



COIMBATORE DISTRICT **DECARBONISATION** ACTION PLAN



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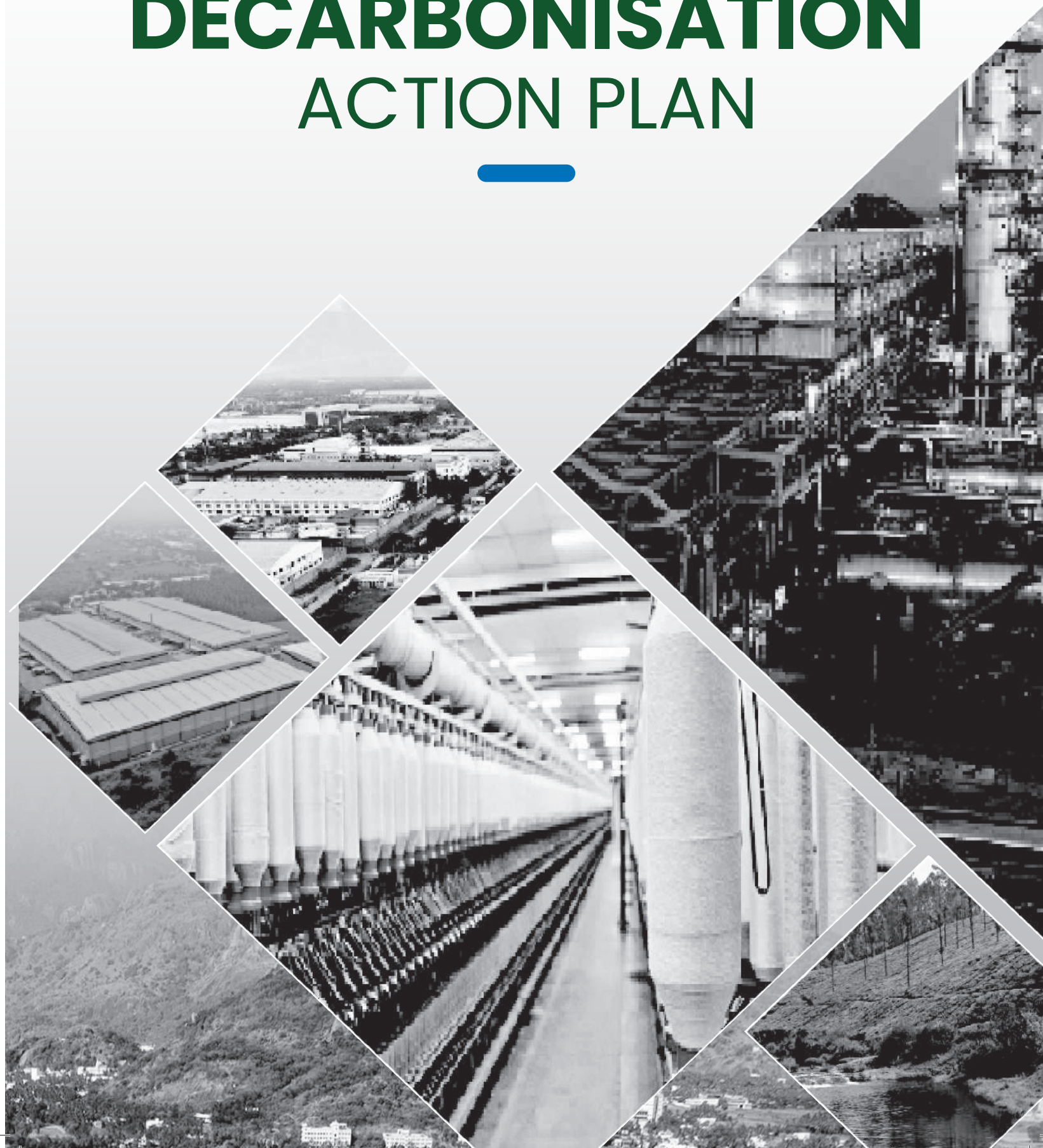
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COIMBATORE DISTRICT **DECARBONISATION** ACTION PLAN





“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.

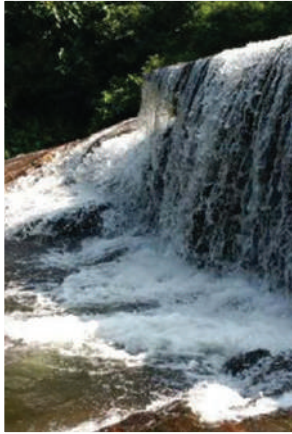
**Additional Chief Secretary to Government, Environment,
Climate Change & Forest Department, Tamil Nadu**



“ 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**



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List of Abbreviation

2W	Two-wheeler	DFCs	Dedicated Freight Corridors
MTEE	Market Transformation for Energy Efficiency	DJF	December- January-February
MTPA	Million Tonnes per Annum	ECBC	Energy Conservation Building Code
MW	Mega Watt	EP	Energy Productivity
3W	Three-wheeler	EV	Electric Vehicle
4W	Four-wheeler	FAME	Faster Adoption and Manufacturing of Hybrid and Electric Vehicles
AES	Aggressive Effort Scenario	FO	Furnace Oil
AFOLU	Agriculture, Forestry and Other Land Use	FOG	Fats Oils and Grease
AMRUT	Atal Mission for Rejuvenation and Urban Transformation	GDP	Gross Domestic Product
ANR	Assisted Natural Regeneration	GHG	Greenhouse Gas
AWD	Alternate Wetting and Drying	GIM	Green India Mission
BAU	Business as Usual	GJ	Giga Joule
BFS	Blast Furnace Slag	GOBARDhan	Galvanising Organic Bio-Agro Resources Dhan
BLDC	Brushless Direct Current	GRIHA	Green Rating for Integrated Habitat Assessment
BOD	Biochemical Oxygen Demand	GWh	Gigawatt Hour
BPKP	Bharatiya Prakritik Krishi Paddhati	HGV	Heavy Goods Vehicles
BUR	Biennial Update Report	HSD	High Speed Diesel
CCTV	Closed Circuit Television	HT	High Tension
CCU	Carbon Capture and Utilisation	ICM	Indian Carbon Market
CFL	Compact Fluorescent Lamp	IEA	International Energy Agency
CGWB	Central Ground Water Board	INCCA	Indian Network on Climate Change Assessment
CH₄	Methane	IPCC	Intergovernmental Panel on Climate change
CMMKMKS	Chief Minister's Manniyur Kaathu Mannuyir Kappom Scheme	IPPU	Industrial Processes and Product Use
CO₂	Carbon Dioxide	IRES	India Residential Energy Survey
COD	Chemical Oxygen Demand	JJM	Jal Jeevan Mission
COP	Conference of Parties	KAVIADP	Kalaigharin All Village Integrated Agriculture Development Programme
CPP	Captive Power Plant		
DEWAT	Decentralised Wastewater Treatment		

KNMT	Kalaigharin Nagarpura Mempattu Thittam
ktCO₂e	Kiloton Carbon Dioxide equivalent
LED	Light Emitting Diode
LPA	Local Planning Area
LPG	Liquified Petroleum Gas
LT	Low Tension
LULUCF	Land Use, Land Use Change and Forestry
MAM	March-April-May
MES	Moderate Effort Scenario
mbgl	Meters Below Ground Level
MLD	Million Liters per Day
MMM	Multi Model Mean
MORTH	Ministry of Road Transport and Highways
N₂O	Nitrous Oxide
NADP	National Agriculture Development Programme
NAP	National Afforestation Program
NAPCC	National Action Plan on Climate Change
NATCOM	National Communications
NBP	National Bio Energy Programme
NDC	Nationally Determined Contributions
NDDP	Net District Domestic Product
NEMMP	National Electric Mobility Mission Plan
NFHS	National Family Health Survey
NGT	National Green Tribunal
NMSA	National Mission for Sustainable Agriculture
NSM	National Solar Mission

OCEMS	Online Continuous Emission / Effluent Monitoring System
ODF+	Open Defecation Free
PAT	Perform Achieve and Trade
PJ	Peta Joule
PLF	Plant Load Factor
PM-KUSUM	Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
PNG	Piped Natural Gas
PV	Photovoltaic
RCP	Representative Concentration Pathways
RPO	Renewable Purchase Obligation
SBM	Swachh Bharat Mission
SCM	Smart Cities Mission
SEEP	Super Efficient Equipment Programme
SRI	System of Rice Intensification
STP	Sewage Treatment Plant
SWM	Solid Waste Management
TANSEED	Tamil Nadu Startup Seed Grant Fund
TANSIM	Tamil Nadu Startup and Innovation Mission
TNGCC	Tamil Nadu Green Climate Company
TNPCB	Tamil Nadu Pollution Control Board
TPD	Tonnes per Day
TSS	Total Suspended Solids
UGD	Underground Drainage
ULBs	Urban Local Bodies
ZLD	Zero Liquid Discharge

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Preamble

The Action Plan for Decarbonisation Pathways in Coimbatore outlines a roadmap for transforming the district into a climate-resilient, energy-efficient, and economically inclusive region. As an industrial hub with a thriving textile, engineering, and MSME base—alongside rich forest and wetland ecosystems—Coimbatore faces the dual challenge of sustaining economic growth while managing rising climate risks such as heatwaves, erratic rainfall, and declining forest carbon stock.

Grounded in scientific assessments, historical emissions analysis, and stakeholder consultations, the plan presents actionable strategies across key sectors through 2050. These are aligned with state and national climate targets and modelled across Business-as-Usual (BAU), Moderate Effort (MES), and Aggressive Effort (AES) scenarios.

While the transition will require upfront investments and policy shifts—particularly in energy, transport, and industry—it promises substantial long-term benefits including reduced emissions, improved air quality, new livelihood opportunities, and enhanced public health. Industrial decarbonisation, electrification of transport, and energy-efficient buildings are central to this transformation.

Complementing these efforts, the plan emphasises nature-based solutions to enhance carbon sinks. Strategic afforestation, agroforestry, and forest restoration will play a key role in reversing carbon stock losses and strengthening the district's overall climate resilience.

By integrating emission reduction with ecological regeneration and inclusive development, this Action Plan positions Coimbatore to lead by example on Tamil Nadu's path to a low-carbon and sustainable future.

This report provides a detailed decarbonisation and climate action plan of Coimbatore, 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

Coimbatore is a prominent district in western Tamil Nadu with a diverse landscape, stretching from the Western Ghats in the west to the plains in the east. It sustains a rich natural ecosystem, thriving industries, extensive land and air connectivity, flourishing agriculture, together building a vibrant economy and expanding its urban ecosystem, reflecting its growing regional importance. The district covers an area of 4723 sq. km, with a forest cover of 1953.18 sq. km (~41.3% of the district geographical area)¹ and a population of approximately 34.6 lakh. Coimbatore district is the second major industrial and economic hub of Tamil Nadu, driven by textile and engineering base, complemented by rapidly growing sectors such as wet grinder and electric pump manufacturing, automobile, information technology, electronics, hardware and logistics.

The increasing urban sprawl poses significant challenges to essential services and resource systems—water, energy, transport, waste management. Coimbatore faces significant climate variability, with declining southwest monsoon rainfall and rainy days, alongside rising summer and winter temperatures. Projections under and high (RCP 8.5) emission scenarios indicate 8



percent to 32 percent increase in monsoon rainfall by 2090 and rising temperatures up to 3.5°C. Heatwaves are expected to intensify, and extreme rainfall events, such as 1-day and 5-day maximum precipitation, will increase significantly. These changes highlight the urgent need for adaptive measures to address heightened climate risks and ensure resilience.

The industrial economy is supported by over 3600 working factories and 1,10,000 Micro, Small, and Medium Enterprises (MSMEs), including 80,000+ manufacturing units and 30000+ service units and agro-based industries.² This offers huge potential for decarbonisation through clean energy adoption and energy efficiency measures across the industrial operations and adjoining residential and commercial segments. The proposed expansion of the transport corridors—Coimbatore International Airport³, road and rail networks—will offer more scope for sustainable mobility solutions such as electrification, modal shifts in the district. This blend of ecological richness, dynamic industries and strong regional connectivity positions Coimbatore as both an economic powerhouse and a key driver of sustainable, low-carbon growth in the region.



Low Carbon and Resilient Pathways for Coimbatore

As of 2022, the total GHG emissions of Coimbatore district stood at 4202 ktCO₂e, with the energy sector being the largest contributor (64%, 2,684 ktCO₂e), followed by agriculture and land use (19%, 785 ktCO₂e), industrial processes and product use (10%, 441 ktCO₂e), and waste (7%, 292 ktCO₂e). Within the energy sector, road transport accounted for 56% of emissions, followed by the building category, including the residential and commercial segments at 22% and the industries category, including captive power plants at 16%, while civil aviation contributed 3%.

Under the Business as Usual (BAU) scenario, Coimbatore's gross GHG emissions are projected to decline slightly from 4120 ktCO₂e in 2022 (excluding emissions from the civil aviation category)* to 3645 ktCO₂e by 2050. Energy emissions – which are projected to reduce from 2602 ktCO₂e to 2186 ktCO₂e due to current EV penetration driven by policy mandates and incentives – can be further curtailed by 81% through higher electrification of 4-wheelers and HGVs, phasing out of fossil based captive power, higher adoption of electric cookstoves and electric pumps and agromachinery. These interventions will also increase electricity demand by 2.5x – from 6456 GWh in 2022 to 16,403 GWh by 2050. In the AFOLU sector, emissions under the BAU scenario are projected to slightly decrease from 785 ktCO₂e to 764 ktCO₂e, due to decline in the agricultural activities and livestock population. Similarly, waste sector emissions are expected to drop from 292 ktCO₂e to 254 ktCO₂e, due to expanded coverage of treatment infrastructure. Targeted sectoral interventions could curtail 77% of projected emissions by 2050 under the AES scenario, over and above the decline in emissions in BAU 2050, in alignment with Tamil Nadu's net-zero ambitions well before 2070.

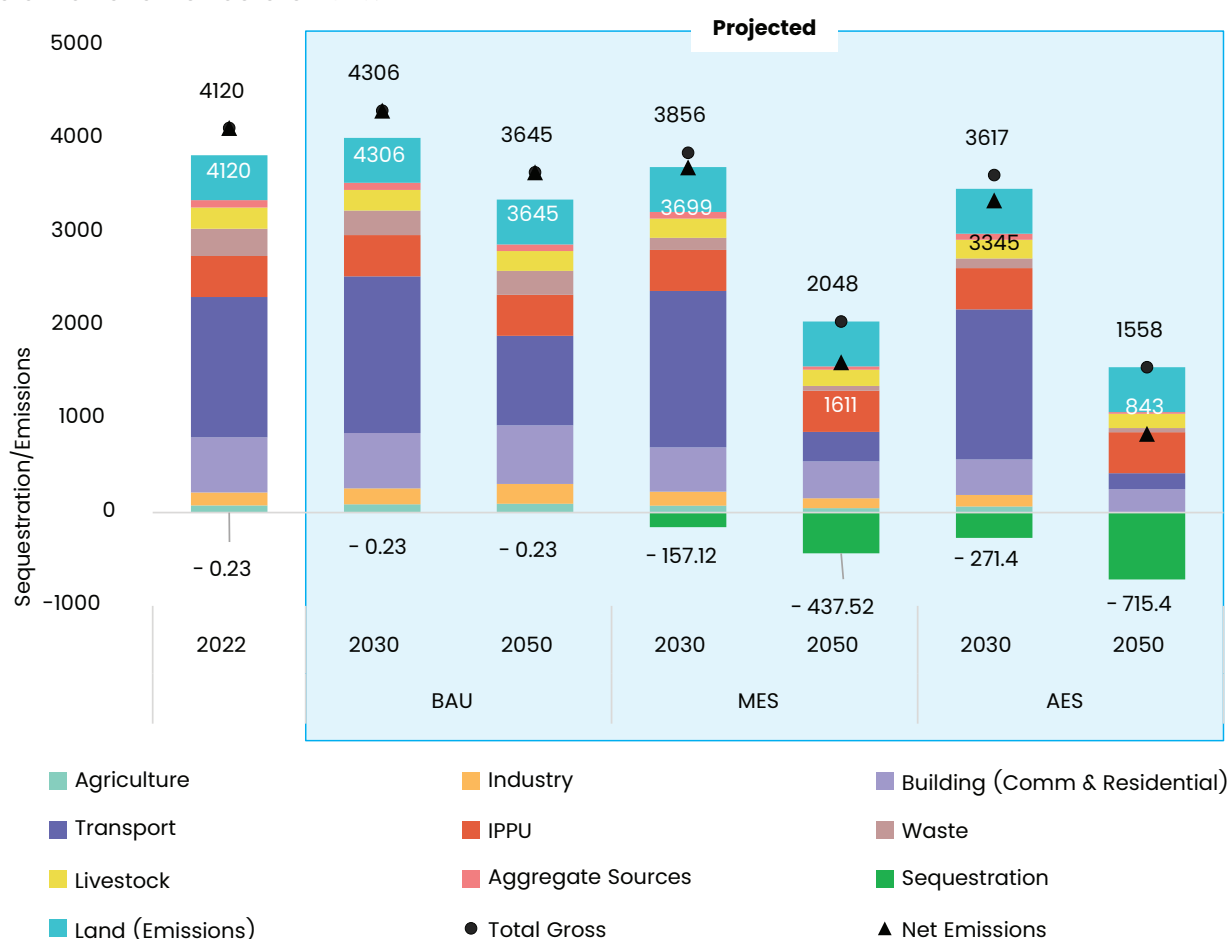


Figure ES1: GHG Emissions in Coimbatore: Actual (2022), Projected under BAU, MES and AES (2030 & 2050)

Note: Aggregate & Non-CO₂ represents aggregate sources and Non-CO₂ emission sources on land consisting of agriculture soil, rice cultivation and biomass burning in cropland

*Civil aviation, being outside the scope of state and district regulatory control, is excluded from the GHG emission projections and decarbonisation strategies, thereby ensuring that the plan focuses on actionable sources and interventions enabling meaningful tracking within the local governance framework.

Implementable Projects in Near Term

Implementing this decarbonisation plan calls for a phased approach, prioritising high-impact and readily implementable projects in the short to medium term, particularly those that can be advanced by 2030. These initiatives are high-priority actions that are well-suited for near-term implementation, deliver developmental co-benefits alongside decarbonisation, and serve as foundational steps in advancing the district's transition toward a low-carbon future. Details on each project, including specific targets, implementation costs, and associated mitigation potential are as below:

- **Electrification of Public Buses:** Coimbatore's vehicle stock of 20.46 lakh 2-wheelers, ~0.12 lakh 3-wheelers, ~4 lakh 4-wheelers, ~2850 buses, and ~29,400 heavy-good vehicles (trucks, trolleys) relies significantly on fossil fuels (diesel, petrol, natural gas), with less than 0.5 percent of the total vehicle stock comprising of electric vehicles in 2022. As the economy grows, mobility needs and resulting emissions are expected to rise. Electric buses can curb these emissions by a two-pronged approach of reducing diesel consumption in the transport sector, and replacing private vehicles as a mode of transport.

By adding 500 intra-city electric buses by 2030, out of a total 2000 additional buses by 2050, as many as ~38 ktCO₂e can be abated yearly by 2030 (~1% of gross GHG emissions).

Interventions	Departments	Expected Cost (Rs. Crores)	Available Finance
Electrification of 500 intra-city buses (15% of current bus fleet) by 2030	Tamil Nadu State Transport Corporation (TNSTC) and State Transport Department	900 ⁴	Rs. ~140 Crore is available under PM E-DRIVE ⁵ with a supplementing Rs. 50 Crore under TN EV Policy 2023 ⁶ Furthermore, the Rs. 70 Crore allocation made by SPCB to TN Transport Corporation ⁷ can be explored.

- **Integration of Renewable Energy:** The decarbonisation of Coimbatore hinges on the district's capacity to transition from fossil based to renewable energy grid. The agriculture sector of Coimbatore, where emissions arise on account of diesel pumpsets, tractors and tillers, represents one of the immediate entry points for integration of renewable energy. By converting 4820 diesel pumpsets to solar pumps by 2035, with 40% of the target achieved before 2030 under PM KUSUM, as much as **52** ktCO₂e can be abated annually with 20 ktCO₂e abated yearly in a short term (~1% of gross emissions of 2030).

By integrating an additional RE capacity of 6 GW in addition to the existing 0.7 GW RE capacity, about **9325** ktCO₂e of Scope 2 emissions could be abated by 2050. A potential assessment would be required to assess the precise scope and develop strategies for integration of rooftop solar, utility scale, wind, floating solar and other technologies.

Similarly, renewable energy could replace diesel and coal for captive power generation in the industrial sector of Coimbatore.

Interventions	Departments	Expected Cost (Rs. Crores)	Available Finance
Potential assessment and installation of rooftop solar, prioritising all the government buildings, institutional and educational set-ups, and residential buildings by 2030–35	Tamil Nadu Green Energy Corporation Limited (TNGECL) and State Energy Department	Subjective to assessment	Partial coverages under different RE schemes/policies such as PM Surya Ghar Muft Bijli Yojana, TN Policy)
Replacing ~2000 diesel pump with solar/electric pumps by 2030	Department of Agriculture	16	Rs. 2 Crore available under PM KUSUM ⁸ , at the rate of Rs. 3,14,088 per 5HP pump

- **Phasing Out of Fossil Fuel based Captive Power Plants and Electrifying Industrial Heating:** Emissions in Coimbatore's industrial sector arise predominantly on account of use of fossil fuels (coal/firewood/diesel) for power backup, and heat generation in industries. By replacing all diesel and coal based CPPs (305.6 MW of installed capacity) with equivalent RE capacity of 153 MW – supported by shift from DG sets to battery based power backup (BESS), 100 percent of CPP led emissions (**293** ktCO₂e) can be abated. Furthermore, electrification of heating processes in industries can abate **215** ktCO₂e by 2050, over and above abatement from shift to RE based captive power plants.

Short Term Interventions	Departments	Expected Cost (Rs. Crores)	Available Finance
Phasing out/replacement of ~306 MW fossil fuel based CPP to equivalent ~153 MW RE capacity by 2030–35	TN Energy Development Agency (TEDA), the Industries, the Investment Promotion & Commerce Department	765	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
Electrification of Heating Processes in Industries by 2050, with a pilot by 2030–35		To be ascertained on case to case basis	

Both these interventions could abate 14% of total projected emissions in Coimbatore by 2050.

- **Promote Energy Savings in Buildings & Public Lighting:** About 89 percent of its energy needs for cooking in residential and commercial buildings in Coimbatore is met through LPG – a trend that is predicted to continue by 2050 with emissions rising from 511 ktCO₂e in 2022 to 541 ktCO₂e in 2050. By adopting 4.51 lakh electric cookstoves, 60% of these projected emissions can be abated. Further, by replacing 5 lakh streetlights with LED lights public lighting alone, as much as 114 GWh of electricity and 91 ktCO₂e of emissions can be saved.

Short Term Interventions	Departments	Expected Cost (Rs. Crores)	Available Finance
Adopting 1.4 lakh electric cookstoves (42% of the target) by 2030	Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO)	49	Potential of Rs. 2.5 lakh electric cookstoves under National Efficient Cooking Program (NECP) which provides cookstoves at a low cost (35% concession)
Replacing ~5 lakh street lights with LED lights by 2030	Commissionerate of Municipal Administration, Directorate of Town Panchayats	1000 ⁹	Some allocations may be available under Street Lighting National Programme, but major coverage would only be possible through municipal finance.

- **Social and Agro-forestry in ~16.5 thousand hectare of barren/fallow lands by 2030:** Coimbatore district has sizable stretches of fallow and underutilised lands around 1,91,616 Ha. 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, and enhancement of carbon stock density an annual carbon sequestration potential of 271 ktCO₂e can be leveraged by 2030, offsetting gross emissions by 6.30% apart from supporting soil conservation, rural livelihoods and improving overall biodiversity of the region. Such initiatives will contribute to improve the district's green cover, reduce heat stress, and create long-term climate resilience.

Short Term Interventions	Departments	Expected Cost (Rs. Crores)	Policies/Funding Schemes
Social and agro forestry in ~16.5 thousand ha of barren/fallow lands by 2030 Enhancement of carbon stock density by ~1% from 82.25 t/ha to 83.25 t/ha	Forest Department, Municipal Administration Department, Horticulture Department	237	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 50,247 ha and enhancing carbon stock density by ~5.5% from 82.25 t/ha to 86.76 t/ha has the potential to mitigate 715 ktCO₂e by 2050, offsetting gross emissions by 19.6%.

- **Enhancing Domestic Wastewater Treatment:** To overcome the risk of untreated discharge while also reducing the strain on existing infrastructure, the proposed intervention aims to achieve 100 percent treatment of domestic wastewater by 2040, thereby targeting a reduction in projected GHG emissions from 202 ktCO₂e under BAU to 36 ktCO₂e annually.

Emission Reduction Potential: **~166 ktCO₂e/year** by 2040, mitigating gross emissions by 4.07%

Short Term Interventions	Departments	Expected Cost (Rs. Crores)	Policies/Funding Schemes
Urban: increase centralised capacity to ≈ 201 MLD Rural: 169751 households connected to septic-tank upgrades + 38 FSTPs. Advanced DEWATS for campuses > 2500 m², resorts, restaurants etc	Municipal Administration Department, Tamil Nadu Water Supply and Drainage Board, Rural Development and Panchayat Raj Department, Tamil Nadu Pollution Control Board	616	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

- **Building Climate Resilient Bioparks:** To transform underutilised open spaces in Coimbatore into climate-resilient, multifunctional green zones serving as both ecological buffers and community-centric public spaces. By integrating blue-green infrastructure, nature-based solutions, and participatory planning, the initiative seeks to address urban challenges such as flooding, heat stress, loss of biodiversity, and lack of inclusive green spaces, while enhancing urban resilience and citizen well-being. In line with the three Eco parks proposed in the Coimbatore Local Planning Area Master Plan 2041—at Marudur, Thenkarai and Karamadai—similar suitable areas can be identified across other key urban and biodiversity hotspots across the district.

Short Term Interventions	Departments	Expected Cost (Rs. Crores)	Policies/Funding Schemes
Green Infrastructure: Native tree plantations, butterfly gardens, community gardens, pollinator habitats, avenue trees and bio-fences. Blue Infrastructure: Rain gardens, bioswales, biofiltration basins, stormwater detention areas, and aquifer recharge points. Social Infrastructure: Walkways, play areas, yoga decks, open-air theatres, sports courts, and shaded seating zones designed for inclusivity and multi-generational use.	Environment and Climate Change Department, Municipal Administration Department, Forest Department	To be assessed on case basis	AMRUT 2.0 (Atal Mission for Rejuvenation and Urban Transformation), National Mission on Sustainable Habitat (NMSH), Smart Cities Mission, Tamil Nadu Climate Change Mission (TNCCM)

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 Coimbatore through 2050: Business as Usual (BAU), Moderate Effort Scenario (MES), and Aggressive Effort Scenario (AES). (Figure ES2)

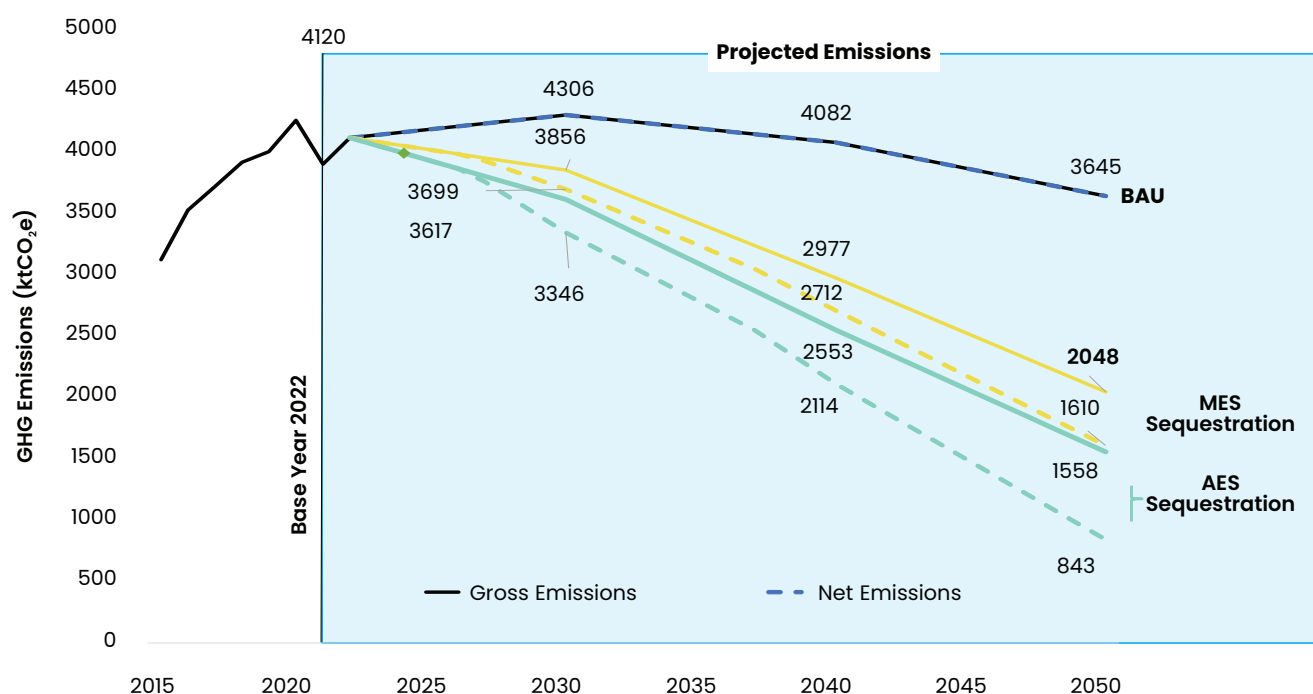


Figure ES2: Actual emissions till 2022 and projections by 2050 under BAU, MES and AES scenario, in Coimbatore, in ktCO₂e

Through this decarbonisation plan, emissions in Coimbatore could be reduced to 843 ktCO₂e. The key messages emerging from the plan are:

Transport emissions in Coimbatore are expected to decline in BAU 2050 due to an existing EV shifts, and can be further abated through promoting electrification of 4-wheelers and HGVs, and adoption of public transport.

Road transport is the highest GHG emitter in the energy sector, contributing 1503 ktCO₂e or 58% of energy related emissions in 2022. Higher EV penetration in new vehicle sales – especially of 2 wheelers and 3 wheelers owing to policy and market dynamics will marginally reduce sectoral emissions to 957 ktCO₂e by 2050 under business-as-usual scenarios. A further push towards achieving 100% penetration of EVs in new sales of four-wheelers and 80% penetration in heavy goods vehicles will abate ~78% of sectoral GHG emissions by 2050, with only 169 ktCO₂e remaining. Due to the fleet electrification, an additional 892 GWh of electricity will be required in BAU by 2050 and 1977 GWh of electricity in AES 2050 to power these vehicles.

Role of behavioral interventions in road transport: Non-motorised transport and smart traffic systems can further curtail emissions over and above the projected abatement. **Using public transport for inter-city and intra-regional movement** can result in 45% reduction in emissions in comparison to private vehicles in Coimbatore. Assuming that 10% commuters in Coimbatore shift from 4W cars to buses, this behavioral change could reduce GHG emissions by ~103 ktCO₂e by 2050. Such a shift could also avoid the need for around~ 47,000 four-wheelers on the road, replaced with an addition of ~2100 buses. Additionally, smart traffic systems can reduce 25% of signal emissions by reducing idle time at intersections.

Decarbonisation of large industries and MSMEs will play a crucial role in reducing emissions in the district

The GHG emissions from the industries in the district, including the captive power plant emissions and Industrial Processes and Product Use (IPPU) emissions, are expected to increase from 874 ktCO₂e in 2022 to 949 ktCO₂e in 2050 under BAU. The majority of these emissions are from cement production. At present, the cement production capacity in Coimbatore is 1.08 MTPA.

A 100% replacement of fossil fuels with clean fuels (such as green hydrogen for firing in Kiln) for heating, energy storage for power backups, electrification of heating processes in MSMEs and large industries, and replacing fossil fuel based CPPs with RE can fully decarbonise the industrial sector by abating 508 ktCO₂e of projected emissions in 2050.

Further, Carbon Capture and Utilisation (CCU), as the technology and market matures in the future, would enable the district to abate the process emissions in the cement sector, driving it closer to becoming carbon neutral.

Electrification and energy efficiency initiatives across end use sectors could reduce final energy consumption, making them key drivers of a sustainable energy future. Electricity demand will, however, increase in the district by 2.5 fold by 2050.

Coimbatore's energy demand is projected to rise from about 54 PJ in 2022 to around 81 PJ by 2050 under BAU. Through higher EV adoption in transport, phasing out of diesel based CPP with renewable energy in industries, fuel switching in cooking and agriculture sector, and improvement in the overall system efficiency, total energy demand can be reduced to roughly 69 PJ in the AES 2025 scenario—about a 17% drop compared to BAU 2050. Energy mix wise, the share of electricity in energy demand will rise – coinciding with reduction in share of diesel, gasoline and other fossil fuels. (Figure ES3)

Electrification across sectors, higher space cooling needs, and economic growth in the district are expected to increase the district's electricity demand from 6,456 GWh to 16,296 GWh by 2050. Electricity demand for space cooling will increase to 6569 GWh by 2050, almost 44% of the total electricity demand of the district. Industrial deep electrification would increase industrial electricity demand to 4376 GWh by 2050, almost 27% of the total electricity demand of the district. A drastic increase in electricity demand is projected in the transport sector due to higher EV adoption, increasing its share in total electricity mix from nil in 2022 to 12.1% in AES 2025. (Figure ES4)

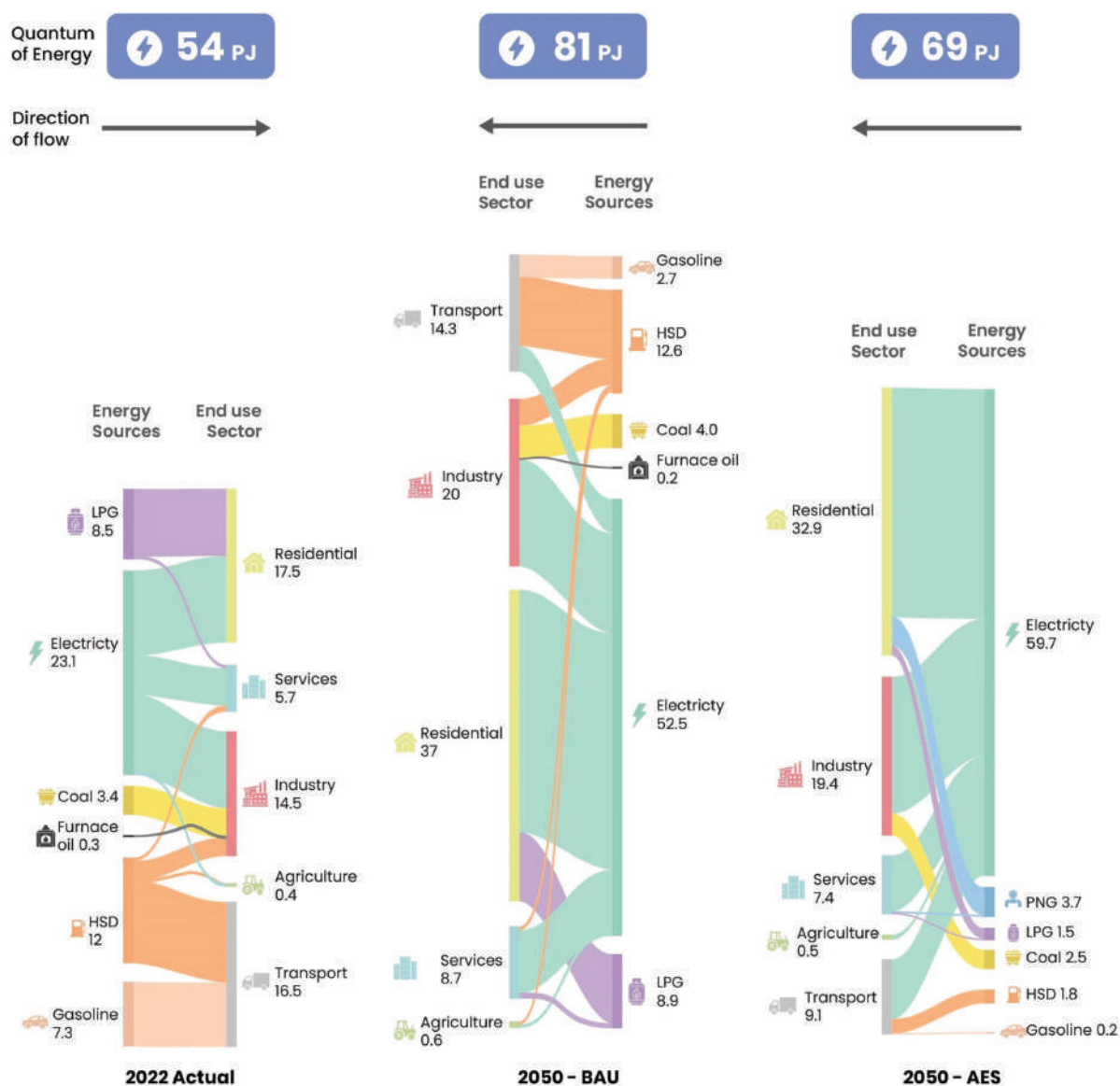


Figure ES3: Energy sources and respective End use sectors flow diagram in Coimbatore across 2022 actual and 2050 both BAU and AES scenario

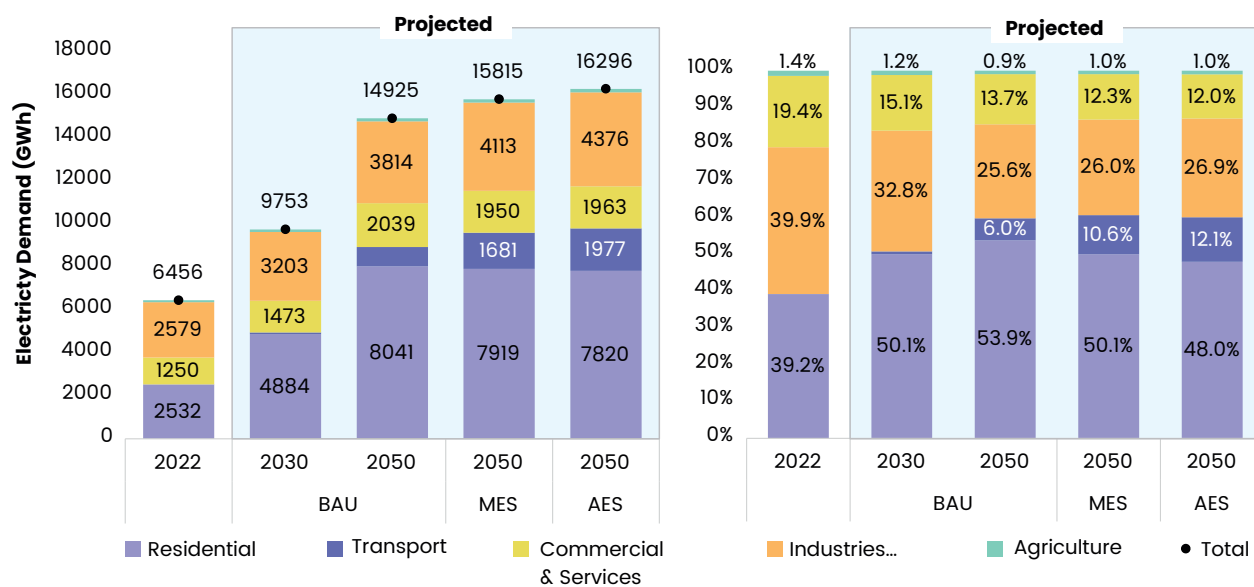


Figure ES4: Electricity demand in energy sector in Coimbatore, in GWh, across scenarios

Decarbonising electricity sector would require holistic assessment and implementation of various renewable energy sources

Over and above the Scope 1 GHG emissions, which have been analysed in the plan, the electricity consumption related GHG emissions (Scope 2 emissions) contribute to almost 3556 ktCO₂e in 2022 and could increase to 9325 ktCO₂e by 2050 in absence of decarbonisation measures. To meet this demand of 16,403 GWh from renewable sources, an additional equivalent capacity of 6 GW (in addition to 0.73 GW renewable capacity) is required. Therefore, there is a need for exhaustive and holistic assessment of various solar energy sources such as utility scale PV plants, rooftop solar, floating solar, and agri-photovoltaic solar, etc, bio energy, and wind energy in the district.

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 9.1 GW in the Coimbatore district. This potential assessment is based on a dynamic land use modeling that identify 10% of total wasteland with high irradiance and adequate 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.

One third of projected non-energy emissions in 2050 can be abated by targeted interventions in the waste sector and improved livestock management—balanced rationing and feed additives to control methanogens, manure management.

In AES, efficient waste management through centralized treatment for urban, septic tanks for rural and fecal sludge treatment plants at Firka level, 100% collection and segregation of municipal solid waste, effluent treatment plants with continuous monitoring systems for industrial wastewater, zero liquid discharge, composting organic waste, reuse etc. can abate 211 ktCO₂e by 2050 from the largely static waste sector. Similarly, through introduction of balanced rationing (90% of livestock), improved feed supplements, methanogen inhibiting substitutes (75% of livestock), and manure management practices, 60 ktCO₂e of emissions from livestock category can be abated by 2050.

Around 75% of the projected emissions from Aggregate Sources and Non-CO₂ emission sources from land can be abated by adoption of sustainable agriculture practices

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 will reduce 51 ktCO₂e of emissions by 2050.

Additionally, carbon sequestration can be scaled up through agro and social forestry, increasing carbon stock density and green space restoration

Promoting social and agroforestry in 35% of land classified as barren or fallow, put to non-agricultural uses or cultivable waste, along with other afforestation projects to increase carbon stock density by 5%, could boost carbon sequestration by 715 ktCO₂e/year by 2050. Active community involvement, technology-driven monitoring, and targeted policies will be critical for maximizing Coimbatore's carbon sequestration potential. (Figure ES5)

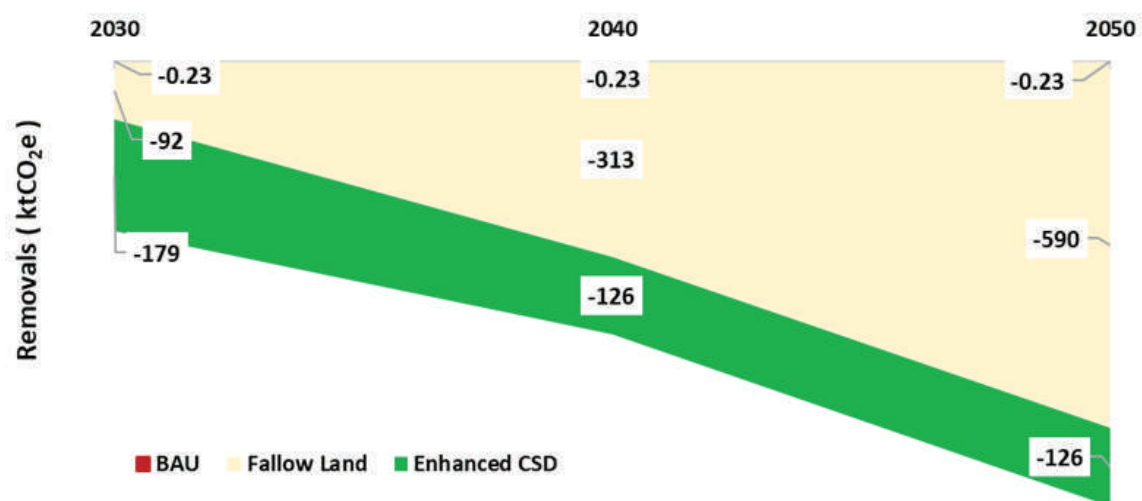


Figure ES5: Carbon sequestration potential in the district (Source: Author's analysis)

Why Should Coimbatore Transition Towards a Low-Carbon, Climate Resilient Future?



DISTRICT HIGHLIGHTS

4th
Largest contributor to
Tamil Nadu's GDP



3 Key industrial sectors
Textile, Pump
Manufacturing, IT



3.23 Lakh MSMEs
second only to Chennai in
Tamil Nadu



40%
of GDP is contributed by
industries, with another 4%
by transport



67%
Total coconut
production



CLIMATE PROFILE



1510 mm Annual Rainfall
20.7 °C - 35.2 °C
Annual Temperature Range



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



8% - 32%
Rise in southwest monsoon rainfall by 2090



Risk of Heat Stress
Vulnerable to landslides and
susceptible to forest fires

GHG Emissions (2022)



4202 ktCO₂e
Gross and net emissions are same since
carbon removal is negligible

Key Contributors (% of Gross Emissions)



36%
Road
Transport



12%
Residential
Energy



10%
Industrial
Energy (incl.
CPP)



10%
Cement
Production



11%
Forest Land

TRANSFORMATION POTENTIAL



2087 ktCO₂e
Annual Mitigation
Potential by 2050



(-715) ktCO₂e
Annual Sequestration
Potential by 2050



**Climate-resilient
Multifunctional
Green Spaces**



100% RE
for Captive Power
in Industries



**Blended Finance and
Community Ownership
Models**
to sustain the interventions



**Robust Public
Transport Ecosystem**
for sustainable and shared
intra-city mobility

Low-carbon Interventions and Ecosystem Livelihood Co-benefits



Blue-Green Ecosystem

-715* ktCO₂e

Intervention

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

Resilience & Co-benefits

- Strengthens heat and disaster resilience
- Enhances water security and soil quality
- Supports biodiversity and climate-resilience with integrated nature-based green-blue infrastructure

Economic and Livelihood Improvement

- Promote eco-tourism and local entrepreneurship
- Support climate-resilient agriculture
- Create green jobs and expands diversified income



Industrial Decarbonisation

508* ktCO₂e

Economic and Livelihood Improvement

- Improve efficiency and operational performance
- Minimise/minimised supply chain disruptions
- Skilling and reskilling of workforce for RE based O&M

Resilience & Co-benefits

- Boosts energy access and health outcomes
- Improves air, water and soil

Intervention

- Replace all diesel and coal based captive power plants of 306 MW installed capacity, with an equivalent RE capacity of 153 MW by 2050
- Electrify all heating processes in Industries by 2050



Sustainable Public Transport

106* ktCO₂e

Intervention

- Addition of 2000 intra-city electric buses by 2030/2035
- Promotion of NMT Transport and Public Bicycle Sharing Infrastructure

Resilience & Co-benefits

- Resilient transport access
- Cooler cities and cleaner air

Economic and Livelihood Improvement

- Boosts sustainable mobility
- Green jobs, especially for women
- Better health, last-mile access

NMT: Non-motorised Transport

PBS: Public Bike Sharing

*Denotes mitigation potential

What Does Climate-Resilient Development Deliver?



Strengthened adaptive capacity of the community



Ecosystem restoration and nature based solutions reducing disaster risks from landslides and urban flooding



Improved thermal comfort and climate-resilient living conditions



Lowered human-wildlife conflict through habitat-sensitive planning



Institutional capacity and local governance for integrated climate resilience



Reduced health risks from heat, waterborne and vector diseases



Enhanced community disaster preparedness and response



Bankable Green Projects | Access to Global Climate Finance | Green Jobs | Livelihood Security

COIMBATORE DECARBONISATION ACTION PLAN

Coimbatore can reduce up to 74% of its projected 2050 (3645 ktCO₂e) emissions through deep electrification, fuel switching, and targeted non-energy interventions including enhancing sequestration and waste management.



Total Emissions (2022): 4,202 ktCO₂e
Gross Emissions (BAU 2050): 3,645 ktCO₂e

- Annual Growth in Emissions (2005 to 2022) : 1.8%
- Per Capita Emissions (2022): 1.06 tonnes CO₂e per capita
- Emission Intensity Reduction in 2022 w.r.t 2005: 76%



Electrification of Industrial Heating Processes

Replace furnace oil (FO), petcoke, and coal with industrial electric heating like green hydrogen plasma generators could cut 215 ktCO₂e emissions in the district by 2050. **AMP: 215 ktCO₂e**



RE-based Captive Power Generation

Shift from the current ~306 MW fossil-based captive power generation to an equivalent ~153 MW renewable energy capacity by 2040. **AMP: 293 ktCO₂e**



Abating IPPU Emissions

- With time, process emissions in the cement sector can be reduced with material substitution (such as limestone calcined clay cement (LC3) and fly ash)
- Technological solutions for carbon capture utilisation (CCU) system



Efficiency & Conservation in Space Cooling

Adopt ~36.2 lakh 3-5 star ACs, primarily by 2040, and inculcate behavioural change (temperature control settings starting at 26°C) would **save 11-12% of electricity demand. AMP: 365 ktCO₂e (Scope 2)**



Electrification & Fuel Switching

Adopt 60 lakh LED bulbs, 42 lakh BLDC fans, and other 3-5 star appliances by 2030, along with 100% electrification of the service sector and phasing out HSD in DG sets by 2050. **AMP 229 ktCO₂e (Scope 2)**



Clean Cooking Fuel

Transition from LPG to PNG, with gradual adoption of ~4.5 lakh electric cook stoves could save 58% emissions in the residential sector by 2050.

AMP: 376 ktCO₂e



Green Building Practices

Heat mitigation measures—such as urban green cover, reflective roofing, and cool surfaces—can reduce ambient temperatures by 1-2°C and lower cooling energy demand by 5-15%

508 ktCO₂e
(14% of Gross Emissions*)

INDUSTRY

376 ktCO₂e
(10% of Gross Emissions*)

594 ktCO₂e
Scope 2

BUILDINGS

Residential, Commercial and Services



Electrification of Fleet

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.



Clean Mobility Infrastructure

Installation of ~525 charging stations and development of other allied clean mobility infrastructure will support the electrification of the fleet in Coimbatore by 2050



Two Wheelers
~20 lakh



Three Wheelers
27,000



Four-Wheelers
6.5 lakh



Buses
11,000



Heavy Goods Vehicles
29,000



788 ktCO₂e
(22% of Gross Emissions*)

TRANSPORT

CARBON SEQUESTRATION



Repurposing of 66,996 ha to horticulture, agro/social forestry

ASP: 590 ktCO₂e/yr by 2050



Enhancing of carbon stock density by ~5.5% from current 82.25 t/ha to 86.76 t/ha through reforestation and sustainable forest management

ASP: 126 ktCO₂e/yr by 2050



Increasing green spaces through climate-resilient bioparks, urban forests, and floating gardens can reduce heat stress



ASP: 716 ktCO₂e
(20% of Gross Emissions*)²



9,325 ktCO₂e
Scope 2



Electricity demand stood at **6,456 GWh in 2022**, led primarily by the industrial sector, including CPP (40%), residential sector (39%) and service sector (19%)



Electricity consumption is expected to increase almost three-fold owing to electrification and other deep decarbonisation efforts under AES 2050



To decarbonise the electricity sector, an additional ~6 GW of RE capacity (solar rooftop, utility-scale, wind, agro-PV, etc.) should be assessed and installed between 2040 and 2050

ELECTRICITY



Sustainable Agriculture and Livestock Practices

Replace existing ~4820 diesel pumps with off-grid solar pumps for irrigation by 2030, and electrifying ~7500 tractors and tillers by 2050 | **AMP: 93 ktCO₂e**



Capacity building to promote sustainable modernisation of agriculture



Replace synthetic nitrogen fertiliser and urea use with 75% organic fertiliser and 25% nano-urea | **AMP: 51 ktCO₂e**



90% balanced rationing and 75% methanogen-inhibiting feed additives for livestock by 2050 | **AMP: 60 ktCO₂e**



38 mini weather monitoring stations (rainfall and temperature)



204 ktCO₂e
(6% of Gross Emissions*)



AGRICULTURE



210 ktCO₂e
(6% of Gross Emissions*)



Domestic Wastewater

Improved wastewater treatment by 2040 **AMP: 166 ktCO₂e**

- Urban: 201 MLD centralised sewage treatment and 100% UGD connection
- Rural: Twin pit septic tanks for 1.7 lakh households, 38 FSTPs at the Firka level and advanced DEWATS for campuses >2500 m², resorts, restaurants etc



Industrial Wastewater

ETPs and a continuous treated effluent monitoring system for 20 MLD industrial wastewater by 2050 and strict adherence to zero liquid discharge **AMP: 28 ktCO₂e**



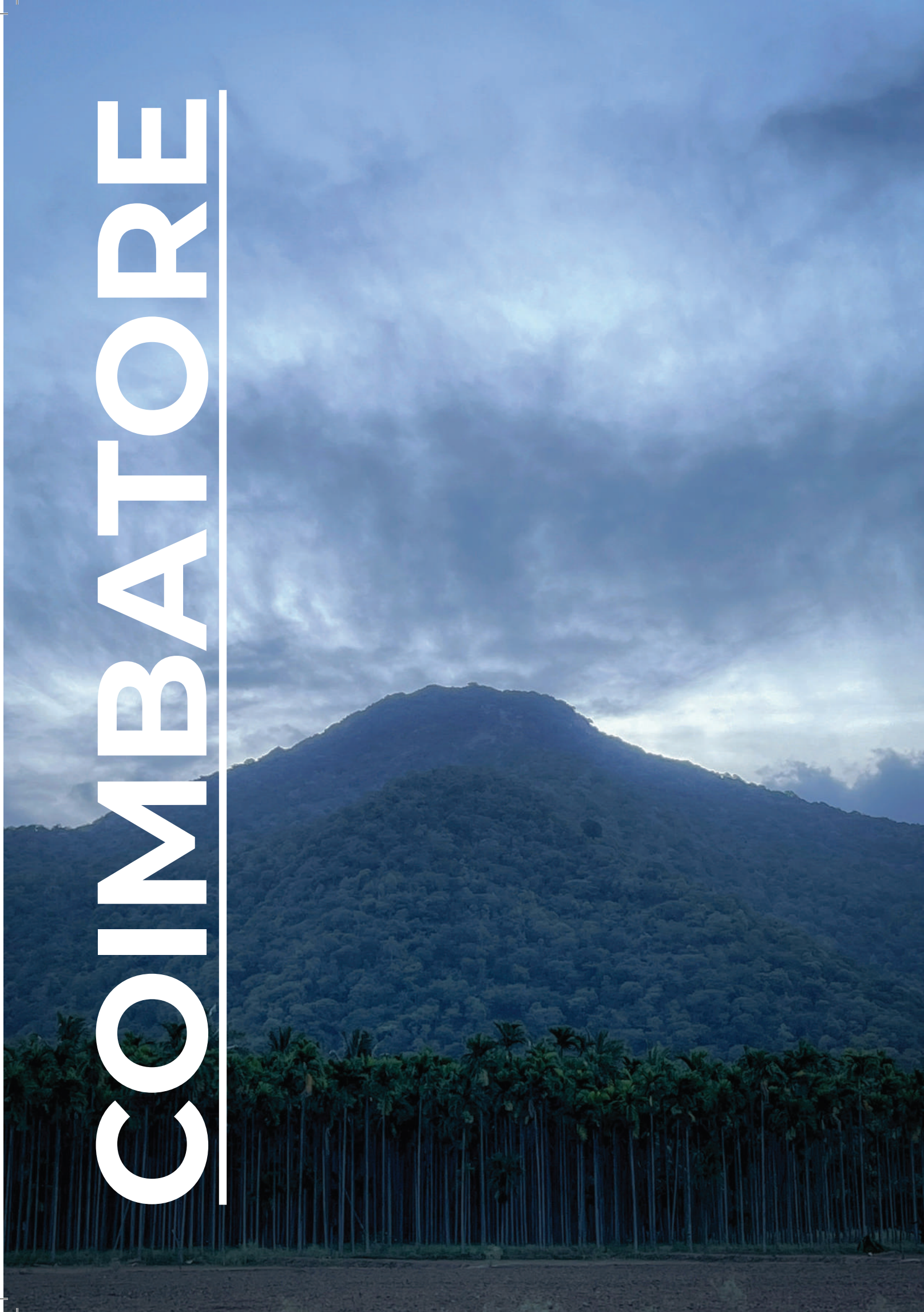
Municipal Solid Waste

100% segregation at source and processing of municipal solid waste with zero landfilling through 38 rural and 32 urban recycling centres and 32 urban composting units **AMP: 16 ktCO₂e**

WASTE

Scope 2 denotes indirect greenhouse gas emissions that relate to purchase of electricity, steam, heat or cooling.

COINBATORRE





1. Context, Methodology, and Scenario Framework

At the 26th Conference of Parties (COP26) in November 2021, India made a bold commitment of achieving net-zero greenhouse gas emissions by 2070, signalling its strong resolve to decarbonising its economy and addressing climate change. While this ambitious pledge marks a significant milestone in India's journey toward sustainable development and reflects the country's determination to play a leading role in global efforts to reduce carbon emissions, the role of sub-national entities is essential in realising this vision. As India advances its national decarbonisation plan, active participation from states and regions is critical to achieving a carbon-neutral and resilient future. Tamil Nadu with its pioneering initiatives aimed at mitigating carbon emissions and promoting climate resilience, has demonstrated leadership towards this.

One such pioneering initiative is the **Tamil Nadu Green Climate Company (TNGCC)** that has been established to implement four key missions of the Government of Tamil Nadu: the Tamil Nadu Climate Change Mission (TNCCM), Green Tamil Nadu Mission (GTM), Tamil Nadu Wetlands Mission (TNWM), Tamil Nadu Coastal Restoration Mission (TNSHORE). TNGCC pursues carbon neutrality at the state level while formulating bottom-up strategies to decarbonise its districts. The establishment of TNGCC reflects the state's commitment to promoting renewable energy, fostering sustainable agriculture, forest and wetland conservation and enhancing climate adaptation efforts at both local and state levels. TNGCC's multi-tiered approach combines state-level policies with district and town-level actions, ensuring a comprehensive and inclusive path toward carbon neutrality. Notably, Rajapalayam is the first town in Tamil Nadu to declare its aspiration to become carbon neutral by 2041. Inspired by such initiatives, this report offers a detailed analysis of Coimbatore's current and projected emissions, energy landscape, and potential decarbonisation pathways.

About this Report

Coimbatore has been identified as one of the key districts for targeted decarbonisation efforts. By embracing Tamil Nadu's renewable energy initiatives and integrating sustainable practices, Coimbatore can significantly contribute to the state's climate goals and India's 2070 net-zero target.

This report outlines a comprehensive decarbonisation strategy for Coimbatore, analysing the district's energy consumption patterns, forecasting future trends, and proposing actionable measures across multiple sectors to achieve long-term sustainability. Coimbatore's efforts will complement Tamil Nadu's environmental stewardship and also align with national policy frameworks.

As the administrative headquarters and the nucleus of regional economic, infrastructural and industrial development, Coimbatore warrants primary emphasis in the district's decarbonisation strategy. The recently formulated Master Plan for the Coimbatore Local Planning Area (LPA), encompassing nearly one third of the district's geographical area, serves as a critical guiding framework with proposals and policy recommendations for sustainable economic growth in the region. This report strives to align with the Master Plan, and also based on the understanding of the current initiatives and long-term vision of the district towards sustainable economic growth, proposes the sector specific decarbonisation strategies to complement them.

This report, developed in collaboration with Environment, Climate Change and Forests Department and TNGCC, environmental experts, and planning professionals, presents:

1

A comprehensive assessment of current and historical emissions in the district

2

An in-depth analysis of energy and non-energy sectors, including future energy needs and consumption patterns

3

A range of decarbonisation scenarios and sectoral strategies

4

Actionable Interventions and phased roadmaps mapped with relevant state and national policies for leveraging finance

By outlining these decarbonisation pathways and key sectoral interventions, the report aims to guide Coimbatore's transition toward a more sustainable and environmentally responsible future, aligning with both state and national climate goals. The report also tries to map these proposed strategies and initiatives across relevant state and national policies and schemes for leveraging finance. This would strengthen Tamil Nadu's environmental leadership and position Coimbatore as a role model for other districts seeking to contribute to the state's net zero journey.

Methodology

A robust methodology has been adopted to derive decarbonisation pathways for Coimbatore. This encompasses the following:



Climate Variability (Temperature and Rainfall in the Region) Analysis, Projections and Vulnerabilities:

Historical climate data and climate model projections under RCP 4.5 and RCP 8.5 scenarios¹⁰ have been used to project future changes in temperature and rainfall.

The projections show changes in rainfall, temperatures, and heatwaves.



Assessment of Historical GHG Emission Inventory:

To determine the historical greenhouse gas (GHG) emissions of the district, the methodology outlined by the Intergovernmental Panel on Climate Change (IPCC) for GHG emission inventory has been adopted¹¹. This approach typically involves collating data from various sectors contributing to emissions, such as energy, agriculture, forestry, and waste, and applying emission factors and activity data to calculate overall GHG emissions.



Energy Demand and Emissions Projection:

A bottom-up energy system model has been used, which projects energy demand and emissions from 2022 to 2050 in five-year intervals. The model tracks the transformation of primary energy to meet end-user energy demand across sectors such as residential, services, agriculture, transportation, and industry. Emissions from rice cultivation, fertiliser use, wastewater, and solid waste were also projected, along with assessing

the potential for carbon sequestration from forestry. The model utilises inputs from the district statistical handbook, census data, electricity feed.



Sectoral GHG Emissions Abatement and Sequestration Potential Assessment: Strategies to minimise emissions and maximise sequestration through afforestation and other interventions have been devised, customised to the sector and its potential for abatement/sequestration.

Scenario Framework

The scenarios analysed in this study have been designed with consideration of different operational and technological parameters. These parameters vary depending on system level efficiency, fuel switching, behavioural changes, improving existing forest cover, waste management practices and land utilisation etc. The studied scenarios in this report are:



Business as Usual (BAU): The BAU scenario projects demand and supply growth based on current policies and historical trends. In this scenario, improvements in energy efficiency, fuel switching, and sequestration remain constant at current levels. Electrification is limited to road transport, with no changes in cooking fuel use or waste management practices. This scenario will be used as the reference scenario upon which the decarbonisation scenarios are built.



Moderate Effort Scenario (MES): MES evaluates the impact of current national and subnational policies and targets on emissions reduction. This scenario makes moderate assumptions on sectoral interventions for emission abatement, such as a partial electrification of tractors and tillers (50%), back-up supply (50%), and cooking fuel (20%). For non-energy sectors, the scenario sets moderate decarbonisation targets for categories such as waste treatment, fertilisers, and enhanced carbon sequestration in the district.



Aggressive Effort Scenario (AES): AES outlines an aggressive strategy to achieve decarbonisation of the district by 2050, prioritising energy security and substantial emission reductions. It emphasises on widespread electrification, implementing energy efficiency measures, promoting behavioural changes, and adopting robust strategies for waste management, optimising fertiliser usage, and enhancing carbon sequestration through afforestation and sustainable land-use practices. Full electrification of the tractors and tillers, and backup supply, among other sectors, and enhanced electrification of cooking (30%) is proposed.

These scenarios are further explained through the Assumption Tree given below.

Table 1.1: Assumption tree considered under this study

Sector	Sub-Sector disaggregation	Demand driver	Scenario-BAU	MES	AES
Agriculture	Irrigation	Annual increase in water consumption* and fuel demand	2022 shares of electrified, diesel, and solar pump sets remain unchanged through 2050. - Fossil fuel-based tractors and tillers in operation retained until 2050.	Conversion of 100% of diesel pump sets to off-grid solar pumps by 2030	
	Agriculture machinery			Electrifying 50% of tractors and tillers by 2050	Electrifying 100% tractors and tillers by 2050
Buildings (residential, commercial, and cooking)	Residential appliances & lighting	GSDP growth leading to higher spend capacities, higher temperatures led space cooling needs	- Current level of EE to continue till 2050 - Stock out of Conventional Lighting by 2030	3-star appliances to cut down energy demand by 7-8% by 2050	5 Star Appliances to cut down energy demand by 11-12% by 2050
	Cookstoves	GSDP Growth, Population Growth	LPG as a major fuel for cookstoves, only 8% cookstoves electrified by 2050	Shift in composition to LPG (50%), PNG (30%) and electricity (20%)	Shift in composition to PNG (50%), electricity (45%) and LPG (5%)
	Commercial buildings, public lighting, miscellaneous services	Commercial development in the district, leading to increase in electricity and fuel consumption	Electricity consumption in commercial buildings and public lighting to increase by 6% and 2.5% respectively by 2050	- Replacement of street lights with LED by 2030 50% electrification for backup supply through commercial DG sets, and solarisation of commercial buildings by 2050	- Replacement of street lights with LED by 2030 100% electrification for backup supply through commercial DG sets, and solarisation of commercial buildings by 2050

Sector	Sub-Sector disaggregation	Demand driver	Scenario-BAU	MES	AES
Transport	Road transport vehicles	Annual growth in vehicle demand*	100% EV share in new sales of 2W, 3W and 4W by 2050 20% and 65% EV share in new sale of Heavy Goods Vehicles (trucks, trolleys etc) and Buses in new sales by 2050	100% electrification of 2W, 3W, 4W and buses 50% electrification of HGVs	100% electrification of 2W, 3W, 4W and buses 80% electrification of HGVs
Industry	Cement, Textile, Spinning, Manufacturing and others	Annual industrial growth* leading to increased energy demand	Current growth and emission rates from fuel consumption to continue till 2050	Substitution of coal with renewable energy (green hydrogen and others), waste heat recovery systems etc.	Industrial emissions, except IPPU, are reduced to zero due to deep decarbonisation strategies.
Waste	Solid waste disposal	Increase in population and per capita waste generation	Current TPD to be the same as 2050	0% solid waste sent to landfills/ dumpsite by 2030	
	Industrial wastewater	Annual industrial growth	Wastewater generation in 2050 is expected to remain at the current levels.	60% treatment by 2050	80% treatment by 2050
	Domestic wastewater	Increase in population	Current growth	100% treatment by 2050	100% treatment by 2040

Sector	Sub-Sector disaggregation	Demand driver	Scenario-BAU	MES	AES
Carbon sequestration	-		Existing sequestration to be same till 2050	- Repurposing 20%-25% of the total 191616 ha of barren/fallow land to horticulture, agro/social forestry - Enhancing carbon stock density from existing ~82.25 t/h to 84.76 t/ha	- Repurposing 30%-40% of the total 191616 ha of barren/fallow land to horticulture, agro/social forestry - Enhancing carbon stock density from existing ~82.25 t/ha to 86.76 t/ha
Agriculture	Agriculture soils	Increase in net sown area and fertiliser demand to enhance productivity	Current growth	Substituting nitrogen fertiliser and urea with 50% organic fertiliser and 50% nano- urea by 2050	Substituting nitrogen fertiliser and urea with 75% organic fertiliser and 25% nano- urea by 2050
	Rice cultivation	Increase in net sown area	Current growth	Increase in multiple aeration water regime from 20% to 60% for rice cultivation by 2050	Increase multiple aeration water regime 20% to 77% for rice cultivation by 2050
	Livestock	Increase in livestock population	Current growth	60% balanced rationing, 45% methanogen inhibiting feed additive and 60% manure management by 2050	90% Balanced rationing, 75% methanogen inhibiting feed additive and 90% manure management by 2050.
* Constant scenario across BAU, MES and AES due to yet evolving policy and market dynamics					

Results from the various assessments conducted, with decarbonisation strategies and pathways, are provided in the subsequent chapters of this report.



2. District Profile

Coimbatore is one of the oldest districts of Tamil Nadu, with its history dating back to well before the 2nd or 3rd century AD. The district, situated in the western part of Tamil Nadu, spans an area of approximately 4,723 square kilometres and is administratively divided into three revenue divisions (Coimbatore, Pollachi, and Mettupalayam) and twelve taluks. The district shares its borders with Kerala to the west, the Nilgiris district to the north, Erode and Tiruppur districts to the east, and Dindigul and Palakkad district of Kerala to the south.

Demography

Coimbatore exhibits notable demographic trends, with a higher female population compared to the national average, reflecting progress in gender equality. However, challenges in education and healthcare persist despite the improved literacy rates.

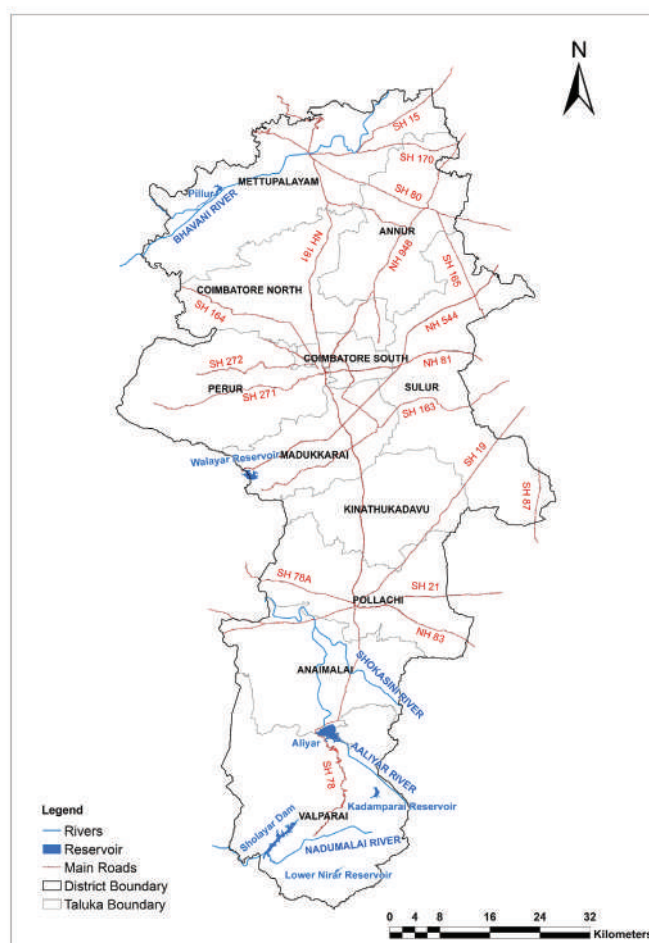


Figure 2.1: Coimbatore district map

Table 2.1 : Important demographic indicators of the district

 Geographical details	Area (in sq.km)	Villages	Blocks	Municipalities	Revenue divisions
	4723 sq.km	296	12	7	3
 Demographic details	Total population	Population density (persons per sq.km)	Urban population	Rural population	Sex ratio
	34,58,045	732	26,18,940	8,39,105	1000

Source: Census 2011, District Statistical Handbook 2022-23

The demographic landscape is expected to evolve significantly. Overall, the district's total population is forecast to grow by 5.68 percent between 2021 and 2050, with an annual growth rate of 0.19 percent, which remains below the national average of 0.61 percent. As per the 2011 Census, around 50.45 percent of the population of Coimbatore district resides in urban areas, while the remaining 49.55 percent lives in rural areas. The urban population is projected to grow by 35.7 percent, while the rural population is expected to decline by 25.24 percent. Additionally, the number of households is anticipated to rise by 20.92 percent, reaching 12,05,195 by 2050.

Topography and Climate

Coimbatore district features a varied topography, with the Western Ghats forming its western and northern boundaries, encompassing the Nilgiris hills and parts of the Anaimalai and Palani hills. The Noyyal River flows through the district, defining the southern part of the city, which is situated within its basin and supported by an extensive tank system. A significant geographical element is the Palghat Gap, a western pass to Kerala, which serves as a prominent transport corridor in this region. The eastern areas of the district are largely dry plains.

Climatically, Coimbatore is situated in the rain shadow region of the Western Ghats. The normal rainfall ranges from 329.9 in the northeast monsoon and 189.9 mm in the southwest monsoon. Temperatures in the district typically range from minimum of 20.7°C to maximum of 35.2 °C. The predominant soil type is red soil, covering about 60 percent of the district, particularly red calcareous soil, while black soils are prevalent in highland areas. Alluvial soils are found in smaller areas along the Noyyal River.

Water Resources

Coimbatore district is a landlocked region with its major rivers flowing eastward to join the Cauvery River. The primary river basin in the district is the Noyyal River basin, a tributary of the Cauvery. Other significant rivers that contribute to the district's water resources within the broader basin include the Bhavani and Amaravathi rivers. All these rivers are seasonal, with substantial flows primarily during the monsoon periods. The district's water management heavily relies on the interconnected tank system associated with the Noyyal River, which aids in groundwater replenishment. In 2021-22, the pre-monsoon water level in the district ranged from five to ten metres below ground level (mbgl), while the post-monsoon water level ranged similarly from five to ten mbgl.

2.1 Land and Other Natural Resources

2.1.1 Natural Resources (Forests and Biodiversity, Mining, Wetlands)

The land use pattern in Coimbatore district is diverse, comprising agricultural lands, forest areas, built-up urban zones, water bodies, and wastelands. A significant portion of the land is utilised for agriculture, especially in the eastern and central parts, while dense forest cover is prominent in the western and northern regions, particularly along the Western Ghats. The district also features rapidly expanding urban settlements, especially around Coimbatore city. The soil types primarily include black cotton soil and red soil, which support a range of agricultural activities.

Coimbatore district has a total geographical area of 472,322 hectares, of which 6,647 hectares (around 1.41%) constitute forest area. The net sown area extends over 165,302 hectares, covering approximately 45 percent of the district's total, with a cropping intensity of 106.26 percent. Fallow land constitutes 101,741.996 hectares (21.54% of the total area), comprising 43,962.519 hectares of current fallow and 57,849.477 hectares of other fallow land. Uncultivated yet potentially arable land, including cultivable waste (8,239.877 ha), permanent pastures and grazing land (76.955 ha), and land under miscellaneous tree crops (3,446.167 ha), amounts to 11,762.999 hectares, which is approximately 2.49 percent of the total geographical area.

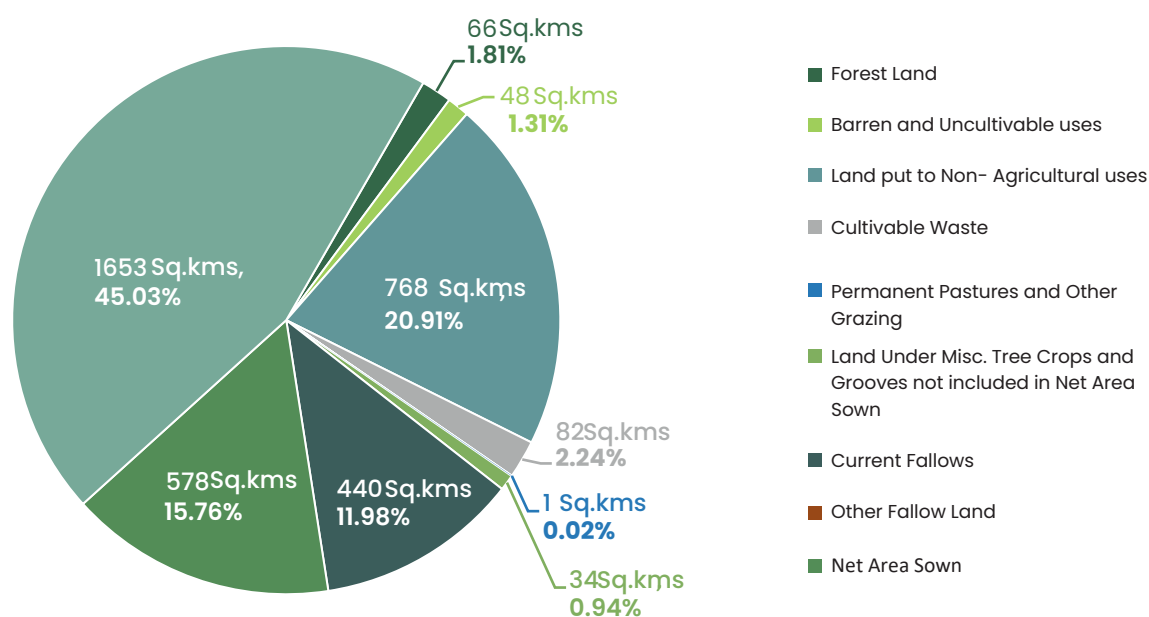


Figure 2.2: Land classification of Coimbatore (District Statistical Handbook, 2022-23)

In the Coimbatore district, the total forest cover in 2013 was 2627 sq. km, while by 2023, it had decreased to 1,953.18 sq. km (FSI, 2023). A broader comparison of land use patterns between 2013 and 2023 depicts significant shifts. Within this overall decline, specific forest categories—Very Dense Forest (VDF), Moderately Dense Forest (MDF), and Open Forest (OF)—collectively decreased by approximately 3.35% (–53.93 sq km). The built-up area saw a substantial increase of 167.20 sq km, representing a 42.19 percent change. Conversely, agriculture land decreased substantially by 113.52 sq km, a 13.32 percent reduction. Meanwhile, plantation areas expanded by 32.38 sq km (4.08%), and waste land increased by 6.74 sq km (29.29%). Other categories, such as scrub land and waterbodies/rivers/streams saw minor decreases (Table 2.2).

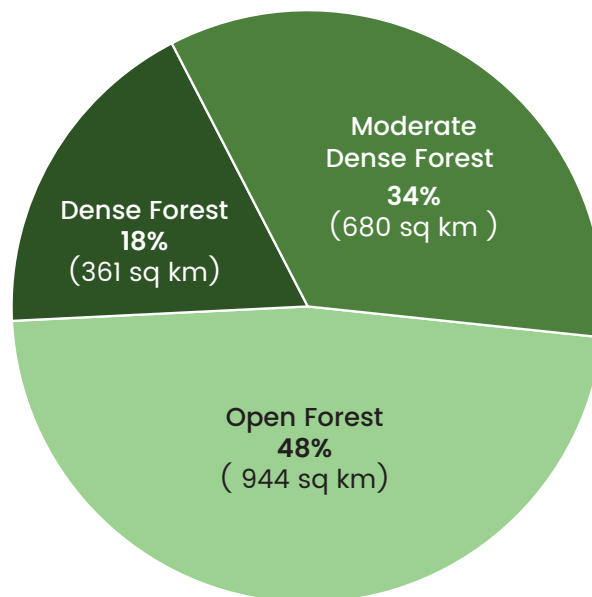
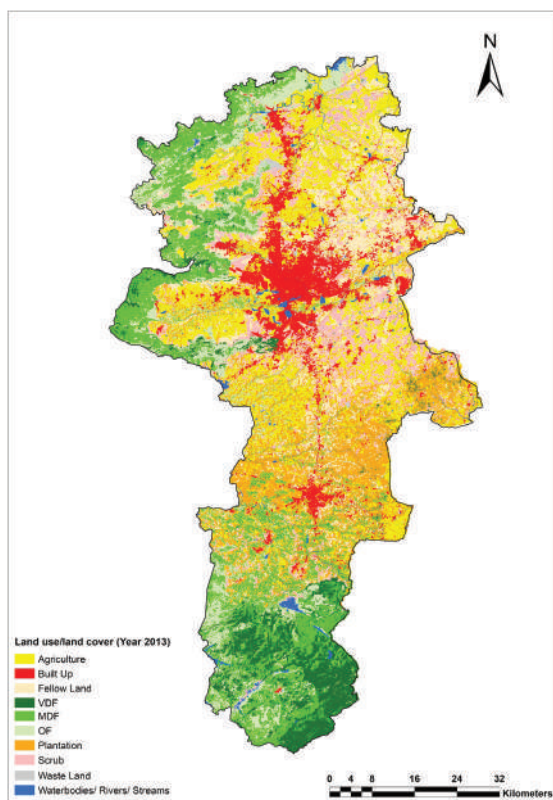
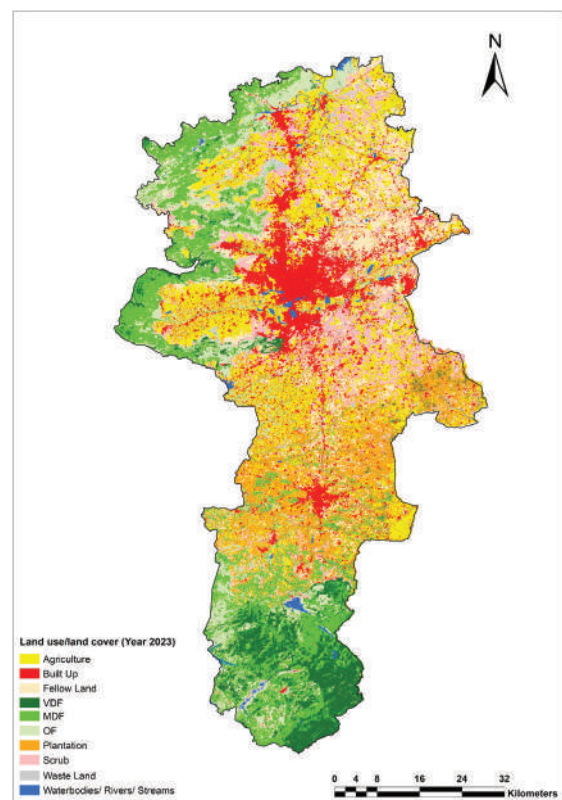


Figure 2.3: Density-wise classification of forest land in Coimbatore

Land-use/land cover Change Map (2013 to 2023) of Coimbatore district (Tamil Nadu)



Source: LISS III Satellite imageries Year 2013



Source: LISS IV Satellite imageries Year 2023

Figure 2.4: Land use pattern map of Coimbatore district

Table 2.2: Land use pattern of the Coimbatore district

Land use/ land cover cate- gories (sq km)	Agri- culture	Built up land	Fallow land	Very dense forest	Mode- rate dense forest	Open forest	Plant- ation	Scrub land	Waste land	Water bodies
Year 2013	852.38	396.35	499.15	363.78	706.88	541.08	793.44	490.42	23.01	75.66
Year 2023	738.86	563.56	469.11	359.91	659.81	538.10	825.82	483.34	29.75	73.90
Change (%)	-13.32	42.19	-6.02	-1.06	-6.66	-0.55	4.08	-1.44	29.29	-2.32

Source: LISS III and IV satellite imageries for 2013 and 2023, Authors' Analysis

2.1.2 Biodiversity and Wetlands

Coimbatore district is endowed with a number of wetlands, forming crucial ecosystems. The region is primarily developed within the watershed expanse of the Noyyal River basin, which emerges from the Vellingiri Hills of the Western Ghats. The Noyyal river and associated wetlands constitute the major life supporting factor for the Coimbatore region. In fact, wetlands make up 1.08 percent of the district's total land area, covering approximately 8070 sq km. The Anamalai Tiger Reserve, a large, protected area of tropical jungle, shola forest, and grassland, is also found here. This reserve, covering 958.59 sq km, rises up to 2400 metres in height and stretches into Kerala. It is home to many unique animals like leopards, about 30 tigers, lion-tailed macaques, elephants, and crocodiles.

2.2 Economy

Known as the textile capital of South India, Coimbatore is the second-largest city in the state, distinguished for its high concentration of industries, primarily automobile, manufacturing of textile industry equipment, spares, motor pump sets, and various other engineering goods and services. Notably, the district also holds a monopoly in the wet-grinder industry, exemplified by its geographical indication for Coimbatore Wet Grinders.

In 2022-23, the estimated Gross District Domestic Product (GDDP) at constant prices in 2022-23 was ₹ 94,76,876 lakh contribute 6.5 percent of Tamil Nadu's GDP. Based on 2022-23 GVA at constant prices, Coimbatore's service sectors including trade, repair, financial and other services and manufacturing are the largest contributors to the district's GVA at 49 percent and 30 percent respectively. Agriculture, despite being a primary occupation of the population, contributes only 8.71 percent to the district's GVA. (Figure 2.5)

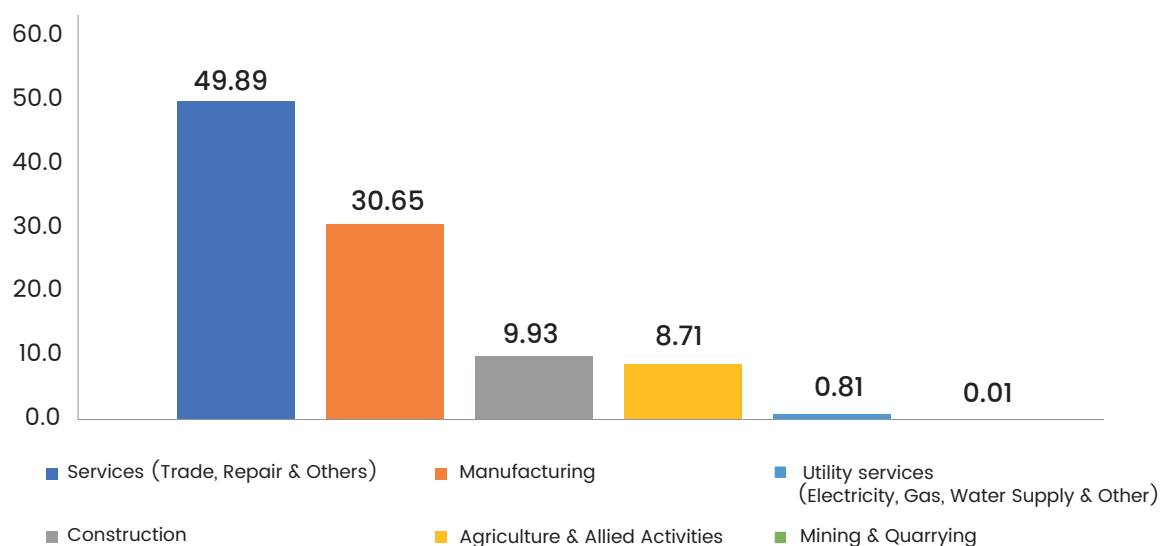


Figure 2.5: Sectoral contribution in GVA of the Coimbatore district for 2022-23

Source: Tamil Nadu Department of Economics and Statistics

2.2.1 Transport and Other Infrastructure



Road Connectivity

Coimbatore district has a road length of 12,497.64 km, of which 11,299.9 km is surfaced road and around 1197.667 km is unsurfaced road. The district is well-connected by roads of both national and state highways. In the city, there are six major arterial roads and three National Highways - NH-544 (Cochin-Salem), NH-67 (Mysore-Nagapattinam), and NH-209 (Bangalore-Dindigul). There are also five National Highways that connect the district to other parts of the state.



Railway Connectivity

Train services in the district had commenced in 1863, with the construction of the Podanur – Madras railway line connecting Kerala and the west coast with the rest of India. There are now 20 railway stations in the district, covering a route length of 189 km. Coimbatore junction is the second-highest revenue-yielding station in the Southern Railway division of Indian Railways, coming under the jurisdiction of the Salem Division and contributing 43.5 percent of its divisional income. Coimbatore North junction and Podanur junction are other key stations in the city, with Podanur junction currently being upgraded to serve as the second railway terminus for the city.



Air Connectivity

The district has an international airport with flights to Sharjah (United Arab Emirates), Sri Lanka, and Singapore. Domestic flights to major Indian cities such as Ahmedabad, Bangalore, Chennai, New Delhi, Hyderabad, Kolkata, and Mumbai also operate from this airport.

2.2.2 Industry

Coimbatore is one of the most industrialised cities in Tamil Nadu, known as the textile capital of South India or the Manchester of the South. The district is also the second-largest software producer in Tamil Nadu, with presence of IT firms like Tata Consultancy Services and Cognizant Technology Solutions.

There are more than 25,000 small, medium, and large-scale industries and textile mills in the district. Coimbatore leads in pump manufacturing and also holds a monopoly in the wet-grinder industry, exemplified by its geographical indication for Coimbatore Wet Grinders. As of 2020-21, the region hosts 30,058 Micro, Small and Medium Enterprises (MSME), which collectively offer 3,39,164 employment opportunities.

2.2.3 Tourism

Coimbatore district is popular for its tourist attractions. Major attractions include Kovai Kutralam, Valparai, Aliyar Dam, Monkey Falls, Siruvani Dam, Sholayar Dam, Botanical Garden, Horticulture Farms, Vellingiri Mountain, Diyana Lingum, Topslip, Anaikatti and Vaitheki Falls. The district recorded 5.9 million tourist arrivals in 2020 and 4.9 million in 2021, including 3776 and 1172 international visitors respectively.

2.2.4 Agriculture

Agriculture is one of the primary occupations in the district, with around 3.36 lakhs people engaged as main agricultural labourers. Major crops include arecanut, coconut, cholan, banana, maize and other food grains. The district accounts for almost 67 percent of the state's total coconut production. In 2022-23, the total cropped area was approximately 1,75,654 hectares, of which around 68 percent was irrigated.

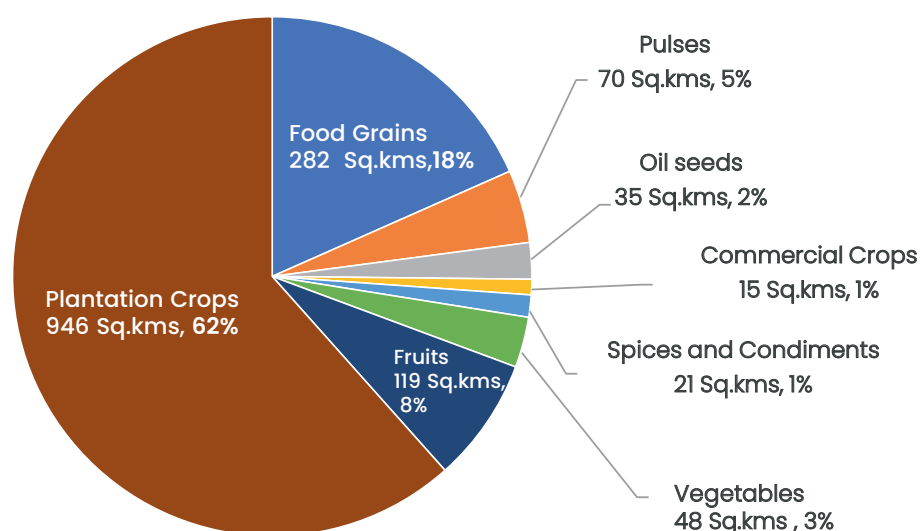


Figure 2.6: Distribution of agriculture crop-wise area (2022-23)

2.3 Power Sector

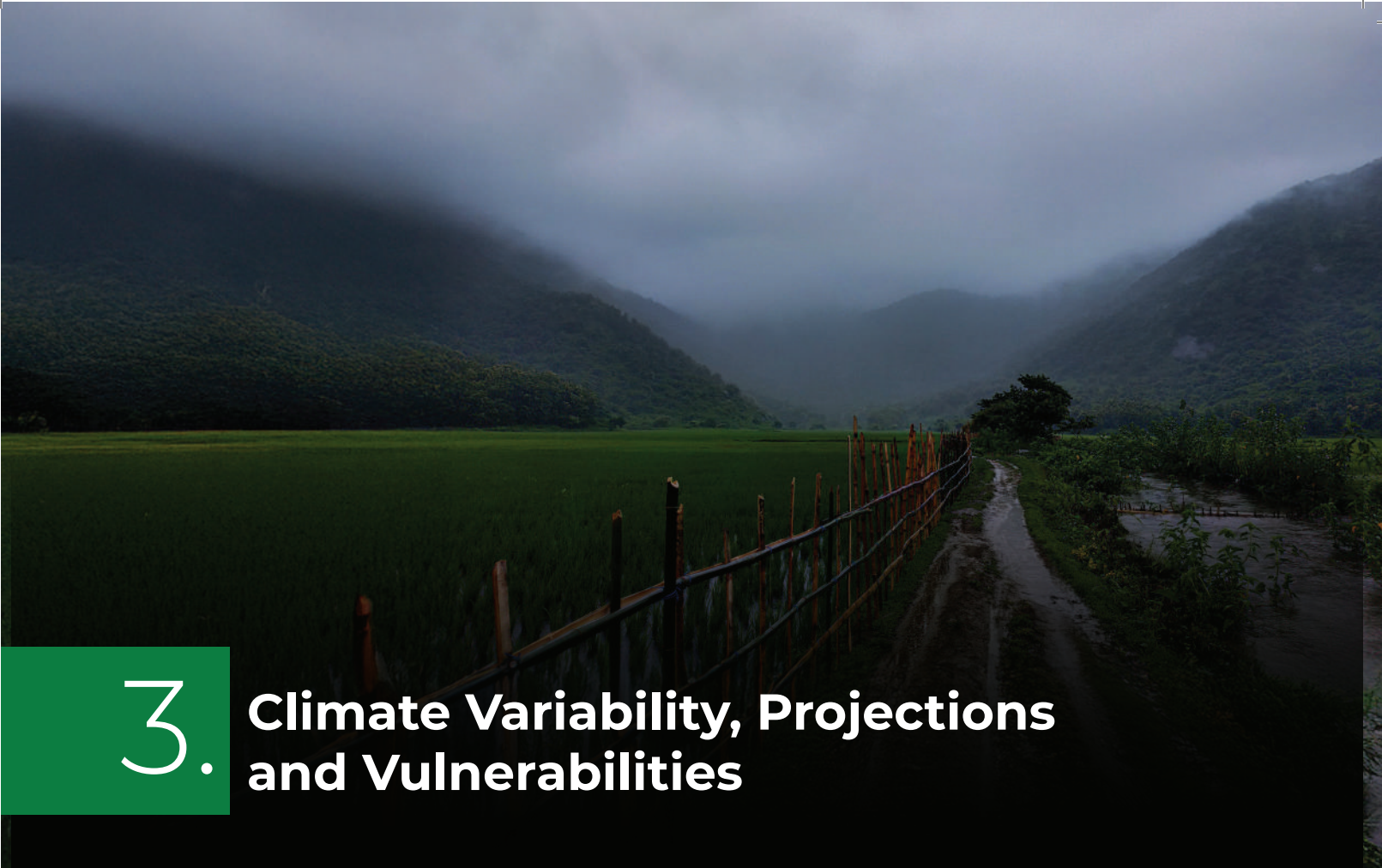
The current installed power capacity Coimbatore district is 730.05 MW, comprising both large and small power stations. Hydropower plants contribute an installed capacity of 603.5 MW, forming a major of the district's energy infrastructure followed by wind power at around 126.55 MW. The largest contribution comes from hydropower plants in Coimbatore. The major hydropower projects in the district are the Kadamparai power house, Sholayar Power House I and II, Aliyar Power House, and Sarkarpathy Power House. These projects collectively offer a substantial operational capacity, with Kadamparai Power House being the most significant contributor at 400 MW.

In 2022-23, net electricity generation from hydropower plants and windmills was of unit 842.96 GWh and 199.81 GWh respectively. In terms of electricity consumption, the district's total stood at

6120 GWh (6456 GWh, including captive demand). This was led predominantly by the residential sector at 2532 GWh (41%), followed by the industrial sector 2246 GWh (37%). The commercial and services sector consumed approximately 1250 GWh – 856 GWh in commercial and 394 in miscellaneous uses– making up 20 percent of the total electricity usage. The agriculture sector consumed 93 GWh, accounting for 2 percent of the total electricity consumption.

2.4 Waste Management

Coimbatore district comprises a total of 811 wards across these ULBs, with door-to-door waste collection services being provided in 809 of them, achieving 99.75% coverage. The total solid waste generated in the district was around, 1225 tonnes per day (TPD) in 2023. Waste source segregation is also practiced in 792 of these wards (97.66%). Out of 41 ULBs, 39 have been declared Open Defecation Free (ODF+). In Coimbatore district, there are seven operational Sewage Treatment Plants (STP) with a total installed capacity of 222.6 million litres per day (MLD), with current utilisation of around 57 MLD.



3. Climate Variability, Projections and Vulnerabilities

The district of Coimbatore is characterised by a tropical, temperate climate. It experiences moderate summers and mild winters. The mean maximum summer temperatures (March–April–May) range from 28°C to 34°C, with April being the hottest month. Winter temperatures (December–January–February) range from 13°C to 19°C, with January being the coldest month. Maximum rainfall occurs during the southwest monsoon period (June to September), with a mean of 745 mm (1951–2020 average); during the northeast monsoon season (October to December), it is around 385 mm.

This chapter focuses on historical climate information (1986–2005) and projects future climate using global climate models. Precipitation and temperature are used as the key climate variables for this analysis. Simulations of precipitation and temperature cover the historical period 1986 to 2005, while projections have been considered over four different epochs: 2021–2040 (2030s), 2041–2060 (2050s), 2061–2080 (2070s) and 2081–2100 (2090s) under medium (RCP4.5) and high (RCP8.5) emission scenarios.

3.1 Temperature

3.1.1 Variability

Maximum Temperature

- The variability in **maximum temperature** in the summer months (March–April–May) **shows a significant increasing trend**, which has accelerated in the last decade (Figure 3.1).
- The mean percentage of **warm days shows a significant increasing trend** (Figure 3.2) in the district.

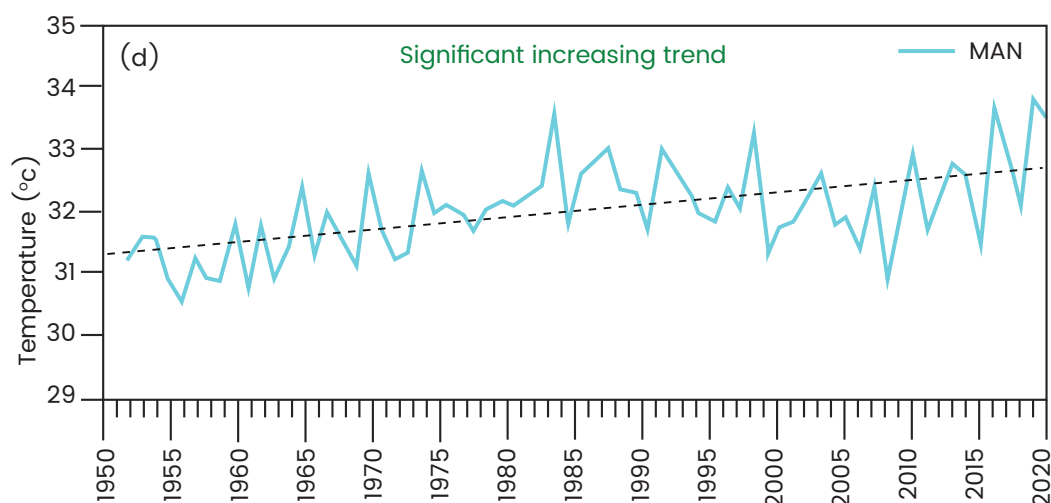


Figure 3.1: Inter annual variability of maximum temperature (deg.C) over Coimbatore for 1951-2020

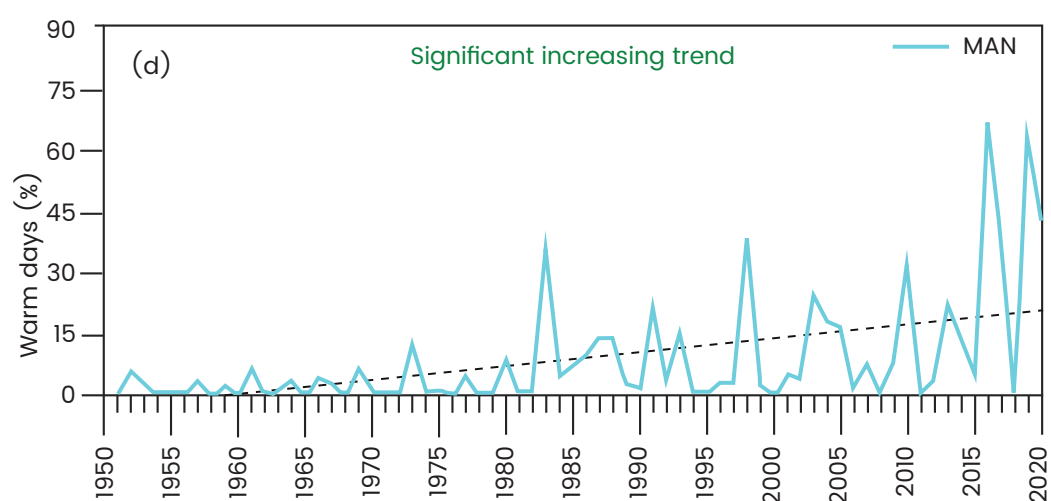


Figure 3.2: Inter annual variability of warm days over Coimbatore for 1951-2020

Minimum Temperature

- The year-to-year variability in **minimum temperature** in the winter months (December-January-February) indicates a **significant increase** from 1951 to 2020 (Figure 3.3).
- The mean percentage of **cold days** has **decreased in recent decades** (Figure 3.4).

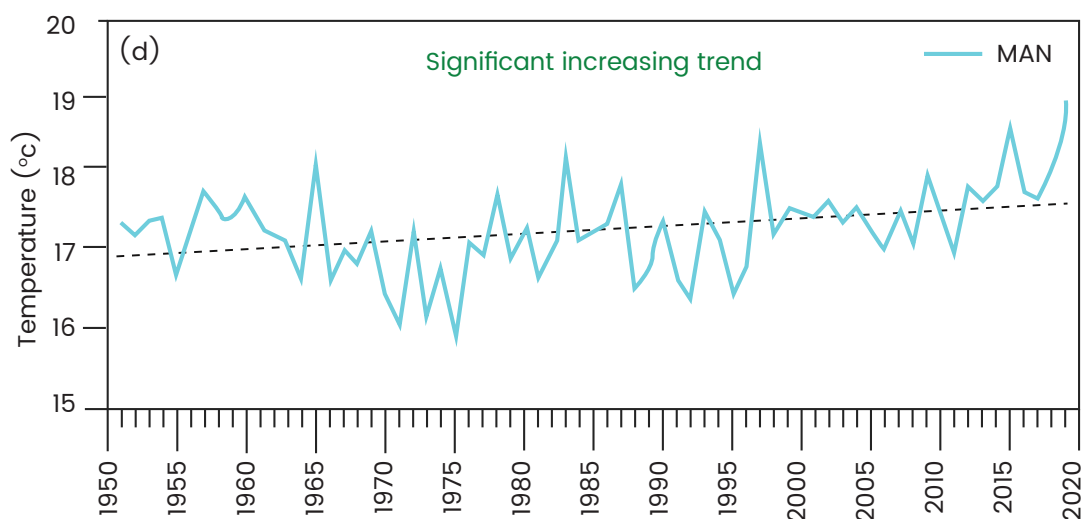


Figure 3.3: Inter annual variability of minimum temperature (°C) over Coimbatore for 1951-2020

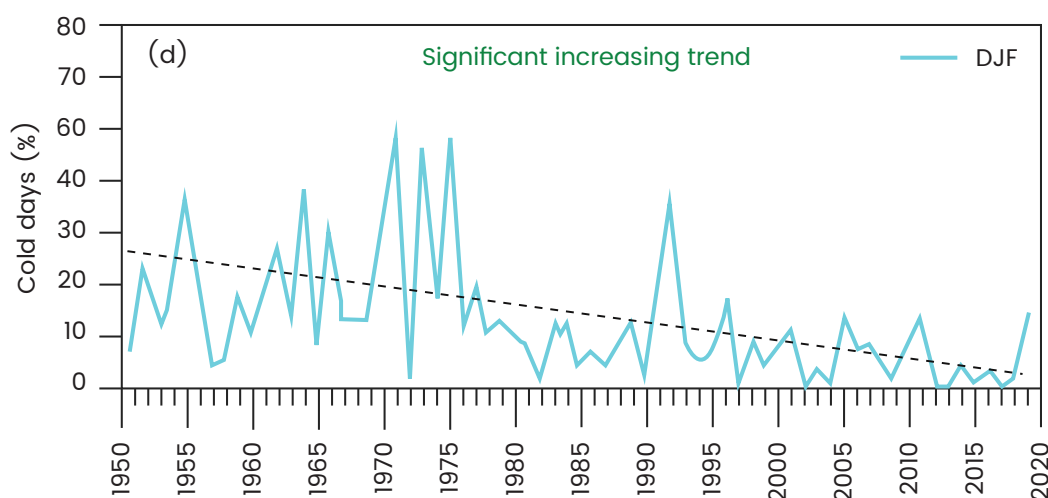


Figure 3.4: Inter annual variability of cold days over Coimbatore for 1951-2020

3.1.2 Projections

Analysis has been carried out for projected changes in maximum and minimum temperatures on a monthly scale during the summertime (MAM) and wintertime (DJF), respectively.

Maximum Temperature

- The projections show that the maximum temperatures may increase by 0.8°C–1.8°C under RCP4.5 and 0.9°C–3.5°C under RCP8.5 over the district (Figure 3.5).
- The percentage of warm days is projected to increase by the end of the century compared to the present climate (Figure 3.6).

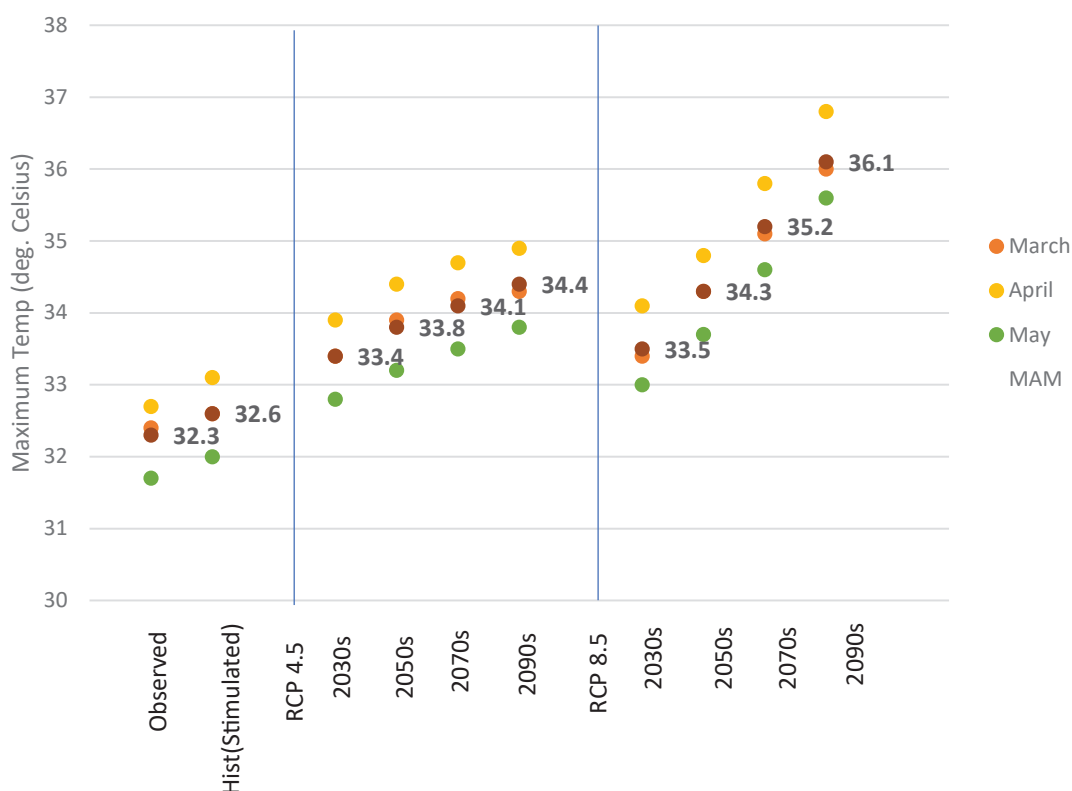


Figure 3.5: Observed, simulated, and projected monthly and seasonal maximum temperature (°C), Coimbatore district

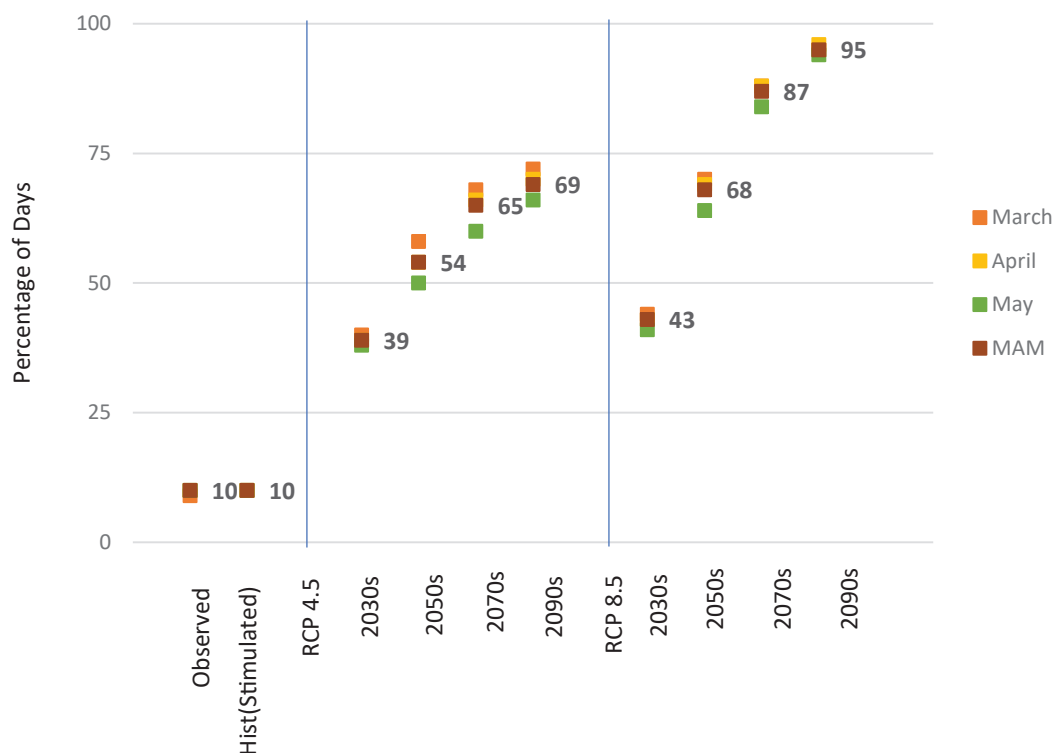


Figure 3.6: Observed, simulated, and projected percentage of warm days, Coimbatore district

- The Heat Wave Duration Index (HWDI) is expected to increase by 0-8 days per season in RCP8.5 by the end of the 21st century (Figure 3.7).
- The Heat Wave Frequency Index (HWFI) is also expected to increase in the range of 15-40 days in RCP4.5, and the intensity is more pronounced in RCP8.5, projected to increase in the range of 16-72 days towards the end of the century (Figure 3.7).

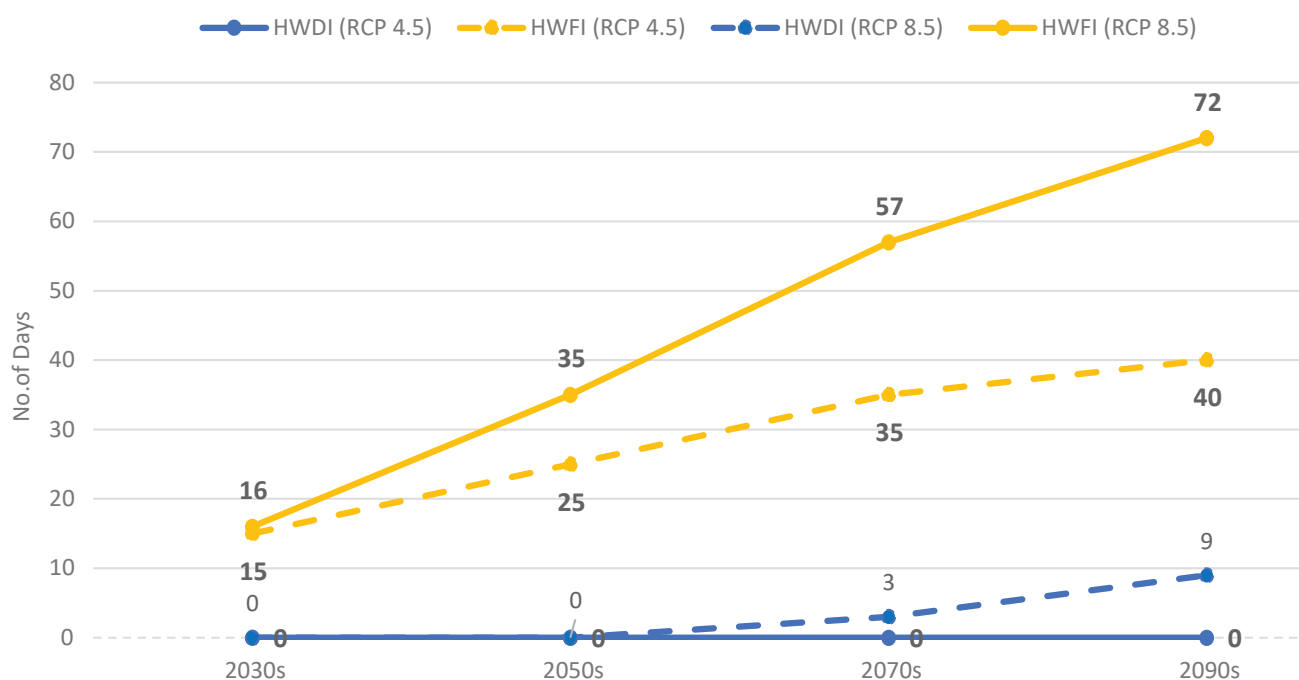


Figure 3.7: Simulated and projected seasonal temperature extremes, Coimbatore district

Minimum Temperature

- Minimum temperatures in the winter season (December-January-February) are projected to increase by 0.8°C–1.8°C under RCP4.5 and 0.9°C–3.6°C under RCP8.5 emission scenarios (Figure 3.8).
- This projected warming trend is accompanied by a decrease in the percentage of cold days across all time periods (Figure 3.9).

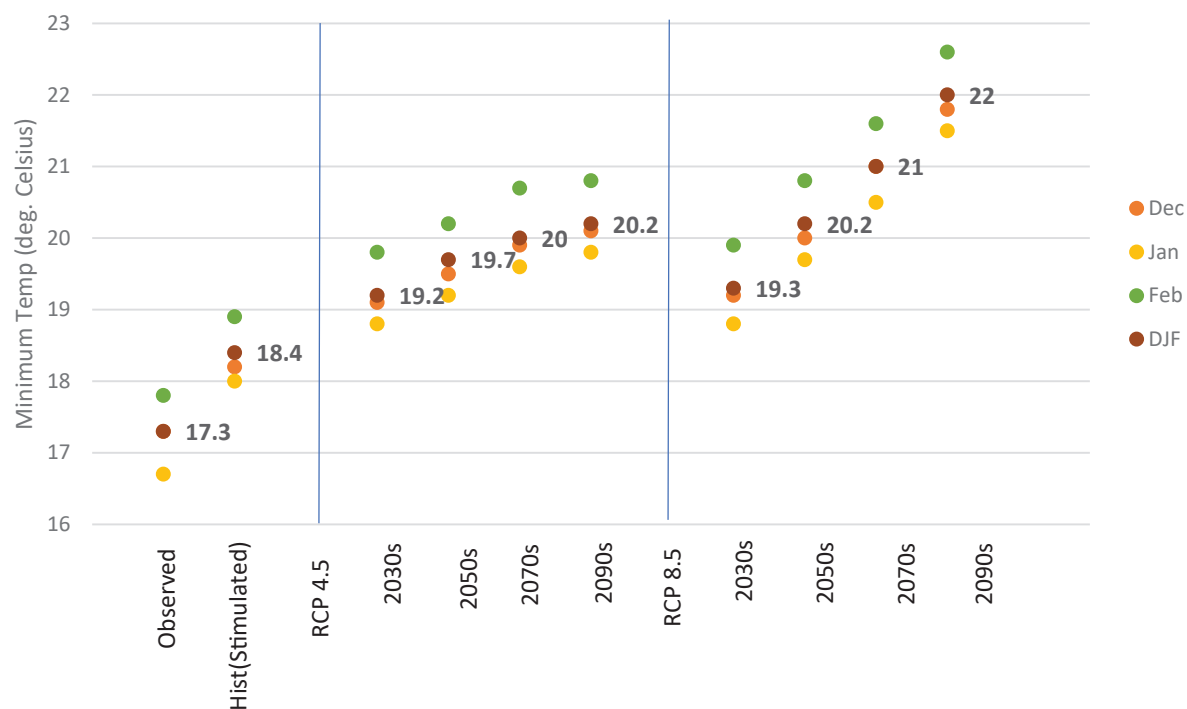


Figure 3.8: Observed, simulated, and projected monthly and seasonal minimum temperature, Coimbatore district

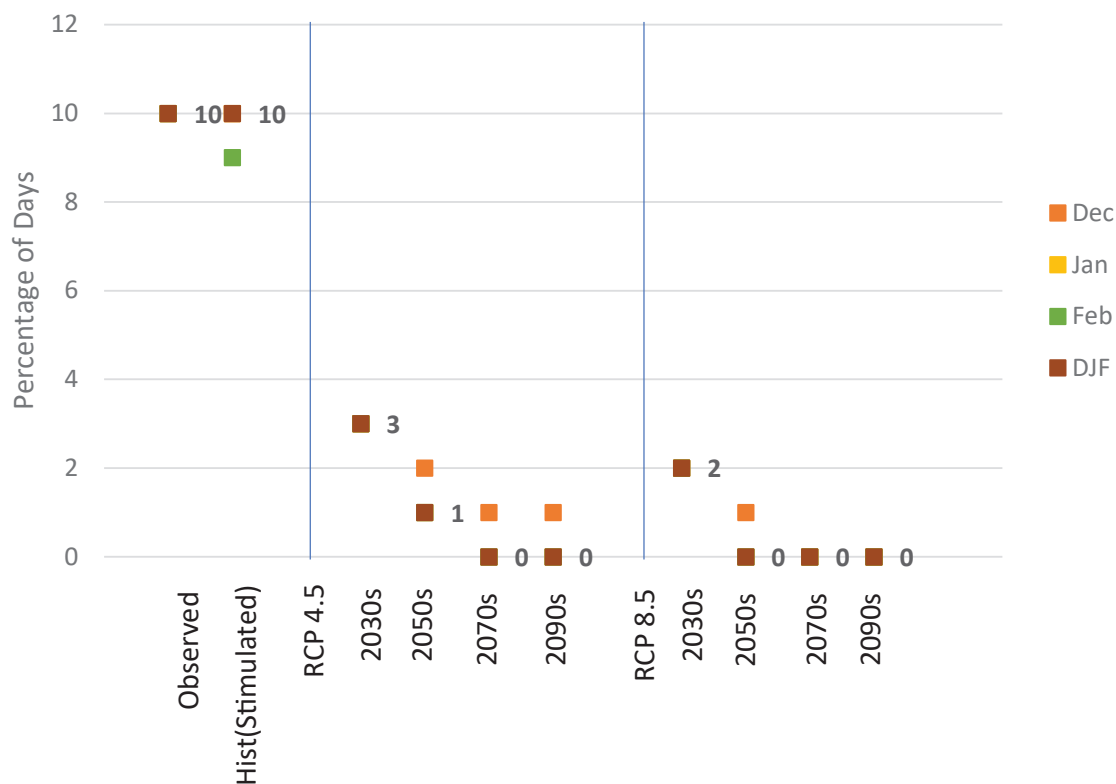


Figure 3.9: Observed, simulated, and projected percentage of cold days, Coimbatore district

3.2 Precipitation

3.2.1 Variability

Southwest Monsoon

- The rainfall shows no significant trend for the June-July-August-September period (Figure 3.10). However, the month of July and the season as a whole shows a **statistically significant decreasing trend**.
- The number of rainy days depicts a decreasing tendency in major rainy months (July-August) and the season as a whole although not statistically significant (Figure 3.11).

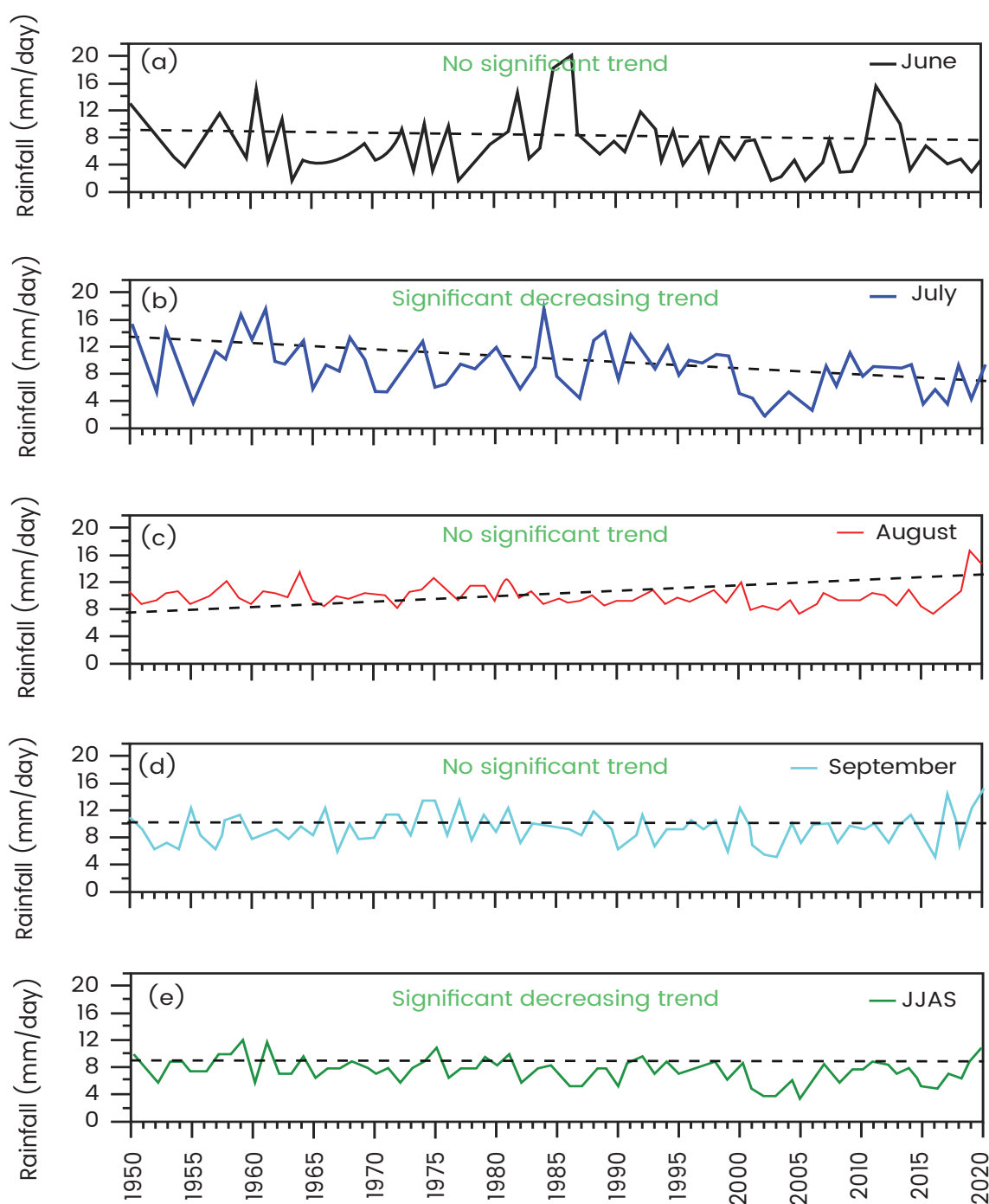


Figure 3.10: Inter annual variability of southwest monsoon rainfall (mm/day) over Coimbatore for 1951-2020

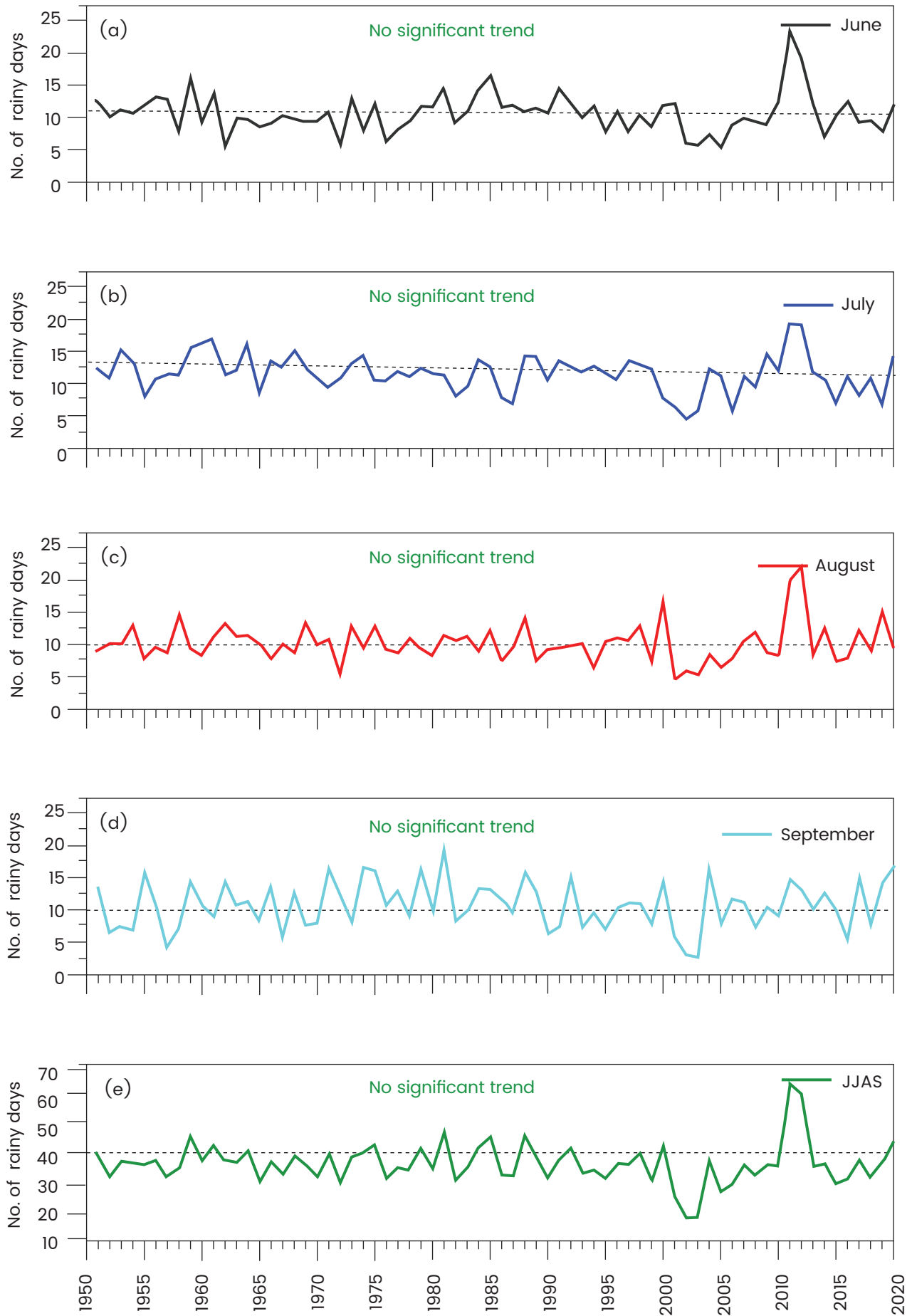


Figure 3.11: Inter annual variability of southwest monsoon rainy days (days) over Coimbatore for 1951–2020

Northeast Monsoon

- The rainfall shows no significant trend for the October–November–December period (Figure 3.12).
- It is observed that the variability in rainy days shows a decreasing trend as observed in October and the entire northeast monsoon season (Figure 3.13).

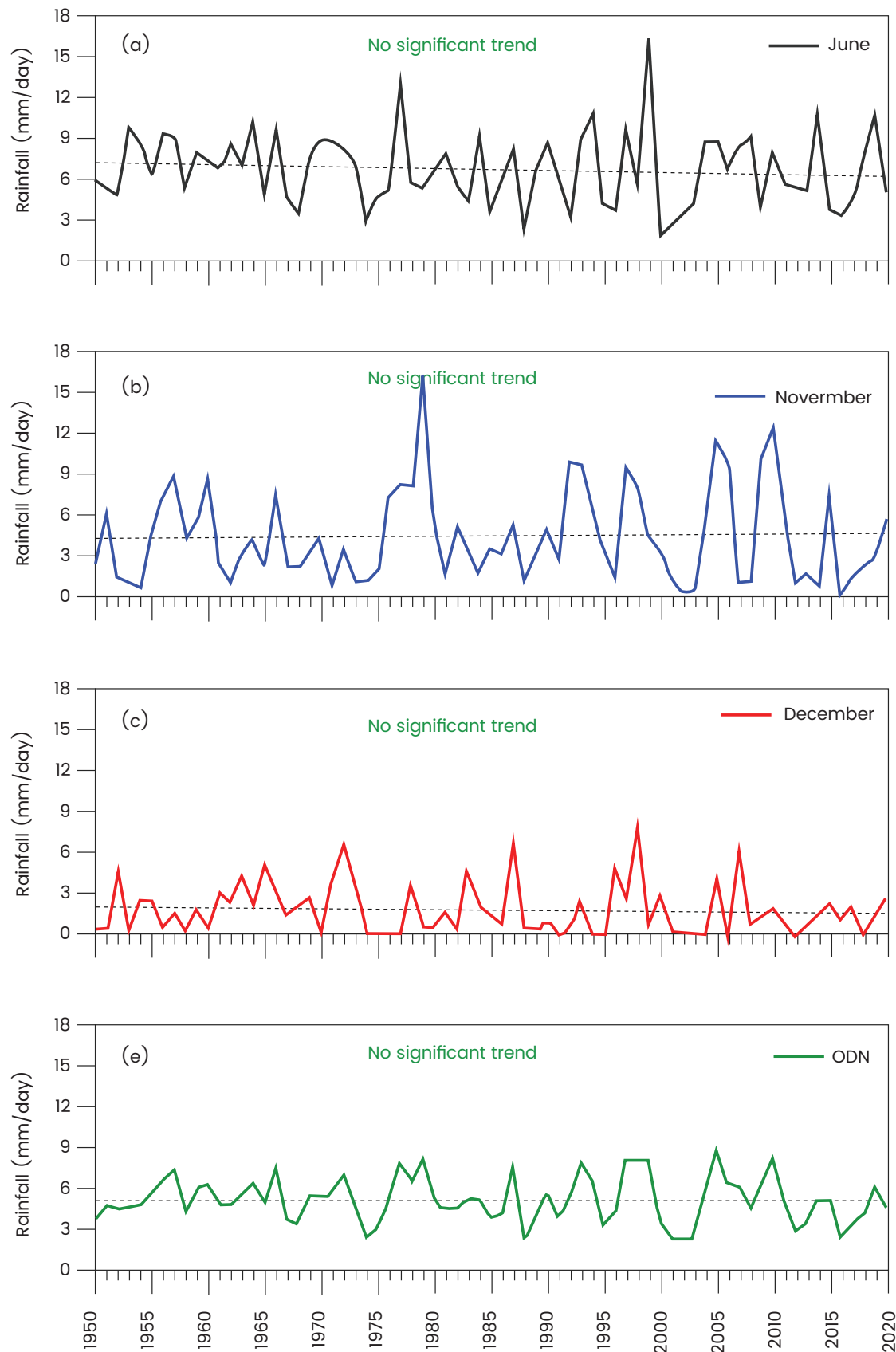


Figure 3.12: Inter annual variability of northeast monsoon rainfall (mm/day) over Coimbatore for 1951–2020

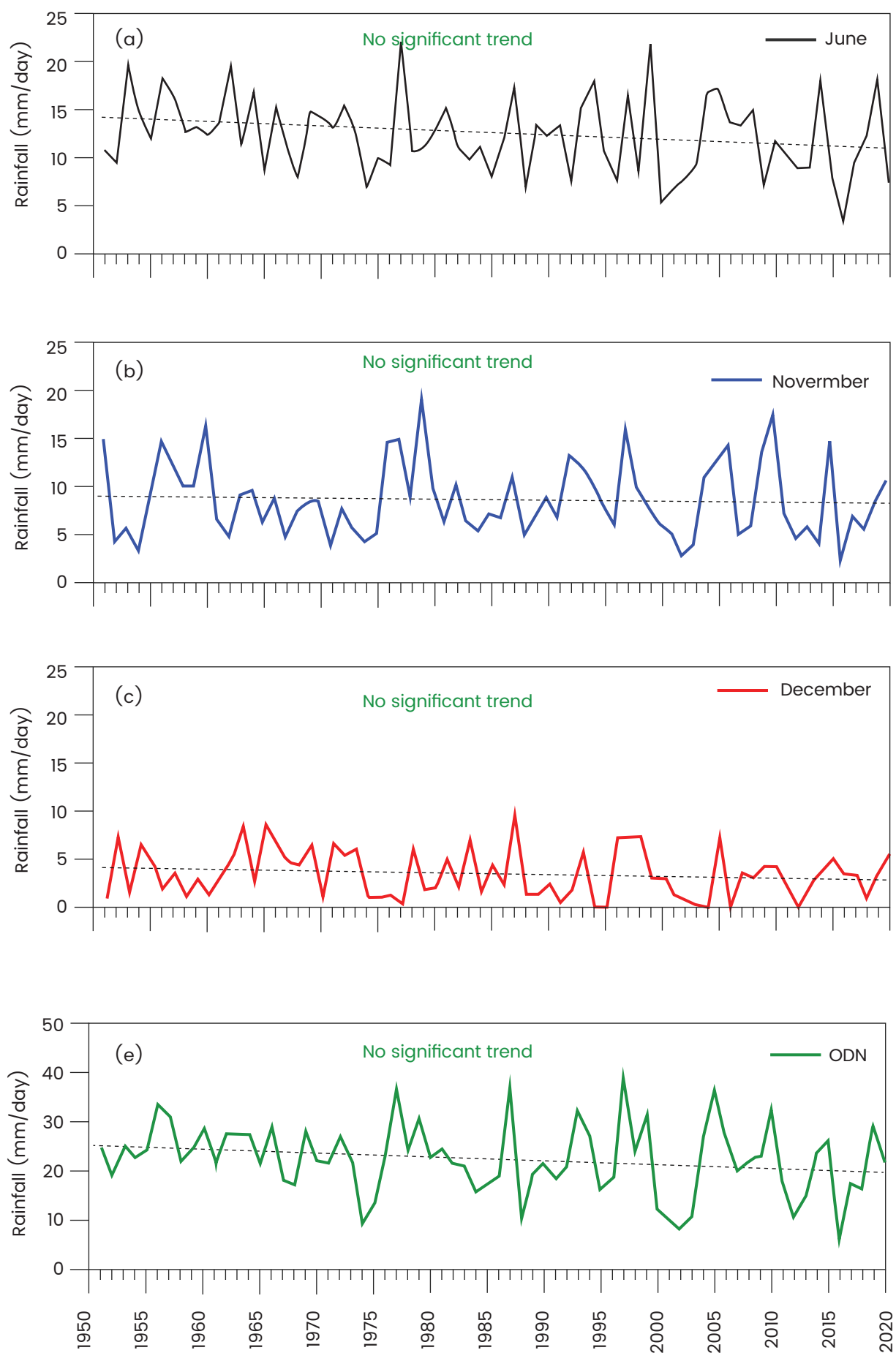


Figure 3.13: Inter annual variability of northeast monsoon rainy days (days) over Coimbatore for 1951–2020

3.2.2 Projections

Southwest Monsoon

- During the southwest monsoon period, the precipitation may increase between 11% – 21% under RCP 4.5 and 8% – 32% under RCP 8.5 emission scenarios (Figure 3.14).
- The number of rainy days is projected to increase mainly during July & August in the southwest monsoon season under both RCP4.5 and RCP8.5 emission scenarios (Table 3.1).

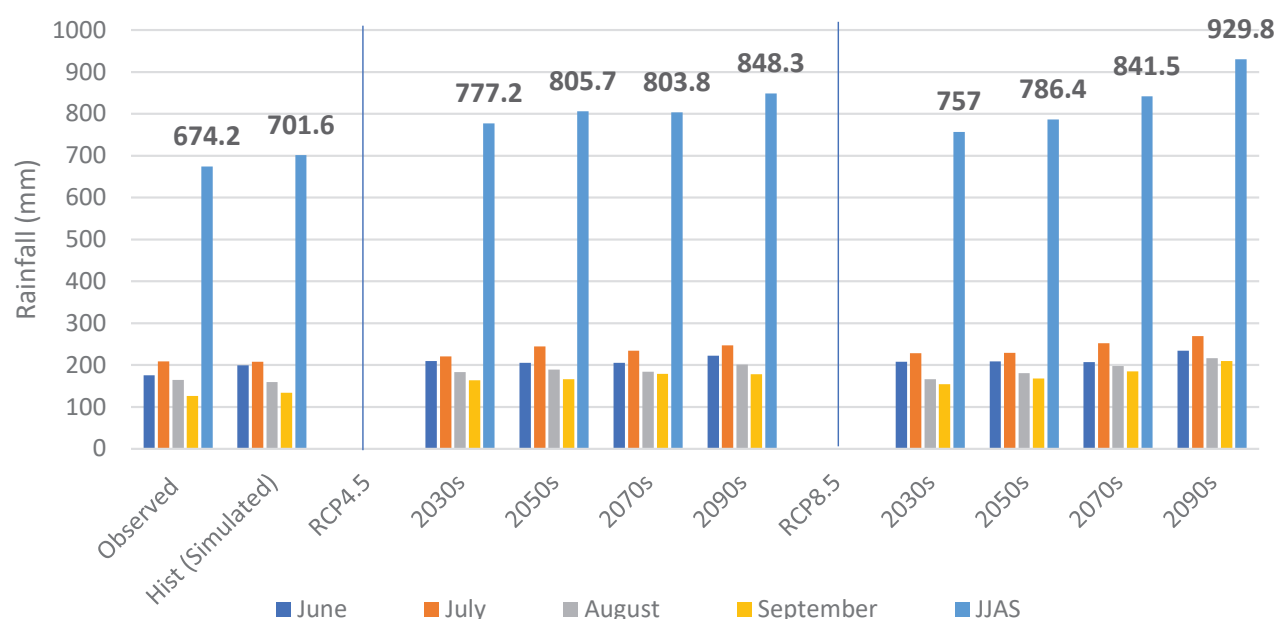


Figure 3.14: Observed (1986–2005), simulated (1986–2005) and projected mean monthly and southwest monsoon rainfall (mm) for Coimbatore district

Table 3.1: Observed (1986–2005), simulated (1986–2005) and projected southwest rainy days (rainfall >2.5 mm) for Coimbatore district

Obs.	Hist. (Simulated)	RCP 4.5	2030s	2050s	2070s	2090s	RCP 8.5	2030s	2050s	2070s	2090s
37	46		51	52	52	53		49	50	51	53

- There is a slight decrease in the number of consecutive dry days during the southwest monsoon season during the historical period and in the future under RCP 4.5 and RCP 8.5 scenarios (Figure 3.15).
- The 1-DAY highest rainfall amount during the southwest monsoon season increases from ~80mm to ~90mm under the RCP4.5 and from ~85mm to ~106mm under the RCP8.5 scenarios (Figure 3.16).
- The 5-DAY cumulative highest precipitation amount during the southwest monsoon is also projected to increase from ~159mm to ~176mm under the RCP4.5 and from ~163mm to ~203mm under the RCP8.5 scenarios (Figure 3.16).

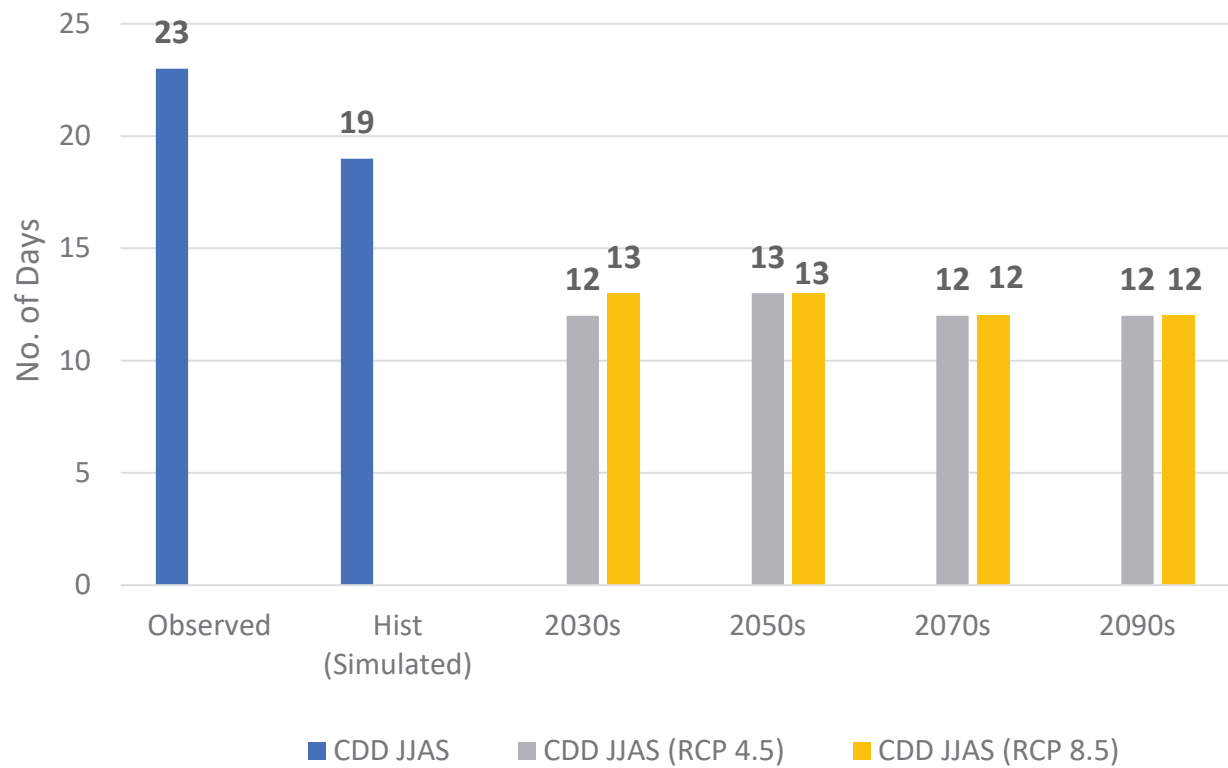


Figure 3.15: Simulated and projected seasonal (JJAS) precipitation extremes, (CDD), Coimbatore district

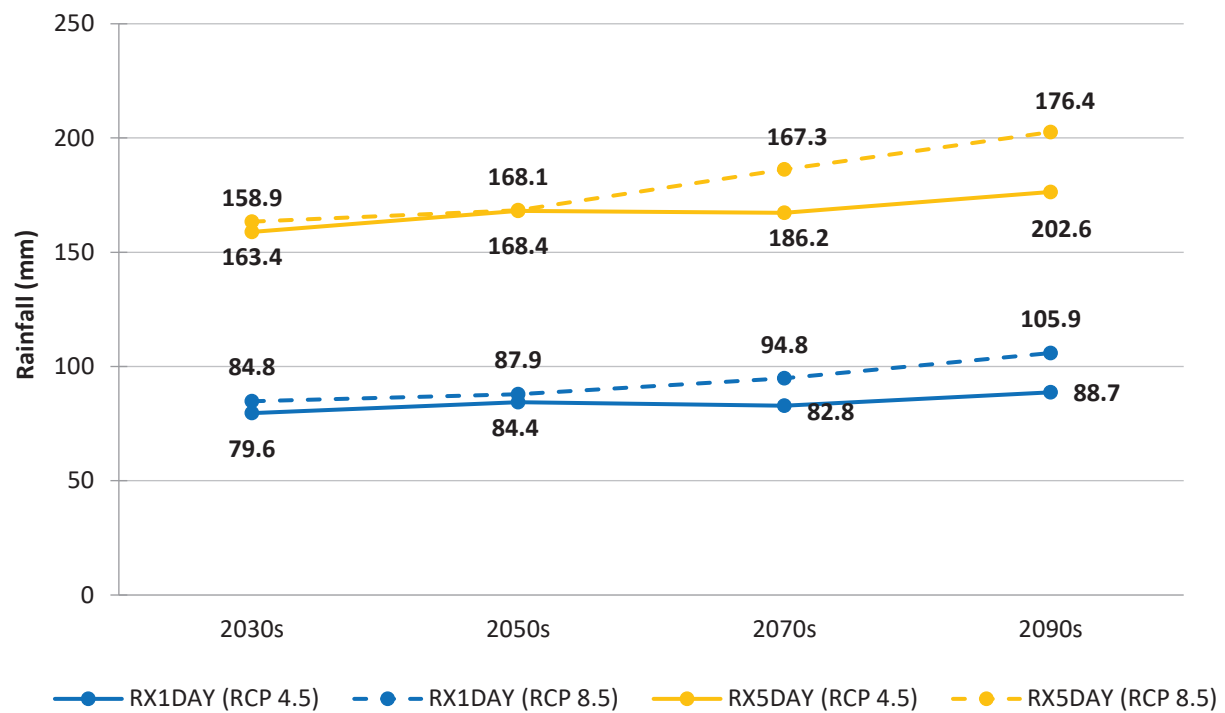


Figure 3.16: Simulated and projected seasonal (JJAS) precipitation extremes, (RX1 and RX5), Coimbatore district

Northeast Monsoon

- The precipitation during the northeast monsoon is also projected to increase in the range of 4% to 10% under RCP4.5 and 2% to 32% under RCP8.5 emission scenarios (Figure 3.17).
- The rainy days for this season are projected to increase by the end of the century under both RCP4.5 and RCP8.5 scenarios (Table 3.2).

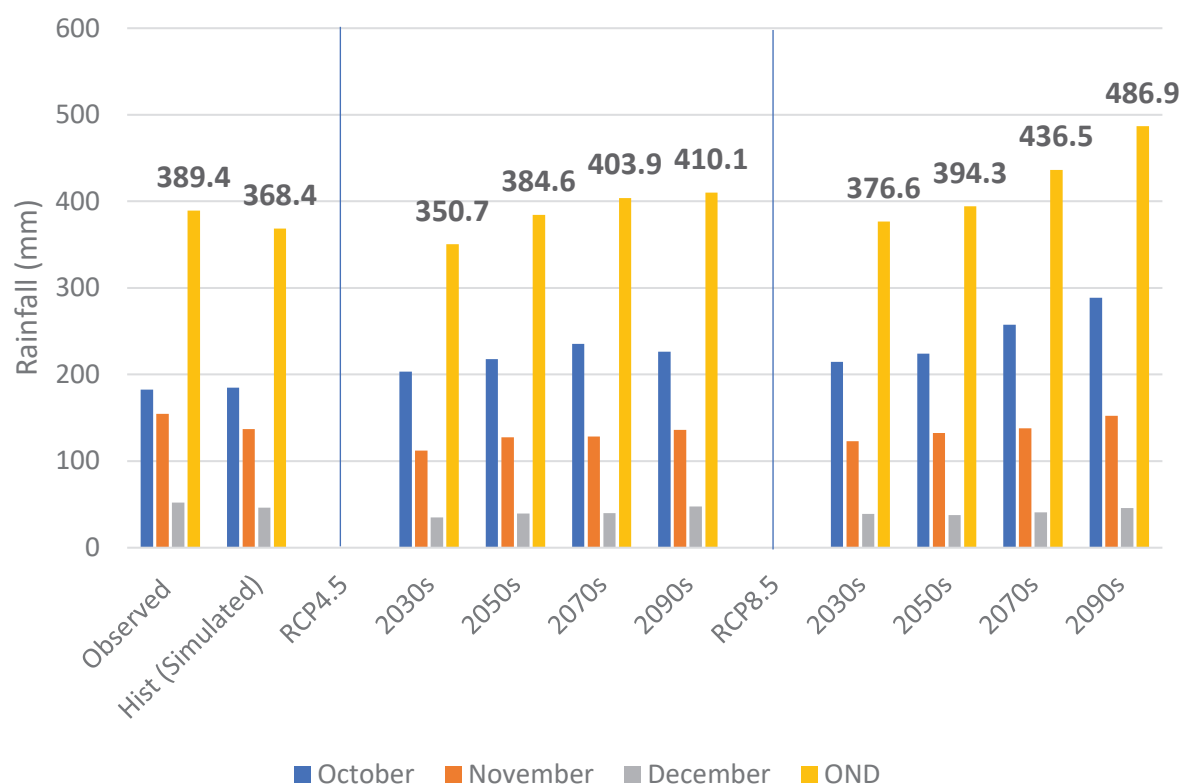


Figure 3.17: Observed (1986–2005), simulated (1986–2005) and projected mean monthly and northeast monsoon rainfall (mm) for Coimbatore district

Table 3.2: Observed (1986–2005), simulated (1986–2005), and projected northeast rainy days (rainfall >2.5 mm) for Coimbatore district

Obs.	Hist. (Simulated)	RCP 4.5	2030s	2050s	2070s	2090s	RCP 8.5	2030s	2050s	2070s	2090s
24	27		27	29	29	30		28	28	30	31

- There is a slight decrease in the number of consecutive dry days during the northeast monsoon season during the historical period and in the future under RCP 4.5 and RCP 8.5 scenarios (Figure 3.18).
- The 1-DAY highest rainfall amount during the southwest monsoon season increases from ~47mm to 48mm under the RCP4.5 and from ~57mm to 68mm under the RCP8.5 scenarios (Figure 3.19).
- The 5-DAY cumulative highest precipitation amount during the southwest monsoon is also projected to increase from ~98mm to 104mm under the RCP4.5 and from ~97mm to 122mm under the RCP8.5 scenarios (Figure 3.19).

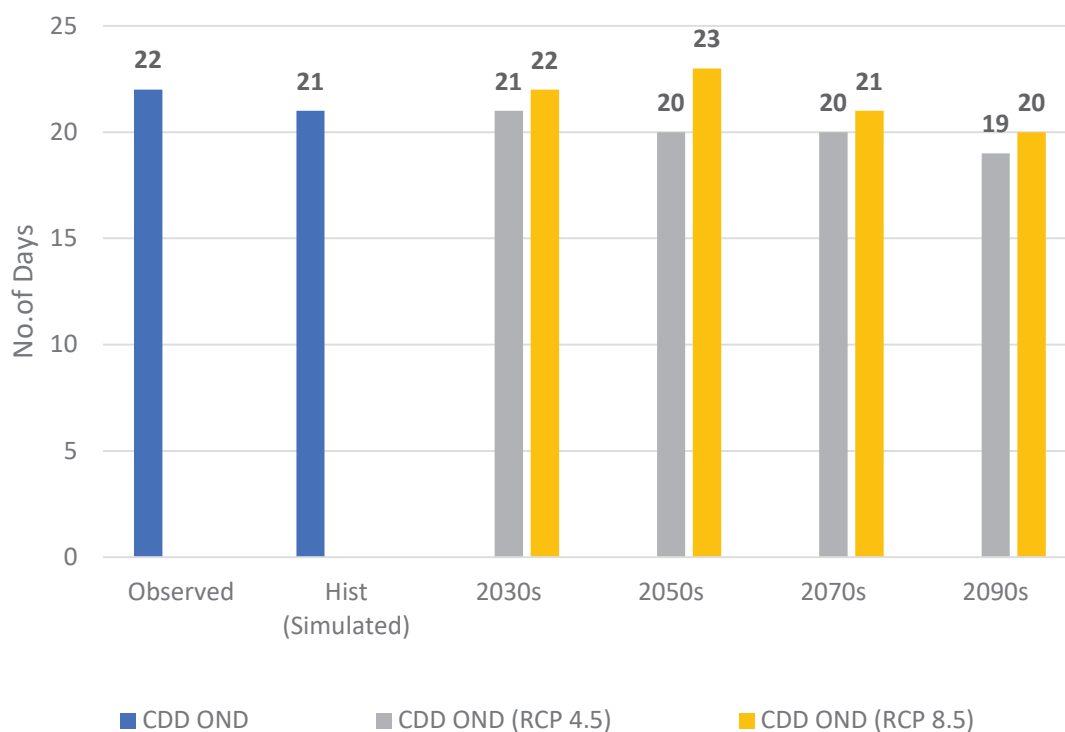


Figure 3.18: Simulated and projected seasonal (OND) precipitation extremes, (CDD), Coimbatore district

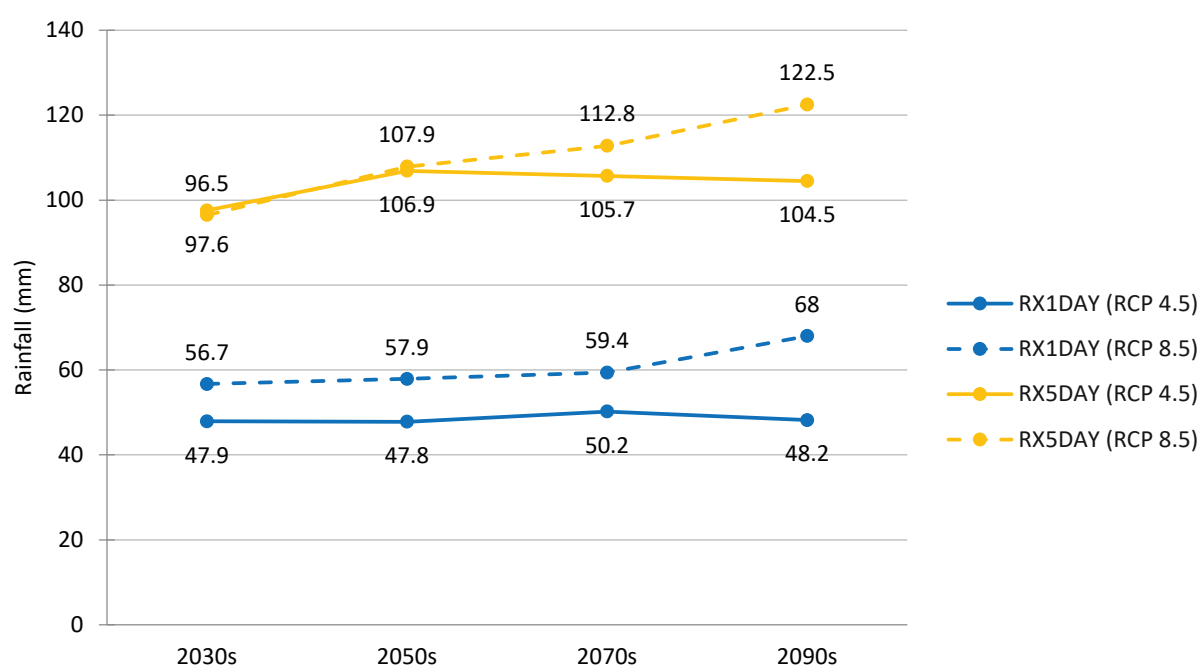


Figure 3.19: Simulated and projected seasonal (OND) precipitation extremes, (RX1 and RX5), Coimbatore district

3.3 Climate Vulnerabilities

Heatwaves

Coimbatore, located on the leeward side of the Western Ghats, experiences high summer temperatures, particularly from March to May. Although traditionally considered moderate in climate, recent trends, especially in 2019 indicate a steady increase in maximum temperatures, with some parts of the district recording temperatures above 40°C¹². Projections also indicate an increased frequency of heatwaves,

with a steep increase in warm days. In particular, the central part of the district experiences higher heat stress compared with the northern or southern parts¹³.

The effects of climate change, coupled with rapid urbanisation, have contributed to the intensification of heat stress in the city and surrounding areas. Urban areas in Coimbatore are particularly vulnerable due to the urban heat island effect; whereby built-up surfaces such as concrete and asphalt retain heat. The reduction in green cover and the increase in impervious surfaces, especially in the localities such as Gandhipuram and Ganapathy¹⁴, have amplified local temperature rises, making densely populated areas more prone to heat related health risks.

Drought

Coimbatore district has a mix of surface and groundwater sources, with significant dependency on seasonal rainfall, tanks, and rivers. Coimbatore city has high dependence on surface water sources such as the Siruvani and Pilloor reservoirs but in years of poor monsoon, storage in these reservoirs drops, leading to urban water shortages and reliance on tankers and borewells, as experienced recently in 2024¹⁵. The peri-urban and rural areas rely on groundwater. Over extraction has led to declining water tables in several areas, with close to 60 percent of the Firkas coming under the category of over exploited ground water based on extraction¹⁶. With the industrial and agricultural demands in the district, especially from the textile and automobile sectors, the considerable stress on available water resources needs to be addressed.

Flooding

Despite being water stressed in summer, Coimbatore is also vulnerable to urban flooding and waterlogging, especially during the Northeast monsoon between October and December. Urban expansion has led to significant encroachments on natural drainage systems and water bodies such as lakes, that once acted as buffers but whose shrinking capacity has made low-lying areas more susceptible to flooding. Inadequate stormwater infrastructure and poor maintenance of drainage channels further exacerbate the problem. Flash floods (flooding due to intense rainfall in short duration) as experienced in the last few years, are of concern in urban areas.



4. GHG Profile

Key Findings

- Total GHG emissions in Coimbatore district increased by approximately 35 percent from 3,109 ktCO₂e in 2005 to 4202 ktCO₂e in 2022 (emissions including civil aviation category), representing a CAGR of 1.8 percent.
- Per capita emissions for 2022 stood at 1.06 tCO₂e/person and the district contributing approximately 2.1 percent to Tamil Nadu's total emissions in 2022¹⁷.
- The emission intensity of Coimbatore district in 2022 decreased by 76 percent compared to the baseline year 2005.¹⁸
- The energy sector consistently remained the largest contributor to GHG emissions, accounting for 2,684 ktCO₂e (64 percent) of the total economy-wide (including civil aviation category) emissions in 2022. This was followed by emissions from Agriculture, Forestry and Other Land Use (AFOLU) at 785 ktCO₂e (19%), Industrial Processes and Product Use (IPPU) at 441 ktCO₂e (11%) and the waste sector at 292 ktCO₂e (7%).
- Energy sector emissions increased from 2260 ktCO₂e in 2005 to 2684 ktCO₂e in 2022 (including civil aviation), with road transport and residential energy as major emitting sub-sectors, accounting for 36 percent and 12 percent of the total economy-wide emissions (including civil aviation category) respectively, in 2022.
- Cement production (IPPU sector) accounted for approximately 10 percent of total economy-wide emissions in 2022, showing a slight increase from ~435 ktCO₂e in 2005 to ~436 ktCO₂e in 2022 (with a dip in 2020 due to COVID-19). Cement production accounted for 99 percent of IPPU emissions.
- Emissions from the AFOLU sector (including land sub-sector) increased almost six-fold from 135 ktCO₂e in 2005 to 785 ktCO₂e in 2022. The emissions increased noticeably post 2016 due to decline in emissions from land sub-sector, primarily because of the reduction in forest cover.
- The waste sector's emissions increased from 275 ktCO₂e in 2005 to 292 ktCO₂e in 2022, with domestic wastewater contributing 66 percent, solid waste disposal 22 percent, and industrial wastewater 12 percent.

The greenhouse gas (GHG) emissions estimate of the Coimbatore district has been developed for the period of 2005 to 2022, accounting for carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). The emissions estimated are of Scope 1¹⁹ type and reported in terms of CO₂ equivalent as per the Second Assessment Reports²⁰ (AR2) of the Intergovernmental Panel on Climate Change (IPCC).

The inventory follows the broad guidelines provided by the IPCC, specifically the 2006 and 2019 guidelines, and aligns with the approach and methodology of GHG inventory development followed by the Government of India in NATCOM²¹ and BUR²² reports.

The data and information used for the development of the Inventory are exclusively from government sources, directly accessed from various line departments of the Government of Tamil Nadu and from national organisations including the Central Electricity Authority and the Petroleum Planning and Analysis Cell. The activity data source is as detailed in Annexure 2.

4.1 Summary of GHG Emission Profile of Coimbatore District

In 2022, Coimbatore district's total greenhouse gas emissions were 4,202 ktCO₂e, amounting to 4,120 ktCO₂e when excluding emissions from the civil aviation sector. While aviation contributes to the district's emissions, the State Government has limited regulatory authority over this sector. Therefore, the emissions excluding aviation offer a more actionable estimate, representing sources that can be directly addressed through state and district-level mitigation policies. This boundary-setting allows for more meaningful tracking of progress and planning of interventions within the local governance framework.

The energy sector emitted 2,684 ktCO₂e, while the Industrial Processes and Product Use (IPPU) sector contributed 441 ktCO₂e. Agriculture, Forestry and Other Land Use (AFOLU) sector (including land sub-sector) contributed 785 ktCO₂e and the waste sector contributed 292 ktCO₂e. The category and gas wise emissions and their percentage contribution is as detailed in the Table (4.1).

Table 4.1: Sector-wise and gas-wise GHG emissions (2022)

Sector	GHG sources and sink categories	CO ₂ (kt)	CH ₄ (t)	N ₂ O (t)	ktCO ₂ e	Contribution (% in total emissions including civil aviation category)
 ENERGY	Captive power plants	292	6	4	293	7%
	Industrial energy	140	6	1	140	3%
	Road transport	1473	347	73	1503	36%
	Civil aviation	81	0.57	2	82	2%
	Residential	510	42	0.98	511	12%
	Commercial	78	8	0.36	78	1.86%
	Agriculture	76	10	0.6	76	1.81%
	Energy total	2650	420	83	2684	64%
 IPPU	Cement production	436	NA	NA	436	10%
	Lubricant use	5	NA	NA	5	0.12%
	IPPU total	441	NA	NA	441	10%

Sector	GHG sources and sink categories	CO ₂ (kt)	CH ₄ (t)	N ₂ O (t)	ktCO ₂ e	Contribution (% in total emissions including civil aviation category)
 AFOLU	Aggregate sources and non-CO₂ emissions sources on land	NA	87	249	79	2%
	Agriculture soil	NA	NA	248	77	1.83%
	Biomass burning in cropland	NA	23	0.6	0.68	0.02%
	Rice cultivation	NA	64	NA	1.35	0.03%
	Land	480	NA	NA	480	11%
	Forestland	480	NA	NA	480	11%
	Agriculture land	0.24	NA	NA	0.24	0.01%
	Settlements	-0.15	NA	NA	-0.15	
	Other land	-0.08	NA	NA	-0.08	
	Livestock	NA	10471	18	226	5%
	Enteric fermentation	NA	9675	NA	203	4.8%
	Manure management	NA	796	18	22	0.5%
	AFOLU total (including land)	480	10558	267	785	19%
 Waste	Solid waste disposal	NA	3106	NA	65	2%
	Domestic wastewater treatment and discharge	NA	6654	169	192	5%
	Industrial wastewater treatment and discharge	NA	1665	NA	35	1%
	Waste total	NA	11425	169	292	7%
 Total emissions (including civil aviation category)		3571	22403	519	4202	
Total emissions (excluding civil aviation category)		3490	22402	516	4120	

NA - Not Applicable

Box Item 1: Soaring demand, growing emissions: India's strategy for greener skies

Currently, emissions from air transport in Coimbatore stand at 82 ktCO₂e. With increasing passenger and freight volumes, the total number of passengers is projected to reach 2.9 million by 2050. In response to this growing demand, the government has announced a 600-acre expansion of the Coimbatore airport, encompassing airstrip extension, a new terminal building, and associated infrastructure – all of which is anticipated to increase emissions, with projections indicating a rise to 240 ktCO₂e by 2050.

It is important to note that the airport industry in India falls outside the purview of district-level jurisdiction, as the governance, regulation, and management of airports are considered matters of national and international significance. To address the challenge of aviation emissions, a multifaceted approach is being undertaken at the central level to decarbonise air transport, involving technological, regulatory, and sector-wide policy measures. The Ministry of Civil Aviation (MoCA), in partnership with other ministries, is advancing the use of Sustainable Aviation Fuel (SAF), implementing operational efficiencies such as air traffic flow management, and supporting international decarbonisation schemes like CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation). India is also aligning decarbonisation of its aviation sector with ICAO's (International Civil Aviation Organization) global goals, setting and monitoring emissions reduction targets and integrating clear decarbonisation requirements in policy support and industry development packages.

Furthermore, research, development, and deployment of alternative propulsion systems and clean fuels is being promoted, supported by national policy frameworks.

- The National Biofuel Coordination Committee (NBCC) has recommended starting SAF blending with jet fuel at a target of 1 percent in 2027, scaling up to 2 percent by 2028, initially for international flights. This timeline aligns with the start of the mandatory phase of ICAO's CORSIA regulations from 2027, which India will be obliged to follow.
- Indian Oil Corporation (IOC) is aiming to start 1 percent SAF blending by July–September 2025, ahead of the government mandate, by setting up dedicated SAF production facilities. However, high costs and production constraints have delayed early mandates for domestic flights, with policymakers preferring to assess global market maturity and costs before widespread rollout.

Since the scope of this report is limited to district level decarbonisation pathways, it excludes aviation from the analysis and recommendations at this point in time.

4.2 Economy-wide Emissions

The total GHG emissions of Coimbatore district were 4,202 ktCO₂e in 2022, and 4,120 ktCO₂e when emissions from civil aviation are excluded. The energy sector remained the largest contributor to emissions throughout this timeframe (Figure 4.1). As illustrated in Figure 4.2, emissions from the energy sector increased from 2,260 ktCO₂e in 2005 to 2,684 ktCO₂e in 2022, and its share in economy-wide emission (including civil aviation category) decreased from ~73 percent to ~64 percent between 2005 and 2022. The IPPU sector emitted 439 ktCO₂e contributing to 14 percent to the total emissions in 2005 and 441 ktCO₂e, contributing to 10 percent in 2022. The AFOLU sector emitted 135 ktCO₂e in 2005, contributing 5 percent of total emissions, and 785 ktCO₂e in 2022, contributing 19 percent, while the waste sector emissions increased from 275 ktCO₂e in 2005 to 292 ktCO₂e in 2022 and contributed 7 percent of the overall GHG emissions in 2022.

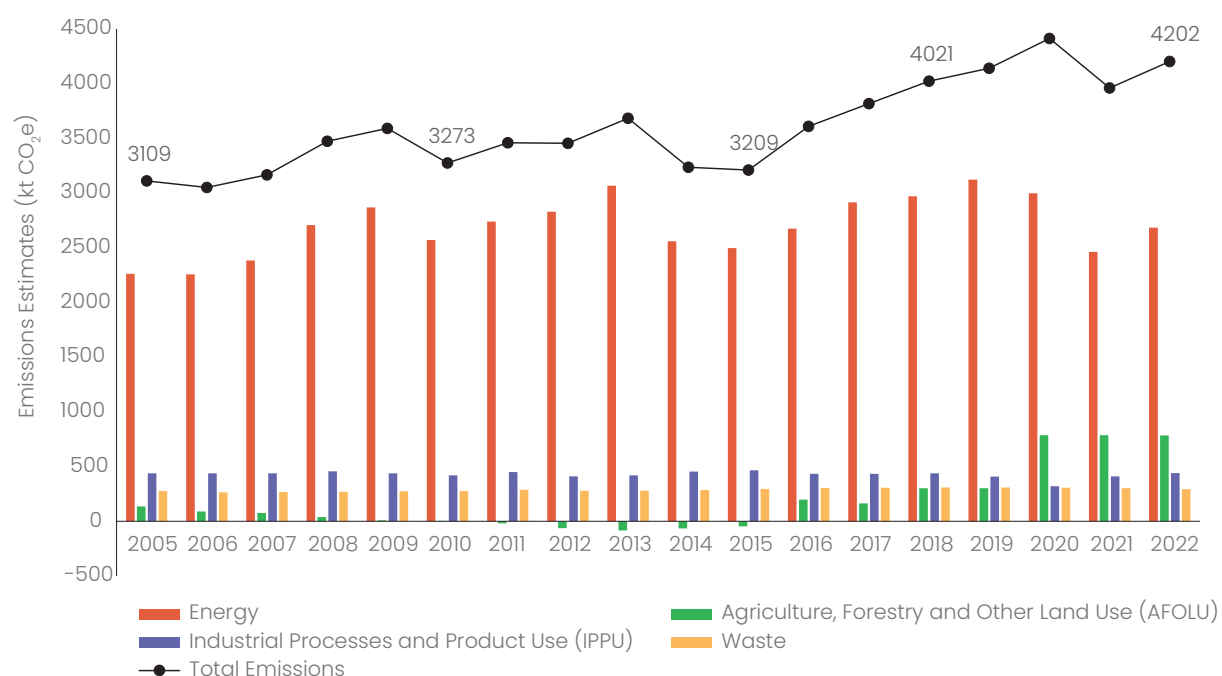


Figure 4.1: Economy-wide GHG emissions estimates (2005 to 2022)

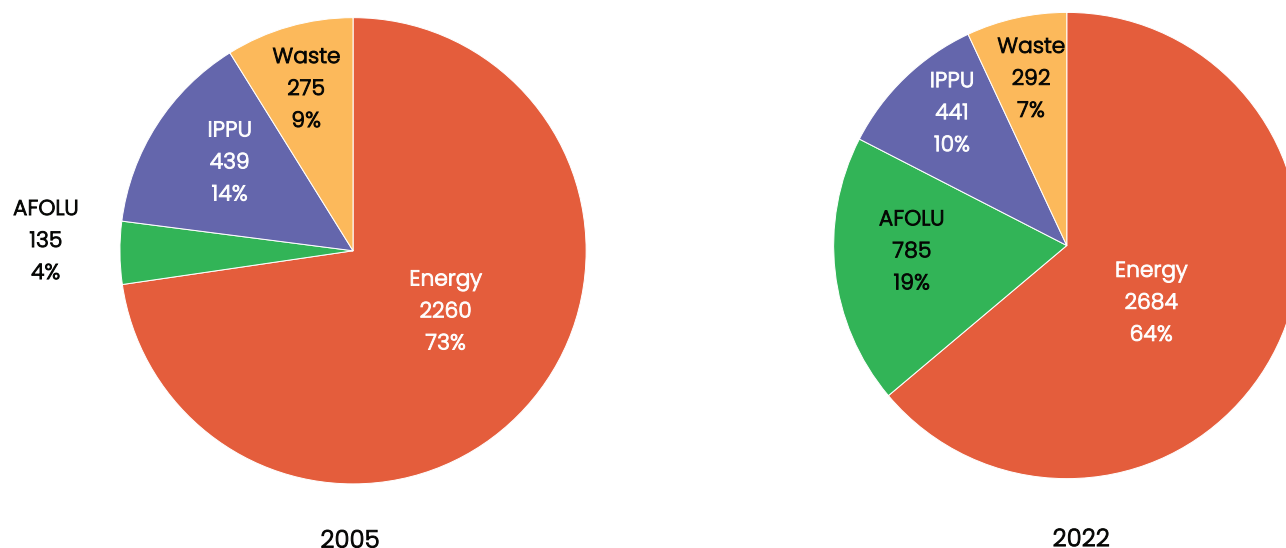


Figure 4.2: Sector-wise contribution (ktCO₂e) and percentage share in economy-wide GHG emissions

4.3 Key Category Analysis

Figure 4.3 shows the top categories contributing to GHG emissions in Coimbatore district in 2022. Emissions from road transport was the major GHG contributor (~36%), followed by residential energy (~12%), forestland (11%), cement production (~10%) and captive power plant (~7%).

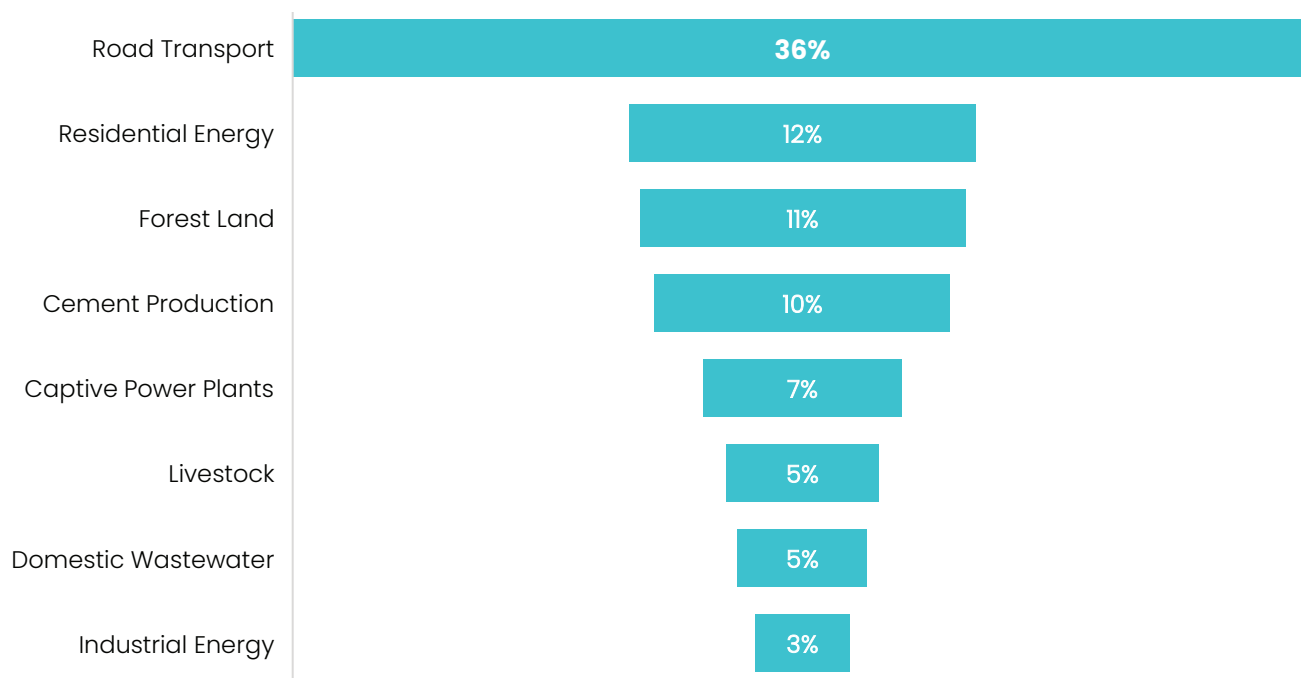


Figure 4.3: Key category analysis for Coimbatore district (2022)

4.4 Sector-wise Emission Trends

4.4.1 Energy Sector

The energy sector emissions comprise emissions from fuel combustion, including captive power plants, transport, industries, commercial, residential, and agriculture categories, contributing 2650 ktCO₂e, 0.42kt of CH₄ and of 0.083 kt of N₂O, with total energy emissions (including the civil aviation

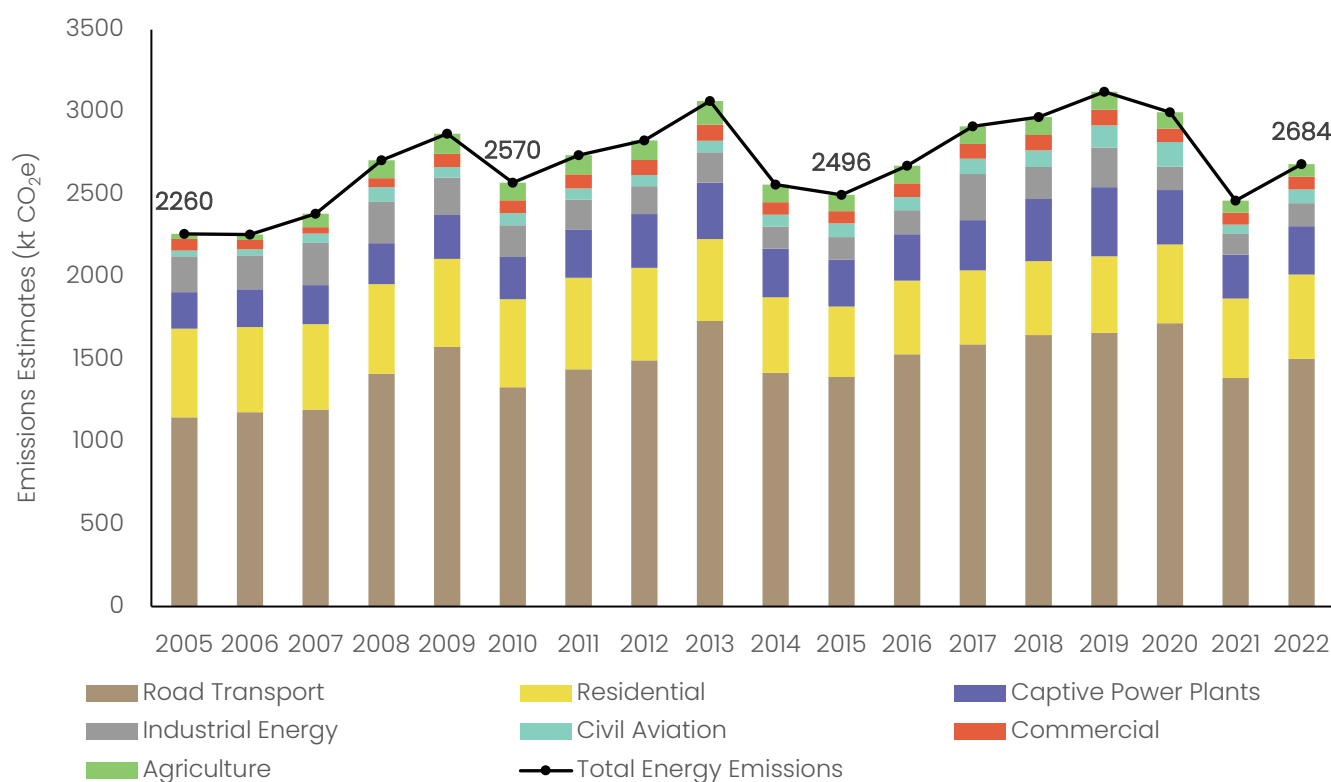


Figure 4.4.1: GHG emissions estimates of energy sector (2005 to 2022)

category) amounted to 2684 ktCO₂e (see Figure 4.4.1) in 2022, while total energy emissions excluding the civil aviation category amounted to 2620 ktCO₂e.

Road transport was the major contributor (~58%), with emissions increasing from ~1148 ktCO₂e in 2005 to ~1503 ktCO₂e in 2022. Other important contributors were residential energy, with a share of ~20 percent and captive power plants with a share of 11 percent in 2022. Emissions from residential energy decreased from ~538 ktCO₂e in 2005 to 511 ktCO₂e in 2022, while the emissions from captive power plants slightly increased from ~221 ktCO₂e in 2005 to ~293 ktCO₂e in 2022.

4.4.2 Industrial Processes and Product Use (IPPU) sector

Emissions from the IPPU sector in Coimbatore were largely driven by cement production. Between 2005 and 2022, emissions from the IPPU sector increased from ~439 ktCO₂e to ~441 ktCO₂e with cement production contributing to 99 percent of the total IPPU emissions and lubricant use contributing 0.98 percent in 2022 (see Figure 4.4.2). Reduced emissions during 2020 can be attributed to the decreased cement production during COVID year.

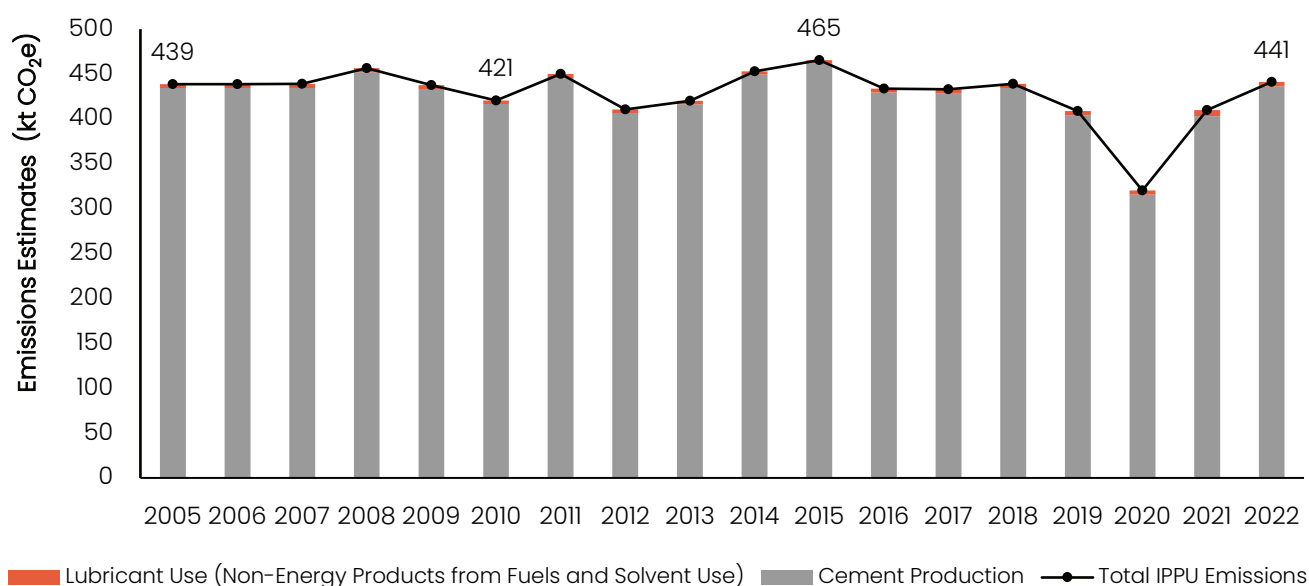


Figure 4.4.2: GHG emissions estimates of IPPU Sector (2005 to 2022)

4.4.3 Agriculture, Forestry and Other Land Use (AFOLU) sector

Emissions from the Agriculture, Forestry and Other Land Use (AFOLU) sector arise from livestock (enteric fermentation and manure management), land, and the aggregate sources & non-CO₂ emission sources on land. The sub-sector 'Aggregate Sources & Non-CO₂ Emission Sources on Land' includes emissions from rice cultivation, agriculture soils and biomass burning in cropland.

The AFOLU sector, including the land sub-sector, emitted 785 ktCO₂e and represented 19 percent of the total economy-wide emissions (including civil aviation category) of Coimbatore in 2022. The overall AFOLU sector was a net sink from 2011 to 2015, removing an average of 55 ktCO₂e per year. Emissions from the AFOLU (including the land sub-sector) increased from 135 ktCO₂e in 2005 to 785 ktCO₂e in 2022, while AFOLU emissions without the land category decreased from 577 ktCO₂e in 2005 to 305 ktCO₂e in 2022, as illustrated in Figure 4.6. The noticeable increment in the AFOLU emissions including land category from 2016 is caused by reduction in CO₂ removals from the land sub-sector, mainly due to decreasing forest cover. AFOLU emissions without the land sub-sector declined from 577 ktCO₂e in 2005 to 305 ktCO₂e (see Figure 4.4.3(a)), which could be attributed to the reduction in emissions from agriculture soils.

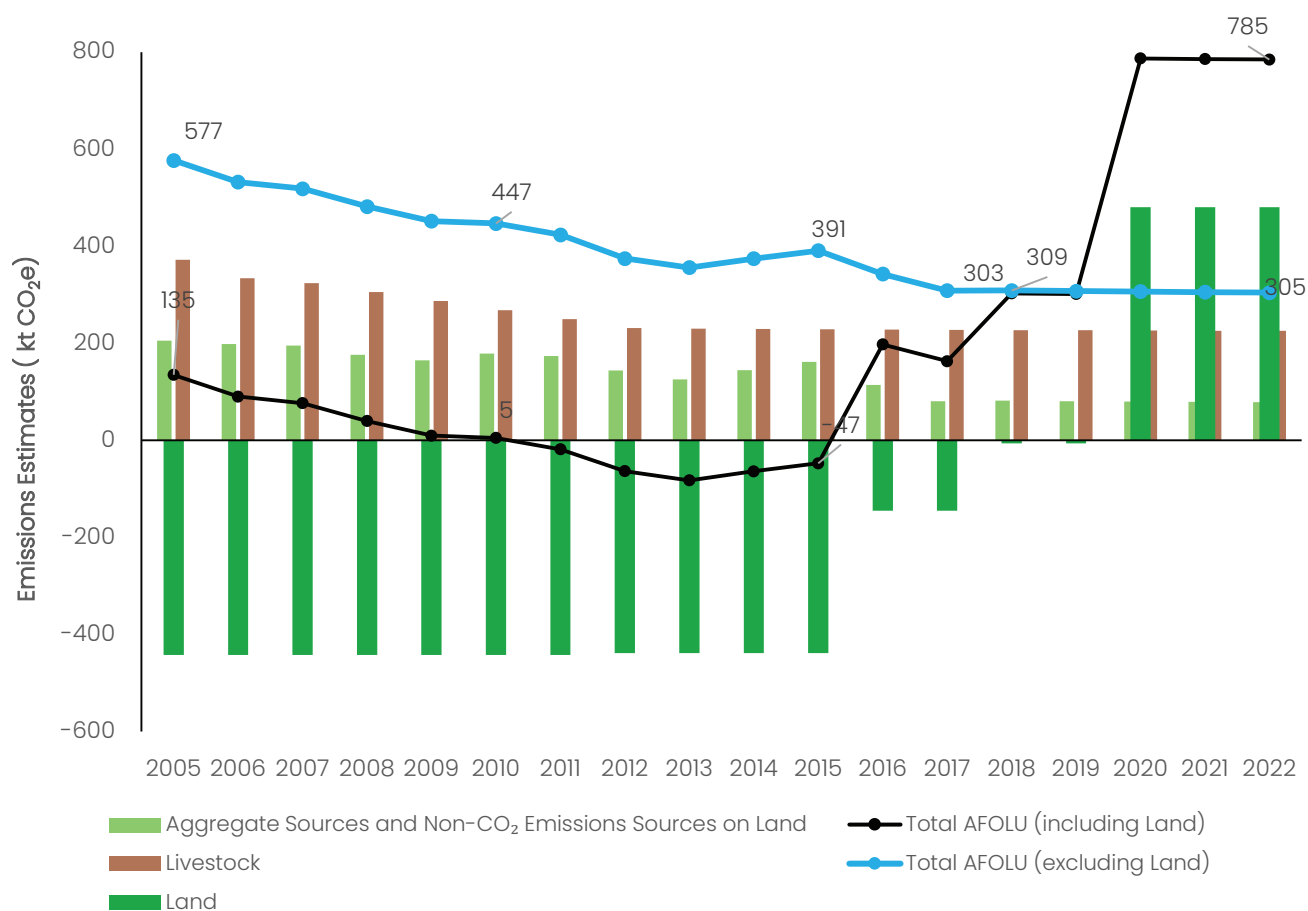


Figure 4.4.3 (a): GHG emissions estimate of AFOLU sector (2005 to 2022)

In the total AFOLU emissions (including the land sub-sector), enteric fermentation accounted for ~26 percent while agriculture soils accounted for 10 percent and manure management contributed ~3 percent respectively in 2022.

In the aggregate sources & non-CO₂ category, agriculture soils were the major contributor, with emissions decreasing from 184 ktCO₂e in 2005 to 77 ktCO₂e in 2022. Emissions from rice cultivation and biomass burning in cropland were negligible throughout the reference period, amounting to around 2 ktCO₂e combined in 2022 (see figure 4.4.3 (b)).

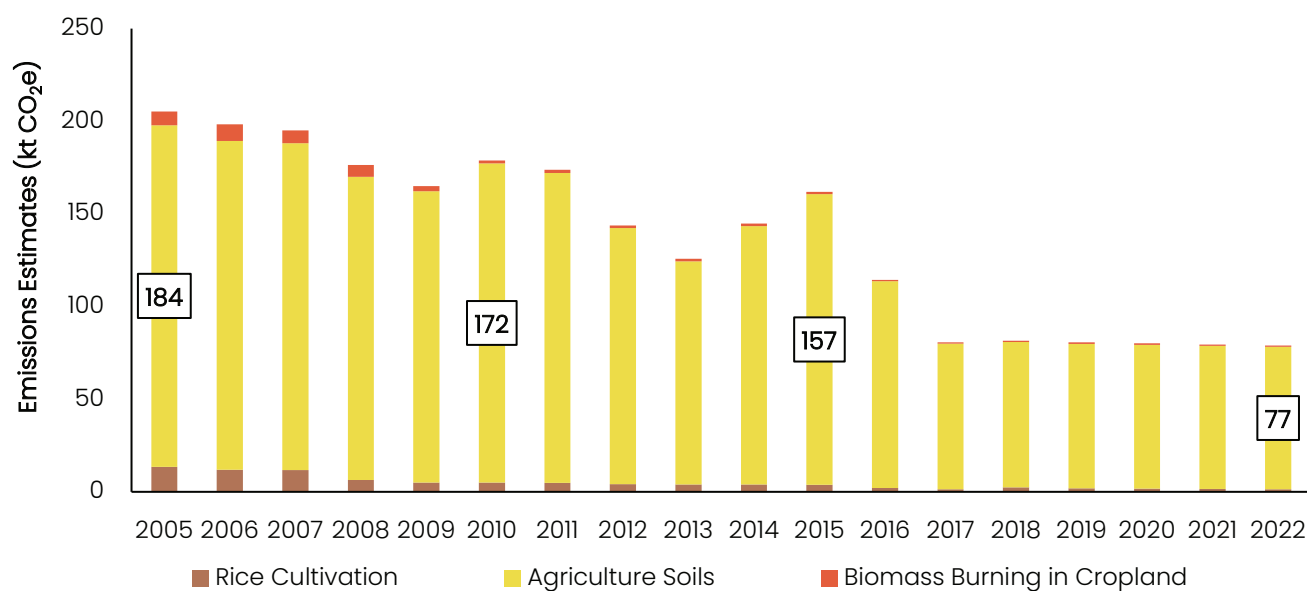


Figure 4.4.3 (b): Emissions from aggregate sources and non-CO₂ emission sources on land (2005 to 2022)

4.4.4 Waste Sector

In Coimbatore district, the waste sector contributed ~11.4 kt of CH₄ and 169 tonnes of N₂O accounting for ~292 ktCO₂e emissions in 2022, compared to 275 ktCO₂e in 2005 (see figure 4.4.4). Domestic wastewater, solid waste disposal and industrial wastewater categories respectively contributed 66 percent, 22 percent and 12 percent in 2022.

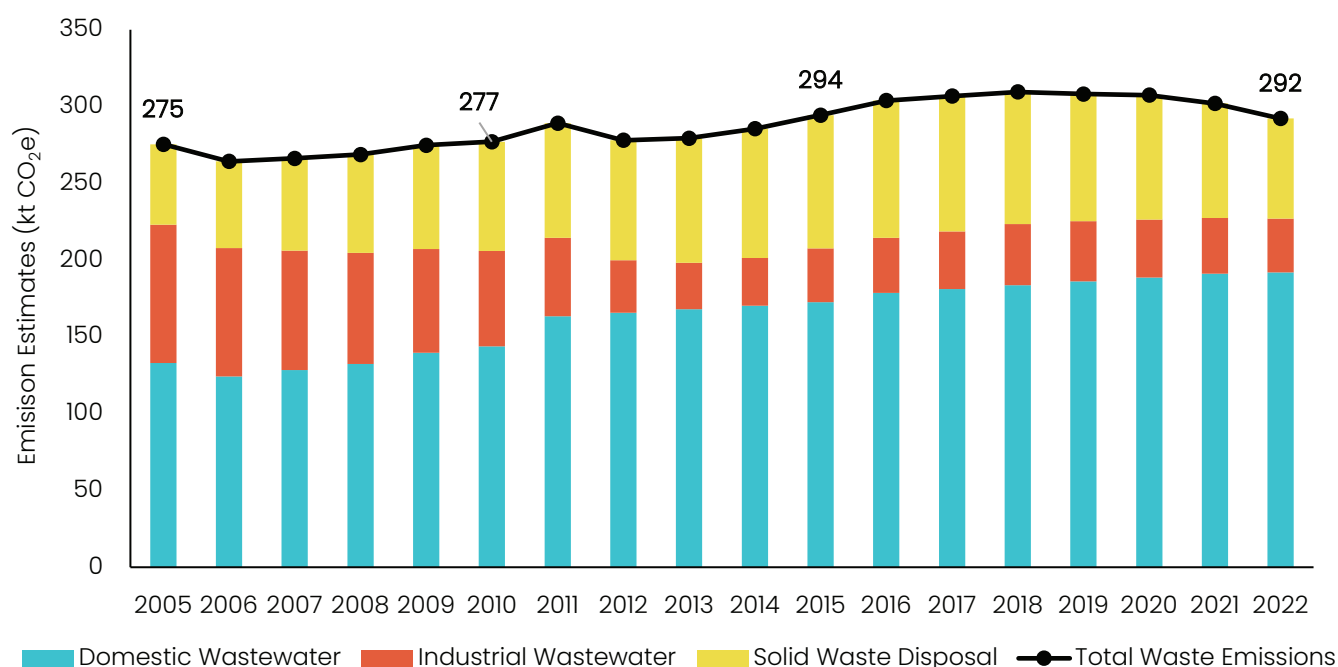


Figure 4.4.4 (a): GHG emissions estimates of waste sector (2005 to 2022)

Of the 192 ktCO₂e from the domestic wastewater category, ~35 ktCO₂e was emitted from rural domestic wastewater (18%) and 157 ktCO₂e from urban domestic wastewater (82%) (see Figure 4.4.4 (b)). Within the industrial wastewater category, emissions from fertilisers contributed ~60 percent, while emissions from meat processing and dairy contributed ~35% and 5% respectively in 2022, as illustrated in Figure 4.4.4 (c).

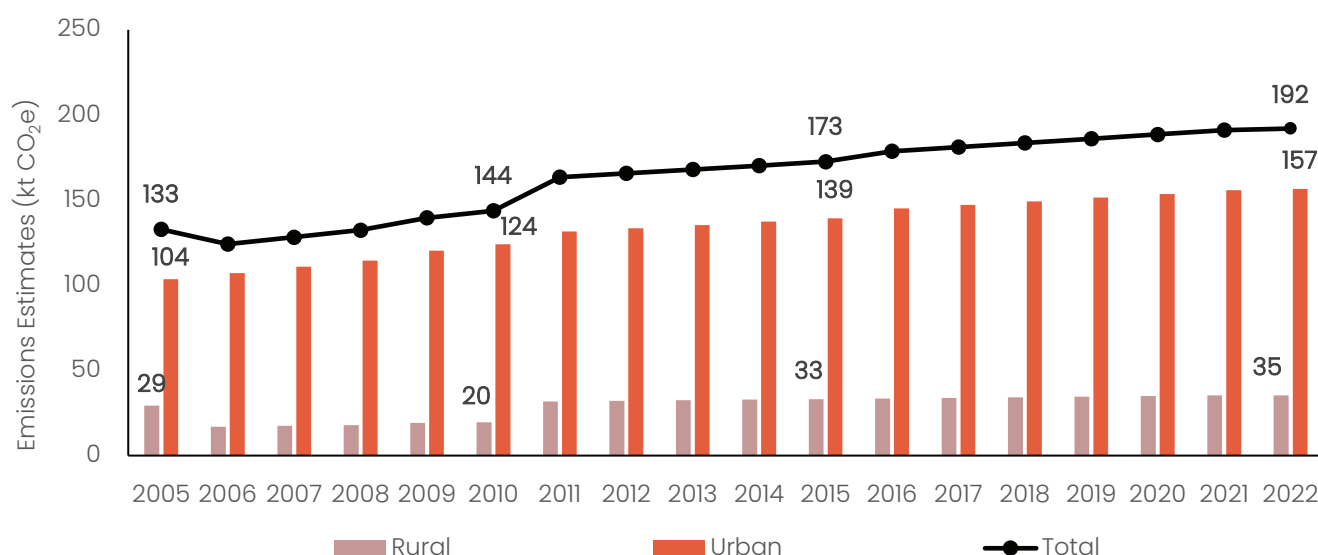


Figure 4.4.4 (b): Area-wise GHG emissions estimates of domestic wastewater (2005 to 2022)

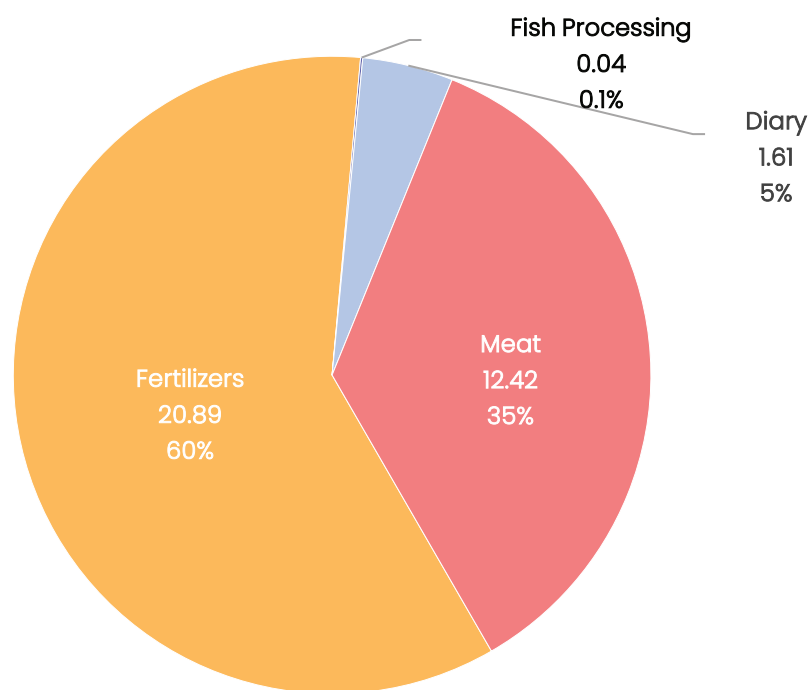


Figure 4.4.4 (c): Category-wise emissions (ktCO₂e) and percentage share in industrial wastewater emissions (2022)



5. Sectoral Analysis and Emission Trajectories by 2050

Key Findings

Emissions in Coimbatore are dominated by energy use (64%), followed by AFOLU (19%) and IPPU (10%).

- Energy demand is projected to rise by ~52 percent, from 54 PJ in 2022 to 81 PJ by 2050. Energy use in the transport sector alone accounts for 18 PJ of this consumption, followed by the residential sector (16.2 PJ).
- In electricity terms, total electricity demand is projected to more than double from 6,456 GWh in 2022 to 14,925 GWh in 2050 – driven largely by adoption of electric vehicles and increased electricity demand for space cooling needs in residential and commercial sectors under business-as-usual scenarios. Electrification interventions to abate sectoral emissions will further push this to 16,296 GWh under AES.
- The same shift from ICE to electric vehicles that increases electricity consumption in transport will also reduce sectoral emissions – resulting in total gross emissions from the energy sector reducing from 2,602 ktCO₂e in 2022 to 2,186 ktCO₂e in 2050. This could be further reduced to 421 ktCO₂e through fuel switching, electrification and other decarbonisation measures under AES.
- Other sectoral abatements will result from fuel switching, such as LPG to PNG and PNG to electric cookstoves in the building sector, from diesel to electric pumpsets and e-agromachinery in agriculture and electric heating for industrial processes.
- IPPU emissions are expected to remain constant. With technological and market developments, these emissions can be completely captured.

In the non-energy sectors,

- The land category is the predominant contributor to the AFOLU emissions at 61 percent, followed by livestock and agriculture soils at 29 percent and 10 percent respectively. Under the BAU scenario, emissions from livestock are projected to slightly decrease from 226 ktCO₂e in 2022 to 213 ktCO₂e in 2050, while emissions from agriculture soils are projected to decline 77 ktCO₂e in

2022 to 68 ktCO₂e in 2050.

- Emissions from solid waste are projected to decline from 65 ktCO₂e in 2022 to 17 ktCO₂e by 2050 in the BAU scenario, largely driven by the improved waste management practices being adopted. Emissions from the domestic wastewater category are projected to slightly increase from 192 ktCO₂e in 2022 to 202 ktCO₂e by 2050, whereas industrial wastewater emissions are projected to remain largely unchanged by 2050.
- The district has 1953.18 sq. km of forest cover (41% of the total geographical area), with a declining carbon stock density from 87.26 t/ha in 2015 to 82.25 t/ha in 2021. Interventions proposed through agroforestry and social forestry (land classified as barren, fallow and wasteland) could increase the current sequestration potential of 0.23 ktCO₂e/year to 438 ktCO₂e/year under MES and 715 ktCO₂e/year under AES.

This chapter presents an integrated analysis of Coimbatore district's greenhouse gas (GHG) emissions, covering both energy and non-energy sectors, while also projecting the district's anticipated energy mix for 2050. It evaluates how future emissions are likely to evolve in response to changing consumption patterns, sectoral developments, and key policy interventions. Energy-related emissions, which dominate the district's GHG profile, are assessed across electricity usage, road transport, industries, buildings, and cooking. Simultaneously, emissions from non-energy sectors—including waste, agriculture, livestock, land-use change, and industrial processes and product use (IPPU)—are also examined to provide a comprehensive understanding of sectoral contributions.

Proposals outlined in the Coimbatore Local Planning Area (LPA) Master Plan 2041, released in July 2025, are reviewed in this context, aligning urban planning strategies with climate mitigation goals.

The chapter further details the projected energy profile of Coimbatore for 2050, analysing both primary energy supply and final energy consumption. It discusses the transformative impact of policy measures such as the Tamil Nadu Electric Vehicle (EV) Policy and the national PM-KUSUM scheme, which are expected to reduce fossil fuel dependency through electrification and solar-powered irrigation. Energy demand projections are developed using a sector-wise bottom-up methodology, serving as the foundation for the decarbonisation scenarios presented in Chapter I. Together, the sectoral analysis and energy projections provide critical insights into the pathways available for achieving low-carbon development in Coimbatore district.

Limitations to the Study

- While the demand projections are based on robust, sector-specific methodologies, certain sectors lack sufficient data. In such cases, projections were made using estimated growth rates derived from the most reliable available data.
- In addition to primary data collected from district offices in Coimbatore, the analysis relied on secondary data sources at national and international levels, particularly where necessary data was unavailable or not maintained in the required format. The energy and sectoral projections are guided by well-founded assumptions to ensure consistency despite data constraints.

However, the following data limitations were identified:

- **Agriculture:** Available data on crop production, irrigation requirements, groundwater usage, and water storage infrastructure for the past 10 to 15 years in the district is currently insufficient.
- **Transport:** There is no data available on railway transport; therefore, it is excluded from the transport sector in our projections.
- **Industrial production and capacity:** Data on the production and installed capacity of industries within the district is limited.

- **Residential:** Specific data on the exact number of electric appliances used by residential end-users is unavailable. Therefore, appliance penetration rates are estimated based on macro-level survey data from the district.

5.1 Energy Sector

Demand forecasting at a sub-sectoral level, concentrating on specific end-use applications, is essential for gaining insights into future growth areas such as appliance penetration, industrial production, and vehicle ownership. For electricity distribution companies, such forecasting exercises support medium-to-long-term planning for power procurement. This section describes the methodology and metrics employed to estimate sectoral energy demand by 2050.

5.1.1 Transport Sector

The transport sector in Coimbatore comprises road, railways and air transport. Due to the unavailability of railway-related data and underdeveloped technologies for abating aviation emissions, railways and air transport have been excluded from this analysis. It should also be noted that both these sub-sectors are outside the jurisdiction of the State Government, and therefore, of the district administration too. Road transport – which dominates transport-based emissions in Coimbatore – is the focus of this analysis. The methodology of analysis and key findings are detailed below.

Road Transport

As of August 2024, Coimbatore's vehicle composition in road transportation is dominated by two-wheelers. There is a significant share of diesel-powered vehicles, especially in heavier categories such as buses and heavy goods vehicles (HGVs). According to the Tamil Nadu Statistical Handbook (2018), Coimbatore accounts for 5 percent of the state's two-wheelers (2W), three-wheelers (3W), buses, and HGVs. Electric vehicles (EVs) currently constitute a small fraction of the total vehicle stock, highlighting the city's continued dependence on fossil fuels.

To assess the decarbonisation potential of the transport sector in Coimbatore, a vehicle stock model was developed using historical vehicle ownership data from the Ministry of Road Transport and Highways (MORTH) yearbook and the VAHAN dashboard. The model projects vehicle ownership trends from 2022 to 2050 across various segments, including two-wheelers, three-wheelers, cars, buses, trucks, and others. Total vehicle stock for the 2022 base year is calculated based on cumulative 2018 vehicle stock data from Transport Department Statistical Handbook 2017-18, with yearly additions based on new registrations in Coimbatore as per VAHAN Dashboard. (Table 5.1)

Table 5.1: Vehicle stock by type in Coimbatore for 2018 and 2022

Year	2W	3W	4W	BUS	HGV	Others
2018	19,64,121	11,770	3,64,069	2,765	27,696	33,308
2022	20,46,045	12,569	4,05,909	2,833	29,373	33,963

Source: Transport Department Statistical Handbook 2017-18 and Vahan Dashboard

To explore pathways for reducing transport emissions, three scenarios have been developed, reflecting varying levels of EV adoption and their impact on energy consumption and emissions from 2022 to 2050 (Table 5.2). The vehicle saturation level for 2050 is also incorporated, reflecting economic growth and increased vehicle ownership. Other assumptions are given in Table 5.3.

Table 5.2: Projected electric vehicle shares in new sales by vehicle type in Coimbatore across scenarios

Scenario	Year	2W	3W	4W	BUS	HGV	Others
BAU	2022	1%	1%	0%	0%	0%	3%
	2030	30%	30%	30%	30%	7%	10%
	2050	100%	100%	70%	65%	20%	40%
MES	2050	100%	100%	100%	100%	50%	85%
AES	2050	100%	100%	100%	100%	80%	95%

Table 5.3: Vehicle characteristics assumptions for road transport in Coimbatore

Characteristics	2W	3W	4W	BUS
Battery size (kWh)	2-3	5-7	28-60	125-350
Battery range (km)	80-100	90-140	250-400	250-350
Payback over fossil fuel vehicle (years)	2 - 3	2 - 4	5 - 6	7 - 8
Emission abatement w.r.t. fossil fuel vehicle (tCO ₂ /vehicle/year)*	0.5-0.8	1.5-2.0	2.8-3.5	80-100

*If charge with renewable sources

The analysis incorporates operational assumptions, including the annual kilometres driven across all vehicle segments, fuel efficiency, the average retirement age of vehicles, and vehicle saturation per 1,000 people. These variables serve as inputs for the **Gompertz growth model**, which is used to forecast the number of vehicles across years and scenarios – then employed to calculate year-on-year fuel consumption, and ultimately, to estimate greenhouse gas (GHG) emissions from road transport.

Key Insights

The BAU scenario projections take into account the momentum built by policy shifts and fiscal incentives under Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) Phase-I Scheme (2015), FAME-II (2019) and the Electric Vehicle Policy of Tamil Nadu (2019; 2023). These incentives along with behavioural shifts, resulted in an 8-fold increase in the new registrations of electric vehicles in India, and a 20-fold increase in Tamil Nadu between 2019-20 and 2023-24, predominantly led by 2W and 3W.

Box Item 2: EV Adoption is on a surge and states like Karnataka, Kerala, Maharashtra, Uttar Pradesh and Tamil Nadu are leading the wave of adoption

Government schemes and higher environmental consciousness have surged adoption of electric vehicles across India. Kerala, Karnataka, and Maharashtra especially exhibit strong EV penetration in the 2-wheeler segment. Similarly, the 3-wheeler segment is dominated by Uttar Pradesh, where a remarkable 82.4 percent of new registrations are electric. Meanwhile, Kerala, Maharashtra, and Tamil Nadu maintain a balanced EV share in this segment.

Vehicle category-wise share of EVs in new registration in Indian states in % for the year 2023-24

Vehicle Category	Karnataka	Kerala	Maharashtra	Tamil Nadu	Uttar Pradesh
2-Wheeler	11.6	13.5	10.1	6.0	2.1
3-Wheeler	9.0	15.6	15.2	12.3	82.4
HPV (Buses)	22.6	12.3	28.0	5.6	0.0
LMV (Cars)	3.1	5.4	2.4	2.3	1.1

In the Light Motor Vehicle category (LMV), mostly 4-wheelers, states like Kerala, Maharashtra, Karnataka, and Tamil Nadu are experiencing an increasing growth in EV registration. In Maharashtra, 28 percent of the new registration in HPV category were electric.

In Figure 5.1 (a), electricity consumption due to the electrification of the road transport fleet is projected to rise to 892 GWh in the BAU scenario by 2050, with the majority of this consumption attributed to 4-wheelers and the heavy-duty vehicle segment. Figure 5.1 (b) highlights the total projected energy demand in different scenarios. A clear reduction in petrol and diesel consumption is expected as EV adoption rises, with the AES showing the most significant shift towards electrification.

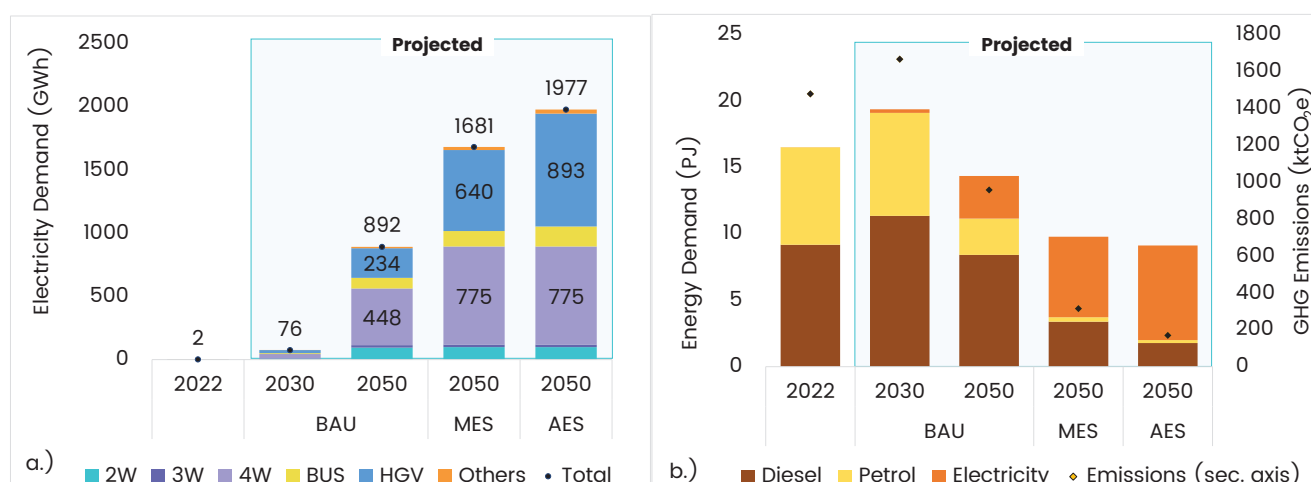


Figure 5.1 (a) : Electricity demand by vehicle type in GWh

Figure 5.1 (b) : Fuel-wise energy demand in road transport, in PJ and GHG emissions, in ktCO₂e

Majority of increase in electricity demand in the transport sector will be driven by 4Ws and HGVs.

As much as 80% of abatement is possible through electrification of fleet.

Box Item 3: Policy directions exist that can accelerate decarbonisation of road transport in Coimbatore

Coimbatore can benefit from Tamil Nadu's initiatives to push electricity mobility. Under the TN Electric Vehicle Policy 2023:

- The state government has announced incentives up to Rs. 5000 for procurement of e-cycles, Rs. 30,000 for e-2W, Rs. 40,000 for e-3W, Rs. 1,50,000 for e-4W and Rs. 10,00,000 for e-buses. In addition, a 100 percent road tax has been exempted, and registration charges and permit fees waived for electric vehicles in the state till 31.12.2025.
- Furthermore, to promote EV supply, electricity tax on EV manufacturing has been exempted for the period of five years and a 100 percent reimbursement of SGST is being offered on a minimum investment of Rs. 50 crores and generation of at least 50 jobs.
- A total investment of Rs. 50,000 crore in EV manufacturing and generation of 1.5 lakh new jobs is targeted under the policy. It also targets increasing the share of electric buses to 30 percent of the fleet by 2030.

Further extension of the timeline under EV policy could be explored.

Promoting non-motorised transport (bicycle, cycle rickshaw, push scooters etc) for shorter distances (3.5-4 km) can complement these efforts in abating GHG emissions of the transport sector. Over and above the projected abatement potential, behavioural interventions such as use of smart traffic systems at intersections and using public transport for inter-city and intra-regional movement could curtail 25 percent of emissions at traffic lights and 45 percent of emissions vis-a-vis private vehicles respectively.

Key Interventions to Decarbonise Road Transport

- **Prioritise 2Ws and 3Ws electrification:** With ~20 lakh 2Ws and 12,569 3Ws dominating the current fleet, of which only 0.1 percent and 0.3 percent respectively are electric, electrification efforts in this segment can be expedited in alignment with the State EV Policy. The district should target 100 percent electrification of 2Ws and 3Ws replacing 4 lakhs conventional 2Ws and 7000 3Ws with electric vehicles by 2050.
- **Scale charging infrastructure:** The analysis projects electricity demand reaching 892 GWh by 2050 under the BAU scenario. The district should augment electricity distribution infrastructure, focusing first on urban areas where 2W/3W adoption will be highest, and increase capital investment in public charging points at bus bays, fuel stations, parking lots, and malls. At least 550 new charging stations should be targeted by 2050.
- **Accelerate bus fleet transition:** Electrification of intra-city public and private buses needs to be prioritised. Given the potential for electrification of public buses and the high upfront costs involved, it is crucial to adopt innovative financing mechanisms, such as the OPEX (operational expenditure) model.

788 ktCO₂e

Decarbonisation
Potential by 2050

Stakeholders

Individual Users, State Transport Department (policies/subsidies), RTO (monitoring and progress), Local Businesses (repair and allied services), Industry (tech availability and infrastructure)

Box Item 4: Air Transport – while not a part of this analysis – will have to be addressed sooner than later for district decarbonisation

Air transport in Coimbatore has seen remarkable growth over the years, with its single operational airport becoming a key player in the district's economic landscape. This growth is especially evident in the rising number of passengers and freight volumes. The aviation industry in Coimbatore rebounded to pre-pandemic levels by 2023, with the total passenger count reaching 2.9 million. Consumption of aviation turbine fuel (ATF) – a major emitting source in air transport – has also recovered, with demand rising to 30.1 TMT in 2023 after dropping to a low of 17.6 TMT in 2021. This consumption is expected to grow with the government planning expansion of the Coimbatore airport by another 600 acres. This includes airstrip expansion, new terminal building and miscellaneous functions.

Key Aviation Statistics for Coimbatore²³ (2023)

- Annual departures: ~18,000 flights
- Domestic flight share: 93%
- Passenger footfall growth (2013–2024): 9%
- Freight hauled growth: 2%
- Average passengers per flight: Increased from 90 to 157 over 11 years

Table: Statistics regarding Coimbatore air traffic

Parameter	Domestic flight	International flight
Average distance (km)	1,500	2,347
Fuel (litres/km/160 passengers)	5.12	4.32
Fuel (litres/ km/ MT of cargo)	8	10

Projected Growth in Air Transport and Corresponding Emissions:

Historical trends (2013–2024) pertaining to air transport in Coimbatore are expected to grow. To forecast future fuel demand for passenger and freight projections, Gompertz growth model is used, with a saturation level function²⁴ of 6.3 million passengers by 2050 and 50 TMT of freight by 2050. This considers a near doubling of passenger and freight demand by 2050.

Below given table shows the estimated fuel demand, using 2022 as base for projections.

Year	Passenger flights	Freight hauled (MT)	Total fuel demand (TMT)	Total GHG emissions (ktCO ₂ e)
2022	17,642	61	21	82
2030	25,733	129	48	154
2050	39,963	397	76	240

The proportion of domestic and international flights is assumed to remain constant, given the stability of these trends over the last 11 years. As domestic and international travel grows, along with rising cargo transit demand, projections suggest that Coimbatore's air transport sector could reach 6.4 million passengers per year by 2050. Therefore, fuel consumption is expected to increase in line with the growing demand for air transport in both the passenger and freight segments. Emissions, accordingly, are predicted to rise from 82 ktCO₂e in 2022 to 240 ktCO₂e by 2050. Decarbonising the air transport in Coimbatore

For Coimbatore to truly decarbonise its transport sector, it would have to abate aviation-based emissions sooner or later. A major strategy towards this is to replace the Aviation Turbine Fuel (ATF) with a better, low-carbon intensive alternative. However, both technology and policies for introducing a low-carbon alternative to ATF and regulating replacement within the aviation sector are at early stages. Aviation sector falls outside the jurisdiction of the state government, as a result, initial impetus would have to come from Central Government for the district of Coimbatore in specific and the State of Tamil Nadu in general to adopt/scale implementation through regulatory measures.

5.1.2 Building Sector

The building sector in Coimbatore is a predominant energy consumer. Energy in buildings is required for four key purposes: cooling, heating, cooking, and to operate appliances. Cooking in Coimbatore is largely driven by Liquefied Petroleum Gas (LPG) and fuelwood. The district mainly relies on electricity for cooling, heating and appliances.

Residential Buildings

Projections for electricity consumption in the residential sector of Coimbatore are based on robust secondary data sources, including the household appliance penetration data from the National Family Health Survey (NFHS) Tamil Nadu reports of 2005-06, 2015-16, and 2019-21. The annual growth rates of these appliances between 2005, 2016, and 2021 were analysed to project household appliance penetration up to 2050. For lighting devices, including incandescent bulbs, CFLs, CFL tubes, LEDs, and LED tubes, household penetration data was obtained from the India Residential Energy Survey (IRES) of 2020. Information on annual hours of usage and wattage for different appliances was retrieved from various secondary literature. Table 5.4 presents the penetration rate of electric fans, refrigerators, air conditioners/coolers, and washing machines.

Table 5.4: Number of residential appliances per household in Coimbatore, actuals for 2021 and projections for 2030, 2040 and 2050

Category	Number of appliances per household			
	2021	2030	2040	2050
Lighting	2.6	2.8	3.1	3.6
Electric fan	1	1	1	1
Refrigerator	0.6	0.7	1	1
Air conditioner/cooler	0.1	0.5	1	1
Washing machine	0.3	0.5	1	1

The role of energy efficiency in evaluating residential electricity demand was also assessed. Annual energy savings for appliances such as fans, refrigerators, air conditioners, and washing machines are computed based on energy efficiency indicators (star labels) of these appliances. Decarbonisation scenarios assume higher efficiency levels, with appliances rated 3 stars and above.

Key Insights

In 2022, Coimbatore's residential electricity consumption reached 2532 GWh, increasing annually at 12 percent from 2014-15 to 2021-22. This change was majorly driven by increased electricity needs for

space cooling, appliances, and lighting – making residential buildings the second highest electricity consumer in the district at a sub-sectoral level after industry. Electricity demand in the residential sector of Coimbatore is projected to further increase to 8041 GWh by 2050. (Figure 5.2)

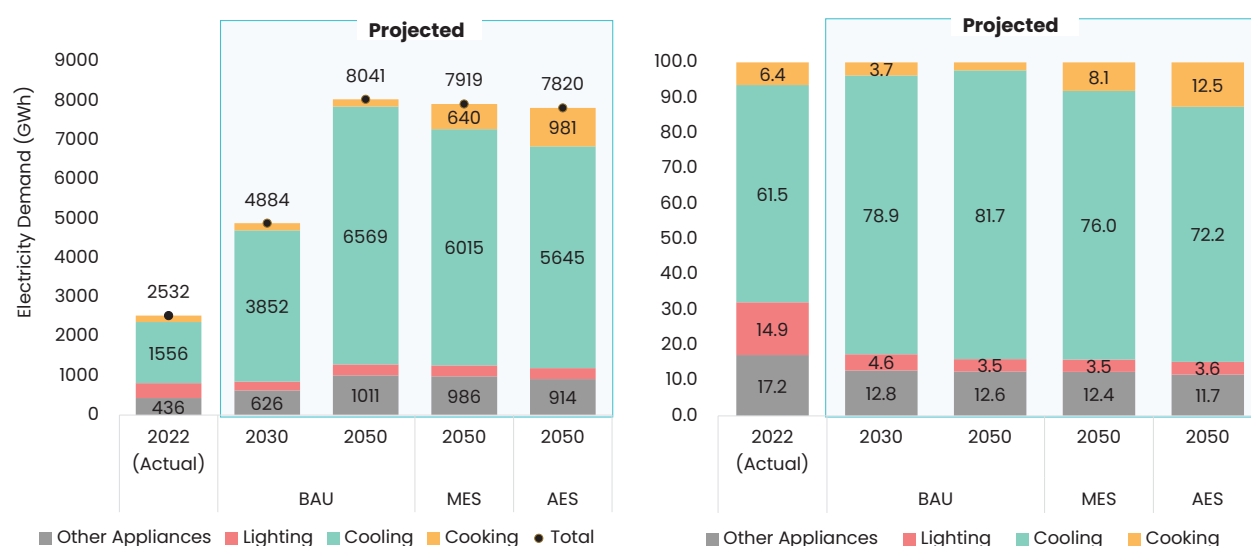


Figure 5.2: Category-wise electricity demand in residential buildings (GWh).
Space cooling demand will drive the majority of domestic electricity demand

In the BAU scenario, current energy efficiency levels are assumed to continue. By 2050, space cooling including the use of ceiling fans and air conditioners, is projected to account for 82 percent of total residential electricity consumption in Coimbatore. Both an increase in cooling needs and the energy-intensive nature of cooling appliances will drive this trend. In comparison, appliances such as refrigerators, washing machines, and motors are projected to consume 13 percent of residential electricity. Lighting and cooking are expected to constitute 3 percent and 2 percent of the remaining share of the residential sector's electricity consumption in 2050.

Moderate adoption of three to five star rated appliances is expected to drive 579 GWh of electricity savings in the residential sector by 2050. This will be partially adjusted with the residential electricity demand for cooking, which is expected to increase by 457 GWh by 2050 resulting in a net electricity saving of 122 GWh for the residential sector under MES.

Far greater electricity savings – up to 1018 GWh – can be achieved by 2050 through comprehensive energy efficiency measures under the AES scenario. Similar to the MES scenario, these savings will partially adjust for the rise in electricity demand for cooking – an increase of 798 GWh by 2050 – resulting in net electricity savings of 221 GWh by 2050.

These projections underscore the critical need for targeted energy efficiency measures and strategic planning to effectively manage the anticipated growth in electricity demand within Coimbatore district's residential sector.

Cooking Sector

Cooking constitutes a significant share of energy consumption, particularly in the residential sector. Projections for cooking energy demand are based on district-specific per capita cooking fuel consumption data. In 2021-22, LPG consumption in the district amounted to 158.6 kt in the residential sector and 13.4 kt in the commercial sector. Since 2004-05, LPG consumption has grown annually by 2 percent till 2022. Historically, residential LPG use has accounted for ~92 percent of total consumption, with commercial LPG use accounting for the remaining. These proportions were assumed to continue, with growth in per capita cooking fuel consumption was projected to estimate future cooking fuel demand. With the decline in kerosene usage for cooking declining from 2005 to 2022, the future projections exclude kerosene and fuelwood.

Under the BAU scenario, 92 percent of the cooking energy demand is met by LPG and 8 percent by electricity. The same trend is expected to continue by 2050, resulting in an increase in cooking related GHG emissions from the residential sector, from 511 ktCO₂e in 2022 to 541 ktCO₂e by 2050. (Figure 5.3)

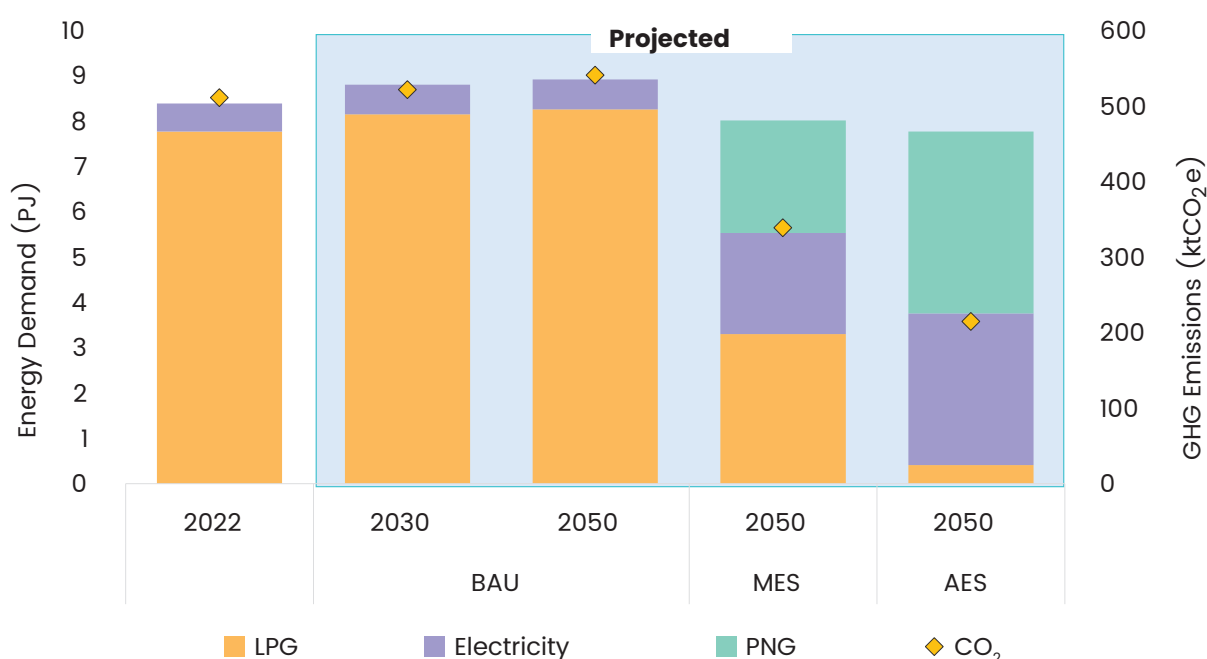


Figure 5.3: Fuel-wise energy demand for cooking, in PJ and emissions in ktCO₂e
Cooking in Coimbatore is primarily LPG driven. Higher adoption of electric cookstoves and shift from LPG to PNG is expected to abate 59% of projected emissions by 2050

In the MES and AES scenario, PNG is expected to replace LPG after 2030, resulting from the introduction of new PNG pipelines in the district. The penetration of electric cookstoves is also expected to rise from 8 percent in the BAU to 20 percent in MES and 45 percent in AES, driven by policy and market shifts. In Tamil Nadu, as of 2021, about 17 percent of households were using some form of electric cooking, a rate matched only by Delhi among Indian states. This adoption has been driven by government campaigns like “Go Electric,” which promote the benefits of electricity-based cooking, and is supported by relatively high urbanisation and awareness in the state.

In the MES scenario, GHG emissions can be reduced by 38 percent to 339 ktCO₂e in 2050. In the AES scenario, GHG emissions are expected to reduce to 225 ktCO₂e by the same year, achieving a 59 percent reduction compared to the BAU projection for 2050.

Box Item 5: Promoting piped natural gas (PNG) over liquified petroleum gas (LPG) will enhance handling efficiency

Piped natural gas (PNG) offers an uninterrupted supply through pipelines, eliminating the need for LPG cylinder storage and refills. Consequently, PNG has fewer handling losses compared to LPG, and is often more economical with metered billing. PNG primarily consists of methane (CH_4), which burns more cleanly and completely, producing minimal CO_2 emissions. Methane has a higher hydrogen-to-carbon ratio, leading to less incomplete combustion. Whereas LPG, composed of propane (C_3H_8) and butane (C_4H_{10}), generates higher CO_2 emissions due to its molecular structure and lower hydrogen-to-carbon ratio.

PNG emits approximately 11-15% less CO_2 compared to LPG, depending on the efficiency of the appliance and the combustion environment. The CO_2 emissions factor for LPG is $63.1 \text{ tCO}_2/\text{TJ}$ and for PNG $56.1 \text{ tCO}_2/\text{TJ}$ as per Indian Network on Climate Change Assessment (INCCA).

In lieu of these benefits, the Indian Oil Corporation Limited (IOCL), authorised by the Petroleum and Natural Gas Regulatory Board (PNGRB), is expanding the City Gas Distribution network to add an additional 9,12,783 domestic PNG connections in Coimbatore district. While the initial target for Indian Oil included around 9,00,000 connections for Coimbatore, this number may be adjusted based on actual demand and feasibility. IOCL has already laid about 75 km of underground gas pipelines in the district, with a total planned pipeline length of 212 km.²⁵

Commercial Buildings and Public Services

Electricity demand projections for the commercial and service sector were developed using a time series regression model (FB Prophet), which analyses 15 years of data for LPG, HSD, and electricity consumption (HT & LT feeders). This approach captures historical trends and cyclic patterns in energy usage. To project future energy growth, the model accounts for current growth rates and anticipated economic value added by the services sector, offering a detailed forecast of energy demand up to 2050.

Key Insights

The commercial and service sector in Coimbatore including finance, retail, education, healthcare, hospitality (hotels and restaurants), and religious activities – primarily rely on electricity, with a need-based use of LPG and diesel fuel. In 2022, electricity demand for commercial buildings reached 856 GWh (including both HT and LT feeders), while public lighting, waterworks, and miscellaneous activities accounted for 394 GWh. Altogether, these sectors accounted for 20 percent of the district's total electricity demand.

An analysis of historical data from fiscal years 2013-14 to 2022-23 reveals varying growth rates in electricity consumption across these categories. Electricity consumption in commercial buildings grew at an annual rate of 5.87 percent, while public lighting, waterworks, and miscellaneous activities experienced an annual growth rate of 2.48 percent.

Under the BAU scenario, total electricity consumption by commercial buildings, public lighting, and miscellaneous categories in Coimbatore is projected to grow at an annual growth rate of 1.7 percent from 2022, reaching 2039 GWh by 2050. [Figure 5.4 (a)] These estimates incorporate current trends and projected economic growth in the services sector. In terms of GHG emissions, the sector emitted 78 ktCO₂e in 2022, which is expected to rise to 87 ktCO₂e by 2050. [Figure 5.4 (b)]

In the MES, GHG emissions could drop by 35 percent as compared to BAU to 57 ktCO₂e by 2050. Under the AES scenario, 100 percent of the energy currently supplied by HSD is expected to be replaced by

electricity, and a partial replacement (60-70%) of LPG by PNG by 2050 could achieve a 70 percent reduction in sectoral emissions, limiting emissions to 27 ktCO₂e by 2050.

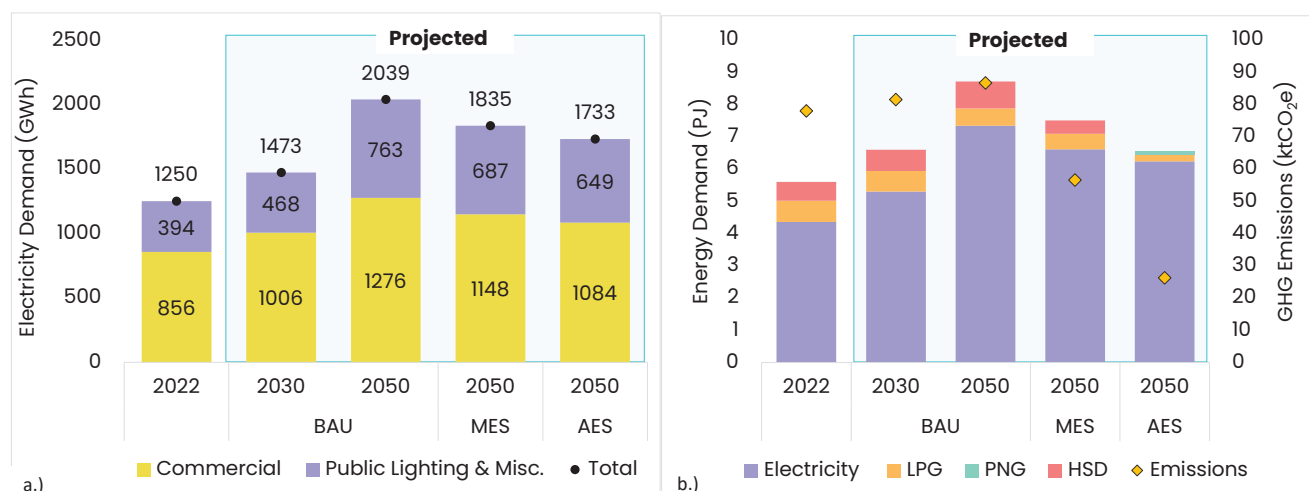


Figure 5.4 (a) : Category wise electricity demand in commercial buildings, across scenarios in GWh

Figure 5.4 (b) : Fuel-wise energy demand in PJ and GHG emissions, in ktCO₂e in commercial buildings
Transitioning from HSD to electricity, and from LPG to PNG will abate 70% of predicted emissions by 2050

Aggregated Results of Building Sector

Figures 5.5 shows the total energy demand met by various fuels and the associated emissions. The aggregate electricity consumption in buildings is projected to increase ~2.5 times, from 4,140 GWh in 2022 to 10,080 GWh by 2050. Electricity consumption from buildings constituted approximately 64 percent of the total electricity supplied in the district in 2022. With adoption of energy-efficient appliances, conversion of liquid fuels to electricity, and substitution of LPG with PNG, an estimated energy saving of ~13.4 percent can be achieved by 2050.

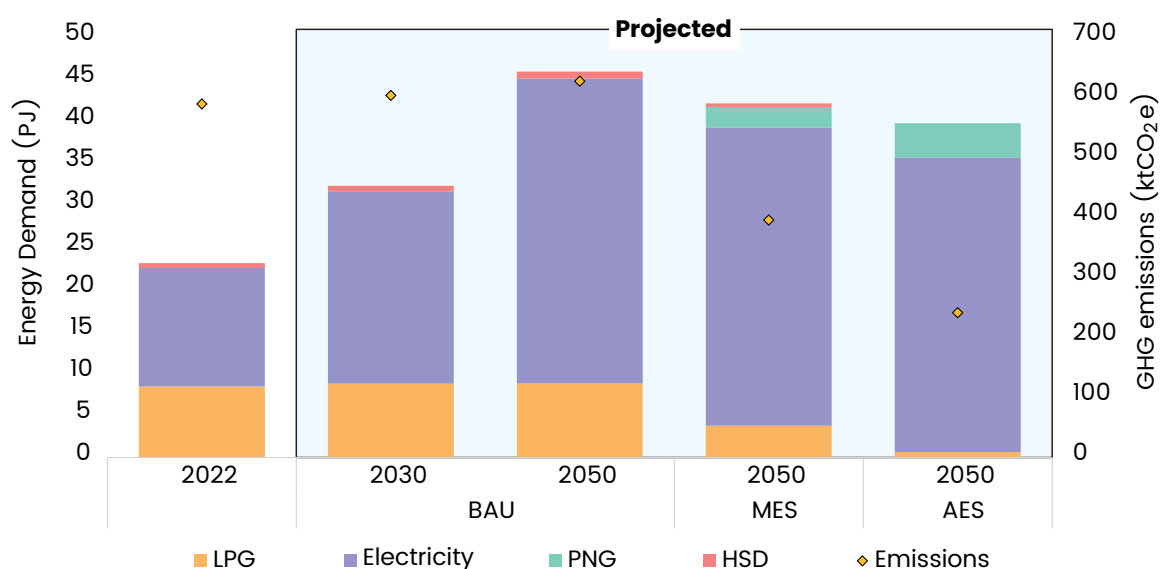


Figure 5.5. Aggregate fuel-wise energy demand in building sector in PJ and GHG emissions, in ktCO₂e

Energy Demand Across Scenarios: In the BAU scenario, the total energy demand in the building sector, met by various fuels, is projected to nearly double, from 23 PJ in 2022 to ~46 PJ by 2050. About 61 percent of the energy demand is projected to be met by electricity and 36.5 percent by LPG. Under

the MES, the energy demand is estimated to reach approximately 42 PJ, while in the AES, it is expected to reduce further to 40 PJ by 2050. Energy efficiency measures in the building sector will play a key role to play in this reduction, which also corresponds to the change in the energy mix under AES, where 88 percent of the energy is anticipated to be met by electricity and the remaining energy by PNG. HSD is anticipated to phase out completely by 2050.

Emissions Across Scenarios: Under BAU, GHG emissions from the building sector are projected to increase from 589 ktCO₂e in 2022 to 628 ktCO₂e by 2050. However, through the implementation of mitigation measures, these emissions could be reduced to 396 ktCO₂e under MES and cut by half to 252 ktCO₂e under AES by 2050 – including 225 ktCO₂e from residential cooking and 27 ktCO₂e from commercial cooking (Scope 1). This substantial reduction is primarily due to two major interventions: **fuel switching** and **energy efficiency improvements**. Fuel switching includes transitioning to electricity based systems, phasing out high-emission fuels like HSD, and switching from LPG to electric based cooking. Energy efficiency improvements – focusing on adopting energy-efficient appliances and implementing better building management systems – could further abate 555 ktCO₂e (Scope 2) over and above the Scope 1 emissions.

Key Interventions to Decarbonise the Building Sector

■ Switching to cleaner cooking fuel:

- **Accelerate PNG infrastructure development and subsidise initial connections-** Increase PNG share to 40–50 percent in residential cooking by 2050 by including credit-linked instalment mechanisms to boost new initial connection charges. The existing momentum of expanding the PNG pipeline connections in the whole of Tamil Nadu will support these efforts.
- **Promote high-efficiency electric cooking appliances:** Subsidise induction and electric cookstoves for approximately 2.47 lakhs households by 2030 and around 4.51 lakhs households by 2050, with support from the National Energy Cooking Program (NECP) and other government schemes/policies.

376 ktCO₂e

of Decarbonisation
Potential by 2050

Stakeholders

Individual Users (for adoption) and Urban Local Bodies (implementation)

Furthermore, the following interventions can enable abate Scope 2 emissions:

- **Promote high-efficiency appliances and cooling solutions:** Encourage adoption of three to five star rated cooling appliances, approximately 43 lakh BLDC fans, ~19 lakh refrigeration units and 36 lakh air conditioners, gradually through incentives coupled with awareness campaigns to drive their market demand. Adopting high-efficiency appliances can save up to 1018 GWh of electricity or 12 percent of the residential consumption by 2050.

439 ktCO₂e
(Scope 2)

of Decarbonisation
Potential by 2050

Stakeholders

Individual users, Bureau of Energy Efficiency (Central - for enforcement), Tamil Nadu Green Energy Corporation Limited (TNGECL) and Tamil Nadu Power Distribution Corporation Limited (TNPDCCL) (State policies and subsidies)

■ Encourage Renewable Energy Integration

- **Solar rooftop:** Increase penetration of rooftop solar in residential buildings by 2030. Mandate or incentivise solar PV installations on commercial buildings, aiming to cover at least 30 percent of electricity demand from on-site renewables by 2030. This could be covered under ECSBC/GRIHA standards compliance in existing and new commercial buildings. Assessment

of potential, door to door campaigning, and low-cost financing options for households can enable this.

- **Battery storage:** Encourage replacement of diesel generators by deploying battery storage systems to manage supply interruptions, power backup and enhance grid reliability.

Stakeholders:

Individual users and Commercial Entities (for adoption), State Energy Department / Tamil Nadu Green Energy Corporation (TNGECL) Limited (potential assessment and subsidies), Private Project Developers and Financiers

- **Public Lighting and Upgrading to Smart LED:** Fast-tracking the replacement of incandescent and CFL lights with LED-based lights can significantly reduce electricity usage at the household level. Convert ~5 lakhs public street lighting to smart LED systems by 2030. Explore adaptive lighting solutions that adjust based on usage patterns and time of day to enhance energy savings.

116 ktCO₂e
(Scope 2)

of Decarbonisation Potential by 2050

Stakeholders

Individual users (for adoption) and Urban Local Bodies (implementation)

A conservative increase in the temperature setting by 2°C from 24°C to 26°C can save Coimbatore an upwards of ~573 GWh out of 5002 GWh of the projected electricity consumption in space cooling in 2050 – abating scope 2 emissions of ~401 ktCO₂e over and above the energy efficiency measures.²⁶

5.1.3 Agriculture Sector

Emissions in the agriculture sector arise mainly from energy use in irrigation, tractors and other agro-machinery. In the 2021-22 period, electricity consumption in the agricultural sector reached 93 GWh. The estimate was derived using water pumping requirements for each cropping season as a key metric. Historical crop production data from 2004-05 onwards were analysed for Coimbatore district and correlated with Tamil Nadu's overall crop production trends. Projections for agricultural crop production until 2050 were based on historical crop production and crop yield data.

An important factor considered was the increasing irrigation demand, with currently 65 percent of the sown area being irrigated. The average irrigation share by source is 86 percent for wells, ~14 percent for canals, and 0.14 percent for tanks. Given the high share of wells, the need for groundwater pumping is significant in Coimbatore.

The electricity required for pumping water from wells was calculated using an average depth to water level of 7.22 metres below ground level (mbgl), based on data from the Central Ground Water Board (CGWB), which monitors groundwater levels across the country.²⁷

Electricity consumption related to groundwater pumping was calculated for the years with available data, and these figures were then used to forecast future electricity needs based on water requirements for upcoming cropping seasons. Analysis of the Minor Irrigation Census (2017-18)²⁸ data on total pumping hours of operation for crops and horsepower of lifting devices in the state suggests that the analysed data aligns with specifications of pump size of approximately 5 HP per connection. This uniform pump capacity for irrigation was used to estimate electricity consumption in the agriculture sector for 2050. Figure 5.6 (a) and (b) provide projections for electricity demand (in GWh), energy demand (in PJ) and GHG emissions (in ktCO₂e) owing to agricultural energy in Coimbatore across scenarios.

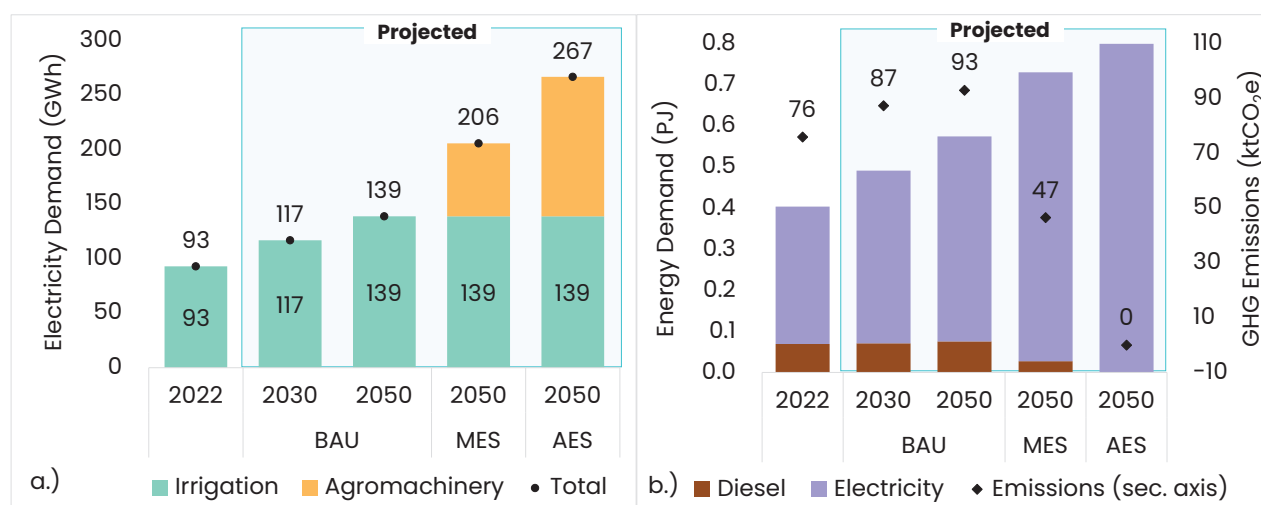


Figure 5.6 (a): Electricity demand in agriculture in GWh

Figure 5.6 (b): Fuel-wise energy demand in PJ and GHG emissions, in ktCO₂e in agriculture

In 2022, 90 percent of irrigation pumps were found to operate on grid electricity, 9.85 percent on diesel, and the rest were solar-powered. Diesel-based operations (agro-machinery and pumpsets) result in GHG emissions of 76 ktCO₂e, which are expected to reach 93 ktCO₂e by 2050 in the BAU scenario.

Under the MES, all diesel-based irrigation pumps are expected to be replaced with solar pumps – potentially under schemes such as PM-KUSUM²⁹ by 2030. Additionally, 50 percent of agricultural machinery is expected to be electrified. This would reduce GHG emissions to 47 ktCO₂e by 2050, with electricity consumption reaching 206 GWh. In the AES, achieving a 100 percent share of solar pumps and complete electrification of agricultural machinery could completely abate sectoral emissions by 2050, with an estimated electricity requirement of 267 GWh.

Key Interventions to Decarbonise Agriculture Energy

■ Promotion of Renewable Energy Solutions:

- **Solar-powered irrigation systems:** Replace ~4820 existing diesel pump sets with solar pumps by 2030, in convergence with the PM-KUSUM scheme.
- **Agrivoltaics³⁰:** Explore the potential for implementing agrivoltaic systems that allow dual use of land for both agriculture and solar energy production. This can be achieved through detailed assessment of crop diversity in the district and viability assessment.³¹

- **Transitioning from diesel machineries to electric machineries in agriculture:** Promote electric tractors by targeting at least 30 percent of new tractor sales to be electric by 2035, supported by tailored financing solutions from agricultural banks and financial institutions. Additionally, transition all ~7500 projected diesel-based tractors and tillers to electric by 2050.

93 ktCO₂e

of Decarbonisation
Potential by 2050

Stakeholders

Individual Farmers / Farmer Producer Organisation (FPO) / Water User Associations, State Agriculture Engineering Department and Energy Department, Tamil Nadu Power Distribution Corporation Limited (TNPDC)

5.1.4 Industrial Sector

Coimbatore, often referred to as the “Manchester of South India,” is renowned for its vibrant textile industry, which hosts numerous small and medium-sized mills. Other major industries include cement manufacturing, automobile spares, motors, electronics, and steel and aluminium foundries. Coimbatore is particularly famous for its pump manufacturing, which meets two-thirds of India’s demand, and enjoys global recognition in the wet grinder industry.

Approximately 40 percent of the district’s electricity demand is consumed by the industrial sector.

In 2021-22, the electricity consumption in the sector stood at 2246 GWh. Large industries in Coimbatore use electricity from both mixed feeders and dedicated high-tension (HT) feeder lines (11 kV). In 2021-22, electricity consumption from LT feeders was 1,414 GWh, while HT feeders accounted for 832 GWh (source: TNPDC). A time-series regression model (FB Prophet) was applied to this historical data, effectively capturing trends, seasonality, and the impact of the COVID years for future projections. The total electricity demand for Coimbatore, including both HT and LT feeders, is expected to reach 3481 GWh in BAU by 2050, with almost 70 percent share contributed from LT consumer category.

Mineral, chemical, textile, and metal industries contribute significantly to GHG emissions in Coimbatore. Fuels used in the industrial sector, such as coal, petcoke, FO/LHS, and bitumen, were available from 2004-05 to 2022. Time series regression has been applied to forecast future fuel consumption. Figure 5.7 (a) provides forecasted electricity demand (in GWh) and Figure 5.7 (b) provides energy demand (in PJ) alongside GHG emissions (in ktCO₂e).

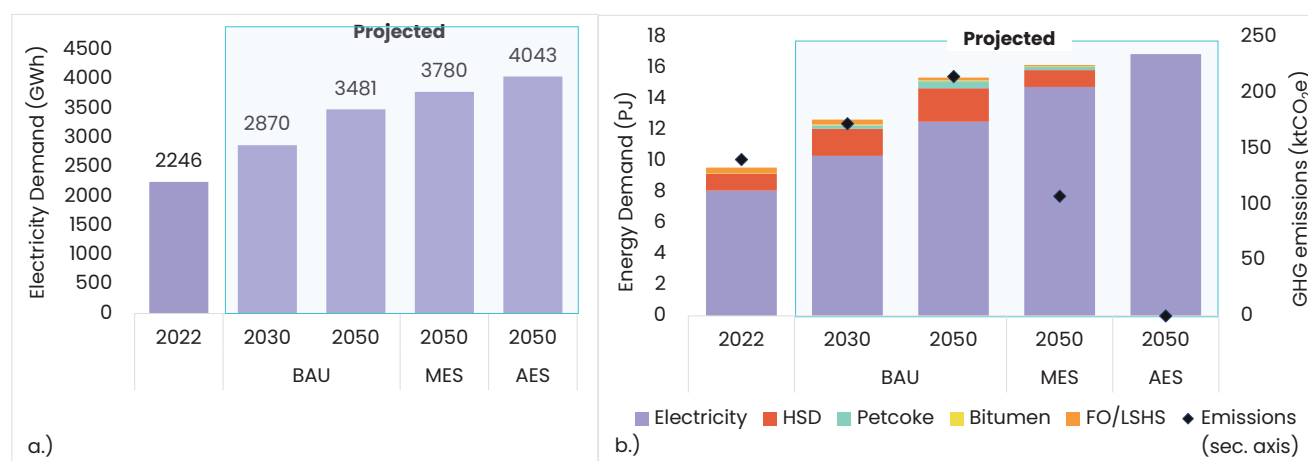


Figure 5.7 (a) : Electricity demand in industries sector in GWh

Figure 5.7 (b) : Fuel-wise energy demand in PJ and GHG emissions, in ktCO₂e in industries

Under the BAU scenario, GHG emissions from the consumption of diesel, HSD and other fossil fuels in the industrial sector are projected to increase from 140 ktCO₂e in 2022 to 215 ktCO₂e by 2050. However, with technologies such as renewable electricity-based systems, green hydrogen, and biomass available to mitigate the fuel combustion emissions, the GHG emissions in the industrial sector could be reduced to 107 ktCO₂e in the MES. In the AES, a full adoption of decarbonisation technologies could reduce GHG emissions to nearly zero by 2050.

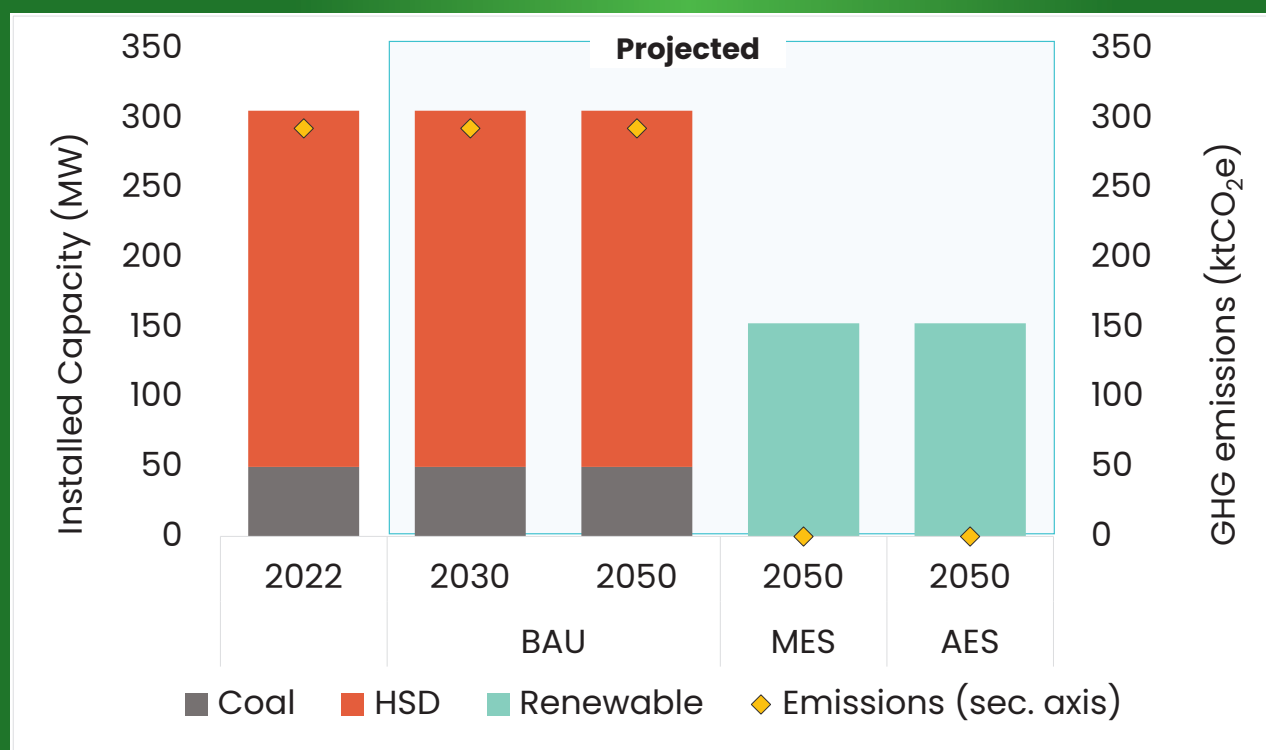
Box Item 6: Decarbonising captive power-based emissions in Coimbatore through RE integration

Almost all industries in Coimbatore operate captive power plants (CPPs) to meet their electricity demand. These industries include textiles, paper, iron & steel, automobiles, and light engineering machinery manufacturing. Diesel and coal are the primary fuels used in these CPPs. According to the Central Electricity Authority (CEA), as of 2018-19, the total installed capacity of steam-based CPPs was 49.9 MW, while diesel-based CPPs had a capacity of 255.7 MW.

Due to unavailability of an active number of captive power plants in the district from 2018-19, the plant capacity (MW), electricity generation (GWh) and GHG emissions (ktCO₂e) are assumed to remain unchanged in the future.

The average plant load factor (PLF) for steam-based CPPs is approximately 54 percent, while for diesel-based CPPs, it is 3.3 percent. For this analysis, it is assumed that the installed capacity of fossil fuel-based CPPs will remain unchanged in the future. Under the BAU scenario, CPP-related GHG emissions are constant from 293 ktCO₂e in 2022 to 2050. In MES and AES, replacing all diesel and coal-based CPPs with renewable energy sources such as solar and wind by 2050, would reduce CPP-related GHG emissions to zero.

This transition shown in the below graph, provides installed capacity and GHG emissions across fuel type for industrial captive power across scenarios, in Coimbatore, in MW and ktCO₂e respectively.



Box item 7: Green Hydrogen-based plasma generators for zero emission heating

Industries that rely on extremely high process temperatures—such as cement production, metal treatment, and ceramic firing—are increasingly moving away from fossil fuels to embrace cleaner, carbon-neutral solutions. One emerging approach gaining attention is the use of plasma generators powered by green hydrogen. These systems utilise hydrogen derived from renewable energy sources like wind and solar to produce intense heat without emitting carbon dioxide during operation.

In this process, green hydrogen is fed into a plasma torch, where it is ionised by an electric arc, resulting in generating exceptionally high thermal heat. This heat can be efficiently transferred to industrial units like furnaces or kilns, replacing conventional carbon-based fuels such as coal, petroleum coke, or natural gas. Consequently, plasma systems fueled by renewable hydrogen not only slash CO₂ emissions but also significantly reduce pollutants like nitrogen oxides and sulfur dioxide.

Despite their promise, the widespread implementation of these systems hinges on several factors: adequate production of green hydrogen, affordable and efficient electrolyzers, dependable infrastructure for hydrogen logistics, and continuous innovations in plasma torch engineering. Addressing these technical and logistical hurdles will be critical to establishing plasma-based hydrogen heating as a scalable, zero-emission alternative for heavy industry.

The advantages of this method are substantial. First, since green hydrogen combustion yields only water vapour, the process eliminates direct carbon emissions. Second, the absence of fossil fuels in combustion creates a flue gas dominated by CO₂ from material reactions like calcination, simplifying and reducing the cost of carbon capture efforts.

Real-world validation is already underway. Projects such as Heidelberg Materials' ELECTRA initiative are testing plasma-heated kilns, while Cemex has partnered with HiiROC to investigate plasma-driven hydrogen generation. Although challenges remain in making the technology commercially viable at scale, its potential to dramatically reduce industrial emissions is clear. With continued progress, hydrogen-powered plasma heating—complemented by efficient carbon capture—can help the cement sector meet climate goals and contribute to a more sustainable infrastructure future.

Key Interventions to Decarbonise Industries

- Conduct a comprehensive assessment on the potential of RE integration in industries, including use of rooftop solar and other clean and zero emission technology (such as green hydrogen based plasma generators) to replace fossil fuel consumption – especially for heating in industries.
- Replace 100 percent of diesel and coal-based CPPs with renewable energy sources (solar, wind) by 2050 through market-based power procurement (open access or power exchange route) or RE based captive power.

508 ktCO₂e

of Decarbonisation
Potential by 2050

Stakeholders

Primarily Industries with support/incentives from TEDA / TANGEDCO, DICs

- Closely monitor energy audits and implement recommendations made under the audits to achieve potential energy savings.

In the long term, **carbon capture technologies could also be implemented to mitigate process emissions, particularly in cement manufacturing plants within the district.**

5.1.5 Aggregate Energy Sector Results

1. Electricity

Total electricity demand in Coimbatore is projected to more than double, increasing from 6456 GWh in 2022 to 14925 GWh in 2050 – driven largely by adoption of electric vehicles and increased electricity demand for space cooling needs in residential and commercial sectors under business-as-usual scenarios. Electrification interventions to abate sectoral emissions will further push this to 16296 GWh under AES.

In 2022, the industries and building sector together accounted for nearly 80 percent of total electricity consumption in Coimbatore. Over the coming decades, a shift in the sectoral shares of electricity consumption is anticipated. By 2050, the building sector's share – including both residential and commercial sector – is projected to increase to ~67 percent, reaching 10,080 GWh. Following the building sector, the industrial sector – including CPP – consumed 33 percent of electricity in 2022. Although its share is expected to decrease to ~26 percent by 2050, its absolute demand could increase from 2579 GWh in 2022 to 3814 GWh by 2050. The transport sector, meanwhile, is projected to experience the fastest growth, with its share rising significantly from 0.03 percent in 2022 to 6 percent by 2050.

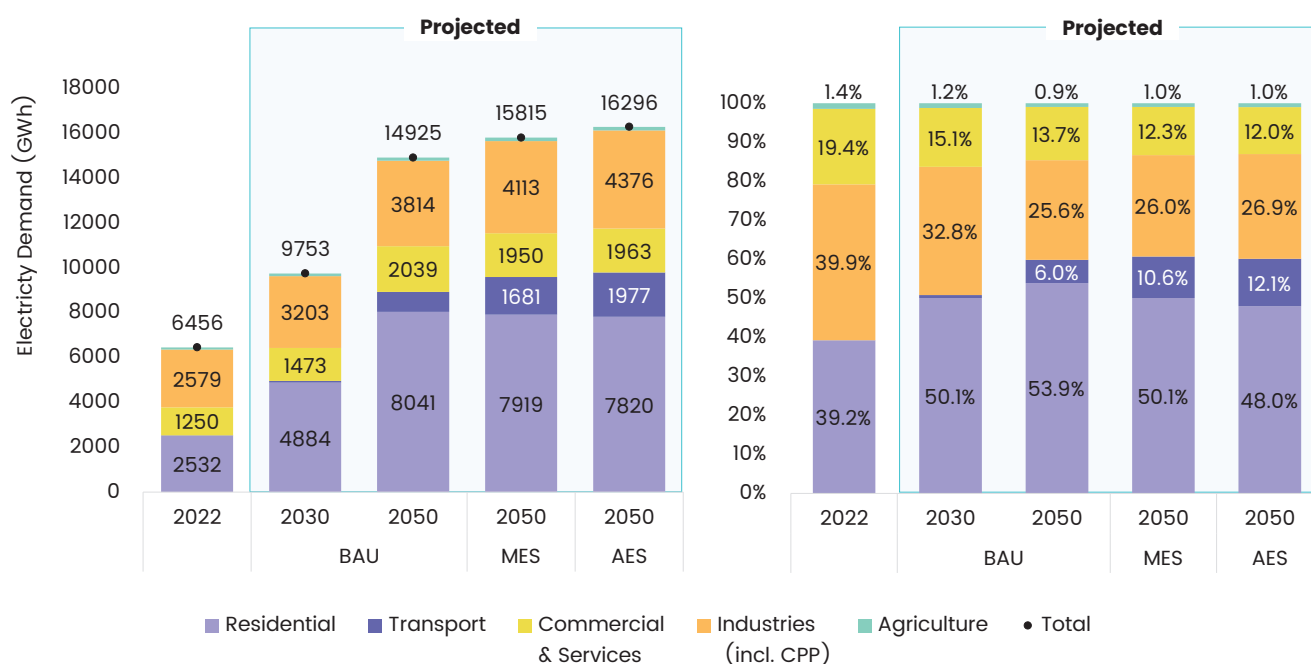


Figure 5.8: Electricity demand in energy sector in GWh

2. Total Energy Use

Total energy use refers to the overall quantity of energy consumed by various economic and social sectors within Coimbatore district annually. Figure 5.9 illustrates the share of total energy use across the demand sectors.

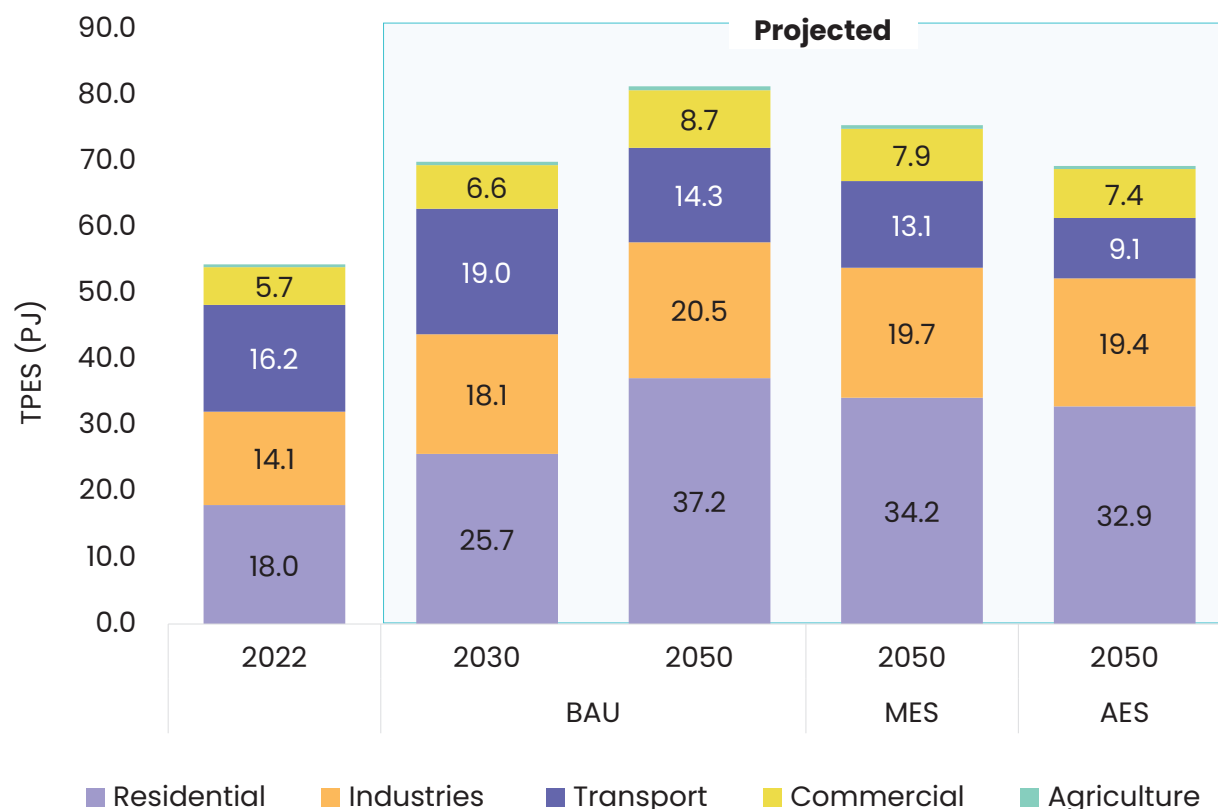


Figure 5.9: Total energy demand across sectors in PJ

Under the BAU, total energy use is projected to grow from 54 PJ to 81 PJ by 2050. In 2022, the building sector was the largest energy consumer, accounting for 42 percent of total energy use. This sector is expected to remain the largest consumer by 2050, with its share increasing to 65 percent.

The transport sector, the second-largest consumer in 2022 with a 32 percent share, is projected to see a decline in its share to approximately 21 percent by 2050. This reduction is primarily attributed to the adoption of efficient electric vehicles (EVs) in place of fossil-fuel-based transportation.

The industrial sector was the third-largest energy-intensive sector in 2022, consuming 26 percent of the total energy use. Its share is expected to remain relatively stable, with a slight decline to 24 percent by 2050.

3. Emissions from the Energy Sector

Figure 5.10 illustrates the projected GHG emissions for the energy sector up to 2050.

Gross GHG emissions in this sector are estimated to decline from 2602 ktCO₂e in 2022 to 2186 ktCO₂e in BAU by 2050.

In 2022, the transport sector was the largest contributor, emitting 1503 ktCO₂e, accounting for 58 percent of total emissions. By 2050, emissions from the transport sector are projected to decrease to 957 ktCO₂e, representing approximately 44 percent of total emissions. This decline is primarily attributed to the accelerated adoption of efficient electric vehicles (EVs), which are replacing fossil-fuel-based transportation.

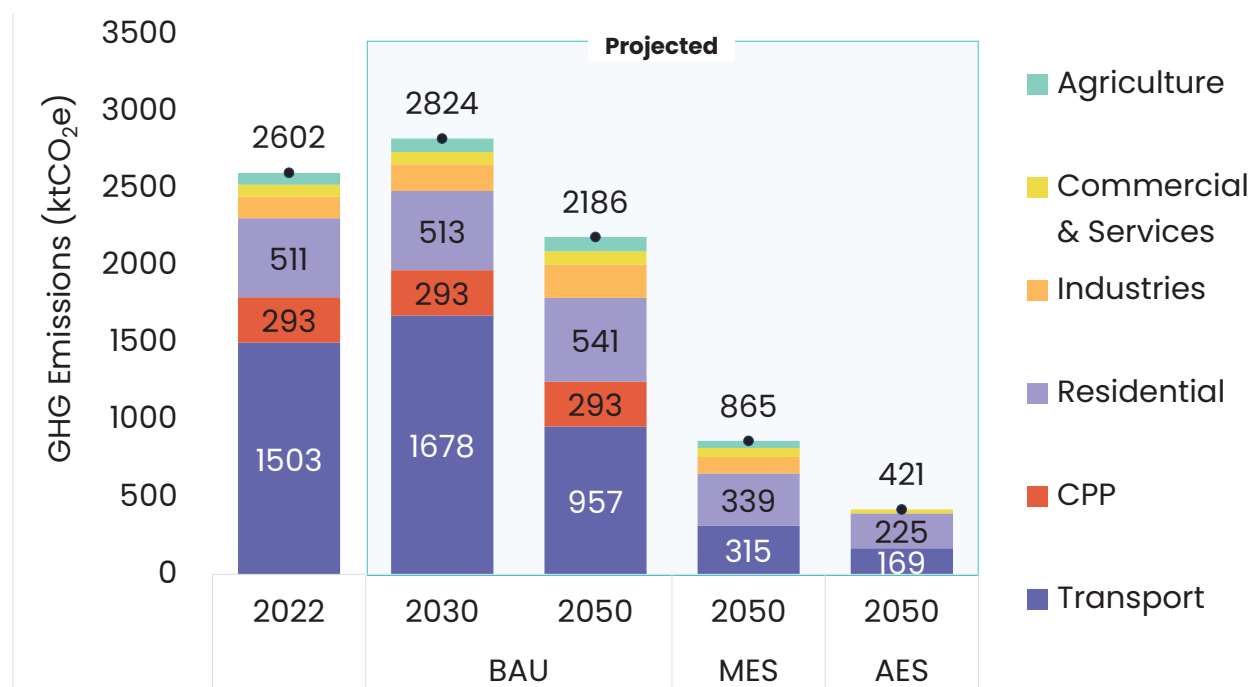


Figure 5.10: Gross GHG emissions of energy sector across sectors in ktCO₂e

The building sectors contributed 22 percent of total GHG emissions in 2022, a share expected to rise to 26 percent by 2050, reaching an absolute value of 627 ktCO₂e. GHG emissions from captive power plants remain constant at 293 ktCO₂e (11% of emissions) till 2050.

Whereas, industry and agriculture had a combined GHG emissions of 216 ktCO₂e in 2022, these are expected to be completely abated such as solar pumping, electrification of farm machinery, fuel switching in industry etc.

Box Item 8: RE integration would be crucial for abating Scope 2 electricity use emissions

Emissions reported in previous sections under various categories at source are from fossil fuel combustion in the various sectors to meet energy demand as well as power generation within the district. These GHG emissions from the source qualify as scope 1 emission. However, district electricity consumption is met through grid electricity procured from outside the district boundary. These emissions are referred to as Scope 2 emissions.

In 2022, the district's electricity consumption was 6,180 GWh (excluding CPP consumption). It also had 0.73 GW of installed renewable energy capacity, generating approximately 1,043 GWh of electricity. The net Scope 2 emissions from the remaining electricity demand 16,403 GWh are expected to increase from 3,596 ktCO₂e in 2022 to 9,325 ktCO₂e by 2050. It is thus imperative to mitigate the electricity consumption related emissions, through integration of renewable sources.

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 9.1 GW in the Coimbatore district. This potential assessment is based on a dynamic land use modeling that identify 10% of total wasteland with high irradiance and adequate 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.

5.2 Industrial Processes and Product Use (IPPU) Sector

The IPPU sector contributed 441 ktCO₂e of GHG emissions in Coimbatore in 2022, with the majority emissions arising from the cement industry. The cement industry is the most energy-intensive sector within Coimbatore's industrial landscape. A significant portion of both thermal and electrical energy is consumed in key processes, such as crushing, milling, reheating, clinkering, and grinding. Over 75 percent of the energy used in cement manufacturing comes from thermal energy sources, primarily coal and petcoke, which are major contributors to CO₂ emissions.

The analysis indicates that coal remains the dominant thermal energy source for the cement industry and is expected to maintain its share through 2050 under the BAU scenario. Coimbatore hosts a large scale cement plant, **ACC Limited, Madukkarai Cement Works** with an annual capacity of 1.08 MTPA.

Key parameters in the cement industry—such as the clinker-to-cement ratio, thermal energy consumption per tonne of clinker (GJ/tonne), and coal requirements per tonne of cement production—were used as the basis for analysis. Using cement production data provided by TNPCB, the specific coal consumption was calculated, and CO₂ emissions per tonne of cement production were estimated for the year 2021–22. The plant utilisation factor for 2021–22 was 0.79, and based on historical data, this factor is assumed to be approximately 0.8 for future projections.

GHG emissions in cement industry is dependent on clinker-to-cement ratio, thermal energy consumption per tonne of clinker (GJ/tonne), and coal requirements per tonne of cement production.

Using cement production data provided by TNPCB, specific coal consumption is calculated, and CO₂ emissions per tonne of cement production have been estimated for the year 2021–22.

Total CO₂ emissions from cement production are divided into two categories: **fuel combustion emissions** and **process emissions**. Fuel combustion, primarily involving coal and pet coke during preheating, co-processing, precalcining, and clinkering, contributes 33–35 percent of total CO₂ emissions. The remaining 65–67 percent of CO₂ emissions are categorised as process emissions, primarily from the chemical decomposition of limestone into lime during calcination, as well as physical transformations in the rotary kiln where pre-calcined meal converts into clinker.

A time series regression analysis was conducted on coal and petcoke consumption data and extrapolated for future years, correlating these with plant utilisation factors and projected cement production levels. By aggregating CO₂ emissions from fuel combustion and process-related emissions, total CO₂ emissions from the cement sector were calculated.

In 2022, greenhouse gas (GHG) emissions from the IPPU sectors were 441 ktCO₂e. Analysis of historical emissions data over the past 15 years confirms figures within the range of 400–450 ktCO₂e, and, under the BAU scenario, they are projected to remain constant until 2050. The cement industry is considered a hard-to-abate sector because process emissions are inherent in the chemistry of traditional Portland cement production. Reducing these emissions requires approaches to alter the chemistry, capture the CO₂ before it is released, or both.

Additionally, **carbon capture and utilisation (CCU)** is a recognised method that can capture approximately 90 percent of process emissions. However, the high energy requirements to operate post-combustion CCU systems in the cement industry, combined with significant capital and operational costs, render retrofitting such technologies economically unfeasible at present. The cost of capturing CO₂ from low-concentration flue gases is estimated at US\$ 60–120 per tonne of CO₂. In Coimbatore alone, capturing 441 ktCO₂e would require a capital investment of approximately US\$ 26–53 million.

Globally, there are about 21 CCUS facilities with a combined capacity to capture approximately 40 million tonnes per annum (MTPA) of CO₂—this accounts for only about 0.1 percent of the 40 gigatonnes per annum (GTPA) of global annual greenhouse gas emissions. With continued technological advancements, the cost of amine-based CCU—currently at a Technology Readiness Level (TRL) of 8–9

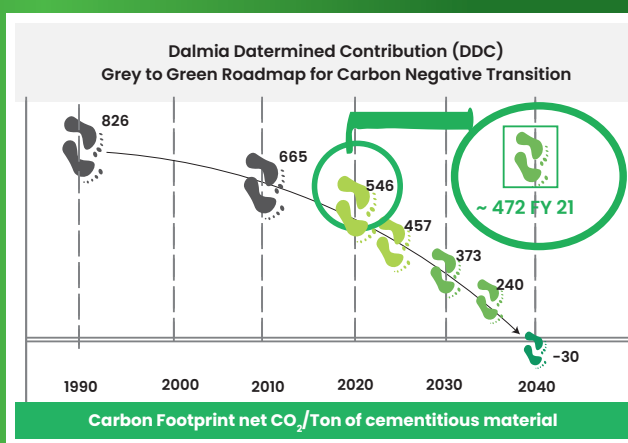
and recognised as a mature technology for the cement industry—is expected to decrease, making retrofitting economically viable in the near future.

Implementing CCU will also require an additional 352–529 GWh of energy per year, translating to a power capacity requirement of 160–240 MW, ideally supplied by renewable energy sources.

Box Item 9: Dalmia cement has adopted a carbon negative roadmap 2040

Dalmia Cement stands as a pioneering example of successful decarbonisation in the traditionally hard-to-abate cement sector, transforming it into a “possible-to-abate” industry. The company has demonstrated that “Clean and Green is Profitable and Sustainable” while expanding from 9 MT capacity (3 plants) in FY ‘11 to 38.5 MT (17 plants) in FY’23. Their carbon negative roadmap, first committed to in 2018, includes ambitious targets:

- Achieving 100% renewable power usage by 2030 under their fossil-free electricity initiative (RE 100).
- Doubling energy productivity by 2030 (EP 100).
- Completely replacing fossil fuels with renewable biomass, hazardous waste, hydrogen, and Municipal Solid Waste by 2035. Carbon Capture and Utilisation (CCU) to make value added products; Carbon Sequestration and adoption of other advanced green technologies by 2040.



The company has already reduced its carbon footprint to a net 472 kg CO₂/ton of cementitious material in FY’21 through various innovative measures. These include optimal utilisation of industrial wastes from steel, thermal power, and aluminium industries, becoming India’s largest producer of Portland Slag cement, implementing state-of-the-art technologies for energy efficiency, monthly GHG footprint monitoring, accelerating alternative fuel use in cement kilns, and integrating renewable energy sources like solar and waste heat recovery from kiln off-gases. This comprehensive approach demonstrates how systematic decarbonisation strategies can be successfully implemented in the cement industry while maintaining business growth and profitability.

Additional efforts to reduce cement sector emissions

In Coimbatore, Tamil Nadu, incorporating alternative materials like fly ash and blast furnace slag in cement production can significantly reduce its environmental footprint. By substituting traditional Portland cement clinker, these alternatives lower the required thermal energy and CO₂ emissions. Fly ash, when used to replace 25 percent of Portland cement clinker, can save up to 15 percent in thermal energy, due to lower need for kiln heating. Similarly, blast furnace slag cement (BFS), when replacing 65 percent of the clinker requirement can reduce energy demand by roughly 36 percent per ton³², given BFS’s inherent reactivity and lower energy-intensive processing.

This approach not only reduces energy intensity of cement production, but also imparts resource efficiency and reduces its carbon footprint. Going forward, reuse and recycled raw material for cement production would aid in imparting sustainability within the value chain.

5.3 Projection of Emissions from Non-energy sector

5.3.1 Livestock

The GHG emissions from livestock management contributed 74% of the AFOLU emissions (excluding land category). Enteric fermentation and manure management respectively accounted for 67 percent and 7 percent. Under BAU, the GHG emissions are projected to decrease from 226 ktCO₂e in 2022 to 213 ktCO₂e in 2050 (Figure 5.11).

The emissions from the livestock management could be significantly reduced through the implementation of balanced rationing³³ and feed additives³⁴ to control methanogens³⁵ and through manure management. By 2050, emissions are projected to decrease from 213 ktCO₂e under BAU to 175 ktCO₂e in MES and to 153 ktCO₂e in AES. The decadal implementation is as detailed in Annexure 3.

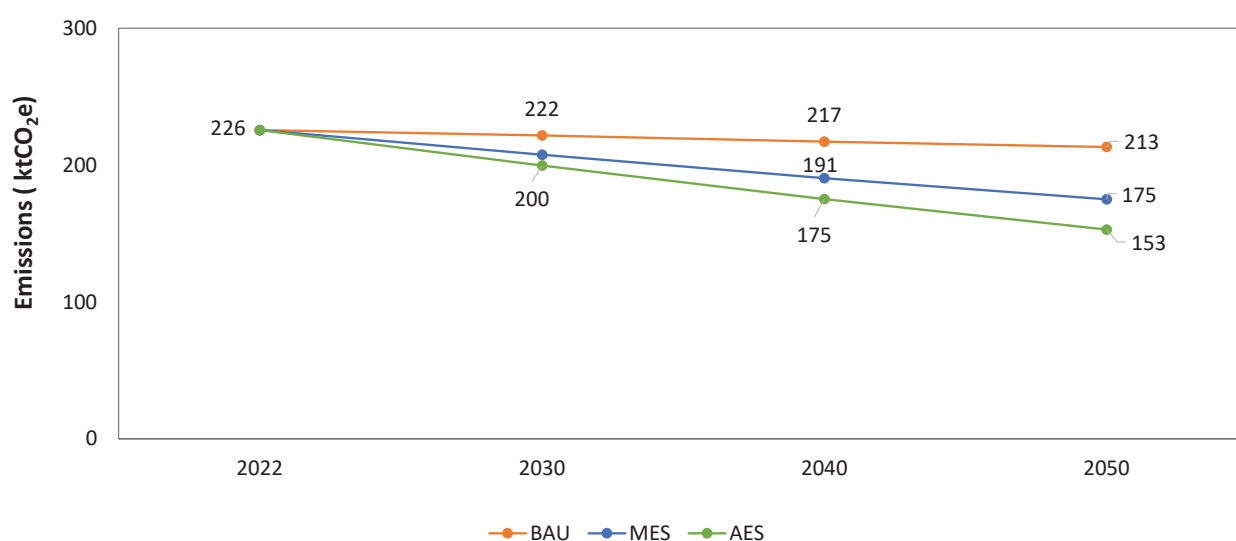


Figure 5.11: Projected emissions from livestock under various scenarios

Key recommendations

- Use of improved feed supplements for suppressing methanogens
- Promote better/efficient manure management practices, like biogas production from cattle manure by endorsing Gobar-Dhan scheme³⁶.
- Promote non-cattle (sheep, goat, donkey) dairy products.
- Encourage and subsidise large-scale cattle farming with advanced feed and manure management.
- Training and promotion of balanced rationing, such as Ration Balancing Programme- initiative of National Dairy Development Board.
- Promote aerobic management of cattle manure such as composting or direct application to the soil.

Box item 10: Climate resilient livestock management

Sustainable livestock management involves adopting strategies and practices that help livestock and farming systems withstand, adapt to, and recover from the impacts of climate change. Extreme heat and increasing atmospheric CO₂ levels affect livestock by impacting their feed, water availability, growth and reproduction, apart from increasing the susceptibility to vector-borne diseases.

Interventions

- Select or develop livestock breeds that are naturally more resilient to extreme weather conditions, such as heat-tolerant or drought-resistant breeds. Indigenous breeds often have traits that make them more adapted to local climates.
- Provide shade, ventilation, and cooling systems (such as fans or sprinklers) in animal housing to reduce heat stress. Properly designed shelters can significantly lower the risk of heat-related illnesses and improve animal welfare.
- Implement water conservation practices and efficient water use strategies, such as rainwater harvesting, to ensure a reliable water supply for livestock during droughts.
- Integrate trees into grazing areas (silvopasture) to provide shade, reduce heat stress, and improve forage availability. Trees also contribute to soil and water conservation.
- Enhance disease surveillance and monitoring to detect and respond to emerging health threats, such as vector-borne diseases, which may become more prevalent due to climate change.
- Adopt better grazing practices in pastures and hygienic environments.
- Ensure complete nutrition requirement is met through the feed by implementing balanced rationing related schemes.
- Periodic veterinary camps to prevent spread of diseases.
- Consider livestock insurance to mitigate financial losses due to climate-related events such as drought, floods, or disease outbreaks.
- Provide support for alternative livelihoods, such as algae culture, fish farming, etc., in case livestock farming becomes unsustainable due to severe climate impacts.

5.3.2 Agriculture Soils

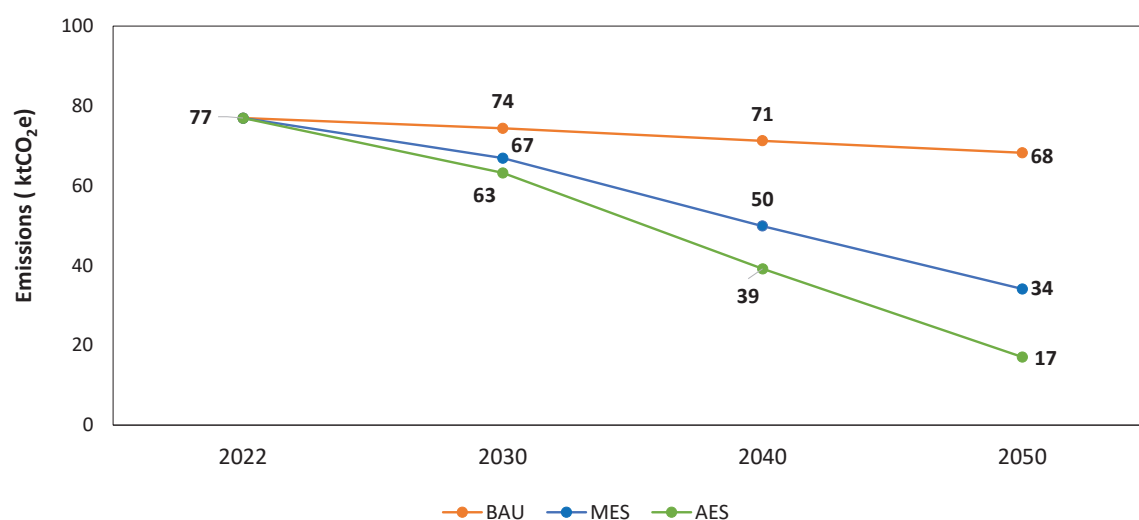


Figure 5.12: Projected emissions from agriculture soils under various scenarios

Emissions from the Agriculture soils category mainly arise due to the use of synthetic nitrogen fertilisers and urea and are projected to decrease from 77 ktCO₂e in 2022 to 68 ktCO₂e in 2050. Nitrogen fertiliser consumption is projected³⁷ to decrease from 26 kt in 2022 to 23 kt in 2050, while urea consumption is projected³⁸ to decrease from 23 kt in 2022 to 17 kt in 2050.

Substitution of organic fertilisers and nano urea can further reduce GHG emissions arising from the use of synthetic fertilisers. Nano fertiliser³⁹ has the potential to regulate the release of nitrogen (N) for an extended period (20 days) in comparison to the conventional urea fertiliser (9 days). The slow and steady release of nitrogen assists in the reduction of nitrous oxide emission by 50 percent in soils treated with nano-fertiliser.⁴⁰

Adoption of organic farming practices can not only decrease GHG emissions but also enhance yield over the long-term. Transitioning to organic farming can contribute significantly to soil health by increasing soil nutrient mineralisation, microorganism abundance, diversity, as well as improving soil physical properties. Farmer support including strengthened extension services with easy access to inputs, together with the development of robust markets for organic produce, certification and branding, is recommended to incentivise farmers to organic farming.⁴¹

In MES, an emission reduction of 50 percent from 68 ktCO₂e in BAU to 34 ktCO₂e by 2050 is estimated by replacing 50 percent of total nitrogen and urea by organic fertiliser and nano urea to meet the remaining urea requirement.

In AES, an emission reduction of 75 percent from 68 ktCO₂e in BAU to 17 ktCO₂e by 2050 is estimated by replacing 75 percent of total nitrogen and urea with organic fertiliser and nano urea. (See Annexure 3 for details regarding organic fertiliser and nano urea substitution.)

In addition, it is also recommended to:

- Promote and encourage use of bio-pesticides and 'zero budget natural farming' practices.
- Encourage use of decision support tools for effective input/nutrient management.

Box item 11: Harnessing Coimbatore's waste-to energy potential can save 135 GWh of electricity demand, abating 190 ktCO₂e GHG emissions by 2050

Coimbatore district, with its substantial livestock population, holds significant potential for biogas production, capable of generating an estimated 30,000 m³/day of biogas (from a potential of 60,000 m³/day at 50% efficiency). This can contribute to clean energy production, including compressed biogas (CBG), and mitigate 64 ktCO₂e of greenhouse gas emissions annually. As an agricultural area, the district also produces substantial crop residues (estimated at 97,472 tonnes per year) from crops like paddy, maize, cotton, sugarcane, jute, cereals, and millets. These residues can be converted into electricity through biomass power plants, with the potential to generate 10–14 MW of electricity, yielding 44–60 GWh of energy per year and offsetting 31–42 ktCO₂e of greenhouse gas emissions. Furthermore, Coimbatore's municipal waste offers another avenue for power generation. In 2022, the district processed about 1029 tons of biodegradable waste daily, enough to power a 15 MW plant, and generate roughly 40 GWh of energy annually, thus, reducing emissions by approximately 93 ktCO₂e. Collectively, the utilisation of these waste streams present a robust pathway for Coimbatore to enhance clean energy generation, improve waste management, and significantly reduce its carbon footprint.

5.3.3 Waste Sector

Waste sector contributed 7 percent to the economy-wide emissions of the Coimbatore district in 2022. Within the waste sector, the largest contributor is the domestic wastewater category (~66%), followed by Solid Waste Disposal (~22%) and Industrial Wastewater (~12 percent). Under BAU, emissions from the waste sector are projected at 254 ktCO₂e for 2050.

a. Domestic Wastewater Treatment

The characteristics of domestic wastewater and the associated GHG emissions vary depending on factors such as economic status, community food intake, water supply status, treatment systems and local climatic conditions. GHG emissions from wastewater management are estimated to increase from ~192 ktCO₂e in 2022 to 202 ktCO₂e in 2050 under BAU, with wastewater generation projected at 484 million litres per day (MLD) at a biochemical oxygen demand (BOD) of 350 mg/L⁴² based on population forecasts. As of May 2025, the centralised treatment capacity stands at 222.6 MLD⁴³, with a utilisation of 57 MLD. Additionally, STP capacity of 21.1 MLD is under construction, and the FSTP treatment capacity stands at 0.05 MLD. Although centralised treatment capacity is substantial, its utilisation remains inadequate. Therefore, a treatment capacity of ~201 MLD (~20% excess) is recommended for urban and 87 MLD for rural areas for effective management and recycling.

For urban areas, centralised sewage treatment⁴⁴ such as the activated sludge process⁴⁵ is suggested, while onsite treatment⁴⁶ such as septic tanks along with FSTPs⁴⁷ at Gram Panchayat cluster level is recommended for rural areas. Advanced decentralised wastewater treatment (DEWAT) is also recommended for spaces exceeding 2500 m² and other isolated facilities such as resorts, restaurants, etc. Tertiary treatment units (e.g., coagulant-aided tertiary sedimentation, chlorination) should be implemented in STPs to improve effluent quality, especially for discharge into water bodies or reuse for irrigation.

Under the MES and AES, the aim is to treat 100 percent of wastewater by 2040, thereby reducing the projected GHG emissions from 202 ktCO₂e BAU to 36 ktCO₂e. This decadal plan is as detailed in the Annexure 3. The recommended wastewater treatment plan contributes to several state and national programs towards improving public health and especially to the targets set by honourable NGT in OA-673. Currently, a Memorandum of Understanding (MoU) has been established between the ULBs and the user agency in Tamil Nadu for the reuse of secondary treated effluent water (STEW). A total of 80.5 million litres per day (MLD) of treated wastewater is being reused across the state for various purposes, including cooling, irrigation, industrial use, and to maintain the TDS level for tanners involved in agroforestry.

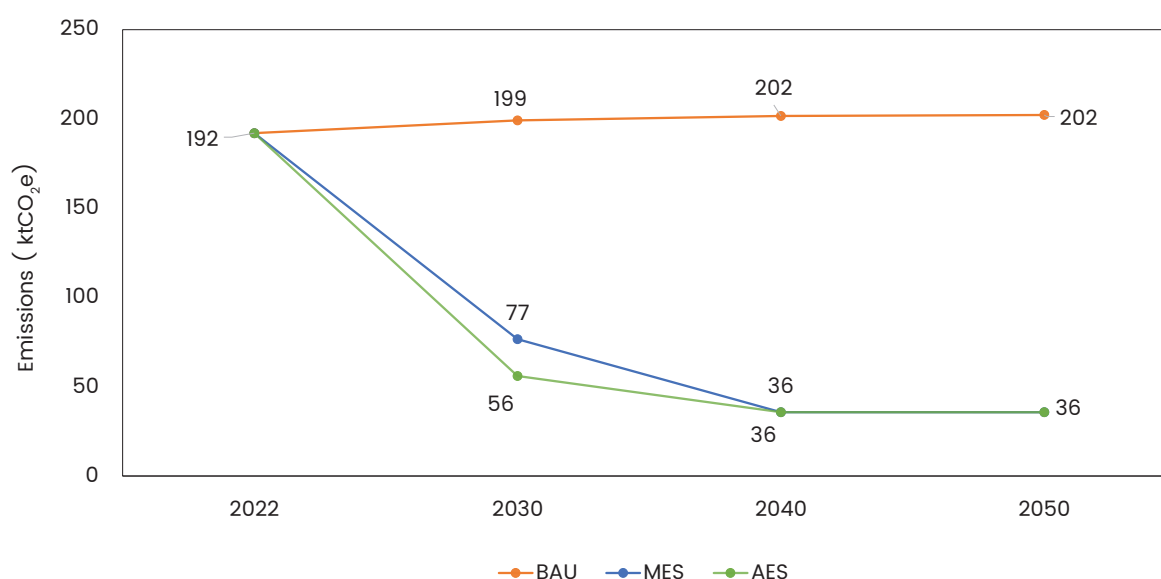


Figure 5.13: Projected emissions from domestic wastewater under various scenarios

166 ktCO₂e

of Decarbonisation
Potential by 2050

Stakeholders

Municipal Administration Department, Rural Development and Panchayat Raj Department Tamil Nadu Water Supply and Drainage Board, Tamil Nadu Pollution Control Board

Box item 12: Domestic wastewater management

Coimbatore district being Tamil Nadu's second largest metropolitan region with a large commercial and industrial base, faces increasing challenges in domestic wastewater management. Though the city corporation and municipalities across the district have made significant progress in domestic wastewater management, the peri urban areas along with town and village panchayats have limited coverage. Coverage of UGD or sewer networks is still lacking in few regions leading to the risk of untreated wastewater discharge. Strengthening the existing collection infrastructure and expanding the network to increase coverage in the peri urban areas is critical for sustainable urban development in the region.

Interventions for domestic wastewater management

- Set up adequate decentralised wastewater treatment facilities (DEWAT) at remote housing entities (resorts/camping grounds/homestays).
- Increase household connections to underground drainage (UGD) in urban areas and promote septic tank-based wastewater treatment for remote houses.
- Ensure Faecal Sludge Treatment Plant (FSTP) facility at gram panchayat cluster level.
- Ensure that untreated wastewater is not discharged into rivers/lakes like Noyyal, Bhavani, Siruvani, Aliyar rivers and Singanallur Vellalore, Valankulam lakes.
- Periodic scouting of the water body periphery to check the discharge of untreated wastewater and penalising the violators.
- Ensure Underground Drainage (UGD) connection within the town areas to respective STPs to avoid ground and surface water body contamination.
- Promote and implement zero discharge policy⁸⁸ for commercial and residential entities in the township boundary.
- Conduct regular water quality testing and monitoring to ensure compliance with treatment standards.
- Regulations for the use of treated water discharged from the Sewage Treatment Plant (STPs).
- Regulate the adherence to the septic tank construction guidelines.
- Upgrade of soak pit and pit latrines to septic tanks.
- Ensure formal system for sludge collection from septic tanks and treatment at FSTP.
- Promote non-potable usage of treated wastewater for construction, landscaping and gardening the public spaces and develop regulations for the use of treated water discharged from the STPs.

Sustainable water management

Coimbatore district, especially the Coimbatore metropolitan city, is facing acute drinking water shortage in summer months due to a combination of increasing temperature and declining groundwater level. Contrary, during rainy seasons the urban areas of the district suffer due to lack of proper stormwater management measures. Although the district has major rivers like Bhavani and Amaravathi under the Cauvery basin and other rivers like Aliyar and Ponnani from the Anaimalai hills in the south, these rivers are non-perennial and do not suffice the demand. The city's water demand has surged past 230 MLD, which mandates sustainable water management practices as listed below,

Interventions

- Explore the possibilities of renewable energy powered ground water recharge projects connecting the major reservoirs of the district with the Cauvery basin and Ponnani basin.
- Set up aquifers and recharge wells at designated locations in the storm water drainage network for ground water recharge.
- Explore the possibilities of Reverse Osmosis (RO) plants for drinking water in metropolitan city locations which face acute water scarcity during summer months.
- Marking and bund construction around the boundaries of the water bodies.
- Water taxing⁸⁹ to control over usage of water by the tourism focused commercial entities.
- Restore existing water harvesting and storage structures and rejuvenate water bodies.
- Mandate groundwater recharge and rainwater harvesting across commercial and residential buildings.
- Undertake restoration, dredging and encourage use of traditional water harvesting systems like tanks (kanmais) and ponds (ooranis) in rural areas.
- Promote watershed management and planting of high shade native trees along the water body bund.
- Undertake tree planting campaigns at various arid zones of the district during social events and ensure proper maintenance.
- Promote crop diversification and encourage native drought resistant crops.
- Promote non-potable usage of treated wastewater (construction, playgrounds, parks, golf courses, car wash, landscaping and gardening public places).
- Identify major water logging hotspots inside the corporation area.
- Develop a storm water network plan for the metropolitan area based on the geography of the area to facilitate smoother draining.
- Desilting the existing storm water network with proper schedule in accordance with the rain season.
- Alternate technologies than storm water drainage like, artificial recharge wells at designated hotspots.

b. Industrial Wastewater Treatment

In 2022, industrial wastewater emissions from meat processing, fish processing, fertiliser and dairy production in Coimbatore district accounted for 35 ktCO₂e. The MES scenario targets a 60 percent wastewater treatment rate by 2050, which will reduce GHG emissions from 35 ktCO₂e to 14 ktCO₂e. The AES scenario aims for an 80 percent treatment by 2050, further lowering emissions to 7 ktCO₂e. Based on the production data, fertiliser, dairy, meat and fish processing produced 12, 3, 1.6, 0.022 MLD of wastewater respectively in 2022.

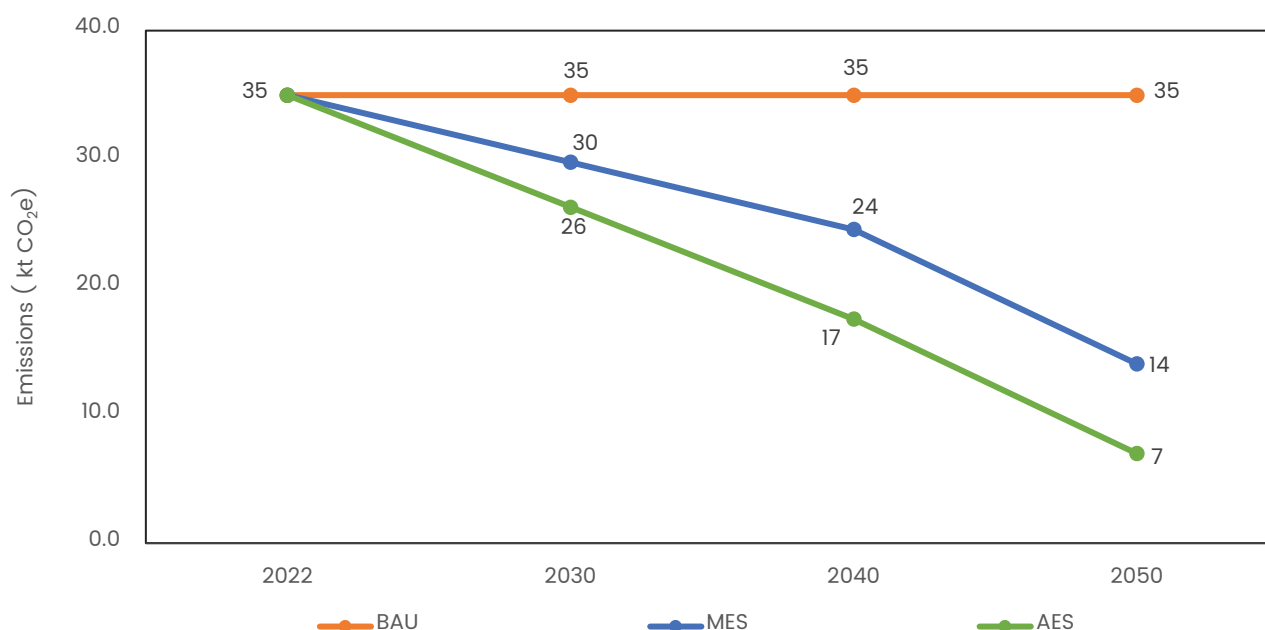


Figure 5.14: Projected emissions from industrial wastewater under various scenarios

28 ktCO₂e

of Decarbonisation
Potential by 2050

Stakeholders

Tamil Nadu Pollution Control Board, Industries Department, Municipal
Administration Department

Box item 13: Industrial wastewater management

Coimbatore is one of the major industrialised districts of Tamil Nadu and a major textile, industrial, commercial and manufacturing hub, housing over 1 lakh MSMEs and more than 3000 working factories. Mining activity including mainly limestone, granite and rough stone quarries are prevalent in the southern and western parts of the district. The industrial and mining activities contribute to significant air, water, soil and noise pollution. The possibility of direct discharge of effluents and waste from industrial units into rivers and other water bodies poses a threat to the local ecosystem. Some of the key wastewater generating industries in the districts are fertiliser, meat processing, dairy, the pump and wet grinder manufacturing plants, textile and dyeing. Extensive red sand mining has greatly affected the ecology of the Thadagam Valley region. Coir pith industry, which is majorly prevalent in the southern part of the district across leased farmlands, make them infertile, thus affecting the agriculture and also pollute the groundwater and nearby water bodies with effluent discharges. Some of the key interventions for industrial wastewater management in the district are as follows,

- Promote purchase and use of treated wastewater from the STPs where relevant (eg., cooling, irrigation, fertiliser industries).
- Adopt zero liquid discharge process by the industries.
- Increase the effluent treatment plants with higher capacities and sludge waste treatment⁹⁰.
- Encourage installation of Online Continuous Emission / Effluent Monitoring System (OCEMS) in the industries.
- Dedicated renewable energy (RE) powered recycling unit for water.
- Alternate dyeing technologies including fluids like Supercritical Carbon dioxide as solvents can be explored.

Fertiliser industry

- Promote usage of bio-methane or Biogas as primary feedstock for hydrogen production replacing traditional natural gas.
- Promote carbon capture and storage (CCS) technologies in the production cycle to reuse in downstream processes.
- Large scale electrolysis for green hydrogen production.
- RE powered nitrogen separation mechanisms.
- Effluent Treatment Plants (ETPs) to treat the process water for reuse in downstream processes.
- Using recycled water in scrubbing processes and cooling towers.
- Separate treatment facilities for oil bearing wastewater from compressor and boiler house.
- ETPs designed for maximum possible removal of COD and ammoniacal nitrogen.

Meat processing

- Promote centralisation of meat processing industries.
- Promote onsite treatment for the meat processing plants and establish CETP facilities for small units and clusters.
- Mandating pre-treatment of wastewater from meat / poultry processing plants.
- Ensure sludge management and disposal.
- Installation of monitoring / instrumentation mechanisms to ensure the reduction of BOD, COD, Total Suspended Solids (TSS) and Fats, oils and greases (FOG) to permissible levels before sewer discharge.
- Electrification of process heat using induction, radiative heating or heat pumps.

Other best practices for industries and mining:

- Proper segregation and disposal of waste and solid metal scraps from municipal solid waste.
- Alternate raw materials / sustainably sourced raw materials (alloys and hazardous chemicals) that have lesser emission potential for textile, dye and other manufacturing industries.
- Greener captive energy consumption by the industries.
- Develop green belt and plantation in undisturbed areas of the mining area.
- Plant rows of native trees as acoustic barriers around mines, roads and other noise generating centres.
- Adopt and maintain air silencers of suitable type which can modulate the noise of the machinery's engine to reduce the noise pollution arising from mining.

c. Solid Waste

GHG emissions from solid waste are projected to decrease from 65.23 ktCO₂e to 16.92 ktCO₂e between 2022 and 2050 in the BAU scenario (Figure 5.15). By 2030 in MES/AES, with Coimbatore district segregating and managing 100 percent of the municipal solid waste and sending none to landfills/dumpsites, GHG emissions from solid waste could be reduced by 96 percent, dropping from 16.92 ktCO₂e to just 0.76 ktCO₂e by 2050. The Coimbatore Master Plan 2041 prioritises solid waste management and circular economy, proposing a target of 80 percent source segregation by 2027 across corporation zones and peri-urban markets, supported by four material recovery facilities (MRFs) and Bio-CNG production from wet market waste. It further proposes the reclamation of Sangnur landfill (25 acres) and three quarries in Thadagam area through the development of a solar park and eco park creation through phytoremediation techniques.

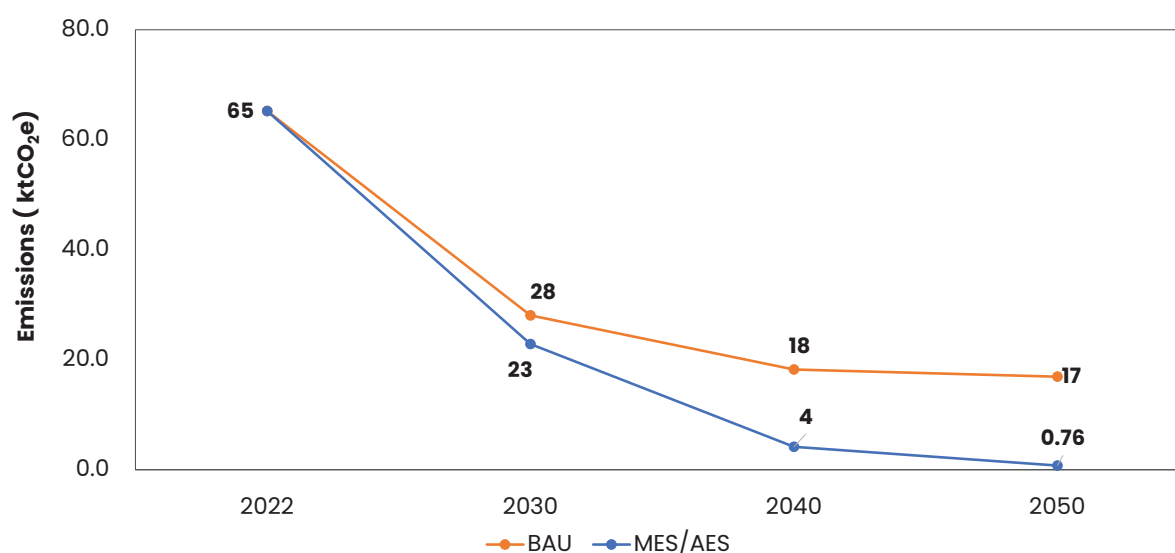


Figure 5.15: Projected emissions from solid waste under various scenarios

16 ktCO₂e

of Decarbonisation
Potential by 2050

Stakeholders

Municipal Administration Department, Rural Development and Panchayat Raj Department, Tamil Nadu Pollution Control Board

Box item 14: Solid waste management

Coimbatore district is the second most industrialised region in Tamil Nadu with a large number of manufacturing companies, while the Coimbatore metropolitan city is also the second largest in the state. As per 2022 reports⁹¹, the city generates close to 1062 TPD of solid waste with an additional ~232 TPD from the district town panchayats and municipalities.

Interventions for solid waste management

- Promote 100 percent segregation and collection of waste at source at both rural and urban areas.
- Ensure adequate placement and management of waste collection bins, segregation centres.
- Install sensor-based community bins to monitor volume and optimise routes of waste collection vehicles.

- Encourage and promote decentralised, community-based composting, vermi-composting and biogas plants at residential and commercial entities (hotels / resorts / homestays).
- Set up and incentivise dry waste collecting centres at village/panchayat level.
- Incentivise the informal sector and build public-private partnerships for segregation, collection and disposal of waste.
- Develop waste management knowledge banks, theme centres, and audio/visual promotions.
- Promote resource utilisation and entrepreneurship focusing on waste reuse, recycle and recovery.
- Facilitate and conduct behaviour change communications workshops on appropriate disposal of solid waste.
- Facilitate infrastructure creation for waste to energy plants.
- Promote Biomining⁹² of legacy waste at the administrative level.
- Facilitate cleaning of dumpsites and encourage development of eco parks.
- Advocate zero waste⁹³, zero carbon footprint⁹⁴, organic thematic centres (restaurants / home stays).

Tourism industry

- Ensure proper waste management at tourist hotspots through appropriate sign boards, surveillance and penalty to avoid littering and throwing of waste.
- Facilitate dry and wet waste bin placement, collection and management of waste in strategic tourist locations.
- Ensure timely and regular collection of waste to avoid overflow and assign staff specifically for waste management, ensuring efficient collection and transportation.
- Promote use of reusable items like cloth bags, leaf bowls, etc and discourage single-use plastics.
- Declare no plastic, zero litter zones etc.
- Limit the use of non-biodegradable materials in religious offerings (eg: packaging).
- Promote eco-tourism and the concept of "Responsible Tourism"⁹⁵
- Facilitate and conduct "Sustainable Consumption" awareness campaigns.
- Engage local volunteers or community groups to monitor and guide proper waste disposal.
- Regularly audit the waste management system to identify areas for improvement.
- Promote Deposit Refund System⁹⁶ for managing plastic waste in the temples, forest areas and tourist spots in and around the hill stations of the district

Special events (fares, celebrations)

- Develop a special waste management plan for large religious festivals or events that attract massive crowds.
- Set up additional waste disposal and management facilities during peak times.
- Waste management outsourcing or through PPP mode.
- Ensure strict regulation, surveillance and penalty for violators.
- Set up onsite composting units for biodegradable waste like flowers, leaves, and food waste. Install biogas plants to convert organic waste into energy.
- Ensure waste management plan before event permission sanction.

5.3.4 Enhancing Carbon Sequestration Potential in Coimbatore

Coimbatore City: The Coimbatore LPA Master Plan 2041 emphasises targeted green cover enhancement, especially within 1200 hectares of reserved land near the district's fault lines. The plan envisions achieving 25 percent green cover by 2030 through Miyawaki forestry and roadside native tree plantation. This would deliver dual benefits of enhancing carbon sequestration and strengthening ecological resilience in the region.

Coimbatore District : The total GHG emissions of Coimbatore were 4210 ktCO₂e in 2022, but the 'Land Use, Land Use Change and Forestry' (LULUCF) removed a negligible amount of 0.23 ktCO₂e. Assuming no significant changes in land use or forest management practices, carbon dioxide removals are projected to 0.23 ktCO₂e by 2050, under the BAU Scenario.

To enhance CO₂ removal and offset GHG emissions, strategies for enhancing land-based sequestration are suggested. Coimbatore has a forest cover of 41 percent (higher than India's average forest cover of 24.62 percent) and the area under the forest cover has increased from 1838 sq.km in 2005 to 1953.18 sq. km in 2021. However, the carbon stock density has decreased from 87.26 tonnes/hectares in 2015 to 82.25 tonnes/hectare in 2021⁴⁸. Additionally, 1,91,615 ha of land is barren, fallow, cultivable waste land or land put to non-agricultural uses, accounting to 40.5 percent of the total geographical area of the district.

The projected carbon sequestration of 0.233 tCO₂e/year under BAU could be enhanced to 438 ktCO₂e/year under MES and 715 ktCO₂e/year under AES (see Figure 5.17 and the details of the scenarios are given in Annexure 3) through following interventions:

1. Promoting social and agroforestry in land classified as barren or fallow, land put to non-agricultural uses or cultivable waste land

- Out of the total geographical area, 1,91,615 hectares are classified as barren, fallow, cultivable waste land or land put to non-agricultural uses, making up 40.5 percent of the total geographical area. These lands present ideal opportunities for agroforestry, which involves practices like planting trees along farmland boundaries, strip cropping (alternating strips of trees and crops), multi-story cropping (growing high-value crops under a well-managed tree canopy), riparian buffers (permanent vegetation strips along watercourses or ditches to prevent nutrient and soil runoff), and silvopasture (integrating trees and livestock, where animals graze on grasses grown under trees in cooler, shaded environments).
- MES considers the conversion of 20 percent to 25 percent of the total fallow land area (1,91,615 hectares) with a median of ~41759 ha, into agro and social forests, which is projected to sequester approximately 367 ktCO₂e by the year 2050. AES, on the other hand, expands this vision by considering 30 percent to 40 percent of the total fallow land area (1,91,615 hectares) with a median of ~67000 ha, anticipating sequestration around 590 ktCO₂e within the same time frame (detailed in box item).

For developing the agro/social forestry in 2026 activities focusing on laying the groundwork – identifying suitable native species, preparing nurseries, stakeholder coordination, approvals and securing planting sites are proposed. From 2027, plantations could be rolled out progressively across the district, integrating fallow and under-utilised land, with institutional mechanisms, irrigation facilities and building capacity. The programme could include protective measures such as fencing, maintenance systems, survival monitoring along with value chain development and impact assessment. Carbon sequestration is expected to gradually increase from 2028 as trees mature, with benefits compounding over time.

Categories of land under non-agriculture uses, barren and uncultivable land, fallow lands other than current fallow and current fallow that are suitable for agro/social forestry and horticulture

interventions have been identified based on expert inputs, historic trend and literature review. In addition to this, the possible site for plantations, reforestation, and enhancing green cover have also been mapped through spatial analysis and is as represented in the map below. These areas represent high potential for enhancing carbon sequestration, restoring ecological function, and supporting sustainable land use practices.

However, it is important to note that these mapped areas are indicative in nature and serve as a preliminary planning tool. Prior to implementation, detailed on-ground verification and ecological assessments are essential to validate site suitability. Such field surveys should evaluate soil characteristics, existing vegetation, slope stability, land tenure, and proximity to water sources, among other factors, thereby ensuring that plantation activities are context-sensitive, ecologically appropriate, and aligned with long-term sustainability goals.

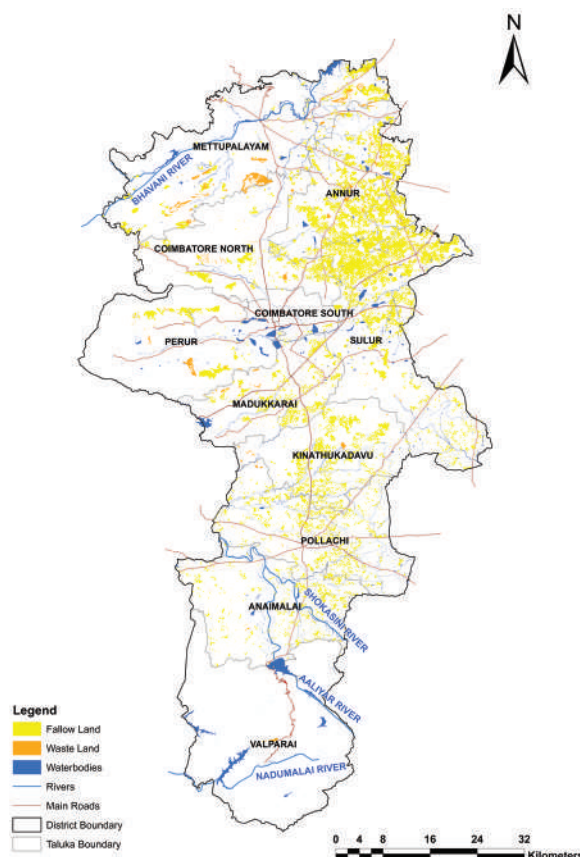


Figure 5.16: Fallow and wasteland areas suitable for agro/social forestry intervention

Box item 15: Social forestry

Social forestry in fallow and waste lands is a community-centred approach to managing forests that integrates social, economic, and environmental objectives. Active participation of local communities in the planning, implementation, and management of forest resources is essential. Along with the social benefits such as food security, community empowerment, cultural preservation, health and nutrition benefits, social forestry could effectively contribute towards enhancing biodiversity, soil health, microclimate regulation, carbon sequestration, water conservation, pollution reduction and improve mental health of the citizens.

- Designate waste lands for social forestry in the district.
- Encourage community/farm/village forests.
- Involve local communities in decision-making processes related to forest management, ensuring that their needs and knowledge are respected and utilised.
- Involve schools and academic institutions, especially children and young adults.
- Training and support to effectively manage forest resources and engage in sustainable practices.
- Analyse soil type, fertility and water availability and choose appropriate species.
- Promote tree diversity and opt for trees that offer multiple benefits, such as timber, fruit, fodder, or nitrogen fixation.
- Increasing tree cover outside forest area: In addition to agroforestry, measures such as planting avenue trees and implementing social forestry in upcoming towns, municipalities can increase the carbon uptake along with shade, oxygen and pollutant absorption benefits.

2. Enhancing carbon stock density

- In 2021, the carbon stock density of the Coimbatore forest was measured at 82.25 tons per hectare (t/ha), compared to 87.26 t/ha in 2015. To reach carbon stock densities near the 2015 level by 2050,

two scenarios have been proposed: MES aims for a 3 percent increase from 82.25 t/ha to 84.76 t/ha, while AES targets a 5 percent increase from 82.25 t/ha to 86.76 t/ha. Achieving these targets could potentially sequester 70 ktCO₂e in MES and 126 ktCO₂e in AES (detailed in box item).

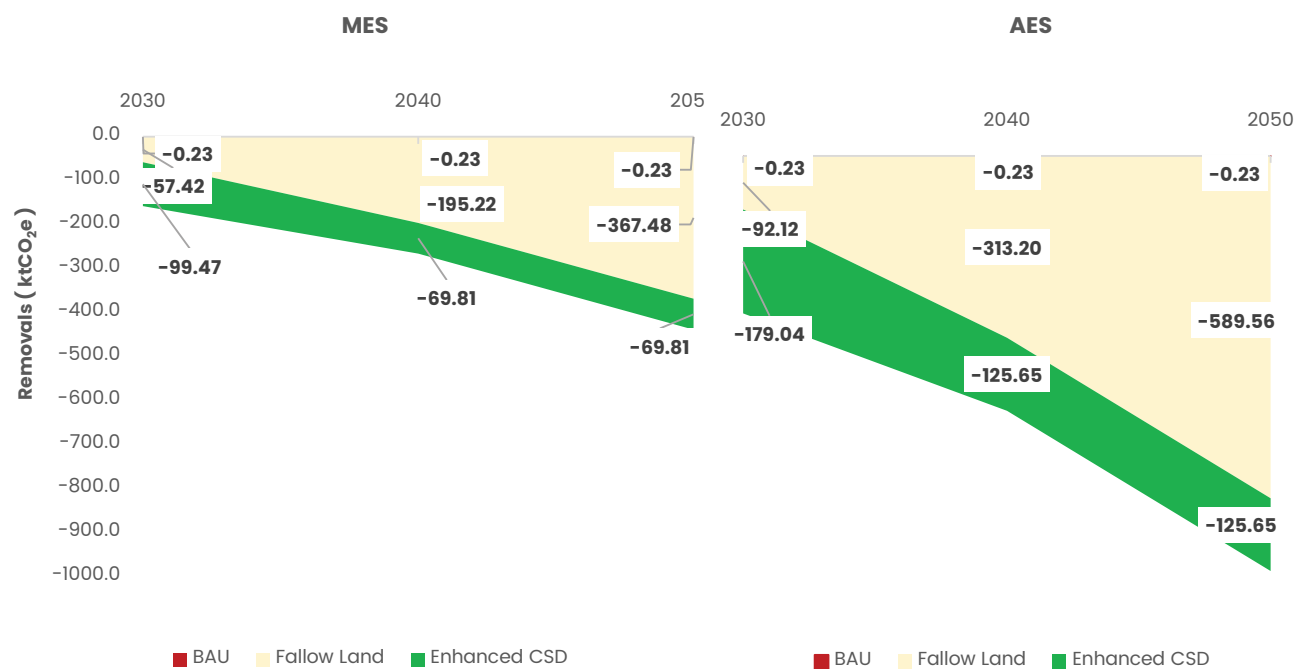


Figure 5.17: Carbon sequestration potential in Coimbatore district under various scenarios

715 ktCO₂e

of Decarbonisation
Potential by 2050

Stakeholders

Forest Department, Environment and Climate Change Department,
Municipal Administration Department, Horticulture Department

Box item 16: Safeguarding forest ecosystems for climate resilience and carbon sequestration in Coimbatore

Coimbatore district has a total forest cover of 1953.18 sq.km which is ~41.3 percent of the district's total geographical area. The major forest areas of the district include Walayar Valley, Bolampatty Valley, Naickenpalayam Valley, Plain Forests around Mettupalayam, Thadagam Valley and Velliangadu Valley.

- Reforestation and afforestation: Planting trees in deforested or degraded forest patches by selecting native species adapted to the local climate and ecosystem, controlling invasive species and ensuring regular maintenance and monitoring.
- Improved forest management: Implementing sustainable forest management practices such as minimising forest degradation through selective logging, protecting old-growth forests, and promoting natural regeneration; preventing forest degradation activities such as illegal logging and forest fires, promote sustainable collection of forest produce.
 - Monitor and remove encroachment of forest land.
 - Use of satellite imagery and other modern technology to identify encroachment, illegal construction and plantation health, threat from invasive tree species etc.

- Demark and place appropriate boundaries for the forest lands.
- Install strategic check-points.
- Promote social and agroforestry.
- Promote and sponsor awareness, plantation and logging activities in the forest areas that are more susceptible to waste littering and dumping.

Forest fire management:

- Strategic controlled burning, where patches of the grassland is burnt at regular intervals in high forest fire susceptible zones to avoid spreading of fire across a big area, would reduce the burn extent.
- Install strategic watch stations to monitor wildfires.
- Formalise protocol for fire control and ensure immediate access to fire extinguishing equipment.
- Establish protocol for use of helicopters for dousing bigger fires across forests and sholas.
- Ground mapping and integration of remote sensing technology to identify fire prone areas in forest.

5.4 Other Key Interventions on Climate Resilience

Strengthening heat resilience through climate-smart cooling

Coimbatore district, part of Tamil Nadu's western zone and nestled along the Western Ghats, experiences increasing urbanisation, changing land use, and rising temperatures. Maximum temperatures are projected to rise by 0.7°C by 2030 and up to 1.9°C by 2090 under the Representative Concentration Pathway (RCP) 8.5 scenario. This warming trend threatens both urban and peri-urban communities, particularly in industrial hubs such as Coimbatore city, Pollachi, and Mettupalayam. Integrating passive cooling, sustainable infrastructure, and robust public health systems is essential to manage heat stress and improve climate resilience. The Coimbatore LPA Master Plan 2041 also acknowledges this impending risk of heat stress, especially in the central zone of the core city area where land surface temperatures exceed 32°C, and has proposed targeted mitigation measures such as cool roofs, vertical gardens and plantation of 10,000 street trees in this area by 2026.

Built environment and sustainable space cooling

- Enforce Energy Conservation Building Code (ECBC) and Indian Green Building Council (IGBC) norms for new constructions across Coimbatore city, including commercial, residential, and institutional buildings.
- Retrofit public buildings such as the Coimbatore Medical College Hospital, government offices in Town Hall area, and schools in Perur and Karamadai with passive cooling features: improved cross-ventilation, reflective roofing, thermal insulation, and shaded courtyards.
- Promote cool roofing technologies and white lime coatings in low-income and informal settlements in North Coimbatore, Sundarapuram, and Ukkadam under Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).
- Establish urban forests and green corridors using native species like *Azadirachta indica* (Neem), *Ficus religiosa* (Peepal), and *Pongamia pinnata* in high-density localities like Saibaba Colony, Gandhipuram, and Kuniyamuthur.
- Create green-blue infrastructure including butterfly parks, bioswales, and shaded walking paths near Valankulam, Ukkadam Periyakulam, and Singanallur Lake.

- Promote rooftop gardens and Agro-Photovoltaic (Agro-PV) installations in textile and engineering industries in SIDCO and SEZ (Special Economic Zones) clusters of Kurichi and Peelamedu.

Public health preparedness for heat stress

- Develop a district-wide Heat Action Plan (HAP) led by the District Health Society and Disaster Management Cell with heatwave alerts, mobile SMS campaigns, and community outreach.
- Establish cooling shelters at community centres and libraries in Pollachi, Mettupalayam, and Thondamuthur equipped with drinking water, fans, and shaded seating.
- Train Primary Health Centre (PHC) staff and Urban Health Nurses in rural and urban blocks like Kinathukadavu, Annur, and Madukkarai to identify and treat heat-related illnesses.
- Install hydration stations at key bus stands (e.g., Gandhipuram and Ukkadam), markets, and railway stations.
- Conduct Information, Education and Communication (IEC) campaigns on heat risk reduction and hydration strategies using FM radio, auto-announcements, and panchayat-level meetings.

Disaster preparedness and health infrastructure

- Solarise PHCs and health sub-centres in remote blocks like Karamadai and Anaimalai to ensure uninterrupted services during heat and power outages.
- Promote electric ambulances and e-rickshaws through the Prime Minister's Electric Vehicle Deployment for Rapid Intervention in Vulnerable Emergencies (PM-E-DRIVE) scheme for health transport in densely populated areas.
- Expand continuous Air Quality Index (AQI) monitoring in traffic-heavy and industrial zones like Avinashi Road and Ganapathy.
- Develop green mobility corridors with shaded cycle tracks and walkways in Singanallur, Saibaba Colony, and Periyanaickenpalayam.

Institutional and community engagement

- Form Local Body Health and Climate Cells to operationalise HAPs and build local capacity.
- Engage industries in conducting workplace risk assessments, implementing heat mitigation practices, and promoting employee health.
- Mobilise women's Self-Help Groups (SHGs), Village Health Sanitation and Nutrition Committees (VHSNCs), and school eco-clubs in green cooling initiatives, water conservation, and heat risk communication.
- Involve Accredited Social Health Activists (ASHAs), Anganwadi workers, and volunteers in early detection of heat illness and community-level preparedness.

Building climate and disaster resilience

Coimbatore district, located in the rain-shadow region of the Western Ghats, faces a complex mix of climate and geophysical hazards, including intense rainfall, urban flooding, drought, heatwaves, forest fires, and occasional seismic tremors. Rapid urbanisation, industrial growth, and encroachment on natural ecosystems have exacerbated vulnerabilities—particularly in low-lying areas of Coimbatore city and peri-urban blocks like Madukkarai, Sarcarsamakulam, and Annur. Implementing a multi-hazard, community-inclusive approach grounded in the Coimbatore District Disaster Management Plan (CDMP) is critical for building long-term resilience and protecting lives, infrastructure, and livelihoods. The Coimbatore LPA Master Plan 2041 also highlights the seismic vulnerability of Coimbatore with the NE-SW fault lines, where around 15 industrial zones are in the hotspot. It has also proposed

seismic zone mitigation interventions including zoning buffer, IS 1893 seismic codes and retrofitting for high risk structures.

Priority interventions

Integration and implementation of Coimbatore District Disaster Management Plan (CDMP)

- Operationalise the *Coimbatore District Disaster Management Plan (CDMP)* through regular updates, localised risk assessments, and inter-departmental coordination led by the District Collector and the District Disaster Management Authority (DDMA).
- Conduct convergence workshops with departments including Revenue, Health, Forest, Agriculture, Public Works, Police, and Tamil Nadu State Disaster Management Agency (TNSDMA) to integrate climate adaptation and disaster preparedness.
- Use the CDMP to guide investments in resilient infrastructure, emergency stockpiles, and early warning systems, particularly in hazard-prone blocks like Kinathukadavu, Thondamuthur, and Pollachi.

Flood and urban waterlogging management

- Rejuvenate and desilt key lakes and tanks such as Ukkadam Periyakulam, Valankulam, Kurichi Kulam, and Selvachinthamani Lake under Tamil Nadu Urban Flagship Investment Program (TNUFIP) and Smart Cities Mission.
- Develop flood hazard vulnerability maps for low-lying urban zones (Town Hall, Ukkadam, Singanallur) using Geographic Information System (GIS) tools.
- Upgrade stormwater drainage infrastructure with recharge pits in commercial and residential areas like Peelamedu and Gandhipuram.
- Ongoing nature based solutions including urban sponge interventions like desilting & restoring lakes and streams such as Singanallur and streams Masaorambu, rainwater harvesting using eco-bloc technology⁴⁹—adopted in selected locations across the city like Race Course and upcoming Semmozhi Poonga—for enhancing flood resilience can be potentially expanded across the metropolitan regions, particularly in identified flood hotspots. Ongoing nature-based solutions including urban sponge interventions like desilting & restoring lakes and streams such as Singanallur and streams Masaorambu, rainwater harvesting using eco-bloc technology—adopted in selected locations across the city like Race Course and upcoming Semmozhi Poonga—for enhancing flood resilience can be potentially expanded across the metropolitan regions, particularly in identified flood hotspots

Drought preparedness and groundwater management

- Use IMD (India Meteorological Department) drought forecasts and Tamil Nadu State Groundwater Database to identify at-risk blocks such as Anaimalai and Karamadai.
- Construct rainwater harvesting structures, recharge shafts, and check dams through Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).
- Promote micro-irrigation under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) for banana, turmeric, and millets in water-scarce areas.

Forest fire risk management

- Strengthen fire monitoring and response in forested areas like Boluvampatti, Siruvani, and Marudamalai by deploying firelines, watchtowers, and wireless alert systems.

- Engage Eco-Development Committees (EDCs) and Joint Forest Management Committees (JFMCs) in fringe villages to conduct patrols, fire drills, and community education.
- Restore degraded slopes using fire-resilient native species like *Pongamia pinnata* (Indian Beech) and *Tamarindus indica* (Tamarind).

Disaster-resilient infrastructure and services

- Retrofit community halls and government schools in Pollachi, Sulur, and Periyanaickenpalayam to function as multipurpose disaster relief shelters.
- Install solar-powered streetlights and backup energy systems in flood-prone and peri-urban panchayats.
- Expand underground cabling networks and smart grids in dense residential localities (Avinashi Road, RS Puram) to ensure energy resilience during disasters.

Community engagement and preparedness

- Activate Local Disaster Management Committees (LDMCs) in all urban wards and Gram Panchayats, with defined response protocols and resource mapping.
- Train Accredited Social Health Activists (ASHAs), Self-Help Groups (SHGs), school teachers, and youth volunteers in basic first aid, emergency communication, and evacuation planning.
- Organise annual multi-hazard mock drills in coordination with Fire and Rescue Services, National Cadet Corps (NCC), and local NGOs.

6. Aggregate Scenario Results and Key Insights

This chapter highlights key insights from the GHG emission projections from 2022 to 2050 across three scenarios: BAU, MES and AES. The energy sector emerges as the primary driver of GHG emissions growth, with the transport sector contributing approximately 60 percent of energy-related emissions, followed by the residential sector at around 19 percent. The AFOLU sector plays a vital role in offsetting GHG emissions, with sequestration showing significant improvement in both the MES and AES scenarios.

GHG Emissions

Table 6.1: Gross and Net Emissions, in ktCO₂e

Sectors	Projections for 2050			
	2022	BAU	MES	AES
Energy Emissions	2602	2186	865	421
Agriculture	76.4	93	47	0
Industrial (Energy)	140.3	215	107	0
Building (Comm & Residential)	589	628	396	252
Captive Power Plant	292.9	292.9	0	0
Transport (excluding aviation)	1503	957	314.9	169
IPPU Emissions	441.2	441.2	441.2	441.2
Livestock Emissions	225.6	213.2	175	152.9
Agg. & Non-CO₂ Emissions	79	70.3	36.2	19.1
Biomass burning in cropland	0.7	0.7	0.7	0.7
Rice cultivation	1.4	1.4	1.4	1.4

Sectors	Projections for 2050			
	2022	BAU	MES	AES
Agriculture soils	77	68.3	34.1	17.1
Net Land Emissions	480.4	480.4	43.1	-234.8
Land (Emissions)	480.7	480.7	480.7	480.7
Removals	-0.2	-0.2	-437.5	-715.4
Waste Emissions	292.2	254.1	50.5	43.5
Domestic wastewater	192.1	202.2	35.7	35.7
Solid waste	65.2	16.9	0.8	0.8
Industrial wastewater	35	35	14	7
Gross Emissions	4120.2	3645.3	2048.4	1558.3
Net Emissions	4120	3645.1	1610.9	842.9

* Agg. & Non-CO₂ represents Aggregate Sources and Non-CO₂ Emission Sources on Land consisting of Agriculture Soil, Rice Cultivation and Biomass burning in cropland

Note: Emissions accruing to aviation are not accounted for within the emission profile. Aviation-led emissions in 2022 were 80 ktCO₂e and are projected to increase 240 ktCO₂e by 2050 due to airport expansion and increasing air passengers and freight.

In the BAU scenario, total GHG emissions are projected to decrease from 4120 ktCO₂e in 2022 to 3645 ktCO₂e by 2050. The energy sector generates the highest emissions at 2186 ktCO₂e, followed by AFOLU (Agriculture, Forestry, and Land Use) at 764 ktCO₂e, IPPU at 441 ktCO₂e, and waste at 254 ktCO₂e, resulting in total net emissions of 3645 ktCO₂e, reflecting a decrease of 11.5%. This reduction in emissions is primarily driven by higher adoption rate of electric vehicles in new sales. Similarly, emissions from livestock management are projected to decrease by ~12 ktCO₂e through the implementation of balanced rationing and feed additives to control methanogens, along with improved manure management practices within the district. Emissions from the waste sector are also projected to decrease by 38 ktCO₂e under the BAU scenario, with predominant reduction in solid waste emissions, owing to stringent waste management practices already in place in the district. **(Figure 6.1)**

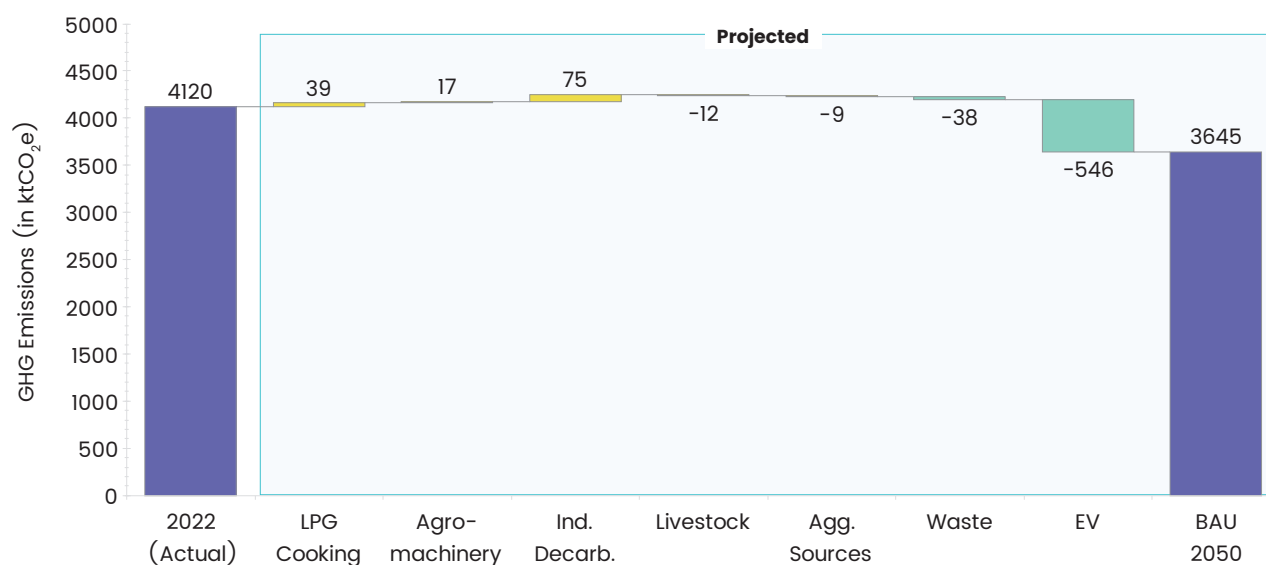


Figure 6.1: Aggregate gross GHG emissions in 2022 and projections by 2050 under business-as-usual scenario in ktCO₂e

*Agg. & Non-CO₂ represents aggregate sources and non-CO₂ emission sources on land consisting of agriculture soil, rice cultivation and biomass burning in cropland

Partial electrification of the 2W, 3W, and 4W segment, phasing out of captive power plants, introduction of electric cookstoves, treatment of industrial wastewater, substituting nitrogen fertiliser and urea with organic fertilisers and nano urea in agriculture and other strategies are expected to result in significant reductions in emissions. The AES represents the most aggressive decarbonisation approach, focusing on complete fuel switching in the industrial heating processes, transport fleet electrification, and higher adoption of PNG and electric cooking in residential sectors, enhances sequestration (agroforestry/ outside forest plantation etc) – thereby, resulting in the highest possible emission reduction. These two scenarios are detailed further below.

Pathways to Decarbonise Coimbatore

Emission reduction potential under moderate effort scenario (MES)

Figure 6.2 illustrates the greenhouse gas (GHG) emissions mitigation measures under the MES. Starting from a baseline of 4120 ktCO₂e gross emissions in 2022, emissions are projected to decrease to 3645 ktCO₂e by 2050 under a business-as-usual (BAU) scenario. Implementation of targeted mitigation measures would lead to abatement under MES over and above this reduction, bringing net emissions down to 1611 ktCO₂e by 2050.

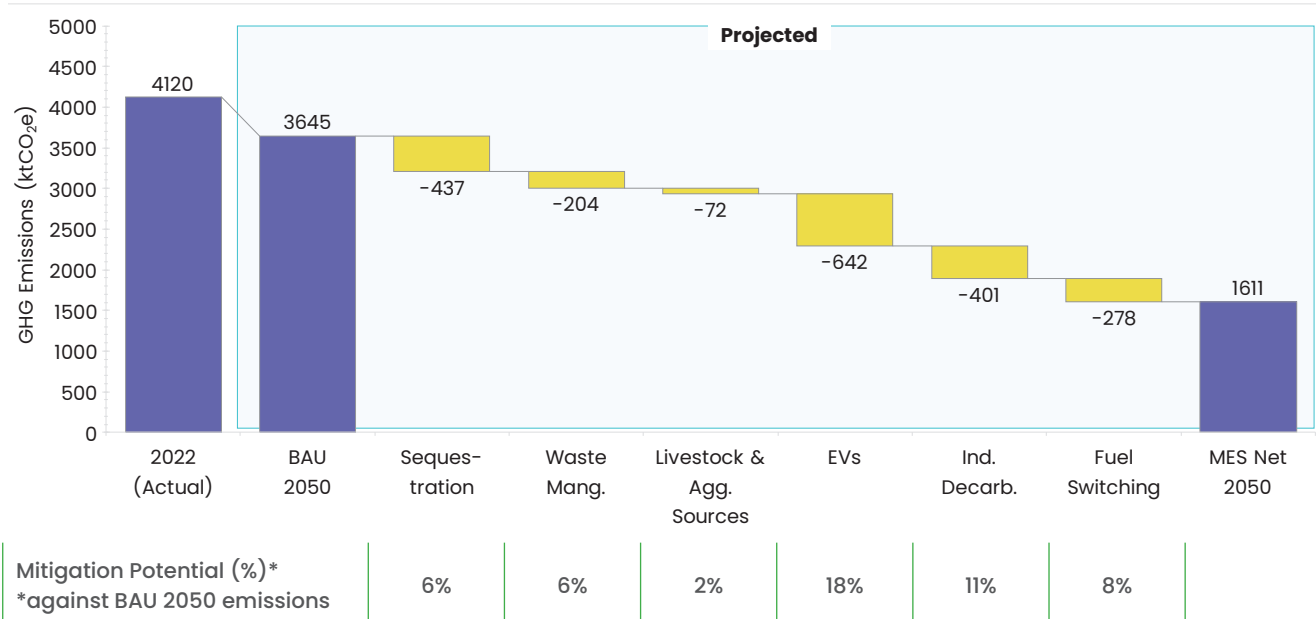


Figure 6.2: Abatement potential by MES 2050 based on BAU 2050 in ktCO₂e

*Agg. & non-CO₂ represents aggregate sources and non-CO₂ emission sources on land consisting of agriculture soil, rice cultivation and biomass burning in cropland

The most substantial contribution to these reductions comes from road transport fleet electrification (642 ktCO₂e), carbon sequestration (437 ktCO₂e), highlighting its critical role in emission reduction strategies. Other key measures include the adoption of clean technologies in industry, including captive power (401 ktCO₂e), fuel switching to cleaner energy sources (278 ktCO₂e), improved waste management (204 ktCO₂e), along with reductions from livestock and aggregate & non-CO₂ sources (72 ktCO₂e).

This integrated approach demonstrates the effectiveness of combining land-based sequestration, renewable energy deployment, electrification, and sustainable practices across sectors to offset emissions—aligning with ambitious climate targets. Further reductions are possible under the AES scenario.

Emission reduction potential under aggressive effort scenario (AES)

Figure 6.3 illustrates greenhouse gas (GHG) emissions mitigation measures under the AES. The implementation of targeted actions results in a significant reduction in emissions, with net emissions dropping to 843 ktCO₂e by 2050. The largest contribution to this reduction comes from road transport fleet electrification (788 ktCO₂e) and carbon sequestration (715 ktCO₂e), highlighting their vital role in emission reduction in Coimbatore.

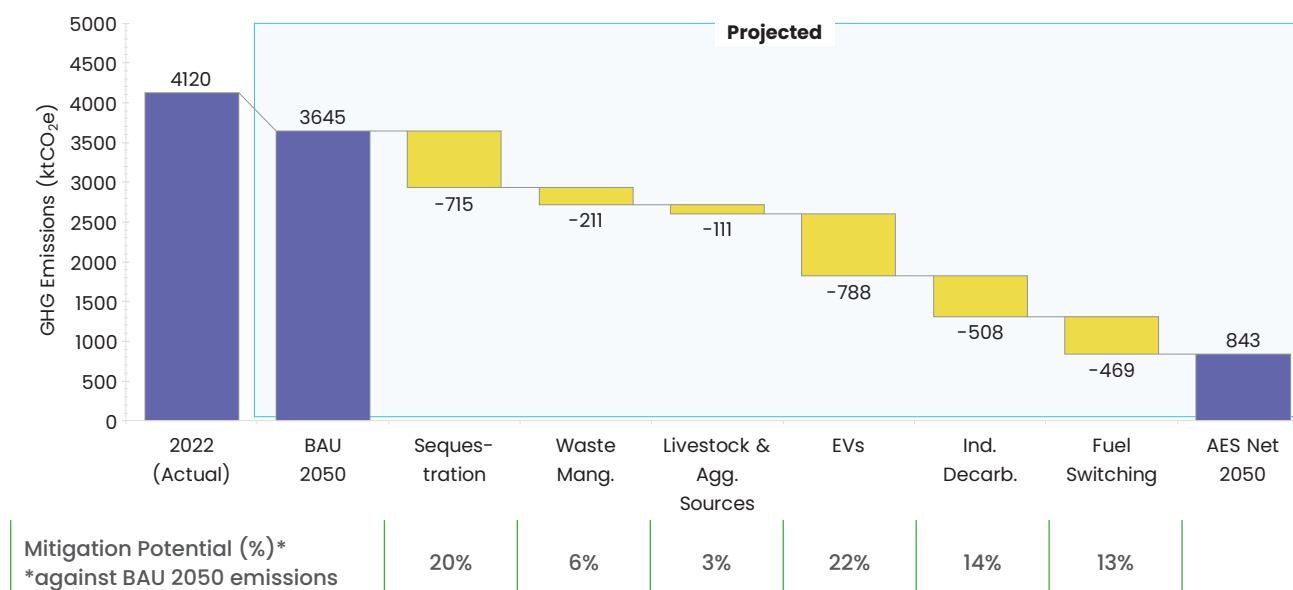


Figure 6.3: Abatement potential by AES 2050 based on BAU 2050 in ktCO₂e

*Agg. & Non-CO₂ represents Aggregate Sources and Non-CO₂ Emission Sources on Land consisting of Agriculture Soil, Rice Cultivation and Biomass burning in cropland

Additional reductions are achieved through the adoption of clean technologies in industry, including captive power (508 ktCO₂e), fuel switching to cleaner energy sources (469 ktCO₂e), improved waste management (211 ktCO₂e), along with reductions from livestock (60 ktCO₂e) and aggregate & non-CO₂ sources (51 ktCO₂e).

Key Insights from Analysis

Replacing ICE vehicles with electric vehicles holds the key to decarbonise road transport

Full electrification of 2W, 3W, 4W and buses and partial electrification of Heavy Goods Vehicles (trucks, trolleys) could save the district 66% of sectoral emissions, from 957 ktCO₂e under BAU 2050 to 169 ktCO₂e in AES 2050. To achieve this, an interim electrification of 0.2 lakh 2Ws, 1000 3Ws, and 0.1 lakh 4Ws by 2030 would be required. By 2040, an additional 3 lakh 2Ws, 4000 3Ws, and 1 lakh 4Ws would have to be electrified in Coimbatore. This would also need a complementary investment towards development of allied infrastructure for electric mobility, including installation of charging stations.

Abatement of Industrial emissions hinges on Industry-wise strategies. Abating IPPU emissions in cement manufacturing is of particular significance for Coimbatore to decarbonise its economy.

Coimbatore's industrial sector comprises roughly 3.23 lakh MSMEs – 3.15 lakh of which are micro enterprises – engaged in allied manufacturing and services, particularly of textile, pump and auto parts. In 2023-24 alone, the district added another 69,241 enterprises, reflecting the strong entrepreneurial growth.

A major electricity consumer and emitter in the district, the industrial sector in Coimbatore and particularly cement production needs to be decarbonised on priority. Electrification of heating processes through green hydrogen and other means, renewable energy based captive power generation and circular economy practices could completely abate 508 ktCO₂e of projected emissions by 2050. Decarbonising the IPPU sector, which is projected to contribute 441 ktCO₂e of GHG emissions in 2050 will require carbon capture and similar technological solutions. The techno-economic feasibility of these are yet to be explored in India.

A mix of energy efficiency measures and fuel switching could significantly reduce carbon footprint of Coimbatore's building sector

Building emissions – resulting majorly from electricity consumption for space cooling needs, heating and appliances, and fuel use for cooking purposes – are expected to rise in response to heat, population growth and economic pressures. Adopting ~3.2 lakh electric cookstoves to reduce LPG consumption in cooking and using cleaner alternatives like solar energy and biofuels for power backup in buildings can lower buildings carbon footprint by 60 percent from 627 ktCO₂e to 252 ktCO₂e by 2050.

Furthermore, replacing all the inefficient appliance with energy efficient appliances, gradually over the years, with 36 lakh 3/5 star ACs and 19 lakh refrigerators, 42 lakh BLDC fans, 60 lakh LED bulbs and 5 lakh streetlights could yield significant energy savings – avoiding 594 ktCO₂e of Scope 2 building emissions by 2050.

The agriculture sector, similarly, could save 93 ktCO₂e of emissions by 2050, through prioritising solarisation of existing ~4820 diesel pumps and electrification of ~7500 tractors and tillers.

While higher sectoral electrification will abate Scope 1 emissions, Scope 2 emissions could still rise on account of higher electricity demand considering a fossil-based electricity generation in the state. Coimbatore can curb this through RE integration.

Electrification of the road transport fleet, industrial decarbonisation, and increased demand for space cooling are expected to increase electricity consumption in the district. Electricity consumption is projected to double, from 6456 GWh in 2022 to 16,296 GWh by 2050 under the AES scenario. Out of this, 8,041 GWh will be required for space cooling needs alone, driven by higher temperature projections under RCP 8.5 scenario. To meet this demand through renewable energy, an additional equivalent capacity of 6 GW will be required. This will curb 9325 ktCO₂e of Scope 2 emissions. Therefore, a comprehensive assessment of the resource potential across various renewable energy sources—such as solar rooftops, utility-scale solar, wind energy, agro-photovoltaics, and others—is required to be carried out for the district. Adopting energy-efficient appliances, insulation, rooftop solar, and smart technologies will curb emissions, ease grid pressure, and support decarbonisation efforts.

In non-energy sectors, emissions can be avoided/sequestered through,

Leveraging non-CO₂ mitigation strategies for deep decarbonisation

Achieving a full spectrum of decarbonisation in Coimbatore requires a comprehensive approach that extends beyond conventional energy sector interventions towards non-CO₂ pollutants—methane, black carbon—which are high impact emission drivers with low visibility and are usually under recognised. Emission mitigation initiatives across waste, agriculture and livestock play a pivotal role in reducing the net residual emissions and moving towards carbon neutrality.

Non-CO₂ pollutants such as methane, nitrous oxide (N₂O), black carbon, and hydrofluorocarbons (HFCs) have high global warming potential, significant impacts on health and ecosystems, and their mitigation holds immense potential for achieving rapid, near-term climate benefits. These pollutants must be prioritised alongside CO₂ mitigation. In Coimbatore, targeted non-CO₂ mitigation—such as

reducing methane and N₂O—offers a potential reduction of around 330 ktCO₂e by 2050. Additionally, interventions to reduce black carbon, especially from transport and industry, could further enhance the mitigation impact. Moreover, non-CO₂ action delivers strong developmental co-benefits, including improved air quality, reduced health risks, and enhanced agricultural yields in peri-urban areas.

Improving waste management and converting waste to energy can mitigate 215 ktCO₂e by 2050

Waste sector emissions projected at 254 ktCO₂e by 2050 could be reduced to 43 ktCO₂e by implementing measures such as 100 percent source segregation and processing of municipal solid waste with zero landfilling, comprehensive domestic wastewater management through 100% UGD connections, centralised STPs in urban areas, septic tanks with FSTPs in rural areas, and improved industrial wastewater management.

About 1029 TPD of **municipal waste** could further generate ~160 GWh annually, mitigating 93 ktCO₂e emissions through municipal solid waste and Refuse Derived Fuel (RDF) based projects. Similarly, 97,472 tonnes of **annual crop residues** could generate 10–14 MW of power, producing 44–60 GWh and reducing 31–42 ktCO₂e emissions. **Livestock waste** could also produce 30,000 m³/day of biogas, enabling compressed biogas (CBG) production and mitigating 64 ktCO₂e annually.

Livestock and aggregate source emissions can be abated through improved fertiliser and manure management practices

Agriculture Soil emissions, which are projected to slightly decrease from 77 ktCO₂e in 2022 to 68 ktCO₂e by 2050, could potentially be reduced to 17 ktCO₂e by replacing synthetic nitrogen fertilisers and urea with organic fertilisers and nano urea.

Livestock emissions, expected to decrease from 226 ktCO₂e in 2022 to 213 ktCO₂e by 2050, can be further reduced to 153 ktCO₂e through balanced rationing, adoption of methanogen-inhibiting feed additives, and improved manure management practices.

Coimbatore's carbon sequestration could be enhanced to 715 ktCO₂e in 2050 by repurposing fallow/barren/wastelands as social/agroforestry and enhancing carbon stock density.

Box Item 6.1: Behavioural shifts will drive emission reductions over and above the proposed interventions in Coimbatore

Behavioural interventions in the aggressive scenario (AES) will result in avoided demand, efficient consumption wherever unavoidable and mindful decision-making regarding choice of fuel, materials and use of appliances. The emission reductions will be over and above those under the interventions proposed for Coimbatore.

Buildings (residential and commercial)

- **Temperature control**, such as setting AC temperature at 26°C, can save Coimbatore upwards of ~573 GWh out of 5002 GWh of the projected electricity consumption for space cooling in 2050 (6% for each degree of temperature change). This measure can abate ~403 ktCO₂e of scope 2 emissions, in addition to savings from other energy efficiency measures.⁵⁰
- **Smart lighting solutions using motion/occupancy sensors and daylight integrators** can prevent idle running of utilities and save the district 40 percent of electricity in lighting or 164 GWh out of ~410 GWh of projected electricity consumption in lighting in residential and commercial buildings by 2050, further abating 114 ktCO₂e of GHG emissions (scope 2).

Transport

- **Smart traffic systems** that optimise signal timings based on real-time traffic data, reduce idle time at intersections and minimise stop-and-go traffic can save up to 25 percent of emissions at traffic lights and intersections.⁵¹
- **Using public transport for inter-city and intra-regional movement** can result in 45 percent reduction in emissions in comparison to private vehicles in Coimbatore.^{52 53} Assuming that 10 percent commuters in Coimbatore shift from 4W cars to buses, this behavioral change could reduce GHG emissions by ~103 ktCO₂e by 2050. It could also avoid the need for around~ 47,000 four-wheelers on the road, replaced with an addition of ~2100 buses.
- **Non-motorised transport** (bicycle, cycle rickshaw, push scooters etc) for shorter distances (3.5-4km), supported with development of sidewalks, pedestrian zones, and safe crosswalks for walkers and cyclists, can further avoid unnecessary emissions.



7. Implementation Plan for Decarbonising Coimbatore District

Short term, medium term and long-term strategies for decarbonising Coimbatore are proposed along with their emission abatement potential in Table 7.1. Through full and effective implementation of these strategies, the district can significantly reduce its carbon footprint by 2050.

Table 7.1: Key short-, medium- and long-term sectoral interventions

Convergence with the government schemes and policies, along with private investments can support this implementation. A list of conducive schemes is provided as Annexure 5.

Coimbatore Decarbonisation Plan

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

Key Short, Medium and Long Term Interventions and their Financial Estimates											
Sr. No.	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.	Departments
				Target	AMP-2030 (kt CO ₂ e /yr) * (Percentage to BAU gross emissions)	Target	AMP-2040 (kt CO ₂ e /yr) * (Percentage to BAU gross emissions)	Target	AMP-2050 (kt CO ₂ e /yr) * (Percentage to BAU gross emissions)		
A	Waste Management in the region										
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 166 MLD of wastewater	143 (3.33%)	Facility to treat 35 MLD of wastewater	166 (4.07%)	Additional maintenance	166 (4.57%)	AMRUT 2.0, Tamil Nadu Urban Flagship Investment Project	Municipal Administration Department, Tamil Nadu Water Supply and Drainage Board, Tamil Nadu Pollution Control Board
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 1,44,288 households		Retrofitting unsanitary septic tanks and unlined hole in the ground with leach pit or twin-pit septic tanks at household level for 25,463 households		Additional maintenance			

Key Short, Medium and Long Term Interventions and their Financial Estimates											
Sr. No.	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.	Departments
				Target	AMP-2030 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2040 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2050 (kt CO ₂ e/yr)* (Percentage to BAU gross emissions)		
A.3		Setting up Fecal Sludge treatment plant (FSTP) at firka level	Government or private initiative	32 FSTPs for 32 firkas		6 FSTPs for remaining 6 firkas		Additional maintenance			
A.4		Increase household connections to underground drainage,	Government initiated and funded	60% Households to be connected with UGD		100% Households to be connected with UGD		Additional maintenance			
A.5	Industrial Wastewater Management	Setting up of Effluent Treatment Plants (ETP) and Contionous Effluent Treatment Plants (CETPs) along with continous treated effluent monitoring system	Market/ industry driven with possibilities of Government funds for industrial areas developed by the Government	Facility to treat 20 MLD	9 (0.20%)	Maintenance and additional facilities as per requirement	17 (0.43%)	Maintenance and additional facilities as per requirement	28 (0.77%)	Common Effluent Treatment Plants (CETPs) financial assistance scheme for MSMEs, Tamil Nadu Industrial Policy 2021	Environment and Climate Change Department, Tamil Nadu Pollution Control Board

Key Short, Medium and Long Term Interventions and their Financial Estimates											
Sr. No.	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.	Departments
				Target	AMP-2030 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2040 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2050 (kt CO ₂ e/ yr)* (Percentage to BAU gross emissions)		
A.6	Solid Waste Management	Dry waste recycling centre	Government or private initiative	1.32 recycling centres for 32 firkas at village level 2. 1 recycling centre per 1 lakh population (total 20 recycling centres))	5 (0.12%)	1.6 recycling centres for 6 firkas at village level 2. Additional 12 recycling centre (total 32 recycling centres)	14 (0.34%)	Maintenace and additional facilities as per requirement	16 (0.44%)	Swachh Bharat Mission, Solid Waste Management Rules 2016	Municipal Administration department, Rural Development and Panchayat Raj department, Tamil Nadu Pollution Control Board
A.7		Composting Centres	Government or private initiative	20 composting centre (1 per 1 lakh population)		12 additional composting centre (total 32)		Maintenace and additional facilities as per requirement			
A.8		Stakeholder capacity building and awareness generation for holistic and sustainable waste management	Government initiated with possibilities for gap funding through private, CSR	Ongoing initiative		Ongoing initiative		Ongoing initiative			
Total Mitigation Potential of Waste Management					157 (3.65%)		197.00 (4.84%)		210 (5.78%)		

Key Short, Medium and Long Term Interventions and their Financial Estimates											
Sr. No.	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.	Departments
				Target	AMP-2030 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2040 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2050 (kt CO ₂ e/ yr)* (Percentage to BAU gross emissions)		
B	Green Spaces & Carbon Sequestration										
B.1	Restoration and conservation of existing forest area and tree cover	Maintaining the current carbon stock densities to ensure the carbon sequestration of ~170.8 kt CO ₂ e 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.	0.23 (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.	0.23 (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.	0.23 (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; National Agriculture Development Programme (NADP);	Forest Department, Environment and Climate Change Department, Municipal Administration Department

Key Short, Medium and Long Term Interventions and their Financial Estimates											
Sr. No.	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.	Departments
				Target	AMP-2030 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2040 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2050 (kt CO ₂ e/yr)* (Percentage to BAU gross emissions)		
B.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 Government initiated for Government lands with possibilities for gap funding through private, CSR	Social and agroforestry in 16749 ha of land (~9% of 191615 ha)	92 (2.14%)	Social and agroforestry in 23448 ha of land (~12% of 191615 ha)	313 (7.67%)	Social and agroforestry in 26798 ha of land (~14% of 191615 ha)	590 (16.17%)	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	
				In the subsequent years, continuous monitoring and maintenance of the plantations need to be undertaken		In the subsequent years, continuous monitoring and maintenance of the plantations need to be undertaken		In the subsequent years, continuous monitoring and maintenance of the plantations need to be undertaken			

Key Short, Medium and Long Term Interventions and their Financial Estimates											
Sr. No.	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.	Departments
				Target	AMP-2030 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2040 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2050 (kt CO ₂ e/yr)* (Percentage to BAU gross emissions)		
B.3		Enhancing Carbon stock density	Government initiated with possibilities for gap funding through private, CSR	Enhancement of carbon stock density by ~1% increase from 82.25 t/ha to 83.25 t/ha	179 (4.16%)	Enhancement of carbon stock density by ~3.35% increase from 82.25 t/ha to 85 t/ha	126 (3.08%)	Enhancement of carbon stock density by ~5.5% increase from 82.25 t/ha to 86.76 t/ha	126 (3.45%)		
	Total Sequestration Potential				271 (6.31%)		439 (10.76%)		716 (19.63%)		
C	Sustainable Agriculture Practices										
C.1	Promote modern cultivation techniques to optimise agricultural inputs and maximise outputs	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	11 (0.26%)	45% agriculture area transitioned to organic fertiliser	32 (0.79%)	75% agriculture area transitioned to organic fertiliser	51 (1.40%)	National Mission for Sustainable Agriculture, Chief Minister's Manniyur Kaathu Mannuyir Kappom Scheme (CM MKS), National Mission on Natural farming	Agriculture Department, Horticulture Department, Environment and Climate Change Department, Animal Husbandary Department

Key Short, Medium and Long Term Interventions and their Financial Estimates											
Sr. No.	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.	Departments
				Target	AMP-2030 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2040 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2050 (kt CO ₂ e/yr)* (Percentage to BAU gross emissions)		
C.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 requirement met through nano urea		55% of urea requirement met through nano urea		25% of urea requirement met through nano urea			
C.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	

Key Short, Medium and Long Term Interventions and their Financial Estimates											
Sr. No.	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.	Departments
				Target	AMP-2030 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2040 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2050 (kt CO ₂ e/yr)* (Percentage to BAU gross emissions)		
C.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	32 mini weather monitoring stations	NA	6 mini weather monitoring stations	NA	Additional maintenance	NA	Krishi Decision Support System, Agricultural Infrastructure Fund (AIF)	

Key Short, Medium and Long Term Interventions and their Financial Estimates											
Sr. No.	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.	Departments
				Target	AMP-2030 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2040 (kt CO ₂ e /yr)* (Percentage to BAU gross emissions)	Target	AMP-2050 (kt CO ₂ e/ yr)* (Percentage to BAU gross emissions)		
C.5	Livestock management	feed inputs for livestock – Tamarin plus and Harit Dhara and balanced rationing to reduce methane emissions from enteric fermentation. Implementation 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 supplements like Harit Dhara and Tamarin plus in 25% of livestock . 30% reduction in manure management emission through GOBAR dhan scheme	22 (0.51%)	Balanced rationing introduced in 60% and improved feed supplements like Harit Dhara and Tamarin plus in 50% of livestock . 60% reduction in manure management emission through GOBAR dhan scheme	42 (1.03%)	Balanced rationing introduced in 90% and improved feed supplements like Harit Dhara and Tamarin plus in 75% of livestock . 90% reduction in manure management emission through GOBAR dhan scheme	60 (1.65%)	Balanced Ration Programme (BRP) GOBAR dhan scheme	
	Total Mitigation Potential of Sustainable Agriculture Practices				33 (0.77%)		74 (1.82%)		111 (3.05%)		

* AMP = Annual Mitigation Potential

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



Sr No	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-2030 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2040 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2050 (kt CO ₂ e /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 for ~306 MW (335 GWh generation) fossil–fuel based Captive Power Plants (CPPs) to equivalent renewable energy capacity of ~153 MW (solar, hydro and others) by 2050.	50% of the existing tied up capacity (equivalent RE capacity 75 MW)	145 (3.37%)	30% of the balance (equivalent RE capacity 50 MW)	228 (5.59%)	20% of the balance (equivalent RE capacity 30 MW)	293 (8.04%)	– 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 ~3.2 lakh electric cookstoves in residential and commercial buildings by 2050	~1.4 Lakh (12% of the households)	200 (4.64%)	1 lakh	306 (7.5%)	0.8 lakh	312 (8.56%)	Potential of covering 1.4 lakh electric cookstoves (worth 26.6 crores) under National Efficient Cooking Program (NECP) which provides cookstoves at a low cost.

Sr No	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-2030 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2040 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2050 (kt CO ₂ e /yr)*	
A.3	Use of Biogas in Residential Sector (Livestock waste, Food Scaps etc)	Installing a biogas plant of approx 30000 m3/day capacity (considering 50% realization of total potential of 60000 m3/day of the district)	20% of the target capacity	13 (0.30%)	30% of the remaining target capacity	32 (0.78%)	50% of the remaining target capacity	64 (1.76%)	Potential of coverage of 10 small biogas plants of 25 m3/day capacity (worth Rs. 0.07 crores) by 2026 under National Biogas Programme . Higher coverage subject to scheme extension.
A.4	Replacement of diesel pumps with solar pumps for irrigation	Conversion of 4820 diesel pumpsets to solar pumps by 2030	40% of the target	20 (0.46%)	60% of the target	52 (1.27%)	NA	52 (1.43%)	Potential of covering 50 solar pumps worth ~INR 2 crore (Rs. 314,088 per 5HP pump) under PM KUSUM (Component B)
A.5	Use of EV tractor and tillers for agriculture land preparation	Electrifying ~7500 tractors and tillers by 2050	375	1 (0.02%)	375	3 (0.07%)	6,750	41 (1.12%)	-
A.6	Replacement of DG set to renewable sourced power backup	Replacement of DG set to renewable sourced power backup	To be assessed						-

Sr No	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-2030 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2040 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2050 (kt CO ₂ e /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	Replacing ~4 Lakh conventional 2W with EV by 2050	0.2 lakh	10 (0.23%)	New 2W addition by 2040: 3 lakh	132 (3.23%)	New 2W addition by 2050: 0.8 lakh	194 (5.32%)	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. 10.3 crore (Rs. 10 crore + Rs. 0.3 crore) is available under current center and state policies (PME-DRIVE Scheme 2024 and TN EV Policy 2023) for 0.2 lakh 2W EVs. Higher coverage is possible subject to scheme extension.
B.2	Shift to EV 3 Wheeler	Replacing ~7000 3W ICE vehicle with EV by 2050	~1000	1 (0.02%)	New 3W addition by 2040: ~4000	7 (0.17%)	New 3W addition by 2050 : ~2000	11 (0.3%)	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. 3.8 crore (Rs. 0.8 crore + Rs. 3 crore) is available under current center and state policies (PME-DRIVE Scheme 2024 and TN EV Policy 2023) for 1000 3W EVs.

Sr No	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-2030 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2040 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2050 (kt CO ₂ e /yr)*	
B.3	Shift to EV 4 Wheeler	Replacement of ~2.1 lakh ICE commercial / private 4W with EV by 2050	~10,000	16 (0.37%)	New 4W addition by 2040: ~1 lakh	176 (4.31%)	New 4W addition by 2050 : ~1 lakh	352 (9.66%)	Maximum incentive of up to Rs. 1.5 lakh per 4W commercial vehicle is available under TNEV Policy 2023 for a maximum of 3000 vehicles per year.
B.4	Shift to EV Buses	Replacing ~2000 Intra district diesel buses (for schools, public transport and commercial mini buses) with EV by 2040	500	38 (0.88%)	1,500	166 (4.07%)	0	166 (4.55%)	The current market price of e-Buses are comparable with the ICE buses, hence market dynamics will decide the pace of e-Buses sales. However, a sum of Rs. ~190 crore (Rs. 140 crore + Rs. 50 crore) is available under current center and state policies (PM E-DRIVE Scheme 2024 and TN EV Policy 2023) for 500 e-Buses.
B.5	Shift to electric Heavy Goods Vehicles (HGVs)	Replacement of small ~1200 fleet trucks/lorries and other small goods vehicle with EV by 2050	100	5 (0.12%)	500	30 (0.73%)	600	65 (1.78%)	-
B.6	Creation of EV Charging infrastructure	Installation of ~550 public charging stations in total by 2050	50	NA	200	NA	300	NA	Incentives worth Rs. 1 lakh for slow charging and Rs. 10 lakh for fast charging stations are available under TNEV Policy 2023 and further coverage under PM E-DRIVE subject to scheme extension.

Sr No	Key Intervention	Activity/ Target	Short Term (till 2030)		Medium Term (2030-40)		Long Term (2040-50)		Incentive under Central/State Schemes and Policies
C	Decarbonisation of the Industry		Target	AMP-2030 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2040 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2050 (kt CO ₂ e /yr)*	
C.1	Deep electrification in Industries	Fully Electrified kiln via plasma generator for heating in industries incl. cement by 2050	25% of the target	49 (1.14%)	35% of the balance target	125 (3.06%)	40% of the balance target	215 (5.9%)	-
Total Scope 1 Mitigation Potential (ktCO₂e)			498.9 (12%)		1,258 (30.82%)			1,765 (48.42%)	
Interventions to Mitigate Scope 2 Emissions (Electricity Sector)									
a.	Addition of Renewable Energy (RE) capacity to meet the domestic electricity demand at district level	- Additional RE capacity integration of ~6 GW (in addition to existing RE capacity of 0.7 GW) a. Potential Assessment b. Installation as per assessment	NA	0	2 GW of the RE capacity target	3,066	4 GW of remaining capacity	9,325	- Subsidy maximum up to Rs. 78,000 for rooftop system under PM Surya Ghar Muft Bijli Yojana

Sr No	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-2030 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2040 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2050 (kt CO ₂ e /yr)*	
b.	Energy Efficiency (EE) improvements*	Installation of ~36.2 lakh 3/5 star EE ACs in residential spaces	13.78 lakh	138	18.71 lakh	327	3.76 lakh	365	-
		Installation of 3/5 star EE refrigeration units up to a total of 18.71 lakh by 2050	18.13 lakh	68	0.48lakh	70	0.097 lakh	70	
		Replacing existing ~60lakh incandescent bulbs and CFL bulbs	48.3 lakh	2	11.7 lakh	25	NA	25	
		Replacing ~5 lakh street lights with LED lights by 2030	100%	91	NA	91	NA	91	
		Adoption of ~42 lakh BLDC fan by 2050	39.74 lakh	3	2.44 lakh	4	0.36 lakh	43	
c.	Utilising biodegradable waste to generate electricity	Installation of waste to energy plant of 15 MW by 2030	100%	92	NA	92	NA	92	Potential for covering 3MW project worth INR. 6 crore (Rs. 2 crore/MW) under National Mission for Waste to Wealth (Policy for Promotion of City Composting)

Sr No	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-2030 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2040 (kt CO ₂ e /yr)*	Additional Target	Cumulative AMP-2050 (kt CO ₂ e /yr)*	
Total Scope 2 Mitigation Potential (ktCO ₂ e)			302.1		3,582.6		9,919		
* AMP = Annual Mitigation Potential									
Note: Percentages denote AMP as a share of respective BAU emissions.									





8. Monitoring and Evaluation

Monitoring and Evaluation (M&E) is essential for ensuring effective implementation, tracking progress, and assessing impacts on resilience and sustainability of the Coimbatore Decarbonisation Plan. In a shifting climate landscape, a robust M&E framework provides the structure needed to evaluate success, address new challenges, and guide data-driven improvements. This section outlines measurable indicators to monitor outcomes, optimise resources, and align actions with Coimbatore's climate resilience goals, supporting continuous, community-focused adaptation. It also identifies key stakeholders and institutions to be engaged in the monitoring and evaluation process.

Suggested indicators

The following table provides indicators across key themes of the decarbonisation plan. The indicators provided as part of this plan are not exhaustive, and should be updated periodically to better reflect the outcomes achieved as part of the implementation of climate action suggestions.

Indicators can be against an established baseline (year when the implementation starts) and then progress of the implementation can be measured annually or bi-annually as per decision of the Monitoring committee.

Table 8.1: Probable list of indicators for monitoring and evaluation

Category	Proposed interventions	Broad suggested indicators	Broad anticipated outcomes
Transport sector	Achieve a zero-emission public and private transportation system by 2050 - Promote electric vehicle (EV) adoption and set up EV charging stations - Electrify public transportation (buses, 3W, 4W passenger vehicles)	Vehicle category wise number of EV registered/% of EV in the new sales Annual change in fossil fuel sales in the district	Medium term: 50% new EV sales for 2W, 3W, 4W and buses - Reduction in fossil fuel consumption Long term: 100% EV adoption for 2W, 3W, 4W, and buses - Fossil fuel phase out
Electricity	Transition to 100% renewable energy in the district: - Rooftop installation - Agro Photovoltaic - Captive RE	Annual new RE capacity addition Rooftop capacity in the District/% No of households having rooftop	Medium term: Completion of potential assessment of renewable energy sources Long term: Replacement of complete fossil based captive capacity to Renewable energy and rooftop solar and alternative sources
Agriculture	Transition to Solar pumps: Replace 100% of diesel pumps with decentralised solar pumps under PM KUSUM scheme Transition from diesel tractors and agro machineries to electric based machineries	Percentage of electric tractors in new sales Number of farmers benefiting from solar pumps installation/ New number of pumps installed	Medium term: targeting at least 30% of new tractor sales as electric. At Least 50% of new pumps to be solar. Long term: Achieve 90% electrification of tractors. 100% of new pump sales as solar.
Industry	Energy Efficiency Improvements: Implement energy efficiency standards across all industrial sectors.	Optimised energy use across industries; substantial operational cost savings and reduced GHG emissions. Full transition to renewable energy; zero emissions from industrial electricity use.	

Category	Proposed interventions	Broad suggested indicators	Broad anticipated outcomes
Industry	Transition to Renewable Energy: Promote utility-scale solar and rooftop solar installations. Circular Economy Initiatives: Encourage material recycling and waste-to-energy solutions. Decarbonisation of Captive Power Plants (CPPs): Replace diesel and coal-based CPPs with renewable energy.	Widespread material reuse and recycling; near-zero industrial waste generation and minimised emissions from material processing. Renewable based captive power capacity.	Medium term: 20% reduction in energy intensity per unit of production. 50% adoption of energy-efficient technologies by industries. ~90 GWh annual energy savings by 2035. 50% renewable energy share in industrial electricity. 30% adoption of circular economy practices. Long Term: 40% reduction in energy intensity per unit of production 100% adoption of energy-efficient technologies ~200 GWh annual energy savings 100% renewable energy share in industrial electricity 70% adoption of circular economy practices
IPPU	Deploy Carbon Capture and Utilisation (CCU) technologies in major cement plants. Achieve 100% replacement of coal with clean fuels (e.g. green hydrogen) in cement production by 2040. Adopt LC3 cement technology.	GHG captured annually: 452 ktCO₂e by 2050 Utilisation: 90% of captured CO₂ Efficient use of locally available limestone and clay Significant reduction in electricity use on implementing WHRS	Medium term: - Pilot CCU technologies in cement plants by 2030, initiating CO₂ capture and reuse - Share of clean fuels 50% by 2030 - Reduce clinker-to-cement ratio to 0.65 by 2030, GHG emissions are reduced by 30-40% per tonne of cement

Category	Proposed interventions	Broad suggested indicators	Broad anticipated outcomes
IPPU	Implement Waste Heat Recovery Systems (WHRS) in cement manufacturing plants		- Implement WHRS in 50% of cement plants by 2035, reducing energy demand and operational costs Long term: - Achieve full deployment of CCU technologies across all cement plants i.e. 90–95% capture efficiency - Share of clean fuel 100% by 2040 - Further reduce clinker-to-cement ratio to 0.55 by 2050. GHG emissions are reduced by 50–55% per tonne of cement - Expand WHRS coverage to 100% of cement plants by 2050
Buildings	Shift to energy efficient residential appliances Adoption of LED based lighting Replacement of diesel generators by clean source of electricity backup Mandate energy efficiency retrofits in commercial buildings	Number of five star rated appliance sales in new appliance sales Number of DG sets replaced with electricity-based alternatives Number of residential/commercial buildings installing rooftop solar. Number of households purchasing electric or induction cooking	Medium term: Adoption of 100% LED in households and streetlights. 60% appliances or more to be 5 star rated. Adoption of ~50% Commercial buildings retrofits for energy conservation. Long term: 100% adoption of super-efficient appliances in households. More than 50% adopt Electric cooking. 100% Commercial buildings adopt building retrofits.

Category	Proposed interventions	Broad suggested indicators	Broad anticipated outcomes
Solid waste management	Ensure 100% segregation and collection of waste at source	Percentage of households (urban+rural) from where segregated waste is collected	Efficient waste collection and processing, increased recycling, and enhanced sanitation services contribute to cleaner and healthier communities, and reduce emissions by preventing waste to reach landfills
		Percentage of commercial and institutional/ administrative establishments from where segregated waste is collected	
		Number of EVs in use for waste collection	
		Percentage of collected dry waste recycled/processed (urban+rural)	
		Percentage of collected wet waste processed (urban+rural)	
		Number of waste collection bins installed at strategic locations	
		Number of operational e-waste collection points established	
		Percentage of localities covered under monthly collection of e-waste	
	Management of organic waste - Setting up of waste management facilities - Encourage and promote composting, vermi-composting and biogas plants at residential	Number and installed capacity of composting centres established	

Category	Proposed interventions	Broad suggested indicators	Broad anticipated outcomes
Solid waste management	and commercial entities (hotels/ resorts/ homestays)		
	Facilitate and conduct Behaviour Change Communications workshops on proper disposal of solid waste		
		Compost sold	
		Number and installed capacity of vermicomposting plants	
		Capacity of waste management plants (TPD)	
		Number and installed capacity of biogas plants	
	Management of C&D waste	Number of C&D collection and transfer stations	
		Total installed capacity of C&D waste management plants (TPD)	
		Amount of recycled material sold/reused (concrete, ceramics, iron, wood, etc)	
	Management of legacy waste	Quantity of legacy waste in all the identified dump sited underwent remediation	
		Number of eco parks	
	Waste management through circular economy	Dry waste being processed out of total dry waste collected	
		Total dry waste collected and capacity of dry waste processing facility	
		Number of waste management-based entrepreneurship supported	

Category	Proposed interventions	Broad suggested indicators	Broad anticipated outcomes
Water and wastewater management	Management of water bodies - Marking and bund construction around the boundaries of the water bodies. - Restoration of Wetlands - Restoration and Softscaping of lakes	Number 3 of wastewater nalahas emptying into water bodies and Interception and Diversion (I&D) works undertaken	
		Water quality assessment test for the lakes	
		Amount spent on lake restoration/ dredging	
		Number of employments generated for lake restoration/ dredging	
		Number of wetlands rejuvenated/restored	Improved water access, groundwater conservation, and rejuvenated water bodies support sustainable water management and resilience. Reduced GHG emissions from wastewater, and enhanced sanitation services contribute to cleaner and healthier communities
		Number of <i>lakes</i> restored, dredged and soft scaping carried out	
	Groundwater management - Construction of rainwater harvesting structures (RwH) across commercial and residential buildings - Construction of RwH in PRI buildings - RwH in all suitable tourist accommodations	Number of public buildings (Government offices, government schools, institutes, etc.) having functional rainwater harvesting mechanism	
		Number of PRI buildings having functional rainwater harvesting mechanism	
		Percentage of public/PRI buildings covered with RwH mechanism	
		Number of hotels/lodges/ guest houses with RwH structures	
		Number of new buildings with RwH structures	

Category	Proposed interventions	Broad suggested indicators	Broad anticipated outcomes
Water and wastewater management	Wastewater management	Percentage (length) of roads with proper storm water drain coverage	
	Enhancing stormwater infrastructure		
		Number of silt traps installed at outfall point of drains	
		Number of trench grates installed along the curb of the road in residential and civil line area	
		Number of households connected to sewage system	
		Percentage of households connected to drainage/ sewage network	
		Capacity of installed, operational, and maintained STPs	
		No. of DEWATS installed in the villages within the planning area	
Tourism		Number of rural households with septic tank adaptation	
	Incorporate sustainable waste management awareness with tourism activities	Number of capacity building workshops organised for hospitality professionals (waste, management)	Increased sustainability practices in hospitality, including water management, waste management and energy efficiency, enhance eco-friendly tourism experiences.
		Number of ' <i>Swacchta Saarthis</i> ' deployed at key locations	
		Number of hotels/lodges/ rest houses with IEC material on waste segregation and disposal displayed	
		Number of solar water kiosks installed and operational at public places	
		Percentage of hotels/lodges/ guest houses with sustainable infrastructure (ECBC compliant, etc.)	

Category	Proposed interventions	Broad suggested indicators	Broad anticipated outcomes
Sustainable agriculture	Increased use of organic fertilisers, promoting balanced rationing for livestock	Quantity of nano urea and organic fertilisers used annually (in tonnes)	Reduced GHG emissions from synthetic fertiliser use and livestock, increased productivity of crops, increased climate resilient crops.
		Quantity of improved feed supplements incorporated in the livestock diet (in tonnes)	
		Annual productivity of crops	
		Agriculture area affected by extreme weather events (Hectare) and change in production of crops (tonnes)	
		Number of solar powered cattle sheds and installed capacity	
Enhancing carbon sequestration	Promoting social and agroforestry Enhancing Carbon stock density through reforestation and afforestation.	Percentage increase in tree cover in the planning area since baseline year	Expanded green cover, enhanced carbon sequestration leading to reduced GHG emissions, improved biodiversity conservation, and increased urban green spaces for environmental and social benefits



9.

Conclusion and Way Forward

The Coimbatore Decarbonisation Plan outlines a comprehensive sector-wise strategy to transition the district towards a low-carbon and climate resilient future. As Tamil Nadu's second most industrialised district and a major urban growth hub, Coimbatore bears both the responsibility and opportunity to lead the state's net zero goal through targeted interventions across energy-intensive sectors.

Under the Aggressive Effort Scenario (AES), Coimbatore can reduce its projected gross emissions by up to 56 percent through transformative actions including **clean energy adoption, transport electrification, energy efficiency, improved solid and wastewater management**. Additionally, the district can enhance its carbon sequestration potential to about 715 ktCO₂e by 2050, with nearly 80 percent of this achieved through **agro/social forestry** in land classified as barren or fallow, non-agricultural or cultivable waste land.

The plan aligns with Tamil Nadu's climate targets and India's Net Zero commitment demonstrating how a **district-level, data-driven, and community-inclusive approach** can operationalise deep decarbonisation while ensuring ecological and economic resilience. Coimbatore district's diverse economy, active civil and business society, and expanding urban landscape position it well to implement pioneering climate solutions in parallel with rapidly growing economies at scale.

The success of this plan hinges on **robust implementation, continuous stakeholder engagement, and sustained collaboration** between government agencies, industries, and local communities. For effective implementation, a dedicated **project management unit (PMU)** could be formed to monitor and provide support throughout execution.

In addition, a centralised data repository, either by strengthening the existing district handbooks or by creating new resources, could help refine the plan and undertake corrective measures.

Further, the decarbonisation plan should be **reviewed and updated periodically** to incorporate the latest technological advancements, changes in policy frameworks, and evolving socio-economic conditions. This will ensure that strategies remain relevant and aligned with the district's long-term vision.

10. Annexures

Annexure 1

Methodology of Climate Variability

Climate variability refers to variations in the mean state of the climate parameters (temperature, rainfall, etc.) and other statistics (such as standard deviations, statistics of extremes, etc.) on temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or due to variations in natural (e.g. solar and volcanic) external forcing (external variability).

Rainfall variability has been analysed for the Southwest monsoon (June to September) and Northeast monsoon (October to December) seasons. Additionally, the precipitation extremes, such as the number of rainy days, Consecutive Dry Days (CDD), and heavy rainfall amounts (RXIDAY, RX5DAY), have been analysed.

Temperature has been analysed for the summer season (March to May) and the winter season (December to February). The temperature extremes such as warm days (%), cold days (%), Heat wave duration and frequency have been analysed.

To assess future climate projections for Virudhunagar, the analysis uses the NEX-GDDP (0.25 x 0.25) bias-corrected, high-resolution, statistically downscaled dataset derived from 20 Global Climate Models (GCMs) under the CMIP5 framework. Projections are made across two greenhouse gas emission scenarios: RCP4.5 (medium emission) and RCP8.5 (high emission), covering the time periods 2021-2040, 2041-2060, 2061-2080, and 2081-2100

- **Rainy day:** A rainy day, according to the India Meteorological Department, is defined as any day receiving >2.5 mm rainfall

- **Consecutive Dry Days (CDD):** Maximum number of consecutive dry days per time period with daily precipitation amount of less than 1 mm
- **RX1DAY:** Highest 1-Day precipitation amount
- **RX5DAY:** Highest consecutive 5-Day precipitation amount
- **Warm days:** Percentage of days when maximum temperature greater than the 90th percentile
- **Cold days:** Percentage of days when maximum temperature less than the 10th percentile

Annexure 2

Methodology- GHG Emission Profile- Coimbatore

The GHG inventory has been developed for the period 2005 to 2022, accounting for carbon-dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) emissions. The inventory covers the four emission sectors, namely, Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry & Other Land Use (AFOLU) & Waste, and relevant sub-sectors, as per the IPCC methodology and guidelines⁵⁴.

The GHG inventory follows a robust approach based on information received from relevant line departments of the Government of Tamil Nadu, and reports published at national and state level, as detailed in **Table A.2**. The emission factors are extracted from Government of India's inventory submissions.

The GHG estimation is based on IPCC Tier 1 (T1) and Tier 2 (T2) approaches. The best effort was made to source activity data and emission factors at the state-level. Although the T2 approach was prioritised, T1 has been followed in the absence of country-specific emission factors. The sector-wise approach is as detailed in **Table A.2**

The inventory also estimates the Global Warming Potentials (GWP) for CH₄ and N₂O based on the GWP of greenhouse gasses for a 100-year timeframe, as per IPCC AR2 (IPCC, 1995).

Table A.2: Sector-wise Data source, Tiers and Assumption Used for Emission Estimations

IPCC ID	Category	Data source	Approach	Assumptions
ENERGY				
1A1 aii	Captive Power Plant	a. Electricity generation data based on fuel-type (Coal and Diesel) of district for the year 2018-19 obtained from CEA b. Electricity generation data based on fuel-type (Coal) for Tamil Nadu for the years 2004-05 to 2022-23 obtained from CEA General Review Report. c. Specific coal consumption data for the years 2005 to 2022 was obtained from CEA General Review Report.	T2	The activity data for the Coal and Diesel were estimated using the following assumption: Coal Consumption - The coal consumption by Captive power plants of Tamil Nadu were estimated between 2005 and 2022 using the electricity generation data and specific gas consumption.. - For Coimbatore district, 2018's coal consumption by Captive Power Plant was estimated using the electricity generation data and specific coal consumption. - The percentage share of coal consumption in 2018 was calculated for Coimbatore district, which was then applied on year-on-year (2005 to 2022) estimated gas consumption to data of Tamil Nadu by captive power plant to estimate the district's gas consumption by captive power plant.

IPCC ID	Category	Data source	Approach	Assumptions
				Diesel Consumption - For Coimbatore district, 2018's diesel consumption by Captive Power Plant was estimated using the electricity generation data and specific diesel consumption. - The percentage share of diesel consumption in 2018 was calculated for Coimbatore district, which was then applied year-on-year (2005 to 2022) to the total Diesel consumption of Coimbatore district (PPAC data) to estimate the diesel consumption by captive power plants.
1A 2	Industrial Energy	Fuel consumption data of FO/LSHS, LDO, HSD, Naphtha, Bitumen, Naphtha, Petcoke and others was obtained from the Petroleum Planning and Analysis Cell (2006 to 2022)	T2	- The emissions from overall Industrial energy was estimated due to unavailability of industry-wise fuel consumption data. - The district level FO/LSHS, Naphtha, LDO, Petcoke and others data from the PPAC was considered solely for the Industries category. - The HSD consumption for the Industries category was estimated by applying the National-level percentage share of HSD consumption in retail and the Tamil Nadu state-level percentage share of Diesel consumption for Industrial purposes (obtained from PPAC report 2013⁵⁵) on the overall district's HSD consumption. - Bitumen consumption in industries was estimated by allocating 5% of total bitumen consumption in Coimbatore district.
1A3	Transport			
1A3a	Civil Aviation	Aviation Turbine Fuel (ATF) fuel consumption data obtained from the Petroleum Planning and Analysis Cell (2006 to 2022)	T2	For the year 2005, ATF fuel consumption data was estimated using the CAGR method.

IPCC ID	Category	Data source	Approach	Assumptions
1A3b	Road Transport	Fuel consumption data of Motor Spirit and HSD was obtained from the Petroleum Planning and Analysis Cell (2006 to 2022)	T1, T2	The fuel consumption data of Motor Spirit and HSD data was estimated using the below assumptions, since data was unavailable. ▪ Motor Spirit: The year-on-year national level retail motor spirit percentage share (obtained from Indian Petroleum and Natural Gas statistics) and the percentage share of Petrol-retail consumption in Road transport for Tamil Nadu (obtained from PPAC report 2013) was applied to the district's overall motor spirit consumption to estimate the Coimbatore district's motor spirit consumption in road transport. ▪ HSD: The year-on-year national level road transport private sales and retail HSD percentage share (obtained from Indian Petroleum and Natural Gas statistics) and the percentage share of Diesel-retail consumption in Road transport for Tamil Nadu (obtained from PPAC report 2013 and 2021) was applied to the district's overall HSD consumption to estimate the Coimbatore district's HSD consumption in road transport. For the year 2005, the overall district's motor spirit and HSD fuel consumption data was estimated using the CAGR method.
1A4	Other Sectors			
1A4a		Fuel consumption data of LPG, HSD and Kerosene was obtained from the Petroleum Planning and Analysis Cell (2006 to 2022)		The fuel consumption data of LPG, HSD and Kerosene data was estimated using the below assumptions, since data was unavailable. ▪ LPG: District level commercial LPG fuel consumption data was estimated by applying the National-level percentage share of LPG consumption at commercial level on the overall District-level fuel consumption data.

IPCC ID	Category	Data source	Approach	Assumptions
	Commercial			▪ HSD: District-level commercial HSD consumption data was estimated by applying the National-level retail and private sales percentage share and state-level percentage share Diesel consumed for the other sector (obtained from PPAC report 2013) along with the percentage share of Diesel consumed in the Commercial sector on the overall district-level fuel consumption data. ▪ Kerosene: District- level commercial Kerosene fuel consumption data was estimated by applying the National-level percentage share of Kerosene consumption at commercial level on the overall District-level fuel consumption data. For the year 2005, the overall district's motor spirit and HSD fuel consumption data was estimated using the CAGR method.
1A4b	Residential	Fuel consumption data of Kerosene, LPG and HSD was obtained from the Petroleum Planning and Analysis Cell (2006 to 2022)		The fuel consumption data of Kerosene, LPG and HSD data was estimated using the below assumptions, since data was unavailable. ▪ Kerosene: District- level residential Kerosene fuel consumption data was estimated by applying the National-level percentage share of domestic Kerosene consumption and national-level percentage share of private sales of kerosene on the overall District-level fuel consumption data. ▪ LPG: District-level residential LPG fuel consumption data was estimated by applying the National-level percentage share of domestic LPG consumption and national-level percentage share of private sales of LPG on the overall District-level fuel consumption data. ▪ HSD: District-level residential HSD consumption data was estimated by applying the National-level retail and private sales percentage share

IPCC ID	Category	Data source	Approach	Assumptions
				and state-level percentage share Diesel consumed for the other sector (obtained from PPAC report 2013) along with the percentage share of Diesel consumed in the Residential sector on the overall district-level fuel consumption data. For the year 2005, the overall district's motor spirit and HSD fuel consumption data was estimated using the CAGR method.
1A4c	Agriculture	Fuel consumption data HSD was obtained from the Petroleum Planning and Analysis Cell (2006 to 2022)		- District-level residential HSD consumption data was estimated by applying the National-level retail and agriculture consumption percentage share and state-level percentage share Diesel consumed in the agriculture sector (obtained from PPAC report 2013) on the overall district-level fuel consumption data. - For the year 2005, the overall district's motor spirit and HSD fuel consumption data was estimated using the CAGR method.
IPPU				
2A1	Cement Production (Mineral Industry)	Production data -2008-09 to 2021-22 from TNPCB	T1	Wherever direct data was not available (2004-05 to 2007-08, 2022-23), an average of production data excluding COVID years (2019-20 and 2020-21) from 2008-09 2021-22 was applied.
2D1	Lubricant Use (Non energy products from fuels and solvent use)	Lubricant Consumption data received from the Petroleum Planning and Analysis Cell (2006 to 2022)	T1	Wherever direct data was not available, suitable statistical methods were applied for estimation like CAGR
AFOLU				
3A	Livestock	Livestock data of cattle, buffaloes, sheep, goats, pigs, horses & ponies, donkeys and poultry:	T1, T2	District-level cattle and buffaloes' data for years 2004, 2007 and 2019 were estimated by applying the percentage share of age-wise cattle and buffaloes population data of 2012.

IPCC ID	Category	Data source	Approach	Assumptions
		2004 and 2017 district-level livestock population data obtained from Tamil Statistical Handbook 2018 and 2022 2019 district-level population data obtained from Open Government Data (OGD) Platform India 2012 district-level livestock population data of cattle and buffaloes (age-wise) and other livestock population data was obtained from Department of Animal Husbandry and Dairying - Govt of India		For years between 2004 and 2007; 2007 and 2012, and 2012 and 2019, livestock population data were estimated using the interpolation method. While for the years 2020 to 2022, livestock population data were estimated using the CAGR method.
3C1b	Biomass Burning in Cropland	- Rice- 2004-05 to 2019-20 - Maize- 2004-05, 2006-07 to 2019-20 - Cotton- 2004-05 to 2019-20 - Rapeseed and mustard- 2011-12, 2013-14, 2016-17 - Groundnut- 2004-05 to 2019-20 - Ragi- 2004-05 to 2019-20 - Bajra- 2004-05 to 2019-20	T1	Wherever direct data was not available, suitable statistical methods were applied for estimation like CAGR and IR.

IPCC ID	Category	Data source	Approach	Assumptions
		- Jowar- 2004-05 to 2009-10,2011-12, 2013-14 to 2019-20 - small millets-2004-05 to 2009-10, 2011-12, 2014-15- 2019-20 - Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare, GoI		
3C7	Rice Cultivation	2004-05 to 2019-20 - Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare, GoI 2020-21- Tamil Nadu Statistical Handbook	T2	- The percentage of rice cultivated area under different water management regimes of Tamil Nadu is assumed to be the same for Coimbatore district. - Wherever direct data was not available, suitable statistical methods were applied for estimation like CAGR
3C4 & 3C5	Agriculture Soils	- Nitrogen Consumption data 2005-2017 International Crops Research Institute for the Semi-Arid Tropics - Urea Consumption data 2011-12- 2020-21- Tamil Nadu Dashboard 2006- 07- District Agricultural plan Coimbatore district 2008	T1 and T2	Wherever direct data was not available, suitable statistical methods were applied for estimation like CAGR and IR

IPCC ID	Category	Data source	Approach	Assumptions
3B2, 3B3, 3B5 & 3B6	Land Use (except Forest land)	2005-06, 2011-12 and 2015-16 of LULC from BHUVAN		In the absence of the Land use Land Cover Change (LULC) matrix, the emissions from LULC were estimated by taking the difference between 2005-06 and 2011-12, and 2011-12 and 2015-16 for the categories of Agricultural Land, Other Land and Settlements.
3B1	Forest Land	- District-level Forest cover data for years 2004, 2006, 2008, 2010, 2013, 2015, 2017, 2019 and 2021 obtained from ISFR reports. - Carbon stock density data of Tamil Nadu was obtained for years 2015, 2017 and 2019 from ISFR reports	T2	Forest Cover: For the years between 2004 and 2021 was estimated using the interpolation method. Carbon stock Density: 2015 CSD was applied between 2005 and 2015, 2017 CSD was applied for 2016-2017, 2019 CSD was applied for the years between 2018 and 2019, and 2021 CSD was applied for the years between 2020 and 2021. - Since, the forest cover data for the year 2022 was not available, hence the emissions were kept the same as in 2021
Waste				
4A	Solid Waste Disposal	Population data: census 1951, 1961, 1971, 1981, 1991, 2001, 2011 Per capita generation: Waste Generation and Composition for 2004-05, Central Pollution Control Board (CPCB), Annual Review Report: 2014-15, CPCB Proportion going to landfill- CPCB Annual reports for 2016-2020 2021-2022- Data received from the district (TNPCB).	T1, T2	- Tiruppur district was a part of Coimbatore district till 2009, hence the population was apportioned accordingly from 1951 to 2001. - Population in between census years were calculated applying decadal population growth percentage - Estimates are based on state level values of per capita waste generation. The per capita waste generation for the years between 2005 and 2022 were kept the same, due to unavailability of the latest per capita generation in the district. - State-level DOC proportions were used to estimate GHG emissions due to lack of data at the district level - State level proportions going to landfill were used to estimate GHG emissions due to lack of data at the district level.

IPCC ID	Category	Data source	Approach	Assumptions
		1951 to 2015 from NATCOM 2 DOC: Integrated Modelling of Solid Waste in India (March, 1999) CREED Working Paper Series no 26 and CPCB, 1999 2005 CPCB and NEERI study in 59 cities - The Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development, GoI (2015): Manual on Municipal Solid Waste Management – 2016, Table 1.6		
4D1	Domestic Wastewater Treatment and Discharge	Population data: census 2001, 2011 Protein intake: MOSPI BOD: National Environmental Engineering Research Institute (NEERI). 2010: Inventorisation of Methane Emissions from Domestic & Key Industries Wastewater – Indian Network for Climate Change Assessment		- Tiruppur district was a part of Coimbatore district till 2009, hence the population was apportioned accordingly from 1951 to 2001. - Population in between census years were calculated applying decadal population growth percentage - Year-wise values of BOD generated per person are not available, hence an average national value for BOD of 40.5 gm/person/day is used across the reporting period. While converting BOD values from daily basis to an annual basis, 365 days have been assumed across all years, including for leap years.

IPCC ID	Category	Data source	Approach	Assumptions
		STP: Availability and Type of Latrine facility is sourced from Census report 2011 and 2001 Urban degree of utilisation: Census of India, Ministry of home affairs, Government of India		- Based on the NATCOM 2 and the 2006 IPCC Guidelines, the default values of Correction Factor are 1.25 for 'I' for collected wastewater and 1 for uncollected wastewater respectively are used in this assessment 2011 census data is used to find the degree of utilisation of Septic tank, Sewer and Public latrine of the year 2001. Corresponding proportions of these systems which are available in the Census 2011 data have been used to estimate the percentage distribution of these systems in year 2001
4D2	Industrial Wastewater Treatment and Discharge	Fertilisers- 2014-15 to 2020-21 -Indian Minerals Yearbook Dairy- Processing Installed capacity of dairies - Dairy development policy note, Animal Husbandry, Dairying and Fisheries Department. 2012-13 to 2015-16, 2018-19 to 2022-23 Meat- Production data from 2009-10 to 2018-19 from tn.data.gov Fish processing data 2010-11, 2016-17, 2020-21 data from statistical handbook	T2	Wherever direct data was not available, installed capacity was taken as production data and suitable statistical methods were applied for estimation like CAGR.

Annexure 3

Scenarios

1. Livestock

Year	MES		
	Enteric Fermentation		Manure Management (GOBAR-Dhan Scheme)
	Balanced Rationing	Feed Supplements	
2030	20%	15%	20%
2040	40%	30%	40%
2050	60%	45%	60%

Year	AES		
	Enteric Fermentation		Manure Management (GOBAR-Dhan Scheme)
	Balanced Rationing	Feed Supplements	
2030	30%	25%	30%
2040	60%	50%	60%
2050	90%	75%	90%

2. Agriculture Soils

Year	Organic fertiliser substituted for total nitrogen and urea		Nano urea substituted for urea	
	MES	AES	MES	AES
2030	10%	15%	25%	35%
2035	20%	30%	50%	70%
2040	30%	45%	75%	100%
2045	40%	60%	100%	100%
2050	50%	75%	100%	100%

3. Domestic Wastewater

Year	Percentage of treatment	
	MES	AES
2030	70%	85%
2040	100%	100%
2050	100%	100%

4. Enhancing Carbon Sequestration Potential

- Shifting 100% of 41,758.97 and 66,995.60 ha of barren or fallow or cultivable waste land or land put to non- agricultural uses to social forestry by 2050 under MES and AES scenarios respectively

Table 4.1: Category wise land suggested for Agro/Social Forestry

Land Classification	Area (in ha)	MES	AES
Barren and Uncultivable Uses	4797.118	10%	20%
Land putto Non-agricultural uses	76766.618	5%	10%
Cultivable waste	8239.877	50%	75%
Current Fallows	43962.519	10%	20%
Other Fallows land	57849.477	50%	75%

Table 4.2: Agro/Social Forestry in Follow land under MES and AES scenarios

Year	% of Fallow land shifting to Social Forestry	Trees planted per hectare	Carbon stored per tree per year (kg)	Carbon sequestration potential with 50% survival rate (tCO ₂ /yr)	
				MES	AES
2030	25%	200	30	-57	-92
2040	60%			-195	-313
2050	100%			-367	-590

- Increasing the Carbon stock density from 82.25 tons per hectare (as recorded in 2021) to 87.26 tons per hectare (recorded in 2005), while maintaining the forest cover at its 2021 extent of 1,98,504 hectares under

Moderate Scenario

Year	Carbon stock density	Carbon sequestration potential (ktCO ₂ /yr)
2030	82.81	-99
2040	83.78	-70
2050	84.76	-70

Aggressive Scenario

Year	Carbon stock density	Carbon sequestration potential (ktCO ₂ /yr)
2030	83.25	-179
2040	85	-126
2050	86.76	-126

Annexure 4

Summary Table: Sector-wise BAU and CN50 Emissions/Removals

Sector	GHG Sources and Sink Categories	2050		
		BAU ktCO ₂ e	MES ktCO ₂ e	AES ktCO ₂ e
Energy	Captive Power Plants	293	0	0
	Industries	215	107	0
	Transport (excluding aviation)	957	315	169
	Commercial	87	57	27
	Residential	541	339	225
	Agriculture	93	47	0
	Energy Total	2186	865	421
IPPU	Cement sector	441	441	441
AFOLU	Aggregate Sources and Non-CO₂ Emissions Sources on Land	70	36	19
	Agriculture Soil	68	34	17
	Biomass burning in cropland	0.68	0.68	0.68
	Rice Cultivation	1.35	1.35	1.35
	Net Land	480	43	-235
	<i>Land Emissions</i>	<i>480.66</i>	<i>480.66</i>	<i>480.66</i>
	<i>Removals</i>	<i>-0.2335</i>	<i>-437.52</i>	<i>-715.45</i>
	Livestock	213⁵⁶	175	153
	AFOLU total	764	254	-63
Waste	Solid Waste Disposal	16.92	0.76	0.76
	Domestic Wastewater	202	35.73 36	35.73 36
	Industrial Wastewater	35	13.99 14	6.99 7
	Waste Total	254	50 51	43
Gross Emissions		3645	2048	1558
Net Emissions		3645	1611	843

Annexure 5

List of Schemes and Policies for Convergence with Coimbatore's Decarbonisation Plan

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
A.	Promoting Shift to Renewable Energy							
A.1	Development of Solar/Green Cities Programme	Up to Rs. 50 lakh per city/town is provided for preparation and implementation of master plans with a goal of minimum 10% reduction in projected total demand of conventional energy at the end of 5 years. This is to be achieved through EE and RE installation measures. Who applies for it? State Governments nominate cities.						
A.2	Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan (PM-KUSUM)	- Focuses at de-dieselisation of the farm sector and enhancing income of farmers. - Subsidy up to 30-50% of the total cost for installation of standalone solar pumps and solarisation of existing grid-connected agricultural pumps. - Farmers can install grid-connected power plants up to 2 MW on their barren/fallow land and sell electricity to local DISCOM at a tariff determined by state regulators. Who can apply? Individual Farmers, FPOs and Cooperatives						
A.3	PM Surya Ghar Muft Bijli Yojana	Under the scheme, households will be provided with a subsidy to install solar panels on their roofs. The subsidy will cover up to 40% of the cost of the solar panels. The scheme is expected to benefit 1 crore households across India. It is estimated that the scheme will save the government Rs. 75,000 crore per year in electricity costs. Who can apply? Individual Households						

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
A.4	Pradhan Mantri Ujjwala Yojana	Aims at making clean cooking fuel available to rural and deprived households. LPG connections are now being released under an additional 75 lakh connections target.⁵⁷ Who can apply? Adult women belonging to SC/ST/OBC households, those enrolled in Pradhan Mantri Awas Yojana (Gramin), Anadyodaya Anna Yojana (AAY), tea and ex-tea garden tribes, forest dwellers, SECC households (AHL TIN) and poor households as per 14-point declaration.						
A.5	Development of Green Hydrogen Hubs under National Green Hydrogen Mission	The Mission provides infrastructure support and policy incentives for private investments in Green Hydrogen Parks in areas close to renewable energy sources, industrial clusters with high hydrogen demand, access to water etc. V.O Chidambaranar Port in TN has already been selected as one of the first Green Hydrogen Parks. Who can apply? Central and State Public Sector Undertakings, Private Sector Companies, State Corporations and Consortiums through the Scheme Implementing Agency (SIA)						
A.6	Incentives for setting up of biogas unit of size up to 25 M ³ under National Biogas Programme	Central Financial Assistance up to Rs. 70,400 per plant depending upon the State and size of the biogas plant. Additional Incentives, - An additional subsidy of Rs.1600 if the biogas plant is linked with a sanitary toilet or MNRE approved Biogas slurry filter unit. - Rs. 3,000 per biogas plant for size ranging from 1 M³ to 10 M³ and Rs. 5,000 for size ranging from 15 M³ to 25 M³ as turnkey job fee for biogas plants involving onsite construction such as fixed dome design Deenbandhu Model, floating gas holder KVIC model etc .						

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
		Rs. 10,000 per 100% biogas based Generator set/biogas engine water Pumping System (BPS) for meeting small farm needs and water pumping from the biogas plant of 10 to 25 M3. Who can apply? Individuals will own land/space about 50 sq meter area for installation of small biogas plants.						
A.7	Incentives for setting up of biogas unit of size above 25 M ³ under National Biogas Programme	Central Financial Assistance up to Rs. 45,000 per kW for power generation and Rs. 22,500 per kWeq thermal/cooling for thermal application is provided. Administrative charges up to 10% of the CFA or Rs. 250,000 for power generation and 5% of the CFA or Rs. 100,000 for thermal application will be provided for technical supervision, submission of project completion and commissioning reports, and monitoring of projects. Who can apply? Individuals will own land/space.						
B. Incentivising Energy Efficiency in Buildings								
B.1	Market Transformation for Energy Efficiency (MTEE)	- Aims to make energy-efficient appliances more affordable in specific sectors. It comprises of two programs - - Bachat Lamp Yojana (BLY)⁵⁸ provides CFLs at the same price as in-candescent bulbs. The cost difference is adjusted by the project implementer through carbon credits earned. Who can apply? Residential Consumers Super Efficient Equipment Programme (SEEP) provides financial stimulus to manufacturers to produce and sell super-efficient appliances. Ceiling fans were the first appliance to come under SEEP with a target of making them 50% more efficient than market average Who can apply? Manufacturers/Industries						

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
B.2	Unnat Jyoti by Affordable LEDs for All (UJALA)	Aims to make LED Lighting more affordable for all. It promotes replacement of incandescent lamps with LED (Light-Emitting Diode) bulbs by providing LED bulbs to domestic consumers at a low cost. Who can apply? Domestic Households with a Metered Connection⁵⁹						
C. Decarbonising Industrial Sector								
C.1	Perform, Achieve and Trade (PAT) ⁶⁰	Focused at reducing specific energy consumption in energy-intensive industries, improving their energy efficiency and enhancing cost effectiveness through certification of excess energy saved which can then be traded. Who can apply? Designated consumers (DCs) (industrial units notified by Central Government to participate in PAT)						
C.2	MSME Sustainable (ZED) Certification	Envisions promotion of Zero Defect Zero Effect (ZED) practices among MSMEs to improve their productivity, reduce waste and enhance their environmental consciousness. - Subsidy up to 80% for micro, 60% for small and 80% for medium enterprises on cost of ZED certification. - Additional subsidy of 10% for women/ SC/ST owned MSMEs or those in NER/ Himalayan/LWE/island territories/ aspirational districts, as well as another 5% for MSMEs which are also a part of the SFURTI or Micro and Small Enterprises - Cluster Development Programme (MSE-CDP). - Up to 75% of the total cost of testing, maximum of Rs. 50,000 in financial assistance for testing/quality/product certification.						

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
		- Up to Rs. 200,000 for consultancy for all ZED certified MSMEs. - Up to Rs. 300,000 in support for technology upgradation to Zero Effect solutions for all ZED certified MSMEs. Who can apply? Micro, Small and Medium Enterprises						
C.3	Tamil Nadu MSME Capital Subsidy⁶¹	- Capital subsidy up to 25% or maximum of Rs. 150,00,000 on the value of eligible plant and machinery. - Additional subsidy up to 5% of the plant/machinery value or a maximum of Rs. 500,000 for enterprises set up by women/SC/ST/PwD/Transgender entrepreneurs. - Additional capital subsidy at 25% of the plant and machinery value or maximum of Rs. 10,00,000 to promote cleaner and environmentally friendly technologies. Who can apply? All new Micro, Small and Medium Enterprises (including those engaged in solar energy equipment and electric vehicle components, clean building materials, charging infrastructure, pollution control equipments, bio technology etc)						
C.4	Tamil Nadu MSME Energy Audit Subsidy (PEACE) Scheme⁶²	- PEACE Scheme aims to promote energy efficiency in MSME units so as to enable them to reduce costs and improve competitiveness. Under this scheme, - The Government will reimburse 75% of the cost of conducting an energy audit subject to a ceiling of Rs. 100,000 per energy audit per unit. 50% of the cost of machinery and equipment replaced, retrofitted and technology acquired for implementing the recommendations of the audit will be subject to reimbursement to a maximum of Rs. 10,00,000. Who can apply? All existing Micro, Small and Medium Enterprises						

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
C.5	Tamil Nadu Quality Certification (Q-cert) Scheme	This scheme aims to encourage MSMEs to acquire quality standards and certifications for processes and products including ZED rating. The Government reimburses payments made to certification and/or consultancy agencies up to Rs. 200,000 for national level quality certification and Rs. 10,00,000 for international level quality certification. Who can apply? All existing Micro, Small and Medium Enterprises						
C.6	Green Industry Incentive under the Tamil Nadu Industrial Policy 2021⁶³	Industrial projects undertaking initiatives in safety and energy efficiency, water conservation and greening (including green buildings) and pollution control solutions are provided a 25% subsidy on the cost of setting up of environmental protection infrastructure to a maximum of Rs. 1 Crore. Who can apply? Industries, including MSMEs						
C.7.	TANSEED 3.0 Grant Programme by Tamil Nadu StartUp and Innovation Mission (TANSIM)⁶⁴	Grant funding up to Rs. 100,00,000 and an AWS promotion credit up to US\$ 100,000 is provided to grant winners in agriculture, climate action and livelihood space. Key focus is on feeds, fodder, animal nutrition and waste to value/circular economy initiatives.						
D.	Decarbonising the Transport Sector							
D.1	PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) Scheme 2024⁶⁵	Promotes faster adoption of electric vehicles (EVs), setting up of charging infrastructure and development of EV manufacturing ecosystem. Demand incentives at Rs.5,000 per kWh for e-2W and e-3W registered in FY 24-25 and for FY 25-26 as under:						

Central & State Policies/Schemes			Applicability to Sectors																					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU																
		<table><tr><td>Cate-gory</td><td>Incentive</td><td>Total Number of Vehicles to be supported</td></tr><tr><td>EV 2W</td><td>Rs. 2500 per kWh</td><td>24,79,120</td></tr><tr><td>EV 3W L5</td><td>Rs. 2500 per kWh</td><td>2,05,392</td></tr><tr><td>EV Buses</td><td>Rs. 20 lakh to Rs. 30 lakh depending upon the size</td><td>14,028</td></tr><tr><td>e-Ambu-lances</td><td colspan="2" rowspan="2">To be notified separately</td></tr><tr><td>e-Trucks</td></tr></table> Other incentives include, - Grants for creation of capital assets (charging stations, testing agencies and others) - Support for IEC activities Who can apply? EV Buyers (claim for subsidy), Original Equipment Manufacturers (claim for reimbursement of subsidy)	Cate-gory	Incentive	Total Number of Vehicles to be supported	EV 2W	Rs. 2500 per kWh	24,79,120	EV 3W L5	Rs. 2500 per kWh	2,05,392	EV Buses	Rs. 20 lakh to Rs. 30 lakh depending upon the size	14,028	e-Ambu-lances	To be notified separately		e-Trucks						
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e-Ambu-lances	To be notified separately																							
e-Trucks																								
D.2	Tamil Nadu Electric Vehicle Policy 2023⁶⁶	The policy provides special demand and supply sided incentives for promotion of electric vehicles and allied infrastructure in the State. Under the policy, the State targets increasing the share of electric buses to 30% of the fleet by 2030. Supply-Sided Incentives: Investment Promotion Subsidy in the form of 100% reimbursement of SGST upon achieving a minimum eligible investment threshold of Rs. 50 Crore and minimum employment threshold of 50 jobs, whichever is lesser. (OR)																						
		- Turnover based Subsidy up to 2% of the project’s annual turnover subject to a cap of 4% of the cumulative investment in eligible fixed assets for a period of 10 years from the date of commercial production. (OR) - Capital Subsidy of 15% of investment in eligible fixed assets. (OR) - Special ACC Capital Subsidy of 20% of investment in eligible fixed assets - Electricity tax exemption (100%) for a period of 5 years																						

Central & State Policies/Schemes			Applicability to Sectors																																			
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU																														
		100% exemption on stamp duty for purchase/lease of land from government agencies or in case of private land, as a backup subsidy for up to 50 acre - Other interest subvention, transition and special incentives for MSMEs. Who can apply? Micro, Small and Medium Enterprises Demand Sided Incentives <table><tr><th>Type</th><th>Category</th><th>Incentive based on better capacity (Rs./kWh)</th><th>Maximum Incentive (Rs.)</th><th>Number of vehicles to support per year</th></tr><tr><td>Private</td><td>e-Cycles</td><td>-</td><td>20% of cost up to Rs. 5000</td><td>6,000</td></tr><tr><td>Commercial</td><td>e-2Wheelers</td><td>10,000/kWh</td><td>30,000</td><td>6,000</td></tr><tr><td>Commercial</td><td>e-3Wheelers (autos/light goods carriers)</td><td>10,000/kWh</td><td>40,000</td><td>15,000</td></tr><tr><td>Commercial</td><td>e-4Wheelers (cabs/good vehicles)</td><td>10,000/kWh</td><td>1,50,000</td><td>3,000</td></tr><tr><td>Commercial</td><td>e-Buses</td><td>20,000/kWh</td><td>10,00,000</td><td>300</td></tr></table> Other demand sided incentives include, - Subsidy for using EVs for transportation of goods and services by industrial units. 100% road tax exemption to EVs, waiver on registration charges and permit fees till 31.12.2025 - Incentives ranging from Rs. 5000 to Rs. 10,00,000 for procurement of electric vehicles by categories. Who can apply? Individuals The policy also provides for incentives to build charging infrastructure including public charging stations, battery swapping stations, as well as for capacity building and skilling.	Type	Category	Incentive based on better capacity (Rs./kWh)	Maximum Incentive (Rs.)	Number of vehicles to support per year	Private	e-Cycles	-	20% of cost up to Rs. 5000	6,000	Commercial	e-2Wheelers	10,000/kWh	30,000	6,000	Commercial	e-3Wheelers (autos/light goods carriers)	10,000/kWh	40,000	15,000	Commercial	e-4Wheelers (cabs/good vehicles)	10,000/kWh	1,50,000	3,000	Commercial	e-Buses	20,000/kWh	10,00,000	300						
Type	Category	Incentive based on better capacity (Rs./kWh)	Maximum Incentive (Rs.)	Number of vehicles to support per year																																		
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Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
2.	Paramparagat Krishi Vikas Yojana (PKVY) ⁶⁷	PKVY aims at supporting and promoting organic farming by providing end-to-end support from production to processing certification and marketing by a cluster approach. Under PKVY, states are provided overall financial assistance of Rs.31500/ha covering on-farm and off-farm organic inputs (for this Rs.15000/ha is provided directly to farmers through DBT), marketing, packaging, branding, value addition, certification and residual analysis						
3.	Bharatiya Prakritik Krishi Paddhati (BPKP) ⁶⁸	BPKP aims at promoting on-farm biomass recycling, use of cow dung-urine formulations and plant based preparations in exclusion of synthetic chemical inputs. Financial assistance of Rs 12200/ha for 3 years is provided for cluster formation, capacity building and continuous hand holding by trained personnel, certification and residue analysis Under this scheme dry lands, rainfed areas and tribal areas are to be given preference, where small and marginal farm holders, including tenant farmers being the preferred target group.						
4.	National Mission on Natural Farming ⁶⁹	This mission aims at implementing self sustainable and self generating natural farming systems to enhance income, ensure resource conservation and soil health. Centrally sponsored scheme with an overall outlay of ₹2,481 crore targeting to initiate 1 crore farmers to natural farming spreading over 7.5 Lakh ha land.						

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
5.	National Mission for Sustainable Agriculture (NMSA) ⁷⁰	NMSA also aims to make agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific Integrated / Composite farming systems. Components under NMSA include Rainfed Area Development (RAD), Sub-Mission on Agroforestry (SMAF), National Bamboo Mission (NBM), Soil Health Management (SHM) and Climate Change and Sustainable Agriculture: Monitoring, Modelling and Networking (CCSAMMN).						
6.	Soil Health Card (SHC) Scheme ⁷¹	In the form of a soil card, farmers will get a report containing all the details about the soil of their particular farm once in every 3 years. SHC displays soil health indicators that can be assessed without the requirement of a laboratory or technical equipment, and are based on farmers' practical experience and knowledge of local natural resources.						
7.	Chief Minister's Manniyur Kaathu Mannuyir Kappom Scheme (CM MK MKS) ⁷²	CM MK MKS aims to achieve sustainable and chemical free agricultural practices through distribution of Green Manure seeds and vermicompost pits and beds for farmers. For the FY 2024-25 the scheme has an outlay of 206 crores covering 22 components to maintain soil health for supply of healthy food to society.						
8.	Kalaigharin All Village Integrated Agriculture Development Programme (KAVIADP) ⁷³	KAVIADP strives to increase the economic status of farmers by bringing fallow lands under cultivation and increase the cultivable area by creation of new water sources thereby to increase agricultural production and productivity. 100% funding for community water source creation (State Plan Scheme) For Union Government shared schemes like PM-KUSUM, PMKSY etc. based on respective guidelines and funding pattern						

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
9.	Kalaigharin Nagarpura Mempattu Thittam (KNMT) ⁷⁴	KNMT aims to fulfil infrastructural gaps in municipalities and town panchayats until Urban Local Bodies (ULB) level. This scheme covers funding for rejuvenation of water bodies, Solid Waste Management (SWM) infrastructure development including greening the vehicle fleet, construction of public toilets and parks etc.						
10.	Namakku Naamae Thittam (Urban) ⁷⁵	This scheme improves the self support mechanism of public participation in creating and maintaining community infrastructure. Renovation of water bodies, storm water drain, Upgradation of earthen /gravel/ WBM roads / streets to all-weather roads, Community toilets / Public toilets, shops, Markets etc can be taken under this scheme. Minimum public contribution for any identified work (except renovation of water bodies) should be one third of the estimated value and for the renovation of water bodies the contribution should be 50%. There is no upper limit for public contribution						
11.	Atal Mission for Rejuvenation and Urban Transformation Scheme (AMRUT 2.0) ⁷⁶	AMRUT 2.0 aims to provide universal coverage of sewerage and septage management in 500 AMRUT cities while also enabling them to become self reliant and water secure Total indicative outlay is 2,99,000 crore with central share of 76,760 crore for a period of 5 years from 2021-2026.						
13.	Swachh Bharat Mission-Gramin (SBM-G) - Phase II ⁷⁷	SBM-G Phase II aims to sustain the Open Defecation Free (ODF) status while also promoting sustainable solid and liquid waste management. The total outlay of SBM(G) Phase II is 1.40 lakh crore with key focus on areas like 100% scientific processing of Municipal Solid Waste, remediation of all legacy waste dumpsites and ensuring ODF status with no untreated faecal sludge or used water is discharged into environment						

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
14.	Galvanising Organic Bio-Agro Resources Dhan (GOBARdhan) ⁷⁸	GOBARdhan scheme aims to convert waste to wealth towards promoting a circular economy by building a robust ecosystem for setting up Biogas/ Compressed Biogas (CBG) and Bio-Compressed Natural Gas (CNG) plants. - Any government/ private entity operating or intending to set up a Biogas/ CBG/ Bio CNG plant can apply. - Supporting villages to efficiently manage their agricultural and cattle waste thereby keeping the surroundings clean. - Eligible entities are classified into Individual household model, Cluster model, Commercial model and Community model.						
15.	Waste to Wealth Mission ⁷⁹	This mission aims at strengthening the waste management system in India by identifying and validating innovative technology solutions and models to achieve a zero-landfill and zero-waste nation. The mission aims to achieve this through effective management of solid waste and development of robust waste-to-energy and composting facilities.						
16.	Tamil Nadu Industrial Policy 2021 ⁸⁰	Industrial projects undertaking green initiatives for recycling waste and water for industrial use and for sustainable energy usage, coupled with online monitoring. Wherever applicable shall be eligible for a 25% subsidy on the cost of setting up such environmental protection infrastructure subject to a limit of Rs. 1 cr.						

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
17.	Jal Jeevan Mission (JJM) ⁸¹	JJM envisions to provide safe and adequate drinking water through individual household tap connections. Aims at providing Functional Household Tap Connections (FHTC) with 55 LPCD capacity and ensure long term sustainability with potable water The program also aims to implement source sustainability measures such as recharge and reuse through grey water management, water conservation and rainwater harvesting.						
18.	Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) ⁸²	PMKSY focusses on sustainable water conservation practices exploring the feasibility of reusing treated municipal wastewater to the extent possible. This scheme has been conceived amalgamating various ongoing schemes and will be jointly implemented by agriculture, water resources and rural development departments. Creation of new water resources through minor irrigation along with repair, restoration and renovation of water bodies (Har khet ko pani scheme) Water harvesting structures like check dams, nala bund, farm ponds, tanks etc. (PMKSY-Watershed) and various components under PMKSY-PDMC scheme						
19.	National Afforestation Program (NAP) ⁸³	NAP is a centrally sponsored scheme aiming to restore degraded forests and develop forest resources by supporting large-scale reforestation and afforestation projects.						

Central & State Policies/Schemes			Applicability to Sectors					
S. No	Scheme	Key Highlights	Agri.	Buil.	Trans.	Ind.	Waste	AFOLU
20.	Green India Mission (GIM) ⁸⁴	GIM aims to protect, restore and enhance India's forest cover, improve ecosystem services and enhance carbon sinks thereby responding to climate change. Key activities include enhancing tree cover in urban and peri-urban areas, eco-restoring open forests and grasslands, restoring mangroves and abandoned mining areas etc.						
21.	Agroforestry Policy ⁸⁵	This policy promotes integrating trees into agricultural landscapes to sequester carbon and boost farmer income. It also involves promoting climate resilient cropping and farming systems thus conserving environment and biological diversity. The Agroforestry component under RKVY provides up to ₹50 lakh for establishing nurseries to produce Quality Planting Materials, with 100% assistance for government agencies and 50% for private agencies						
22.	Compensatory Afforestation Fund Management and Planning Authority (CAMPA) ⁸⁶	State CAMPA to submit the Annual Plan of Operations (APO) to get funds and engage the local communities in afforestation, soil water conservation and forest protection activities.						
23.	Nagar Van Yojana ⁸⁷	Promotes urban forestry by creating urban forests/parks. Grants limited to 50 ha, with funding up to ₹4 lakhs per hectare. At least two-thirds of the area must be under tree cover and may include biodiversity parks, butterfly conservatories, smriti vans, herbal gardens, and waterbodies.						

Endnotes

- 1 https://tnslurb.tn.gov.in/wp-content/uploads/State_Forest.pdf
- 2 <https://msmeonline.tn.gov.in/deap/pdf/012.pdf>
- 3 <https://timesofindia.indiatimes.com/city/coimbatore/master-plan-is-in-place-for-coimbatore-airport-expansion/articleshow/119316037.cms>
- 4 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 Coimbatore too. An average of Rs. 1.8 Crore is assumed per electric bus.
- 5 Scheme valid till March 2026, unless extended.
- 6 Scheme valid till December 2025, unless extended.
- 7 https://tnpcb.gov.in/PDF/About_Us/Announcementgos/GONo116_16625.pdf
- 8 Scheme valid till December 2026, unless extended.
- 9 The cost of LED streetlight system, excluding poles, civil works, wiring and installation, comes to Rs. ~9200 per unit as per the Greater Chennai Corporation tender (Ref E.L.D.C.No.SMII/P10/1713/2025). With installation costs, an average of Rs. 20,000 per unit of LED streetlight system is assumed.
- 10 RCP 4.5 and RCP 8.5, short for Representative Concentration Pathways, are scenarios used to model future climate change based on different levels of GHG emissions. RCP 4.5 is a moderate scenario where emissions peak around 2040 and then decline. This includes a substantial growth in renewable energy resources by 2050. RCP 8.5 is a high baseline emissions scenario where emissions continue to rise on account of an increase in fossil fuel energy use throughout this century. RCP 8.5 is a scenario where energy consumption and overall consumption rates become unsustainable.
- 11 Intergovernmental Panel on Climate Change (IPCC). "2006 IPCC Guidelines for National Greenhouse Gas Inventories." Corrected chapter as of April 2007. Accessed at <https://www.ipcc-nggip.iges.or.jp/public/2006gl/>
- 12 <https://timesofindia.indiatimes.com/city/coimbatore/mercury-rising-city-records-hottest-march-in-2-decades/articleshow/68786274.cms>
- 13 https://spc.tn.gov.in/wp-content/uploads/Heat_Mitigation_Strategy.pdf
- 14 <https://timesofindia.indiatimes.com/city/coimbatore/coimbatore-corporation-begins-work-to-identify-urban-heat-islands/articleshow/119882047.cms>
- 15 <https://timesofindia.indiatimes.com/city/coimbatore/government-steps-to-address-water-shortage-in-coimbatore/articleshow/109962311.cms>
- 16 <https://www.twadboard.tn.gov.in/content/coimbatore>
- 17 The Tamil Nadu State emissions are taken from Tamil Nadu's Green House Gas Inventory and Pathways for Net Zero Transition Report - 2024
- 18 Under the updated NDC submitted in 2022, India has committed to reduce the emissions intensity of its GDP by 45% by 2030 from the 2005 levels.
- 19 'Scope 1' indicates direct greenhouse gas (GHG) emissions that are from sources owned or controlled by the reporting entity
- 20 CO₂e are also calculated in terms of Global Warming Potential (GWPs) as reported in the Sixth Assessment Report (AR6) of the IPCC.
- 21 The National Communications (NATCOM) provides information on greenhouse gas (GHG) inventories, measures to mitigate and to facilitate adequate adaptation to climate change, and any other information that the Party considers relevant to the achievement of the objective of the Convention. They are submitted every four years
- 22 Biennial Update report (BUR) provides an update of the information presented in NCs, in particular on national GHG inventories, mitigation actions, constraints and gaps, including support needed and received.
- 23 <https://www.aai.aero/en/business-opportunities/aai-traffic-news>
- 24 <https://swarajyamag.com/infrastructure/coimbatore-airport-expansion-land-acquisition-to-be-completed-in-two-weeks>
- 25 <https://timesofindia.indiatimes.com/city/coimbatore/iocl-lays-gas-pipeline-for-75km-in-district/articleshow/91570036.cms>
- 26 Bureau of Energy Efficiency (BEE)

- 27 <https://pib.gov.in/PressReleasePage.aspx?PRID=1742815>
- 28 <https://mowr.nic.in/core/WebsiteUpload/2023/M16.pdf>
- 29 The PM-KUSUM scheme aims to reduce diesel usage by promoting the electrification and solarisation of irrigation pumps.
- 30 GIZ. "Agrivoltaics in India." January 2024. Accessed at <https://beta.cstep.in/staaidv/assets/manual/APV.pdf>
- 31 NREL, Energy Analysis. Agricultural decarbonisation. Accessed at <https://www.nrel.gov/analysis/agricultural-decarbonisation.html>
- 32 <https://escholarship.org/content/qt77n9d4sp/qt77n9d4sp.pdf?t=lnqdul>
- 33 Balanced rationing: process to balance the level of various nutrients of an animal, from the available feed resources, to meet its nutrient requirements for maintenance and production. <https://www.nddb.coop/services/animalnutrition/programmes/ration-balancing-programme>
- 34 Improved Feed Supplements: Use of improved feed supplements have been shown to decrease methane emissions from livestock. ICAR-National Institute of Animal Nutrition and Physiology developed a feed supplement - Harit Dhara and Tamarin Plus, for cattle, are effective in cutting down enteric methane emissions by 20% <http://nianp.res.in/harit-dhara-tamarin-plus>.
- 35 Feed additives like neem cake, seaweed, tannins, essential oils and enzyme supplements.
- 36 Galvanizing Organic Bio-Agro Resources Dhan (GOBAR-Dhan) Scheme launched in April 2018 by the Ministry of Drinking Water & Sanitation focuses to generate energy and organic manure from cattle waste, promote circular economy, reduce GHG emissions, create rural employment opportunities etc. <https://gobardhan.co.in/about-us>
- 37 Projected based on CAGR between 2017 and 2022 data.
- 38 Projected based on CAGR between 2005 and 2022 data.
- 39 Nano fertilizers are nutrients that are encapsulated or coated within nano material in order to enable controlled release and its subsequent slow diffusion into the soil.
- 40 Jagatheesan, Mohanraj & Subramanian, K. & Lakshmanan, A.. (2019). Role of Nano-Fertilizer On Green House Gas Emission In Rice Soil Ecosystem. Madras Agricultural Journal. 106. 10.29321/MAJ.2019.000327.
- 41 United Nations Environment Programme (2024). Promoting a Sustainable Agriculture and Food Sector in India. Nairobi
- 42 https://kspcb.kerala.gov.in/assets/uploads/widget/wm_files/guidelines_swm.pdf
- 43 https://nmcg.nic.in/writereaddata/fileupload/ngtmpr/14_Tamil%20Nadu%20-%20MPR%20May%202025.pdf
- 44 Centralized wastewater treatment involves three stages: primary, secondary, and tertiary. In primary treatment, larger solids are removed through physical processes. Secondary treatment uses microorganisms to biodegrade remaining particulates. Tertiary treatment further purifies the water using advanced filtration, disinfection, and other methods to remove pathogens and nutrients, achieving 50-90% BOD removal efficiency
- 45 Activated sludge process- In the activated sludge process, wastewater is mixed with treated sludge in an aeration tank, where microorganisms break down organic pollutants into carbon dioxide, water, and biomass.
- 46 An on-site sewage system with multiple compartments allows sedimentation and sludge digestion. Solids settle as sludge, and scum is retained. Sludge undergoes anaerobic digestion, achieving 20-40% BOD removal efficiency.
- 47 An independent facility treats faecal sludge and septage for safe disposal and reuse using four modules: Sludge Drying Beds, Anaerobic Baffled Reactor, Planted Gravel Filter, and a Disinfection unit, achieving over 80% BOD removal efficiency
- 48 Forest Survey of India Annual Reports
- 49 Eco-bloc technology:
- 50 Bureau of Energy Efficiency (BEE)
- 51 ITF-OECD
- 52 The United Nations.
- 53 The International Association of Public Transport. "Why public transport is vital in achieving clean air for blue skies." Accessed at <https://www.uitp.org/news/why-public-transport-is-vital-in-achieving-clean-air-for-blue-skies/>
- 54 <https://www.ipcc-nggip.iges.or.jp/public/2006gl/>
- 55 All India Study on Sectoral Demand on Diesel and Petrol , Petroleum Planning and Analysis Cell (2013) https://ppac.gov.in/uploads/rep_studies/1674814577_201411110329450069740AllIndiaStudyonSectoralDemandofDiesel%20%282%29.pdf

- 56 Livestock sub-sector emissions projected in 2050 is 213 ktCO₂e consisting of emissions from Enteric Fermentation (199 ktCO₂e) and Manure Management (14 ktCO₂e).
- 57 The original target under the scheme was to release 8 crore LPG connections to deprived households by March 2020. Under Ujjwala 2.0, an additional allocation of 1.6 Crore LPG connections with special facilities to migrant households is provided. This target was achieved during December 2022.
- 58 Promoted energy efficient lighting in the country.
- 59 National Ujala Dashboard. Accessed at <http://ujala.gov.in/>
- 60 Currently, PAT Cycle VII is in progress for the FY 2022-23 to the FY 2024-25, covering 707 designated companies with an overall energy saving target of around 8.5 million tonnes of oil equivalent (MTOE) in 9 major energy intensive sectors. Also, with the introduction of the Carbon Credit Trading Scheme (CCTS) in June 2023, industries including aluminium, cement, fertilizers, petrochemicals, petroleum refining, pulp and paper have moved from PAT to CCTS. Refineries, iron and steel plants and textile industries will transition out of PAT into CCTS by 2026-27. PAT will only cover thermal power plants.
- 61 Department of MSME, Government of Tamil Nadu. Guidelines for Availing Capital Subsidy. Accessed at https://www.ms-meonline.tn.gov.in/incentives/html_cye_CS.php
- 62 Department of MSME, Government of Tamil Nadu. Guidelines for Availing Energy Audit Subsidy. Accessed at https://ms-meonline.tn.gov.in/incentives/html_cye_peace1.php
- 63 Government of Tamil Nadu. Tamil Nadu Industrial Policy 2021. Accessed at <https://tidco.com/wp-content/uploads/2021/08/Industrial%20Policy%202021.pdf>
- 64 StartUp Tamil Nadu. TANSEED 3.0. Accessed at <https://villgro.startuptn.in/>
- 65 The Electric Mobility Promotion Scheme 2024, implemented for the period from 1st April 2024 to 30th September 2024 is subsumed under PM E-Drive. Another scheme, Faster Adoption and Manufacturing of Electric Vehicle (FAME) had supported development of EV infrastructure. Phase II of this scheme concluded in March 2024. The suggestions received on scope of improvements in FAME under Phase I and II have been incorporated in the PM E-DRIVE. Source: Ministry of Heavy Industries, Government of India. Lok Sabha, Unstarred Question No. 2448. Phase-III of FAME Scheme. Accessed here. https://sansad.in/getFile/loksabhaquestions/annex/183/AU2448_7DstiP.pdf?source=pqals
- 66 Government of Tamil Nadu. Tamil Nadu Electric Vehicle Policy 2023. Accessed at https://investingintamilnadu.com/DI-GIGOV/StaticAttachment?AttachmentFileName=/pdf/poli_noti/TN_Electric_Vehicles_Policy_2023.pdf
- 67 <https://pib.gov.in/PressReleasePage.aspx?PRID=2099756#:~:text=Under%20PKVY%2C%20States%20are,and%20off%20farm%20organic%20inputs.>
- 68 <https://naturalfarming.dac.gov.in/Initiative/BPKP>
- 69 https://www.agriwelfare.gov.in/Documents/HomeWhatsNew/GuidelineofNMNF_FinalApproved_27122024.pdf
- 70 <https://nmsa.dac.gov.in/Default.aspx>
- 71 <https://www.soilhealth.dac.gov.in/home>
- 72 http://tnenvis.nic.in/Database/TN-ENVIS_792.aspx
- 73 <https://aed.tn.gov.in/en/schemes/special-schemes/kagovvt/>
- 74 https://cms.tn.gov.in/cms_migrated/document/GO/maws_e_70_2021.pdf
- 75 <https://www.tnurbantree.tn.gov.in/namakku-naame-thittam/>
- 76 <https://pib.gov.in/PressReleaselframePage.aspx?PRID=2078409>
- 77 https://swachhbharatmission.ddws.gov.in/about_sbm
- 78 <https://www.india.gov.in/spotlight/gobardhan-galvanizing-organic-bio-agro-resources-dhan>
- 79 <https://www.psa.gov.in/waste-to-wealth>
- 80 <https://spc.tn.gov.in/policy/tamil-nadu-industrial-policy-2021/>
- 81 <https://jaljeevanmission.gov.in/>
- 82 <https://pmksy.gov.in/AboutPMKSY.aspx>
- 83 <https://pib.gov.in/PressReleaselframePage.aspx?PRID=1795073>
- 84 <https://www.indiascienceandtechnology.gov.in/st-visions/national-mission/national-mission-green-india-gim>
- 85 <https://agriwelfare.gov.in/Documents/Operational%20Guidelines%20of%20AGROFOREST%20Y%20under%20RKVY.pdf>

- 86 <https://pib.gov.in/PressReleasePage.aspx?PRID=1906384>
- 87 <https://nams.nic.in/nagarvan.php>
- 88 Zero liquid discharge (ZLD) is a strategic wastewater management system that ensures that there will be no discharge of industrial wastewater into the environment. It is achieved by treating wastewater through recycling and then recovery and reuse for industrial purposes.
- 89 Water tax is a tax imposed on the use of water in buildings and leased premises. It is regulated by state government municipal corporation acts and is issued after consulting with departments such as engineering, fire, and health.
- 90 https://msmedi-chennai.gov.in/GARMS_Admin/basictools/images/DIPSReport/Ramanathapuram.pdf
- 91 <https://ss2022.sbmurban.org/#/dashboard>
- 92 Biomining is a process that uses living organisms, such as microorganisms, to extract metals from ores, minerals, and other solid materials.
- 93 Zero waste is the principle of minimizing waste production as much as possible, then composting, reusing, or recycling any other waste generated.
- 94 A zero carbon footprint, also known as carbon neutrality or net zero, means that an individual, organization, or entity balances the amount of greenhouse gas emissions it produces with an equivalent amount removed from the atmosphere.
- 95 Responsible tourism is a collaborative approach to tourism that aims to reduce the negative impacts of tourism on local communities while maximizing its positive benefits. It involves addressing issues such as climate change, over-tourism, and biodiversity loss, while also supporting the local economy and cultural heritage
- 96 A deposit-refund system combines a tax on product consumption with a rebate when the product or its packaging is returned for recycling. <https://www.rff.org/publications/working-papers/deposit-refund-systems-in-practice-and-theory/>

NOTES

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