

# Trend Analysis of GHG Emissions in TAMIL NADU

GHG Platform India is a civil society initiative providing an independent estimation and analysis of India's Greenhouse Gas (GHG) emissions across key sectors, namely- Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry & Other Land Use (AFOLU) and Waste.

The Platform seeks to add value to the various ongoing GHG emission estimation efforts by helping address existing data gaps and data accessibility issues, extending beyond the scope of national inventories to state inventories, and by increasing the volume of analytics and policy dialogue on India's GHG emissions sources, profile, and related policies.

The initiative estimates and assesses GHG emissions and removals from the following sectors:



**ENERGY**



**IPPU\***



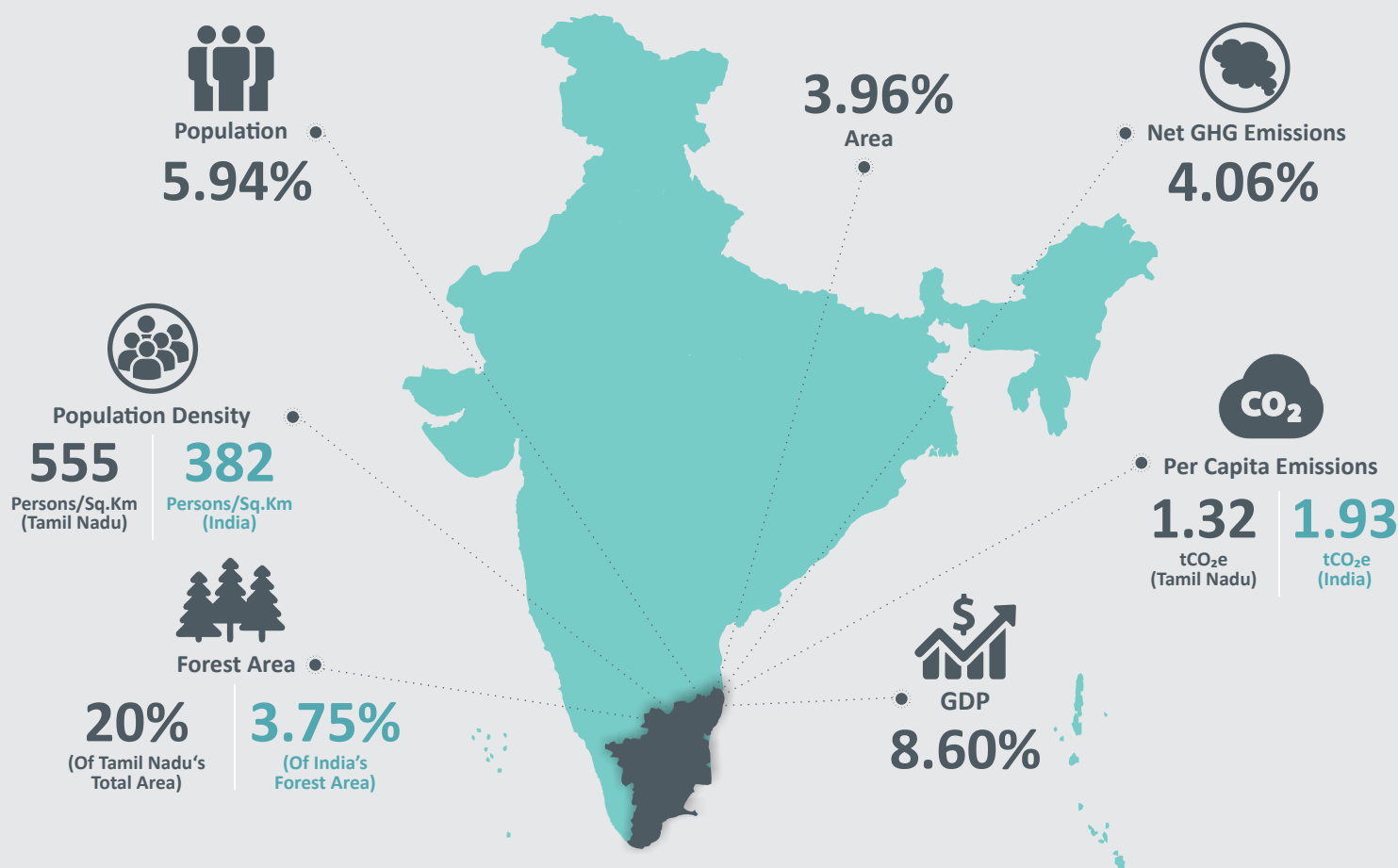
**AFOLU**



**WASTE**

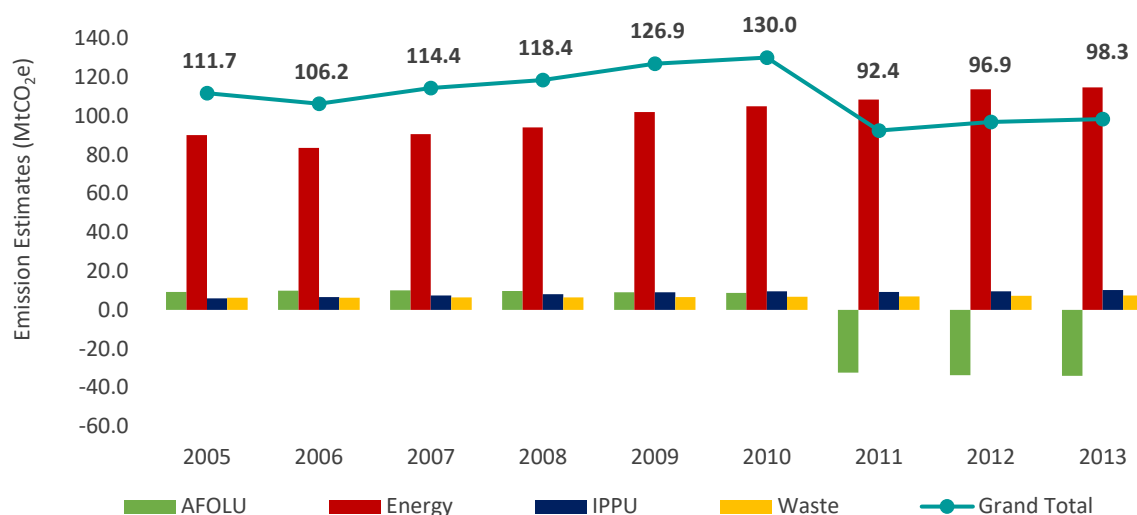
\*Fuel combusted for Captive Electricity Generation (Auto-Producers) has been reported under Energy sector.

## Tamil Nadu at a glance (2013)



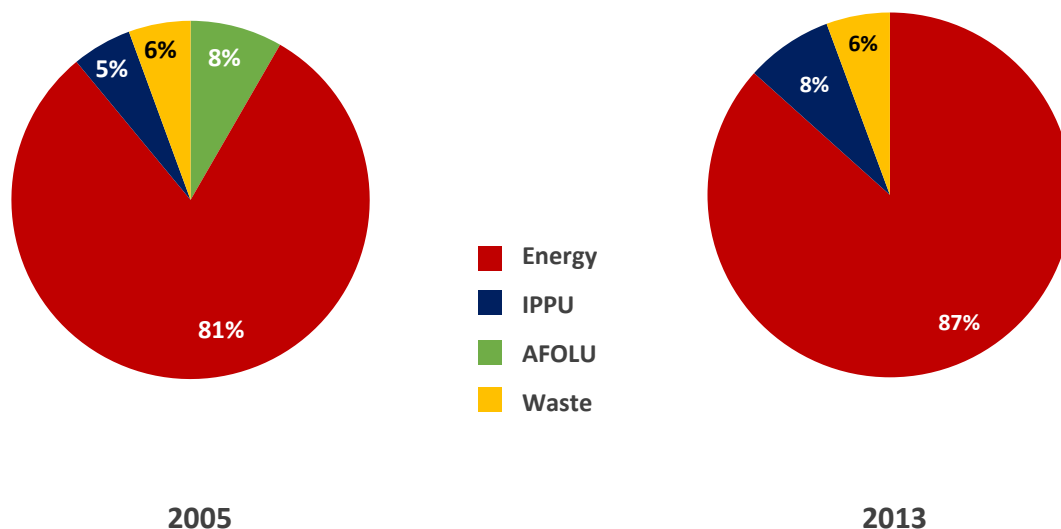
## Economy-wide Emission Estimates

**Figure 1: GHG Emission Estimates for Tamil Nadu (2005 to 2013)**



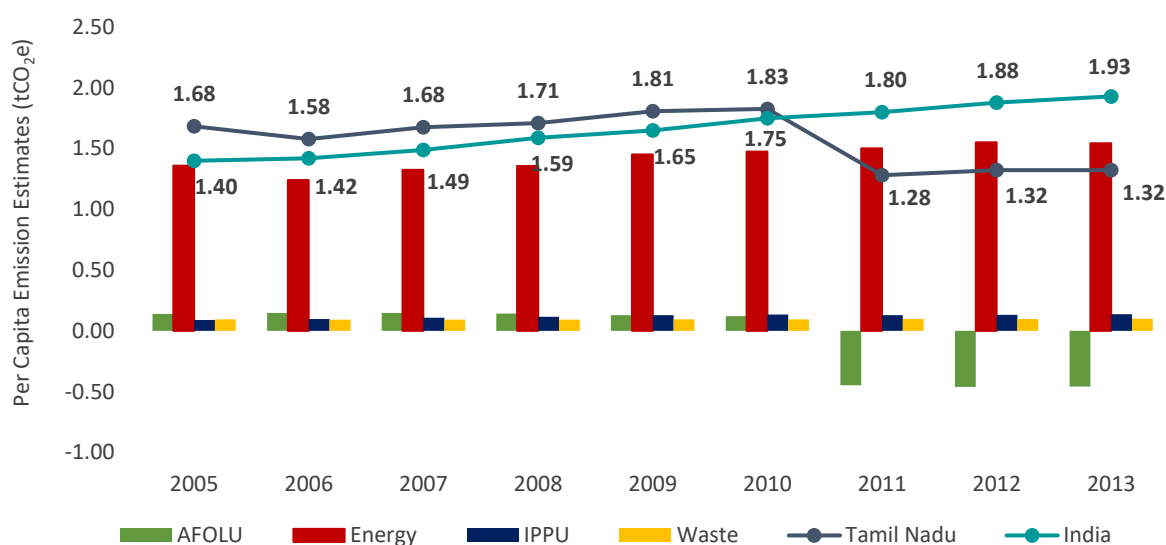
Emissions of Tamil Nadu declined at an overall rate of 1.58% (compounded annually) from 111.7 MtCO<sub>2</sub>e in 2005 to 98.3 MtCO<sub>2</sub>e in 2013<sup>1</sup>. The Energy sector remained the major contributor of the total emissions across all the reference years. In 2011, the AFOLU sector became a net sink owing to increased removals from the Land sub-sector as shown in Figure 1 above. In 2005, the Energy sector had the maximum share of ~81% in the total emissions of Tamil Nadu. The remaining ~19% emissions resulted from the combination of the AFOLU (~8%), Waste (~6%) and IPPU (~5%) sectors. In 2013, if emissions were considered without taking removals from the AFOLU sector into account, the Energy sector represented ~87% of the total Energy emissions while the IPPU and Waste sectors had a share of ~8% and ~6% respectively as illustrated in Figure 2 below.

**Figure 2: Sector-wise Contribution to Economy-wide GHG Emissions of Tamil Nadu (Excluding AFOLU in 2013)**



<sup>1</sup> Calendar year values have been considered for this analysis. For Global Warming Potential (GWP) calculations IPCC-ARII values have been considered.

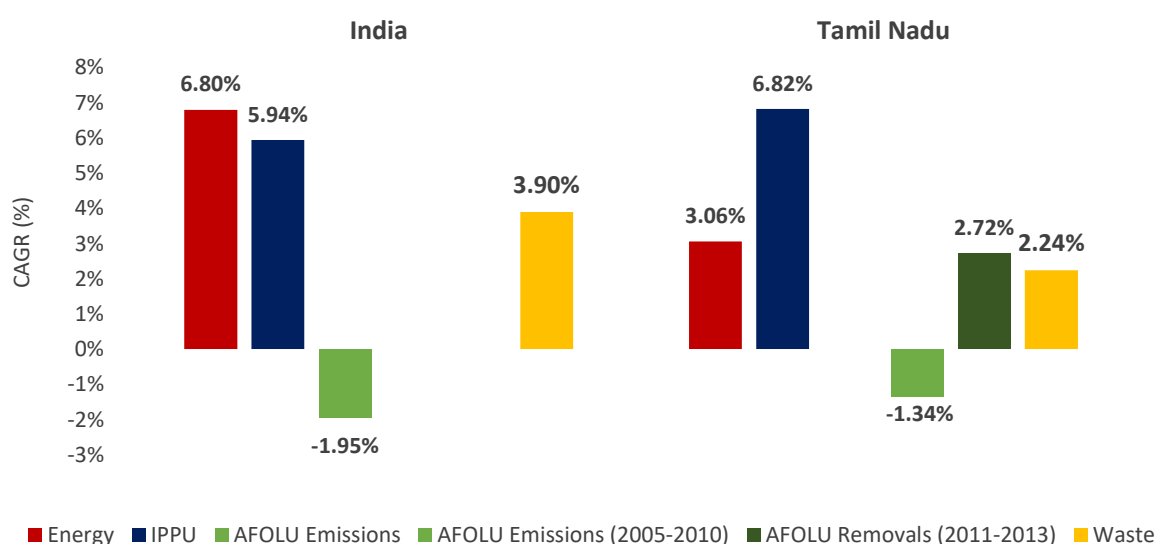
**Figure 3: Per Capita GHG Emissions for Tamil Nadu and India (2005 to 2013)**



The per capita emissions of Tamil Nadu declined at a rate of 2.97% from 1.68 tCO<sub>2</sub>e in 2005 to 1.32 tCO<sub>2</sub>e in 2013. When compared to India, the per capita emissions of Tamil Nadu were found to be slightly higher than that of the country till 2010. In 2011, an abrupt decline was observed in the per capita emissions owing to increased removals from the AFOLU sector, leading to lower per capita emissions of Tamil Nadu than that of India till the year 2013 as shown in Figure 3 above.

**Figure 4: Sector-wise GHG Emissions Growth Rate from 2005 to 2013**

*These growth rates have been compounded annually.*



GHG emissions from the IPPU sector recorded the highest CAGR<sup>2</sup> of 6.82% from 2005 to 2013. Between 2005 and 2010, the emissions from the AFOLU sector declined at a compounded rate of 1.34%. Subsequently, the AFOLU removals from 2011 onwards increased at a rate of 2.72% as shown in Figure 4 above. The observed CAGR of the Energy and Waste sectors were 3.06% and 2.24% respectively from 2005 to 2013. When compared to India, only the IPPU sector registered a higher growth rate of GHG emissions in Tamil Nadu from 2005 to 2013.

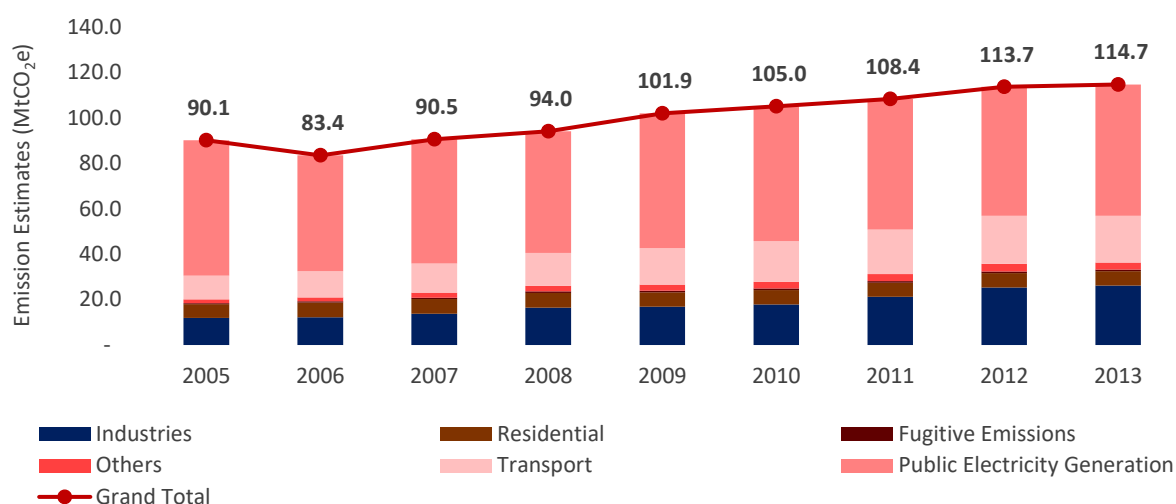
<sup>2</sup> Compound Annual Growth Rate



## Energy Sector

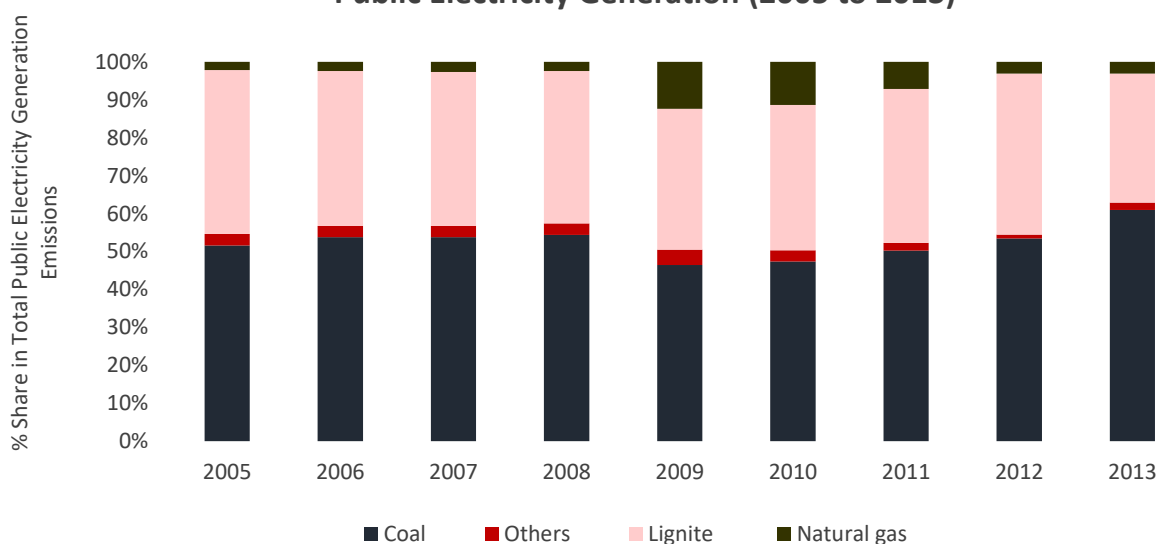
The Energy sector represented ~87% of the total emissions (if values are considered excluding AFOLU sector) of Tamil Nadu in 2013. In general, emissions from the Energy sector arise from two main sub-sectors – Fuel Combustion (Public Electricity Generation, Transport, Industries and Agriculture, Commercial and Residential categories) and Fugitive. In 2013, nearly 99% emissions were from the Fuel Combustion sub-sector, while only ~1% emissions were Fugitive. Emissions from the Energy sector grew at a CAGR of 3.06% from 90.1 MtCO<sub>2</sub>e in 2005 to 114.7 MtCO<sub>2</sub>e in 2013.

**Figure 5: GHG Emission Estimates for Energy Sector in Tamil Nadu (2005 to 2013)**



Within the Energy sector, Public Electricity Generation was a major contributor (~50%) of emissions in Tamil Nadu followed by the Industries (~23%) and Transport categories (~18%) respectively in 2013. Notably, the hierarchy in the share of emissions followed the same trend throughout the reference period. Deep diving into the Public Electricity Generation category, Coal-based Thermal Power Plants contributed the most to the GHG emissions of this category with an average share of nearly 52% across the reference years followed by emissions from Lignite (~40%) and Natural Gas (~5%) respectively as illustrated in the Figure 6 below.

**Figure 6: Share of GHG Emissions from Public Electricity Generation (2005 to 2013)**

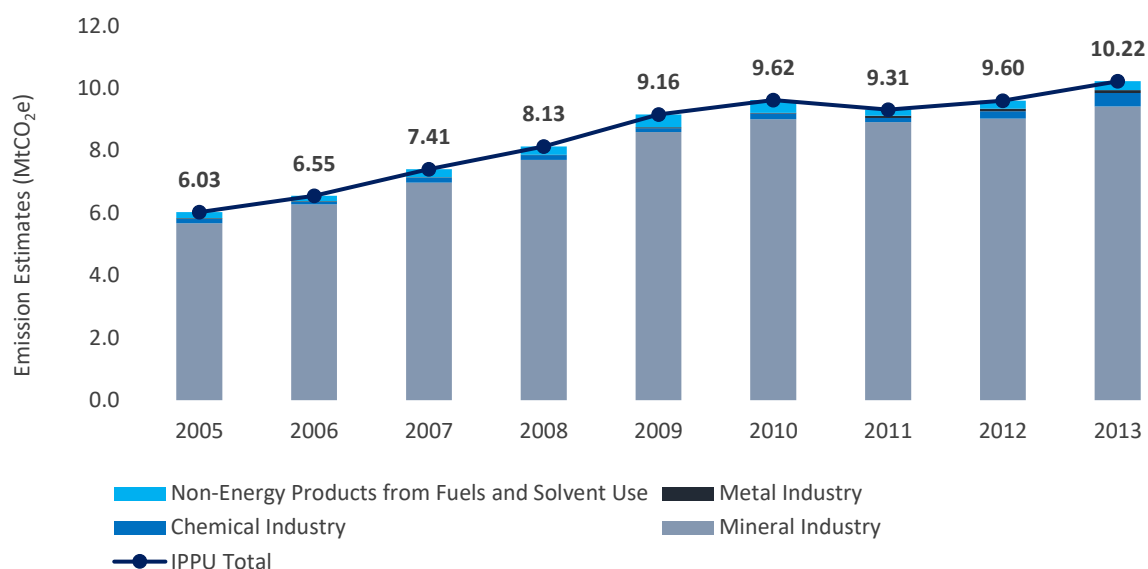




## IPPU Sector

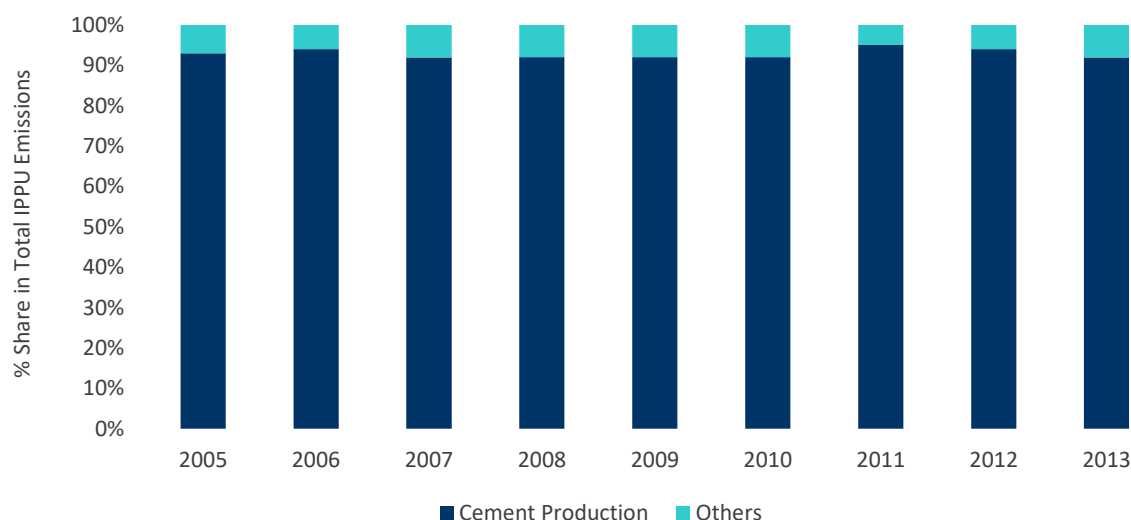
The IPPU sector represented ~8% of the total GHG emissions (if values were considered excluding AFOLU sector) in Tamil Nadu in 2013. Between 2005 and 2013, the overall IPPU emissions grew at a CAGR of 6.82% from 6.03 MtCO<sub>2</sub>e in 2005 to 10.22 MtCO<sub>2</sub>e in 2013. Emissions from IPPU sector were primarily driven by emissions from the Chemical Industries which grew at a CAGR of 6.54% from 5.67 MtCO<sub>2</sub>e in 2005 to 9.42 MtCO<sub>2</sub>e in 2013 as depicted in Figure 7 below.

**Figure 7: GHG Emission Estimates for IPPU Sector in Tamil Nadu (2005 to 2013)**



A detailed trend of GHG emissions by various IPPU Categories is depicted in the Figure 8 below. Cement Production was the key driver of emissions across all the years, with an average share of ~93% throughout the reference years.

**Figure 8: Share of GHG Emissions from IPPU Categories (2005 to 2013)**

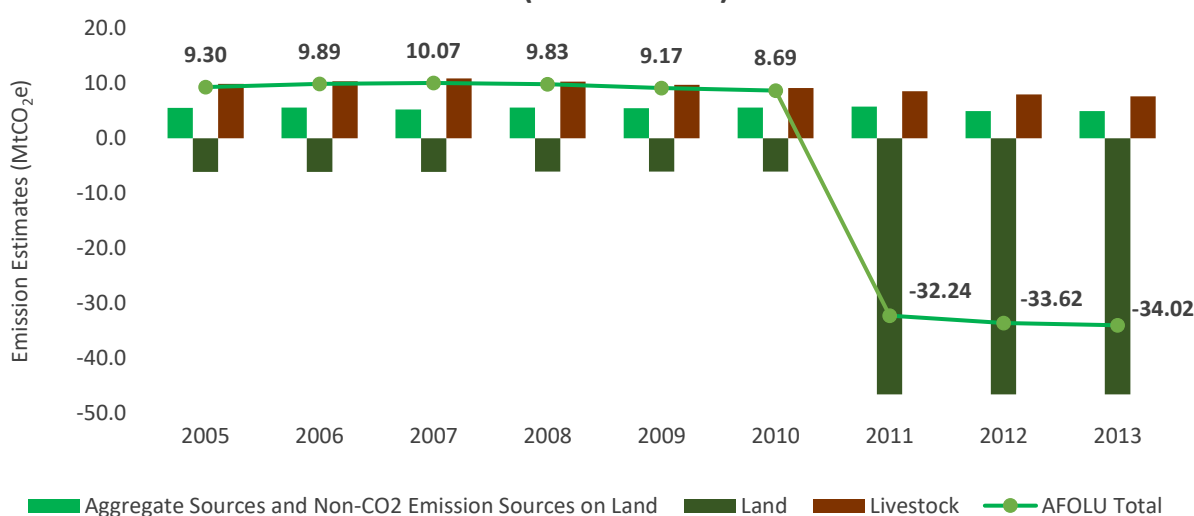




## AFOLU Sector

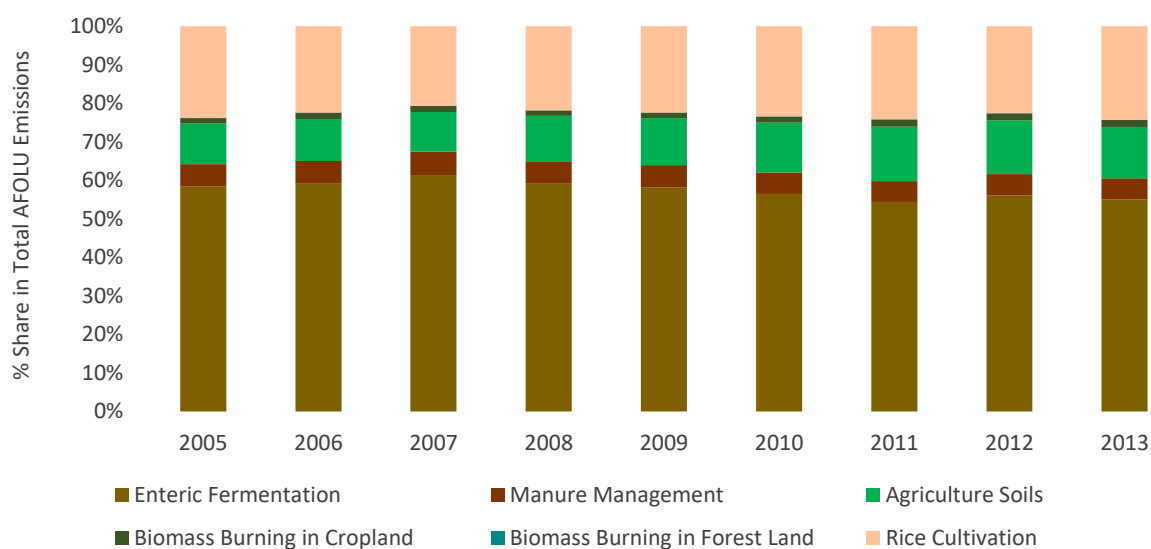
The AFOLU sector in Tamil Nadu absorbed 34.02 MtCO<sub>2</sub>e of GHG emissions in 2013. Emissions from the AFOLU sector arise from three main sub-sectors namely Livestock, Land and Aggregate Sources and Non-CO<sub>2</sub> Emissions Sources on Land. Notably, the AFOLU sector was a net emitter till 2010, but 2011 onwards, it became a net sink due to increased removals from the Land sub-sector. Net emissions from this sector declined at a rate of 1.34% from 9.30 MtCO<sub>2</sub>e in 2005 to 8.69 MtCO<sub>2</sub>e in 2010. Whereas, from 2011 onwards net removals grew at a CAGR of 2.72% from 32.24 MtCO<sub>2</sub>e in 2005 to 34.02 MtCO<sub>2</sub>e in 2013 as depicted in Figure 9 below.

**Figure 9: GHG Emission Estimates for AFOLU Sector in Tamil Nadu (2005 to 2013)**



Notably, Livestock was a major emitter of GHG emissions in the AFOLU sector throughout the reference period. Under the Livestock sub-sector, Enteric Fermentation (~55%) contributed the most to the AFOLU emissions if values were considered excluding the Land sub-sector in 2013. However, the contribution of emissions from this category declined at a rate of 3.21% (compounded annually) from 8.99 MtCO<sub>2</sub>e in 2005 to 6.93 MtCO<sub>2</sub>e in 2013. Emissions due to Rice Cultivation was the second major contributor of GHG emissions with a share of ~24% in 2013 as depicted in Figure 10 below.

**Figure 10: Share of GHG Emissions from AFOLU Sub-sectors (Excluding Land)**

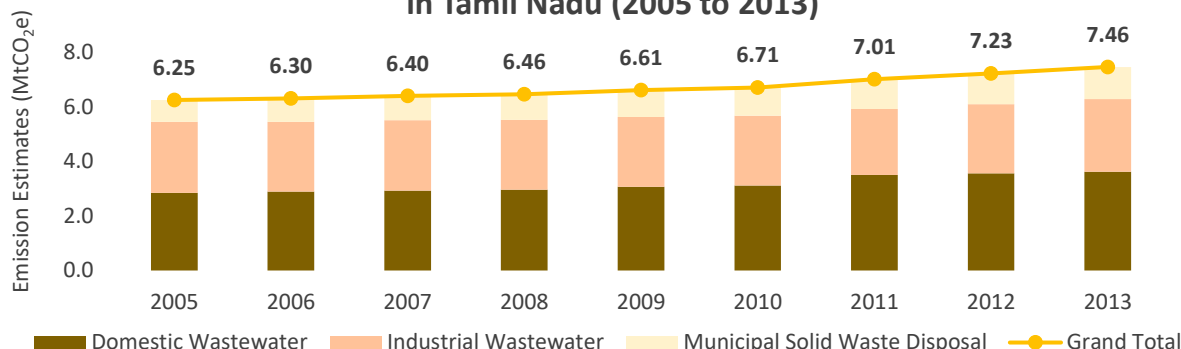




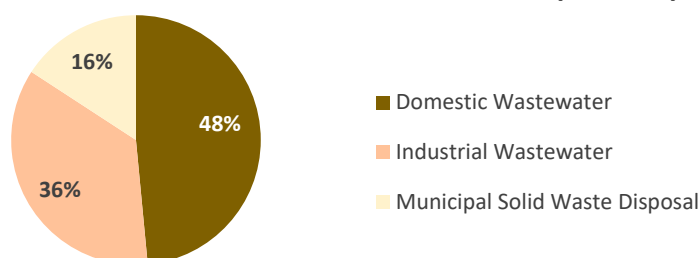
## Waste Sector

The Waste sector contributed to almost 6% of total emissions (if values were considered excluding the AFOLU sector) in Tamil Nadu in 2013. Municipal Solid Waste<sup>3</sup>, Domestic Wastewater and Industrial Wastewater are the key sources of GHG emissions in the Waste sector. GHG emissions from Waste grew at a CAGR of 2.24% from 6.25 MtCO<sub>2</sub>e in 2005 to 7.46 MtCO<sub>2</sub>e in 2013. A spike in emissions in 2011 was observed which can be attributed to higher Domestic wastewater emissions, which reflects changing trends in use of various treatment systems as reported in Census of India 2011.

**Figure 11: GHG Emission Estimates for Waste Sector in Tamil Nadu (2005 to 2013)**



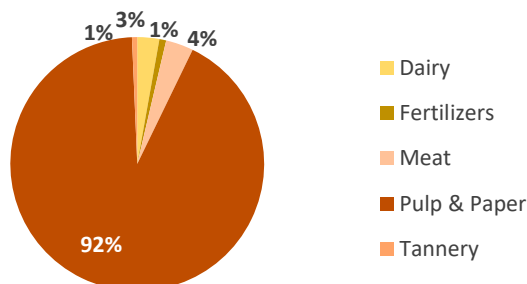
**Figure 12: Category-wise Share of GHG Emissions for Waste Sector (in 2013)**



Domestic Wastewater had a share of ~48% in the total emissions from the Waste sector in 2013 (Figure 12). Tamil Nadu's emissions from Domestic Wastewater grew at a CAGR of 3.04% from 2.85 MtCO<sub>2</sub>e in 2005 to 3.62 MtCO<sub>2</sub>e in 2013. In 2013, almost 54% of Domestic Wastewater emissions emanated from the urban areas of Tamil Nadu. Discharge of untreated wastewater and use of septic tanks are key drivers of emissions in this sub-sector.

Industrial Wastewater comprised ~36% of the Waste sector emissions in 2013. Emissions from this sub-sector grew at a rate of 0.29% (compounded annually) from 2.60 MtCO<sub>2</sub>e in 2005 to 2.66 MtCO<sub>2</sub>e in 2013. In 2013, ~92% of the Industrial Wastewater emissions were from the Pulp and Paper Industries and the remaining ~8% share corresponded to the combined emissions of Meat (~4%), Dairy (~3%) and Tannery (~1%) Industries. Municipal Solid Waste Disposal represented ~16% of the Waste sector emissions in 2013. The emissions from this sub-sector grew at an estimated CAGR of 5% from 0.80 MtCO<sub>2</sub>e in 2005 to 1.18 MtCO<sub>2</sub>e in 2013.

**Figure 13: Share of Emissions from Industrial Wastewater Categories (in 2013)**



<sup>3</sup> 'Refers to emission in urban areas. Emissions from Municipal Solid Waste Disposal in rural areas are not considered, as disposal predominantly occurs in a dispersed manner and does not generate significant CH<sub>4</sub> emissions'



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The Platform comprises of the following civil society:



*An initiative supported by*



The **Council on Energy, Environment and Water (CEEW)** is one of South Asia's leading not-for-profit policy research institutions. It uses data, integrated analysis and strategic outreach to explain – and change – the use, reuse, and misuse of resources.

The **International Maize and Wheat Improvement Center (CIMMYT)** is the global leader in agricultural research for development in wheat and maize-based farming systems.

**Center for Study of Science, Technology and Policy (CSTEP)** is a not for profit research organisation incorporated in 2005 u/s 25 of The Companies Act, 1956.

**ICLEI - Local Governments for Sustainability** is a leading global network of over 1,500 cities, towns and regions committed to building a sustainable future.

**Shakti Sustainable Energy Foundation** works to strengthen the energy security of the country by aiding the design and implementation of policies that encourage energy efficiency, renewable energy and sustainable transport solutions.

**Vasudha Foundation**, set up in 2010, is a not for profit organisation, working in the clean energy and climate policy space.

**WRI-India** is a research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

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