Southland Regional Greenhouse Gas Emissions Inventory For 2022

SUMMARY REPORT

GREAT SOUTH

Southland Regional Development Agency

Date Date 18/9/23

Southland Greenhouse Gas Emissions Inventory for 2022

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RECOMMENDATION

SUMMARY

This is the fourth emissions inventory report prepared by Great South to measure Southland's Region's greenhouse gas (GHG) emissions[1]. This report and compares the 2022 Greenhous Gas emissions against the 2018 baseline emissions and also compares the emissions to the 2021 results. The inventory was compiled following the Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC)[2], which is considered the current best practice model.

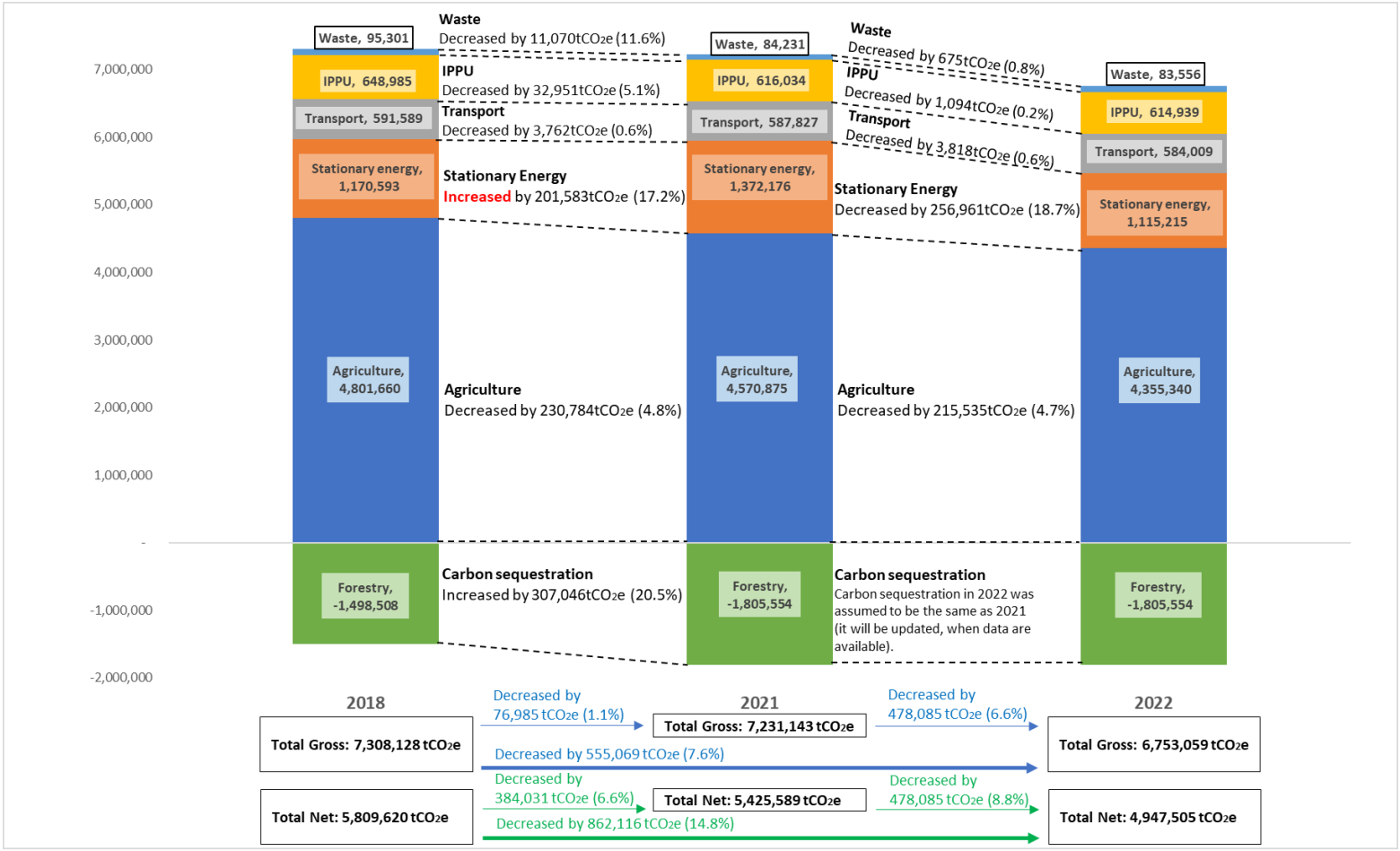
Ministry for Primary Industries (MPI)'s *2023 National Exotic Forest Description (NEFD)* report has not yet been released, carbon sequestration from forestry is assumed to be the same as in 2021 and will be updated as the 2023 NEFD report is released.

The progressive downward trend in the Regional Emissions continues with net emissions having decreased by -14.8% or *62,116 tCO_2e below the 2018 baseline figure and - 8.8% below the 2021 emissions.

Agriculture emissions in the Southland Region have seen the most significant decrease (-446,319 tCO_2e or -9.3%) primarily due to a decrease in overall stock numbers. **Numbers of cattle and sheep in Southland 2018-2022 shows the table below:**

Livestock	2018	2019	2020	2021	2022	Total Change in stock numbers
Beef cattle	173,770	181,921	200,557	203,928	185,155	**+11,385**
Dairy cattle	681,011	658,626	659,726	642,690	636,148	**-44,864**
Sheep	3,737,512	3,407,144	3,350,354	3,395,748	3,281,894	**-455,618**

[1] Throughout this document 'emissions' means GHG emissions.
[2] World Resources Institute. (2021). Global Protocol for Community-Scale Greenhouse Gas Inventories. GPC_Full_MASTER_RW_v7.pdf (ghgprotocol.org)



- The stationary energy sector, the only sector in which total emissions increased in the previous year, also decreased this year (55,379 tCO_2e or 4.7%). This is mainly due to the decarbonisation projects implemented throughout Southland and decrease in the emission factor of electricity caused by increase in hydro lake inflow.

- Landfill Gas capture and use has decreased methane emissions by 11,745 tCO_2e or 12.3%, mainly due to the significant increase in the recovery of methane at the Regional Landfill where collection efficiency increased from 30% to 75% gas recovery as site infrastructure was improved in 2021.

- Forestry sequestration based on the 2021 figures has increased from the 2018 base line sequestration by 307,046 tCO_2e or 20.5%, primarily due to an increase in forest area.

Great South is constantly tracking the regional emissions however reporting delays in reporting by MPI, MBIE, and MFE as well as others means that there is up to an 18-month lag in availability of data. Great South is advocating for more timely reporting. A further report for 2022 will be prepared in March 2024 when MPI has released the 2022 forestry data.

The Summary Report Southland Regional Greenhouse Emissions Inventory For 2022 is attached.

GREAT SOUTH
Southland Regional Development Agency

Summary Report

This is the fourth emissions inventory report prepared by Great South for Southland's Region's greenhouse gas (GHG) emissions[3]. This report compares the 2022 GHG emissions against the 2018 baseline emissions. The inventory was compiled following the Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC)[4], which is considered best practice for community-based inventories.

As the Global Warming Potential (GWP) values used in New Zealand's national GHG emissions inventory have been updated to align with the requirements for GHG inventory reporting under the Paris Agreement, from this edition, the GWP values are updated from the Fourth Assessment Report (AR4) to the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). The change from AR4 to AR5 GWPs may cause a significant change in sectors, including agriculture that use emission factors with relatively high contributions of methane. It would be misleading to interpret this as a true increase or reduction. Therefore, all previous inventories were recalculated based on updated GWPs, to ensure time series consistency.

Table 1 Global warming potential (GWP) of GHGs, based on 100-year period

GHGs	Scientific Formula	GWP (AR4)	GWP (AR5)
Carbon dioxide	CO_2	1	1
Methane	CH_4	25	28
Nitrous oxide	N_2O	298	265

Since Ministry for Primary Industries (MPI)'s *2023 National Exotic Forest Description (NEFD)* report has not yet been released, carbon sequestration from forestry is assumed to be the same as in 2021 and will be updated as the 2023 NEFD report is released.

Activities within Southland Region's boundaries generated approximately 6,753,059 metric tonnes of carbon dioxide equivalent (tCO_2e) in the 2022 calendar year.

When forestry carbon sequestration is included, the total net emissions for the region are 4,947,505 tCO_2e which is reduced by 14.8% or 862,116 tonnes of CO2e below the 2018 baseline year.

Agriculture is the largest contributor to the total gross emissions for Southland (64.5%), followed by Stationary energy (16.5%) and Industrial Processes and Product Uses (9.1%). Forestry removed a net volume of 1,805,554 tCO_2e or about 27% of the total gross emissions.

An overall reduction in total stock numbers (Table 4) in Southland has been the most significant factor in reducing regional GHG emissions. Agricultural emissions reduction was followed by Stationary energy, Industrial Processing, waste methane recovery and transport.

Tables 2 and 3 below show the regional emissions by scope and GHG type.

Scope 1 emissions (GHG emissions from sources located within the Southland region boundary) account for most emissions in the Southland Region, followed by

Scope 2 emissions (GHG emissions occurring through the use of grid-supplied electricity, heat, steam and/or cooling within the Southland region boundary).

Scope 3 emissions (GHG emissions that are happening outside the Region but are driven by activities within the region) have been estimated for stationary energy and transport related activities.

[3] Throughout this document 'emissions' means GHG emissions.
[4] World Resources Institute. (2021). Global Protocol for Community-Scale Greenhouse Gas Inventories. GPC_Full_MASTER_RW_v7.pdf (ghgprotocol.org)

Table 2 Southland region's Net emissions by sector and scope for 2022

Sector	Scope 1 (tCO_2e)	Scope 2 (tCO_2e)	Scope 3 (tCO_2e)	Total (tCO_2e)	% of Total
Stationary energy	614,874	448,351	51,990	1,115,215	22.5%
Transport	463,537		120,472	584,009	11.8%
Industrial Processes & Product Uses *	614,939			614,939	12.4%
Waste	83,556			83,556	1.7%
Agriculture**	2,549,786			2,549,786	51.6%
Total	**4,326,692**	**448,351**	**172,462**	**4,947,505**	**100%**

** Industrial Processes and Product Uses (**IPPU**)*
***Agriculture, Forestry, and Other Land Use (**AFOLU**)*

Table 3 Southland region's Net emissions by sector and gas type for 2022

Sector	CO_2 (tCO_2e)	CH_4 (tCO_2e)	N_2O (tCO_2e)	HFCs (tCO_2e)	PFCs (tCO_2e)	SF_6 (tCO_2e)	Total (tCO_2e)
GWP*	1	28	265	4 – 12,400	6,630 – 11,100	23,500	
Main source	Combustion of fossil fuel	Live stocks (burp and manure)	Urea and other fertiliser	Refrigeration, Foams and Aerosols	Aluminium production	Electrical transmission and distribution equipment	
Stationary energy**	1,082,625	28,316	4,273				1,115,215
Transport	569,910	3,020	11,079				584,009
Industrial Processes & Product Uses	544,514			24,562	45,578	286	614,939
Waste	5,797	73,760	3,999				83,556
Agreculture	-1,625,801	3,284,367	891,220				2,549,786
Total	**577,044**	**3,389,464**	**910,571**	**24,562**	**45,578**	**286**	**4,947,505**

** The Global Warming Potential (GWP) of a greenhouse gas is its ability to trap extra heat in the atmosphere over time relative to carbon dioxide (CO_2).*
*** The combustion of fuel (including electricity) for energy purposes in all uses other than transport. As such, it includes electricity generation, oil refineries, and direct combustion of fuels in the manufacturing, commercial, household, and primary industry sectors.*

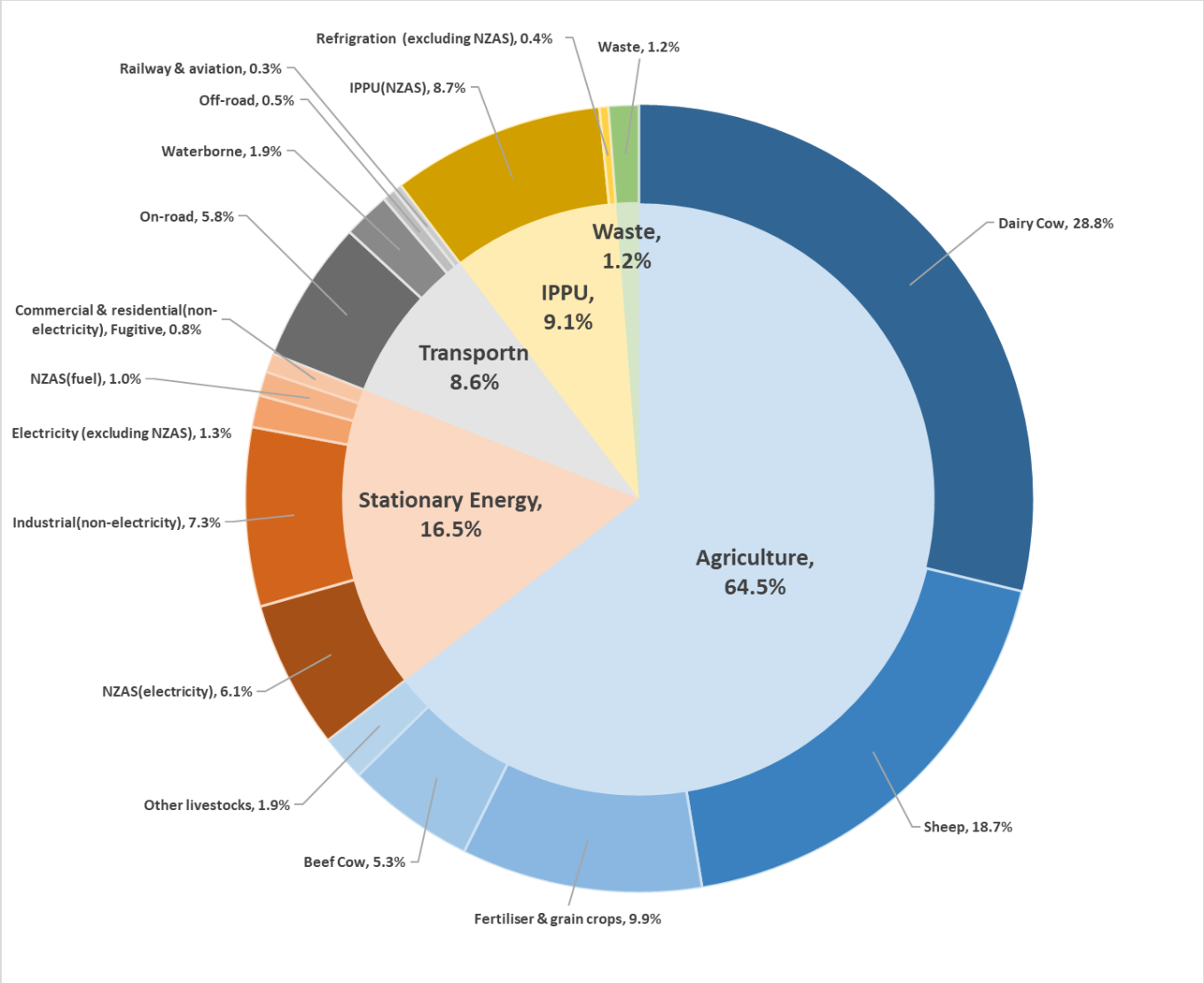


Figure 1 Southland region's emissions (tCO2e) by Sector (excluding forestry) for 2022

Figure 2 Emissions overview and changes from 2018 baseline

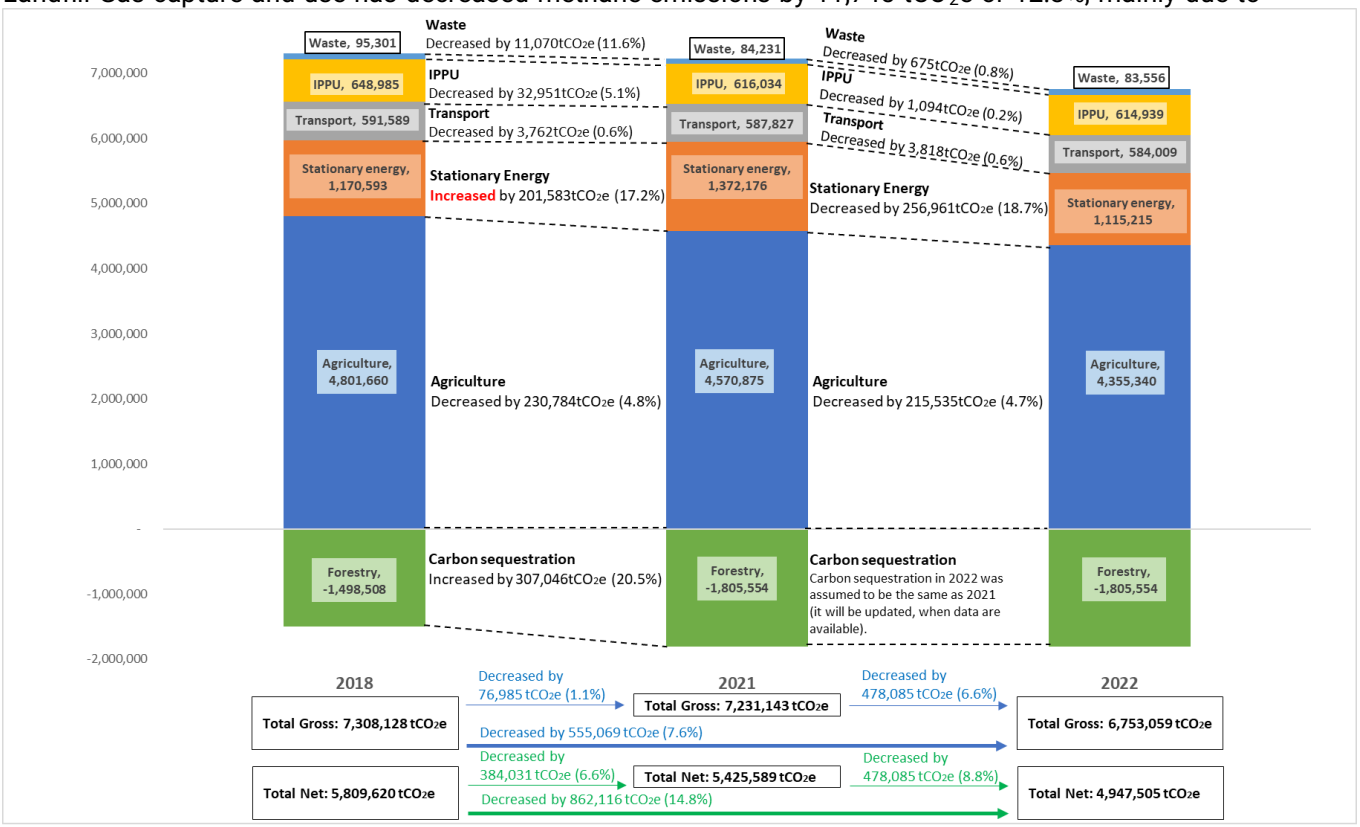
Table 4 Numbers of cattle and sheep in Southland 2018-2022

Livestock	2018	2019	2020	2021	2022	Total Change in stock numbers
Beef cattle	173,770	181,921	200,557	203,928	185,155	**+11,385**
Dairy cattle	681,011	658,626	659,726	642,690	636,148	**-44,864**
Sheep	3,737,512	3,407,144	3,350,354	3,395,748	3,281,894	**-455,618**

Changes from 2018 baseline

In gross terms, the total emissions for the Southland region have decreased by 555,069 tCO_2e between 2018 and 2022.

- As Table 4 shows the number of livestock units in Southland continues to decline and this is reflected in Figure 2 which shows agriculture emissions in the Southland Region have decreased the most (446,320 tCO_2e or 9.3%) – primarily due to:
  - Dairy cattle numbers decreased by 44,864 or 7% and
  - Sheep numbers decreased by 455,618 or 12% in the Southland region.
  - However, the number of beef cows increased by 11,385 or 7%,
- The stationary energy sector, the only sector in which total emissions increased in the previous year, also decreased this year (55,379 tCO_2e or 4.7%). This is mainly due to the decarbonisation projects implemented throughout Southland and decrease in the emission factor of electricity caused by increase in hydro lake inflow.
- Landfill Gas capture and use has decreased methane emissions by 11,745 tCO_2e or 12.3%, mainly due to



the significant increase in the recovery of methane at the Regional Landfill where collection efficiency increased from 30% to 75% gas recovery as site infrastructure was improved in 2021.

- Forestry sequestration has increased by 307,046 tCO_2e or 20.5%, primarily due to an increase in forest area.

Key findings

- In 2022, Southland emitted a total gross of 6,132,246 tCO_2e emissions under scope 1, with 448,351 tCO_2e reported as scope 2 and 172,462 tCO_2e reported as scope 3; All scopes combined total gross emissions of 6,753,059 tCO_2e and net emissions of 4,947,505 tCO_2e which is an overall reduction of 14.8%, from the 2018 baseline.
- Agriculture is the largest contributing sector, accounting for 64.5% of total gross emissions. The majority of this sector emissions is from dairy cows and sheep, accounting for about 74% of this sector.
- The next largest emission sources are the stationary energy sector and the industrial processes and product use (IPPU) sector, which account for 17% and 9% of total gross emissions, respectively. The emissions

from the Stationary energy sector are largely attributed to the electricity use at Tiwai Smelter[5] and fossil fuels used in milk process plants. More than 90% of the IPPU sector emissions were released as part of the aluminium smelting process in Tiwai smelter.

- In the Stationary energy sector, aside from electricity, the majority comes from coal, accounting for about 46% of the total emissions from this sector. About 76% of total coal use was used in dairy processing followed by meat processing and other heating and boiler systems.
- Gross emissions in Southland have been steadily decreasing since 2018 which is the baseline from which all emissions are measured. Total emissions for 2018 and 2022 were 7,308,128 tCO_2e and 6,753,059 tCO_2e respectively.
- Favourable hydro conditions decreased NZ's reliance on non-renewable sources for electricity generation in 2022. This change in power mix reduced emissions from electricity use by about 35% compared to 2021 and 8.7% compared to 2018.
- As carbon emissions in stationary energy and Industrial Processes and Product Uses (IPPU) sectors are mostly emitted from Tiwai Smelter[5] and Fonterra's Edendale operations, the forward planning of the decarbonisation of these industries is very important.
- To continue Emissions reduction, it is critical that the implementation of the Southland Murihiku Regional Energy Strategy 2022-2050 is supported, as this identifies the need for greater availability of renewable electricity, increased volumes of wood biomass fuels, and capture and use of methane as a direct substitute for LPG.

[5] The electricity used in Tiwai smelter was generated at Manapōuri hydro station, which is carbon neutral, but in this report, it was calculated by applying the national carbon emissions factor for electricity and includes coal consumption at Huntly Power Station