Renewables,
Climate and
Future Industries
Tasmania

Tasmanian Greenhouse Gas Emissions Report

2022

Renewables, Climate and Future Industries Tasmania
Department of Treasury and Finance

Tasmanian Government

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Minister's Message

I am pleased to provide this detailed report on the latest greenhouse gas inventory for Tasmania, confirming our world-leading net negative emissions profile. In 2020, Tasmania's net greenhouse gas emissions were minus 3.73 megatonnes of carbon dioxide equivalent, which is a decrease of 120.9 per cent between 1990 and 2020.

In 2014, we were the first Australian jurisdiction to achieve net zero emissions and we have maintained this status for the last seven reported years. This accomplishment reflects the carbon sink in our managed forest estates, and our longstanding investment in renewable energy generation. Tasmania is 100 per cent self-sufficient in renewable electricity and has a target to double renewable energy generation by 2040 and fast-track a renewable hydrogen industry by 2030.

Despite our achievements so far, the Government understands we must continue to reduce emissions to contribute to the global response to climate change. Last year, I tabled in Parliament the Climate Change (State Action) Amendment Bill 2021 (the Bill) which will strengthen our climate change legislation and provide a robust framework to continue our action on climate change. The Bill will legislate:

- a net zero emissions target, or lower, from 2030; the most ambitious legislated emissions reduction target in Australia and one of the most ambitious in the world;
- a requirement for a statewide climate change risk assessment to be completed every five years to inform adaptation planning;
- a requirement to develop sectoral Emissions Reduction and Resilience Plans, in partnership with industry, for the emissions sectors presented in this report;
- a requirement to prepare a climate change action plan at least every five years, to ensure continued action to grow a climate-ready economy, reduce emissions and adapt to climate change; and
- increased reporting and accountability mechanisms, including the preparation and tabling of reports such as these, to ensure the Tasmanian Parliament and community is kept fully informed.

The first step to reducing emissions is to know their source, which is why I am pleased to present this report. It will be an important reference in the development of the sector-based Emissions Reduction and Resilience Plans outlined in the Bill, and our next Climate Change Action Plan.

The Government continues to take action to reduce emissions. We are supporting the uptake of electric vehicles with incentives and charging infrastructure, and are transitioning the government fleet to electric or hydrogen vehicles by 2030. We are providing up to $18.3 million to Metro Tasmania to trial zero emissions buses and providing $10 million to replace government-owned fossil fuel boilers with renewable energy. We have provided $6 million to divert organic waste from landfill and improve reprocessing, reducing both waste and emissions, and we are supporting our major industrials to trial new technologies to reduce emissions.

The Government is committed to reducing emissions and building resilience across all sectors as we transition to a low emissions economy.

Roger Jaensch MP

Minister for Environment and Climate Change

Introduction

This report presents an overview of Tasmania's greenhouse gas emissions (emissions) sources and sinks from 1990 to 2020. It accounts for emissions from goods and services produced in, and exported from, Tasmania. Emissions are reported in financial years to 30 June, so the year 2020 refers to the financial year 1 July 2019 to 30 June 2020. This report draws from the most recent official data in Australia on annual emissions.

Under the *Climate Change (State Action) Act 2008*[1], Tasmania has an emissions reduction target of 60 per cent below 1990 baseline levels by 2050. The *Climate Change (Greenhouse Gas Emissions) Regulations 2012* require the Minister to publish the reduction in emissions compared with the 1990 baseline level.

What are greenhouse gases?

Greenhouse gases trap heat in the atmosphere and make the earth warmer. Those with the most significant impact on global warming are water vapour, carbon dioxide, methane, and nitrous oxide. Other common greenhouse gases include ozone and chlorofluorocarbons.

How are emissions measured?

Each greenhouse gas varies in terms of its contribution to climate change. Global warming potentials are used as a measure of how much heat a greenhouse gas traps in the atmosphere. They compare the amount of heat trapped by a certain mass of each gas to the amount of heat trapped by a similar mass of carbon dioxide. Using this method, greenhouse gases are combined into a single, consistent value of carbon dioxide equivalent (CO_2-e), which is presented in this Report.

What are carbon sinks?

A carbon, or emissions, sink removes more carbon from the atmosphere than it emits. The removed carbon is stored, often in the form of growing vegetation.

[1] At the time of publication, the Climate Change (State Action) Amendment Bill 2021, which sets a target of net zero emissions, or lower, from 2030, is before Parliament.

How are emissions reported?

Reporting framework

Tasmania's emissions are reported in accordance with the Intergovernmental Panel on Climate Change (IPCC) reporting framework for national greenhouse gas inventories.

Data sources

State and Territory Greenhouse Gas Inventories (STGGI)

The main source of data on Tasmania's emissions is the Australian Government's *State and Territory Greenhouse Gas Inventories 2020* (STGGI).

The STGGI is prepared as part of Australia's National Greenhouse Accounts and the National Inventory Report, which is submitted annually in accordance with the international guidelines agreed under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol (KP).

The National Inventory Report runs two years behind the current date and represents the most recent official data in Australia on annual emissions. The current National Inventory Report details estimates of Australia's emissions for the period 1990 to 2020.

Under the UNFCCC, the National Inventory Report must report net emissions from the following sectors:

- energy;
- industrial processes and product use (IPPU);
- agriculture;
- land use, land use change and forestry (LULUCF); and
- waste.

For the purposes of this Report, the energy sector is further broken down into three sub-sectors:

- electricity generation;
- the direct combustion of fuels from all other forms of stationary energy excluding electricity generation (direct combustion); and
- transport.

Within the STGGI, electricity generation is reported under the energy sub-sector 'Energy Industries'. 'Direct combustion' has been aggregated to include the STGGI energy sub-sectors of 'Fugitive emissions', 'Manufacturing Industries and Construction' and 'Other Sectors'.

The STGGI uses the information provided in the National Inventory Report and disaggregates it for each jurisdiction.

The STGGI data relates to production-based, rather than consumption-based emissions in Tasmania, also called Scope 1 emissions. The data accounts for emissions from goods and services produced in, and exported from, Tasmania.

Australian Bureau of Statistics (ABS)

This report also compares Tasmania's STGGI data to the State's Gross State Product (GSP) and population as at June 2020. GSP data were sourced from the ABS *Australian National Accounts: State Accounts 2020-21 (Cat No 5220.0)*.

Tasmania's population data are sourced from *ABS National, State and Territory Population December quarter 2021 (Cat No 3101.0)*.

Units of measure

Greenhouse gases are frequently reported in megatonnes (Mt) CO_2-e, with 1 Mt CO_2-e equal to 1 000 kilotonnes (kt) CO_2-e and 1 kt CO_2-e equal to 1 000 tonnes (t) CO_2-e.

Confidential information

In accordance with the Australian Government's reporting protocols, where reporting at a sub-sector level could lead to the disclosure of commercially sensitive emissions data, the Australian Government treats the information as confidential and aggregates it with other sectors before publication. Examples in Tasmania include fugitive emissions, which are reported in the energy sector under 'Direct combustion', and emissions from the metal industry and the food and beverage industry, which are reported as combined emissions in the IPPU sector.

Discrepancies in table totals

Data in the tables of this Report are sourced directly from the STGGI. Any discrepancy between table totals and the sum of sectors and sub-sectors reflects rounding anomalies and/or the inclusion of confidential emissions data.

Report structure

Chapter One: changes in Tasmania's emissions over the period 1990 to 2020, emissions per person and per unit of Gross State Product (GSP) and the State's contribution to national emissions.

Chapter Two: Tasmanian emissions by sector and energy sub-sectors using the IPCC sector categories.

A list of Abbreviations and Acronyms is included at the end of this Report.

Appendix A: a summary of methodological changes included in the 2020 STGGI.

Appendix B: UNFCCC emissions reporting sectors and descriptions.

Appendix C: a table of greenhouse gas source and sink categories for Tasmania 2019-20.

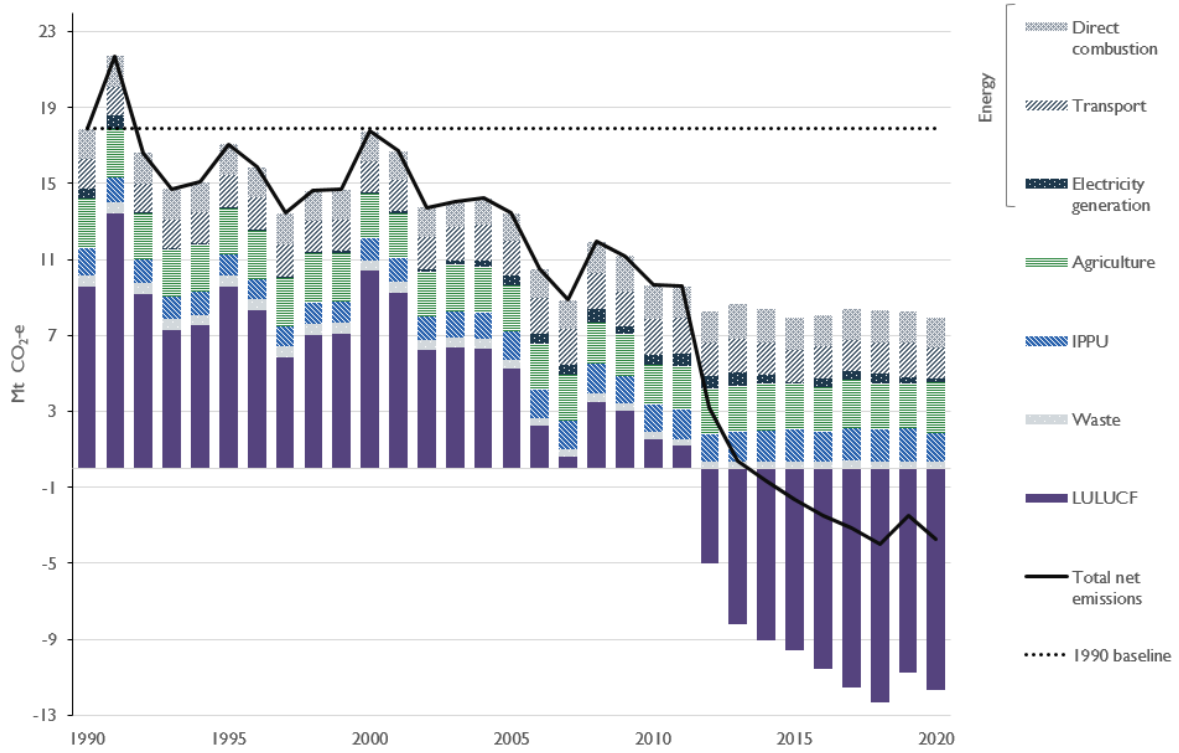
1. Changes in Tasmania's emissions

1.1 Tasmania's emissions - 1990 to 2020

In 2020, Tasmania's net emissions were minus 3.73 megatonnes (Mt) of carbon dioxide equivalent (CO_2-e). Tasmania's emissions decreased by 21.62 Mt CO_2-e between 1990 and 2020, which is a 120.9 per cent reduction from the 1990 baseline.

There is a clear downward trend in Tasmania's total annual emissions from 1990 to 2020 (Figure 1). Tasmania first achieved negative net emissions in 2014 and subsequently maintained this level each year to 2020.

Figure 1: Tasmania's emissions by sector and energy sub-sector - 1990 to 2020



Changes in the LULUCF sector have had a major influence on Tasmania's total annual emissions, reducing emissions and increasing carbon sequestration by 21.23 Mt CO_2-e (Table 1) from 1990 levels.

Reductions in emissions also occurred in waste (down 0.20 Mt CO_2-e), and energy sub-sectors direct combustion (down 0.05 Mt CO_2-e) and electricity generation (down 0.43 Mt CO_2-e).

Sectors that experienced an increase in emissions over this period were IPPU (up 0.08 Mt CO_2-e), agriculture (up 0.08 Mt CO_2-e) and the transport sub-sector (up 0.13 Mt CO_2-e).

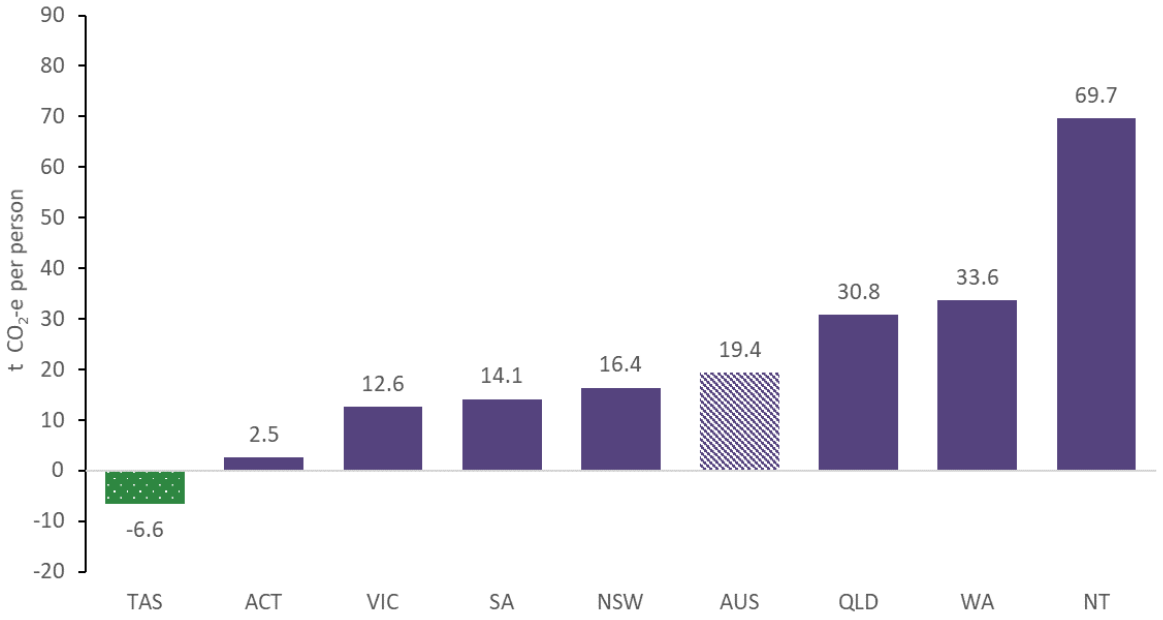
Table 1: Tasmania's emissions by sector and energy sub-sector - 1990 to 2020

Sector/Sub-sector	Emissions (Mt CO_2-e)		Change (Mt)	Change (%)
	1990	2020		
Energy	3.70	3.35	-0.35	-9.4
Direct combustion	*1.60*	*1.55*	*-0.05*	*-3.0*
Transport	*1.53*	*1.66*	*0.13*	*8.2*
Electricity generation	*0.57*	*0.14*	*-0.43*	*-74.8*
Agriculture	2.61	2.69	0.08	3.0
IPPU	1.42	1.50	0.08	5.9
Waste	0.57	0.37	-0.20	-35.0
LULUCF	9.59	-11.64	-21.23	-221.4
Total	**17.89**	**-3.73**	**-21.62**	**-120.9**

1.2 Tasmania's emissions per person

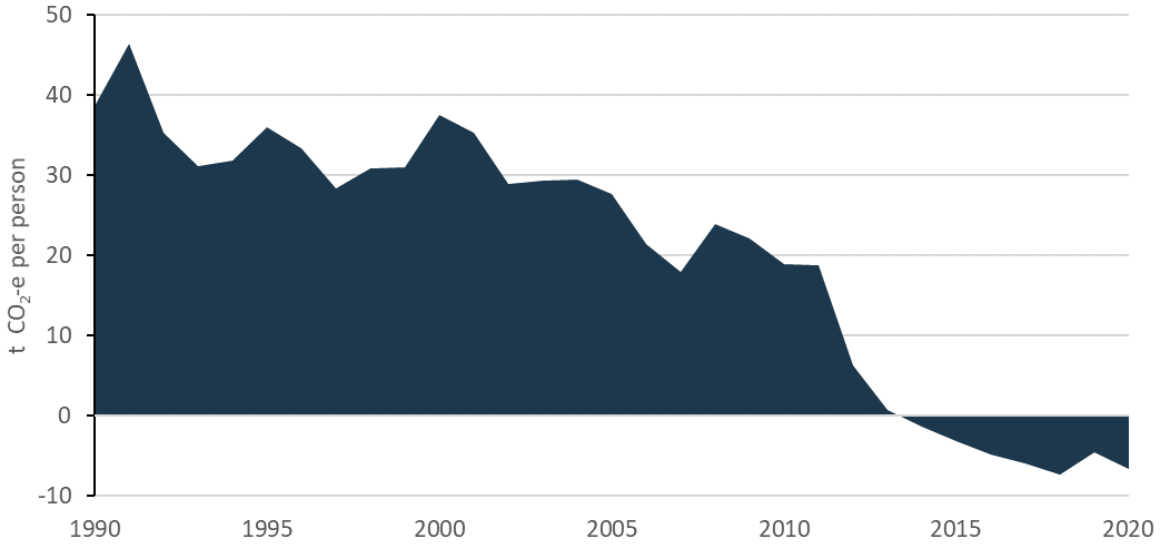
In 2020, Tasmania had the lowest emissions per person of any Australian jurisdiction, at minus 6.6 t CO_2-e per person (Figure 2). This is significantly less than the national average of 19.4 t CO_2-e per person.

Figure 2: Tasmania's emissions per person relative to Australia and other states and territories – 2020



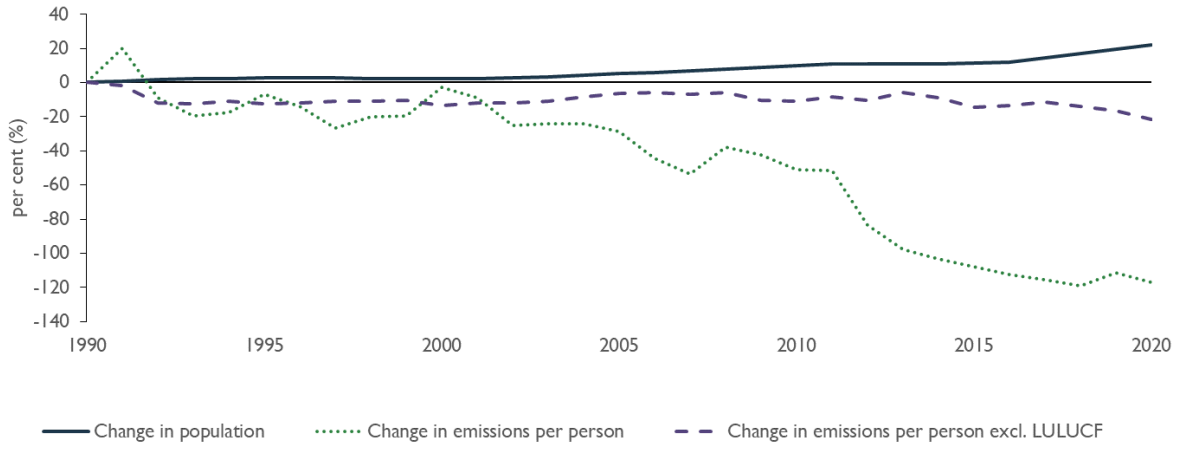
Tasmania's emissions per person have decreased from 38.7 t CO_2-e in 1990 to minus 6.6 t CO_2-e in 2020, a reduction of 117.1 per cent (45.3 t CO_2-e) over 30 years (Figure 3).

Figure 3: Change in Tasmania's emissions per person - 1990 to 2020



When emissions from the LULUCF sector are excluded, the percentage change in Tasmania's emissions per person relative to the 1990 baseline also declines, while Tasmania's population has steadily grown (Figure 4).

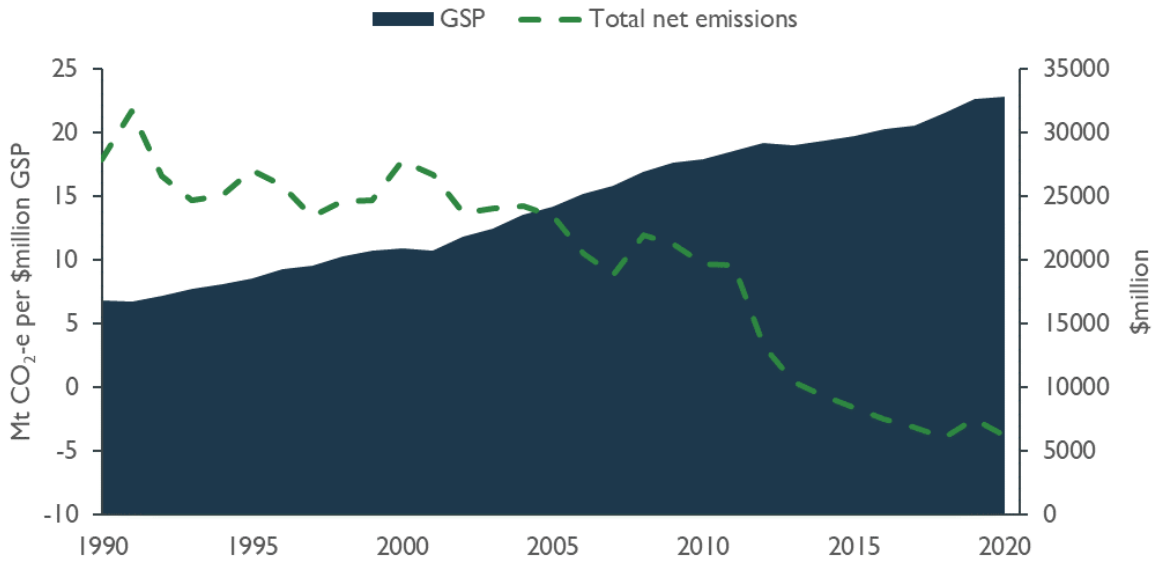
Figure 4: Change in Tasmania's population and emissions per person – 1990 to 2020



1.3 Tasmania's emissions and Gross State Product

From 1990 to 2020, Tasmania's real GSP increased by 95.7 per cent (to over $32 billion) while Tasmania's emissions decreased by 120.9 per cent (Figure 5).

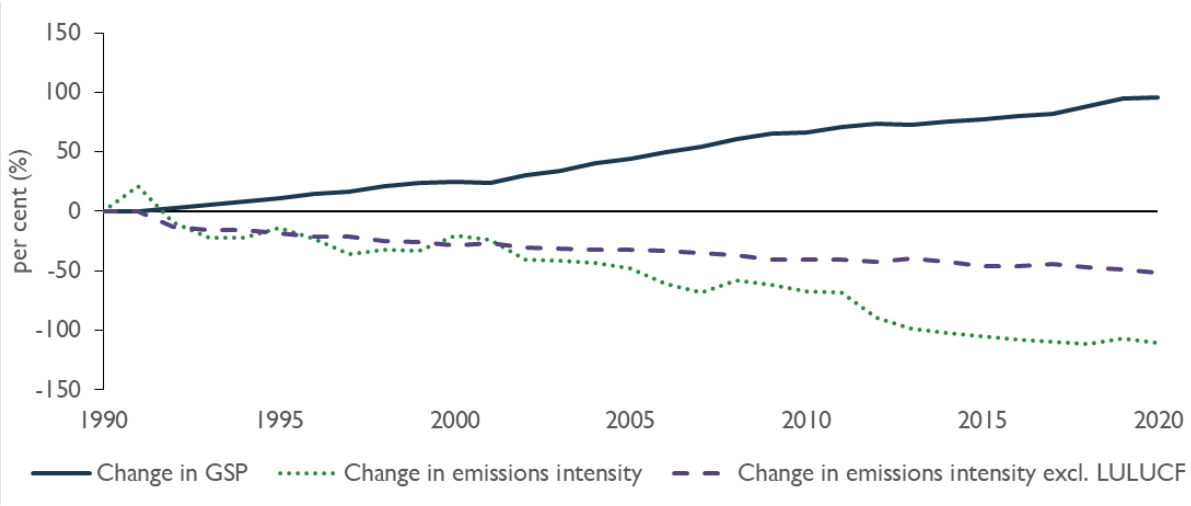
Figure 5: Change in Tasmanian emissions and real Gross State Product – 1990 to 2020



The rise in Tasmania's GSP, coupled with the decrease in Tasmania's emissions, resulted in a reduction in the emissions intensity of the Tasmanian economy, from 1 066 to minus 114 t CO_2-e per million dollars of GSP (a reduction of 111 per cent) (Figure 6).

When the emissions from the LULUCF sector are excluded, the emissions intensity of Tasmania's economy demonstrates a downward trend, declining from 495 t CO_2-e to 241 t CO_2-e per million dollars of GSP between 1990 and 2020, which is a reduction of 51.3 per cent over this period.

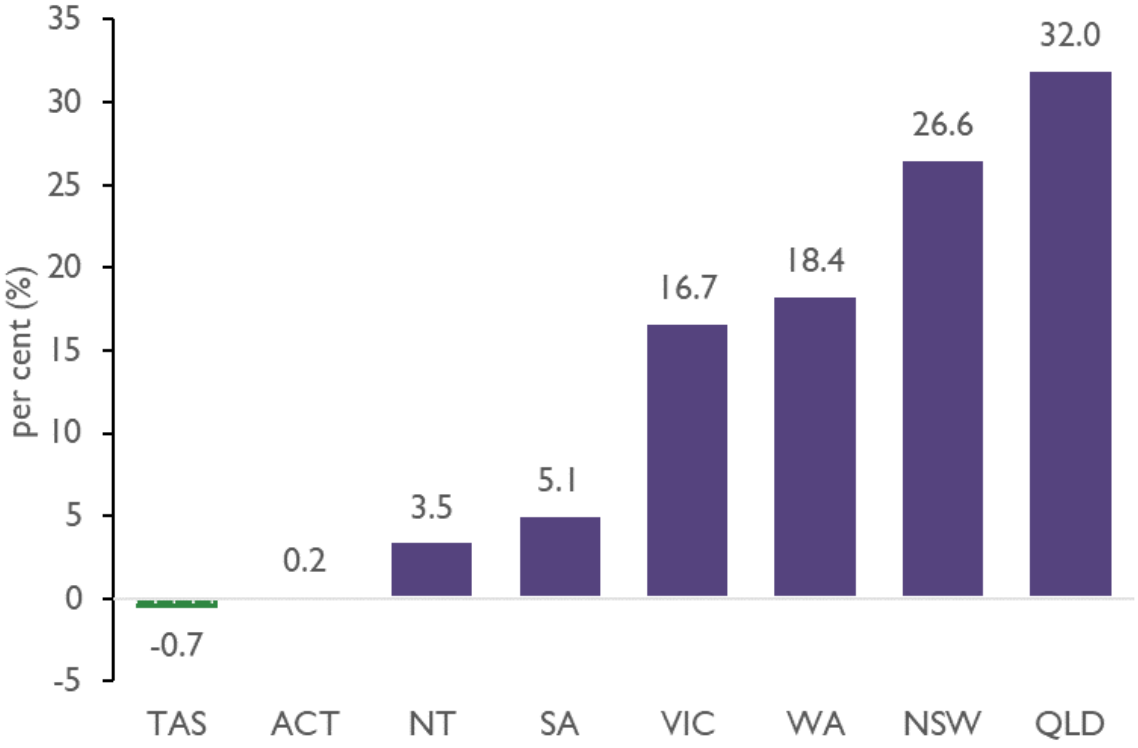
Figure 6: Percentage change in Tasmania's real GSP and emissions intensity – 1990 to 2020



1.4 Tasmania's contribution to national emissions

In 2020, Tasmania helped reduce Australia's total emissions (497.7 Mt CO_2-e) by 0.7 per cent (Figure 7).

Figure 7: Tasmania's contribution to national emissions – 2020



2. Tasmania's emissions by sector

This chapter details Tasmania's emissions by the IPCC sectors of energy; agriculture; IPPU; waste; and LULUCF.

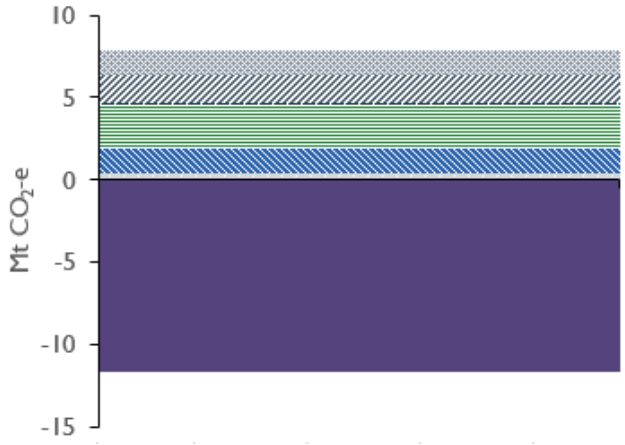
The energy sector is disaggregated into three sub-sectors: electricity generation; direct combustion (of fuels for stationary energy uses); and transport.

Tasmania's net emissions in 2020

Tasmania's net emissions for 2020 by sector and energy sub-sector (Figure 8):

- Tasmania's net emissions in 2020 were minus 3.73 Mt CO_2-e.
- The LULUCF sector provided net sequestration of emissions (a carbon sink) of minus 11.64 Mt CO_2-e, offsetting emissions from all other sectors.
- Excluding LULUCF, the remaining sectors contributed 7.91 Mt CO_2-e to Tasmania's emissions, which comprised emissions from the following sectors: energy (42.3 per cent); agriculture (34.0 per cent); IPPU (19.0 per cent); and waste (4.7 per cent).
- The energy sector contributed 3.35 Mt CO_2-e to Tasmania's net emissions. Excluding LULUCF, the energy sub-sectors accounted for the following emissions: direct combustion (19.6 per cent of total emissions); transport (20.9 per cent); and electricity generation (1.8 per cent).

Figure 8: Tasmanian emissions by sector and energy sub-sectors – 2020



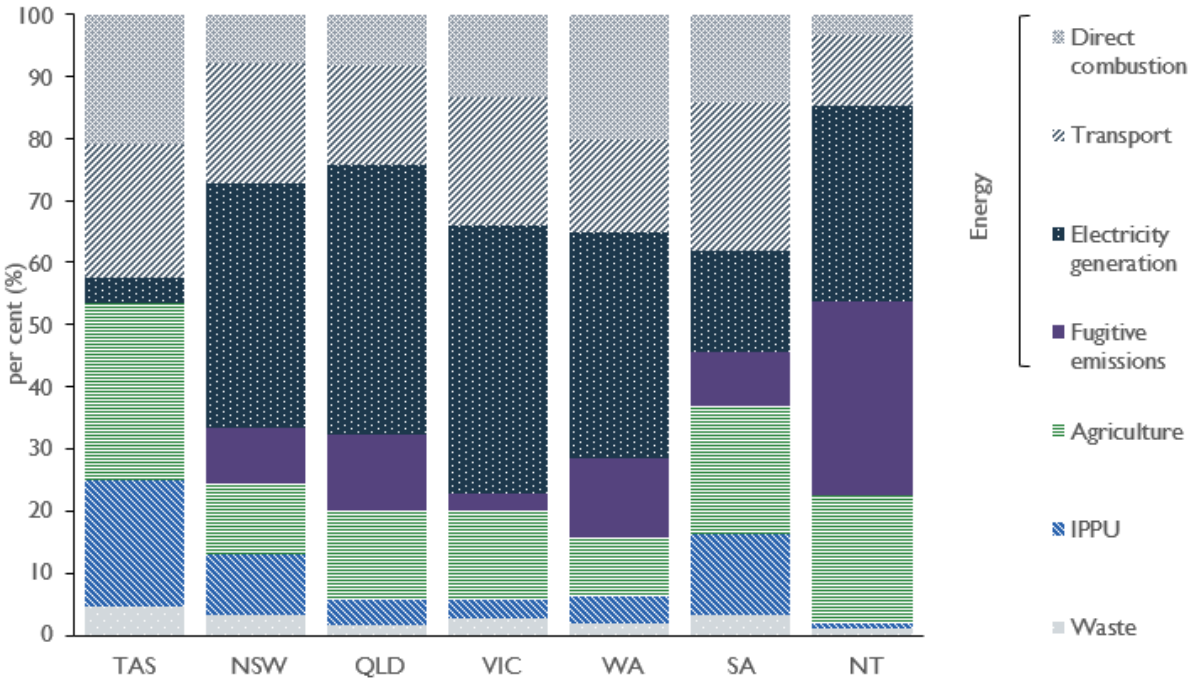
	Mt CO_2-e
Energy – Direct Combustion	1.55
Energy – Transport	1.66
Energy – Electricity Generation	0.14
Agriculture	2.69
IPPU	1.50
Waste	0.37
LULUCF	-11.64
Total	-3.73

Figure 9 highlights the differences in the relative contribution of each sector and energy-subsector to an Australian state or territory's total emissions. The LULUCF sector has been excluded from this analysis. The Australian Capital Territory is also excluded from this analysis as it only has a partial inventory, because its electricity is supplied by New South Wales.

Tasmania's emissions profile differs from other Australian states and territories, due to much lower contributions from the electricity generation sub-sector to Tasmania's total emissions.

Emissions from Tasmania's transport, direct combustion, IPPU and agriculture sectors make a larger relative contribution to the State's total emissions than in most other jurisdictions.

Figure 9: Relative contribution of each sector and energy sub-sector to an Australian state or territory's emissions, excluding LULUCF – 2020[2]

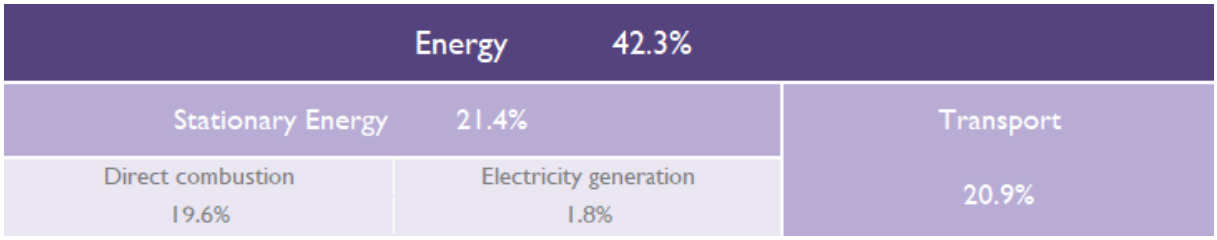


2.1 Energy

Tasmania's energy sector comprises electricity generation, direct combustion, transport, and fugitive emissions. The Australian Government treats Tasmania's fugitive emissions as confidential, so these emissions are reported in the direct combustion sub-sector. Tasmania's energy sector contributed 3.35 Mt CO_2-e in 2020, accounting for 42.3 per cent of Tasmania's emissions when LULUCF is excluded.

Compared to other states and territories (Figure 9), Tasmania has high levels of renewable energy generation. This means most of Tasmania's energy emissions are attributed to direct combustion and transport (Figure 10).

Figure 10: Breakdown of Tasmanian emissions by energy sub-sector (excl. LULUCF) – 2020



[2] Fugitive emissions in Tasmania are confidential and have been aggregated in the direct combustion sub-sector.

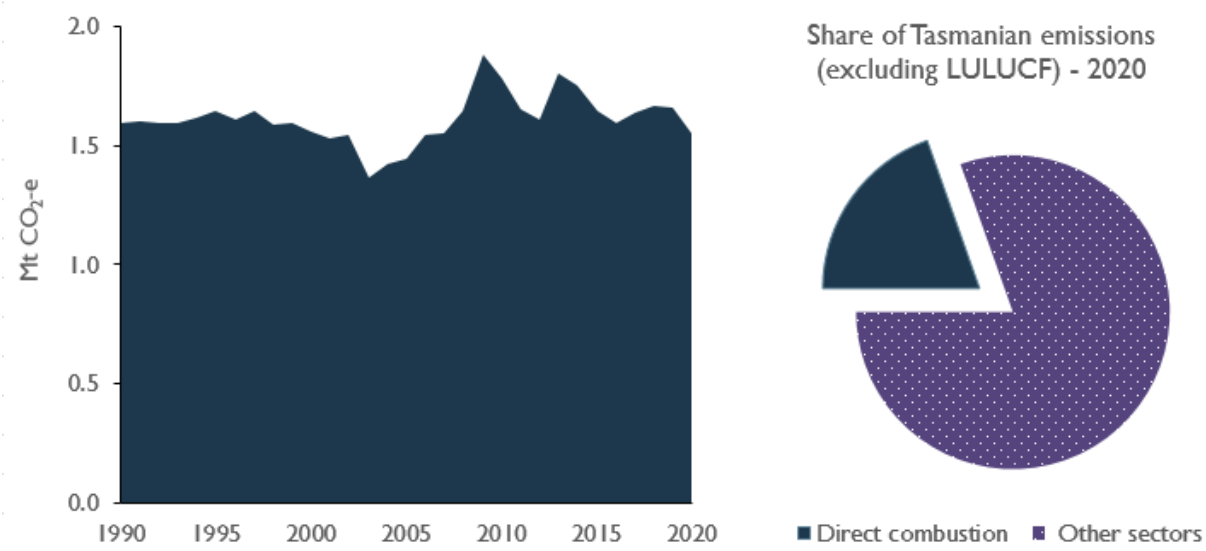
2.1.1 Direct combustion

Emissions from the combustion of fossil fuels for stationary energy purposes used directly on site and fugitive emissions have been aggregated into the direct combustion sub-sector. Direct combustion includes burning coal, gas, agricultural waste, or forestry residue to generate heat, steam, or pressure for commercial and major industrial operations, and burning wood or gas for household heating and cooking. The activities and industries that cause these emissions include manufacturing, construction, agriculture, fisheries, residential, and commercial operations. There is no double counting of emissions from biomass consumption, including fuelwood, between the LULUCF and energy sectors.

Emissions associated with the use of electricity, or fuel combustion in transport, are accounted for in the electricity generation and transport sub-sectors respectively.

Direct combustion accounted for 19.6 per cent of Tasmania's emissions, excluding the emissions from LULUCF (Figure 11). The emissions from direct combustion decreased by 0.05 Mt CO_2-e (3.0 per cent) between 1990 and 2020.

Figure 11: Tasmanian emissions from direct combustion – 1990 to 2020



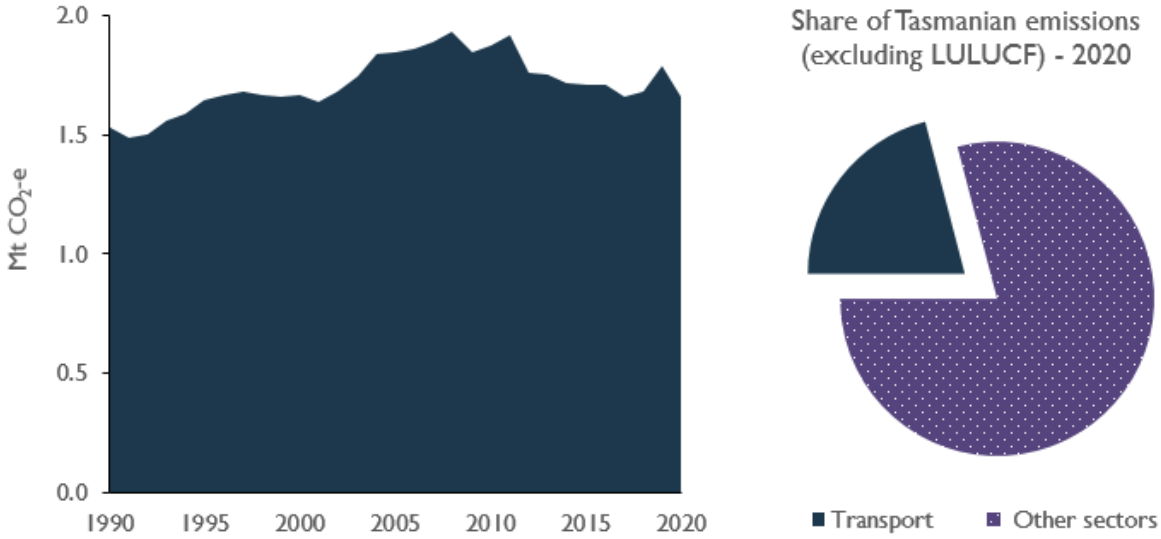
2.1.2 Transport

Emissions from the transport sub-sector are produced by the combustion of fuels such as petrol, diesel, and liquefied petroleum gas (LPG), in passenger and commercial motor vehicles, railways, domestic aviation and shipping.

Emissions from electricity used to power electric vehicles, and liquid fuels used to run logging and farming machinery such as log skidders and tractors, are accounted for in the electricity generation and direct combustion sub-sectors respectively.

Transport accounted for 20.9 per cent of Tasmania's emissions, excluding LULUCF (Figure 12).

Figure 12: Tasmanian emissions from transport – 1990 to 2020



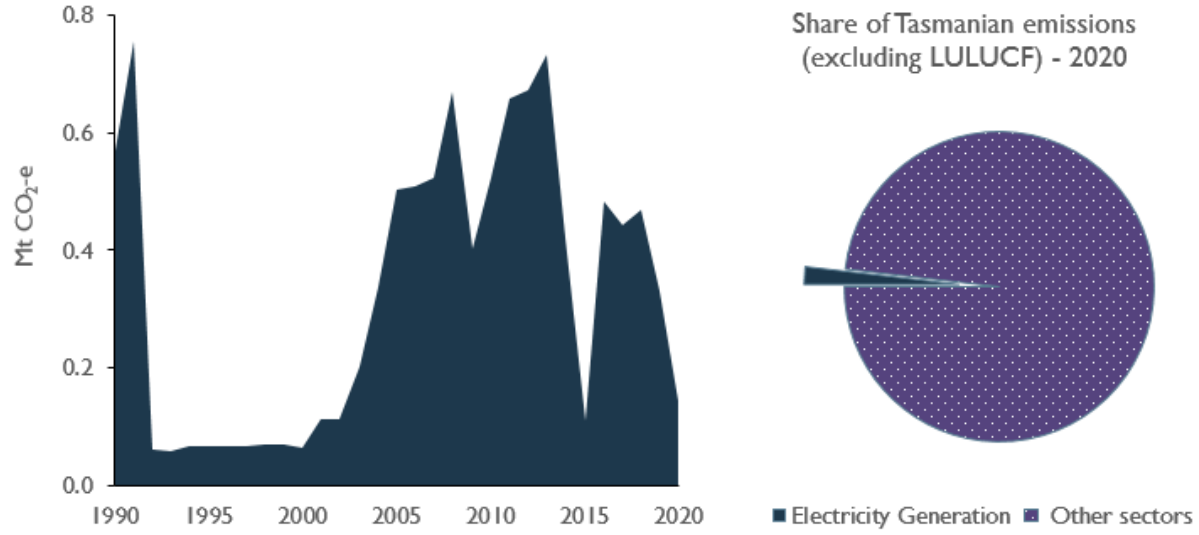
2.1.3 Electricity generation

Emissions from electricity generation are produced by the combustion of fuels to generate electricity that is supplied to the electricity grid for domestic and commercial use.

This sub-sector covers emissions from electricity that is generated in Tasmania, some of which is exported to the National Electricity Market via Basslink. Emissions from electricity imported into Tasmania via Basslink are accounted for in the greenhouse gas inventory of the state that generates the electricity.

Electricity generation only accounted for 1.8 per cent of Tasmania's emissions, excluding LULUCF (Figure 13).

Figure 13: Tasmanian emissions from electricity generation – 1990 to 2020



2.2 Agriculture

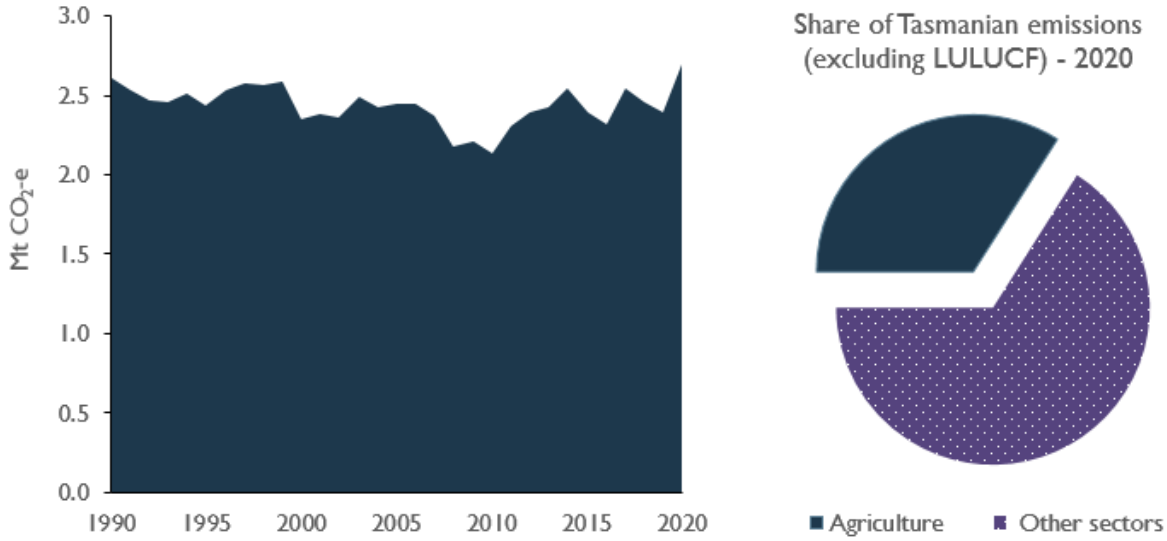
Sources of emissions from the agriculture sector include livestock digestive systems (enteric fermentation), the release of nitrous oxide from cropping and pastureland, and manure management.

- Enteric fermentation of plant material that is digested by livestock (eg cattle, sheep, and pigs) results in methane emissions.
- Urine and dung deposited by grazing animals, and nitrogen leaching and run-off, result in emissions from microbial and chemical transformations that produce and consume nitrous oxide in the soil.
- Manure management produces emissions through the anaerobic (without oxygen) decomposition of the organic matter contained in manure.
- Land management practices such as lime, fertiliser and urea applications produce nitrous oxide emissions.

Emissions associated with the use of electricity, fuel consumption from operating agricultural equipment, and fuel consumption in transport, are accounted for in the energy sector. Emissions associated with land use change, including the clearing and re-clearing of vegetation, are accounted for in the LULUCF sector.

Tasmania's agriculture sector accounted for 34.0 per cent of Tasmania's emissions, excluding LULUCF (Figure 14).

Figure 14: Tasmanian emissions from agriculture – 1990 to 2020



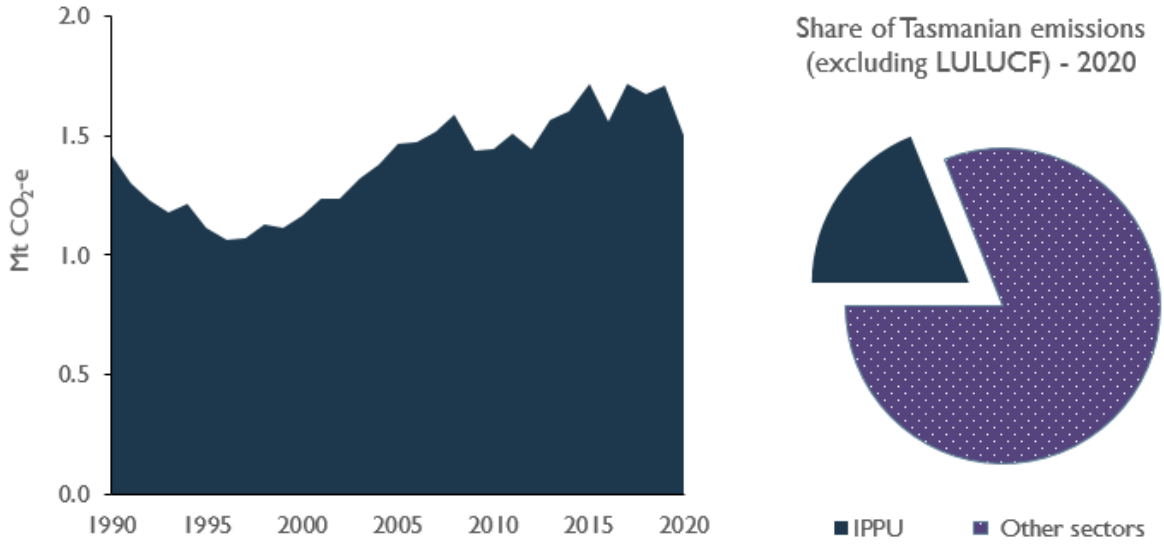
2.3 Industrial processes and product use

Emissions from the IPPU sector are generated from a range of production processes that include: the calcination of carbonate compounds (eg cement, lime or glass production); carbon when used as a chemical reductant (eg iron, steel or aluminium production); and the production and use of synthetic gases such as hydrofluorocarbons (HFCs) (eg used in refrigeration and air conditioning equipment and as solvents) and sulphur hexafluoride (electrical equipment).

Emissions associated with the energy used in industrial production processes are accounted for in the electricity generation and direct combustion sub-sectors. For example, the emissions from cement manufacture may include combustion of fuels (coal or natural gas) used to heat kilns in the manufacturing process. However, these combustion-related emissions are reported in the energy sector (as direct combustion) and not with IPPU, which only includes the emissions from calcination.

Tasmania's IPPU sector accounted for 19.0 per cent of Tasmania's emissions, excluding LULUCF (Figure 15).

Figure 15: Tasmanian emissions from IPPU – 1990 to 2020



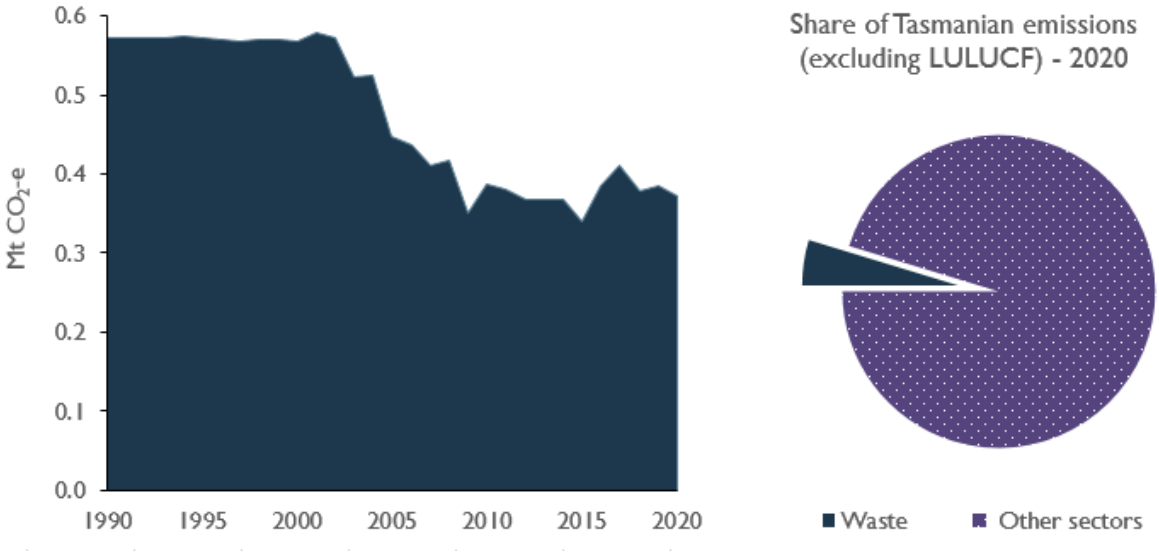
2.4 Waste

Emissions from the waste sector are produced by the anaerobic decomposition of organic matter from solid waste in landfills and from the release of greenhouse gases during the treatment of wastewater. Methane is produced by anaerobic digestion processes in wastewater treatment plants and the nitrification and denitrification of urea and ammonia produces nitrous oxide emissions.

Emissions associated with the energy used in the management and transportation of waste are reported in the electricity generation, direct combustion, and transport sub-sectors.

Tasmania's waste sector accounted for 4.7 per cent of Tasmania's emissions, excluding LULUCF (Figure 16).

Figure 16: Tasmanian emissions from the waste sector – 1990 to 2020



2.5 Land use, land use change, and forestry

The LULUCF sector includes emissions and sequestration (removals or carbon sinks) of greenhouse gases from direct human-induced land use, land use change and forestry activities. This includes emissions and sequestration associated with:

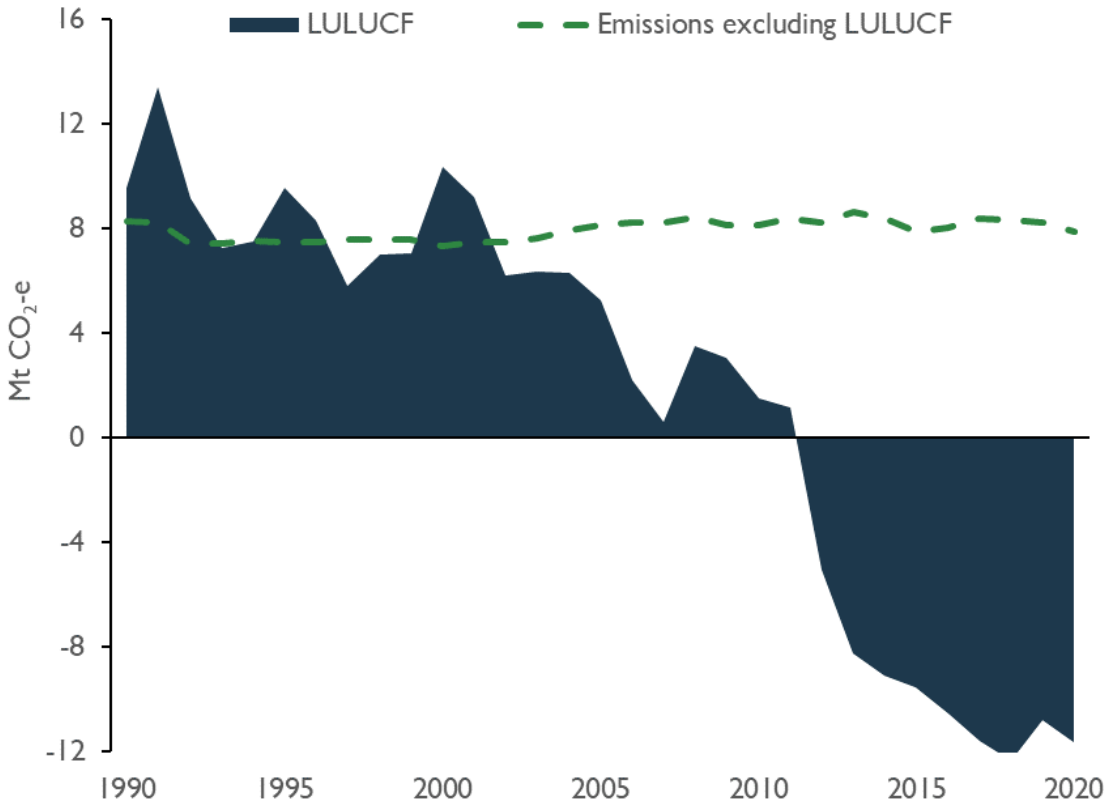
- the clearance of forested land and conversion to other land uses (eg cropland, grassland, wetlands and settlements);
- the establishment of new forests planted on previously unforested land; and
- other practices that change emissions and sequestration, such as forest management, cropland management and grazing land management.

Emissions from fuelwood consumption, controlled burning and wildfires on forest land are also included in the LULUCF sector, as are removals associated with post-fire recovery. Carbon that is stored in harvested wood products is included as a carbon sink.

The combustion of fossil fuels associated with forestry activity and land management (eg diesel to run logging machinery and farming equipment) is accounted for in the direct combustion sub-sector of the energy sector. Non-CO_2 emissions associated with livestock (eg enteric fermentation) and cropping (eg release of nitrous oxide from agricultural soils) are accounted for in the agriculture sector.

In 2020, Tasmania's LULUCF sector was a net carbon sink, contributing minus 11.64 Mt CO_2-e. This offset the emissions from other sectors that had a combined contribution of 7.91 Mt CO_2-e (Figure 17).

Figure 17: Tasmania's emissions from LULUCF relative to other sectors – 1990 to 2020



Abbreviations and acronyms

Abbreviation or Acronym	Description
ABS	Australian Bureau of Statistics
Carbon sink	A carbon, or emissions, sink removes more carbon than it emits. The removed carbon is stored, often in the form of growing vegetation.
CH_4	Methane; a greenhouse gas
CO_2	Carbon dioxide; a greenhouse gas
CO_2-e	Carbon dioxide equivalent
DISER	Australian Government Department of Industry, Science, Energy and Resources
Emissions	Greenhouse Gas Emissions
FullCAM	Full Carbon Accounting Model
GSP	Gross State Product
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
LULUCF	Land Use, Land Use Change and Forestry
Mt	Megatonnes
N_2O	Nitrous oxide
STGGI	State and Territory Greenhouse Gas Inventories
t	Tonnes
Time series	A sequence of data taken at successive equally spaced points in time
UNFCCC	United Nations Framework Convention on Climate Change

References

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Appendix A

Summary of methodological changes to 2020 STGGI

- Each year the Australian Government reviews how it calculates greenhouse gas emissions to ensure national and state inventories reflect the latest available data, improved modelling techniques, and any changes in sectoral classifications and estimation methodologies.
- The recalculations are undertaken according to the Australian Government's *National Inventory Systems Inventory Improvement Plan*, which aims to reduce existing emission estimate uncertainties, with development focused on key source categories, sources with high uncertainties, where implementation of new methods is feasible, and in response to international expert reviews (the 2018 National Inventory Report was subject to the most recent UNFCCC review).
- This revision process includes the recalculation of historical emissions data between 1990 and 2020, nationally and for each state and territory, to ensure that the estimates of emissions are accurate, transparent, complete, consistent through time and comparable with those produced in other countries.
- The Australian Government has been working with Sustainable Timber Tasmania (STT) to apply a new spatially explicit modelling method for estimating emissions from harvested native forests on public lands, which comprises part of the forest land remaining forest land sub-category of the LULUCF reporting sector.
- The new modelling approach improves the accuracy of estimating emissions for this sub-category compared to the previous estate method. The estate method calculated the areas logged each year based on aggregated log volumes published by the Australian Bureau of Agricultural and Resource Economics and Sciences.
- The new spatially explicit modelling method calculates the emissions from specific harvesting events, including areas affected; types of harvesting practices and vegetation species; and, overlays other variables such as weather patterns, fire history, local vegetation and biomass spatial datasets. These variables affect tree growth, dead organic matter and soil composition, which contribute to the production and sequestration of emissions.
- The new spatially explicit model has also resulted in more accurate data on harvested log volumes allocated to private native forests.
- The recalculations undertaken for the 2020 STGGI have resulted in significant changes in Tasmania's emissions figures across all sectors but especially in the LULUCF sector.
- As a result of these recalculations, the emissions figures in the 2020 STGGI are not directly comparable to the figures published in the STGGI reports of previous years.

Revisions in Tasmania's emissions between the 2019 STGGI and 2020 STGGI

- The effect of the recalculated data on Tasmania's net emissions shows that:
  - Tasmania's net emissions figure in the baseline year of 1990 is revised down 1.75 Mt CO_2-e to 17.89 Mt CO_2-e.
  - Tasmania's net emissions figure in 2019 is revised down by 0.83 Mt CO_2-e to minus 2.51 Mt CO_2-e.
  - The reduction in Tasmania's net emissions figure between 1990 and 2019 is revised down from 114.4 to 114.0 per cent.
  - Tasmania's net emissions figures are wholly revised, resulting in Tasmania first achieving net negative emissions from 2014 onward rather than first in 2013 and then from 2015 onward as reported in the 2019 STGGI.
- Table 2 presents a summary of the changes in Tasmania's 2019 emissions by sector and energy sub-sector between the 2019 STGGI and 2020 STGGI. It shows that the recalculations have resulted in changes across all sectors. The most significant change is concentrated in the LULUCF sector. This is replicated across the time series.
- When compared with the 2019 STGGI, methodological changes in the 2020 STGGI have had different effects in LULUCF emissions data since 1990. The changes have resulted in a decrease in emissions in the LULUCF sector of approximately 1.79 Mt CO_2-e in 1990 and an increase in the net sink provided by the LULUCF sector of approximately minus 0.73 Mt CO_2-e in 2019.

Table 2: Revisions to Tasmania's emissions for 2019 by sector and energy sub-sector, following recalculations

Sector/Sub-sector	2019 Emissions (Mt CO_2-e)		Change (Mt CO_2-e)
	2019 STGGI	2020 STGGI	
Energy	3.88	3.78	-0.10
Direct combustion	*1.75*	*1.66*	*-0.09*
Transport	*1.80*	*1.79*	*-0.01*
Electricity generation	*0.33*	*0.33*	*0.00*
Agriculture	2.40	2.40	0.00
IPPU	1.69	1.71	0.02
Waste	0.39	0.39	-0.01
LULUCF	-10.04	-10.78	-0.73
Total	**-1.68**	**-2.51**	**-0.83**

- The main methodological changes in the sub-categories that have materially contributed to the revision in Tasmania's emissions between the 2019 STGGI and 2020 STGGI are summarised in Table 3.

Table 3: Methodological changes and data revisions contributing to change in Tasmania's emissions between the 2019 STGGI and 2020 STGGI

Sector/Sub-sector	Methodological Change
Energy	
Energy industries	Revisions in the Australian Energy Statistics for 2019 are reflected in a recalculation for diesel and natural gas consumption.
Manufacturing industries and construction	Recalculations were made in response to revisions in fuel consumption for wood and wood waste and various liquid fuels reported in the Australian Energy Statistics.
Transport	Recalculations were made in response to revisions to Australian Energy Statistics fuel consumption data and liquefied petroleum gas and natural gas were removed from rail transport
Agriculture	
Manure management	Recalculations of manure management have occurred due to the application of the default factor of 0.02 for the parameter FracLEACH-MS (leaching from solid manure storage) from the 2019 Refinement to the 2006 IPCC Guidelines (vol. 4, chap. 10, table 10.22), according to Expert Review Team recommendation A.3.
Agricultural soils	Recalculations of agricultural soils estimates have occurred due to the application of the default factors for the parameters FracLEACH-H (fraction of N lost through leaching and runoff in managed soils) and FracLEACH-MS (fraction of managed manure N losses) from the 2019 Refinement to the 2006 IPCC Guidelines, according to Expert Review Team recommendation A.3.
IPPU	
Product uses as ozone depleting substance substitutes	Recalculations were made to the entire time series arising from discontinuation of atmospheric calibration of refrigeration and air-conditioning equipment annual leakage rates and technical updates to the HFC emissions model retirement mechanism.

Sector/Sub-sector	Methodological Change
Waste	
Solid waste disposal	Recalculations have occurred as a result of improvements to the integration between the solid waste and harvested wood products models. Minor revisions to activity data have also been made.
Waste water treatment and discharge	A recalculation was performed in response to revisions in data reported in the National Greenhouse and Energy Reporting Scheme. Revisions were also made to parameters used in the calculation of emissions from meat and poultry processing industrial wastewater treatment as well as the inclusion of emissions from seafood processing for the first time.
LULUCF	
Forest land remaining forest land	Recalculations were made in the other native forest sub-category due to updates in: • spatial simulation of prescribed fires using FullCAM in selected states and territories; • carbon stock changes from the combustion and subsequent recovery of live biomass from prescribed fires have been expanded in this submission; and • calibrations for the tropical savannah fires model. Recalculations were made in the pre-1990 plantations sub-category due to: • updated spatial observations of forest cover change; • revised weather and climate data using improved methodology; and • recalibration to the Tree Yield Formula (TYF) to include a thinning response. Recalculations were made in the harvested native forests sub-category due to: • a new spatially-explicit methodology introduced for the state of Tasmania; and • updated data on harvested log volumes allocated to private native forests.
Land converted to forest land	Recalculations were made in the plantation calibrations sub-category due to: • recalibration of the TYF to incorporate a thinning response; and

Sector/Sub-sector	Methodological Change
	• updated FullCAM parameters. Recalculations were made in the coastal wetlands Tier 3 model sub-categories due to: • changes to spatial inputs and FullCAM calibration with the introduction of the tier 3 FullCAM Wetlands – coastal sub-model that replaced the tier 2 coastal wetlands spreadsheet models. Recalculations were made in the spatial updates sub-category due to updates in: • clay content data layer based on new soil-data; and • revision of spatial datasets for forest cover change, based on annual analysis of satellite imagery. Recalculations were made in the non-temperate fire updates sub-category due to updates in: • calibrations for the tropical savannah fires model.
Cropland remaining cropland	Recalculations have occurred due to: • a revision of land areas and land-use allocations across LULUCF sectors; • an update of the clay content map layer; • database updates affecting the crop yield and grazing pressure; and • minor corrections to the perennial woody crop parameters.
Land converted to cropland	Recalculations have occurred due to: • updated spatial data; and • agricultural parameters were updated for consistency with cropland remaining cropland. Recalculations were made in the wetland converted to cropland sub-category due to: • improved spatial attribution of organic soils to ensure the area of cultivated organic soils reported in common reporting format (CRF) tables 4.B and 4.C, is consistent with that of category 3.D.a.6 in CRF table 3.D., for wetland converted to cropland.
Grassland remaining grassland	Recalculations were made due to: • updated land areas and land-use allocations across the LULUCF sectors; • an update of the clay content map layer;

Sector/Sub-sector	Methodological Change
	• database updates affecting the crop yield and grazing pressure; • revised activity data for grass and shrub transitions due to annual updates in image analysis; and • revised reporting of biomass burning emissions to reflect updated carbon dynamics modelling consistent with the revisions for non-temperate fire management.
Land converted to grassland	Recalculations were made in the forest land converted to grassland sub-category due to: • updates to spatial observations of forest cover change; • an update of the clay content map layer; • updated agricultural parameters for consistency with grassland remaining grassland; • calibrations for the tropical savannah fires model; and • an application of stratified emission factor values that are based on both soil type and climate zone. Recalculations were made in the wetland converted to grassland sub-category due to: • improved spatial attribution of organic soils to ensure the area of cultivated organic soils reported in CRF tables 4.B and 4.C, is consistent with that of category 3.D.a.6 in CRF table 3.D., for wetland converted to grassland.
Wetland remaining wetland	Recalculations were made due to: • revised activity data for grass and shrub transitions due to improvements in image analysis and expanded national coverage; • updated calibrations for the tropical savannah fires model; • improved method for determining monthly average surface areas for reservoirs, and inclusion of age of reservoirs here, or in land converted to flooded land; and • an update to Australia's aquaculture production statistics for 2018/19 applied to Aquaculture Use.
Land converted to wetland	Recalculations were made due to: • improvements in remote sensing of forest cover change and in FullCAM agricultural parameters, as detailed for forest converted to grassland; • CH_4 emissions from young reservoirs (up to 20 years old) are disaggregated from established reservoir emissions reported under wetland remaining wetland; and

Sector/Sub-sector	Methodological Change
	• CO_2 emissions from young reservoirs are now reported.
Settlements remaining settlements	Recalculations have occurred due to revisions to activity data for grass and shrub transitions due to improvements in image analysis.
Land converted to settlements	Recalculations have occurred due to: • updated spatial observations of terrestrial forest cover change; • changes to spatial inputs and FullCAM calibration with the introduction of the tier 3 FullCAM Wetlands – coastal sub-model that replaced the tier 2 coastal wetlands spreadsheet models; and • agricultural parameter updates (grass yields) – as detailed in section 6.9.5.1, recalculation of forest converted to grassland.
Harvested wood products	Recalculations of harvested wood products have occurred due to revisions in the waste sector that impact harvested wood products in waste disposal sites.

Appendix B

UNFCCC emissions reporting sectors and descriptions

- The STGGI provides estimates of emissions sources and sinks across five sectors. The five sectors included in the STGGI are:
  - energy;
  - IPPU;
  - agriculture;
  - LULUCF; and
  - waste.
- Due to the significance of the energy sector in Tasmania, this sector is disaggregated into three sub sectors:
  - electricity generation;
  - direct combustion (of fuels for stationary energy); and
  - transport.

Sector	Description
Energy	
Electricity generation	Emissions from electricity generation are included in the energy industries sub-sector in the STGGI. Emissions are produced by the combustion of fuels to generate electricity that is supplied to the electricity grid for domestic and commercial use. This sub-sector covers emissions resulting from electricity that is generated in Tasmania, some of which is exported for consumption in the National Electricity Market (NEM) via Basslink. Emissions from electricity imported via Basslink from other states in the NEM are accounted for in the emissions inventory for the generating state.
Direct Combustion	Emissions from direct combustion are covered by a number of energy sub-sectors in the STGGI (namely, Manufacturing Industries and Construction; Other Sectors; and Other). These sub-sectors include all emissions that arise from the combustion of fuel for stationary energy used directly on site, such as: • burning coal, liquefied natural gas or forestry residue to generate heat, steam or pressure for major industrial operations; and • burning wood or gas for household heating and cooking.

Sector Description	
	The industries that generate these emissions include manufacturing; construction; agriculture and fisheries; residential; and commercial activities. Emissions from these industries associated with the combustion of fuels to generate electricity, or fuel combustion in transport, are accounted for in the electricity generation and transport sub-sectors respectively.
Transport	Emissions from the transport sub-sector are produced by the combustion of fuels such as petrol, diesel and liquefied petroleum gas in passenger and commercial motor vehicles; railways; domestic aviation; and shipping. Emissions from the electricity used to power electric vehicles are accounted for in the electricity generation sub-sector.
Industrial processes and product use (IPPU)	
Emissions from the IPPU sector are generated from a range of production processes that include: • the calcination of carbonate compounds (eg cement, lime or glass production); • carbon when used as a chemical reductant (eg iron, steel or aluminium production); and • the production and use of synthetic gases such as hydrofluorocarbons (eg refrigeration, air conditioning, solvents) and sulphur hexafluoride (electrical equipment). Emissions associated with the energy used in industrial production processes are accounted for in the electricity generation and direct combustion sub-sectors. For example, the emissions from cement manufacture include the combustion of fuels (coal) for heat used in the manufacturing process. However, these combustion-related emissions are reported as energy emissions (direct combustion sub-sector) and not with IPPU, which only includes the emissions from calcination.	
Agriculture	
Emissions from the agriculture sector include emissions from: • livestock digestion (enteric fermentation); and • the release of nitrous oxide from cropping and pasture land, and manure management. Enteric fermentation of plant material that is digested by livestock (cattle, sheep and pigs) results in methane emissions. Urine and dung deposited by grazing animals, and nitrogen leaching and run-off, results in emissions from microbial and chemical	

Sector Description
transformations that produce and consume nitrous oxide in the soil. Manure management produces emissions through the anaerobic decomposition of the organic matter contained in manure. Emissions associated with the use of electricity, fuel consumption from operating agricultural equipment, and fuel consumption in transport, are accounted for in the energy sector. Emissions from land use change (eg clearing of forest land for the purpose of creating cropping and pasture land) are accounted for under the LULUCF sector.
Land use, land use change and forestry (LULUCF)
The LULUCF sector includes emissions and sequestration (removals or carbon sinks) of greenhouse gases from direct human-induced land use, land-use change and forestry activities. This includes emissions and sequestration associated with clearance of forested land and conversion to other land uses (cropland, grassland, wetlands and settlements), from new forests planted on previously unforested land, and from other practices that change emissions and sequestration (forest management, cropland management and grazing land management). Emissions from fuelwood consumption, controlled burning and wildfires on forest land are also included, as are removals associated with post-fire recovery. Carbon that accumulates in harvested wood products is included as a sink. Combustion of fossil fuels associated with forestry and land management (eg diesel to run logging machinery and farming equipment) are accounted for in the direct combustion sub-sector. Emissions associated with livestock (eg enteric fermentation) and cropping (eg release of nitrous oxide), are accounted for in the agriculture sector.
Waste
Emissions from the waste sector are produced by the decomposition of organic waste in landfills and from the release of greenhouse gases during the treatment of wastewater. The anaerobic decomposition of organic matter from solid waste in landfills and wastewater treatment plants produces methane. The nitrification and denitrification of urea and ammonia in wastewater treatment plants produces nitrous oxide emissions. Emissions associated with the energy used in the management and transportation of waste are reported in the electricity generation, direct combustion and transport sub-sectors.

Appendix C

Greenhouse gas source and sink categories for Tasmania 2019-20

Sector/Sub-sector	Emissions Mt CO_2-e
Energy (including fugitive emissions)	3.3486
Direct combustion and fugitive emissions	1.5487
Manufacturing industries and construction	1.0319
Electricity generation	0.1437
Transport	1.6562
IPPU	1.5005
Mineral industry	0.6469
Chemical industry	0.0064
Non-energy products from fuels and solvent use	0.0023
Product uses as ODS substitutes	0.2307
Other product manufacture and use	0.0020
Agriculture	2.6906
Enteric fermentation	2.0072
Manure management	0.1619
Agricultural soils	0.4299
Field burning of agricultural residues	0.0003
Liming	0.0510
Urea application	0.0401
LULUCF	-11.6442
Forest Land	-12.5859

Sector/Sub-sector	Emissions Mt CO_2-e
Forest land remaining forest land	-10.3220
Land converted to forest land	-2.2638
Plantations and Natural Regeneration	-1.7463
Regrowth on deforested land	-0.5175
Cropland	0.0750
Cropland remaining cropland	0.0682
Land converted to cropland	0.0068
Grassland	0.9172
Grassland remaining grassland	-0.1667
Land converted to grassland	1.0839
Wetland	0.2678
Wetland remaining wetland	0.2669
Land converted to wetland	0.0009
Settlements	0.0155
Settlements remaining settlements	-0.0014
Land converted to settlements	0.0169
Harvested Wood Products	-0.3339
Forest converted to other land uses	1.0034
Direct emissions from forest clearing	0.5220
Emissions from post-clearing land uses	0.4814
Waste	0.3718
Solid waste disposal	0.2697
Biological treatment of solid waste	0.0059
Waste water treatment and discharge	0.0961
Total	**-3.7327**

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