TNGCC
Tamil Nadu Green Climate Company

GOVERNMENT OF TAMILNADU
TRUTH ALONE TRIUMPHS

Tamil Nadu Climate Change Mission

RAMANATHAPURAM

DISTRICT DECARBONISATION ACTION PLAN

VASUDHA FOUNDATION
Green ways for a good earth!

Credits

Guidance
Ms. Supriya Sahu, IAS, Additional Chief Secretary, Environment, Climate Change and Forest Department, Government of Tamil Nadu
Mr. A.R. Rahul Nadh, IAS, Director, Department of Environment and Climate Change/Managing Director, Tamil Nadu Green Climate Company
Mr. Simranjeet Singh Kahlon, IAS, District Collector, Ramanathapuram
Mr. Srinivas Krishnaswamy, CEO, Vasudha Foundation
Ms. Hemalatha, District Forest Officer, Ramanathapuram

Core Team (Vasudha Foundation)

Low Carbon Pathways & Modelling
Mr. Gajendra Singh Negi, Ms. Saundharaya Khanna, Mr. Raghav Pachouri, Mr. Vikas Kumar and Mr. Rahul Patidar

Climate Policy
Dr. Tejaswini Eregowda, Ms. Fathima Saila, Mr. Bala Ganesh, Ms. Aleena Thomas, Ms. Vrinda Vijayan and Ms. Rini Dutt

Geospatial Analysis
Dr. Akinchan Singhai, Mr. Amit Yadav and Mr. Gourav Panchal

Editorial
Mr. Rohin Verma and Ms. Malvika Solanki

Cover and Layout Design
Mr. Aman kumar

TNGCC
Dr. S. Viswanathan, CEO, TNGCC
Dr. Sridevi Karpagavalli M, TO, TNGCC
Ms. Sri Priya, MIS Analyst
Dr. Prasanna Venkatesh, Climate Change Expert, TNGCC
Dr. P. Thiru Murugan, Wetland and Biodiversity Expert, TNGCC

TNCCM
Mr. Palwe Girish Haribhahu, IFS, Assistant Mission Director, TNCCM
Mr. N. Ashok Balaji, Project Coordinator, TNCCM
Ms. Kaveena M, Green Fellow, Ramanathapuram

D-2, 2nd Floor, Southern Park, Saket District Centre,
New Delhi-110 017, India
For more information, visit www.vasudha-foundation.org

Tamil Nadu has always led the nation in showing how growth and responsibility can go hand in hand. We are steadily building on our actions toward becoming a Net-Zero economy well before 2070. These District Decarbonisation Action Plans take this commitment deeper by bringing climate action closer to the people, to our villages, towns, and industries. When every district and every citizen joins hands, Tamil Nadu will demonstrate how sustainability can take root in local action and collective responsibility.

Thiru M.K.Stalin

Honourable Chief Minister of Tamil Nadu

“For Tamil Nadu, economic progress and environmental care go hand in hand and they are central to how we plan and govern. These District Decarbonisation Action Plans reflect our commitment to ensuring that development also builds climate resilience. They will guide each district to grow responsibly, aligning prosperity with the health of our land, air, and water. This is how we see the future of Tamil Nadu where fiscal discipline, environmental stewardship, and people’s well-being move forward together.”

Thiru Thangam Thennarsu

Honourable Minister for Finance,
Environment and Climate Change, Tamil Nadu

“The District Decarbonisation Action Plans strengthen Tamil Nadu’s commitment to integrating climate priorities into development planning. They bring together policy, people, and business to act on shared goals of resilience and sustainability. This approach reflects our focus on turning data and collaboration into practical outcomes that safeguard our environment and support inclusive growth. This is where the strength of Tamil Nadu truly lies, in turning science and policy into action that uplifts people and protects nature.”

Tmt. Supriya Sahu, I.A.S.

Additional Chief Secretary to Government, Environment, Climate Change & Forest Department, Tamil Nadu

“The District Decarbonisation Action Plans reflect Tamil Nadu’s participatory and bottom-up approach to climate action. They combine data, local experience, and cross-sector coordination to help districts plan and act with clarity. Through collaboration between departments, industries, and communities, TNGCC is working to ensure that every local effort contributes meaningfully to the state’s long-term climate goals.”

Thiru A.R. Rahul Nadh, I.A.S.

Director, Department of Environment and Climate Change, Tamil Nadu

Preamble

The District Decarbonisation Action Plan for Ramanathapuram has been developed with the overarching vision of enabling a low-carbon, climate-resilient, and economically inclusive future for the district. Anchored in scientific analysis, district-level energy modelling, and long-term climate projections, the plan outlines detailed sectoral strategies, emission trajectories, and actionable interventions tailored to Ramanathapuram's specific socio-economic and ecological context.

Situated along the southeastern coast of Tamil Nadu, Ramanathapuram is defined by its expansive coastline, vibrant fishing economy, and deep cultural and ecological heritage. At the same time, the district faces unique vulnerabilities stemming from rising temperatures, recurrent flooding, and increasing pressure on natural resources.

While some interventions—such as electrification of fishing fleets, transition to clean cooking fuels, and improved waste management—may entail short-term costs or disruptions, their long-term impacts are expected to be transformative. For instance, replacing diesel-powered fishing boats with electric alternatives can reduce operational costs, cut emissions, and improve air quality, contributing to both economic and environmental resilience.

A key pillar of the plan is nature-based carbon removal, leveraging Ramanathapuram's coastal and terrestrial ecosystems. Restoration and expansion of mangroves, seagrass, and seaweed habitats, alongside agroforestry on fallow lands, offer significant sequestration potential while enhancing livelihoods, land productivity, and community resilience.

The Action Plan cautions against a business-as-usual approach, which may seem economically viable in the near term but will likely accelerate ecosystem degradation, heighten climate risks, and erode the district's development gains. Instead, it advocates a forward-looking strategy—balancing technological decarbonisation with ecosystem restoration and climate adaptation.

By aligning sustainability with inclusive development, the plan sets a course for Ramanathapuram to not only meet Tamil Nadu's carbon neutrality goals but also become a model coastal district in climate leadership and just transition.

This brief provides a snapshot of the decarbonisation and climate action plan of Ramanathapuram, including infographics on the need for climate resilience and decarbonisation in the district in an easy-to-understand manner. It also includes ready to implement projects for near term, sectoral interventions elaborated in a decadal plan.

Executive Summary

Ramanathapuram is a coastal district in south-eastern Tamil Nadu, spanning 4,069 sq. km with a population of ~13.5 lakh (Census 2011). It is defined by a 276 km coastline, vibrant fishing economy, significant pilgrimage and heritage tourism, and unique coastal and marine biodiversity, including five Ramsar sites and multiple sanctuaries. The district's economy is shaped by marine fisheries, agriculture, MSMEs, and renewable energy production, with solar capacity exceeding 1.1 GW alongside gas-based power plants. Its geographical diversity—from sandy plains to rich coastal ecosystems—underpins both its livelihoods and its vulnerability to climate risks.

The district also forms a key part of the Gulf of Mannar Biosphere Reserve, one of India's first marine biosphere reserves, renowned for its rich coral reefs, seagrass meadows, and diverse marine life. This protected area not only sustains fisheries and coastal livelihoods but also serves as a vital carbon sink and a natural barrier against coastal erosion and extreme weather.

The district experiences a dry tropical climate with rising temperatures and erratic rainfall trends. Historical data (1951–2020) and climate projections under RCP8.5 indicate a temperature increase of up to 3.5°C and monsoonal rainfall increases of 33–82% (southwest) and 17–43% (northeast) by 2090. These shifts heighten vulnerability to high temperatures and floods, particularly in low-lying and coastal regions.

Why Transform Ramanathapuram into a Carbon Neutral and Climate Resilient Hub?

Credits: Pamban Bridge in Ramanathapuram; Source: Ramanathapuram District Administration

DISTRICT HIGHLIGHTS

5 Ramsar Sites - Gulf of Mannar Biosphere Reserve and 4 Bird Sanctuaries: Chitrangudi, Kanjirankulam, Sakkarakottai and Therthangal

GDDP: **49.8%** by service sector, 30.65% by industries with **~12,000** MSMEs

Wetlands cover **18.05%** of the district's geographic area (highest in Tamil Nadu)

Contributes **14%** of TN & **2.6%** of India's marine fish catch - vital for livelihoods and exports

CLIMATE PROFILE

976 mm
Annual rainfall

22.77°C to 34.7°C
Annual temperature range

0.9°C to 3.5°C
Projected increase in maximum summer temperature by 2090

33% - 82%
Rise in SW monsoon rainfall by 2090

17% - 43%
Rise in NE monsoon rainfall by 2090

GHG EMISSIONS (2022)

1,999 $ktCO_2e$
Gross and net emissions are same since carbon sequestration is negligible

Key Contributors
(% of Gross Emissions)

28% Public Electricity Generation

11% Road Transport

10% Captive Power Plants

26% Non-CO_2 emissions (paddy cultivation, livestock and agriculture soils)

6% Fisheries

TRANSFORMATION POTENTIAL

Potential to be carbon neutral by 2047

Rameswaram as **eco-spiritual & carbon neutral hub** - attracting global recognition

1,064 $ktCO_2e$
Annual mitigation potential by 2050 across interventions

(-944) $ktCO_2e$
Annual sequestration by 2050

Blended Finance and Community-Ownership Models, to sustain low carbon interventions

Gulf of Mannar: Preserving ecosystems, sustaining resilient livelihoods.

Low-Carbon Interventions and Ecosystem-Livelihood Co-benefits

Blue-Green Ecosystem

-944 $ktCO_2e$*

Intervention

- Enhance the carbon stock density of the existing forest
- Agroforestry in waste/fallow lands
- Restoration of mangroves, seagrass and seaweed

Resilience & Co-benefits

- Strengthens coastal climate resilience and heat resilience.
- Enable sustainable fishing and climate-resilent agriculture
- Enhances water security and water salinity management

Economics and Livelihood Improvement

- Promotes ecotourism and green entrepreneurships
- Strengthens fishers livelihood through value- added product development.
- Expands access to climate insurance, farmers's institution, market access
- Support livelihood opportunities for women and youth
- Improves energy access.

Sustainable Tourism

87 $ktCO_2e$*

Intervention

- Addition of 600 electric public buses, 6,000 electric 3Ws (autos) and 48,000 electric 4Ws (taxis) by 2050
- Adoption of 72,000 electric cookstoves in hotels/restaurants by 2050
- Low Carbon Eco-Spiritual Corridor- connecting Rameswaram Temple to Dhanushkodi and other hotspots using electric buses and shaded pathways for non-motorized transport.

Resilience & Co-benefits

- Reduced indoor and outdoor pollution
- Improved air quality
- Better energy access

Economics and Livelihood Improvement

- Decent working conditions
- Enhanced access to affordable and shared mobility

Sustainable Fisheries

125 $ktCO_2e$*

Intervention

Electrification of ~3300 mechanised and motorised fishing vessels by 2050

Resilience & Co-benefits

- Zero exhaust emissions →cleaner coastal air and water
- No diesel spills, safer marine ecosystems

Economics and Livelihood Improvement

- Resilience to fuel price shocks
- Improved efficiency and operational performance
- Community ownership of solutions

NMT: Non-motorised Transport; PBS: Public Bike Sharing

*Denotes mitigation potential

What Does Climate-Resilient Development Deliver?

- Stronger community adaptive capacity
- Climate-resilient communities with reduced risks from heat, drought, extreme weather and enhanced thermal comfort
- Smarter water management (restoration, recharge, efficiency, reuse, reduced salinity)
- Climate-informed planning, governance, and disaster readiness
- Conservation and restoration of ecosystems, supporting tourism
- Climate-informed planning, governance, and disaster readiness
- Bankable green projects, access to climate finance, green jobs, and livelihood security

Low Carbon and Resilient Pathways for Ramanathapuram

As climate risks intensify energy demand, addressing emissions in alignment with broader climate goals would be essential for Ramanathapuram.

In 2022, the district's GHG emissions were estimated at ~2000 $ktCO_2e$, with energy sector contributing 62% (1,247 $ktCO_2e$), AFOLU 34% (674 $ktCO_2e$), and waste 4% (78 $ktCO_2e$). Overall, key emission sources include public electricity generation (559 $ktCO_2e$), rice cultivation (248 $ktCO_2e$), road transport (224 $ktCO_2e$), and fisheries (119 $ktCO_2e$).

Under the Business-as-Usual (BAU) scenario, gross GHG emissions are projected to decline to 1,746 $ktCO_2e$ by 2050. This reduction is driven primarily by the planned retirement of the gas-based public electricity generation units and the organic uptake of electric vehicles under current policy trajectories. Energy sector emissions under BAU are expected to fall from 1,247 $ktCO_2e$ in 2022 to approximately 664 $ktCO_2e$ by 2050, while the IPPU sector emissions are expected to remain unchanged at 0.03 $ktCO_2e$. Emissions from the AFOLU sector are projected to increase from 674 ktCO2e in 2022 to 1006 $ktCO_2e$ by 2050 and waste sector emissions are anticipated to marginally reduce to 76 $ktCO_2e$.

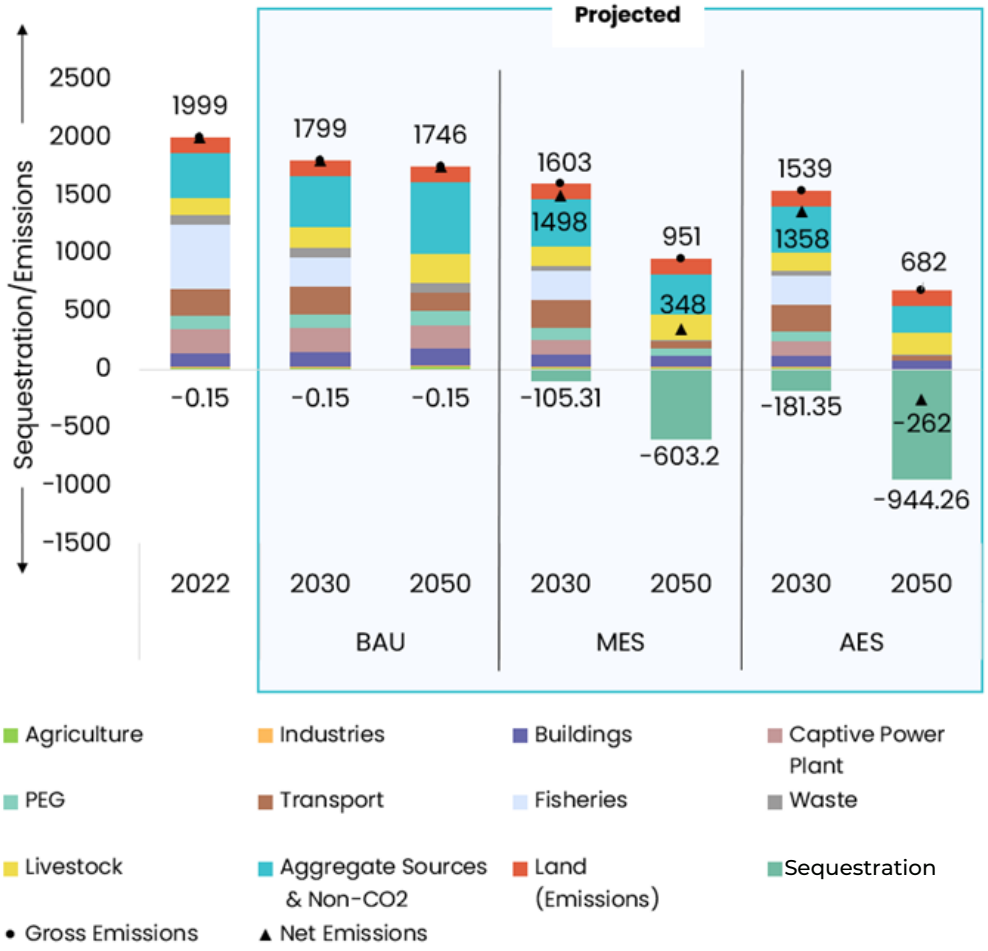


Figure i: GHG emissions (in $ktCO_2$) in Ramanathapuram in 2022 (actual), 2030 and 2050 (projections) under BAU, MES and AES

The **Aggressive Effort Scenario (AES)** achieves **net-negative emissions of 262 $ktCO_2e$ by 2050** through a combination of deep mitigation and large-scale sequestration. Mitigation measures include complete electrification of ~3,300 mechanised and motorised fishing vessels, 100% electrification of two, three, and four-wheelers and high-capacity goods vehicles, electrification of agricultural pumps and machinery, phasing out fossil-based captive power, and widespread adoption of electric cooking solutions. These reduce gross emissions to **~682 $ktCO_2e$ by 2050** (a 61% drop from 2022 levels).

The AES also incorporates extensive nature-based carbon removal measures. It is proposed that 40 to 50 percent of the district's available barren, fallow, and cultivable-waste land be converted to social and agroforestry. Agroforestry in 99597 hectares of barren/fallow land could potentially sequester 876 $ktCO_2e$/year annually by 2050. Further, other blue-carbon interventions include the restoration of ~304 hectares of mangroves, expansion of seagrass meadows and seaweed cultivation by 2000 hectares, and seaweed cultivation in 2000 hectares, combined with respective sequestration potentials of 28 $ktCO_2e$, 26.4 $ktCO_2e$. In addition, enhancement of forest carbon stock density is projected to further sequester 13 $ktCO_2e$. Collectively, these interventions are expected to achieve approximately 944 $ktCO_2e$ of annual sequestration by 2050, exceeding the district's residual emissions and enabling a net-negative emissions outcome.

Through a coordinated strategy combining targeted sectoral mitigation measures, accelerated deployment of renewable energy, and extensive ecosystem restoration for carbon sequestration, Ramanathapuram is projected to achieve carbon neutrality by 2045, positioning the district as a model for low-carbon, climate-resilient development in Tamil Nadu's coastal regions.

KEY SECTORAL INSIGHTS

The developed pathways focus on key emitting categories, exploring a range of distinct interventions aimed at reducing emissions while ensuring that the transition aligns with ongoing programmes and schemes at both the state and central levels. The pathways explore three emission scenarios for Ramanathapuram through 2050: Business as Usual (BAU), Moderate Effort Scenario (MES), and Aggressive Effort Scenario (AES). (Figure ii)

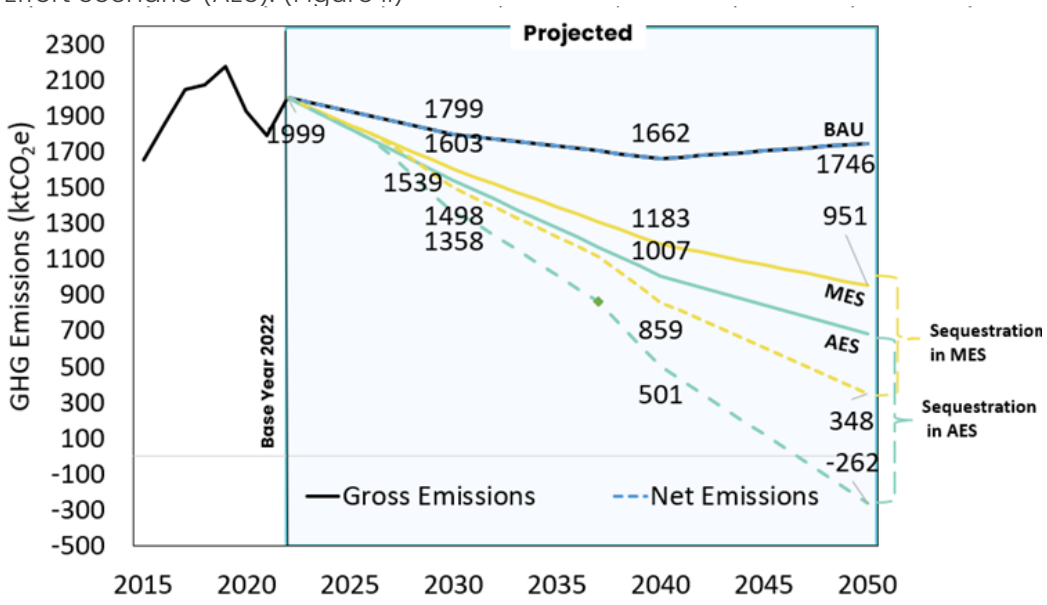


Figure ii: Actual emissions till 2022 and projections by 2050 under BAU, MES and AES scenario, in Ramanathapuram, in $ktCO_2e$

Emissions are projected to decline from 1999 $ktCO_2e$ to 1746 $ktCO_2e$ under business as usual scenario due to planned retirement of the gas-based public electricity generation units and adoption of electric vehicles. This abatement can be further accelerated through aggressive sectoral decarbonisation strategies as mentioned in this plan – enabling Ramanathapuram to attain carbon neutrality by 2047 and net-negative emissions by 2050. The key messages emerging from the plan are:

A structured decarbonisation of the fishing industry will play a major role in Ramanathapuram's carbon neutrality

Fishing is a major livelihood generating sector in Ramanathapuram, but it relies heavily on diesel as a fuel for operating boats and other fishing equipment, which drove 119 $ktCO_2e$ of GHG emissions in 2022. This is further projected to increase to 125 $ktCO_2e$ in 2050 due to sectoral growth. By electrifying all existing ~3300 mechanized and motorised fishing boats by 2050, ~38 kt of diesel and ~125 $ktCO_2$ of sectoral emissions could be reduced annually.

Electrification of transport, clean cooking and proper waste management among other interventions could help the district curtail emissions from its tourism sector

Transportation fleet in Ramanathapuram is predicted to expand as tourism in the district grows – boosting transport activities. This fleet is currently run on fossil fuels. Current market dynamics and policies are expected to promote higher adoption of electric vehicles, reducing emissions from road transport from 224 $ktCO_2e$ in 2022 to 155 $ktCO_2e$ in 2050. Further, 100% penetration of EVs in new sales of 2W, 3W, 4W and buses and 80% penetration in new sales of Heavy Good Vehicles (trucks, trolleys) could curtail up to 76% of remaining emissions in 2050.

Behavioural interventions can abate emissions over and above the projected abatement. A shift in transportation mode from 4W cars to public buses by one-tenth commuters in Ramanathapuram can lead to an additional abatement of ~13.2 $ktCO_2e$ of GHG emissions by 2050. This would also avoid the need for ~6100 four-wheelers on the road, replacing it with an addition of ~280 buses. Non-motorized transport, smart traffic systems and other interventions as listed in detail in this report could supplement these efforts.

Cooking in Ramanathapuram's residential and commercial sector has historically been dominated by LPG, meeting 94% of sectoral energy demand. With growth in population, emissions from cooking are predicted to increase from 97 $ktCO_2e$ in 2022 to 116 ktCO2e by 2050. Policy shifts promoting conversion of LPG cylinder usage to PNG, and adoption of electric cook stoves – increasing their penetration from 4 per 100 HH in 2022 to at least 28 in 100 HH in 2050 will reduce emissions to 70 $ktCO_2e$ by 2050. Further, biomass pellets processed from palm tree residues could also be used for clean cooking and for heating fuel in buildings.

Waste in Ramanathapuram accounts for 4% of total economy-wide emissions, with domestic wastewater contributing the largest share (77%), followed by solid waste (15%) and industrial wastewater (8%). Emissions from the waste sector are expected to remain almost constant, from 78 $ktCO_2e$ in 2022 to 76 $ktCO_2e$ in 2050. Through waste avoidance, community-based composting, waste reuse/recovery and other waste management interventions, 57 $ktCO_2e$ can be abated. Adoption of Zero Liquid Discharge processes by the industries and sludge waste treatment can further curtail 5 $ktCO_2e$ by 2050.

Electrification across sectors will nearly triple the electricity demand by 2050. Additional renewable energy sources could be harnessed to meet this demand

Ramanathapuram is an electricity-surplus district, with a total electricity generation of 2,483 GWh and electricity consumption, including captive power plants, amounting to 1000 GWh in 2022. Scope 2 emissions are solely attributed to gas-based public electricity generation units. Due to their high variable costs and a typical economic lifetime of 25 years, these gas plants are expected to fully retire by 2033. Further electrification across fishing, transport, agriculture, building and other sectors is also expected to increase electricity demand from current levels to approximately 2893 GWh by 2050 – (Figure iii) Procurement of electricity to meet the district's demand will result in 816 $ktCO_2e$ of potential Scope 2 emissions.

By installing an additional RE capacity of at least 0.7 GW, supplementing the existing RE capacity of 1.05 GW, the district will not only meet this demand but in doing so, also abate the potential Scope 2 emissions. Rameswaram, a water-locked municipality, also has an offshore wind potential of 1 GW (at 100 m agl). Further assessments of utility-scale solar, rooftop solar, onshore wind, and biomass could contribute to maintaining Ramanathapuram's status as an electricity-surplus district in 2050.

In the 'Solar PV Potential of India: Ground Mounted' assessment report published in September 2025, the National Institute of Solar Energy (NISE) has estimated a potential of ground-mounted solar capacity of 9.7 GW in the Ramanathapuram district. This potential assessment is based on a dynamic land use modeling that identify 10% of total wasteland with high irradiance and adequate

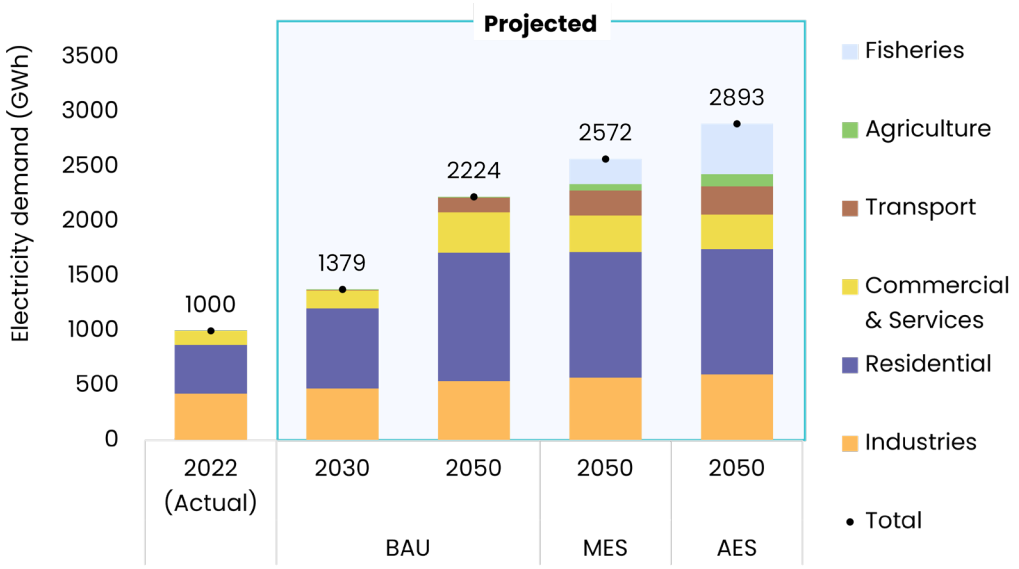


Figure iii: Sector-wise electricity demand, across scenarios, in GWh

Deep electrification of fisheries and agriculture sector will drive increase in electricity demand in the decarbonisation scenario.

grid access as feasible site for deployment of ground mounted solar in the State. Realising this potential in medium to long term will make the district carbon neutral from electricity standpoint, and support the state's vision of achieving net zero by 2070.

Deep electrification and energy efficiency initiatives lead to reduction of final energy consumption, making them key drivers of a sustainable energy future

Implementing energy efficiency measures, deep electrification (particularly in industry and transport), and fuel switching from LPG to PNG in the AES 2050 scenario reduces total energy demand to roughly 13 PJ—about a 23% drop compared to BAU 2050. This shift is driven by higher EV adoption in transport (replacing gasoline and diesel vehicles) and electric furnaces in industry (replacing fossil-fueled processes), which together reduce fuel consumption and improve overall system efficiency. Electricity's share in final energy jumps significantly—from around 7.6 PJ in BAU 2050 to over 11.2 PJ in the AES scenario—while the contribution from fossil fuels such as diesel, gasoline, coal, and bitumen declines. Likewise, the substitution of LPG with PNG in residential and commercial applications not only curbs direct emissions but also lowers primary energy use due to PNG's cleaner combustion characteristics and potential for more efficient distribution. (Figure iv)

Temperature control in the building sector i.e., setting the AC to 24–26°C can supplement sectoral abatement. A conservative increase in the temperature setting by 2°C from 24°C to 26°C could reduce electricity demand by approximately 57 GWh, saving ~40 ktCO2e (Scope 2) emissions. Additionally, smart lighting solutions can prevent 40% of lighting electricity usage or 17 GWh in Ramanathapuram district. Additionally, promoting the implementation of cool roofs can contribute to lowering cooling energy demand in buildings and advancing overall energy efficiency goals

Decarbonising the non-energy sector would drive to carbon neutrality and potential carbon negative future

As of 2022, total non-energy emissions in Ramanathapuram stood at 752 $ktCO_2e$ (~37% of total emissions), primarily led by aggregate sources and non-CO_2 emission sources on land (52%, 389 $ktCO_2e$), which includes emissions from rice cultivation (33%, 248 $ktCO_2e$), agriculture soil (18%, 138 $ktCO_2e$) and biomass burning in cropland (0.4%, 3 $ktCO_2e$), followed by livestock (20%, 147 $ktCO_2e$), land (18%, 138 $ktCO_2e$) and waste sector (10%, 78 $ktCO_2e$). In BAU, the total non-energy emissions are

projected to increase by 331 $ktCO_2e$ to 1005 $ktCO_2e$ (~58% of total emissions) by 2050, significantly increasing the sectoral contribution to the total emissions. The emissions from aggregate sources alone are projected to increase by 221 $ktCO_2e$ with predominant contributions from agriculture soil (137 $ktCO_2e$) and rice cultivation (84 $ktCO_2e$).

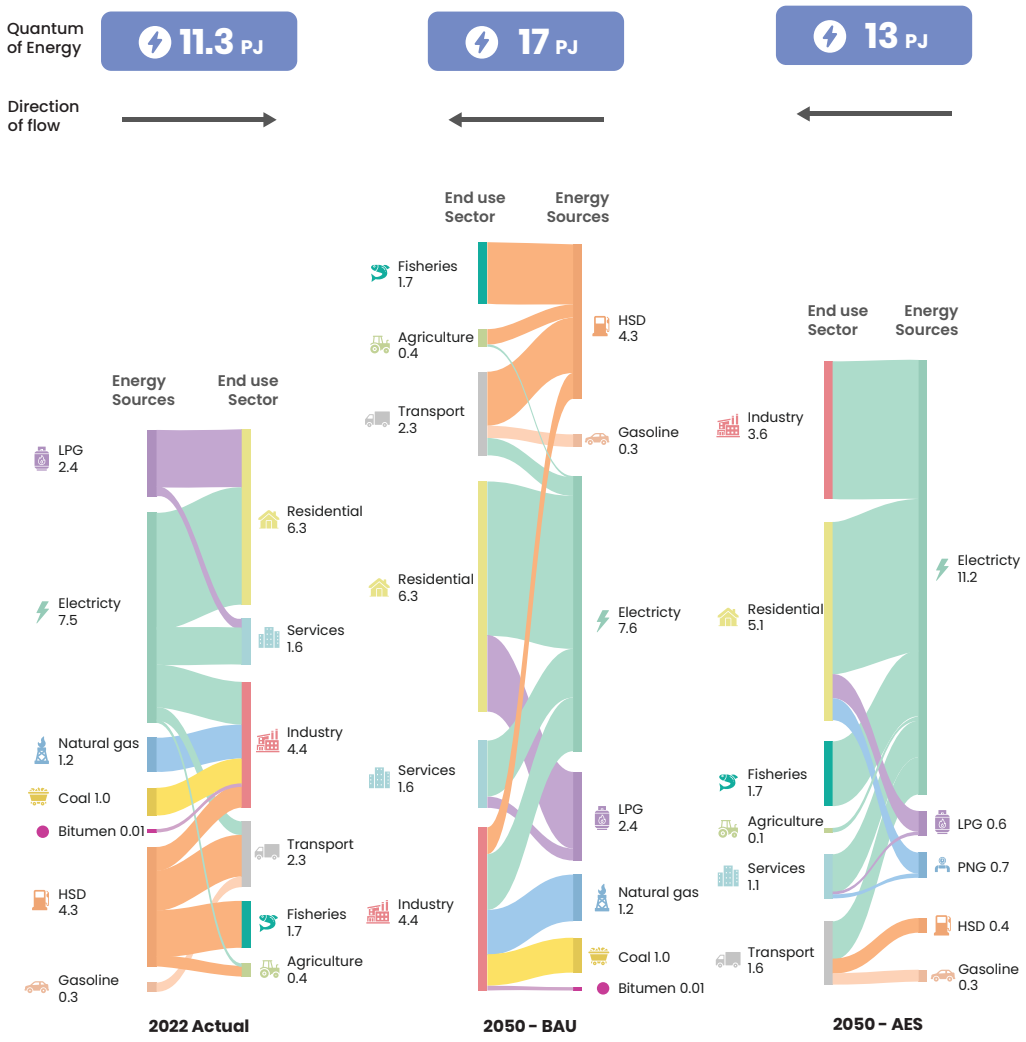


Figure iv: Fuel to sector linkages in Ramanathapuram, across scenarios, in PJ Electricity can replace fossil fuels across sectors by 2050, aligned with the decarbonisation plan

Around half of the projected non-energy emissions in 2050 can be abated by adoption of sustainable agriculture practices and targeted interventions in livestock management

Replacing synthetic fertilisers and urea with organic fertiliser and nano urea, and increasing the percentage of multiple aeration in the rice cultivated area would help to reduce the emissions from the agriculture sector. Under AES, transitioning 75% of agriculture area to organic fertiliser and increasing the multiple aeration for rice cultivation from 20% to 77%, will reduce 206 $ktCO_2e$ and 177 $ktCO_2e$ of emissions respectively, by 2050. Similarly, through introduction of balanced rationing (90% of livestock), improved methanogen inhibiting feed supplements (75% of livestock) and manure management practices, 71 $ktCO_2e$ of emissions from livestock category, arising from methane, can be abated by 2050. Additionally, efficient waste management through centralised treatment for urban, septic tanks for rural and fecal sludge treatment plants at Firka level, zero liquid discharge, composting organic waste, reuse etc. can abate 62 $ktCO_2e$ by 2050 from the largely static waste sector.

In addition to the emission reduction interventions the rich coastal ecosystem of Ramanathapuram provides immense opportunity for land and blue carbon sequestration

Restoring mangroves, implementing agroforestry practices, increasing carbon stock density, and enhancing seagrass and seaweed ecosystems have the potential to sequester up to 944 $ktCO_2e$ annually by 2050. About 73% of this can be achieved by monitoring and removing encroachments of forest lands and dedicating current barren, fallow and non-cultivable lands to social and agroforestry, with a special focus on community and village forests for enhanced local participation. Restoration of degraded coastal and inland areas, such as expanding mangrove cover along the 276 km coastline, could further offer co-benefits like biodiversity preservation and coastal protection (Figure v). This aligns with and can overtime benefit from support under other State initiatives, including the Marine Resource Foundation that has been announced in the TN State Budget 2025-26 with an initial funding of Rs. 50 crore to focus on mangrove forest conservation and sustainable marine resource management.[1]

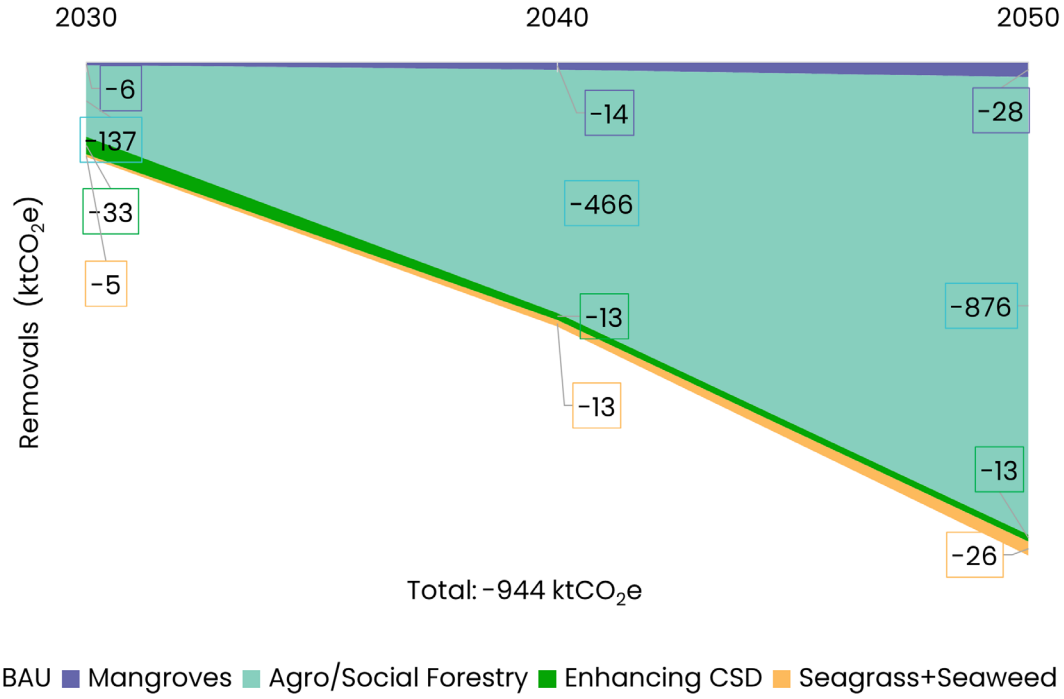


Figure v: Carbon sequestration potential under aggressive effort scenario (AES), by 2050, in $ktCO_2e$

Ramanathapuram's decarbonisation strategy emphasises renewable energy adoption, electrification of key sectors, preservation and enhancement of natural carbon sinks. By implementing these measures, the district can surpass its climate goals, achieve net-negative emissions, and contribute significantly to Tamil Nadu's and India's carbon neutrality targets while enhancing resilience against climate impacts.

RAMANATHAPURAM
Path to Decarbonisation

Ramanathapuram has the potential to become carbon neutral by 2047, and achieve a net negative of ~262 $ktCO_2e$ by 2050 – all the while transforming itself into a sustainable tourism hub. Some key interventions that could support this through sectoral decarbonisation and enhancement of the district's sequestration potential are as follows:

Total Emissions (2022): 1,999 $ktCO_2e$

- **Annual Growth in Emissions (2005 to 2022) : 3.9%**
- **Per Capita Emissions (2022): 1.40 tonnes CO_2e per capita**
- **Emission Intensity Reduction in 2022 w.r.t 2005: 66%**

Electrification of INDUSTRIES

AMP: 226 $ktCO_2e$ (12.94% of gross emissions)

- Replace existing **~87 MW** fossil-fuel-based Captive Power Plants (CPPs) with equivalent renewable energy capacity of **~156 MW** (solar, wind and GH2) by 2050
  AMP: 209 $ktCO_2e$
- Replacement of HSD by biodiesel in diesel generators for backup supply/renewable-based backup supply support
  AMP: 17 $ktCO_2e$
- Explore electrification of heating processes in industries to reduce fossil fuel consumption (Furnace Oil, HSD, etc.)

Electrification of TRANSPORT

AMP: 118 $ktCO_2e$ (6.76% of gross emissions)

- Promote 100% penetration of electric vehicles in **2W, 3W, 4W** and buses, and **80%** penetration of heavy goods vehicles (trucks, trolleys) in new sales by 2050
- Install ~400 charging stations and development of other allied clean mobility and sustainable transport in Ramanathapuram by 2050

Stock of EVs in 2050

e - 2W **~1.8 lakh**	e - 3W **6,000**	e - 4W **0.48 lakh**	
e - buses **600**	e - Heavy Goods Vehicles (HGVs) **500**		

Electrification of Fishing Boats

AMP: 125 $ktCO_2e$ (7.16% of gross emissions)

- Electrify **~3,300 mechanised and motorised fishing** vessels by 2050

CARBON SEQUESTRATION

ASP: 944 $ktCO_2e$ (54.08% of gross emissions)

- Repurposing **996** ha of barren/fallow lands to horticulture, agro/social forestry
  ASP: 876 $ktCO_2e$/yr
- Enhance Carbon Stock Density by 5.5% from the existing **~82.25 tCO_2/ha to 86.25 t/ha** through reforestation/ afforestation and sustainable forest management
  ASP: 13.36 $ktCO_2e$/yr
- Restoring 304 ha of mangrove forests **ASP: 28 $ktCO_2e$/yr**
- Enhancement of seagrass and seaweed by 20 sq km
  ASP: 26 $ktCO_2e$/yr

*AMP stands for Annual Mitigation Potential
**ASP stands for Annual Sequestration Potential

Scope 2 denote indirect GHG emissions from purchase of energy (electricity, heat, steam etc).

AGRICULTURE

AMP: 477 $ktCO_2e$ (27.32% of gross emissions)

Electrify 1,400 tractors and tillers with EVs by 2050 **AMP: 5 $ktCO_2e$**

Convert 5,837 diesel pumpsets to solar pumps by 2050 **AMP: 16 $ktCO_2e$**

90% balanced rationing and **75% methanogen** inhibiting feed additives for livestock and 90% manure management through biogas plantsby 2050 **AMP: 71 $ktCO_2e$**

Increase multiple aeration water regime from **20% to 77%** for rice cultivation by 2050 **AMP: 178 $ktCO_2e$**

Replace synthetic nitrogen fertiliser and urea with **75% organic** fertiliser and **25% nano-urea** **AMP: 207 $ktCO_2e$**

39 mini weather monitoring stations (rainfall and temperature)

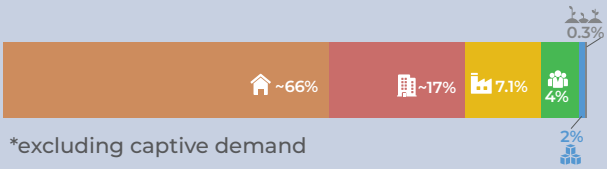
Capacity building to promote sustainable modernisation

ELECTRICITY

AMP: 816 $ktCO_2e$ (Scope 2)

Electricity Generation: **~2,497 MU (2023-24),** about **71%** of which is driven by solar power, followed by gas turbines at **~29%**.

Electricity consumption: **625 MU** (2023-24)
Led primarily by:



*excluding captive demand

PEG Units – that contribute **28% (559 $ktCO_2e$)** of gross emissions – are expected to retire by 2033 as per their economic lifecycle, fully abating the related emissions.

Electricity demand is expected to nearly triple from **1,000 GWh** in **2022 to 2,893 GWh** by **2050** under AES

A holistic assessment for setting up an additional RE capacity of at least **0.7 GW** (including solar plants on existing salt pans), supplementing the existing RE capacity of **1.05 GW,** could meet future electricity demand while abating Scope **2 emissions**

WASTE

AMP: 61 $ktCO_2e$ (3.53% of gross emissions)

(Scope 2) **5 $ktCO_2e$**

Improved wastewater treatment by 2040 **AMP: 48 $ktCO_2e$**
Urban: **71 MLD** centralised sewage treatment and **100% UGD connection**
Rural: Twin pit septic tanks for **1.7 lakh households** and **38 FSTPs** at Firka level

Install **1 MW** of waste-to-energy plant, requiring ~30 tons of waste per day, by 203 **AMP: 5 $ktCO_2e$**

Setting up of ETPs and a continuous treated effluent monitoring system for **4 MLD industrial wastewater** by 2050, and strict adherence to zero liquid discharge **AMP: 5 $ktCO_2e$**

100% segregation at source and processing of municipal solid waste with zero landfilling through **38 rural and 8 urban recycling centres** and **8 urban composting** units **AMP: 8 $ktCO_2e$**

BUILDINGS (Residential, Commercial and Services)

AMP: 57 $ktCO_2e$ (3.26% of gross emissions)

(Scope 2) **136 $ktCO_2e$**

Scope 1

Transition from LPG to PNG, and gradual adoption of **~0.72 lakh electric cook stoves** by 2050 **AMP: 29 $ktCO_2e$**

Install a biogas plant of ~15,000 m^3/day capacity by 2050 **AMP: 28 $ktCO_2e$**

Scope 2

Adopt **~4 lakh 3-5 star ACs and 4.2 lakh refrigeration units,** primarily by 2040. **AMP: 106 $ktCO_2e$**

Add **7.3 lakh** LED bulbs, **5.76 lakh** BLDC fans, and **0.5 lakh** LED street lights by 2030 **AMP: 30 $ktCO_2e$**

Domestic sector (434 MU) | Commercial sector (108 MU) | Industrial sector (44 MU)
Miscellaneous (14 MU) | Agriculture (2 MU) | Public works (23 MU)

Implementable Projects in Near Term

Ramanathapuram's decarbonisation plan presents an integrated pathway of mitigation, resilience, and development. It provides a replicable framework for other vulnerable districts in India striving to meet subnational climate targets while advancing livelihoods and ecological stability. This plan can be implemented in a phase-wise manner – focusing on the main convertible projects with high impact in short to near run to commence the implementation, to be further built upon in medium and long run.

Key projects with higher scope of conversion in short to near term are provided below:

1. **Sustainable Tourism through Electric Vehicles and Electric Cookstoves:** Emissions from the tourism sector in Ramanathapuram are majorly derived from transport, commercial and waste segments. By adding new or electrifying public buses and replacing stock of diesel run cookstoves with electric cookstoves, as much as 6 $ktCO_2e$ and 14 $ktCO_2e$ can be abated respectively in a short run, which is 1% of the gross emissions in 2030.

Interventions	Departments	Expected Cost (Rs. Crores)	Available Finance
Electrification of 100 (~10% of the stock) public buses by 2030	Ramanathapuram Regional Transport Office and State Transport Department	180[2]	Rs. 20.6 Crore available under PM E-DRIVE[3] with a supplementing Rs. 0.8 Crore under TN EV Policy 2023[4] Furthermore, the Rs. 70 Crore allocation made by SPCB to TN Transport Corporation[5] can be explored.
Adoption of 37,000 electric cookstoves	Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO)	7	Potential of Rs. 0.9 lakh electric cookstoves under National Efficient Cooking Program (NECP) which provides cookstoves at a low cost (35% concession)

Electrifying ~600 public buses by 2050 will extend the abatement to ~30 $ktCO_2e$ by 2050. Similarly, replacement of 0.72 lakh diesel run cookstoves with electric cookstoves could abate another ~30 $ktCO_2e$ in the long run.

Particularly in Rameswaram, which is one of the most famous pilgrim destinations and accounts for 90% of Ramanathapuram's total tourist count, tourism is an essential economic driver while also resulting in emissions since transport, food and lodging are yet fossil-fuel reliant. By electrifying ~15,000 2W, ~4,000 3W, ~3000 4W and ~85 buses and heavy goods vehicles in Rameswaram, 30.8 $ktCO_2e$ of emissions can be abated. An additional 5.7 $ktCO_2e$ of emissions can be abated through electric cooking and bio-methanation.

2. **Electrification of Fishing Boats:** Ramanathapuram's 274 km of coastline houses 179 fishing villages, accounting for 78.8 MT of marine and 4.8 MT of inland fish production. Emissions from fishing emerge due to diesel consumption in fishing boats. As much as 35 $ktCO_2e$ can be abated by 2030 through electrification of 900 fishing boats, negating ~2% of the gross GHG emissions. Additionally, solar cold storage systems and other technologies can be explored for decarbonising the value chain of the fishing industry.

Short Term Interventions	Departments	Expected Cost (Rs. Crores)
Electrification of 900 mechanised and motorised fishing vessels by 2030	Fisheries Department	26

Through subsequent electrification of 1432 mechanised and 2390 country craft fishing boats and motorised fishing vessels by 2050, the abatement potential will rise to 125 $ktCO_2e$.

3. **RE Installation to Abate Scope 2 Emissions:** Electrification across fishing, transport, buildings, and agriculture sectors, as suggested in this action plan, would triple the electricity demand—from 1000 GWh in 2022 to 2,893 GWh by 2050. Coupled with timely retirement of PEG units, this demand increase could create a supply lacunae and emissions, if energy is sourced from outside. By integrating an additional 0.7 GW of renewable energy capacity over and above the existing 1.05 GW, both the supply shortfalls and 816 $ktCO_2e$ of associated Scope 2 emissions can be abated. Integrating solar power generation with existing salt pan operations for dual land use and clean energy production could also be explored in the district. Achieving this requires conducting a potential assessment to gauge the scope at earliest.

Interventions	Departments	Expected Cost (Rs. Crores)
Potential assessment by 2030, followed by installation of 0.7 GW of RE capacity (in addition to existing RE capacity of 1.05 GW)	TN Energy Development Agency (TEDA) and State Energy Department	5,500

4. **Agro/Social Forestry in fallow and barren lands:** Ramanathapuram district has sizable stretches of fallow and underutilized lands. These lands offer significant potential for agro and social forestry interventions. By implementing targeted programs of social forests, agro forests, and horticulture plantations with native species, an annual carbon sequestration potential of 137 $ktCO_2e$ can be leveraged, offsetting gross emissions by 7.61% by 2030, apart from supporting soil conservation, rural livelihoods, and improving overall biodiversity of the region. The initiative will contribute to improving the district's green cover, reduce heat stress, and create long-term resilience against climate change.

Short Term Interventions	Departments	Expected Cost (Rs. Crores)	Policies/Funding Schemes
Social and agro forestry in 249 sq.km of barren/ fallow lands by 2030	Forest Department, Municipal Administration Department, Horticulture Department	349	Sub-Mission on Agro Forestry (SMAF), Green Tamil Nadu Mission, Green India Mission, State Compensatory Afforestation Fund Management and Planning Authority Fund (CAMPA), Trees Outside Forests in India initiative by MoEFCC and Government of Tamil Nadu

Further, expanding agro/social forestry over an additional 747 sq. km has the potential to mitigate 876 $ktCO_2e$ by 2050, offsetting gross emissions by 50.20%.

5. **Restoration of mangroves and enhancing seagrass meadows and seaweed cultivation:** Ramanathapuram district, located along the Gulf of Mannar, has ecologically significant stretches of mangroves and seagrass meadows. Enhancing these blue carbon ecosystems provide immense potential for carbon sequestration while offering critical co-benefits such as shoreline protection, improved fishery productivity, and enhanced biodiversity. By 2030, enhancing seaweed and seagrass ecosystems by 4 sq. km has the potential to sequester 5.3 $ktCO_2e$ annually, offsetting gross emissions by 0.29%, while restoring 61 ha of mangrove forests can sequester an additional 5.6 $ktCO_2e$ annually, offsetting gross emissions by 0.31%.

Short Term Interventions	Departments	Expected Cost (Rs. Crores)	Policies/Funding Schemes
• Enhancement of seaweed and seagrass both by 4 sq.km by 2030 • Restoring 61 ha of mangrove forests by 2030	Forest Department , Department of Fisheries, Department of Environment & Climate Change, Tamil Nadu State Wetland Authority	61	Green Tamil Nadu Mission, National Adaptation Fund on Climate Change (NAFCC), Blue Carbon Initiative (potential integration), State Coastal Zone Management Authority Programmes, CSR initiatives in coastal ecosystem management

Further, expanding seaweed and seagrass over an additional 16 sq. km has the potential to mitigate 26.4 $ktCO_2e$ by 2050, offsetting gross emissions by 1.51%. Restoration of an additional 243 ha of Mangroves has the potential to mitigate 28 $ktCO_2e$ by 2050, offsetting gross emissions by 1.60%.

6. **Enhancing Domestic Wastewater Treatment:**To overcome the risk of untreated discharge, the proposed intervention aims to achieve 100% treatment of domestic wastewater by 2040, thereby reducing projected GHG emissions from 61 $ktCO_2e$ under BAU to 13 $ktCO_2e$ annually. Beyond climate benefits, effective wastewater management will significantly improve public health by reducing the spread of waterborne diseases, ensuring cleaner water sources, and creating a healthier living environment for communities.

Emission Reduction Potential: **~48 $ktCO_2e$/year by 2040, mitigating gross emissions by 2.89%**

Short Term Interventions	Departments	Expected Cost (Rs. Crores)	Policies/Funding Schemes
Urban and Rural Wastewater Management by 2040: • Urban: Centralised treatment capacity of ≈ 72 MLD by 2040 • Rural: 1,70,704 households connected to septic tanks and 38 FSTPs for sludge treatment • Advanced DEWATS for campuses > 2500 m^2, resorts, restaurants etc	Forest Department , Department of Fisheries, Department of Environment & Climate Change, Tamil Nadu State Wetland Authority	294	Government initiated with possibilities for gap funding through private, CSR, Swachh Bharat Mission, Tamil Nadu Urban Development Project. Namakku Namae Thittam, Kalaignar Nagarpura Mempattu Thittam

7. **Shifting from synthetic nitrogenous fertilisers to nano urea and organic fertilisers:** Shifting from synthetic nitrogenous fertilisers to organic farming and nano urea substitution aims to reduce nitrous oxide (N_2O) emissions from agriculture. This transition enhances nutrient-use

efficiency, lowers the environmental footprint, and promotes soil health, thereby contributing to sustainable farming systems.

Emission Reduction Potential: **~ 25 $ktCO_2e$/year by 2030, mitigating gross emissions by 1.40%**

Short Term Interventions	Departments	Expected Cost (Rs. Crores)	Policies/Funding Schemes
• 15% agriculture area transitioned to organic farming • 30% of urea requirement met through nano urea	Horticulture Department, Environment and Climate Change Department, Agriculture Department	85	Farmer driven with possibilities of Government funds and subsidies under various listed schemes such as National Mission for Sustainable Agriculture, Chief Minister's Manniyur Kaathu Mannuyir Kappom Scheme (CM MK MKS), National Mission on Natural farming

Further, transitioning 75% of agricultural land to organic farming and meeting 15% of urea demand with nano urea by 2050 could mitigate 207 $ktCO_2e$ annually by 2050, mitigating gross emissions by 11.83%.

Financial incentives and allocations made available under AMRUT 2.0, Swachh Bharat Mission, Tamil Nadu Industrial Policy 2021, PM KUSUM, National Mission for Sustainable Agriculture, Pradhan Mantri Krishi Sinchayee Yojana, Green India Mission, Green Tamil Nadu Mission and other such policies/ schemes can further support the implementation of the decarbonisation plan.

Ramanathapuram Decarbonisation Plan

Key Interventions

The decadal target and the activities along with their mitigation potential, cost estimate, and supporting policies are as detailed in the table below:

	Key Intervention	Activity/Target	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Incentive under Central/ State Schemes and Policies
			Target	AMP in 2030 ($ktCO_2e$/ yr)*	Target	Cumulative AMP in 2040 ($ktCO_2e$/ yr)	Target	Cumulative AMP in 2050 ($ktCO_2e$/ yr)	
	Interventions to Mitigate Scope 1 Emissions								
A.	**Decarbonising the Energy Sector**								
A.1	Shift from Fossil-Fuel to RE based Captive Power Generation	Replacing/tying up PPAs from existing ~87 MW fossil-fuel based Captive Power Plants (CPPs) to equivalent renewable energy capacity of ~156 MW (solar, wind and GH2) by 2050.	~40% of the existing tied up capacity (equivalent RE capacity 65 MW)	87 (4.84%)	30% additional capacity (equivalent RE capacity ~50 MW)	154 (9.26%)	30% of the balance (equivalent RE capacity 50 MW)	209 (11.97%)	- 100% electricity tax exemption for 5 years on power generated and consumed from captive sources - Concessions on land purchase or lease through reduced stamp duty available under Tamil Nadu Industrial Policy 2021
A.2	Use of Electric Cookstove in Cooking	Adoption of ~0.72 lakh electric cookstoves in residential cooking by 2050	0.37 lakh	14 (0.78%)	0.3 lakh additional	25 (1.5%)	0.04 lakh additional	29 (1.66%)	Potential of covering 0.9 lakh electric cookstoves under National Efficient Cooking Program (NECP) which provides cookstoves at a low cost (35% concession)
A.3	Use of Biogas using Waste (Agrowaste, Cow Dung, Food Scaps etc)	Installing a biogas plant of approx 15000 m3/day capacity, considering 50% realisation of total potential of 30000 m3/day of the district	20% of the total capacity	6 (0.33%)	50% of the remaining	20 (1.2%)	30% of the remaining	28 (1.6%)	Potential of coverage of 12 small biogas plants of 25 m3/ day capacity (worth Rs. 0.08 crores) by March 2026 under National Biogas Programme. Higher coverage subject to scheme extension.

	Key Intervention	Activity/Target	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Incentive under Central/ State Schemes and Policies
			Target	AMP in 2030 ($ktCO_2e$/ yr)*	Target	Cumulative AMP in 2040 ($ktCO_2e$/ yr)	Target	Cumulative AMP in 2050 ($ktCO_2e$/ yr)	
A.4	Replacement of diesel pumps with solar pumps for irrigation	Conversion of 5837 diesel pumpsets to off-grid solar pumps by 2050	20% of the target	3 (0.17%)	40% additional	10 (0.6%)	40% remaining target	16 (0.92%)	Potential of covering 100 off-grid solar pumps of approx. Rs. 31.4 Crore under PM KUSUM (Component B) by December 2026. Higher coverage subject to scheme extension.
A.5	Use of EV tractor and tillers for agriculture land preparation	Electrifying ~1400 tractors and tillers with EV by 2050	NA	0	600	2 (0.12%)	800	5 (0.29%)	
A.6	Replacement of HSD by Biodiesel in Diesel Generator for Backup Supply / Renewable based Backup Supply Support	"Replacement of HSD by Biodiesel in Diesel Generator for Backup Supply / Renewable based Backup Supply Support • Exploring biodiesel availability production in the district (assessment) • Pilot implementation of biodiesel use in commercial DG sets / RE based backup supply support • Using biodiesels in all the DG sets in the districts"	To be assessed						

	Key Intervention	Activity/Target	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Incentive under Central/ State Schemes and Policies
			Target	AMP in 2030 ($ktCO_2e$/ yr)*	Target	Cumulative AMP in 2040 ($ktCO_2e$/ yr)	Target	Cumulative AMP in 2050 ($ktCO_2e$/ yr)	
B.	**Shift to Electric Mobility*** *The target suggested in below mentioned interventions are over and above the stock in BAU scenario.								
B.1	Shift to EV 2 Wheeler	Increasing the share of EV in 2W sales to achieve 100% penetration (upto ~1.8 lakhs EV 2W) by 2050	0.03 lakh	1.42 (0.08%)	0.28 lakh additional	13 (0.78%)	1.49 lakh	22 (1.26%)	The current market price of EV 2W are comparable with the ICE counterparts, hence market dynamics will decide the pace of 2W EV sales. However, a sum of Rs. 1.8 crore (Rs. 1.5 crore + Rs. 0.3 crore) is available under current center and state policies (PM E-DRIVE Scheme 2024 and TN zEV Policy 2023) for 3000 2W EVs. Higher coverage possible subject to scheme extension.
B.2	Shift to EV 3 Wheeler	Increasing the share of EV in 3W sales to achieve 100% penetration (upto ~6000 EV 3W) by 2050	~300	0.415 (0.02%)	1500 additional	2.30 (0.14%)	4200 additional	4 (0.23%)	The current market price of EV 3W are comparable with the ICE counterparts, hence market dynamics will decide the pace of 3W EV sales. However, a sum of Rs. 1.13 crore (Rs. 0.23 crore + Rs. 0.9 crore) is available under current center and state policies (PM E-DRIVE Scheme 2024 and TN EV Policy 2023) for 300 3W EVs. Higher coverage possible subject to scheme extension.

	Key Intervention	Activity/Target	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Incentive under Central/ State Schemes and Policies
			Target	AMP in 2030 ($ktCO_2e$/ yr)*	Target	Cumulative AMP in 2040 ($ktCO_2e$/ yr)	Target	Cumulative AMP in 2050 ($ktCO_2e$/ yr)	
B.3	Shift to EV 4 Wheeler	Increasing the share of EV in 4W sales to achieve 100% penetration (upto ~0.48 lakhs EV 4W) by 2050	~500	1.17 (0.07%)	5000 additional	10 (0.6%)	43000 additional	23 (1.32%)	Maximum incentive of up to Rs. 1.5 lakh for 4W commercial vehicle is available under TN EV Policy 2023 for a maximum of 3000 vehicles per year.
B.4	Shift to EV Buses	Increasing the share of EV buses in sales to achieve 100% penetration (upto ~600 EV buses) by 2050	100	6 (0.33%)	400 additional	27 (1.62%)	100 additional	31 (1.78%)	The current market price of electric buses are comparable with the ICE counterparts, hence market dynamics will decide the pace of EV buses' sales. However, a sum of Rs. 21.4 crore (Rs. 20.6 crore + Rs. 0.8 crore) is available under current center and state policies (PM E-DRIVE Scheme 2024 and TN EV Policy 2023) for 75 EV buses. Higher coverage possible subject to scheme extension.
B.5	Shift to Electric based Heavy Goods Vehicles (HGVs)	Increasing the share of electric Heavy Goods Vehicles (trucks, trolleys) in sales to achieve 80% penetration (upto ~500 EV HGVs) by 2050	20	1.46 (0.08%)	250 additional	20 (1.2%)	200 additional	38 (2.18%)	
B.6	Creation of EV Charging Infrastructure	Installation of ~400 charging stations in total by 2050	33	NA	140	NA	227	NA	Incentives worth Rs. 1 lakh for slow charging and Rs. 10 lakh for fast charging stations are available under TN EV Policy 2023 and further coverage under PM E-DRIVE subject to scheme extension.

	Key Intervention	Activity/Target	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Incentive under Central/ State Schemes and Policies
			Target	AMP in 2030 ($ktCO_2e$/ yr)*	Target	Cumulative AMP in 2040 ($ktCO_2e$/ yr)	Target	Cumulative AMP in 2050 ($ktCO_2e$/ yr)	
B.7	Electrification of Mechanised and Motorised Fishing Vessels	Electrifying ~3300 mechanised and motorised fishing vessels by 2050	900	35 (1.95%)	1171	80 (4.81%)	1158	125 (7.61%)	
C.	**Decarbonising the Industry Sector**								
C.1	Exploring Electrification of Heating Processes in Industries to Reduce Fossil Fuel Consumption (Furnace Oil, HSD etc)	Identification of heating processes for electrification by 2050.	25% of the target	4 (0.22%)	20% additional	10 (0.6%)	55% of the remaining target	17 (0.97%)	
	Total Scope 1 Mitigation Potential (ktCO2e)		**159.0** (8.86%)		**373.2** (22.46%)		**548** (31.33%)		
	Interventions to Mitigate Scope 2 Emissions (Electricity Sector)								
a	Additional RE capacity integration of 0.7 GW (in addition to existing RE capacity of 1.05GW)"	Electrifying ~3300 mechanised and motorised fishing vessels by 2050 • Potential Assessment for various RE sources including rooftop solar, utility scale, wind, floating solar, agro PV and others) • Installation as per assessment	NA	0.00	0.25 GW of the additional RE capacity integration target	276	0.5 GW of the remaining RE capacity integration target	816	- Subsidy maximum up to Rs. 78,000 for rooftop system under PM Surya Ghar Muft Bijli Yojana

	Key Intervention	Activity/Target	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Incentive under Central/ State Schemes and Policies
			Target	AMP in 2030 ($ktCO_2e$/ yr)*	Target	Cumulative AMP in 2040 ($ktCO_2e$/ yr)	Target	Cumulative AMP in 2050 ($ktCO_2e$/ yr)	
b	Energy Efficiency (EE) improvements*	Installation of ~4 lakh 3/5 star EE ACs in residential spaces to replace old/ inefficient ACs	1.9 lakh	48	1.2 lakh	74	0.9 lakh	96	
		Installation of 3/5 star EE refrigeration units up to a total of 4.2 lakh by 2050	2.74 lakh	4	1.24 lakh	10	0.22 lakh	10	
		Replacing existing ~7.3 lakh incandescent/CFL bulbs and tubelights with LED in residential space by 2030	100%	2	NA	3	NA	5	
		Replacing ~0.5 lakh street lights with LED lights by 2030	100%	21	NA	21	NA	21	
		Adoption of ~5.76 lakh BLDC fan by 2030, to a total of ~6 lakh by 2050.	5.76 lakh	2	0.15 lakh	4	0.09 lakh	4	
c	Utilizing biodegradable waste to generate electricity	Installation of waste to energy plant of 1 MW (the plant will require ~30 tons waste per day) by 2030	100%	5	NA	5	NA	5	Potential for covering 1MW project worth INR. 2 crore under National Mission for Waste to Wealth (Policy for Promotion of City Composting)
	Total Scope 2 Mitigation Potential ($ktCO_2e$)		**77.0**		**387.3**		**952**		

Non Energy Interventions

	Key Intervention	Activity/ Target	Description of Financing the Activity (to be read with color codes)	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Policies/Fiscal Measures by State and Central Govt.
				Target	Approximate AMP in 2030 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2040 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2050 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	
A.	**Waste Management**									
A.1	Domestic Wastewater Management	Set up adequate centralised wastewater treatment plants for urban	Government initiated with possibilities for gap funding through private, CSR	Facility to treat 56 MLD of wastewater	36 (2.00%)	Facility to treat additional 15 MLD wastewater	48 (2.89%)	Additional maintenance	48 (2.76%)	Swachh Bharat Mission, AMRUT 2.0, Kalaignarin Nagarpura Mempattu Thittam (KNMT), Tamil Nadu Urban Development Project (TNUDP) III, Namakku Namae Thittam
A.2		Enhancing decentralised treatment	Market/ household driven with possibilities of government subsidies	Retrofitting unsanitary septic tanks and unlined hole in the ground with leach pit or twin-pit septic tanks at household level for 119493 households		Retrofitting unsanitary septic tanks and unlined hole in the ground with leach pit or twin-pit septic tanks at household level for 51211 households		Additional maintenance		
A.3		Setting up Fecal Sludge treatment plant (FSTP) at firka level	Government or private initiative	27 FSTP for 27 firkas		11 FSTP for remaining 11 firkas		Additional maintenance		

	Key Intervention	Activity/ Target	Description of Financing the Activity (to be read with color codes)	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Policies/Fiscal Measures by State and Central Govt.
				Target	Approximate AMP in 2030 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2040 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2050 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	
A.4		Increase household connections to underground drainage	Government initiated and funded	70 % Households to be connected with UGD		100 % Households to be connected with UGD		Additional maintenance		
A.5	Industrial Wastewater Management	Setting up of ETPs and continous treated effluent monitoring system	Market/industry driven with possibilities of Government funds for industrial areas developed by the Government	Facility to treat 4 MLD	2 (0.09%)	Maintenance and additional capacity if required	3 (0.18%)	Maintenance and additional capacity if required	5 (0.28%)	Tamil Nadu Industrial Policy 2021

	Key Intervention	Activity/ Target	Description of Financing the Activity (to be read with color codes)	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Policies/Fiscal Measures by State and Central Govt.
				Target	Approximate AMP in 2030 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2040 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2050 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	
A.6	Solid Waste Management	Dry waste recycling centre	Government or private initiative	1. 27 recycling centres for 27 firkas at village level 2. 1 recycling centre per 1 lakh population (total 6 recycling centres)	2 (0.13%)	1. 11 recycling centres for remaining 11 firkas at village level 2. 2 additional recycling centre (total 8 recycling centres)	7 (0.42%)		8 (0.49%)	Swachh Bharat Mission, Solid Waste Management Rules 2016
A.7		Composting Centres	Government or private initiative	6 composting centre (1 per 1 lakh population)		2 additional composting centre (total 8)				
A.8		Stakeholder capacity building and awareness generation	Government initiated with possibilities for gap funding through private, CSR	Ongoing initiative		Ongoing initiative		Ongoing initiative		
	Total Mitigation Potential of Waste Management				**40 (2.22%)**		**58 (3.49%)**		**61 (3.53%)**	

	Key Intervention	Activity/ Target	Description of Financing the Activity (to be read with color codes)	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Policies/Fiscal Measures by State and Central Govt.
				Target	Approximate AMP in 2030 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2040 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2050 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	
B.	**Sustainable Agriculture Practices**									
B.1	Modern Cultivation Techniques	Use of organic fertiliser and compost in place of urea in agricultural production	Farmer driven with possibilities of Government funds as subsidies under various listed schemes	15% agriculture area transitioned to organic fertiliser	25 (1.40%)	45% agriculture area transitioned to organic fertiliser	97 (5.83%)	75% agriculture area transitioned to organic fertiliser	207 (11.83%)	National Mission for Sustainable Agriculture, Chief Minister's Manniyur Kaathu Mannuyir Kappom Scheme (CM MK MKS), National Mission on Natural farming
B.2		Use of nano urea in place of urea in agricultural production	Farmer driven with possibilities of Government funds as subsidies under various kisted schemes	30% of urea requiremnt met through nano urea		55% of urea requiremnt met through nano urea		25% of urea requiremnt met through nano urea		

	Key Intervention	Activity/ Target	Description of Financing the Activity (to be read with color codes)	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Policies/Fiscal Measures by State and Central Govt.
				Target	Approximate AMP in 2030 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2040 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2050 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	
B.3		Capacity building programmes can be conducted through Krishi Vigyan Kendra for creating awareness on climate resilient practices	Government initiated with possibilities for gap funding through private, CSR	Can be an ongoing initiative	NA	Can be an ongoing initiative	NA	Can be an ongoing initiative	NA	National Innovations in Climate Resilient Agriculture (NICRA), Paramparik Krishi Vikas Yojana
B.4		Establish local network of mini weather monitoring stations to monitor rainfall and temperature as well as to be able to forecast extreme weather conditions - this can help inform farmers of appropriate sowing, harvesting and irrigation timings	Government or private initiative	27 mini weather monitoring stations	NA	11 mini weather monitoring stations	NA	Additional maintenance	NA	Krishi Decision Support System, Agricultural Infrastructure Fund (AIF)

	Key Intervention	Activity/ Target	Description of Financing the Activity (to be read with color codes)	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Policies/Fiscal Measures by State and Central Govt.
				Target	Approximate AMP in 2030 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2040 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2050 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	
B.5	Emission Reduction from Rice Cultivation	Increase the percentage of multiple aeration in the rice cultivated area	Farmer driven with possibilities of Government funds as subsidies under various schemes as listed	Increase in multiple aeration from 20% to 27%	20 (1.09%)	Increase in multiple aeration from 20% to 51%	87 (5.24%)	Increase in multiple aeration from 20% to 77%	178 (10.19%)	Chief Minister's Manniyur Kaathu Mannuyir Kappom Scheme (CM MK MKS)
B.6	Livestock Management	feed inputs for livestock - Tamarin plus and Harit Dhara and balanced rationing to reduce methane emissions from enteric fermentation. Implemetation of GOBARdhan scheme for manure maangement	Farmer driven with possibilities of Government funds as subsidies under various schemes as listed	Balanced rationing introduced in 30% and improved feed supplemts like Harit Dhara and Tamrin plus in 25% of livestock . 90% reduction in manure managemnt emisison through GOBAR dhan scheme	17 (0.92%)	Balanced rationing introduced in 60% and improved feed supplemts like Harit Dhara and Tamrin plus in 50% of livestock . 90% reduction in manure managemnt emisison through GOBAR dhan scheme	40 (2.43%)	Balanced rationing introduced in 90% and improved feed supplemts like Harit Dhara and Tamrin plus in 75% of livestock . 90% reduction in manure managemnt emisison through GOBAR dhan scheme	71 (4.09%)	Balanced Ration Programme (BRP) GOBAR dhan scheme
	Total Mitigation Potential of Sustainable Agriculture Practices				**62 (3.41%)**		**224 (13.5%)**		**456 (26.11%)**	

	Key Intervention	Activity/ Target	Description of Financing the Activity (to be read with color codes)	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Policies/Fiscal Measures by State and Central Govt.
				Target	Approximate AMP in 2030 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2040 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2050 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	
C.	Green Spaces and Carbon Sequestration									
C.1	Restoration and Conservation of Existing Forest Area and Tree Cover	Maintaining the current carbon stock densities to ensure the carbon sequesteration of -153 t CO_2e per year	Government initiated with possibilities for gap funding through private, CSR	Strengthening protection around existing reserved forest areas with additional measures of protection like: strengthening the fencing; eliminating encroachment; levying penalty on defaulters; etc.	0.15 (0.01%)	Strengthening protection around existing reserved forest areas with additional measures of protection like: strengthening the fencing; eliminating encroachment; levying penalty on defaulters; etc.	0.15 (0.01%)	Strengthening protection around existing reserved forest areas with additional measures of protection like: strengthening the fencing; eliminating encroachment; levying penalty on defaulters; etc.	0.15 (0.01%)	Compensatory Afforestation Fund Management and Planning Authority Fund (CAMPA), Nagar Van Yojana, Rashtriya krishi Vikas Yojana (RKVY), National Afforestation Programme, Sub-mission on Agroforestry (SMAF) - Har Medh Par Ped Scheme; Kalaignarin All Village Integrated Agriculture Development Programme (KAVIADP);

	Key Intervention	Activity/ Target	Description of Financing the Activity (to be read with color codes)	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Policies/Fiscal Measures by State and Central Govt.
				Target	Approximate AMP in 2030 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2040 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2050 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	
C.2		Promoting social and agroforestry in land classified as barren or fallow, land put to non-agricultural uses of cultivable waste land	Private driven for private lands and Governent initiated for Government lands with possibilities for gap funding through private, CSR	Social and agroforestry in 24899 ha In the subsequent years, continuous monitoring and maintenance of the plantations need to be undertaken	137 (7.61%)	Social and agroforestry in additional 34859 ha In the subsequent years, continuous monitoring and maintenance of the plantations need to be undertaken	466 (28.01%)	Social and agroforestry in additional 39839 ha In the subsequent years, continuous monitoring and maintenance of the plantations need to be undertaken	876 (50.20%)	National Agriculture Development Programme (NADP); CCUS Policy; Tamil Nadu Climate Change Mission; Green India Mission; Green Tamil Nadu Mission; Trees Outside Forests in India' initiative by MoEFCC and Governemnt of Tamil Nadu;
C.3		Enhancing carbon stock density	Government initiated with possibilities for gap funding through private, CSR	Enhancement of carbon stock density by 2% increase from 82.25 t/ha to 83.75 t/ha	33 (1.86%)	Enhancement of carbon stock density by 4% increase from 82.25 t/ha to 85.26 t/ha	13.36 (0.80%)	Enhancement of carbon stock density by 5.5% increase from 82.25 t/ha to 86.76 t/ha	13.36 (0.76%)	

	Key Intervention	Activity/ Target	Description of Financing the Activity (to be read with color codes)	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Policies/Fiscal Measures by State and Central Govt.
				Target	Approximate AMP in 2030 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2040 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	Target	Approximate AMP in 2050 ($ktCO_2e$/ yr)* (Percentage to BAU gross emissions)	
C.4		Restoration of mangroves	Government initiated with possibilities for gap funding through private, CSR	Restoring 61 Ha of mangrove forests	5.6 (0.31%)	Restoring additional 91 Ha of mangrove forests	14 (0.84%)	Restoring additional 152 Ha of mangrove forests	28 (1.60%)	
C.5		Enhancing seagrass and sea weed stretch	Government initiated with possibilities for gap funding through private, CSR	Enhancement of seagrass and seaweed both by 4 sq km	5.3 (0.29%)	Enhancement of seagrass and seaweed both by additional 6 sq.km	13.2 (0.79%)	Enhancement of seagrass and seaweed both by additional 10 sq.km	26.3 (1.51%)	
	Total Mitigation Potential of Green Spaces and Carbon Sequestration				**181 (10.08%)**		**506 (30.46%)**		**944 (54.08%)**	

* AMP = Annual Mitigation Potential

Note: Percentages denote AMP as a share of respective BAU emissions.

Purely Government Backed / Investment

Partially backed by Government

Market Driven

Endnotes

1. Tamil Nadu State Budget 2024-25, Speech. https://financedept.tn.gov.in/en/my-documents/2020/07/BS_2025-26_English_A4_Final.pdf
2. Chennai recently deployed 120 electric buses under the MTC fleet with a total investment of Rs. 207.9 Crore. Since the cost of electric buses could vary by seating capacity and features, this investment is taken as a comparable figure for Ramanathapuram too. An average of Rs. 1.8 Crore is assumed per electric bus.
3. Estimated for all 64 buses. The scheme is valid till March 2026, unless extended.
4. Only 300 buses can be supported under TN EV Policy per year, giving an average of 8 EV buses per district. Estimates are generated accordingly. The scheme is valid till December 2025, unless extended.
5. https://tnpcb.gov.in/PDF/About_Us/Announcementgos/GONo116_16625.pdf

D-2, 2nd Floor, Southern Park,
Saket District Centre, New Delhi-110 017, India
vasudha-foundation.org