GHG Platform INDIA

Trend Analysis of GHG Emissions in UTTARAKHAND

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.

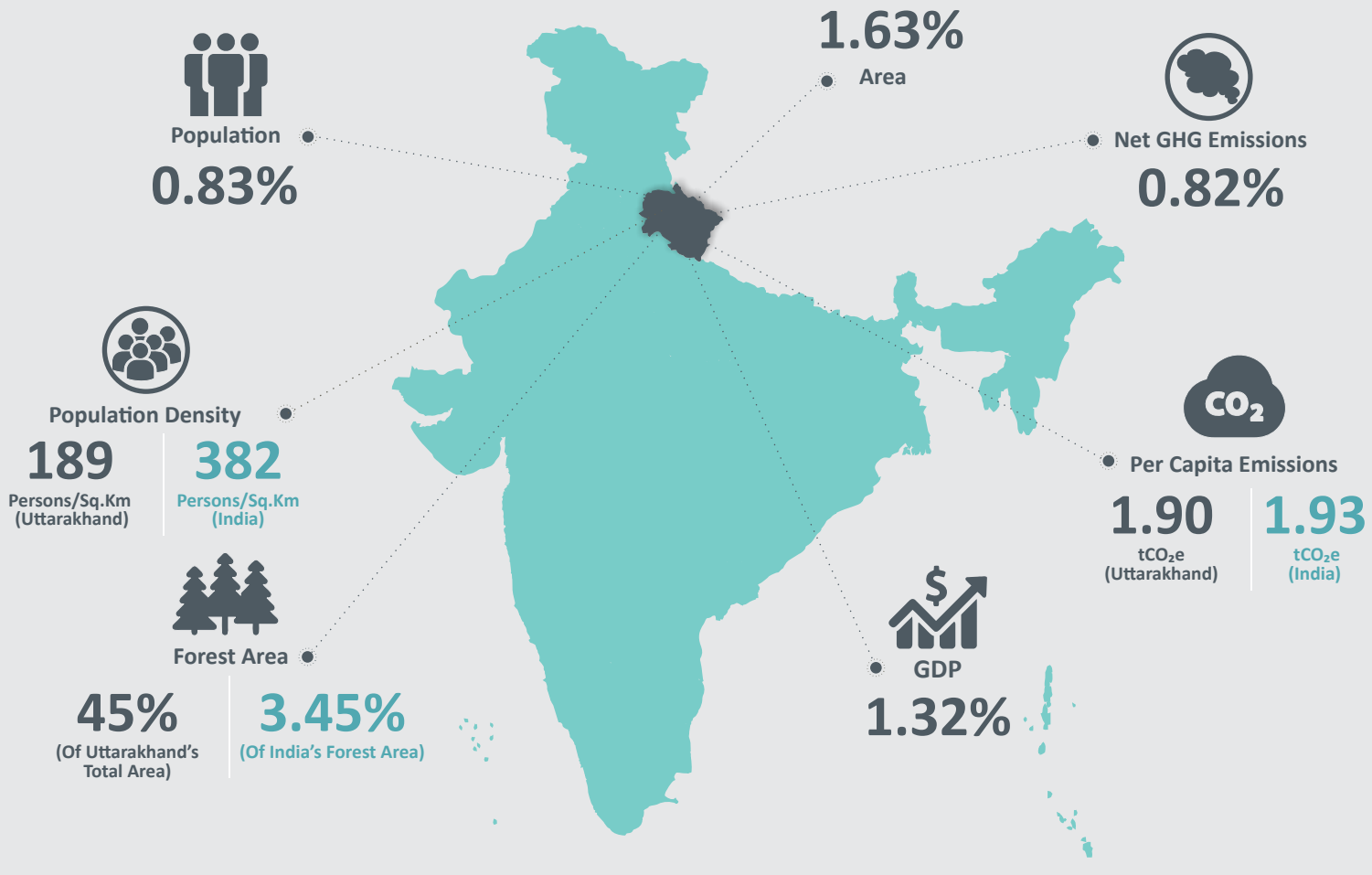
The Platform seeks to add value to the various ongoing GHG emission estimation efforts by helping address existing data gaps and data accessibility issues, extending beyond the scope of national inventories to state inventories, and by increasing the volume of analytics and policy dialogue on India's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

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

ENERGY | IPPU* | AFOLU | WASTE

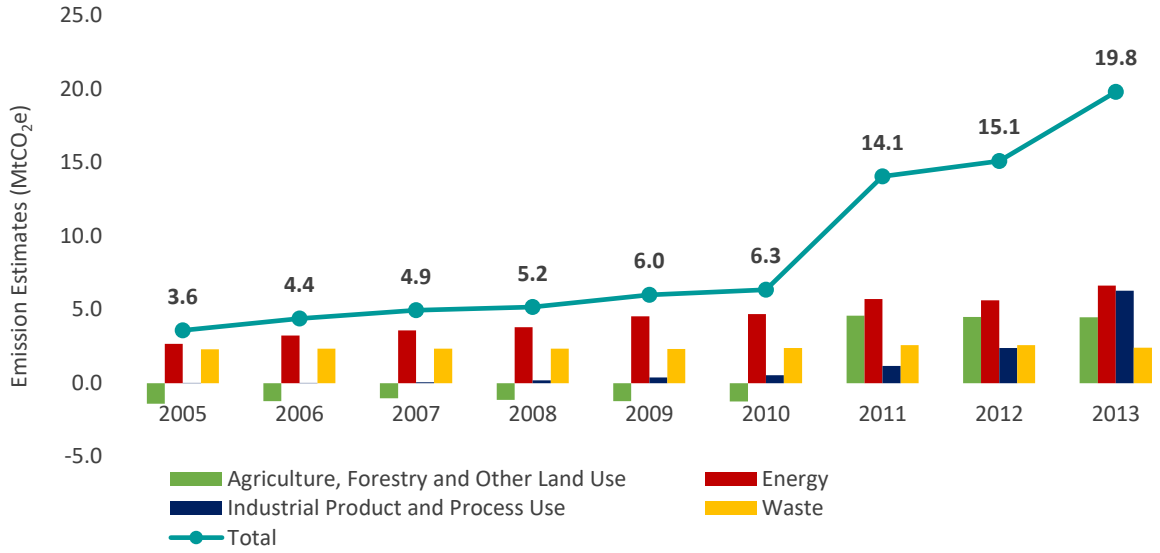
*Fuel combusted for Captive Electricity Generation (Auto-Producers) has been reported under Energy sector.

Uttarakhand at a glance (2013)



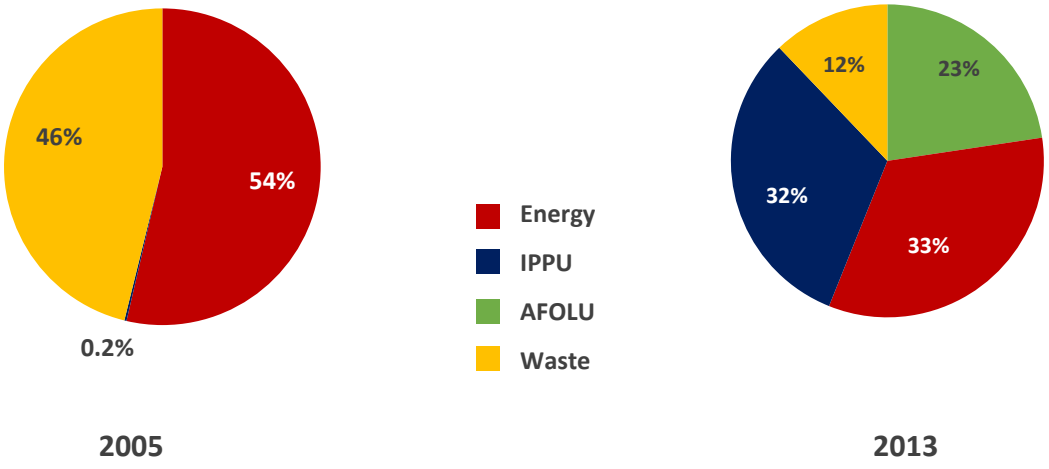
Economy-wide Emission Estimates

Figure 1: GHG Emission Estimates For Uttarakhand (2005 to 2013)



Emissions of Uttarakhand grew from 3.6 $MtCO_2e$ to 19.8 $MtCO_2e$ at an estimated CAGR[1] of 23.81% from 2005 to 2013[2] as depicted in Figure 1 above. A significant jump in the overall emissions was observed from 2011 onwards which was primarily due to rise in IPPU and AFOLU sector emissions. Notably, the AFOLU sector in Uttarakhand was a sink of GHG emissions from year 2005 to 2010, but from 2011 onwards, it became an emitter of GHGs indicating a significant rise in deforestation in Uttarakhand. In 2005, if emissions were considered without taking the removals from the AFOLU sector into account, the Energy sector had a major share of ~54% in the total emissions followed by the Waste (~46%) and IPPU sector which had a very minor share of ~0.2%. In 2013, Energy sector still had the maximum share of ~33% in the total emissions followed by IPPU (~32%) and Waste sector (~12%). Notably, the AFOLU sector was an emitter in 2013 and had a share of ~23% in the total emissions of the as illustrated in Figure 2 below.

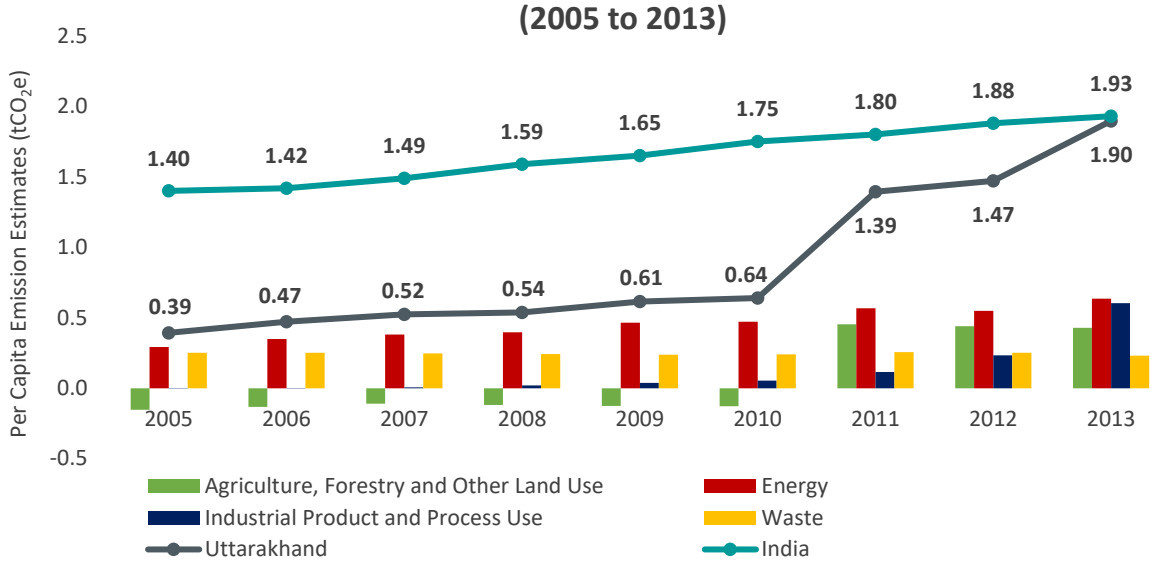
Figure 2: Sector-wise Contribution to Economy-wide GHG Emissions of Uttarakhand (Excluding AFOLU in 2005)



[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

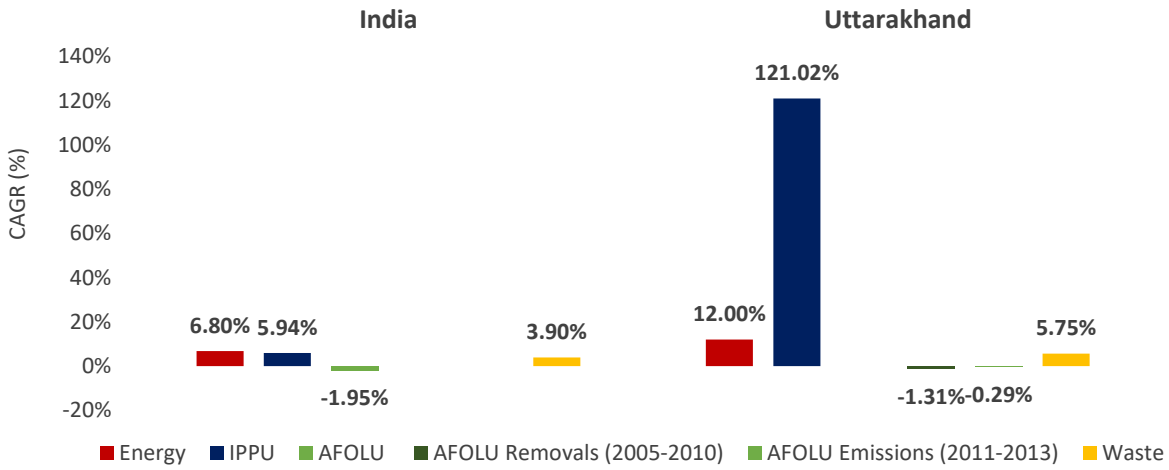
Figure 3: Per Capita GHG Emissions for Uttarakhand and India (2005 to 2013)



Per capita emissions of Uttarakhand grew from 0.39 tCO_2e in 2005 to 1.90 tCO_2e in 2013. The observed CAGR of the GHG emissions of Uttarakhand and India from 2005 to 2013 were 21.75% and 4.07% respectively. When compared to per capita emissions of India, Uttarakhand was far below India's per capita emissions in 2005, but had almost caught up by 2013. This was primarily due to the high rate of growth of overall emissions of Uttarakhand as already illustrated in Figure 1 above.

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

These growth rates have been compounded annually.



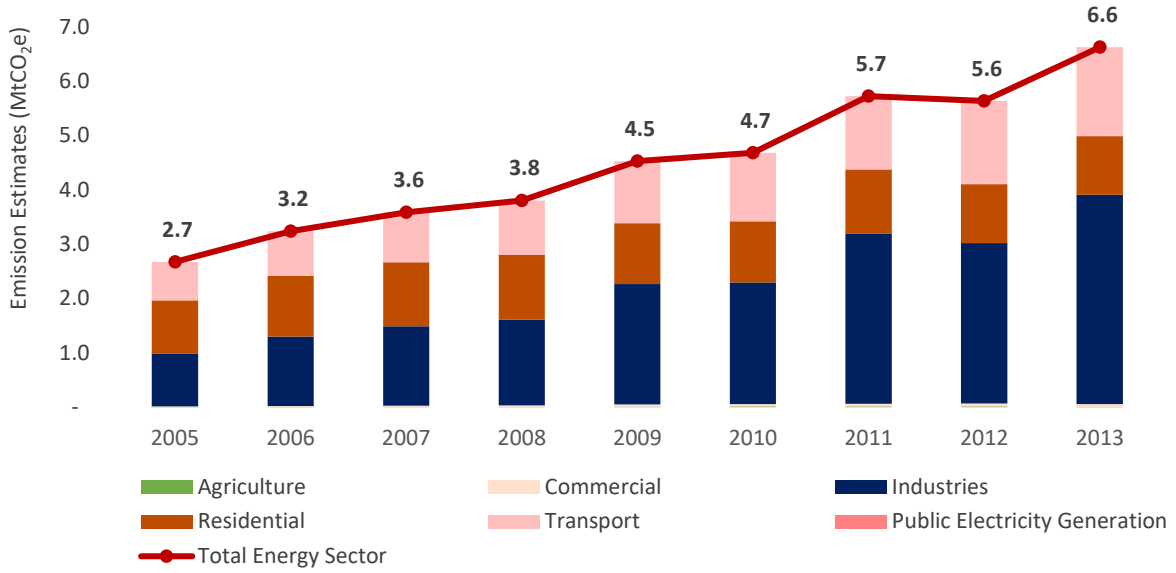
GHG emissions from the IPPU sector of Uttarakhand grew an enormously high CAGR of 121.02[3]% from 2005 to 2013 amongst all other sectors (Figure 4). This was followed by the Energy sector which also recorded a much lower growth rate of 12% followed by the Waste sector (5.75%) for the same period. The removals from the AFOLU sector declined at a rate of 1.31% (compounded annually) from 2005 to 2010 whereas the emissions also declined at a rate of 0.29% (compounded annually) from 2011 to 2013. When compared to India's sectoral growth rates, all the sectors recorded a higher growth rate from 2005 to 2013. However, the AFOLU sector was an exception, which transformed itself from a net sink to an emitter in 2011 and hence could not be compared to India's AFOLU sector emissions which declined at a negative rate of 1.95% during the reference period.

[3] The CAGR value is very high but the corresponding change in absolute emissions was only of the order of 6.28 $MtCO_2e$ from 2005 to 2013 because the base value was very low.

Energy Sector

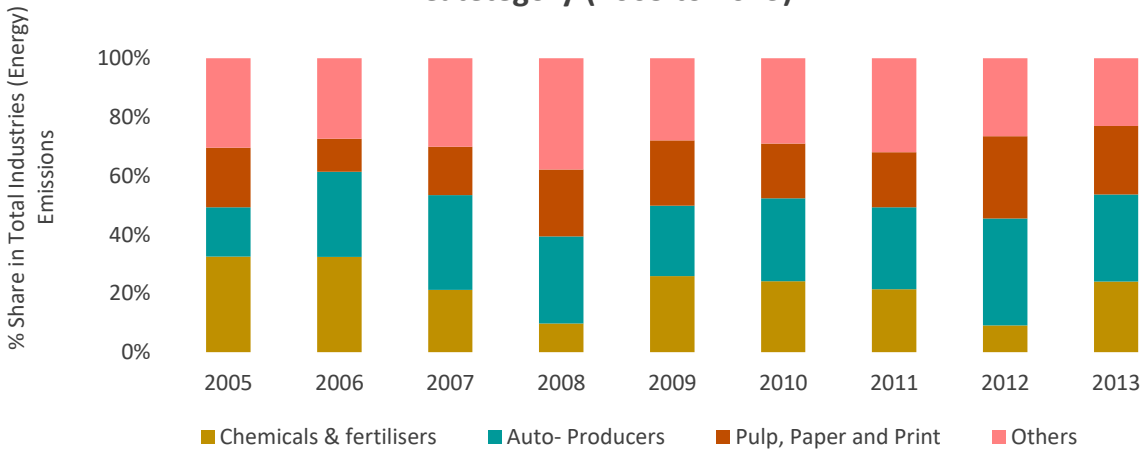
The Energy sector represented ~33% of total emissions of Uttarakhand in 2013. In general, emissions from the Energy sector arise from two main sub-sectors– Fuel Combustion (Public Electricity Generation, Transport, Industries and Agriculture, Commercial and Residential categories) and Fugitive. In Uttarakhand, emissions arose only from Fuel Combustion. The Energy sector emissions increased at a CAGR of 12% from 2.7 $MtCO_2e$ in 2005 to 6.6 $MtCO_2e$ in 2013 as depicted in Figure 5 below.

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



Fuel Combustion in Industries was a major category in Uttarakhand's Energy emissions portfolio with almost 58% contribution in 2013. Emissions from this category increased from 1 $MtCO_2e$ in 2005 to 3.8 $MtCo_2e$ in 2013 at an enormous CAGR of ~18.76%. Under the Industries category, Auto-Producer Power Plants, Chemical & Fertilizer Industries and Pulp, Paper and Print Industries were the top emitters of GHG emissions from 2005 to 2013. However, the share of emissions from each sub-category was varied year to year throughout the reference period as illustrated in Figure 6 below.

Figure 6: Share of GHG Emissions from Indusries (Energy) Catetegory (2005 to 2013)



IPPU Sector

The IPPU sector represented ~32% of the total GHG emissions in Uttarakhand in 2013. Emissions from IPPU sector are largely driven by Chemical, Metal, Mineral Industries and Non-Energy Products from Fuels and Solvent Use. Between 2011 and 2013, the overall IPPU emissions in Uttarakhand rose steeply at a very high CAGR. In 2013, IPPU sector emitted 6.29 $MtCO_2e$ of GHGs from only 0.01 $MtCO_2e$ of GHG emissions in 2005 (as illustrated in Figure 7). The growth in emissions till the year 2011 is primarily due to rise in cement production. In the subsequent years, the growth can be attributed to the sudden spike in production of ethylene oxide from the state.

Figure 7: GHG Emission Estimated for IPPU Sector in Uttarakhand (2005 to 2013)

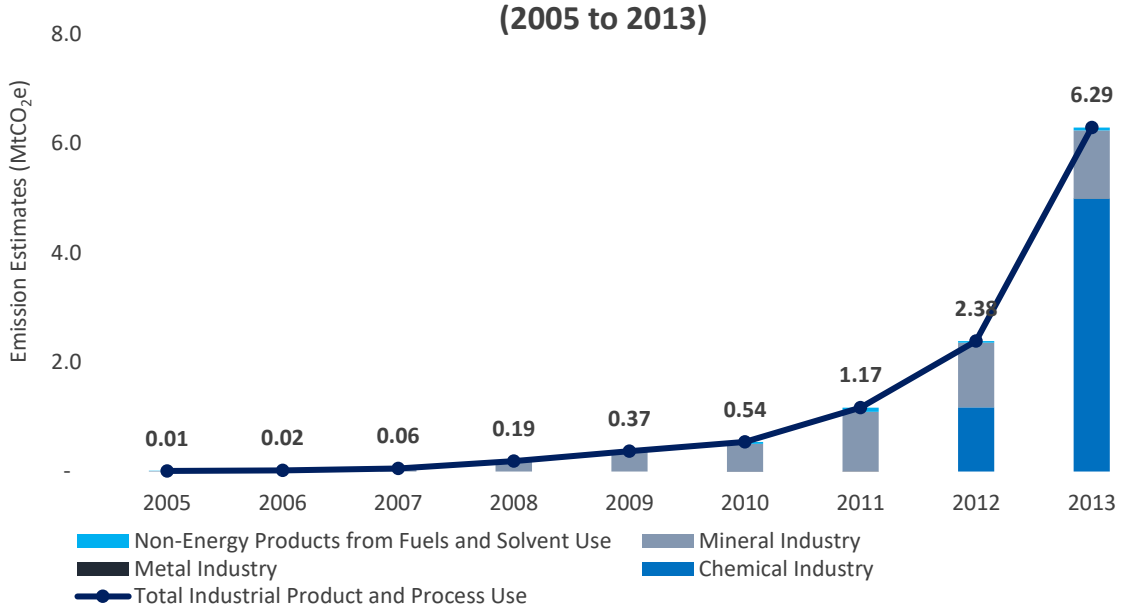
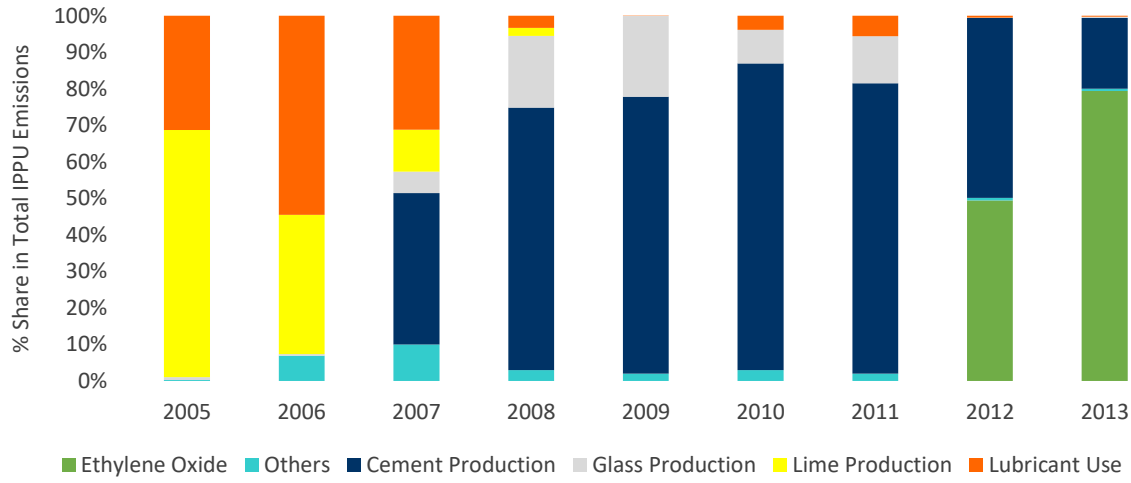


Figure 8 below depicts the trend of GHG emissions by various IPPU categories. In 2005, Lime Production was the key driver of emissions in the IPPU sector whereas in 2006, Lubricant Use had the maximum share of emissions in the Uttarakhand's IPPU emissions portfolio. From 2007 onwards, Cement Production was a key driver of IPPU emissions till 2011. As highlighted earlier, Ethylene Oxide was the major contributor GHG emissions in 2012 and 2013.Detailed information is needed for Ethylene Oxide production at the state level to validate this trend and perform recalculations.

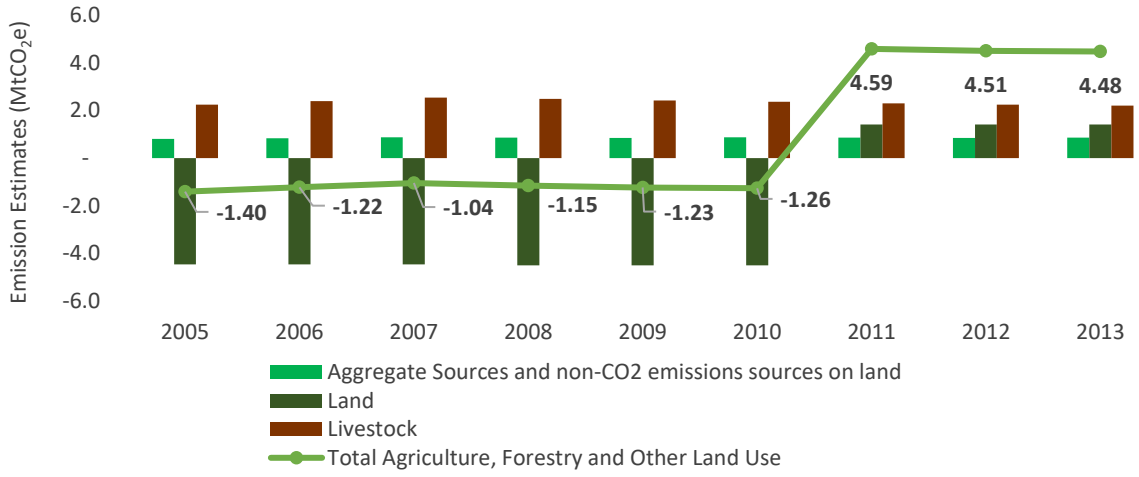
Figure 8: Share of GHG Emissions from IPPU Categories (2005 to 2013)



AFOLU Sector

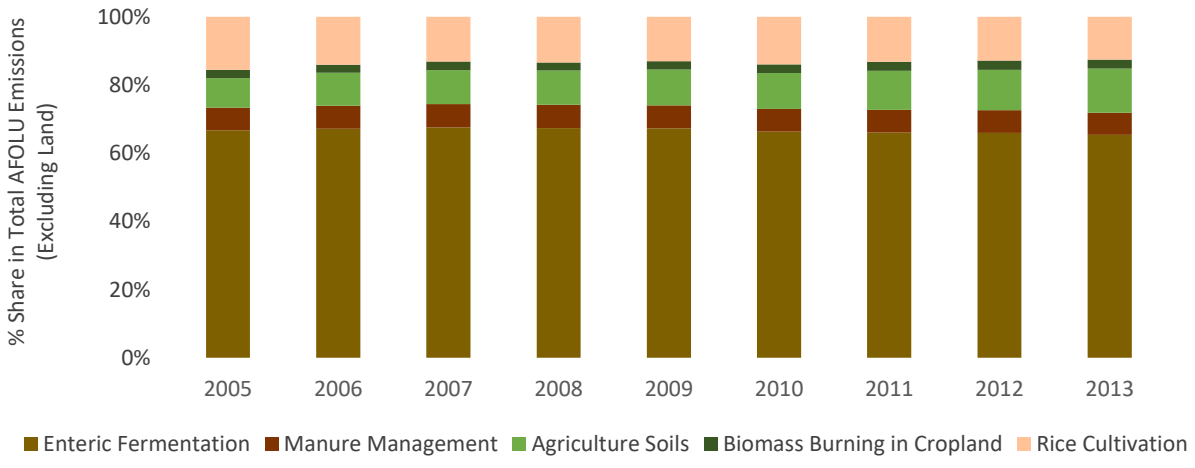
Emissions from the AFOLU sector represented ~23% of emissions of Uttarakhand in 2013. Emissions of the AFOLU sector arise from three main sub-sectors namely Livestock, Land and Aggregate sources and Non-CO_2 Emissions Sources on Land. From 2005 to 2010, GHG emission removals from the Land sub-sector were higher than the aggregate GHG emissions of the other two sub-sectors making the AFOLU sector a net sink of GHGs. But due to loss of forestland in Uttarakhand, the AFOLU sector transformed itself from being a net sink to a net emitter in the year 2011 (4.59 $MtCO_2e$) as depicted in Figure 9 below. Removals from the AFOLU sector in Uttarakhand declined at a rate of 2.08% (compounded annually) from 1.40 $MtCO_2e$ in 2005 to 1.26 $MtCO_2e$ in 2010. While the emissions from the AFOLU declined at a rate of 1.15% from 4.59 $MtCO_2e$ in 2011 to 4.48 $MtCO_2e$ in 2013 as illustrated in Figure 9 below.

Figure 9: GHG Emission Estimates For AFOLU Sector in Uttarakhand (2005 to 2013)



If emissions from the AFOLU sector in Uttarakhand were considered without taking removals from the Land sub-sector into account, maximum emissions arose from the Livestock sub-sector (~72%) in 2013. This is mainly due to increase in the Livestock population of Uttarakhand. Emissions due to Aggregate Sources and Non-CO_2 Emission Sources on Land (Agricultural Soils, Biomass Burning and Rice Cultivation) also had a significant share in in total emissions of the AFOLU sector as illustarted in Figure 10 below.

Figure 10: Share of GHG Emissions for AFOLU Sub-Sectors (Excluding Land) (2005 to 2013)



Waste Sector

Waste sector contributed to ~12% of total emissions in Uttarakhand in 2013. Municipal Solid Waste[4], Domestic Wastewater and Industrial Wastewater are the key sources of GHG emissions in the Waste sector. GHG emissions from Waste sector grew at a low CAGR of 0.55% from 2.3 $MtCO_2e$ in 2005 to 2.4 $MtCO_2e$ in 2013 as depicted in Figure 11 below. A significant bump in the total emissions of this sector was observed during the years 2011 and 2012 due to increase in emissions of the Domestic Wastewater sub-sector which resulted from the changing trends in the usage of various treatment systems as reported in Census of India 2011. However, a slight dip in the total emissions was registered in 2013 which was a reflection of reduced industrial activity in the state's Pulp and Paper sector.

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

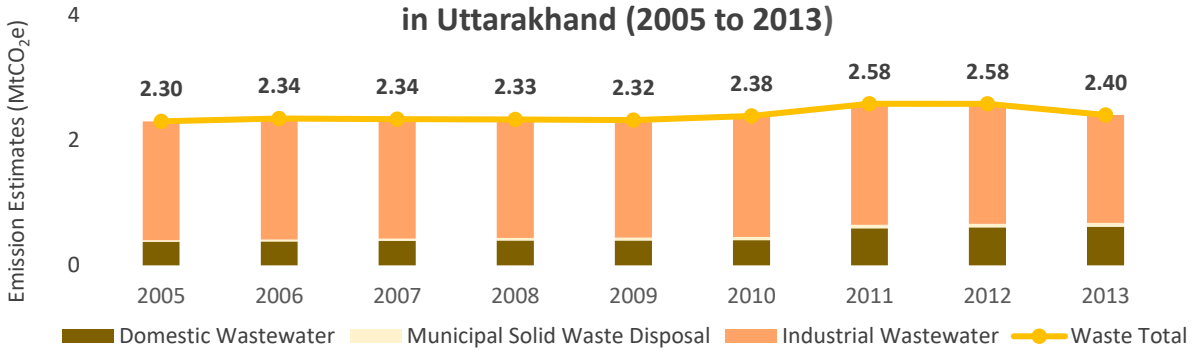
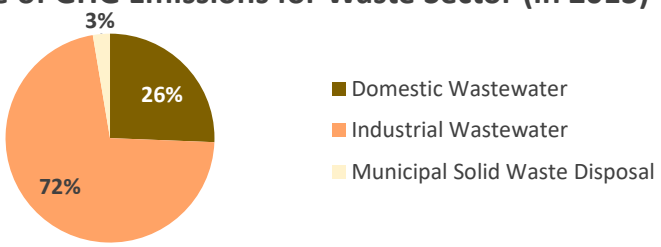
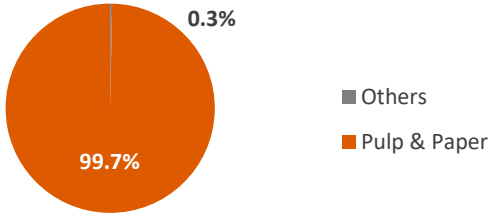


Figure 12: Category-wise Share of GHG Emissions for Waste Sector (in 2013)



Maximum emissions in Uttarakhand arose from Industrial Wastewater (72%) followed by Domestic Wastewater (26%) and very minor emissions from Municipal Solid Waste (~3%). Deep diving into the various Industrial Wastewater categories, it was observed that almost 99.7% of the Industrial Wastewater emissions arose from Pulp and Paper Industries in 2013 as depicted in Figure 13 below.

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



Domestic Wastewater comprised ~26% of the total Waste sector emissions in Uttarakhand in 2013. Emissions from this sub-sector grew at a CAGR of 6.3% from 6.8 $MtCO_2e$ in 2005 to 9.5 $MtCO_2e$ in 2013. Under the Domestic Wastewater sub-sector, maximum emissions originated from the rural areas of Uttarakhand, with a share of ~71% in the total Domestic Wastewater emissions in 2013. As already mentioned, Municipal Solid Waste had a minor share of ~3% in the total Waste sector emissions in 2013. Emissions from this sub-sector grew at a CAGR of 13.3% from 0.02 $MtCO_2e$ in 2005 to 0.06 $MtCO_2e$ in 2013.

[4] '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 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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