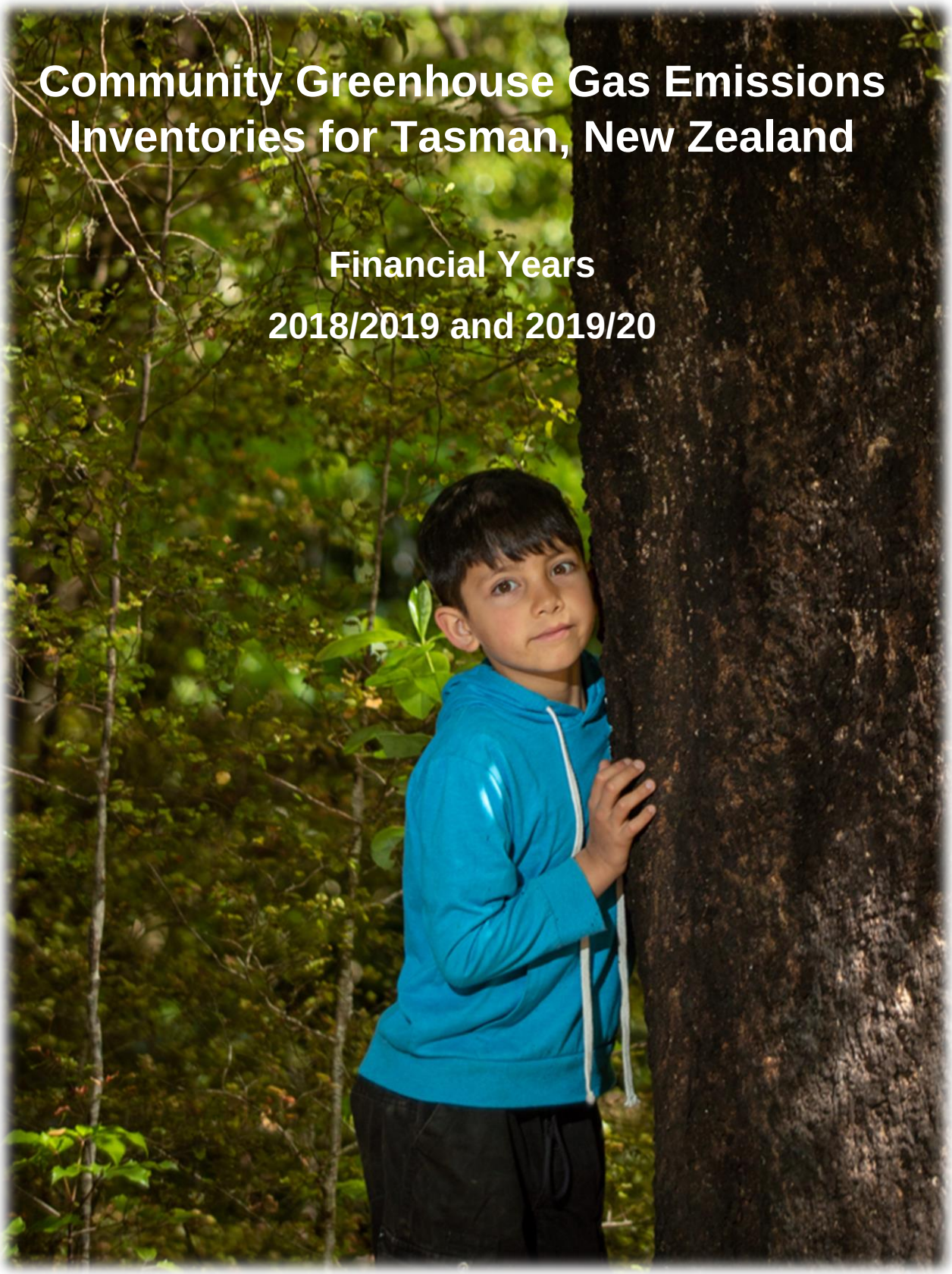

Community Greenhouse Gas Emissions Inventories for Tasman, New Zealand

Financial Years

2018/2019 and 2019/20

tasman district council | Te Kaunihera o te tai o Aorere

Nelson Tasman Climate Forum

nelsontasman.nz

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Verification status: Verified

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Introduction

Tasman District Council completed community Greenhouse Gas (GHG) emission inventories for the Tasman District (hereafter referred to as Tasman) for the financial year (FY) 2019/20 and 2018/19 which consist of a period of 12 months from 1st July to 30th June.

The report was led by Nelson City Council and developed on a collaborative approach with Tasman District Council, Nelson Regional Development Agency (NRDA) and the Nelson Tasman Climate Forum (NTCF) members of the Science Technology and Research group. Technical support was provided by consultants from KPMG on a pro-bono basis and verification was conducted by McHugh & Shaw on a pro-bono basis too.

The report will:

- Help Council understand Tasman's local GHG emissions profile and key emission sources.
- Help Council monitor GHG emissions from Tasman and examine progress toward emission reductions.
- Inform policy development and decision-making.
- Identify GHG emission sectors and stakeholders that could be encouraged to reduce local community emissions
- Provide a baseline for emissions projection modelling

Methodology

The approach used for calculating the GHG emission inventories Is based on the *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories* (GPC) published by the World Resource Institute (WRI) 2021. It reports production-based emissions within a specific geographic area (direct), referred to as Scope 1 in the GPC reporting framework. It also includes consumption-based emissions (indirect) such as energy consumption produced outside the geographic boundary (Scope 2). Scope 3 includes additional indirect GHG emissions, such as cross-boundary travel (e.g. flights), and power transmission and distribution losses.

The GPC method accounts for GHG emissions from stationary energy, transport, waste, industrial processes and product use (IPPU), agriculture, and forestry sectors. Key data limitations are detailed throughout the report.

Regular reporting (e.g., every two years) will assist Council in measuring GHG emission trends and assessing efforts toward GHG emissions reduction. GHG emissions are typically reported in tonnes of carbon dioxide equivalent (tCO_2-e).

All of the GHG emission calculations in these inventories are based on workbooks and advice for measuring GHG emissions. Where applicable, Council's GHG emissions calculations follow guidelines provided by the New Zealand's Ministry for the Environment (MfE) or Water NZ.

Section 4 Assumptions and Exclusions are reflected throughout data collection and analysis.

We used the BASIC+ reporting level.

We acknowledge that removals may not be unique and may have been used in organisational inventories, carbon credit projects or the national inventory.

Reporting is voluntary and not a legal requirement in New Zealand.

Assurance

Independent verification was completed by McHugh & Shaw Limited. The assurance level achieved is Limited.

The district

The boundaries for the Tasman District are set by the Local Government (Nelson–Marlborough Region) Reorganisation Order 1989 and have been in place since 1989. These boundaries are regularly used to report regional statistics and other districts in New Zealand use these boundaries. The regional boundaries are therefore the most appropriate geographic boundary available.

The land area of Tasman District is approximately 9616km^2 (Source: Statistics NZ).

Using 2022 prices, the GDP of Tasman was $2570m in 2018, $2689m in 2019, and $2763m in 2020 (Source: Infometrics).

Further information on the Tasman District can be found in our 2020 and 2023 Environmental Scans.

1. 2018/19 GHG Emission Inventory

1.1 GHG Emission Inventory Results

During the 2018/19 financial year Tasman District emitted a total gross 832,590 tonnes of carbon dioxide equivalent (tCO_2-e). Accounting for removals, the Tasman's net emissions were -1,160,851 tCO_2-e.

The Tasman District's population in 2018/19 was approximately 54,450 people, resulting in per capita gross GHG emissions of 15.3 tCO_2-e/person in 2018/19. Agriculture the largest contributor to the inventory for Tasman, followed by Transport.

Throughout this report a consistent colour scheme has been used to display GHG emissions from each of the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) sector categories. The colour scheme follows the recommended GPC reporting framework to ensure consistency of reporting in New Zealand and internationally.

Table 1: GHG emissions by sector, 2018-2019

Sector	GHG Emissions (tCO_2-e)	% of Total Gross GHG Emissions
Transport	286,277	34.4%
Stationary Energy	74,576	9%
Agriculture	380,979	45.8%
Waste	68,883	8.3%
Industrial Processes and Product Use	21,875	2.6%
Total Gross GHG Emissions (excl. Forestry)	832,590	100%
Forestry	-1,993,441	Not included in total gross GHG emissions
Total Net GHG Emissions (incl. Forestry)	-1,160,851	-

Figure 1: Gross emissions by sector, 2018-2019

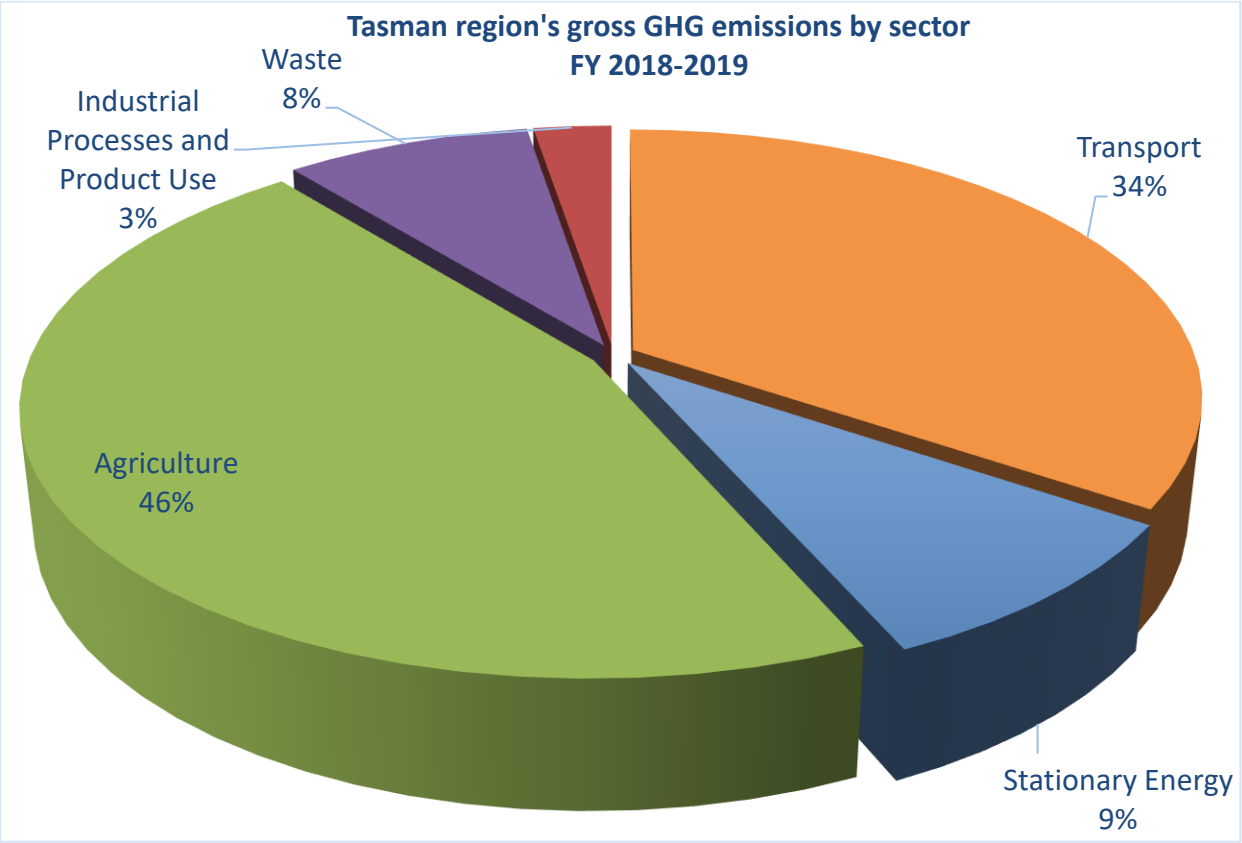
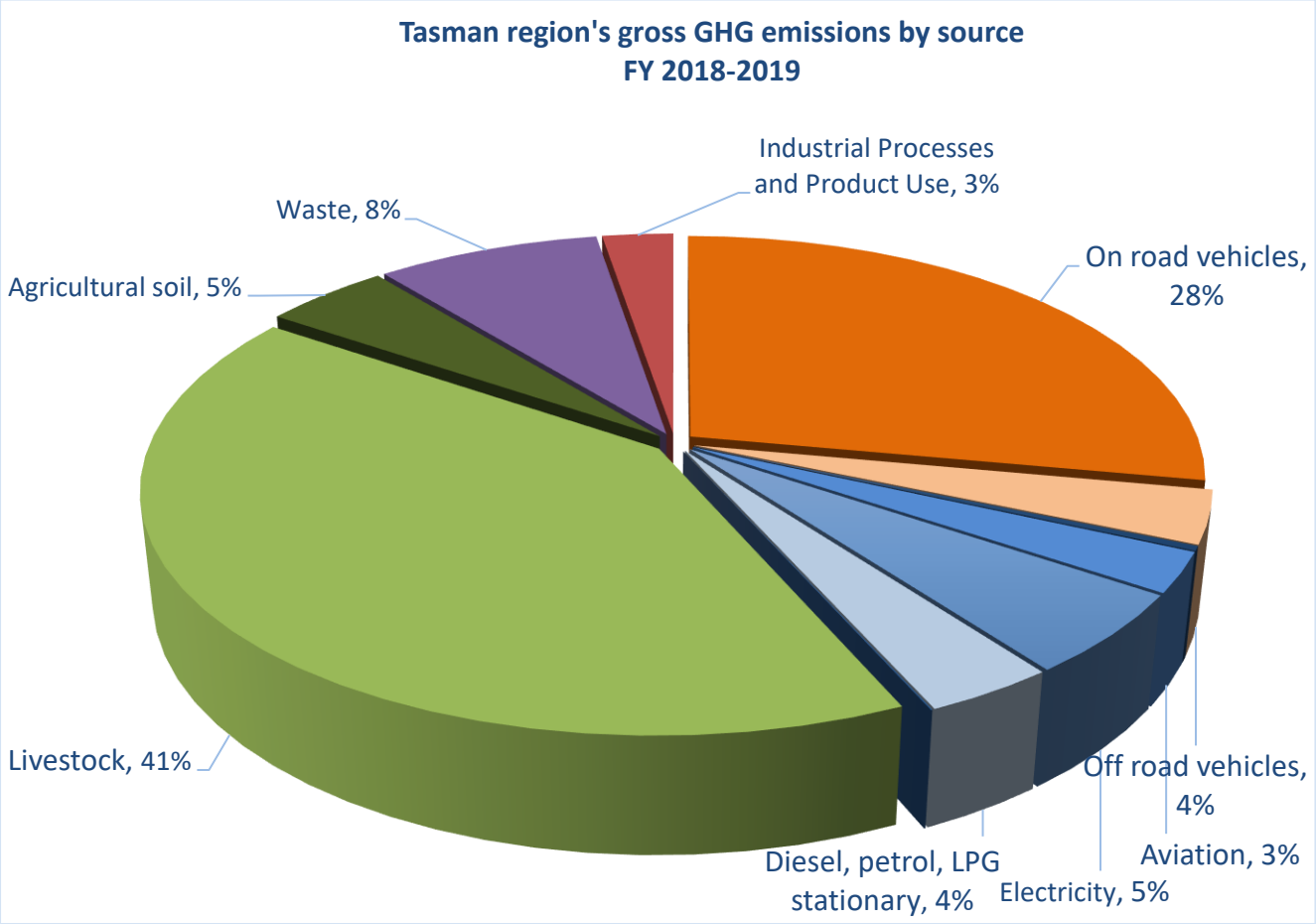


Table 2: GHG emissions by sector and source, 2018-2019

GHG Emission Sector/Source		GHG Emissions (tCO_2-e)	% of GHG Emissions
Transport	Petrol (On-Road)	95,109	11.4%
	Diesel (On-Road)	137,134	16.5%
	Electric vehicles (On-Road)	0	0.0%
	Biodiesel (Vehicle Use)	0	0.0%
	Petrol (Off-Road)	1,111	0.1%
	Diesel (Off-Road)	28,068	3.4%
	Marine Light Fuel Oil (Freight Cargo) - International	2,498	0.3%
	Marine Light Fuel Oil (Freight Cargo) - Domestic	179	0.0%
	Marine Diesel (Tourism Vessels and Local Ferries)	0	0.0%
	Jet Kerosene (Commercial Flights)	21,118	2.5%
	Aviation Gas (Local Flights)	1,014	0.1%
	LPG (Road Mobile Uses)	45	0.0%
Stationary Energy	Electricity Consumed	40,738	4.9%
	Electricity Transmission and Distribution Losses	3,986	0.5%
	Diesel (Stationary Use)	15,853	1.9%
	Petrol (Stationary Use)	501	0.1%
	LPG (Stationary Use)	13,158	1.6%
	Biodiesel (Stationary Use)	0	0.0%
	Coal	340	0.0%
Agriculture – See Section 5.3 for a breakdown of Sources	Livestock	342,205	41.1%
	Agricultural soil	38,774	4.7%
Waste	Open Landfill Sites	63,565	7.6%
	Wastewater Treatment	5,318	0.6%
Industrial Processes and Product Use	Industrial Processes and Product Use	21,875	2.6%
Total Gross GHG Emissions		**832,590**	
Forestry	Exotic Forest Sequestration	-1,993,441	Not included in total gross GHG emissions
Total Net GHG Emissions		**-1,160,851**	

Figure 2: Tasman region's gross GHG emissions by source, 2018-2019



1.2 Transport GHG Emissions

The Transport sector was the second largest GHG emissions source, producing 286,277 tCO_2-e (34.4% of Tasman's total gross GHG emissions). The largest contributor to the Transport sector's GHG emissions was from petrol and diesel, contributing to 91.3% of the Transport sector's GHG emissions. Petrol and diesel transport GHG emissions can be broken down into:

- On-road transport 81.1% of Tasman's total gross Transport GHG emissions. This consists of all standard transport vehicles used on roads (e.g. cars, trucks, buses, etc.)
- Off-road transport 10.2% of Tasman's total gross Transport GHG emissions. This consists of all fuel used for the movement of machinery and vehicles off-roads (e.g., within agriculture, construction and industry).

The second largest source of the Transport sector's GHG emissions was from air travel (jet kerosene + aviation gas), which produced 22,132 tCO2-e (7.7% of the Transport sector's GHG emissions). The remaining 0.9% of the Transport sector's GHG emissions were from marine transport.

Figure 3: Transport emissions by source, 2018-2019

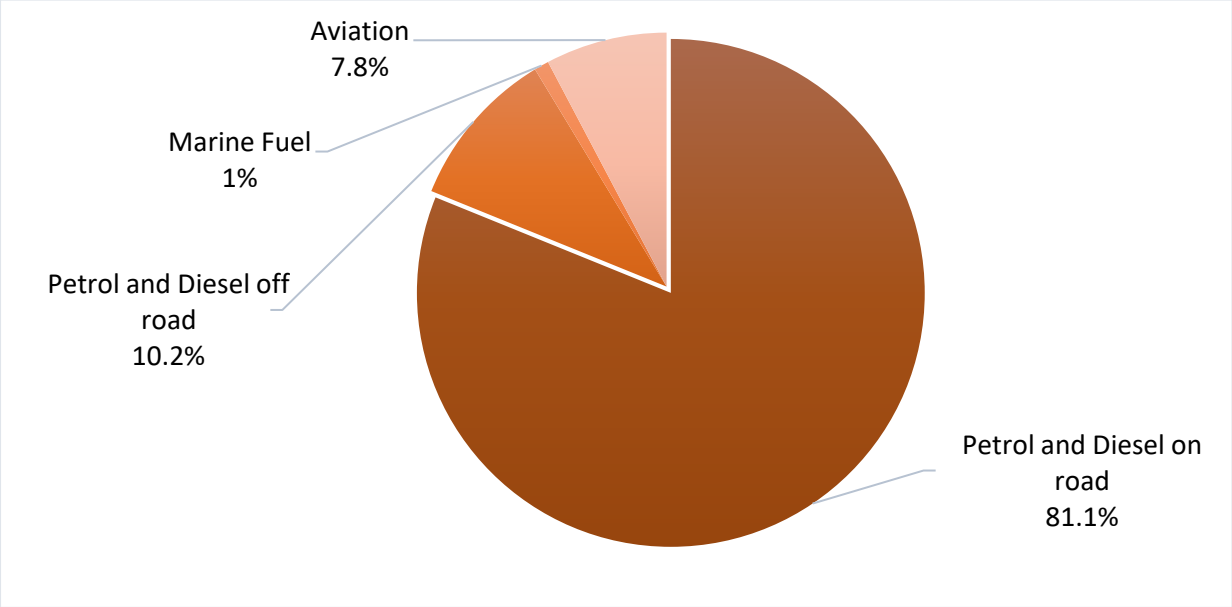


Table 3: Transport GHG emissions by source, 2018-2019

Sector/Source		GHG Emissions (tCO_2-e)		% of sector gross GHG emissions
Transport	Petrol (On-Road)	95,109	286,277	33.2%
	Diesel (On-Road)	137,134		47.9%
	Electric vehicles (On-Road)	0.14		0.0%
	Biodiesel (Vehicle Use)	0		0.0%
	Petrol (Off-Road)	1,111		0.4%
	Diesel (Off-Road)	28,068		9.8%
	Marine Light Fuel Oil (Freight Cargo) - International	2,498		0.9%
	Marine Light Fuel Oil (Freight Cargo) - Domestic	179		0.1%
	Marine Diesel (Tourism Vessels and Local Ferries)	0		0.0%
	Jet Kerosene (Commercial Flights)	21,118		7.4%
	Aviation Gas (Local Flights)	1,014		0.4%
	LPG (Road Mobile Uses)	45		0.0%
		286,277.49		**100%**

1.3 Stationary Energy GHG Emissions

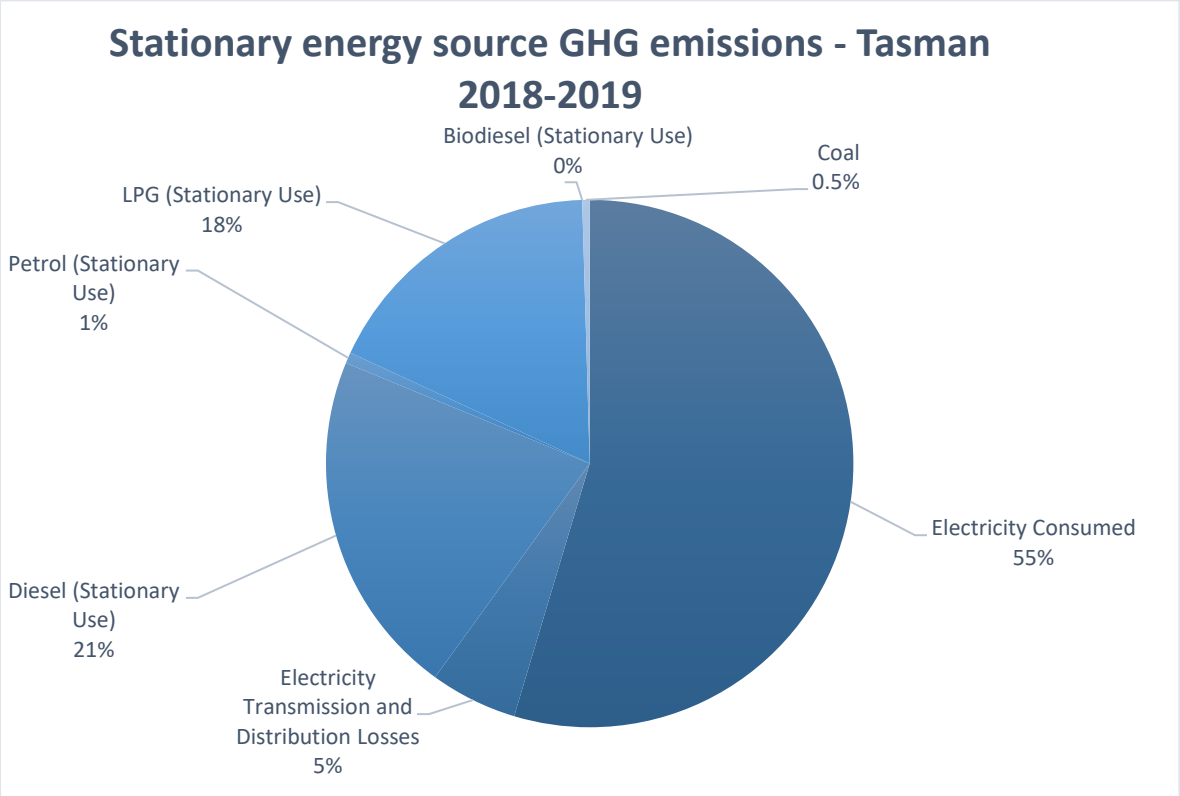
Stationary Energy was Tasman's third largest emitting sector producing 74,576 tCO_2-e (9.0% of Tasman's total gross GHG emissions). The largest contributor to Stationary Energy was from electricity consumed (including associated electricity transmission and distribution losses), producing (54.6% of the sector's emissions). The second largest source (21.3%) was diesel use in stationary energy activities.

Combustion of biogas (methane) for flaring of biogas (methane) at the landfill results in carbon dioxide (CO_2). These biogenic GHG emissions (i.e. generated from organic materials) are excluded from the total gross GHG emissions and reported in the biogenic GHG emissions section of this inventory (section 4.7), following GPC guidance.

Table 4: Stationary energy emissions by source, 2018-2019

Sector/Source		GHG Emissions (tCO_2-e)		% of sector gross GHG emissions
Stationary Energy	Electricity Consumed	40,738	74,576	54.6%
	Electricity Transmission and Distribution Losses	3,986		5.3%
	Diesel (Stationary Use)	15,853		21.3%
	Petrol (Stationary Use)	501		0.7%
	LPG (Stationary Use)	13,158		17.6%
	Biodiesel (Stationary Use)	0		0.0%
	Coal	340		0.5%

Figure 4: Stationary energy GHG emissions, by % contribution for FY 2018-2019

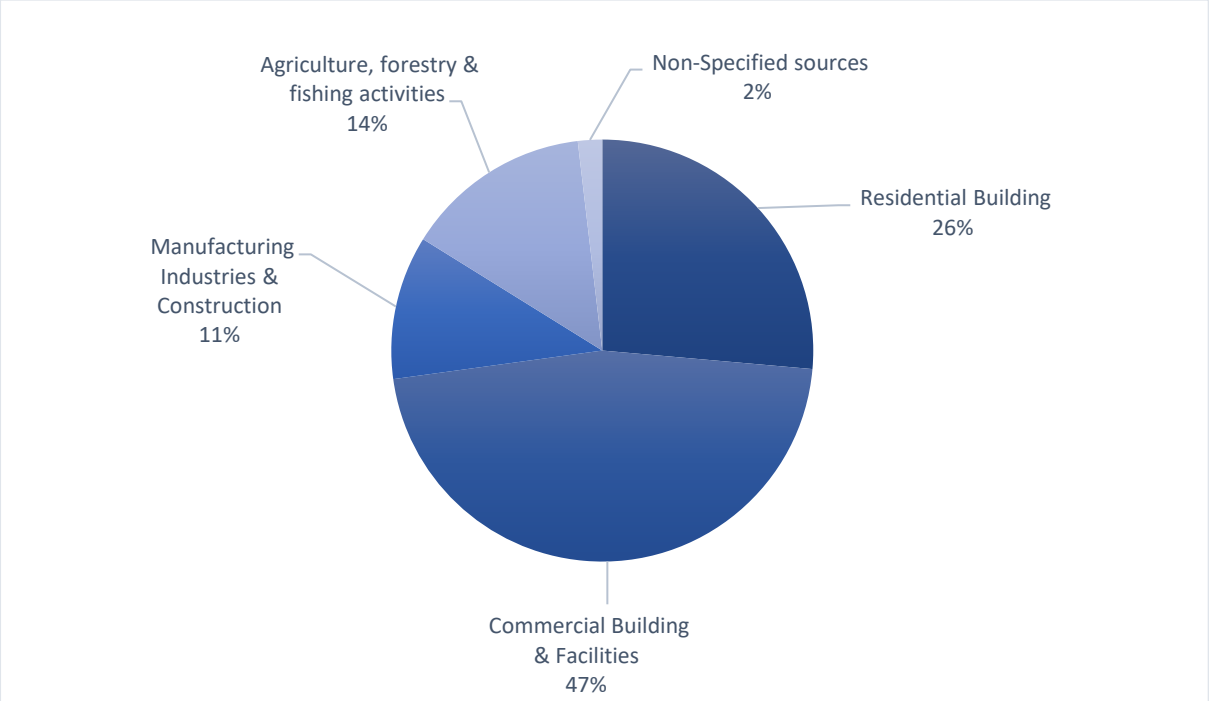


The Stationary Energy sector's GHG emissions are also broken down by sub-sector.

Table 5: Stationary energy emissions by sub-sector, 2018-2019

Sub-sector	Description	tCO_2e
Residential Building	All emissions from energy use in households	19,687
Commercial/Institutional Building & Facilities	All emissions from energy use in commercial buildings and facilities	34,632
	All emissions from energy use in public buildings such as schools, hospitals, government offices, highway street lighting, and other public facilities	
Manufacturing Industries & Construction	All emissions from energy use in industrial facilities and construction activities, except those included in energy industries sub-sector. This also includes combustion for the generation of electricity and heat for own use in these industries.	8,212
Energy Industries	All emissions from energy production and energy use in energy industries	-
Energy Generation supplied to the grid	All emissions from the generation of energy for grid-distributed electricity, steam, heat and cooling	-
Agriculture, forestry & fishing activities	All emissions from energy use in agriculture, forestry, and fishing activities	10,659
Non-Specified sources	All remaining emissions from facilities producing or consuming energy not specified elsewhere	1,386
Fugitive emissions	from mining, processing, storage and transport of coal/oil and natural gas systems	-
Total		**74,576**

Figure 5: Stationary energy sub-sector GHG emissions, FY 2018-2019



1.4 Agriculture GHG Emissions

Agriculture was Tasman's highest emitting sector producing 380,979 tCO_2-e in 2018/19 (45.8% of Tasman's total gross GHG emissions). Livestock produced the majority of the agriculture sector's GHG emissions (89.8% of the agriculture sector's GHG emissions).

The majority of livestock in Tasman are sheep, accounting for 81.1% of farmed livestock. Enteric fermentation from livestock produced 321,615 tCO_2-e (84.4% of agriculture emissions). The second largest source of the agriculture sector's GHG emissions was from nitrous oxide (N_2O) released by urine and dung deposited by grazing animals.

The measurement of agriculture emissions in this report considered the following sources and GHG gases:

Livestock

- Enteric fermentation (CH_4): driven primarily by the number of animals, type of digestive system, and type and amount of feed consumed
- manure management (CH_4): from manure deposited directly onto pasture. This source of emission was calculated using emission factors from the National inventory and data from number of livestock (dairy cattle, non-dairy cattle (beef cattle); sheep and lambs)

Agricultural soils

- Urine and Dung Deposited by Grazing Animals (used a percentage of livestock from National inventory data) N_2O released from manure deposited directly onto pasture by grazing livestock
- Liming and dolomite (CO_2): Lime applications (calcic lime and dolomite). Liming is used to reduce soil acidity and improve plant growth on agricultural land and managed forest.

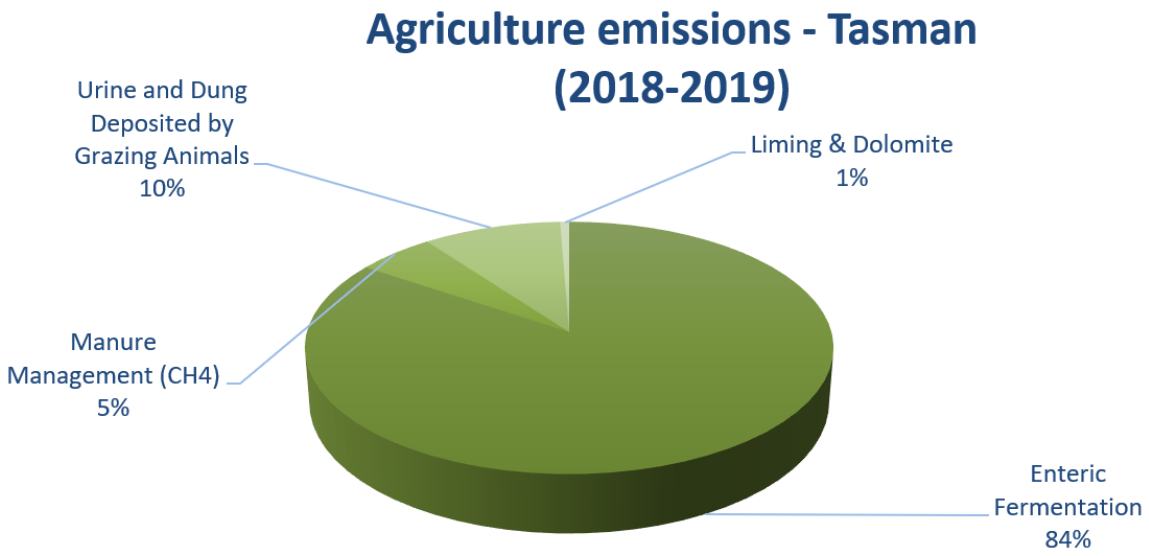
All of these emissions represent nearly 88.4% of the sources of GHG in the agriculture sector in the National GHG Inventory report. The remainder 11.6% from the sector that were not included in this report are:

- Manure management (N_2O emissions) – New Zealand has a much lower proportion of agricultural emissions from manure management, compared with other Annex I Parties as most manure is deposited directly onto pastures.
- Inorganic and organic fertilizers (N_2O emissions)
- Crop residues
- Cultivation of organic soils
- Indirect (N_2O emissions) from managed soils
- Field burning of agricultural resides
- Urea application

Table 6: Agriculture emissions by source, 2018-2019

	GHG Source	% of sector gross GHG emissions	GHG emissions tCO_2	% of sector gross GHG emissions
Livestock	Enteric Fermentation	84.4%	321,615	89.8%
	Manure Management	5.4%	20,590	
Agricultural soil	Urine and dung deposited by grazing animals	9.5%	36,381	10.2%
	Liming & Dolomite	0.6%	2,393	
Total emissions CO_2e			**380,979**	**100%**

Figure 6: Agriculture emissions by source, 2018-2019



1.5 Waste GHG Emissions

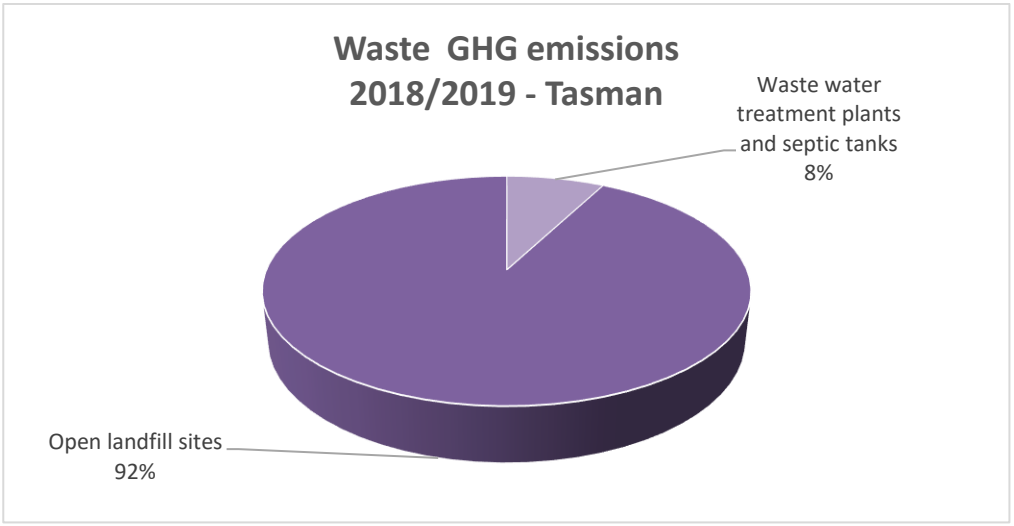
Waste (solid waste and wastewater treatment) was Tasman's fourth highest emitting source producing 68,882.60 tCO_2-e in 2018/19 (8.3% of Tasman's total gross GHG emissions). Solid waste sent to landfill is 92.3% of the Waste sector's GHG emissions.

Waste GHG emissions include emissions from open landfills.

Table 7: Waste emissions by source, 2018-2019

Sector/Source		GHG Emissions (tCO_2-e)		% of sector gross GHG emissions
Waste	Open Landfill Sites	63,565	68,883	92%
	Wastewater Treatment	5,318		8%

Figure 7: Waste emissions by source, 2018-2019



1.6 Industrial Processes and Product Use (IPPU) GHG Emissions

IPPU was Tasman's fifth highest emitting source, producing 21,875 tCO_2-e in 2018/19 (2.6% of Tasman's total gross GHG emissions). The use of refrigerants represents 87.7% of the IPPU sector's GHG emissions.

The GHG emissions for Industrial Product Use include emissions from Hydrofluorocarbon (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6). It is understood that there are no large industrial operations within the Tasman region's boundary that result in significant Industrial Processes GHG emissions for industrial processes of:

- **Mineral industry**: cement production, lime production, or glass production.
- **Chemical industry**: Ammonia, Nitric acid, Adipic acid, Caprolactam, glyoxal, and glyoxylic acid, Carbide, Titanium dioxide, Soda ash
- **Metal industry**: production of iron steel and metallurgical coke, ferroalloy, aluminium, magnesium, lead, zinc, and rare earth metals.

The data was estimated using the following emissions from the national figure from "product use emissions" per capita using Tasman's population

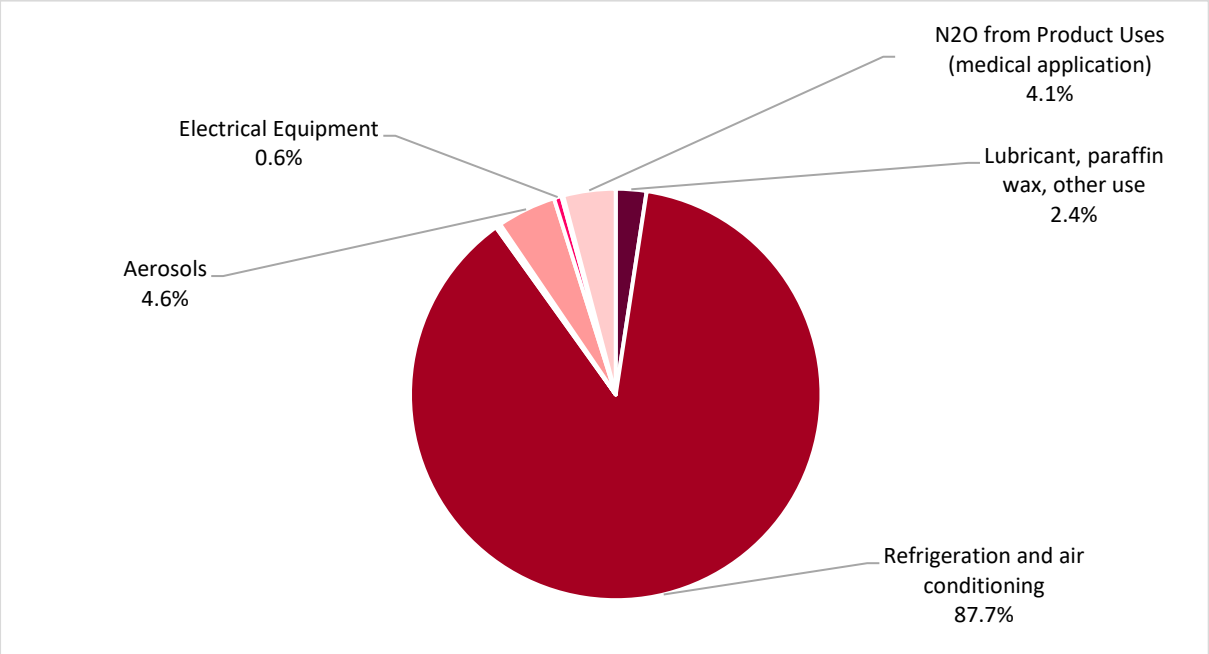
- Non-energy Products from Fuels and Solvent Use (Lubricant, paraffin wax, other use)
- Product Uses as Substitutes for ODS
    - Refrigeration and air conditioning (Commercial, domestic, industrial, transport refrigeration, Mobile Air-Conditioning)
    - Foam Blowing Agents
    - Fire Protection
    - Aerosols

- Other Product Manufacture and Use
    - Electrical Equipment
    - SF6 and PFCs from Other Product Use (medical and others)
    - N_2O from Product Uses (medical application)

Table 8: IPPU emissions by source, 2018-2019

Sector/Source		GHG Emissions (tCO_2-e)		% of sector gross GHG emissions
Non-energy Products from Fuels and Solvent Use	Lubricant, paraffin wax, other use	527	527	2.4%
Product Uses as Substitutes for ODS	Refrigeration and air conditioning (Commercial, domestic, industrial, transport refrigeration, Mobile Air-Conditioning)	19,183		87.7%
	Foam Blowing Agents	63		0.3%
	Fire Protection	24		0.1%
	Aerosols	1,015	20,286	4.6%
Other Product Manufacture and Use	Electrical Equipment	132		0.6%
	SF6 and PFCs from Other Product Use (medical and others)	30		0.1%
	N_2O from Product Uses (medical application)	900	1,063	4.1%
Total		**21,875**		**100%**

Figure 8: IPPU GHG emissions, by % contribution for FY 2018-2019



1.7 Forest Carbon Sequestration and GHG Emissions

This inventory accounts for exotic forest carbon stock.

GHG emissions from harvesting and deforestation were not applicable as it was used the "average accounting" approach for land use, Land-Use Change, and Forestry (LULUCF) emission factors.

This inventory doesn't consider native forest as the data for regenerating (growing) forest areas was not available.

For exotic forest, the only data available was for FY19/20, so the same data was used for base year FY 18/19.

In 2018/19 the Forestry sector produced net negative GHG emissions of -1,993,441 tCO_2-e due to the sequestration of carbon mostly by exotic forest.

1.8 Biogenic GHG Emissions

Biogenic carbon dioxide (CO_2) and methane (CH_4) emissions from biomass combustion are accounted but reported separately as an information item, because the carbon embedded in biomass is part of the natural carbon cycle. Emissions are listed in Table 9.

The following biogenic CO_2 GHG emissions from plants and animals are excluded from total gross GHG emissions as they originate from organic material disposed of in the landfill or they are part of the natural carbon cycle:

- Combustion of recovered biogas (methane) from the York Valley landfill used at Nelson Hospital - reported in the Nelson GHG Emission inventory only and not included in this report.
- Biogas flaring at the York Valley landfill
- wood biofuels originate from forestry

The following biogenic CH_4 GHG emissions are included in total gross GHG emissions:

- enteric fermentation and manure produced by farmed cattle.
- Landfill biogas (methane) produced from solid waste
- Biodiesel (Stationary and Transport Use)

The national Emission Reduction Plan includes targets to reduce Biogenic CH_4 GHG emissions by between 24 percent and 47 percent below 2017 levels by 2050, and a 10 percent reduction below 2017 levels by 2030.

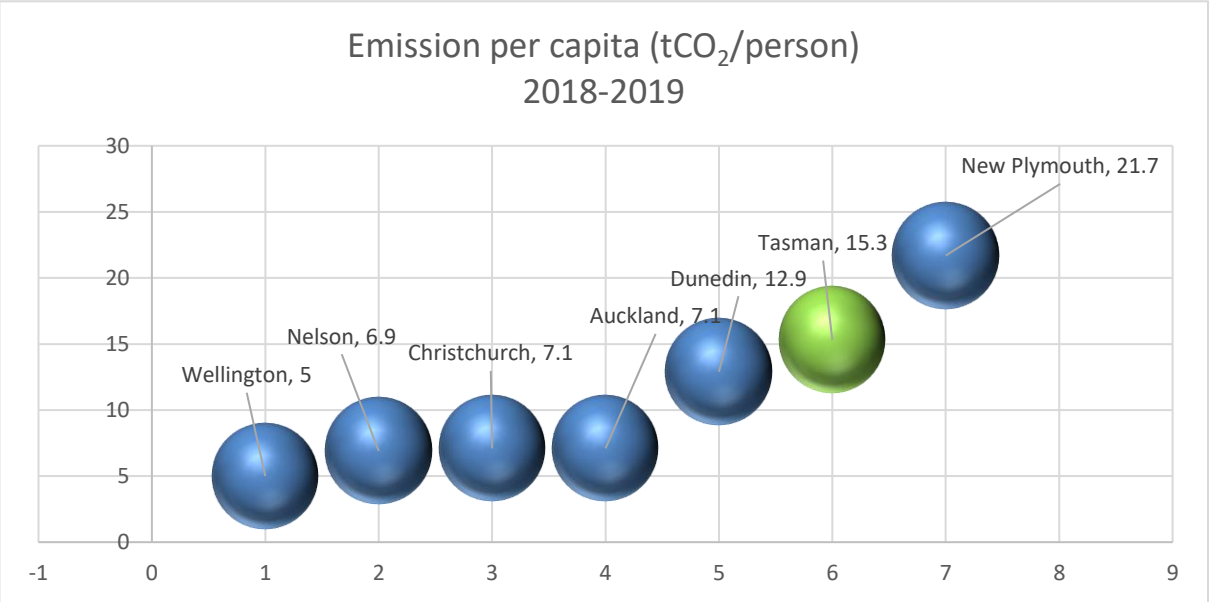
Table 9: Biogenic carbon dioxide emissions, for FY 2018-2019

Sector/Source		Biogenic GHG Emissions ($tCO_{2\ equivalent}$)
Biogenic CO_2 GHG Emissions	Biofuel (Wood)	289
	Landfill Biogas - Methane (Recovered)	Non-applicable (allocated to Nelson)
	Biodiesel (Stationary Use)	No data available
	Biodiesel (Transport)	No data available
	Enteric Fermentation	321,615
	Manure Management	20,590
	Landfill Biogas - Methane (Non-Recovered)	13,959

1.9 GHG Emissions Inventory - Summary

During the financial year 2018/19 reporting period Tasman's total gross GHG emissions were 832,590 tonnes of carbon dioxide equivalent (tCO_2-e). This equates to 15.3 tCO_2-e/person. This was above per capita estimates for Dunedin City, Auckland, Wellington City, Christchurch and Nelson and below the per capita estimate for New Plymouth (see Figure 9).

Figure 9: Per capita total gross GHG emissions comparison, FY 2018-2019



The comparison of total gross GHG emissions with other councils that have reported under the GPC provides a high-level comparison as they might have differences in methodology and emission factors.

Table 1 summarises the 2018/19 GHG emission results for different sectors while Table 2 displays emissions from all calculated emissions sources. High level findings are provided below.

- **Agriculture** (e.g. from livestock and agricultural soil) was the highest GHG emission emitting sector, producing 45.8% of Tasman's total gross GHG emissions, with livestock producing the majority of the agriculture sector's GHG emissions (89.8% of the agriculture sector's GHG emissions).

- **Transport** (e.g. road and air travel) was the second largest GHG emission emitting sector, producing 34.4% of Tasman's total gross GHG emissions.

- **Stationary Energy** (i.e. non-transport energy use) produced was the third largest GHG emission emitting sector, producing 9.0% of Tasman's gross GHG emissions.

- **Waste** (e.g. gas emitted from landfill sites and wastewater treatment) produced 8.3% of Tasman's total emissions.

- **Industrial Processes and Product Use (IPPU)** sector (e.g. the use of industrial chemicals) produced the remaining 2.6% of Tasman's total gross GHG emissions.

2. FY 2019/20 GHG Emission Inventory Results

During the 2019/2020 financial year, the Tasman District emitted 763,389 gross tonnes of carbon dioxide equivalent (tCO_2-e). Accounting for removals, the Tasman District 's net emissions were -1,230,052 tCO_2-e.

The Tasman District's population in 2019/20 was approximately 56,100 people, resulting in per capita gross GHG emissions of 13.6 tCO_2-e/person. The Agriculture sector's GHG emissions were the largest contributor to the inventory, followed by the Transport sector (refer to Table 10).

Table 10: GHG emissions by sector, for FY 2019-2020

Sector	GHG Emissions (tCO_2-e)	% of Total Gross GHG Emissions
Transport	261,816	34.3%
Stationary Energy	79,795	10.5%
Agriculture	355,680	46.6%
Waste	45,127	5.9%
Industrial Processes and Product Use	20,971	2.7%
Total Gross GHG Emissions (excl. Forestry)	763,389	-
Forestry	-1,993,441	Not included in total gross GHG emissions
Total Net GHG Emissions (incl. Forestry)	-1,230,052	-

Figure 10: Gross GHG emissions by sector, for FY 2019-2020

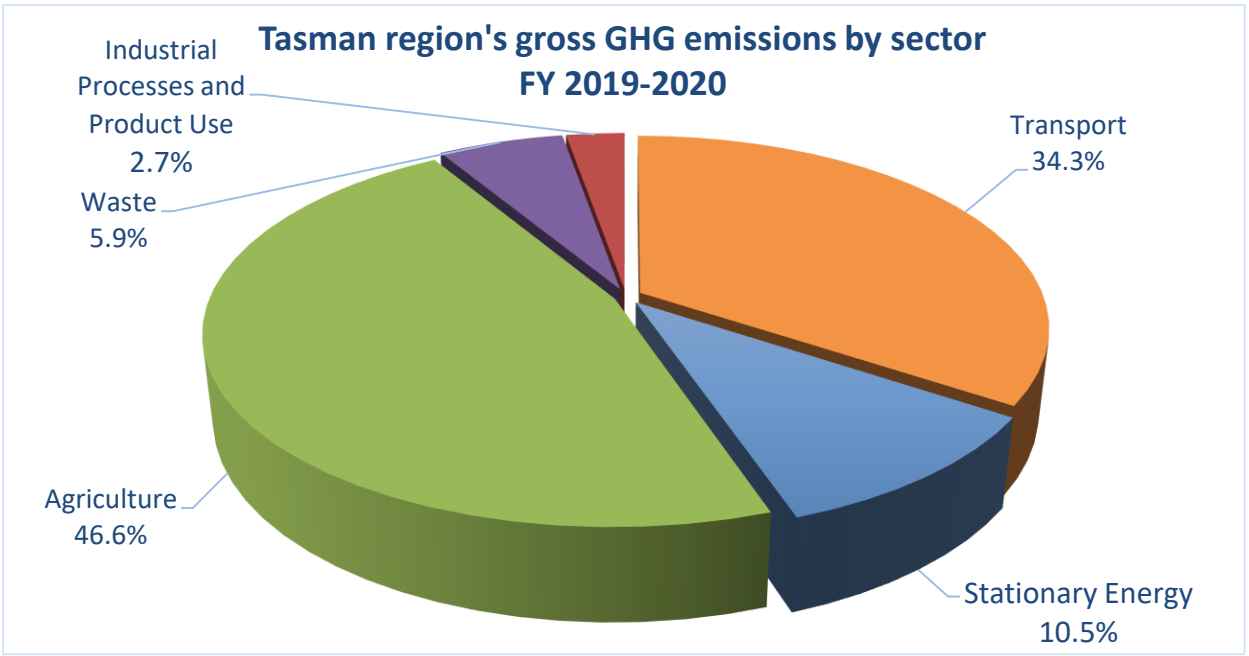
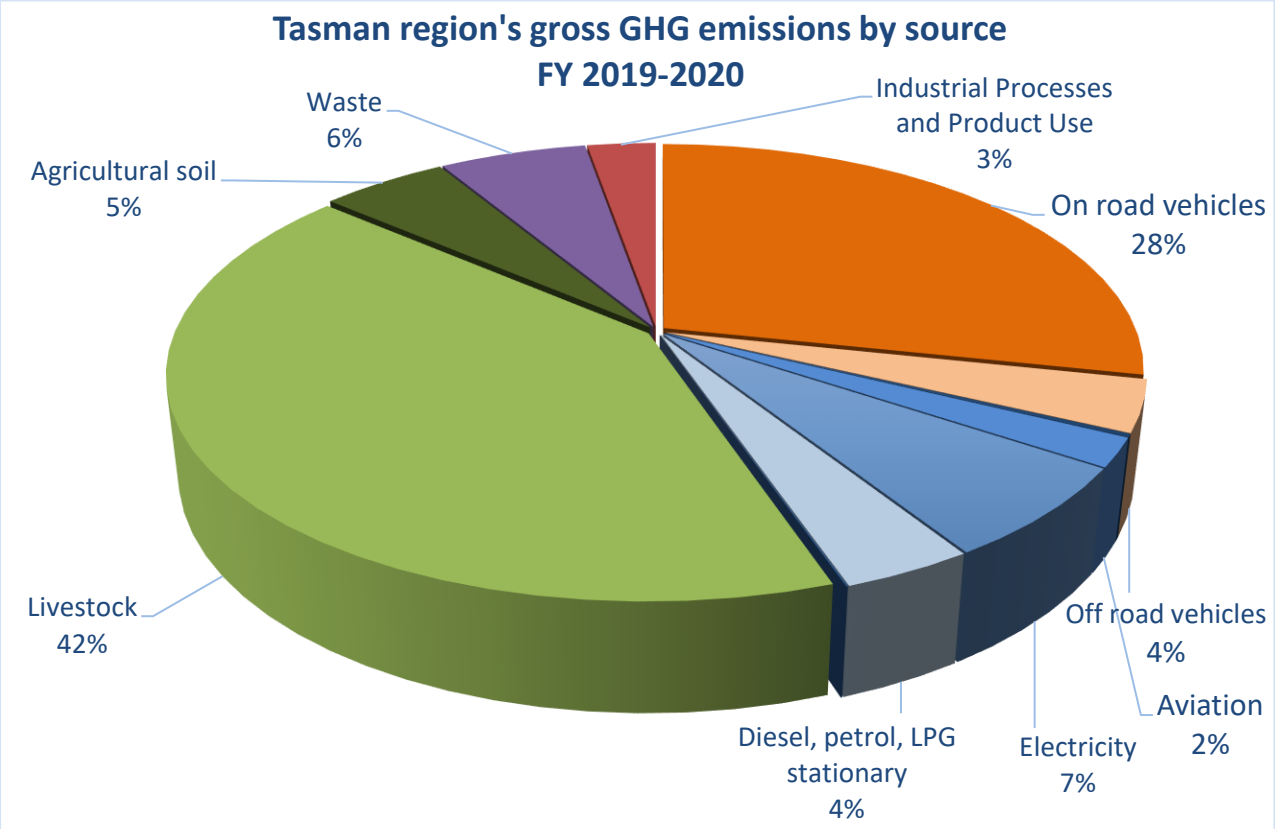


Table 11: Gross GHG emissions by sector, for FY 2019-2020

GHG Emission Sector/Source		GHG Emissions (tCO_2-e)	% of Gross GHG Emissions
Transport	Petrol (On-Road)	83,733	11.0%
	Diesel (On-Road)	132,337	17.3%
	Electric vehicles (On-Road)	0	0.0%
	Biodiesel (Vehicle Use)	0	0.0%
	Petrol (Off-Road)	978	0.1%
	Diesel (Off-Road)	27,087	3.5%
	Marine Light Fuel Oil (Freight Cargo) - International	1,668	0.2%
	Marine Light Fuel Oil (Freight Cargo) - Domestic	174	0.0%
	Marine Diesel (Tourism Vessels and Local Ferries)	0	0.0%
	Jet Kerosene (Commercial Flights)	14,779	1.9%
	Aviation Gas (Local Flights)	1,014	0.1%
	LPG (Road Mobile Uses)	44	0.0%
Stationary Energy	Electricity Consumed	45,801	6.0%
	Electricity Transmission and Distribution Losses	4,943	0.6%
	Diesel (Stationary Use)	15,298	2.0%
	Petrol (Stationary Use)	441	0.1%
	LPG (Stationary Use)	12,972	1.7%
	Biodiesel (Stationary Use)	0	0.0%
	Coal	340	0.0%
Agriculture – See Section 3.3 for a breakdown of Sources	Livestock	316,853	41.5%
	Agricultural soil	38,827	5.1%
Waste	Open Landfill Sites	39,756	5.2%
	Wastewater Treatment	5,371	0.7%
Industrial Processes and Product Use	Industrial Processes and Product Use	20,971	2.7%
Total Gross GHG Emissions		763,389	100.0%
Forestry	Exotic Forest Sequestration	-1,993,441	
Total Net GHG Emissions		-1,230,052	

Figure 11: Gross GHG emissions by source, for FY 2019-2020



2.1 Transport GHG Emissions

The Transport sector was the second largest GHG emissions source producing 261,816 tCO_2-e in 2019/20 (34.3% of Tasman's total gross GHG emissions). The largest contributor to the Transport sector's GHG emissions was from petrol and diesel, contributing to 93.3% of the Transport sector's GHG emissions. Petrol and diesel transport GHG emissions can be broken down into:

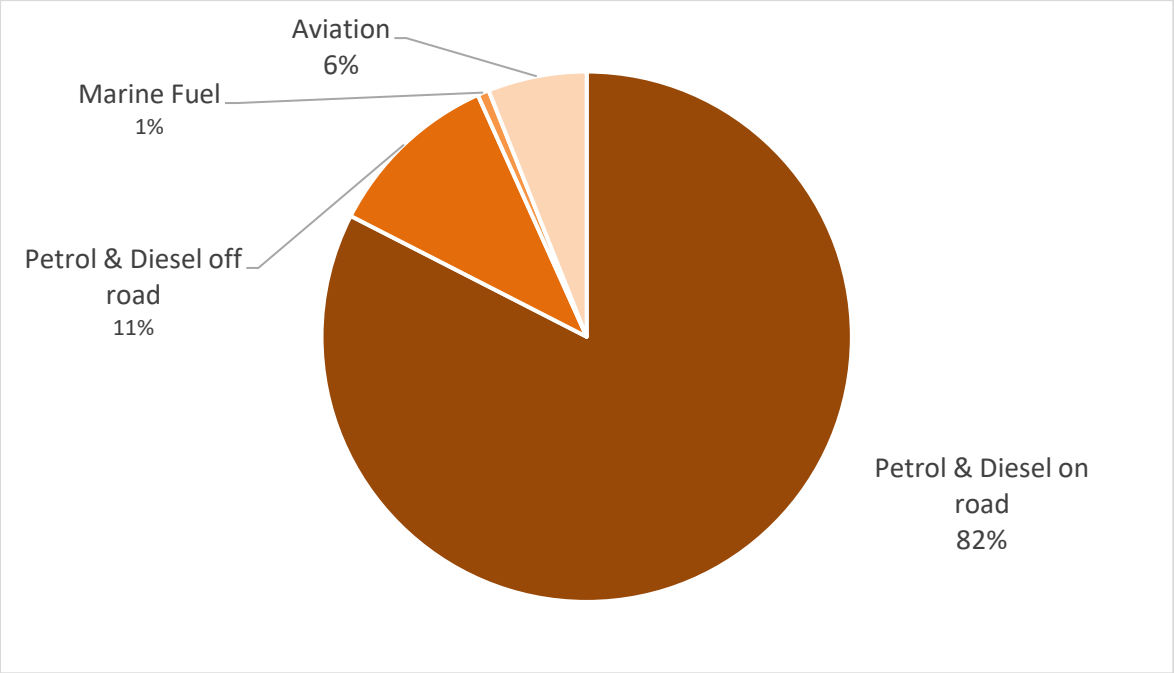
- On-road transport – 82.5% of Tasman's total gross Transport GHG emissions. This consists of all standard transport vehicles used on roads (e.g. cars, trucks, buses, etc.)
- Off-road transport - 10.7% of Tasman's total gross Transport GHG emissions. This consists of all fuel used for the movement of machinery and vehicles off-roads (e.g. within agriculture, construction and industry).

The second largest source of the Transport sector's GHG emissions was from air travel (jet kerosene + aviation gas) which produced 15,793 tCO2-e (6.0% of the Transport sector's GHG emissions). The remaining 0.7% of the Transport sector's GHG emissions were from marine transport.

Table 12: Transport emissions by source, 2019-2020

Sector/Source		GHG Emissions (tCO_2-e)		% of sector gross GHG emissions
Transport	Petrol (On-Road)	83,733	261,816	32.0%
	Diesel (On-Road)	132,337		50.5%
	Electric vehicles (On-Road)	0.31		0.0%
	Biodiesel (Vehicle Use)	0		0.0%
	Petrol (Off-Road)	978		0.4%
	Diesel (Off-Road)	27,087		10.3%
	Marine Light Fuel Oil (Freight Cargo) - International	1,668		0.6%
	Marine Light Fuel Oil (Freight Cargo) - Domestic	174		0.1%
	Marine Diesel (Tourism Vessels and Local Ferries)	0		0.0%
	Jet Kerosene (Commercial Flights)	14,779		5.6%
	Aviation Gas (Local Flights)	1,014		0.4%
	LPG (Road Mobile Uses)	44		0.0%

Figure 12: Transport GHG emissions by % contribution for FY 2019-2020



2.2 Stationary Energy GHG Emissions

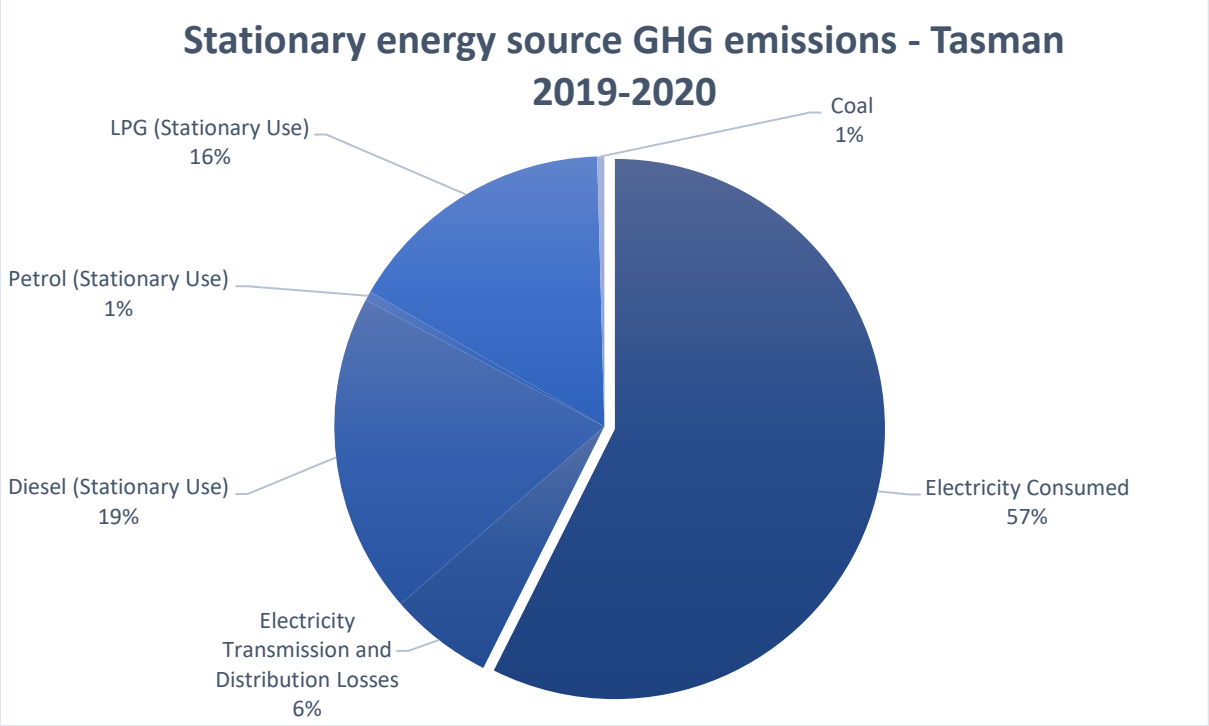
Stationary Energy was Tasman's third-largest emitting sector, producing 79,795 tCO_2-e (10.5% of Tasman's total gross GHG emissions). The largest contributor to Stationary Energy was from electricity consumed (including associated electricity transmission and distribution losses) (63.6% of the sector's emissions). The second largest source was petrol and diesel use in stationary energy activities.

Combustion of biogas (methane) for flaring of biogas (methane) at the landfill results in carbon dioxide (CO_2). These biogenic GHG emissions (i.e. generated from organic materials) are excluded from the total gross GHG emissions and reported in the biogenic GHG emissions section of this inventory (section 4.7), following GPC guidance.

Table 13: Stationary energy GHG emissions by sub-sector, for FY 2019-2020

Sector/Source		GHG Emissions (tCO_2-e)		% of sector gross GHG emissions
Stationary Energy	Electricity (kWh)	45,801	79,795	57.4%
	Transmission & distribution losses	4,943		6.2%
	Diesel	15,298		19.2%
	Petrol	441		0.6%
	LPG	12,972		16.3%
	Biodiesel	0		0.0%
	Coal	340		0.4%

Figure 13: Stationary energy GHG emissions by % contribution, for FY 2019-2020

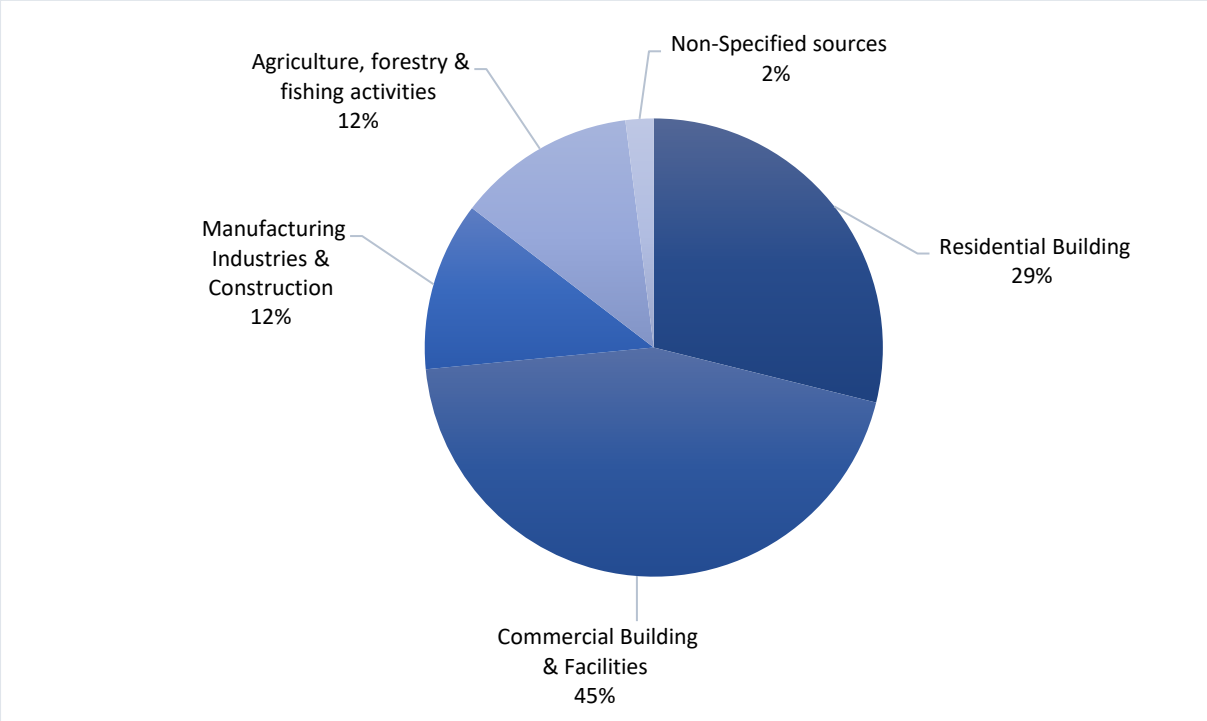


The Stationary Energy sector's GHG emissions are also broken down by sub-sector.

Table 14: Stationary energy GHG emissions by source, for FY 2019-2020

Sub-sector	Description	tCO_2e
Residential Building	All emissions from energy use in households	23,022
Commercial Building & Facilities	All emissions from energy use in commercial buildings and facilities	35,589
Institutional Buildings & Facilities	All emissions from energy use in public buildings such as schools, hospitals, government offices, highway street lighting, and other public facilities	-
Manufacturing Industries & Construction	All emissions from energy use in industrial facilities and construction activities, except those included in energy industries sub-sector. This also includes combustion for the generation of electricity and heat for own use in these industries.	9,532
Energy Industries	All emissions from energy production and energy use in energy industries	-
Energy Generation supplied to the grid	All emissions from the generation of energy for grid-distributed electricity, steam, heat and cooling	-
Agriculture, forestry & fishing activities	All emissions from energy use in agriculture, forestry, and fishing activities	10,068
Non-Specified sources	All remaining emissions from facilities producing or consuming energy not specified elsewhere	1,584
Fugitive emissions	From mining, processing, storage and transport of coal/oil and natural gas systems	-
Total		**79,795**

Figure 14: Stationary energy sub-sector GHG emissions, for FY 2019-2020



2.3 Agriculture GHG Emissions

Agriculture was Tasman's highest emitting sector producing 355,680 tCO_2-e in 2019/20 (46.6% of Tasman's total gross GHG emissions). Livestock produced the majority of the agriculture sector's GHG emissions, (89.1% of the agriculture sector's GHG emissions).

The majority of livestock in Tasman is sheep, accounting for 81.2% of farmed livestock. Enteric fermentation from livestock produced 299,360 tCO_2-e (84.2% of the agriculture sector's GHG emissions). The second largest source of agriculture emissions was from nitrous oxide (N_2O) released by urine and dung deposited by grazing animals.

The measurement of agriculture emissions in this report considered the following sources and GHG gases:

Livestock

- Enteric fermentation (CH_4): driven primarily by the number of animals, type of digestive system, and type and amount of feed consumed
- Manure management (CH_4): from manure deposited directly onto pasture. This source of emission was calculated using emission factors from the National inventory and data from number of livestock (dairy cattle, non-dairy cattle (beef cattle); sheep and lambs)

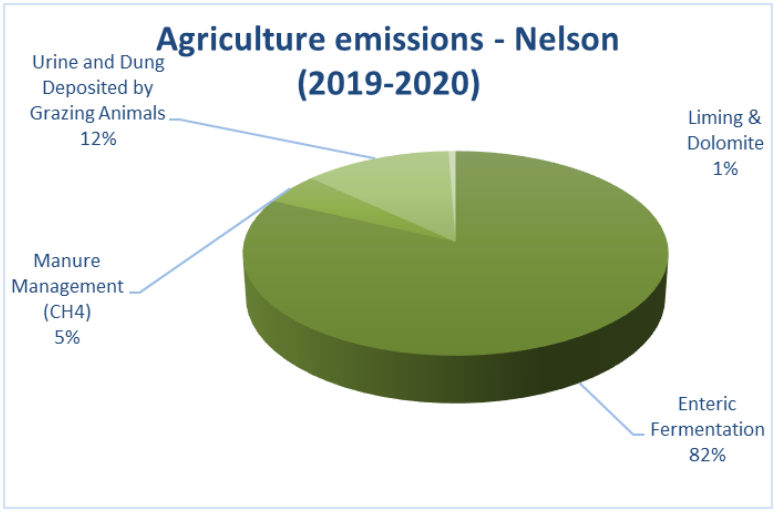
Agricultural soils

- Urine and Dung Deposited by Grazing Animals (used a percentage of livestock from National inventory data) N_2O released from manure deposited directly onto pasture by grazing livestock
- Liming and dolomite (CO_2): Lime applications (calcic lime and dolomite). Liming is used to reduce soil acidity and improve plant growth on agricultural land and managed forest.

Table 15: Agriculture's GHG emissions by source, for FY 2019-2020

	GHG Source	% of sector gross GHG emissions	GHG emissions tCO_2	% of sector gross GHG emissions
Livestock	Enteric Fermentation	84.2%	299,360	89.1%
	Manure Management	4.9%	17,493	
Agricultural soil	Urine and dung deposited by grazing animals	10.2%	36,434	10.9%
	Liming & Dolomite	0.7%	2,393	
Total emissions CO_2e			**355,680**	100%

Figure 15: Agriculture's GHG emissions by % contribution, for FY 2019-2020



2.4 Waste GHG Emissions

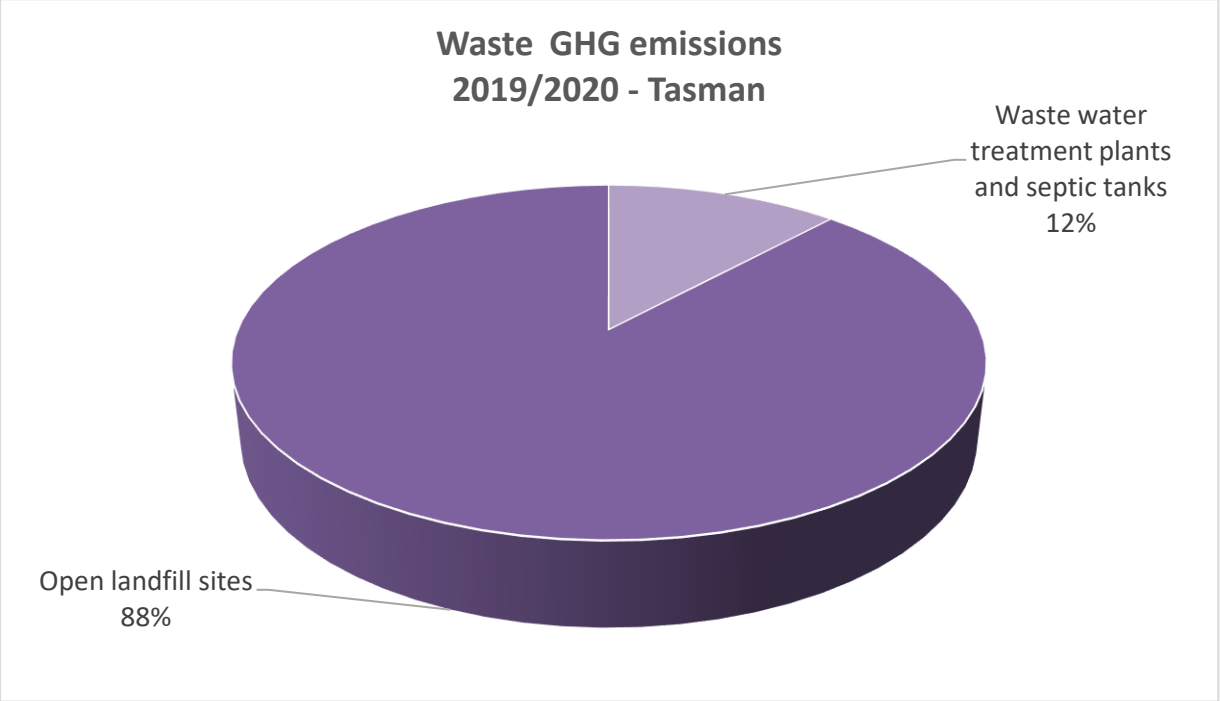
Waste (solid waste and wastewater treatment) was Tasman's fourth highest emitting source, producing 45,127 tCO_2-e in 2019/20 (5.9% of Tasman's total gross GHG emissions). Solid waste sent to landfill is 88.1% of the Waste sector's GHG emissions.

Waste emissions include emissions from open landfills.

Table 16: Waste GHG emissions by source, for FY 2019-2020

Sector/Source		GHG Emissions (tCO_2-e)		% of sector gross GHG emissions
Waste	Open Landfill Sites	39,756	45,127	88%
	Wastewater Treatment	5,371		12%

Figure 16: Waste GHG emissions by % contribution, for FY 2019-2020



2.5 Industrial Processes and Product Use (IPPU) GHG Emissions

The IPPU sector was Tasman's fifth highest emitting sector, producing 20,971 tCO_2-e in 2019/20 (2.7% of Tasman's total gross GHG emissions). The use of refrigerants represents 87.0% of the IPPU sector's GHG emissions.

The GHG emissions for Industrial Product Use include GHG emissions from Hydrofluorocarbon (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6). It is understood that there are no large industrial operations within the Tasman region's boundary that result in significant Industrial Processes GHG emissions for industrial processes of:

- **Mineral industry**: cement production, lime production, or glass production.
- **Chemical industry**: Ammonia, Nitric acid, Adipic acid, Caprolactam, glyoxal, and glyoxylic acid, Carbide, Titanium dioxide, Soda ash

- **Metal industry**: production of iron steel and metallurgical coke, ferroalloy, aluminium, magnesium, lead, zinc, and rare earth metals.

The data was estimated using the following emissions from the national figure from "product use emissions" per capita using Tasman's population:

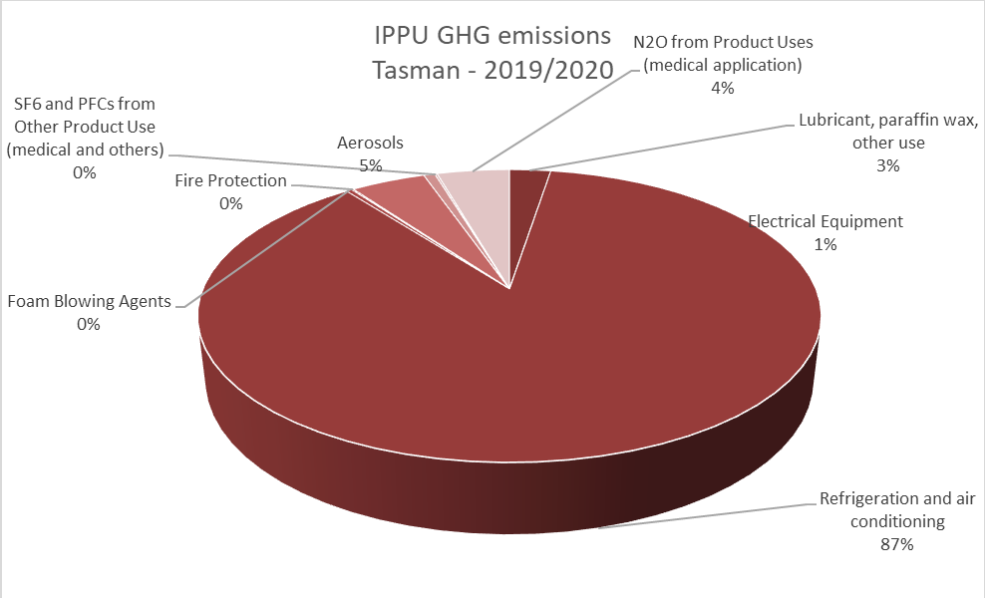
- Non-energy Products from Fuels and Solvent Use (Lubricant, paraffin wax, other use)
- Product Uses as Substitutes for ODS
    - Refrigeration and air conditioning (Commercial, domestic, industrial, transport refrigeration, Mobile Air-Conditioning)
    - Foam Blowing Agents
    - Fire Protection
    - Aerosols

- Other Product Manufacture and Use
    - Electrical Equipment
    - SF6 and PFCs from Other Product Use (medical and others)
    - N_2O from Product Uses (medical application)

Table 17: IPPU GHG emissions by source, for FY 2019-2020

Sector/Source		GHG Emissions (tCO_2-e)		% of sector gross GHG emissions
Non-energy Products from Fuels and Solvent Use	Lubricant, paraffin wax, other use	535	535	2.6%
Product Uses as Substitutes for ODS	Refrigeration and air conditioning (Commercial, domestic, industrial, transport refrigeration, Mobile Air-Conditioning)	18,249	19,319	87.0%
	Foam Blowing Agents	75		0.4%
	Fire Protection	25		0.1%
	Aerosols	971		4.6%
Other Product Manufacture and Use	Electrical Equipment	145	1,116	0.7%
	SF6 and PFCs from Other Product Use (medical and others)	31		0.1%
	N_2O from Product Uses (medical application)	941		4.5%
Total		**20,971**		100%

Figure 17: IPPU GHG emissions by % contribution, for FY 2019/2020



2.6 Forest Carbon Sequestration and GHG Emissions

This inventory accounts for exotic forest carbon stock.

GHG emissions from harvesting and deforestation were not applicable as it was used the "average accounting" approach for LULUCF land-use emission factors.

This inventory doesn't consider native forest as the data for regenerating (growing) forest areas was not available.

For exotic forest, the only data available was for FY19/20, so, the same data was used for base year FY 18/19.

In 2019/20 the Forestry sector produced net negative GHG emissions of -1,993,441tCO_2-e due to the sequestration of carbon. This was mostly by exotic forest.

2.7 Biogenic GHG Emissions

Biogenic carbon dioxide (CO_2) and methane (CH_4) GHG emissions from biomass combustion are accounted but reported separately as an information item, because the carbon embedded in biomass is part of the natural carbon cycle.

The following biogenic CO_2 GHG emissions from plants and animals are excluded from total gross GHG emissions as they originate from organic material disposed of in the landfill or they are part of the natural carbon cycle:

- Combustion of recovered biogas (methane) from the York Valley landfill used at Nelson Hospital - reported in the Nelson GHG Emission inventory only and not included in this report.
- Biogas flaring at the York Valley landfill
- wood biofuels originate from forestry

The following biogenic CH_4 GHG emissions are included in total gross GHG emissions:

- enteric fermentation and manure produced by farmed cattle.
- Landfill biogas (methane) produced from solid waste
- Biodiesel (Stationary and Transport Use)

The national Emission Reduction Plan includes targets to reduce Biogenic CH_4 GHG emissions by between 24 percent and 47 percent below 2017 levels by 2050, and a 10 percent reduction below 2017 levels by 2030.

Table 18: Biogenic carbon dioxide emissions for FY 2019/2020

Sector/Source		Biogenic GHG Emissions ($tCO_{2\ equivalent}$)
Biogenic CO_2 GHG Emissions	Biofuel (Wood)	289
	Landfill Biogas - Methane (Recovered)	Non applicable (allocated to Nelson)
	Biodiesel (Stationary Use)	No data available
	Biodiesel (Transport)	No data available
	Enteric Fermentation	299,360
	Manure Management	17,493
	Landfill Biogas - Methane (Non-Recovered)	10,998

2.8 GHG Emission Inventory - Summary

During the financial year 2019/20 reporting period Tasman's total gross GHG emissions were 763,389 tonnes of carbon dioxide equivalent (tCO_2-e). This equates to 13.6 tCO_2-e/person.

Table 10 summarises the 2019/20 GHG emission results for different sectors while Table 11 displays emissions from all calculated emissions sources. High level findings are provided below.

- **Agriculture** (e.g. from livestock and crops) was the highest GHG emission emitting sector, producing 46.6% of Tasman's total gross GHG emissions, with livestock producing the majority of the agriculture sector's GHG emissions (89.1% of the agriculture sector's GHG emissions).

- **Transport** was second largest GHG emission emitting sector, producing 34.3% of Tasman's total gross GHG emissions, with petrol and diesel use contributing to 93.2% of the Transport sector's GHG emissions.

- **Stationary Energy** (i.e. non-transport energy use) produced 10.5% of Tasman's gross GHG emissions, with electricity consumed (including associated electricity transmission and distribution losses) contributing to 63.6% of the Stationary Energy sector's GHG emissions.

- **Waste** (gas emitted from landfill sites and wastewater treatment) produced 5.9% of Tasman's gross emissions.

- **Industrial Processes and Product Use (IPPU)** sector (e.g. the use of industrial chemicals) produced the remaining 2.7% of Tasman's gross emissions.

3 Comparison of GHG Emission Inventories Between 2018/2019 and 2019/2020

Between 2018/19 and 2019/20, total gross GHG emissions in Tasman decreased from 832,590 tCO_2-e to 763,389 tCO_2-e, (69,201 tCO_2-e). The sector with the largest real decrease in emissions was Agriculture, decreasing by 25,299 tCO2-e between 2018/19 and 2019/20. The largest increase in GHG emissions was Electricity Consumed, increasing by 5,219 tCO2-e between 2018/19 and 2019/20.

Table below shows the change in gross GHG emissions for each sector between years. The decrease in emissions from the Agriculture and Transport sectors were predominantly responsible for the decrease in Tasman's total gross GHG emissions.

Table 19: GHG emissions comparison by sector and financial year

Sector	2018/19 GHG Emissions (tCO_2-e)	2019/20 GHG Emissions (tCO_2-e)	Change Between 2018/19 and 2019/20 (tCO_2-e)	Proportion of Total % Change Between 2018/19 and 2019/20
Transport	286,277	261,816	(24,462)	-2.9%
Stationary Energy	74,576	79,795	5,219	0.6%
Agriculture	380,979	355,680	(25,299)	-3.0%
Waste	68,883	45,127	(23,756)	-2.9%
Industrial Processes and Product Use	21,875	20,971	(904)	-0.1%
Total Gross GHG Emissions (excl. Forestry)	**832,590**	**763,389**	**(69,201)**	**-8.3%**

Figure 18: GHG emissions comparison by sector and financial year

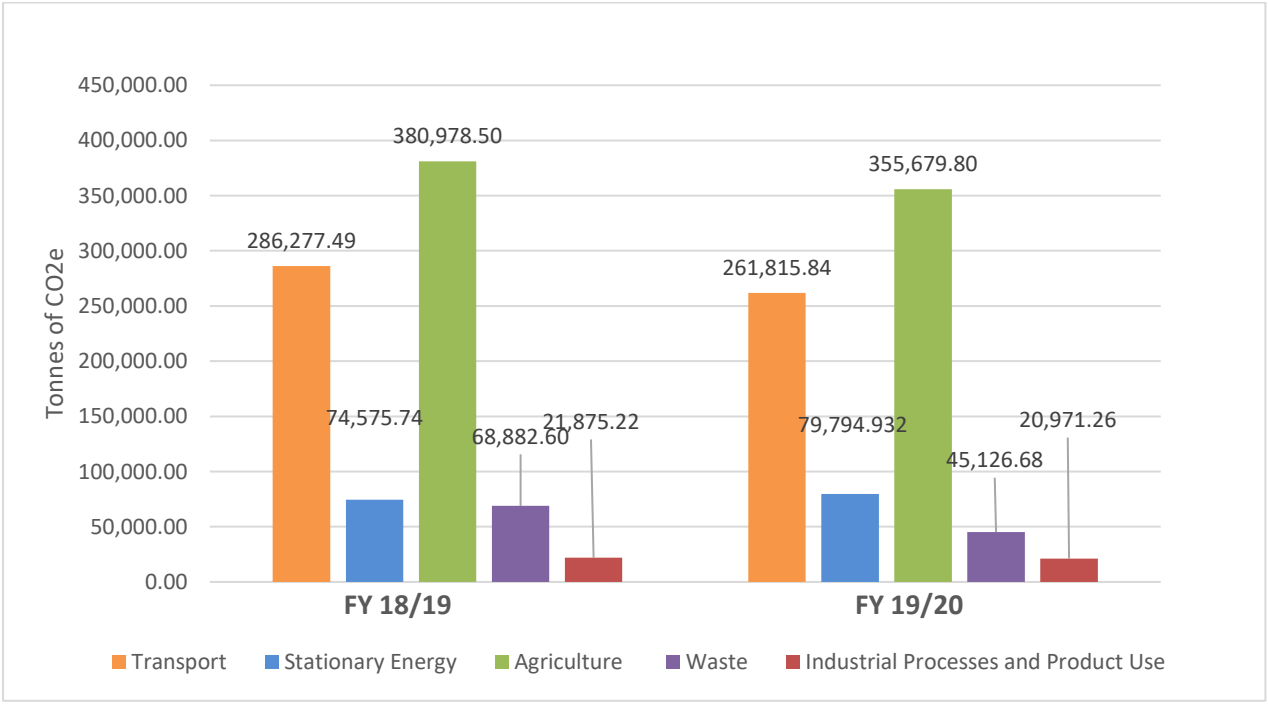


Table 20: GHG breakdown emissions comparison by sector and financial year

GHG Emission Sector/Source		2018/19 GHG Emissions (tCO_2-e)	2019/20 GHG Emissions (tCO_2-e)	Change Between 18/19 and 19/20 (tCO_2-e)	Proportion of Total Change Between 18/19 and 19/20 (%)
Transport	Petrol (On-Road)	95,109	83,733	(11,376)	-1.4%
	Diesel (On-Road)	137,134	132,337	(4,797)	-0.6%
	Electric vehicles (On-Road)	0	0	0	0.0%
	Biodiesel (Vehicle Use)	0	0	0	0.0%
	Petrol (Off-Road)	1,111	978	(133)	0.0%
	Diesel (Off-Road)	28,068	27,087	(982)	-0.1%
	Marine Light Fuel Oil (Freight Cargo) - International	2,498	1668	(830)	-0.1%
	Marine Light Fuel Oil (Freight Cargo) - Domestic	179	174	(5)	0.0%
	Marine Diesel (Tourism Vessels and Local Ferries)	0	0	0	0.0%
	Jet Kerosene (Commercial Flights)	21,118	14,779	(6,339)	-0.8%
	Aviation Gas (Local Flights)	1,014	1,014	0	0.0%
	LPG (Road Mobile Uses)	45	44	0	0.0%
Stationary Energy	Electricity Consumed	40,738	45,801	-5,062	0.6%
	Electricity Transmission and Distribution Losses	3,986	4,943	-957	0.1%
	Diesel (Stationary Use)	15,853	15,298	(554)	-0.1%
	Petrol (Stationary Use)	501	441	(60)	0.0%
	LPG (Stationary Use)	13,158	12,972	(186)	0.0%
	Biodiesel (Stationary Use)	0	0	0	0.0%
	Coal	340	340	0	0.0%
Agriculture	Livestock	342,205	316,852	(25,352)	-3.0%
	Agricultural soil	38,774	38,827	-53	0.0%
Waste	Open Landfill Sites	63,565	39,756	(23,809)	-2.9%
	Wastewater Treatment	5,318	5,371	-53	0.0%
Industrial Processes and Product Use	Industrial Processes and Product Use	21,875	20,971	(904)	-0.1%
Total Gross GHG Emissions		832,590	763,389	(69,201)	-8.3%

4 Assumptions and Exclusions

This report was prepared between January 2021 and April 2023 and is based on the information retrieved during that time.

General assumptions

- Local Government NZ (LGNZ) local council mapping boundaries have been applied.
- GHG emissions are expressed on a carbon dioxide-equivalent basis (CO2-e)
- Total GHG emissions are reported as gross GHG emissions (excluding Forestry) and net GHG emissions (including Forestry).
- The colour scheme used for each sector follows the recommended GPC reporting framework
- Where location specific data was not accessible, information was calculated via a per capita break-down of national or regional level data.
- When data is shown as “zero” is because the total amount of footprint is a decimal or centesimal figure and was too low to be rounded to a entire number.
- When data is shown with a dash “- “is because the information was not available

Exclusions

- Exclude embodied GHG emissions