

# Trend Analysis of GHG Emissions of 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.

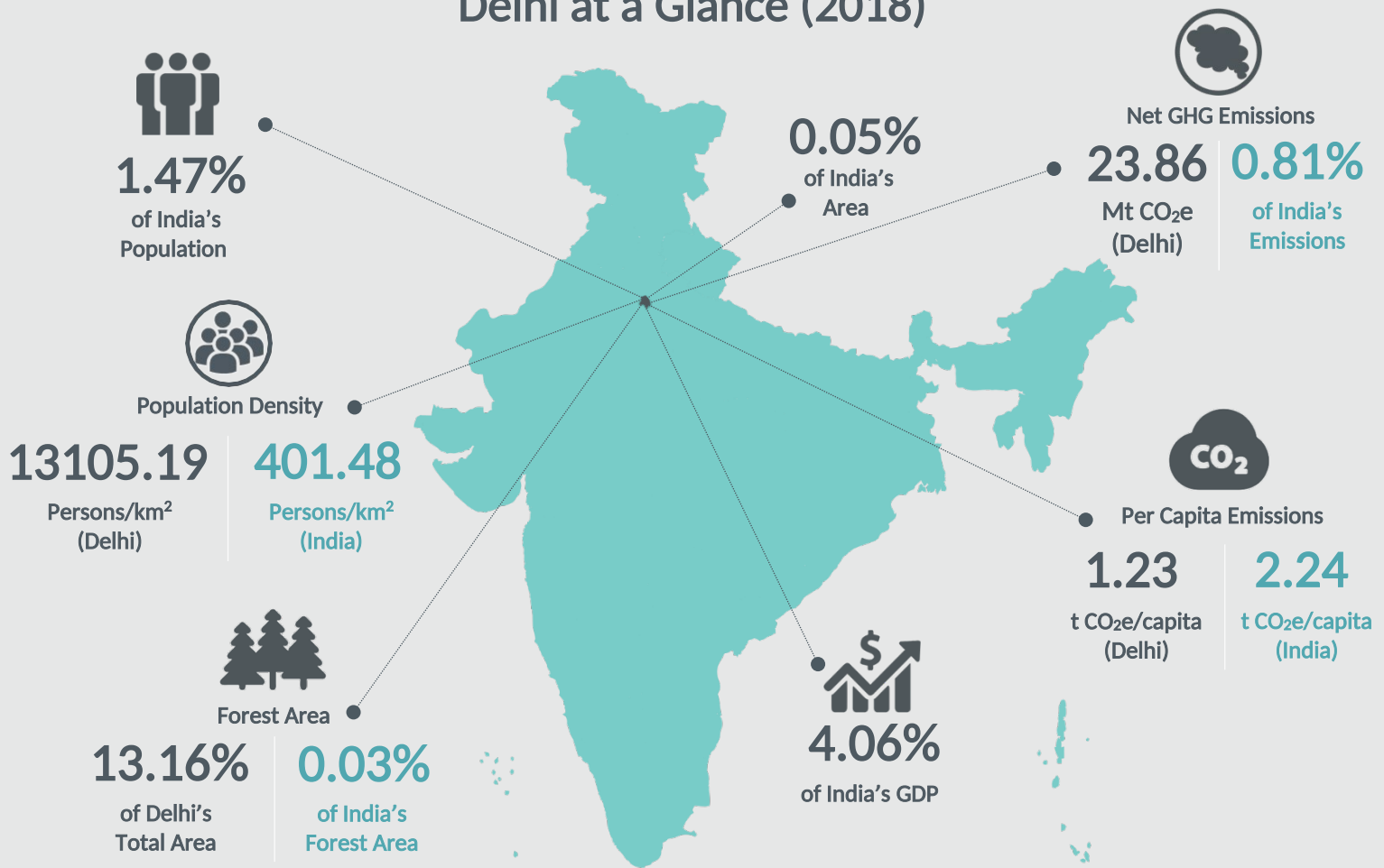
The Platform aims to add value to the various ongoing GHG emissions estimation efforts by addressing existing data gaps and data accessibility issues, broadening the scope of national inventories to include state inventories, and increasing the volume of analytics and policy dialogue on India's GHG emissions sources, profile, and related policies.

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



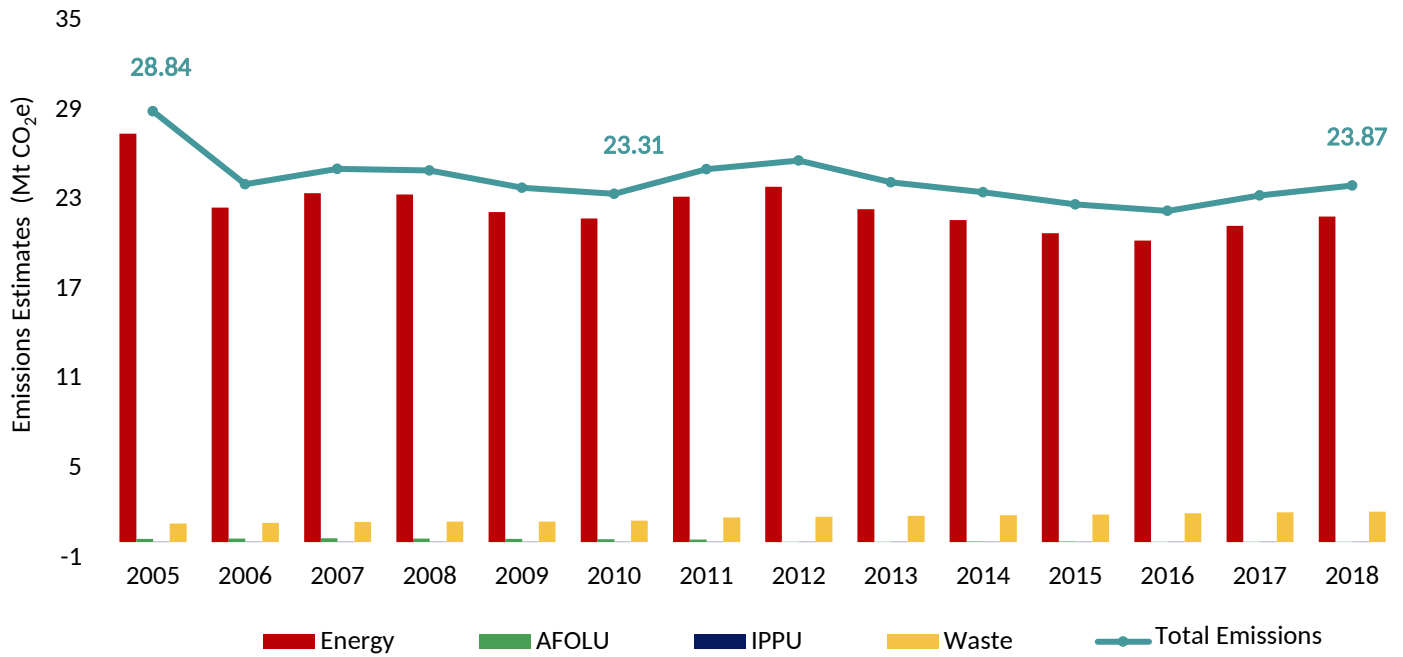
\* Fuel combusted for captive electricity generation (auto-producers) and direct fuel combustion (industrial energy) has been reported under Energy sector.

## Delhi at a Glance (2018)



# Economy-wide Emissions Estimates

Figure 1: GHG Emissions Estimates of Delhi (2005 to 2018)



Delhi's Emissions decreased at a rate of 2.12% (compounded annually) from 28.84 Mt CO<sub>2</sub>e in 2005 to 23.87 Mt CO<sub>2</sub>e in 2018. Decline in the overall emissions can be attributed to reduction in emissions from the Energy sector (see Figure 1). In 2005, the share of Energy sector in the total economy-wide emissions of Delhi was ~95%, while the Agriculture, Forestry and Other Land Use (AFOLU) and Waste sectors accounted for ~1% and ~4%, respectively. As can be seen in Figure 2, in 2018, the share of emissions from Energy sector had decreased to ~91% while that of the Waste sector increased to ~9%. Across the reference period, the contribution of emissions from the Industrial Processes and Product Use (IPPU) sector has been negligible.

Figure 2: Sector-wise Contribution (Mt CO<sub>2</sub>e) and Percentage Share in Total Economy-wide GHG Emissions of Delhi

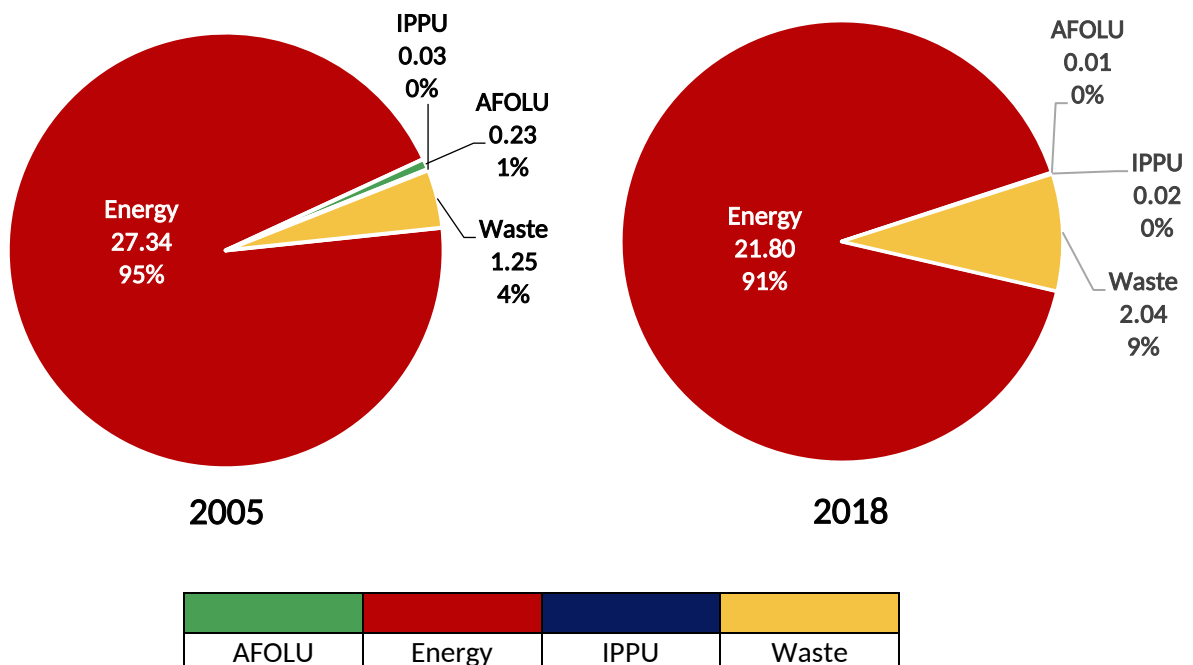
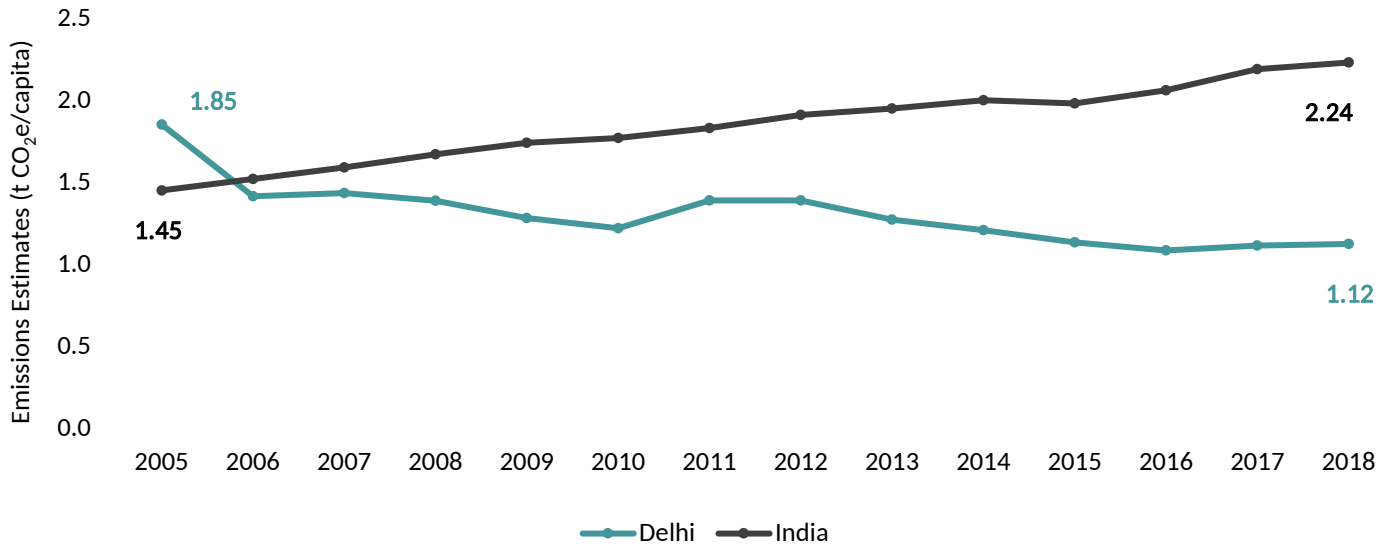


Figure 3: Per Capita GHG Emissions of Delhi and India (2005 to 2018)



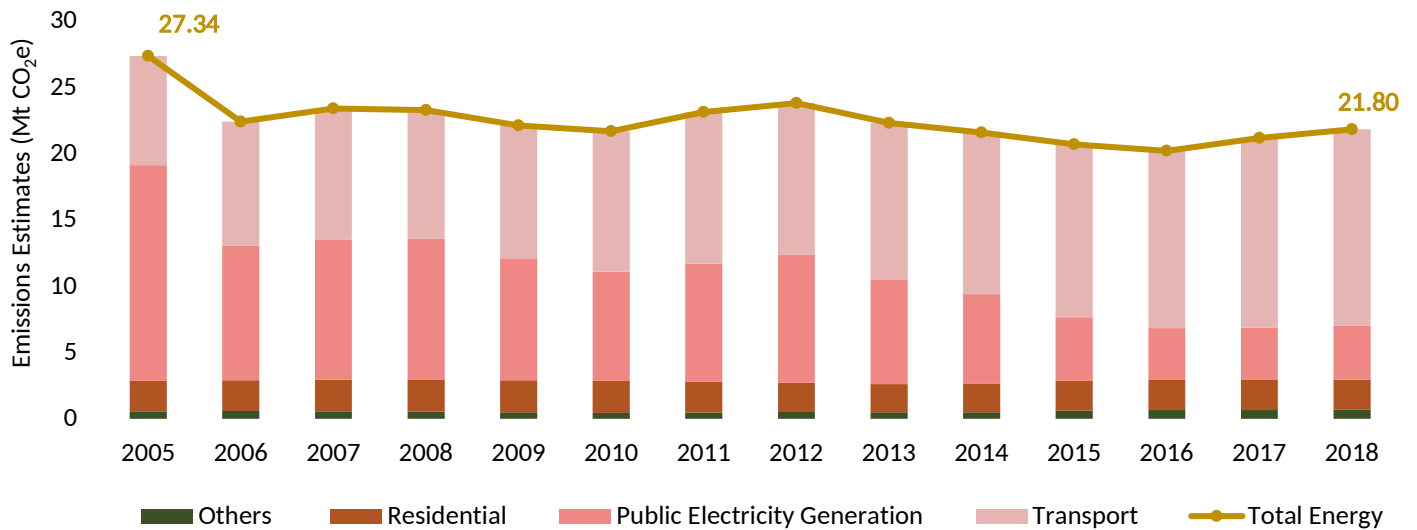
As seen in Figure 3, the per capita emissions of Delhi were lower than the per capita emissions of India between 2006 to 2018. However, in 2005 the per capita emission of Delhi was higher than that of India. In Delhi, per capita emissions decreased at a compounded rate of 3.78% from 1.85 t CO<sub>2</sub>e per capita in 2005 to 1.12 t CO<sub>2</sub>e per capita in 2018, whereas India's per capita emissions increased at a rate of ~3.41% (compounded annually).

# Energy Sector



The Energy sector emissions comprise of emissions from Fuel Combustion and Fugitive Emissions. Fuel Combustion includes emissions from Public Electricity Generation, Transport, Captive Power Plants, Industries, Agriculture, Commercial, and Residential categories. Fugitive Emissions are due to Fuel Production. The Energy sector of Delhi accounted for ~91% of the total economy-wide emissions in 2018. Emissions from the Energy sector decreased at rate of 1.73% (compounded annually) from 27.34 Mt CO<sub>2</sub>e in 2005 to 21.80 Mt CO<sub>2</sub>e in 2018 as shown in Figure 4.

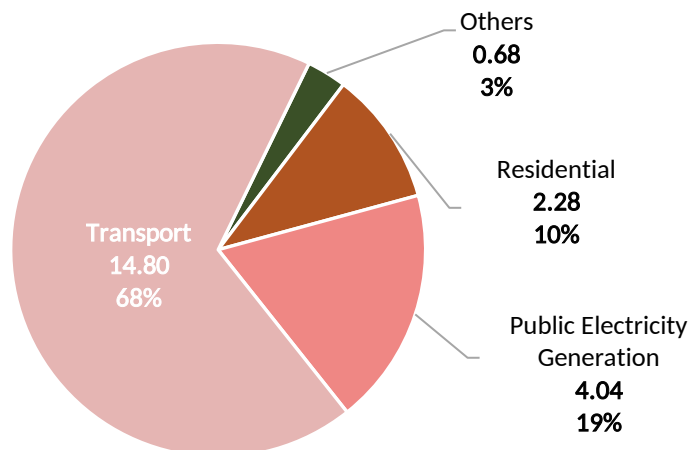
**Figure 4: GHG Emissions Estimates of Energy Sector - Delhi (2005 to 2018)**



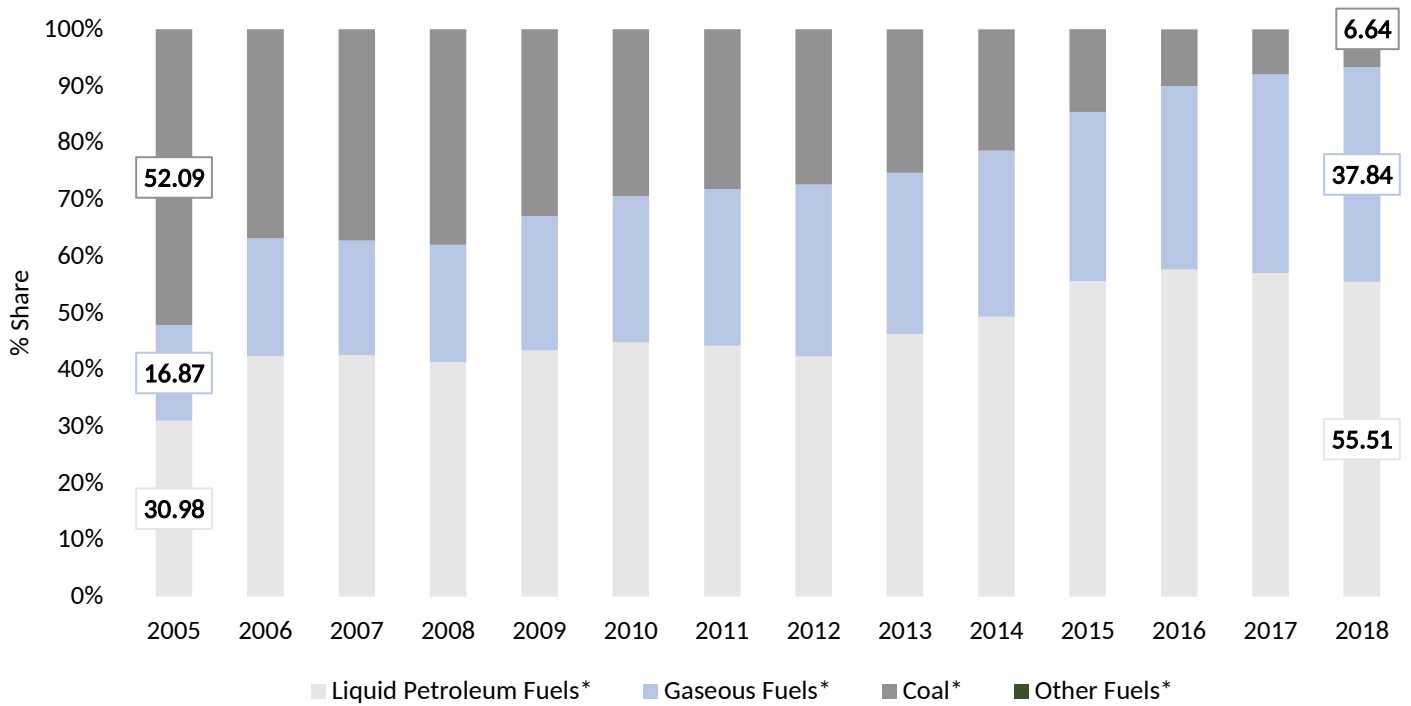
Within the Energy sector, Transport category was the major contributor of GHG emissions with a share of ~68% of the total Energy emissions in 2018. This was followed by Public Electricity Generation and Residential categories at 19% and 10%, respectively (see Figure 5).

Within Fuel Combustion sub-sector, emissions from Liquid Petroleum Fuels were the major contributor with an average share of ~47%, across the reference period (see Figure 6). This was followed by emissions from combustion of Gaseous Fuels with an average share of ~27% between 2005 and 2018. Coal had the major share of ~53% in 2005 but decreased to ~6% in 2018, while Other Fuels contributed less than ~1% to the Fuel Combustion emissions throughout the reference period.

**Figure 5: Category-wise Emissions (Mt CO<sub>2</sub>e) and Percentage Share in Total Energy Sector Emissions (2018)**



**Figure 6: Percentage Share of GHG Emissions by Fuel Type due to Fuel Combustion in Energy Sector (2005 to 2018)**



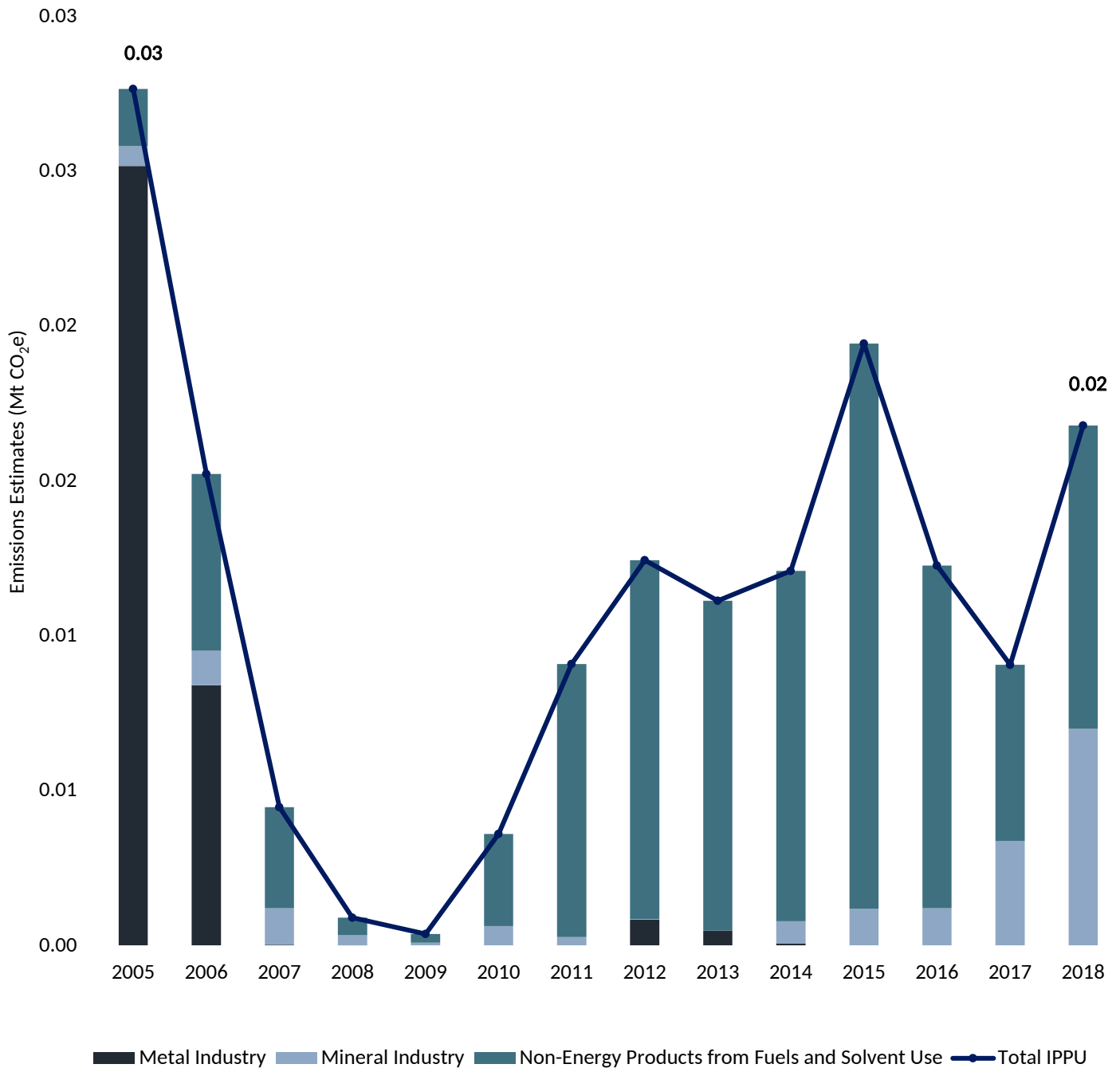
**\*Notes**

1. Coke is considered in coal because the bifurcation of pet-coke and coke was not available.
2. Gaseous Petroleum Fuels- Natural Gas, LPG and other gaseous fuels
3. Liquid Petroleum Fuels- ATF, Diesel, Kerosene, Motor spirit and other liquid fuels
4. Other Fuels comprise of Firewood and Charcoal



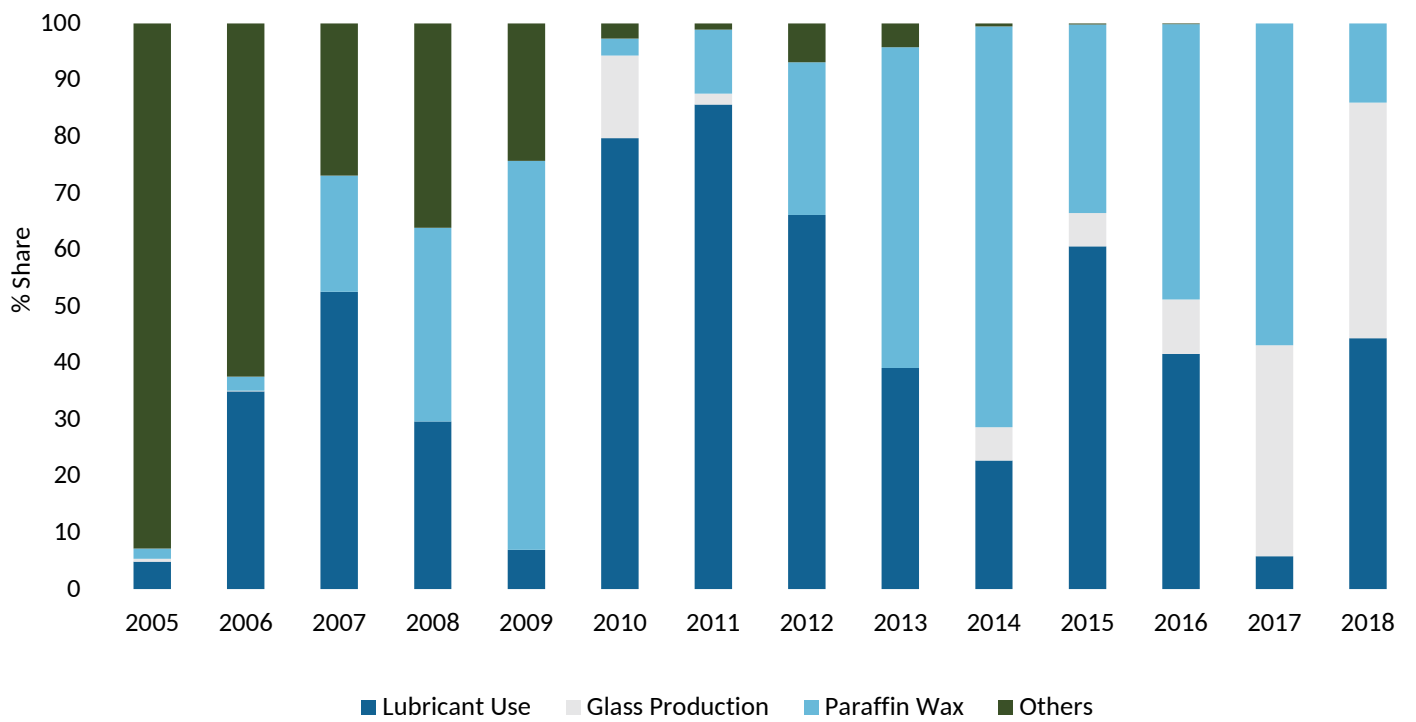
Emissions from the Industrial Processes and Product Use (IPPU) sector are largely driven by Chemical, Metal, Mineral Industries and Non-Energy Products from Fuels and Solvent Use. In Delhi, the IPPU sector had negligible contribution to the overall GHG emissions in 2018. Between 2005 and 2018, the overall IPPU emissions decreased at a compounded rate of 3.77% from 0.03 Mt CO<sub>2</sub>e in 2005 to 0.02 Mt CO<sub>2</sub>e in 2018. Emissions from Mineral Industry increased at a CAGR of 20.25% from 2005 to 2018 (see Figure 7). Peaks observed post 2011 were due to emissions from Non-Energy Products from Fuels and Solvent Use sub-sector owing to increase in emissions from Lubricant Use category.

**Figure 7: GHG Emissions Estimates of IPPU Sector - Delhi (2005 to 2018)**



A detailed trend of the GHG emissions by various IPPU categories is depicted in Figure 8. The Lubricant Use category, a key contributor to the IPPU emissions, alone accounted for ~44% share in overall IPPU sector emissions, followed by Glass Production (41%) and Paraffin Wax (~14%) in 2018.

Figure 8: Percentage Share of GHG Emissions from IPPU Categories (2005 to 2018)

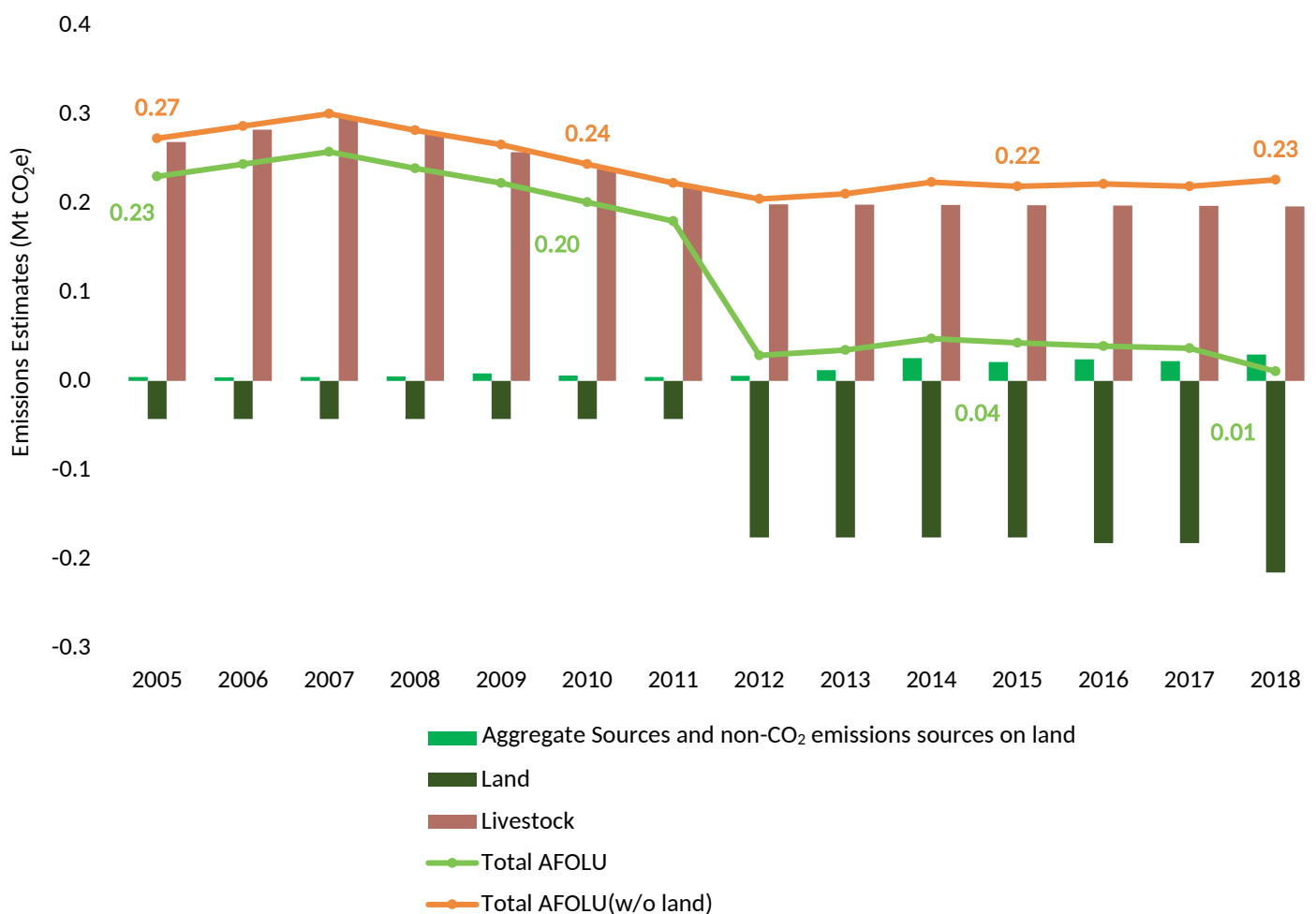




Emissions from the Agriculture, Forestry and Other Land Use (AFOLU) sector arise from three main sub-sectors, namely Livestock, Land and Aggregate Sources and Non-CO<sub>2</sub> Emissions Sources on Land\*. In Delhi, while the Livestock and Aggregate Sources and Non-CO<sub>2</sub> Emissions Sources on Land sub-sectors were net GHG emitters, the Land sub-sector was a sink across all the reference years. The sink from the Land sub-sector increased significantly after 2012 due to increase in sink from Land Use and Land-Use Change practices. The total emissions of AFOLU sector declined at a rate of 27.27% (compounded annually), from 0.23 Mt CO<sub>2</sub>e in 2005 to 0.01 Mt CO<sub>2</sub>e in 2018.

The average annual removals from the Land sub-sector in Delhi during the reference period were 0.11 Mt CO<sub>2</sub>e, around ~47% of the average annual gross AFOLU emissions (excluding Land sub-sector).

**Figure 9: GHG Emissions Estimates of AFOLU Sector - Delhi (2005 to 2018)**



The Livestock sub-sector had the maximum share of ~86% in the gross AFOLU emissions (excluding Land sub-sector) of Delhi in the year 2018. Within the Livestock sub-sector, Enteric Fermentation was the major contributor of emissions across the reference period with an average share of ~84% in the gross AFOLU emissions. However, the contribution of emissions from this category declined at a rate of 1.15% (compounded annually) from 0.24 Mt CO<sub>2</sub>e in 2005 to 0.17 Mt CO<sub>2</sub>e in 2018.

Within the Aggregate Sources sub-sector, the contribution to gross AFOLU emissions from Agriculture Soils increased from ~0.1% in 2005 to ~12% in 2018. The contribution to gross AFOLU emissions from Rice Cultivation almost remained constant throughout the reference period (~1%) as illustrated in Figures 10 and 11.

\* The sub-sector called 'Aggregate Sources and Non-CO<sub>2</sub> Emissions Sources on Land' includes emissions from Rice Cultivation, Agriculture Soils, and Biomass Burning in Cropland and Forestland.



Figure 10: Category-wise Emissions (Mt CO<sub>2</sub>e) and Percentage Share in Gross AFOLU Emissions (excluding Land sub-sector) (2018)

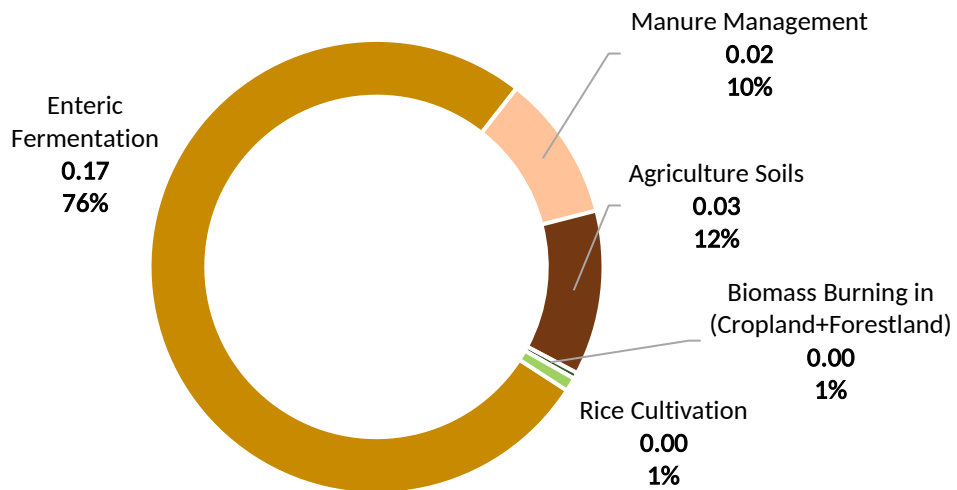
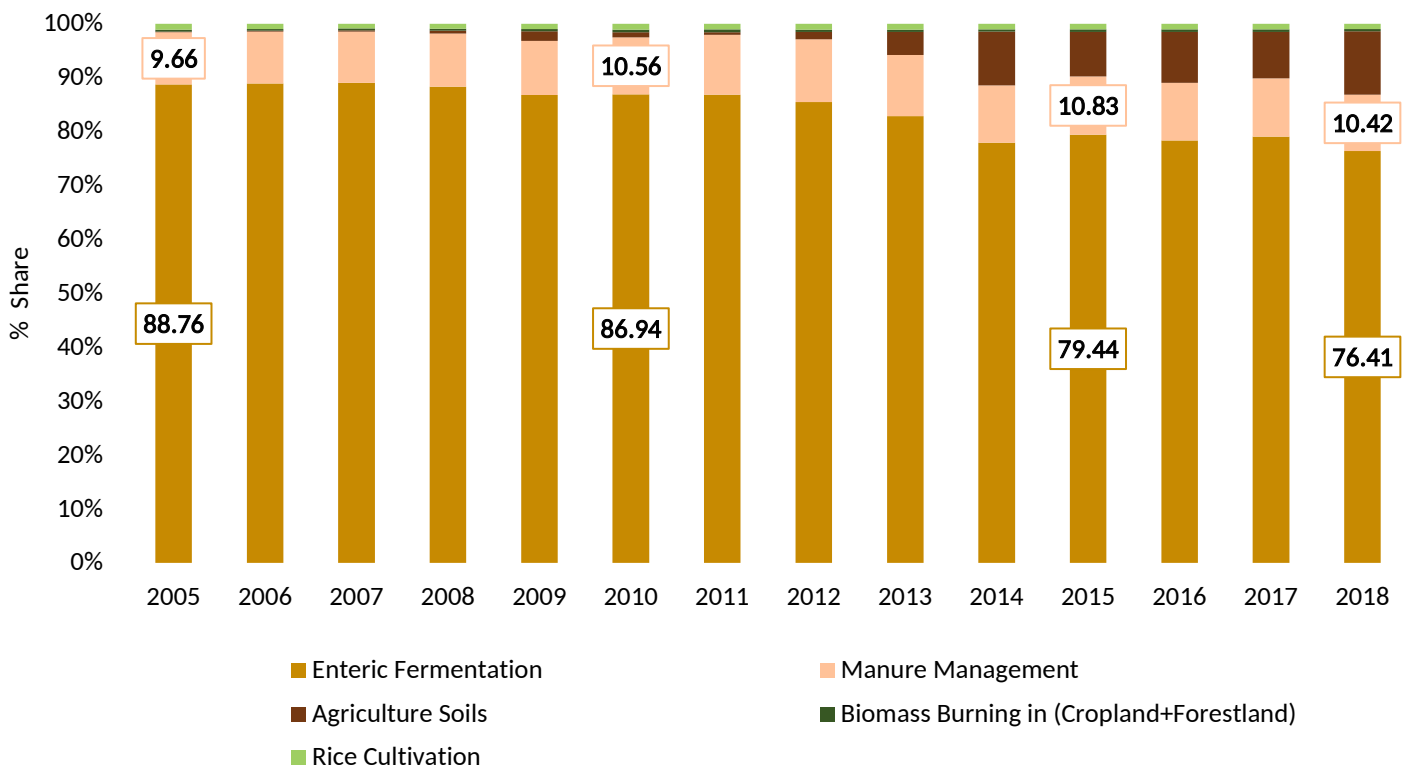


Figure 11: Category-wise Share of Gross AFOLU Emissions (excluding Land sub-sector) (2005 to 2018)





# Waste Sector

Solid Waste Disposal, Domestic Wastewater and Industrial Wastewater are the key sources of GHG emissions in the Waste sector. The Waste sector contributed to almost 9% of the total economy-wide emissions of Delhi in 2018. GHG emissions from the Waste sector of Delhi grew at a CAGR of 3.85% from 1.25 Mt CO<sub>2</sub>e in 2005 to 2.04Mt CO<sub>2</sub>e in 2018 as illustrated in Figure 12.

Figure 12: GHG Emissions Estimates of Waste Sector - Delhi (2005 to 2018)

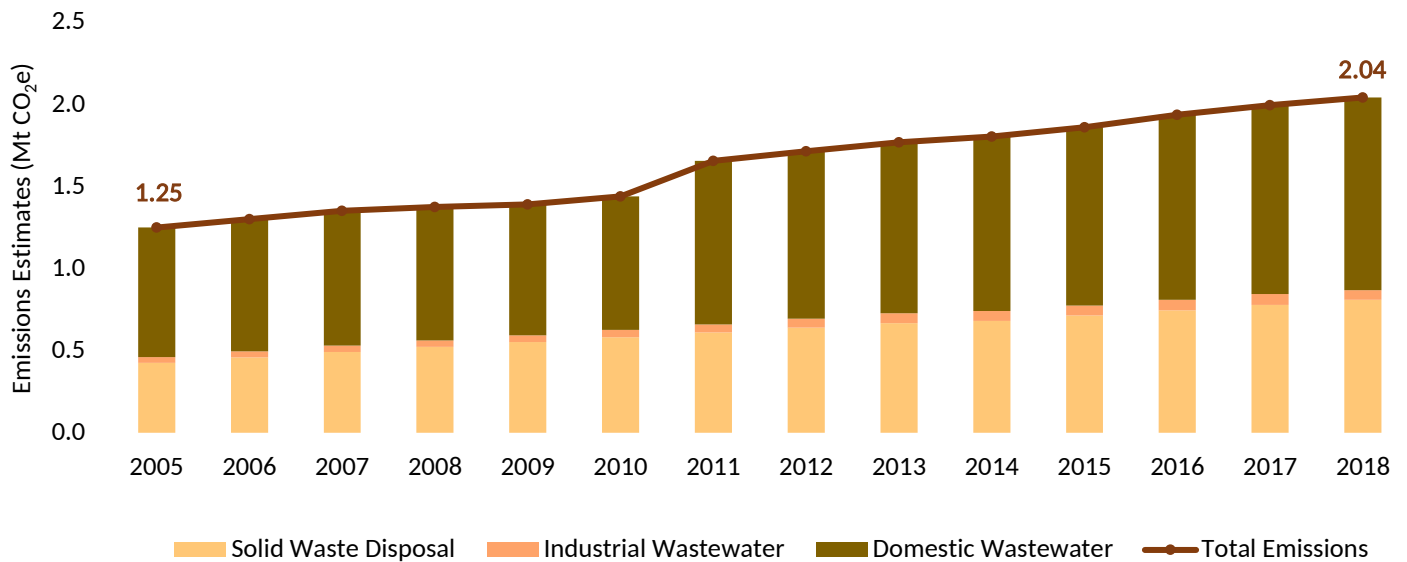
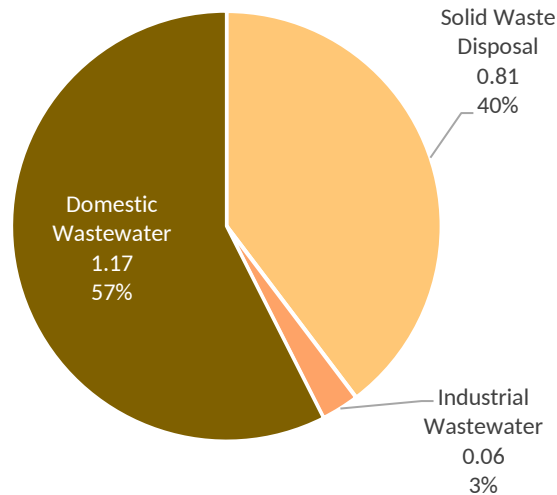


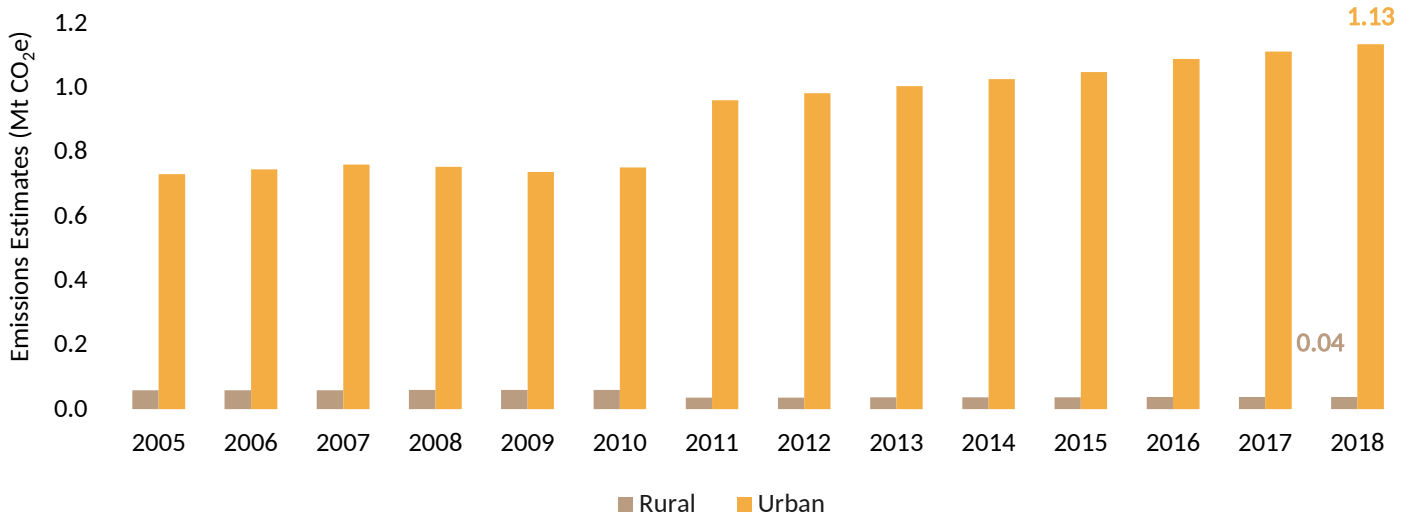
Figure 13: Sub-sector Emissions (Mt CO<sub>2</sub>e) and Percentage Share in Total Waste Sector Emissions (2018)



Discharge of untreated wastewater and use of septic tanks are the key drivers of emissions due to Domestic Wastewater sub-sector. Domestic Wastewater had a share of 57% in the total Waste sector emissions of Delhi in 2018. Approximately 40% of the Waste sector emissions were from Solid Waste Disposal, which grew at an estimated CAGR of 5% from 0.42 Mt CO<sub>2</sub>e in 2005 to 0.81 Mt CO<sub>2</sub>e in 2018. Industrial Wastewater accounted for nearly 3% of Waste sector emissions in 2018 and grew at a CAGR of 3.83% (0.04 Mt CO<sub>2</sub>e in 2005 to 0.06 Mt CO<sub>2</sub>e in 2018) (see Figure 13).

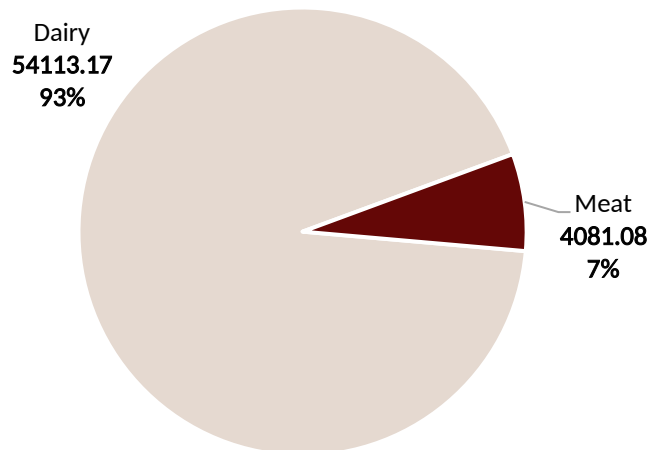
Emissions from Domestic Wastewater of both rural and urban areas grew at a CAGR of 3.10% from 0.79 Mt CO<sub>2</sub>e in 2005 to 1.17 Mt CO<sub>2</sub>e in 2018. Almost 97% of Domestic Wastewater emissions were from the urban areas of Delhi in 2018 (see Figure 14).

Figure 14: Area-wise GHG Emissions Estimates for Domestic Wastewater (2005 to 2018)



The Dairy Industry was a major contributor to Industrial Wastewater emissions with a share of ~93% in 2018. This was followed by Meat (~7%) as illustrated in Figure 15 below.

Figure 15: Category-wise Emissions (t CO<sub>2</sub>e) and Percentage Share in Industrial Wastewater Emissions (2018)





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:



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.

**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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