

Trend Analysis of GHG Emissions of ASSAM

GHG Platform India is a civil society initiative providing an independent estimation and analysis of India's Greenhouse Gas (GHG) emissions across key sectors.

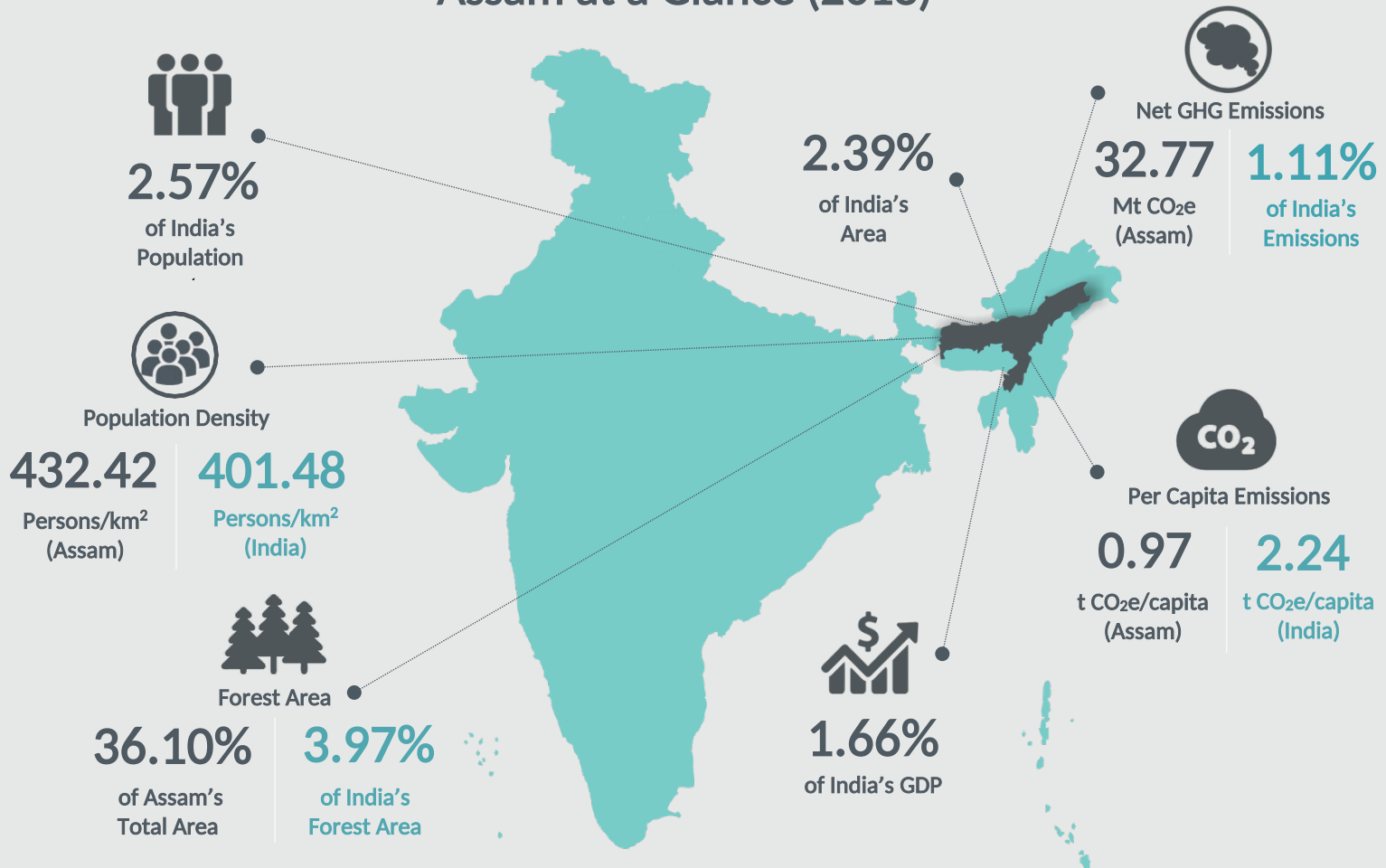
The Platform aims to add value to the various ongoing GHG emissions estimation efforts by addressing existing data gaps and data accessibility issues, broadening the scope of national inventories to include state inventories, and increasing the volume of analytics and policy dialogue on India's GHG emissions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

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



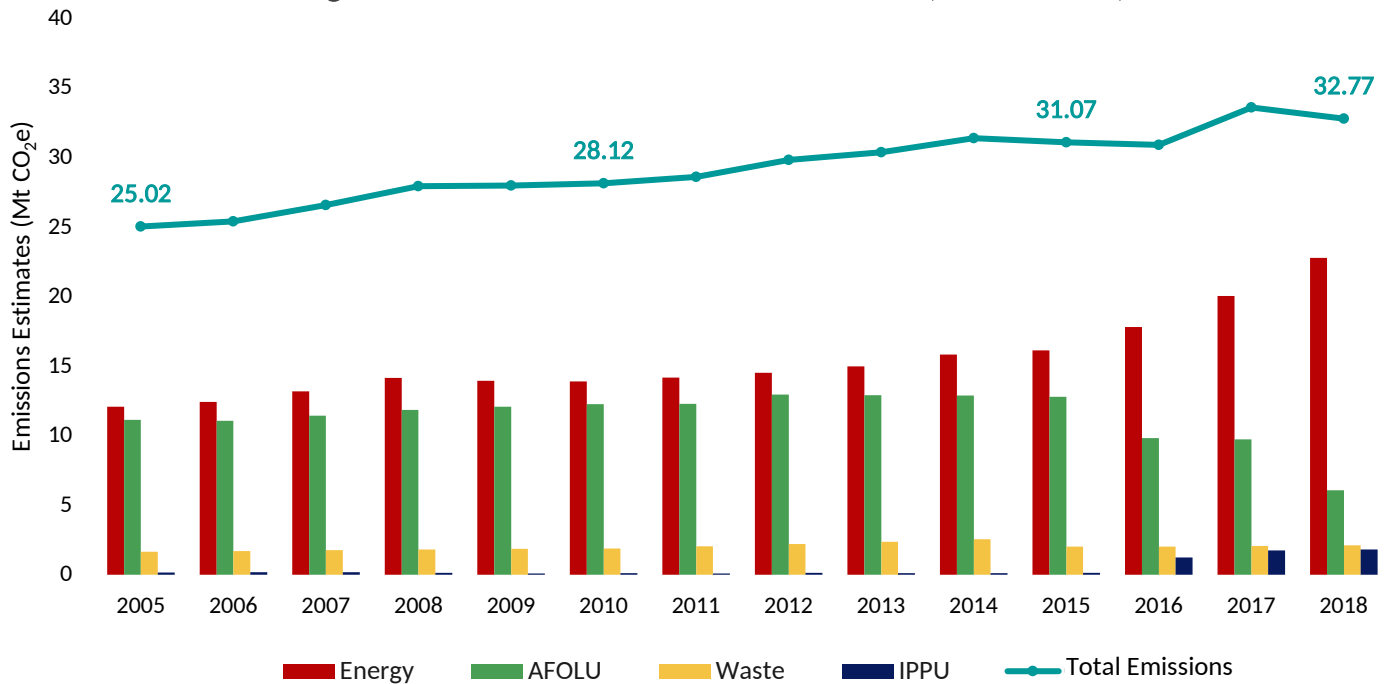
* Fuel combusted for captive electricity generation (auto-producers) and direct fuel combustion (industrial energy) has been reported under Energy sector.

Assam at a Glance (2018)



Economy-wide Emissions Estimates

Figure 1: GHG Emissions Estimates for Assam (2005 to 2018)



Emissions of Assam increased at a rate of 2.10% (compounded annually) from 25.02 Mt CO₂e in 2005 to 32.77 Mt CO₂e in 2018 (see Figure 1). In 2005, the share of emissions from the Energy sector in economy-wide emissions was ~48%, followed by Agriculture Forestry and Other Land-Use (AFOLU) sector (44%). While, Waste and Industrial Processes and Product Use (IPPU) sectors accounted for ~7% and ~1%, respectively. In 2018, the share of emissions from Energy and IPPU sector increased to ~69% and 6%, while, that of the AFOLU and Waste sectors declined to 19% and 6%, respectively (see Figure 2).

Figure 2: Sector-wise Contribution (Mt CO₂e) and Percentage Share in Economy-wide GHG Emissions of Assam

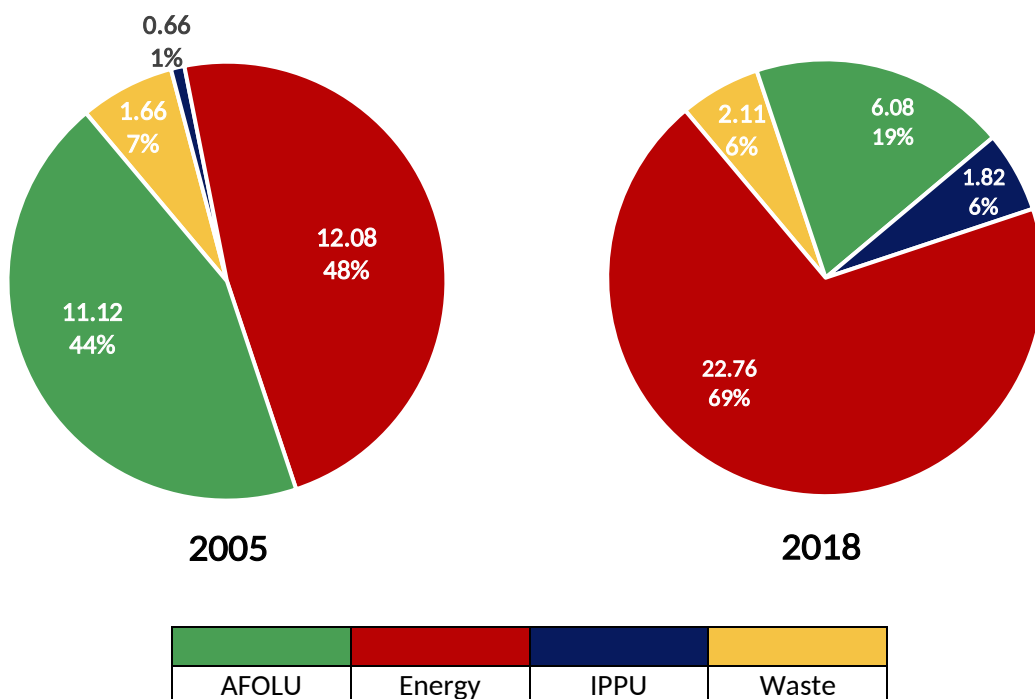
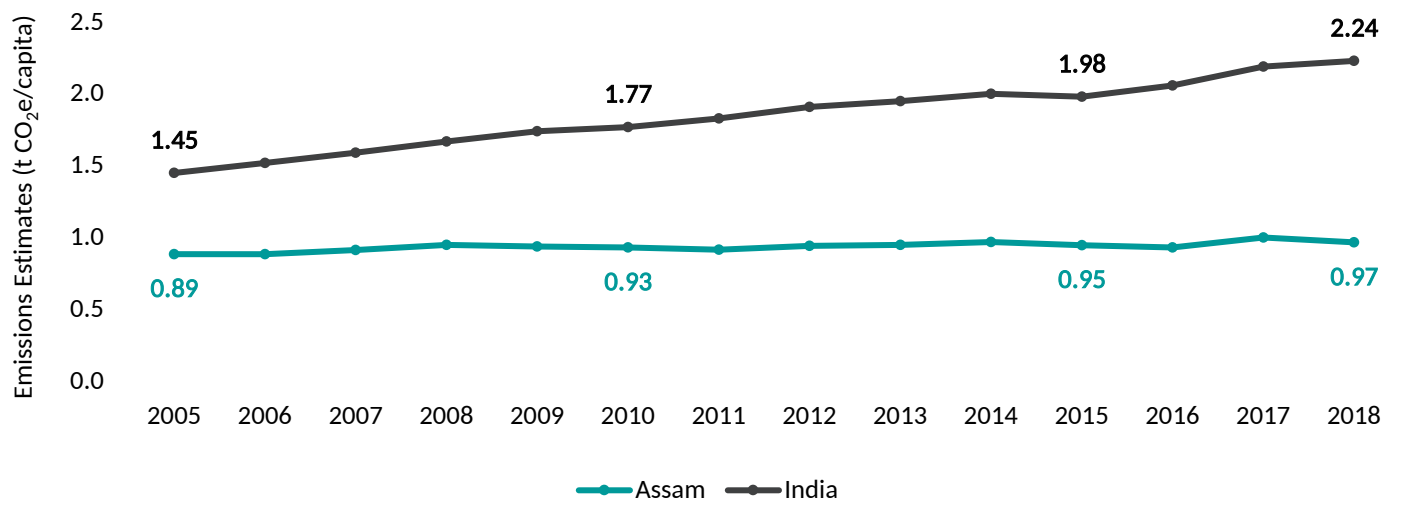


Figure 3: Per Capita GHG Emissions of Assam and India (2005 to 2018)



The per capita emissions of Assam are significantly lower than the per capita emissions of India. The growth in per capita emissions for the state grew sluggishly at a compounded rate of 0.68% from 0.89 t CO₂e per capita in 2005 to 0.97 t CO₂e per capita in 2018, in comparison to that of India i.e., 3.41% (Figure 3).

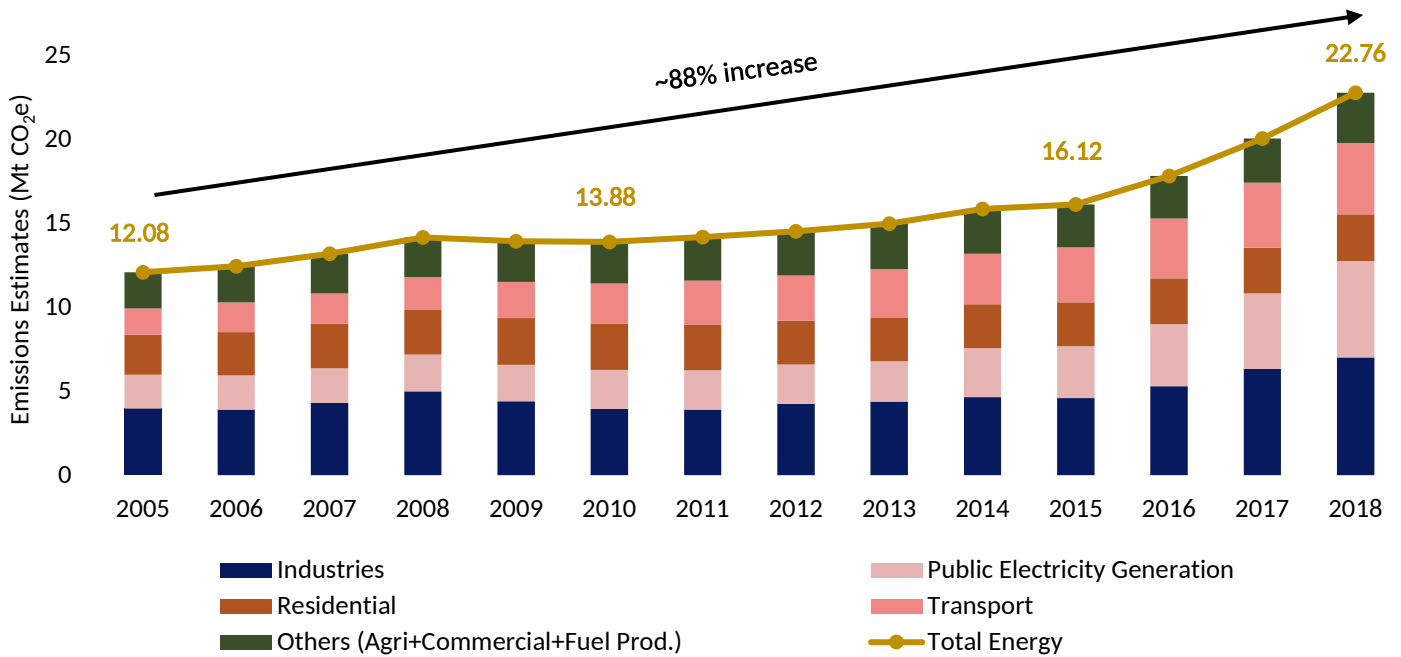
Energy Sector



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.

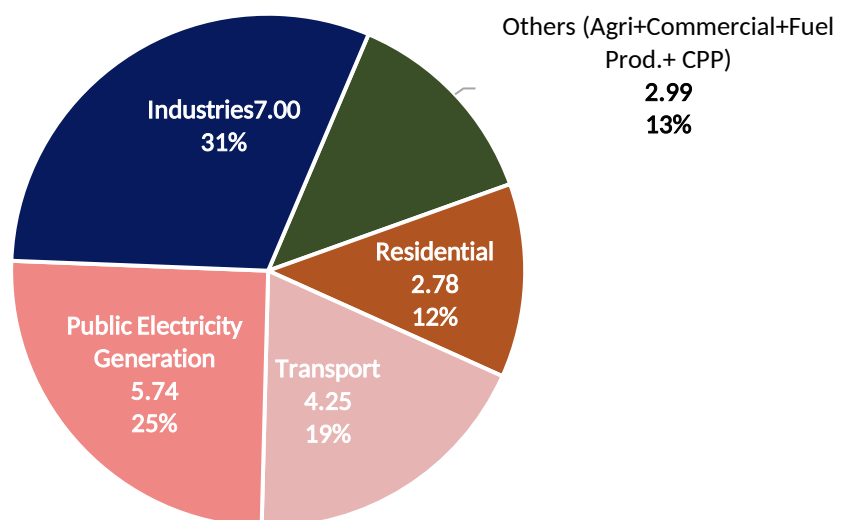
The Energy sector of Assam accounted for ~69% of the total GHG emissions in 2018. The Energy sector emissions of Assam recorded a growth rate of 5% (compounded annually) across the reference period. Emissions from this sector increased almost 2 times from 12.08 Mt CO₂e in 2005 to 22.7 Mt CO₂e in 2018 as shown in Figure 4.

Figure 4: GHG Emissions Estimates of Energy Sector in Assam (2005 to 2018)



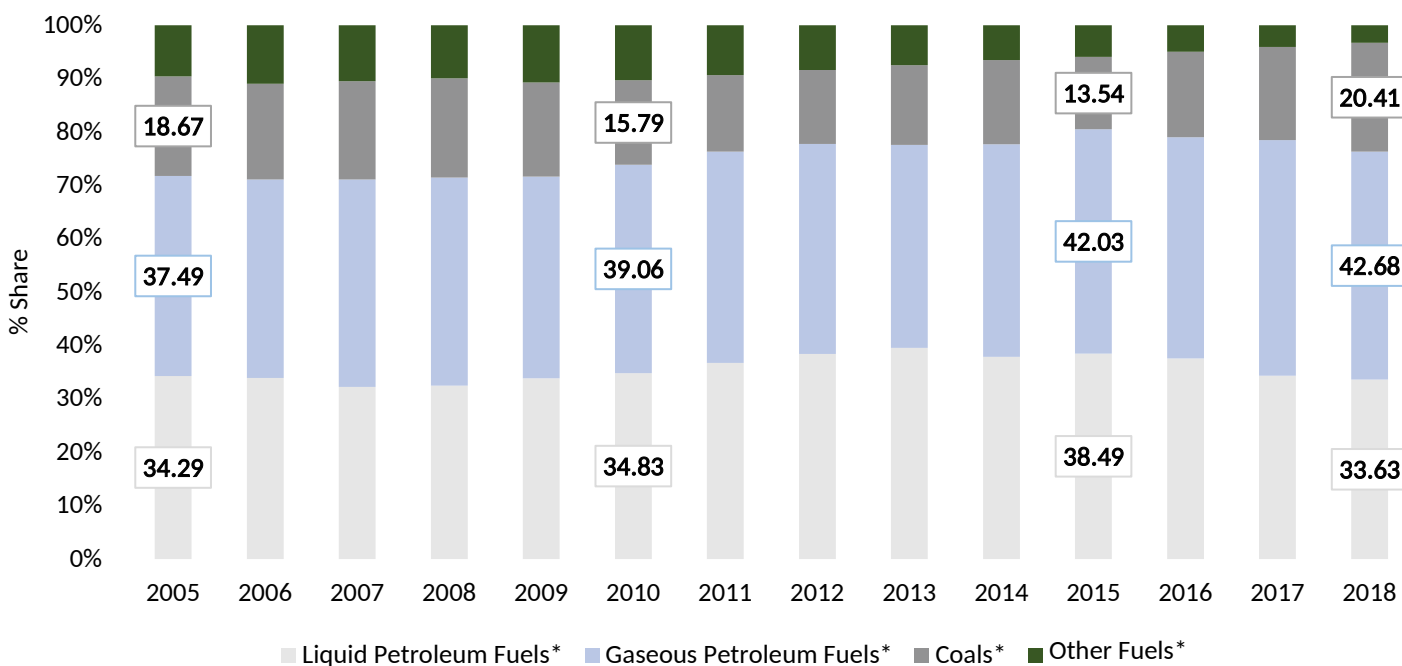
Within the Energy sector, Industries category was the major contributor of GHG emissions with a share of ~31% of the total Energy emissions in 2018. This was followed by Public Electricity Generation and Transport categories at 25% and 19%, respectively (see Figure 5).

Figure 5: Category-wise Emissions (Mt CO₂e) and Percentage Share in Total Energy Sector Emissions (2018)



Within the Fuel Combustion sub-sector, emissions from Gaseous Petroleum Fuels were the major contributor, with the average share being ~40% across the reference period (see Figure 6). This was followed by emissions from combustion of Liquid Petroleum Fuels, with an average share of ~36% between 2005 and 2018. Coal had an average share of ~17%, while Other Fuels contributed ~8% to the Fuel Combustion emissions throughout the reference period.

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



***Notes:**

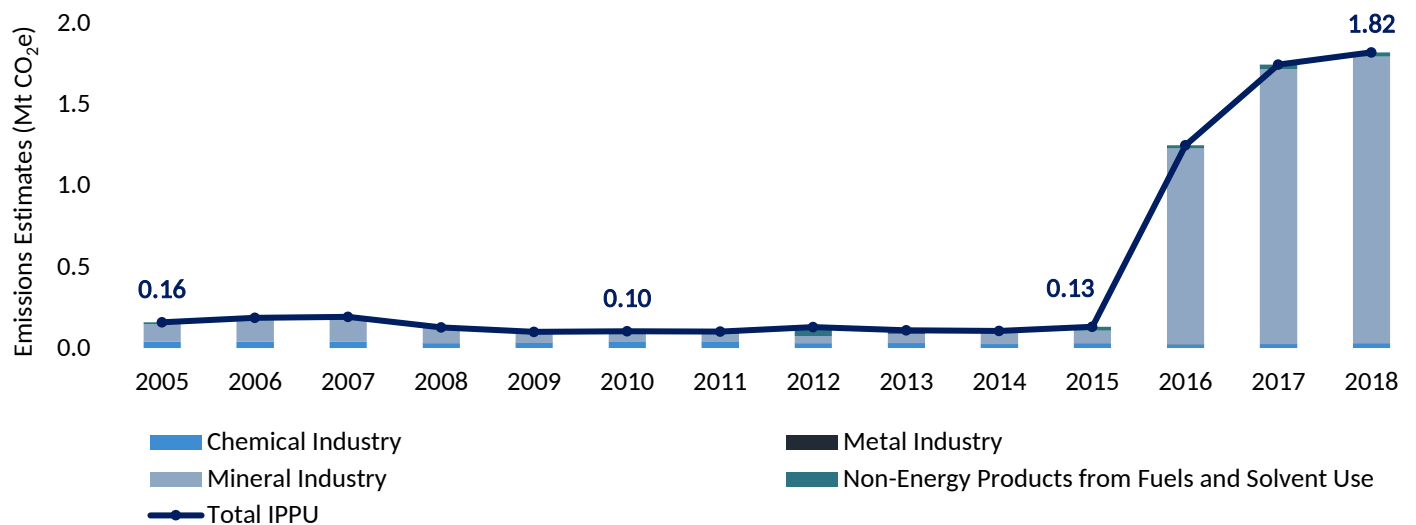
1. Coke is included in Coal because the bifurcation of pet-coke and coke was not available
2. Gaseous Fuels - natural gas, LPG and other gaseous fuels
3. Liquid Petroleum Fuels - ATF, diesel, kerosene, motor spirit and other liquid fuels
4. Other Fuels comprises of firewood and charcoal



IPPU Sector

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 Assam, the IPPU sector represented ~6% of the total economy-wide emissions in 2018. Between 2005 and 2018, the overall IPPU emissions increased at a compounded rate of 20.66% from 0.16 Mt CO₂e in 2005 to 1.82 Mt CO₂e in 2018. Emissions from the Mineral Industry sub-sector increased at a CAGR of 24.06% from 2005 to 2018 (see Figure 7). A jump was observed from 2016 onwards due to increase in emissions from Mineral industry (primarily due to Cement Production). Majority of Assam's IPPU emissions were recorded from Mineral Industry (~97%,) followed by Chemical Industry (~2%) and Non-Energy Products from Fuels and Solvent Use (1%) in 2018 as illustrated in Figure 8.

Figure 7: GHG Emissions Estimates for IPPU Sector - Assam (2005 to 2018)



Emissions from Cement Production increased at a CAGR of 30.79%, with it becoming the major contributor (>95%) from 2016 to 2018. Whereas, emissions from Lime Production and Methanol declined at a rate of 2.58% and 2.78% (compounded annually), respectively, between 2005 to 2018 (see Figure 9).

Figure 8: Sub-Sector Emissions (Mt CO₂e) and Percentage Contribution in Total IPPU Emissions (2018)

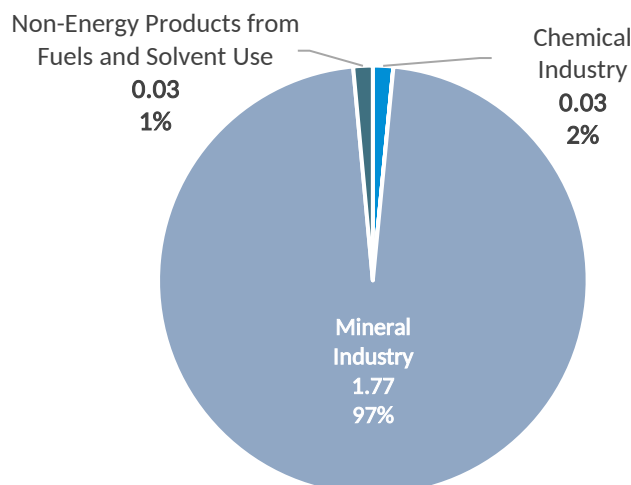
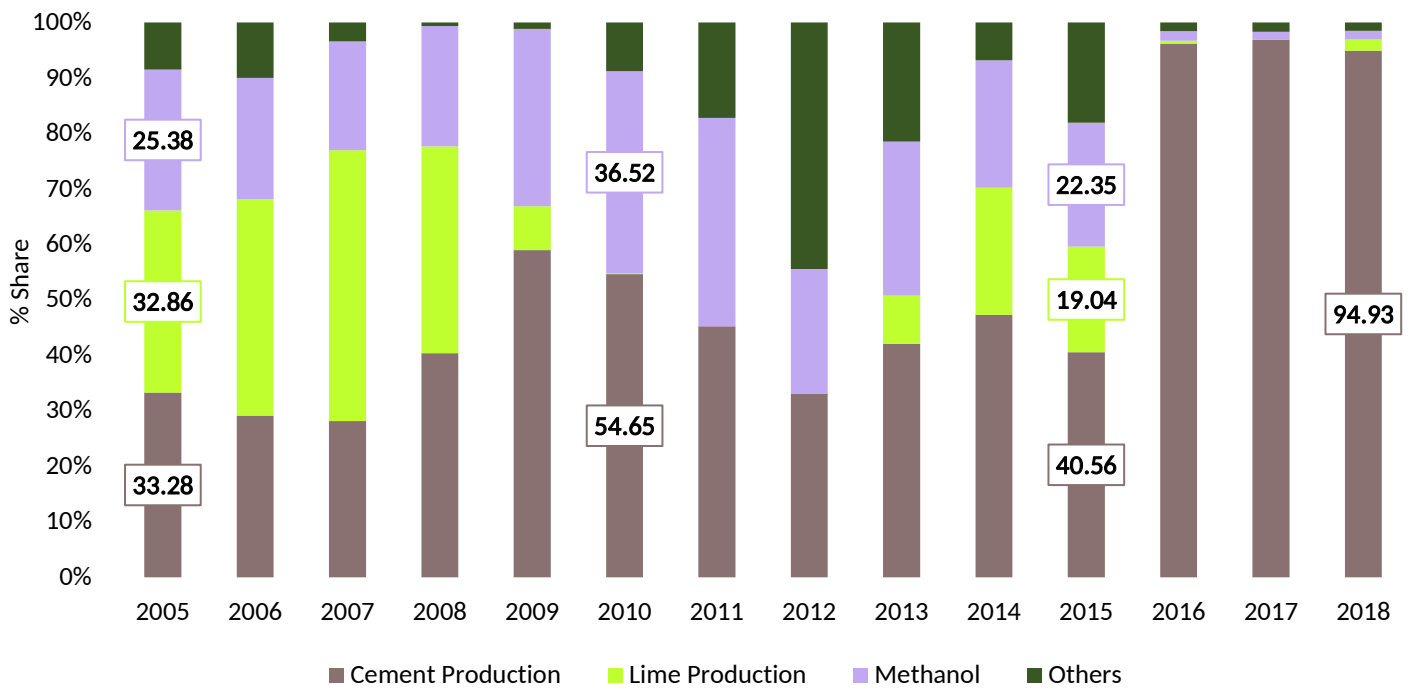


Figure 9: Percentage Share of GHG Emissions from IPPU Categories (2005 to 2018)



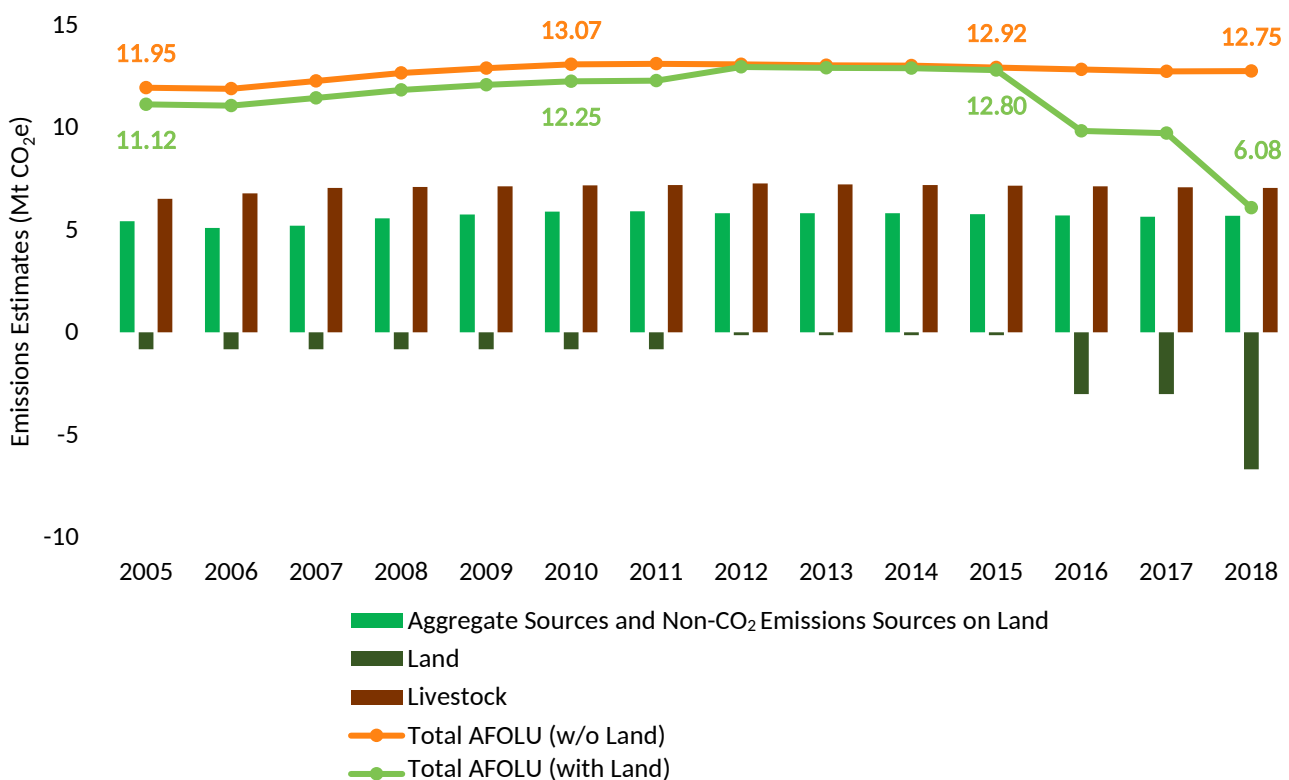


AFOLU Sector

Emissions from the Agriculture, Forestry and Other Land Use (AFOLU) sector arise from three main sub-sectors: Livestock, Land and Aggregate Sources and Non-CO₂ Emissions Sources on Land*. In Assam, the AFOLU sector represented ~19% of the total economy-wide emissions. The net AFOLU emissions in the state decreased at a rate of 4.54 % (compounded annually) from 2005 to 2018.

While the Livestock and Aggregate Sources and Non-CO₂ Emissions Sources on Land sub-sectors were net GHG emitters, the Land sub-sector was a sink across the reference period (see Figure 10). Removals by the Land sub-sector declined from 0.83 Mt CO₂e in 2005-2011 to 0.13 Mt CO₂e in 2012-2015. Post 2015 removals by the Land sub-sector increased steadily. This enhancement of removals between 2016 and 2018 was mainly because of significant increase in removals from the Forest Land category. This can be attributed to increase in quantum of forest area as well as the carbon stock density of the forests in the state as reported by FSI (2021)**. The average annual removals from the Land Sub-Sector in Assam during the reference period were 1.35 Mt CO₂e, around 10.62% of the average annual gross AFOLU emissions (excluding Land sub-sector).

Figure 10: GHG Emissions Estimates of AFOLU Sector - Assam (2005 to 2018)



The Livestock sub-sector had the maximum share of ~56% of gross AFOLU emissions of Assam in 2018 (see Figure 11). Within the Livestock sub-sector, Enteric Fermentation was the major contributor to gross AFOLU emissions (excluding Land sub-sector) across the reference period with an average share of ~49%. The contribution of emissions from this category increased at a rate of 0.58% (compounded annually) from 5.76 Mt CO₂e in 2005 to 6.22 Mt CO₂e in 2018.

From the sub-sector of Aggregate Sources, the categories Rice Cultivation and Agricultural Soils were the major contributors to gross AFOLU emissions, with average shares of ~40% and ~3%, respectively, during the reference period. Between 2005 and 2018, emissions from Rice Cultivation increased nominally at CAGR of 0.05%, while emissions from Agriculture Soils grew at CAGR of 5.54% (see Figure 12).

* The sub-sector called 'Aggregate Sources and Non-CO₂ Emissions Sources on Land' includes emissions from Rice Cultivation, Agriculture Soils, and Biomass Burning in Cropland and Forestland.

** FSI Report 2021 reports data for 2019

Figure 11: Category-wise Emissions (Mt CO₂e) and Percentage Share in Gross AFOLU Emissions (excluding Land sub-sector) (2018)

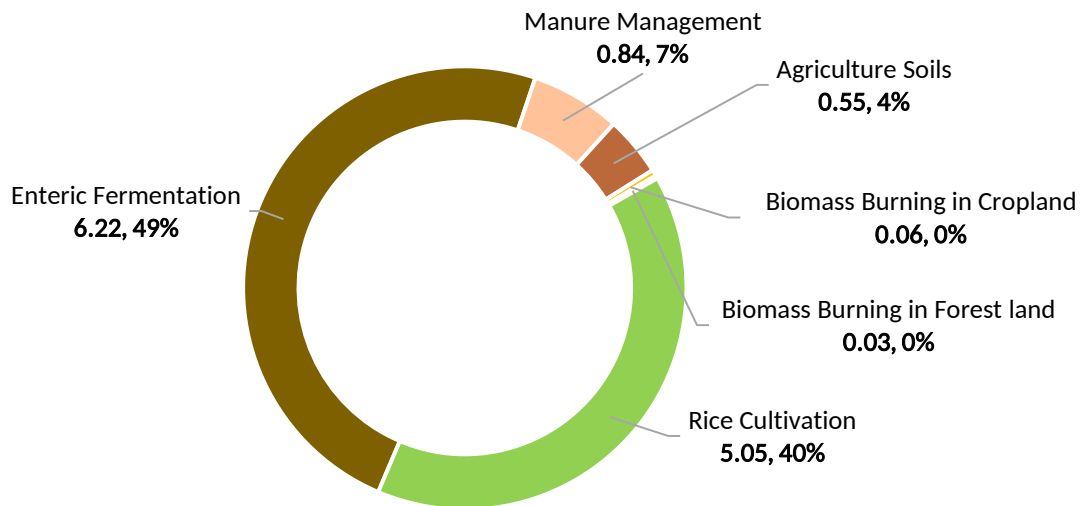
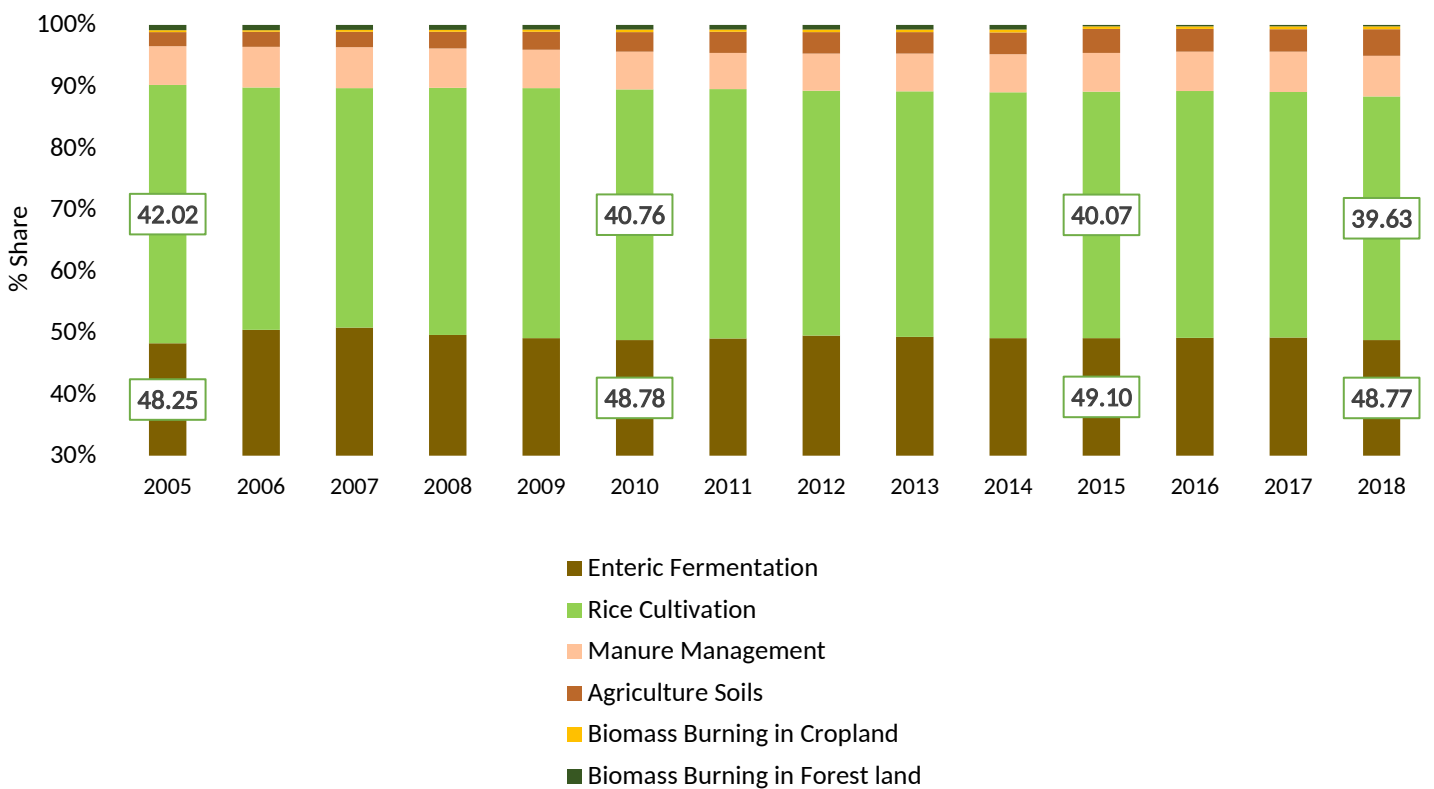


Figure 12: Category-wise Share of Gross AFOLU Emissions (excluding Land sub-sector) (2005 to 2018)





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 6% of the total economy-wide emissions of Assam in 2018. GHG emissions from the Waste sector of Assam grew at a CAGR of 1.85% from 1.66 Mt CO₂e in 2005 to 2.11 Mt CO₂e in 2018. There was a peak in emissions in 2014 which can be attributed to increase in emissions from both Domestic and Industrial Wastewater sub-sectors (see Figure 13).

Figure 13: GHG Emissions Estimates for Waste Sector - Assam (2005 to 2018)

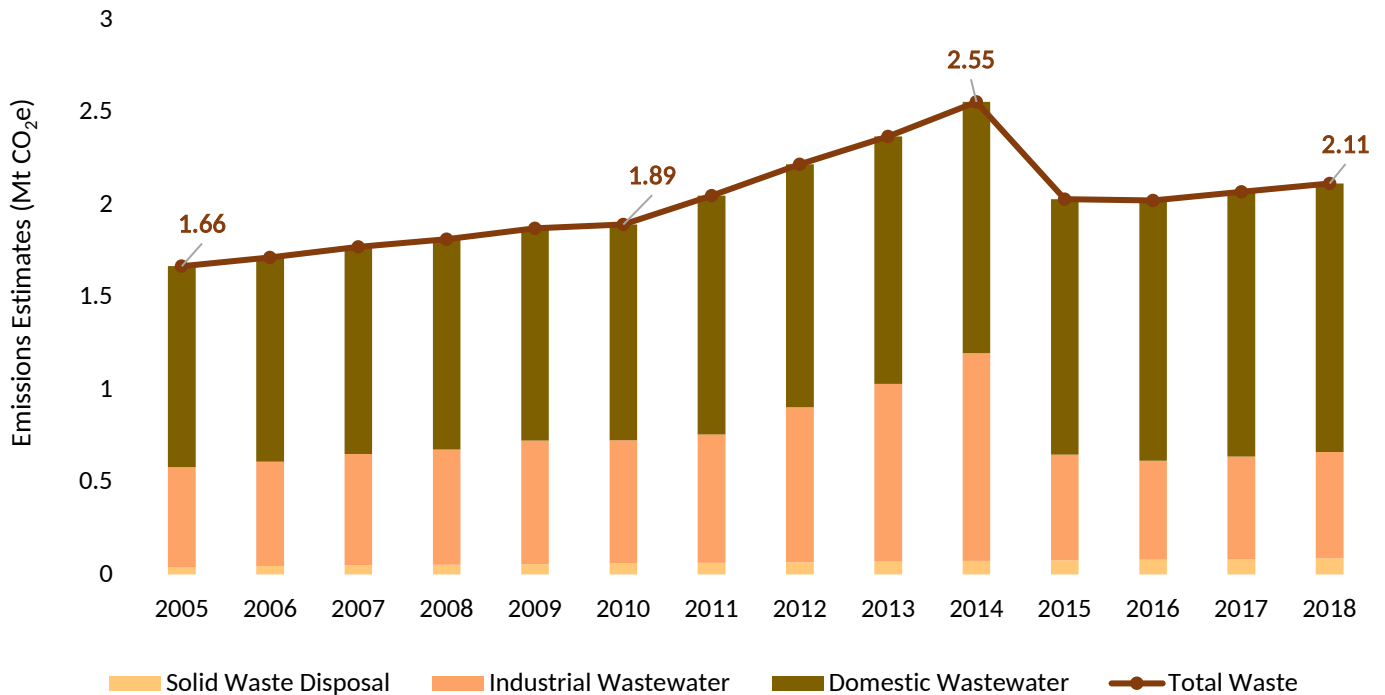
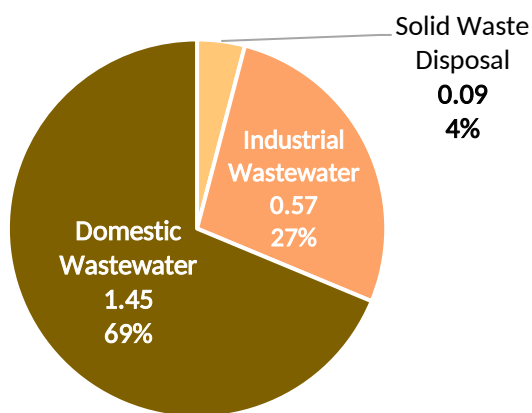


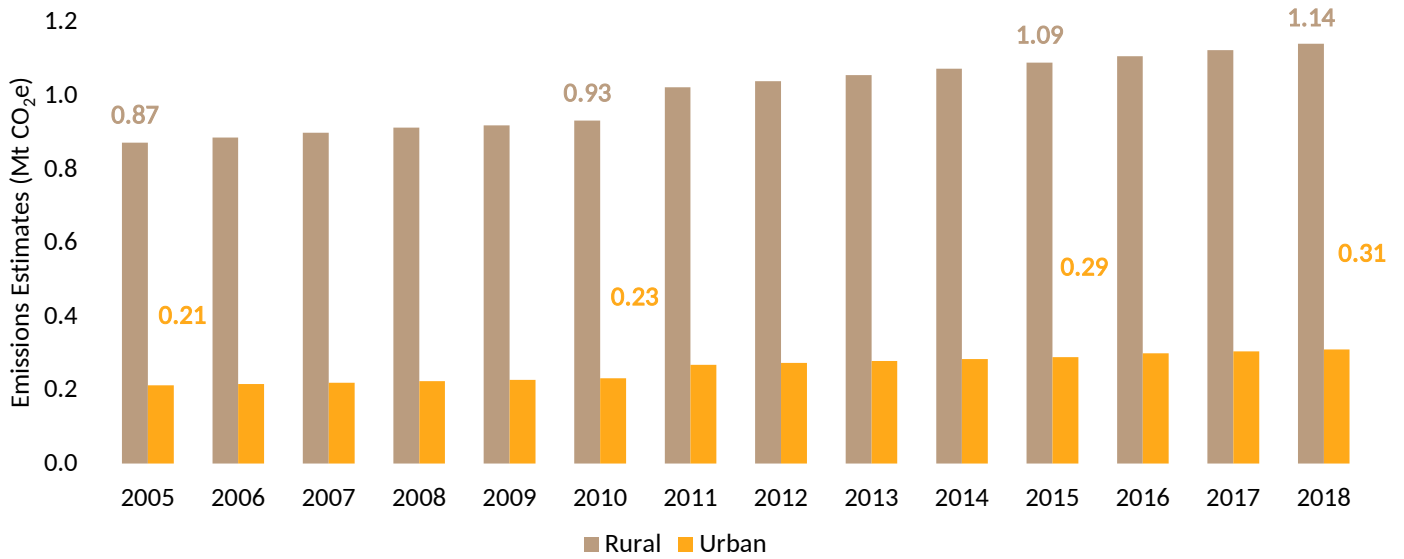
Figure 14: Sub-sector Emissions (Mt CO₂e) and Percentage Share in Total Waste Sector emissions (2018)



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 69% in the total Waste sector emissions of Assam in 2018. Approximately 4% of the Waste sector emissions were from Solid Waste Disposal, which grew at an estimated CAGR of 5.99% from 0.04 Mt CO₂e in 2005 to 0.09 Mt CO₂e in 2018. Industrial Wastewater accounted for nearly 27% of Waste sector emissions in 2018 and grew at a CAGR of 0.48% from 0.54 Mt CO₂e in 2005 to 0.57 Mt CO₂e in 2018 (see Figure 14).

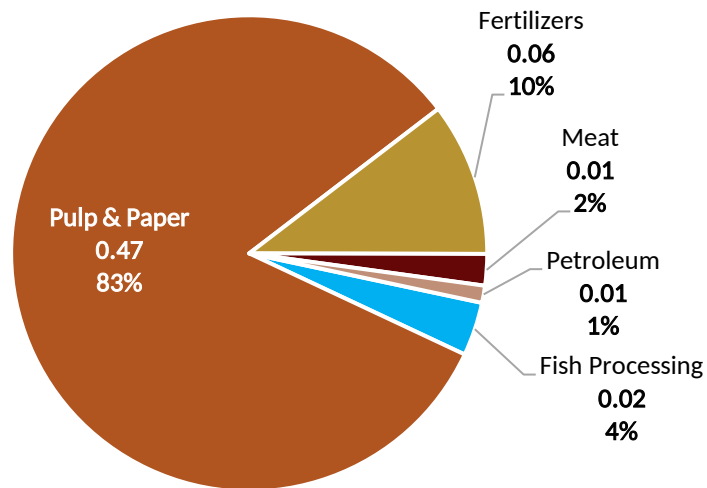
Emissions from Domestic Wastewater of both the rural and urban areas grew at a CAGR of 2.26% from 1.08 Mt CO₂e in 2005 to 1.45 Mt CO₂e in 2018. Almost 78.60% of Domestic wastewater emissions were from the rural areas of Assam while 21.40% were from urban areas in 2018 as shown in Figure 15.

Figure 15: Area-wise GHG Emissions Estimates of Domestic Wastewater (2005 to 2018)



The Pulp and Paper Industry was the major contributor to Industrial Wastewater emissions in Assam with a share of ~83% in 2018. This was followed by Fertilizers (10%) as illustrated in Figure 16.

Figure 16: Category-wise Emissions (Mt CO₂e) 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.

Secretariat Contact

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