

Trend Analysis of GHG Emissions in DELHI

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*



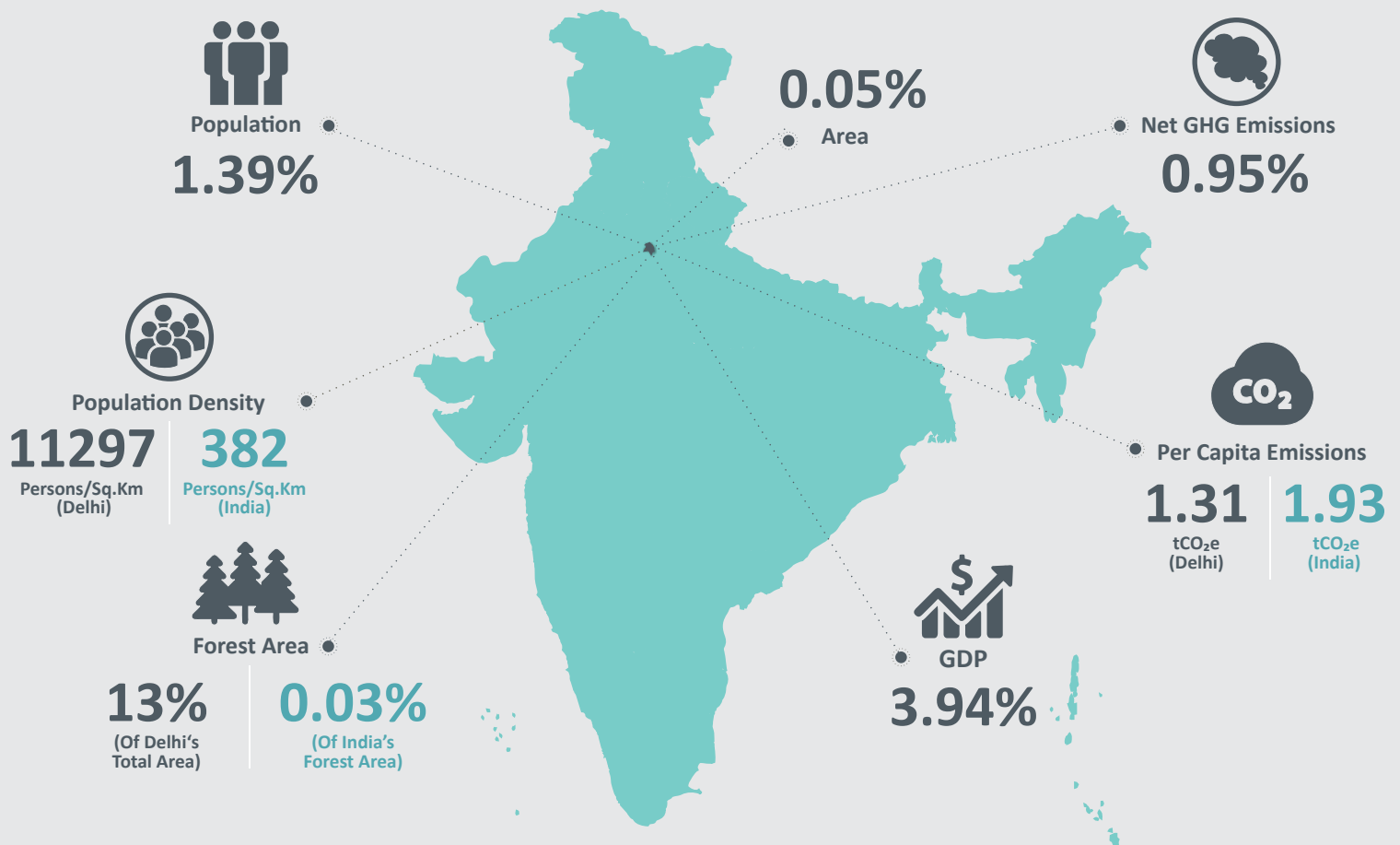
AFOLU



WASTE

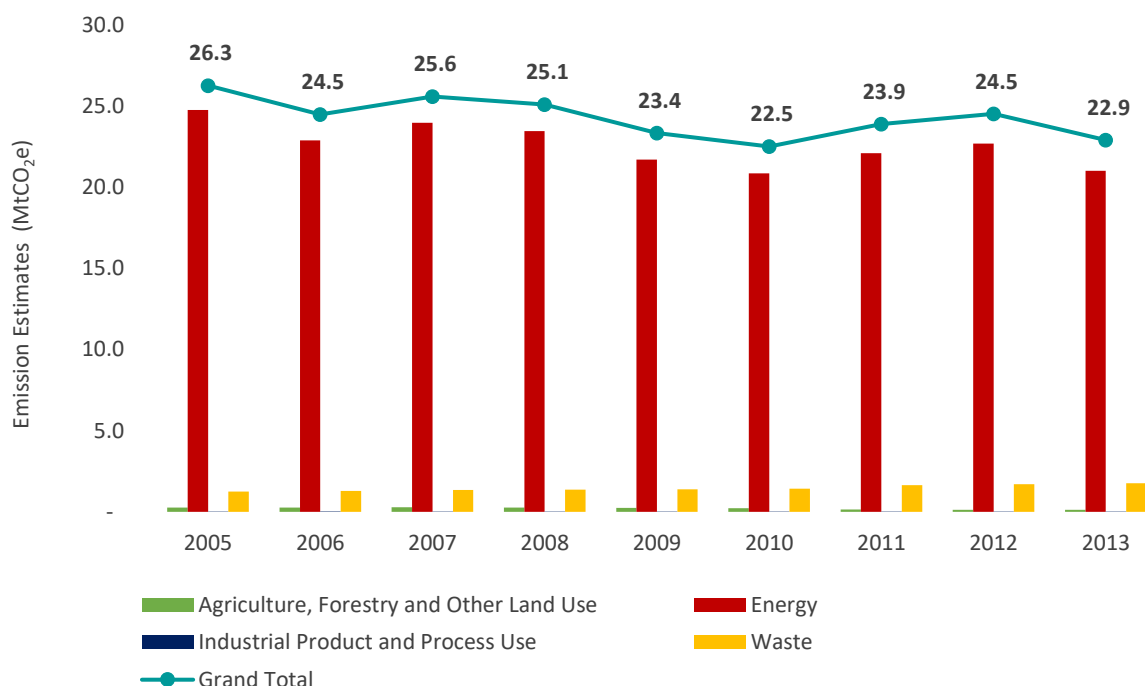
*Fuel combusted for Captive Electricity Generation (Auto-Producers) has been reported under Energy sector.

Delhi at a glance (2013)



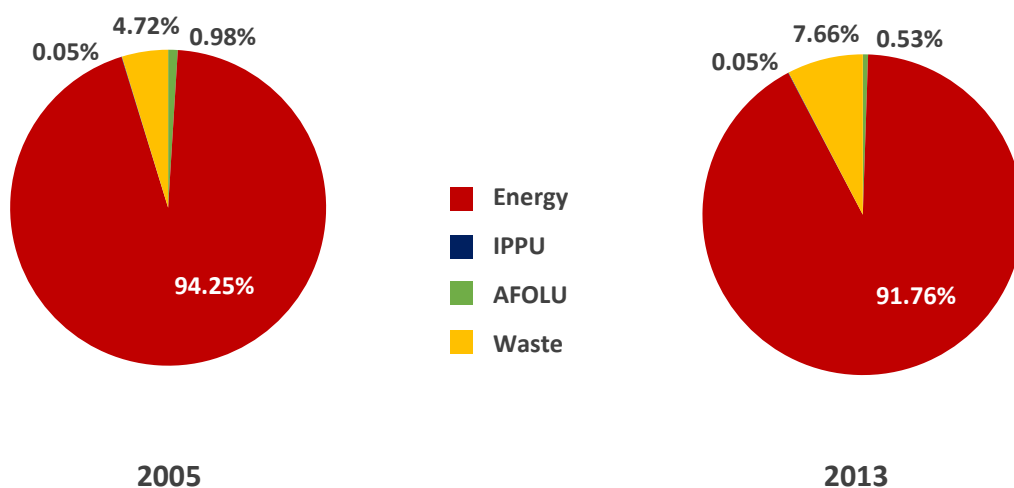
Economy-wide Emission Estimates

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



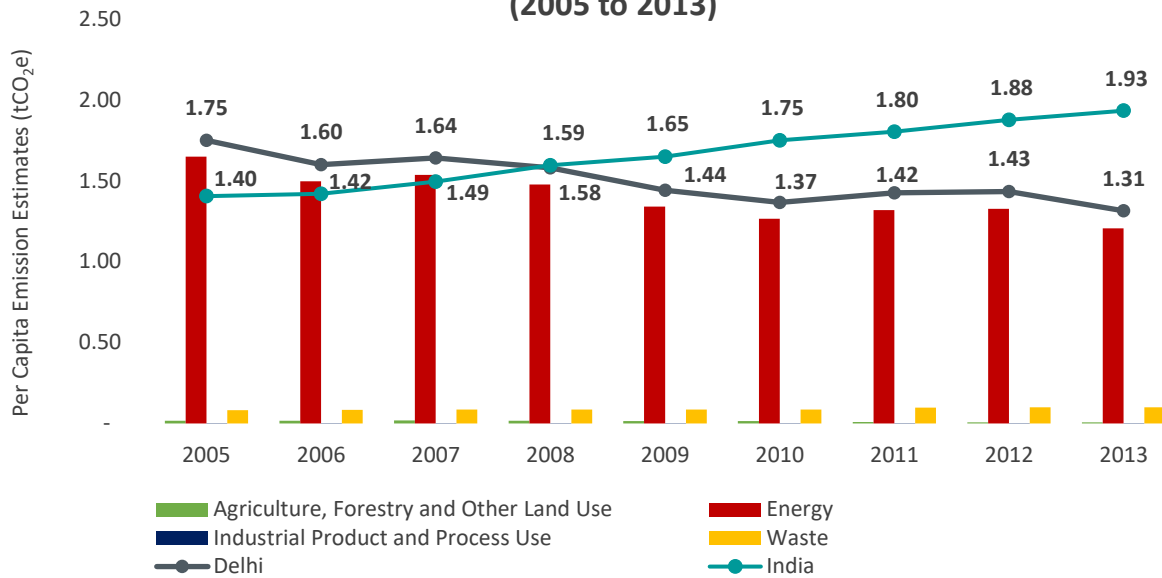
Emissions from Delhi declined at a rate of 1.70% (compounded annually) from 26.3 MtCO₂e in 2005 to 22.9 MtCO₂e in 2013¹ as depicted in Figure 1 above. The Energy sector had the major share of emissions with 91.76% contribution to the total emissions of Delhi in 2013. The remaining emissions emanated from Waste (7.66%) and AFOLU sectors (0.53%) respectively in 2013. When compared to 2005 emissions, the share of the Energy sector was 94.25%, higher than in 2013, while the share of the Waste sector was lower than in 2013 at 4.72% (Figure 2). Notably, the IPPU sector had a very minute share (0.05%) in both 2005 and 2013.

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



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

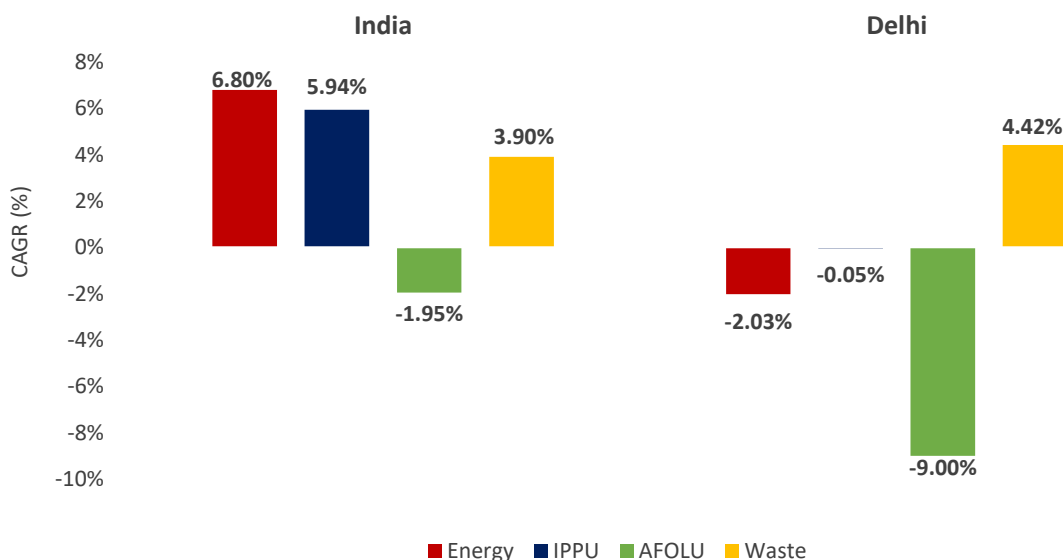
Figure 3: Per Capita GHG Emissions for Delhi and India (2005 to 2013)



Delhi’s per capita emissions declined from 1.75 tCO₂e in 2005 to 1.31 tCO₂e in 2013. When compared to India, per capita emissions of Delhi were higher than that of the country until 2008, when they intersected with India’s per capita emissions. But, from 2009 onwards, the per capita emissions of Delhi were much lower than that of the country and remained low till 2013 as illustrated in Figure 3 above. The per capita emissions of Delhi declined at a rate of 3.52% (compounded annually) while that of India grew at a CAGR² of 4.07% from 2005 to 2013.

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 Delhi observed the highest growth of 4.42% from 2005 to 2013 amongst all other sectors (Figure 4). The other sectors observed a decline in emissions. Maximum reduction was observed by the AFOLU sector wherein the emissions declined by 9%, much higher than India’s rate of decline for AFOLU emissions (1.95%). This was followed by the Energy sector which recorded a decrease of 2.03%. The rate of decline of IPPU emissions was very low (0.05%).

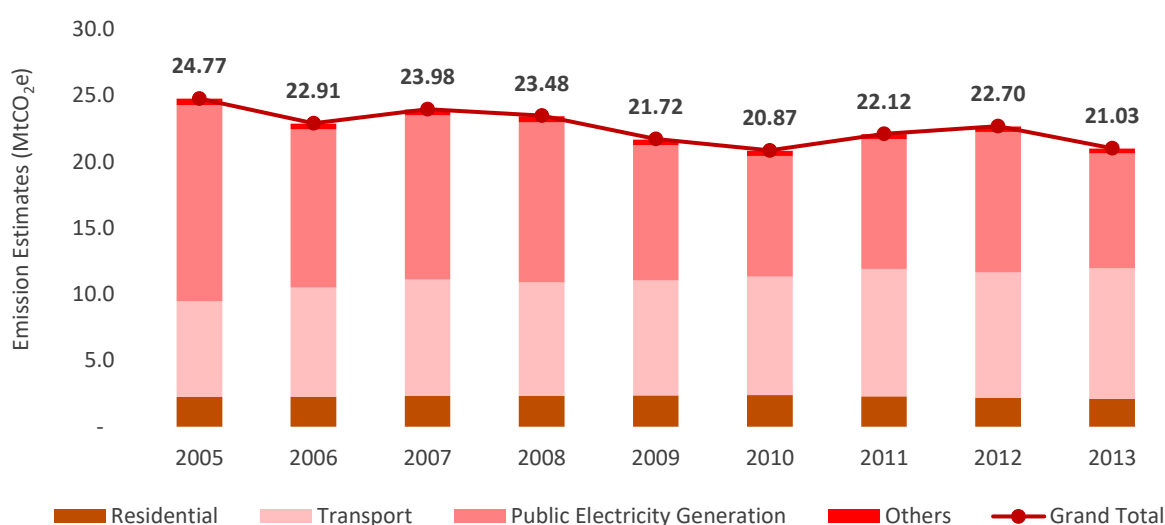
² Compound Annual Growth Rate



Energy Sector

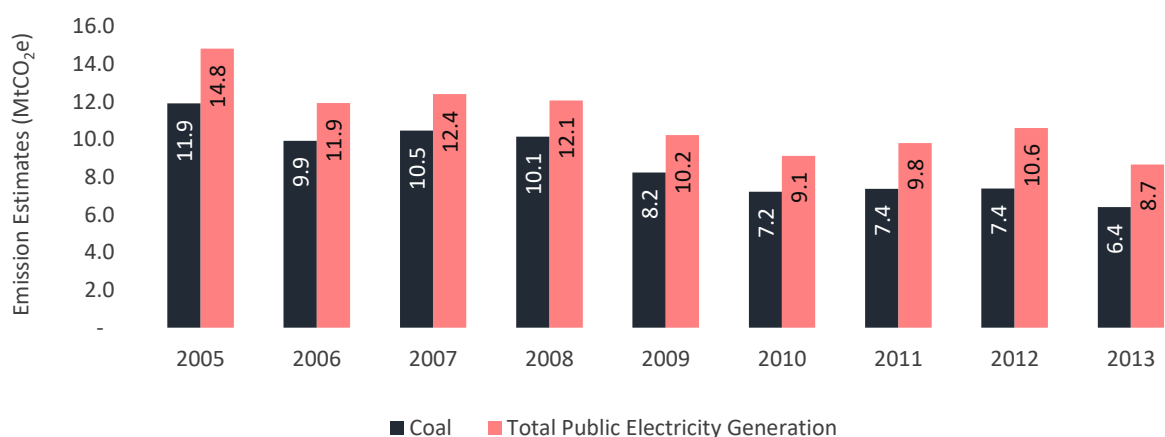
The Energy sector represented ~92% of the total emissions of Delhi in 2013. Emissions from this sector declined at rate of 2.03% (compounded annually) from 24.77 MtCO₂e in 2005 to 21.03 MtCO₂e in 2013 as depicted in Figure 5 below. In general, emissions of the Energy sector arise from two main sub-sectors – Fuel Combustion (Public Electricity Generation, Transport, Industries and Agriculture, Commercial and Residential categories) and Fugitive. But, in Delhi all the emissions were due to Combustion of Fuels and no Fugitive emissions were observed during all the years in consideration.

Figure 5: GHG Emission Estimates for Energy Sector in Delhi (2005 to 2013)



Public Electricity Generation and Transport were the two major contributors of GHG emissions in this sector. Within the Public Electricity Generation category, maximum emissions arose from the burning of Coal in the Thermal Power Plants. However, these emissions declined at a rate of 7.48% (compounded annually) from 11.9 MtCO₂e in 2005 to 6.4 MtCO₂e in 2013 as depicted in Figure 6 below. This was mainly because bulk of the increase in electricity demand was met through imports from the grid during the reference years, while production from Power Plants located within Delhi either stagnated or declined.

Figure 6: GHG Emission Estimates from Coal-based Power Generation (2005 to 2013)

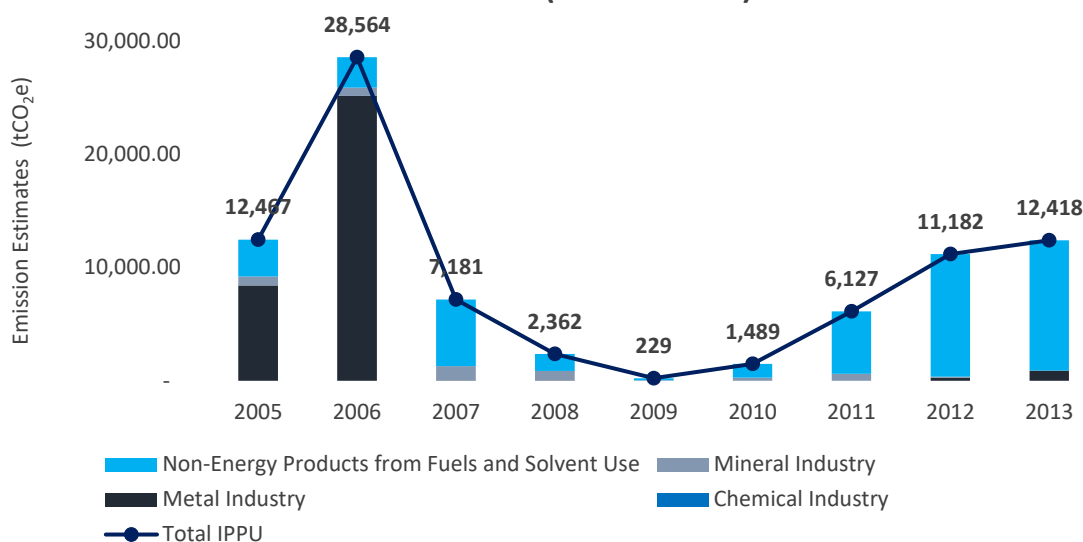




IPPU Sector

Although negligible IPPU emissions were observed from Delhi during the reference period, the estimates were found to be highly inconsistent. Between 2005 and 2013, the overall IPPU emissions declined at a rate of 0.05% (compounded annually) from 12467 tCO₂e in 2005 to 12418 tCO₂e in 2013³ (Figure 7).

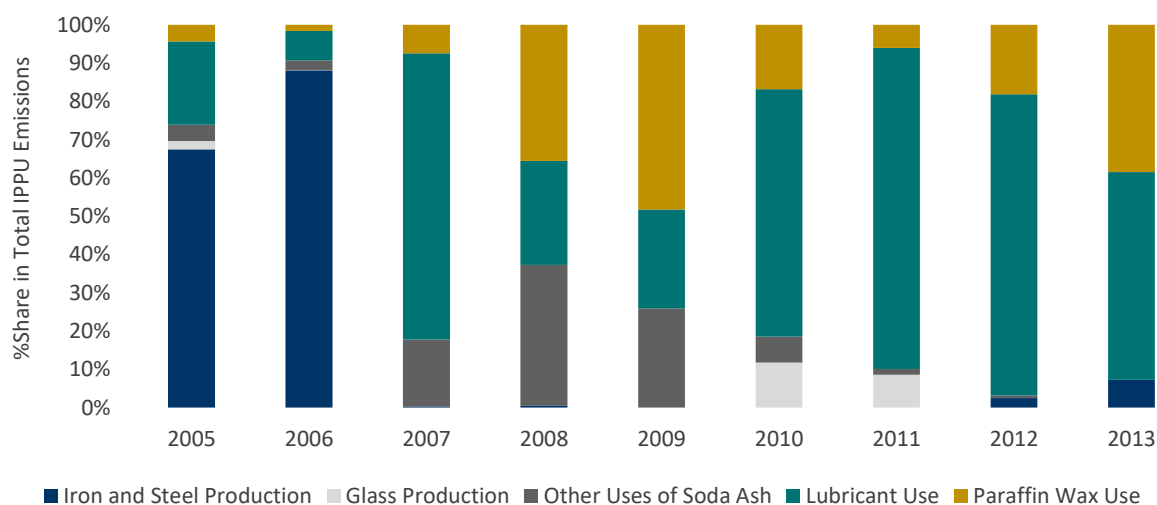
Figure 7: GHG Emission Estimates for IPPU sector in Delhi (2005 to 2013)



Deep diving into the various IPPU categories, it was observed that Iron and Steel Industries was the major contributor of emissions in the initial years (2005 and 2006). However, during the following years the sectoral emissions do not show any particular trend. In 2007, largest share of emissions was contributed by the usage of lubricants, in 2008 the largest share was contributed by use of soda ash as so on.

But, since 2010, share of emissions due to the usage of Lubricants became dominant again and remained the major contributor till 2013 as illustrated in Figure 8 below.

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



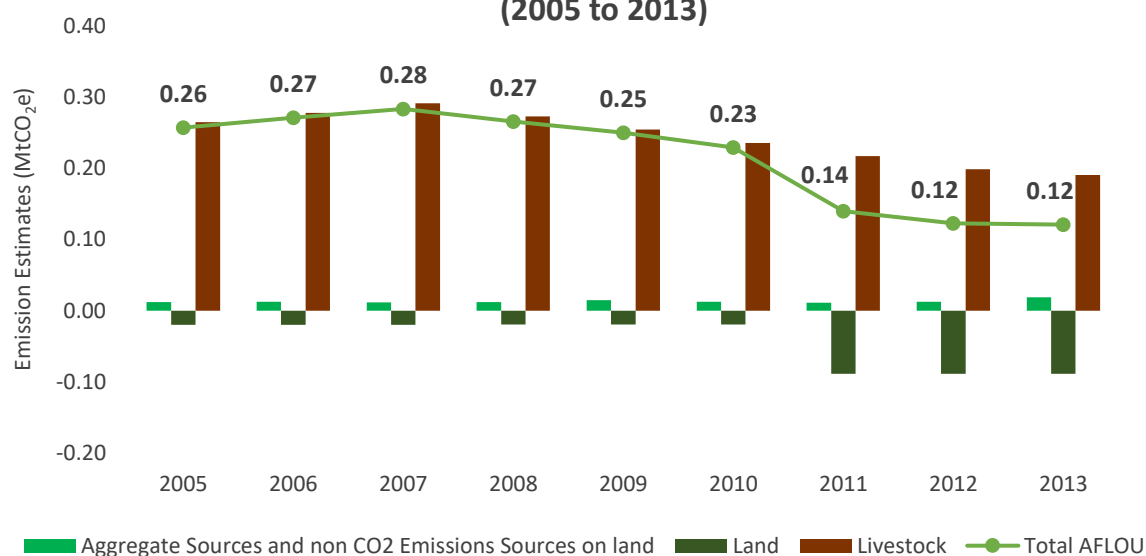
³ Emissions from IPPU sector are represented in tCO₂e instead of MtCO₂e due to low intensity of emissions from this sector in Delhi.



AFOLU Sector

The AFOLU sector represented ~1% of the total emissions of Delhi in 2013. Emissions from the AFOLU sector arise from three main sub-sectors namely Livestock, Land and Aggregate Sources and Non-CO₂ Emissions Sources on Land. Emissions from this sector declined at a rate of 9% (compounded annually) from 0.26 MtCO₂e in 2005 to 0.12 MtCO₂e in 2013 as shown in Figure 9 below. Maximum emissions in this sector were due to the Livestock sub-sector which declined at an estimated rate of 4.02% (compounded annually) from 0.26 MtCO₂e in 2005 to 0.19 MtCO₂e in 2013. A dip was observed from 2011 onwards, owing to the increased removals from the Land sub-sector between 2011 to 2013, thus lowering the overall emissions of the AFOLU sector.

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



On further investigation of the AFOLU sub-sectors it was found that maximum emissions occurred due to Livestock, mainly Enteric Fermentation across all the reference years. Notably, the share of Enteric Fermentation reduced from ~86% in 2005 to ~79% in 2013 as depicted below in Figure 10. Manure Management and other activities contributed significantly to the GHG emissions of the AFOLU sector during the reference period (Figure 10).

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





Waste Sector

Waste sector contributed to ~8% of the total emissions of Delhi in 2013. Municipal Solid Waste⁴, Domestic Wastewater and Industrial Wastewater are the key sources of GHG emissions in the Waste sector. GHG emissions from the Waste sector grew at an estimated CAGR of 4.42% from 1.24 MtCO₂e in 2005 to 1.76 MtCO₂e in 2013 as depicted in Figure 11 below.

Figure 11: GHG Emission Estimates for Waste Sector in Delhi (2005 to 2013)

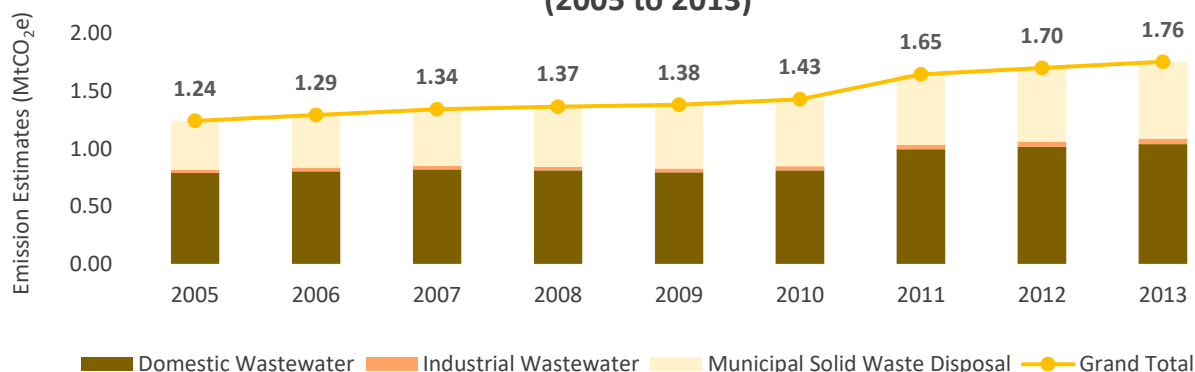
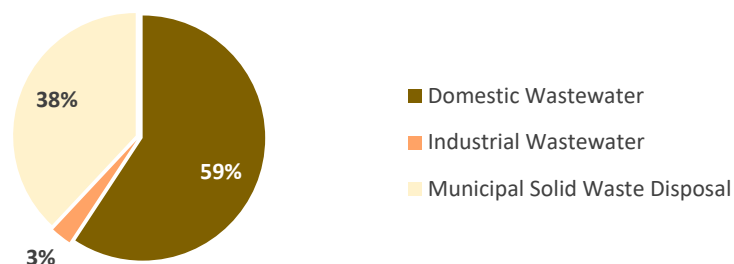
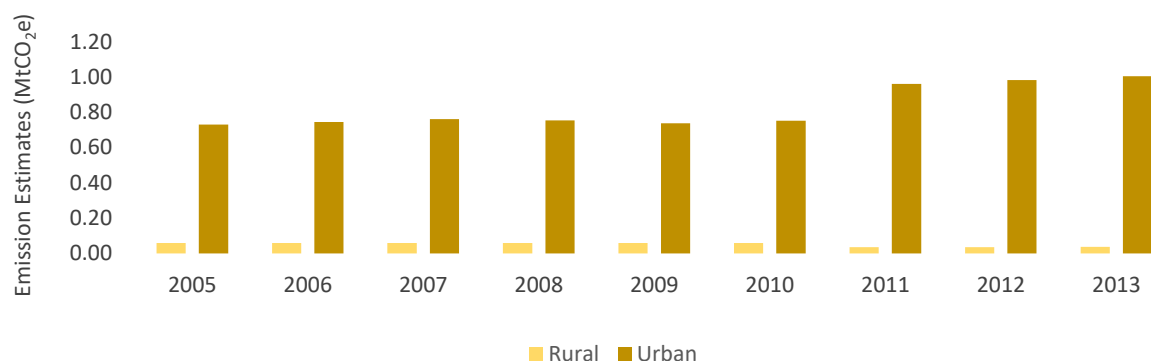


Figure 12: Category-wise Share of GHG Emissions for Waste Sector (in 2013)



Domestic Wastewater had a share of ~59% in the total emissions from the Waste sector of Delhi in 2013. Emissions of Domestic Wastewater increased at a CAGR of 3.52% from 0.79 MtCO₂e in 2005 to 1.04 MtCO₂e in 2013 in Delhi. In 2013, ~96% of the emissions from Domestic Wastewater were from the urban areas of Delhi.

Figure 13: Area-wise GHG Emission Estimates for Domestic Wastewater (2005 to 2013)



In 2013, ~38% of the total emissions of the Waste sector were due to Municipal Solid Waste. Emissions from this category grew at a CAGR of 5.82% from 0.42 MtCO₂e in 2005 to 0.67 MtCO₂e in 2013. Approximately 3% of the total emissions of the Waste sector were due to Industrial Wastewater in 2013. The emissions from this sub-sector grew at a rate of 6.54% (compounded annually) from 0.03 MtCO₂e in 2005 to 0.05 MtCO₂e in 2013.

⁴ 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'



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



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