

Southland Regional Carbon Footprint 2018

Summary Report

Client: Great South

Co No.: N/A

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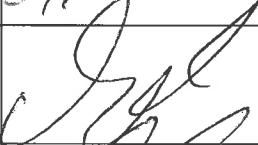

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1.0 Introduction

AECOM New Zealand Limited (AECOM) has been commissioned by Venture Southland (VS), now Great South, to assist in the development of a greenhouse gas footprint for the Southland Region for the 2018 calendar year. The study boundary includes the jurisdictions of the Southland District Council, Invercargill City Council, Gore District Council and Environment Southland.

2.0 Scope and Approach

This baseline greenhouse gas carbon footprint report for the Southland Region follows the methodology outlined in the Global Protocol for Community Scale Greenhouse Gas Emissions Inventory (GPC), published by the World Resources Institute (WRI 2015) and includes emissions from stationary energy, transport, waste, industry, agriculture and forestry activities within the district boundary.

This is the same methodology used for other community scale greenhouse gas (GHG) inventories around New Zealand (e.g. Auckland, Dunedin, Christchurch, Tauranga and Wellington) and internationally.

This inventory assesses both direct (production-based) emission sources within the geographic area (Scope 1) and indirect emission sources from electricity from the national grid (Scope 2), and transport that originates or terminates outside the district boundary, e.g. aviation (Scope 3). Examples of consumption-based emission sources included in the inventory are emissions from product use occurring within the district such as refrigerants used in air conditioning. The GPC methodology represents international best practice for city and regional level GHG emissions reporting.

The City Inventory Reporting and Information System (CIRIS), developed by C40 has been used to collate the greenhouse gas inventory. This is a publicly available reporting tool that is accepted by the Global Covenant of Mayors for Climate and Energy, ICLEI (carbon registry) and CDP.

The following aspects are worth noting in reviewing the inventory:

- Emissions are expressed on a carbon dioxide-equivalent (CO₂e) basis including using the 100-year GWP (Global Warming Potential) values including climate-carbon feedback from the Intergovernmental Panel on Climate Change Fifth Assessment Report (AR5): Climate Change 2014;
- Total emissions are reported as net emissions (including forestry) and gross emissions (excluding forestry);
- Emissions from some sources were not able to be split up and proportioned to subsectors, e.g. recreational boating is reported under off-road transportation. For this reason, the report should be read in full;
- Due to data limitations, this inventory estimates emissions from industrial product use by scaling national emissions from industrial product use on a population basis;
- Due to data limitations, this inventory did not estimate the landfill gas flare efficiency from solid waste emissions and used a default figure provided in the CIRIS tool;
- This inventory accounts for forest carbon stock changes from afforestation, reforestation, deforestation and forest management (i.e. it applies land-use accounting conventions under the UN Framework Convention on Climate Change rather than the Kyoto Protocol). It treats emissions from harvesting and deforestation as instantaneous rather than accounting for the longer-term emission flows associated with harvested wood products.

3.0 Southland Regional Carbon Footprint

3.1 Key messages

- During the 2018 reporting period, Southland emitted total gross emissions of 8,041,526 tCO₂e under Scope 1, with 764,876 tCO₂e reported as Scope 2 and 104,404 tCO₂e as Scope 3; all scopes combined total 8,910,806 tCO₂e gross emissions and 6,679,154 tCO₂e net emissions.
- Agricultural related emissions across the region represent 69% of the overall gross emissions and are the region's largest emission source. The majority of these emissions are from methane emissions from enteric fermentation from dairy cows and sheep.
- The second largest source of emissions in the region are from stationary energy, which are 17% of total gross emissions. The majority of stationary energy emissions are from emissions from grid supplied energy consumed within the study boundary (Scope 2). Industrial emissions represent 7% of total gross emissions. Transportation represents 6% of overall gross emissions, with the majority from passenger transport and heavy vehicles. As the airport and port provide a service beyond the Southland boundary, only part of the total emissions from these sources have been allocated to Southland.
- Forestry emissions are driven by the amount of harvesting, burning of harvested wood and tree planting that takes place in any given year. In the 2018 reporting period the amount of harvesting that took place in Southland resulted in forestry-related sequestration of -3,693,767 tCO₂e, and total harvest emissions of 1,462,113 tCO₂e.
- Southland's per capita net emissions are 58.6 tCO₂e/person for Scope 1 emissions and 89.9 tCO₂e/person Scope 1, 2 and 3 combined. When Agricultural, Forestry and Other Land Use (AFLOU) emissions are excluded from all Scopes, the per capita net emissions are 28.1 tCO₂e/ person. Overall, Southland is responsible for an estimated 9.7% of the total national gross emissions.
- The Waikato Region carbon footprint completed in 2015/16, had higher overall emissions at 15% of NZ's total emissions compared with Southland. For Waikato Region agriculture made up 75% of the total emissions.
- The Bay of Plenty Region carbon footprint completed for 2015/16, had a similar level of emissions to those reported for Southland and a total of 4% of NZ's total emissions, and a similar amount of emissions from livestock. However, due to the larger population size in the Bay of Plenty Region, the per capita emissions were lower.
- When comparing the region to cities throughout the country the per capita emissions (Scope 1-3) for Southland are above the per capita estimates for Dunedin City 2014/15 (11.4 tCO₂e), Auckland City 2014 (7.9 tCO₂e) and Tauranga 2015/16 (5.9 tCO₂e), due to the region's lower population and larger primary and industrial sector emissions.

4.0 Results

4.1 Overview

During the 2018 reporting period, Southland emitted gross 8,041,526 tCO₂e and net 5,809,874 tCO₂e emissions under Scope 1, or 8,910,806 tCO₂e gross emissions and 6,679,076 tCO₂e net emissions under Scope 1-3, approximately 9.7% of NZ's total gross emissions. The population was approximately 99,100 people, resulting in per capita net emissions of 58.6 for Scope 1 and 89.9 tCO₂e/person. Agricultural emissions are the largest source of emissions for the region (refer Figure 1).

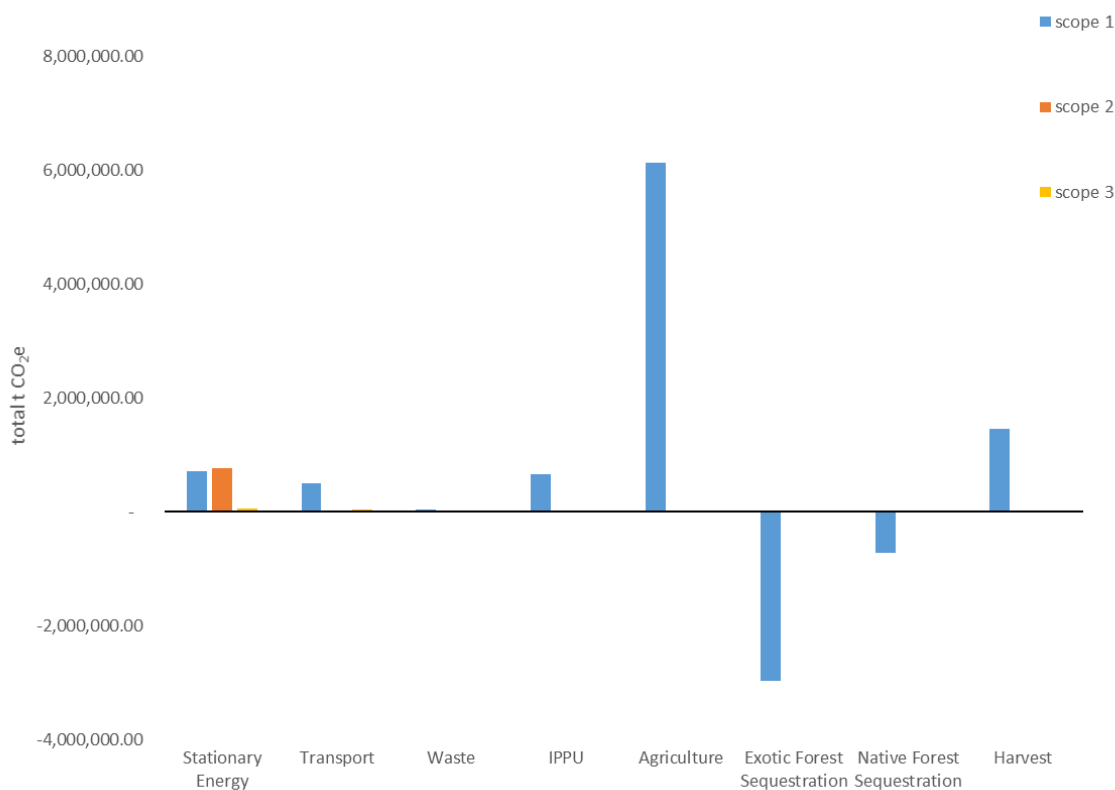









Figure 1: Total gross emissions by sector for the Southland Region.

The Regional Carbon Footprint results are calculated using the following emissions sectors:

- Stationary energy** includes emissions from the consumption of petrol, diesel, coal, gas, biodiesel and wood, as well as fugitive emissions from coal mining and the combustion of landfill gas (all Scope 1). The sector also includes emissions from electricity consumed by residential, commercial and industry users (Scope 2), as well as emissions from electricity transmission and distribution losses (Scope 3).

- **Transportation** includes emissions from petrol and diesel sold within the inventory boundary, and LPG used for road transport. Jet kerosene and aviation gas used for aviation and diesel used for transboundary flights and sea vessels are included in this sector as Scope 3 (indirect) emissions (see below)
- **Waste** includes emissions from the treatment of wastewater and the disposal of solid waste and composting of organic material (Scope 1).
- **Industrial processes and product use (IPPU)** covers emissions associated with the consumption of GHGs for refrigerants, foam blowing, fire extinguishers, aerosols, metered dose inhalers and Sulphur Hexafluoride (SF₆) for electrical insulation and equipment production.
- **Agriculture, forestry and other land use (AFOLU)** includes emissions from livestock, crops and fertiliser use as well as carbon sequestered from commercial exotic forests and other native forest cover. Emissions from harvested trees are also included in this sector. The emissions reported take into account the sequestration and therefore Table 1 represents net emissions for the region.

Table 1: Summary of net emissions (including Forestry) for the Southland Region

tCO ₂ e	BASIC+ Other Scope 3	Scope 1	Scope 2	Scope 3
	Stationary	711,805	764,876	57,948
	Transportation	501,031		46,456
	Waste	44,030		
	IPPU	657,588		
	AFOLU	3,895,420		
	Other Scope 3			
	TOTAL		6,679,154	

Scope 1: includes direct emissions (released within the Region) from stationary and transport fuel combustion, refrigerants, industrial processes, industrial product use, solid waste and waste water treatment processes, agriculture and forestry.

Scope 2: includes emissions electricity, heat and steam generation.

Scope 3: includes emissions from transboundary travel (e.g. air travel and marine navigation), as well as emissions from transmission and distribution losses from grid supplied electricity.

4.2 Stationary Energy Emissions

Stationary energy use in Southland emitted 1,534,628 tCO₂e in 2018; representing 9% of Southland's Scope 1 emissions and 17% of Southland's gross emissions of Scope 1, 2 and 3.

The main source of emissions from stationary energy is from grid supplied energy consumed within the study boundary (Scope 2), contributing 764,876 tCO₂e.

The second largest source of emissions with 115,499 tCO₂e is from fugitive emissions from coal mining in the region, which produces 280,747 tonnes of sub bituminous coal (lignite coal is excluded from the fugitive emissions calculations as it is surface mined). This is followed by Scope 1 (direct) emissions from manufacturing industries generated from consumption of fuel, coal and LPG. The Stationary Energy Scope 3 emissions are from transmission and distribution losses from grid supplied electricity.

A breakdown of the stationary energy emission sources is provided below.

Table 2: Stationary Energy Emissions by source

Emission Source	Scope 1	Scope 2	Scope 3	Total tCO ₂ e
Residential buildings	2,383	32,984	2,499	37,866
Commercial buildings and facilities	45,856	25,191	1,908	72,955
Manufacturing industries	543,736	706,701	53,540	1,303,978
Agriculture, forestry and fisheries	4,330			4,330
Fugitive emissions from coal	115,499			115,499
TOTAL	711,805	764,876	57,948	1,534,628

4.3 Transportation Emissions

Transportation sources contributed 547,487 tCO₂e, representing 6% of Southland's Scope 1 gross emissions and 6% of Southland's overall gross emissions.

Table 3: Transportation Emissions by source

	Emission Source	Scope 1	Scope 2	Scope 3	Total tCO ₂ e
On-Road	Passenger Vehicles	238,371			238,371
	Mobile LPG consumption	1,741			1,741
	Buses	7,481			7,481
	Heavy Vehicles	195,496			195,496
Shipping/ Marine				41,480	41,480
Aviation				4,976	4,976
Off-Road		57,943			57,943
TOTAL		501,031	0	46,456	547,487

Direct transport emissions (Scope 1) are dominated by diesel and petrol used for on and off-road transport contributing the majority of transportation emissions during the reporting period.

Emissions from air travel (Aviation gas) have been estimated based on the number of flights arriving and departing from the airport and the assumed fuel consumption during these flights. Half of the emissions were allocated to Southland and the other half to the airport of origin or destination.

Emissions from international and coastal shipping have been estimated based on the number of ships departing from the port and their assumed fuel consumption to their next destination.

4.4 Waste Emissions (solid and wastewater)

Waste emissions in the Southland Region are produced from solid waste in the landfill and waste water treatment plants (WTPP). There is only one reported active landfill in the Southland region, it is capped and has a gas flare for methane produced. Waste water treatment emissions source from approximately 24 individual schemes within the region. Septic tanks also service a large proportion of the population across the Southland Region.

The waste sector which includes both solid waste and wastewater within the Southland region contributes 44,030 tCO₂e of Scope 1 emissions, this equates to less than 1% of total gross emissions.

Solid waste emissions from landfill represent 36,550 tCO₂e. Wastewater emissions from district treatment schemes contribute 7,480 tCO₂e, of which septic tanks contribute 5,746 tCO₂e. Methane generated at the Invercargill WWTP is captured and flared or combusted for electricity generation, reducing the overall methane emissions from waste water treatment.

4.5 Industrial Processes and Product Use

In 2018 industrial GHG emissions contributed 657,588 tCO₂e of Scope 1 emissions, or approximately 7% of Southland’s gross emissions. The emissions for industrial processes and product use include emissions from hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) (Scope 1) and from industrial processes. Nitrogen trifluoride emissions do not occur in New Zealand, and therefore are not included in this report.

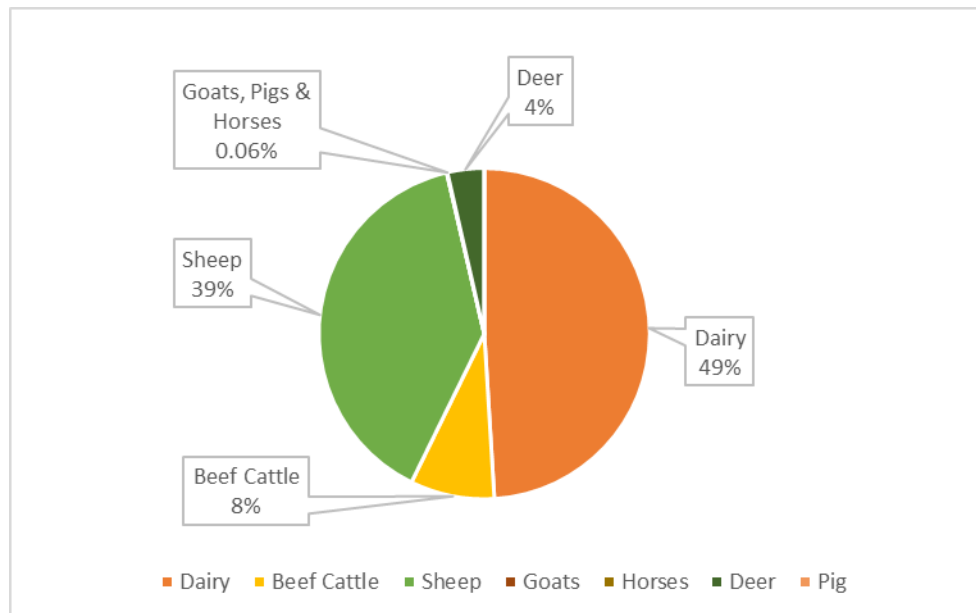
Energy used in industrial manufacturing processes has been included in the relevant stationary energy sector (e.g. coal, electricity and/or petrol and diesel use).

4.6 Agriculture, Forestry and other land use

4.6.1 Agriculture

In 2018 agricultural GHG emissions contributed the majority of the region’s emissions at 6,127,073 tCO₂e of Scope 1 emissions only.

The Southland region has around 4 million sheep and almost 700,000 dairy cows¹. Methane (CH₄) is the most significant agricultural emission source predominantly from gas released during digestion of organic material (e.g. from cows and sheep). Nitrous oxide (N₂O) emissions come from farming of animals, manure management and agricultural soils.



¹ Statistics New Zealand: Livestock Numbers by Region, 2017
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Figure 2: Breakdown of Agricultural emissions by livestock category within the Southland Region.

The majority of agricultural emissions in Southland are attributed to dairy and sheep livestock, with dairy emissions contributing almost half of the emissions from livestock.

Table 4 Agriculture emissions by source

	Emission Source	Scope 1	Scope 2	Scope 3	Total tCO ₂ e
Livestock	Dairy	2,900,319			2,900,319
	Beef	486,869			486,869
	Sheep	2,312,310			2,312,310
	Goats	363			363
	Horses	3,189			3,189
	Deer	211,939			211,939
	Pigs	134			134
Fertilizer use		178,855			178,855
Crops		2			2
Organic Soils		33,092			33,092
TOTAL		6,127,073	0	0	6,127,073

4.6.2 Forestry and other land use

The sequestration of GHG emissions from forestry activities in Southland are estimated at net 2,231,654 tCO₂e.

Indigenous and exotic forests sequester an estimated 3,693,767 tCO₂e. The majority of carbon is sequestered by exotic forest plantations (80%), while still maturing native forests (e.g. Manuka and Kanuka) sequestered the remaining 20%.

Harvesting related emissions were estimated based on harvesting volumes reported by Statistics New Zealand and Ministry for Primary Industries (MPI) National Exotic Forest Description (NEFD) data for 2017 and are estimated at 1,462,113 tCO₂e². Emissions associated with land-use changes have not been included, due to the lack of data. Only carbon sequestered in broadleaf forests, grey shrubs, manuka and kanuka and gorse and broom have been included (as per the New Zealand Land Cover Database - LCDB4).

5.0 Emissions by Economic Sectors

The following graphs outline the regional emissions by economic sectors by attributing estimates for Southland to the relevant economic sectors. Where no regional breakdown in the emissions source data was available the economic breakdown uses national average contribution by sector to overcome data gaps. For example, at a national level tourism is responsible for 6.3% of transport emissions. We have therefore assumed that tourism also represents 6.3% of Southland's transport emissions.

Overall, the primary industries sector is, with 69% or 6,131,402 tCO₂e, the largest contributor of emissions³. Goods producing industries represent 22% or 1,994,986 tCO₂e of emissions, Service Industries 6% (552,529 tCO₂e), Mining 1% (115,499 tCO₂e), Households 0.4% (37,866 tCO₂e), Waste 0.5% (44,030 tCO₂e) and Tourism around 0.4% (34,492 tCO₂e) respectively. Forestry activities within

² Due to the accounting method chosen for this report, all carbon stored in harvested trees, including in the wood products removed, below ground and in residues left on site, is assumed to result in emissions in the harvesting year.

³ This excludes carbon sequestered and released from forests and is consistent with the gross emissions reported for the Region.

the Region, sequestering carbon in forests, reduce the regional footprint by approximately 2,231,652 tCO₂e or 25%.

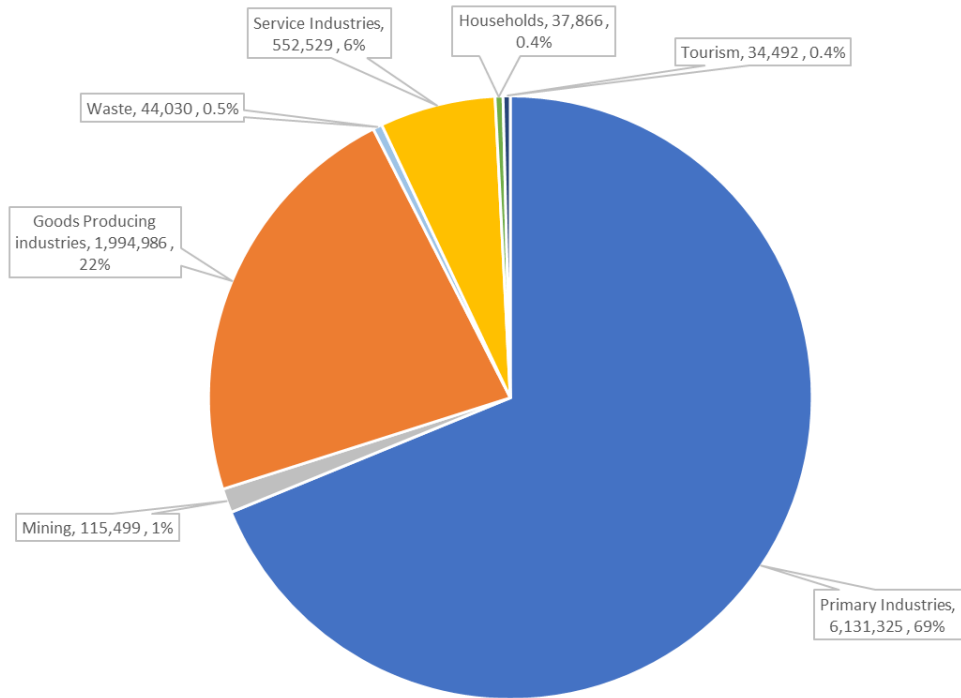


Figure 3 Southland's emissions by sector

The figures below provide a detailed breakdown of the Primary Industries and Goods Producing Industries sectors, respectively.

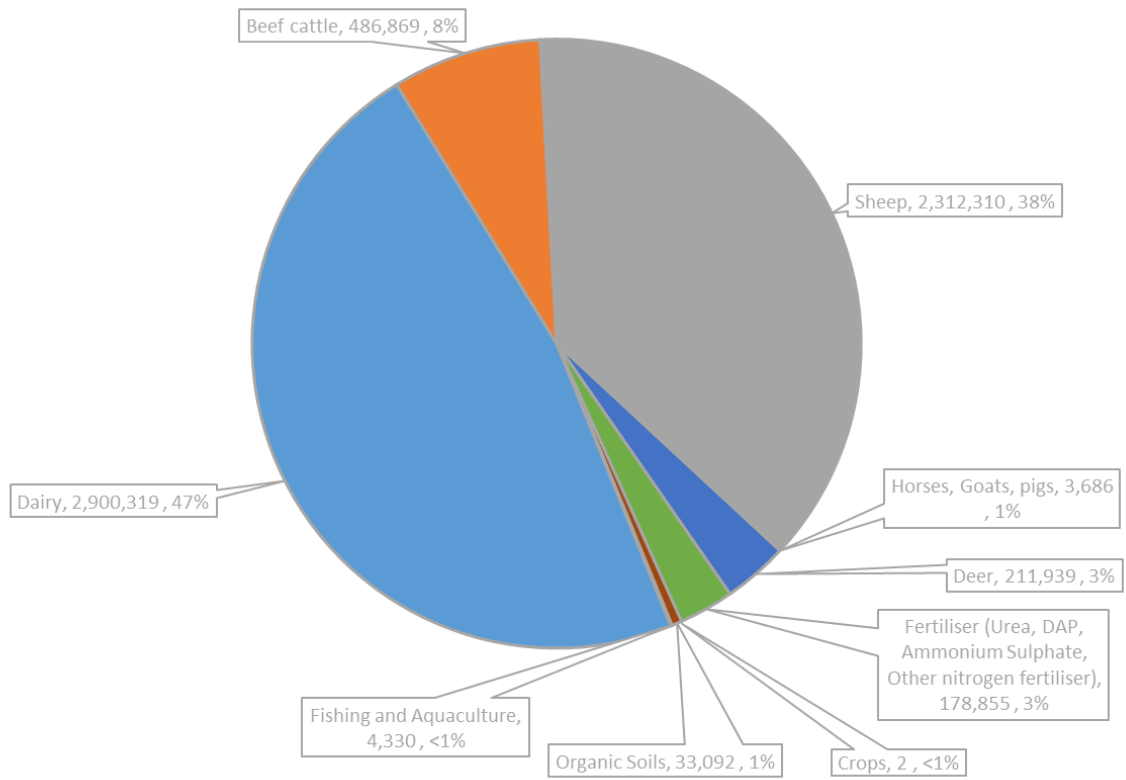


Figure 4 Breakdown of Primary Industries emissions by sub-sector

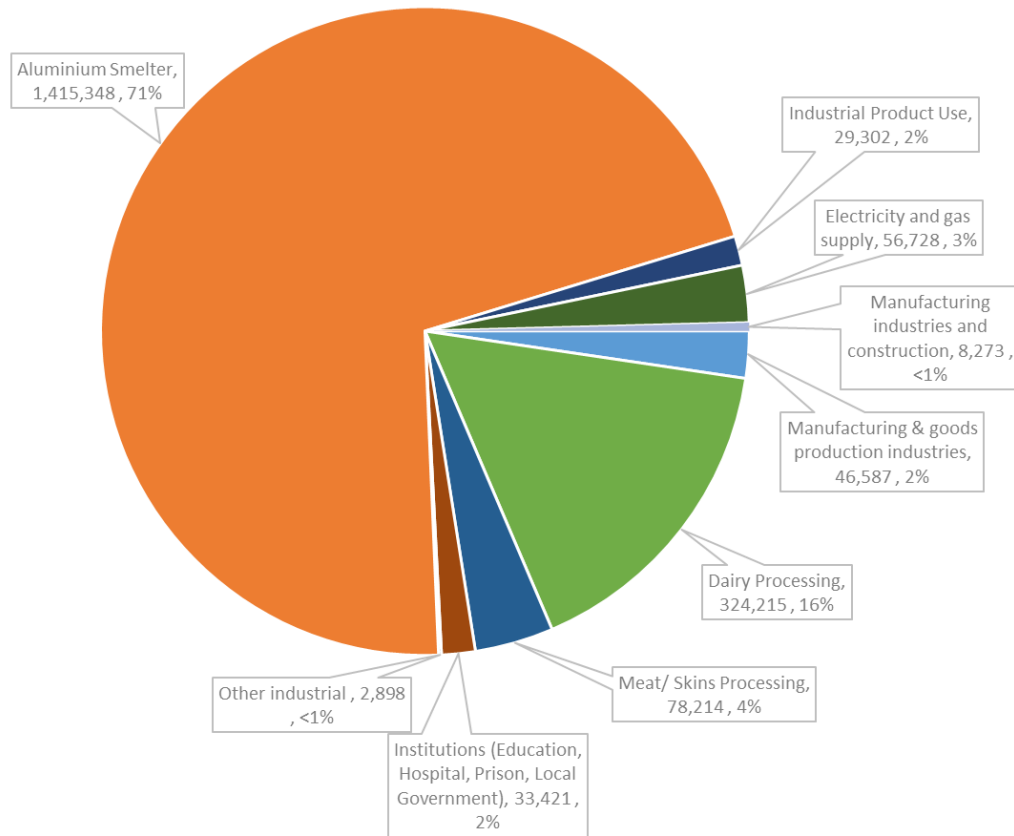


Figure 5 Breakdown of Good Producing Industries emissions by sub-sector

Emissions from Service Industries largely include emissions from transport, as well as emissions from stationary energy consumption of commercial and institutional buildings and facilities. Household emissions include emissions from residential stationary energy use. Waste Sector includes emissions from solid waste disposal and waste water treatment. The Tourism sector only accounts for tourism transport related emissions.

6.0 Key Assumptions & Limitations

6.1 Assumptions and data sources

The assumptions used to estimate emission sources and the data used are detailed in Appendix A. Significant data gaps are also noted.

6.2 Limitations

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