

Trend Analysis of GHG Emissions in PUDUCHERRY

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*



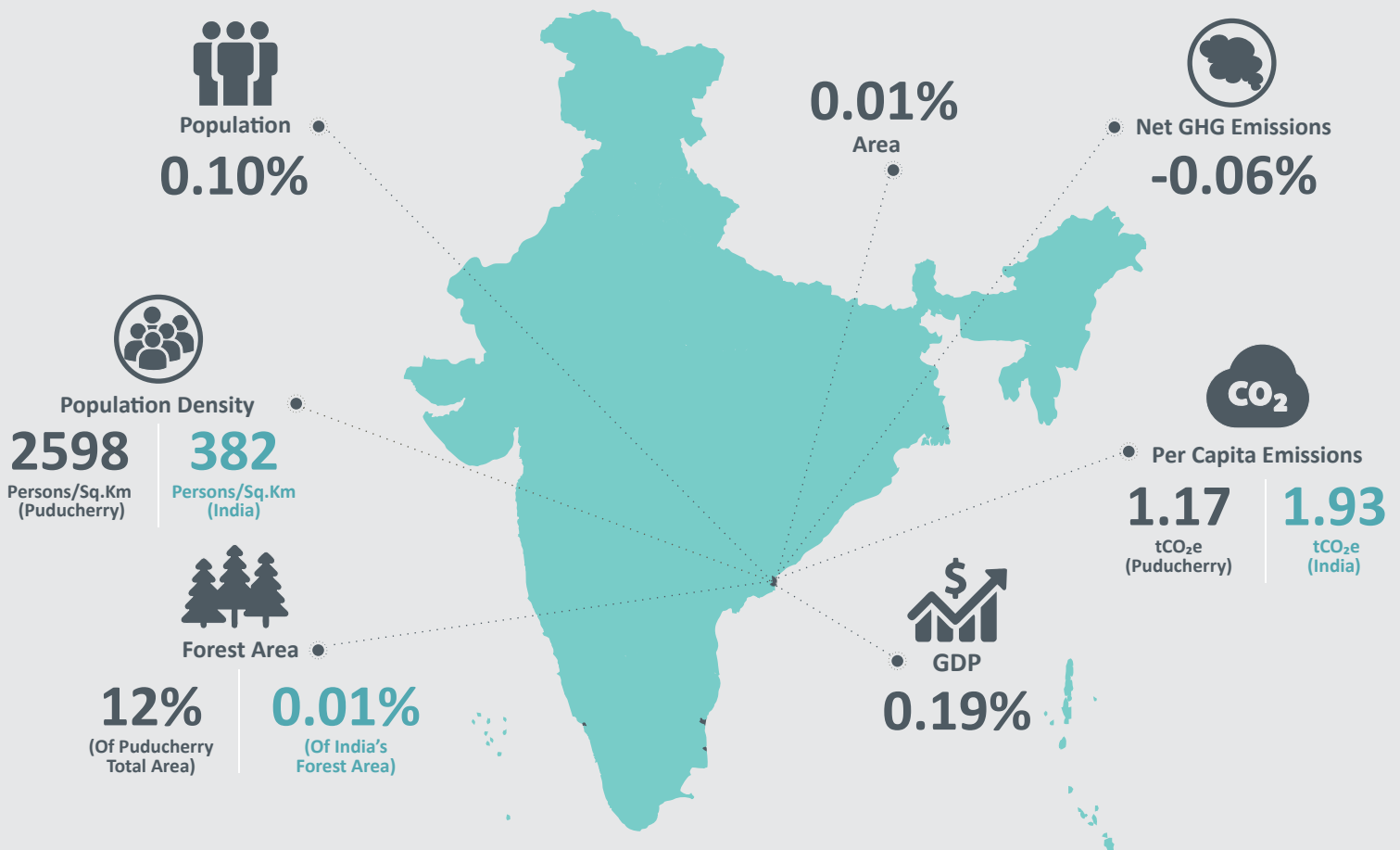
AFOLU



WASTE

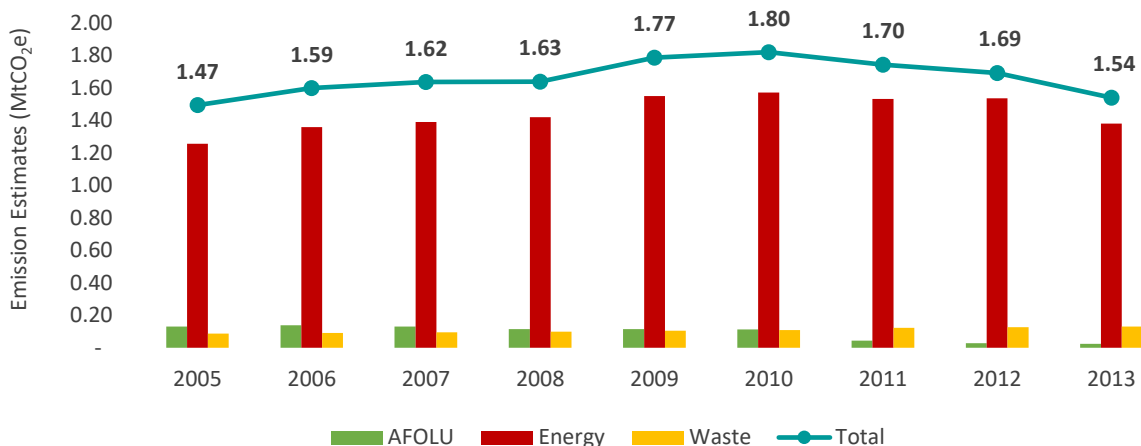
*Fuel combusted for Captive Electricity Generation (Auto-Producers) has been reported under Energy sector.

Puducherry at a glance (2013)



Economy-wide Emission Estimates

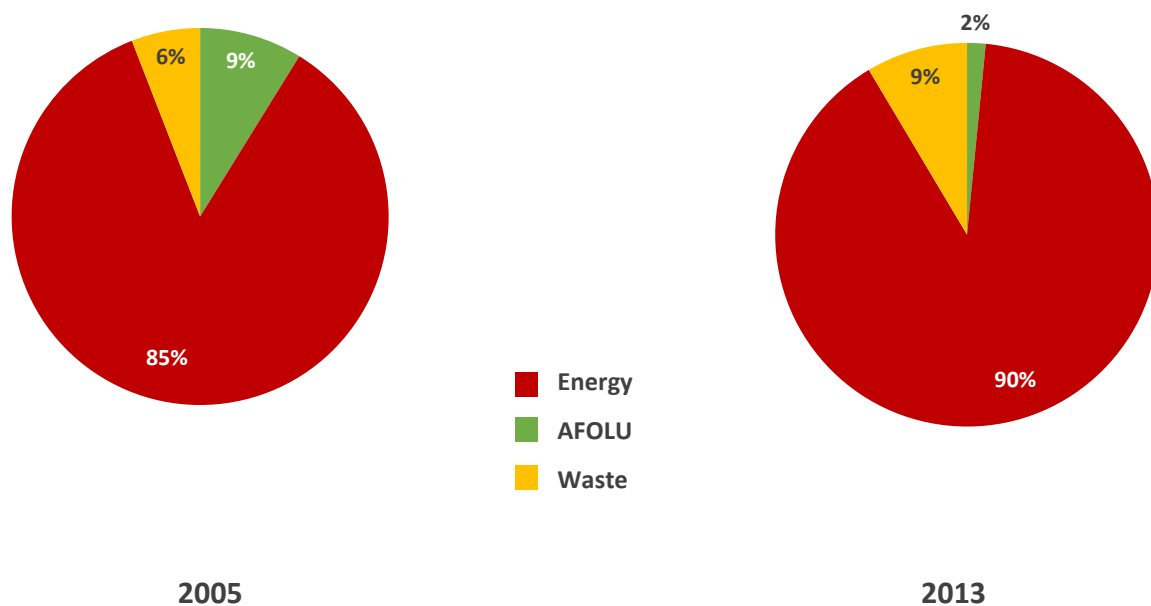
Figure 1: GHG Emission Estimates for Puducherry (2005 to 2013)



Emissions of the Union Territory of Puducherry increased marginally at a CAGR¹ of 0.53% from 1.47 MtCO₂e in 2005 to 1.54 MtCO₂e in 2013². A significant peak in 2010 (1.80 MtCO₂e) and a subsequent decline thereafter was observed as illustrated in Figure 1 above. Puducherry registered positive emissions from the Energy, AFOLU and Waste sectors respectively.

In 2013, ~90% of the emissions emanated from the Energy sector, ~9% from the Waste sector, and the remaining from AFOLU sector (~2%) (Figure 2). When compared to 2005 emissions, the share of the Energy sector was ~85%, lower than in 2013, while the share of the AFOLU sector was higher than in 2013 at ~9%.

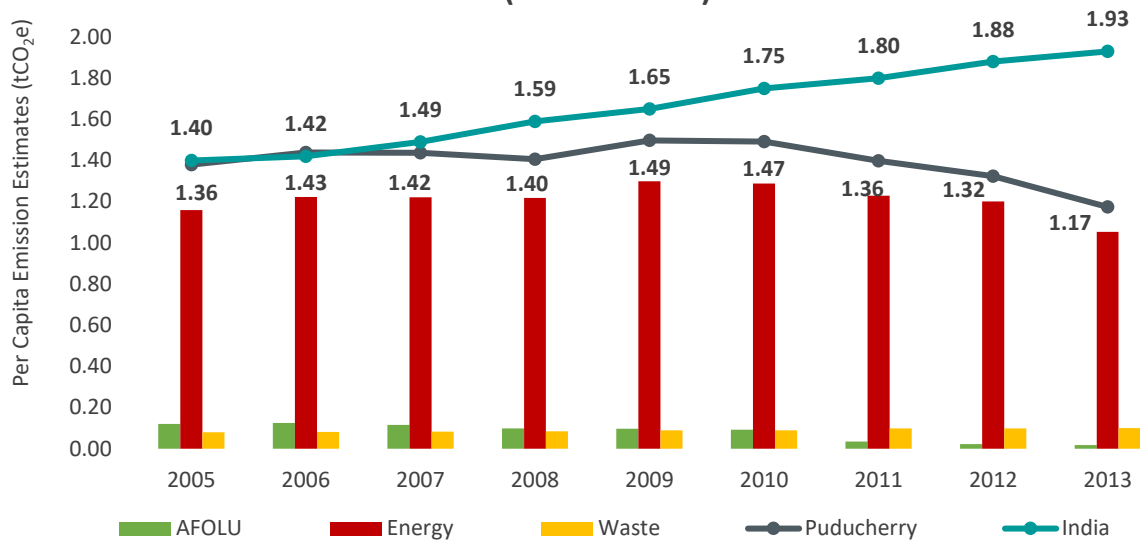
Figure 2: Sector-wise Contribution to Economy-wide GHG Emissions of Puducherry



¹ Compound Annual Growth Rate

² Calendar year values have been considered for this analysis. For Global Warming Potential (GWP) calculations IPCC-ARII values have been considered.

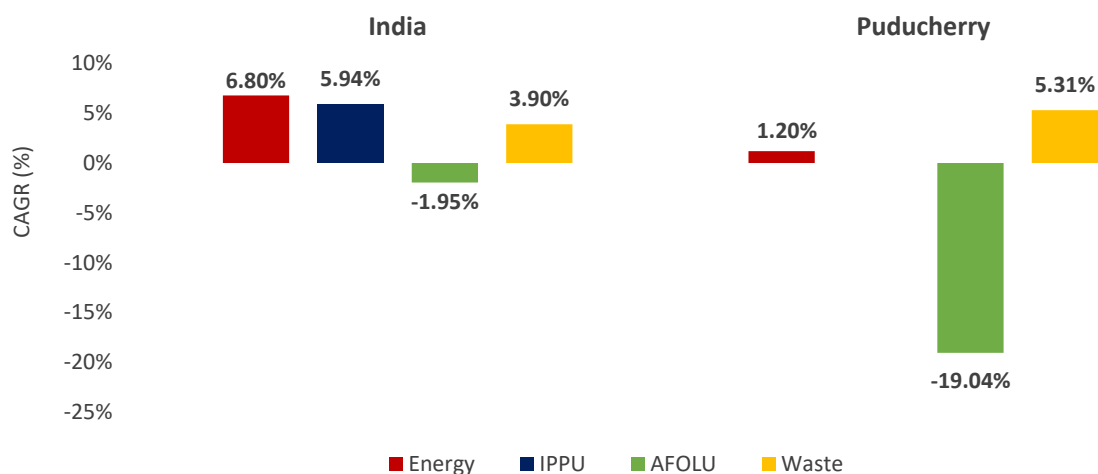
Figure 3: Per Capita GHG Emissions for Puducherry and India (2005 to 2013)



Per capita emissions of Puducherry declined from 1.36 tCO₂e in 2005 to 1.17 tCO₂e in 2013. They peaked in 2009 (1.50 tCO₂e) due to high per capita emissions from the Energy sector and declined subsequently. Though the per capita emissions of India and Puducherry were comparable from 2005 to 2007, the per capita emissions of Puducherry began to decline from 2007 onwards, creating a divergence from the country's per capita emissions. The growth/decline rates of per capita emissions from 2005 to 2013 were 4.07% for India and -2.0% for Puducherry (Figure 3).

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

These growth rates have been compounded annually.



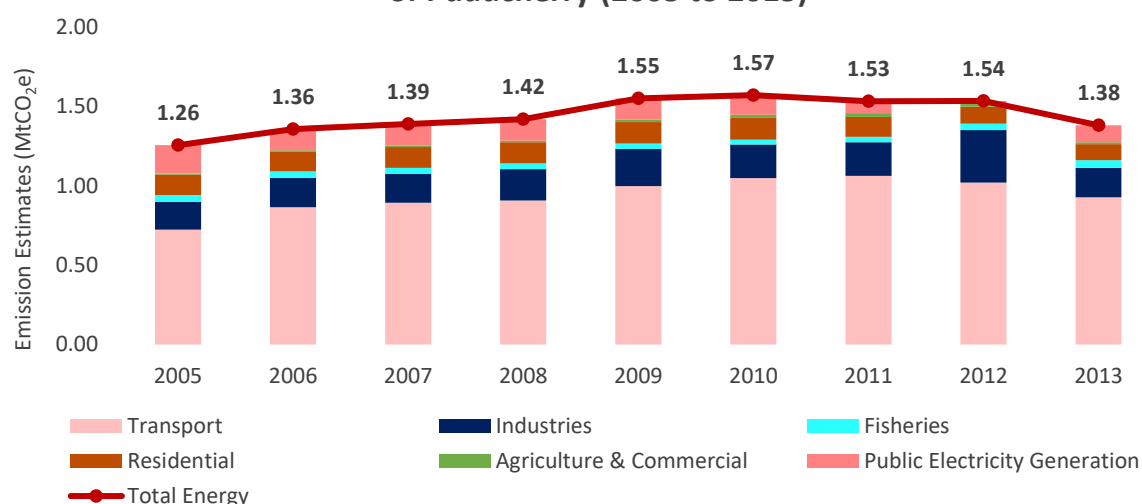
GHG emissions from the Waste sector of Puducherry grew at the highest CAGR of 5.31% from 2005 to 2013 amongst all other sectors (Figure 4). This was followed by the Energy sector which recorded a growth rate of 1.20%, much lower than India's growth of Energy emissions. Notably, emissions from the AFOLU sector declined by 19.04%.



Energy Sector

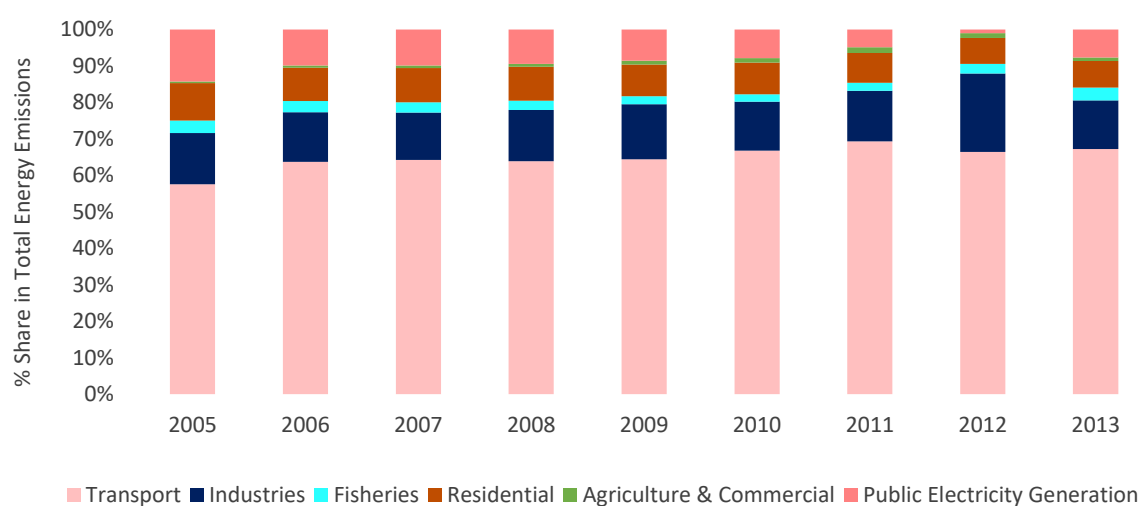
The Energy sector represented nearly 90% of total emissions of Puducherry in 2013. In general, emissions from the Energy sector arise from two main sub-sectors – Fuel Combustion (Public Electricity Generation, Transport, Industries and Agriculture, Commercial and Residential categories) and Fugitive. In Puducherry, emissions were only registered from Fuel Combustion sub-sector. The Energy sector emissions increased at a CAGR of 1.20% from 1.26 MtCO₂e in 2005 to 1.38 MtCO₂e in 2013 with a peak in 2010 and subsequent decline (Figure 5).

Figure 5: GHG Emission Estimates for Energy Sector of Puducherry (2005 to 2013)



Transport was a major category under the Fuel Combustion sub-sector with ~67% contribution in Puducherry's Energy emissions portfolio followed by ~13% contribution from the Industries and ~8% from the Public Electricity Generation category in 2013 (Figure 6). From the Transport category, ~99.9% emissions were from Road Transport alone. Within Public Electricity Generation, ~100% emissions were observed from Natural Gas-based Thermal Power Plants.

Figure 6: Share of GHG Emissions from Energy Sub-sectors (2005 to 2013)

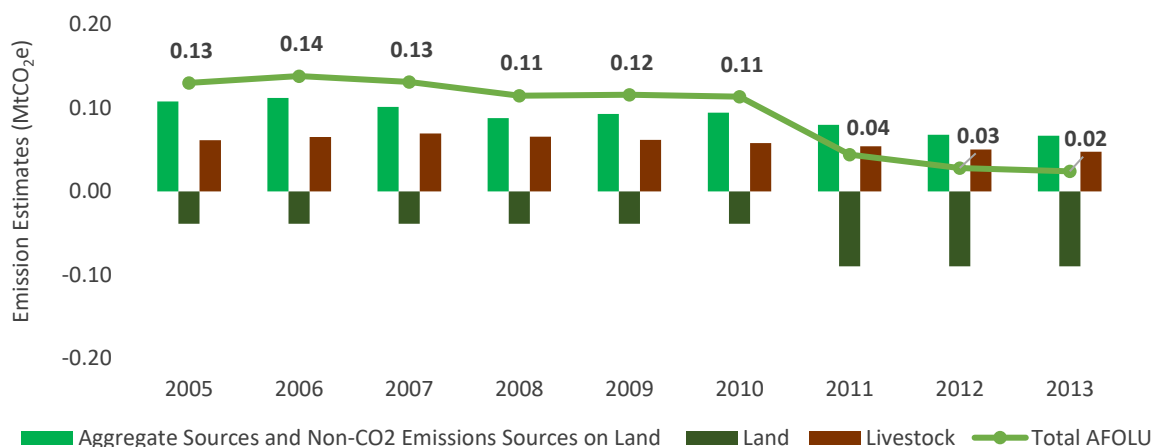




AFOLU Sector

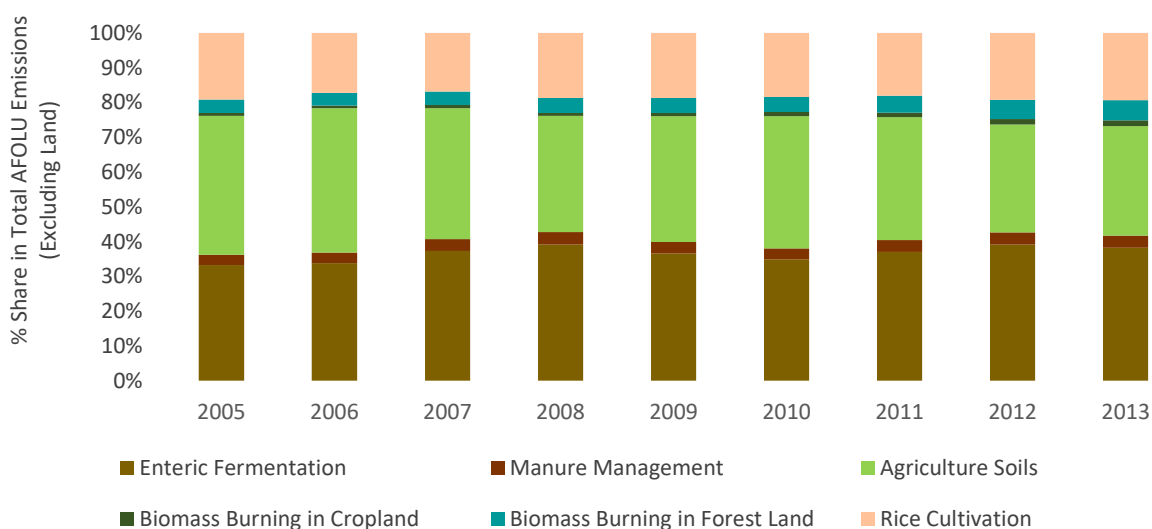
The AFOLU sector represented ~2% of the total emissions of Puducherry in 2013. Emissions/removals from this sector arise from three main sub-sectors namely Livestock, Land and Aggregate Sources and Non-CO₂ Emissions Sources on Land. The emissions decreased at a rate of 19.04% from 0.13 MtCO₂e in 2005 to 0.02 MtCO₂e in 2013 in Puducherry. Notably, the Land sub-sector was a sink across all the years from 2005 to 2013. Markedly, the removals from Land sub-sector increased at a CAGR of 11.02% from 0.04 MtCO₂e in 2005 to 0.09 MtCO₂e in 2013.

Figure 9: GHG Emission Estimates for AFOLU Sector in Puducherry (2005 to 2013)



If only positive emissions were considered, maximum emissions in year 2013 were from Aggregate Sources and Non-CO₂ Emissions Sources on Land. Amongst this sub-sector, Agriculture Soils were the major contributor of emissions. The share of emissions from Agriculture Soils had decreased from ~40% in 2005 to ~32% in 2013 under this sub-sector (Figure 10). Enteric Fermentation (38%) was found to be the second major contributor in 2013. Emissions from Enteric Fermentation remained fairly stable throughout the reference period.

Figure 10: Share of Emissions from AFOLU Categories (Excluding Land) (2005 to 2013)





Waste Sector

The Waste sector contributed ~9% of total emissions of Puducherry in 2013. Municipal Solid Waste³, Domestic Wastewater and Industrial Wastewater are the key sources of GHG emissions in the Waste sector. The Waste sector emitted 0.087 MtCO₂e in 2005 which increased to 0.131 MtCO₂e in 2013. GHG emissions from Waste grew at a CAGR of 5.31% from 2005 to 2013 (Figure 11). 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.

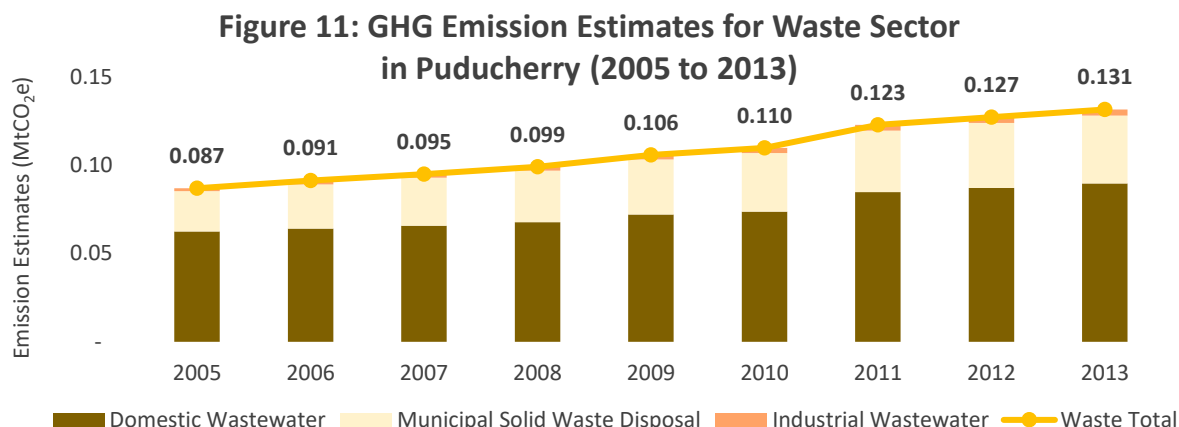
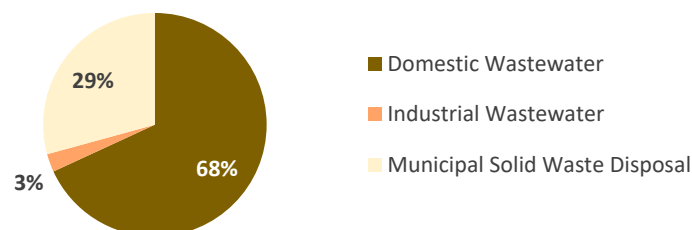
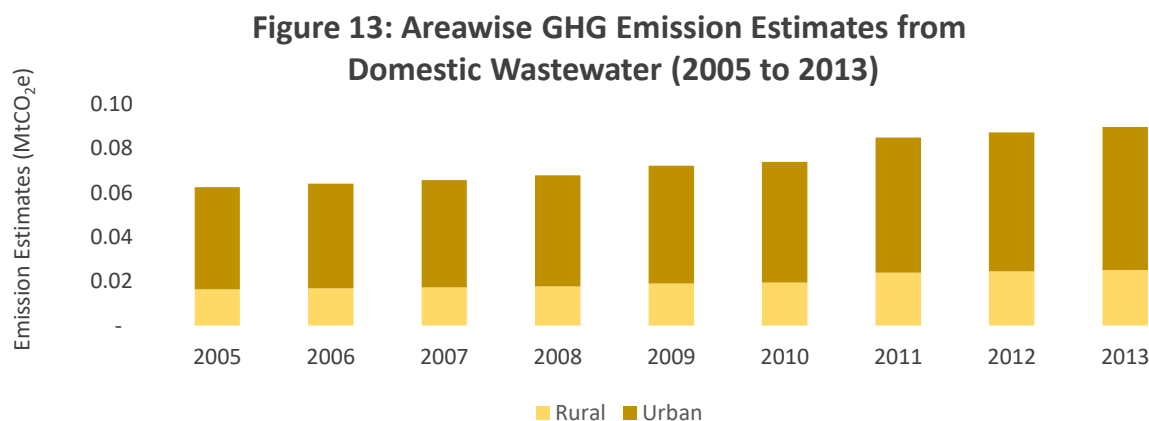


Figure 12: Category-wise Share of GHG Emissions for Waste Sector in 2013



Maximum Waste sector emissions (~68%) in Puducherry emanated from Domestic Wastewater of the rural and urban areas of Puducherry and rose at a CAGR of 4.6% from 0.06 MtCO₂e in 2005 to 0.09 MtCO₂e in 2013. Almost 72% Domestic Wastewater emissions emanated from urban areas of Puducherry in 2013. Discharge of untreated wastewater and use of septic tanks are key drivers of emissions in this sub-sector.

Municipal Solid Waste Disposal contributed to the remaining 29% of emissions in 2013. Changing Solid Waste Composition resulted in an increase in the GHG emissions generated from every tonne of Solid Waste Disposed over the years in Puducherry and emissions from this category had increased at 6.72% (CAGR) from 0.02 MtCO₂e in 2005 to 0.04 MtCO₂e in 2013. Remaining 3% emissions were recorded from the Industrial Wastewater sector in Puducherry (Figure 12).



³ 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 CH₄ emissions'



IPPU Sector

Due to insignificant industrial activity within Puducherry, no IPPU emissions were observed during the reference period.



The 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, IPPU, AFOLU and Waste.

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.

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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.

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Secretariat Contact

Vasudha Foundation, CISRS House, 14 Jangpura B,
Mathura Road, New Delhi - 110014, India
Phone No. - 011-24372680