WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA

PARAMAKUDI BLOCK

Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

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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.

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 Manage-ment will be on a saturation mode with GIS based planning. The impact of each inter-vention will be maximised through convergence.

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

In this context, implemen-tation of Water Security and Climate Adaptation (WAS-CA) 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.
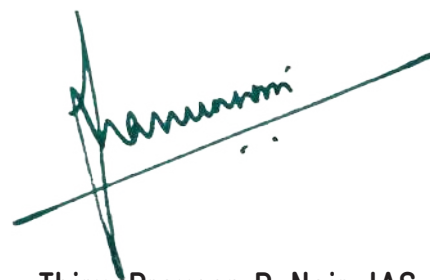
1.	Development of Public and Common lands
2.	Development of Agriculture and allied activities
3.	Development of Rural Infrastructure Management
4.	Development of Climate Resilience Measures

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 na- tional level, this process Rural Development and Mission, Ministry of Jal is anchored in the Ministry of supported by National Water Shakti.

The state government of port from Director Thiru. ment of Rural Develop- lated departments, under District Collector, Thiru. barked on this strategic of water security which is that we are increasingly report uses strong scien- GIS and statistical data to ture of water and climate

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

Tamil Nadu, with core sup- Praveen Nair I.A.S., Depart- ment and a host of water re- the active leadership of the B.Murugesh, I.A.S., has em- response to the strong crisis affected by climate change witnessing. This Block level tific data and analysis using develop a medium-term pic- 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 strate- gically 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 devel- opment 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

MESSAGES

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

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

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

Through District level GIS 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 Composite 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.

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

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 (Socio-economic, agriculture, eters) and identified the most for project implementation. vannamalai in Northern Tamil South coastal aspirational WASCA project Composite Wa- (CWRM) Plan is used.

18 Vulnerability parameters water and climate parameters vulnerable two districts The two districts are Tiru- Nadu and Ramanathapuram district. For implementing ter Resource Management

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

The CWRM plans assessed both water using data pertaining parameters, catchment are- riculture and prepared a wa- identified a set of key water

the supply and demand for to land resources, climate as, soil, surface runoff, ag- ter budget. Besides, it has 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

⁰C
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 - G

DLSC
District Level Steering Committee

DLT
Drainage Line Treatment

DRD&PR
Department of Rural Development & Panchayat Raj

EC
End Century

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

H - K

ha
Hectare

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

L - M

LULC
Land use and land cover

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

N - P

NAPCC
National Action on Climate Change

NARP
National Agricultural Research Project

NADEP
Nadepkaka

NDC
Nationally Determined Contributions

NEM
North-East monsoon

NGO
Non-Governmental Organization

NITI
National Institution for Transforming India

No.
Number

NRM
Natural Resource Management

NRSC
National Remote Sensing Centre

NWC
National Water Commission

PWD
Public Works Department

R - S

Rabi crop
Sown in winter and harvested in monsoon

RDPR
Rural Development & Panchayat Raj

RF
Reserve Forest

RTRWHS
Roof top rain water harvesting structures

RWHS
Rain Water Harvesting System

SAPCC
State Action Plan on Climate Change

SC
Scheduled Caste

SDG
Sustainable Development Goal

SDMA
State Disaster Management Authority

SDMRI
Suganthi Devadasan Marine Resources Institute

SECC
Socio Economic and Caste Census

S - W

SHG
Self Help Group

SLSC
State Level Steering Committee

ST
Scheduled Tribe

SWM
South-West monsoon

SW
Surface Water

TN
Tamil Nadu

UN
United Nations

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.

Indo-German Project **Water Security and Climate Adaptation (WASCA) in Rural India**

bi-lateral project commissioned by,

German Federal Ministry for Economic Cooperation and Development (BMZ)

Ministry of Rural Development (MoRD)

Ministry of Jal Shakti (MoJS)

GIZ (Represented by Government of Germany)

implemented by,
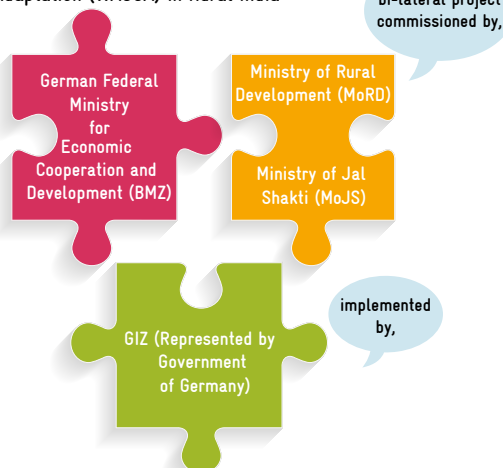
Initially WASCA Tamil Nadu conducted a preliminary state level scoping study on the State's Rural Water Security using the 18 vulnerable indicators, which covered four important and interconnected parameters/areas of Climate extremities, water resource, agriculture and socio-economic at the District 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 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 complete chapters

1

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

2

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

3

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

4

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

5

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

7

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

6

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

8

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

9

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

துப்பார்க்குத் துப்பாய துப்பாக்கித் துப்பார்க்குத்
துப்பாய தூஉம் மழை

குறள் - 12

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

Thirukkural - 12

CHAPTER 1

ABOUT THE BLOCK

1 | ABOUT THE BLOCK

Paramakudi Block of Ramanathapuram district lies between 9°26'26.624"N to 9°37'33.064"N latitude and 78°22'27.049"E to 78°39'45.256"E longitude and surrounded by Nainarkoil, Bogalur, Mudhukulathur and Kamuthi Blocks of Ramanathapuram district and sivaganga and Virudhunagar districts (Figure 1.1). The total geographical area of Block is 31,837 ha (318.37 Km²). The Block has 39 Gram Panchayats with 163 hamlets.
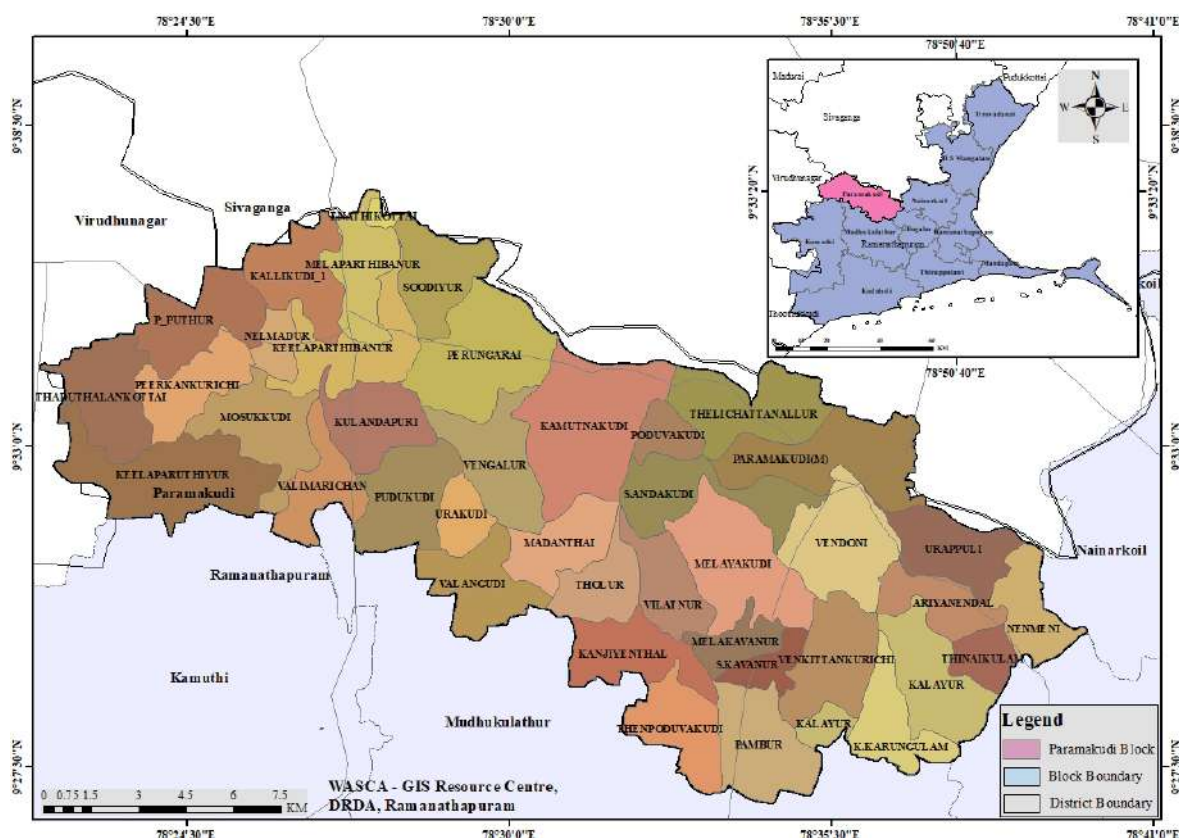
Figure 1.1. Paramakudi Block and it's environ

According to Census 2011, the population of the Block is 1,77,259 The population density of the Block is 610 per Km² which is much higher than the district (331 Km²) and the State's density (555 Km²). The population growth has increased in the last decade with an increase of 13.47% in population, observed since 2001. The proportion of sex ratio is 968 females for 1000 males. The average literacy rate of this Block is 84.35 % which is much higher than the national average (72.98%). The male literacy rate is high (91%) than female literacy rate (77.49%). Vulnerable population, Scheduled Castes and Scheduled Tribes accounted for 23.27 % of the total population.

Economically, this urban backward Block has high employment opportunities with higher percentage of household workers (13.06 %) than other blocks of Ramanathapuram District. According to the State Planning Commission, Government of Tamil Nadu's Human Development Report – 2017, 29.13 % families are in below poverty line (BPL). Weaving, handlooms, small scale charcoal industries, charcoal producer companies managed by community are well established in Paramakudi Block and leads 73.35% of the area is cultivated with Paddy. The rest of the area is cultivation with Green chillies, dry chilli, coconut, cotton, other plantation crops, oil palm and minor millets. The Block has 9 milk societies with 11.21 lakh liters of milk being produced.

> The proportion of sex ratio is 968 females for 1000 males.

> The average literacy rate of this Block is 84.35 % which is much higher than the national average (72.98%).

> 73.35% of the area is cultivated with Paddy

Hydrologically, Paramakudi Block comes under Gridhambal, Lower Vaigai, Paralayar and Uthirakosamangaiya sub-basins of Vaigai and Gundar basin. Vaigai and Paralayar Rivers flow through the Block. Gridhambal, Lower Vaigai (3), Lower Vaigai (4) and Terkku Upper macro- watersheds covers the Block with 63 micro-watersheds. (Figure 1.2). Situated in the rain shadow area, Ramanathapuram District has the extraordinary tank irrigation system which was built hundreds of years ago. The tanks were designed in such a way that the outflow from one tank would serve as the inflow for the next tank after it has reached its capacity, allowing the excess water to flow out into the next tank.
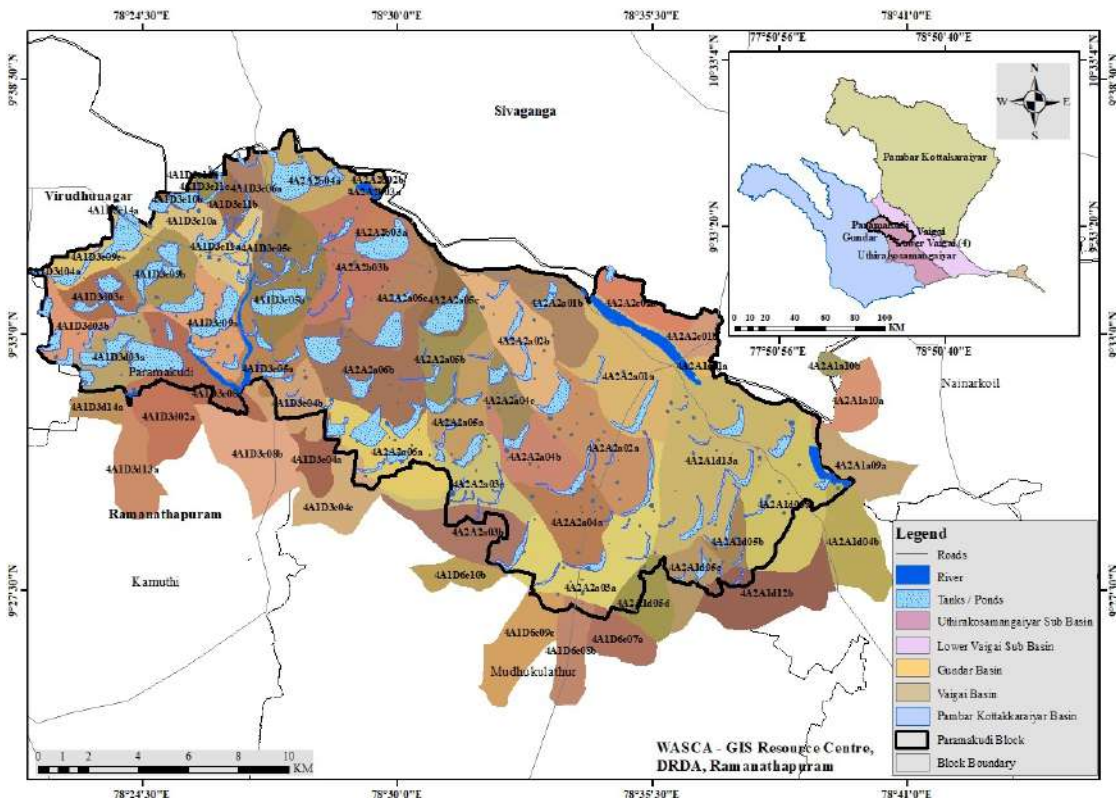
Figure 1.2. Watersheds – Paramakudi Block

Water harvesting structures 'Ooranis' also play a huge role in groundwater conservation and recharge, guaranteeing availability of safe drinking water and also useful for farmers who do not have water source for irrigation or find it expensive. There are 138 major and minor tanks in this Block, 77 Ex Zamin MI tanks, 12 Panchayat MI tanks, 49 Vaigai basin (PWD) tanks (Human Development Report 2017). Figure 1.3 shows the spatial distribution of water bodies in this Block. Two firkas namely Parthipanoor and Manjur cover the Block, and both firkas are safe in ground water development (CGWB's ground water assessment report 2017).

GROUND WATER LEVEL OF THIS BLOCK

SAFE – ‹70%	Parthipanoor, Manjur
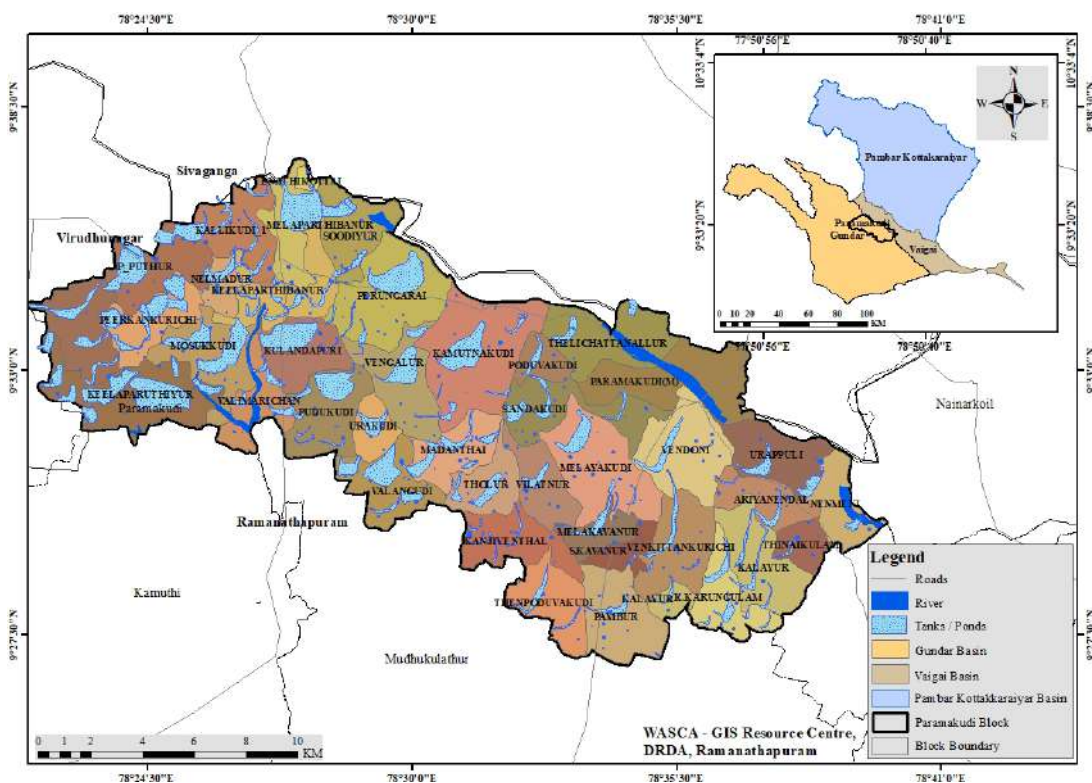
Figure 1.3. Spatial distribution of waterbodies

Demographic status
* High Population density
* Higher percentage of household workers

Economic status
* Urban based Block
* Agricultural based primary activities
* Small scale charcoal industries

Hydrological Status
* 138 tanks
* Tank irrigation system
* Safe ground water
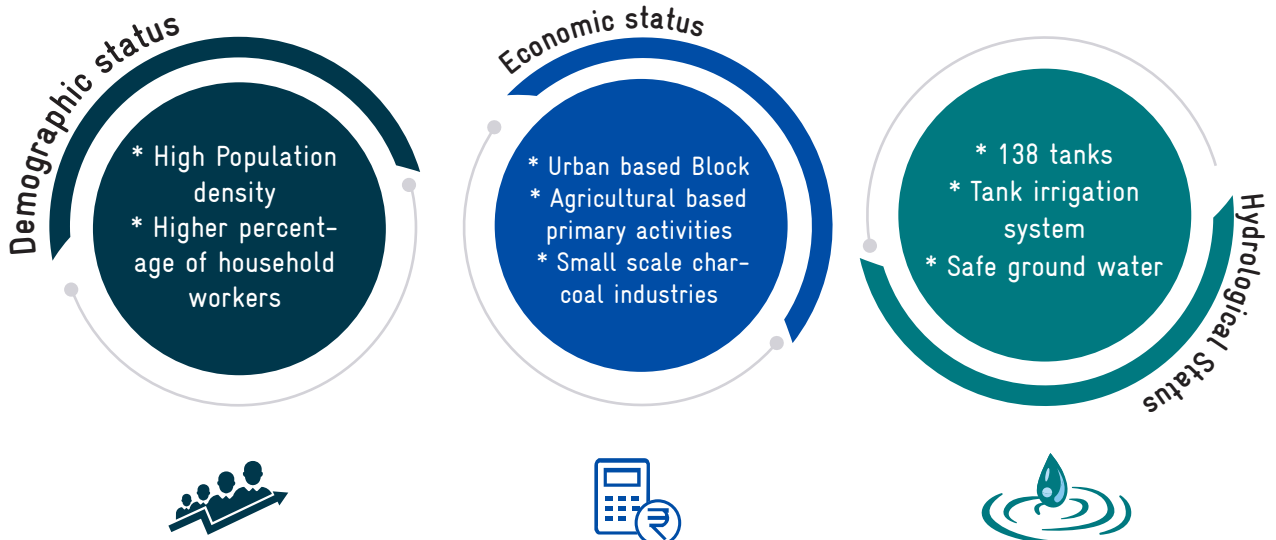
விண்இன்று பொய்ப்பின் விரிநீர் வியனுலகத்து
உள்நின்று உடற்றும் பசி

குறள் - 13

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

Thirukkural - 13

CHAPTER 2

CLIMATE AND WATER SECURITY

2 | CLIMATE AND WATER SECURITY

Water has always been a contentious subject in this region. This semi-arid region is classified as southern agro-climatic zone of State and East coast plains 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

Agro-climatic Region* (Planning Commission)**
East Coast Plains and Hill Region (XI)

Agro-climatic Zone* (NARP)**
Southern zone (TN-5)

Agro Ecological Sub-Region* (ICAR)**
Hot dry semi-arid eco sub region(18.1)

Temperature
32.6 to 23.8 °C

Rainfall
806 mm

Humidity
75- 79 %
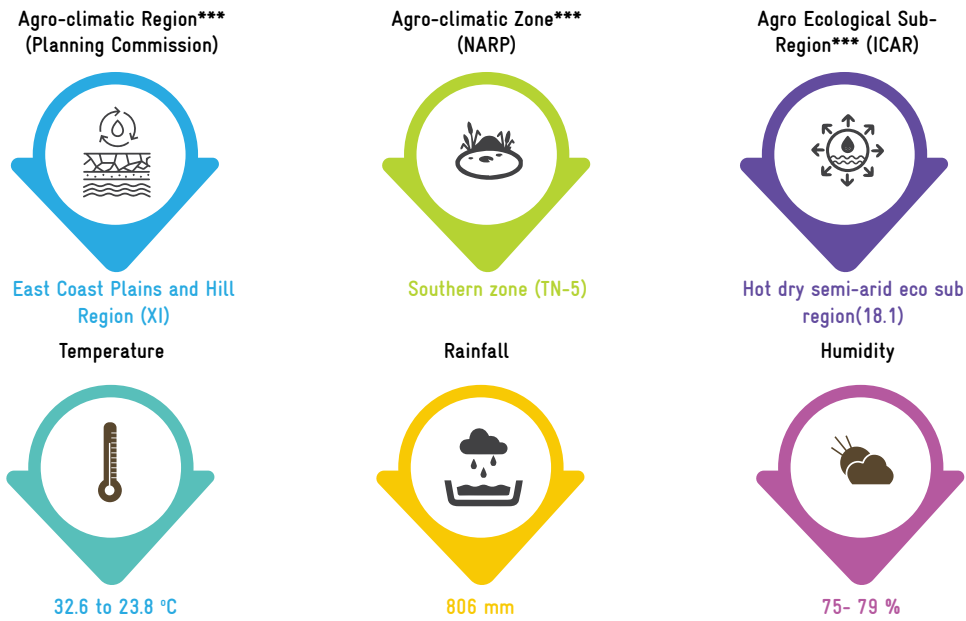
In general, this semi-arid region has dry and hot weather. The mean maximum temperature is 32.6°C and mean minimum temperature is 23.8°C during the last 30 years (1989-2018) (IMD). In summer months the maximum temperature goes up to 45°C for a few days. The monthly average temperature characteristic during June 2018 to May 2019 is shown in Figure 2.1.

32.6°C mean max temp
23.8°C mean min temp
Temp – (1989-2018)

62.9% & 15% NE&SW
11.8% & 10% Summer & Winter
Rainfall – 806 mm

85 % High
75 % Low
Humidity
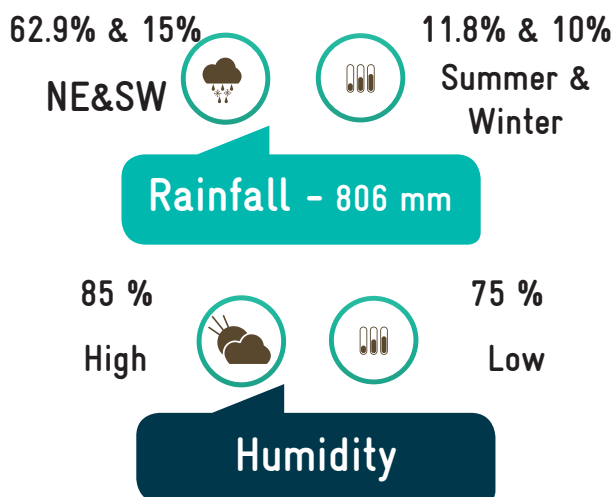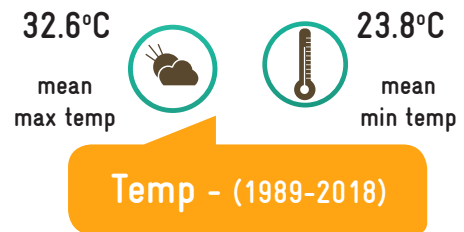
The annual rainfall of this region is 806 mm (IMD) which is less than the State's average rainfall. Normally this region receives major rainfall from North East Monsoon (NEM) (October to December) followed by South West Monsoons (SWM) (June to September), and during winter and summer months. NEM contributes a maximum of 62.9 % (507.4mm) of the total annual rainfall and SWM contributes 15% (121.7mm). This region normally receives rainfall during summer (March to May) and winter (January, February) months also. Summer rainfall accounts for 11.8 % (95.5mm) and winter season accounts for 10% (82.2mm) of the annual

Month	Minimum temperature	Maximum temperature
Jun-18 01	27.3	34.8
Jul-18 02	27.5	36.3
Aug-18 03	26.3	35.3
Sep-18 04	26.2	35.2
Oct-18 05	25	31.9
Nov-18 06	23.5	30.9
Dec-18 07	23.1	31.2
Jan-19 08	20.9	31.1
Feb-19 09	24.8	33.5
Mar-19 10	26.6	35.6
Apr-19 11	28.1	36.9
May-19 12	28.6	36.4

Monthly Temperature

in degree celsius (^{0}C)

Minimum temperature

Maximum temperature
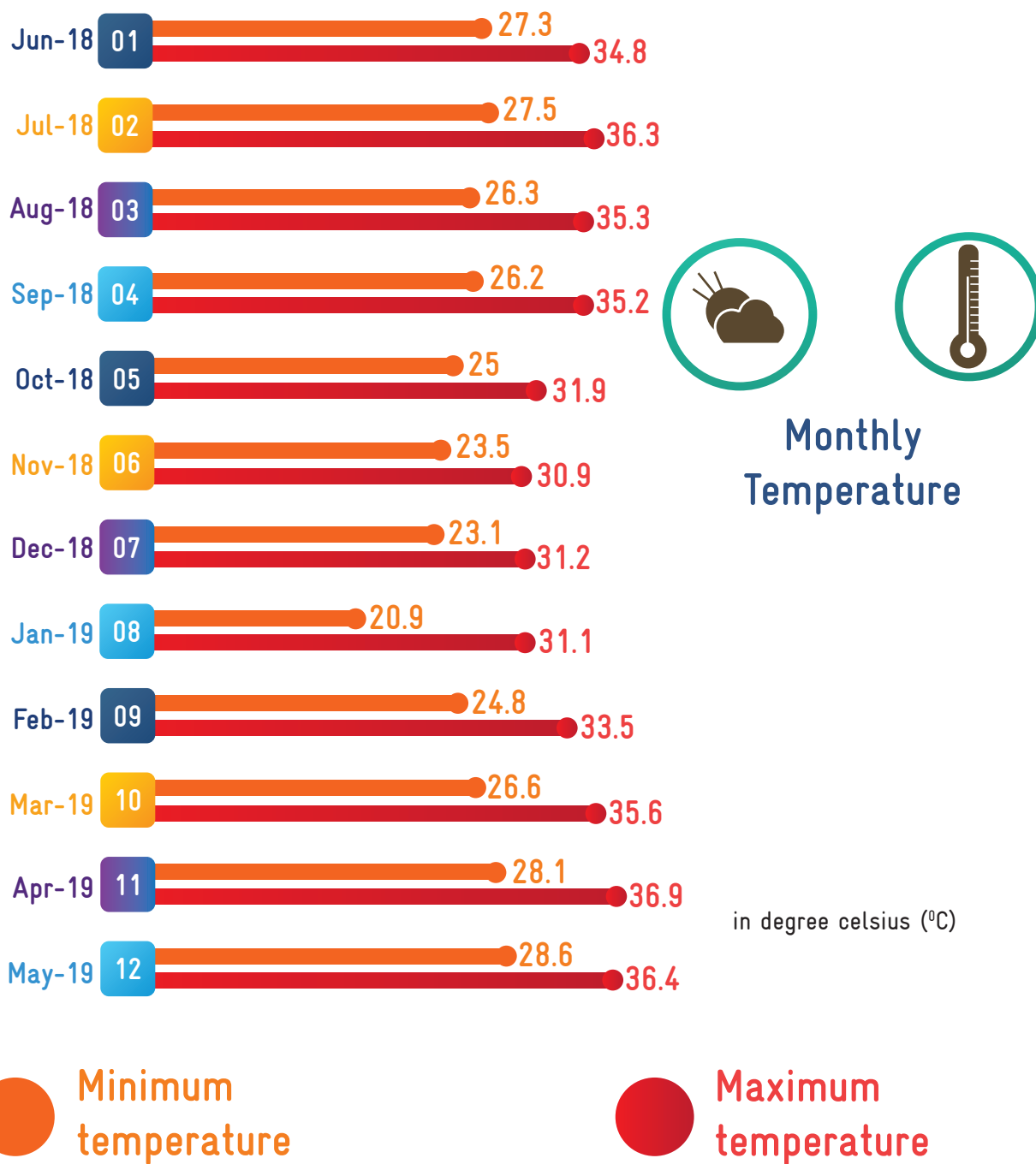
Figure 2.1. Monthly average maximum and minimum temperature

rainfall (WRIS, GoI) (Figure 2.2). The average annual rainfall days are 107 days in which a majority of 84 days are from NEM. Next to NEM, summer months have major rainy days of 10 days followed by 9 days in SWM and 4 days in winter months. The onset of NEM rainfall starts in the first week of October and ceases during the fourth week of De-cember. In general, the humidity percentage ranges between 75% to 79%. The highest relative humidity percentage of 85% is recorded during the month of November and the lowest relative humidity percent-age of 75% is recorded during the month of May in this southern zone.

Annual Rainfall

107 Average rainy days

806.8 mm

9 rainy days

121.7 mm

15%

South West Monsoon
(June-Sept)

84 rainy dyas

507.4 mm

63%

North East Monsoon
(Oct-Dec)

4 rainy days

82.2 mm

10%

Winter
(Jan-Mar)

10 rainy days

95.5 mm

12%

Summer
(Apr-May)
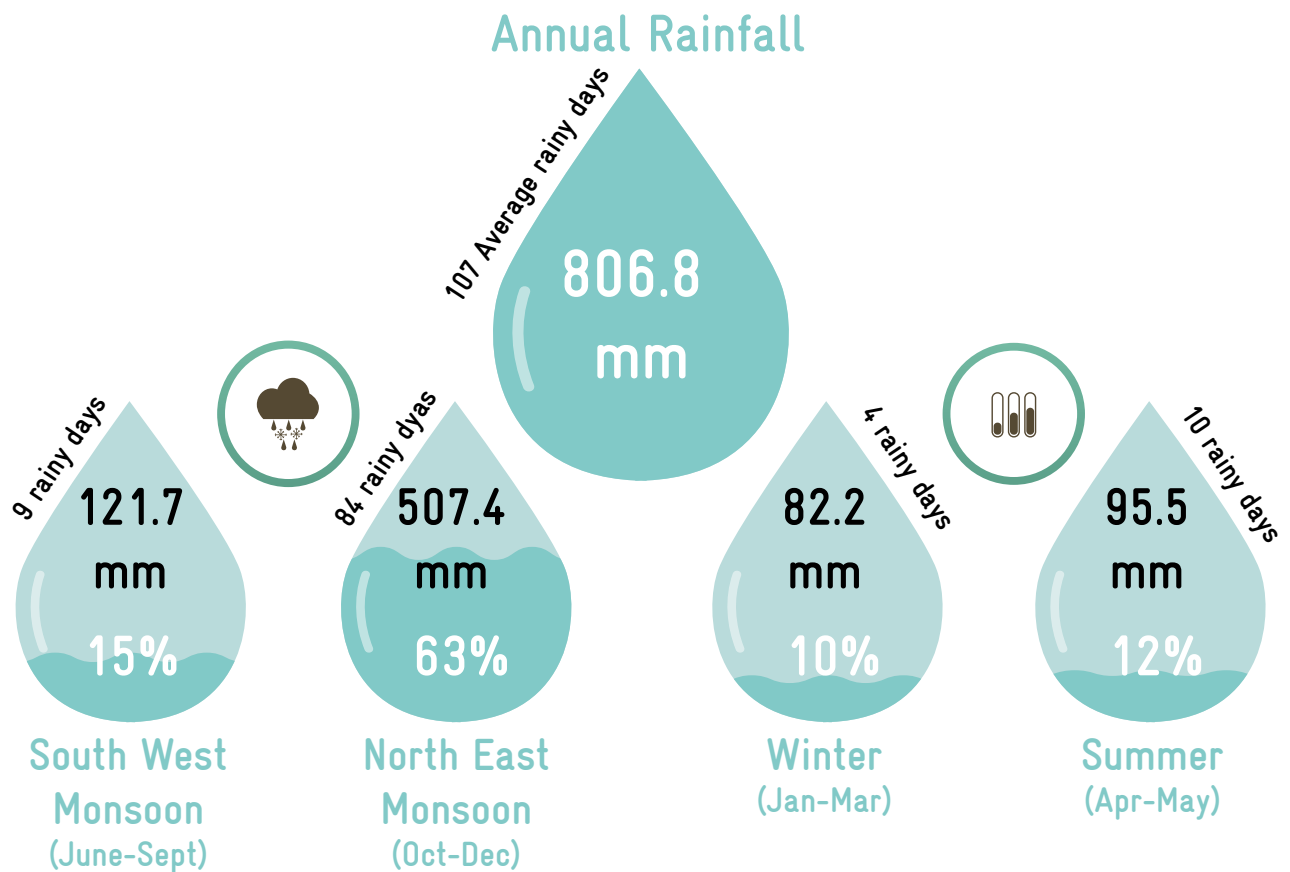
Figure 2.2. Season wise distribution to annual rainfall

In recent decades, the world has witnessed significant changes in its climate. These changes include increase in average temperature, variations in the rainfall intensity and its frequency. This region is also no exception, and 1.4°C and 0.4°C increase in maximum and minimum temperature was observed during 1951 to 2015 (IMD). The rainfall variability is also well observed. During 1951 to 2015, 18 deficient rainfall years (below normal rainfall) were recorded. The deficient rainfall years are highest among the rest of the districts of Tamil Nadu. Since this region is heavily dependent on NEM monsoon rains alone, the consecutive deficient rain-

fall leads to severe drought. As rainfall is the major source for determining water storage, existing water resources, major and minor tanks fail 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 (AR 6) outlines that climate changes will increase in all regions of the globe over the coming decades and that even with 1.5°C of global warming, there will be increasing heat waves, longer warm seasons, and shorter cold seasons – which will become more intense at 2°C of warming.

Climate projection based on global climate models indicated that there would be 1.1°C increase in maximum temperature in mid-century (MC) period (2041-2070) and 1.9°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 1.3°C and 2.2°C during MC and EC periods. Average annual rainfall for IPCC AR5 RCP4.5 scenarios is projected to increase about 1 percent towards MC to EC period.

1.1ºC
MC

1.9ºC
EC

Max Temp - 2071-2100

IPCC AR5 RCP 4.5

1.3ºC
MC

2.2ºC
EC

Min Temp - 2071-2100
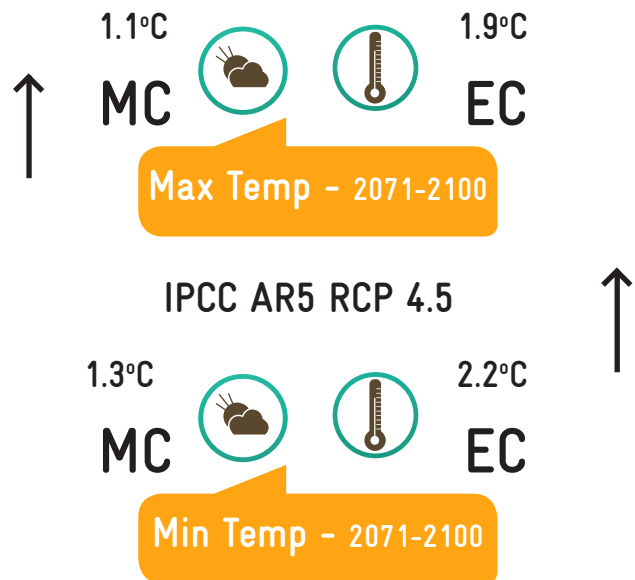
The observed and projected climate changes will have serious impacts in the areas of :

"
* surface and ground water availability
* water quality
* soil moisture
* evapo-transpiration
* sea water intrusion
"

"
* 1.4ºC increase in maximum temperature during 1951-2015
* 0.4ºC increase in minimum temperature during 1951-2015
* 1.5ºC increase in max temp during 2041-2070 (RCP4.5)
* 1.9ºC increase in max temp during 2071-2100 (RCP 4.5)
"

Being a water scarce and drought prone region coupled with saline ground water, the changes in climate pose severe threats to dependent sectors such as agriculture and allied activities, industry, and livelihoods of people, particularly the vulnerable sector.

2.1 | CLIMATE RISKS

Increasing temperature, fluctuating rainfall patterns and its extremities creates shorter rainy seasons and longer dry seasons making the river basins more vulnerable. This district experiences frequent droughts, cyclones, floods, and storm surges. Being a coastal district, sea level rise is also a distressing issue under the changing climate scenario.

* Frequent Droughts
* Cyclones
* Flood inundation

Drought

Generally, this rain shadow region has a prolonged dry climate. Majority of the lands are rain fed which depends on monsoons, especially NEM. Thus, frequent and consecutive monsoon failures (less than 40% of normal rainfall) coupled with the erratic behavior of the monsoon makes the district more vulnerable to droughts. This district experiences drought once in 3 years which   impacts the ground water levels, reservoir levels, crop conditions, and soil moisture. Sandy soils in the region are more prone to severe drought. The district experienced consecutive droughts in recent decades particularly in 2003, 2009, 2016, 2017 and 2019. All parts are affected by drought and its consequences are large areas of crop losses and drinking water scarcity.

Cyclones

A tropical cyclone is a multi-hazard weather phenomenon, as it leads to heavy rainfall, gale wind and storm surge during the landfall. The winds, heavy rainfall and storm surge associated with the cyclone result in flooding of coastal areas, erosion, saline intrusion, loss of life, property, belongings, disruption of communication facilities, damages to agricultural and plantation crops and livestock etc., Being a coastal region, this district faces hazard due to cyclone forms in Bay of Bengal. The 1964 Rameswaram cyclone was regarded as one of the most powerful storms to ever strike India on record and worst to hit the district. In recent years, some of the tropical cyclones such as Burevi (2020), Gaja (2018) cyclones had its impacts here. This district also experiences storm surges exceeding 6m above the concurrent sea level. IMD, High soil erosion is also noticed here. Ministry of Earth Science, Govt. of India, prepared Cyclone hazard proneness of districts based on frequency of total cyclones, total severe cyclones, actual/estimated maximum wind strength, Probable Maximum Storm Surge (PMSS) associated with the cyclones and Probable Maximum Precipitation (PMP). The report indicates Ramanathapuram district is highly prone (Cyclone warning in India, IMD, March 2021).

Flood

Though it is a low rainfall region, it experiences heavy rain and flood during deep depressions/cyclones forms in the Bay of Bengal. State Disaster Management Authority (SDMA), Government of Tamil Nadu has identified 39 locations of Ramanathapuram district as flood vulnerability of medium category (inundation of water from 2 to 3 feet) based on past events (Ramanathapuram District Disaster Management Plan 2020-2021). Four locations Kattuparamakudi, Emaneswaram, Ponnaiahpuram and Kallikottai in S.Andakkudi, Thelichethanallur and Nenmeni GPs are vulnerable to medium floods.

Sea level rise

Sea level rise (SLR) is one of the greatest challenges of the low-lying coastal regions of the world. Recent Intergovernmental Panel on Climate Change (IPCC) 2021 report cautioned that there The average rate of SLR was 1.3mm/yr (1901-1971) and rose by 03.7mm yr (2006-2018), and it would continue to rise to 2 m by the end of the Century under a very high emissions scenario (SSP5-85 low confidence) (IPCC, 2021). IPCC cautions that coastal areas will get continued SLR throughout the 21st century, contributing to more frequent and severe coastal flooding in low-lying areas and coastal erosion. This coastal region will also face sea level rise and future SLR projection studies indicates there would be 4.51 cm (low range)/ 7.21cm (medium range) increases for the year 2025 and it would be 30.29 (low range), 49.10 cm (medium range) under IPCC AR5-RCP 4.5 scenario (CCCDM, Anna University). In Ramanathapuram District, about 180 coastal habitations are identified for coastal vulnerability based on their distance from sea shore, soil erosion, saltwater intrusion (Ramanathapuram District Disaster Management Plan 2021-2022).

2.2 | WASCA CLIMATE VULNERABILITY INDICATORS

During 2019, WASCA TN conducted preliminary State level scoping study on the State's rural water security through the lens of climate and identified climate and water security hotspots/potential geographical areas for project demonstration through scientific criteria, jointly with the 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 the 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 the 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 for these 18 biophysical and socio-economic indicators were 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, Tiruvannamalai and Ramanathapuram 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 were envisaged for the above two 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 the 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 three technical partners of WASCA project Viz., MS Swaminathan Research Foundation (MSSRF), Sugandhi Devadasan Marine Resources Institute (SDMRI), Prime Meridian and key sectoral experts. Based on the 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 were thus identified under four areas via climate, water, agriculture and socio-economic for advancements towards actions. The major parameters identified at Block level (Table 3) are collected both from primary and secondary sources and analyzed statistically and geospatially.

TABLE 3. MAJOR PARAMETERS IDENTIFIED FOR BLOCK LEVEL VULNERABILITY ASSESSMENT
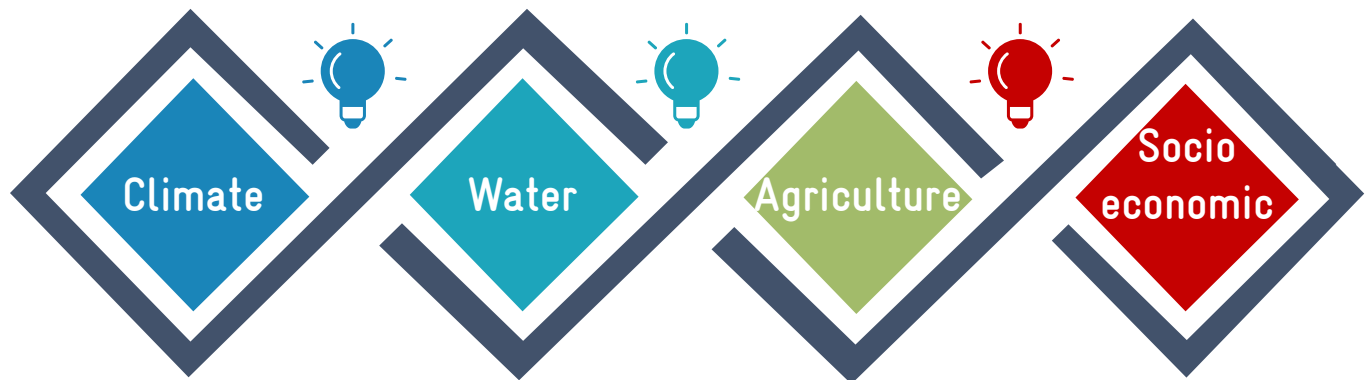
Climate	Water	Agriculture	Socio economic
Drought, Locations based on past disasters and vulnerability	Watershed and drainage network, traditional water bodies, canal networks, irrigation facilities, catchments area wise available runoff, ground water and surface water utilization, ground water status, ground water availability, evapo-transpiration losses, and water demand for drinking, agriculture and livestock, water quality, sea water mixing and salinity	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

GRAM PANCHAYAT PLANNING IN MAHATMA GANDHI NREGS

GRAM PANCHAYAT PLANNING IN MAHATMA GANDHI NREGS

3 | GRAM PANCHAYAT PLANNING IN MAHATMA GANDHI NREGS

WASCA, GIZ has evolved a GP based CWRM planning approach for facilitating convergent planning under Mahatma Gandhi NREGA as per the recommendations of the National Level Workshop organized by MoRD, MoJS, GIZ along with State Rural Development Department of WASCA implementing states in February 2020. While developing the framework, inputs from all the relevant stakeholders including communities, public institutions, civil society, research organizations, and private agencies were taken into consideration. Both the Annual Master Circular issued by MoRD during 2021-22 and the Annual Planning Circular issued in September 2020 focused on developing GIS based planning in all Gram Panchayats. 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 and allied activities and livelihood related works on individual lands leading to sustainable livelihoods as well as provisioning of livestock shelters for the individual households. The NRM related works under Mahatma Gandhi NREGS shall be taken up in convergence with Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), Integrated Watershed Management Programme (IWMP) and Command Area and Water Management (CAD&WM) schemes for better outcomes of the water conservation and water harvesting measures. Technical inputs for planning shall be drawn from the technical resources available in the district under Mahatma Gandhi NREGS, CSO partners and other line department agencies. In case of planning for NRM works, the technical inputs will be drawn from the joint pool of technical personnel of IWMP in Watershed Cell cum Data Centre (WCDC), Mahatma Gandhi NREGS unit, Water Resource Department and the Agriculture Department. The technical inputs relating to Excavation, Renovation & Modernization (ERM)/ water bodies may also be sought from Regional Office of Central Ground Water Commission (CWC). The Gram Panchayats, while deliberating and finalizing prioritization of shelf of projects, will keep in perspective, the macro and micro- watersheds of 500-1000 hectares that often comprise 1-10 Gram Panchayats.

The special focus on vulnerable households and communities are considered while preparing estimates for anticipated demand, list of works on individual land, and list of other works that provide direct individual benefits. The Convergent Planning Exercise shall make use of automatically included and deprived Households of SECC to ensure full coverage of poor and vulnerable households. Infrastructure built under Mahatma Gandhi NREGS leads to increased water availability for irrigation, groundwater recharge, increased agricultural production, and carbon sequestration. The Ministry of Environment, Forest and Climate Change recognizes Mahatma Gandhi NREGA as one of the 24 key initiatives to address the problem of climate change, while simultaneously improving the livelihoods of the poor. Mahatma Gandhi NREGA, particularly Category A activities, which are public works relating to natural resource management. Planning and design of works under Mahatma Gandhi NREGS should take into account, impacts of climate change in order to ensure resilience of vulnerable rural communities and make the benefits sustainable in the long run.

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 relate to NRM alone and out of the 182 NRM works, 85 are water related and 164 are related to Agriculture and allied works. The works taken up in Mahatma Gandhi NREGS should change from taking up individual, standalone works in a typical 'relief works mode' to an INRM perspective. Planned and systematic development of land and harnessing of rainwater following watershed principles should become the central focus of Mahatma Gandhi NREGS work across the country to sustainably enhance farm productivity and income of poor people. Even the works on private lands should be taken up following the principles of watershed management in an integrated manner. To facilitate evidence based scientific NRM planning process, Technological support shall be taken from National Remote Sensing Centre, ISRO for identification and holistic planning of permissible works to be taken up in the watersheds using GIS Technology (BHUVAN). The GIS plans 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 the Annual Master Circular provides key steps for GIS based planning.
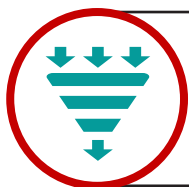
> The Geographical Information System (GIS) plans shall be comprehensive ones incorporating all eligible works under Mahatma Gandhi NREGS and the same shall be implemented in a phased manner.
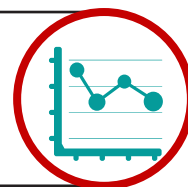
3.1 | COMPOSITE WATER RESOURCE MANAGEMENT APPROACH

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

tion and soil moisture are used to understand the climate related issues. Lastly, land use, watersheds, drainage networks and surface runoff, existing wa-

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

BOX 1. MAJOR COMPONENTS INVOLVE IN CWRM PLANNING WORKOUTS

a. Spatial and non-spatial data collection
b. Spatial data: Bhuvan geo-portal (NRSC) & WRIS
c. Non-Spatial data (Secondary): Govt. sources (published)
d. Non-Spatial data (Primary): Govt. records local level

a. Analysis of water from supply and demand side
b. Water budgeting: Surface & ground water
c. Status of soil moisture availability
d. Status of evapo-transpiration losses

Scientific planning

Gram Panchayat water budget

Deriving GP Water Actions

Results

Gram Sabha Approval

Integration & Implementation

a. Identification of Key water challenges at GP level
b. Identification of location specific actions at GP level
c. Integration actions at block, sub-basin and District level
d. 261 list of works under Mahatma Gandhi NREGS
e. List of Works -under various schemes

a. Works and its impact on augmenting Water
b. Works and its impact on conserving water
c. Works and its impact promoting efficient use of water ·Block level

a. Block level
b. Watershed level & Sub-basin level
c. District level and
d. Baseline for assessing the impact

a. Verification
b. Community consultation
c. GP Approval
d. Integration to NREGA software
e. AS and TS

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

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

STEPS INVOLVED IN BLOCK LEVEL ANALYSIS THROUGH CWRM APPROACH

4. Drafting Key Water Actions – Integrating GP based actions in 4 categories – Public and common land, agriculture and allied sectors, rural infrastructures and climate resilient measures

3. Data analysis – Identification of Key water challenges & vulnerability analysis climatic risks, issues in socio-economic, edaphic, hydrological & agricultural sectors

2. Data Collection – Integration and synthesis of GP based spatial and non-spatial data at the block level scale

1. Categorization of GPs

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

Pre-Planning Stage

Main stages of CWRM planning process

Planning Stage

Integration and Approval

Review and Verification

FOUR LEVELS OF CWRM PLANNING UNDER WASCA

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

4. INTEGRATING GP PLANS TO DEVELOP WASCA DISTRICTS CWRM PLANS
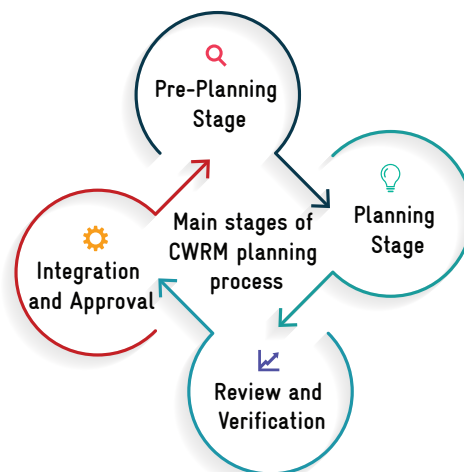
1. Preparation of Integrated plans (at Block, Watershed levels)

2. District Level WASCA Plan

3. Approval at GP level for preparation of Labour budget using CWRM frame work outcomes

4. Approval of District plan at DLSC as per above recommendations of GP level

5. Submitting approved District WASCA plan from DLSC to SLSC for financing and convergence

INTEGRATION AND APPROVAL

1. Matching spatial data as per Mahatma Gandhi NREGA– MoRD guidelines on GIS based planning

2. Field Verification, GP level Meetings for inclusion in labour budget 2021-22

3. Approvals of verified works at GP by the Block and GP level officers implementing Mahatma Gandhi NRGES

4. Integrating verified, approved works into NREGA soft (MORD NIC Portal) for mainstreaming WASCA

5. Regular review on progress at each level

REVIEW AND VERIFICATION

3.2 | CATEGORIZATION OF GPs

The CWRM uses both spatial and non-spatial data for developing GP level plans. Most of the non-spatial data are available at the revenue village level. To synchronize planning at GP, keeping data availability and administrative boundaries 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 of categorization of GP's is given in Annexure 1. Details of categorization of GPs in Paramakudi Block is tabulated in Table 4.

TABLE 4. CATEGORIZATION OF PARAMAKUDI BLOCK GPs

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
11	GP and revenue village data and boundary match (Type-I)	Pambur, Kulandapuri, Arungulam, Kamuthakudi, Melayakudi, Perungarai, Thenpoduvakudi, Vendoni, Poduvakudi, Vengalur, Villathur, Venkittankurichi
13	Having more than one GPs in one Revenue Village (Type-II)	Ariyanendai, Thinaikulam, S.Kavanur, Melakavanur, Tholur, Kanjiyendai, Valimarichan, Pudukudi, Urakkudi, Valangudi, Madanthai, Enathikottai, Melaparthibanur
15	GPs having more than one GP, one Revenue Villages data, boundary (Type IV)	Kallikudi, Nelmadur, Keelaparthibanur, Soodiyur, Mosukkudi, P.Puthur, Keelaparuthiyur, Thelichathanallur, S.Andakkudi, Peerkankurihi, Thaduthalankottai, Urappuli, Nenmeni, Kalaiyur, K.Karungulam

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 morphology, ground water potential, slope terrain, erosion, Land Use and Land Cover (LULC), waste land, salt and erosion affected lands, drainage lines, and slope will play a significant role in contributing to preparation of the most appropriate and suitable science-based decision plans towards holistic development of the region, emphasized with the water actions. The use of different spatial data to assess and confirm the key water challenges along with the non-spatial data is discussed below:

NON SPATIAL DATA

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

- Watershed based analysis is to understand the hydrological and administrative boundaries. This aids in understanding the profile and condition of the watershed at macro or micro level for planning 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

ASSESSMENT OF GROUND WATER QUALITY AND SEA WATER INTRUSION

The vulnerability of the groundwater quality, seawater intrusion in the aquifers were assessed and spatially mapped for the Ramanathapuram District. The water quality samples were collected from 380 locations throughout the district during pre-monsoon and post-monsoon season. The collected samples were analyzed using standard methodology for calculating Water Quality Index (WQI) and Sea Water Mixing Index (SMI). This data helps to identify the suitability of water for domestic purpose and to detect the concentration of major ionic constituents in seawater at GP level.

Over all, data from 102 parameters were collected, out of which 16 parameters are from primary source, collected from GP administrative units by GPs officers, 65 parameters are from secondary source, 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. The water quality standards and formula used are in Annexure 3.6.

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. As the current data at the Block level is not available at present, previous hydro-meteorological disasters are considered to denote Block's flood and coastal vulnerability which was assessed by State Disaster Management Agency, 2020 as given in Table 5.

TABLE 5. CLIMATE RISKS AND VULNERABLE GP's

Flood

S.Andakkudi,
Thelichethanallur,
Nenmeni

Drought

All GPs
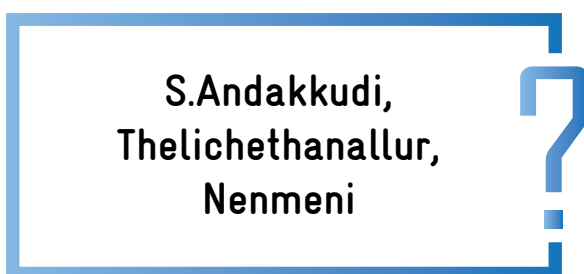
3.5 | CWRM PLANNING ANALYSIS – WATER

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

3.5.1 SPATIAL DATA

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

3.5.1.1 Geomorphology: Geomorphology deals with the scientific study of "landforms and landscapes, including their description, type, and genesis". Landform is the end product resulting from the interactions of the natural surface genesis and the type of rock. The scope of geomorphology was further expended with landform maps, which are widely used in various fields of hydrology, pedology, geoscience, urban and regional planning etc. Paramakudi Block is engrossed with coastal origin landform units (Figure 3.1). Coastal landform is further classified based on the landform age and its characteristics including biodiversity existence such as older deltaic plain, young coastal plain and coral reef. GP-wise detailed view of the landforms with area in percentage is shown in the illustration below. This fundamental information of landforms by its units will act as a critical input while identifying suitable sites for NRM activities under CWRM plan preparation.
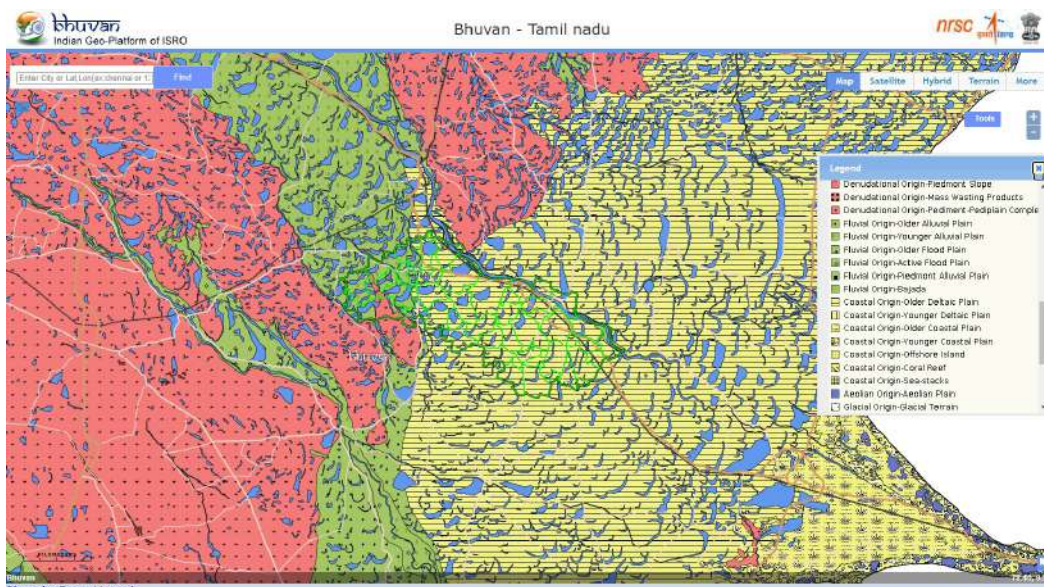
Figure 3.1. Geomorphology map

Landform unit	Area coverage in %	Gram Panchayat
Coastal Origin – Older Deltaic Plain		
	100%	A.Puthur, Bogalur, Deivendranallur, Ettivayal, K.Valasai, Kamankottai, Karuthanenthal, Kavithaikudi, Keelampal, Kumukkottai, Manjakkollai, Manjur, Mennanthi Nagachi, Muthalur, Muthuvayal, Pandikanmai, Pottithatti, S.Kodikulam, Semanur, Sevvur, Sheiyalur, T.Karungulam, Theeyanur, Urathur, Vairavanendal, Veeravanur

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 or fracture (Figure 3.2). Lineament plays a significant role in identification of ground water and oil exploration sources. Lineament is represented with linear feature where two different landforms converge or diverges. This site allows water to percolate at a high rate. GP-wise lineament type is illustrated in the table below. These observations are widely used to locate points of high-water flow especially in groundwater exploration.
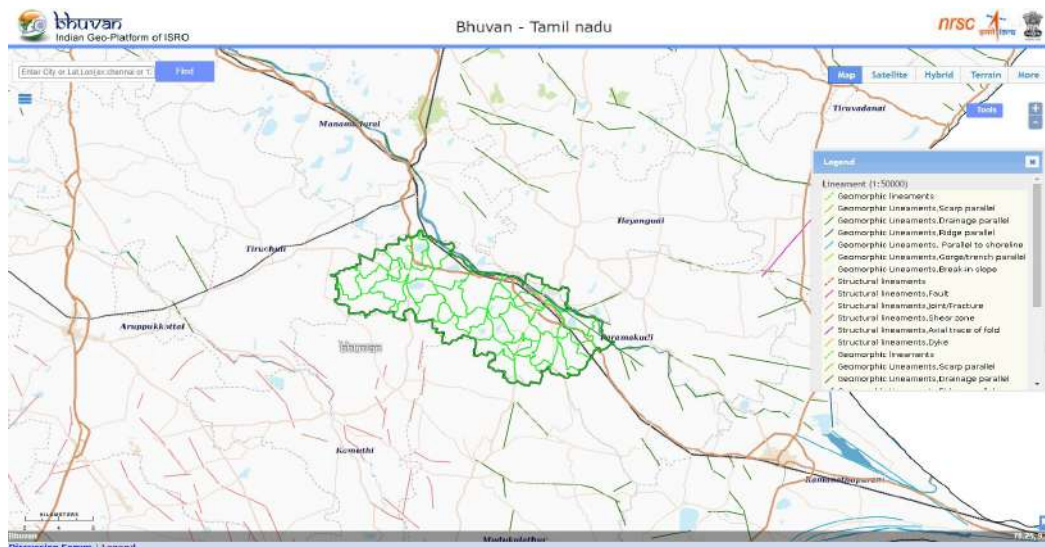
Figure 3.2. Lineament map

Lineament type	Gram Panchayat
Geomorphic lineaments, Drainage parallel	
	K.Valasai, Karuthnendhal, Kavithaikudi, Kumukottai, Mennandhi Nagachi, Mudalur, Sevvur, Kamankottai

3.5.1.3 Terrain: The terrain map gives information related to elevation from above sea level. A terrain of the same range is noticed in the Block area at the available scale map (Figure 3.3). This map will be useful in identification of better sites suitable for proposing water and soil conservation related activities.
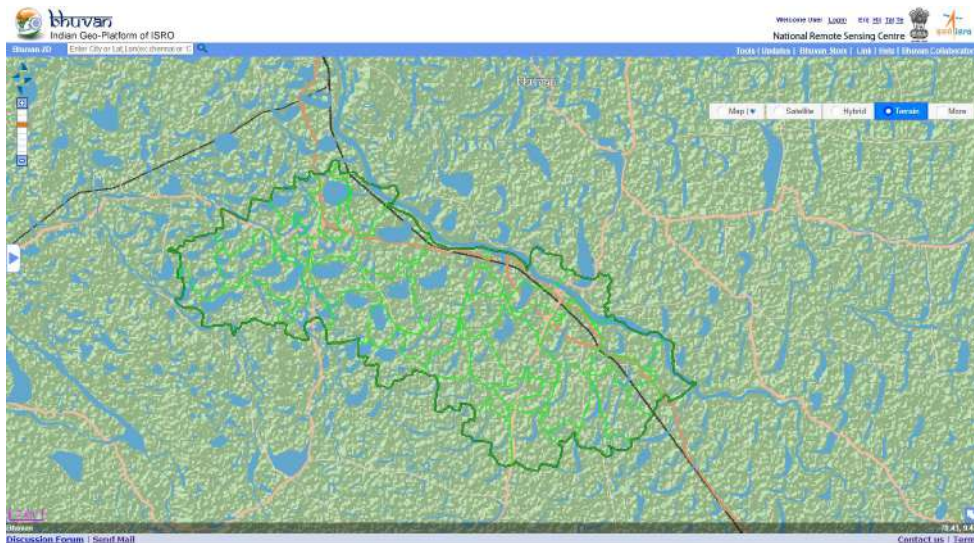
Figure 3.3. Terrain map

3.5.1.4 DEM: DEM is an important element in the representation of the terrain and only one which determines relief forms such as valleys and hills, and the steepness or gentleness of slopes geometrically. The map plays a vital role in delineation of watershed and its units, used in planning and identifying recharge structures, farm ponds and construction of grey water drain network etc., (Figure 3.4).

Figure 3.4. DEM map

61
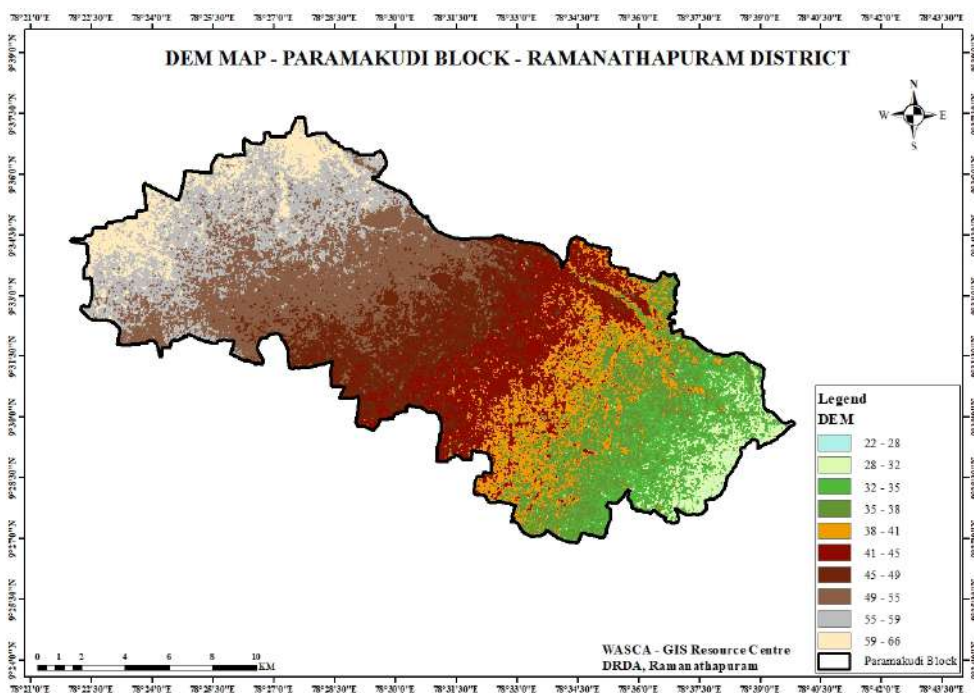
3.5.1.5 Slope: The average slope of a terrain feature is calculated from contour lines on a topology map or DEM. Slope is typically expressed in percentage, angle, or in ratio. Slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. Flat and very flat slope ranges from 1 to 3 % and 0 to 1 % is noticed in the Block (Figure 3.5). Details of GP-wise slope area in percentage is shown in the illustration below. Slope information plays a significant role in identification of soil eroded sites, depth profiles, also used in analyzing / proposing soil conservation measures such as check dam, bunding land development, farm ponds etc.

Figure 3.5. Slope map

Slope range	Area in %	Gram Panchayat

Very Flat (0-1%)

95% — A.Puthur, Deivendranallur, Ettivayal, Kavithaikudi, Manjakkollai, Mennanthi Nagachi, Muthuvayal, Pandikanmai, Pottithatti, S.Kodikulam, Semanur, Sevvur, Sheiyalur, Urathur, Vairavanendal, Veera-vanur - 100%, Kamankottai - 95%, Bogalur, Karuthanenthal, Kumukkottai, Manjur, Theeyanur - 90%, Muthalur - 85%, K.Valasai, Keelampal, T.Karungulam - 80%

Flat (1-3%)

29% — Karuthanenthal, Kumukkottai - 90%, K.Valasai, Keelampal, T.Karungulam - 20%, Muthalur - 15%, Bogalur, Manjur, Theeyanur - 10%, Kamankottai - 5%

3.5.1.6 Drainage Network : The drainage network pattern of a region is particularly dependent on the lithological characteristics, regional slope, structural control, climate condition etc. It is noticed that very less dense drainage network and a lower order stream is flowing towards South-West from East in the Block (Figure 3.6). Drainage network is referred to while identifying suitable sites for soil and water conservation measures such as dams, ponds, bunding, restoration of gullied region etc.
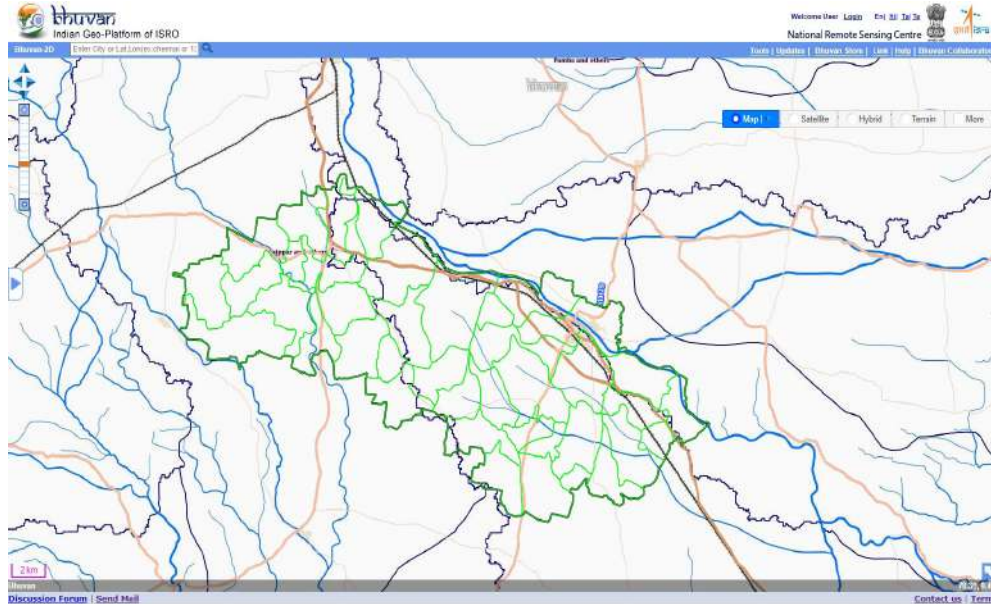
Figure 3.6. Drainage network

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. Paramakudi Block watershed map is illustrated in Figure 3.7. Watershed is used for the interventions based on Ridge to Valley (R2V) concept and sequencing the plan accordingly. R2V approach intends to conserve each drop of rain water from ridge to a reasonable extent and it ensures the better surface water flow management also aids in strengthening the durability of land, soil and water conservation structures of the downstream.
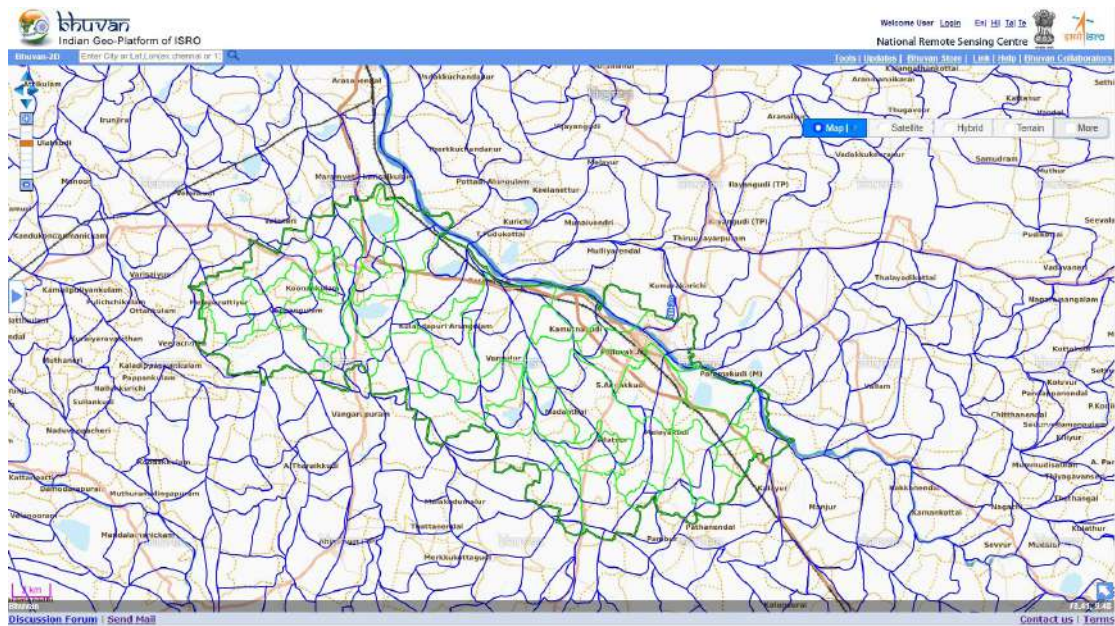
Figure 3.7. Watershed map

3.5.1.8 Ground water perspectives: Ground water is one of the important natural resources in a semi-arid region like Paramakudi 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. In the Block area, ground water is available from 30 m. GP is witness the GW in 30 to 80 m with yield of 200 to 400 LPM (Figure 3.8). The GPs wise details of GW prosperity is shown in the illustration below. This specific information will play a crucial role in identifying sites for recharge structures in order to address water scarcity issues in the Block.
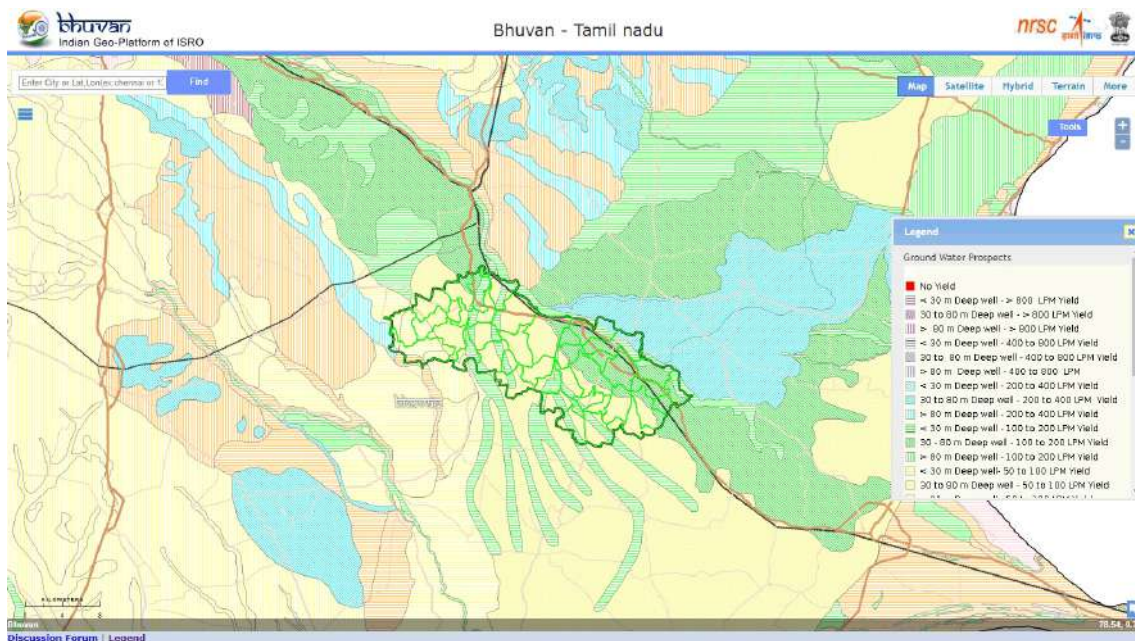
Figure 3.8. Ground water perspective map

| Groundwater Prospects | Area in % | Gram Panchayat |

‹30-80m Deep Well-100 to 200 LPM Yield

84% — Bogalur, Deivendranallur, Karuthanendhal, Manjakollai, Manjur, Pottihatti, Seiyalur, Vaira-vanendal, Veeravanur - 100%, Mennanthi Nagachi, Sevvur - 80%, Keelambal - 75%, Muthuvayal - 70%, Mudalur - 60%, Ettivayal - 45%, K.Valasai - 30%

30m to 80m Deep well - 50 to 100 LPM Yield

80% — Kavithaikudi, Pandikanmai, S.Kodikulam, Sema-nur, T.Karungulam, Theeyanur, Urathur - 100%, A.Puthur - 70%, Ettivayal - 55%, Muthuvayal - 30%, Keelambal - 25%

‹30m Deep well –100 to 200 LPM Yield

30% — A.Puthur

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). GP wise current water resources status and its supply and demand side are shown in Annexure 3.7.

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

Canal Network	Extent
Canal Network (m)	
Length of Main Canal (m)	32,800
Length of Minor Canal (m)	75,957
Length of Distributaries (m)	38,700
Water Courses (Field Channels) (m)	1,00,500
Traditional Water bodies (No.)	
Number of Tanks (PWD & Union)	114
Number of Ooranis	270
Irrigation Facilities (ha)	
Tank Irrigation	5,619.80

Canal Irrigation	709.15
Open & Tube Well Irrigation	869.32
Catchment Area wise Available Runoff (ha.m)	
Good Catchment Area	1,743.7
Average Catchment Area	380.7
Bad Catchment Area	2,167.4
Watershed and Drainage Networks	
Length of Natural Drainage Lines (m)	93,900.51
Number of Natural Drainage Lines (No.)	108.00
Number of Micro-watersheds (No.)	193.00
Water Demand	
For Humans (ha.m)	294.29
For Livestock (ha.m)	35.72
For Agriculture (ha.m)	11,742.13
GW Utilization for Drinking (%)	81.9
GW Utilization for Livestock (%)	48.8
GW Utilization for Agriculture. (%)	20.8
SW Utilization for Drinking (%)	18.1
SW Utilization for Livestock (%)	51.18
SW Utilization for Agriculture (%)	79.1

3.5.2.1 Existing Water Structures

Waterbodies are the life lines of local communities for their lives and livelihoods. The Block has structured traditional water storage units such as tanks, ooranis and other surface waterbodies. It is noticed that the number of Ooranis are more (270) than other structures (Figure 3.9).
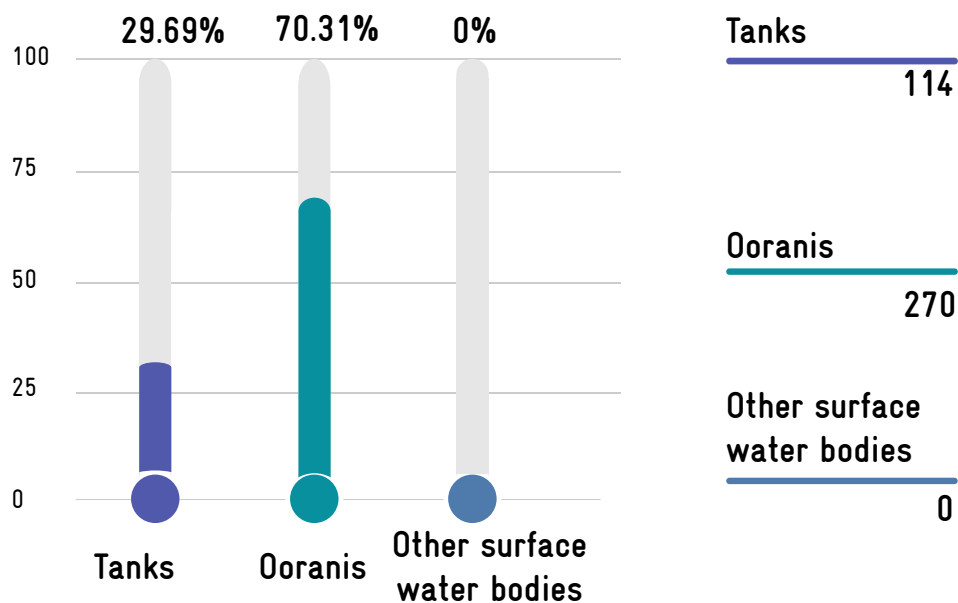
Figure 3.9. Traditional Waterbodies

3.5.2.2 Sources of Irrigation

The total area under irrigation in the Block is 7,198.3 ha, of which 78 % (5,619.8) area is irrigated through tanks, followed by 12 % (869.3 ha) through open/tube well and the remaining 9.8 % (709.15 ha) area is through canal-based irrigation (Figure 3.10).

A   **Open well & Tube well Irrigation**   869.3 ha

B   **Tank Irrigation**   5,169.8 ha

C   **Canal Irrigation**   709.15 ha

9.85%   78.07%   12.08%
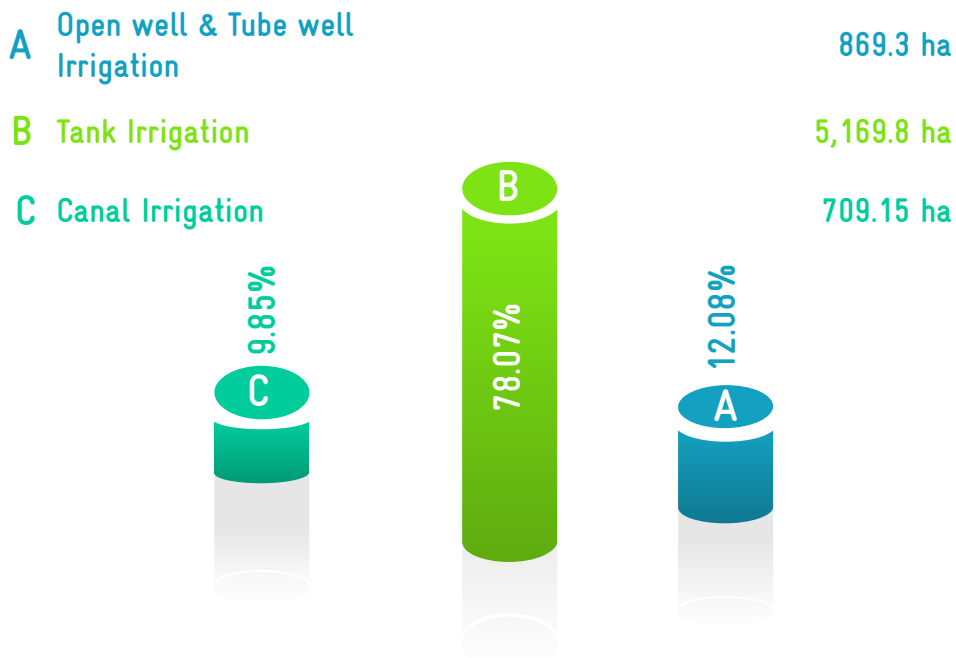
Figure 3.10. Irrigation sources

3.5.2.3 Available Run off

The total available runoff in the catchment area is 4,291.8 ha.m out of which highest of 50.5 % is from bad catchment area followed by 40.63 % is good catchment area and the remaining 8.87 % is of average catchment area. As the area has worse catchment area, the runoff generated is more (Figure 3.11).

50.5%   40.63%   8.87%

2,167.4 ha.m   1,743.8 ha.m   380.7 ha.m

50.5%   40.63%   8.87%

● Bad Catchment   ● Good Catchment   ● Average Catchment
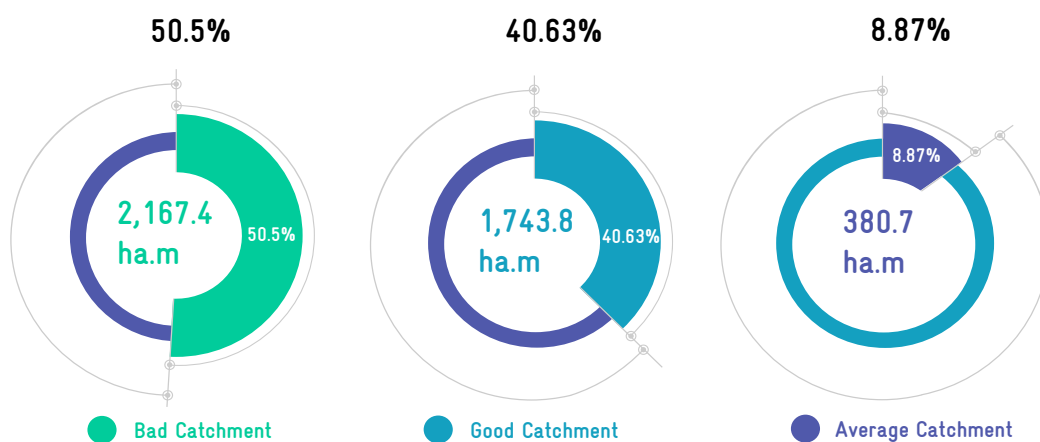
Figure 3.11. Runoff from catchments

3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 12,072 ha.m. The highest demand is from the agriculture sector of 11,742 ha.m (97.27 %) followed by domestic use demand of 294.3 ha.m (2.4 %) and rest is from livestock.

Domestic

Agriculture

Livestock

2.4%

97.27%

0.33%

294.3 ha.m

11,742.1 ha.m

35.7 ha.m
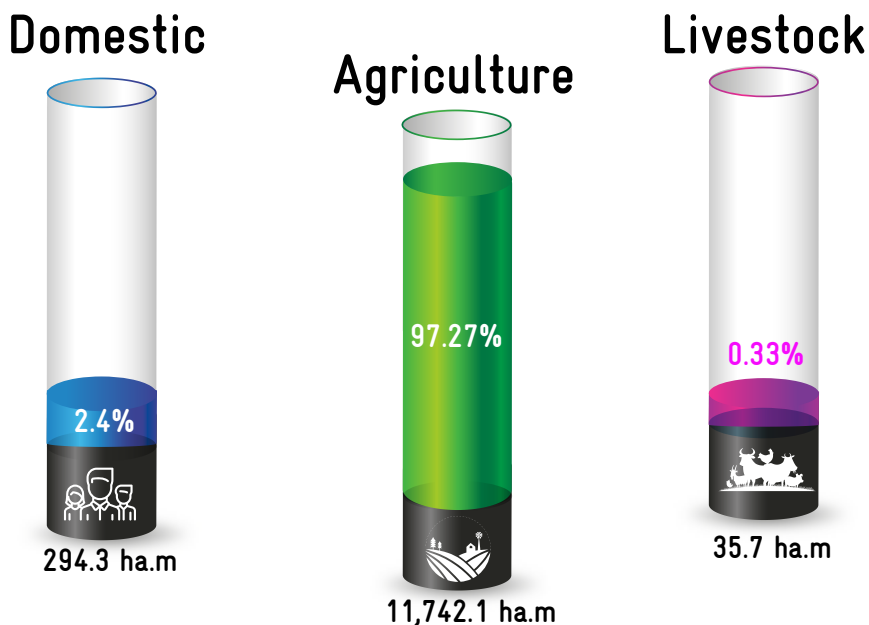
Out of the total water demand, 81.9 and 48.8 % for domestic and livestock purpose usage of water is met through ground water, while 79.15 % for Agriculture purpose is met through surface water sources (Figure 3.12).

% OF GROUND WATER UTILIZATION

81.9%

20.85%

48.82%

Domestic

Agriculture

Livestock

18.1%

79.15%

51.18%
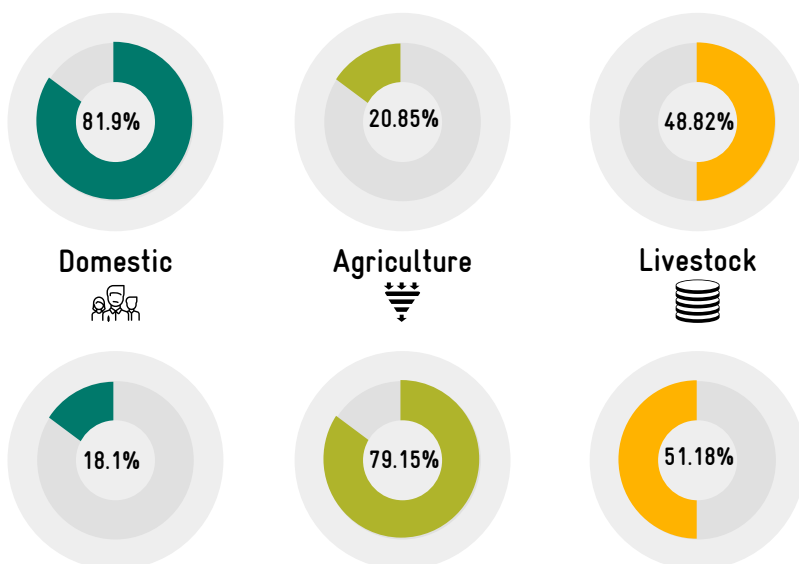
% OF SURFACE WATER UTILIZATION

Figure 3.12. Sector-wise water utilization

3.5.3 ANALYSIS OF PHYSICOCHEMICAL PARAMETERS

Physicochemical parameters were assessed to understand their influences on nature of water through Water Quality Index (WQI), Seawater Mixing Index (SMI) and Salinity. To understand WQI and SMI, 34 water samples were collected across Block area, out of which 18 samples were of open well water and the remaining were from ground water (Figure 3.13).

Figure 3.13. Location of water samples

3.5.3.1 Water Quality Index

The WQI is defined as a measure of rating that provides the composite influence of individual water quality parameter to overall water quality. WHO (2004) recommended ten parameters such as pH, TDS, HCO_3, Cl, SO_4, NO_3, Ca, Mg, Na and K to determine the water quality. The results showed that the average content of ions was as follows: Cl > TH >TA > Na > HCO_4 > Ca > Mg > CO_3 > SO_4 > NO_4 > K. The predominant hydro-chemical facies are Chloride (C) and total hardness (TH) while Potassium (K) is very less. The excellent water quality /suitable water for domestic purpose is found in 13 spots (blue colour in (Figure 3.14) over the Block area while very poor-quality water/ unsuitable water for domestic purpose with index value >300 is found in five spots. Buffer area of very poor sites falls under poor quality water of index zone ranging from 200 to 300. However, most of the area falls under good water quality zone of index value range of good to medium (50-100) (Figure 3.14). These zones act as inputs in identifying suitable sites to propose appropriate treatment measures. GP wise water quality during pre and post monsoons are attached in Annexure 3.8 and 3.9 respectively.

Physicochemical parameters	Cl	TH	TA	Na	HCO_4	Ca	Mg	SO_4	CO_3	NO_4	K
Average in mg/l	990.18	425.8	452.5	377.3	278.96	206.4	148.8	72.7	77.97	25.4	25.6

(TH = Total hardness, TA = Titratable acidity, Ca =calcium, Na= Sodium, Cl= Chloride, HCO_3=Bicarbonate, Mg= Magnesium, SO_4= Sulphate, NO_3= Nitrate, K= Potassium, CO_3= Carbonate)

EXCELLENT QUALITY	‹50
GOOD QUALITY	50- 100
MEDIUM QUALITY	100- 200
POOR QUALITY	200-300
VERY POOR QUALITY	›300
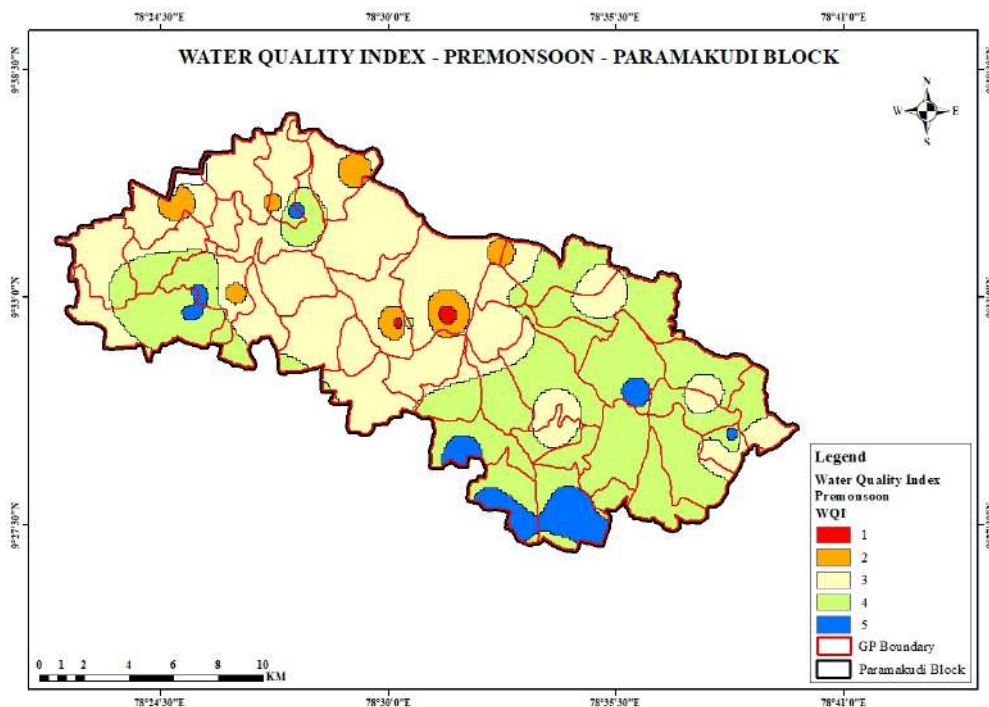
Figure 3.14. Water Quality Index

3.5.3.2 Seawater Mixing Index

SWI parameter is calculated based on mixing of major ionic constituents (Na, Cl, Mg, and SO_4) of sea water to ground water during pre-monsoon season. The results show that the average content of ions was as follows: Na > Ca > Mg > SO_4. The predominant hydro-chemical facies are Sodium followed by Calcium while Sulphate is less. Geographically small spots were found with high SWI while three zones were with less sea water mixed. However, most of the Block area falls under the index value range 2-3 which is moderate (Figure 3.15).
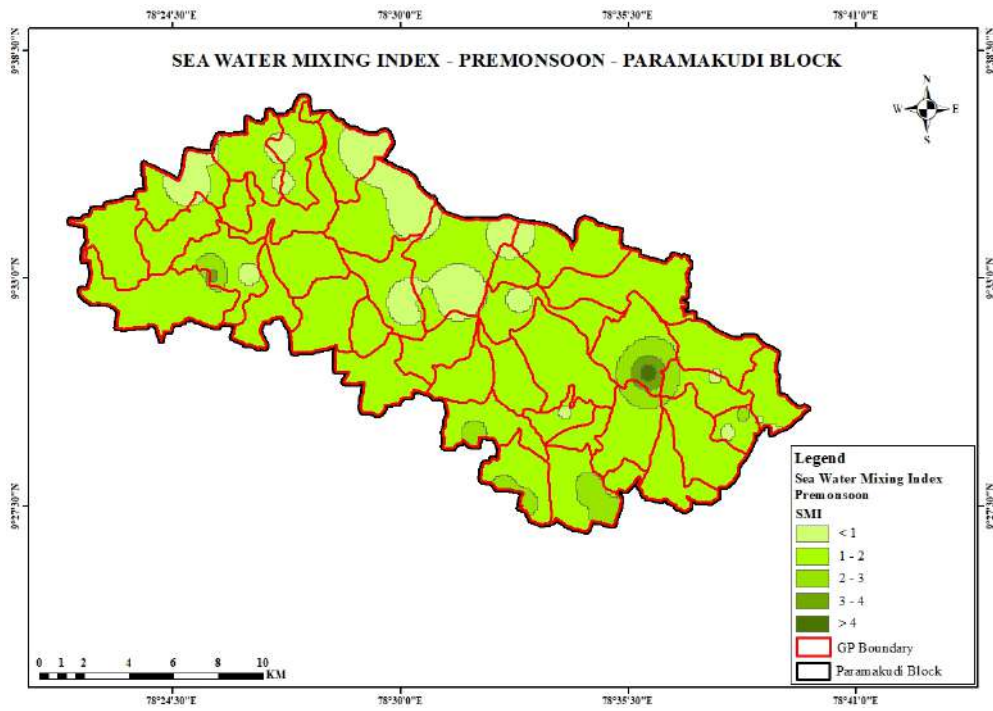
Figure 3.15. Seawater Mixing Index

3.5.3.3 Salinity

Seawater mix and salinity in the water are directly proportional, higher the sea water mix higher the salinity in the water (Figure 3.16).
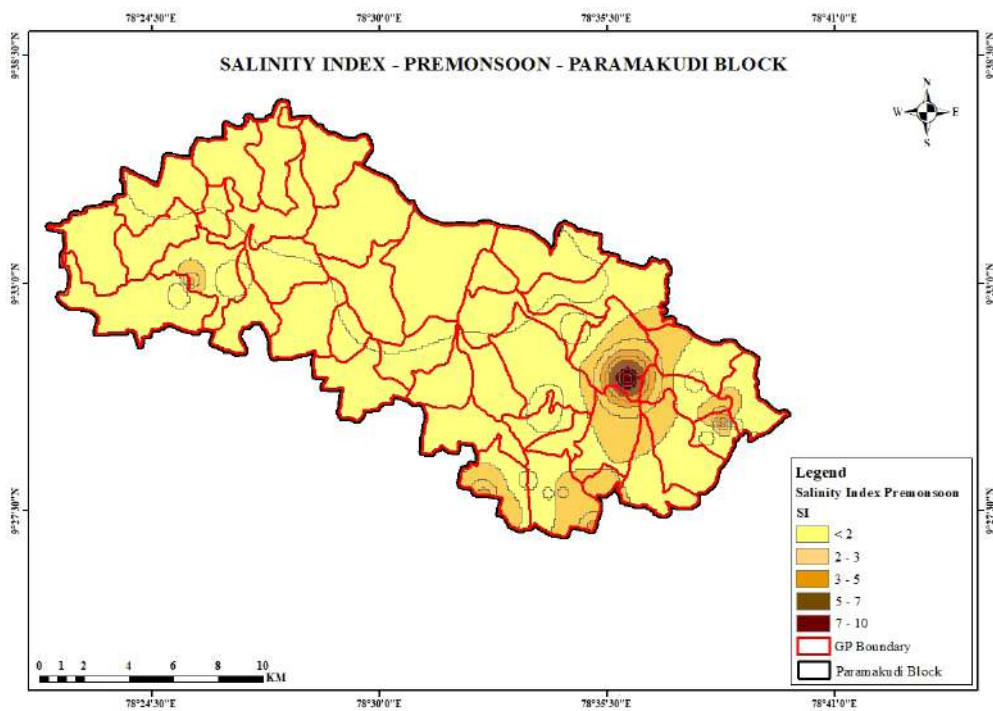
Figure 3.16. Salinity Index

3.6 | CWRM PLANNING ANALYSIS-AGRICULTURE

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

3.6.1 SPATIAL DATA

Bhuvan based spatial data for LULC, waste land, salt affected land, soil erosion and soil texture were taken into consideration to understand Paramakudi Block's problems in order to draft scientific key water actions.

3.6.1.1 Soil texture: The soil consistency of particle size is distinguished through soil texture types, especially determined by the amount of sand, silt or clay. The Block has diverse soil types and predominant in vertisol and alfisol. With reference to soil texture, the proportion of fine and fine loamy type is dominant across the Block (Figure 3.17). Soil texture helps in determining the properties of the soil such as water holding capacity, permeability, soil workability and also the ability of plants to grow. This data will help in proposing relevant conservation measures for natural resources.
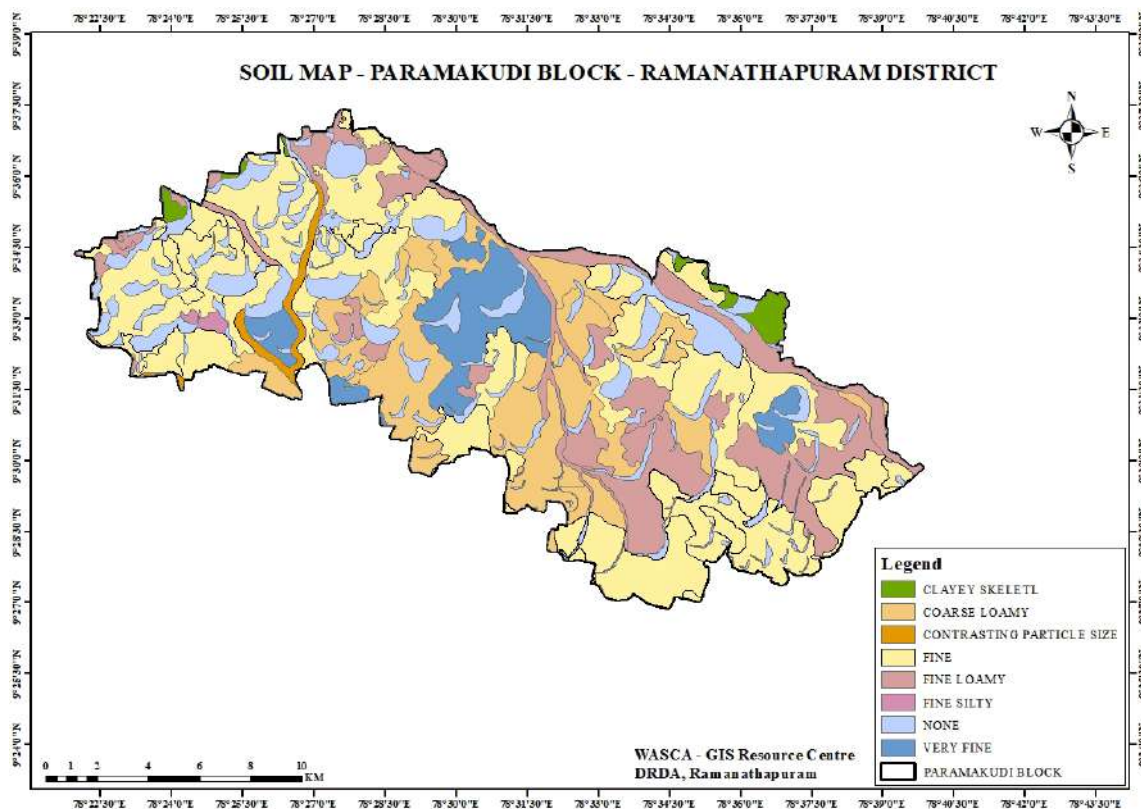
Figure 3.17. Soil texture

3.6.1.2 Soil erosion: Soil erosion is a natural process of displacement of upper layer of soil caused by dynamic erosion agents i.e. water, air, plants and humans. Sheet eroded type soil erosion sites are found in the Block (Figure 3.18) and the illustration below gives area wise soil erosion details respect to GPs. Soil eroded sites will help in preparing plans, to suggest soil conservation and watershed management activities.
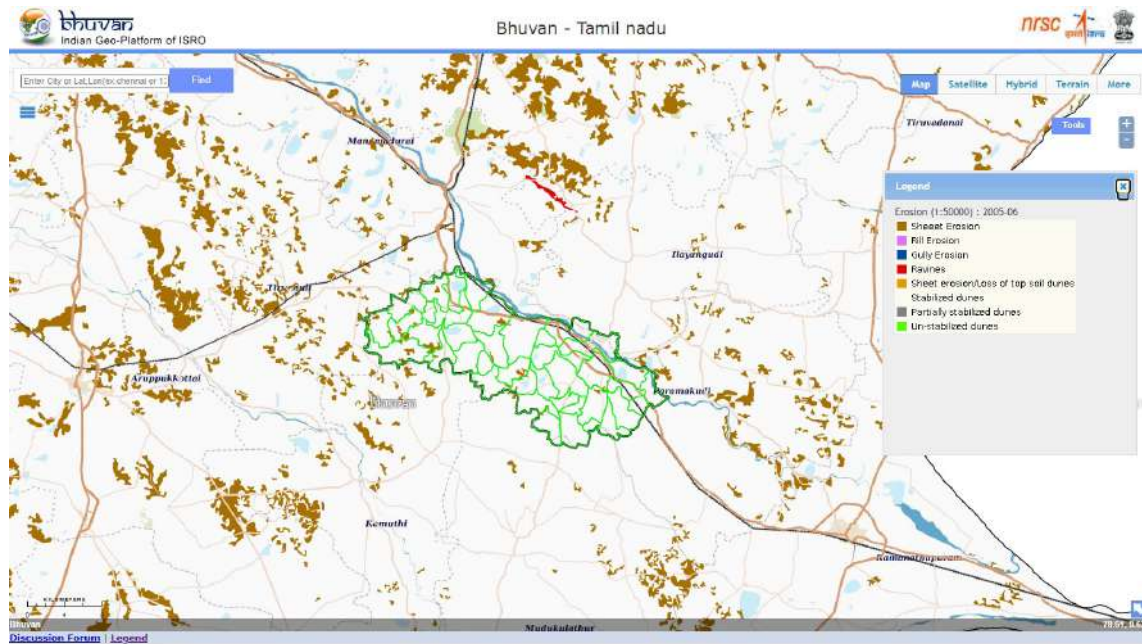
Figure 3.18. Soil erosion map

Erosion type	Area in %	Gram Panchayat
		Sheet Erosion
	10%	Keelaparuthiyur - 25%, Mosukkudi - 20%, Madanthai, Thaduthalankottai - 15%, Peerkankurichi, Perungarai, Tholur - 10%, Kallikudi, Thenpoduvakudi, Urappuli, Valangudi, Vengalur, Venkittankurichi - 5%

3.6.1.3 Land Use & Land Cover (LULC): LULC are two separate terminologies which are often used interchangeably. In general, land cover is defined as 'the observed biophysical cover on the Earth's surface'. It includes vegetation and man-made features as well as bare rock, bare soil, and inland water surfaces; while land use refers to 'the way in which land has been used by humans and their habitat, usually with the accent on the functional role of land for economic activities'. LULC has become an increasingly important factor playing a major role in making environment-development policies. Paramakudi Block is majorly covered by agricultural crop (Figure 3.19). The GP wise LULC is tabulated in the table below. LULC map helps the decision makers and planners to focus on the fallow land development activities.
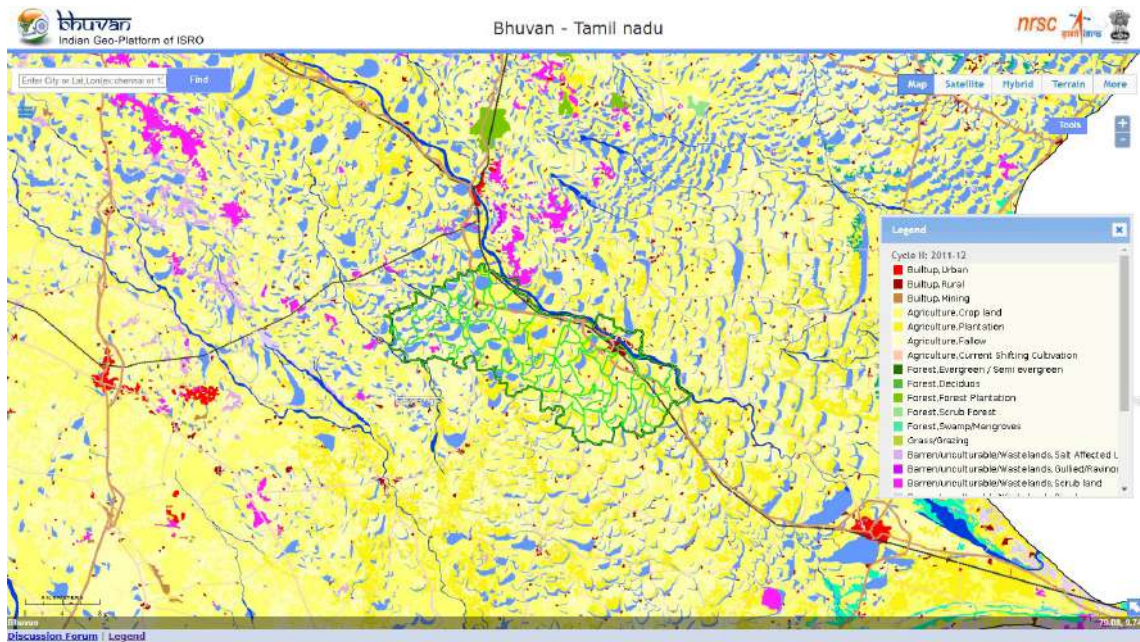
Figure 3.19. Land Use Land Cover map

Land Use	Area coverage in %	Gram Panchayat
Agriculture, Fallow lands	44%	Thenpoduvakudi – 65%, K.Karungulam, Thaduth-alankottai, Venkittankurichi – 60%, Keelapa-ruthiyur – 45%, Kanjiyenthal, Pambur, Urappuli, Vendoni – 40%, Kalayur, Peerkankurichi – 35%, P Puthur – 30%, Vilatnur – 20%
Agriculture, Crop lands	22%	Melayakudi – 45%, Kamutnakudi, S.Andakudi – 30%, Thenpoduvakudi – 25%, Kalayur – 20%, Soodiyur, Vendoni – 10%, Kanjiyenthal – 5%
Agriculture, Plantation	19%	Kamutnakudi – 40%, Paramakudi – 35%, S.An-dakudi – 30%, Vendoni – 20%, Perungarai – 15%, Thenpoduvakudi, Vengalur – 10%, Kalayur, Keelaparthibanur – 5%
Builtup, Rural	38%	Paramakudi – 35%, Melaparthibanur, Pudukudi, Venkittankurichi – 5%
Barren/un-cultivable/wastelands, Scrub land	13%	Keelaparuthiyur, Mosukkudi, Peerkankurichi

3.6.1.4 Waste land: A Parcel of land that is not suitable for any agriculture activity and mostly covered with dense or open scrub is called as wasteland. The extent of wasteland will act as a direct input for preparation of plans for land development activities or greenery. Scrub land type wasteland is noticed in Paramakudi Block (Figure 3.20). GP wise details is shown in the illustration below. During planning for the GPs, plantation measures have been taken up in the identified portions to convert the wasteland into productive land.
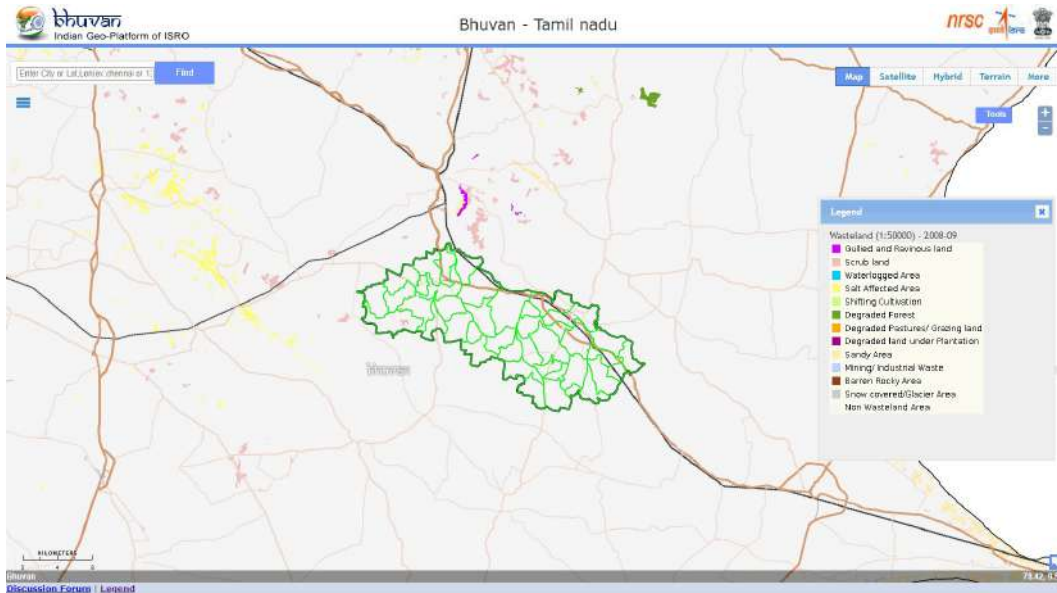
Figure 3.20. Wasteland map

Wasteland type	Area in %	Gram Panchayat
		Scrub Land
	8%	Keelaparuthiyur - 15%, Mosukkudi, Peerkankurichi - 5%
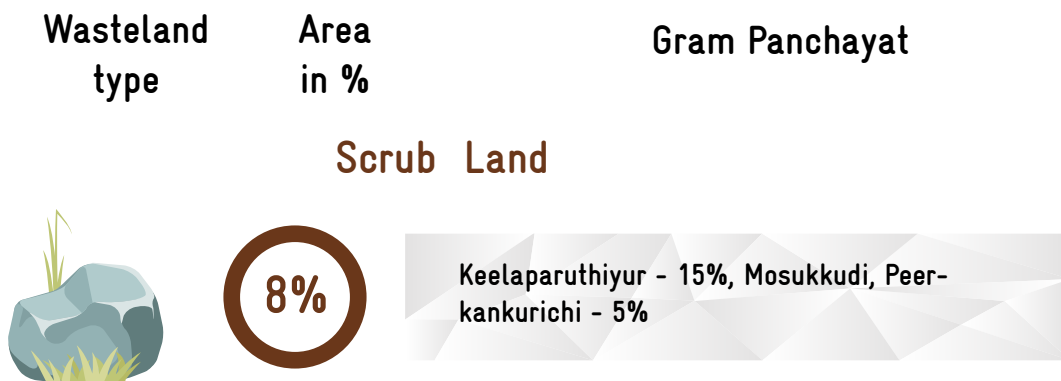
3.6.1.5 Salt affected area: Due to the Block's proximity to coastal region, Block area witnessed the sodic in nature and same was found in the results of salinity analysis of water samples (Figure 3.21). GP-wise details of salt affected area is shown in the illustration below. These parcels will act as a direct input in the planning process to propose soil conservation measures, mainly activities to reduce salinization and suggestions for alternative cropping.
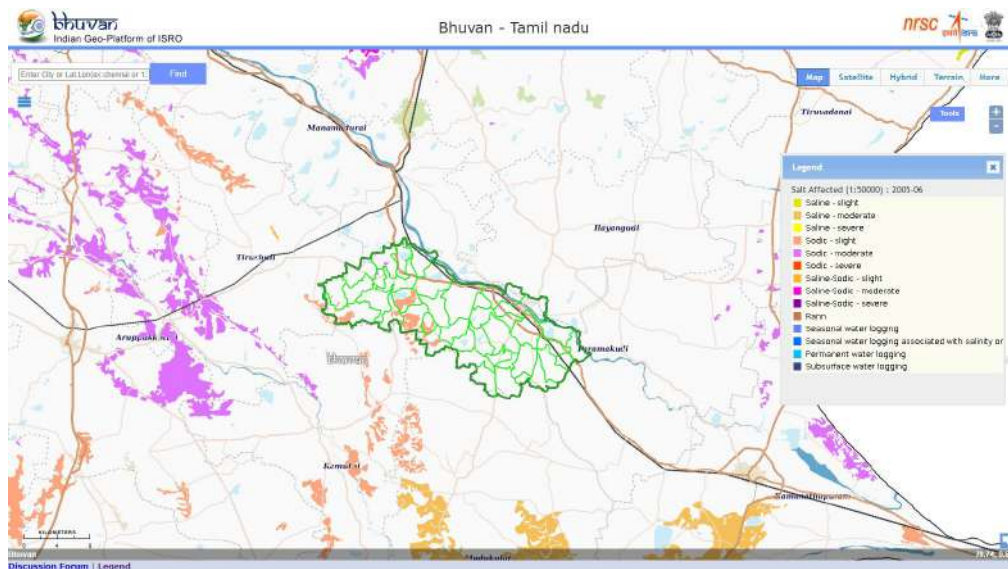
Figure 3.21. Salt affected area

Thematic unit	Area in %	Gram Panchayat
Sodic-Moderate		
	7%	Kallikudi - 10%, Nelmadur, P Puthur - 5%
Sodic-Slight		
	36%	Pudukudi - 70%, Urakudi - 55%, Kulandapuri - 40%, Keelaparuthiyur - 30%, Valangudi, Valimarichan - 25%, Thaduthalankottai - 5%
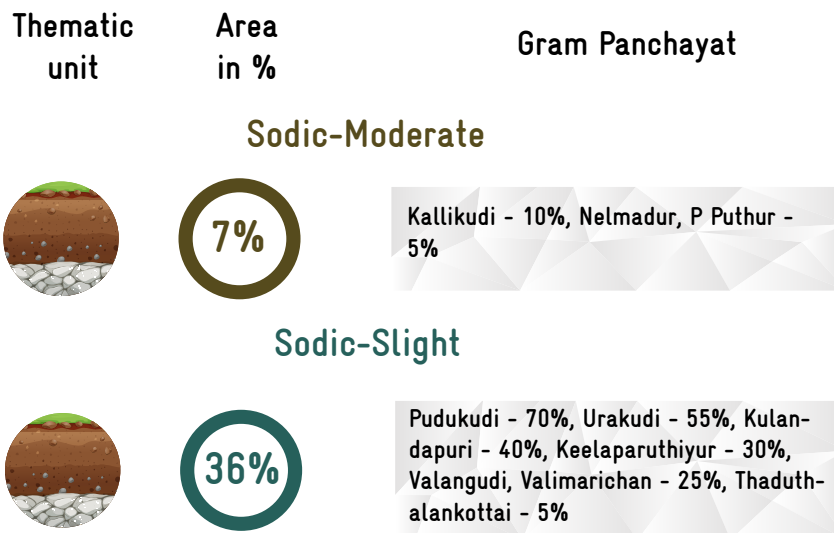
3.6.2   NON SPATIAL DATA

Agriculture based non-spatial secondary data related to land resources, catchment, crop type, soil micro-macro nutrient, moisture, ET and livestock data were collected from govt. sources (Table 7). The key CWRM parameters of agriculture area for all GPs are tabulated in Annexure 3.10.

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

Key parameter	Extent
Area under Land Resources (ha.)	
Area under Forest land	0.00
Non-Agricultural Uses	7,323.14
Area under Barren & Un-cultivable Land	535.34
Area under Permanent Pastures and Other Grazing Land	0.00
Land Under Miscellaneous Tree Crops etc.	1,999.43
Cultivable Waste Land	235.36

Fallows Land other than Current Fallows	2,543.94
Current Fallow land	7,277.74
Unirrigated Land	3,666.54
Area Irrigated by Source	5,593.84
Land under Catchment Area (ha)	
Good Catchment	7,858.48
Average Catchment	2,234.79
Bad Catchment	19,082.06
Crop Details	
Irrigated Area (ha)	5,901.50
Rainfed area (ha)	4,384.69
Paddy Cultivation (ha)	7,545.25
Crop Water Requirement - Irrigated condition (ha.m)	8,034.74
Crop Water Requirement - Rainfed condition (ha.m)	3,707.42
Soil Resources: Status of Available Nitrogen (%)	
Very Low	36.11
Low	61.99
Medium	1.82
High	0.07
Very High	0.01
Status of Organic Carbon (%)	
Very Low	12.65
Low	33.17
Medium	3.07
High	18.88
Very High	32.21
Status of Soil Micro Nutrients (%)	
Sufficient	63.6
Deficient	36.38
Status of Physical condition of the soil (%)	
Acidic Sulphate	0.1
Highly Acidic	0.2
Moderately Acidic	9.8
Slightly Acidic	9.3
Neutral	0.9
Moderately Alkaline	71.5
Strongly Alkaline	8.2
Soil Texture (%)	
Fine Soil	64.31
Coarse loamy	19.67
Soil Water Permeability (Low, Moderate, high)	Moderate
Soil moisture and ET	
Volumetric Soil Moisture (%)	17.00
Estimated Soil Moisture (ha.m)	3,714.87
ET Losses (ha.m)	5,877.62

Means of Water Extraction (%)	
Gravity	52.49
Lifting	48
Irrigation Methods (%)	
Wild Flooding	85.1
Control Flooding	14.9
Livestock (No.)	
Cattle Population	5,183
Sheep Population	23,368
Goat Population	20,089
Poultry	33,444

3.6.2.1 Land utilization

The standard land use classification helps to understand the distribution and the extent of different land use categories. As the runoff and water harvesting actions are linked to the land use systems, its distribution across the geographical boundary of the Block is necessary to take decisions. Of the total land area of 29,175.3 ha, the highest of 25.1 % land is Non-agricultural uses, followed by 24.94 % is current fallow land, while less than a percent of land under forest land, permanent pastures and other grazing land found (Figure 3.22).
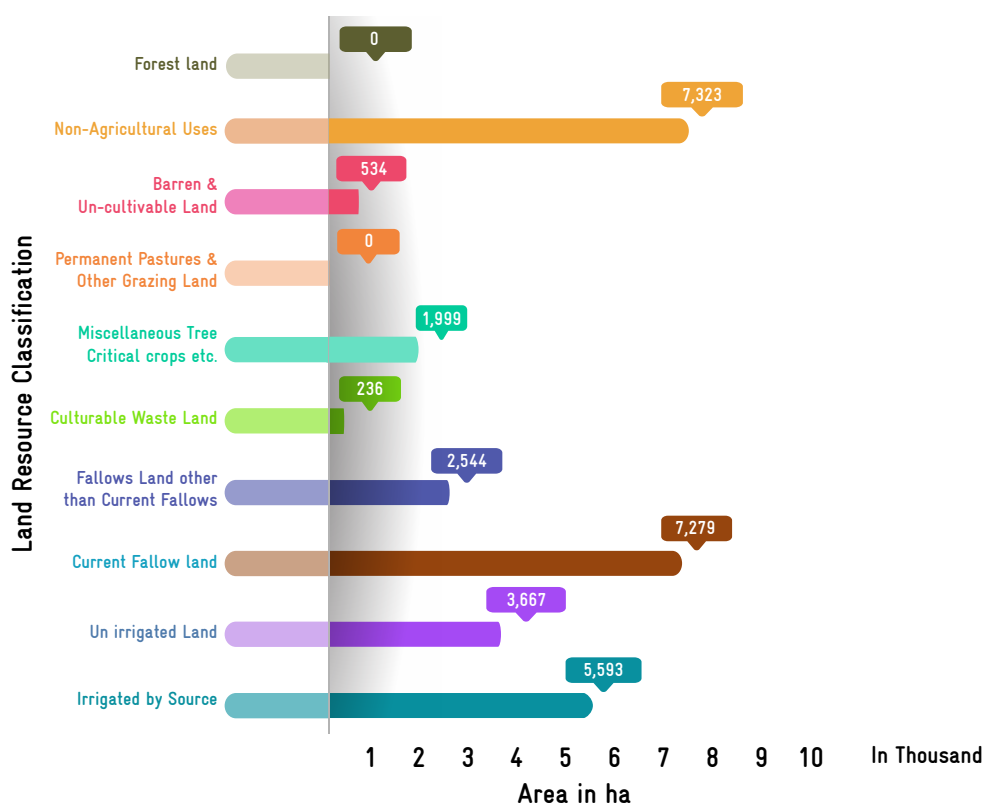
Figure 3.22. Land utilization

3.6.2.2 Catchment Area

The land use types in each of the GPs are categorized into three different types of runoffs; good, average and bad catchment area. Out of the total catchment area of 29,175.33 ha, of the Block, the highest of about 65.44% is from bad catchment area followed by 26.9 % from good catchment area and remaining is under average catchment area. This analysis helps to focus on prioritizing the works in the land use systems under the good and bad catchment areas (Figure 3.23).

65.44% **26.9%** **7.66%**

19,092.34 ha — 65.44% — ● Bad Catchment

7,848.16 ha — 26.9% — ● Good Catchment

2,234.83 ha — 7.66% — ● Average Catchment
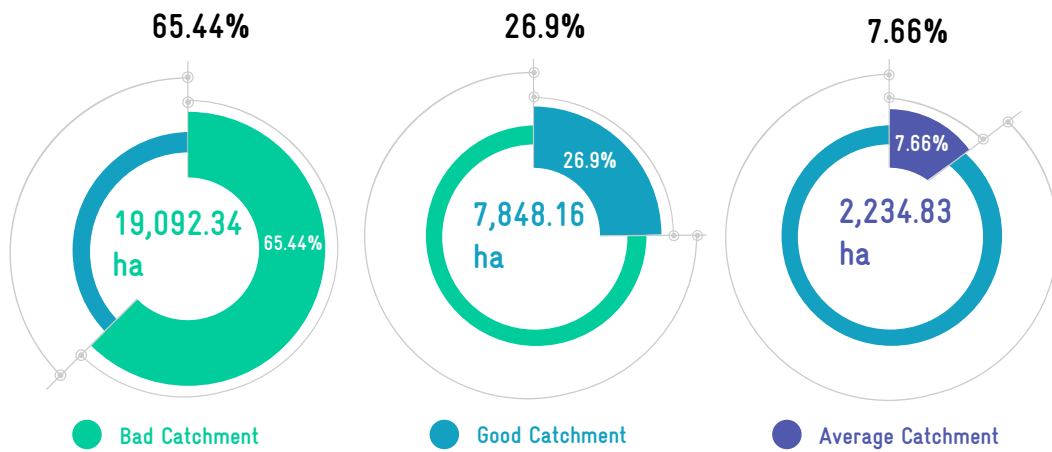
Figure 3.23. Catchment area

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 (17%), is taken for estimating the amount of water stored as soil moisture which accounts to 3,714.9 ha.m

3.6.2.4 ET losses

The transformation of liquid state of water state from earth surface to vapour state of water to atmosphere is the ET loss. The loss of water through ET is important in water budgeting. The Block area witnessed an annual total ET loss of 5,877.6 ha.m during 2018-19, with a monthly average of 489 ha.m.

01 — 3,714.9

02 — 5,877.6

■ Soil Moisture ■ ET Losses

in ha.m
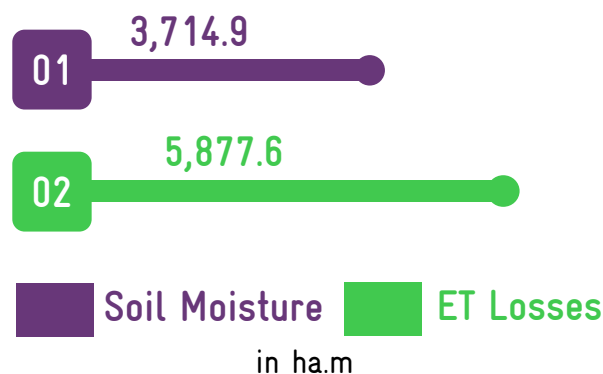
3.6.2.5 Macro-nutrients
Nitrogen

The available nitrogen is low (61.99 %) in of the samples tested while it is high for 0.07 % of the tested samples (Figure 3.24). According to soil resource map, this Block is identified as one of the Nitrogen deficient Blocks (Ramanathapuram District profile 2020).
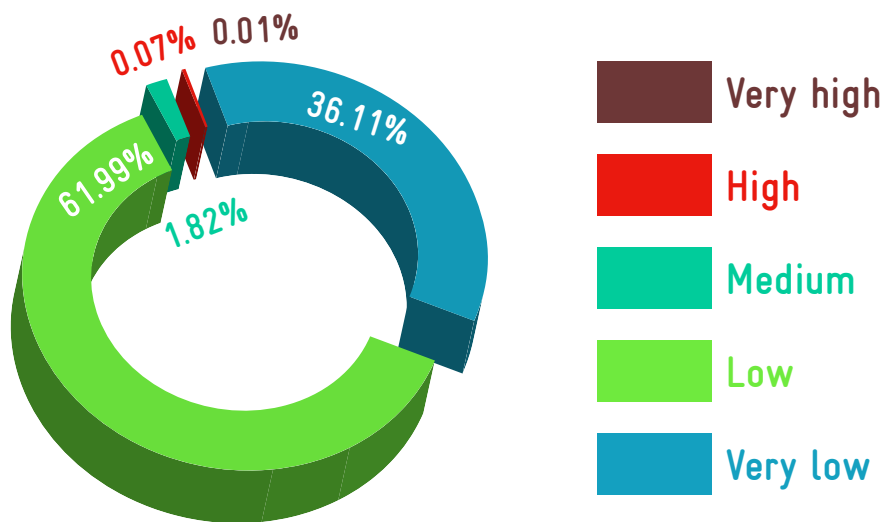
Figure 3.24. Status of available Nitrogen

Organic Carbon

Soil organic carbon ranges between very low and very high in the tested soil samples. 33.17 % of the soil samples tested fall under low category followed by 32.23 % which falls under very high category while less of 3.07 % samples are witnessed with medium organic carbon (Figure 3.25). This indicates that the soil fertility is moderately poor.
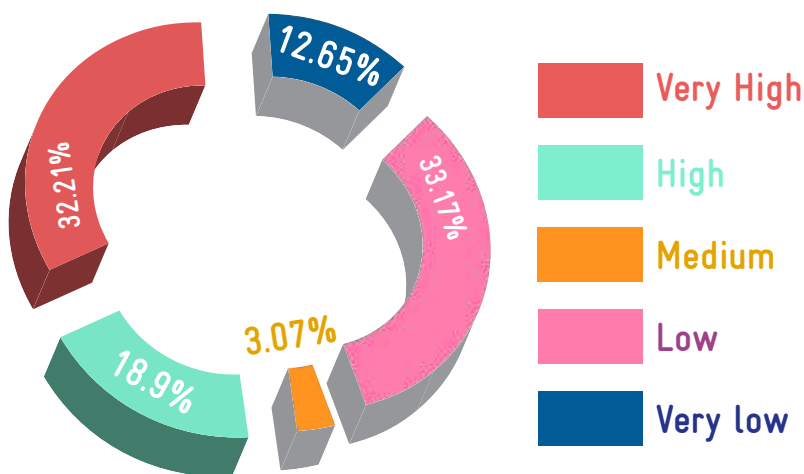
Figure 3.25. Status of soil Organic Carbon

3.6.2.6 Status of the soil micro-nutrients

This Block is one of the Nitrogen, Zinc and Ferrous deficient Blocks of Ramanathpuram District. The micro-nutrient status of the soil with specific reference to Manganese, Boron and Zinc, Ferrous, Copper, and Sulphate are deficient in 36.38 % and 63.62 % sufficient in the soils tested (Figure 3.26).
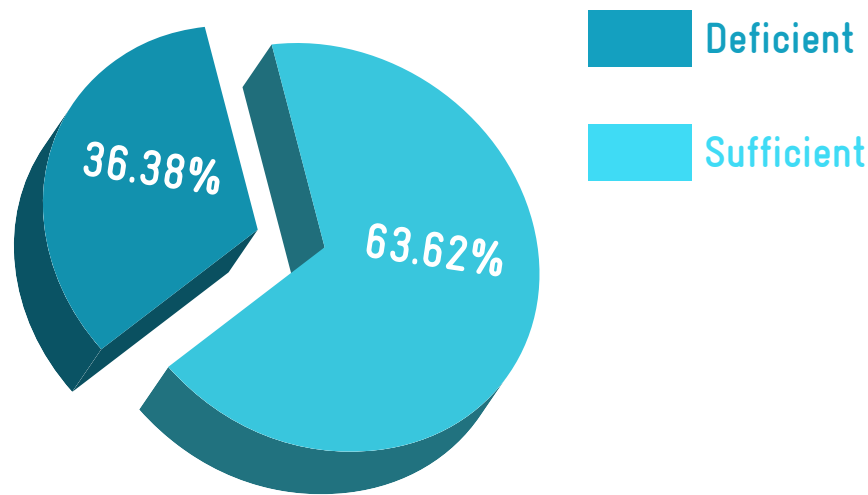
Figure 3.26. Status of soil micro-nutrients

3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 55.93 % of the soil is moderately alkaline in nature followed by 23.94 % is moderately acidic while 0.75 % is neutral (Figure 3.27).
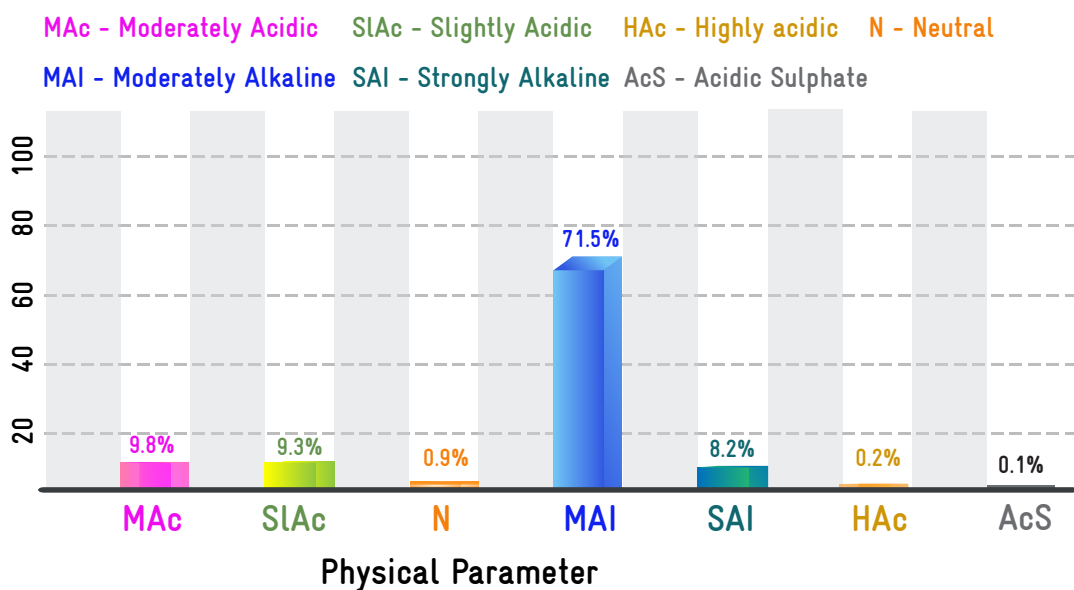
Figure 3.27. Status of pH of soil

3.6.2.8 Cropping pattern and the irrigation

A total area of 10,286.2 ha is used for crop cultivation in which 57.4 % area is cultivated using irrigation sources and the rest or the area is cultivated using rain fed irrigation. Paddy is a dominant crop in both water source field which accounts to 73.35 % (7,545.2 ha) of total cultivated area followed by green chilli of 8.94 % while cultivation of minor millets, ragi, coconut, garlic, jowar, other pulses, sugar cane, maize, guava, brinjal, soybean accounts to less than one percent of the cultivated area.
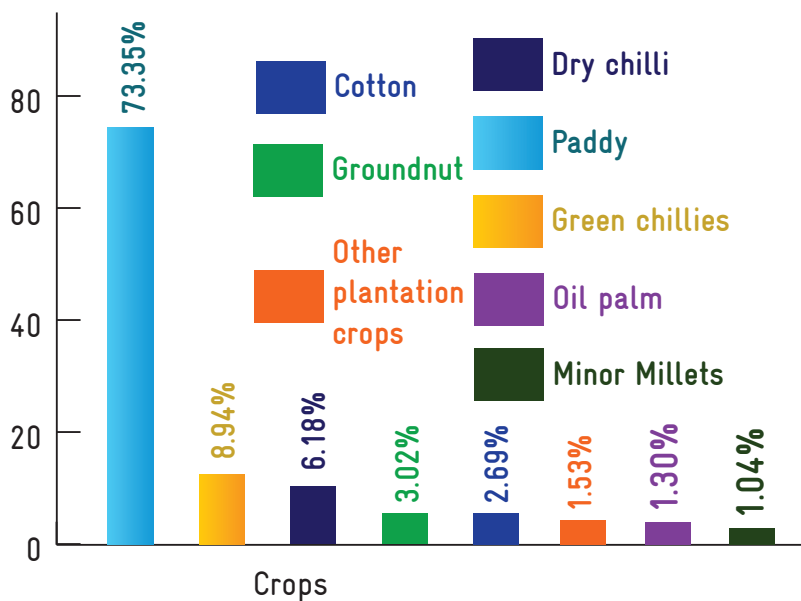
Figure 3.28. Crop pattern (including rain-fed and irrigation area)

3.6.2.9 Irrigation methods

In case of the surface water resources, wild flooding is the primary method of irrigation. But in case of ground water resources, the predominant type of irrigation is control flooding. In the Block, 85.1 % of the irrigation is done by wild flooding and rest of irrigation is done by control flooding (Figure 3.29).
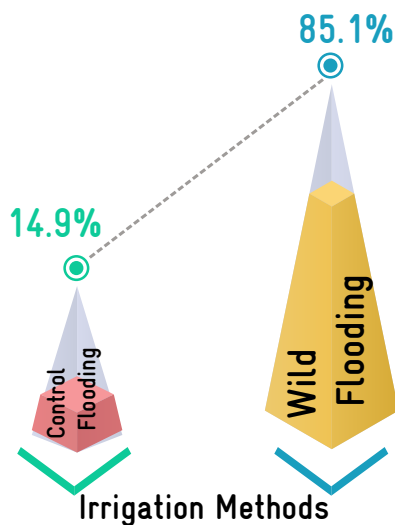
Figure 3.29. Irrigation methods

3.6.2.10 Means of water extraction

Water is extracted in two ways, one by gravity and the other is by lifting. Water is drawn from surface water sources such as tanks, ponds etc., by using gravity method and that of ground water sources such as open well, hand pump, bore well by using lifting method. In the Block, 52.5 % of the water extraction is through gravity and rest comes under lifting means of water extraction (Figure 3.30).

47.5%

52.5%

Lifting

Gravity

Means of Extraction
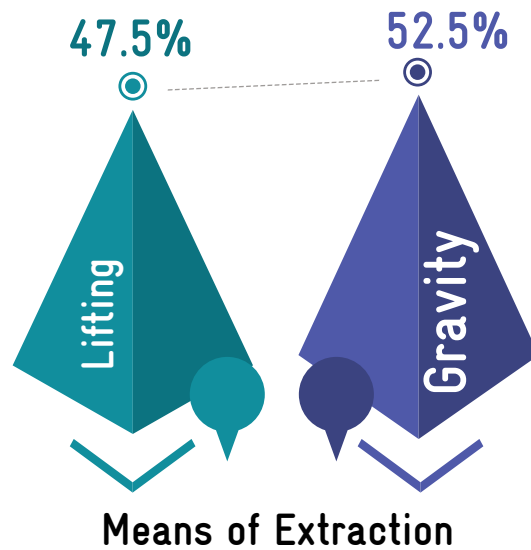
Figure 3.30. Means of water extraction

3.6.2.11 Livestock details

This Block has considerable proportion of livestock resources about 82,084. Of which small ruminants poultry populations is high 40.7 % (33,444) followed by sheep of 28.5, % (23,368) and 24.5 % of goat's (20,089), while cattle population is about 6.3 % (5,183) (Figure 3.31). The total water requirement for livestock is 35.72 ha.m. Of the total water demand of 51.2 % is met through surface water and remaining is from surface water resources.

6.3%

40.7%

28.5%

24.5%

Poultry

Goat

Sheep

Cattle
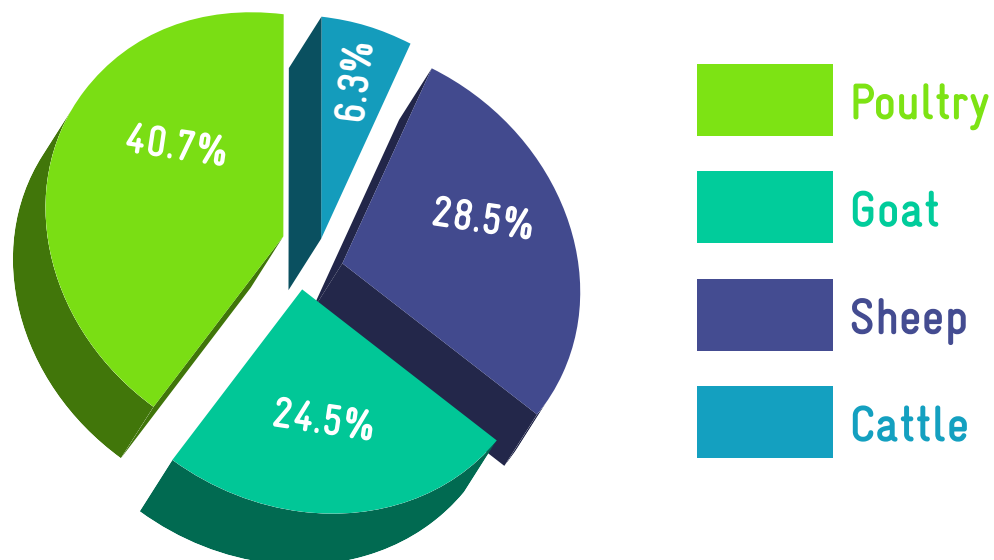
Figure 3.31. Livestock details

3.7 | CWRM PLANNING ANALYSIS- SOCIO-ECONOMIC

The demographic details such as population, gender, vulnerable population/ households, drinking and grey water details are collected from authentic primary and secondary sources and analyzed. Data of MGNREGA job holders is also taken for the analysis. Table 8 lists the demographic and socio-economic status of Paramakudi Block. GP wise demographic and socio-economic status are attached in Annexure 3.11.

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

Parameter	Total
Geographical Area (ha)	28,244
Male Population (No.)	50,994
Female Population (No.)	49,316
Total Population (No.)	1,07,501
SC Population (No.)	36,422
Vulnerable Population (No.)	136
Households (HH's) (No.)	36,558
Only one room HH's (SECC) (No.)	26,678
Female Headed HH's (SECC) (No.)	1,235
Vulnerable Households (SECC) (No.)	1,630
% of Vulnerable Households (%)	6%
Registered MGNREGA Job cards (Persons)	24,420
Active person working in MGNREGA job Cards (Persons)	18,797
Drinking Water Sources (No.)	3,913
HH's have tap water connection for drinking water (No.)	15,595
HH's dependent on other sources for drinking water (No.)	16,676
Annual Greywater Generation (ha.m)	187

3.7.1 Population:

The total population of this Block is 1,07,501* in which the male proportion is slightly higher than female population. 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 34 % of the total population are under vulnerable population (Figure 3.32).

Female 49,316   **Male** 50,994

49.16%   50.84%

SC Population   36.31%   36,422
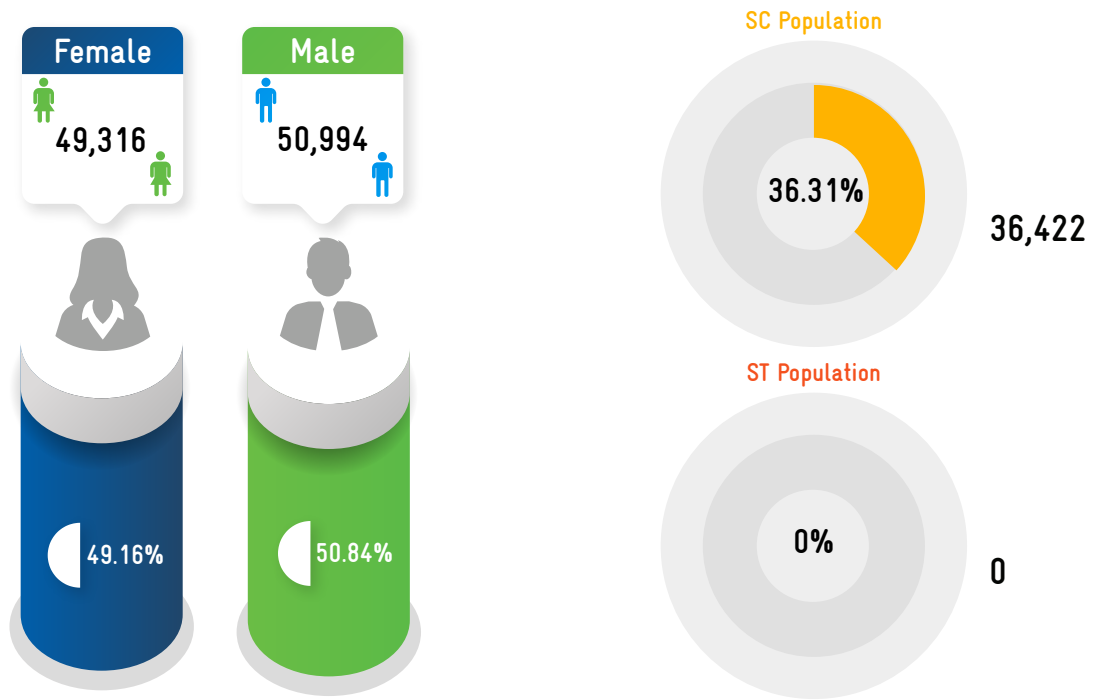
ST Population   0%   0

Figure 3.32. Population details

population figures may differ from Census 2011 due to categorization of GPs based on revenue panchayat boundaries

3.7.2 Details of households

There are a total of 26,678 households in which 4.6 % households have only one room, 6.1 % households are headed by women and 5.07 % are vulnerable households (Figure 3.33)

15,994

Households   HH's having only one room 1,235   HH's headed by Women 1,630   Vulnerable HH's 1,353

in Thousand's

● **Different Vulnerable Households**
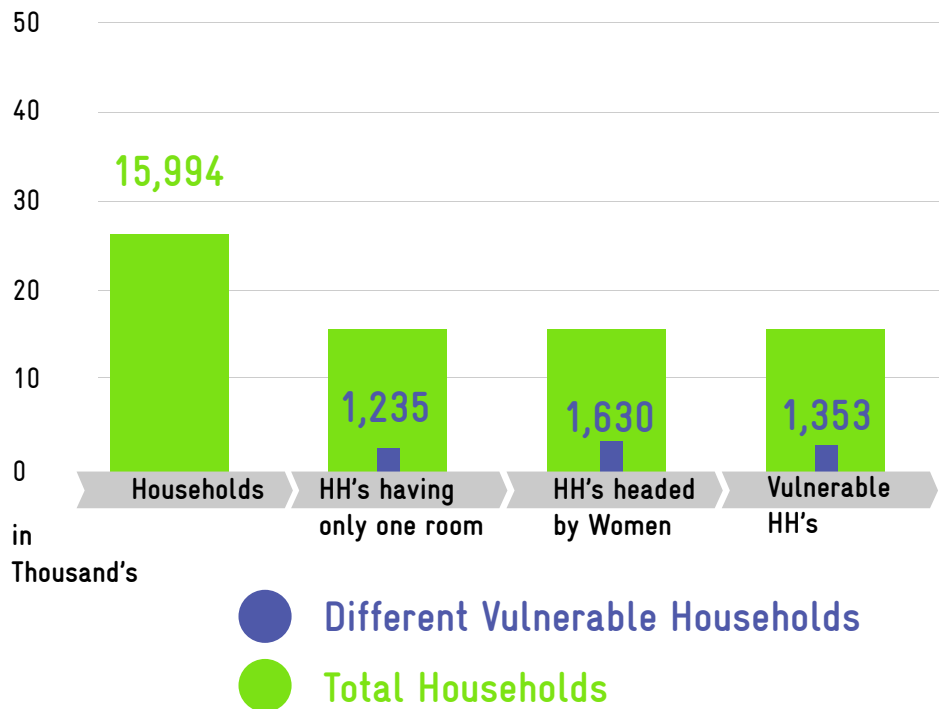
● **Total Households**

Figure 3.33. Details of households

3.7.3 Status of Mahatma Gandhi NREGA - job card status

In the Block, of the total population of 1,07,501. 24,420 are registered for job cards in Mahatma Gandhi NREGA scheme in which 22.72 % of the job cards are in active category (Figure 3.34).

24,420 57%

18,797 43%

● Registered MGNREGA Job cards

● Active person working
in MGNREGA job Cards
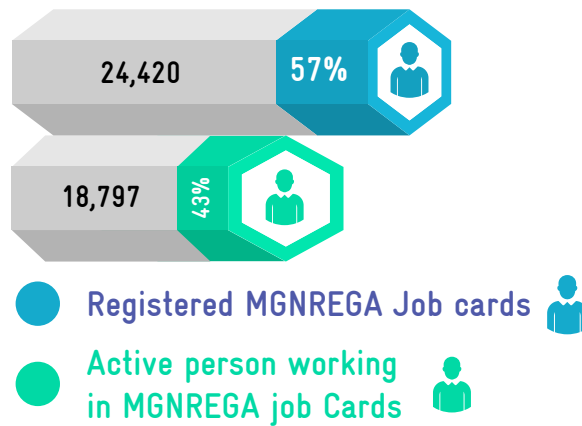
Figure 3.34. Status of MGNREGA job cards

3.7.4 Drinking Water Sources

Nearly 15,595 households have tap water connection and 16,676 households depend on other water sources for domestic use, where other sources include RTRWHS / Tanka (roof rain water harvesting systems, hand pump, open wells, bore wells, tank/ pond/ oorani, springs and river/ streams.

Tap water connection

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

**15,595
Households**

**16,676
Households**
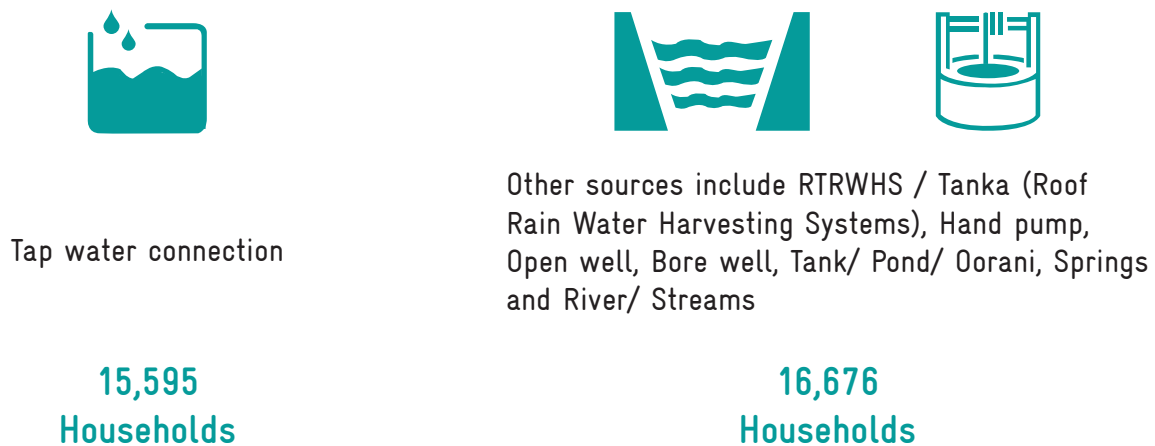
3.7.5 Annual Greywater Generation

The grey water generation estimated across this Block is 187 ha.m which is available for reuse or recycle.

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

Morphology — Ariyanendal, Kalayur, Pudukudi

Wasteland — Keelaparthiyur, Mosukkudi

Soil erosion — Mosukkudi, Tholur, Kallikudi

Physicochemical parameters — Kalayur, Kallikudi, Pudikudi

Salt affected area — Pudukudi, Kudlandapuri, Valsngudi

Ground water prosperity — Vendoni, Urappuli, Kalayur

Upland/Slope — Kallikudi, Madanthai

Climate

Drought

All GPs

Flood
S.Andakkudi,
Thelichethanal-
lur, Nenmeni

Socio economic

**Population
density high** in
Urakkudi, Thinaiku-
lam

**Vulnerable
population high** in
Melaparthibanur,
Nelmadur

**% of vulnerable
households high**
in
Kulandapuri
Arungulam,
Soodiyur

No. of households
and female headed
households high in
Nenmeni, Urappuli

**Total population,
Female population
high** in Nenmeni,
Urappuli

**Grey water
generation more**
in Nenmeni,
Urappuli

Most of GP HH's
have tap water
connection for
drinking water high
in Vendoni, Venkit-
tankurichi

Registered
MGNREGA job cards
and active persons
working are low in
Enathikottai

Water

High ground water utiliza-tion for agri-culture in many GPs

Tank irrigation in majority of all GPs

Soil

More bad catchment area

More area under non agriculture land, un irri-gated land

More Poultry population

More moderately alkaline soil

Nitrogen availability is low

கெடுப்பதூஉம் கெட்டார்க்குச் சார்வாய்மற் றாங்கே
எடுப்பதூஉம் எல்லாம் மழை

<div align="right">குறள் - 15</div>

Destruction it may sometimes pour
But only rain can life restore

<div align="right">Thirukkural - 15</div>

VULNERABILITY RANKING OF GP

4 | VULNERABILITY RANKING OF GP

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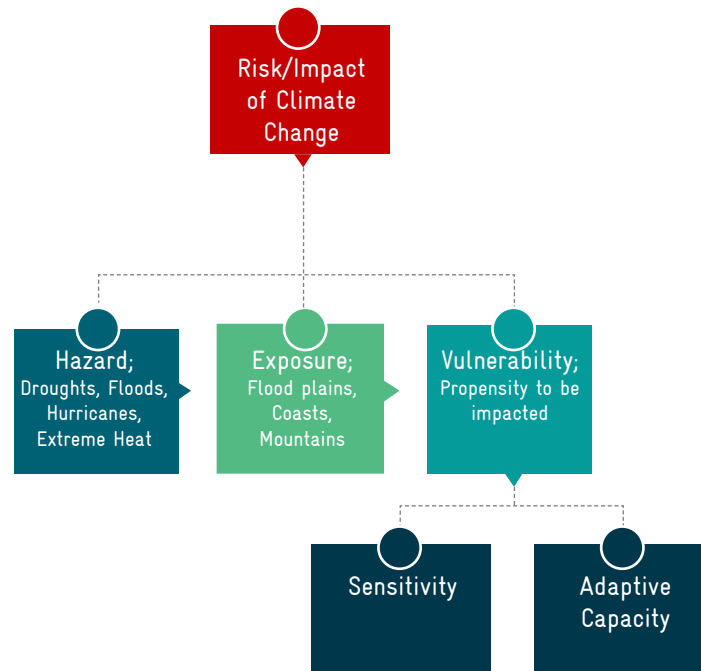
Figure 4.1. Vulnerability of the system as defined by IPCC

Generally, vulnerability assessments are made to identify.

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

The CWRM parameters which been explored through rigorous study were considered here to address the key water challenges at GP level. About 73 spatial and non-spatial parameters/ indicators under 4 dimensions via Climate (3), Water (28), Agriculture (31) and Socio-demographic (11) are categorized into adaptive capacity, sensitivity and exposure indicators for vulnerability analysis as per IPCC norms. Table 9 lists CWRM parameters/indicators, its rationale to vulnerability, source of data and its linkage with WASCA TN's primary 18 indicators.
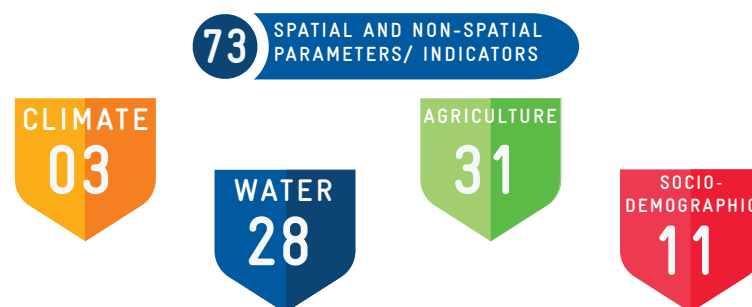
TABLE 9. CWRM PARAMETERS/INDICATORS SELECTED FOR BLOCK LEVEL VULNERABILITY

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

Agriculture	Fallows land other than current fallows	Sensitivity
	Current fallow land	
	Unirrigated land	
	Area irrigated by source	
	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	

Socio economic	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 levels very high, high, medium, low and very low category. The vulnerability assessment methodology is given in Annexure 4. The GPs categorized based on vulnerability scores are shown in Figure 4.2. Kothaidal, Ayangudi, Tiruppalaikkudi, Sattanur, Karkathakudi, Kavanakottai, Chiituruvadi, Senkudi, Radhanur and Varavani GPs have very high rural water security vulnerability to climate risks followed by Thumbadakottai, Karungudi, Pitchanakurichi, Pullamadai, Govindamangalam, Melapanaiyur, Sanavelli, Urangudi, Sirunagudi, Thiruthervalai, Sethidal, Sholandur, Alagarthevankottai, Odaikkal, Kadalur, Paranur and Anandur GPs with high vulnerability. A.Manakudi GP has very low vulnerability.

Upto	Category	Color range
0.524	Very High	
0.495	High	
0.467	Medium	
0.438	Low	
0.409	Very low	

Cumulative Vulnerability Scores

Name of the GP/Unit

GP/Unit	Score
Keelaparthibanur	0.487
Poduvakudi	0.484
Soodiyur	0.483
Valimarichan	0.483
Keelaparuthiyur	0.482
P.Puthur	0.480
Kallikudi	0.478
Madanthai	0.477
Melaparthibanur	0.475
Pudukudi	0.473
Tholur	0.472
Thenpoduvakudi	0.470
Valangudi	0.468
Perungarai	0.466
K.Karungulam	0.465
Peerkankurichi	0.463
Enathikottai	0.453
Kanjiyendai	0.423
S.Andakkudi	0.409

Name of the GP/Unit

GP/Unit	Score
Vendoni	0.552
S.Kavanur	0.542
Thinaikulam	0.541
Venkittankurichi	0.541
Nelmadur	0.534
Kalaiyur	0.530
Ariyanendai	0.517
Thelichathanallur	0.516
Pambur	0.512
Urappuli	0.511
Kamuthakudi	0.507
Urakkudi	0.507
Kulandapuri Arungu...	0.505
Nenmeni	0.505
Villathur	0.505
Melakavanur	0.504
Thaduthalankottai	0.504
Melayakudi	0.497
Vengalur	0.495
Mosukkudi	0.489

Figure 4.2. Final cumulative vulnerability scores

Sectoral vulnerability

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

Climate risks vulnerability

The climate risk vulnerability index shows that all GPs in this Block are affected with droughts in last decades. Flood hot spots are Thelichathanallur, Nenmeni and S.Andakkudi

THELICHATHANALLUR, NENMENI, S.ANDAKKUDI

Water resource vulnerability

The water resources vulnerability index shows that Vendoni, S.Kavanur, Urappuli, Thinaikulam, Pambur and Kalaiyur GPs have high vulnerability

VENDONI, S.KAVANUR, URAPPULI, THINAIKULAM, PAMBUR, KALAIYUR

Agriculture resources vulnerability

In agriculture and allied sectors, Nelmadur, Venkittankurichi and Villathur GPs have high vulnerability

NELMADUR, VENKITTANKURICHI, VILLATHUR

Socio-economic vulnerability

Kulandapuri Arungulam, Enathikottai and Urakkudi GPs have high socio-economic vulnerability

KULANDAPURI ARUNGULAM, ENATHIKOTTAI, URAKKUDI

Vulnerability Dimensions

● Agriculture ● Climate ● Socio-economic ● Water

Gram Panchayats

Gram Panchayat	Socio-economic	Climate	Water	Agriculture
Enathikottai	5.4		12.9	13.0
S.Andakkudi	3.5		11.0	12.9
Kanjiyendal	3.4		12.3	13.4
Meleparithibanur	5.0		13.6	14.3
Thelichathanallur	4.8	2.0	14.1	15.2
Thoilur	4.6		13.8	14.2
Pudukkudi	4.1		14.0	14.6
Ur-appui	4.4		14.7	15.6
Nemmeni	4.5		14.4	14.9
P.puthur	3.9		13.7	15.0
Mosukkudi	3.2		15.0	15.0
Ur-akkudi	5.4		14.5	15.1
Keelaparithibanur	4.7		13.3	15.1
Soodiyur	5.0		12.7	15.2
Thadithiaanhotai	4.2		14.9	15.3
Peerkanhurchi	3.3		12.8	15.4
Valmanichan	5.0		12.7	15.7
Valangudi	3.4		13.3	15.7
Keelaparuthiyur	3.9		13.2	15.7
Ariungulam	5.5		13.6	15.8
Kulandapuri	3.9		15.5	15.9
Pambur	3.8		13.1	15.9
Madanhai	4.7		12.2	16.1
Kalikkudi	2.4		13.1	16.2
K.Karungulam	4.5		14.0	16.2
Melakkavanui	2.5		13.7	16.3
thenpoduvakkudi	2.9		13.0	16.4
Perungarai	4.9		15.9	16.7
S.Kavanur	3.8		12.8	16.7
Poduvakkudi	4.4		14.5	16.7
Ariyanendai	4.1		13.9	17.0
Kamuthakudi	4.3		16.8	17.1
Vendori	3.5		13.7	17.2
Melayakudi	4.6		15.5	17.2
Thinalkuam	3.3		15.5	17.2
Kaliyur	4.4		12.4	17.4
Vengalur	3.3		14.0	17.6
Villathur	4.4		14.7	18.3
Venkitankurchi	4.9		13.5	18.5
Neimadui				

Figure 4.3. GP wise vulnerability dimensions

99

Contributing indicators to the total vulnerability

Climate

Drought

Agriculture

Livestock

Flooding method

Area under public land

Soil nitrogen

Physical status of soil

Soil moisture

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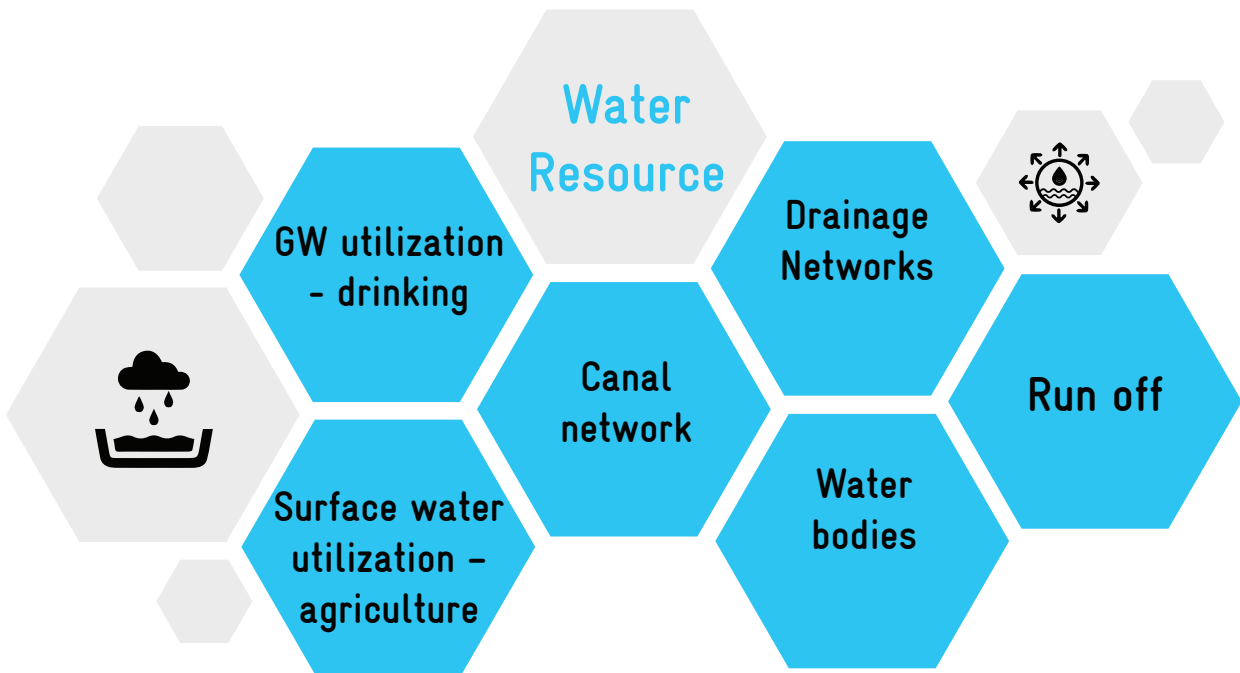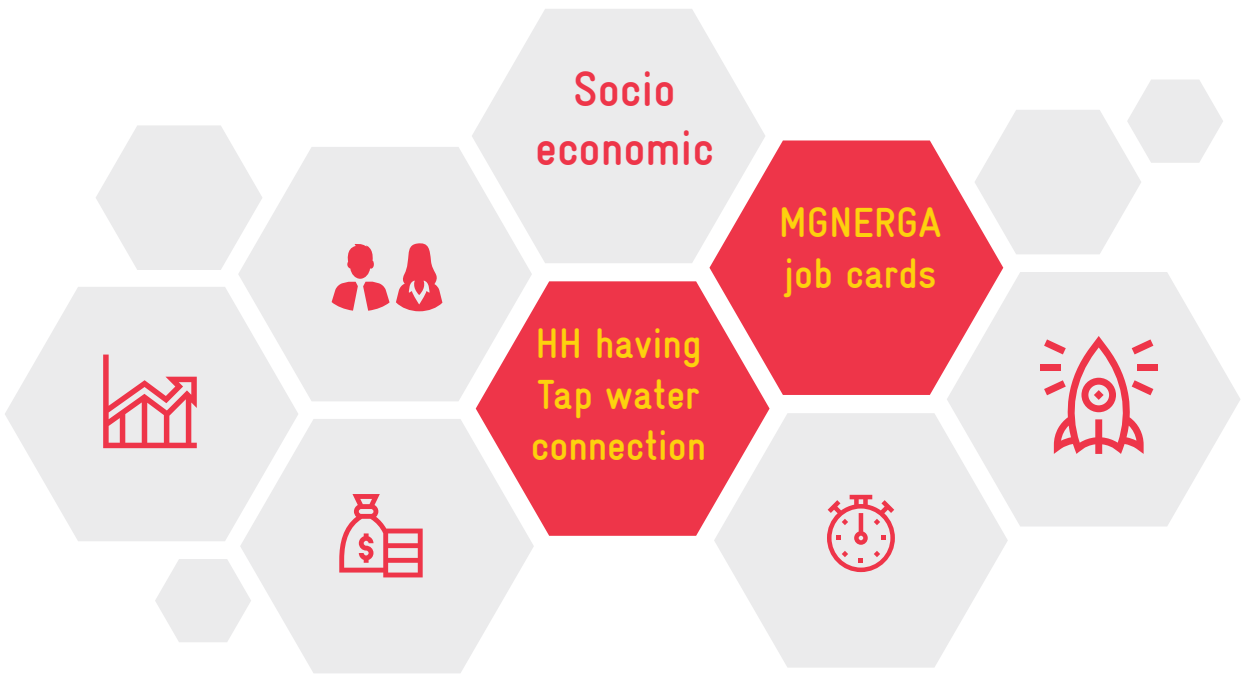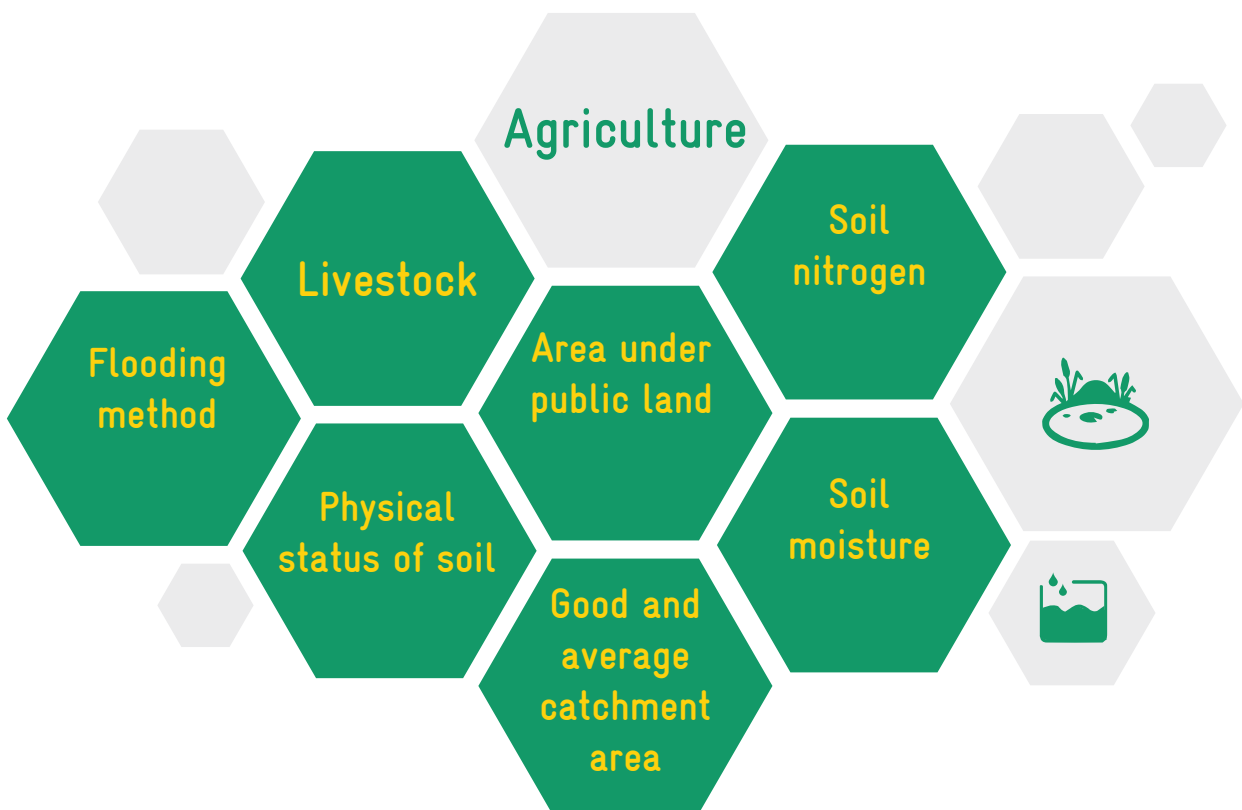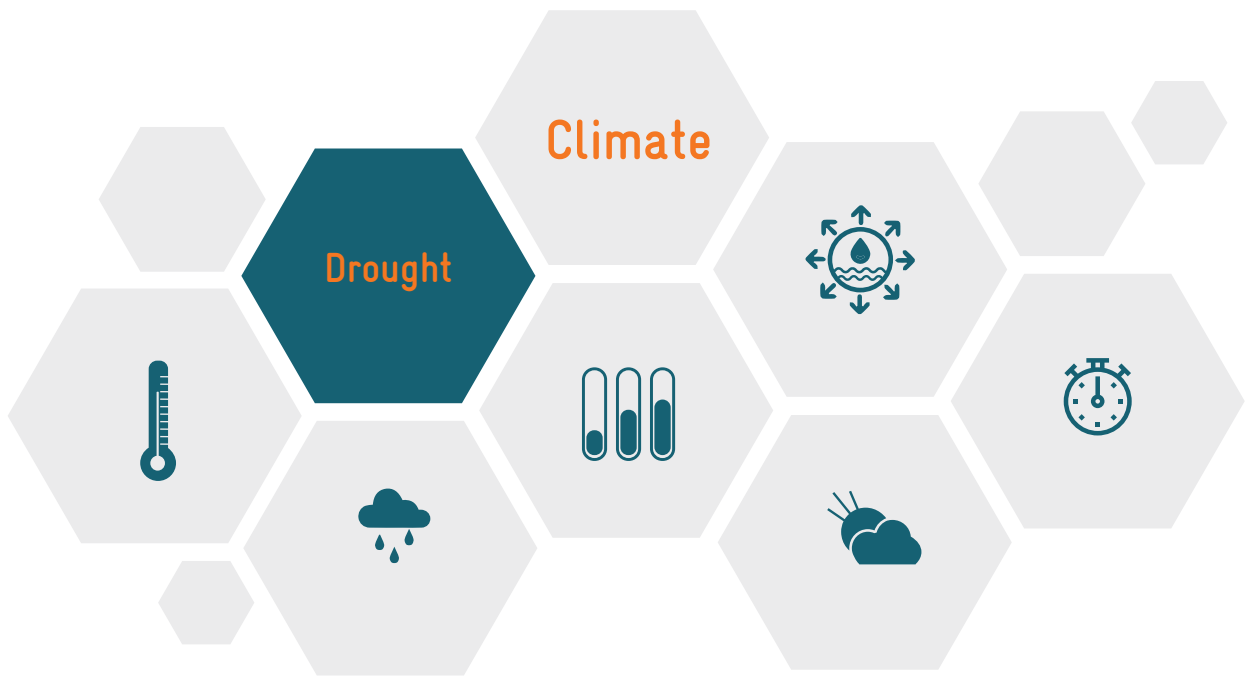
Based on the vulnerability assessment, high attention has been provided to identify more shelf of works/actions in the resource management in order to reduce the vulnerability and increase its adaptive capacity towards climate change.

விசும்பின் துளிவீழின் அல்லால்மற் நாங்கே
பசும்புல் தலைகாண்பு அரிது

குறள் - 16

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

Thirukkural – 16

CHAPTER 5

KEY WATER ACTIONS UNDER MGNRGES CONVERGENCE

PROPOSED KEY WATER ACTIONS UNDER MAHATMA GANDHI NREGS CONVERGENCE

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

After identifying the key water issues at GP level through vulnerability analysis, the area for key water action treatments were proposed. The comprehensive and holistic understanding of the key water challenges adopting the eco-system approach enable to identify water action works in public and common land (afforestation, soil and water conser-vation, improving the traditional water storage and catchment assets etc.,), agriculture and allied sector (farm ponds, artificial recharge structures, on-farm plantation, irrigation methods, livestock - fodder development etc.,) and rural infrastructure (on safe drinking water and efficient handling of grey water).

5.1 | THE PROPOSED AREA UNDER WASCA TREATMENT

Out of 29,175.3 ha available land in Paramakudi Block, 4,769.4 ha (16.3 %) area is proposed for treatment under WASCA TN– CWRM planning. A major portion of Key Water Actions is proposed in 1,699.5 ha of land under miscellaneous tree crops (35.6 % of total proposed area), followed by 725.3 ha of non-agricultural land (15.2 % of total proposed area) while in forest and permanent pastures and other grazing land, nothing was considered for treatment. The detailed land wise proposal for WASCA treatments is given in the Table 10 and Figure 5.1. GP wise proposed area for treatment is also attached in Annexure 5.1.

TABLE 10. THE PROPOSED AREA FOR WASCA TREATMENT

Land use	Total available land (ha)	WASCA proposed treatment area (ha)
Non-Agricultural Uses	7,323.1	725.3
Current Fallow land	7,277.7	533.7
Area Irrigated by Source	5,593.8	518.6
Unirrigated Land	3,666.5	359.3
Fallows Land other than Current Fallows	2,543.9	277.9
Land Under Miscellaneous Tree Crops etc.	1,999.4	1,699.5
Barren & Un-cultivable Land	535.3	455.0
Cultivable Waste Land	235.4	200.1

in ha

- Area under Non-Agricultural Uses
- Treatment Area under Non-Agricultural Uses
- Area under Barren & Un-cultivable Land
- Treatment Area under Barren & Un-cultivable Land
- Area under Land Under Miscellaneous Tree Crops etc.
- Treatment Area under Land Under Miscellaneous Tree Crops etc.
- Area under Culturable Waste Land
- Treatment Area under Culturable Waste Land
- Area under Fallows Land other than Current Fallows
- Treatment Area under Fallows Land other than Current Fallows
- Area under Current Fallow land
- Treatment Area under Current Fallow land
- Area under Unirrigated Land
- Treatment Area under Unirrigated Land
- Area Irrigated by Source
- Treatment Area Irrigated by Source

Good Catchment

Average Catchment

Bad Catchment

Figure 5.1. WASCA treatment area in percentage

Expected Runoff Conservation after WASCA treatment

The productive developmental activities that were taken up in the WASCA proposed areas are termed as Key Water Actions. With the above proposed treatment area, the expected runoff harvested due to WASCA intervention would be around 1,267.7 ha.m which is 29.5 % of the total runoff. Of the expected runoff conservation, the highest of 60 % good catchment area was considered for treatment followed by 24.6 % of average and rest from bad catchment area (Figure 5.2).
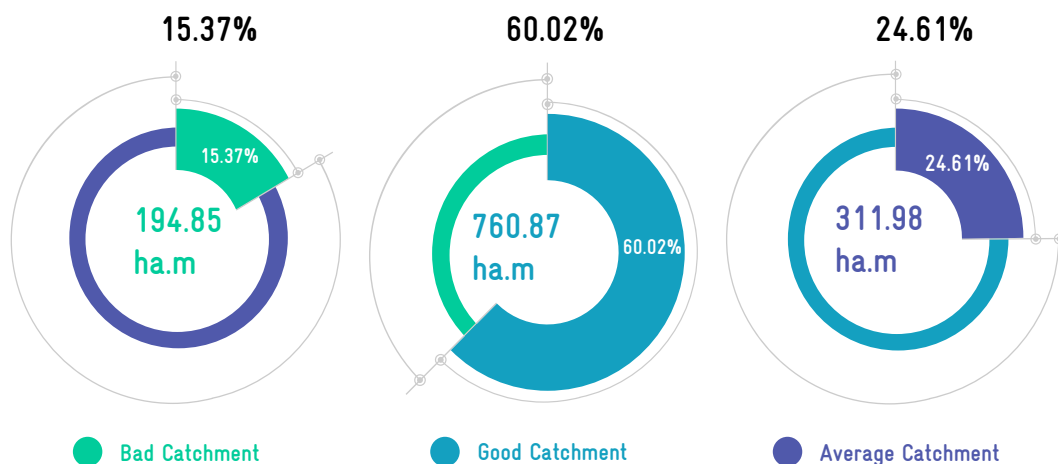
Figure 5.2. Expected conservation after WASCA treatment

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

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

Work (unit)	Abbreviation (unit)	No.	Extent (area in ha or length in m)
Azolla units - Individual (Number of units)	Az	128	1,301
Cattle Shelters (Number of units)	CS	128	1,301
Cattle Trough(Number of units)	CT	128	1,301
Fodder development - Community & Individual	FD	128	1,301
Goat Sheep Shelters (Number of units)	GSS	2,543	25,439
Poultry Shed (Number of units)	PS	833	8,366
Silvi-pasture Development (ha)	SPD	-	-
Soak Pits (Community) (Number of units)	SPC	271	27,327
Soak Pits (Individual) (Number of units)	SPI	2,736	27,327

Description	Code	Value 1	Value 2
Artificial Recharge Structure(Number of units)	ARS	525	1,312
Construction of Farm Ponds - Individual (Number of units)	FP	468	1,689
Restoration of water bodies: PWD and Union Tanks(Number)	RPWDT	114	
Restoration of water bodies:Ooranis(Number)	Roo	270	
Restoration of water bodies: Ponds(Number)	RP	-	
Roof Rain Water Harvesting (Number of units)	RRWH	76	
Water Course - Irrigation Channels - Desilting (Mtrs)	WCICD	55492	
Afforestation in Public/common lands(ha)	Aff	9,43,211	1,180
Avenue plantation(km)	AVP	39,395	1,57,554
Block Plantation (Community)(ha)	BP	15,19,649	1,900
Canal Bund Plantation(ha)	CBP	31,517	1,26,065
Contour Continuous Bunds (CCB) for Afforestation area(Mtrs)	CCBF	2,36,067	1,180
Drainage Line Treatment (Mtrs)	DLT	10,690	42,749
Dry land Horticulture/Agro-forestry - Individual (ha)	DLHAI	337	844
Irrigation Channel Plantation (Mtrs)	ICP	13,875	55,492
Linear Plantation(km)	LP	13,988	55,950
Micro Irrigation(ha)	MI	210	519
Nursery Development (Number of units)	ND	1,36,635	27,327
Composting(Number of units)	Co	468	1,689
Farm Bunding with Boundary Trenches - Individual (ha)	FBBTI	676	1,689
Land development - Individual (ha)	LDI	235	585
NADEP Vermi compost (Number of units)	NADEP	128	1,301

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

Land development works over 5,265 ha area

More than 29 Lakhs plants planting

1,450 sites for WCWH

6,890 livelihood works

Expected Runoff Conservation

Gram Panchayats

- Average Catchment Area
- Bad Catchment Area
- Good Catchment Area
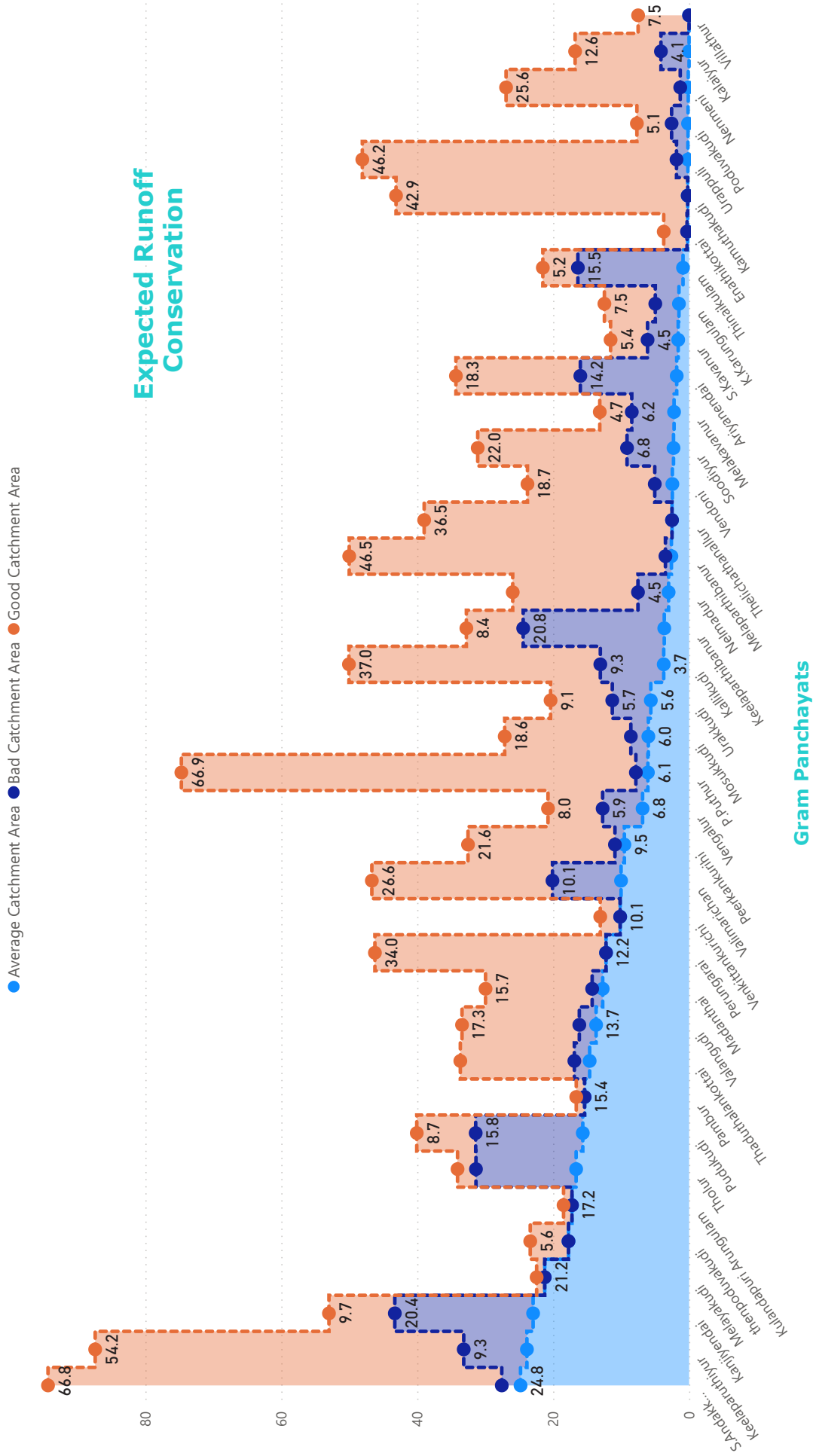
Figure 5.3. Expected GP wise runoff conservation after WASCA treatment

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

Water Actions

1 Development of Public and Common Lands

2 Development of Agricultural and Allied sector

3 Development for Rural Infrstructure

4 Development of CRM Measures
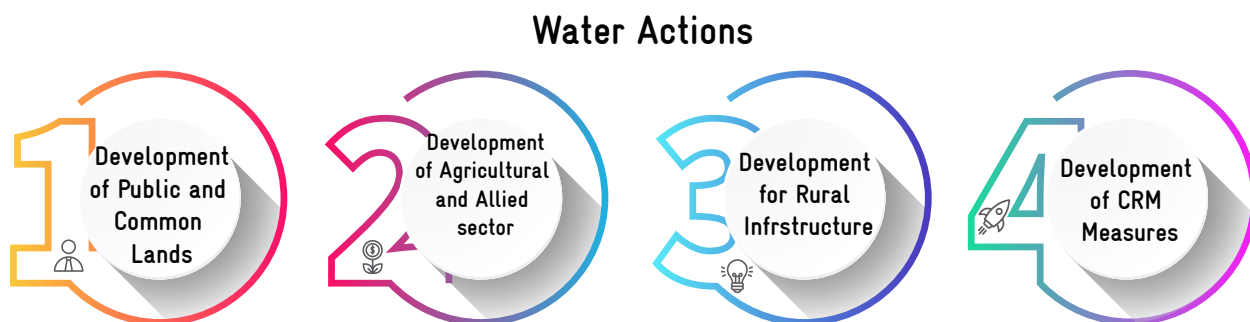
5.2 | DEVELOPMENT OF PUBLIC & COMMON LANDS

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

DEVELOPMENT OF PUBLIC AND COMMON LANDS

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

	NO. OF WORKS	PERSON DAYS PER UNIT	UNIT COST IN INR (LAKHS)	ESTIMATED COST IN INR (LAKHS)	ESTIMATED PERSON DAYS
CONTOUR CONTINOUS BUNDS (CCB) FOR AFFORESTATION AREA(m)	4,721	10	0.025	118	47,213
COMPOSTING (NUMBER OF UNITS)	468	15	0.17	80	7,020
AFFORESTATION IN PUBLIC/ COMMON LANDS (ha)	1,180	3,344	8.6	10,148	39,45,920
BLOCK PLANTATION (COMMUNITY) (ha)	1,900	4,320	11.1	21,090	82,08,000
SILVI-PASTURE DEVELOPMENT (ha)	-	6,664	17.1	-	-
LINEAR PLANTATION (km)	56	703	1.8	101	39,333
CANAL BUND PLANTATION (ha)	173	2,930	7.5	1,298	5,07,095
IRRIGATION CHANNEL PLANTATION (m)	10,050	6	0.015	151	60,300
AVENUE PLANTATION(km)	158	703	1.8	284	1,10,760
NURSERY DEVELOPMENT (NUMBER OF UNITS)	683	2,344	15	10,248	16,01,362
RESTOTARATION OF WATER BODIES: PWD AND UNION TANKS (NUMBER)	111	800	5	555	88,800
RESTORATION OF WATER BODIES: OORANIS (NUMBER)	270	200	2	540	54,000
RESTORATION OF WATER BODIES: PONDS (NUMBER)	-	200	1	-	-
ARTIFICIAL RECHARGE STRUCTURE (NUMBER OF UNITS)	585	391	2.5	1,463	2,28,735
WATER COURSE - IRRIGATION CHANNELS - DESILTING (M)	10,050	3	0.0075	75	30,150
DRAINAGE LINE TREATMENT (m)	1,069	5	0.03	32	5,345
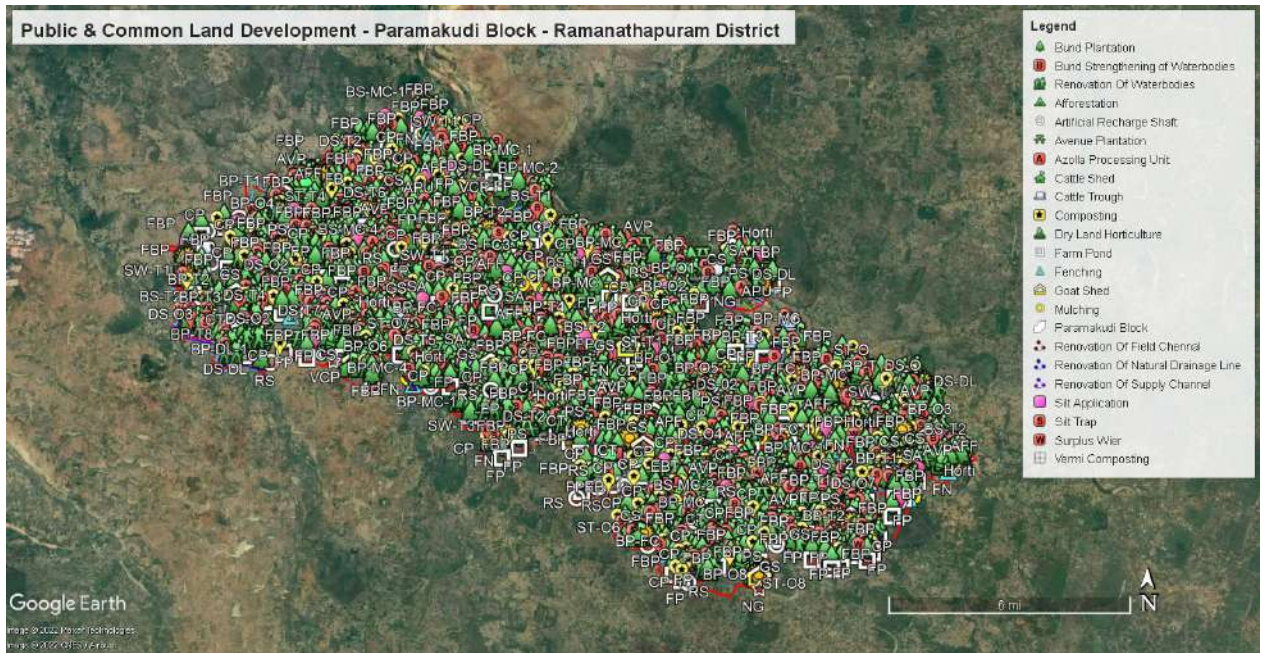
Figure 5.4. Proposed development activities in Public and Common land

5.3 DEVELOPMENT OF AGRICULTURE AND ALLIED SECTOR

Based on the assessment, the works which enhance the agriculture and allied sectors particularly for irrigation, soil and live stocks are proposed in the lands under individual ownership (Table 12 & 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)	1,689	586	1.5	2,533.50	9,89,754
MICRO IRRIGATION (ha)	210	–	1	210	–
CONSTRUCTION OF FARM PONDS – INDIVIDUAL (NUMBER OF UNITS)	468	781	2	936	3,65,508
LAND DEVELOPMENT – INDIVIDUAL (ha)	585	3,906	10	5,850	22,85,010
DRY LAND HORTICULTURE/AGRO-FORESTRY – INDIVIDUAL (ha)	844	3,321	8.5	7,174	28,02,924
AZOLLA UNITS – INDIVIDUAL (NUMBER OF UNITS)	128	23	0.15	19.20	2,944
NADEP VERMI-COMPOST (NUMBER OF UNITS)	128	27	0.18	23.04	3,456
FODDER DEVELOPMENT – COMMUNITY & INDIVIDUAL	128	2,344	1.48	189.44	3,00,032
CATTLE SHELTERS (NUMBER OF UNITS)	128	331	2.12	271.36	42,368
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	2,543	355	2.27	5,772.61	9,02,765
CATTLE TROUGH (NUMBER OF UNITS)	128	6	0.05	6.40	768
POULTRY SHED (NUMBER OF UNITS)	833	10	0.09	74.97	8,330
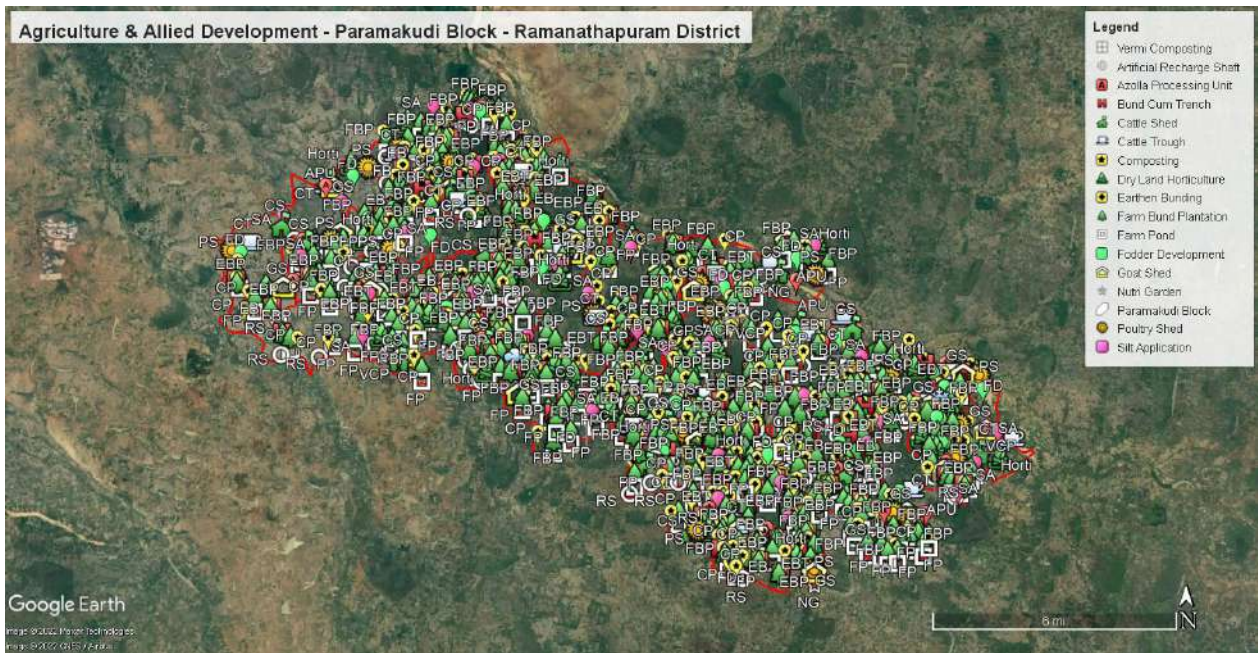
Figure 5.5. Proposed development activities in Agriculture and allied Sectors

5.4 | DEVELOPMENT OF RURAL INFRASTRUCTURE

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

DEVELOPMENT OF RURAL INFRASTRUCTURE

TABLE 13. DETAILS OF WORK PROPOSED TO DEVELOP RURAL INFRASTRUCTURE

	NO. OF WORKS	PERSON DAYS PER UNIT	UNIT COST IN INR	ESTIMATED COST IN INR (LAKHS)	ESTIMATED PERSON DAYS
SOAK PITS (COMMUNITY) (NUMBER OF UNITS)	271	20	0.13	35.23	5,420
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	2,736	16	0.1	273.60	43,776
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	78	625	4	312	48,750
TANKA – COMMUNITY LEVEL (NUMBER OF UNITS)	1	300	30	30	300
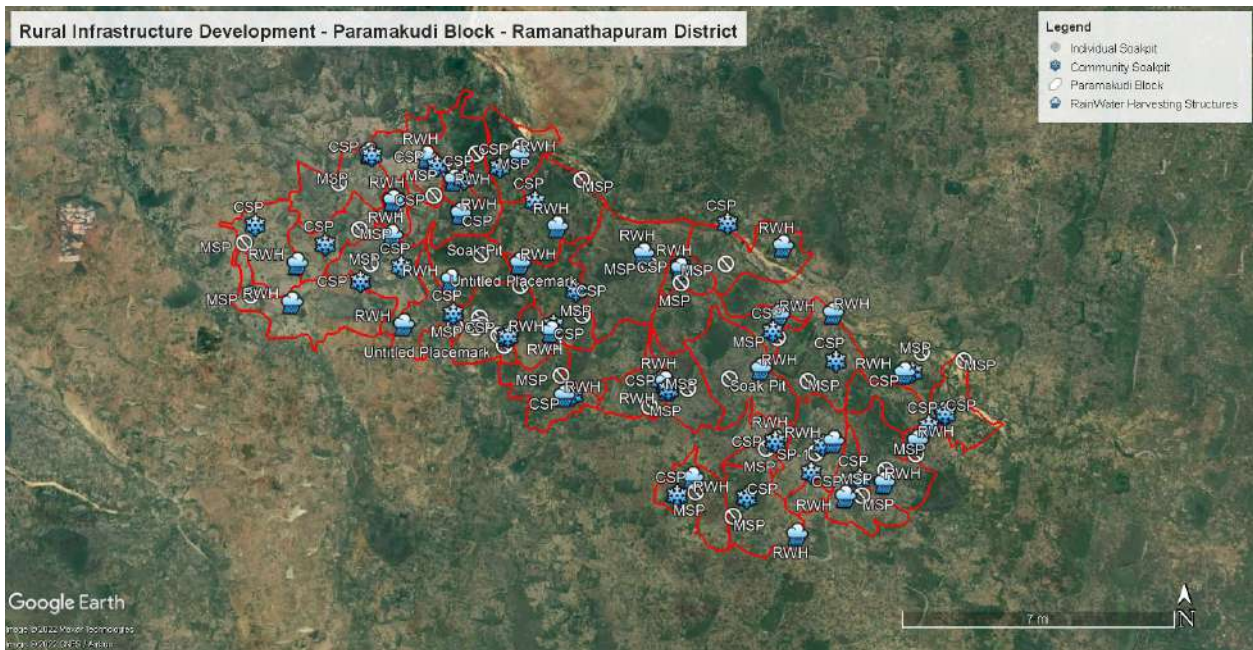
Figure 5.6. Proposed Rural Infrastructure activities

5.5 | PROPOSED CLIMATE RESILIENCE MEASURES

Climate resilient measures are proposed to enable the system to cope up with future climate risks such as droughts, heatwaves and floods (Figure 5.7). Proposed CRM includes public, agriculture and rural infrastructure activities, whereas focus is given on public and common land development measures followed by agriculture and allied development (Table 14). Measures such as farm ponds (Table 15), horticulture park (Table 16), mega forest plantation (Table 17), mini forest (Table 18), tanka (Table 19), District nursery development (Table 20), Block nursery development (Table 21), GP level nursery development (Table 22), and Native tree species (Table 23) were proposed in this Block in saturation mode. Among the activities mini forest works are more in number (100) followed by Mega forest (58).
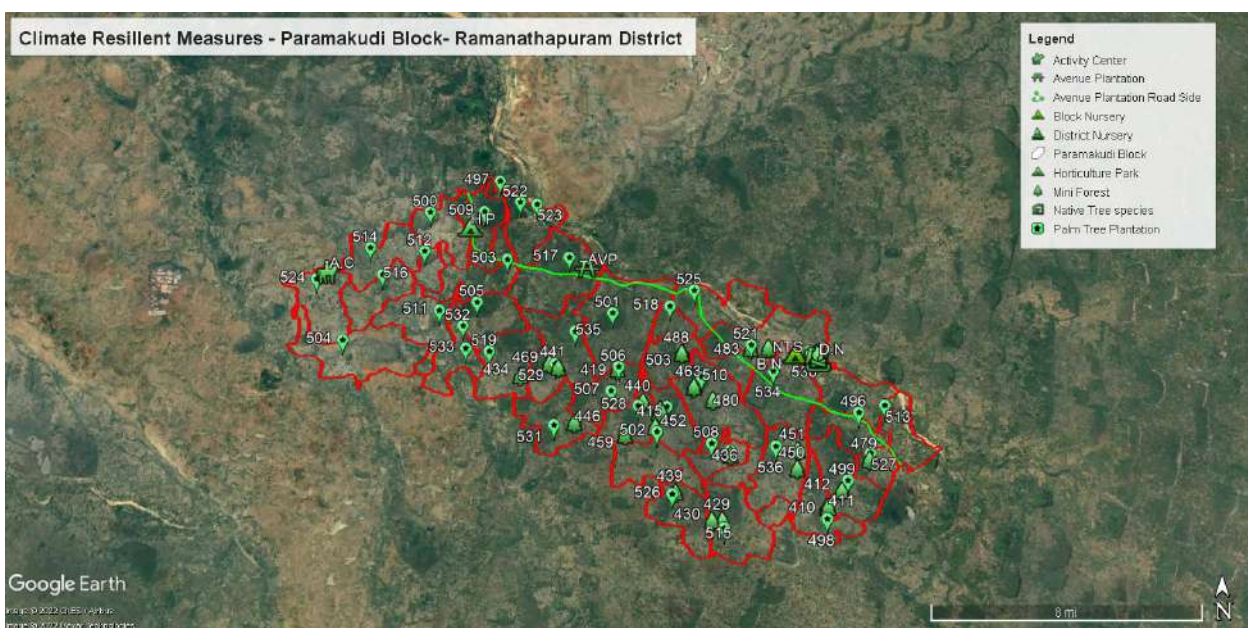
Figure 5.7. Proposed Climate Resilient measures

TABLE 14. GP WISE PROPOSED CRM

GP	Agriculture and allied activities	Public and common land	Rural infrastructure
Ariyanendal	Mega forest	GP level nursery	Tanka
	Mini forest		
Enathikottai	Mega forest	GP level nursery	
	Mini forest		
S.Andakkudi		GP level nursery	
K.Karungulam	Mega forest	GP level nursery	Tanka
	Mini forest		
Kalaiyur	Mini forest		Tanka
	Mega forest		
Kallikudi	Mega forest	GP level nursery	Tanka
Kamuthakudi	Mega forest	GP level nursery	
	Mini forest		
Kanjiyendhal	Mini forest	GP level nursery	Tanka
	Mega forest		
Keelaparthibanur	Mega forest	GP level nursery	Tanka
	Mini forest		
Keelaparuthiyur	Mini forest	GP level nursery	Tanka
	Mega forest		
Kulandapuri	Mini forest	GP level nursery	Tanka
	Mega forest		
Madanthai	Mega forest	GP level nursery	Tanka
	Mini forest		
Melaaykkudi		GP level nursery	
Melakavanur	Mega forest	GP level nursery	Tanka
	Mini forest		
Melaparthibanur	Mini forest	GP level nursery	Tanka
Melayakudi	Mega forest		Tanka
	Mini forest		
Moosukudi	Mini forest	GP level nursery	Tanka
	Mega forest		
Nelmadur	Mega forest	GP level nursery	Tanka
	Mini forest		
Nenmeni	Mini forest	GP level nursery	Tanka
P.Puthur	Mini forest	GP level nursery	Tanka
Pambur	Mega forest	GP level nursery	Tanka
	Mini forest		
Peerkankurichi	Mini forest	GP level nursery	Tanka
Perungarai	Mega forest	GP level nursery	Tanka
	Mini forest		
Pudukkkudi	Mega forest	GP level nursery	Tanka
	Mini forest		
S. Kavanur	Mini forest	GP level nursery	Tanka
	Mega forest		

S.Andakkudi	Mega forest		Tanka
	Mini forest		
Soodiyur	Mega forest	GP level nursery	Tanka
	Mini forest		
Thaduthalankottai	Horticulture park		Tanka
	Mini forest		
Thaduthalankottai	Mega forest	GP level nursery	
Thelichathanallur	Mega forest	GP level nursery	Tanka
	Mini forest		
Thenpodhuvakkudi	Mini forest	GP level nursery	Tanka
	Mega forest		
Thinaikulam	Mega forest	GP level nursery	Tanka
	Mini forest		
Tholoor	Mini forest	GP level nursery	Tanka
	Mega forest		
Urakkudi	Mega forest	GP level nursery	Tanka
	Mini forest		
Urappuli	Mega forest	native tree species	Tanka
	Mini forest	GP level nursery	
		District level nursery	
Vaalangudi	Mini forest	GP level nursery	Tanka
Valimarichan	Mega forest		Tanka
	Mini forest		
Valimarichan		GP level nursery	
Vendhoni	Mini forest	GP level nursery	Tanka
	Mega forest		
Vendoni (ITI Campus)	Mini forest	Block level nursery	
Vengaaloor	Mega forest	GP level nursery	
Venkittankurichchi	Mini forest	GP level nursery	Tanka
	Mega forest		
Vilatnur	Mini forest	GP level nursery	Tanka

TABLE 15. DETAILS OF PROPOSED FARM PONDS ACTIVITY UNDER CRM

Block Target	Community Farm Ponds	Community Farm Ponds Completed	Individual Farm Ponds	Individual Farm Ponds Completed
112	57	57	55	55

TABLE 16. DETAILS OF PROPOSED HORTICULTURE PARK ACTIVITIES UNDER CRM

GP	Area for Plantation (In ha)	No. of Plants (1 ha – 10,000 saplings)	Classification of land
Thaduthalankottai	7	10,000	Govt./ Purampokku land

TABLE 17. DETAILS OF PROPOSED MEGA FOREST ACTIVITY UNDER CRM

GP	Area for Plantation (In ha)	Total No. of Plants (1 ha - 10000 saplings)	Land type
Ariyanendal	0.5	5,000	
Enathikottai	0.5	10,000	
K.Karungulam	0.5	500	
Kalayur	0.5	500	
Kallikudi	0.5	500	
Kamuthakudi	1.5	1,500	
Kanjiyendal	1	1,000	
Keelaparthibanur	0.5	1,000	
Keelararuthiyur	1	1,000	
Kulanthapuri	0.5	2,000	
Madanthai	1.5	1,500	
Melakavanur	0.5	1,000	
Melayakudi	1.5	1,500	
Mosukudi	1	1,000	
Nelmadur	0.5	5,000	
Pambur	1.5	3,500	
Perungarai	2	3,000	Govt. Purampok-ku land
Podhuvakkudi	0.5	500	
Pudukkudi	0.5	500	
S.Andakkudi	1.5	2,000	
S.Andakudi	1	1,500	
S.Kavanur	0.5	1,000	
Soodiyur	0.5	10,000	
Thaduthalankottai	1	11,000	
Thelichathanallur	0.5	10,000	
Thenpohduvakudi	0.5	5,000	
Thinaikulam	0.5	500	
Tholur	1.5	2,000	
Urakkudi	0.5	2,000	
Urappuli	0.5	10,000	
Valimarichan	1	2,500	
Vendoni	0.5	500	
Vengaloor	1	1,000	
Venkittankurichi	1.5	1,500	
Total	**29**	**1,01,000**	

TABLE 18. DETAILS OF PROPOSED MINI FOREST ACTIVITY UNDER CRM

GP	Area for Plantation (In ha)	Total No. of Plants (1 ha - 10000 saplings)	Classification of land
Ariyanendhal	0.6	6,000	
Enathikottai	0.1	1,000	
K.Karungulam	0.1	1,000	
Kalaiyur	0.05	500	
Kamuthakudi	0.25	2,500	
kanjiyaendhal	0.1	1,000	
Keelaparthibanur	0.1	1,000	
keelapparuththiyur	0.15	1,500	
kulandhaapuri	0.05	500	
Madanthai	0.05	500	
Melakavanur	0.05	500	
Melaparthibanur	0.25	2,500	
Melayakudi	0.15	1,500	
moosukudi	0.1	1,000	
Nelmadur	0.1	1,000	
Nenmeni	0.1	1,000	
P.Puthur	0.05	500	
Pambur	0.1	1,000	
Peerkkankurichchi	0.05	500	Govt Purampokku land
Perungarai	0.1	1,000	
Pudukkudi	0.05	500	
S. Kavanur	0.05	500	
S.Andakkudi	0.3	3,000	
Soodiyur	0.15	1,500	
Thaduthalankottai	0.15	1,500	
Thelichathanallur	0.15	1,500	
Thenpoduvakkudi	0.2	2,000	
Thinaikulam	0.05	500	
tholoor	0.05	500	
Urakkudi	0.1	1,000	
Urappuli	0.5	5,000	
vaalangudi	0.05	500	
Valimarichan	0.1	1,000	
vendhoni	0.2	2,000	
vengaaloor	0.05	500	
venkittankurichchi	0.15	1,500	
vilaththur	0.05	500	
Total	**4.95**	**49,500**	

TABLE 19. DETAILS OF PROPOSED TANKAS ACTIVITY UNDER CRM

Sl. No.	GP
1	Ariyanendal
2	K.Karungulam
3	Kalayur
4	Kallikudi_1
5	Kanjiyenthal
6	Keelaparthibanur
7	Keelaparuthiyur
8	Kulandapuri
9	Madanthai
10	Melakavanur
11	Melaparthibanur
12	Melayakudi
13	Mosukkudi
14	Nelmadur
15	Nenmeni
16	P_Puthur
17	Pambur
18	Peerkankurichi
19	Perungarai
20	Pudukudi
21	S.Andakudi
22	S.Kavanur
23	Soodiyur
24	Thaduthalankottai
25	Thelichattanallur
26	Thenpoduvakudi
27	Thinaikulam
28	Tholur
29	Urakudi
30	Urappuli
31	Valangudi
32	Valimarichan
33	Vendoni
34	Venkittankurichi
35	Vilatnur

TABLE 20. DETAILS OF PROPOSED DISTRICT LEVEL NURSERY DEVELOPMENT ACTIVITY UNDER CRM

GP	Area for Plantation (In ha)	No. of Plants (1 ha – 10,000 saplings)	Classification of land
Urappuli (Thondra Devi Pattinam)	8.09	6 Lakhs	**River bed Govt Puram-pokku land**

TABLE 21. DETAILS OF PROPOSED BLOCK LEVEL NURSERY DEVELOPMENT ACTIVITY UNDER CRM

GP	Area for Plantation (In ha)	No. of Plants (1 ha – 10,000 saplings)	Classification of land
Vendoni (ITI Campus)	2.42	5 Lakhs	ITI Campus Govt Land

TABLE 22. DETAILS OF PROPOSED GP LEVEL NURSERY DEVELOPMENT ACTIVITY UNDER CRM

GP	Total No.of Plants
Ariyanendal	
Enathikottai	
S.Andakkudi	
Kalayur	
Kallikudi	
Kamuthakudi	
Kanjiyae Ndhal	
Keelaparthibanur	
Keelapparuththiyur	
K.Karungulam	
Kulandhaapuri	
Madanthai	
Melaaykkudi	
Melakavanur	
Melappaarthibanur	
Moosukudi	
Nelmadoor	1,000 saplings in each GP
Nenmeni	
Pambur	
Peerkkankurichchi	
Perungarai	
Podhuvakkudi	
P.Puthur	
Pudukkkudi	
S. Kavanur	
Soodiyur	
Thaduthalankottai	
Thelichathanallur	
Thenpodhuvakkudi	
Thinaikulam	
Tholoor	
Urakudi	
Urappuli	
Vaalangudi	

Valimarichan	1,000 saplings in each GP
Vendhoni	
Vengaaloor	
Venkittankurichchi	
Vilaththur	
Total	**39,000**

TABLE 23. DETAILS OF PROPOSED NATIVE TREE SPECIES ACTIVITY UNDER CRM

GP	Area for Plantation (In ha)	Total No. of Plants	Classification of land
Urappuli	2.02343	133	**River Bed - Govt. Poramboke Land**

நெடுங்கடலும் தன்நீர்மை குன்றும் தடிந்தெழிலி
தான்நல்கா தாகி விடின்

<div align="right">குறள் - 17</div>

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

<div align="right">Thirukkural - 17</div>

CHAPTER 6

PROJECTED OUT COMES OF PLANNING

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	4,769.4 ha (16.35 %) of the total area treated under WASCA
2	Percentage reduction of run off	2	1,267.7 ha.m i.e. 29.5 % of the total runoff harvested due to WASCA interventions
3	No. of waterbodies restored	3	384 waterbodies (tanks/pond and ooranis) restored
4	Area under afforestation	4	1,180 ha area under afforestation
5	Length of drainage line treated	5	42.749 km length of drainage line treated
6	Canal Bund Plantation	6	More than 34 thousand plants through 173 works
7	Nursery development	7	683 units

4,769.4 ha
AREA TREATED

1,267.7 ha.m
TOTAL RUNOFF HARVESTED

384
WATER BODIES RESTORED

1,180 ha
AREA AFFORESTATION

42.749 km
DRAINAGE LINE TREATED

34,000
PLANTS

683 UNITS
NURSERY DEVELOPMENT

6.2 | OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED SECTOR

OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

INDICATOR	OUTCOMES/ IMPACT
1 Assessment of sources of water for live-stock and agriculture demand No of structures established for on-farm (in-situ) water harvesting in dry lands	1 468 farm ponds established which target the harvest of 82.3 ha.m of water which has the potential to irrigate 163.8 ha area
2 Improvement in soil health	2 128 NADEP vermicomposting units for soil health improvement
3 Dry land development with agro-forestry	3 844 ha under dry land horticulture
4 Households established fodder plots	4 1,353 vulnerable households established fodder plots
5 Sheds for livestock's (cattle, goat, poultry)	5 3,504

468 FARM PONDS	**128** COMPOST UNITS	**1,353** FODDER PLOTS	**844 ha** DRY LAND HORTICULTURE	**3,504** SHEDS FOR LIVESTOCK'S

6.3 | OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

OUTCOMES OF RURAL INFRASTRUCTURE DEVELOPMENT

	INDICATOR		OUTCOMES/ IMPACT
1	No. of villages having liquid waste management systems	1	2,736 individual and 271 community level soak pits established for recycle of grey water benefiting 26,678 HHs
2	Roof rain water harvesting measures	2	78 common roof rainwater harvesting and storage structures with a target to harvest and store 0.097 ha.m of rainwater for use
3	Nutri-garden	3	26,678 HHs established nutri-gardens in homesteads and planted 1,33,390 saplings

271 COMMON &
2,736 INDIVIDUAL
SOAK PITS

7856
COMMON ROOF
RAINWATER HARVESTING

26,678
NUTRI-GARDENS

1,33,390
SAPLINGS

6.4 | OUTCOMES OF CLIMATE RESILIENCE MEASURES

OUTCOMES OF CLIMATE RESILIENCE MEASURES

INDICATOR	OUTCOMES/ IMPACT
1 Climate resilient measures are identified for climate risks	1 8 models are identified via., farm ponds, horticulture park, mini forest, mega forest, tankas, district, Block and GP level nursery development and Cascade of Tanks
	112 farm ponds
	Horticulture Park in 7.0 ha.
	Mega forest in 6.5 ha area with 65,000 plants
	Native tree species in 2.023 ha with 133 number of plants
	Mini forest in 5 ha with 50,000 plants
	Tankas in 35 GPs
	District level Nursery in 8.09 ha area
	Block level Nursery in 2.428 ha area
	39 GP Nursery development sites

112
FARM PONDS

2.023 ha
NATIVE TREE SPECIES

39
GP LEVEL NURSERY

6.5 ha
MEGA FOREST

7 ha
HORTICULTURE PARK

8.09 ha
DISTRICT LEVEL NURSERY

5 ha
MINI FOREST

35
TANKAS

2.428 ha
BLOCK LEVEL NURSERY

Estimated person days

The total estimated person days required for the above propose activities are 2,27,36,139 as specified below Figure 6.1.

Estimated Cost

The total estimated cost budgeted for the above propose activities is Rs. 69,893 Lakhs as specified below in Figure 6.2.

CWRM THEMES	Estimated person days	Estimated cost in lakhs
Development of public and common lands	1,49,34,034	46,181
Development of agriculture and allied activities	77,03,859	23,061
Development of rural infrastructure	98,246	651
TOTAL	2,27,36,139	69,893
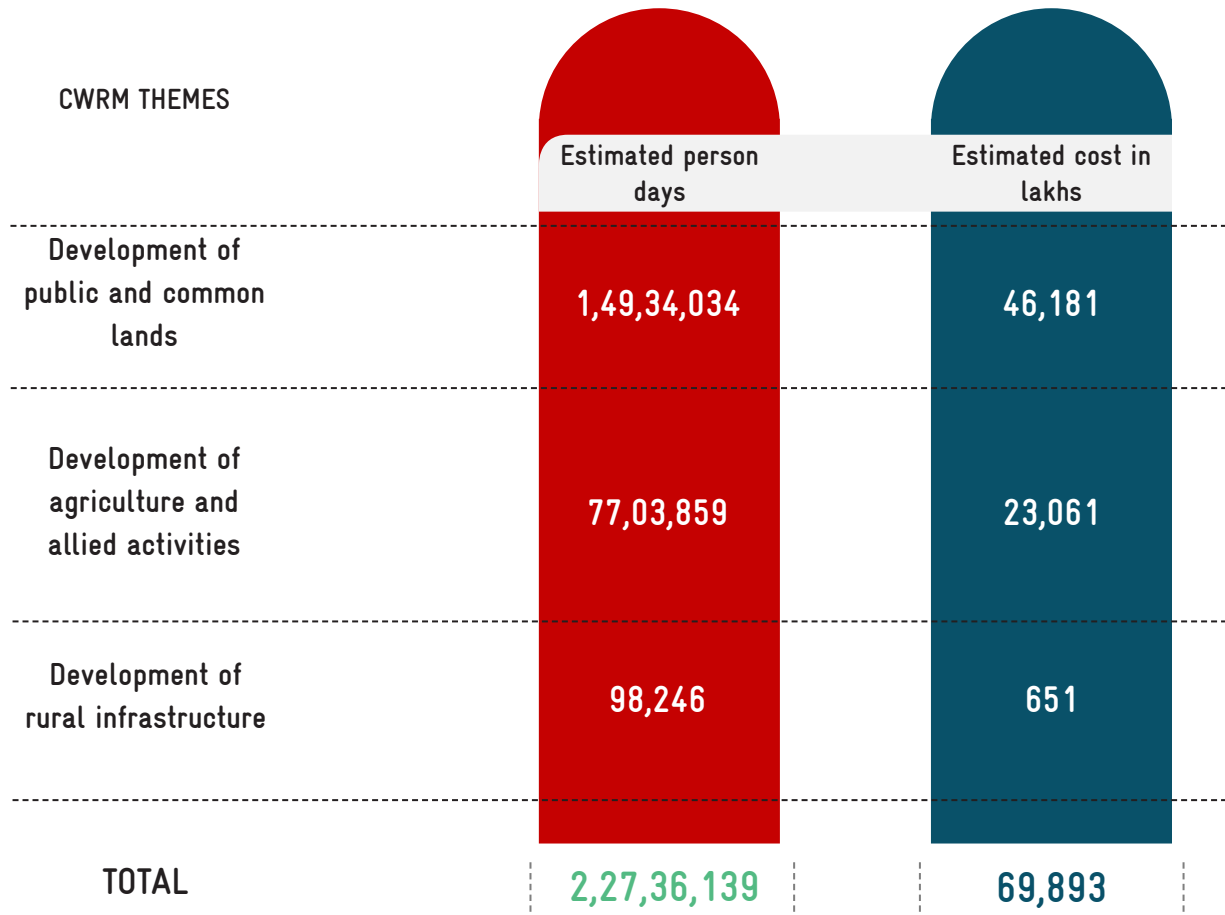
PARAMAKUDI

ESTIMATED PERSON DAYS   2,27,36,139

ESTIMATED COST IN LAKHS   69,893

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 (SDGs) have been agreed that are to be universally achieved. Under the Paris Agreement, countries are committed to reduce greenhouse gas emissions through Nationally Determined Contributions (NDC) in order to strengthen resilience to climate change. Both the SDGs and Paris Agreements demands urgent climate action and linking WASCA activities with these two agendas is indispensable.

6.5.1 NATIONALLY DETERMINED CONTRIBUTION GOALS AND WASCA TN 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 ° C above pre-industrial levels. Through the Paris Agreement, Parties also agreed to a long-term goal for adaptation – to increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production. Additionally, they agreed to work towards making finance flows consistent with a pathway towards low greenhouse gas emissions and climate- resilient development. Nationally Determined Contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement (Article 4, Paragraph 2) requires each Party to prepare, communicate and maintain successive NDCs that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

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

India's NDC

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

Activities

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

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

1 Supporting creation of an additional carbon sink of 2.5–3 billion tonnes through additional forest and tree cover

2 Enhancing investments in development programs for climate change adaptation in vulnerable sectors

3 Implementing programs to achieve the sustainable natural resource management and efficient utilization of natural resources, leading to a reduction in the "ecosystem footprint"

4 Providing qualitative information on the likely effect of climate risks on key sectors via, water, agriculture and allied sector and socio economic

6.5.2 WASCA TN SUPPORTS SDG

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

"Climate Resilience for Future Livelihoods"

1 Development of Public and Common Lands

2 Development of Agricultural and Allied Sector

3 Development for Rural Infrstructure

4 Development of CRM Measures
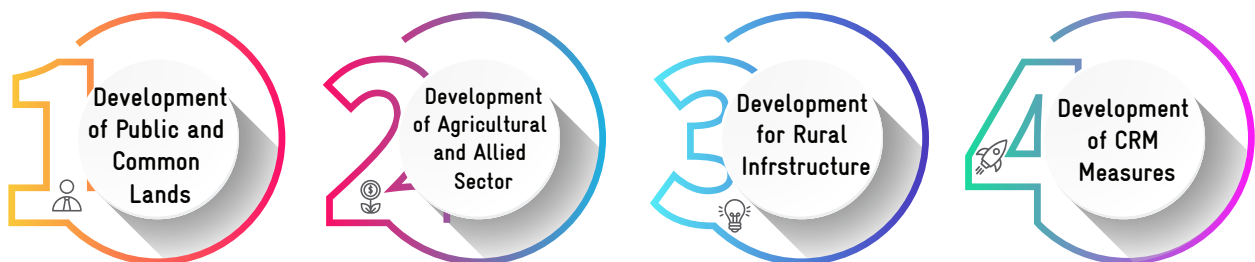
TN WASCA will achieve the above actions working closely with Mahatma Gandhi NREGA programme of Ministry of Rural Development and National Water Mission programme of (MoJS). These two ministries are the key stakeholders for WASCA. Apart from these two ministries, the works under WASCA TN are closely linked 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.

WASCA TN contribution to the Sustainable Development Goals at local level

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

SDG GOAL 6

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

6.1 Achieve universal and equitable access to safe and affordable drinking water for all

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

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

Indicators considered for district and Block level vulnerability assessment of WASCA TN which is also used in SDG India 2020-21 report (Table 24).

TABLE 24. COMMON VULNERABILITY INDICATORS USED IN WASCA TN & SDG INDIA 2020-21

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

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

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

Percentage of rural population having improved source of drinking water

Percentage of ground water withdrawal against availability

Percentage of Blocks/Mandals/Talukas over-exploited

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

Percentage of degraded land over total land area

Percentage increase in area of desertification

The indicators used for district level vulnerability assessment along with its linked SDGs are already tabulated in (Table 2). The detailed proposed water actions in CWRM which was assessed based on the vulnerability dimensions are linked with climate vulnerability index and SGDs are tabulated in Table 25 to 27.

TABLE 25. 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 for Afforestation area (m)	4,721	W3	SDG 1,2, 6,13&15
Composting (No. of units)	468	W1	SDG1& 6
Afforestation in Public/common lands (ha)	1,180	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community) (ha)	1,900	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	0	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (km)	56	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation (ha)	173	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	10,050	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (km)	158	C1,C2,C3,W3,S2	SDG 1, 6&13

Nursery Development (No. of units)	683	C1,S2,S4	SDG 1,2 &6
Restoration of waterbodies :PWD and Union Tanks (No.)	111	S2, S1	SDG 6, 1, 13
Restoration of water bodies : Ooranis (No.)	270	S2, S1	SDG 6, 1, 13
Restoration of waterbodies :Ponds (No.)	0	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	585	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	10,050	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (m)	1,069	W1,W3,W4	SDG1 & 6

TABLE 26. 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)	1,689	A1,A3,W1,W3	SDG 1,2&6
Micro Irrigation(ha)	210	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	468	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	585	W1,W5,A1,A3,S2,S4	SDG 2, 6&
Dry land Horticulture/Agro-forestry - Individual (ha)	844	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	128	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (No. of units)	128	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	128	A3, S4	SDG 1& 2, 15
Cattle shelters (No. of units)	128	S4	SDG 1& 2
Goat/sheep shelters (No. of units)	2,543	S4	SDG 1& 2
Cattle trough(No. of units)	128	W5,S4	SDG 1& 2
Poultry Shed (No. of units)	833	S2,S4	SDG 1& 2

TABLE 27. WATER ACTIONS ON RURAL WATER MANAGEMENT & IT'S LINKED SDG

Name of the work	No. of CWRM works	CVI	Linking SDG
Soak Pits (Community) (No. of units)	271	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	2,736	W3,S2	SDG 1& 6
Roof Rain Water harvesting (No. of units)	78	W3,S1,S3	SDG 1& 6

சிறப்பொடு பூசனை செல்லாது வானம்
வறக்குமேல் வானோர்க்கும் ஈண்டு

குறள் - 18

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

Thirukkural – 18

CHAPTER 7

IMPLEMENTATION OF GP PLANS

7 | IMPLEMENTATION OF GP PLANS

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

7.1 | INTEGRATION INTO NREGA SOFT

WASCA is progressing towards digitizing and integrating GP level GIS based plans, both NRM and Non-NRM into Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of Paramakudi Block is listed in Table 28 and work progress, expenditure during the past 3 financial years are shown in Figure 7.1 and 7.2. The Total No. of works, ongoing and completed GIS works are shown in Figure 7.3. The GP wise recommendations and works uploaded are given in Annexure 7.1.

TABLE 28. GIS-BASED PLAN IMPLEMENTATION- KEY PARAMETERS PERFORMANCE IN PARAMAKUDI BLOCK

39 — Target GPs

Number of GPs with GIS based plan uploaded in NREGA — 39

3,596 — Total no. of works

Estimated cost INR in lakhs — 5,134.92

1,711.64 — Avg. Expenditure for a GIS plan phase in 3 year/ GP (GIS GP) in Lakhs

Per HH Expenditure (GIS GP) Average estimated expenditure as per GIS plan — 1,423.74

5,681 — Proposed individual works

Proposed community works — 2,601

MoJS goals

Promotion of citizen & state actions for water conservation, augmentation & preservation

Comprehensive water data base in public domain and assessment of the impact of climate change on water resource

MoJS goals

Focused attention to vulnerable areas including over-exploited areas

Promotion of basin level integrated water resources management

Figure 7.1. Work progress in last three years
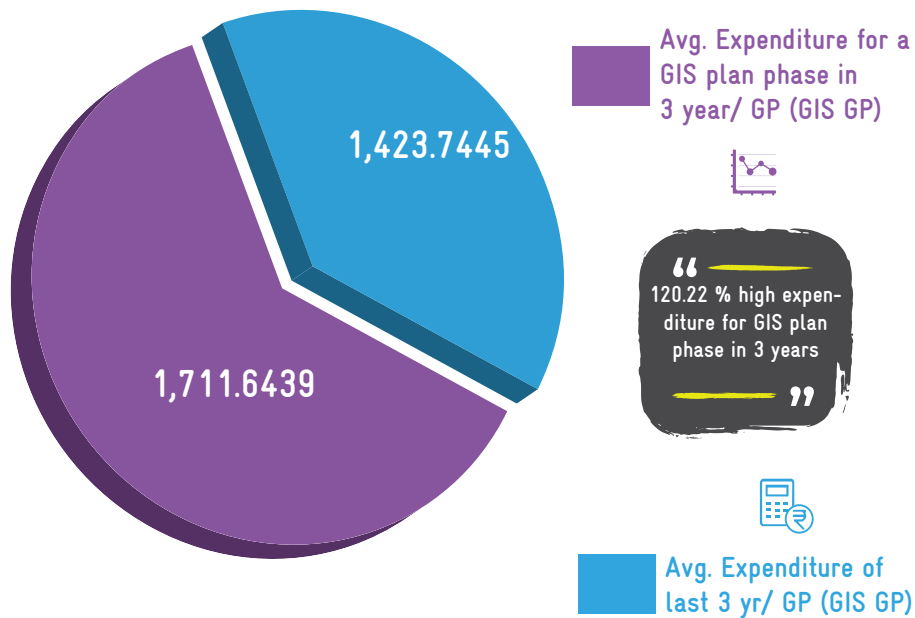
Figure 7.2. Average Expenditure for GIS plan in last 3 years

Total, Completed & Ongoing GIS works

- Total GIS Completed
- Total GIS Ongoing Works
- Total No. Of Works Taken

Gram Panchayats
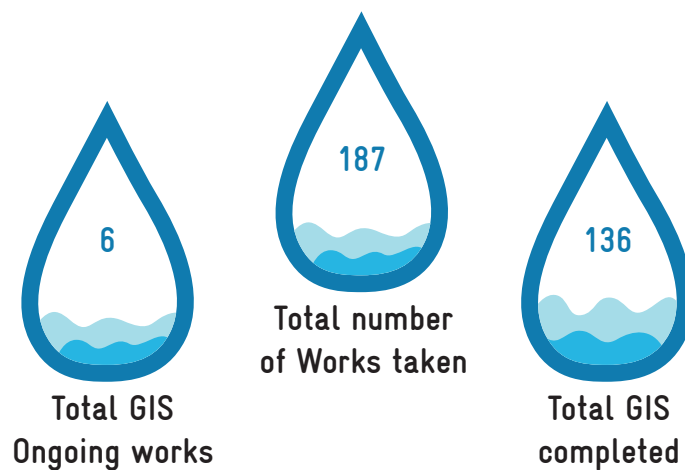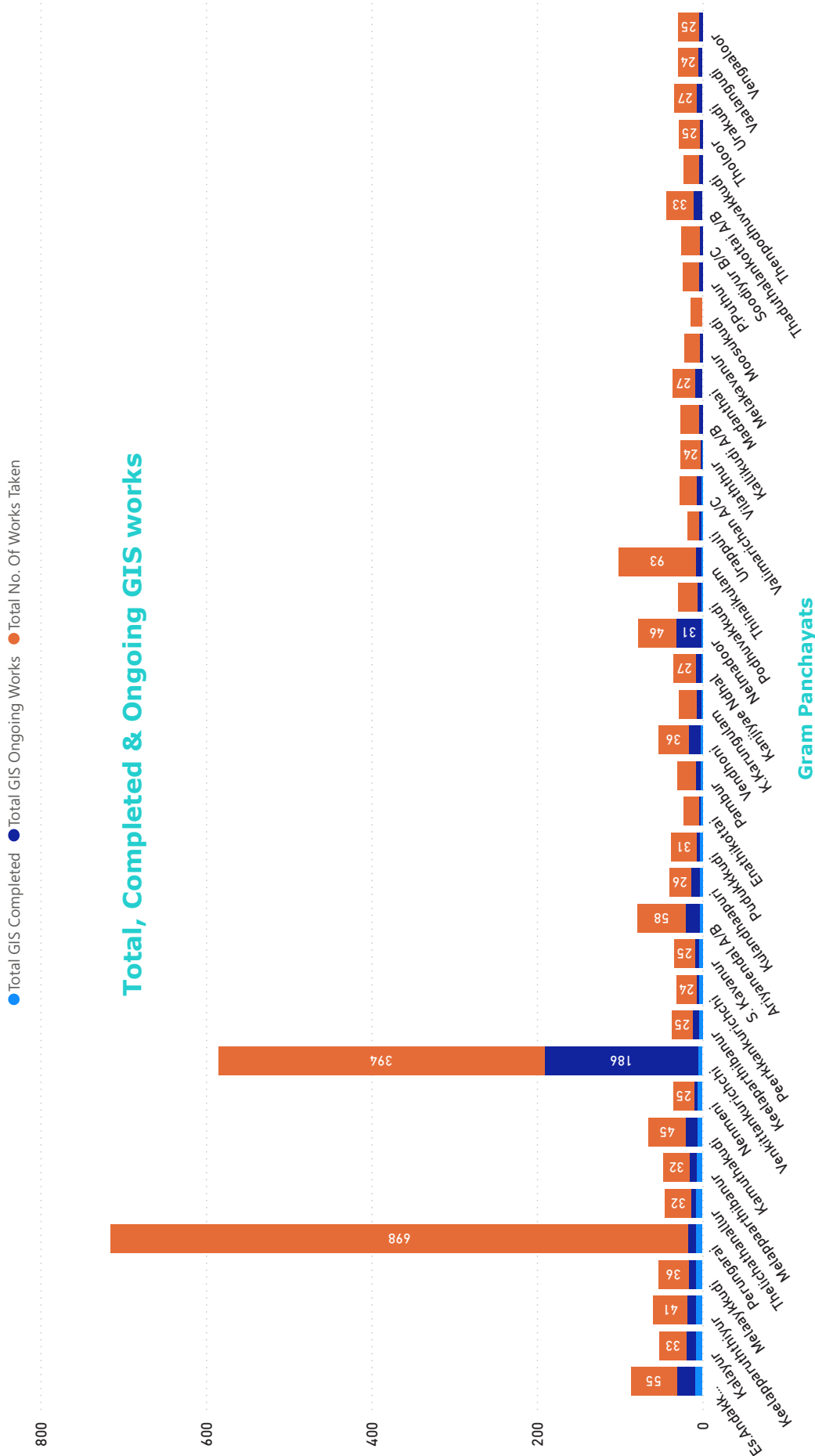
Figure 7.3. GP wise total, completed and ongoing GIS works (2021-22)

7.2 | WASCA RECOMMENDED NRM AND NON-NRM WORKS

WASCA recommended 44,308 works for a period of 3 years, out of which 3,814 are NRM works and 40,494 are non NRM works (Figure 7.4). A total of 3,381 works has been uploaded so far for the financial year 2021-22 as on 16/03/2022.

for 3 years

3,814

NRM works

44,308

Over-all works WASCA recommended

40,494

non-NRM works

Recommended NRM & Non-NRM Works

● NON-NRM ● NRM

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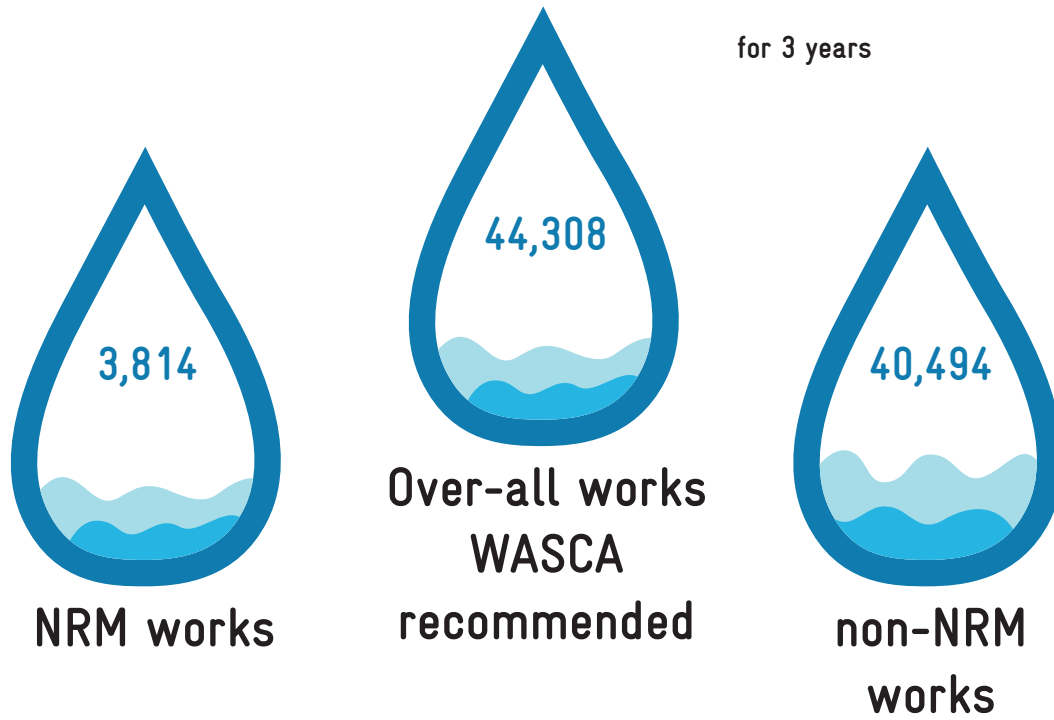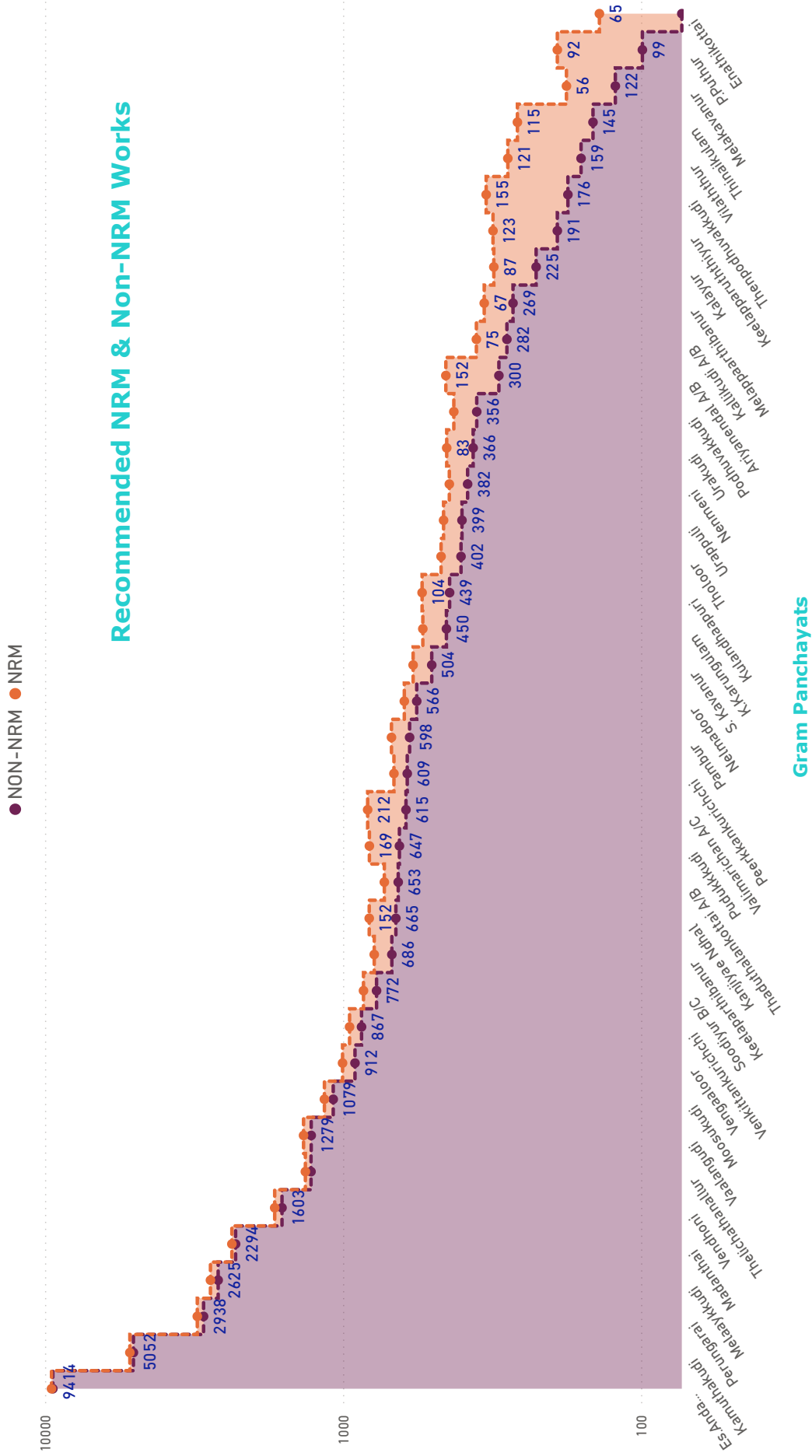
Figure 7.4. GP wise recommended NRM and Non-NRM works

7.3 | ONGOING WORKS

The ongoing works in Paramakudi Block includes Water Conservation and Water Harvesting, Works on Individuals Land (Category IV), Rural Connectivity, and Drought Proofing. A total of 182 works are ongoing in the Block, in which individual beneficiaries' works are more (42.9 %) followed by WCWH related work (26.4 %) while rural infrastructure works are less in numbers (Figure 7.5), GP and work category wise ongoing works are tabulated in Annexure 7.2.
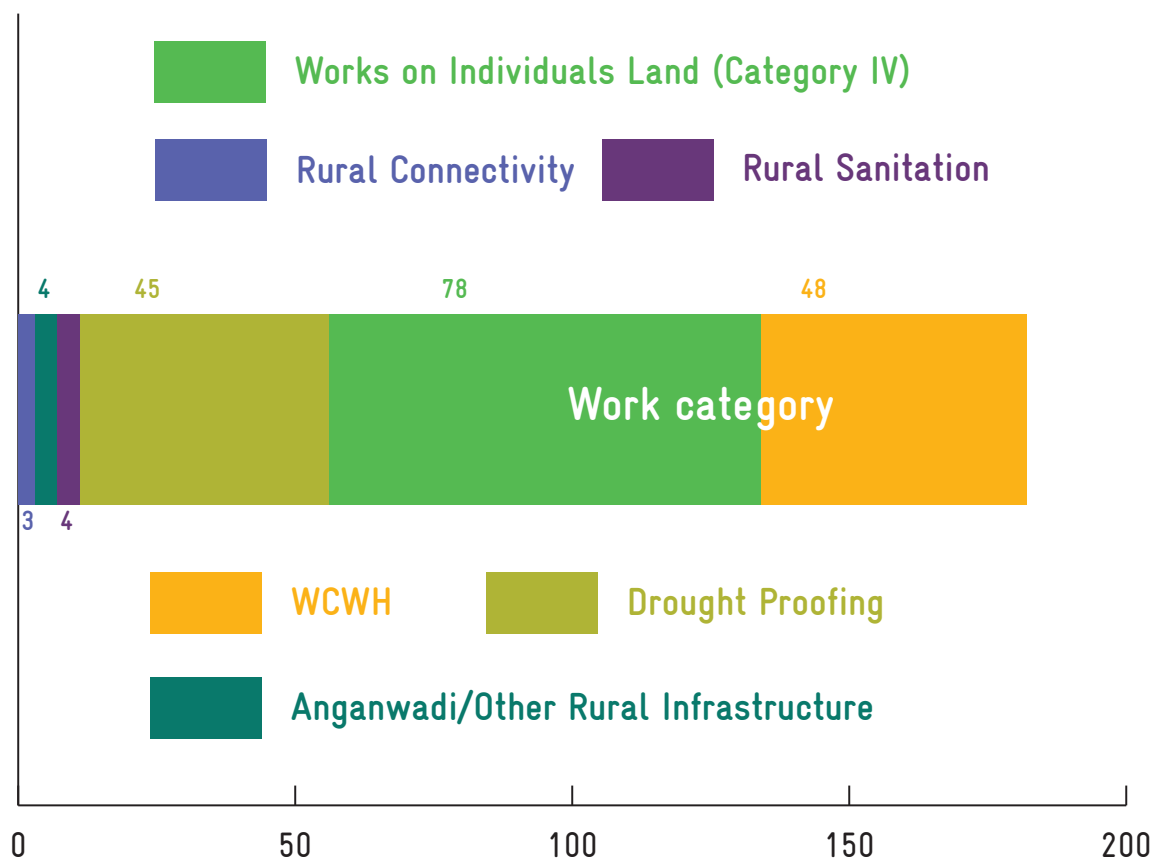
Figure 7.5. Category-wise ongoing works in Paramakudi Block

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 subsoil 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 Paramakudi Block is Rs. 1,944.48 Lakhs and nearly 52.9 % of the expenditure utilized for water conservation and Rain water harvesting (Figure 7.6).

Catch the rain

1,944.48

Expenditure in lakhs

Water Conservation and Rain water Harvesting

1,029.69

Renovation of Traditional and other Water Bodies/ Tanks

235.45

Reuse and Recharge Structures

44.59

249.23

Watershed Development

385.52

Intensive Afforestation
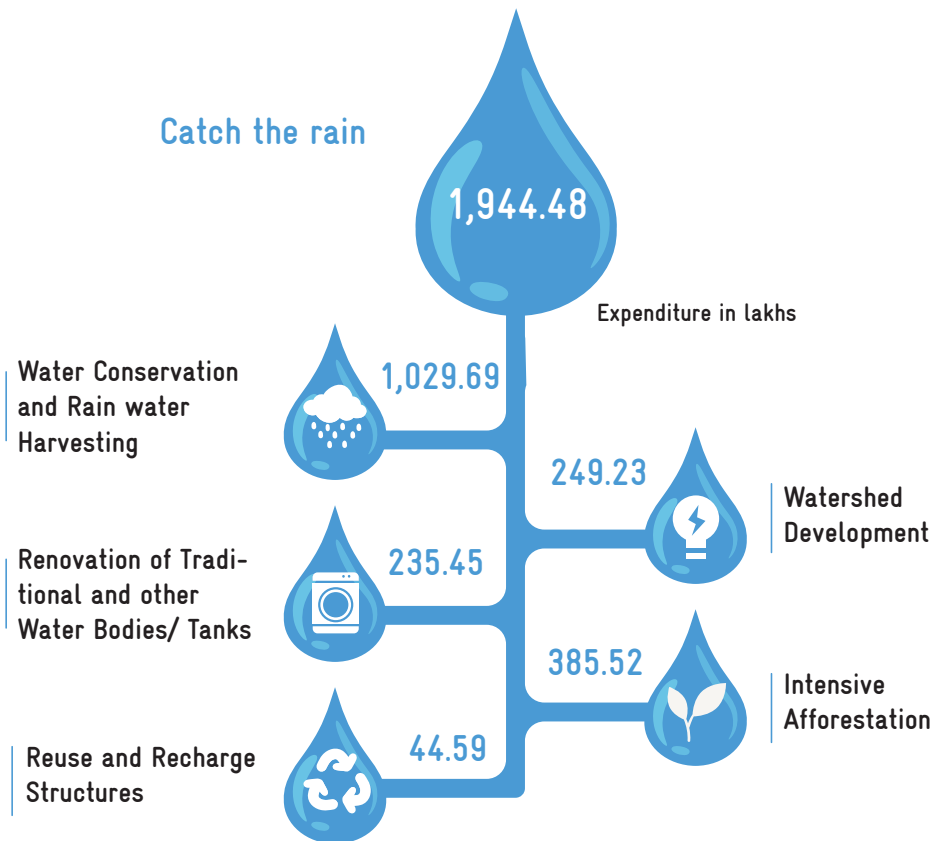
Figure 7.6. Expenditure for Catch the Rain campaign in Paramakudi Block

Improving existing planning and financial mechanism

W
A
S
C
A

Developing Climate Resilient Water Measures
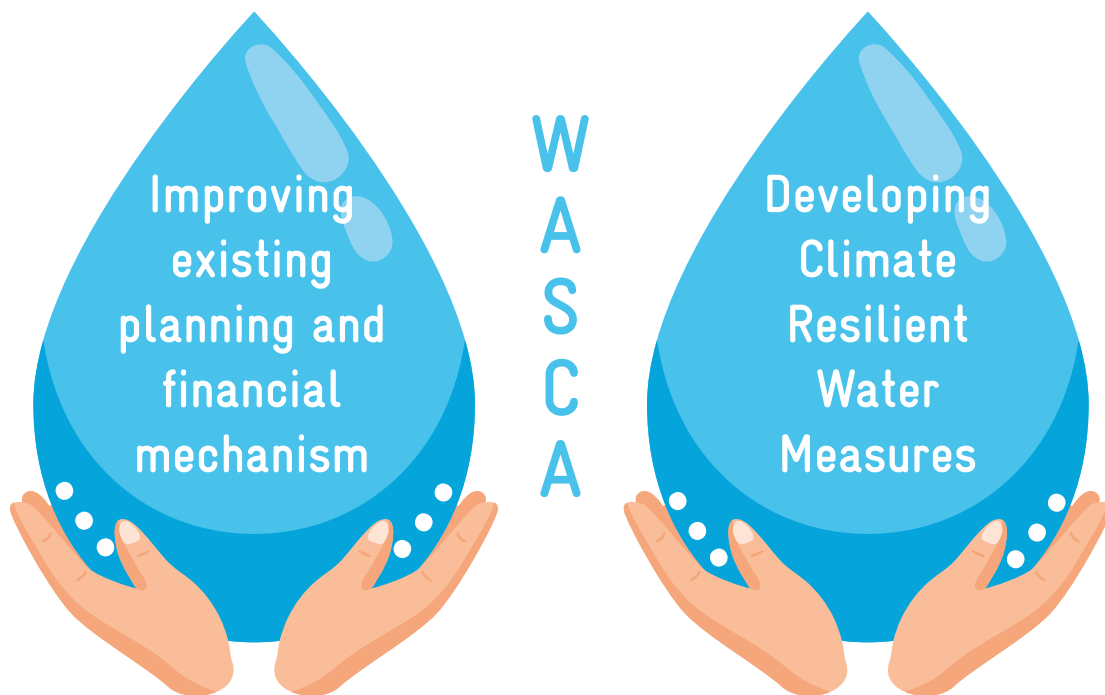
தானம் தவம்இரண்டும் தங்கா வியன்உலகம்
வானம் வழங்கா தெனின்

குறள் - 19

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

Thirukkural - 19

CHAPTER 8

CASE STUDY

8 | CASE STUDY

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

8.1 | MACRO-WATERSHEDS OF PARAMAKUDI BLOCK

Paramakudi Block comes under Gridhambal, Lower Vaigai, Paralayar and Uthirakosamangaiyar sub-basins of Vaigai and Gundar basins. Vaigai River and Paralayar River flows through the Block. Gridhambal, Lower Vaigai (3), Lower Vaigai (4) and Terkku Upper macro-watersheds cover the Block and has 63 micro-watersheds. Gridhambal watershed (4A1D3) has 26 micro-watersheds covering an area of 7982.92 ha. Lower Vaigai (3) watershed (4A2A2) has 22 micro-watersheds covering an area of 16154.64 ha. Lower Vaigai (4) watershed (4A2A1) consists of 11 micro-watersheds covering an area of 4591.49 ha. Therkku Upper watershed (4A1D6) has 4 micro-watersheds covering an area of 147.18 ha. (Table 29). Out of 39 GPs in Paramakudi Block, 11 GPs fall under Gridhambal macro-watershed, 19 GPs fall under Lower Vaigai (3) watershed, 7 GPs under Lower Vaigai (4) watershed (4A2A1) and 2 GPs under Therkku Upper watershed (4A1D6) (Table 30). The map below shows the boundary of Gridhambal, Lower Vaigai (3), Lower Vaigai (4) and Therkku Upper Watersheds boundaries on Paramakudi Block boundary. The micro-watershed based works are identified using Basin, Sub-basin, and Micro-watershed with GP administrative boundaries through Composite Water Resources Management plan approach.

TABLE 29. GENERAL DESCRIPTION OF MACRO-WATER-SHEDS COVERING PARAMAKUDI BLOCK

Macro-watershed	Area in ha	No. of micro-watersheds
Gridhambal	7982.92	26
Lower Vaigai (3)	16154.64	22
Lower Vaigai (4)	4591.49	11
Therkku Upper	147.18	4

TABLE 30. NO. OF GPs COVERED UNDER WATERSHEDS IN PARAMAKUDI BLOCK

Name of watershed	No. of GPs
Gridhambal	11
Lower Vaigai (3)	19
Lower Vaigai (4)	7
Therkku Upper	2
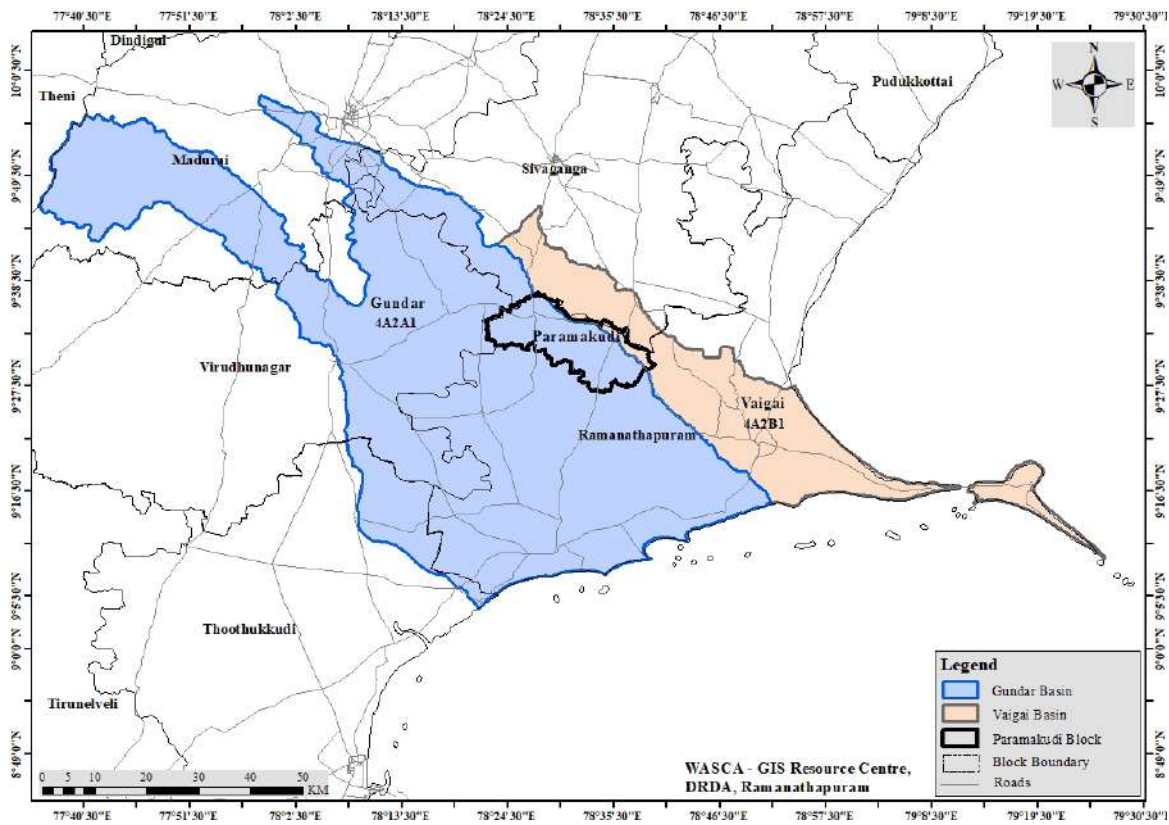
Figure 8.1. Macro-watershed map - Paramakudi Block
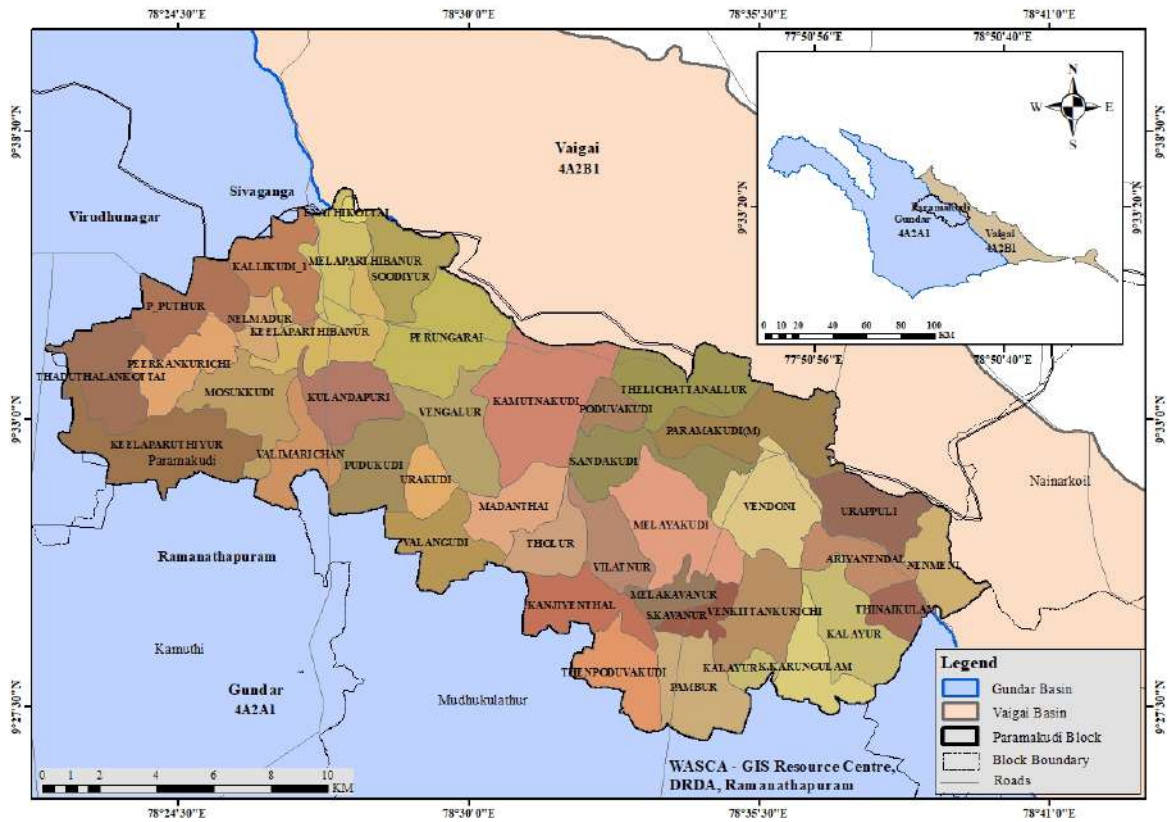
Figure 8.2. Macro-watershed with GPs

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, proposed works in all macro-watersheds of GPs in Paramakudi Block are listed in Tables 31 to 42.

TABLE 31. MICRO-WATERSHED FALLING UNDER GRIDHAMBAL MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4A1D3c12a	3.767380935	
2	4A1D3c06a	287.445861	
3	4A1D3c11c	120.5871942	
4	4A1D3c14a	4.417769776	
5	4A1D3c10b	112.524428	
6	4A1D3c11b	218.3787981	
7	4A1D3c10a	484.411548	
8	4A1D3c11a	274.5907412	
9	4A1D3c09c	549.1436038	
10	4A1D3c05c	295.3798072	
11	4A1D3c05b	898.530402	
12	4A1D3c09b	764.8869889	
13	4A1D3d04a	2.285498187	Lower
14	4A1D3d03b	475.75843	
15	4A1D3c09a	691.9589654	
16	4A1D3d03c	435.7627075	
17	4A1D3c05a	520.969674	
18	4A1D3d03a	671.686091	
19	4A1D3c08c	622.5735951	
20	4A1D3d14a	0.000299882	
21	4A1D3c04b	350.7393135	
22	4A1D3d02a	79.18144039	
23	4A1D3d13a	3.94928275	
24	4A1D3c08b	2.210670873	
25	4A1D3c04a	28.90161243	
26	4A1D3c04c	82.87447191	

TABLE 32. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER GRIDHAMBAL MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Name of the GP	Ridge Type
1	Kallikudi A/B	
2	Keelaparthibanur	
3	Keelapparuththiyur	
4	Kulandhaapuri	
5	Moosukudi	
6	Nelmadoor	Lower
7	Peerkkankurichchi	
8	P.Puthur	
9	Pudukkkudi	
10	Thaduthalankottai A/B	
11	Valimarichan A/C	

TABLE 33. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER GRIDHAMBAL MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Contour Continuous Bunds (CCB) for Afforestation area (m)		181
2	Afforestation in Public/common lands (ha)		180.75
3	Drainage Line Treatment (m)		1,928
4	Block Plantation (Community) (ha)		666.1
5	Avenue plantation (km)		51
6	Composting (No.)		103
7	Canal Bund Plantation (km)		20.9
8	Restoration of water bodies: Tanks and Ooranis (No.)		48
9	Artificial Recharge Structure (No.)		151
10	Farm Bunding with Boundary Trenches - Individual (ha)		489.02
11	Construction of Farm Ponds - Individual (No.)		103
12	Land development - Individual (ha)		130.59
13	Azolla units - Individual (No.)	Lower	36
14	NADEP Vermi compost (No.)		36
15	Fodder development - Community & Individual (No.)		36
16	Cattle Shelters (No.)		36
17	Goat Sheep Shelters (No.)		1,049
18	Cattle Trough (No.)		36
19	Poultry Shed (No.)		283
20	Soak Pits (Community) (No.)		59
21	Soak Pits (Individual) (No.)		604
22	Roof Rain Water Harvesting (No.)		22
23	Nutri Garden (No.)		11
24	Silt application (No.)		57
25	Mini Forest (No.)		19

TABLE 34. MICRO-WATERSHED FALLING UNDER LOWER VAIGAI (3) MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4A2A2b02b	41.72807186	
2	4A2A2b04a	761.7255338	
3	4A2A2b03b	1055.810243	
4	4A2A2b03a	381.7389899	
5	4A2A2a05c	431.2842754	
6	4A2A2c02a	409.818696	
7	4A2A2c01b	263.710432	Lower
8	4A2A2a06c	707.9561719	
9	4A2A2a02b	1086.928928	
10	4A2A2a01b	775.0777034	
11	4A2A2a01a	1510.0777	
12	4A2A2a05b	559.9174865	
13	4A2A2a06b	1443.705973	

14	4A2A2a05a	735.2736099	
15	4A2A2a04c	381.083208	
16	4A2A2a02a	1187.532579	
17	4A2A2a04b	728.3597953	
18	4A2A2a06a	762.9301882	Lower
19	4A2A2a03c	612.1282825	
20	4A2A2a03a	1208.306557	
21	4A2A2a04a	769.5149293	
22	4A2A2a03b	340.0285626	

TABLE 35. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER LOWER VAIGAI (3) MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Name of the GP	Ridge Type
1	Enathikottai	
2	S.Andakkudi	
3	Kamuthakudi	
4	Kanjiyae Ndhal	
5	Madanthai	
6	Melaaykkudi	
7	Melakavanur	
8	Melappaarthibanur	
9	Perungarai	
10	Podhuvakkudi	Lower
11	S. Kavanur	
12	Soodiyur B/C	
13	Thelichathanallur	
14	Tholoor	
15	Urakudi	
16	Vaalangudi	
17	Vendhoni	
18	Vengaaloor	
19	Vilaththur	

TABLE 36. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER LOWER VAIGAI (3) MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Contour Continuous Bunds (CCB) for Afforestation area (m)		491
2	Afforestation in Public/common lands (ha)		490.58
3	Drainage Line Treatment (km)		0
4	Block Plantation (Community) (ha)		903.12
5	Avenue plantation (km)	Lower	77.91
6	Composting (No.)		211
7	Canal Bund Plantation (km)		73.96
9	Restoration of water bodies: Tanks and Ooranis (No.)		138
10	Artificial Recharge Structure (No.)		303

11	Farm Bunding with Boundary Trenches - Individual (ha)		728.54
12	Construction of Farm Ponds - Individual (No.)		211
13	Land development - Individual (ha)		261.62
14	Dryland Horticulture/Agroforestry - Individual (ha)		364
15	Azolla units - Individual (No.)		66
16	NADEP Vermi compost (No.)		66
17	Fodder development - Community & Individual (No.)		66
18	Cattle Shelters (No.)		66
19	Goat Sheep Shelters (No.)	Lower	1,171
20	Cattle Trough (No.)		66
21	Soak Pits (Community) (No.)		150
22	Soak Pits (Individual) (No.)		1,496
23	Roof Rain Water Harvesting (No.)		38
24	Poultry Shed (No.)		456
25	Nutri Garden (No.)		19
26	Silt application (No.)		105
27	Mini Forest (No.)		43

TABLE 37. MICRO-WATERSHED FALLING UNDER LOWER VAIGAI (4) MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4A2A1a11a	66.31608802	
2	4A2A1a10b	3.546161073	
3	4A2A1a10a	11.47594934	
4	4A2A1d13a	2541.712915	
5	4A2A1d05a	1101.757918	
6	4A2A1a09a	26.63352569	Lower
7	4A2A1d04b	56.05001851	
8	4A2A1d05b	212.217949	
9	4A2A1d12b	106.329607	
10	4A2A1d05c	293.7086711	
11	4A2A1d05d	171.739635	

TABLE 38. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER LOWER VAIGAI (4) MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Name of the GP	Ridge Type
1	Ariyanendal A/B	
2	Kalayur	
3	K.Karungulam	
4	Nenmeni	Lower
5	Thinaikulam	
6	Urappuli	
7	Venkittankurichchi	

TABLE 39. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER LOWER VAIGAI (4) MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Contour Continuous Bunds (CCB) for Afforestation area (m)		507
2	Afforestation in Public/common lands (ha)		506.67
3	Drainage Line Treatment (m)		78
4	Block Plantation (Community) (ha)		97.19
5	Avenue plantation (km)		20.59
6	Composting (No.)		314.04
7	Canal Bund Plantation (km)		23.5
8	Restoration of water bodies: Tanks and Ooranis (No.)		49
9	Artificial Recharge Structure (No.)		48
10	Farm Bunding with Boundary Trenches - Individual (ha)		314.04
11	Construction of Farm Ponds - Individual (No.)		102
12	Land development - Individual (ha)		127.56
13	Dryland Horticulture/Agroforestry - Individual (ha)	Lower	157
14	Azolla units - Individual (No.)		24
15	NADEP Vermi compost (No.)		24
16	Fodder development - Community & Individual (No.)		24
17	Cattle Shelters		24
18	Goat Sheep Shelters (No.)		287
19	Cattle Trough (No.)		24
20	Soak Pits (Community) (No.)		56
21	Soak Pits (Individual) (No.)		569
22	Roof Rain Water Harvesting (No.)		14
23	Poultry Shed (No.)		71
24	Nutri Garden (No.)		7
25	Silt application (No.)		51
26	Mini Forest (No.)		32

TABLE 40. MICRO-WATERSHED FALLING UNDER THERKKU UPPER MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4A1D6c10b	0.27205864	
2	4A1D6c09c	64.212131	Lower
3	4A1D6c08b	56.23752602	
4	4A1D6c07e	26.45689364	

TABLE 41. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER THERKKU UPPER MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Name of the GP	Ridge Type
1	Pambur	Lower
2	Thenpodhuvakkudi	

TABLE 42. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER THERKKU UPPER MACRO-WATERSHED IN PARAMAKUDI BLOCK

Sl.No	Proposed Work	Ridge Type	Extent
1	Contour Continuous Bunds (CCB) for Afforestation area (m)		23
2	Afforestation in Public/common lands (ha)		2.33
4	Block Plantation (Community) (ha)		233.21
5	Avenue plantation (km)		7.81
6	Composting (No.)		52
7	Canal Bund Plantation (km)		7.67
9	Restoration of water bodies: Tanks and Ooranis (No.)		21
10	Artificial Recharge Structure (No.)		23
11	Farm Bunding with Boundary Trenches - Individual (ha)		157.89
12	Construction of Farm Ponds - Individual (No.)		52
13	Land development - Individual (ha)		65.68
14	Dryland Horticulture/Agroforestry - Individual (ha)		78
15	Azolla units - Individual (No.)	Lower	2
16	NADEP Vermi compost (No.)		2
17	Fodder development - Community & Individual (No.)		2
18	Cattle Shelters (No.)		2
19	Goat Sheep Shelters (No.)		36
20	Cattle Trough (No.)		2
21	Soak Pits (Community) (No.)		6
22	Soak Pits (Individual) (No.)		67
23	Roof Rain Water Harvesting (No.)		4
24	Poultry Shed (No.)		23
25	Nutri Garden (No.)		2
26	Silt application (No.)		26
27	Mini Forest (No.)		6

8.2 | MODEL MICRO-WATERSHED- KAMUTHAKUDI
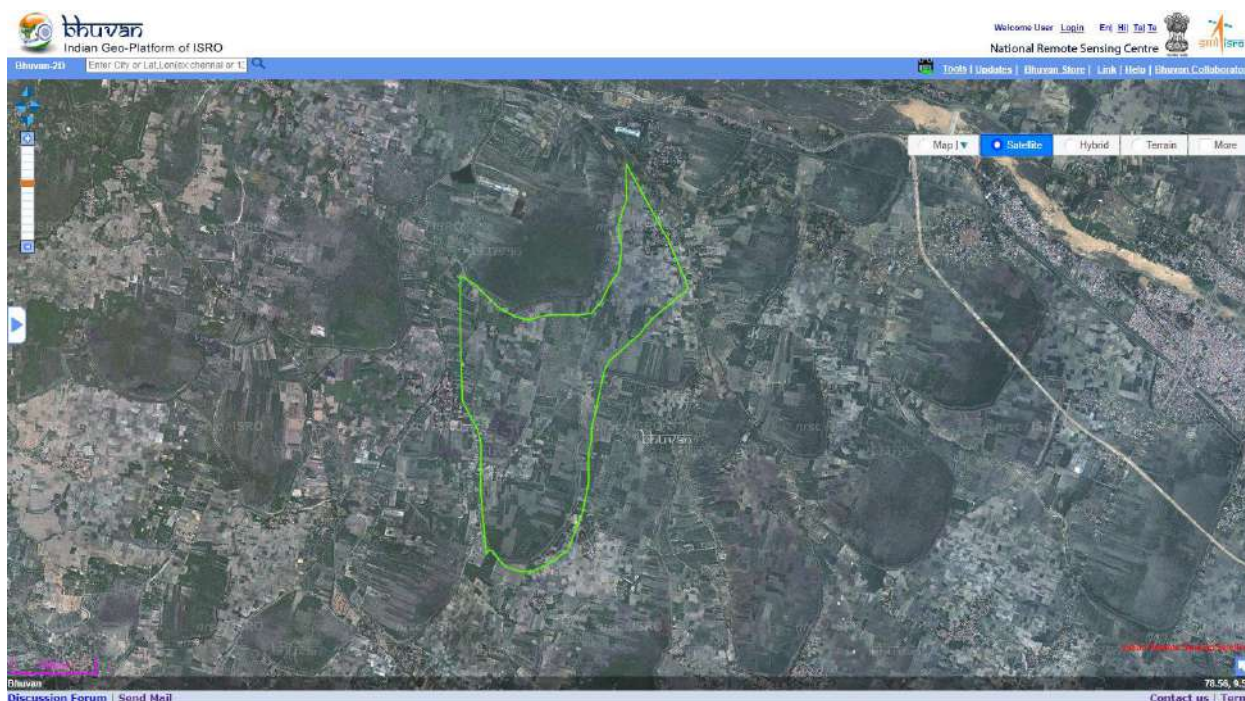
Figure 8.3. Satellite image of Kamuthakudi micro-watershed

The micro-watershed case study addresses the issues of water conservation and climate change through an 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.

KAMUTHAKUDI MICRO-WATERSHED

Kamuthakudi micro-watershed falls under Kamuthakudi and Madanthai GPs, in Paramakudi Block, Ramanathapuram District. The satellite image of the micro-watershed is shown in Figure 8.3. This micro-watershed is the part of Lower Vaigai (4) macro-watershed in Lower Vaigai sub-basin. The general information, geology, hydrogeology, natural drainage line, catchment area, ground water status, water budget of Kamuthakudi micro-watershed is given below in separate sections followed by proposed works, ridge wise proposed treatment area, estimated cost and required person days and key outcomes. (Table 43 to 55 & Figure 8.4). The key CWRM parameters for the GPs falling in this micro-watershed is given in Annexure 8.

TABLE 43. GENERAL INFORMATION OF THE MICRO-WATERSHED

Description	Name/ Number/ Quantity/ Status
Name of the micro-watershed	Kamuthakudi micro-watershed
micro-watershed Number	4A2A2a05b
Name of the Basin	Vaigai Basin
Name of the sub basin	Lower Vaigai Sub Basin
Name of the Macro-watershed	Lower Vaigai (4)
Number of GPs covered under the micro-watershed	2
Name of the GPs	1.Kamuthakudi
	2. Madanthai
Latitude of micro-watershed (From To)	9°31'18.556"N to 9°34'0.477"N
Longitude of micro-watershed (From To)	78°30'25.661"E to 78°31'59.39"E
Total area of the micro-watershed in ha	559.92 ha
% of micro-watershed area in Kamuthakudi GP	77%
% of micro-watershed area in Madanthai GP	23%
Area of micro-watershed falling in Kamuthakudi GP (ha)	433.92 ha
Area of micro-watershed falling in Madanthai GP (ha)	126 ha
Total Population of Kamuthakudi GP	3,474
Total Population of Madanthai GP	573
Annual Average Rainfall (mm)	821 mm
Annual maximum Temperature (°C)	32.6 °C
Annual Minimum Temperature (°C)	23.8 °C
Evapo-Transporation Losses of Kamuthakudi GP (ha.m)	13.88 ha.m
Evapo-Transporation Losses of Madanthai GP (ha.m)	8.69 ha.m
Volumetric soil moisture availability (%)	23%
Climate Risk	Drought
CVI Index Value for Kamuthakudi (Based on WASCA Climate study)	0.507 (High Agriculture Vulnerability)
CVI Index Value for Madanthai (Based on WASCA Climate study)	0.477 (High Agriculture Vulnerability)
Agro-Climatic Zone	Southern Zone (TN 05)
Agro Ecological Sub-Region (ICAR)	Hot dry semi-arid eco sub region (18.1)
Status of Ground water in Kamuthakudi GP	Safe
Status of Ground water in Madanthai GP	Safe

TABLE 44. HYDROGEOLOGY & OTHER CHARACTERISTICS IN MICRO-WATERSHED

Type of Geomorphology	Coastal Origin - Older Deltaic Plain
Geomorphology occurrence in %	58
Principle Aquifer	Alluvium
Salt Affected Area passing through the micro-watershed	None
Type of lineaments passing through the micro-watershed	None
Barren & waste lands	None

TABLE 45. EXISTING WATER HARVESTING STRUCTURES IN KAMUTHAKUDI & MADANTHAI GPs

Sl.No.	Name of Structure	Kamuthakudi GP	Madanthai GP
		Existing Structures	Existing Structures
		No.	No.
1	Oorani	10	8
2	Tank	5	4
	Total	**15**	**12**

TABLE 46. CATCHMENT AREA OF MICRO-WATERSHED (STRANGE METHODOLOGY - CGWB)

Catchment Area in ha	Kamuthakudi GP	Madanthai GP
Good catchment area	378.04	88.1
Average catchment area	1.69	85.50
Bad catchment area	1,155.29	443.01

TABLE 47. GROUND WATER STATUS OF MICRO-WATERSHED

Name of the Firka (Assessment Unit) falling under micro-watershed	Kamuthakudi
Recharge from other sources during monsoon season (ha.m)	2433.72
Recharge from other sources during non-monsoon season (ha.m)	569.13

TABLE 48. SALINITY AND SEA WATER INTRUSION IN THE MICRO-WATERSHED

Pre monsoon Water Quality Index	Poor Quality
Post monsoon Water Quality Index	Medium Quality
Pre monsoon Sea Water Mixing Index	< = 1
Post monsoon Sea Water Mixing Index	< = 1

TABLE 49. WATER BUDGET OF GPs FALLING IN MICRO-WATERSHED-KAMUTHAKUDI & MADANTHAI GPs

Water Budget in ha.m	Kamuthakudi GP	Madanthai GP
Water for domestic	9.51	1.57
Water for agriculture	375.9	223.7
Water for livestock	2.55	0.48
Village wise water required	388.0	225.8
Available run-off from rain water (derived from Strange method)	215.4	84.4
Harvested Runoff from Water Harvesting Activities	154.3	192.5
Potential Harvesting from proposed Interventions	43.1	68.0
Total Water harvested	197.4	260.5
Water demand and Supply Difference	-190.6	-34.7
Water demand supply gap status	Deficient	Deficient
Per capita Water Availability in cum	568.22	1,326.3
International Standard per capita water Availability (cum)	1,700	1,700
Water Availability Gap (cum)	-1,131.78	-373.7
Water security status	Water Stress	Water Stress

TABLE 50. GP WISE PROPOSED MICRO-WATERSHED WORKS – KAMUTHAKUDI & MADANTHAI GPs

Proposed Work	Kamuthakudi GP	Madanthai GP
Proposed works in Upper Ridge	0	0
Proposed works in Middle Ridge	0	0
Proposed works in Lower Ridge	62	40
Total works	62	40

TABLE 51. RIDGE WISE TREATMENT AREA ESTIMATED COST AND PERSON DAYS REQUIRED- KAMUTHAKUDI & MADANTHAI GPs

Ridge Type	Kamuthakudi GP	Madanthai GP
Lower Ridge		
Estimated cost for Lower Ridge area (INR in Lakhs)	109.51	107.36
Total area in ha of Lower Ridge	433.92	126
Estimated Person days generated for Treatment of Lower Ridge	35,978	38,706
Treatment cost of Lower Ridge (Lakhs/ha)	0.252	0.852

Kamuthakudi GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	NA	NA
Lower Ridge	0.252 lakh/ha	35,978
	0.252 lakh/ha	35,978

Madanthai GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	NA	NA
Lower Ridge	0.852 lakh/ha	38,706
	0.852 lakh/ha	38,706

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

Description	Number
Total No. of works in micro-watershed area (Arable, Non arable & DLT)	74
Total No. of works in micro-watershed including livelihood Activities	12
Total No. of works in micro-watershed including Rural Greywater Management Activities	7

TABLE 53. KEY OUTCOMES OF INTERVENTION

1 No. of Mini and Mega Forest in Community Lands

5.86 Total Area Under Community Plantation (ha)

20.35 Area of Farm lands belonging to small and marginal treated (ha)

2,399 Total no. of plantations undertaken (Community)

8 No. of Waterbodies restored (Ooranis for Drinking Water)

74,684 Estimated number of Person days generated for Treatment of micro- watershed area 559.92 ha is

133.38 Estimated Per ha Person days Provided with Wage Employment under MGNREGS

0.364 Estimated Per ha Wage Provided for Treatment of micro- watershed Under MGNREGS (in INR lakh)

9 No. of farm ponds constructed

Expenditure for FY 2020-21 (in INR lakh)

Kamuthakudi GP   111.59 lakh

Madanthai GP   85.50 lakh

TABLE 54. ESTIMATES OF MICRO-WATERSHED IN KAMUTHAKUDI 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						
Mini Forest (No.)	Lower	Completed	500	1	5.75	3,950
Restoration of Traditional water bodies: (Oorani & Tank) (No.)		Not commenced	5	5	41	14,935
Oorani bund Plantation (No.)			632	5	2.91	1,048
Avenue plantation (km.)			1.71	1	1.57	560
Block Plantation (ha)			3.96	1	11.39	4,154
Dry Land Horticulture (No.)			1	1	5	1,794
Roof Rain Water Harvesting in GP Building (No.)			2	2	0.6	30
Sub total				**16**	**68.22**	**26,471**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Recharge Shaft for bore well farmers for Salinity Reduction (No.)	Lower	Not commenced	6	6	1.62	72
Farm Bunding with Boundary Trenches - Individual (ha &No.)			12.5	5		
			5	5	18.75	2,930
Construction of Farm Ponds - Individual (No.)			6	6	10.8	3,720
Composting (No.)			7	7	0.63	217
NADEP Vermi compost (No.)			1	1	0.12	5
Fodder development - Individual (No.)			1	1	1.48	2,344
Sub total				**31**	**33.4**	**9,288**
Total				**47**	**101.62**	**35,759**
Livelihood enhancement activities for Individual Farmers (Coastal Area)						
Azolla Production Unit (No.)	Lower	Not commenced	1	1	0.15	14
Cattle Shelters (No.)			2	2	2.56	66
Poultry Shed (No.)			1	1	2	22
Goat Sheep Shelters (No.)			2	2	2.3	60
Cattle Trough (No.)			2	2	0.4	22
Sub total				**8**	**7.41**	**184**

Rural Greywater and Rooftop Rainwater Management						
Soak Pits (Individual) (No.)	Lower	Not commenced		3	3	0.324	24
Soak Pits (Community) (No.)				1	1	0.13	8
Nutri Garden (No.)				3	3	0.03	3
Sub total					**7**	**0.484**	**35**
Total					**62**	**109.51**	**35,978**

TOTAL ESTIMATES OF MICRO-WATERSHED IN KAMUTHAKUDI GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Kamuthakudi GP	62	109.51	35,978

TABLE 55. ESTIMATES OF MICRO-WATERSHED IN MADANTHAI 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						
Restoration of Traditional water bodies: (Oorani & Tank) (No.)	Lower	Not commenced	3(2+1)	3	24	8,741
Oorani bund Plantation (No.)			767	3	3.53	1,276
Avenue plantation (km)			1.5	1	1.38	489
Afforestation (ha)			2.66	1	7.65	2,785
Dry Land Horticulture (No.)			1	1	5	1,794
Sub total				**9**	**41.56**	**15,085**
Works in Individual Farmer lands (Agriculture and Allied Activities)						
Recharge Shaft for bore well farmers for Salinity Reduction (No.)	Lower	Not commenced	3	3	0.81	36
Farm Bunding with Boundary Trenches - Individual (ha & No.)			7.5	3		
			3	3	11.12	4,071
Construction of Farm Ponds - Individual (No.)			3	3	5.4	1,860
Composting (No.)			4	4	0.36	124
NADEP Vermi compost (No.)			1	1	0.12	5
Fodder development - Individual (No.)			1	1	1.48	2,344
Sub total				**18**	**19.29**	**8,440**
Total				**27**	**60.85**	**23,525**

Livelihood enhancement activities for Individual Farmers (Coastal Area)						
Cattle Shelters (No.)	Lower	Not commenced	1	1	1.6	33
Poultry Shed (No.)			1	1	2	22
Goat Sheep Shelters (No.)			1	1	1.15	30
Cattle Trough (No.)			1	1	0.2	11
Sub total				**4**	**4.95**	**96**
Total				**40**	**107.36**	**38,706**

TOTAL ESTIMATES OF MICRO-WATERSHED IN MADANTHAI GP

	No. of works as per KML	Estimate cost in INR (Lakhs)	Person days
Madanthai GP	40	107.36	38,706
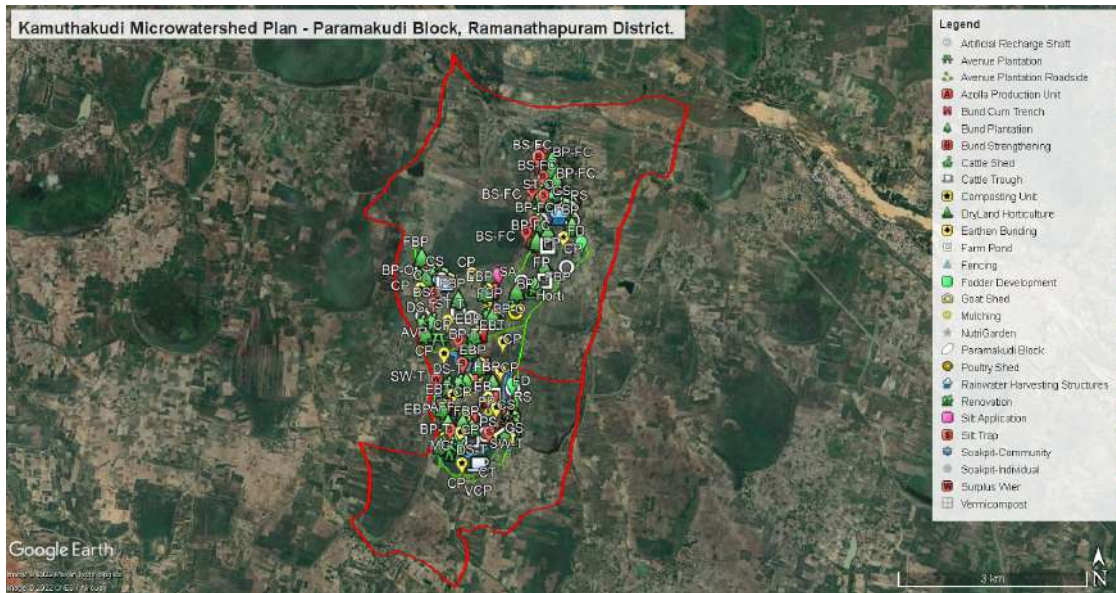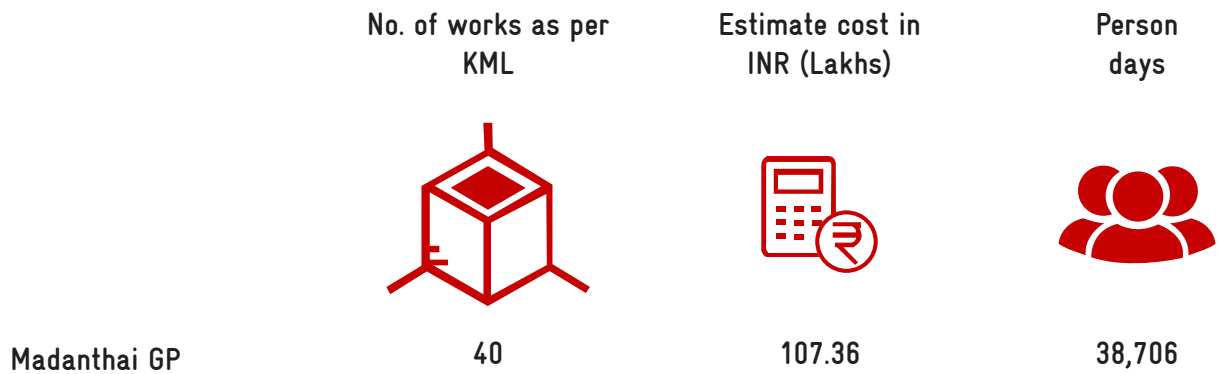
Figure 8.4. Proposed activities in Kamuthakudi Micro-watershed

8.3 | MODEL GP – S. KAVANUR

BACKGROUND OF GRAM PANCHAYAT - S. KAVANUR

Figure 8.5. Satellite Image of S. Kavanur GP

S. Kavanur GP is located in Paramakudi Block of Ramanathapuram District, Tamil Nadu. The total geographic area of this village is about 268 ha. As per the Population Census 2011, the total population of the GP is 1,937 out of which 978 are males, 959 are females. The total number of HH in the village is 496. Out of this 46.77% of the population are vulnerable population (Table 56).

TABLE 56. GENERAL DESCRIPTION OF S. KAVANUR GP, PARAMAKUDI BLOCK
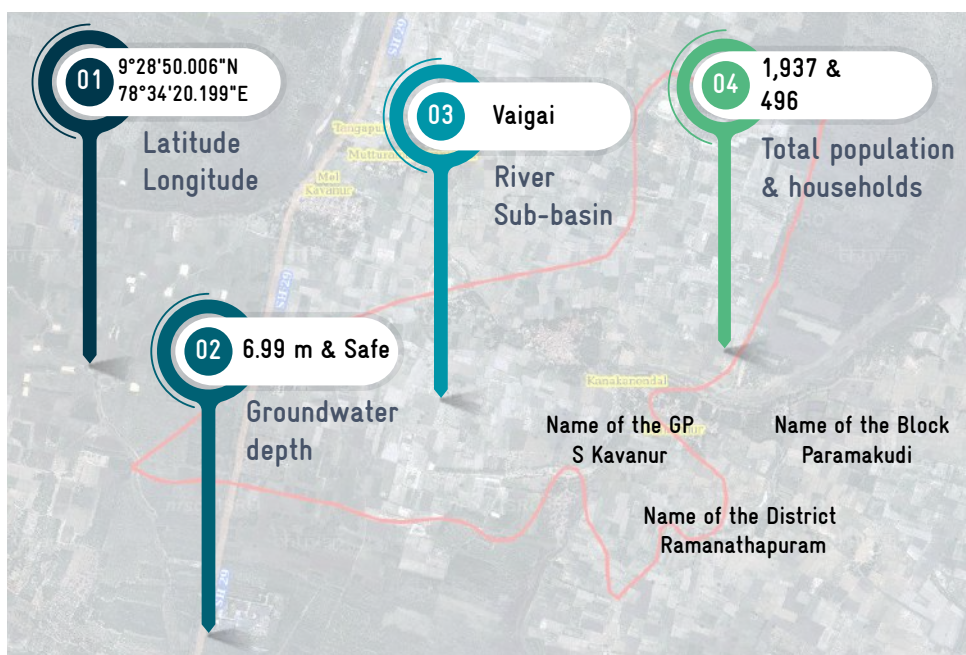
8.3.1 CWRM PLANNING - SPATIAL DATA

CWRM adapted the geospatial technologies in its process of plan preparation towards climate-resilient infrastructure, Water Conservation Water Harvesting etc. at cadastral levels. Geospatial datasets allow players to understand the study area in terms of geomorphology, lineaments, salt-affected area, erosion, watershed, LULC, and wasteland. In some cases, spatial data will serve as a direct input for a particular activity to be implement towards conservation of resources. Various thematic datasets for S. Kavanur GP shown in Figure 8.6 (A,B,C,D,E) and discussed below.
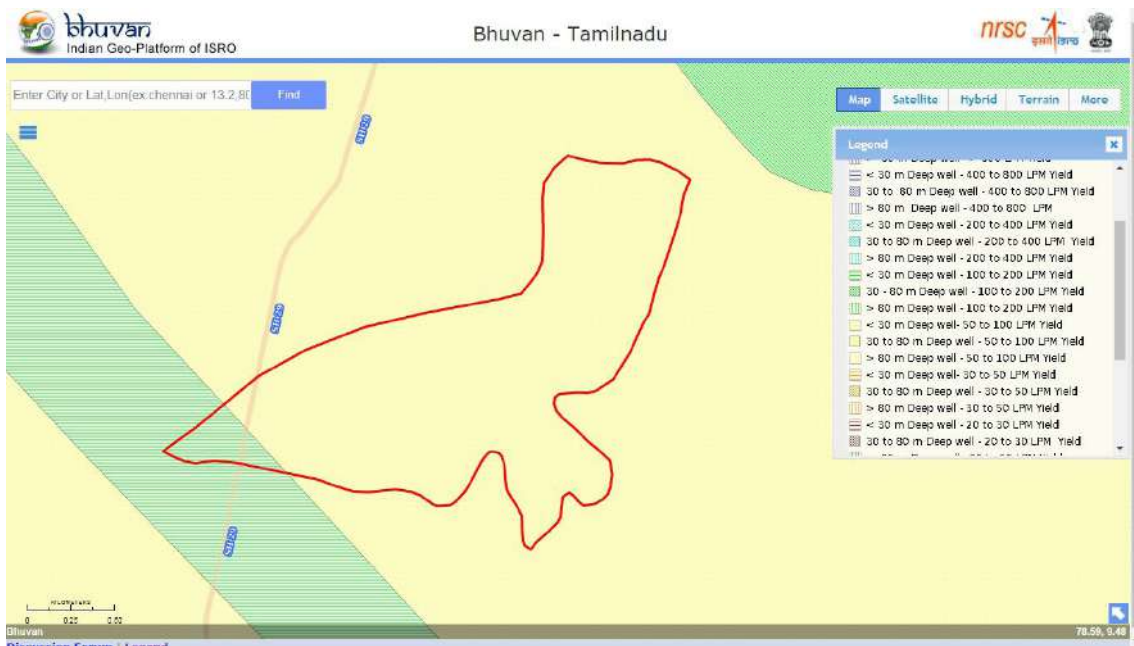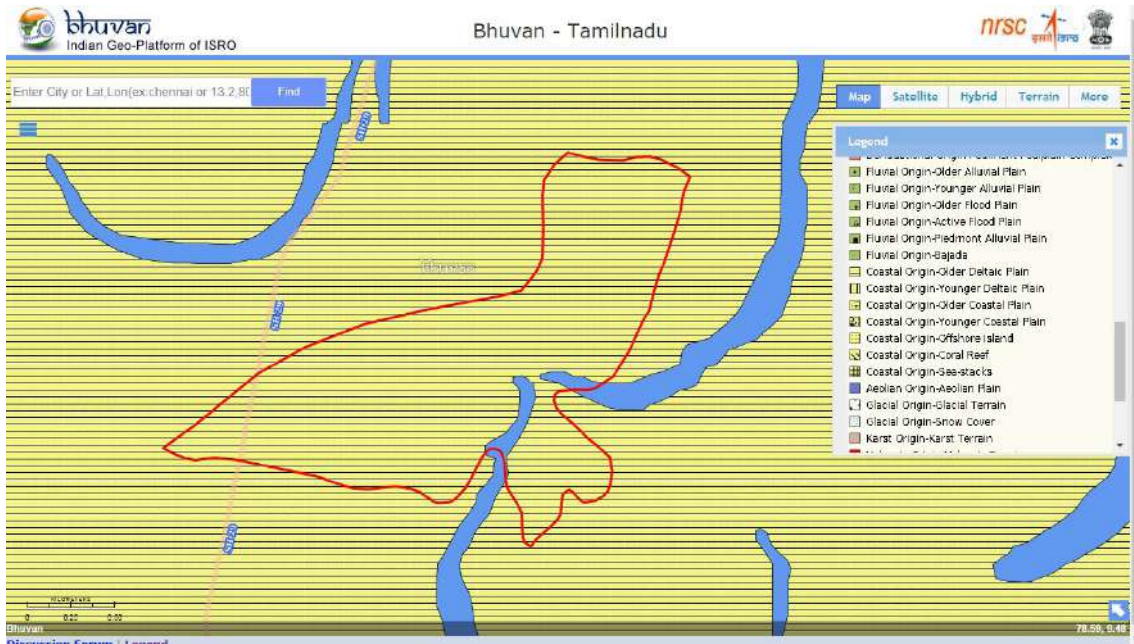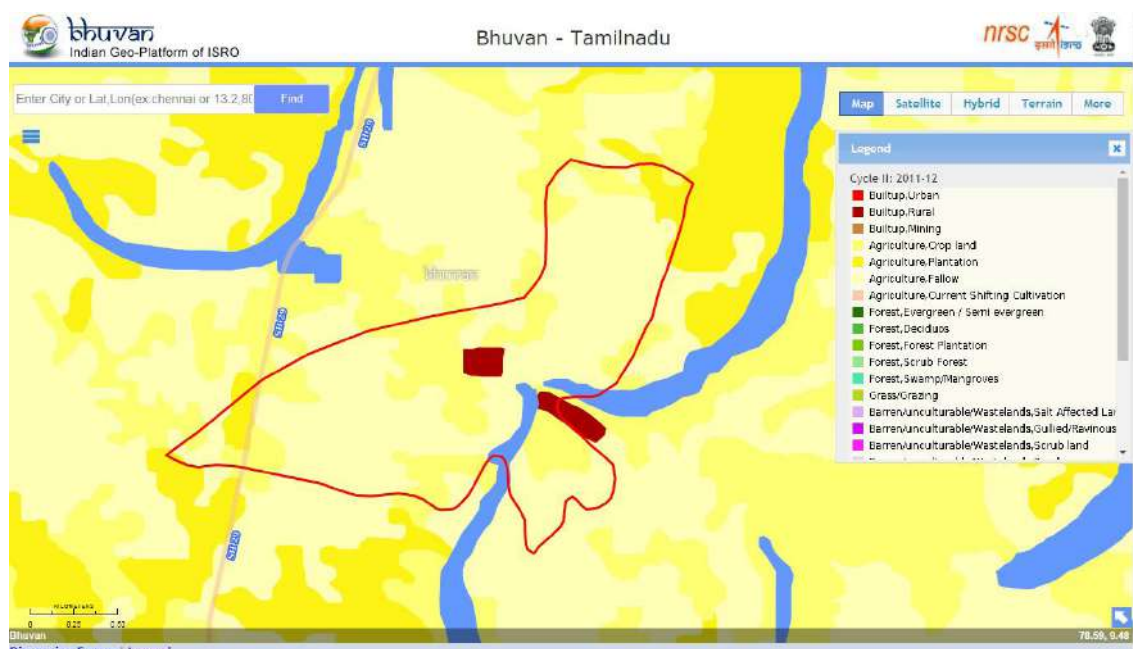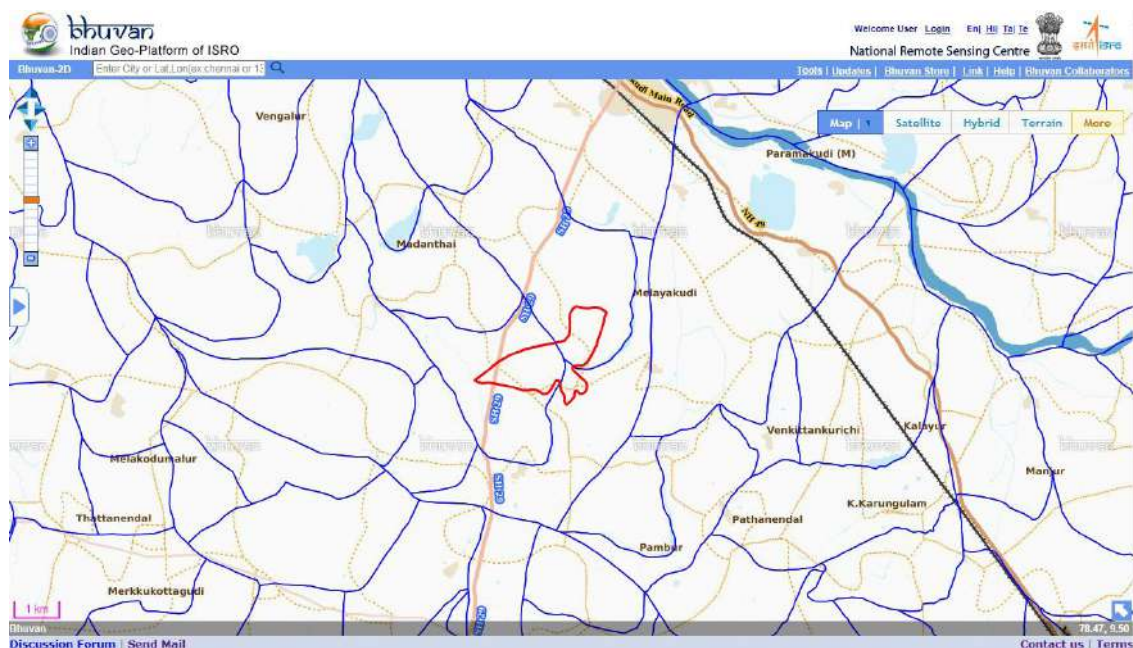
Figure 8.6. Spatial thematic maps of S. Kavanur GP. A. Geomorphology, B. GW prosperity, C. Watershed, D. LULC

S. Kavanur GP is engrossed under Coastal Origin- Deltaic Plain. (A). The groundwater prospectus of the entire GP at the west side is 30-80 m deep well and 50 to 100 liters per minute yield. (B). GP area is falls under three micro-watershed units (C). Most of the land area is under crop land, plantation area and fallow land (D). There is no Salinization in the GP. (E).

8.3.2 CWRM PLANNING- NON-SPATIAL DATA

The non-spatial data covered four important themes – socio economic, climate, water and agriculture with 116 parameters (Table 57). 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 the GP as the lowest unit of planning and execution.

TABLE 57. NON-SPATIAL DATA-S. KAVANUR GP

Key CWRM Parameter	Details
Climate Vulnerability Area (CVA) 1: Socio-Economic	
Geographical Area	268
Male Population	978
Female Population	959
Total Population	1,937
SC Population	906
ST Population	0
Vulnerable Population	906
Households (HH's)	496
Only one room HH's (SECC)	42
Female Headed HH's (SECC)	36
Vulnerable Households (SECC)	40
% of Vulnerable Households	8%
Registered MGNREGA Job cards	422
The active person working in job Cards	297
Drinking Water Sources	13
HH's have tap water connection for drinking water	290
HH's dependent on other sources for drinking water	64
Annual Greywater Generation (ha.m)	4
Climate Vulnerability Area (CVA) 3: Water Resources	
Canal Network (m)	
Length of Minor Canal	775
No.of Ooranis	6
Irrigation Facilities (ha)	
Area under Canal Irrigation	90.92
Catchment Area wise Available Runoff (ha.m)	
Good Catchment Area	13.1

Average Catchment Area	1.7
Bad Catchment Area	20.5
Watershed and Drainage Networks	
No. of Micro Watersheds	3
Water Demand (ha.m)	
Water Demand for Humans	5
Water Demand for Agriculture	291
% G.W Utilization for Drinking	100%
% G.W Utilization for Livestock	51%
% SW Utilization for Livestock	49%
% SW Utilization for Agriculture	100%
Climate Vulnerability Area 4: Agriculture	
Area Under Land Resources (ha)	
Area under Non-Agricultural Uses	58.86
Area under Land Under Miscellaneous Tree Crops etc.	10.08
Area under Fallows Land other than Current Fallows	7.48
Area under Current Fallow land	35.67
Area under Unirrigated Land	102.9
Area Irrigated by Source	34.67
Catchment Area (ha)	
Land under Good Catchment	58.86
Land under Average Catchment	10.08
Land under Bad Catchment	180.72
Crop Details (ha)	
Irrigated Area	94.23
Rainfed area	207.62
Area under Paddy Cultivation	163.23
Crop Water Requirement - Irrigated condition (ha.m)	128.03
Crop Water Requirement - Rainfed condition (ha.m)	163.07
Soil Resources: Status of Available Nitrogen (%)	
Very Low (VL)	32%
Low (L)	68%
Status of Organic Carbon (%)	
Very High (VH)	100%
Status of Soil Micro Nutrients (%)	
Sufficient	73%
Deficient	27%
Status of Physical condition of the soil (%)	
Moderately Acidic (MAc)	16%
Slightly Acidic (SlAc)	25%

Neutral (N)	2%
Moderately Alkaline (MAl)	57%
Soil Texture	
% of Fine Soil	98%
Soil Water Permeability	Moderate to Low (5-20 mm/hr)
Soil moisture and ET	
Volumetric Soil Moisture (%)	17%
Estimated Soil Moisture (ha.m)	32.44
ET Losses (ha.m)	77.07
Means of Water Extraction (%)	
Gravity	10%
Lifting	90%
Irrigation Methods (%)	
Wild Flooding	83%
Control Flooding	17%
Livestock (No)	
Cattle Population	27
Goat Population	221
Poultry	1615
Livestock Water Requirement (ha.m)	0.19

8.3.3 KEY WATER CHALLENGES

Socio-Economic

1. Female population almost equal to male population
2. 46.77 percent of the population belongs to the SC category and according to SECC data
3. 8% of the households are vulnerable, 36 HH are female headed
4. 42 HH have only one room.
5. 4 ha.m grey water from 496 households living in the coast needs attention

Water

1. No major, minor canals, distributaries in this GP
2. 6 Ooranis in the GP
3. 100% Ground Water utilized for drinking water purpose
4. 100% of surface water utilized for agriculture
5. More water for agriculture (291 ha.m)
6. 35.3 ha.m of water is an available runoff in which 58.07% of the runoff is from the bad catchment, 37.11 % of the conservation is from the good catchment

Agriculture and Allied Sector

1. 72.38 % is under Individual lands
2. Worse catchment area (72.38%)
3. Rainfed area (68.78%)
4. Low soil Nitrogen and very high Organic Carbon
5. 57 % moderately Alkaline
6. 98% fine soil
7. 83% Wild flooding
8. Area under paddy cultivation 163.23 ha

8.3.4 PERSPECTIVE PLAN - WORKS PROPOSED: WATER ACTIONS

The appropriate and site-specific works are identified for the development of public and common land, agriculture and allied activities, rural infrastructures, and climate-resilient measures to reduce the vulnerability in the GP. About 9.93% of the total land area is taken for WASCA activities like plantation, conservation works. The total proposed area for treatment is 24.81 ha out of which 58.24% of the proposed work is under individual lands and the rest (41.74%) is under common land (Figure 8.7). Through the proposed conservation activities, 11.55 ha.m run off would be harvested in which, about 47.09 % of the runoff is from the good catchment, 13.85% of the run off is from the average catchment and 39.04% is from the bad catchment area (Figure 8.8).
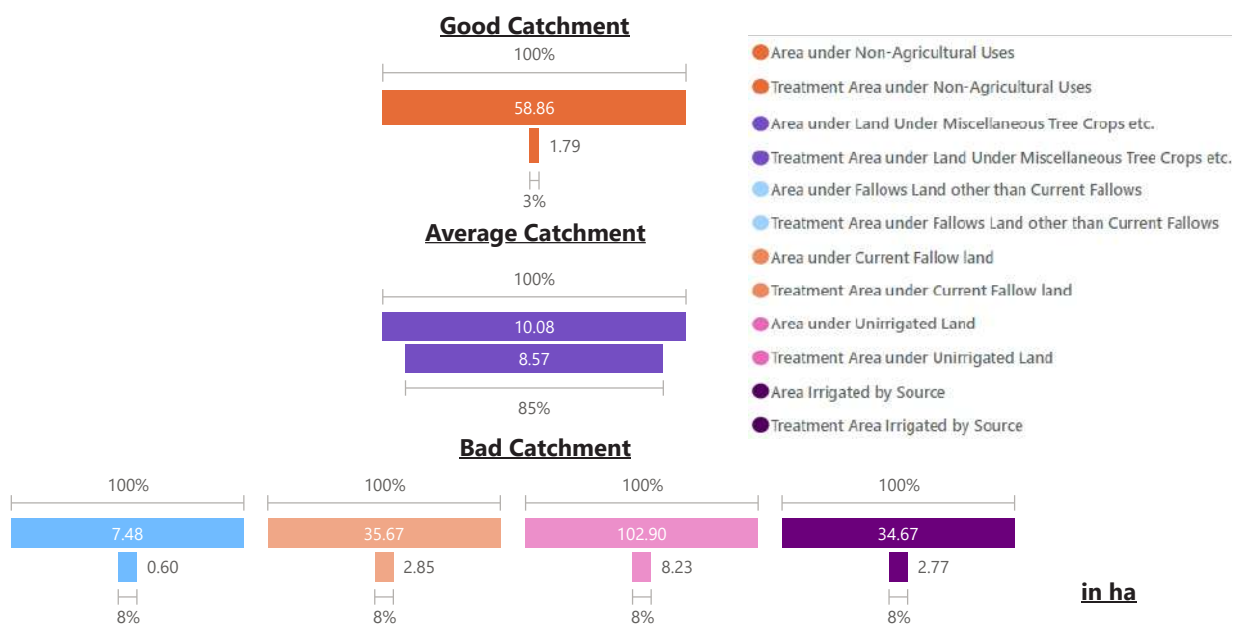
Figure 8.7. Proposed land resource treatment area in S. Kavanur GP
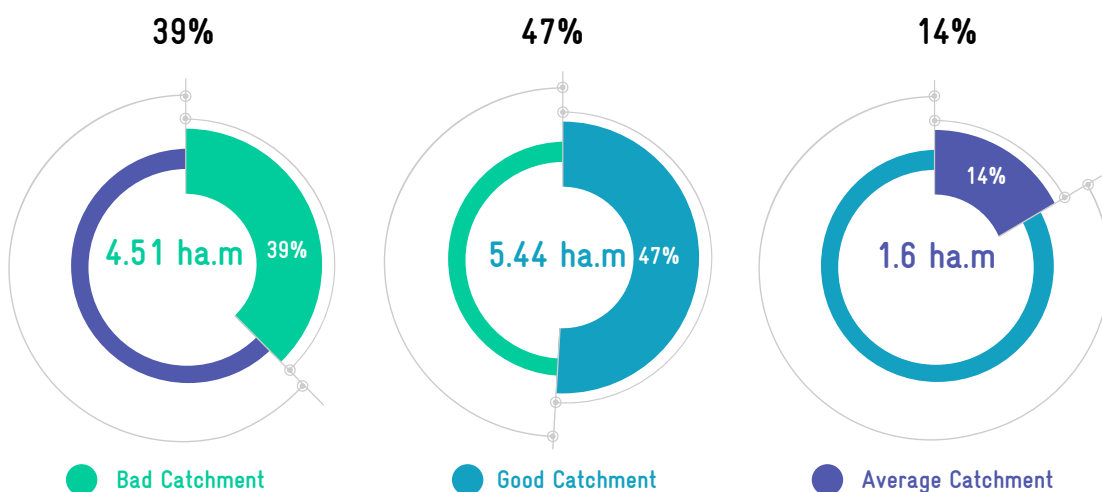
Figure 8.8. Expected run off conservation after treatment in S. Kavanur GP

Table 58 shows the detailed perspective plan and estimates of the work, budget, and person-days for three years from 2021-2022 to 2023-2024 in S. Ka-vanur GP. Since it is a vulnerable village, attention was given to include appropriate works to improve the common and public land development.

TABLE 58. PERSPECTIVE PLAN OF S. KAVANUR GP – FY (2021-2024)

Name of the Work	Ridge Type	No of Works	Estimated cost (INR in Lakhs)	Estimated Person Days
CWRM Water Action 1: Improvement of Public & Common Lands Development				
CWRM Water Action 1: Works in Upper& Middle Ridge				
Afforestation in Public/common lands (ha)	Lower	1.79	15.39	5,985.76
Contour Continuous Bunds (CCB) for Afforestation area (m)		7.16	0.18	71.6
Composting (No)		5	0.85	75
Avenue plantation (km)		2.243	4.04	1,576.829
Block Plantation (Community) (km)		8.57	95.13	37,022.4
Restoration of water bodies (No.)		6	12	1,200
Artificial Recharge Structure (No.)		32	80	12,512
Canal Bund Plantation (km)		360	2,700	10,54,800
WC - Irrigation channels - Desilting		86.9	1.3	521.4
Subtotal Water Action - I		**510**	**2,909**	**11,13,765**
CWRM Water Action 2: Agricultural and allied Sector development				
CWRM Water Action 2: Works in Lower Ridge				
Farm Bunding (ha)	Lower	14	21.69	8,474
Micro Irrigation (ha)		1	1	0
Construction of farm ponds (No.)		5	10	3,905
Land development (ha)		6	58.4	22,811
Cattle Shelters (No.)		1	2.12	331
Goat Sheep Shelters (No.)		22	49.94	7,810
Fodder development for cattle (No.)		1	1.48	2,344
Azolla units (No.)		1	0.15	23
Cattle Trough (No.)		1	0.05	6
Poultry shed (No.)		40	3.6	400
Dry land Horticulture/Agro-forestry (ha)		7	59.5	23,247
Vermi Compost (No.)		1	0.18	27
Subtotal Water Action - II		**100**	**208**	**69,378**

CWRM Water Action 3: Rural Water Management				
CWRM Water Action 3: Works in Lower Ridge				
Soak pits (Community) (No.)	Lower	5	0.65	100
Soak pits (Individual) (No.)		51	5.1	816
Roof rain Water Harvesting (No.)		2	8	1,250
Community Tanka (Rajasthan Model) (No.)		1	30	300
Subtotal Water Action - III		59	43.75	2,466
Overall Total GP		669	3161	11,85,609

Water actions

Regarding CWRM themes, of the total number of projects identified, 76.23 percent works are in public and common land, 14.94 percent in agriculture and allied sector while it is 8.8 percent under rural infrastructure. (Table 59)

TABLE 59. SUMMARY OF WORKS IDENTIFIED AND ESTIMATED PERSON-DAYS FOR 2021-2024

CWRM themes	No of works	Estimated budget (INR in lakhs)	Estimated person days
Public and common land development	510	2,909	11,13,765
Agriculture and Allied sector development	100	208	69,378
Rural water management	59	43.75	2,466
TOTAL	669	3,161	11,85,609

8.3.5 IMPACTS

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

TABLE 60. WASCA- WATER ACTIONS AND INDICATORS

WASCA CWRM ACTION PLAN

DEVELOPMENT OF PUBLIC AND COMMON LAND

	INDICATOR		OUTCOMES/ IMPACT
1	Number of water bodies restored in the village	1	6 water bodies restored
2	Quantum of water harvested/recharge	2	11.5 ha.m surface runoff is harvested due to WASCA interventions
3	The proportion of land treated under WASCA	3	10 percent of the total area treated under WASCA (24.82 ha)
4	Area under afforestation	4	1.79 ha area under afforestation
5	Length of drainage line treated	5	Nil

10	**1.79 ha**	**11.5 ha.m**	**10 %**
TRADITIONAL WATER BODIES RESTORED	AFFORESTATION	RUNOFF HARVESTED	AREA OF THE VILLAGE TREATED

WASCA CWRM ACTION PLAN

DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

	INDICATOR		OUTCOMES/ IMPACT
1	Assessment of sources of water for live-stock and agriculture demand	1	2.77 ha covered under micro-irrigation
2	No structures were established for on-farm (in-situ) water harvesting in drylands	2	5 farm ponds established
3	Improvement in soil health	3	5 compost units for soil health improvement
4	Changes in the irrigation practices	4	14.46 ha Farm bunding with trenches
5	Dryland development with agro-forestry	5	7 ha under dryland horticulture
6	Households established fodder plots	6	7 vulnerable households established fodder plots

5	**5**	**14.46 ha**	**7 ha**	**7**
FARM PONDS	VERMI COMPOST	FARM BUNDING	DRYLAND HORTICULTURE	FODDER PLOTS

WASCA CWRM ACTION PLAN

DEVELOPMENT OF RURAL INFRASTRUCTURE

INDICATOR

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

OUTCOMES/ IMPACT

1	5 common and 51 individual soak pits were established for recycling greywater benefiting 507 households
2	2 common roof rainwater harvesting and storage and 504 individual level roof rainwater harvesting
3	504 Households established Nutri-gardens in homesteads

5 COMMUNITY &
51 INDIVIDUAL SOAK PITS

2 COMMON & **504** INDIVIDUAL ROOF RAINWATER HARVESTING

504 NUTRI-GARDENS

Table 61 provides both the prospective plan for three years and the annual plan for the one year from 2021-2022 on the shelf of projects/number of works and number of person-days.

TABLE 61. PROPOSAL FOR THE MGNREGS, S. KAVANUR GP, PARAMAKUDI BLOCK

	No of works	No of person days
Perspective plan	669	11,85,609
Annual plan	268	4,74,244

8.3.6 PROPOSED ACTIVITY MAP

The proposed activity map (Figure 8.9) for S. Kavanur GP, Paramakudi Block shows a shelf of projects for all three year works from 2021-2024.
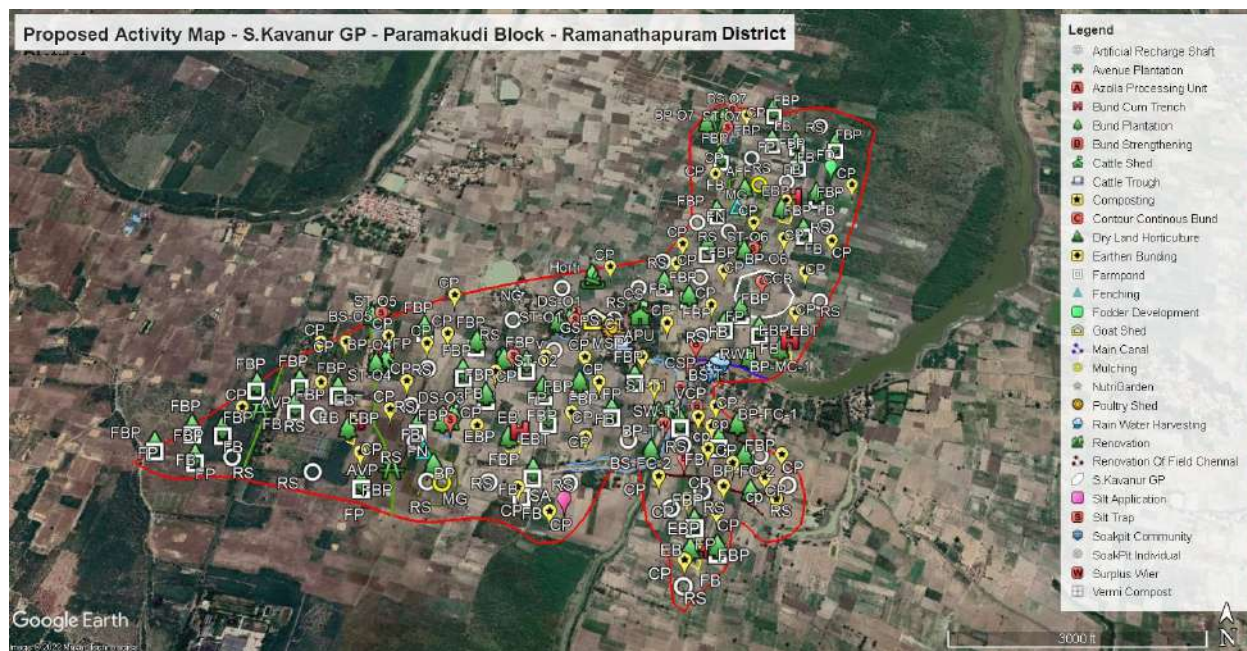
Figure 8.9. Proposed action plan of S. Kavanur GP

8.3.7 GIS PLAN IMPLEMENTATION AND KEY PARAMETERS

The GIS plan implementation and performance of S. Kavanur GP, Paramakudi Block is represented in Table 62.

TABLE 62. GIS PLAN IMPLEMENTATION, KEY PARAMETERS PERFORMANCE IN NUMBERS

669 — Total No of Works in GIS

Expenditure GIS plan years to previous three years (%) — 322

3 — Total number of Works taken

Total GIS Ongoing works — 0

0 — Total GIS completed (No)

89.8813 — Avg. Expenditure for a GIS plan phase in 3 year/ GP (GIS GP) (INR in lakhs)

Per HH Expenditure (GIS GP) Average estimated expenditure as per GIS plan (INR in lakhs) — 0.2783

191 — Proposed Individual Works

Proposed Community Works — 83

நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்
வான்இன்று அமையாது ஒழுக்கு

குறள் - 20

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

Thirukkural - 20

CHAPTER 9

CONCLUSION

CONCLUSION

> "WASCA TN took an 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 dis-

comprehensive vulnerability assessment at dis-
area and its key problems. The 18 bio-
of four interrelated areas via water,
climate used at district lev-
110 parameters at Block
non-spatial CWRM pa-
mentioned four interre-
represent risk, sensitivi-
ity of the GPs, which
rural water security. The
Blocks are identified
adaptation options 'Key
drawn up under WASCA
common land, agricul-
rural infrastructure ar-
parameters and Key Water
appropriate SDG and India's NDC.
the 3 areas along with climate resilient
vulnerability and building the resilience of the

trict and Block level to identify the vulnerable
physical and socio-economic indicators
agriculture, socio economic and
el are further expanded to
level. The spatial and
rameters for the above
lated areas are used to
ty and adaptive capac-
eventually reflects
key problems of the
and the best possible
Water Actions' are
initiatives in public and
ture and allied sector,
eas. All the indicators/
Action are aligned to the
The developmental activities in
measures will contribute in reducing 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

02 Preference of key water actions based on water demand and budget

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

04 Continuous field monitoring for constant actions

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

WATER QUALITY STANDARDS AND FORMULA USED

RELATIVE WEIGHTS ASSIGNED FOR DIFFERENT WATER QUALITY PARAMETERS

S. No.	Physical and chemical pa-rameters	World Health Organization (WHO 2004)	Weight (w)	Relative weight (wi)
1	pH	8.5	4	0.133
2	Total dissolved solids (mg/l)	500	5	0.167
3	Bicarbonate (mg/l)	200	1	0.033
4	Chloride (mg/l)	200	4	0.133
5	Sulphate (mg/l)	200	3	0.1
6	Nitrate (mg/l)	45	3	0.1
7	Calcium (mg/l)	75	2	0.067
8	Magnesium (mg/l)	30	2	0.067
9	Sodium (mg/l)	200	4	0.133
10	Potassium (mg/l)	100	2	0.067

$$SI_i = W_i \times Q_i \qquad WQI = \sum_{i=1}^{n} SI_i$$

Where qi is the quality rating, Ci is the concentration of individual element in water samples represented in mg/l and Si is the drinking water standard for individual chemical constituents (in mg/l)

Sea water mixing index (SMI) (Park et al. (2005)

$$SMI = a \; X \frac{C \; Na}{T \; Na} + b \; X \frac{C \; Mg}{T \; Mg} + c \; X \frac{C \; Cl}{T \; Cl} + d \; X \frac{CSO_4}{TSO_4}$$

The measurements a, b, c and d represent the relative concentration percentage of Na^+, Mg^{2+}, Cl^- and SO_4^{2-} assumed

ANNEXURE 3.7

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.)
Pambur	1,500	-	-	1,000	1	10	-
Kulandapuri Arungulam	-	-	7,000	8,000	2	3	-
Kamuthakudi	-	-	4,000	8,000	5	10	-
Melayakudi	-	-	2,400	3,600	4	11	-
Perungarai	-	-	3,000	7,000	4	15	-
thenpoduvakudi	-	-	3,500	3,500	2	8	-
Vendoni	-	-	1,000	3,800	2	7	-
Poduvakudi	-	-	2,500	3,000	1	2	-
Vengalur	-	-	3,000	5,000	4	6	-
Villathur	-	-	4,000	6,500	1	7	-
Venkittankurichi	-	-	-	9,400	3	7	-
Ariyanendai	-	1,500	-	500	2	6	-
Thinaikulam	-	600	-	500	-	7	-
S.Kavanur	-	775	-	-	-	6	-
Melakavanur	500	-	-	800	1	5	-
Tholur	500	-	-	700	3	7	-
Kanjiyendai	2,000	5,000	4,000	2,000	7	9	-
Valimarichan	500	30	1,300	1,200	7	7	-
Pudukudi	1,500	2,000	-	8,000	6	6	-
Urakkudi	1,000	3,000	1,500	600	1	6	-
Valangudi	-	3,202	-	1,000	4	10	-
Madanthai	-	5,000	-	1,000	4	8	-
Enathikottai	3,500	-	-	1,000	-	2	-
Melaparthibanur	3,500	-	-	1,000	1	2	-

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.)
Kallikudi	-	16,000	-	200	5	4	-
Nelmadur	-	1,500	-	200	1	9	-
Keelaparthibanur	-	2,000	-	200	1	7	-
Soodiyur	-	12,000	-	1,000	3	4	-
Mosukkudi	-	1,500	-	1,000	7	10	-
P.Puthur	-	1,050	-	1,000	2	8	-
Keelaparuthiyur	1,500	2,500	-	500	8	7	-
Thelichathanallur	9,000	2,500	-	2,000	2	3	-
S.Andakkudi	7,000	-	-	13,000	3	13	-
Peerkankurihi	-	8,000	-	1,000	6	7	-
Thaduthalankottai	-	4,000	-	1,000	3	5	-
Urappuli	-	1,200	-	-	1	3	-
Nenmeni	800	100	-	-	4	6	-
Kalaiyur	-	2,500	-	1,000	-	14	-
K.Karungulam	-	-	1,500	1,300	3	3	-

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.)
Pambur	55.80	-	41.43	22.80	21.70	71.90	350	1	5
Kulandapuri Arungulam	195.87	-	41.77	26.60	24.30	50.40	1,438	3	5
Kamuthakudi	204.39	-	-	83.90	0.30	131.20	7,041	5	7
Melayakudi	204.64	-	35.38	46.90	30.00	89.40	639	4	6
Perungarai	273.70	-	57.07	111.50	17.30	93.20	1,200	2	6
thenpoduvakudi	64.32	-	14.41	7.50	25.00	52.60	1,200	2	7
Vendoni	85.60	-	49.45	64.90	2.80	84.10	895	1	4
Poduvakudi	40.34	-	44.14	9.30	0.20	26.20	895	1	2
Vengalur	122.27	-	57.68	45.10	7.80	63.70	4,477	5	6
Villathur	64.63	-	-	21.30	-	54.60	-	-	4
Venkittankurichi	88.59	-	45.18	36.70	14.30	67.70	492	1	3
Ariyanendai	75.25	-	60.00	43.70	2.10	35.40	4,273	3	2
Thinaikulam	80.52	-	20.58	22.50	1.00	17.70	-	-	2
S.Kavanur	-	90.92	-	13.10	1.70	20.50	-	-	3
Melakavanur	80.93	-	-	18.00	2.40	28.30	213	1	3
Tholur	24.28	-	-	23.00	18.60	33.20	2,445	3	4
Kanjiyendai	-	182.10	-	31.70	25.70	45.90	10,089	7	6
Valimarichan	-	1.50	0.01	31.20	11.00	39.70	3,125	5	6
Pudukudi	-	153.70	4.04	48.70	17.10	62.00	2,167	3	5
Urakkudi	-	80.93	-	17.50	6.20	22.30	1,522	1	2
Valangudi	103.70	-	2.60	23.10	15.70	60.10	1,701	2	5
Madanthai	224.00	-	2.60	19.50	14.60	50.30	850	2	5
Enathikottai	146.91	-	85.26	9.00	0.20	3.20	187	1	1
Melaparthibanur	215.92	-	-	118.90	3.00	42.90	2,526	4	4
Kallikudi	121.20	-	-	56.50	4.10	48.60	2,970	5	9

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.)
Nelmadur	222.00	-	4.60	25.00	3.20	33.70	193	1	5
Keelaparthibanur	80.92	-	28.20	60.90	4.90	57.40	3,715	5	9
Soodiyur	80.92	-	19.40	52.60	2.60	51.30	4,811	4	5
Mosukkudi	275.00	-	14.50	22.90	6.90	83.90	399	2	8
P.Puthur	204.10	-	81.00	84.00	7.00	57.40	1,067	2	6
Keelaparuthiyur	256.00	-	31.00	60.90	27.40	90.70	6,321	7	8
Thelichathanallur	114.80	-	-	108.50	3.50	105.70	4,311	5	4
S.Andakkudi	114.80	-	60.92	162.10	28.40	134.60	7,946	6	7
Peerkankurihi	366.40	-	22.31	40.30	10.90	45.20	1,565	3	6
Thaduthalankottai	900.00	-	32.00	23.10	16.80	54.70	1,037	1	5
Urappuli	-	200.00	-	69.90	0.20	54.70	6,089	5	3
Nenmeni	52.00	-	4.60	48.90	0.10	38.30	4,953	3	5
Kalaiyur	443.00	-	6.10	19.20	-	44.80	665	1	7
K.Karungulam	37.00	-	3.09	12.50	1.70	19.90	134	1	3

Gram Panchayat	Water Demand			% GW Utilization for Drinking (%)	% GW Utilization for Livestock (%)	% GW Utilization for Agriculture. (%)	% SW Utilization for Drinking (%)	% SW Utilization for Livestock (%)	% SW Utilization for Agriculture (%)
	For Humans (ha.m)	For Livestock (ha.m)	For Agriculture (ha.m)						
Pambur	5.89	0.50	330.16	13	78	37	87	22	63
Kulandapuri Arungulam	4.90	4.24	345.50	100	33	18	-	67	82
Kamuthakudi	9.51	2.55	375.93	57	47	-	43	53	100
Melayakudi	9.49	0.91	322.75	-	-	74	100	100	26
Perungarai	8.38	1.97	388.14	100	57	82	-	43	18
thenpoduvakudi	1.31	0.17	260.35	-	-	44	100	100	56
Vendoni	16.08	0.51	148.57	100	81	37	-	19	63
Poduvakudi	2.44	1.05	84.61	100	36	52	-	64	48
Vengalur	4.44	1.03	213.26	100	41	32	-	59	68
Villathur	4.97	0.81	243.48	-	-	52	100	100	48
Venkittankurichi	6.50	0.87	429.65	97	41	49	3	59	51
Ariyanendai	8.06	0.95	279.41	95	69	44	5	31	56
Thinaikulam	8.06	0.41	279.41	7	69	20	93	31	80
S.Kavanur	5.30	0.19	291.10	100	51	-	-	49	100
Melakavanur	5.30	0.19	153.24	100	51	-	-	49	100
Tholur	8.93	0.51	415.26	100	28	-	-	72	100
Kanjiyendai	8.93	0.71	415.26	100	28	-	-	72	100
Valimarichan	13.17	0.54	491.02	90	54	1	10	46	99
Pudukudi	13.17	0.85	491.02	82	54	3	18	46	97
Urakkudi	13.17	0.31	491.02	100	54	-	-	46	100
Valangudi	5.58	0.42	223.70	94	40	2	6	60	98
Madanthai	1.57	0.48	223.70	98	45	1	2	55	99
Enathikottai	2.13	0.27	78.43	100	55	37	-	45	63
Melaparthibanur	19.83	1.02	78.43	100	62	-	-	38	100
Kallikudi	5.66	0.49	326.00	89	68	-	11	32	100
Nelmadur	5.66	0.66	326.00	91	55	2	9	45	98

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 (%)
Keelaparthibanur	7.51	0.67	165.51	82	52	26	18	48	74
Soodiyur	7.51	1.04	252.72	99	43	19	1	57	81
Mosukkudi	1.68	1.59	396.80	85	49	5	15	51	95
P.Puthur	4.83	1.10	557.88	80	64	28	20	36	72
Keelaparuthiyur	5.23	0.40	486.03	92	52	11	8	48	89
Thelichathanallur	22.04	0.92	78.56	90	79	75	10	21	25
S.Andakkudi	1.94	2.88	87.98	97	73	35	3	27	65
Peerkankurihi	3.12	0.81	28.65	94	41	5	6	59	95
Thaduthalankottai	3.35	0.74	552.33	96	35	3	4	65	97
Urappuli	14.86	1.48	312.33	98	82	-	2	18	100
Nenmeni	14.86	1.04	312.33	90	82	8	10	18	92
Kalaiyur	7.62	0.38	676.63	94	29	1	6	71	99
K.Karungulam	1.31	0.06	128.98	84	26	10	16	74	90

ANNEXURE 3.8

LOCATION WISE WATER QUALITY IN PARAMAKUDI BLOCK DURING PRE-MONSOON SEASON

GP	Locations	Latitude	Longitude	Well type	pH	Salinity	EC (μS/cm)	TDS (ppm)	TA (mg/l)
Ariyanendhal	Ariyanenthal	E 78° 37' 35.342"	N 9° 30' 38.203"	Bore well	7.49	0	1,425	833	400
Kamuthakudi	Nandupatti	E 78° 31' 24.834"	N 9° 32' 34.397"	Bore well	7.65	0	435	215	435
Kanjiyendhal	MelaThattankudiyiruppu	E 78° 31' 42.251"	N 9° 29' 2.728"	Bore well	7.4	1	10,740	6,750	384
Kanjiyendhal	Thattankudiyiruppu	E 78° 31' 45.476"	N 9° 29' 16.328"	Bore well	7.24	1	12,780	8,050	342
Keelaparuthiyur	Mochakudi	E 78° 25' 13.685"	N 9° 32' 43.044"	Open well	7.43	0	8,550	5,370	394
Keelaparuthiyur	Near Mochakudi	E 78° 25' 9.109"	N 9° 32' 54.305"	Bore well	7.6	0	2,954	1,826	417
Melakavanur	Melakavanoor	E 78° 34' 7.961"	N 9° 30' 11.815"	Bore well	7.12	0	2,396	1,497	318
Melakavanur	S Kavanoor	E 78° 33' 57.715"	N 9° 29' 45.629"	Bore well	7.38	0	2,257	1,328	382
MelaParthibanur	MelaParthibanur	E 78° 27' 44.23"	N 9° 35' 5.896"	Bore well	7.81	0	9,700	6,160	457
MelaParthibanur	Parakai	E 78° 27' 6.631"	N 9° 36' 7.466"	Bore well	7.37	0	2,938	1,790	372
MelaParthibanur	Parthibanoor	E 78° 27' 15.023"	N 9° 35' 16.231"	Bore well	7.5	0	1,483	851	401
Mosukudi	KaatuEmaneshwaram	E 78° 26' 16.069"	N 9° 33' 5.738"	Bore well	7.86	0	1,068	632	464
Mosukudi	PP Yenthal	E 78° 25' 24.568"	N 9° 33' 3.193"	Bore well	7.33	4	21,730	12,860	364
Nenmeni	Thinaikulam Highway	E 78° 38' 37.09"	N 9° 29' 35.866"	Bore well	7.21	0	2,144	1,243	375
P Puthur	Pidaricheri	E 78° 24' 52.765"	N 9° 35' 14.323"	Bore well	7.62	0	879	539	425
Pambur	Muthunagar	E 78° 33' 34.65"	N 9° 28' 14.527"	Bore well	7.1	0	3,572	2,186	316
Pambur	Near Malakavanoor	E 78° 34' 22.685"	N 9° 27' 57.11"	Bore well	6.85	3	20,740	12,360	300
Pambur	Pamboor	E 78° 34' 6.244"	N 9° 27' 56.635"	Bore well	7.24	0	6,080	3,840	342
Paramakudi	Paramakudi	E 78° 35' 2.677"	N 9° 33' 1.447"	Bore well	7.78	0	2,543	1,571	452
Perungarai	KeelaPerungarai	E 78° 30' 14.029"	N 9° 35' 16.958"	Bore well	7.63	0	2,092	1,284	430
Perungarai	Rajakalpatti	E 78° 30' 19.519"	N 9° 34' 31.688"	Bore well	7.62	0	1,529	862	425
Poduvakudi	Somanathapuram	E 78° 33' 15.782"	N 9° 32' 54.208"	Bore well	7.86	0	3,388	2,091	464
S.Andakudi	Ambethkar Nagar	E 78° 32' 52.811"	N 9° 32' 27.326"	Bore well	7.83	0	2,273	1,337	462
S.Andakudi	Vengadesh Colony	E 78° 34' 46.142"	N 9° 31' 50.588"	Bore well	7.25	0	3,418	2,010	346
Sudiyur	Sudiyur	E 78° 29' 9.758"	N 9° 36' 2.03"	Bore well	7.97	0	569	325	472

GP	Locations	Latitude	Longitude	Well type	pH	Salinity	EC (µS/cm)	TDS (ppm)	TA (mg/l)
Thelichatthanallur	KattuParamakudi	E 78° 34' 2.867"	N 9° 33' 43.474"	Bore well	7.32	0	3,630	2,284	362
Thelichatthanallur	Thelichatthanallur	E 78° 32' 44.135"	N 9° 34' 3.803"	Bore well	7.75	0	1,216	712	445
Thenpoduvakudi	Near Puluthikulam	E 78° 33' 2.228"	N 9° 27' 37.58"	Bore well	7.35	2	10,620	6,710	367
Thenpoduvakudi	Puluthikulam	E 78° 32' 30.217"	N 9° 27' 54.238"	Bore well	7.22	4	9,760	6,070	334
Thinaikulam	Arriyananthai	E 78° 38' 17.869"	N 9° 29' 41.507"	Bore well	7.19	5	14,370	9,080	333
Thinaikulam	Tthinaikulam	E 78° 37' 55.531"	N 9° 29' 18.103"	Bore well	8.08	0	1,664	929	478
Vendoni	Kumarakudi	E 78° 35' 58.387"	N 9° 30' 43.16"	Bore well	6.82	10	26,580	16,300	296
Vengalur	Ramalingampatti	E 78° 30' 15.653"	N 9° 32' 22.769"	Bore well	7	0	584	332	309
Vengalur	Vengalur	E 78° 30' 28.843"	N 9° 32' 22.898"	Bore well	7.42	0	3,760	2,386	392

Gram Panchayat	CO$_3$ (mg/l)	HCO$_3$ (mg/l)	TH (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K(mg/l)	S0$_4$ (mg/l)	Cl (mg/l)	NO$_3$ (mg/l)	WQI	SMI
Ariyanendhal	95	282	170	78	44	216	18	121	356	17	105.4	0.45
Kamuthakudi	151	263	52	24	13	63	5	9	69	5	34.9	0.07
Kanjiyendhal	123	228	1,280	585	328	626	16	123	2,679	35	596.8	1.51
Kanjiyendhal	97	222	1,524	696	390	848	36	47	3,527	21	729.3	1.76
Keelaparuthiyur	96	286	1,019	466	261	486	31	136	2,157	20	479.6	1.28
Keelaparuthiyur	97	301	480	320	90	386	14	26	1,153	25	231.6	0.62
Melakavanur	85	207	286	131	73	294	22	86	746	35	171.8	0.55
Melakavanur	103	248	269	123	69	228	16	29	668	24	149.7	0.39
MelaParthibanur	114	324	1,156	529	296	688	17	22	2,767	15	566.3	1.36
MelaParthibanur	85	272	290	160	90	225	12	21	758	25	178.4	0.41
MelaParthibanur	95	275	177	81	45	136	13	88	275	25	95.6	0.33
Mosukudi	98	345	127	58	33	124	10	14	236	3	71.9	0.16
Mosukudi	46	287	2,590	1,184	663	1,567	97	63	6,162	13	1220.5	3.06
Nenmeni	85	265	361	153	96	243	8	32	667	20	154.9	0.41
P Puthur	96	286	520	48	27	164	4	12	199	5	66.4	0.15
Pambur	69	235	426	195	109	341	23	67	1,092	16	229.5	0.67
Pambur	69	195	2,472	1,130	633	2,530	27	11	3,602	13	1077.9	2.30
Pambur	66	252	725	331	186	752	3	21	1,283	29	353.5	0.80
Paramakudi	102	315	303	139	78	289	13	39	750	22	171.2	0.46
Perungarai	131	286	249	114	64	256	14	57	486	13	135.3	0.39
Perungarai	94	306	182	83	47	189	8	67	351	18	102.4	0.33
Poduvakudi	116	305	320	40	134	424	9	17	883	14	207.1	0.52
S.Andakudi	121	314	271	124	69	336	9	36	684	11	156	0.45
S.Andakudi	68	255	407	186	104	326	15	61	887	16	206.5	0.58
Sudiyur	92	357	280	120	134	12	6	11	32	22	72.6	0.07
Thelichatthanallur	69	265	420	160	112	480	22	38	1,232	17	248	0.71
Thelichatthanallur	116	316	145	66	37	178	6	26	269	11	83.9	0.22
Thenpoduvakudi	85	269	380	80	112	2,296	21	27	2,781	21	613.1	1.84

Gram Panchayat	CO$_3$ (mg/l)	HCO$_3$ (mg/l)	TH (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K(mg/l)	S0$_4$ (mg/l)	Cl (mg/l)	NO$_3$ (mg/l)	WQI	SMI
Thenpoduvakudi	86	217	1,163	532	298	1,924	9	10	2,887	19	653.2	1.77
Thinaikulam	101	198	1,713	783	439	992	26	21	4,176	26	834.2	2.01
Thinaikulam	95	361	198	91	51	186	7	17	489	18	113.4	0.29
Vendoni	95	182	420	280	134	3,660	54	136	6,865	34	1328.3	4.01
Vengalur	77	201	70	32	18	76	7	21	123	9	45.7	0.11
Vengalur	113	255	448	205	115	471	13	27	1,243	18	255.4	0.69

ANNEXURE 3.9

LOCATION WISE WATER QUALITY IN PARAMAKUDI BLOCK DURING POST-MONSOON SEASON

GP	Locations	Latitude	Longitude	Well type	pH	Salinity	EC (µS/cm)	TDS (ppm)	TA (mg/l)
Ariyanenthal	Ariyanenthal	E 78° 37' 35.342"	N 9° 30' 38.203"	Bore well	7.31	0	758	470	167
Kamuthakudi	Nandupatti	E 78° 31' 24.834"	N 9° 32' 34.397"	Bore well	7.1	0	2,320	1,438	267
Kanjiyendhal	MelaThattankudiyiruppu	E 78° 31' 42.251"	N 9° 29' 2.728"	Bore well	6.85	0	10,200	6,324	799
Kanjiyendhal	Thattankudiyiruppu	E 78° 31' 45.476"	N 9° 29' 16.328"	Bore well	6.7	1	11,970	7,421	684
Keelaparuthiyur	Mochakudi	E 78° 25' 13.685"	N 9° 32' 43.044"	Open well	7.71	0	192	119	64
Keelaparuthiyur	Near Mochakudi	E 78° 25' 9.109"	N 9° 32' 54.305"	Bore well	6.63	0	8,110	5,028	515
Melakavanur	Melakavanoor	E 78° 34' 7.961"	N 9° 30' 11.815"	Bore well	7.21	0	2,151	1,334	225
Melakavanur	S Kavanoor	E 78° 33' 57.715"	N 9° 29' 45.629"	Bore well	7.28	0	2,283	1,415	233
MelaParthibanur	MelaParthibanoor	E 78° 27' 44.23"	N 9° 35' 5.896"	Bore well	7	3	14,450	8,959	946
MelaParthibanur	Parakai	E 78° 27' 6.631"	N 9° 36' 7.466"	Bore well	6.81	0	7,150	4,433	522
MelaParthibanur	Parthibanoor	E 78° 27' 15.023"	N 9° 35' 16.231"	Bore well	7.05	0	1,632	1,012	162
Mosukudi	KaatuEmaneshwaram	E 78° 26' 16.069"	N 9° 33' 5.738"	Bore well	6.75	0	8,020	4,972	553
Mosukudi	PP Yenthal	E 78° 25' 24.568"	N 9° 33' 3.193"	Bore well	7.33	0	1,413	876	246
Nenmeni	Thinaikulam Highway	E 78° 38' 37.09"	N 9° 29' 35.866"	Bore well	6.7	5	13,730	8,513	1,046
P Puthur	Pidaricheri	E 78° 24' 52.765"	N 9° 35' 14.323"	Bore well	7.45	0	671	416	148
Pambur	Muthunagar	E 78° 33' 34.65"	N 9° 28' 14.527"	Bore well	7.05	0	2,150	1,333	189
Pambur	Near Malakavanoor	E 78° 34' 22.685"	N 9° 27' 57.11"	Bore well	7.31	0	303	188	68
Pambur	Pamboor	E 78° 34' 6.244"	N 9° 27' 56.635"	Bore well	7.47	0	347	215	81
Paramakudi	Paramakudi	E 78° 35' 2.677"	N 9° 33' 1.447"	Bore well	7.45	0	962	596	112
Perungarai	KeelaPerungarai	E 78° 30' 14.029"	N 9° 35' 16.958"	Bore well	6.69	0	2,048	1,270	167
Perungarai	Rajakalpatti	E 78° 30' 19.519"	N 9° 34' 31.688"	Bore well	7.17	0	1,648	1,022	153
Poduvakudi	Somanathapuram	E 78° 33' 15.782"	N 9° 32' 54.208"	Bore well	7.35	0	3,359	2,083	316
S.Andakudi	Ambethkar Nagar	E 78° 32' 52.811"	N 9° 32' 27.326"	Bore well	7.17	0	3,528	2,187	273
S.Andakudi	Vengadesh Colony	E 78° 34' 46.142"	N 9° 31' 50.588"	Bore well	6.81	0	2,531	1,569	231
Sudiyur	Sudiyur	E 78° 29' 9.758"	N 9° 36' 2.03"	Bore well	7.38	0	689	427	108

GP	Locations	Latitude	Longitude	Well type	pH	Salinity	EC (µS/cm)	TDS (ppm)	TA (mg/l)
Thelichatthanallur	KattuParamakudi	E 78° 34' 2.867"	N 9° 33' 43.474"	Bore well	6.84	0	3,426	2,124	346
Thelichatthanallur	TThelichatthanallur	E 78° 32' 44.135"	N 9° 34' 3.803"	Bore well	7.44	0	1,347	835	135
Thenpoduvakudi	Near Puluthikulam	E 78° 33' 2.228"	N 9° 27' 37.58"	Bore well	6.91	0	3,130	1,941	476
Thenpoduvakudi	Puluthikulam	E 78° 32' 30.217"	N 9° 27' 54.238"	Bore well	6.93	0	3,192	1,979	311
Thinaikulam	Arriyananthai	E 78° 38' 17.869"	N 9° 29' 41.507"	Bore well	6.9	6	16,730	10,373	1,166
Thinaikulam	Tthinaikulam	E 78° 37' 55.531"	N 9° 29' 18.103"	Bore well	6.63	4	12,100	7,502	956
Vendoni	Kumarakudi	E 78° 35' 58.387"	N 9° 30' 43.16"	Bore well	7.35	0	746	463	190
Vengalur	Ramalingampatti	E 78° 30' 15.653"	N 9° 32' 22.769"	Bore well	6.41	0	3,342	2,072	369
Vengalur	Vengalur	E 78° 30' 28.843"	N 9° 32' 22.898"	Bore well	7.16	0	2,075	1,287	179

Gram Panchayat	CO$_3$ (mg/l)	HCO$_3$ (mg/l)	TH (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K(mg/l)	SO$_4$ (mg/l)	Cl (mg/l)	NO$_3$ (mg/l)	WQI	SMI
Ariyanendhal	11	156	71	24	35	33	7.2	50.26	67.9	4.125	47.7	0.303
Kamuthakudi	46	206	195	75	108	126	34	114	218	12.621	123.5	0.287
Kanjiyendhal	141	643	633	346	273	395	81	217	883	53	426.2	1.308
Kanjiyendhal	125	546	706	316	383	492	83	236	865	65.133	493.4	1.558
Keelaparuthiyur	13	50	24	10	6	8	1	2	18	1.044	20.4	0.508
Keelaparuthiyur	82	426	485	256	217	416	68	183	836	62	359.9	1.003
Melakavanur	31	183	179	69	97	121	26	56	192.8	11.708	111.5	0.459
Melakavanur	42	170	217	113	92	116	21.7	72	204.5	18	119.5	0.411
MelaParthibanur	163	768	921	489	416	646	78	183	1294.7	106	612.8	1.569
MelaParthibanur	85	427	505	225	267	416	49	187	816	45.5	342.6	0.838
MelaParthibanur	23	136	146	53	76	98	15.5	67	210	26	97.1	0.313
Mosukudi	93	453	539	236	289	403	75	186	718.5	48	361.3	0.688
Mosukudi	36	196	75	37	26	68	15	62	134	12	70	1.725
Nenmeni	217	806	796	367	415	586	75	223	1176	74.718	569.3	1.089
P Puthur	13	116	56	28	16	19	5	26	53	10	40.3	0.219
Pambur	33	143	191	97	83	138	13	93	176	16	112.6	0.529
Pambur	4	62	20	10	5	9	1	2	22	1	22.2	2.598
Pambur	5	71	34	16	10	15	3.3	22.99	31.1	1.887	27.4	0.805
Paramakudi	14	92	67	36	18	26	9.1	17	49	6	46.5	0.337
Perungarai	29	126	166	87	63	124	31	83	192	26	107.6	0.438
Perungarai	33	115	138	68	54	81	14	52	186	19	88.9	0.339
Poduvakudi	63	246	226	125	86	218	26	129	405	56	173.3	0.76
S.Andakudi	43	226	261	114	143	168	41	76	410	29	177.6	0.635
S.Andakudi	36	187	196	83	98	133	28	68	226.7	28	127.6	0.519
Sudiyur	13	86	68	36	21	27	6.5	45.66	63	6	43.7	0.086
Thelichatthanallur	49	286	259	113	124	193	35	143	384	48.6304	177.9	0.824
Thelichatthanallur	21	105	143	68	61	89	12.8	54	210	13	85.5	0.342
Thenpoduvakudi	42	268	235	120	91	128	26	97	267	14	142.5	2.576

Gram Panchayat	CO₃ (mg/l)	HCO₃ (mg/l)	TH (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K(mg/l)	S0₄ (mg/l)	Cl (mg/l)	NO₃ (mg/l)	WQI	SMI
Thenpoduvakudi	46	258	212	113	87	134	30.3	101	286	17.369	145.1	2.208
Thinaikulam	236	913	920	426	482	736	86	214	2236	117	742.1	2.389
Thinaikulam	156	786	721	326	374	411	63	202	1216	65.844	510	1.027
Vendoni	38	105	60	30	16	21	3.3	27	59	9	42.1	3.794
Vengalur	67	291	233	126	95	236	41	51	406	38	168	0.339
Vengalur	22	146	178	68	97	113	22	63	286	31	119.8	0.693

ANNEXURE 3.10

GP WISE STATUS OF AGRICULTURE RESOURCE

Gram Panchayat	Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Land Under Miscellaneous Tree Crit-icalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Pambur	102.67	-	127.00	0.36	98.07	233.07	204.27	97.23
Kulandapuri Arungulam	119.72	-	140.00	2.75	115.91	77.03	13.13	237.64
Kamuthakudi	378.04	-	-	1.69	-	836.25	114.65	204.39
Melayakudi	211.30	-	176.00	-	217.12	204.45	125.58	240.02
Perungarai	502.54	-	99.00	2.25	87.90	307.32	94.45	330.77
thenpoduvakudi	33.83	-	147.00	-	34.26	143.93	206.11	78.73
Vendoni	292.39	-	15.00	1.52	88.42	479.46	37.08	135.05
Poduvakudi	42.14	-	1.00	0.04	61.70	82.51	1.88	84.48
Vengalur	203.23	-	46.01	-	128.89	177.91	74.06	179.95
Villathur	96.01	-	-	0.02	-	327.27	88.90	64.63
Venkittankurichi	165.28	-	48.00	36.00	148.75	71.97	241.23	133.77
Ariyanendai	196.91	-	12.24	-	51.60	75.67	123.97	60.55
Thinaikulam	101.44	-	6.12	-	25.80	37.84	61.99	30.27
S.Kavanur	58.86	-	10.08	-	7.48	35.67	102.90	34.67
Melakavanur	81.23	-	13.92	-	10.32	49.17	142.10	47.88
Tholur	103.58	-	108.78	0.58	34.83	1.98	166.61	89.04
Kanjiyendai	143.04	-	150.22	0.81	48.09	2.74	230.08	122.96
Valimarichan	140.61	-	55.36	9.00	63.63	103.07	38.30	144.21
Pudukudi	219.70	-	86.50	14.06	99.42	161.05	59.84	225.34
Urakkudi	79.09	-	31.14	5.06	35.79	57.98	21.54	81.12
Valangudi	104.02	-	92.00	-	115.50	204.66	34.04	174.87
Madanthai	88.00	-	43.00	42.50	90.37	195.93	17.71	139.01
Enathikottai	40.35	-	1.13	0.19	-	-	12.16	16.25

Gram Panchayat	Land Resources (ha)							
	Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Land Under Miscellaneous Tree Crit-icalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Melaparthibanur	536.08	-	15.00	2.49	-	-	161.58	215.92
Kallikudi	254.52	-	19.80	4.33	26.74	141.09	45.22	215.17
Nelmadur	112.83	-	18.48	0.38	39.92	67.00	72.66	116.74
Keelaparthibanur	274.52	-	28.28	0.54	80.00	162.86	30.97	231.59
Soodiyur	237.03	-	14.28	1.14	89.41	122.71	30.15	209.34
Mosukkudi	103.27	-	38.95	1.37	169.09	280.23	52.22	237.42
P.Puthur	378.62	-	40.80	-	1.78	6.98	242.39	254.43
Keelaparuthiyur	274.29	-	157.41	3.11	336.80	31.50	185.70	244.14
Thelichathanallur	488.86	-	-	20.76	17.80	703.48	82.51	126.32
S.Andakkudi	730.81	-	84.00	82.87	103.27	838.17	137.89	105.80
Peerkankurihi	181.56	-	62.60	1.48	56.49	82.72	45.54	213.24
Thaduthalankottai	103.99	-	98.40	-	23.98	142.54	40.54	274.57
Urappuli	-	314.91	1.14	0.02	0.34	339.31	75.37	66.74
Nenmeni	-	220.43	0.79	0.01	0.24	237.51	52.76	46.72
Kalaiyur	86.58	-	-	0.03	-	233.76	119.02	41.88
K.Karungulam	56.20	-	10.00	-	34.23	20.95	79.44	40.99

Gram Panchayat	Land under Catchment Area (ha)			Irrigated Area (ha)	Rainfed area (ha)	Crop Details		
	Good Catchment	Average Catchment	Bad Catchment			Paddy Cultivation (ha)	Crop Water Requirement - Irrigated condition (ha.m)	Crop Water Requirement - Rainfed condition (ha.m)
Pambur	102.67	127.36	632.64	109.27	231.25	237.30	121.77	208.40
Kulandapuri Arungulam	119.72	142.75	443.71	234.65	7.19	220.34	338.91	6.59
Kamuthakudi	378.04	1.69	1155.29	225.02	85.02	195.90	307.29	68.64
Melayakudi	211.30	176.00	787.17	173.95	104.42	202.84	239.37	83.38
Perungarai	502.54	101.25	820.44	230.93	85.27	212.96	319.28	68.86
thenpoduvakudi	33.83	147.00	463.03	100.48	159.71	189.63	114.19	146.16
Vendoni	292.39	16.52	740.01	88.51	31.98	99.55	122.02	26.56
Poduvakudi	42.14	1.04	230.57	48.50	20.50	53.90	67.37	17.24
Vengalur	203.23	46.01	560.81	148.36	46.93	69.10	173.30	39.96
Villathur	96.01	0.02	480.80	99.39	155.90	138.06	126.60	116.89
Venkittankurichi	165.28	84.00	595.72	177.83	251.93	285.85	210.08	219.57
Ariyanendai	196.91	12.24	311.79	79.98	208.67	193.50	98.33	181.09
Thinaikulam	101.44	6.12	155.90	79.98	208.67	193.50	98.33	181.09
S.Kavanur	58.86	10.08	180.72	94.23	207.62	163.23	128.03	163.07
Melakavanur	81.23	13.92	249.47	55.23	114.50	81.50	64.94	88.30
Tholur	103.58	109.36	292.46	184.38	177.85	291.00	259.64	155.62
Kanjiyendai	143.04	151.03	403.87	184.38	177.85	291.00	259.64	155.62
Valimarichan	140.61	64.36	349.21	226.73	209.48	334.53	312.76	178.26
Pudukudi	219.70	100.56	545.65	226.73	209.48	334.53	312.76	178.26
Urakkudi	79.09	36.20	196.43	226.73	209.48	334.53	312.76	178.26
Valangudi	104.02	92.00	529.07	157.58	53.99	116.84	180.73	42.97
Madanthai	88.00	85.50	443.02	157.58	53.99	116.84	180.73	42.97
Enathikottai	40.35	1.32	28.41	48.71	23.15	43.30	60.09	18.34
Melaparthibanur	536.08	17.49	377.50	48.71	23.15	43.30	60.09	18.34
Kallikudi	254.52	24.13	428.22	194.81	34.02	228.31	292.09	33.91
Nelmadur	112.83	18.86	296.32	194.81	34.02	228.31	292.09	33.91

| 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)
Keelaparthibanur	274.52	28.82	505.42	104.80	9.73	112.36	155.98	9.53
Soodiyur	237.03	15.42	451.61	210.86	31.73	130.74	229.99	22.73
Mosukkudi	103.27	40.32	738.96	240.92	48.69	264.64	358.73	38.06
P.Puthur	378.62	40.80	505.58	334.34	68.60	379.10	500.05	57.83
Keelaparuthiyur	274.29	160.52	798.14	212.48	256.33	219.20	315.30	170.74
Thelichathanallur	488.86	20.76	930.11	45.18	22.57	52.60	58.87	19.70
S.Andakkudi	730.81	166.87	1185.13	56.52	30.76	47.62	63.54	24.44
Peerkankurihi	181.56	64.08	397.99	21.99	3.29	14.91	26.68	1.97
Thaduthalankottai	103.99	98.40	481.63	323.39	77.00	385.39	485.08	67.25
Urappuli	314.91	1.16	481.76	150.80	115.82	212.19	212.70	99.63
Nenmeni	220.43	0.80	337.23	150.80	115.82	212.19	212.70	99.63
Kalaiyur	86.58	0.03	394.66	201.60	406.04	528.84	295.40	381.23
K.Karungulam	56.20	10.00	175.61	50.49	72.38	85.88	66.54	62.44

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
Pambur	-	100.00	-	-	-	-	97.73	2.27	-	-	60.00	40.00
Kulandapuri Arungulam	40.79	59.21	-	-	-	1.32	98.68	-	-	-	69.00	31.00
Kamuthakudi	100.00	-	-	-	-	38.02	61.16	-	0.83	-	39.00	61.00
Melayakudi	57.35	42.65	-	-	-	35.55	61.14	2.84	0.47	-	52.00	48.00
Perungarai	100.00	-	-	-	-	75.24	24.76	-	-	-	67.00	33.00
thenpoduvakudi	18.92	81.08	-	-	-	2.70	97.30	-	-	-	70.00	30.00
Vendoni	61.95	38.05	-	-	-	45.13	54.87	-	-	-	70.00	30.00
Poduvakudi	22.73	77.27	-	-	-	-	100.00	-	-	-	72.00	28.00
Vengalur	14.93	85.07	-	-	-	50.75	47.76	1.49	-	-	51.00	49.00
Villathur	54.24	45.76	-	-	-	54.24	40.68	5.08	-	-	60.00	40.00
Venkittankurichi	22.43	77.57	-	-	-	1.87	98.13	-	-	-	65.00	35.00
Ariyanendai	13.85	86.15	-	-	-	4.62	-	-	49.23	46.15	71.00	29.00
Thinaikulam	13.85	86.15	-	-	-	4.62	-	-	49.23	46.15	71.00	29.00
S.Kavanur	32.10	67.90	-	-	-	-	-	-	-	100.00	73.00	27.00
Melakavanur	32.10	67.90	-	-	-	-	-	-	-	100.00	73.00	27.00
Tholur	54.10	45.90	-	-	-	-	-	-	-	100.00	66.00	34.00
Kanjiyendai	54.10	45.90	-	-	-	-	-	-	-	100.00	66.00	34.00
Valimarichan	44.73	55.27	-	-	-	0.42	-	-	45.99	53.59	71.00	29.00
Pudukudi	44.73	55.27	-	-	-	0.42	-	-	45.99	53.59	71.00	29.00
Urakkudi	44.73	55.27	-	-	-	0.42	-	-	45.99	53.59	71.00	29.00
Valangudi	47.58	52.42	-	-	-	25.00	74.19	-	-	0.81	61.00	39.00
Madanthai	13.89	86.11	-	-	-	-	100.00	-	-	-	76.00	24.00
Enathikottai	0.57	69.54	29.89	-	-	-	-	-	95.98	4.02	43.00	57.00
Melaparthibanur	0.57	69.54	29.89	-	-	-	-	-	95.98	4.02	43.00	57.00
Kallikudi	-	100.00	-	-	-	-	-	23.91	72.83	3.26	71.00	29.00
Nelmadur	27.54	72.46	-	-	-	4.35	95.65	-	-	-	57.00	43.00

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	Suffi-cient	Defi-cient
Keelaparthibanur	27.54	72.46	-	-	-	4.35	95.65	-	-	-	57.00	43.00
Soodiyur	53.51	46.49	-	-	-	1.75	-	-	-	98.25	50.00	50.00
Mosukkudi	31.48	67.59	0.93	-	-	1.85	-	-	-	98.15	64.00	36.00
P.Puthur	14.29	74.11	9.82	1.79	-	-	-	-	-	100.00	80.00	20.00
Keelaparuthiyur	2.56	97.44	-	-	-	-	-	2.56	52.99	44.44	73.00	27.00
Thelichathanallur	38.02	61.16	-	0.83	-	-	-	-	57.02	42.98	36.00	64.00
S.Andakkudi	-	100.00	-	-	-	-	-	33.33	61.90	4.76	50.00	50.00
Peerkankurihi	-	100.00	-	-	-	-	-	33.33	61.90	4.76	50.00	50.00
Thaduthalankottai	72.66	26.59	0.75	-	-	1.12	0.37	-	-	98.50	81.00	19.00
Urappuli	58.52	41.48	-	-	-	41.48	51.14	7.39	-	-	60.00	40.00
Nenmeni	58.52	41.48	-	-	-	41.48	51.14	7.39	-	-	60.00	40.00
Kalaiyur	91.74	7.85	-	-	0.41	56.61	43.39	-	-	-	83.00	17.00
K.Karungulam	41.67	58.33	-	-	-	-	-	-	-	100.00	78.00	22.00

Gram Panchayat	Status of Physical condition of the soil (%)								Soil Texture (%)			Soil Water Permeability (Low, Moderate, high)
	Moderately Acidic	Strongly Acidic	Highly Acidic	Moderately Acidic	Slighly Acidic	Neutral	Moderately Alkaline	Strongly Alkaline	Clay soil	Fine Soil	Coarse loamy	
Pambur	-	-	-	-	-	-	100.00	-	-	95.60	0.35	Moderate
Kulandapuri Arungulam	-	-	-	-	-	-	80.00	20.00	-	39.46	35.90	Moderate
Kamuthakudi	0.83	-	-	-	3.67	2.48	86.78	6.00	-	77.00	15.50	Moderate
Melayakudi	0.83	-	-	-	-	2.48	86.78	10.00	-	66.00	20.73	Moderate
Perungarai	-	-	-	-	-	-	98.10	2.00	-	55.00	31.41	Moderate
thenpoduvakudi	-	-	-	-	-	-	100.00	-	-	82.00	12.58	Moderate
Vendoni	-	1.43	-	-	-	-	72.86	25.71	-	77.36	5.95	Moderate
Poduvakudi	-	-	-	-	4.55	-	95.45	-	-	2.82	84.51	High
Vengalur	-	-	-	1.52	1.52	-	81.82	15.15	-	70.00	17.60	Moderate
Villathur	-	-	-	-	-	-	100.00	-	-	47.00	47.71	High
Venkittankurichi	-	-	4.76	44.76	25.71	-	24.76	-	-	86.00	4.87	Moderate
Ariyanendai	-	-	-	1.54	1.54	-	41.54	55.38	-	89.00	-	Moderate
Thinaikulam	-	-	-	1.54	1.54	-	41.54	55.38	-	96.00	-	Moderate
S.Kavanur	-	-	-	16.05	24.69	2.47	56.79	-	-	98.00	-	Moderate
Melakavanur	-	-	-	16.05	24.69	2.47	56.79	-	-	80.00	5.80	Moderate
Tholur	-	-	-	-	-	-	100.00	-	-	13.00	79.04	High
Kanjiyendai	-	-	-	-	-	-	100.00	-	-	13.00	84.60	High
Valimarichan	-	0.42	-	1.69	0.42	-	90.72	6.75	-	36.00	33.70	Moderate
Pudukudi	-	0.42	-	1.69	0.42	-	90.72	6.75	-	28.00	54.84	High
Urakkudi	-	0.42	-	1.69	0.42	-	90.72	6.75	-	3.78	76.80	High
Valangudi	0.81	-	-	3.23	6.45	2.42	83.06	4.03	-	44.00	48.96	High
Madanthai	-	-	-	-	-	-	88.89	11.11	-	50.00	39.59	Moderate
Enathikottai	-	-	-	9.77	19.54	4.60	66.09	-	-	98.00	-	Moderate
Melaparthibanur	-	-	-	9.77	19.54	4.60	66.09	-	-	59.00	-	Moderate
Kallikudi	-	-	1.09	28.26	13.04	-	57.61	-	-	63.00	-	Moderate
Nelmadur	-	-	-	-	-	-	100.00	-	-	85.00	-	Moderate

Gram Panchayat	Status of Physical condition of the soil (%)								Soil Texture (%)			Soil Water Permeability (Low, Moderate, high)
	Mod-erately Acidic	Strongly Acidic	Highly Acidic	Mod-erately Acidic	Slighly Acidic	Neutral	Mod-erately Alkaline	Strongly Alkaline	Clay soil	Fine Soil	Coarse loamy	
Keelaparthibanur	-	-	-	-	-	-	100.00	-	-	73.00	-	Moderate
Soodiyur	-	-	-	-	-	-	100.00	-	-	92.00	-	Moderate
Mosukkudi	-	-	-	-	-	6.48	93.52	-	-	55.00	4.74	Moderate
P.Puthur	-	-	-	50.89	34.82	-	14.29	-	-	73.80	-	Moderate
Keelaparuthiyur	0.85	-	-	26.50	21.37	-	51.28	-	-	61.06	4.36	Moderate
Thelichathanallur	0.83	-	-	-	25.00	2.48	69.00	2.48	-	69.00	6.29	Moderate
S.Andakkudi	-	-	-	-	-	-	66.67	33.33	-	49.00	42.82	Moderate
Peerkankurihi	-	-	-	-	-	-	66.67	33.33	-	79.00	-	Moderate
Thaduthalankottai	-	-	-	40.82	4.87	0.75	50.94	2.62	-	74.00	-	Moderate
Urappuli	-	-	-	31.82	49.43	1.14	17.05	0.57	-	71.00	4.04	Moderate
Nenmeni	-	-	-	31.82	49.43	1.14	17.05	0.57	-	90.00	4.57	Moderate
Kalaiyur	-	-	0.83	64.46	30.58	-	4.13	-	-	84.00	-	Moderate
K.Karungulam	-	-	-	-	-	-	79.17	20.83	-	83.40	-	Moderate

Gram Panchayat	Soil moisture and ET			Means of Water Extraction (%)		Irrigation Methods (%)		Livestock (No.)			
	Volumetric Soil Moisture (%)	Estimated Soil Moisture (ha.m)	ET Losses (ha.m)	Gravity	Lifting	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population	Poultry
Pambur	17	129.20	223.68	61	39	57	43	54	510	301	453
Kulandapuri Arungulam	17	99.70	203.98	24	76	82	18	380	3,400	4,367	1,890
Kamuthakudi	17	196.69	166.54	50	50	100	-	327	2,638	1,039	1,609
Melayakudi	17	163.74	282.72	9	91	85	15	173	724	2	1,083
Perungarai	17	156.69	273.64	9	91	83	17	309	1,592	710	448
thenpoduvakudi	17	103.71	225.42	17	83	82	18	28	-	163	469
Vendoni	17	128.61	97.68	12	88	63	37	114	-	216	1,136
Poduvakudi	17	39.37	45.60	14	86	48	52	104	1,161	666	369
Vengalur	17	103.16	156.61	18	82	68	32	116	1,305	325	859
Villathur	17	81.74	80.14	29	71	100	-	91	455	827	779
Venkittankurichi	17	115.55	220.81	71	29	66	34	98	665	693	910
Ariyanendai	17	55.09	102.71	58	42	56	44	181	415	374	356
Thinaikulam	17	27.54	51.35	80	20	80	20	78	178	160	152
S.Kavanur	17	32.44	77.07	10	90	83	17	27	-	221	1,615
Melakavanur	17	44.78	106.44	9	91	83	17	27	-	221	1,615
Tholur	17	68.31	190.23	50	50	100	-	39	681	307	642
Kanjiyendai	17	94.33	262.70	100	-	100	-	54	941	423	887
Valimarichan	17	70.31	124.17	68	32	86	14	81	229	404	1,161
Pudukudi	17	109.86	194.02	50	50	97	3	128	358	632	1,815
Urakkudi	17	39.55	69.84	100	-	100	-	45	129	228	653
Valangudi	17	105.58	157.08	57	43	98	2	46	545	221	456
Madanthai	17	89.85	104.25	65	35	99	1	60	205	484	230
Enathikottai	17	5.05	15.42	65	35	63	37	40	-	316	326
Melaparthibanur	17	67.15	204.89	65	35	100	-	174	16	860	2,262
Kallikudi	17	76.90	146.26	100	-	100	-	92	45	358	871

Gram Panchayat	Soil moisture and ET			Means of Water Extraction (%)		Irrigation Methods (%)		Livestock (No.)			
	Volumetric Soil Moisture (%)	Estimated Soil Moisture (ha.m)	ET Losses (ha.m)	Gravity	Lifting	Wild Flooding	Control Flooding	Cattle Population	Sheep Population	Goat Population	Poultry
Nelmadur	17	53.58	108.51	88	22	99	1	99	438	308	726
Keelaparthibanur	17	90.82	151.82	47	53	52	48	97	606	254	327
Soodiyur	17	79.40	132.47	57	43	95	5	122	1,191	406	286
Mosukkudi	17	132.48	171.52	53	47	95	5	214	1,339	700	1,782
P.Puthur	17	92.88	280.64	52	48	72	28	192	425	548	1,171
Keelaparuthiyur	17	162.97	306.54	58	42	89	11	58	208	302	504
Thelichathanallur	17	161.65	109.01	63	37	100	-	199	253	241	876
S.Andakkudi	17	229.84	171.05	64	36	65	35	578	973	1,058	2,230
Peerkankurihi	17	78.55	167.76	56	44	95	5	90	432	306	594
Thaduthalankottai	17	98.61	215.85	80	20	97	3	70	316	372	478
Urappuli	17	135.63	74.78	80	20	100	-	332	217	511	456
Nenmeni	17	94.94	52.34	56	44	92	8	232	152	358	320
Kalaiyur	17	67.10	83.99	58	42	99	1	30	596	135	96
K.Karungulam	17	31.55	68.08	44	66	90	10	4	30	72	552

ANNEXURE 3.11

GP WISE DEMOGRAPHIC AND SOCIO ECONOMIC STATUS

Gram Panchayat	Geo-graphical Area (ha)	Male Popula-tion (No.)	Female Popula-tion (No.)	Total Popula-tion (No.)	SC Pop-ulation (No.)	ST Pop-ulation (No.)	Vulnera-ble pop-upation (No.)	House-holds (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vul-nerable House-holds (SECC) (No.)
Pambur	863	1,058	1,092	2,150	1,036	-	1,036	505	21	31	24
Kulandapuri Arungulam	706	912	879	1,791	801	-	801	429	285	32	209
Kamuthakudi	1,535	1,756	1,718	3,474	844	-	844	869	62	51	59
Melayakudi	1,174	1,758	1,710	3,468	534	-	534	829	8	28	14
Perungarai	1,424	1,572	1,489	3,061	567	-	567	806	-	21	6
thenpoduvakudi	644	257	222	479	277	-	277	124	1	12	4
Vendoni	1,049	3,003	2,870	5,873	2,633	133	2,766	1,265	34	52	39
Poduvakudi	274	448	444	892	250	-	250	214	21	12	18
Vengalur	810	813	810	1,623	1,122	-	1,122	432	1	39	12
Villathur	577	904	913	1,817	174	-	174	493	-	31	9
Venkittankurichi	845	1,156	1,219	2,375	1,055	-	1,055	620	83	39	70
Ariyanendai	510	1,472	1,472	2,944	786	-	786	764	34	62	42
Thinaikulam	302	1,472	1,472	2,944	786	-	786	764	34	62	42
S.Kavanur	268	978	959	1,937	906	-	906	496	42	36	40
Melakavanur	346	978	959	1,937	906	-	906	496	42	36	40
Tholur	522	1,691	1,571	3,262	791	-	791	732	50	34	45
Kanjiyendai	714	1,691	1,571	3,262	791	-	791	732	50	34	45
Valimarichan	542	2,490	2,321	4,811	2,022	1	2,023	1,183	30	69	42
Pudukudi	828	2,490	2,321	4,811	2,022	1	2,023	1,183	30	69	42
Urakkudi	320	2,490	2,321	4,811	2,022	1	2,023	1,183	30	69	42
Valangudi	724	1,049	991	2,040	377	-	377	527	20	25	22
Madanthai	640	280	293	573	400	-	400	109	3	4	3

Gram Panchayat	Geo-graphical Area (ha)	Male Popula-tion (No.)	Female Popula-tion (No.)	Total Popula-tion (No.)	SC Pop-ulation (No.)	ST Pop-ulation (No.)	Vulnera-ble pop-upation (No.)	House-holds (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vul-nerable House-holds (SECC) (No.)
Enathikottai	70	380	398	778	618	-	618	195	1	17	6
Melaparthibanur	931	3,653	3,591	7,244	2,036	-	2,036	1,874	7	91	32
Kallikudi	720	1,008	1,059	2,067	1,769	-	1,769	463	7	36	16
Nelmadur	253	1,008	1,059	2,067	1,769	-	1,769	463	7	36	16
Keelaparthibanur	800	1,377	1,366	2,743	1,023	-	1,023	710	101	67	91
Soodiyur	699	1,377	1,366	2,743	1,023	-	1,023	710	101	67	91
Mosukkudi	847	318	295	613	200	-	200	177	-	15	5
P.Puthur	795	893	871	1,764	746	-	746	470	3	45	16
Keelaparuthiyur	1,285	983	927	1,910	315	-	315	520	57	40	52
Thelichathanallur	1,440	431	428	8,050	661	-	661	2,307	3	100	32
S.Andakkudi	832	361	347	708	616	-	616	176	-	11	3
Peerkankurihi	644	579	559	1,138	165	-	165	258	6	10	7
Thaduthalankottai	803	614	608	1,222	486	-	486	305	1	39	12
Urappuli	719	2,805	2,622	5,427	1,369	-	1,369	1,347	14	84	35
Nenmeni	527	2,805	2,622	5,427	1,369	-	1,369	1,347	14	84	35
Kalaiyur	1,020	1,439	1,346	2,785	1,022	-	1,022	332	31	27	30
K.Karungulam	242	245	235	480	133	-	133	269	1	13	5

Gram Panchayat	% of Vulnerable Households (%)	Registered MGNREGA Job cards (Persons)	Active person working in MGNREGA job Cards (Persons)	Drinking Water Sources (No.)	HH's have tap water connection for drinking water (No.)	HH's dependent on other sources for drinking water (No.)	Annual Greywater Generation (ha.m)
Pambur	5	517	435	31	537	100	4
Kulandapuri Arungulam	49	763	589	23	428	-	3
Kamuthakudi	7	970	709	159	503	363	6
Melayakudi	2	1,109	839	101	280	-	6
Perungarai	1	1,270	1,032	346	280	-	6
thenpoduvakudi	3	227	173	48	280	-	1
Vendoni	3	1,202	859	332	1,433	-	11
Poduvakudi	9	482	300	55	230	-	2
Vengalur	3	710	486	47	432	-	3
Villathur	2	694	571	151	260	-	3
Venkittankurichi	11	711	583	120	795	850	4
Ariyanendai	6	664	524	97	650	900	5
Thinaikulam	6	387	317	164	650	388	5
S.Kavanur	8	422	297	13	290	64	4
Melakavanur	8	341	276	25	175	100	4
Tholur	6	613	379	30	242	200	6
Kanjiyendai	6	865	709	7	500	75	6
Valimarichan	4	663	465	67	612	1,221	9
Pudukudi	4	625	446	17	300	186	-
Urakkudi	4	681	478	29	200	150	9
Valangudi	4	486	384	52	289	469	4
Madanthai	3	581	477	161	110	700	1
Enathikottai	3	243	181	84	190	260	1
Melaparthibanur	2	1,156	867	84	190	260	13
Kallikudi	3	416	352	38	428	428	4
Nelmadur	3	497	442	97	486	463	4

Gram Panchayat	% of Vulnerable Households (%)	Registered MGNREGA Job cards (Persons)	Active person working in MGNREGA job Cards (Persons)	Drinking Water Sources (No.)	HH's have tap water connection for drinking water (No.)	HH's dependent on other sources for drinking water (No.)	Annual Greywater Generation (ha.m)
Keelaparthibanur	13	604	503	39	320	560	5
Soodiyur	13	528	412	305	485	965	5
Mosukkudi	3	588	435	66	150	730	1
P.Puthur	3	401	335	40	433	433	3
Keelaparuthiyur	10	370	280	63	360	524	3
Thelichathanallur	1	783	588	31	207	1,568	15
S.Andakkudi	2	708	544	337	301	850	1
Peerkankurihi	3	578	395	114	235	632	2
Thaduthalankottai	4	433	350	146	425	810	2
Urappuli	3	393	312	250	583	828	10
Nenmeni	3	484	404	39	521	949	10
Kalaiyur	9	899	760	86	690	550	5
K.Karungulam	2	356	309	19	115	100	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 jth indicator for i^{th} GP and X_{ij}^P is the normalized value

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

ANNEXURE 5.1

GP WISE WASCA PROPOSED TREATMENT AREA

Gram Panchayat	Non-Agricultural Uses	Barren & Un-cultivable Land	Land Under Miscellaneous Tree Criticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
Pambur	1.75	-	107.95	0.31	2.94	6.99	6.13	2.92
Kulandapuri Arungulam	2.04	-	119.00	2.34	56.80	37.74	6.43	116.44
Kamuthakudi	14.89	-	-	1.44	-	58.54	8.03	14.31
Melayakudi	3.60	-	149.60	-	43.42	40.89	25.12	48.00
Perungarai	65.37	-	84.15	1.91	8.79	30.73	9.45	33.08
thenpoduvakudi	0.58	-	124.95	-	10.28	43.18	61.83	23.62
Vendoni	19.60	-	12.75	1.29	2.65	14.38	1.11	4.05
Poduvakudi	0.72	-	0.85	0.03	5.55	7.43	0.17	7.60
Vengalur	8.80	-	39.11	-	11.60	16.01	6.67	16.20
Villathur	1.63	-	-	0.02	-	65.45	17.78	12.93
Venkittankurichi	2.81	-	40.80	30.60	10.41	5.04	16.89	9.36
Ariyanendai	29.83	-	10.40	-	20.12	29.51	48.35	23.61
Thinaikulam	15.97	-	5.20	-	10.06	14.76	24.17	11.81
S.Kavanur	1.79	-	8.57	-	0.60	2.85	8.23	2.77
Melakavanur	2.47	-	11.83	-	0.83	3.93	11.37	3.83
Tholur	0.44	-	92.46	0.50	2.09	0.12	10.00	5.34
Kanjiyendai	0.60	-	127.69	0.69	2.89	0.16	13.80	7.38
Valimarichan	6.43	-	47.06	7.65	2.55	4.12	1.53	5.77
Pudukudi	10.04	-	73.53	11.95	3.98	6.44	2.39	9.01
Urakkudi	3.62	-	26.47	4.30	1.43	2.32	0.86	3.24
Valangudi	1.77	-	78.20	-	4.62	8.19	1.36	6.99
Madanthai	1.50	-	36.55	36.13	2.71	5.88	0.53	4.17
Enathikottai	12.90	-	0.96	0.16	-	-	0.36	0.49
Melaparthibamur	171.43	-	12.75	2.12	-	-	3.23	4.32

Gram Panchayat	Non-Agricul-tural Uses	Barren & Un-cultivable Land	Land Under Miscellane-ous Tree Crit-icalops etc.	Cultivable Waste Land	Fallows Land other than Current Fal-lows	Current Fal-low land	Unirrigated Land	Treatment Area Irrigat-ed by Source
Kallikudi	34.67	-	16.83	3.68	0.80	4.23	1.36	6.45
Nelmadur	6.11	-	15.71	0.32	1.20	2.01	2.18	3.50
Keelaparthibanur	32.57	-	24.04	0.46	10.40	21.17	4.03	30.11
Soodiyur	27.57	-	12.14	0.97	11.62	15.95	3.92	27.21
Mosukkudi	1.76	-	33.11	1.16	5.07	8.41	1.57	7.12
P.Puthur	67.44	-	34.68	-	0.05	0.21	7.27	7.63
Keelaparuthiyur	5.24	-	133.80	2.64	33.68	3.15	18.57	24.41
Thelichathanallur	58.05	-	-	17.65	0.18	7.03	0.83	1.26
S.Andakkudi	93.83	-	71.40	70.44	2.07	16.76	2.76	2.12
Peerkankurihi	12.68	-	53.21	1.26	1.69	2.48	1.37	6.40
Thaduthalankottai	1.77	-	83.64	-	0.96	5.70	1.62	10.98
Urappuli	-	267.67	0.96	0.01	0.01	10.18	2.26	2.00
Nenmeni	-	187.37	0.68	0.01	0.01	7.13	1.58	1.40
Kalaiyur	1.47	-	-	0.03	-	21.04	10.71	3.77
K.Karungulam	1.55	-	8.50	-	5.82	3.56	13.50	6.97

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	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Pambur	1.23	15.37	-
Kulandapuri Arungulam	1.24	17.23	-
Kamuthakudi	42.92	0.20	-
Melayakudi	1.19	21.24	-
Perungarai	34.01	12.22	-
thenpoduvakudi	5.63	17.74	-
Vendoni	18.73	2.46	2.59
Poduvakudi	5.11	0.15	2.42
Vengalur	8.04	6.84	5.88
Villathur	7.50	-	-
Venkittankurichi	2.93	10.14	-
Ariyanendai	18.31	1.82	14.18
Thinaikulam	5.16	0.89	15.47
S.Kavanur	5.44	1.60	4.51
Melakavanur	4.71	2.21	6.22
Tholur	2.71	16.62	14.74
Kanjiyendai	9.69	22.95	20.35
Valimarichan	26.58	10.01	10.09
Pudukudi	8.67	15.64	15.76
Urakkudi	9.08	5.63	5.67
Valangudi	17.26	13.68	2.47
Madanthai	15.69	12.71	1.55
Enathikottai	3.43	0.20	0.10
Melaparthibanur	46.53	2.60	0.88
Kallikudi	36.99	3.73	9.33
Nelmadur	18.43	3.01	4.51
Keelaparthibanur	8.36	3.65	20.76
Soodiyur	21.97	2.29	6.84
Mosukkudi	18.56	5.99	2.58
P.Puthur	66.88	6.06	1.77
Keelaparuthiyur	54.23	23.86	9.30
Thelichathanallur	36.47	2.51	-
S.Andakkudi	66.77	24.80	2.76
Peerkankurihi	21.62	9.52	1.39
Thaduthalankottai	16.78	14.63	2.25
Urappuli	46.23	0.17	1.68
Nenmeni	25.63	0.12	1.18
Kalaiyur	12.63	-	4.14
K.Karungulam	7.49	1.49	3.48

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.	Extent	Plants	Area	No.	Length	No.
Ariyanendal	23,861	30	24	760	3,039	5	45	8,323	10	823	3,293	5
Enathikottai	10,322	13	34	735	2,938	1	10	895	1	251	1,005	1
K.Karungulam	1,240	2	2	350	1,399	-	1	6,800	9	-	-	-
Kalaiyur	1,179	1	2	539	2,156	1	7	22	0	397	1,588	1
Kallikudi	27,736	35	-	848	3,392	2	23	16,406	21	650	2,600	2
Kamuthakudi	11,910	15	-	987	3,947	8	82	1,149	1	4,764	19,057	8
Kanjiyendal	482	1	73	1,113	4,451	1	13	102,698	128	2,504	10,016	1
Keelaparthibanur	26,058	33	-	706	2,822	2	24	19,596	24	879	3,515	2
Keelaparuthiyur	4,195	5	12	2,381	9,522	1	15	109,153	136	666	2,662	1
Kulandapuri Arungulam	1,630	2	17	233	933	10	95	97,070	121	452	1,809	10
Madanthai	1,198	2	1	735	2,938	2	15	58,140	73	-	-	2
Melakavanur	1,975	2	-	589	2,356	1	7	9,466	12	-	-	1
Melaparthibanur	137,141	171	-	1,081	4,323	4	44	11,895	15	341	1,362	4
Melayakudi	2,877	4	14	860	3,439	4	43	119,680	150	405	1,618	4
Mosukkudi	1,406	2	6	2,033	8,132	5	54	27,416	34	-	-	5
Nelmadur	4,886	6	-	306	1,225	2	25	12,823	16	108	431	2
Nenmeni	149,895	187	2	1,303	5,212	6	58	547	1	1,316	5,264	6
P.Puthur	53,956	67	32	1,503	6,011	5	48	27,744	35	195	780	5
Pambur	349	2	17	881	3,524	1	14	86,605	108	1,469	5,875	1
Peerkankurihi	10,147	13	9	1,293	5,172	2	23	43,574	54	-	-	2
Perungarai	52,295	65	23	1,608	6,430	8	77	68,850	86	1,695	6,781	8
Poduvakudi	574	1	18	350	1,399	3	26	707	1	625	2,500	3
Pudukudi	8,035	10	61	1,405	5,618	3	32	68,381	85	884	3,536	3
S.Andakkudi	75,067	94	24	1,734	6,936	14	145	113,472	142	1,691	6,764	14
S.Kavanur	1,433	2	32	561	2,243	1	7	6,854	9	90	360	1

Gram Panchayat	Aff		ARS	AVP		Az		BP		CBP		CS
	No.	Area	No.	No.	Length	No.	Extent	Plants	Area	No.	Length	No.
Soodiyur	22,053	28	8	1,371	5,484	3	31	10,487	13	855	3,421	3
Thaduthalankottai	1,416	2	13	750	2,999	2	18	66,912	84	807	3,228	2
Thelichathanallur	46,444	58	-	2,424	9,697	5	50	14,117	18	-	-	5
Thenpoduvakudi	461	1	6	1,073	4,290	1	7	99,960	125	449	1,797	1
Thinaikulam	12,779	16	-	500	2,000	2	20	4,162	5	140	561	2
Thinaikulam.1a												
Tholur	349	0	-	1,026	4,105	1	10	74,367	93	1,517	6,068	1
Tholur												
Urakkudi	2,893	4	32	676	2,702	1	11	24,617	31	152	607	1
Urakkudi.4b												
Urappuli	214,135	268	-	1,275	5,098	8	83	782	1	2,132	8,526	8
Valangudi	1,416	2	1	2,459	9,837	1	12	62,560	78	1,684	6,737	1
Valimarichan	5,143	6	1	1,353	5,413	2	20	43,764	55	590	2,361	2
Vendoni	15,677	20	20	350	1,399	3	29	11,234	14	250	1,000	3
Vengalur	7041	8.8	23	350	1399	3	29	31287	39.11	750	3000	3
Venkittankurichi	2250	2.81	18	422	1688	2	25	57120	71.4	1070	4281	2
Villathur	1307	1.63	0	472	1886	2	23	14	0.02	916	3662	2

Gram Panchayat	CT No.	Co No.	Co Area	FP No.	CCBF No.	CCBF Area	DLT Plants	DLT Length	DLHAI No.	DLHAI Area	FBBTI No.	FBBTI Area	FD No.
Ariyamendal	5	39	122	39	5,965	30	-	-	24	61	49	122	5
Enathikottai	1	-	1	-	2,581	13	-	-	-	-	-	1	1
K.Karungulam	-	9	30	9	310	2	33	134	6	15	12	30	-
Kalaiyur	1	13	36	13	295	1	-	-	7	18	14	36	1
Kallikudi	2	3	13	3	6,934	35	1,174	4,694	3	6	5	13	2
Kamuthakudi	8	27	81	27	2,978	15	-	-	16	40	32	81	8
Kanjiyendal	1	7	24	7	120	1	-	-	5	12	10	24	1
Keelaparthibanur	2	14	66	14	6,515	33	525	2,100	13	33	26	66	2
Keelaparuthiyur	1	22	80	22	1,049	5	485	1,939	16	40	32	80	1
Kulandapuri Arungulam	10	40	217	40	408	2	280	1,118	43	109	87	217	10
Madanthai	2	4	13	4	300	2	-	-	3	7	5	13	2
Melakavanur	1	6	20	6	494	2	-	-	4	10	8	20	1
Melaparthibanur	4	1	8	1	34,285	171	645	2,579	2	4	3	8	4
Melayakudi	4	44	157	44	719	4	-	-	31	79	63	157	4
Mosukkudi	5	6	22	6	352	2	647	2,587	4	11	9	22	5
Nelmadur	2	2	9	2	1,221	6	513	2,051	2	4	4	9	2
Nenmeni	6	3	10	3	37,474	187	934	3,734	2	5	4	10	6
P.Puthur	5	3	15	3	13,489	67	625	2,498	3	8	6	15	5
Pambur	1	6	19	6	349	2	-	-	4	9	8	19	1
Peerkankurihi	2	2	12	2	2,537	13	-	-	2	6	5	12	2
Perungarai	8	20	82	20	13,074	65	-	-	16	41	33	82	8
Poduvakudi	3	5	21	5	143	1	224	895	4	10	8	21	3
Pudukudi	3	5	22	5	2,009	10	-	-	4	11	9	22	3
S.Andakkudi	14	9	24	9	18,767	94	-	-	5	12	9	24	14
S.Kavanur	1	5	14	5	358	2	-	-	3	7	6	14	1
Soodiyur	3	13	59	13	5,513	28	451	1,803	12	29	23	59	3
Thaduthalankottai	2	3	19	3	354	2	-	-	4	10	8	19	2
Thelichathanallur	5	3	9	3	11,611	58	1,252	5,007	2	5	4	9	5

Gram Panchayat	CT	Co		FP	CCBF		DLT		DLHAI		FBBTI		FD
	No.	No.	Area	No.	No.	Area	Plants	Length	No.	Area	No.	Area	No.
Thenpoduvakudi	1	46	139	46	115	1	-	-	28	69	56	139	1
Thinaikulam	2	20	61	20	3,195	16	-	-	12	30	24	61	2
Thinaikulam.1a													
Tholur	1	5	18	5	87	0	-	-	4	9	7	18	1
Tholur													
Urakkudi	1	2	8	2	723	4	-	-	2	4	3	8	1
Urakkudi.4b													
Urappuli	8	5	14	5	53,534	268	984	3,936	3	7	6	14	8
Valangudi	1	6	21	6	354	2	-	-	4	11	8	21	1
Valimarichan	2	3	14	3	1,286	6	575	2,301	3	7	6	14	2
Vendoni	3	7	22	7	3,919	20	224	895	4	11	9	22	3
Vengalur	3	14	50.47	14	1760	8.8	1119	4476.89	10	25	20	50.47	3
Venkittankurichi	2	13	41.7	13	563	2.81	0	0	8	21	17	41.7	2
Villathur	2	33	96.16	33	327	1.63	0	0	19	48	38	96.16	2

Gram Panchayat	GSS No.	ICP Plants	ICP Length	LDI No.	LDI Area	LP Plants	LP Length	MI No.	MI Area	NA-DEP No.	ND Plants	ND HHs	PS No.
Ariyanendal	48	142	568	20	49	204	816	9	24	5	3,920	784	9
Enathikottai	32	-	-	-	0	4	14	-	0	1	950	190	8
K.Karungulam	8	331	1,323	5	11	152	606	3	7	-	575	115	14
Kalaiyur	28	139	557	6	16	18	72	2	4	1	3,485	697	2
Kallikudi	37	188	750	1	3	-	-	3	6	2	2,485	497	22
Kamuthakudi	170	796	3,183	13	33	1,131	4,524	6	14	8	4,430	886	40
Kanjiyendal	66	222	888	3	8	-	-	3	7	1	3,895	779	22
Keelaparthibanur	41	179	715	7	18	-	-	12	30	2	3,495	699	8
Keelaparuthiyur	35	179	715	11	28	1,270	5,078	10	24	1	2,355	471	13
Kulandapuri Arungulam	522	924	3,694	20	50	13	53	47	116	10	2,140	428	47
Madanthai	54	382	1,528	2	5	1,135	4,540	2	4	2	720	144	6
Melakavanur	22	143	572	3	8	-	-	2	4	1	2,535	507	40
Melaparthibanur	86	218	873	1	2	130	519	2	4	4	8,395	1,679	57
Melayakudi	18	253	1,013	22	55	546	2,185	19	48	4	4,250	850	27
Mosukkudi	103	618	2,473	3	8	1,376	5,504	3	7	5	800	160	45
Nelmadur	42	155	620	1	3	-	-	1	4	2	2,485	497	18
Nenmeni	40	-	-	2	4	725	2,900	1	1	6	6,705	1,341	8
P.Puthur	65	-	-	2	4	583	2,330	3	8	5	2,235	447	29
Pambur	20	333	1,331	3	8	500	2,000	1	3	1	2,685	537	11
Peerkankurihi	41	414	1,656	1	3	392	1,568	3	6	2	1,240	248	15
Perungarai	111	356	1,422	10	24	1,125	4,501	13	33	8	3,875	775	11
Poduvakudi	96	58	233	3	7	103	412	3	8	3	1,150	230	9
Pudukudi	72	455	1,818	3	6	-	-	4	9	3	5,685	1,137	45
S.Andakkudi	130	81	325	4	11	928	3,713	1	2	14	805	161	56
S.Kavanur	22	217	869	2	6	-	-	1	3	1	2,535	507	40
Soodiyur	70	-	-	6	16	321	1,282	11	27	3	3,495	699	7
Thaduthalankottai	45	215	861	2	4	128	512	4	11	2	1,500	300	12

Gram Panchayat	GSS	ICP		LDI		LP		MI		NA-DEP	ND		PS
	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.	Plants	HHs	No.
Thelichathanallur	6	810	3,241	2	4	681	2,724	1	1	5	13,700	2,740	22
Thenpoduvakudi	16	695	2,780	23	58	434	1,734	9	24	1	630	126	12
Thinaikulam	20	170	679	10	25	-	-	5	12	2	3,920	784	4
Thinaikulam.1a													
Tholur	48	244	977	2	6	-	-	2	5	1	3,895	779	16
Tholur													
Urakkudi	26	102	406	1	2	-	-	1	3	1	5,685	1,137	16
Urakkudi.4b													
Urappuli	57	161	644	2	6	474	1,896	1	2	8	6,705	1,341	11
Valangudi	33	-	-	3	7	960	3,840	3	7	1	2,650	530	11
Valimarichan	46	245	978	2	4	-	-	2	6	2	5,685	1,137	29
Vendoni	22	1,529	6,117	4	9	300	1,200	2	4	3	7,265	1,453	28
Vengalur	65	1657	6626	7	17.14	122.5	490	6	16.2	3	2160	432	21
Venkittankurichi	86	356	1425	6	16.17	39	156	4	9.36	2	3145	629	23
Villathur	94	908	3632	17	41.62	195.2	780.8	5	12.93	2	2370	474	19

Gram Panchayat	RPWDT No.	Roo No.	RP No.	RRWH No.	SPD No.	SPD Area	SPC No.	SPI No.	WCICD Length
Ariyamendal	2	6		2			8	78	568
Enathikottai		2		2			2	19	0
K.Karungulam	3	3	0	2	0	0	1	12	1323
Kalaiyur	-	14	0	2	0	0	7	70	557
Kallikudi	5	4	0	2	0	0	5	50	750
Kamuthakudi	5	10	0	2	0	0	9	89	3183
Kanjiyendal	7	9		2			8	78	888
Keelaparthibanur	1	7	0	2	0	0	7	70	715
Keelaparuthiyur	8	7	0	2	0	0	5	47	715
Kulandapuri Arungulam	2	3	0	2	0	0	4	43	3694
Madanthai	4	8		2			1	14	1528
Melakavanur	1	5		2			5	51	572
Melaparthibanur	1	2		2			17	168	873
Melayakudi	4	11	0	2	0	0	9	85	1013
Mosukkudi	7	10	0	2	0	0	2	16	2473
Nelmadur	1	9	0	2	0	0	5	50	620
Nenmeni	4	6	0	2	0	0	13	134	0
P.Puthur	2	8	0	2	0	0	4	45	0
Pambur	1	10	0	2	0	0	5	54	1331
Peerkankurihi	6	7	0	2	0	0	2	25	1656
Perungarai	4	15	0	2	0	0	8	78	1422
Poduvakudi	1	2	0	2	0	0	2	23	233
Pudukudi	6	6		2			11	114	1818
S.Andakkudi	3	13	0	2	0	0	2	16	325
S.Kavanur		6		2			5	51	869
Soodiyur	3	4	0	2	0	0	7	70	0
Thaduthalankottai	3	5	0	2	0	0	3	30	861
Thelichathanallur	2	3	0	2	0	0	27	274	3241

Gram Panchayat	RPWDT	Roo	RP	RRWH	SPD		SPC	SPI	WCICD
	No.	No.	No.	No.	No.	Area	No.	No.	Length
Thenpoduvakudi	2	8	0	2	0	0	1	13	2780
Thinaikulam				2			8	78	679
Thinaikulam.1a	0	7	0		0	0			
Tholur				2			8	78	977
Tholur	3	7	0		0	0			
Urakkudi				2			11	114	406
Urakkudi.4b	1	6	0		0	0			
Urappuli	1	3	0	2	0	0	13	134	644
Valangudi	4	10		2			5	53	0
Valimarichan	7	7		2			11	114	978
Vendoni	2	7	0	2	0	0	15	145	6117
Vengalur	4	6	0	2	0	0	4	43	6626
Venkittankurichi	3	7	0	2	0	0	6	63	1425
Villathur	1	7	0	0	0	0	5	47	3632

ANNEXURE 7.1

GP WISE WASCA RECOMMENDATION AND WORKS UPLOADED

GP	WASCA Recommendation for 3 Years	WASCA Uploaded for FY-2021-22 as on 16-03-2022 FY-2021-22 as on 02/02/2022
Ariyanendal A/B	452	95
Enathikottai	138	46
Es.Andakkudi	9,513	1
Kalayur	312	93
Kallikudi A/B	357	107
Kamuthakudi	5,193	3
Kanjiyae Ndhal	817	151
Keelaparthibanur	786	-
Keelapparuththiyur	314	81
K.Karungulam	540	243
Kulandhaapuri	543	227
Madanthai	2,361	188
Melaaykkudi	2,786	-
Melakavanur	178	47
Melappaarthibanur	336	-
Moosukudi	1,155	493
Nelmadoor	623	-
Nenmeni	440	-
Pambur	688	-
Peerkkankurichchi	675	136
Perungarai	3,084	282
Podhuvakkudi	425	57
P.Puthur	191	166
Pudukkkudi	816	197
S. Kavanur	582	141
Soodiyur B/C	854	-
Thaduthalankottai A/B	727	2
Thelichathanallur	1,338	-
Thenpodhuvakkudi	331	-
Thinaikulam	260	144
Tholoor	469	-
Urakudi	449	150
Urappuli	460	59
Vaalangudi	1,357	-
Valimarichan A/C	827	-
Vendhoni	1,696	-
Vengaaloor	1,004	-
Venkittankurichchi	951	140
Vilaththur	280	132

ANNEXURE 7.2

GP WISE ONGOING WORKS IN PARAMAKUDI BLOCK

GP	Work Category	No of ongoin works
Ariyanendal A/B	Anganwadi/Other Rural Infrastructure	2
	Drought Proofing	1
	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	2
Enathikottai	Drought Proofing	1
Es.Andakkudi	Drought Proofing	3
	Water Conservation and Water Harvesting	3
	Works on Individuals Land (Category IV)	2
K.Karungulam	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Kalayur	Water Conservation and Water Harvesting	4
Kallikudi A/B	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	2
Kamuthakudi	Drought Proofing	4
	Water Conservation and Water Harvesting	3
	Works on Individuals Land (Category IV)	1
Kanjiyae Ndhal	Drought Proofing	3
	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	1
Keelaparthibanur	Rural Sanitation	1
	Water Conservation and Water Harvesting	3
Keelapparuththiyur	Drought Proofing	2
Kulandhaapuri	Drought Proofing	2
	Water Conservation and Water Harvesting	2
Madanthai	Anganwadi/Other Rural Infrastructure	1
	Drought Proofing	1
	Water Conservation and Water Harvesting	2
Melaaykkudi	Anganwadi/Other Rural Infrastructure	1
	Drought Proofing	4
	Water Conservation and Water Harvesting	1
Melakavanur	Drought Proofing	2
Melappaarthibanur	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Nelmadoor	Drought Proofing	1
	Rural Sanitation	1
	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	1
Nenmeni	Drought Proofing	2
	Works on Individuals Land (Category IV)	1
P.Puthur	Water Conservation and Water Harvesting	3
Pambur	Drought Proofing	2
	Works on Individuals Land (Category IV)	1

GP	Work Category	No of ongoin works
Peerkkankurichchi	Drought Proofing	1
Perungarai	Rural Connectivity	1
	Water Conservation and Water Harvesting	3
Podhuvakkudi	Drought Proofing	1
	Water Conservation and Water Harvesting	1
Pudukkkudi	Water Conservation and Water Harvesting	2
S. Kavanur	Drought Proofing	2
Soodiyur B/C	Drought Proofing	1
Thaduthalankottai A/B	Rural Connectivity	1
	Water Conservation and Water Harvesting	2
Thelichathanallur	Works on Individuals Land (Category IV)	2
Thenpodhuvakkudi	Drought Proofing	2
Thinaikulam	Rural Connectivity	1
	Works on Individuals Land (Category IV)	2
Tholoor	Drought Proofing	3
	Works on Individuals Land (Category IV)	1
Urakudi	Drought Proofing	1
	Water Conservation and Water Harvesting	4
Urappuli	Drought Proofing	2
	Rural Sanitation	1
Vaalangudi	Water Conservation and Water Harvesting	3
Valimarichan A/C	Drought Proofing	1
	Rural Sanitation	1
	Water Conservation and Water Harvesting	1
Vendhoni	Drought Proofing	2
	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	2
Vengaaloor	Water Conservation and Water Harvesting	1
Venkittankurichchi	Drought Proofing	1
	Works on Individuals Land (Category IV)	58

ANNEXURE 8

CWRM KEY INDICATORS FOR GPs IN KAMUTHAKUDI MICRO-WATERSHED

CWRM Parameter	Kamuthakudi	Madanthai
Soil Resources: Status of Available Nitrogen (%)		
Very Low	100.00	13.89
Low	0.00	86.11
Status of Organic Carbon (%)		
Very Low	38.02	0.00
Low	61.16	100.00
High	0.83	0.00
Status of Soil Micro Nutrients (%)		
Sufficient	39.00	76.00
Deficient	61.00	24.00
Status of Physical condition of the soil (%)		
Moderately Acidic	0.83	0.00
Slighly Acidic	3.67	0.00
Neutral	2.48	0.00
Moderately Alkaline	86.78	88.89
Strongly Alkaline	6.00	11.11
Soil Texture (%)		
Fine Soil	77.00	50.00
Coarse loamy	15.50	39.59
Soil Water Permeability (Low, Moderate, high)	Moderate	Moderate
Soil moisture and ET		
Volumetric Soil Moisture (%)	17.00	17.00
Estimated Soil Moisture (ha.m)	196.69	89.85
ET Losses (ha.m)	166.54	104.25
Means of Water Extraction (%)		
Gravity	50	65
Lifting	50	35
Irrigation Methods (%)		
Wild Flooding	100	99
Control Flooding	0	1
Livestock (No.)		
Cattle Population	327	60
Sheep Population	2,638	205
Goat Population	1,039	484
Poultry	1,609	230
Land Resources (ha)		
Non-Agricultural Uses	378.04	88.00
Area under Barren & Un-cultivable Land	0.00	0.00
Land Under Miscellaneous Tree Criticalops etc.	0.00	43.00
Cultivable Waste Land	1.69	42.50
Fallows Land other than Current Fallows	0.00	90.37
Current Fallow land	836.25	195.93
Unirrigated Land	114.65	17.71
Area Irrigated by Source	204.39	139.01

பாரதீய ஊராட்சி தினியம்
உரப்புளி ஊராட்சி
அரியலூரக மாரங்களின் சாலைலையும்