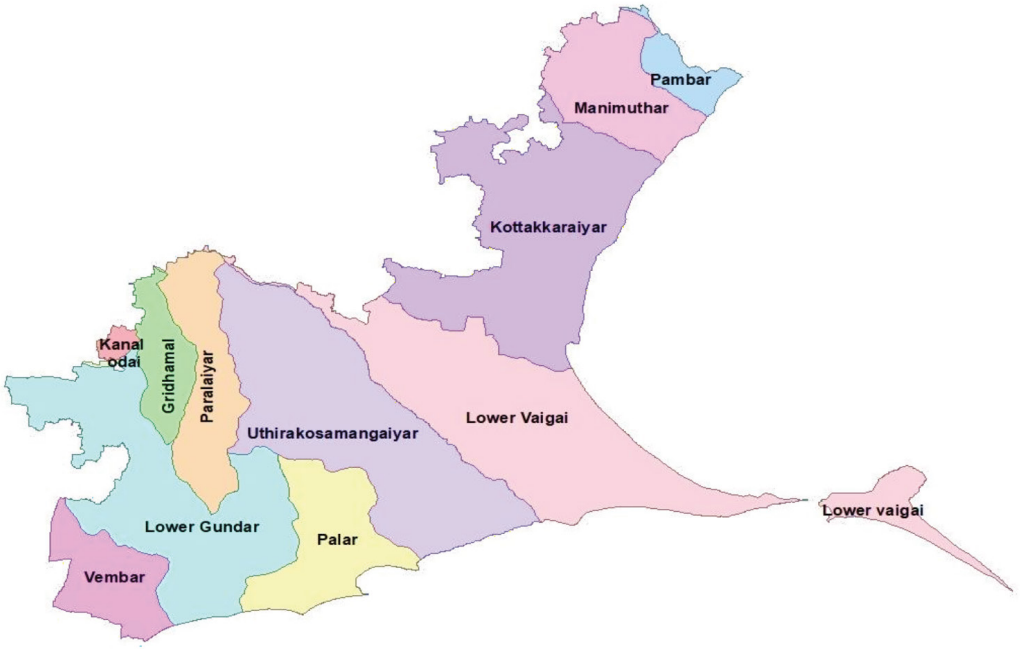
Ministry of Rural Development

Ministry of Jal Shakthi

Water Security and Climate Adaptation in Rural India - Tamil Nadu



District Composite Water Resource Management Plan Report

6 February 2021

District Rural Development Agency (DRDA),Ramanathapuram

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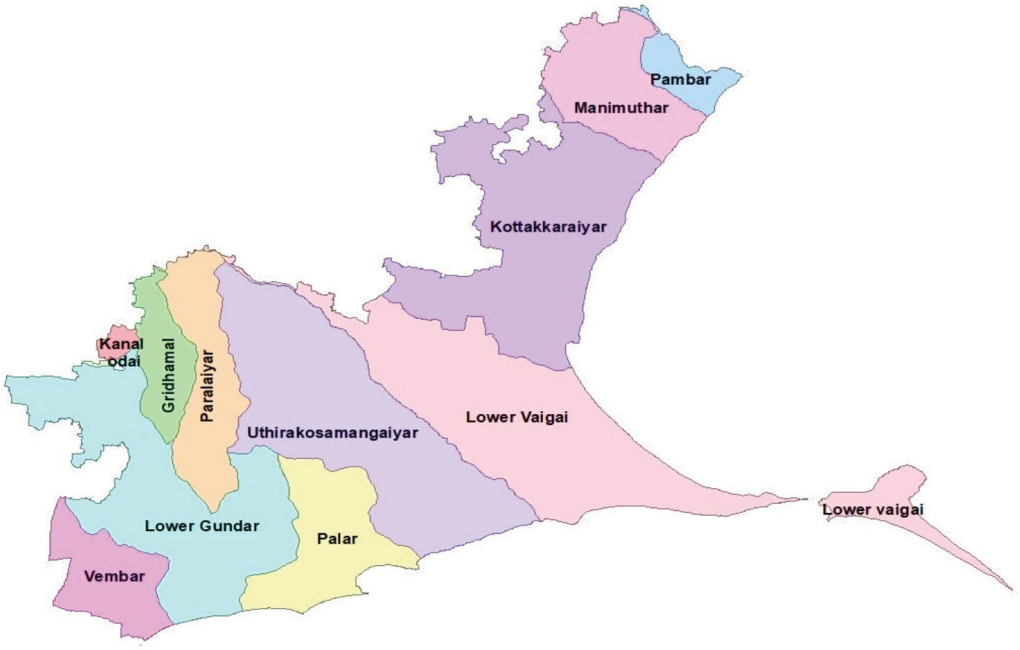


District Composite Water Resource Management Plan Report

06 February 2021

District Rural Development Agency (DRDA),Ramanathapuram

Foreword

Water is the foremost important natural resource in Ramanathapuram District, which has both coastal and semi-arid ecosystems. Ramanathapuram is one of the two aspirational districts in Tamil Nadu and covers an area of 4123 sq.km. The total population of the district is 1.3 million. Agriculture is the primary source of livelihood to two-thirds of the district population. The net sown area of the district is 1,72,646 Ha (as per 2016-17 G-return) with an average cropping intensity of 100.2%. Of the total cultivated area, 33% is irrigated and the remaining 67% is under rainfed cultivation. Paddy, millets, chilli, cotton and pulses are the dominant crops; with goat and sheep rearing in the inland, and fisheries in the coastal areas are the allied enterprises supporting the local population.

The annual average rainfall is 821 mm, and 62.84 % of the annual rainfall is received during North East Monsoon between October to December. The major rivers flowing in the district are Vaigai and

Gundar. These rivers are rainfed and thus remain dry for a significant number of months in a year. The district has a huge network of water storage structures; 477 tanks with >40 Ha area and 1217 tanks with <40 Ha area. In the context of increasing climate risks, water management is one of the crucial focus areas of the district.

The Indo-German project on Water Security and Climate Adaptation in Rural India (WASCA) is in partnership with the Ministry of Rural Development and Ministry of Jal Shakti and is ibeing mplemented in five states namely, Rajasthan, Madhya Pradesh, Uttar Pradesh, Karnataka and Tamil Nadu. In Tamil Nadu, the project is implemented in two Districts; Ramanathapuram and Tiruvannamalai. The duration of the project is for three years (2019-2022) and in Ramanathapuram it was started in December 2019. The core objective of the initiative is to accelerate the climate-resilient water resource management practices in the district.

The Composite Water Resources Management (CWRM) planning framework is being adopted in the project and recently, 429 Gram Panchayat-based plans have been developed. The planning process followed a bottom-up approach in, having started at the Gram Panchayat level and further integrated and consolidated at block and district levels.

I hope this CWRM based planning will be of great use in strengthening the water resources of the district and to ensure access to water to all sectors in the district.

Best wishes,

Dinesh Ponraj Oliver IAS
District Collector, Ramanathapuram

Foreword

The Water Security and Climate Adaptation in Rural India (WASCA), a bi-lateral project commissioned by the German Federal Ministry for Economic Cooperation and Development in partnership with the Ministry of Rural Development (MoRD) and Ministry of Jal Shakti (MoJS) is being implemented in Ramanathapuram district of Tamil Nadu. The project was initiated in December 2019 in the district with the consultations at both state and district levels.

The main objective of WASCA is to boost the water resources of the district by addressing the planning, financing and implementation mechanisms to achieve water security and adapt to the changing climate. The key strategies and pathways planned to achieve the objectives are strengthening the convergence of existing plans, promoting climate resilient water management measures, forging cooperation with the private sectors for enhancing financial investments in water resources and promoting climate resilient and water efficient production systems.

WASCA is promoting a scientific and innovative approach of planning in water resources management at the Gram Panchayat level using hydrological and geo-spatial data and tools across all GPs in the district.

The project is moving forward to strengthen the water security of the district in view of the climate change forecast for the mid and end century. The investments in water harvesting and recharge will be useful to meet the future water requirements for human, agriculture and other uses. The augmentation of water resources will also inspire and motivate farmers to sustain in farming and achieve higher production and income.

I wish the team WASCA and the supporting agencies to successfully work collaboratively with district administration to achieve and ensure water secured communities in the Ramanathapuram district.

Best wishes,

M. Pradeep Kumar IAS
Additional Collector (Dev.)
DRDA, Ramanathapuram district, Tamil Nadu, India

Contents

Acronyms and Abbreviations

ADRD - Additional Director for Rural Development

BMZ - German Federal Ministry for Economic Cooperation and Development

CCCDM - Centre for Climate Change and Disaster Management

CII - Confederation of Indian Industries

CVI - Cumulative Vulnerability Index

CWRM - Composite Water Resources Management

DLSC - District Level Steering Committee

DRDA - District Rural Development Agency

GIS - Geographical Information System

GIZ - Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH

Ha M - Hectare Metre

IWRM - Integrated Water Resources Management

MCM - Million Cubic Metre

MGNREGA - Mahatma Gandhi Rural Employment Guarantee Act

MOJS - Ministry of Jal Shakti

MORD - Ministry of Rural Development

MSSRF - M.S. Swaminathan Research Foundation

NABARD - National Bank for Agriculture and Rural Development

NGO - Non-Governmental Organization

RDPR - Rural Development and Panchayati Rai

SDG - Sustainable Development Goal

SDMRI - G Suganthi Devadasan Marine Resources Institute

SE - Superintendent Engineer

SLSC - State Level Steering Committee

TCM - Thousand Million Cubic feet

TN SAP - Tamil Nadu State Action Plan for Climate Change

WASCA - Water Security and Climate Adaptation in Rural India

Chapter 1
Project WASCA: An Overview

1.1 WASCA: An Introduction

Better water management requires comprehensive planning, and management at all levels is a crucial part in sustainable water security. The Indo-German Project Water Security and Climate Adaptation in Rural India (WASCA), is a bilateral 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 is being implemented by GIZ India.

The project period is three years from April 2019 to March 2022. As part of this project, water resources management is enhanced through an integrated approach, called Composite Water Resources Management (CWRM) Planning, at national, state and local levels (see Fig. 1.2). It is operational in five states – Madhya Pradesh, Rajasthan, Tamil Nadu, Uttar Pradesh and Karnataka – in 13,000+ villages in 10 districts. The project includes land and soil development, water harvesting and conservation, and protection against extreme weather events, such as drought and flooding, thus creating significant climate adaptation and mitigation co-benefits.

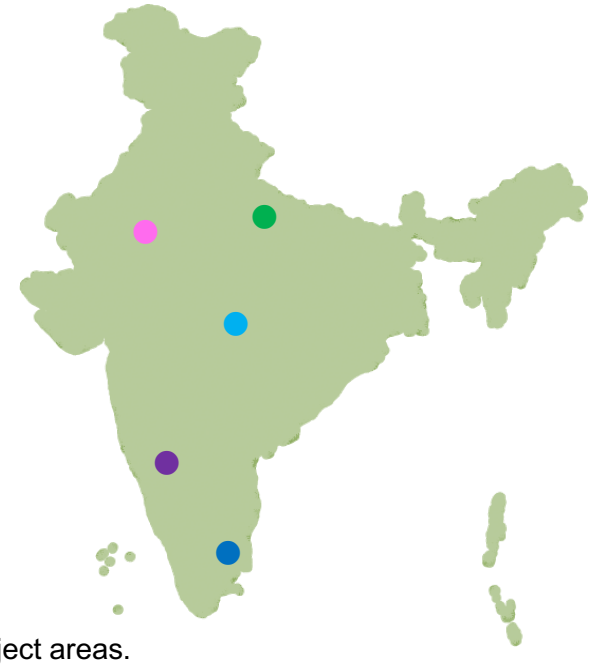


Figure 1: WASCA project areas.

The geographical maps used in this report are for informational purposes only and do not constitute recognition of international boundaries or regions; GIZ makes no claims concerning the validity, accuracy or completeness of the maps nor assumes any liability resulting from the use of the information therein.

The Ministry of Jal Shakti, the nodal ministry for water in India, brings together National agencies working on water including National Water Mission, Central Water Commission, Central Ground Water Board, River Boards, Department of Drinking Water and Sanitation, Atal Bhujal Yojana for groundwater management and Jal Jeevan Mission to enhance the scope for WASCA interventions in rural India.

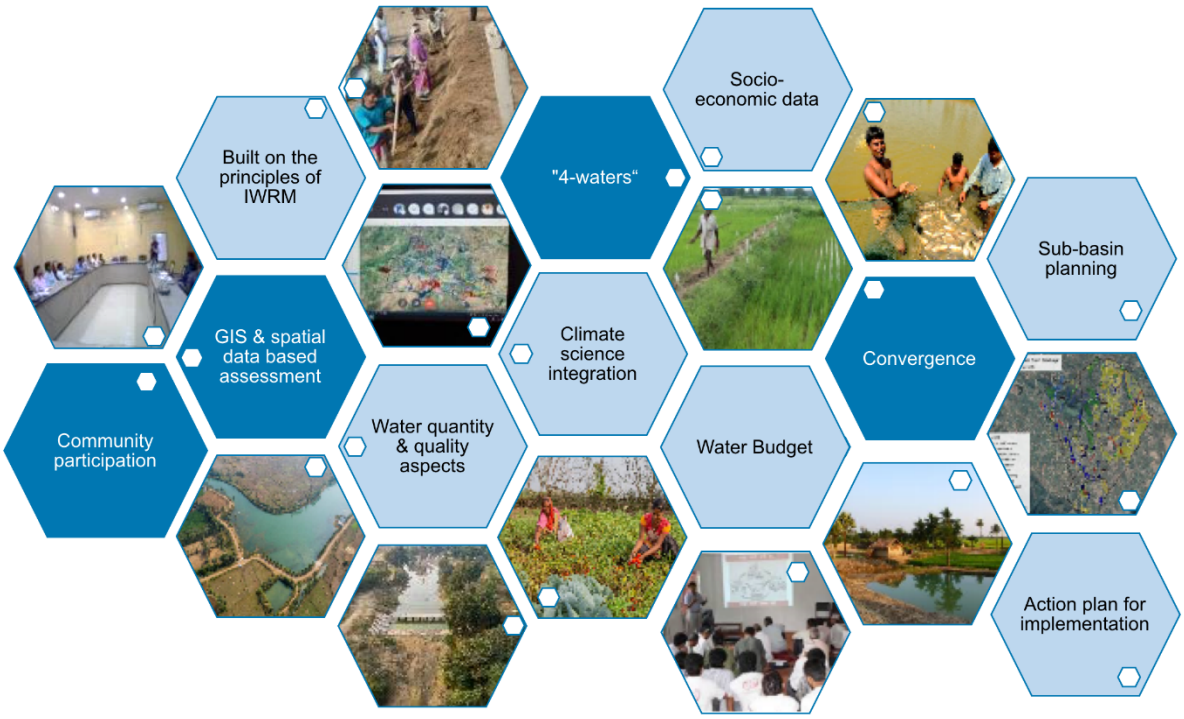


Fig. 1.2 Components of CWRM

Project WASCA seeks to address planning, financing and implementation mechanisms developed in the field of rural water resource management and climate change adaptation. It aims at the following three output areas:

1. Improved convergence of existing planning and financing approaches to strengthen water security.
2. Demonstration of convergent planning, financing and implementation at local level and
3. Co-operation with the private sector.

1.2 WASCA Scoping Study and Climate Vulnerability Indicators

In the state of Tamil Nadu, GIZ India conducted a scoping study between July-October 2019, with the technical support of Centre for Climate Change and Disaster Management (CCCDM), Anna University, which studied the state's rural water security through a systematic analysis via availability of water, accessibility of water, and its governance through the climate lens at the district scale. At present, the state is one of the water-deprived states in India, which is clearly evident from the fast decline in the per-capita availability of water in Tamil Nadu; the current per capita water availability is well below the national average of 1,544 cubic meters.

The scoping study used 18 different biophysical and socio-economic indicators under 4 dimensions via climate (5), water (5), agriculture (4) and socio-demographic (4) and have been composed and categorised into adaptive capacity, sensitivity and exposure indicators for the analysis. The details of the 18 indicators used in the vulnerability assessment at the scale of district level are as follows (Table 1.1).

Meeting with CCCDM, Anna University, Chennai team with ADRD and SE (MGNREGS), DRD,

Table 1.1. List of biophysical and socio-economic indicators used in vulnerability assessment vis-a- vis CWRM data

S. No.	Climate Vulnerability Area for WASCA	WASCA Climate Vulnerability Indicators	Climate Vulnerability Indicator	Unit for Assessment
(1)	(2)	(3)	(4)	(5)
1	Climate	changes in max T	C1	Degree Celsius
2		changes in min T	C2	Degree Celsius
3		changes in RF	C3	%
4		Excess rainfall years	C4	No. of Years
5	Water Resource	Deficient rainfall years	W1	No. of Years
6		Ground water extraction	W2	%
7		Ground water Recharge	W3	in cubic meter
8		surface water availability	W4	Mm
9		water gap	W5	MCM
10		% of contamination	W6	%
11	Agriculture	Rainfed area	A1	%
12		Cropping intensity	A2	%
13		Soil moisture	A3	kg/m^2
14		Evapotranspiration	A4	$kg/m^2/s$
15	Socio-economic	Rural proportion	S1	%
16		Multidimensional poverty index	S2	Index Value
17		source of drinking water within premises in rural	S3	%
18		marginal farmer_ landholdings	S4	%

Source: Scoping study, GIZ, CCCDM, Anna University, Chennai for WASCA- TN, GIZ, Nov 2019

The Composite Vulnerability Index was prepared using the above 18 indicators and ranked the different districts (Table 1.2).

Table 1.2 WASCA - TN: Climate Vulnerability Indicators: CWRM Planning: Ramanathapuram District

Climate Vulnerability Area	Climate Vulnerability Indicator	Computed Composite Index Value	
		Functional Relationship with Climate Vulnerability	CVI Value
(1)	(2)	(3)	(4)
Socio Economic Vulnerability	Rural proportion	A	0.73
	Multidimensional poverty index	A	0.794
	source of drinking water within premises in rural	B	0.98
	Small & marginal Farmer landholdings	A	0.822
Agriculture Vulnerability	Rainfed area	A	0.656
	Cropping intensity	B	1
	Soil moisture	B	0.808
	Evapotranspiration	A	0.714
Water Resources Vulnerability	Ground water extraction	A	0
	Ground water Recharge	B	0.687
	surface water availability	B	0.992
	water gap	A	0.379

Climate Vulnerability Area	Climate Vulnerability Indicator	Computed Composite Index Value	
		Functional Relationship with Climate Vulnerability	CVI Value
	% of contamination	A	0.565
Climate Vulnerability	changes in maxT	A	0.817
	changes in minT	A	0.437
	changes in RF	A	0.731
	Excess rainfall years	A	0.5
	Deficient rainfall years	A	1
WASCA – TN: Climate Vulnerability Index Range for all Districts of TN: 0-1			
A : Higher Value high vulnerability			
B : Lower Value High vulnerability			
Source: Scoping Study, CCCDM, Anna University for WASCA-TN, GIZ, Nov, 2019			

Ramanathapuram, Dharmapuri, Perambalur, and Tiruvannamalai districts are ranked high in cumulative vulnerability index (CVI) and the CVI values are 0.7, 0.64, 0.62 and 0.61, respectively (Table 1.3).

Table 1.3. Ranking of Highly Vulnerable districts in the states based on CVI values

Districts	Climate	Water Resource	Agriculture	Socio-economic
(1)	(2)	(3)	(4)	(5)
Ramanathapuram	4	16	1	13
Dharmapuri	28	1	9	11
Perambalur	18	12	6	7
Tiruvannamalai	6	11	17	5

Source: Scoping study, GIZ, CCCDM, Anna University, Chennai for WASCA- TN, GIZ, Nov 2019

Of the four highly vulnerable districts in the State, Ramanathapuram and Tiruvannamalai districts were prioritized for WASCA interventions (Fig 1.3) through approval by State Level Steering Committee on WASCA, headed by Additional Chief Secretary, Department of Rural Development & Panchayat Raj and Heads of all line department. Of the two districts, Ramanathapuram is the most vulnerable district in terms of

- Exposure to climate extremities was very high during 1951-2015;
- Wide gap between supply and demand - availability of water resources for productive and domestic use;
- Agriculture vulnerability is very high and
- High socio-economic vulnerability.

The vulnerability will be further exacerbated under the changing climate scenarios in both mid (2050) and end century (2080). It is projected that there will be an increase in annual rainfall by 2050s and in 2080s it will be +1.0% with respect to baseline (1970-2000) of 821 mm along with sharp increase in both minimum and maximum temperatures.

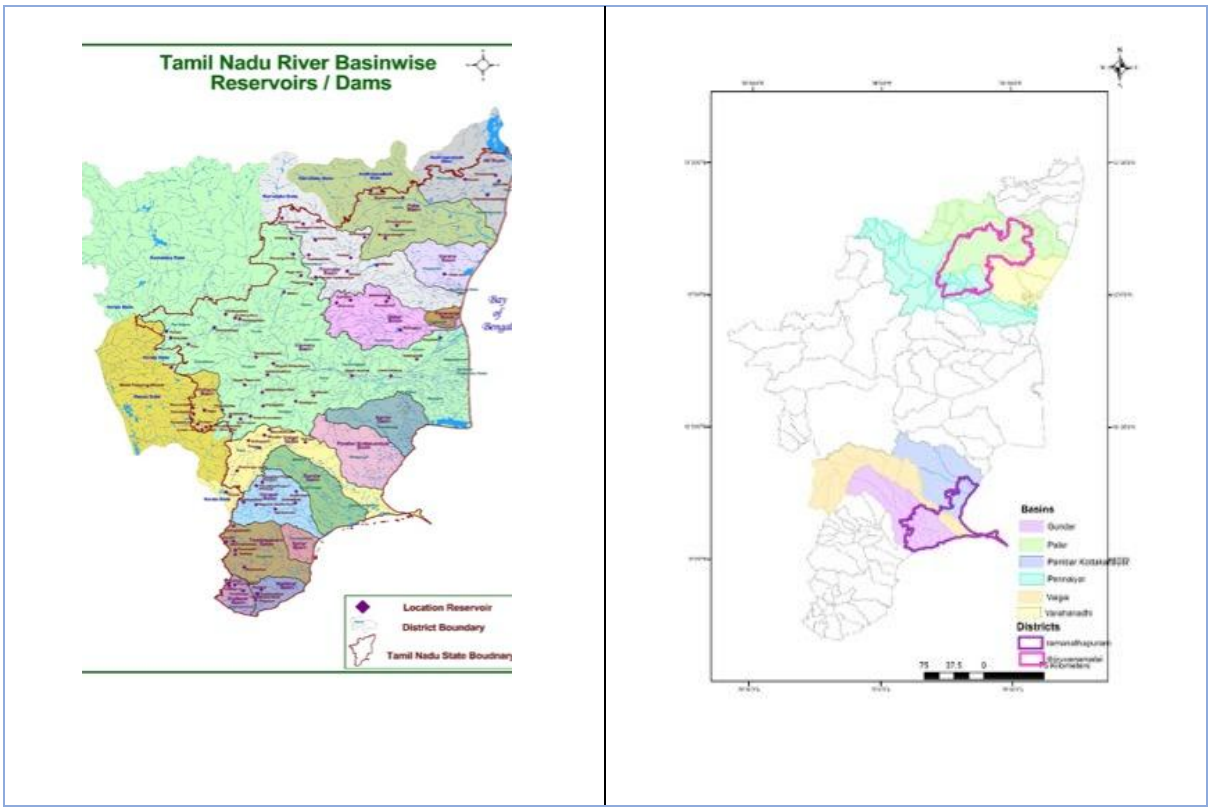


Fig 1.3. District boundary with the identified districts for WASCA- TN

In this backdrop, implementation of WASCA in Ramanathapuram district is planned to strengthen its water resources and build context specific climate resilient models as a preparedness measure to build better resilience under this bilateral support. Besides, as Ramanathapuram is a coastal district, seawater intrusion is one of the major issues affecting the groundwater quality. The groundwater in the district is present in both the porous and fissured formations. The aquifer system consists of unconsolidated & semi-consolidated formations and of weathered and fractured crystalline rocks. The groundwater levels in the district range from 6 meter to 777 meters below ground level depending upon the type of the formation. The quality of groundwater in general is colourless, odourless and slightly alkaline, and total hardness exceeds the permissible limits. So proper water management strategies are to be adopted before using the groundwater for drinking, domestic, irrigation and industrial purposes. In order to take proper management action, a detailed study was undertaken to estimate the extent of seawater intrusion in aquifers and of the groundwater quality for the entire district.

1.3 Profile of Ramanathapuram District

Ramanathapuram is one of the coastal districts in Tamil Nadu where one can find the predominant nature of agriculture in sea-belt. It is located between the latitude of 90 05' N and 90 50' N and latitude of 780 10' E and 790 27' E (Fig. 4). It has a long coast line measuring about 271 km, which is one fourth of the coastal length of Tamil Nadu state. The coastline is almost a sandy tract with minimal vegetation.

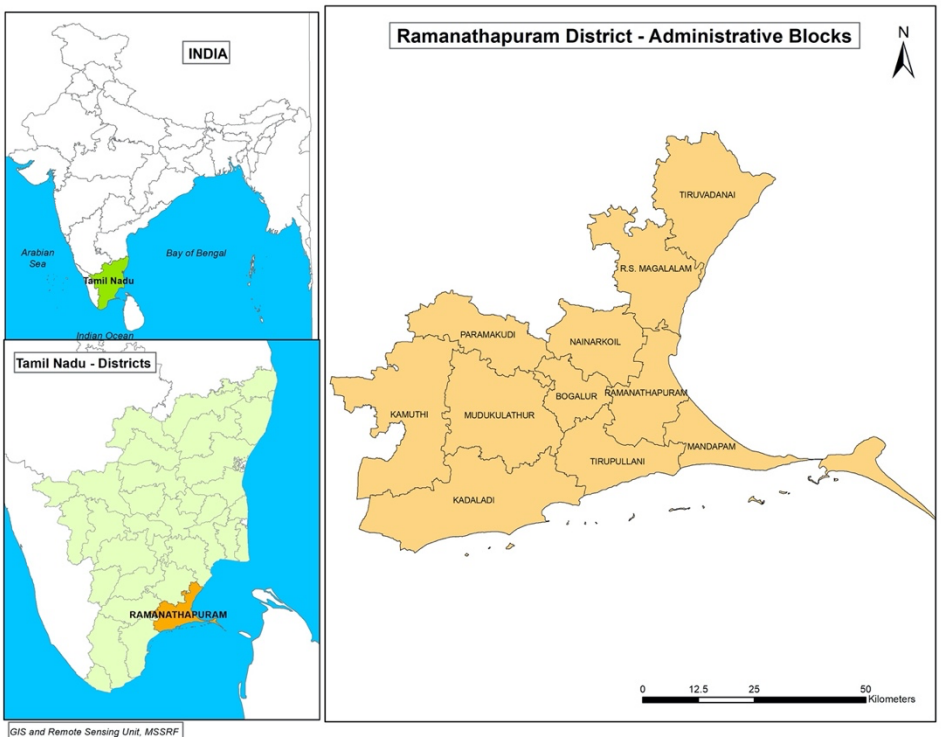


Fig 1.4. Location and block map of Ramanathapuram

The total geographical area of the district is 4,175 sq.km. The district has a hot tropical climate, temperature ranging from 22.3^0 C as a minimum to 37.8^0 C as a maximum. The relative humidity is as high as 79% on an average, it ranges between 80 to 90 % in the coastal areas. The annual normal rainfall is 821 mm, in which 60% of rainfall is received during North East Monsoon (October – December) season. The table 1.4. shows the administrative divisions in the district

Table 1.4. Administrative units and water resources in the district

Sl No.	Details	Numbers
(1)	(2)	(3)
1	Revenue division	2
2	Municipal	4

3	Taluks	7
4	Firkas	38
5	Revenue villages	400
6	Blocks	11
7	Gram Panchayats	429
8	Hamlet villages	2362
9	No of river basins	3
10	No of river sub basins	10
11	No of catchments	3
12	No of watersheds	7
13	No of Micro watersheds	736
14	No of Coastal Micro Watersheds	253

Sources: District Human Development report 2017; official web site of Ramanathapuram Dist. 2018; District Agricultural Plan Ramanathapuram, 2008, and Census of India 2011.

- Demographic features of the Ramanathapuram district, as per 2011 census is with the population of 1,353,445 with a sex-ratio of 983 females for every 1,000 males. The district has of 69.60 percent of the rural population with population density of 331 inhabitants which is lower than the State population density (555) in 2011 census. Scheduled Castes population in the district constitutes 18.4% of its total population. The district has the literacy rate of 80.7%.

- The net sown area of the district is 1,72,646 Ha (as per 2016-17 G-return) with an average cropping intensity of 100.2%. Of the total cultivated area, 33% is irrigated and remaining 67% is under rainfed cultivation.

- The total operational land holders in the district is 3,93,888, and 82% of them are marginal holders having less than one Ha of agricultural land. Paddy, Chillies, millets, cotton and pulses are the predominant crops cultivated in the district.

- According to the CGWB study, 2018-19, on the ground water status, out of 11 blocks one block is under saline category and rest under safe category. The table 1.5. shows the definition for the different ground water development status in the district.

Table 1.5. Status of ground water development across different blocks in the district

Sl. No	GW Development Category	Number of blocks	Level of Ground Water Development	Explanation
(1)	(2)	(3)	(4)	(5)
1	Safe	10	0-70%	Areas which have ground water potential for development

2	Semi critical	-	70-90%	Areas where cautious ground water development is recommended
3	Critical	-	90-100%	Areas which need intensive monitoring and evaluation for ground water development
4	Overexploited	-	>100%	Areas where future ground water development is linked with water conservation measures
5	Saline	1	-	Areas where ground water development is recommended for augmenting freshwater table

The district has considerable number of water bodies managed by the panchayat as well as the state government (Table 1.6).

Table 1.6. Ayacut area under different irrigation source in the district (Ha)

Sl. No.	Block	PWD Tanks	Panchayat Union Tanks	Ex *zamin* Tanks	Total
(1)	(2)	(3)	(4)	(5)	(6)
1	Ramanathapuram	5180.8	660	102.4	5943.2
2	Thiruppullani	2478.4	784.8	64.8	3328
3	Mandapam	38	–	–	38
4	Paramakudi	5819.6	276.4	1312.8	7408.8
5	Bogalur	3000.4	66.8	632	3699.2
6	Nainarkoil	4198	133.6	914.4	5246
7	Thiruvadanai	5114.8	2049.2	968.8	8132.8
8	R.S. Mangalam	10060	1944	1065.2	13069
9	Kamuthi	3676.4	2454.4	468.8›	6599.6
10	Mudukulathur	3740.4	1773.2	53240	6046
11	Kadaladi	7025.6	2352	235.6	9613.2
	Total	50332	12494	6297	69124

1.4 WASCA Project Focus in Tamil Nadu

The main motto of WASCA Tamil Nadu is "Climate Resilience for Future Livelihoods".

The project is guided by the State Level Steering Committee (SLSC) under the chairpersonship of Additional Chief Secretary, Department of Rural Development & Panchayat Raj Department, Commissioner, Rural Development & Panchayat Raj as Member Secretary. The members of SLSC are Heads of Line Departments (Public Works Department (PWD), Tamil Nadu Water Supply and Drainage Board (TWAD Board), Department of Agriculture, Horticulture, Fisheries Department, Animal Husbandry, Forest

Department, NABARD etc.), M.S. Swaminathan Research Foundation, Madras School of Economics, Confederation of Indian Industry, Research institutes and academia represented by CCCDM and, Department of Water Resources from Anna University, Tamil Nadu Agriculture University, Indian Institute of Soil and Water Conservation, as members. For the formation of SLSC, the Government of Tamil Nadu has issued a GO (Ms.) No. 170 dated 25.11.2019 given in Annexure 1.

At the District, District Level Steering Committee (DLSC) is headed by District Collector as Chairperson and Project Director, DRDA as Convener, line departments, local NGOs as members. Close monitoring mechanism has been in place to assess the progress and get the inputs for the necessary actions (Table1.7).

Table 1.7. Monitoring systems at different levels

Sl. No.	Monitoring Mechanism	Level	Periodicity
(1)	(2)	(3)	(4)
1	State Level Steering Committee	State	Bi-Monthly
2	State Level Review DRD	State	Monthly
3	District Steering Committee	District	Bi-Monthly
4	Convergence Meeting - Block Level Line departments	Block Level	Monthly

Approach and Strategies: The whole initiative adopts the following approach and strategies in planning, facilitating and piloting the interventions/actions in the field:

- At the overall level, the initiative intends to adopt the “area saturation approach” to treat all four types of actions depending upon the context so that all types of land and soil related issues within the geographical units are addressed comprehensively.
- Following this at the implementation level, it adopts a comprehensive approach by integrating water conservation using multi-dimensional measures backed up with scientific evidence in planning, execution and ensuring the stakeholders participation.

Strategies at different phases of the intervention

A. ***Scientific Planning***

(a) Evidence Based Planning: GIS, Hydrology, Statistical data analysis along with socio-economic parameters of the village/block

(b) Adopts Ecosystem Based Approach (EBA) for Natural Resources Management and Sustainable Livelihoods: The data analysis as well as planning follows EBA to reduce the vulnerability by building appropriate risk reduction measures, enhance the systems productivity by conserving all forms of natural resources and achieve sustainable livelihoods.

(c) Capacity building of the planners: Building the capacity of the government officials who work at GP level in water budget estimation, use scientific evidence-based inputs for planning water conservation initiatives.

B. ***Nature Based Solutions are considered in identification of works***

(a) Blue: Conservation and enhancement of Four Waters (Rain Water, Surface, Ground and Soil Moisture)

(b) Green: Nature Based Solutions and vegetative Improvement (on farm, off farm and public and private lands)

(c) Grey: Civil Structures (Earthen and CC) for water storage, re-charge, recycling and conservation

C. Saturation and Area Based Project Approach for enhancing results, provisions under Mahatma Gandhi NREGA

- The provision under sub Para (2) of Para 4 of Schedule 1, Mahatma Gandhi NREGA, lays down that, “at least 60% of the works to be taken up in a district in terms of cost shall be for creation of productive assets directly linked to agriculture and allied activities through development of land, water and trees.” With the thrust on development of livelihoods, works prioritised in the convergent planning process for individual beneficiaries will be given priority

- 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 Agri and Agri-Allied works.

- The works taken up in Mahatma Gandhi NREGS should change from taking up individual, standalone works in a typical ‘relief works mode’ to an INRM perspective. Planned and systematic development of land and harnessing of rainwater following watershed principles should become the central focus of Mahatma Gandhi NREGS work across the country to sustainably enhance farm productivity and income of poor people. Even the works on private lands should be taken up following the principles of watershed management in an integrated manner.

D. Community Participation*:* Through Gram Sabha organised by Department of Rural Development with the support of government officials at the district and block levels.

E. Convergence*:* Convergence at the Block and district levels for the MGNREGA work Implementation along with other line department schemes including Department of Agriculture, Horticulture, Animal Husbandry, Agricultural Engineering, *Adi Dravidar* and Tribal welfare etc. Given below the convergence guidelines as mentioned in the Annual Master Circular of MGNREGA 2020-21 adopted to bring synergy in technical, financial and other resources.

Box 1. MGNREGA Convergence guidelines salient points from MGNREGA annual master circular 2020-21

- "Convergence both at State and District level with departments / schemes like agriculture, forest, horticulture, fisheries, sericulture, animal husbandry, FFC/SFC grants to Panchayat, irrigation, minerals, NRLM, PMAY, MPLADS, Railways, DWS, School education etc.
- There can be two kinds of convergences

  (1) Where the converging department provides its technical know-how to MGNREGS,

  (2) Where the converging department also provides funds for convergence with MGNREGS e.g. AWC buildings.
- Even in this case, there are two ways of converging funds. In one method, the converging department can deposit its funds with SEGF and complete the works using both the funds. In the second method, the converging department and MGNREGS clearly identify the items to be completed by their own funds respectively such that the work can be completed.
- Works identified under convergence plan shall be approved by the competent Panchayat i.e. the Gram Panchayat/ Intermediate Panchayat/ District Panchayat level, before being included in the Shelf of Projects.
- If the work identified for convergence is to be taken up after the appropriate Panchayat has approved the Annual Action Plan, then such works can be placed before the competent Panchayats for their approval. After such approval, the works will become part of the Annual Action Plan".

F. Capacity Development: At the district level, to promote the common awareness, working in technical cooperation as a team on WASCA project framework, series of virtual and face to face training workshops were organised from Jan 2020-Dec 2021 for facilitating GP level planning, execution of works as per guidance of SLSC, DLSC (Table 1.8).

Table 1.8 . Details of the training programmes organised

S.N.	Details	No of Persons Trained	Key Learning Outcomes
(1)	(2)	(3)	(4)
1	Orientation to the WASCA – CWRM planning, 9-12 Jan 2020, Madurai	86	• Framework of Composite water Management Plan • Capacity development and institutional mechanism

S.N.	Details	No of Persons Trained	Key Learning Outcomes
2	Cross learning – Exposure visit to Rajasthan- learning Rajiv Gandhi *Jal Sanchay Yojana* (formerly MJSA), Four Water Concepts, Water Conservation, Model GP, Eco Parks etc, 3-8 March 2020	6	• Four water concept and implementing ridge to valley approach • Developing degraded community lands to pasture and silvi-pastures • Convergent planning and financing mechanisms and state flagship Programs • Innovations in Water Conservations (*Tankas, Kadims*, Lining of Ponds etc) • Innovations in Plantations (Floriculture, horticulture, road side plantations, silviculture) • Innovation in asset creation (Mini stadium, Model Crematorium, Food Grain storage structures)
3	Online sessions – CWRM plan preparation – three sessions May to June 2020	90	Spatial and Non spatial data sets necessary for CWRM planning Identifying Key water challenges Identifying appropriate actions and how to do the planning – using a model GP
4	Cascading of tanks – Experience from Andhra Pradesh	60	How to identify the cascade systems and the processes required for restoring it
5	Saline water Management – SDMRI	30	Status of the saline water issues and possible measures to address
6	Discussion on Coastal Watershed to identify the key activities with the experts	10	To identify the potential restoration practices of different types of coastal water resources in the three different pilots

Simultaneously efforts are undertaken to convey the key messages of the project through a communication plan which is jointly evolved by stakeholders of WASCA-TN in line with the key objectives and outputs of WASCA. The communication materials were shared using social media and online platforms to ensure:

1. Strengthened knowledge and capacity of public and private institutions, as well as stakeholders at different levels, to plan and implement integrated water resources management
2. Collaboration between various government departments and other stakeholders promoted to improve financing of climate adapted water security
3. Holistic pilot measures at district/ sub-catchment level in selected districts for successful approaches to be scaled-up at the state and national levels

As an initial step, series of four e-posters developed and disseminated to the district level officials

Fig 5. E-posters- Strategy to build awareness among

1.5 District Steering Committee

The launch and the first district level steering committee (DLSC) meeting was organised by the district administration in partnership with GIZ on 13 Jan 2020.

- The participants were from heads of all line departments including agriculture, agriculture engineering, horticulture, forestry, Water Resources Organization, Central Ground Water Board, AEs and AEEs of all the blocks, NGOs and research organizations (IISWC, Udhagamandalam and Coastal Saline Research station, Ramanathapuram, Baba Atomic Research Station, Kalpakkam), representatives of CII from Madurai.
- The meeting was inaugurated by the district collector and coordinated by additional collector.
- WASCA – CWRM plan approach and the status of the district in terms of forest cover, agriculture and horticulture, soil and water management, water quality, ground water potential, training and capacity building opportunities for sustainable livelihoods were discussed along with potential opportunities to leverage financial resources.
- Discussion was also focussed on how to improve the convergence among different stakeholders to make the district as one of the model districts in the state.

Launch and the first district level steering committee with all

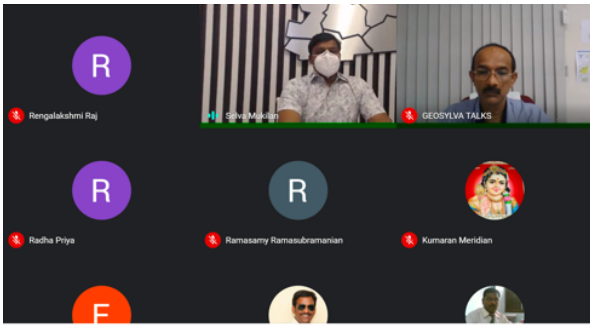
The second DLSC was conducted during 24 May 2020, combined with Joint Field Visits by State Additional Director MGNREGS, S.E (MGNREGS) the Nodal officer of WASCA along with DLSC members.

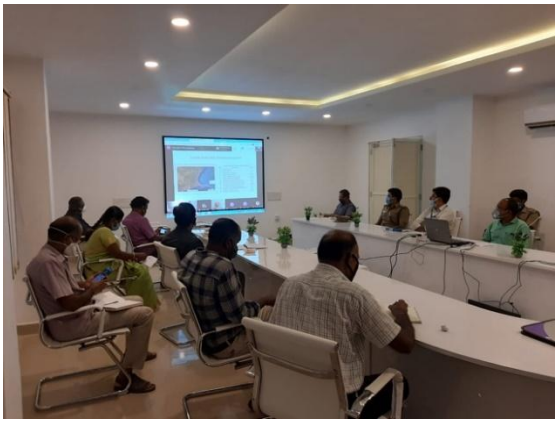
- Categorization of GPs based on Revenue and GP boundary data sets into Five types.
- CWRMP targets are set for completing GP level planning
- The different potential climate resilient model locations, model GPs, quarterly action plan are presented and discussed with the district collector and additional collector. (Chairperson and Convenors of DLSC)
-
- Key six different climate resilient actions that are in priority for effective water management and adapt to climate change are jointly identified by State and District officials along with GIZ, partner agency MSSRF.

The third DLSC meeting was conducted on 24th Aug 2020. The members of DLSC, heads of line departments and WASCA GIZ technical partnering institutions participated. Following are the key highlights of the meetings

- Member line Departments Agriculture, Animal Husbandry, Forests, PWD (WRO), Agriculture Engineering, Watershed, Horticulture and scientists from KVKs, TNAU Research Institutions participated
- 48 GPs CWRM plans have been submitted, presented the progress in additional, 198 GPs and action plan to cover all 429 GPs.
- In the DLSC, The District Action Plans presented and approved as per NSC, SLSC guidelines and revised targets, timelines.
- An advisory committee for undertaking pilots of Coastal Watersheds is approved. The advisory committee provided inputs on the implementation of coastal watershed piloting as per guidelines of Additional Chief Secretary and Director Rural Development & Panchayat Raj

- District level Joint Teams from line departments have been constituted to make field visits of 10 GPs and Coastal watershed pilot area for convergence, verification of CWRMP and guide in its implementation at GPs.
- Involvement of CSR, from PSU through the works under CWRMP will be explored.
- Necessary guidelines for working with line departments are drawn up, especially in raising of Nurseries for various plantations, micro irrigation, farm ponds construction.
- Directions are provided on the need for change in the cropping system, promoting integrated farming systems, horticulture, agroforestry development, cascading tanks and coastal watershed development.
- Coastal watershed approach design and implementation plan was discussed with a focus to improve the coastal ecology
- A decision is taken to include non NRM works in completed CWRM GP plans to facilitated uploading into NREGS Soft portal for GIS Planning.





Third DLSC meeting - online and in-person meeting at Ramanathapuram

1.6) WASCA District Resource Centre:

To facilitate participatory planning, implementation and coordination, GIZ in collaboration with Director, Rural Development & Panchayat Raj, Additional Collector, DRDA, Ramanathapuram established WASCA District Resource centre at DRDA Office, Ramanathapuram. The WASCA district resource centre was inaugurated by District Collector, Ramanathapuram on 13 Jan 2020.

District Level Water Security & Climate Adaptation Resource Centres: These Centres will provide the required knowledge and tools for IWRM & Climate Adaptation in planning and

financing works for the river sub-basin or district and convergence framework with as per existing guidelines of state and central governments.

The WASCA Resource centre has hardware equipped with resources useful for GIS and conduct short batches trainings. Hardware with high end computers (3 number), GPS, Projector, TV Screen (large) etc. The WASCA Resource Centre provides the following support to DRDA for implementation of WASCA:

Establishment of GIS lab

- Computers
- Trained human resources
- Technical agency supporting GIS based planning
- Scanner, printers, GPS
- Material useful for GIS planning

Module Development

- Planning module for water and climate for GP to district / sub-basin level using GIS tools
- CWRM Framework for the river sub-basin and district
- Module on Climate Resilience measures
- Handbook on Potential Financing water security and Climate Adaptation: Projects, Programmes and schemes

Assessments and studies

- Training Needs Assessment
- Capacity building needs assessment
- Potential for Artificial recharge to rejuvenate river basin
- Climate Adaptation strategies and innovations

Trainings and Workshops

- Conduct trainings on understanding water sector useful for the district
- Conduct Training for the officers concerned (RDPR, MGNREGS and other line departments) on GIS based tools for effective participatory planning.
- Conduct Workshop and Trainings on Water Security, Ground Water Recharge, Pollution Control, Climate Change etc.
- Organize workshops for increasing technical capacities of staff under RDPR and other line departments

Generating IEC material for the project

- Connect each resource centre with Technical Agency and CSR for sustained inputs
- Facilitate in preparation of DPR at GP and district for River Sub-basin
- Any other inputs as per suggestion by RDPR will be included in the resource centre.

Chapter 2
Composite Water Resources Management (CWRM) Planning

WASCA adopted CWRM Planning as per guidelines of National Level Workshop held in Feb, 2020. Mahatma Gandhi NREGS is the key partnership for WASCA. Hence, the basic unit of planning for CWRM is identified as Gram Panchayat (GP). There are 429 GPs in the district spread over in 11 blocks (Table 2.1 and Fig 2.1).

2.1 Categorisation of GPs for CWRM planning in the district

CWRM uses spatial and non-spatial data for developing plans. Most of the data for non-spatial are available at revenue village level. To synchronise planning at Gram Panchayat keeping data availability and boundary for GIS planning, various Gram panchayat are categorised based on revenue village boundaries, for collecting and organizing the datasets. Based on the boundary alignments between GPs and revenue villages five different categories or types were observed (table 2.1 and Fig 2.1.)

1) **Type 1:** GP and Revenue Village data and boundary match
2) **Type 2:** Having more than one GPs in one Revenue Village
3) **Type 3:** One GP is falling under more than one Revenue Village
4) **Type 4:** GPs having more than one GP, one Revenue Villages data, boundary
5) **Type 5:** Missing GP and data in census 2011

The above categorization was discussed and approved during second DLSC meeting and various GPs, block details are submitted to DLSC, accordingly type wise distribution of the GPs planning process initiated as given in the table below.

Table 2.1 Category of GPs block wise adopted under CWRM Planning

No.	Name of the Block	Total No of GPs	Type 1	Type 2	Type 3	Type 4	Type 5	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Bogalur	26	8	9	3	6	0	26
2	Kadaladi	60	13	18	0	28	1	60
3	Kamuthi	53	15	12	0	26	0	53
4	Mandapam	28	7	20	0	0	1	28
5	Mudukulathur	46	6	3	0	37	0	46
6	Nainarkoil	37	23	8	2	4	0	37
7	Paramakudi	39	12	14	0	12	1	39

No.	Name of the Block	Total No of GPs	Type 1	Type 2	Type 3	Type 4	Type 5	Total
8	R.S. Mangalam	35	9	9	3	14	0	35
9	Ramanathapuram	25	15	3	2	2	3	25
10	Thiruppullani	33	13	16	3	0	1	33
11	Thiruvadanai	47	10	2	1	33	1	47
	Total	**429**	131	114	14	162	4	429

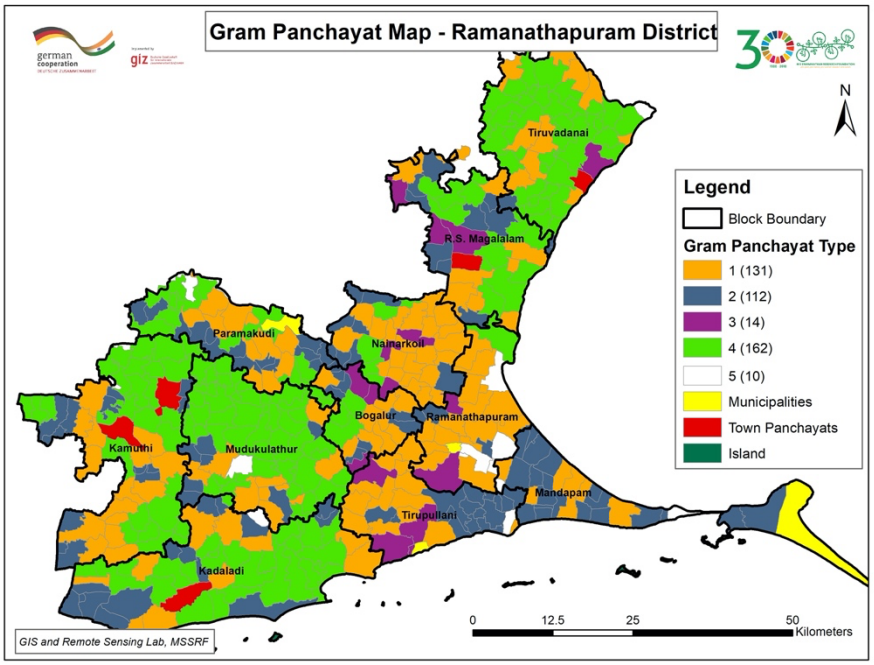


Fig 2.1. Distribution of different types of GPs in the district

2.2 Salient Features of CWRM Planning

Composite Water Resources Management Planning (CWRMP) designed at a National Level Workshop organised by GIZ in Feb 2020 with participation of all WASCA implementing states and approved by MoRD and MoJS.

The principles of CWRM are based on national and internationally approved approaches on Four Waters, approaches set under Sustainable Development Goal number 6 and Nationally Determined Contributions (NDCs) on Climate Change, namely Integrated Water Resources Management (IWRM) principles, for which Indian Government is also a signatory. There are three stages for CWRM Planning for WASCA based on above national and international approaches:

1. Developing Plans at lowest administrative level: GP level plans
2. Integrating GP level plans at Block level
3. Integrating GP plans at Watershed and Sub-basin (Catchment) level on natural resources
4. Integrating GP plans to develop WASCA District CWRM Plan

- The CWRM Plan comprises of analysing of both spatial and non-spatial data. Spatial data is taken from open source (Bhuvan – NRSC) and Non-spatial data from published data of government of India as well as data from the records of the respective state, district and GPs information.
- The non-spatial data including socio-economic, bio-physical and hydrological data to identify the key water challenges. While analysing key water challenges both water supply and side sources have been taken in to consideration and arrived at a GP based water budgeting.
- Identification of Key water challenges,
- Identification of location specific actions
- Results are developed on the identified to augment the water resources and promoting efficient use for a positive water budget.
- Baseline for assessing the impact

Table No: 2.2 Details of the Non-spatial datasets used

S.N.	Climate Vulnerability Area	Key Variables used in analysing the key water challenges
(1)	(2)	(3)
1	Socio-economic	1) Demography from Census and 2) SECC data for identifying vulnerable population
		3) Active Job Cards and expenditure in MGNREGA
		4) Drinking water demand
		5) Grey water management
2	Climate	1) Identification of the Agro-ecological and Agro-climatic zones as a larger level characteristic of the region at the regional level along with sub basin
		2) Understanding the climate trends –in the past 30 years as well as last year (2018-19) on Annual Rainfall, Maximum and Minimum Temperature
3		1) Watershed profile including the natural drainage lines

	Water resources (Hydrological)	2) Existing Water Recharge or Storage structures – Tank system details and canal network
		3) Status of the ground water
		4) Run-Off estimation
		5) Water Demand estimation – Sources, Use, Demand for human use, agriculture, livestock etc from primary and secondary sources
		6) Water budgeting
4	Agriculture and Allied sectors	1) Soil profile – macro and micro nutrients, physical properties as well as soil texture
		2) Land use classification
		3) Agriculture – Cropping pattern
		4) Livestock
		5) Irrigation Profile

Table No: 2.3.Spatial Data utilised in CWRM Planning

No	Thematic Layer	Description	Relevance
(1)	(2)	(3)	(4)
1	Satellite map	The aerial view from satellite in True Colour Composite gives a real time picture of any geographic area. The landforms and its characteristics can be easily visualised and provide objective understanding of the context	The satellite image provides the overview of the village, how the habitations and other land use forms are distributed within the total geographical area of the village
2	Location map and Hybrid map	The map shows about the location in which the GPs is present in the district	It provides the geographical area of the GP and its location in the district.
3	Soil erosion map	The erosion map shows the soil erosion capacity with respect to rainfall, soil physical properties, terrain slope, land cover.	It provides the soil capacity of erosion. Based on this map , the improvement of soils activities can be taken. For instance, if the GP has sheet erosion, it shows that the region is going to erode vastly. So the steps can be taken to arrest further erosion.
4	Wasteland map	The map shows the available wasteland in the GP which can be used for any restoration or plantation.	The wastelands can be used to raise the Mini forest plantation or any other greenery activities in the GP

No	Thematic Layer	Description	Relevance
5	Land use Land cover	The map shows the actual Land use and their land cover of the GP which will be useful for the planning. The land coverage that includes unused or barren lands is called land cover. However, land use shows nature human interaction such as settlements, road networks, crop land, mining and irrigation networks, etc.	The land use pattern affects all parameters as the run-off, rate of erosion, etc. are affected by the state of land use. The information of the existing land use and land cover helps the decision maker in choosing the type, mode and site of activities. The barren areas can be made productive by terracing and plantation. The vegetation cover indicates the status of infiltration and nature of erosion. Vegetation reduces the peak flow.
6	Salt Affected Area map	The map shows the regions which are salt affected. While planning the GP, this area can be treated specially and give alternative cropping or any other steps to reduce the Salinization. Salinization can result from improper management of canal irrigation water, resulting in rise of water table and consequent accumulation of salt in the root zone in arid, semi-arid and sub- humid (dry) conditions. It also results due to sea water ingression in coastal regions and/or use of high-salt containing ground water. Salt- affected soils have been identified as one of the main hurdles against crop production.	Assessment of salt-affected and water-logged areas is an important prerequisite for planning reclamation and improving land productivity. Salinity can be controlled in some situations once the specific causes are understood. In the recharge area, improved drainage and water-efficient crop management practices will reduce the amount of water that enters the groundwater system. In the discharge area, where salinity appears, it is important to enhance the vegetative cover.
7	Geomorpholo gy map	This map is the graphical inventories of a landscape depicting landforms and surface as well as subsurface materials. It determines the character of soil, vegetation, water percolation and land cover. Geomorphology deals with landforms which help in understanding erosion processes and hazards. The geomorphology of this area is very conspicuous and guided by the composition of the rocks. There are four major divisions in geomorphology i.e. structural hill, denudation hill, pediment, alluvial plain and aeolian plain. Structural hills are formed as the result of regional deformation.	Suitability of any intervention will have definite influence on geomorphological conditions. Hence, it needs to be closely examined. Geo morphology determines character of soil, vegetation, water percolation and land cover. The geomorphic and geologic conditions guide us to undertake appropriate work in a particular location to reap maximum benefits.
8	Ground water prospectus	It provides the required information on geological parameters connected to ground water exploration and the probable ground water prospects.	The map helps to identify the prospective Ground Water Zones for conducting site specific investigations. The map helps in identification of sites for planning recharge structures to address

No	Thematic Layer	Description	Relevance
			water scarcity in a more effective manner. The map facilitates identification of prospective groundwater zones for systematic selection of appropriate sites for drilling. The map also reveals the stage of groundwater development and scope of extracting groundwater for critical purposes. Groundwater map plays an important role as it examines suitability of proposed actions in a particular location and determines expected outcomes. Through analysis of this map, the decision maker can provide inputs on suitable sites and structures
9	Lineament	A lineament map shows the linear feature in a landscape that is an expression of an underlying geological structure such as a fault, fracture, or joint. The structural features are useful to make decisions to decide the suitable water conservation, harvesting and recharge measures.	As Lineament decides the runoff percentage, it is an important parameter to be considered for artificial recharge structures. If the density is higher there is a good scope for ground water recharge, if not focus should be mostly on the surface storage measures.
10	MGNERGA works map	This map shows the MGNERGA works carried out in the GP	This will be useful to understand the past works and to propose the future works to avoid duplication.
11	Watershed map	It shows how the micro watersheds are distributed in the village geographical area	Adopt the watershed approach. For GP level planning, it is important to analyze the relationship between administrative boundaries and natural boundaries and plan accordingly to harmonize both the scalers: The micro-watershed boundaries explain the extent and run-off characteristics in given conditions.The drainage lines and the size of the watershed reveal the kind of interventions that need to be undertaken The map guides the prioritization of interventions based on ridge to valley concept and sequencing the plan accordingly
12	Drainage (base hydrology) map	The drainage patterns and texture seen on images are good indicators of landform and bedrock type. For example, dendritic drainage patterns are the most common drainage pattern found in nature. The drainage pattern indicates the water flow direction. As the water flows from higher to lower level, the contour helps us in marking the uplands from where the water flows and lowlands where water accumulates.	Since the drainage directly affects the run-off, infiltration and land management condition: The drainage map shows the drainage order, pattern and destiny It also shows spread and extent of surface water bodies Different water harvesting structures are suitable for different drainage orders. For instance, temporary check dams are put on mall streams and larger or permanent gabion structures are suitable for rivers (See Annexure).
13	Terrain Map	A terrain map shows an area of land divided into terrain map units defined by similar elevation, slope, landform	This map will be useful to understand the terrain of the project area to identify the water and soil conservation related activities.

No	Thematic Layer	Description	Relevance
14	Contour map	Contour map is also called as a topographic map which shows the elevation of land on a flat paper surface.A contour map is illustrated with contour lines which shows valleys and hills, and the steepness or gentleness of slopes. The contour interval of a contour map is the difference in elevation between successive contour lines.	The contour map plays a vital role in planning and identifying the recharge structures, farm ponds
15	Slope map	Slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. Slope is typically expressed as a percentage, an angle, or a ratio. The average slope of a terrain feature is calculated from contour lines on a topo map or DEM	The slope map will be used for analysing the soil conservation measures and construction of the water recharge structures such as check dam, farm ponds etc.,

2.3 The Key themes of WASCA TN, relevant illustrative indicators and measures

The above non-spatial data and spatial data helps to identify the key water challenges and identify the appropriate actions to augment the supply and managing the demand. The action areas are broadly categorised in to four and the key indicators and expected outcomes are given in table 2.4.

Table 2.4. The Key themes of WASCA TN, indicators, measures

S.N.	Climate Vulnerability Area	WASCA CWRM Action Plan	Indicator	Measure
(1)	(2)	(3)	(4)	(5)
1	Climate vulnerability	Climate Resilient and Adaptation	Varies based on the kind of hotspot area (Area of Interest)	Pilot models showing the climate resilient models in the sub- basin
2	Water	Development of degraded, Public lands	1) Number of water bodies ready for use in the village 2) Quantum of water harvested/recharge 3) Proportion of land is treated 4) Reduction in the annual runoff percentage 5) Area under afforestation	Total quantum of water harvested and green cover

S.N.	Climate Vulnerability Area	WASCA CWRM Action Plan	Indicator	Measure
(1)	(2)	(3)	(4)	(5)
3	Agriculture	Production Systems Enhancement (Agriculture and allied sector development)	1) Baseline data for agriculture crop requirement and major crops 2) Identification of areas for implementing water use efficiency 3) Identify intervention areas for bringing in water use efficiency with climate resilience 4) Water requirement for livestock is assessed 5) Special site-specific works for meeting the water demands for livestock are identified for demonstration.	Additional area brought under productive use with climate resilience and also livestock production
4	Socio Economic	Rural Infrastructure	1) No of water bodies and streams freed from waste dumping 2) No of Villages having complete solid and liquid waste management systems 3) Creating additional employment opportunities to strengthen the rural livelihoods of vulnerable population	Establishment of systems for grey water management and Creating additional person days for additional employment opportunities

2.4 Steps in CWRM planning under WASCA in Tamil Nadu

1. Pre-Planning Stage

a. Categorizing Villages for planning as per MGNREGS guidelines

b. Identification of GP, Block, District officers for planning facilitation

c. Capacity Building and district specific CWRM frame work and indicators suitable to the terrain and geography

d. Identification of Phases for planning (4 GP Plans per block) as per DLSC and SLSC

2. Planning Stage:

a. Collection on Non-Sptial Data as per MoRD guidelines and CWRMP

b. Collection of Spatial as per MoRD guidelines and CWRMP

c. Water Budget Estimation (CWRMP)

d. Conducting district specific studies on Ground Water Assessment as per CWRM

e. Inclusion on Non-NRM activities under MGNREGS with CWRMP

f. Identification of Key Water Challenges - CWRMP

g. Identification of Key Water Actions- CWRMP

3. **Review and Verification Stage:**

a. Matching spatial data as per MGNREGA- MoRD guidelines on GIS based planning

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

c. Regular review on progress at all levels

4. **Integration and Approval Stage:**

a. Preparation of Integrated plans (Block, Watershed)

b. District Level WASCA Plan

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

d. Approval of District plan at DLSC

Chapter 3
Analysis of Composite Water Resources Management Plan - Ramanathapuram

3.1 Socio-Economic Vulnerability Area

3.1.1 Population and household information

The district has the total population of 9.42 Lakhs, of which the proportion of men and women are almost equal. While the SC and ST populations are socio-economically in the lower rung, considered as vulnerable categories. In this district about 22 percent of the total population are under this category proportionate to the number of GPs in the block and population as well (Table 3.1).

Table 3.1. Block wise Population and Household Information

S.No	Name of the block	Total Population			Total House Holds	Category wise Population		
		Female	Male	Total		SCs	STs	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	Bogalur	24479	25215	49694	14206	18,816	1	18,817
2	Kadaladi	75024	76039	151063	45811	24002	12	24014
3	Kamudi	57652	58970	116622	36770	27020	0	27020
4	Mandapam	62085	62666	124751	111725	4255	30	4285
5	Mudukulathur	37266	36928	74194	29110	21286	5	21291
6	Nainarkoil	21950	21666	43616	15816	10098	2	10100
7	Paramakkudi	33520	34501	68021	27327	23736	72	23808
8	R S Mangalam	38333	37653	75986	20552	19676	50	19726
9	Ramanathapuram	30631	31126	61757	20604	18680	166	18846
10	Tiruppullani	38118	39918	78036	39422	21029	1	21030
11	Tiruvadanai	49180	49826	99006	29407	16730	162	16892
	Total	**468238**	**474508**	**942746**	**390750**	**205328**	**501**	**205829**
	Percentage to the total population	**49.63 %**	**50.47 %**			**22 %**	**0.05 %**	

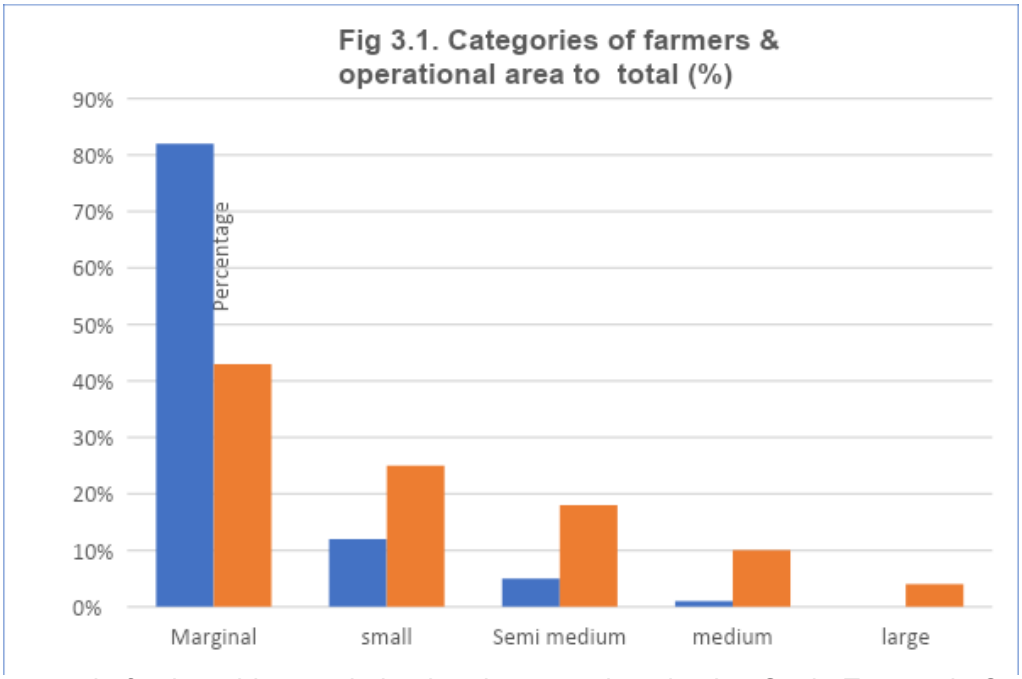
Source: Census of India, 2011

In addition to the SC and ST population, the district has highest number of farmers under marginal category (82%) owning less than one ha of land. This is 43 % of the total land in the district. Also, of the total holdings only 13% are from SC and ST communities (Table 3.2).

3.1.2. Proportion of Marginal farmers and operational holdings in the district

Table 3.2 Marginal farmers and operation holding

	All- Total Holdings		% to the total for all		SC- Total Holdings		ST- Total Holdings	
Category	Number	Area (Ha)	Number	Area	Number	Area (Ha)	Number	Area (Ha)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Marginal	275785	95453	82%	43%	37239	13385	4	2
small	40030	55662	12%	25%	4752	6533	0	0
Semi medium	15319	41275	5%	18%	1473	3949	0	0
medium	3948	22170	1%	10%	244	1323	0	0
large	489	9786	0%	4%	18	437	0	0
Total	335571	224346	0	0	43726	25627	4	2
Source: Agriculture Census 2015-16								



Besides, extend of vulnerable population has been analysed using Socio Economic Caste Census (SECC, 2011) data sets, with the categories of Female Headed Households and households with one room as an priority categories (as proxy indicators) to define the vulnerability for gender and poverty. According to this assessment nearly 29% of the households are highly vulnerable. The block Kamudi has the highest percentage of the most vulnerable households and Mudukulathur has the least percentage (11%)(Table 3.3).

Table 3.3. Proportion of vulnerable households - SECC data

S.No	Name of the block	Total Households	Female headed households	No of HHs with one room with kutcha wall and roof	vulnerable Households (Composite value of 30% FHH and 70% of house with one room)	Percentage of vulnerability
1	Bogalur	14206	2604	6905	5615	40%
2	Kadaladi	45811	7805	18123	15028	33%
3	Kamudi	36770	6398	26587	20530	56%
4	Mandapam	111725	6655	16661	13659	12%
5	Mudukulathur	29110	1951	3863	3289	11%
6	Nainarkoil	15816	2467	6542	5320	34%
7	Paramakkudi	27327	3609	9570	7782	28%
8	RS Mangalam	20552	3224	7874	6479	32%
9	Ramanathapuram	20604	3545	6620	5698	28%
10	Tiruppullani	39422	4416	8246	7097	18%
11	Tiruvadanai	29407	4052	9791	8069	27%
Total		**390750**	**46726**	**120782**	**98565**	**29%**
Source: Socio-Economic Caste Census- 2011						

3.1.3. Status of Mahatma Gandhi NREGA

In the district, of the total population of 9,42,746 persons, 32.35% are registered for job cards in MGNREGA scheme. Among the registered job card holders, 75% of the job cards are in active category (Fig 3.2). With reference to the expenditure, the amount incurred during 2018-19 is 3.35 times higher than the expenditure spent in the past years since its inception. The expenditure incurred is high in Kadaladi block and low in Ramanathapuram block

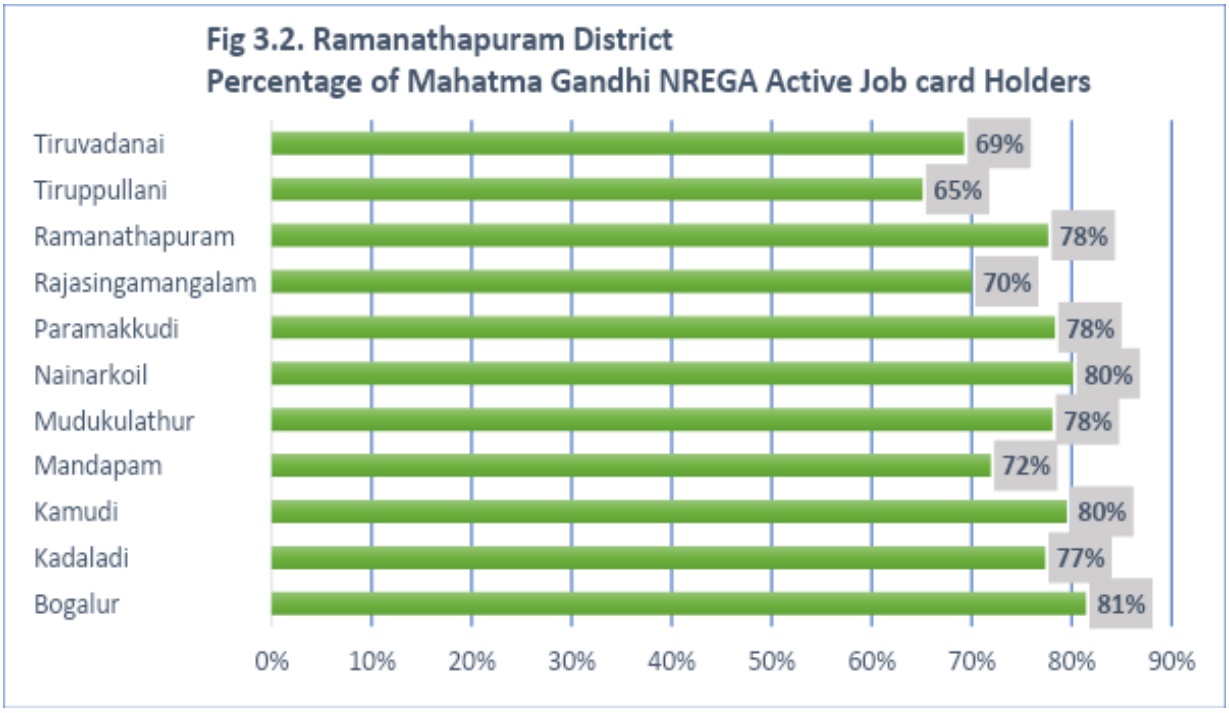
(Table 3.4).

Table 3.4 Block wise details of MGNREGA Job card Holders and expenditure

Sl. No	Name of the block	Registered Job cards		Active Job Cards		Expenditure Since Inception (in lakhs)	Expenditure 2018-19 (in lakhs)
		HHs	Person	HHs	Person		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Bogalur	10,400	12,866	9,464	10,478	993	3,209
2	Kadaladi	37,360	53,031	32,185	41,026	2,571	9,375
3	Kamudi	27,017	39,869	24,039	31,708	1,982	5,559
4	Mandapam	18,684	22,099	14,811	15,893	1,203	3,916
5	Mudukulathur	24,676	34,925	22,346	27,271	1,498	5,426
6	Nainarkoil	12,514	16,821	11,549	13,484	1,190	3,887

Sl. No	Name of the block	Registered Job cards		Active Job Cards		Expenditure Since Inception (in lakhs)	Expenditure 2018-19 (in lakhs)
		HHs	Person	HHs	Person		
7	Paramakkudi	18,663	25,123	16,759	19,681	1,629	4,999
8	R S Mangalam	16,737	24,154	14,705	16,914	1,226	4,652
9	Ramanathapuram	14,811	17,798	12,827	13,823	953	2,869
10	Tiruppullani	19,195	26,158	15,153	17,029	1,196	3,828
11	Tiruvadanai	24,031	32,224	19,877	22,317	1,608	6,082
	Total	**224088**	**305068**	**193715**	**229624**	**16049**	**53803**

Source: http://mnregaweb4.nic.in/netnrega/MISreport4.aspx



3.1.4. Estimation of Annual Grey Water Generation

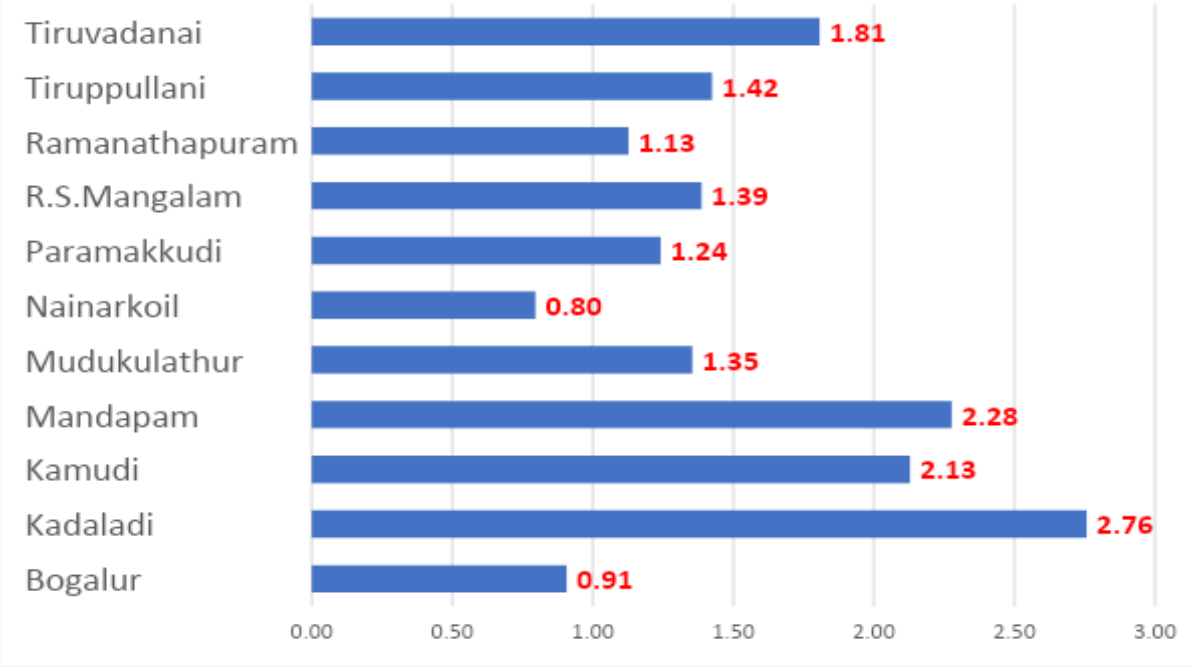
The grey water generation estimated across the GPs indicated that 1720.51 Ha M is being available for reuse or recycle. Also, data was collected on the status of safe disposal of the grey water for recycle/reuse at the GP level which is necessary for the liquid waste management systems in rural areas (Table 3.5 and Fig 3.3).

Table 3.5 Estimated Annual grey water generation

S. No	Name of the Block	Annual Grey water generated in HaM	Annual Grey water generated in MCM
(1)	(2)	(3)	(4)
1	Bogalur	90.69	0.91

2	Kadaladi	275.69	2.76
3	Kamudi	212.84	2.13
4	Mandapam	227.67	2.28
5	Mudukulathur	135.40	1.35
6	Nainarkoil	79.60	0.80
7	Paramakkudi	124.14	1.24
8	R.S.Mangalam	138.67	1.39
9	Ramanathapuram	112.71	1.13
10	Tiruppullani	142.42	1.42
11	Tiruvadanai	180.69	1.81
Total		1720.51	17.21
Source: WASCA – CWRM- TN- Ramanathapuram Plan, 2020-21			

Fig 3.3. Estimation Annual Greywater Generated in MCM



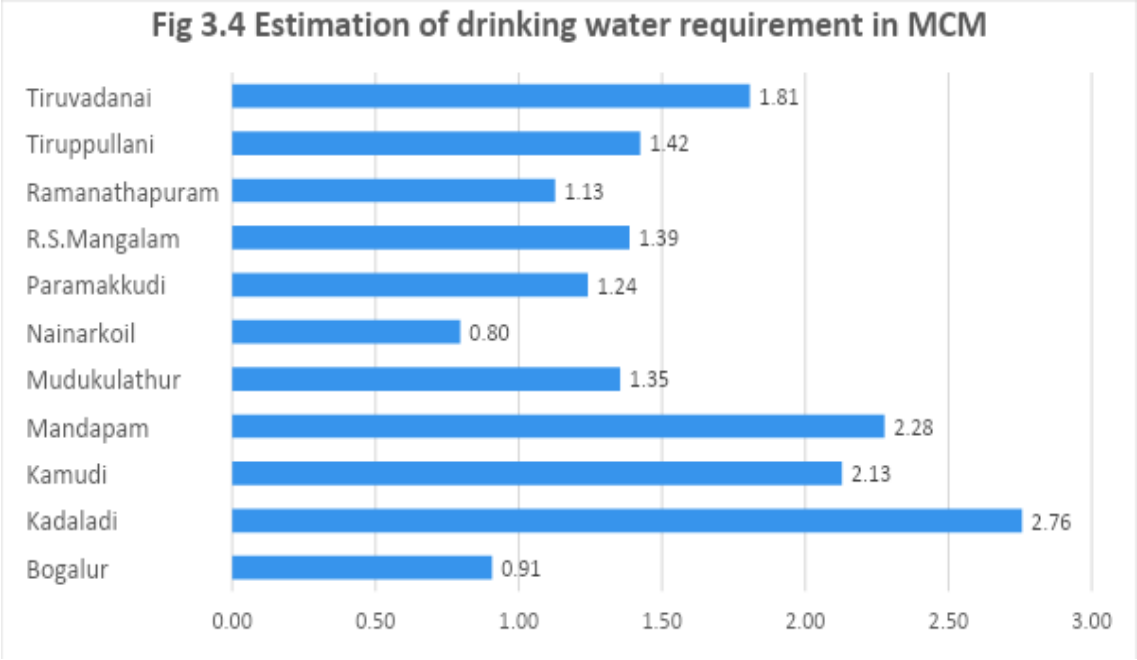
3.1.5 Drinking Water Status

The drinking water requirement to the total population is 3459.4 Ha m, of this 86% is met through ground water resources and remaining 14% is met by surface water sources (Table 3.6 and Fig 3.4).

Table 3.6. Drinking water demand in HaM and the proportion of the sources of drinking water

Sl. No	Block	Total Drinking water Annual Demand (HaM)	Percentage of Ground Water (in %)	Percentage of Surface Water (in %)
(1)	(2)	(3)	(4)	(5)
1	Bogalur	157.23	89%	11%
2	Kadaladi	502.65	89%	11%
3	Kamudi	366.80	77%	23%

4	Mandapam	487.96	98%	2%
5	Mudukulathur	302.88	92%	8%
6	Nairnarkoil	160.96	67%	33%
7	Paramakudi	294.28	84%	16%
8	R.S.Mangalam	231.75	91%	9%
9	Ramanathapuram	233.51	82%	18%
10	Tiruppullani	378.87	95%	5%
11	Tiruvadanai	342.49	86%	14%
	Total	3459.40	86%	14%
Source: WASCA - CWRM- TN- Ramanathapuram Plan, 2020-21				



3.2 Climate Vulnerability Area (rainfall and maximum and minimum temperature)

The climatic profile considered for the analysis is at the district scale. The monthly average rainfall of last 30 years and 2018-19 monthly rainfall and maximum and minimum temperature are the primary climatic parameters used in the analysis. The annual normal rainfall and annual actual rainfall of the Ramanathapuram district are 821 mm and 473 mm respectively and the average annual mean temperature of the is 30 °C (Table 3.7 and 3.8). Within the rainfall, number of rainy days and its distribution within the given season plays a crucial part in both water storage and efficient use for productive purposes. More than 67% of the cultivated land is under rainfed condition, efficient water storage and use practices are crucial here.

Table 3.7. Monthly Rainfall - Monthly Normal Rainfall and Actual Rainfall(mm)

S.N	Month	Normal rainfall	Actual Rainfall
(1)	(2)	(3)	(4)
1	Jun-18	14	12.88
2	Jul-18	29.9	9.18
3	Aug-18	41.3	20.73
4	Sep-18	50.9	28.64
5	Oct-18	180.5	228.16
6	Nov-18	193.6	148.76
7	Dec-18	133.3	15.69
8	Jan-19	35.3	0
9	Feb-19	18.6	0.2
10	Mar-19	28.3	0
11	Apr-19	55.9	5.63
12	May-19	39.6	2.74
	Total	821.2	472.61

Source: WRIS, CWC, MoJS, GoI, https://indiawris.gov.in/wris/

Table 3.8. Monthly maximum and minimum temperature (mm)

S.N	Month	Minimum Temperature in °C	Maximum Temperature in °C	Average Temperature in °C
(1)	(2)	(3)	(4)	(5)
1	Jun-18	27.3	34.8	31.05
2	Jul-18	27.5	36.3	31.9
3	Aug-18	26.3	35.3	30.8
4	Sep-18	26.2	35.2	30.7

5	Oct-18	25	31.9	28.45
6	Nov-18	23.5	30.9	27.2
7	Dec-18	23.1	31.2	27.15
8	Jan-19	20.9	31.1	26
9	Feb-19	24.8	33.5	29.15
10	Mar-19	26.6	35.6	31.1
11	Apr-19	28.1	36.9	32.5
12	May-19	28.6	36.4	32.5
	Total	**307.9**	**409.1**	**358.5**
Source: WRIS, CWC, MoJS, GoI, https://indiawris.gov.in/wris/				

The climate projection study carried out by the CCCDM, has indicated that there has been changes in the maximum and minimum temperature as well as rainfall quantity compared the annual normal (1970-2000) of the district.

3.2.1 Maximum temperature

The maximum temperature, the annual normal value of the district is 31.8°C, The average maximum temperature range in the district is predicted to 1.83°C-2.51 °C mid of the century. For End- century, this increase would be of 2.71 ° C-3.73 °C (Fig 3.5 and Table 3.9).

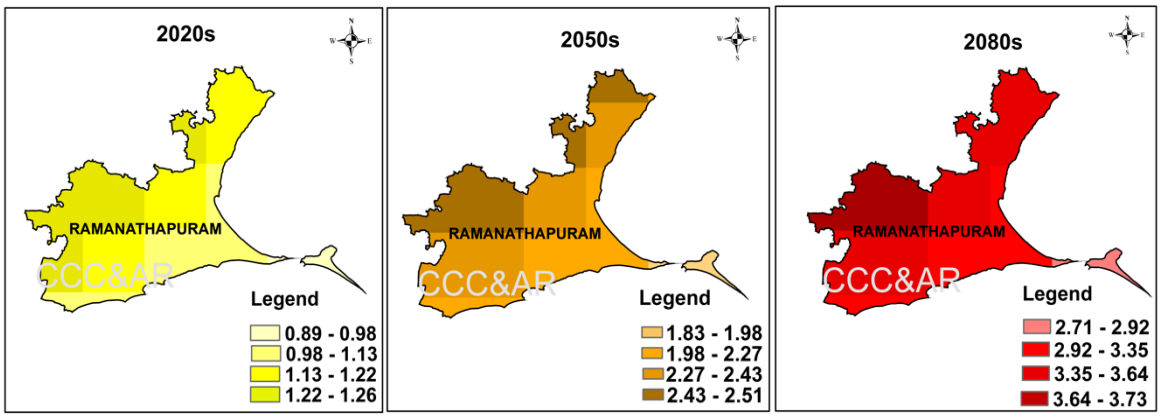


Fig 3.5 Projected Future changes in Annual Maximum Temperature by PRECS, Reginal climate model projections for Mid and End Century with Base line of 1981-2010 for Ramanathapuram District

Source: Scoping Study, CCCDM, Anna University for WASCA-TN, GIZ, Nov 2019)

Table 3.9. Projected Future Changes in Annual Maximum Temperature by PRECIS, Reginal climate model projections for Mid and End Century with Base line of 1981-2010 for Ramanathapuram District

Projection year with respect to baseline	Projection period	Maximum Temperature (projected)
2020	2010-2040	0.89°C -1.26°C
2050	2040-2070	1.83°C - 2.51°C
2080	2070-2100	2.71°C - 3.73°C

Source: Scoping Study, CCCDM, Anna University for WASCA-TN, GIZ, Nov 2019)

3.2.2 Minimum temperature

While for the minimum temperature, the annual normal value of the district is 25.2**°C.** The average minimum temperature in the district is predicted to 1.56°C-2.20 °C mid of the century. For End- century, this increase would be of 2.39 ° C-3.23 °C (Fig 3.6 and Table 3.10).

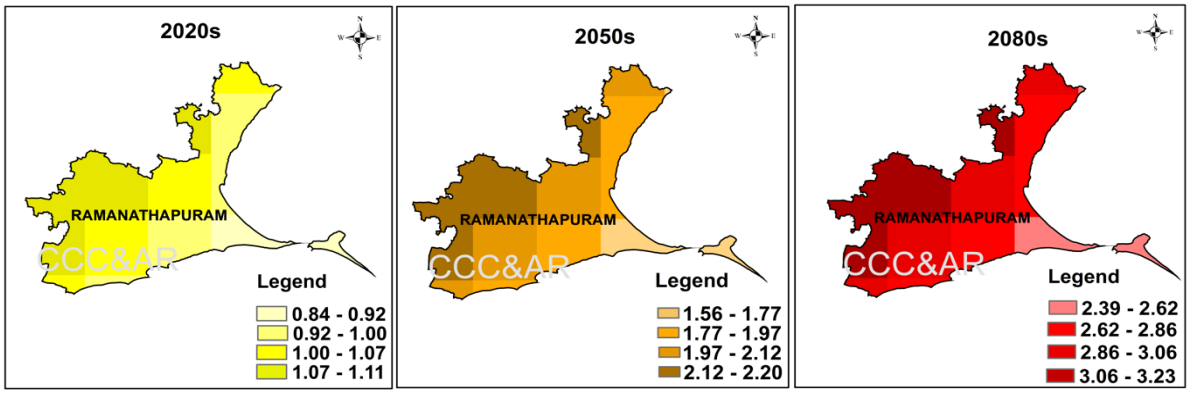


Fig 3.6 Projected Future Changes in Annual Minimum Temperature by PRECIS, Reginal climate model projections for Mid and End Century with Base line of 1981-

Source: Scoping Study, CCCDM, Anna University for WASCA-TN, GIZ, Nov 2019)

Table 3.10. Projected Future Changes in Annual Minimum Temperature by PRECIS

Projection with respect to baseline (projection Period)	Minimum Temperature (projected)
2020 (2010-2040)	0.84°C -1.11°C
2050 (2040-2070)	1.56°C -2.20°C
2080 (2070-2100)	2.39°C -3.23 °C

Source: Scoping Study, CCCDM, Anna University for WASCA-TN, GIZ, Nov 2019)

3.2.3 Rainfall

The annual rainfall of the district is 821mm, the estimated projections for the period is there will be an increase in 1% rainfall in both the century (Mid and End) (Fig 3.7 and Table 3.11)

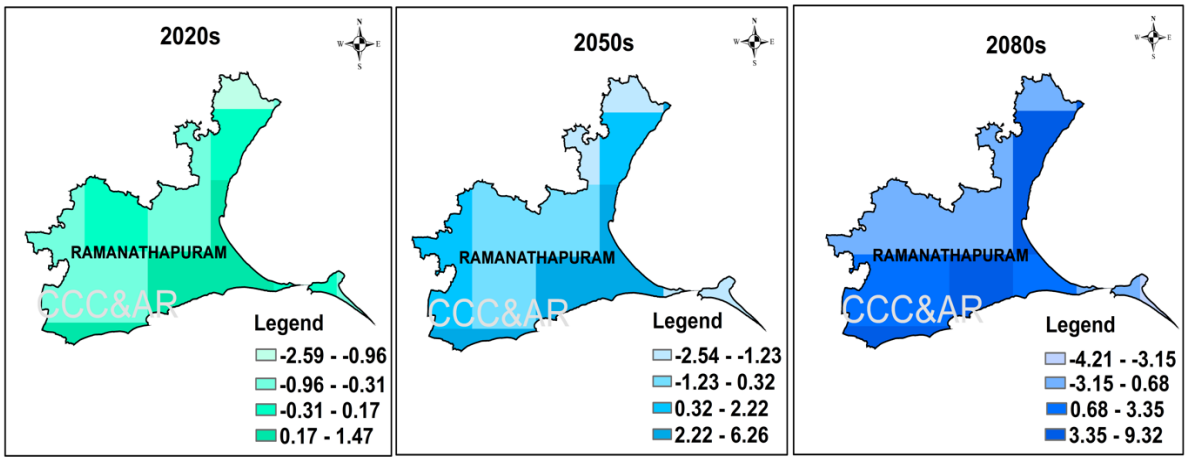


Fig 3.7. Projected Future Changes in Annual Average rainfall by PRECIS, Reginal climate model projections for 2020, Mid and End Century with Base line of 1981-

Source: Scoping Study, CCCDM, Anna University for WASCA-TN, GIZ, Nov 2019

Table 3.11.Projected Future Changes in Annual Average rainfall by PRECIS, Reginal climate model projections for 2020, Mid and End Century with Base line of 1981-2010 for Ramanathapuram District

Projection with respect to baseline (projection Period)	Average Annual Rainfall (Projected)
2020 (2010-2040)	+0.1%
2050 (2040-2070)	+ 1.0%
2080 (2070-2100)	+1.0 %

Source: Scoping Study, CCCDM, Anna University for WASCA-TN, GIZ, Nov 2019)

3.3 Agriculture and Allied sectors

Agriculture is the primary livelihood for more than 50% of the households in addition to livestock resources. Water is the critical component for farming and north east monsoon is the main growing season in which about 84% of the total rainfall is received.

3.3.1 Soil resources

The predominant soil type is clay occupying 45% of the total cultivated area of the district followed by coastal alluvial soil to an extend of 17% in the northern part of the district (17%). Remaining area is characterized by sandy loam in 15% of the total area. The detailed analysis of its physical and chemical properties indicates that the poor soil health status.

3.3.2 Soil Analysis – Macronutrients

The macro soil nutrients such as nitrogen and phosphorus are very low to medium category in the total number of soil samples tested, while potassium is medium to high. Also, the content of the organic carbon also ranges between very low to low category. This indicates that the soil fertility is very poor and further intensive practices make soil more vulnerable to soil erosion and land becomes degraded over a period of time.

Table 3.12. Percentage of the soil samples tested for soil available Nitrogen(N)

S.No.	Block	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Bogalur	72%	28%	0.17%	0.04%	0.04%
2	Kadaladi	6%	83%	10.40%	0.27%	0.07%
3	Kamudi	22%	57%	19.48%	1.27%	0.73%
4	Mandapam	16%	69%	10.56%	0.80%	4.11%
5	Mudukulathur	57%	40%	2.19%	0.61%	0.09%
6	Nainarkoil	58%	41%	1.11%	0.33%	0.07%
7	Paramakkudi	43%	55%	2.57%	0.07%	0.02%
8	R.S.Mangalam	12%	81%	7%	0%	0%
9	Ramanathapuram	45%	52%	2.06%	0.47%	0.24%
10	Tiruppullani	44%	42%	13.00%	0.77%	0.19%
11	Tiruvadanai	11%	73%	14.82%	0.65%	0.32%
Total		**31%**	**35%**	**56%**	**8%**	**0%**

Table 3.13. Percent of the soil samples tested and reported for the different categories of available Phosphorus(P)

S.no	Block	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Bogalur	7%	16%	55%	13%	9%
2	Kadaladi	5%	63%	31%	1%	0%
3	Kamudi	6%	28%	35%	20%	11%
4	Mandapam	25%	58%	12%	5%	0%
5	Mudukulathur	44%	16%	26%	7%	7%
6	Nainarkoil	39%	28%	27%	1%	4%
7	Paramakkudi	30%	47%	23%	0%	0%
8	R.S.Mangalam	12%	45%	43%	0%	0%
9	Ramanathapuram	26%	44%	29%	0%	0%
10	Tiruppullani	57%	7%	19%	7%	10%
11	Tiruvadanai	9%	63%	26%	2%	1%
Total		**21%**	**24%**	**38%**	**30%**	**5%**

Table 3.14. Percent of the soil samples tested and reported for the different categories of Potassium(K)

S.no	Block	Very Low (VL)	Low (L)	Medium (M)	High (H)	Very High (VH)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Bogalur	1%	5%	17%	20%	57%
2	Kadaladi	2%	18%	35%	17%	28%
3	Kamudi	7%	28%	38%	11%	16%
4	Mandapam	16%	19%	2%	24%	39%
5	Mudukulathur	5%	11%	42%	17%	25%
6	Nainarkoil	1%	19%	29%	6%	44%
7	Paramakkudi	5%	22%	32%	20%	21%
8	R.S.Mangalam	1%	15%	39%	26%	19%
9	Ramanathapuram	1%	11%	48%	5%	34%
10	Tiruppullani	12%	50%	9%	9%	20%
11	Tiruvadanai	1%	20%	50%	17%	12%
Total		**5%**	**20%**	**31%**	**16%**	**29%**

Source: https://soilhealth.dac.gov.in/NewHomePage/NutriPage

3.3.3 Soil Analysis – Status of the soil micronutrients

The micronutrient status of the soil with specific reference to Zinc and Boron are deficient in more than 58 to 85% of the soils tested. Similarly, the soils were deficit in Boron content to a range of 77-94%. Remaining other nutrients such as Fe, Cu, Mn and S are sufficient in the soil.

Table 3.15. Status of the soil Micro Nutrients Status - Block Wise

Soil Deficiency in terms of Nutrients in							
Sr.No	Block	Zn	Fe	Cu	Mn	B	S
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Bogalur	62%	22%	5%	7%	89%	12%
2	Kadaladi	58%	13%	7%	12%	83%	12%
3	Kamudi	75%	9%	8%	7%	84%	18%
4	Mandapam	66%	20%	5%	13%	82%	19%
5	Mudukulathur	70%	20%	6%	4%	84%	13%
6	Nainarkoil	69%	24%	5%	5%	95%	2%
7	Paramakkudi	69%	17%	2%	6%	97%	3%
8	R S Mangalam	80%	7%	3%	7%	77%	13%
9	Ramanathapuram	66%	15%	2%	4%	91%	4%
10	Tiruppullani	69%	35%	6%	17%	94%	11%
11	Tiruvadanai	85%	11%	9%	8%	84%	15%

	Total	71%	16%	5%	8%	86%	12%

Source: https://soilhealth.dac.gov.in/NewHomePage/NutriPage

3.3.4 Physical parameters – pH status

With reference to the physical parameters, more than 70% of the soils are moderately acidic to moderately alkaline in nature.

Table 3.16. Physical condition of the soil in terms of its pH value

Source: https://soilhealth.dac.gov.in/NewHomePage/NutriPage

S. No	Block/ Mandal	AS	SrAc	HAc	MAc	SlAc	N	MAl	SlAl
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	Bogalur	0.59%	0.24%	0.84%	4.08%	7.28%	1.01%	6.29%	3.81%
2	Kadaladi	1.78%	0.94%	6.51%	7.43%	9.20%	63.70%	11.96%	2.09%
3	Kamudi	43.70%	4.01%	6.51%	10.57%	8.51%	9.36%	10.50%	6.97%
4	Mandapam	32.15%	3.30%	9.07%	8.36%	6.75%	1.14%	6.37%	3.01%
5	Mudukulathur	13.33%	0.94%	2.19%	6.75%	11.35%	3.30%	14.14%	20.67%
6	Nainarkoil	1.63%	0.47%	1.25%	2.00%	6.04%	2.69%	11.57%	8.34%
7	Paramakkudi	1.19%	6.13%	1.43%	4.15%	7.80%	2.36%	9.26%	26.23%
8	R S Mangalam	1.04%	6.13%	36.68%	20.57%	12.35%	3.43%	6.87%	0.42%
9	Ramanathapuram	1.19%	2.83%	1.14%	2.43%	2.60%	1.89%	8.95%	14.31%
10	Tiruppullani	1.19%	2.12%	1.61%	4.77%	5.56%	2.36%	8.05%	7.35%
11	Tiruvadanai	2.22%	30.19%	32.77%	28.88%	22.56%	8.75%	6.05%	6.81%

3.3.5 Soil types

The district has diverse soil types and predominant in vertisol and alfisol, with reference to soil texture the proportion of fine, coarse and fine loamy types are in higher in proportion (Table 3.17 and Fig 3.8).

Table 3.17 Area under different soil texture (Ha)

Sl.No	Block/ Mandal	Fine	Fine loamy	Coarse loamy	Very fine	Fine silty	Clayey	Clayey Skeletal	Contrasting Particle Size	Sandy	None
1	Bogalur	13816	1334	1097	68	32	0	0	331	0	1165
2	Kadaladi	35277	3540	6586	2333	10000	0	908	2108	314	9344
3	Kamudi	32921	8667	4800	1211	3122	0	15	1862	0	4098
4	Mandapam	17838	2291	993	0	1463	0	0	835	1621	3079
5	Mudukulathur	22400	2257	6636	1856	2697	0	0	272	0	3221
6	Nainarkoil	11673	5145	3760	2299	0	9	0	1518	78	2477
7	Paramakkudi	10773	5196	5220	2264	96	0	135	334	0	3967
8	R S Mangalam	14155	5865	5710	3478	33	0	0	1940	554	7619
9	Ramanathapuram	12614	1375	2273	9	2669	0	0	1385	2488	5812
10	Tiruppullani	17067	3405	272	0	2667	0	0	125	1016	4101

11	Tiruvadanai	13094	8070	7531	2991	0	0	137	402	644	7680
	Total	**201628**	**47145**	**44878**	**16509**	**22779**	**9**	**1195**	**11112**	**6715**	**52563**

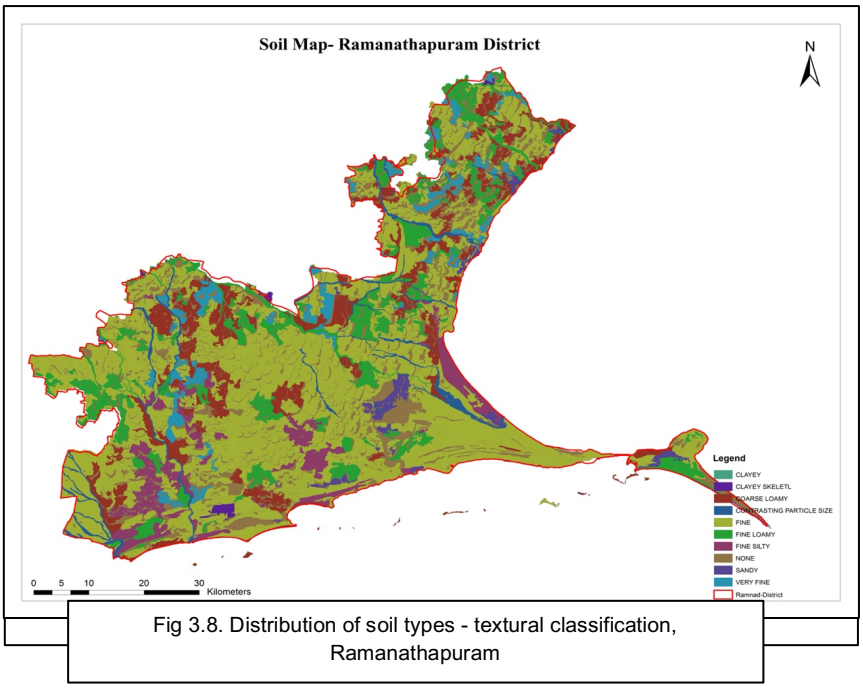
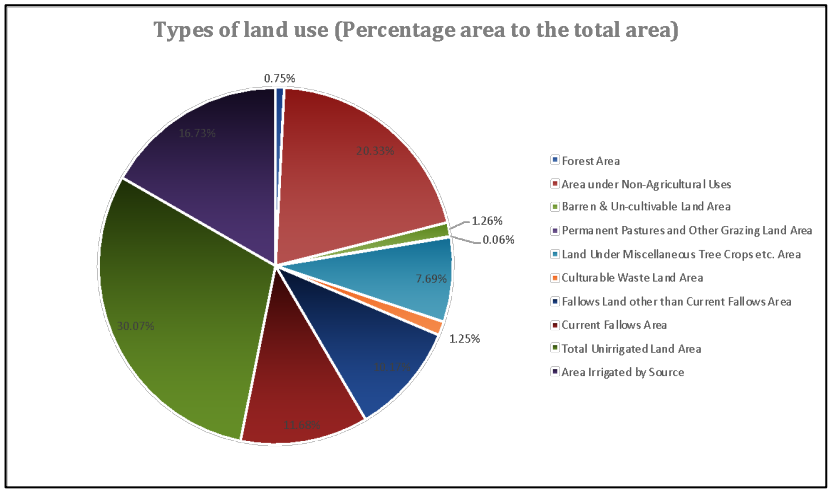


Fig 3.8. Distribution of soil types - textural classification, Ramanathapuram

3.3.6 Land Use Analysis



The standard land use classification helps to understand the distribution and the extend of different land use categories. As the runoff and water harvesting actions are linked to the land use systems, its distributions across the geographical boundary (GP/block/watershed/sub-basins) are necessary to take the decisions. The table 3.18 shows the area under different land uses. From the table 3.18 and Fig 3.9 it is evident that

- 31.35 % of the land is under public and degraded land
- 68.65% of the land is under individual ownership
- Of the individual ownership land, 21.85% is under fallow land other than current fallow and the fallow land
- 46.80% of the total area is currently under cultivation.
- Under public and degraded land, the district has negligible area under permanent pastures, however the district has considerable number of small ruminants which are normally open grazed

Table 3.18 Area under different land use systems (Ha)

Name of the block	Forest Area	Area under Non-Agricultural Uses	Barren & Un-cultivable Land Area	Permanent Pastures and Other Grazing Land Area	Land Under Miscellaneous Tree Crops etc. Area	Culturable Waste Land Area	Fallows Land other than Current Fallows Area	Current Fallows Area	Total Unirrigated Land Area	Area Irrigated by Source	Total Area
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Bogalur	0	3461.37	94.47	21	1369.65	34.84	1613.28	3837.9	4025.99	3232.37	17690.88
Kadaladi	2874.4	13533.62	0	8	5706.13	1039.27	10586.57	2356.84	23396.71	9004.35	68505.89
Kamudi	0	8951.23	31	4	720.28	277.11	8422.75	11556.97	20706.72	5292.28	55962.33
Mandapam	0	6548.14	6.26	0	2011.48	646.74	56.37	4244.22	7500.94	2123	23137.13
Mudukulathur	0	5795.32	230.7	16	1297.41	481.13	2420.39	2518.53	14580.26	4906.14	32245.89
Nairnarkoil	0	6182.47	27	3	2150.81	72.53	2386.64	3733.91	6976.82	4808.13	26341.31
Paramakudi	0	7323.14	535.34	0	1999.43	235.35	2543.94	7277.72	3666.54	5593.85	29175.3
R.S.Mangalam	0	4842.41	1779.8	0	8131.59	707.62	436.59	2133.33	5068.83	4935.24	28035.39
Ramanathapuram	19.1	5836.3	418.23	3.8	288.26	400.82	5761.62	4275	9632.62	11000.09	37635.84
Tiruppullani	0	7897.01	0	0	5697.27	400.72	308.25	1455.9	6749.24	5920.74	28429.13
Tiruvadanai	19.04	8290.03	1771.1	168.33	391.98	542.32	4821.51	1788.44	14027.99	7916.46	39737.19
	2912.54	78661.04	4893.9	224.13	29764.29	4838.45	39357.91	45178.76	116332.66	64732.65	386896.28
Percentage area to the total area	0.75%	20.33%	1.26%	0.06%	7.69%	1.25%	10.17%	11.68%	30.07%	16.73%	100%

Source: Census of India, 2011

3.3.7 Area proposed under WASCA for treatment

Of the total area in the district, 19% of the total area is proposed for different actions to conserve water.

Table No 3.19 Area under different land use categories (Tenfold classification)

Sl. No	Block	Total area in Ha	Treatment under WASCA area in Ha	Area proposed for treatment in WASCA (%) to total area
(1)	(2)	(3)	(4)	(5)
1	Bogalur	17690.88	2211.9	13
2	Kadaladi	68505.89	13184.81	19
3	Kamudi	55962.33	9629.83	17
4	Mandapam	23137.13	5106.17	22
5	Mudukulathur	32245.89	4041.66	13
6	Nairnarkoil	26341.31	4784.86	18
7	Paramakudi	29175.3	4769.38	16
8	R S Mangalam	37635.84	4352.75	12
9	Ramanathapuram	28035.39	10705.21	38
10	Tiruppullani	28429.13	8795.42	31
11	Tiruvadanai	39737.19	6517.99	16
	Total	**386896.28**	**74099.98**	**19**

Source: Census of India, 2011

3.3.8 Agriculture – Cropping pattern and the irrigation

Paddy is the primary crop cultivated in 68% of the total area cultivated followed by dry chilli (8.81%), coconut (4.45%), other pulses (3.28%), Jowar (2.98%) and other crops in 8.81% of the area. Of the total crops, 42% is cultivated under irrigated condition and 58% is under rainfed cultivation. Paddy, being a predominantly cultivated, 41.06% of the area is under irrigation (Fig 3.10.) and remaining 58.94% is under rainfed cultivation. With reference to water requirement, of the total water needed for cultivation paddy consumes more than 82.12% followed by chillies(5.55%)(Table 3.20 and 3.21).

Table 3.20. Major crops and the percentage area under cultivation

Crops	% of the area to the total cultivation	Volume in Ha m irrigated	Volume in Ha m Rainfed	Total Volume in Ha M	Proportion to the total water demand (%)
(1)	(2)	(3)	(4)	(5)	(6)
Paddy	68.10%	61972	59314	121286	82.12%
Jowar	2.98%	2340	77	2417	1.64%
Other pulses	3.28%	35	1665	1700	1.15%

Cotton	2.05%	999	1387	2386	1.62%
Dry Chilli	8.81%	923	7267	8190	5.55%
Coconut	4.45%	3290	0	3290	2.23%
Other plantation	1.51%	55	1061	1116	0.76%
Other crops	8.81%	4044.82	3266.65	7311.47	4.95%

Source: CWRM- TN- Ramanathapuram Plan, 2020-21 from G returns, 2018-19, Ramanathapuram

3.3.9) Crop Water Requirements

Fig 3.10 Percentage of area under main crops and its water demand to the total Amount

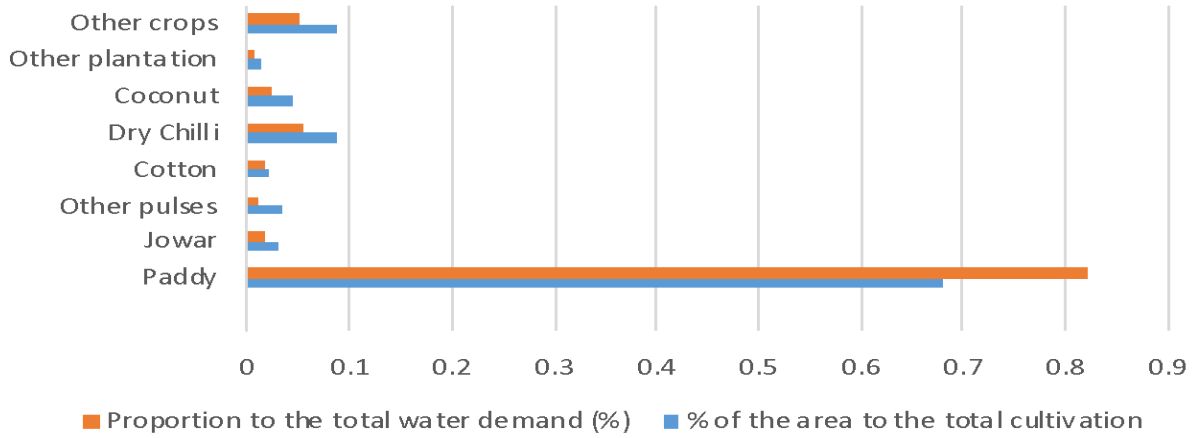


Table 3.21. Area under irrigated and rainfed cultivation and its water requirement

Sl. No	Crops	Irrigated area (Ha)	Rainfed area (Ha)	Volume in Ha m irrigated	Volume in Ha m Rainfed	Total Volume in Ha M
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Paddy	41314	59314	61972	59314	121285
2	Jowar	4255	154	2340	77	2417
3	Bajra	860	155	344	54	398
4	Maize	2104	30	1262	16	1279
5	Ragi	121	139	55	56	110
6	Minor Millets	351	58	123	17	140
7	Bengal gram	0	10	0	4	4
8	Red gram	6	11	4	7	12

Sl. No	Crops	Irrigated area (Ha)	Rainfed area (Ha)	Volume in Ha m irrigated	Volume in Ha m Rainfed	Total Volume in Ha M
9	Other pulses	89	4758	35	1665	1701
10	Groundnut	143	936	86	468	553
11	Castor	0	1	0	1	1
12	Sunflower	0	468	0	234	234
13	Soybean	3	8	1	3	5
14	Sesamum	156	411	70	144	214
15	Sugar cane	86	153	173	260	433
16	Cotton	1175	1850	999	1387	2386
17	Mango	309	56	185	34	219
18	Banana	89	0	196	0	196
19	Lemon	7	0	6	0	6
20	Guava	54	1	32	1	33
21	Sapota	42	0	21	0	21
22	Pomegranate	1	0	1	0	1
23	Papaya	5	0	5	0	5
24	Other fruits	28	0	17	0	17
25	Tomato	31	0	21	0	21
26	Brinjal	40	0	28	0	28
27	Beans	0	0	0	0	0
28	Onion	100	13	60	7	66
29	Green chillies	362	638	217	383	600
30	Ladies finger	18	0	9	0	9
31	Total leafy vegetables	3	0	1	0	1
32	Total gourds	18	0	7	0	7
33	Other vegetables	6	0	3	0	3
34	Tamarind	0	76	0	46	46
35	Dry Ginger	47	77	42	69	111
36	Turmeric	0	0	0	0	0
37	Garlic	9	18	6	11	16
38	Dry chilli	1846	11179	923	7267	8190
39	Coriander	450	1146	270	687	957
40	Other spices	0	28	0	20	20

Sl. No	Crops	Irrigated area (Ha)	Rainfed area (Ha)	Volume in Ha m irrigated	Volume in Ha m Rainfed	Total Volume in Ha M
41	Coconut	6579	0	3290	0	3290
42	Coffee	8	0	8	0	8
43	Oil palm	1457	125	728	87	816
44	Cashew	60	56	30	28	58
45	Other plantation crops	110	2122	55	1061	1116
46	Total flower crops	37	0	26	0	26
47	Medicinal plants	9	1	6	1	7
48	Aromatic crops	0	19	0	13	13
49	Forest	5	1371	2	617	619
	Total	62391	85380	73659	74038	147696

Source: G returns for the area in year 2018-19 and CWRM analysis for water requirement

3.3.10 Sources of water for Irrigation and type of irrigation

The analysis indicates that of the total water used for irrigation, 82% is through surface water resources followed by remaining 18% through ground water resources (Table 3.22 and Fig 3.11). The surface water demand for agriculture is met through the storage structures namely tanks exclusively developed for irrigation purposes. Here for distribution of water to field takes place via canal network and thus wild flooding is the primary method of irrigation.

In case of ground water resources, the predominant type of irrigation is controlled flooding. Besides, with reference to means of extraction, since surface water is used via canal network, gravity is the main type followed by lifting method using electric power from ground water resources.

Table 3.22. Proportion on the sources of water for agriculture

S. No	Block/ Mandal	Surface water	Ground water
(1)	(2)	(3)	(4)
1	Bogalur	79%	21%
2	Kadaladi	97%	3%
3	Kamudi	83%	17%
4	Mandapam	24%	76%
5	Mudukulathur	90%	10%
6	Nainarkoil	74%	26%
7	Paramakkudi	74%	26%
8	Rajasingamangalam	96%	4%
9	Ramanathapuram	82%	18%

10	Tiruppullani	51%	49%
11	Tiruvadanai	94%	6%
Total		82%	**18%**

Source: WASCA- CWRM- TN- Ramanathapuram Plan, 2020-21

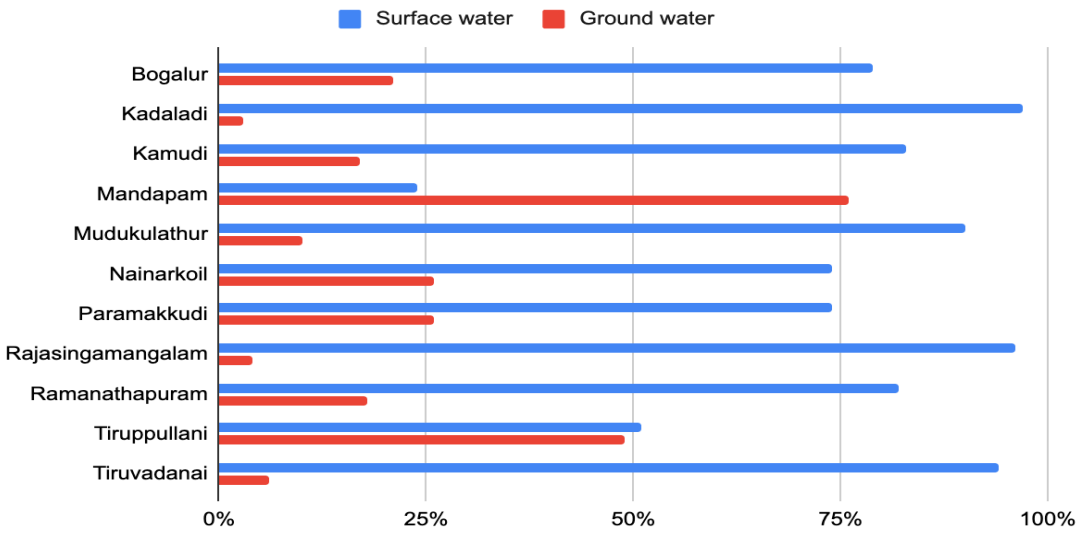


Fig 3.11. Proportion of sources of water for Agriculture

3.3.11 Livestock resources

The district has considerable proportion of livestock resources of which small ruminants such as sheep and goat constitute 52% of the total followed by poultry (36.08%) and cow (9.66%) (Table 3.23). Kamudhi and Kadaladi blocks have the highest area under livestock (Fig 3.12). Of the total livestock population, small ruminants - goat and sheep is about more than 50% followed by poultry (Fig 3.13).

Fig 3.13 Percentage of specific livestock species

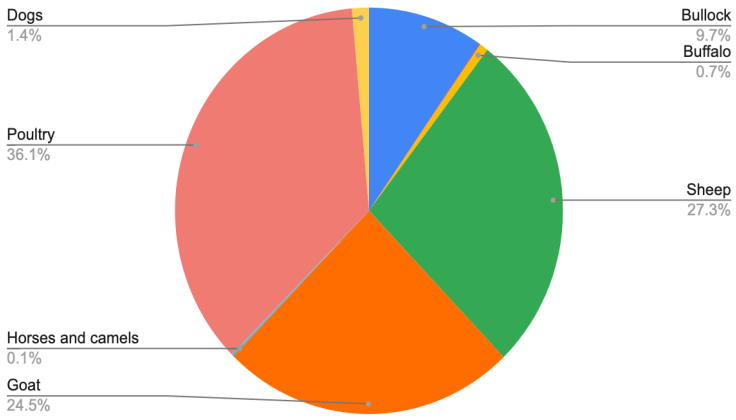


Table 3.23. Block wise details of Livestock and poultry population (in Numbers)

S. No	Name of the Block	Cattle	Buffalo	Sheep	Goat	Horses and camels	Pig	Poultry	Dogs	Rabits	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	Bogalur	2352	2	23786	10754	0	0	16040	294	0	53228
2	Kadaladi	7789	124	44829	23531	0	0	42686	1791	0	120750
3	Kamudi	10204	272	36202	35331	668	32	57688	1502	0	141899
4	Mandapam	6026	231	16301	15572	0	0	20305	2639	0	61074
5	Mudukulathur	3249	4863	26144	23404	202	0	23076	392	0	81330
6	Nairnarkoil	2972	4	7086	10482	0	0	12513	225	0	33282
7	Paramakudi	5181	102	23266	20087	0	0	33436	670	0	82740
8	Rajasingamangalam	11444	58	6539	9436	124	0	14756	683	10	43050
9	Ramanathapuram	7573	134	8192	17476	0	0	19063	732	17	53189
10	Tiruppullani	6421	48	23900	19094	0	579	21546	1246	0	72834
11	Tiruvadanai	15789	104	6106	14181	0	0	32292	1308	0	69780
	Total	78571	5942	222352	199347	994	611	293401	11482	27	813156

Source: Livestock census - http://livestockcensus.gov.in/

The total water demand for livestock in the district is 481.76 Ha.m, of which 52% is consumed by sheep and goat followed by 36% and 9.66% by poultry and cow respectively (Table 3.24).

3.3.12) Livestock Water Requirement

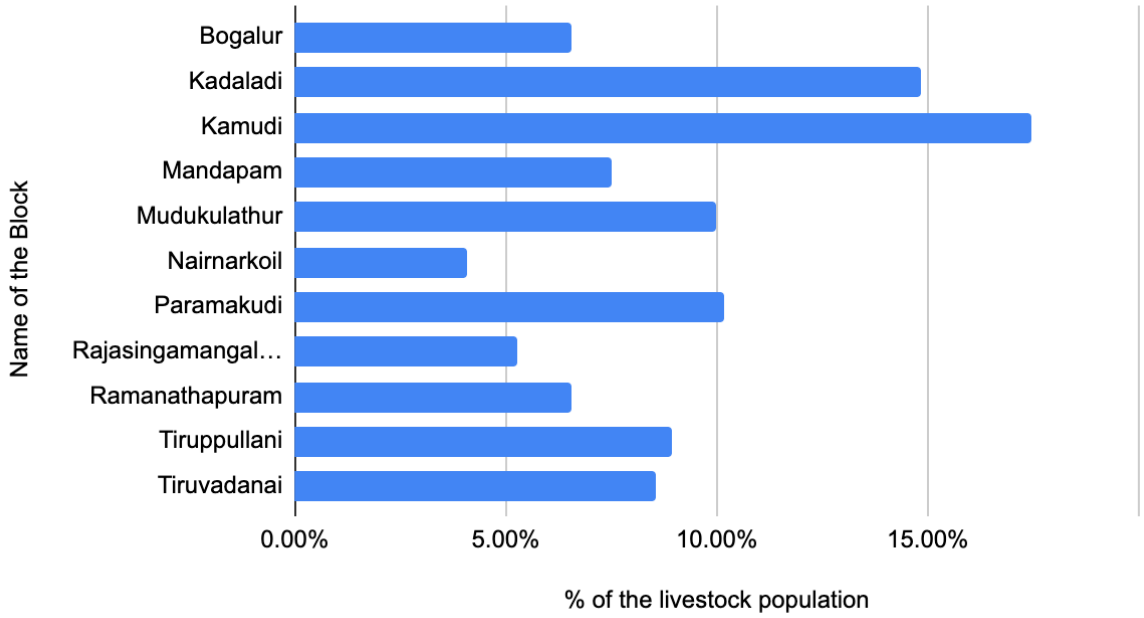
Table 3.24. Proportion of different livestock types and its total water requirement

Type of livestock	% to the total livestock population	Total water requirement Ha M
(1)	(2)	(3)
Cow	9.66%	46.55
Sheep	27.34%	131.73
Goat	24.52%	118.10
Poultry	36.08%	173.82

Type of livestock	% to the total livestock population	Total water requirement Ha M
Others	2.40%	11.56
Total		481.76

Source: WASCA - CWRM- TN- Ramanathapuram Plan, 2020-21

Fig 3.12 Percentage of the livestock population



Of the total water demand of 481.74 Ha m for livestock, 60% is met through surface water and remaining 40% is met through surface water resources (Table 3.25).

Table 3.25 Block wise livestock resources, water requirement and sources

Sl. No	Block	Numbers	Water Req. (HaM)	Ground Water Percentage	Surface Water Percentage
(1)	(2)	(3)	(4)	(5)	(6)
1	Bogalur	53228	21.40	59%	41%
2	Kadaladi	120750	54.78	47%	53%
3	Kamudi	141899	67.22	43%	57%
4	Mandapam	61074	35.56	38%	62%

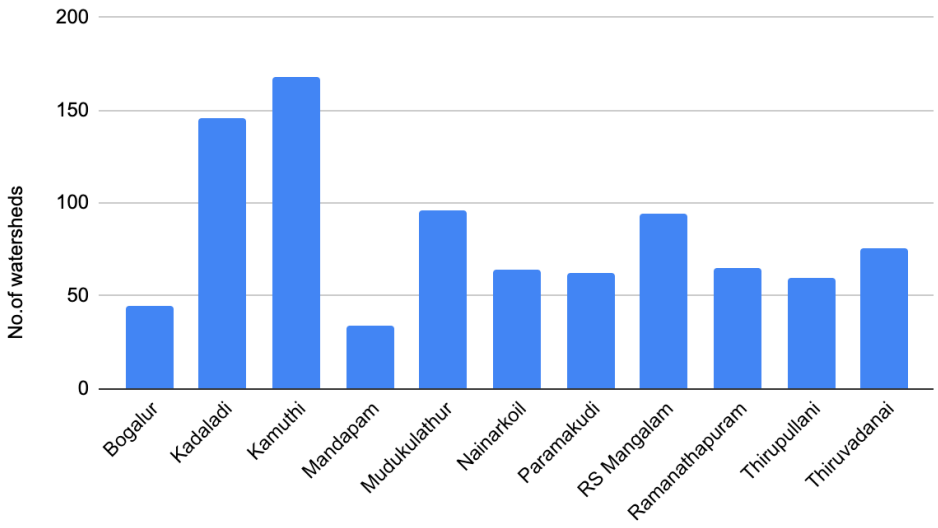
Sl. No	Block	Numbers	Water Req. (HaM)	Ground Water Percentage	Surface Water Percentage
5	Mudukulathur	81330	57.09	79%	21%
6	Nairnarkoil	33282	17.44	37%	63%
7	Paramakudi	82740	35.72	46%	54%
8	R.S.Mangalam	43050	48.32	13%	87%
9	Ramanathapuram	53189	38.05	27%	73%
10	Tiruppullani	72834	40.03	41%	59%
11	Tiruvadanai	69780	66.14	12%	88%
Total		813156	481.74	40%	60%

Source: WASCA- CWRM- TN- Ramanathapuram Plan, 2020-21

3.4. Water resources vulnerability

3.4.1 River Sub-basin and Watershed

Fig 3.14 No.of watersheds across blocks



The district primarily falls in Gundar-Vaigai river basin. Besides, these two main rivers, Virusuliyaru, Kottakariyaru and Upparu are the other rivers flowing and draining in this district. These rivers are seasonal and considerable amount of water flows during the main monsoon season from October to December.

The district has 914 micro watersheds and the details of its are given in table 3.26 and Fig 3.14 and 3.15. Of the 11 blocks Kadaladi and Kamuthi has relatively more number of micro watersheds.

3.4.1A Micro Watersheds

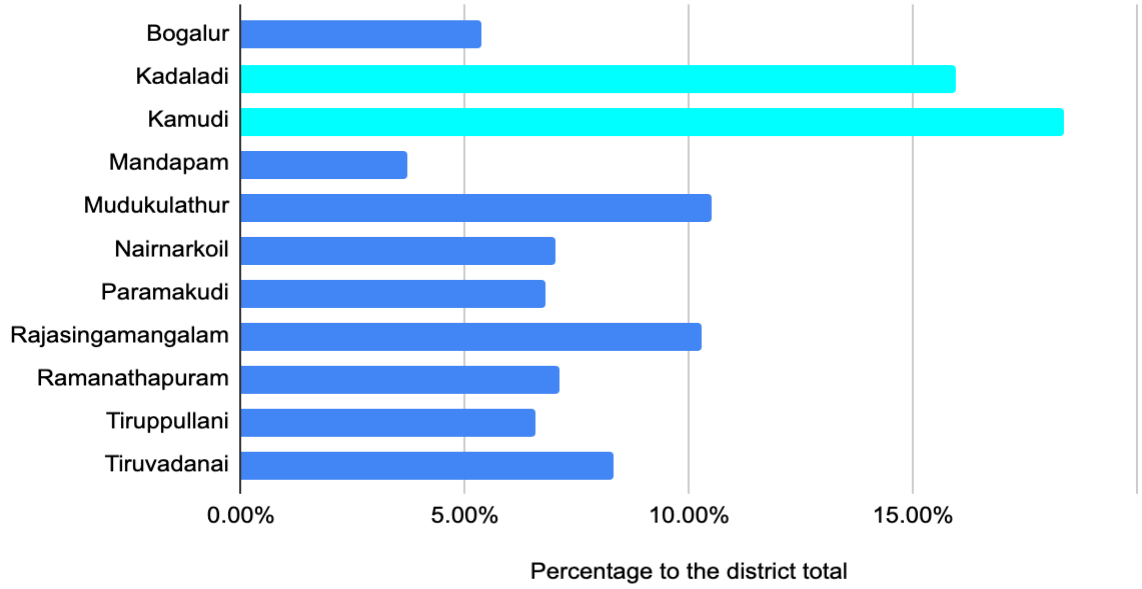
Table 3.26. Details of the watershed - Block Wise

S.N	Block	Macro Watershed Name	Macro Watershed No.	Macro Watershed Area (Ha.)	Micro Watershed No.	Micro Watershed Area (Ha)	No. of Micro watersheds
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Bogalur	LOWER VAIGAI(4)	4A2A1	27457.28		36389.36	49
		Terkku Upper	4A1D6	8830.68			
2	Kadaladi	VEMBAR	4A1D1	17552.37		85752.46	146
		GUNDAR	4A1D2	14032.75			
		GRIDHAMAL	4A1D3	13975.89			
		Terkku Upper	4A1D6	41528.03			
3	Kamuthi	VEMBAR	4A1D1	9375.75		71351.18	168
		GUNDAR	4A1D2	40709.77			
		GRIDHAMAL	4A1D3	21131.48			
		LOWER VAIGAI(3)	4A2A2	2177.82			
4	Mandapam	LOWER VAIGAI(4)	4A2A1	7862.18		35919.05	34
		Terkku Upper	4A1D6	15781.20			
5	Mudukulathur	GRIDHAMAL	4A1D3	16189.28		62143.2	96
		Terkku Upper	4A1D6	37453.47			
		LOWER VAIGAI(4)	4A2A1	6520.75			
		LOWER VAIGAI(3)	4A2A2	3996.27			
6	Nainarkoil	LOWER VAIGAI(4)	4A2A1	36780.72		38217.5	64
		KOTTAKARAI	4A2B1	1044.36			
7	Paramakudi	GRIDHAMAL	4A1D3	13058.55		40237.91	62
		Terkku Upper	4A1D6	2204.28			
		LOWER VAIGAI(4)	4A2A1	9350.52			
		LOWER VAIGAI(3)	4A2A2	16804.45			
8	R.S.Mangalam	LOWER VAIGAI(4)	4A2A1	9394.81		49894.73	94
		KOTTAKARAI	4A2B1	46950.67			
9	Ramanathapuram	LOWER VAIGAI(4)	4A2A1	32037.34		46575.73	65
		Terkku Upper	4A1D6	12910.98			

S.N	Block	Macro Watershed Name	Macro Watershed No.	Macro Watershed Area (Ha.)	Micro Watershed No.	Micro Watershed Area (Ha)	No. of Micro watersheds
10	Thiruppullani	Terkku Upper	4A1D6	42346.00		42233.46	60
		LOWER VAIGAI(4)	4A2A1	3901.01			
11	Thiruvadanai	KOTTAKARAI	4A2B1	8817.28		45855.01	76
		MANIMUTTAR	4A2B2	36024.20			
		Total		**556200.15**		**554569.59**	**914**

Source: National watershed atlas, GoI

Fig 3.15. Number of microwatersheds across blocks to the district total (%)



3.4.2 Coastal Watersheds

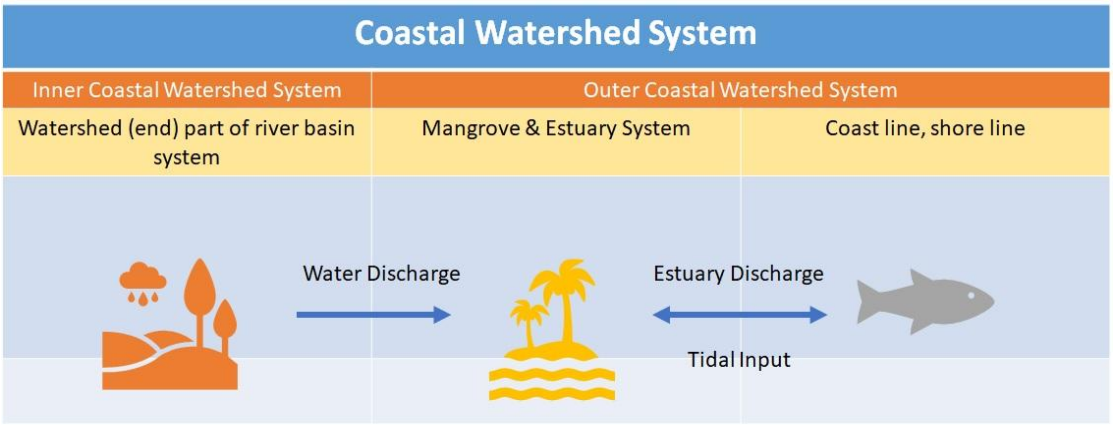
Coastal watershed is a geographic coastal area in which all sources of water, including lakes, tanks, rivers, estuaries, brackish water, wetlands, streams, as well as ground water, drain towards sea. It is defined as a set of systems influencing the land, water management that is directly linked to the coastal ecosystem and coastal plains. The district has 271 km stretch of coast line and 6 out of 11 blocks are coastal blocks. Here 45 Gram panchayats are covered. This unique ecosystem consists of 253 coastal micro watersheds covering a geographical area of 1,75,200 Ha in the district. Of the total 253 micro watersheds, 189 are located in the inner or upstream side and 64 are in the outer or downstream side. The region is significant for its aquatic biodiversity and Gulf of Mannar Biosphere is a unique ecosystem supporting flora and faunal resources. There are two coastal watershed systems:

1) **Inner/Upstream Coastal Watershed System**

This system consists of micro-watersheds with water catchment near to end of a river-sub basin, abundant agriculture land, freshwater drains, streams, water bodies, before joining or meeting the estuary or tidal waters influence.

2) **Outer/Downstream Coastal Watershed System**

3) This system has two core areas: one consists of consists of mangroves, estuaries, and its micro catchments and other the coastline and its landforms.



Development of the Coastal Watershed as integral part of river basin / sub-basin, watershed management strategy helps meeting the objectives, commitments of India, to UN Framework Convention on Climate Change, and Sustainable Development Goals for safeguarding coastal resources. Three major watersheds are identified in the district are shown in Fig 3.16 a and b.

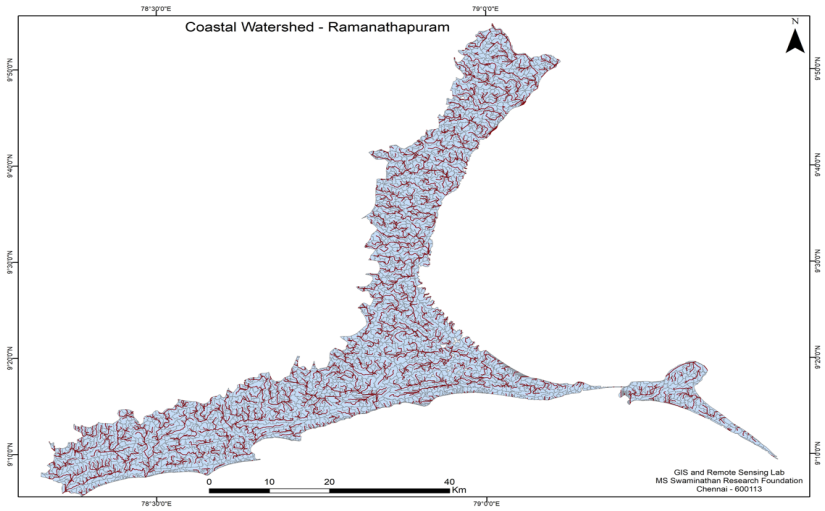


Fig 3.16 a. Coastal watersheds in Ramanathapuram District

Following are the key water challenges and issues in the district:

- Shoreline Erosion and Soil Erosion
- Water logging and water transportation
- Salinity (Surface; ground water and soil)
- Invasive species restricting productivity of lands and water courses
- Pollution and sewage contamination of the marine coastal environment and coastal sewage discharges
- Eutrophication of water bodies including marine
- Sediments and sediment movement, accumulation. Increased sediment is a major threat to coral reefs and marine ecosystems
- Excessive consumption of fresh water and ground water sources reduces river flows to coastal areas resulting in increased estuary salinity, decreased fish catch, decreased sedimentation, saltwater intrusion into groundwater, leading to challenges in availability of fresh water for drinking
- Loss of native vegetation and
- Sand mining

Activities for Development of Coastal Watershed in Rural Areas (CWRA) under WASCA

a) **Delineation of Coastal watersheds**

b) **Development of Composite Water Resource Management (CWRM) for Coastal Watersheds, for GP level planning:**

1) Non-Spatial Data Analysis (in addition to the existing CWRM data)

i. Data on Sea Level Rise and number of cyclones

ii. Extend of the area under shrimp farming - active and inactive farms

iii. Number of borewells used for shrimp farming

iv. methods of waster water disposal in the shrimp farms

v. Groundwater quality - TDS, pH and EC

vi. Livestock population - sheep/goat/cow and its grazing practices

vii. Number of borewells and its depth

viii. Flood control measures - the status of the check dams

ix. Extend of soil and water salinity levels

x. extend of soil erosion in the agricultural fields

xi. status of the drainage systems

xii. Number of small, medium and big industries

2) Spatial Data Analysis in addition to CWRMP existing thematic layers; additional layers:

i. Coastal Morphology

ii. Shore Profile / coastal profile

iii. Wetland Profile

iv. Coastal Zone Management Profile

v. Mud flats Profile

vi. Tidal Channels, Creeks profile

vii. Morphology of estuaries

viii. Dunes Mapping

ix. Foreshore area

x. Headland area

xi. Inter-tidal zone

xii. Lagoons

xiii. Littoral zone

xiv. Tidal Channels

3) Identification of Water Challenges

4) Identification of Water Actions

5) Identification of Livelihood Actions

6) Identification of climate resilience plans for ecological zones

c) Coastal Watersheds Zones (based on NRM & Land, Water Use)

1) Water Bodies (Fresh, brackish and saline)

2) Streams & Creeks

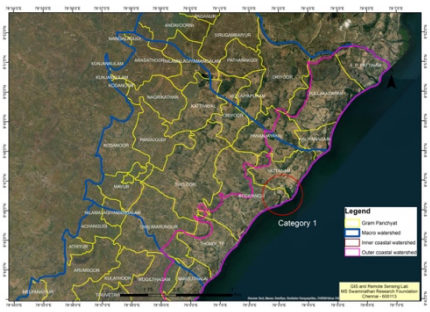
3) Wetlands (Inland and Coastal)

4) Lands covered under invasive species
5) Farmlands
6) Aquaculture ponds
7) Rural Drinking Water & Sanitation
8) Mudflat area &Mangroves
9) Coastline &Seashore area through sustainable ICZM principles

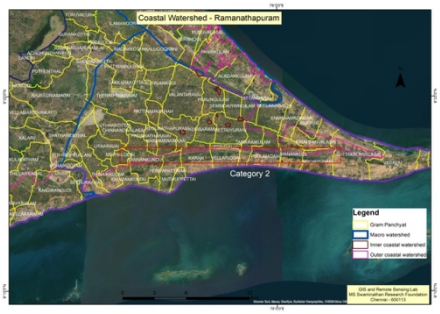
d) Action Plan Preparation (Google Earth pro)

1) CWRMP GP plans
2) CWRMP: Coastal Watershed plan (Micro-watershed)
3) CWRMP: Coastal Watershed Plan (Mega Watershed)

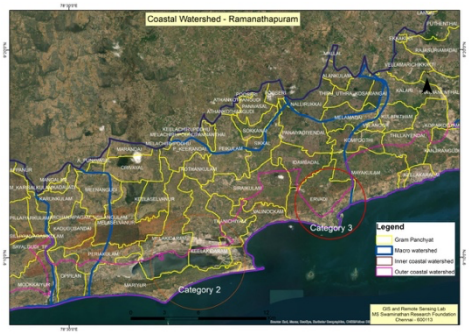
Three potential watershed sites identified for actions are:



Category 1 : Agriculture land+ Creek –River +Mangrove+ Coast line



Category 2 : Agriculture +Wetland++Coast line



Category 3 :

Agriculture+Coast line+

Fig 3.16 b. Three main coastal watersheds

3.4.3 Natural Drainage Lines

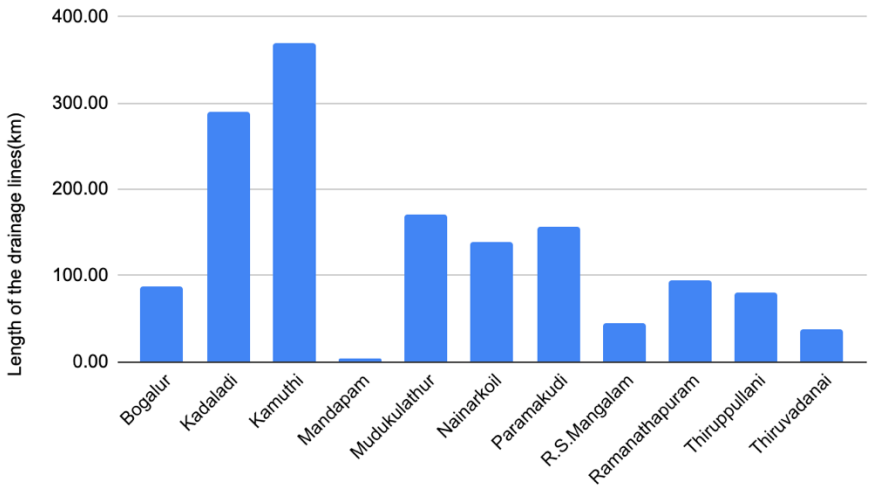
The total length of the natural drainage lines in the district is 1476 km which is significant in regulating the water flow (Table 3.27 and Fig3.17). Identifying the order of the drain and location in each of the GPs and micro watersheds were delineated to identify the actions.

Table 3.27. Length of the natural drainage lines - Block Wise

S. No	Block	Length in Block Area (m)	Length in KM
(1)	(2)	(3)	(4)
1	Bogalur	87762.63	87.76
2	Kadaladi	288950.47	288.98
3	Kamudi	370261.44	370.26
4	Mandapam	4803.23	4.83
5	Mudukulathur	170078.09	170.08
6	Nairnarkoil	139415.05	139.42
7	Paramakudi	156988.55	156.99
8	R.S.Mangalam	45460.79	45.46
9	Ramanathapuram	94243.28	94.24
10	Tiruppullani	80081.04	80.08
11	Tiruvadanai	37968.53	37.97
	Total	1476013.11	1476.01

Source: Water Resources Organization, Government of India

Fig 3.17 Length of the drainage lines(Km)



3.4.4 Surface Water Resources

3.4.4.1 Existing Water Structures

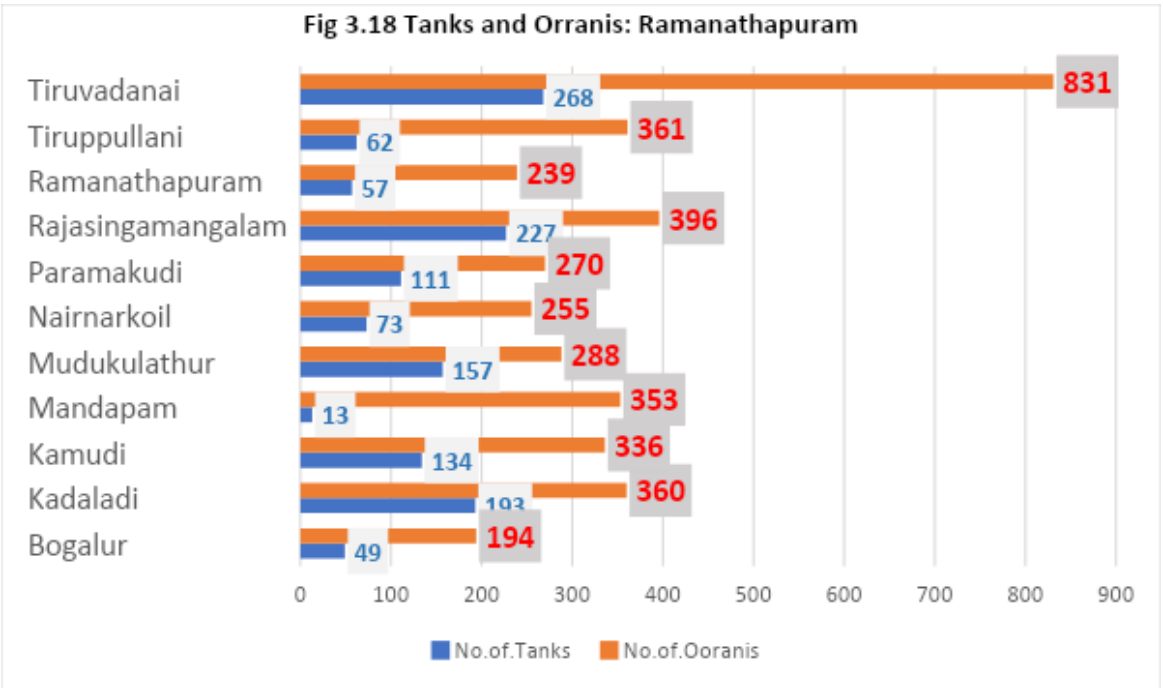
The district has structured traditional water storage units as tanks, ponds and ooranis which are the life line of local communities for their lives and livelihoods. The district has 1344 tanks and 3883 *ooranis* with 1576 Km length of field channels to distribute water to the agriculture fields (Table 3.28 and Fig 3.18). Most of the water storage structures needs restoration by increasing the storage capacity and strengthening its distribution structures.

Table 3.26. Details of the existing Water storing structures

S. No	Block	No. Of. Tanks	No. Of. Ooranis	Field channel in Km
(1)	(2)	(3)	(4)	(5)
1	Bogalur	49	194	95.94
2	Kadaladi	193	360	193.82
3	Kamudi	134	336	182.11
4	Mandapam	13	353	16.50
5	Mudukulathur	157	288	204.08
6	Nairnarkoil	73	255	412.54
7	Paramakudi	111	270	100.50
8	R.S.Mangalam	227	396	163.16
9	Ramanathapuram	57	239	150.04
10	Tiruppullani	62	361	89.500
11	Tiruvadanai	268	831	338.98
Total		**1344**	**3883**	**1575.89**

Source: Primary data from the Panchayat office, 2020

Fig 3.18 Tanks and Orranis: Ramanathapuram



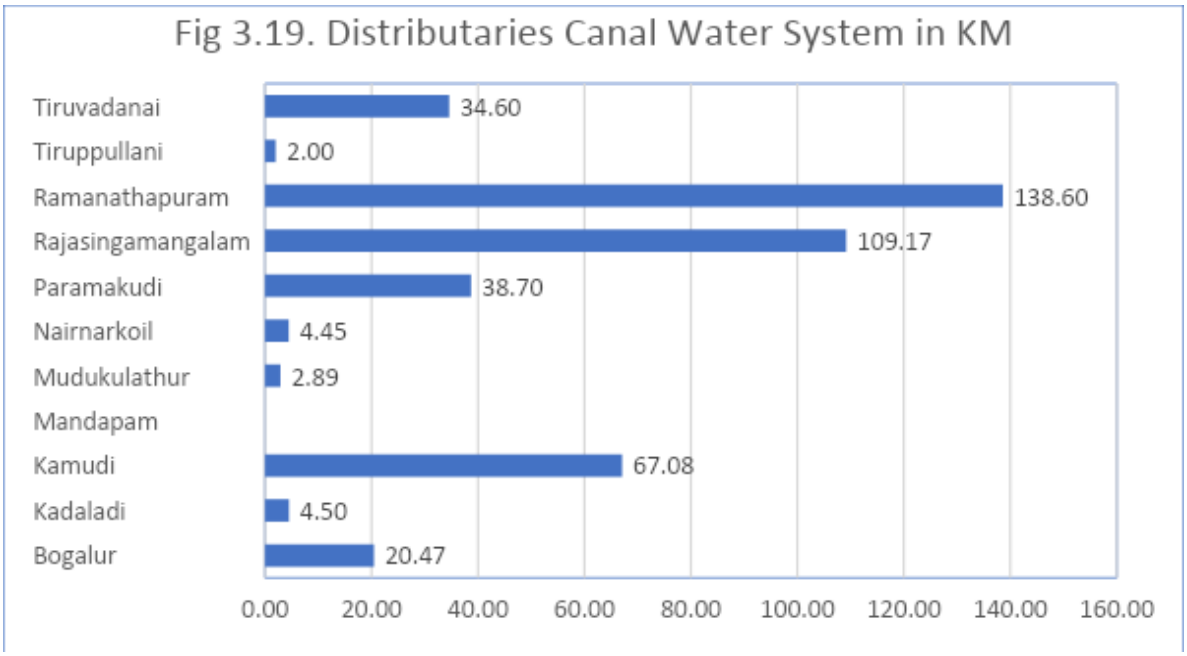
3.4.4.2 Canal Networks System

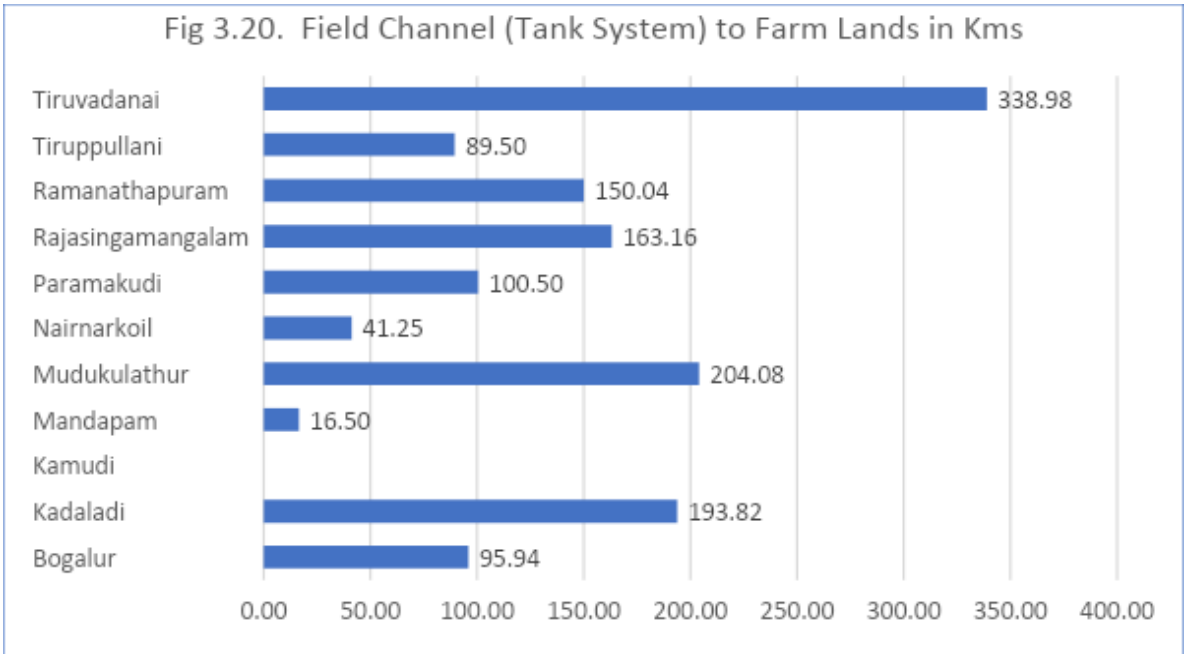
The district has wider network of water supply systems as surface water is the main source for more than 80% of the irrigated land in the district. It has the total length of 1097 Km length of main canal, 5921.49 km length of minor canal systems. Further it has 422.46 km of distributaries and 1576 km length of field channels (Table 3.29 and Fig 3.19 and 3.20).

Table 3.29. Water Courses Identified for MGNREGS Intervention: WASCA

Sl. No	Name of the block	Distributaries	Water Courses (Field channel)
(1)	(2)	(3)	(4)
1	Bogalur	20.47	95.94
2	Kadaladi	4.50	193.82
3	Kamudi	67.08	-
4	Mandapam	0.00	16.50
5	Mudukulathur	2.89	204.08
6	Nairnarkoil	4.45	41.25
7	Paramakudi	38.70	100.50
8	R.S.Mangalam	109.17	163.16
9	Ramanathapuram	138.60	150.04
10	Tiruppullani	2.00	89.50
11	Tiruvadanai	34.60	338.98
12	Total	422.46	1575.89

Source: Census of India, 2011





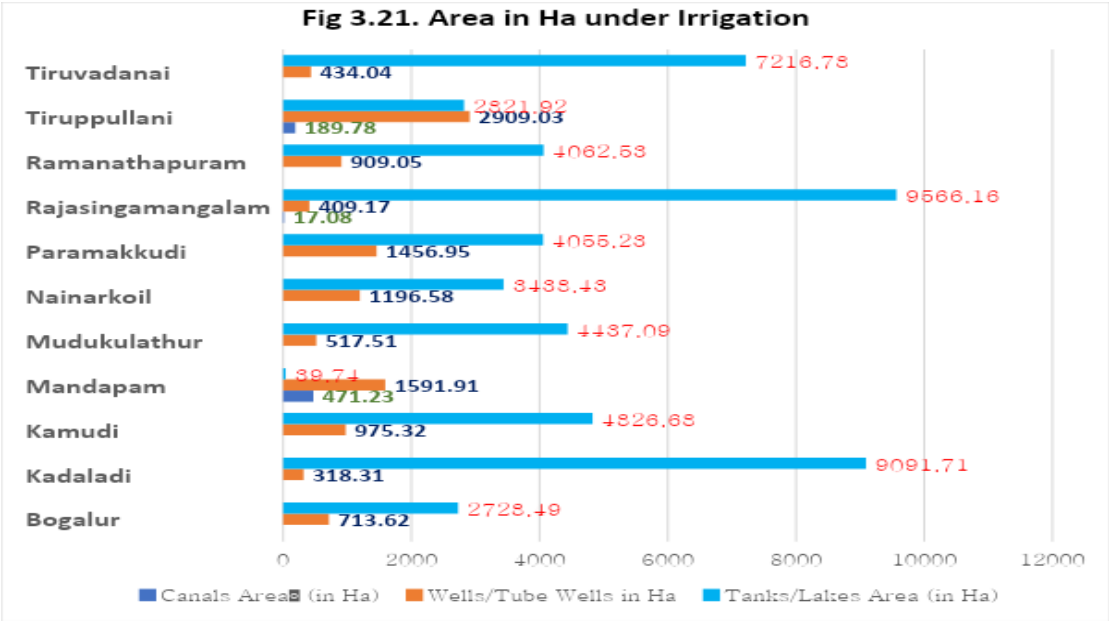
3.4.4.3 Status of Irrigation facilities

The total area under irrigation in the district is 64394 Ha, of which 82% is irrigated through surface water stored in the tanks/lakes and canal area while remaining 18% is through ground water using open/tube wells. Mandapam has the highest area underground water based irrigation (76%), followed by Thirupullani (46%) and Nainarkovil and Paramakudi accounting each 26% of its total irrigated area. Kadaladi, R.S.Mangalam, Thiruvadanai and Mudukulathur blocks have more 90% of the irrigated area using surface water resources (tanks/lakes/canal) (Table 3.30 and Fig 3.21).

Table 3.30 Area Under Irrigation by sources

#	Block	Canals Area (in Ha)	Wells/Tube Wells in Ha	Tanks/Lakes Area (in Ha)
(1)	(2)	(3)	(4)	(5)
1	Bogalur	0	713.62	2728.49
2	Kadaladi	0	318.31	9091.71
3	Kamudi	0	975.32	4826.68
4	Mandapam	471.23	1591.91	39.74
5	Mudukulathur	0	517.51	4437.09
6	Nainarkoil	0	1196.58	3438.43
7	Paramakkudi	0	1456.95	4055.23
8	R.S.Mangalam	17.08	409.17	9566.16
9	Ramanathapuram	0	909.05	4062.53
10	Tiruppullani	189.78	2909.03	2821.92
11	Tiruvadanai	0	434.04	7216.78
12	**Total**	**678.09**	**11431.49**	**52284.76**

Source: Census of India, 2011 and *and WASCA*- CWRM- TN- Ramanathapuram Plan, 2020-21



3.4.5) Surface Water Run-Off estimation

3.4.5.1): Catchment area classification

The total catchment area of the district is 439103 ha, of which 19% is proposed for treatment under WASCA – CWRM planning. By making interventions in the 19% of the area, it is aimed that 51% of the total runoff in the district is expected to be harvested and stored (Table 3.31).

The land use types in each of the GPs are categorised into three different types of runoff types; Good Catchment area, Average Catchment area and Bad Catchment area and it is characteristics are briefed in table 3.29. From the analysis, it is concluded that about 12% each in good and bad catchment area and 85% in average catchment area are treated and from whch 51% of the total runoff is expected to be harvested.

Table 3.31. Different catchment types and run off potential

Sl.No	Runoff types	Land use categories covered	Characteristics and illustrative actions
(1)	(2)	(3)	(4)
1	Good catchment area	(1) Forest area, (2) Area under Non-Agricultural Uses (3) Barren & Un cultivable Land Area	This is generally recharge area: and here priority is to be for the recharge works Works - including block plantation; afforestation and soil and water conservation works, run off management in constructed areas, water bodies management, Maintenance and drinking water bodies, bore-well, DLT etc
2	Average catchment area	(4) Permanent Pastures and Other Grazing Land Area (5) Land Under Miscellaneous Tree Crops etc. Area (6) Culturable Waste Land Area	This is also recharge area where priority is to given for recharge works related to land management and recharge structures Works: Land development, bunds, plantation, storage structures like farm pond, percolation ponds etc
3	Bad Catchment area	(7) Fallows Land other than current Fallows Area (8) Current Fallow area (9) Total unirrigated land area (10) Area Irrigated by source	This is discharge zone where importance has to be given for both storage and the charge works Works: Land development, farm bund, farm ponds, plantation- different kinds of agro-forestry systems, recharge structures for bore/open wells etc

Source: WASCA - CWRM- TN- Ramanathapuram Plan, 2020-21

3.4.5.2 Surface run off estimation

The surface runoff generated is estimated using Modified Strange Table with the type of respective land use. The total catchment area of the district is 4,39,103 Ha, with an average annual rainfall of 821 mm, the total runoff generated is 48528 Ha m. Of the total geographical area of the district, 22.5% is under good catchment, 9.4% under average and 68.40% in bad catchment category (Fig 3.22).

Similar trend is seen in the runoff quantity also. The good catchment generates 37.64%, average at 17.12% while the bad catchment is 45.24%. Under WASCA the proposed area under treatment in different runoff catchments are 15.48% in good, 40.61% in average and 43.91% in bad category. As a result it is expected that good catchment generates runoff @ 58.29%, while average is at 22.88% and bad catchment at 18.83% (Table 3.32, 3.33).

Figure 3.22: Area Under Different Catchment Categories

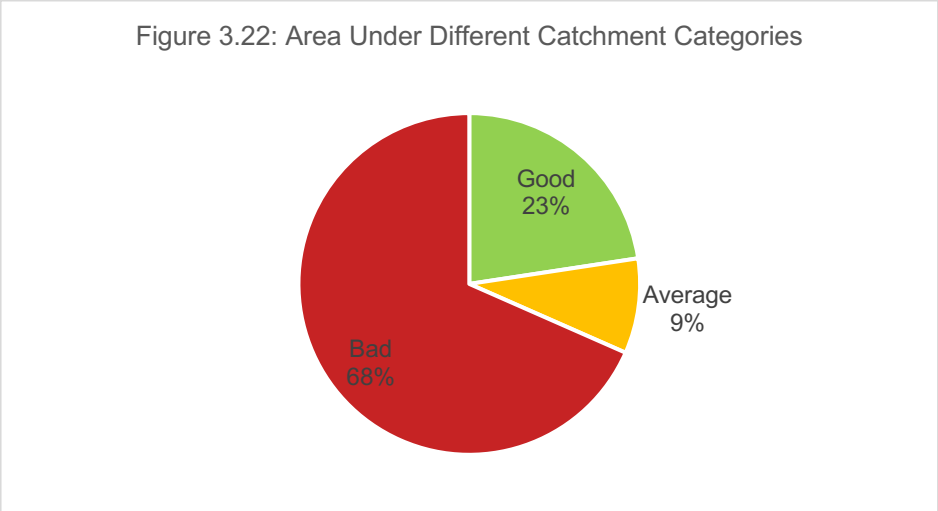


Table 3.32. Block Wise Surface Water Run-off Analysis

S. No	Block	Catchment Area in Ha	Runoff in Ha-m	Proposed Treatment Area WASCA CWRMP (Ha)	Expected RO treated in HaM	Percentage of RO treated
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Bogalur	17690.88	2475.57	2211.9	1236.24	50%
2	Kadaladi	120712.61	9942.03	22262.71	4507.67	45%
3	Kamudi	55962.33	7103.2	8520.95	2015.86	28%
4	Mandapam	23137.13	3488.88	5106.17	3374.41	97%
5	Mudukulathur	32245.89	4417.38	4041.66	1856.37	42%
6	Nainarkoil	26341.31	3022.1	4784.86	2269.43	75%
7	Paramakkudi	29175.3	2973.28	4769.38	1884.63	63%
8	R.S.mangalam	37635.84	3056.91	4352.75	861.38	28%
9	Ramanathapuram	28035.39	2138.49	10705.21	1972.42	92%
10	Tiruppullani	28429.13	4430.77	8795.42	1990.86	45%
11	Tiruvadanai	39737.19	5479.6	6517.99	2540.77	46%
Total		**439103**	**48528.21**	**82069**	**24510.04**	**51%**

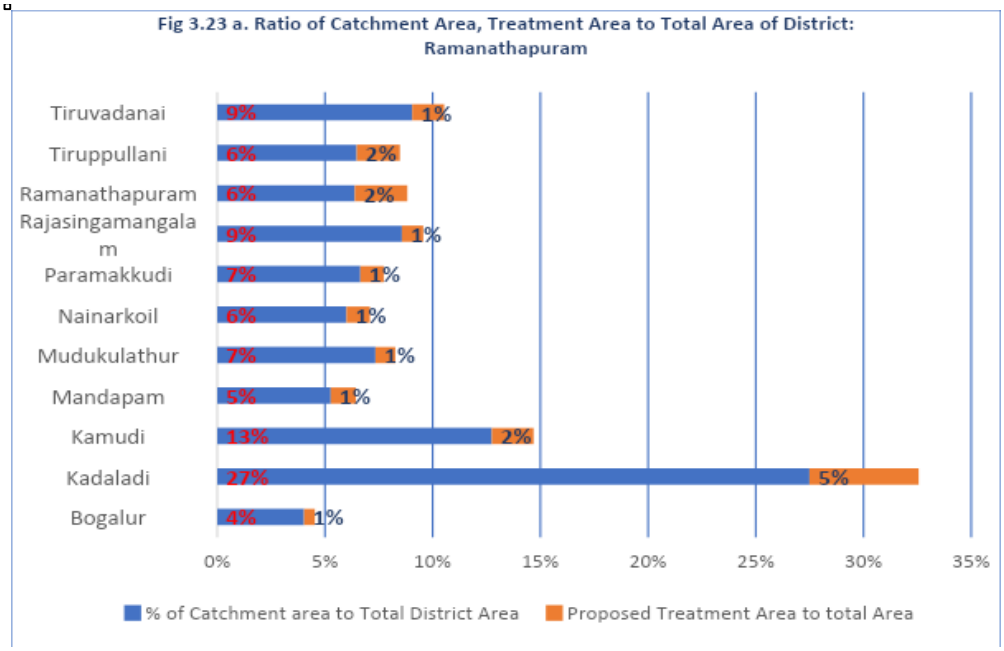
With regard to proportion of the catchment area to the total geographical area, of the 11 blocks Kadaladi block has more area under good catchment. Proportionately the area under treatment is also higher in this block compared to remaining all blocks (Table 3.34 and Fig 3. 23 a and b).

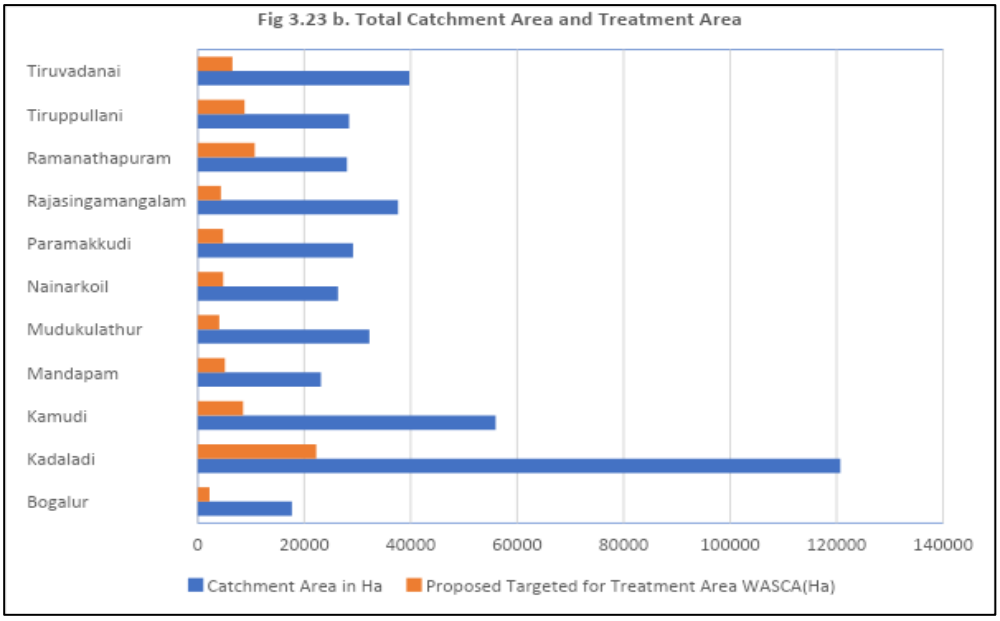
Table 3.33. Surface Run-off: Catchment Characteristics (Strange Table)

Block	% of Catchment area to Total District Area	Proposed Treatment Area to total Area
(1)	(2)	(3)
1) Bogalur	4%	1%
2) Kadaladi	27%	5%
3) Kamudi	13%	2%
4) Mandapam	5%	1%
5) Mudukulathur	7%	1%
6) Nainarkoil	6%	1%
7) Paramakkudi	7%	1%
8) R.S.Mangalam	9%	1%
9) Ramanathapuram	6%	2%
10) Tiruppullani	6%	2%
11) Tiruvadanai	9%	1%
Total Treatment Area		19%

Source: CWRMP- WASCA TN, Nov 2020

Catchment and Treatment Areas: Figures





3.4.6 Water Balance

3.4.6.1 Water budgeting-Surface runoff management

The water budgeting analysis indicates that the demand is 141.60 TMC for human, livestock and agriculture. The total demand for water including human, agriculture and livestock is 27362.97 HaM . Agriculture is the biggest user of water which is about 96%, only 2.4% for human and 1.6% for livestock. Through existing water storage measures 51.4 TMC water is harvested from the runoff amount of 54.8 TMC water available from runoff. But the total deficit in the district is 67.3 TMC (Table 3.34).

Table 3.34. Water budgeting - Demand vs supply

Blocks	Water for Human	Water for Agriculture	Water for Animal	Village wise water required (1 to 5)	Available run-off from rain water	Harvested Runoff from Water Harvesting Activities	Potential Harvesting from proposed Interventions	Total Water harvested	Water deficiency/Surplus (10-6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bogalur	700.12	5307.6	19.58	5703.8	2313.8	1920.6	866.9	2157.8	-2892.8
Kadaladi	507.67	8787.0	54.82	9349.5	9942.0	6325.0	4043.3	10368.4	1018.9
Kamuthi	377.08	10300.2	67.22	10744.5	7386.5	3626.1	2222.9	5849.0	-4895.5
Mandapam	487.96	3162.9	35.56	3686.4	3488.9	972.1	3374.4	4346.5	660.1
Mudukulathur	302.88	637.4	57.09	997.4	4288.8	10152.3	1805.0	11957.3	10960.0
Nainarkoil	160.96	13164.3	17.44	13342.7	3609.0	1929.9	1491.1	3224.2	-10118.5

Paramakudi	294.28	11742.2	35.72	12072.2	4291.9	5350.7	1884.6	7235.3	-4836.8
R.S.Mangalam	236.39	28311.0	48.32	28595.7	4993.9	1815.6	842.5	2658.1	-25937.6
Ramanathapuram	233.51	10462.3	38.05	10733.9	4403.7	1774.4	1972.4	3746.8	-6987.0
Tiruppullani	378.87	12501.7	40.03	12920.6	4430.8	1138.0	1983.1	3121.1	-9799.5
Tiruvadanai	342.49	33047.7	66.14	33456.4	5668.0	16450.5	2540.8	18991.2	-14465.1
Total	4022.2	137424.2	479.97	141603.0	54817.4	51455.2	23027.2	73655.8	-67293.9

Source: CWRM- TN- Ramanathapuram Plan, 2020-21

3.4.6.2) Sources of Water Demand

The main sources of water for all sectors - agriculture, human and livestock are surface water which is 79% while the remaining portion of the demand (21%) is met through ground water resources (Table 3.35).

Table 3.35. Estimated Water Demand in Ha M across sectors

#	Block	Total Annual Requirement (HaM)	Requirement met by Gr. Water (HaM)	Requirement met by S.Water (HaM)	Percentage of Ground Water Requirement (in %)	Requirement of Surface Water (in %)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Bogalur	6035.30	975.96	5052.47	16%	84%
2	Kadaladi	9344.47	3059.18	6241.38	33%	67%
3	Kamudi	10734.21	2318.72	8490.85	22%	79%
4	Mandapam	3686.38	1032.25	2204.17	28%	60%
5	Mudukulathur	997.37	371.99	589.24	37%	59%
6	Nairnarkoil	13032.04	3661.23	9343.73	28%	72%
7	Paramakudi	11970.64	2265.19	9592.49	19%	80%
8	R.S.Mangalam	28591.09	4065.88	24486.44	14%	86%
9	Ramanathapuram	10733.87	2632.03	8100.14	25%	75%
10	Tiruppullani	12920.61	2703.66	10205.05	21%	79%
11	Tiruvadanai	33456.36	4276.88	27830.46	13%	83%
	Total	141502.33	27362.97	112,136.42	21%	79%

Source: CWRM- TN- Ramanathapuram Plan, 2020-21

3.5.3 Water Budgeting- Ground Water management

During the pre monsoon, the water level generally shows declining trend ranges from G.L. to 15m. The depth of well below Ground Level 12.0m become dry during hot season like May, June, July. In the post monsoon, the water level generally in upward trend due to rainfall and it may reach the Ground Level also. The long term fluctuations of water levels range from G.L. to 14.0m in many parts of the Ramanathapuram District.

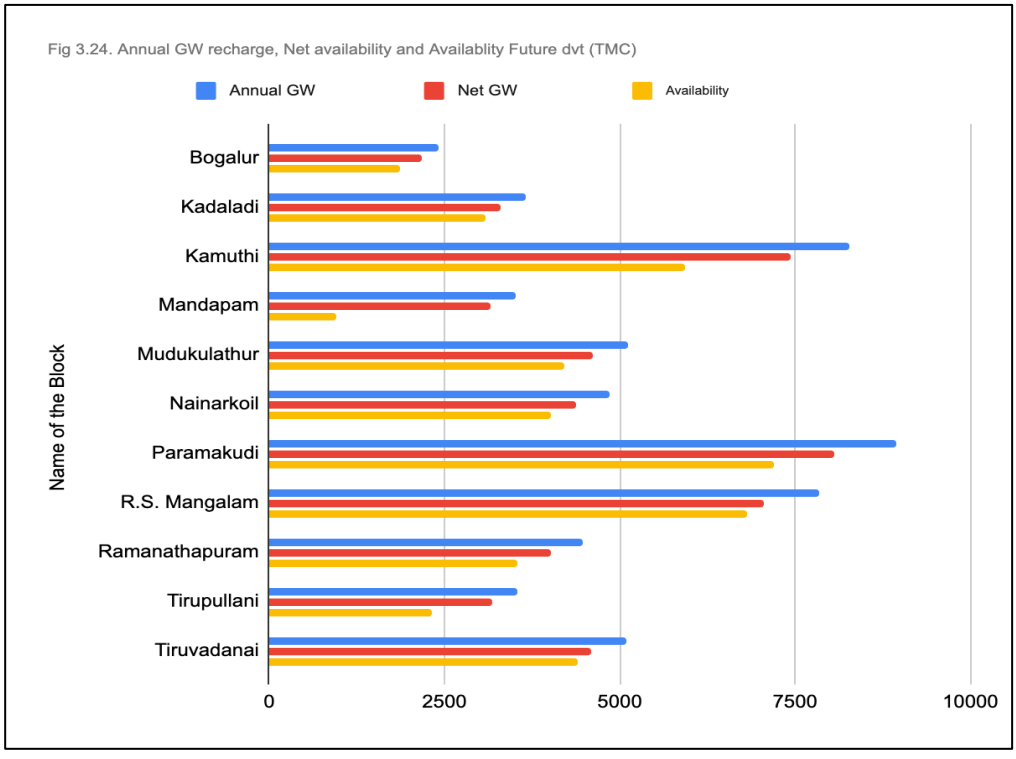
The analysis reveals that the water level has gone down in the north, west and central parts of the Ramanathapuram District. The inference taken from the annual fluctuation is due to

lack of rainfall which in turn affects the groundwater levels in phreatic aquifer. The seasonal fluctuation study reveals that due to necessity for development of ground water for different sectoral needs and due to failure of monsoons, the water level has gone down .

Table 3.33. Ground water budgeting

SL.NO.	TEH_NAME	Name of the Block	Annual GW Recharge	Net GW Availability	Draft GW Irrigation	Draft GW Domestic	Total DRAFT	Availability for Future Dvtt	Stage of Development	Area Sq KM
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	PARAMAKUDI	Bogalur	2426.70	2184.03	243.30	55.79	299.09	1874.27	76.80	116.37
2	KADALADI	Kadaladi	3669.00	3302.10	102.50	91.55	194.05	3090.54	61.65	751.68
3	KAMUTHI	Kamuthi	8271.86	7444.67	1270.30	212.16	1482.46	5921.64	114.31	605.95
4	RAMANATHAPURAM	Mandapam	3512.46	3161.21	1969.90	188.68	2158.58	966.55	83.24	292.86
5	MUDUKULATHUR	Muduku lathur	5120.14	4608.13	228.14	150.12	378.26	4201.21	97.28	328.67
6	PARAMAKUDI	Nainarkoil	4851.76	4366.58	265.70	72.13	337.83	4014.95	97.50	237.82
7	PARAMAKUDI	Paramakudi	8942.61	8048.34	642.10	174.00	816.09	7198.98	86.24	440.70
8	TIRUVADANAI	R.S. Mangalam	7835.60	7052.04	91.97	118.06	210.03	6819.44	101.66	545.58
9	RAMANATHAPURAM	Ramanathapuram	4463.68	4017.31	289.80	146.76	436.56	3552.69	97.01	247.99
10	RAMANATHAPURAM	Tirupullani	3547.97	3193.18	766.80	89.43	856.23	2319.84	92.92	299.94
11	TIRUVADANAI	Tiruvadanai	5094.35	4584.92	60.53	104.86	165.39	4399.48	97.45	424.45

Source: *WASCA TN, Ground Water Assessment, Ramanathapuram- Prime Meridian Study Jan 2021*



3.5.4 Water budgeting- Soil Moisture Management

The soil is an important medium to store the available water and the storage capacity vary 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 Ramanathapuram because of it higher proportion of area under rainfed cultivation. The average annual volumetric soil moisture is taken for estimating the amount of water stored as soil moisture which accounts to 52.15 TMC, which is almost equal to the amount of surface runoff (Table 3.34 and 3.35 and Fig 3.25 and 3.26).

Table 3.34. Soil Moisture Analysis

S.No	Month	Volumetric Soil Moisture in (%)	Soil moisture in mm/m
(1)	(2)	(3)	(4)
1	Jun-18	21	210
2	Jul-18	19	190
3	Aug-18	25	250
4	Sep-18	38	380
5	Oct-18	37	370
6	Nov-18	19	190
7	Dec-18	14	140
8	Jan-19	13	130
9	Feb-19	1	10
10	Mar-19	6	60
11	Apr-19	3	30
12	May-19	7	70
	Average	16.92	

Source: CWC- WRIS, and CWRM- TN- Ramanathapuram Plan, 2020-21

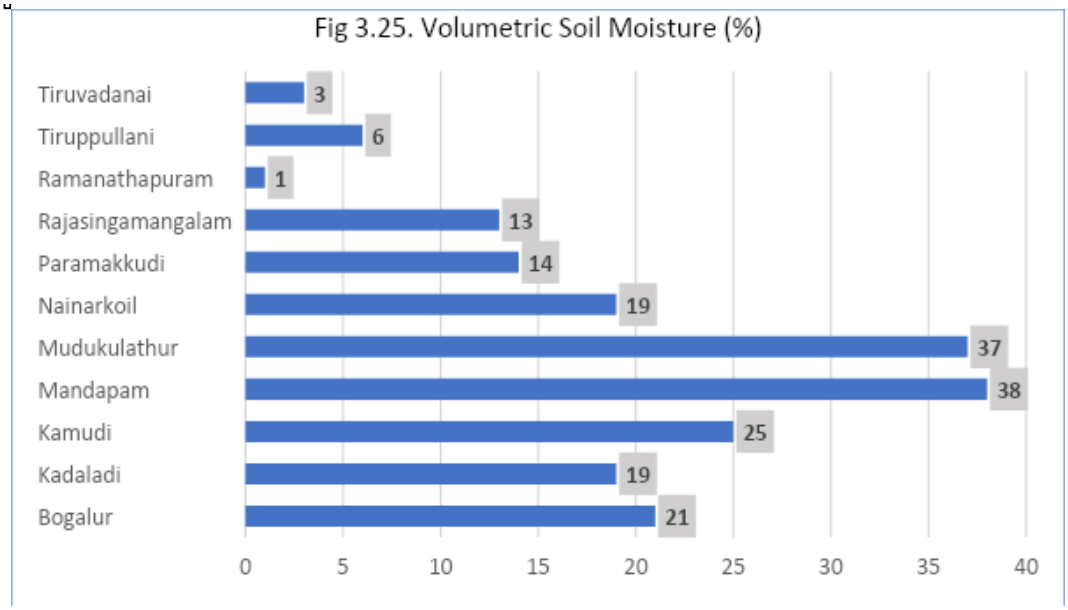
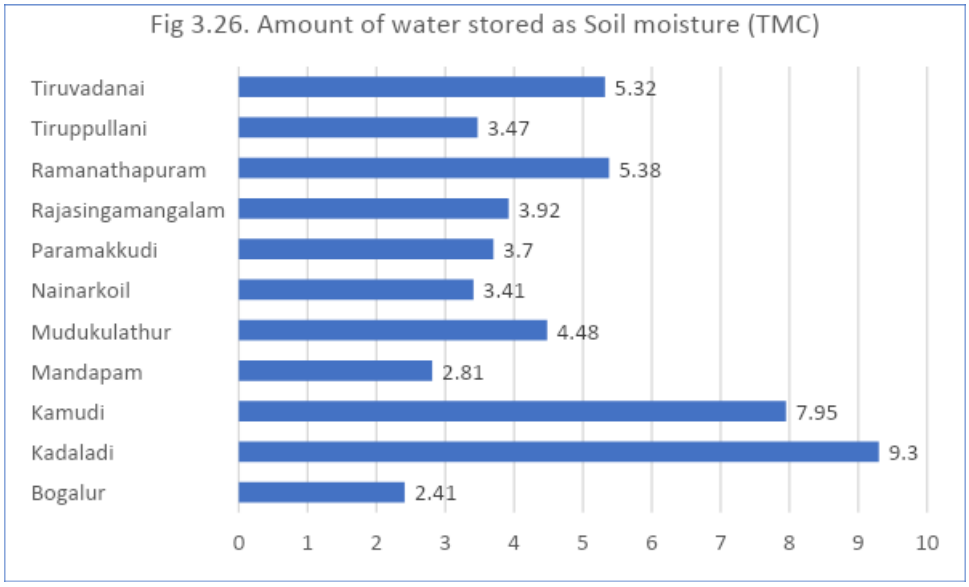


Table 3.35 Amount of water stored as soil moisture in different blocks

Name of the block	Area influencing soil moisture content (Ha)	Converting to M2 and to one m soil depth - m3	Amount of water stored as Soil moisture (Ha m)	Amount of water stored as Soil moisture (TMC)
(1)	(2)	(3)	(4)	(5)
Bogalur	14229.51	142295100	2407.63	2.41
Kadaladi	54972.27	549722700	9301.31	9.30
Kamudi	47011.1	470111000	7954.28	7.95
Mandapam	16588.99	165889900	2806.86	2.81
Mudukulathur	26450.57	264505700	4475.44	4.48
Nairnarkoil	20158.84	201588400	3410.88	3.41
Paramakudi	21852.16	218521600	3697.39	3.70
R.S.Mangalam	23192.98	231929800	3924.25	3.92
Ramanathapuram	31799.54	317995400	5380.48	5.38
Tiruppullani	20532.12	205321200	3474.03	3.47
Tiruvadanai	31447.16	314471600	5320.86	5.32
Total	308235.24	3082352400	52153.40	52.15
Note: The average annual soil moisture percent of 16.92% is taken for analysis and all land area of the block except the area under non-agriculture is considered for arriving the total area influencing soil moisture content				

Source: CWRM- TN- Ramanathapuram Plan, 2020-21



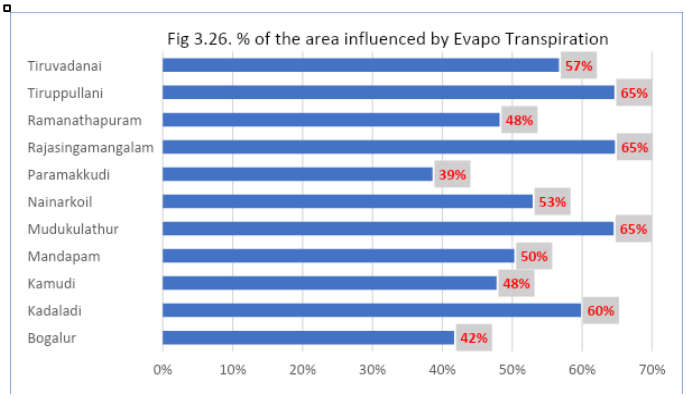
3.5.5) Water budgeting- Evapotranspiration losses and management

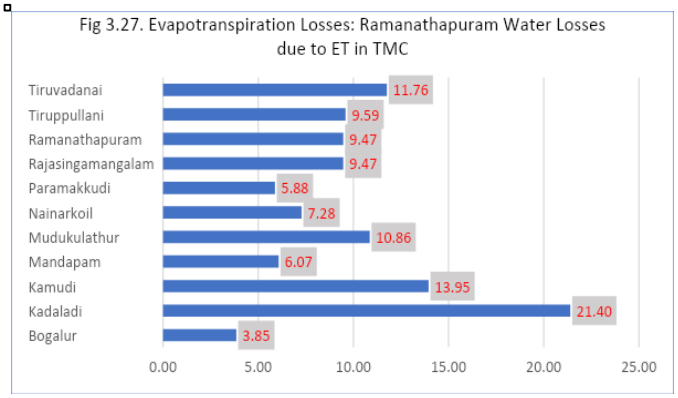
Evapotranspiration Analysis: The loss of water through evapotranspiration is important in the water budgeting. The annual total ET loss during 2018-19 was 522 mm with monthly average of 43.5 mm. The average percentage area influences the water loss through ET in

the district was 54% and the total annual losses due to ET alone 110 TMC in the district (Table 3.36).

Table 3.36. Estimates of the losses due to Evapotranspiration: Ramanathapuram District

Name of the block	% of the area influenced by Evapo Transpiration	Water loss due to ETo in Ha-m	Water loss due to ETo in MCM	Water Losses due to ET in TMC
(1)	(2)	(3)	(4)	(5)
Bogalur	42%	3849.14	38.49	3.85
Kadaladi	60%	21396.57	213.97	21.40
Kamudi	48%	13949.55	139.50	13.95
Mandapam	50%	6073.69	60.74	6.07
Mudukulathur	65%	10857.50	108.58	10.86
Nainarkoil	53%	7276.03	72.76	7.28
Paramakkudi	39%	5877.63	58.78	5.88
R.S.Mangalam	65%	9466.81	94.67	9.47
Ramanathapuram	48%	9466.81	94.67	9.47
Tiruppullani	65%	9587.70	95.88	9.59
Tiruvadanai	57%	11757.42	117.57	11.76
Total	**54%**	**109558.86**	**1095.59**	**109.56**
Source: CWC, WRIS, Govt of India and WASCA - CWRM- TN- Ramanathapuram Plan, 2020-21				





3.6) Seawater Intrusion and Salinity of Ground Water

To reduce the effects of seawater intrusion into freshwater resources SDMRI has conducted a vulnerability mapping and assessment for the whole Ramanathapuram District with support from GIZ. The specific objectives were 1) To map vulnerability of the groundwater quality in aquifers, extent of seawater intrusion in the aquifers; 2) to estimate annual rate of sea water intrusion; and 3) to develop effective plan, suitable methodology for the sustainable management for arresting/reducing seawater intrusion (with Climate Adaptation). The study adopted the following methodology:

- **Collection of groundwater samples:**
  Tthe entire Ramanathapuram district was divided into 227 grids of 5 km, and samples from the grids were collected at 1x1km. Samples were collected from bore wells or open wells during the pre-monsoon and post-monsoon seasons. Extensive fieldwork was undertaken for the entire Ramanathapuram district from 15th to 18th July 2020 and 18th to 21st August 2020, in order to collect groundwater samples. Totally 378 numbers of groundwater samples were collected during the pre-monsoon period.

- **Analysis of groundwater samples**
  Both the physical and chemical parameters were analysed for the collected groundwater samples using standard methodology (APHA 2005).

- **Water Quality Index (WQI) and Seawater Mixing Index (SMI)**
  Both WQI and SMI were used for rating the water quality and effective isolation of seawater mixing in groundwater.

- **Spatial mapping using GIS**
  Spatial database was prepared for the different water quality parameters and index. Thematic maps were prepared using Inverse Distance Weighted (IDW) interpolation method.

The results are presented in the form of shape file/kml format to prepare CWRM plan at Gram Panchayat levels for the entire district.

The main results shows that

- pH ranges from 6.12 to 8.13, salinity varies between 0‰ and 40‰,
- electrical conductivity ranges between 377 µS/cm and 53,900 µS/cm,
- TDS ranges between 214 mg/l and 32,020 mg/l,
- total Hardness ranges between 45 mg/l and 6,425 mg/l,
- calcium ranges from 21 to 2937 mg/l,
- magnesium ranges from 12 to 1645 mg/l,

- sodium ranges from 10 to 4,270 mg/l,
- potassium ranges from 1 to 97 mg/l,
- chloride ranges from 32 to 8,609 mg/l,
- nitrate ranges between 1 and 140 mg/l,
- sulphate ranges between 2 and 240 mg/l,
- total alkalinity ranges from 220 to 481 mg/l,
- carbonate ranges from 34 to 152 mg/l, and bicarbonate ranges from 121 to 363 mg/l.

The computed WQI ranges from 32.52 to 1,830.66 and SMI indicates **30% of the samples are influenced by seawater intrusion.** The key findings of the study in pre-monsoon groundwater quality of the district indicates that

- Higher concentration of EC and TDS along the coastal region, possibly due to the seawater intrusion in the aquifer.
- Higher concentration of calcium in the groundwater, possibly due to the existence of calcium rich minerals such as gypsum, limestone, etc.
- Higher concentration of sodium in the groundwater, possibly due to the seawater intrusion.
- Higher concentration of chloride in the groundwater, possible due to the seawater intrusion.
- Water Quality Index indicates that only 9% of the groundwater is excellent, 24% each comes under the good and medium categories, 10% comes under poor and 33% under very poor quality categories, which could be due to seawater intrusion, effective discharge of ions and agriculture impact.
- Seawater Mixing Index indicates that 30% of the groundwater samples are affected by seawater intrusion.

The spatial distribution of various groundwater quality parameters, WQI and SMI clearly indicate that seawater intrusion is observed in the Ramanathapuram district, particularly from the south coastal tract to the central region in the Gulf of Mannar coast and in the east to west direction in the Palk Bay coastal region.

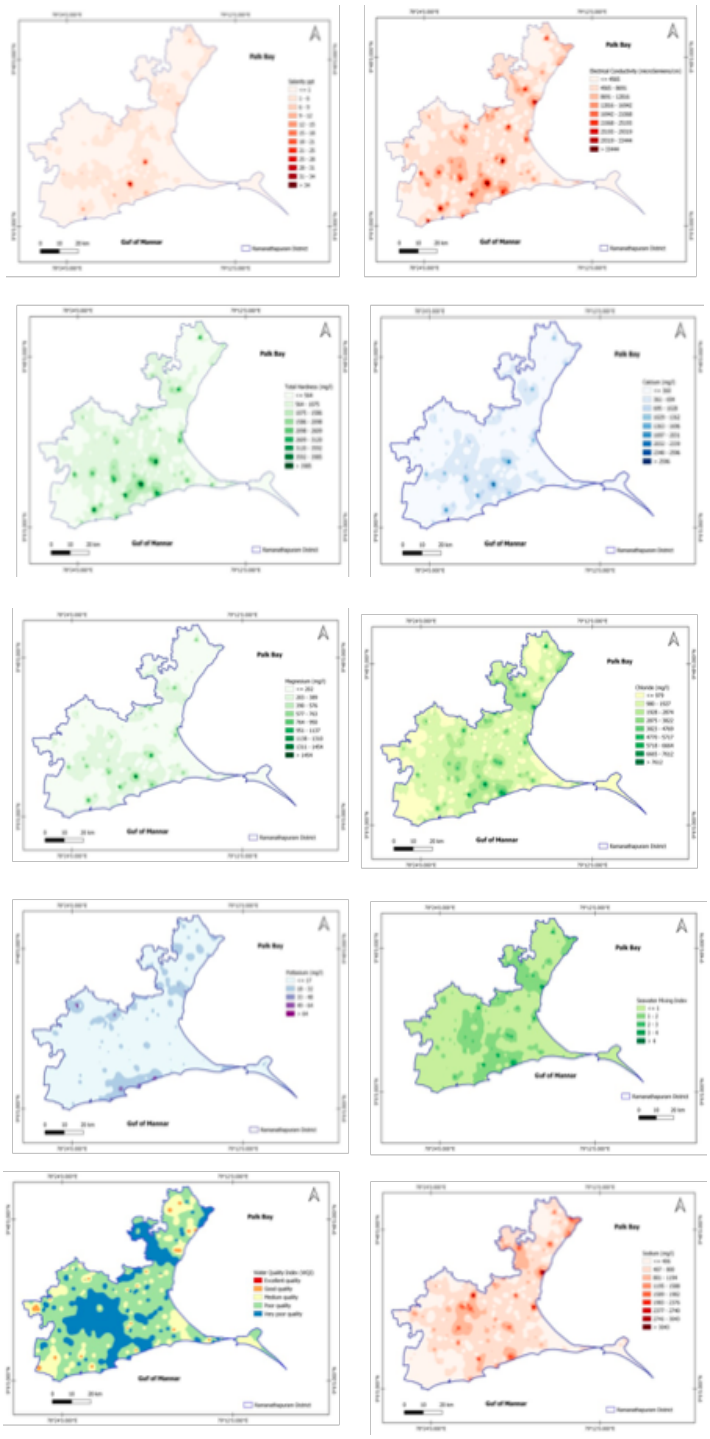


Fig 3.28. Sea water intrusion status in the district

Source: Field study, SDMRI, 2020, WASCA-TN

3.7 Water Quality

There were no major issues in both chemical and biological contamination, however, six out of the eleven blocks are located in the coastal area. Here TDS is high in the villages which are closer to the coast line. The recent study of the Prime meridian also highlighted the

increasing number of area's getting salinized and ending up with poor water quality. According to the latest Ground Water assessment out of 39 firkas, 29 fall in safe category and 9 fall in saline category. In order to improve the Ground Water and Quality 8 check Dams and 54 recharge wells have been Proposed to be constructed in this study(Fig 3.29).

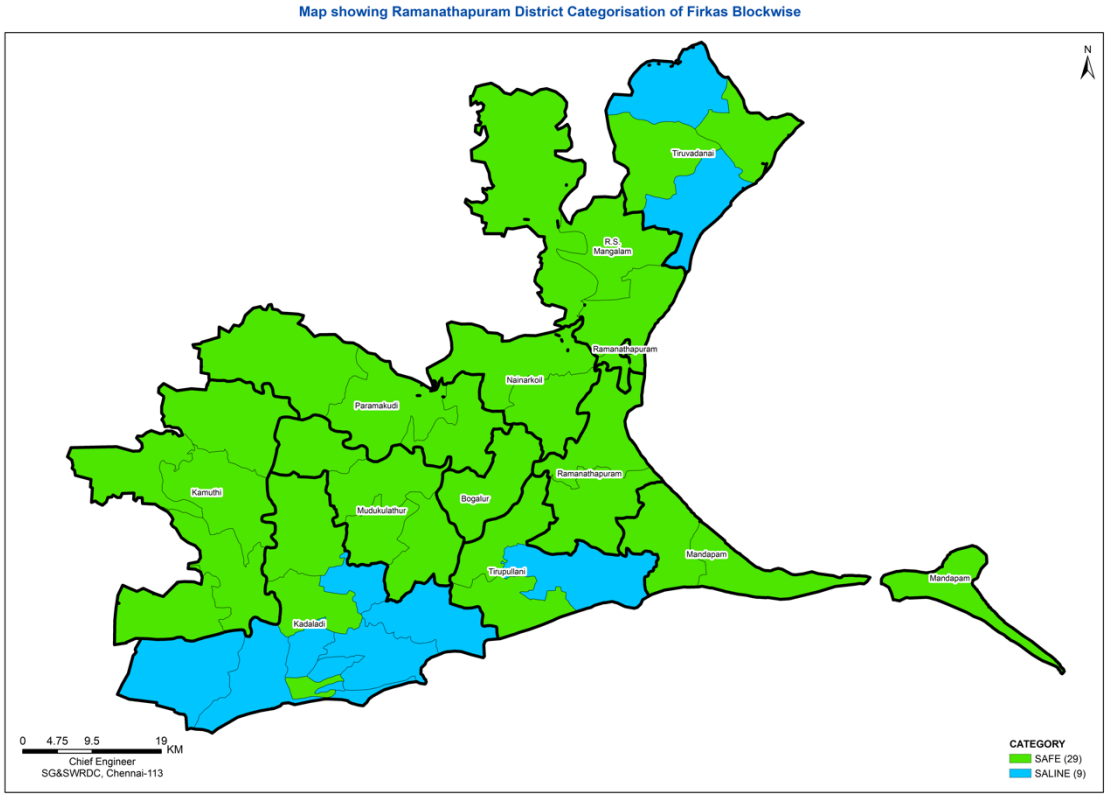


Fig 3.29. Ground water status across firka's in the Ramanathapuram District

3. 8. Thematic maps

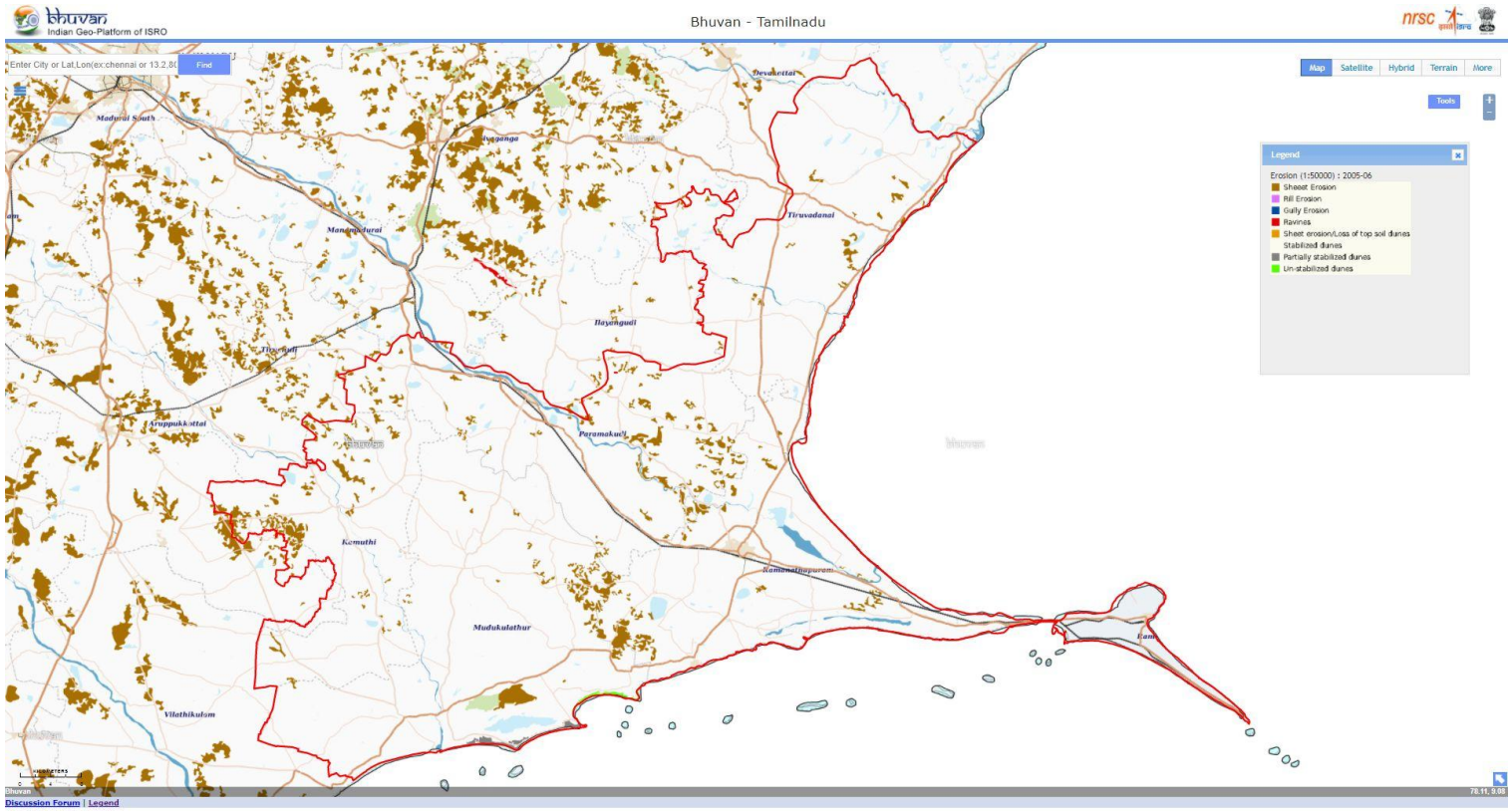
Under spatial data, following thematic maps are used to identify key water challenges and to find the suitable sites to undertake water management actions. The maps are used by over laying different thematic layers to identify the interrelated issues in land use.

1. Satellite view map

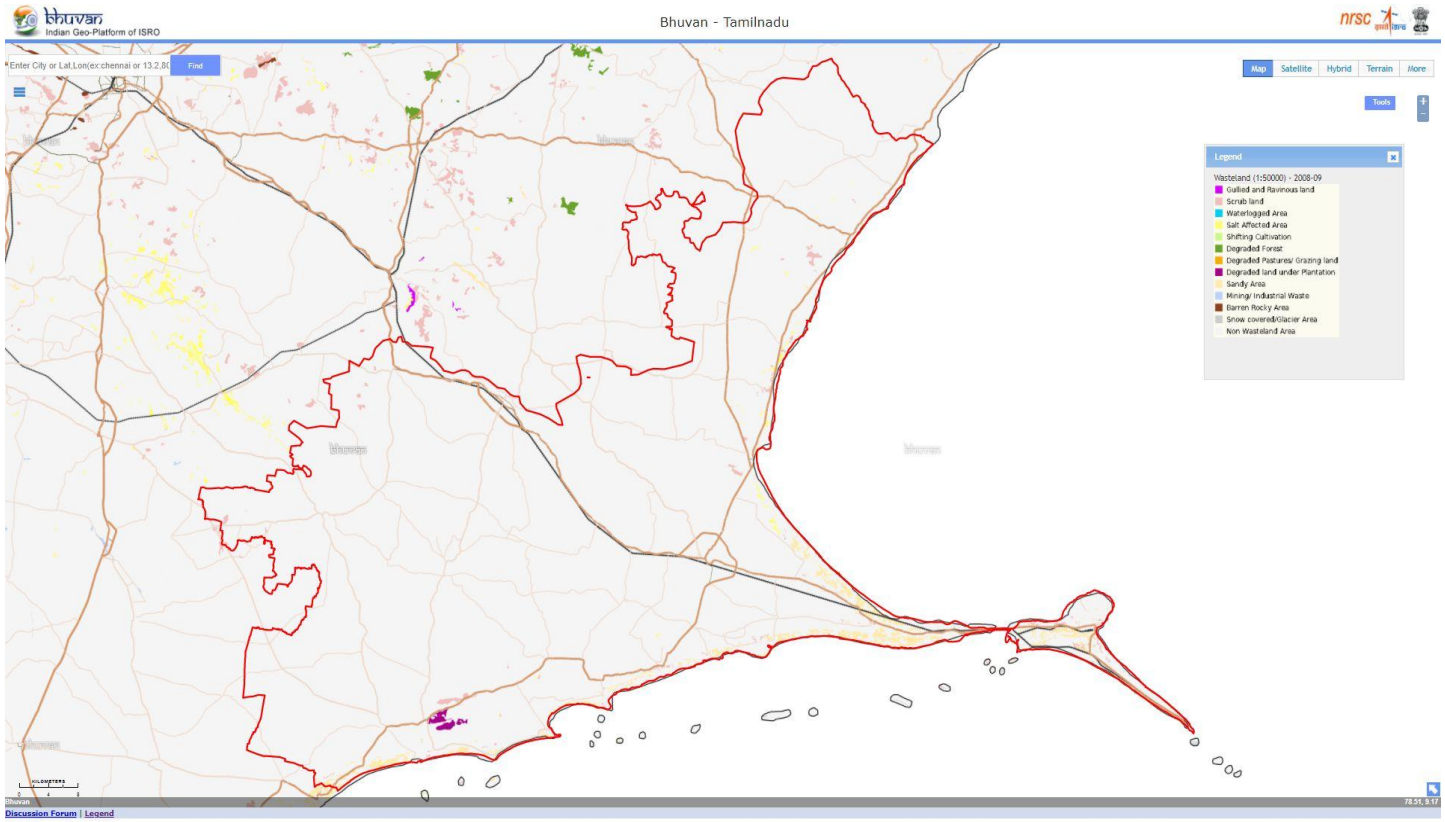
The map shows about the overall satellite view of the GPs in Ramanathapuram district. The Satellite image provides the overview of the village; how the habitations and other land forms are distributed within the geographical area of the village.

2. Location map: The map shows the location of the GPs/ block which are present in the Ramanathapuram district.

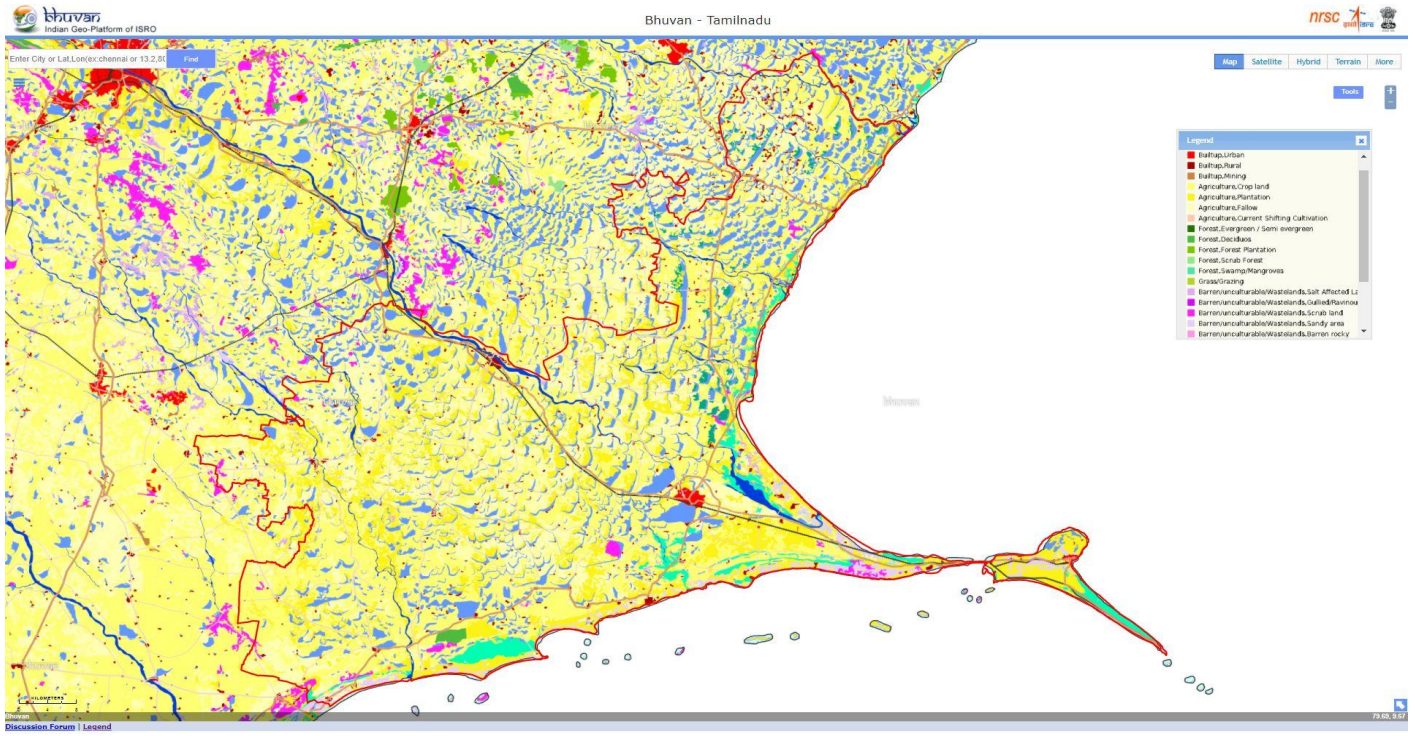
3. Soil erosion map: The erosion map shows the soil erosion capacity with respect to rainfall, soil physical properties, terrain slope, land cover of Ramnathapuram district. The soil erosion map used for soil conservation and regional planning and watershed management. In Ramanathapuram district, it is observed that sheet erosion is more predominant so the measures has been planned to arrest further erosion.


bhuvan
Indian Geo-Platform of ISRO
Bhuvan - Tamilnadu
nrsc
Find
Map
Satellite
Hybrid
Terrain
More
Tools
Legend
Erosion (1:50000) : 2005-06
Sheeet Erosion
Rill Erosion
Gully Erosion
Ravines
Sheet erosion/Loss of top soil dunes
Stabilized dunes
Partially stabilized dunes
Un-stabilized dunes
Devakottai
Madurai South
Vaigai
Manamadurai
Tiruvadanai
Ilayangudi
Paramakudi
Aruppukkottai
Kamuthi
Ramanathapuram
Mudukulathur
Vilathikulam
Discussion Forum | Legend

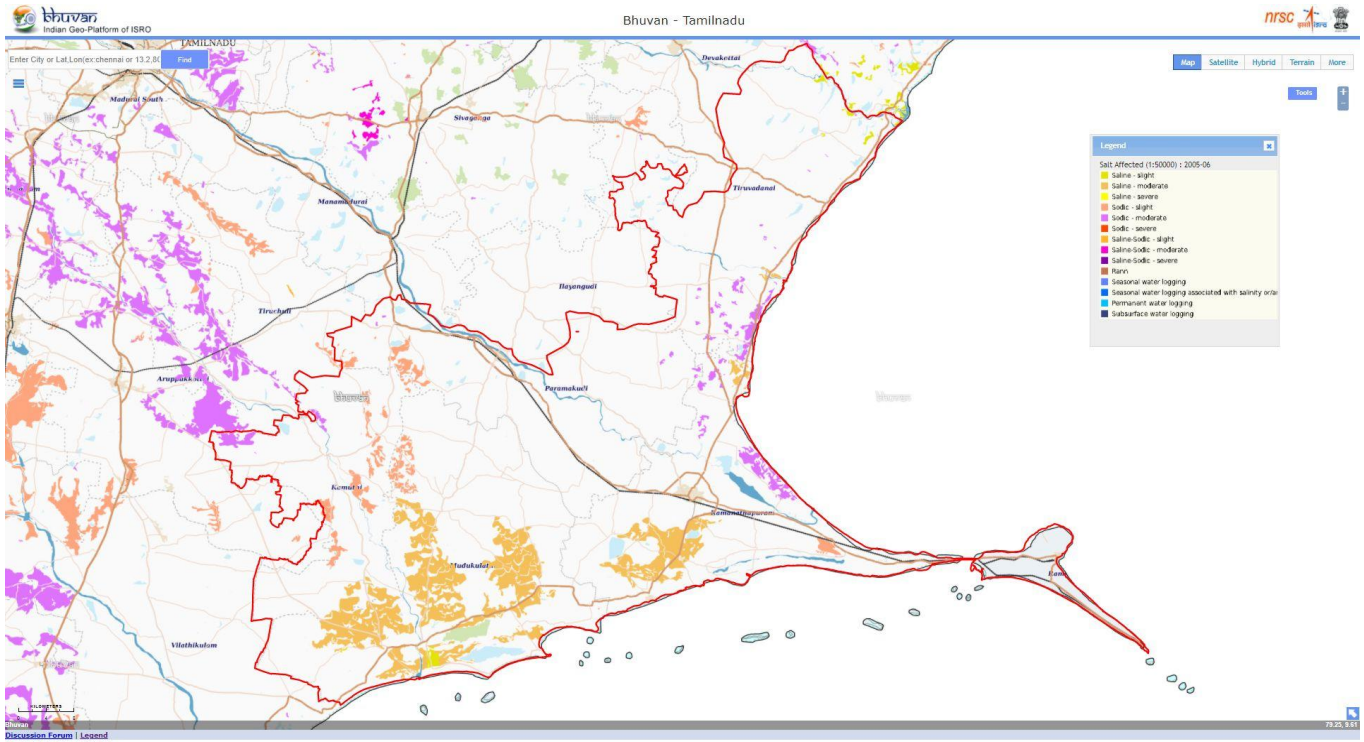
4. Wasteland map: The wasteland map illustrates the availability of the wasteland in Ramanathapuram. Its shows that sand which is categorised as wasteland is spatially spread over coast of Ramanathapuram. During planning the GPs, the plantation measures have been taken up in the identified wastelands to convert into productive land.



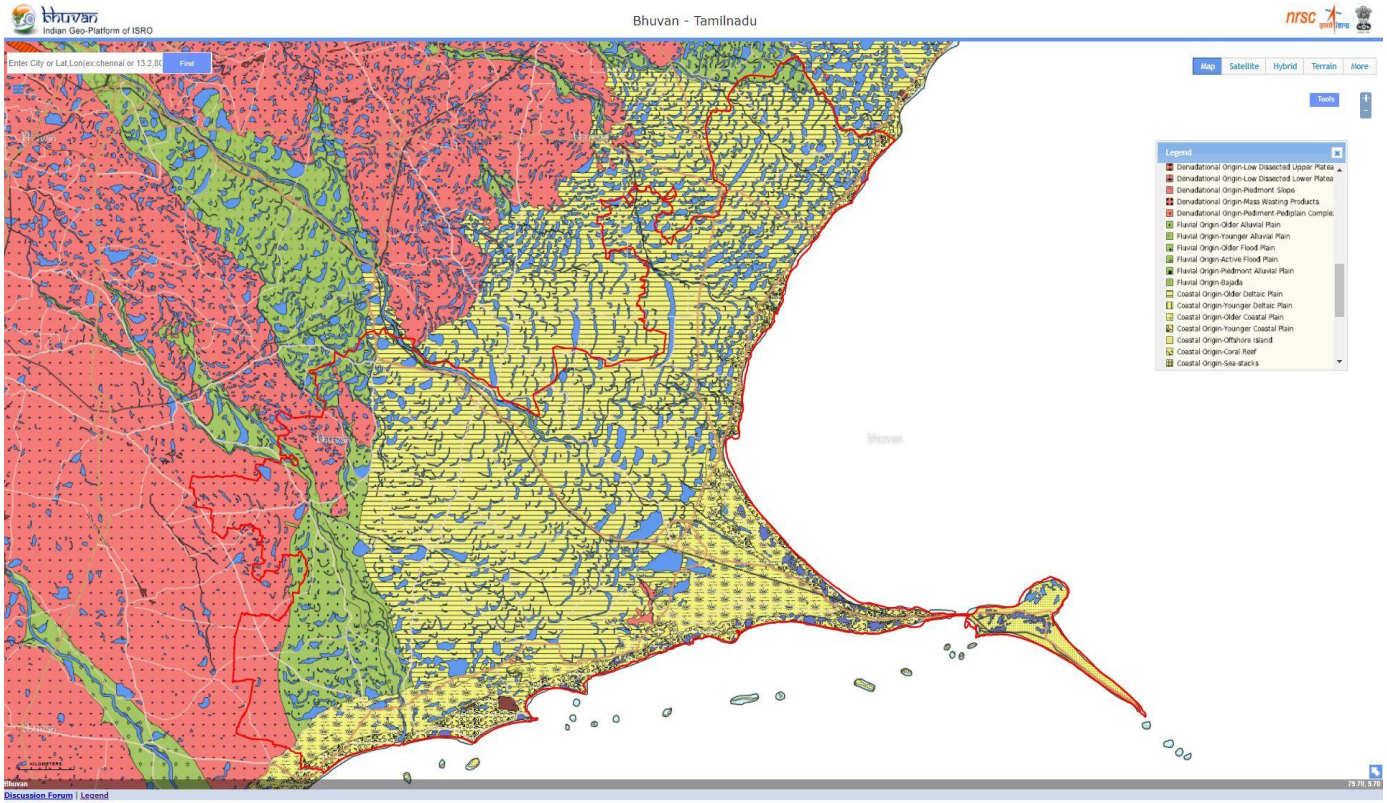
5. Land use land cover map: Land Use Land Cover (LULC) map provides the information about the current landscape and the existing land use pattern. The map clearly shows that the Ramanathapuram district is covered by the agricultural plantation and fallow lands. The map helps the decision makers and planners to concentrate on the fallow land development activities. During the planning of GPs, the more fallow land activities has been proposed in the Ramanathapuram district.



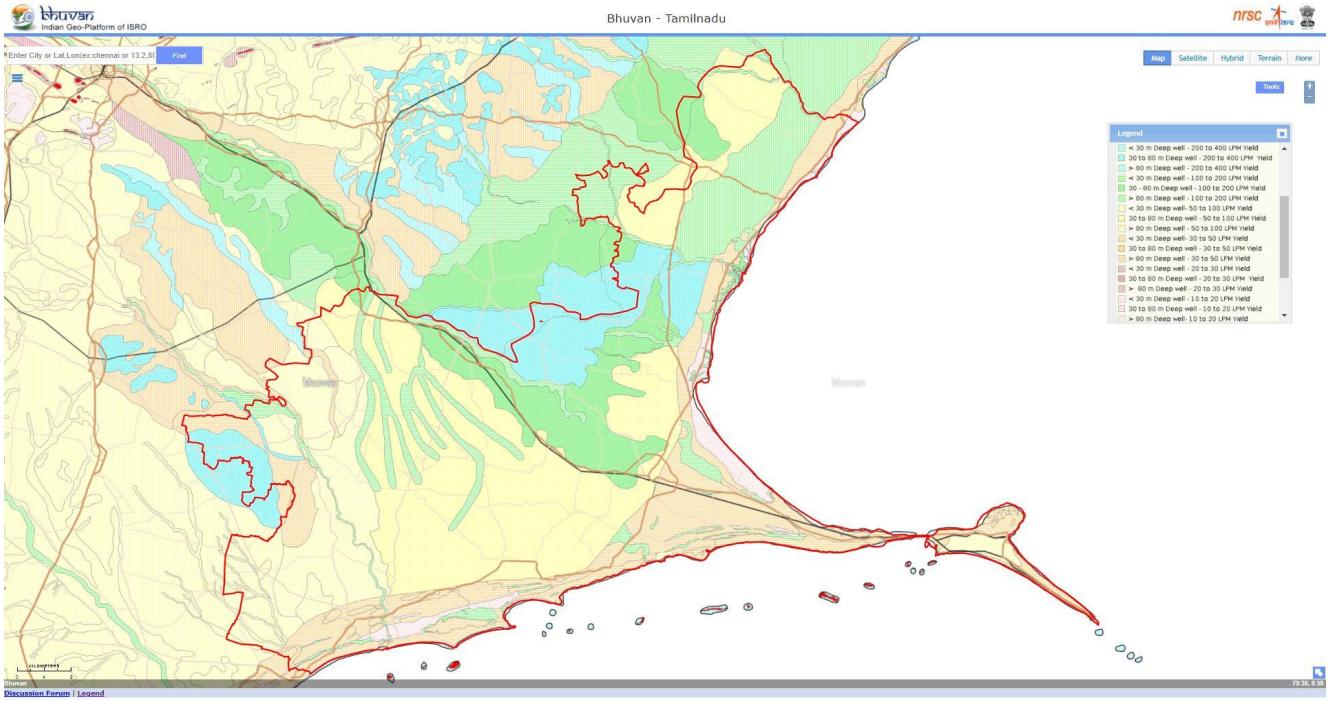
6. Salt affected area map: Salt affected areas are one of the most important degraded areas where soil productivity is reduced due to either salinisation or sodicity or both. In Ramanathapuram district, it is observed that the some parts of the land are moderately saline around the Southern coast of the Ramanathapuram and sodic along the east coast of Ramanathapuram. While planning the GP, this area has been treated specially and given alternative cropping and other any other steps has been suggested to reduce the salinization.



7. Geomorphology map: The Geomorphology map is the graphical inventories of a landscape depicting landforms and surface as well as subsurface materials. It determines the character of soil, vegetation, water percolation and land cover. The Ramanathapuram districts clearly covers under the Coastal origin deltaic and coastal plain category. The geomorphic and geologic conditions is guided us to undertake appropriate work in particular location to reap maximum benefits.

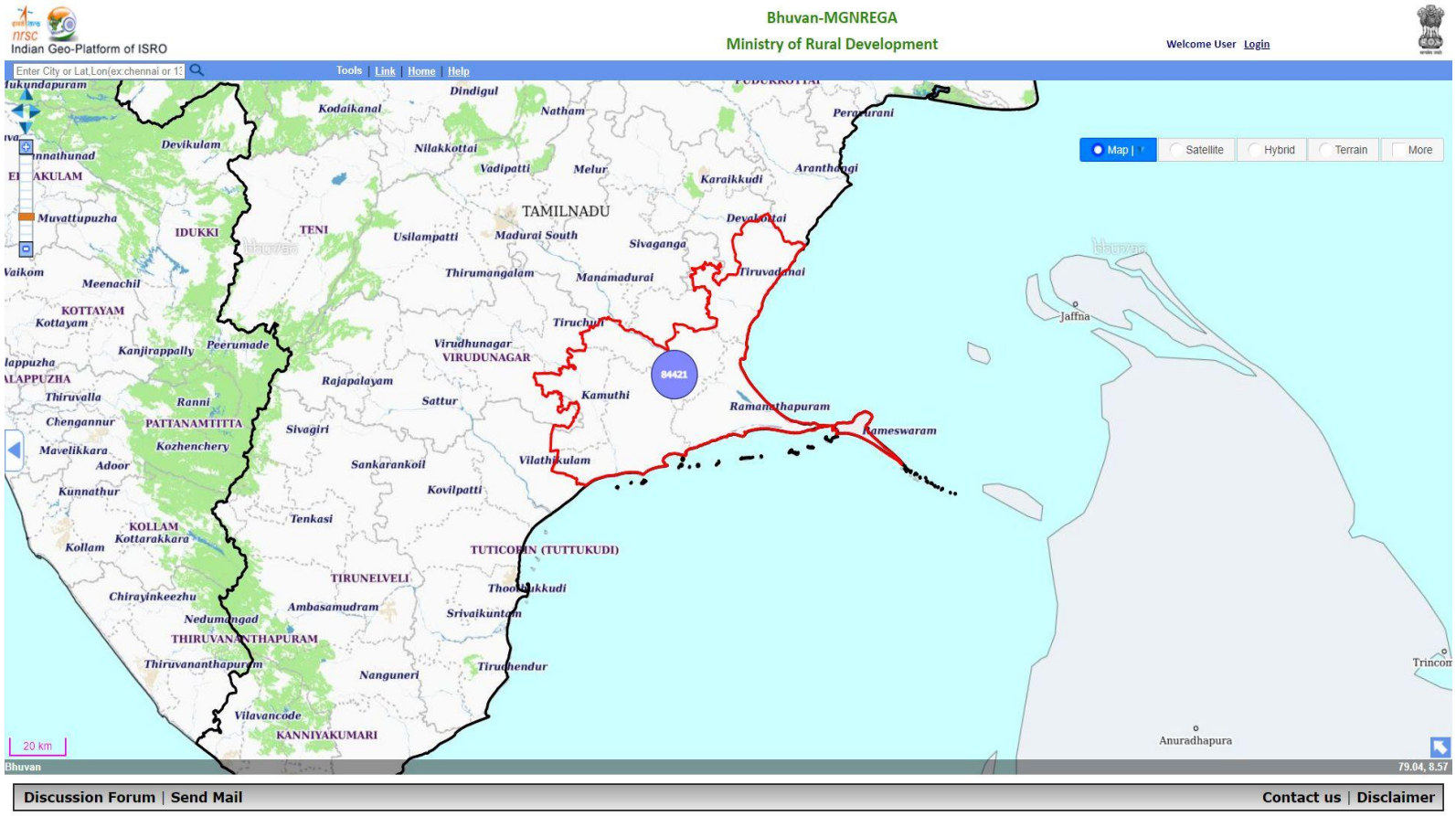


8.Ground water prospectus: The map provides the required information on geological parameters connected to ground water exploration and the probable ground water prospects and helps in identification of sites for planning recharge structures to address water scarcity in a more effective manner for Ramanathapuram district.

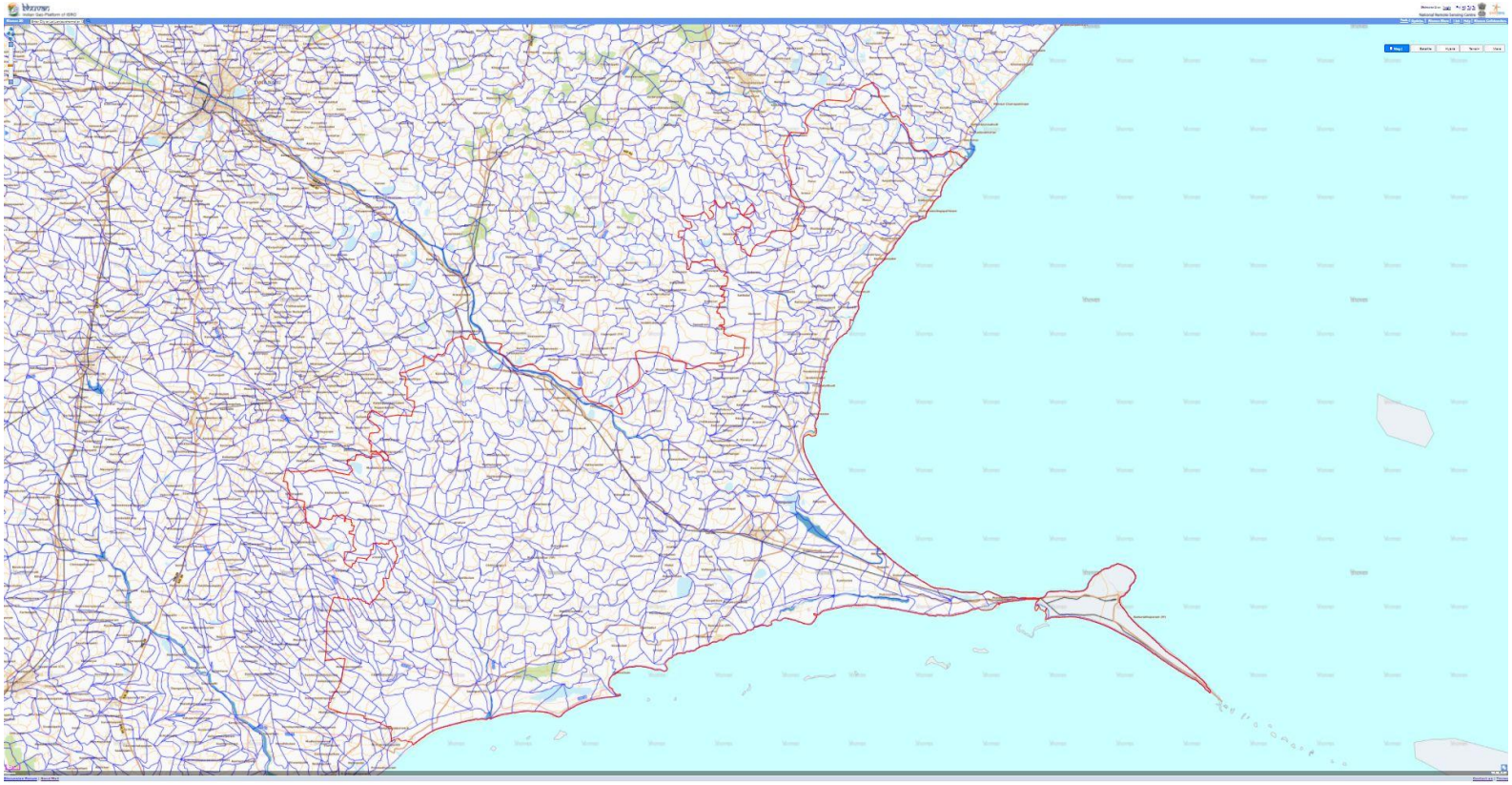


9. Lineament map: A lineament map shows the linear feature in a landscape that is an expression of an underlying geological structure such as a fault, fracture, or joint in the district. In Ramanathapuram, mostly the lineament drainage parallel is noticed. This map is very useful to decide the suitable water conservation, harvesting and recharge measures in the district.

10. MGNERGA works map: This map shows the MGNERGA works carried out in the Ramanathapuram district. This will be useful to understand the past works and to propose the future works to avoid duplication.



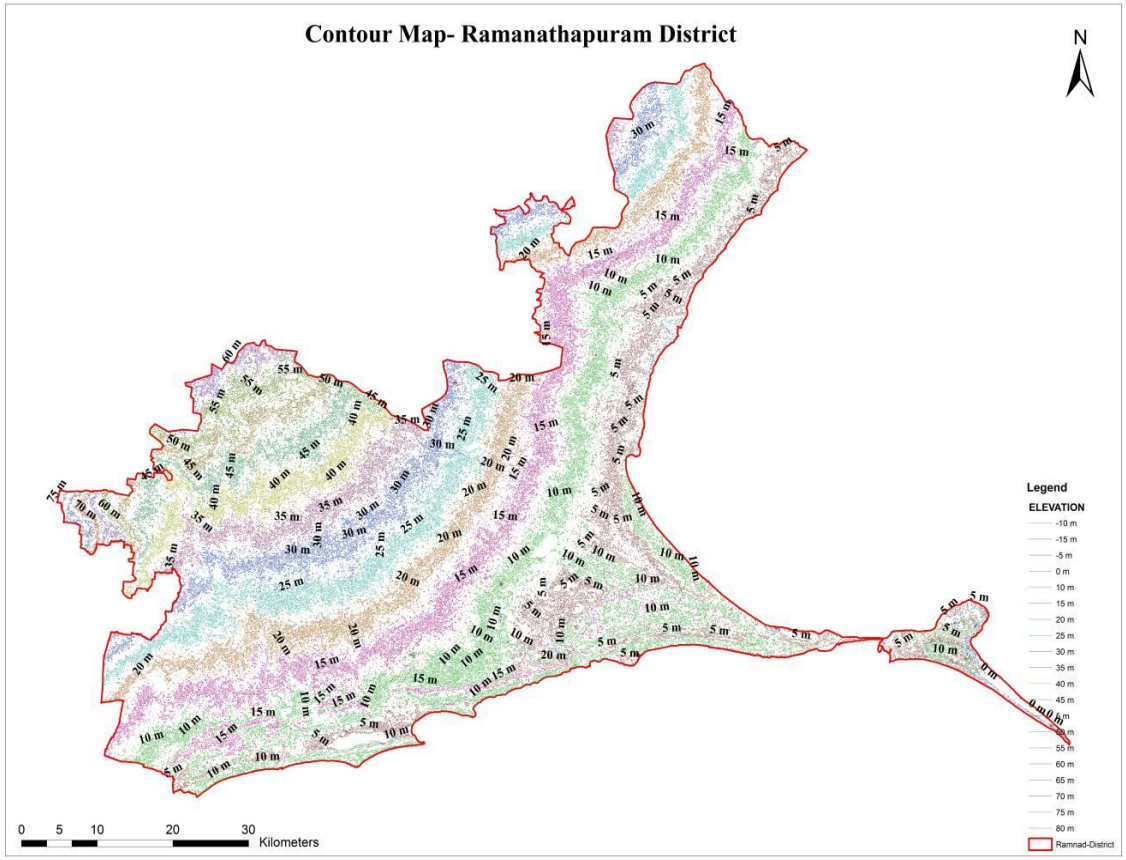
11. Watershed map: A watershed map is the area of land where all of the water that falls in it and drains off of it goes into the common outlet. This map is used for the interventions based on ridge to valley concept and sequencing the plan accordingly.



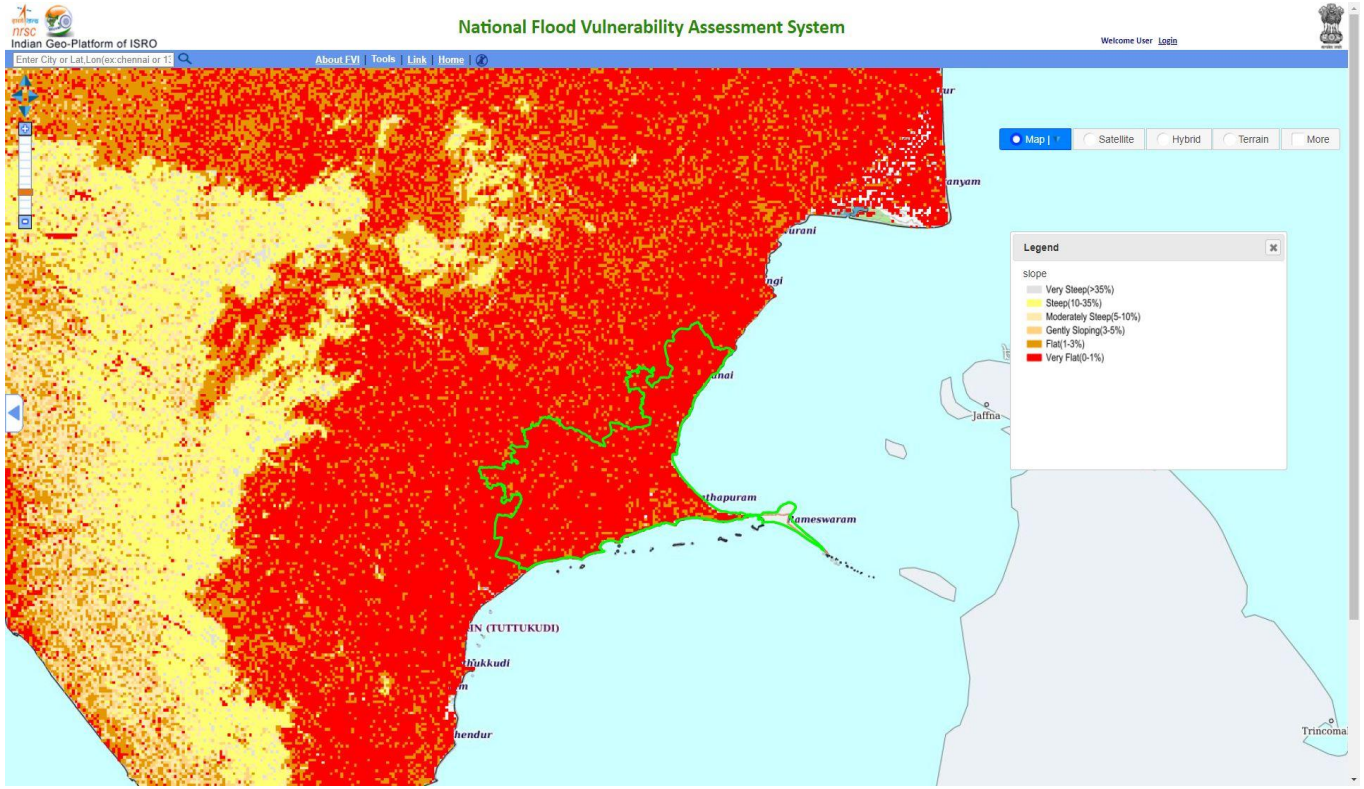
12. Drainage map: The drainage map shows the drainage order, pattern and destiny. Also, It shows the spread and extent of surface water bodies in the Ramanathapuram district. This map is widely used to identify the suitable locations for check dams on the drainage, gabion structures and desilting the drains

13. Terrain map: A terrain map shows an area of land divided into terrain map units defined by similar elevation, slope, landform. This map will be useful to understand the terrain to identify the water and soil conservation related activities in the Gps of Ramanathapuram.

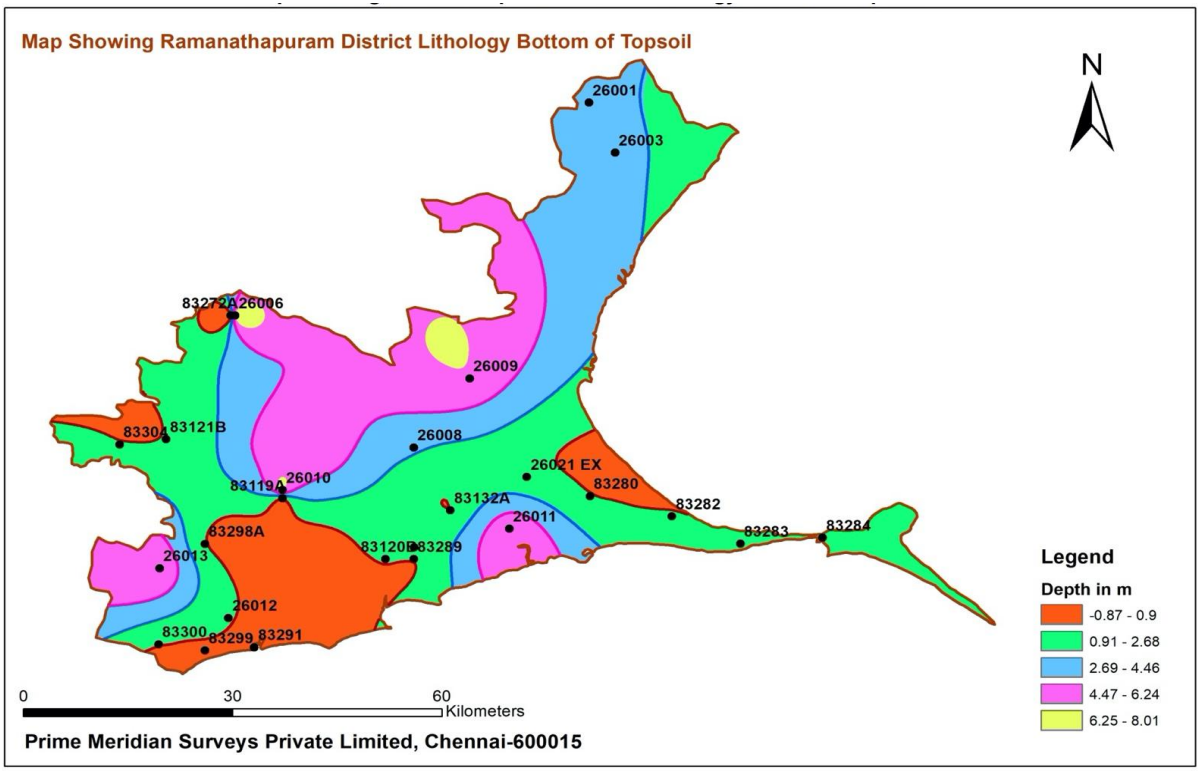
14. Contour map: A contour map is illustrated with contour lines which shows valleys and hills, and the steepness or gentleness of slopes. The map clearly shows gentle slope towards the coast. The contour map plays a vital role in planning and identifying the recharge structures, farm ponds and construction of grey water drain network etc.,

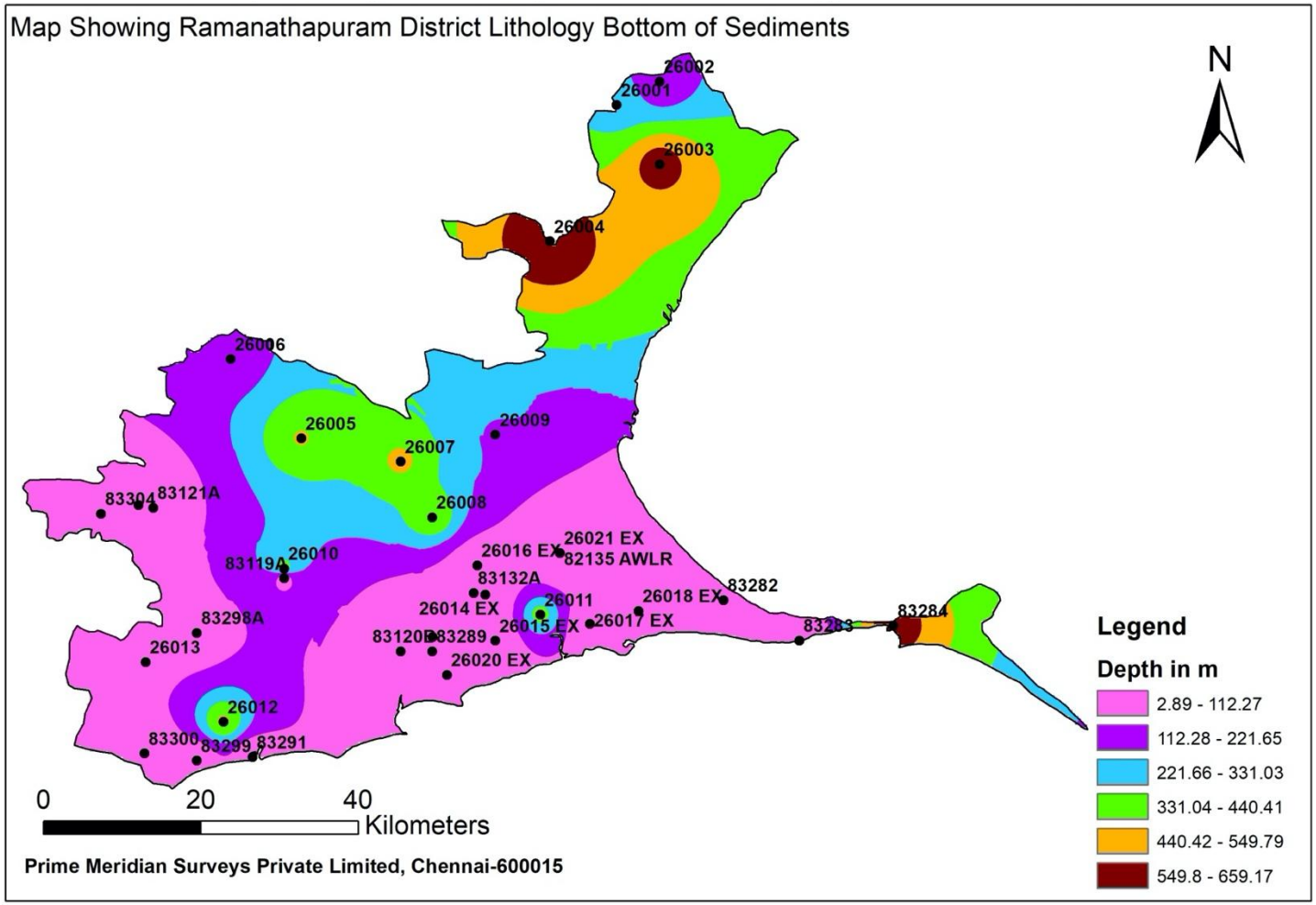


15. Slope map: Slope map illustrates the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. Slope is typically expressed as a percentage, an angle, or a ratio. The average slope of a terrain feature is calculated from contour lines on a topo map or DEM . It is used for analysing the soil conservation measures and construction of the water recharge structures such as check dam, farm ponds etc.,



16. Lithology maps




Map Showing Ramanathapuram District Lithology Bottom of Sediments
N
26002
26001
26003
26004
26006
26005
26007
26009
83304
83121A
26008
26021 EX
26016 EX
82135 AWLR
83119A
26010
83132A
83282
26018 EX
26014 EX
26011
83284
83298A
26015 EX
26017 EX
83289
26013
26020 EX
26012
83300
83299
83291
0
20
40
Kilometers
Prime Meridian Surveys Private Limited, Chennai-600015
Legend
Depth in m
2.89 - 112.27
112.28 - 221.65
221.66 - 331.03
331.04 - 440.41
440.42 - 549.79
549.8 - 659.17

Chapter 4
Key Water Challenges in WASCA – Ramanathapuram

The key water issues under each of the four key vulnerability themes namely socio-economic, climate, water and agriculture and allied sectors were analyzed at the GP levels to identify the actions necessary for improved management of the water resources. The issues under land use categories- one to six (areas under forest, non-agricultural use, barren and uncultivable lands, permanent pastures and other grazing land area, land under miscellaneous tree crops, cultural waste lands) are related to public and common land resources. While the issues under productive land scape's are from land use categories six to ten (fallow land other than current fallow, current fallow, total unirrigated land and irrigated land). Besides, issues related to common rural infrastructures and services for drinking water access and grey water management (Table 4.1).

Table No: 4.1 Key water challenges in four different vulnerability areas

S.N.	Climate Vulnerability Area	Key Water Challenges
1	Socio-economic	1) **SC and ST population**: 22.05% of the total Population belongs to SC and ST population who are socio economically vulnerable, mostly landless and with less assets 2) **Marginal farmers proportion**: Among farmers, 82% of them are marginal farmers holding less than one Ha of land and hold only 43 % of the total land in the district. In addition, of the total holdings only 13% are from SC and ST communities
		3) **Active job card holders**: Only 75% of the total job card holders are active
		4) **Drinking water demand**- Of the total drinking water demand 86% is met through ground water resources and remaining 14% is met by surface water sources. Increasing

S.N.	Climate Vulnerability Area	Key Water Challenges
		salinization of ground water is an area of concern in the district.
		5) **Grey water management**: 17.21 MCM grey water generation is estimated annually and reuse and recycle strategies are in need
2	Climate	6) There has been changes in the **maximum and minimum temperature as well as rainfall quantity** compared the annual normal (1970-2000) of the district a) Rainfall: The annual rainfall of the district is 821mm, the estimated projections for the period is there will be an increase in 1% rainfall in both the century (Mid and End) b) Max. temp: average maximum temperature range in the district is predicted to 1.83°C-2.51 °C mid of the century. For End- century, this increase would be of 2.71 ° C-3.73 °C. c) Min temp: average minimum temperature in the district is predicted to 1.56°C-2.20 °C mid of the century. For End- century, this increase would be of 2.39 ° C-3.23 °C.
3	Water resources (Hydrological)	7) **Watershed profile including the natural drainage lines**: The district has 914 micro watersheds covering an area of 5,54,570 Ha, of which 253 coastal micro watersheds covering a geographical area of 1,75,200 Ha in the district Six out of 11 blocks are coastal blocks and increasing rate of ground water salinization has been reported in nine firkas in the coastal areas The district has 1476 Km total length of the natural drainage lines in the district- the issues are current status, siltation, bund strengthening and delink of the connected tanks cascades

S.N.	Climate Vulnerability Area	Key Water Challenges
		8) **Existing Water Recharge or Storage structures and canal netwoks** • Tank system details and canal network:1344 tanks and 3883 *ooranis* with 1576 Km length of field channels to distribute water to the agriculture fields – Needs marking the original area, deepening, desilting, bund strengthening, surplus weirs and bund plantation are the key issues • Canal network: 1097 Km length of main canal, 5921.49 km length of minor canal systems. Further it has 422.46 km of distributaries and 1576 km length of field channels are present in the district. Most of the channels have issues related to marking the original area, removing the silts and deepening the flow area, strengthening the side bunds and lack of vegetation in the bund areas
		9) **Status of the ground water**: **9 a) Ground water**: There were no major issues in both chemical and biological contamination, however, increasing TDS content in six out of the eleven blocks that are located in the coastal area. The recent Ground Water assessment shows that out of 39 firkas, 29 fall in safe category and 9 fall in saline category **9 b) Sea water intrusion** – 30% of the samples are influenced by seawater intrusion and the pre-monsoon groundwater quality study of the district indicates that ● Higher concentration of EC and TDS along the coastal region, possibly due to the seawater intrusion in the aquifer.

S.N.	Climate Vulnerability Area	Key Water Challenges
		• Higher concentration of calcium in the groundwater, possibly due to the existence of calcium rich minerals such as gypsum, limestone, etc. • Higher concentration of sodium in the groundwater, possibly due to the seawater intrusion. • Higher concentration of chloride in the groundwater, possible due to the seawater intrusion. • Water Quality Index indicates that only 9% of the groundwater is excellent, 24% each comes under the good and medium categories, 10% comes under poor and 33% under very poor quality categories, which could be due to seawater intrusion, effective discharge of ions and agriculture impact. • Seawater Mixing Index indicates that 30% of the groundwater samples are affected by seawater intrusion.
		10) **Run-Off estimation** • 22.5% is under good catchment, 9.4% under average and 68.40% in bad catchment category. • In the runoff, the good catchment generates 37.64%, average at 17.12% while the bad catchment is 45.24%.
		11) **Water Demand estimation** – Sources, Use, Demand for human use, agriculture, livestock etc from primary and secondary sources • The total demand for water including human, agriculture and livestock is 27362.97 Ha m

S.N.	Climate Vulnerability Area	Key Water Challenges
		• 79% is met through surface water while the balance proportion of 21% is met by ground water resources • Agriculture is the biggest user of water which is about 96%, only 2.4% for human and 1.6% for livestock
		12) Water budgeting **12.a) Surface runoff water** • The total demand is 141.60 TMC for human, livestock and agriculture. Through existing water storage measures 51.4 TMC water is harvested from the runoff amount of 54.8 TMC water available from runoff. But the total deficit in the district is 67.3 TMC • In total demand for water 79% is met through surface water while the balance proportion of 21% is met by ground water resources • Agriculture is the biggest user of water which is about 96%, only 2.4% for human and 1.6% for livestock **12.b) Ground water** • During the pre monsoon, the water level generally shows declining trend ranges from G.L. to 15m. The depth of well below Ground Level 12.0m become dry during hot season like May, June, July. In the post monsoon, the water level generally in upward trend due to rainfall and it may reach the Ground Level also. • The long term fluctuations of water levels range from G.L. to 14.0m in many parts of the Ramanathapuram District. The analysis reveals that the water level has gone down in the north, west and central parts of the Ramanathapuram District. The inference taken from the annual fluctuation is due to lack of rainfall which in turn affects the groundwater levels in

S.N.	Climate Vulnerability Area	Key Water Challenges
		phreatic aquifer. The seasonal fluctuation study reveals that due to necessity for development of ground water for different sectoral needs and due to failure of monsoons, the water level has gone down . 12.**c) Soil moisture**: • The average annual volumetric soil moisture is taken for estimating the amount of water stored as soil moisture which accounts to 52.15 TMC, which is almost equal to the amount of surface runoff 12.**d) Evapotranspiration loss**: • Annual total ET loss during 2018-19 was 522 mm with monthly average of 43.5 mm. The average percentage area influences the water loss through ET in the district was 54% and the total annual losses due to ET alone 110 TMC in the district
4	Agriculture and Allied sectors	**13) Soil profile** • Soil type: Predominant soil type is clay occupying 45% of the total cultivated area of the district followed by coastal alluvial soil to an extend of 17% in the northern part of the district (17%). Remaining area is characterized by sandy loam in 15% of the total area • Macro Nutrients: Nitrogen and Phosphorus are very low to low category in the total number of soil samples tested, while potassium is medium to high. Also, the content of the organic carbon also ranges between very low to low category. This indicates that the soil fertility is very poor and further intensive practices make soil more vulnerable to soil erosion and land becomes degraded over a period of time

S.N.	Climate Vulnerability Area	Key Water Challenges
		• Micro nutrients: Zinc and Boron are deficient in more than 58 to 85% of the soils tested • Physical condition of the soil – pH value based:70% of the soils are moderately acidic to moderately alkaline in nature
		14) **Land use profile** • 31.35 % of the land is under public and degraded land • 68.65% of the land is under individual ownership • Of the individual ownership land, 21.85% is under fallow land other than current fallow and the fallow land • 46.80% of the total area is currently under cultivation. • Under public and degraded land, the district has negligible area under permanent pastures, however the district has considerable number of small ruminants which are normally open grazed
		15) Agriculture **15a) crops** • Cropping pattern: Paddy is the primary crop cultivated in 68% of the total area cultivated followed by dry chilli (8.81%), coconut (4.45%), other pulses (3.28%), Jowar (2.98%) and other crops in 8.81% of the area. Of the total crops, 42% is cultivated under irrigated condition and 58% is under rainfed cultivation. Paddy, being a predominantly cultivated, 41.06% of the area is under irrigation and remaining 58.94% is under rainfed cultivation. With reference to water requirement, of the total water needed for cultivation paddy consumes more than 82%.

S.N.	Climate Vulnerability Area	Key Water Challenges
		• of the total water used for irrigation, 82% is through surface water resources followed by remaining 18% through ground water resources • The total water demand for agriculture is 1,47,696 Ha M
		15 b) Livestock resources • The share of small ruminants such as sheep and goat constitute 52% of the total followed by poultry (36.08%) and cow (9.66%). • The total water demand for livestock in the district is 481.76 Ha.m, of which 52% is consumed by sheep and goat followed by 36% and 9.66% by poultry and cow respectively
		16) Irrigation Profile • Type of Irrigation: the predominant type of irrigation is controlled flooding. • Means of extraction: since surface water is used via canal network, gravity is the main type followed by lifting method using electric power from ground water resource • Source of water: The total area under irrigation in the district is 64,394 Ha, of which 82% is irrigated through surface water stored in the tanks/lakes and canal area while remaining 18% is through ground water using open/tube wells

Chapter 5
Key Water Actions in Ramanathapuram

The integrated scientific approach has been adopted to identify the suitable water actions for each of the key vulnerable areas to accelerate the resilience measures. The following table 5.1 indicates the key water actions under socio-economic, climate, water and agriculture and allied sectors. The detailed list of activities are given under the four main sub themes namely

a. Public and common land resources
b. Agriculture and allied sectors and
c. Rural infrastructure

In addition to that, the extend as well as number of the works are also given in table 5.2. Under the public and common land resources 4,88,590 works, agriculture and allied sectors 1,21,966 number of works and in rural infrastructure 43,740 works are identified and proposed to improve the water resources.

Summary of the number of works, estimated budget and person days based on CWRM plans

CWRM water action areas	Number of Works	Budget Estimate (Rs in Lakhs)	Person days (number)	Number of works	Budget Estimate	Person days
Public and common land development	4,88,590	5,32,505	25,29,16,962	74.67%	49.31%	59.98%
Agriculture and allied activities	1,21,966	5,39,568	16,75,14,607	18.64%	49.96%	39.73%
Rural infrastructure	43,740	7,897	12,38,510	6.69%	0.73%	0.29%
Total	6,54,296	10,79,969	42,16,70,079			

5.1: Key water actions proposed for the four different vulnerability areas

S.N.	Climate Vulnerability Area	Key Water Actions
1	Socio-economic	1) Ensuring socio-economic equity issues: Asset Creation for SC and ST are given high Priority, including access to safe drinking water, land development, creating additional employment days, explore the possibility to bring skilled jobs especially for women Marginal farmers are targeted in the individual assets creation including plantation, farm ponds, compost pits etc
		2) Increasing the rate of active job cards: There is a need for increase the active job holders to the total job cards registered in the village which is one of the strategies to increase work participation rate in the rural areas, here focus can be given to individual assets creation which encourage men and women to access the employment opportunities. Also, by encouraging the skilled works, the un employed rural youth's participation can be motivated
		3) Access to drinking water: Actions to improve the access by roof rainwater harvesting measures at both community and individual houses, models like tanka, restoring the traditional water bodies with low cost, simple water treatment plants etc which further ensure their access to drinking water and also here convergence under Jal Jeevan Mission(JJM) helps to meet the gaps in the rural areas

S.N.	Climate Vulnerability Area	Key Water Actions
		4) **Grey water management**: Soak pit concept to be used for Grey water management (Community, Individual); Also under take Nutri Gardens with Five Plants per House Hold, focus with SC,ST and other marginal category families under MGNREGS with Moringa; Coconut, Papaya, Agathi, Curry leaf plants provided, near border of house- soak pit. At community soak pit area; Moringa plantation, Neem Plantation and Grass cultivation can be taken up after the soak pit as natural filters, besides, community soakpits and improvement to existing drains are essential.
2	Climate	**1) Climate resilient action models** are being piloted considering the key climate risks in different sectors (1) Coastal watershed approach - wetland management, sand dune development, creek and other water bodies restoration, coastal plantation etc (2) Community and individual level tanka models (3) Plantations - Mini forest, Silvi pasture, Agro forestry - dry land horticulture and other models like Mega forest - 5000 saplings/unit (4) Degraded land restoration - community level village based integrated farming system models with a focus to horticulture, millets, pulses etc - one in each of the blocks (5) Nurseries at block and regional level mini nurseries (6) Avenue plantation (7) Cascade of tanks (8) Kottakariyar river rejuvenation - includes tank cascades, artificial recharge structures and check dams (9) Integrated food park as livelihood support centres (10) River bank stabilization through plantation (11) Sea water intrusion control and soil erosion
3	Water resources (Hydrological)	**1) Watershed profile including the natural drainage lines**: Ridge to valley approach through water shed analysis at GP level is done to identify the potential areas of interventions
		2) Existing Water Recharge or Storage structures and canal networks: Restoration of storage structures activities includes deepening and de-siliting, providing silt traps at inlets, bund strengthening and planting as well as weir repair and construction
		3) Status of the ground water: Artificial recharge structures both at common and individual lands, check dams, check walls, percolation tanks, sunken bunds, contour bunds, water absorption trenches, compartmental bunds etc

S.N.	Climate Vulnerability Area	Key Water Actions
		4) Run-Off Management The catchment profile based planning is proposed by assessing the type of land and its current and past use pattern
		5) Water Demand estimation – sector wise water demand has been done – Human, livestock and agriculture sectors by understanding the area under cultivation by different crops and its water requirement as well as livestock population and its requirements were taken in to consideration
		6) Water budgeting Estimated water budget is done for the Surface runoff water, ground water, soil moisture and evapotranspiration with the surface runoff water based village level water budgeting in CWRM approach
4	Agriculture and Allied sectors	**1) Soil profile:** Measures that improve soil fertility as well as conservation were proposed including composting, bund plantation with fast growing nitrogen fixing plants and mulching, Farm bund with trench cum bund to allow excess water flow out of the farmland, improve moisture conservation and have better drainage are few important illustrations
		2) **Land use profile** Actions for each of the lands types – common and individual with a set of logics were applied to identify the potential areas for actions in each of the land use types. Through these measures 19% of the additional area has been proposed under WASCA with different soil and water conservation actions
		3) Agriculture **3a) crops** • diversification of cropping system with low water requirement crops and cropping systems and • increase the water use efficiency within the field • crop intensification with inter/mixed crops and agro forestry etc
		3 b) Livestock resources Forage needs are crucial for livestock as the district has limited scope for irrigation to raise grasses under irrigated conditions: hence focus is given to actions such as silvi pasture, agro-forestry with trees having forage value, azolla, promoting good rearing practices by ensuring infrastructures like sheds, troughs, composting units etc
		4) Irrigation Profile Improve the conveyance efficiency by restoring the supply channels, promoting improved irrigation methods including micro irrigation, alternate wetting and drying in paddy etc.

5.2 Livelihoods Development

a. Individual Assets: Horticulture, Land Development, Livestock Management
b. Community: Block Plantation, Tank Cascades, etc

Table 5.2. Livelihoods Development – Block-Wise

#	Block/ Mandal	Individual assets and works					Community Assets and works		
		Horticulture		Land Development		Livelihoods Management	Block Plantation		Tank Cascades
		No.of. Plantations	Area in Ha	No. of. Silt Application	Area in Ha	No. of. Animals	No.of. Plantation	Area in Ha	No. of. Tanks
1	2	3	4	5	6	7	8	9	10
1	Bogalur	76800	384.00	115	286.62	53228	961855	1212	49
2	Kadaladi	482600	2413.00	805	2013.28	120750	4471263	5625	193
3	Kamudi	830400	4152.00	1495	3737.52	141899	678222	851	134
4	Mandapam	214754	1073.77	345	862.86	61074	1807592	2260	13
5	Mudukulathur	215200	1076.00	336	839.43	81330	1209408	1525	157
6	Nairnarkoil	247190	1235.95	337	842.85	33282	1314704	1892.41	73
7	Paramakudi	168800	844.00	234	585.45	82740	1519649	1900	111
8	R.S.Mangalam	300000	1500.00	411	1027.21	43050	5530495	7513	227
9	Ramanathapuram	144854	724.27	182	455.33	53189	468575	589	57
10	Tiruppullani	266000	1330.00	302	754.89	72834	3731669	5183	62
11	Tiruvadanai	345400	1727.00	505	1262.59	69780	487981	937	268
	Total	**3291998**	**16459.99**	**5067**	**12668.03**	**813156**	**22181413**	**29487**	**1344**

5.3 Block-Wise Summary of Works

The total number of works identified are relatively more in the blocks namely Kadaladi, Thiruvadanai, Kamudi, Ramanathapuram and Muthukulahtur. Of the three different kind of works, more than five times works are under NRM category.

Table 5.3. Block-wise summary of works under three themes

No.	Block	Number of works identified			
		Improvement of Public and common lands development	Agricultural and allied Sector development (Productivity En-hancement)	Rural water Management	Total no of works in the block
(1)	(2)	(3)	(4)	(5)	(6)
1	Bogalur	23602	3521	1617	28740
2	Kadaladi	75855	17035	5035	97925
3	Kamudi	50778	27417	4152	82347
4	Mandapam	11955	10967	12347	35270
5	Mudukulathur	46766	9629	3294	59689
6	Nairnarkoil	15450	6989	1819	24259
7	Paramakudi	30791	8495	3086	42372
8	R.S.Mangalam	44242	9159	2331	55732
9	Ramanathapuram	55525	6836	2320	64681
10	Tiruppullani	44539	9475	4403	58416
11	Tiruvadanai	89087	12443	3336	104867
	Total	**4,88,591**	**1,21,966**	**43,740**	**6,54,297**

5.4 Convergence Plans

The schemes of both government (state and central) and private sectors which were implemented focusing on integrated water resources management and climate adaptation on district level was reviewed to understand its intensity of works and reach, the details are given below in Table 5.5. There are 7 existing schemes and financing mechanisms apart from MGNEREGS, comprise approaches for an integrated, climate-adapted water resource management in rural areas.

Table 5.4. Areas and line departments identified for convergence

S.N.	Areas of Convergence	Name of the Department
1	Coastal Watershed	NABARD, Name other Line departments,
2	Agro Forestry	NABARD, State planning commission
3	Nursery raising	Dept of forestry
4	Fallow Land Development	State planning commission, DRD
5	Dry Land Farming and Horticulture	Dept of Agriculture and Horticulture
6	Silvi-pasture and pastureland development	Dept of Animal Husbandry
7	Involvement of SHGs in maintenance, management of community block plantations	Dept of Rural Development
8	Restoration of Cascade tanks	Water Resources Organization, Gram Panchayats, FPO/Water users associations, DRD
9	River Rejuvenation (Name of the river)	WRO, CGWB and Dept of Agriculture Engineering

Table 5.5. Major schemes leveraged for actions under convergence approach

Sl. No.	Name of the schemes	About the programme details in the scheme/policy reference	Specific allocation to district
1	*Kudimaramath*: Tamil Nadu Water Resource Conservation and Augmentation Mission	The Government have given Orders in G.O (Ms) No.96, RD & PR Dept., Dated. 26.7.2019 for the implementation of Kudimaramathu – A participatory Programme for the Rejuvenation of 5,000 Minor Irrigation (MI) Tanks under the 142 control of Panchayat Unions and 25,000 Ponds / Kuttai and Ooranies of Village Panchayats at a cost of Rs.1250 Crore.	The details of allocation to the Ramanathapuram district is restoration of 70 tanks and details are given here
2	Tamil Nadu – Irrigated Agriculture Modernization and Water-Bodies Restoration and Management (TN-IAMWRM)	Under Phase II and III total five sub basins are covered which aims to increase the water use efficiency and productivity and the scheme is supported by World Bank and implemented through Govt of Tamil Nadu	Uthirakosamangai - 9963 Ha Vembar - 1789 Ha Palar - 2598 Ha Girdhamal - 24934 Ha and lower Gundar - 2178 Ha
3	Rainwater Harvesting and Runoff Management Programme	It is a state plan scheme and the kind of works undertaken are percolation ponds, major, medium and minor check dams, farm ponds, rejuvenation of unused wells, village tanks/ooranies	Allocation details are not given and it is taken under convergence with watershed development programmes
4	Mission on Sustainable Dryland Agriculture	Rain water harvesting is adopted as an entry point activities and promoted water harvesting structures such as checkdams, village ponds, community ponds and deepening of Ooranies	Rs 5 lakh per cluster was adopted and for the 24 cluster the total budget for the work in this district was Rs 1.20 Cr.

5	Tamil Nadu Watershed Development Agency (TAWDEVA)	*Micro Irrigation scheme under Per Drop More Crop component*	Implemented with 100% subsidy for small and marginal farmers, in Ramanathapuram district in the year 2017-18, Rs.113.00 lakhs was allocated which covered 200 ha
		Pradhan Mantri Krishi Sinchayee Yojana (Integrated Watershed Management Programme)	Implemented through 24 District Watershed Development Agencies in 26 Districts covering 2770 watersheds and Rs 5.32 Cr was allocated to the district out of Rs 115.16 Cr for the whole state, through this 123 works were completed, major ones are farm ponds, recharge shaft, renovation of pond, percolation pond and new pond
6	*Jal Shakthi Abiyan*	Importance was given to water augmentation initiatives, specifically the block is categorized as saline by CGWB	In Kadaladi block - 60 GPs and works are promoted on NRM works such as check dams, trenches
7	*Jal Jeevan Mission*	The scheme is started from 2019-2020 - focus is given on drinking water	In Ramanathapuram the focus under this scheme has been initiated in 8 blocks, at the state level during 2019-20, Rs 373.87 Cr was allocated to provide tap connections to 13.86 lakh households

The other important schemes being implemented are "Fallow land development under individual farmer category", Here 350 ha was targeted to restore the cultivation of millets and pulses. Similar to Agriculture on the fisheries side, many schemes are being implemented and the important ones are: providing 50% Subsidy for Fishermen to procure New Tuna Long liner-cumGill netter Boats, promoting deep sea fishing, sea weed cultivation, ornamental fish culture etc are important from resource conservation and livelihood points of view in the district..

Besides, other central schemes such as National Food Security Mission (NFSM), National Horticulture Mission (NHM) and state specific fallow land development scheme activities have been focusing on agriculture and horticulture, provisions for constructing and maintaining farm ponds,

dug wells and tanks exist to ensure sustainable water supply for agriculture. Also, under *PMKSY- Har Khet Ko Pani (HKKP)* water bodies had been included under Repair, Renovation and Restoration framework and completed of water bodies in 2017[1].

Private sector schemes: There are two NGOs and three private sector institutions have been working in the district under the Corporate Social Responsibility programme with the partnership of NABARD to implement the watershed schemes.

5.5 Action points - KMZ layers of four GPs per block

The action plans are geo coded following the MORD guidelines to identify the location and follow up the actions.

Table 5.6 Action plans in KMZ form for the four GPs of 11 Blocks

Sl.No	Name of the GPs	Block
1	Bogalur	Bogalur
2	Kamankottai	Bogalur
3	Mudalur	Bogalur
4	Valravanendhal	Bogalur
5	Avathandal	Kadaladi
6	Chithirirangudi	Kadaladi

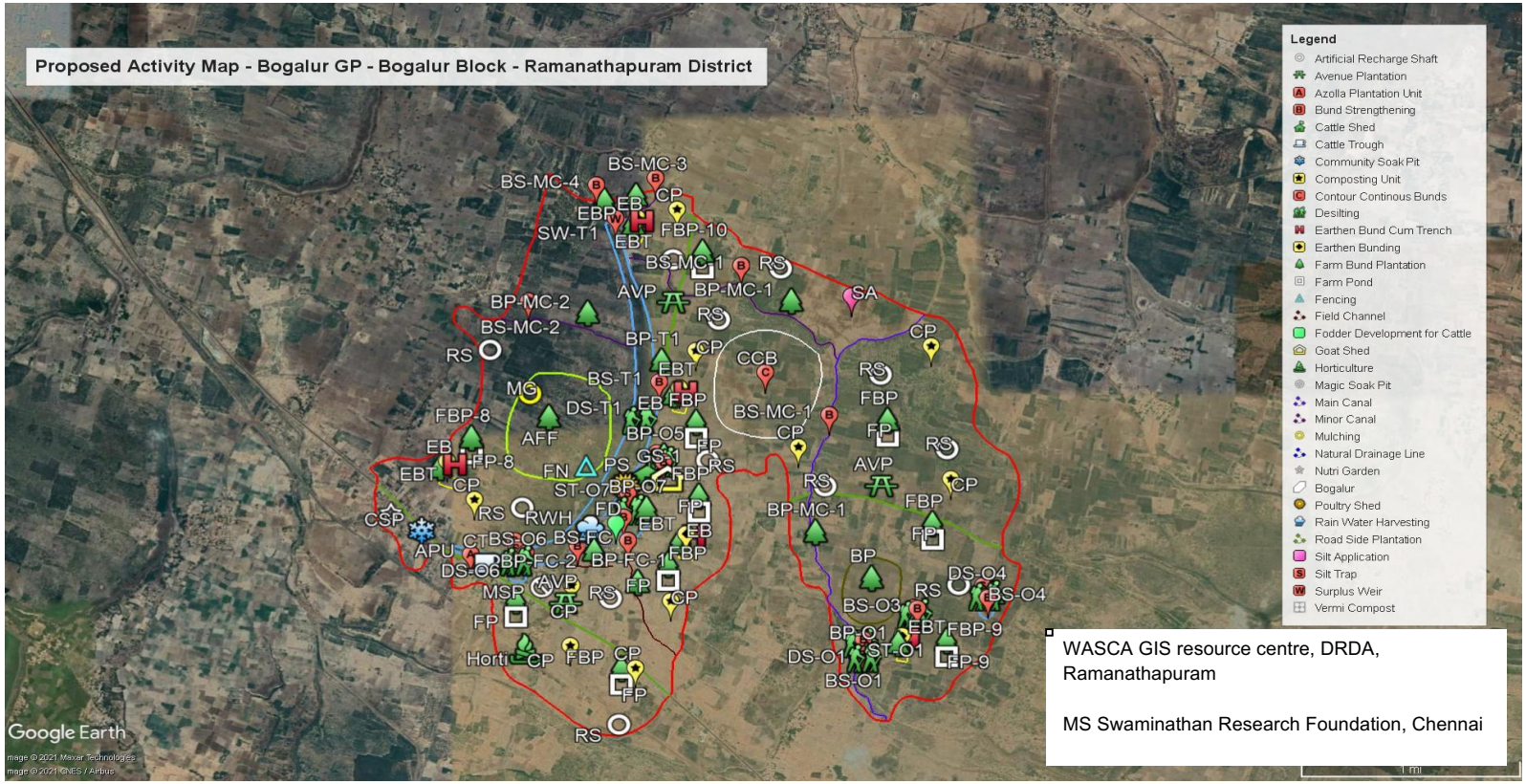
[1] https://sureshe.files.wordpress.com/2018/01/au4298.pdf

Sl.No	Name of the GPs	Block
7	Idambadal	Kadaladi
8	Naripayur	Kadaladi
9	Achchangulam	Kamuthi
10	Mavilangai	Kamuthi
11	Nelmadur	Kamuthi
12	Sengappadai	Kamuthi
13	Enmanamondan	Mandapam
14	Kumbaram	Mandapam
15	Kuyavankudi	Mandapam
16	Valantharavai	Mandapam
17	Karumal	Mudhukulathur
18	Kathankulam	Mudhukulathur
19	Micheal Pattanam	Mudhukulathur
20	Poseri	Mudhukulathur
21	A.Panaiyur	Nainarkoil
22	Arasanur	Nainarkoil
23	Koluvur	Nainarkoil
24	Kulathur	Nainarkoil
25	K.Karungulam	Paramakkudi
26	Nenmeni	Paramakkudi
27	Thaduthalankottai	Paramakkudi
28	Thelichattanallur	Paramakkudi
29	A.Manakudi	R.S.Mangalam

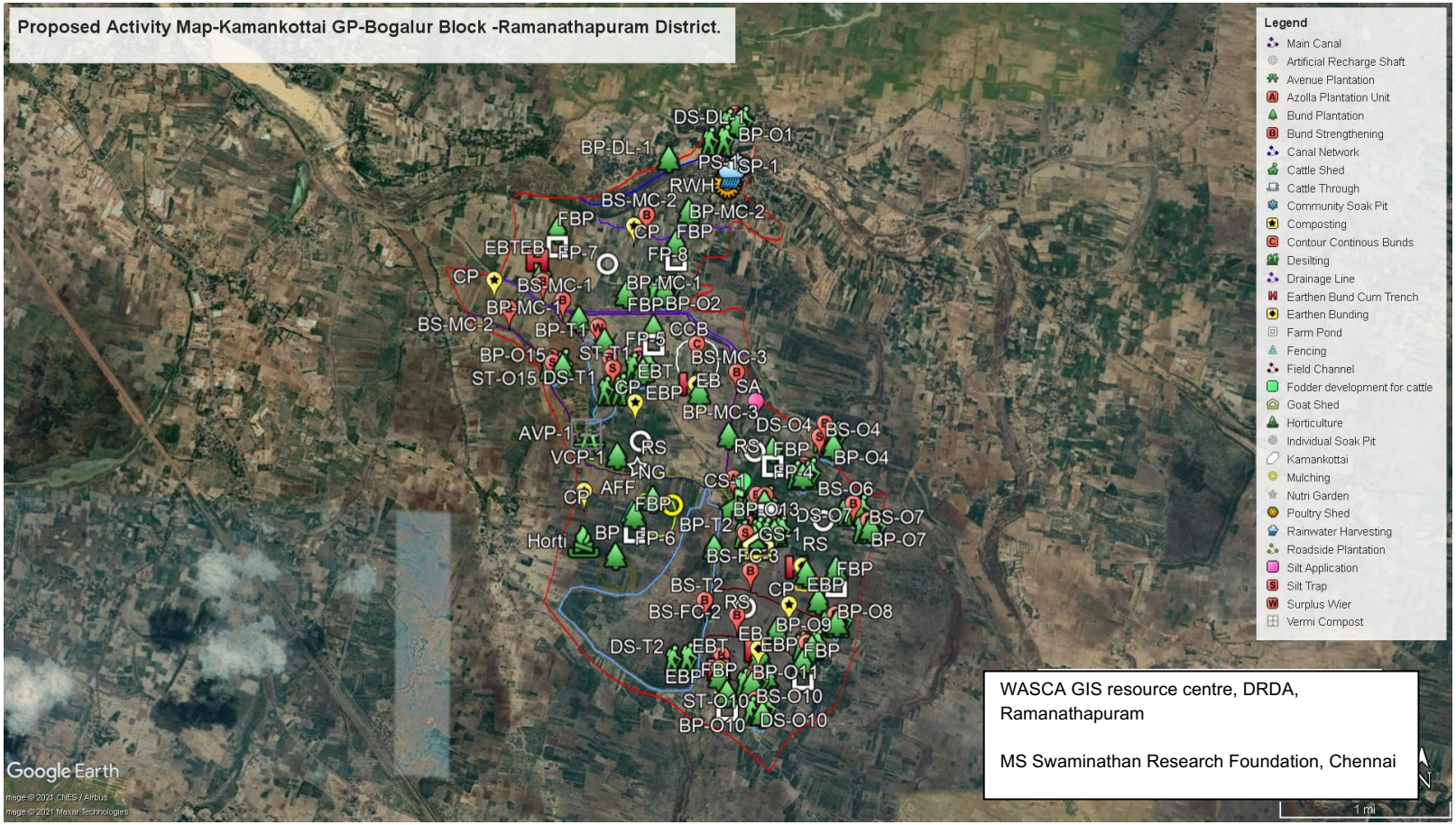
Sl.No	Name of the GPs	Block
30	Kavanakkottai	R.S.Mangalam
31	Kothidal	R.S.Mangalam
32	Kottakudi	R.S.Mangalam
33	Madavanur	Ramanathapuram
34	Puthenthal	Ramanathapuram
35	Surankottai	Ramanathapuram
36	Toruvallur	Ramanathapuram
37	Kuthankkottai	Tirupullani
38	Methalodai	Tirupullani
39	Nainamaraikkan	Tirupullani
40	Utharaval	Tirupullani
41	Andavoorani	Thiruvadanai
42	Kulanthoor	Thiruvadanai
43	Mangalakudi	Thiruvadanai
44	Thallirmarungur	Thiruvadanai

Proposed Action Plan Maps

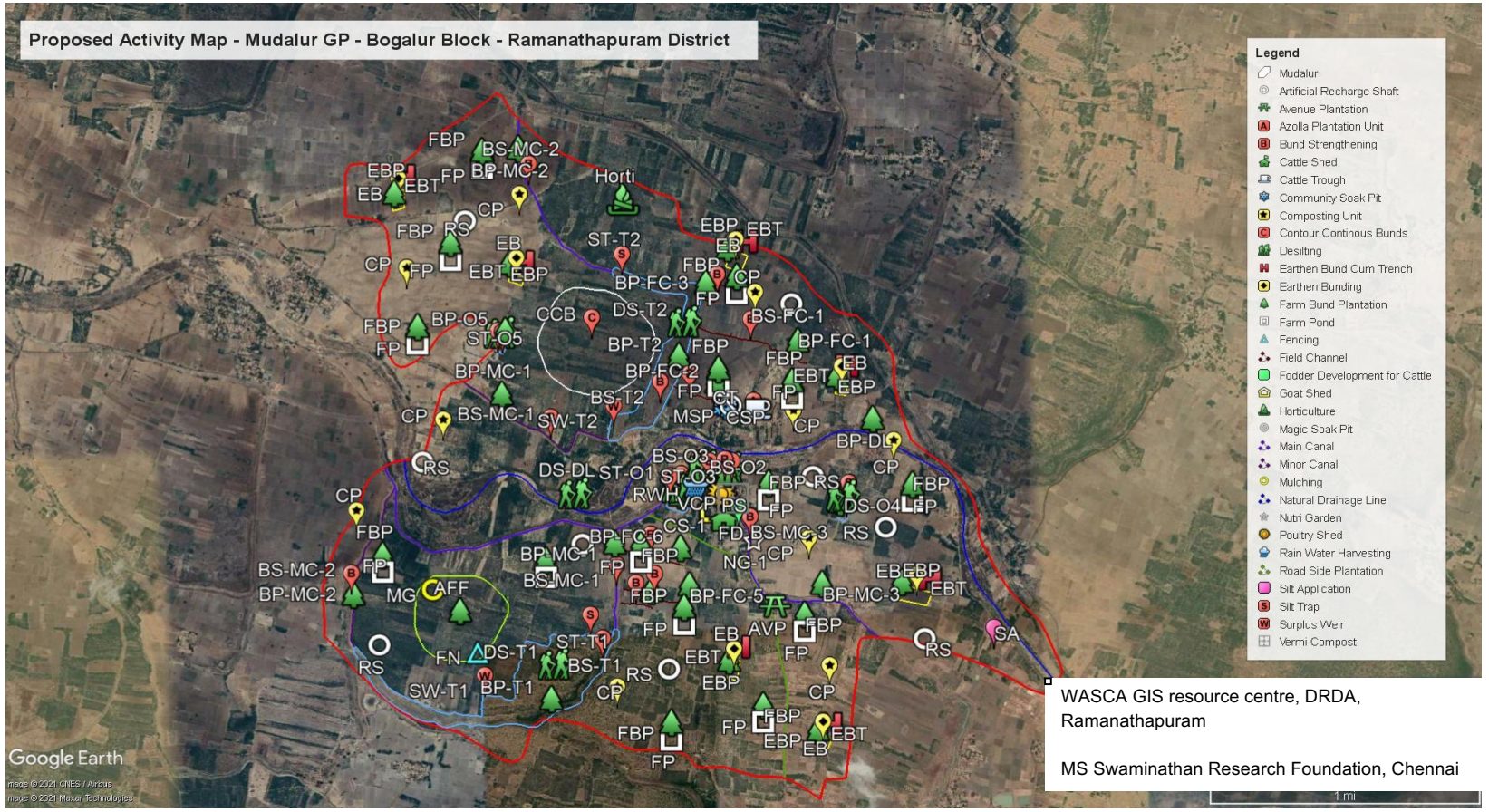
Bogalur Gram Panchayat – Bogalur block



Kamankottai Gram Panchayat – Bogalur block



Mudalur Gram Panchayat – Bogalur block



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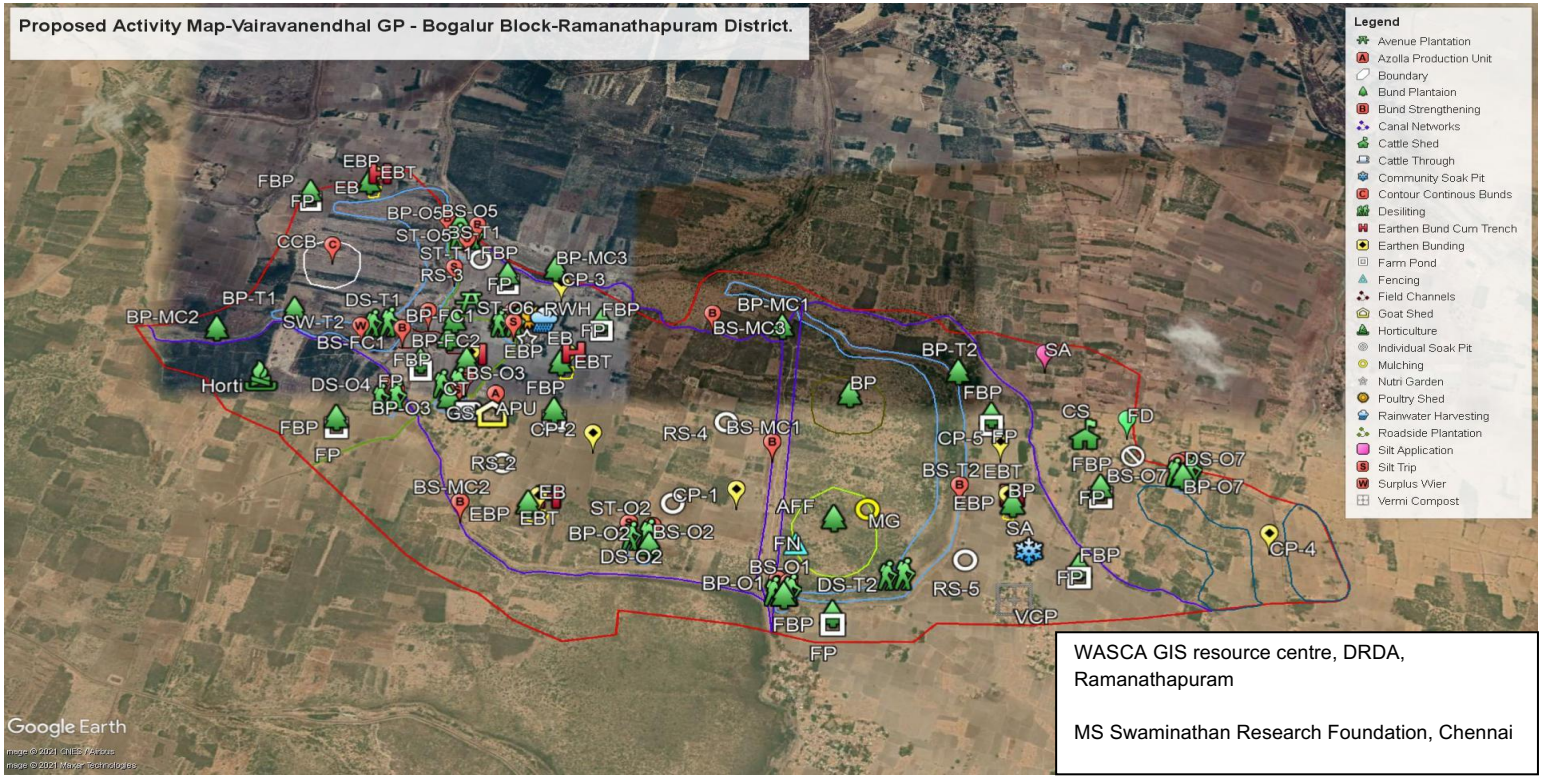
Valravanendhal Gram Panchayat – Bogalur block



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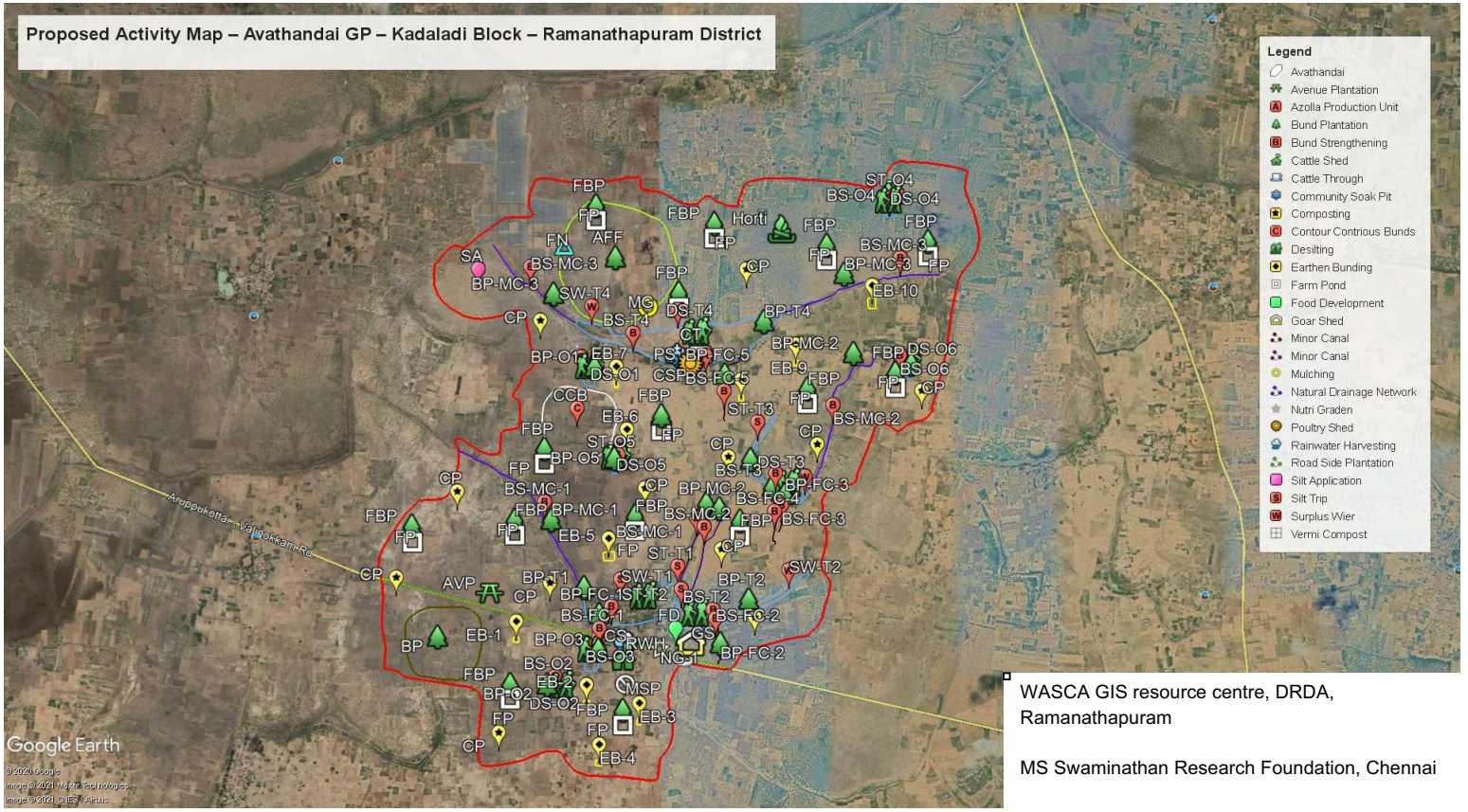
Avathandal Gram Panchayat – Kadaladi block



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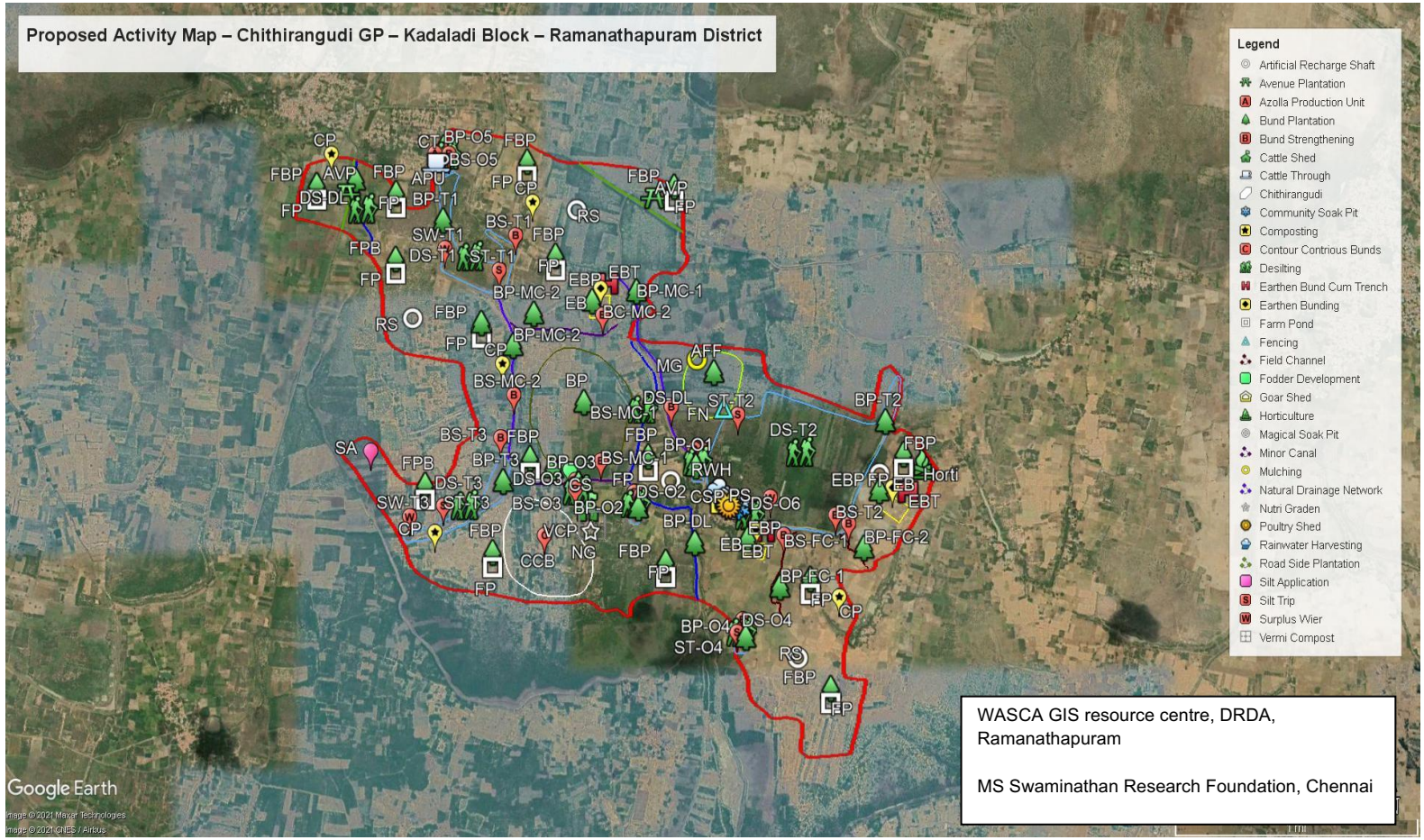
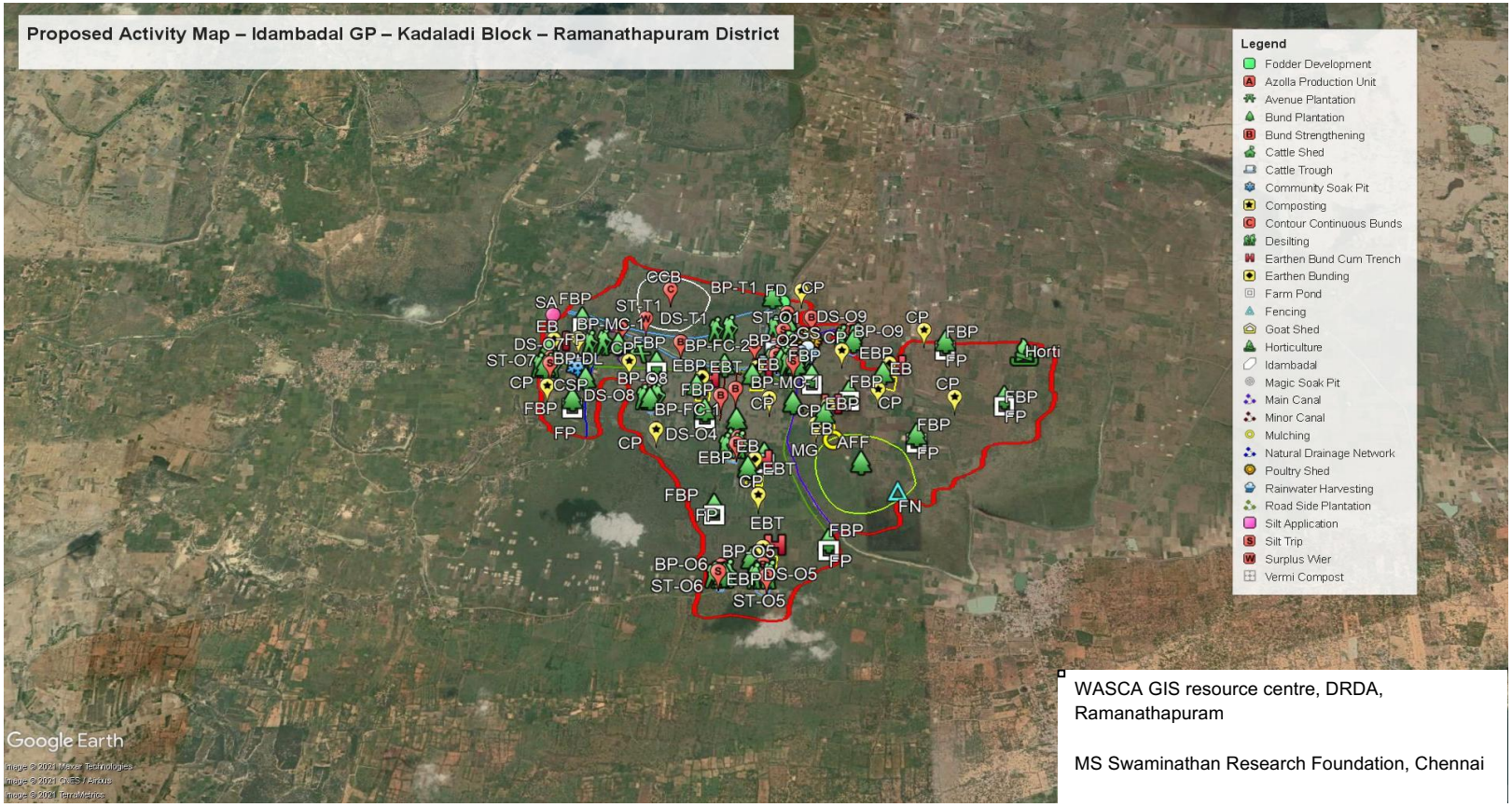
Chithirirangudi Gram Panchayat – Kadaladi block



Idambadal Gram Panchayat – Kadaladi block



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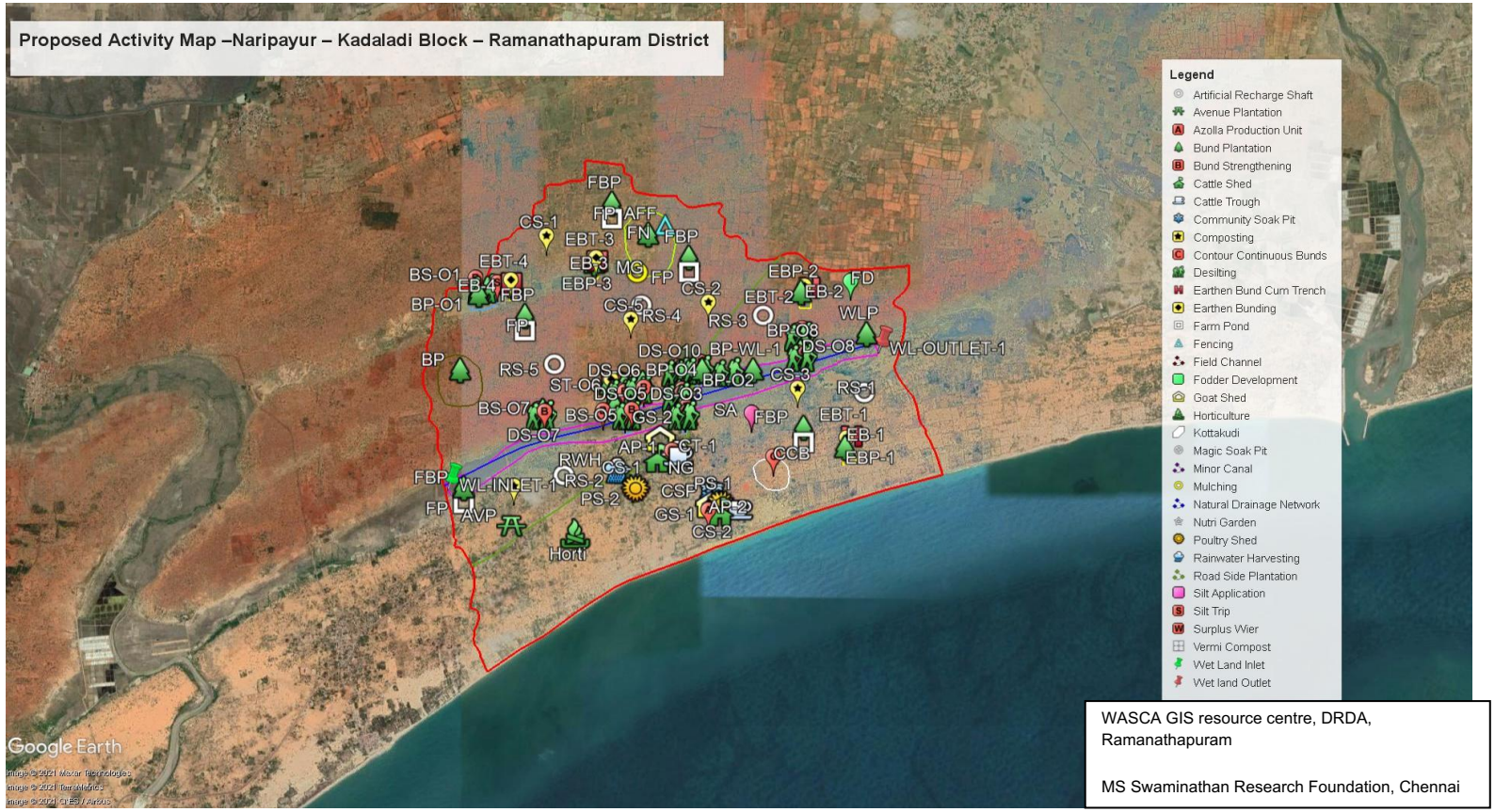
Naripayur Gram Panchayat – Kadaladi Block



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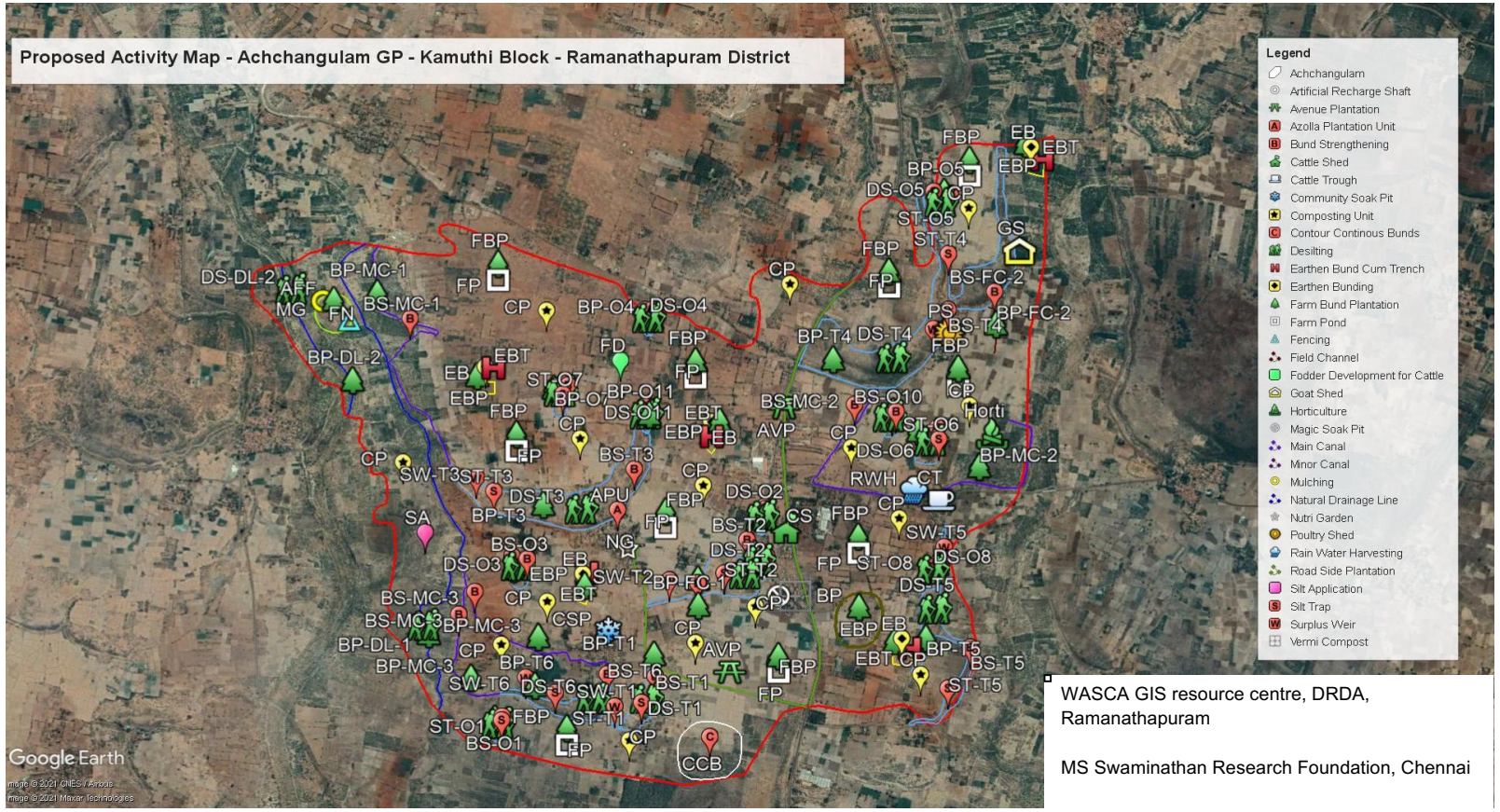
Achchangulam Gram Panchayat – Kamuthi Block



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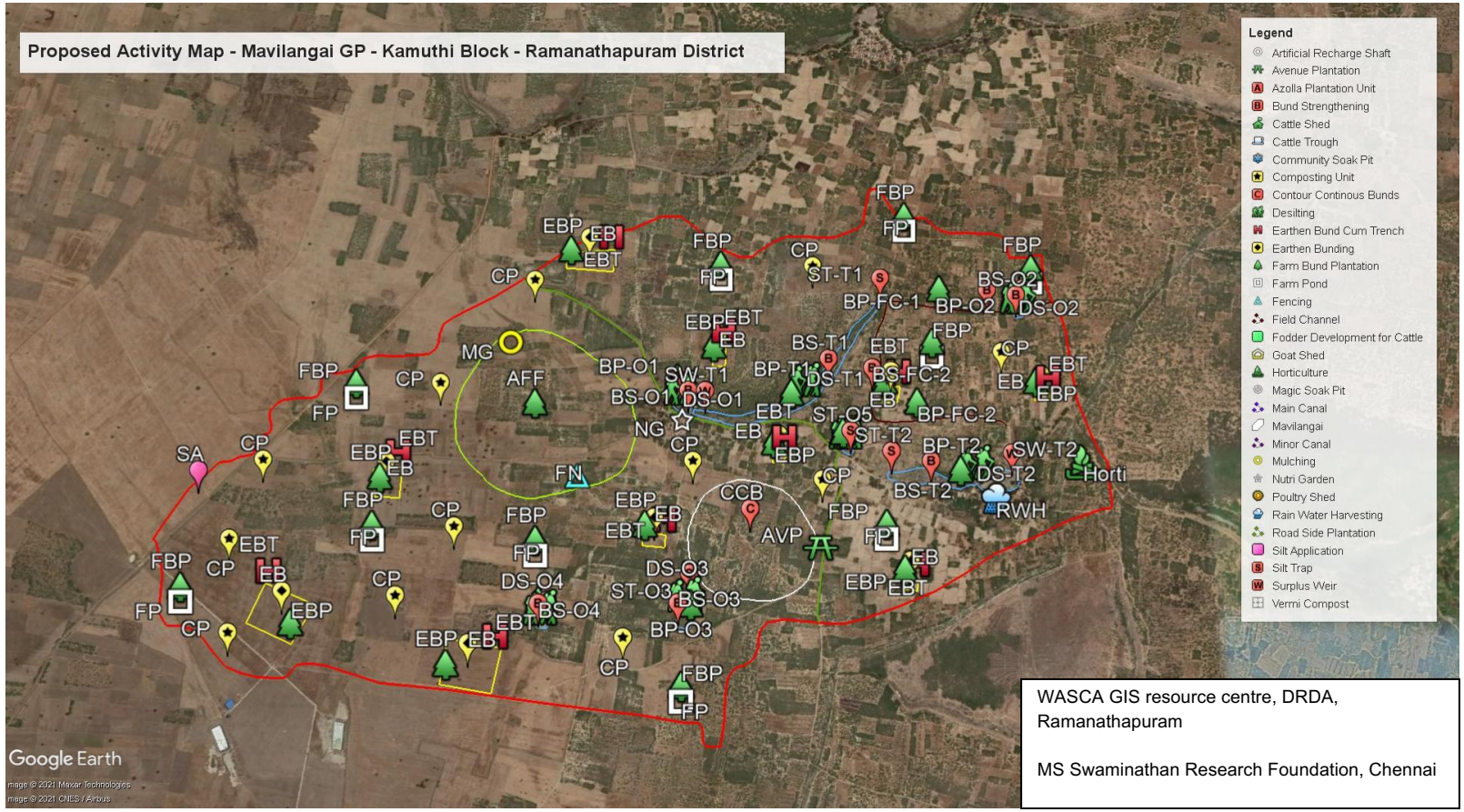
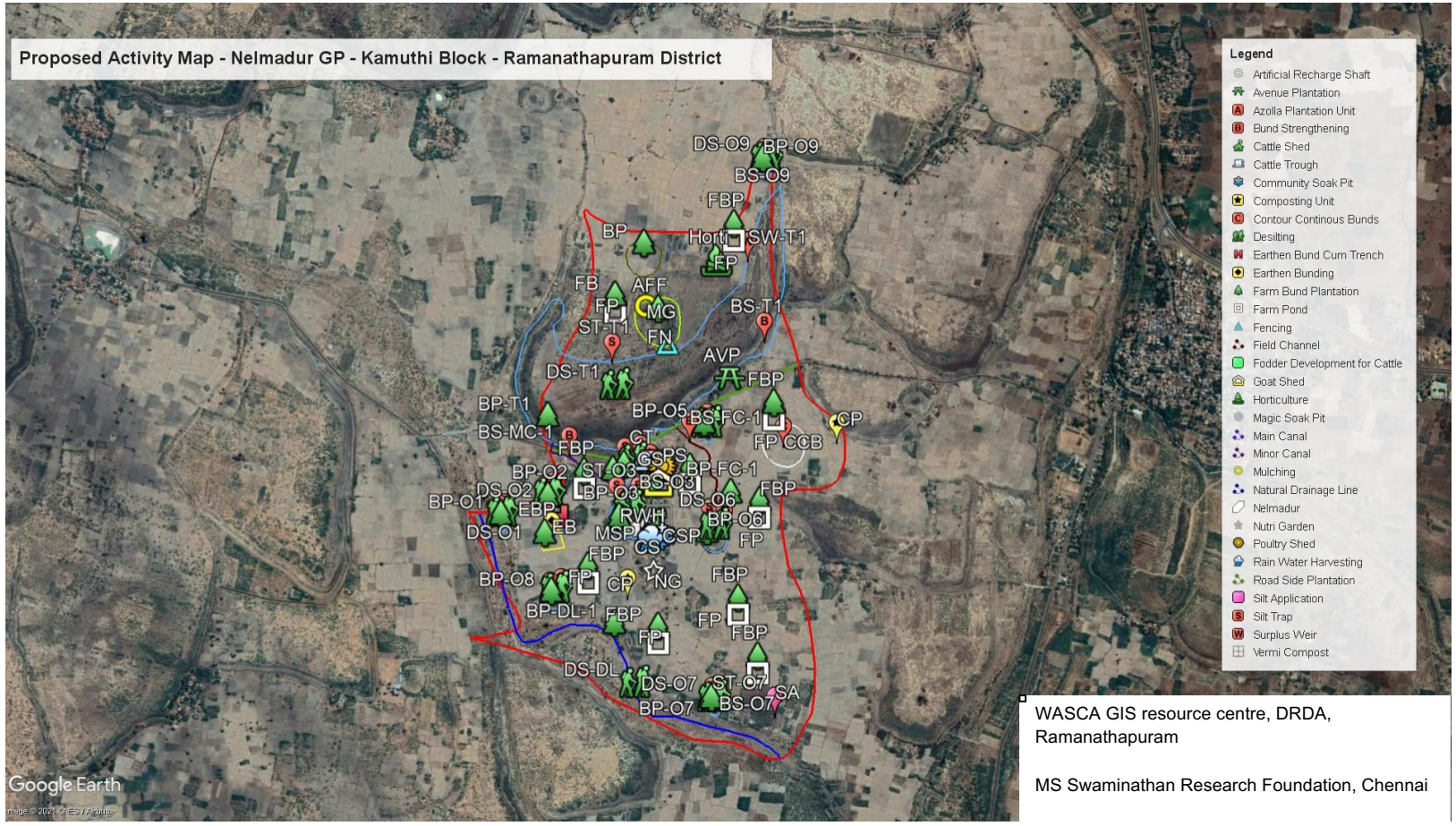
Mavilangai Gram Panchayat – Kamuthi Block



Nelmadur Gram Panchayat – Kamuthi Block



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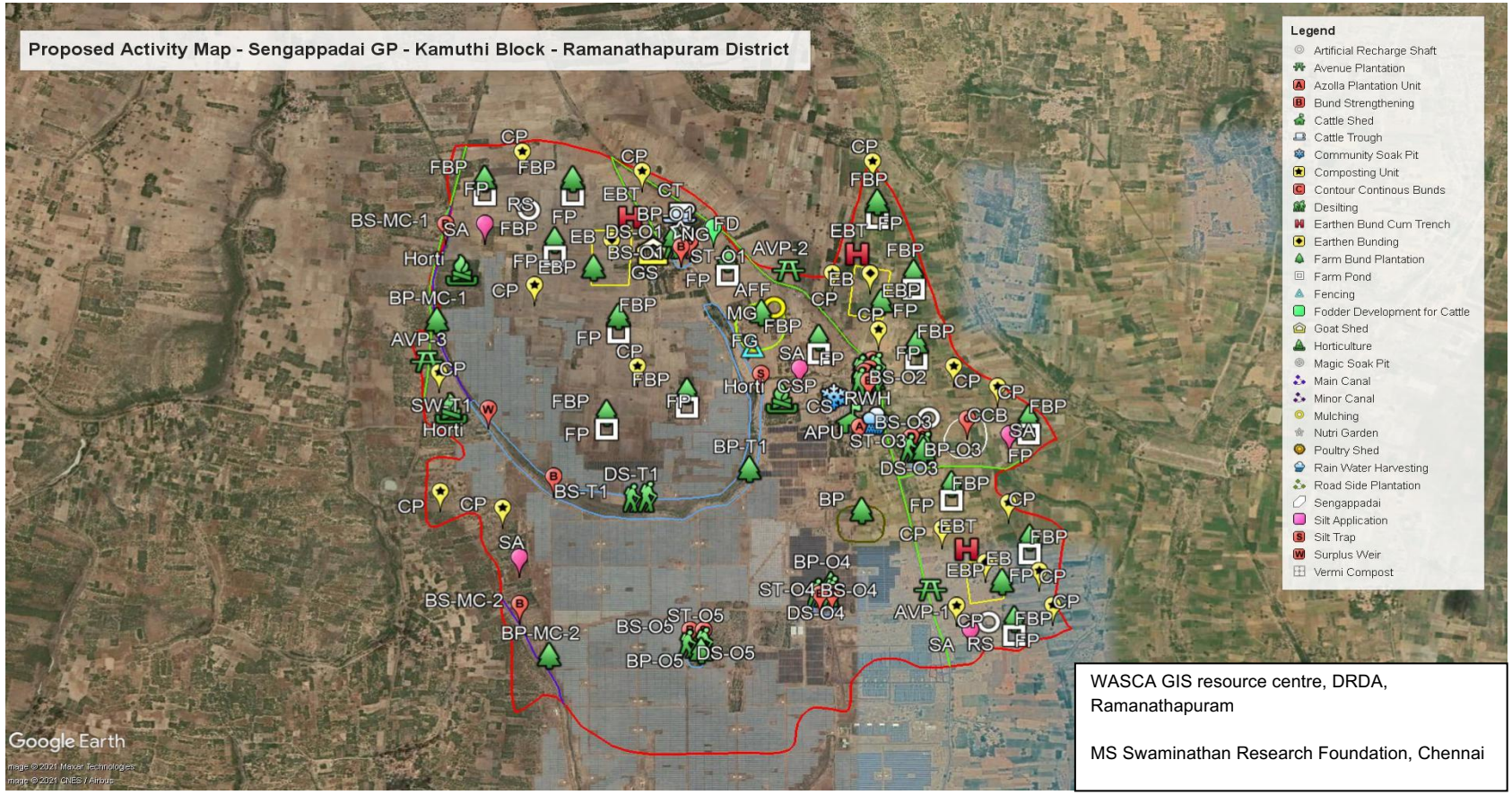
Sengappadai Gram Panchayat – Kamuthi Block



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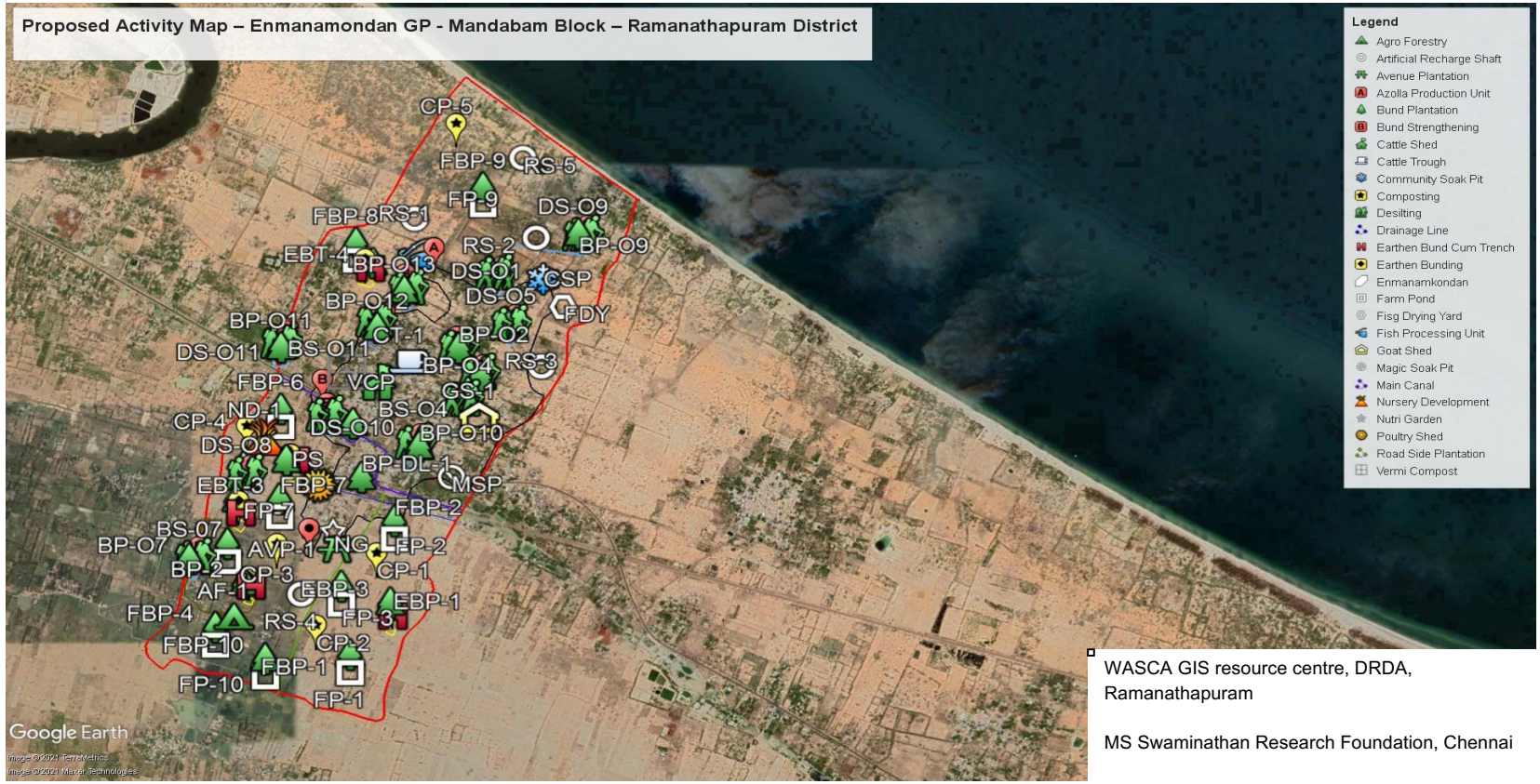
Enmanamondan Gram Panchayat - Mandapam Block



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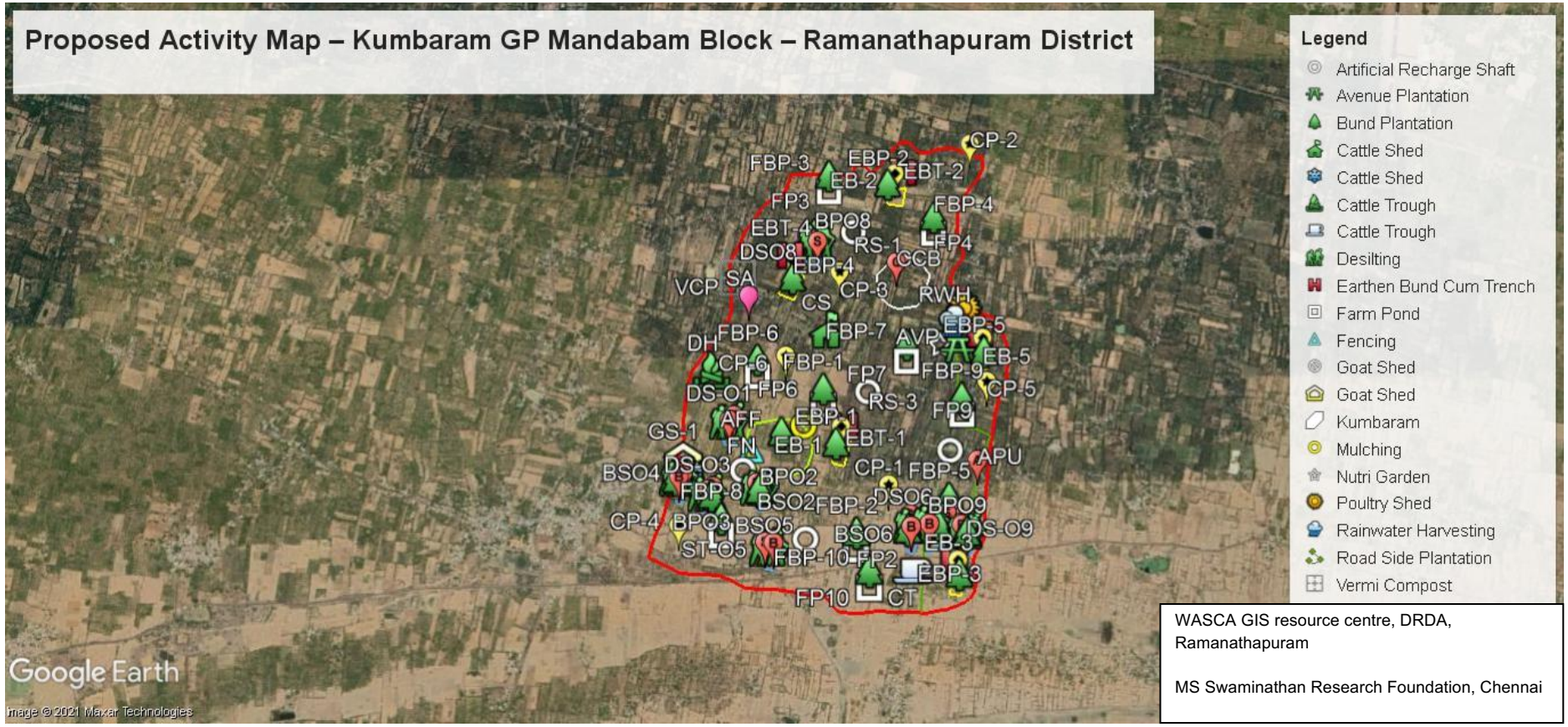
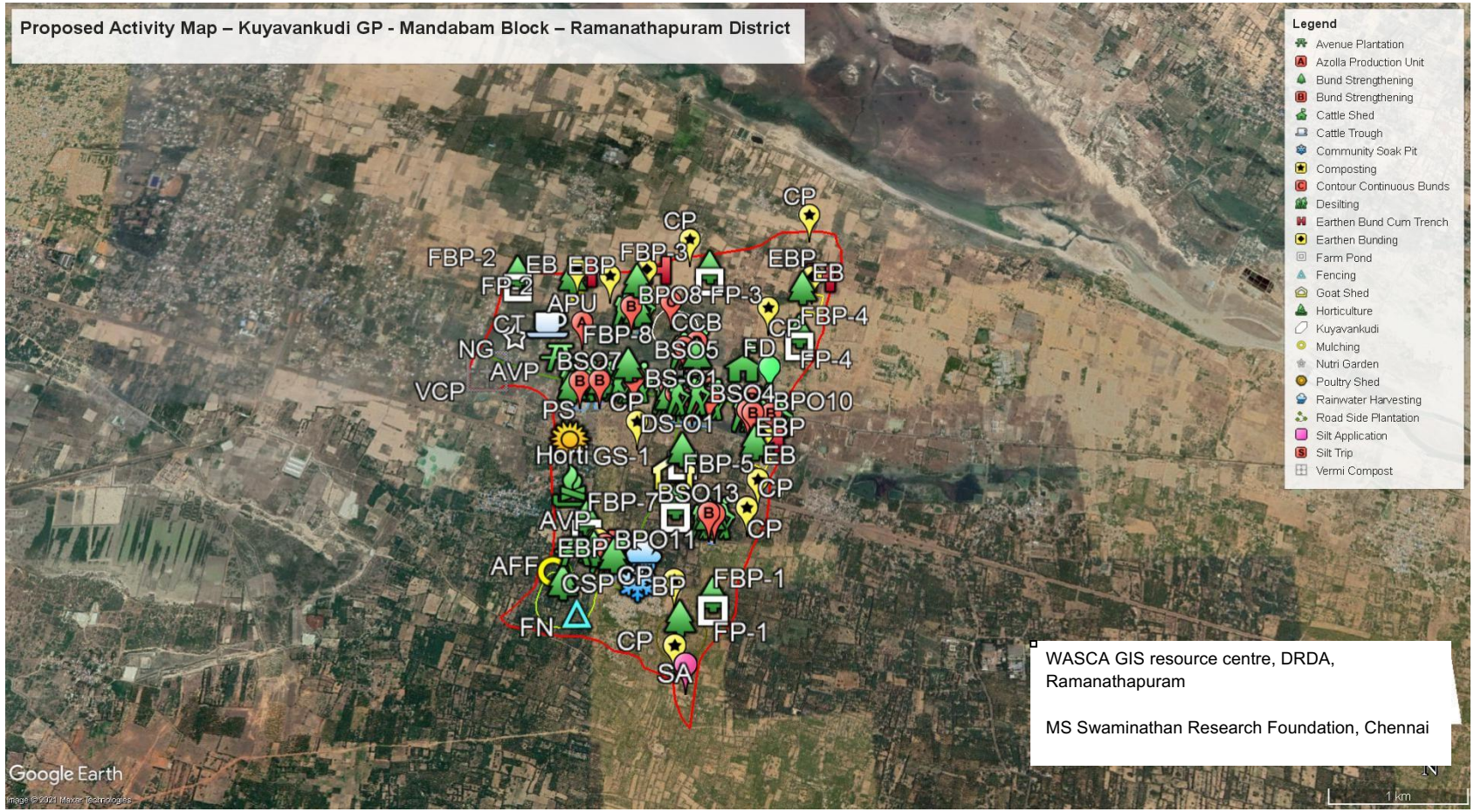
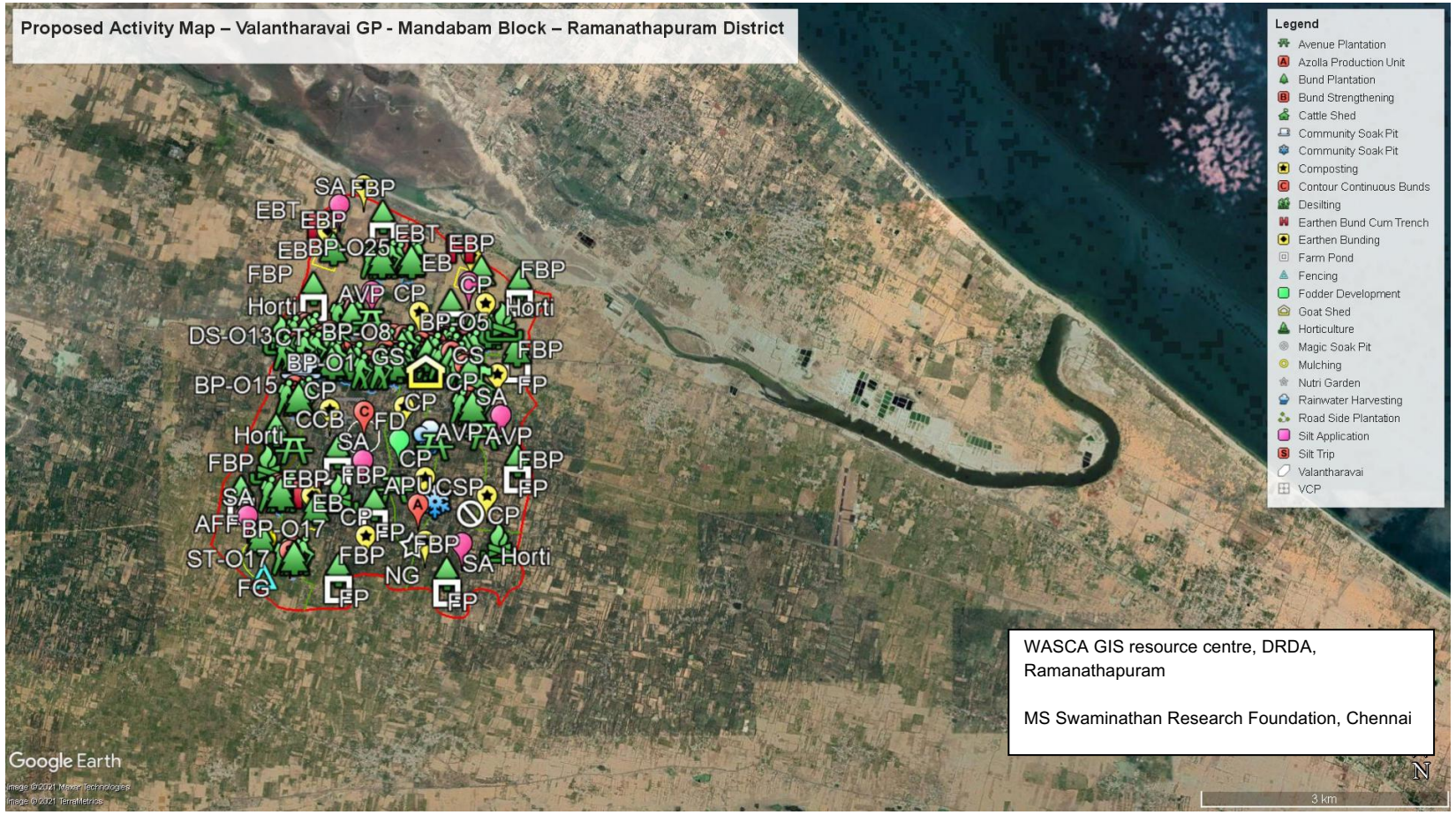
Kumbaram Gram Panchayat - Mandapam Block



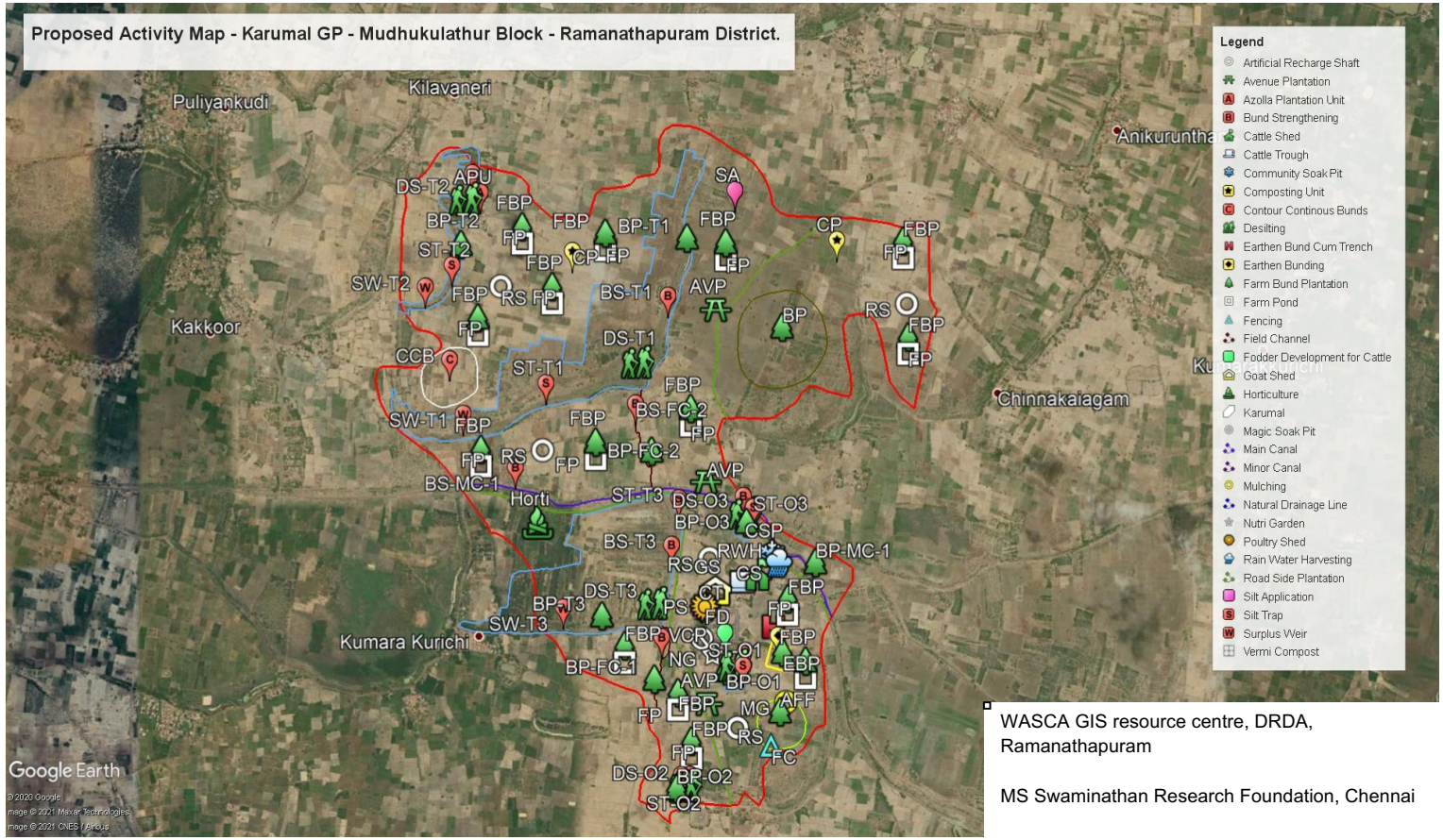
Kuyavankudi Gram Panchayat - Mandapam Block



Valantharavai Gram Panchayat - Mandapam Block



Karumal Gram Panchayat - Mudhukulathur Block



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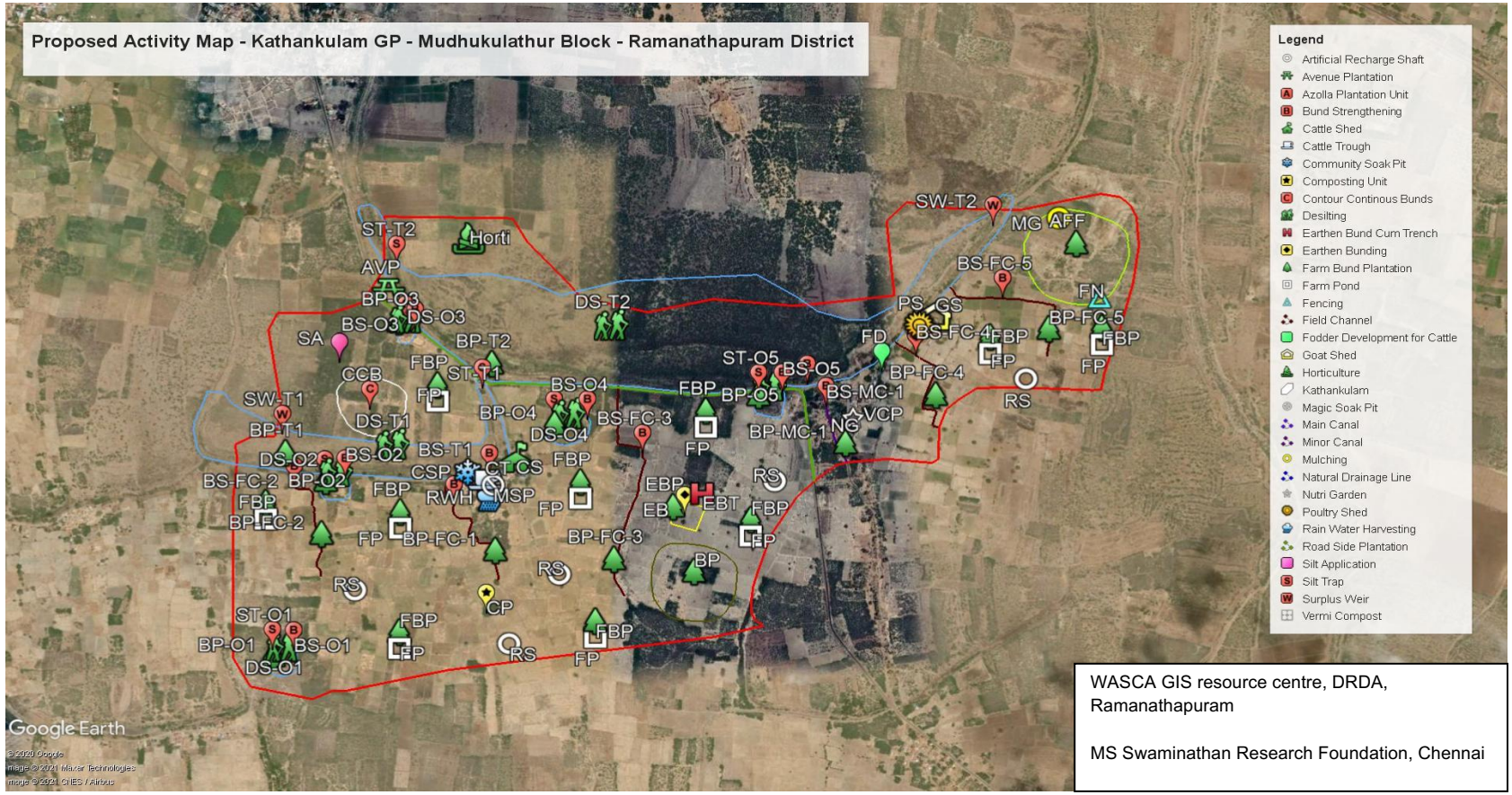
Kathankulam Gram Panchayat - Mudhukulathur Block



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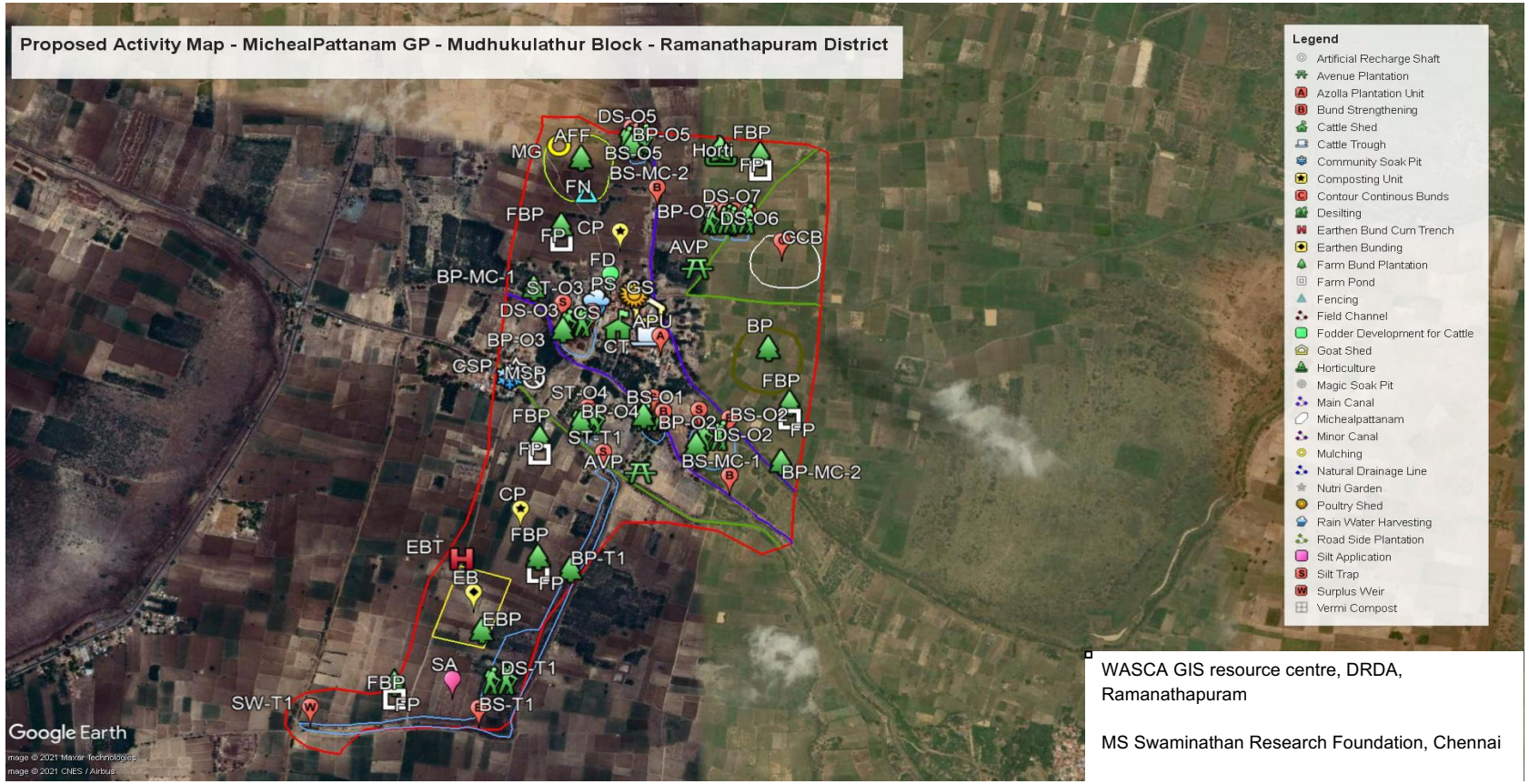
MichealPattanam Gram Panchayat - Mudhukulathur Block



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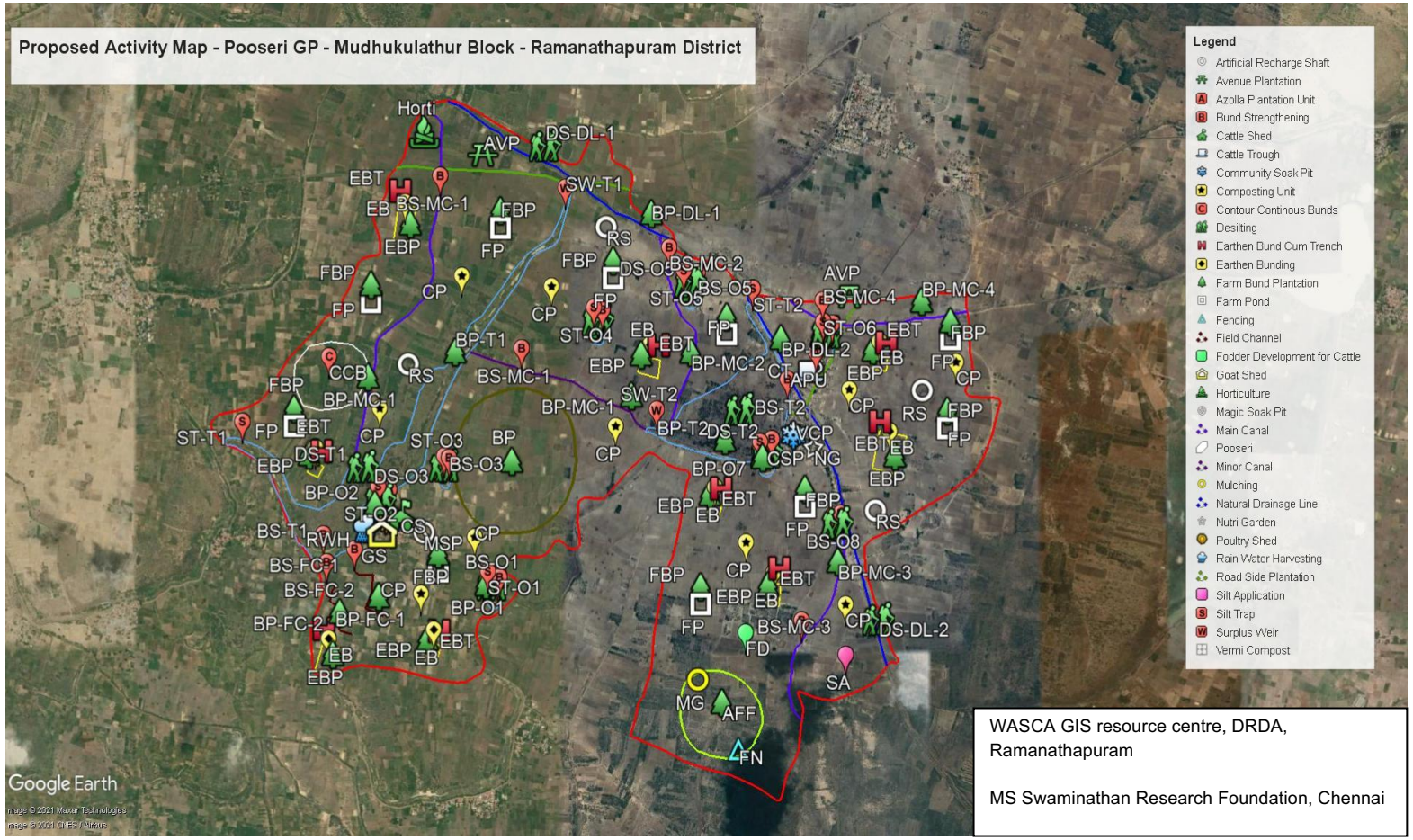
Poseri Gram Panchayat - Mudhukulathur Block



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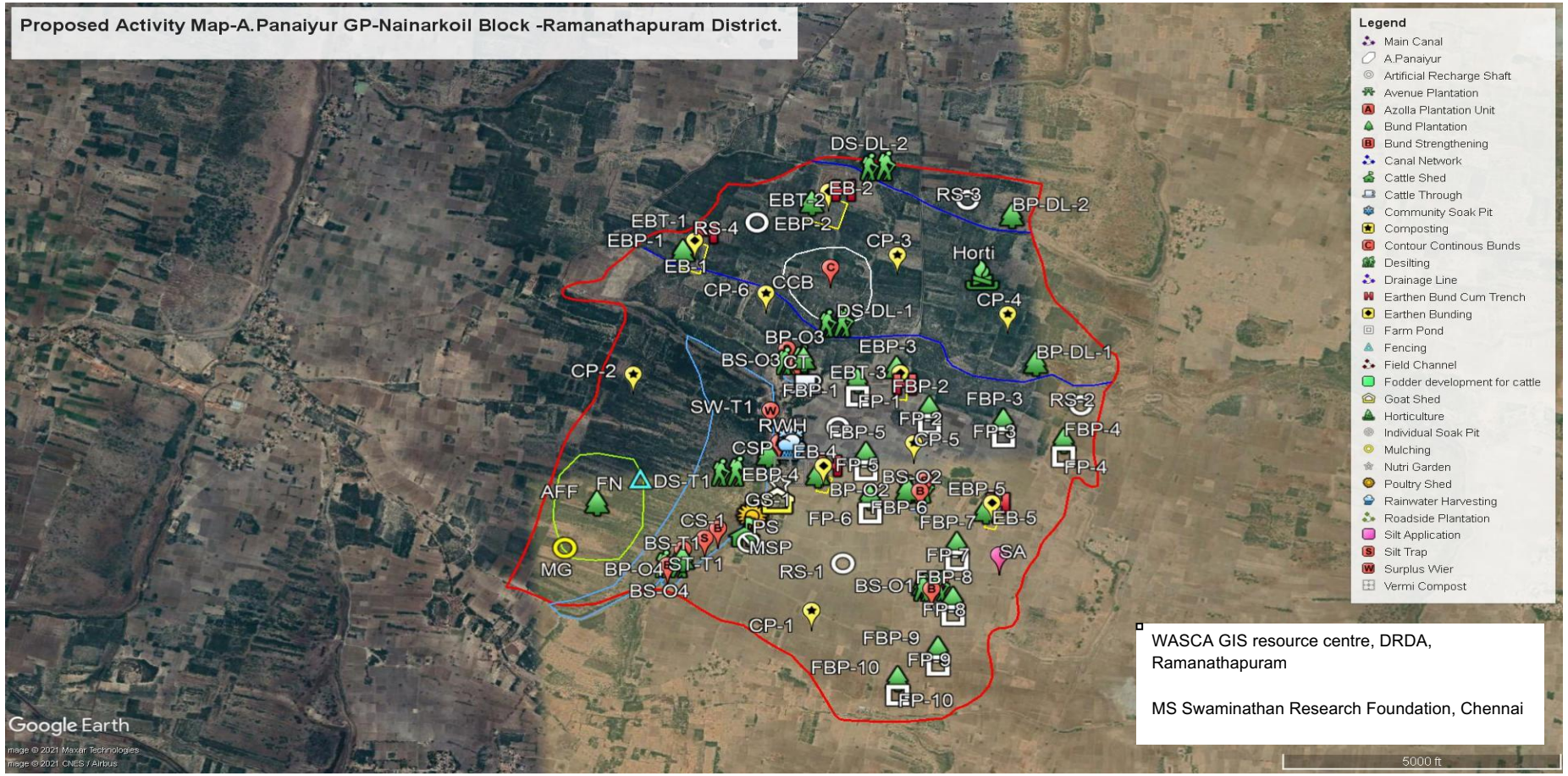
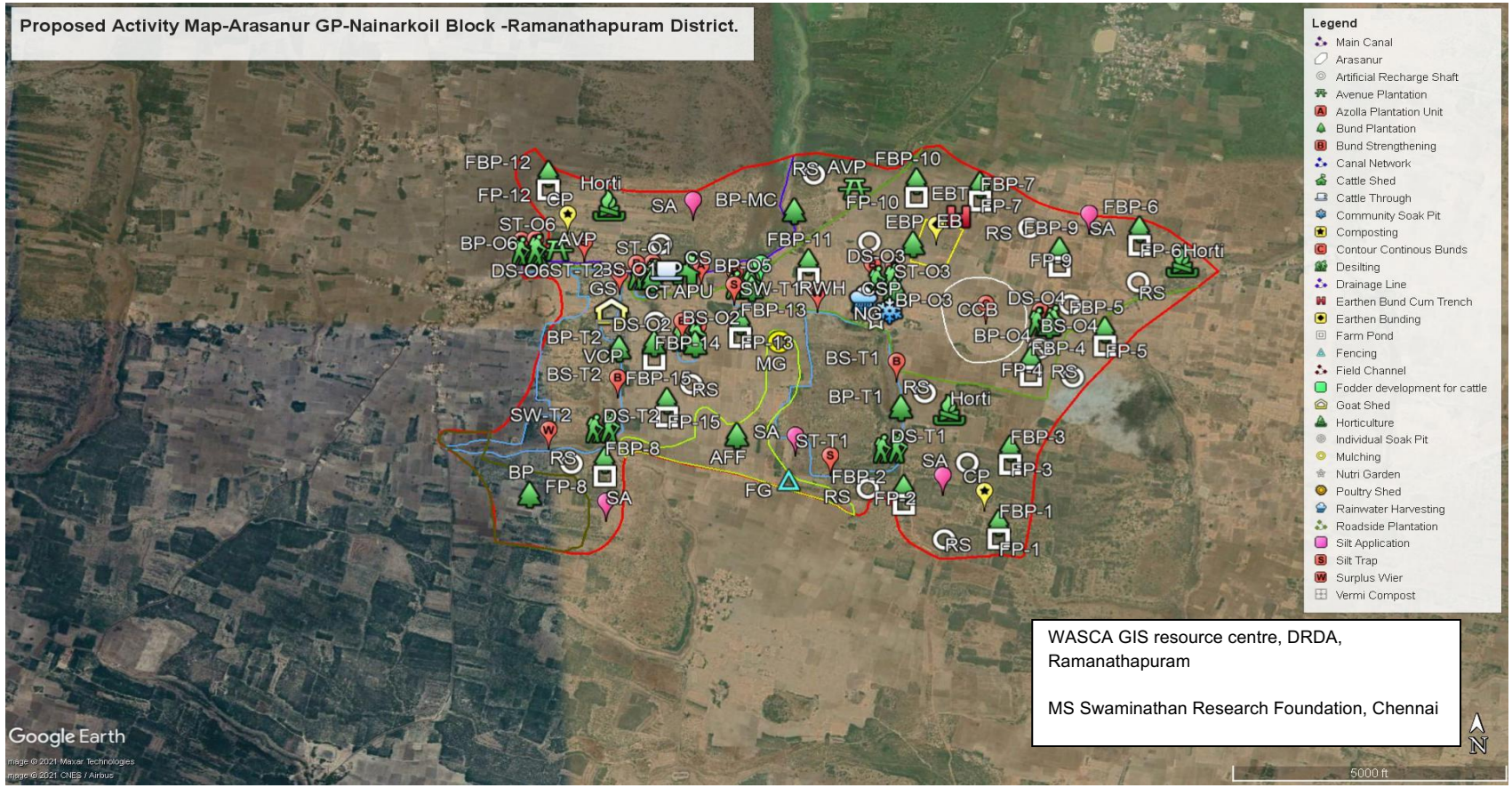
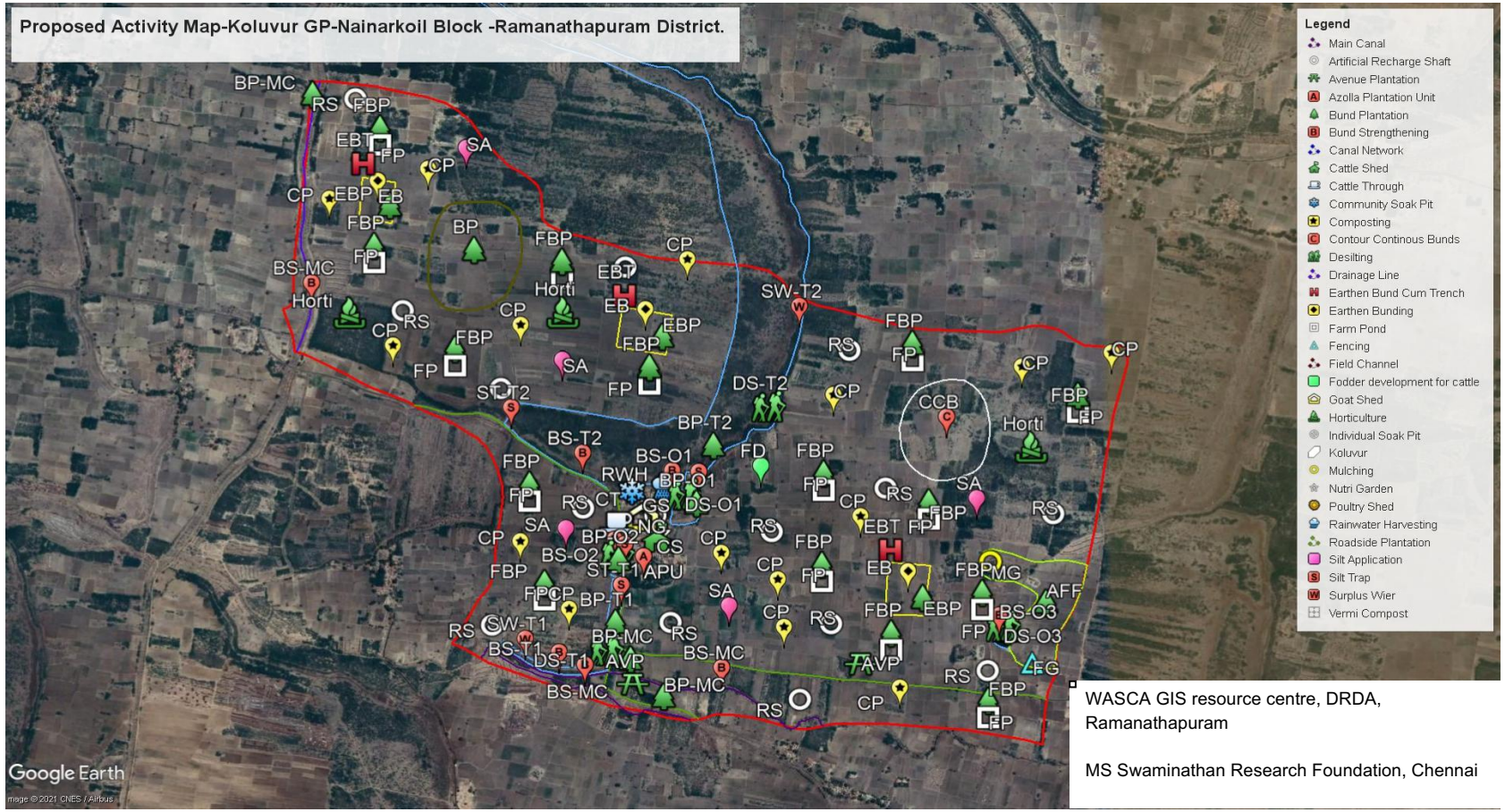
A.Panaiyur Gram Panchayat - Nainarkoil Block



Arasanur Gram Panchayat - Nainarkoil Block



Koluvur Gram Panchayat - Nainarkoil Block



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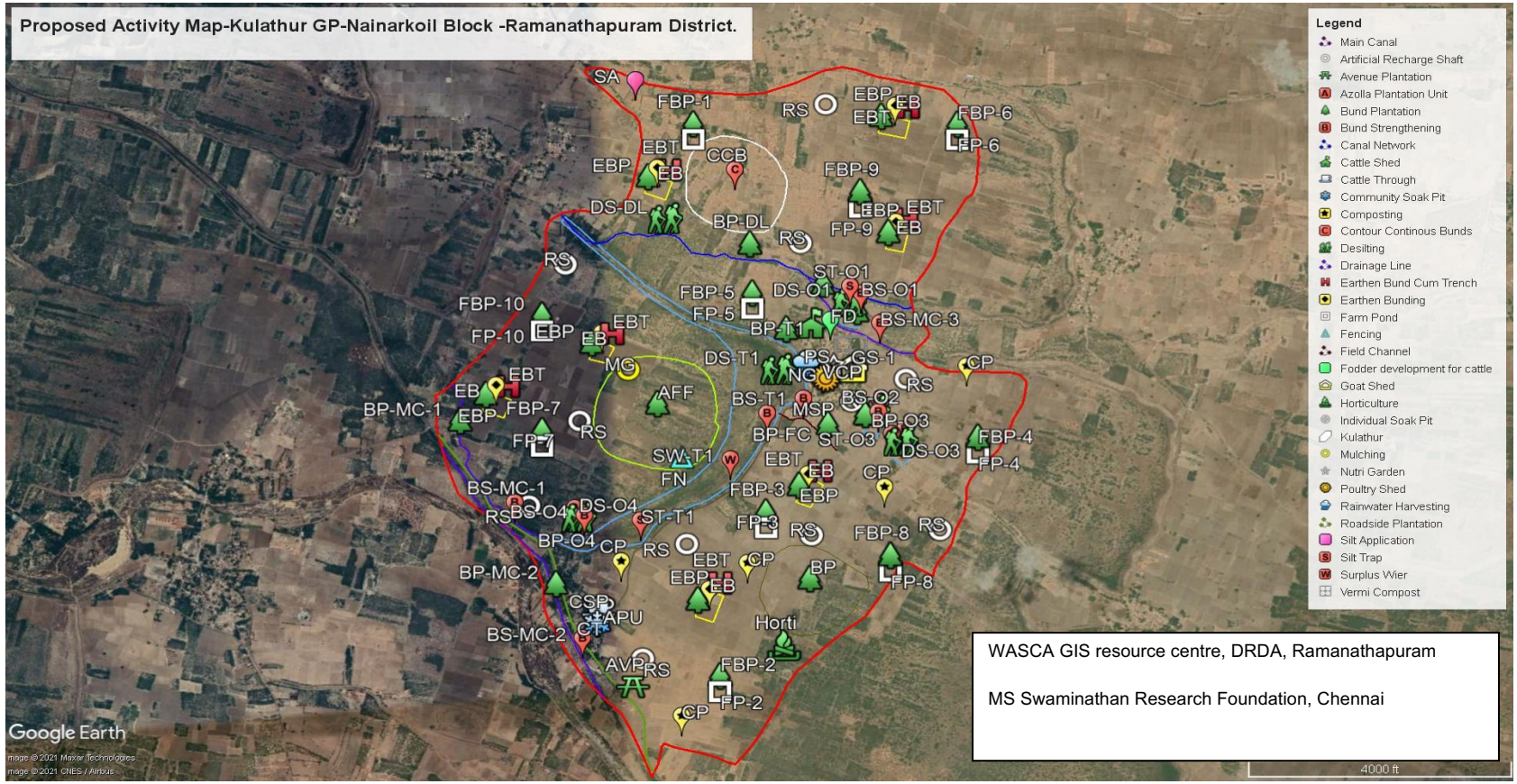
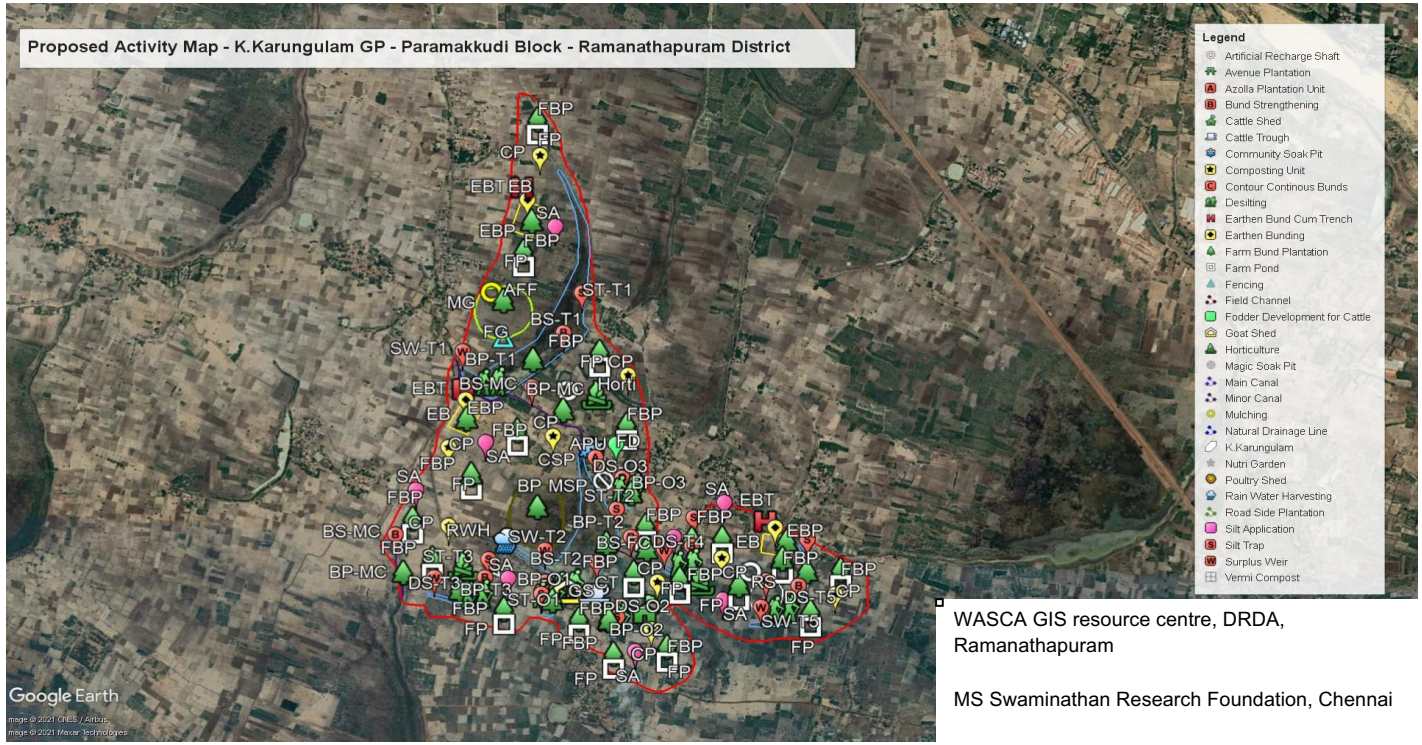
Kulathur Gram Panchayat – Nainarkoil Block



K.Karungulam Gram Panchayat - Paramakkudi Block



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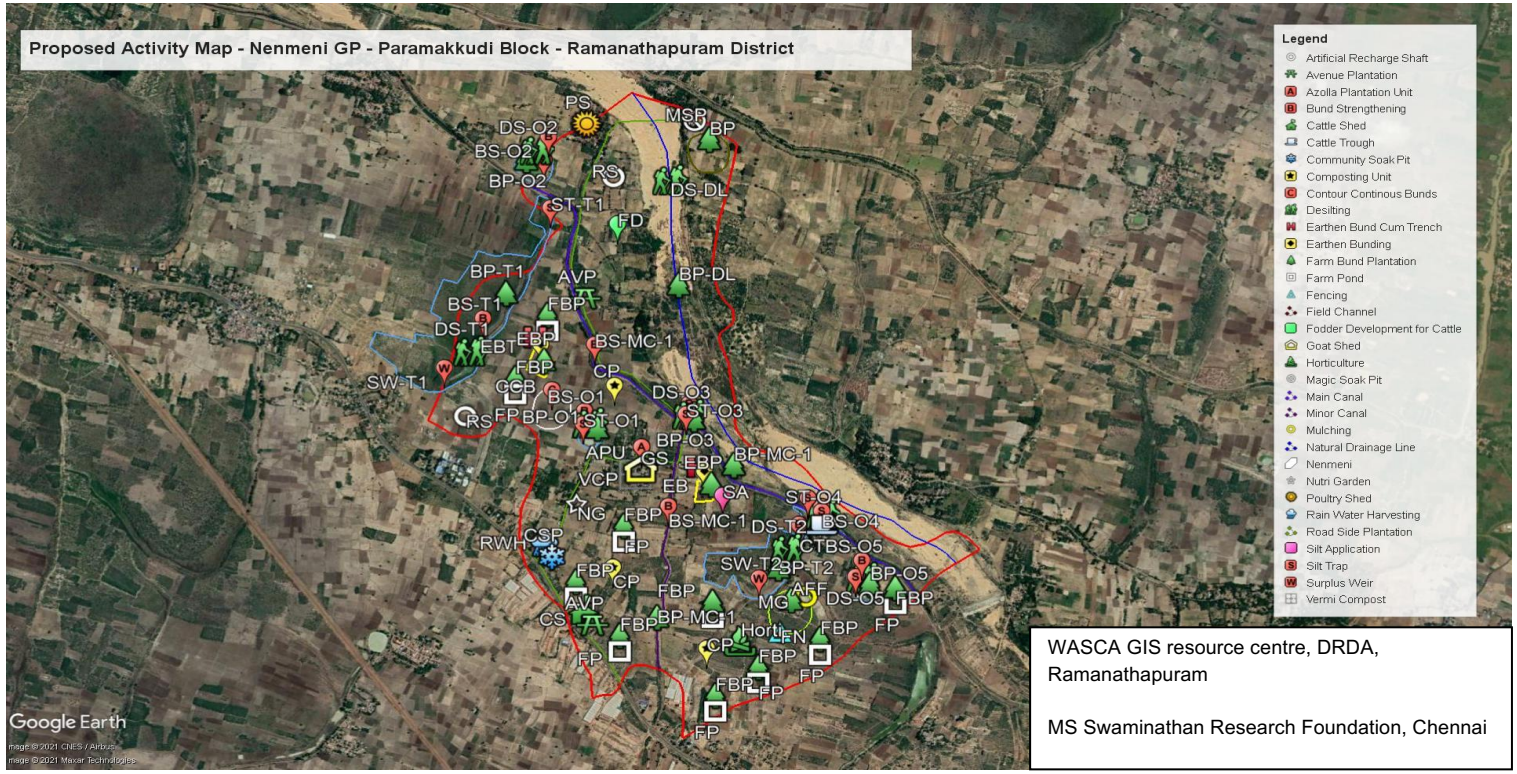
Nenmeni Gram Panchayat - Paramakkudi Block



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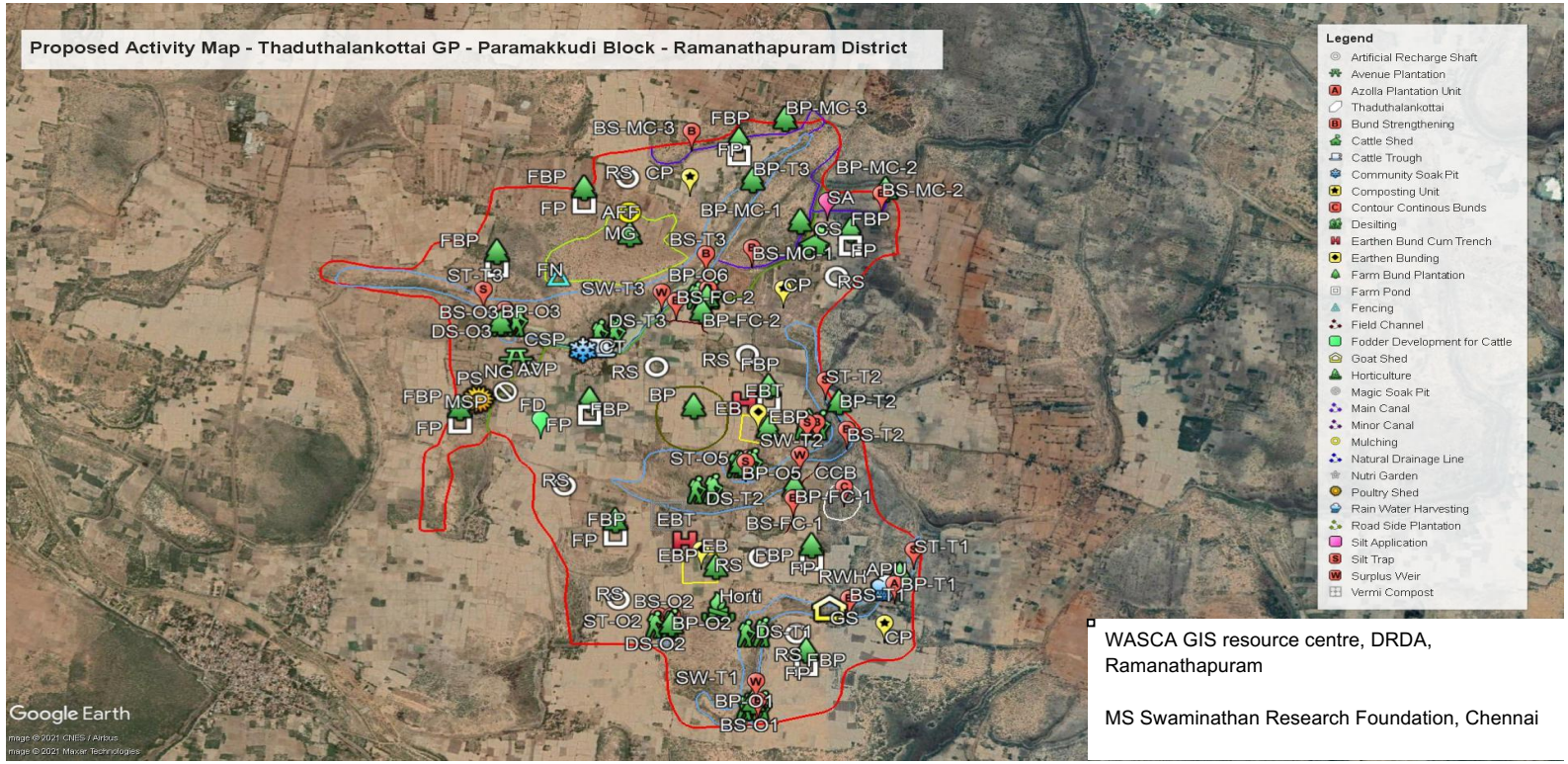
Thaduthalankottai Gram Panchayat - Paramakkudi Block



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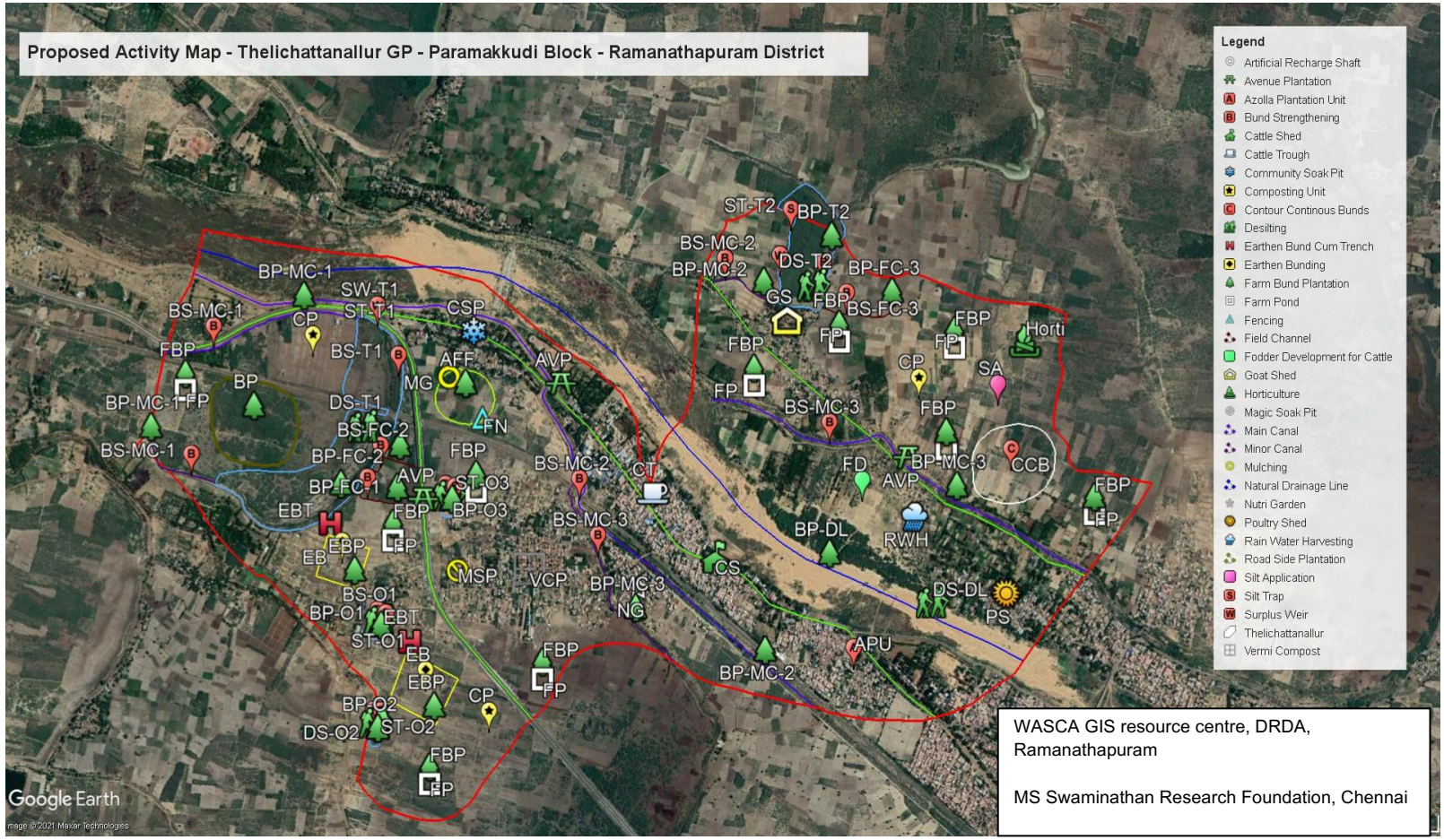
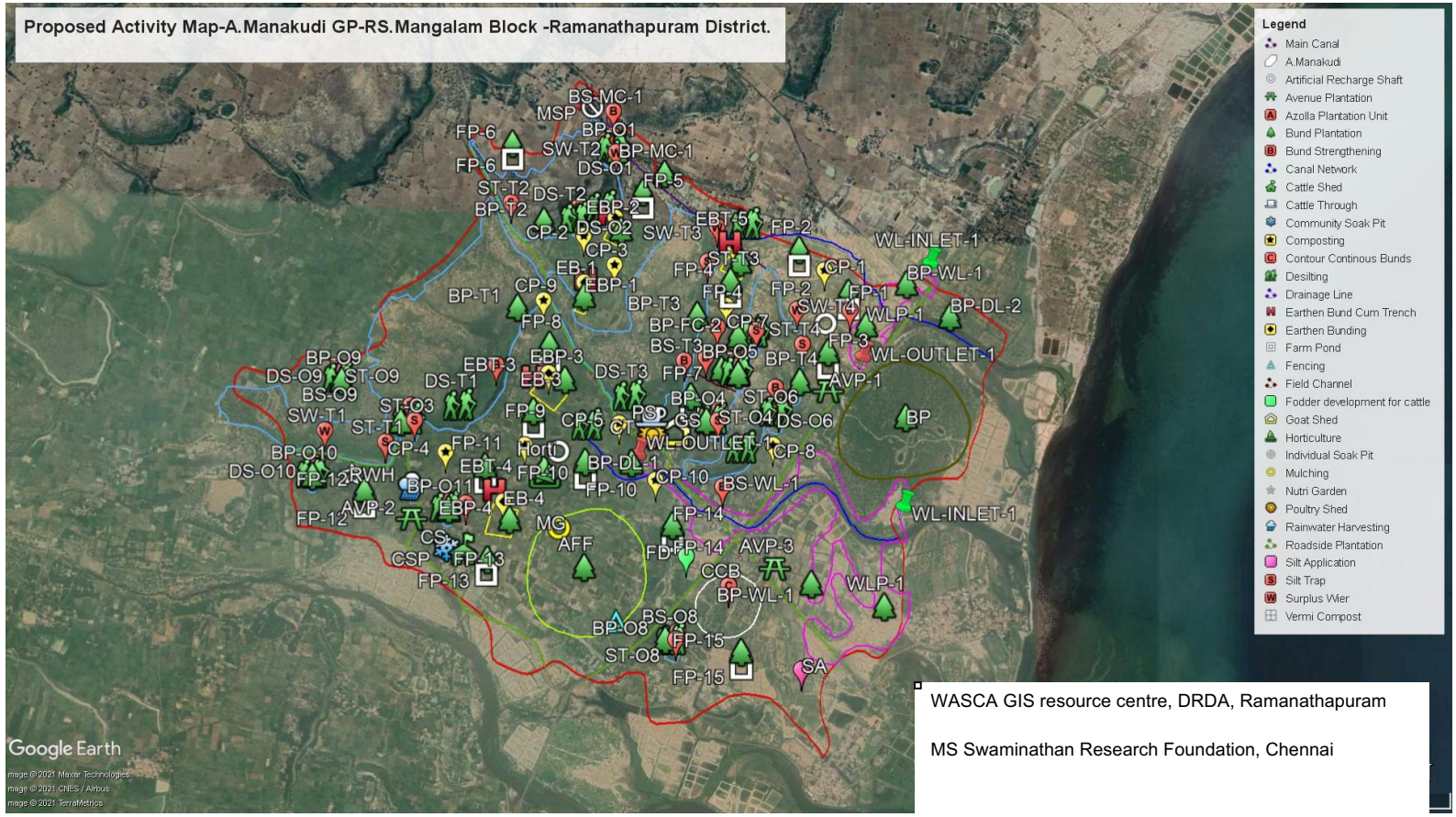
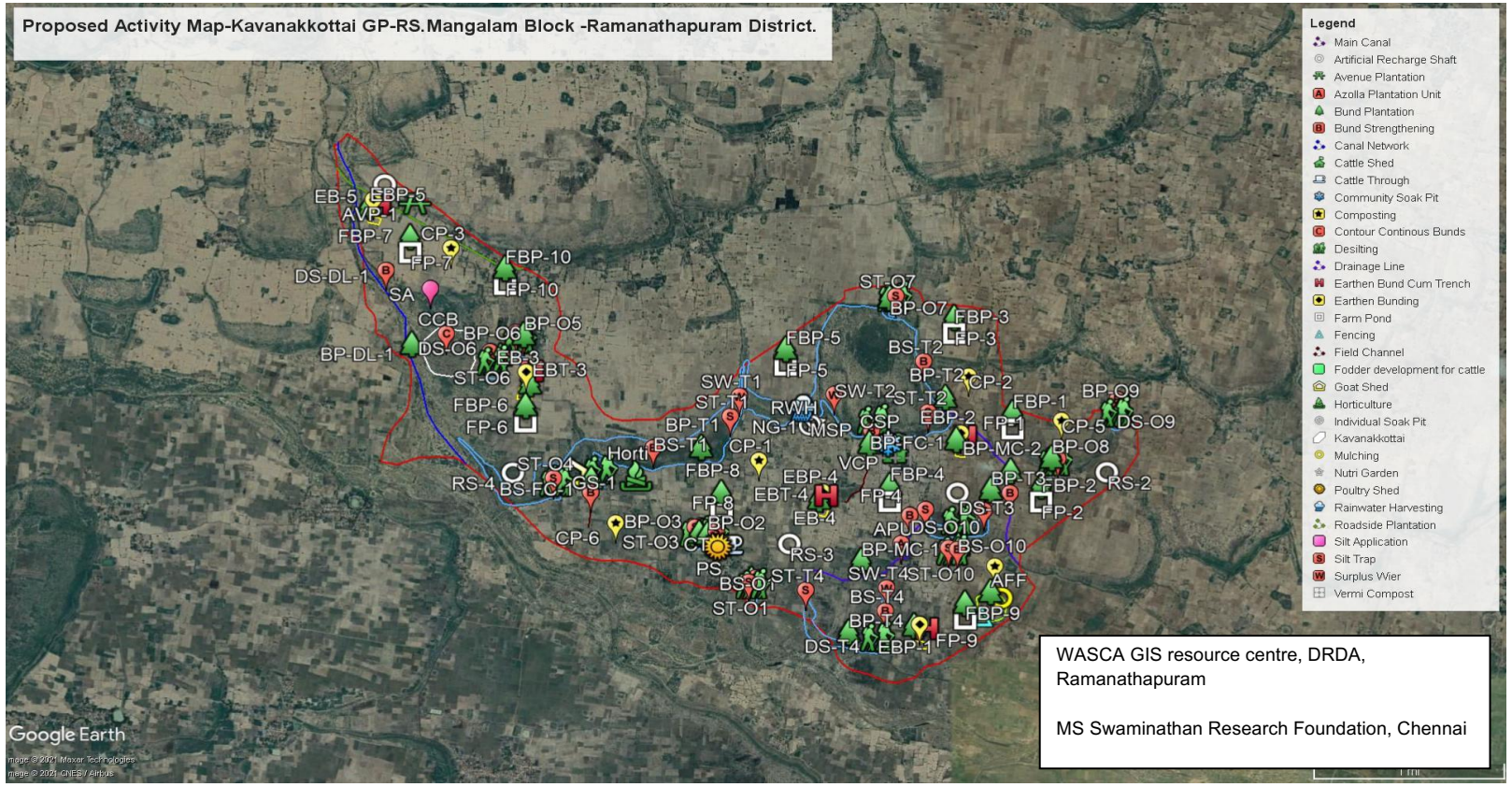
Thelichattanallur Gram Panchayat - Paramakkudi Block



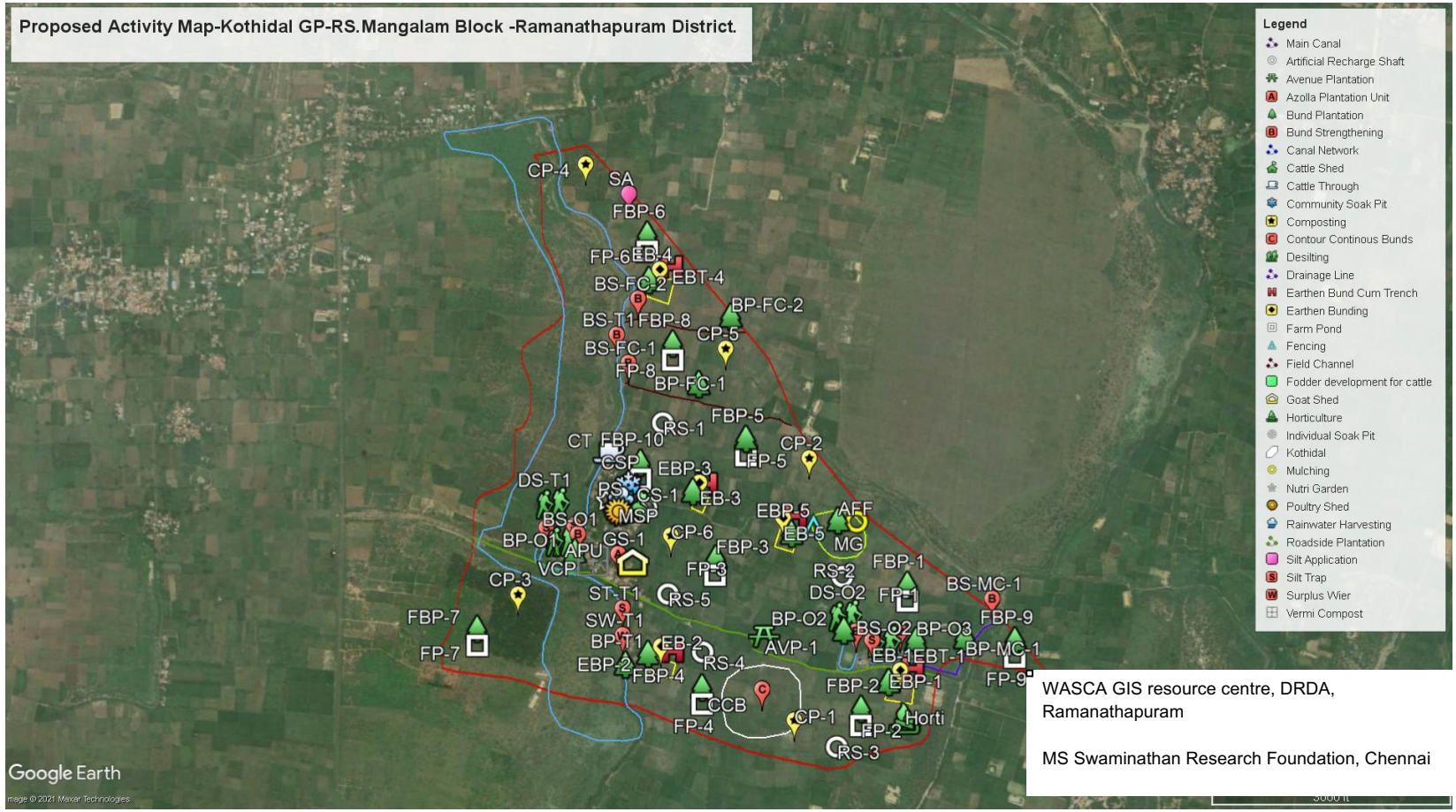
A.Manakudi Gram Panchayat – R.S.Mangalam Block



Kavanakkottai Gram Panchayat – R.S.Mangalam Block



Kothidal Gram Panchayat – R.S.Mangalam Block



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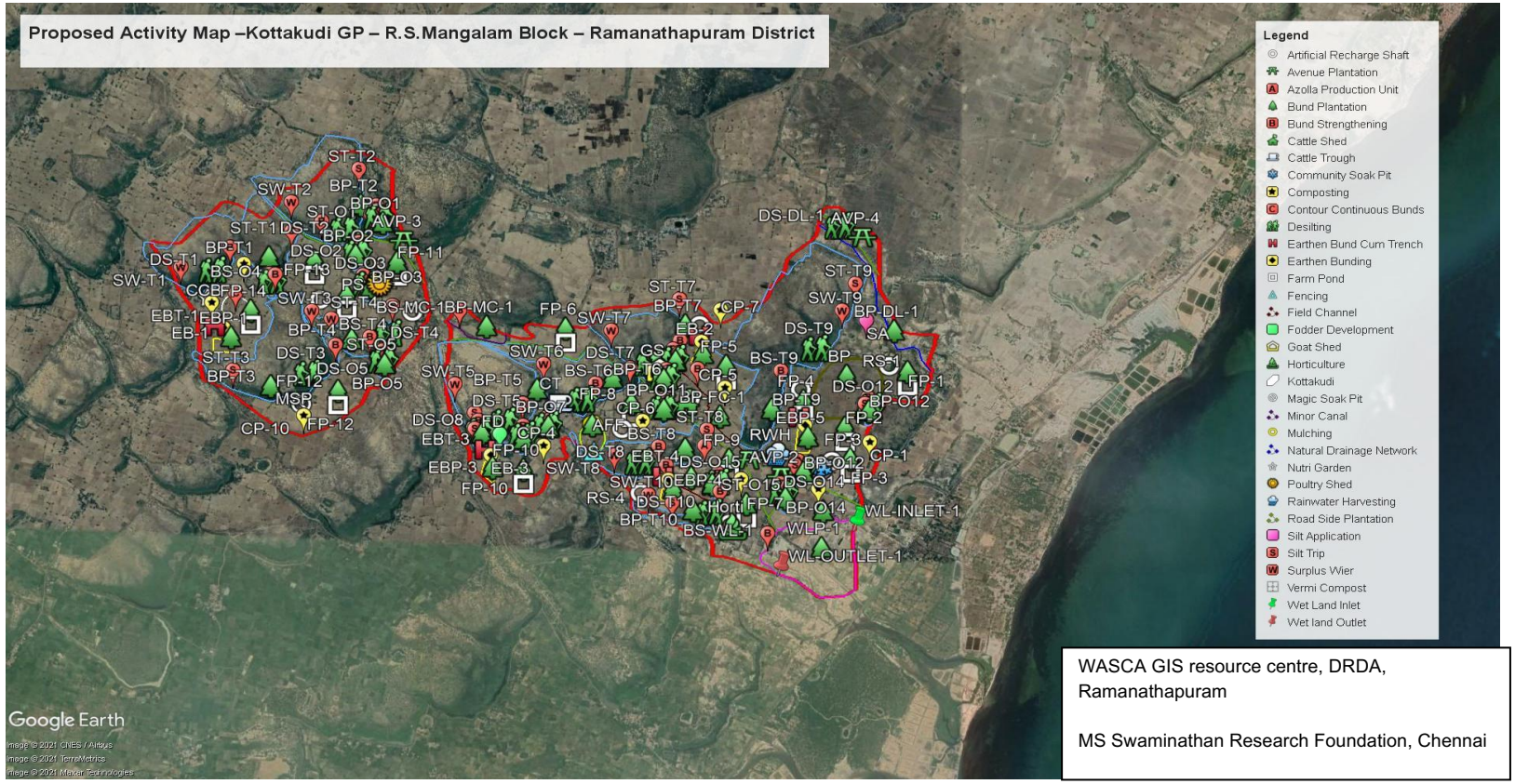
Kottakudi Gram Panchayat – R.S.Mangalam Block



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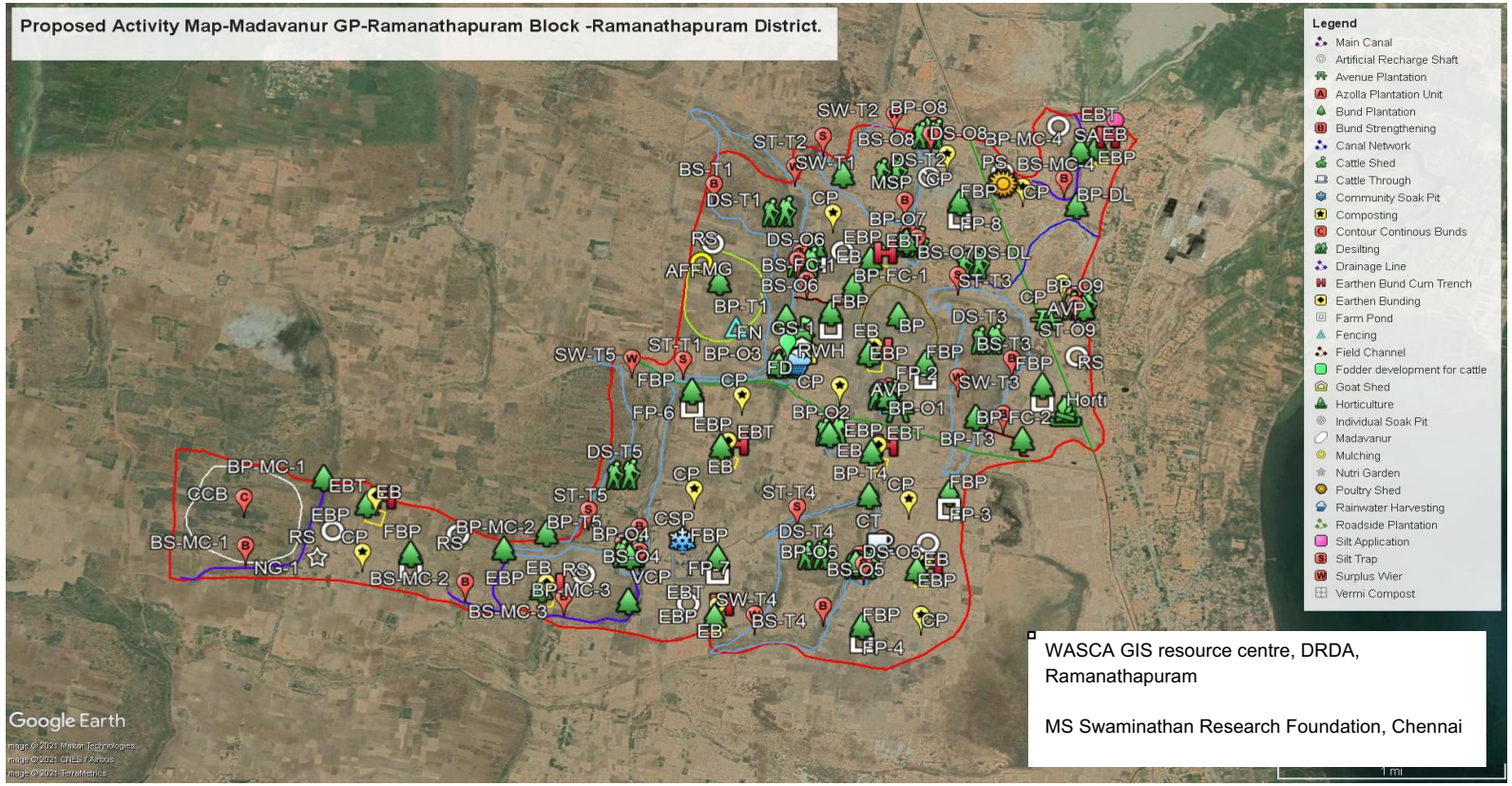
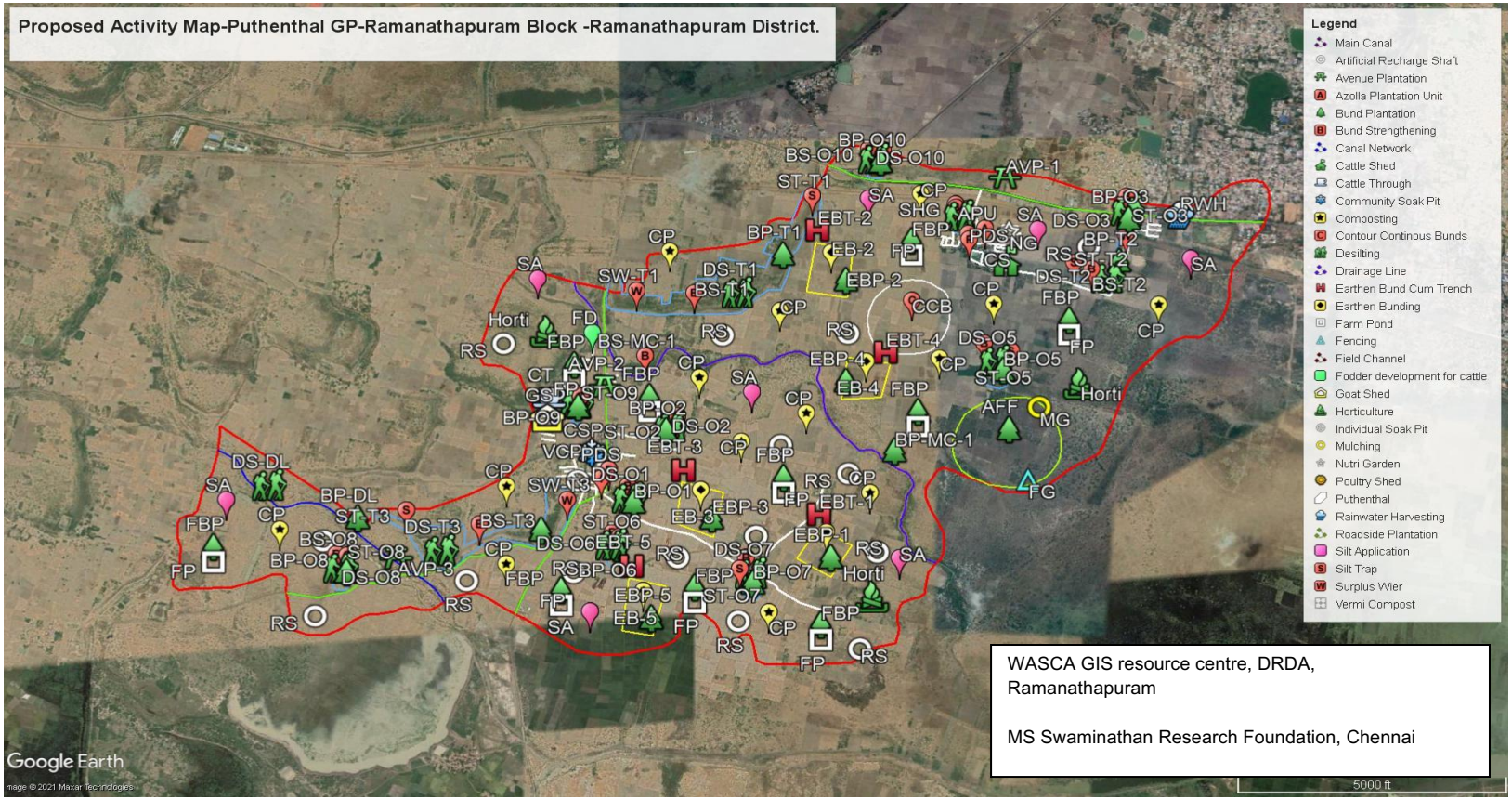
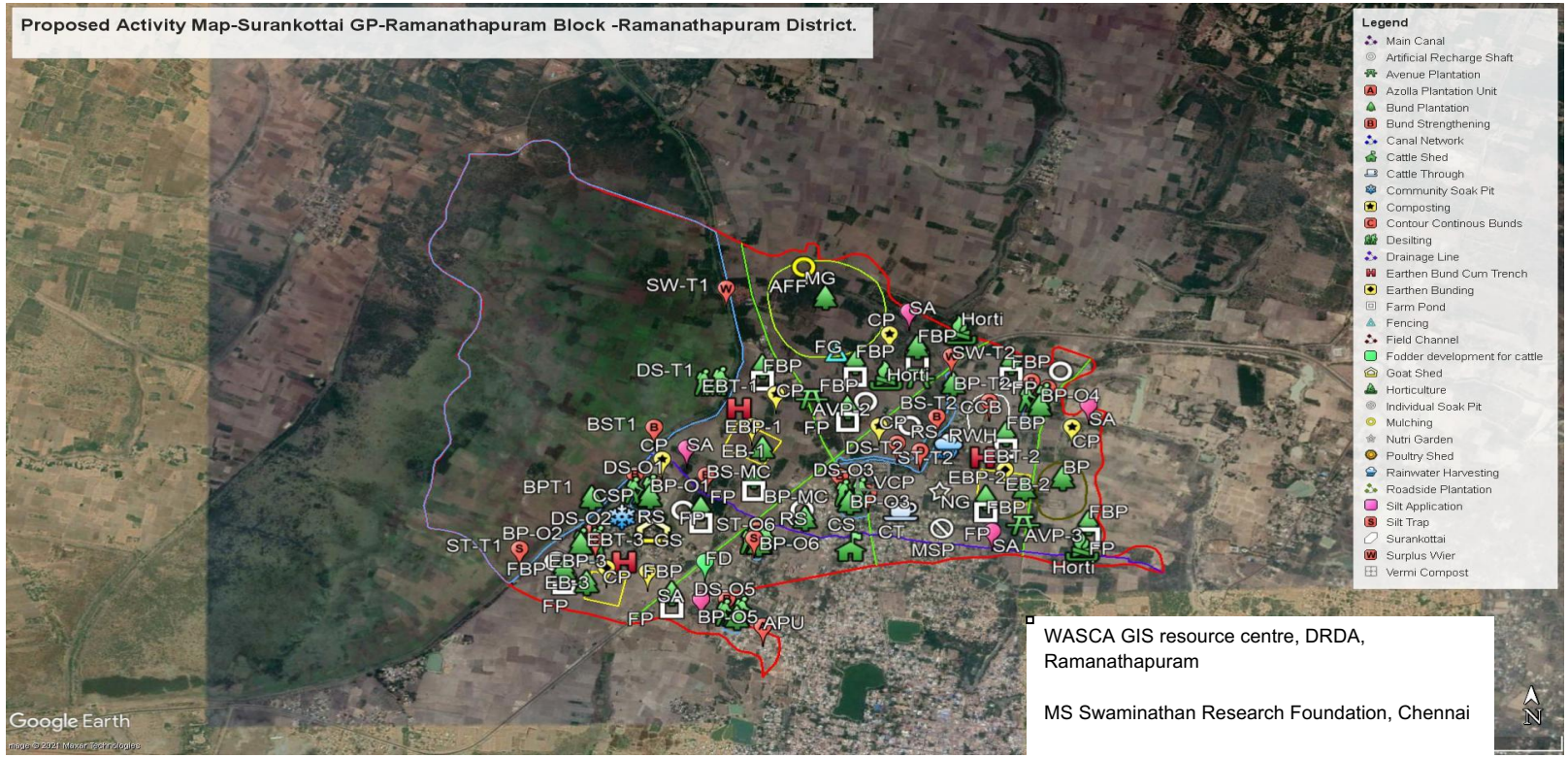
Madavanur Gram Panchayat – Ramanathapuram Block



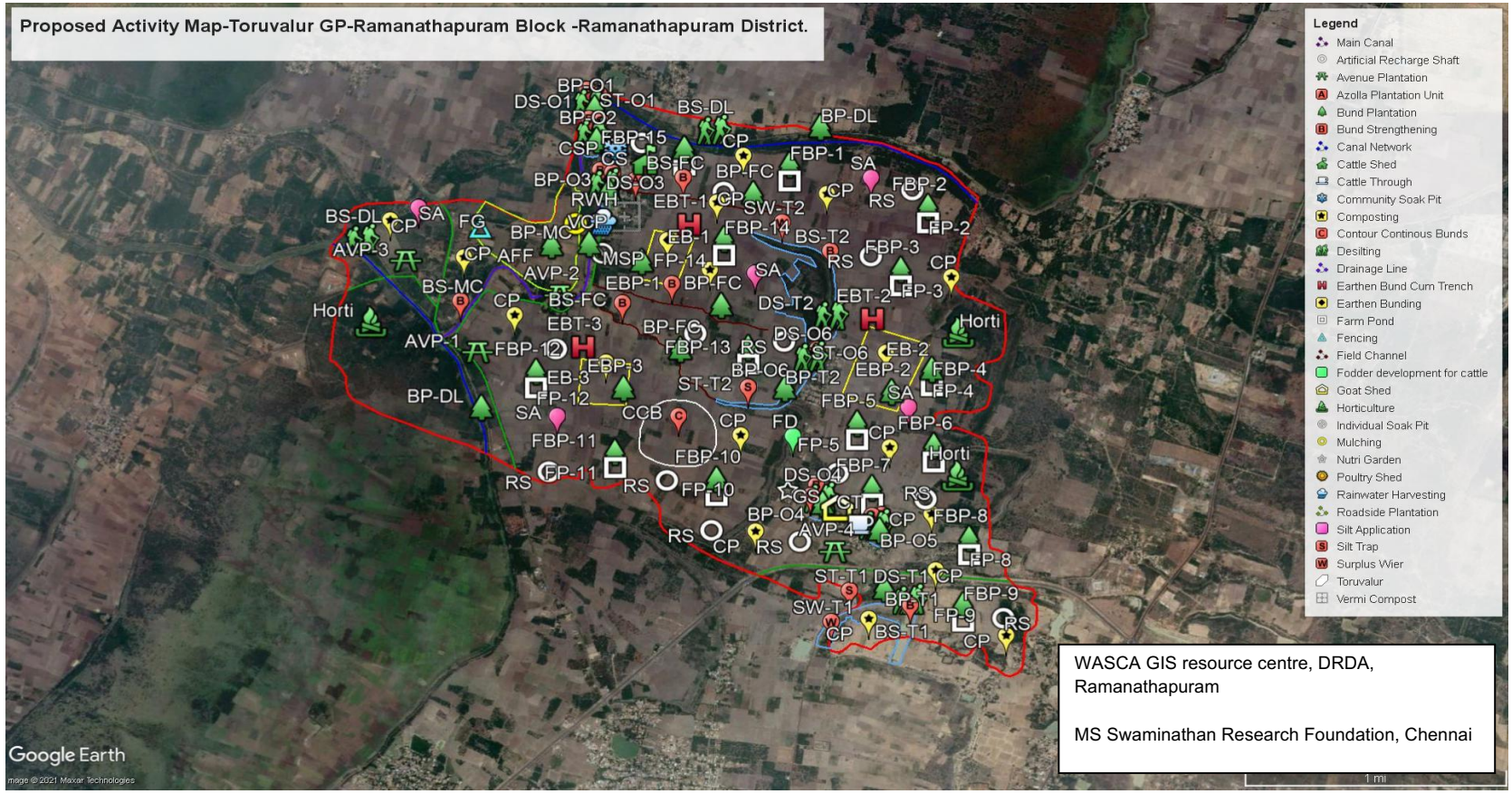
Puthenthal Gram Panchayat – Ramanathapuram Block



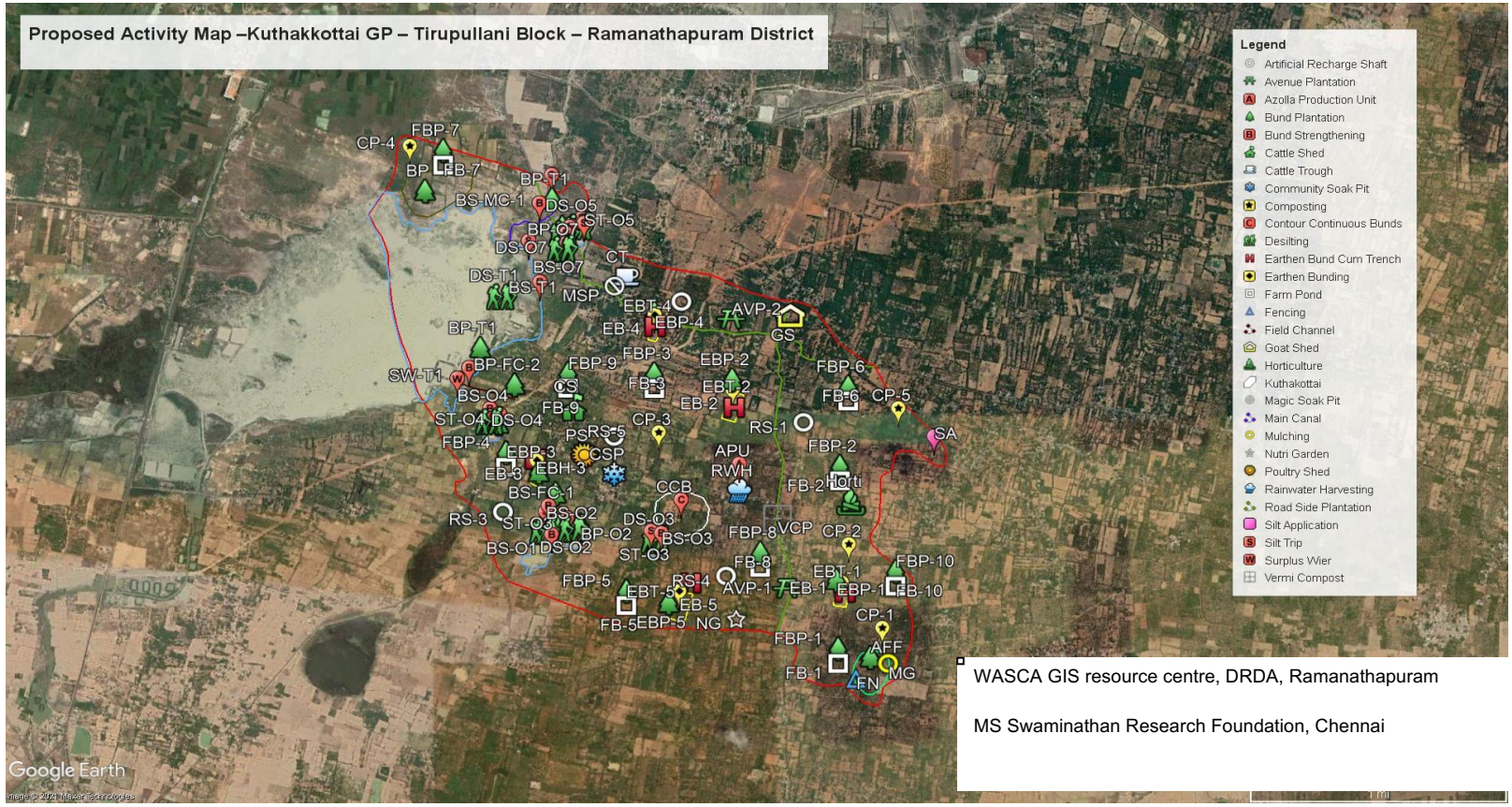
Surankottai Gram Panchayat – Ramanathapuram Block



Toruvallur Gram Panchayat – Ramanathapuram Block



Kuthankkottai Gram Panchayat – Tirupullani Block



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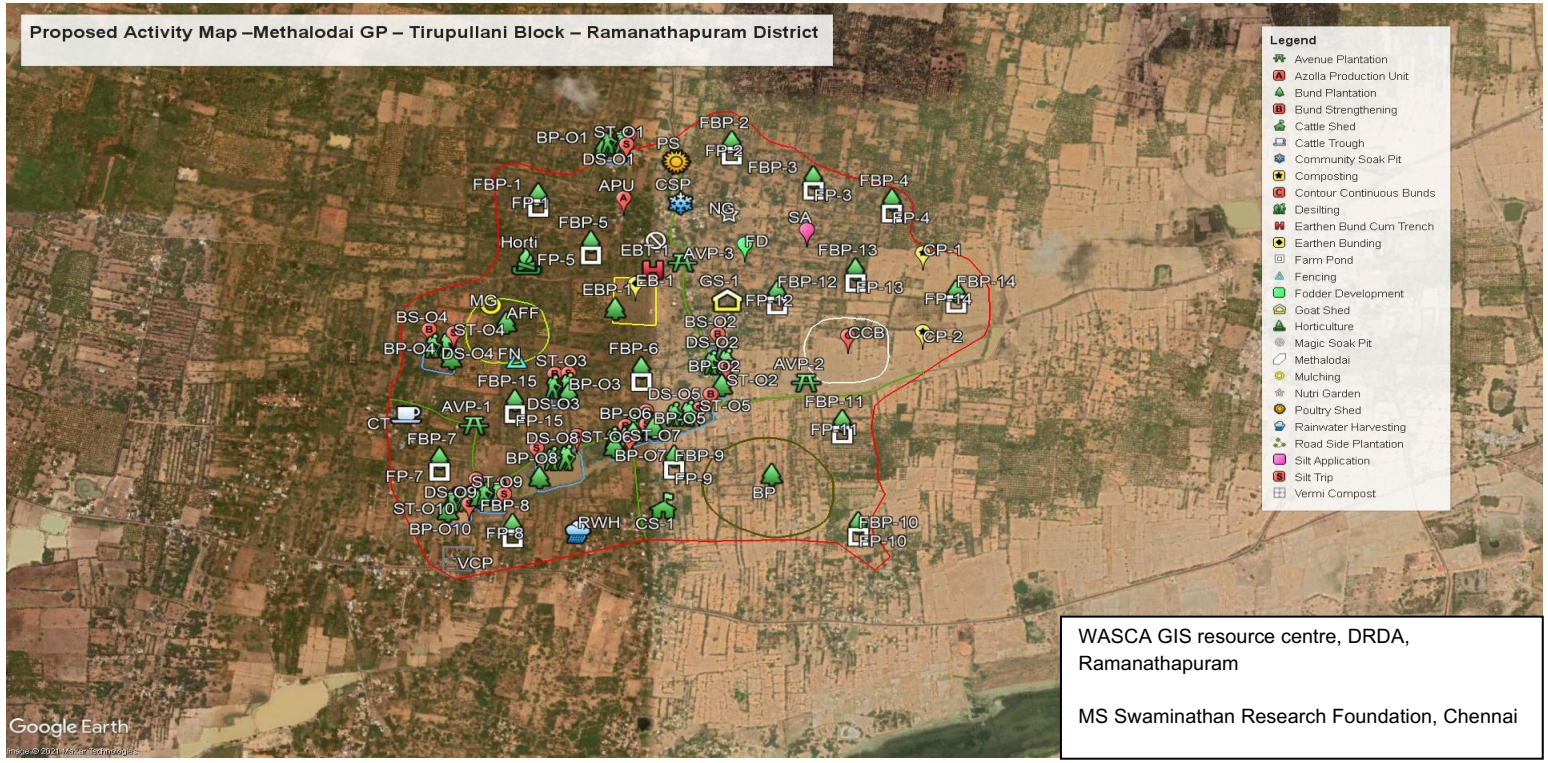
Methalodai Gram Panchayat – Tirupullani Block



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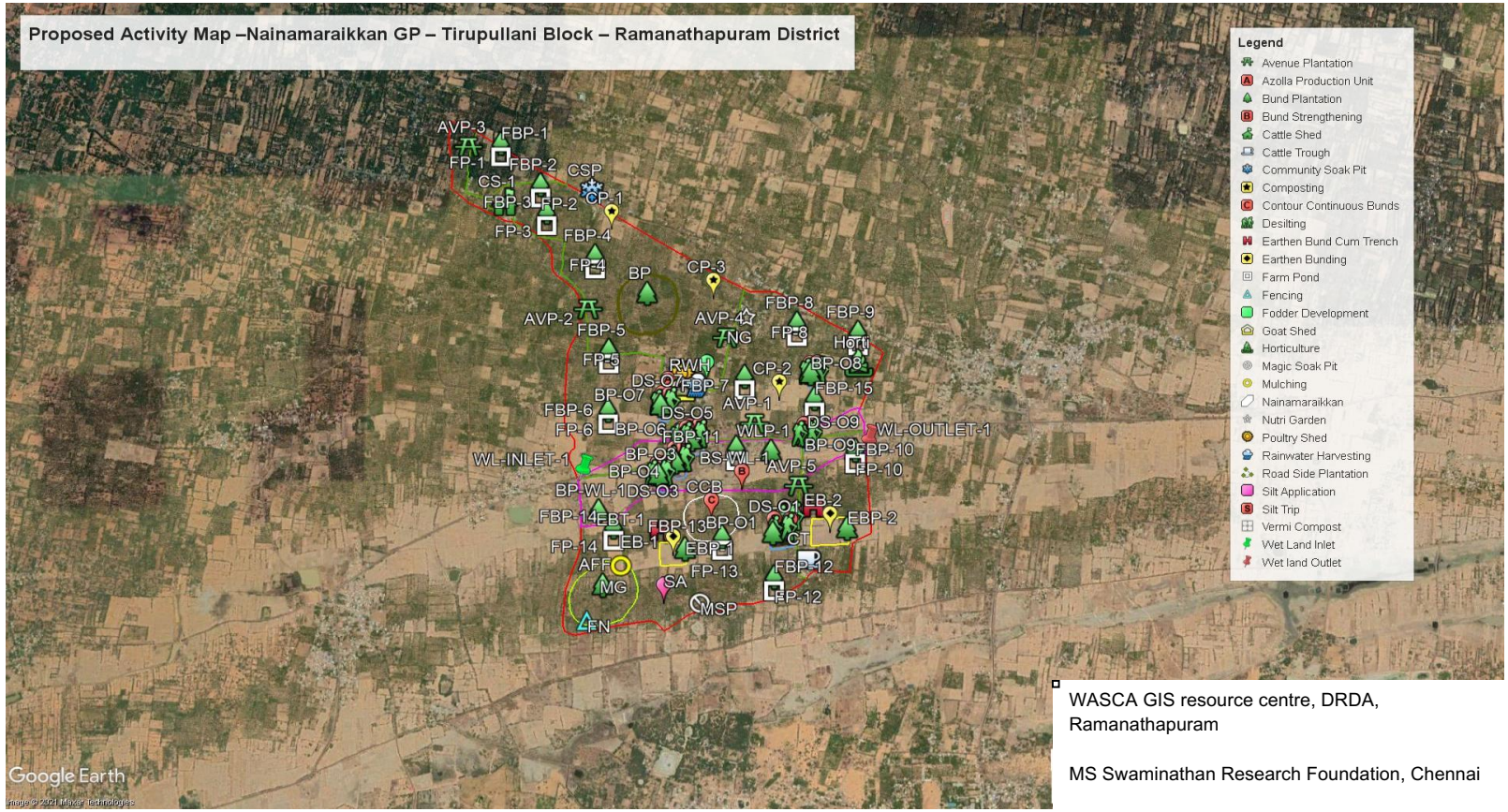
Nainamaraikkan Gram Panchayat – Tirupullani Block



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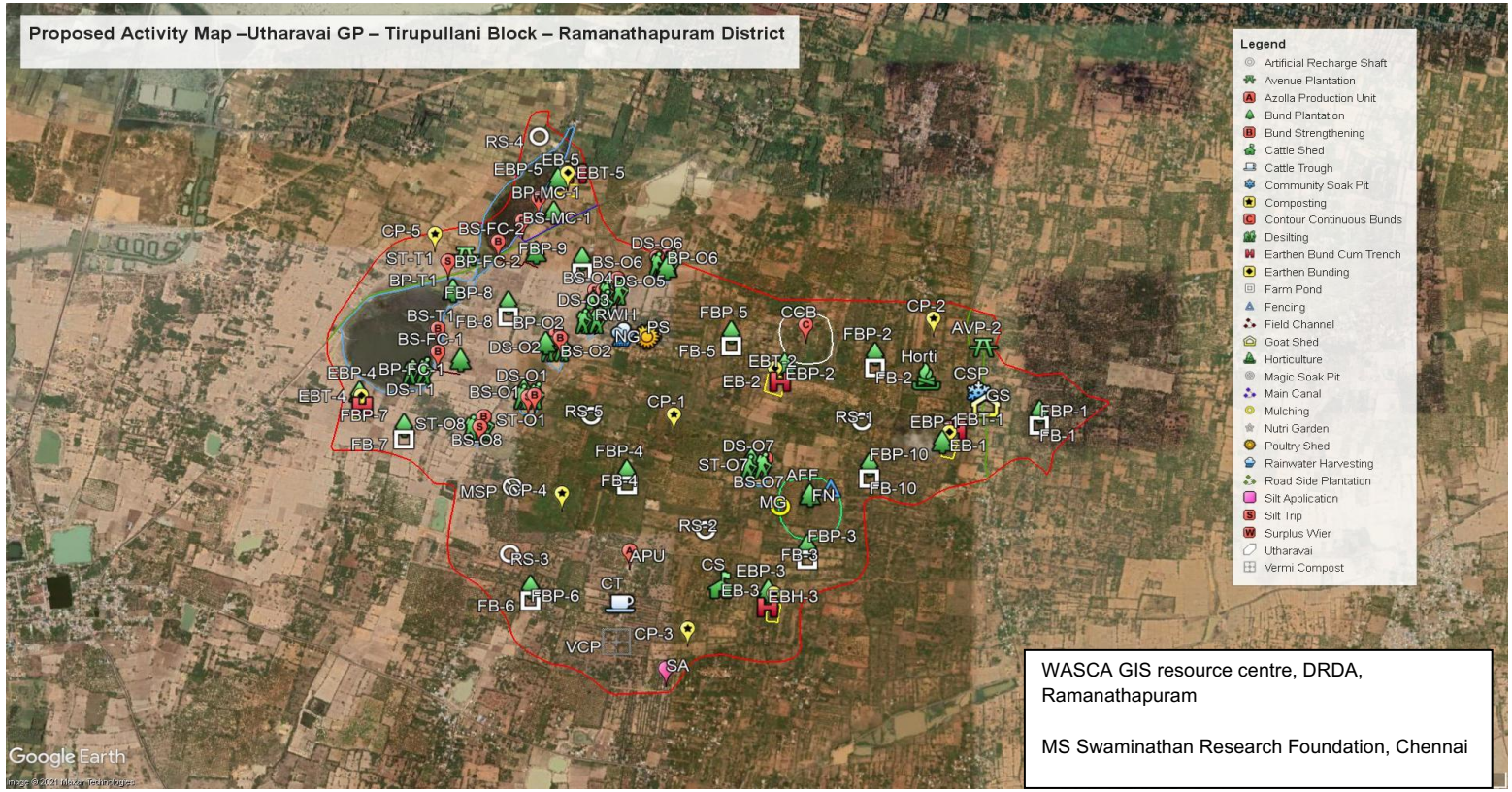
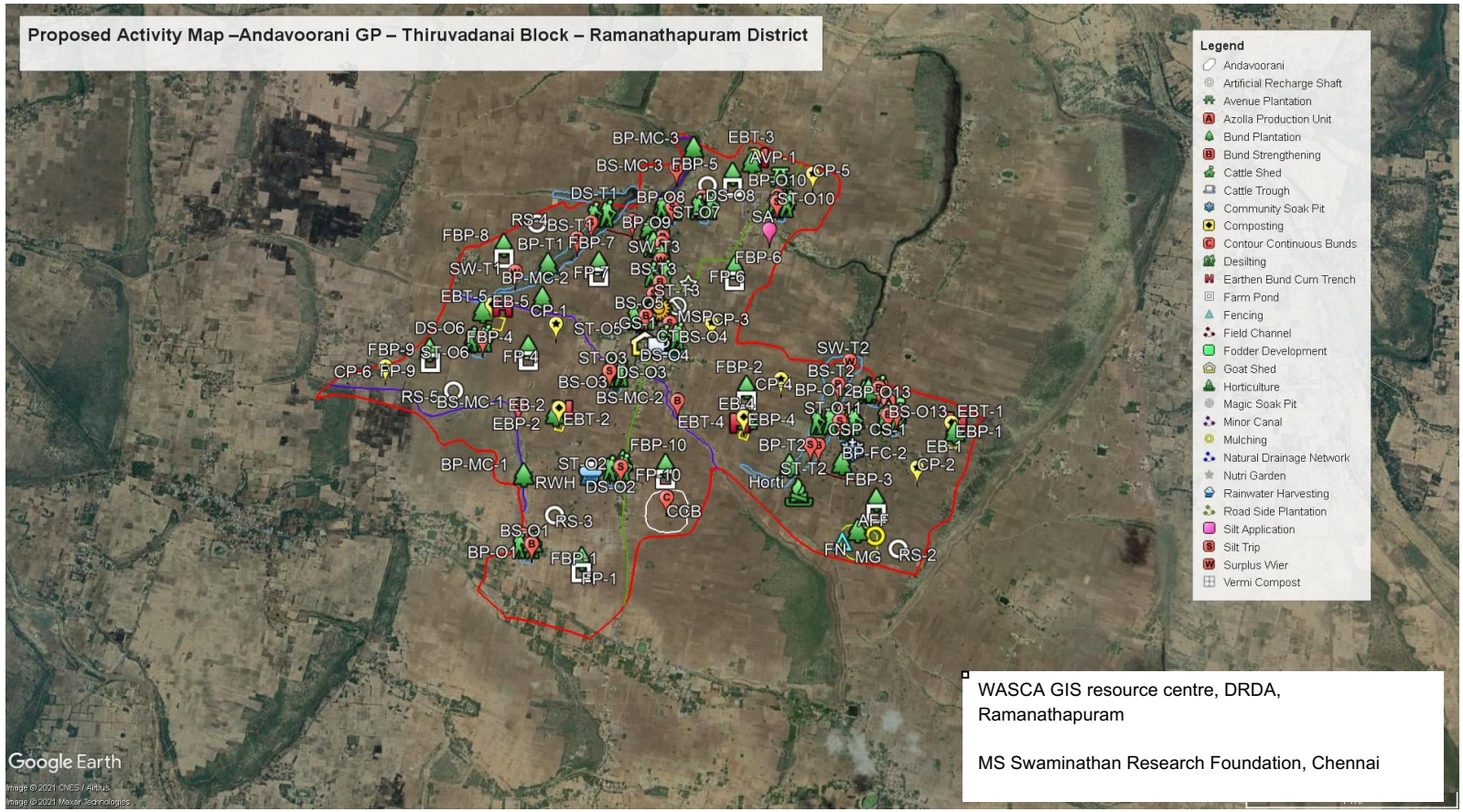
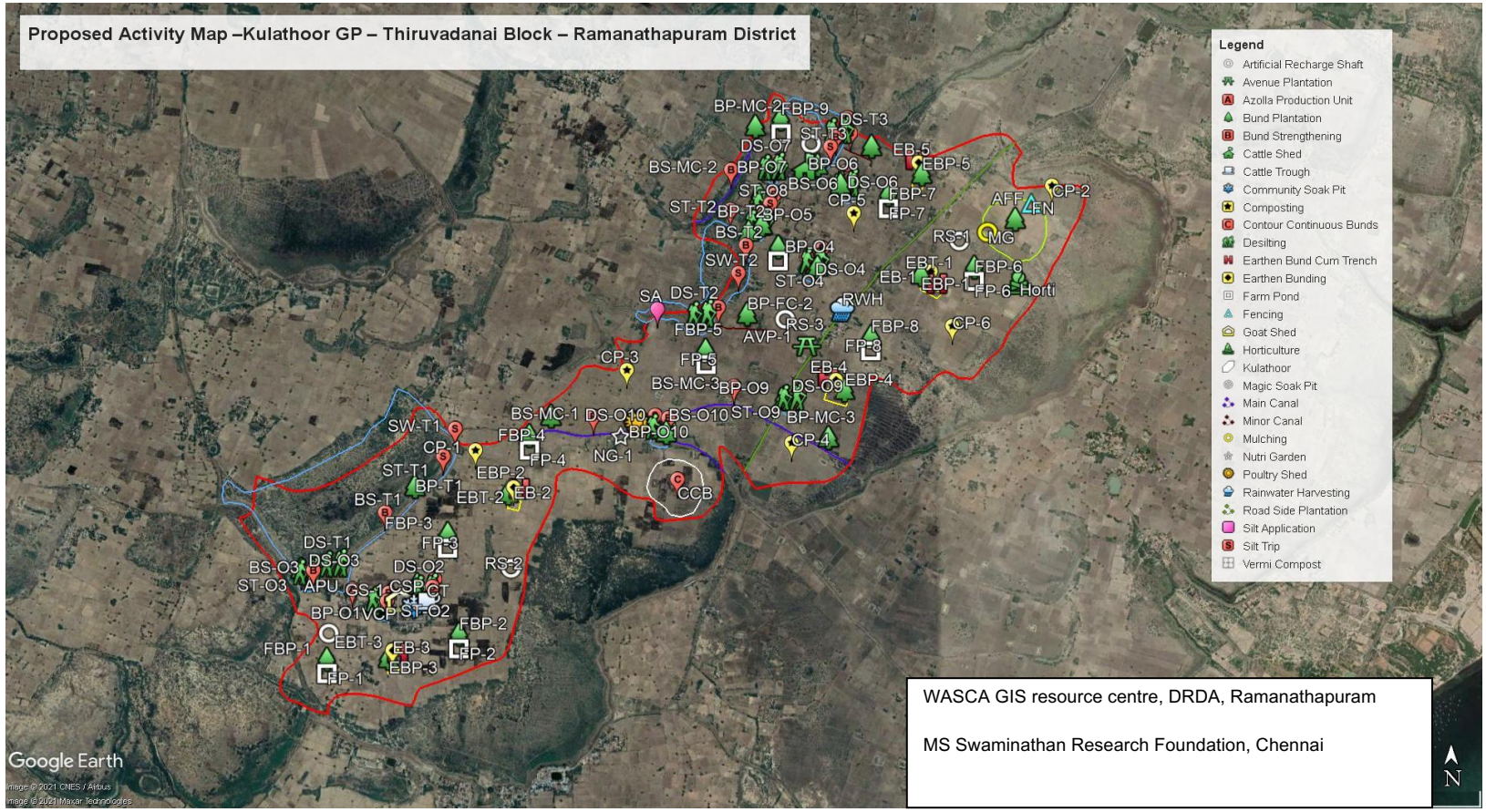
Utharaval Gram Panchayat – Tirupullani Block



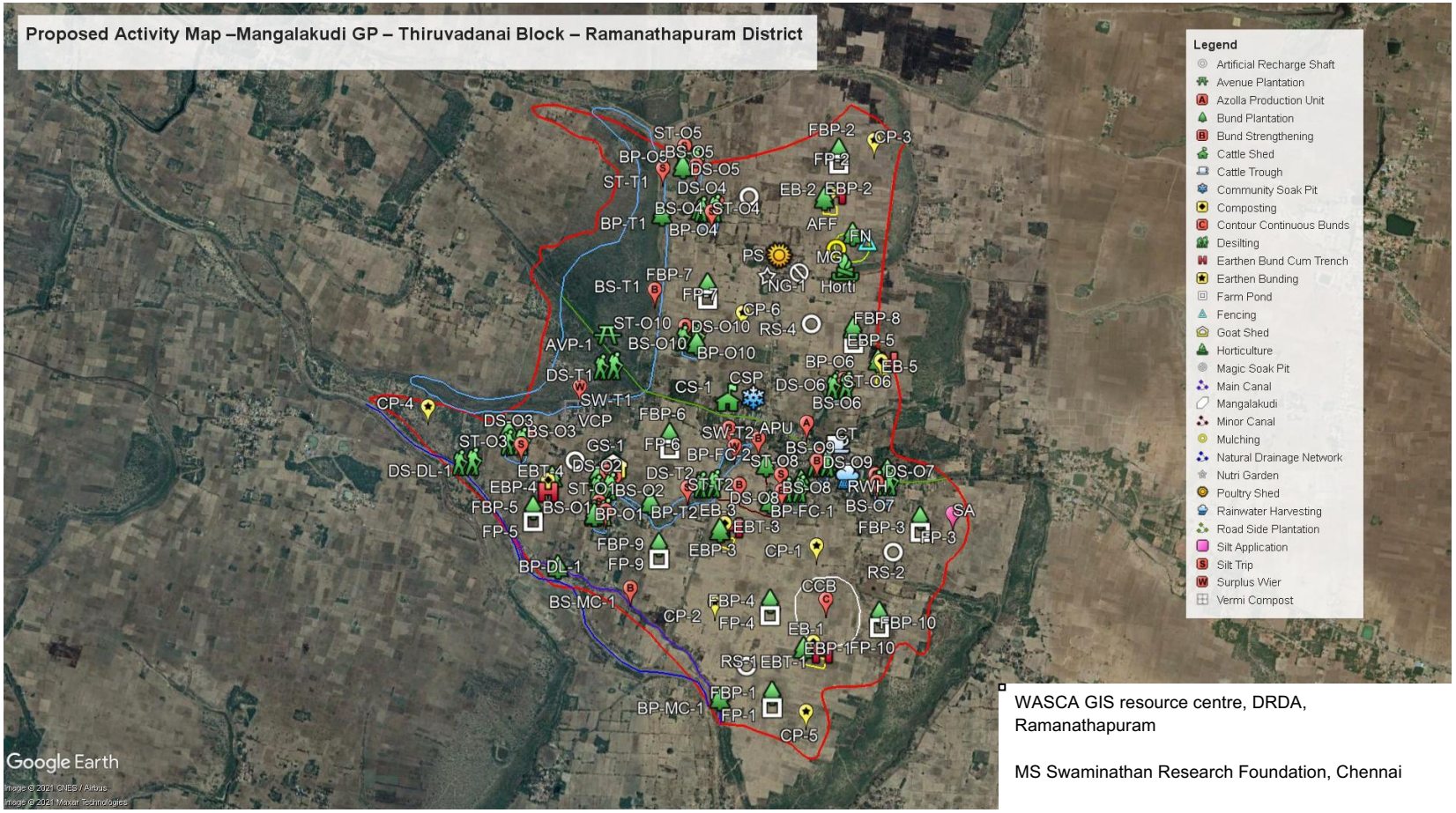
Andavoorani Gram Panchayat – Thiruvadani Block



Kulanthoor Gram Panchayat – Thiruvadani Block



Mangalakudi Gram Panchayat – Thiruvadani Block



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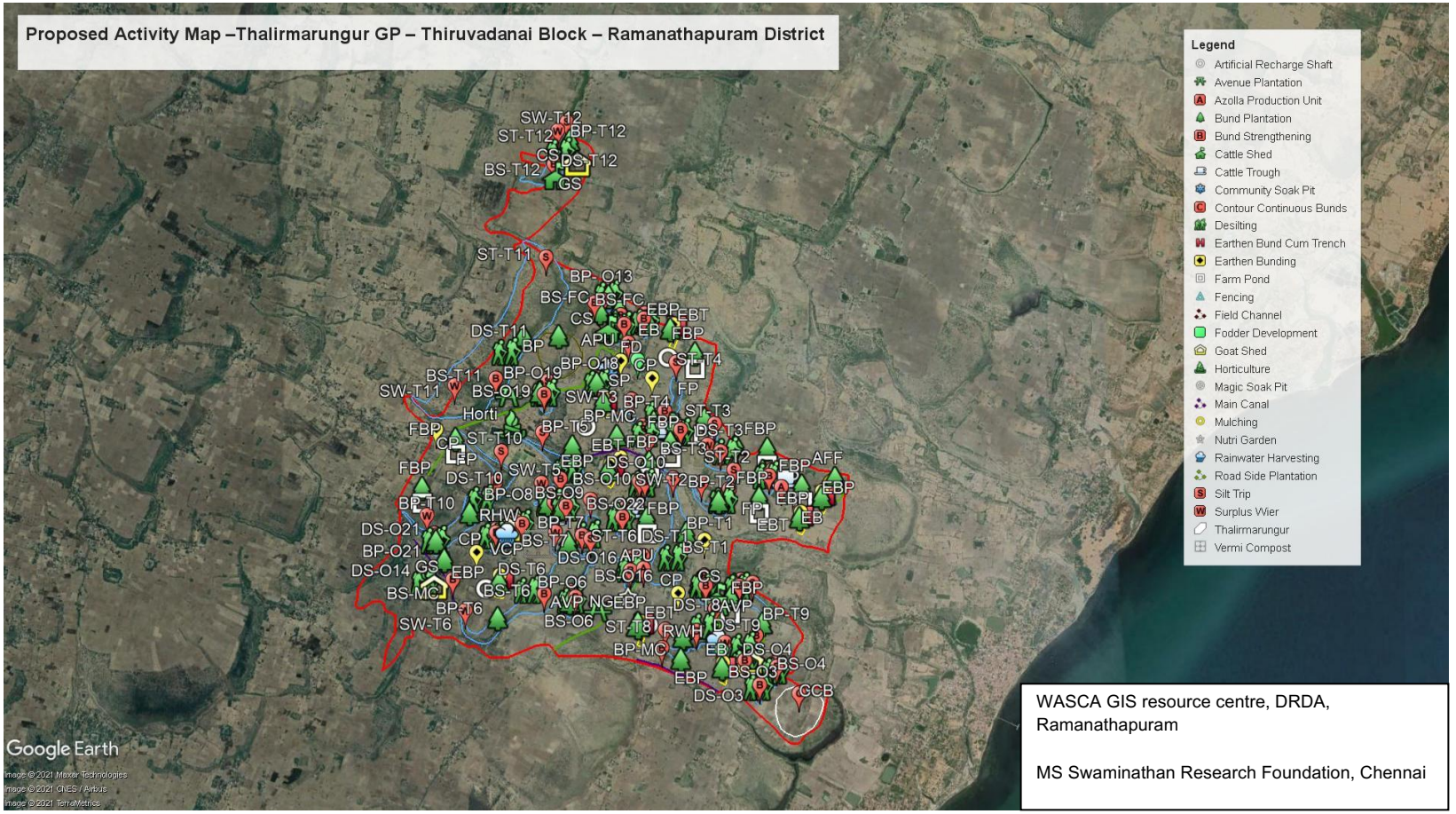
Thallirmarungur Gram Panchayat – Thiruvadani Block



Chapter 6
Climate Resilience Measures in Ramanathapuram

6.1 CRM Framework: Current and Future Extremities of TN

Tamil Nadu already faces several consequences of climate change causing distress to its farmers and other local communities. It is vulnerable to different types of climatic hazards such as floods, hailstorms, heat waves, drought, thunder and lightning and forest fires. Most of these hazards have direct or indirect linkages with climate change. Adverse effects these hazard ravage agricultural crops, livestock productivity, net primary productivity of forests etc.

Tamil Nadu, the trends in selected extreme event indices based on MMM projections, although due to the poor RCM performance in replicating historical extreme events caution is required when interpreting these trends. They report positive trends in certain temperature related indices, such as maximum day time temperature (TXx), maximum night time temperature (TNx) and Minimum day time temperature (TXn) and Minimum night time temperature (TNn). This indicates a warming up for both time periods and RCPs and these trends are statistically significant for limited geographical areas (districts) only. Moreover, the percentage of warm days and warm nights is projected to increase, and percentage of cool days and cool nights is projected to decrease under all scenarios and time periods. Cold spell duration indicator is projected to decrease, and warm spell duration indicator is projected to increase.

Ramanathapuram is a coastal length if 236.8 km long coastline involving 45 coastal Gps. It is endowed with varied coastal habitats such as mangroves, corals, seaweeds, sea grass beds, salt marshes, mudflats and sand dunes. Climate change-induced sea-level rise (SLR) poses a serious threat to coastal resources and communities of Ramanathapuram.

SLR is one of the greatest climate change impacts faced by the low-lying coastal regions of the world. Coastal districts of Tamil Nadu are no exception (Ramachandran et al., 2017). Therefore, adaptation to the SLR using pragmatic and locally suitable approaches is considered as the most appropriate response measure. SimCLIM climate modelling software has been used to project SLR for the Tamil Nadu coast in India for four time periods namely 2025, 2050, 2075 and 2100 for RCP 4.5 IPCC AR5. For Ramanathapuram District SLR is Highlighted In given Table 6.1.

Table 6.1 Projection of climate change-induced SLR for the coasts of Tamil Nadu using SimCLIM based on IPCC AR5-RCP 4.5 Supporting Actions for climate resilient & adaptation:

Year	2025			2050			2075			2100		
Range	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Districts												
Thiruvallur	04.94	07.37	12.64	13.20	19.75	33.95	23.22	34.79	59.87	33.25	49.84	85.80
Chennai	04.94	07.37	12.64	13.20	19.75	33.95	23.22	34.79	59.87	33.25	49.84	85.80
Kancheepuram	04.77	07.51	11.47	12.74	20.11	30.80	22.42	35.44	54.31	32.10	50.76	77.81
Villupuram	04.77	07.51	11.47	12.74	20.11	30.80	22.42	35.44	54.31	32.10	50.76	77.81
Cuddalore	04.74	07.54	12.98	12.64	20.19	34.86	22.24	33.57	61.47	31.84	50.95	88.09
Nagapattinam	04.74	07.40	12.25	12.64	19.82	32.90	22.24	34.92	58.02	31.84	50.02	83.14
Thiruvarur	04.74	07.40	12.25	12.64	19.82	32.90	22.24	34.92	58.02	31.84	50.02	83.14
Thanjavur	04.74	07.40	12.25	12.64	19.82	32.90	22.24	34.92	58.02	31.84	50.02	83.14
Pudukkotai	04.81	07.40	12.32	12.85	19.82	33.09	22.60	34.92	58.35	32.36	50.02	83.62
Ramanathapuram	04.51	07.27	11.55	12.03	19.46	31.00	21.16	34.28	54.67	30.29	49.10	78.33
Tuticorin	04.55	07.10	11.57	12.13	19.02	31.05	21.34	33.51	54.74	30.55	47.99	78.44
Thirunelveli	04.53	07.00	11.70	12.09	18.73	31.41	21.26	32.99	55.39	30.44	47.25	79.37
Kanyakumari	04.94	07.67	10.89	13.18	20.55	29.24	23.20	36.21	51.55	33.21	51.87	73.86
Average	04.74	07.39	11.97	12.66	19.81	32.14	22.28	34.78	56.68	31.90	50.01	81.23

Both at the international and national targets and schemes are supporting the above actions: important ones are Tamil Nadu State Action Plan on Climate change, Nationally Determined contributions and SDGs, MGNREGA and other government schemes more relevant and contributing

1. Tamil Nadu State Action Plan on Climate Change (TNSAPCC)
2. Preparation of State Specific Action plan for Tamil Nadu (PWD)
3. Nationally Determined Contributions: Climate Change: India as per Paris Agreement and Sustainable Development Goals influencing WASCA TN (SDG 1, 6; 12, 13,14,15) related Targets

Table. 6.2 State-level targets of relevance to Agriculture and allied sectors and their linkages to national and international goals. SDG-related targets stem from the Planning, Development and Special Initiatives Department's SDG Monitoring Platform.

Levels	SDG-related			NDC-related
International targets	SDG 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	SDG 6: Ensure availability and sustainable management of water and sanitation for all	SDG 12: Ensure sustainable consumption and production patterns	
National targets/ indicators	National-indicators have been defined in the National Indicator Framework (NIF) developed by the Ministry of Statistics and Programme Implementation, but no national-level targets other than the international Sustainable Development goals and the associated targets have been defined			For better adaptation to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture
State-level targets 2030	Proportion of population (marginalized and vulnerable) with access to food grains at subsidized prices: target value to be defined	· Capacity of sewage water treated (MLD): 100%		

Targets	SDG-related	NDC-related
International targets	SDG 6: Clean Water and Sanitation: Ensure Availability and sustainable management of water and sanitation for all	
National targets/ indicators	National-indicators have been defined in the National Indicator Framework (NIF) developed by the Ministry of Statistics and Programme Implementation, but no national-level targets other than the international Sustainable Development goals and the associated targets have been defined.	To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly water resources

Targets	SDG-related	NDC-related
State-level i.e. targets 2030	100% Capacity of sewage water treated (MLD)	
Other targets and planned initiatives	• All the households rural villages are connected with water lines in Tamil Nadu. • Water meters are fixed for calculating the water usage and accordingly water charges are levied • Safe drinking water is provided to all the people in urban as well as in rural areas • Tamil Nadu is giving utmost importance to sanitation and hygiene • Under the smart city programme, for the main cities underground drainage (UGD) systems have been laid and connection have been given to all the households • Regular monitoring of water quality and identification of point sources of pollution is done • In the Cauvery sub-basin (Kalingarayan basin), baby canal has been constructed to separate the polluted water. • Industries that are not following the pollution treatment processes are not given license for further running • Selection of irrigation projects and undertaking activities for efficiency improvement –NWM • IAMWARM project supports drip and sprinkle irrigation which increases the water use efficiency to more than 60 percent Setting of up of basin management organizations under the auspices of DoWR and CWC	

Table State-level Targets of relevance to Coastal Zone Management and their linkages to National and International goals. SDG-related targets stem from the Planning, Development and Special Initiatives Department's SDG Monitoring Platform.

Targets	SDG-related	NDC-related
International targets	SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development	

Targets	SDG-related	NDC-related		
National targets/ indicators		To put forward & propagate a healthy and sustainable way of living based on traditions & values of conservation & moderation	To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly coastal areas	To create additional carbon sink of 2.5 to 3 billion tones of CO2 equivalent through additional forest and tree cover by 2030.
State-level targets (2030)	5600 hectares area under mangrove cover 42 % live coral cover of the total coral area under Tamil Nadu Increase in the extent of protected areas (WLS, NP, BR &CR) to 11218 sq.km. 00 associated fishing implements- FRP Boats Assistance Associated Fishing Implements – Ice Boxes Compliance of International Law- Tamil Nadu Marine Fishing Regulation Act 1 Days under Fishing Ban Period- International Compliance of International Law			
(Source TN-SAPCC 2.0)				

6.2 Climate-Resilient Actions

CRM No.	Name of the CRM	GP and block	Details
1	Mini forest: (500 saplings/unit)	1000 mini forest units in 11 blocks covering all 429 GPs	♦ Promoted 5 lakhs trees in 250 acres ♦ 33 native species are grown ♦ Promoted 162 miniforest in schools and maintained by women and students
2	Horticulture Park:	11 thematic parks in 11 blocks-	♦ Developed focussing on different themes- Fruit park, Agro forestry park, food park, Community park, Integrated Farming System. ♦ In the IFS model -included allied enterprises such as cattle rearing, goat rearing, Mushroom production, Spirulina production, compost production, organic input production and cultivation of vegetables, fruits and medicinal plants, fodder in organic farming
3	TANKA - Community level	Chitturvadi in R. S. Mangalam and Thillainendhal, Thiruppullani	♦ Storage capacity is 30000 lits/ tanka
4	Nursery at the district level	Vendoni, Paramakudi block	♦ Raised 15 lakhs tree saplings for transplanting in the District ♦ 20 varieties of native species are maintained and ♦ Scientific management of Nursery was imparted
5	Avenue plantation	1) Parthibanur (Ramnad district border starting) to Kamuthi (Viruthunagar district border)- 40 Kms (double side - 80 kms 2) Parthibanur to Paramakudi- 15 kms (double side- 30 kms) 3) Ramanathapuram to Sayalkudi	♦ 4,00,000 trees will be transplanted in 370 Km - consist of 100 big trees and 200 small trees per 1000 m and completed areas and SHGs are given responsibility for tree maintenance

CRM No.	Name of the CRM	GP and block	Details
		(Thoothukudi district border)- 70 (140kms) 4) Ramnad toThondi (border of Sivagangai district)- 60 (120 kms)	
6	Cascade of tanks	R.S Mangalam block is selected for cascade tank - Planned to work in 15 cascade tank	♦ Discussed with PRADHAN- a NGO expertise in cascade tank- NGO will support to renovate (planning and implementation)
7	Integrated Food park	Thaduthalankottai , Paramakudi	♦ Established in 25 acres of land- ♦ Navthanya (millets and pulses) cultivation and processing, ♦ Moringa cultivation and value added products- ♦ Traditional Vegetable seed production- 70 varieties of vegetable and Flowers crop cultivation
8	Coastal watersheds	list of villages are given in Annexure 1	♦ three pilots have been identified and discussion is initiated for comprehensive planning. Activities includes Wetlands, Coastal bio-shields, mangroves, coastal sand dune management, coastal plantation, river creek management, eco-tourism, local sea grass cultivation etc
9	River bank stabilization through plantation	Paramakudi block	Plantation and surface vegetation is promoted in erosion prove areas
	Under Planning Phase:		
1	Oxygen park	Planned in 10 acres (8000 trees) of land at Ramnathapuram block	♦ Planned to promote Bamboo for increasing the oxygen and Moringa trees and its value added products for reducing the anaemia
2	Livelihood Activity centers	Planned to promote 50-60 types of enterprises covering one Livelihood activity in each GP (in 429 Gps)	♦ Building a center using local available resources like mud, Prosopis sticks and Palm leaves

CRM No.	Name of the CRM	GP and block	Details
3	Mini nursery in all panchayats	Promoted fruit and flower seedlings in 429 panchayats	450000 seedlings will be produced in six months
4	Traditional life park	Mandapam block – Developing models of five types geo-based land (kurunji, mullai, marutham, neithal , palai)	♦ Traditional food court ♦ Ornamental plants/ fishes ♦ Traditional games ♦ Total area 7.5 acres ♦
5	Mega forest – 5000 saplings/unit	four GPs	block plantation in degraded land
6	River rejuvenation	Kottakariyar river sub basin	Artificial recharge Structures and check dams – potential sites have been identified
7	Sea water intrusion control and soil erosion	Coastal GPs	

Chapter 7
WASCA Tamil Nadu: Estimates

7.1 MGNREGS (NRM and Non NRM works)

The following tables detail the Water Security and Climate Adaptation Project Works Estimates under MGNREGS (FY: 2021-22 to 2023-24) under the various **CWRM Water Actions** identified through Composite Water Resources Management Planning (CWRMP).

District Rural Development Agency: Ramanathapuram Water Security and Climate Adaptation Project Works Estimates under Mahatma Gandhi NREGS FY: 2021-22 to 2023-24 Water Action 1: Development of Public & Common Lands Estimated through CWRMP				
S.No.	Name of the work	Number of works identified	Estimates for Three Years (2021-22 to 2023-24)	
			Estimated cost of proposed work as per RSSR-TN (INR in Lakhs)	Estimated Person Days
1	Afforestation in Public/common lands	11217	96467	37509916
2	Contour Continuous Bunds (CCB) for Afforestation area	43894	1097	438941
3	Composting	11931	2028	178965
4	Drainage Line Treatment (DLT)	23248	697	116238
5	Silvi-pasture Development	191	3258	1269559
6	Linear Plantation	754	1358	530185
7	Avenue plantation	1801	3242	1266137
8	Block Plantation (Community)	29487	327309	127385136
9	Restoration of water bodies			
10	a.Tanks	1344	6720	1075200
11	b. Ooranis	3883	7766	776600
12	c. Ponds	47	47	9400
13	Artificial Recharge Structure	4627	11568	1809174
14	Canal Bund Plantation	2618	19636	7671161

15	WC - Irrigation channels - Desil-ting	157589	1182	472766
16	WC- Irrigation channels - canal side plantation	157589	2364	945533
Coastal water shed works				
17	Agro forestry	1614	12106	4729577
18	Check dam	27	41	6318
19	Mangrove planta-tions	135	2159	843375
20	Riverside plantation	0	0	0
21	Fish Drying Yard	34	72	11254
23	Nursery develop-ment - plantation	12	248	96745
24	Shelter belts	16	120	46880
25	Coastal wetland - Bund strengthening	22579	1411	22059781
26	Bund Plantation wet lands	10964	2056	32124520
27	Wetland plantation (inner)	133	998	389823
28	Wetland Inlet im-provement works	2856	28556	11153778
	Sub total Water action 1	**4,88,590**	**5,32,505**	**25,29,16,962**

CWRM Water Action 2: Agricultural and allied Sector development (Productivity Enhancement)				
S.No.	Name of the work	Number of works identified	Estimates for Three Years (2021-22 to 2023-24)	
			Estimated cost of proposed work as per RSSR-TN (INR in Lakhs)	Estimated Person Days
1	Farm Bunding	32926	49388	19294437
2	Micro Irrigation	3081	3081	0
3	Construction of farm ponds	10084	20168	7875604
4	Land development	12668	126680	49481325
5	Nursery Development	9769	146531	22897950
6	Cattle Shelters	2329	4937	770899
7	Goat Sheep Shelters	19385	44004	6881675
8	Fodder development for cattle	2329	3447	5459176
9	Azolla units	2329	349	53567
10	Cattle Trough	2329	116	13974
11	Poultry shed	5949	535	59490
12	Dry land Horticulture/Agro-forestry	16460	139910	54663627
13	Vermi compost	2329	419	62883
	Sub total - Water action 2	**1,21,966**	**5,39,568**	**16,75,14,607**

CWRM Water Action 3: Development of Rural Infrastructure			Estimates for Three Years (2021-22 to 2023-24)	
S.No.	Name of the work	Number of works identified	Estimated cost of proposed work as per RSSR-TN (INR in Lakhs)	Estimated Person Days
1	Soak pits (Community)	3895	506	77900
2	Soak pits (Individual)	38985	3899	623760
3	Roof rain Water Harvesting	858	3432	536250
4	Community Tanka (Rajasthan Model)	2	60	600
Sub total - Water action 3		**43740**	**7897**	**1238510**
Total Water actions		**654296**	**1079969**	**421670079**
Source: CWRM- TN- Ramanathapuram Plan, 2020-21				

Chapter 8
WASCA TN: CWRMP- Climate-Resilience for Future Livelihoods

Climate change, a phenomenon of international concern, poses a serious threat to human existence. As this phenomenon is constantly evolving and changing, responses to mitigation must also be dynamic, scalable and in line with new national and international threats and structures. Individual structures, such as the “Paris Agreement”, have led the countries to implement their own measures to reduce emissions and take mitigation and adaptation measures reflected in the “Nationally Determined Contributions”. The mitigation and adaptation measures must consider the development needs of the country and the state in order to ensure a sustainable development pathway for a country. National Action Plan on Climate Change (NAPCC) and State Action Plan on Climate Change (SAPCCs) provides guidance on long term strategy to address climate change at National and State levels respectively.

Since the adoption of NAPCC & SAPCC, important developments and changes have occurred in the broad domain of climate change. Not only have the science, knowledge and understanding of climate change evolved at the global and regional levels, so has the policy context. Notable in this context is the ratification of important development and climate goals at the International level such as the Sustainable Development Goals (SDGs) and the Paris Agreement that aims at checking the global warming (temperature. target of 1.5° C). Related Indian Government commitments, such as those recorded in the Nationally Determined Contribution and corresponding goals of individual State pose the need for an evolving, appropriate climate change action planning process.

8.1 Intended Nationally Determined Contribution Linkages WASCA-TN

NDC Goals and WASCA

2015 was a historic year in which 196 Parties came together under the Paris Agreement to transform their development trajectories so that they set the world on a course towards sustainable development, aiming at limiting warming to 1.5 to 2 degrees C above pre-industrial levels. Through the Paris Agreement, Parties also agreed to a long-term goal for adaptation – to increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten

food production. Additionally, they agreed to work towards making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change.

The Paris Agreement (Article 4, paragraph 2) requires each Party to prepare, communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

For achieving NDCs, India has a definite plan of action for Mitigation and Adaption which includes 8 goals (1.Sustainable Lifestyles, 2.Cleaner Economic Development, 3.Reducing Emission intensity of Gross Domestic Product (GDP), 4.Increasing the Share of Non Fossil Fuel Based Electricity, 5. Enhancing Carbon Sink (Forests), 6. Adaptation, 7.Mobilizing Finance & Technology Transfer and 8.Capacity Building).

In these 8 goals of NDCs, WASCA in Tamil Nadu State's interventions will achieve 2 major Goals (Goal5 &6) namely:

- "Enhancing Carbon Sink (Forests) - To create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030" and
- "Adaptation - To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management"

8.2 Sustainable Development Goals – Linkages with WASCA implementation in Tamil Nadu

WASCA – TN is working on three major Actions for making "Climate Resilience for Future Livelihoods". These water actions are:

1. Developing degraded public lands and common lands
2. Developing lands under agricultural and allied activities to enhance productivity
3. Rural Water Management for reaching the domestic needs.

WASCA TN aims to achieve the above works closely with MGNREGA programme of Ministry of Rural Development and National Water Mission programme of Ministry of Jal Shakti are key stakeholders for WASCA. Apart from these two ministries, in addition to these two ministries, the works under WASCA TN are closely linked with Ministry of Agriculture and Ministry of Environment Forest and Climate Change (MoEFCC).

Hence the commitments of the ministries on SDG goals achievements are mapped in the tables given in this section linking them with the interventions under WASCA Tamil Nadu. The intervention under WASCA TN has direct and indirect contribution to the SDGs. SDGs, its national targets set as per NITI Aayog.

Sustainable Development Goal 1

SDG Goal 1 aims to end poverty in all its forms everywhere. Ending poverty in all its forms everywhere implies focusing on complete eradication of extreme poverty as well as paying attention to other determinants that influence poverty such as socia- economic, cultural, political and environmental factors. Also, Goal aims to reduce, at least by half, the proportion of men, women and children of all ages, living in poverty in all its dimensions according to national definitions.

It calls for continuous monitoring including monitoring progress in social protection and inequality. Further its emphasis on creating sound policy frameworks, mobilization of resources from a variety of sources and implementing nationally appropriate social protection systems that ensure equal rights; and access to basic services and economic resources.

Poverty manifests itself in diminished opportunities for livelihoods and quality education, lack of access to resources, social discrimination and exposure and vulnerability to extreme climate events.

Improved economic performance coupled with concerted interventions by the government towards poverty eradication has led to decline in poverty rates across all economic, social and religious groups at the national level and in all States.

The MGNREG Act, 2005- The MGNREGA Act, 2005 aims to provide hundred days of guaranteed wage employment in every financial to every rural household whose adult member volunteers' who demanded employment under this ACT were provided the same, in the year 2017-18. WASCA interventions will expected to lead betterment of the districts.

Table 8.1 Sustainable Development Goals (SDGs):1 Targets, WASCA Targets

India's Commitment to SDG: Nodal Ministry: MoRD
SDG 1: End Poverty in all its forms everywhere
1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day
1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions
1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable
1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance
1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters
1.a Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in all its dimensions
1.b Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions
WASCA TN interventions will be impacted all targets (1.1-1.5)

Sustainable Development Goal 2

SDG 2: Eliminating hunger is fundamental to ensuring human development. Goal 2 aims to end all forms of hunger and malnutrition by 2030, making sure all people- especially children – have access to sufficient and nutritious food all year round. It seeks to end all forms of malnutrition, double agricultural productivity and ensure sustainable food production systems. Food security is influenced by a number of factors, including those that determine food availability domestic food production and the capacity to import food, as well as determinants of food access, utilization and vulnerability. Although India has surpluses of wheat and rice stocks, improving access, utilization and reducing vulnerability remain a significant challenge. Access is determined by purchasing power of households or access to government prorammes.

Additionally, it is also determined by inequalities such as quality of food, sanitation and quality of water. Vulnerability to shocks and disasters too influence food security.

India's Goal for 2030 is to end hunger and malnutrition by ensuring that quality food is accessible to all, to meet their nutritional needs for a healthy life. Ending hunger and malnutrition demands resilient food production systems and sustainable agricultural practices. Additionally, it requires ensuring equitable access to nutritious food by all, improving sanitation and hygiene, and reducing vulnerability to shocks and disasters.

India has targeted initiatives, both at the national as well as State level, aiming to achieve this Goal. The National Food Security Act, 2013, which mandates provision of food grains to nearly 75 percent of the population in rural areas and 50 percent of the population in urban areas at affordable prices under the targeted public distribution system.

Table 8.2 : Sustainable Development Goals (SDGs):2 Targets, WASCA

India's Commitment to SDG: Nodal Ministry: Agriculture& Farmers welfare
SDG 2: End hunger, achieve food security and improved nutrition & promote sustainable agriculture
2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.
2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed

2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries
WASCA TN interventions will be impacted all targets (Targets 2.1-2.5)

Sustainable Development Goal 6

Every year millions of people, most of them children, die from diseases associated with inadequate water supply, sanitation, and hygiene. It is estimated that by 2050, more than half of the world's population will live in water stressed regions, as per researchers at MIT. More than two and a half billion people have gained access to improved drinking water sources since 1990, but 666 million people are still without. Between 1990 and 2015, the proportion of the global population using an improved drinking water source increased from 76% to 91%, however, each day, nearly 1000 children die due to preventable water and sanitation-related diarrheal diseases.

Clean water is critical to survival, and its absence can impact the health, food security, and livelihoods of families across the world. Although our planet has sufficient fresh water to achieve a regular and clean water supply for all, bad economics and poor infrastructure can skew supply unfavorably. Drought afflicts some of the world's poorest countries, worsening hunger and malnutrition. Floods and other water-related disasters account for 70% of all deaths related to natural disasters. Global goals and national priorities on reliable energy, economic growth, resilient infrastructure, sustainable industrialisation, consumption and production, and food security, are all inextricably linked to a sustainable supply of clean water. Hydropower is one of the most crucial and widely-used renewable sources of energy and as of 2011, represented 16% of total electricity production worldwide.

The Sustainable Development Goals have committed the international community to expand international cooperation and capacity building on water and sanitation related activities and programmes, and also to support local communities in improving water and sanitation management. Through Goal 6, the countries of the world have resolved to achieve universal access to safe drinking water and adequate sanitation and hygiene to all in the next fifteen years.

India's SDG:6 The overall proportion of Indian households with access to improved water sources increased from 68% in 1992-93 to 89.9% in 2015-16. However, in 2015-16, 63.3% of rural households and 19.7% of urban households were not using improved sanitation facilities. According to the World Bank, more than 520 million in India were defecating in the open – the highest number in the world. This figure is expected to have reduced significantly given that

improving sanitation is a key priority of the government which has introduced several flagship programmes, WASCA will also help to achieve the bellow targets.

Table 8.3 : Sustainable Development Goals (SDGs):6 Targets, WASCA Targets

India's Commitment to SDG: Nodal Ministry: Ministry of Water Resources, MoJS
SDG 6: Ensure availability and sustainable management of water and sanitation for all
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all
6.2 By 2030, 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 By 2030, 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 By 2030, substantially 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 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
6.a By 2030, 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
WASCA TN interventions will be impacted Targets 6.1,6.3,6.5 &6.6

Sustainable Development Goal 13

Goal 13 on Climate Change aims to integrate climate change measures into national policies and strategies; and further aims to plan and promote mechanisms for raising capacity for effective climate change – related planning and management. A comprehensive strategy is required to combat the effects of climate change. Efforts at the national level for adopting green technologies', promoting use of clean and modern source of energy, advocating for behavior change for sustainable use of resources have to be complimented by international cooperation on climate change since the causes and effects of climate change transcend national boundaries.

India has great geographic diversity, and a variety of climate regimes and regional and local weather conditions, which are vulnerable to climate change. This is manifested in floods, droughts as well as the risk from tsunamis and cyclones experienced in coastal areas.

Table 8.4 Sustainable Development Goals (SDGs):13 Targets, WASCA Targets

India's Commitment to SDG: Nodal Ministry: MoEF&CC
SDG 13: Take urgent action to combat climate change and its impacts
13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
13.2 Integrate climate change measures into national policies, strategies and planning
13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
13.a Implement the commitment undertaken by developed- country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible
13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries, and small islands developing States, including focusing on women, youth and local and marginalized communities
WASCA TN interventions will be impacted Targets 13.1 &13.2

Sustainable Development Goal 15

Goal 15 aims to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation, while also integrating ecosystems and biodiversity into national and local planning, developmental processes, poverty reduction strategies and national accounts. It also seeks to promote fair and equitable sharing of benefits arising from the utilization of genetic resources, promote appropriate access to such resources, and prevent poaching and trafficking of protected species of flora and fauna.

Land that provides habitat to more than 80 percent of all terrestrial species of animals, plants and insects, is an essential and irreplaceable resource of the world. However, unsustainable developmental activities like deforestation and desertification pose a threat to the ecosystem and affect the lives of millions of people. India's forest cover is presently 21 percent and secured territories make up almost 5 percent of the nation's aggregate land area. Millions people in India depend on land resources for their livelihood. Therefore, India aims to integrate ecosystem

and biodiversity values into local planning, development processes and poverty reduction strategies.

India's progress on this Goal is important globally, since the country is home to 8 percent of the world's biodiversity, including numerous species that are unique to the country. India's global leadership on biodiversity is reflected in the pivotal role it played in facilitating the implementation of the Nagoya Protocol — one of the global Aichi Biodiversity Targets. The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of benefits.

Table 8.5: Sustainable Development Goals (SDGs):15 Targets, WASCA Targets

India's Commitment to SDG: Nodal Ministry: MoEFF&CC
SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements
15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally
15.3 By 2020, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land- degradation-neutral world
15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development
15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species
15.6 Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed
15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products
15.8 By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species
15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts
WASCA TN interventions will be impacted Targets 15.1, 15.2 & 15.8

WASCA TN: Composite Water Resources Management Works linkage with Climate Vulnerability Area and Climate Vulnerability Indicators

WASCA TN DRDA- Ramanathapuram WASCA TN: Composite Water Resources Management Works linkage with Climate Vulnerability Area and Climate Vulnerability Indicator						
Sl. no	Name of the Work	Climate Vulnera-bility Area	No of Works Identified CWRM	Climate Vul-nerability Index Im-pacting (WAS-CA TN)	SDG Goals	India's NDC
Water Action 1: Improvement of Public & Common Lands Development						
1	Afforestation in Public/ common lands (Ha)	Climate, Water Re-source and socio-eco-nomic	11217	C1,C2.C3. W3,	SDG 1, 2,6,13&15	1) To create an addi-tional carbon sink of 2.5 to 3 billion tonnes of CO2 through addition al forest and tree cover by 2030
2	Contour Continuous Bunds (CCB) for Affores-tation area (Mts)	Water Resource	43894	W3	SDG 1,2, 6,13&15	1) To better adapt to cli-mate change by enhanc-ing investments in de-velopment programmes in sectors vulnerable to climate change, particu-larly water resources 2) To create an addi-tional carbon sink of 2.5 to 3 billion tonnes of CO2 through addition al forest and tree cover by 2030
3	Composting (Nos)	Water Resource	11931	W1	SDG1& 6	
4	Drainage Line Treat-ment (DLT) (Mts)	Water Resource	23248	W1,W3,W4	SDG1 & 6	
5	Silvi-pasture Develop-ment (ha)	Agriculture, Climate and Socio-economic	191	C1,C2.C3. W3,	SGG 6,12&13	
6	Linear Plantation (Km)	Climate, Water Re-sources and socio-eco-nomic	754	C1,C2.C3. W3,S2	SDG 1,2,6,12&13	
7	Avenue plantation (Km)	Climate, Water Re-source and socio-eco-nomic	1801	C1,C2.C3. W3,S2	SDG 1, 6&13	
8	Block Plantation (Com-munity) (Ha)	Climate, Water Re-source and socio-eco-nomic	29487	C1,C2.C3. W3,S2	SDG 1,6&13	

9	Restoration of water bodies					1) To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly water resources 2) To create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 through addition al forest and tree cover by 2030
10	a. Tanks	Socio Economic, water resources, climate	1344	S2, S1	SDG 1, 13 &14	
11	b. Ooranis	Socio Economic, water resources, climate	3883	S2, S1	SDG 1, 13 &14	
12	c. Ponds	Socio Economic, water resources, climate	47	S2, S1	SDG 1, 13 &14	
13	Artificial Recharge Structure (Nos)	Water Resource &Agriculture	4627	W3	SDG 1,2& 6	
14	Canal bund plantation	Socio Economic, water resources, climate	2618	C1,C2.C3. W3,S2	SDG 1, 6&13	
15	WC- Irrigation channels - desilting	Socio Economic, water resources, climate	157589	C1,C2.C3. W3,S2	SDG 1, 6&13	
16	WC- Irrigation channels- canal side plantation (Mts)	Water Resource, agriculture and Socio-economic	157589	W4,W5,S2	SDG 1,2& 6	
17	Agro forestry: Coastal Watershed (CW) (Ha)	Socio Economic, water resources, climate	1614	C1,C2.C3. W3,S2, S4,	SDG 6,13 &15	1) To create additional carbon sink of 2.5 to 3 billion tones of CO2 equivalent through additional forest and tree cover by 2030 2) By 2030,programmes will be implemented to achieve the sustainable natural resource management and efficient utilization of natural resources, leading to a reduction in the "ecosystem footprint"
18	Check dam(Nos)	Socio Economic, water resources, climate	27			
19	Mangrove planta-tions: CW (Ha)	Socio Economic, water resources, climate	135	C1,C2.C3. W3,S2,	SDG 15&13	
20	Riverside plantation: CW (Ha)	Socio Economic, water resources, climate	0	C1,C2.C3. W3,S2,	SDG 1& 15	

21	Fish Drying yard (Nos)	Socio Economic	34	S4,S1,	SDG 1& 14	1) To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly coastal areas
22	Nursery dvt	Socio Economic, water resources, climate	12	S2	SDG 1&2	
23	coastal wetland - bund strengthening	Socio Economic, water resources, climate	16	S4,S1	SDG 1& 14	
24	bund plantation wetlands	Socio Economic, water resources, climate	22579	S2, S1	SDG 1, 13 &14	

Water Action 2: Agricultural and allied Sector development (Productivity Enhancement)						
1	Farm Bunding (Ha (Area in)	Water Resources, Agriculture	32926	A1,A3,W1,W3	SDG 1,2&6	1) For better adaptation to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture & allied activities
2	Micro Irrigation (Nos)	Water Resources, Agriculture	3081	A1,A3,A5,W5	SDG 1, 2&6	
3	Construction of farm ponds (Nos)	Water Resources, Agriculture	10084	A1,A3,W5,W1, W3	SDG 2& 6	
4	Land development	Agriculture, Water Resources, Socio-Economic & Climate	12668	W1,W5,A1,A3,S2,S4	SDG 2, 6&13	
5	Nursery dvt	Socio Economic and Climate	9769	C1,S2,S4	SDG 1,2 &6	1) For better adaptation to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture & allied activities
6	Cattle Shelters (Nos)	Socio Economic	2329	S4	SDG 1& 2	
7	Goat Sheep Shelters (Nos)	Socio Economic	19385	S4	SDG 1& 2	
8	Fodder development for cattle (Nos)	Agriculture and Socio Economic	2329	A3, S4	SDG 1& 2	
9	Azolla units (Nos)	Agriculture and Socio Economic	2329	A3,A4,S4	SDG 1& 2	
10	Cattle Trough (Nos)	Water Resources and Socio Eco-nomic	2329	W5,S4	SDG 1& 2	
11	Poultry shed (Nos)	Socio Economic	5949	S2,S4	SDG 1& 2	
12	Dry land Horticulture/ Agro-forestry (Ha)	Agriculture, Water Resources, Socio-Economic and climate	16460	A1,A3,A4,W1,S4,S2,C1	SDG 1& 2	
13	Vermi compost in Farm lands (Nos)	Agriculture, water and Socio Economic	2329	A3, W1, S4	SDG 1& 2	

Water Action 3: Rural Water Management						
1	Soak pits (Community) (Nos)	Water Resources and Socio-Economic	3895	W3,S2	SDG 1& 6	1) To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly water resources
2	Soak pits (Individual) (Nos)	Water and Socio-Economic	38985	W3,S2	SDG 1& 6	
3	Roof rain Water Harvesting (Nos)	Water Resources	858	W3,S1,S3	SDG 1& 6	
4	Community Tanka (Rajasthan Model) (Nos)	Water Resources and Socio-Economic	2	S3,W5,W1	SDG 1& 6	
	Total		**654296**			
Note: SDG 1, Poverty Eradication; SDG 2: Zero Hunger; SDG6: Clean Water and Sanitation, SDG 13: Climate Action, SDG15: Life on Land, SDG- Sustainable Development Goal						

WASCA Tamil Nadu: Vulnerability Index & Key Water Actions

#	Vulnerability Area	WASCA Vulnerability Indicators	Vulnerability Indicator	Unit for Assessment
1	**Climate Vulnerability**	Changes in maxT	C1	Degree Celsius
2		Changes in minT	C2	Degree Celsius
3		Changes in RF	C3	%
4		Excess rainfall years	C4	No. of Years
5	**Water resource vulnerability**	Deficient rainfall years	W1	No. of Years
6		Ground water extraction	W2	%
7		Ground water Recharge	W3	in cubic meter
8		Surface water availability	W4	Mm
9		Water gap	W5	MCM
10		% of contamination	W6	%
11	**Agriculture vulnerability**	Rainfed area	A1	%
12		Cropping intensity	A2	%
13		Soil moisture	A3	kg/m2
14		Evapotranspiration	A4	kg/m2/s
15	**Socio-economic vulnerability**	Rural proportion	S1	%
16		Multidimensional poverty index	S2	Index Value
17		Source of drinking water within premises in rural	S3	%
18		Marginal farmer landholdings	S4	%

Annexure 1: Govt. orders of SLSC and DLSC on WASCA

ABSTRACT

Mahatma Gandhi National Rural Employment Guarantee Scheme – Implementation of Water Security and Climate Adaptation (WASCA) Project – Formation of State Level Steering Committee – Orders – Issued.

Rural Development and Panchayat Raj (CGS.1) Department

G.O.(Ms.)No.170 **Dated:25.11.2019**
விகாரி, கார்த்திகை 9
திருவள்ளுவர் ஆண்டு 2050

Read:

1. Minutes of the Meeting held under the Chairmanship of Additional Chief Secretary to Government, RD&PR Department on 20.11.2019.
2. From the Director of Rural Development and Panchayat Raj, Letter Roc.No.60138/2019/MGNREGS-I-1, dated 20.11.2019.

ORDER:

In the letter second read above, the Director of Rural Development and Panchayat Raj has stated in his proposal dated:20.11.2019 that the core objective of the Mahatma Gandhi National Rural Employment Guarantee Act is to provide 100 days of wage employment and create durable assets. In the year 2016, Mahatma Gandhi National Rural Employment Guarantee Scheme taken up national wide to address the water scarcity, implement Mission Water Conservation across the country. Mission Water Conservation is a convergence framework with scientific planning and execution of water management works with the use of latest technology. This has been mandated in consultation with an agreement of the Ministry of Water Resources (now JalShakthi) and the Ministry of Agriculture and Farmers' Welfare. Out of 260 permissible works / activities under Mahatma Gandhi National Rural Employment Guarantee Scheme, of which 181 kinds of works relate to Natural Resource Management (NRM) alone and out of the 181 NRM works, 84 are water related. 164 of the total works are related to Agriculture and Agriculture-Allied works.

Mission Water Conservation

Under Mission Water Conservation it is emphasized that the works taken up in Mahatma Gandhi National Rural Employment Guarantee Scheme should change from taking up individual, standalone works in a typical 'relief works mode' to an Integrated Natural Resource Management (INRM) perspective. Planned and systematic development of land and harnessing of rainwater following watershed principles should become the central focus of Mahatma Gandhi National Rural Employment Guarantee Scheme work across the country to sustainably enhance farm productivity and income of poor people.

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 Geographical Information System (GIS) Technology (BHUVAN). The GIS plans shall be comprehensive ones incorporating all eligible works under Mahatma Gandhi National Rural Employment Guarantee Scheme and the same shall be implemented in a phased manner. Pilot implementation has been started during 2019-20 with 770 Village Panchayats i.e 2 Village Panchayats per Block for all 385 Blocks.

Focus on Climate

The new master circular 2019-20 section 6.3 elaborated on need for Focus on Climate Change Infrastructure built under Mahatma Gandhi National Rural Employment Guarantee Scheme leading to increased water availability for irrigation, groundwater recharge, increased agricultural production, and carbon sequestration.

The Ministry of Environment, Forest and Climate Change recognizes Mahatma Gandhi NREGA as one of the 24 key initiatives to address the problem of climate change, while simultaneously improving the livelihoods of the poor. Mahatma Gandhi NREGA, particularly the Category A activities, which are public works relating to natural resource management. Planning and design of works under Mahatma Gandhi National Rural Employment Guarantee Scheme 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.

GIZ

GIZ is an international technical agency (Indo-German Corporation for Cooperation) working on issues of environment, energy in India on behalf of the German Government. GIZ is associated with MoRD through bilateral project "Environmental Benefits under Mahatma Gandhi NREGA" during 2013-19 implemented in the states of Andhra Pradesh, Chattisgrah and Rajasthan. The project for developing successful NRM and INRM models, GIS based planning and scaled up across the country.

Water Security and Climate Adaptation (WASCA)

'Water Security and Climate Adaptation" is a new MoRD GIZ bi-lateral project that will be implemented during 2019-22. The project WASCA is approved by both the governments and four pilot states are identified for the project. The states are Tamil Nadu, Rajasthan, Uttarpradesh and Madhya Pradesh. The objective of WASCA is Water resource management is enhanced through an integrated approach at national,

state and local level with regards to water security and climate adaptation in rural areas. The focus of the project is on improved planning, financing, demonstrating models in two districts per state and private sector participation.

To identify two pilot districts in the state, GIZ undertaken scientific analysis by engaging services of Centre for Climate Change and Disaster Management (CCCDM), Anna University, Chennai. CCCDM had five rounds of discussion with senior officials from RD & PR, DRD and presented their findings and recommendation to department on 20th November 2019 to Additional Chief Secretary. The 18 Indicators used by the CCCDM for the study for identification of most needy districts for WASCA are decided. They are Ramanathapuram and Tiruvanamalai districts. For implementation of WASCA, GIZ will engage technical resource agencies with various expertises in this project namely CCCDM, Anna University and MS Swaminathan Research Foundation, which has expertise in agriculture and bio-diversity.

Formation of Steering Committee

In order to oversee and smooth implementation of WASCA, it is decided to constitute a State Level Steering Committee. The Steering Committee will meet once in every Quarter and review the progress, approve action plans, provide guidance and direction on reaching the objectives set for WASCA.

Following are the members of the Steering Committee proposed:

Sl No	Designation	Role in the Committee
1.	The Additional Chief Secretary, RD & PR	Chairperson
2.	Director, RD & PR	Member Secretary / Convenor
3.	Managing Director, Tamil Nadu Water Supply and Drainage Board	Member
4.	Director, Agriculture Department.	Member
5.	Director, Horticulture Department	Member
6.	The Principal Chief Conservator of Forests	Member
7.	Director, Department of Environment	Member
8.	Director, Fisheries Department	Member
9.	Vice Chancellor, Tamil Nadu Agriculture University	Member
10.	Engineer-in-Chief, Water Resources Department(PWD)	Member
11.	Director, NRM Division, GIZ, New Delhi	Member
12.	Additional Director(MGNREGS)	Member
13.	Superintending Engineer(MGNREGS)	Member
14.	Regional Director, Central Ground Water Board	Member
15.	Regional Director, Indian Institute of Soil and Water Conservation Research Centre, Ooty (SR)	Member

18.	Director, Centre for Water Resources, Anna University	Member
19.	Director, Confederation of Indian Industry(CII)	Member
20.	Chief Engineer, Agricultural Engineering , Department of Agriculture Engineering, Nandanam	Member
21.	Prof Kavi Kumar, Madras School of Economics, Madras University	Member
22.	Director, M.S.Swaminathan Research Foundation	Member

3. The Director of Rural Development and Panchayat Raj has stated that a co-ordination meeting in this regard was conducted on 20.11.2019 under the chairmanship of Additional Chief Secretary to Government, Rural Development and Panchayat Raj Department with Anna University Officials and GIZ representatives.

4. The Director of Rural Development and Panchayat Raj has therefore requested the Government to approve the State Level Steering Committee to implement, monitor and review the Water Security and Climate Adaptation (WASCA) Project in the two districts i.e. Ramanathapuram and Tiruvannamalai.

5. The Government after careful examination, have decided to accept the proposal of the Director of Rural Development and Panchayat Raj and issue orders for the formation of the State Level Steering Committee to implement, monitor and review the Water Security and Climate Adaptation (WASCA) Project in the two districts i.e. Ramanathapuram and Tiruvannamalai, with the following Members:

1.	The Additional Chief Secretary to Government, RD & PR Department	Chairperson
2.	Director, RD & PR	Member Secretary / Convenor
3.	Managing Director, Tamil Nadu Water Supply and Drainage Board	Member
4.	Director, Agriculture Department.	Member
5.	Director, Horticulture Department	Member
6.	The Principal Chief Conservator of Forests	Member
7.	Director, Department of Environment	Member
8.	Director, Fisheries Department	Member
9.	Vice Chancellor, Tamil Nadu Agriculture University	Member
10.	Engineer-in-Chief, Water Resources Department(PWD)	Member
11.	Director, NRM Division, GIZ, New Delhi	Member
12.	Additional Director(MGNREGS)	Member
13.	Superintending Engineer(MGNREGS)	Member

14.	Regional Director, Central Ground Water Board	Member
15.	Regional Director, Indian Institute of Soil and Water Conservation Research Centre, Ooty (SR)	Member
16.	Director, Water Technology Centre, TNAU, Coimbatore	Member
17.	Director, Centre for Climate Change and Disaster Management (CCCDM), Anna University	Member
18.	Director, Centre for Water Resources, Anna University	Member
19.	Director, Confederation of Indian Industry(CII)	Member
20.	Chief Engineer, Agricultural Engineering , Department of Agriculture Engineering, Nandanam	Member
21.	Prof Kavi Kumar, Madras School of Economics, Madras University	Member
22.	Director, M.S.Swaminathan Research Foundation	Member

(BY ORDER OF THE GOVERNOR)

HANS RAJ VERMA
ADDITIONAL CHIEF SECRETARY TO GOVERNMENT

To
All Members of State Level Steering Committee of WASCA Project,
The Director of Rural Development and Panchayat Raj, Chennai-15.
All District Collectors (except Chennai District). (Through the Director of Rural Development and Panchayat Raj, Chennai-15)
All Project Directors, District Rural Development Agencies (through the Director of Rural Development and Panchayat Raj, Chennai-15).

Copy to:
The Senior Personal Assistant to Hon'ble Minister (Municipal Administration & Rural Development, Implementation of Special Programme), Chennai-9.
The Principal Private Secretary to Additional Chief Secretary to Government, Rural Development and Panchayat Raj Department, Chennai-9.
The National Informatics Centre, Secretariat, Chennai-9.
Stock file / Spare copy.

//FORWARDED BY ORDER//

25.11.2014

SECTION OFFICER

Annexure 2
CWRM Plan Preparation Team

District Rural Development Agency, Ramanathapuram Team

S.No	Name	Designation	District / Block
1	Mr.M.Pradeep Kumar IAS	Additional Collector - Dev.	Ramanathapuram
2	Ms. Sivarani	Executive Engineer and District Nodal Officer for WASCA TN	Ramanathapuram
3	AEEs of all the blocks		
4	BDOs of all blocks		
5	AEs of all blocks		
6	Overseers of all blocks		

M.S. Swaminathan Research Foundation Team:

S.No	Name	Designation/Expertise	Location
1	Dr R. Rengalakshmi	Team lead	Chennai
2	Mr.R.Nagarajan	GIS and RS coordinator	Chennai
3	Mr.B.Selvamukilan	Dt. Coordinator	Ramanathapuram
4	Mr. R.Srinivasan	Information technology	Chennai
5	Mr. Kannappan	Information technology	Chennai
6	Mr. Karunamurthy	GIS	Ramanathapuram
7	Ms. S. Bhavani	Watershed coordinator	Ramanathapuram
8	Mr. Dr.R.Gopinath	Social Science	Chennai
9	Dr.S.Malarvannan	Agriculture	Chennai
10	Ms. S.Punitha	GIS	Chennai
11	Ms. B.Jayashree	Communication	Chennai
12	Mr.P.Gopalakrishnan	GIS	Ramanathapuram
13	Mr.Dharma Muneeswaran	GIS	Ramanathapuram
14	Mr.Mohamed Thasimkhan	GIS	Ramanathapuram
15	Ms.R. Yogalakshmi	Water Management	Chennai
16	Ms. Madhumita	Water Management	Chennai
17	Mr.Kumaragurubaran	GIS	Ramanathapuram
	WASCA Resource Centre		
1	Dr.K.Palanisamy	Water Management	
2	Dr.S.Ramasubramanian	Coastal Resources	
3	Dr.A.Balasubramanian	Agro Forestry	
4	Mr.Balla Lakshmikantham	Forestry	
5	Dr.Vinod	Sand Dune Engineering	
6	Dr.S.Manivannan	Soil and Water Conservation	

SDMRI Team

S No	Name	Designation	Location
1	Dr. J.K.Patterson Edward	Team leader	Tuticorin

2	Dr.K.Immaculate Jayasantha	Hydro-geologist and coastal resources	Tuticorin
3	Dr.Gladwin Gnana Asir	Geologist	Tuticorin
4	Dr.M.Selva Bharath	Data collection and analysis	Tuticorin
5	Dr.P.Dinesh Kumar	Data collection and analysis	Tuticorin
6	Dr.G.Mathews	GIS	Tuticorin

Prime Meridian Team

S No	Name	Designation	Location
1	Mr. S.Mahalingam	Team Leader	Chennai
2	Mr. G.N.Kumaran	GIS	Chennai
3	Mr.N.Krishnan	Support staff	Chennai
4	Mr.M.Muthamilselvan	Support staff	Chennai
5	Mr.G.N.Ganesan	IT	Chennai

WASCA – NRM Division, GIZ- India Team for CWRM Planning and Support to Tamil Nadu

S No	Name	Designation	Location
1	Ms. Astrid Regler	Technical Advisor	Germany / New Delhi
2	Dr Jagdish Purohit	Technical Advisor	New Delhi
3	Dr Jagdish Menon	Jr Technical Expert	Jaipur / Rajasthan
4	Mr. Krishan Tyagi	Technical Adviser	New Delhi
5	Dr Vaibhav Sharma	Technical Expert	New Delhi
6	Ms. Rajasindhura Aravalli	Communication Expert	New Delhi
7	Meeka Hana Paul	Technical Expert	New Delhi
8	Dr Radhapriya	Jr Technical Expert	Chennai
9	V.R. Sowmithri	Technical Expert	Chennai
10	Dr.Rajeev Ahal	Team Lead	New Delhi

National Water Mission Team

S No	Name	Designation	Location
1	Mr. E. Raja	EE, State Ground and Surface water Resources Data Centre and nodal officer to NWM, MoJS	Chennai
2	PWD local staff		Ramanathapuram

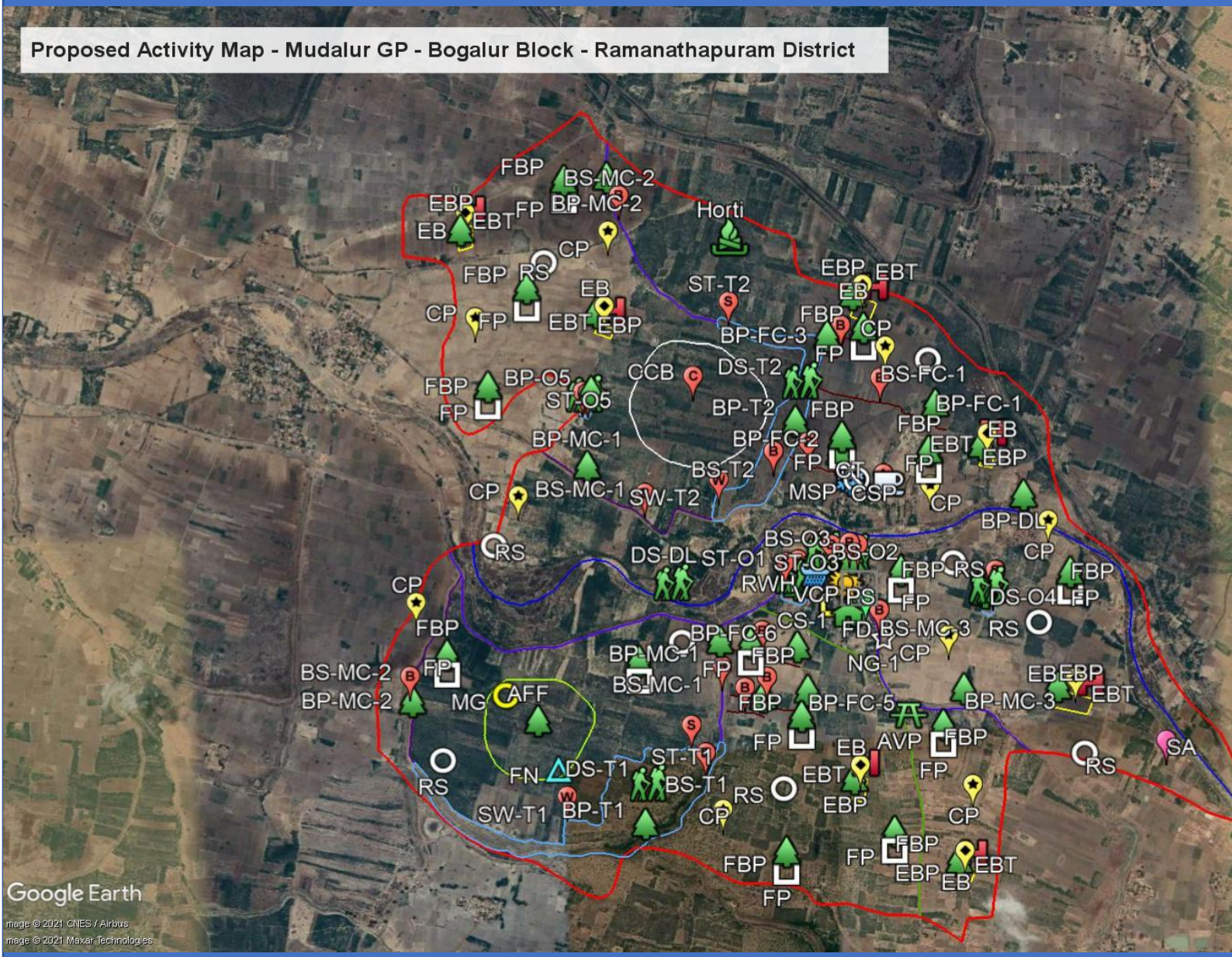
Annexure 3
List of GPs – Coastal Watersheds

Pilot 1 - Thiruvadanai block	
S.No	GPs
1	Andavoorni
2	Nilamalagiyamangalam
3	Vattanam
4	Kattivayal
5	Kodanoor
6	Pandugudi
7	Theloor
8	Achangudi
9	Kodipangu
10	Thalimarungur
11	Mugilthagam
12	Oriyoor
13	Kunjankulam
14	Nagrikathan
15	Mavur
16	Vellaiyapuram
17	Thondi_tp
18	Nambuthalai
19	Arasathoor
20	Mangalagudi
21	Kaliyanagari
22	Pananjayayal

Pilot 2-Mandapam block	
S.NO	GPs
1	Iruurni
2	Mandapam _tp
3	Koravalli
4	Karan
5	Panaikulam
6	Attangarai
7	Perungulam
8	Enmanamkondan
9	Pirappanvalasai
10	Kumbaram
11	Nochiyurani
12	Vellariodai
13	Manankudi
14	Sembidaiyarkulam
15	Maraikkarpattinam
16	Kuyavankudi
17	Keelanagachi
18	Rettaiyurani
19	Pudumadam
20	Sattakkonvalasai
21	Vedalai
22	Alagankulam
23	Pattinamkathah
24	Tamaraikulam
25	Valantaravai
26	Terbhogi
27	Madakkotan
28	Peravoor
29	Kalugoorani
30	Sakkarakottai
31	Ilamanoor
32	Therku tharavai
33	Rajasuriamadai
34	Sethukkarai
35	Muthuppettai
36	Kuthakkottai
37	Thathanenthal

Pilot 3 - Kadaladi block	
S. No	GPs
1	P.keeranthai
2	Kotthangulam
3	Melachirupodhu
4	Marandai
5	A.punavaasal a/e
6	Orivayal
7	Keelaselvanur
8	Ervadi
9	Meenagudi
10	Thanichiyam a/c
11	Periakulam a/e
12	Keelakidaram
13	Melakidaram a/c
14	Melaselvanur
15	Mariyur a/c
16	Siraikulam
17	Valinokkam
18	Ithampadal
19	Sikkal a/c
20	Peikulam
21	Sokkanai
22	Kalari
23	Nallirukkai
24	Panaiyadiyenthal
25	Kulapatham
26	Velanur
27	Komboothi
28	Thiru uthirakosamangai
29	Melamadai
30	Mayakulam

38	Vannankundu
39	Kalimankundu
40	Koraikootam
41	Methalodai
42	Thinaikkulam
43	Pathiratharavai
44	Utharavai
45	Periyapattinam
46	Nainamaraikkan
47	Thiruppullani
48	Chinnandivalasai
49	Regunathapuram


Proposed Activity Map - Mudalur GP - Bogalur Block - Ramanathapuram District
FBP
BS-MC-2
EBP
FP
BP-MC-2
Horti
EB
EBT
CP
FBP
RS
EB
ST-T2
EBP
EBT
CP
FP
EBT
EBP
FBP
CP
BP-FC-3
FP
DS-T2
CCB
BS-FC-1
FBP
BP-O5
ST-O5
BP-T2
FBP
BP-FC-1
FP
FBP
EB
BP-MC-1
BP-FC-2
EBT
FP
BS-T2
FP
EBP
CP
BS-MC-1
SW-T2
MSP
CSP
CP
BP-DL
RS
BS-O3
BS-O2
CP
DS-DL
ST-O1
ST-O3
FBP
RS
FBP
CP
RWH
VCP
PS
FP
DS-O4
FP
CS-1
FD
BS-MC-3
RS
FBP
BP-FC-6
BP-MC-1
FBP
NG-1
CP
BS-MC-2
FP
BS-MC-1
EB
EBP
BP-MC-2
MG
AFF
FBP
BP-FC-5
BP-MC-3
EBT
FP
EB
AVP
FBP
SA
RS
ST-T1
FN
DS-T1
EBT
FP
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BS-T1
RS
EBP
SW-T1
BP-T1
CP
CP
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