GHG Platform INDIA

Trend Analysis of GHG Emissions in PUNJAB

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.

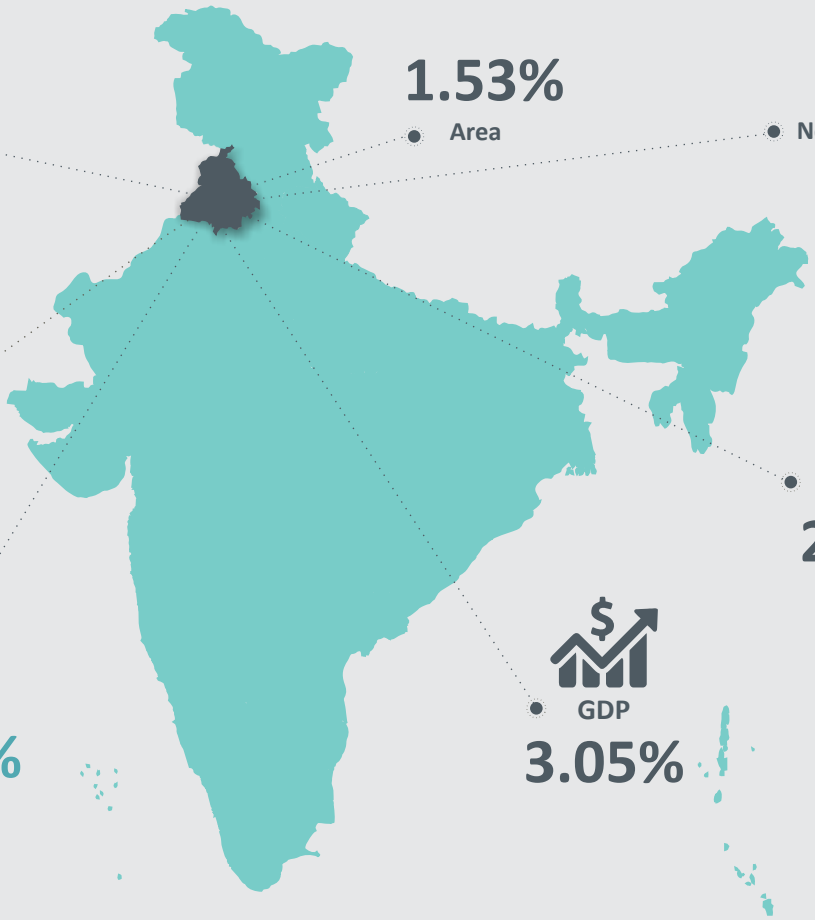
The Platform seeks to add value to the various ongoing GHG emission estimation efforts by helping address existing data gaps and data accessibility issues, extending beyond the scope of national inventories to state inventories, and by increasing the volume of analytics and policy dialogue on India's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

Punjab at a glance (2013)



Population
2.28%

Area
1.53%

Net GHG Emissions
2.47%

Population Density
550 Persons/Sq.Km (Punjab)
382 Persons/Sq.Km (India)

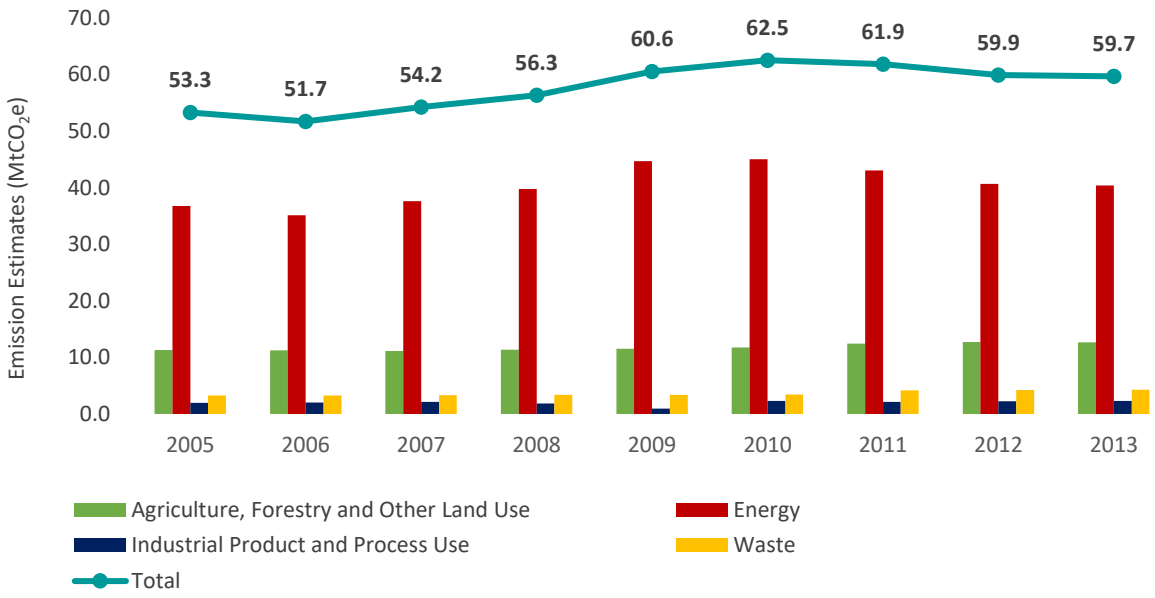
Per Capita Emissions
2.10 tCO_2e (Punjab)
1.93 tCO_2e (India)

Forest Area
4% (Of Punjab's Total Area)
0.25% (Of India's Forest Area)

GDP
3.05%

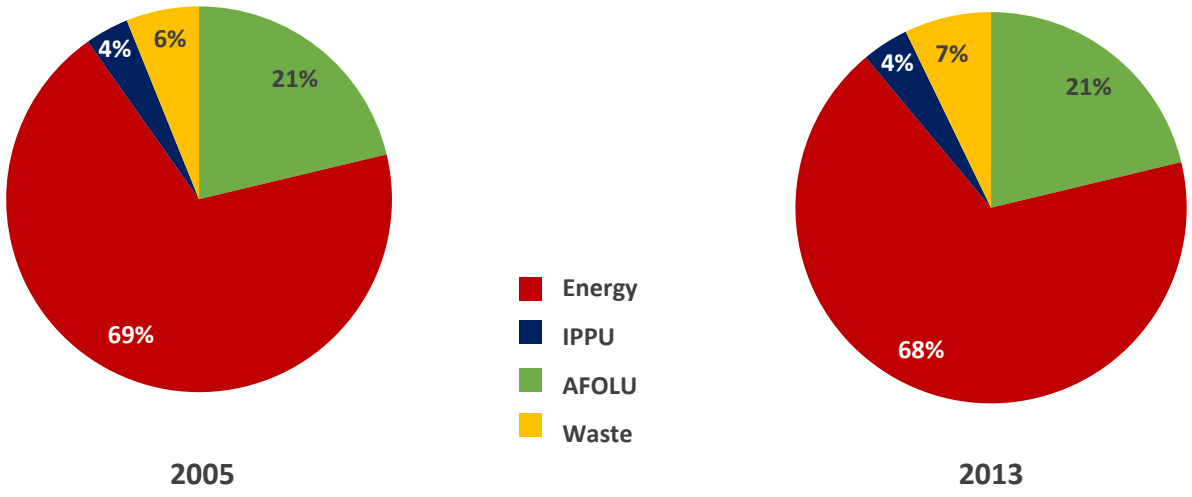
Economy-wide Emission Estimates

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



Emissions of Punjab grew from 53.3 $MtCO_2e$ to 59.7 $MtCO_2e$ at an estimated CAGR[1] of 1.43% from 2005 to 2013[2]. A slight bump in the overall emissions was observed in 2010 owing to increased emissions from the Energy sector. The Energy and AFOLU sectors were the top contributors of GHG emissions across all the reference years. In 2013, the Energy sector had the maximum share of ~68% followed by the AFOLU sector (~21%). The Waste (~7%) and the IPPU (~4%) sectors had a combined share of ~11% in 2013, Notably, the percentage sectoral shares of emissions in 2013 were almost the same when compared to 2005 as illustrated in Figure 2 below.

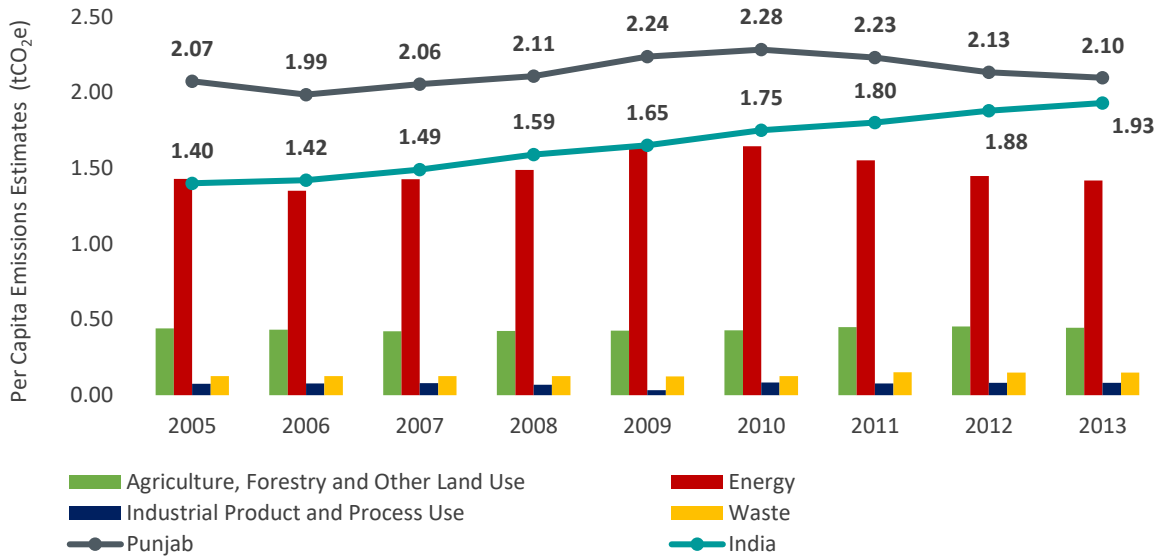
Figure 2: Sector-wise Contribution to Economy-wide GHG Emissions of Punjab



[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

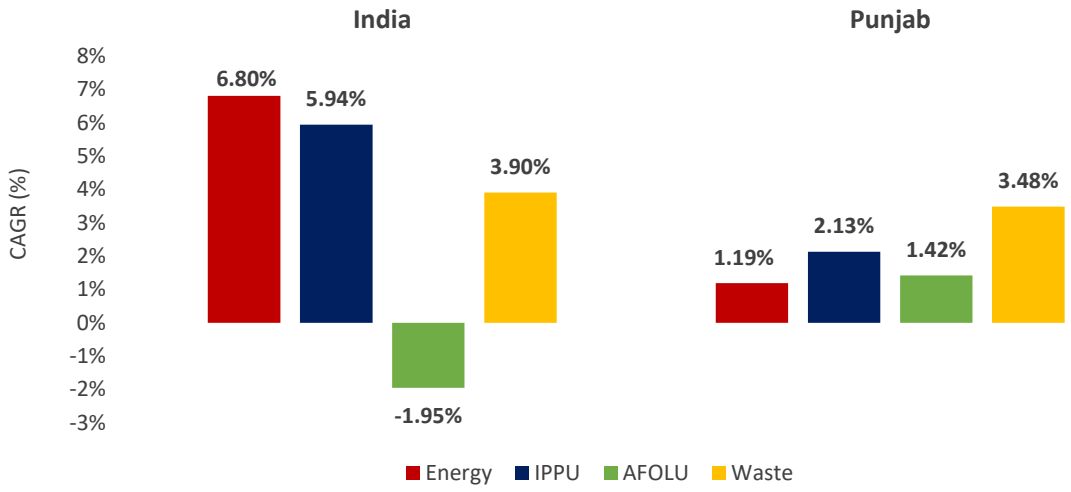
Figure 3: Per Capita GHG Emissions for Punjab and India (2005 to 2013)



The per capita emissions trend of Punjab was fairly flat and grew at a low CAGR of 0.14% from 2.07 tCO_2e in 2005 to 2.10 tCO_2e in 2013. The per capita emissions of Punjab peaked at 2.28 tCO_2e in 2010 and started declining thereafter. When compared to the per capita emissions of India, Punjab recorded a slightly higher level of per capita emissions. However, this difference had decreased substantially between 2005 and 2013 as illustrated in Figure 3 above. The per capita emissions of India grew an observed CAGR of 4.07% from 2005 to 2013, unlike Punjab.

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

These growth rates have been compounded annually.

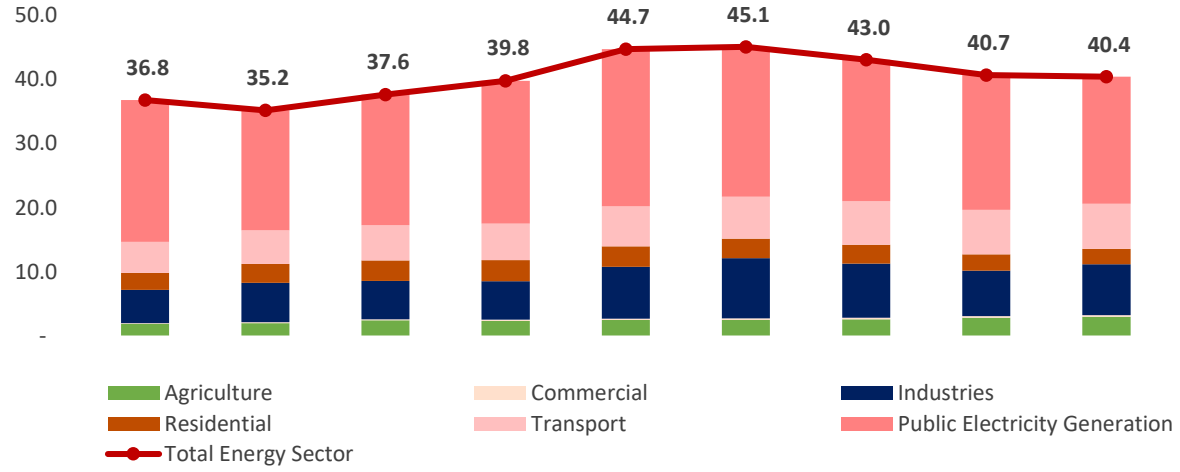


The Waste sector in Punjab registered the highest CAGR of 3.48% from 2005 to 2013. This was followed by the IPPU and AFOLU sectors, which had a lower CAGR of 2.13% and 1.42% respectively for the same period. The Energy sector in Punjab recorded the lowest growth rate of 1.19% (compounded annually) during the reference period. When compared to India's sectoral growth rates, all the sectors of Punjab registered a lower growth rate as shown in Figure 4 above. The exception was the AFOLU sector, whose GHG emissions grew at a CAGR of 1.42%, unlike the negative growth witnessed for India's AFOLU sector during the reference period.

Energy Sector

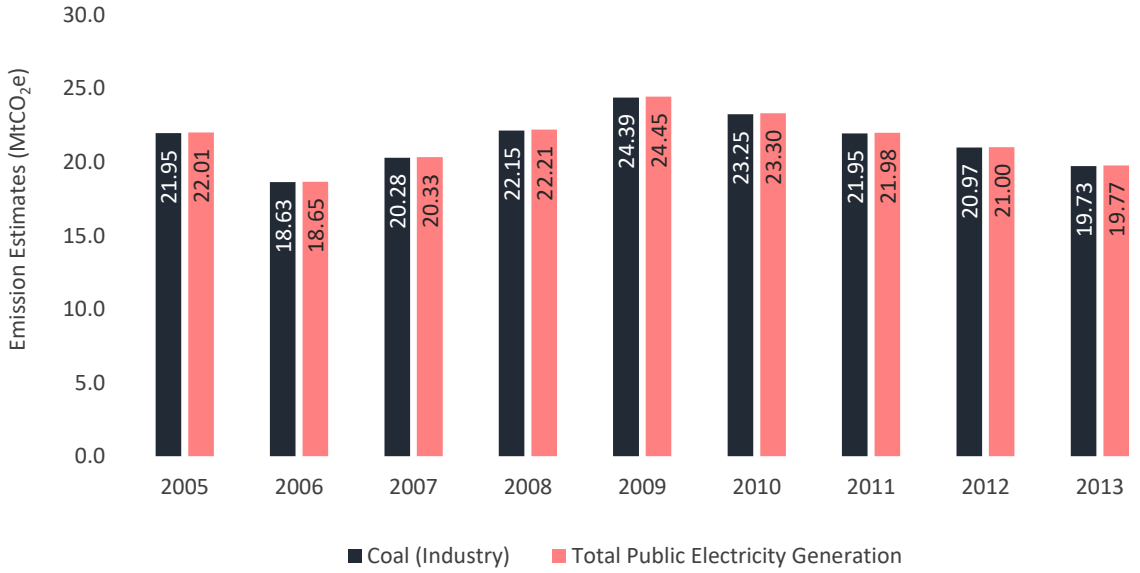
The Energy sector represented ~68% of total emissions in Punjab in 2013. In general, emissions from the Energy sector arise from two main sub-sectors– Fuel Combustion and Fugitive. For Punjab, however, almost all the emissions were from the Fuel Combustion sub-sector. The Energy Sector emissions of Punjab grew at a CAGR of 1.19% from 36.8 $MtCO_2e$ in 2005 to 40.4 $MtCO_2e$ in 2013.

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



Public Electricity Generation was a major category under the Fuel Combustion sub-sector in Punjab's Energy emissions portfolio. Under Public Electricity Generation, almost all the emissions emanated from the Coal-based power plants as illustrated in Figure 6 below. Notably, the share of emissions from this category saw a significant decline at a rate of 1.34% (compounded annually) from 22.0 $MtCO_2e$ in 2005 to 19.8 $MtCO_2e$ in 2013.

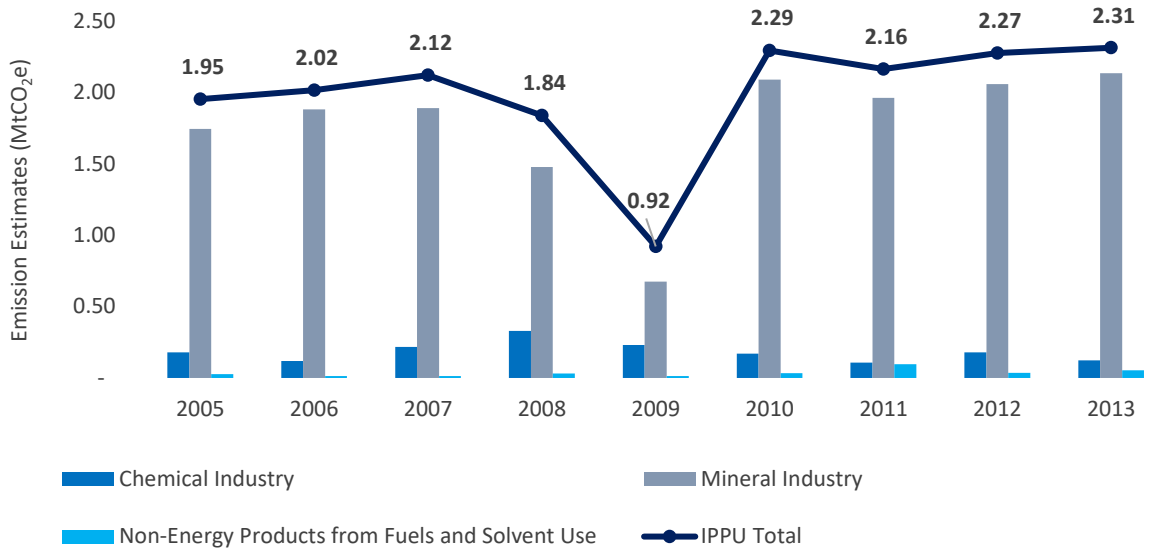
Figure 6: GHG Emission Estimates from Coal-based Power Generation (2005 to 2013)



IPPU Sector

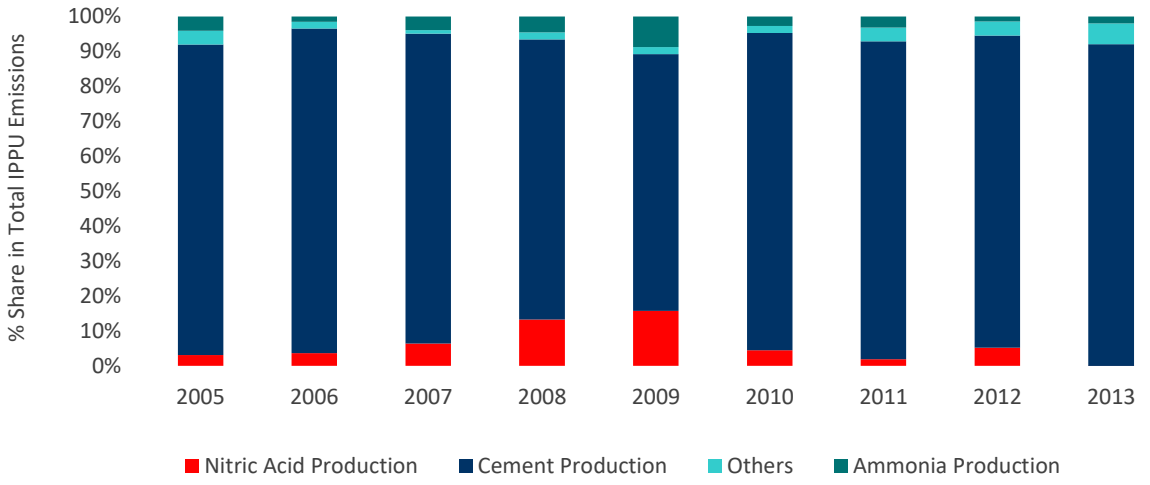
The IPPU sector represented ~4% of the total GHG emissions of Punjab in 2013. Emissions from the IPPU sector are largely driven by Chemical, Metal, Mineral Industries and Non-Energy Products from Fuels and Solvent Use. Between 2005 and 2013, the overall IPPU emissions in Punjab grew at a CAGR of 2.13% from 1.95 $MtCO_2e$ in 2005 to 2.31 $MtCO_2e$ in 2013 as shown in Figure 7 below. However, an interim dip was observed in 2009 during the reference period.

Figure 7: GHG Emission Estimates for IPPU Sector in Punjab (2005 to 2013)



Disaggregation at a sectoral level, shows that the emissions were primarily driven by the Cement Industry (Figure 8). A decrease in production of Cement led to an interim dip in the emissions in the year 2009 (IBM, 2009[3]). In addition, emissions from Nitric Acid Production showed an interim peak in 2009, and no production data was reported for the year 2013.

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

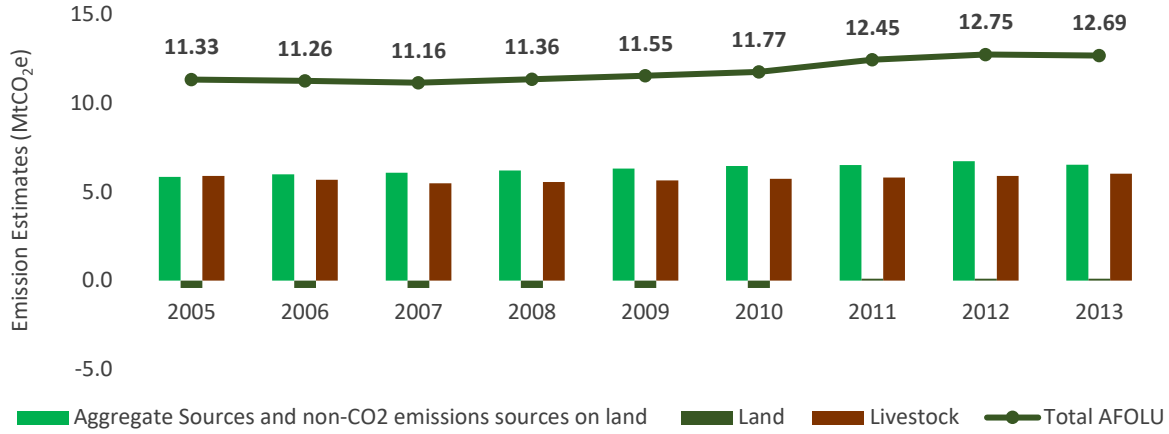


[3] IBM mineral yearbook 2010-11

AFOLU Sector

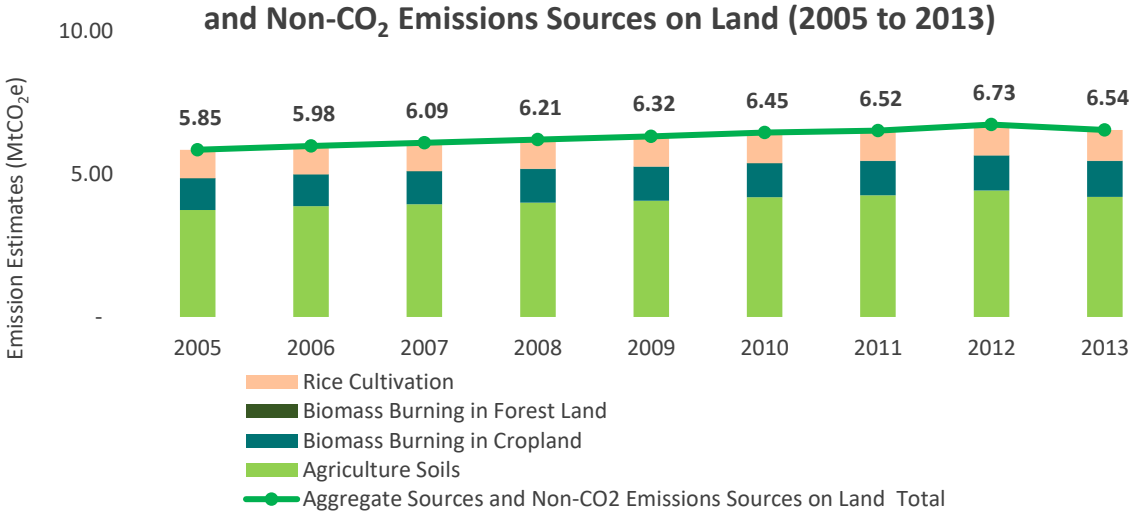
The AFOLU sector represented ~21% of the GHG emissions of Punjab in 2013. Emissions of the AFOLU sector arise from three main sub-sectors namely Livestock, Land and Aggregate sources and Non-CO_2 Emissions Sources on Land. Notably, the Land sub-sector was a net sink of GHGs till 2010 and became a net emitter thereafter. Emissions from this sector grew at a CAGR of 1.42% from 11.33 $MtCO_2e$ in 2005 to 12.69 $MtCO_2e$ in 2013 as depicted in Figure 9 below. On the whole, emissions from the AFOLU sector remained fairly flat throughout the reference period.

Figure 9: GHG Emission Estimates from AFOLU Sector in Punjab (2005 to 2013)



Out of the three sub-sectors, maximum emissions were observed from Aggregate Sources and Non-CO_2 Emissions Sources on Land across all the years except in 2005 when the Livestock sub-sector had a slightly higher contribution. The share of emissions (excluding Land) from Aggregate Sources and Non-CO_2 Emissions Sources on Land rose from 49.8% in 2005 to 52% in 2013 while the share of the Livestock sub-sector reduced from 50.2% in 2005 to 48% in 2013. Together, both these sub-sectors accounted for almost all of the AFOLU sector emissions of Punjab. The slight rise in Aggregate Sources and Non-CO_2 Emissions Sources on Land can be attributed to the increased use of fertilizers between 2005 to 2013 leading to a corresponding rise in Direct and Indirect N_2O emissions from Agriculture Soils. However, as inferred from Figure 10 below, GHG emissions from all the categories under Aggregate Sources and Non-CO_2 Emissions Sources on Land increased slowly from 2005 to 2013, thus leading to an overall emission rise in this sub-sector from 5.85 $MtCO_2e$ in 2005 to 6.54 $MtCO_2e$ in 2013 at a CAGR of 1.40%.

Figure 10: GHG Emission Estimates from Aggregate Sources and Non-CO_2 Emissions Sources on Land (2005 to 2013)



Waste Sector

The Waste sector comprised ~7% of total emissions of Punjab in 2013. Municipal Solid Waste[4], Domestic Wastewater and Industrial Wastewater are the key sources of GHG emissions in the Waste sector. The Waste sector emitted 4.28 $MtCO_2e$ in 2013, up from 3.26 $MtCO_2e$ in 2005 as shown in Figure 10 below. GHG emissions from this sector grew at a CAGR of 3.48% from 2005 to 2013. Notably, a significant rise in the overall Waste emissions was observed in 2011 owing to higher Domestic wastewater emissions, which reflects changing trends in use of various treatment systems as reported in Census of India 2011.

Figure 10: GHG Emission Estimates for Waste Sector in Punjab (2005 to 2013)

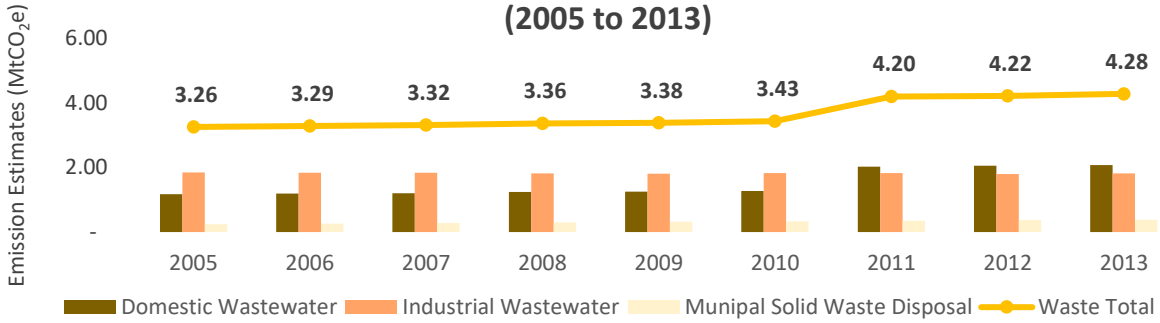
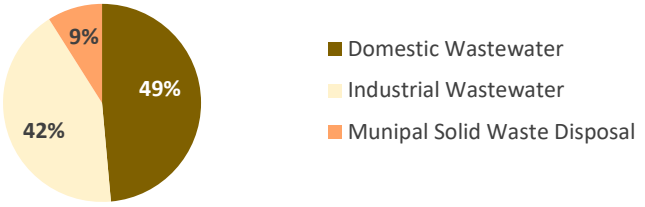
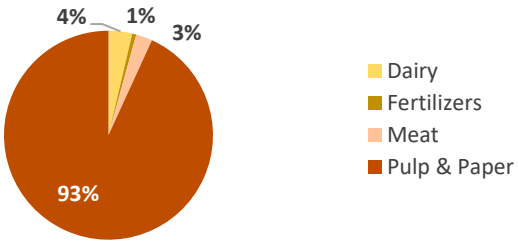


Figure 11: Category-wise Share of GHG Emissions for Waste Sector (in 2013)



Domestic Wastewater from the rural and urban areas of Punjab had a share of ~49% in the total Waste emissions of the state. Emissions from this sector grew at a CAGR of 7.38% from 1.18 $MtCO_2e$ in 2005 to 2.08 $MtCO_2e$ in 2013. Nearly 55% of the Domestic Wastewater emissions emanated from the rural areas of Punjab in 2013. Discharge of untreated wastewater and use of septic tanks are key drivers of emissions in this sub-sector.

Figure 12: Share of GHG Emissions from Industrial Wastewater Categories (in 2013)



Industrial Wastewater comprised ~42% of the Waste emissions in 2013. Emissions declined at a rate of 0.17% (compounded annually) from 1.84 $MtCO_2e$ in 2005 to 1.82 $MtCO_2e$ in 2013. Deep diving into the Industrial Wastewater categories, Pulp and Paper Industries recorded the maximum emissions with a share of ~93% in the total emissions of this sub-sector as shown in Figure 12 above. This was followed by Dairy (~4%), Meat (~3%) and Fertilizers (~1%) Industries respectively.

Municipal Solid Waste Disposal had a share of ~9% in the total Waste sector emissions. Emissions from this sub-sector grew from 0.24 MtCO2e in 2005 to 0.38 MtCO2e in 2013. Changing Solid Waste composition resulted in an increase in the GHG emissions generated from every tonne of Solid Waste disposed over the years in Punjab and emissions from this category grew at a CAGR of 6.18%.

[4] 'Refers to emission in urban areas. Emissions from 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'

GHG Platform INDIA

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

SHAKTI SUSTAINABLE ENERGY FOUNDATION

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.

Shakti Sustainable Energy Foundation works to strengthen the energy security of the country by aiding the design and implementation of policies that encourage energy efficiency, renewable energy and sustainable transport solutions.

Vasudha Foundation, set up in 2010, is a not for profit organisation, working in the clean energy and climate policy space.

WRI-India is a research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

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

This document has been compiled and analysed by Vasudha Foundation. All information mentioned in this document is sourced from GHG Platform India.
To download this document and to know more about the Platform, please visit www.ghgplatform-india.org or write to info@ghgplatform-india.org