

Trend Analysis of GHG Emissions of DAMAN and DIU

GHG Platform India is a civil society initiative providing an independent estimation and analysis of India's Greenhouse Gas (GHG) emissions across key sectors.

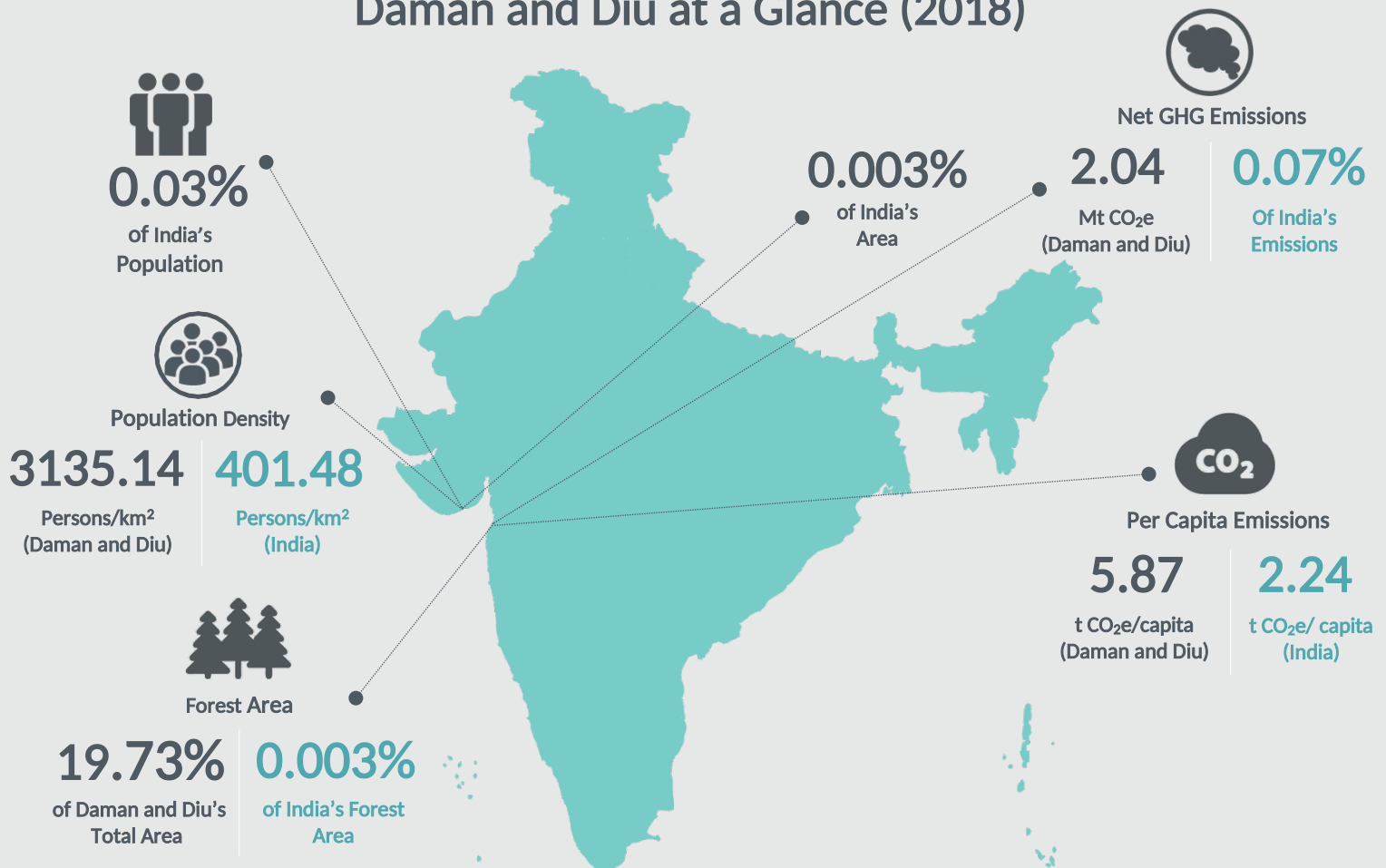
The Platform seeks to add value to the various ongoing GHG emissions estimation efforts by helping address existing data gaps and data accessibility issues, extending beyond the scope of national inventories to state inventories, and by increasing the volume of analytics and policy dialogue on India's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

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



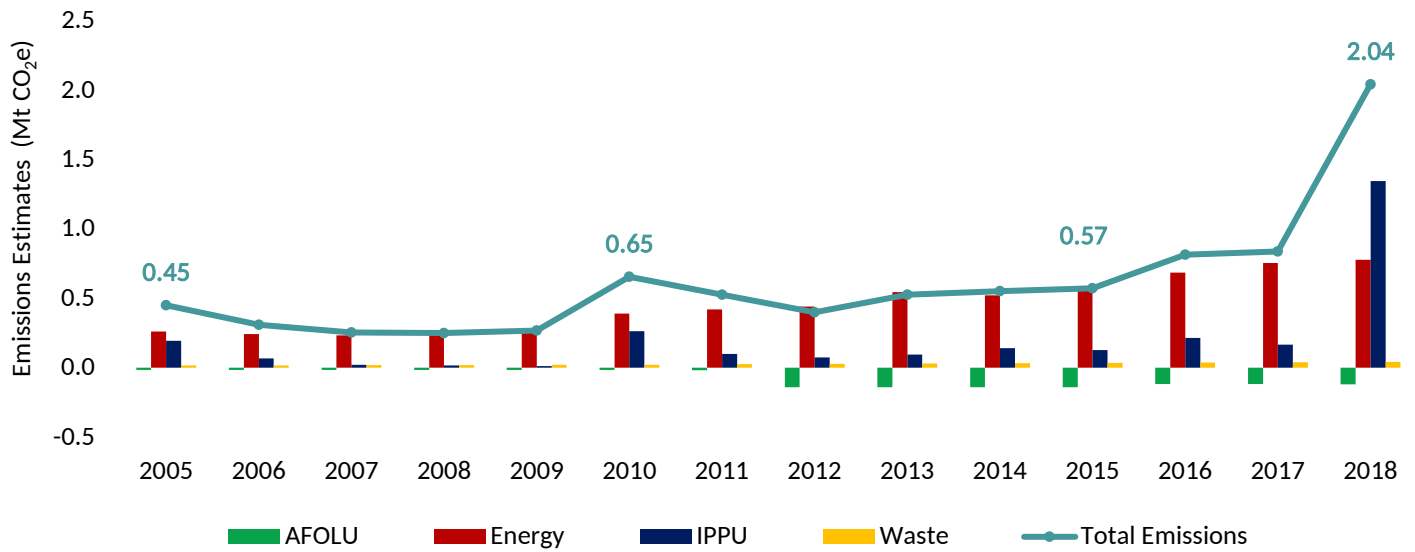
* Fuel combusted for captive electricity generation (auto-producers) and direct fuel combustion (industrial energy) has been reported under Energy sector.

Daman and Diu at a Glance (2018)



Economy-wide Emissions Estimates

Figure 1: GHG Emissions Estimates of Daman and Diu (2005 to 2018)



Emissions of Daman and Diu increased at a CAGR of 12.35% from 0.45 Mt CO₂e in 2005 to 2.04 Mt CO₂e in 2018. As illustrated in Figure 1, the Agriculture, Forestry and Other Land Use (AFOLU) sector was a net sink of GHGs throughout the reference period. From 2005 until 2017, Energy sector was the major contributor to the economy-wide emissions. However, in 2018, emissions of Industrial Processes and Product Use (IPPU) sector jumped a significant 1.18 Mt CO₂e (>700% increase), over 2017 and became the major contributor to the total economy-wide emissions.

Daman and Diu's, share of IPPU sector in gross economy-wide emissions (excluding AFOLU sector) increased from ~41% in 2005 to ~62% in 2018. Whereas, the share of Energy sector emissions in gross economy-wide emissions of the Union Territory, reduced from ~56% to ~36% and that of Waste sector reduced from ~3% to ~2% during the reference period (see Figure 2).

Figure 2: Sector-wise Contribution (Mt CO₂e) and Percentage Share in Gross Economy-wide GHG Emissions of Daman and Diu (excluding AFOLU sector)

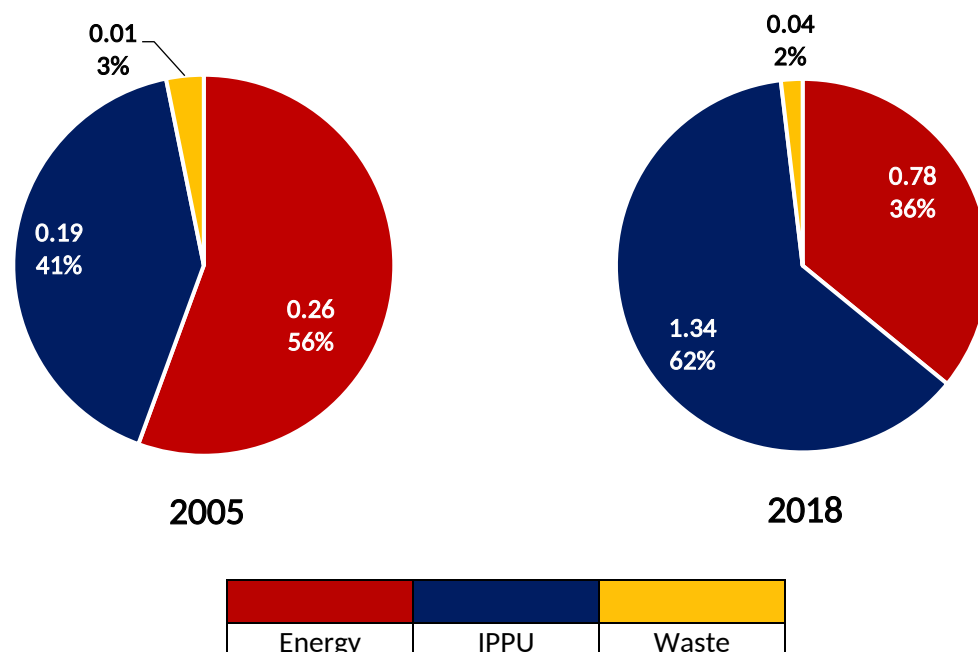
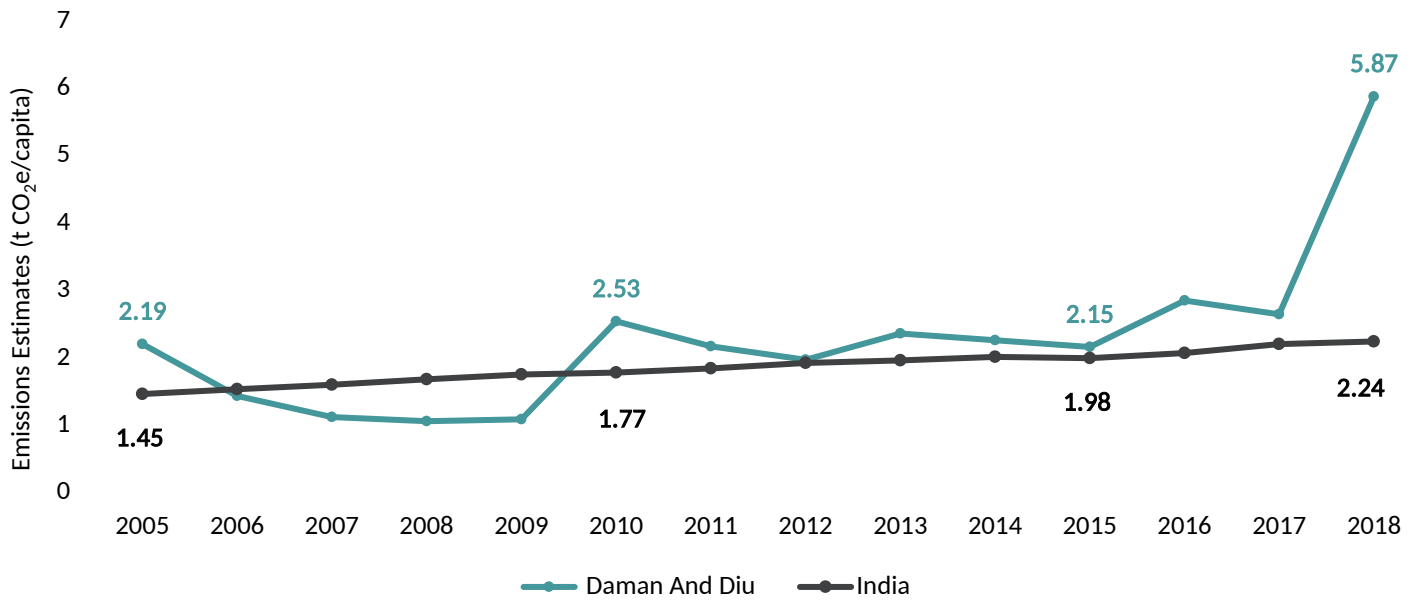


Figure 3: Per Capita GHG Emissions of Daman and Diu and India (2005 to 2018)



The per capita emissions of Daman and Diu were higher as compared to the per capita emissions of India, except between 2006 to 2009 (see Figure 3). The per capita emissions of Daman and Diu increased at a CAGR of 7.87% from 2.19 t CO₂e/capita in 2005 to 5.87 t CO₂e/capita in 2018, which was much higher than that of India's CAGR (~3.41%).



Energy Sector

The Energy sector emissions comprise of emissions from Fuel Combustion and Fugitive Emissions. Fuel Combustion includes the 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 Daman and Diu accounted for ~36% of its gross economy-wide emissions (excluding AFOLU sector) in 2018. Emissions from the Energy sector increased at a CAGR of 8.80% from 0.26 Mt CO₂e in 2005 to 0.78 Mt CO₂e in 2018 as shown in Figure 4. Emissions were recorded only from Fuel Combustion sub-sector.

Figure 4: GHG Emissions Estimates of Energy Sector - Daman and Diu (2005 to 2018)

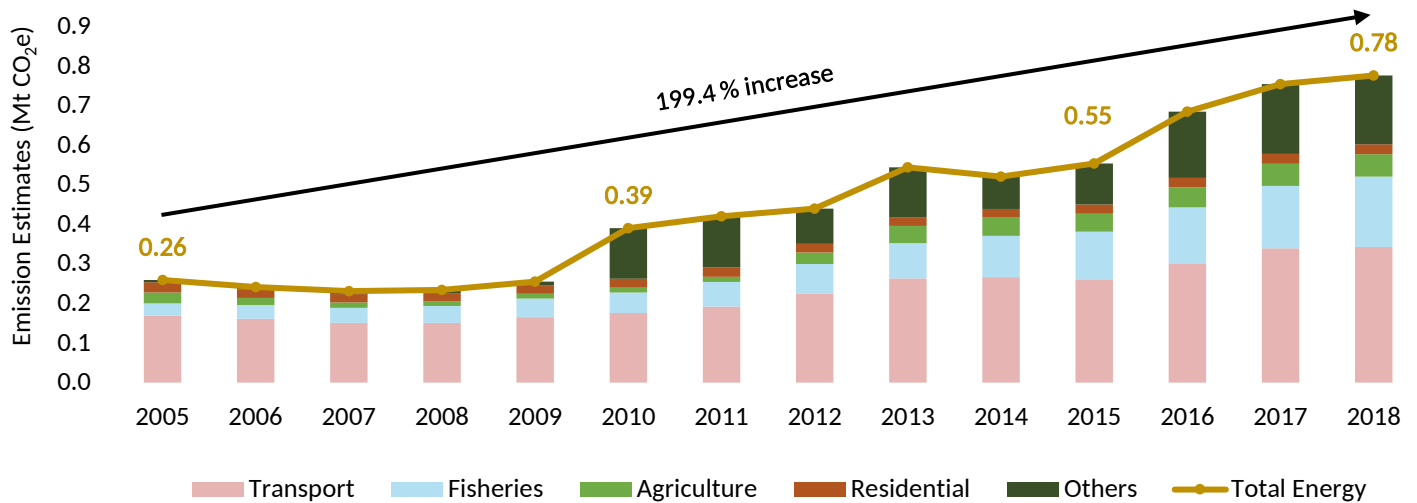
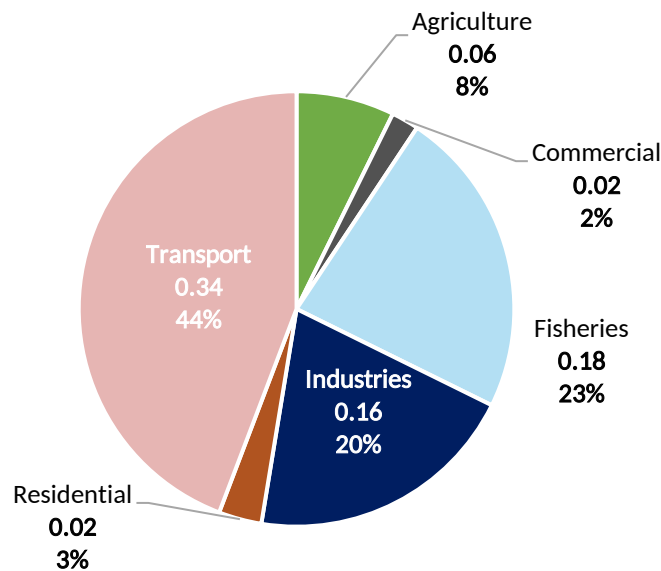


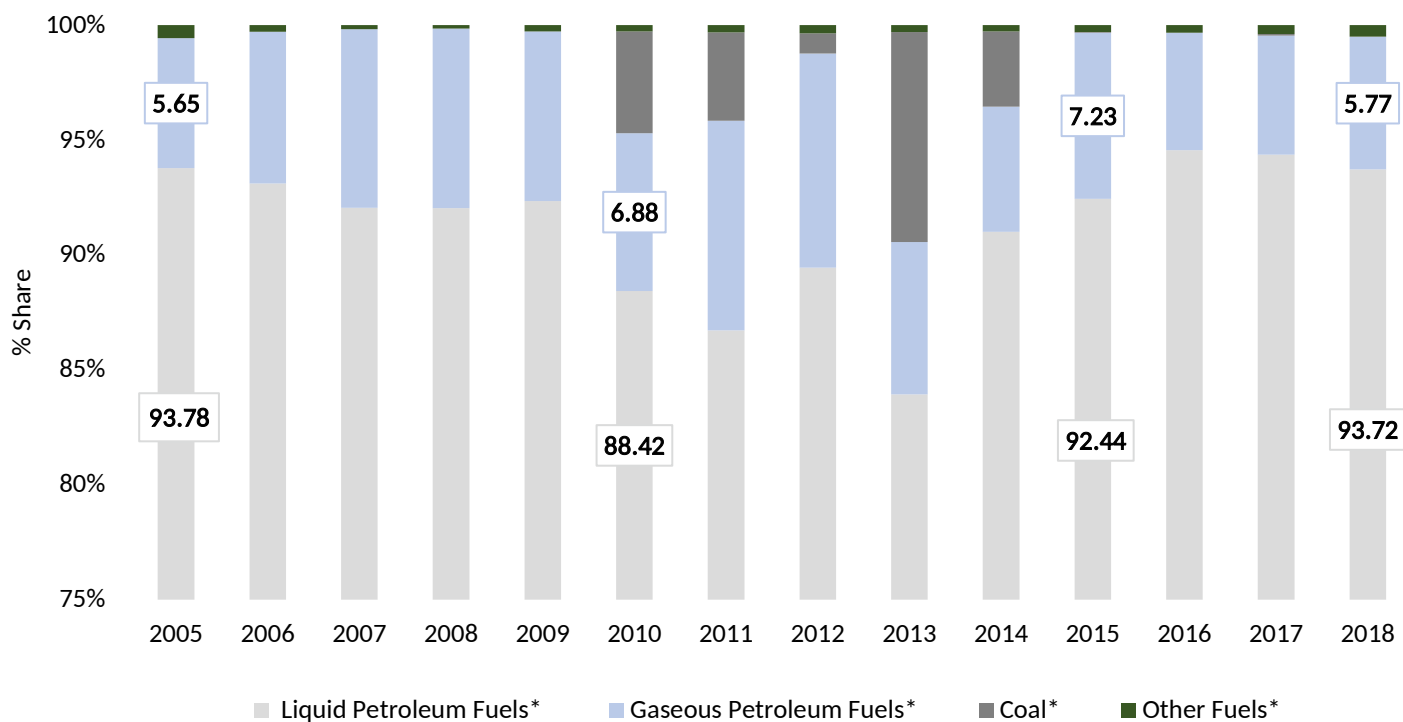
Figure 5: Category-wise Emissions (Mt CO₂e) and Percentage Share in Total Energy Sector Emissions (2018)



Within the Energy sector, Transport category was the major contributor of emissions with a share of ~44% of the total Energy emissions in 2018. This was followed by Fisheries and Industrial Energy categories with shares of 23% and 20%, respectively, in 2018 (see Figure 5).

Within the Fuel Combustion sub-sector, emissions from Liquid Petroleum Fuels were the major contributor to GHG emissions, with an average share of ~91% across the reference period (see Figure 6). This was followed by emissions from combustion of Gaseous Petroleum Fuels, with an average share of ~7% between 2005 and 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 comprises of firewood and charcoal

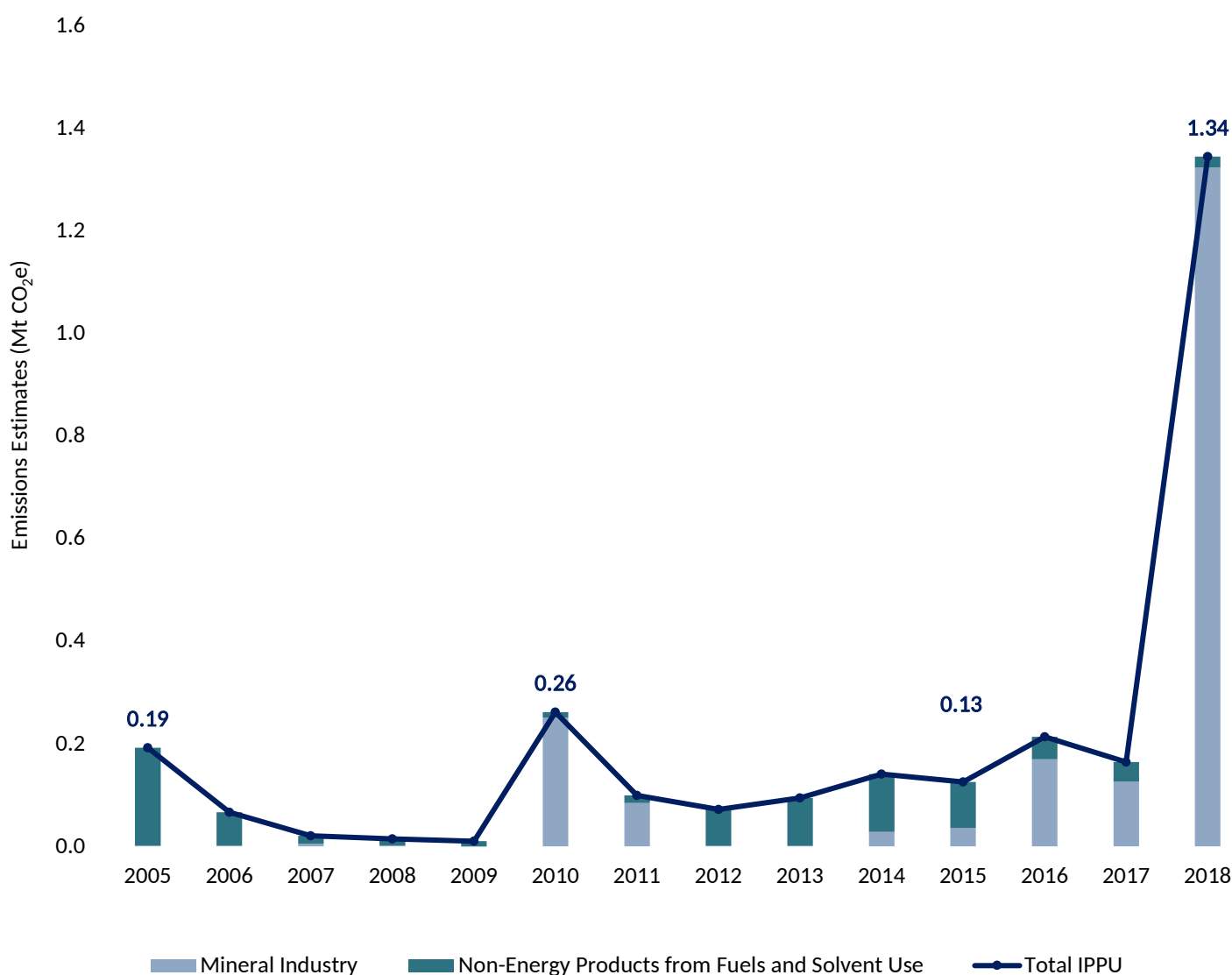


IPPU Sector

Emissions from the 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 Daman and Diu, the key contributing industrial sub-sectors were Mineral and Non-Energy Products from Fuels and Solvent Use.

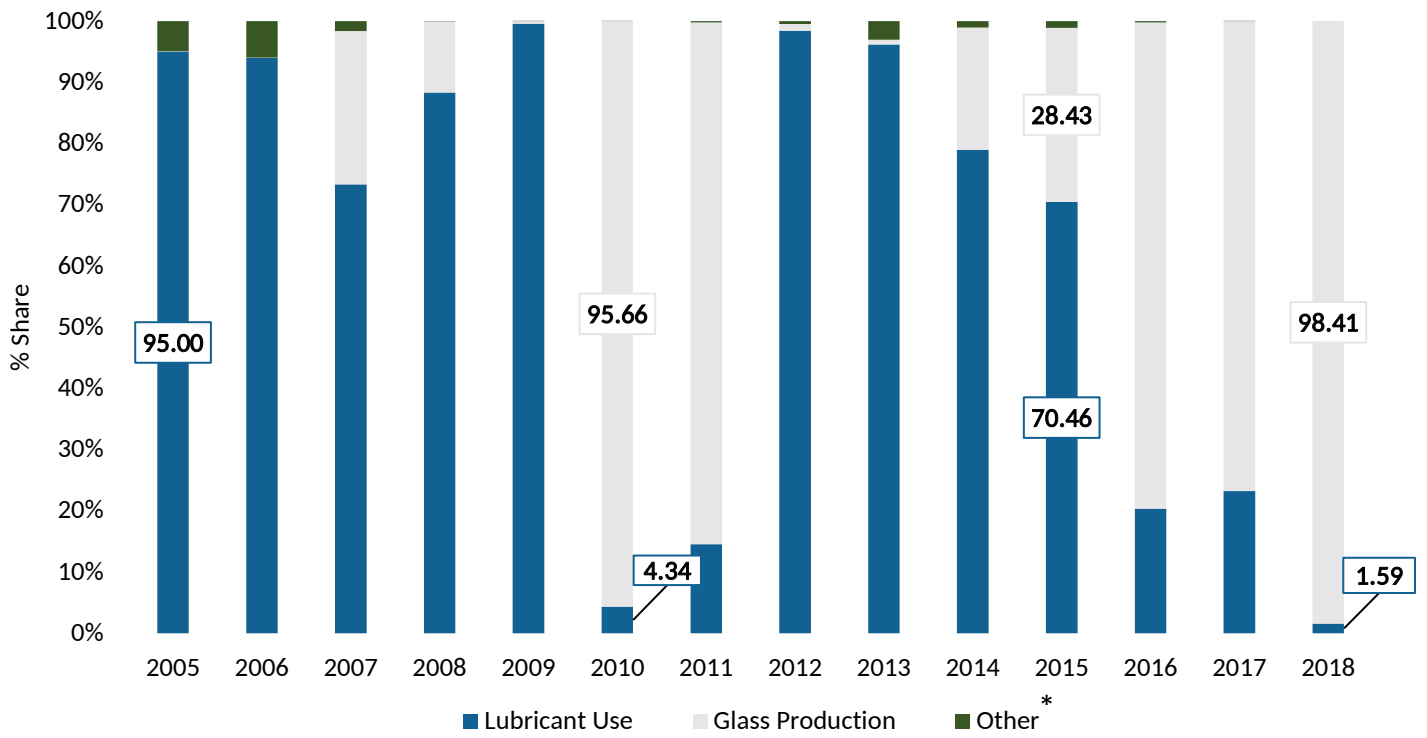
The IPPU sector of Daman and Diu represented ~62% of its gross economy-wide emissions (excluding AFOLU sector) in 2018. The emissions from IPPU sector increased at a CAGR of 16.14% from 0.19 Mt CO₂e in 2005 to 1.34 Mt CO₂e in 2018. The overall IPPU emissions increased significantly in 2018 due to increase in emissions from Mineral Industry sub-sector (primarily from Glass Production) as illustrated in Figure 7. Significant emissions were also observed from Non-Energy Products sub-sector. However, these emissions were not reported consistently through the reference period, and in absolute terms, the emissions from this sub-sector declined at a rate of 15.50% (compounded annually) from 0.19 Mt CO₂e in 2005 to 0.02 Mt CO₂e in 2018, which can be attributed to the reduction in emissions from Paraffin Wax Use category.

Figure 7: GHG Emissions Estimates of IPPU Sector - Daman and Diu (2005 to 2018)



The detailed trend of the GHG emissions by various IPPU categories is illustrated in Figure 8. Although emissions from Glass Production dominated in the recent years, the average share of Lubricant Use was ~61% during the reference period. In 2018, Glass Production and Lubricant Use contributed ~98% and ~2%, respectively, in the total IPPU emissions.

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

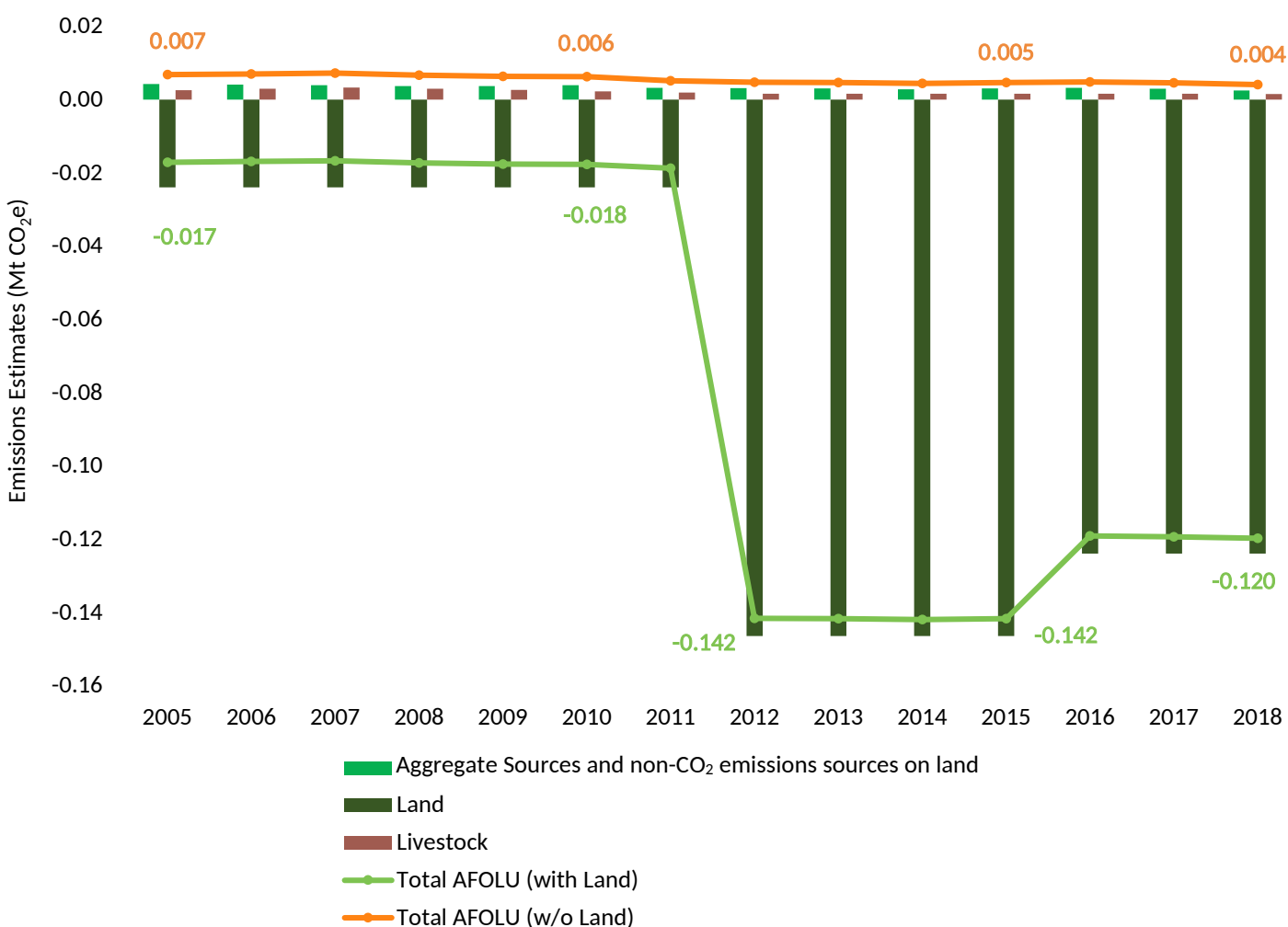


*Others include Paraffin Wax Use and Other uses of Soda Ash



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-CO₂ Emissions Sources on Land*. In Daman and Diu, the Aggregate Sources and Non-CO₂ Emissions Sources on Land and Livestock sub-sectors were positive GHG emitters, while the Land sub-sector was a sink throughout the reference years. The AFOLU sector as a whole was a net sink for all the years in consideration (see Figure 9). This can be attributed to significant increase in removals due to Land Use and Land-Use Change activities. Removals from Land sub-sectors increased at a CAGR of 16.16% from 0.017 Mt CO₂e in 2005 to 0.120 Mt CO₂e in 2018. The average annual emissions from Livestock and Aggregate sources were 0.01 Mt CO₂e that were neutralised by CO₂ removals from the Land sub-sector which was, on an average, removing 0.08 Mt CO₂e during the reference period.

Figure 9: GHG Emissions Estimates of AFOLU Sector - Daman and Diu (2005 to 2018)



Within the Livestock sub-sector, Enteric Fermentation was the major contributor to positive AFOLU emissions with an average share of ~34% across the reference period (see Figure 11). However, the emissions from this category declined at a rate of 3.8% (compounded annually) from 0.002 Mt CO₂e in 2005 to 0.001 Mt CO₂e in 2018.

The Aggregate Sources sub-sector had the maximum share of ~62% of positive AFOLU emissions (excluding Land sub-sector) in Daman and Diu in 2018 (see Figure 10). Within this sub-sector, Rice Cultivation and Agriculture Soils were the major contributors to positive AFOLU emissions with average shares of ~50% and ~12%, respectively, during the reference years. The share of emissions from Rice Cultivation increased from ~40% in 2005 to ~51% in 2018, while the share of emissions from Agriculture Soils declined from ~21% in 2005 to ~10% in 2018.

Figure 10: Category-wise Emissions (Mt CO₂e) and Percentage Share in Positive AFOLU Emissions (excluding Land Sub-sector) (2018)

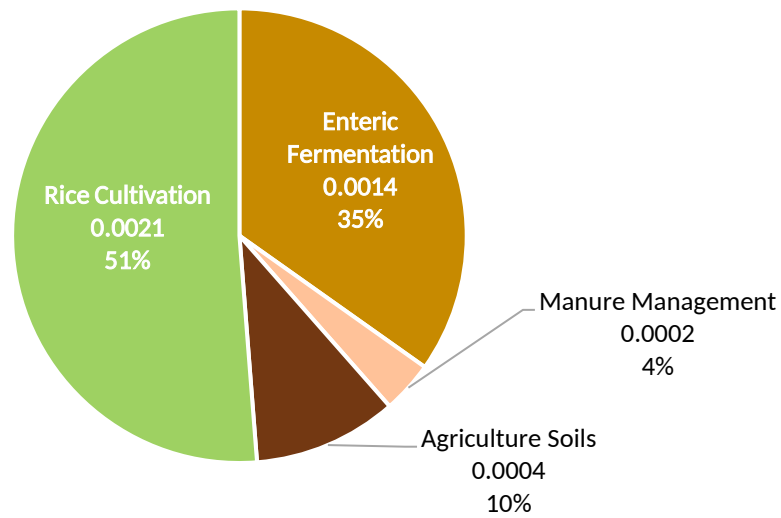
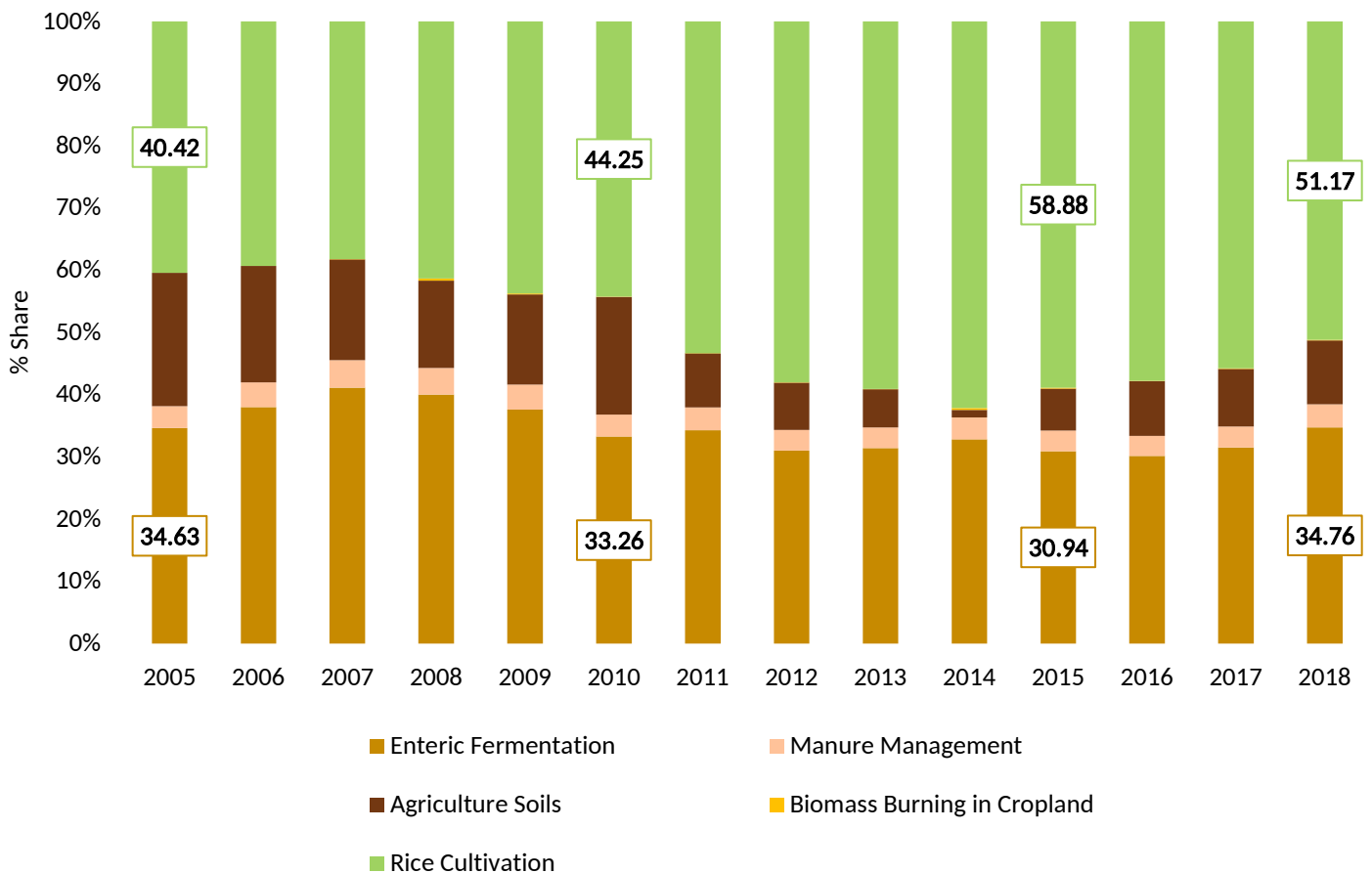


Figure 11: Category-wise Percentage Share in Positive AFOLU Emissions (excluding Land Sub-sector) (2005 to 2018)



* The sub-sector called 'Aggregate Sources and Non-CO₂ Emissions 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 sector contributed almost 2% to gross economy-wide emissions (excluding AFOLU sector) of Daman and Diu in 2018. GHG emissions from the Waste sector of Daman and Diu grew at a CAGR of 8.03% from 0.01 Mt CO₂e in 2005 to 0.04 Mt CO₂e in 2018. Domestic Wastewater sub-sector emissions accelerated from 2011 onwards during the reference period (see Figure 12).

Figure 12: GHG Emissions Estimate of Waste Sector - Daman and Diu (2005 to 2018)

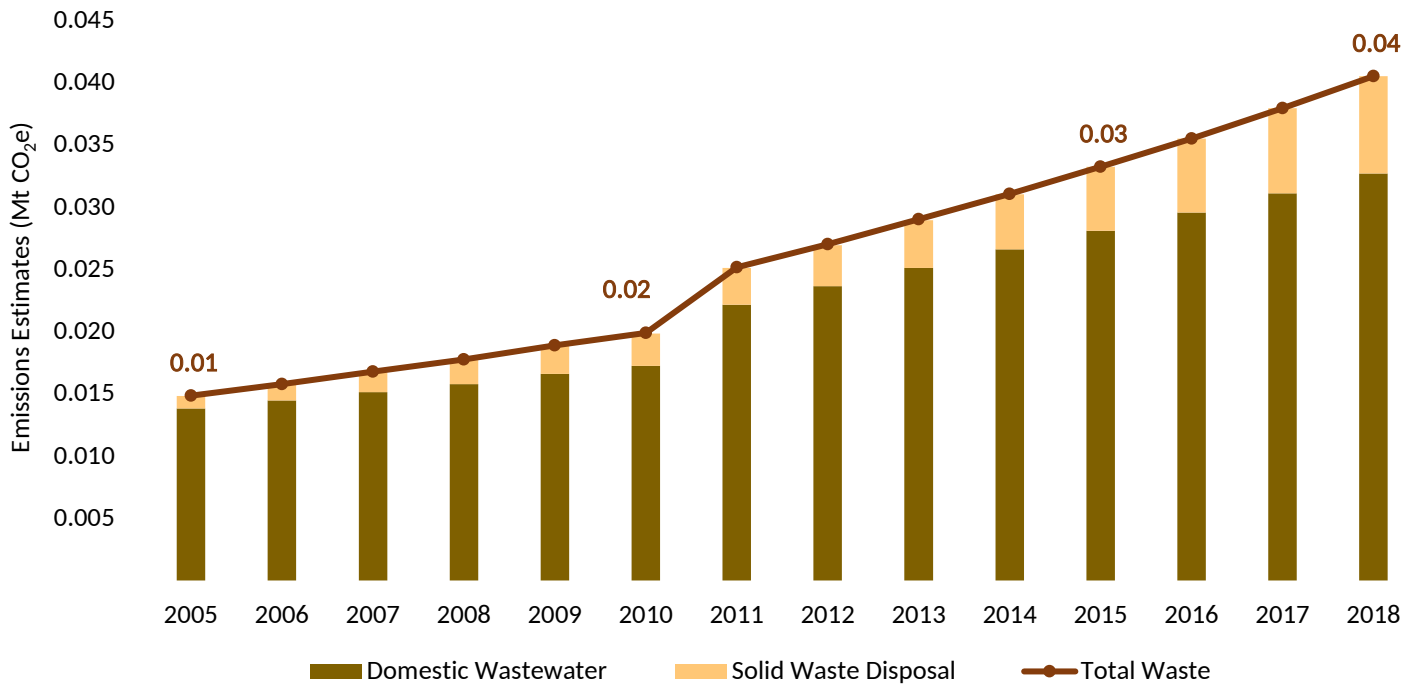
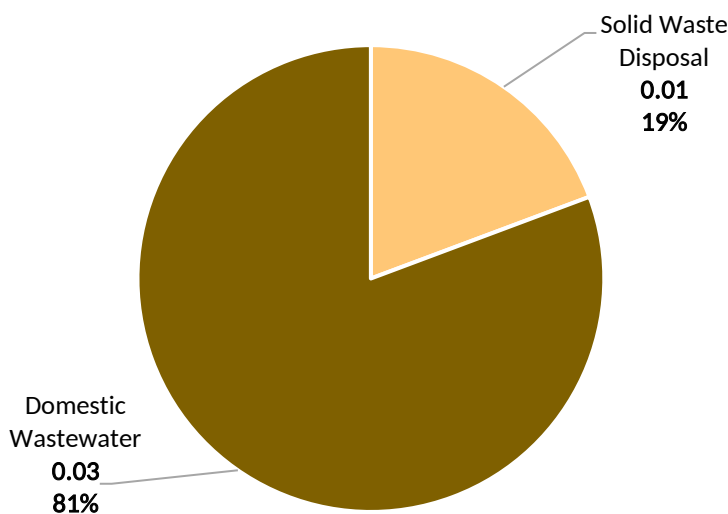


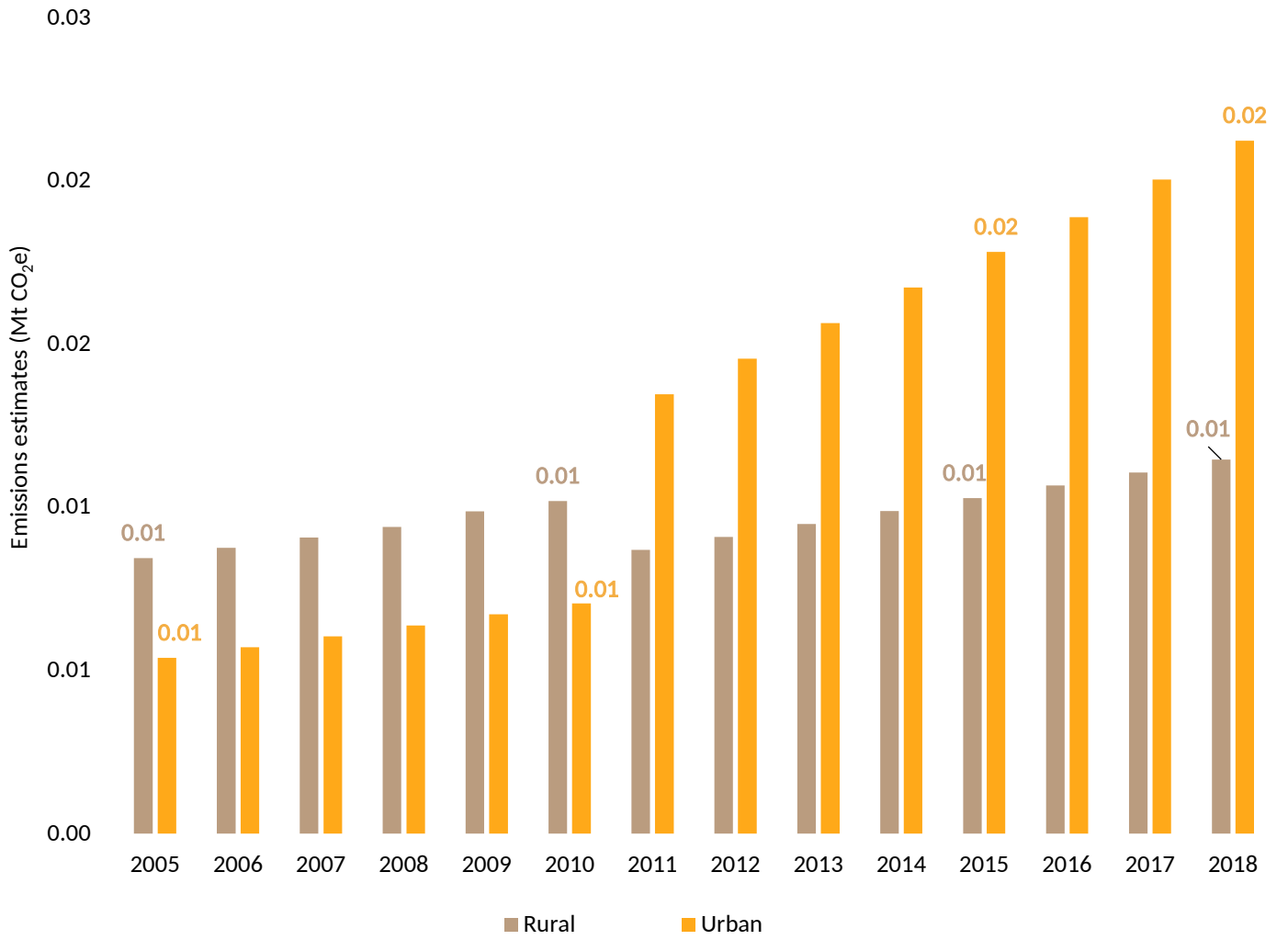
Figure 13: Sub-sector Emissions (Mt CO₂e) and Percentage Share in Total Waste Sector emissions (2018)



Discharge of untreated wastewater and use of septic tanks are the key drivers of emissions due to Domestic Wastewater sub-sector. Domestic Wastewater had a share of 81% in the total Waste sector emissions of Daman and Diu in 2018. Approximately 19% of the Waste sector emissions were from Solid Waste Disposal, which grew at an estimated CAGR of 17.07% from 0.001 Mt CO₂e in 2005 to 0.008 Mt CO₂e in 2018. Daman and Diu registered negligible emissions from Industrial Wastewater category throughout the reference period (see Figure 13).

Emissions from Domestic Wastewater of both rural and urban areas grew at a CAGR of 6.85% from 0.01 Mt CO₂e in 2005 to 0.03 Mt CO₂e in 2018. Almost 65% of Domestic wastewater emissions were from the urban areas of Daman and Diu in 2018 as shown in Figure 14.

Figure 14: Area-wise GHG Emissions Estimates of Domestic Wastewater (2005 to 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

Vasudha Foundation, CISRS House, 14, Jangpura B,

Mathura Road, New Delhi - 110014, India

Phone No. - 011-24372680