Groundwater Management in India

A multi-state field study of availability, utilisation and locally appropriate solutions for sustainable, equitable and efficient use of groundwater

Tamil Nadu State Report

August 2022

RAJIV GANDHI
INSTITUTE FOR CONTEMPORARY STUDIES

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1.1 Groundwater Scenario in India

Over the last few decades our dependence on ground water has increased tremendously. It has become a major source of water for domestic and agricultural use in India. According to an estimate the ground water resource meets 80% of our water demand. Agriculture is a major consumer of the ground water; it supplies nearly 60% of water demand of the agriculture sector. Worryingly, since the 1990s the area under canal and tank irrigation has observed absolute decrease in India, whereas, ground water fed agricultural area has increased in these years. The convenience and efficient last mile connectivity of ground water resources encouraged many farmers in this country to switch from canal/tank irrigation to the tube well/bore well.

A committee constituted by the government of India to review water governance in the country led by Dr. Mihir Shah in his report in 2016 observed that the public finance on water resources after independence largely focused on surface water. Huge amount was invested on creating surface water infrastructure. The ground water resource remains neglected despite it is replacing surface water from agriculture to domestic use in the last some decades. Individuals invested hugely in ground water infrastructure especially after the green revolution as it was easier and efficient in terms of available for the end use. The technological advancement and availability & affordability of power also helped individual investors (largely farmers) to create groundwater structures. Currently there are around 30 million groundwater structures in this country.

For the purpose of ground water extraction, enough knowledge and data is available. The problem is with lack of data on aquifer management. Being a large country, the geological and hydrological characteristics of the landmass varies from region to region. It further creates complexity to understand sub-surface characteristics pertinent to water seepage, storage and water movement. The CGWB has categorized 14 different aquifer settings in India. Major aquifers include Alluvial, Laterite, Sand stone, shale aquifer, Lime stone aquifer, Basalt aquifers and Crystalline aquifers. According to a classification of geohydrologist Dr. Kulkarni, Crystalline and Alluvial aquifers comprise 59% of the total aquifer area in the country. The mountain and volcanic system of aquifers accounts for 16% of the total area each. These complex aquifer systems require detailed mapping and study for better management of ground water.

[1] https://www.indiawaterportal.org/sites/default/files/iwp2/report_on_restructuring_cwc_cgwb.pdf

1.2 Groundwater Policy Gaps

The increasing unsustainable extraction of groundwater is a serious issue that has now turned into a water crisis in many parts of the country. In the states like Punjab, Rajasthan, Haryana, Delhi, Madhya Pradesh, parts of Uttar Pradesh and Tamil Nadu have started withdrawing more water from sub surface than available for usage. This gap in demand and supply is continuously increasing as there is no aquifer management system in the place. The numbers of critical and over exploited units are on rise. This invited crisis due to mismanagement of natural wealth has serious social, economic and ecological consequences. There are many reasons behind this problem and these problems have been discussed a number of times.

Ground water extraction is largely unregulated. The only law that loosely governs this precious resource in India is the Indian Easement Act, 1882. This law gives all rights to land owners to extract the ground water. In other words it excludes land less people from access and use of groundwater. This law does not control or regulate water extraction and its usage by the land owner. To strengthen the regulatory mechanisms, the central government has so far issued four versions of model law to be adopted by state governments. The first model bill was released in 1992 and the latest bill was released in 2017. Yet not all states have converted the model Bill into state legislation. Andhra Pradesh, Assam, Goa, Bihar, Delhi, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Lakshadweep, Puducherry and West Bengal have adopted the older version of model bill, but in most cases the attempt is half hearted.[2] Moreover experts believe that the model Bill must also move from command and control mode to participatory mode to ensure full participation of people.

The unavailability of data and knowledge on aquifer systems is another big problem in developing better management plans for the ground water. The CGWB collects data from selected wells four times a year to monitor ground water development. The sample size for this yearly exercise is so low that nothing can be argued conclusively based on collected information. There is a long pending demand of mapping aquifers in this country for better management plan. The CGWB has been attempting to map aquifers for all districts in the country. This data and mapping of aquifers would definitely improve our ability to manage groundwater better.

The absence of an integrated approach of ground water recharge and extraction is completely missing in India. There have been some attempts through government and non-government agencies to integrate both of these aspects, but this idea is still not part of national or state level management plans. The absence of regulations and public finance for the management of ground water further discourages any national or state level plans for ground water resource management.

In the past the CGWB attempted to design a national level master plan for artificial recharge of aquifers in 2002 and 2013. The board has now revised this master plan in 2021. According to this master plan, nearly 1.41 crore artificial recharge structures are needed across the country. The type of structures recommended for states and districts varies depending on their geological and hydrological features. The plan is expected to be financed by ongoing projects such as MGNREGA and Watershed Management. The implementation of the master plans requires investment of Rs. 1.33 lakh crore.[3]

Involvement of people in planning and execution of activities related to artificial recharge and ground water extraction has not been seriously promoted at the policy level. However, we have numerous small examples across the country to show that if people are involved aquifers can be managed sustainably and benefits can be shared equitably.

1.3 The Project

There have been some attempts in various states commissioned by nongovernmental organizations to empower farmers with knowledge and capacity to help them to make the right agricultural decisions and choices. Many of these serious attempts helped in yielding good results as well. On the other hand there are numerous examples where projects related to artificial recharge were carried out successfully both by the government and non government agencies. Some states also tried to regulate groundwater resources. All these actions by different organizations generated huge knowledge and experiences to vet success and failure of each type of programs. These small scale and localized solutions for ground water management are effective in terms of striking a balance between water supply and demand. Learning from these models can help improving ground water regulations in different states. Therefore this study was commissioned by Rajiv Gandhi Institute for Contemporary Studies (RGICS) in 2021 in ten different states namely Punjab, Rajasthan, Gujarat, Uttar Pradesh, West Bengal, Assam, Madhya Pradesh, Maharashtra, Telangana and Tamil Nadu. Main objectives of the study were as follows:

- To develop an overview of the hydro-geological characterises of different states/regions and the extent of ground water extraction.
- To document and assess the regulatory framework in different states for the management of ground water resources
- To assess the ability of localized solutions for management of ground water resources to strike a balance between demand and supply of groundwater.
- To draw policy lessons from successful localized solutions for ground water resource management

Groundwater experts and NGOs specialized in groundwater management in different states helped us to implement this project. This is a qualitative research project which involved methods like field work, stakeholder consultation and secondary data analysis. This state report gives an overview of the context and main natural features- geographical, geological, hydrological and hydrogeological- which impacts that status of groundwater in the state. Then it deals with the human interventions – in terms of demand and utilisation, the major policies, laws and regulations, programs, schemes and institutions pertinent to groundwater in the study state.

The main incremental contribution is in the section on lessons from locally appropriate solutions for sustainable groundwater management. We have given summaries of case studies from different location in the studied state documenting such locally appropriate solutions.

1.4 Lessons from the Fieldwork in Tamil Nadu – The Eightfold Path

The study arrived at the key point that Tamil Nadu has an enormous diversity of hydrological and hydrogeological and crop-soil-weather conditions in different parts of the state, therefore no one size fits all approach can work. Therefore, the state needs locally appropriate solutions. To develop these, there is a need for participation of the local community in groundwater management. To make this participation effective, the community must be involved in data collection, collation and analysis of data on water availability, crop planning based on that and encouraging good practices for efficient and equitable use. Water intensive crops and non-recycling of industrial and domestic water will be discouraged. Only then can sustainable groundwater utilisation be possible. There is an eightfold path to sustainable groundwater management.

[2] https://scroll.in/article/929433/as-the-water-crisis-deepens-can-india-afford-to-leave-groundwater-unregulated

[3] http://cgwb.gov.in/Whatisnew/2021-06-30-Final-Approved%20Master%20Plan%202020-00002.pdf

1.4.1 Need for a New Approach to Achieve Sustainable, Equitable and Efficient Use

Nearly 73% of the total geographic area of Tamil Nadu is underlain with variably weathered, crystalline basement (hard) rocks (granites, gneisses, charnockites), forming a widespread but minor low storage aquifer with low transmission capacities. Moreover, the average annual rainfall of 650-850 mm is largely concentrated in the months of October, November and December (North-east monsoon). Both hydro-geological and hydrological conditions of the state limit ground recharge through rainfall. However, over time, the demand for water has increased, and our dependence on ground water to fulfil that demand has grown exponentially. This has further led to drastic depletion of ground water tables across the state of Tamil Nadu. The state's stage of groundwater extraction stands at 82.93%, which is the fifth highest among states in the country. Therefore new approaches are required for groundwater replenishment and demand side management of water.

1.4.2 The Efficacy of Participatory Data Collection

Ensuring participation is very crucial for successful understanding of the groundwater dynamics and planning activities for the same. The study of locally appropriate solutions for groundwater management in Tamil Nadu reveals that well planned grassroots initiatives have high potential to strike a balance between water demand and supply. The common in these all locally appropriate initiatives is informed decisions by community and collaborating experts. These initiatives draw from cultural knowledge/practices and integrate them in modern science and evidence.

1.4.3 Understanding the Prevailing Policy Framework and Using It Beneficially

Chennai was the first city in India to legislate on urban groundwater through the Chennai Metropolitan Area Groundwater (Regulation) Act. While this is not implemented well to effectively manage the demand and supply of the ground water, its progressive provisions are laudable. It is therefore the Madras High Court suggested that the State legislature could extend the applicability of Chennai Metropolitan Area Groundwater (Regulation) Act of 1987 to all districts to regulate and control the extraction, use and transportation of groundwater.

The state government has drafted a law on Groundwater development and management; however it is yet to be enacted. Moreover, the state has laws to protect tanks from encroachment and protection of the agricultural zone of Cauvery delta zone. It is important to understand these policy frameworks and use them for the benefit of common people.

1.4.4 Whistleblowing in the face of non-Implementation of Laws and Regulations

Once the community is involved with collecting the data and understands the prevailing policy, laws and regulations, it can become a watchdog against any violations. Moreover, demands can be raised for more appropriate laws and policies. Like in many other parts of the country, concerned individuals and institutions have been raising voices against non-implementation of existing laws. The Madras High Court has issued directions to the state government based on such concerns to extend provisions of the Chennai Metropolitan Area Groundwater (Regulation) Act of 1987 to other parts of the state.

1.4.5 Planning for Balancing Demand with Supply

Moving from conservation oriented development to managing the use, the community demonstrated the capacity to work on both the supply side management options and demand side management strategies. By studying the provisions under the law, and using it for developing water resources in the aquifer, communities can move towards sustainable water governance. Both examples of locally appropriate solutions documented in this study from Tam Nadu have shown ways to plan demand with supply balancing.

1.4.6 Enhancing Supply by Groundwater Conservation and Recharge

Given the status of groundwater in the state and rapid depletion, groundwater conservation and recharge is the only way to ensure supply of the water. The case studies of KAIFA from Cauvery Delta Zone and 'Wake for Lake' in Namakkal District have tried to enhance the supply of groundwater by increasing conservation capacity. The revival of the Peravuranilake located at the southernmost tip of Thanjavur district by KAIFA has significantly improved the water table in surrounding areas. Before the work of KAIFA began the groundwater level was found at 300-400 ft and sometimes even at 800 to 1000 ft. The groundwater level in the area slowly improved from that to 150-200 feet to about 40 feet recently.

1.4.7 Rationalising Demand for Water by Rationalising Prices for Crops and Energy

India has 18% of world population, having 4% of world's fresh water, out of which 80% is used in agriculture. India receives an average of 4,000 billion cubic meters of precipitation every year. However, only 48% of it is used in India's surface and groundwater bodies. A dearth of storage procedure, lack of adequate infrastructure, inappropriate water management has created a situation where only 18-20% of the water is actually used. India's annual rainfall is around 1183 mm, out of which 75% is received in a short span of four months during monsoon (July to September). This results in run offs during monsoon and calls for irrigation investments for the rest of the year.

Irrigation is the biggest consumer of groundwater in Tamil Nadu, as is the case nationally. The sector consumes a staggering 92% of the groundwater in the state. An agricultural paradigm based on Intensive irrigation with groundwater is pushing the groundwater systems to teeter on the point of no return and threatening the viability and the very existence of the agricultural/food system that is built on it.

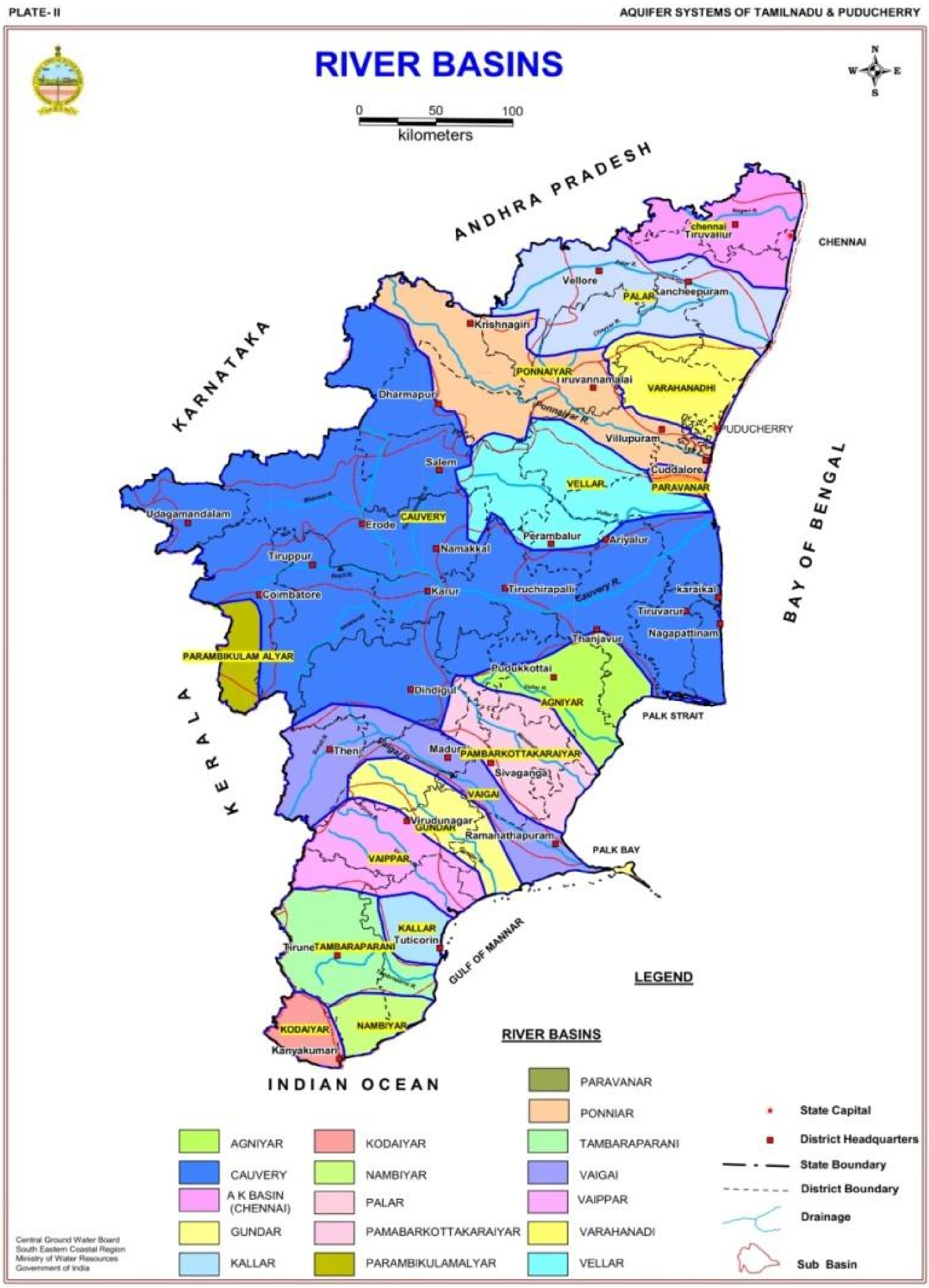
1.4.8 Building Capacity of the Community for the above Functions is a Must

It is very clear that the 'one size fits all' approach is not going to solve the problem of groundwater. Every step from groundwater recharge to the utilization of water has deep social, economic, geological, hydro geological and geo morphological underpinning. Therefore, it is necessary to understand physical and social sciences in each region to experiment locally appropriate solutions for groundwater management. Moreover, this exercise cannot be done without building capacities of the community. The two successful examples documented in this report have demonstrated that capacity development of the local youth and farmers has immensely helped in reviving lakes, enhancing irrigation capacities and increasing groundwater level.

2 Tamil Nadu State Report

2.1 Context and Key Features

Tamil Nadu, located at the southernmost tip of the Indian peninsula, is the tenth largest state by area in the country. It is bounded by the Bay of Bengal in the east, the Indian Ocean in the south, Kerala in the west and by Karnataka and Andhra Pradesh in the north. It is situated between N. Latitudes 08⁰00" and 13⁰30' and E. Longitudes 76⁰15' and 80⁰18'. The state comprises 38 districts.



2.1.1 Drainage Systems

The state is drained by several major and minor rivers. All the major rivers originate in the Western Ghats and flow eastwards.

- The Palar, Ponnaiyar, Cheyyar, Kortallaiyar and Araniyar are the important rivers in the north. They are all ephemeral or intermittent/seasonal rivers.
- Cutting across the centre of the state is the river Cauvery. The Cauvery delta consists of a gently sloping alluvial plain covering an area of 11,600 sq. km and amongst its tributaries the Bhavani and Amaravathi rivers form the most important sources of canal irrigation in the state. Bhavani, Noyil and Amaravathi rivers originate in the hill ranges of Nilgiri and Anaimalais and flow through matured valleys across the plateau.
- The important rivers flowing in the southern part of Tamil Nadu are (i) Vellar (ii) Vaigai (iii) Vaippar and (iv) Tambaraparani. Of these, Tamiraparani River is only perennial, forming a good source of canal irrigation.
- There are a number of smaller rivers such as the Aliyar, Sholaiyar, ParambikulamAr, etc. flowing westwards. Except the perennial rivers, all the rivers remain dry for a good number of months in a year.
- The Pulicat Lake and Kaliveli tank are the important lagoons.

The rivers of the state flow in broad and shallow valleys graded almost to their heads with only slight interruptions of profiles when they pass through the Eastern Ghats. The Western Ghats form the main watershed of the state having numerous waterfalls and Courtallam Falls is one of the important waterfalls of the state.

Tamil Nadu's major rivers tend to have eroded through the weathered zone, mainly flowing on beds of exposed bedrock, and **today have no significant base flow**. Baseflow (also called drought flow, groundwater recession flow) is the portion of the streamflow that is sustained between precipitation events, fed to streams by delayed pathways.

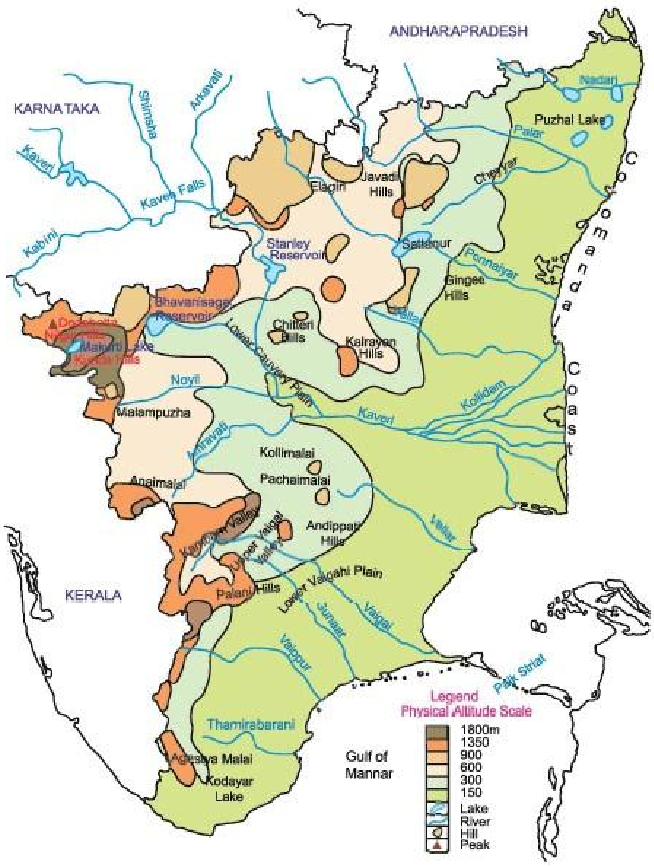
2.1.2 Climate

The climatic regime of Tamil Nadu State ranges humid to semi-arid tropical.The major rainfall (more than 50% of the average total of 650-850 mm/a) occurs during the North-East Monsoon (October-December), with a subsequent cooler dry season (January-February) followed by an extended 'summer' season in which some rainfall occurs in most months with greatest likelihood during the South-West Monsoon (June-September). Primary groundwater recharge occurs directly as a result of monsoon rainfall in excess of plant moisture requirements and soil moisture deficits, but is limited by soil infiltration capacity with higher intensity rainfall being rejected as surface runoff. Some indirect primary recharge also occurs under favourable conditions as a result of streambed and irrigation tank infiltration, but overall average rates are not believed to exceed 10% of average total rainfall (less than 100 mm/a). Secondary groundwater recharge also occurs as a result of infiltration returns from irrigated agriculture and urban water mains leakage/sanitation percolation, but this does not represent 'new water' to the groundwater system unless the original water supply was derived from a surface water source.

2.1.3 Soils

Apart from the rich alluvial soil of the river deltas, the predominant soils of the state are clays, loams, sands, and red laterites (soils with a high content of iron oxides and aluminum hydroxide). The black cotton-growing soil known as regur is found in parts of the central, west-central, and southeastern regions of Tamil Nadu.

2.1.4 Hydro-geological Conditions of Tamil Nadu



The interactions between physiography/geomorphology, hydrology, drainage, rainfall, hydrogeological conditions and ground water resources development play a significant role in determining the base status of groundwater in Tamil Nadu. The state is broadly divided into four physiographic units:

i) Coastal Plains

These stretch from Pulicat Lake to Cape Comorin and range in elevation from 2 to 30 m above mean sea level. The plains are further subdivided into:

a) Coromandel Coast

comprising parts of the districts of Tiruvallur, Kancheepuram and Cuddalore,

b) Alluvial plain of Cauvery delta

extending over Nagapattinam, Thanjavur, Thiruvarur districts

c) Dry southern plains

comprising parts of Pudukkottai, Ramanathapuram, Tuticorin, Tirunelveli and Kanyakumari districts.

ii) Eastern Ghats

Eastern Ghats comprises the chain of flat-topped hills of Javadis, the Servarayan, the Kalrayan and the Pachamalai hills, which join Cardamom hills in the south. These hills rise steeply above plateau level to 1160 m above mean sea level (Javadi hills) and to 1645 m above mean sea level (Servarayan hills).

iii) Central Plateau

The Central Plateau lies between the Eastern and Western Ghats. It comprises Erode and Coimbatore with elevations between 150 and 610 m above mean sea level giving rise to an undulating topography. West of the region lies the broad Palghat gap between the Nilgiri and Anaimalai Hills. Between Cauvery River and the Palghat gap lies an extensive low plateau rising gradually from 120 to 180 m above mean sea level, along the tributaries of the Cauvery River, to 365 to 455 m above mean sea level in the west.

iv) Western Ghats

The central plateau is fringed on the west by a group of high hills known as the Western Ghats, comprising the western part of the Nilgiris, Madurai and Kanyakumari districts. On the other side of the Palghat gap, the high mountains of the Peninsula dominate. These are the Nilgiri in the north, Anaimalai Hills, Palani and Cardamom hills in the south, with a summit level of 1830 to 2440 m above mean sea level rising sharply from the plateau.

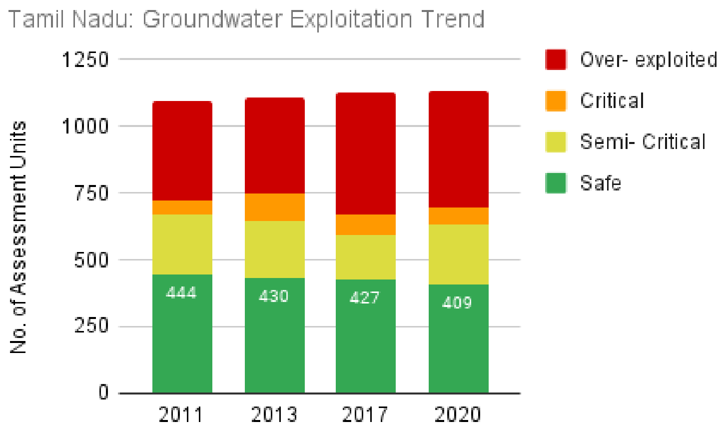
2.2 Ground Water Availability and Utilization

Tamil Nadu is spread over 130,058 km.[2] Of this area, **73% is underlain with variably weathered, crystalline basement (hard) rock**(granites, gneisses, charnockites), forming a **widespread but minor low storage aquifer** with low transmission capacities.[4] The groundwater is mainly confined to the weathered mantle, with more localised flow in fractures, joints and linear features of the underlying bedrock. Semi consolidated and consolidated formations overlie the crystalline basement and their occurrence is mainly confined to the east coast only.

In the hard rock areas, groundwater is developed through dug wells tapping the weathered zone; dug cum borewells and borewells tap the deeper fractures down to a depth of 300 m. In semi consolidated and unconsolidated formations, shallow zones are tapped by filter points and shallow tube wells and deeper zones through deeper tube wells. The yield of open wells vary from 1 to 3 litres per second(lps), whereas in dug wells tapping soft rocks including sedimentary formations, the yield can go up to 10 lps. The yield from unconsolidated and semi consolidated formations are in general 10 to 20 lps but yields as high as 40 lps are also possible in some places.

The rampant exploitation of groundwater and aquifer depletion, particularly for use by agriculture, is pushing Tamil Nadu to the brink. Water is being withdrawn at a far greater pace than is possible to reasonably replenish. **The state's stage of groundwater extraction stands at 82.93%, which is the fifth highest among states in the country.** This was up from 80.94 % in 2017. The stage of groundwater extraction is the groundwater extraction as a percentage of the annual extractable groundwater resources available. Monitored units across the state are categorised by degree of exploitation ranging from over-exploited to safe. **43% of the 1166 monitored administrative units in Tamil Nadu fall under the categories of over-exploited and critical.** The seriousness of Tamil Nadu's groundwater overexploitation situation is made evident by the fact that it was **one of 8 states prioritised by the Central Ground Water Board(CGWB), for its National Aquifer Mapping and Management Programme (NAQUIM)** initiated in 2012.[5] CGWB, the national agency under the Department of Water Resources, is tasked with the assessment, management, conservation, augmentation and sustainable development of groundwater resources in the country. The NAQUIM target for the duration of the XII plan (2012-17) was on an area of 5.26 lakh km[2] covering parts of eight priority states.

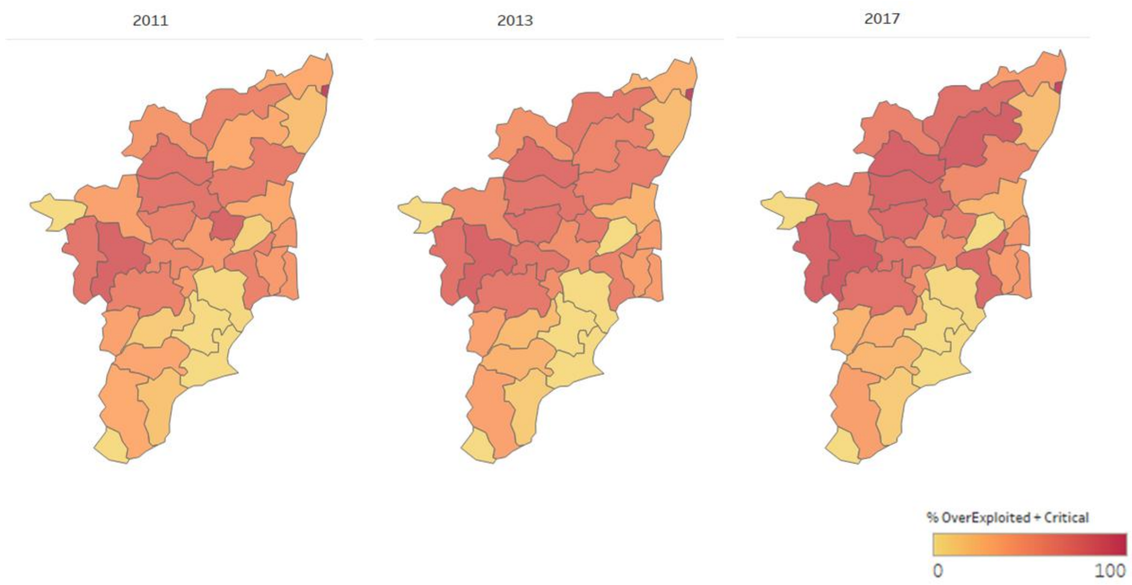
Ground water resources are replenished through rainfall and other sources like return flow from irrigation, canal seepage, recharge from water bodies, water conservation structures etc. In **Tamil Nadu in 2020, 41% of recharge replenishment was attributable to rainfall while the remaining 59% is due to other sources**. A lot of rainwater is lost as surface runoff. Water balance studies in various watersheds demonstrate that water can be effectively stored in the watershed after losses by improving the drainage and capacity of the storage infrastructure and properly harvesting it.



[4] https://www.un-igrac.org/sites/default/files/resources/files/GWMATE%20case%20profile%20-%20India.pdf

[5] https://www.aims-cgwb.org/aquifer-mapping-during-2012-17.php

Irrigation is the biggest consumer of groundwater in Tamil Nadu, as is the case nationally. The sector consumes a staggering 92% of the groundwater in the state. An agricultural paradigm based on Intensive irrigation with groundwater is pushing the groundwater systems to teeter on the point of no return and threatening the viability and the very existence of the agricultural/food system that is built on it. Socio-economic impacts of groundwater overexploitation on farmers are immense and mounting - relentless construction of deeper new wells, increasing water salinity and spread of contaminants — arsenic, fluoride, increased energy requirement to lift water. In coastal zones, the groundwater boom is destroying the balance between coastal freshwater aquifers and the sea leading to saltwater ingress. Exacerbating all these issues is climate change that is set to bring in both predictable and unpredictable challenges to the groundwater regime by way of increased number and distribution of extreme rainfall events, longer periods of droughts, rising temperatures and so on.



Groundwater Status

The dynamic ground water resources for the state are assessed firka-wise. There are currently 1166 firkas in total.[6]

- The Annual Ground Water Extraction is 14.67 bcm and Stage of Ground Water Extraction is 82.9 %.
- In 2020, 43% of assessment units are categorised as over-exploited and critical administrative units. This is down from 46% in 2017
- Safe assessment units have consistently been reducing from 39% in 2011, to 38% in 2013 to 37% in 2017 to 35% in 2020.
- As compared to 2017 assessment, the Total Annual Groundwater Recharge has decreased from 20.22 to 19.59 bcm in 2020
- The Annual Extractable Ground Water Resources has decreased from 18.2 to 17.7 bcm, the annual groundwater extraction has decreased from 14.73 to 14.67 bcm. Consequently, there is an increase in the stage of ground water extraction from 80.94 % to 82.42 %. The marginal reduction in recharge is due to changes in rainfall recharge and decreased extraction is due to revision of well census data.
- Rainfall contributed to 41% of the total annual groundwater recharge in Tamil Nadu.
- Northern, Western and Central districts have the poorest groundwater status.

[6] National Compilation on DYNAMIC GROUND WATER RESOURCES OF INDIA, 2020, https://phedwater.rajasthan.gov.in/content/dam/doitassets/water/Ground%20Water/Pdf/Reports/assessment_reports/2021-07-14-GWRA_India_2020.pdf

2.3 Groundwater Policies and Governance in the State

Major Policies and Legislations Governing Ground Water Resources in Tamil Nadu	
Chennai Metropolitan Area Groundwater (Regulation) Act, 1987	• The Act covers the control, regulation, abstraction and transportation of groundwater in the notified areas through the registration of existing wells, issuing licences to extract water for non-domestic use and to transport groundwater on vehicles. • The Act exempted wells used for agricultural purposes from its purview. • The Act made it mandatory for every person in the scheduled areas to obtain the permission of Chennai Metropolitan Water Supply and Sewerage Board before sinking any kind of well and to register existing wells.
Tamil Nadu Law on Groundwater Development and Management (Draft)	• Every existing commercial user of groundwater will be required to apply to the authority concerned for an NOC. The term 'commercial users' refers to industrial units and those engaged in the transportation of groundwater • If any new well is to be sunk or groundwater transported, a permit is required to be obtained. • Those extracting groundwater of less than one million gallons a day (MGD) or about 4.55 million litres a day (MLD) will have to approach the chief engineer of the State Groundwater and Surface Water Resources Data Centre, and for others, the authority. • Offences and penalties have been proposed for violators of the law. • Commercial, industrial, infrastructural and bulk users, withdrawing groundwater of two lakh litres a day or more, will be mandated to recycle water. The installation of sewage treatment plants will be mandatory for all residential apartments where groundwater requirement is more than 20 cubic metres/dayday or 20,000 litres/day.
Tamil Nadu Protection of Tanks and Eviction of Encroachment Act, 2007	• The Tamil Nadu Protection of Tanks and Eviction of Encroachment Act, 2007 was enacted to protect the tanks under the control of Water Resources Department and for checking the encroachments besides and ensuring early eviction of the encroachers. The Act also provides for the conduct of survey of the tanks in the State by an officer nominated by the Revenue Department to determine their limits, demarcate boundaries and initiate action for eviction of encroachment in coordination with Revenue Department and police authorities.
The Tamil Nadu Protected Agricultural Zone Development Act, 2020	• The Act has declared the Cauvery delta region a Protected Special Agriculture Zone (PSAZ). It is intended to protect agriculture and prohibit Petroleum, Chemical and Petrochemical Investment Regions (PCPIRs) and hydrocarbon projects in the delta region. It, however, does not cover all districts of the Cauvery delta.

Chennai was the first city in India to legislate on urban groundwater through the Chennai Metropolitan Area Groundwater (Regulation) Act. The notified area under this Act includes the entire city of Chennai and 302 villages surrounding the city located in the adjoining districts of Kancheepuram and Tiruvallur. The Act had been enacted to address acute water scarcity due to consecutive failure of monsoon.

The Act covers the control, regulation, abstraction and transportation of groundwater in the notified areas through the registration of existing wells, issuing licences to extract water for non-domestic use and to transport groundwater on vehicles. The Act exempted wells used for agricultural purposes from its purview. The Act made it mandatory for every person in the scheduled areas to obtain the permission of Chennai Metropolitan Water Supply and Sewerage Board before sinking any kind of well and to register existing wells. It also contained several provisions such as keeping a tab on the types of well, their exact location, the devices used for lifting groundwater, the purposes for which it was used, the quantity of groundwater utilised, the vehicles used for transporting the water and the licences to be obtained for such transportation. **In 2002, The state further tightened the rules by promulgating the Chennai Metropolitan Area Groundwater (Regulation) Amendment Act, 2002.**

In July 2019, in the absence of any groundwater management act in the rest of Tamil Nadu, the Madras High Court suggested that the State legislature could extend the applicability of Chennai Metropolitan Area Groundwater (Regulation) Act of 1987 to all districts to regulate and control the extraction, use and transportation of groundwater. They suggested this in the context of similar scarcity that had come to prevail in many other cities whose water needs were being fulfilled by transporting groundwater from their suburbs.

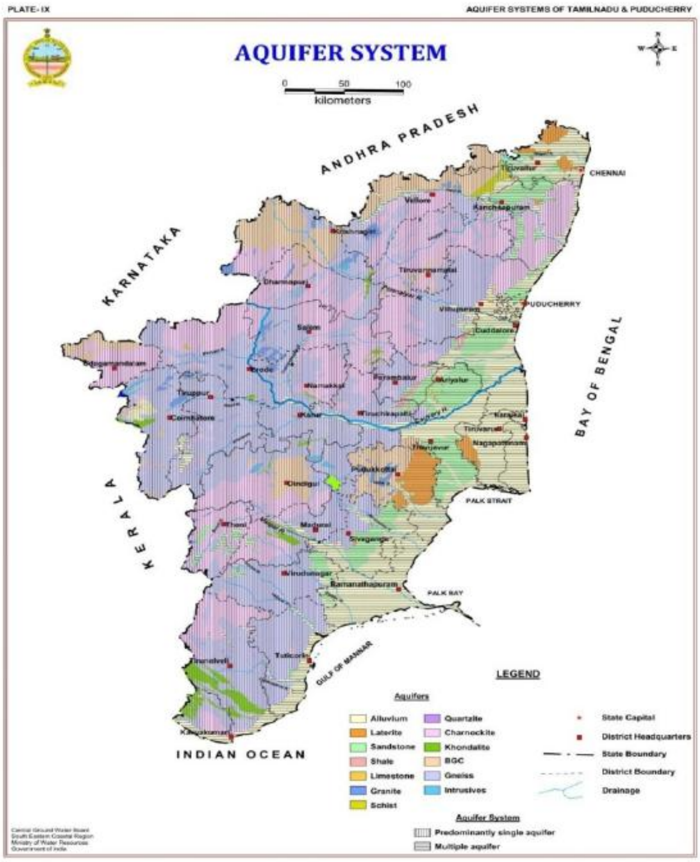
In October 2019, while disposing of a batch of writ petitions regarding illegal groundwater extraction from a Chennai suburb, a division bench of the Madras High Court urged the state government to legislate on groundwater extraction for all parts of the state in light of the alarming rate of groundwater depletion. Meanwhile the Government has resorted to invoking the powers under Article 162 of the Constitution to bring out Government Orders to deal with the issue. However, there are no provisions in these orders to initiate criminal proceedings against violators nor any effective provisions in the Indian Penal Code to combat illegal extraction of water.

The court directed the Collectors of Kanchipuram and Tiruvallur to maintain a register of the existing wells in their areas mentioned in the schedule to the Act in order to properly implement the Chennai Metropolitan Area Ground Water (Regulation) Act. It directed them to ensure that no vehicle be permitted to transport groundwater without obtaining a valid licence under Sec.5 of the Act and that the vehicles be confiscated and vested with the State if found in violation as provided under Sec.12A. It also directed confiscation and vesting with the state of motor-pumps and other paraphernalia under the same section.

The Tamil Nadu Protection of Tanks and Eviction of Encroachment Act, 2007 was enacted to protect the tanks under the control of Water Resources Department and for checking the encroachments besides and ensuring early eviction of the encroachers. The Act also provides for the conduct of survey of the tanks in the State by an officer nominated by the Revenue Department to determine their limits, demarcate boundaries and initiate action for eviction of encroachment in coordination with Revenue Department and police authorities.

2.4 Locally Appropriate Solutions for Groundwater Management:

By virtue of its hydro-geological characteristics, its rainfall patterns and the near complete absence of perennial rivers, **Tamil Nadu has an inherent predisposition for water scarcity and deficits in many parts of the state. Judicious water management has historically been an imperative for it.** This was recognised centuries ago. The recognition is attested to by the fact that rulers from ancient times, starting with the dynasties of the Sangam Era, developed highly evolved and efficient systems of water conservation and management and entrusted the management to communities and skilled water management practitioners. Some of the reservoirs, dams and tanks have survived and are in use to this day.



However, both the water conservation structures and the community management systems overseeing them, began to degenerate over time. The reasons for this are myriad and complex .

While the predominant reason attributed to the decline of surface water bodies has been the incursion of the British colonial state into traditional village institutions and the consequent erosion of the autonomous functioning of village management systems, others point to the degeneration having occurred slowly over time and as a result of many, often unrelated reasons. They include factors associated with deforestation(from the late 18th century), population growth, intensified land use and crop regimes, siltation and encroachment of water bodies, etc. **The degeneration of surface water structures has been accelerated in recent decades as a consequence of the explosive growth of irrigation from individually owned groundwater wells** which began in the 1960s. The trend has grown by orders of magnitude since the 1990s. Area under canal and tank irrigation have stagnated and decreased respectively since the 1960s.

2.4.1 Wake our Lakes in North Western Tamil Nadu

As per Central Groundwater Board data, **the western and north-western zone districts have the poorest groundwater status in Tamil Nadu** in terms of stage of groundwater extraction (the ratio of extraction to availability). The north-western districts comprise Krishnagiri, Dharmapuri, Salem and Namakkal(parts) while the western districts comprise Coimbatore, Tiruppur, Erode and parts of Namakkal.

Groundwater and surface water systems are inextricably interconnected and interact with each other in multitudinal ways - management of any one component of the hydrologic system in isolation, such as revival of an aquifer, commonly will only be partly effective because each hydrologic component is in continuing interaction with other hydrologic components. Therefore it is critical to focus on revival and management of surface water bodies.

The north western agroclimatic zone of Tamil Nadu comprises 4 districts - Krishnagiri, Dharmapuri, Salem, and most of Namakkal. Wake Our Lakes initiative has predominantly focussed on this zone with a particularly large bouquet of work in Namakkal District. Namakkal district was formed by bifurcating Salem district in 1997. One part of Namakkal is classified as falling under the Western Agroclimatic Zone.

The North Western Zone comprises three geographical tracts:

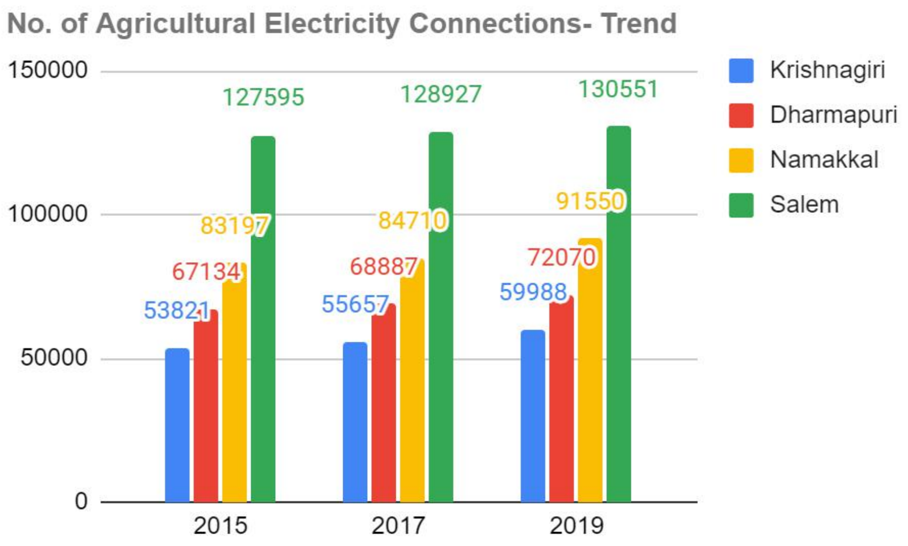
- Tableland/Plateau (includes parts of Karnataka).Rocky patches in the north and east; dense jungles in the south and west. Contains greater parts of Hosur, Denkanikottaitaluks; small portion of Krishnagiritaluk
- Extension basin intermediate between the Karnataka tableland and the plains(350-660 m above Mean Sea Level). Comprises Krishnagiri, Dharmapuritaluks.
- Tract lower than 350 m above MSL. This is divided into two portions by the watershed between the Cauvery and the Vellar river systems. Attur, Rasipuram and Namakkaltaluks lie on the eastern portion and Salem, Omalur and Mettur on the western.

The western/north western part of the state is almost entirely underlain with hard rock. The borewells in these regions are dug very deep before they hit water (more than hundred feet in depth).

The Study Region

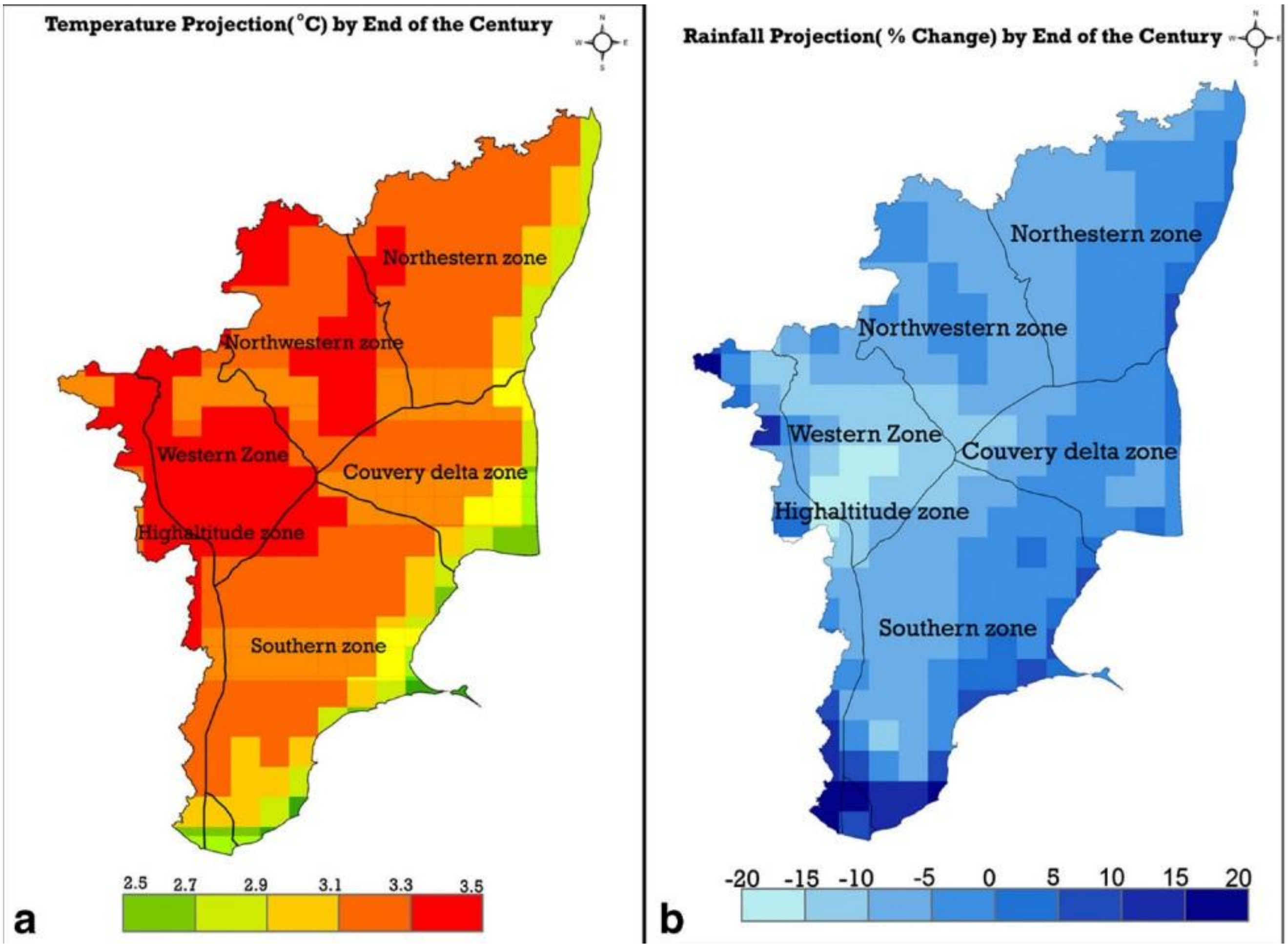
Namakkal District spans a geographical area of 3,36,719 Hectares. **Less than half of its area is cultivated.** The net cultivated area ranges between 1,40,00 and 1,48,000 hectares. **Between 40 to 45% is irrigated while 55 to 60% is rainfed.** While tubewells, open wells, tanks, canals and lift irrigation form the sources of irrigation in this district, **tubewells/borewells are by far the most dominant source of irrigation - by one estimate for 2017-18, they contributed to over 90% of the district's irrigation**.

This is supported by the fact that the four **north-western districts alone accounted for 17% of total agricultural electricity connections** across the state in 2019. These districts also accounted for **22% of pending agricultural connection applications** at the time. Salem has the 4th highest number of existing connections at 130551 in the state, while Namakkal has the 11th highest at 91550. Krishnagiri had the highest number of pending applications (32638) while Dharmapuri had 31432.



Tamil Nadu's biggest dam, the Mettur Dam, and the Stanley Reservoir created by the dam, are located in the adjoining district of Salem. The east and west bank canals of the Mettur dam irrigate cultivation in Salem, Namakkal and Erode districts. **The canal system covers about 45,000 acres total - Salem (16,433 acres), Namakkal (11,337 acres)** and Erode (17,230 acres). Mettur East Bank canal irrigates Pallipalayam Block (ayacut area 4585 Ha), Rajavaikal canal (ayacut area 4215 Ha), Mohanurvaikal (ayacut area 355 Ha). Kumarapalayamvaikal (ayacut area 1146 Ha) and Poiyerivaikal (ayacut area 323 Ha).

Frequently occurring recurrent drought conditions resulted in groundwater levels plummeting alarmingly over the past years and has led to a large number of borewells failing. A key plea by farmer groups to the Public Works Department was to release water across canals and use the water to fill up water bodies across the districts in order to recharge groundwater and the wells in the region. The banks of canals tend to develop cracks if faced with continuous dry conditions and and additionally any sudden increased release of water only served to weaken the banks further- making the case for regular release of water to avoid this.



2.4.2 Climate Change: Impact on Temperatures and Rainfall in the District

Climate change is set to aggravate the water situation most severely across the northern and north western agroclimatic districts of the state as compared to the rest of the state. By the end of the century, a general maximum increase of 3.0–4.2 and 2.8–3.9 °C is projected over the northwestern and western part of Tamil Nadu including the districts Nilgiris, Dharmapuri, Salem, Namakkal, Krishnagiri, Dindigul, Coimbatore, Tiruppur, Karur and Erode. Rising temperatures will increase overall transpiration levels. Coupled with a projected decline in the rainfall in these districts, recharge of groundwater is set to face even bigger challenges going ahead.

Rainfall Projections For North-Western Districts

% Change in Annual Rainfall	2020s	2030s	2040s
Namakkal	-3.0%	-3.0%	-8.0%
Dharmapuri	-3.0%	-2.0%	-6.0%
Salem	-2.0%	-2.0%	-7.0%
Krishnagiri	-4.0%	-3.0%	-5.0%

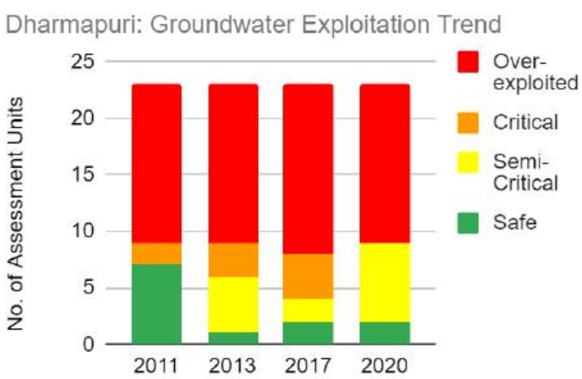
Namakkal Temperature Projections

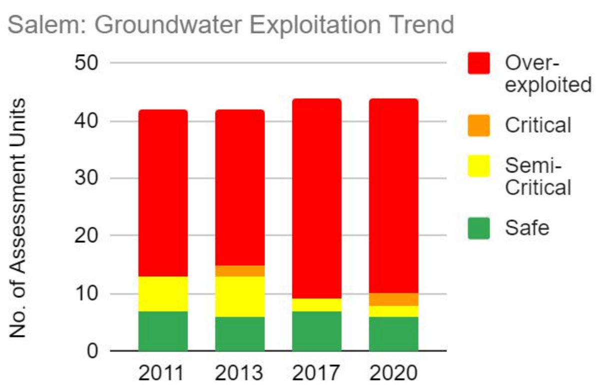
Parameter	2020s	2050s	2080s
Maximum Temperature	+1.1°C	+2.2°C	+3.3°C
Minimum Temperature	+1.2°C	+2.5°C	+3.8°C

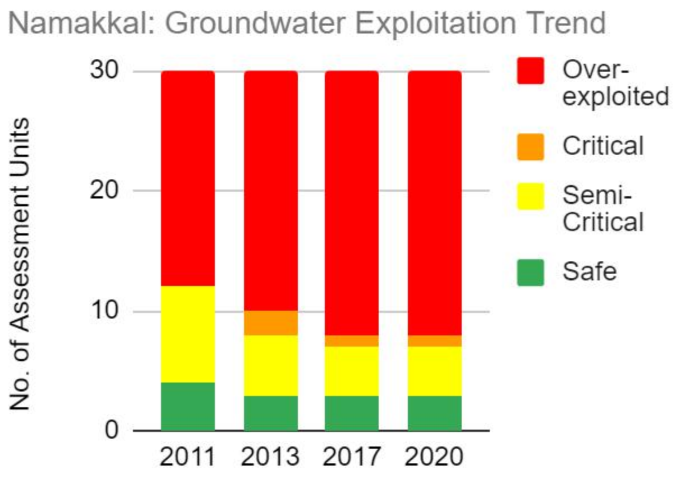
Groundwater Scenario

The groundwater status has consistently been deteriorating in the northern and north western districts of Tamil Nadu as per both the Central Ground Water Board data as well as the data from the State Ground and Surface Water Resources Data Centre(SGSWRDC). As per data published by the SGSWRDC in October 2021, the groundwater level dipped significantly in five western districts — Namakkal, Dharmapuri, Krishnagiri, Erode, and Tiruppur. Namakkal was the worst affected with the level dipping by 1.58 m, the highest in the State, going down from 10.64 m in October 2020 to 12.22 m in 2021.

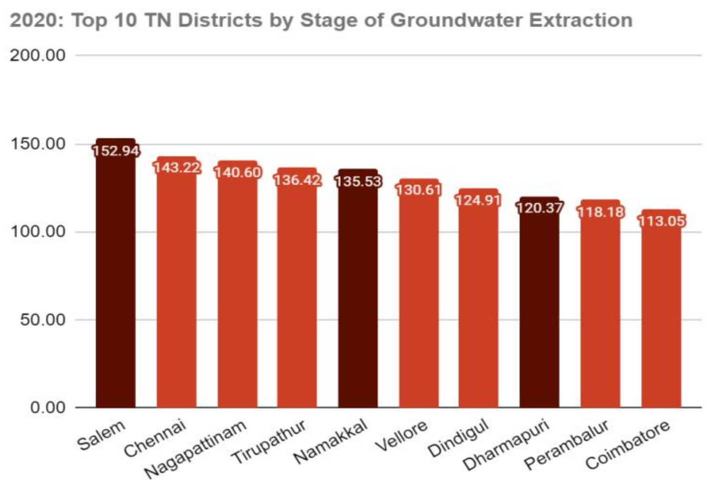
Groundwater exploitation trends between 2011 and 2020 in the North-western Districts

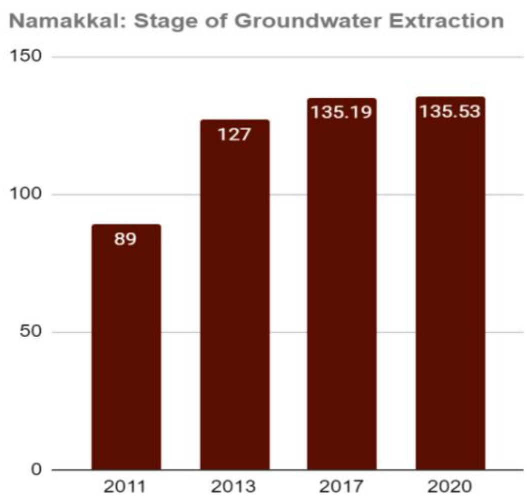






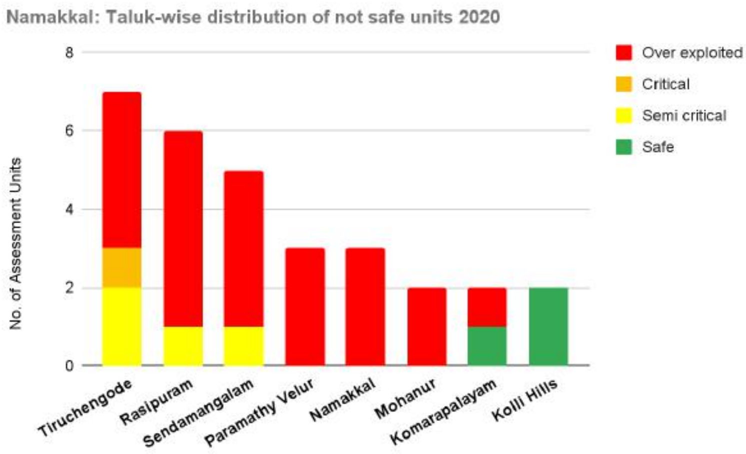
Salem, Namakkal and Dharmapuri also appear in the top 10 districts with the highest numbers for Stage of Extraction – which is the percentage of extraction to availability. Namakkal's Stage of Extraction has also consistently over the decade remained highly unsustainable.





Wake Our Lake's Journey

The organisation **began in 2017 with work in NarsimhanKadu Village located in the foothills of Kolli Malai in the Belukurichi Panchayat of Sendamangalam Block in Namakkal District.** Kolli Malai is a small mountain range that is part of the Eastern Ghats with the mountains rising to a height of 1300 m. It has a predominantly tribal population – over 95% of the taluk's population is tribal. The village and Kolli Malai more broadly as well as other bordering villages in Sendamangalam had seen a steady deterioration of groundwater over the previous decade. As per CGWB data, there are no safe assessment units in SendamangalamTaluk. SaravananThiyagarajan, a native of Narasimhan Kadu village, was moved to start working on revival of water bodies in and around the area, as he bore direct witness to the water deterioration over the years. A reasonably green environment supported by sufficient rainfall had begun to disappear. Water bodies dried up; coconut and palm trees, a water retentive and fairly drought resistant species, began to shrivel – all strong evidence of serious and increasing water scarcity. Borewells at even 800 to 1000 feet depth were going dry.



Saravanan, along with friends from the region, felt compelled to look for solutions. He was joined by a fellow resident of the village who had been reviving and teaching the youth of the village an ancient traditional martial art called silambam – he had been using this engagement to talk to the youth about water issues. They initiated conversations with a few local people as well as a range of people outside and brainstormed on what could be done. Thereafter he formed a group who were interested in addressing the issue as well as experts whose expertise that the group hoped would help them bring science to the water revival/conservation process they wanted to embark on.

The group that came together early on included a water and soil restoration technical expert with experience in integrated watershed management, Arul Sekar, who surveyed the foothills area around the village in detail to understand the water flows, the existing water structures and allied information in consultation with the people of the village. The group identified two very different kinds of lakes to start work on. One lake was large but had no functional inlet channels connecting it to the catchment area. The other had a large catchment area but the lake itself was relatively small.The group then decided to start their work with the revival of the former – Thendral Lake. Buoyed by the success with Thendral it moved to working on the second lake – Punnagai Lake. A senior soil scientist, Dr A Velmurugan, began assisting their efforts with technical advice starting with this. Success with this too spurred the group and community to try something radically new – the creation of a brand new waterbody.

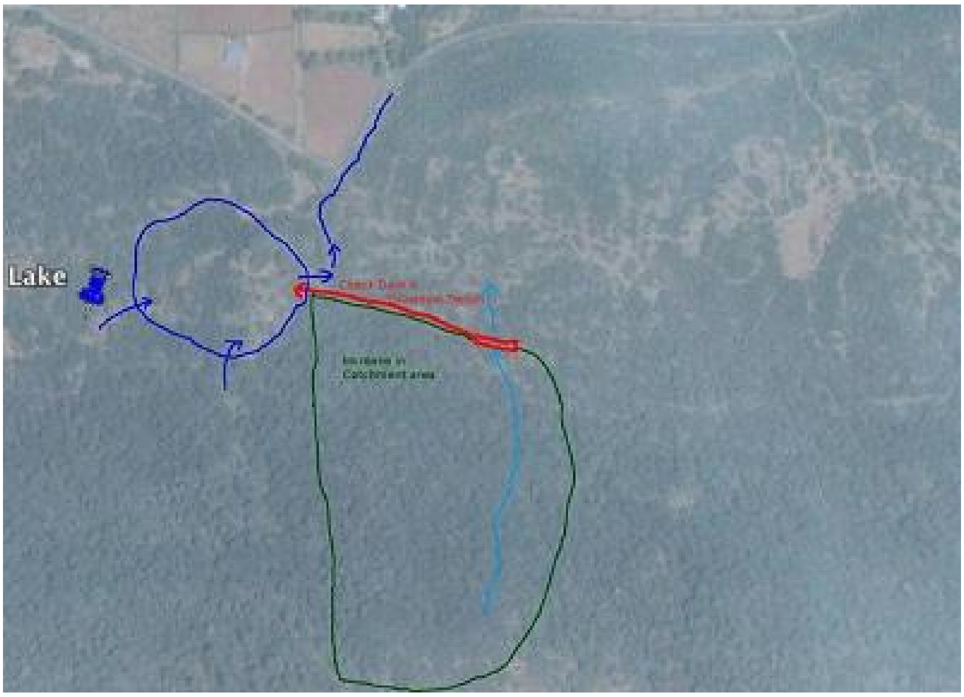
The onwards the group went on to revive many water bodies in the KolliMalai foothills region and then expanded to work on water bodies in the other water stressed taluks of Namakkal district(Tiruchengode, Rasipuram, ParamathyVelur, Namakkal) as well as more broadly in the north-western districts(Dharmapuri, Salem) and beyond(other districts in Tamil Nadu, Karnataka, etc).

Thendral Lake

The group that came together initially on this project to revive water in the Kolli Malai foothills located in the BelukurichiTaluk, **used Google Earth to map the trajectory of the shrinkage of lakes in the area over the preceding decade**. They also trekked around the area with locals to understand in detail the history and locations of the water bodies, the rains, the topography(contours), the catchment areas, the soil etc.

Having formed an understanding, they picked Thendral as their first Thendral Lake located in Narasimhan Kadu village. The primary issue with the lake was the absence of an inlet connecting the catchment area to the lake. No functional inlets ensured in essence that the catchment area for the lake was just the lake periphery only. This meant that no matter how much it rained, water from the catchment area would never reach it.

The group realised that with this lake, in addition to creating an inlet, increasing catchment area was a critical component to reviving it. The lake, with a capacity of 2 crore litres of water, had slowly shrunk over the decades and eventually became completely dry. There were some shrubs and trees in the lake bed.



Arul Sekhar drew up a plan based with the knowledge gained during the survey and conversations – they marked the catchment area, They decided to expand the catchment area and planned a 1 kilometre long path connecting the catchment area to the lake – this included the clearing/creation of contour trenches and diversion trenches to create for the inlet to the lake. They also found an underground spring opening along the path during the survey.

The implementation would require permissions from the forest department. This took longer than expected – about two months from May to July 2017– and more effort than was initially anticipated. Eventually permissions came through after the forest officers conducted a survey of the area.

With the increase in activity, the initial broader scepticism in the village turned into curiosity and excitement. When the work began, people pitched in in various ways – with labour, supply of food (Muthu cooked), milk and water(Latha provided), a doctor offered his services.

The work was carried out by the WakeOurLake team, NSS students and community members. Trenches were dug. Pathways were cleared. A JCB earthmover was hired to deepen the trenches and lake.

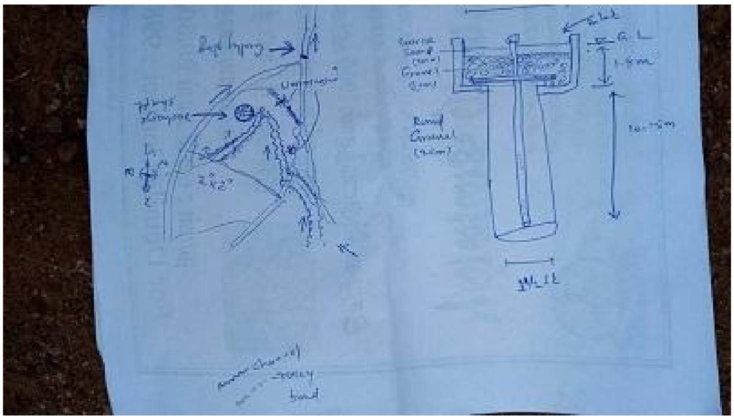
The team also worked on planting seed balls. The school children in the village and from Namagiripettai participated in competitions for the making of seedballs. They also participated in the dispersal of 20,000 seed balls in barren areas. They planted trees along the perimeter of the lake and inlet channel. Teachers from the local schools used the project to educate and raise interest in the children about environmental issues – deforestation, water depletion, climate change – and to get them to experience it directly on ground.

Post the work, with the first rains the lake began to fill up – for the first time in over a decade. The revival of the lake has benefited roughly 1000 acres in vicinity – it has resulted in open wells and even borewells seeing water rise again. Prior to this, only those who could afford expensive borewells were able to cultivate, and cultivate at great cost. This lake revival had relied on the community's efforts and cost only an additional Rs.20,000 – Rs. 15000 for the hiring of an earthmover and the remaining for miscellaneous expenses.

The increase in groundwater levels also led to improvement in soil health and quality. The community was delighted to experience this and having benefited first hand, resolved to maintain the lake in the future.

Punnagai Lake

The second lake was its relatively small size(20 to 30 lakh litres) in spite of a large catchment area(roughly 300 acres). This meant that there was a lot of runoff. There was a need to slow down the fast moving water flowing from the catchment area to the lake and to also allow the slowed down water to percolate. To facilitate this, check dams were built, using locally available materials, to contain the rainwater in several places for longer periods which helped ensure water percolation. In the lower catchment area various mud check dams, gabions, minor recharge pits and contour trenches were created. A rainwater recharge pit was built adjacent to the lake, with the help of Dr. Velmurugan. He used the opportunity to teach both community members and the children the principles involved in the design of recharge pits. Additionally, the existing inlets needed to be cleared and new inlets to be created.



The team reached out for volunteers from the community as well as to others through social media. There was an overwhelming response.

The check dams and rainwater recharge pit together resulted in the successful recharging of groundwater. The lake itself was widened and deepened and its bunds were strengthened by the planting of vetiver. The community went on to build several recharge pits in the area.

Kumaran Pond

The successful revival of Thendral and Punnagai lakes led to other farmers from neighbouring villages approaching the Wake Our Lake team to help with water revival and specifically for recharging groundwater in their areas. The team decided to do something different this time round- to build a brand new lake. The villagers and the team pooled money to buy a 2 acre plot of private land and constructed a water body on it in Belakurichi. The pond filled up with water the very next rainfall and also began to recharge the ground. It has continuously improved the water table in the area since it was built.

Kumaran Pond after the rains in 2021(2019 start work july) - islands in the centre - biodiversity...palm and vetiver on bunds

The Wake Our Lakes Model - why and how it works; challenges

1.Scientific, technical, data based approach to waterbody revival. Strong support network of people with relevant expertise in water restoration, soil science and restoration.
2. Focus on involving community participation and engagement in the process – starting from planning to execution to maintenance.
3. Flexible and more distributed model where water revival projects are initiated and executed in different ways:
a)Initiated by the existing WoL group members and then they reach out and build a group to plan and execute it
b)Initiated by an individual/group who then approach WoL for various kinds of assistance including planning, getting requisite permissions, raising partial or entire funds, executing it, etc. existing govt schemes – familiarise – mnrega – local leader. rotary /access csr funds/givt scheme – local panchayat – forest dept
4. Process explainer brochure with a flowchart on all the requirements to get the work going – this can be used by anyone wishing to revive a lake/pond in their region. This has been created using their learnings from reviving over two dozen lakes.
5. The **focus on greening the area** around the water body with native species goes hand in hand with the water body creation/desilting/deweeding/creation or cleaning of inlet channels, planning for spillover outlets, etc. Focus on improving soil health.
6. Conducting regular workshops across districts and taluks on lake conservation, revival, afforestation and related issues. In many of these Dr. Velmurugan (soil scientist) explains geological matters in an accessible manner – rocks, water streams etc are discussed. Mr. Arul Sekhar, their technical advisor and watershed management specialist, familiarises participants with several technologies and date sources(Google earth, Bhuvan data). Other specialists are invited to share knowledge and experience on the issue.
7. Continuous learning through interactions with other lake revival/watershed management groups in the state and beyond.
8. Using the **lake revival process as an education opportunity**
9. **Challenges:** fundraising for newer projects is not always easy. In the distributed model, the completion of projects fluctuates based on the ability of the partner to see it through. – permissions are challenging– labour.

Going Forward

Before COVID brought everything to a halt, Wake Our Lakes was working in tandem with groups from across 20 districts in Tamil Nadu, Karnataka and Andhra Pradesh. Every district had at least 5-6 people actively engaged in lake rejuvenation. Through 2020 and 2021 there was a hiatus in onground work. However, the group used the time effectively to virtually expand the network and bring in more interested groups as well as experts to enrich the thinking around water body revival. They also interacted and learnt from many other such initiatives – particularly those involved in work across Tamil Nadu – this included interactions with groups like KAIFA, Salem Citizens Forum etc.

2.4.3 KAIFA: A New Model for Rehabilitating Water Bodies in Cauvery Delta Region

The Cauvery Delta Zone (CDZ) is located in the eastern part of Tamil Nadu. It is bounded by the Bay of Bengal on the east and the Palk Strait on the south, **Trichy** district on the west, Perambalur, Ariyalur districts on the north west, Cuddalore district on the north and Pudukkottai district on the south west. CDZ has a total geographic land area of 14.47 lakh ha. The erstwhile **Thanjavur** district (comprising **Thanjavur, Thiruvarur, Nagapattinam**) occupies 57 percent of CDZ followed by **Trichy, Ariyalur, Cuddalore and Pudukkottai** districts.

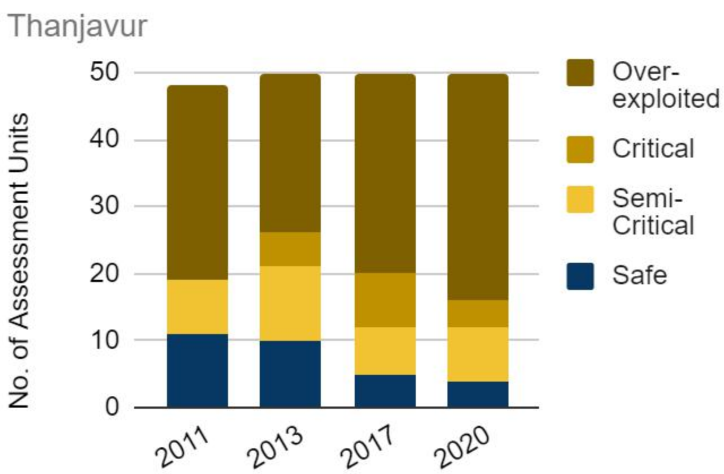
The district comprises 9 taluks; it lies in the delta region of the river Cauvery and has an **extensive, lengthy network of irrigation canals** crisscrossing it. The Cauvery flows through the entire district with different names, through its tributaries and branches viz., Grand Anaicut canal, Vennar, Pannaiyar, Koraiyar, Vettar, Kodamuritiyar, Thirumalairajanar, Arasalar, Veerasozhanar, Mudikondan, Noolar, Vanjiar, Vikaraman, Nattar, Kirtimanar, Nandalar, Majalar, Mahimalayar, Palavar, Cholasudamani, Puthar, Valappar, Vadavar, Pamaniar, Mulliyar, Ayyanar, Adappar, Harichandranathi, Vellaiyar, Pandavaiyar, Odambogiyar, Kattar, Kaduvaiyar and all these branch off into a number of small streams.

The deltaic plain of the district comprises the old and new delta. The old delta has a network of canals and channels of the rivers Cauvery and Vennaru. The upper portion of this new delta area is irrigated by the Grand Anaicut canal.

In addition to the rivers-canals-streams network, the district has a large number of tanks and other surface water bodies. The Public Works Department, which is responsible for tanks of more than 40 hectares, maintains 559 lakes and tanks in the district. Additionally, there are many water bodies smaller than 40 hectares that are under the control of the Rural Development Department (Panchayat Unions).

The delta is an extremely fertile region. The major crops cultivated in Thanjavur district are paddy, pulses, gingelly, groundnut and sugarcane. The minor crops like maize, soybeans, red gram are in rice fallows. In the new delta area, the groundnut is the principal crop. Thanjavur is commonly referred to as the **Rice Bowl of Tamil Nadu**. Thanjavur, Thiruvarur and Nagapattinam, between them, contain 30% of the acreage of rice in the state and Thanjavur has about 8% of acreage of coconut in the state. The net area irrigated by canals is amongst the highest in Thanjavur district as compared to other districts across the state. **In spite of the existence of widespread irrigation networks and the existence of surface water bodies, the reliance on groundwater exists and has been on the rise.**

Over the years, groundwater depletion has been increasing worryingly. An analysis of Central Ground Water Board's data shows that the number of safe firkas in Thanjavur has been decreasing consistently over the last decade. As per 2020 data, 92% of the assessed units were not safe, with as many as 60% were over-exploited.



Additionally, climate change is set to aggravate the water situation across the district. District wise climate change projections for Thanjavur are as below:

- The average change of maximum and minimum temperature for Thanjavur district is expected to increase by 3.0 °C and 3.4 °C respectively by the end of the century. Rising temperatures will increase evapotranspiration levels.

Parameter	2020s	2050s	2080s
Maximum Temperature	+1.0°C	+2.0°C	+3.0°C
Minimum Temperature	+1.1°C	+2.3°C	+3.4°C

The annual rainfall normal (1970-2000) of Thanjavur district is 1053 mm.3 Projections of rainfall over Thanjavur for the periods 2010-2040 (2020s), 2040-2070 (2050s) and 2070-2100 (2080s) with reference to the baseline (1970-2000) indicate a general decrease. The annual rainfall for Thanjavur district may reduce by 2.0% by the end of the century as per the emission scenario of A1B. A1B refers to a scenario with balanced emphasis on all energy sources as per the **Special Report on Emissions Scenarios (SRES)**, a report by the Intergovernmental Panel on Climate Change (IPCC).

KAIFA (Kadaimadai (tail-end) Area Integrated Farmers' Association)

KAIFA is a farmers' association cum network of members and volunteers that has been engaged in very successful and innovative water revival work in Tamil Nadu, with a large part of their work happening in the Cauvery Delta region. The group's origin in some ways dates back to the time when Cyclone Gaja hit Tamil Nadu in 2018. The cyclone wreaked havoc across the state, particularly over the Cauvery Delta. It destroyed 80% of the standing coconut trees in the region in its wake.

Some estimates have suggested that 75 lakh trees were damaged either fully or partially and 90 villages located in the region, lost everything they had. Losing standing coconut plantations was particularly painful for farmers as it is a perennial crop rather than a seasonal crop - it requires a long gestation period before it starts to pay back. The destruction extended to all agricultural crops including banana, sugarcane and paddy. The damage has been extensive across Alangudi, Aranthangi, Peravurani and Pattukottai. With property and livelihoods devastated, many young people from the region who were working abroad at the time but with plans to return in a few years, abandoned their plans to return. Villagers began to consider moving out of agriculture and the region in search of other jobs.

Moved by the situation, a small group of youth, some of whom returned from their urban jobs abroad, began relief work and the work of rebuilding the region. Through the course of their relief they learnt a lot about the nuances of the art of (community) organising around issues. They wove their technical skills and knowledge of social media tools into the work in order to engage a larger number of people and give them ways to become connected with and contribute to the relief and reconstruction work. They coined the social media hashtag #BounceBackDelta which gained a lot of traction. (https://www.facebook.com/Bounce-back-Delta-119457182305324/). They had funds and relief material pouring in from across the globe in response to this hashtag that went viral.

In this way KAIFA were able to massively expand community engagement and raise resources both online and offline. As the relief work progressed, it became evident that mere relief work was insufficient to keep farmers stay with agriculture. There were many underlying issues even before the cyclone hit that needed to be addressed for farmers to continue with their profession. A common and widespread concern was the increasing lack of adequate water resources to reliably sustain and support farming.

Over the years as the flow of the Cauvery has fluctuated and frequently drastically declined, groundwater exploitation has increased significantly in Peravurani like it has elsewhere in the delta. KAIFA felt inspired to stay on and expand the scope of their work to address the long term issues of the farmers in the region - particularly around water. **Starting with its work in rejuvenating the large Periyakulamlake in Peravurani, KAIFA organically expanded its work to include tank and lake revival and rejuvenation, on some direct groundwater level improvement work**, afforestation programmes, as well as rainwater harvesting in districts across Tamil Nadu.

KAIFA has managed to amplify its successes very well through outreach to the traditional and digital media, social media platforms. Nimal Raghavan, a co-founder of KAIFA, and the articulate face of KAIFA has been instrumental in this. Their initial successes have led to massive interest in replicating the model. Communities and groups of individuals started reaching out to them to seek help in this regard. KAIFA responded to these requests helping with various aspects of the process including facilitating/aiding in obtaining of requisite permissions from relevant authorities by looping in people from the village/region with the astuteness to overcome any bureaucratic and/or political barriers , bringing in expertise as required and possible, helping thinking through fundraising, providing equipment to help with the implementation etc. They also began to mentor youth groups that reached out to them.

Their effectiveness is attested to by the Collector of Thanjavur who became aware of their work through the coverage in media and reached out to them in 2021 to discuss working with them. To date KAIFA has worked on over a 100 lakes, predominantly in the districts of Thanjavur, Pudukkottai, Thiruvarur, Nagappattinam, Sivagangai, Thoothukkudi, Tirunelveli and Virudhunagar districts.

Peravurani Lake- First waterbody restoration by KAIFA and their collaborators

Peravurani Taluk is located at the southernmost tip of Thanjavur district. Known for coconut cultivation,it was a source of livelihood for 80 % of the families there and all of them were grossly impacted by Cyclone Gaja. **The PeravuraniPeriyakulam Lake is one of the largest lakes in the delta region. Spread across roughly 565 acres(shrunk to about 366 acres due to indiscriminate encroachments) it has an associated irrigation area of 6000 acres affecting roughly 2 lakh people. The main villages irrigated by it are Ponkadu, Mudappulikkadu, Mavadukuruchi, Peravurani and Old Peravurani.**

KAIFA, initially just a group of 11 friends, decided to take up the rejuvenation of this lake as their first project – their pilot, in a sense.

Prior to KAIFA's work on the lake, over the decades the lake had become highly silted, leading to poor water retention. Groundwater levels had also gone down in the areas surrounding the lake. The channel ways leading water into the lake from catchment areas were deeply silted.

KAIFA members began the project with Rs. 20000 – money the team had personally pooled in. The money was grossly insufficient. Daily renting charges for desilting machinery ranged from Rs 40,000 to Rs. 60,000.

Also, initially they were met with a fair amount of scepticism from the community. They, however, persisted and engaged a great deal with various community members who eventually agreed to support them in various ways. They faced no obstacles from either the Public Works Department nor the district administration which went a long way for them. Experienced farmers agreed to help them given the group members themselves had no deep understanding of the lake and its issues. One the initial barrier of resistance was pierced, support came cascading in. They ran social media campaigns, online fundraisers, etc to raise the level of excitement around the rejuvenation of the lake. They managed to enthuse a large number of people including school students, senior citizens, and others who were all keen to share their savings towards the rejuvenation of the lake.

It resulted in the cleaning up of the lake which involved clearing the source supply channel from the catchment area to the lake, then deweeding, desilting and deepening the lake followed by fortifying the boundaries. **Aananthavalli and Sengamangalam canals are the supply channels for Peravurani Periyakulam.** There are also two sub channels feeding the lake. Originally 4 kilometres of supply channels were cleared leading up to the tank, which had turned into a dumping place in previous years. In 107 days about 70% of the lake was restored. Soil boundaries were set up spanning 12.5 kilometres on one side, 4 kilometres on another side. Additionally, the lake was deepened to increase its carrying capacity. The lake had an existing bund. They raised its height by 5 metres. They also formed and widened a bund on another side of the lake. The boundaries and slopes of both the supply channel and lake were planted with vetiver(khus) and palmyra balls to prevent soil erosion.

Additionally they created islands within the lake and planted native saplings on them. Before the work began the groundwater level was found at 300-400 ft and sometimes even at 800 to 1000 ft. The groundwater level in the area slowly improved from that to 150-200 feet to about 40 feet recently. The rejuvenation was done at a cost of Rs. 32 lakhs. The assessment is that the desilting and deepening of the lake has resulted in preventing the loss of about 750 crores litres of water per year since 2019 which would otherwise have run off into the sea eventually. **The overflow system was designed such that the overflow from one lake would flow via channels to a second lake.**

When the second lake got full, the overflow would be channelled to a third lake and so in a cascading manner to 15 lakes in total, the last being UmathanaduPeriyaEri, that directly benefited more than 10000 acres of farm and around 200000 people.

A critical practice adopted by the group that went a long way in building trust among all stakeholders was to maintain a high degree of transparency through a WhatsApp group they created to track progress on the work. They would regularly, often daily, update all donors with records of expenditure and progress made on the project. They used this forum to also acknowledge donors and motivate others to contribute by posting donors' photographs.

Towards the end of 2019, the lake was handed over to the community. Crucially, the lake rejuvenation exercise doesn't end here – ensuring the lake continues to get maintained is key. Time will tell how successfully that happens.

KAIFA, encouraged by the success of restoration of Periyakulamlake, has expanded its work significantly by replicating the model. Political astuteness has played a part in the negotiations with district administration and local politicians to ensure the work is not hindered in any way.

KAIFA's work has **gained traction and has inspired replication** in neighbouring districts by other organisations, youth groups etc. **Biotasoilis** one organisation taking forward this work in a big way. NimalRaghavan, in particular, who started with and continues to be with KAIFA, is also associated with Biotasoil, has now begun to be invited from across state lines to help with lake rejuvenation – he has been invited to Uttar Pradesh (Macferson lake in Prayagraj), Sri Lanka, Maharashtra(Chandrapur), etc. **OorKoodiOoraniKaapom** in Sivagangai and Thoothukudi is another example.

The work done on Peravurani got extensive coverage in the press, on radio and on various social media platforms. The work has been documented well. Here is some sample coverage:

- https://www.youtube.com/watch?v=mo6MaUqEZSA
- https://www.youtube.com/watch?v=9KYDiHQTh20

The KAIFA Model: why and how it works

1.Initiative rests with the community or small group of individuals who want to revive a water body. They approach KAIFA for assistance which could range from process know-how to fundraising to equipment and assistance with implementation to help with setting up systems to continue to manage waterbody in the future.

2.Absence of delays, red tape – KAIFA helps interface with government to get requisite permissions. However, once the permissions are in place the work is not impeded by the elaborate red tape that normally accompanies accessing government scheme funds. This is achieved by including people with political access.

3.Flexibility – each project is implemented based on availability of resources and needs of the community/group of individuals who are interested in the project.

4.Innovative Fundraising- Funds are crowd sourced from the community or set of individuals. They have managed to get companies to contribute towards purchase of machinery such as JCBs to help with dredging and desilting. The companies do this as part of their CSR. Having this machinery brings down the cost of implementation significantly.

5.Mentoring of youth groups- There are many challenges in rejuvenating lakes. It involves undertaking a detailed study of the history of the lake, studying rainfall patterns, native flora and fauna, inspecting the soil data and quality, strengthening and raising of existing bunds, to driving community engagement. KAIFA has mentored and continues to mentor groups that approach them for help in regenerating their local water bodies.

6.Transparency and Accountability- Details of collections and expenditure are shared transparently with everyone involved.

7.Community Ownership- Community involvement in implementation – help team with understanding the topography, rainfall, history of the lake/water body, needs from the lake to help plan the implementation.

8.New, modern tools of engagement –

1. website : https://www.kaifa.org.in/Web/About.aspx
2. Presence on linkedin, facebook which are regularly updated and maintained.

9. Well documented – processes and successes are well documented across various media and a lot of this material is made available in the public domain.

Going Forward

The initiative and its replications are just over three years old. There is already thinking about the long term maintenance of all the water bodies that have been revived and certain informal structures in place to ensure that this happens. However, time will tell how effective and energised these structures are.

It is critical to recognise that groundwater recharge measures alone will not solve the current crisis. **Demand side management is crucial - a new non water intensive paradigm will play an all important role.** Thinking on that is relatively absent as a focus at the moment in this model.

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