

# Trend Analysis of GHG Emissions of 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.

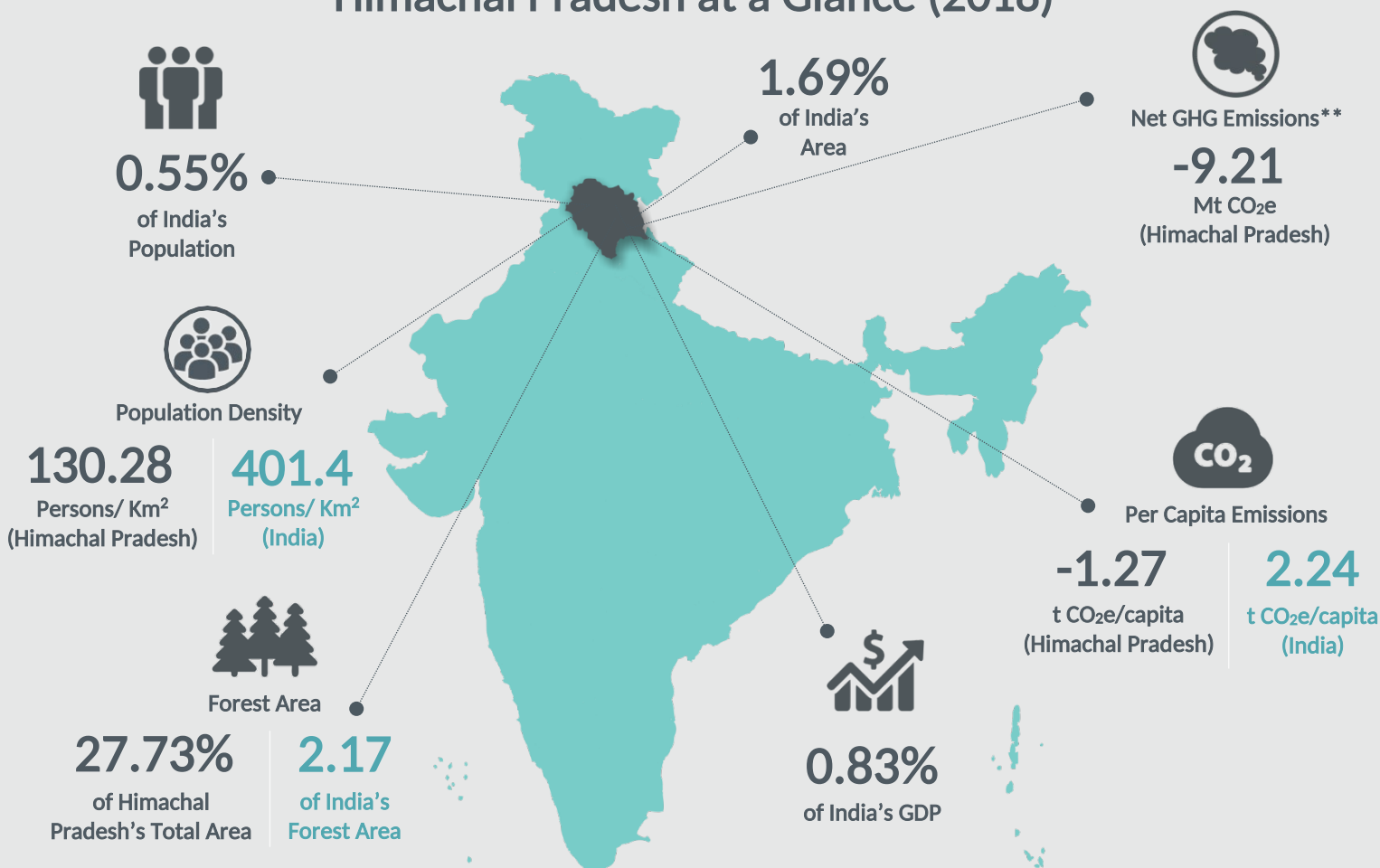
The Platform aims to add value to the various ongoing GHG emissions estimation efforts by addressing existing data gaps and data accessibility issues, broadening the scope of national inventories to include state inventories, and increasing the volume of analytics and policy dialogue on India's GHG emissions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

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



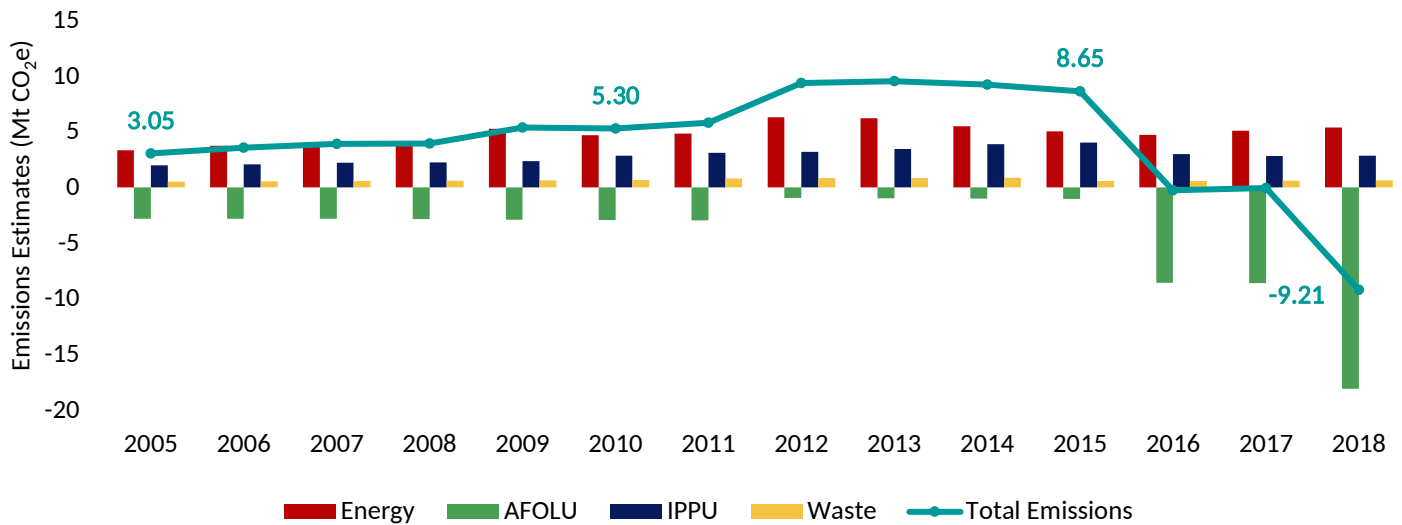
\*Fuel combusted for captive electricity generation (auto-producers) and direct fuel combustion (industrial energy) has been reported under Energy sector.

## Himachal Pradesh at a Glance (2018)



# Economy-wide Emissions Estimates

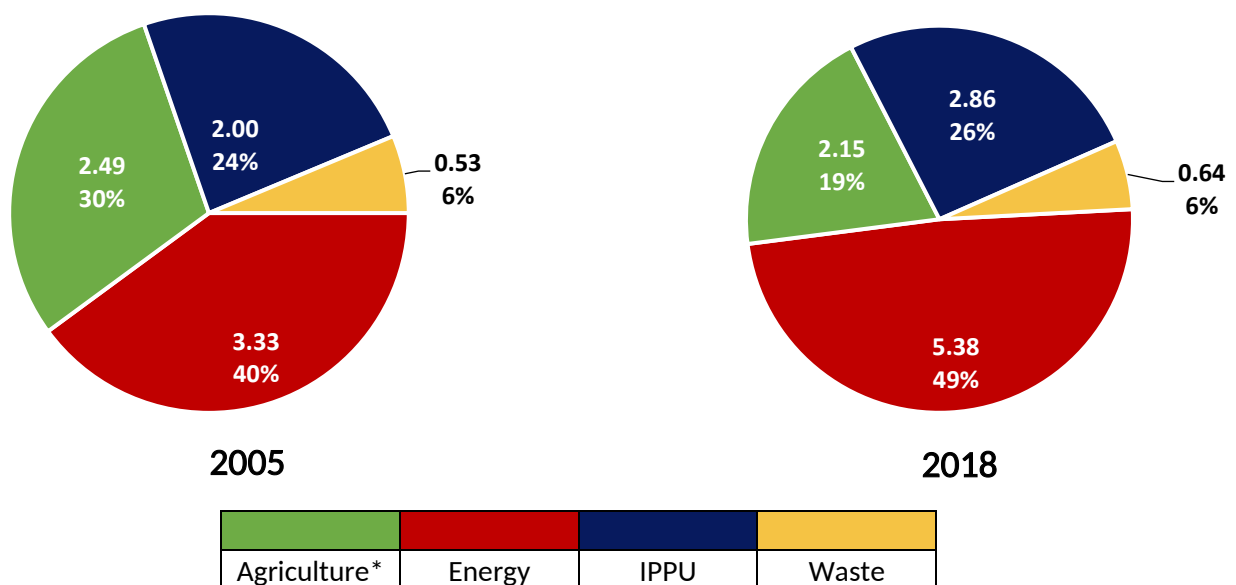
Figure 1: GHG Emissions Estimates of Himachal Pradesh (2005 to 2018)



Emissions of Himachal Pradesh increased at a CAGR of 9.81% from 3.05 Mt CO<sub>2</sub>e in 2005 to 8.65 Mt CO<sub>2</sub>e in 2015 (as seen in Figure 1). Post 2015, the state became a net sink due to enhancement of removals from Agriculture, Forestry and Other Land Use (AFOLU) sector (see Figure 1).

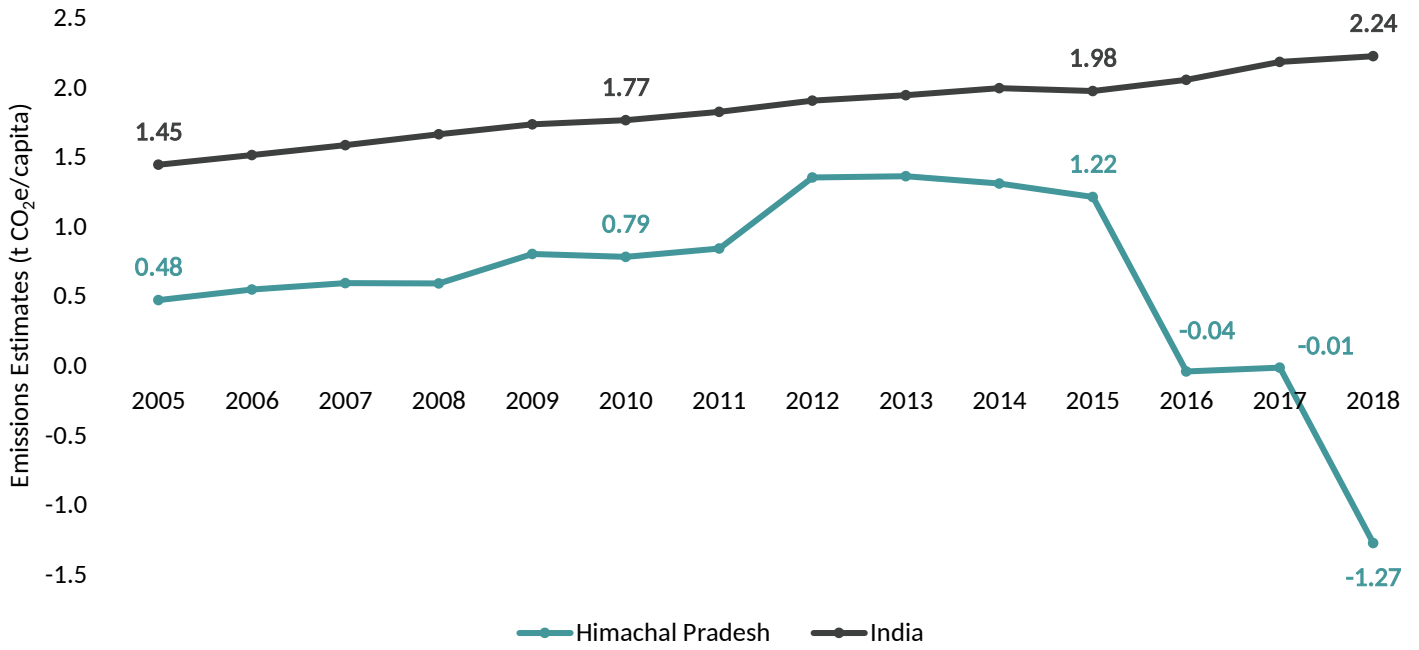
In 2005, the Energy sector accounted for ~40% of the gross economy-wide emissions (excluding Land sub-sector within AFOLU) in Himachal Pradesh. This was followed by Agriculture (excluding the Land sub-sector in AFOLU) which accounted for 30% of economy-wide emissions. The Industrial Processes and Product Use (IPPU) sector contributed 24% to gross economy-wide emissions. As can be seen in Figure 2 below, the share of Energy and IPPU sectors increased to ~49% and ~26% while that of Agriculture reduced to ~19% in 2018. Waste sector emissions remained constant during the reference years, at around 6% of the gross economy-wide emissions of Himachal Pradesh.

Figure 2: Sector-wise Contribution (Mt CO<sub>2</sub>e) and Percentage Share in Gross Economy-wide GHG Emissions (excluding Land sub-sector within AFOLU) of Himachal Pradesh



\* For the purpose of this comparison, agriculture emissions do not include removals from lands and forests. For further details, please see the section on AFOLU emissions below.

Figure 3: Per Capita Net GHG Emissions of Himachal Pradesh and India (2005 to 2018)



The per capita emissions of Himachal Pradesh were significantly lower than the per capita emissions of India. Between 2005 and 2015, the net emissions increased at a compounded rate of 9.81% from 0.48 t CO<sub>2</sub>e to 1.22 t CO<sub>2</sub>e per capita which was higher than India's CAGR (~2.42%) for the same reference years. However, since 2016, the per capita emissions of Himachal Pradesh became negative, and in 2018 they were -1.27 t CO<sub>2</sub>e per capita.

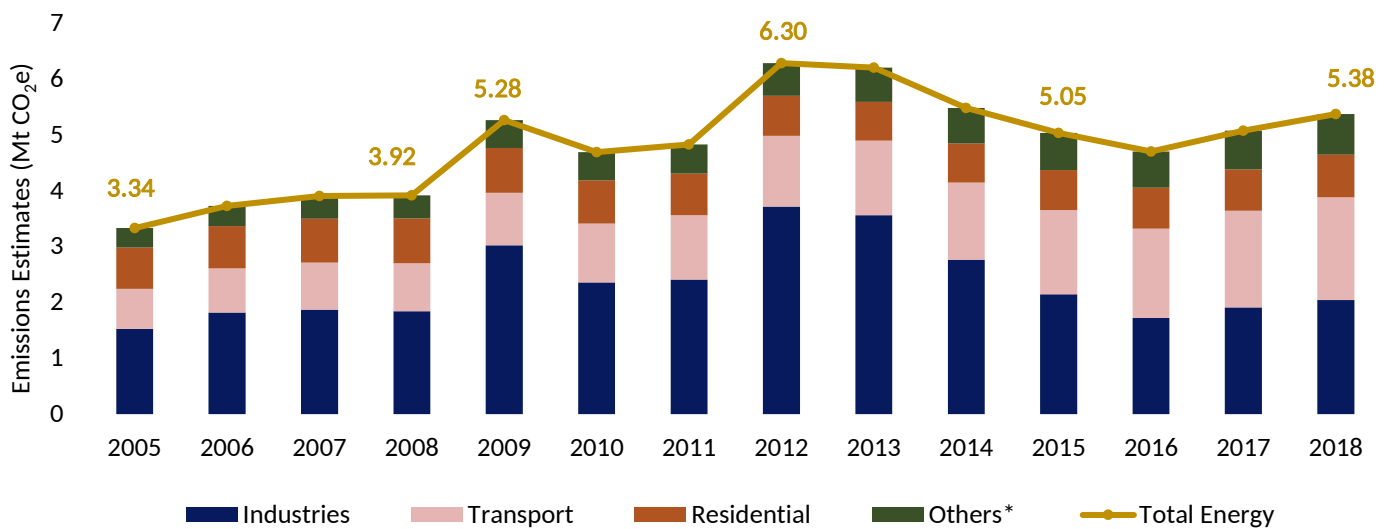


# Energy Sector

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 Himachal Pradesh accounted for ~49% of the gross economy-wide emissions (excluding Land sub-sector within AFOLU) in 2018. Emissions from the Energy sector increased at a CAGR of 3.75% from 3.34 Mt CO<sub>2</sub>e in 2005 to 5.38 Mt CO<sub>2</sub>e in 2018 as shown in Figure 4.

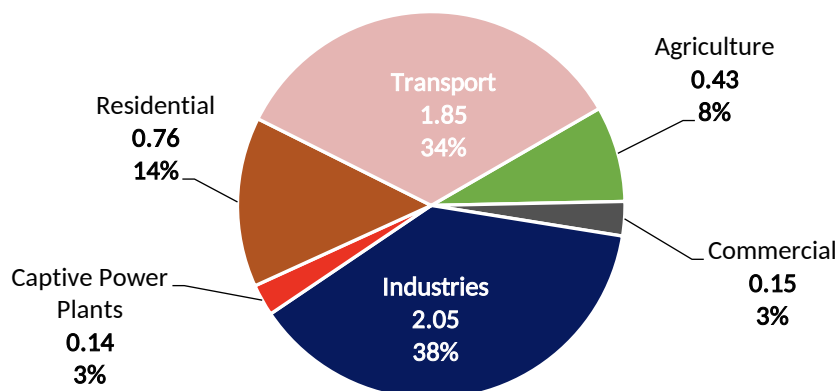
Figure 4: GHG Emissions Estimates of Energy Sector - Himachal Pradesh (2005 to 2018)



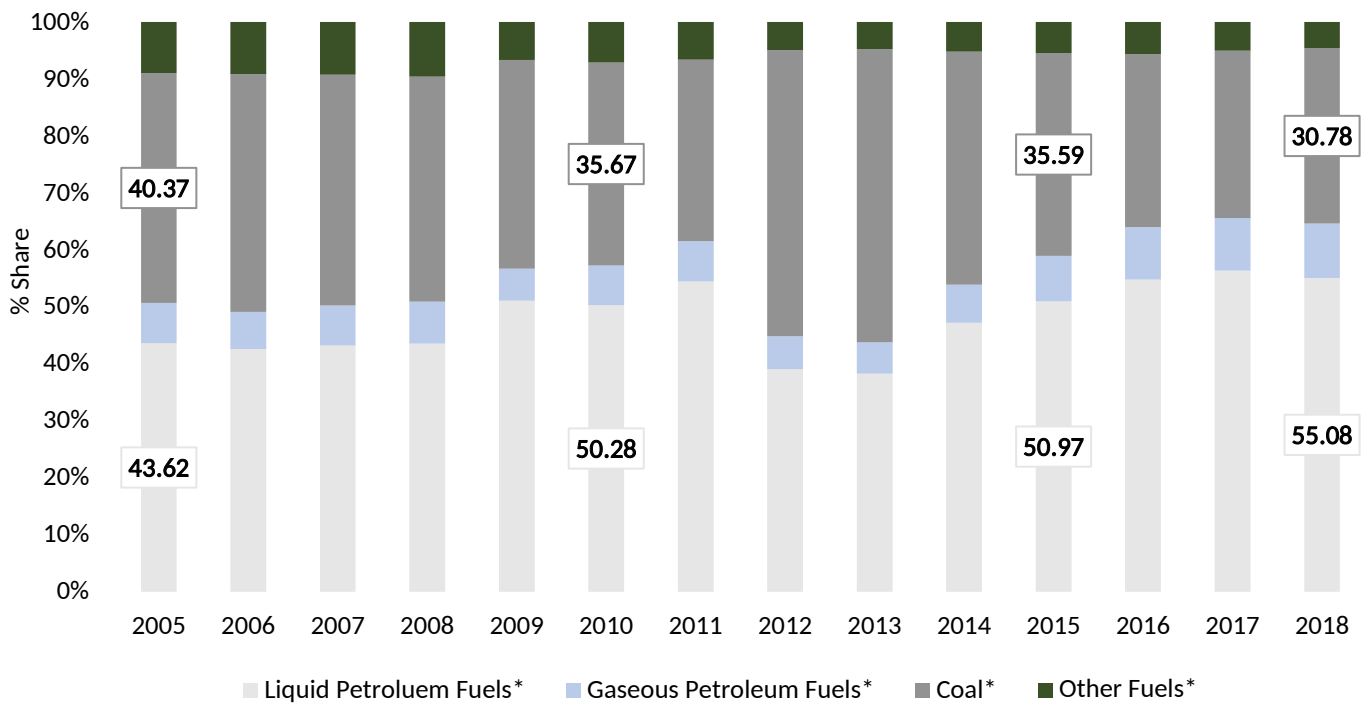
Within the Energy sector, Industrial Energy was the major contributor of GHG emissions with a share of 38% of the total Energy sector emissions in 2018. This was followed by emissions from Transport (34%) and Residential (14%) categories, with shares of 34% and 14%, respectively (see Figure 5).

Within the Fuel Combustion sub-sector, Liquid Petroleum Fuels were the largest contributor of emissions, with the average share being ~48% across the reference period (see Figure 6). This was followed by emissions from Coal and Gaseous Petroleum Fuels, with average shares of ~38% and ~7%, respectively. The share of emissions from Coal decreased from ~40% in 2005 to ~31% in 2018 in the Fuel Combustion emissions as shown in Figure 6.

Figure 5: Category-wise Emissions (Mt CO<sub>2</sub>e) 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**

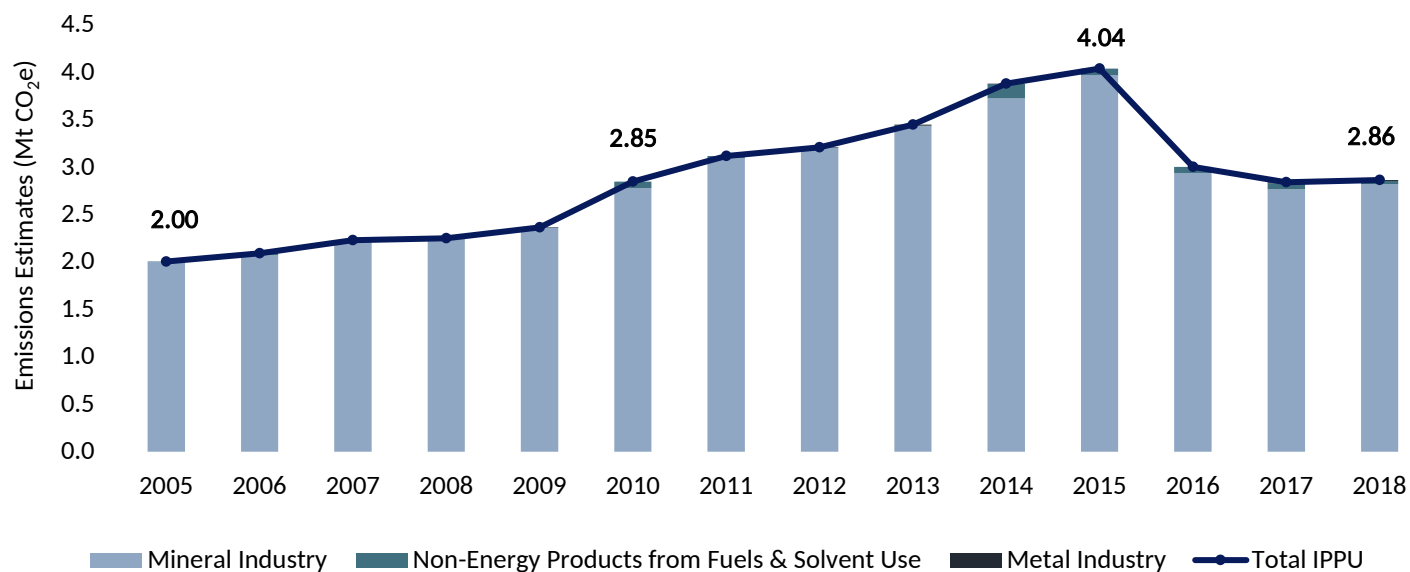
1. Coke is included in coal because the bifurcation of pet-coke and coke was not available.
2. Gaseous Petroleum Fuels- Natural Gas, LPG, and other gaseous fuels
3. Liquid Petroleum Fuels- ATF, Diesel, Kerosene, Motor spirit and other liquid fuels
4. Other Fuels comprise of Firewood and Charcoal



## IPPU Sector

Emissions from 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 Himachal Pradesh, the IPPU sector contributed to ~26% of the gross economy-wide emissions in 2018 (excluding Land sub-sector within AFOLU). Between 2005 and 2018, the overall IPPU emissions increased at a CAGR of 2.78% from 2.00 Mt CO<sub>2</sub>e in 2005 to 2.86 Mt CO<sub>2</sub>e in 2018 (see Figure 7). The peak seen in 2015 was due to increase in emissions from Mineral Industry sub-sector (mainly due to Cement Production).

Figure 7: GHG Emission Estimates of IPPU Sector - Himachal Pradesh (2005 to 2018)



Within the Mineral Industry, Cement Production was the major contributor and it accounted for ~98% of total IPPU emissions in 2018. This was followed by emissions from Lubricant use, Paraffin Wax Use and Others (Iron and Steel, Glass Production etc) (see Figures 8 and 9).

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

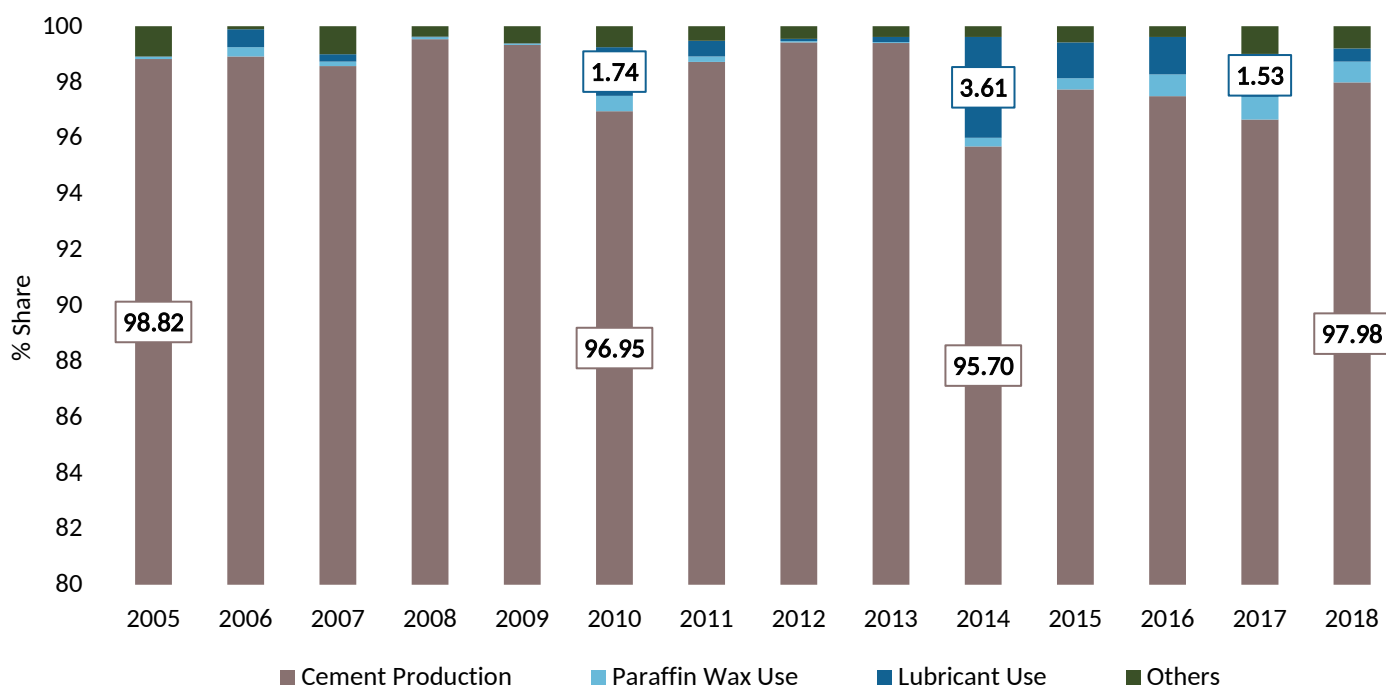
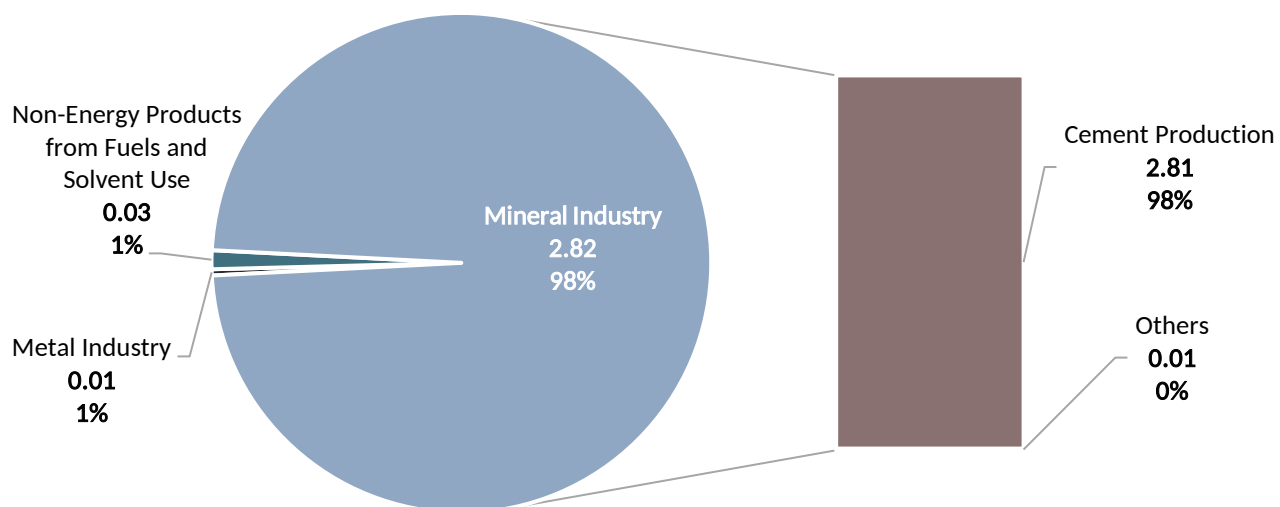


Figure 9: Sub-sector Emissions (Mt CO<sub>2</sub>e) and Percentage Contribution in Total IPPU Emissions (2018)



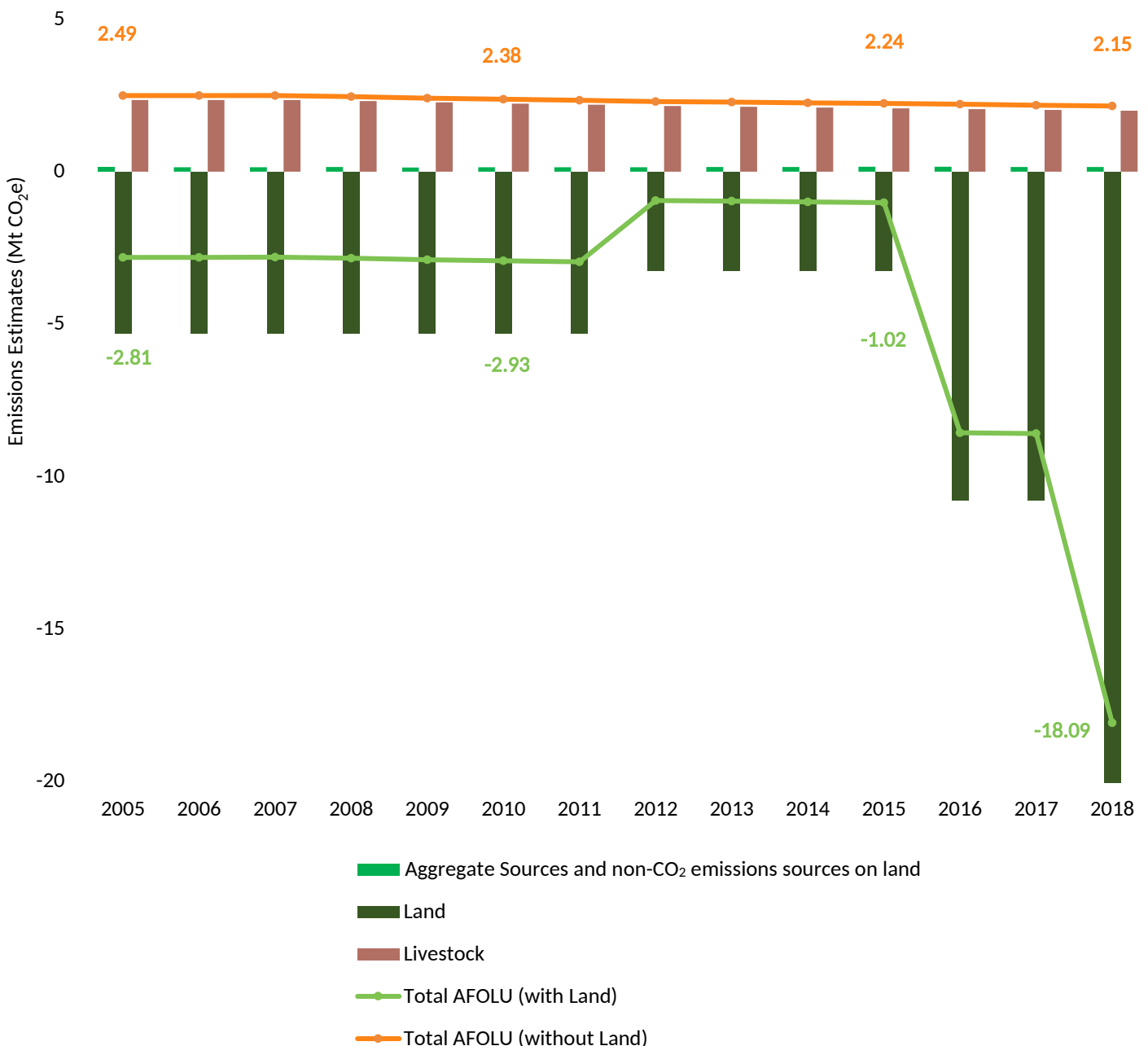
# AFOLU Sector



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-CO<sub>2</sub> Emissions Sources on Land\*. In Himachal Pradesh, while the Livestock and Aggregate Sources and Non-CO<sub>2</sub> Emissions Sources on Land sub-sectors were net GHG emitters, the Land sub-sector was a sink across all the reference years. AFOLU sector overall remained a net sink of emissions throughout the reference period.

The average annual emissions from Livestock and Aggregate Sources sub-sectors were 2.34 Mt CO<sub>2</sub>e, that were neutralised by CO<sub>2</sub> removals from the Land sub-sector which was, on an average, annually removing 6.57 Mt CO<sub>2</sub>e during the reference period. The Land sub-sector sink declined between the years 2012 and 2016 due to reduction in removals from the Other Land category of this sub-sector. Post 2015, the Land sub-sector sink increased steadily. This can be attributed to increase in forest area as well as carbon stock density of the state, in addition to enhancement of the sink due to Land Use and Land-Use Change trends and practices (see Figure 10).

Figure 10: GHG Emissions Estimates of AFOLU Sector - Himachal Pradesh (2005 to 2018)

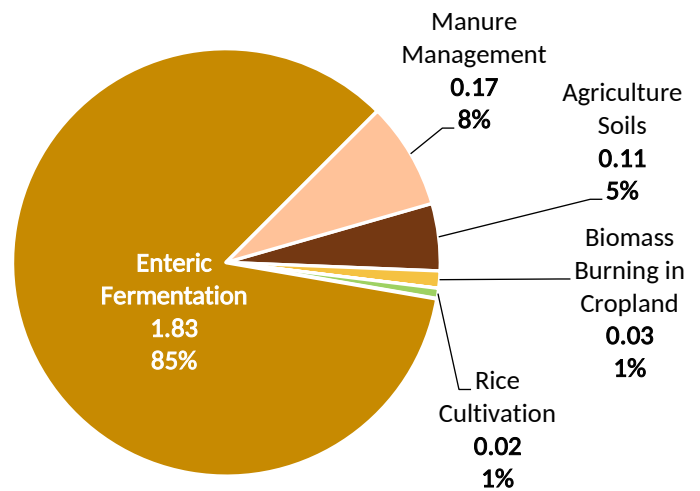




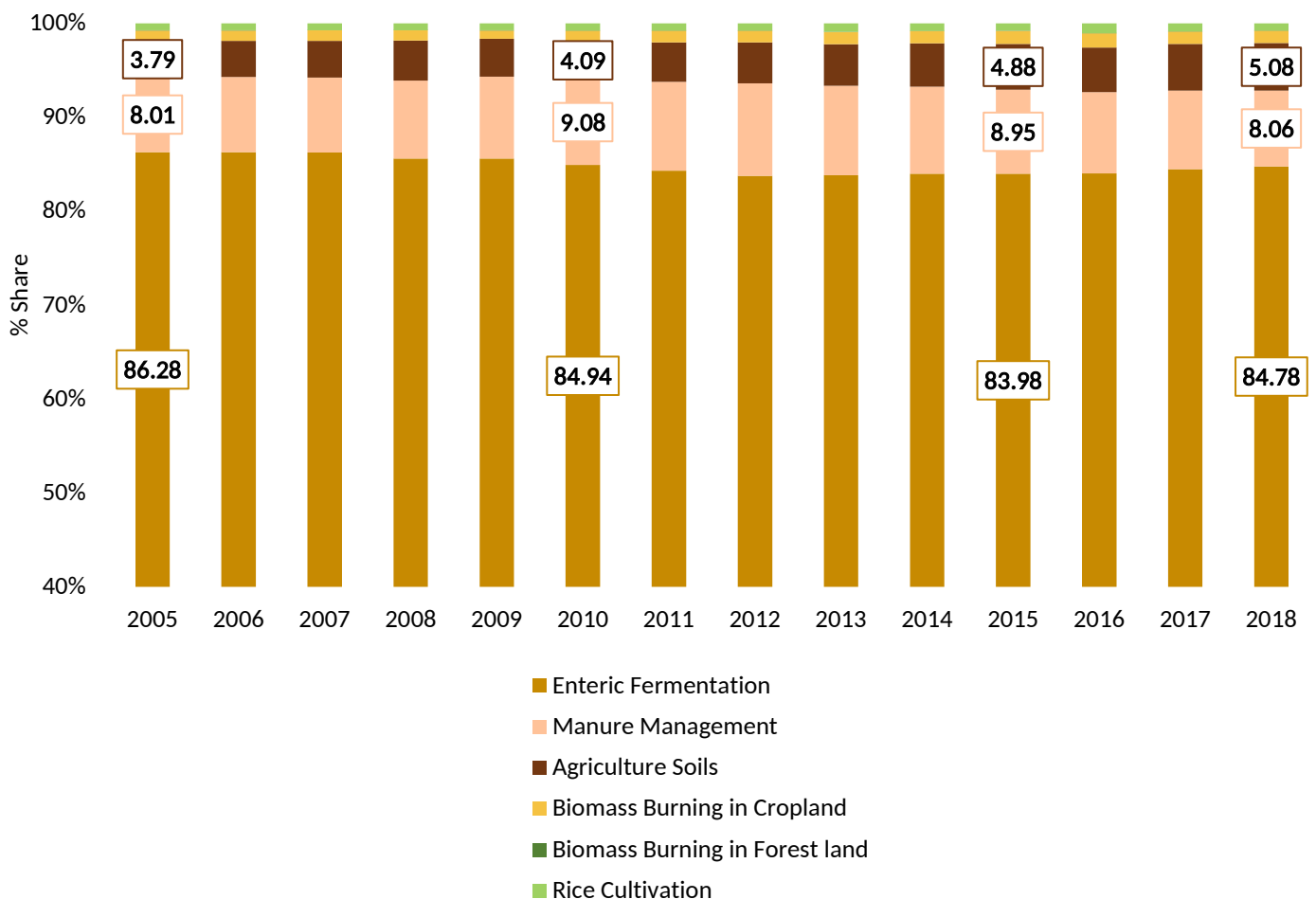
The Livestock sub-sector had the maximum share of ~93% of positive AFOLU emissions (excluding Land sub-sector) in Himachal Pradesh in 2018. Within the Livestock sub-sector, Enteric Fermentation was the major contributor to positive AFOLU emissions across the reference period, with an average share of ~85%. The emissions from Enteric Fermentation category declined at a rate of 1.25% (compounded annually) from 2.15 Mt CO<sub>2</sub>e in 2005 to 1.83 Mt CO<sub>2</sub>e in 2018.

From the Aggregate Sources sub-sector, the contribution of Agriculture Soils to positive AFOLU emissions was ~5%. This was followed by Rice Cultivation and Biomass Burning in Cropland with share of ~1%, each. While emissions from Biomass Burning in Cropland decreased at CAGR of 0.3%, emissions from Agriculture Soils increased at CAGR of 1.14% between 2005 and 2018 (see Figures 11 and 12).

**Figure 11: Category-wise Emissions (Mt CO<sub>2</sub>e) and Percentage Share in Positive AFOLU Emissions (excluding Land sub-sector) (2018)**



**Figure 12: Category-wise Share of Positive AFOLU GHG Emissions (excluding Land sub-sector) (2005 to 2018)**



\*The sub-sector called 'Aggregate Sources and Non-CO<sub>2</sub> Emission Sources on Land' includes emissions from Rice Cultivation, Agriculture Soils and Biomass Burning in Cropland and Forestland.



# Waste Sector

Solid Waste Disposal, Domestic Wastewater and Industrial Wastewater are the key sources of GHG emissions in the Waste sector. The Waste sector contributed to almost 6% of gross economy-wide emissions (excluding Land sub-sector within AFOLU) of Himachal Pradesh in 2018. GHG emissions from the Waste sector of Himachal Pradesh grew at a CAGR of 1.48% from 0.53 Mt CO<sub>2</sub>e in 2005 to 0.64 Mt CO<sub>2</sub>e in 2018. There was a dip in emissions post 2014 which can be attributed to decline in emissions from Industrial Wastewater sub-sector (see Figure 13).

Figure 13: GHG Emissions Estimates of Waste Sector - Himachal Pradesh (2005 to 2018)

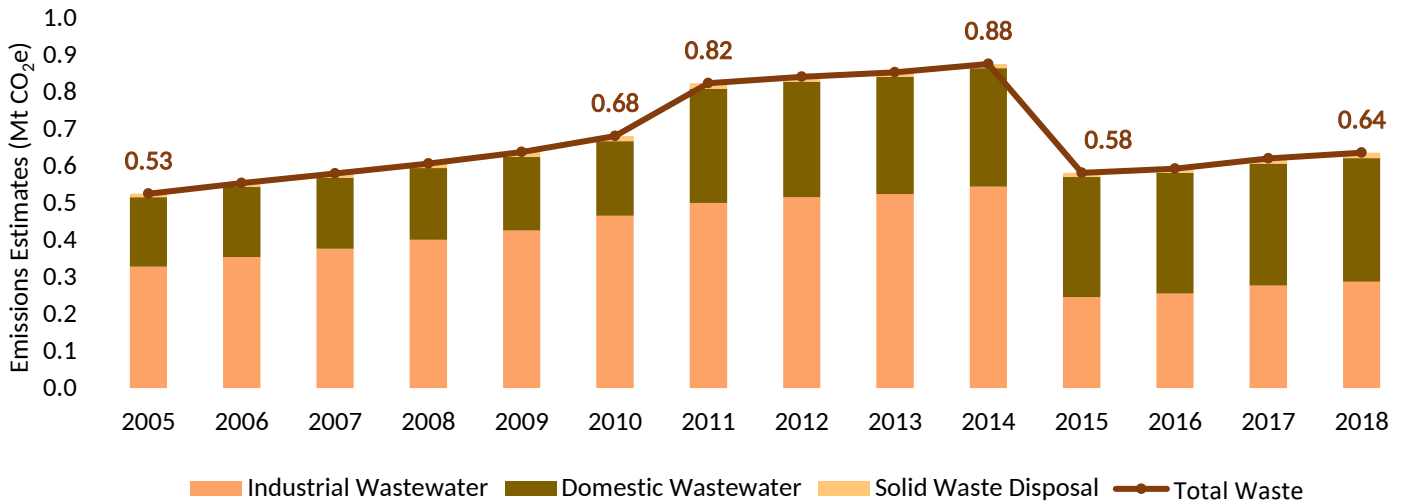
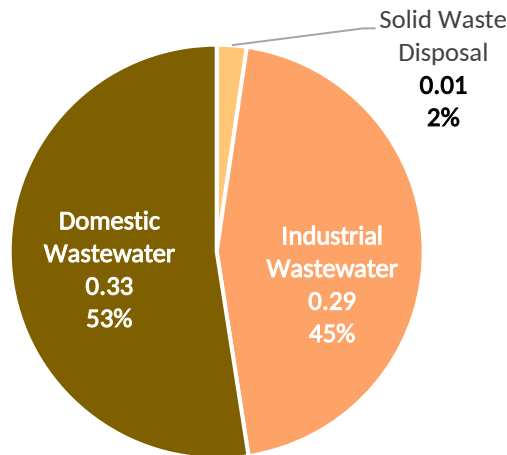


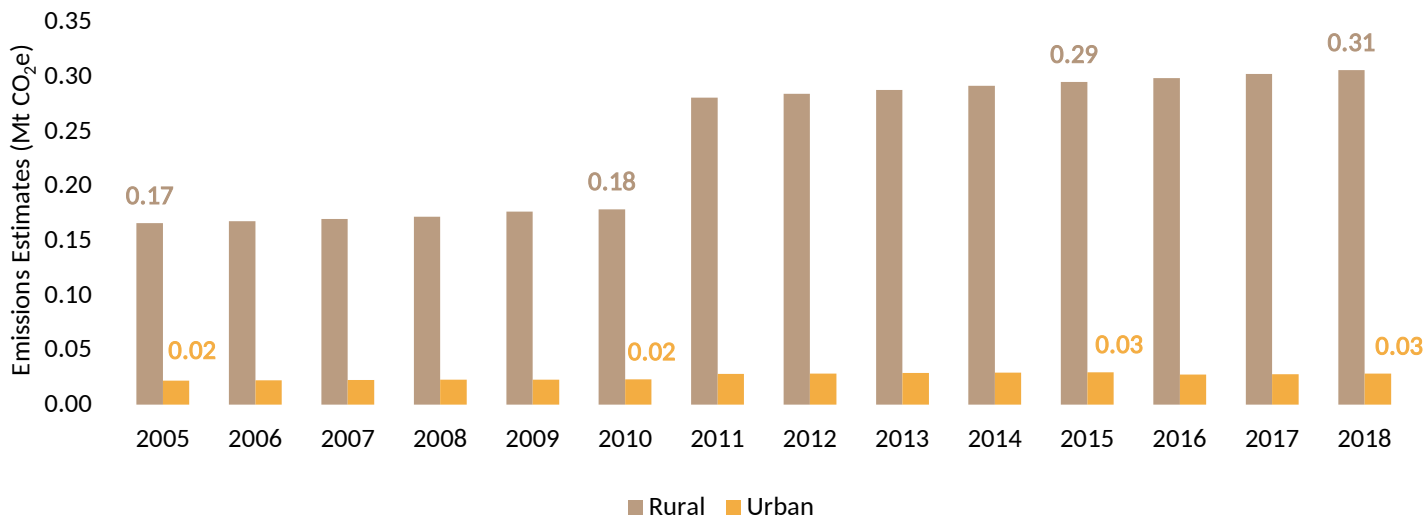
Figure 14: Sub-sector Emissions (Mt CO<sub>2</sub>e) and Percentage Share in Total Waste Sector Emissions (2018)



Discharge of untreated wastewater and use of septic tanks are the key drivers of emissions due to Domestic Wastewater sub-sector. Domestic Wastewater accounted for ~53% of the total Waste emissions in 2018. Emissions from Solid Waste Disposal contributed ~2% of Waste sector emissions and grew at a CAGR of 3.56% from 0.009 Mt CO<sub>2</sub>e in 2005 to 0.015 Mt CO<sub>2</sub>e in 2018. Industrial Wastewater contributed 45% to the overall Waste sector emissions of Himachal Pradesh and declines at a CARG of 1.02% from 0.33 Mt CO<sub>2</sub>e in 2005 to 0.29 Mt CO<sub>2</sub>e in 2018(see Figure 14).

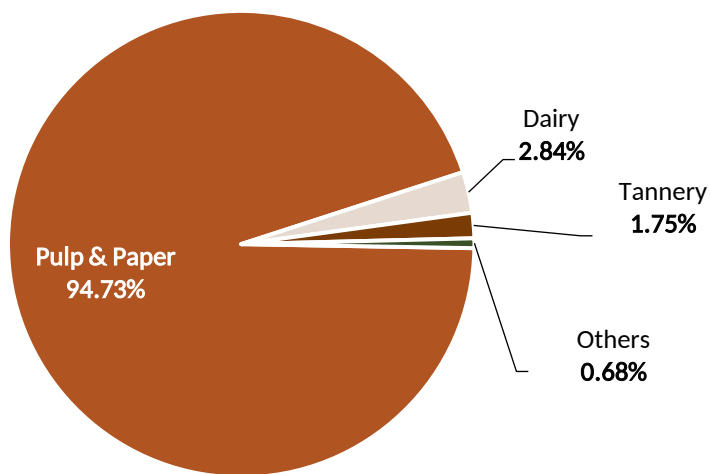
Emissions from Domestic Wastewater of both rural and urban areas of the Himachal Pradesh increased at CAGR of 4.54% from 0.19 Mt CO<sub>2</sub>e in 2005 to 0.33 Mt CO<sub>2</sub>e in 2018. In 2018, more than 91% of Domestic Wastewater emissions emanated from rural areas of Himachal Pradesh, as seen in Figure 15.

Figure 15: Area-wise GHG Emissions Estimates of Domestic Wastewater (2005 to 2018)



Within the Industrial Wastewater sub-sector, Pulp and Paper Industry was the highest contributor (~95%) followed by Dairy (~3%) and Tannery (~2%) in 2018 (see Figure 16).

Figure 16: Category-wise Emissions (Mt CO<sub>2</sub>e) 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.

Secretariat Contact

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