



Ministry of Rural Development Ministry of Jal Shakti



# WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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

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# WATER SECURITY AND CLIMATE ADAPTATION IN RURAL INDIA



## Block Level Composite Water Resources Management Plan under Mahatma Gandhi NREGS

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





# FOREWORD



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



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

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

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

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

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

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

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

tation of Water Security and CA) a technical cooperation

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

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

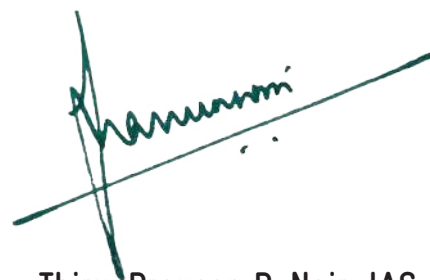
1.	Development of Public and Common lands
2.	Development of Agriculture and allied activities
3.	Development of Rural Infrastructure Management
4.	Development of Climate Resilience Measures

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

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

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

“  
The block level CWRM book will help the GP,  
Block officers and Gram Panchayats in plan-  
ning, implementing works in holistic manner,  
reducing water scarcity in the district  
”



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



# FOREWORD

**Rajeev Ahal**  
Director,  
NRM & Agroecology, GIZ India



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

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

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

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

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

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

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

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

We look forward to its success!

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

**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 partners MSSRF build canonical officers of Rural Depletion of 1,289 GP plans. In Nationally approved Com-agement (CWRMP) frame Bhuvan NRSC ISRO GIS

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

resource centres, GIZ with the pacity of Block, GP level tech-velopment Department in com-parison of GP level plans, posite Water Resources Man-works is adopted along with platform.

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

tified through CWRM are up-works focused on treatment of

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

**Thiru. S.S Kumar**

Additional Director (MGNREGS),  
RD&PR, Government of Tamil Nadu



# MESSAGES



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



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

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

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

of public and common land, agriculture and allied activities and rural infrastructure. The whole planning process followed a bottom-up approach in identifying appropriate actions based on scientific analysis. I consider such decentralized level of planning is necessary in ensuring water security in the context of increasing climate change impacts.

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

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

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

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







# CONTENT

## **Chapter 1 About the Block**

## **Chapter 2 Climate and Water Security**

**2.1** Climate risks

**2.2** WASCA climate vulnerability indicators

**2.3** Compressive analysis of Block level vulnerability

## **Chapter 3 Gram Panchayat Planning in Mahatma Gandhi NREGS**

**3.1** Composite water resource management approach

**3.2** Categorization of GPs

**3.3** Data collection – Spatial & non-spatial

**3.4** CWRM planning analysis – Climate

**3.5** CWRM planning analysis – Water

**3.6** CWRM planning analysis – Agriculture

**3.7** CWRM planning analysis – Socio-economic

## **Chapter 4 Vulnerability ranking of GPs**

## **Chapter 5 Proposed key water actions under Mahatma Gandhi NREGS convergence**

**5.1** The proposed area under WASCA treatment

**5.2** Development of public & common lands

**5.3** Development of agriculture and allied sectors

**5.4** Development of rural infrastructure

**5.5** Proposed climate resilience measures

## **Chapter 6 Projected outcomes of planning**

**6.1** Outcomes of Development of public and common lands





- 6.2** Outcomes of Development of agriculture and allied sector
- 6.3** Outcomes of Rural infrastructure development
- 6.4** Outcomes of Climate resilience measures
- 6.5** Linkages to SDGs, NDCs

## **Chapter 7 Implementation of GP plans**

- 7.1** Integration into NREGA-soft
- 7.2** NRM and non-NRM works
- 7.3** On-going Works
- 7.4** Catch the Rain

## **Chapter 8 Case Study**

- 8.1** Macro-watersheds in Thiruvadanai Block
- 8.2** Model Micro-watershed - Theerthandathanam micro-watershed - Thiruvadanai Block
- 8.3** Model GP - Nilamalgiyamangalam GP -Thiruvadanai Block

## **Chapter 9 Conclusion**





## LIST OF FIGURES

S.NO	FIGURE NUMBER	DESCRIPTION	PAGE NUMBER
<b>CHAPTER-1 ABOUT THE BLOCK</b>			
1	1.1	Thiruvadanai Block and it's environ	
2	1.2	Watersheds – Thiruvadanai Block	
3	1.3	Spatial distribution of waterbodies	
<b>CHAPTER-2 CLIMATE AND WATER SECURITY</b>			
4	2.1	Monthly average maximum and minimum temperature	
5	2.2	Season-wise distribution to annual rainfall	
<b>CHAPTER-3 GRAM PANCHAYAT PLANNING IN MAHATMA GANDHI NREGS</b>			
6	3.1	Geomorphology map	
7	3.2	Lineament map	
8	3.3	Terrain map	
9	3.4	DEM map	
10	3.5	Slope map	
11	3.6	Drainage network	
12	3.7	Watershed map	
13	3.8	Ground water perspective map	
14	3.9	Traditional waterbodies	
15	3.10	Irrigation sources	
16	3.11	Runoff from catchments	
17	3.12	Sector-wise water utilization	
18	3.13	Location of water samples	
19	3.14	Water Quality Index	
20	3.15	Seawater Mixing Index	
21	3.16	Salinity Index	
22	3.17	Soil texture	
23	3.18	Soil erosion map	

24	3.19	Land Use Land Cover Map
25	3.20	Wasteland map
26	3.21	Salt affected area
27	3.22	Land utilization
28	3.23	Catchment area
29	3.24	Status of available Nitrogen
30	3.25	Status of soil Organic Carbon
31	3.26	Status of soil micro nutrients
32	3.27	Status of pH of soil
33	3.28	Crop pattern (including rain-fed and irrigation area)
34	3.29	Irrigation methods
35	3.30	Means of water extraction
36	3.31	Livestock details
37	3.32	Population details
38	3.33	Details of households
39	3.34	Status of MGNREGA job cards

#### **CHAPTER-4**

#### **VULNERABILITY RANKING OF GPs**

40	4.1	Vulnerability of the system as defined by IPCC
41	4.2	Final cumulative vulnerability scores
42	4.3	GP wise vulnerability dimensions

#### **CHAPTER-5**

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

43	5.1	WASCA treatment area in percentage
44	5.2	Expected conservation after WASCA treatment
45	5.3	Expected GP wise runoff conservation after WASCA treatment
46	5.4	Proposed development activities in public and common land
47	5.5	Proposed development activities in Agriculture and allied Sectors
48	5.6	Proposed Rural Infrastructure activities
49	5.7	Proposed climate resilience measures

## **CHAPTER-6**

### **PROJECTED OUTCOMES OF PLANNING**

- 50 6.1 Estimated person days for all water actions
- 51 6.2 Estimated cost for all water actions

## **CHAPTER-7**

### **IMPLEMENTATION OF GP PLANS**

- 52 7.1 Work progress in last 3 years
- 53 7.2 Average Expenditure for GIS plan in last 3 years
- 54 7.3 GP wise total, completed and ongoing GIS works
- 55 7.4 GP wise recommended NRM and Non NRM works
- 56 7.5 Category-wise ongoing works in Thiruvadanai Block
- 57 7.6 Expenditure for Catch the Rain campaign in Thiruvadanai Block

## **CHAPTER-8**

### **CASE STUDY**

- 58 8.1 Macro-watershed map - Thiruvadanai Block
- 59 8.2 Macro-watershed with GPs
- 60 8.3 Satellite image of Theerthandathanam micro-watershed
- 61 8.4 Proposed activities in Theerthandathanam micro-watershed
- 62 8.5 Satellite image of Nilamalgiyamangalam GP
- 63 8.6 Spatial thematic maps of Nilamalgiyamangalam GP. A. Geomorphology, B. GW prosperity, C. Watershed, D. LULC, E. Wasteland
- 64 8.7 Proposed land resource treatment area in Nilamalgiyamangalam GP
- 65 8.8 Expected run off conservation after treatment in Nilamalgiyamangalam GP
- 66 8.9 Proposed action plan of Nilamalgiyamangalam GP

## LIST OF TABLES

<b>TABLE NUMBER</b>	<b>DESCRIPTION</b>	<b>PAGE NUMBER</b>
1	General climate description	
2	Biophysical and socio-economic indicators used in vulnerability assessment	
3	Major parameters identified for Block level vulnerability assessment	
4	Categorization of Thiruvadanai Block GPs	
5	Climate risks and vulnerable GP's	
6	CWRM parameter based water resources status in the Block	
7	CWRM parameter based agriculture resources status in the Block	
8	CWRM parameter based socio-economic status in the Block	
9	CWRM parameters/indicators selected for Block level vulnerability	
10	The proposed area for WASCA treatment	
11	Details of work proposed to develop public and common lands	
12	Details of works proposed to develop agriculture and allied sectors	
13	Details of work proposed to develop Rural Infrastructure	
14	GP wise proposed CRM	
15	Details of proposed Farm ponds activity under CRM	
16	Details of proposed Mangrove Plantation activities under CRM	
17	Details of proposed horticulture park activities under CRM	
18	Details of proposed Mega Forest activity under CRM	
19	Details of proposed Avenue plantation activity under CRM	
20	Details of proposed GP Level Nursery activity under CRM	
21	Details of proposed mini forest activity under CRM	
22	Details of proposed Tanka activity under CRM	
23	Common vulnerability Indicators used in WASCA TN & SDG India 2020-21	
24	Water actions on development of public & common lands & its linked SDG	
25	Water actions on development of agricultural and allied sector & it's linked SDG	
26	Water actions on rural water management & it's linked SDG	
27	GIS-based plan implementation- key parameters performance in Thiruvadanai Block	

- 28 General description of macro-watersheds covering Thiruvadanai Block
- 29 No. of GPs covered under watersheds in Thiruvadanai Block
- 30 Micro-watershed falling under Manimuthar macro-watershed in Thiruvadanai Block
- 31 List of GPs with type of ridge falling under Manimuthar macro-watershed in Thiruvadanai Block
- 32 List of works proposed under CWRM – WASCA with type of Ridge falling under Manimuthar macro-watershed in Thiruvadanai Block
- 33 Micro-watershed falling under Kottakkaraiyar macro-watershed in Thiruvadanai Block
- 34 List of GPs with type of ridge falling under Kottakkaraiyar macro-watershed in Thiruvadanai Block
- 35 List of works proposed under CWRM – WASCA with type of Ridge falling under Kottakkaraiyar macro-watershed in Thiruvadanai Block
- 36 General Information of the micro-watershed
- 37 Hydrogeology other characteristics in micro-watershed
- 38 Existing Water Harvesting Structures in Pullakadamban GP
- 39 Catchment area of micro-watershed
- 40 Ground water status of micro-watershed
- 41 Salinity and Sea Water Intrusion in the micro-watershed
- 42 Water budget of GP's falling in micro-watershed- Pullakadamban GP
- 43 GP wise proposed micro-watershed works – Pullakadamban GP
- 44 Ridge wise treatment area estimated cost and person days required- Pullakadamban GP
- 45 Nature and No. of works in micro-watershed
- 46 Key outcomes of intervention
- 47 Estimates of micro-watershed in Pullakadamban GP
- 48 General description of Nilamalgiyamangalam GP, Thiruvadanai Block
- 49 Non-spatial data- Nilamalgiyamangalam GP
- 50 Perspective plan of Nilamalgiyamangalam GP – FY (2021-2024)
- 51 Summary of works identified and estimated person-days for 2021-2024
- 52 WASCA- Water actions and indicators
- 53 Proposal for the MGNREGS, Nilamalgiyamangalam GP, Thiruvadanai Block
- 54 GIS plan Implementation, Key Parameters performance in Numbers



# ANNEXURE

S. NO	ANNEXURE NUMBER	DESCRIPTION	PAGE NUMBER
		<b>CHAPTER-1 ABOUT THE BLOCK</b>	
1	1	Types of GPs	
		<b>CHAPTER-3 GRAM PANCHAYAT PLANNING IN MAHATMA GANDHI NREGS</b>	
2	3.1	Key CWRM parameter from secondary sources	
3	3.2	Key CWRM parameters from primary sources	
4	3.3	Key CWRM parameter - Primary data generated	
5	3.4	Standard norms for calculating water demand	
6	3.5	Standard norms for grey water generation calculation	
7	3.6	Water quality standards and formula used	
8	3.7	GP wise status of water resource and its supply and demand	
9	3.8	Location wise Water Quality in R S Mangalam Block during pre-monsoon season	
10	3.9	Location wise Water Quality in R S Mangalam Block during post-monsoon season	
11	3.10	GP wise status of agriculture resource	
12	3.11	GP wise demographic and socio-economic status	
		<b>CHAPTER-4 VULNERABILITY RANKING OF GPs</b>	
13	4	IPCC vulnerability assessment methodology	
		<b>CHAPTER-5 PROPOSED KEY WATER ACTIONS UNDER MAHATMA GANDHI NREGS CONVERGENCE</b>	
14	5.1	GP wise WASCA proposed treatment area	
15	5.2	GP wise expected runoff conservation after WASCA treatment	
16	5.3	GP wise proposed works based on watershed and livelihood approach	
		<b>CHAPTER-7 IMPLEMENTATION OF GP PLANS</b>	
17	7.1	GP wise WASCA recommendation and works uploaded	
18	7.2	GP wise Ongoing works in Thiruvadanai Block	
		<b>CHAPTER-8 CASE STUDY</b>	
19	8	CWRM Key Indicators for GPs in Theerthandathanam micro-watershed	



# ABBREVIATIONS AND ACRONYMS

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





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**L - M**

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**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 &amp; 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

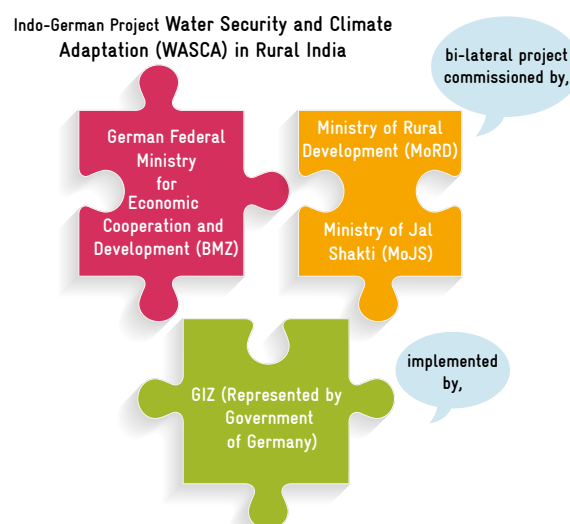


# EXECUTIVE SUMMARY

“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.



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

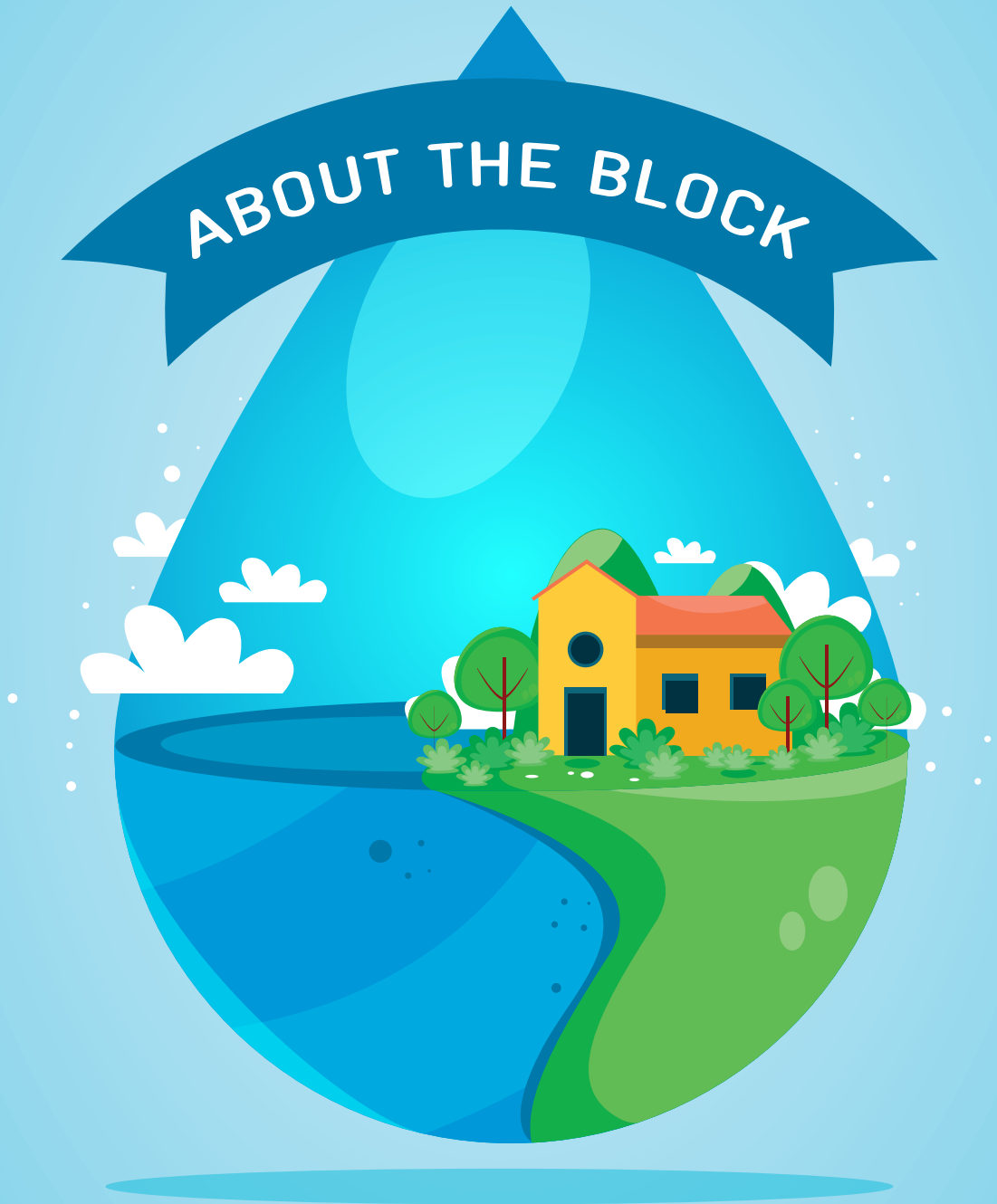
குறள் - 12

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

Thiruvadanai, a coastal Block of Ramanathapuram District lies between 9°38'52.205"N to 9°56'30.398"N latitude and 78°51'41.485"E to 79°6'43.539"E longitude. This Block has long coastal stretch in East side along the Bay of Bengal and surrounded by R S Mangalam Block in the south, Sivagangai and Pudukkottai districts in west and north side (Figure 1.1). The total geographical area of Block is 44,193 ha (441.93 Km<sup>2</sup>). Administratively, this Block comes under Thiruvadanai talu, and it has 47 Gram Panchayats with 310 hamlets.

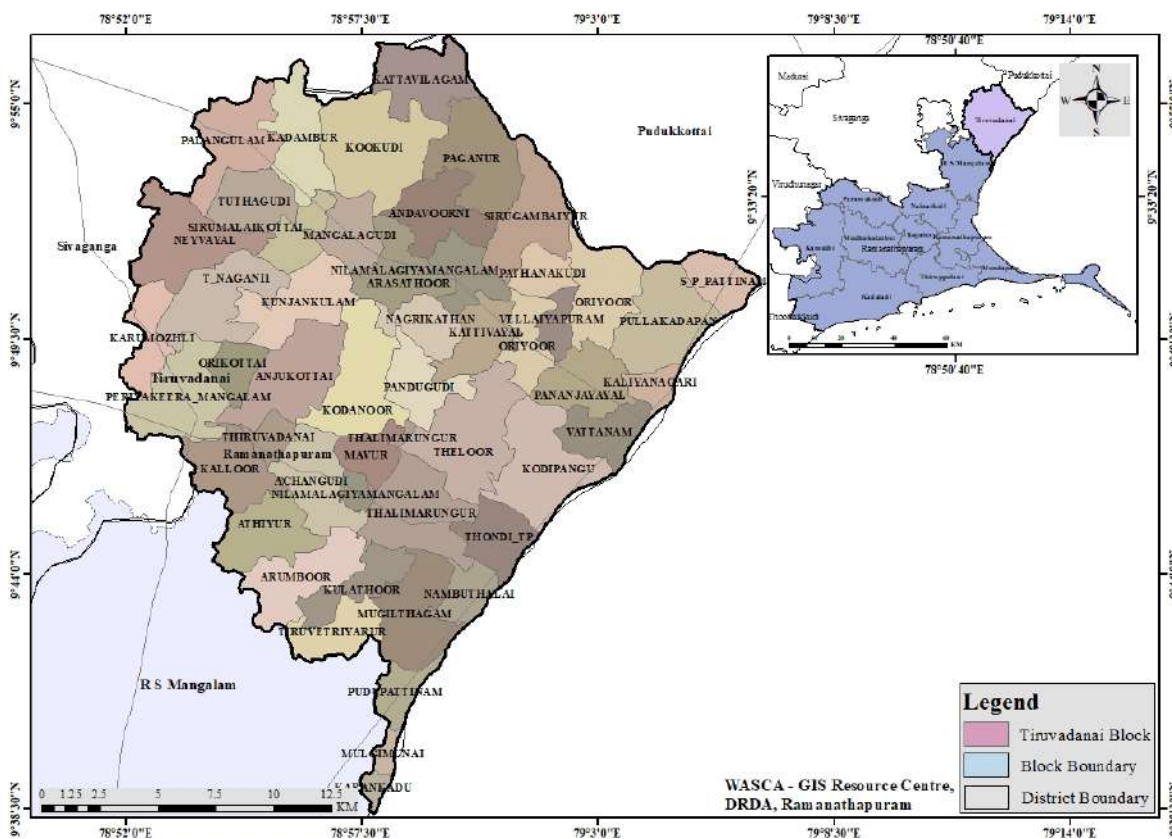


Figure 1.1. Thiruvadanai Block and its environ

According to Census 2011, the population of the Block is 1,27,287. The population density of the Block is 290 per Km<sup>2</sup> which is lower than the District (331Km<sup>2</sup>) and the State's density (555 Km<sup>2</sup>). The population growth has increased in the last decade with an increase of 14.20% in population, observed since 2001. The proportion of sex ratio is 986 females for 1000 males. The average literacy rate of this Block is 81.05 % which is much higher than the national average (72.98%). The male literacy rate is high (88.84%) than female literacy rate (73.18%). Vulnerable population, Scheduled Castes and Scheduled Tribes accounted for 17.28 % of the total population. Economically, this rural coastal Block is one of the backward Block and has high multidimension-

al poverty index. According to the State Planning Commission, Government of Tamil Nadu's Human Development Report – 2017, 41.44 % families are in below poverty line (BPL). The % of BPL families are very high in the Block and higher than the District poverty status. Paddy is the dominant crop both under irrigated and rainfed conditions with 99.77% of the crop area being cultivated by paddy. Coconut, Oil palm, Brinjal, Ragi, Mango and Other pulses are cultivated in small areas. The growth of marginal workers is high in this Block due to cultivators being converted as agriculture laborers. The Block has 35 milk societies with 18.89 lakh liters of milk being produced.



“

The proportion of sex ratio is 986 females for 1000 males.

”

“

The average literacy rate of this Block is 81.05 % which is much higher than the national average (72.98%).

”

“

99.77% of the crop area being cultivated by paddy

”

Hydrologically, Thiruvadanai Block lies in Pambar Kottakkaraiyar basin and Pambar, Manimuthar and Kottakkaraiyar sub basins. Pambar and Manimuthar Rivers flow through the Block. Manimuthar and Kottakkaraiyar macro-watersheds cover the Block and has 83 micro-watersheds. (Figure 1.2). Situated in rain shadow area, Ramanathapuram District has an 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.

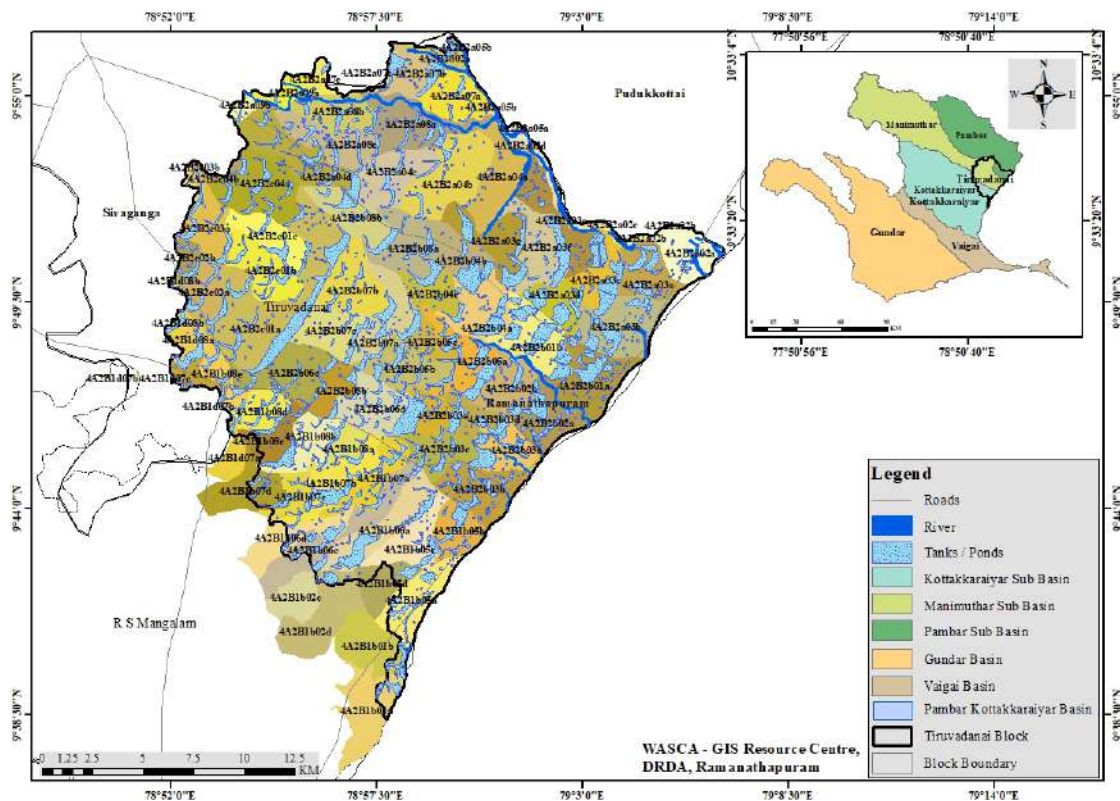


Figure 1.2. Watersheds – Thiruvadanai Block



Water harvesting structures ‘Ooranis’ also play a huge role in groundwater conservation and recharge, guaranteeing availability of safe drinking water and useful for farmers who do not have water source for irrigation or find it expensive. This Block has largest number of water bodies when compared to other Blocks. There are a total of 287 tanks: 83 Ex-zamin MI tanks, 115 panchayat MI tanks, 62 PWD tanks in Vaigai basin and 27 PWD tanks Manimuthar in this Block (Human Development Report 2017). Figure 1.3 shows the spatial distribution of water

bodies in this Block. Four firkas viz., Thiruvadanaï, Pullur, Thondi and Mangalakudi cover the Block, and while Thiruvadanaï and Pullur firkas are safe Thondi and Mangalakudi are saline in ground water development (CGWB’s ground water assessment report 2017).

### GROUND WATER LEVEL OF THIS BLOCK

SAFE - <70%	Thiruvadanaï, Pullur
SALINE	Thondi, Mangalakudi

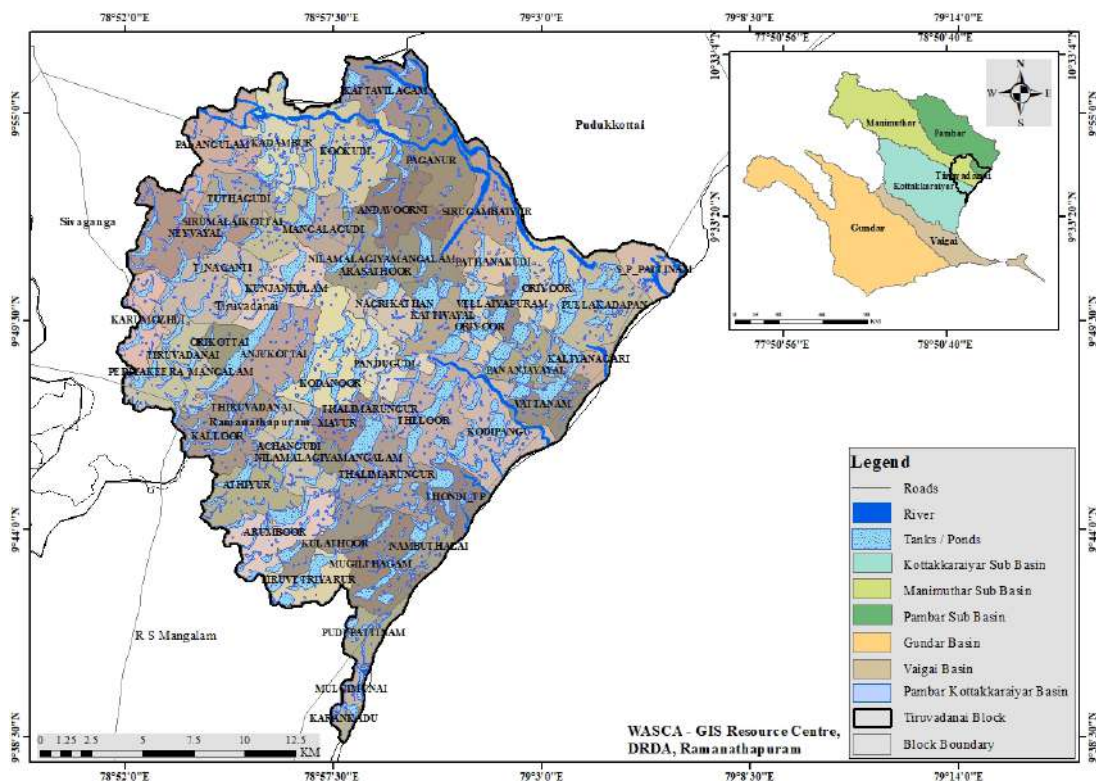
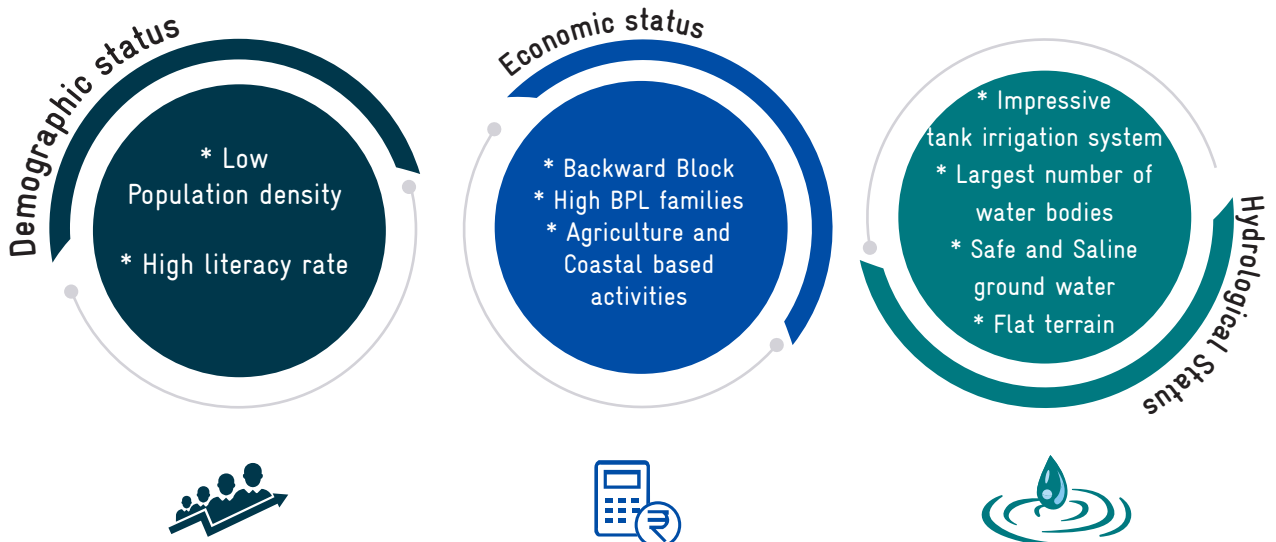


Figure 1.3. Spatial distribution of waterbodies



விண்இன்று பொய்ப்பின் விரிநீர் வியனுலகத்து  
உள்நின்று உடற்றும் பசி

குறள் - 13

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

Thirukkural - 13

# CHAPTER 2

CLIMATE AND WATER SECURITY

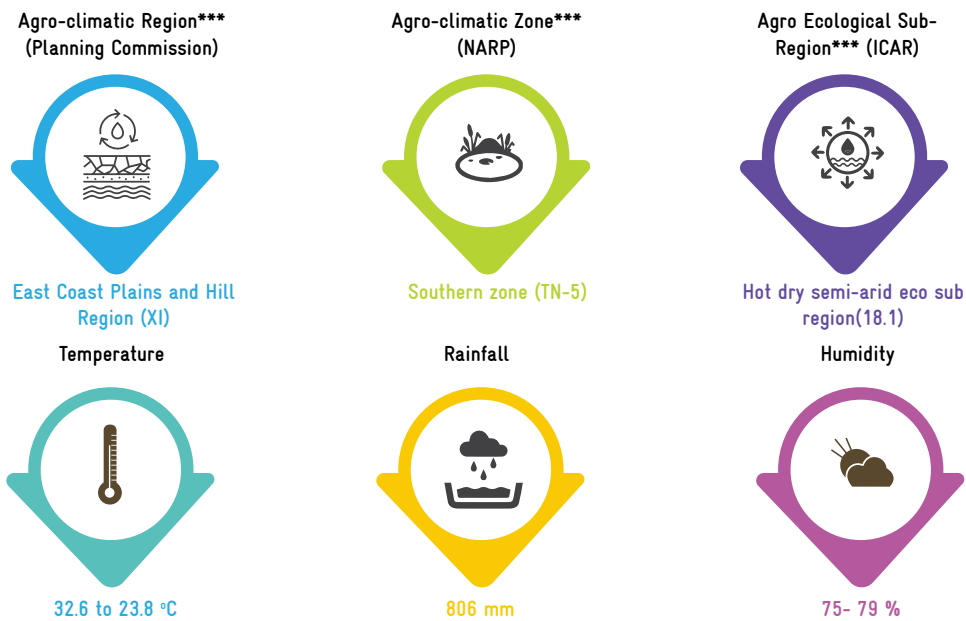




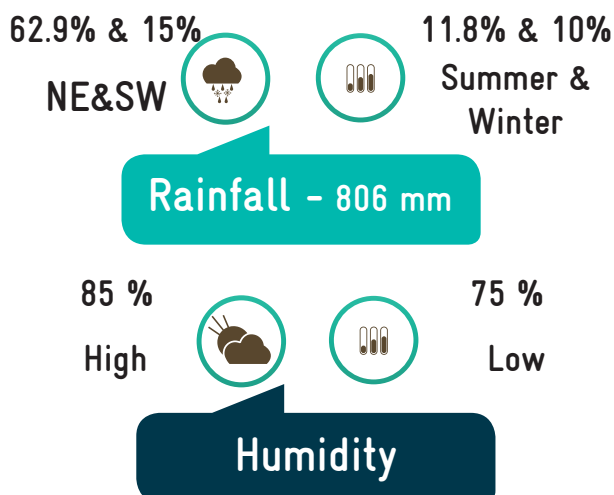
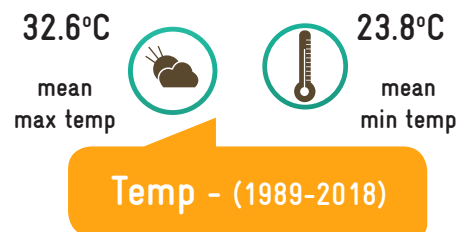
## 2 | CLIMATE AND WATER SECURITY

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



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.



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

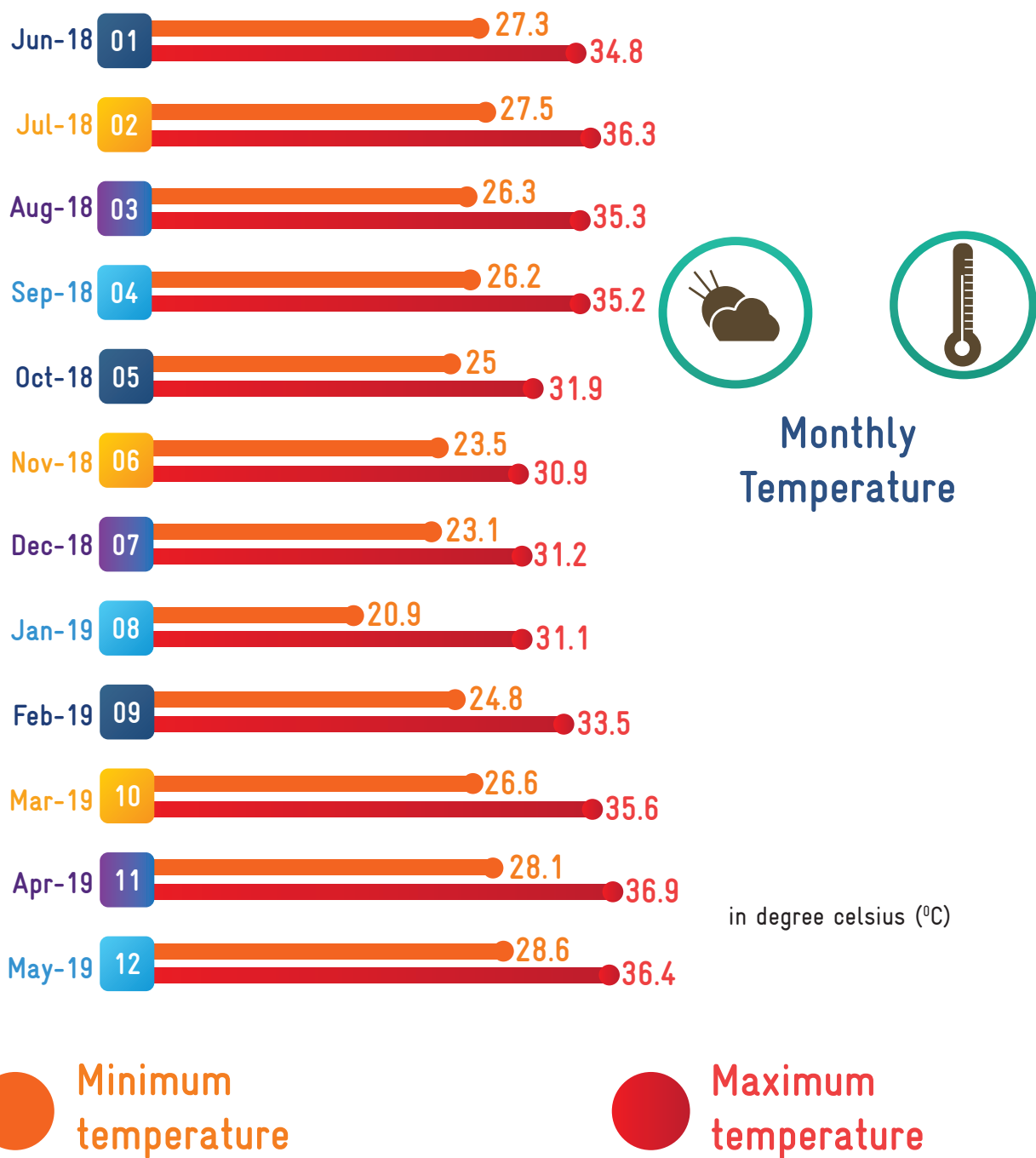


Figure 2.1. Monthly average maximum and minimum temperature

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 December. 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 percentage of 75% is recorded during the month of May in this southern zone.

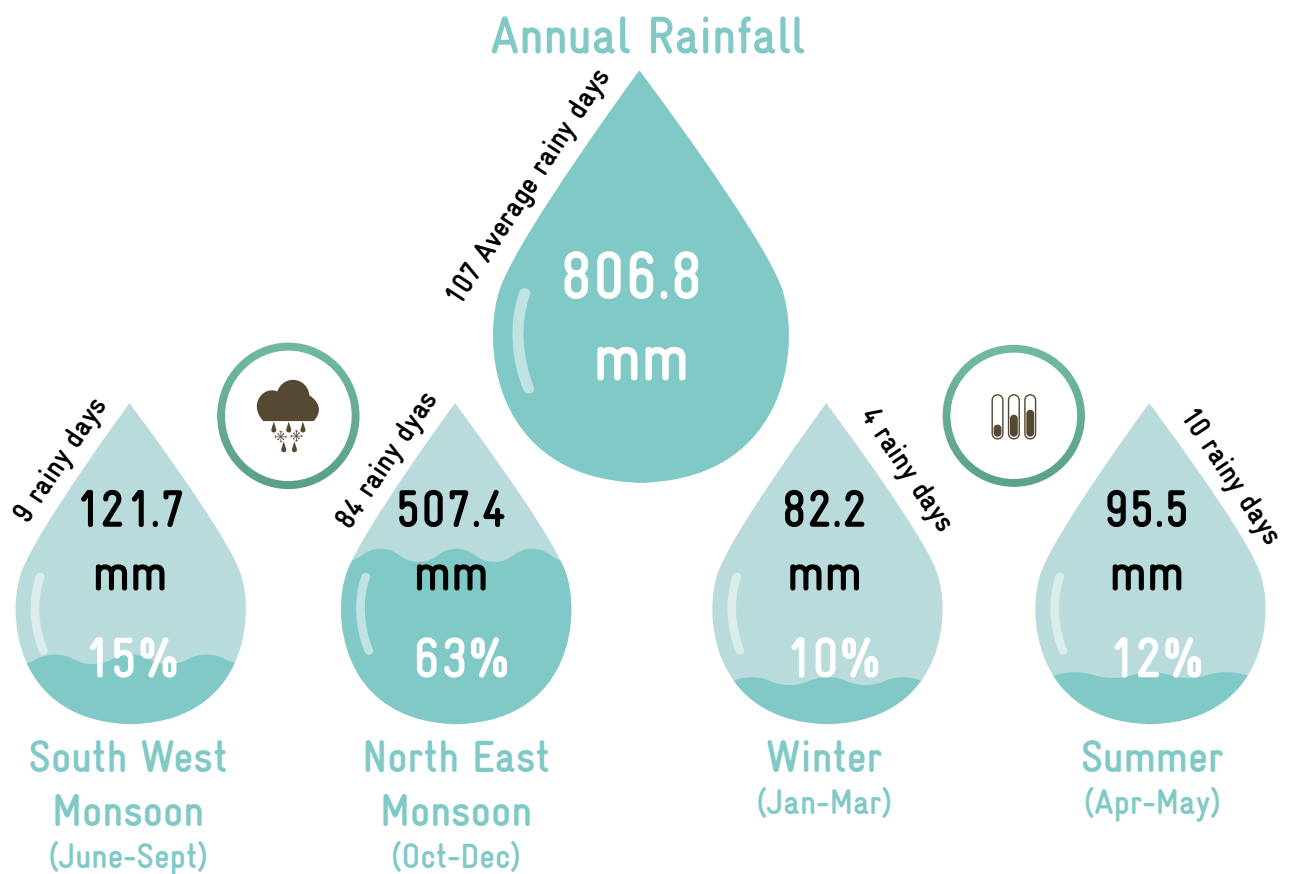


Figure 2.2. Season wise distribution to annual rainfall

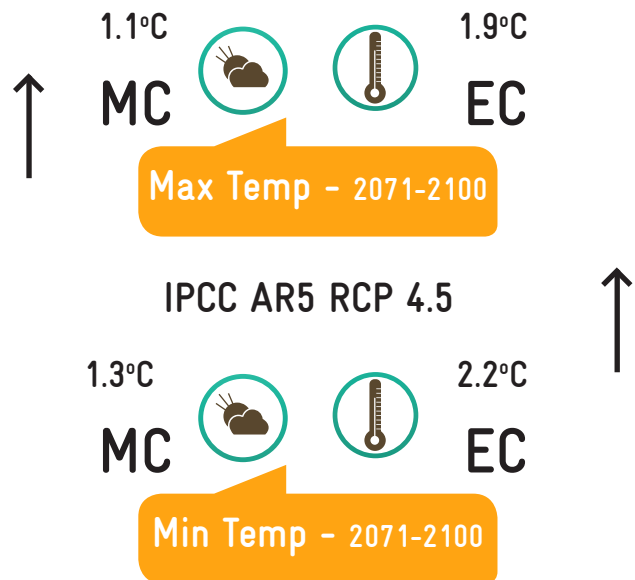
In recent decades, the world has witnessed significant changes in its climate. These changes include increase in average temperature, variations in the rainfall intensity and its frequency. This region is also no exception, and 1.4°C and 0.4°C increase in maximum and minimum temperature was observed 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. The average annual rainfall for IPCC AR5 RCP4.5 scenarios is projected to increase about 1 percent towards MC to EC period.



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



- \* 1.4°C increase in maximum temperature during 1951-2015
- \* 0.4°C increase in minimum temperature during 1951-2015
- \* 1.5°C increase in max temp during 2041-2070 (RCP4.5)
- \* 1.9°C 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
- \* Storm surges up to 6m
- \* Soil erosion
- \* Flood inundation
- \* Sea level rise

### 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 results 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 hazards due to cyclone forms in the Bay of Bengal. The 1964 Rameswaram cyclone was regarded as one of the most powerful storms to ever strike India on record and the 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 to cyclones. (Cyclone warning in India, IMD, and March 2021).

## Flood

Though it is a low rainfall region, it experiences heavy rain and floods 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). There are no flood vulnerable locations identified by SDMA (State Disaster Management Agency) in Thiruvadanai Block.

## 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 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 indicate that there would be 4.51 cm (low range)/ 7.21cm (medium range) increase 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, and saltwater intrusion (Ramanathapuram District Disaster Management Plan 2021-2022). Out of this 180 habitations, 15 habitations in 11 GPs are in Thiruvadanai Block and are considered in this study for the vulnerability assessment.

## 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 (°C)	C1	Goal 13
	Changes in min temperature (°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 <sup>3</sup> )	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 <sup>2</sup> )	A3	Goal 15
	Evapo-transpiration (Kg/m <sup>2</sup> )	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

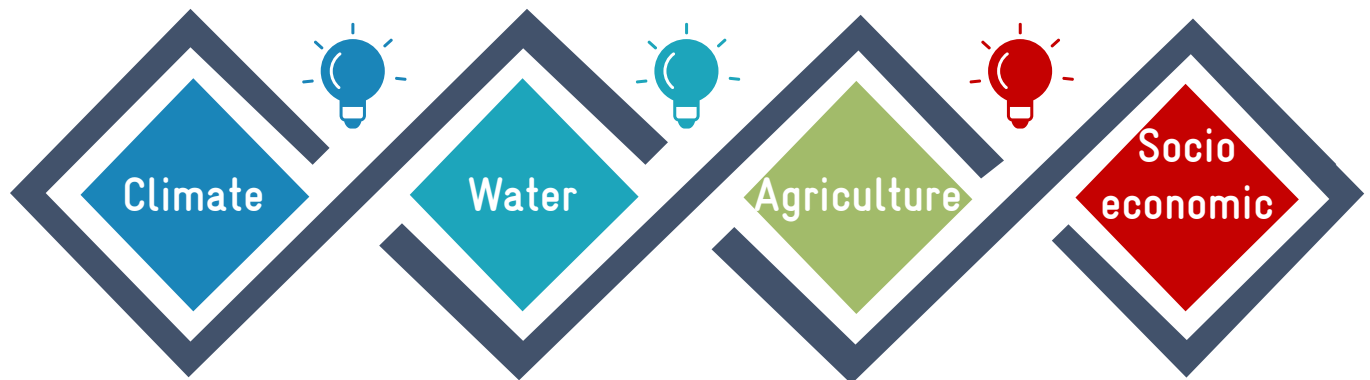
headed by the Secretary RD&PR in Nov 2019 for implementing the WASCA. Subsequently, all the key water actions, CWRM planning and implementation works were envisaged for the above two districts through these influencing indicators collectively under four CWRM areas viz. climate, water, agriculture and 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



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 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 Annual Master Circular issued by MoRD during 2021-22 and 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.

Special focus is given to vulnerable households and communities and are considered while preparing estimates for anticipated demand, list of works on individual lands, 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, particularly the '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

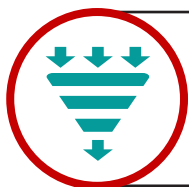


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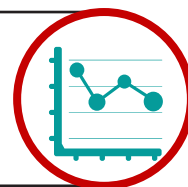
Water related works out of NRM

In pursuance of Schedule-I of Mahatma Gandhi NREGA, 262 kinds of works/ activities have been identified as permissible works, of which 182 kinds of works relate to NRM alone and out of the 182 NRM works, 85 are water related. 164 of the total works 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 produc-

tivity 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 the 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

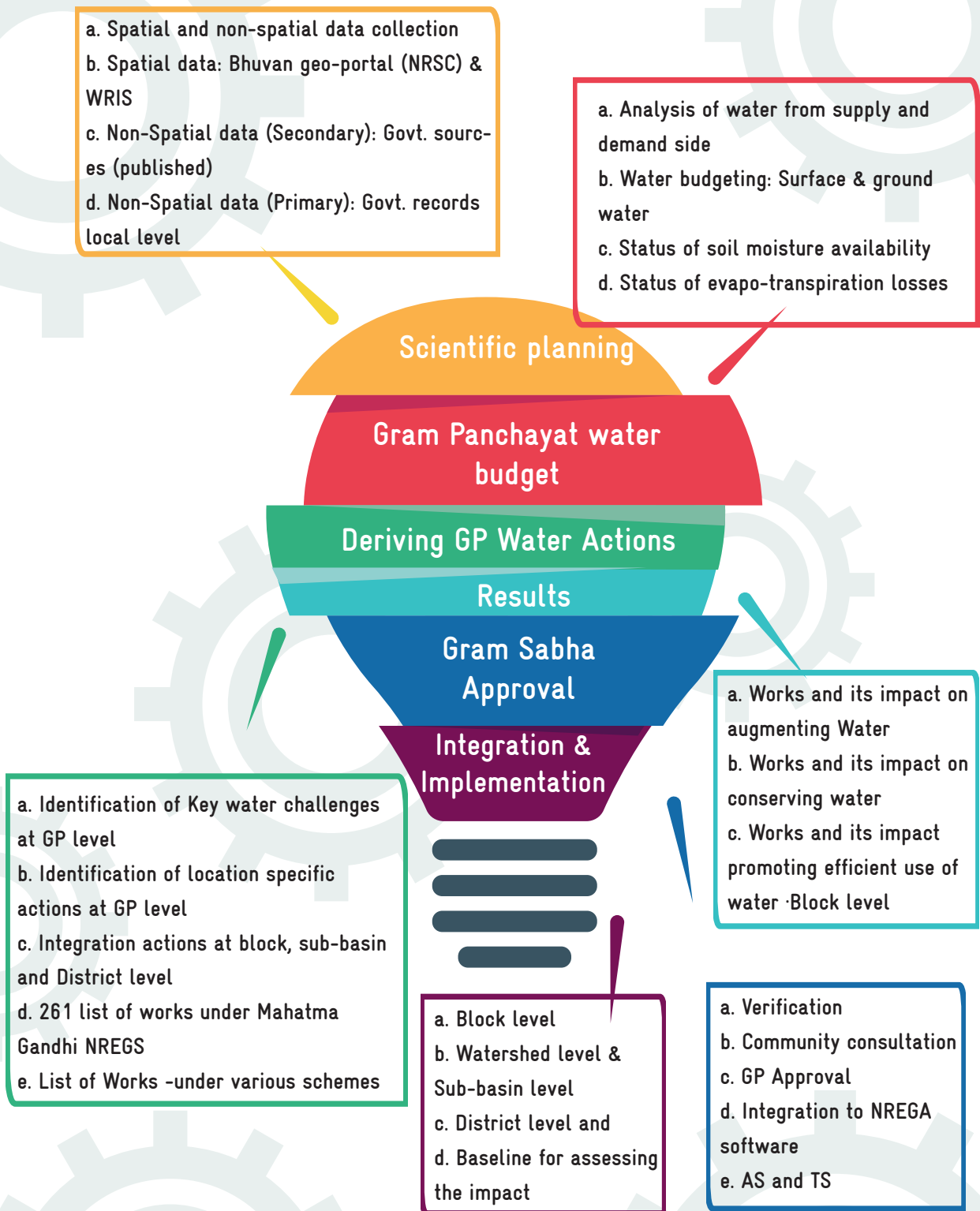
CWRM approach for Water Security and Climate Adaptation uses simple scientific tools that can help Block or GP level officer to organize, analyze and prepare a draft plan for participatory discussion at the Gram Panchayat level. This approach involves analyzing key water challenges using both non-spatial 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**

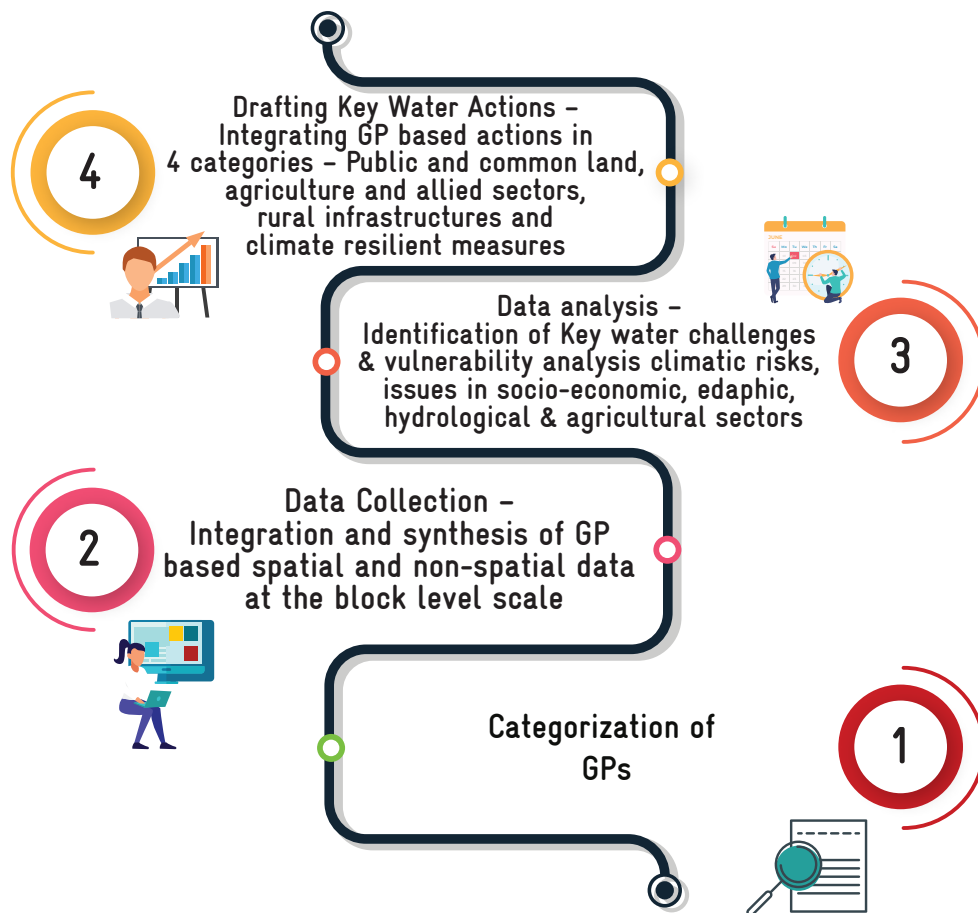


Such a comprehensive analysis in preparing the water budget integrating ground water, surface water through runoff from rainfall, evapo-transpiration and soil moisture helps to identify potential areas of action to augment the water resources in public and common land, agriculture and allied sectors and rural infrastructure dimensions. The analysis also helps to understand the areas of interest and appropriate climate resilient measure as an adaptive measure to the emerging climate change scenarios. The water challenge linked water actions are the key to developing the perspective plan for the water secured GPs, and serve as shelf of projects. The shelf of projects are again mapped with the available schemes and financial plans for execution, adopting convergence and inter-sectoral principles. In the execution process the District level technical and administrative teams

are involved in planning, monitoring and evaluation in terms of outcome/impact mapping. In the execution stage, the approach of saturation of works, planning at watershed approach (ridge to valley), and convergence is some of the key aspects which needs attention for a tangible outcome 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



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**

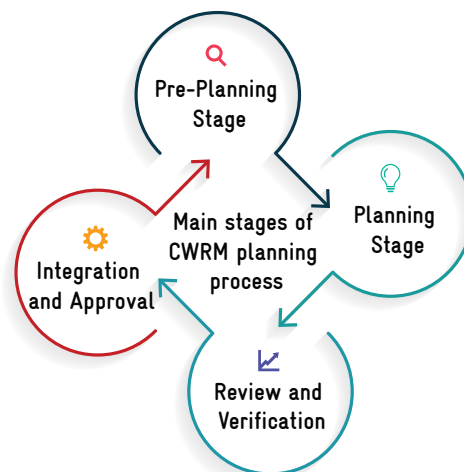
**1. DEVELOPING PLANS AT LOWEST ADMINISTRATIVE LEVEL: GP LEVEL PLANS**

**2. INTEGRATING GP LEVEL PLANS AT BLOCK LEVEL**

**FOUR LEVELS OF CWRM PLANNING UNDER WASCA**

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

**4. INTEGRATING GP PLANS TO DEVELOP WASCA DISTRICTS CWRM PLANS**



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

**INTEGRATION AND APPROVAL**

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

**REVIEW AND VERIFICATION**

## 3.2 | CATEGORIZATION OF GPs

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

TABLE 4. CATEGORIZATION OF THIRUVADANAI BLOCK GPs

NUMBER OF GP	GP TYPE	NAME OF THE PANCHAYAT
10	GP and revenue village data and boundary match (Type-I)	Achankudi, Anjukottai, Athiyur, Kaliyanagari, Palangulam, Paganur, Kodanur, Nam-buthalai, Sirugambaiyur, Kattavilagam
37	GPs having more than one GP, one Revenue Villages data, boundary (Type-IV)	Tiruvetriyur, Mugithagam, Nilamalgiyaman-galam, Nagrikathan, Kookudi, Arasathur, Andavorani, Kunjankulam, Karumozhi, Sananvayal, T.Nagani, Neyvayal, Sirumalai-kottai, Thuthagudi, Kadambur, Mangalagudi, Orikottai, Kallur, Thiruvadanai, Periakeer-amangalam, Pandugudi, Mavur, Thalir-marungur, Orur, Pullakadamban, Panchayal, Vellayapuram, Pathangudi, Thelur, Kattivayal, Vattanam, Kodipangu, Karankadu, S.P.Pattinam, Kulathur, Pudupattinam, Arumber, Mullimunai

## 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 pro-

cess comprises of the following dimensions in a scientific and organized manner to prepare a meaningful plan at the lowest administrative unit i.e. GP plans.



## 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 con-

tributing 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 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 Seawater 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.

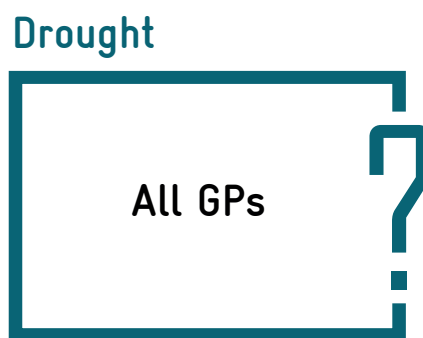
Over all, data from 102 parameters were collected, out of which 16 parameters are from primary source, collected from GP administrative units by GPs officers, 65 parameters are from secondary source, collected from Govt. sources and authentic websites and the remaining 21 requisite parameters for water budgeting and grey water were calculated using standards/suitable methods or formulas. CWRM parameters and its data sources is attached in Annexures 3.1 to 3.3. The methods, 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 the Block's flood and coastal vulnerability which was assessed by State Disaster Management Agency, 2020 as given in Table 5.

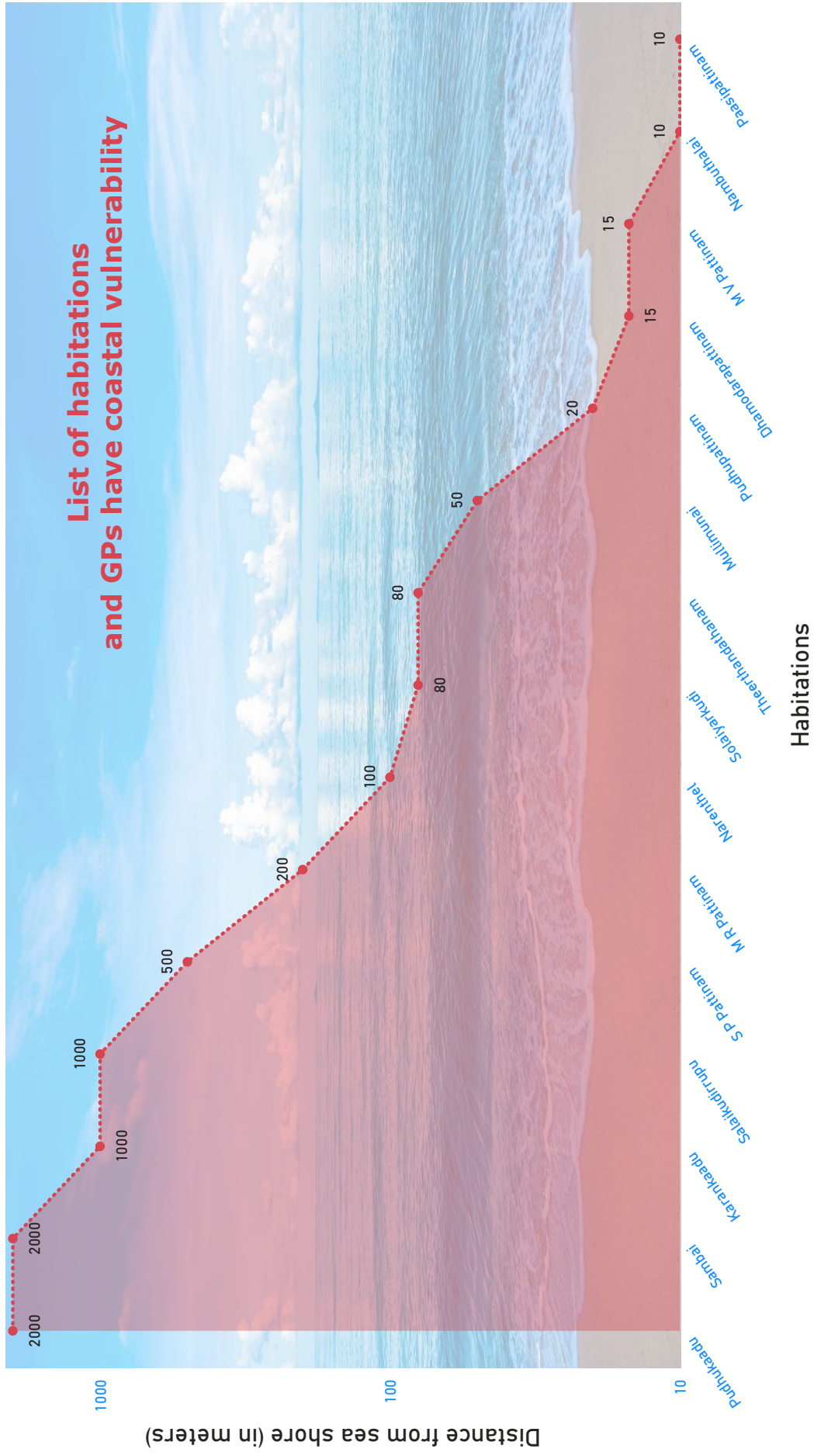
TABLE 5. CLIMATE RISKS AND VULNERABLE GP's



LIST OF HABITATIONS AND GPs HAVE COASTAL VULNERABILITY

GP name	Habitations
<b>A. Manakkudi</b>	Pudhukaadu
<b>Kaliyanagari</b>	Paasipattinam
<b>Karankaadu</b>	Karankaadu
<b>Kodipangu</b>	Narenthel
<b>Mugilthagam</b>	Solaiyarkudi, M V Pattinam, M R Pattinam, Sambai
<b>Mullimunai</b>	Mullimunai
<b>Nambuthalai</b>	Nambuthalai
<b>Pudupattinam</b>	Pudhupattinam
<b>Pullakkadamban</b>	Theerthandathanam
<b>S P Pattinam</b>	S P Pattinam
<b>Vattanam</b>	Dhamodarapattinam, Salaikudirrupu





## 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 the Block level is necessary. Both spatial and non-spatial data including details and status on watershed and drainage network, canal network,

irrigation facilities, catchments area wise available runoff, conserved runoff, present ground water extraction, water demand for domestic, agriculture and livestock, ground water utilization for domestic, agriculture and livestock are collected from authorized open sources and analyzed at the 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 analyse 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. Thiruvadanai Block is engrossed with costal origin landform units (Figure 3.1). Costal landform is further classified based on the landform age and its characteristics including biodiversity existence such as older deltaic plain, young coastal plain and piedmont alluvial plain. 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 critical input in identifying suitable sites for NRM activities under CWRM plan preparation.

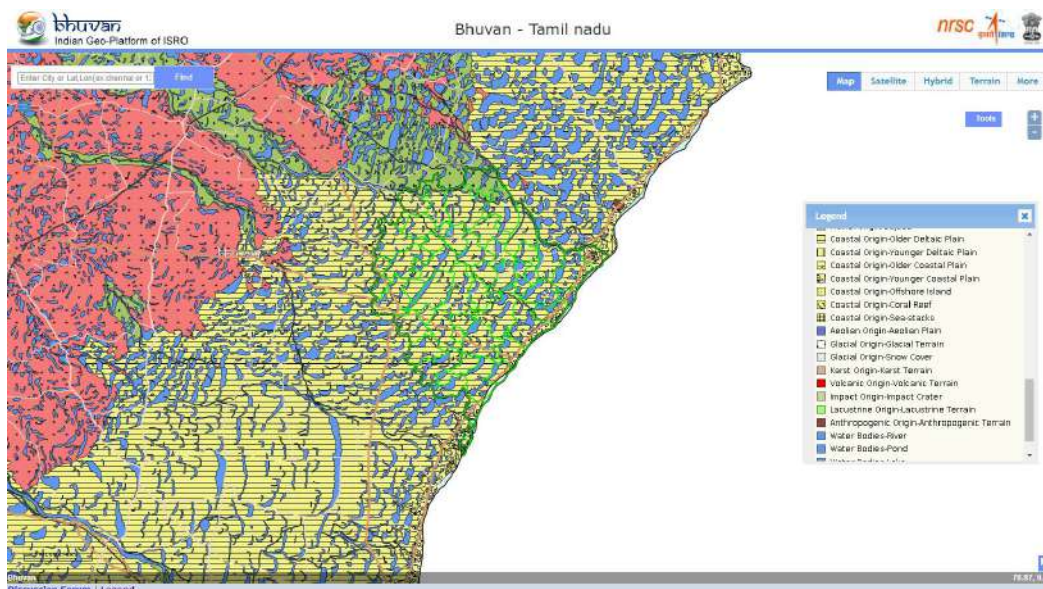
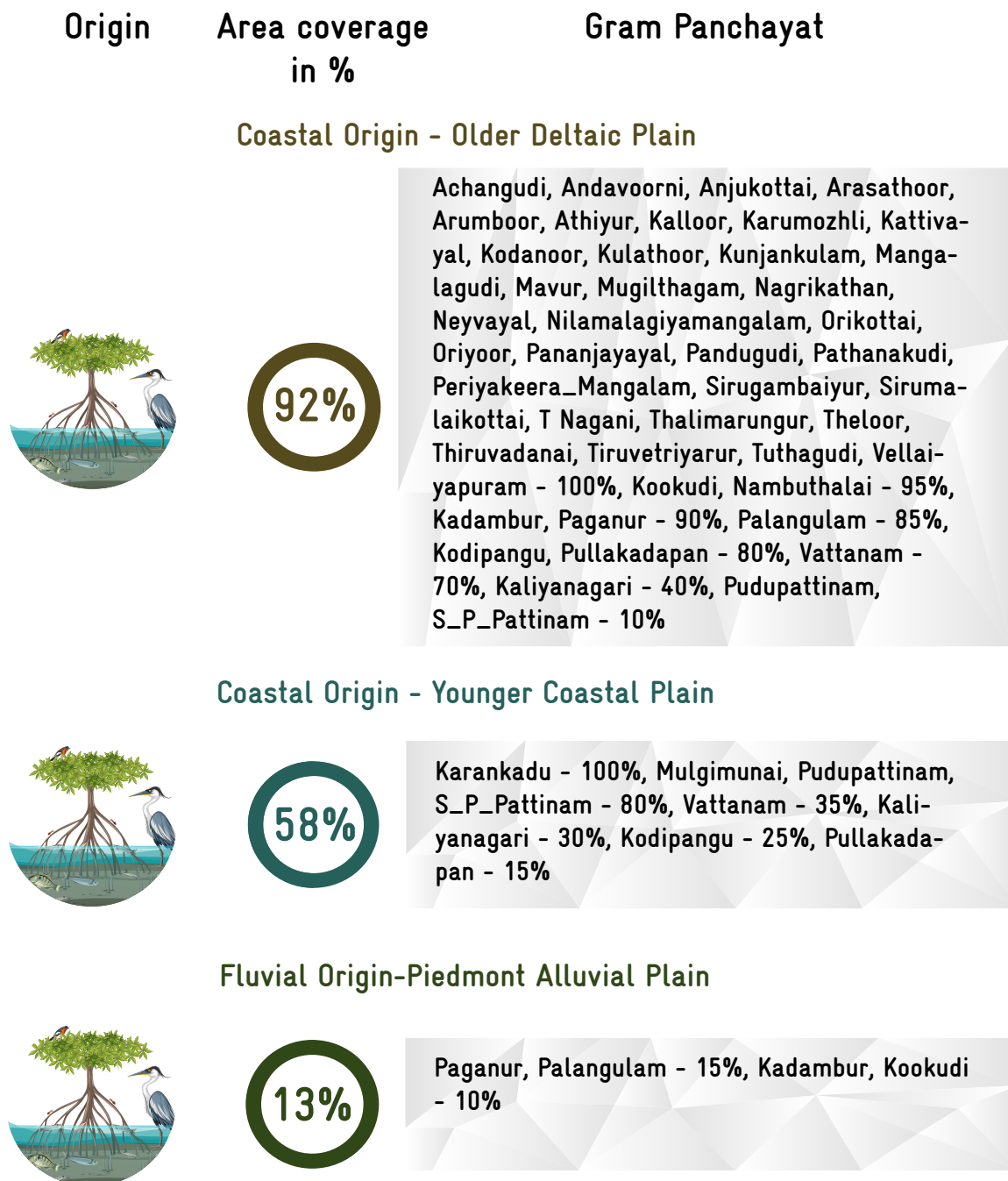


Figure 3.1. Geomorphology map



**3.5.1.2 Lineament:** The lineament is also a lithological unit which reveals the hidden architecture of rock basement, representation of an underlying geological structure such as a fault, fracture (Figure 3.2). Lineament plays a significant role in identification of ground water and oil exploration sources. Lineament is represented with linear feature where two different 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.



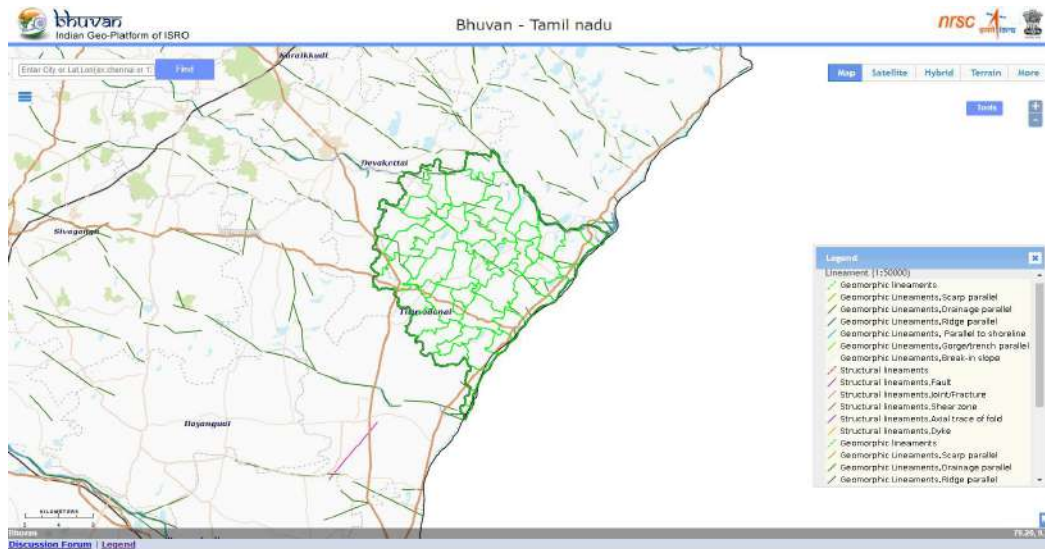


Figure 3.2. Lineament map

Lineament type	Gram Panchayat
<b>Geomorphic lineaments, Drainage parallel</b>	



Andavoorni, Kadambur, Karumozhli, Kattavilagam, Kattivayal, Kodipangu, Kookudi, Nagrikathan, Oriyoor, Palangulam, Periyakeera\_Mangalam, Pullakadapan, Sirumalaikottai, T Nagani, Theloor, Tuthagudi, Vattanam

**3.5.1.3 Terrain:** The terrain map gives information related to elevation from above sea level. A terrain of 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.

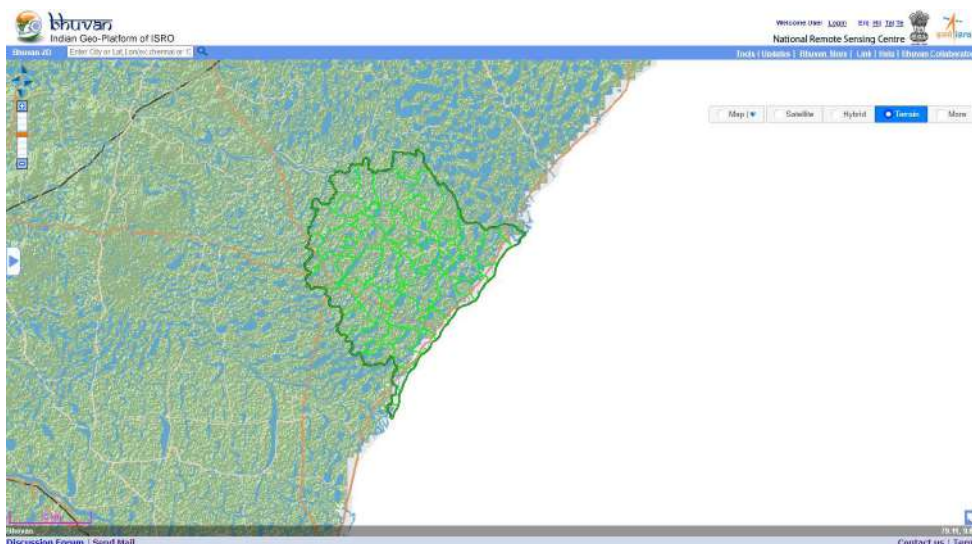


Figure 3.3. Terrain map

**3.5.1.4 DEM:** The 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).

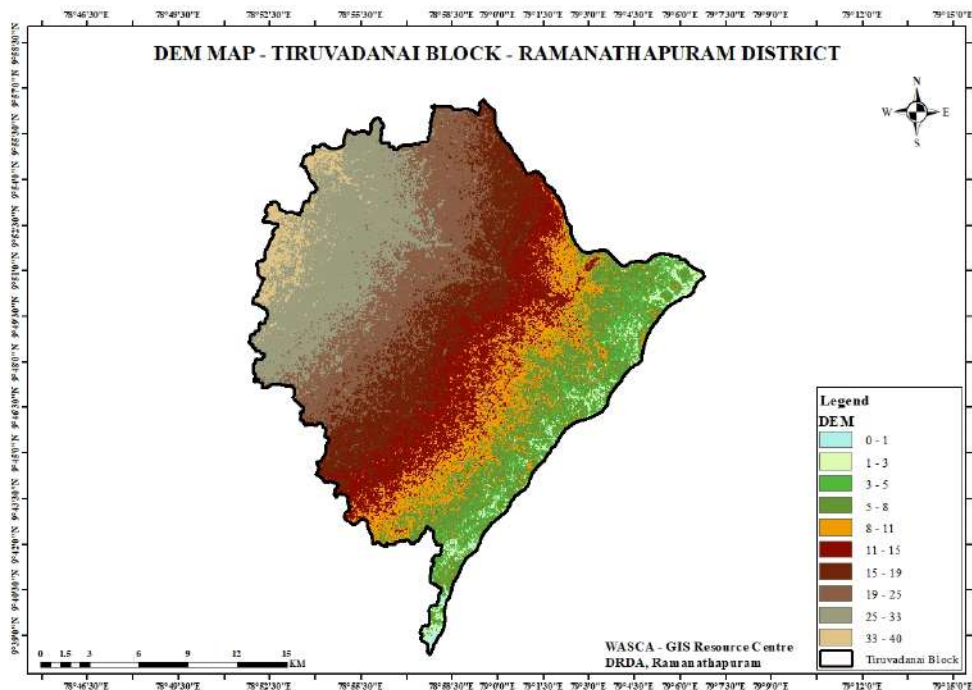


Figure 3.4. DEM map

**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. Very flat slope ranges from 0 to 1 % is noticed in the Block and small patches of steep locations are noticed (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.

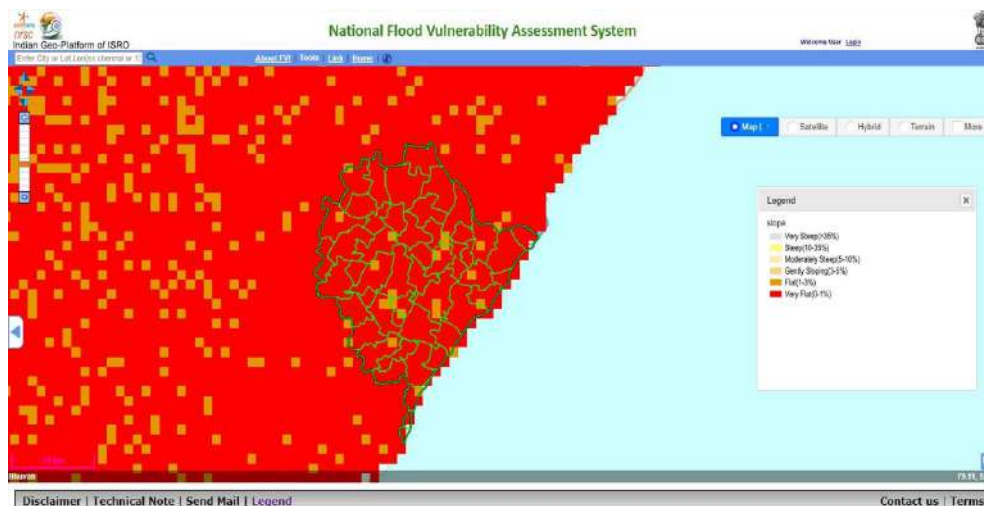


Figure 3.5. Slope map

Slope  
rangeArea  
in %

Gram Panchayat

**Very Flat (0-1%)**

95%

Arasathoor, Arasathoor, Kadambur, Kaliyanagari, Kalloor, Karumozhli, Kattavilagam, Kattivayal, Kodipangu, Kookudi, Kulathoor, Mangalagudi, Mugilthagam, Nambuthalai, Orikottai, Paganur, Pandugudi, Pathanakudi, Periyakeera\_Mangalam, Pullakadapan, S\_P\_Pattinam, Sirumalaikottai, T\_Nagani, Thalimarungur, Thiruvadanai, Tiruvetriyarur, Vellaiyapuram - 100%, Athiyur, Kattivayal, Kodanoor, Kodipangu, Nagrikathan, Neyvayal, Pananjayayal, Sirugambaiyur - 95%, Anjukottai, Arumboor, Kunjankulam, Oriyoor - 90%, Theloor - 85%, Achangudi, Pananjayayal - 80%, Mavur - 75%, Nilamalagiyamangalam, Pudupattinam - 70%

**Flat (1-3%)**

12%

Nilamalagiyamangalam - 30%, Pudupattinam - 25%, Mavur - 20%, Achangudi - 15%, Theloor, Anjukottai, Arumboor, Kunjankulam, Oriyoor, Pananjayayal - 10%, Athiyur, Kattivayal, Kodanoor, Kodipangu, Nagrikathan, Neyvayal, Pananjayayal, Sirugambaiyur - 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 East from West (Figure 3.6). Drainage network is referred to while identifying suitable sites for soil and water conservation measurements such as dams, ponds, bunding, restoration of gullied region etc.



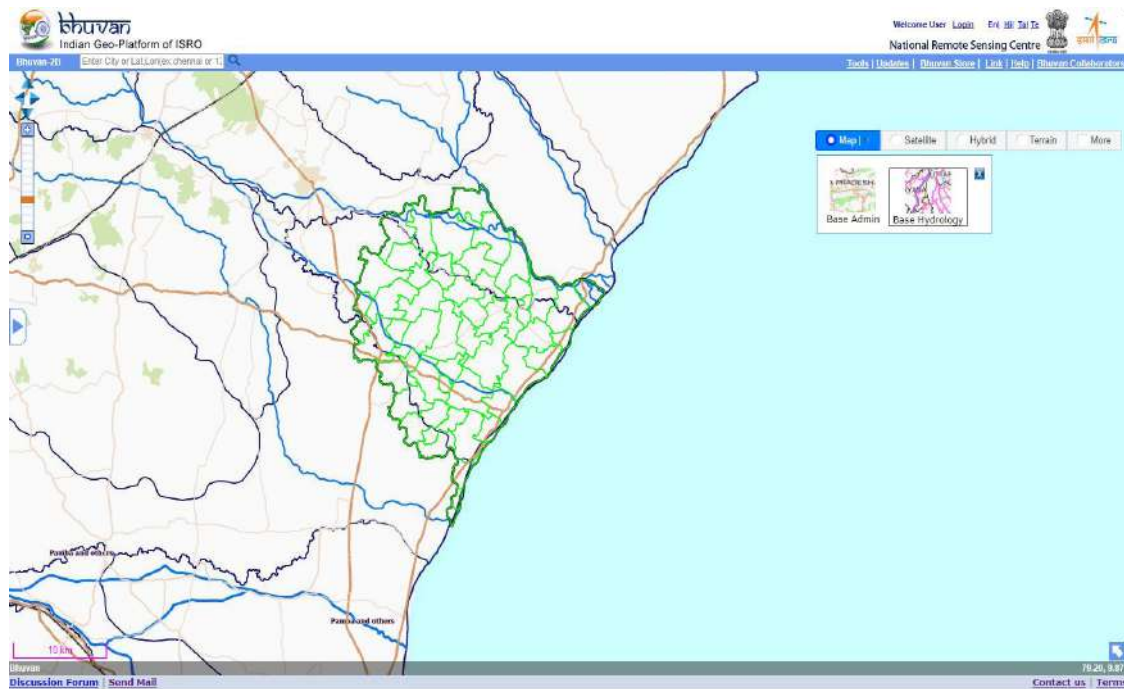


Figure 3.6. Drainage network

**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. Thiruvadanai 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 in downstream.

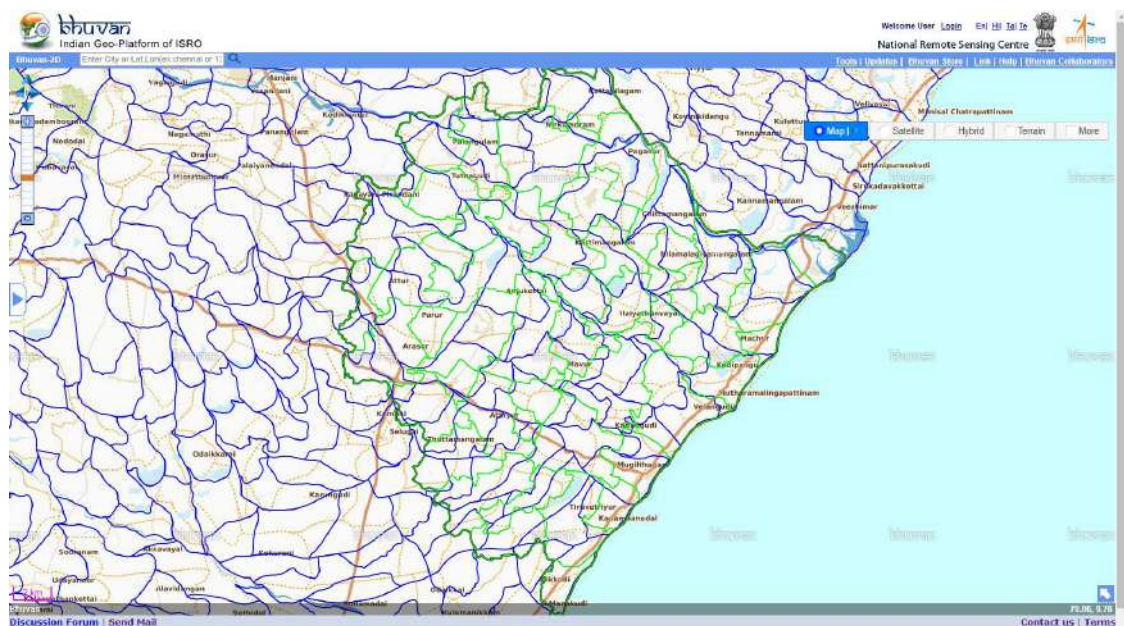


Figure 3.7. Watershed map

**3.5.1.8 Ground water perspectives:** Ground water is one of the important natural resources in semi-arid region like Thiruvadanai 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 (Figure 3.8). The GP wise detailed 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.

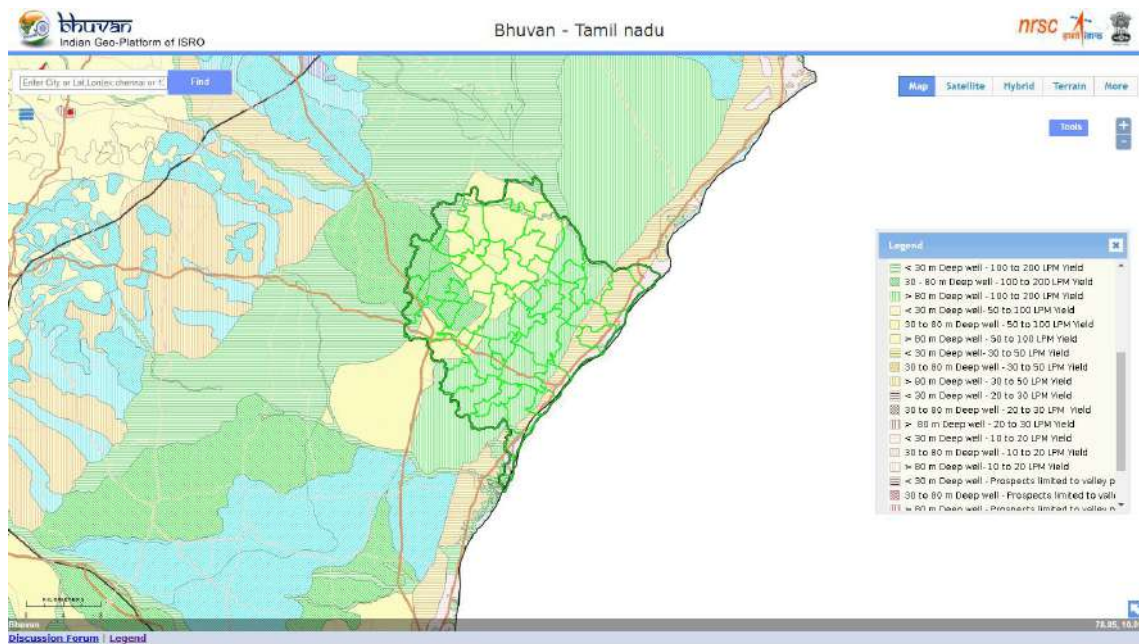


Figure 3.8. Ground water perspective map





Groundwater  
ProspectsArea  
in %

Gram Panchayat

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

Karumozhli, Orikottai - 100%, Neyvayal, T Nagani - 80%, Anjukottai - 65%, Kunjankulam - 60%, Periyakeera\_Mangalam - 25%, Palangulam, Tuthagudi - 10%

**>80m Deep well - 1000 to 200 LPM Yield**

Arumboor, Kattivayal, Kulathoor, Mavur, Nilamalagiyamangalam, Oriyoor, Pandugudi, Pathanakudi, Thalimarungur, Theloor, Tiruvetriyarur, Vellaiyapuram - 100%, Oriyoor, Sirugambaiyur - 95%, Achangudi - 80%, Athiyur - 65%, Kodanoor, Mugilthagam - 60%, Kodipangu - 45%, Nagrikathan - 40%, Nambuthalai, Pananjayal - 30%

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

Andavoorni, Arasathoor, Kadambur, Kookudi, Mangalagudi, Sirumalaikottai, Thiruvadana - 100%, Paganur, Tuthagudi - 85%, Kalloor, Kattavilagam - 80%, Anjukottai, Periyakeera\_Mangalam - 65%, Kunjankulam - 60%, Kodanoor - 40%, Palangulam - 35%, Achangudi, Nagrikathan, Nilamalagiyamangalam - 20%, Neyvayal, T Nagani - 15%

**<30 m Deep well -30 to 50 LPM Yield**

Pullakadapan - 80%, Vattanam - 70%, Pananjayal - 65%, Kodipangu - 55%, Nambuthalai, S\_P\_Pattinam - 40%, Kaliyanagari - 30%, Mugilthagam - 20%, Oriyoor - 15%

**<30m Deep well -10 to 20 LPM Yield**

S\_P\_Pattinam - 50%, Vattanam - 40%, Kaliyanagari - 30%, Kodipangu - 25%, Nambuthalai, Pullakadapan - 20%, Mugilthagam, Pudupattinam - 10%

### 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
<b>Canal Network (m)</b>	
Length of Main Canal (m)	3,00,800
Length of Minor Canal (m)	64,640
Length of Distributaries (m)	34,000
Water Courses (Field Channels) (m)	3,50,683
<b>Traditional Water bodies (No.)</b>	
Number of Tanks (PWD & Union) (No.)	248
Number of Ooranis (No.)	831
<b>Irrigation Facilities (ha)</b>	
Tank Irrigation	10,794
Canal Irrigation	1,103
Open & Tube Well Irrigation	1,312
<b>Catchment Area wise Available Runoff (ha.m)</b>	
Good Catchment Area	2,237
Average Catchment Area	188
Bad Catchment Area	3,244
<b>Watershed and Drainage Networks</b>	
Length of Natural Drainage Lines (m)	55,735
Number of Natural Drainage Lines (No.)	58
Number of Micro-watersheds (No.)	263
<b>Water Demand</b>	
For Humans (ha.m)	342
For Livestock (ha.m)	66
For Agriculture (ha.m)	33,813
GW utilization for Drinking (%)	79.2
GW utilization for Livestock (%)	86.2
GW utilization for Agriculture. (%)	11.3
SW utilization for Drinking (%)	20.8
SW utilization for Livestock (%)	13.8
SW Utilization for Agriculture (%)	88.7

#### 3.5.2.1 Existing Water Structures

The Block has structured traditional water storage units such as tanks and Ooranis. It is noticed that the Ooranis are more (831) than tanks (248) (Figure 3.9).

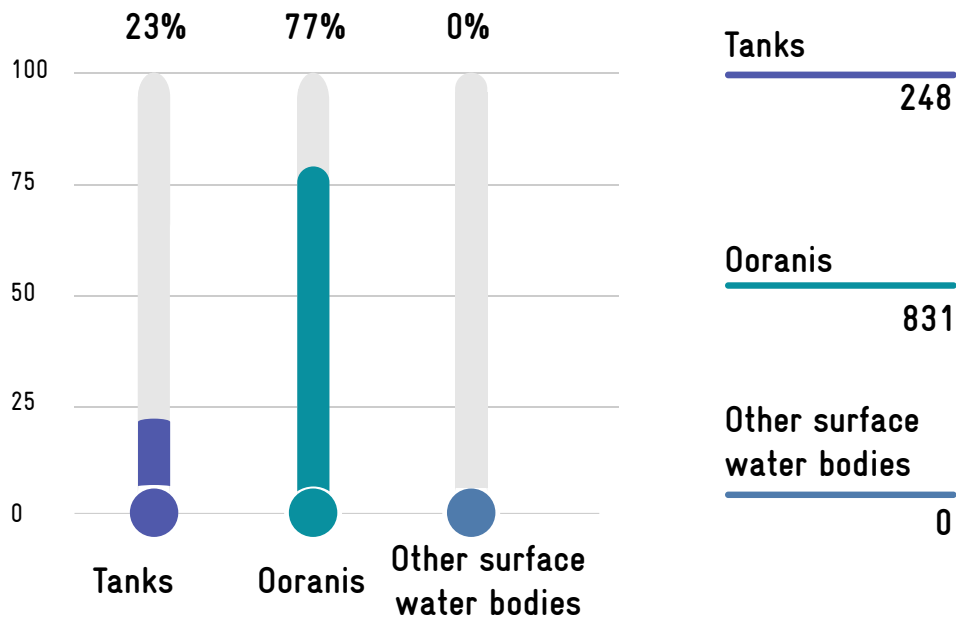


Figure 3.9. Traditional Waterbodies

### 3.5.2.2 Sources of Irrigation

The total area under irrigation in the Block is 13,208.5 ha, of which 81.7 % (10,794 ha) is irrigated through tanks, followed by 9.9 % (1,312 ha) through open/tube well and the remaining 8.3 % (1,103 ha) area is through canals-based irrigation (Figure 3.10).

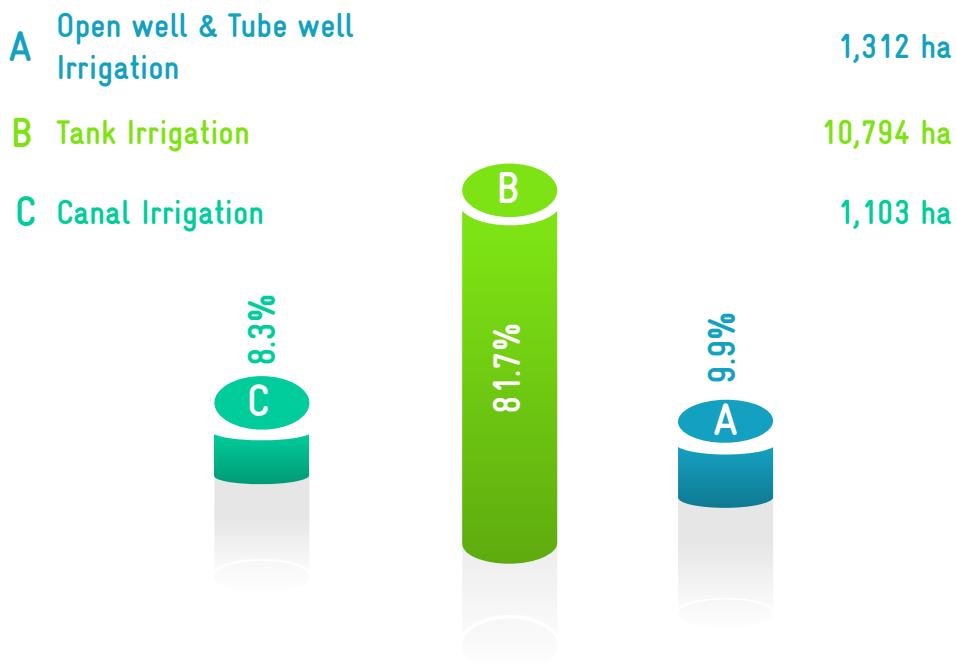


Figure 3.10. Irrigation sources

### 3.5.2.3 Available Run off

The total available runoff in the catchment area is 5,668.4 ha.m out of which 39.5 % is from good catchment area followed by 57.2 % from bad catchment area and the remaining 3.3 % is from average catchment area. As the area has worse catchment area, the runoff generated is more (Figure 3.11).

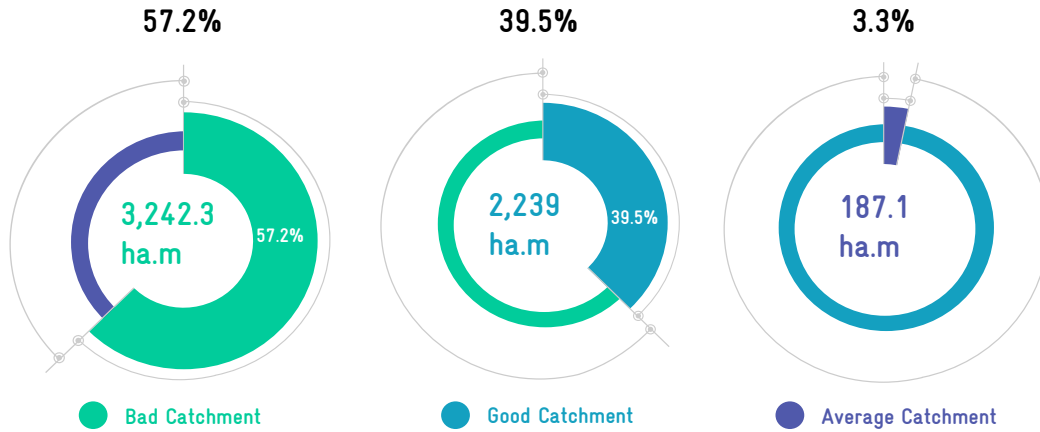
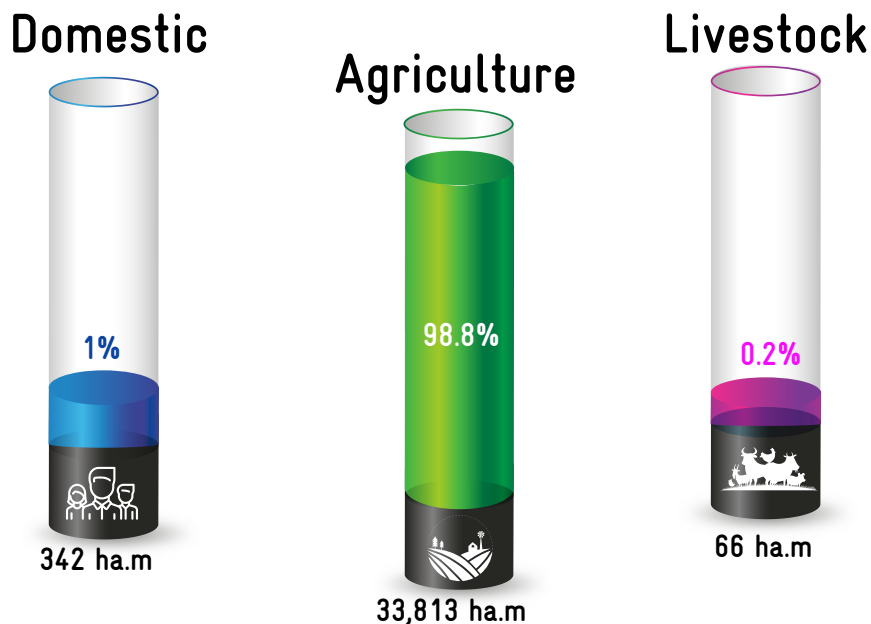


Figure 3.11. Runoff from catchments

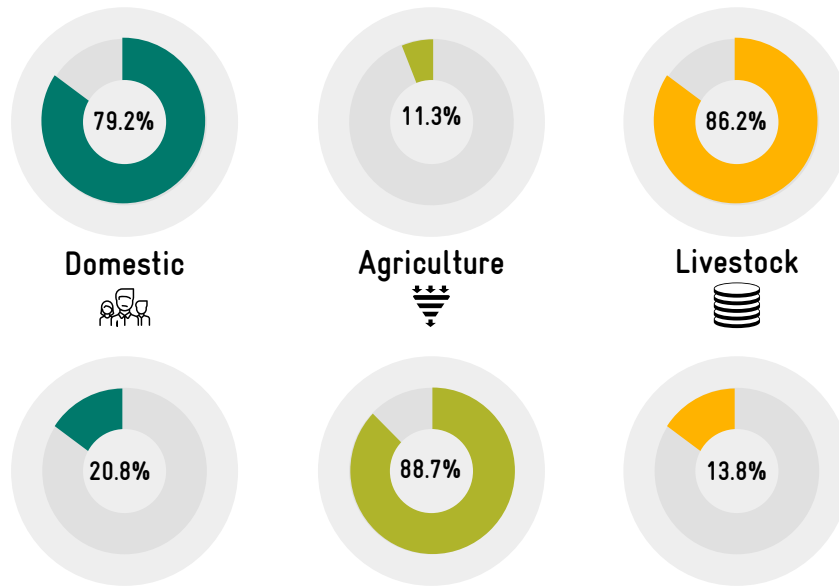
### 3.5.2.4 Water Demand

The total demand for water including domestic, agriculture and livestock purpose is 34,221 ha.m. The highest demand is from the agriculture sector of 33,813 ha.m (98.8 %) followed by domestic use demand of 342 ha.m (1 %) and rest is from livestock.



Out of the total water demand, 79.2 % for domestic purpose usage is met through ground water while the remaining 20.8 % from surface water resources. Utilization of 88.7 % for agriculture is from surface water while 86.2 % for livestock is met by ground water (Figure 3.12).

## % OF GROUND WATER UTILIZATION



## % 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 Mixture Index (SMI) and Salinity. To understand WQI and SMI, 33 water samples were collected across Block area, out of which 22 samples were of open well water and 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,  $\text{HCO}_3$ , Cl,  $\text{SO}_4$ ,  $\text{NO}_3$ , Ca, Mg, Na and K to determine the water quality. The results showed that the average content of ions was as follows:  $\text{Cl} > \text{TA} > \text{TH} > \text{HCO}_3 > \text{Na} > \text{Ca} > \text{Mg} > \text{CO}_3 > \text{SO}_4 > \text{K} > \text{NO}_3$ . The predominant hydro-chemical parameters 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 seven spots (blue colour in Figure 3.10) over the Block area while very poor-quality water/ unsuitable water for domestic purpose with index value  $>300$  is found in two 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 good to medium (50-100) (Figure 3.14). These zones act as inputs in identifying suitable sites to propose appropriate treatment measures. Location wise water quality during pre and post monsoons are attached in Annexure 3.8 and 3.9.

Physicochemical parameters	Cl	Na	TH	TA	$\text{HCO}_3$	Ca	Mg	$\text{CO}_3$	$\text{SO}_4$	$\text{NO}_3$	K
Average in mg/l	895.9	366.6	345.7	276.2	200.8	175.2	9	57.8	40.6	20.1	17.9

(TH = Total hardness, TA = Titratable acidity, Ca = calcium, Na= Sodium, Cl= Chloride,  $\text{HCO}_3$ =Bicarbonate, Mg= Magnesium,  $\text{SO}_4$ = Sulphate,  $\text{NO}_3$ = Nitrate, K= Potassium,  $\text{CO}_3$ = Carbonate)

EXCELLENT QUALITY	<50
GOOD QUALITY	50- 100
MEDIUM QUALITY	100- 200
POOR QUALITY	200-300
VERY POOR QUALITY	>300

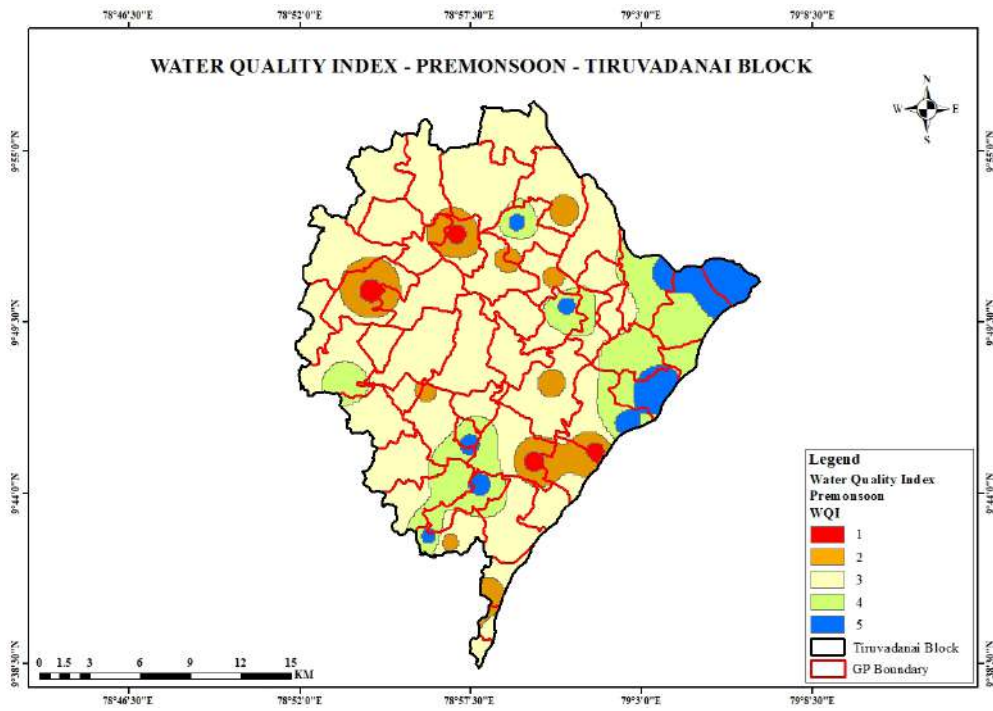


Figure 3.14. Water Quality Index

### 3.5.3.2 Seawater Mixing Index

SWI parameter is calculated based on mixing of major ionic constituents (Na, Cl, Mg, and SO<sub>4</sub>) of sea water to ground water during pre-monsoon season. The results showed that the average content of ions was as follows: Na > Ca > Mg > S<sub>04</sub>. The predominant hydro-chemical facies are Sodium followed by Calcium while Sulphate is less. Geographically three spots were found with high SMI while two zones with less sea water mixed. However, most of the Block area falls under the index value range 1- 2 which is moderate (Figure 3.15).

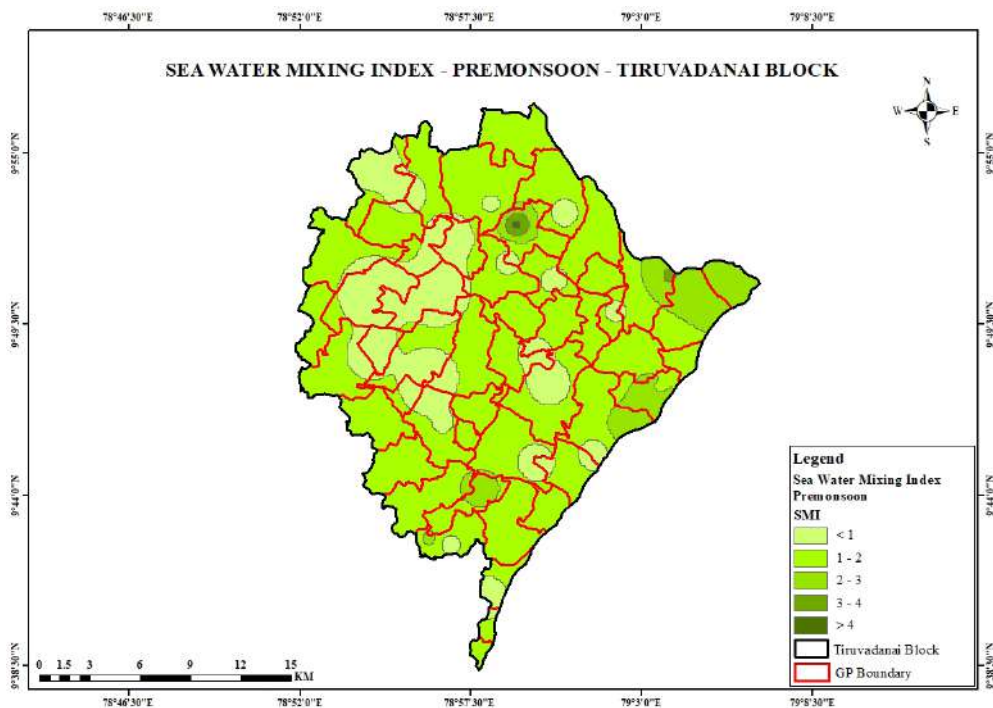


Figure 3.15. Seawater Mixing Index



### 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).

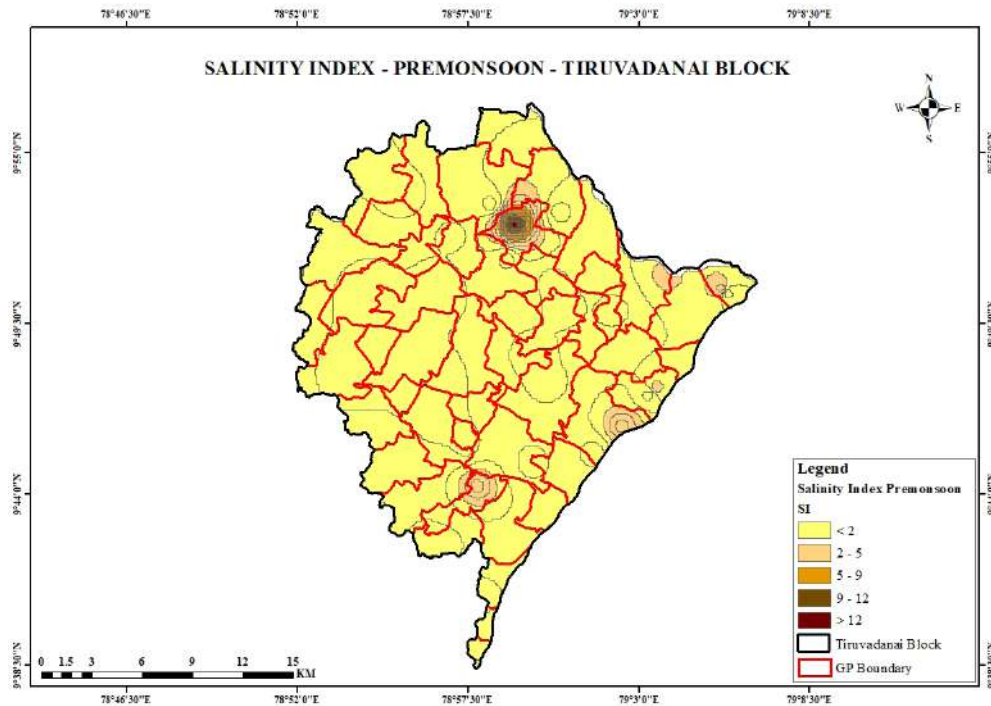


Figure 3.16. Salinity Index

## 3.6 | CWRM PLANNING ANALYSIS- AGRICULTURE

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

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

### 3.6.1 SPATIAL DATA

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

nai 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 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.



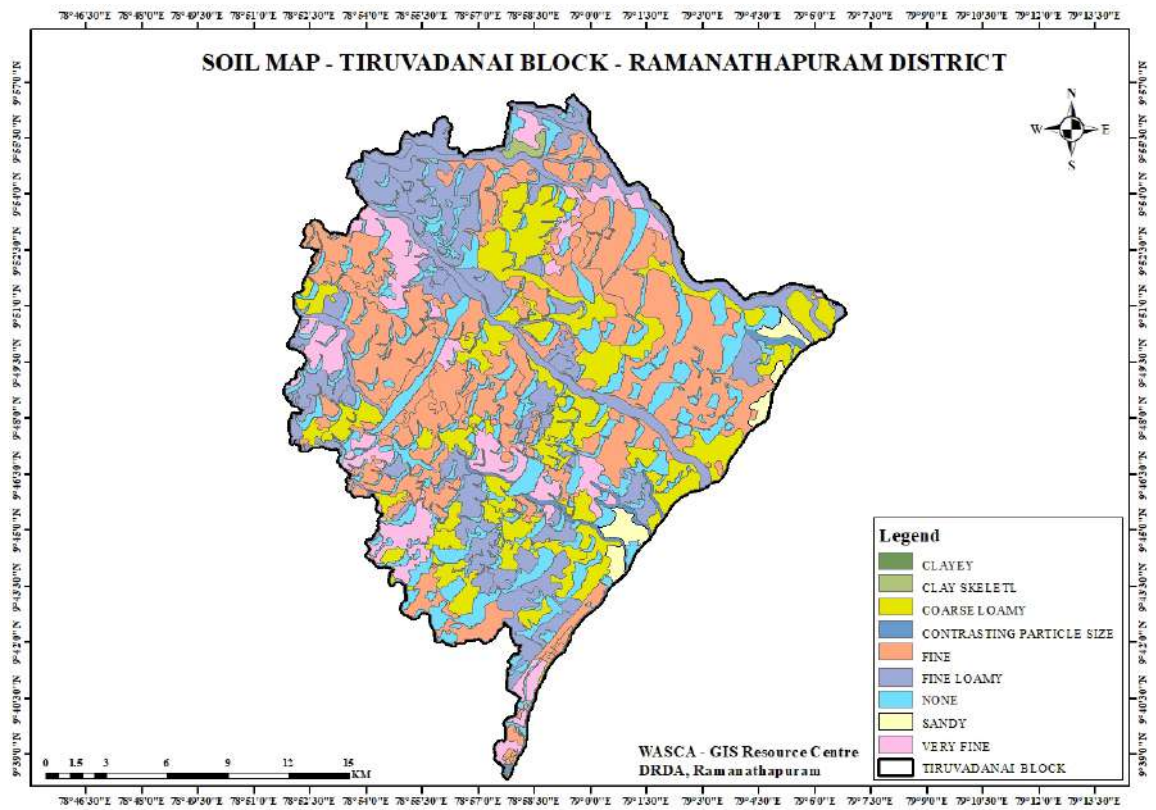


Figure 3.17. Soil texture

**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 erosion type soil erosion is found in the eastern region and a small patch in the central part of Thiruvadana Block (Figure 3.18) and the illustration below gives area wise soil erosion details of the GPs. Soil eroded sites will help in preparing plans, to suggest soil conservation and watershed management activities.

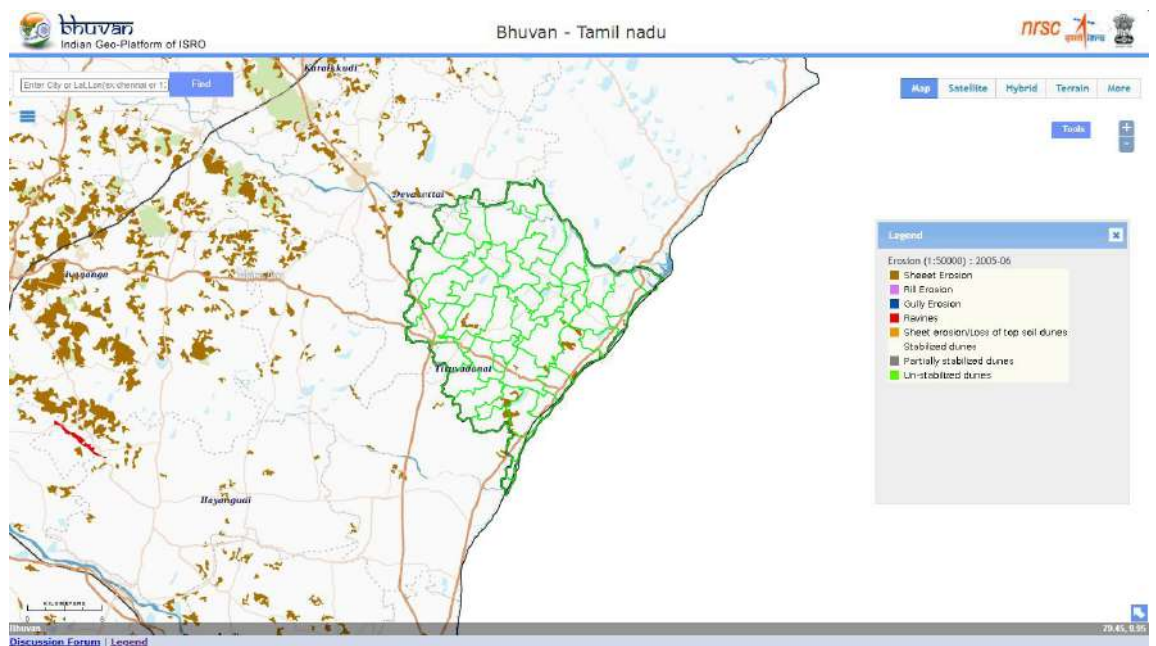


Figure 3.18. Soil erosion map

Erosion  
type

Area  
in %

Gram Panchayat

### Sheet Erosion



Kulathoor - 20%, Anjukottai, Kodipangu - 15%,  
Mugilthagam - 10%, Theloor, Tiruvetriyarur - 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. Thiruvadanai Block is majorly covered by the agricultural crop, barren land and small portions of swamps/mangroves (Figure 3.19). The GP wise LULC is tabulated below. LULC map helps the decision makers and planners to focus on the fallow land development activities.

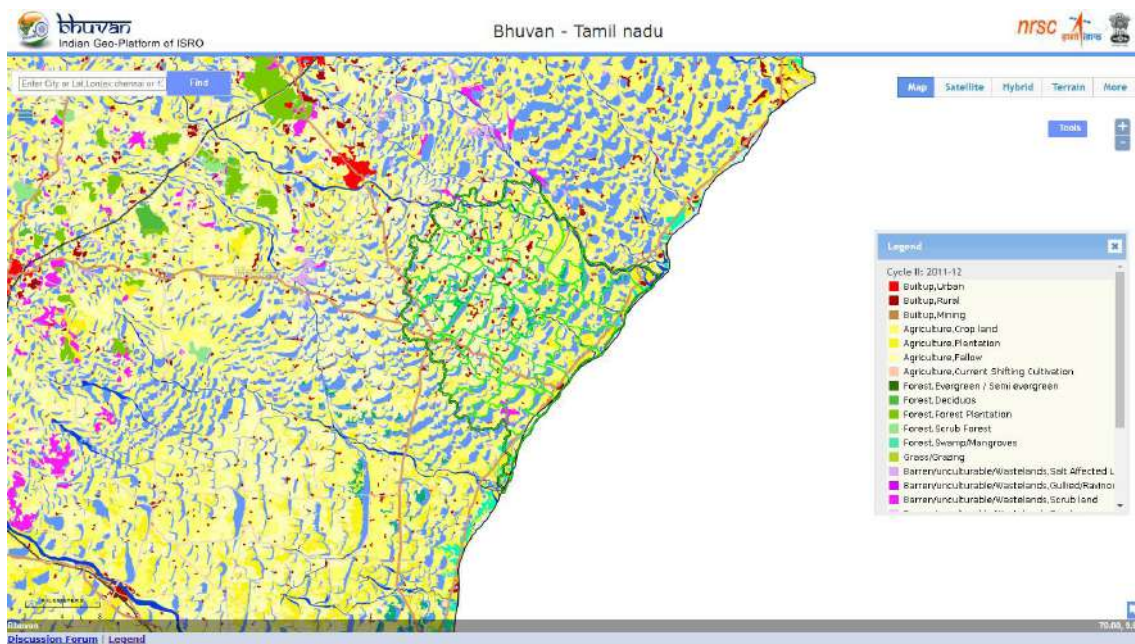
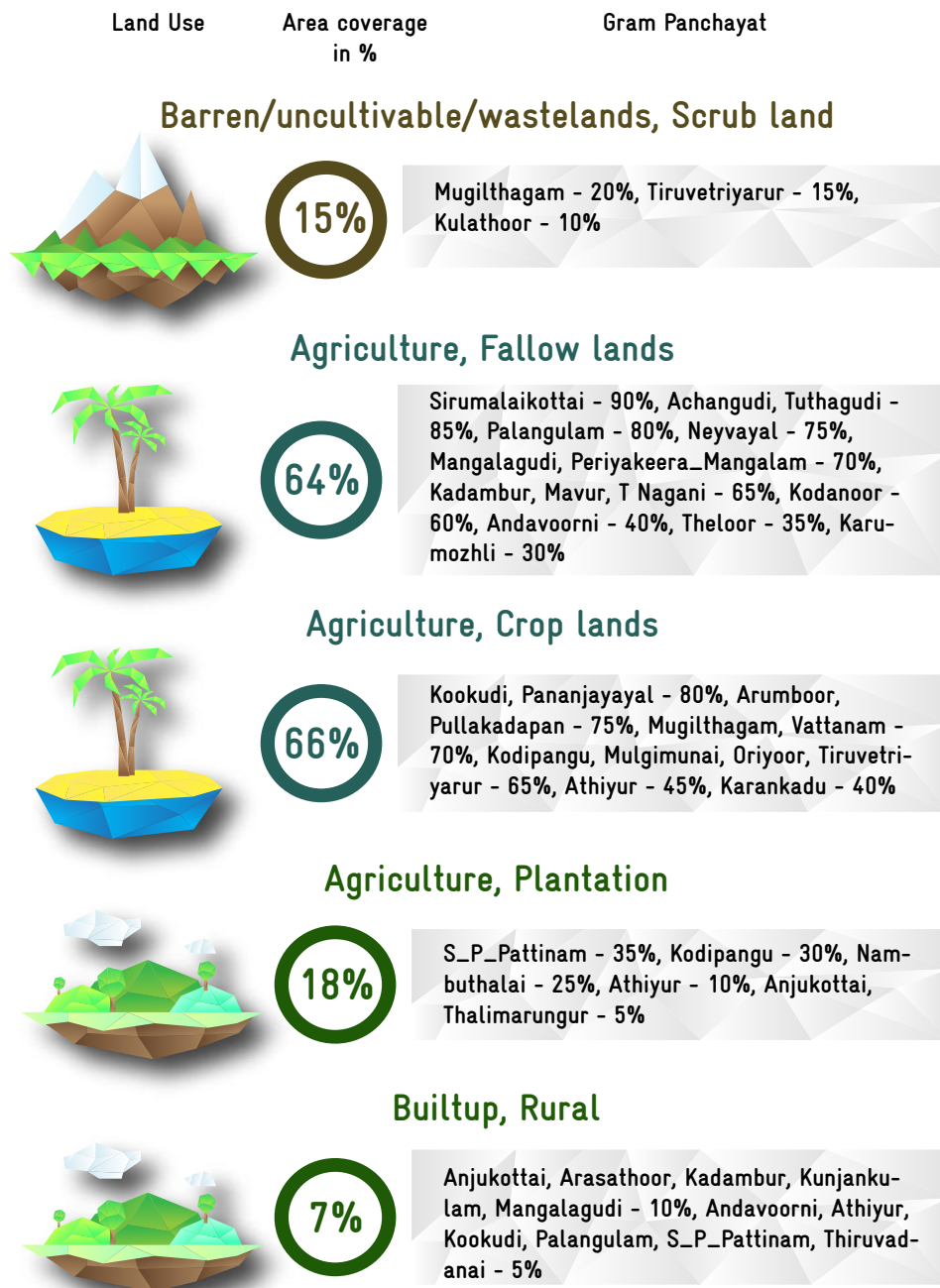


Figure 3.19. Land Use Land Cover map



**3.6.1.4 Waste land:** A Parcel of land that is not suitable for any agricultural 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 is noticed in Thiruvadanai Block as wasteland (Figure 3.20). GP wise details are 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.



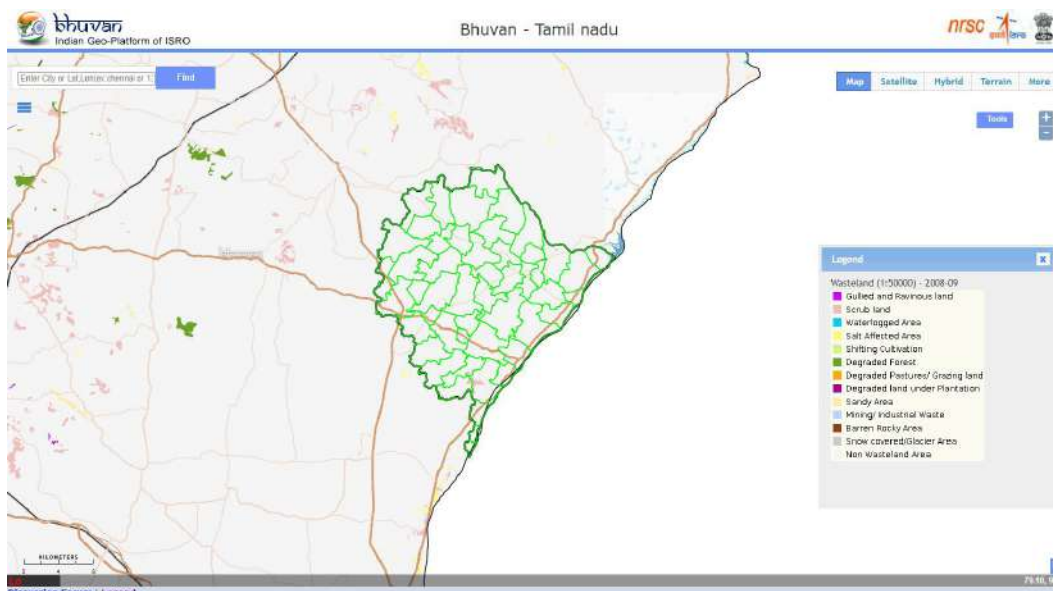
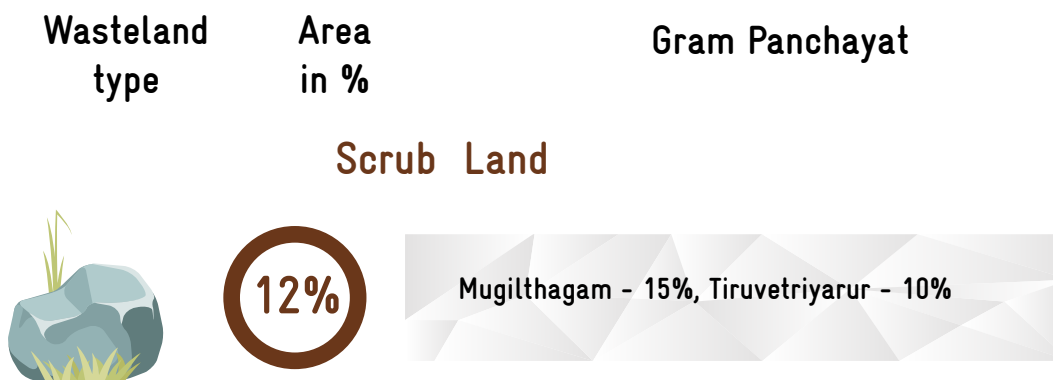


Figure 3.20. Wasteland map



**3.6.1.5 Salt affected area:** Due to the Block’s proximity to coastal region, small portion of slight salinity is noticed (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.

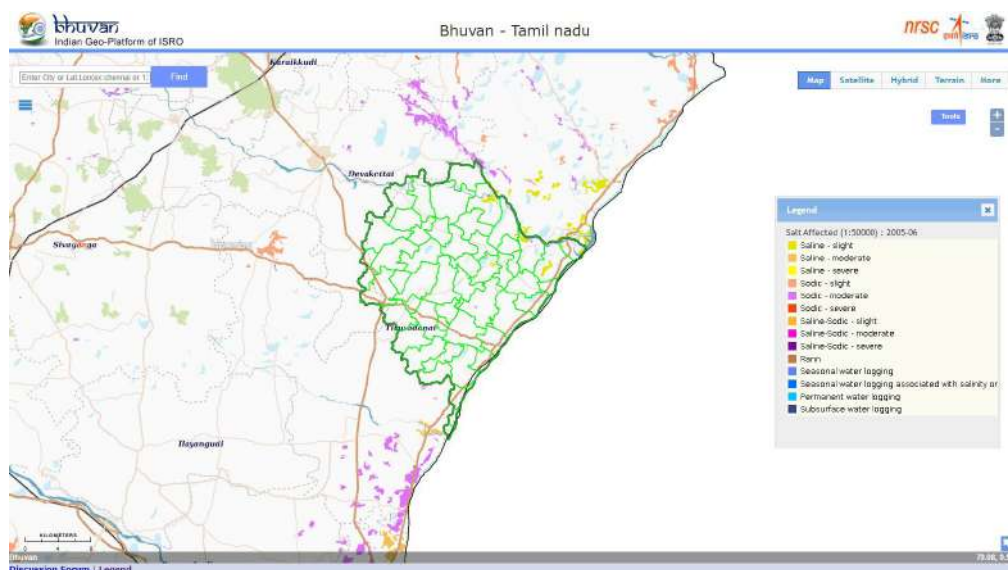


Figure 3.21. Salt affected area

Thematic  
unit

Area  
in %

Gram Panchayat

Saline - Slight



Paganur, Pullakadapan - 10%, Oriyoor,  
S.P.Pattinam -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
<b>Area under Land Resources (ha.)</b>	
Non-Agricultural Uses	8,290
Land Under Miscellaneous Tree Crops etc.	392
Cultivable Waste Land	542
Fallows Land other than Current Fallows	4,822
Current Fallow land	1,788
Unirrigated Land	14,028
Area Irrigated by Source	7,916
<b>Land under Catchment Area (ha)</b>	
Good Catchment	10,080
Average Catchment	1,103
Bad Catchment	28,554
<b>Crop Details</b>	
Irrigated Area (ha)	9,018
Rainfed area (ha)	20,348
Paddy Cultivation (ha)	29,303
Crop Water Requirement - Irrigated condition (ha.m)	13,465
Crop Water Requirement - Rainfed condition (ha.m)	20,348
<b>Soil Resources: Status of Available Nitrogen (%)</b>	
Very Low	11.34
Low	72.58
Medium	15.14
<b>Status of Organic Carbon (%)</b>	
Very Low	7.47
Low	32.46
Medium	14.4

High	27.65
Very High	18
<b>Status of Soil Micro Nutrients (%)</b>	
Sufficient	66.28
Deficient	33.74
<b>Status of Physical condition of the soil (%)</b>	
Moderately Acidic	34.55
Slightly Acidic	14.99
Neutral	1.31
Moderately Alkaline	49.14
<b>Soil Texture (%)</b>	
% of Fine Soil	62.63
% of Coarse loamy	17.22
Soil Water Permeability (Low, Moderate, high)	Moderate
<b>Soil moisture and ET</b>	
Volumetric Soil Moisture (%)	17
Estimated Soil Moisture (ha.m)	5,346
ET Losses (ha.m)	11,757
<b>Means of Water Extraction (%)</b>	
Gravity	52.88
Lifting	47.17
<b>Irrigation Methods (%)</b>	
Wild Flooding	89.23
Control Flooding	10.77
<b>Livestock (No.)</b>	
Cattle Population	15,789
Sheep Population	6,106
Goat Population	14,181
Poultry	32,292

### 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 39,737.3 ha, the highest of 35.3 % land is Unirrigated land, followed by 20.86 % Non-agricultural uses, while less than five percent of land is cultivable wasteland, Land under Miscellaneous Tree Crops etc., Permanent Pastures and Other Grazing Land and Forest Land (Figure 3.22).

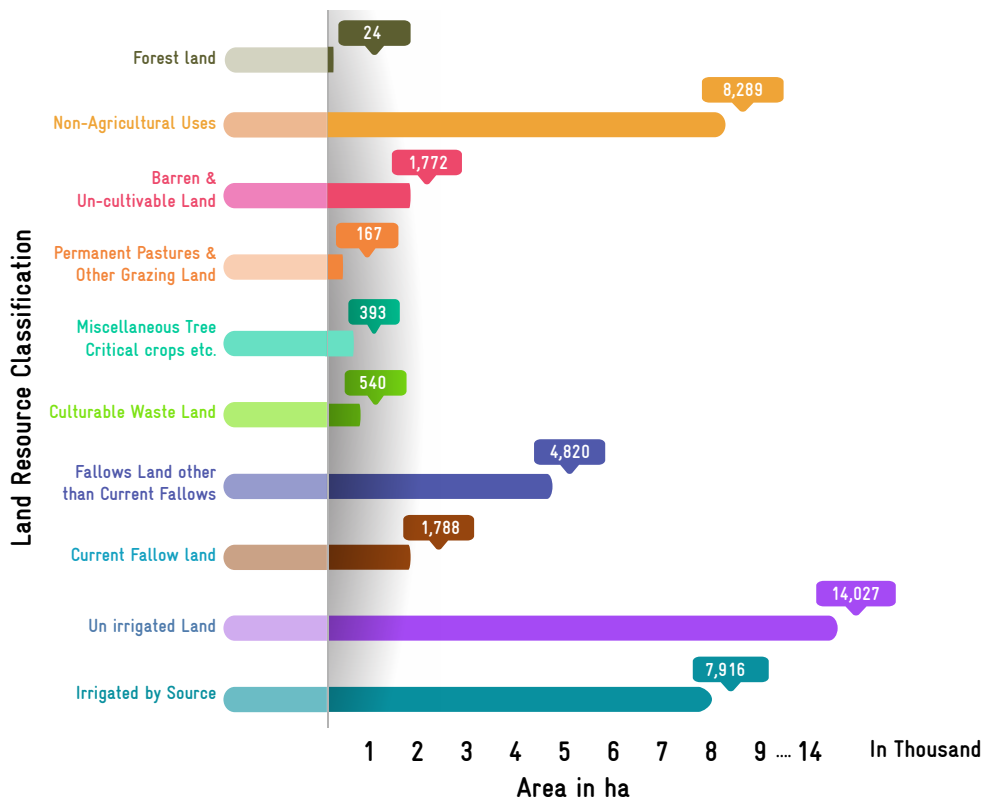


Figure 3.22. Land utilization

### 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 total catchment area of 39,737 ha, of the Block, the highest of about 71.86 % from bad catchment area followed by 25.37 % 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). It is noticed that the good and average catchment area are with similar extension, with effective and better plans of treatment measures, there is a high possibility of converting the average catchment area to good catchment area.

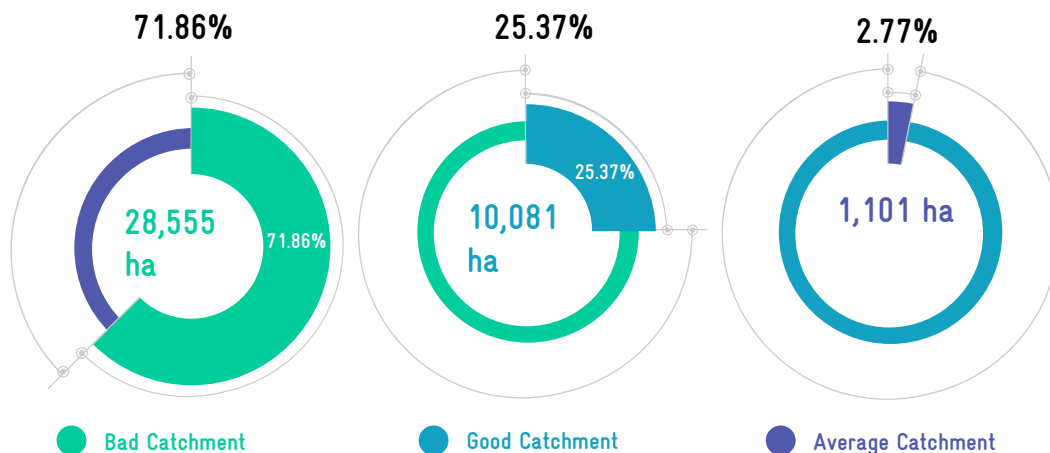


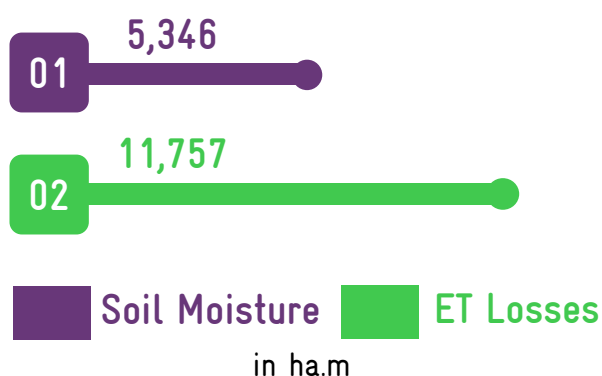
Figure 3.23. Catchment area

### 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 5,346 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 11,757 ha.m during 2018-19, with a monthly average of 979.8 ha.m.



### 3.6.2.5 Macro-nutrients

#### Nitrogen

The macro soil nutrients such as nitrogen and organic carbon falls under very low to medium category in all the soil samples tested. The available nitrogen is very low in 11.34 % of the samples tested while it was 72.58 % under low category and remaining is medium Nitrogen (Figure 3.24). According to soil resource map, this Block is identified as one of the nitrogen deficient Blocks (Ramanathapuram District profile 2020).

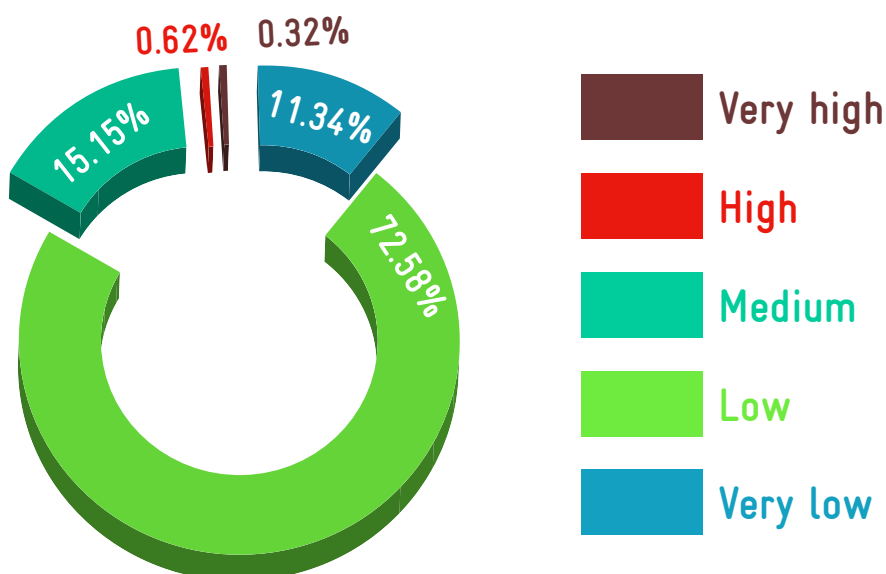


Figure 3.24. Status of available Nitrogen



## Organic Carbon

Soil organic carbon ranges between very low and very high in the tested soil samples. Nearly 32.46 % of the soil samples tested fall under low category followed by 27.65 % which falls under high category while less than 10 % falls under very low organic carbon (Figure 3.25). This indicates that the soil fertility is moderately poor.

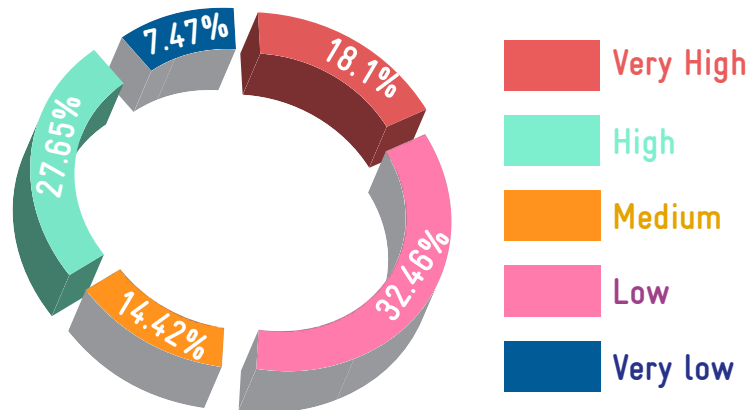


Figure 3.25. Status of soil Organic Carbon

### 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 34 % and 66 % sufficient in the soils tested (Figure 3.26).

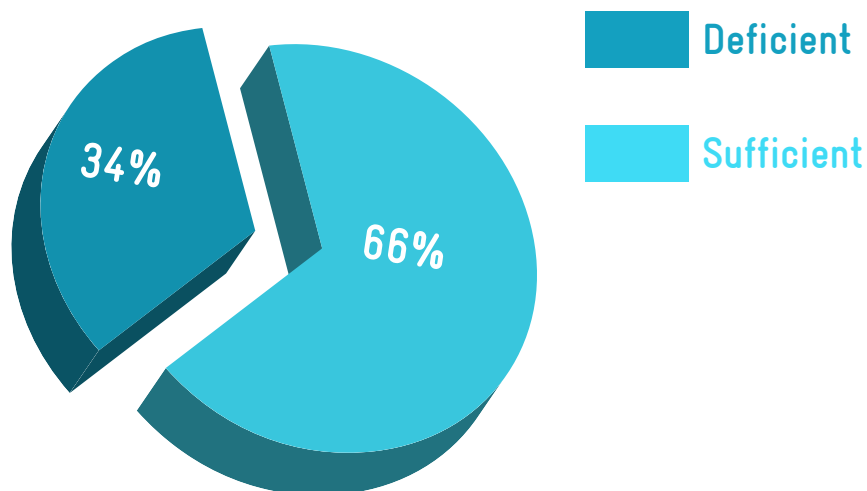


Figure 3.26. Status of soil micro-nutrients

### 3.6.2.7 Physical parameters – pH status

With reference to the physical parameters, 49.1 % of the soil is moderately alkaline in nature followed by 34.5 % moderately acidic and rest is slightly acidic (Figure 3.27).

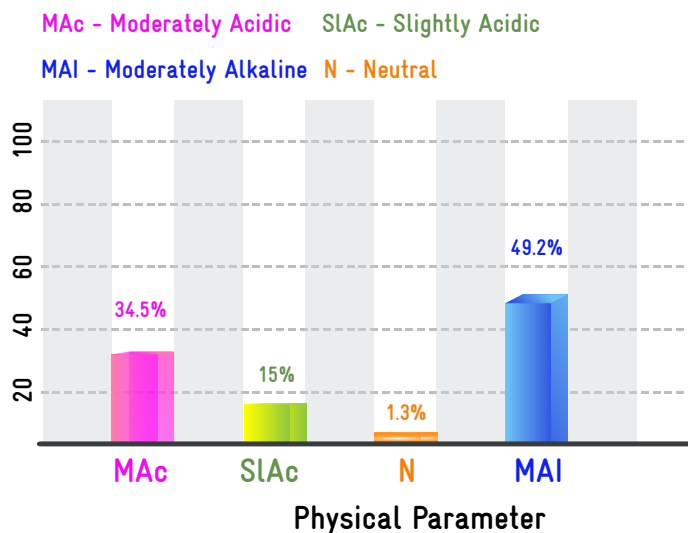


Figure 3.27. Status of pH of soil

### 3.6.2.8 Cropping pattern and the irrigation

A total of 28,766.6 ha area is used for crop cultivation in which 69.8 % area is irrigated with rain based water and the rest of the area is by irrigation based sources. Paddy is a major crop with about 28,703 ha (99.77 %) followed by coconut while cultivation of vegetables is less in area. Sugar cane, red gram, ragi, dry chilli, brinjal, water melon, ladies finger, gourds, flower crops, banana, guava, medicinal plants, lemon, mango, tomato are cultivated in less than one percent of the area.

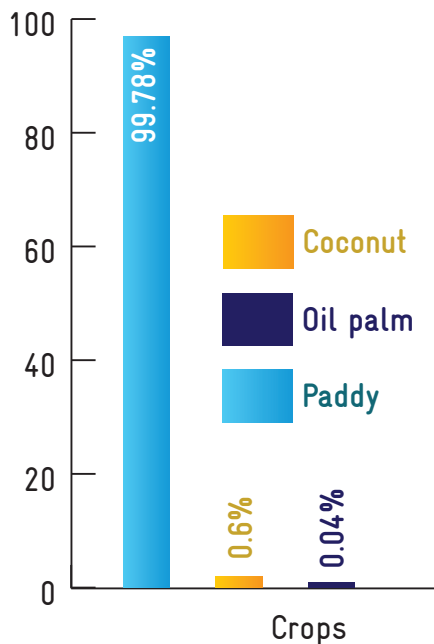


Figure 3.28. Crop pattern (including rain-fed and irrigation area)

### 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, 89.2 % of the irrigation is done by wild flooding and rest of irrigation is done by control flooding (Figure 3.29).

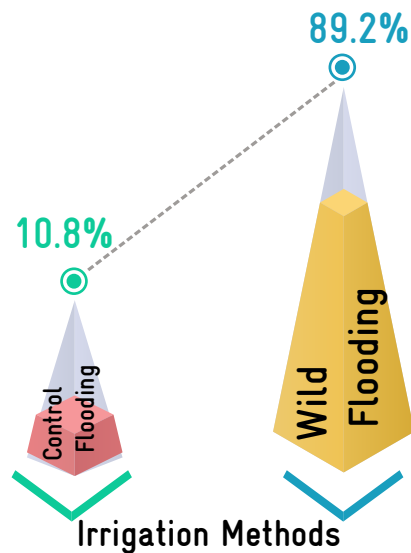


Figure 3.29. Irrigation methods

### 3.6.2.10 Means of water extraction

Water is extracted in two ways, one by gravity and another is by lifting. Water is drawn from surface water sources such as tanks, ponds etc., by using gravity method and that of ground water sources such as open well, hand pump, bore well by using lifting method. In the Block, 52.8 % of the water extraction is through gravity and rest is through lifting means of water extraction (Figure 3.30).

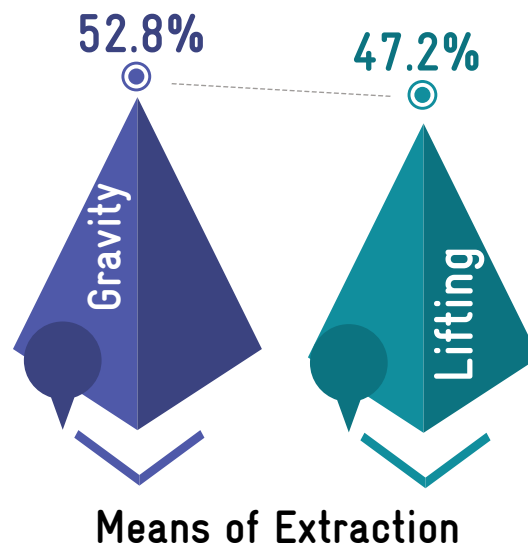


Figure 3.30. Means of water extraction

### 3.6.2.11 Livestock details

This Block has considerable proportion of livestock resources of about 68,368. Of which poultry population is high 47.2 % (32,292) followed by cattle population of 23.1 % (15,789), while small ruminant's sheep is less than 10 % (6,106) (Figure 3.31). The total water requirement for livestock is 66 ha.m. Of the total water demand, 86.2 % is met through ground water and remaining is from surface water resources.

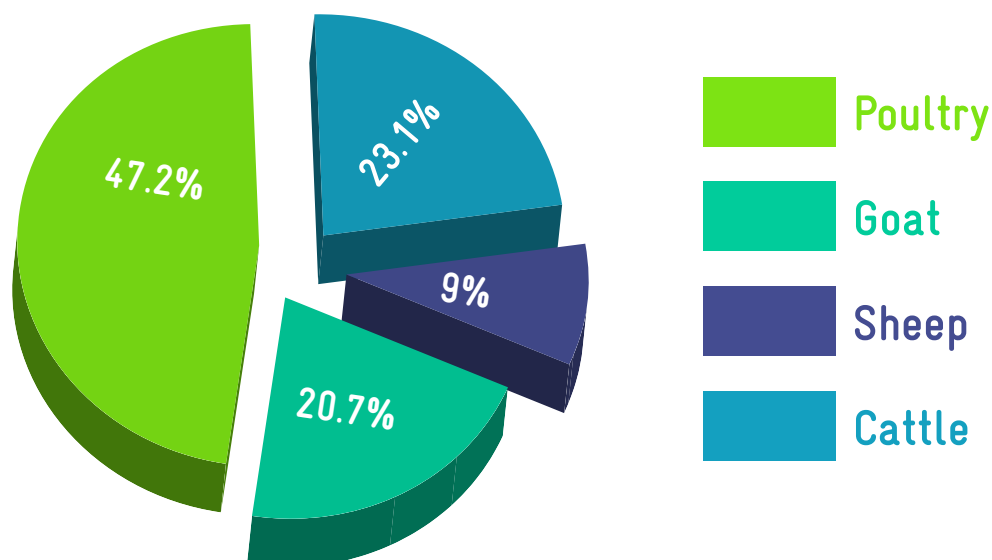


Figure 3.31. Livestock details

### 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 Thiruvadanai Block. GP wise demographic and socio-economic status is attached in Annexure 3.11.

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

Parameter	Total
Geographical Area (ha)	42,476
Male Population (No.)	62,878
Female Population (No.)	62,239
Total Population (No.)	1,25,111
SC Population (No.)	22,572
ST Population (No.)	33
Vulnerable Population (No.)	22,605
Households (HH's) (No.)	31,194
Only one room HH's (SECC) (No.)	4,592
Female Headed HH's (SECC) (No.)	1,373
Vulnerable Households (SECC) (No.)	3,628
% of Vulnerable Households (%)	12.2
Registered MGNREGA Job cards (Persons)	31,858
Active person working in MGNREGA job Cards (Persons)	21,727
Drinking Water Sources (No.)	6,387
HH's have tap water connection for drinking water (No.)	16,455
HH's dependent on other sources for drinking water (No.)	20,792
Annual Greywater Generation (ha.m)	228.3

### 3.7.1 Population:

The total population of this Block is 1.25 Lakhs\* in which the female proportion is almost equal to male 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 18 % of the total population are under vulnerable population of SC (Figure 3.32).

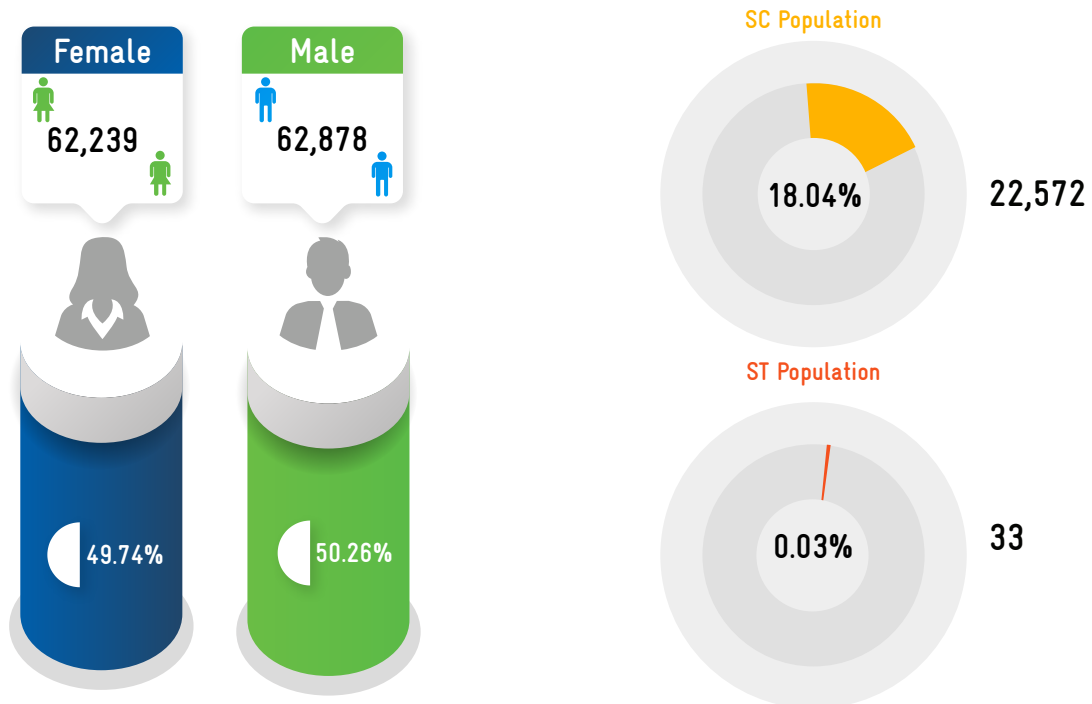


Figure 3.32. Population details

*\*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 31,194 households in which 15 % households have only one room, 4% households are headed by women and 12 % are vulnerable households (Figure 3.33).

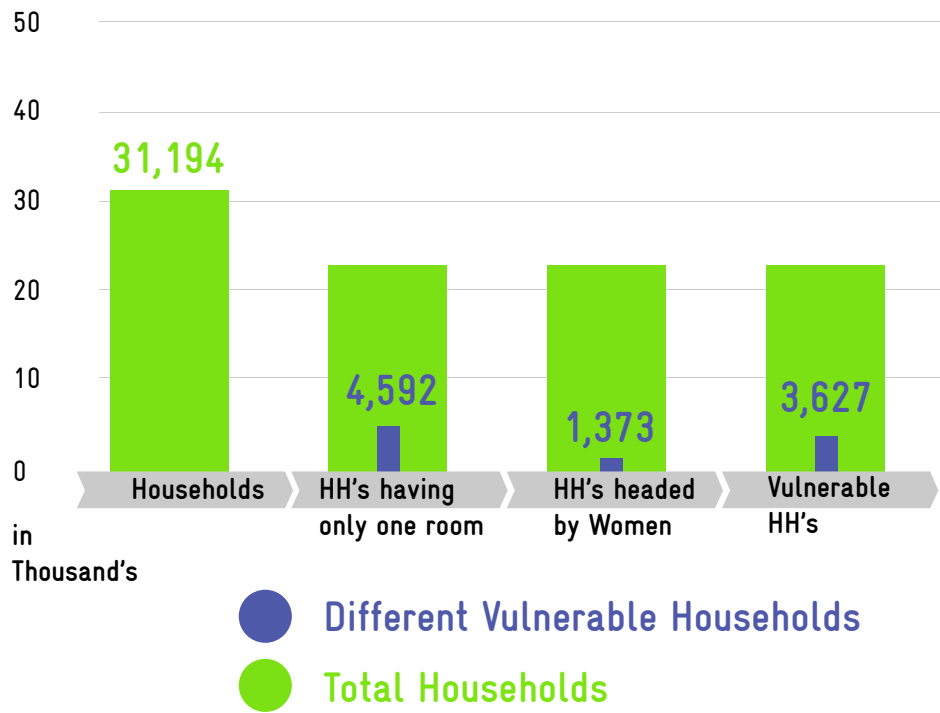


Figure 3.33. Details of households

### 3.7.3 Status of Mahatma Gandhi NREGA - job card status

In the Block, of the total population of 1.25 Lakhs, 31,858 are registered for job cards in Mahatma Gandhi NREGA scheme in which 68 % of the job cards are in active category (Figure 3.34).

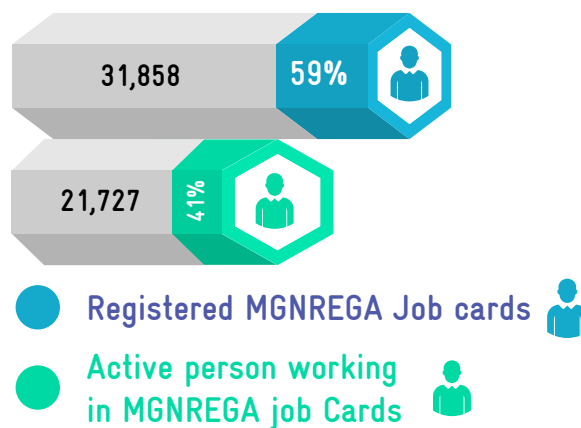


Figure 3.34. Status of MGNREGA job cards

### 3.7.4 Drinking Water Sources

Nearly 16,455 households have tap water connection and 20,792 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

**16,455**  
**Households**



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

**20,792**  
**Households**

### 3.7.5 Annual Greywater Generation

The grey water generation estimated across this Block is 228.33 ha.m which is available for reuse or recycle.

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



Morphology

Achangudi, Karnakadu,  
Palangulam



Wasteland

Mugithagam, Tiruvetriyarur



Soil erosion

Kulathoor, Anjukottai,  
Mugilthagam



Physicochemical  
parameters

Kulathoor, Kodaipangu,  
Oriyoor



Salt affected area

Paganur, Pullakadapam,  
Oriyoor



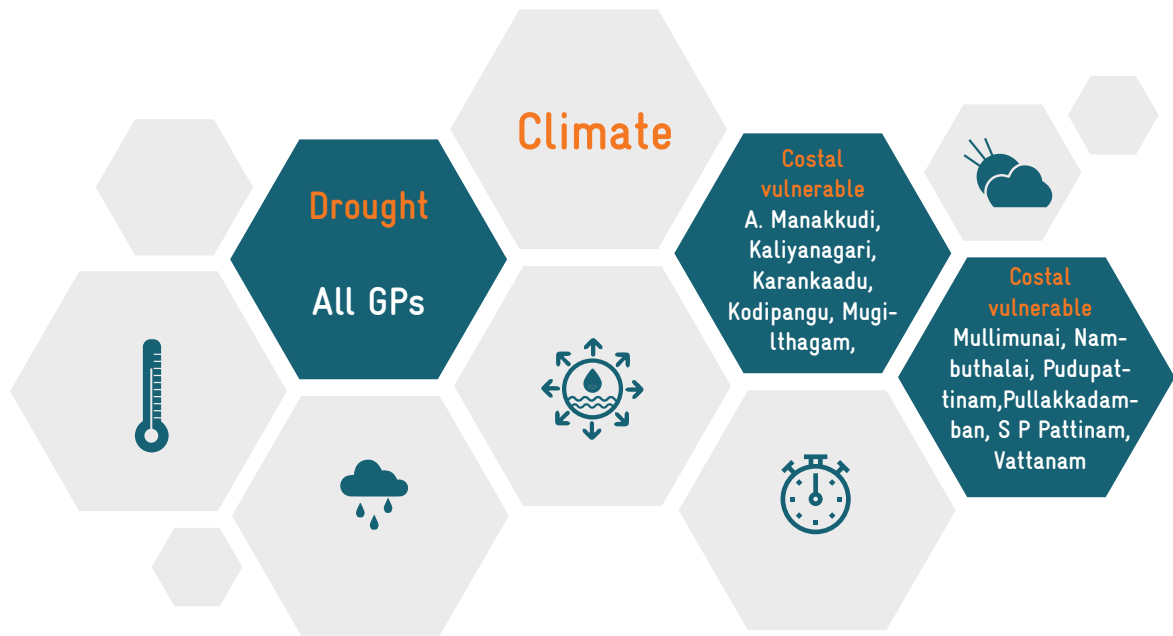
Ground water prosperity

Karumozhil, Arumboor,  
Andavoomi



Upland/Slope

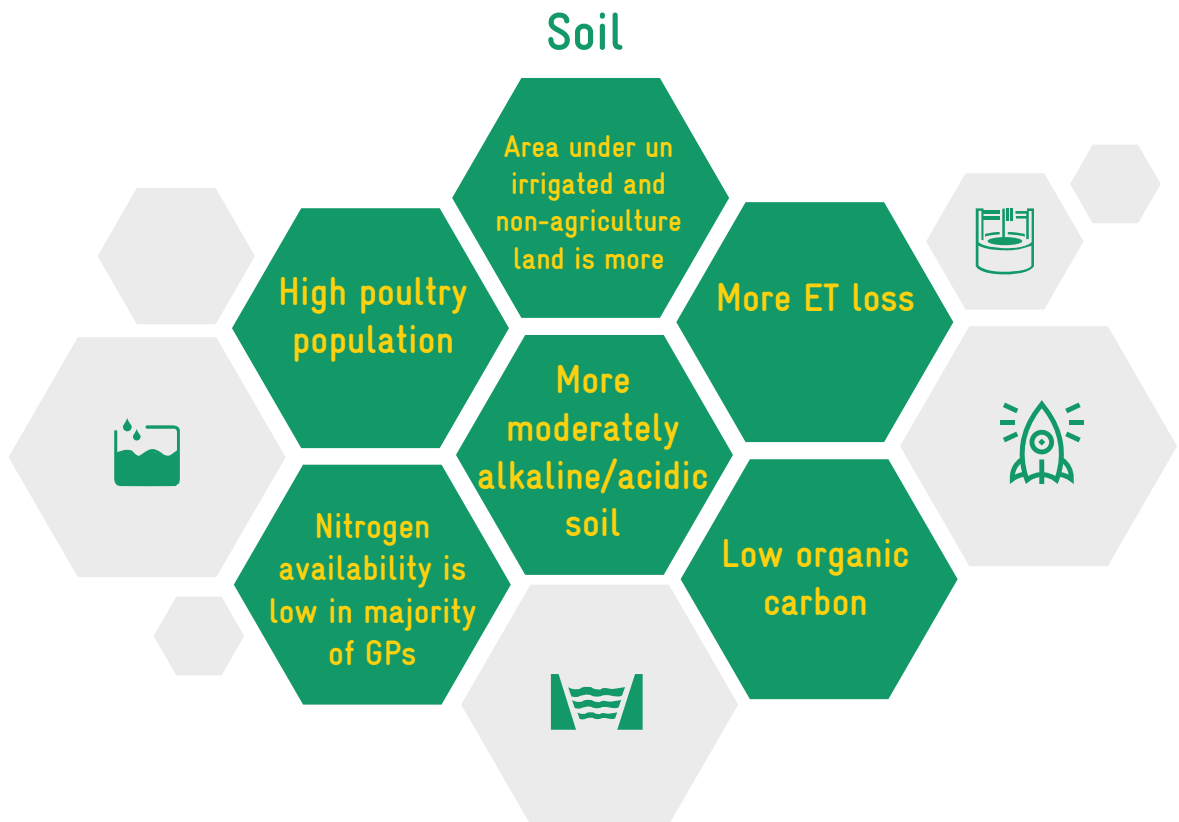
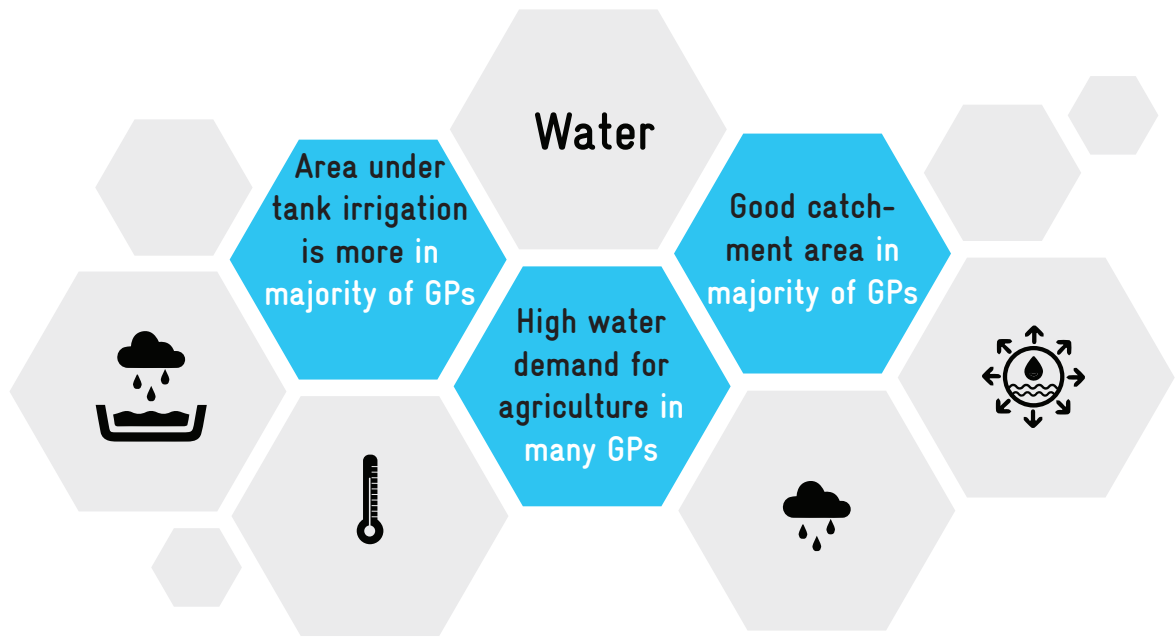
Nilamalagiyamangalam,  
Pudupattinam, Mavur



## Socio economic







கெடுப்பதூஉம் கெட்டார்க்குச் சார்வாய்மற் றாங்கே  
எடுப்பதூஉம் எல்லாம் மழை

குறள் - 15

Destruction it may sometimes pour  
But only rain can life restore

Thirukkural - 15

# CHAPTER 4

VULNERABILITY RANKING OF GP





## 4 | VULNERABILITY RANKING OF GP

The vulnerability assessment has been carried out using IPCC methodology. Intergovernmental Panel on Climate Change (IPCC) defined Vulnerability as ‘the propensity or predisposition to be adversely affected’ (IPCC 2014). Vulnerability encompasses a

variety of concepts and elements including sensitivity or susceptibility to harm and the lack of capacity to cope and adapt. It is determined by sensitivity and adaptive capacity of the system (Figure 4.1).

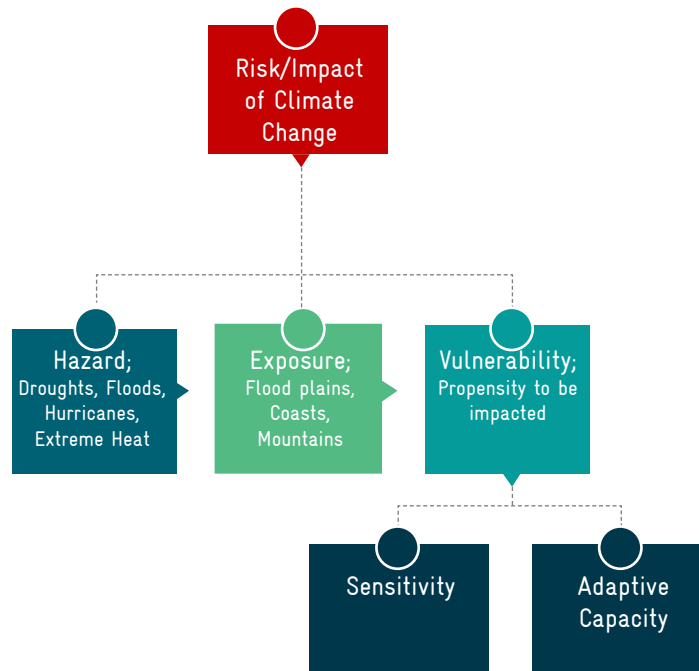


Figure 4.1. Vulnerability of the system as defined by IPCC

Generally, vulnerability assessments are made to identify.

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

The CWRM parameters which been explored through rigorous study were considered here to address the key water challenges at GP level. About 73 spatial and non-spatial parameters/ indicators under 4 dimensions via Climate (3), Water (28), Agriculture (31) and Socio-demographic (11) are cate-

gorized into adaptive capacity, sensitivity and exposure indicators for vulnerability analysis as per IPCC norms. Table 9 lists CWRM parameters/indicators, its rationale to vulnerability, source of data and its linkage with WASCA TN’s primary 18 indicators.

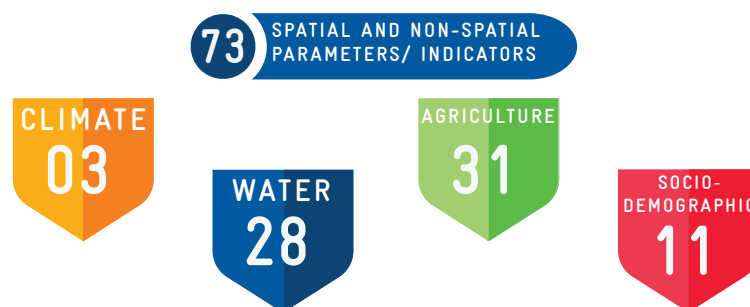


TABLE 9. CWRM PARAMETERS/INDICATORS SELECTED FOR BLOCK LEVEL VULNERABILITY

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

Agriculture	Fallow land other than current fallows	Sensitivity	
	Current fallow land		
	Unirrigated land		
	Area irrigated by source		
	<b>Land under catchment area (ha)</b>		
	Good Catchment	Adaptive capacity	
	Average Catchment		
	Bad Catchment	Sensitivity	
	<b>Crop Area details (in ha)</b>		
	Irrigated Area	Sensitivity	
	Rainfed area		
	<b>Soil Resources: Status of available Nitrogen (in %)</b>		
	Very low to low	Sensitivity	
	<b>Status of Organic Carbon (in %)</b>		
	Very low to low	Sensitivity	
	<b>Status of Soil Micro Nutrients (in %)</b>		
	Deficient	Sensitivity	
	<b>Status of Physical condition of the soil (in %)</b>		
	Highly acidic/alkaline	Sensitivity	
	Slightly acidic	Adaptive capacity	
	Neutral		
	Moderately alkaline		
	<b>Soil Texture (in %)</b>		
	Clay	Sensitivity	
	Fine	Adaptive capacity	
	Coarse loamy		
	Soil Water Permeability (Low, Moderate, high)		
	<b>Soil moisture and ET (in ha.m)</b>		
	Estimated soil moisture	Adaptive capacity	
	ET losses	Sensitivity	
	<b>Means of Water Extraction (in %)</b>		
	Lifting	Sensitivity	
<b>Irrigation Methods (in %)</b>			
Wild flooding	Sensitivity		
<b>Livestock (in No.)</b>			
Livestock density (cattle, sheep, Goat, poultry)	Sensitivity		
Population density (persons per ha)			
<b>Demographic (in %)</b>			
Female Proportion	Sensitivity		
Vulnerable population Proportion			
<b>Economic (In %)</b>			
Only one room HH's	Sensitivity		
Female headed HH's			
Vulnerable households			
<b>MGNREGA (in %)</b>			
Registered MGNREGA Job cards	Adaptive capacity		
Active person working in MGNREGA job Cards			
Socio economic			



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 as 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. Neyvayal, Pathangudi, Nilamalgiyamangalam, Andavorani GPs have very high rural water security vulnerability to climate risks followed by Thiruvadana, Vellayapuram, Anjukottai, Pudupattinam, Orikkottai, Nagrikathan, Kulathur and Kallur GPs with high vulnerability. Thelur, Kodipangu, Sirumalaikottai, Kaliyanagari, Sirugambaiyur, Nambuthalai and Mullimunai GPs have very low vulnerability.

Upto	Category	Color range
0.576	Very High	Red
0.554	High	Light Red
0.532	Medium	Yellow
0.510	Low	Orange
0.488	Very low	Green



### Cumulative Vulnerability Scores

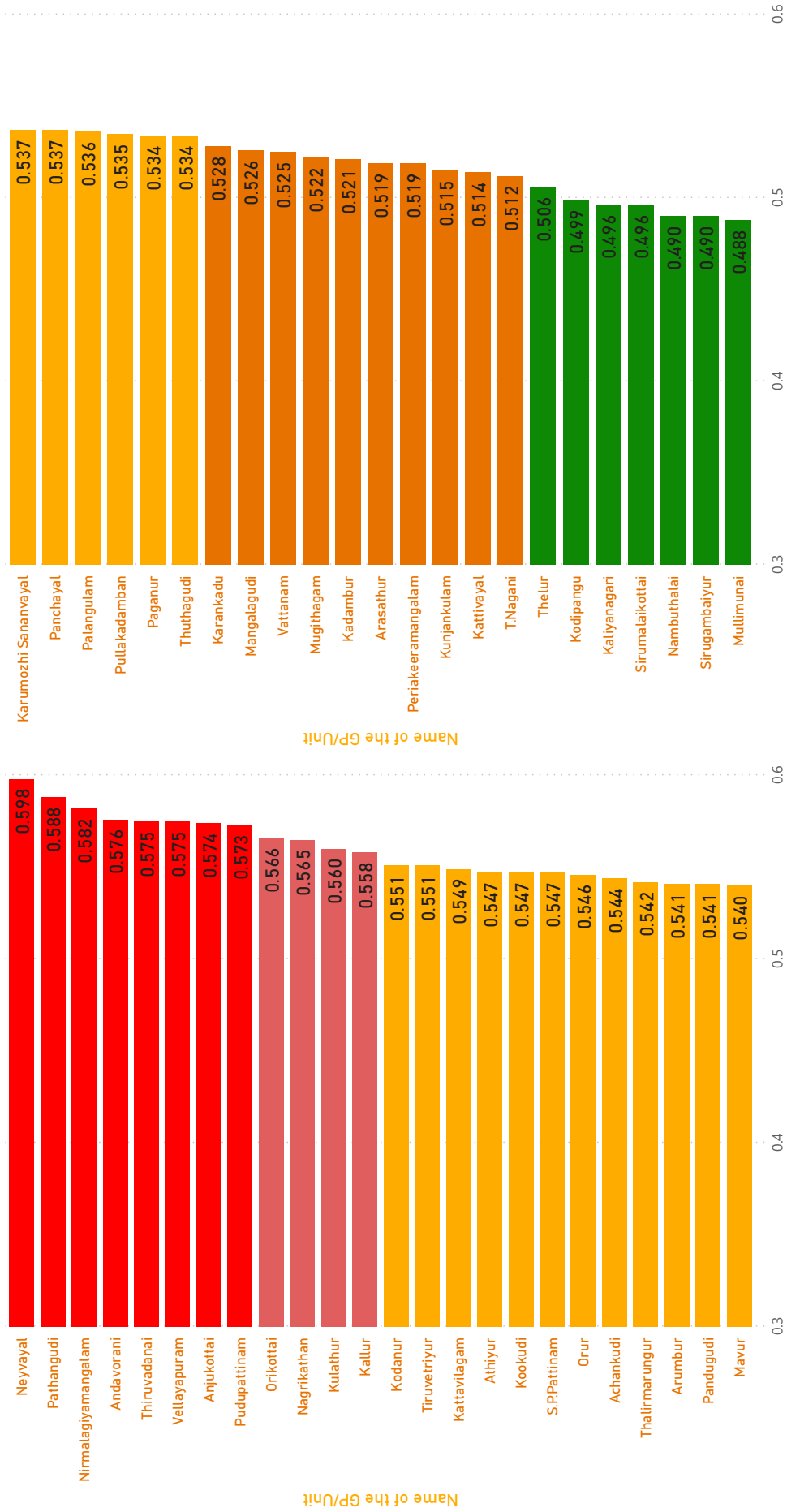


Figure 4.2. Final cumulative vulnerability scores

## Sectoral vulnerability

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



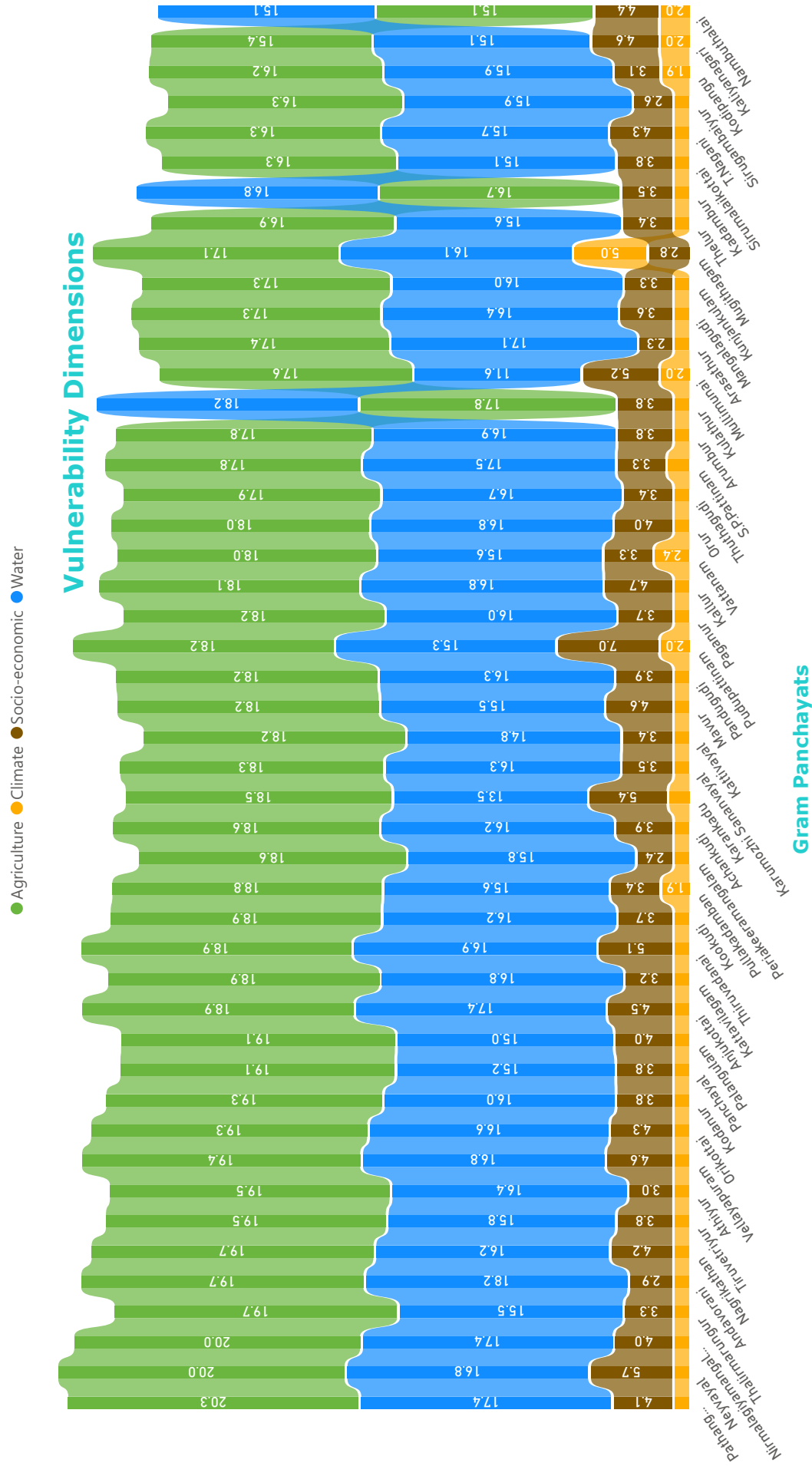
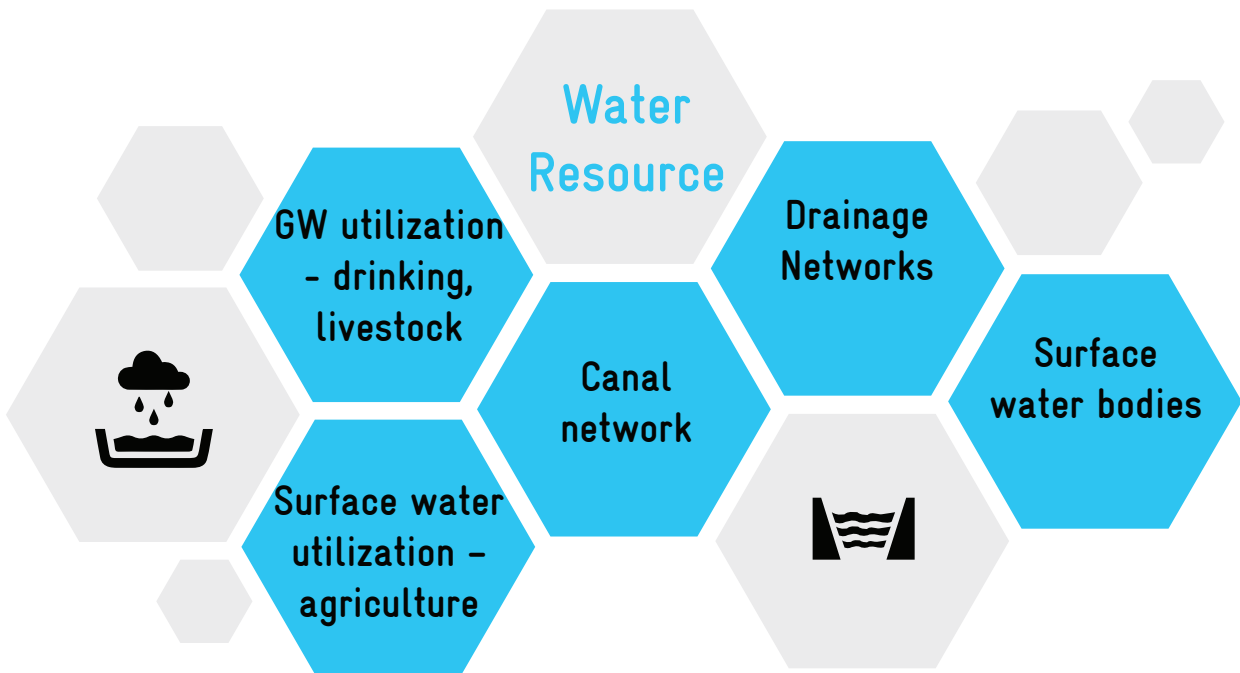
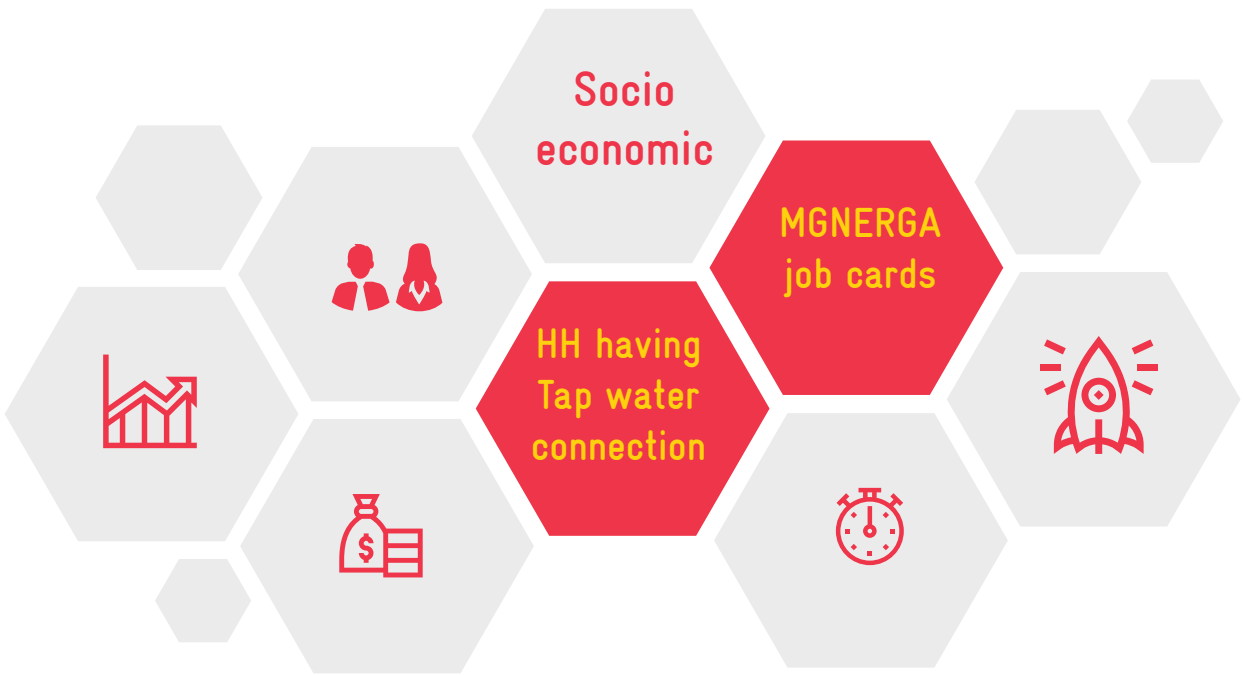
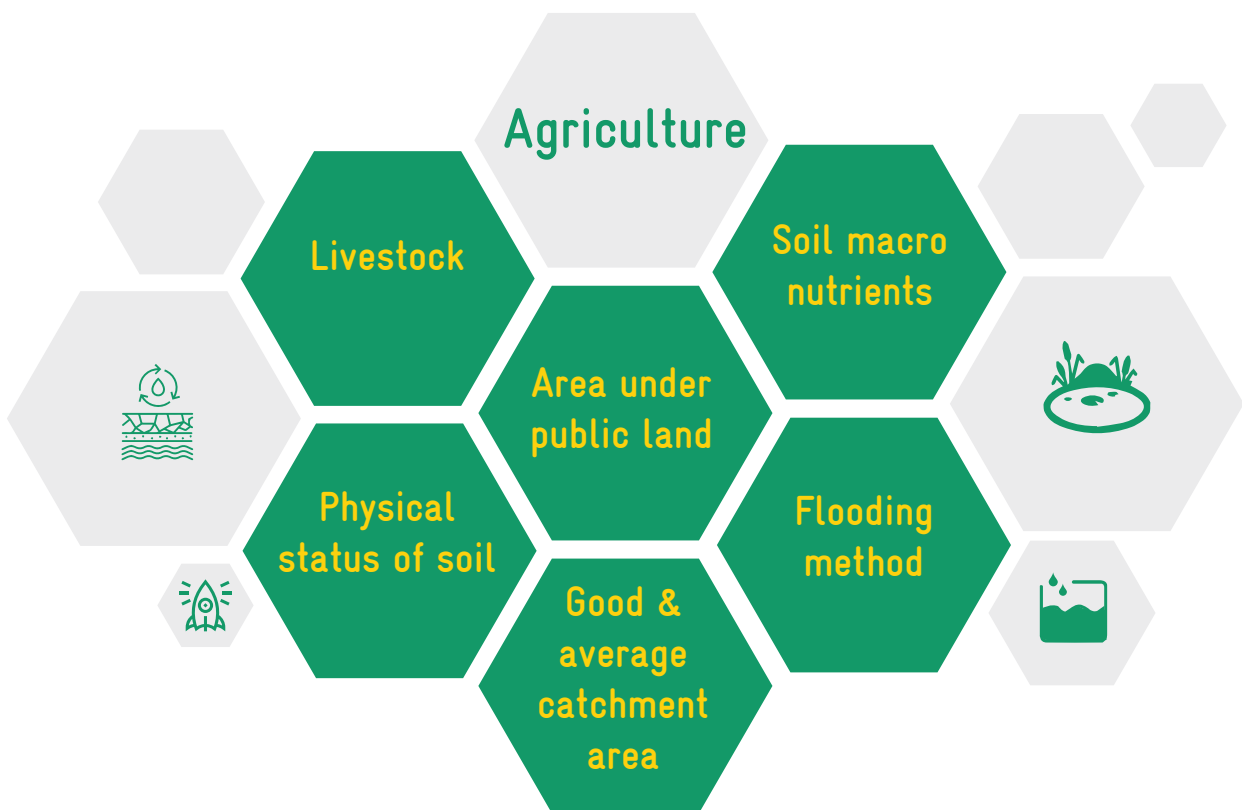
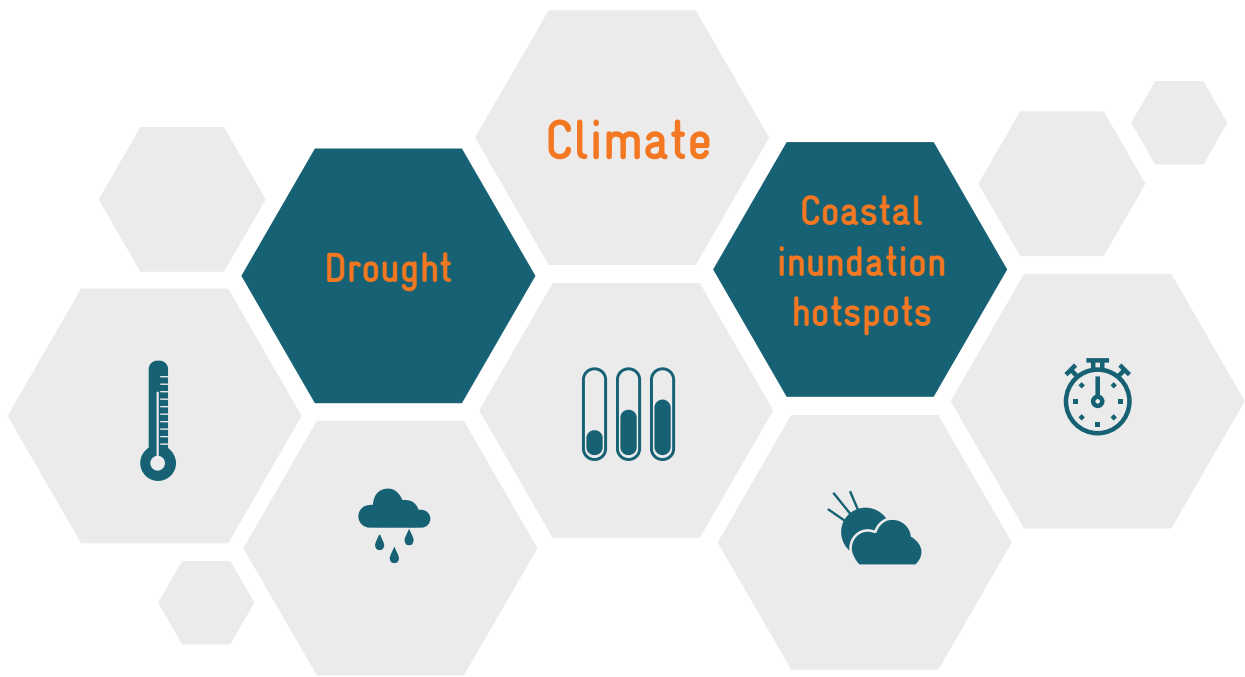


Figure 4.3. GP wise vulnerability dimensions

### Contributing indicators to the total vulnerability





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

விசம்பின் துளிவீழின் அல்லால்மற் றாங்கே  
பசும்புல் தலைகாண்பு அரிது

குறள் - 16

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

Thirukkural - 16



# CHAPTER 5



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



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

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

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

### 5.1 | THE PROPOSED AREA UNDER WASCA TREATMENT

Out of 39,737 ha available land in Thiruvadanai Block, 6,522 ha (16.41 %) area is proposed for treatment under WASCA TN– CWRM planning. A major portion of Key Water Actions is proposed in 1,714 ha of unirrigated land (26.29 % of total area), followed by 1,505 ha of barren and uncultivable land (23.08 % of total area) while least of 0.12 % area of forest land 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)
Unirrigated Land	14,028.01	1,714.43
Barren & Un-cultivable Land	1,771.11	1,505.46
Area Irrigated by Source	7,916.48	927.13
Non-Agricultural Uses	8,290.04	619.17
Fallows Land other than Current Fallows	4,821.54	602.85
Cultivable Waste Land	542.33	460.98
Land Under Miscellaneous Tree Crops etc.	391.99	333.17
Current Fallow land	1,788.46	207.87
Permanent Pastures and Other Grazing Land	168.33	143.07
Forest Land	19.04	7.62



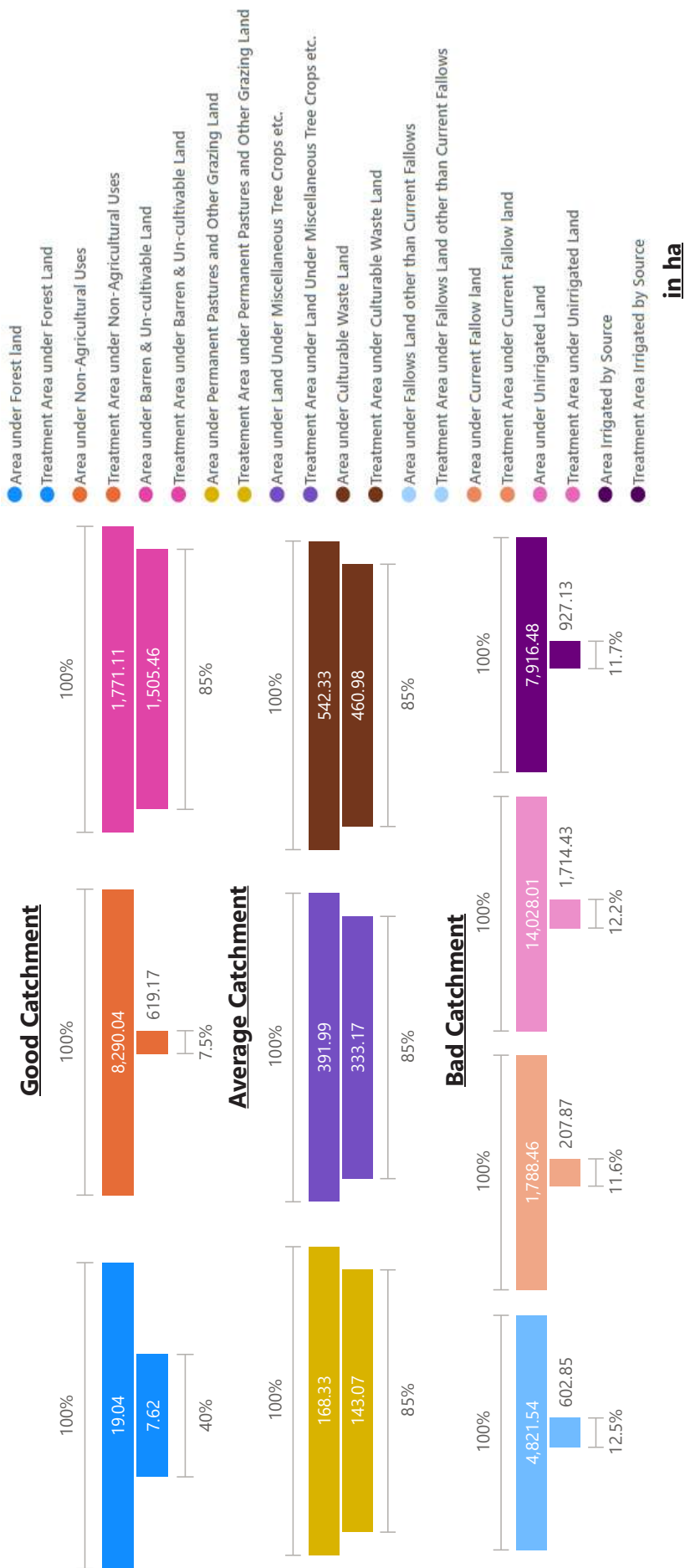


Figure 5.1. WASC-A treatment area in Percentage

## 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 1,985 ha.m which is 35 % of the total runoff. Of the expected runoff conservation, the highest of 70.4 % good catchment area was considered for treatment followed by 21.5 % of bad and the rest from average catchment (Figure 5.2).

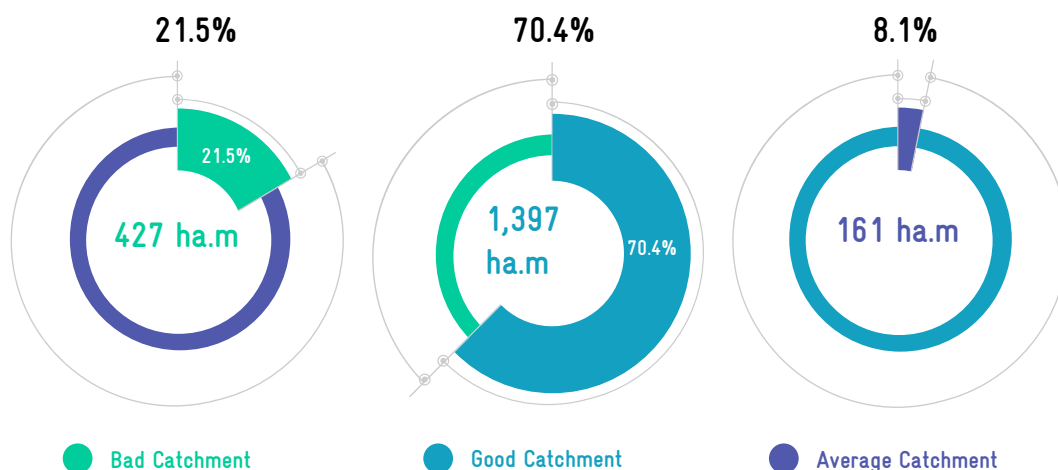


Figure 5.2. Expected conservation after WASCA treatment

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	357	3,394
Cattle Shelters (Number of units)	CS	357	3,394
Cattle Trough (Number of units)	CT	357	3,394
Fodder development - Community & Individual	FD	357	3,394
Goat Sheep Shelters (Number of units)	GSS	1,403	14,051
Poultry Shed (Number of units)	PS	699	7,016
Silvi-pasture Development (ha)	SPD	1,14,456	143
Soak Pits (Community) (Number of units)	SPC	294	29,407
Soak Pits (Individual) (Number of units)	SPI	2,948	29,407
Artificial Recharge Structure (Number of units)	ARS	2,036	5,092
Construction of Farm Ponds - Individual (Number of units)	FP	1,008	3,452

Restoration of water bodies:PWD and Union Tanks(Number)	RPWDT	248	
Restoration of water bodies: Ooranis(Number)	Roo	831	
Restoration of water bodies:Ponds(Number)	RP	20	
Roof Rain Water Harvesting (Number of units)	RRWH	94	
Water Course - Irrigation Channels - Desilting (Mtrs)	WCICD	42,780	
Afforestation in Public/common lands(ha)	Aff	16,96,699	2,128
Avenue plantation(km)	AVP	39,662	1,58,643
Block Plantation (Community)(ha)	BP	4,87,981	937
Canal Bund Plantation(ha)	CBP	18,082	72,315
Contour Continuous Bunds (CCB) for Afforestation area(Mtrs)	CCBF	4,24,174	2,128
Drainage Line Treatment (Mtrs)	DLT	27,858	1,11,419
Dry land Horticulture/Agro-forestry - Individual (ha)	DLHAI	686	1,727
Irrigation Channel Plantation (Mtrs)	ICP	10,697	42,780
Linear Plantation(km)	LP	39,369	1,57,475
Micro Irrigation(ha)	MI	371	927
Nursery Development (Number of units)	ND	1,47,035	29,407
Composting(Number of units)	Co	1,008	3,453
Farm Bunding with Boundary Trenches - Individual (ha)	FBBTI	1,379	3,452
Land development - Individual (ha)	LDI	502	1,263
NADEP Vermi compost (Number of units)	NADEP	357	3,394



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



Land development works over 11,560 ha area



More than 28.6 Lakhs plants planting



4,200 sites for WCWH



3,800 livelihood works



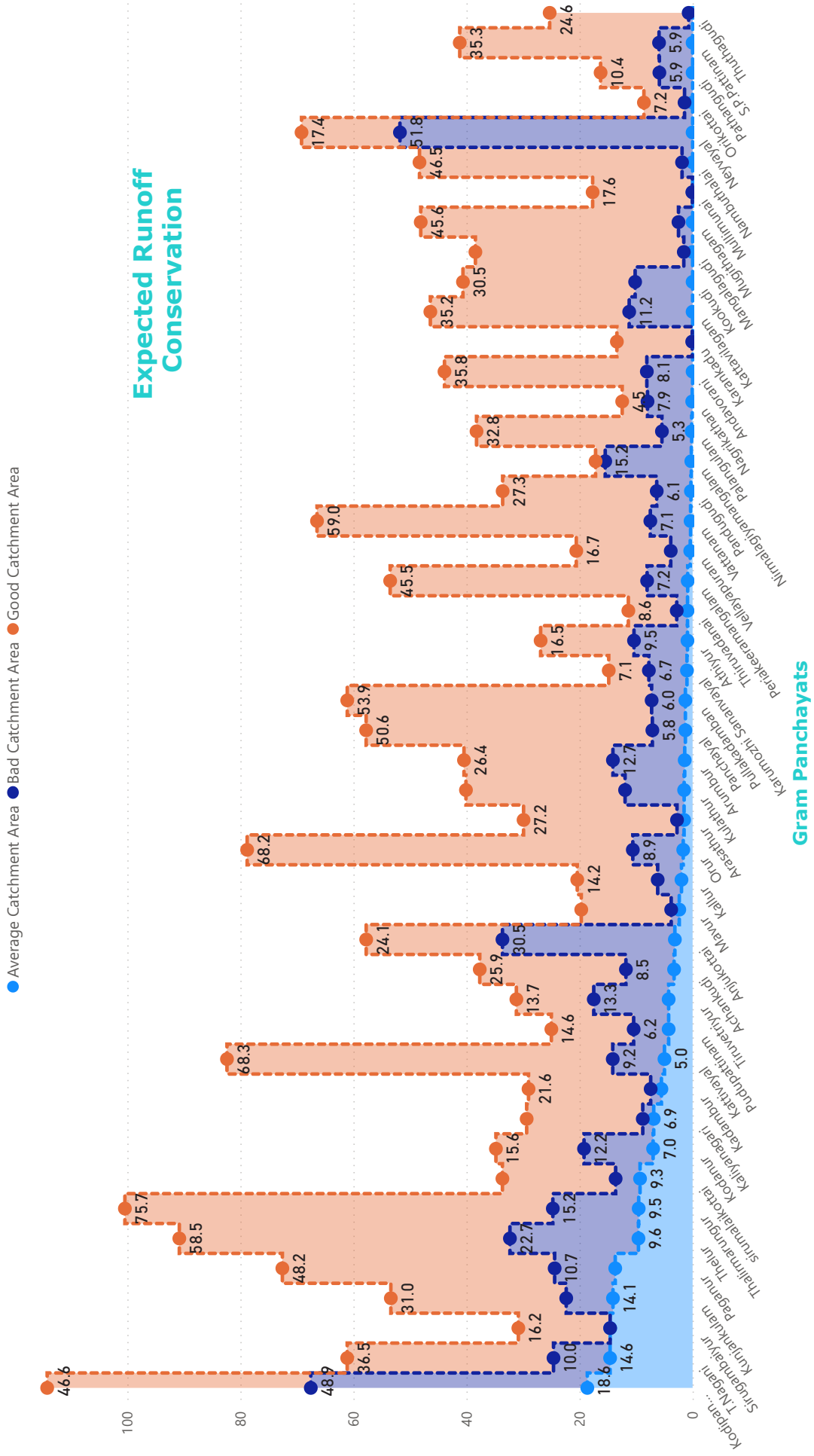


Figure 5.3. Expected C:P wise runoff conservation after W/ASCA treatment

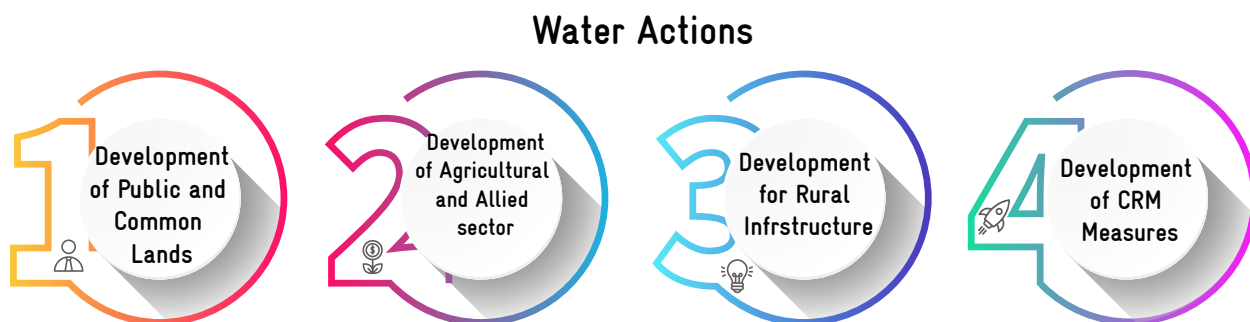
### MAHATMA GANDHI NREGS Annual circular 2020-21 (Clause 6.3)

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

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

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

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






## 5.2 | DEVELOPMENT OF PUBLIC & COMMON LANDS

The effective water augmentation measures are proposed in public and common lands via massive tree plantation, restoration of 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 CONTINUOUS BUNDS (CCB) FOR AFFORESTATION AREA(m)	8,483	10	0.025	212.09	84,835
COMPOSTING (NUMBER OF UNITS)	1,008	15	0.17	171.36	15,120
AFFORESTATION IN PUBLIC/ COMMON LANDS (ha)	2,129	3,344	8.6	18,309.4	71,19,376
BLOCK PLANTATION (COMMUNITY) (ha)	937	4,320	11.1	10,400.7	40,47,840
SILVI-PASTURE DEVELOPMENT (ha)	144	6,664	17.1	2,462.40	9,59,616
LINEAR PLANTATION (km)	157	703	1.8	283.46	1,10,705
CANAL BUND PLANTATION (ha)	500	2,930	7.5	3,750.38	14,65,147
IRRIGATION CHANNEL PLANTATION (m)	33,898	6	0.015	508.47	2,03,390
AVENUE PLANTATION(km)	159	703	1.8	285.56	1,11,526
NURSERY DEVELOPMENT (NUMBER OF UNITS)	735	2,344	15	11,027.6	17,23,250
RESTOTARATION OF WATER BODIES: PWD AND UNION TANKS (NUMBER)	268	800	5	1,340	2,14,400
RESTORATION OF WATER BODIES: OORANIS (NUMBER)	831	200	2	1,662	1,66,200
RESTORATION OF WATER BODIES: PONDS (NUMBER)	20	200	1	20	4,000
ARTIFICIAL RECHARGE STRUCTURE (NUMBER OF UNITS)	182	391	2.5	455	71,162
WATER COURSE - IRRIGATION CHANNELS - DESILTING (M)	33,898	3	0.0075	254.24	1,01,695
DRAINAGE LINE TREATMENT (m)	2,786	5	0.03	83.57	13,929

COASTAL WATERSHED WORKS

NURSERY DEVELOPMENT - COASTAL PLANTATION (NUMBER OF UNITS)	2	7,813	20	41.38	16,165
MANGROVE PLANTATIONS (ha)	54	6,250	16	864	3,37,500
RIVERSIDE PLANTATION (ha)	-	703	1.8	-	-
COASTLINE SHELTER BELT PLANTATION (ha)	-	2,930	7.5	-	-
BUND PLANTATION WET LANDS (km)	986	2,930	0.1875	184.80	28,87,808
WETLAND PLANTATION (INNER) (ha)	18	2,930	7.5	138.60	54,146
COASTAL WETLAND - BUND STRENGTHENING (km)	2,249	977	0.0625	140.58	21,97,566
WETLAND INLET IMPROVEMENT WORKS (NUMBER OF UNITS)	104	3,906	10	1,040	4,06,224
CHECK DAM FOR CONTROLLING SEA WATER INTRUSION (NUMBER OF UNITS)	5	234	1.5	7.50	1,170
CONSTRUCTION OF FISH DRYING YARD (NUMBER OF UNITS)	9	331	2.12	19.08	2,979
AGRO FORESTRY IN INDIVIDUAL LANDS (ha)	259	2,930	7.5	1,942.50	7,58,870

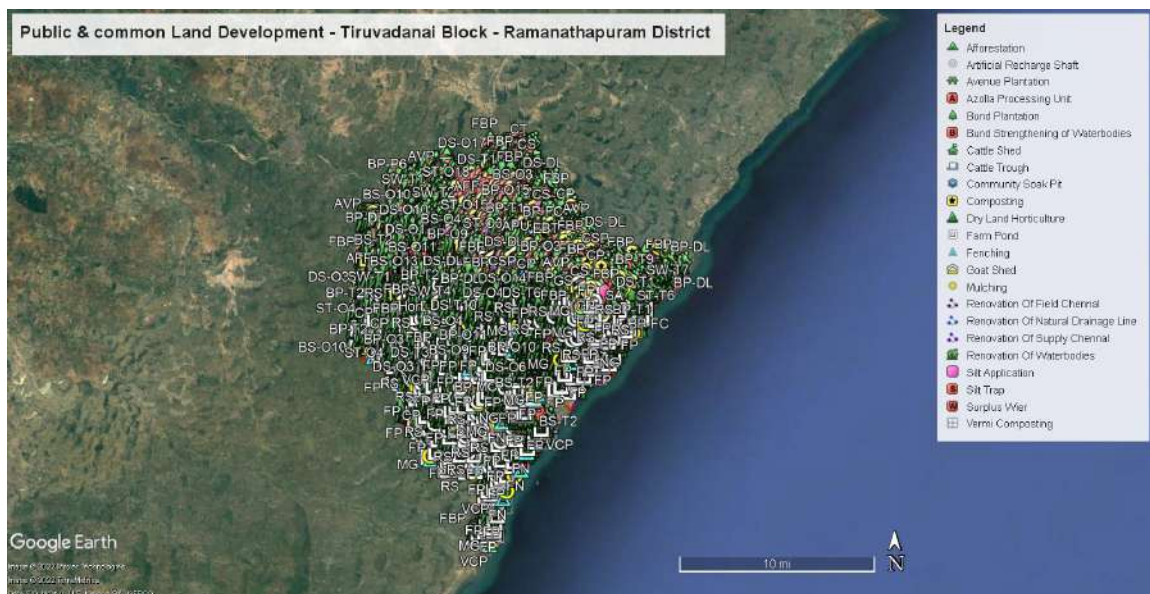







Figure 5.4. Proposed development activities in Public and Common land

## 5.3 | DEVELOPMENT OF AGRICULTURE AND ALLIED SECTOR

Based on the assessment, the works which enhance the agriculture and allied sectors particularly for irrigation, soil and livestock 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)	3,452	586	1.5	5,178	20,22,872
MICRO IRRIGATION (ha)	371	-	1	371	-
CONSTRUCTION OF FARM PONDS - INDIVIDUAL (NUMBER OF UNITS)	1,008	781	2	2,016	7,87,248
LAND DEVELOPMENT - INDIVIDUAL (ha)	1,262	3,906	10	12,620	49,29,372
DRY LAND HORTICULTURE/AGRO-FORESTRY - INDIVIDUAL (ha)	1,727	3,321	8.5	14,680	57,35,367
AZOLLA UNITS - INDIVIDUAL (NUMBER OF UNITS)	357	23	0.15	54	8,211
NADEP VERMI-COMPOST (NUMBER OF UNITS)	357	27	0.18	64	9,639
FODDER DEVELOPMENT - COMMUNITY & INDIVIDUAL	357	2,344	1.48	528	8,36,808
CATTLE SHELTERS (NUMBER OF UNITS)	357	331	2.12	757	1,18,167
GOAT SHEEP SHELTERS (NUMBER OF UNITS)	1,403	355	2.27	3,185	4,98,065
CATTLE TROUGH (NUMBER OF UNITS)	357	6	0.05	18	2,142
POULTRY SHED (NUMBER OF UNITS)	699	10	0.09	63	6,990

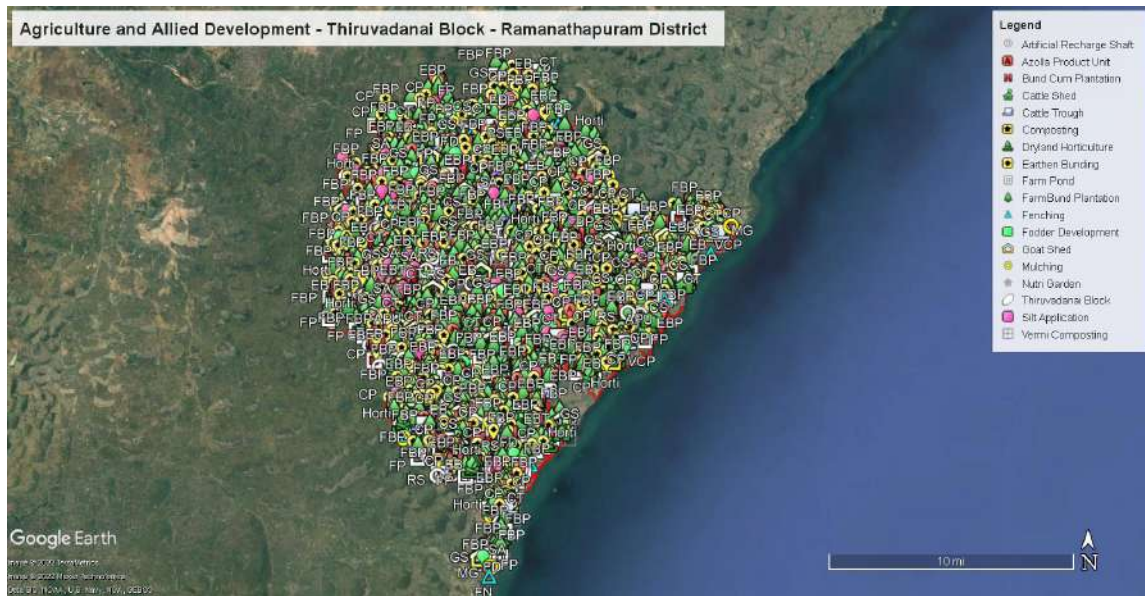







Figure 5.5. Proposed development activities in Agriculture and allied Sectors

## 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)	294	20	0.13	38	5,880
SOAK PITS (INDIVIDUAL) (NUMBER OF UNITS)	2,948	16	0.1	295	47,168
ROOF RAIN WATER HARVESTING (NUMBER OF UNITS)	94	625	4	376	58,750
TANKA - COMMUNITY LEVEL (NUMBER OF UNITS)	-	300	30	-	-



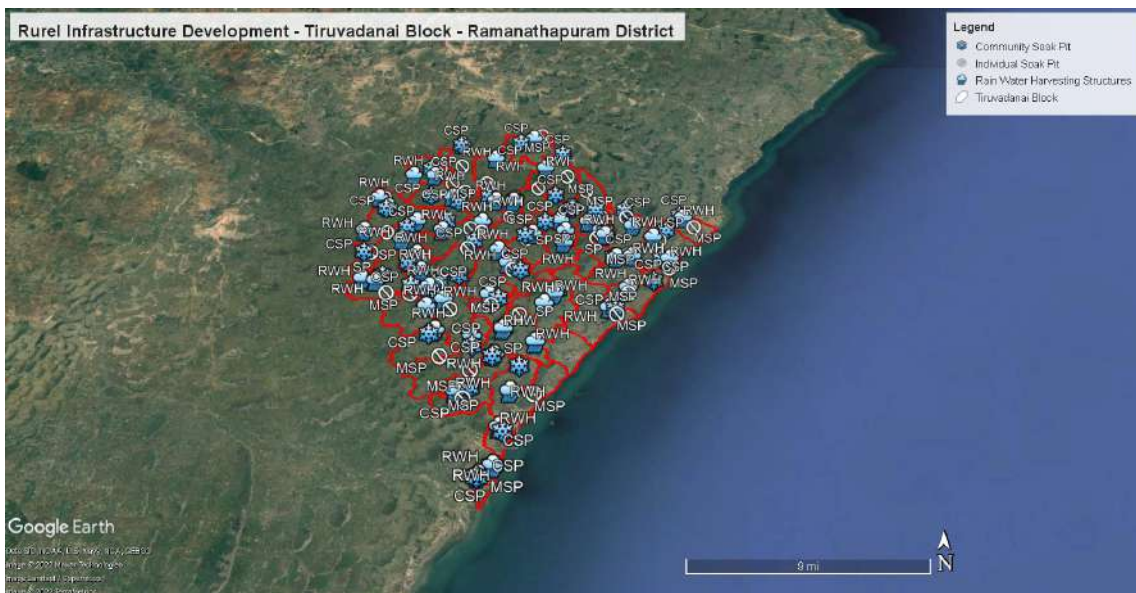


Figure 5.6. Proposed Rural Infrastructure activities

## 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, agricultural and rural infrastructure activities, whereas focus is given on public and common land development measures followed by agriculture and allied development (Ta-

ble 14). Measures such as farm ponds (Table 15), Mangrove plantation (Table 16), horticulture park (Table 17), mega forest plantation (Table 18), Avenue Plantation (Table 19), Village level nursery (Table 20), mini forestry (Table 21) and tanka (Table 22) were proposed in this Block in saturation mode.

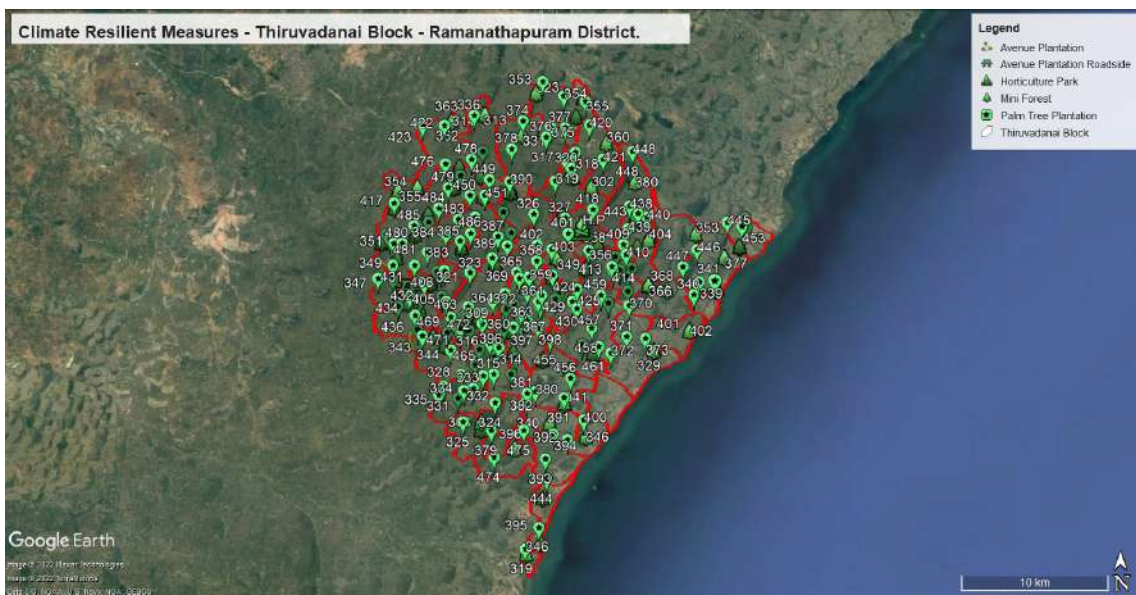


Figure 5.7. Proposed climate resilient measures



TABLE 14. GP WISE PROPOSED CRM

GP	Agriculture and allied activities	Public and common land	Rural infrastructure
Achankudi	Village nursery	Mega Forest	Tanka
		Mini forest	
Andavoorani	Village nursery	Mini forest	Tanka
Anjukottai	Village nursery	Mini forest	
Arasathur	Village nursery	Mini forest	Tanka
Arumboor	Village nursery	Mini forest	Tanka
Athiyur	Village nursery	Mini forest	Tanka
Kadambur	Village nursery	Mini forest	
Kaliyanagari	Avenue Plantation	Mini forest	Tanka
	Mangrove Plantation		
	Village nursery		
Kallur	Village nursery	Mini forest	
Karankadu	Village nursery	Mini forest	Tanka
Karumoli	Village nursery	Mini forest	
Kattavilagam	Village nursery	Mini forest	Tanka
Kattivayal	Village nursery	Mega Forest	Tanka
		Mini forest	
Kilathor		Mini forest	
Kodanur	Village nursery	Mega Forest	
		Mini forest	
Kodipangu	Avenue Plantation	Mini forest	Tanka
	Village nursery		
Kookudi	Village nursery	Mega Forest	Tanka
		Mini forest	
Kulathur	Village nursery	Mega Forest	Tanka
		Mini forest	
Kunjankulam	Village nursery	Mini forest	
Mangalakudi	Village nursery	Mini forest	
Mavur	Village nursery	Mini forest	Tanka
Mugilthagam	Avenue Plantation	Mini forest	Tanka
	Village nursery		
Mullimunai	Village nursery	Mini forest	Tanka
Nagani		Mega Forest	
Nagarikathan	Village nursery	Mini forest	Tanka
Nambuthalai	Cascade Of Tanks	GP level nursery	Tankas
	Avenue Plantation	Mini forest	Tanka
	Village nursery		
Neivayal	Village nursery	Mini forest	
NM Mangalam	Horticulture park	Mini forest	Tanka
	Village nursery		
Orikottai	Village nursery	Mini forest	
Oriyur	Village nursery	Mega Forest	Tanka
		Mini forest	

Paganur	Village nursery	Mini forest	Tanka
Palangulam	Village nursery	Mega Forest	
		Mini forest	
Pananjayal	Village nursery	Mini forest	Tanka
Pandukudi	Village nursery	Mini forest	
Pathanakudi	Village nursery	Mini forest	Tanka
PK Mangalam	Village nursery	Mega Forest	Tanka
Pullakadamban	Avenue Plantation	Mini forest	Tanka
	Village nursery		
Puthupattinam	Avenue Plantation	Mini forest	
S.P.Pattinam	Village nursery		Tanka
Sirugambaiyur	Village nursery	Mega Forest	Tanka
Sirumalaikottai	Village nursery	Mini forest	
SP Pattinam	Village nursery	Mini forest	
T Nagani	Village nursery	Mini forest	
Thalimarungur	Village nursery	Mini forest	Tanka
Thellur	Village nursery	Mega Forest	Tanka
		Mini forest	
Thiruvadana	Farm pond	Mini forest	
	Village nursery		
Thiruvetriyur	Village nursery	Mini forest	Tanka
Thondi	Avenue Plantation		
Thuthakudi	Village nursery	Mini forest	
Vattanam	Avenue Plantation	Mega Forest	Tanka
	Village nursery		
Vellaiyapuram	Village nursery	Mini forest	Tanka

TABLE 15. DETAILS OF PROPOSED FARM PONDS ACTIVITY UNDER CRM

Community Farm Ponds Completed	Individual Farm Ponds Completed	Individual Farm Ponds Ongoing
105	22	3

TABLE 16. DETAILS OF PROPOSED MANGROVE PLANTATION ACTIVITIES UNDER CRM

GP	Area for Plantation (in ha)	No. of Plants (1 ha – 10,000 saplings)	Land type
Kaliyanagari	2.023	1,000	Govt. Land

TABLE 17. DETAILS OF PROPOSED HORTICULTURE PARK ACTIVITIES UNDER CRM

GP	Area for Plantation (in ha)	No. of Plants (1 ha – 10,000 saplings)	Land type
N.M.Mangalam	0.3	1000	Govt. purampokku land

TABLE 18. DETAILS OF PROPOSED MEGA FOREST ACTIVITY UNDER CRM

GP	Area in ha	No. of Plants	MGNREGA (INR in Lakhs)			Man-days	Land type
			Labour (L)	Materials (M)	Total (L+M)		
Sirugambaiyur	0.5	5,000	15.62	0	15.62	6,101	Govt. Puram-pokku land
Kodanur	0.5	5,000	15.62	0	15.62	6,101	
Oriyur	0.5	5,000	15.62	0	15.62	6,101	
Vattanam	0.5	5,000	15.62	0	15.62	6,101	
Thellur	0.5	5,000	15.62	0	15.62	6,101	
Achankudi	0.5	5,000	15.62	0	15.62	6,101	
Kulathur	0.5	5,000	15.62	0	15.62	6,101	
Kattivayal	0.5	5,000	15.62	0	15.62	6,101	
Palangulam	0.5	5,000	15.62	0	15.62	6,101	
Nagani	0.5	5,000	15.62	0	15.62	6,101	
PK Mangalam	0.5	5,000	15.62	0	15.62	6,101	
Vattanam	0.5	5,000	15.62	0	15.62	6,101	
Kookudi	0.5	5,000	15.62	0	15.62	6,101	
<b>Total</b>	<b>6.5</b>	<b>65,000</b>	<b>203.06</b>	<b>0</b>	<b>203.06</b>	<b>79,313</b>	

TABLE 19. DETAILS OF PROPOSED AVENUE PLANTATION ACTIVITY UNDER CRM

GP	Road Length (in km)	Area of plantation (in ha)		Total No. of Plants	Classification of Land
		Number of Big Trees	Number of Small Trees		
S.P.Pattinam	4	392	784	1,176	Govt Puram-pokku land
Pullakadamban	5	476	952	1,428	
Kaliyanagari	3	324	648	972	
Vattanam	4	402	804	1,206	
Kodipangu	4	389	778	1,167	
Thondi	2	154	308	462	
Nambuthalai	3	310	620	930	
Mukilthagam	1	136	272	408	
Pudupattinam	4	352	704	1,056	

TABLE 20. DETAILS OF PROPOSED GP LEVEL NURSERY ACTIVITY UNDER CRM

GP	Total No. of Plants
Achangudi	1,000 plants in each GP
Andavoorani	
Anjukottai	
Arasathur	
Arumboor	
Athiyur	
Kadambur	
Kaliyanagari	

Kallur	
Karangadu	
Karumoli	
Kattavilagam	
Kattivayal	
Kodannor	
Kodippangu	
Kookudi	
Kulathur	
Kunjangulam	
Mangalakkudi	
Mavur	
Mugilthagam	
Mullimunai	
Nagarikathan	
Nambuthalai	
Neyvayal	
Nilamalgiyamangalam	
Orikottai	
Oriur	1,000 plants in each GP
Paganur	
Palangulam	
Pananjayal	
Pandukudi	
Pathanakudi	
Periyakeeramangalam	
Pudupattinam	
Pullakkadamban	
Sirugambaiyur	
Sirumalaikkottai	
Sundarapandianpat- tinam	
Thalirmarungur	
Thehur	
Thiruvetriyur	
Thuthakudi	
Tiruvadanai	
T. Nagani	
Vattanam	
Vellayapuram	
<b>Total</b>	<b>47,000</b>

TABLE 21. DETAILS OF PROPOSED MINI FOREST ACTIVITY UNDER CRM

GP	Total No. of Plants	Classification of land
Achankudi		
Andavoorani		
Anjukottai		
Arasathur		
Arumboor		
Athiyur		
Kadambur		
Kalivanagari		
Kallur		
Karankadu		
Karumoli		
Kattavilagam		
Kattivayal		
Kilathor		
Kodanur		
Kodipangu		
Kookudi		
Kulathur		
Kunjankulam		
Mangalakudi		
Mavur	500 in each village	Govt Purampokku land
Mugilthagam		
Mugilthakam		
Mullimunai		
Nagarikathan		
Nambuthalai		
Neivayal		
NM Mangalam		
Oorikottai		
Ooriyur		
Paganur		
Palangulam		
Pananjayal		
Pandukudi		
Pathanakudi		
PK Mangalam		
Pullakkadampan		
Puthupattinam		
Sirukambaiyur		
Sirumalaikottai		
SP Pattinam		

T Nagani	500 in each village	Govt Purampokku land
Thalirmarungoor		
Thehur		
Thiruvadana		
Thiruvetriyur		
Thuthakudi		
Vattanam		
Vellaiyapuram		
<b>Total</b>	<b>24,500</b>	

TABLE 22. DETAILS OF PROPOSED TANKA ACTIVITY UNDER CRM

Sl. No.	GP
1	Achangudi
2	Andavoorni
3	Arasathoor
4	Arumboor
5	Athiyur
6	Kaliyanagari
7	Karankadu
8	Kattavilagam
9	Kattivayal
10	Kodipangu
11	Kookudi
12	Kulathoor
13	Mavur
14	Mugilthagam
15	Mulgimunai
16	Nagrikathan
17	Nambuthalai
18	Nilamalagiyamangalam
19	Oriyoor
20	Paganur
21	Pananjayayal
22	Pathanakudi
23	Periyakeera Mangalam
24	Pullakadapan
25	S.P.Pattinam
26	Sirugambaiyur
27	Thalimarungur
28	Theloor
29	Tiruvetriyarur
30	Vattanam
31	Vellaiyapuram





நெடுங்கடலும் தன்நீர்மை குன்றும் தடிந்தெழிலி  
தான்நல்கா தாகி விடின

குறள் - 17

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

Thirukkural - 17

# CHAPTER 6

PROJECTED OUT COMES OF PLANNING



PROJECTED OUTCOMES  
OF PLANNING



## 6 | PROJECTED OUTCOMES OF PLANNING

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 outcomes will reduce the water security vulnerability and increase the resilience of the GPs under current and projected climatic change scenarios.

### 6.1 | OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

#### OUTCOMES OF DEVELOPMENT OF PUBLIC AND COMMON LANDS

INDICATOR		OUTCOMES/ IMPACT	
1	Proportion of Land development under WASCA treatment	1	6,522 ha (16.4 %) of the total area treated under WASCA
2	Percentage reduction of run off	2	1,984.95 ha.m i.e 35 % of the total runoff harvested due to WASCA interventions
3	No. of waterbodies restored	3	1,079 waterbodies (tanks/pond and ooranis) restored
4	Area under afforestation	4	2,129 ha area under afforestation
5	Length of drainage line treated	5	11.1 km length of drainage line treated
6	Canal Bund Plantation	6	More than 1 lakh plants through 500 works
7	Nursery development	7	735 units

**6,522 ha**  
AREA TREATED

**1,984.95 ha.m**  
TOTAL RUNOFF  
HARVESTED

**1,079**  
WATER BODIES  
RESTORED

**2,129 ha**  
AREA  
AFFORESTATION

**11.1 km**  
DRAINAGE LINE TREATED

**1,00,000**  
PLANTS

**735 UNITS**  
NURSERY DEVELOPMENT

## COASTAL WATERSHED WORKS

### INDICATOR

1	Check dam
2	Bund plantation in west land
3	Agroforestry in coastal area

### OUTCOMES/ IMPACT

1	5 check dams for controlling sea water intrusion
2	986 plants
3	259 ha

**5**  
CHECK DAMS

**259 ha**  
AGROFORESTRY

**986**  
PLANTS (BUND PLAN-  
TATION)

## 6.2 | OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED SECTOR

### OUTCOMES OF DEVELOPMENT OF AGRICULTURE AND ALLIED ACTIVITIES

#### INDICATOR

1	Assessment of sources of water for livestock and agriculture demand No of structures established for on-farm (in-situ) water harvesting in dry lands
2	Improvement in soil health
3	Dry land development with agro-forestry
4	Households established fodder plots
5	Sheds for livestock's (cattle, goat, poultry)

#### OUTCOMES/ IMPACT

1	1,008 farm ponds established which target the harvest of 177.4 ha.m of water which has the potential to irrigate 352.8 ha area in both kharif and rabi seasons
2	357 NADEP vermicomposting units for soil health improvement
3	1,727 ha under dry land horticulture
4	357 vulnerable households established fodder plots
5	2,459

**1,008**  
FARM PONDS

**357**  
COMPOST UNITS

**357**  
FODDER PLOTS

**1,727 ha**  
DRY LAND HORTICULTURE

**2,459**  
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 2,948 individual and 294 community level soak pits established for recycle of grey water benefiting 1,55,970 HHs
2 Roof rain water harvesting measures	2 94 common roof rainwater harvesting and storage structures with a target to harvest and store 0.11 ha.m of rainwater for use
3 Nutri-garden	3 31,194 HHs established nutri-gardens in homesteads and planted 1,55,970 saplings

**294** COMMON &  
**2,948** INDIVIDUAL  
SOAK PITS

**94**  
COMMON ROOF  
RAINWATER HARVESTING

**31,194**  
NUTRI-GARDENS

**1,55,970**  
SAPLINGS





# 6.4 | OUTCOMES OF CLIMATE RESILIENCE MEASURES

## OUTCOMES OF CLIMATE RESILIENCE MEASURES

### INDICATOR

### OUTCOMES/ IMPACT

<p>1 Climate resilient measures are identified for climate risks</p>	<p>1 8 models are identified via., Farm ponds, mangrove plantation, horticulture park, vil- lage level nursery, Avenue plantation, mini forest, mega forest, and tankas</p> <p>105 community and 22 individual farm ponds are completed in the GP</p> <p>Mangrove plantation in 2.023 ha area with 10,000 plants</p> <p>Village level nursery in 47 GPs with 47,000 plants in each GP</p> <p>Avenue Plantation with 8,805 plants</p> <p>Horticulture park in 0.3 ha with 1,000 plants.</p> <p>Mega forest in 6.5 ha area with 65,000 plants</p> <p>Mini forest in 2.45 ha with 24,500 plants</p> <p>Tankas in 31 GPs</p>
--	--

**105** COMMON &  
**22** INDIVIDUAL FARM  
PONDS

**8,805 plants**  
AVENUE PLANTATION

**2.45 ha**  
MINI FOREST

**47**  
GP NURSERY

**0.3 ha**  
HORTICULTURE PARK

**2.023 ha**  
MANGROVE PLANTATION

**6.5 ha**  
MEGA FOREST

**31**  
TANKAS



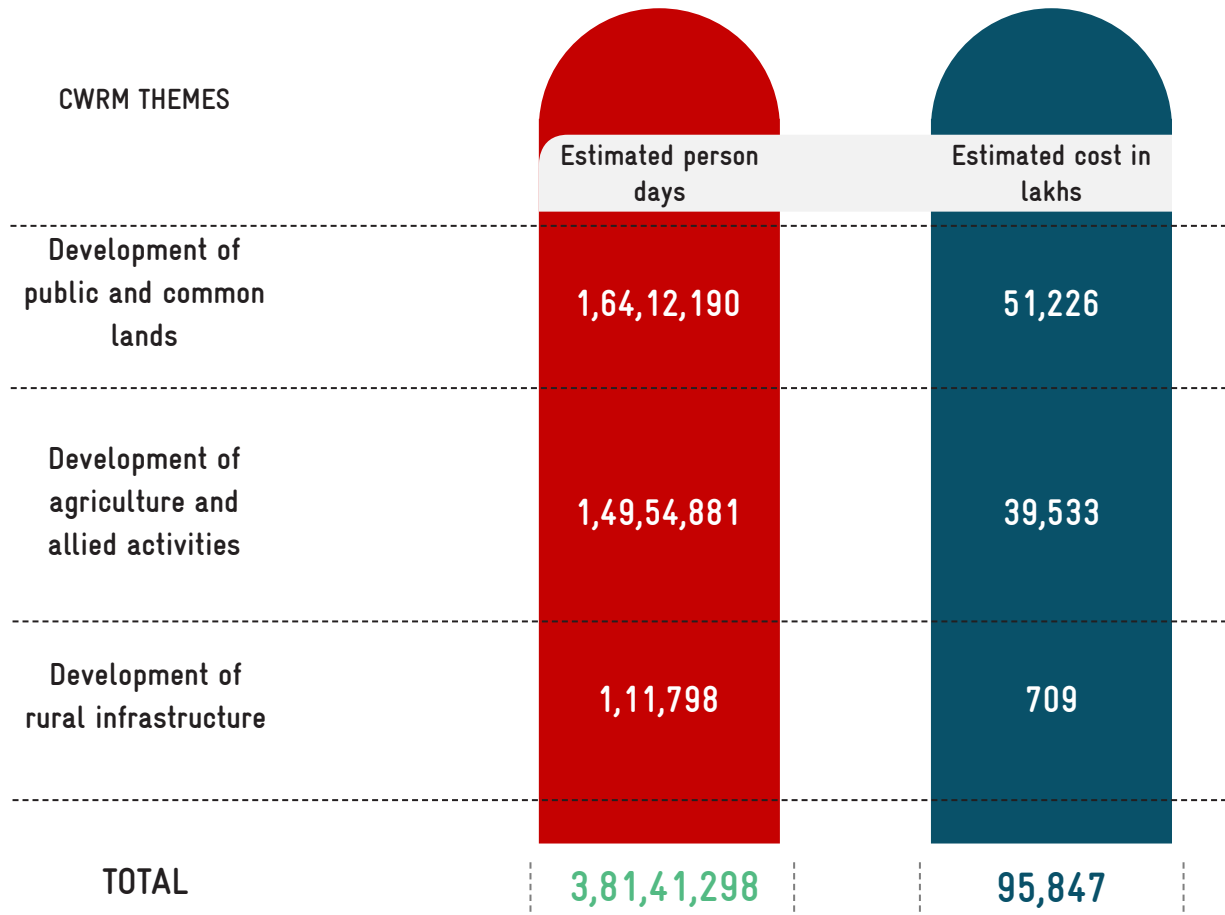


### Estimated person days

The total estimated person days required for the above proposed activities are 3,81,41,298 as specified below Figure 6.1

### Estimated Cost

The total estimated cost budgeted for the above proposed activities is Rs 95,847 Lakhs as specified below in Figure 6.2.



THIRUVADANAI



ESTIMATED PERSON DAYS

3,81,41,298



ESTIMATED COST IN LAKHS

95,847

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, coun-

tries 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"

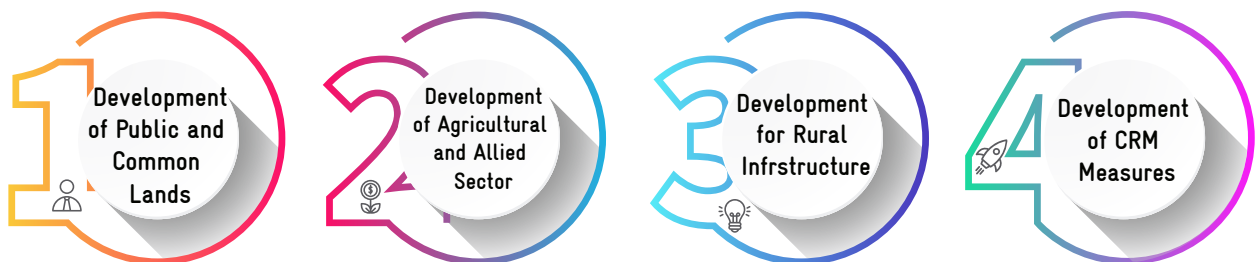
4

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"



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

Agriculture and MoEFCC. The commitments of the above mentioned four ministries towards SDG goals achievements are mapped in connection with the interventions under WASCA Tamil Nadu. The intervention under WASCA TN has direct and indirect contribution to the SDGs and its national targets set as per NITI Aayog.



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



# SDG GOAL 6

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



6.1

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

6.2

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

6.3

Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.4

Increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.5

Implement integrated water resources management at all levels (6.5.1)

6.6

Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.A

Expand international cooperation and capacity-building support to developing countries in water-and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

6.B

Support and strengthen the participation of local communities in improving water and sanitation management

Indicators considered for District and Block level vulnerability assessment of WASCA TN which is also used in SDG India 2020-21 report (Table 23).

TABLE 23. COMMON VULNERABILITY INDICATORS USED IN WASCA TN & SDG INDIA 2020-21

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



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

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

Percentage of rural population having improved source of drinking water

Percentage of ground water withdrawal against availability



Percentage of Blocks/Mandals/Talukas over-exploited

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



Percentage of degraded land over total land area

Percentage increase in area of desertification

The indicators used for District level vulnerability assessment along with its linked SDGs are already tabulated in (Table 2). The detailed proposed water actions in CWRM which was assessed based on the vulnerability dimensions are linked with climate vulnerability index and SDGs are tabulated in Table 24 to 26.

**TABLE 24. 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)	8,483	W3	SDG 1,2, 6,13&15
Composting (No. of units)	1,008	W1	SDG1& 6
Afforestation in Public/common lands (ha)	2,129	C1,C2,C3, W3,	SDG 1, 2,6,13&15
Block Plantation (Community) (ha)	937	C1,C2,C3,W3,S2	SDG 1,2, 6 &13, 15
Silvi-pasture Development (ha)	144	C1,C2,C3,W3	SGG 12 &15
Linear Plantation (km)	157	C1,C2,C3,W3,S2	SDG 1,2,6,12&13, 15
Canal Bund Plantation (ha)	500	C1,C2,C3,W3,S2	SDG 1, 6&13, 15
Irrigation Channel Plantation (m)	33,898	W4,W5,S2	SDG 1,2& 6, 15
Avenue plantation (km)	159	C1,C2,C3,W3,S2	SDG 1, 6&13

Nursery Development (No. of units)	735	C1,S2,S4	SDG 1,2 &6
Restoration of waterbodies :PWD and Tanks (No.)	268	S2, S1	SDG 6, 1, 13
Restoration of water bodies : Ooranis (No.)	831	S2, S1	SDG 6, 1, 13
Restoration of waterbodies :Ponds (No.)	20	S2, S1	SDG 6,1, 13
Artificial Recharge Structure (No. of units)	182	W3	SDG 1, 2, & 6
Water Course - Irrigation Channels - Desilting (m)	33,898	C1,C2,C3,W3,S2	SDG 1, 6&13
Drainage Line Treatment (m)	2,786	W1,W3,W4	SDG1 & 6
<b>Coastal watersheds works</b>			
Nursery development -Coastal plantation (No.)	2	C1,S2,S4	SDG 1, 6, 13,
Mangrove plantations(ha)	54	C1,C2,C3,W3,S2	SDG 1, 6, 13, 14, 15
Riverside plantation(ha)	0	W3,S2	SDG 1, 6, 13, 14, 15
Coastline Shelter belt Plantation (ha)	0	W3,S2	SDG 1, 6, 13, 14, 15
Bund Plantation wet lands (km)	986	W3,S2	SDG 1, 6, 13, 14, 15
Wetland plantation (inner)(ha)	18	W3,S2	SDG 1, 6, 13, 14, 15
Coastal wetland - Bund strengthening (km)	2,249	W3,S2	SDG 1, 6, 13, 14, 15
Wetland Inlet improvement works (No.)	104	W3,S2	SDG 1, 6, 13, 14, 15
Check dam for controlling sea water intrusion (No.)	5	W5	SDG 1, 6, 13, 14, 15
Construction of Fish Drying Yard (No.)	9	S2	SDG 1, 2, 4, 12
Agro Forestry in Individual lands (ha)	259	S2	SDG 1, 2, 6, 13

TABLE 25. WATER ACTIONS ON DEVELOPMENT OF AGRICULTURAL AND ALLIED SECTOR &amp; ITS LINKED SDG

Name of the Work	No. of CWRM works	CVI	SDG
Farm Bunding with Boundary Trenches - Individual (ha)	3,452	A1,A3,W1,W3	SDG 1,2&6
Micro Irrigation(ha)	371	A1,A3,A5,W5	SDG 1, 2&6
Construction of Farm Ponds - Individual (No. of units)	1,008	A1,A3,W5,W1, W3	SDG 2& 6
Land development - Individual (ha)	1,262	W1,W5,A1,A3,S2,S4	SDG 2, 6&
Dry land Horticulture/Agro-forestry - Individual (ha)	1,727	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2,15
Azolla units - Individual (No. of units)	357	A3,A4,S4	SDG 1& 2
NADEP Vermi compost (No. of units)	357	A3, W1, S4	SDG 1& 2,6
Fodder development - Community & Individual	357	A3, S4	SDG 1& 2, 15
Cattle shelters (No. of units)	357	S4	SDG 1& 2



Goat/sheep shelters (No. of units)	1,403	S4	SDG 1& 2
Cattle trough(No. of units)	357	W5,S4	SDG 1& 2
Poultry Shed (No. of units)	699	S2,S4	SDG 1& 2

**TABLE 26. 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)	294	W3,S2	SDG 1& 6
Soak Pits (Individual) (No. of units)	2,948	W3,S2	SDG 1& 6
Roof Rain Water harvesting (No. of units)	94	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 to-

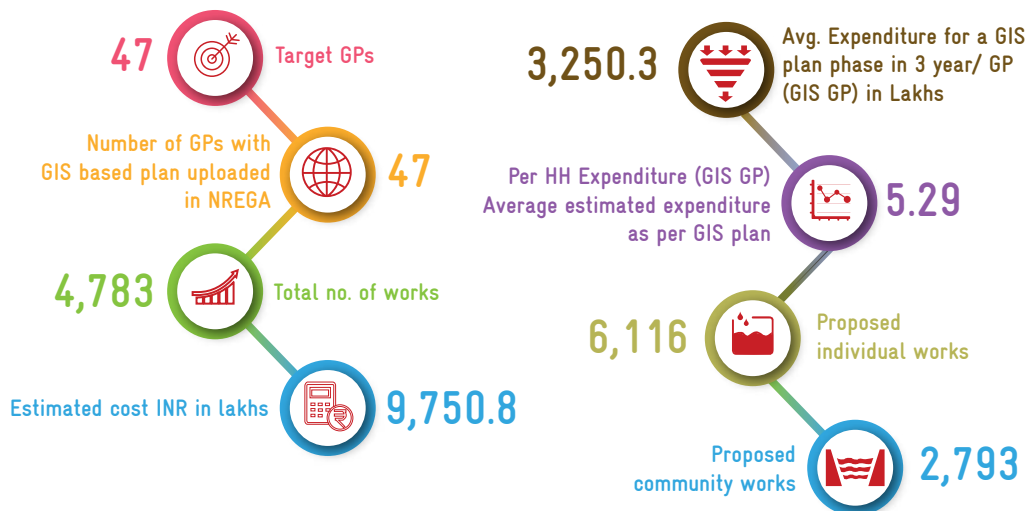
tal works along with its expenditure and category wise estimation cost of works as per GIS Plan, GIS based planning cumulative report are uploaded as given below

## 7.1 | INTEGRATION INTO NREGA SOFT

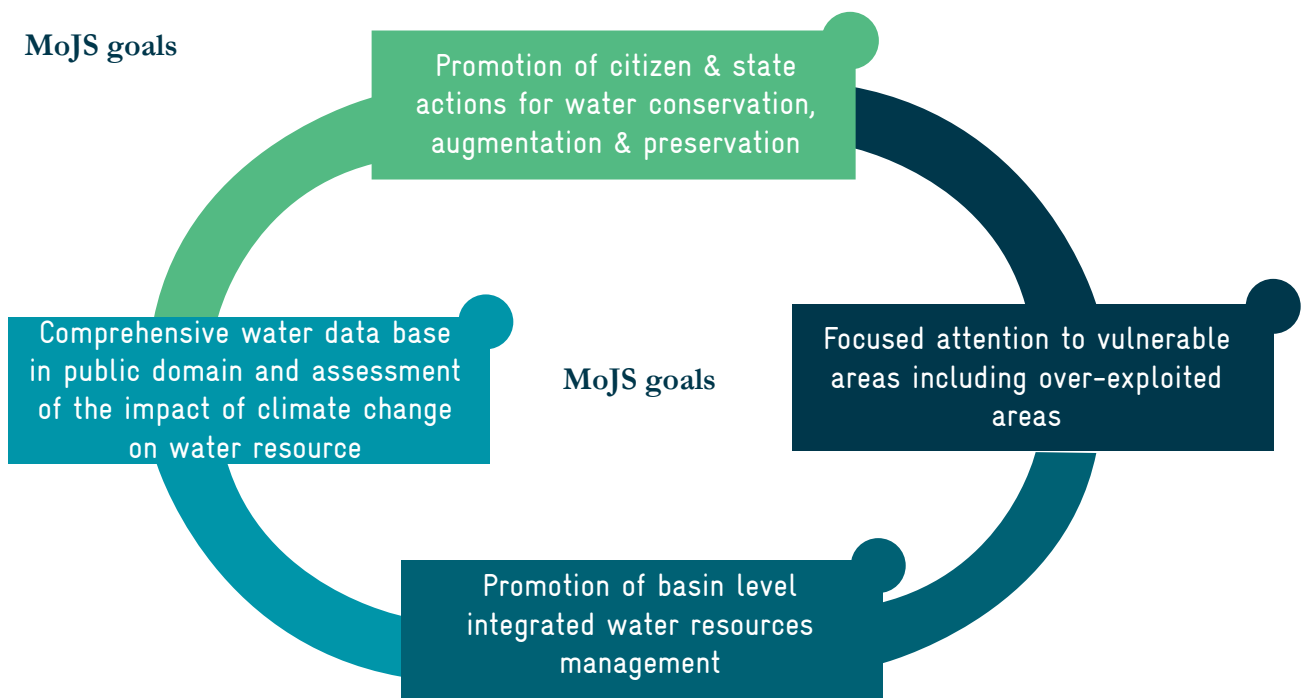
WASCA is progressing towards digitizing and integrating GP level GIS based plans, both NRM and Non-NRM into Mahatma Gandhi NREGS portal. The performance and implementation of GP plans of Thiruvadanai Block is listed in Table 27 and

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 27. GIS-BASED PLAN IMPLEMENTATION- KEY PARAMETERS PERFORMANCE IN THIRUVADANAI BLOCK



### MoJS goals



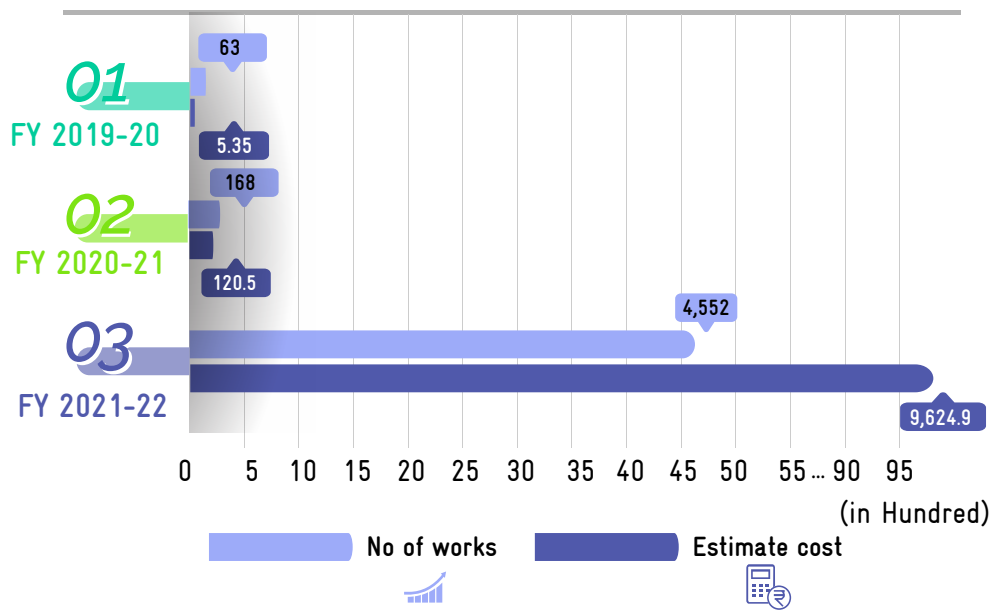


Figure 7.1. Work progress in last three years

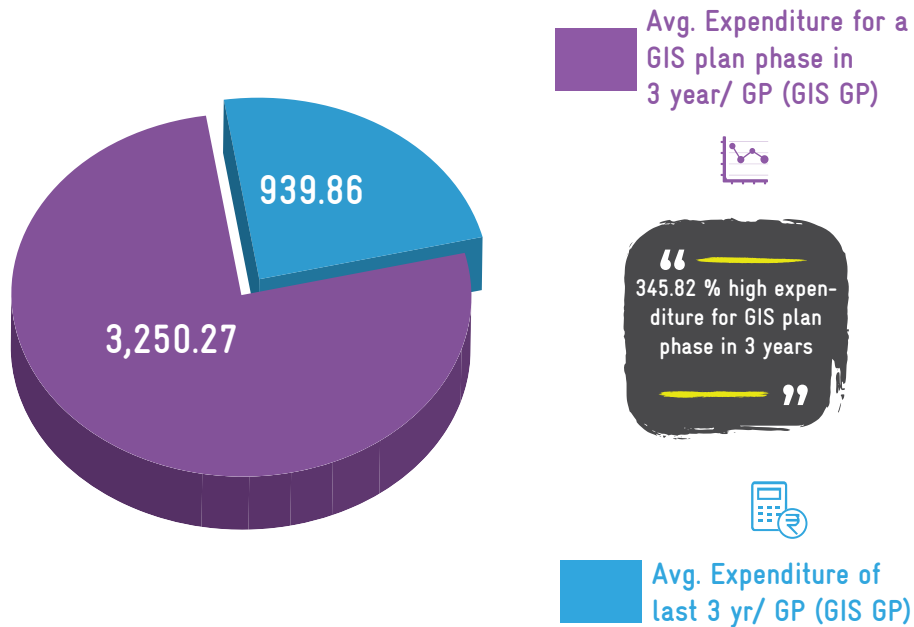
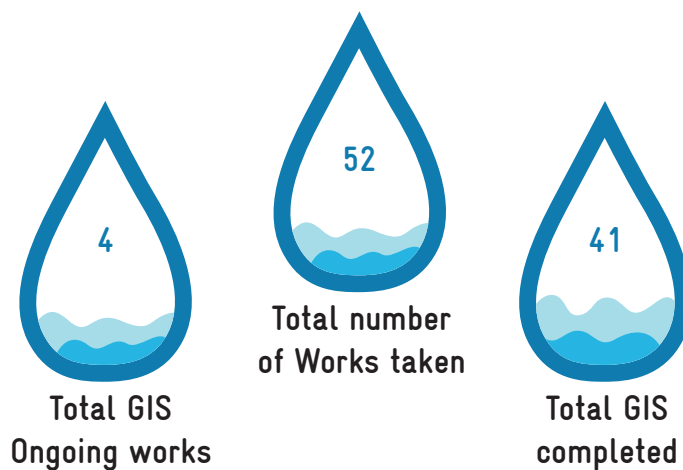


Figure 7.2. Average Expenditure for GIS plan in last 3 years



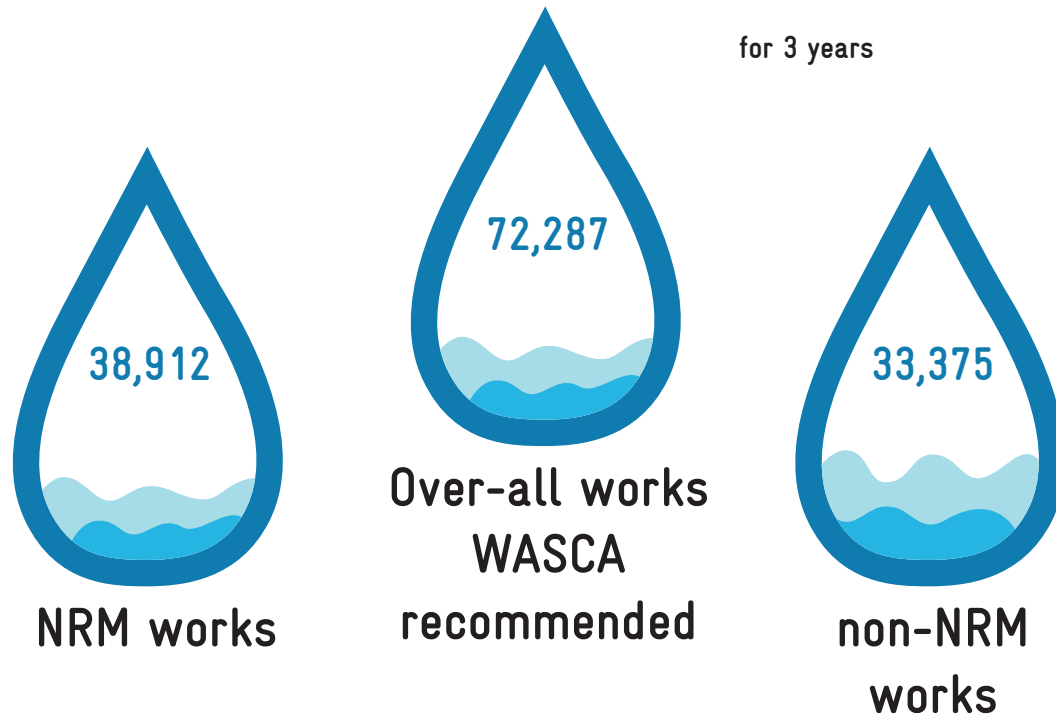




## 7.2 | WASCA RECOMMENDED NRM AND NON-NRM WORKS

WASCA recommended 72,287 works for a period of 3 years, out of which 38,912 are NRM works and 33,375 are non NRM works (Figure 7.4). A total of

4,552 works has been uploaded so far for the financial year 2021-22 as on 26/02/2021.





## 7.3 | ONGOING WORKS

The ongoing works in Thiruvadanai Block includes Water Conservation and Water Harvesting, Works on Individuals Land (Category IV), Drought Proofing, Anganwadi/other rural infrastructure and Rural Connectivity. A total of 122 works are ongoing in the Block, in which WCWH works (63.11 %) are more followed by individual beneficiary works (29.51 %) while Anganwadi/other rural infrastructure and Rural Connectivity works are less in number (1.64 %) (Figure 7.5), GP and work category wise ongoing works are tabulated in Annexure 7.2.

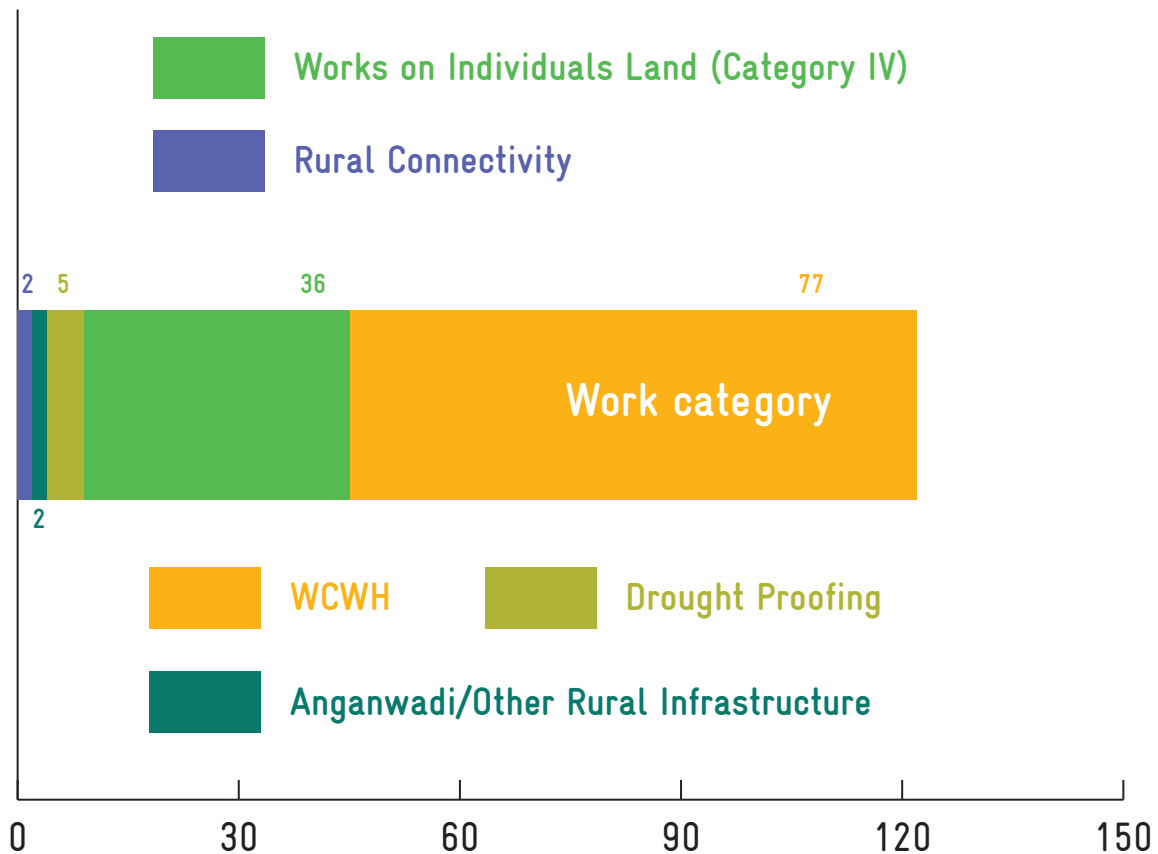


Figure 7.5. Category-wise ongoing works in Thiruvadanai Block

## 7.4 | CATCH THE RAIN

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

which bring water to them from the catchment areas, repairs to step-wells and using defunct bore wells and unused wells to put water back to aquifers etc., are to be taken up with the active participation of people. The total expenditure towards progressive works on Catch the Rain campaign of Thiruvadanai Block is Rs. 2,051.06 Lakhs and nearly 47% of the expenditure utilized for water conservation and Rain water harvesting (Figure 7.6).

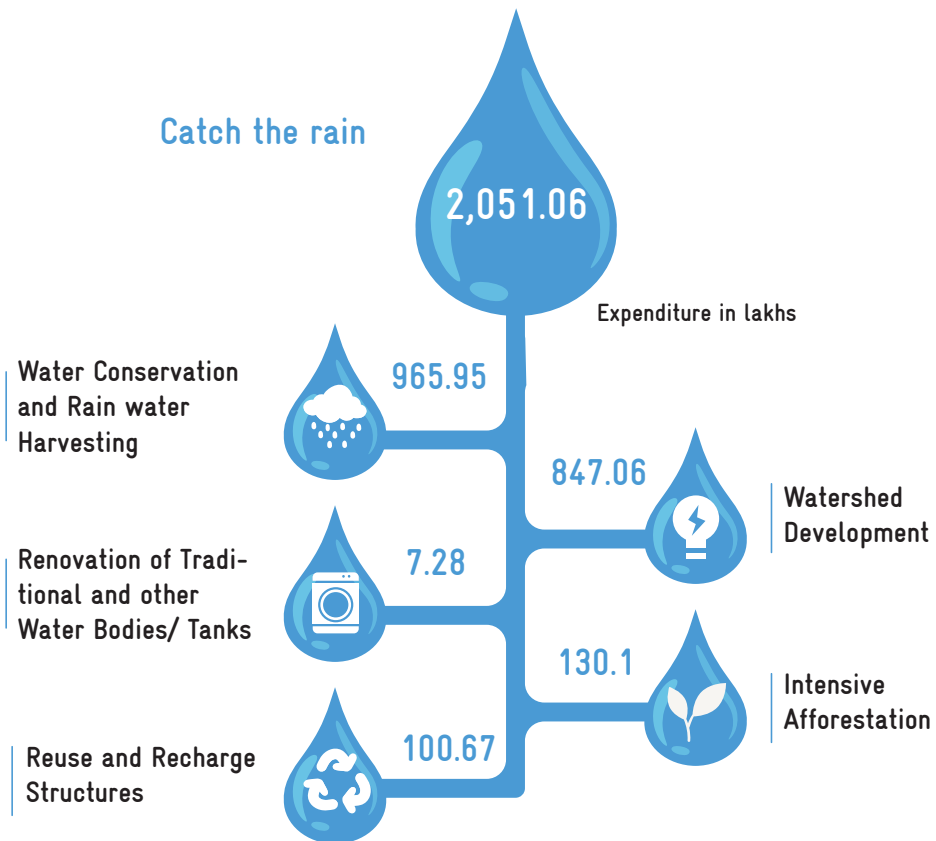
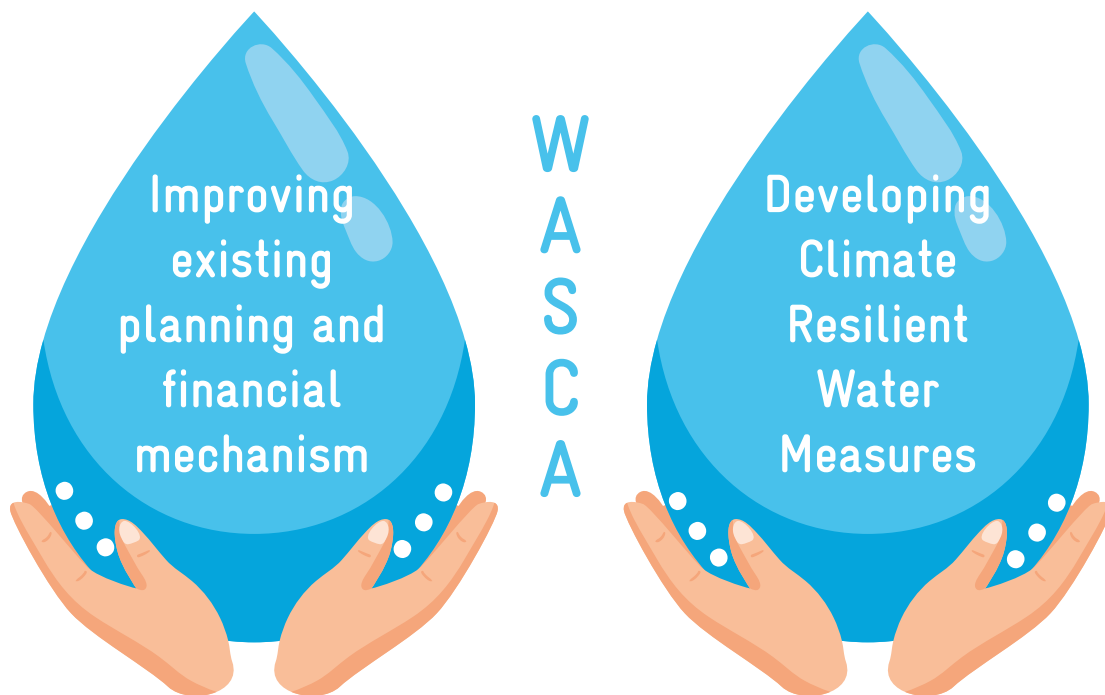


Figure 7.6. Expenditure for Catch the Rain campaign in Thiruvadanai Block



தானம் தவம்இரண்டும் தங்கா வியன்உலகம்  
வானம் வழங்கா தெனின்

குறள் - 19

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

Thirukkural - 19



# CHAPTER 8

## 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 of projects efficiently.

### 8.1 | MACRO-WATERSHEDS OF THIRUVADANAI BLOCK

Thiruvadanai Block comes under Pambar, Manimuthar and Kottakkaraiyar sub-basin of Pambar Kottakkaraiyar basin. Pambar and Manimuthar Rivers flow through the Block. Manimuthar and Kottakkaraiyar macro-watersheds cover 83 micro-watersheds. Manimuthar watershed (4A2B2) has 58 micro-watersheds covering an area of 35078.60 ha. Kottakkaraiyar watershed (4A2B1) has 25 micro-watersheds covering an area of 8706.53 ha (Table 28). In Thiruvadanai Block, out of 47 GPs, 33 GPs fall under Manimuthar watershed (4A2B2), 14 GPs under Kottakkaraiyar watershed (4A2B1) (Table 29). Figure 8.1 and 8.2 displays macro-watershed maps of the Block and its GPs. The micro-watershed related works are identified using Basin, Sub-basin, and micro-watershed with GP administrative boundaries through CWRM approach.

**TABLE 28. GENERAL DESCRIPTION OF MACRO-WATERSHEDS COVERING THIRUVADANAI BLOCK**

Macro-watershed	Area in ha	No. of micro-watersheds
Manimuthar	35078.60	58
Kottakkaraiyar	8706.53	25

**TABLE 29. NO. OF GPs COVERED UNDER WATERSHEDS IN THIRUVADANAI BLOCK**

Name of watershed	No. of GPs
Manimuthar	33
Kottakkaraiyar	14



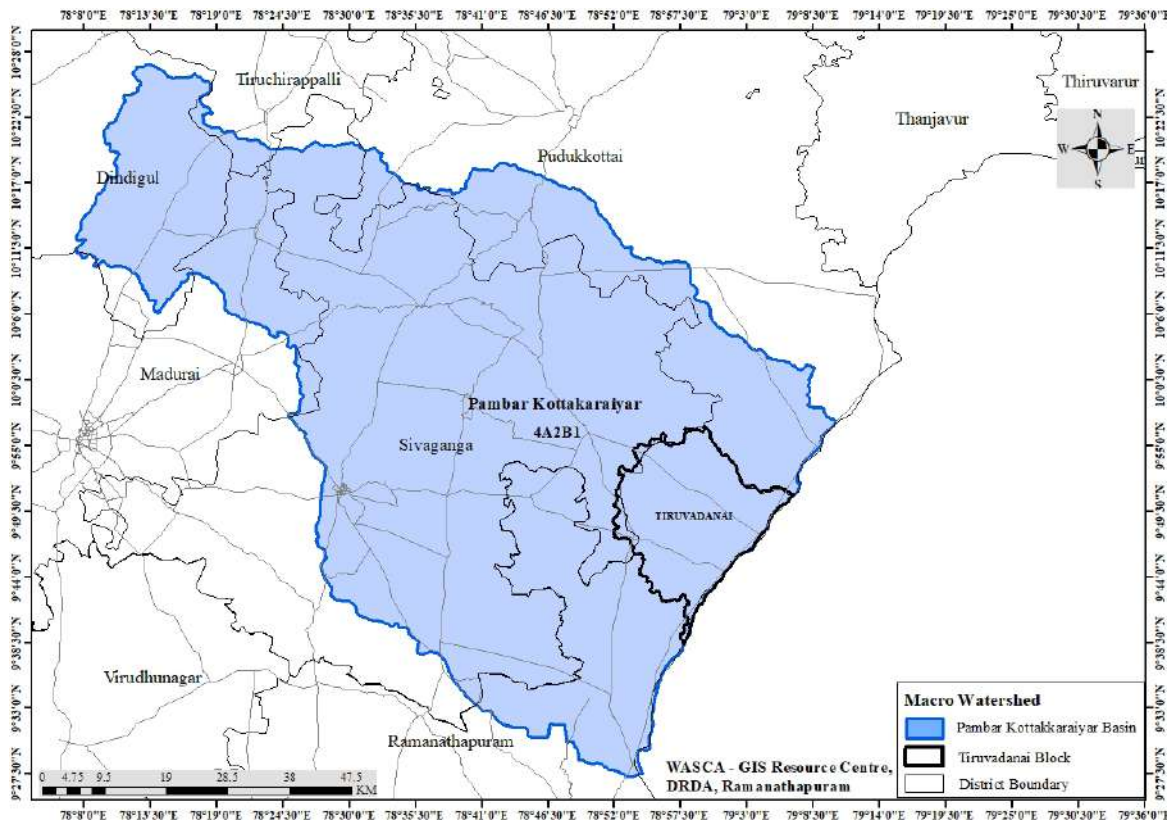


Figure 8.1. Macro-watershed map - Thiruvadanai Block

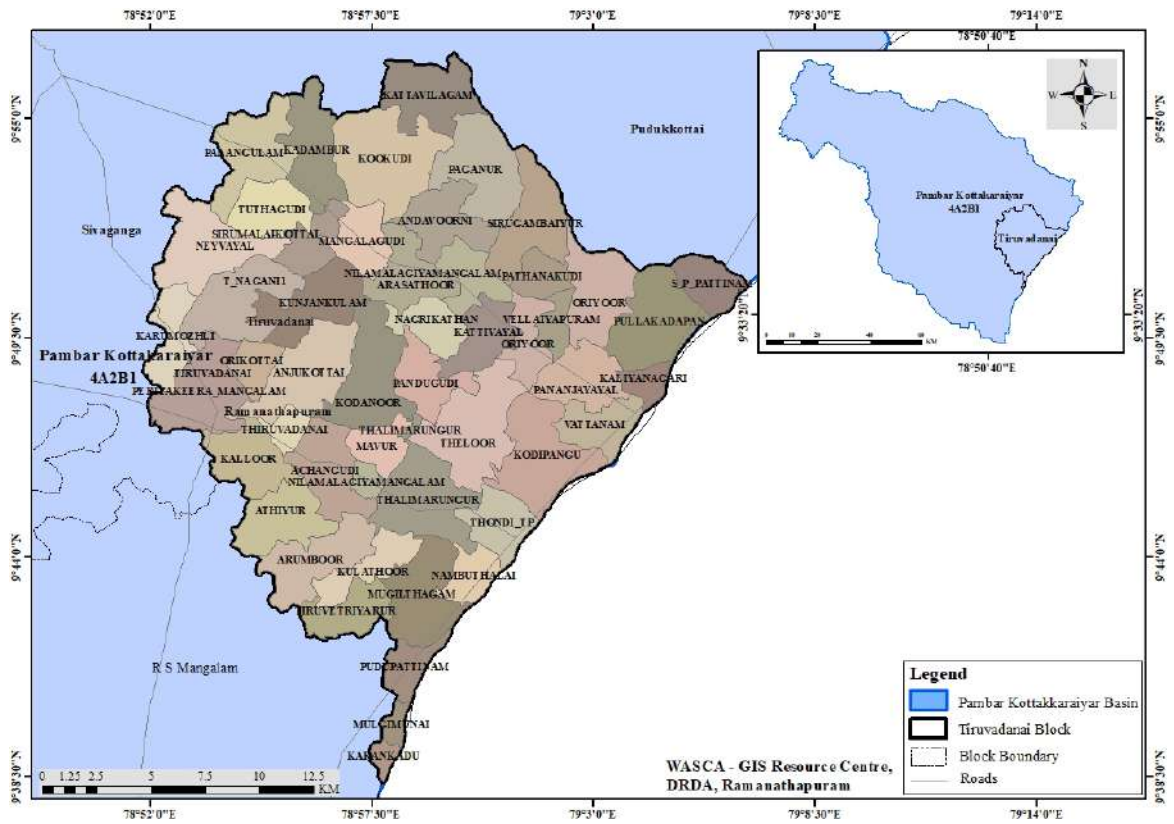


Figure 8.2. Macro-watershed with GPs



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 Thiruvadanai Block are listed in Tables 30 to 35.

**TABLE 30. MICRO-WATERSHED FALLING UNDER MANIMUTHAR MACRO-WATERSHED IN THIRUVADANAI BLOCK**

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4A2B2d02a	226.1276808	Lower
2	4A2B2a05b	19.06856346	
3	4A2B2a07c	257.7494209	
4	4A2B2a07b	472.2897685	
5	4A2B2a09a	243.7079333	
6	4A2B2a07a	623.2615594	
7	4A2B2c04b	135.8321348	
8	4A2B2a08a	962.0622006	
9	4A2B2a09b	128.9193435	
10	4A2B2a05a	32.13360624	
11	4A2B2a08b	584.3513079	
12	4A2B2a04d	1009.75622	
13	4A2B2a02d	198.0292921	
14	4A2B2a08c	718.7581477	
15	4A2B2a04a	785.356984	
16	4A2B2a04b	1136.953517	
17	4A2B2c04a	1013.116215	
18	4A2B2a04c	781.732115	
19	4A2B2c03b	132.9611764	
20	4A2B2a02c	125.7174185	
21	4A2B2a03e	750.1147044	
22	4A2B2c03a	589.4805825	
23	4A2B2a02b	100.6832405	
24	4A2B2c01a	2265.744816	
25	4A2B2b08b	658.1587365	
26	4A2B2a03f	827.6284163	
27	4A2B2a03g	808.2842171	
28	4A2B2b08a	773.107098	
29	4A2B2c01c	572.0798134	
30	4A2B2a02a	633.0235236	
31	4A2B2b04b	616.0162669	
32	4A2B2a03c	519.2836494	
33	4A2B2c02b	187.5373922	
34	4A2B2c01b	700.0011448	
35	4A2B2b07b	827.7745965	
36	4A2B2a03a	627.0348032	
37	4A2B2c02a	496.374014	
38	4A2B2b07a	686.8780856	

39	4A2B2b04c	417.7773459	Lower
40	4A2B2b04a	717.199174	
41	4A2B2a03d	482.981551	
42	4A2B2b01b	854.6219869	
43	4A2B2a03b	960.3784339	
44	4A2B2b05c	353.1671835	
45	4A2B2b07c	650.7924978	
46	4A2B2b05a	665.1798599	
47	4A2B2b01a	950.8408514	
48	4A2B2b05b	745.2315545	
49	4A2B2b06c	859.7103447	
50	4A2B2b02b	724.0768394	
51	4A2B2b06b	414.4044076	
52	4A2B2b06a	859.0645656	
53	4A2B2b02a	525.3650536	
54	4A2B2b03e	408.7245902	
55	4A2B2b03d	392.3336927	
56	4A2B2b03a	429.5264856	
57	4A2B2b03c	600.0009664	
58	4A2B2b03b	840.1309551	

**TABLE 31. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER MANIMUTHAR MACRO-WATERSHED IN THIRUVADANAI BLOCK**

Sl.No	Name of the GP	Ridge Type
1	Andavoorani	Lower
2	Anjukottai	
3	Arasathur	
4	Kadambur	
5	Kaliyanagari	
6	Kattavilagam	
7	Kattivayal	
8	Kodannor	
9	Kodippangu	
10	Kookudi	
11	Kunjangulam	
12	Mangalakkudi	
13	Mavur	
14	Nagarikathan	
15	Neyvayal	
16	Orikottai A/B	
17	Oriur	
18	Paganur	
19	Palangulam	
20	Pananjayal	
21	Pandukudi	
22	Pathanakudi	

23	Pullakkadamban	Lower
24	Sirugambaiyur	
25	Sirumalaikkottai	
26	Sundarapandianpattinam	
27	Thalirmarungur A/B	
28	Thehur	
29	Thuthakudi	
30	Tiruvadana	
31	T. Nagani	
32	Vattanam	
33	Vellayapuram	

**TABLE 32. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER MANIMUTHAR MACRO-WATERSHED IN THIRUVADANA BLOCK**

Sl.No	Proposed Work	Ridge Type	Extent
1	Contour Continuous Bunds (CCB) for Afforestation area (m)	Lower	16,916.8
2	Afforestation in Public/common lands (ha)		1,691.68
3	Drainage Line Treatment (m)		9,900
4	Block Plantation (Community) (ha)		824.89
5	Avenue plantation (km)		122.5
6	Composting (No.)		774
7	Canal Bund Plantation (km)		505.05
8	Restoration of water bodies: Tanks and Ooranis (No.)		814
9	Artificial Recharge Structure (No.)		2,831
10	Farm Bunding with Boundary Trenches - Individual (ha)		2,608
11	Construction of Farm Ponds - Individual (No.)		774
12	Land development - Individual (ha)		969.59
13	Azolla units - Individual (No.)		251
14	NADEP Vermi compost (No.)		251
15	Fodder development - Community & Individual (No.)		251
16	Cattle Shelters (No.)		251
17	Goat Sheep Shelters (No.)		1,012
18	Cattle Trough (No.)		251
19	Soak Pits (Community) (No.)		195
20	Soak Pits (Individual) (No.)		1,936
21	Roof Rain Water Harvesting (No.)		66
22	Agro Forestry (ha)		132.32
23	Nutri Garden (No.)		33
24	Silt application (No.)		390
25	Mini Forest (ha)		74
26	Fish Drying Yard (No.)		2
27	Bird Watching Tower (No.)		1
28	Fish Processing Unit (No.)		2
30	Wetland Bund Strengthening (km)		72.31
31	Wetland Bund Plantation (No.)		1,808
32	Wetland Inlet (No.)		1

**TABLE 33. MICRO-WATERSHED FALLING UNDER KOTTAKKARAIYAR MACRO-WATERSHED IN THIRUVADANAI BLOCK**

Sl.No	Micro-watershed Code	Micro-watershed Area in ha	Ridge Type
1	4A2B1d08b	95.0130405	Lower
2	4A2B1d08a	273.4789346	
3	4A2B1b08e	388.4330985	
4	4A2B1d07c	229.5582649	
5	4A2B1d07b	1.910718777	
6	4A2B1b08d	444.7803697	
7	4A2B1b08c	410.9121624	
8	4A2B1d07a	31.44823888	
9	4A2B1b08b	543.4016482	
10	4A2B1b08a	306.3151254	
11	4A2B1b07b	655.5596271	
12	4A2B1b07a	565.5128604	
13	4A2B1b07d	283.9576074	
14	4A2B1b06c	626.331018	
15	4A2B1b06a	878.9272579	
16	4A2B1b07c	300.8411608	
17	4A2B1b05c	599.7433913	
18	4A2B1b05b	527.7092214	
19	4A2B1b06d	285.2888567	
20	4A2B1b05a	663.2544662	
21	4A2B1b05d	194.9715164	
22	4A2B1b02d	110.3587844	
23	4A2B1b02c	6.75116E-07	
24	4A2B1b01b	116.5206461	
25	4A2B1b01a	172.2965423	

**TABLE 34. LIST OF GPs WITH TYPE OF RIDGE FALLING UNDER KOTTAKKARAIYAR MACRO-WATERSHED IN THIRUVADANAI BLOCK**

Sl.No	Name of the GP	Ridge Type
1	Achangudi	Lower
2	Arumboor	
3	Athiyur	
4	Kallur	
5	Karangadu	
6	Karumoli	
7	Kulathur B/D	
8	Mugilthagam	
9	Mullimunai	
10	Nambuthalai	
11	Nilamalgiyamangalam	
12	Periyakeeramangalam	
13	Pudupattinam	
14	Thiruvetriyur	



**TABLE 35. LIST OF WORKS PROPOSED UNDER CWRM – WASCA WITH TYPE OF RIDGE FALLING UNDER KOTTAKKARAIYAR MACRO-WATERSHED IN THIRUVADANAI BLOCK**

Sl.No	Proposed Work	Ridge Type	Extent
1	Contour Continuous Bunds (CCB) for Afforestation area (m)	Lower	4,394.3
2	Afforestation in Public/common lands (ha)		439.43
3	Drainage Line Treatment (m)		12,419
4	Block Plantation (Community) (ha)		112.35
5	Avenue plantation (km)		361.28
6	Composting (No.)		234
7	Canal Bund Plantation (km)		21.81
8	Restoration of water bodies: Tanks and Ooranis (No.)		243
9	Artificial Recharge Structure (No.)		327
10	Farm Bunding with Boundary Trenches - Individual (ha)		844.22
11	Construction of Farm Ponds - Individual (No.)		234
12	Land development - Individual (ha)		293.5
13	Azolla units - Individual (No.)		99
14	NADEP Vermi compost (No.)		99
15	Fodder development - Community & Individual (No.)		99
16	Cattle Shelters (No.)		99
17	Goat Sheep Shelters (No.)		395
18	Cattle Trough (No.)		99
19	Soak Pits (Community) (No.)		99
20	Soak Pits (Individual) (No.)		1,012
21	Roof Rain Water Harvesting (No.)		28
23	Nutri Garden (No.)		14
24	Silt application (No.)		116
25	Mini Forest (ha)		31



## 8.2 | MODEL MICRO-WATERSHED- THEERTHANDATHANAM

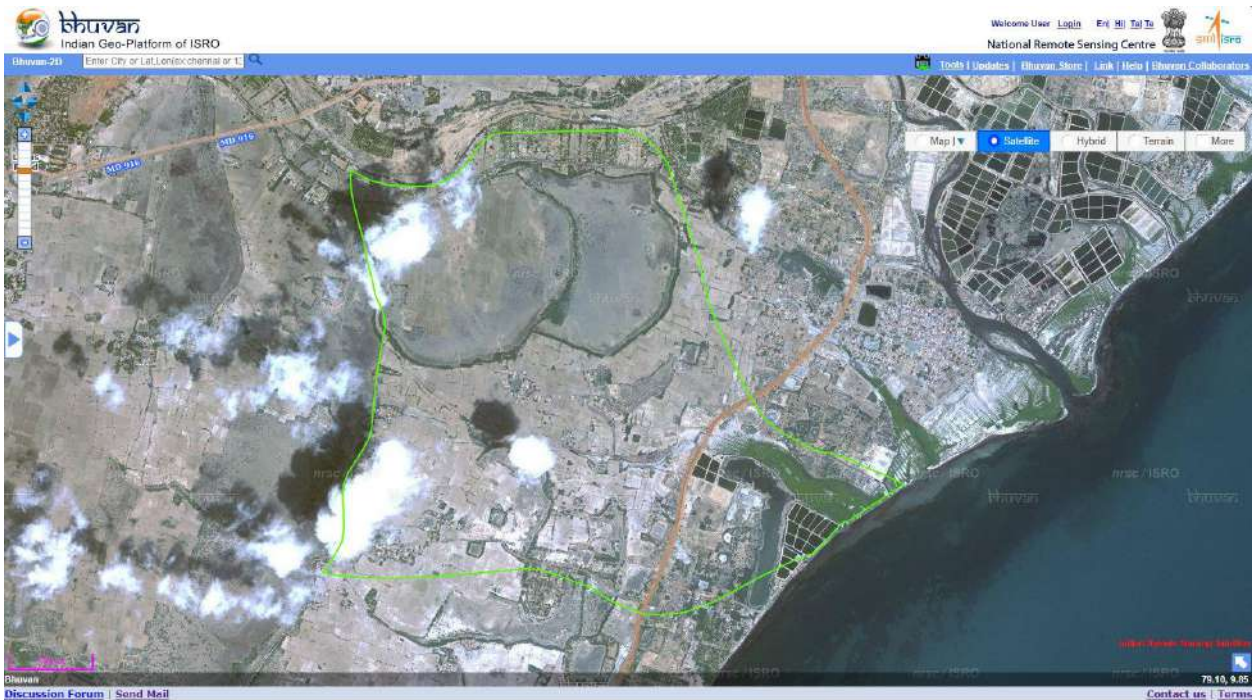


Figure 8.3. Satellite image of Theerthandathanam micro-watershed

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 develop-

ment 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 components. The ultimate goal is to achieve and maintain a balance between resources development to increase the welfare of the population.

### THEERTHANDATHANAM MICRO-WATERSHED

Theerthandathanam micro-watershed falls under Pullakadamban GP, Thiruvadanai Block in Ramanathapuram District. The satellite image of the micro-watershed is shown in Figure 8.3. This micro-watershed is the part of Manimuthar Macro-watershed in Manimuthar sub-basin. The general information, geology, hydrogeology, natural drainage line, catchment area, ground water

status, water budget of Theerthandathanam 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 36 to 47 & Figure 8.4). The key CWRM parameters for the GPs falling in this micro-watershed is given in Annexure 8.



TABLE 36. GENERAL INFORMATION OF THE MICRO-WATERSHED

Description	Name/ Number/ Quantity/ Status
Name of the Micro-watershed	Theerthandathanam Micro-watershed
Micro-watershed Number	4A2B2a03a
Name of the Basin	Pambar-Kottakkaraiyar Basin
Name of the sub basin	Manimuthar Sub basin
Name of the Macro-watershed	Manimuthar Macro-watershed
Number of GPs covered under the Micro-watershed	1
Name of the GP	Pullakadamban
Latitude of Micro-watershed (From To)	9°49'39.934"N to 9°51'6.762"N
Longitude of Micro-watershed (From To)	79°3'53.691"E to 79°5'51.424"E
Total area of the Micro-watershed in ha	627.03
Percentage of Micro-watershed area in Pullakadamban GP	100
Area of Micro-watershed falling in Pullakadamban GP (ha)	627.03
Length of the Coastal Line on Pullakadamban GP (m)	1297
Total Population of Pullakadamban GP	1,834
Annual Average Rainfall (mm)	821
Annual maximum Temperature (°C)	32.6 °C
Annual Minimum Temperature (°C)	23.8 °C
Evapo-Transpiration Losses of Pullakadamban GP (ha.m)	15.84
Volumetric soil moisture availability (%)	17
Climate Risk	Drought and coastal inundation
CVI Index Value for Pullakadamban (Based on WASCA Climate study)	0.535 (High Water 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 Pullakadamban GP	Safe

TABLE 37. HYDROGEOLOGY &amp; OTHER CHARACTERISTICS IN MICRO-WATERSHED

Type of Geomorphology	Coastal Origin - Older Deltaic Plain
Geomorphology occurrence in %	95
Principle Aquifer	Alluvium
Salt Affected Area passing through the micro-watershed	32.2 ha (Lower Ridge)
Type of lineaments passing through the micro-watershed	None
Barren & waste lands	8.66 ha (Lower Ridge)

TABLE 38. EXISTING WATER HARVESTING STRUCTURES IN PULLAKADAMBAN GP

Sl.No.	Name of Structure	Pullakadamban GP	
		Existing Structures	
		No.	Area in ha
1	Oorani	25	24.74
2	Tank	11	168.55
3	Farm Pond	14	2.83
	<b>Total</b>	<b>50</b>	<b>196.12</b>

TABLE 39. CATCHMENT AREA OF MICRO-WATERSHED (STRANGE METHODOLOGY - CGWB)

Catchment Area in ha	Pullakadamban GP
Good catchment area	103.5
Average catchment area	1.5
Bad catchment area	58.2

TABLE 40. GROUND WATER STATUS OF MICRO-WATERSHED

Name of the Firka (Assessment Unit) falling under micro-watershed	Pullur
Recharge from other sources during monsoon season (ha.m)	1704.28
Recharge from other sources during non-monsoon season (ha.m)	379.59

TABLE 41. SALINITY AND SEA WATER INTRUSION IN THE MICRO-WATERSHED

Pre monsoon Water Quality Index	Very Poor Quality
Post monsoon Water Quality Index	Medium Quality
Pre monsoon Sea Water Mixing Index	1-2
Post monsoon Sea Water Mixing Index	1-2

TABLE 42. WATER BUDGET OF GP'S FALLING IN MICRO-WATERSHED- PULLAKADAMBAN GP

Water Budget in ha.m	Pullakadamban GP
Water for human	5.02
Water for agriculture	568.4
Water for livestock's	0.41
Village wise water required	573.8
Available run-off from rain water (derived from Strange method)	163.1
Harvested Runoff from Water Harvesting Activities	274.1
Potential Harvesting from proposed Interventions	61.1
Total Water harvested	335.2
Water demand and Supply Difference	-238.7
Water demand supply gap status	deficient
Per capita Water Availability in cum	1827.7
International Standard per capita water Availability (cum)	1700
Water Availability Gap (cum)	127.70
Water security status	Water Stress

TABLE 43. GP WISE PROPOSED MICRO-WATERSHED WORKS – PULLAKADAMBAN GP

Proposed Work	Pullakadamban GP
Proposed works in Upper Ridge	0
Proposed works in Middle Ridge	0
Proposed works in Lower Ridge	97
Total works	97

TABLE 44. RIDGE WISE TREATMENT AREA ESTIMATED COST AND PERSON DAYS REQUIRED- PULLAKADAMBAN GP

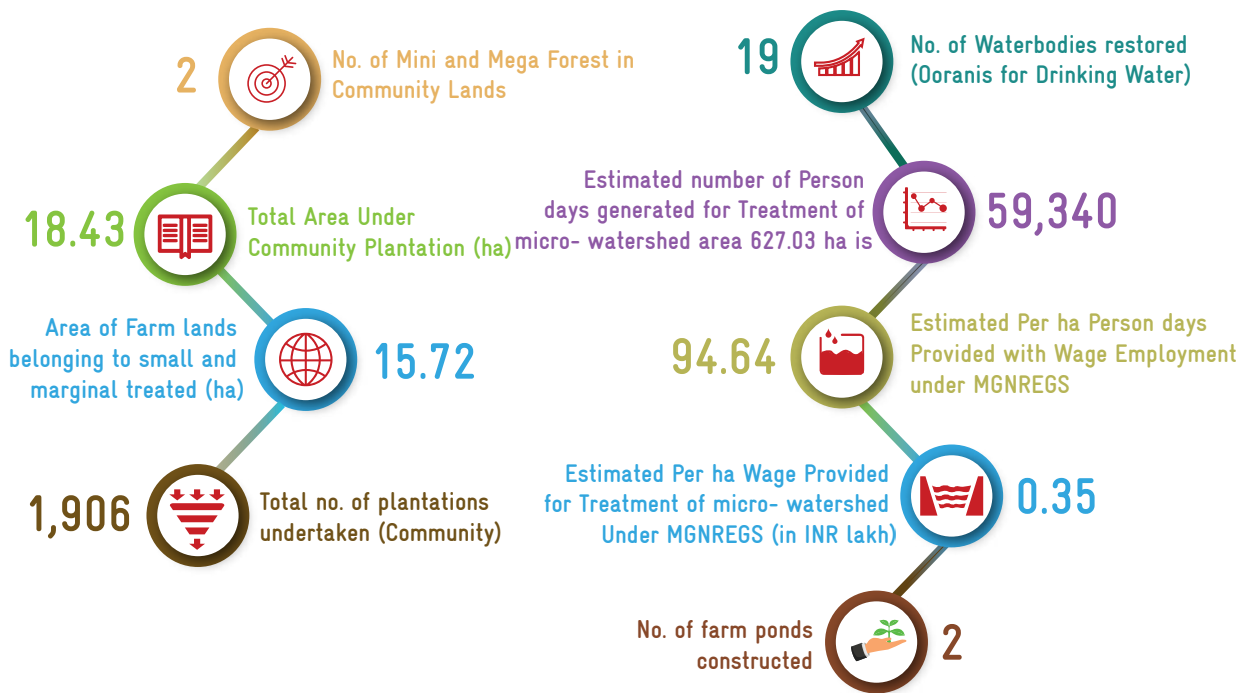
Ridge Type	Pullakadamban GP
<b>Lower Ridge</b>	
Estimated cost for Lower Ridge area (INR in Lakhs )	220.57
Total area in ha of Lower ridge	627.03
Estimated Person days generated for Treatment of Lower Ridge	59,340
Treatment cost of Lower Ridge Lakhs/ha	0.352

Pullakadamban GP	Treatment cost (INR in lakhs)	Estimated person days
Upper Ridge	NA	NA
Middle Ridge	NA	NA
Lower Ridge	0.352 lakh/ha	59,340
	.....	.....
	0.352 lakh/ha	59,340
	.....	.....

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

Description	Number
Total No. of works in Micro-watershed area (Arable, Non arable & DLT)	61
Total No. of works in Micro-watershed including livelihood Activities	22
Total No. of works in Micro-watershed including Rural Greywater Management Activities	14

**TABLE 46. KEY OUTCOMES OF INTERVENTION**



Expenditure for FY 2020-21 (in INR lakh)



Pullakadamban GP

44.73 lakh

TABLE 47. ESTIMATES OF MICRO-WATERSHED IN PULLAKADAMBAN 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
<b>NRM works in Public and Community Lands</b>						
Restoration of Traditional water bodies: (Oorani & Tank) (No)	Lower	Not commenced	19	19	107	38,462
Oorani bund Plantation (No)			3,289	19	15.13	5525
Avenue plantation (km)			36.27	2	33.37	1219
Block Plantation (ha)			3.52	1	7.29	2653
Afforestation (ha)			2.7	1	5.59	2031
Mini Forest (No.)		Completed	1,000	2	4.6	3,160
Roof Rain Water Harvesting in GP Building (No.)		Not commenced	25000 L	1	0.3	15
<b>Sub total</b>				<b>45</b>	<b>173.28</b>	<b>53,065</b>
<b>Coastal Watershed Activities</b>						
Watch Tower (No.)	Lower	Not commenced	1	1	10	733
<b>Sub total</b>				<b>1</b>	<b>10</b>	<b>733</b>
<b>Works in Individual Farmer lands (Agriculture and Allied Activities)</b>						
Recharge Shaft for bore well farmers for Salinity Reduction (No.)	Lower	Not commenced	4	4	1.08	48
Farm Bunding with Boundary Trenches - Individual (ha & No.)			5		7.5	1172
Construction of Farm Ponds - Individual (No.)			2	2	3.6	1,240
Composting (No.)			3	3	0.27	93
NADEP Vermi compost (No.)			3	3	0.36	15
Fodder development - Individual (No.)			1	1	1.48	2344
<b>Sub total</b>						<b>15</b>
<b>Total</b>				<b>61</b>	<b>197.57</b>	<b>58,710</b>
<b>Livelihood enhancement activities for Individual Farmers (Coastal Area)</b>						
Fish Drying Yard (No.)	Lower	Not commenced	1	1	6.19	108
Azolla Production Unit (No.)			6	6	0.9	84
Cattle Shelters (No.)			5	5	8	165
Goat Sheep Shelters (No.)			5	5	5.75	150
Cattle Trough (No.)			5	5	1	55
<b>Sub total</b>						<b>53</b>



Rural Greywater and Roof Rainwater Management						
Soak Pits (Individual) (No.)			8	8	0.86	48
Soak Pits (Community) (No.)	Lower	Not commenced	2	2	0.26	16
Nutri Garden (No.)			4	4	0.04	4
<b>Sub total</b>				<b>14</b>	<b>1.16</b>	<b>68</b>
<b>Total</b>				<b>97</b>	<b>220.57</b>	<b>59,340</b>

### TOTAL ESTIMATES OF MICRO-WATERSHED IN PULLAKADAMBAN GP

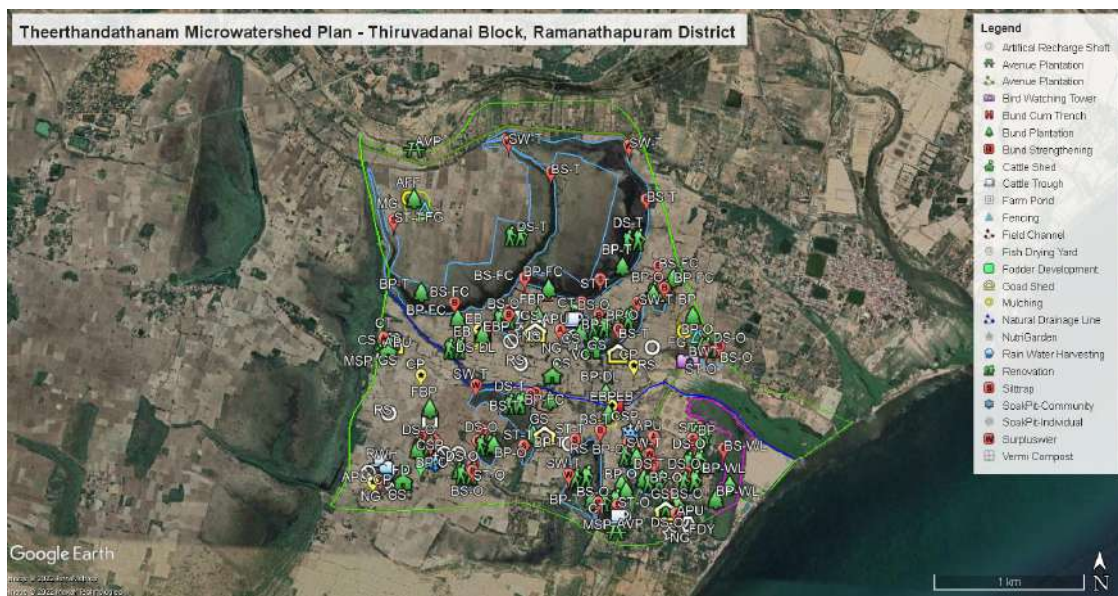
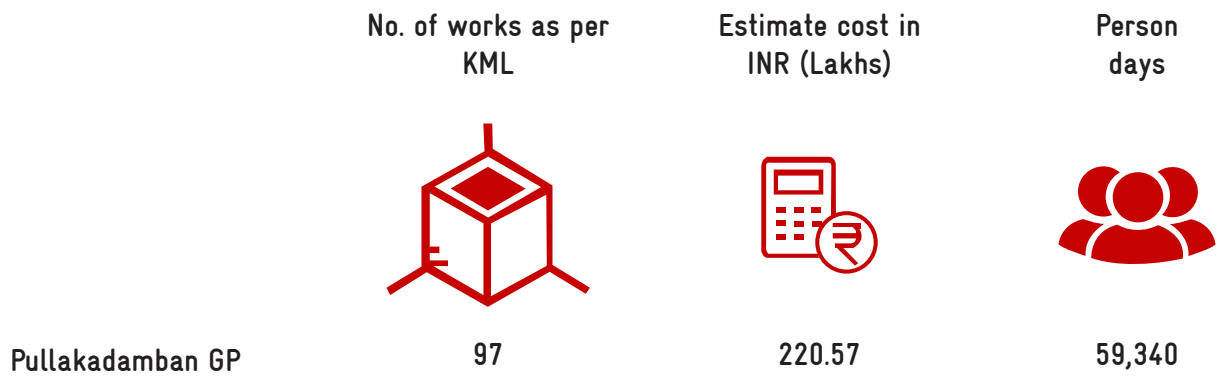


Figure 8.4. Proposed activities in Theerthandathanam micro-watershed

## 8.3 | MODEL GP - NILAMALGIYAMANGALAM

### BACKGROUND OF GRAM PANCHAYAT - NILAMALGIYAMANGALAM

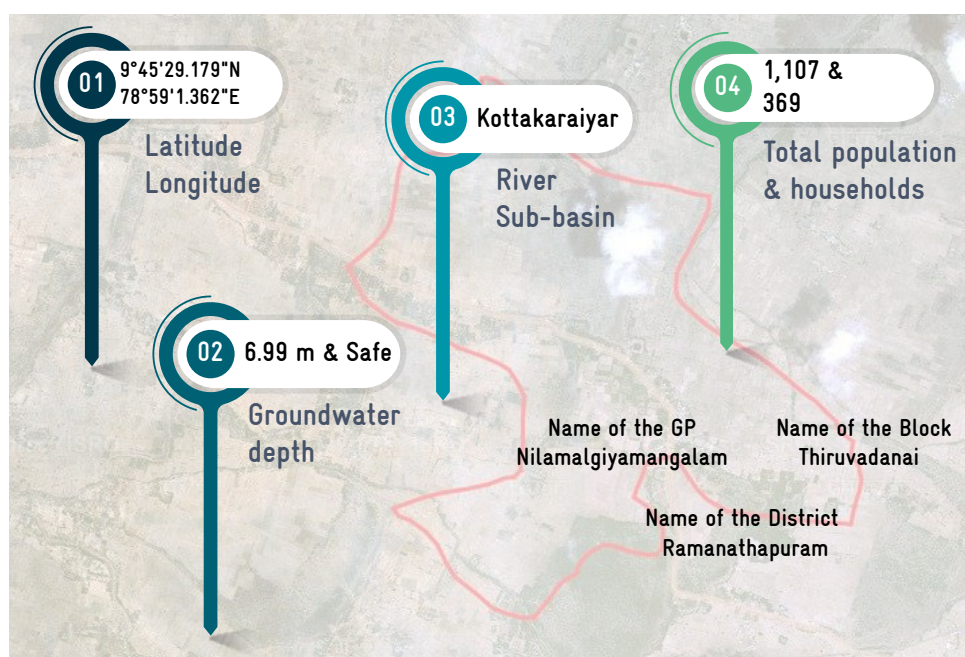


Figure 8.5. Satellite image of Nilamalgiyamangalam GP

Nilamalgiyamangalam GP is situated near the coast of the Bay of Bengal, in the Thiruvadana Block of Ramanathapuram District, Tamil Nadu (Figure 8.5). The total geographical area of the village is about 819 ha. It has a population of 1107. The

male and female populations are 556 and 551 respectively. 14.81% of the population comprises of SC population and no ST population. The total number of households in the village is 369. The general description of the GP is given in (Table 48).

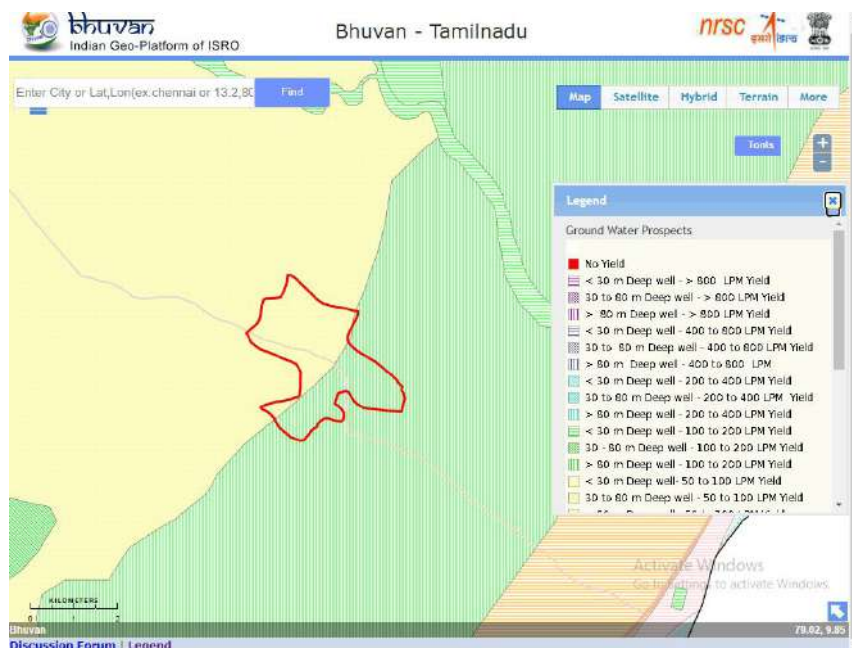
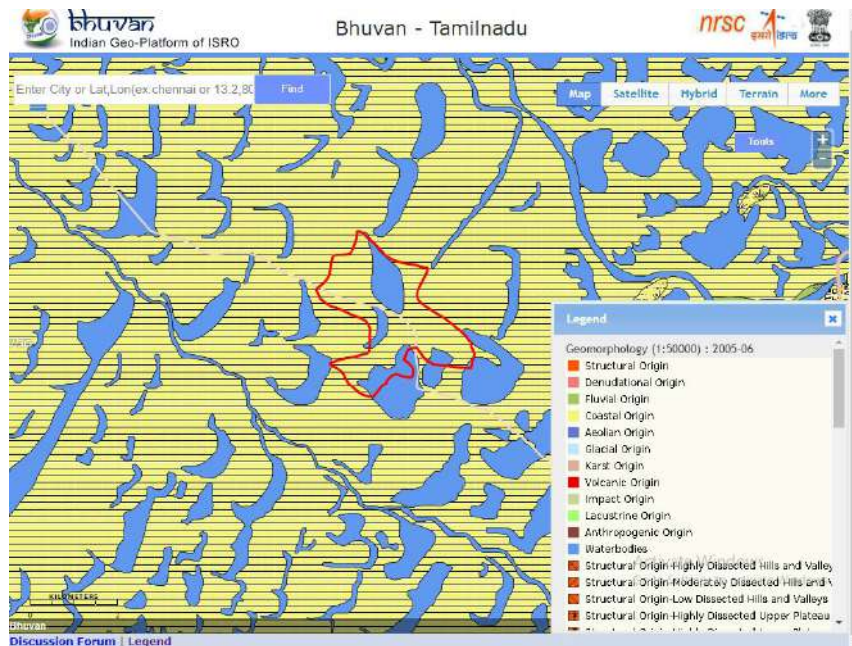
TABLE 48. GENERAL DESCRIPTION OF NILAMALGIYAMANGALAM GP, THIRUVADANA BLOCK

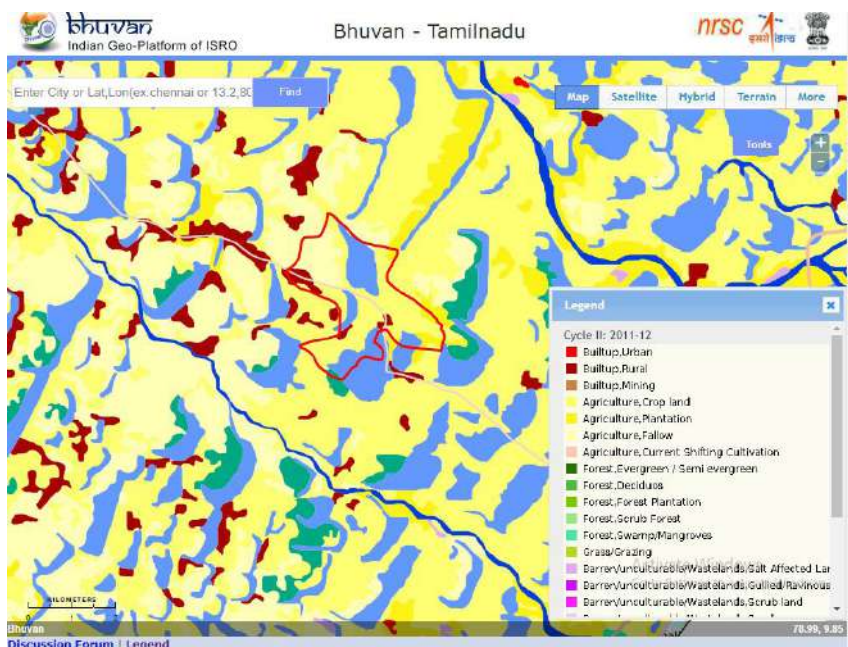
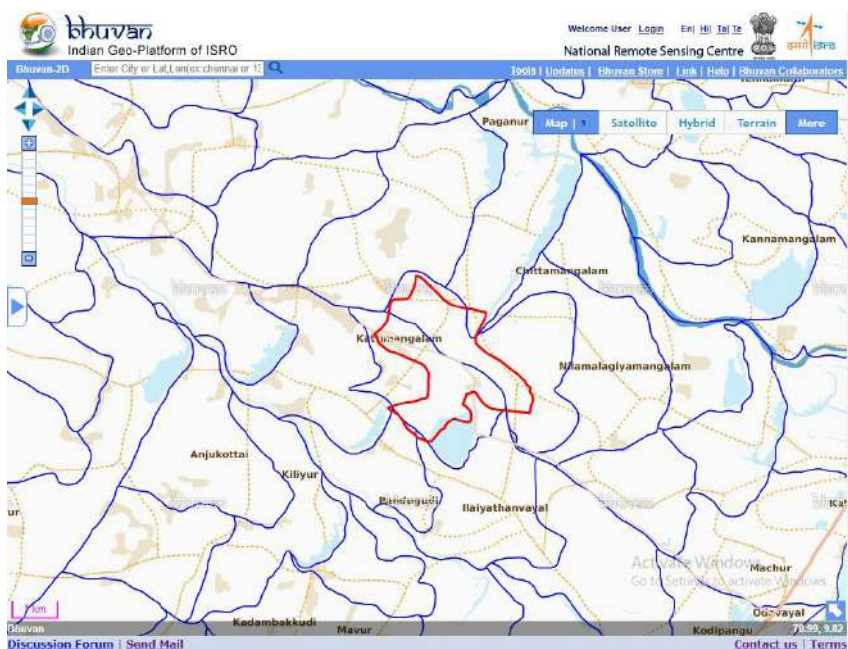




### 8.3.1 CWRM PLANNING - SPATIAL DATA

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 serves as a direct input for a particular activity to be implemented towards conservation of resources. Various thematic datasets for Nilamalgiyamangalam GP are shown in Figure 8.6 (A, B, C, D, E) and discussed below.





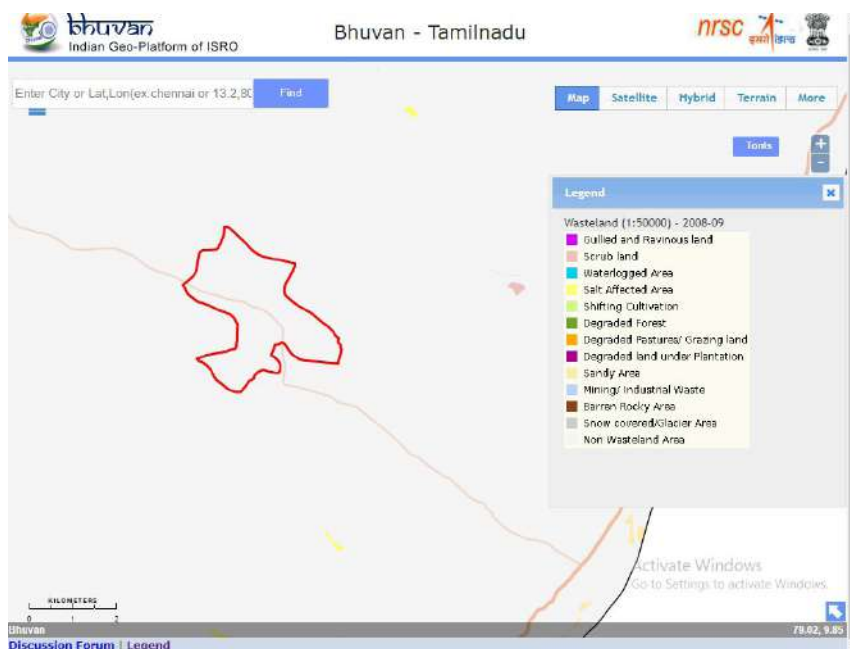


Figure 8.6. Spatial thematic maps of Nilamalgiyamangalam GP. A. Geomorphology, B. GW prosperity, C. Watershed, D. LULC, E. Wasteland

The northern part of Nilamalgiyamangalam GP is under older alluvial plain and the southern part is under the older deltaic plain. (A). The groundwater prospectus of the GP at the north side is less than 30 m deep well and 100 to 200 liters per minute yield and 30 to 80 m deep well and 50 – 100 liters per minute yield potential is in the southern part of this GP. (B). GP area falls under 11 micro-watershed units (C). It shows the area under barren waste land and fallow land (D). Areas of wasteland such as sandy areas are identified in the GP (E).

### 8.3.2 CWRM PLANNING- NON-SPATIAL DATA

The non-spatial data covers four important themes – socio economic, climate, water and agriculture with 116 parameters (Table 49). 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 49. NON-SPATIAL DATA- NILAMALGIYAMANGALAM GP

Key CWRM Parameter	Details
<b>Climate Vulnerability Area (CVA) 1: Socio-Economic</b>	
Geographical Area (ha)	819
Male Population	556
Female Population	551
Total Population	1,107
SC Population	164
ST Population	0
Vulnerable Population	164
Households (HH's)	369

Only one room HH's (SECC)	99
Female Headed HH's (SECC)	22
Vulnerable Households (SECC)	76
% of Vulnerable Households	21
Registered MGNREGA Job cards	593
The active person working in job Cards	378
Drinking Water Sources	47
HH's have tap water connection for drinking water	250
HH's dependent on other sources for drinking water	260
Annual Greywater Generation (ha.m)	2
<b>Climate Vulnerability Area (CVA) 3: Water Resources</b>	
<b>Canal Network (m)</b>	
Length of Main Canal	7,000
Water Courses (Field Channels)	500
No.of Ooranis	15
<b>Irrigation Facilities (ha)</b>	
Area under Canal Irrigation	837.29
Area under Open & Tube Well Irrigation	3.23
<b>Catchment Area wise Available Runoff (ha.m)</b>	
Good Catchment Area	32.3
Average Catchment Area	0.3
Bad Catchment Area	70.7
<b>Watershed and Drainage Networks</b>	
Length of Natural Drainage Lines (km)	1,644
No. of Natural Drainage Lines	1
No. of Micro Watersheds	11
<b>Water Demand (ha.m)</b>	
Water Demand for Humans	3
Water Demand for Livestock	2
Water Demand for Agriculture	863
% G.W Utilization for Drinking	96
% G.W Utilization for Livestock	75
% SW Utilization for Drinking	4
% SW Utilization for Livestock	25
% SW Utilization for Agriculture	100
<b>Climate Vulnerability Area 4: Agriculture</b>	
<b>Area Under Land Resources (ha)</b>	
Area under Non-Agricultural Uses	145.78
Area under Cultivable Waste Land	1.57
Area under Fallows Land other than Current Fallows	98.46



Area under Current Fallow land	14.23
Area under Unirrigated Land	364.6
Area Irrigated by Source	144.66
<b>Catchment Area (ha)</b>	
Land under Good Catchment	145.78
Land under Average Catchment	1.57
Land under Bad Catchment	621.95
<b>Crop Details (ha)</b>	
Irrigated Area	164.66
Rainfed area	615.6
Area under Paddy Cultivation	780.26
Crop Water Requirement - Irrigated condition (ha.m)	246.99
Crop Water Requirement - Rainfed condition (ha.m)	615.6
<b>Soil Resources: Status of Available Nitrogen (%)</b>	
Very Low (VL)	4
Low (L)	96
<b>Status of Organic Carbon (%)</b>	
Very Low (VL)	40
Low (L)	56
Medium (M)	4
<b>Status of Soil Micro Nutrients (%)</b>	
Sufficient	65
Deficient	35
<b>Status of Physical condition of the soil (%)</b>	
Moderately Acidic	60
Slightly Acidic	25
Moderately Alkaline	15
<b>Soil Texture</b>	
% of Fine Soil	32
% of Coarse loamy	44
Soil Water Permeability	Moderate to Low (5-20 mm/hr)
<b>Soil moisture and ET</b>	
Volumetric Soil Moisture (%)	17
Estimated Soil Moisture (ha.m)	106
ET Losses (ha.m)	265.83
<b>Means of Water Extraction (%)</b>	
Gravity	56
Lifting	44
<b>Irrigation Methods (%)</b>	
Wild Flooding	99



Control Flooding	1
<b>Livestock (No)</b>	
Cattle Population	436
Sheep Population	435
Goat Population	390
Poultry	1,163
Livestock Water Requirement (ha.m)	2.11

### 8.3.3 KEY WATER CHALLENGES

#### Socio-Economic



1. Low population density 135 person per ha
2. Female population is almost equal to male population
3. 14.81% percent of the population belongs to the SC category, according to SECC data
4. 21% of the households are vulnerable, 22 HH are female headed
5. 99 HH have only one room
6. 2 ha.m grey water from 369 households living in the coast needs attention

#### Water



1. No major, minor canals, distributaries in this GP
2. 15 Ooranis in the GP
3. 96% Drinking water requirement depends on Ground Water
4. 100% of Surface Water utilized for agriculture
5. More water for agriculture (863 ha.m)
6. 103.03 ha.m of water is an available runoff in which 68% of the runoff is from Bad catchment
7. 88.70% of the conservation is from the bad catchment

#### Agriculture and Allied Sector



1. 80.84 % is under Individual lands
2. More bad catchment area (80.84%)
3. Rain fed area (78.89%)
4. Low soil Nitrogen and Carbon
5. 60 % moderately acidic soil
6. 44% coarse
7. loamy soil
8. 99% Wild flooding
9. Area under paddy cultivation 780.26 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 infra-structures, and climate-resilient measures to reduce the vulnerability in the GP. About 17.47 % of the total land area is taken for WASCA activities like plantation, conservation works. The total proposed area for treatment is 134.43 ha out of which 97.16

% of the proposed work in under individual lands. (Figure 8.7). Through the proposed conservation activities, 17.17 ha.m run off would be harvested in which, about 88.70 % of the runoff is from the bad catchment, 9.9% of the run off is from the good catchment and 1.3 % of conservation is from the average catchment area (Figure 8.8).

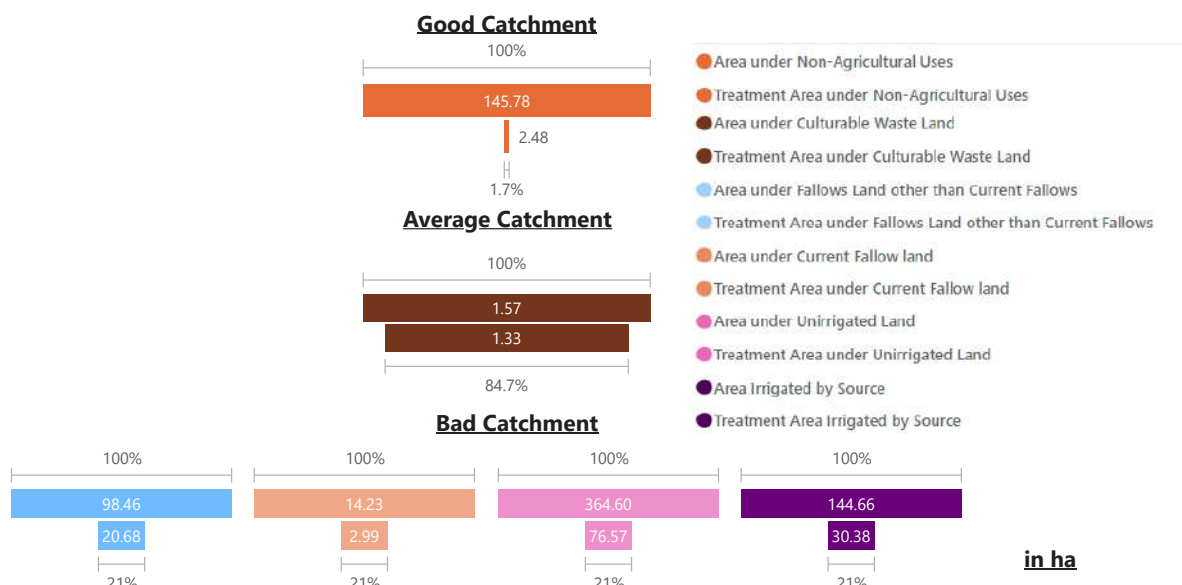


Figure 8.7. Proposed land resource treatment area in Nilamalgiyamangalam GP

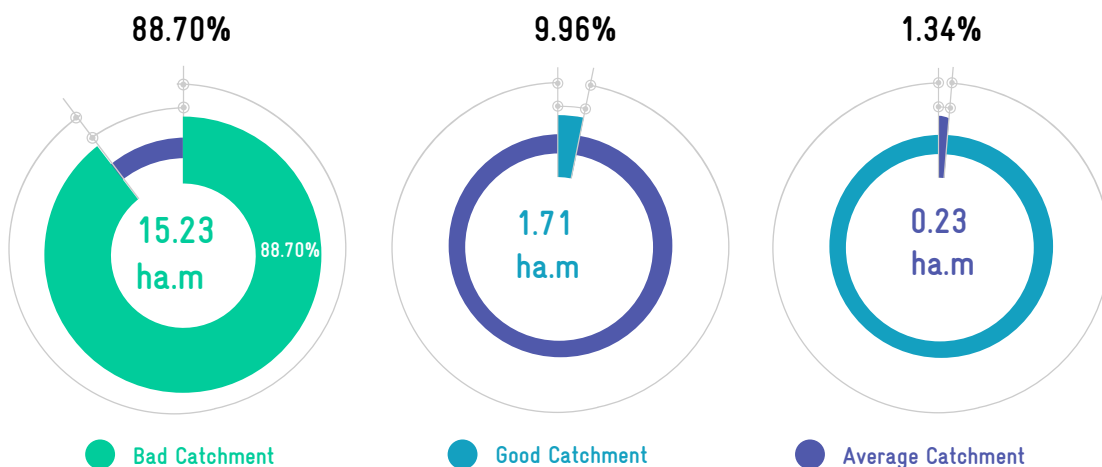


Figure 8.8. Expected run off conservation after treatment in Nilamalgiyamangalam GP

Based on the above key water challenges, relevant site-specific works are identified for the development of public and common land, agriculture and allied activities, rural infrastructure, and climate-resilient measures to reduce the vulnerability in the GP. Table 50 shows the detailed perspective plan

and estimates of the work, budget, and person-days for three years from 2021-2022 to 2023-2024 for Nilamalgiyamangalam GP. Since it is a vulnerable village, attention was given to include appropriate works to improve the common and public land development.

**TABLE 50. PERSPECTIVE PLAN OF NILAMALGIYAMANGALAM GP - FY (2021-2024)**




<b>CWRM Water Action 1: Improvement of Public &amp; Common Lands Development</b>					
<b>CWRM Water Action 1: Works in Upper&amp; Middle Ridge</b>					
<b>Name of the Work</b>	<b>Ridge Type</b>	<b>No of Works</b>	<b>Estimated cost (INR in Lakhs)</b>	<b>Estimated Person Days</b>	
Afforestation in Public/common lands (ha)	Lower	2.48	21.33	8,293.12	
Contour Continuous Bunds (CCB) for Afforestation area (m)		9.92	0.25	99.2	
Composting (No.)		40	6.8	600	
Deepening of water bodies (No.)		1.33	14.76	5,745.6	
Block Plantation (Community) (ha)		20	100	16,000	
<b>Subtotal Water Action – I</b>			<b>74</b>	<b>143</b>	<b>30,738</b>
<b>CWRM Water Action 2: Agricultural and allied Sector development</b>					
<b>CWRM Water Action 2: Works in Lower Ridge</b>					
Farm Bunding (ha)	Lower	131	195.92	76,537	
Micro Irrigation (ha)		12	12	0	
Construction of farm ponds (No.)		40	80	31,240	
Land development (ha)		50	501.2	1,95,769	
Cattle Shelters (No.)		11	23.32	3,641	
Goat Sheep Shelters (No.)		50	113.5	17,750	
Fodder development for cattle (No.)		11	16.28	25,784	
Azolla units (No.)		11	1.65	253	
Cattle Trough (No.)		11	0.55	66	
Poultry shed (No.)		29	2.61	290	
Dry land Horticulture/Agro-forestry (ha)		65	552.5	2,15,865	
Vermi Compost (No.)		11	1.98	297	
<b>Subtotal Water Action – II</b>			<b>432</b>	<b>1,502</b>	<b>5,67,492</b>

<b>CWRM Water Action 3: Rural Water Management</b>				
<b>CWRM Water Action 3: Works in Lower Ridge</b>				
Soak pits (Community) (No.)	Lower	3	0.39	60
Soak pits (Individual)		31	3.1	496
Roof rain Water Harvesting (No.)		2	8	1,250
Community Tanka (Rajasthan Model) (No.)		1	30	300
<b>Subtotal Water Action – III</b>		<b>37</b>	<b>41.49</b>	<b>2,106</b>
<b>Overall Total GP</b>		<b>542</b>	<b>1,686</b>	<b>6,00,336</b>

### Water actions

Regarding CWRM themes, of the total number of projects identified, 13.62 percent works are in public and common land, 79.55 percent in agriculture and allied sector while it is 6.8 percent under rural infrastructure. (Table 51)

**TABLE 51. SUMMARY OF WORKS IDENTIFIED AND ESTIMATED PERSON-DAYS FOR 2021-2024**

<b>CWRM themes</b>	<b>No of works</b> 	<b>Estimated budget (INR in lakhs)</b> 	<b>Estimated person days</b> 
Public and common land development	74	143	30,738
Agriculture and Allied sector development	432	1502	5,67,492
Rural water management	57	41.49	2,106
<b>TOTAL</b>	<b>543</b>	<b>1,686</b>	<b>6,00,336</b>

### 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 were envisaged (Table 52). It is expected that the impacts will

potentially reduce the vulnerability and improve the resilience of the system to the projected climatic change events and ensures water security.

TABLE 52. 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	15 water bodies restored
2	Area under afforestation	2	17.2 ha.m surface runoff is harvested due to WASCA interventions
3	Quantum of water harvested/recharge	3	17.5 percent of the total area treated under WASCA (58.58 ha)
4	The proportion of land treated under WASCA	4	2.48 ha area under afforestation
5	Drainage Line Treatment	5	Nil

<b>15</b> TRADITIONAL WATER BODIES RESTORED	<b>2.48 ha</b> AFFORESTATION	<b>17.2 ha.m</b> RUNOFF HARVESTED	<b>17.5 %</b> AREA OF THE VILLAGE TREATED
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## 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	40 farm ponds established
2	No structures were established for on-farm (in-situ) water harvesting in drylands	2	130.61 ha Farm bunding with trenches
3	Improvement in soil health	3	40 compost units for soil health improvement
4	Changes in the irrigation practices	4	30.38 ha covered under micro-irrigation
5	Dryland development with agro-forestry	5	65 ha under dryland horticulture
6	Households established fodder plots	6	109 vulnerable households established fodder plots

<b>40</b> FARM PONDS	<b>40</b> VERMI COMPOST	<b>130.61 ha</b> FARM BUNDING	<b>65 ha</b> DRYLAND HORTICULTURE	<b>109</b> FODDER PLOTS
-------------------------	----------------------------	----------------------------------	--------------------------------------	----------------------------

**WASCA CWRM ACTION PLAN**  
**DEVELOPMENT OF RURAL INFRASTRUCTURE**

**INDICATOR**

**OUTCOMES/ IMPACT**

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

1	3 common and 31 individual soak pits were established for recycling greywater benefiting 307 households
2	2 common roof rainwater harvesting and storage and 307 individual level roof rainwater harvesting
3	307 Households established Nutri-gardens in homesteads





**3** COMMUNITY &  
**31** INDIVIDUAL SOAK  
 PITS

**2**  
 COMMON ROOF  
 RAINWATER HARVESTING

**307**  
 NUTRI-GARDENS

Table 53 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 53. PROPOSAL FOR THE MGNREGS, KOTHIDAL GP, R S MANGALAM BLOCK**

	No of works	No of person days
 Perspective plan	 542	 6,00,336
 Annual plan	217	2,40,134



### 8.3.6 PROPOSED ACTIVITY MAP

The proposed activity map (Figure 8.9) for Nilamalgiyamangalam GP, Thiruvadanai Block shows a shelf of projects for all three year works from 2021-2024.

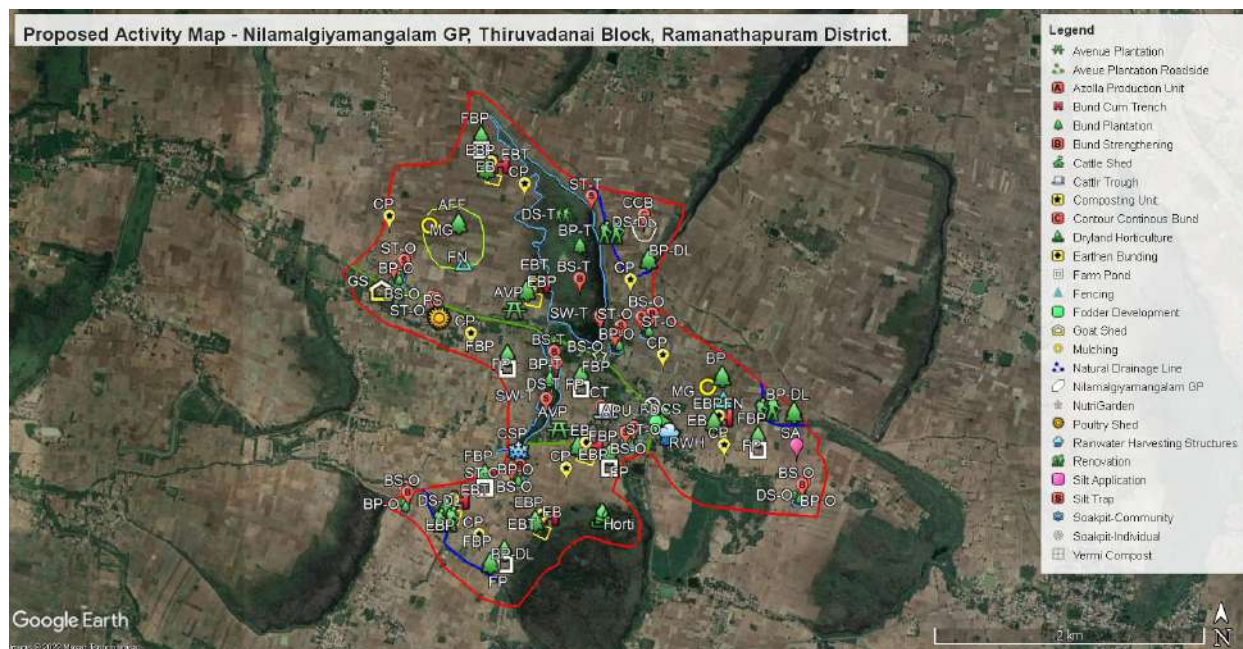


Figure 8.9. Proposed action plan of Nilamalgiyamangalam GP

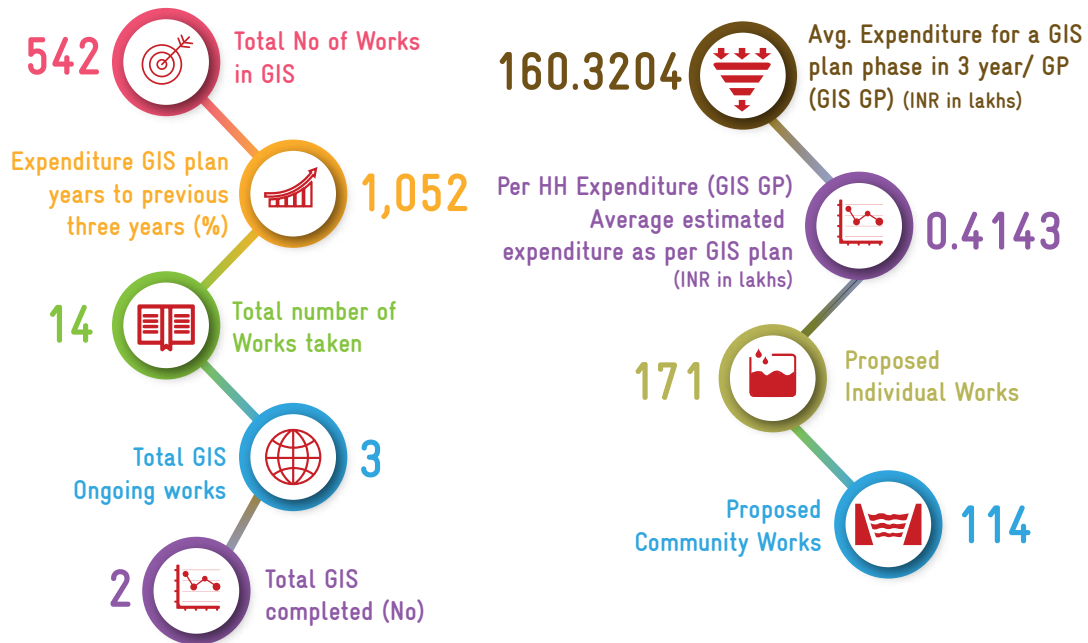




### 8.3.7 GIS PLAN IMPLEMENTATION AND KEY PARAMETERS

The GIS plan implementation and performance of Nilamalgiyamangalam GP, Thiruvadanai Block is represented in Table 54.

**TABLE 54. GIS PLAN IMPLEMENTATION, KEY PARAMETERS PERFORMANCE IN NUMBERS**





நீர்இன்று அமையாது உலகெனின் யார்யார்க்கும்  
வான்இன்று அமையாது ஒழுக்கு

குறள் - 20

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

Thirukkural - 20

# CHAPTER 9







# CONCLUSION

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

In recent decades, the demand for water is increasing at a fast rate due to rapid increase in population, industrial and economic growth. The evident changes in climate and its extremities are bringing more threats to water security. Frequent monsoon failures lead to acute water scarcity and severe droughts. Thus, dependency on ground water has increased many folds during recent years which resulted in lowering of ground water levels and even drying up of wells. WASCA TN took an initiative to address the problem holistically through comprehensive vulnerability assessment at district and Block level to identify the vulnerable area and its key problems. The 18 bio-physical and socio-economic indicators used at district level are further expanded to 110 parameters at Block level. The spatial and non-spatial CWRM parameters for the above mentioned four interrelated areas are used to represent risk, sensitivity of the GPs, which eventually reflects rural water security. The Key Water Action and the best possible adaptation options ‘Key Water Actions’ are drawn up under WASCA initiatives in public and common land, agricultural infrastructure and allied sector, rural infrastructure parameters and Key Water Action are aligned to the appropriate SDG and India’s NDC. The developmental activities in the 3 areas along with climate resilient measures will contribute in reducing the vulnerability and building the resilience of the local communities at the GP level. The GP based planning and integration at the Block level based on macro and micro-watershed enables to adopt an ecosystem approach in promoting nature-based solutions. The productive impacts are visualized through a convergence approach by mobilizing necessary finance, knowledge and technologies at the end of the three years of implementation. This integrated Block level approach will be more effective with Block level climate information which is not currently available.



Recommendations towards stable development and its progressive outcome are:

01

Participatory Rural Appraisal  
at village level



Preference of key water actions  
based on water demand and budget

02



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

03



Continuous field monitoring  
for constant actions

04



05

Engaging village level institutions  
such as SHGs, FPOs





# ANNEXURES

## ANNEXURE 1

### TYPES OF GPs

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





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

## ANNEXURE 3.1

## KEY CWRM PARAMETER FROM SECONDARY SOURCES

Key CWRM Parameter	Secondary Source
<b>Socio economic</b>	
Geographical Area	Census-2011, MoHA, GOI <a href="https://censusindia.gov.in/2011census/dccb/DCHB.html">https://censusindia.gov.in/2011census/dccb/DCHB.html</a>
Male Population	
Female Population	
Total Population	
SC Population	
ST Population	
Vulnerable population	
Households (HH's)	Socio-economic caste census (SECC) 2011 <a href="https://secc.gov.in/homePageLgd.htm">https://secc.gov.in/homePageLgd.htm</a>
Only one room HH's	
Female Headed HH's	
Vulnerable Households	
% of Vulnerable Households	
Registered MGNREGA Job cards	<a href="http://mnregaweb4.nic.in/netnrega/app_issue.aspx?page=s&amp;flag=eng&amp;state_name=TAMIL%20NADU&amp;state_code=29&amp;fin_year=2020-2021&amp;source=national&amp;Digest=3ics8+9Z9fEQ8y7j5E3qcQ">http://mnregaweb4.nic.in/netnrega/app_issue.aspx?page=s&amp;flag=eng&amp;state_name=TAMIL%20NADU&amp;state_code=29&amp;fin_year=2020-2021&amp;source=national&amp;Digest=3ics8+9Z9fEQ8y7j5E3qcQ</a>
Active person working in MGNREGA job Cards	
<b>Water Resources</b>	
<b>Irrigation Facilities</b>	Census-2011, MoHA, GOI <a href="https://censusindia.gov.in/2011census/dccb/DCHB.html">https://censusindia.gov.in/2011census/dccb/DCHB.html</a>
Area under Tank Irrigation	
Area under Canal Irrigation	
Area under Open & Tube Well Irrigation	
<b>Water Quality</b>	<a href="https://ejalshakti.gov.in/IMISReports/Reports/WaterQuality/WQ/rpt_WQ_DistrictProfile_S.aspx?Rep=0&amp;RP=Y">https://ejalshakti.gov.in/IMISReports/Reports/WaterQuality/WQ/rpt_WQ_DistrictProfile_S.aspx?Rep=0&amp;RP=Y</a>
Chemical Contaminants	
Bacterial and Other Contaminants	
<b>Watershed and Drainage Networks</b>	NRSC, ISRO, GoI
Length of Natural Drainage Lines	
Number of Natural Drainage Lines	
Number of Micro-watersheds	
<b>Agriculture</b>	
<b>Land Resources</b>	<a href="https://censusindia.gov.in/2011census/dccb/DCHB.html">https://censusindia.gov.in/2011census/dccb/DCHB.html</a>
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	<a href="https://censusindia.gov.in/2011census/dccb/DCHB.html">https://censusindia.gov.in/2011census/dccb/DCHB.html</a>
Area under Unirrigated Land	
Area Irrigated by Source	
<b>Soil Resources: Status of Available Nitrogen</b>	<a href="https://soilhealth.dac.gov.in/NewHomePage/NutriPage">https://soilhealth.dac.gov.in/NewHomePage/NutriPage</a> 
Very Low (VL)	
Low (L)	
Medium (M)	
High (H)	
Very High (VH)	
<b>Status of Organic Carbon</b>	
Very Low (VL)	
Low (L)	
Medium (M)	
High (H)	
Very High (VH)	
<b>Status of Soil Micro Nutrients</b>	
Sufficient	
Deficient	
<b>Status of Physical condition of the soil</b>	<a href="https://soilhealth.dac.gov.in/NewHomePage/NutriPage">https://soilhealth.dac.gov.in/NewHomePage/NutriPage</a> 
Acidic Sulphate	
Strongly Acidic	
Highly Acidic	
Moderately Acidic	
Slightly Acidic	
Neutral	
Moderately Alkaline	
Strongly Alkaline	
<b>Soil Texture</b>	NRSC
% of Clay Soil	
% of Fine Soil	
% of Coarse loamy	standard table
Soil Water Permeability	
<b>Soil moisture and ET</b>	<a href="https://indiawris.gov.in/wris/#/">https://indiawris.gov.in/wris/#/</a> 
Volumetric Soil Moisture	
<b>Livestock</b>	<a href="https://farmer.gov.in/livestockcensus.aspx">https://farmer.gov.in/livestockcensus.aspx</a> 
Cattle Population	
Sheep Population	
Goat Population	
Poultry	

## ANNEXURE 3.2

### KEY CWRM PARAMETERS FROM PRIMARY SOURCES

Key CWRM Parameter	Primary Data
<b>Water sources</b>	
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	
<b>Canal network</b>	
Length of Main Canal	Block level officer/ GP level assistants
Length of Minor Canal	
Length of Distributaries	
Water Courses (Field Channels)	
<b>Traditional water bodies</b>	
Number of Tanks (PWD & Union)	Block level officer/ GP level assistants
Number of Ooranis	
Other Surface Water Bodies	
<b>Crop details</b>	
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
<b>Water Demand</b>	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	
<b>Annual Greywater Generation</b>	Standard Norms are in Annexure 3.5
<b>Available Runoff</b>	Strange table method (based on rainfall, land area)
<b>Run Off Conserved</b>	Formula (based on tank storage, built up, linear measurement)
Estimated Soil Moisture	calculation & formula
ET Losses	calculation & formula
<b>Means of Water Extraction (Gravity/Lifting)</b>	(Number of Gravity or lifting /Total number of extraction)*100
<b>Irrigation Methods (Wild/Control)</b>	(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
	<b>Total</b>	<b>50</b>
	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
	<b>Total</b>	<b>50*total population</b>
	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
	<b>Total</b>	<b>(Total daily volume of grey water in litres *365)/ 1000</b>
	<b>Annual Grey water generated in ha.m</b>	<b>Annual Grey water in Cum/10000</b>

## ANNEXURE 3.6

### WATER QUALITY STANDARDS AND FORMULA USED

#### RELATIVE WEIGHTS ASSIGNED FOR DIFFERENT WATER QUALITY PARAMETERS

S. No.	Physical and chemical parameters	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

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

Where  $q_i$  is the quality rating,  $C_i$  is the concentration of individual element in water samples represented in mg/l and  $S_i$  is the drinking water standard for individual chemical constituents (in mg/l)

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

$$SMI = a \times \frac{C_{Na}}{T_{Na}} + b \times \frac{C_{Mg}}{T_{Mg}} + c \times \frac{C_{Cl}}{T_{Cl}} + d \times \frac{C_{SO_4}}{T_{SO_4}}$$

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 Dis-tributaries (m)	Water Courses (Field Chan-nels) (m)	Number of Tanks (PWD & Union) (No.)	Number of Ooranis (No.)	Other Surface Water Bodies (No.)
Achankudi	-	-	-	4,000	8	19	-
Anjukottai	-	-	-	5,000	4	14	-
Athiyur	-	-	-	3,000	11	16	-
Kaliyanagari	2,000	4,500	-	7,000	2	14	-
Palangulam	1,000	-	-	4,883	8	23	-
Paganur	-	-	-	1,000	7	15	-
Kodanur	-	-	-	2,000	12	24	-
Nambuthalai	-	-	-	13,000	2	15	-
Sirugambaiyur	-	-	-	3,000	3	21	-
Kattavilagam	-	-	-	3,000	3	20	-
Tiruvetriyur	-	-	-	600	4	5	-
Mugithagam	4,000	-	-	16,000	5	40	-
Nirmalagiyamangalam	7,000	-	-	500	-	15	-
Nagrikathan	4,000	-	3,000	8,000	2	22	-
Kookudi	2,500	-	-	10,000	9	29	-
Arasathur	12,000	-	-	20,000	6	21	-
Andavorani	3,000	-	-	4,000	3	13	-
Kunjankulam	7,000	-	-	5,250	7	14	-
Karumozhi Sananvayal	6,000	1,500	2,500	30,000	6	14	-
T.Nagani	8,000	-	-	12,000	7	20	-
Neyvayal	20,000	500	-	6,000	10	20	-
sirumalaikottai	3,000	-	-	3,000	1	15	15
Thuthagudi	600	30	-	1,650	3	15	-
Kadambur	1,000	-	-	3,000	6	16	-

Gram Panchayat	Canal Irrigation			Tradational Water bodies			
	Length of Main Canal (m)	Length of Minor Canal (m)	Length of Dis-tributaries (m)	Water Courses (Field Chan-nels) (m)	Number of Tanks (PWD & Union) (No.)	Number of Oorans (No.)	Other Surface Water Bodies (No.)
Mangalagudi	10,000	-	20,000	3,000	2	10	-
Orikottai	3,000	-	-	2,500	1	4	5
Kallur	2,000	1,000	500	1,000	10	11	-
Thiruvadana	300	-	1,000	500	1	9	-
Periakeramangalam	15,000	-	-	1,500	8	24	-
Pandugudi	1,050	-	-	6,500	8	37	-
Mavur	-	-	-	3,000	6	9	-
Thalimarungur	5,000	3,000	2,000	3,000	12	23	-
Orur	4,000	2,000	-	1,600	8	38	-
Pullakadamban	5,000	2,000	-	10,000	10	30	-
Panchayal	8,000	600	-	3,000	10	25	-
Vellayapuram	1,500	130	-	4,500	1	5	-
Pathangudi	1,000	-	-	5,000	1	10	-
Thealur	15,000	5,000	-	20,000	12	31	-
Kattivayal	15,000	10,000	-	40,000	6	17	-
Vattanam	1,000	300	5,000	500	-	31	-
Kodipangu	250	80	-	500	12	29	-
Karankadu	-	-	-	-	-	7	-
S.P.Pattinam	20,000	10,000	-	10,000	2	10	-
Kulathur	2,600	-	-	2,700	2	6	-
Pudupattinam	-	-	-	-	-	3	-
Arumbur	55,000	12,000	-	33,000	7	18	-
Mullimunai	55,000	12,000	-	33,000	-	4	-

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.)
Achankudi	157.02	-	-	29.50	3.80	103.80	-	-	-	7.00
Anjukottai	241.61	-	140.89	50.00	3.60	135.10	1,712.50	2.00	2.00	4.00
Athiyur	236.13	-	16.90	38.80	1.00	83.80	-	-	-	6.00
Kaliyanagari	101.17	-	-	28.50	7.90	17.20	-	-	-	2.00
Palangulam	122.50	-	-	50.40	0.20	73.20	3,935.37	3.00	3.00	7.00
Paganur	102.72	-	31.10	50.80	15.70	104.40	3,131.68	2.00	2.00	8.00
Kodanur	242.08	-	12.20	43.90	8.00	132.30	3,597.51	2.00	2.00	9.00
Nambuthalai	81.71	-	-	71.00	-	15.20	4,078.83	4.00	4.00	3.00
Sirugambaiyur	265.24	-	34.73	97.60	20.60	70.20	4,700.48	3.00	3.00	7.00
Kattavilagam	273.83	-	21.94	72.40	-	109.30	3,202.81	3.00	3.00	6.00
Tiruvetriyur	141.31	-	4.20	13.70	4.90	36.10	-	-	-	5.00
Mugithagam	485.20	-	20.23	56.40	-	81.30	-	-	-	5.00
Nirmalagiyamangalam	-	837.29	3.23	32.30	0.30	70.70	1,643.98	1.00	1.00	11.00
Nagrakathan	79.26	-	6.20	17.00	0.10	48.20	-	-	-	7.00
Kookudi	151.15	-	37.96	57.50	-	110.10	-	-	-	8.00
Arasathur	210.34	-	86.34	37.30	1.70	60.80	-	-	-	8.00
Andavorani	146.12	-	46.29	38.90	-	71.70	840.03	1.00	1.00	6.00
Kunjangkulam	140.07	-	68.12	41.00	16.20	89.60	-	-	-	7.00
Karumozhi Sananvayal	101.96	-	26.32	30.00	1.10	59.70	-	-	-	7.00
T.Nagani	163.86	-	83.91	47.80	16.70	108.30	-	-	-	5.00
Neyvayal	105.17	-	18.16	31.50	-	123.10	-	-	-	7.00
sirumalaikottai	24.80	16.18	-	22.20	10.70	46.80	-	-	-	5.00
Thuthagudi	307.35	-	43.70	39.00	-	68.70	-	-	-	4.00
Kadambur	196.14	-	57.43	48.20	6.30	92.40	-	-	-	6.00
Mangalagudi	131.28	8.09	26.06	45.30	-	50.60	-	-	-	4.00

Gram Panchayat	Irrigation Facilities (ha)			Catchment Area wise Available Runoff (ha.m)			Watershed and Drainage Networks		
	Tank Irrigation	Canal Irrigation	Open & Tube Well Irrigation	Good Catchment Area	Average Catchment Area	Bad Catchment Area	Length of Natural Drainage Lines (m)	Number of Natural Drainage Lines (No.)	Number of Micro-watersheds (No.)
Orikottai	36.37	-	17.06	12.30	-	46.40	-	-	1.00
Kallur	141.05	-	33.74	30.40	2.30	58.60	2,892.90	4.00	8.00
Thiruvadana	64.12	-	15.34	13.80	1.00	26.60	1,191.22	2.00	4.00
Periakeramangalam	239.16	-	35.79	56.70	1.00	100.00	-	-	6.00
Pandugudi	627.00	-	46.84	46.10	0.30	65.50	236.07	1.00	6.00
Mavur	74.15	-	3.45	19.90	2.70	27.80	765.09	1.00	3.00
Thalimarungur	202.30	113.30	20.20	80.70	10.90	185.00	-	-	9.00
Orur	647.49	-	-	79.70	1.90	86.90	3,976.70	3.00	10.00
Pullakadamban	242.50	24.30	-	103.50	1.50	58.20	9,653.03	7.00	5.00
Panchayal	287.33	-	-	96.10	1.50	51.70	697.63	1.00	4.00
Vellayapuram	95.50	1.60	-	17.10	0.50	28.00	-	-	3.00
Pathangudi	81.74	-	-	22.00	-	47.70	400.02	1.00	2.00
Thealur	2,832.70	9.71	-	99.40	11.00	123.10	670.20	3.00	11.00
Kattivayal	187.77	-	-	73.30	5.70	49.60	-	-	8.00
Vattanam	-	80.30	-	81.40	0.40	33.00	-	-	4.00
Kodipangu	131.50	-	42.58	125.20	20.30	108.00	1,539.74	2.00	6.00
Karankadu	-	-	-	18.40	-	0.30	4,924.50	5.00	1.00
S.P.Pattinam	134.55	12.14	29.74	46.60	-	31.60	-	-	2.00
Kulathur	33.01	-	21.00	31.50	1.70	67.90	-	-	4.00
Pudupattinam	-	-	-	22.40	4.90	12.10	1,456.55	6.00	3.00
Arumbur	526.00	-	260.00	44.60	1.60	72.80	-	-	6.00
Mullimunai	1.72	-	-	24.50	-	0.40	488.10	1.00	3.00

Gram Panchayat	Water Demand									
	For Hu- mans (ha.m)	For Live- stock (ha.m)	For Agricul- ture (ha.m)	% GW Utilization for Drinking (%)	% GW Utili- zation for Livestock (%)	% GW Utili- zation for Agriculture, (%)	% SW Utili- zation for Drinking (%)	% SW Utili- zation for Livestock (%)	% SW Utili- zation for Agriculture (%)	
Achankudi	5.55	1.15	913.17	9	81	-	91	19	100	
Anjukottai	8.53	2.14	1,164.74	10	79	6	90	21	94	
Athiyur	4.85	1.91	806.91	18	99	7	82	1	93	
Kaliyanagari	8.64	0.81	86.13	80	85	-	20	15	100	
Palangulam	3.48	1.55	627.15	32	94	-	68	6	100	
Paganur	3.92	2.41	168.53	-	98	42	100	2	58	
Kodanur	6.50	1.53	1,134.21	11	86	5	89	14	95	
Nambuthalai	22.08	1.15	134.27	100	66	-	-	34	100	
Sirugambaiyur	4.72	3.41	803.65	74	95	12	26	5	88	
Kattavilagam	4.60	1.08	871.29	23	90	7	77	10	93	
Tiruvetriyur	1.62	1.74	348.62	92	95	3	8	5	97	
Mugithagam	5.08	2.68	494.19	98	88	4	2	12	96	
Nirmalagiyamangalam	3.03	2.11	862.59	96	75	-	4	25	100	
Nagrikathan	5.88	0.80	862.44	96	94	7	4	6	93	
Kookudi	5.95	1.75	745.26	100	89	20	-	11	80	
Arasathur	3.58	4.98	862.59	96	82	29	4	18	71	
Andavorani	0.98	1.10	217.11	100	94	24	-	6	76	
Kunjankulam	7.42	0.84	1,347.76	98	72	33	2	28	67	
Karumozhi Sananvayal	2.01	2.06	1,092.74	97	87	21	3	13	79	
T.Nagani	7.47	2.36	1,092.74	96	87	34	4	13	66	
Neyvayal	6.81	1.95	1,184.46	48	88	15	52	12	85	
sirumalaikottai	7.42	0.84	1,347.76	98	72	-	2	28	100	
Thuthagudi	0.90	1.39	273.37	96	85	12	4	15	88	
Kadambur	5.72	1.92	916.28	96	90	23	4	10	77	
Mangalagudi	11.03	4.19	1,037.98	98	91	16	2	9	84	
Orikottai	3.68	0.69	540.12	98	86	32	2	14	68	

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 (%)	
Kallur	26.56	1.45	813.65	94	83	19	6	17	81	
Thiruvadanai	26.56	1.18	813.65	100	83	19	-	17	81	
Periakceramangalam	4.54	0.27	445.01	100	80	13	-	20	87	
Pandugudi	4.72	2.94	846.73	96	85	7	4	15	93	
Mavur	1.83	1.37	292.27	4	78	4	96	22	96	
Thalirmarungur	4.16	1.10	846.73	90	93	6	10	7	94	
Orur	13.87	1.17	870.10	93	92	-	7	8	100	
Pullakadamban	5.02	0.41	568.40	83	94	-	17	6	100	
Panchayal	6.24	0.41	486.46	95	94	-	5	6	100	
Vellayapuram	13.87	0.23	927.46	98	92	-	2	8	100	
Pathangudi	13.87	0.47	870.10	93	92	-	7	8	100	
Thealur	4.37	0.27	813.49	91	83	-	9	17	100	
Kattivayal	8.59	0.44	637.16	97	92	-	3	8	100	
Vattanam	0.67	0.82	103.55	93	67	-	7	33	100	
Kodipangu	3.68	1.48	315.71	60	92	24	40	8	76	
Karankadu	5.02	0.67	568.40	100	95	-	-	5	100	
S.P.Pattinam	5.57	0.59	643.08	91	97	17	9	3	83	
Kulathur	12.37	0.50	765.13	100	74	39	-	26	61	
Pudupattinam	12.37	0.40	765.13	100	70	-	-	30	100	
Arumbur	4.79	0.90	719.55	90	96	33	10	4	67	
Mullimunai	12.37	0.53	765.13	95	70	-	5	30	100	



## ANNEXURE 3.8

## LOCATION WISE WATER QUALITY IN THIRUVADANAI BLOCK DURING PRE-MONSOON SEASON

Gram Panchayat	Location	Latitude	Longitude	Well type	pH	Salinity	EC ( $\mu$ S/cm)	TDS (ppm)	TA (mg/l)
Achankudi	Achankudi	E 78° 56' 38.033"	N 9° 46' 17.641"	Open well	7.35	0	2,067	1,233	367
Achankudi	Near T. Keelaiyur	E 78° 56' 5.19"	N 9° 47' 20.242"	Bore well	7.16	0	1,159	678	330
Andavoorani	Andavoorani	E 78° 58' 58.681"	N 9° 52' 42.654"	Open well	6.61	13	28,930	17,940	274
Andavoorani	Peruvakottai	E 78° 58' 43.514"	N 9° 51' 35.078"	Bore well	7.22	0	1,307	784	335
Kattivayal	Kattivayal	E 79° 0' 34.34"	N 9° 50' 3.804"	Open well	7.09	0	6,670	4,120	315
Kodanur	T. Keelaiyur	E 78° 56' 20.947"	N 9° 47' 47.472"	Open well	6.8	0	2,617	1,519	292
Kodipangu	PV Pattanam	E 79° 2' 27.694"	N 9° 46' 12.241"	Open well	6.21	5	17,180	9,590	235
Kodipangu	Velankudi	E 79° 1' 32.106"	N 9° 45' 21.737"	Open well	7.12	0	637	388	318
Kookudi	Arivithi	E 78° 58' 11.748"	N 9° 53' 21.473"	Open well	6.81	0	1,540	971	294
Kulathur	Sekunthidal	E 78° 57' 46.724"	N 9° 44' 17.164"	Bore well	6.52	5	15,420	9,810	262
Kunjankulam	Kunjankulam	E 78° 56' 41.104"	N 9° 50' 50.165"	Bore well	7.23	0	2,285	1,342	340
Kunjankulam	Veliyankudi	E 78° 56' 36.913"	N 9° 50' 21.109"	Open well	6.84	0	1,591	998	297
Mangalakudi	Mangalakudi	E 78° 57' 3.132"	N 9° 52' 20.122"	Open well	7.26	0	488	290	348
N.M.Mangalam	Karungavayal	E 78° 57' 26.406"	N 9° 45' 35.388"	Open well	7.12	0	6,200	3,800	318
NM Mangalam	NM Mangalam	E 79° 0' 11.916"	N 9° 50' 53.322"	Open well	7.3	0	1,103	672	352
Orikottai	Bharathinagar	E 78° 54' 12.334"	N 9° 48' 25.808"	Bore well	6.81	0	1,749	1,034	293
Oriyur	OriyurPuthuvayal	E 79° 3' 52.952"	N 9° 51' 4.14"	Open well	6.36	3	13,330	8,430	253
P.K.Mangalam	Kuruvankadu	E 78° 53' 41.114"	N 9° 47' 43.912"	Open well	7.23	0	3,825	2,372	339
Paganur	Peramangalam	E 79° 0' 26.568"	N 9° 53' 4.621"	Open well	7.26	0	854	507	347
Palangulam	Keppuli	E 78° 54' 16.29"	N 9° 54' 47.549"	Bore well	6.9	0	1,685	946	302
Palangulam	Kurunthangudi	E 78° 55' 27.919"	N 9° 53' 45.056"	Bore well	7.24	0	2,040	1,268	342
Pandugudi	Ertukudi	E 78° 59' 37.525"	N 9° 48' 35.651"	Bore well	7.17	0	2,596	1,512	332
Pudupattinam	Puthupattanam	E 78° 57' 58.446"	N 9° 40' 44.494"	Open well	7.12	0	908	541	318
S P Pattinam	Near SP Pattanam	E 79° 5' 38.663"	N 9° 50' 38.566"	Bore well	6.48	4	14,490	9,140	259
S P Pattinam	S P Pattinam	E 79° 5' 51.824"	N 9° 50' 28.583"	Bore well	6.93	0	8,130	5,160	304

Gram Panchayat	Location	Latitude	Longitude	Well type	pH	Salinity	EC ( $\mu\text{S/cm}$ )	TDS (ppm)	TA (mg/l)
<b>T Nagini</b>	Elangundram	E 78° 54' 17.878"	N 9° 50' 30.602"	Open well	7	0	582	341	310
<b>Thalimarungur</b>	T' Puthukudi	E 78° 59' 31.751"	N 9° 45' 1.462"	Open well	7.65	0	535	332	436
<b>Theloor</b>	Palangulam	E 79° 0' 6.059"	N 9° 47' 35.272"	Bore well	7.69	0	807	503	438
<b>Thiruvetriyur</b>	Pottakudi	E 78° 56' 10.943"	N 9° 42' 36.576"	Open well	7.5	0	9,940	6,260	402
<b>Thiruvetriyur</b>	Thiruvetriyur	E 78° 56' 46.842"	N 9° 42' 26.201"	Open well	6.87	0	1,372	795	300
<b>Vattanam</b>	RC Nagar	E 79° 3' 18.709"	N 9° 47' 13.099"	Open well	6.62	0	14,840	7,070	275
<b>Vattanam</b>	Vattanam	E 79° 3' 32.908"	N 9° 47' 27.085"	Open well	7.23	3	8,220	5,170	339
<b>Vellaiyapuram</b>	Vellaiyapuram	E 79° 2' 10.655"	N 9° 49' 55.801"	Open well	6.96	0	1,918	1,159	306

Gram Panchayat	CO <sub>3</sub> (mg/l)	HCO <sub>3</sub> (mg/l)	TH (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K(mg/l)	S0 <sub>4</sub> (mg/l)	Cl (mg/l)	NO <sub>3</sub> (mg/l)	WQI	SMI
Achankudi	64	269	246	113	63	254	21	33	552	6	134.8	0.36
Achankudi	96	215	138	63	35	102	12	22	225	18	74.9	0.17
Andavoorani	59	178	3,449	1,577	883	1,956	22	55	7,452	29	1582.6	3.70
Andavoorani	74	248	156	71	40	125	14	44	245	22	85.3	0.23
Kattivayal	86	187	310	160	112	1,055	16	22	2,205	12	409.7	1.22
Kodanur	89	169	490	440	22	12	12	12	798	15	164	0.33
Kodipangu	57	153	1,650	1,480	202	1,480	26	55	4,523	29	917	2.31
Kodipangu	86	207	76	35	19	72	12	22	80	14	46.6	0.10
Kookudi	66	191	184	84	47	240	12	20	530	6	115.4	0.32
Kulathur	89	149	630	320	246	2,250	12	32	4,526	25	880	2.51
Kunjankulam	89	221	260	80	45	252	22	41	458	25	129.6	0.34
Kunjankulam	69	193	190	87	49	155	12	31	355	22	103.9	0.25
Mangalakudi	68	256	58	27	15	105	6	11	95	8	42.8	0.09
N.M.Mangalam	72	207	739	338	189	566	26	33	1,580	8	358.1	0.87
NM Mangalam	85	229	290	60	34	125	12	21	235	15	75.9	0.18
Orikottai	79	190	208	95	53	225	22	22	523	10	120	0.32
Oriyur	81	145	270	120	134	2,532	24	52	4,521	25	811.4	2.62
P.K.Mangalam	87	220	456	208	117	352	32	15	1,025	16	233.1	0.55
Paganur	95	226	320	160	45	76	9	48	195	16	77.1	0.20
Palangulam	95	186	201	92	51	201	18	15	458	21	112.4	0.27
Palangulam	95	222	350	120	22	365	19	36	635	13	141.8	0.43
Pandugudi	97	216	309	141	79	105	20	32	525	13	139.6	0.31
Pudupattinam	84	207	108	49	28	56	9	22	95	14	54.7	0.10
S P Pattinam	76	168	1,727	790	442	1,452	19	22	5,231	25	936.7	2.55
S P Pattinam	87	198	390	280	45	1,523	11	14	2,652	16	501.1	1.51
T Nagini	98	186	250	120	22	10	11	14	65	24	49.7	0.06
Thalimarungur	117	285	64	29	16	86	11	12	60	5	41.4	0.08
Theloor	98	315	96	44	25	95	22	41	84	16	57.3	0.15

Gram Panchayat	CO <sub>3</sub> (mg/l)	HCO <sub>3</sub> (mg/l)	TH (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K(mg/l)	S0 <sub>4</sub> (mg/l)	Cl (mg/l)	NO <sub>3</sub> (mg/l)	WQI	SMI
Thiruvetriyur	69	316	1,185	542	303	1,105	24	22	3,215	22	631.5	1.66
Thiruvetriyur	69	195	164	80	45	125	10	10	298	21	88.4	0.18
Vattanam	67	179	420	200	45	2,152	5	15	3,582	12	659.8	2.06
Vattanam	66	250	980	448	251	854	12	12	2,758	11	528.1	1.38
Vellaiyapuram	95	199	229	105	59	158	15	21	415	21	116.9	0.26

## ANNEXURE 3.9

### LOCATION WISE WATER QUALITY IN THIRUVADANAI BLOCK DURING POST-MONSOON SEASON

Gram Panchayat	Location	Latitude	Longitude	Well type	pH	Salinity	EC (µS/cm)	TDS (ppm)	TA (mg/l)
Achankudi	Achankudi	E 78° 56' 38.033"	N 9° 46' 17.641"	Open well	6.73	0	2,911	1,805	348
Achankudi	Near T. Keelaiyur	E 78° 56' 5.19"	N 9° 47' 20.242"	Bore well	6.66	0	4,420	2,740	287
Andavoorani	Andavoorani	E 78° 58' 58.681"	N 9° 52' 42.654"	Open well	7.35	0	1,423	882	208
Andavoorani	Peruvakottai	E 78° 58' 43.514"	N 9° 51' 35.078"	Bore well	7.26	0	2,881	1,786	314
Kattivayal	Kuttivayal	E 79° 0' 34.34"	N 9° 50' 3.804"	Open well	6.9	0	1,303	808	193
Kodanur	T. Keelaiyur	E 78° 56' 20.947"	N 9° 47' 47.472"	Open well	6.66	0	3,910	2,424	269
Kodipangu	PV Pattanam	E 79° 2' 27.694"	N 9° 46' 12.241"	Open well	7.84	5	15,960	9,895	946
Kodipangu	Velankudi	E 79° 1' 32.106"	N 9° 45' 21.737"	Open well	7.19	0	703	436	124
Kookudi	Arivithi	E 78° 58' 11.748"	N 9° 53' 21.473"	Open well	7.36	0	1,388	861	193
Kulathur	Sekunthidal	E 78° 57' 46.724"	N 9° 44' 17.164"	Bore well	6.49	5	15,520	9,622	905
Kunjankulam	Kunjankulam	E 78° 56' 41.104"	N 9° 50' 50.165"	Bore well	7.1	0	837	519	185
Kunjankulam	Veliyankudi	E 78° 56' 36.913"	N 9° 50' 21.109"	Open well	7.41	0	645	400	163
Mangalakudi	Mangalakudi	E 78° 57' 3.132"	N 9° 52' 20.122"	Open well	7.66	0	228	141	60
N.M.Mangalam	Karungavayal	E 78° 57' 26.406"	N 9° 45' 35.388"	Open well	6.62	0	2,856	1,771	306
NM Mangalam	NM Mangalam	E 79° 0' 11.916"	N 9° 50' 53.322"	Open well	7.31	0	2,734	1,695	286
Orikottai	Bharathinagar	E 78° 54' 12.334"	N 9° 48' 25.808"	Bore well	7.22	0	570	353	128
Oriyur	OriyurPuthuvayal	E 79° 3' 52.952"	N 9° 51' 4.14"	Open well	6.95	0	1,402	869	192
P.K.Mangalam	Kuruvaikadu	E 78° 53' 41.114"	N 9° 47' 43.912"	Open well	7.28	0	550	341	134
Paganur	Peramangalam	E 79° 0' 26.568"	N 9° 53' 4.621"	Open well	7.59	0	458	284	118
Palangulam	Keppuli	E 78° 54' 16.29"	N 9° 54' 47.549"	Bore well	7.3	0	1,671	1,036	191
Palangulam	Kurunthangudi	E 78° 55' 27.919"	N 9° 53' 45.056"	Bore well	7.11	0	2,193	1,360	216
Pandugudi	Ettukudi	E 78° 59' 37.525"	N 9° 48' 35.651"	Bore well	7.16	0	1,215	753	162
Pudupattinam	Puthupattanam	E 78° 57' 58.446"	N 9° 40' 44.494"	Open well	7.25	0	544	337	113
S P Pattinam	Near SP Pattanam	E 79° 5' 38.663"	N 9° 50' 38.566"	Bore well	7.24	0	1,477	916	236
S P Pattinam	SP Pattanam	E 79° 5' 51.824"	N 9° 50' 28.583"	Bore well	7.07	0	1,418	879	186

Gram Panchayat	Location	Latitude	Longitude	Well type	pH	Salinity	EC ( $\mu\text{S/cm}$ )	TDS (ppm)	TA (mg/l)
<b>T Nagini</b>	Elangundram	E 78° 54' 17.878"	N 9° 50' 30.602"	Open well	7.5	0	492	305	152
<b>Thalimarungur</b>	T' Puthukudi	E 78° 59' 31.751"	N 9° 45' 1.462"	Open well	6.5	0	719	446	128
<b>Theloor</b>	Palangulam	E 79° 0' 6.059"	N 9° 47' 35.272"	Bore well	7.31	0	755	468	136
<b>Thiruvetriyur</b>	Pottakudi	E 78° 56' 10.943"	N 9° 42' 36.576"	Open well	7.62	0	295	183	77
<b>Thiruvetriyur</b>	Thiruvetriyur	E 78° 56' 46.842"	N 9° 42' 26.201"	Open well	7.38	0	273	169	69
<b>Vattanam</b>	RC Nagar	E 79° 3' 18.709"	N 9° 47' 13.099"	Open well	6.87	0	1,839	1,140	225
<b>Vattanam</b>	Vattanam	E 79° 3' 32.908"	N 9° 47' 27.085"	Open well	7	0	1,857	1,151	204
<b>Vellaiyapuram</b>	Vellaiyapuram	E 79° 2' 10.655"	N 9° 49' 55.801"	Open well	7.01	0	1,373	851	206



Gram Panchayat	CO <sub>3</sub> (mg/l)	HCO <sub>3</sub> (mg/l)	TH (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K(mg/l)	S0 <sub>4</sub> (mg/l)	Cl (mg/l)	NO <sub>3</sub> (mg/l)	WQI	SMI
Achankudi	51	289	218	106	93	169	37	144	340	39	153.1	0.568
Achankudi	64	214	309	143	153	183	32	106	439	25	202.9	0.438
Andavoorani	26	174	173	71	88	114	13.5	47	267	28	101.7	2.185
Andavoorani	51	251	221	116	83	145	28	51	353	23	142.4	0.361
Kattivayal	31	154	141	56	66	89	17	37	156	13	79.6	1.197
Kodanur	55	206	335	162	165	191	38	98	412	33	197.3	0.327
Kodipangu	149	786	1,026	487	523	658	103	215	1688	134	705.4	2.618
Kodipangu	16	95	58	26	21	32	6	17	61	6	41.6	0.122
Kookudi	22	162	164	86	65	113	16	44	243	23	94.4	0.414
Kulathur	136	758	1,088	564	501	683	118	242	1638	125	694.9	3.4
Kunjangulam	12	173	80	27	39	36	8	55.5	75	6	51.6	0.348
Kunjangulam	19	133	67	33	21	27	8	23	66	5	41.6	0.214
Mangalakudi	10	48	38	18	8	8	2.2	6	34	4	24.2	0.131
N.M.Mangalam	42	251	206	85	105	186	27	138	366	41	154.9	0.896
NM Mangalam	42	236	199	99	82	169	33	43	326	14.877	135.6	0.34
Orikottai	8	116	49	26	12	19	4	8	52	4	34.4	0.265
Oriyur	23	162	155	67	73	112	19	53	241	26	95.3	2.763
P.K.Mangalam	16	110	58	25	21	21	5.2	16	61	4	37.2	0.407
Paganur	18	93	49	26	13	24	3.4	19	55	13	35.9	0.123
Palangulam	25	157	173	76	83	121	15.9	41	237	22	103	0.371
Palangulam	33	176	198	89	93	138	14	37	282	18	119.8	0.559
Pandugudi	18	133	64	29	24	46	8	31	77	15	57.9	0.176
Pudupattinam	23	86	62	36	14	22	2	8	72	4	36.6	0.102
S P Pattinam	36	188	172	89	65	115	21	47	224	21	95.3	1.645
S P Pattinam	20	155	160	82	64	104	13	61	210	29	93.2	1.723
T Nagini	18	124	53	28	15	18	6	18	58	2.6832	34.7	0.057
Thalimarungur	18	106	67	36	19	28	4	13	51	4	39.6	0.127
Theloor	14	115	56	27	16	22	9	42	58	11	43.5	0.165

Gram Panchayat	CO <sub>3</sub> (mg/l)	HCO <sub>3</sub> (mg/l)	TH (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K(mg/l)	S0 <sub>4</sub> (mg/l)	Cl (mg/l)	NO <sub>3</sub> (mg/l)	WQI	SMI
Thiruvetriyur	14	61	44	22	10	12	2.8	8	42	4	27.3	1.158
Thiruvetriyur	13	53	39	21	8	9	2.2	6	36	4	25.2	0.152
Vattanam	33	185	188	93	81	129	11	46	268	31	111.4	2.384
Vattanam	26	164	172	88	72	134	7	38	255	21	108.9	1.043
Vellaiyapuram	26	166	138	67	58	96	15	43	188	16	83.8	0.301

## ANNEXURE 3.10

## GP WISE STATUS OF AGRICULTURE RESOURCE

Gram Panchayat	Land Resources (ha)									
	Area under Forest land	Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Area under Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Croticalops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Achankudi	-	102.11	31.02	-	20.09	1.98	86.81	49.20	621.02	157.02
Anjukottai	-	225.20	-	-	20.14	1.00	137.70	23.02	771.88	256.50
Athiyur	-	122.10	52.90	-	-	6.11	57.80	31.25	395.36	253.03
Kaliyanagari	-	71.20	57.10	-	26.20	20.10	65.38	20.80	10.33	55.15
Palangulam	-	226.96	-	-	-	1.16	-	21.06	500.58	122.50
Paganur	-	110.88	117.92	-	92.13	-	67.56	49.34	668.48	133.82
Kodanur	-	198.00	-	-	36.78	10.22	216.00	20.20	674.13	254.28
Nambuthalai	19.04	228.20	72.80	-	-	-	26.02	0.21	26.08	81.71
Sirugambaiyur	-	439.82	-	-	-	120.89	4.30	3.81	310.00	299.97
Kattavilagam	-	326.30	-	-	-	-	209.12	28.96	428.64	295.77
Tiruvetriyur	-	57.95	3.80	-	18.31	10.22	103.56	46.07	45.01	122.70
Mugithagam	-	254.15	-	-	-	-	106.87	69.56	323.15	216.35
Nirmalagiyamangalam	-	145.78	-	-	-	1.57	98.46	14.23	364.60	144.66
Nagrikathan	-	76.52	-	-	-	0.50	81.82	6.20	256.72	79.26
Kookudi	-	213.98	45.01	-	-	-	241.37	37.96	538.44	151.15
Arasathur	-	57.37	110.61	9.98	-	0.20	47.46	86.34	190.79	210.34
Andavorani	-	156.43	18.79	-	-	-	139.29	46.29	299.89	146.12
Kunjankulam	-	145.49	39.50	30.40	0.70	63.68	88.52	68.12	491.67	140.07
Karumozhi Sananvayal	-	116.92	18.30	-	1.25	5.45	41.43	26.32	355.63	101.96
T.Nagani	-	165.18	50.48	30.40	0.85	66.95	113.37	83.91	592.66	163.66
Neyyayal	-	142.20	-	-	-	-	113.53	18.16	846.36	105.17
sirumalai kottai	-	68.86	30.99	33.78	0.20	28.57	32.01	29.11	244.09	106.97

Gram Panchayat	Land Resources (ha)									
	Area under Forest land	Non-Agricultural Uses	Area under Barren & Un-cultivable Land	Area under Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Crops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Area Irrigated by Source
Thuthagudi	-	83.20	92.58	-	-	-	12.23	43.70	241.19	307.35
Kadambur	-	172.68	44.44	37.16	-	-	34.50	57.43	525.03	196.14
Mangalagudi	-	111.09	92.90	-	-	-	44.10	26.06	244.18	131.28
Orikottai	-	55.35	-	-	-	-	6.97	17.06	347.78	36.37
Kallur	-	85.91	51.23	11.55	-	1.73	104.10	33.74	237.02	141.05
Thiruvadanai	-	39.05	23.29	5.25	-	0.79	47.32	15.34	107.74	64.12
Periakeramangalam	-	236.77	18.63	4.20	-	1.67	73.50	35.79	531.78	239.16
Pandugudi	-	145.64	62.00	-	1.86	0.18	225.85	46.84	158.16	145.82
Mavur	-	71.35	18.22	-	1.00	14.85	0.87	1.10	165.45	77.60
Thalimarungur	-	363.71	-	-	62.19	1.96	442.15	88.37	598.60	499.58
Orur	-	226.56	132.85	-	-	11.17	297.29	16.35	214.83	236.22
Pullakadamban	-	366.90	99.54	-	-	8.59	55.92	92.26	132.22	231.89
Panchayal	-	323.08	110.23	5.61	-	3.00	42.19	96.63	122.33	193.87
Vellayapuram	-	71.57	5.61	-	-	2.79	115.76	4.06	65.85	60.83
Pathangudi	-	99.32	-	-	-	-	215.00	6.21	120.86	78.22
Thehur	-	448.12	-	-	43.16	21.27	189.17	92.76	424.89	376.78
Kattivayal	-	262.88	67.34	-	-	33.52	99.16	11.40	65.06	260.63
Vattanam	-	343.29	23.78	-	-	2.40	18.94	90.50	54.25	127.16
Kodipangu	-	443.48	120.89	-	48.28	70.60	327.51	99.37	193.37	330.63
Karankadu	-	82.76	-	-	-	-	-	1.39	1.29	-
S.P.Pattinam	-	55.46	154.56	-	-	-	68.94	8.88	101.20	99.57
Kulathur	-	141.82	-	-	0.54	9.55	195.09	31.87	180.75	190.13
Pudupattinam	-	97.08	3.80	-	18.31	10.22	31.91	21.00	20.24	33.01
Arumbur	-	201.03	-	-	-	9.44	94.69	68.38	216.71	260.91
Mullimunai	-	110.34	-	-	-	-	-	1.85	1.72	-

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)	
Achankudi	133.13	22.07	914.05	154.03	682.13	836.16	231.04	682.13	
Anjukottai	225.20	21.14	1,189.10	258.98	776.27	1,035.25	388.47	776.27	
Athiyur	175.00	6.11	737.44	253.00	428.25	680.20	378.66	428.25	
Kaliyanagari	128.30	46.30	151.66	58.29	6.57	56.89	79.56	6.57	
Palangulam	226.96	1.16	644.14	109.26	463.85	572.20	163.89	463.26	
Paganur	228.80	92.13	919.20	47.16	97.79	144.95	70.74	97.79	
Kodanur	198.00	47.00	1,164.61	252.57	755.35	1,007.92	378.86	755.35	
Nambuthalai	320.04	-	134.02	75.68	20.75	96.43	113.52	20.75	
Sirugambaiyur	439.82	120.89	618.08	287.88	420.41	659.71	383.24	420.41	
Kattavilagam	326.30	-	962.49	296.04	427.24	723.27	444.05	427.24	
Tiruvetriyur	61.75	28.53	317.34	150.22	123.30	273.51	225.32	123.30	
Mugithagam	254.15	-	715.93	192.31	205.73	398.04	288.46	205.73	
Nirmalagiyamangalam	145.78	1.57	621.95	164.66	615.60	780.26	246.99	615.60	
Nagrikathan	76.52	0.50	424.00	165.66	615.00	779.66	247.44	615.00	
Kookudi	258.99	-	968.92	102.10	592.11	694.21	153.15	592.11	
Arasathur	167.98	10.18	534.93	164.66	615.60	780.26	246.99	615.60	
Andavorani	175.22	-	631.59	34.12	165.93	200.05	51.18	165.93	
Kunjankulam	184.99	94.78	788.38	244.37	981.21	1,225.58	366.56	981.21	
Karumozhi Sananvayal	135.22	6.70	525.34	155.34	859.73	1,015.07	233.01	859.73	
T.Nagani	215.66	98.20	953.60	155.34	859.73	1,015.07	233.01	859.73	
Neyvayal	142.20	-	1,083.22	101.42	1,032.34	1,133.76	152.12	1,032.34	
sirumalaikottai	99.85	62.55	412.18	244.37	981.21	1,225.58	366.56	981.21	
Thuthagudi	175.78	-	604.47	58.56	185.54	244.09	87.83	185.54	
Kadambur	217.12	37.16	813.10	133.15	716.55	849.70	199.73	716.55	
Mangalagudi	203.99	-	445.62	278.25	620.60	898.85	417.38	620.60	
Orikottai	55.35	-	408.18	49.58	465.75	515.33	74.37	465.75	

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)
<b>Kallur</b>	137.14	13.28	515.91	224.00	477.65	701.65	336.00	477.65
<b>Thiruvadana</b>	62.34	6.04	234.52	224.00	477.65	701.65	336.00	477.65
<b>Periakeramangalam</b>	255.40	5.87	880.23	127.43	253.87	381.30	191.14	253.87
<b>Pandugudi</b>	207.64	2.04	576.67	315.47	373.53	689.00	473.21	373.53
<b>Mavur</b>	89.57	15.85	245.02	75.86	178.48	254.34	113.79	178.48
<b>Thalimarungur</b>	363.71	64.15	1,628.70	315.47	373.53	689.00	473.21	373.53
<b>Orur</b>	359.41	11.17	764.69	193.04	580.55	773.59	289.55	580.55
<b>Pullakadamban</b>	466.44	8.59	512.29	224.05	232.32	456.37	336.08	232.32
<b>Panchayal</b>	433.31	8.61	455.01	252.10	108.31	360.41	378.15	108.31
<b>Vellayapuram</b>	77.18	2.79	246.50	450.11	252.30	702.41	675.16	252.30
<b>Pathangudi</b>	99.32	-	420.29	193.04	580.55	773.59	289.55	580.55
<b>Thehur</b>	448.12	64.43	1,083.60	226.77	473.35	700.11	340.15	473.35
<b>Kattivayal</b>	330.22	33.52	436.25	214.00	316.16	530.16	321.00	316.16
<b>Vattanam</b>	367.07	2.40	290.85	26.73	63.45	90.18	40.10	63.45
<b>Kodipangu</b>	564.37	118.88	950.88	99.99	169.79	265.72	145.92	169.79
<b>Karankadu</b>	82.76	-	2.68	224.05	232.32	456.37	336.08	232.32
<b>S.P.Pattinam</b>	210.02	-	278.59	205.05	335.50	540.55	307.58	335.50
<b>Kulathur</b>	141.82	10.09	597.84	330.25	269.75	600.00	495.38	269.75
<b>Pudupattinam</b>	100.88	28.53	106.16	330.25	269.75	600.00	495.38	269.75
<b>Arumbur</b>	201.03	9.44	640.69	249.60	345.15	594.75	374.40	345.15
<b>Mullimunai</b>	110.34	-	3.57	330.25	269.75	600.00	495.38	269.75

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
Achankudi	-	43.85	55.38	0.77	-	-	-	10.77	37.69	51.54	78.00	22.00
Anjukottai	13.81	86.19	-	-	-	-	46.96	51.38	1.10	0.55	69.00	31.00
Athiyur	4.11	84.93	9.59	1.37	-	17.81	60.27	19.18	1.37	1.37	73.00	27.00
Kaliyanagari	-	100.00	-	-	-	13.79	86.21	-	-	-	66.00	34.00
Palangulam	11.11	88.89	-	-	-	-	40.40	49.49	10.10	-	78.00	22.00
Paganur	-	100.00	-	-	-	24.78	74.93	0.30	-	-	68.00	32.00
Kodanur	1.16	98.26	0.58	-	-	4.07	66.28	29.07	0.58	-	56.00	44.00
Nambuthalai	7.14	92.86	-	-	-	-	100.00	-	-	-	60.00	40.00
Sirugambaiyur	97.42	2.58	-	-	-	30.97	65.16	2.58	1.29	-	59.00	41.00
Kattavilagam	19.11	80.89	-	-	-	11.46	84.71	3.82	-	-	83.00	17.00
Tiruvetriyur	-	100.00	-	-	-	-	100.00	-	-	-	62.00	38.00
Mugithagam	-	47.73	52.27	-	-	2.27	-	11.36	43.18	43.18	76.00	24.00
Nirmalagiyamangalam	4.03	95.97	-	-	-	39.60	55.70	4.36	0.34	-	65.00	35.00
Nagrikathan	41.57	58.43	-	-	-	0.60	56.63	42.77	-	-	67.00	33.00
Kookudi	72.28	20.79	-	-	6.93	0.99	-	-	12.87	86.14	49.00	51.00
Arasathur	14.29	84.62	-	1.10	-	-	1.10	4.40	24.18	70.33	69.00	31.00
Andavorani	67.33	28.71	-	-	3.96	72.28	20.79	-	-	6.93	50.00	50.00
Kunjanikulam	11.73	88.27	-	-	-	0.56	41.34	48.60	9.50	-	74.00	26.00
Karumozhi Sananvayal	0.50	58.71	40.80	-	-	-	7.46	0.50	91.54	0.50	68.00	32.00
T.Nagani	0.50	58.71	40.80	-	-	-	7.46	0.50	91.54	0.50	68.00	32.00
Neyvayal	20.27	74.32	4.73	0.68	-	3.38	1.35	-	-	95.27	25.00	75.00
sirumalaikottai	0.56	41.34	48.60	9.50	-	-	0.56	15.64	47.49	36.31	74.00	26.00
Thuthagudi	-	43.08	56.92	-	-	-	-	16.15	45.38	38.46	76.00	24.00
Kadambur	-	43.08	56.92	-	-	-	-	16.15	45.38	38.46	76.00	24.00
Mangalagudi	2.90	71.01	26.09	-	-	-	0.72	-	75.36	23.91	65.00	35.00
Orikottai	-	92.81	6.59	-	0.60	-	-	33.53	66.47	-	66.00	34.00



Gram Panchayat	Soil Resources: Status of Available Nitrogen (%)					Status of Organic Carbon (%)					Status of Soil Micro Nutrients (%)	
	Very Low	Low	Medium	High	Very High	Very Low	Low	Medium	High	Very High	Sufficient	Deficient
<b>Kallur</b>	4.86	82.00	12.29	-	0.86	2.29	0.29	20.29	70.86	6.29	68.00	32.00
<b>Thiruvadana</b>	4.86	82.00	12.29	-	0.86	2.29	0.29	20.29	70.86	6.29	68.00	32.00
<b>Periakeramangalam</b>	-	100.00	-	-	-	-	17.24	51.72	31.03	-	71.00	29.00
<b>Pandugudi</b>	6.14	92.11	1.75	-	-	-	-	21.05	78.95	-	66.00	34.00
<b>Mavur</b>	0.65	99.35	-	-	-	14.29	85.06	0.65	-	-	67.00	33.00
<b>Thalimarungur</b>	40.11	59.89	-	-	-	25.67	54.01	4.81	14.97	0.53	67.00	33.00
<b>Orur</b>	15.48	56.13	27.10	0.65	0.65	0.65	-	4.52	92.90	1.94	72.00	28.00
<b>Pullakadamban</b>	0.75	96.24	3.01	-	-	18.80	73.68	5.26	1.50	0.75	68.00	32.00
<b>Panchayal</b>	-	100.00	-	-	-	25.32	74.68	-	-	-	56.00	44.00
<b>Vellayapuram</b>	15.48	56.13	27.10	0.65	0.65	0.65	-	4.52	92.90	1.94	72.00	28.00
<b>Pathangudi</b>	15.48	56.13	27.10	0.65	0.65	0.65	-	4.52	93.55	1.29	72.00	28.00
<b>Thealur</b>	1.46	16.06	68.61	13.87	-	-	-	-	5.19	94.81	68.00	32.00
<b>Kattivayal</b>	2.10	97.90	-	-	-	16.78	78.32	4.90	-	-	66.00	34.00
<b>Vattanam</b>	13.21	62.26	24.53	-	-	7.55	12.26	8.49	25.47	46.23	64.00	36.00
<b>Kodipangu</b>	8.33	91.67	-	-	-	-	4.17	45.83	-	50.00	63.00	37.00
<b>Karankadu</b>	8.33	91.67	-	-	-	-	4.17	45.83	-	50.00	63.00	38.00
<b>S.P.Pattinam</b>	-	100.00	-	-	-	12.63	86.32	-	-	1.05	67.00	33.00
<b>Kulathur</b>	-	48.72	51.28	-	-	-	-	-	43.59	56.41	69.00	31.00
<b>Pudupattinam</b>	0.60	99.40	-	-	-	0.60	58.43	36.75	4.22	-	67.00	33.00
<b>Arumbur</b>	4.76	38.10	57.14	-	-	-	-	-	63.81	36.19	54.00	46.00
<b>Mullimunai</b>	0.60	99.40	-	-	-	0.60	58.43	36.75	4.22	-	67.00	33.00

Gram Panchayat	Status of Physical condition of the soil (%)					Soil Texture (%)			
	Moderately Acidic	Slightly Acidic	Neutral	Moderately Alkaline	Clay soil	Fine Soil	Coarse loamy	Soil Water Permeability (Low, Moderate, high)	
Achankudi	58.14	35.66	-	6.20	-	67.00	17.75	Moderate	
Anjukottai	11.60	7.73	19.89	61.00	-	94.00	5.93	Moderate	
Athiyur	5.41	-	-	95.00	-	55.00	23.21	Moderate	
Kaliyanagari	-	-	-	100.00	-	54.00	38.02	Moderate	
Palangulam	44.44	52.53	-	3.03	-	93.00	-	Moderate	
Paganur	65.88	5.93	-	28.00	-	84.00	0.16	Moderate	
Kodanur	30.06	30.64	-	39.00	-	52.00	21.55	Moderate	
Nambuthalai	60.71	17.86	3.57	17.86	-	28.00	37.63	High	
Sirugambaiyur	31.41	39.10	7.05	22.00	-	77.00	0.25	Moderate	
Kattavilagam	42.04	34.39	5.10	18.47	-	80.00	-	Moderate	
Tiruvetriyur	15.94	1.45	-	83.00	-	95.60	1.85	Moderate	
Mugithagam	63.04	26.09	-	10.87	-	95.60	4.00	Moderate	
Nirmalagiyamangalam	60.20	24.75	-	15.00	-	32.00	44.13	High	
Nagrikathan	69.88	23.49	-	7.00	-	78.00	13.18	Moderate	
Kookudi	5.94	6.93	0.99	86.14	2.75	56.00	30.64	Moderate	
Arasathur	4.40	5.49	2.20	87.91	-	51.00	37.83	Moderate	
Andavorani	5.94	6.93	0.99	86.14	-	72.00	20.14	Moderate	
Kunjankulam	68.89	21.67	-	9.00	-	70.00	6.78	Moderate	
Karumozhi Sananvayal	17.91	27.36	-	54.23	0.15	85.00	0.77	Moderate	
T.Nagani	17.91	27.36	-	54.23	-	83.00	-	Moderate	
Neyvayal	-	-	-	100.00	-	70.00	13.45	Moderate	
sirumalaikottai	68.89	21.67	-	9.00	-	82.00	-	Moderate	
Thuthagudi	68.46	26.15	-	5.38	-	86.00	-	Moderate	
Kadambur	68.46	26.15	-	5.38	-	81.00	-	Moderate	
Mangalagudi	12.32	30.43	8.70	49.00	-	48.00	37.75	Moderate	
Orikottai	99.40	0.60	-	-	-	81.00	0.47	Moderate	

Gram Panchayat	Status of Physical condition of the soil (%)				Soil Texture (%)				Soil Water Permeability (Low, Moderate, high)
	Moderately Acidic	Slightly Acidic	Neutral	Moderately Alkaline	Clay soil	Fine Soil	Coarse loamy		
<b>Kallur</b>	38.29	6.29	-	55.00	-	72.00	8.39	Moderate	
<b>Thiruvadanai</b>	38.29	6.29	-	55.00	-	43.25	21.45	Moderate	
<b>Periakceramangalam</b>	96.55	3.45	-	-	-	51.00	28.39	Moderate	
<b>Pandugudi</b>	32.46	-	-	68.00	-	40.00	40.13	Moderate	
<b>Mavur</b>	51.97	47.37	-	0.66	-	78.00	4.40	Moderate	
<b>Thalirmarungur</b>	-	22.58	1.08	76.34	-	37.00	31.57	Moderate	
<b>Orur</b>	15.09	-	-	85.00	-	61.00	14.22	Moderate	
<b>Pullakadamban</b>	72.18	3.76	-	24.00	-	36.00	17.94	Moderate	
<b>Panchayal</b>	34.62	-	-	65.00	-	67.00	0.11	Moderate	
<b>Vellayapuram</b>	15.09	-	-	85.00	-	72.12	2.73	Moderate	
<b>Pathangudi</b>	15.09	-	-	85.00	-	78.06	9.48	Moderate	
<b>Thehur</b>	34.31	13.87	2.19	50.00	-	53.00	25.59	Moderate	
<b>Kattivayal</b>	63.64	-	2.10	34.27	-	28.00	47.30	High	
<b>Vattanam</b>	28.43	0.98	-	71.00	-	37.00	45.16	High	
<b>Kodipangu</b>	-	4.17	-	95.83	-	43.00	32.90	Moderate	
<b>Karankadu</b>	-	4.17	-	95.83	-	27.94	6.62	Moderate	
<b>S.P.Pattinam</b>	55.79	29.47	-	15.00	-	43.00	54.98	High	
<b>Kulathur</b>	-	28.21	7.69	64.10	-	41.00	34.90	Moderate	
<b>Pudupattinam</b>	17.37	16.77	-	65.87	-	68.00	5.57	Moderate	
<b>Arumbur</b>	-	-	-	100.00	-	47.00	16.94	Moderate	
<b>Mullimunai</b>	17.37	16.77	-	65.87	-	70.00	5.23	Moderate	

Gram Panchayat	Soil moisture and ET			Means of Water Ex- traction (%)		Irrigation Methods (%)		Livestock (No.)			
	Volumet- ric Soil Moisture (%)	Estimat- ed Soil Moisture (ha.m)	ET Loss- es (ha.m)	Gravity	Lifting	Wild Flooding	Control Flooding	Cattle Popula- tion	Sheep Popula- tion	Goat Popula- tion	Poultry
Achankudi	0.17	164.41	416.62	24.00	76.00	100.00	-	254	178	400	696
Anjukottai	0.17	205.74	547.33	18.00	82.00	95.00	5.00	464	329	849	954
Athiyur	0.17	135.40	338.46	80.00	20.00	93.00	7.00	518	33	-	841
Kaliyanagari	0.17	43.36	47.86	80.00	20.00	100.00	-	187	52	279	334
Palangulam	0.17	109.70	325.25	3.00	97.00	100.00	-	398	70	149	900
Paganur	0.17	191.97	466.89	20.00	80.00	76.00	24.00	648	-	135	28
Kodanur	0.17	205.97	503.83	95.00	5.00	95.00	5.00	359	72	476	739
Nambuthalai	0.17	38.40	66.21	89.00	11.00	100.00	-	238	27	666	974
Sirugambaiyur	0.17	125.62	318.40	71.00	29.00	88.00	12.00	889	128	257	2,010
Kattavilagam	0.17	163.62	378.14	93.00	7.00	93.00	7.00	267	235	18	572
Tiruvetriyur	0.17	59.44	97.10	53.00	47.00	97.00	3.00	453	112	68	566
Mugithagam	0.17	121.71	281.62	84.00	16.00	96.00	4.00	646	205	610	1,162
Nirmalagiyamangalam	0.17	106.00	265.83	56.00	44.00	99.00	1.00	436	435	390	1,163
Nagrikathan	0.17	72.17	175.38	56.00	44.00	93.00	7.00	206	121	3	112
Kookudi	0.17	172.37	359.97	77.00	23.00	80.00	20.00	426	161	318	1,771
Arasathur	0.17	111.47	214.60	67.00	33.00	71.00	29.00	1,124	351	1,118	669
Andavorani	0.17	110.56	232.82	7.00	93.00	76.00	24.00	283	61	84	1,065
Kunjangkulam	0.17	156.85	346.00	57.00	43.00	67.00	33.00	166	291	310	730
Karumozhi Sananvayal	0.17	93.56	239.51	44.00	56.00	80.00	20.00	488	185	522	1,025
T.Nagani	0.17	187.39	411.11	67.00	33.00	66.00	34.00	561	356	465	1,103
Neyvayal	0.17	184.15	496.70	46.00	54.00	85.00	15.00	467	386	198	1,835
sirumalaikottai	0.17	85.97	200.99	90.00	10.00	100.00	-	166	291	310	730
Thuthagudi	0.17	118.50	286.34	40.00	60.00	88.00	12.00	325	225	304	670
Kadambur	0.17	152.10	395.85	88.00	12.00	77.00	23.00	473	135	296	890
Mangalagudi	0.17	91.55	195.99	8.00	92.00	84.00	16.00	1,045	304	630	1,637

Gram Panchayat	Soil moisture and ET			Means of Water Ex- traction (%)		Irrigation Methods (%)		Livestock (No.)			
	Volumet- ric Soil Moisture (%)	Estimat- ed Soil Moisture (ha.m)	ET Loss- es (ha.m)	Gravity	Lifting	Wild Flooding	Control Flooding	Cattle Popula- tion	Sheep Popula- tion	Goat Popula- tion	Poultry
<b>Orikottai</b>	0.17	69.39	200.53	61.00	39.00	68.00	32.00	162	11	250	295
<b>Kallur</b>	0.17	98.67	203.38	25.00	75.00	81.00	19.00	330	106	508	1,258
<b>Thiruvadnai</b>	0.17	44.85	92.45	40.00	60.00	80.00	20.00	270	87	416	1,029
<b>Periakeramangalam</b>	0.17	153.80	404.62	67.00	33.00	87.00	13.00	59	-	143	237
<b>Pandugudi</b>	0.17	108.92	159.65	80.00	20.00	93.00	7.00	686	216	906	1,684
<b>Mavur</b>	0.17	47.45	127.39	35.00	65.00	95.00	5.00	293	178	637	355
<b>Thalimarungur</b>	0.17	287.78	605.71	96.00	4.00	94.00	6.00	280	75	124	442
<b>Orur</b>	0.17	154.48	235.45	29.00	71.00	100.00	-	294	105	150	280
<b>Pullakadamban</b>	0.17	105.47	190.07	85.00	15.00	100.00	-	105	8	40	45
<b>Panchayal</b>	0.17	97.55	167.98	71.00	29.00	100.00	-	105	8	40	45
<b>Vellayapuram</b>	0.17	43.33	66.13	71.00	29.00	100.00	-	59	21	30	56
<b>Pathangudi</b>	0.17	71.45	103.92	25.00	75.00	100.00	-	118	42	60	112
<b>Thealur</b>	0.17	195.17	441.00	86.00	14.00	100.00	-	61	53	68	160
<b>Kattivayal</b>	0.17	91.31	170.01	60.00	40.00	100.00	-	112	-	77	394
<b>Vattanam</b>	0.17	53.90	94.70	2.00	98.00	100.00	-	150	139	610	173
<b>Kodipangu</b>	0.17	202.41	298.73	65.00	35.00	76.00	24.00	370	123	193	664
<b>Karankadu</b>	0.17	0.46	0.67	-	100.00	100.00	-	174	13	66	74
<b>S.P.Pattinam</b>	0.17	73.64	104.80	55.00	45.00	93.00	7.00	157	26	12	217
<b>Kulathur</b>	0.17	103.35	193.88	38.00	62.00	61.00	39.00	102	27	308	417
<b>Pudupattinam</b>	0.17	23.54	37.35	-	100.00	100.00	-	76	27	285	401
<b>Arumbur</b>	0.17	110.52	249.32	79.00	21.00	67.00	33.00	237	62	23	243
<b>Mullimunai</b>	0.17	0.61	0.90	-	100.00	100.00	-	102	36	380	535

## ANNEXURE 3.11

## GP WISE DEMOGRAPHIC AND SOCIO ECONOMIC STATUS

Gram Panchayat	Geo-graphical Area (ha)	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable population (No.)	Households (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vulnerable Households (SECC) (No.)
Achankudi	1,069	1,029	999	2,028	663	-	663	481	41	29	37
Anjukottai	1,435	1,565	1,551	3,116	656	-	656	763	221	49	169
Athiyur	919	912	860	1,772	396	-	396	439	31	13	26
Kaliyanagari	326	1,584	1,571	3,155	197	-	197	608	82	24	65
Palangulam	872	603	667	1,270	144	2	146	348	25	24	25
Paganur	1,240	722	710	1,432	438	-	438	344	40	17	33
Kodanur	1,410	1,178	1,198	2,376	366	-	366	547	52	35	47
Nambuthalai	454	4,019	4,045	8,064	655	-	655	1,524	253	35	188
Sirugambaiyur	1,179	889	837	1,726	124	-	124	398	13	14	13
Kattavilagam	1,289	897	784	1,681	317	-	317	391	53	10	40
Tiruvetriyur	408	311	281	592	121	-	121	179	89	6	64
Mugithagam	1,228	957	897	1,854	271	-	271	436	9	21	13
Nirmalagiyamangalam	819	556	551	1,107	164	-	164	369	99	22	76
Nagrikathan	623	1,066	1,083	2,149	88	-	88	488	88	49	76
Kookudi	1,822	1,090	1,085	2,175	471	-	471	818	85	56	76
Arasathur	915	681	625	1,306	139	-	139	297	8	3	7
Andavorani	969	176	182	358	5	-	5	582	65	66	65
Kunjankulam	1,107	1,402	1,310	2,712	470	-	470	771	86	29	69
Karumozhi Sananvayal	646	379	355	734	149	-	149	175	15	17	16
T.Nagani	1,301	1,371	1,357	2,728	746	-	746	662	88	37	73
Neyvayal	1,347	1,221	1,268	2,489	651	-	651	588	325	46	241
sirumalaikottai	587	1,402	1,310	2,712	470	-	470	771	86	29	69

Gram Panchayat	Geo-graphical Area (ha)	Male Population (No.)	Female Population (No.)	Total Population (No.)	SC Population (No.)	ST Population (No.)	Vulnerable population (No.)	House-holds (HH's) (No.)	Only one room HH's (SECC) (No.)	Female Headed HH's (SECC) (No.)	Vulnerable House-holds (SECC) (No.)
Thuthagudi	797	156	172	328	46	-	46	61	1	-	1
Kadambur	1,041	1,018	1,072	2,090	389	-	389	519	6	26	12
Mangalagudi	666	2,049	1,981	4,030	456	-	456	908	23	43	29
Orikottai	425	672	674	1,346	302	-	302	369	99	22	76
Kallur	931	4,916	4,786	9,702	1,907	15	1,922	1,971	163	74	136
Thiruvadanai	290	4,916	4,786	9,702	1,907	15	1,922	1,971	163	74	136
Periakeramangalam	1,284	880	780	1,660	438	-	438	369	5	2	4
Pandugudi	757	865	861	1,726	236	-	236	305	29	23	27
Mavur	350	314	353	667	134	-	134	163	6	11	8
Thalimarungur	1,478	727	791	1,518	109	-	109	445	35	34	35
Orur	1,705	2,472	2,595	5,065	320	-	320	1,766	218	65	172
Pullakadamban	1,367	950	884	1,834	90	-	90	430	98	11	72
Panchayal	916	1,190	1,089	2,279	523	-	523	457	62	17	49
Vellayapuram	331	2,472	2,595	5,065	320	-	320	1,126	166	46	130
Pathangudi	445	2,472	2,595	5,065	320	-	320	1,126	166	46	130
Thealur	1,643	771	826	1,597	55	-	55	456	111	16	83
Kattivayal	743	1,636	1,501	3,137	486	-	486	203	6	8	7
Vattanam	714	101	145	246	-	-	-	670	183	39	140
Kodipangu	1,526	652	693	1,345	133	-	133	223	34	12	27
Karankadu	136	2,256	2,263	4,519	1,992	-	1,992	1,527	253	35	188
S.P.Pattinam	563	950	884	1,834	93	-	93	1,115	147	40	115
Kulathur	666	1,032	1,001	2,033	363	1	364	796	162	24	121
Pudupattinam	431	2,256	2,263	4,519	1,992	-	1,992	394	280	24	203
Arumbur	1,152	889	860	1,749	268	-	268	318	69	15	53
Mullimunai	154	2,256	2,263	4,519	1,992	-	1,992	1,527	253	35	188



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)
Achankudi	7.78	640	466	115	350	636	4
Anjukottai	22.20	960	727	196	-	-	6
Athiyur	5.83	683	551	38	507	971	3
Kaliyanagari	10.63	1,017	369	69	200	970	6
Palangulam	7.10	574	371	34	-	468	2
Paganur	9.62	672	472	77	186	150	3
Kodanur	8.57	919	628	88	216	551	4
Nambuthalai	12.31	689	495	162	1,289	110	15
Sirugambaiyur	3.34	594	492	58	150	175	3
Kattavilagam	10.26	525	389	44	126	406	3
Tiruvetriyur	35.81	390	297	90	530	1,463	1
Mugithagam	3.00	776	622	182	400	575	3
Nirmalagiyamangalam	21.00	593	378	47	250	260	2
Nagrikathan	16.00	445	296	46	235	300	4
Kookudi	9.00	798	587	309	533	675	4
Arasathur	2.00	656	518	146	282	400	2
Andavorani	11.00	784	545	82	86	100	1
Kunjankulam	9.00	715	562	326	450	210	5
Karumozhi Sananvayal	9.00	555	396	266	191	292	1
T.Nagani	11.00	898	501	343	394	258	5
Neyvayal	41.00	933	516	736	543	900	5
sirumalaikottai	9.00	413	263	218	237	75	5
Thuthagudi	1.00	442	246	209	66	744	1
Kadambur	2.00	783	467	278	518	109	4
Mangalagudi	3.00	522	344	139	500	211	7
Orikottai	21.00	390	265	180	247	207	2

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)
<b>Kallur</b>	7.00	1,189	798	63	700	350	18
<b>Thiruvadanai</b>	7.00	733	596	498	724	491	18
<b>Periakeramangalam</b>	1.00	967	776	197	370	415	3
<b>Pandugudi</b>	9.00	737	468	133	260	900	3
<b>Mavur</b>	4.60	526	297	27	137	1,880	1
<b>Thalimarungur</b>	8.00	673	550	50	300	230	3
<b>Orur</b>	10.00	1,263	819	115	280	1,029	9
<b>Pullakadamban</b>	17.00	883	554	54	300	537	3
<b>Panchayal</b>	11.00	896	531	63	210	391	4
<b>Vellayapuram</b>	12.00	455	270	61	500	368	9
<b>Pathangudi</b>	12.00	284	235	29	48	200	9
<b>Thealur</b>	18.00	1,076	737	108	300	310	3
<b>Kattivayal</b>	3.00	580	444	74	80	550	6
<b>Vattanam</b>	21.00	545	384	71	500	213	0
<b>Kodipangu</b>	12.00	636	520	58	300	392	2
<b>Karankadu</b>	12.00	351	216	15	530	-	3
<b>S.P.Pattinam</b>	10.00	202	139	56	450	179	4
<b>Kulathur</b>	15.00	836	578	77	630	150	8
<b>Pudupattinam</b>	52.00	423	170	28	530	-	8
<b>Arumbur</b>	17.00	742	504	111	201	372	3
<b>Mullimunai</b>	12.00	495	378	21	619	619	8

## ANNEXURE 4

### IPCC VULNERABILITY ASSESSMENT METHODOLOGY

#### Normalization of Indicators:

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

- for indicators with positive relationship with vulnerability

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

- for indicators with negative relationship with vulnerability

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

#### Aggregation and categorization of Indicators

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

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

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

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

## ANNEXURE 5.1

## GP WISE WASCA PROPOSED TREATMENT AREA

Gram Panchayat	Forest Land	Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Crops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
Achankudi	-	1.74	26.37	-	17.08	1.68	6.94	3.94	49.68	12.56
Anjukottai	-	0.78	-	-	17.12	0.85	30.29	5.06	169.81	56.43
Athiyur	-	2.08	44.97	-	-	5.19	6.36	3.44	43.49	27.83
Kaliyanagari	-	1.10	48.54	-	22.27	17.09	7.19	2.29	1.14	6.07
Palangulam	-	12.51	-	-	-	0.99	-	1.47	35.04	8.58
Paganur	-	-	100.23	-	78.31	-	6.76	4.93	66.85	13.38
Kodanur	-	3.37	-	-	31.26	8.69	19.44	1.82	60.67	22.89
Nambuthalai	7.62	40.23	61.88	-	-	-	3.12	0.03	3.13	9.81
Sirugambaiyur	-	49.06	-	-	-	102.76	0.77	0.69	55.80	45.00
Kattavilagam	-	16.83	-	-	-	-	20.91	2.90	42.86	29.58
Tiruvetriyur	-	0.99	3.23	-	15.56	8.69	37.09	16.50	16.12	43.94
Mugithagam	-	13.41	-	-	-	-	3.21	2.09	9.69	6.49
Nirmalagiyamangalam	-	2.48	-	-	-	1.33	20.68	2.99	76.57	30.38
Nagrikathan	-	1.30	-	-	-	0.43	13.09	0.99	41.07	12.68
Kookudi	-	3.64	38.26	-	-	-	21.72	3.42	48.46	13.60
Arasathur	-	0.98	94.02	8.48	-	0.17	0.95	1.73	3.82	4.21
Andavorani	-	2.66	15.97	-	-	-	15.32	5.09	32.99	16.07
Kunjankulam	-	2.48	33.58	25.84	0.60	54.13	7.97	6.13	44.25	12.61
Karumozhi Sananvayal	-	1.99	15.55	-	1.06	4.63	4.56	2.89	39.12	11.22
T.Nagani	-	2.81	42.91	25.84	0.72	56.91	10.20	7.55	53.34	14.73
Neyvayal	-	2.42	-	-	-	-	46.55	7.45	347.01	43.12
sirumalaikottai	-	1.17	26.34	28.71	0.17	24.28	2.88	2.62	21.97	9.63
Thuthagudi	-	1.42	78.70	-	-	-	0.12	0.44	2.41	3.07

Gram Panchayat	Forest Land	Non-Agricultural Uses	Barren & Uncultivable Land	Permanent Pastures and Other Grazing Land	Land Under Miscellaneous Tree Crops etc.	Cultivable Waste Land	Fallows Land other than Current Fallows	Current Fallow land	Unirrigated Land	Treatment Area Irrigated by Source
Kadambur	-	2.94	37.77	31.58	-	-	0.69	1.15	10.50	3.92
Mangalagudi	-	1.89	78.96	-	-	-	1.32	0.78	7.33	3.94
Orikottai	-	0.94	-	-	-	-	0.21	0.51	10.43	1.09
Kallur	-	1.46	43.55	9.82	-	1.47	7.29	2.36	16.59	9.87
Thiruvadana	-	0.66	19.79	4.46	-	0.67	3.31	1.07	7.54	4.49
Periakeramangalam	-	1.50	15.84	3.57	-	1.42	5.14	2.50	37.22	16.74
Pandugudi	-	2.48	52.70	-	1.58	0.15	20.33	4.22	14.23	13.12
Mavur	-	1.91	15.49	-	0.85	12.62	0.04	0.06	8.27	3.88
Thalimarungur	-	6.19	-	-	52.86	1.67	35.37	7.07	47.89	39.97
Orur	-	-0.08	112.92	-	-	9.50	29.73	1.64	21.48	23.62
Pullakadamban	-	53.58	84.61	-	-	7.30	5.59	9.23	13.22	23.19
Panchayal	-	44.05	93.69	4.77	-	2.55	4.64	10.63	13.46	21.33
Vellayapuram	-	1.17	4.77	-	-	2.37	13.89	0.49	7.90	7.30
Pathangudi	-	1.69	-	-	-	-	25.80	0.75	14.50	9.39
Thealur	-	30.80	-	-	36.68	18.08	34.05	16.70	76.48	67.82
Kattivayal	-	28.77	57.24	-	-	28.49	17.85	2.05	11.71	46.91
Vattanam	-	93.45	20.21	-	-	2.04	3.98	19.01	11.39	26.70
Kodipangu	-	26.94	102.76	-	41.03	60.01	39.30	11.92	23.20	39.68
Karankadu	-	54.13	-	-	-	-	-	0.29	0.27	-
S.P.Pattinam	-	0.94	131.38	-	-	-	6.89	1.86	21.25	20.91
Kulathur	-	2.41	-	-	0.46	8.11	29.26	4.78	27.11	28.52
Pudupattinam	-	17.53	3.23	-	15.56	8.69	15.95	10.50	10.12	16.50
Arumbur	-	6.19	-	-	-	8.02	16.10	11.62	36.84	44.36
Mullimunai	-	72.18	-	-	-	-	-	0.22	0.21	-

Land Resources - WASCA Treatment Proposed Area	logic
<b>Treatment Area under Forest Land</b>	40% of the total Area (area after removal of potential voids)
<b>Treatment Area under Non-Agricultural Uses</b>	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)
<b>Treatment Area under Barren &amp; Un-cultivable Land</b>	75% of the total Area (area after removal of potential voids)
<b>Treatment Area under Permanent Pastures and Other Grazing Land</b>	75% of the total Area (potential area for treatment after removal of voids)
<b>Treatment Area under Land Under Miscellaneous Tree Crops etc.</b>	75% of the total Area (non- voids area)
<b>Treatment Area under Cultivable Waste Land</b>	75% of the total Area (non- voids area)
<b>Treatment Area under Fallows Land other than Current Fallows</b>	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
<b>Treatment Area under Current Fallow land</b>	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
<b>Treatment Area under Unirrigated Land</b>	Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF
<b>Treatment Area Irrigated by Source</b>	Bore Well Farmer Factor arrived as per Vulnerability Assessment in Table 1 and out of which 50% is for horticulture or AF

## ANNEXURE 5.2

## GP WISE EXPECTED RUNOFF CONSERVATION AFTER WASCA TREATMENT

Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
Achankudi	25.86	3.28	8.52
Anjukottai	24.11	3.14	30.50
Athiyur	16.52	0.91	9.46
Kalivanagari	20.54	6.88	1.94
Palangulam	32.80	0.17	5.26
Paganur	48.17	13.69	10.72
Kodanur	15.59	6.99	12.22
Nambuthalai	46.45	-	1.87
Sirugambaiyur	16.24	14.59	-
Kattavilagam	35.18	-	11.22
Tiruvetriyur	13.69	4.24	13.25
Mugithagam	45.60	-	2.50
Nirmalagiyamangalam	1.71	0.23	15.23
Nagrikathan	4.48	0.07	7.91
Kookudi	30.46	-	10.17
Arasathur	27.15	1.51	1.25
Andavorani	35.80	-	8.10
Kunjankulam	31.03	14.09	8.27
Karumozhi Sananvayal	7.10	1.00	6.74
T.Nagani	36.50	14.60	10.01
Neyvayal	17.41	-	51.78
sirumalaikottai	20.03	9.30	4.32
Thuthagudi	24.59	-	0.70
Kadambur	21.61	5.52	1.90
Mangalagudi	36.87	-	1.56
Orikottai	7.19	-	1.43
Kallur	14.23	1.97	4.21
Thiruvadanai	8.56	0.90	1.91
Periakeeramangalam	45.46	0.87	7.18
Pandugudi	27.26	0.30	6.05
Mavur	15.91	2.36	1.43
Thalirmarungur	75.71	9.54	15.19
Orur	68.23	1.66	8.92
Pullakadamban	53.85	1.28	5.97
Panchayal	50.64	1.28	5.84
Vellayapuram	16.71	0.42	3.45
Pathangudi	10.40	-	5.88
Thehur	58.49	9.58	22.74
Kattivayal	68.25	4.98	9.15
Vattanam	58.97	0.36	7.12



Key CWRM Parameter	Good Catchment Area	Average Catchment Area	Bad Catchment Area
<b>Kodipangu</b>	46.64	18.63	48.92
<b>Karankadu</b>	13.33	-	0.07
<b>S.P.Pattinam</b>	35.26	-	5.94
<b>Kulathur</b>	28.15	1.50	10.45
<b>Pudupattinam</b>	14.56	4.24	6.19
<b>Arumbur</b>	26.35	1.40	12.70
<b>Mullimunai</b>	17.64	-	0.05

## ANNEXURE 5.3

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

Gram Panchayat	Aff		ARS		AVP		Az		BP		CBP		CS	
	No.	Area	No.	No.	No.	Length	No.	Area	Plants	Area	No.	Length	No.	No.
Achankudi	22,484	28	-	-	-	-	6	19	3,752	798	3,193	6	6	
Andavorani	14,907	19	58	1,034	4,137	7	-	-	-	1,514	6,056	7	7	
Anjukottai	620	1	6	-	-	8	18	14,375	-	-	-	-	8	
Arasathur	75,996	95	84	-	-	28	9	136	-	-	-	-	28	
Arumbur	4,952	6	104	1,053	4,211	6	8	6,416	1,555	6,220	6	6		
Athiyur	37,635	47	-	-	-	13	5	4,155	873	3,491	13	13		
Kadambur	32,568	41	78	2,168	8,672	12	32	25,267	1,032	4,129	12	12		
Kaliyanagari	39,711	50	-	-	-	5	39	7,871	-	-	-	5		
Kallur	36,008	45	56	1,293	5,170	8	11	9,032	381	1,523	8	8		
Karankadu	43,305	54	-	438	1,752	2	-	-	-	-	-	2		
Karumozhi sananvayal	14,033	18	41	763	3,052	12	6	4,556	-	-	-	12		
Kattavilagam	13,467	17	9	-	-	7	-	-	-	-	-	7		
Kattivayal	68,807	86	75	1,418	5,672	3	28	22,791	178	710	3	3		
Kodanur	2,696	3	5	-	-	9	40	7,990	833	3,331	9	9		
Kodipangu	103,759	130	-	1,609	6,437	9	101	80,835	910	3,639	9	9		
Kookudi	33,520	42	60	-	-	11	-	-	-	-	-	11		
Kulathur	-1,047	-1	12	662	2,646	4	9	6,857	877	3,506	4	4		
Kunjankulam	28,842	36	56	2,072	8,288	4	81	43,778	306	1,225	4	4		
Mangalagudi	64,681	81	53	645	2,579	26	-	-	432	1,727	26	26		
Mavur	13,919	17	1	-	-	7	13	2,695	355	1,418	7	7		
Mugilthagam	10,726	13	8	1,431	5,723	-	-	-	-	-	-	-		
Mullimunai	57,740	72	-	211	844	3	-	-	638	2,553	3	3		
Nagrikathan	1,042	1	32	2,704	10,815	5	0	340	-	-	5	5		
Nambuthalai	81,687	110	-	-	-	19	-	-	106	425	19	19		
Neyvayal	1,936	2	42	1,871	7,484	12	0	-	-	-	12	12		

Gram Panchayat	Aff		ARS		AVP		Az		BP		CBP		CS	
	No.	Area	No.	Area	No.	Length	No.	Length	Plants	Area	No.	Length	No.	No.
Nirmalagiyamangalam	1,985	2	-	2	-	-	11	-	1,068	1	-	-	-	11
Orikottai	754	1	15	1	619	2,477	4	2,477	-	-	175	701	-	4
Orur	90,268	113	259	113	3,037	12,148	7	12,148	7,597	10	223	890	-	7
Paganur	80,186	100	12	100	-	-	-	-	15,662	78	-	-	-	-
Palangulam	10,004	13	-	13	-	-	-	-	197	1	966	3,865	-	-
Panachayal	110,193	138	115	138	920	3,678	3	3,678	5,856	7	328	1,311	-	3
Pandugudi	44,143	55	251	55	905	3,619	17	3,619	1,386	2	104	416	-	17
Pathanagudi	1,352	2	33	2	953	3,813	3	3,813	-	-	-	-	-	3
Periakeramangalam	13,865	17	96	17	2,244	8,977	1	8,977	3,992	5	-	-	-	1
Pudupattinam	16,605	21	8	21	938	3,753	3	3,753	19,400	24	-	-	-	3
Pullakadamban	110,554	138	97	138	1,369	5,477	3	5,477	5,838	7	-	-	-	3
S.P.Pattinam	105,856	132	-	132	873	3,492	4	3,492	-	-	768	3,072	-	4
Sirugambaiyur	39,252	49	14	49	-	-	22	-	20,551	103	1,195	4,779	-	22
Sirumalaikottai	22,012	28	10	28	878	3,512	4	3,512	19,564	53	434	1,735	-	4
T.Nagani	36,575	46	65	46	1,123	4,493	14	4,493	46,104	83	1,058	4,231	-	14
Thalimarungur	4,952	6	81	6	1,617	6,467	7	6,467	43,624	55	726	2,904	-	7
Thealur	24,637	31	11	31	2,166	8,662	2	8,662	43,809	55	385	1,539	-	2
Thiruvadanai	16,367	20	26	20	-	-	7	-	4,106	5	-	-	-	7
Thuthagudi	64,089	80	123	80	618	2,472	8	2,472	-	-	707	2,827	-	8
Tiruvetriyur	3,373	4	2	4	-	-	11	-	4,850	24	225	899	-	11
Vattanam	90,931	114	-	114	1,029	4,116	-	4,116	1,632	2	-	-	-	-
Vellayapuram	4,752	6	38	6	1,001	4,005	-	4,005	1,899	2	-	-	-	-

Gram Panchayat	CT		Co		FP		CCBF		DLT			DLHAI		FBBTI		FD
	No.	No.	No.	Area	No.	Area	No.	Area	Plants	Length	No.	Area	No.	Area	No.	No.
Achankudi	6	24	24	73	24	5,621	28		-	-	15	37	29	73	6	
Andavorani	7	21	21	69	21	3,727	19		-	-	14	35	28	69	7	
Anjukottai	8	82	82	262	82	155	1		258	1,032	52	131	105	262	8	
Arasathur	28	3	3	11	3	18,999	95		-	-	2	5	4	11	28	
Arumbur	6	25	26	100	26	1,238	6		-	-	22	54	44	109	6	
Athiyur	13	21	21	81	21	9,409	47		-	-	16	41	32	81	13	
Kadambur	12	5	5	16	5	8,142	41		859	3,436	3	8	7	16	12	
Kaliyanagari	5	4	4	17	4	9,928	50		477	1,908	3	8	7	17	5	
Kallur	8	10	10	36	10	9,002	45		653	2,610	7	18	14	36	8	
Karankadu	2	-	-	1	-	10,826	54		-	-	-	-	-	1	2	
Karumozhi sananvayal	12	19	19	58	19	3,508	18		418	1,672	12	29	23	58	12	
Kattavilagam	7	27	27	96	27	3,367	17		2,062	8,248	19	48	38	96	7	
Kattivayal	3	13	13	79	13	17,202	86		260	1,038	16	39	31	79	3	
Kodanur	9	33	33	105	33	674	3		-	-	21	52	42	105	9	
Kodipangu	9	30	30	114	30	25,940	130		1,461	5,842	23	57	46	114	9	
Kookudi	11	29	29	87	29	8,380	42		-	-	17	44	35	87	11	
Kulathur	4	24	24	90	24	-262	-1		-	-	18	45	36	90	4	
Kunjankulam	4	23	23	71	23	7,211	36		572	2,287	14	35	28	71	4	
Mangalagudi	26	4	4	13	4	16,170	81		696	2,782	3	7	5	13	26	
Mavur	7	3	3	12	3	3,480	17		2,032	8,128	2	6	5	12	7	
Mugilthagam	-	6	6	21	6	2,681	13		-	-	4	11	9	21	-	
Mullimunai	3	8	8	19	-	14,435	72		401	1,605	-	-	-	0	3	
Nagrikathan	5	22	22	68	22	260	1		811	3,243	14	34	27	68	5	
Nambuthalai	19	3	3	16	3	20,422	110		-	-	3	8	6	16	19	
Neyvayal	12	160	160	444	160	484	2		-	-	89	222	178	444	12	
Nirmalagiyamangalam	11	40	40	131	40	496	2		-	-	26	65	52	131	11	
Orikottai	4	4	4	12	4	188	1		121	483	2	6	5	12	4	
Orur	7	21	21	76	21	22,567	113		-	-	15	38	31	76	7	

Gram Panchayat	CT		Co		FP		CCBF		DLT		DLHAI		FBBTI		FD	
	No.	No.	Area	No.	No.	Area	No.	Area	Plants	Length	No.	Area	No.	Area	No.	No.
Paganur	-	31	92	31	20,046	100	2,642	10,569	18	46	37	92	-	-	-	-
Palangulam	-	15	45	15	2,501	13	1,981	7,922	9	23	18	45	-	-	-	-
Panachayal	3	11	50	11	27,548	138	-	-	10	25	20	50	3	3	3	3
Pandugudi	17	16	52	16	11,036	55	732	2,928	10	26	21	52	17	17	17	17
Pathanagudi	3	16	50	16	338	2	535	2,140	10	25	20	50	3	3	3	3
Periakeramangalam	1	18	62	18	3,466	17	650	2,600	12	31	25	62	1	1	1	1
Pudupattinam	3	15	53	15	4,151	21	983	3,932	11	27	21	53	3	3	3	3
Pullakadamban	3	11	51	11	27,639	138	1,256	5,024	10	26	20	51	3	3	3	3
S.P.Pattinam	4	12	51	12	26,464	132	2,671	10,685	10	25	20	51	4	4	4	4
Sirugambaiyur	22	23	102	23	9,813	49	2,032	8,128	20	51	41	102	22	22	22	22
Sirumalaikottai	4	11	37	11	5,503	28	237	947	7	19	15	37	4	4	4	4
T.Nagani	14	28	86	28	9,144	46	-	-	17	43	34	86	14	14	14	14
Thalimarungur	7	36	130	36	1,238	6	-	-	26	65	52	130	7	7	7	7
Thealur	2	48	195	51	6,159	31	668	2,673	39	98	78	195	2	2	2	2
Thiruvadanai	7	5	27	5	4,092	20	-	-	3	8	7	16	7	7	7	7
Thuthagudi	8	6	16	1	16,022	80	824	3,295	1	3	2	6	8	8	8	8
Tiruvetriyur	11	28	114	28	843	4	-	-	23	57	45	114	11	11	11	11
Vattanam	-	14	61	14	22,733	114	1,566	6,262	12	31	24	61	-	-	-	-
Vellayapuram	-	-	-	9	1,188	6	-	-	6	15	12	30	-	-	-	-

Gram Panchayat	GSS		ICP		LDI		LP		MI		NADEP		ND		PS	
	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.	Area	No.	Plants	HHs	No.	No.
Achankudi	44	341	1,364	12	30	1,013	4,050	5	13	6	13	6	2,430	486	17	17
Andavorani	10	221	883	11	27	600	2,400	6	16	7	16	7	430	86	27	27
Anjukottai	8	-	-	41	103	675	2,700	23	56	8	56	8	3,825	765	-	-
Arasathur	121	-	-	1	3	1,013	4,050	2	4	28	4	28	1,465	293	17	17
Arumbur	4	446	1,782	13	32	938	3,750	18	44	6	44	6	1,925	385	6	6
Athiyur	1	694	2,774	11	27	-	-	11	28	13	28	13	2,130	426	21	21
Kadambur	33	364	1,457	2	6	825	3,300	2	4	12	4	12	2,675	535	22	22
Kaliyanagari	29	225	900	2	5	600	2,400	2	6	5	6	5	3,225	645	8	8
Kallur	53	-	-	5	13	788	3,150	4	10	8	10	8	12,130	2,426	31	31
Karankadu	29	-	-	-	0	367	1,467	-	-	2	-	2	4,745	949	10	10
Karumozhi sananvayal	57	-	-	9	23	750	3,000	4	11	12	11	12	960	192	26	26
Kattavilagam	8	248	993	13	33	863	3,450	12	30	7	30	7	1,980	396	14	14
Kattivayal	8	-	-	6	16	863	3,450	19	47	3	47	3	3,630	726	10	10
Kodanur	49	422	1,689	16	41	1,350	5,400	9	23	9	23	9	2,895	579	18	18
Kodipangu	22	1,345	5,381	15	37	1,538	6,150	16	40	9	40	9	1,580	316	17	17
Kookudi	36	-	-	15	37	1,425	5,700	5	14	11	14	11	2,715	543	44	44
Kulathur	2	140	559	12	31	450	1,800	11	29	4	29	4	2,370	474	5	5
Kunjankulam	38	-	-	12	29	788	3,150	5	13	4	13	4	3,375	675	18	18
Mangalagudi	71	176	702	2	5	450	1,800	2	4	26	4	26	4,485	897	41	41
Mavur	68	572	2,288	2	4	563	2,250	2	4	7	4	7	785	157	9	9
Mugilthagam	61	-	-	3	7	1,688	6,750	3	6	-	6	-	2,210	442	-	-
Mullimunai	39	-	-	-	0	994	3,977	-	-	3	-	3	4,745	949	13	13
Nagrikathan	3	-	-	11	28	840	3,360	5	13	5	13	5	2,565	513	3	3
Nambuthalai	-	472	1,886	1	3	595	2,380	4	10	19	10	19	7,985	1,597	-	-
Neyvayal	29	-	-	80	201	1,050	4,200	17	43	12	43	12	3,195	639	46	46
Nirmalagiyamangalam	50	-	-	20	50	700	2,800	12	30	11	30	11	1,535	307	29	29
Orikottai	25	-	-	2	6	175	700	-	1	4	1	4	1,830	366	7	7
Orur	18	-	-	11	26	1,610	6,440	9	24	7	24	7	5,855	1,171	7	7

Gram Panchayat	GSS		ICP		LDI		LP		MI		NADEP		ND		PS	
	No.	Plants	Length	No.	Area	Plants	Length	No.	Area	No.	Area	No.	Plants	HHs	No.	No.
Paganur	14	660	2,640	16	39	770	3,080	5	13	-	13	-	1,820	364	-	-
Palangulam	15	157	627	7	18	1,085	4,340	3	9	-	9	-	1,795	359	-	-
Panachayal	4	-	-	6	14	1,225	4,900	9	21	3	21	3	2,610	522	1	1
Pandugudi	96	266	1,065	8	19	1,575	6,300	5	13	17	13	17	2,275	455	42	42
Pathanagudi	7	-	-	8	21	385	1,540	4	9	3	9	3	5,855	1,171	3	3
Periakeramangalam	14	-	-	9	22	1,120	4,480	7	17	1	17	1	1,940	388	6	6
Pudupattinam	31	119	475	7	18	300	1,200	7	17	3	17	3	4,745	949	10	10
Pullakadamban	4	-	-	6	14	1,293	5,171	9	23	3	23	3	2,105	421	1	1
S.P.Pattinam	7	-	-	6	15	673	2,690	8	21	4	21	4	2,105	421	2	2
Sirugambaiyur	29	591	2,363	11	29	840	3,360	18	45	22	45	22	1,940	388	50	50
Sirumalaikottai	38	-	-	5	14	560	2,240	4	10	4	10	4	3,375	675	18	18
T.Nagani	55	142	569	14	36	945	3,780	6	15	14	15	14	3,490	698	28	28
Thalimarungur	14	234	937	18	45	1,225	4,900	16	40	7	40	7	2,045	409	11	11
Thealur	8	639	2,556	25	64	1,255	5,020	27	68	2	68	2	1,925	385	4	4
Thiruvadanai	44	-	-	2	6	350	1,400	2	4	7	4	7	12,130	2,426	26	26
Thuthagudi	36	556	2,225	1	1	630	2,520	1	3	8	3	8	380	76	17	17
Tiruvetriyur	10	933	3,731	14	35	338	1,350	18	44	11	44	11	655	131	14	14
Vattanam	61	734	2,934	7	17	1,085	4,340	11	27	-	27	-	315	63	-	-
Vellayapuram	-	-	-	4	11	210	840	3	7	-	7	-	5,855	1,171	-	-



Gram Panchayat	RPWDT		Roo		RP		RRWH		SPD		SPC		SPI		WCICD	
	No.	No.	No.	No.	No.	No.	No.	No.	No.	Area	No.	No.	No.	No.	Length	
Achankudi	8	19	-	2	-	-	2	-	-	-	5	49	1,364			
Andavorani	3	13	-	2	-	-	2	-	-	-	1	9	883			
Anjukottai	4	14	-	2	-	-	2	-	-	-	8	77	-			
Arasathur	6	21	-	2	-	-	2	6,784	8	3	29	29	-			
Arumbur	7	18	-	2	-	-	2	-	-	4	39	39	1,782			
Athiyur	11	16	-	2	-	-	2	-	-	4	43	43	2,774			
Kadambur	6	16	-	2	-	-	2	25,264	32	5	54	54	1,457			
Kaliyanagari	2	14	-	2	-	-	2	-	-	6	65	65	900			
Kallur	10	11	-	2	-	-	2	7,856	10	24	243	243	-			
Karankadu	-	7	-	2	-	-	2	-	-	9	95	95	-			
Karumozhi sananvayal	6	14	-	2	-	-	2	-	-	2	19	19	-			
Kattavilagam	3	20	-	2	-	-	2	-	-	4	40	40	993			
Kattivayal	6	17	-	2	-	-	2	-	-	7	73	73	-			
Kodanur	12	24	-	2	-	-	2	-	-	6	58	58	1,689			
Kodipangu	12	29	-	2	-	-	2	-	-	3	32	32	5,381			
Kookudi	9	29	-	2	-	-	2	-	-	5	54	54	-			
Kulathur	2	6	-	2	-	-	2	-	-	5	47	47	559			
Kunjankulam	7	14	-	2	-	-	2	20,672	26	7	68	68	-			
Mangalagudi	2	10	-	2	-	-	2	-	-	9	90	90	702			
Mavur	6	9	-	2	-	-	2	-	-	2	16	16	2,288			
Mugilthagam	5	40	-	2	-	-	2	-	-	4	44	44	-			
Mullimunai	-	4	-	2	-	-	2	-	-	9	95	95	-			
Nagrikathan	2	22	-	2	-	-	2	-	-	5	51	51	-			
Nambuthalai	2	15	-	2	-	-	2	-	-	16	160	160	1,886			
Neyvayal	10	20	-	2	-	-	2	-	-	6	64	64	-			
Nirmalagiyamangalam	-	15	-	2	-	-	2	-	-	3	31	31	-			
Orikottai	1	4	5	2	5	4	2	-	-	4	37	37	-			
Orur	8	38	-	2	-	-	2	-	-	12	117	117	-			

Gram Panchayat	RPWDT		Roo		RP		RRWH		SPD		SPC		SPI		WCICD	
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Length	
Paganur	7	15	-	2	-	-	-	-	-	-	4	36	4	36	2,640	
Palangulam	8	23	-	2	-	-	-	-	-	-	4	36	4	36	627	
Panachayal	10	25	-	-	-	-	-	-	3,816	5	5	52	5	52	-	
Pandugudi	8	37	-	2	-	-	-	-	-	-	5	46	5	46	1,065	
Pathanagudi	1	10	-	2	-	-	-	-	-	-	12	117	12	117	-	
Periakeramangalam	8	24	-	2	-	-	-	-	2,856	4	4	39	4	39	-	
Pudupattinam	-	3	-	2	-	-	-	-	-	-	9	95	9	95	475	
Pullakadamban	10	30	-	2	-	-	-	-	-	-	4	42	4	42	-	
S.P.Pattinam	2	10	-	2	-	-	-	-	-	-	4	42	4	42	-	
Sirugambaiyur	3	21	-	2	-	-	-	-	-	-	4	39	4	39	2,363	
Sirumalaikottai	1	15	15	2	-	-	-	-	22,968	29	7	68	7	68	-	
T.Nagani	7	20	-	2	-	-	-	-	20,672	26	7	70	7	70	569	
Thalimarungur	12	23	-	2	-	-	-	-	-	-	4	41	4	41	937	
Thehur	12	31	-	2	-	-	-	-	-	-	4	39	4	39	2,556	
Thiruvadanai	1	9	-	2	-	-	-	-	3,568	4	24	243	24	243	-	
Thuthagudi	3	15	-	2	-	-	-	-	-	-	1	8	1	8	2,225	
Tiruvetriyur	4	5	-	2	-	-	-	-	-	-	1	13	1	13	3,731	
Vattanam	-	31	-	2	-	-	-	-	-	-	1	6	1	6	2,934	
Vellayapuram	1	5	-	2	-	-	-	-	-	-	12	117	12	117	-	

## ANNEXURE 7.1

## GP WISE WASCA RECOMMENDATION AND WORKS UPLOADED

GP	WASCA Recommendation for 3 Years	WASCA Uploaded for FY-2021-22 as on 26-02-2021 FY-2021-22 as on 02/02/2022
Achangudi	1,872	-
Andavoorani	891	195
Anjukottai	2,433	-
Arasathur	1,381	-
Arumboor	2,214	164
Athiyur	1,324	131
Kadambur	1,751	-
Kaliyanagari	1,424	-
Kallur	3,477	-
Karangadu	1,087	7
Karumoli	1,006	-
Kattavilagam	1,200	-
Kattivayal	1,838	8
Kodannor	2,372	158
Kodippangu	1,809	79
Kookudi	1,494	166
Kulathur B/D	908	153
Kunjangulam	1,173	-
Mangalakkudi	1,397	-
Mavur	1,073	-
Mugilthagam	1,048	463
Mullimunai	1,129	7
Nagarikathan	1,270	1
Nambuthalai	2,009	-
Neyvayal	2,396	-
Nilamalgiyamangalam	1,102	171
Orikottai A/B	972	221
Oriur	3,433	-
Paganur	889	-
Palangulam	1,039	358
Pananjayal	1,905	703
Pandukudi	1,770	-
Pathanakudi	1,536	-
Periyakeeramangalam	868	-
Pudupattinam	1,741	177
Pullakkadamban	948	328
Sirugambaiyur	1,265	346
Sirumalaikkottai	1,085	255
Sundarapandianpattinam	657	-
Thalimarungur A/B	1,142	312
Thealur	1,335	-

GP	WASCA Recommendation for 3 Years	WASCA Uploaded for FY-2021-22 as on 26-02-2021 FY-2021-22 as on 02/02/2022
Thiruvetriyur	1,841	-
Thuthakudi	970	1
Tiruvadanai	3,092	148
T. Nagani	1,893	-
Vattanam	932	-
Vellayapuram	1,896	-

## ANNEXURE 7.2

## GP WISE ONGOING WORKS IN THIRUVADANAI BLOCK

GP	Work Category	Ongoing works
Achangudi	Rural Connectivity	1
	Water Conservation and Water Harvesting	3
Andavoorani	Water Conservation and Water Harvesting	1
Anjukottai	Water Conservation and Water Harvesting	3
Arasathur	Water Conservation and Water Harvesting	2
Arumboor	Water Conservation and Water Harvesting	2
Athiyur	Water Conservation and Water Harvesting	2
Kadambur	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	10
Kaliyanagari	Water Conservation and Water Harvesting	1
Kallur	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Karangadu	Water Conservation and Water Harvesting	1
Karumoli	Water Conservation and Water Harvesting	2
Kattavilagam	Anganwadi/Other Rural Infrastructure	1
	Water Conservation and Water Harvesting	2
Kattivayal	Water Conservation and Water Harvesting	2
Kodannor	Water Conservation and Water Harvesting	2
Kodippangu	Water Conservation and Water Harvesting	2
Kookudi	Water Conservation and Water Harvesting	2
Kulathur B/D	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	2
Kunjangulam	Water Conservation and Water Harvesting	2
Mangalakkudi	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	2
Mavur	Water Conservation and Water Harvesting	2
Mugilthagam	Drought Proofing	1
	Water Conservation and Water Harvesting	2
Mullimunai	Water Conservation and Water Harvesting	1
Nambuthalai	Water Conservation and Water Harvesting	1
Neyvayal	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	3
Orikottai A/B	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	4
Oriur	Water Conservation and Water Harvesting	2
Paganur	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	1
Palangulam	Water Conservation and Water Harvesting	2
Pananjayal	Water Conservation and Water Harvesting	2
Pandukudi	Water Conservation and Water Harvesting	1
Pathanakudi	Rural Connectivity	1

GP	Work Category	Ongoing works
Pathanakudi	Water Conservation and Water Harvesting	1
Periyakeeramangalam	Water Conservation and Water Harvesting	5
Pudupattinam	Drought Proofing	1
Pullakkadamban	Water Conservation and Water Harvesting	2
Sirugambaiyur	Water Conservation and Water Harvesting	1
Sirumalaikkottai	Water Conservation and Water Harvesting	3
	Works on Individuals Land (Category IV)	4
Sundarapandianpattinam	Water Conservation and Water Harvesting	1
T. Nagani	Water Conservation and Water Harvesting	2
Thalirmarungur A/B	Water Conservation and Water Harvesting	2
	Works on Individuals Land (Category IV)	4
Thehur	Water Conservation and Water Harvesting	2
Thiruvetriyur	Works on Individuals Land (Category IV)	2
Thuthakudi	Water Conservation and Water Harvesting	1
	Works on Individuals Land (Category IV)	2
Tiruvadanai	Anganwadi/Other Rural Infrastructure	1
	Water Conservation and Water Harvesting	2
Vattanam	Drought Proofing	2
	Works on Individuals Land (Category IV)	1
Vellayapuram	Drought Proofing	1
	Water Conservation and Water Harvesting	1

## ANNEXURE 8

## CWRM KEY INDICATORS FOR GPs IN THEERTHANDATHANAM MICRO-WATERSHED

CWRM Parameter	Pullakadamban
<b>Soil Resources: Status of Available Nitrogen (%)</b>	
Very Low	0.752
Low	96.241
Medium	3.008
<b>Status of Organic Carbon (%)</b>	
Very Low	18.797
Low	73.684
Medium	5.263
High	1.504
Very High	0.752
<b>Status of Soil Micro Nutrients (%)</b>	
Sufficient	68.000
Deficient	32.000
<b>Status of Physical condition of the soil (%)</b>	
Moderately Acidic	72.180
Slightly Acidic	3.760
Moderately Alkaline	24.000
<b>Soil Texture (%)</b>	
Fine Soil	36.000
Coarse loamy	17.940
Soil Water Permeability (Low, Moderate, high)	Moderate
<b>Soil moisture and ET</b>	
Volumetric Soil Moisture (%)	17.00
Estimated Soil Moisture (ha.m)	105.47
ET Losses (ha.m)	190.07
<b>Means of Water Extraction (%)</b>	
Gravity	85.00
Lifting	15.00
<b>Irrigation Methods (%)</b>	
Wild Flooding	1.00
<b>Livestock (No.)</b>	
Cattle Population	105
Sheep Population	8
Goat Population	40
Poultry	45
<b>Land Resources (ha)</b>	
Non-Agricultural Uses	366.90
Area under Barren & Un-cultivable Land	99.54
Cultivable Waste Land	8.59
Fallows Land other than Current Fallows	55.92
Current Fallow land	92.26
Unirrigated Land	132.22
Area Irrigated by Source	231.89



















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