

Trend Analysis of GHG Emissions in CHHATTISGARH

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*



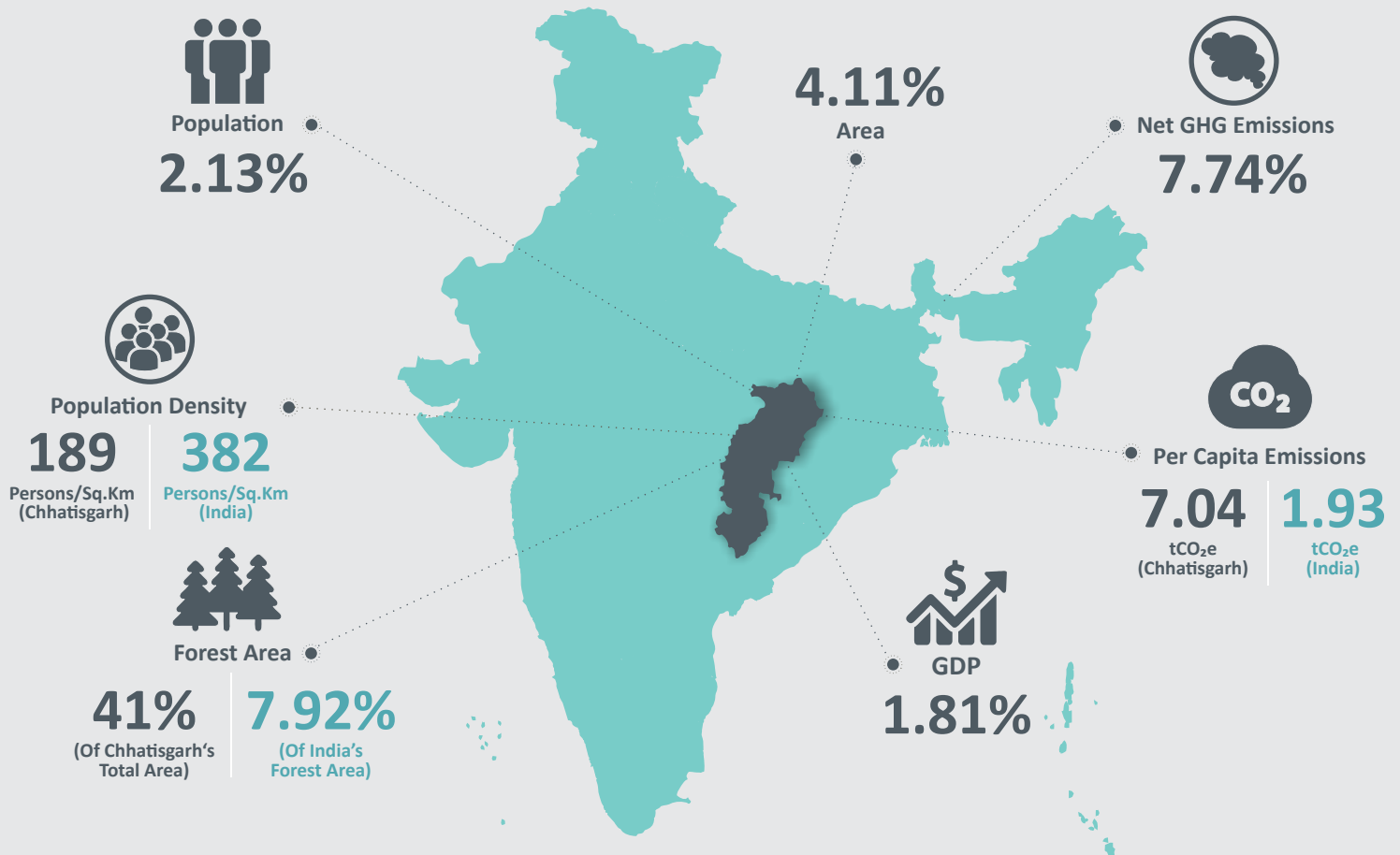
AFOLU



WASTE

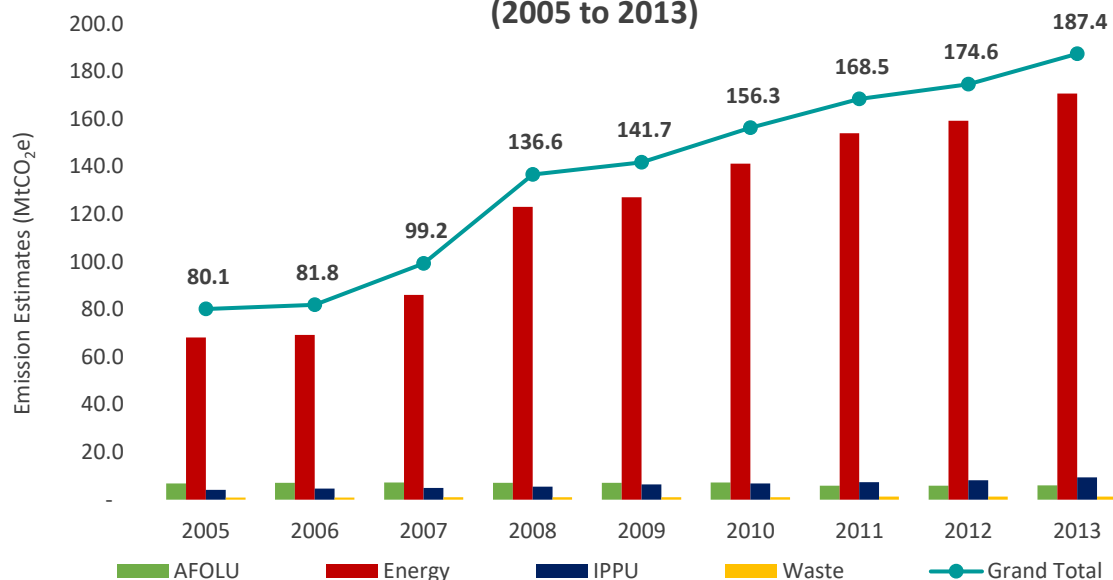
*Fuel combusted for Captive Electricity Generation (Auto-Producers) has been reported under Energy sector.

Chhatisgarh at a glance (2013)



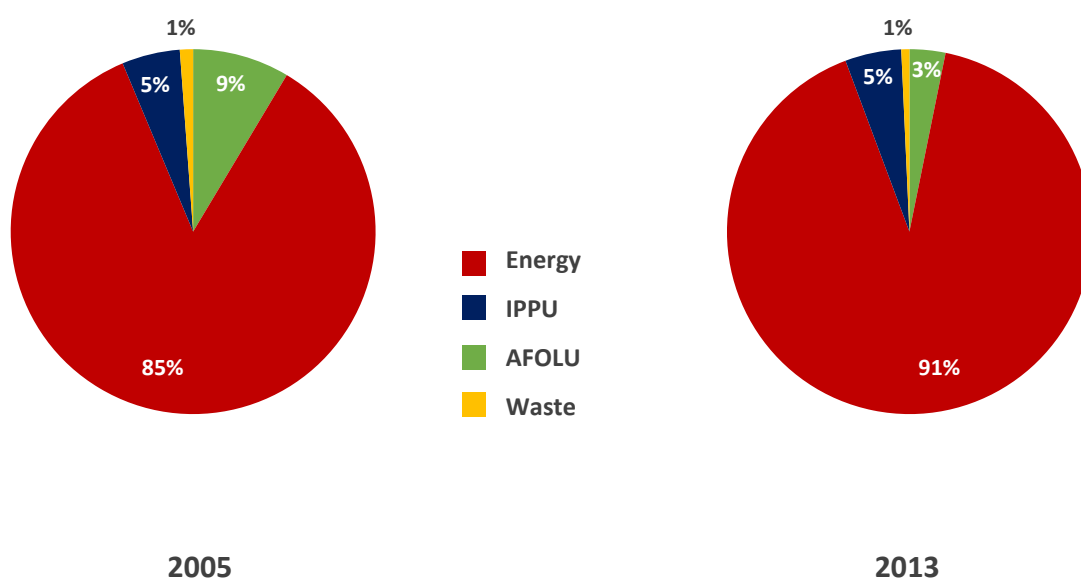
Economy-wide Emission Estimates

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



Emissions of Chhattisgarh grew at a CAGR¹ of 11.20% from 80.1 MtCO₂e in 2005 to 187.4 MtCO₂e in 2013². A substantial jump in total emissions was observed in 2008 owing to increased Energy sector emissions, that continued to rise subsequently, as shown in Figure 1 above. In 2005, the Energy sector formed the major share of emissions (~85%) from this state. The remaining ~15% emissions were from IPPU (~5%), AFOLU (~9%) and Waste sector (~1%) respectively. As inferred from Figure 2, the percentage share of the Energy sector rose to ~91% while that of the AFOLU sector decreased to ~3% in 2013. However, the shares of IPPU and Waste sectors remained unchanged when compared to 2005 levels.

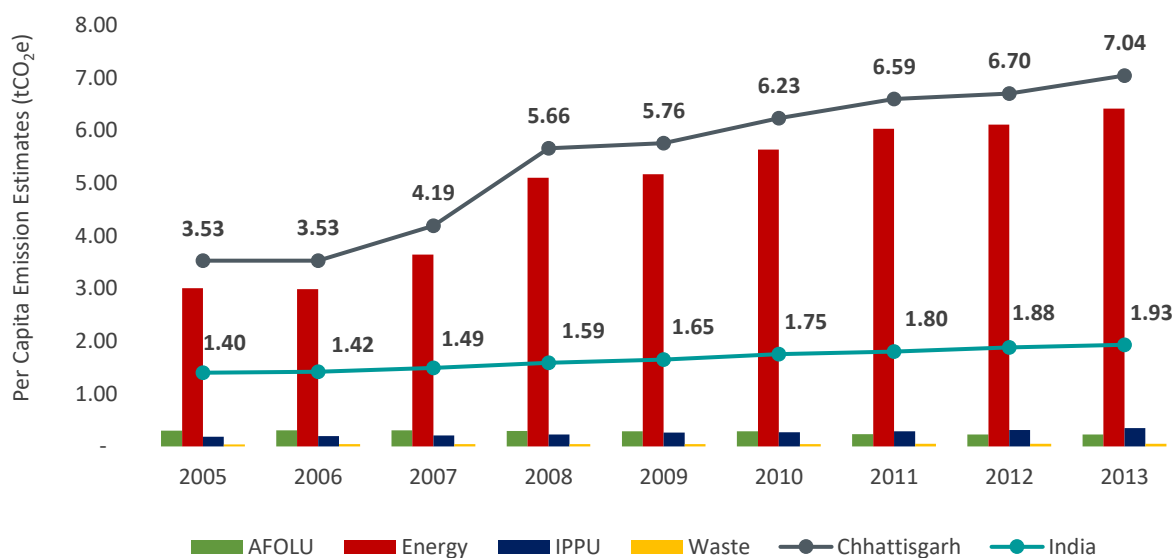
Figure 2: Sector-wise Contribution to Economy-wide GHG Emissions of Chhattisgarh



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.

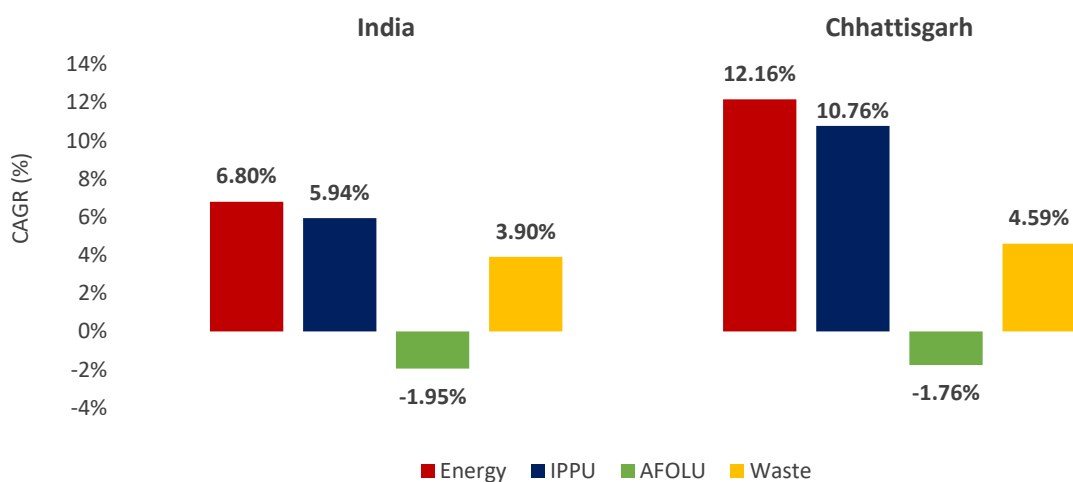
Figure 3: Per Capita GHG Emissions from Chhattisgarh and India (2005 to 2013)



The per capita emissions from Chhattisgarh grew at a CAGR of 9.03% from 3.53 tCO₂e in 2005 to 7.04 tCO₂e in 2013 as depicted in Figure 3 above. When compared to India, the per capita emissions of Chhattisgarh remained very high throughout the reference period. This is perhaps a reflection of increased power production, perhaps for exports to other states, as well as a concentration of heavy industries in the state.

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

These growth rates have been compounded annually.



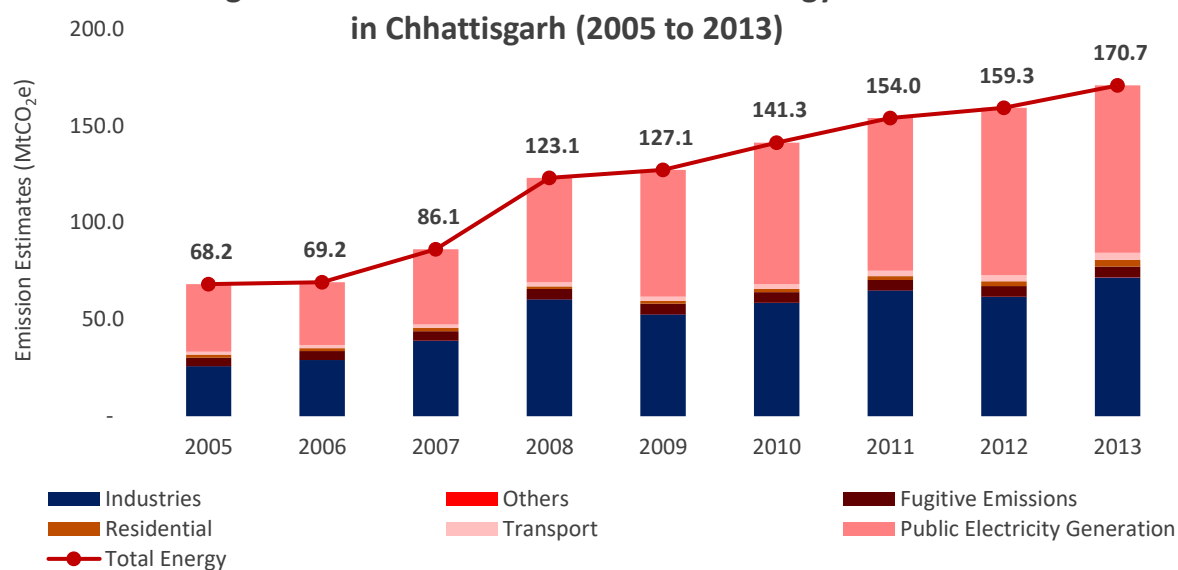
Energy sector registered the highest growth of 12.16% in Chhattisgarh from 2005 to 2013 followed by the IPPU sector which relatively had a slightly lower growth rate of 10.76%. Waste sector recorded a moderate growth of 4.59% from 2005 to 2013. The AFOLU sector registered a decline of 1.76% from 2005 to 2013. When compared to India's sectoral growths, all the sectors in Chhattisgarh recorded a higher growth rate except the AFOLU sector which registered a lower decline rate when compared to India's AFOLU sector (-1.95%) as shown in Figure 4 above.



Energy Sector

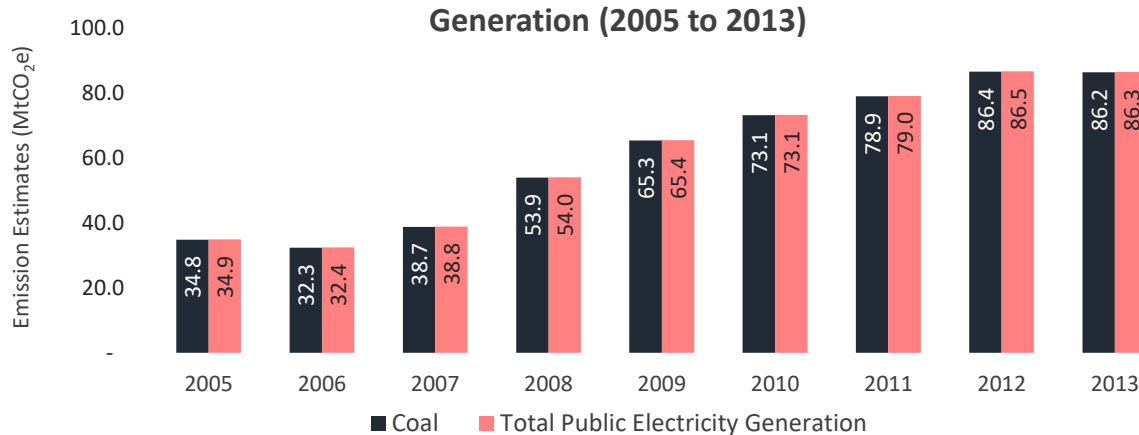
The Energy sector represented ~91% of the total emissions of Chhattisgarh in 2013. In general, emissions from the Energy sector arise from two main sub-sectors – Fuel Combustion (Public Electricity Generation, Transport, Industries and Agriculture, Commercial and Residential categories) and Fugitive. In 2013, ~97% of the Energy sector emissions were from the Fuel Combustion sub-sector whereas only ~3% of the emissions were Fugitive. Emissions from the Energy sector grew at an estimated CAGR of 12.16% from 68.2 MtCO₂e in 2005 to 170.7 MtCO₂e in 2013. In 2008, a substantial rise in the overall Energy emissions was observed in Chhattisgarh due to an abrupt rise in emissions from the Public Electricity Generation and Industries categories as depicted in Figure 5 below.

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



Public Electricity Generation was the top GHG emitter of this sector with an average share of ~50% across all the reference years. Emissions from this category grew at an estimated CAGR of 12% from 34.9 MtCO₂e in 2005 to 86.3 MtCO₂e in 2013. Almost all the Public Electricity Generation emissions were found to be emanating from Coal-based Power Plants of Chhattisgarh as depicted in Figure 6 below.

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

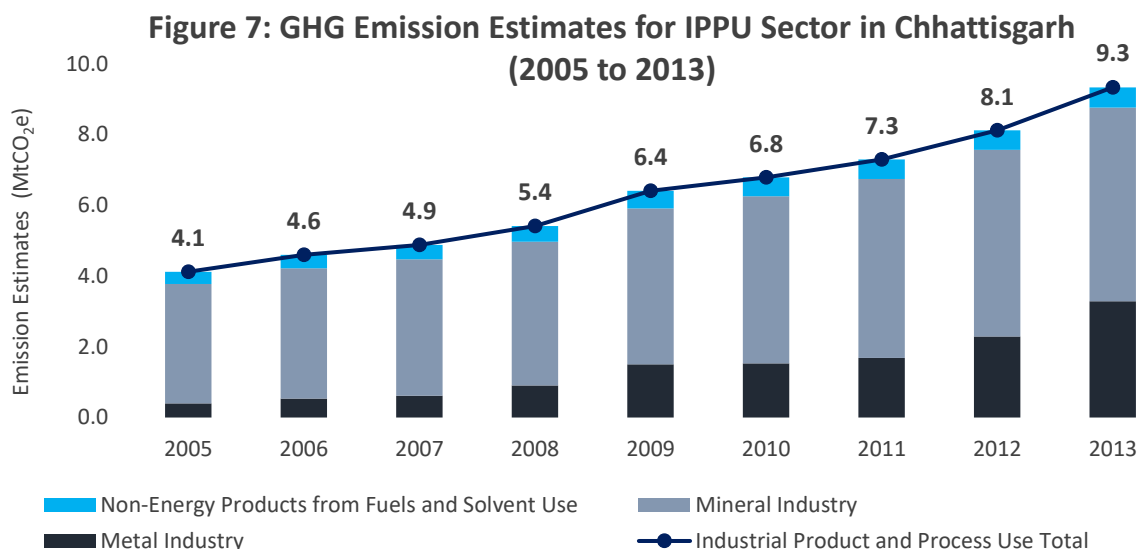


Fuel combusted in the Industries was the second major GHG emitting category in the Energy sector with an average share of ~42% across all the reference years. Emissions from this category grew at a CAGR of 13.60% from 25.9 MtCO₂e in 2005 to 71.7 MtCO₂e in 2013 primarily driven by emissions from Fuel combusted in Iron and Steel Industries in Chhattisgarh.

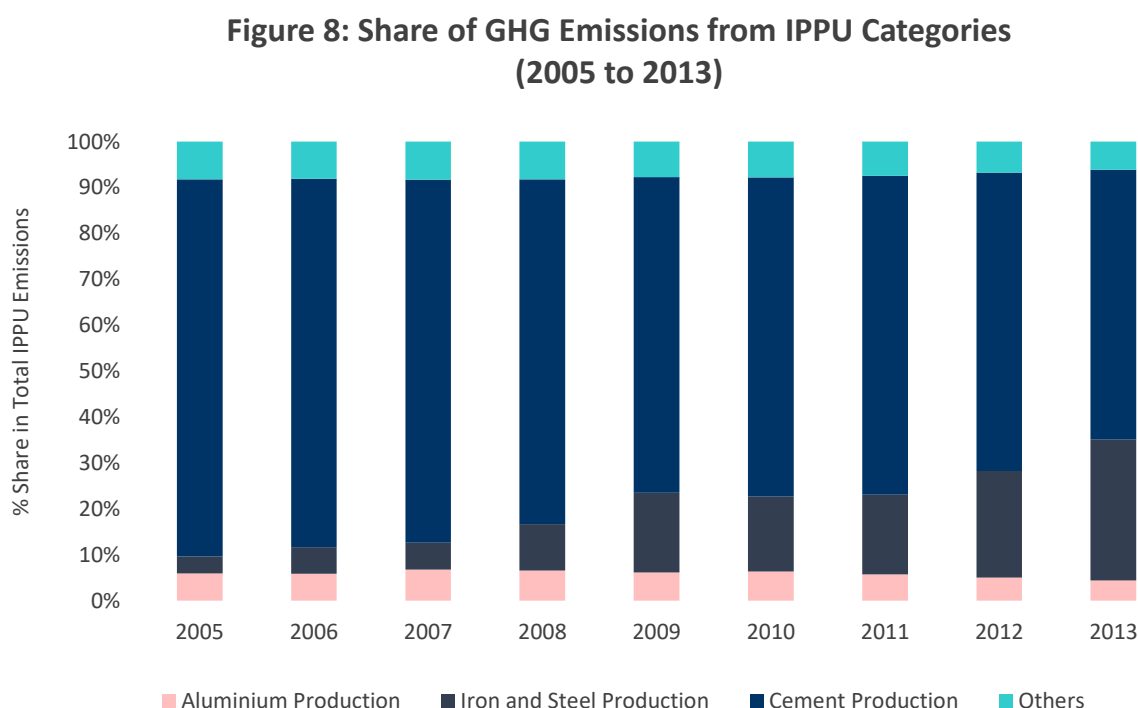


IPPU Sector

The IPPU sector represented ~5% of the total GHG emissions in Chhattisgarh in 2013. IPPU emissions in Chhattisgarh arise from Mineral, Metal and Non-Energy Products from Fuels and Solvent use. Between 2005 and 2013, the overall IPPU emissions grew at a CAGR of 10.76% from 4.1 MtCO_{2e} in 2005 to 9.3 MtCO_{2e} in 2013. Majority of Chhattisgarh's IPPU emissions were recorded from Mineral Industry (~59%) followed by Metal Industry (~35%) in 2013.



A detailed trend of GHG emissions by various IPPU categories is illustrated in Figure 8 below. Although, Cement Production (Mineral Industry) was the key driver of emissions in this sector across all the reference years. However, during the later years its share in the total IPPU emissions declined from ~82% in 2005 to ~59% in 2013 while the share of emissions from the Iron and Steel Industries (Metal Industry) increased from ~4% in 2005 to ~31% in 2013.

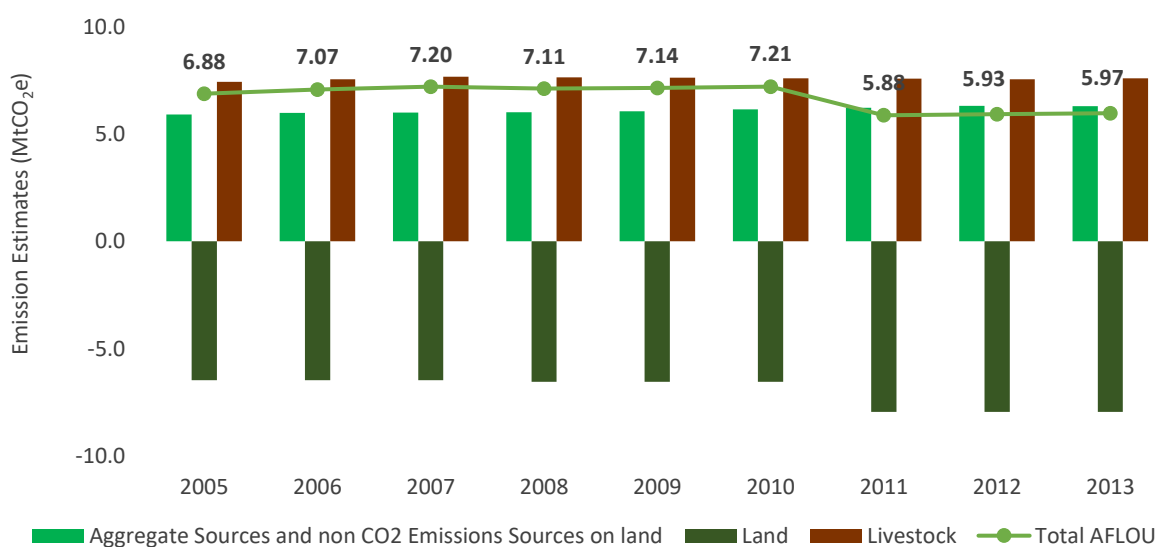




AFOLU Sector

The AFOLU sector represented ~3% of the total emissions of Chhattisgarh 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. Chhattisgarh's Land sub-sector acted as a net sink across all the reference years while the other categories were net emitters of GHGs. The overall emissions of the AFOLU sector declined at a compounded rate of 1.76% from 6.88 MtCO₂e in 2005 to 5.97 MtCO₂e in 2013. However, in 2011 a dip in the total AFOLU emissions was recorded owing to increased removals from the Land sub-sector as depicted in Figure 9 below. Notably, removals from the Land sub-sector accelerated at a CAGR of 2.60% from 6.46 MtCO₂e in 2005 to 7.94 MtCO₂e in 2013.

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



Livestock (Enteric Fermentation and Manure Management) sub-sector was a major contributor of GHG emissions with an average share of ~55% across all the reference years. Under the Livestock sub-sector, maximum emissions in the AFOLU sector were registered from Enteric Fermentation with an average share of ~50% throughout the reference period as shown in Figure 10 below. Rice Cultivation remained the second major GHG emitter in this sector with an average share of ~38% across all the reference years.

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





Waste Sector

The Waste sector contributed to nearly 1% of total emissions of Chhattisgarh in 2013. Municipal Solid Waste³, 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 4.59% from 0.94 MtCO₂e in 2005 to 1.34 MtCO₂e in 2013. However, in 2011, a slight rise in the total Waste emissions was observed owing to the significant rise in Domestic Wastewater which reflects changing trends in use of various treatment systems as reported in Census of India 2011 (Figure 11).

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

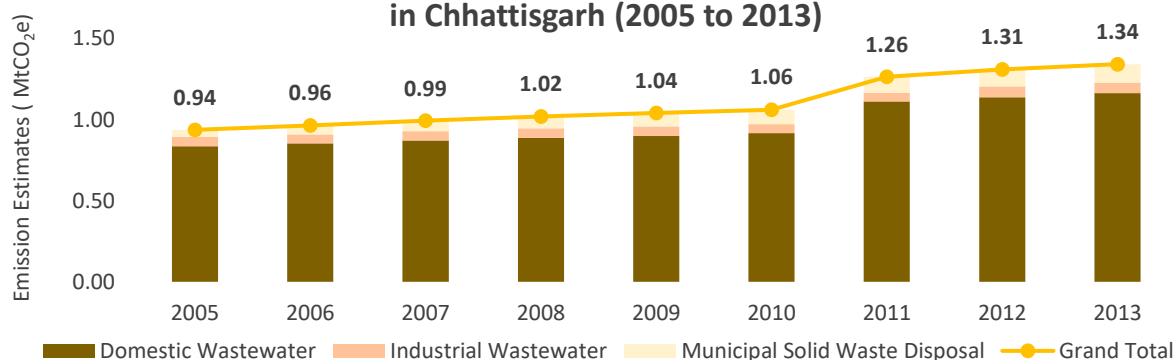
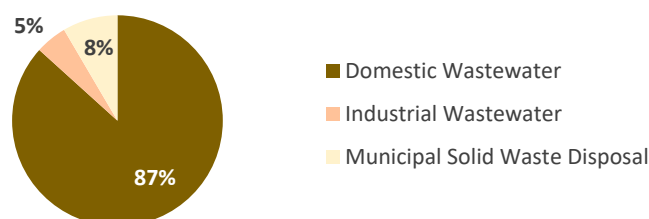
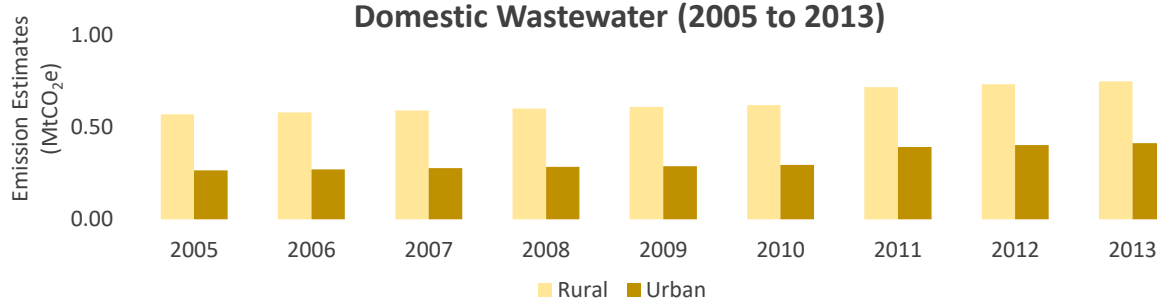


Figure 12: Category-wise Share of GHG Emissions for Waste Sector (in 2013)



Domestic Wastewater had a share of ~87% in the total emissions of the Waste sector in 2013. Emissions from Domestic Wastewater grew at a CAGR of 4.22% from 0.84 MtCO₂e in 2005 to 1.16 MtCO₂e in 2013. In 2013, almost 64% of the Domestic Wastewater emissions emanated from the rural areas of Chhattisgarh (Figure 13). Discharge of untreated wastewater and use of septic tanks are key drivers of emissions in this sub-sector.

Figure 13: Areawise GHG Emission Estimates from Domestic Wastewater (2005 to 2013)



Municipal Solid Waste represented ~8% of the total Waste emissions in 2013. Emissions from this sub-sector grew at a CAGR of 12.74% from 0.04 MtCO₂e in 2005 to 0.11 MtCO₂e in 2013. Remaining 5% of the total Waste sector emissions resulted from Industrial Wastewater in 2013. The emissions from this sub-sector grew at a rate of 12.74% (compounded annually) from 2005 to 2013. In 2013, Pulp and Paper Industries had a major share of ~89% in the total Industrial Wastewater emissions while Meat (~9%) and Dairy (~1%) Industries formed the remaining 10% of the emissions in this sub-sector.

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 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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