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

Published by:
Department of Rural Development & Panchayat Raj,
Government of Tamil Nadu, Chennai

Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

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Design and Layout:
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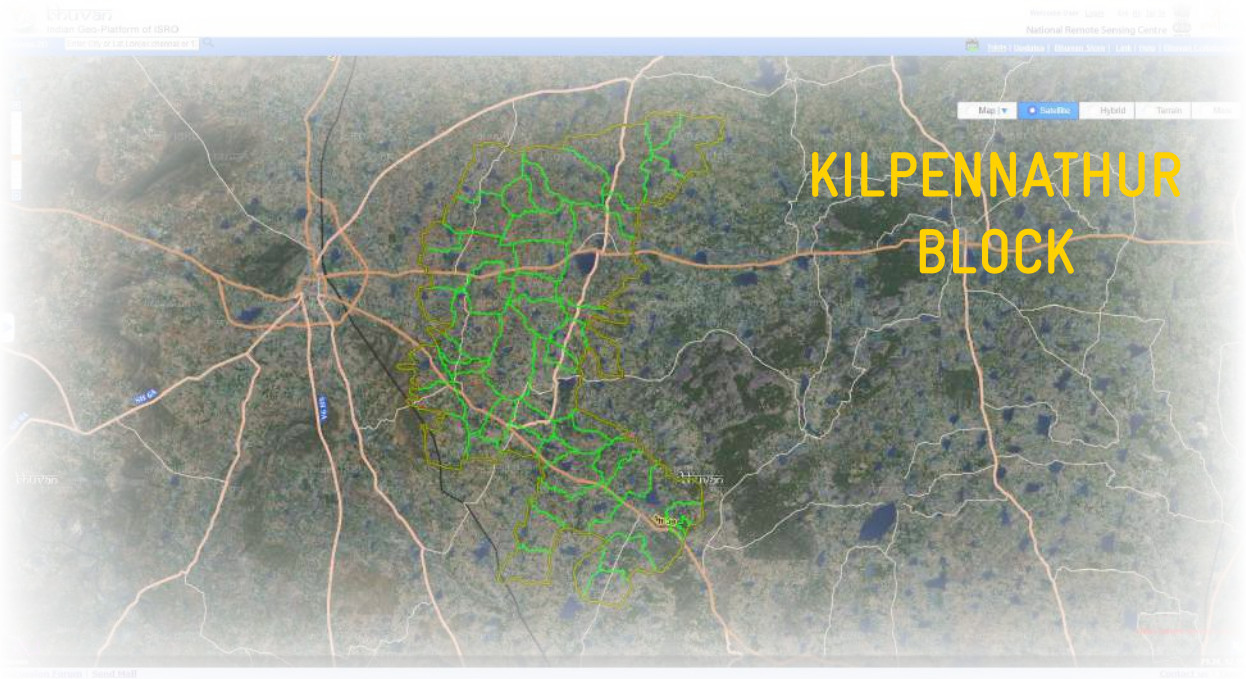
Image Credits: RD & PR, DRDA and GIZ India

On behalf of
German Federal Ministry for Economic Cooperation and Development (BMZ)
GIZ is responsible for the content of this publication.
New Delhi, India, Jan 2022

WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

FOREWORD

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

FOREWORD

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

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

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

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

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

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

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

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

We look forward to its success!

Rajeev Ahal
Director,
NRM & Agroecology, GIZ India

FOREWORD

Thiru. B. Murugesh, IAS
District Collector,
Tiruvannamalai

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

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

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

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

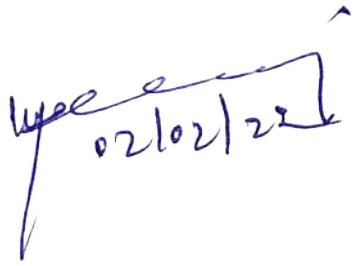
Through GIS based planning in 860 GPs, works identified under CWRM are verified, approved at Gram Sabha. These works would potentially reduce 38% surface runoff to be harvested or recharged by various interventions through ridge to valley watershed approach.

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

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

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

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



Thiru. B. Murugesh, IAS
District Collector,
Tiruvannamalai

MESSAGES

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

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

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

M. P—

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

MESSAGES

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

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

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

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

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

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

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

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

MESSAGES

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

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

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

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

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

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

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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

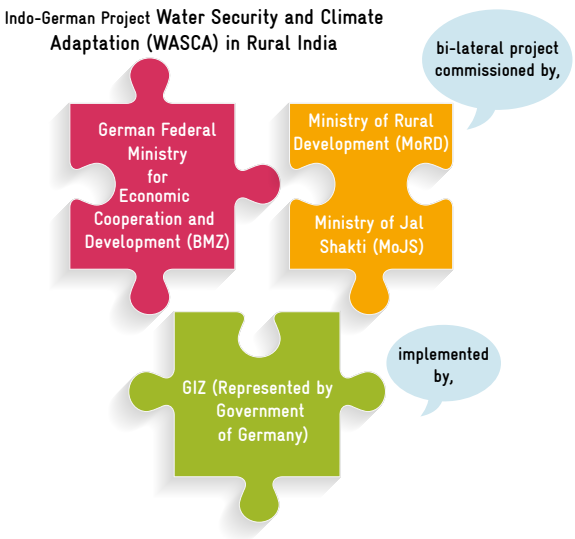
Thirukkural - 11

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

Kilpennathur Blocks of Thiruvannmalai District lies between 12°3'36.805"N to 12°18'11.808"N latitude79°7'54.469"E to 79°14'7.548"E longitude and is surrounded by Thurinjapuram and Thiruvannamalai Blocks (Figure 1.1). The total geographical area of this Block is 24,217.88 ha (242.17 Sq.km). Administratively, this Block comes under Kilpennathur taluk, with 45 Gram panchayats and 202 habitations in it.

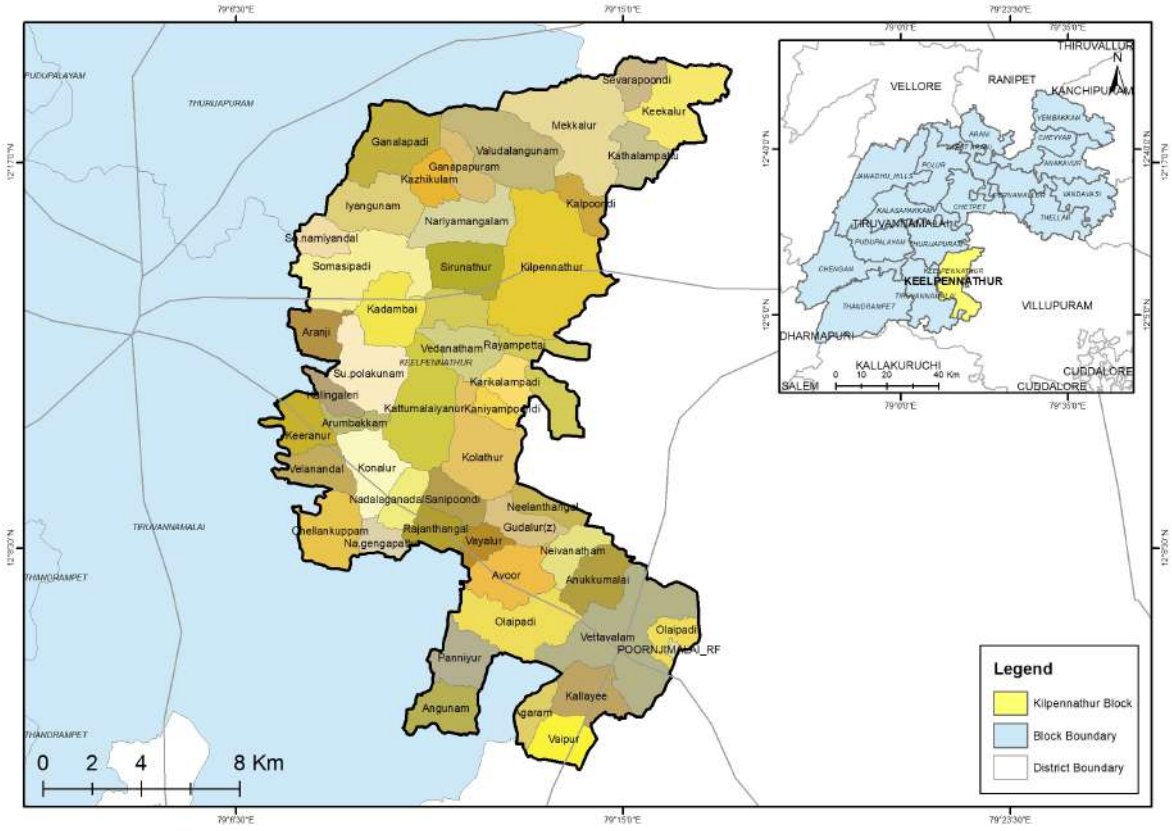


Figure 1.1. Kilpennathur Block and it's environ

According to Census 2011, the population of Kilpennathur Block is 132,897. The population density of the Block is 481 per Sq. km which is higher than the district population density (473 per Sq. km) and much lower than the State's density (555 per Sq.km). There is a 20.12 % increase in the population observed since 2001 in this rural Block. The percentage of male population is slightly higher than (50.33 %) female population (49.66%). The proportion of sex ratio is 987 females per 1000 males, which is lower compared to the District average sex-ratio (994 females per 1,000 males). However, the literacy rate of female population is lower (44.28%) than male literacy (55.72%). At 75.43 % the literacy rate of the Block is slightly higher than the national average (72.98%). Scheduled Castes and Scheduled Tribes accounted for 20.6% of the total population (Thiruvannamalai District profile 2020).

Economically, Kilpennathur average revenue earning Blocks of the Tiruvannamalai District. The primary source of income for most of the Block's inhabitants is agriculture. Ground nut tops as the predominant crop, with 40 % of the irrigated area cultivated with it. The other major crops grown in the Block area are other pulses, Paddy and Sugarcane. Under rainfed crops also Ground nut is the predominant crop with 58.66% of the area being cultivated followed by other pulses (40.24). Significant cultivated areas of Maize, dry chilli, coconut, mango and other fruits and vegetables can also be seen. Groundnut and other pulses is cultivated

> The proportion of sex ratio is 987 females per 1000 males, which is lower compared to the District average sex-ratio (994 females per 1,000 males).

> At 75.43 % the literacy rate of the Block is slightly higher than the national average (72.98%).

both under irrigated and rainfed conditions. This Block put up first in sericulture practice with 281 acres under mulberry cultivation and shares nearly 19% cocoon production of the Tiruvannamali Distrcit. About 65 families are engaged in handlooms. This Blocks A livestock count of 42,081 was recorded during 2019-20. The cattle count is 28,284 and the Block has 34 milk societies with 18,416 litres of milk being produced per day.

> Ground nut is the predominant crop with 58.66% of the area being cultivated followed by other pulses (40.24).

Hydrologically, Kilpennathur Block comes under Thurinjalar and Varahanadhi sub-basins of Pennaiyar and Varahanadhi basins. Thurinjalar River flows through the Block. Thurinjalar, Tondi Veraha and Pambai macro-watersheds cover the Block with 79 micro-watersheds (Figure 1.2)

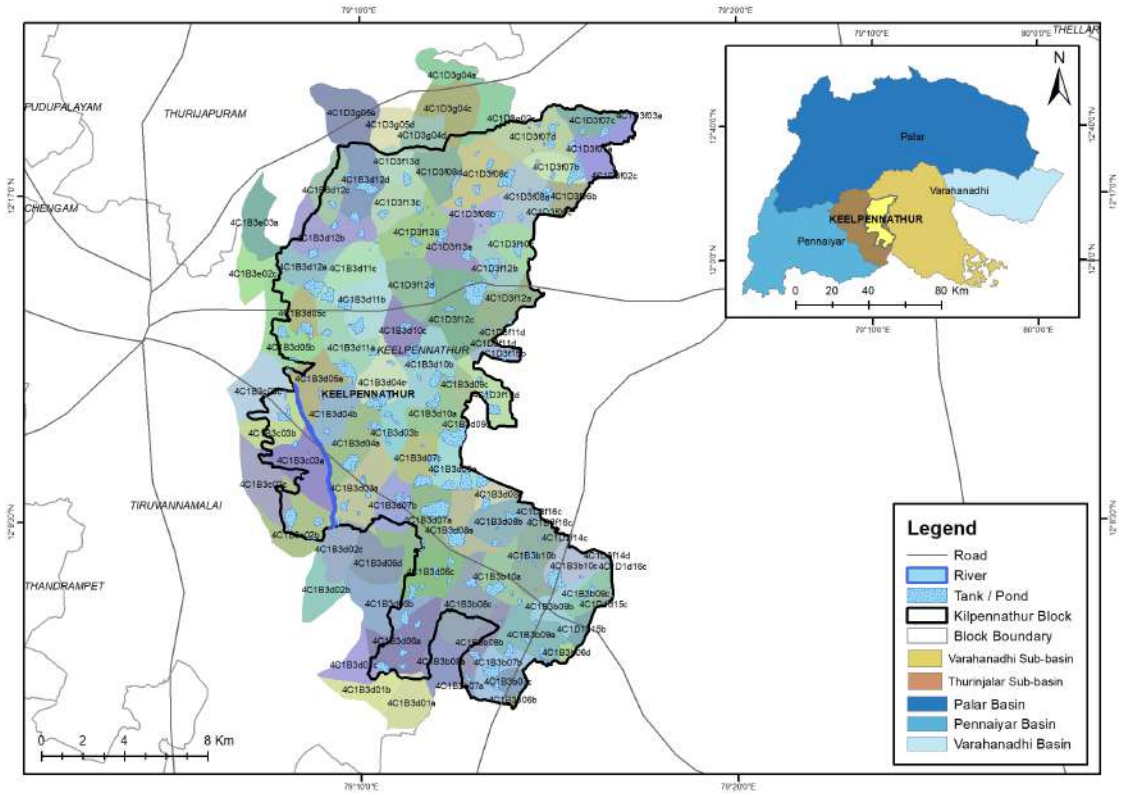


Figure 1.2. Watersheds- Kilpennathur Block

There are 125 tanks in the Block with the largest tank being the Kilpennathur Big Tank with an area of 202.29 ha. Other important tanks are Avoor Tank (83.20 ha), Kolathur Tank (74.38 ha), Vettavalam Tank (74.35 ha), and Mekkalur Tank (73.56 ha) (Figure 1.3). The ground water levels in Kilpennathur Block is in an over exploited state of depletion stage of ground water development. Vettavlam and Somaspadi firkas cover the Block and both firksa are in an over exploited stage.

GROUND WATER LEVEL OF THIS BLOCK

OVER EXPLOITED- › 100%	Vettavlam, Somaspadi

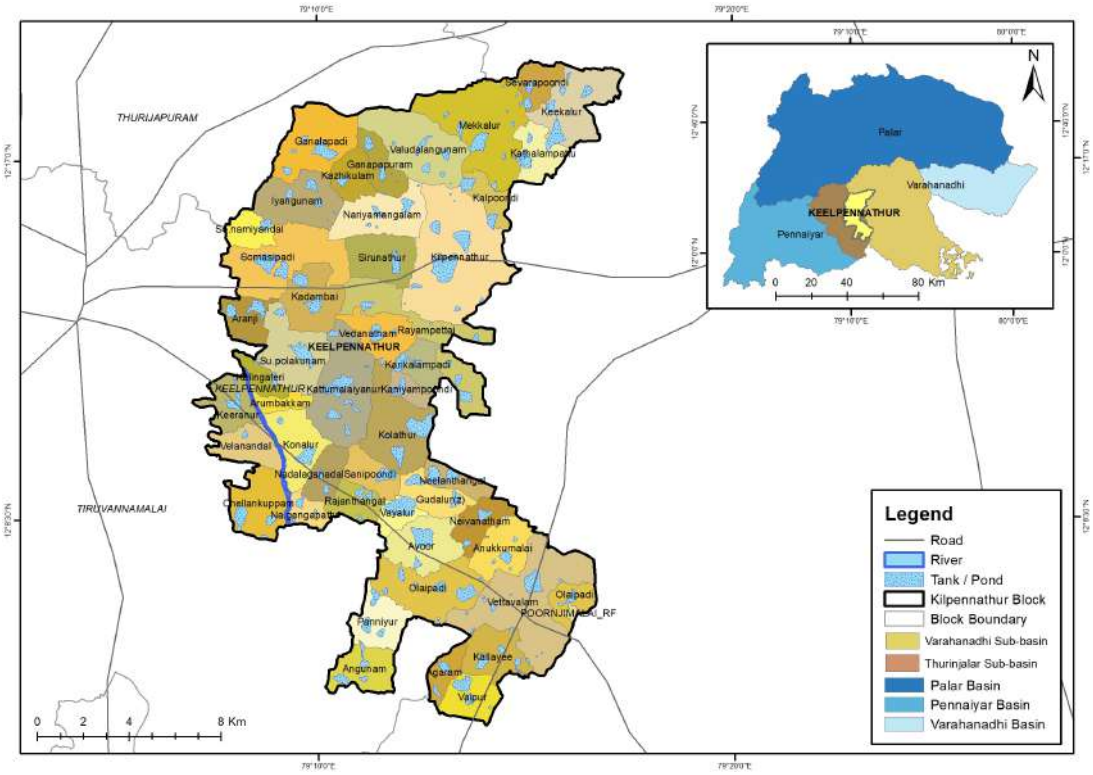
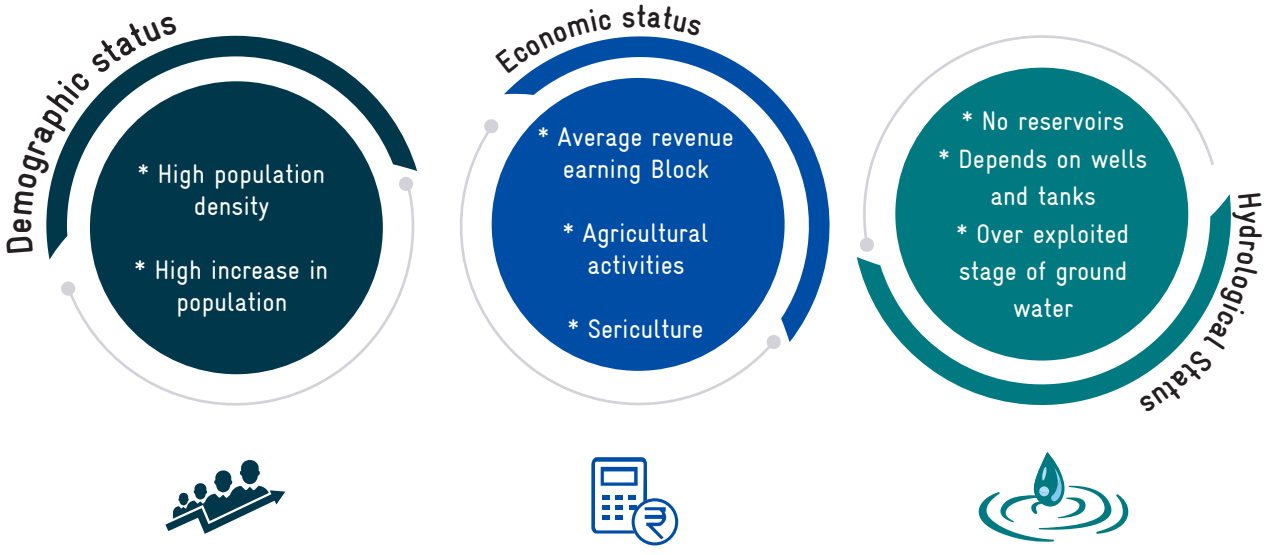


Figure 1.3. Spatial distribution of waterbodies



விண்இன்று பொய்ப்பின் விரிநீர் வியனுலகத்து
உள்நின்று உடற்றும் பசி

குறள் - 13

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

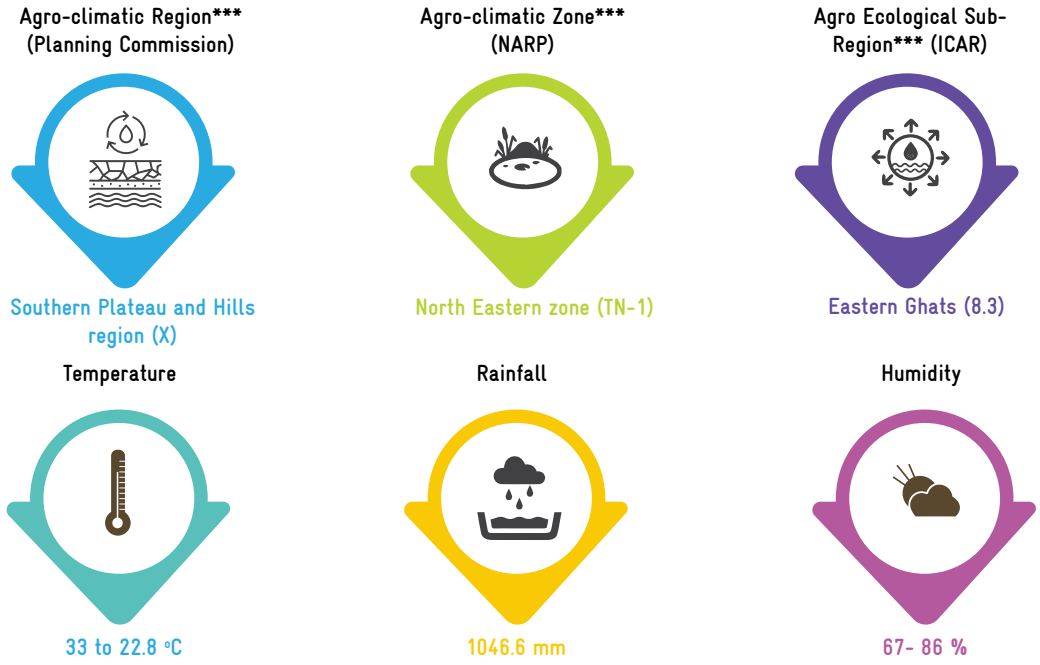
Thirukkural - 13

CHAPTER 2

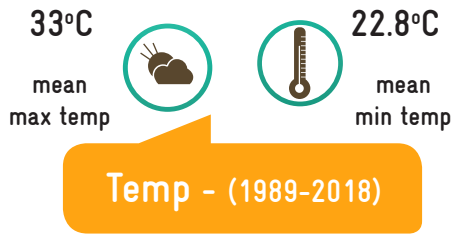
2 CLIMATE AND WATER SECURITY

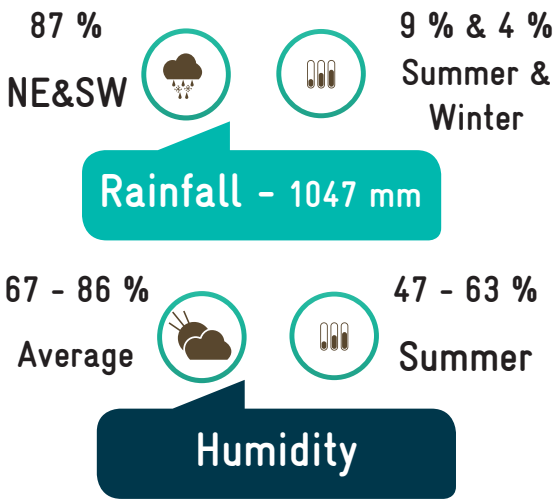
This region has typical tropical climate, located in the North Eastern agro-climatic zone of State and Southern Plateau and Hills region according to the agro climatic regional classification of planning commission. The general climate description of this region is given below (Table 1).

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 %.

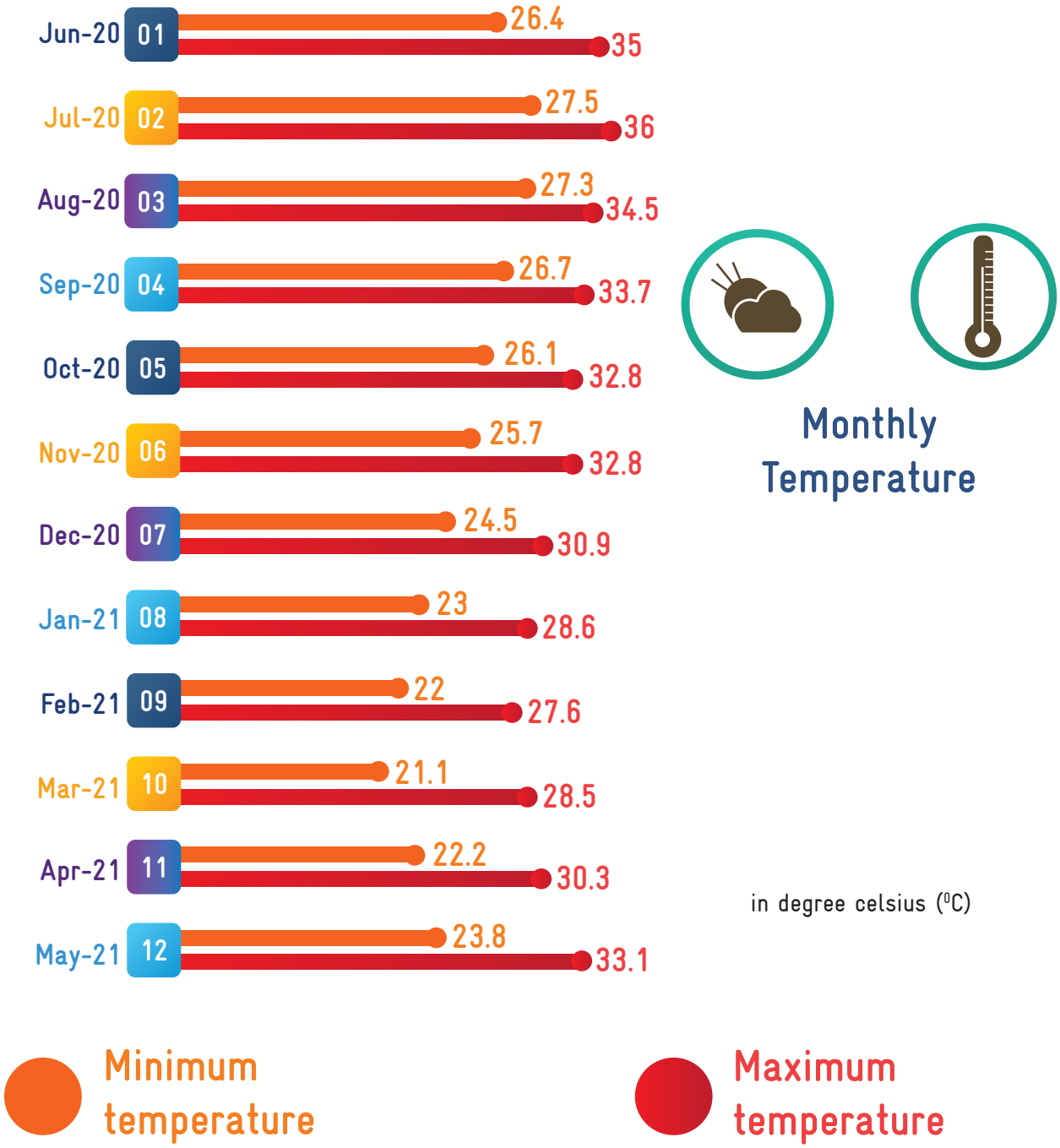


Figure 2.1. Average monthly temperature

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.

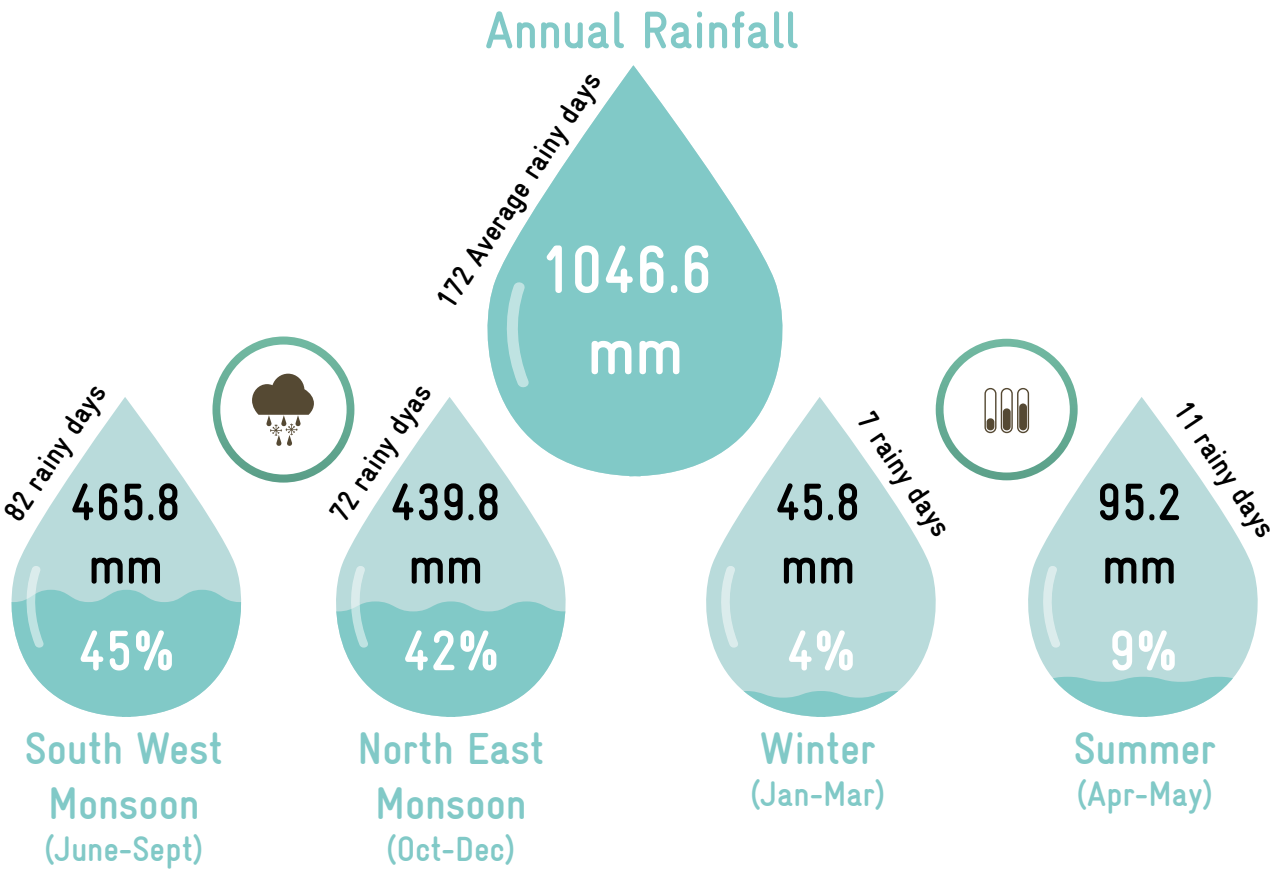


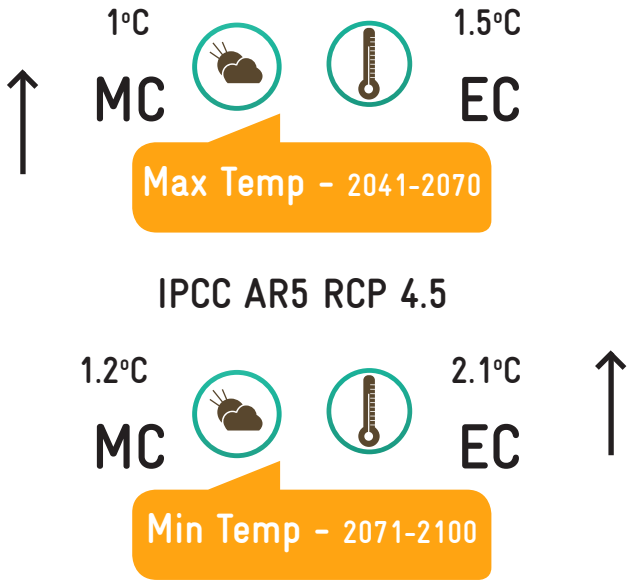
Figure 2.2. Season-wise distribution of annual rainfall

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 only during deep depressions/cyclones forms in the Bay of Bengal. In recent decades, all parts were severely affected during 2005, 2010, 2015 heavy rainfall events and Thane (2011) and Vardah (2016) cyclones. State Disaster Management Authority, Government of Tamil Nadu identified 75 locations of Thiruvannamalai District as flood vulnerability spots. In Kilpennathur Block, One GP is 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 Kilpennathur 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 Kilpennathur 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

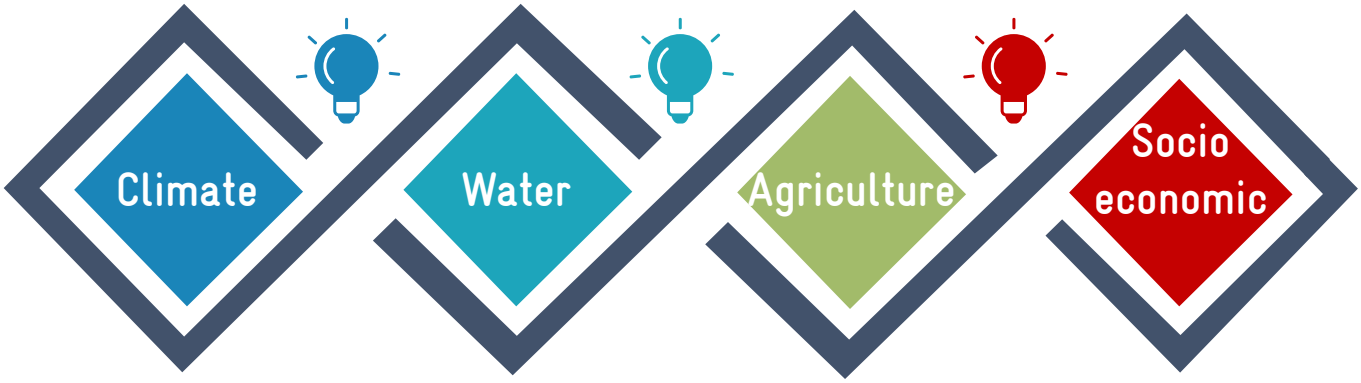
CWRM	Indicators of Rural water security vulnerability	Indicators label	Linked SDG
Climate	Changes in max temperature (^{O}C)	C1	Goal 13
	Changes in min temperature (^{O}C)	C2	
	Changes in rainfall (%)	C3	
	Excess rainfall years	C4	
	Deficient rainfall years	C5	
Water	Ground water extraction (%)	W1	Goal 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, evapo-transpiration losses, and water demand for drinking, agriculture and livestock	Land resources, land use under different categories, catchment area, means of water extraction, irrigation methods, crop details, status of soil resources including macro and micro nutrients, soil physical condition, soil moisture, and livestock details	Area, population, gender, vulnerable population and household, details of MGNREGA job seekers, drinking water sources and grey water generation

ஏரின் உழாஅர் உழவர் புயலென்னும்
வாரி வளங்குன்றிக் கால்

குறள் - 14

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

Thirukkural - 14

CHAPTER 3

CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA

3 CONVERGENCE OF WASCA AND MAHATMA GANDHI NREGA

GIZ has evolved a GP based CWRM planning approach for facilitating convergent planning under MGNREGA for water security and climate 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.

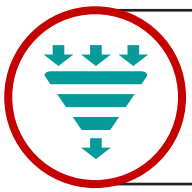
262 Total Kinds of works in Schedule-I of Mahatma Gandhi NREGA

182 Kinds of works relate to NRM alone

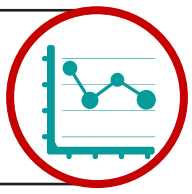
164 Kinds of works related to Agriculture & allied works

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.



The GIS (Geographical Information System) plans shall be comprehensive ones incorporating all eligible works under Mahatma Gandhi NREGS and the same shall be implemented in a phased manner.

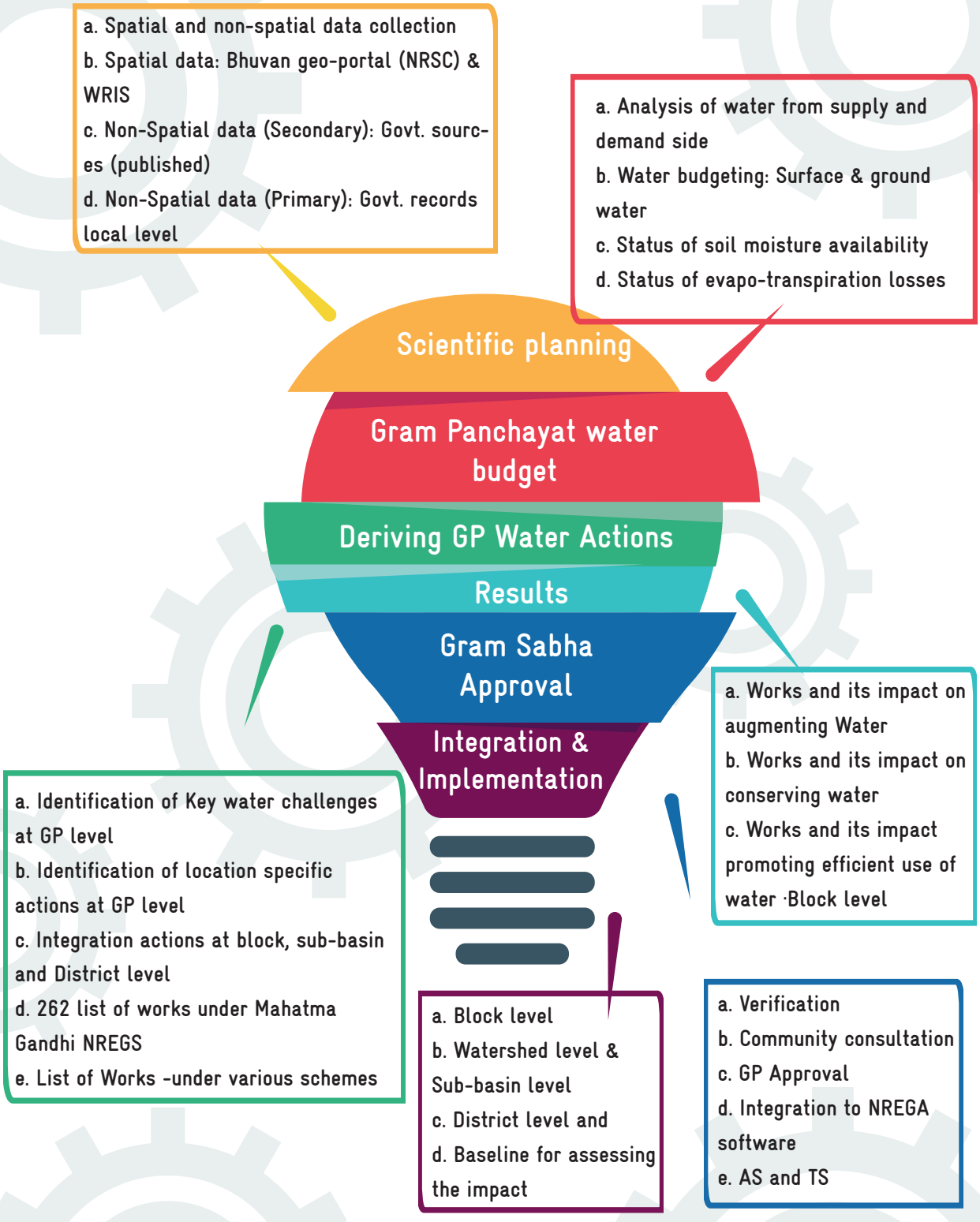


3.1 COMPOSITE WATER RESOURCE MANAGEMENT APPROACH

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

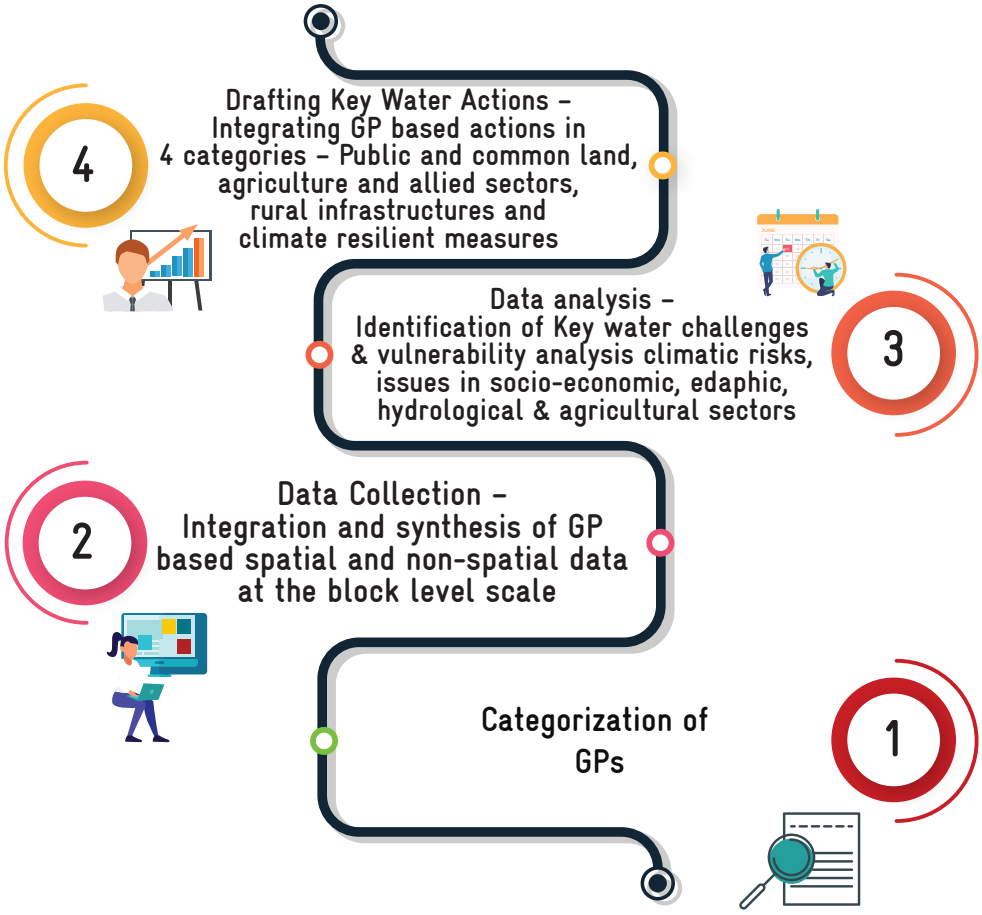
and soil moisture are used to understand the climate related issues. The next step is to assess land use, watersheds, drainage networks and surface runoff, existing water supply and storage systems, water management for the key sectors and water demand and prepare the water budget for the GP (Box 1).

BOX 1. MAJOR COMPONENTS INVOLVED IN CWRM PLANNING



Such a comprehensive analysis helps in preparing the water budget integrating ground water, surface water through runoff from rainfall, evapo-transpiration and soil moisture which further helps to identify potential areas of action to augment the water resources in public /common land, agriculture and allied sectors and rural infrastructure dimensions. The analysis also helps to understand the areas of interest and appropriate climate resilient measure as an adaptive measure to the emerging climate change scenarios. The water challenge linked water actions are the key in developing the perspective plan for the water secured GPs, 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

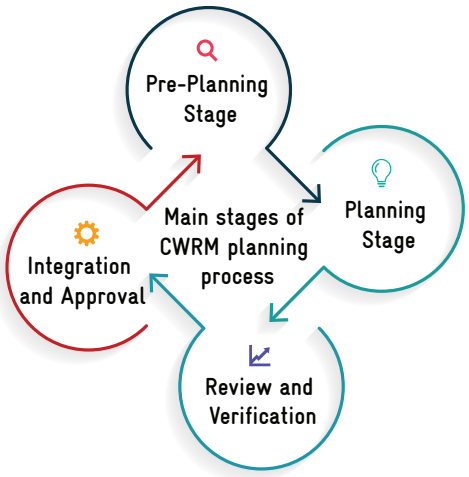
PLANNING STAGE

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 GPs of Kilpennathur Block is tabulated in Table 4.

TABLE 4. CATEGORIZATION OF KILPENNATHUR BLOCK GPs

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
29	GP and revenue village data and boundary match (Type-I)	Agaram, Angunam, Keeranur, Arumbakkam, Avur, Gudalur (Z) Nalathangal, Konalur, Kalpoondi, Ganapapuram, Gengapattu (NA), Nadalarganandal, Neivanatham, Panniyur, Kaniyampoondi, Karikilambadi, Kathalampattu, Kattumalaiyanur, Kazhikulam, Keekalur, Mekalur, Sirunathur, Sanippundi, Sevarapundi, Somasipadi, Vaipur, Valuthalangunam, Nammiandal, Vayalur, Vedanatham
15	One GP is falling under more than Type 1 one Revenue Village (Type-III)	Anukkumalai,Aranji,Chellankuppam, Iyagunnam, Kadambai, Kallayyee, Ganalapadi, Kalingaleri, Kolathur, Nariyamangalam, Olaipadi, Rajanthangal, Rayampettai, Su.Polakunam, Velanandal
1	Newly formed GP after 2011 census publication (Type V)	Neelathangala

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. Kilpennathur 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.

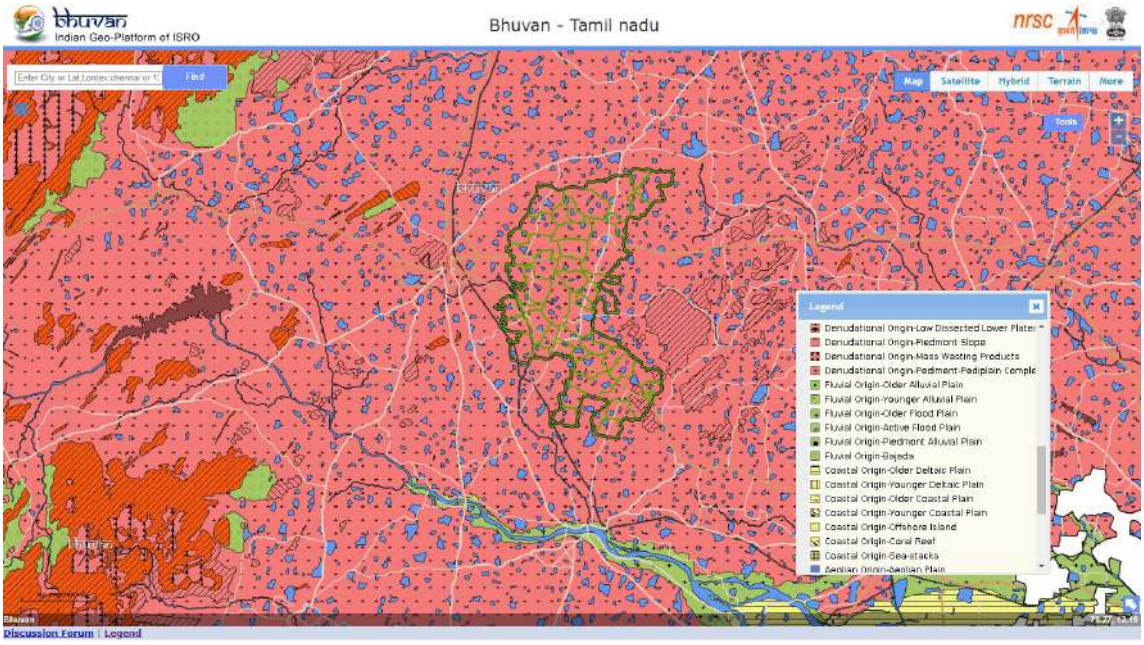


Figure 3.1. Geomorphology map

Landform unit	Area in %	Gram Panchayat
Denudational origin-Pediment- Pediplain complex		

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 landforms converge 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 in the table below. These observations are widely used to locate points of high-water flow especially in groundwater exploration.

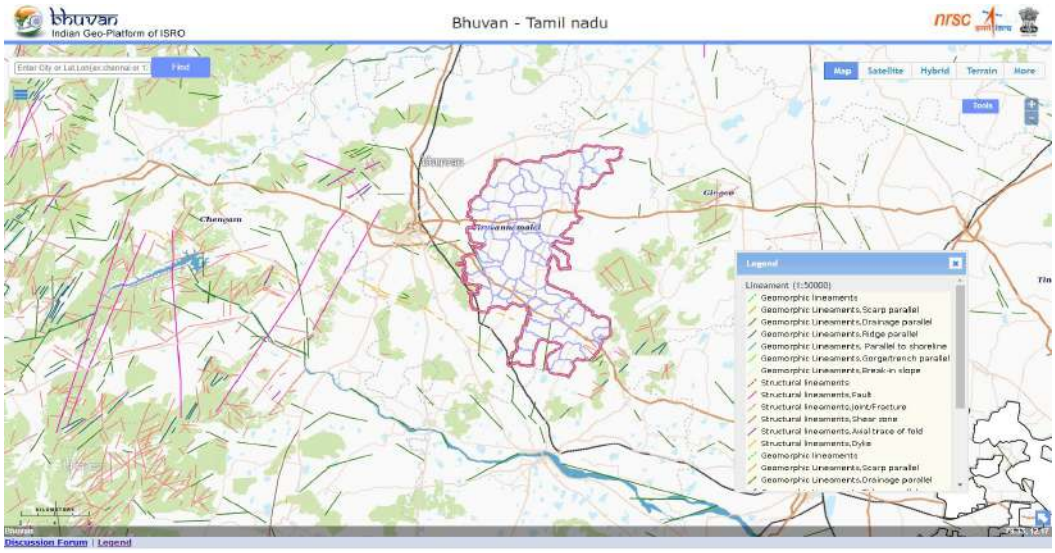


Figure 3.2. Lineament map

Lineament type	Gram Panchayat
Geomorphic lineaments, Drainage parallel	Angunam, Keeranur, Konalur, Olaipaddi, Panniyur
Structural Lineaments, Dykes	Anukkumalai, Gudalur Z Nalathangal, Neivanatham, Sanipoondi, Velanandal

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) (Figure 3.3). This map will be useful in identification of sites suitable for proposing activities related to water and soil conservation.

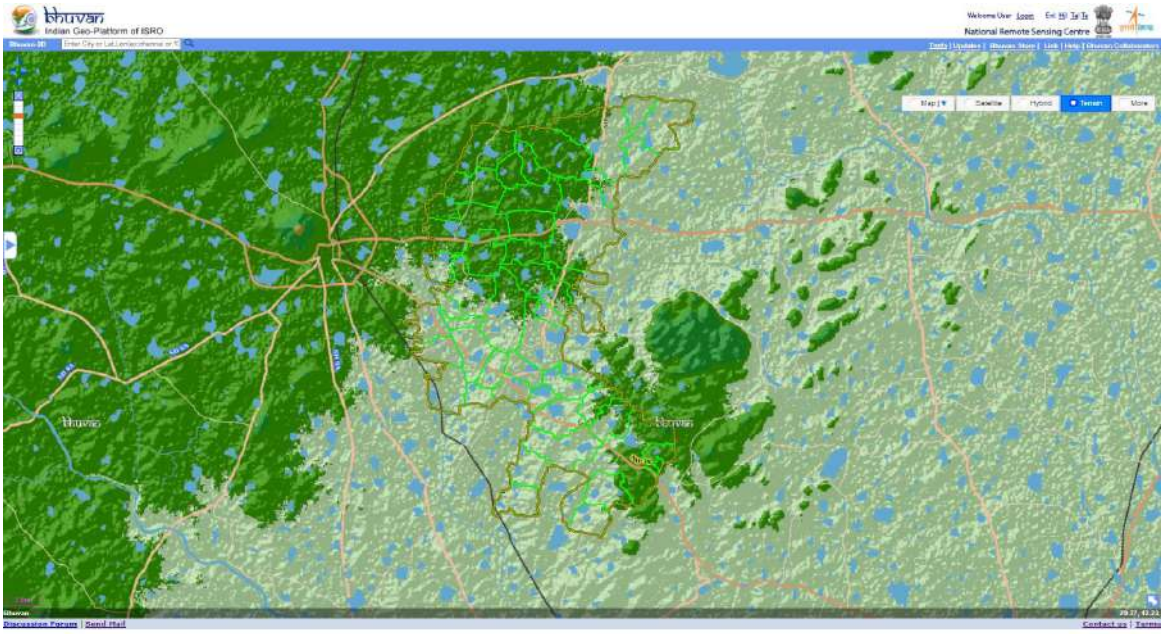


Figure 3.3. Terrain map

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 Kilpennathur 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).

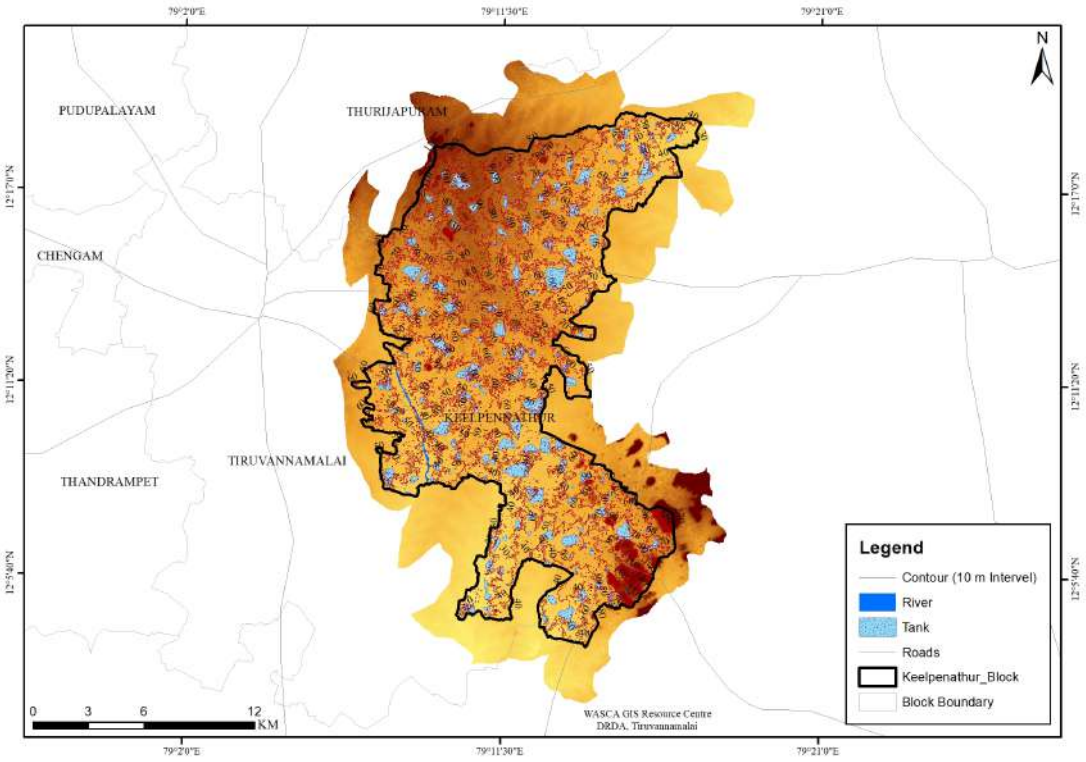


Figure 3.4. Contour map

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. Very flat (0 – 1 %) to flat (1 – 3 %) and steep slope (10 – 35 %) ranges were noticed in the Block (Figure 3.5). 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.

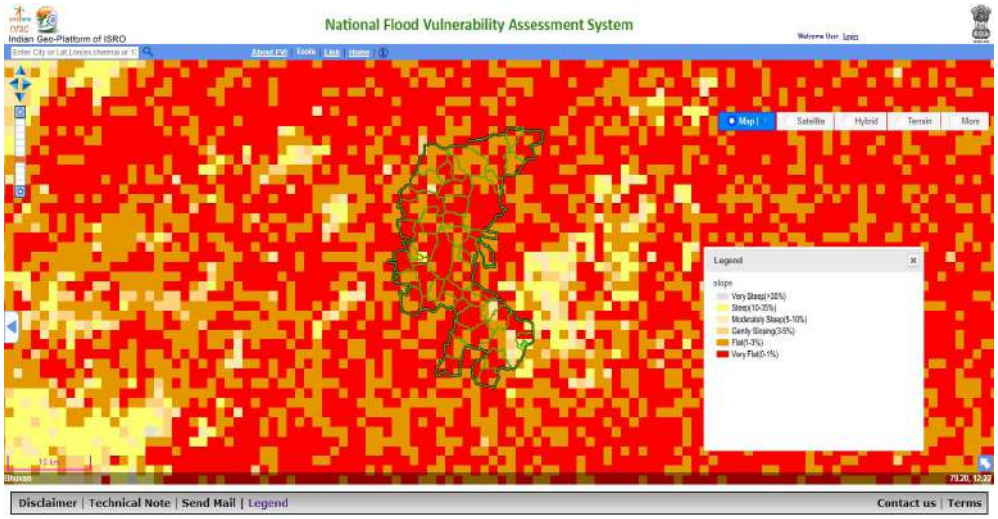
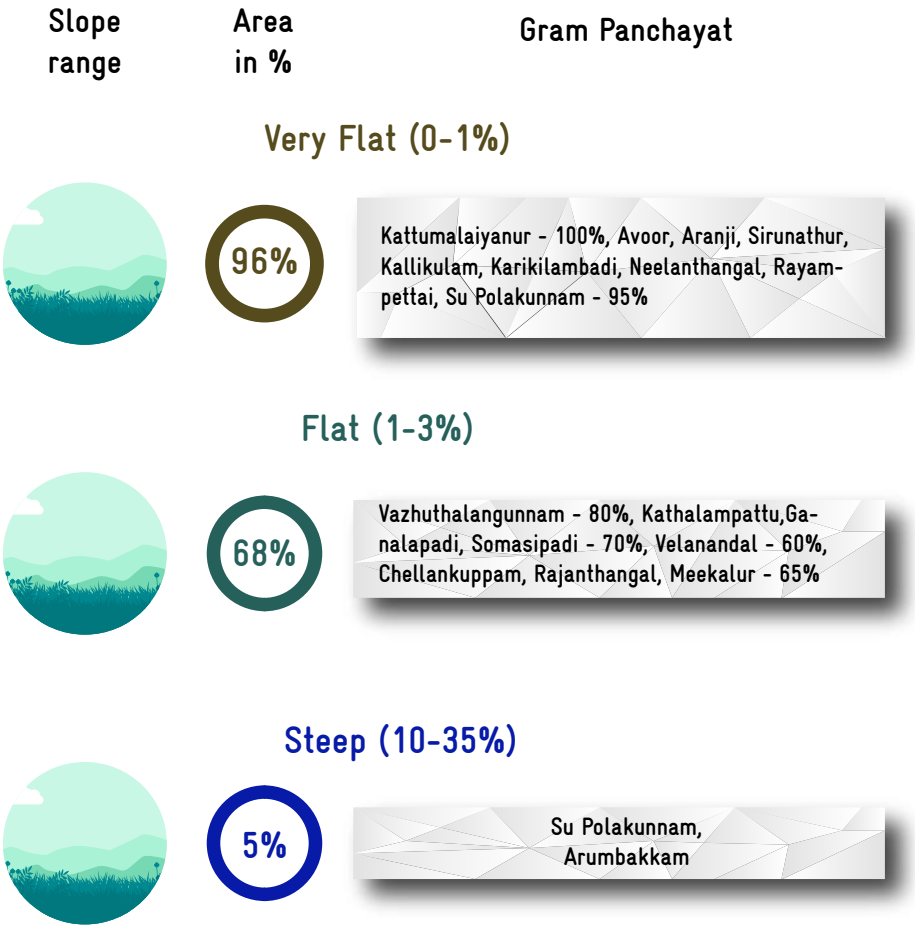


Figure 3.5. Slope map



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 Kilpennathur Block. Block area is drained with lees to moderate less dense drainage network (Figure 3.6). 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.

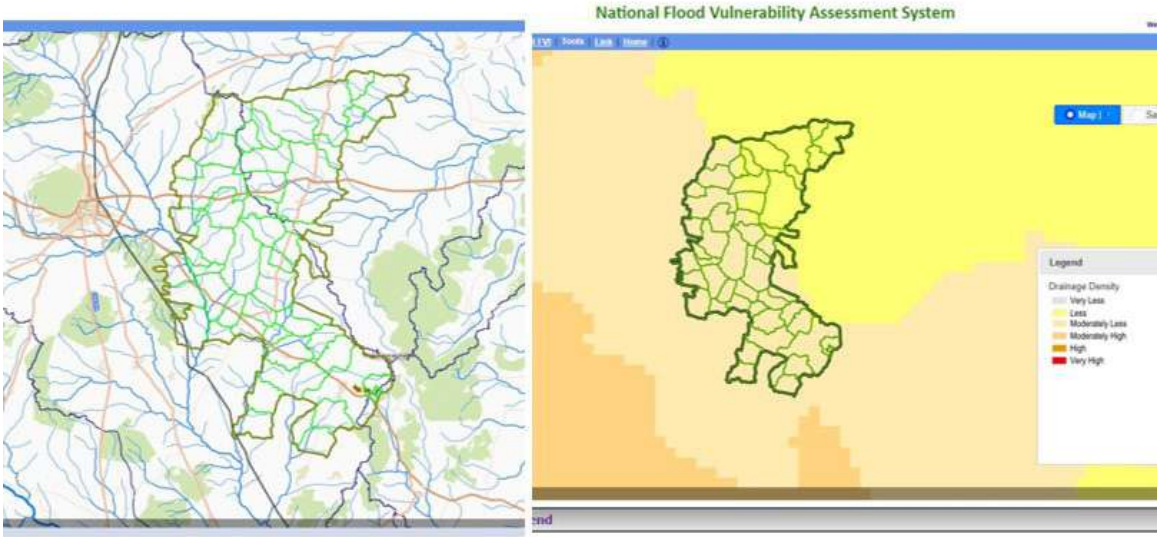


Figure 3.6. Drainage network and density map

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. Kilpennathur 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.

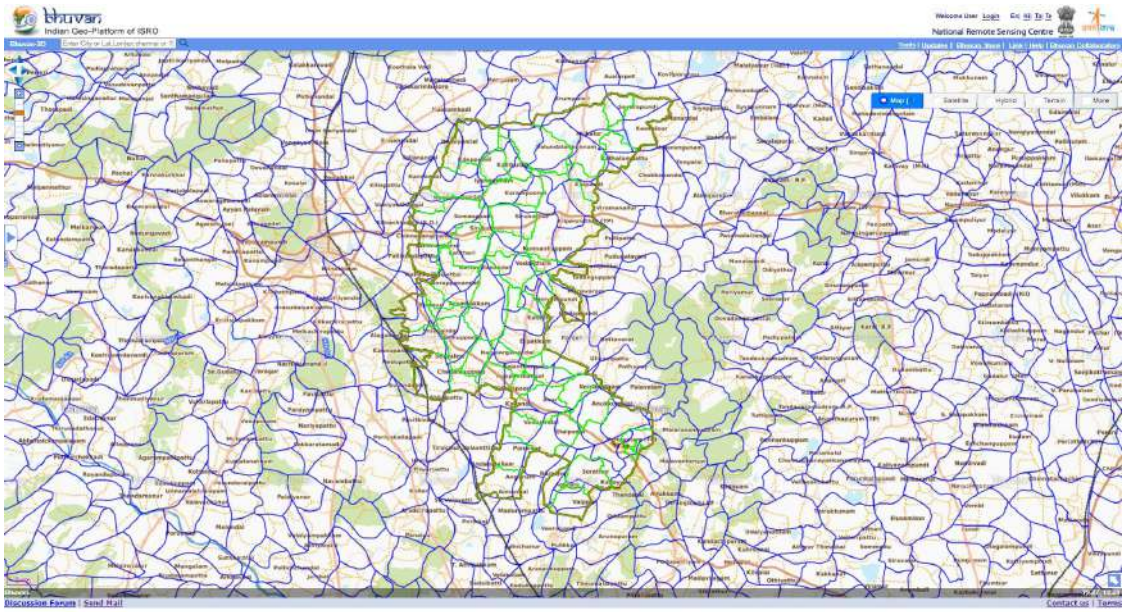


Figure 3.7. Watershed map

3.5.1.8 Ground water perspectives: Ground water (GW) is one of the important natural resources in semi-arid region like Kilpennathur 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.

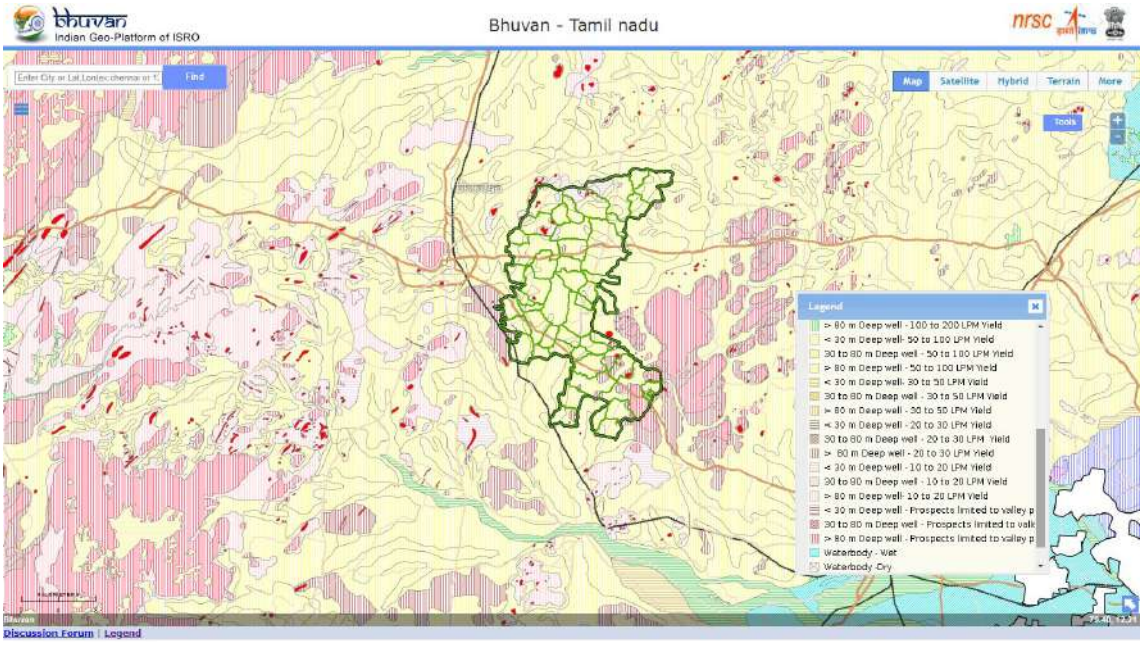
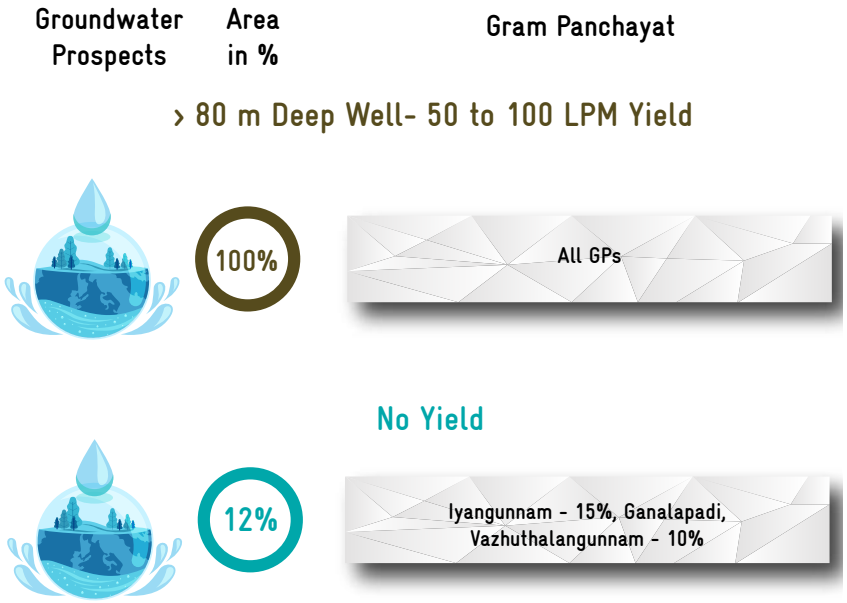


Figure 3.8. Ground water perspective map



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 (m)	
1	Length of Main Canal (m)	1,48,275
2	Length of Minor Canal (m)	16,050
3	Length of Distributaries (m)	19,400
4	Water Courses (Field Channels) (m)	27,700
	Traditional Water bodies (No.)	
5	Number of Tanks (PWD & Union) (No.)	103
6	Number of Ooranis (No.)	21
7	Other Surface Water Bodies (No.)	282
	Irrigation Facilities (ha)	
8	Tank Irrigation	1,299
9	Canal Irrigation	234
10	Open & Tube Well Irrigation	6,840
	Catchment Area wise Available Runoff (ha.m)	
11	Good Catchment Area	1,874
12	Average Catchment Area	32
13	Bad Catchment Area	3,689
	Watershed and Drainage Networks	
14	Length of Natural Drainage Lines (m)	2,17,542
15	Number of Natural Drainage Lines (No.)	274
16	Number of Critical Watersheds (No.)	246
	Water Demand	
17	For Humans (ha.m)	268
18	For Livestock (ha.m)	148
19	For Agriculture (ha.m)	7,596
20	GW Utilization for Drinking (%)	78
21	GW Utilization for Livestock (%)	90
22	GW Utilization for Agriculture. (%)	85
23	SW Utilization for Drinking (%)	22
24	SW Utilization for Livestock (%)	10
25	SW Utilization for Agriculture (%)	15

3.5.2.1 Existing Water Structures

The Block has structured traditional water storage units as tanks, ponds and Ooranis which are the life line for their lives and livelihoods. The Block has 103 tanks, 21 Ooranis and 282 other surface waterbodies (Figure 3.9).

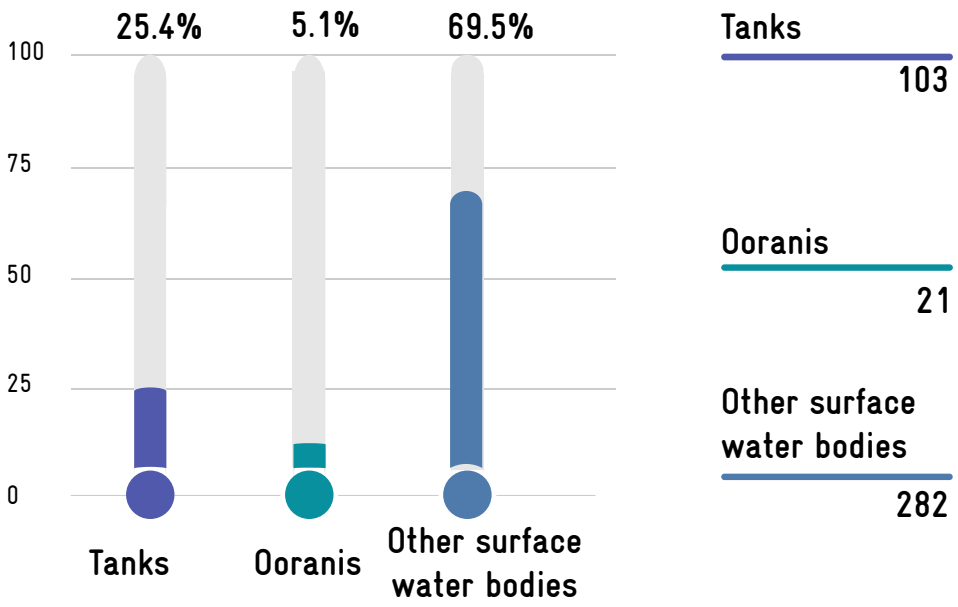


Figure 3.9. Traditional waterbodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the Block is 8,373 ha, of which 81.69 % (6,840 ha) is irrigated through open & tube well followed by 15.52 % (1,299 ha) is tank based irrigation and remaining is canal based irrigation (Figure 3.10).

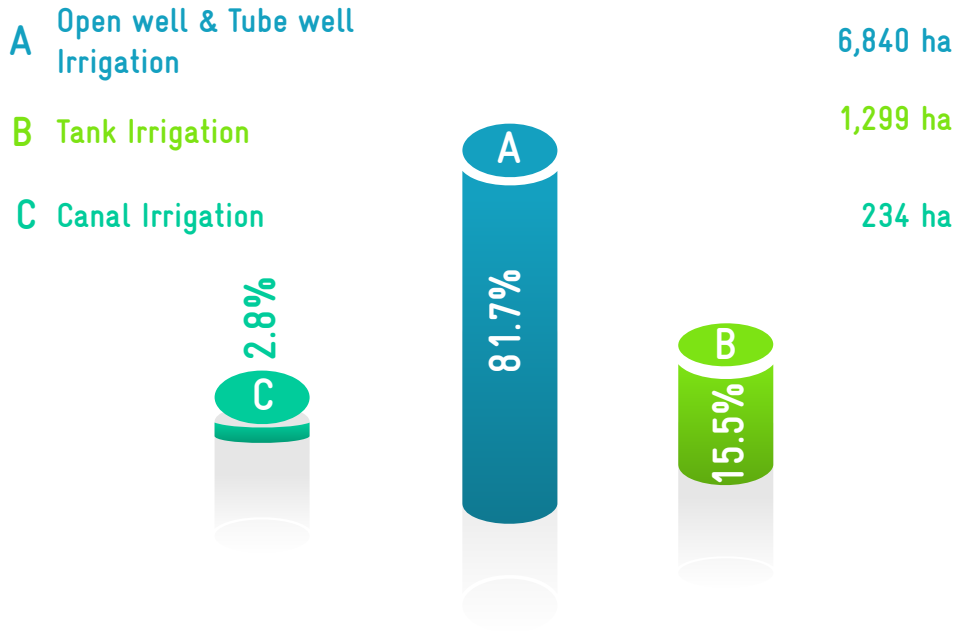


Figure 3.10. Irrigation Sources

3.5.2.3 Available run-off

The available runoff in catchment area is 5,595 ha.m, out of which 65.94 % (3,869 ha.m) comes from bad catchment area, 33.49 % (1,874 ha.m) comes from good catchment area and 0.57 % (32 ha.m) is from average catchment area (Figure 3.11).

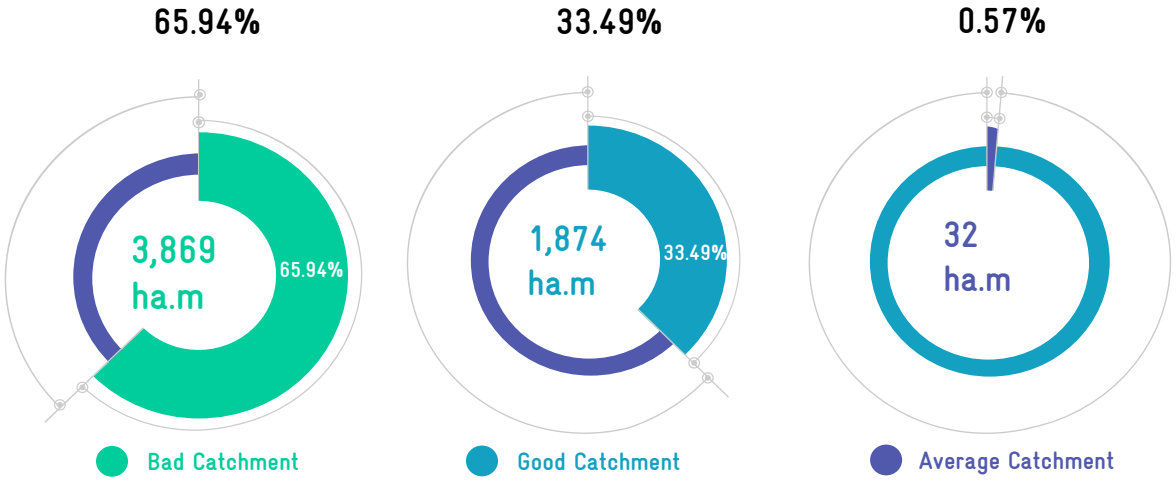
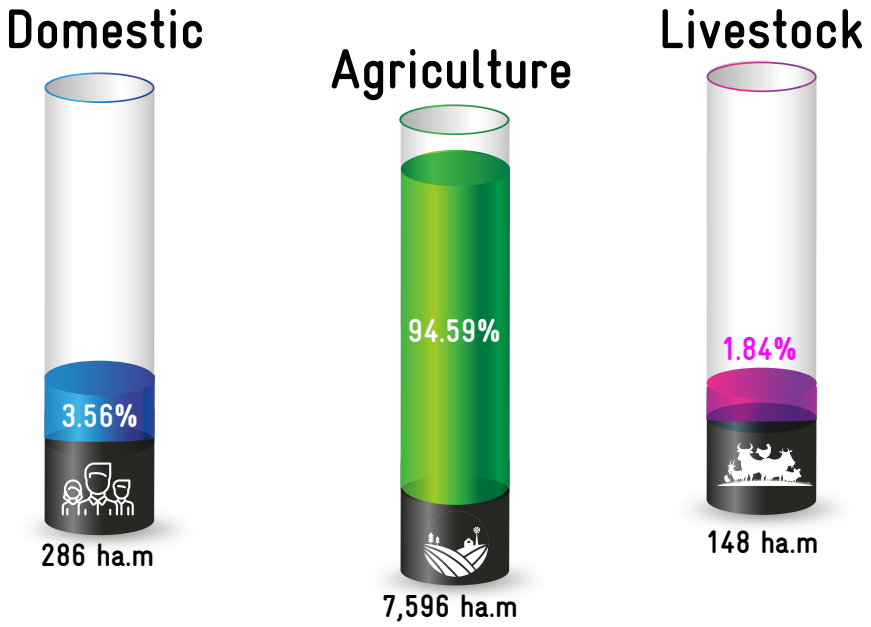


Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 8,012 ha.m. In which 286 ha.m for domestic, 148 ha.m for livestock and 7,596 ha.m for agriculture sector. In the Block, utilization of ground water is more than surface water. About 85 % for agriculture purpose, 90 % for livestock's and 78 % for domestic purpose is met through groundwater (Figure 3.12).



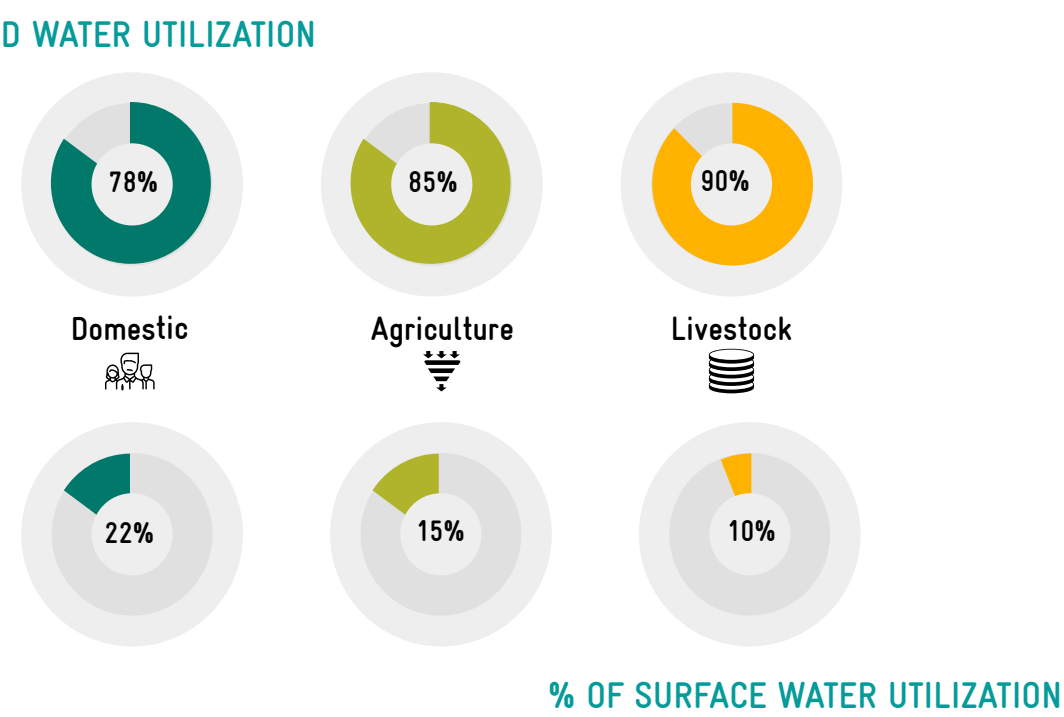


Figure 3.12. Sector wise water utilization

3.6 CWRM PLANNING ANALYSIS- AGRICULTURE

Agriculture is the primary livelihood for the households in Kilpennathur 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 Kilpennathur 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 Block has diverse soil types and predominant in vertisol and alfisol, with reference to soil texture the proportion of fine and fine loamy texture type soil is dominant in the Block (Figure 3.13).

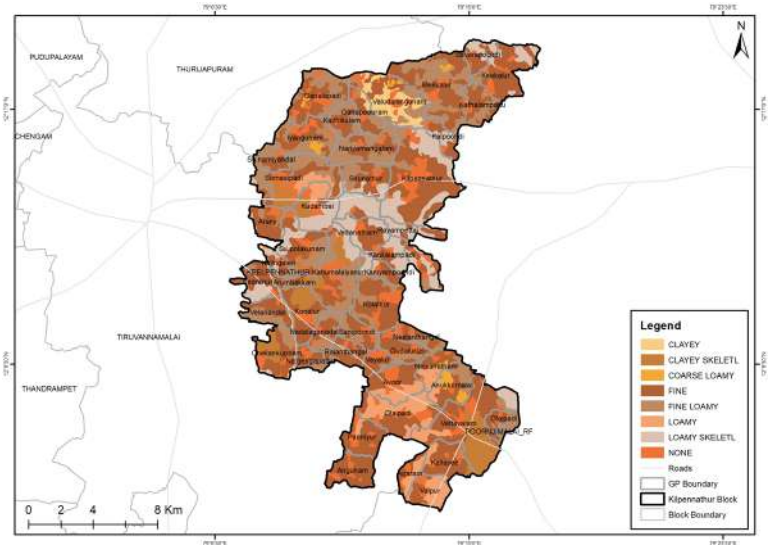


Figure 3.13. Soil texture map

3.6.1.2 Soil erosion: Soil erosion is a natural process of displacement of the 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 details 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.

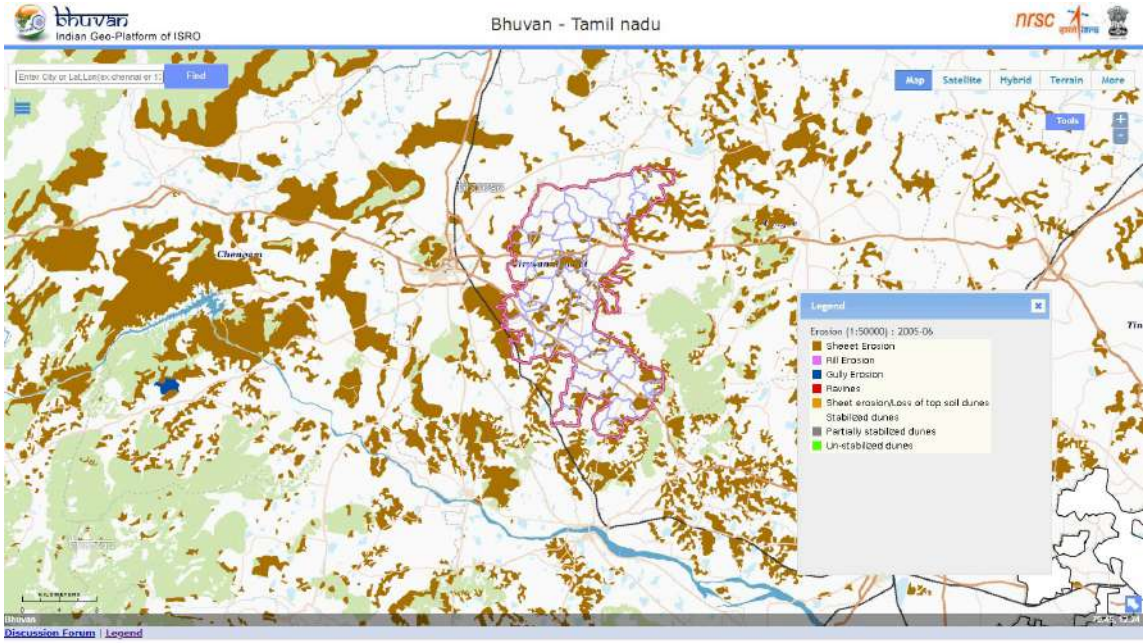


Figure 3.14. Soil erosion map

Area in %	Gram Panchayat
Sheet Erosion	
50.4%	Somasipadi - 65%, Rayampettai, Namiyandal So - 60%, Panniyur, Konalur - 55%, Kattumalaiyanur, Keeranur, Chellankuppam, Rajanthangal - 50%, Nadalarganandal, Keekalur - 45%, Nariyamangalam, Gudalur Z Nalathangal, Kolathur - 40%

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 Kilpennathur 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.

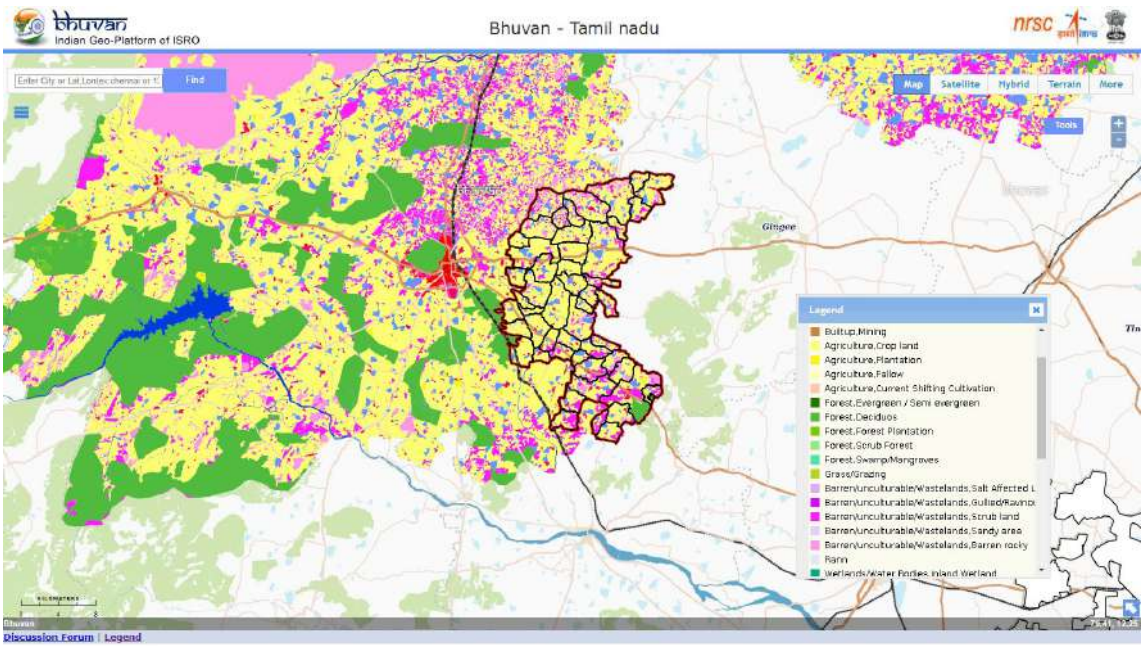
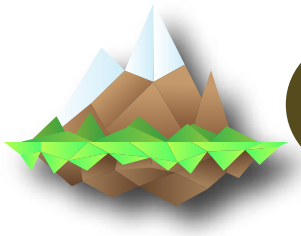


Figure 3.15. Land Use Land Cover map

Land Use	Area coverage in %	Gram Panchayat

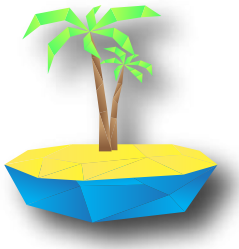
Barren Lands



54%

Agaram, Angunam - 80%, Panniyur - 70%, Avoor, Gudalur Z Nalathangal, Anukkumalai - 60%, Ganalapadi, Kallikulam, Vazhuthalangunnam, Meekalur - 50%, Kathalampattu, Keekalur, Kadambai, Rayampettai, Kolathur - 40%

Agriculture crop lands and Plantation



67%

Chellankuppam, Velanandal - 85%, Gengapattu (NA), Konalur, Keeranur, Anukkumalai, Kallayyee, Vaippur - 80%, Kattumalaiyanur, Nadalarganandal, Sanipoondi, Su Polakunnam, Kalingaleri, Arumbakkam - 70%, Somasipadi, Kadambai - 65%, Sirunathur, Namiyandal_so, Keekalur, Sevarapoondi - 60%, Iyangunnam, Nariyamangalam, Meekalur, Karikilambadi, Gudalur Z Nalathangal - 50%, Vayalur - 40%

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).

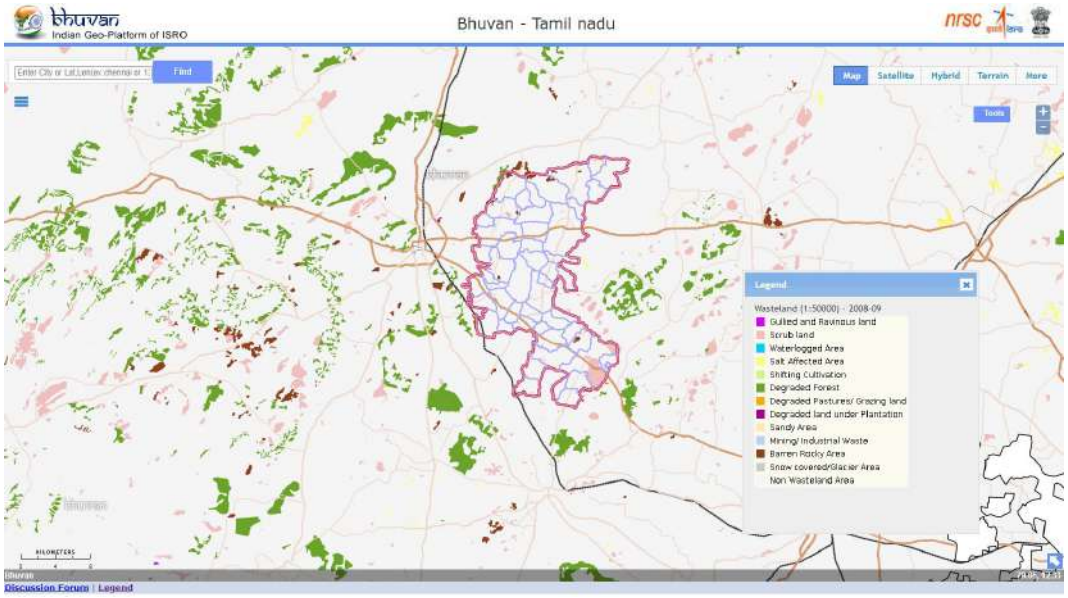


Figure 3.16. Wasteland map

Wasteland type	Area in %	Gram Panchayat
Scrub Land	5%	Vazhuthalangunnam, Su Polakunnam, Anukkumalai

3.6.1.5 Salt affected area: No salt affected area is noticed in the Block (Figure 3.17).

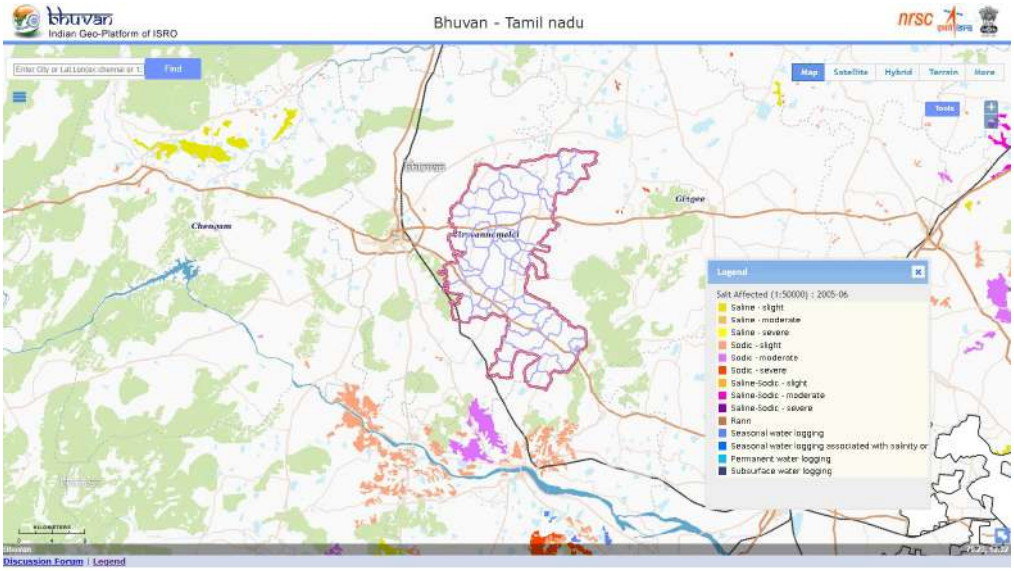


Figure 3.17. Salt affected area map

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
	Area under Land Resources (ha.)	
1	Land Resources (ha)	
2	Non-Agricultural Uses	4,061.76
3	Area under Barren & Un-cultivable Land	933.67
4	Area under Permanent Pastures and Other Grazing Land	2.92
5	Land Under Miscellaneous Tree Crops etc.	46.11
6	Cultivable Waste Land	65.31
7	Fallows Land other than Current Fallows	19.45
8	Current Fallow land	7,393.56
9	Unirrigated Land	4,631.33
10	Area Irrigated by Source	7,685.03
	Land under Catchment Area (ha)	
11	Good Catchment	4,995.43
12	Average Catchment	114.34
13	Bad Catchment	19,729.37
	Crop Details	
14	Irrigated Area (ha)	6,067.93
15	Rainfed area (ha)	3,173.84
16	Paddy Cultivation (ha)	2,089.25
17	Crop Water Requirement - Irrigated condition (ha.m)	6,450.31
18	Crop Water Requirement - Rainfed condition (ha.m)	1,145.68
	Soil Resources: Status of Available Nitrogen (%)	
19	Very Low	13.18
20	Low	77.83
21	Medium	6.09
22	High	0.68
	Status of Organic Carbon (%)	
23	Very Low	35.23
24	Low	59.87
25	Medium	2.00
26	High	0.56
	Status of Soil Micro Nutrients (%)	
27	Sufficient	55.40
28	Deficient	44.60

	Status of Physical condition of the soil (%)	
29	Moderately Acidic	0.10
30	Moderately Acidic	0.60
31	Slightly Acidic	3.06
32	Neutral	4.99
33	Moderately Alkaline	91.03
34	Strongly Alkaline	0.19
	Soil Texture (%)	
35	Clay soil	5.64
36	Fine Soil	68.33
37	Coarse loamy	15.62
38	Soil Water Permeability (Low, Moderate, high)	Moderate
	Soil moisture and ET	
39	Volumetric Soil Moisture (%)	23.00
40	Estimated Soil Moisture (ha.m)	4,778.80
41	ET Losses (ha.m)	9,614.02
	Means of Water Extraction (%)	
42	Gravity	3.27
43	Lifting	96.73
	Irrigation Methods (%)	
44	Wild Flooding	19.13
45	Control Flooding	80.87
	Livestock (No.)	
46	Cattle Population	37,665
47	Sheep Population	14,947
48	Goat Population	11,145

3.6.2.1 Land utilization

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 24,839.14 ha, 30.94 % of land is irrigated through sources, followed by 29.77 % area is current fallow land. Less than a percent area of cultivable wasteland, land under tree crops, pastures or grazing land were noticed. (Figure 3.18).

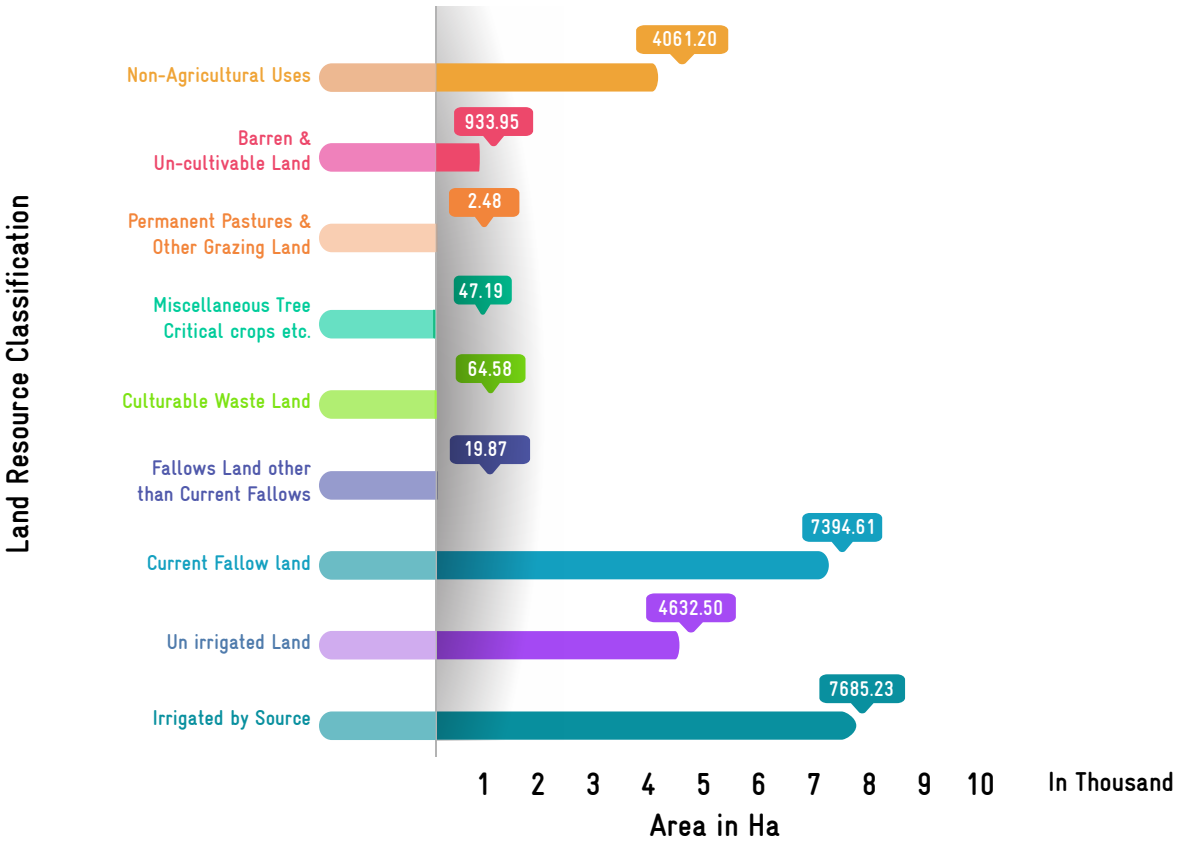


Figure 3.18. Land Utilization

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 (24,839.14 ha), the highest of 79.43 % area is from bad catchment area followed by 20.11 % 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.

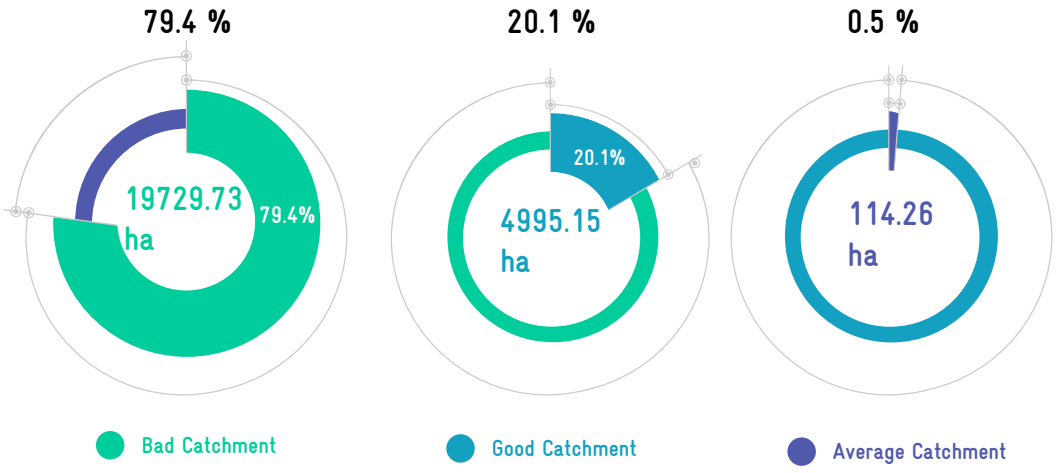


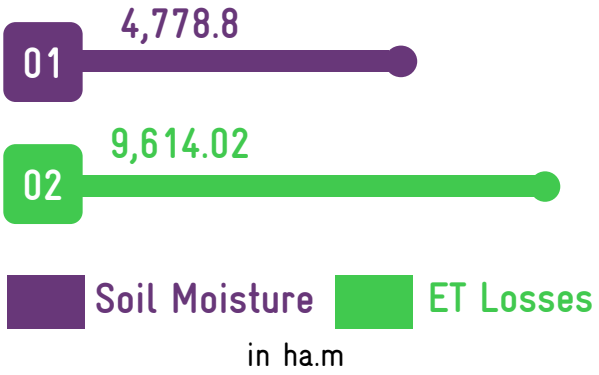
Figure 3.19. Catchment area

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 4,778.8 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 9,614.02 ha.m.



3.6.2.5 Macro soil nutrients
Nitrogen Status

The macro soil-nutrients nitrogen falls under very low to high category in the total number of soil samples tested. The available nitrogen is very low in 13.18 % of the samples tested while it was 77.83 % under low category, 6.09 % of medium and 0.68 % with high (Figure 3.20). According to soil resource map, this Block is identified as one of the nitrogen deficient Blocks (Tiruvannamalai District profile 2020).

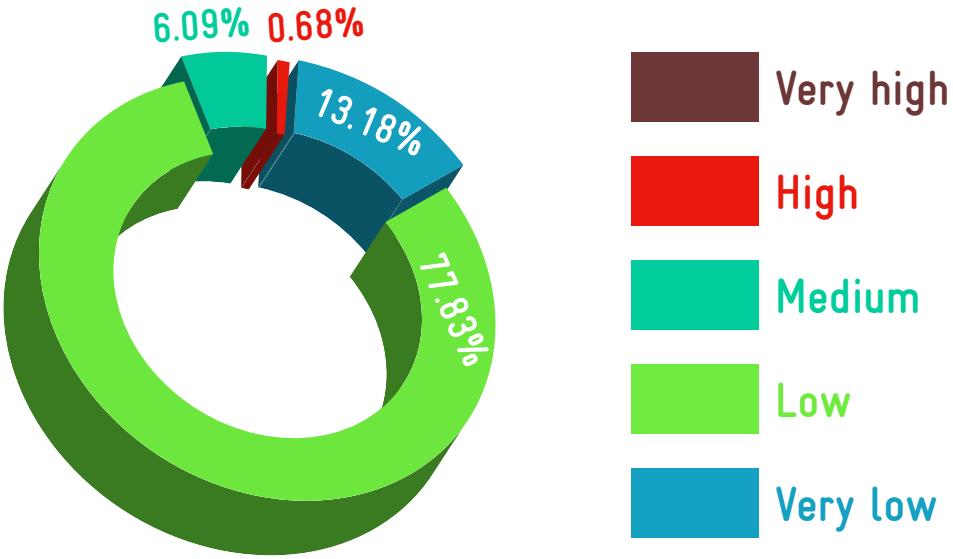


Figure 3.20. Status of available Nitrogen

Organic Carbon Status

A similar trend has been recorded for soil organic carbon. Soil organic carbon varied from very low to high category in this Block. The highest of samples witnessed a low percentage (59.87 %) of organic carbon content followed by very low of 35.23 % (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.

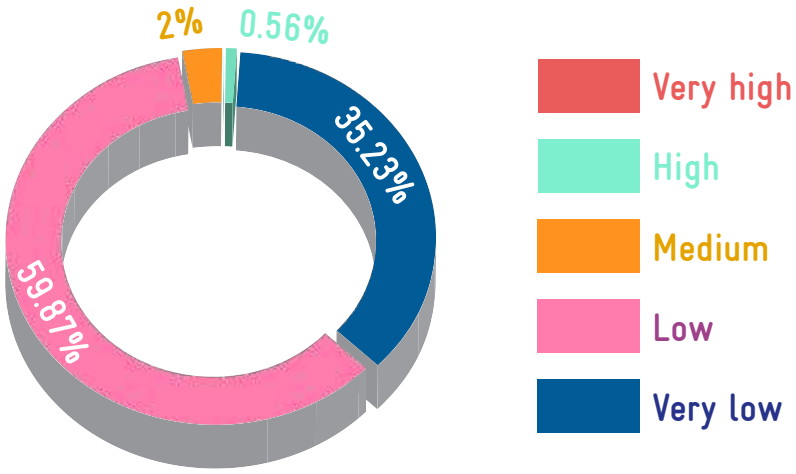


Figure 3.21. Status of soil Organic Carbon

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 44.60 % and 55.40 % sufficient (Figure 3.22).

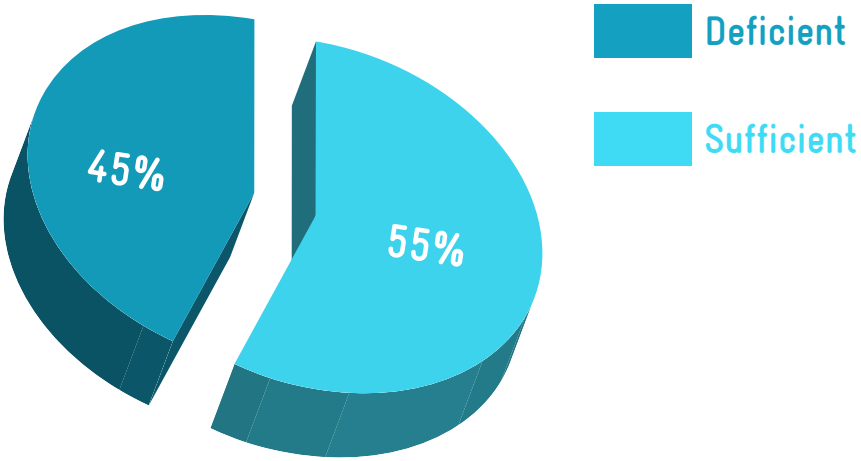


Figure 3.22. Status of soil micro nutrients

3.6.2.6 Physical parameters – pH status

With reference to the physical parameters, 91.03 % of the soil is moderately alkaline in nature, rest is acidic variations, except 5 % is neutral in nature (Figure 3.23).

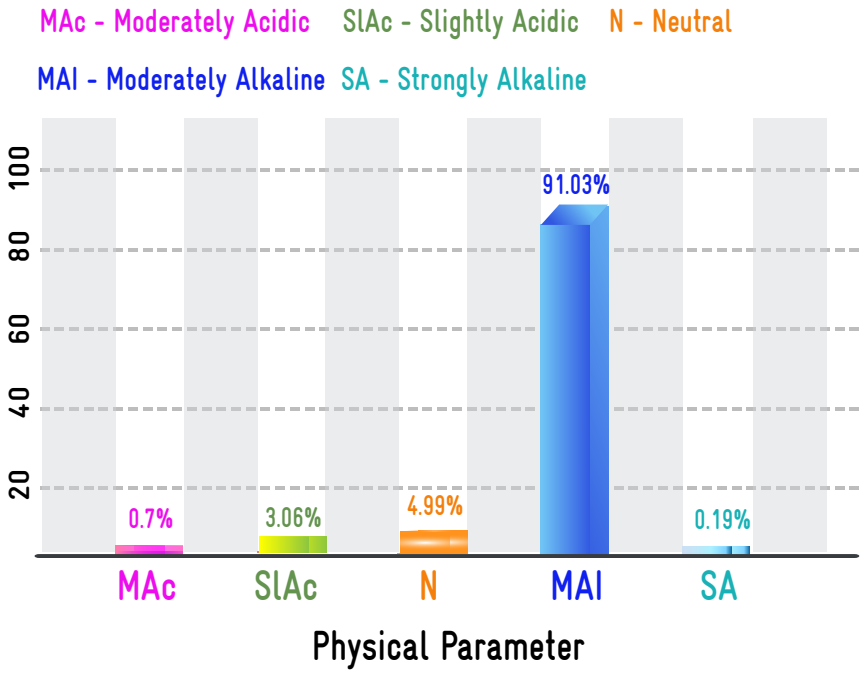


Figure 3.23. Status of pH of soil

3.6.2.7 Cropping pattern and the irrigation

The total of 18,655.18 ha of land is used for crop cultivation, of which 59 % area is under irrigation practices and remaining is under rain-fed cultivation. Overall, groundnut shares the highest cultivation area of 47.6 % followed by other pulses of 30.4 % area (Figure 3.24) while total flower crops, mango, ladies finger, total gourds, medicinal plants, ragi, brinjal, banana, red gram, coconut, guava, tomato, papaya, lemon accounted less than a percent of area.

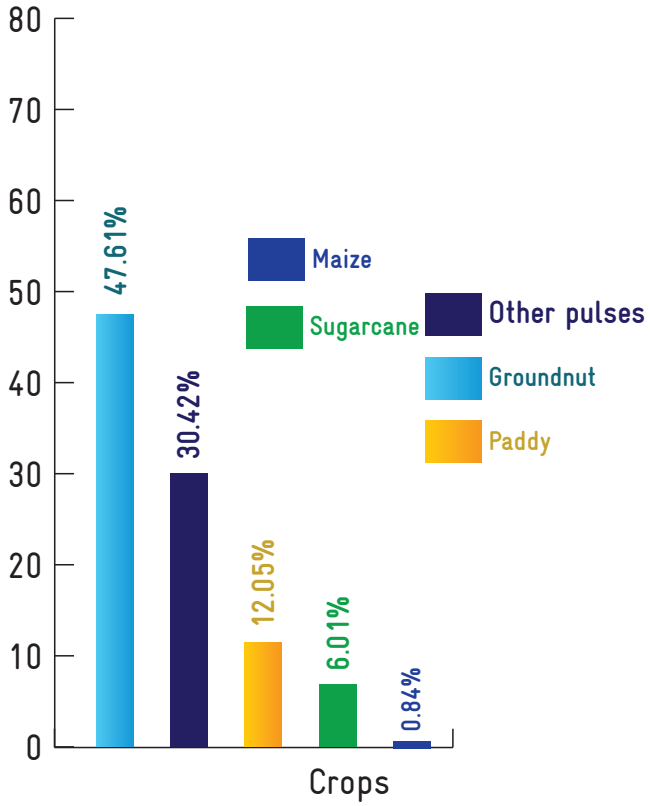


Figure 3.24. Cropping pattern

3.6.2.8 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, 80.87 % of the irrigation is done by control flooding and rest is of wild flooding irrigation (Figure 3.25).

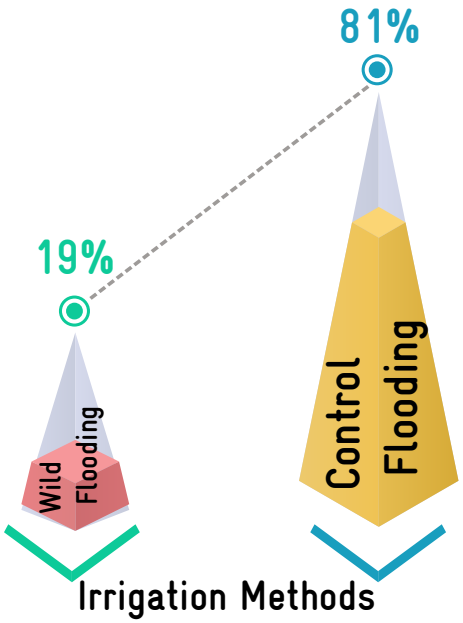


Figure 3.25. Irrigation methods

3.6.2.9 Means of water extraction

In the Block, water is extracted in two ways viz., 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, 96.73 % of the water extraction is through lifting means of extraction and only 3.27 % is through gravity means of water extraction (Figure 3.26).

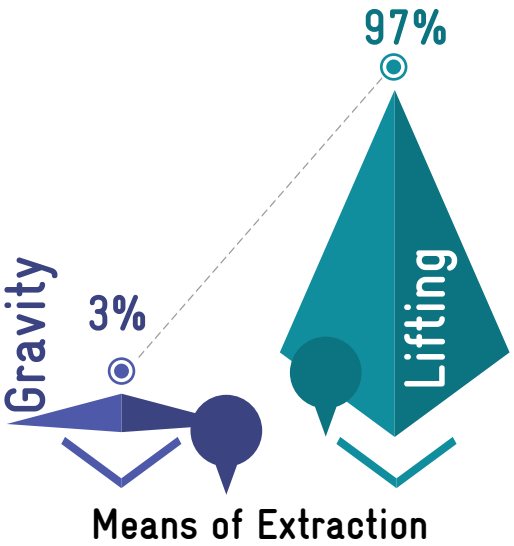


Figure 3.26. Means of water extraction

3.6.2.10 Livestock details

The Block has a total livestock population of 63,757 which includes, cattle, sheep and goats. The small ruminants such as sheep and goat constitute 23.44 % and 17.48 % respectively of the total livestock. Cattle population is higher in this Block at 59.07 % (Figure 3.27). The total water requirement for livestock is 148 ha.m. Of the total water demand, 90 % is met through ground water and remaining 10 % is from surface water resources.

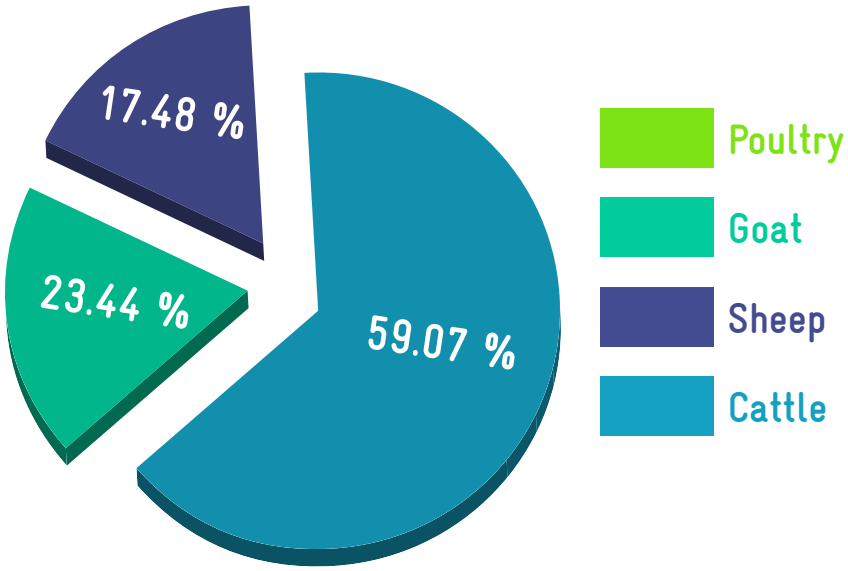


Figure 3.27. Livestock details

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 Kilpennathur Block. GP wise demographic and socio-economic status are attached in Annexure 3.8.

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

Sl. No.	Key CWRM Parameter	Total/Average
1	Geographical Area (ha)	24,830
2	Male Population (No.)	52,868
3	Female Population (No.)	52,068
4	Total Population (No.)	1,04,936
5	SC Population (No.)	24,687
6	ST Population (No.)	2,477
7	Vulnerable population (No.)	25,999
8	Households (HH's) (No.)	24,720
9	Only one room HH's (SECC) (No.)	3,148
10	Female Headed HH's (SECC) (No.)	1,244
11	Vulnerable Households (SECC) (No.)	2,576

12	Vulnerable Households (%)	10.00
13	Registered MGNREGA Job cards (Persons)	39,914
14	Active person working in MGNREGA job Cards (Persons)	26,750
15	Drinking Water Sources (No.)	5,852
16	Ground Water - Drinking source (No.)	164
17	Surface water - Drinking source (No.)	48
18	Sum of drinking water sources (No.)	212
19	HH's have tap water connection for drinking water (No.)	17,991
20	HH's dependent on other sources for drinking water (No.)	7,556
21	Annual Greywater Generation (ha - m)	191

3.7.1 Population:

The total population of the Block is 1.04 Lakhs*, of which the proportion of males is slightly higher than females (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 26 % of the total population constitute vulnerable population.

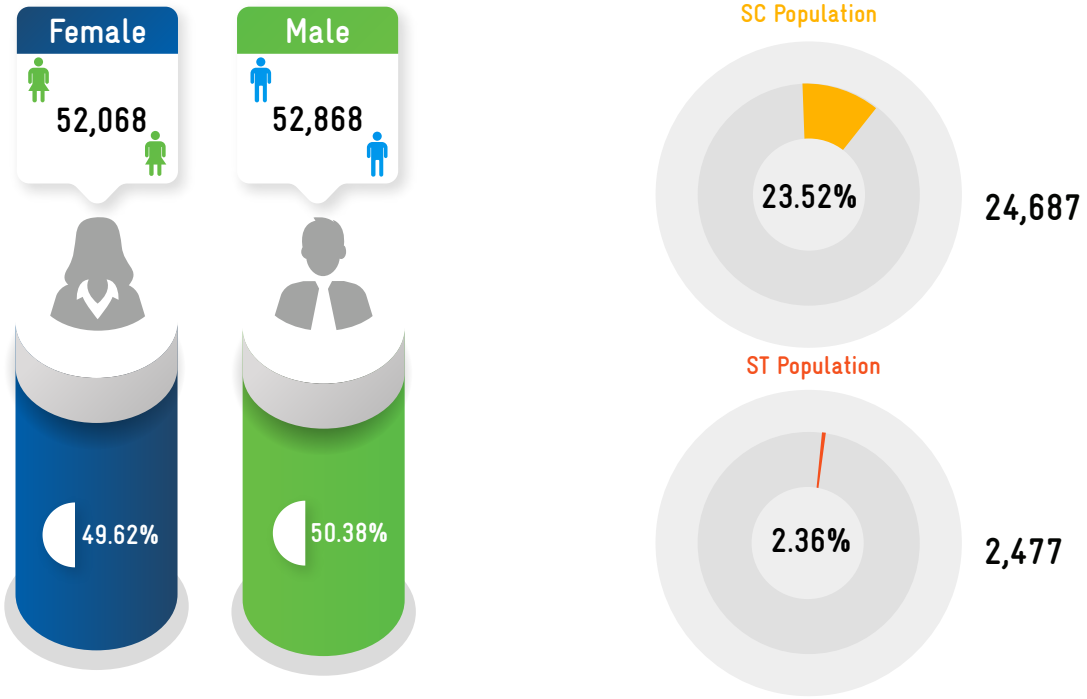


Figure 3.28. Population details

**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 24,720 households in which 12.73 % households have only one room, 5.03 % households are headed by women and 10.42 % are vulnerable households (Figure.3.29)

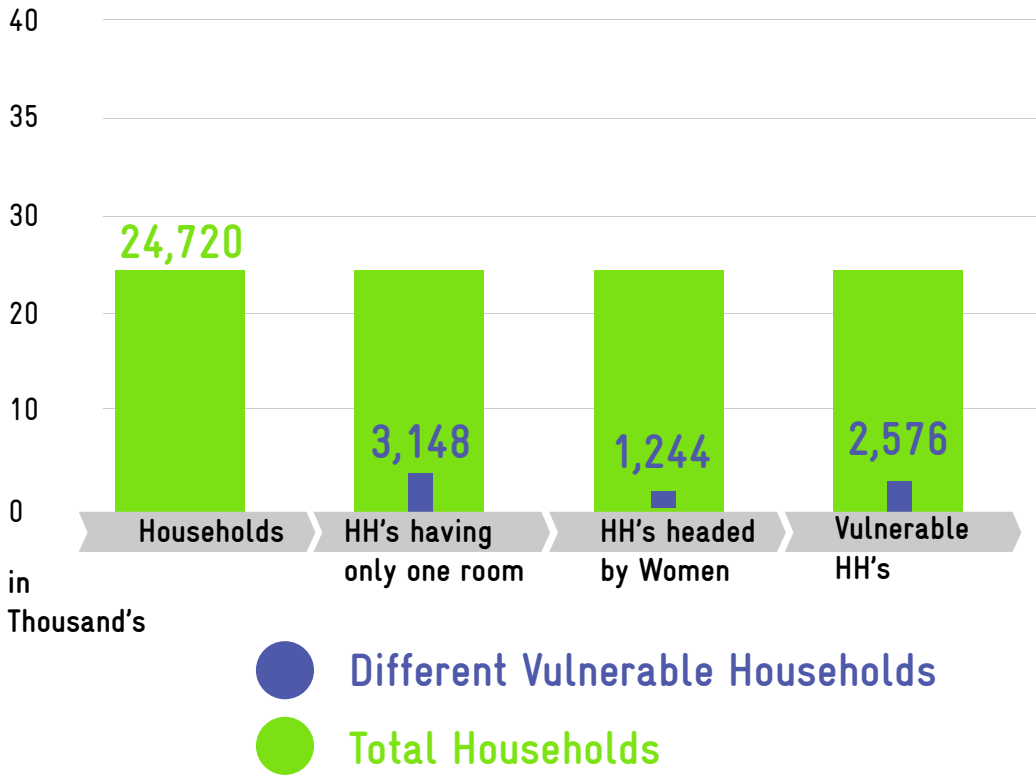


Figure 3.29. Details of Households

3.7.3 Status of Mahatma Gandhi NREGA - job card status

In the Block, of the total population of 1.04 Lakhs, 38 % are registered for job cards in Mahatma Gandhi NREGA scheme, in which 67% of the job cards are in active category (Figure 3.30)

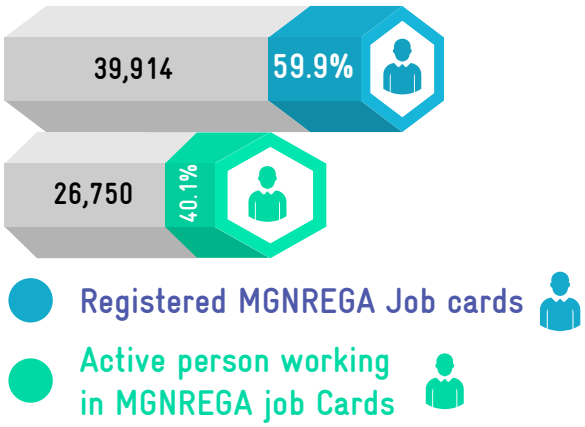


Figure 3.30. Status of MGNERGA job cards

3.7.4 Drinking Water Sources

Only 17,991 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

17,991
Households

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

6,729
Households

3.7.5 Annual Greywater Generation

The grey water generation estimated across this Block is 191 ha.m which is available for reuse or recycle.

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

Morphology

Neivanatham, Anukkumalai, Olaipaddi

Wasteland

Agaram, Angunam, Panniyur

Soil erosion

Rayampettai, Namiyandal, Somasipadi

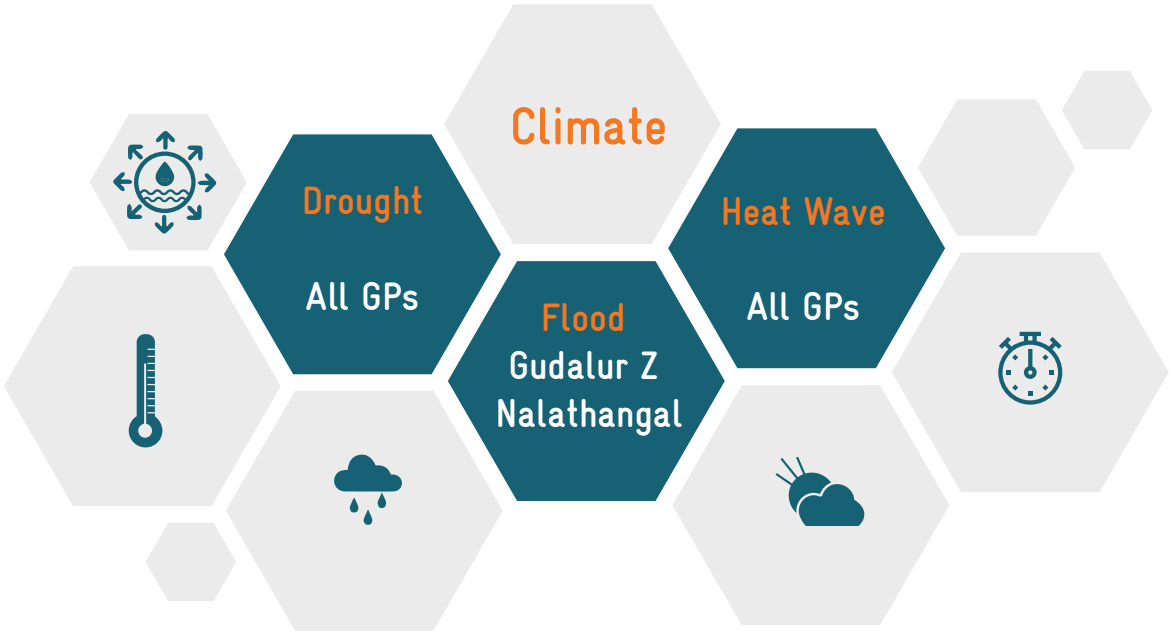
Upland/Slope

Su Polakunnam, Arumbakkam, Vazhuthalangunnam

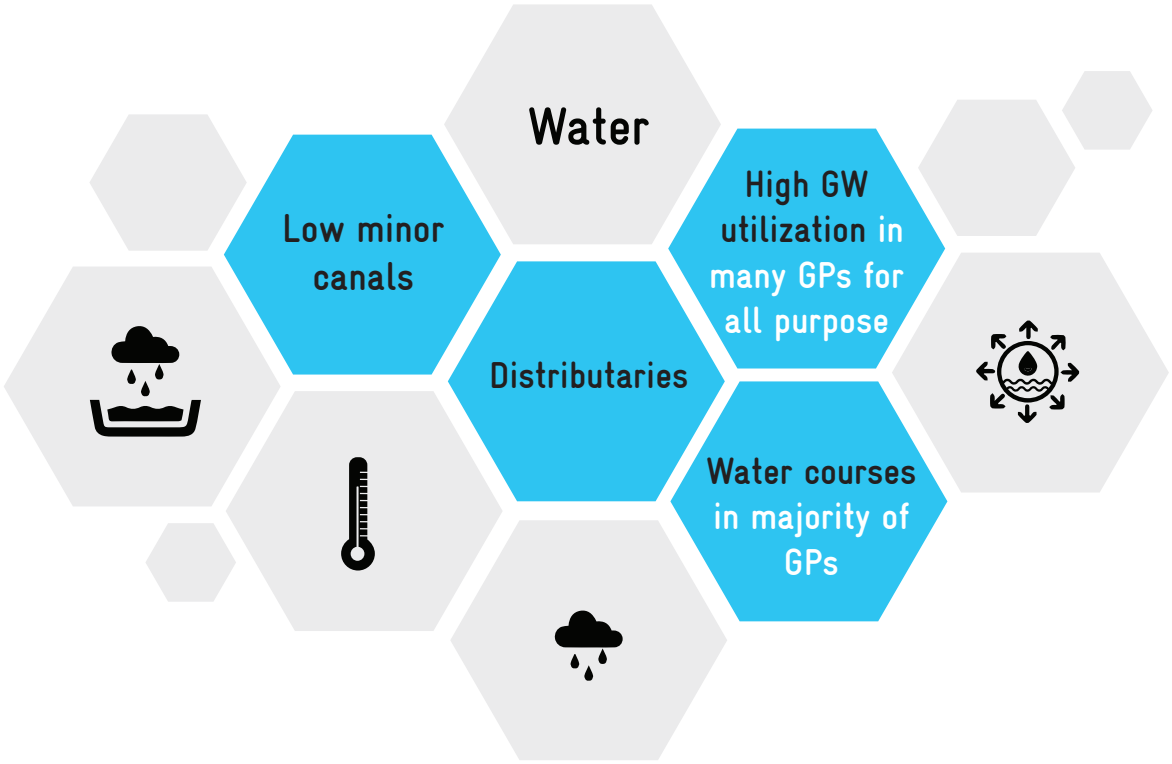
Ground water prosperity

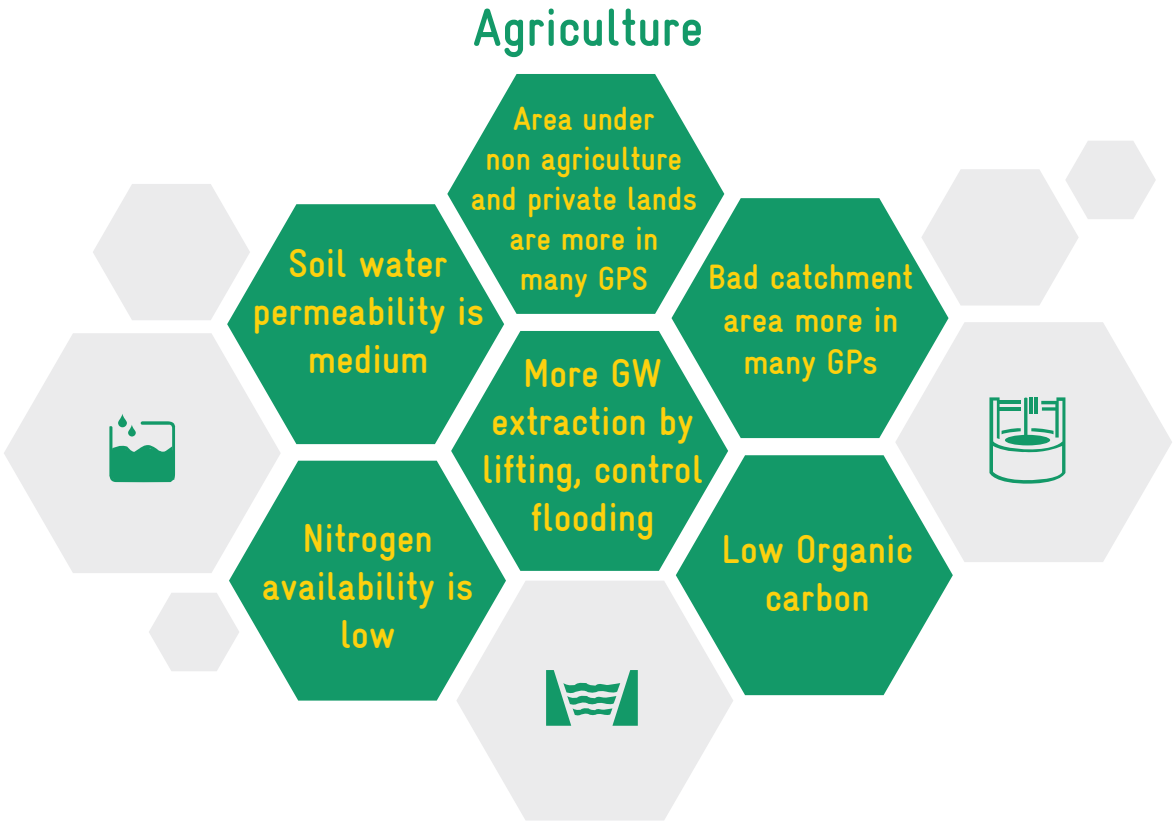
Iyangunnam, Ganalapadi, Vazhuthalangunnam

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
Gudalur Z
Nalathangal


Socio economic
Population density high in Avur, Gengapattu, Nadalarganandal
Vulnerable population high in Mekalur, Somasipadi, Kattumalaiyanur
% of vulnerable households high in Sirunathur, Agaram
No. of households and female headed households high in Mekalur, Somasipadi
Total population, Female population, Only one room households high in Mekalur, Avur
Grey water generation more in Somasipadi, Avur
Registered MGNREGA job cards and active persons working are low in Kaniyampoondi, Vayalur, Kalingaleri


Water
Low minor canals
High GW utilization in many GPs for all purpose
Distributaries
Water courses in majority of GPs


Agriculture
Area under non agriculture and private lands are more in many GPS
Soil water permeability is medium
Bad catchment area 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 GP

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

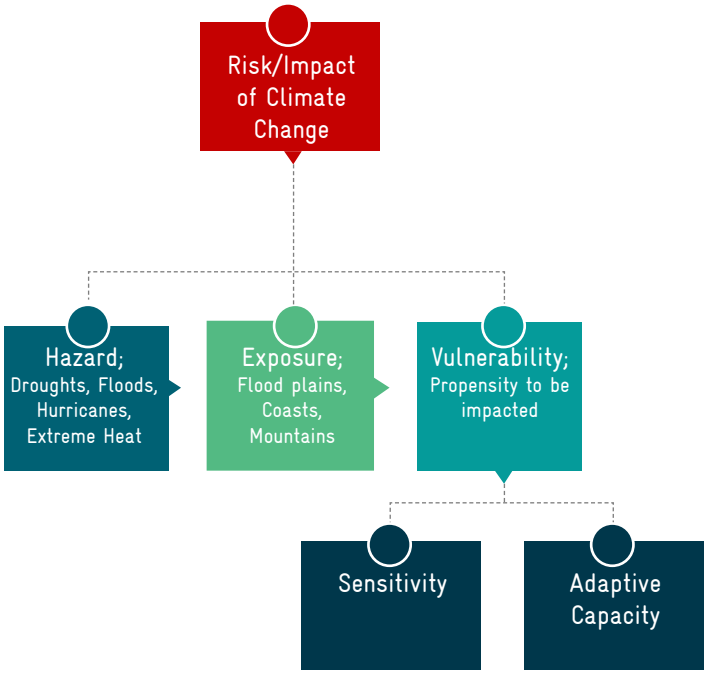


Figure 4.1. Vulnerability of the system as defined by IPCC

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.

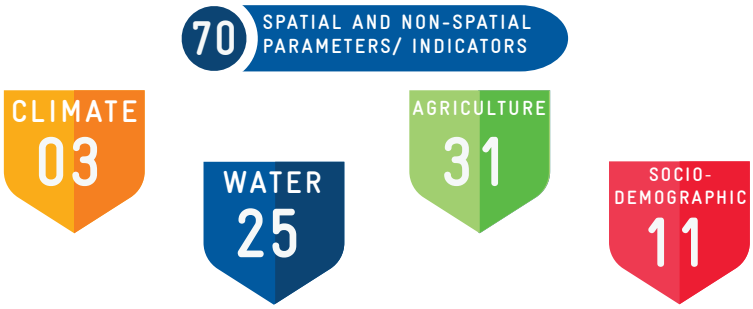


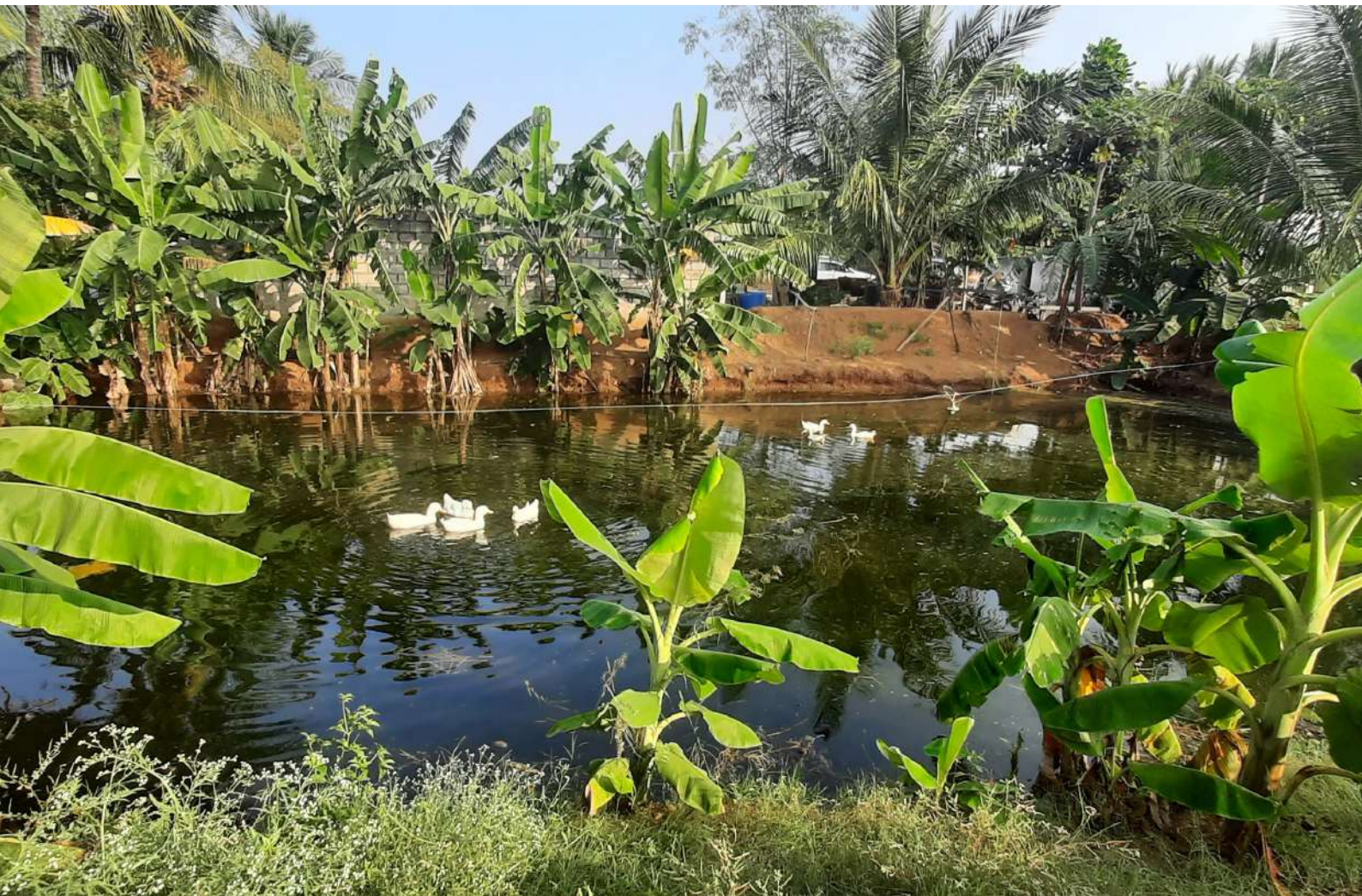
TABLE 9. CWRM PARAMETERS SELECTED FOR BLOCK LEVEL VULNERABILITY

	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 as vey high, high, medium, low very low vulnerability. The vulnerability assessment methodology is given in Annexure 4. The normalized indicators are aggregated and categorized to different vulnerability level. GP Kattumalaiyanur has a high CVI value of 0.619 followed by Konalur, Nadalarganandal and Rayampettai. These GPs have very high vulnerability on rural water security. On the other hand, Angunam, Avur, Gengapattu(NA) and Vayalur GPs have low CVI (Figure 4.2).

Upto	Category	Color range
0.592	very high	
0.566	high	
0.539	medium	
0.512	low	
0.486	very low	



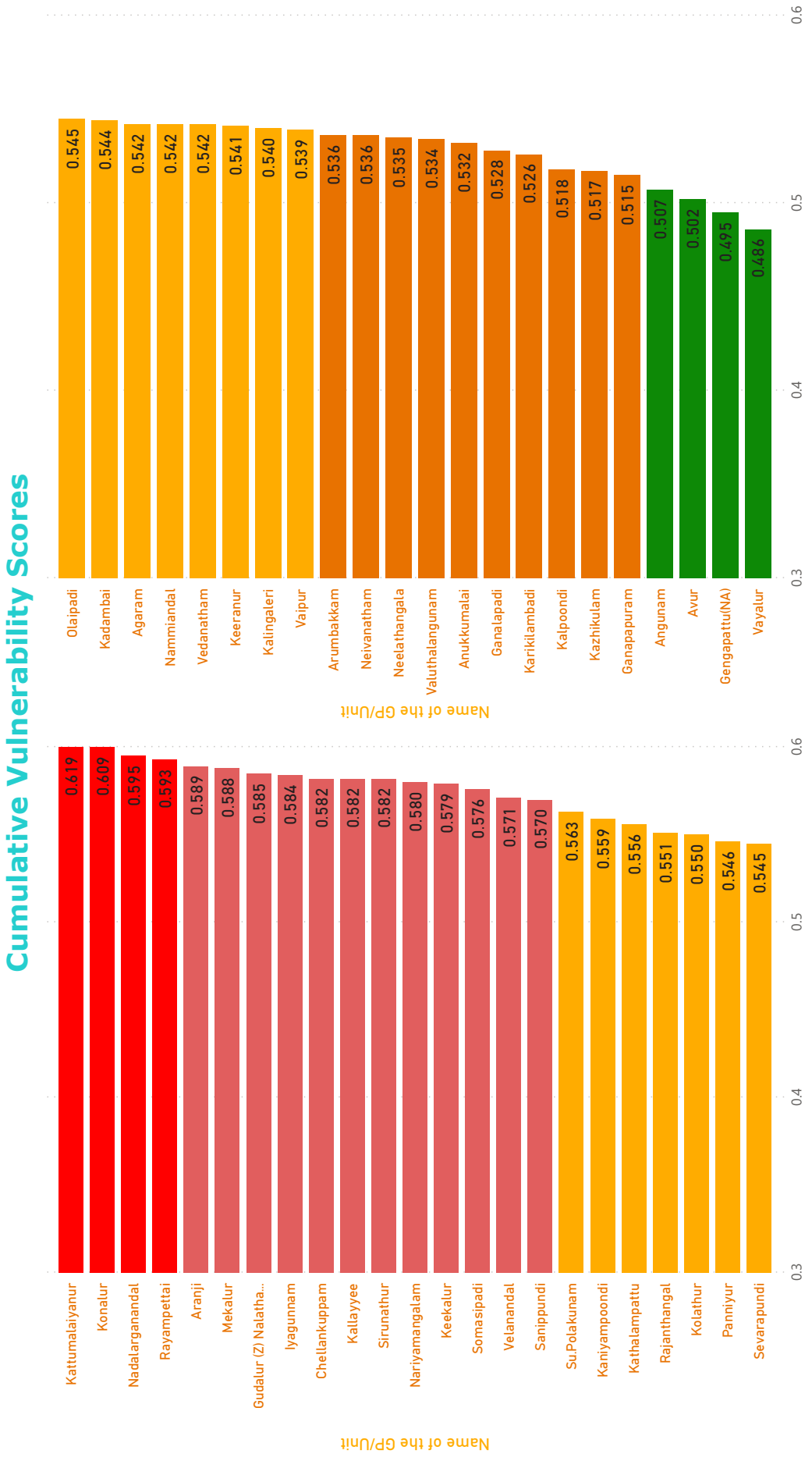


Figure 4.2. Final cumulative vulnerability scores

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 while Gudalur Z Nalathangal GP is vulnerable to floods.

GUDALUR Z NALATHANGAL

Water resource vulnerability

The water resources vulnerability index shows that Kattumalaiyanur GP is highly vulnerable followed by Rayampettai, Aranji while Gengapattu GP is least vulnerable.

KATTUMALAIYANUR, RAYAMPETTAI, ARANJI, GENGAPATTU

Agriculture resources vulnerability

In agriculture and allied sectors, Konalur GP is highly vulnerable followed by Nadalarganandal, Kattumalaiyanur while Vayalur GP is least vulnerable.

KONALUR, NADALARGANANDAL, KATTUMALAIYANUR, VAYALUR

Socio-economic vulnerability

Sirunathur GP has very high vulnerable score followed by Mekalur while Neelathangala GP is least vulnerable.

SIRUNATHUR, MEKALUR, NEELATHANGALA

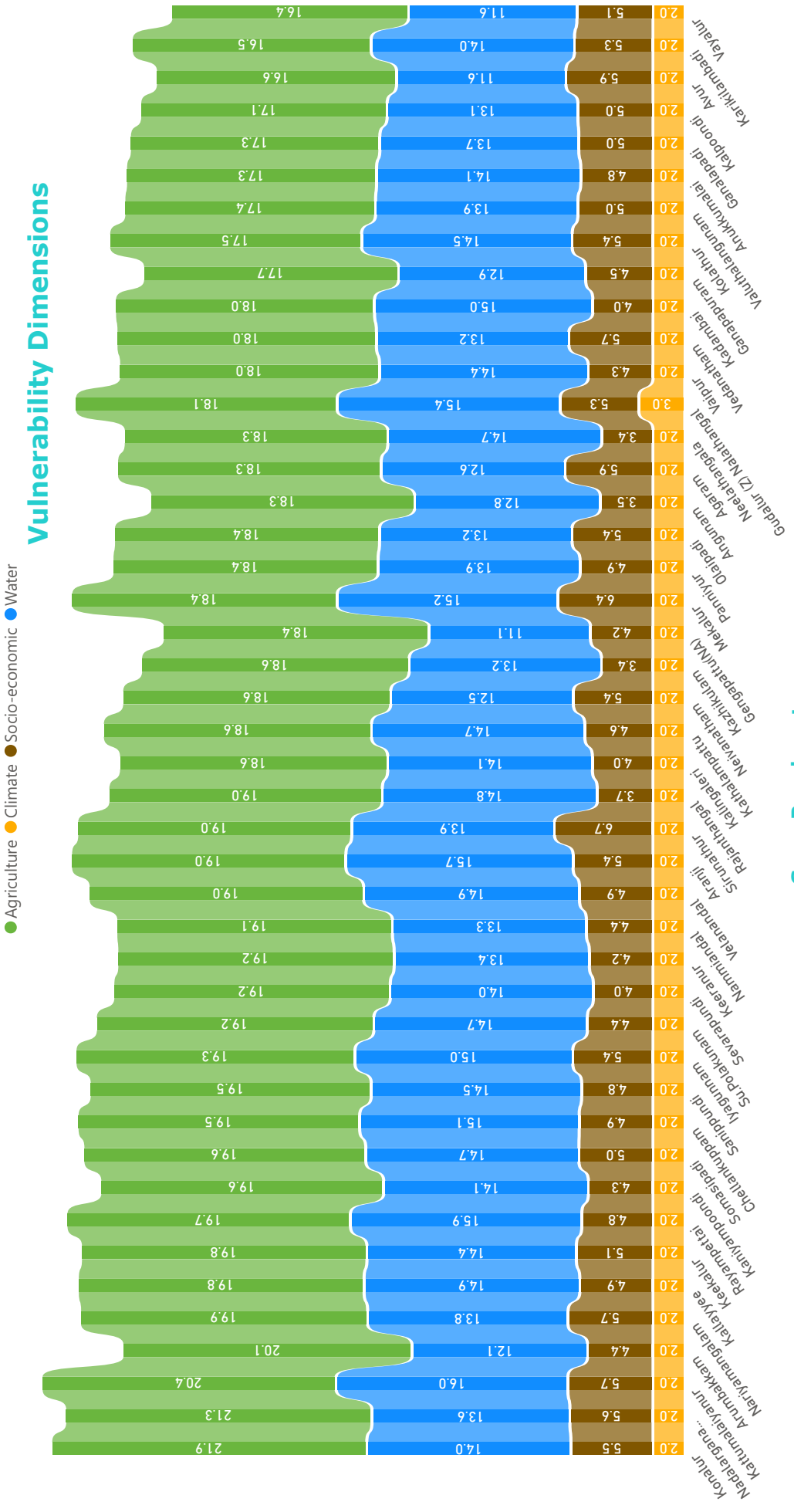
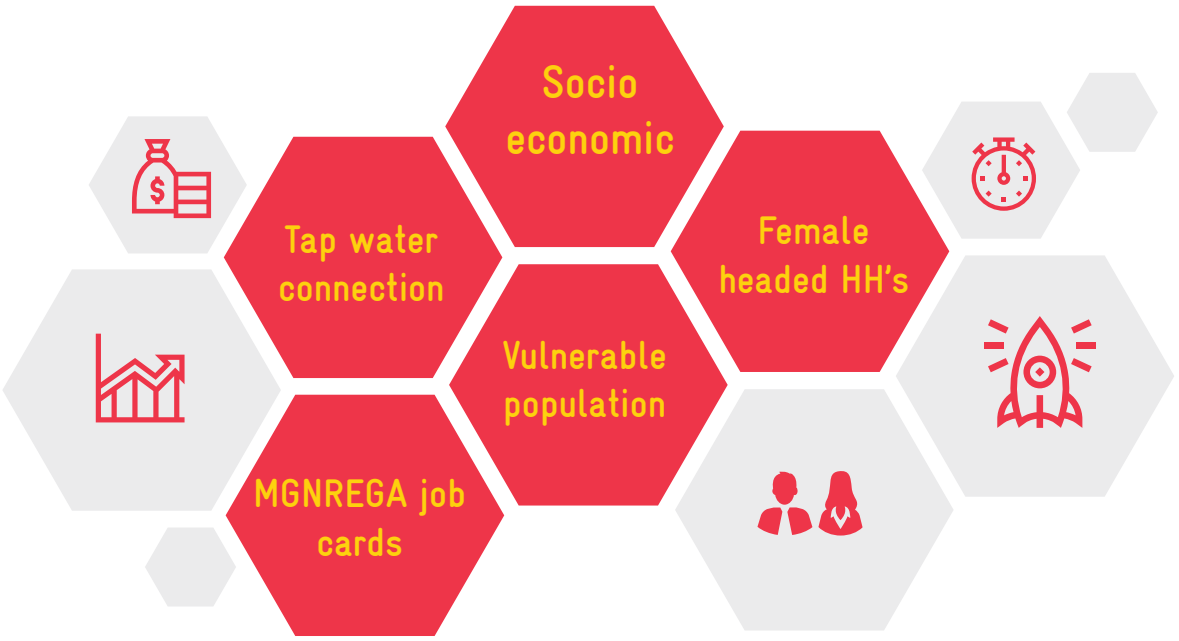
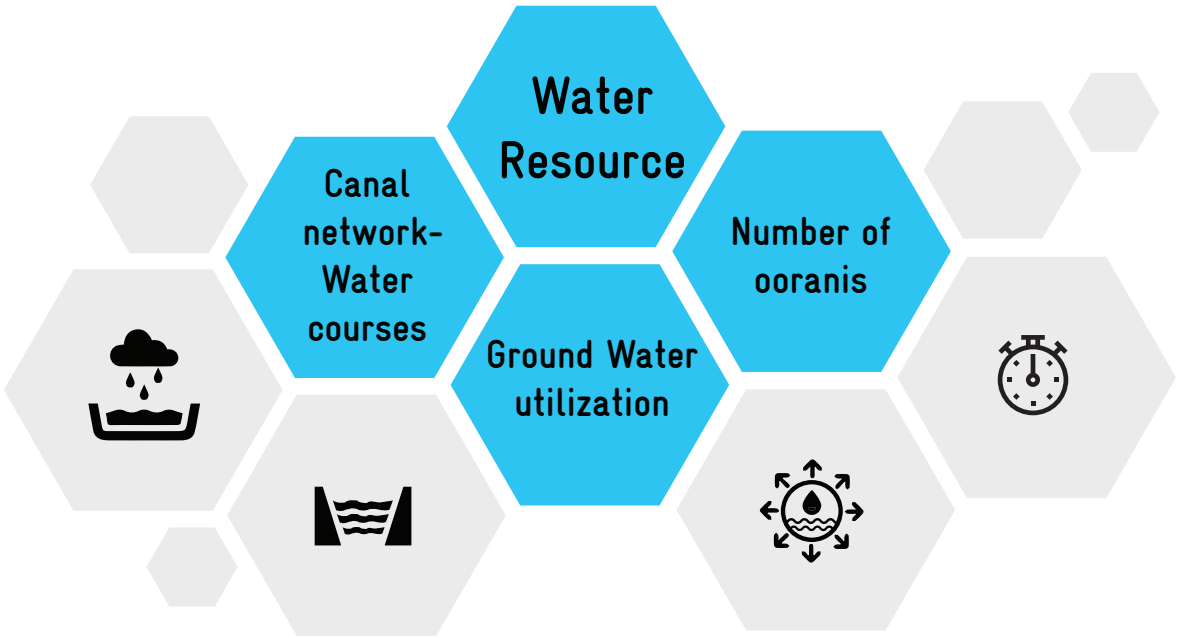
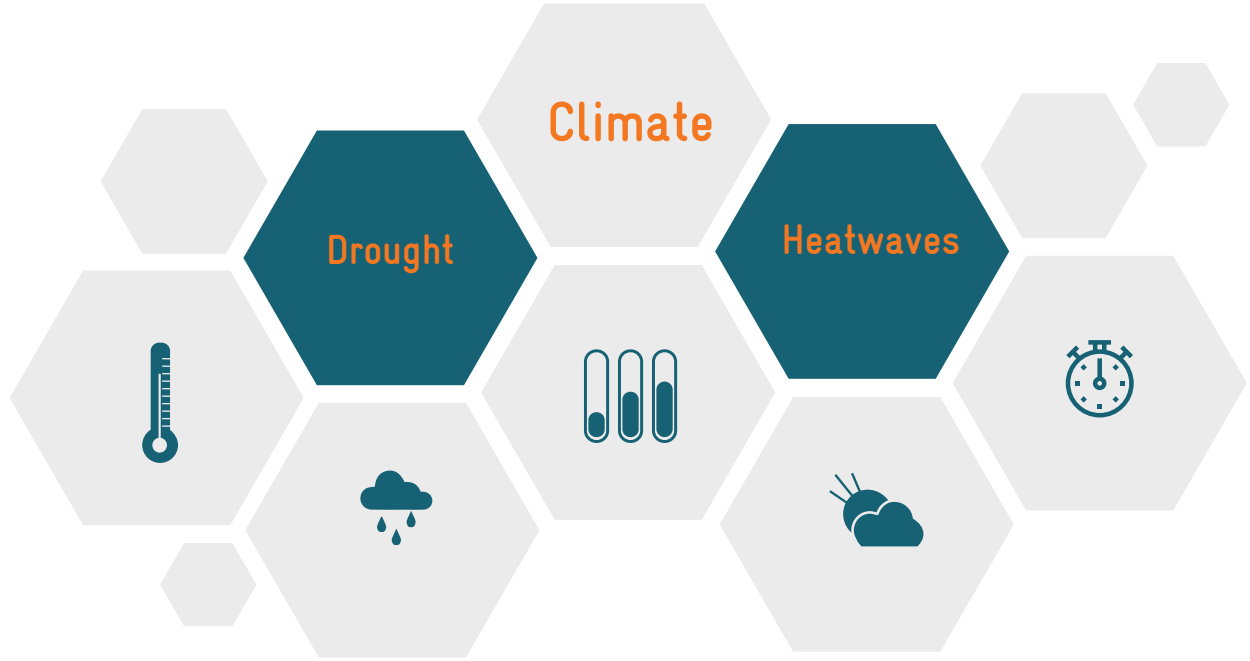


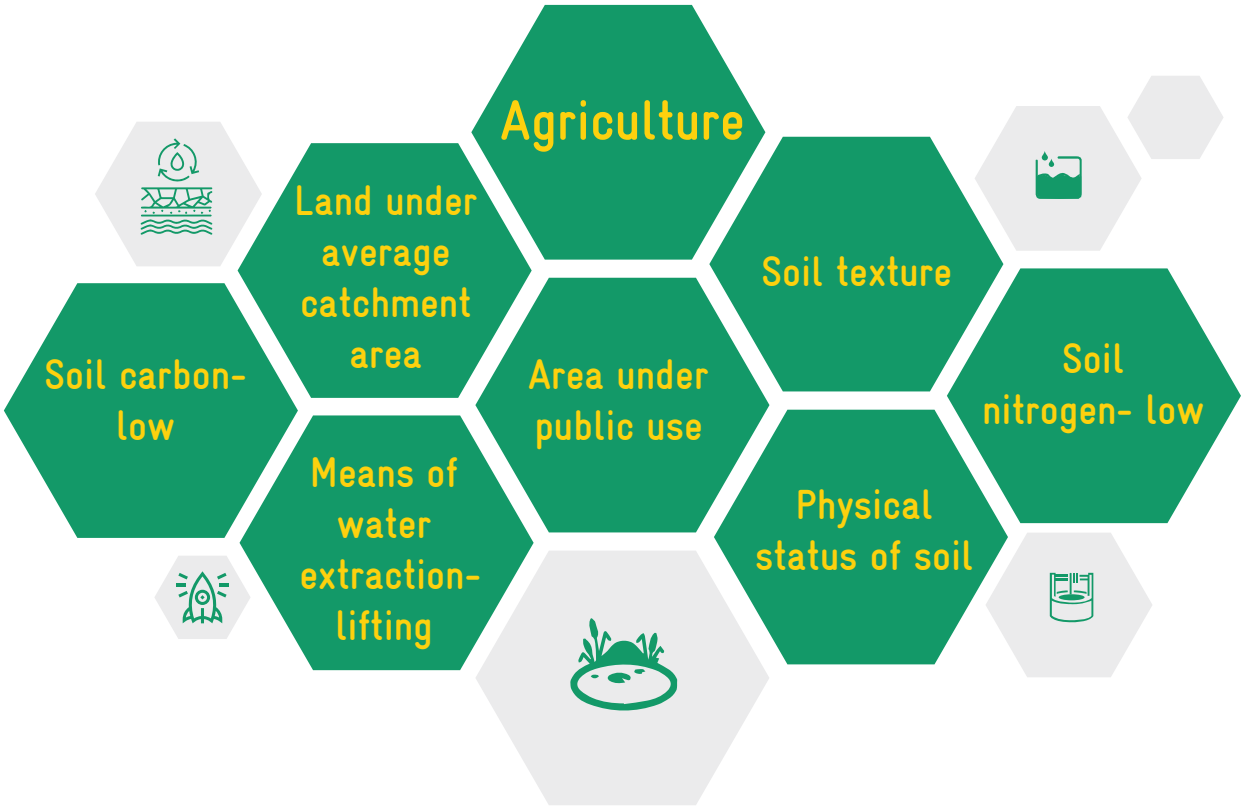
Figure 4.3. GP wise vulnerability dimensions

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 discusses the proposed treatment actions under WASCA, CWRM and CRM.

5.1 THE PROPOSED AREA UNDER WASCA TREATMENT

Out of 24,839 ha available land in Kilpennathur Block, 4,190 ha (16.86 %) 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)
Area Irrigated by Source	7,685.03	806.09
Barren & Un-cultivable Land	933.67	700.3
Cultivable Waste Land	65.31	49.01
Current Fallow land	7,393.56	824.38
Fallows Land other than Current Fallows	19.45	2.37
Land Under Miscellaneous Tree Crops etc.	46.11	34.6
Non-Agricultural Uses	4,061.76	1,203.95
Permanent Pastures and Other Grazing Land	2.92	2.2
Unirrigated Land	4,631.33	566.9

The highest of 28.74% of non-agriculture land is considered and proposed for water treatment under WASCA followed by current fallow land of 19.68 % while least permanent pastures and other grazing land area is considered (Figure 5.1).

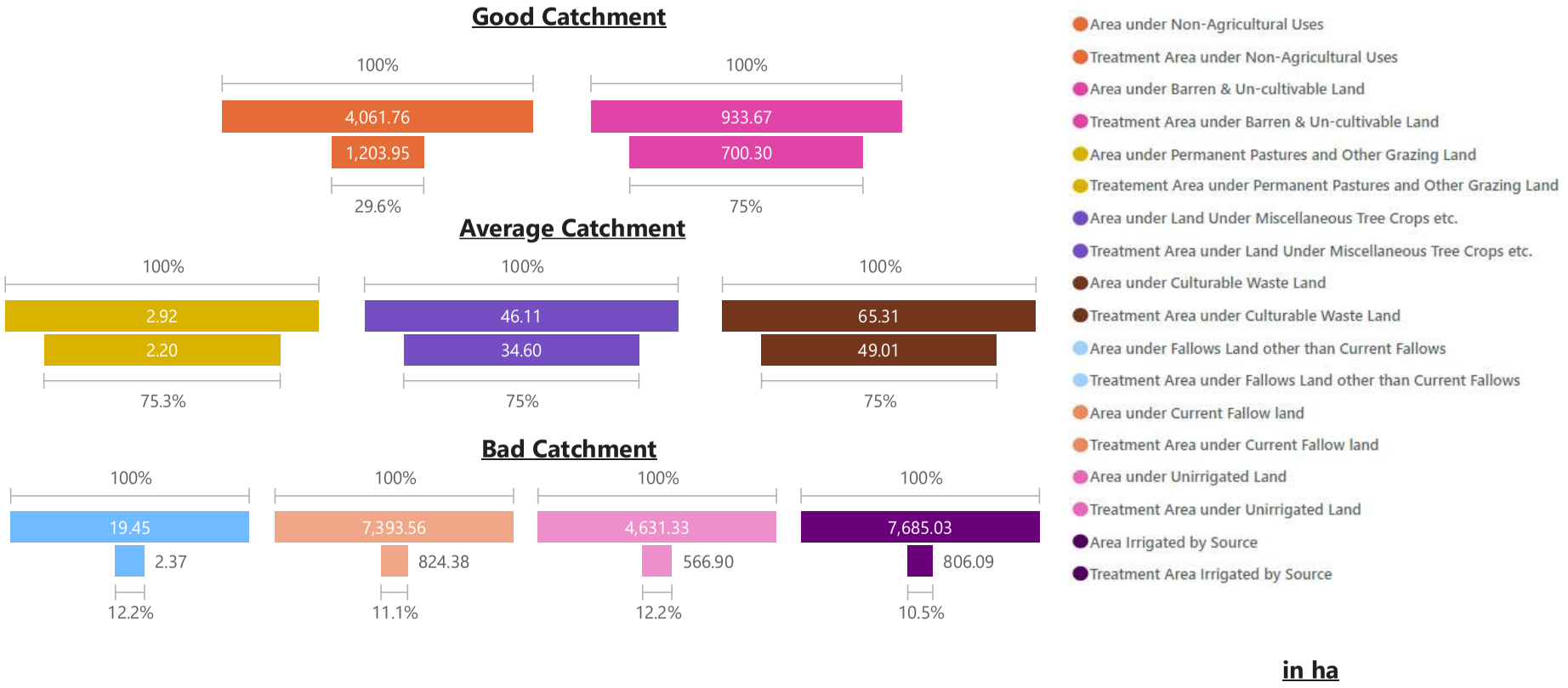


Figure 5.1. WASCA treatment area in percentage

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 1,461 ha.m which is 26.12 % of the total runoff. Of which the expected runoff conservation of 68.82 % comes from good catchment area followed by 29.46 % from bad catchment area and rest is from average catchment area (Figure 5.2).

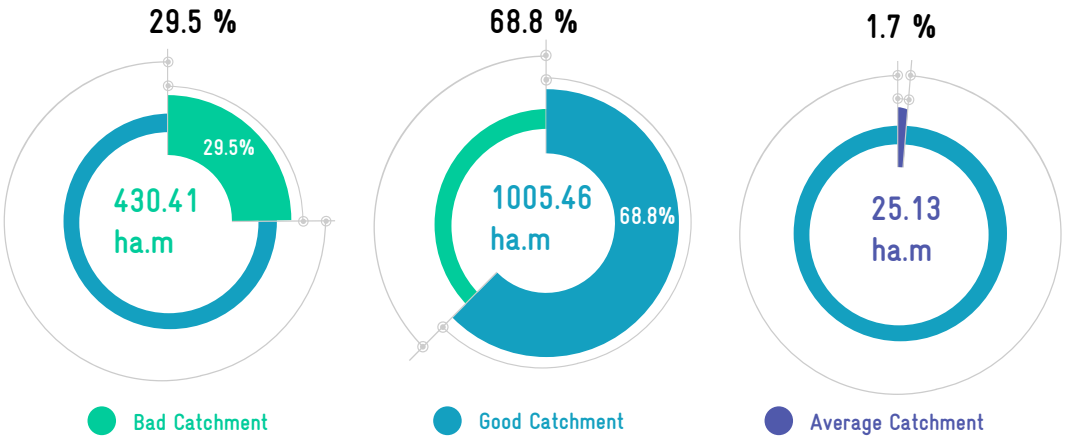


Figure 5.2. Expected conservation after WASCA treatment

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. GP wise works are annexed in annexed in Annexure 5.3.

Work (unit)	Abbreviation (unit)	No.	Extent (area in ha or length in m)
Azolla units - Individual (Number of units)	Az	2,569	
Cattle Shelters (Number of units)	CS	2,627	
Cattle Trough(Number of units)	CT	2,627	
Fodder development - Community & Individual	FD	2,219	
Goat Sheep Shelters (Number of units)	GSS	1,749	
Poultry Shed (Number of units)	PS	-	
Silvi-pasture Development(ha)	SPD	9,674	12.10
Soak Pits (Community) (Number of units)	SPC	280	
Soak Pits (Individual) (Number of units)	SPI	274	
Artificial Recharge Structure(Number of units)	ARS	53	
Construction of Farm Ponds - Individual (Number of units)	FP	886	

Construction of new open wells & Recharge Shafts (Number of units)	COWRS	2,152	
Restotaration of water bodies:a.PWD and Tanks(Number)	RPWDT	93	-
Restotaration of water bodies:b. Ooranis(Number)	Ro	21	
Restotaration of water bodies:c. Ponds(Number)	RP	282	
Roof Rain Water Harvesting (Number of units)	RRWH	90	
Water Course - Irrigation Channels - Desilting (Mtrs)	WCICD	-	21,000
Afforestation in Public/common lands(ha)	Aff	872,871	1,166.13
Avenue plantation(km)	AVP	337.40	20,102
Block Plantation (Community)(ha)	BP	499,786	633.29
Canal Bund Plantation(ha)	CBP	27,056	135,280
Contour Continous Bunds (CCB) for Afforestaion area(Mtrs)	CCBF	458,302	3,534.81
Drainage Line Treatment (DLT)(Mtrs)	DLT	4,523	22,616
Dry land Horticulture/Agro-forestry - Individual (ha)	DLHAI	1,84,876	924
Irrigation Channel Plantation (Mtrs)	ICP	4,200	21,000
Linear Plantation(km)	LP	24,984	1,21,239
Micro Irrigation(ha)	MI	-	-
Nursery Development(Number of units)	ND	1,00,931	20,186
Composting (Number of units)	Co	559	-
Farm Bunding with Boundary Trenches - Individual (ha)	FBBTI	241	596
Land development - Individual (ha)	LDI	323	800
NADEP Vermi compost (Number of units)	NADEP	2,219	


Proposed works are included the drought proofing, livelihood, land development and WCWH, measures
Land development works over 800 ha area
More than 25 Lakhs plants planting
8,300 sites for WCWH
60,000 livelihood works

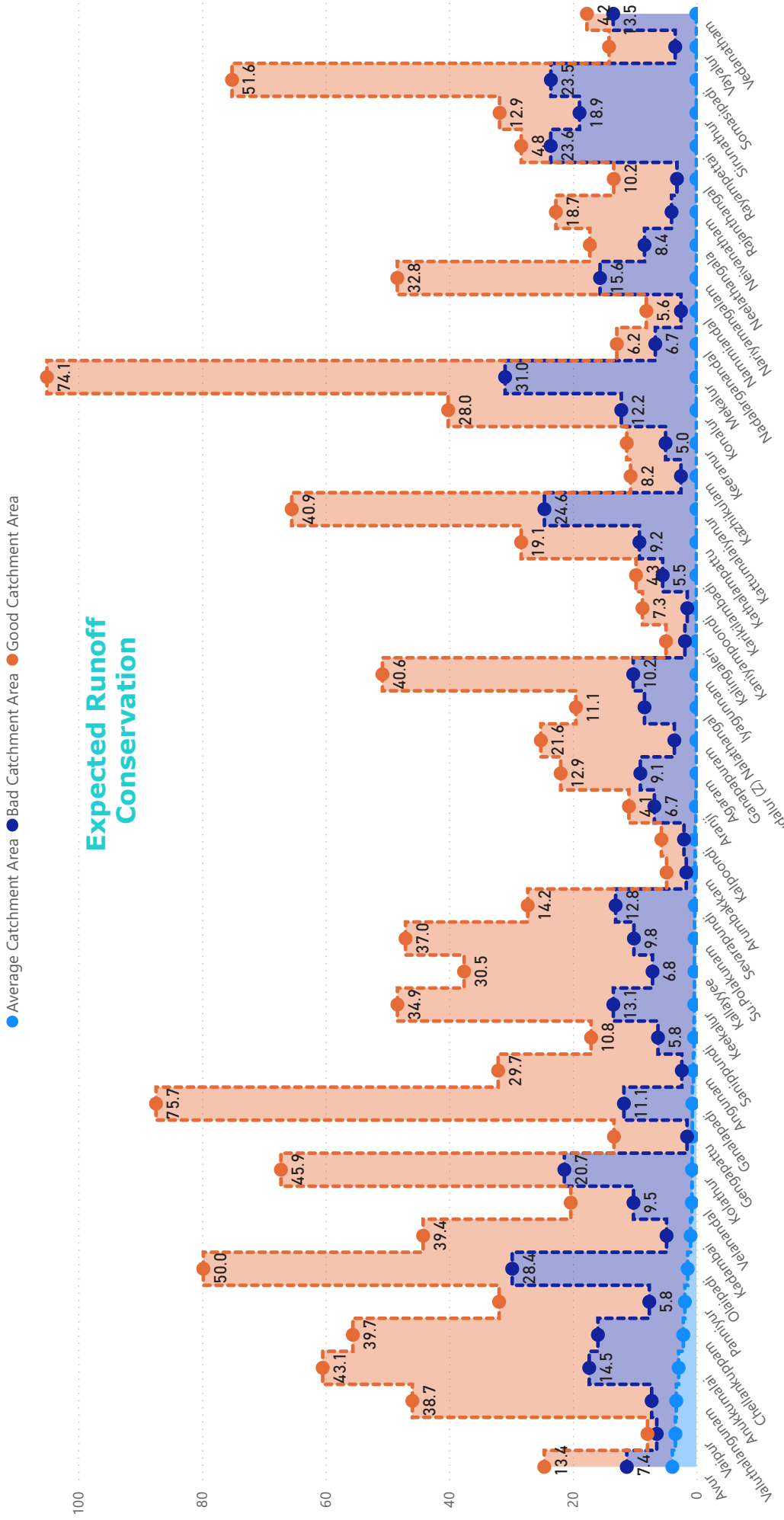


Figure 5.3. Expected GP wise runoff conservation after WASCA treatment

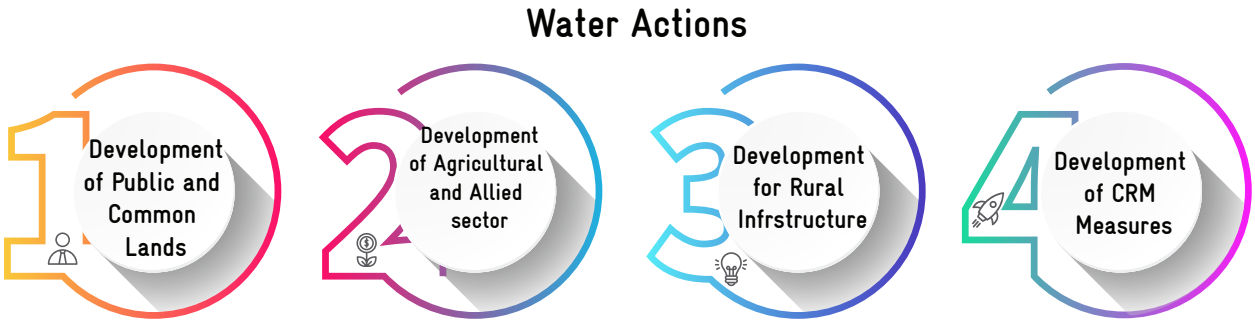
MAHATMA GANDHI NREGS Annual circular 2020-21 (Clause 6.3)

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)	92	10	0.025	2.29	917
COMPOSTING(NUMBER OF UNITS)	524	15	0.17	89.08	7,860
AFFORESTATION IN PUBLIC/ COMMON LANDS(ha)	1063	3,344	8.6	9139.48	35,53,769
BLOCK PLANTATION (COMMUNITY)(ha)	622	4320	11.1	6907.42	26,88,293
SILVI-PASTURE DEVELOPMENT(ha)	103	6,664	17.1	1761.30	6,86,392
LINEAR PLANTATION(km)	1	703	1.8	2.12	829
CANAL BUND PLANTATION(ha)	450	2,930	7.5	3375	8,63,370
IRRIGATION CHANNEL PLANTATION (m)	120	6	0.015	1.80	722
AVENUE PLANTATION(km)	2	703	1.8	2.93	1,144
NURSERY DEVELOPMENT (NUMBER OF UNITS)	5	2,344	15	75.90	11,861
RESTORATION OF WATER BODIES:A.PWD AND UNION TANKS (NO.)	125	800	5	625	1,00,000
RESTORATION OF WATER BODIES:B. OORANIS (NO.)	0	200	2.0	-	-
RESTORATION OF WATER BODIES:C. PONDS (NO.)	279	200	1	558	55,800
ARTIFICIAL RECHARGE STRUCTURE (NO.OF UNITS)	2132	391	2.5	4266	8,33,612
WATER COURSE - IRRIGATION CHANNELS - DESILTING (M)	120	3	0.0075	0.90	361
DRAINAGE LINE TREATMENT (M)	124	5	0.03	3.72	620

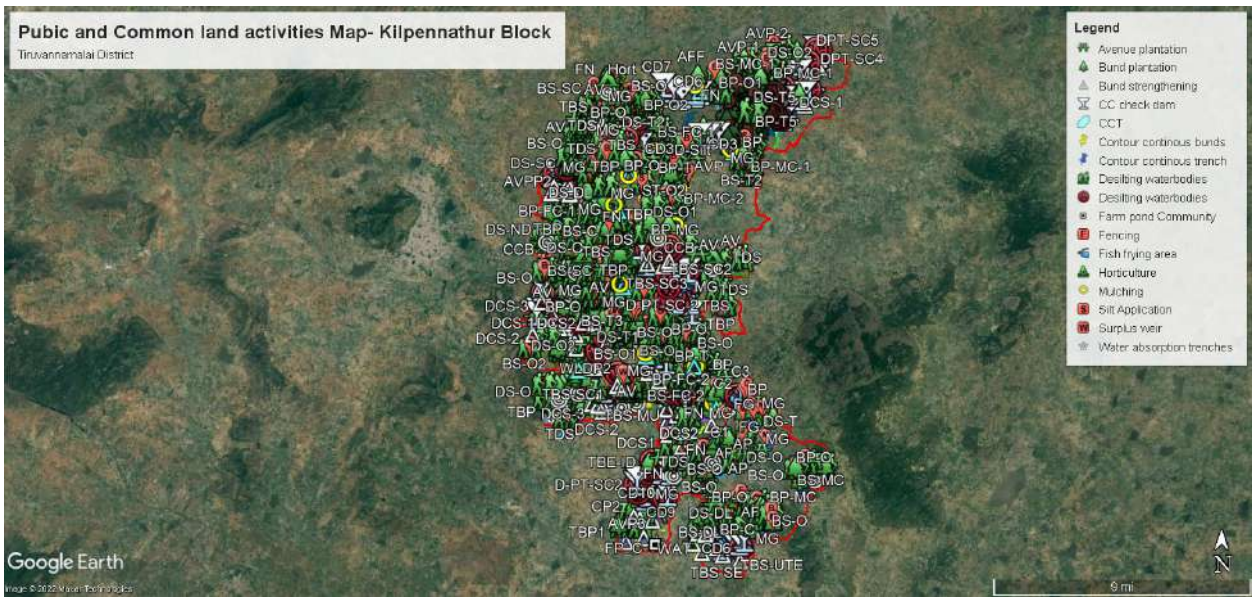


Figure 5.4. Proposed development activities in Public and Common Land

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 livestock 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)	1,213	586	1.5	1,819.50	7,10,818
MICRO IRRIGATION (ha)	0	0	1	0	0
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	856	781	2	1712	6,68,536
LAND DEVELOPMENT - INDIVIDUAL (ha)	3,056	3,906	10	30,560	1,19,36,736
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	5,211	3,321	8.5	44,293.50	1,73,05,731
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	2,260	23	0.15	339	51,980
NADEP VERMI-COMPOST (NUMBER OF UNITS)	2,219	27	0.18	399.42	59,913
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	2,219	2,344	1.48	3,284.12	52,01,336
CATTLE SHELTERS (NUMBER OF UNITS)	2,219	331	2.12	4,704.28	7,34,489
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	1,640	355	2.27	3,722.80	5,82,200
CATTLE TROUGH (NUMBER OF UNITS)	2,219	6	0.05	110.95	33,314
POULTRY SHED (NUMBER OF UNITS)	1,432	10	0.09	128.88	14,320
CONSTRUCTION OF NEW OPEN WELLS & RECHARGE SHAFTS (NUMBER OF UNITS)	2,152	926	5	10,760	19,92,752

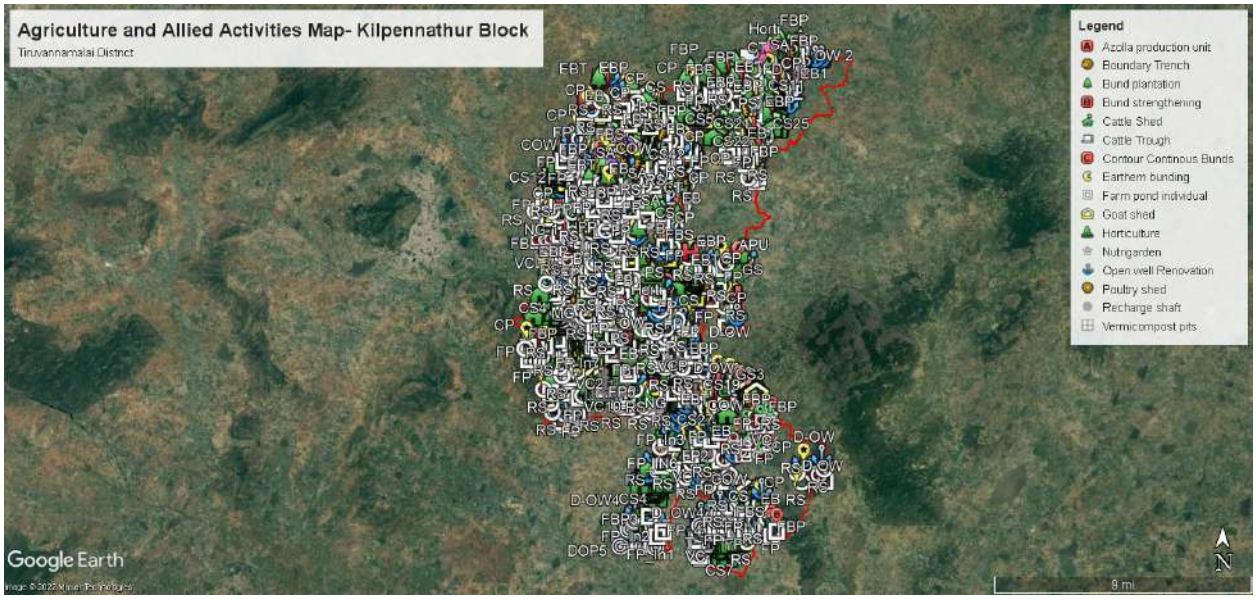


Figure 5.5. Proposed development activities in Agriculture and allied Sectors

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)	246	20	0.13	31.98	4,920
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	2,465	16	0.1	246.50	39,440
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	155	625	4	620	96,875

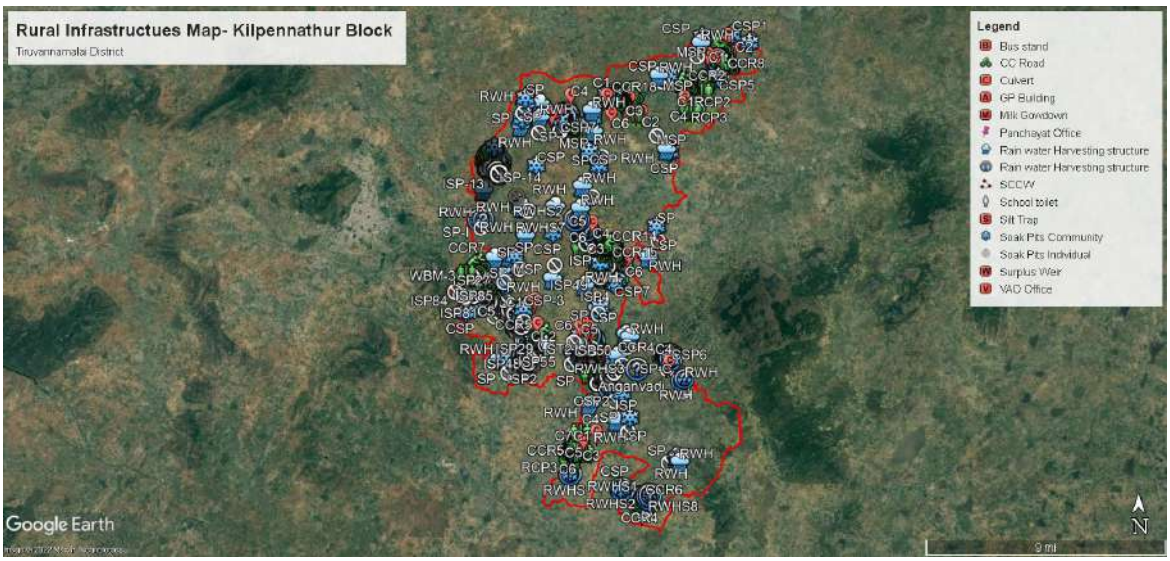


Figure 5.6. Proposed rural infrastructure activities

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 Kilpennathur Block is also affected by droughts and heat waves, climate resilient measures are proposed to cover-up maximum of GPs (Figure 5.7 & Table 14). CRM such as greening of hillocks (Table 15), silvi-pasture (Table 16), cascade of tanks (Table 17), and farm ponds (Table 18) were proposed.

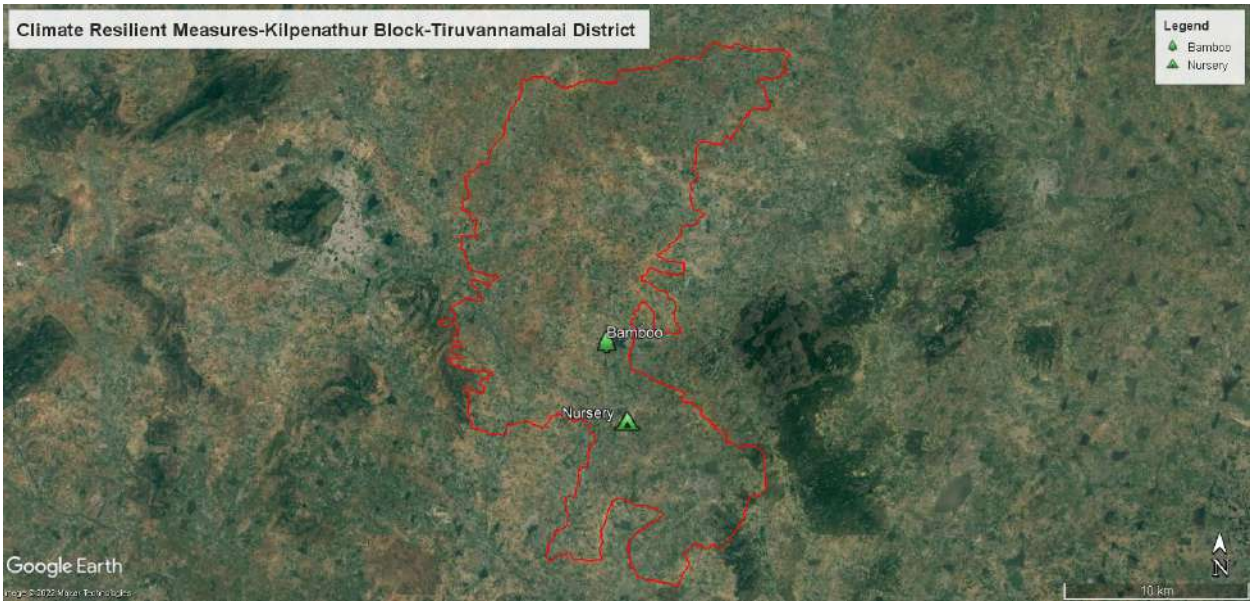


Figure 5.7. Proposed climate resilient measures

TABLE 14. GP WISE PROPOSED CRM

GP	Public and Common land	Agriculture
Agaram		Farm pond
Angunam		Farm pond
Anukkumalai		Farm pond
Avoor		Farm pond
Chellankuppam	Silvi-pasture Development	Farm pond
Erpakkam	Silvi-pasture Development	
Ganalapadi		Farm pond
Kadambai		Farm pond
Kalpundi		Farm pond
Kanapapuram	Silvi-pasture Development	
Kaniyampundi		Farm pond
Kathalampattu	Silvi-pasture Development	Farm pond
Kattumalaiyanur		Farm pond
Kazhikulam		Farm pond
Keeranur	Cascade of Tanks	
Kolathur	Silvi-pasture Development	Farm pond
Konalur		Farm pond
Mekkalur		Farm pond
Nadalaganandal		Farm pond
Nadalagananthal		Farm pond
Nariyamangalam		Farm pond
Neivanatham		Farm pond
Olaipadi		Farm pond
Panniyur		Farm pond
Rajanthangal		Farm pond
Rayampettai		Farm pond
Sanipoondi	Silvi-pasture Development	Farm pond
Sevarapundi		Farm pond
Sirunathur		Farm pond
So.Namiyanthal		Farm pond
Somasipadi		Farm pond
Su Polakunam		Farm pond
Vayalur		Farm pond
Vazhuthalakunam		Farm pond
Vedanatham		Farm pond
Velananthal		Farm pond
Vettavalam	Greening of Hillocks	
Gudalur Z		Farm pond

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

GP	Category	Recommended Area in ha	Classification of land
Vettavalam	High	300	Town Panchayat

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

GP	Habitation	Area for Plantation	Total Number of Plants
Erpakkam	Erpakkam	1.005	1,900
Kanapapuram	Kanapapuram	0.455	880
Kathazampattu	Kathazampattu	0.505	980
Kolathur	Kolathur	2.145	4,100
Sanipoondi	Sanipoondi	1.735	3,300
Chellankuppam	Chellankuppam	1.45	2,688

TABLE 17. DETAILS OF PROPOSED CASCADE OF TANKS ACTIVITIES UNDER CRM

GP	Local Name Of The Tank
Keeranur	Chiteri
Keeranur	Periya Eri

TABLE 18. DETAILS OF PROPOSED BAMBOO PLANTATION ACTIVITY UNDER CRM

GP	Habitation	Count
Agaram	Agaram	1
Angunam	Angunam	1
Anukkumalai	Anukkumalai	1
Avoor	Avoor	3
Chellankuppam	Chellankuppam	2
Ganalapadi	Ganalapadi	1
Kadambai	Kadambai	1
Kalpundi	Kalpundi	1
Kaniyampundi	Kaniyampundi	1
Kathalampattu	Kathalampattu	1
Kattumalaiyanur	Kattumalaiyanur	2
Kazhikulam	Kazhikulam	6
Kolathur	Kolathur	3
Konalur	Konalur	1
Mekkalur	Mekkalur	1
Nadalaganandal	Nadalaganandal	1
Nadalagananthal	Nadalagananthal	1
Nariyamangalam	Nariyamangalam	1
Neivanatham	Neivanatham	5
Olaipadi	Olaipadi	3
Panniyur	Panniyur	2
Rajanthangal	Rajanthangal	1
Rayampettai	Rayampettai	5
Sanipoondi	Sanipoondi	1
Sevarapundi	Sevarapundi	3

Sirunathur	Sirunathur	1
So.Namiyanthal	So.Namiyanthal	1
Somasipadi	Somasipadi	1
Su.polakunam	Kalitheri	1
	Su.Polakunam	1
Vayalur	Vayalur	1
Vazhuthalakunam	Vazhuthalakunam	2
Vedanatham	Vedanatham	1
Velananthal	Velananthal	1
Z.Gudalur	Z.Gudalur	1

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	4,189.8 ha (16.87 % of the total) area considered for treated under WASCA
2	Percentage reduction of run off	2	1,461 ha.m (26.2 % of the total available runoff) runoff harvested due to WASCA interventions
3	No. of waterbodies restored	3	1,183 waterbodies restored
4	Area under afforestation	4	1,063 ha area under afforestation
5	Area under silvi-pasture development	5	103 ha under Silvi-pasture plantation
6	Length of drainage line treated	6	1,638 m length of drainage line treated

4,189.8 ha
AREA TREATED

1,461 ha.m
TOTAL RUNOFF HARVESTED

1,183
WATER BODIES RESTORED

1,063 ha
AREA AFFORESTATION

103 ha
SILVI-PASTURE PLANTATION

1,638 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	856 farm ponds established which target the harvest of 15,06,560 cu m of water which has the potential to irrigate 300 ha area
2	Improvement in soil health	2,219 NADEP compost units for soil health improvement
3	Changes in the irrigation practices	587 ha Farm bunding with trenches
4	Dry land development with Agro-forestry	5,211 No. of works
5	Households established fodder plots	2,576 vulnerable households established fodder plots

856 FARM PONDS

2,219 COMPOST UNITS

2,576 FODDER PLOTS

587 ha DRY LAND DEVELOPMENT WITH AGRO-FORESTRY

6.3 OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

	INDICATOR	OUTCOMES/ IMPACT
1	No. of villages having liquid waste management systems	246 common and 2,465 individual soak pits established for recycle of grey water benefiting 24,720 households
2	Roof rain water harvesting measures	155 common roof rainwater harvesting and storage structures with a target to harvest and store 0.2 ha.m of rainwater for use
3	Nutri-garden	24,720 Households established nutri-gardens in homesteads and planted 1,23,600 saplings

246 COMMON & **2,465** INDIVIDUAL SOAK PITS

155 COMMON ROOF RAINWATER HARVESTING

24,720 NUTRI-GARDENS

1,23,600 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	4 models are identified via., greening of hillocks, silvi-pasture, cascade of tanks, farm pond Greening of hillocks in 300 ha 60 farm ponds in 34 GPs 7.295 ha under silvi-pasture with 13,848 plants

60
FARM PONDS

7.295 ha
SILVI PASTURE

13,848
PLANTS

Estimated person days

The total estimated person days required for the above proposed activities are 4,82,38,909 as specified below Figure 6.1.

Estimated Cost

The total estimated cost budgeted for the above proposed activities is Rs. 1,29,544 Lakhs as specified below Figure 6.2.

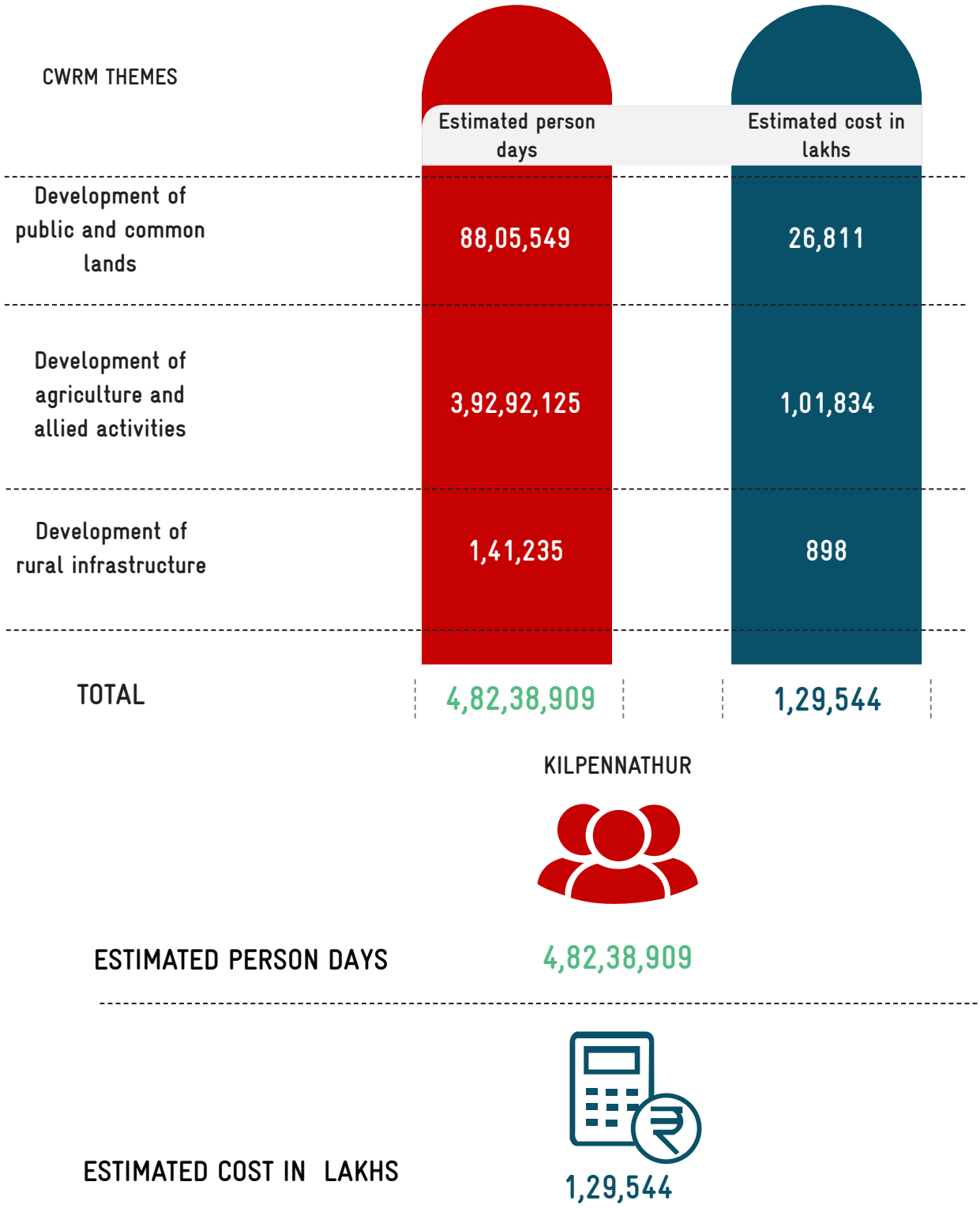


Figure 6.1 & 6.2. Estimated person days & cost for all water actions

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.

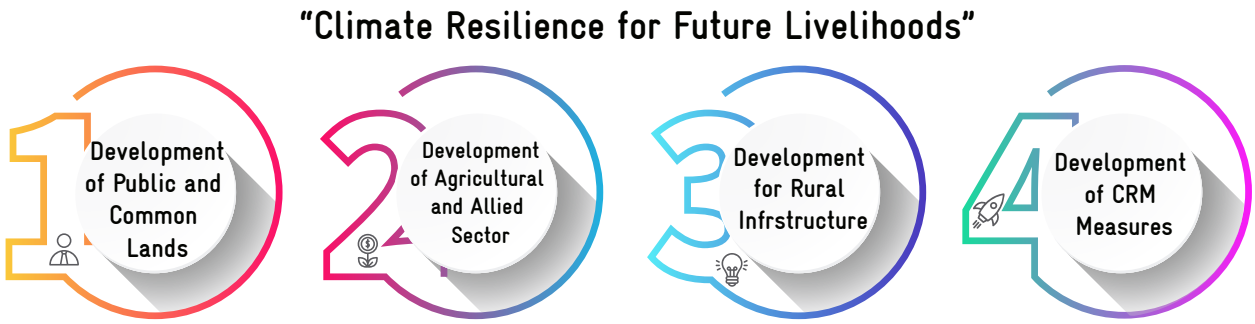
Internationally, the recent process on NDC Enhancement (2020) significantly acknowledge the climate change vulnerability on national sectors including agriculture, energy, and urban areas, especially through impacts on water resources. The role that water and water-related activities play in national 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 will achieve the above actions working closely with Mahatma Gandhi NREGA programme of Ministry of Rural Development and National Water Mission programme of (MoJS). These two ministries are the key stakeholders for WASCA. Apart from these two ministries, the works under WASCA TN are closely linked with Ministry of Agriculture and MoEFCC. The commitments of the above mentioned four ministries towards SDG goals achievements are mapped in connection with the interventions under WASCA Tamil Nadu. The intervention under WASCA TN has direct and indirect contribution to the SDGs and its national targets set as per NITI Aayog.

SDG GOAL 6

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

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

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

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

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

Head count ratio as per the multidimensional poverty index (%)	
	Persons provided employment as a percentage of persons who demanded employment under MGNREGA

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

Percentage of rural population having improved source of drinking water

Percentage of ground water withdrawal against availability

Percentage of Blocks/Mandals/Talukas over-exploited

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

Percentage of degraded land over total land area

Percentage increase in area of desertification

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

TABLE 20. 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)	92	W3	SDG 1,2, 6,13&15
Composting (No. of units)	524	W1	SDG1& 6
Afforestation in Public/common lands (ha)	1,063	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community) (ha)	622	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	103	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (m)	1	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation (ha)	450	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	120	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (m)	2	C1,C2,C3,W3,S2	SDG 1, 6&13

Nursery Development (No. of units)	5	C1,S2,S4	SDG 1,2 &6
Restoration of waterbodies: PWD and Union tanks (count)	125	S2, S1	SDG 6, 1, 13
Restoration of waterbodies: Ponds (count)	279	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	2,132	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	120	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (m)	124	W1,W3,W4	SDG1 & 6

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

Name of the Work	No. of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	1,213	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)	856	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	3,056	W1,W5,A1,A3,S2,S4	SDG 2, 6&15
Dry land Horticulture/Agro-forestry - Individual (ha)	5,211	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	2,260	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (No. of units)	2,219	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	2,219	A3, S4	SDG 1& 2, 15
Cattle Shelters (No. of units)	2,219	S4	SDG 1& 2
Goat Sheep Shelters (No. of units)	1,640	S4	SDG 1& 2
Cattle Trough (No. of units)	2,219	W5,S4	SDG 1& 2
Poultry Shed (No. of units)	1,432	S2,S4	SDG 1& 2
Construction of new open wells & Recharge Shafts (No. of units)	2,152	S3,W5,W1	SDG 1,2 & 6

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

Name of the work	No. of CWRM works	CVI	Linking SDG
Soak Pits (Community) (No. of units)	246	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	2465	W3,S2	SDG 1& 6
Roof Rain Water Harvesting (No. of units)	155	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

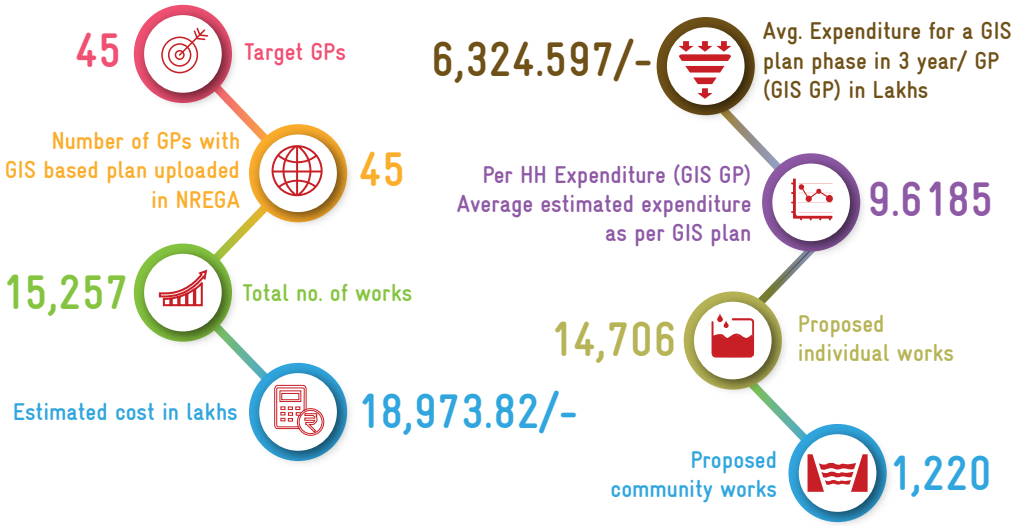
7 IMPLEMENTATION OF GP PLANS

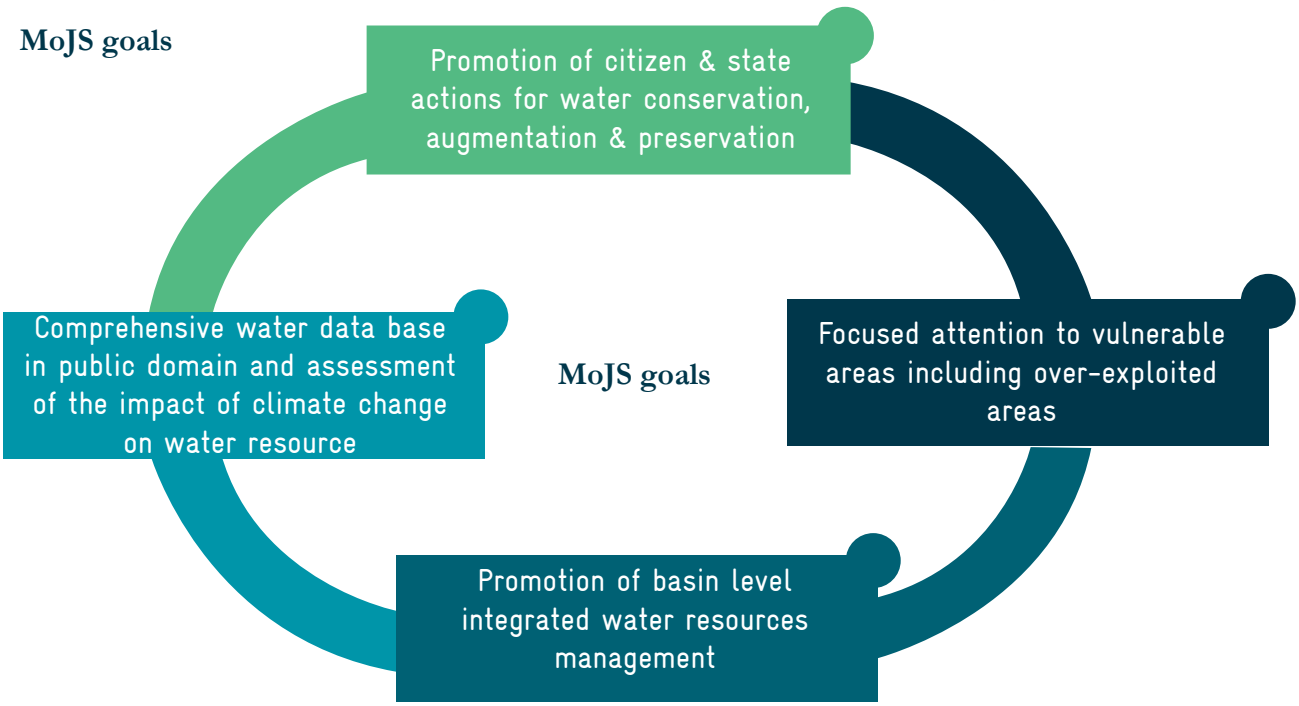
Execution of GP plans includes integrating all verified, approved works in MORD's web enabled ap-plication NREGA Soft (https://nrega.nic.in) for mainstreaming WASCA. The target GPs are identified first, the status of GIS based plans and total works along with its expenditure and category wise esti-mation 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 integrating GP level GIS based plans, both NRM and Non NRM into Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of Kilpennathur Block is listed in Table 23 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 recommendations and works uploaded are given in Annexure 7.1.

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





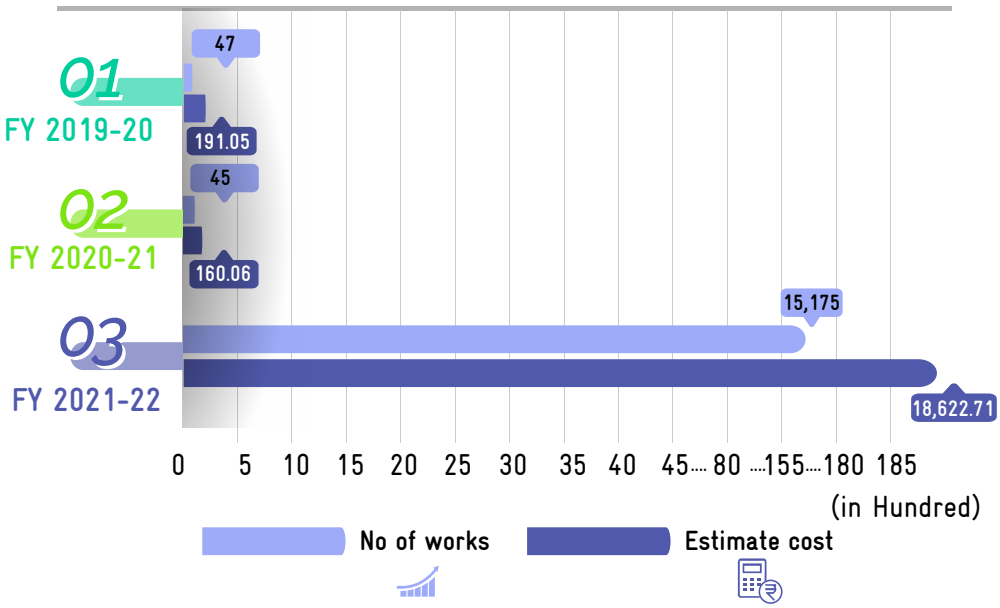


Figure 7.1. Work progress in last 3 years

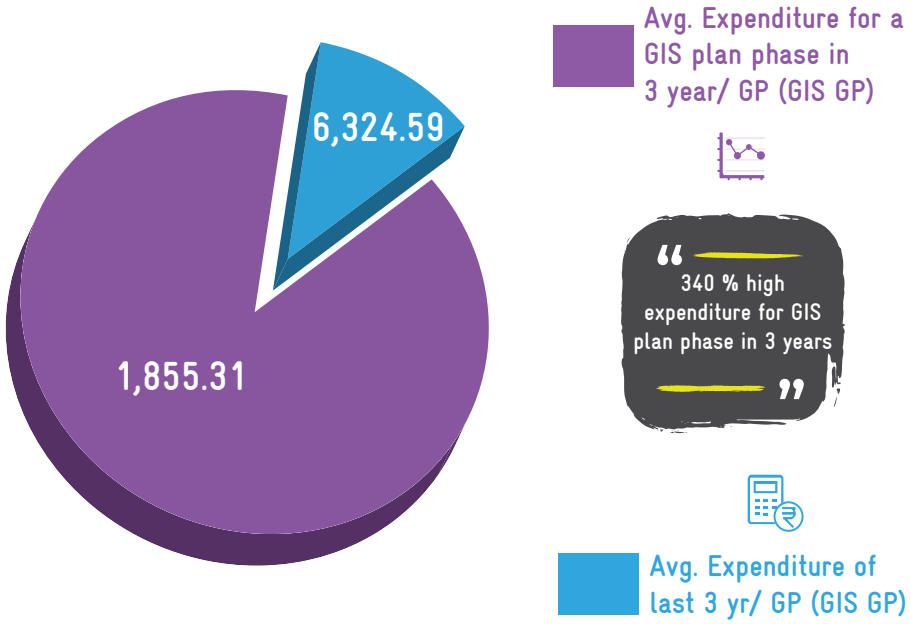
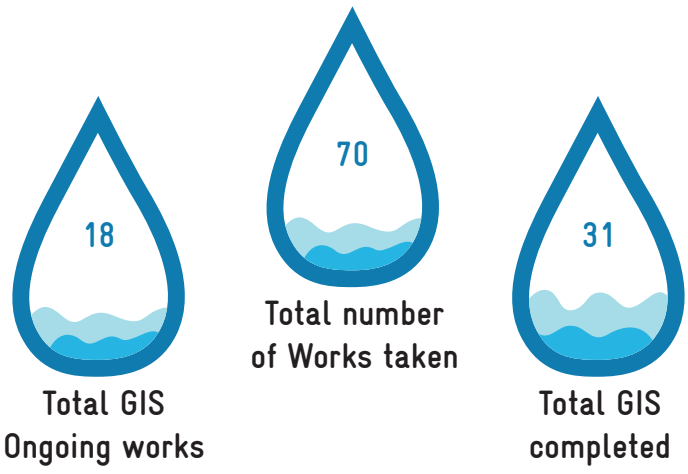


Figure 7.2. Average Expenditure for GIS plan in last 3 years



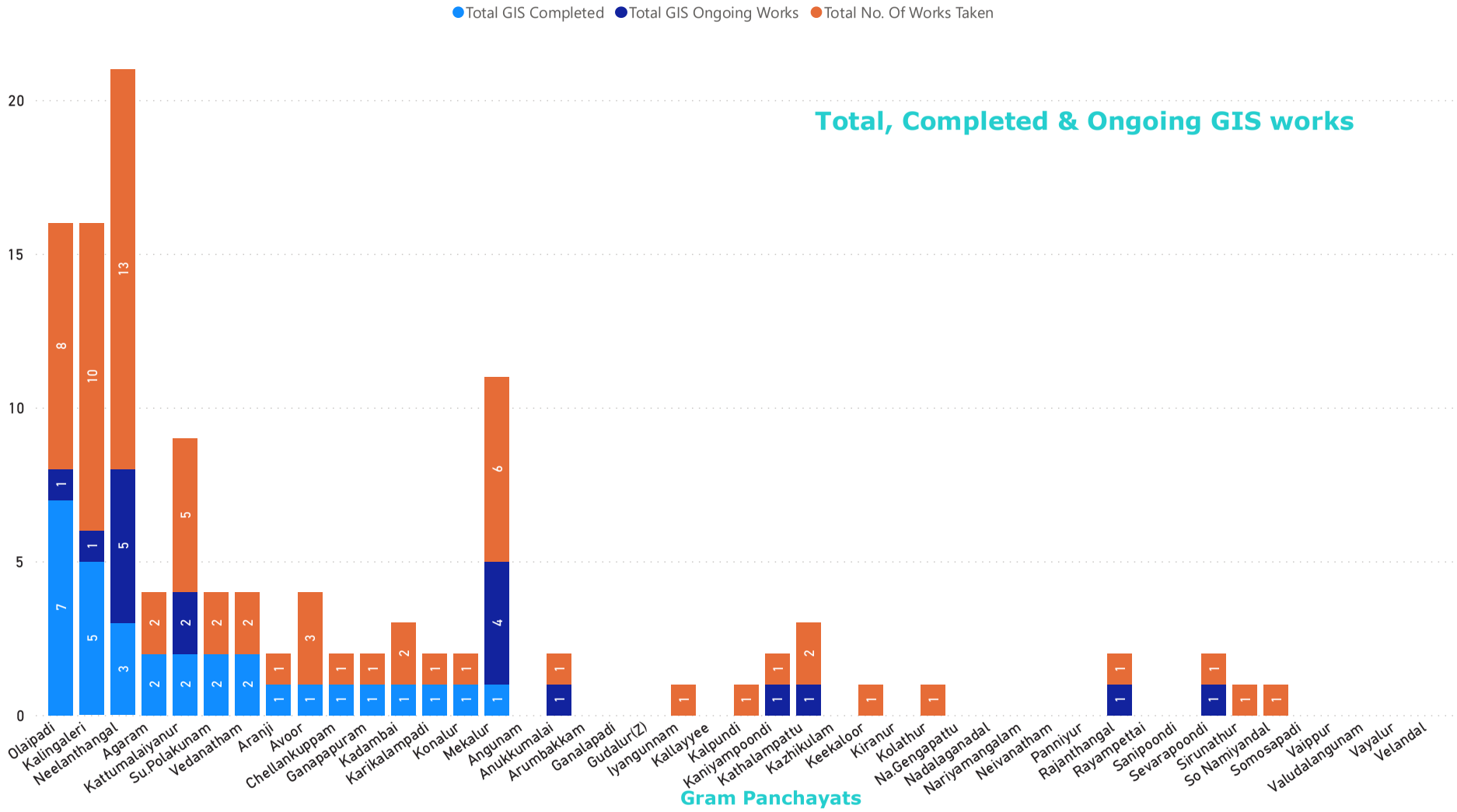
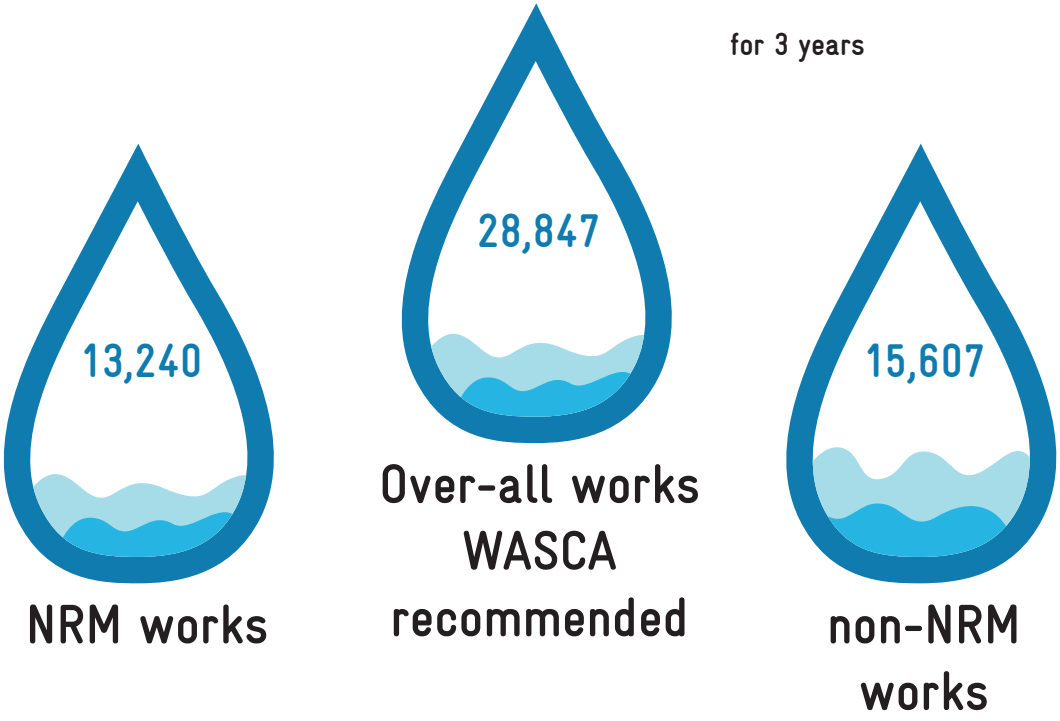


Figure 7.3. GP wise total, completed and ongoing GIS works

7.2 WASCA RECOMMENDED NRM AND NON-NRM WORKS

WASCA recommended 28,847 works for a period of 3 years, out of which 13,240 are NRM works and 15,607 are Non-NRM works (Figure 7.4). A total of 14,215 works has been uploaded so far for the financial year 2021-22 as on 04/02/2022.



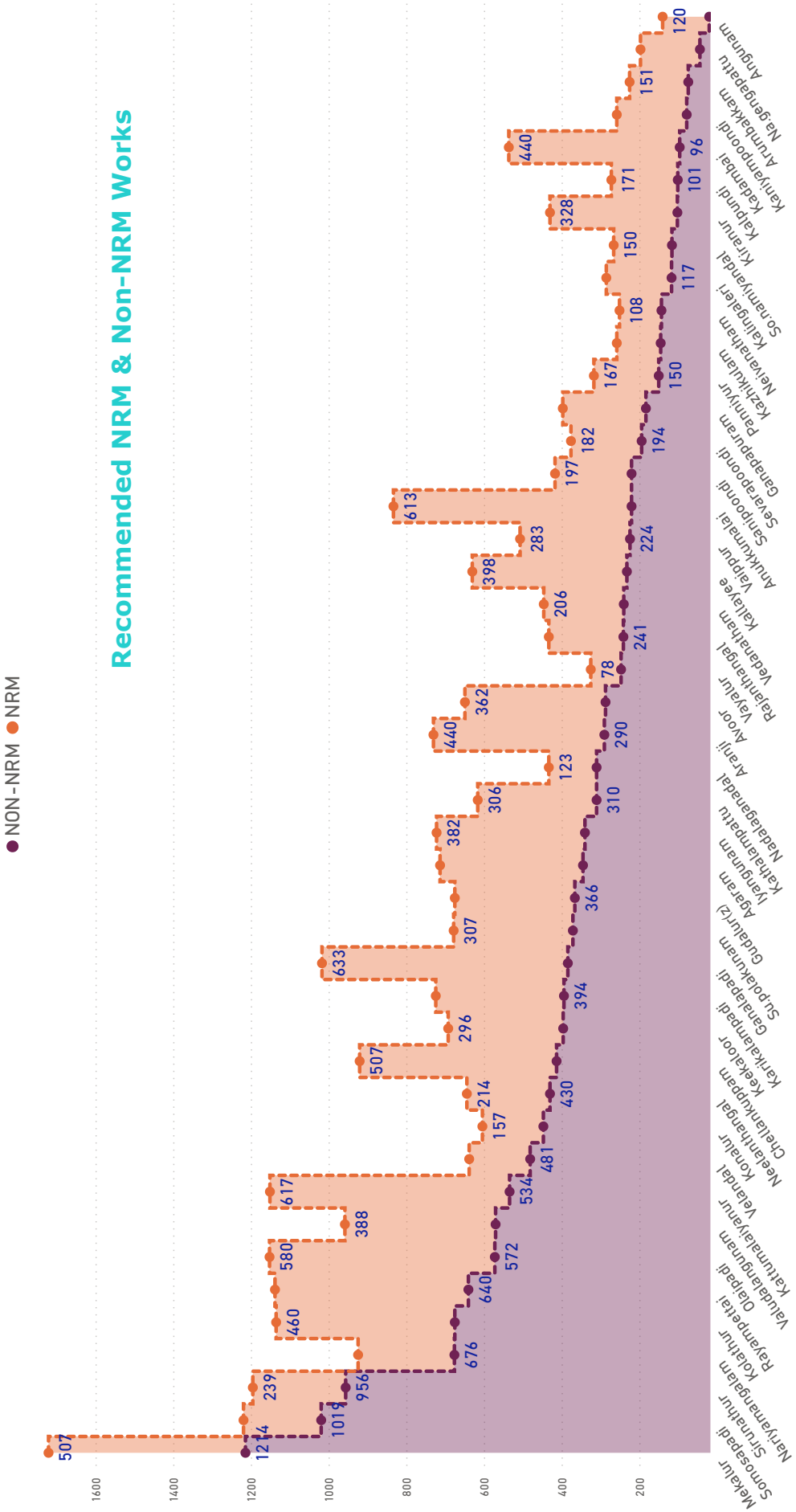


Figure 7.4. GP wise recommended NRM and Non-NRM works

7.3 ONGOING WORKS

The ongoing works in Kilpennathur Block includes Anganwadi/Other Rural Infrastructure, Drought Proofing, Rural Sanitation, Water conservation and water harvesting (WCWH), and Works on Individuals Land (Category IV). A total of 35 works are ongoing in the Block, in which individual beneficiary oriented works are more (88 %) followed rural sanitaion (5 %) while WCWH, Anganwadi/Other Rural Infrastructure works are less in number (Figure 7.5). GP and work category wise ongoing works are tabulated in Annexure 7.2.

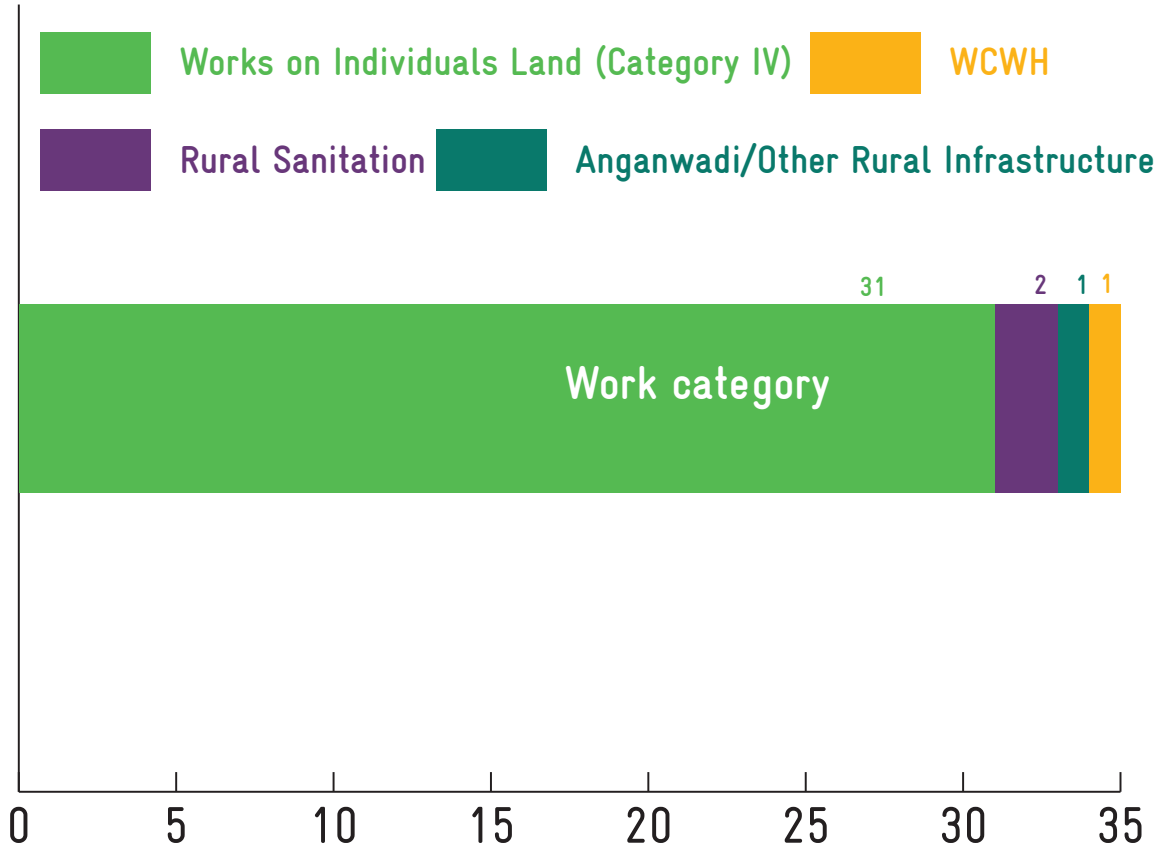


Figure 7.5. Category wise Ongoing works in Kilpennathur Block

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 Kilpennathur Block is Rs. 2,305.05 Lakhs, of it nearly 81.2 % of the expenditure utilized for watershed development (Figure 7.6).

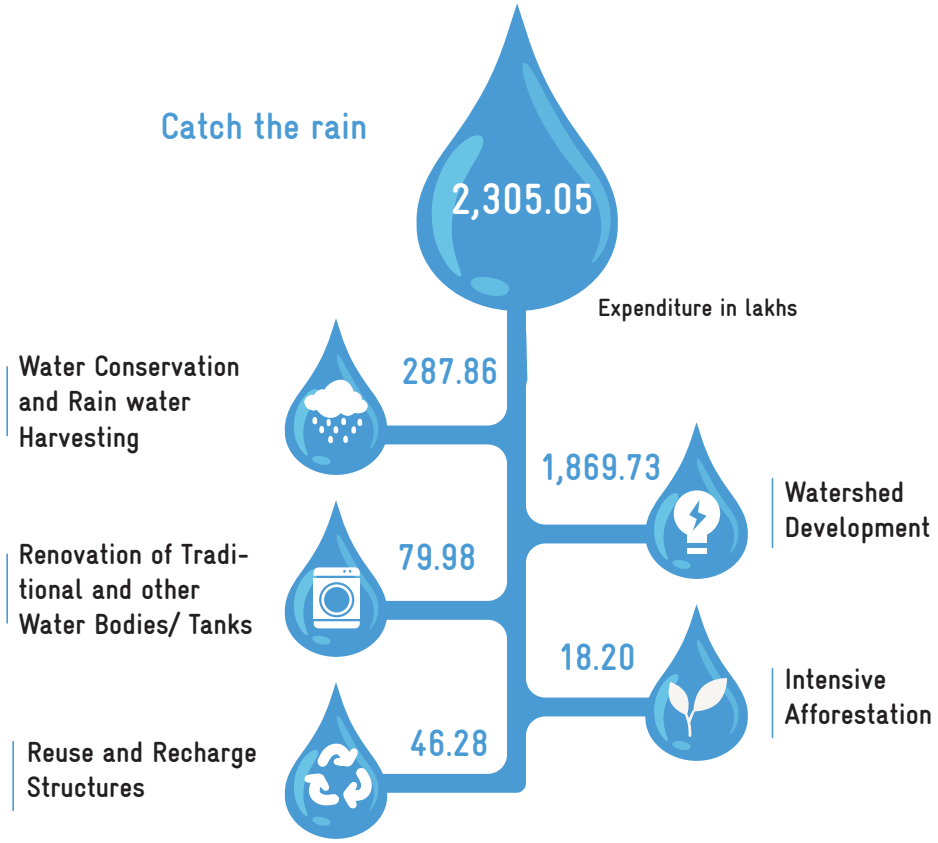
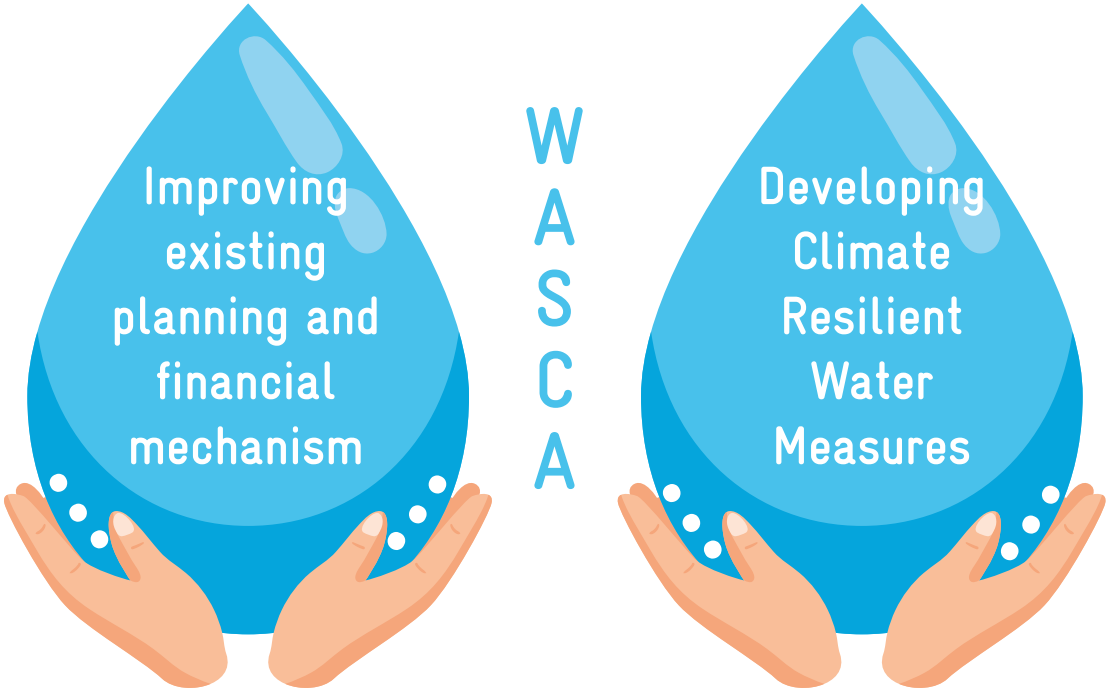


Figure 7.6. Catch the Rain campaign in Kilpennathur Block



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 KILPENNATHUR BLOCK

Kilpennathur Block comes under Thurinjalar and Varahanadhi sub-basins and has Thurinjalar, Tondi Veraha and Pambai macro-watersheds. Thurinjalar watershed (4C1B3) has 52 micro-watersheds covering an area of 26199.23 ha. Tondi Veraha watershed (4C1D3) has 25 micro-watersheds covering an area of 14011.65 ha. Pambai watershed (4C1D1) has 2 micro-watersheds covering an area of 666.08 ha. (Table 24 & Figure 8.1). Out of 45 GPs in the Block, 31 GPs fall under Thurinjalar (4C1D3) watershed, 10 GPs fall under Tondi Veraha (4C1D3) watershed. Three GPs have watershed boundaries passing through Thurinjalar and Tondi Veraha. One GP has watershed boundaries passing through Thurinjalar & Pambai. (Table 25 & 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.

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

Macro-watershed	Area in ha	No. of micro-watersheds
Thurinjalar	26,199.23	52
Tondi Veraha	14,011.65	25
Pambai	666.08	2

TABLE 25. NO. OF GPs COVERED UNDER WATERSHEDS IN KILPENNATHUR BLOCK

Name of watershed	No. of GPs
Thurinjalar	31
Tondi Veraha	10
Thurinjalar & Tondi Veraha	3
Thurinjalar & Pambai	1

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 26 & Figure 8.3) and GPs boundaries (Table 27 & 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.

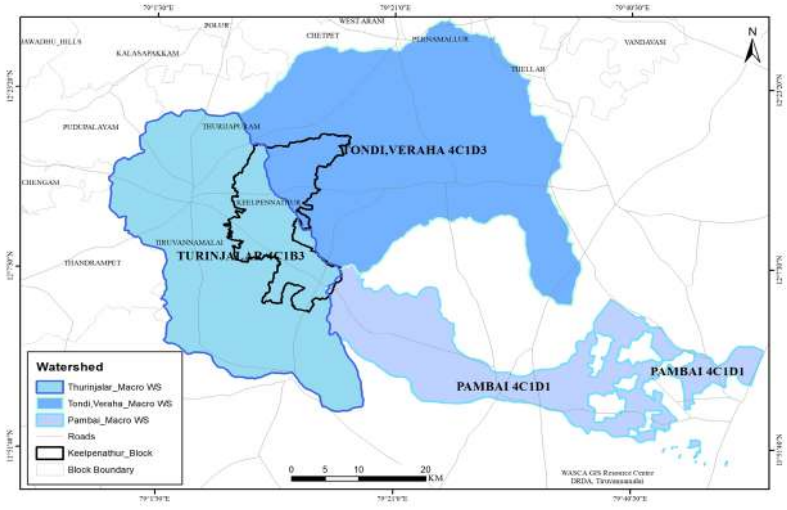


Figure 8.1. Macro-watershed Map of Kilpennathur Block

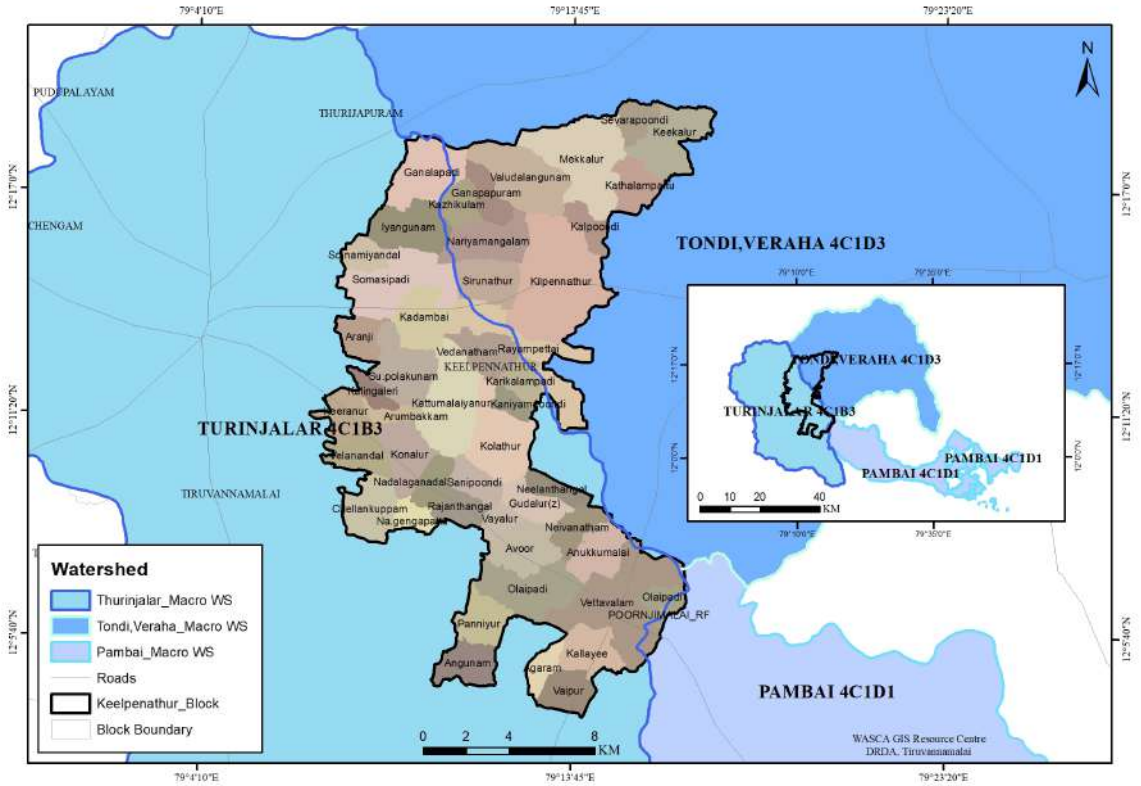


Figure 8.2. Macro-watershed with GPs map

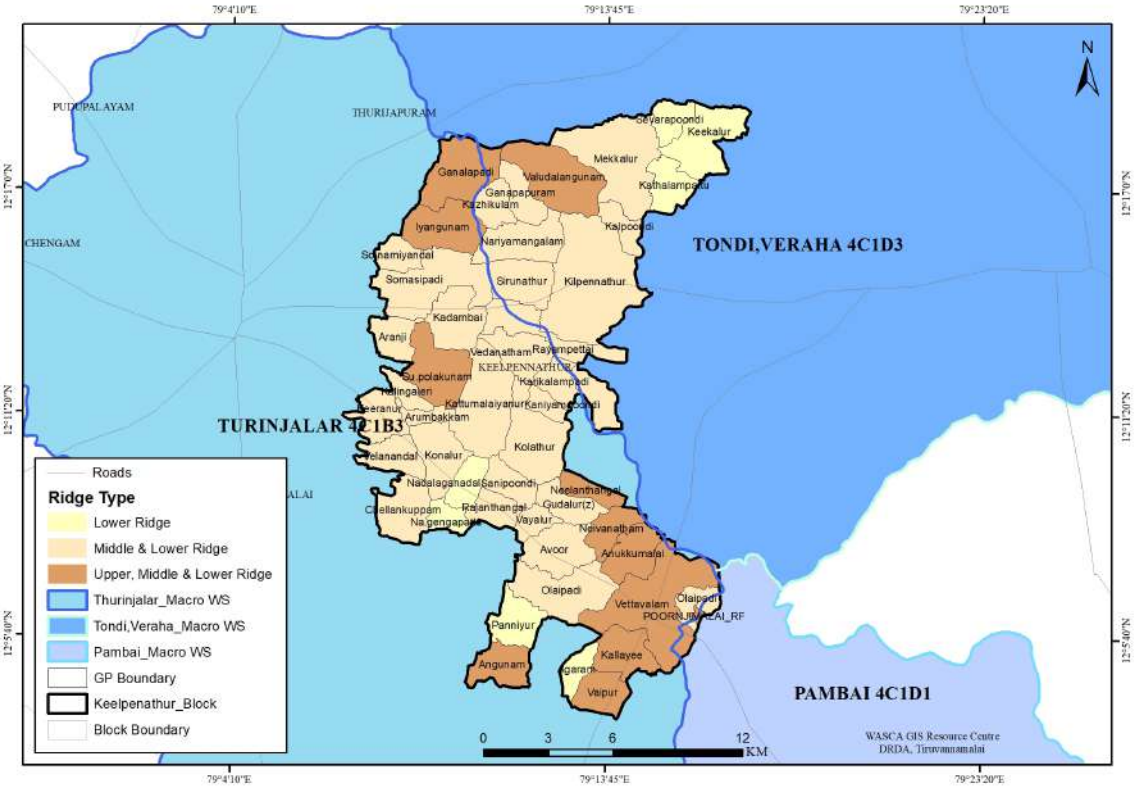


Figure 8.3. Macro-watershed Ridge Map

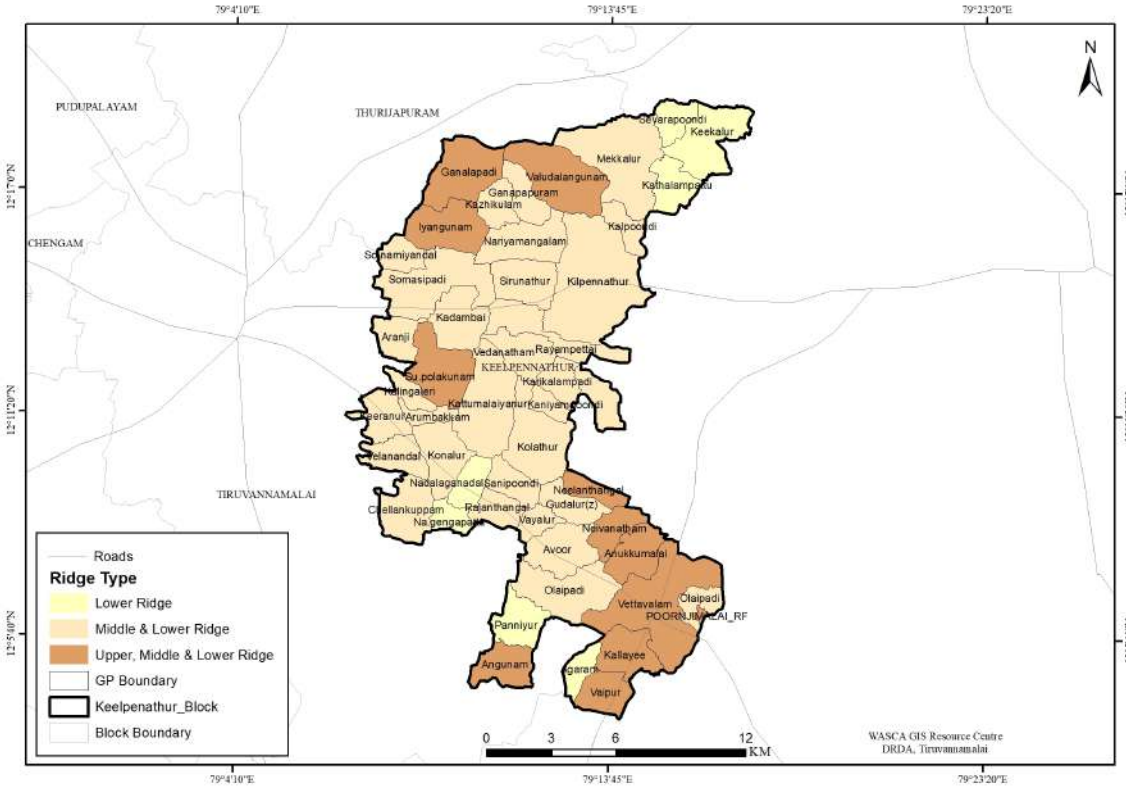


Figure 8.4. GP level Ridge Map

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 Kilpennathur Block are listed in Tables 28 to 37.

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

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C1B3d12c	442.19	Upper, Middle & Lower
2	4C1B3d12b	664.53	
3	4C1B3d11c	483	
4	4C1B3d04b	438.9	
5	4C1B3d08b	568.89	
6	4C1B3b10b	606.68	
7	4C1B3b10c	449.5	
8	4C1B3b09c	245.42	
9	4C1B3b09b	322.14	
10	4C1B3d06a	726.45	
11	4C1B3b09a	611.5	
12	4C1B3b07b	505.39	
13	4C1B3b06d	230.44	
14	4C1B3b07c	193.81	
15	4C1B3d12d	576.37	Middle & Lower
16	4C1B3d12a	435.32	

17	4C1B3d11b	639	Middle & Lower
18	4C1B3d05b	726.82	
19	4C1B3d05c	267.83	
20	4C1B3d10c	389.57	
21	4C1B3d11a	606.61	
22	4C1B3d10b	635.56	
23	4C1B3d04c	509.8	
24	4C1B3d05a	502.02	
25	4C1B3d04a	592.43	
26	4C1B3c03a	676.47	
27	4C1B3d03a	708.09	
28	4C1B3d07b	409.87	
29	4C1B3b08c	744.51	
30	4C1B3c03c	716.13	Lower
31	4C1B3d10a	539.49	
32	4C1B3d09c	405.51	
33	4C1B3c03b	451.8	
34	4C1B3d03b	306.4	
35	4C1B3d07c	401.48	
36	4C1B3d09a	833.16	
37	4C1B3c02c	628.68	
38	4C1B3d08c	363.25	
39	4C1B3c02b	621.02	
40	4C1B3d07a	676.97	
41	4C1B3d08a	427.82	
42	4C1B3d02c	402.37	
43	4C1B3d06d	484.42	
44	4C1B3b10a	422.05	
45	4C1B3d06c	625.63	
46	4C1B3d06b	630.15	
47	4C1B3b08b	353.05	
48	4C1B3d01c	347.75	
49	4C1B3b08a	409.65	
50	4C1B3b07a	379.06	
51	4C1B3d01a	465.4	
52	4C1B3b06b	398.88	

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

Sl.No	Name of the GP	Ridge Type
1	Su.polakunam	Upper, Middle & Lower
2	Iyangunam	
3	Vaipur	
4	Neivanatham	
5	Anukkumalai	
6	Neelanthangal	

7	Kallayee	Upper, Middle & Lower
8	Angunam	
9	Vedanatham	Middle & Lower
10	Chellankuppam	
11	So.namiyandal	
12	Aranji	
13	Kalingaleri	
14	Keeranur	
15	Konalur	
16	Velanandal	
17	Rajanthangal	
18	Sanipoondi	
19	Arumbakkam	
20	Kaniyampoondi	
21	Somasipadi	
22	Kadambai	
23	Kattumalaiyanur	
24	Avoor	
25	Kolathur	
26	Gudalur Z	
27	Vayalur	
28	Na.gengapattu	Lower Ridge
29	Nadalaganadal	
30	Panniyur	
31	Agaram	

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

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	505
2	Drainage Line Treatment (m)		13,110
3	CC Check dams (No.)	Middle	24
4	Block Plantation (Community) (ha)		277
5	Avenue plantation (m)		1,00,796
6	Composting (No.)	Lower	272
7	Canal Bund Plantation (m)		84,100
8	Restoration of water bodies: Tanks and Ooranis (No.)		223
9	Artificial Recharge Structure (No.)		1,253
10	Farm Bunding with Boundary Trenches - Individual (ha)		238
11	Construction of Farm Ponds - Individual (No.)		405
12	Land development - Individual (ha)		350
13	Azolla units - Individual (No.)		1,297
14	NADEP Vermi compost (No.)		1,086

15	Cattle Shelters (No.)	Lower	1,282
16	Goat Sheep Shelters (No.)		906
17	Cattle Trough (No.)		1,282
18	Construction of new open wells & Recharge Shafts (No.)		1,233
19	Soak Pits (Community) (No.)		185
20	Soak Pits (Individual) (No.)		985
21	Roof Rain Water Harvesting (No.)		54
22	Nutri Garden (No.)		1,282
23	Silt application (No.)		350

TABLE 29. MICRO-WATERSHED IN KILPENNATHUR BLOCK FALLING UNDER TONDI VERAHA MACRO- WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C1D3f08c	745.1	Upper, Middle & Lower
2	4C1D3f08d	417.58	
3	4C1D3f14c	515.46	
4	4C1D3f13d	269.83	Middle & Lower
5	4C1D3f08a	564.03	
6	4C1D3f13c	455.03	
7	4C1D3f13b	621.03	
8	4C1D3f13a	452.76	
9	4C1D3f12b	415.12	
10	4C1D3f12d	519.75	
11	4C1D3f12c	881.59	
12	4C1D3f12a	661.23	
13	4C1D3f15d	493.76	
14	4C1D3g04a	889.91	Lower
15	4C1D3g04c	613.62	
16	4C1D3f07c	528.66	
17	4C1D3f07d	712.92	
18	4C1D3f07a	698.44	
19	4C1D3g04d	334.53	
20	4C1D3f07b	313.12	
21	4C1D3f06b	668	
22	4C1D3f08b	248.34	
23	4C1D3f06c	456.6	
24	4C1D3f10c	900.77	
25	4C1D3f15b	634.46	

TABLE 30. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER TONDI VERAHA MACRO-WATERSHED IN KILPENNATHUR BLOCK

Sl.No	Name of the GP	Ridge Type
1	Valudalangunam	Upper, Middle & Lower
2	Nariyamangalam	Middle & Lower
3	Kazhikulam	
4	Sirunathur	
5	Kalpoondi	
6	Ganapapuram	
7	Mekkalur	
8	Sevarapoondi	Lower
9	Kathalampattu	
10	Keekalur	

TABLE 31. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER TONDI VERAHA MACRO-WATERSHED IN KILPENNATHUR BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	47.55
2	CC Check dams (No.)	Middle	5
3	Block Plantation (Community) (ha)		31.11
4	Avenue plantation (m)		12442
5	Agro Forestry (ha)		46.21
6	Composting (No.)	Lower	32
7	Canal Bund Plantation (m)		10130
8	Restoration of water bodies: Tanks and Ooranis (No.)		18
9	Artificial Recharge Structure (No.)		20
10	Farm Bunding with Boundary Trenches - Individual (ha)		40.13
11	Construction of Farm Ponds - Individual (No.)		47
12	Land development - Individual (ha)		40.13
13	Azolla units - Individual (No.)		119
14	NADEP Vermi compost (No.)		119
15	Cattle Shelters (No.)		119
16	Goat Sheep Shelters (No.)		112
17	Cattle Trough (No.)		119
18	Construction of new open wells & Recharge Shafts (No.)		20
19	Soak Pits (Community) (No.)		11
20	Soak Pits (Individual) (No.)		119
21	Roof Rain Water Harvesting (No.)	Lower	20
22	Nutri Garden (No.)		119
23	Silt application (No.)		40

TABLE 32. MICRO-WATERSHED IN KILPENNATHUR BLOCK FALLING UNDER PAMBAI MACRO-WATERSHED

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4C1D1d15c	332.72	Upper, Middle & Lower
2	4C1D1d15b	333.36	

TABLE 33. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER THURINJALAR & PAMBAI MACRO- WATERSHED IN KILPENNATHUR BLOCK

Sl.No	Name of the GP	Ridge Type
1	Olaipadi	Middle & Lower

TABLE 34. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER THURINJALAR & PAMBAI MACRO- WATERSHED IN KILPENNATHUR BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	91.2
2	CC Check dams (No.)	Middle	2
3	Block Plantation (Community) (ha)		11.45
4	Avenue plantation (m)		6,472
5	Composting (No.)	Lower	40
6	Canal Bund Plantation (m)		9,600
7	Restoration of water bodies: Tanks and Ooranis (No.)		19
8	Artificial Recharge Structure (No.)		91
9	Farm Bunding with Boundary Trenches - Individual (ha)		49.76
10	Construction of Farm Ponds - Individual (No.)		60
11	Land development - Individual (ha)		49.73
12	Azolla units - Individual (No.)		90
13	NADEP Vermi compost (No.)		90
14	Cattle Shelters (No.)		90
15	Goat Sheep Shelters (No.)		26
16	Cattle Trough (No.)		90
17	Construction of new open wells & Recharge Shafts (No.)		91
18	Soak Pits (Community) (No.)		5
19	Soak Pits (Individual) (No.)		91
20	Roof Rain Water Harvesting (No.)		2
21	Nutri Garden (No.)		91
22	Silt application (No.)		49

TABLE 35. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER THURINJALAR & TONDI VERAHA MACRO-WATERSHED IN KILPENNATHUR BLOCK

Sl.No	Name of the GP	Ridge Type
1	Ganalapadi	Upper, Middle & Lower
2	Karikalampadi	Middle & Lower
3	Rayampettai	

TABLE 36. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER THURINJALAR & TONDI VERAHA MACRO- WATERSHED IN KILPENNATHUR BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Afforestation in Public/common lands (ha)	Upper	63.84
2	CC Check dams (No.)	Middle	2
3	Block Plantation (Community) (ha)		82.42
4	Avenue plantation (m)		13,206
5	Agro Forestry (ha)		102.43
6	Composting (No.)	Lower	47
7	Canal Bund Plantation (m)		9,250
8	Restoration of water bodies: Tanks and Ooranis (No.)		22
9	Artificial Recharge Structure (No.)		304
10	Farm Bunding with Boundary Trenches - Individual (ha)		58.37
11	Construction of Farm Ponds - Individual (No.)		79
12	Land development - Individual (ha)		58.37
13	Azolla units - Individual (No.)		206
14	NADEP Vermi compost (No.)		206
15	Cattle Shelters (No.)		206
16	Goat Sheep Shelters (No.)		299
17	Cattle Trough (No.)		206
18	Construction of new open wells & Recharge Shafts (No.)		304
19	Soak Pits (Community) (No.)		19
20	Soak Pits (Individual) (No.)		306
21	Roof Rain Water Harvesting (No.)		6
22	Nutri Garden (No.)		206
23	Silt application (No.)		58

8.2 MODEL MICRO-WATERSHED- VALUDALANGUNAM

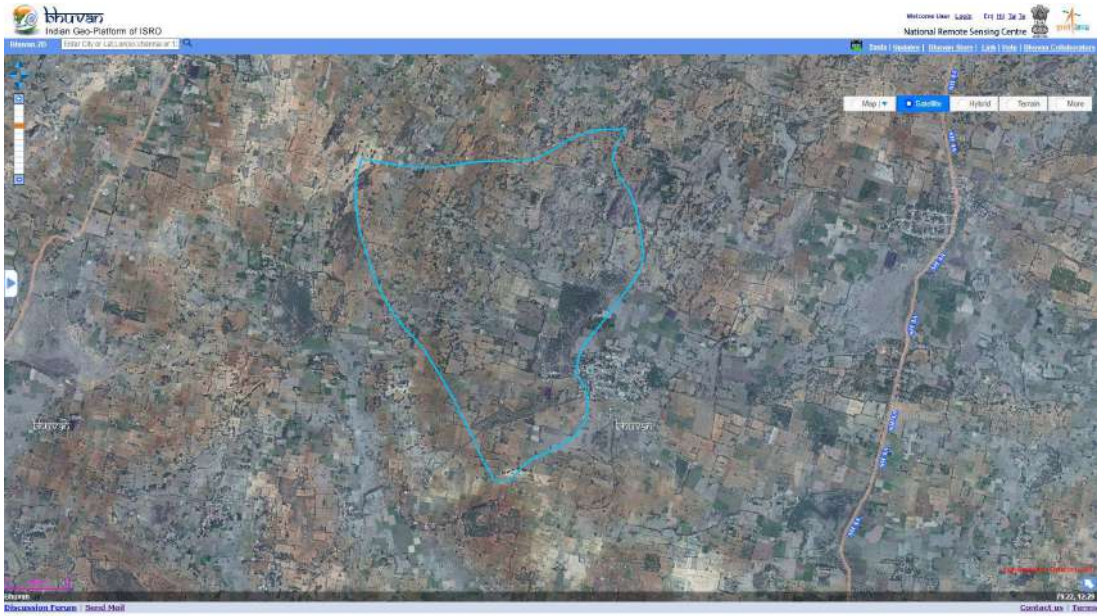


Figure 8.5. Satellite image of Valudalangunam micro-watershed

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.

VALUDALANGUNAM MICRO-WATERSHED

Valudalangunam micro-watershed falls under Valudalangunam and Mekalur GPs, Kilpennathur Block in Thiruvannamalai District (Figure 8.5 and 8.6). This micro-watershed is a part of Tondi Veraha macro-watershed in Varahanadhi sub-basin. The general information, geology, hydrogeology, natural drainage line, catchment area, ground water status, water budget of Valudalangunam 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 37 to 48). The key CWRM parameters for the GPs falling in this micro-watershed is Annexed 8.

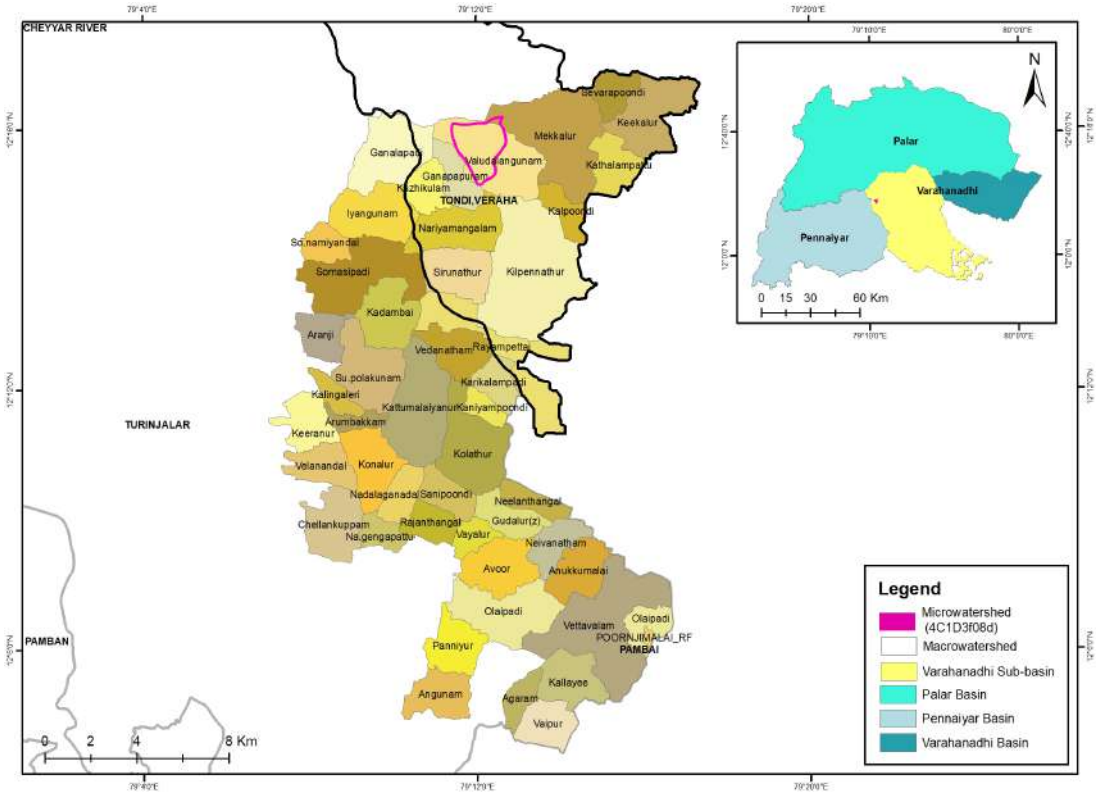


Figure 8.6. Valudalangunam micro-watershed with GPs

TABLE 37. GENERAL INFORMATION OF THE MICRO-WATERSHED

Name of the micro-watershed	Valudalangunam
Micro-watershed Number	**4C1D3f08d**
Name of the Basin	**Varahanadhi Basin**
Name of the subbasin	Varahanadhi Sub Basin
Name of the macro-watershed	Tondi, Veraha
Number of GPs covered under the micro-watershed	2
Name of the GPs	1. Valudalangunam
	2. Mekalur
Latitude of micro-watershed (From To)	12°16'42.93"N to 12°18'6.74"N
Longitude of micro-watershed (From To)	79°11'32.25"E to 79°12'42.76"E
Total area of the micro-watershed in ha	418
% of micro-watershed area in Valudalangunam GP	97%
% of micro-watershed area in Mekalur GP	3%
Area of micro-watershed falling in Valudalangunam GP (ha)	405
Area of micro-watershed falling in Mekalur GP (ha)	13
Total Population of Valudalangunam GP	3,230
Total Population of Mekalur GP	4,657
Annual Average Rainfall (mm)	1047
Annual maximum Temperature °C	33
Annual Minimum Temperature °C	22.8
Evapo-Transpiration Losses of Valudalangunam GP (ha.m)	36.53
Evapo-Transpiration Losses of Mekalur GP (ha.m)	29.84
Volumetric soil moisture availability (%)	23%
Climate Risk	Drought and heat waves
CVI Index Value for Valudalangunam (Based on WASCA Climate study)	0.534
CVI Index Value for Mekalur GP (Based on WASCA Climate study)	0.588
Agro-Climatic Zone	North eastern zone (TN-1)
Agro Ecological Sub-Region (ICAR)	Eastern Ghats
Status of Ground water in Valudalangunam GP	Over Exploited
Status of Ground water in Mekalur GP	Over Exploited

TABLE 38. 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
Barren & waste lands (ha)	42 (Upper & Middle ridges)

TABLE 39. MICRO-WATERSHED'S CATCHMENT AREA

Catchment Area in ha	Valudalangunam GP	Mekalur GP
Good catchment area	230	301.06
Average catchment area	14.76	0
Bad catchment area	737.61	1074.83

TABLE 40. NATURAL DRAINAGE LINES & HILLOCKS IN VALUDALANGUNAM MICRO-WATERSHED

No. of 1st Order drains	1
Total length of natural drainage line (m)	1,809
Drainage density (ha.m)	4.33
No. of Hillocks/hills surrounding the micro-watershed	1
Type of Hillocks / hills	Highly degraded

TABLE 41. GROUND WATER STATUS OF MICRO-WATERSHED

Firka Assessment Unit for Valudalangunam and Mekalur GP in ha.m	
Name of the Firka (Assessment Unit) falling under micro-watershed	Kilpennathur
Net Annual Ground Water Availability	1,764.12
Existing Gross Ground Water Draft for Irrigation	1,869.20
Existing Gross Ground Water Draft for domestic and industrial water supply	66.32
Existing Gross Ground Water Draft for All uses	1,935.52
Provision for domestic and industrial requirement supply to 2025	75.37
Net Ground Water Availability for future irrigation development	-180.45

TABLE 42. GP WISE WATER BUDGET OF MICRO-WATERSHED- VALUDALANGUNAM & MEKALUR

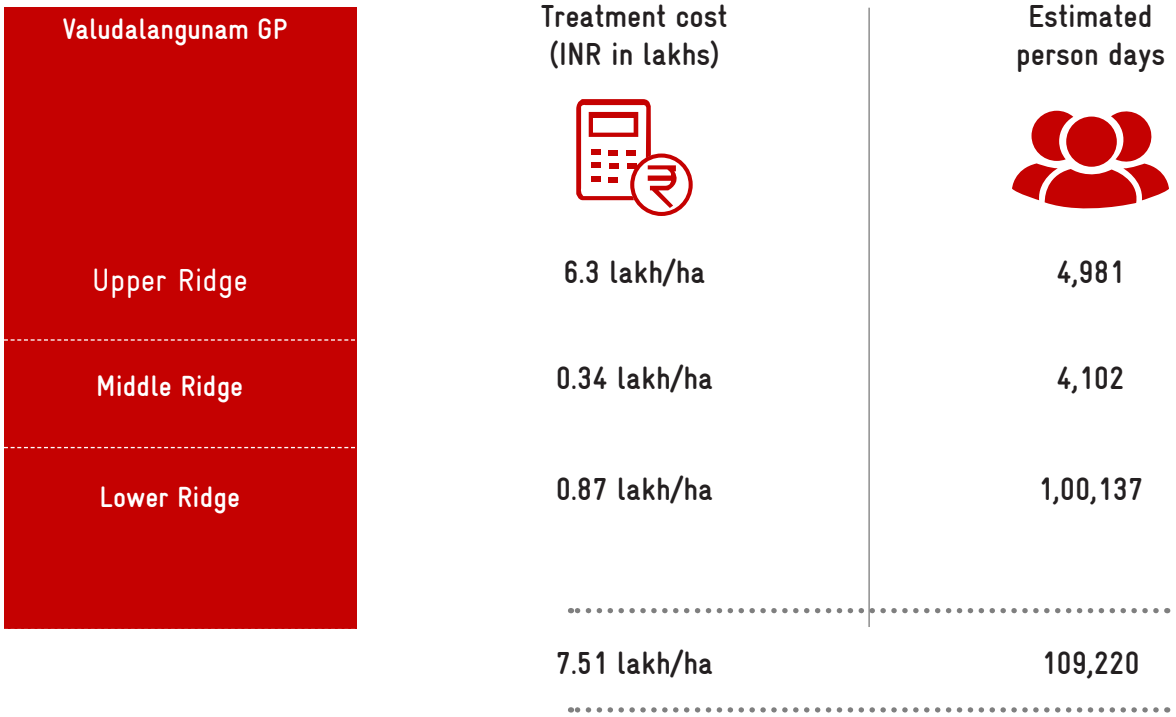
Water Budget in ha.m	Valudalangunam GP	Mekalur GP
Water for Human	8.84	12.75
Water for Agriculture	231.6	378.3
Water for Animal	4.03	4.62
Village wise water required	244.4	395.6
Available run-off from rain water (derived from strange method)	228.3	313.9
Harvested Runoff from Water Harvesting Activities	1.1	2.2
Potential Harvesting from proposed Interventions	45.9	105.1
Total Water harvested	47	107.3
Water demand and Supply Difference	-197.4	-288.4
Water Demand Supply Gap Status	Deficient	Deficient
Per capita Water Availability in cum	706.81	674.04
International Standard per capita water Availability in cum	1,700	1,700
Water Availability Gap	-993.19	-1,025.96
Water security status	Water Stress	Water Stress

TABLE 43. GP WISE PROPOSED MICRO-WATERSHED WORKS – VALUDALANGUNAM AND MEKALUR

Ridge type	Valudalangunam GP	Mekalur GP
Upper	2	No works in Upper Ridge
Middle	7	No works in Middle Ridge
Lower	118	6
Total	**127**	**6**

TABLE 44. RIDGE WISE TREATMENT AREA, ESTIMATED COST AND PERSON DAYS REQUIRED - VALUDALANGUNAM AND MEKALUR

	Valudalangunam GP	Mekalur GP
Upper Ridge		
Estimated cost for Upper Ridge area (INR in Lakhs)	25.2	No works in Upper Ridge
Total area in ha of Upper Ridge	4	
Treatment cost of Upper Ridge Lakhs per ha	**6.3**	
Estimated Persondays generated for Treatment of Upper Ridge	**4,981**	
Middle Ridge		
Estimated cost for Middle Ridge area (INR in Lakhs)	10.5	No works in Middle Ridge
Total area in ha of Middle Ridge	31	
Treatment cost of Middle Ridge (Lakhs per ha)	**0.34**	
Estimated Person days generated for Treatment of Middle Ridge	**4,102**	
Lower Ridge		
Estimated cost for Lower Ridge area (INR in Lakhs)	322.42	34.6
Total area in ha of Lower Ridge	370	13
Treatment cost of Lower Ridge (INR in Lakhs per ha)	**0.87**	**2.66**
Estimated Person days generated for Treatment of Lower Ridge	**1,00,137**	**11,742**

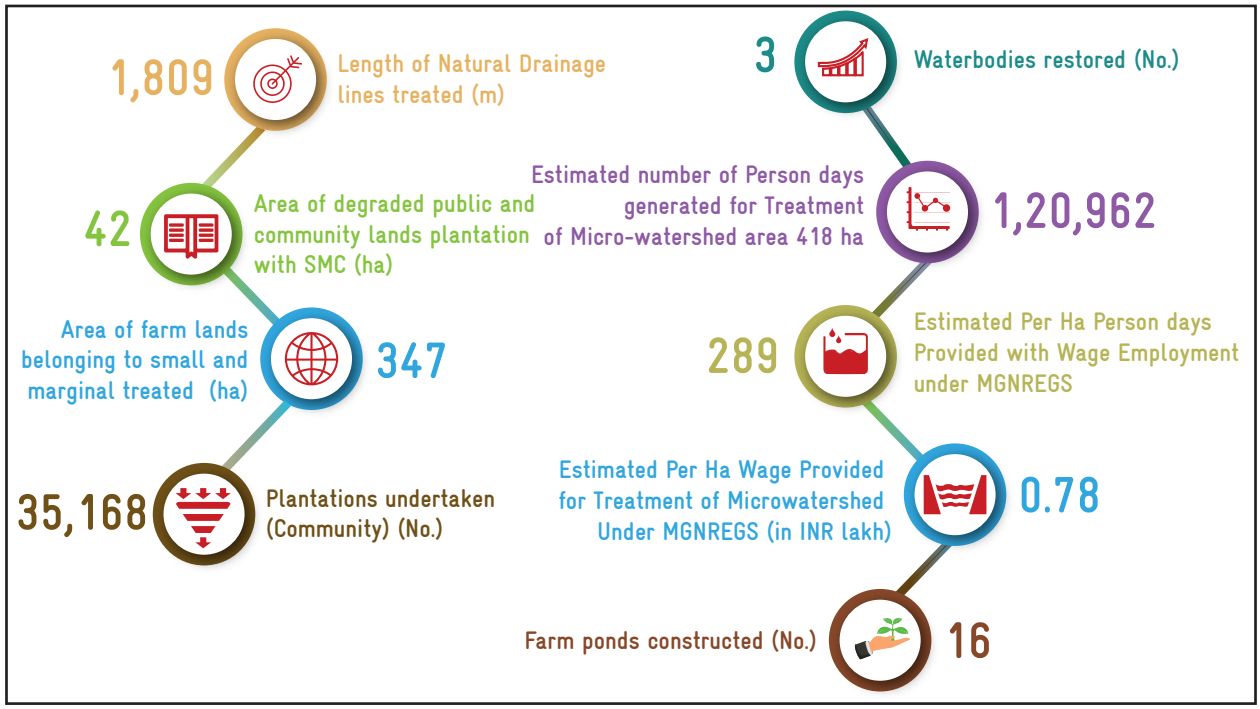


Mekalur GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	NA	NA
Lower Ridge	2.66 lakh/ha	11,742
	2.66 lakh/ha	11,742

TABLE 45. NATURE AND NO. OF WORKS IN MICRO-WATERSHED

Description	Number
Total No. of works in Micro-watershed area (Arable, Non arable & DLT)	97
Total No. of works in Micro-watershed including livelihood Activities	15
Total No. of works in Micro-watershed including Rural Greywater Management Activities	21

TABLE 46. KEY OUTCOMES OF INTERVENTION



Expenditure for FY 2020-21 (in INR lakh)

Valudalangunam GP	36.44 lakh
Mekalur GP	57.77 lakh

TABLE 47. ESTIMATES OF MICRO-WATERSHED IN VALUDALANGUNAM 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						
Avenue plantation	Lower	Commenced	3.321	1	5.9778	2,335
Restoration of Traditional water bodies: (Union Tank) (No.)			2	2	50	16,000
Water Absorption Trench (m)		Not commenced	3,000	1	49	3,150
Loose boulder check dam (No.)			2	2	1.7	84
Sunken Pit in 1st order drain (No.)			2	2	3.08	766
Tank bund Plantation (No.)			2	2	3.6	1,406
Afforestation (ha)			3	1	25.8	10,032
Block Plantation (ha)			1	1	11.1	4,320
Silvi Pasture (ha)			2	1	34.2	13,328
Compost Pit (No.)			13	13	2.21	195
Restoration of Traditional water bodies: (Pond) (No.)			1	1	1	200
Staggered Trench (No.)	Upper & Middle		6,400	1	6.72	2,048
Greening of Hillocks Plantation and Maintenance (No.)			6,400	1	18.3	2,933
Sub total				**29**	**212.24**	**56,797**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Azolla Production units - Individual (No.)	Lower	Commenced	6	6	0.9	138
NADEP Vermi compost (No.)			6	6	1.08	162
Artificial Recharge Structure for borewell farmers (No.)		Not commenced	15	15	37.5	5,865
Dryland Horticulture (ha & No.)			10	4	34	13,284
			4			
Silt application (No.)			4	4		
Fodder development - Individual (No.)			6	6	8.88	14,064
Construction of Farm Ponds - Individual (No.)		Ongoing	14	14	28	10,934

Farm Bunding with Boundary Trenches - Individual (ha & No.)	Middle	Not commenced	15	7	10.5	4,102
Construction of Farm Ponds - Individual			7			
Sub total				**62**	**120.86**	**48,549**
Total				**91**	**333.1**	**1,05,346**
Livelihood enhancement activities for Individual Farmers (dryland)						
Cattle Shelters (No.)	Lower	Commenced	6	6	12.72	1,986
Goat Sheep Shelters (No.)			3	3	6.81	1,065
Cattle Trough (No.)		Not commenced	6	6	0.3	36
Sub total				**15**	**19.83**	**3,087**
Rural Greywater and Rooftop Rainwater Management						
Rainwater Harvesting Structures (No.)	Lower	Not commenced	1	1	4	625
Nutri Garden (No.)			10	10	0.01	
Soak Pits (Individual) (No.)		Ongoing	10	10	1	160
Sub total				**21**	**5.01**	**787**
Total				**127**	**357.94**	**1,09,220**

TOTAL ESTIMATES OF MICRO-WATERSHED IN VALUDALANGUNAM GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Valudalangunam GP	127	357.94	1,09,220

TABLE 48. ESTIMATES OF MICRO-WATERSHED IN MEKALUR 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						
Afforestation (No.)	Lower	Not commenced	1	1	8.6	3,344
Compost Pit (No.)			2	2	0.34	30
Sub total				**1**	**8.6**	**3,344**

Works in Individual Farmer lands (Agriculture and Allied Activities)						
Artificial Recharge Structure for borewell farmers (No.)	Lower	Not commenced	1	1	7.5	1,173
Farm Bunding with Boundary Trenches - Individual (ha & No.)	Lower	Not commenced	5			
Sub total			**2**	**2**	**4.5**	**1,758**
Construction of Farm Ponds - Individual (No.)	Lower	Ongoing	2	2	14	5,467
Sub total				**5**	**26**	**8,398**
Total				**6**	**34.6**	**11,742**

TOTAL ESTIMATES OF MICRO-WATERSHED IN MEKALUR GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Mel Sholankuppam GP	6	34.6	11,742

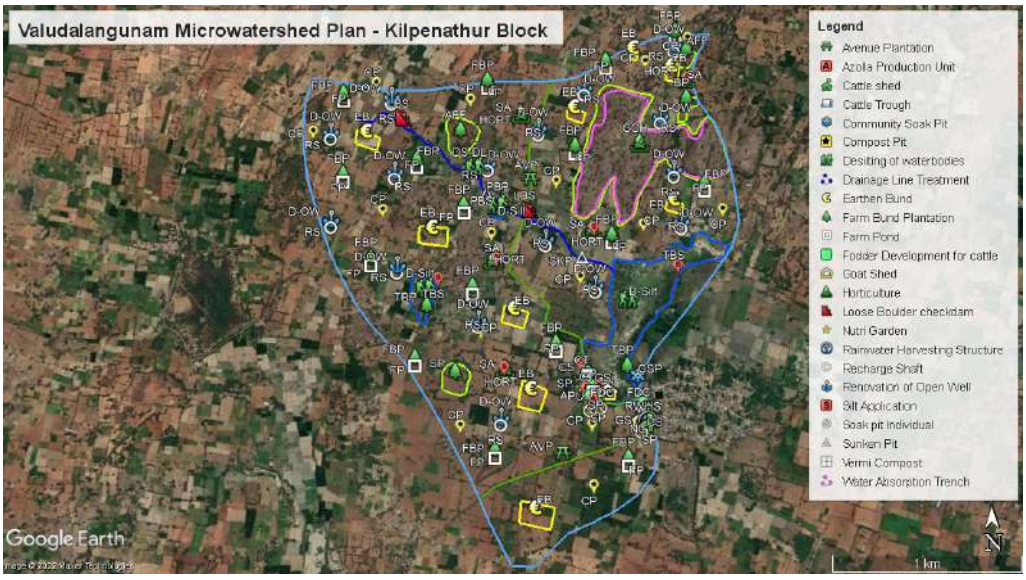
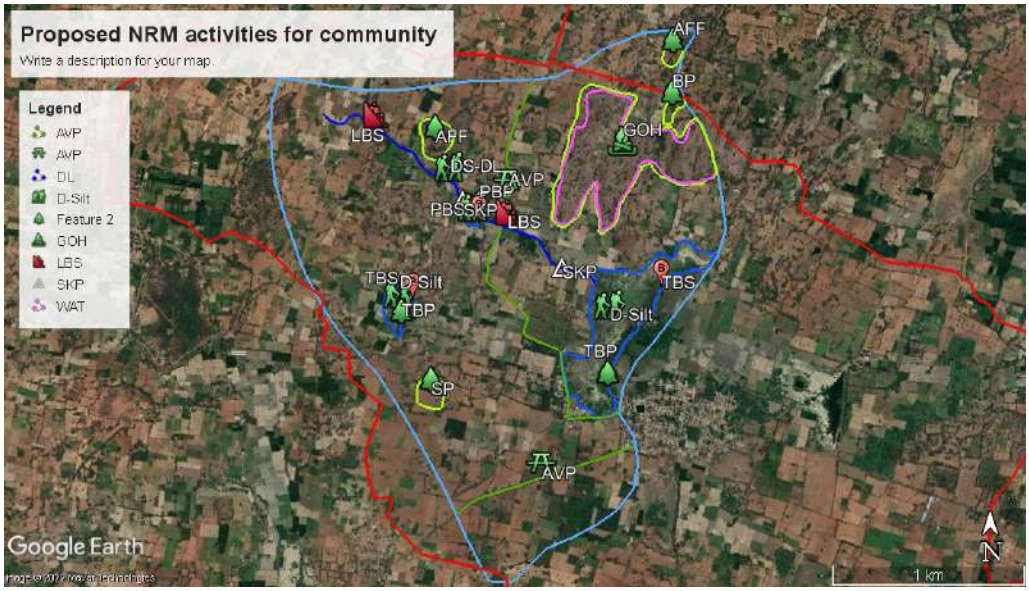


Figure 8.7. Proposed activities in Valudalangunam micro-watershed


Proposed NRM activities for community
Write a description for your map.
Legend
AVP
AVP
DL
D-Silt
Feature 2
GOH
LBS
SKP
WAT
AFF
BP
GOH
LBS
AFF
DS-DL
AVP
PBF
PBS
SKP
LBS
SKP
TBS
TBS
D-Silt
TBP
D-Silt
TBP
SP
AVP
Google Earth
1 km
N


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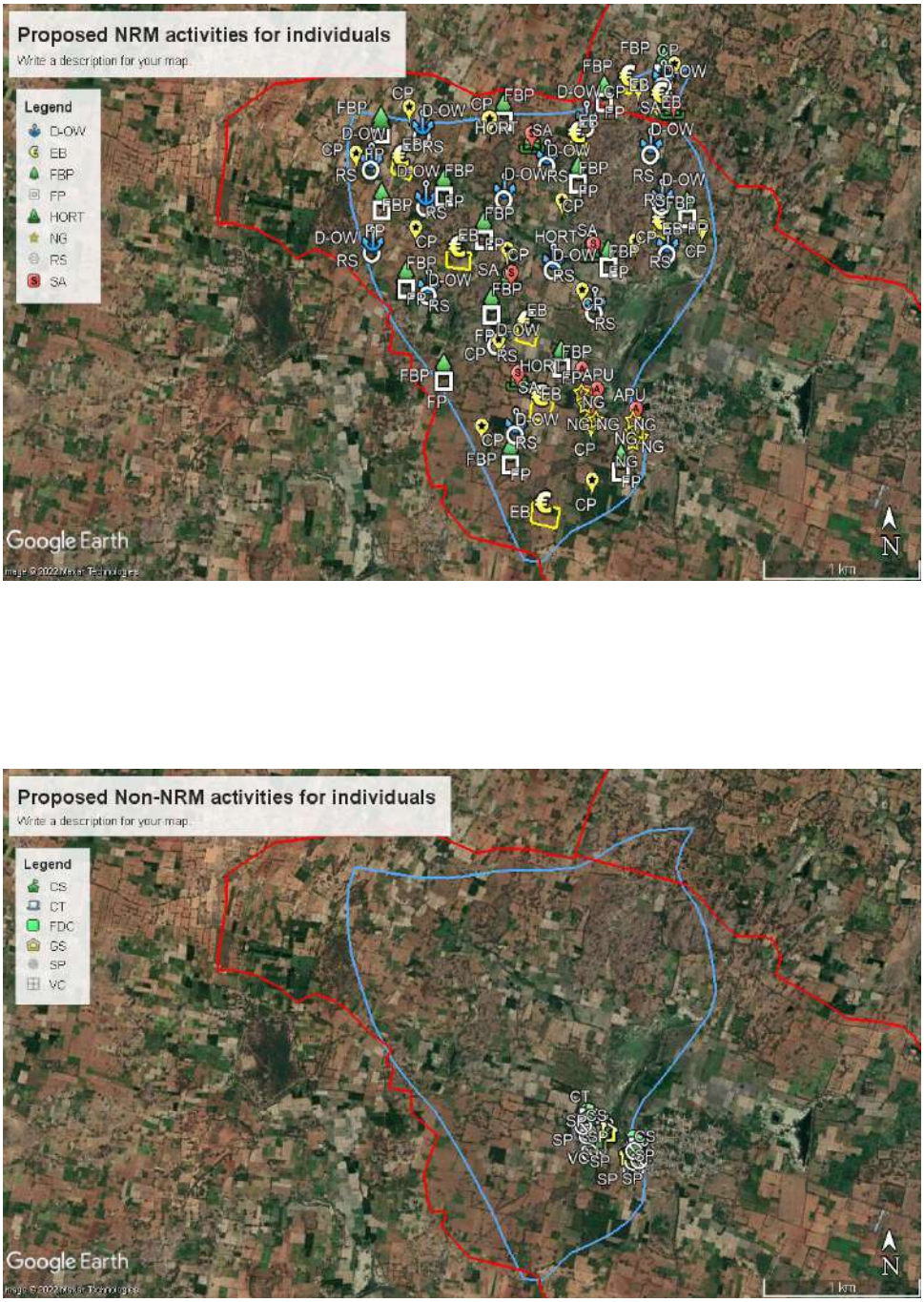


Figure 8.8. Proposed activities in Valudalangunam micro-watershed A: NRM activities for community. B: Non-NRM activities for community. C: NRM activities for Individuals. D: Non-NRM activities for Individuals

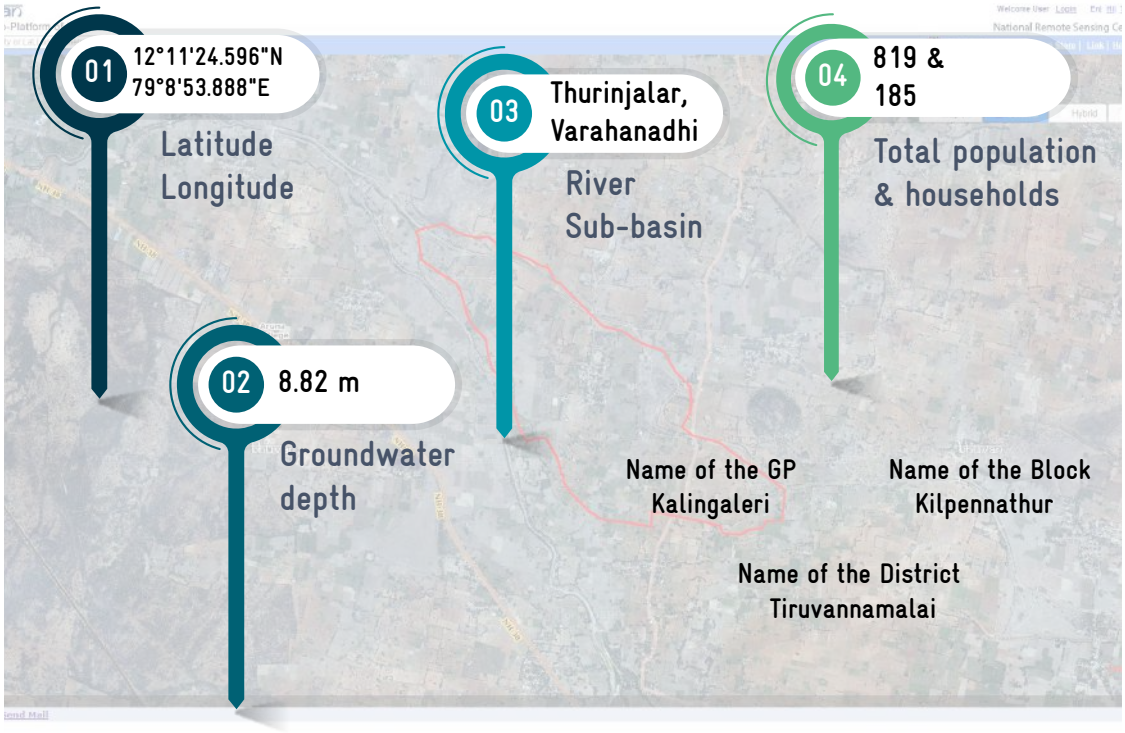
(APU: Azolla Production unit, AVP: Avenue Plantations, CP: Compost pit, CS: Cattle Shed, D-silt: Desilting, D-OW: De-silting open well, CT: Cattle through, EB: Farm Bunding with Boundary Trenches - Individual, FBP: Farm Bund Plantations, FDC: Fodder Development, FP_in: Farm Pond for Individuals, FN: 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- KALINGALERI

8.3.1 BACKGROUND OF GRAM PANCHAYAT – KALINGALERI

Kalingaleri GP is geographically situated between 12°11'24.596"N to 12°12'27.814"N and 79°8'13.542"E to 79°8'53.888"E located in Kilpennathur Block of Tiruvannamalai District. (Table 49). The average annual temperature of GP is 27.9 °C, and receives annual average rainfall of 1,047 mm. The total geographical area of GP is 206 ha. As per Census 2011, the total population is 819 of which 416 are males and the female population is 403. The total number of households is 185. The Scheduled Caste and Scheduled Tribes constitute 23.4% of the total population in Kalingaleri village.

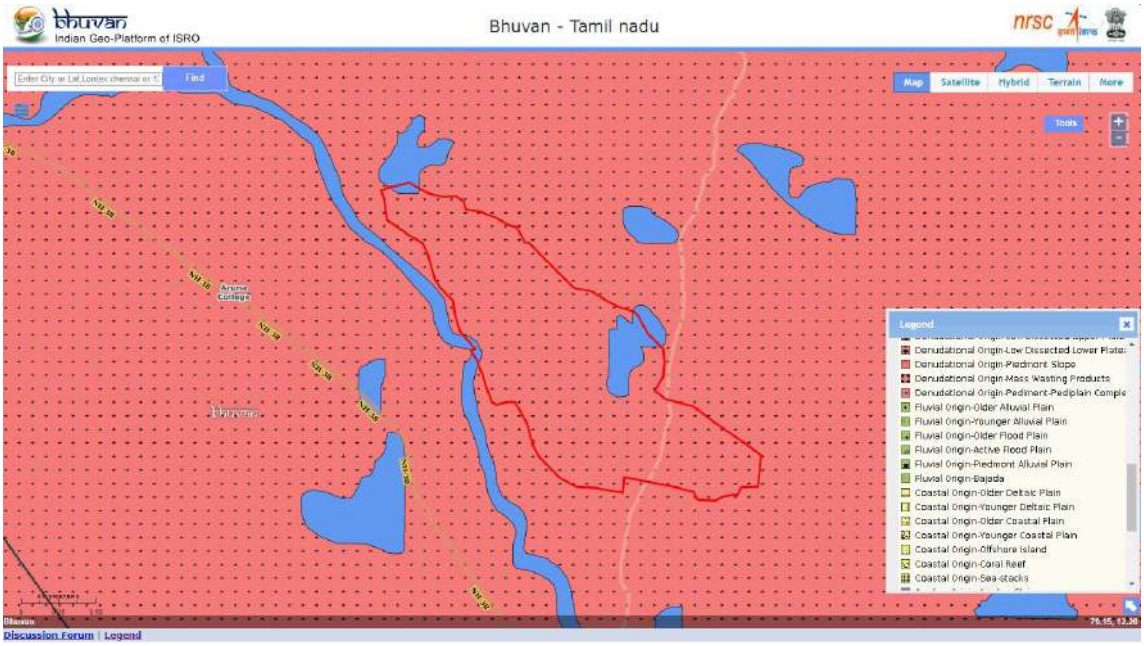
TABLE 49. GENERAL DESCRIPTION OF KALINGALERI GP, KILPENNATHUR BLOCK

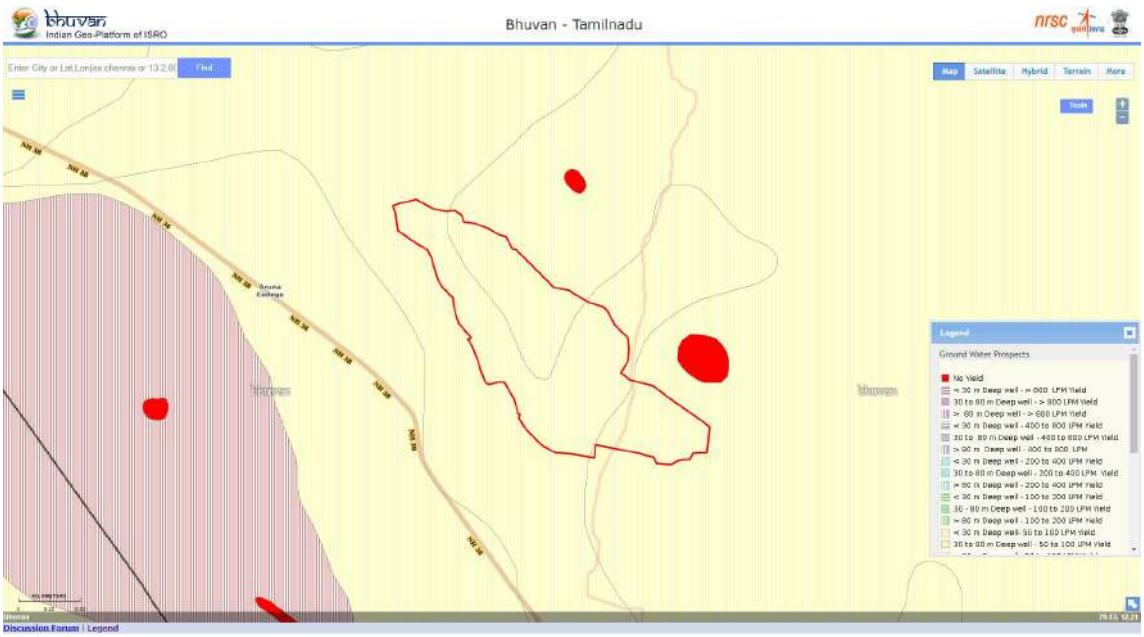


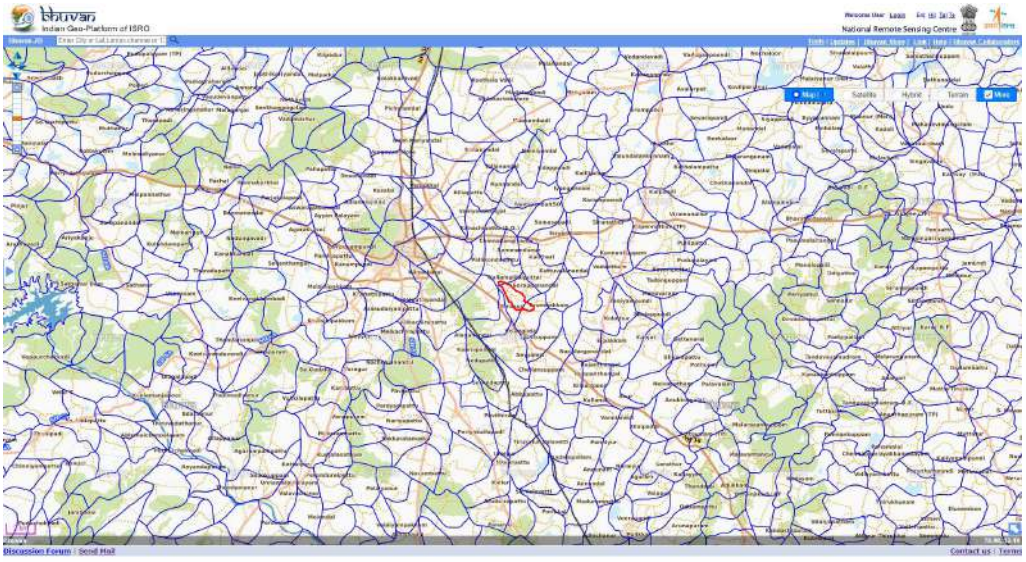
The detailed spatial and non-spatial data considered in the process of preparation of climate resilient measures under CWRM for Kalingaleri GP is illustrated as follows:

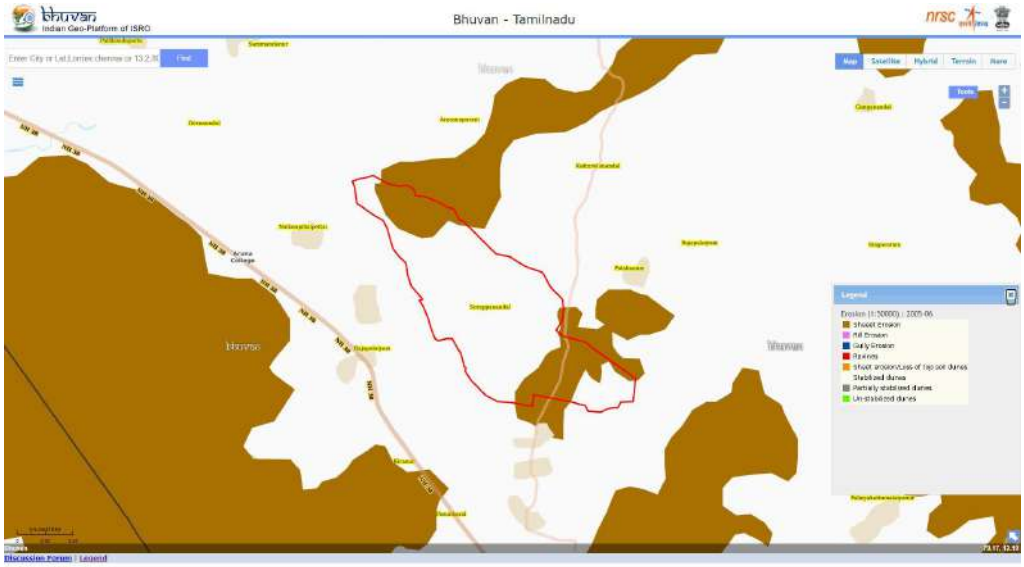
8.3.2 CWRM PLANNING - SPATIAL DATA

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 Kalingaleri GP are shown in Figure 8.9 (A, B, C, D, E, F). Kalingaleri 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 (E), Whereas GP area is falls under three micro-watershed units (C). Agriculture plantation is dominated in the GP (E) and one fourth of land is witnessed the sheet erosion (D).






bhuvan
Indian Geo-Platform of ISRO
National Remote Sensing Centre
Discussion Forum | Send Mail
Contact us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Indian Geo-Platform of ISRO
Bhuvan - Tamilnadu
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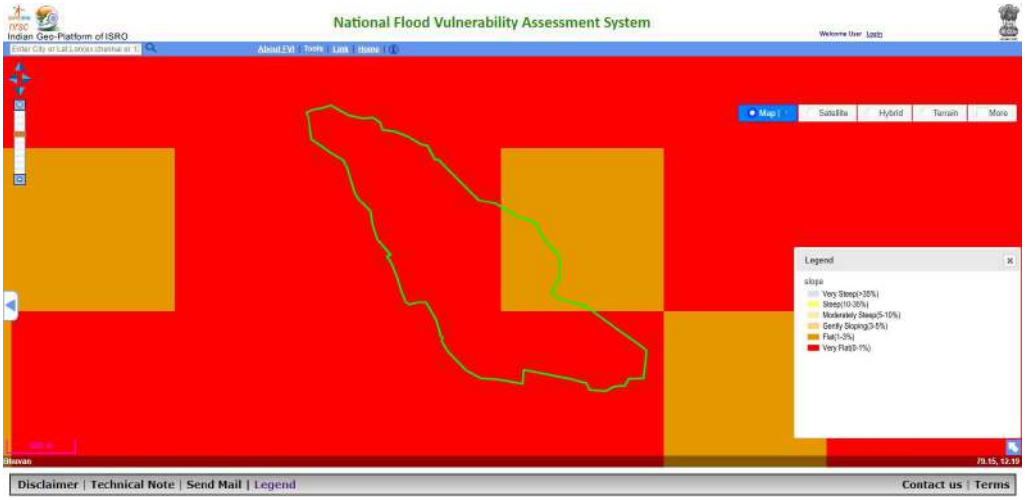
National Flood Vulnerability Assessment System
Indian Geo-Platform of ISRO
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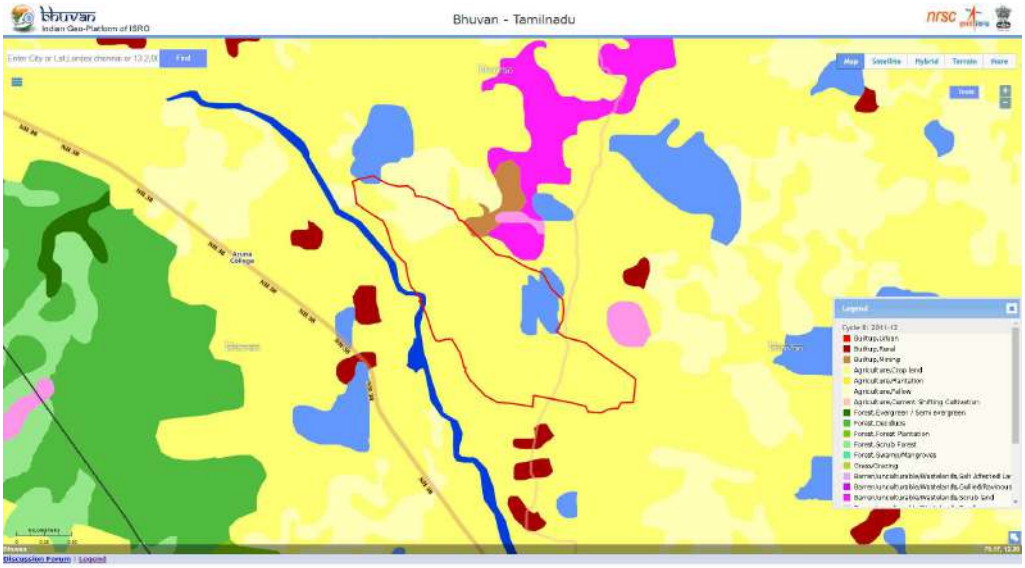


Figure 8.9. Spatial thematic maps of Kalingaleri GP. A. Geomorphology, B. GW prosperity, C. Watershed, D. Soil erosion, E. Slope, F. LULC

8.3.3 | CWRM PLANNING- NON-SPATIAL DATA

The non-spatial data covered four important themes – socio economic, climate, water and agriculture with 116 parameters (Table 50). These non-spatial data are concurrently used for analysis along with the spatial data mentioned above to identify the key water challenges, prepare water budget by understanding the supply and demand and develop water actions to the different land use and slope categories. The process starts with mapping of the administrative (habitations/panchayat/revenue village, Block/taluk), agro-ecological (regional and sub-regional, climatic and agricultural zonation's) and hydrological (drainage points/watersheds/sub basin) units keeping GP as the lowest unit of planning and execution.

TABLE 50. NON-SPATIAL DATA- KALINGALERI GP

Key CWRM Parameter	Details
Climate Vulnerability Area (CVA) 1: Socio-Economic	
Geographical Area (ha)	206
Male Population	416
Female Population	403
Total Population	819
SC Population	156
ST Population	36
Vulnerable population	192
Households (HH's)	185

Only one room HH's (SECC)	13
Female-Headed HH's (SECC)	7
Vulnerable Households (SECC)	11
% of Vulnerable Households	6
Registered MGNREGA Job cards	390
Active persons working in job Cards	206
Drinking-Water Sources	7
Groundwater sources - Drinking water	190
Surface water sources - Drinking water	2
Annual Grey water Generation (ha.m)	1.49
Climate Vulnerability Area (CVA) 3: Water Resources	
Canal Network (m)	
Length of Main Canal (m)	2,200
No. of Tanks (PWD & Union)	2
No.of Ooranis	3
Other Surface Water Bodies	4
Irrigation Facilities (ha)	
Area under Tank Irrigation	16.78
Area under Open & Tube Well Irrigation	111.01
Catchment Area wise Available Runoff (ha.m)	
Good Catchment Area	17.9
Bad Catchment Area	29.65
Watershed and Drainage Networks	
Length of Natural Drainage Lines	2,284
Number of Natural Drainage Lines	3
Number of Micro Watersheds	5
Water Demand (ha.m)	
Water Demand For Humans	2.24
Water Demand for Livestock	1.59
Water Demand For Agriculture	58.79
% G.W Utilization for Drinking	71
% G.W Utilization for Livestock	85
% G.W Utilization for Agriculture.	91
% SW Utilization for Drinking	29
% SW Utilization for Livestock	15
% SW Utilization for Agriculture	9
Climate Vulnerability Area 4: Agriculture	
Area Under Land Resources (ha)	
Area under Non-Agricultural Uses	42.9
Area under Barren & Un-cultivable Land	4.82

Area under Current Fallow land	28.36
Area under Unirrigated Land	2.4
Area Irrigated by Source	127.79
Catchment Area (ha)	
Land under Good Catchment	47.72
Land under Bad Catchment	158.55
Crop Details (ha)	
Irrigated Area (ha)	127.8
Rainfed area (ha)	2.4
Area under Paddy Cultivation (ha)	18.6
Crop Water Requirement - The irrigated condition (ha.m)	52.95
Crop Water Requirement - Rainfed condition (ha.m)	5.83
Soil Resources: Status of Available Nitrogen (%)	
Low	100
Status of Organic Carbon (%)	
Very Low	57.14
Low	42.86
Status of Soil Micro Nutrients (%)	
Sufficient	50
Deficient	50
Status of Physical condition of the soil (%)	
Moderately Alkaline	100
Soil Texture	
% of Clay Soil	8
% of Fine Soil	34
Soil Water Permeability	Moderate to Low
Soil moisture and ET	
Volumetric Soil Moisture (%)	23
Estimated Soil Moisture (ha.m)	37.98
ET Losses (ha.m)	105.45
Means of Water Extraction (%)	
Gravity	2
Lifting	98
Irrigation Methods (%)	
Wild Flooding	13
Control Flooding	87
Livestock (No)	
Cattle Population	370
Sheep Population	461
Goat Population	183

8.3.4 KEY WATER CHALLENGES

Socio-Economic

1. 6% of the households are vulnerable in the village
2. Female population almost equal to male population
3. 13 one room households, and 7 female headed households
4. Access to drinking water through tap water connections is negligible
5. Grey water generation is 1.49 ha.m; Handling of grey water from households needs attention

Water

1. Ground water status -Over exploited
2. 9 traditional waterbodies in the GP
3. Irrigation depends more on open and tube well
4. 91 % Agriculture and 85% livestock water needs met through groundwater
5. 47.55 ha.m of water is available runoff -Bad catchment area is more

Agriculture and Allied Sector

1. 23 % of the land covers the common area
2. 77% of the land covers an individual land area
3. Main crop in the GP is paddy which is cultivated about 18.6 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 is low, organic carbon is very low to low
8. 100% Moderately Alkaline soil
9. 34% fine soil is predominant in the GP
10. Slightly high ET loss at 105.45 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 9.1% of the total land area is taken for WASCA treatment activities like plantation and conservation works. The total proposed area for treatment is 18.86 ha with more attention being given for area irrigated by source followed by area under current fallow land and area under barren and uncultivable land. (Figure 8.10). Through the proposed conservation activities, 5.49 ha.m run off would be harvested in which, about 53 % of the runoff from the bad catchment, 46.8% of the run off from the good catchment and nil amount of conservation from the average catchment area (Figure 8.11).

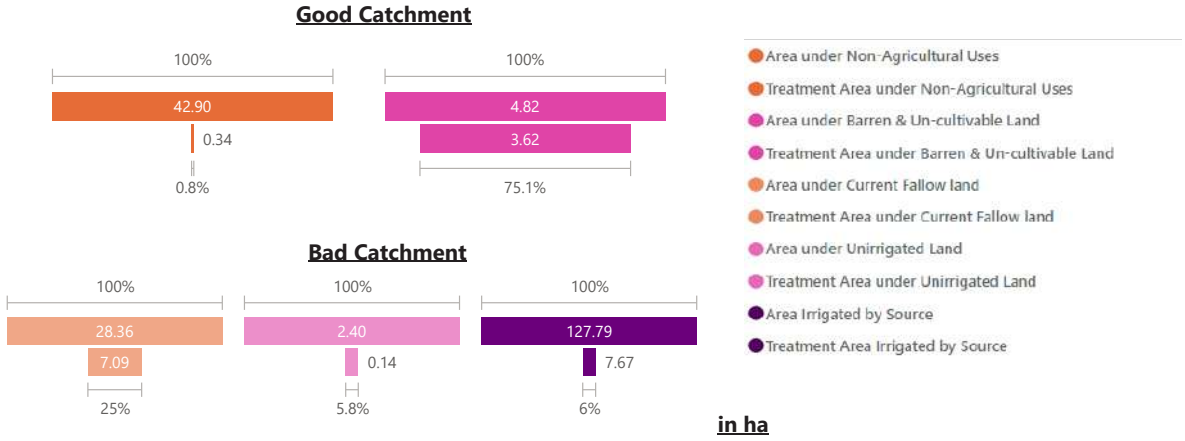


Figure 8.10. Proposed land resource treatment area in Kalingaleri GP

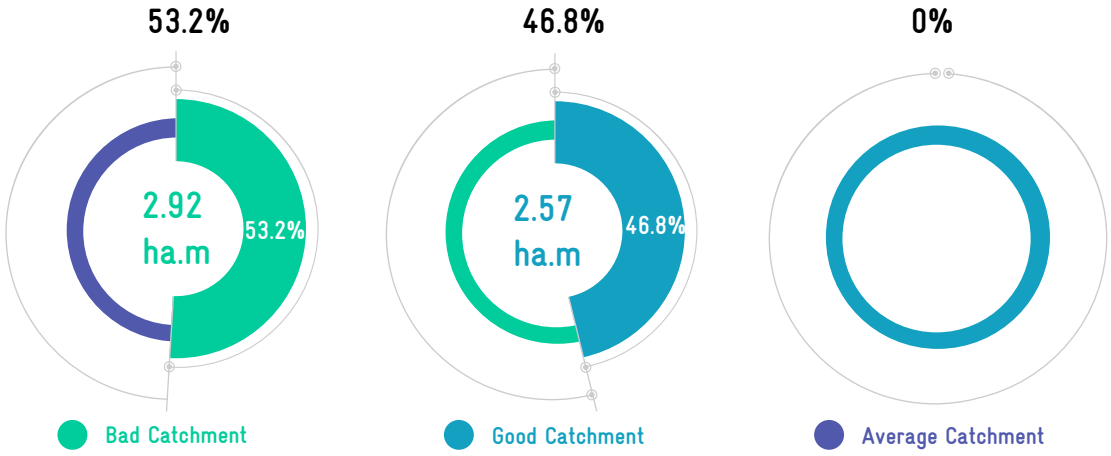


Figure 8.11. Expected run off conservation after treatment in Kalingaleri GP

The detailed proposed activities along with salient parameters are showed in the Table 51 for 2021-2024. More attention towards common and public land developments are given with appropriate works to improve the resilience of the GP.

TABLE 51. PERSPECTIVE PLAN OF KALINGALERI 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 (INR in lakhs)	Estimated person days
Contour Continuous Bunds (CCB) for Afforestation area (m)	Upper	1	0.03	10
Composting (No.of units)	Lower	4	0.68	60
Afforestation in Public/common lands (ha)	Upper	1	8.6	3,344
Block Plantation (Community) (ha)	Middle	1	11.1	4,320
Linear Plantation (m)		3	5.4	2,109
Canal Bund Plantation (m)	Lower	2	15	5,860
Avenue plantation (m)	Middle	3	5.4	2,109
Nursery Development (No. of units)	Lower	3	46.25	7,227
Restoration of water bodies: a.PWD and Tanks (No.)		1	5	800
Restoration of water bodies: b. Ponds (No.)		2	2	400
Artificial Recharge Structure (No. of units)		44	110	17,204
Drainage Line Treatment (m)	Upper	3	0.09	15
Sub Total Water Action -1		**68**	**209.55**	**43,458**
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	2	3	1,172
Micro Irrigation (ha)		13	13	0
Construction of Farm Ponds - Individual (No.of units)		2	4	1,562
Land development - Individual (ha)		2	20	7,812
Dry land Horticulture/Agro-forestry - Individual (ha)		3	25.5	9,963
Azolla units - Individual (No.of units)		10	1.5	230
NADEP Vermi compost (No. of units)		10	1.8	270
Fodder development - Community & Individual (No. of units)		10	14.8	23,440
Cattle Shelters (No.of units)		10	21.2	3,310
Goat Sheep Shelters (No. of units)		41	93.07	14,555
Cattle Trough (No. of units)		10	0.5	60
Construction of new open wells & Recharge Shafts (No.of units)		44	220	40,744
Sub Total Water Action - 2		**157**	**418.37**	**1,03,118**

CWRM Water Action 3: Rural Water Management				
CWRM Water Action 3: Works in Lower Ridge				
Soak Pits (Community) (No. of units)	Lower	2	0.26	40
Soak Pits (Individual) (No. of units)		19	1.9	304
Roof Rain Water Harvesting (No. of units)		2	8	1,250
Sub Total Water Action -3		**23**	**10**	**1,594**
Overall GP Total		**248**	**638**	**1,48,170**

Of the total number of projects identified under CWRM themes, 63.30 % works are in agriculture and allied sectors while 9.27 % works are in rural water management and 27.4 % works are in public and common land. Table 52 provides the estimates of the work budget, and personal days for three years from 2021-2024 in the Kalingaleri GP.

TABLE 52. 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	68	209.55	43,458
Agriculture and Allied sector development	157	418.37	1,03,118
Rural water management	23	10	1,594
TOTAL	248	638	1,48,170

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 53). 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 53. 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	Area under afforestation	2	274 ha under afforestation
3	Percentage reduction in the annual surface runoff	3	14.65 ha.m surface runoff harvested and stored
4	The proportion of land treated under WASCA	4	22 % of the total geographical area of the village treated under WASCA in three years
5	Drainage Line Treatment	5	2.3 km length of drainage lines treated

3 TRADITIONAL WATER BODIES RESTORED

274 ha.m UNDER AFFORESTATION

22 % AREA OF THE VILLAGE TREATED

14.65 ha.m SURFACE 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	3 Farm ponds established
2	Reducing area under fallow lands	2	28.36 ha under fallow land restored for cultivation
3	Improvement in soil health	3	10 units of vermi compost established
4	No of artificial recharge structures proposed	4	44 artificial recharge structures were established to replenish groundwater flow

3 FARM PONDS

10 VERMI COMPOST

44 ARTIFICIAL RECHARGE STRUCTURES

WASCA CWRM ACTION PLAN

DEVELOPMENT OF RURAL INFRASTRUCTURE

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

OUTCOMES/ IMPACT	
1.	2 community level and 19 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.	185 households established Nutri-gardens in homesteads

2 COMMUNITY & **19** INDIVIDUAL SOAK PITS

2 COMMON ROOF RAINWATER HARVESTING

185 NUTRI-GARDENS

Table 54 provides both the perspective plan for three years' period and the annual plan for the one-year period from 2021-2022 on the shelf of projects/number of works and number of person-days.

TABLE 54. PROPOSALS FOR THE MGNREGS, KALINGALERI GP

	No of works	No of person days
Perspective plan	248	1,48,170
Annual plan	99	59,268

8.3.7 PROPOSED ACTIVITY MAP

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

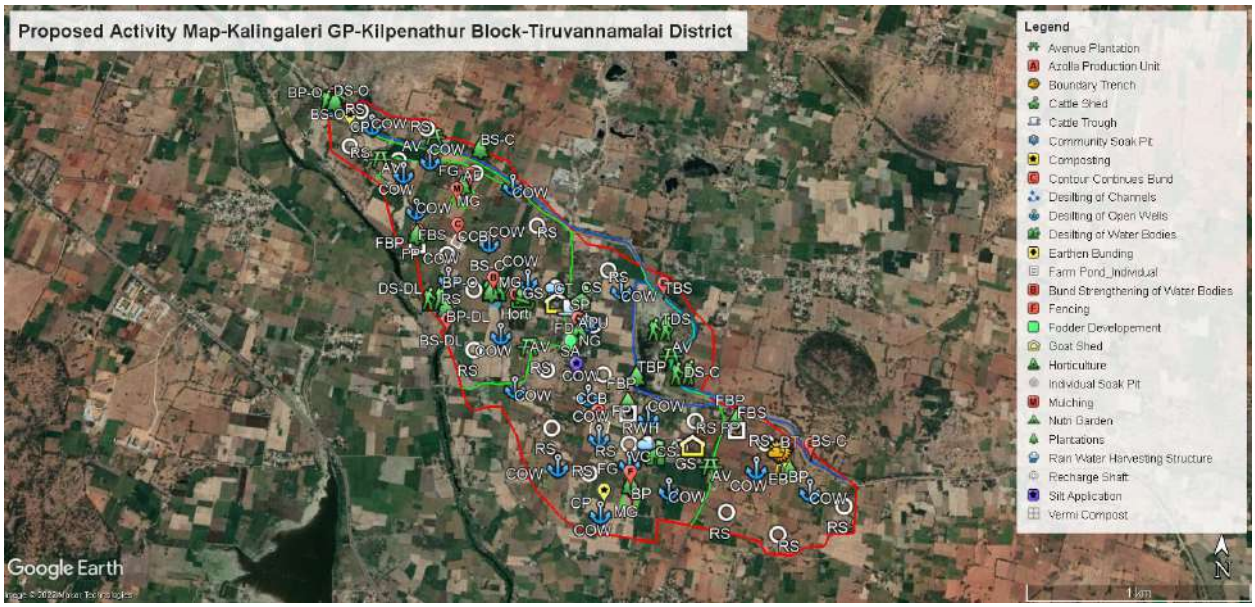


Figure 8.12. Proposed action plan of Kalingaleri GP

Figure 8.13. Works on Upper Ridge of Kalingaleri GP

Figure 8.14. Works on Middle Ridge of Kalingaleri GP

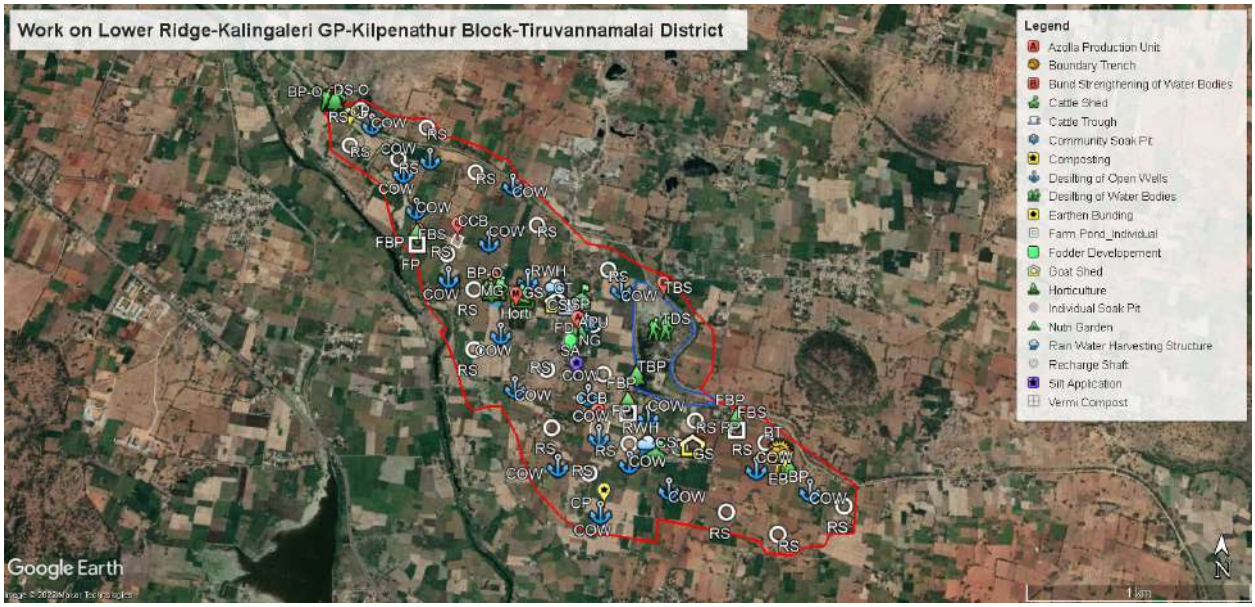
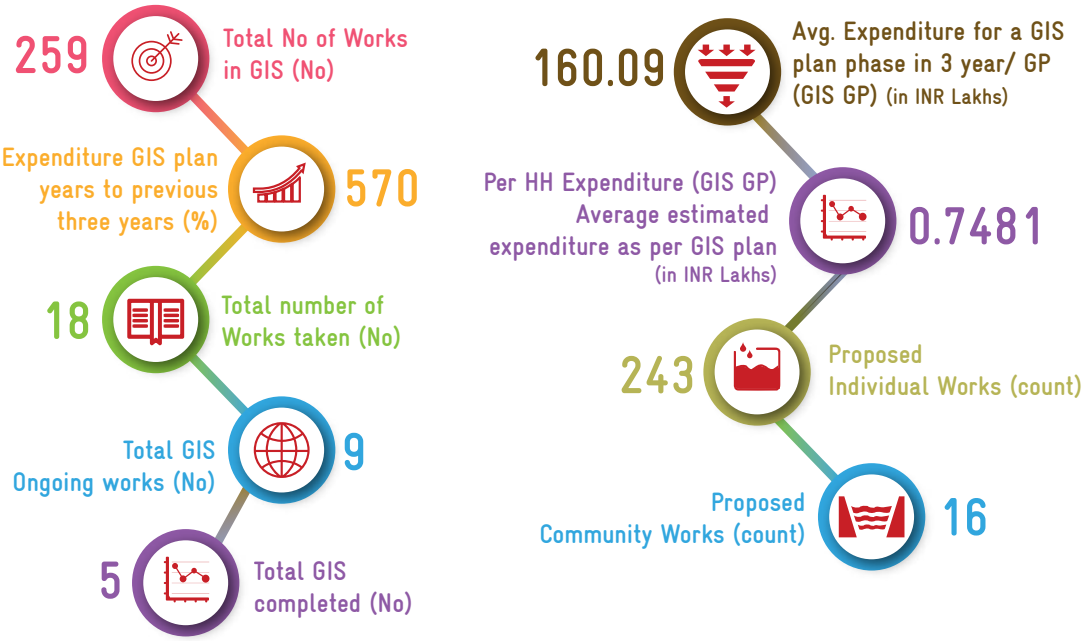


Figure 8.15. Works on Lower Ridge of Kalingaleri GP

8.3.8 GIS PLAN IMPLEMENTATION, KEY PARAMETERS

The GIS plan implementation and performance of Kalingaleri GP, Kilpennathur Block is represented in Table 55.

TABLE 55. KEY PARAMETERS PERFORMANCE IN KALINGALERI GP -KILPENNATHUR BLOCK



நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு

குறள் - 20

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

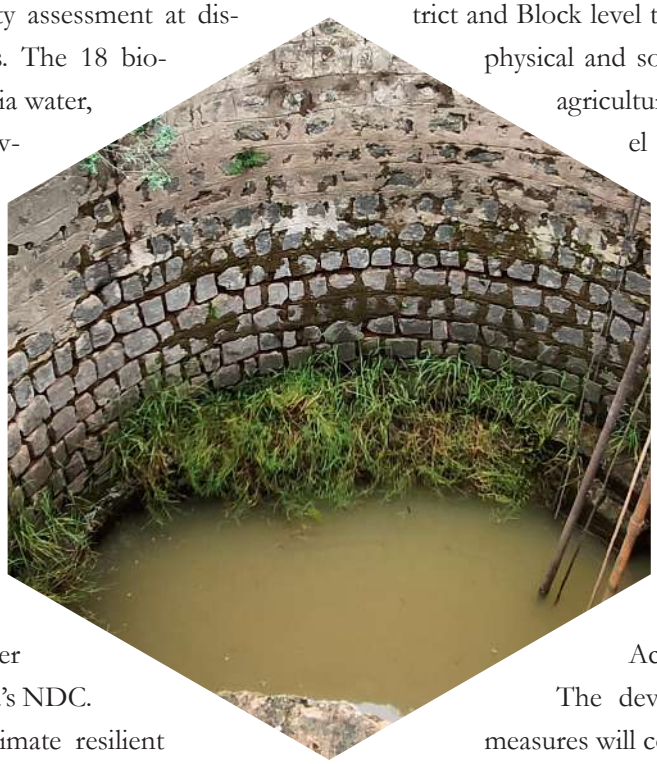
Thirukkural - 20

CHAPTER 9

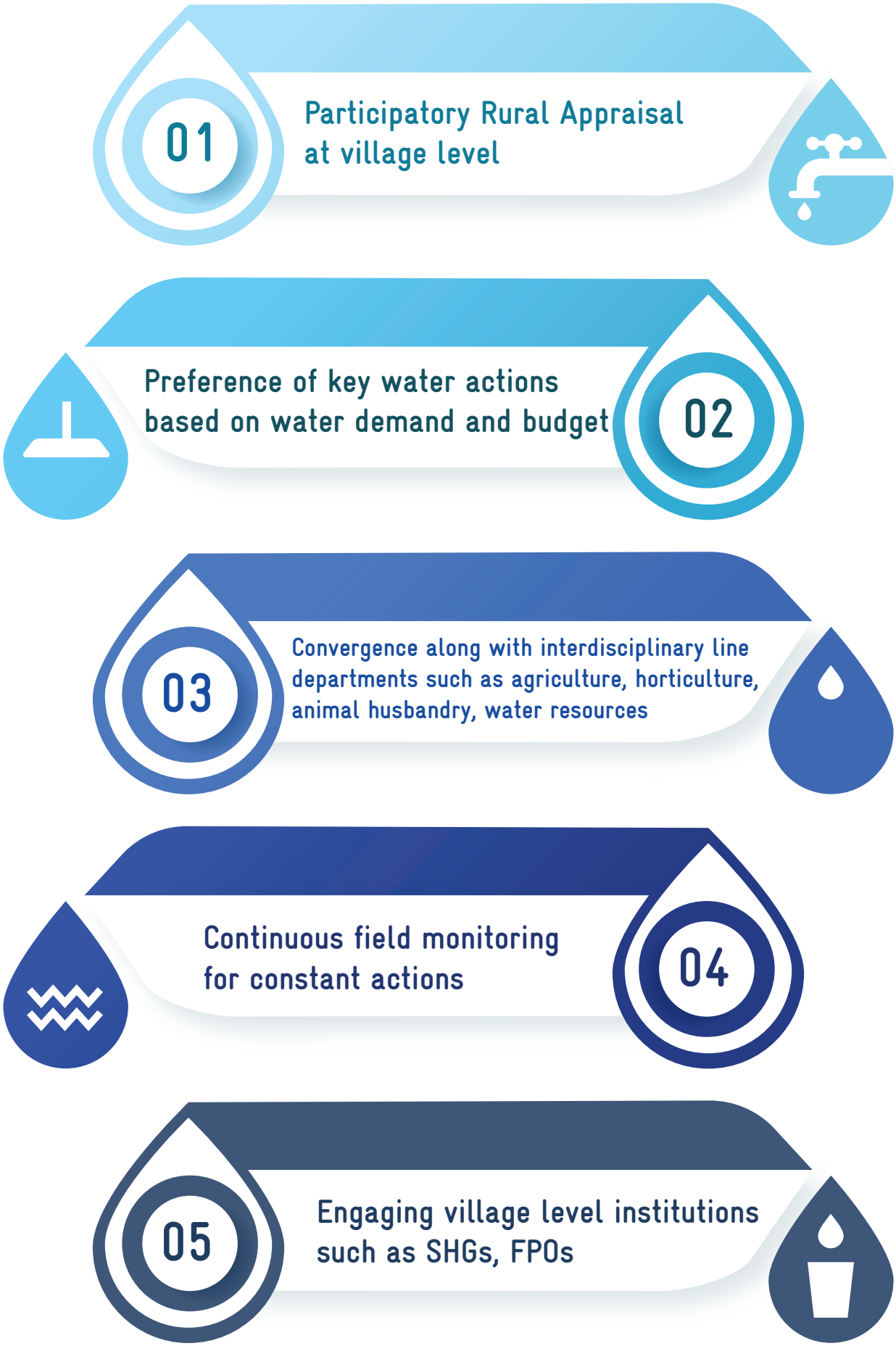
CONCLUSION

> **"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.)
Agaram	5,000	1,000	1,500	-	3	1	7
Angunam	2,000	1,600	1,300	-	3	2	3
Keeranur	2,000	1,000	3,000	-	2	1	7
Arumbakkam	2,200	-	-	1,500	-	-	3
Avur	10,000	3,500	7,000	-	2	-	7
Gudalur (Z) Nalathangal	-	-	-	-	2	3	7
Konalur	2,200	1,200	700	-	2	-	8
Kalpoondi	3,000	-	-	-	2	1	7
Ganapapuram	7,000	-	-	-	2	-	6
Gengapattu	1,500	750	500	-	2	3	2
Nadalarganandal	3,000	700	300	-	2	1	5
Neivanatham	4,000	3,000	1,000	-	3	-	4
Panniyur	-	-	-	-	1	1	3
Kaniyampoondi	-	-	-	2,150	1	-	4
Karikilambadi	-	-	-	2,850	1	-	4
Kathalampattu	-	-	-	-	3	-	8
Kattumalaiyanur	3,200	-	-	-	5	-	8
Kazhikulam	6,000	-	-	-	1	1	5
Keekalur	-	-	-	4,000	5	3	7
Mekalur	-	-	-	9,000	5	-	8
Sirunathur	3,000	1,000	-	1,500	1	1	9
Sanippundi	-	-	-	2,700	1	-	3
Sevarapundi	1,000	-	-	-	1	2	5

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.)
Somasipadi	1,150	800	2,000	2,800	-	1	9
Vaipur	2,000	-	-	-	3	-	5
Valuthalangunam	8,200	-	600	-	-	-	9
Nammiandal	3,245	-	-	-	1	-	2
Vayalur	2,000	1,500	1,500	-	2	-	10
Vedanatham	3,200	-	-	1,200	-	-	11
Anukkumalai	5,000	-	-	-	2	-	7
Aranji	4,300	-	-	-	2	-	4
Chellankuppam	6,300	-	-	-	3	-	2
Iyagunnam	4,100	-	-	-	2	-	10
Kadambai	2,100	-	-	-	2	-	9
Kallayyee	6,500	-	-	-	4	-	7
Ganalapadi	4,430	-	-	-	4	-	10
Kalingaleri	2,200	-	-	-	1	-	2
Kolathur	6,200	-	-	-	2	-	9
Nariyamangalam	4,130	-	-	-	3	-	8
Olaipadi	9,600	-	-	-	9	-	10
Rajanthangal	2,660	-	-	-	2	-	7
Rayampettai	4,820	-	-	-	1	-	2
Su.Polakunam	6,550	-	-	-	6	-	9
Velanandal	1,900	-	-	-	2	-	5
Neelathangala	2,590	-	-	-	2	-	5

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.)
Agaram	20	-	158	19	-	41	2,055	2	5
Angunam	47	-	92	46	1	67	5,339	7	5
Keeranur	40	-	187	38	-	65	4,311	6	6
Arumbakkam	-	-	97	8	0	27	3,998	3	5
Avur	4	-	119	58	5	86	5,439	7	7
Gudalur (Z) Nalathangal	75	-	137	54	-	87	-	-	-
Konalur	68	-	4	42	-	89	9,517	6	6
Kalpoondi	17	-	50	28	0	38	935	5	3
Ganapapuram	25	-	73	39	-	44	3,956	7	5
Gengapattu	5	-	38	17	1	33	2,801	6	6
Nadalarganandal	19	-	55	17	-	53	3,499	4	3
Neivanatham	48	-	90	36	-	47	3,902	7	5
Panniyur	27	-	106	37	2	71	6,423	5	6
Kaniyampoondi	31	-	81	12	-	27	2,816	2	3
Karikilambadi	20	-	106	27	-	45	3,156	7	5
Kathalampattu	33	-	84	29	-	61	1,135	4	5
Kattumalaiyanur	5	-	277	67	-	171	9,085	7	9
Kazhikulam	9	-	17	20	-	47	911	2	5
Keekalur	95	-	30	59	0	133	3,616	4	7
Mekalur	11	-	313	113	-	201	10,311	7	9
Sirunathur	23	-	104	38	-	82	7,008	6	6
Sanippundi	-	-	174	18	1	54	1,548	5	6
Sevarapundi	2	-	40	20	0	49	-	-	2
Somasipadi	67	-	400	67	-	161	11,562	6	7
Vaipur	36	-	290	23	4	73	7,555	6	5

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.)
Valuthalangunam	-	-	332	86	4	138	9,506	7	8
Nammiandal	-	-	70	10	-	43	3,245	7	5
Vayalur	-	-	78	36	-	25	2,049	4	2
Vedanatham	-	-	131	42	-	68	8,256	6	7
Anukkumalai	18	-	299	67	4	118	8,006	7	5
Aranji	42	-	204	32	0	52	346	2	4
Chellankuppam	50	-	172	49	3	94	6,249	7	7
Iyagunnam	38	234	238	50	-	109	10,527	13	7
Kadambai	60	-	269	48	1	93	4,139	4	3
Kallayyee	65	-	216	39	0	81	4,190	7	5
Ganalapadi	70	-	340	83	1	118	13,609	24	7
Kalingaleri	17	-	111	18	-	30	2,285	3	5
Kolathur	6	-	141	72	1	141	8,621	12	5
Nariyamangalam	-	-	31	44	-	106	6,536	14	7
Olaipadi	77	-	227	72	2	136	-	-	10
Rajanthangal	18	-	123	20	0	50	2,107	6	3
Rayampettai	11	-	314	44	-	171	9,559	20	10
Su.Polakunam	57	-	168	53	0	117	969	2	7
Velanandal	5	-	109	27	1	64	1,301	3	4
Neelathangala	36	-	146	54	-	87	5,164	5	4

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 (%)
Agaram	4	1	167	67	95	97	33	5	3
Angunam	3	1	136	97	92	95	3	8	5
Keeranur	6	1	147	93	86	100	7	14	-
Arumbakkam	3	2	41	91	95	100	9	5	-
Avur	14	2	227	97	92	88	3	8	12
Gudalur (Z) Nalathangal	7	5	129	88	91	95	12	9	5
Konalur	8	2	186	84	94	79	16	6	21
Kalpoondi	4	1	86	91	86	95	9	14	5
Ganapapuram	5	2	108	78	89	100	22	11	-
Gengapattu	4	1	68	90	89	83	10	11	17
Nadalarganandal	6	3	113	96	92	59	4	8	41
Neivanatham	5	1	104	85	89	81	15	11	19
Panniyur	5	1	149	67	98	74	33	2	26
Kaniyampoondi	2	1	98	82	93	100	18	7	-
Karikilambadi	6	4	130	69	91	100	31	9	-
Kathalampattu	4	2	177	68	93	97	32	7	3
Kattumalaiyanur	10	11	304	93	97	53	7	3	47
Kazhikulam	4	4	58	87	92	99	13	8	1
Keekalur	10	5	283	83	97	76	17	3	24
Mekalur	13	5	378	86	91	64	14	9	36
Sirunathur	8	6	228	90	98	100	10	2	-
Sanippundi	5	4	149	75	92	86	25	8	14
Sevarapundi	3	1	80	100	86	52	-	14	48
Somasipadi	1	6	217	-	93	90	100	7	10
Vaipur	5	1	259	100	96	92	-	4	8
Valuthalangunam	9	4	232	100	97	99	-	3	1

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 (%)
Nammiandal	4	5	79	100	-	100	-	100	-
Vayalur	3	2	127	91	89	93	9	11	7
Vedanatham	7	4	165	100	93	100	-	7	-
Anukkumalai	5	3	248	78	94	88	22	6	12
Aranji	5	3	109	69	94	89	31	6	11
Chellankuppam	9	3	355	93	96	91	7	4	9
Iyagunnam	8	5	94	55	92	50	45	8	50
Kadambai	7	3	113	40	97	65	60	3	35
Kallayyee	7	2	265	69	89	92	31	11	8
Ganalapadi	8	6	167	75	90	66	25	10	34
Kalingaleri	2	2	59	71	85	90	29	15	10
Kolathur	8	5	299	50	83	87	50	17	13
Nariyamangalam	9	4	207	50	96	81	50	4	19
Olaipadi	2	2	136	52	92	61	48	8	39
Rajanthangal	5	6	210	62	94	85	38	6	15
Rayampettai	7	5	284	82	91	100	18	9	-
Su.Polakunam	8	4	158	79	95	72	21	5	28
Velanandal	7	3	140	62	96	86	38	4	14
Neelathangala	2	5	129	71	91	95	29	9	5

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 Crictalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Agaram	-	44.82	5.72	-	-	-	-	47.38	12.53	158.87
Angunam	-	89.92	33.25	-	-	2.20	-	202.17	14.27	139.47
Keeranur	-	98.91	2.81	-	-	-	-	110.34	12.30	227.18
Arumbakkam	-	18.34	3.67	-	-	0.95	-	46.50	1.33	96.89
Avur	-	134.80	18.73	-	16.10	1.54	-	271.84	64.35	122.90
Gudalur (Z) Nalathangal	-	122.70	20.11	-	-	-	-	107.43	145.55	211.36
Konalur	-	106.29	4.67	-	-	-	-	157.93	247.13	72.21
Kalpoondi	-	74.71	-	-	-	0.92	-	119.66	18.23	67.08
Ganapapuram	-	42.70	60.40	-	-	-	0.27	50.86	110.55	73.23
Gengapattu	-	44.18	1.56	-	-	3.00	0.30	129.05	2.05	42.64
Nadalarganandal	-	36.01	10.25	-	-	-	8.49	74.91	142.29	55.02
Neivanatham	-	41.01	54.55	-	-	-	-	142.25	20.00	90.14
Panniyur	-	87.17	11.95	-	8.49	-	-	231.79	15.65	133.24
Kaniyampoondi	-	31.07	0.25	-	-	-	-	22.29	13.06	111.32
Karikilambadi	-	64.82	6.00	-	-	-	-	23.24	89.75	125.82
Kathalampattu	-	64.41	12.05	-	-	-	-	185.83	56.70	83.95
Kattumalaiyanur	-	178.68	-	-	-	-	-	463.17	175.09	276.90
Kazhikulam	-	34.15	18.32	-	-	-	-	52.75	168.55	27.98
Keekalur	-	152.20	4.79	0.14	-	1.46	-	238.17	347.44	125.58
Mekalur	-	204.18	96.88	-	-	-	-	629.44	121.61	323.78
Sirunathur	-	64.53	36.39	-	-	-	-	92.61	218.09	126.88
Sanippundi	-	44.61	4.54	1.73	-	0.04	-	91.03	21.90	173.56
Sevarapundi	-	33.53	20.07	-	-	1.16	-	36.06	183.28	42.29

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 Critica-lops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Somasipadi	-	158.02	20.01	-	-	-	4.79	334.67	119.78	399.60
Vaipur	-	55.46	5.81	-	-	15.40	-	55.08	7.27	325.72
Valuthalangunam	-	96.01	133.99	-	14.76		0.99	206.18	198.02	332.42
Nammiandal	-	25.57	-	-	-	-	-	28.76	129.33	69.95
Vayalur	-	95.22	-	-	-	-	-	20.27	33.23	78.27
Vedanatham	-	111.00	-	-	-	-	-	55.06	177.93	131.11
Anukkumalai	-	86.63	92.21	-	-	13.05	-	192.65	138.44	298.96
Aranji	-	84.57	0.66	-	-	0.39	-	53.23	21.18	203.99
Chellankuppam	-	127.97	1.90	-	5.00	4.60	0.57	262.32	13.28	227.73
Iyagunnam	-	107.60	25.41	-	-	-	-	213.18	129.47	237.61
Kadambai	-	115.23	12.69	-	-	4.24	-	196.20	32.05	268.76
Kallayyee	-	80.75	22.69	-	-	1.44	-	43.90	108.15	280.59
Ganalapadi	-	126.45	93.90	-	-	2.94	-	137.63	150.82	340.28
Kalingaleri	-	42.90	4.82	-	-	-	-	28.36	2.40	127.79
Kolathur	-	176.13	14.41	1.05	-	2.14	-	414.48	192.30	146.80
Nariyamangalam	-	95.09	22.81	-	-	-	-	112.80	374.80	81.32
Olaipadi	-	182.44	8.86	-	-	6.41	-	314.34	183.28	227.49
Rajanthangal	-	52.20	2.22	-	0.26	0.25	-	131.07	14.09	123.03
Rayampettai	-	109.33	7.05	-	-	-	4.04	420.57	164.82	325.28
Su.Polakunam	-	140.90	-	-	-	1.38	-	347.48	53.81	224.86
Velanandal	-	55.85	17.16	-	1.50	1.80	-	191.20	39.63	113.82
Neelathangala	-	122.70	20.11	-	-	-	-	107.43	145.55	211.36

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)
Agaram	50.54	-	218.78	155.85	12.53	60.87	162.12	4.39
Angunam	123.17	2.20	355.91	119.94	19.91	32.94	128.56	7.02
Keeranur	101.72	-	349.82	113.15	0.60	57.53	146.20	0.36
Arumbakkam	22.01	0.95	144.72	51.81	0.20	10.61	40.47	0.07
Avur	153.53	17.64	459.09	122.89	78.91	69.81	199.58	27.62
Gudalur (Z) Nalathangal	142.81	-	464.34	85.55	18.81	46.37	122.30	6.58
Konalur	110.96	-	477.27	101.82	109.55	78.55	147.78	38.34
Kalpoondi	74.71	0.92	204.97	75.34	11.38	23.89	82.09	3.98
Ganapapuram	103.10	-	234.91	136.08	-	27.97	107.55	-
Gengapattu	45.74	3.00	174.04	35.04	17.79	27.02	56.56	11.27
Nadalarganandal	46.26	-	280.71	43.20	130.88	35.02	67.25	45.81
Neivanatham	95.56	-	252.39	53.91	55.43	45.95	84.46	19.40
Panniyur	99.12	8.49	380.68	66.95	111.11	36.38	109.84	39.58
Kaniyampoondi	31.32	-	146.67	114.22	-	36.11	97.50	-
Karikilambadi	70.82	-	238.81	147.54	-	46.01	129.91	-
Kathalampattu	76.46	-	326.48	227.45	15.71	24.45	171.78	5.50
Kattumalaiyanur	178.68	-	915.16	102.13	404.06	37.22	161.36	142.60
Kazhikulam	52.47	-	249.28	115.50	1.31	4.83	57.34	0.78
Keekalur	156.99	1.60	711.19	180.05	190.47	22.60	216.23	66.66
Mekalur	301.06	-	1074.83	169.65	369.53	44.08	240.41	137.86
Sirunathur	100.92	-	437.58	401.86	-	35.87	227.72	-
Sanippundi	49.15	1.77	286.49	86.40	58.58	75.51	128.56	20.50
Sevarapundi	53.60	1.16	261.63	29.79	108.30	11.03	41.86	38.33
Somasipadi	178.03	-	858.84	228.31	62.72	44.33	195.23	21.95
Vaipur	61.27	15.40	388.07	226.47	62.71	81.84	237.52	21.92
Valuthalangunam	230.00	14.76	737.61	314.66	5.05	37.56	228.53	3.03

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)
Nammiandal	25.57	-	228.04	110.60	-	17.04	78.87	-
Vayalur	95.22	-	131.77	73.77	23.71	46.08	118.94	8.30
Vedanatham	111.00	-	364.10	215.63	-	18.07	164.52	-
Anukkumalai	178.84	13.05	630.05	145.44	81.54	137.75	219.46	28.65
Aranji	85.23	0.39	278.40	59.81	34.25	23.63	96.63	12.29
Chellankuppam	129.87	9.60	503.90	226.93	87.82	113.89	323.94	30.74
Iyagunnam	133.01	-	580.26	41.81	135.19	19.00	46.84	47.31
Kadambai	127.92	4.24	497.01	42.21	108.62	7.71	73.55	39.42
Kallayyee	103.44	1.44	432.64	157.76	61.23	129.99	243.97	21.43
Ganalapadi	220.35	2.94	628.73	74.04	160.24	38.12	110.84	56.41
Kalingaleri	47.72	-	158.55	40.04	16.65	18.69	52.96	5.84
Kolathur	190.54	3.19	753.58	251.95	107.09	87.54	261.82	37.48
Nariyamangalam	117.90	-	568.92	257.10	114.90	48.13	166.90	40.26
Olaipadi	191.30	6.41	725.11	54.91	148.09	32.65	82.95	52.74
Rajanthangal	54.42	0.51	268.19	111.81	47.19	78.73	179.27	30.63
Rayampettai	116.38	-	914.71	448.48	0.27	48.69	283.69	0.09
Su.Polakunam	140.90	1.38	626.15	83.53	126.02	51.50	113.86	44.11
Velanandal	73.01	3.30	344.65	81.07	56.74	71.39	120.28	19.86
Neelathangala	142.81	-	464.34	85.55	18.81	46.37	122.30	6.58

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)					Status of Organic Carbon (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High	Sufficient	Deficient
Agaram	-	80.56	19.44	-	-	5.56	94.44	-	-	-	60.00	40.00
Angunam	22.73	70.45	6.82	-	-	34.09	65.91	-	-	-	56.00	44.00
Keeranur	10.81	86.49	2.70	-	-	39.19	60.81	-	-	-	45.00	55.00
Arumbakkam	9.09	90.91	-	-	-	36.36	63.64	-	-	-	47.00	53.00
Avur	7.79	89.61	2.60	-	-	44.74	53.95	1.32	-	-	48.00	52.00
Gudalur (Z) Nalathangal	31.76	34.12	30.59	3.53	-	11.76	87.06	1.18	-	-	62.00	38.00
Konalur	8.99	84.27	6.74	-	-	25.84	74.16	-	-	-	42.00	58.00
Kalpoondi	-	68.75	31.25	-	-	15.63	62.50	21.88	-	-	47.00	53.00
Ganapapuram	2.70	89.19	8.11	-	-	45.95	51.35	2.70	-	-	57.00	43.00
Gengapattu	5.13	94.87	-	-	-	35.90	64.10	-	-	-	35.00	65.00
Nadalarganandal	4.08	95.92	-	-	-	24.49	71.43	-	2.04	2.04	58.00	42.00
Neivanatham	28.26	60.87	10.87	-	-	45.65	41.30	2.17	10.87	-	52.00	48.00
Panniyur	13.51	81.08	5.41	-	-	43.24	56.76	-	-	-	53.00	47.00
Kaniyampoondi	26.32	73.68	-	-	-	34.21	63.16	-	2.63	-	54.00	46.00
Karikilambadi	39.68	55.56	4.76	-	-	53.97	36.51	4.76	4.76	-	75.00	25.00
Kathalampattu	16.33	71.43	12.24	-	-	28.57	67.35	4.08	-	-	76.00	24.00
Kattumalaiyanur	20.92	79.08	-	-	-	56.86	43.14	-	-	-	49.00	51.00
Kazhikulam	13.79	86.21	-	-	-	56.90	43.10	-	-	-	67.00	33.00
Keekalur	12.67	76.67	10.67	-	-	15.33	84.67	-	-	-	53.00	47.00
Mekalur	2.84	82.39	14.77	-	-	11.36	88.64	-	-	-	64.00	36.00
Sirunathur	15.49	80.28	4.23	-	-	61.97	33.80	4.23	-	-	78.00	22.00
Sanippundi	8.06	87.10	4.84	-	-	16.13	75.81	8.06	-	-	52.00	48.00
Sevarapundi	18.97	77.59	3.45	-	-	41.38	58.62	-	-	-	63.00	37.00
Somasipadi	22.77	77.23	-	-	-	57.43	42.57	-	-	-	80.00	20.00
Vaipur	11.76	67.65	20.59	-	-	26.47	70.59	1.47	-	1.47	58.00	42.00
Valuthalangunam	-	-	-	-	-	-	-	-	-	-	42.00	58.00

Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)					Status of Organic Carbon (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High	Sufficient	Deficient
Nammiandal	30.91	21.82	20.00	27.27	-	16.36	83.64	-	-	-	61.00	39.00
Vayalur	35.48	64.52	-	-	-	58.06	32.26	9.68	-	-	57.00	43.00
Vedanatham	35.37	62.20	2.44	-	-	41.46	51.22	7.32	-	-	50.00	50.00
Anukkumalai	13.10	83.33	3.57	-	-	27.71	72.29	-	-	-	56.00	44.00
Aranji	-	94.59	5.41	-	-	24.32	75.68	-	-	-	50.00	50.00
Chellankuppam	18.29	79.27	2.44	-	-	32.93	67.07	-	-	-	55.00	45.00
Iyagunnam	6.15	93.85	-	-	-	52.31	47.69	-	-	-	49.00	51.00
Kadambai	6.76	85.14	8.11	-	-	10.81	89.19	-	-	-	56.00	44.00
Kallayyee	13.79	86.21	-	-	-	68.97	20.69	6.90	3.45	-	53.00	47.00
Ganalapadi	5.26	90.35	4.39	-	-	50.88	44.74	4.39	-	-	47.00	53.00
Kalingaleri	-	100.00	-	-	-	57.14	42.86	-	-	-	50.00	50.00
Kolathur	11.67	80.00	8.33	-	-	45.83	45.83	8.33	-	-	52.00	48.00
Nariyamangalam	8.20	90.16	1.64	-	-	49.18	47.54	1.64	-	1.64	68.00	32.00
Olaipadi	17.65	82.35	-	-	-	42.35	57.65	-	-	-	63.00	37.00
Rajanthangal	-	100.00	-	-	-	33.33	66.67	-	-	-	48.00	52.00
Rayampettai	7.69	84.62	7.69	-	-	15.38	84.62	-	-	-	54.00	46.00
Su.Polakunam	16.44	79.45	4.11	-	-	26.03	72.60	-	1.37	-	51.00	49.00
Velanandal	-	95.35	4.65	-	-	25.58	74.42	-	-	-	38.00	62.00
Neelathangala	11.76	87.06	1.18	-	-	37.65	62.35	-	-	-	62.00	38.00

Gram Panchayat	Status of Physical condition of the soil (%)					
	Moderately Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline
Agaram	-	-	-	-	100.00	-
Angunam	-	-	5.00	7.00	88.00	-
Keeranur	1.35	-	-	2.70	95.95	-
Arumbakkam	-	-	-	-	100.00	-
Avur	-	-	-	1.30	98.70	-
Gudalur (Z) Nala-thangal	-	-	-	1.18	98.82	-
Konalur	-	-	-	1.12	98.88	-
Kalpoondi	-	6.25	53.13	18.75	21.88	-
Ganapapuram	-	-	-	2.70	97.30	-
Gengapattu	-	-	-	-	100.00	-
Nadalarganandal	-	-	-	-	100.00	-
Neivanatham	-	-	-	2.17	95.65	2.17
Panniyur	-	-	-	5.41	94.59	-
Kaniyampoondi	-	-	-	-	100.00	-
Karikilambadi	-	-	-	1.59	98.41	-
Kathalampattu	-	-	37.50	4.17	58.00	-
Kattumalaiyanur	-	-	-	1.31	98.69	-
Kazhikulam	-	-	-	5.17	94.83	-
Keekalur	-	-	0.67	15.33	84.00	-
Mekalur	-	-	1.14	-	98.86	-
Sirunathur	-	-	-	-	100.00	-
Sanippundi	-	-	-	-	95.16	5.00
Sevarapundi	-	-	12.07	18.97	68.97	-
Somasipadi	-	-	0.99	-	99.01	-
Vaipur	-	-	-	-	100.00	-
Valuthalangunam	-	-	-	-	100.00	-
Nammiandal	-	-	-	1.82	98.18	-

Gram Panchayat	Status of Physical condition of the soil (%)					
	Moderately Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline
Vayalur	3.23	-	-	-	96.77	-
Vedanatham	-	-	-	1.22	97.56	1.22
Anukkumalai	-	-	-	-	100.00	-
Aranji	-	-	-	-	100.00	-
Chellankuppam	-	-	-	-	100.00	-
Iyagunnam	-	-	-	3.08	96.92	-
Kadambai	-	-	1.35	8.11	90.54	-
Kallayyee	-	-	-	6.90	93.10	-
Ganalapadi	-	-	-	1.00	99.00	-
Kalingaleri	-	-	-	-	100.00	-
Kolathur	-	19.17	18.33	6.67	55.83	-
Nariyamangalam	-	-	-	5.00	95.08	-
Olaipadi	-	-	-	-	100.00	-
Rajanthangal	-	-	-	-	100.00	-
Rayampettai	-	-	7.69	84.62	7.69	-
Su.Polakunam	-	1.37	-	15.07	83.56	-
Velanandal	-	-	-	1.00	97.67	-
Neelathangala	-	-	-	1.00	98.82	-

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
Agaram	-	33.00	47.00	High	23.00	51.64	89.47	4.00	96.00
Angunam	-	85.00	-	Moderate	23.00	90.01	123.61	2.00	98.00
Keeranur	6.00	56.00	32.00	Moderate	23.00	81.10	192.54	1.00	99.00
Arumbakkam	30.00	69.00	-	Moderate	23.00	34.35	78.97	-	100.00
Avur	-	42.00	35.00	Moderate	23.00	113.96	163.49	1.00	99.00
Gudalur (Z) Nalathangal	-	90.00	-	Moderate	23.00	111.42	286.96	1.00	99.00
Konalur	32.00	56.00	-	Moderate	23.00	110.85	256.75	2.00	98.00
Kalpoondi	-	58.00	30.00	Moderate	23.00	47.35	68.59	2.00	98.00
Ganapapuram	11.00	80.00	-	Moderate	23.00	67.92	147.76	4.00	96.00
Gengapattu	2.00	86.00	-	Moderate	23.00	41.08	35.93	3.00	97.00
Nadalarganandal	-	87.00	-	Moderate	23.00	66.92	158.64	2.00	98.00
Neivanatham	2.00	85.00	7.00	Moderate	23.00	70.60	88.55	3.00	97.00
Panniyur	-	72.00	8.00	Moderate	23.00	92.26	126.53	1.00	99.00
Kaniyampoondi	-	77.00	13.00	Moderate	23.00	33.79	100.00	6.00	94.00
Karikilambadi	-	30.00	59.00	High	23.00	56.31	173.32	2.00	98.00
Kathalampattu	-	91.00	-	Moderate	23.00	77.86	113.08	6.00	94.00
Kattumalaiyanur	15.00	58.00	14.00	Moderate	23.00	210.49	363.40	2.00	98.00
Kazhikulam	-	99.00	-	Moderate	23.00	61.55	102.59	2.00	98.00
Keekalur	-	68.00	20.00	Moderate	23.00	165.04	380.42	12.00	88.00
Mekalur	-	92.00	2.00	Moderate	23.00	269.49	358.09	3.00	97.00
Sirunathur	-	73.00	19.00	Moderate	23.00	109.01	277.36	2.00	98.00
Sanippundi	-	89.00	-	Moderate	23.00	67.34	158.54	1.00	99.00
Sevarapundi	-	46.00	40.00	Moderate	23.00	65.06	181.36	4.00	96.00
Somasipadi	13.00	81.00	2.00	Moderate	23.00	202.14	417.58	1.00	99.00
Vaipur	-	24.00	57.00	Moderate	23.00	94.13	267.72	2.00	98.00

Gram Panchayat	Soil Texture (%)				Soil moisture and ET			Means of Water Extraction (%)	
	Clay soil	Fine Soil	Coarse loamy	Soil Water Permeability (Low, Moderate, high)	Volumetric Soil Moisture (%)	Estimated Soil Moisture (ha.m)	ET Losses (ha.m)	Gravity	Lifting
Valuthalangunam	44.00	37.00	2.00	Moderate	23.00	203.86	438.34	-	100.00
Nammiandal	-	100.00	-	Moderate	23.00	52.45	160.22	3.00	97.00
Vayalur	-	100.00	-	Moderate	23.00	30.31	89.65	2.00	98.00
Vedanatham	-	41.00	47.00	High	23.00	83.74	248.47	-	100.00
Anukkumalai	-	61.00	22.00	Moderate	23.00	169.12	228.32	3.00	97.00
Aranji	13.00	70.00	7.00	Moderate	23.00	64.27	181.04	2.00	98.00
Chellankuppam	34.00	50.00	16.00	Moderate	23.00	118.54	197.79	2.00	98.00
Iyagunnam	-	81.00	6.00	Moderate	23.00	139.30	295.13	3.00	97.00
Kadambai	18.00	5.00	64.00	High	23.00	118.21	241.85	3.00	97.00
Kallayyee	9.00	67.00	-	Moderate	23.00	105.06	312.55	3.00	97.00
Ganalapadi	-	85.00	3.00	Moderate	23.00	166.88	394.84	20.00	80.00
Kalingaleri	8.00	53.00	27.00	Moderate	23.00	37.58	104.67	2.00	98.00
Kolathur	-	78.00	8.00	Moderate	23.00	177.37	273.48	3.00	97.00
Nariyamangalam	-	95.00	-	Moderate	23.00	136.10	366.72	9.00	91.00
Olaipadi	-	49.00	39.00	Moderate	23.00	170.29	330.26	6.00	94.00
Rajanthangal	-	100.00	-	Moderate	23.00	62.31	110.45	3.00	97.00
Rayampettai	-	29.00	61.00	Moderate	23.00	212.00	394.04	4.00	96.00
Su.Polakunam	4.00	84.00	12.00	Moderate	23.00	144.33	224.05	3.00	97.00
Velanandal	6.00	86.00	4.00	Moderate	23.00	83.98	124.58	4.00	96.00
Neelathangala	7.00	77.00	-	Moderate	23.00	111.42	186.31	3.00	97.00

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)		
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population
Agaram	11.00	89.00	282	19	122
Angunam	34.00	66.00	144	40	80
Keeranur	18.00	82.00	344	199	124
Arumbakkam	-	100.00	574	136	154
Avur	3.00	97.00	591	62	398
Gudalur (Z) Nalathangal	35.00	65.00	1205	863	378
Konalur	94.00	6.00	536	255	66
Kalpoondi	25.00	75.00	237	295	100
Ganapapuram	26.00	74.00	585	451	250
Gengapattu	12.00	88.00	346	301	81
Nadalarganandal	26.00	74.00	701	510	85
Neivanatham	36.00	64.00	172	35	70
Panniyur	21.00	79.00	135	25	6
Kaniyampoondi	28.00	72.00	332	32	154
Karikilambadi	16.00	84.00	1118	834	265
Kathalampattu	28.00	72.00	466	196	152
Kattumalaiyanur	2.00	98.00	3031	684	205
Kazhikulam	33.00	67.00	1051	354	573
Keekalur	76.00	24.00	1258	70	335
Mekalur	3.00	97.00	1155	226	562
Sirunathur	18.00	82.00	1612	122	247
Sanippundi	-	100.00	919	282	275
Sevarapundi	5.00	95.00	121	-	197
Somasipadi	14.00	86.00	1514	724	14
Vaipur	11.00	89.00	366	131	19
Valuthalangunam	-	100.00	1069	24	245
Nammiandal	-	100.00	1288	-	128

Gram Panchayat	Irrigation Methods (%)		Livestock (No.)		
	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population
Vayalur	-	100.00	372	138	301
Vedanatham	-	100.00	895	518	115
Anukkumalai	6.00	94.00	696	184	194
Aranji	17.00	83.00	856	156	356
Chellankuppam	23.00	77.00	730	120	157
Iyagunnam	14.00	86.00	1199	207	764
Kadambai	18.00	82.00	783	145	92
Kallayyee	23.00	77.00	488	325	304
Ganalapadi	17.00	83.00	1572	689	1106
Kalingaleri	13.00	87.00	380	461	183
Kolathur	4.00	96.00	1040	1820	323
Nariyamangalam	61.00	39.00	928	98	323
Olaipadi	25.00	75.00	477	362	77
Rajanthangal	13.00	87.00	1541	610	387
Rayampettai	3.00	97.00	1359	1034	341
Su.Polakunam	25.00	75.00	1101	192	289
Velanandal	4.00	96.00	891	155	170
Neelathangala	20.00	80.00	1205	863	378

ANNEXURE 3.8

GP WISE DEMOGRAPHIC AND SOCIO ECONOMIC STATUS

Key CWRM Parameter\ GP	Geographical Area (ha)	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable population (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vulnerable Households (SECC) (No.)
Agaram	257	693	683	1,376	410	-	410	391	108	24	83
Angunam	481	498	482	980	334	47	381	179	6	2	5
Keeranur	452	1,156	1,148	2,304	-	-	-	504	43	22	37
Arumbakkam	168	533	548	1,081	-	-	227	252	13	12	13
Avur	630	2,654	2,559	5,213	374	49	423	1,054	117	15	86
Gudalur (Z) Nalathangal	607	1,369	1,349	2,718	-	105	105	621	67	35	57
Konalur	588	1,551	1,468	3,019	978	-	978	702	118	29	91
Kalpoondi	281	758	768	1,526	981	138	1,119	362	16	17	16
Ganapapuram	338	903	872	1,775	91	36	127	441	39	23	34
Gengapattu	223	755	765	1,520	6	-	6	329	7	11	8
Nadalarganandal	327	1,044	1,140	2,184	38	-	38	536	79	32	65
Neivanatham	351	880	892	1,772	316	334	650	435	39	27	35
Panniyur	488	911	853	1,764	1,415	-	1,415	345	32	14	27
Kaniyampoondi	178	448	436	884	99	8	107	217	13	7	11
Karikilambadi	310	1,123	1,040	2,163	494	183	677	469	68	24	55
Kathalampattu	403	746	737	1,483	682	111	793	362	69	13	52
Kattumalaiyanur	1,094	1,934	1,885	3,819	1,588	53	1,641	875	157	34	120
Kazhikulam	302	767	702	1,469	178	-	178	271	13	16	14
Keekalur	870	1,815	1,815	3,630	1,332	-	1,332	869	94	53	82
Mekalur	1,376	2,333	2,324	4,657	1,689	66	1,755	1,098	199	74	162
Sirunathur	539	1,508	1,524	3,032	819	-	819	692	204	33	153
Sanippundi	337	892	877	1,769	352	3	355	405	55	12	42
Sevarapundi	316	531	518	1,049	200	35	235	464	34	36	35

Key CWRM Parameter\ GP	Geographical Area (ha)	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable population (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vulnerable Households (SECC) (No.)
Somasipadi	1,037	2,799	2,687	5,486	1,489	281	1,770	1,190	97	44	81
Vaipur	465	885	886	1,771	359	25	384	498	15	31	20
Valuthalangunam	982	1,580	1,650	3,230	1,541	31	1,572	718	15	31	20
Nammiandal	254	698	720	1,418	12	-	12	364	9	29	15
Vayalur	227	533	496	1,029	238	126	364	238	40	12	32
Vedanatham	475	1,271	1,250	2,521	844	-	844	602	150	29	114
Anukkumalai	822	876	916	1,792	9	634	643	413	64	12	48
Aranji	364	984	1,013	1,997	424	-	424	506	74	35	62
Chellankuppam	643	1,686	1,630	3,316	1,392	-	-	714	127	29	98
Iyagunnam	713	1,430	1,485	2,915	782	23	805	673	70	49	64
Kadambai	629	1,179	1,220	2,399	-	-	-	505	19	21	20
Kallayyee	538	1,262	1,271	2,533	454	-	454	607	52	31	46
Ganalapadi	852	1,479	1,479	2,958	842	15	857	684	66	45	60
Kalingaleri	206	416	403	819	156	36	192	185	13	7	11
Kolathur	947	1,517	1,504	3,021	781	13	794	749	126	51	104
Nariyamangalam	687	1,654	1,580	3,234	1,018	-	1,018	765	129	50	105
Olaipadi	923	1,396	1,288	2,684	969	74	1,043	470	118	26	90
Rajanthangal	323	901	854	1,755	258	-	258	444	35	13	28
Rayampettai	1,031	1,346	1,313	2,659	17	49	66	693	114	38	91
Su.Polakunam	768	1,493	1,454	2,947	721	2	723	662	62	34	54
Velanandal	421	1,308	1,237	2,545	5	-	5	546	96	27	75
Neelathangala	607	373	347	720	-	-	-	621	67	35	57

Key CWRM Parameter\ GP	% of Vulnerable House-holds (%)	Registered MGNRE-GA Job cards (Per-sons)	Active person working in MGNREGA job Cards (Persons)	Drinking Water Sources (No.)	Ground Water - Drinking source (No.)	Surface wa-ter - Drink-ing source (No.)	sum of drinking water sources (No.)	HH's have tap water connection for drinking water (No.)	HH's de-pendent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Agaram	21.00	690	419	94	5	1	6	698	160	3
Angunam	3.00	366	232	243	4	1	5	494	279	2
Keeranur	7.00	580	459	294	5	2	7	627	206	4
Arumbakkam	5.00	480	288	80	4	1	5	425	60	2
Avur	8.00	1,142	636	860	4	1	5	702	754	10
Gudalur (Z) Nalathangal	9.00	547	337	227	5	1	6	221	209	5
Konalur	13.00	791	629	554	4	2	6	295	523	6
Kalpoondi	5.00	480	327	147	4	1	5	443	109	3
Ganapapuram	8.00	755	473	112	4	1	5	200	115	3
Gengapattu	2.00	316	217	198	4	2	6	379	151	3
Nadalarganandal	12.00	904	705	207	5	2	7	443	190	4
Neivanatham	8.00	692	405	87	4	1	5	162	65	3
Panniyur	8.00	495	353	119	4	2	6	183	100	3
Kaniyampoondi	5.00	263	208	100	5	1	6	-	230	2
Karikilambadi	12.00	930	515	183	3	2	5	1,112	395	4
Kathalampattu	14.00	613	450	69	4	2	6	1,189	220	3
Kattumalaiyanur	14.00	1,442	1,006	205	5	1	6	1,090	810	7
Kazhikulam	5.00	577	487	178	5	1	6	514	180	3
Keekalur	9.00	1,501	1,028	212	4	2	6	3,075	1,016	7
Mekalur	15.00	1,861	1,056	36	3	1	4	-	-	9
Sirunathur	22.00	937	674	169	5	1	6	710	350	6
Sanippundi	10.00	734	419	165	4	1	5	1,064	455	3
Sevarapundi	7.00	695	512	72	5	-	5	155	75	2
Somasipadi	7.00	2,653	1,707	355	5	1	6	1,300	320	10
Vaipur	4.00	1,527	593	109	4	-	4	164	135	3

Key CWRM Parameter\ GP	% of Vulnerable House-holds (%)	Registered MGNRE-GA Job cards (Per-sons)	Active person working in MGNREGA job Cards (Persons)	Drinking Water Sources (No.)	Ground Water - Drinking source (No.)	Surface wa-ter - Drink-ing source (No.)	sum of drinking water sources (No.)	HH's have tap water connection for drinking water (No.)	HH's de-pendent on other sources for drinking water (No.)	Annual Greywater Generation (ha - m)
Valuthalangunam	3.00	1,183	637	240	5	-	5	860	300	6
Nammiandal	4.00	553	417	6	2	-	2	34	-	3
Vayalur	13.00	361	228	229	5	1	6	227	149	2
Vedanatham	19.00	1,018	784	16	3	-	3	385	-	5
Anukkumalai	12.00	799	511	32	4	1	5	68	-	3
Aranji	12.31	854	672	13	3	1	4	25	-	4
Chellankuppam	14.00	958	778	28	2	1	3	-	-	6
Iyagunnam	9.00	822	678	22	3	1	4	-	-	5
Kadambai	4.00	985	685	15	2	1	3	43	-	4
Kallayyee	8.00	836	561	16	3	1	4	42	-	5
Ganalapadi	9.00	1,274	910	20	2	1	3	49	-	5
Kalingaleri	6.00	390	206	7	3	1	4	26	-	1
Kolathur	13.82	1,344	921	18	3	1	4	80	-	6
Nariyamangalam	14.00	1,445	863	16	2	1	3	72	-	6
Olaipadi	20.00	805	658	21	2	1	3	52	-	5
Rajanthangal	6.00	518	435	13	2	1	3	40	-	3
Rayampettai	13.00	1,245	769	11	2	1	3	55	-	5
Su.Polakunam	8.00	1,259	996	24	2	1	3	93	-	5
Velanandal	14.00	886	667	13	2	1	3	55	-	5
Neelathangala	9.00	408	239	17	4	1	5	140	-	1

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	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
Agaram	22.41	4.29	-	-	-	-	10.03	2.65	33.64
Angunam	44.96	24.94	-	-	1.65	-	5.42	0.38	3.74
Keeranur	1.88	2.11	-	-	-	-	8.03	0.90	16.54
Arumbakkam	-	2.75	-	-	0.71	-	2.34	0.07	4.88
Avur	1.87	14.05	-	12.08	1.16	-	22.28	5.27	10.07
Gudalur (Z) Nalathangal	0.26	15.08	-	-	-	-	9.93	13.45	19.54
Konalur	53.15	3.50	-	-	-	-	20.54	32.14	9.39
Kalpoondi	4.95	-	-	-	0.69	-	5.39	0.82	3.02
Ganapapuram	-	45.30	-	-	-	0.02	3.94	8.57	5.68
Gengapattu	22.09	1.17	-	-	2.25	0.01	3.22	0.05	1.06
Nadalarganandal	-	7.69	-	-	-	1.03	9.07	17.23	6.66
Neivanatham	-	40.91	-	-	-	-	11.58	1.63	7.34
Panniyur	43.59	8.96	-	6.37	-	-	17.87	1.21	10.27
Kaniyampoondi	15.54	0.19	-	-	-	-	1.15	0.67	5.75
Karikilambadi	0.61	4.50	-	-	-	-	2.72	10.49	14.70
Kathalampattu	32.21	9.04	-	-	-	-	26.80	8.18	12.11
Kattumalaiyanur	89.34	-	-	-	-	-	63.57	24.03	38.01
Kazhikulam	-	13.74	-	-	-	-	2.71	8.65	1.44
Keekalur	76.10	3.59	0.11	-	1.10	-	22.39	32.66	11.81
Mekalur	102.09	72.66	-	-	-	-	92.58	17.89	47.62
Sirunathur	-	27.29	-	-	-	-	20.44	48.12	28.00
Sanippundi	22.31	3.41	1.30	-	0.03	-	9.46	2.28	18.04
Sevarapundi	16.77	15.05	-	-	0.87	-	9.02	45.82	10.57
Somasipadi	79.01	15.01	-	-	-	0.67	46.85	16.77	55.94

Key CWRM Parameter	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
Vaipur	-4.47	4.36	-	-	11.55	-	2.19	0.29	12.95
Valuthalangunam	-9.82	100.49	-	11.07	-	0.03	5.69	5.46	9.17
Nammiandal	12.79	-	-	-	-	-	1.19	5.33	7.00
Vayalur	20.90	-	-	-	-	-	2.69	4.41	10.39
Vedanatham	3.73	-	-	-	-	-	10.40	33.61	24.76
Anukkumalai	-	69.16	-	-	9.79	-	22.58	16.22	35.04
Aranji	2.73	0.50	-	-	0.29	-	6.55	2.61	25.12
Chellankuppam	25.59	1.43	-	3.75	3.45	0.08	36.72	1.86	31.88
Iyagunnam	53.80	19.06	-	-	-	-	19.19	11.65	21.38
Kadambai	57.62	9.52	-	-	3.18	-	7.85	1.28	10.75
Kallayyee	40.38	17.02	-	-	1.08	-	3.51	8.65	22.45
Ganalapadi	63.23	70.43	-	-	2.21	-	12.39	13.57	30.63
Kalingaleri	0.34	3.62	-	-	-	-	1.70	0.14	7.67
Kolathur	88.07	10.81	0.79	-	1.61	-	58.03	26.92	20.55
Nariyamangalam	47.55	17.11	-	-	-	-	15.79	52.47	11.38
Olaipadi	91.22	6.65	-	-	4.81	-	62.87	36.66	45.50
Rajanthangal	10.44	1.67	-	0.20	0.19	-	7.86	0.85	7.38
Rayampettai	-	5.29	-	-	-	0.53	55.35	21.69	42.81
Su.Polakunam	70.45	-	-	-	1.04	-	27.80	4.30	17.99
Velanandal	-	12.87	-	1.13	1.35	-	26.77	5.55	15.93
Neelathangala	0.26	15.08	-	-	-	-	9.93	13.45	19.54

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
Agaram	13	-	9
Angunam	30	0	2
Keeranur	6	-	5
Arumbakkam	3	0	1
Avur	13	4	7
Gudalur (Z) Nalathangal	11	-	8
Konalur	28	-	12
Kalpoondi	4	0	2
Ganapapuram	22	-	4
Gengapattu	12	1	1
Nadalarganandal	6	-	7
Neivanatham	19	-	4
Panniyur	24	2	6
Kaniyampoondi	7	-	1
Karikilambadi	4	-	5
Kathalampattu	19	-	9
Kattumalaiyanur	41	-	25
Kazhikulam	8	-	3
Keekalur	35	0	13
Mekalur	74	-	31
Sirunathur	13	-	19
Sanippundi	11	0	6
Sevarapundi	14	0	13
Somasipadi	52	-	24
Vaipur	1	3	3
Valuthalangunam	39	3	4
Nammiandal	6	-	3
Vayalur	11	-	3
Vedanatham	4	-	13
Anukkumalai	43	3	14
Aranji	4	0	7
Chellankuppam	40	2	14
Iyagunnam	41	-	10
Kadambai	39	1	4
Kallayyee	30	0	7
Ganalapadi	76	1	11
Kalingaleri	3	-	2
Kolathur	46	1	21
Nariyamangalam	33	-	16
Olaipadi	50	1	28
Rajanthangal	10	-	3
Rayampettai	5	-	24

GP/Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Su.Polakunam	37	0	10
Velanandal	10	1	9
Neelathangala	9	-	8

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.	Plants	Area	No.	Length	No.
Agaram	17928	22.41	0	0	0	83	3432	4.29	1500	7500	83
Angunam	35968	44.96	0	0	0	5	21270	26.59	980	4900	5
Anukkumalai	0	0	0	0	0	48	63156	78.95	1000	5000	48
Aranji	2187	2.73	0	0	0	62	630	0.79	860	4300	62
Arumbakkam	0	0	0	0	0	13	2772	3.47	440	2200	13
Avur	1497	1.87	0	0	0	86	21822	27.28	4100	20500	86
Chellankuppam	20475	25.59	0	0	0	98	6900	8.63	0	0	98
Ganalapadi	50580	63.23	0	0	0	60	58104	72.63	886	4430	60
Ganapapuram	0	0	0	0	0	34	36240	45.3	1400	7000	34
Gengapattu	17672	22.09	0	0	0	8	2736	3.42	800	4000	8
Gengapattu											
Gudalur (Z) , Nalathangal	205	0.26	0	0	0	57	12066	15.08	0	0	57
Gudalur (Z) Nalathangal											
Iyagunnam											
Iyangunnam	43040	53.8	0	0	0	64	15246	19.06	0	0	64
Kadambai	46092	57.62	0	0	0	20	10158	12.7	0	0	20
Kalingaleri	274	0.34	0	0	0	11	2892	3.62	440	2200	11
Kallayyee	32300	40.38	0	0	0	46	14478	18.1	1300	6500	46
Kalpoondi	3960	4.95	0	0	0	16	552	0.69	600	3000	16
Kaniyampoondi	12428	15.54	0	0	0	11	150	0.19	0	0	11
Karikilambadi	485	0.61	0	0	0	55	3600	4.5	0	0	55
Kathalampattu	25764	32.21	0	0	0	52	7230	9.04	0	0	52
Kattumalaiyanur	71472	89.34	0	0	0	120	0	0	640	3200	120
kazhikulam	0	0	0	0	0	14	10992	14	1200	6000	14
Keekalur	60880	76.1	0	0	0	82	3750	4.69	0	0	82

Gram Panchayat	Aff		ARS	AVP		Az	BP		CBP		CS
	No.	Area	No.	No.	Length	No.	Plants	Area	No.	Length	No.
Keeranur	1507	1.88	0	0	0	37	1686	2.11	1200	6000	37
Kolathur	70452	88.07	0	0	0	104	9930	12.41	1240	6200	104
Konalur	42516	53.15	0	0	0	91	2802	3.5	240	1200	91
Mekalore	81672	102.09	0	0	0	162	58128	72.66	0	0	162
Mekalur											
Nadalarganandal	0	0	0	0	0	65	6150	7.69	800	4000	65
Nammiandal											
Nammiandal(SO)	0	0	0	0	0	40	0	0	0	0	106
Nariyamangalam	38036	47.55	0	0	0	105	13686	17.11	826	4130	105
Neelathangala	205	0.26	0	0	0	57	12066	15.08	0	0	57
Neivanatham	0	0	0	0	0	35	32730	40.91	1600	8000	35
Olaipadi	72976	91.22	0	0	0	90	9162	11.45	1920	9600	90
Panniyur	34868	43.59	0	0	0	27	12264	15.33	0	0	27
Rajanthangal	8352	10.44	0	0	0	28	1638	2.05	0	0	28
Rayampettai	0	0	0	0	0	91	4230	5.29	964	4820	91
Sanippundi	2720	3.4	0	0	0	35	0	0	0	0	45
Sevarapundi	0	0	0	337.4	1687		0	0	0	0	
Sirunathur	0	0	0	0	2440	153	21834	27.29	200	1000	153
Somasipadi	0	0	40	0	1855	135	0	0	230	1150	151
Su. Polakunam	56360	70.45	0	0	0	54	828	1.04	1310	6550	54
Su.Polakunam											
Vaipur	0	0	0	0	0		0	0	0	0	
Valuthalangunam	20000	100	13	0	0	99	2200	11	0	0	106
Vayalur	0	0	0	0	8655		0	0	0	0	
Vedanatham	0	0	0	0	2145	41	0		0	0	0
Velananandal	0	0	0	0	3320	75	12276	15.35	380	1900	75
Velanandal											

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Area	Plants	Length	No.	Area	No.	Area
Agaram	83	5	0	10	63	6672	73.03	0	0	4633	23.16	3	6.34
Angunam	5	3	0	26	37	14927	81.09	0	0	954	4.77	1	2.9
Anukkumalai	48	16	0	31	120	19789	152.78	0	0	7384	36.92	8	19.4
Aranji	62	4	0	7	82	1702	37.8	0	0	3428	17.14	2	4.58
Arumbakkam	13	2	0	4	39	973	10.76	0	0	729	3.65	0	1.21
Avur	86	11	0	18	48	8633	66.78	0	0	3763	18.82	6	13.78
Chellankuppam	98	15	0	24	69	10779	104.77	0	0	7055	35.27	8	19.33
Ganalapadi	60	10	0	39	136	29903	192.44	0	0	5659	28.29	5	12.98
Ganapapuram	34	6	0	15	29	10343	63.52	0	0	1822	9.11	3	6.27
Gengapattu	8	3	0	10	15	5445	29.85	0	0	434	2.17	1	1.64
Gengapattu													
Gudalur (Z) , Nalathangal	57	9	0	13	55	5461	58.26	0	0	4292	21.46	5	11.69
Gudalur (Z) Nalathangal													
Iyagunnam													
Iyangunnam	64	12	0	28	95	17750	125.08	0	0	5222	26.11	6	15.42
Kadambai	20	4	0	19	108	15083	90.19	0	0	1988	9.94	2	4.57
Kalingaleri	11	2	0	3	44	1020	13.47	0	0	951	4.76	0	0.92
Kallayyee	46	5	0	16	86	12997	93.08	0	0	3461	17.31	2	6.08
Kalpoondi	16	3	0	4	20	1769	14.87	0	0	923	4.61	1	3.1
Kaniyampoondi	11	2	0	6	32	3359	23.29	0	0	757	3.79	0	0.91
Karikilambadi	55	5	0	7	42	2384	33.01	0	0	2790	13.95	3	6.6
Kathalampattu	52	14	0	22	34	11779	88.32	0	0	4708	23.54	7	17.49
Kattumalaiyanur	120	35	0	51	111	26739	214.95	0	0	12561	62.81	18	43.8
kazhikulam	14	5	0	7	7	3891	27	0	0	1279	6.39	2	6
Keekalur	82	22	0	40	12	21696	147.76	0	0	6686	33.43	11	27.53
Keeranur	37	4	0	7	75	1766	29.46	0	0	2547	12.74	2	4.47
Kolathur	104	34	0	56	56	28804	206.77	0	0	10550	52.75	17	42.47

Gram Panchayat	CT	Co		FP	COWRS	CCBF		DLT		DLHAI		FBBTI	
	No.	No.	Area	No.	No.	No.	Area	Plants	Length	No.	Area	No.	Area
Konalur	91	21	0	33	2	16599	118.72	0	0	6207	31.04	11	26.34
Mekalore	162	44	0	79	125	46122	332.84	0	0	15809	79.05	22	55.23
Mekalur													
Nadalarganandal	65	12	0	14	22	4292	41.68	0	0	3399	16.99	5	13.66
Nammiandal													
Nammiandal(SO)	106	0	0	0	0	0	0	0	0			0	0
Nariyamangalam	105	27	0	40	13	19769	144.3	0	0	7965	39.82	14	34.13
Neelathangala	57	9	0	13	58	5464	58.26	0	0	4292	21.46	5	11.69
Neivanatham	35	5	0	14	36	9539	61.45	0	0	2054	10.27	3	6.6
Olaipadi	90	40	0	60	91	30487	247.69	0	0	14502	72.51	20	49.76
Panniyur	27	8	0	20	42	13733	88.27	0	0	2935	14.68	4	9.54
Rajanthangal	28	4	0	9	49	3418	28.58	0	0	1609	8.05	2	4.35
Rayampettai	91	32	0	33	126	8940	125.66	0	0	12038	60.19	16	38.79
Sanippundi	45	35	0	10	10	0	0	310	1548			0	0
Sevarapundi		0	0	0	0	0	0	0	0			0	0
Sirunathur	153	27	0	32	42	12356	123.85	0	0	9656	48.28	14	34.28
Somasipadi	151	38	0	10	10	0	0	2312	11562			0	0
Su. Polakunam	54	13	0	28	67	17575	121.58	0	0	5009	25.05	6	16.05
Su.Polakunam													
Vaipur		0	0	0	0	0	0	0	0			0	0
Valuthalangunam	106	0	0	10	0	0	0	1901	9506			0	0
Vayalur		0	0	0	0	0	0	0	0			0	0
Vedanatham	0	0	0	0	0	0	0	0	0			0	0
Velananandal	75	13	0	18	44	6344	63.6	0	0	4825	24.13	6	16.16
Velanandal													

Gram Panchayat	FD	GSS	ICP		LDI		LP		MI		NADEP
	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.
Agaram	83	13	0	0	3	6.34	443	2214.5	0	0	83
Angunam	5	10	0	0	1	2.9	647	3236.8	0	0	5
Anukkumalai	48	29	0	0	8	19.4	587	2936.5	0	0	48
Aranji	62	43	0	0	2	4.58	349	1747	0	0	62
Arumbakkam	13	22	300	1500	0	1.21	84	419	0	0	13
Avur	86	43	0	0	6	13.78	471	2355.4	0	0	86
Chellankuppam	98	22	0	0	8	19.33	768	3841	0	0	98
Ganalapadi	60	145	0	0	5	12.98	1092	5461.5	0	0	60
Ganapapuram	34	48	0	0	3	6.27	528	2640.3	0	0	34
Gengapattu	8	23	0	0	1	1.64	384	1920	0	0	8
Gengapattu											
Gudalur (Z) , Nalathangal	57	81	0	0	5	11.69	757	3785.7	0	0	57
Gudalur (Z) Nalathangal											
Iyagunnam											
Iyangunnam	64	87	0	0	6	15.42	866	4330	0	0	64
Kadambai	20	16	0	0	2	4.57	950	4748	0	0	20
Kalingaleri	11	41	0	0	0	0.92	238	1187.5	0	0	11
Kallayyee	46	47	0	0	2	6.08	553	2765	0	0	46
Kalpoondi	16	25	0	0	1	3.1	662	3308.2	0	0	16
Kaniyampoondi	11	17	430	2150	0	0.91	313	1565.3	0	0	11
Karikilambadi	55	68	570	2850	3	6.6	526	2630	0	0	55
Kathalampattu	52	25	0	0	7	17.49	33	638	0	0	52
Kattumalaiyanur	120	55	0	0	18	43.8	1207	6032.6	0	0	120
kazhikulam	14	75	0	0	2	6	298	1489	0	0	14
Keekalur	82	34	800	4000	11	27.53	1213	6066	0	0	82
Keeranur	37	22	0	0	2	4.47	707	3536	0	0	37
Kolathur	104	123	0	0	17	42.47	819	4096	0	0	104

Gram Panchayat	FD	GSS	ICP		LDI		LP		MI		NADEP
	No.	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.
Konalur	91	19	0	0	11	26.34	609	3045.9	0	0	91
Mekalore	162	68	1800	9000	22	55.23	1207	6034.5	0	0	162
Mekalur											
Nadalarganandal	65	34	0	0	5	13.66	461	2304.5	0	0	65
Nammiandal											
Nammiandal(SO)		12	0	0	0	0	0	0	0	0	
Nariyamangalam	105	37	0	0	14	34.13	480	2399	0	0	105
Neelathangala	57	81	0	0	5	11.69	515	2572.6	0	0	57
Neivanatham	35	9	0	0	3	6.6	718	3590.4	0	0	35
Olaipadi	90	26	0	0	20	49.76	1433	7167.2	0	0	90
Panniyur	27	2	0	0	4	9.54	329	1643.9	0	0	27
Rajanthangal	28	69	0	0	2	4.35	530	2648	0	0	28
Rayampettai	91	86	0	0	16	38.79	693	3466.5	0	0	91
Sanippundi		13	0	0	11	27	650	1235	0	0	
Sevarapundi			0	0	0	0	0	0	0	0	
Sirunathur	153	31	300	1500	14	34.28	595	2973.6	0	0	153
Somasipadi		72	0	0	34	85	0	0	0	0	
Su. Polakunam	54	39	0	0	6	16.05	934	4669.6	0	0	54
Su.Polakunam											
Vaipur			0	0	0	0	231	853	0	0	
Valuthalangunam		12	0	0	37	92	0	0	0	0	
Vayalur			0	0	0	0	614	1235	0	0	
Vedanatham		0	0	0	0	0	0	0	0	0	
Velananandal	75	25	0	0	6	16.16	490	2450.5	0	0	75
Velanandal											

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	No.	Area	No.	No.	Length
Agaram	1955	391	0	0	1	7	2	0	0	4		0
Angunam	895	179	0	0	2	3	2	0	0	2		0
Anukkumalai	2065	413	0	2	0	7	2	0	0	4		0
Aranji	2530	506	0	2	0	4	2	0	0	5		0
Arumbakkam	1260	252	0	0	0	3	2	0	0	3		1500
Avur	5270	1054	0	0	0	7	2	0	0	11		0
Chellankuppam	3570	714	0	3	0	2	2	0	0	7		0
Ganalapadi	3420	684	0	4	0	10	2	0	0	7		0
Ganapapuram	2205	441	0	2	0	6	2	0	0	4		0
Gengapattu	1645	329	0				2	0	0	3		0
Gengapattu				2	3	2						
Gudalur (Z) , Nalathangal	3105	621	0				2	0	0	6		0
Gudalur (Z) Nalathangal				2	3	7						
Iyagunnam				2	0	10						
Iyangunnam	3365	673	0				2	0	0	7		0
Kadambai	2525	505	0	2	0	9	2	0	0	5		0
Kalingaleri	925	185	0	1	0	2	2	0	0	2		0
Kallayyee	3035	607	0	4	0	7	2	0	0	6		0
Kalpoondi	1810	362	0	2	1	7	2	0	0	4		0
Kaniyampoondi	1085	217	0	1	0	4	2	0	0	2		2150
Karikilambadi	2345	469	0	1	0	4	2	0	0	5		2850
Kathalampattu	1810	362	0	3	0	8	2	0	0	4		0
Kattumalaiyanur	4375	875	0	5	0	8	2	0	0	9		0
kazhikulam	1355	271	0	1	1	5	2	0	0	3		0
Keekalur	4345	869	0	5	3	7	2	84	0.11	9		4000
Keeranur	2520	504	0	0	1	7	2	0	0	5		0
Kolathur	3745	749	0	2	0	9	2	630	0.79	7		0
Konalur	3510	702	0	2	0	8	2	0	0	7		0

Gram Panchayat	ND		PS	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	Plants	HH	No.	No.	No.	No.	No.	No.	Area	No.	No.	Length
Mekalore	5490	1098	0				2	0	0	11		9000
Mekalur				5	0	8						
Nadalarganandal	2680	536	0	2	1	5	2	0	0	5		0
Nammiandal				1	0	2						
Nammiandal(SO)	455	91					2	0	0	0	40	0
Nariyamangalam	3825	765	0	3	0	8	2	0	0	8		0
Neelathangala	3105	621	0	2	0	5	2	0	0	6		0
Neivanatham	2175	435	0	3	0	4	2	0	0	4		0
Olaipadi	2350	470	0	9	0	10	2	0	0	5		0
Panniyur	1725	345	0	1	1	3	2	0	0	3		0
Rajanthangal	2220	444	0	2	0	7	2	0	0	4		0
Rayampettai	3465	693	0	1	0	2	2	0	0	7		0
Sanippundi	885	177		1	0	3	2	960	1.2	35		0
Sevarapundi				1	2	5	2	0	0	0		0
Sirunathur	675	135	0	1	1	9	2	0	0	7		1500
Somasipadi	675	135		0	1	9	2	8000	10		135	0
Su. Polakunam	3310	662	0				2	0	0	7		0
Su.Polakunam				6	0	9						
Vaipur				3	0	5	2	0	0			0
Valuthalangunam	496	99		0	0	9	2	0	0	1	99	0
Vayalur				2	0	10	2	0	0	0		0
Vedanatham	0	0		0	0	11	2	0	0	41		0
Velananandal	2730	546	0				2	0	0	5		0
Velanandal				2	0	5						

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	Agaram	713	329
2	Angunam	140	227
3	Aranji	730	271
4	Arumbakkam	225	258
5	Anukkumalai	833	216
6	Avoor	649	1072
7	Chellankuppam	920	259
8	Ganapapuram	397	497
9	Ganalapadi	1017	507
10	Na.gengapattu	197	100
11	Gudalur(z)	675	288
12	Iyangunam	722	263
13	Kadambai	536	283
14	Kalingaleri	285	194
15	Kallayee	630	296
16	Kalpundi	272	183
17	Kaniyampoondi	258	102
18	Karikalampadi	724	224
19	Kathalampattu	616	514
20	Kattumalaiyanur	1151	441
21	Kazhikulam	258	158
22	Keekaloor	692	352
23	Kiranur	430	320
24	Konalur	604	275
25	Kolathur	1135	447
26	Mekalur	1721	275
27	Nadalaganadal	433	278
28	So.namiyandal	266	299
29	Nariyamangalam	924	420
30	Neivanatham	251	129
31	Neelanthangal	644	379
32	Olaipadi	1152	496
33	Panniyur	317	213
34	Su.polakunam	678	282
35	Rajanthangal	433	364
36	Rayampettai	1138	361
37	Sanipoondi	417	88
38	Sevarapoondi	376	194
39	Sirunathur	1195	353
40	Somosapadi	1219	280
41	Vaippur	507	112

Sl. No	GP	WASCA Recommendation for 3 Years	Works uploaded for FY-2021-22 as on 02/02/2022
42	Valudalangunam	958	545
43	Vedanatham	446	606
44	Vayalur	325	271
45	Velandal	638	194

ANNEXURE 7.2

GP AND WORK CATEGORY-WISE ONGOING WORKS IN KILPENNATHUR BLOCK

GP	Work Category	Ongoing works
Agaram	Works on Individuals Land (Category IV)	7
Angunam	Works on Individuals Land (Category IV)	1
Anukkumalai	Works on Individuals Land (Category IV)	6
Aranji	Works on Individuals Land (Category IV)	3
Arumbakkam	Works on Individuals Land (Category IV)	2
Avoor	Works on Individuals Land (Category IV)	1
Chellankuppam	Works on Individuals Land (Category IV)	4
Ganalapadi	Works on Individuals Land (Category IV)	3
Ganapapuram	Works on Individuals Land (Category IV)	3
Gudalur(Z)	Works on Individuals Land (Category IV)	1
Iyangunnam	Works on Individuals Land (Category IV)	11
Kadambai	Works on Individuals Land (Category IV)	5
Kalingaleri	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	6
Kalpundi	Works on Individuals Land (Category IV)	4
Kaniyampoondi	Works on Individuals Land (Category IV)	3
Karikalampadi	Rural Sanitation	1
Kattumalaiyanur	Rural Sanitation	1
	Works on Individuals Land (Category IV)	4
Kazhikulam	Works on Individuals Land (Category IV)	3
Keekaloor	Works on Individuals Land (Category IV)	5
Konalur	Works on Individuals Land (Category IV)	19
Mekalur	Works on Individuals Land (Category IV)	5
Na.Gengapattu	Anganwadi/Other Rural Infrastructure	1
Nariyamangalam	Works on Individuals Land (Category IV)	2
Olaipadi	Works on Individuals Land (Category IV)	9
Panniyur	Works on Individuals Land (Category IV)	2
Sanipoondi	Works on Individuals Land (Category IV)	5
Sevarapoondi	Works on Individuals Land (Category IV)	2
Sirunathur	Works on Individuals Land (Category IV)	14
Somosapadi	Works on Individuals Land (Category IV)	8
Su.Polakunam	Works on Individuals Land (Category IV)	1
Valudalangunam	Works on Individuals Land (Category IV)	3
Vedanatham	Works on Individuals Land (Category IV)	7
Velandal	Works on Individuals Land (Category IV)	10

ANNEXURE 8

CWRM KEY INDICATORS FOR GPs IN VALUDALANGUNAM MICRO-WATERSHED

CWRM Parameter	Valuthalangunam	Mekalur
Soil Resources: Status of Available Nitrogen (%)		
Very Low	0.00	2.84
Low	0.00	82.39
Medium	0.00	14.77
Status of Organic Carbon (%)		
Very Low	0.00	11.36
Low	0.00	88.64
Status of Soil Micro Nutrients (%)		
Sufficient	42.00	64.00
Deficient	58.00	36.00
Status of Physical condition of the soil (%)		
Slighly Acidic	0.00	1.14
Moderately Alkaline	100.00	98.86
Soil Texture (%)		
Clay soil	44.00	0.00
Fine Soil	37.00	92.00
Coarse loamy	2.00	2.00
Soil Water Permeability (Low, Moderate, high)	Moderate	Moderate
Soil moisture and ET		
Volumetric Soil Moisture (%)	23.00	23.00
Estimated Soil Moisture (ha.m)	203.86	269.49
ET Losses (ha.m)	438.34	358.09
Means of Water Extraction (%)		
Gravity	0.00	3.00
Lifting	100.00	97.00
Irrigation Methods (%)		
Wild Flooding	0.00	3.00
Control Flooding	100.00	97.00
Livestock (No.)		
Cattle Population	1,069	1,155
Sheep Population	24	226
Goat Population	245	562
Land Resources (ha)		
Non-Agricultural Uses	96.01	204.18
Area under Barren & Un-cultivable Land	133.99	96.88
Area under Permanent Pastures and Other Grazing Land	0.00	0.00
Land Under Miscellaneous Tree Criticalops etc.	14.76	0.00
Cultivable Waste Land		0.00
Fallows Land other than Current Fallows	0.99	0.00
Current Fallow land	206.18	629.44
Unirrigated Land	198.02	121.61
Area Irrigated by Source	332.42	323.78

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