		-
Nariyambadi	-	-	-	2	-	4	2	1,768	2	2		1,850
Nedungunam	-	-	-	4	-	16	2	2,200	3	5		1,300
Peranambakkam	-	-	-	2	-	3	2	-	-	2		3,600
Poongunam	-	-	-	2	-	3	2	1,760	2	1		1,500
Raghunathasamudram	-	-	-	1		4	2	-	-	2		690
Reddikuppam	-	-	-	1	-	3	2	2,200	3	3		730
Semmambadi	-	-	-	1	-	3	2	1,400	2	2		720
Septankulam	-	-	-	2	-	3	2	1,800	2	3		820
Solaiarugavur	-	-	-	2	-	3	2	1,760	2	3		720
Solavaram	-	-	-	1	-	5	2	1,200	2	2		610
Sudrakatteri	-	-	-	1	-	3	2	1,200	2	2		610
Thadinolambai	-	-	-	1	-	3	2	1,400	2	2		-
Thavani	-	-	-	2		3	2	-	-	3		3,274
Vallam	-	-	-	2	-	3	2	-	-	2		2,400
Vayaloor	-	-	-	2	-	5	2	1,784	2	2		1,200
Veppampattu	-	-	-	1	-	7	2	1,400	2	3		520
Vilanallur	-	-	-	1	-	4	2	3,000	4	-	52	-
Vinayagapuram	-	-	-	2	-	5	2	800	1	2		840
Visamangalam	-	-	-	3	-	3	2	800	1	2		1,020

ANNEXURE 7.1

GP WISE WASCA RECOMMENDATION AND WORKS UPLOADED

Sl. No	GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 02/02/2022
1	Aliyur	190	223
2	Alliyandal	53	271
3	Anaibogi	226	320
4	Anadimangalam	291	218
5	Anmarudai	271	921
6	Arasambattu	157	379
7	Ariyapadi	169	585
8	Avaniyapuram	318	842
9	Ayalavadi	327	642
10	Chandrambadi	398	133
11	Endal	196	271
12	Erumbur	424	197
13	Gangapuram	281	82
14	Imapuram	302	316
15	Injimedu	405	456
16	Isakolathur	265	128
17	Jagnnathapuram	257	488
18	Kalyanapuram	299	128
19	Kolappalur	279	223
20	Kolipuliyur	308	113
21	Konaiyur	432	207
22	Konamangalam	232	193
23	Kottupakkam	450	290
24	Madam	424	256
25	Mahadevimangalam	276	168
26	Marakkunam	325	145
27	Melanur	630	680
28	Melapoondi	353	206
29	Melathangal	284	332
30	Melnandhiyambadi	232	282
31	Melsathamangalam	242	157
32	Melvillivalam	213	161
33	Morakaniyanur	376	192
34	Mosavadi	219	226
35	Nalladisenai	298	159
36	Namathodu	313	359
37	Nambedu	172	319
38	Narayanamangalam	387	115
39	Nariyambadi	265	202
40	Nedungunam	341	304
41	Pernambakkam	360	222

Sl. No	GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 02/02/2022
42	Poongunam	474	211
43	Ragunadasamudram	691	180
44	Reddikuppam	299	251
45	Semmambadi	293	213
46	Septankulam	261	360
47	Solaiarugavur	337	107
48	Solavaram	406	165
49	Sudrakatteri	329	232
50	Thadinolambai	512	404
51	Thavani	375	115
52	Vallam	82	121
53	Vayaloor	334	267
54	Veppambattu	157	119
55	Villanallur	527	305
56	Vinayagapuram	367	128
57	Visamangalam	320	150

ANNEXURE 7.2

GP AND WORK CATEGORY-WISE ONGOING WORKS IN PERANAMALLUR BLOCK

GP	Work Category	Ongoing works
Alliyandal	Works on Individuals Land (Category IV)	2
Arasambattu	Works on Individuals Land (Category IV)	1
Avaniyapuram	Works on Individuals Land (Category IV)	3
Isakolathur	Works on Individuals Land (Category IV)	3
Jagnnathapuram	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Kalyanapuram	Works on Individuals Land (Category IV)	2
Kolappalur	Works on Individuals Land (Category IV)	3
Kolipuliyur	Works on Individuals Land (Category IV)	2
Melanur	Works on Individuals Land (Category IV)	3
Melapoondi	Works on Individuals Land (Category IV)	1
Melathangal	Works on Individuals Land (Category IV)	1
Melnandhiyambadi	Works on Individuals Land (Category IV)	2
Melsathamangalam	Works on Individuals Land (Category IV)	1
Morakaniyanur	Works on Individuals Land (Category IV)	1
Mosavadi	Works on Individuals Land (Category IV)	1
Namathodu	Works on Individuals Land (Category IV)	1
Nambedu	Rural Sanitation	1
	Works on Individuals Land (Category IV)	4
Narayanamangalam	Works on Individuals Land (Category IV)	1
Pernambakkam	Water Conservation and Water Harvesting	1
Poongunam	Works on Individuals Land (Category IV)	2
Ragunadasamudram	Works on Individuals Land (Category IV)	5
Semmambadi	Works on Individuals Land (Category IV)	1
Septankulam	Water Conservation and Water Harvesting	2
Solaiarugavur	Works on Individuals Land (Category IV)	1
Thadinolambai	Water Conservation and Water Harvesting	1
Vallam	Works on Individuals Land (Category IV)	3
Veppambattu	Works on Individuals Land (Category IV)	3
Villanallur	Drought Proofing	1
	Water Conservation and Water Harvesting	2
Vinayagapuram	Works on Individuals Land (Category IV)	1
Visamangalam	Works on Individuals Land (Category IV)	3

ANNEXURE 8

CWRM KEY INDICATORS FOR GPs MICRO-WATERSHED

CWRM Parameter	Gengapuram	Kolappalur
Soil Resources: Status of Available Nitrogen (%)		
Very Low	0	76.86
Low	100	23.14
Status of Organic Carbon (%)		
Very Low	0	25.21
Low	100	74.79
Status of Soil Micro Nutrients (%)		
Sufficient	54	55
Deficient	46	45
Status of Physical condition of the soil (%)		
Slighly Acidic	1.69	0
Neutral	0	0
Moderately Alkaline	98.31	100
Soil Texture (%)		
Fine Soil	63	93
Course loamy	0	2
Soil Water Permeability (Low, Moderate, high)	Moderate	Moderate
Soil moisture and ET		
Volumetric Soil Moisture (%)	23	23
Estimated Soil Moisture (ha.m)	115.89	168.89
ET Losses (ha.m)	247.50	276.27
Means of Water Extraction (%)		
Gravity	3.42	1.57
Lifting	96.58	98.43
Irrigation Methods (%)		
Control Flooding	100	100
Livestock (No.)		
Cattle Population	946	893
Sheep Population	141	286
Goat Population	87	104
Land Resources (ha)		
Non-Agricultural Uses	254.64	433.85
Land Under Miscellaneous Tree Criticalops etc.	5.17	0.35
Cultivable Waste Land	7.47	12.13
Fallows Land other than Current Fallows	21.12	40.52
Current Fallow land	167.42	337.97
Unirrigated Land	90.62	30.36
Area Irrigated by Source	212.05	312.91

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