TNGCC
Tamil Nadu Green Climate Company

GOVERNMENT OF TAMILNADU
TRUTH ALONE TRIUMPHS

Tamil Nadu Climate Change Mission

THE NILGIRIS DISTRICT DECARBONISATION ACTION PLAN

VASUDHA FOUNDATION
Green ways for a good earth!

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THE NILGIRIS DISTRICT
DECARBONISATION ACTION PLAN

“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 the Nilgiris has been formulated with the overarching vision of transforming the region into a climate-smart, ecologically secure, and economically resilient geography. Grounded in scientific assessments and stakeholder consultations, the report provides a comprehensive set of sector-wise strategies, emission reduction trajectories, and actionable interventions tailored to the district's unique ecological and socio-economic context. While several of the proposed interventions may carry financial implications and influence economic activities in the short term, the medium- to long-term impacts are expected to deliver substantial and sustained benefits for both the local communities and the ecosystem.

For instance, introducing a cap on tourist influx within the sensitive biosphere areas may initially affect stakeholders in the tourism and transport sectors. However, this measure is vital for preserving the region's ecological integrity and ensuring that tourism remains within the limits of the carrying capacity. In the long run, such an approach will protect the very assets that drive the region's economy—its pristine landscapes and biodiversity—thus securing a steady and sustainable income for communities dependent on eco-tourism and related livelihoods.

Continuing with Baseline Case Scenerio (BCS) practices might seem economically favorable in the immediate term for certain sectors. However, such unregulated growth is likely to result in resource degradation, ecosystem collapse, and eventually, significant economic disruptions and losses. Therefore, the Action Plan emphasises a preventive and forward-looking strategy that integrates decarbonisation, sustainable resource management, and climate resilience into the region's development trajectory.

By balancing ecological sustainability with community well-being, the Action Plan aims to build long-term resilience, promote inclusive growth, and safeguard Nilgiris' unique natural and cultural heritage for future generations.

The brief provides a snapshot of the decarbonisation and climate action plan for the Nilgiris, highlighting the need for climate resilience and decarbonisation in a clear and accessible manner. It outlines ready-to-implement projects for the near term, sectoral interventions with their abatement/sequestration potential, and a decadal implementation roadmap.

Executive Summary

The Nilgiris district, part of the Nilgiris Biosphere Reserve in the Western Ghats, is rich in biodiversity and home to a wide range of exotic and endangered flora and fauna. The region is renowned for its tea, spices, and a diverse mix of commercial horticulture crops, enabled by its high-altitude (~2,000 m) and temperate climate. The district's unique physio-climatic features - steep terrain, abundant rainfall, and perennial streams - have made the district a strategic location for hydropower generation, with small and medium-scale projects having an installed capacity of ~830 MW, contributing significantly to Tamil Nadu's non-fossil electricity generation.

Further, Nilgiris is a major tourism hub with an annual tourist count of 2.5 million across Ooty, Coonoor, Kotagiri and other hill stations (2022-2024). It faces the challenge of local environmental degradation and increased emissions driven by higher transportation and electricity needs by tourists. Other issues include increased use of nitrogen fertiliser and land-use changes driven by increasing developmental pressures.

However, the pristine forest and shola grasslands offer a huge potential for sequestering carbon. This along with climate smart initiatives that are recommended in this action plan can chart a pathway for the district to become carbon neutral by 2028, contributing further towards Tamil Nadu's vision of becoming carbon neutral well before 2070.

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

- Preserving Biodiversity
- Empowering Communities
- Climate Proofing

DISTRICT HIGHLIGHTS

900–2,636 m
Above mean sea level

3,500
Plant species

Indigenous tribes
Toda, Kota, Kurumba, Badaga, Irulas etc.

3 Rivers
Bhavani, Moyar, and Pykara

42,324 Tonnes
Annual tea production (2023-24)

5520 sq kms
Nilgiris Biosphere Reserve

3 key economic sectors
Tourism, horticulture, tea industry

CLIMATE PROFILE

1,609 mm Annual rainfall

1.2°C – 29.7°C
Annual temperature range

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

23% - 46%
Projected increase in south-west monsoon rainfall by 2090

Highly vulnerable to landslides & susceptible to forest fires

GHG EMISSIONS (2022)

Carbon neutral
Already achieved in electricity

334 $ktCO_2e$ Gross emissions

43% Road transport
20% Residential energy
10% Domestic wastewater
Key contributors (% of gross emissions)

11 $ktCO_2e$
Net emissions

(-323) $ktCO_2e$
Annual sequestration

TRANSFORMATION POTENTIAL

One of the 1st
Carbon neutral hubs in India before 2030

276 $ktCO_2e$
Annual mitigation potential by 2050

(-498) $ktCO_2e$
Annual sequestration potential by 2050

Enhanced Forest Cover
Leading to minimised landslides risk

Carbon Credit-based Financing

Sustainable Tourism
Attracting global recognition

Low-Carbon Interventions and Ecosystem-Livelihood Co-benefits

Blue-Green Ecosystem

-498 $ktCO_2e$*

Intervention

- Shola restoration
- Enhance the carbon stock density of existing forest cover
- Agroforestry in waste/fallow lands

Resilience & Co-benefits

- Reduces flash floods, landslides, fires
- Improves air, water & soil

Economics and Livelihood Improvement

- Supports eco-tourism & green jobs
- Reduced loss & damage
- Empowers indigenous communities
- Builds community stewardship

Agri and Tea Industry

103 $ktCO_2e$*

Intervention

- Replace 80% fuelwood heaters in tea industry
- Shift 2,000 diesel pumps to solar by 2030
- Use 75% organic fertiliser & 25% nano urea

Resilience & Co-benefits

- Boosts energy access, health & savings
- Increases soil & crop resilience
- Improves air, water & soil

Economics and Livelihood Improvement

- Improved efficiency & operational performance
- Minimised supply chain disruption
- Self resilient farming community

Low-Carbon Mobility

80 $ktCO_2e$* + unquantified (PBS)

Intervention

- Transition to EVs (2W, 3W, 4W, buses)
- NMT & PBS infrastructure

Resilience & Co-benefits

- Resilient transport access
- Cooler cities
- Cleaner air

Economics and Livelihood Improvement

- Boost ecotourism
- Green jobs, especially for women
- Better health, last-mile access

*The values refers to mitigation potential
NMT: Non-motorised transport; PBS: Public bike sharing

What Does Climate-Resilient Development Deliver?

- Enhanced adaptive capacity of the town/community
- Improved thermal comfort and climate-resilient living conditions
- Reduced health risks from heat, waterborne, and vector diseases
- Enhanced community capacity to withstand climate shocks
- Inclusive action benefiting indigenous and vulnerable groups
- Ecosystem restoration reducing disaster risks (e.g., landslides)
- Lowered human–wildlife conflict through habitat-sensitive planning
- Bankable green projects | Access to global climate finance | Green jobs | Livelihood security | Savings from energy transition & efficiency | Offset infrastructure expansion

Low Carbon and Resilient Pathways for Nilgiris

Given the fragile ecology and limited carrying capacity of the region, it is imperative to develop a detailed intervention-based action plan across economic sectors to abate GHG emissions, while also building resilience of the district. This plan provides an analysis of the 2022 emissions profile of Nilgiris and projections up till 2050 under different scenarios. In 2022, transport and building sectors together accounted for ~67% (223 $ktCO_2e$) of the total GHG emissions in Nilgiris. Remaining emissions occurred in livestock (25 $ktCO_2e$), agricultural soils (22 $ktCO_2e$), industries (20 $ktCO_2e$) and agriculture (9 $ktCO_2e$). These emissions – a gross total of 334 $ktCO_2e$ – were substantially countered by land based sequestration (323 $ktCO_2e$), leaving a net GHG emissions of 11 $ktCO_2e$ in the district.

In the baseline case scenario (BCS), emissions from the energy sectors are estimated to increase by 16% from 252 $ktCO_2e$ in 2022 to 292 $ktCO_2e$ in 2030, and by 22% to 308 $ktCO_2e$ in 2050 – driven by increased electricity demand and fuel consumption in the transport, buildings, and industries as well as tourist influx. Through introduction of electric vehicles, electrification of heating processes in industries, shift from LPG to electric cookstoves, and solarisation of agriculture pumpsets, the Nilgiris can abate 21% of energy emissions in 2030. Continued and compounding efforts can further result in abatement of 54% of projected energy emissions in 2050.

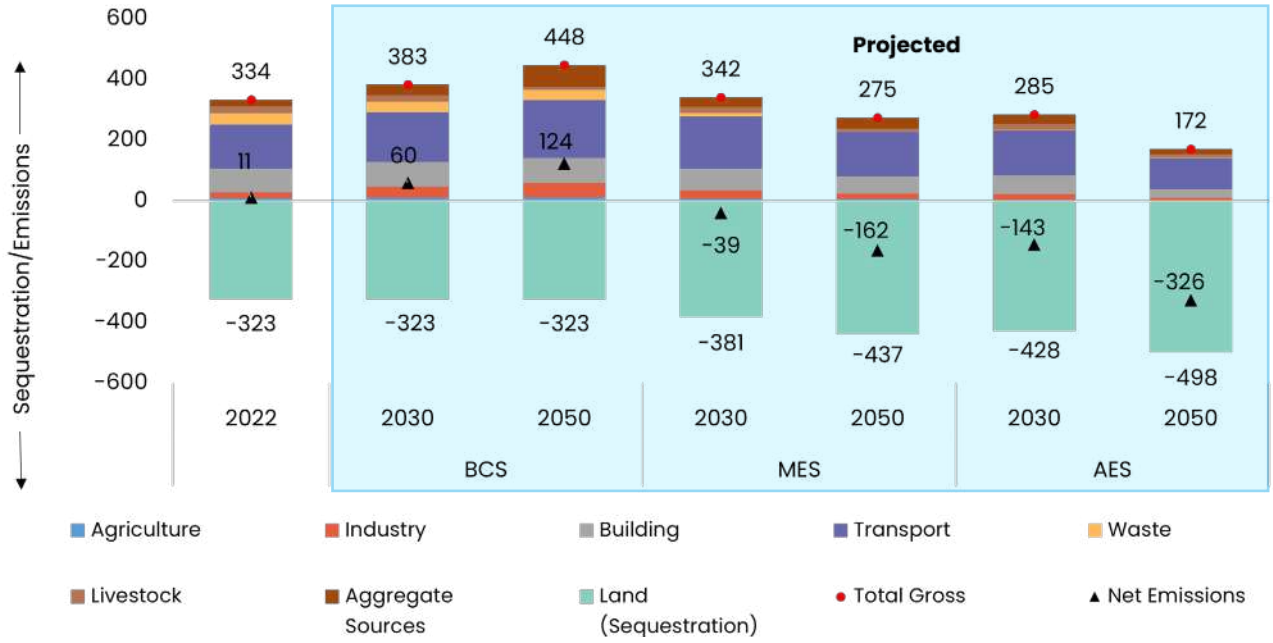


Figure 1: GHG emissions in Nilgiris in 2022 (actual), 2030 and 2050 (projections) under BCS, MES and AES

Similarly, gross emissions from the non-energy sectors are estimated to increase by 12% – from 82 $ktCO_2e$ in 2022 to 92 $ktCO_2e$ in 2030, and further by 41%, to 116 $ktCO_2e$ in 2050. Use of organic fertiliser and nano-urea, improved waste management, including wastewater, could abate 42% of gross non-energy emissions in 2030 and 74% of projected non-energy emissions in 2050.

Some residual emissions may still occur in transport, building and aggregate sources. Land based sequestration, forests and shola grasslands restoration, along with promoting agroforestry will be the key to offset the remaining emissions. With the ongoing efforts to enhance forest cover expected to continue with the same rigour, the current sequestration level of 323 $ktCO_2e$ (as of 2022) can be sustained under the Business-as-Usual scenario. Furthermore, targeted interventions such as enhancing the carbon stock density, expanding agroforestry in barren and fallow lands and strengthening social forestry are projected to significantly boost annual carbon sequestration—reaching 430 $ktCO_2e$ by 2030 and 492 $ktCO_2e$ by 2050 - enabling the Nilgiris to become carbon neutral by well before 2030. The decarbonisation could further be expedited through policy and regulatory mechanisms (such as a pragmatic cap on vehicular traffic) which would rapidly drive emissions reduction and result in additional abatements over and above the projections.

Key Sectoral Insights

Current development pathways are expected to contribute to a swift growth in GHG emissions, which were largely stable throughout the past decade. However, early interventions such as enhanced sequestration and responsible management of vehicular traffic could enable Nilgiris to become carbon neutral well before 2030.

Gross GHG emission (excluding land based sequestration), which remained stable at 334 $ktCO_2e$ in the past decade, is expected to reach 448 $ktCO_2e$ by 2050. However, with the available set of technologies and decarbonisation measures, 62% of these economy-wide emissions can be abated, with residual emissions in both energy and non-energy sectors. Considering existing as well enhanced land-based sequestration, the net GHG emissions could drop to a net negative of 326 $ktCO_2e$ by 2050 (Figure 2).

Nilgiris has already embarked on the journey to become carbon neutral, undertaking a slew of measures, including planting 60,000 native trees in Nilgiris with another ~19000 saplings across Udhagamandalam, Coonoor, Kundha, Kotagiri, Gudalur and Pandalur for enhancing the forest cover. The district can build upon this momentum to amplify land based sequestration. Recent initiatives aimed at promoting responsible vehicular traffic management in Ooty and other tourist destinations in Nilgiris through limiting daily vehicle volume to 6,000 on weekdays and 8,000 on weekends could further reduce the emissions significantly.[1]

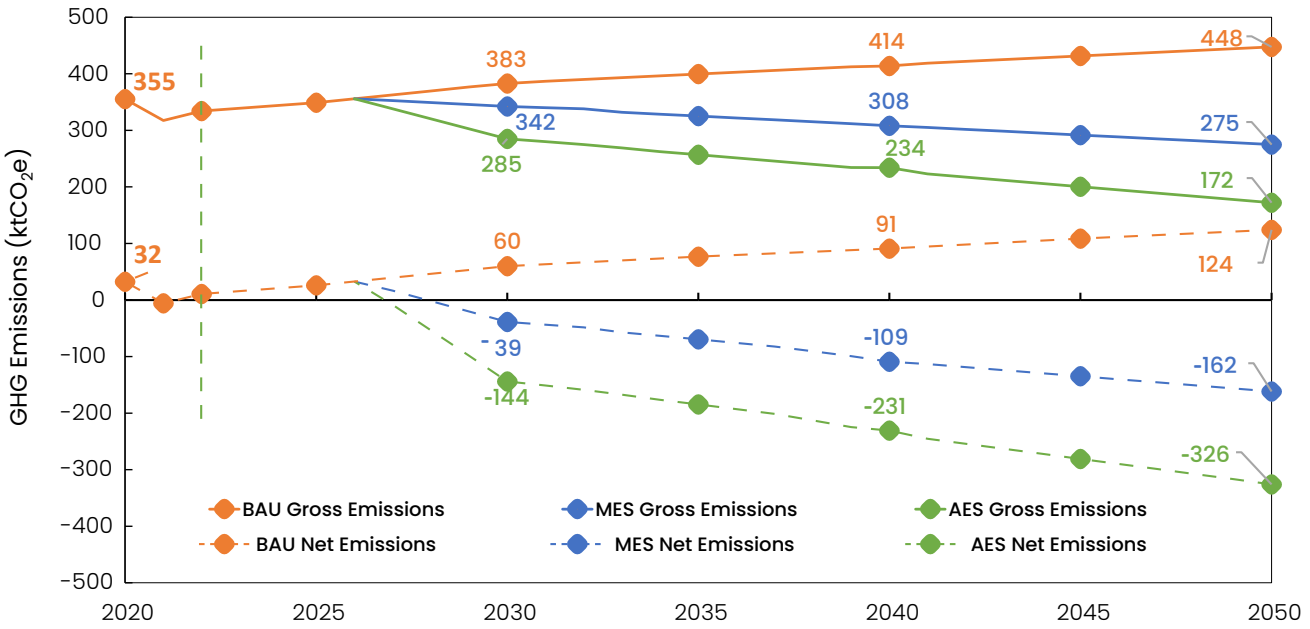


Figure 2: Economy wide gross and net GHG emissions across the scenarios

Energy sector, especially road transport, is the key to achieve carbon neutrality.

Gross energy sector GHG emissions (excluding IPPU) could grow to 332 $ktCO_2e$ by 2050. In 2022, the total energy emissions amount to 252 $ktCO_2e$, with the transport sector as the primary contributor at 145 $ktCO_2e$. By 2050, the transport sector is expected to experience a steady growth, with emissions growing by approximately 30 percent, reaching 189 $ktCO_2e$ by 2050. However, with the decarbonisation measures, the sector's GHG emissions is expected to drop 46 percent to 103 $ktCO_2e$ as compared to the BCS (Figure 3). Similarly, emissions from the building sector, which account for 31% of remaining energy emissions in 2022 and is expected to continue as the second highest emitter in the energy sector in 2050 too, can be reduced by 65% through adoption of clean cooking and energy efficient solutions.

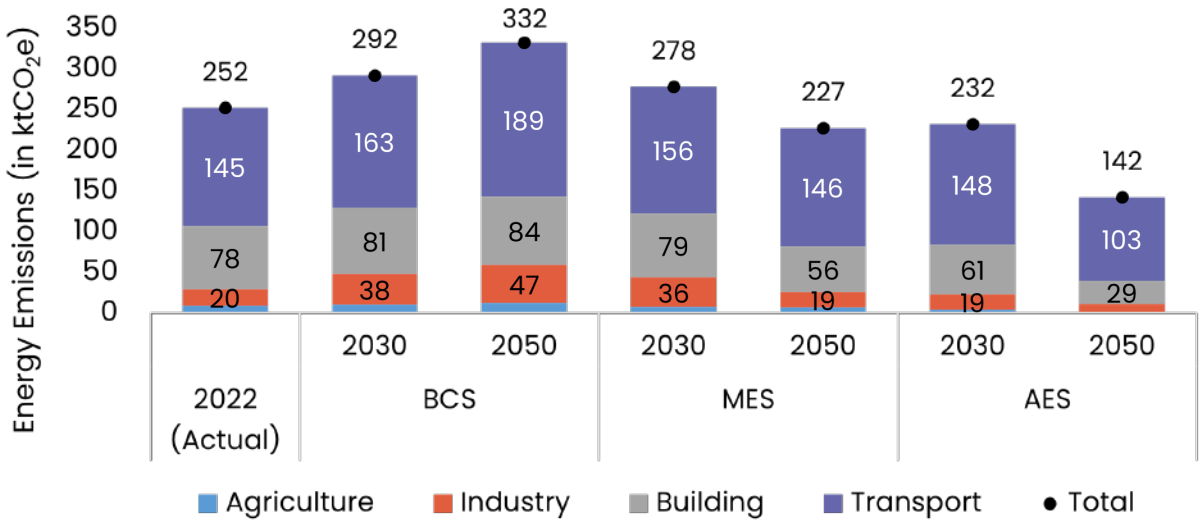


Figure 3: Total primary energy supply across the scenarios

Electricity consumption is set to grow twofold with new demand sectors ready to shape electricity mix.

The district produces ~2100 GWh of hydro based clean electricity (2022), which is almost five times its electricity demand. With fuel switching in the transport and cooking sector, the demand for electricity will rise in the future.

In 2022, the domestic sector was the largest electricity consumer, constituting 46 percent of the total consumption at 198 GWh. By 2050, the domestic sector's share is expected to remain the same, as the efficiency gains from appliances are offset by the increased demand from electric cooking. Meanwhile, the transport sector is expected to grow fast during this period, with its share increasing from 4 percent to 17 percent between 2022 and 2050. Overall, the total electricity consumption is expected to almost double between 2022 and 2050 to 865 GWh. This indicates that despite rising electricity demand, hydro generation will be sufficient to meet future needs. Therefore, from an electricity perspective, the district is already carbon neutral and will remain so.

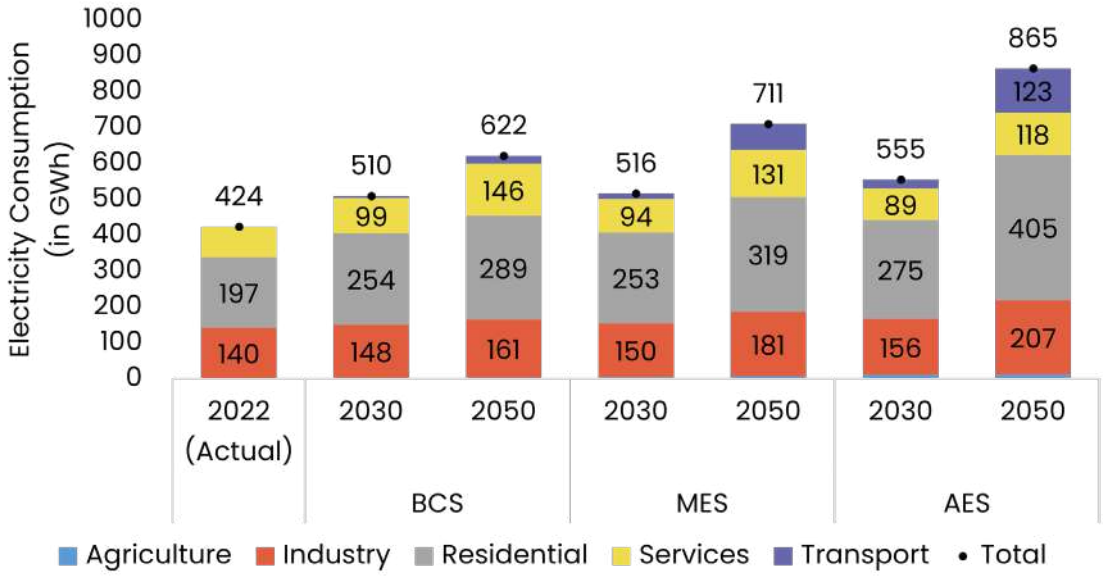


Figure 4: Electricity consumption across the scenarios

Energy efficiency and behavioural interventions are set to play a major role in abating additional demand for electricity in the district.

Energy efficiency improvements across residential and commercial sectors will help offset rising electricity demand by 2050. High-efficiency appliances in homes can lead to electricity savings of ~15 percent, while commercial buildings adopting energy-efficient HVAC and lighting can reduce electricity consumption by ~10 percent. Cumulatively, these measures could save ~48 GWh of the projected electricity demand in residential and commercial buildings. By 2050, energy-efficient technologies are expected to be adopted in ~100 percent households, easing pressure from growing electrification in transport and cooking sectors.

Enhancing carbon sequestration through grassland restoration and agro forestry has the potential to bring district's GHG emissions to net negative.

Restoring grasslands, expanding agroforestry, and increasing carbon stock density will play a critical role in achieving net-negative emissions by 2050. Shola forest restoration, along with reforestation and sustainable land management practices, can significantly enhance the district's carbon sequestration potential. An improvement in carbon stock density (CSD) in the range of 4-6 percent could increase CSD from the current rate of 96.22 t/ha to 99.84 t/ha-101.66 t/ha. Achieving these targets could potentially sequester additional 69 $ktCO_2e$ to 104 $ktCO_2e$ in 2050. Whereas, with conversion of 20 percent of 22843 hectares of the total barren/fallow land suitable for agroforestry is projected to sequester approximately 38.7 $ktCO_2e$ by 2050. On the other hand, a 32 percent of the same land area is anticipated to result in a carbon sequestration resulting in around ~63 $ktCO_2e$ by 2050.

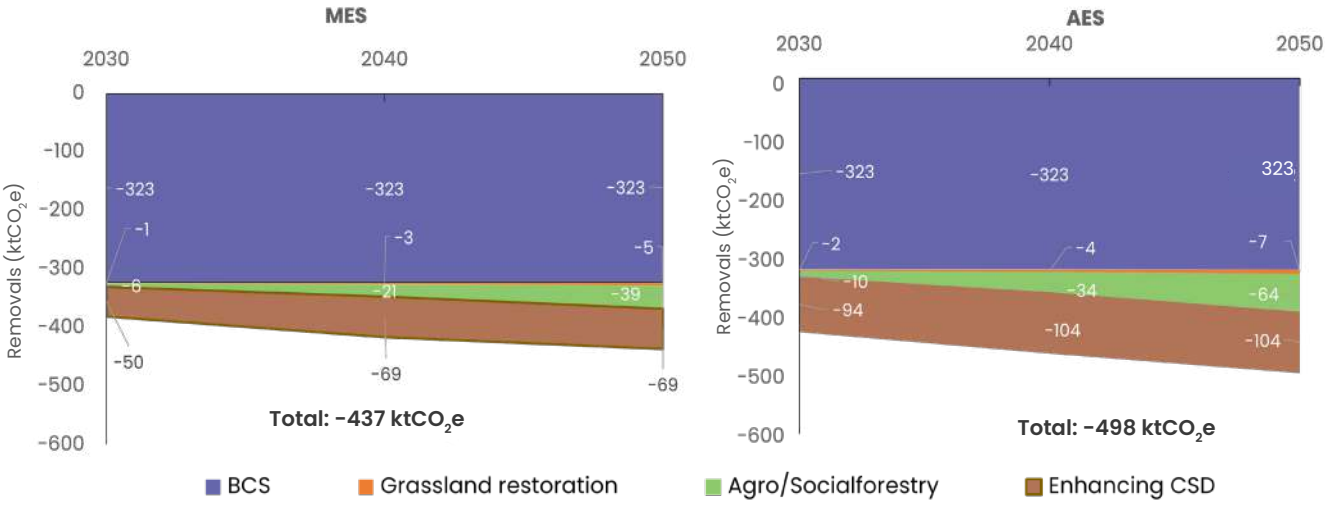


Figure 5: Sequestration potential through additional interventions

The sectoral interventions for decarbonising Nilgiris and enhancing the carbon sequestration are summarised in the following section.

NILGIRIS DECARBONISATION ACTION PLAN

Nilgiris has the potential to become carbon neutral well before 2030

The gross GHG emissions are expected to reach 383 $ktCO_2e$ by 2030, and subsequently 448 $ktCO_2e$ by 2050 from current level of 334 $ktCO_2e$ in 2022. However, the net emissions, considering the sequestration, in 2022 are 11 $ktCO_2e$. It could further achieve a net negative of 362 $ktCO_2e$ under AES and 162 $ktCO_2e$ under MES by 2050 - serving as a model and catalyst for other districts in Tamil Nadu.

AES - Aggressive Effort Scenario | MES - Moderate Effort Scenario

ELECTRICITY

From the perspective of electricity generation and consumption, **Nilgiris is already carbon neutral**, its **hydroelectric** capacity stands at **830 MW generating ~2200 GWh** electricity annually.

Electricity consumption expected to rise to **711-865 GWh in 2050**, growing twofold from the current level. However, the **generation from the clean sources will remain higher than the consumption.**

Holistic assessment of **solar rooftop, floating Solar,** and other **DRE sources** needed on priority.

Electrification of Road Transport

EV penetration as % of new vehicle sales

Two/three-wheelers
70% by 2030
100% by 2050

Four-wheelers
30% by 2030
70% by 2050

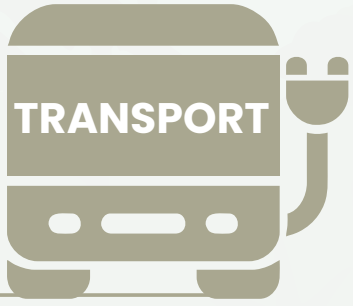
Buses
20% by 2030
50% by 2050

86 $ktCO_2e$
(19% of gross emissions)
GHG emissions can be abated by 2050 through electrification.

Prioritise addition of **intra-district E-buses** to cater tourist demand.

Non-motorised transport, build cycle lanes, public bike-sharing, and pedestrian-friendly walking lanes.

Public charging stations, set up 5 charging stations on petrol pumps, and another 5 in optimal positions near bus depots.



Electrification of Pumping and Agro Machinery

Replace 100% of diesel pumps i.e **~1,120 with decentralised solar pumps** under the PM KUSUM by 2030 and a total of 2000 solar pumps by 2050.

Reduce diesel use in farming; exploring the possibility of replacing diesel tractors and tillers with EVs in a long term.

~11 $ktCO_2e$
(2% of gross emissions)
GHG emissions can be abated by switching to solar pumps and electric tractors by 2050.

Fertiliser Shift

Replacing **75%** of nitrogen fertiliser and urea with **organic fertiliser and nano-urea** by 2050.

Agriculture soils emission abated by **54 $ktCO_2e$ (12% of gross emissions).**

Promoting Social & Agroforestry in Barren/Fallow Lands

Repurposing **7276 ha** of barren/fallow land for horticulture and agro/social forestry can abate **~10 $ktCO_2e$ by 2030 and ~64 $ktCO_2e$ by 2050.**

Enhancing Carbon Stock Density

Enhancing the carbon stock density (CSD) by **6%, from ~96 t/ha to 102 t/ha (2015 baseline),** can sequester **94 $ktCO_2e$ annually by 2030 and 104 $ktCO_2$ by 2050** through reforestation and afforestation and implementing sustainable forest management practices.

497 $ktCO_2e$
(112% of gross emissions by 2050)

Restoration of Shola Grassland

in degraded grasslands & additionally **56.4 km² of cultivable wasteland** by reviving resilient native grass species that thrive amidst invasive pressures can sequester 2 $ktCO_2e$ by 2030 and 7 $ktCO_2e$ by 2050.
Eg. *Andropogon lividus and Eulalia phaeothrix*

Efficiency and Conservation

Mandate retrofits for hotels and public buildings, including **energy-efficient heating, electrification of firewood-based heating** and **LED lighting.**

Diesel Generator Phase-out

Transition to hybrid solar-battery systems in hotels and commercial establishments **can save ~5.2 TMT diesel.**

COMMERCIAL BUILDINGS

Energy Efficiency

Promote **5-star appliances with govt backed schemes like EEFP and SEEP.** High-efficiency appliances and lighting in homes and commercial buildings can save **~48 GWh electricity in buildings.**

Clean Cooking Transition

Shifting **~50% of households** cooking from LPG to induction cooktops; and **100% cooking demand in commercial** hotels and institutions can abate.

RESIDENTIAL BUILDINGS

55 $ktCO_2e$ (12% of gross emissions) + 279 $ktCO_2e$ (Scope 2)
GHG emissions in buildings sector by 2050.

Fuel Switching

Shifting from fuel oil/firewood to electricity can help abate **~38 $ktCO_2e$ (8% of gross emissions)** industry GHG emissions by 2050.

By 2030
Rooftop solar & electric air heaters at Indcoserve's Kaikatty Tea Factory.

By 2050
Fully decarbonise tea production with electric air heaters & captive solar.

Mandate **Zero discharge policy** in all industrial areas.

INDUSTRY

Waste Management

Improved waste treatment can help abate **32 $ktCO_2e$ (7% of gross emissions)** GHG emissions by 2050.

45 MLD centralised wastewater treatment is recommended for urban centers, twin-pit septic tanks and **FSTPs** are recommended at gram p anchayat clusters for rural areas.

WASTE

Implementable Projects in Near Term

Implementation of the decarbonisation plan is estimated to require around Rs. 10,000 crores by 2050. This financial requirement could be met phase-wise. In the initial phases, the following key suggested projects could be undertaken to set a foundation for the district's decarbonisation.

The region holds immense potential for piloting decarbonisation strategies, particularly in tourism and tea production. The following projects are identified for early implementation based on their high short- to medium-term impact and ease of implementation.

1. **Sustainable mobility for tourists:** An average of 20,011 vehicles, including 11509 cars, 1341 vans, 637 buses, and 6524 two-wheelers enter the Nilgiris every day during the peak season for visiting Ooty and other hill stations. By adding 40 electric buses and 1,400 electric autos in Nilgiris by 2030, with routes supporting tourist movements in Ooty, up to 5 $ktCO_2e$, 1% of the total projected gross emissions by 2030, can be abated each year. Regulatory levers promoting adoption of electric vehicles can be further explored.

Short term interventions	Departments	Expected cost (Rs. Crores)	Available finance
Addition of 40 electric buses by 2030	Nilgiris Regional Transport Office (RTO) and State Transport Department	48	Rs. 11 Crores under PM E-Drive[2] with a supplementing Rs. 4 Crores under TN EV Policy[3] Furthermore, the Rs. 70 Crore allocation made by SPCB to TN Transport Corporation[4] can be explored
Addition of ~1,400 electric autos by 2030		42	Rs. 1.1 Crores under PM E-Drive with a supplementing Rs. 4.2 Crores under TN EV Policy

Given the scale and nature of tourist inflow, targeted low-carbon mobility interventions, including addition of a total of 200 electric buses and 7400 e-autos by 2050, can abate 25 $ktCO_2e$ or 6% of total gross emissions by 2050, while improving visitor experience and local air quality.

2. **Sustainable ecotourism:** Nilgiris, a major tourist destination in South India, draws millions of visitors annually, providing vital livelihoods for the local population. However, this influx places significant stress on the district's fragile ecosystem—through increased waste, water demand, and infrastructure pressure. Promoting sustainable tourism offers an opportunity to balance economic benefits with environmental protection and enhance climate resilience.

Short term interventions	Departments	Expected cost (Rs. Crores)	Policies/funding schemes
Designating and developing 'eco-heritage villages' in areas with strong tribal or historic significance (e.g., Tranquebar-style settlements or Toda munds)	Municipal Administration Department, Tourism Department, Forest Department	To be assessed, on case to case basis	Swadesh Darshan 2.0, Corporate SR funding, PPPs, and other national and international donors
Revitalisation of Ooty Lake: Electric/pedal boats, eco-trails, and green-certified amenities, eco-education centre and nature-guided tours			
Fostering ecotourism centric livelihoods: Train locals as eco-guides and support SHGs for eco-souvenir stalls			

3. **RE installation and electrification in tea factories & other commercial establishments:** Nilgiris is a notable hub for tea production, with factories spread in Ooty alongside Coonoor and Kotagiri. Emissions in tea production occur due to use of fossil fuel (coal/natural gas/firewood) at various stages from withering and rolling, to fermentation, steaming and drying of tea leaves.[5] By replacing 40% of the fuelwood based heaters with electric heaters in the tea industry by 2030 (and 80% by 2050), as many as 19 $ktCO_2e$ (5% of total projected gross emissions by 2030) can be abated each year. Rooftop solar and captive ground mounted solar plants can further fuel processes in tea factories and other commercial establishments, enhancing the RE capacity and generation in the district and respectively in Ooty.

Short term interventions	Departments to be involved	Expected cost (Rs. Crores)	Available finance
Replacing 40% of fuelwood based heaters with electric heaters	TN Energy Development Agency (TEDA) and the Tamil Nadu Tea Plantation Corporation (TANTEA)	0.035 per heater[6]	Rs. 1.5 crore of capital subsidy and 0.1 crore of additional capital subsidy (up to 25% of plant or machinery value) under TN MSME Capital Subsidy Scheme
Installation of rooftop solar on Government buildings and other large commercial and industrial setups including TEA industries	TN Energy Development Agency (TEDA), the Industries, the Investment Promotion & Commerce Department, the Tamil Nadu Tea Plantation Corporation (TANTEA)	To be assessed, on case to case basis	

4. **Adoption of solar pumpsets in agriculture:** Nilgiris is a horticulture rich district, with 60 percent of the cultivable land on slopes such as that of Ooty growing potato, cabbage, carrots, beetroot and other cruciferous vegetables. The growing demand for irrigation, currently met majorly through diesel pumps, can be supported through installation of 1,120 solar pumps of 5HP by 2030 – abating 6 $ktCO_2e$ (2% of the projected gross emissions by 2030) each year.

Short term interventions	Departments	Expected cost (Rs. Crores)	Available finance
Replacement of 1,120 diesel pumps with solar pumps (average capacity 5HP)	Department of Agriculture	35	Rs. 0.03 Crore per off-grid solar pump under PM KUSUM[7]

5. **Agro/Social Forestry in fallow and barren lands, enhancement of carbon stock density and restoration of grassland:** The Nilgiris district with its unique blend of forest slopes and cultivated valleys, contains pockets of barren and underutilised lands, that offer significant potential for agro and social forestry interventions. Currently, these lands contribute little to local livelihoods and are vulnerable to erosion and invasive species. By implementing targeted programs of social forests, agro forests and horticulture plantations with native species enhancement of carbon stock density and restoration of grassland, an annual carbon sequestration potential of 105 $ktCO_2e$, mitigating emissions by 3% can be leveraged, apart from supporting soil conservation, rural livelihoods and improving overall biodiversity of the region.

Short term interventions	Departments	Expected cost (Rs. Crores)	Available finance
• Social and agro forestry in 1819 ha of barren/fallow lands • Restoration of grassland in 14 sq. km • Enhancement of carbon stock density by 2% from 96.22 t/ha to 98 t/ha	Forest department, Municipal Administration Department, Horticulture department	41	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 5457 ha, restoraing grassland additionally in 42.3 sq.km, enhancing carbon stock density by 6% from 96.22 t/ha to 102 t/ha has the potential to mitigate 174 $ktCO_2e$ by 2050, offseting gross emissions by 39%.

6. **Enhancing domestic wastewater treatment:** One of the predominant challenges in the Nilgiris district is handling the domestic wastewater generated, driven by its resident population as well as heavy seasonal tourist inflows, especially in key urban centres and tourist destinations like Ooty, Coonoor and Gudalur. To overcome the risk of untreated discharge while also reducing the strain on existing infrastructure, the proposed intervention aims to achieve 100% treatment of domestic wastewater by 2030, thereby targeting a reduction in projected GHG emissions from 33.4 $ktCO_2e$ under BCS to less than 1 $ktCO_2e$ annually mitigating emissions by 8.69%.

Short term interventions	Departments	Expected cost (Rs. Crores)	Available finance
Scaling up the STP capacity to ~45 MLD, upgrading rural septic systems, establishing 5 new FSTPs at village panchayat cluster level, DEWAT for isolated commercial centres such as resorts and homestays	Municipal Administration department, Tamil Nadu Water Supply and Drainage Board, Rural Development and Panchayat Raj Department, Tamil Nadu Pollution Control Board	133	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. **Sustainable agricultural practices:** The Nilgiris district, known for its diverse horticulture and tea plantations, faces challenges in the form of soil degradation and resulting emissions from chemical intensive farming practices that threaten long term productivity and ecosystem health. This intervention aims to promote natural farming practices to offset agriculture soil emissions of around 5 $ktCO_2e$/year by 2030, with mitigating emissions by 1.39% added co-benefits of enhancing soil fertility, reducing the dependence on synthetic fertilisers and safeguarding water quality in the sensitive hill region.

Short Term Interventions	Departments	Expected Cost (Rs. Crores)	Available Finance
10840 Ha (15%) of net sown area transitioned to organic fertiliser; 15% of urea demand met through nano urea	Agriculture department, Horticulture department	11	National Mission for Sustainable Agriculture, Mission for Integrated Development of Horticulture, National Agriculture Development Program

Further, transitioning 54,199 Ha (75%) of agricultural land to organic farming and meeting 13% of urea demand with nano urea by 2050 could mitigate 54 $ktCO_2e$ annually by 2050,mitigating gross emissions by 0.69%. Allocations can be leveraged through PM KUSUM, PM E-DRIVE/Tamil Nadu EV Policy, National Mission for Sustainable Agriculture, Tamil Nadu Urban Development Project (TNUDP) III, Namakku Namae Thittam and various other government initiatives. Private partnerships and market instruments can further supplement these efforts.

Short and Long Term Plan

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

Sr no	Key intervention	Activity matrix	Target for year 2030	Approximate annual mitigation potential in 2030 ($ktCo_2e$) (Percentage to bau gross emissions)	Target for year 2050	Approximate annual mitigation potential in 2050 ($ktCo_2e$) (Percentage to bau gross emissions)	Financial implications till 2050 (in Rs Cr)	Policies/fiscal measures by state and central govt.
Scope 1 Interventions								
A	**Harnessing Renewable Energy Potential**							
A1	Use of solar pump in the region	Currently district has a approximately 2000 electric based pumps	1120 solar pumps (5HP) to be installed for irrigation	6 (1.61%)	880 additional solar pumps (5HP) to be installed for irrigation	11 (2.46%)	50	PM-KUSUM
B	**Clean and Sustainable Practices**							
B1	Shift to Private Electric Mobility	Replacing ~37500 conventional 2W with EV by 2050	A total of ~7500 electric 2-wheelers to be added to the stock by 2050	4 (~1%)	An additional 30000 electric 2-wheelers to be added to the stock between 2030 and 2050	19 (4.25%)	658	PM E-Drive, Tamil Nadu EV policy, FAME, Vehicle Scrapping Policy and other fiscal measures of the state and central government
		Replacement of ~9800 ICE commercial/private 4W with EV by 2050	A total of ~3300 electric 4-wheelers to be added to the stock by 2030	4 (~1%)	An additional 8400 electric 4-wheelers to be added to the stock between 2030 and 2050	28 (6.26%)	4800	
B2	Electrify the Public and heavy transport vehicles (3 wheelers, buses and trucks)	Replacing ~200 Intra district diesel buses (for schools, public transport and commercial mini buses) with EV by 2050	A total of ~40 electric buses to be added to the stock by 2050	3 (~1%)	An additional 160 electric buses to be added to the stock between 2030 and 2050	16 (3.58%)	480	

Sr no	Key intervention	New energy matrix	Target for year 2030	Approximate annual mitigation potential in 2030 ($ktCo_2e$) (Percentage to bau gross emissions)	Target for year 2050	Approximate annual mitigation potential in 2050 ($ktCo_2e$) (Percentage to bau gross emissions)	Financial implications till 2050 (in Rs Cr)	Policies/fiscal measures by state and central govt.
		Replacing ~7400 3W ICE vehicle with EV by 2050	A total of ~1400 electric 3-wheelers to be added to the stock by 2050	2 (~1%)	An additional 6000 electric 3-wheelers to be added to the stock between 2030 and 2050	11 (2.46%)	90	
		Replacement of small ~165 fleet trucks/lorries and other small goods vehicle with EV by 2050	A total of ~40 electric HGVs to be added to the stock by 2030	3 (~1%)	An additional 125 electric HGVs to be added to the stock between 2030 and 2050	13 (2.9%)	800	
B3	Creation of EV Charging infrastructure	Installing 10 new charging station	-	-	5 charging stations on petrol pumps and 5 charging stations in the optimal positions near bus depots	N/A	4.8	
B4	Cooking Fuel switching (Biomass and LPG to electricity)	Residential households to shift to electric cookstoves	0.66 lakh electric cookstoves to replace LPG in households by 2030	20 (5.20%)	1.1 lakh additional electric cookstoves (two plate) to be use in place of conventional LPG gas stoves by 2050	55 (12.29%)	28	Go-electric campaign, National Efficient Cooking Program (NECP), Mission LIFE
B5	Electrification of Industrial Processes	Replacement of wood heater with electric heaters in the tea industry	Replace 40% of the fuelwood in industry use with electricity	19 (4.93%)	Replace 80% of the fuelwood in industry use with electricity	38 (8.49%)	-	-
	Total mitigation potential by 2030			**60 (15.7%)**	**Total mitigation potential by 2050**	**191 (42.68%)**		

Sr no	Key intervention	New energy matrix	Target for year 2030	Approximate annual mitigation potential in 2030 ($ktCo_2e$) (Percentage to bau gross emissions)	Target for year 2050	Approximate annual mitigation potential in 2050 ($ktCo_2e$) (Percentage to bau gross emissions)	Financial implications till 2050 (in Rs Cr)	Policies/fiscal measures by state and central govt.
Scope 2 Interventions								
a	Rooftop Solar	Potential Assessment of Solar rooftop in the district and installation				To be estimated based on potential assessment	To be estimated based on potential assessment	PM-Suryaghar Muft Bijli Yojana, Grid Connected Rooftop Solar Programme
b	Energy Efficiency improvements (All Mitigiation potential in this category is computed based on state's mean electricity emission intensity)	Increasing share of energy efficient water heaters in new heater sales	A total 0.6 lakhs 3/5 star water heater to be used for water heating purposes	45.3	An additional 0.15 lakhs 3/5 star water heater to be used for water heating purposes	57	4	National Mission for Enhanced Energy Efficiency (NMEEE), MTEE, FEEED, EEFP
		Increasing share of energy efficient space heaters in new heater sales	A total 0.24 lakhs 3/5 star space heater to be used for space heating purpose	11.3	A total 1700 3/5 star space heater to be used for space heating purpose	12	8	
		Increasing share of energy efficient refrigeration units in new sales	A total ~1.2 lakh 3/5 star refrigeration units are to be used for cooling purposes	14.6	An additional 0.4 lakh 3/5 star refrigeration units are to be used for cooling purposes	19	288	
		Residential households to adopt LED bulbs to replace incandescent bulbs	5.42 lakh LED bulbs to be installed in the region to replace old lighting stock	15.2	9 lakh LED bulbs to be installed in the region to replace old lighting stock	25	7	NMEEE, UJALA

Sr no	Key intervention	New energy matrix	Target for year 2030	Approximate annual mitigation potential in 2030 ($ktCo_2e$) (Percentage to bau gross emissions)	Target for year 2050	Approximate annual mitigation potential in 2050 ($ktCo_2e$) (Percentage to bau gross emissions)	Financial implications till 2050 (in Rs Cr)	Policies/fiscal measures by state and central govt.
		Inefficient public building and street lights to be replaced with LED lights	1.07 lakh street and public place lights to be replaced by year 2030	11.3	An additional 0.3 lakh street and public place lights to be replaced between 2030 and 2050	73	17	NMEEE, UJALA
		Adoption of Other Five-star appliances, BLDC fan	3.5 lakh fans to be replaced with energy-efficient fans	37.0	An additional 8000 fans to be replaced with energy-efficient fans between 2030 and 2050	37.9	70	Energy Efficient Fans Platform(EEFP)
	Total mitigation potential by 2030			**134.73**	**Total mitigation potential by 2050**	**224**		

Non-Energy Interventions

C	Waste Management in the Region							
C1	Wastewater management	Set up adequate centralised wastewater treatment plants for urban	Facility to treat 45 MLD of wastewater	33.3 (8.69%)	Repair and maintenance of STPs and UGD	32.05 (7.16%)	56.25	AMRUT 2.0, Kalaignarin Nagarpura Mempattu Thittam (KNMT), Tamil Nadu Urban Development Project (TNUDP) III, Namakku Namae Thittam
		Twin pit septic tanks	Retrofitting unsanitary septic tanks and unlined hole in the ground with leach pit or twin-pit septic tanks at household level in rural areas		Additional maintenance		16.75	

Sr no	Key intervention	New energy matrix	Target for year 2030	Approximate annual mitigation potential in 2030 ($ktCo_2e$) (Percentage to bau gross emissions)	Target for year 2050	Approximate annual mitigation potential in 2050 ($ktCo_2e$) (Percentage to bau gross emissions)	Financial implications till 2050 (in Rs Cr)	Policies/fiscal measures by state and central govt.
		Setting up Fecal Sludge treatment plant (FSTP) at village level cluster level	5 FSTPs for village panchayat clusters of 5		Additional maintenance		3.75	
		Increase household connections to underground drainage, promote pitbased treatment for remote houses	75 % Households to be connected with UGD		100 % Households to be connected with UGD		56.25	
	Total mitigation potential by 2030			**33.3 (8.69%)**	**Total mitigation potential by 2050**	**32.05 (7.16%)**		
D	**Carbon Sequestration**							
D1		Maintaining the current carbon stock densities to ensure the carbon sequesteration of -323 $ktCO_2e$ per year	Strengthening protection around existing reserved forest areas with additional measures of protection like: strengthening the fencing; eliminating ecroahcment; levying penalty on defaulters; etc.	323 (84.30%)	Strengthening protection around existing reserved forest areas with additional measures of protection like: strengthening the fencing; eliminating ecroahcment; levying penalty on defaulters; etc.	323 (72.22%)	25	

Sr no	Key intervention	New energy matrix	Target for year 2030	Approximate annual mitigation potential in 2030 ($ktCo_2e$) (Percentage to bau gross emissions)	Target for year 2050	Approximate annual mitigation potential in 2050 ($ktCo_2e$) (Percentage to bau gross emissions)	Financial implications till 2050 (in Rs Cr)	Policies/fiscal measures by state and central govt.
	Restoration and conservation of existing forest area and tree cover	Promoting social and agroforestry in land classified as barren or fallow, land put to non-agricultural uses of cultivable waste land	"Social and agroforestry in 1,819 ha (8% of 24,245 hectares of land which is either barren, fallow, and land used for non-agricultural purposes) "	10 (2.61%)	"Social and agroforestry in 7,276 ha (30% of 24,245 hectares of land which is either barren, fallow, and land used for non-agricultural purposes) In the subsequent years, continuous monitoring and maintenance of the plantations need to be undertaken"	64 (14.31%)	164	Sub-mission on Agroforestry (SMAF) - Har Medh Par Ped Scheme ; National Agriculture Development Programme (NADP); Green India Mission; Green Tamil Nadu Mission; Trees Outside Forests in India' initiative by MoEFCC and Government of Tamil Nadu; State Compensatory Afforestation Fund Management and Planning Authority Fund (State CAMPA fund)
		Enhancing Carbon stock density	Enhancement of carbon stock density by 2% from 96.22 t/ha to 98.03 t/ha	94 (24.39%)	Enhancement of carbon stock density by 6% from 96.22 t/ha to 101.66 t/ha	104 (23.15%)	10	
		Restoration of grassland	Restoration of grassland in the existing degraded area and additionally in 14.09 sq km land classified as cultivable wasteland	1.7 (0.44%)	Restoration of grassland in the existing degraded area and additionally in 56.37 sq km land classified as cultivable wasteland	7 (1.52%)	50	
	Total mitigation potential by 2030			**428 (112%)**	**Total mitigation potential by 2050**	**498 (111%)**		

Sr no	Key intervention	New energy matrix	Target for year 2030	Approximate annual mitigation potential in 2030 ($ktCo_2e$) (Percentage to bau gross emissions)	Target for year 2050	Approximate annual mitigation potential in 2050 ($ktCo_2e$) (Percentage to bau gross emissions)	Financial implications till 2050 (in Rs Cr)	Policies/fiscal measures by state and central govt.
E	**Behavioural Interventions*** *Behavioural interventions can be implemented immediately, but may only yield substantial results over long run."							
E1	Use of more intra-regional public transport	More penetration of intra city transport to reduce dependency on private mode of transport	Introducing 70 new intra city buses as feeder and last mile connectivity			6.44	70	Mission LIFE
E2	Enhancing Non Motorised Transport (NMT): Formation of sidewalks, pedestrian zones, and safe crosswalks for walkers and cyclists, specially women and children.	Enhancing Non Motorised Transport (NMT): Formation of sidewalks, pedestrian zones, and safe crosswalks for walkers and cyclists, specially women and children	As per masterplan			NA	50	
E3	Automation of lighting in commercial segment	Installation of lighting sensors in commercial buildings	2162 (20% of total commercial buildings) building to use lighting sensors			7.9	0.22	
E4	Efficient driving behaviour	Improvement in ICE Vehicle Efficiency by 0.5% annually	Majority ICE 2W and 4W in the LPA show efficient driving behaviour			18	NA	

Sr no	Key intervention	New energy matrix	Target for year 2030	Approximate annual mitigation potential in 2030 ($ktCo_2e$) (Percentage to bau gross emissions)	Target for year 2050	Approximate annual mitigation potential in 2050 ($ktCo_2e$) (Percentage to bau gross emissions)	Financial implications till 2050 (in Rs Cr)	Policies/fiscal measures by state and central govt.
E5	Waste	Awaress campaigns to inform the residents of importance of waste segregation and to promote sustainable practices such as repair, reuse, recycle, reduce	Enhanced awareness of residents and commercial users about the need of waste segregation			N.A.	2	Swachh Bharat Mission
	Sub-total of possible financial implications for behavioural interventions						**122.22**	
F	**Sustainable Agriculture Practices**							
F1	Promote modern cultivation techniques to optimise agricultural inputs and maximise outputs	Use of organic fertiliser and compost in place of urea in agricultural production	10,840 Ha (15%) of net sown area transitioned to organic fertiliser	5 (1.39%)	54,199 Ha(75%) net sown area transitioned to organic fertiliser	54 (12.06%)	885	National Mission for Sustainable Agriculture, Chief Minister's Manniyur Kaathu Mannuyir Kappom Scheme (CM MK MKS)
		Use of nano urea in place of urea in agricultural production	15% urea demand met via nano urea		Remaining 13% urea demand met via nano urea.		30.5	
		Total					915.5	
		Capacity building programmes can be conducted through Krishi Vigyan Kendra for creating awareness on climate resilient practices	Can be an ongoing initiative		Can be an ongoing initiative	NA	NA	National Innovations in Climate Resilient Agriculture (NICRA), Paramparik Krishi Vikas Yojana

Sr no	Key intervention	New energy matrix	Target for year 2030	Approximate annual mitigation potential in 2030 ($ktCo_2e$) (Percentage to bau gross emissions)	Target for year 2050	Approximate annual mitigation potential in 2050 ($ktCo_2e$) (Percentage to bau gross emissions)	Financial implications till 2050 (in Rs Cr)	Policies/fiscal measures by state and central govt.
		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	15 mini weather monitoring stations		Additional maintenace	NA	1.5	Krishi Decision Support System, Agricultural Infrastructure Fund (AIF)
F2	Livestock management	feed inputs for livestock - Tamarin plus and Harit Dhara to reduce methane emissions from enteric fermentation	30% manure managed to avoid methane emissions, balanced rationing adopted for 6,436 cattle (30%); improved feed supplements for 5,363 cattle (25%)	NA	90% manure managed to avoid methane emissions, balanced rationing implemented for 9,223 cattle (90%); improved feed supplements for 7,686 cattle (75%)	NA	103	Balanced Ration Programme (BRP)
	Total mitigation potential by 2030			**5 (1.39%)**	**Total mitigation potential by 2050**	**54 (12.06%)**		

***For the detailed plan, refer to the report.*

Endnotes

1 As per the count of 1,035 commercial accommodations with 5,620 rooms apart from 575 licensed homestays.

2 Scheme valid till March 2026, unless extended.

3 Scheme valid till December 2025, unless extended.

4 https://tnpcb.gov.in/PDF/About_Us/Announcementgos/GONo116_16625.pdf

5 https://www.cag.org.in/blogs/leaf-cup-journey-through-energy-efficient-tea-processing

6 An electric tea dryer with capacity of 100-200 kgs of tea/hour costs Rs. 3.5 lakh to Rs. 4.6 lakh. Source: https://depcent.nitc.ac.in/electrical/ipg-new/PDF/INDUSTRIAL%20AUDIT/EAM3.pdf

7 Scheme is valid till December 2026. While the average installation per year in Nilgiris is unknown, the average installation rate in districts like Ramanathapuram and Virudhunagar has been 20 pumps per year. A rapid installation will have to be pursued and a realistic target set for coverage under PM KUSUM.

8 As per the count of 1,035 commercial accommodations with 5,620 rooms apart from 575 licensed homestays.

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