GHG Platform INDIA

Trend Analysis of GHG Emissions in BIHAR

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.

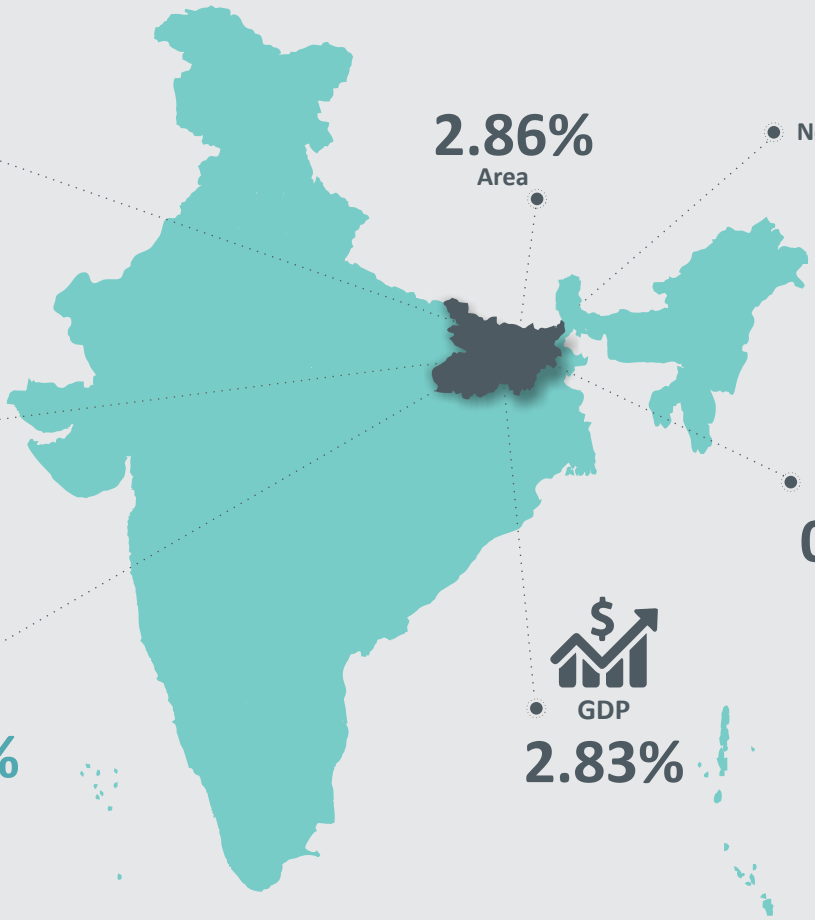
The Platform seeks to add value to the various ongoing GHG emission estimation efforts by helping address existing data gaps and data accessibility issues, extending beyond the scope of national inventories to state inventories, and by increasing the volume of analytics and policy dialogue on India's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

Bihar at a glance (2013)



Population
8.71%

2.86%
Area

Net GHG Emissions
2.75%

Population Density
1102 Persons/Sq.Km (Bihar)
382 Persons/Sq.Km (India)

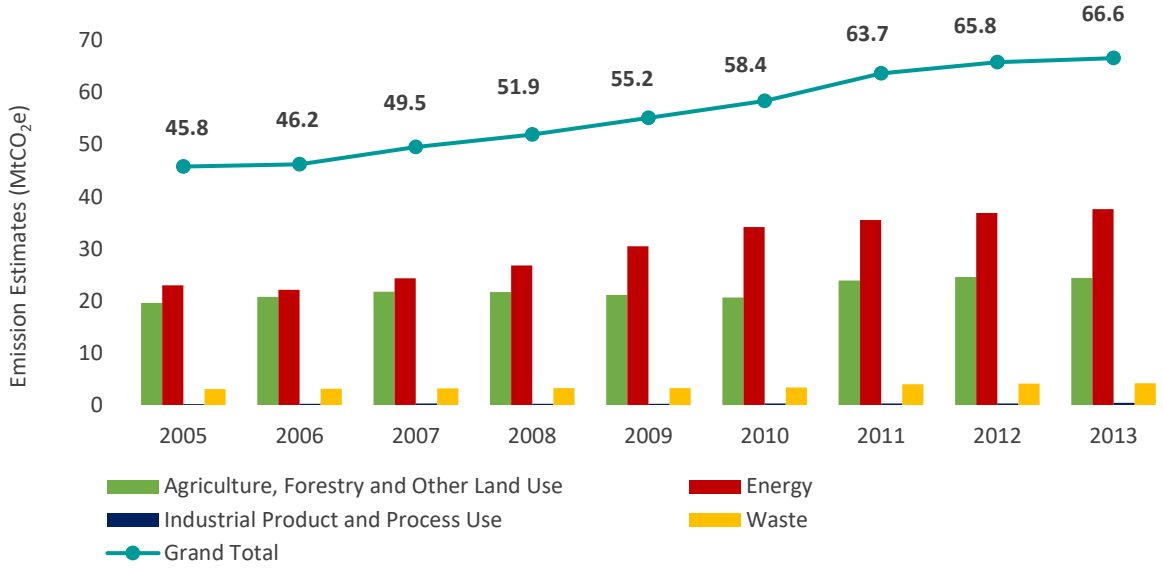
Per Capita Emissions
0.61 tCO_2e (Bihar)
1.93 tCO_2e (India)

Forest Area
8% (Of Bihar's Total Area)
1.04% (Of India's Forest Area)

GDP
2.83%

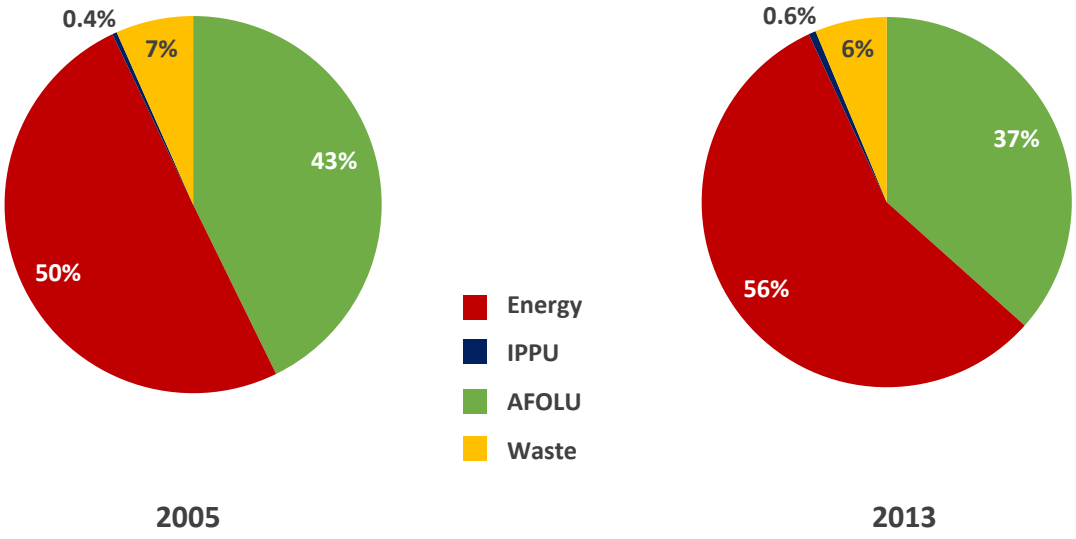
Economy-wide Emission Estimates

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



Emissions of Bihar grew from 45.8 $MtCO_2e$ to 66.6 $MtCO_2e$ at an estimated CAGR[1] of 4.79% from 2005 to 2013[2] as depicted in Figure 1 above. In 2013, the Energy sector contributed ~56% of the total emissions of Bihar while the AFOLU sector had a share of ~37%. As inferred from Figure 2 below, share of the Energy emissions increased from ~50% in 2005 to ~56% in 2013. While the share of the AFOLU sector decreased from ~43% in 2005 to ~37% in 2013. The contributions from the Waste and IPPU sectors to GHG emissions of Bihar remained almost the same, with the IPPU sector contribution remaining below 1%.

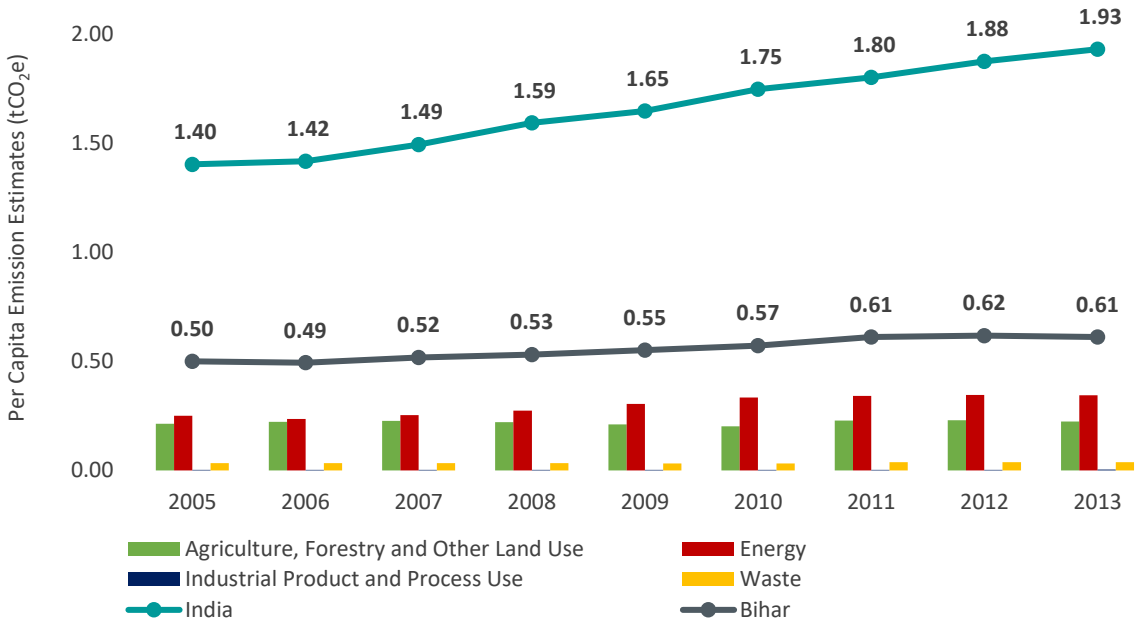
Figure 2: Sector-wise Contribution to Economy-wide GHG Emissions of Bihar



[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

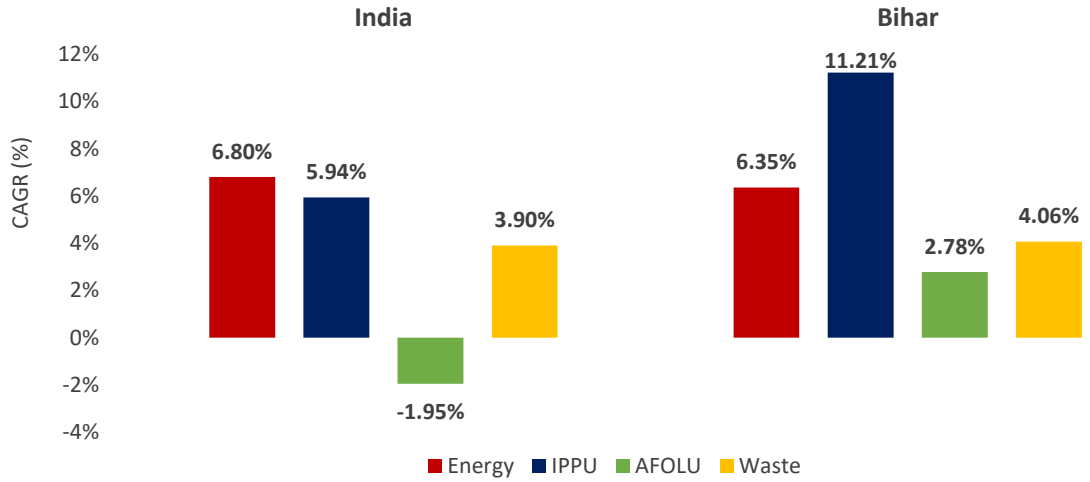
Figure 3: Per Capita GHG Emissions for Bihar and India (2005 to 2013)



Per capita emissions of Bihar saw a slight increase from 0.50 tCO_2e in 2005 to 0.61 tCO_2e in 2013 as illustrated in Figure 3 above. When compared to India, Bihar recorded significantly lower per capita emissions. The CAGR of per capita emissions in India and Bihar were 4.07% and 2.53% respectively. Thus, not only were per capita emissions of Bihar much lower than that of the country, they also grew at a rate that was significantly lower.

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

These growth rates have been compounded annually.

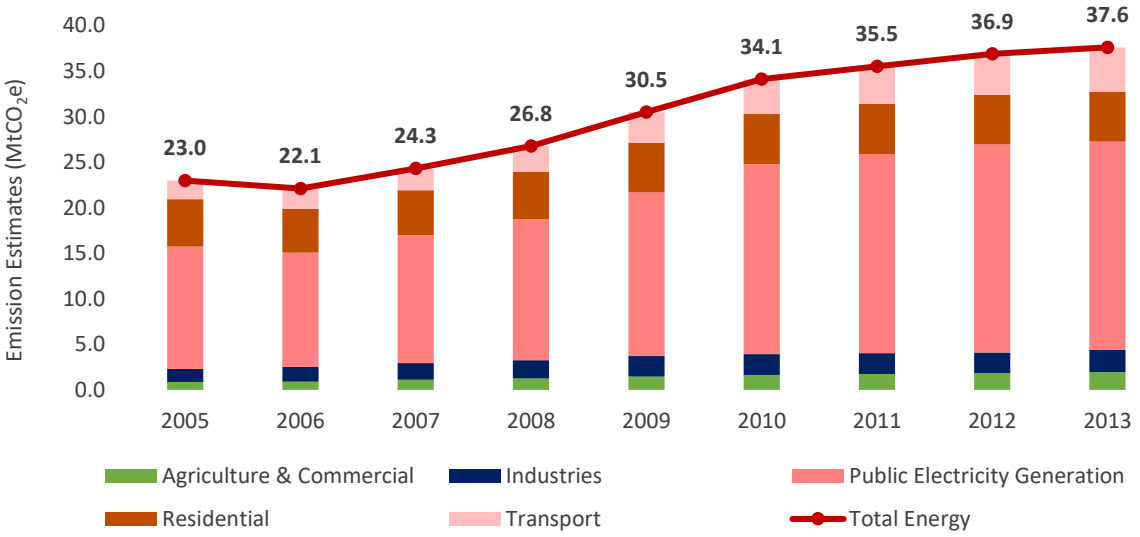


The IPPU sector had registered the highest CAGR of 11.21% but with a very low baseline and negligible contribution to total emissions, while emissions from the Energy and AFOLU sectors grew at a CAGR of 6.35% and 2.78% respectively. The growth of GHG emissions for all sectors of Bihar were much higher than India's, except for the Energy sector.

Energy Sector

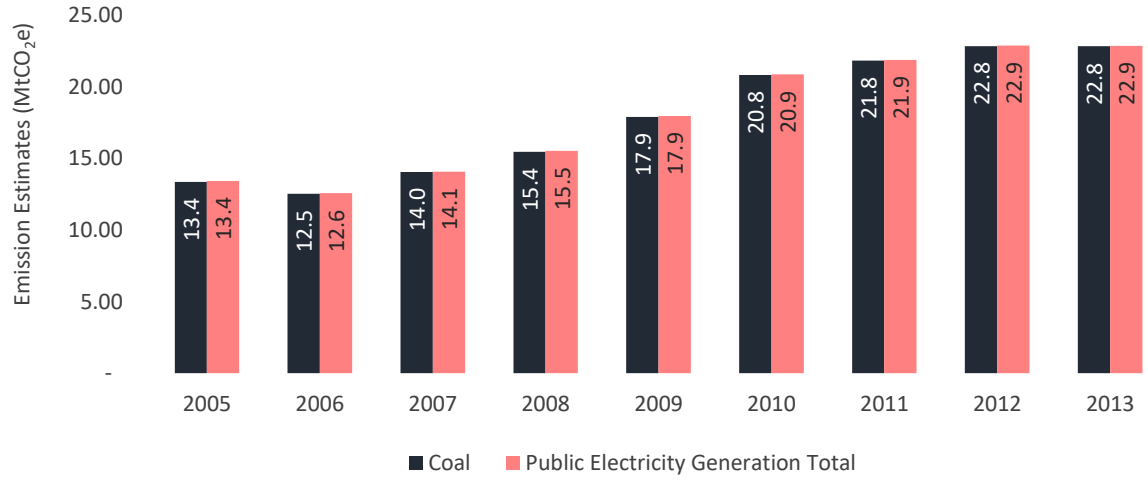
The Energy sector comprised of ~56% of the total emissions of Bihar in 2013. In general, emissions from the Energy sector arise from two main sub-sectors – Fuel Combustion (Public Electricity Generation, Transport, Industries, Agriculture, Commercial and Residential categories) and Fugitive. Among the two, emissions arising from Fuel Combustion were very large compared to almost negligible Fugitive emissions in Bihar. The Energy sector emissions increased at a CAGR of 6.3% from 23 $MtCO_2e$ in 2005 to 37.6 $MtCO_2e$ in 2013 as depicted in Figure 5 below.

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



Public Electricity Generation was a major contributor to emissions with its share being ~61% of the total Energy sector emissions of Bihar in 2013. This was followed by the Residential and Transport categories each contributing ~15% and ~13% respectively in 2013. Emissions arising out of Public Electricity Generation were mainly from Coal-based Power Generation. Emissions from Public Electricity Generation grew at a CAGR of 6.9% from 13.4 $MtCO_2e$ in 2005 to 22.9 $MtCO_2e$ in 2013 as depicted in Figure 6 below.

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



IPPU Sector

The IPPU sector embodied ~0.6% of the total GHG emissions of Bihar in 2013. IPPU emissions from the state were largely driven by Mineral and Chemical Industries. The emissions of the IPPU sector grew from 0.18 $MtCO_2e$ in 2005 to 0.42 $MtCO_2e$ in 2013 as depicted in Figure 7 below. Although the IPPU sector formed a very minor portion of the total emissions in Bihar, it witnessed a CAGR of 11.2% during the reference period.

Figure 7: GHG Emission Estimates for IPPU Sector of Bihar (2005 to 2013)

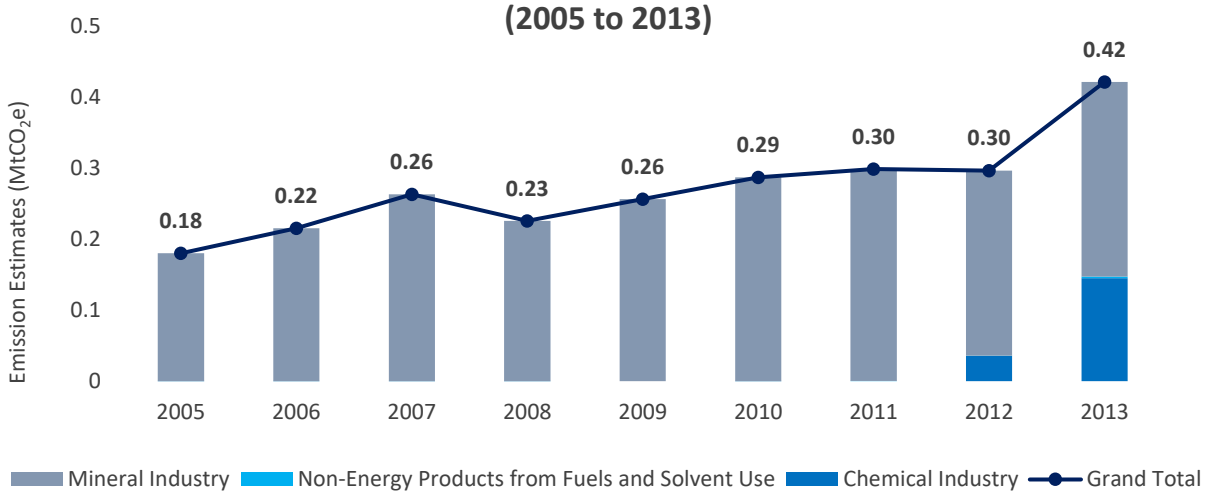
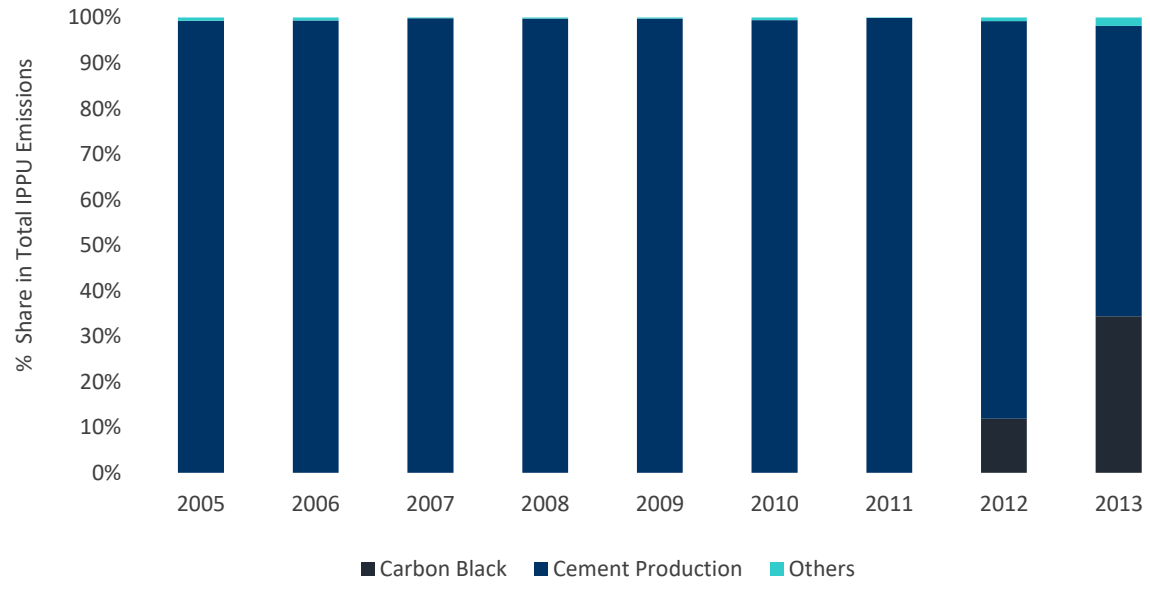


Figure 8 below depicts a trend of GHG emissions by various IPPU categories. While Cement Production was the key driver of emissions during the reference period, an abrupt increase in the overall emissions was observed in 2012 owing to reported data of Carbon Black production in the IPPU sector.

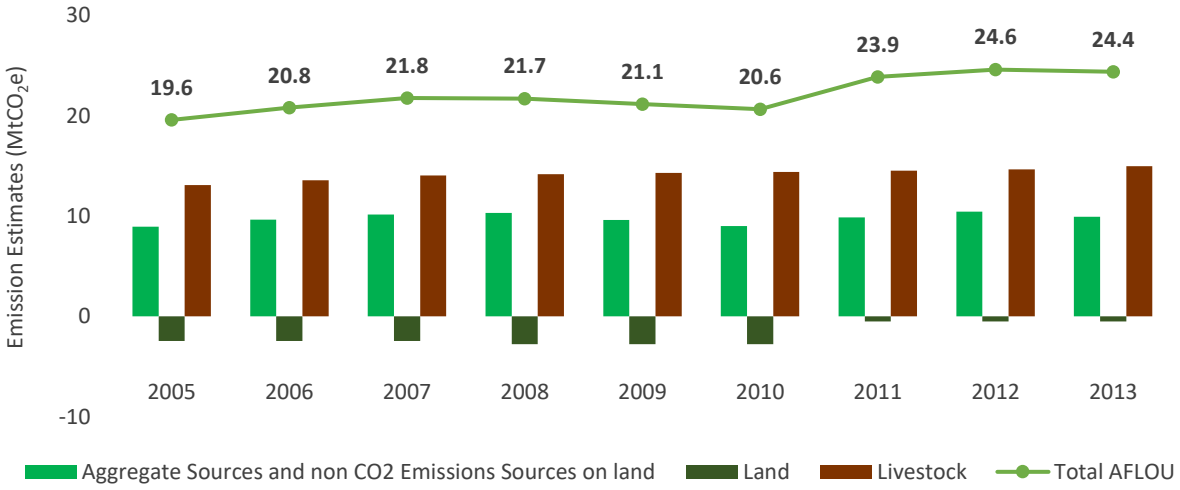
Figure 8: Share of GHG Emissions from IPPU Categories (2005 to 2013)



AFOLU Sector

Emissions from the AFOLU sector represented almost 37% of the total emissions of Bihar in 2013. Emissions from the AFOLU sector arise from three main sub-sectors namely Livestock, Land and Aggregate sources and Non-CO_2 Emissions Sources on Land. The AFOLU emissions increased at a CAGR of 2.78% from 19.6 $MtCO_2e$ in 2005 to 24.4 $MtCO_2e$ in 2013 as depicted in Figure 9 below. Notably, the Land sub-sector acted as a sink in all the reference years in Bihar. Livestock emissions contributed most to the emissions from the AFOLU sector across all the years from 2005 to 2013. This is perhaps a reflection of the importance of dairy and other associated activities in the animal husbandry sector in the economy of Bihar. Emissions due to Aggregate Sources and Non-CO_2 Emission Sources on Land did not show any significant change in the years in consideration. Removals from Land decreased significantly owing to the reduction in the greencover of the state.

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



On further investigation of the AFOLU sub-sectors, it can be clearly seen that, Enteric Fermentation was a major contributor but with little or no change in the proportion or growth of its emissions. Significantly, the percentage share of emissions from Rice Cultivation decreased from 31% in 2005 to 27% in 2013. There was a sustained increase in the emissions of Agriculture Soils from 9% in 2005 to 12% in 2013. This can be attributed to the increased usage of fertilizers in Bihar.

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

Waste Sector

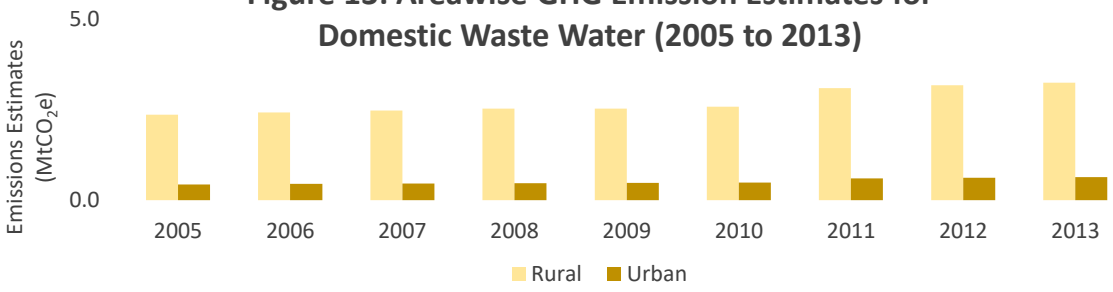
The Waste sector contributed to ~6% of the total emissions of Bihar in 2013. The key sources of GHG emissions from the Waste sector are Municipal Solid Waste[3], Domestic Wastewater and Industrial Wastewater. GHG emissions from Waste grew at a CAGR of 4.06% from 3 $MtCO_2e$ in 2005 to 4.2 $MtCO_2e$ in 2013. The emissions from the Waste sector in Bihar followed an almost linear trend until 2011.The spike in emissions in 2011 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 11: Category-wise Share of GHG Emissions for Waste Sector (in 2013)

Figure 12: GHG Emission Estimates from Waste Sector in Bihar (2005 to 2013)

Domestic Wastewater comprised ~92% of the total Waste emissions of Bihar. Emissions of Domestic Wastewater originating from the rural and urban areas of Bihar grew at a CAGR of 4.2% from 2.8 $MtCO_2e$ in 2005 to 3.9 $MtCO_2e$ in 2013. Given Bihar's large rural population, over 80% emissions from this sub-sector originated from its rural areas during the reference period as depicted in Figure 13 below. Discharge of untreated wastewater and use of septic tanks are key drivers of emissions in this sub-sector.

Figure 13: Areawise GHG Emission Estimates for Domestic Waste Water (2005 to 2013)



Municipal Solid Waste contributed approximately 6% of the total Waste emissions in 2013. Emissions from this sub-sector grew at a CAGR of 2.1% from 2005 to 2013, driven by increasing waste generation rates, changing composition, and growing population. Industrial Wastewater had a minor share of ~2% in the total Waste emissions in 2013.

[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 CH_4 emissions'

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The Platform comprises of the following civil society:

An initiative supported by

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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.

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