

Trend Analysis of GHG Emissions in HIMACHAL PRADESH

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*



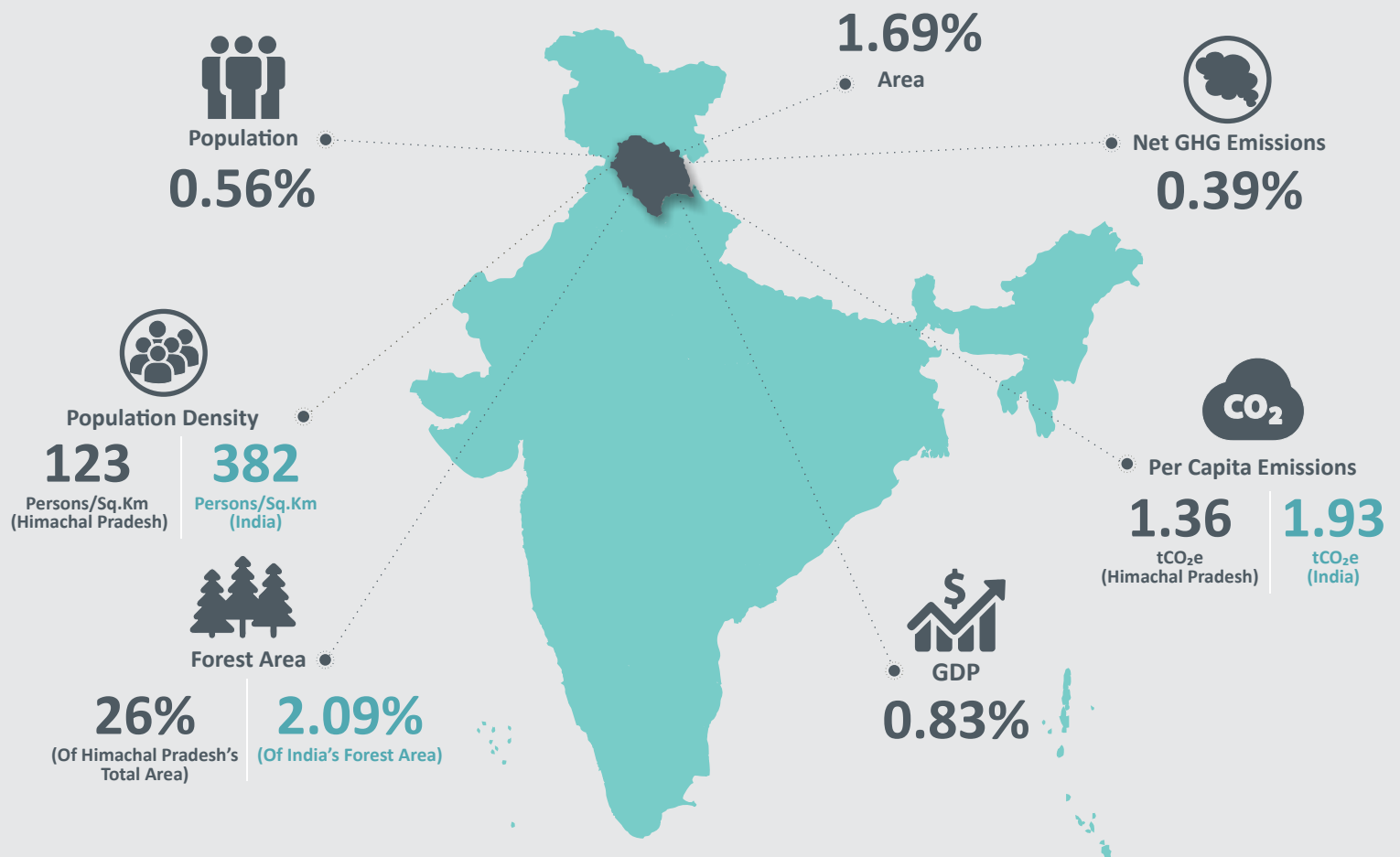
AFOLU



WASTE

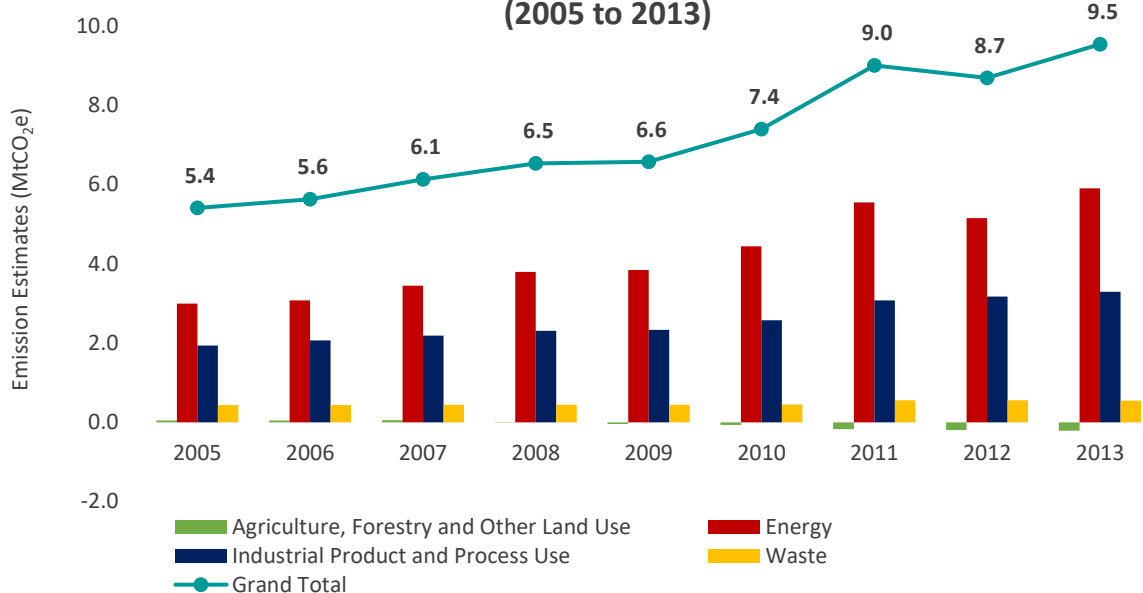
*Fuel combusted for Captive Electricity Generation (Auto-Producers) has been reported under Energy sector.

Himachal Pradesh at a glance (2013)



Economy-wide Emission Estimates

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



Emissions of Himachal Pradesh grew at a rate of 7.35% (CAGR¹) from 5.4 MtCO₂e in 2005 to 9.5 MtCO₂e in 2013². A significant rise in the overall emissions of the state was observed in 2011 owing to increased emissions from the Energy and IPPU sectors as depicted in Figure 1 above. Notably, the AFOLU sector was a net emitter till 2007 and thereafter it became a net sink owing to increased removals from the Land sub-sector.

Markedly, the Energy and IPPU sectors were the top two contributors of GHG emissions in the state across all the reference years. In 2005 the share of the Energy sector (~55%) was maximum followed by IPPU (~36%), Waste (~8%) and AFOLU (~1%) sectors. If the values were considered excluding the AFOLU sector in 2013, the shares of Energy and IPPU sectors in the total emissions were found to be ~61% and ~34% respectively.

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

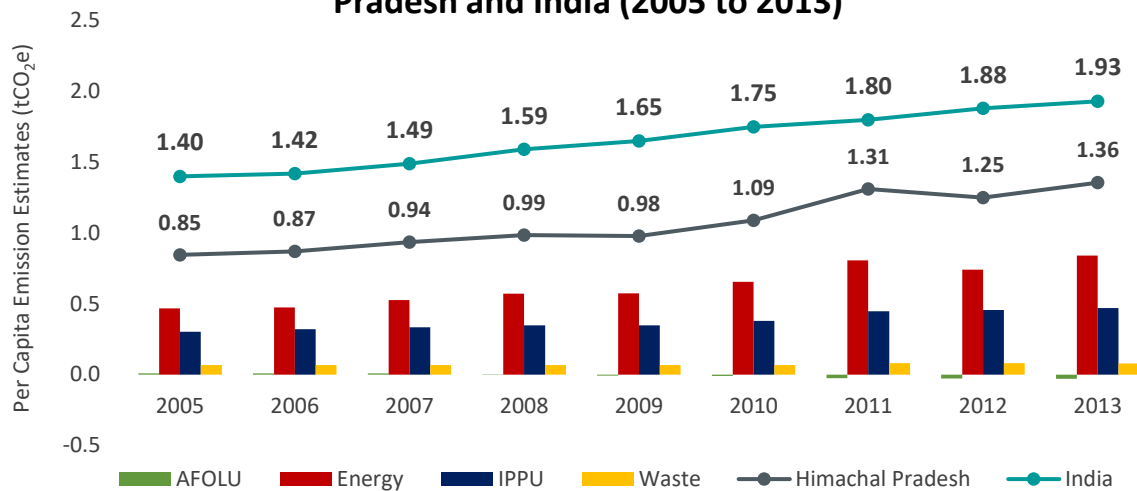


¹ Compound Annual Growth Rate

² Calendar year values have been considered for this analysis. For Global Warming Potential (GWP) calculations IPCC-ARII values have been considered.

³ AFOLU sector was a net sink of GHGs in Himachal Pradesh in 2013, hence, the sectoral shares have been considered excluding the AFOLU sector for this year.

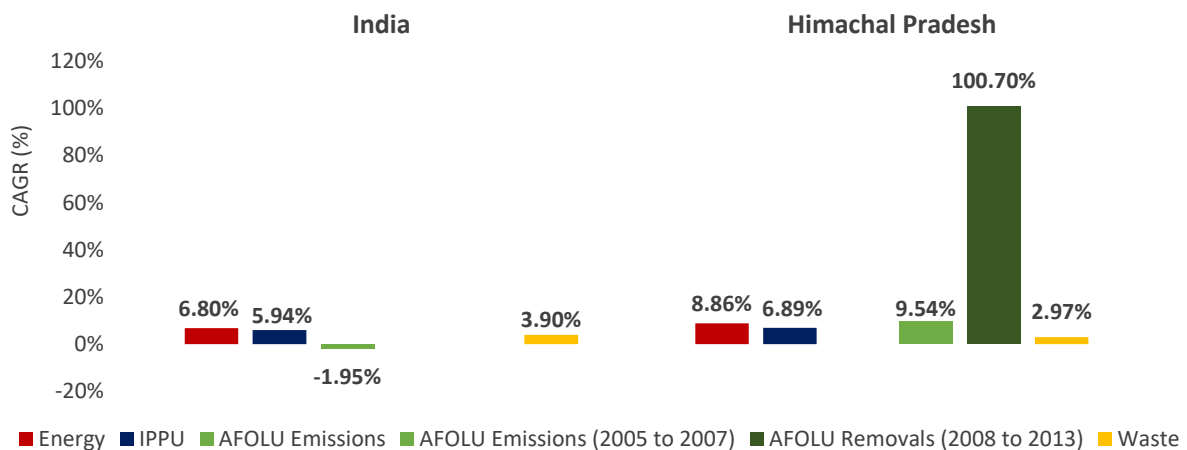
Figure 3: Per capita GHG Emission Estimates from Himachal Pradesh and India (2005 to 2013)



Per capita emissions of Himachal Pradesh grew from 0.85 tCO₂e in 2005 to 1.36 tCO₂e in 2013. This was mainly due to the increased emissions from the Energy and IPPU sectors during the reference years. When compared to India, per capita emissions of Himachal Pradesh were lower than that of the country but grew at a faster pace, throughout the reference period as depicted in Figure 3 above. The observed CAGR of Himachal Pradesh and India from 2005 to 2013 were 6.08% and 4.07% respectively.

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

These growth rates have been compounded annually.



From 2005 to 2007, the AFOLU sector of Himachal Pradesh was a net emitter and the emissions grew at a compounded rate of 9.54%. From 2008 onwards, the sector became a net sink and the reported removals of GHGs grew at an enormous CAGR of 100.70%⁴ from 2008 to 2013. The other sectors namely Energy, IPPU and Waste were net emitters of GHGs from 2005 to 2013 and the emissions from all of these sectors recorded growth in emissions. The observed CAGR of Energy, IPPU and Waste sectors was 8.86%, 6.89% and 2.97% respectively from 2005 to 2013. When compared to India's sectoral growth rates, emissions from the Energy sector of Himachal Pradesh were increasing at a higher rate than the rest of the country. Similarly, the state's IPPU sector emissions were increasing at a faster pace than that of India. On the contrary, the growth of the Waste sector emissions from this state was relatively lower than that of India (Figure 4).

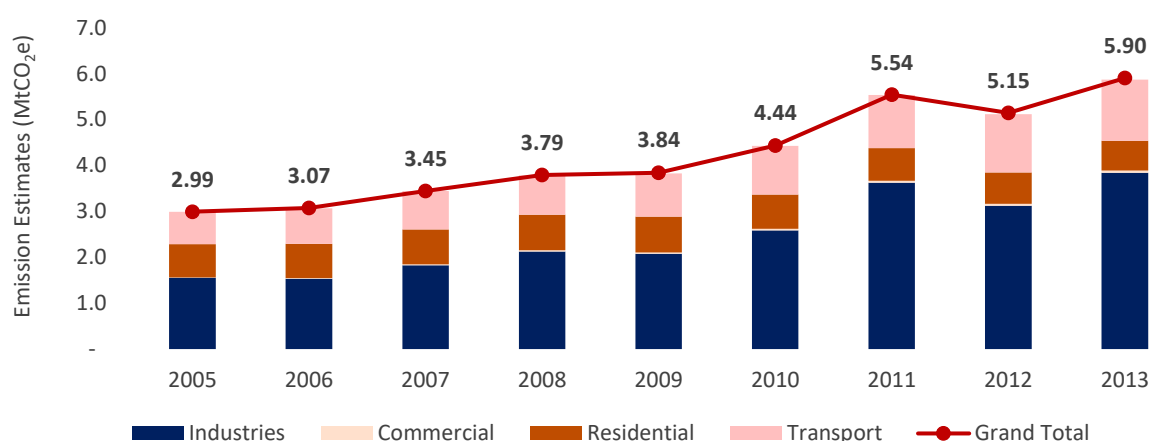
⁴ The CAGR value is very high but the corresponding change in absolute emissions was only of the order of 0.206 MtCO₂e from 2008 to 2013



Energy Sector

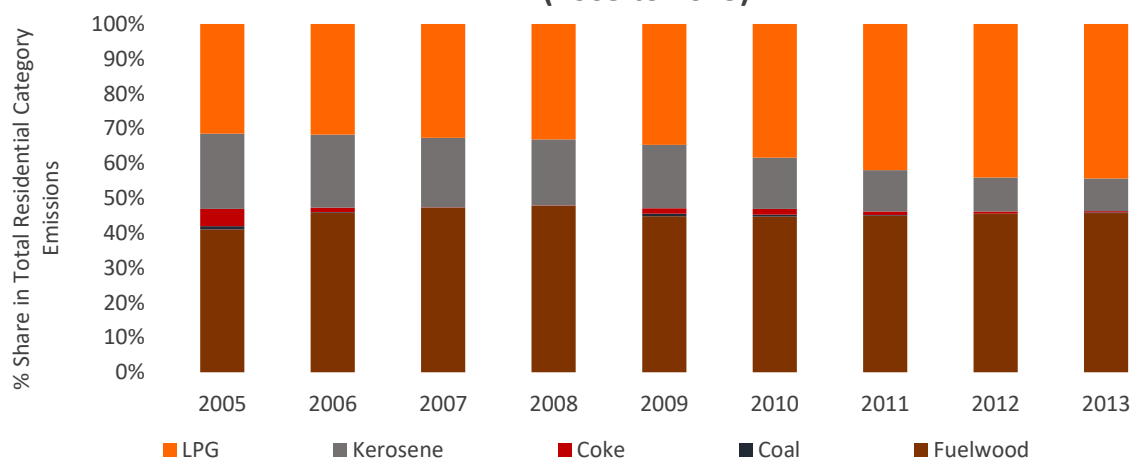
The Energy sector represented ~61% of the total emissions (if values were considered excluding AFOLU sector) in Himachal Pradesh in 2013. In general, emissions of the Energy sector arise from two sub-sectors – Fuel Combustion (Public Electricity Generation, Transport, Industries and Agriculture, Commercial and Residential categories) and Fugitive. However, no Fugitive emissions were observed in Himachal Pradesh across all the reference years. Emissions from the Energy sector in Himachal Pradesh grew at a CAGR of 8.86% from 2.99 MtCO₂e in 2005 to 5.90 MtCO₂e in 2013. A significant rise in the total emissions of the Energy sector was observed in the year 2011 and 2013 owing to increased emissions from the Fuel combusted in Industries as depicted in Figure 5 below.

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



Deep diving into various Energy sub-sectors, the Industries category was found to be the major contributor of GHG emissions from 2005 to 2013 with an average share of ~57% in the total Energy emissions. Maximum emissions in this category arose from the Fuel Combusted in Non-Metallic Minerals Industry during the reference period with an average share of ~79% in the total emissions of the Fuel Combusted in Industries. Transport category was the second major contributor of emissions with an average share of ~24% from 2005 to 2013. Notably, the share of the Residential category in the total Energy emissions reduced from ~24% in 2005 to ~11% in 2013. As inferred from Figure 6 below, an increase in the share of emissions from LPG and a subsequent decrease in the share of Kerosene emissions was registered from 2005 to 2013. This can be attributed to the substitution of LPG cylinders in place of the conventional Kerosene based stoves in the households of Himachal Pradesh.

Figure 6: Share of GHG Emissions for Residential Category (2005 to 2013)

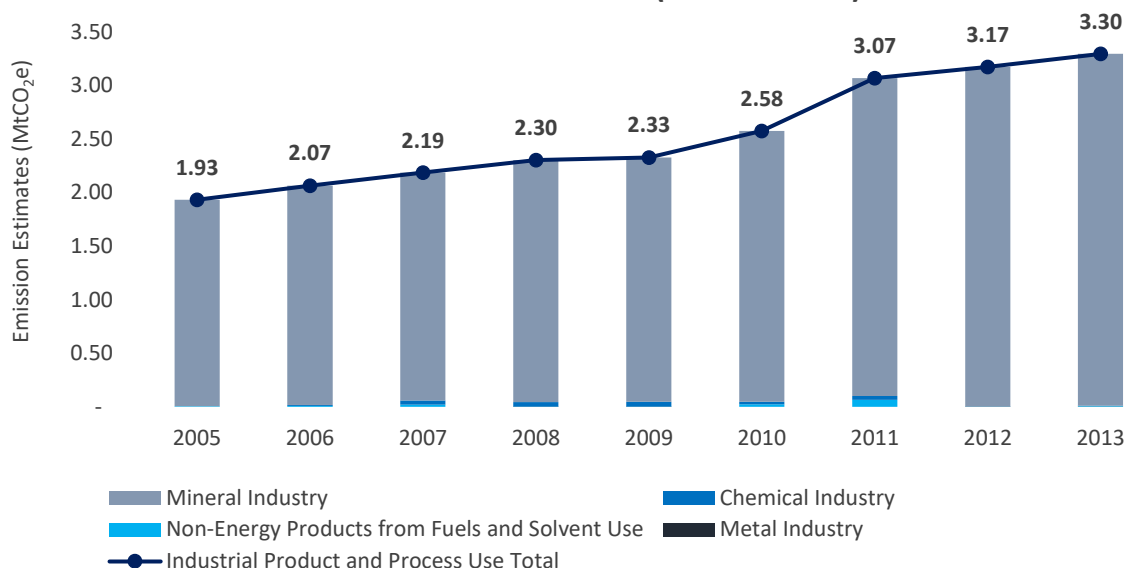




IPPU Sector

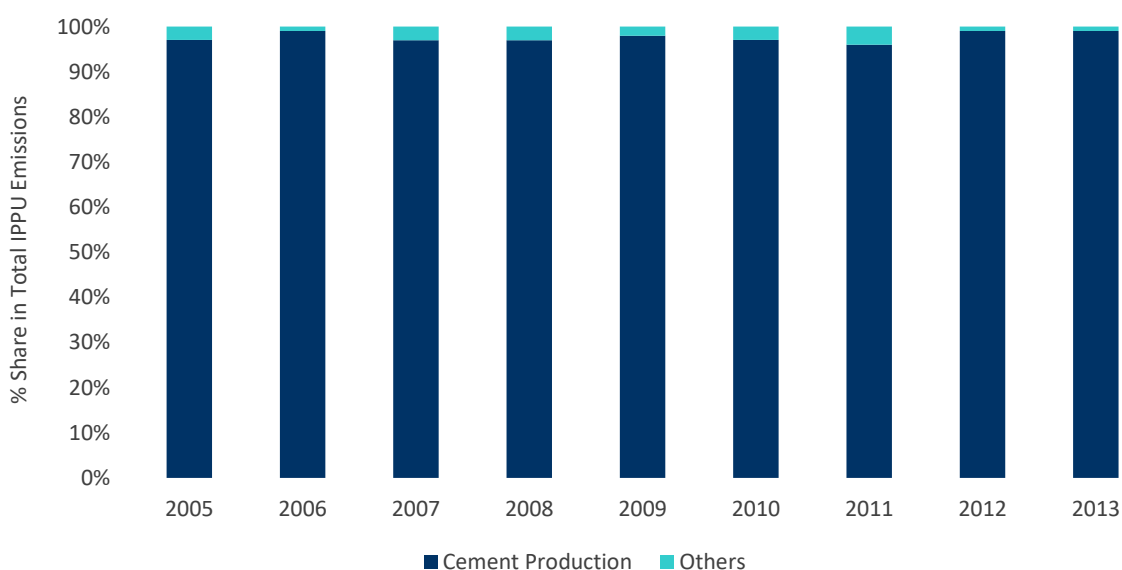
The IPPU sector represented ~34% of the total GHG emissions (if values were considered excluding the AFOLU sector) in Himachal Pradesh in 2013. Emissions from the IPPU sector are primarily driven by emissions from the Minerals Industry (Figure 7). Between 2005 and 2013, the overall IPPU emissions grew at a CAGR of 6.89% from 1.93 MtCO₂e in 2005 to 3.30 MtCO₂e in 2013.

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



Deep diving into various IPPU categories, Cement Production was found to be the key driver of emissions across all the reference years with an average share of ~98% in the total IPPU emissions as shown in Figure 8 below.

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

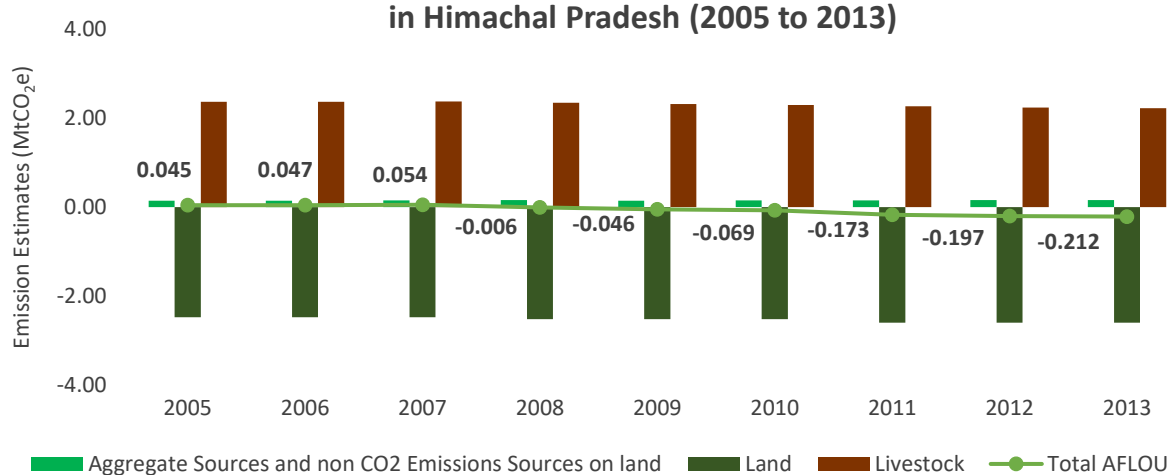




AFOLU Sector

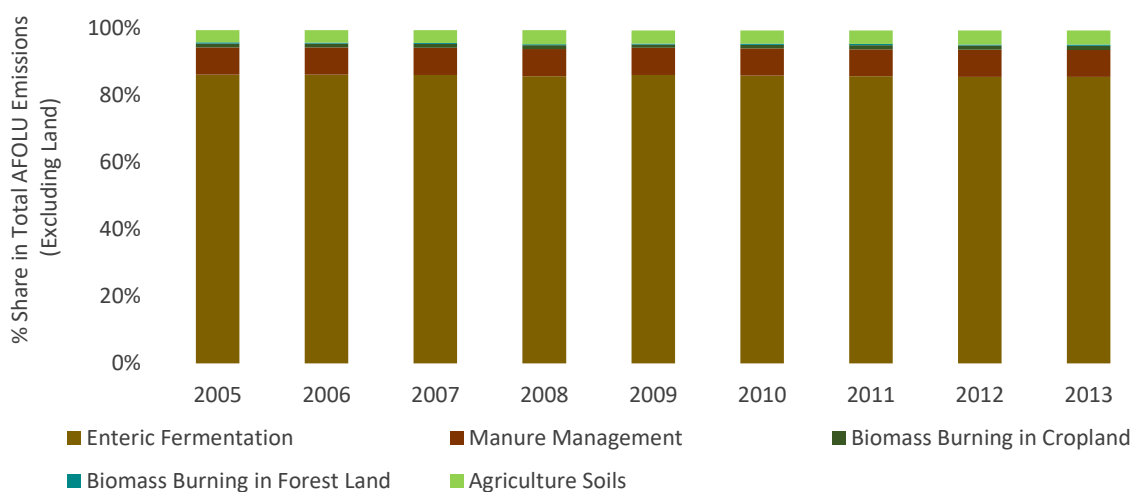
In 2013, the AFOLU sector absorbed almost 0.212 MtCO₂e of GHGs in Himachal Pradesh. Emissions from the AFOLU sector arise from three main sub-sectors namely Livestock, Land and Aggregate Sources and Non-CO₂ Emissions Sources on Land. While Livestock sub-sector and Aggregate Sources and Non-CO₂ Emissions Sources on Land were GHG emitters, the Land sub-sector acted as a sink in Himachal Pradesh across all the years. Notably, the AFOLU sector was a net GHG emitter from 2005 to 2007, whereas, from 2008 onwards it became a net sink. This was mainly because the removals from Land surpassed the emissions of the other two sub-sectors from 2008 onwards as illustrated in Figure 9 below. Emissions from the AFOLU sector grew at an estimated CAGR of 9.54% from 0.045 MtCO₂e in 2005 to 0.054 MtCO₂e in 2007. While the removals grew at an enormous CAGR of 100.70%⁵ from 0.006 MtCO₂e in 2008 to 0.212 MtCO₂e in 2013 as depicted in Figure 9 below.

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



If emissions were considered without taking into account the removals by the Land sub-sector, maximum emissions arose from Enteric Fermentation across all the reference years with an average share of ~86%. The share of emissions from all the categories remained stable showing a flat growth of emissions from 2005 to 2013 as shown in Figure 10 below.

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



⁵ The CAGR value is very high but the corresponding change in absolute emissions was only of the order of 0.206 MtCO₂e from 2008 to 2013



Waste Sector

The Waste sector represented ~6% of the total emissions (if values were considered excluding the AFOLU sector) in Himachal Pradesh in 2013. Municipal Solid Waste⁶, Domestic Wastewater and Industrial Wastewater are the key sources of GHG emissions in the Waste sector. GHG emissions from Waste grew at a CAGR of 2.97% from 0.433 MtCO₂e in 2005 to 0.547 MtCO₂e in 2013. A sudden rise in 2011 and a gradual decline thereafter was observed in the total Waste emissions owing to variations in GHG emissions from Domestic Wastewater which reflects changing trends in use of various treatment systems as reported in Census of India 2011 as shown in Figure 11 below.

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

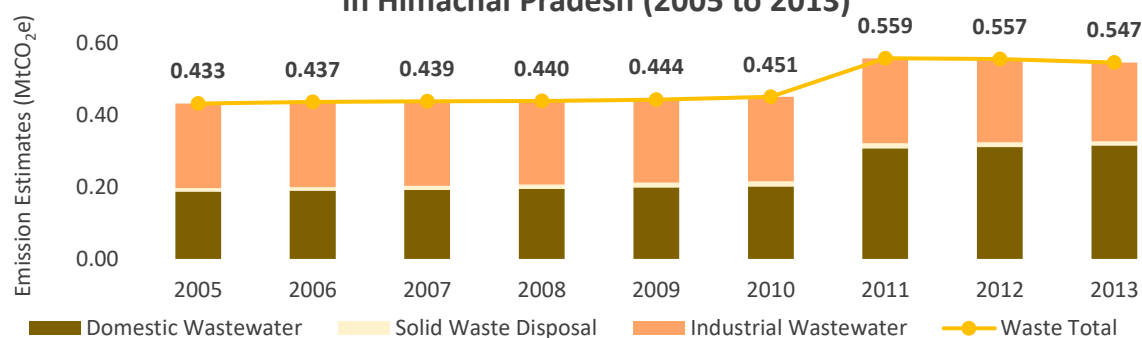
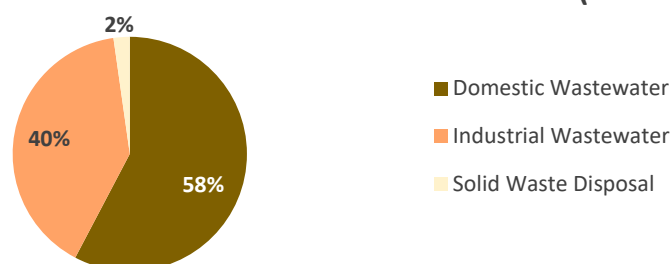


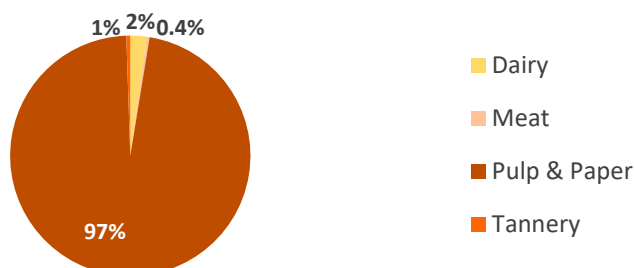
Figure 12: Category-wise Share of GHG Emissions for Waste Sector (in 2013)



Domestic Wastewater had a share of ~58% in the total emissions of the Waste sector in 2013 (Figure 12). In Himachal Pradesh, emissions from Domestic Wastewater increased at CAGR of 6.71 % from 0.188 MtCO₂e in 2005 to 0.315 MtCO₂e in 2013. In 2013, almost 91% of the Domestic wastewater emissions emanated from the rural areas of Himachal Pradesh and it grew at a CAGR of 7.14% from 0.166 MtCO₂e in 2005 to 0.288 MtCO₂e in 2013.

Industrial Wastewater represented ~40% of the total Waste sector emissions. Deep diving into various Industrial Wastewater categories, it was found that bulk of the emissions emanated from the Pulp and Paper Industries (~96%) and the remaining emissions were from Dairy (~2%), Tannery (~1%) and Meat Industries (~0.4%) as represented in Figure 13 below. Municipal Solid Waste Disposal contributed ~2% of the total Waste sector emissions in 2013. Emissions from this sub-sector grew at an estimated CAGR of 3.33% from 0.009 MtCO₂e in 2005 to 0.012 MtCO₂e in 2013.

Figure 13: Share of GHG Emissions from Industrial Wastewater Categories (in 2013)



⁶ 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



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The Platform comprises of the following civil society:



An initiative supported by



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.

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