

Trend Analysis of GHG Emissions of WEST BENGAL

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

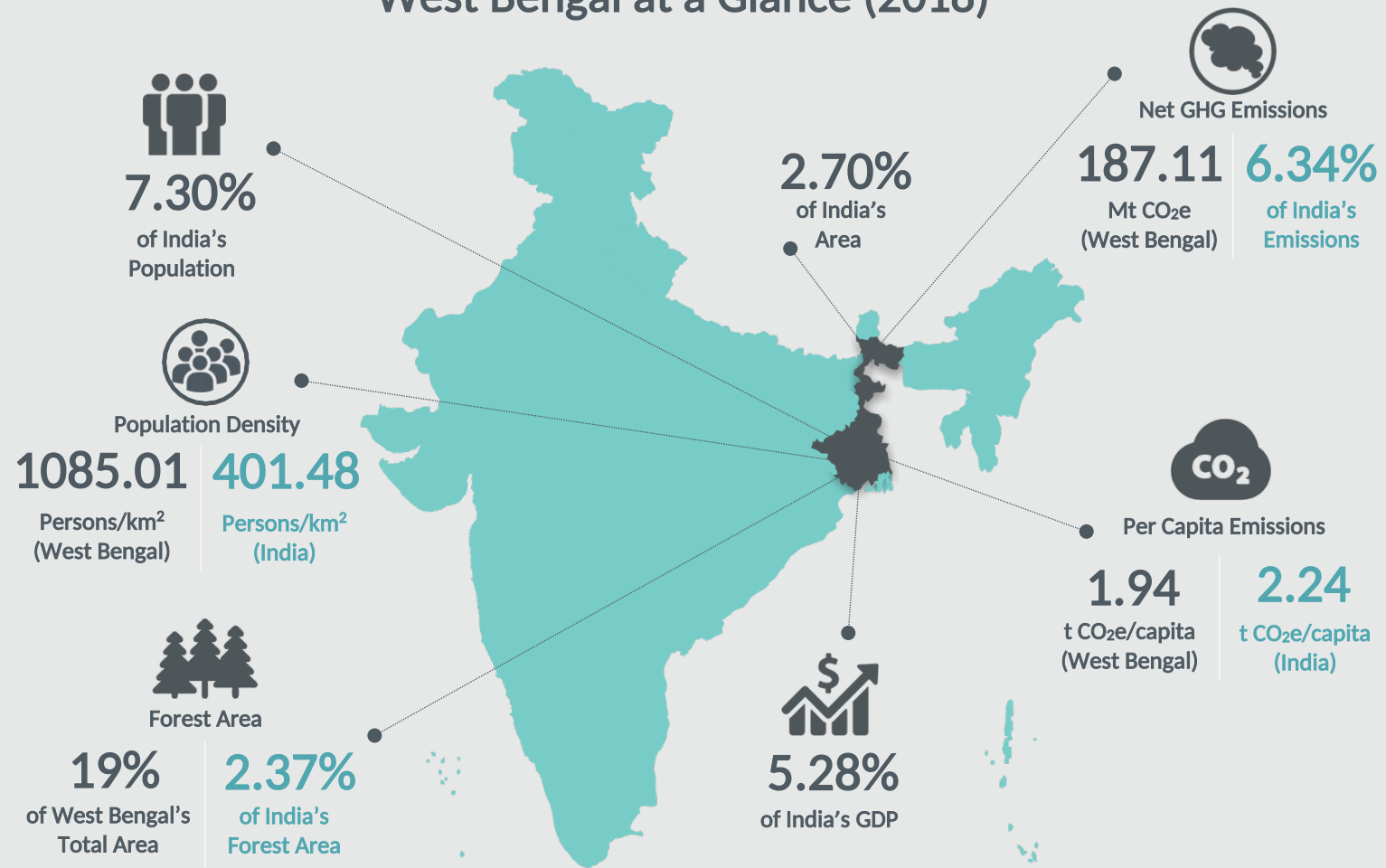
The Platform seeks to add value to the various ongoing GHG emissions estimation efforts by helping address existing data gaps and data accessibility issues, extending beyond the scope of national inventories to state inventories, and by increasing the volume of analytics and policy dialogue on India's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

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



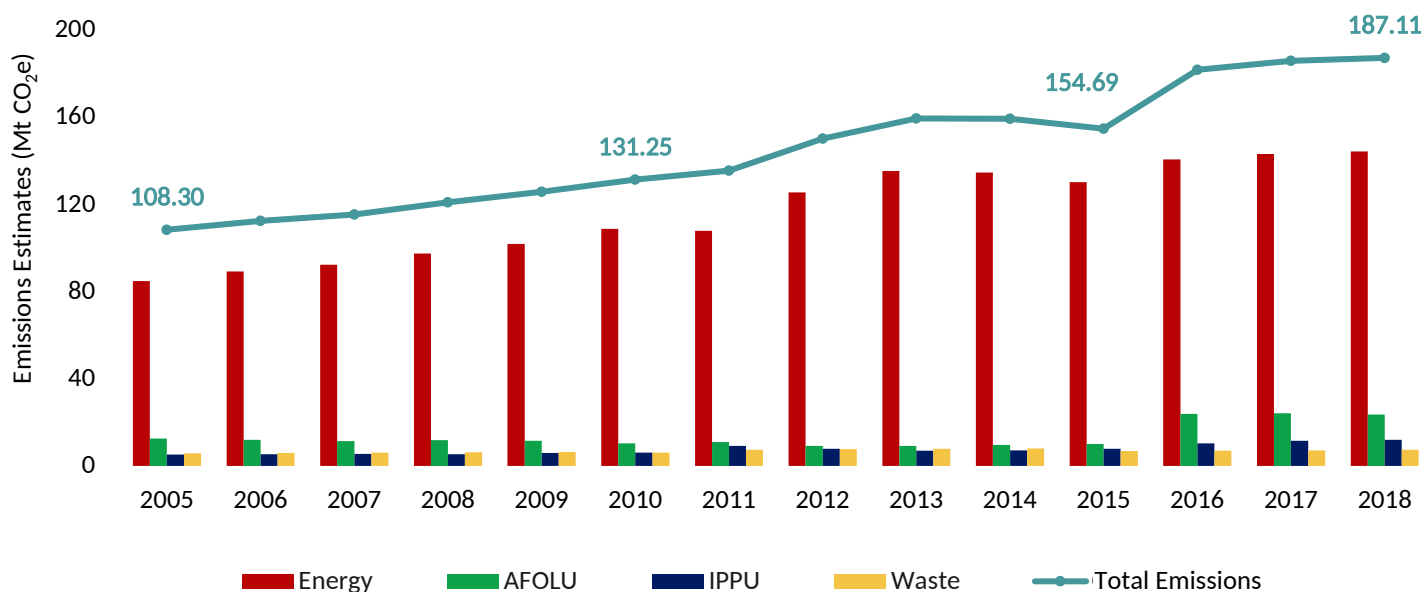
*Fuel combusted for captive electricity generation (auto-producers) and direct fuel combustion (industrial energy) has been reported under Energy sector.

West Bengal at a Glance (2018)



Economy-wide Emissions Estimates

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



Emissions of West Bengal increased at a CAGR of 4.30% from 108.30 Mt CO₂e in 2005 to 187.11 Mt CO₂e in 2018 (see Figure 1). The decrease in total emissions in 2015 can be attributed to the decline in emissions from the Energy sector. In 2005, the share of Energy sector in economy-wide emissions in West Bengal was ~78%, while Agriculture, Forestry and Other Land Use (AFOLU), Industrial Processes and Product Use (IPPU) and Waste sectors accounted for ~12%, ~5% and ~5%, respectively. As seen in Figure 2, in 2018, the share of Energy and Waste sector emissions in the overall emissions of the State decreased to ~77% and 4% respectively. Whereas, emissions from IPPU and AFOLU sectors increased to ~6% and 13%, respectively.

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

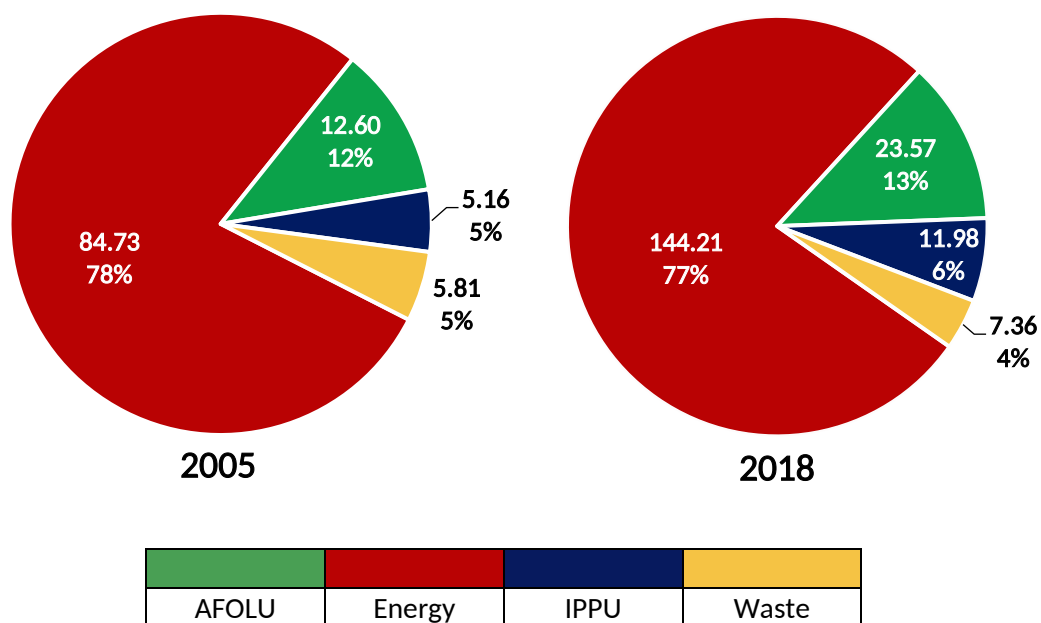
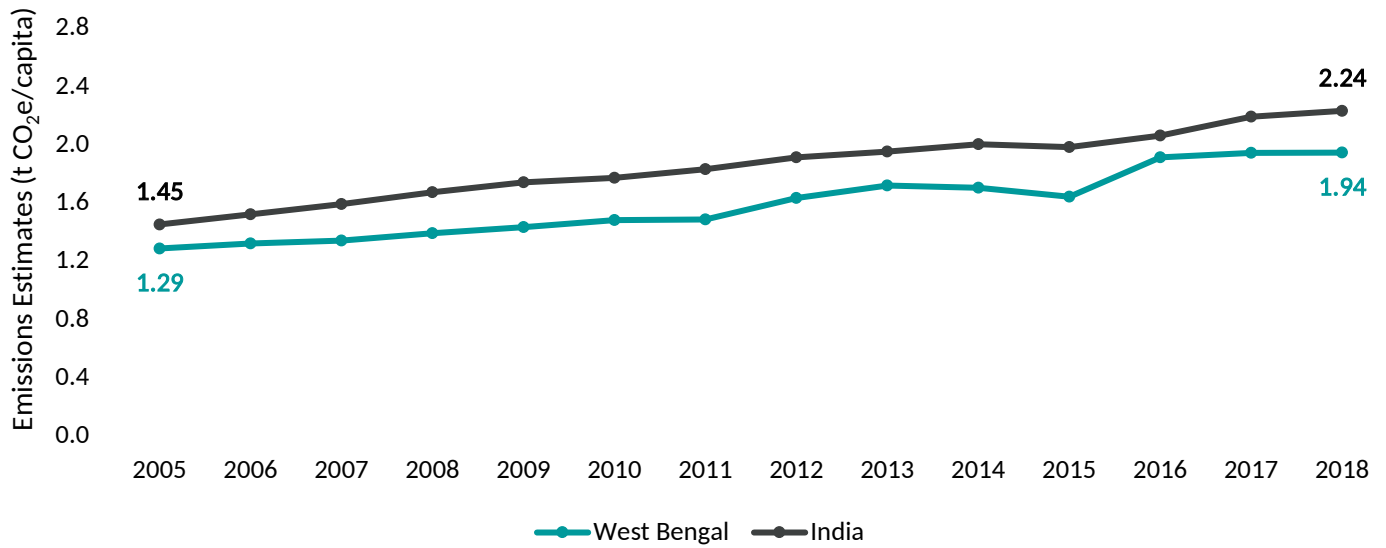


Figure 3: Per Capita GHG Emissions of West Bengal and India (2005 to 2018)



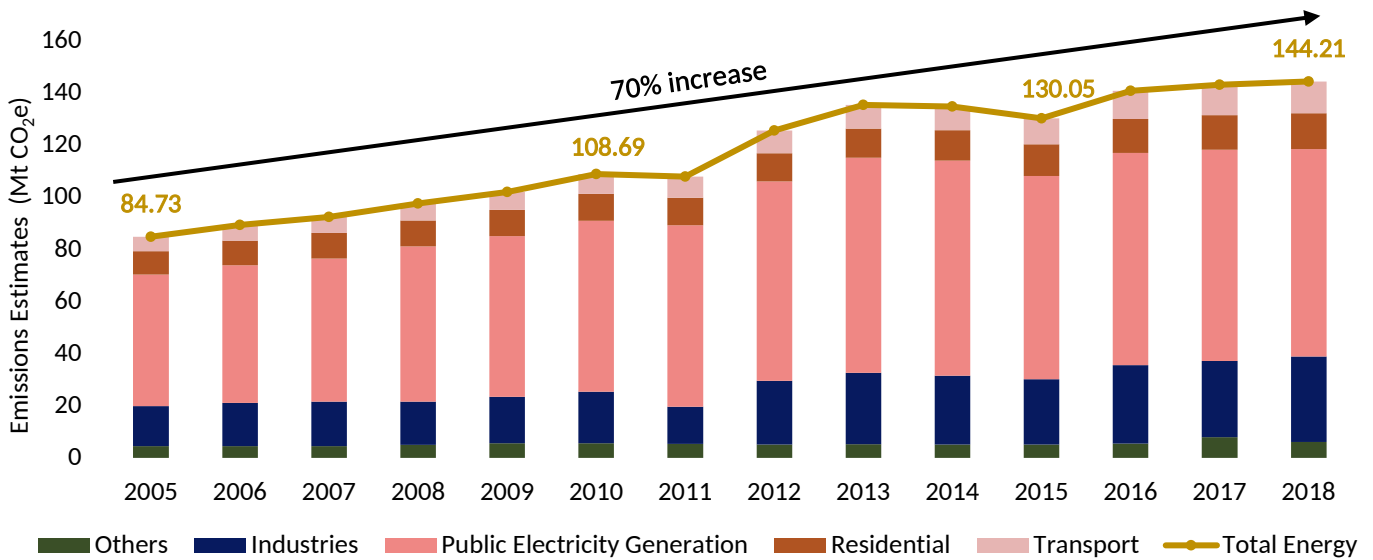
Per capita emissions of West Bengal were lower than that of India, throughout the reference period (see Figure 3). In West Bengal, per capita emissions increased at a compounded rate of 3.23%, from 1.29 t CO₂e per capita in 2005 to 1.94 t CO₂e per capita in 2018, which was slightly lower than India's CAGR (~3.41%).

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 West Bengal accounted for ~77% of the total economy-wide emissions in 2018. Emissions from the State’s Energy sector increased at the rate of 4.18% (compounded annually), from 84.73 Mt CO₂e in 2005, to 144.21 Mt CO₂e in 2018 (see Figure 4).

Figure 4: GHG Emissions Estimates of Energy Sector - West Bengal (2005 to 2018)



Within the Energy sector, Public Electricity Generation category was the major contributor of GHG emissions with a share of ~55% in 2018. This was followed by Industrial Energy and Residential categories with shares of 23% and 10%, respectively (see Figure 5).

Within the Fuel Combustion sub-sector, emissions from Coal were the major contributor with an average share of ~82% of the total Energy emissions during the reference period (see Figure 6). This was followed by emissions from combustion of Liquid Petroleum Fuels with an average share of ~13% between 2005 and 2018. Gaseous Petroleum Fuels had an average share of ~3%, while Other Fuels accounted for ~2% of the Fuel Combustion emissions during the reference period.

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

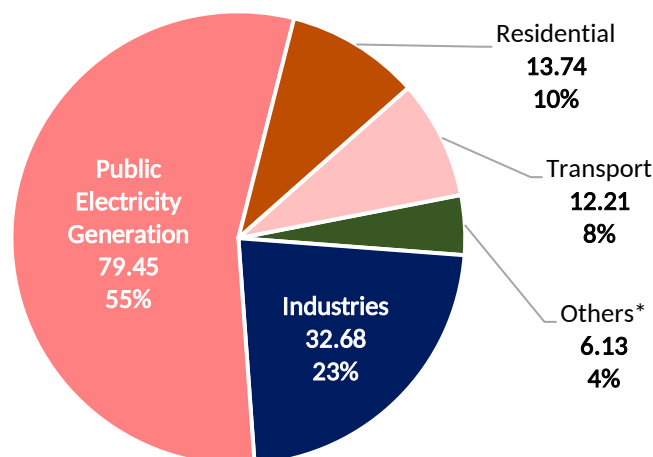
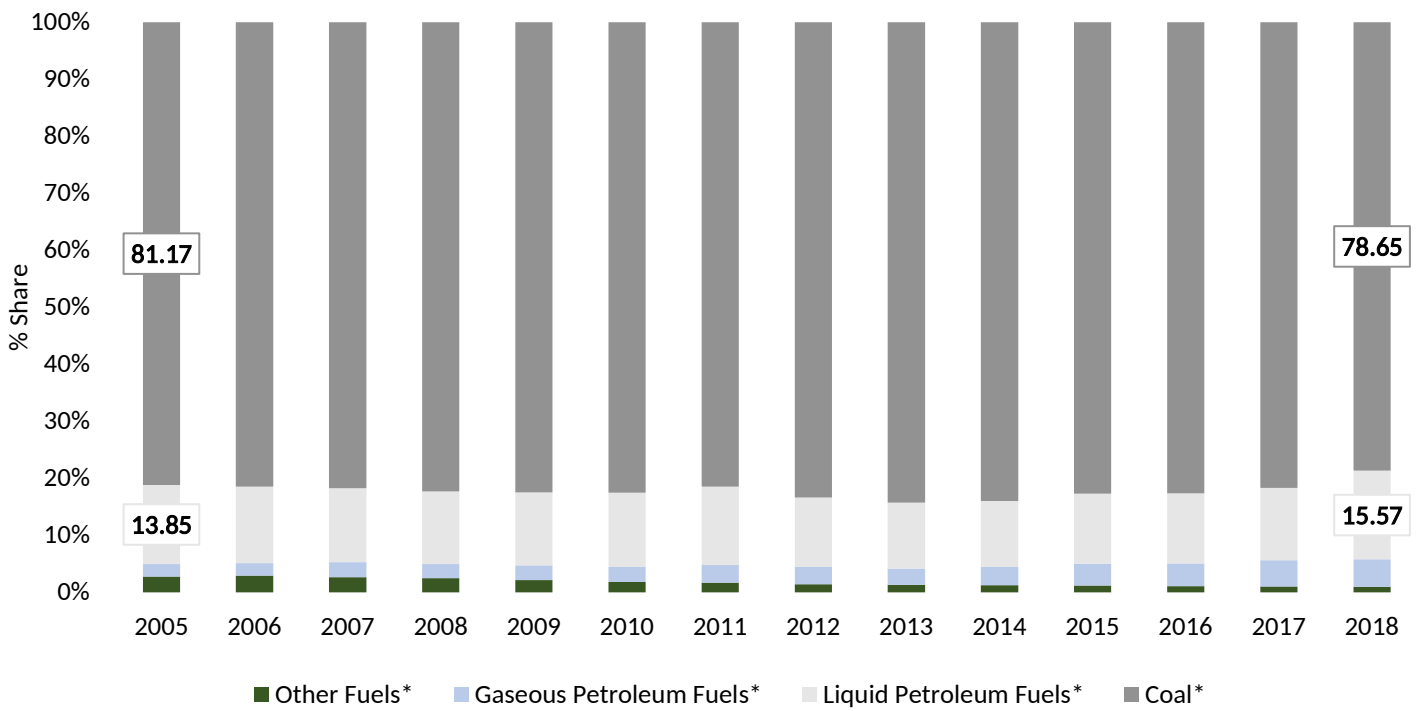


Figure 6: Percentage Share of GHG Emissions by Fuel Type due to Fuel Combustion in Energy Sector (2005 to 2018)



***Notes:**

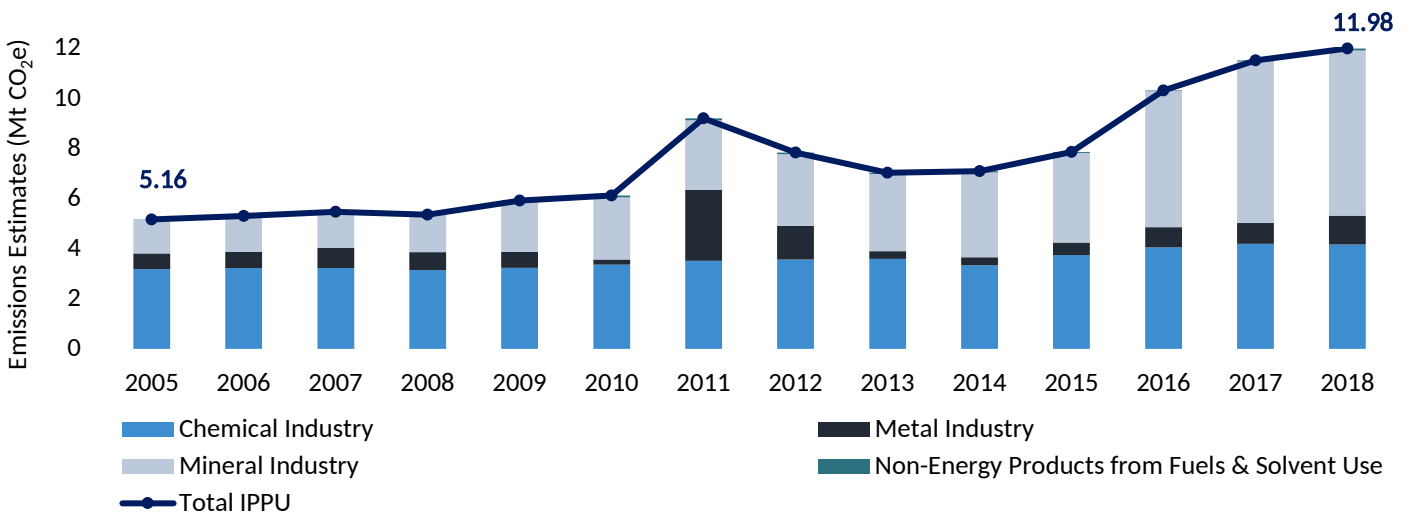
1. Coke is included in Coal because the bifurcation of pet-coke and coke was not available
2. Gaseous Petroleum Fuels - natural gas, LPG and other gaseous fuels
3. Liquid Petroleum Fuels - ATF, diesel, kerosene, motor spirit and other liquid fuels
4. Other Fuels comprises of firewood and charcoal



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 West Bengal, IPPU sector represented ~6% of total economy-wide emissions in 2018. Between 2005 and 2018, the overall IPPU emissions increased at a compounded rate of 6.69%, from 5.16 Mt CO₂e in 2005, to 11.98 Mt CO₂e in 2018. During the reference period, Chemical Industry was the major contributor to the overall IPPU emissions and they increased at a CAGR of 2.10%. Emissions from the Mineral Industry, Metal Industry and Non-Energy Products from Fuels and Solvent Use increased at rate of 13.03%, 4.79% and 12.46% (compounded annually) respectively, throughout the reference period. A spike in emissions was observed in 2011, which can be attributed to the increase in emissions from Metal Industry (from Iron and Steel Production) sub-sector (see Figure 7).

Figure 7: GHG Emissions Estimates of IPPU Sector - West Bengal (2005 to 2018)



Cement and Ammonia Production were the two key drivers of IPPU sector emissions with average shares of ~39% and ~32%, respectively, across all the reference years. However, share of emissions from Cement Productions increased from ~26% in 2005 to ~55% in 2018, whereas, share of emissions from Ammonia Production reduced from ~40% in 2005 to ~22% in 2018. Significant emissions were also registered from Iron and Steel Production, Ethylene and Carbon Black with shares of ~10%, ~8% and 5%, respectively, in 2018 (see Figures 8 and 9).

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

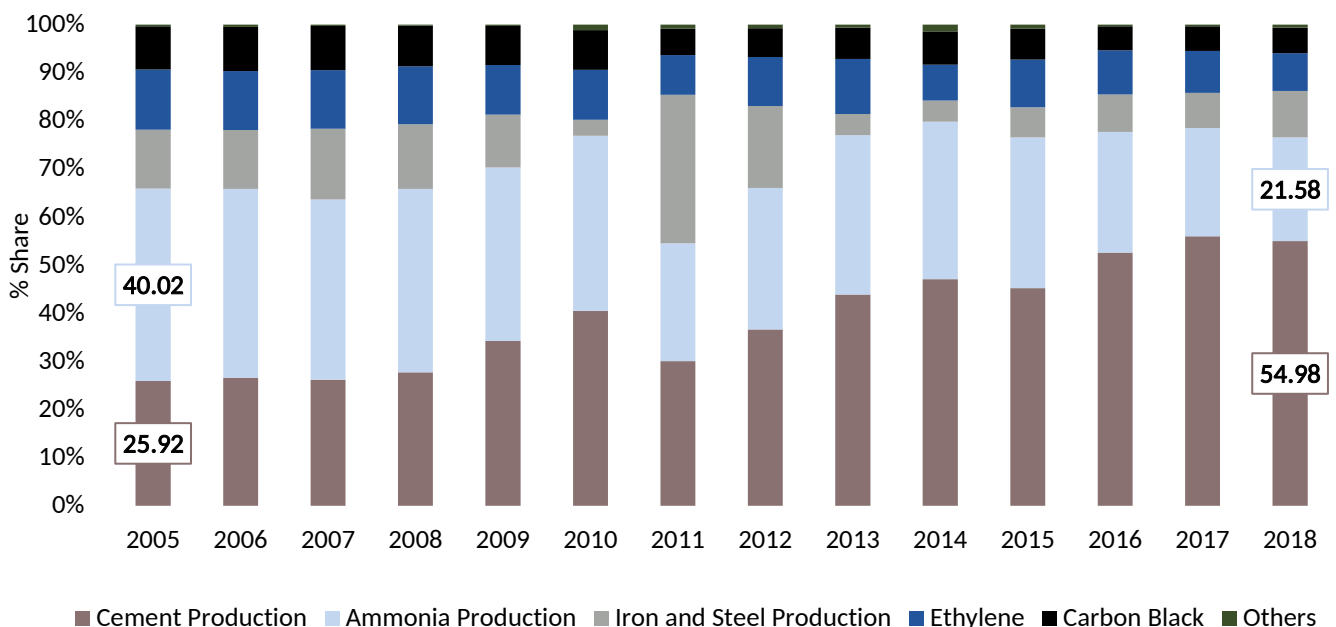
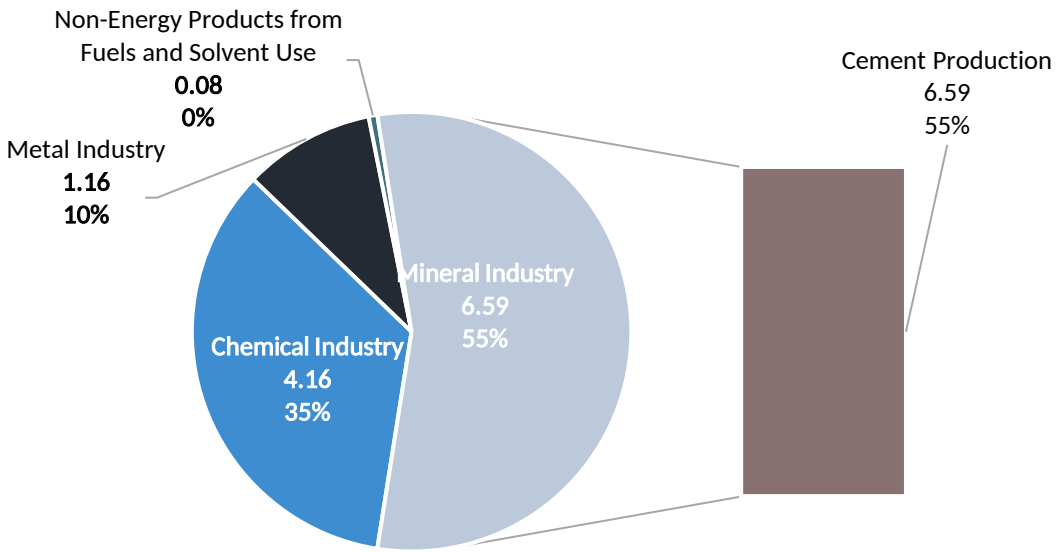


Figure 9: Sub-Sector Emissions (Mt CO₂e) and Percentage Share in Total IPPU Emissions (2018)



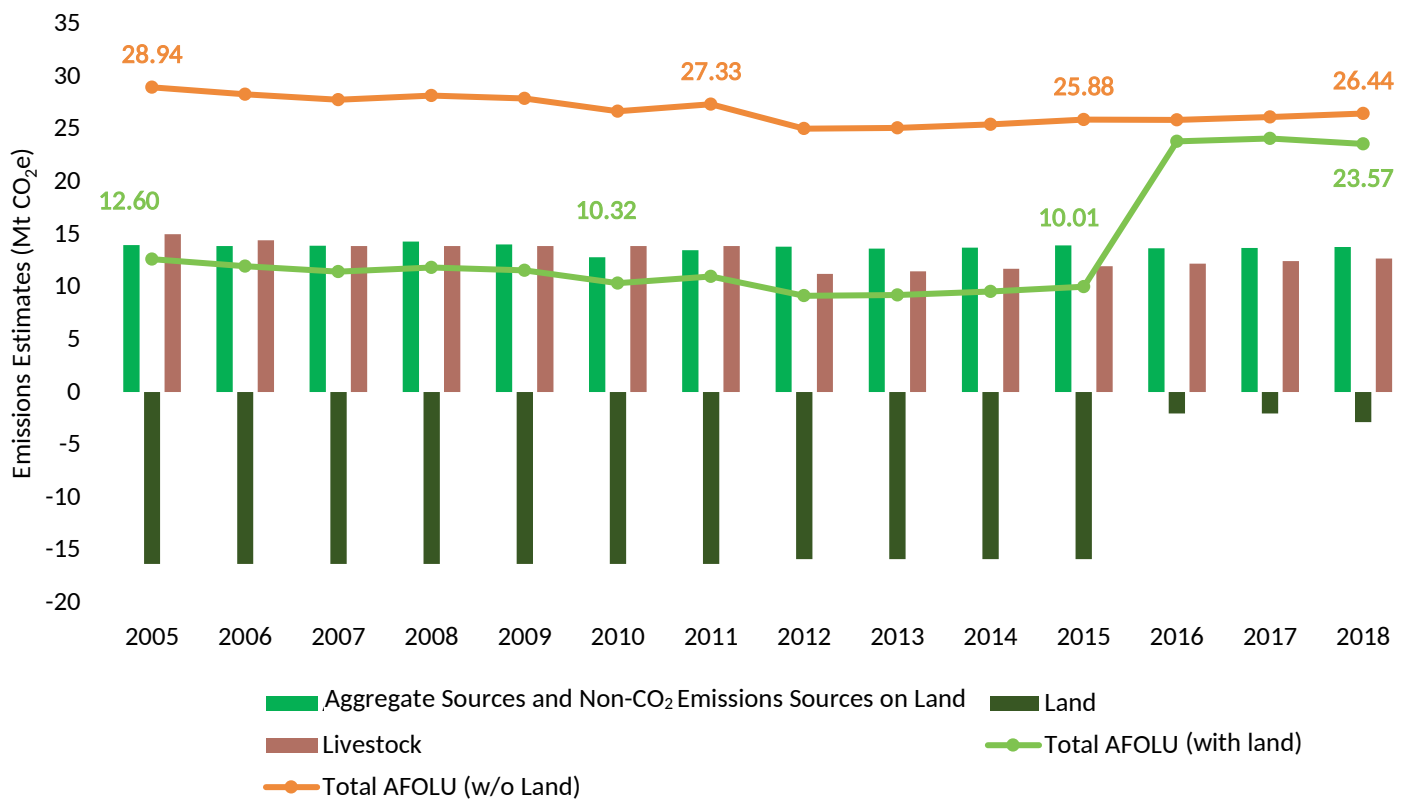


AFOLU Sector

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-CO₂ Emissions Sources on Land*. AFOLU sector represented ~13% of West Bengal’s total economy-wide emissions in 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 net sink throughout the reference period. Between 2005 and 2018, net AFOLU emissions increased at a rate of 4.93% (compounded annually). The significant increase observed in net AFOLU emissions post 2015 was due to decrease in removals from Land sub-sector. This primarily was a result of decrease in the Forest Land sink (see Figure 10). The average annual removals from the Land sub-sector in West Bengal during the reference period were 13.20 Mt CO₂e, around ~49% of the average annual gross AFOLU emissions (excluding Land sub-sector).

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



In 2018, Livestock sub-sector had the maximum share of ~48% in West Bengal’s gross AFOLU emissions (excluding Land sub-sector). Within the Livestock sub-sector, Enteric Fermentation was the highest contributor to gross AFOLU emissions throughout the reference period, with an average share of ~44%. Emissions from this category declined at a rate of 1.27% (compounded annually), from 14.99 Mt CO₂e in 2005, to 12.68 Mt CO₂e in 2018.

Within the Aggregate Sources sub-sector, the contribution of Agriculture Soils to gross AFOLU emissions increased from ~7% in 2005 to ~9% in 2018 and that of Rice Cultivation increased from ~41% in 2005 to ~43% in 2018 (see Figures 11 and 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.

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

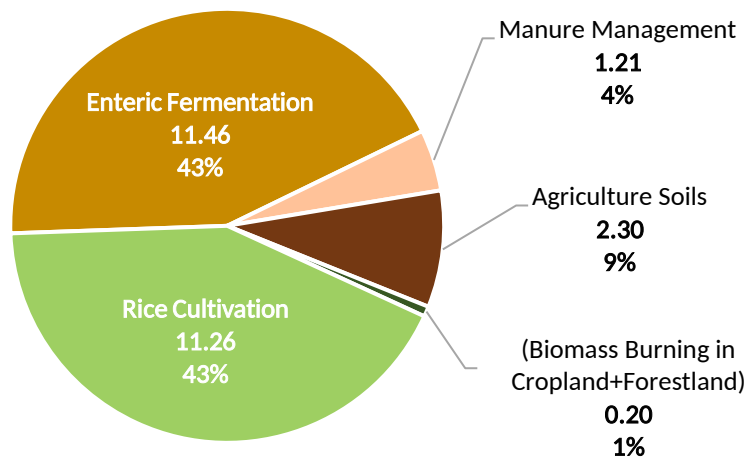


Figure 12: Category-wise Percentage Share of Gross AFOLU Emissions (excluding Land sub-sector) (2005 to 2018)





Waste Sector

Solid Waste Disposal, Domestic Wastewater and Industrial Wastewater are the key sources of GHG emissions in the Waste sector. In West Bengal, Waste sector contributed ~4% to its net emissions in 2018. Emissions from Waste sector increased at a CAGR of 1.83% from 5.81 Mt CO₂e in 2005, to 7.36 Mt CO₂e in 2018. Waste sector emissions decreased in 2010 and 2015, due to the decline in emissions from the Industrial Wastewater sub-sector (see Figure 13).

Figure 13: GHG Emissions Estimates of Waste Sector - West Bengal (2005 to 2018)

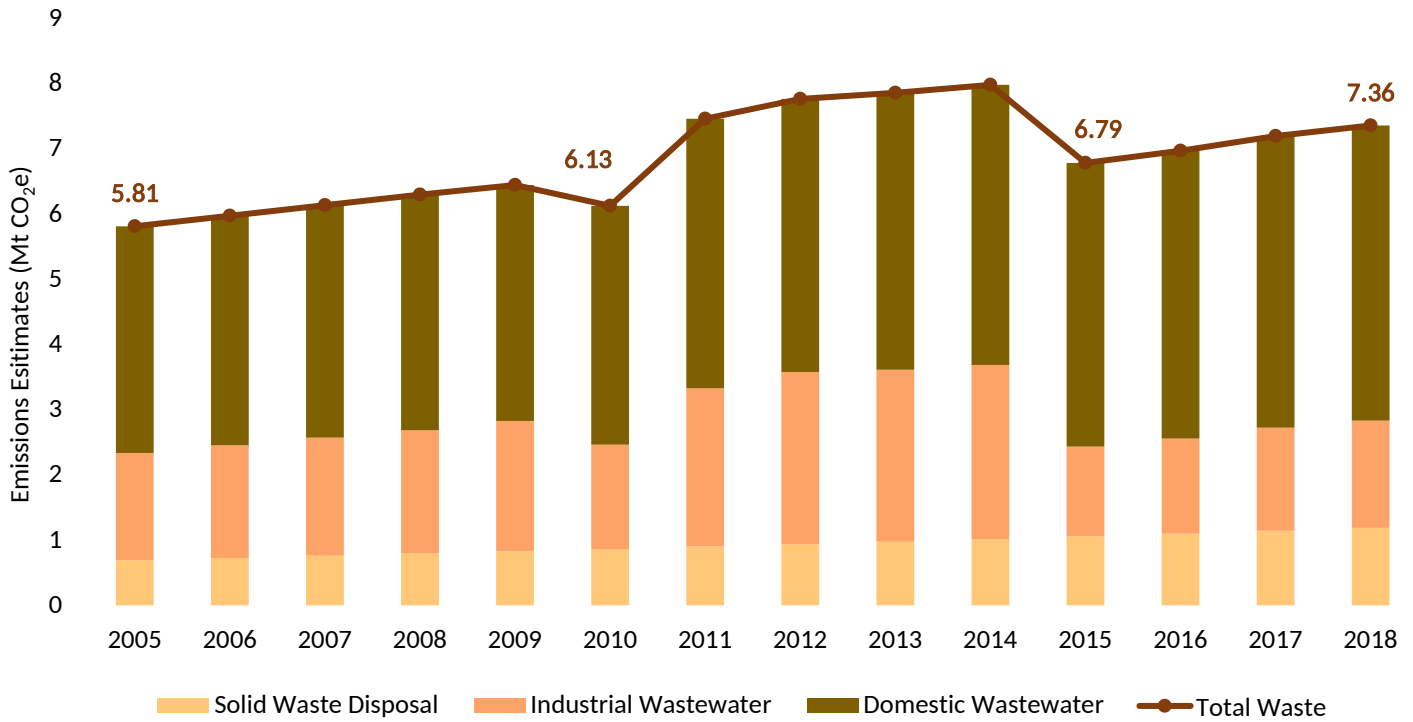
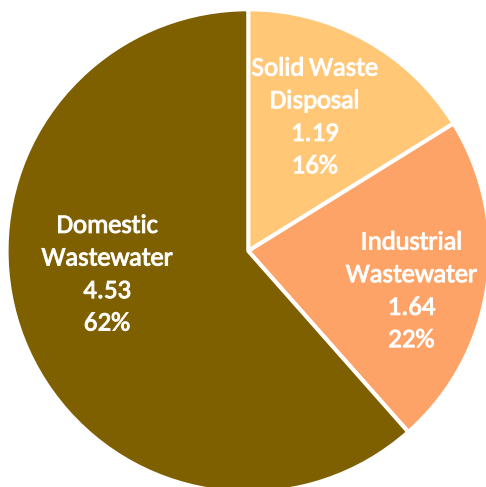


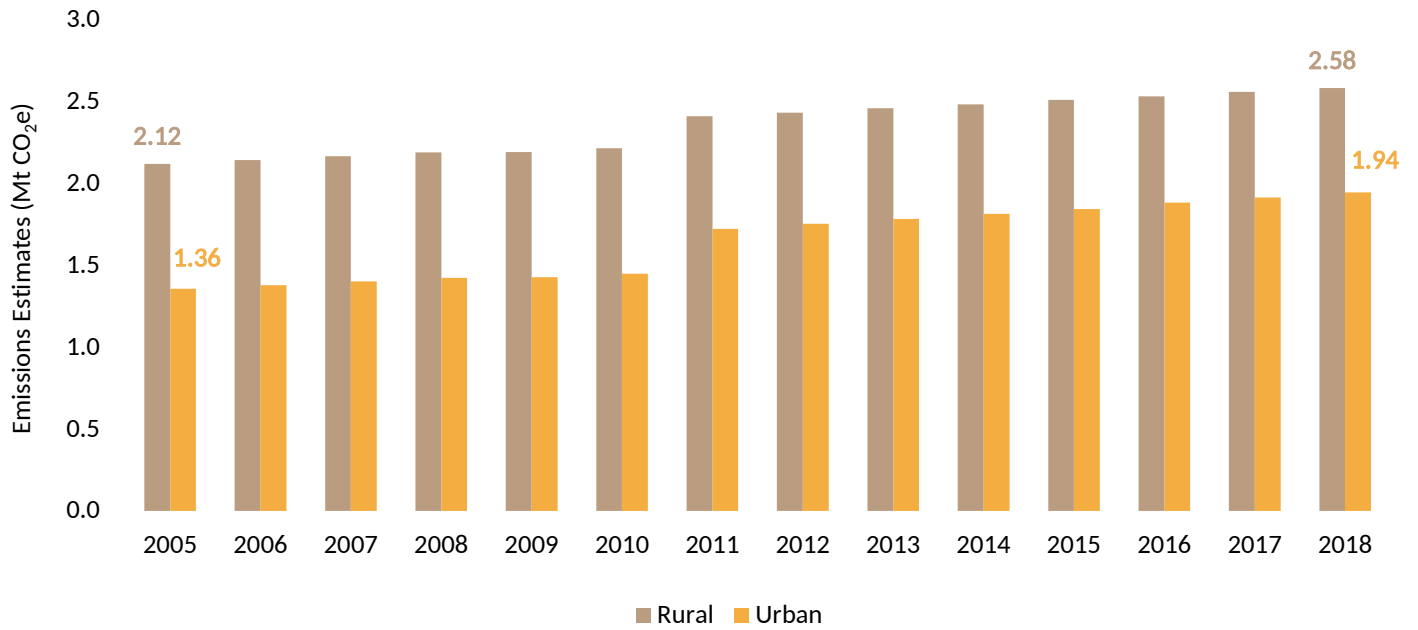
Figure 14: Sub-sector Emissions (Mt CO₂e) and Percentage Share in Total Waste Sector Emissions (2018)



Discharge of untreated wastewater and use of septic tanks are the key drivers of emissions in the Domestic Wastewater sub-sector. In 2018, the Domestic Wastewater had a share of 62% in the total Waste sector emissions of West Bengal. Approximately 16% of the Waste sector emissions were from Solid Waste Disposal, which increased at an estimated CAGR of 4.24% during the reference period from 0.69 Mt CO₂e in 2005 to 1.19 Mt CO₂e in 2018. Industrial Wastewater accounted for nearly 22% of Waste sector emissions in 2018. Emissions from this sub-sector declined at a CAGR of 0.01%, from 1.65 Mt CO₂e in 2005 to 1.64 Mt CO₂e in 2018 (see Figure 14).

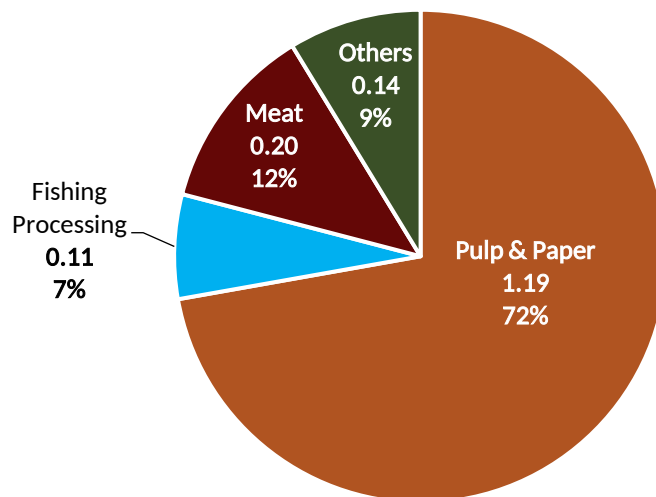
Emissions from Domestic Wastewater in both rural and urban areas increased at a CAGR of 2.05%, from 3.48 Mt CO₂e in 2005, to 5.43 Mt CO₂e, in 2018. Almost 57% of Domestic wastewater emissions emanated from rural areas of West Bengal in 2018 (see Figure 15).

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 with a share of ~72% in 2018. This was followed by Meat (~12%), Fish Processing (~7%) and other industries (~9%), 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.

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