Guide to the Jersey Greenhouse Gas Inventory

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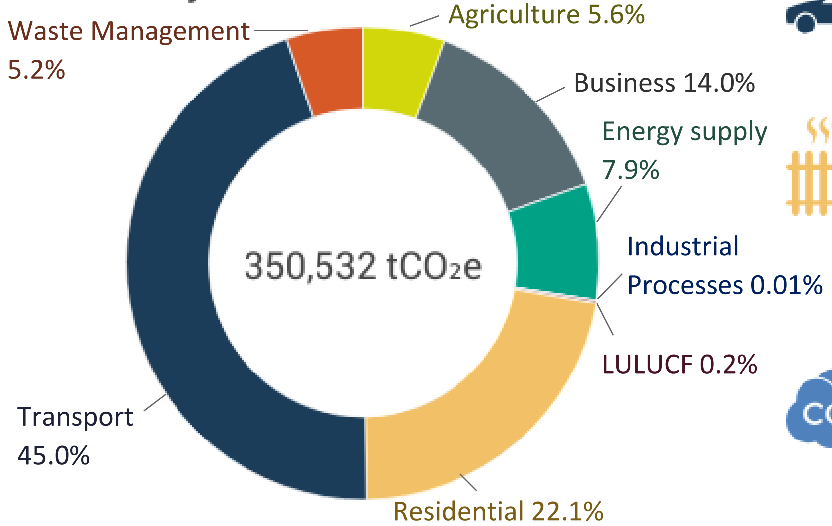
List of acronyms

AIS – Automatic Identification System
CAA – Civil Aviation Authority
CDs – Crown Dependencies
CH_4 - Methane
CO_2 - Carbon dioxide
DEFRA – Department for Environment, Food and Rural Affairs
DUKES – Digest of UK energy statistics
ERF – Energy recovery facility
EMEP/EEA – European Monitoring and Evaluation Programme/European Environment Agency
FAO – Food and Agriculture Organisation of the United Nations
FAOSTAT – Food and Agriculture Organisation Corporate Statistical Database
F-gases – Fluorinated gases
GDP – Gross domestic product
GHG – Greenhouse gas
GVA – Gross value added
GWP – Global Warming Potential
HFCs - Hydrofluorocarbons
IPCC – Intergovernmental Panel on Climate Change
LTO – Landing/take off
LULUCF – Land use, land use change and forestry
MSW – Municipal solid waste
MW - Megawatt
N_2O - Nitrous oxide
NF_3 – Nitrogen trifluoride
OTs – Overseas Territories
PFCs – Perfluorocarbons
SF_6 - Sulphur hexafluoride
SOC – Soil organic carbon
tCO_2eq – Tonnes of carbon dioxide equivalent
UK – United Kingdom
UNFCCC – United Nations Framework Convention of Climate Change

Jersey's Greenhouse Gas Emisisons Inventory 1990 - 2022

Jersey's GHG emissions inventory is updated every year and covers emissions from sources across several sectors and gases - primarily carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and f-gases. Emissions are reported as tonnes of carbon dioxide equivalents, tCO_2e

Emissions by sector in 2022



157,732 tCO_2e

Were emitted by the transport sector in 2022

122,895 tCO_2e

Emissions resulted from heating, cooling, and cooking in the business and residential sectors in 2022

84%

Of greenhouse gases emitted in 2022 were CO_2

1 tCO_2e is equivalent to travelling 5,737 miles with a small petrol car

Change from 2021

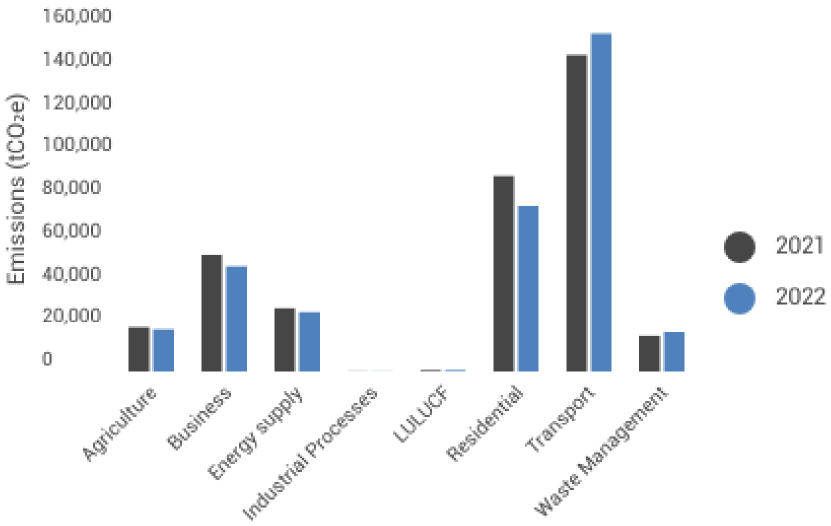
Overall, emissions **decreased by 3%** between 2021 and 2022

The largest change was in the **residential** sector, where emissions decreased by **15%**

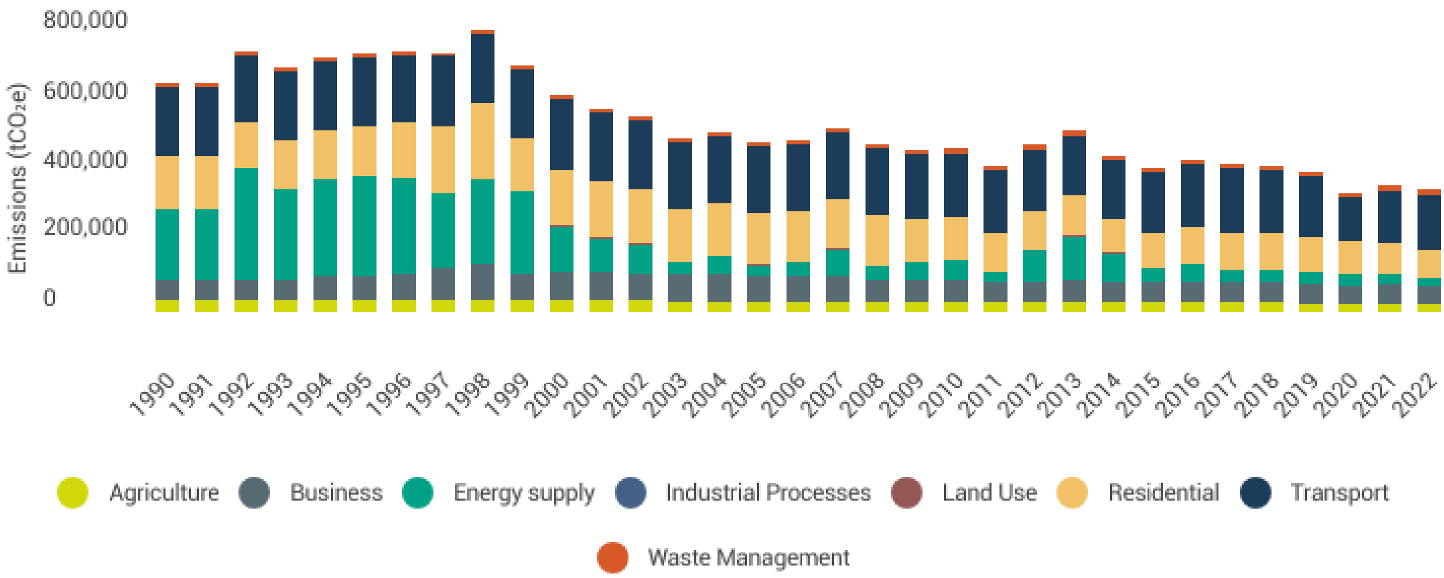
Transport emissions increased due to increased flights to the UK, other Crown Dependencies and several Overseas Territories signed up to the Kyoto Protocol

Business emissions decreased due to reduction in kerosene usage in commercial buildings

Waste management emissions increased due to continued incineration of waste without energy recovery



Emissions since 1990



Emissions have **decreased 47% since 1990**, from 661,568 tCO2e to 350,532 tCO_2e

Greatest reduction seen in the energy supply sector, driven by increase in imported electricity from France, emissions for which are reported under France's GHG inventory

Introduction

In 2019, the States Assembly declared a climate emergency and in doing so has recognised that climate change could have profound effects in Jersey. In response to the climate emergency declaration, the Minister for the Environment presented plans on how Jersey could aim to be carbon neutral by 2030 and presented the Carbon Neutral Strategy 2019. In May 2022 the States Assembly adopted the Carbon Neutral Roadmap, a document which outlines the policies needed to progress towards net zero. The roadmap focuses on action to be taken from 2022 to 2026.

The Paris Agreement is a legally binding international treaty on climate change with the aim to limit global warming to below 2°C, and to preferably 1.5°C, compared to pre-industrial levels. It was adopted by 196 Parties on 12th December 2015 and the UK's ratification was extended on the 3rd May 2022 to include Jersey.

A key component of planning for net zero carbon is to understand the key sources of emissions in Jersey, the trends in these key sources and their potential for future emissions reductions. This information is provided by the Jersey greenhouse gas emissions inventory. The inventory provides estimates for historical emissions of greenhouse gases from 1990 until the most recent submission year minus 2 (so the 2024 inventory covers the period 1990 to 2022).

This document provides a Q&A guide to the greenhouse gas inventory including an overview of the inventory methodology; how it is compiled, coverage and information on specific sources. Further detailed information on the inventory data and planned actions to reduce emissions can be found here.

1 Introduction to greenhouse gas inventories

1.1 What is a greenhouse gas inventory?

A greenhouse gas (GHG) inventory is a dataset which presents estimates of emissions of various greenhouse gases from a wide range of activities in a country or other geographical area. Greenhouse gas inventories are reported to the United Nations Framework Convention on Climate Change (UNFCCC) by countries and are used for policymaking, monitoring progress in carbon reductions and for modelling in the scientific community. The Jersey inventory forms part of the UK inventory, along with the other Overseas Territories and Crown Dependencies such as Guernsey and the Isle of Man. Decisions on what is and isn't included in the inventory and how the data are reported are not made by the UK or Jersey, but by the UNFCCC.

1.2 What sectors are included and excluded?

In line with international reporting guidelines, produced by the Intergovernmental Panel on Climate Change, greenhouse gas emissions are reported by National Communications sectors:

- Agriculture
- Business
- Energy supply
- Land use change
- Residential
- Transport
- Industrial processes
- Waste management

Figure 1 provides an overview of what is included and excluded from the Jersey greenhouse gas inventory. Emissions from international aviation and shipping are reported as memo items. This means that the activity is occurring outside of the country jurisdiction and, whilst an estimate of emissions is calculated, it is not included in the total emissions value (more information on aviation and shipping is provided in Chapter 2).

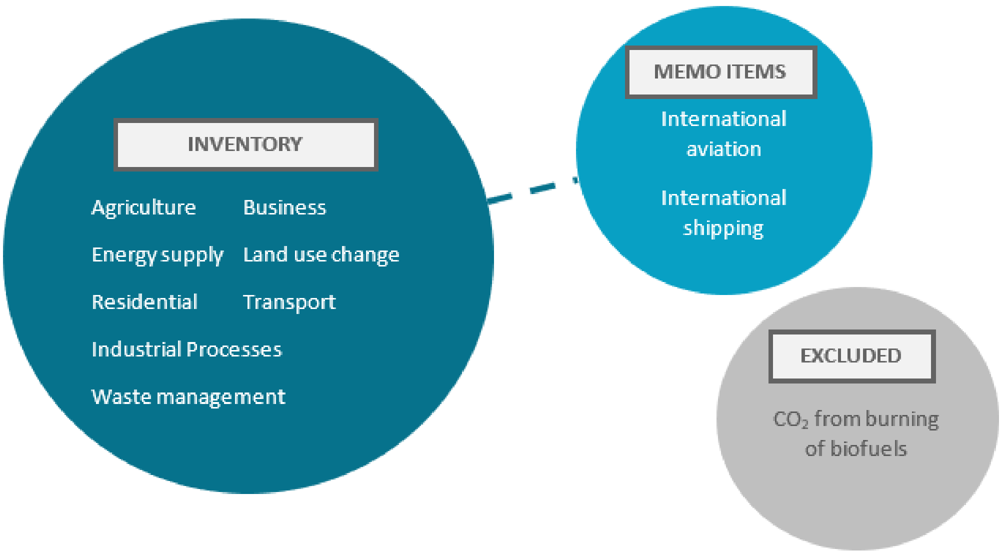


Figure 1 - Overview of sectors included and excluded from the greenhouse gas inventory

1.3 What is included within each inventory sector?

Figure 2 provides an overview of the key activities that are included in each inventory sector. Further information and data on sector and sub-sector trends and methodologies can be found in Chapters 3 and 4. A description of each sub-sector can be found in Annex 1.

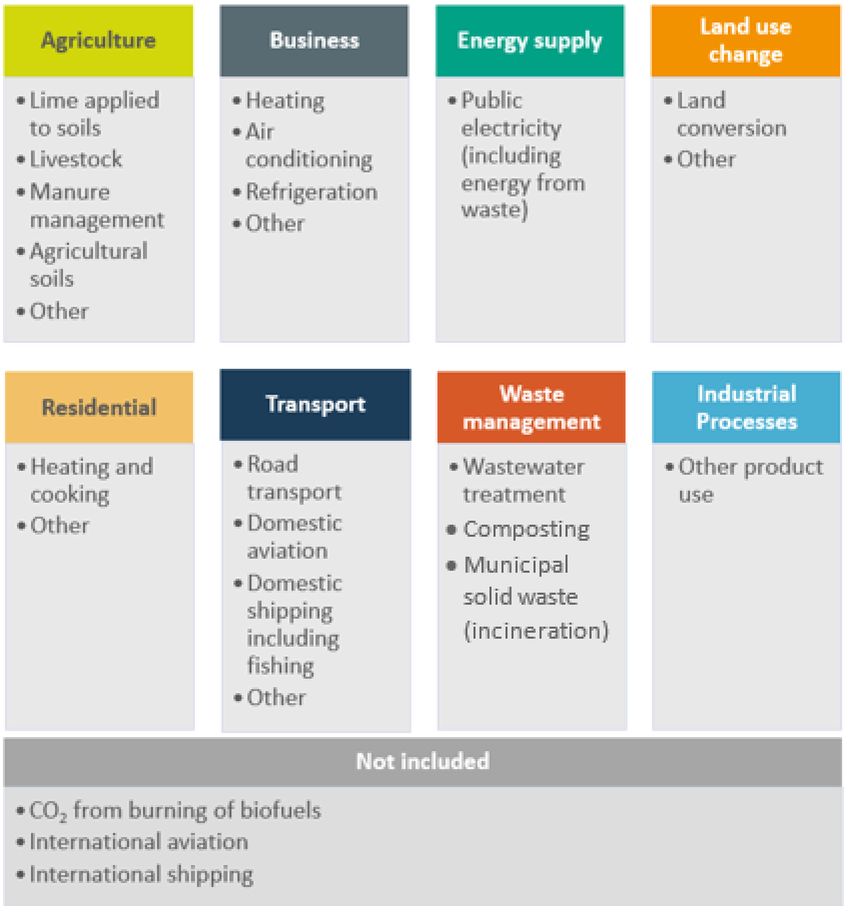


Figure 2 - Overview of activities covered in each sector.

Agriculture – This includes emissions from livestock, crop production and fertiliser application. In 2022 this sector contributed 6% to total GHG emissions in Jersey.

Business – This includes emissions from fuel use in the commercial and industrial sector as well as some specific industrial processes relating to the use of aerosols in air conditioning and refrigeration. In 2022, this sector contributed 14% to total GHG emissions in Jersey.

Energy supply – This sector includes emissions from fuel combustion for the generation of energy, predominantly the production of public electricity. For Jersey, this includes emissions from the Energy Recovery Facility where energy is generated from burning solid, non-biogenic waste and on-island energy generation. In 2022, this sector contributed 8% to total GHG emissions in Jersey.

Land use change – This sector consists of emissions or removals from the conversion of land from one use to another, for example the conversion of cropland to settlements. In 2022, this sector contributed 0.17% to total GHG emissions in Jersey.

Residential – This sector includes emissions from combustion of fuels in homes, for heating and cooking, as well as some smaller sources such as metered dose inhalers and other aerosols used in a domestic setting. In 2022 this sector contributed 22% to total GHG emissions in Jersey.

Transport – This sector includes emissions from road transport, domestic aviation, and domestic shipping. The largest source in this sector is passenger cars. This sector is the largest emissions source in Jersey in 2022, contributing 45% to total GHG emissions.

Waste management – This sector includes emissions from the treatment of domestic wastewater, composting, and incineration where waste burnt in the Energy Recovery Facility is not used to generate electricity. In 2022, this sector contributed 5% to total GHG emissions in Jersey.

Industrial processes – This sector includes emissions from the use of N_2O as a propellant in squirty cream. In 2022, this sector contributed 0.03% to total GHG emissions.

Not included - CO_2 emissions from the burning of biofuels are not included in the Jersey inventory, in accordance with IPCC Guidelines, and are therefore not included in national total emission estimates. Biogenic emissions are excluded in GHG inventories as bio carbon is renewable and naturally circulates in the environment. For further information on live and fossil carbon and the potential for soil carbon sequestration on the island, please see the 'Carbon sequestration and the role of soil and crops' report and sections 2.6 and 2.8.

Emissions from international aviation and shipping in Jersey are not included in the GHG inventory total but are included as a 'Memo Item' for the UK inventory. These memo items provide Jersey with an opportunity to report emissions from international transport, but not including these emissions in the national totals.

More information on the emission trends for each sector can be found in Chapters 3 and 4.

1.4 Which greenhouse gases are reported in the inventory?

The Jersey inventory covers the seven main greenhouse gases (GHG) required for reporting under the Paris Agreement. These seven GHGs directly contribute to climate change:

- Methane (CH_4)
- Carbon dioxide (CO_2)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF_6)
- Nitrogen trifluoride (NF_3)

HFCs, PFCs and SF_6 are commonly referred to as 'F-gases'. The Paris Agreement requires the reporting on nitrogen trifluoride (NF_3). This has not been included within the inventory as it is assumed there is no activity on the island that would result in these emissions.

Global Warming Potentials

Greenhouse gases absorb energy and slow the rate at which the energy can escape into space, causing global temperatures to increase. Different greenhouse gases absorb energy at different rates and therefore have different 'global warming potentials' (GWP). GWPs allow you to compare the impacts of each gas on global warming.

Carbon dioxide always has a global warming potential of 1 because it is used as the reference gas. The global warming potential of other gases is therefore a measure of how much energy will be absorbed by 1 tonne of the gas, relative to the amount of energy absorbed by 1 tonne of CO_2 over a given period of time (usually 100 years). **Table 1** shows the GWPs for key greenhouse gases.

Example: The global warming potential of methane is 28. Therefore, 1 metric tonne of methane (CH_4) emitted is equivalent to 28 metric tonnes of carbon dioxide (CO_2).

In the GHG inventory, each of the six GHGs is presented in carbon dioxide equivalent (CO_2eq) units, as this helps to increase consistency in reporting and allows the emissions to be added together to calculate a total. These are calculated by multiplying the emissions of a gas by the corresponding global warming potential. This metric of measurements allows for emissions from various GHGs to be compared.

The IPCC revise GWPs to reflect improvements in our understanding of the impact of each greenhouse gas on global temperatures. Since the 1990 – 2021 inventory, to align with international reporting requirements, the GWPs are the values from the IPCC's Fifth Assessment Report (AR5).

Table 1 *- Global Warming Potentials (GWPs) for 100-year time horizon from IPCC Fifth Assessment Report (AR5) **

Greenhouse gas (GHG)	Global Warming Potential (tonnes of CO_2 equivalent per tonne of gas)
Carbon dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous oxide (N_20)	265
Hydrofluorocarbons (HFCs)	Between 4 and 12,400
Perfluorinated compounds (PFCs)	Between 6,630 and 11,100
Sulphur hexafluoride (SF_6)	23,500

* AR5 values are used in line with international reporting requirements

1.5 How frequently are emissions reported?

The most recent inventory includes estimates of emissions from all sources and sectors for the years 1990 to 2022. The inventory always reports data for the timeframe of 1990 to the year that is 2 years before the year of reporting i.e. 2022 in 2024. This delay is the result of the time required for official statistics to be available and the amount of time to compile the necessary data and check and finalise the emissions reported. The data are provided annually in accordance with international regulations.

Every year the whole timeseries is updated and revised (from 1990) to capture any improvements in methodologies and ensure internal consistency. This is important as emissions from one source in 2010 may differ between the 2018 and 2019 inventory for example, as methodologies may have changed. The latest inventory year is therefore the most up to date and is the inventory which should be used.

Example: In the waste management sector of the Jersey inventory, the emissions in 2021 for 5D1 Domestic wastewater treatment were 6,273 tCO_2eq in the 1990-2021 inventory but in the 1990-2022 inventory this category is estimated at 10,160 tCO_2eq. This reflected an improvement made to the data for the most recent inventory and therefore this inventory more accurately reflects activities in Jersey.

1.6 How are greenhouse gases emissions estimated?

The basic equation for estimating most emissions is:

Activity X **Emission Factor** = **Emission**

Activity - This is a measure of the activity which is taking place, such as number of cows or tonnes of fuel combusted. This data typically comes from national statistical datasets.

Emission Factor - This is the emissions per unit of activity, which usually comes from the scientific literature. It is typically derived from measurement.

Example: Emissions of N_2O from diesel fuelled power stations in 2022 in Jersey

Tonnes of diesel used at power stations in Jersey in 2022 X **N_2O per tonne of diesel** = **Emissions (tonnes) of N_2O from diesel power stations**

Emission factors often come from scientific literature and reference documentation, most notably the IPCC National Greenhouse Gas Inventory Guidelines[1]. The activity data is derived from the national datasets. By multiplying both values together, an amount of emissions for N_2O from diesel fuelled power stations for the relevant year is calculated. It is important to note that this is basic equation for calculating emissions, and that in reality it is rarely this simple. In this example, the type of fuel used, maintenance of the power station, age and more will impact the emissions estimate.

1.7 What is the difference between 'by source' and 'end user' emission inventories?

There are two methods for reporting GHG emissions, by-source and end user. The difference in the two lies in where the emissions related to fuel production are reported.

By Source – In a by-source inventory, emissions are allocated to the source sector in which they occur and emit emissions directly. The emissions related to fuel production are allocated to where the fuel is produced and processed.

[1] https://www.ipcc-nggip.iges.or.jp/public/2006gl/

Example: The energy supply emissions in the Jersey inventory remain continually small as emissions from electricity production and fuel processing are reported by source. As Jersey predominantly imports its electricity from France, the resultant greenhouse gas emissions from the energy supply sector are therefore counted in France's national inventory. However, the on-island generation of energy i.e. from Energy from Waste facilities is counted within Jersey's inventory.

End User – This method reallocates some emissions to the final user of fuels. This means that emissions from the production and processing of fuels, including the production of electricity, are reallocated to users of these fuels to reflect total emissions for each type of fuel consumed.

The officially reported greenhouse gas inventory for Jersey is a 'by source' inventory, rather than an 'end user' one, in line with international reporting. This means emissions reported are attributed to the sector that emits them directly, from the production and processing of fuels (including the production of electricity). An 'end user' inventory by comparison allocates these emissions to the consumers of these fuels, to reflect the total emissions relating to that fuel use.

Example: If Jersey's inventory were reported on an end-user basis, this would include emissions associated with the production of imported electricity used in the island. This would increase emissions related to energy consumption.

1.8 Are there other methods for carbon accounting?

The UK government has historically published GHG emissions using 3 different accounting methods:

- **Emissions from the GHG inventory** – a by-source inventory of emissions occurring in the country for reporting under the United Framework Convention on Climate Change (UNFCCC) and for tracking progress against national and international emission reduction targets.
- **Emissions measured by the UK Environmental Accounts** – estimates emissions resulting from the various sectors of the UK economy. The figures represent emissions resulting from activities of UK residents and industries whether in the UK or abroad. This excludes emissions produced within the UK by oversees residents and businesses.
- **Embedded emissions** – measures emissions on a "consumption" basis and takes into account emissions that are embedded in goods and services imported and exported by the UK.

Jersey only produces emissions using the first method of accounting, the GHG inventory. Scope definitions and embodied carbon are therefore not considered as they are not included within the framework of UNFCCC inventories.

When looking at other forms of carbon accounting beyond the inventory, emissions are sometimes divided into three categories, or scopes, in order to distinguish between direct and indirect emission sources (**Table 2**). For more information on indirect GHG emissions, see the 'Considering the Channel Islands' indirect GHG emissions' report.

Table 2 - Description of different emission scopes according to the GHG Protocol for Cities[2]

Category	Description	Example sources
Scope 1: Direct emissions	Emissions from all activities that occur within the reporting jurisdiction, including operations that are owned or controlled by the jurisdiction	• All modes of transport, including cars, lorries and trains • Combustion in houses and commercial buildings e.g. for cooking and heating • On-island electricity generation
Scope 2: Indirect emissions	Emissions from the generation of purchased or acquired electricity, steam, heating, or cooling consumed by the reporting jurisdiction	• Emissions associated with electricity that is imported
Scope 3: Indirect emissions	GHG emissions that occur outside of the island boundaries as a result of activities that take place on-island	• Transboundary transport • Waste treatment and disposal outside the island boundary • Transmission and distribution losses from grid-supplied energy
Other Scope 3	Additional Scope 3 emissions that occur due to on-island activities. These are harder to measure and calculate and are not so well defined	• Embodied emissions in fuels, water, food and construction materials

This approach can help to improve completeness of reporting for certain requirements (such as organisation level carbon reporting) but is not consistent with the methods used for national inventories, which only include scope 1 emissions, and so is not relevant to the Jersey GHG inventory. Jersey has however committed to including both Scope 1 and 2 emissions in their emission reduction targets, as set out in their Carbon Neutral Roadmap. The relative magnitude of Jersey's scope 1 and scope 2 emissions are presented in

[2] https://ghgprotocol.org/sites/default/files/standards/GHGP_GPC_0.pdf

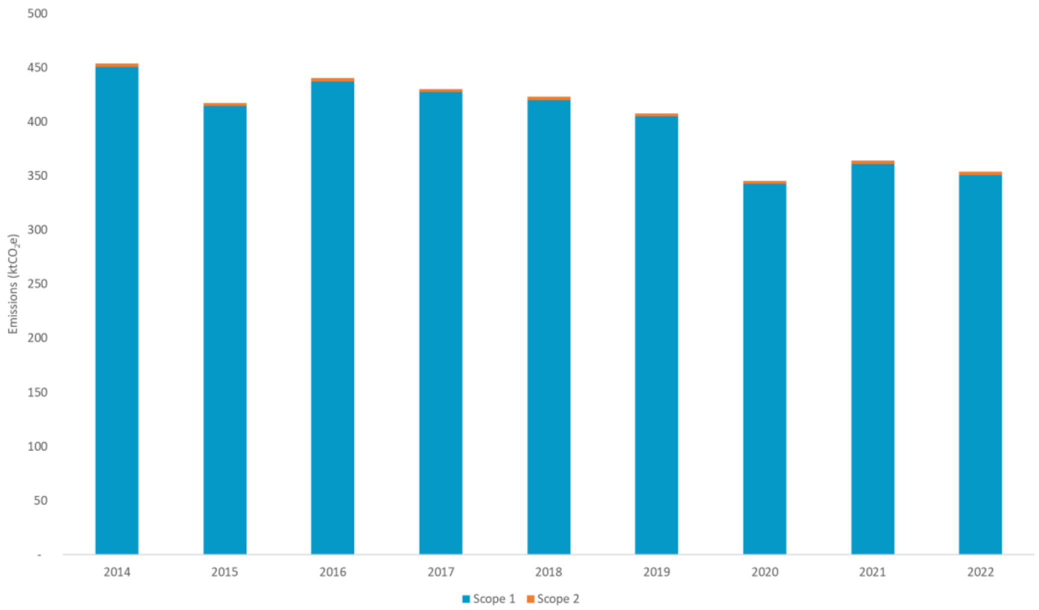


Figure 3 and **Table 3.**

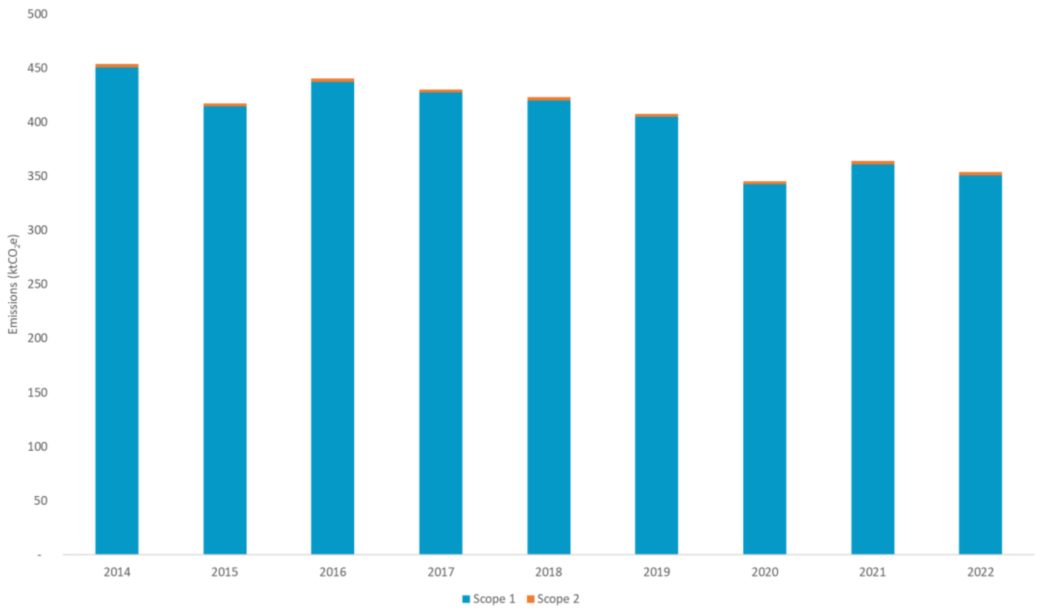


Figure 3: Jersey's total scope 1 and scope 2 emissions in $ktCO_2e$, 2014 - 2022

Table 3: Jersey's total scope 1 and scope 2 emissions in $ktCO_2e$, 2014 - 2022

Year	Emissions ($ktCO_2e$)	
	Scope 1	Scope 2
2014	450.7	2.8
2015	414.3	2.9
2016	437.2	2.9
2017	427.4	3.0
2018	420.0	3.0

2019	404.6	3.1
2020	342.4	3.1
2021	360.7	3.2
2022	350.5	3.2

Figure 4 and **Table 4** . Scope 1 emissions represent emissions from on-island generation whilst scope 2 covers emissions from electricity imported from France. In 2022, 90% of total energy supply emissions were scope 1 on-island generation.

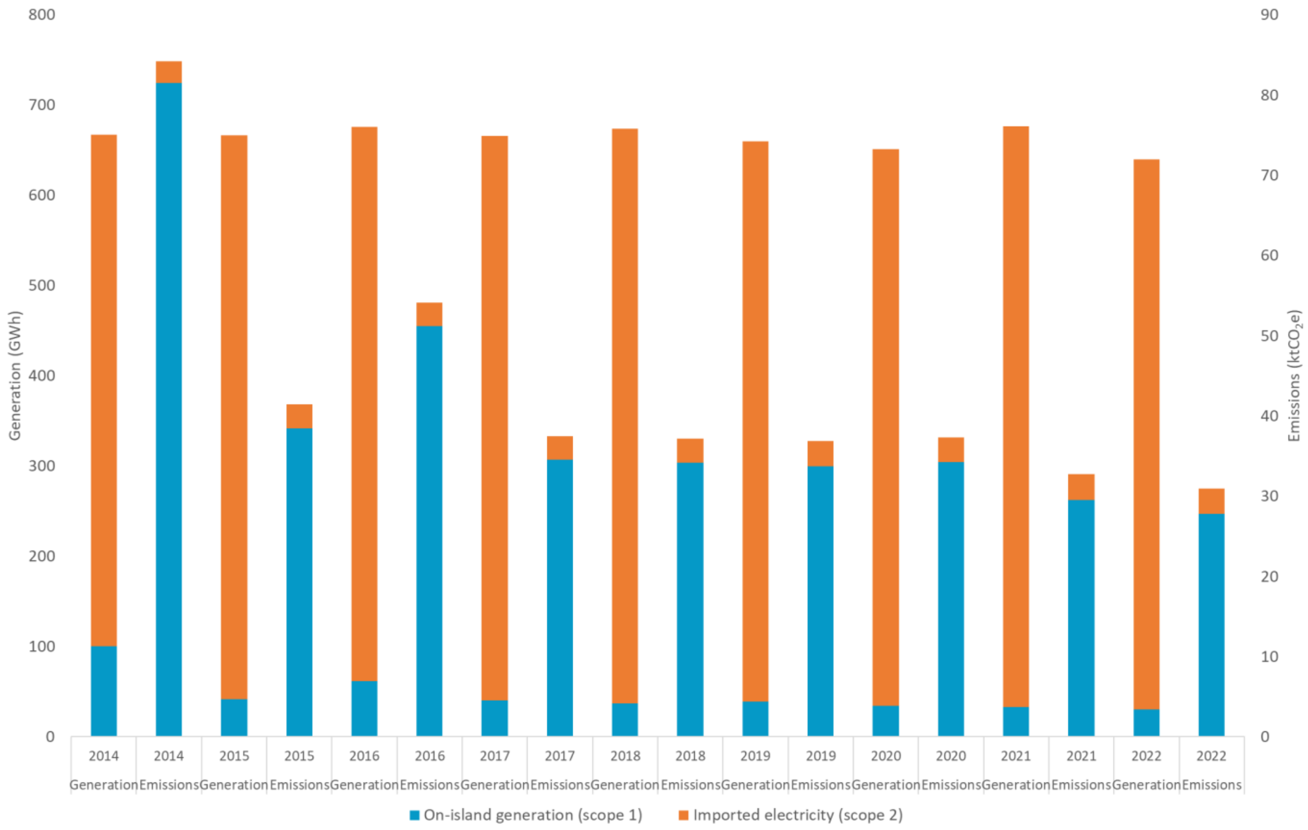


Figure 4: Scope 1 and 2 electricity generation and emissions from the energy supply sector, 2014 - 2022

Table 4: Scope 1 and 2 electricity generation and emissions from the energy supply sector, 2014 - 2022

Year	Generation (GWh)		Emissions (ktCO₂e)	
	Scope 1	Scope 2	Scope 1	Scope 2
2014	100.7	566.2	81.5	2.8
2015	41.7	625.0	38.5	2.9
2016	61.7	614.2	51.2	2.9
2017	40.3	625.5	34.5	3.0
2018	36.9	636.8	34.1	3.0
2019	39.0	621.0	33.8	3.1
2020	34.2	617.2	34.3	3.1
2021	33.2	643.3	29.5	3.2

2022	30.0	609.6	27.8	3.2

Scope 3 emissions by comparison are proportionally much larger than scope 1 and scope 2 emissions and cover sources such as international travel, imported goods, investments, and embodied emissions. As an example, **Figure 5** demonstrates the different scope 3 emission sources associated with imported cheese. Scope 3 sources are currently not included in the inventory, aside from international travel which categorised as a 'Memo item'. Embodied emissions are not included as such in the Jersey inventory, because the structure of the inventory is not defined in this way – the purpose of the inventory is to capture scope 1 emission sources, and inclusion of embodied emissions would result in double counting. Under international reporting, one country's scope 1 source could also be another country's scope 3 source. Some production emissions are included at source such as for food products in the agriculture sector.

Figure 5: Scope 3 emissions associated with imported cheese

Embodied carbon can be defined as the full carbon footprint of a certain product or material. Different emissions are produced throughout the supply chain of the material including emissions from fuel combustion at the factory where a product is created, or emissions from transport as the goods are imported.

2 Frequently asked questions

2.1 How are emissions from La Collette and Energy Recovery Facility reported?

In 2000, the 90MW Normandie 2 supply cable was installed, supplying Jersey with electricity from France, reducing the need for the diesel engine power plant and therefore causing a reduction in emissions. The La Collette site is where energy is produced on the island. At this site there are 2 facilities: an Energy Recovery Facility (ERF) and a back-up power station. Around 5% of Jersey's energy supply was produced on-island in 2022, from the ERF and solar panels. The back-up power station at La Collette relies on the burning of two fuel types: heavy fuel oil and diesel.

The amount of energy generated at La Collette (and hence the amount of fuel used and emissions produced on-island) depend on the supply of energy from France. In 2012, failure of the 90MW Normandie 2 supply cable meant electricity had to be generated on-island, leading to an increase in emissions in the energy supply sector.

Greenhouse gas emissions generated through Energy Recovery Facilities are largely accounted for in the energy supply sector because energy is captured from the incinerated solid waste and used to produce electricity. The solid waste is therefore considered as a fuel for energy supply. However, in late 2021 and early 2022, a portion of municipal solid waste was incinerated and not used for electricity generation. Greenhouse gas emissions resulting from this are accounted for in the waste management sector. Municipal solid waste is split into biogenic (of biological origin, such as paper, cardboard and wood) and non-biogenic (manmade materials). The UK percentage split of biogenic and fossil carbon is applied to Jersey. Only non-biogenic waste is considered to contribute to GHG emissions and therefore only this data is included in the emissions calculation. This is because any impact of natural biomass reduction, e.g. through forestry or wood production, on carbon stock change are assumed to be accounted for in the land use change sector.

2.2 How are emissions from aviation sources reported?

Aviation emissions are split into domestic and international. Domestic aviation emissions are accounted for in the Jersey inventory whilst international aviation emissions are not.

Domestic aviation covers emissions from civil domestic passenger and freight traffic that depart and arrive the same country. The Jersey inventory is included within the UK inventory for reporting under the UNFCCC along with other Crown Dependencies (CDs) and Overseas Territories (OTs). Therefore the UK, Jersey and other OTs and CDs are all considered as the same country and classified as domestic when accounting for aviation emissions. The activity data used to calculate emissions comes from the UK Civil Aviation Authority who hold data on aircraft movements by airport, aircraft type and destination. Emissions from aircrafts are distinguished between two separate operations: Landing/Take Off (LTO) and Cruise. Emissions for the whole journey are attributed to the country that the flight departed from.

International aviation includes emissions from flights that depart in one country and arrive in another. For Jersey this means any flight that departs from Jersey and arrives anywhere outside of the UK and other OTs and CDs, or vice versa. The emissions for the entire journey are divided between the source country and the destination country. These emissions are included as 'memo items' for the UK inventory.

Figure 6 and **Table 5** summarise the differences between domestic and international aviation.

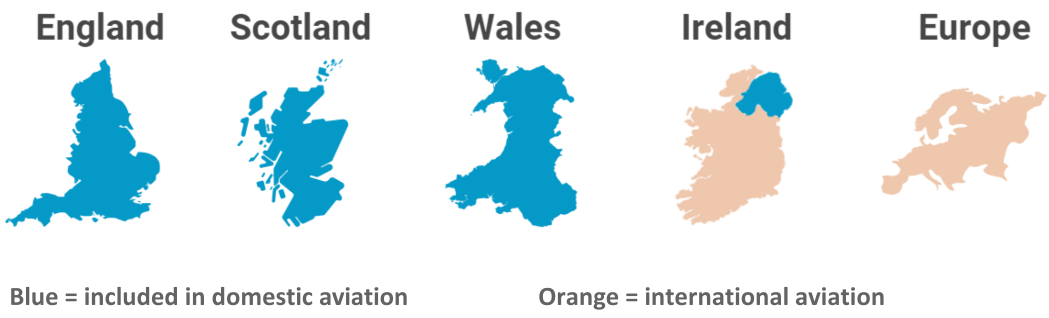


Figure 6 -Domestic and international boundaries for the Jersey inventory

Table 5 - Overview of domestic and international aviation for the Jersey inventory

Domestic aviation	International aviation
Civil domestic passenger and freight traffic that arrive and depart in the same country	Flights that depart from one country and arrive in another (outside of UK)
This includes flights between Jersey and the UK and other Crown Dependencies e.g. Guernsey	Emissions for the entire journey are divided between the two countries
Reported in the inventory under domestic aviation	Not included in national total emissions. Included as a memo item to the UK inventory

Jersey has witnessed an increase in overall emissions from aviation sources from 1990 – 2019. Emissions from domestic aviation remained a significant proportion of Jersey's total transport emissions at 31% in 2019. The travel restrictions imposed to reduce the spread of COVID-19 during 2020-2021 impacted the aviation sector. As such, emissions from domestic aviation decreased, comprising 23% of transport emissions in the 2021 inventory and became the third greatest source of emissions after cars and heavy-duty trucks and buses, respectively. In 2022, domestic aviation emissions returned to 31% of Jersey's total transport emissions.

2.3 How are emissions from marine sources reported?

Emissions from international water-borne navigation and domestic water-borne navigation are differentiated. As with aviation, domestic navigation emissions are accounted for in the Jersey inventory whilst international navigation emissions are not.

The same definition of domestic and international as used for aviation (see section 2.2.) is used for navigation. Therefore, any journey leaving the UK, Jersey or another OT or CD and arriving in Jersey is classed as domestic navigation. Emissions for these journeys are attributed to the place of arrival.

International journeys are treated the same as in aviation, emissions are split equally between the two countries and reported as a memo item in the UK inventory.

Emissions from fishing in Jersey are counted as a separate marine source, and this includes emissions from fuels combusted for inland, coastal and deep-sea fishing. Any fishing vessel which has refuelled in Jersey (including international fishing), is considered in the inventory.

Emissions from shipping remain a small proportion of Jersey's total transport emissions, accounting for 5.5% in 2022. Emissions from fishing vessels in Jersey were estimated at 0.8% of total transport emissions in Jersey's 2022 inventory.

Chapter 3 provides more information on the Jersey inventory, considering trends, sources and methodologies in more detail.

2.4 Is blue carbon accounted for?

Blue carbon is the atmospheric carbon dioxide (CO_2) that is captured and stored in coastal and marine ecosystems such as mangroves, marshes and seagrass meadows. These coastal ecosystems can store more carbon per unit area than terrestrial forests and as such these ecosystems can therefore offer an option for the mitigation of climate change whilst also providing benefits for adaptation including coastal protection and food security. However, whilst these ecosystems sequester carbon, if they become degraded or damaged by human activity, the sequestered carbon could be released, contributing to CO_2 emissions.

Currently, accounting for blue carbon is not a key element of a national greenhouse gas inventory, although mangroves, salt marshes and seagrasses can be included in national accounting (included under wetlands) where relevant. The '2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands' provides methodologies and emission factors for calculating emissions from coastal wetlands. Several countries, including Japan, Australia and Canada have started to implement this in their national inventory report[3].

Conserving and restoring terrestrial forests is currently recognised as an important aspect of climate change mitigation with countries taking action to manage and conserve natural systems. For example, the UNFCCC's mechanism for reducing emissions from deforestation and forest degradation in developing countries (REDD+) encourages sustainable management of forest ecosystems. These approaches could be extended to coastal ecosystems, promoting sustainable management of the ecosystems and avoiding damage and degradation[4]. This is not yet something that is included in standard accounting practices for national emissions inventories. As outlined in Jersey's Carbon Neutral Roadmap 2022, additional research into Jersey's marine environment is underway. Once complete, this will provide more information relating to marine ecosystems and blue carbon.

2.5 How could Jersey achieve net zero emissions?

How Jersey aims to achieve net zero emissions has been set out in the Carbon Neutral Roadmap.

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[3] Australian Government initiatives for blue carbon

[4] IUCN https://www.iucn.org/resources/issues-briefs/blue-carbon

Although Jersey aims to be net zero carbon emissions in 2050, in reality, there will likely still be some “unavoidable” carbon emissions.

Individuals and organisations can reduce these emissions by purchasing offsets as part of the voluntary carbon market. Carbon offsetting is the process of compensating for CO_2-equivalent emissions that have been emitted into the atmosphere through human activity. This enables individuals and organisations to compensate for any emissions they cannot avoid or reduce, by paying for a carbon credit i.e. to pay for an equivalent amount of emissions to be reduced or removed elsewhere. These emissions savings are generated through the implementation of a wide variety of projects across a wide range of locations and might range from planting trees, to installing solar panels, to cancelling industrial carbon credit allowances. The Climate Change Committee warns that offsetting is not a sole solution and that to reach net zero, “most sectors will need to reduce emissions close to zero without offsetting; the target cannot be met by simply adding mass removal of CO_2 onto existing plans.”[5]

Carbon offsetting can take place internationally wherein investors from one country implement a project in another country which removes CO_2, for example, Jersey offsetting emissions through planting trees abroad. Offset emissions would not be accounted for in Jersey’s inventory in this instance as this would result in double counting. Whilst there are standards and guidance within the voluntary carbon market e.g. Gold Standard, there are also mechanisms in place at a country or region level. For example, since leaving the European Union, the UK has established a UK ETS (Emissions Trading Scheme) which operates on the same principle of the EU ETS. A ‘cap and trade’ approach to reducing emissions is in place - a total cap is set on GHG emissions in certain sectors which will decrease over time and participants can receive free allowances and/or buy emission allowances to trade with other participants.

At a national scale, Jersey can also put in place measures that remove emissions from the atmosphere which could result in a net zero emissions inventory. These measures could include tree planting and implementing technology solutions such as carbon capture and storage on the Energy Recovery Facility. The use of carbon capture and storage on the Energy Recovery Facility would lead to a reduction in emissions from the energy supply sector of the inventory. In the long term, tree planting would impact emissions in the LULUCF sector, assuming that local land cover maps are used in future inventory updates. However, the extent to which tree planting can help to achieve negative emissions in Jersey is limited by land availability. Carbon credits bought by individuals and organisations as part of offsetting schemes would not impact the Jersey national GHG inventory unless the offsetting project was occurring within Jersey. For offsetting projects occurring within Jersey, the impacts would be reflected in changes in the activity data used in the inventory.

2.6 How are emissions from soil carbon sequestration accounted for?

Carbon sequestration is the act of capturing carbon dioxide (CO_2) from the atmosphere, storing it, and preventing it from being re-released. In the context of GHG inventories, the uptake and storage of CO_2 is covered under the land-use, land-use change and forestry (LULUCF) sector. CO_2 fluxes between the atmosphere and ecosystems are

[5] Committee on Climate Change (2019), Net Zero – The UK’s contribution to stopping global warming, 2 May 2019

primarily controlled by uptake through plant photosynthesis and releases via respiration, decomposition and combustion of organic matter (**Figure 7**).

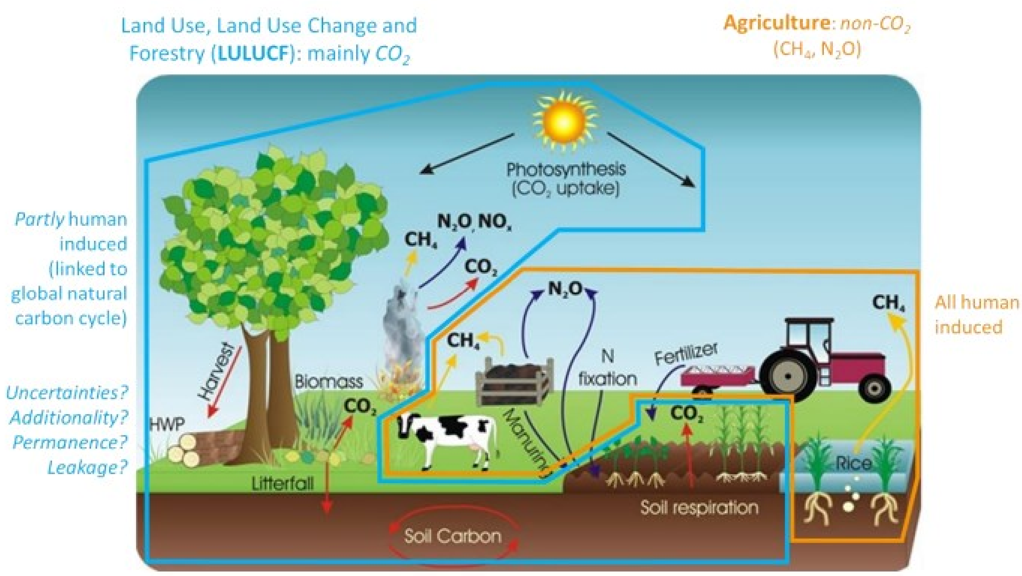

Figure 7 Sources and sinks of GHG emissions in agriculture, forests, and other land use systems. Source: IPCC 2006, Volume 4, Chapter 1[6]

Soil organic matter includes organic carbon in mineral soils to a specified depth. This includes live and dead fine roots and dead organic matter less than around 2mm which cannot be distinguished from the soil. The dominant processes governing the balance of soil organic carbon stocks are carbon inputs from plant residues (transfer of carbon from the living biomass pool) and carbon losses as emissions from decomposition. For further detail please see the 'Carbon sequestration and the role of soil and crops' report.

In the case of Jersey, the Tier 1 approach outlined in the IPCC Guidelines and default values for soil organic carbon and management factors were used. Grassland converted to Cropland is considered as natural grassland changed to annual cropland. It is assumed that the soil organic carbon (SOC) is higher in grassland compared to cropland so as such, each year there is a loss of SOC until equilibrium is reached. It was assumed that the transition to equilibrium took place over 20 years, which is the default year listed within the IPCC Guidelines.

2.7 What is the difference between Kyoto and Paris reporting?

The Kyoto Protocol is an international treaty that was created in December 1997 in Kyoto, Japan. The protocol came into force in 2005 and was an agreement for adopted Parties to collectively reduce the emissions from six greenhouse gases: CO_2, CH_4, N_2O, SF_6, HFCs, and PFCs. The Kyoto Protocol was extended to Jersey in 2007 and therefore Jersey's emissions are included as part of the UK's total emissions. Reduction commitments were set across two periods, 2008-2012 and 2013-2020. In the first commitment period, the reduction target was 5% compared to 1990 levels. In 2012, as part of the Doha amendment, a reduction commitment of 18% reduction from 1990 levels was set for the second commitment period. The GHG nitrogen trifluoride, NF_3, was also introduced during the second commitment period. To recognise that developed nations, owing to economic development, are historically responsible for the

[6] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_01_Ch1_Introduction.pdf

current levels of GHG in the atmosphere, the agreement was legally binding for developed nations. Jersey's obligations regarding Kyoto fell under the UK's legally binding obligations. Developing nations were not required to ratify the Kyoto Protocol.

The Paris Agreement was signed in November 2016 at COP21. Currently 194 Parties have ratified the Paris Agreement[7], committing to contribute to the overall goal of limiting global temperatures to 1.5^{o}C above pre-industrial levels. As under the Kyoto Protocol, Parties are required to annually submit a GHG inventory covering seven GHGs across five sectors. Reporting under the Paris Agreement will commence in 2024 and each nation must declare its next set of targets every five years. In addition to reporting of a GHG inventory, Parties under the Paris Agreement are required to monitor and report progress towards meeting their targets. The Paris Agreement is a non-binding document where Parties don't incur any penalties for not meeting their targets.

The UK's ratification of the Paris Agreement was extended to cover Jersey in May 2022. From 2024 (covering the 1990 – 2022 inventory), the UK, and by extension Jersey, adheres to Paris reporting.

2.8 Biofuel emissions

Biofuel is fuel derived from biomass such as vegetable oils, animal fat and plant matter rather than fossil fuels and encompasses biogasoline, biodiesel, and other liquid biofuels. Biofuels can be used in place of diesel to run vehicles or in place of heating oil to heat homes.

In line with established GHG inventory conventions, emissions related to the growing of plant biomass are attributed to land use change in the inventory of the country or countries where biomass is grown along with other land management. CO_2 emissions from the combustion of the biogenic carbon of these fuels are treated in the agriculture and land use and forestry sectors and should be reported separately as an information item in the inventory of the country or countries where combustion occurs. However, CH_4 and N_2O emission rates depend largely upon the combustion and emission control technology present in the vehicles or heating appliances and these emissions are reported in the energy sector (for example under transport or residential depending on where the biofuel is specifically being burnt as a fuel).

Biofuel use is not currently reflected in Jersey's GHG inventory, however, an improvement to include this source is under close review. An unknown but likely small quantity of CH_4 and N_2O emissions resulting from the combustion of biofuel in Jersey is currently not accounted for. CO_2 emissions from combustion would be reported as information rather than as part of the official total. It is currently assumed that only petrol and DERV (road diesel) are used by road transport and that there is no biofuel usage. To include any biofuel used in road transport, the quantities of each biofuel type used in each vehicle type will be needed. Similarly, for biofuel emissions from the residential or commercial sector to be included, information on the quantities of each biofuel type used in these sectors is needed.

Whilst biofuel is a low carbon alternative to fossil fuels, there are wider impacts which need to be considered. Examples include competing requirements for land to grow biofuel versus food and potentially increased air pollutant emissions.

[7] https://unfccc.int/process/the-paris-agreement/status-of-ratification

3 Jersey's greenhouse gas inventory – overview

3.1 Total GHG emissions from different sources

Figure 8 provides an overview of Jersey's inventory categorised by sector.

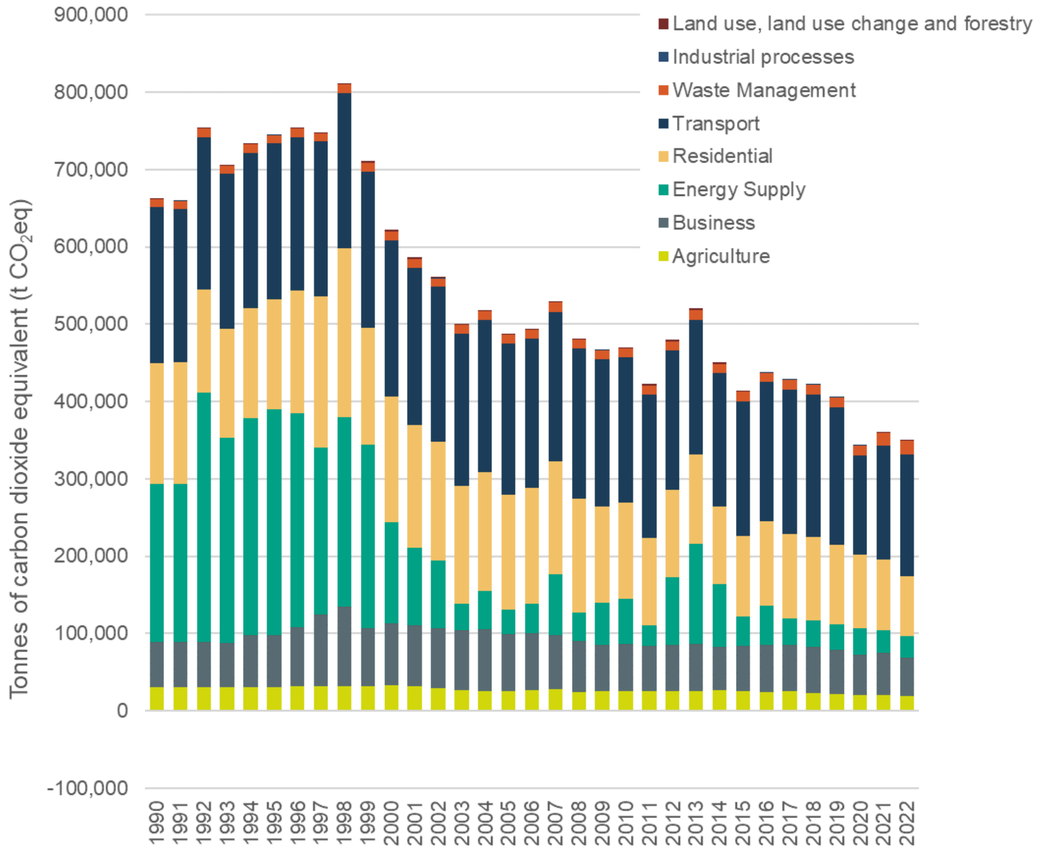

Figure 8 Jersey's Inventory categorised by sector

In 2022, Jersey emitted 350,532 tCO_2eq. Between 1990 and 2022, emissions in Jersey have decreased by 47%. As

Figure 8 shows, this reduction is largely driven by a decrease in emissions from energy supply. This reduction has been noticeable since the installation of the 90MW Normandie 2 supply cable in 2000. This cable supplies electricity to Jersey from France. Emissions associated with electricity supplied via the cable are accounted for in France's inventory. There was a reduction in 2019 caused by the pandemic but emissions have since increased from 342,386 tCO_2e in 2020 to 360,669 tCO_2e in 2021, resulting from the recovery from the COVID-19 pandemic. However, the emission has decreased to 350,532 tCO_2e in 2022. The waste management and LULUCF sectors experienced largest percentage increase between these years. Transport emission have remained one of the largest sources (45% of 2022 GHG emission) across the timeseries despite decreasing by 22% between 1990 and 2022.

Figure 9 shows the proportion of emissions by category for 2022. Emissions for the transport sector are the largest source at 45% of total emissions.

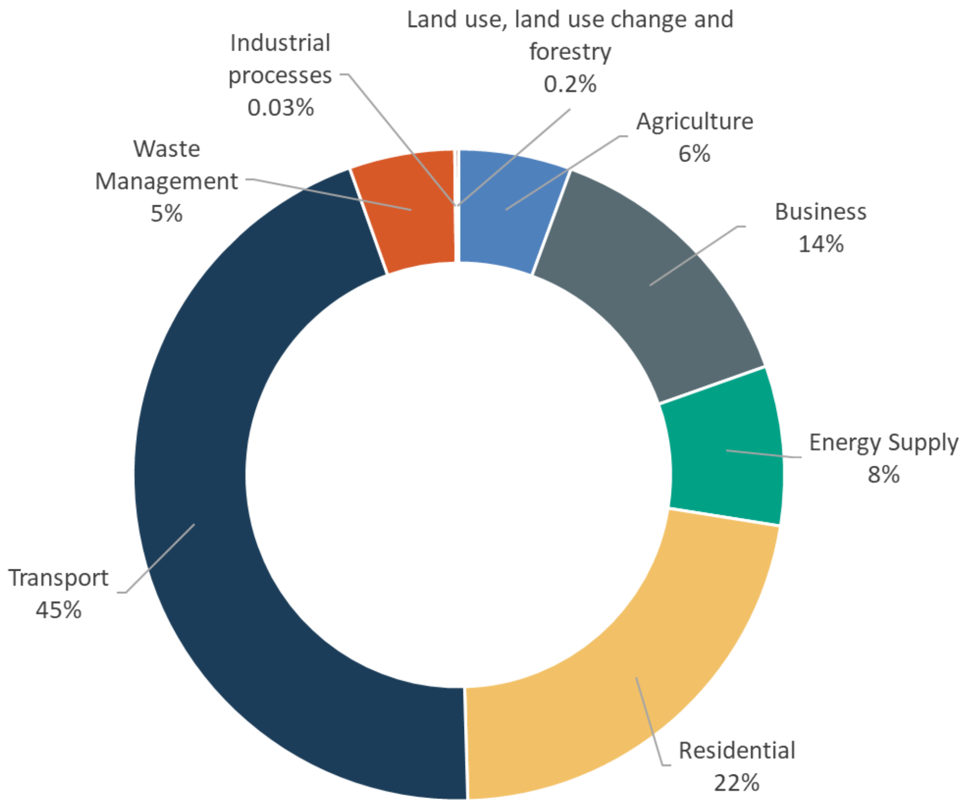

Figure 9 Jersey's Inventory in 2022 categorised by sector

Table 4 outlines the percentage contribution from each sector to the total GHG emissions by year. The balance of contributions from each sector to total emissions has changed over the timeseries. The decrease in contribution from energy supply has impacted the relative contributions of other sectors. In 1990, the largest contributions to total emissions came from energy supply (31%) and transport (30%) whilst in 2022 the largest contribution came from transport alone (45%).

Figure 10 shows the change in emissions by sector between 2021 and 2022 in the 1990 – 2022 inventory. Emissions changed the most in the transport sector, where emissions increased from 147,539 tCO_2e in 2021 to 157,732 tCO_2e in 2022. This was driven by an increase in domestic aviation, which includes travel between the UK and other Crown Dependencies and Overseas Territories. See section 2.2 for further information on the classification of domestic and international travel.

Table 6 shows the proportional emissions by sector across the timeseries. Transport has remained the sector with the greatest emissions since 2000.

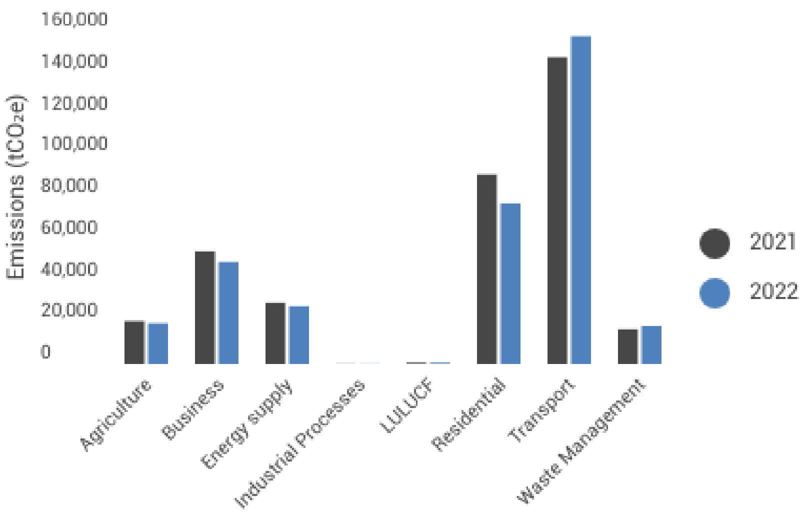

Figure 10: Change in total emission by sector between the 1990-2021 and 1990 – 2022 inventories

Table 6 Percentage contribution of each sector to Jersey's total GHG emissions

	Agriculture	Business	Energy Supply	Residential	Transport	Waste Management	Industrial processes	Land use, land use change and	Total
1990	5%	9%	31%	24%	30%	2%	0.01%	0.003%	100%
1995	4%	9%	39%	19%	27%	1%	0.01%	-0.05%	100%
2000	5%	13%	21%	26%	32%	2%	0.01%	0.5%	100%
2007	5%	13%	15%	28%	37%	2%	0.02%	0.2%	100%
2008	5%	14%	8%	31%	40%	2%	0.02%	0.2%	100%
2009	5%	13%	12%	27%	41%	3%	0.02%	-0.08%	100%
2010	6%	13%	12%	26%	40%	3%	0.02%	0.02%	100%
2011	6%	14%	6%	27%	44%	3%	0.02%	0.5%	100%
2012	5%	12%	18%	24%	37%	3%	0.01%	0.4%	100%
2013	5%	12%	25%	22%	33%	2%	0.02%	0.5%	100%
2014	6%	12%	18%	22%	38%	3%	0.02%	0.4%	100%
2015	6%	14%	9%	25%	42%	3%	0.02%	0.3%	100%
2016	6%	14%	12%	25%	41%	3%	0.02%	-0.1%	100%
2017	6%	14%	8%	25%	44%	3%	0.02%	-0.2%	100%
2018	6%	14%	8%	26%	44%	3%	0.02%	-0.3%	100%
2019	5%	14%	8%	25%	44%	3%	0.02%	-0.2%	100%
2020	6%	15%	10%	28%	37%	4%	0.03%	-0.1%	100%
2021	6%	15%	8%	25%	41%	5%	0.03%	0.2%	100%
2022	6%	14%	8%	22%	45%	5%	0.03%	0.2%	100%
1990-2022 % change in contribution to total emissions	1.0 %	5.1%	-22.9%	-1.7%	14.6%	3.7%	0.02%	0.2%	

3.2 Total GHG emissions from different gases

Figure 11 provides an overview of Jersey's inventory categorised by gas.

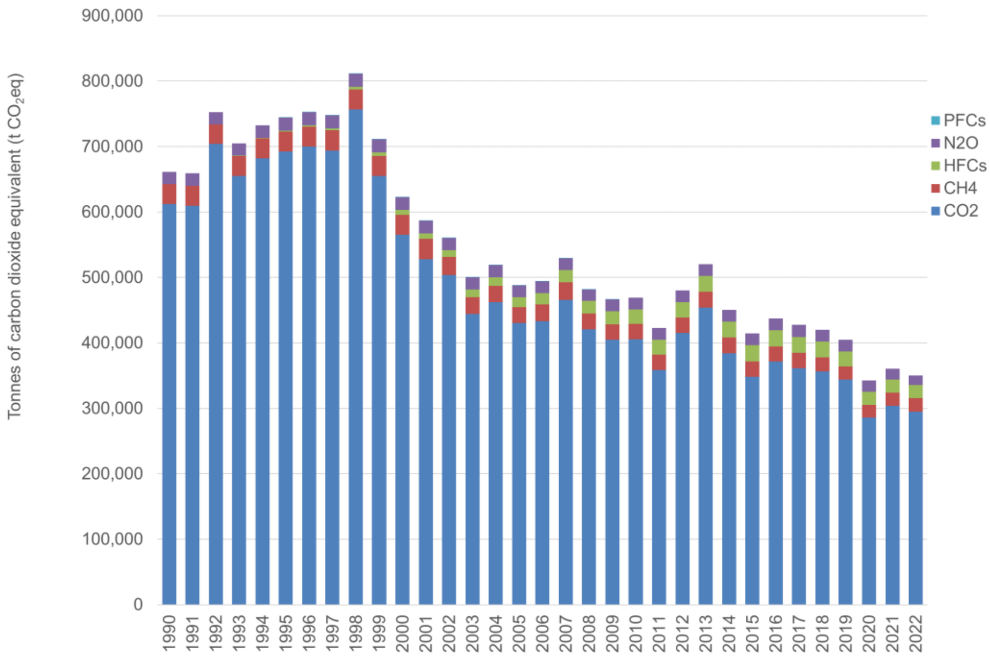

Figure 11 - Jersey's greenhouse gas inventory by gas

CH_4 – 66.5% of methane emissions in Jersey's 2022 inventory came from the agricultural sector, through activity such as livestock and use of fertilisers. Waste management is also a significant methane source.

Jersey has seen an overall reduction in methane emissions between 1990 and 2022, largely driven by the reduction in the number of cattle between 2000 and 2005. There was a peak in the number of cattle in 2006 and 2007 resulting in a peak of methane emissions.

CO_2 – 53.1% of carbon dioxide emissions in Jersey's 2022 inventory came from the transport sector, with passenger cars being the biggest source. The residential, business and energy supply sectors additionally continue to be significant sources of carbon dioxide. Carbon dioxide emissions in Jersey have seen a decrease since 1990 due to a reduction in the number of flights to the island, increased energy and fuel efficiency of buildings and vehicles, and decreased activity in the glasshouse sector of the agriculture industry.

Emissions reduced significantly between 1998 and 2005 when the first subsea cable was installed, causing a reduction in electricity generation. The spike in emissions in 2013 was when the cable failed, meaning Jersey saw an increase in electricity generation on the island. Carbon dioxide emissions continued to reduce from 2014, once the subsea cable had been restored.

N_2O – The biggest source of nitrous oxide in Jersey's 2022 inventory was the waste management sector, accounting for 44.2% of N_2O emissions. The agriculture sector was also a significant source, with 35.8% of total N_2O emissions emitted.

Nitrous oxide emissions have remained relatively stable across the timeseries. There was a decrease in emissions between 2000 and 2003 due to a reduction in the number of cattle.

Fluorinated gases (F-gases) – The two F-gases are produced by the business and residential sectors. HFCs are mainly used as refrigerants and in foams, aerosols and fire extinguishers. PFCs are used in the electronics sector. These gases were introduced to replace ozone depleting substances, meaning F-gas emissions have increased since 1990. SF_6 and NF_3 are not currently being emitted in a quantity that is deemed significant enough to be included in the inventory.

3.3 Recalculations to the inventory

As stated in section 1.5, each year the whole timeseries is updated and revised (from 1990) to capture any improvements in methodologies and ensure internal consistency. **Figure 12** shows the overall change in emissions between the 1990-2021 inventory and the latest 1990-2022 inventory.

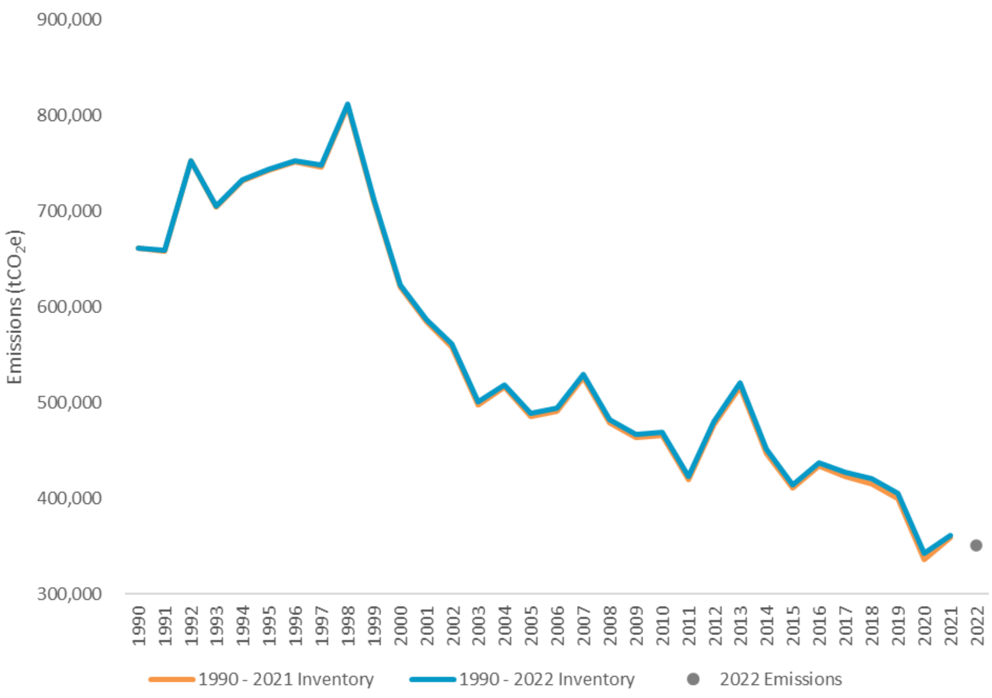

Figure 12: Change in emission estimates between the 1990 – 2021 and 1990 – 2022 inventories for Jersey

The most significant change was in the Waste Management sector, where improvements to the methodology resulted in a revision to emission estimates of more than 2,200 tCO_2eq across all years (**Figure 13**). The recalculation reasons are further outlined in section 4.8 but result from a combination of a correction to a calculation error for domestic wastewater treatment and update to the Jersey-specific emission factor used to estimate emissions from waste incineration.

Between the 1990 – 2021 and 1990 – 2022 inventories, there were also changes to the transport methodology which resulted in a reduction in estimated emissions compared to the previous inventory.

For the Energy Supply sector, corrections to the methodology for municipal waste incineration for energy generation were made, impacting emission estimates for 2020 and 2021. The reason for this is further explained in section 4.3.

Figure 13: Change in emission estimates by sector resulting from improvements between the 1990 – 2021 and 1990 – 2022 GHG inventories[8]

4 Jersey's greenhouse gas inventory - by sector

4.1 Agriculture

4.1.1 Sector and sub-sector trends

Emissions from the agriculture sector accounted for 5.6% of total greenhouse gas (GHG) emissions in the 2022 inventory. The largest agriculture emissions source in 2022 was enteric fermentation from dairy cattle (**Figure 14**). Enteric fermentation is part of the digestive process in ruminant animals which produces methane emissions. Emissions therefore come from the raising of animals for meat and milk.

Emissions from the agriculture sector for Jersey are separated into 4 different subsectors: 3F field burning, 3G liming, 3H urea application and 3J livestock. The subsector 3J livestock, includes enteric fermentation and manure management, and is by far the largest emission source in the agriculture sector.

[8] Agriculture and land use are not presented in the graph as the change in emission estimates between years is less than 1%

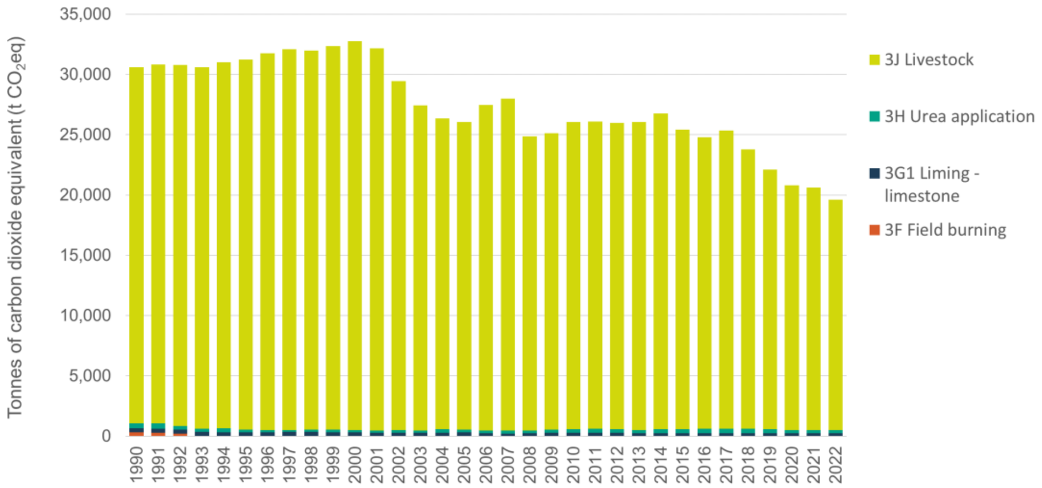

Figure 14 Agriculture sector emissions by sub-sector 1990-2022[9]

Emissions from the agriculture sector reduced by 35.9% from 1990-2022. Sources from all sub-sectors reduced over the timeseries. Field Burning (3F) ceased in 1993 in England and Wales and is considered negligible in Northern Ireland and Scotland. It is assumed that Jersey followed the same time trend as England, and hence emissions from field burning cease in 1993 (**Table 7**).

Across the timeseries, agricultural emissions have steadily decreased, largely due to declining numbers of dairy cattle. There was, however, a peak in the number of cows in 2006 and 2007 resulting in a peak in emissions.

[9] Note: Field burning emissions were accidentally missed from the final dataset for the 1990-2022 inventory. They were included in this guide for completeness as emissions from this source have remained unchanged for several years. This error will be corrected in the 1990 – 2023 inventory.

Table 7 Agriculture sector emissions by sub-sector with percentage changes

Tonnes of carbon dioxide equivalent (tCO_2eq)	1990	2021	2022	% change 1990-2022	% change 2021-2022
3F Field burning	335			-100.0%	-
3G1 Liming - limestone	322	263	263	-18.3%	0.0%
3H Urea application	421	258	258	-38.6%	0.0%
3J Livestock	29,532	20,108	19,108	-35.3%	-5.0%
Grand Total	**30,274**	**20,630**	**19,629**	**-35.2%**	**-4.9%**

4.1.2 Gases

Emissions in the agriculture sector are dominated by emissions of methane (CH_4), which accounts for 70.0% of agriculture sector emissions in 2022. Of the remaining 2022 emissions, 27.3% came from nitrous oxide (N_2O) emissions and 2.7% from carbon dioxide (CO_2) (**Figure 15**). Emissions from methane primarily come from enteric fermentation and manure management from livestock, mineralisation/immobilisation of agricultural soils, and application of fertilisers lead to emissions of N_2O. CO_2 emissions are caused by the application of urea to agricultural soils and liming.

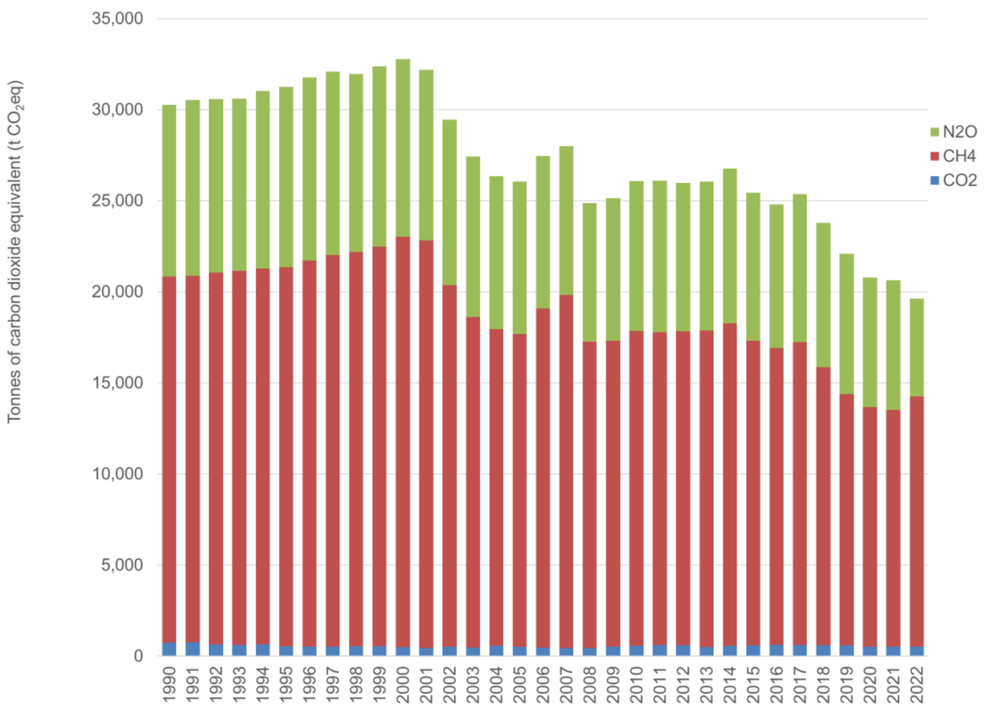

Figure 15 Agriculture sector emissions by greenhouse gas 1990-2022

4.1.3 Methodologies

Activity data

Activity data for the agriculture sector is provided by the Jersey Government, in the 'Agricultural Statistics' document. Jersey Government provided data up to 2022 while the most recent addition published online was in 2018 by the Department of Growth, Housing and Environment. The statistics provided include number of livestock, grassland and cereal areas, and crop and vegetable exports. Animal numbers are included in the inventory in the following categories: dairy cattle, non-dairy cattle, sheep, pigs, poultry, goats and horses.

Emission factors

"Implied emission factors" for the UK are generated by dividing total emissions from a source by total activity data such as livestock data and land area. In order to calculate the emission factor for enteric fermentation from pigs for example, the total UK emissions of methane from pig enteric fermentation is divided by total livestock numbers of pigs in the UK. This gives an emission factor that represents a weighted average of several different sources. These implied emission factors are applied to Jersey. Therefore, in this example, the implied emission factor for methane from pig enteric fermentation (based on UK data) is applied to Jersey pig livestock numbers. Similarly, in order to calculate the implied emission factor for synthetic fertilisers applied to grasslands, the UK total emissions of N_2O from synthetic fertilisers would be divided by total grassland areas in the UK. This implied emission factor would then be multiplied by Jersey specific activity data (grassland areas which are provided by the Centre for Ecology and Hydrology), in order to give the emissions from that source.

UK implied emission factors (which consider agricultural practices and climatic conditions on a UK level) are applied to the livestock data and, for agricultural soils, to cropland and grassland land areas. However, Jersey specific nuances are not captured (for example, body weight of Jersey specific cattle breeds and specific feed types). A reflection of these specific Jersey distinctions in the data would require improvements in the methodology and increased complexity in the inventory.

Assumptions

Implied emission factors represent weighted averages based on values from the UK which it is assumed can be applied to Jersey because the activities in Jersey are similar to those in the UK. The use of implied emission factors is a common approach used in calculating emission estimates where local data cannot be sourced.

Recent improvements to the inventory

There were no recent improvements to the emission estimates for this sector.

4.2 Business

4.2.1 Sector and sub-sector trends

Emissions from the business sector accounted for 14.0% of total greenhouse gas (GHG) emissions in the 2022 inventory. The largest business emissions source in 2022 was Other Manufacturing Industries and Construction (**Figure 16**). This subsector represents emissions from kerosene use in commercial settings.

Emissions from the business sector for Jersey are separated into 14 different subsectors, including air conditioning, refrigeration, stationary combustion in commercial and institutional settings and other manufacturing industries.

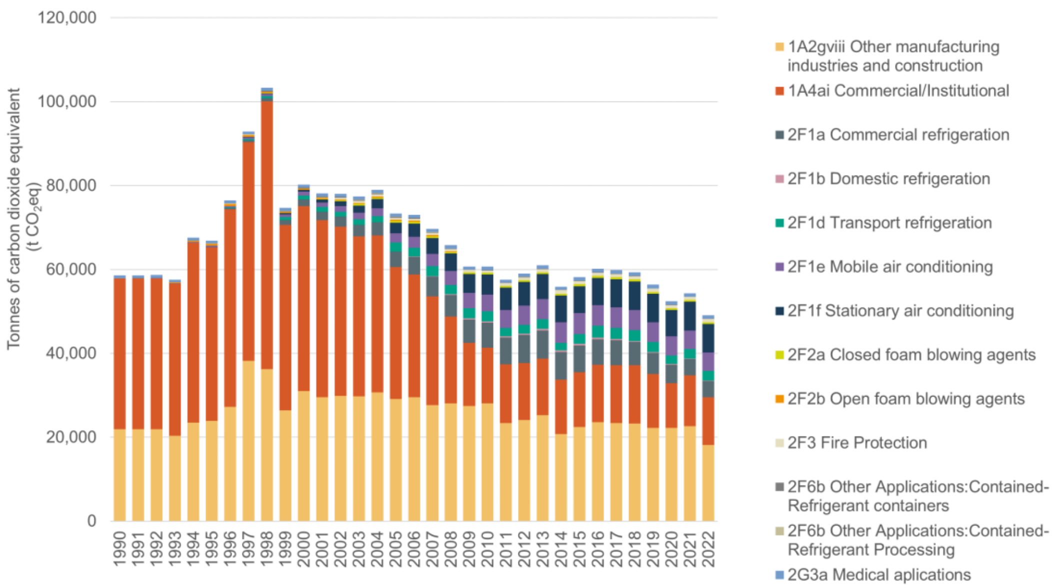

Figure 16 Business sector emissions by sub-sector 1990-2022

Emissions from the business sector reduced by 16.2% from 1990-2022. Although there was an increase between 2020 and 2021, emissions have reduced by 9.7% between 2021 and 2022. In 2022, emissions from the business sector were the smallest they have been across the whole timeseries (**Table 8**). However, there is limited data from most of the subsectors at the start of the timeseries with no emissions reported from refrigeration, stationary air conditioning, blowing agents and fire protection.

Gas oil imports peaked in the late 1990s and this is related to an increase in the area of protected crops that were grown under glass. These crops, especially tomatoes, required heating which is reflected in the increased gas oil imports. Since the late 1990s this activity has substantially reduced and in 2006 and 2007 there was a government supported exit strategy for the high value protected crop sector.

Table 8 - Business sector emissions by sub-sector with percentage changes

Tonnes of carbon dioxide equivalent (tCO_2eq)	1990	2021	2022	% change 1990-2022	% change 2021-2022
1A2gviii Other manufacturing industries and construction	21,930	22,660	18,109	-17.4%	-20.1%
1A4ai Commercial/Institutional	35,917	12,102	11,425	-68.2%	-5.6%
2F1a Commercial refrigeration		3,892	3,892	-	0.0%
2F1b Domestic refrigeration		139	139	-	0.0%
2F1d Transport refrigeration		2,234	2,199	-	-1.6%
2F1e Mobile air conditioning	15	4,445	4,489	28,994%	1.0%
2F1f Stationary air conditioning		6,839	6,713	-	-1.8%
2F2a Closed foam blowing agents		429	447	-	4.1%
2F2b Open foam blowing agents				-	-
2F3 Fire Protection		687	715	-	4.1%
2F6b Other Applications: Contained-Refrigerant containers	5.39	54	56	939%	4.1%
2F6b Other Applications: Contained-Refrigerant processing	0.87	16	17	1,856%	4.1%
2G3a Medical applications	677	838	838	23.8%	0.0%
Grand Total	**58,546**	**54,335**	**49,039**	**-16.2%**	**-9.7%**

4.2.2 Gases

Emissions in the business sector are dominated by emissions of carbon dioxide (CO_2), which account for 60.0% of business sector emissions in 2022. 38.1% of the remaining 2022 emissions come from HFCs, a fluorinated gas (**Figure 17**). Between 1990 and 2022, CO_2 emissions fell by 48.9% from 57,567 tonnes of carbon dioxide equivalent (tCO_2eq) to 29,406 tCO_2eq but peaked in 1998 at 99,588 tCO_2eq.

HFC emissions are associated with refrigeration and air conditioning. Whilst these emissions have grown since 1990, emissions have declined in more recent years from 21,475 tCO_2eq in 2013 to 18,667 tCO_2eq in 2022 (**Figure 17**).

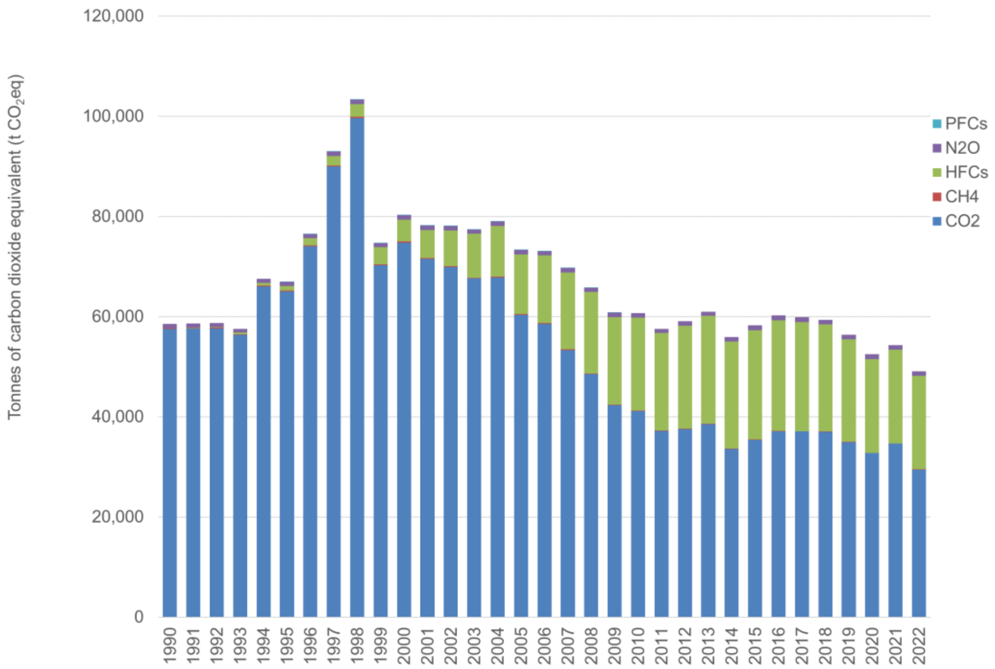

Figure 17 Business sector emissions by greenhouse gas 1990-2022

4.2.3 Methodologies

Activity data

Data to calculate emissions in the business sector comes from the 'Jersey Energy Trends' report which is published annually. Emissions arising from solvents are based on UK emissions and scaled by Jersey specific indicators such as population, GDP and number of houses. Population estimates are sourced from Government of Jersey publications, most recently 'Report on the 2021 Jersey Census'. GDP estimates are taken from 'Measuring Jersey's Economy GVA and GDP'. House numbers are extrapolated from the 2011 and 2021 census figure, by dividing the Jersey total population by the 'number of persons per household' statistic.

Emission factors

Emission factors for carbon are UK specific, applied to the Jersey inventory. For other gases, default emission factors found in the 2019 EMEP/EEA Guidebook[10] are used. The Guidebook is an international document that supports the reporting of national emissions inventories by setting out methodologies, describing the data that is needed and providing default emission factors.

Assumptions

To split fuel use data (kerosene, heavy fuel oil, gas oil, LPG and coal) between residential and commercial, a 70/30 split is used, therefore assuming that 30% of the fuel used is being used in commercial settings. This assumption has been made based on advice from a representative fuel supplier. Emissions arising from solvent use (e.g. substances used to make products such as paint) are based on UK emissions and are scaled by proxy data

[10] https://www.eea.europa.eu/publications/emep-eea-guidebook-2019

such as GVA, population and number of households thereby assuming that activities are similar to those in the UK. Similarly, for carbon dioxide emissions, UK emissions factors are used therefore assuming that activities in Jersey are similar to those in the UK.

Recent improvements to the inventory

Between the 1990-2021 inventory and the most recent 1990-2022 inventory, there has been minor revisions to the proxy values used to estimate solvent emissions.

4.3 Energy supply

4.3.1 Sector and sub-sector trends

Emissions from the energy supply sector accounted for 7.9% of total greenhouse gas (GHG) emissions in the 2022 inventory. All emissions in this sector are attributed to the generation of public electricity (**Figure 18**).

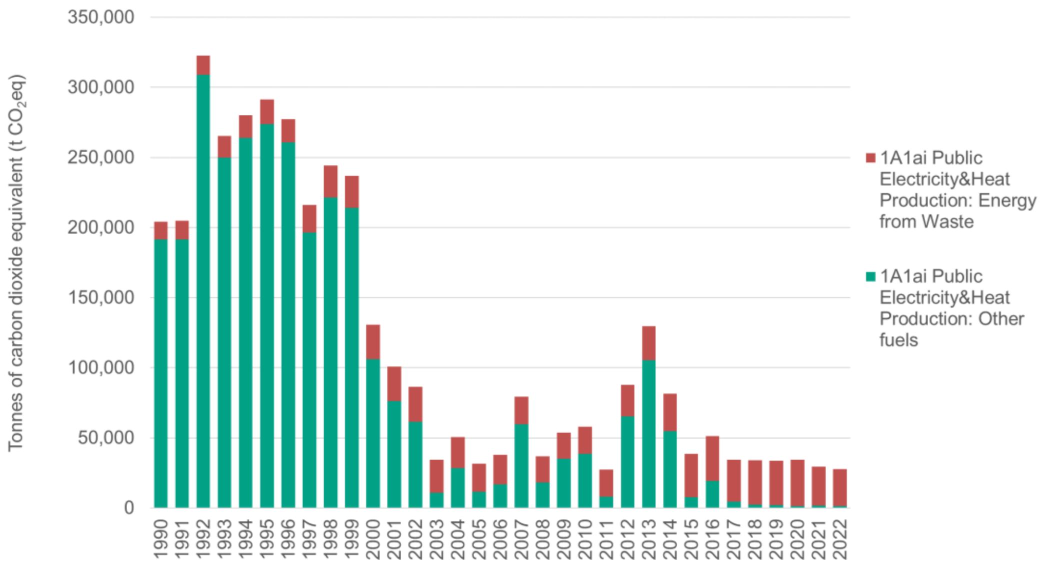

Figure 18 Energy supply sector emissions by sub-sector 1990-2022

Emissions from the energy supply sector reduced by 86.4% from 1990-2022 and saw a decrease of 6.0% between 2021 and 2022 (**Table 9**). Emissions from the energy supply sector reduced significantly when the 90MW Normandie 2 supply cable was installed in 2000 reducing the need for the diesel engine power plant. In 2012, the failure of this cable meant electricity had to be generated on-island using gas turbines and diesel engines leading to a spike in emissions until the cable was restored in 2014.

Table 9 Energy supply sector emissions by sub-sector with percentage changes

Tonnes of carbon dioxide equivalent (tCO_2eq)	1990	2021	2022	% change 1990-2022	% change 2021-2022
1A1ai Public electricity and heat production	191,432	1,578	1,232	-99.4%	-21.9%
1A1ai Public electricity and heat production: EfW	12,757	27,965	26,530	108%	-5.1%
Grand Total	**204,189**	**29,543**	**27,763**	**-86.4%**	**-6.0%**

4.3.2 Gases

Emissions in the energy supply sector are dominated by emissions of carbon dioxide (CO_2), which accounts for 97.2% of emissions in 2022. Between 1990 and 2022, CO_2 emissions fell by 86.7% from 203,084 tCO_2eq to 26,981 tCO_2eq but peaked in 1992 at 321,139 tCO_2eq (

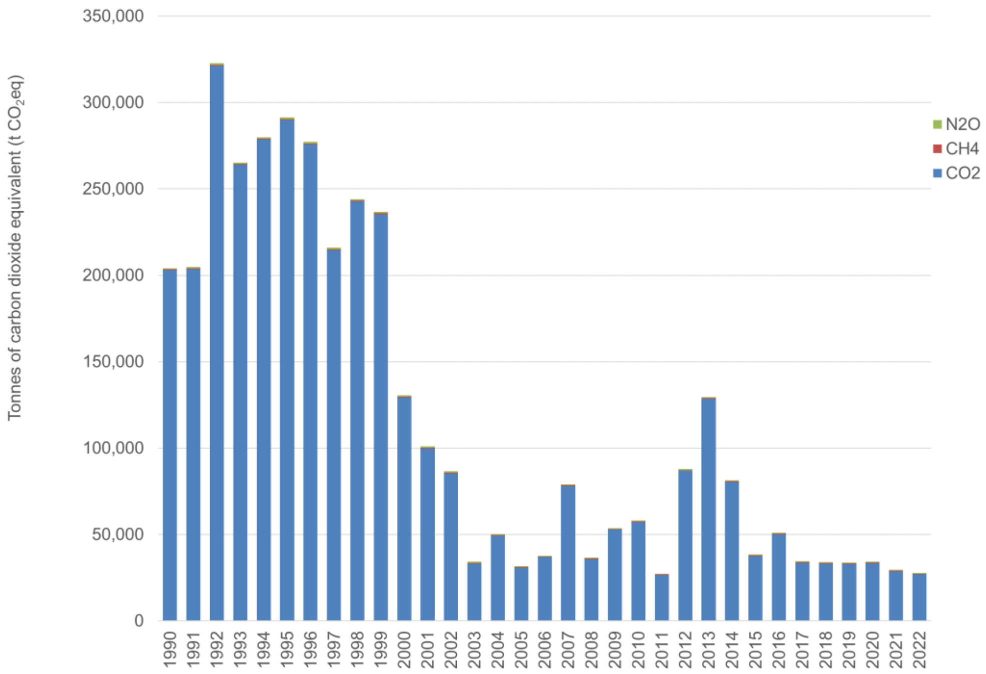

Figure 19).

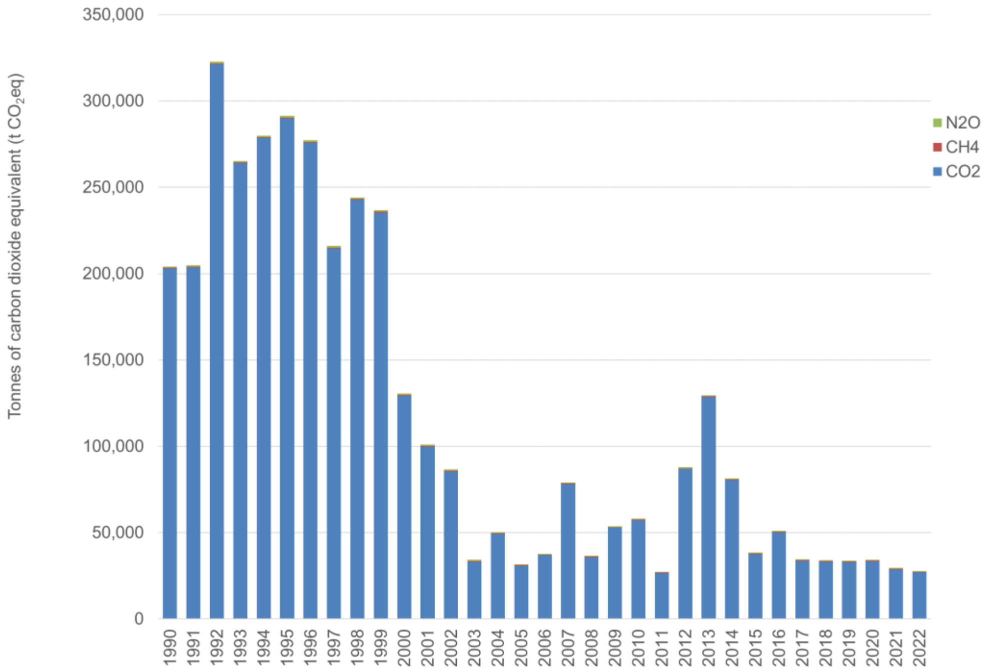

Figure 19 Energy supply sector emissions by greenhouse gas 1990-2022

4.3.3 Methodologies

Activity data

The Jersey government publishes the 'Jersey Energy Trends' annually which provides the statistics for the energy supply and transport sector. The amount of heavy fuel used on the island is influenced by the consistency of energy supply from France. For example, when the subsea cable failed in 2012, electricity had to be generated using the on-island backup generators, increasing emissions from energy supply. These emissions are accounted for in the Jersey inventory. For electricity that is imported from France, emissions are accounted for in the French inventory and not in the Jersey inventory. Municipal solid waste that is burned at the Energy Recovery Facility also contributes to emissions in the energy supply sector (see section 2.1 for more detail). Municipal Solid Waste data is taken from 'Jersey in Figures'.

Emission factors

Emissions factors for CO_2 from power stations are taken from the UK inventory and are UK specific factors. Non-CO_2 emission factors are IPCC defaults. Emission factors for incineration of municipal solid waste are derived from Jersey-specific waste composition and IPCC defaults for parameters such as fossil carbon fraction and moisture content. IPCC defaults are emissions factors that are found in the IPCC guidelines – international literature providing methods and information on emissions inventories.

Assumptions

Alongside MSW, gas oil and fuel oil are used to provide energy to Jersey. Statistics on fuel use prior to 2010 covered the quantities of each fuel used for power generation. For 2011 onwards, the data were the combined gas and fuel oil used to for power generation. Emissions from each fuel were calculated separately as the emission factors vary between fuels, and as such the ratio of gas oil to fuel oil used in 2010 was assumed to remain constant for later years.

Recent improvements to the inventory

Between the 1990-2021 inventory and the 1990-2022 inventory there was a correction to the methodology used to calculate a Jersey-specific emission factor for municipal waste incinerated at the Energy Recovery Facility – a conversion factor was applied to convert carbon to CO_2 and corrections to the unit conversion for CH_4 and N_2O were made.

Small revisions have also been made to the DUKES conversion factors used to convert fuel quantities into energy units (TJ).

4.4 Industrial processes

4.4.1 Sector and sub-sector trends

Emissions from the industrial processes sector accounted for 0.03% of total greenhouse gas (GHG) emissions in the 2022 inventory. All emissions in this sector are attributed to N_2O from product use: Other. This sub-sector is now included to improve the completeness of Jersey's inventory and relates to emissions from N_2O use as a propellant in squirty cream. (**Figure 20**).

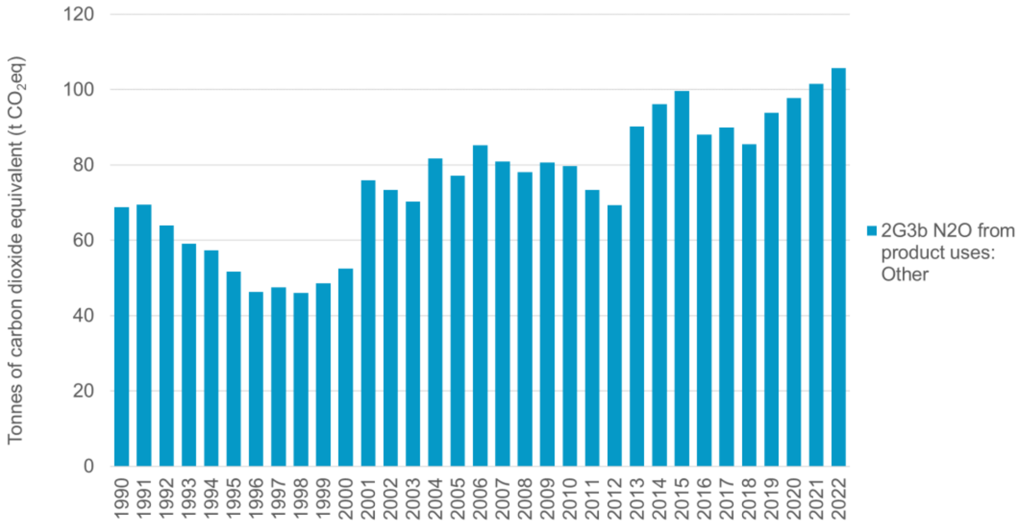

Figure 20 Industrial processes sector emissions by sub-sector 1990-2022

Despite decreasing at various points in the timeseries, emissions from the industrial processes sector have increased by 53.5% from 1990-2022 (**Table 10**).

Table 10 Industrial processes sector emissions by sub-sector with percentage changes

Tonnes of carbon dioxide equivalent (tCO_2eq)	1990	2021	2022	% change 1990-2022	% change 2021-2022
2G3b N_2O from product uses: Other	69	102	106	53.5%	4.1%
Grand Total	**69**	**102**	**106**	**53.5%**	**4.1%**

4.4.2 Gases

Emissions in the industrial processes sector, specifically the subsector 2G3b N_2O from product use: Other, are entirely emissions of N_2O, which have increased from 68.8 tCO_2eq to 105.6 tCO_2eq between 1990 and 2022. Emissions from this sector reached the highest value in 2022 (**Figure 21**).

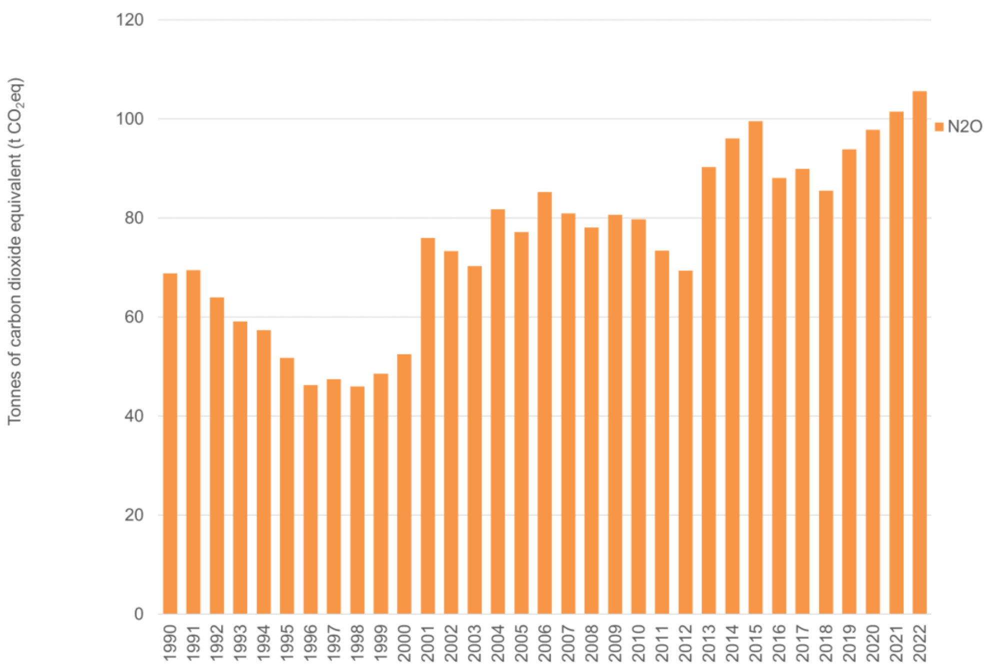

Figure 21 Industrial processes sector emissions by greenhouse gas 1990-2022

4.4.3 Methodologies

Activity data

Estimates of emissions from 2G3b N_2O from product use: Other in Jersey are scaled from the UK estimate using GDP as a proxy. For the UK estimate, cream consumption data is available from the Department for Environment, Food and Rural Affairs (DEFRA).

Emission factors

The methodology for this sub-sector uses emission factors presented in the Danish GHG inventory. This assumes that UK consumption of whipped cream sprays and the design of these products are the same in the UK as they are in Denmark.

Assumptions

The UK method for calculating emissions in this sub-sector assumes that 1% of cream consumption is in the form of whipped cream sprays and that N_2O consumption in those sprays is equal to 5% of the mass of the cream. It also assumes that all emissions are N_2O. As Jersey emissions are scaled from the UK, these assumptions are also applicable to the Jersey estimate.

Recent improvements to the inventory

Between the 1990-2021 inventory and the 1990-2022 inventory there have been small recalculations to the UK and Jersey GDP datasets across the timeseries.

4.5 Land use change

The land use, land use change and forestry (LULUCF) sector includes emissions from the conversion of land to other land types and forestry and harvested wood products. Emissions from the LULUCF sector accounted for 0.17% of total greenhouse gas (GHG) emissions in the 2022 inventory.

4.5.1 Sector and sub-sector trends

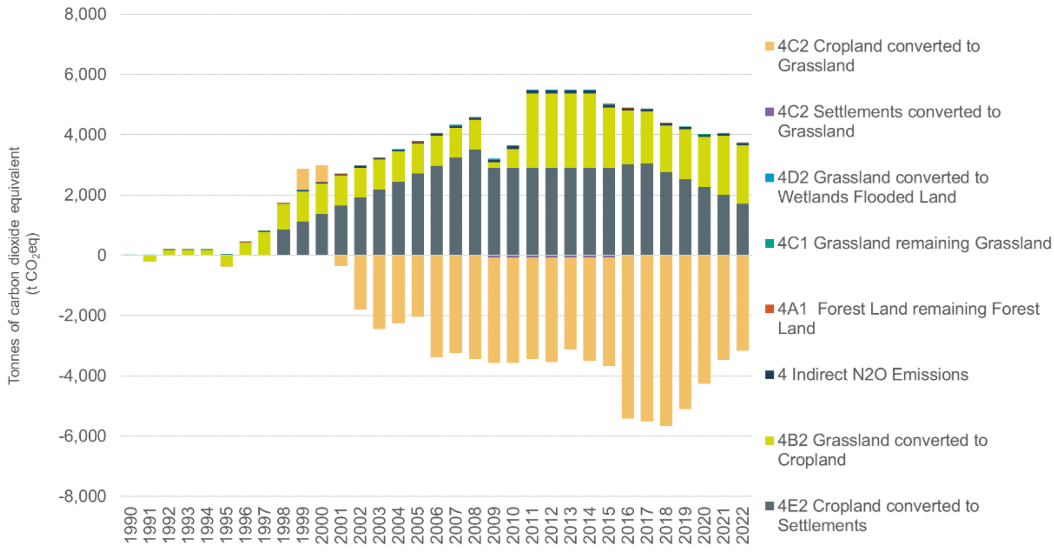

Figure 22 Land Use Change sector emissions by sub-sector 1991-2022

The land use sector continued to be a net source of emissions in 2022 (**Figure 22**). Cropland converted to grassland is the only emission sink (emissions are removed from the atmosphere) in 2022, with 3,160 tonnes of carbon being stored in the land and not emitted into the atmosphere. Conversion of grassland to cropland resulted in 1,952 tonnes of carbon being released and conversion of cropland to settlements released 1,716 tonnes of carbon in 2022. (**Table 11**). As there is limited data available for land cover types and a simple methodology is applied to calculate emissions, some sources do not have any associated emissions.

Due to the complex nature of carbon flows within terrestrial ecosystems, there is a lag-time between land use changing and the effect that this has on emissions. As an example, in one year there may be a change in land use from grassland to forest land. The default period for carbon emissions and removals to reach equilibrium is 20 years, according to the IPCC Guidelines. Until this equilibrium is reached, the rate of emissions and removals will vary. For example, in the immediate years after grassland has converted into forest land where there is a high rate of tree growth. Conversely, in later years emissions from biomass decomposition may exceed removals. The emissions in the inventory therefore reflect the legacy effect of a change in land use over the course of multiple years.

Table 11 Land Use, Land Use Change and Forestry (LULUCF) sector emissions by sub-sector with absolute changes

Tonnes of carbon dioxide equivalent (tCO_2eq)	1991	2021	2022	Absolute change 1991-2022	Absolute change 2021-2022
4E2 Cropland converted to Settlements		2,018	1,716	1716	-302
4B2 Grassland converted to Cropland	-214	1,952	1,952	2166	0
4A1 Forest Land remaining Forest Land	14	14	14	0	0
4C1 Grassland remaining Grassland	2.8	3.8	3.8	1.1	0
4 Indirect N_2O Emissions	2.9	62	58	55	-4.2
4D2 Grassland converted to Wetlands Flooded Land				0	0
4C2 Settlements converted to Grassland				0	0
4C2 Cropland converted to Grassland		-3,466	-3,160	-3,160	305
Grand Total	**-195**	**584**	**583**	**778**	**-0.3**

4.5.2 Gases

In the LULUCF sector in 2022, 262 tonnes of CO_2 were released, an increase from 240 tonnes CO_2 in 2021. The LULUCF sector was also a source of N_2O in 2022, emitting 319 tonnes of carbon dioxide equivalent (**Figure 23**). N_2O emissions from the LULUCF sector were emitted from forest land remaining forest land, grassland converted to cropland, grassland remaining grassland and cropland converted to settlements, and through indirect emissions. Indirect N_2O emissions were 58.1 tonnes CO_2 equivalent in 2022. This emission source results from nitrogen removal from agricultural soils and animal waste in addition to processes like leaching, harvest, and runoff.

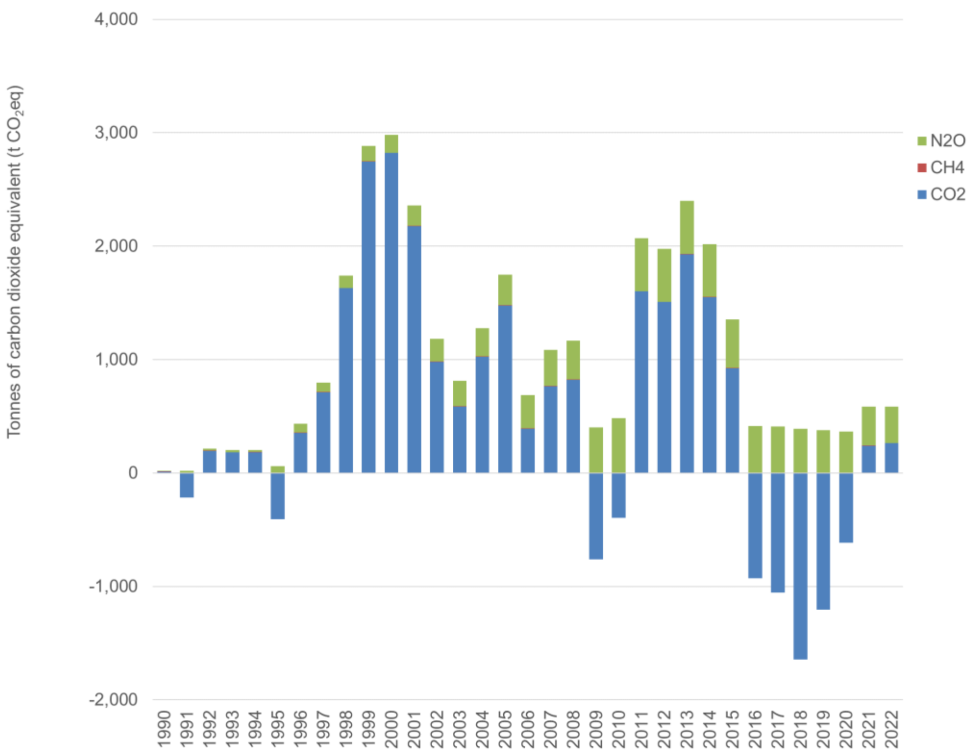

Figure 23 Land Use Change sector emissions by greenhouse gas 1990-2022

4.5.3 Methodologies

Activity data

Land cover surveys and agricultural land statistics have been used to compile annual land use change matrices for Jersey. These are then converted into a format consistent with international guidance (from the UNFCCC). Activity data for this sector, specifically land use areas, are supplied from various publications from the Government of Jersey. Forestry land area statistics for the years 1990-2010 are provided by the 'FAO (2010) Global Forest Resources Assessment: Jersey'. Statistics on Forestland, Cropland, Grassland and Settlement land areas for 2006, 2008-2011 are provided in the documents 'Jersey in Figures 2008-2011'. As no new surveys have been conducted, data for the most recent years has been extrapolated from the last available data.

Emission factors

Emission factors for estimating LULUCF emissions from Jersey are default factors found in the IPCC Guidebook. Emission factors for calculating harvested wood products and forest land fluxes come from a Carbon-Flow model.

Assumptions

The activity data for Jersey does not cover the entire timeseries, with most data covering until 2011. Activity data for the latter years are therefore extrapolated from the latest available year, which assumes a certain trend in the activity data has occurred. Other specific assumptions include the use of a carbon flow model to calculate forest land fluxes; only perennial crops included in the 'Crop remaining crop' subsector; rate of UK forest and grassland wildfires used as a proxy for Jersey; and default values for Soil Organic Carbon (SOC) in different land areas.

Recent improvements to the inventory

There have been no recent improvements to the emission estimates for this sector.

4.6 Residential

The residential sector includes emissions from residential stationary combustion, metered dose inhalers and other aerosols.

4.6.1 Sector and sub-sector trends

Emissions from the residential sector accounted for 22.1% of total GHG emissions in the 2022 inventory. The majority of emissions are from residential stationary combustion, the burning of fuels in homes, mainly for heating and cooking (Figure 24).

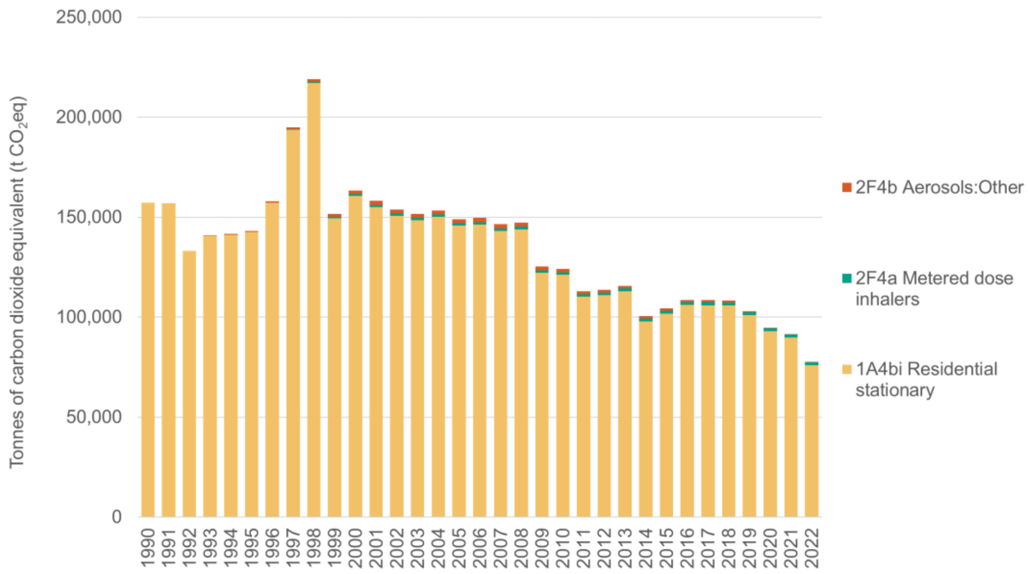

Figure 24 Residential sector emissions by sub-sector 1990-2022

Between 1990 and 2022, residential sector emissions have decreased by 50.8% from 157,078 to 77,297 tonnes of carbon dioxide equivalent (tCO_2eq). As mentioned above, this is driven by emissions from combustion of fuels in homes. There is an increase in emissions from 1996 to 1998 which is being driven by a peak in kerosene and gas oil use. Emissions were increasing between 2014 and 2016 but remained relatively constant from 2016 to 2018. A decrease in emissions of 15.3% is seen between 2021 and 2022 (**Table 12**).

Table 12 Residential sector emissions by sub-sector with percentage changes

Tonnes of carbon dioxide equivalent (tCO_2eq)	1990	2021	2022	% change 1990-2022	% change 2021-2022
1A4bi Residential stationary	157,078	89,828	75,856	-51.7%	-15.6%
2F4a Metered dose inhalers		1,417	1,417	-	-
2F4b Aerosols: Other		24	24	-	-
Grand Total	**157,078**	**91,269**	**77,297**	**-50.8%**	**-15.3%**

4.6.2 Gases

Emissions in the residential sector are dominated by emissions of carbon dioxide (CO_2) which accounted for 97.6% of residential emissions in 2022. Between 1990 and 2022, residential sector CO_2 emissions fell by 50.8% from 153,369 to 75,425 tCO_2eq (**Figure 25**). This trend is being driven by a reduction in the use of all fuel types for residential stationary combustion as a result of the uptake of electrical space heating and an associated switch from gas and oil to electricity.

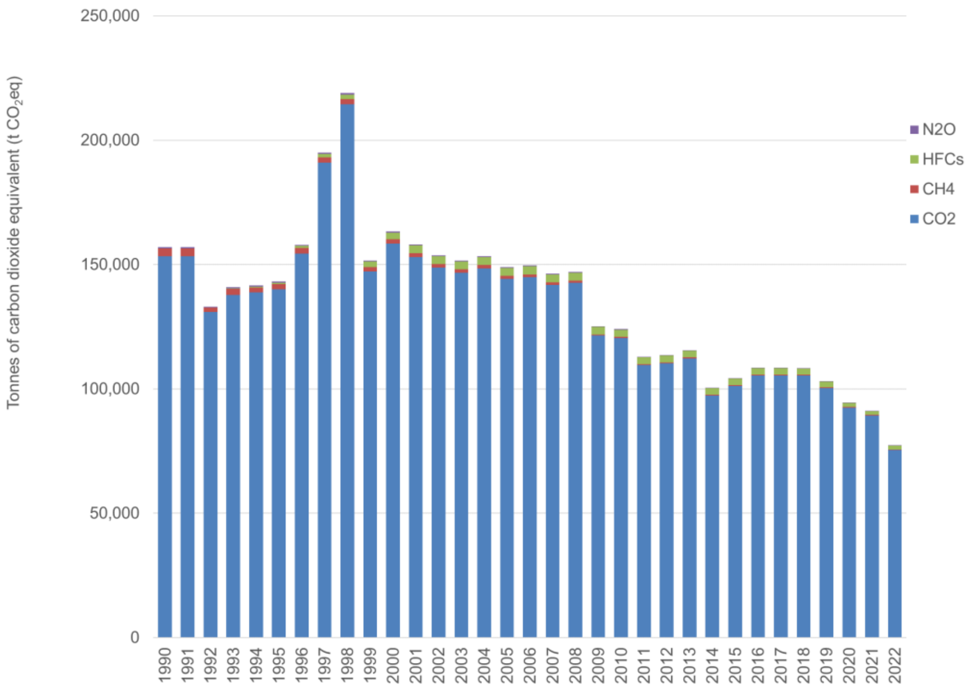

Figure 25 Residential sector emissions by greenhouse gas 1990-2022

4.6.3 Methodologies

Activity data

Data on fuel use is obtained from the 'Jersey Energy Trends' report which is published annually.

Emission factors

Emission factors for carbon are UK specific, applied to the Jersey inventory. For other gases, default emission factors found in the 2019 EMEP/EEA Guidebook[11] are used. The Guidebook is an international document that supports the reporting of national emissions inventories by setting out methodologies, describing the data that is needed and providing default emission factors.

Assumptions

To estimate the split of fuel use (kerosene, heavy fuel oil, gas oil, LPG and coal) between residential and commercial, a 70/30 split is used, therefore assuming that 70% of the fuel used is being used in residential settings. This assumption has been made based on advice from a representative fuel supplier. Emissions arising from solvent use are based on UK emissions and are scaled by proxy data such as GDP, population and number of households thereby assuming that activities are similar to those in the UK. Similarly, for

[11] https://www.eea.europa.eu/publications/emep-eea-guidebook-2019

carbon dioxide emissions, UK emissions factors are used therefore assuming that activities in Jersey are similar to those in the UK.

Recent improvements to the inventory

Between the 1990-2021 inventory and the most recent 1990-2022 inventory there have been small revisions to the DUKES conversion factors used to convert fuel quantities into energy units (TJ).

4.7 Transport

The transport sector includes emissions from road transport, domestic aviation and domestic navigation (i.e. shipping). Domestic aviation and navigation refer to activities that occur within Jersey and between Jersey and the UK. This includes, for example, take-off, landing and internal, recreational flights and shipping activity that occurs within Jersey waters. For international aviation and shipping (journeys to and from other countries), the emissions are equally divided between the two countries. However, these statistics are recorded as memo items to the inventory and are not included in the national total.

4.7.1 Sector and sub-sector trends

Transport sector emissions accounts for 45.0% of total GHG emissions in the 2022 inventory. The largest emissions source in 2022 in this sector is passenger cars (**Figure 26**). Between 1990 and 2022, emissions in the transport sector have decreased by 21.5% from 200,851 to 157,732 tCO_2eq.

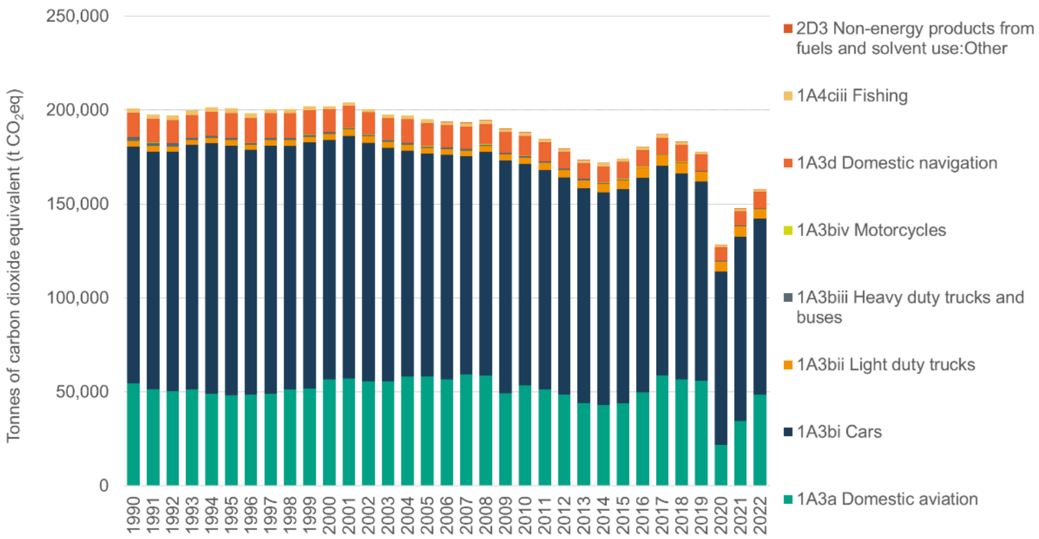

Figure 26 Transport sector emissions by sub-sector 1990-2022

The overall trend is dominated by emissions from passenger cars and domestic aviation. Passenger car emissions have decreased by 25.8% between 1990 and 2022. There was a small increase in emissions from this source between 2020 and 2021, but emissions decreased by 4.6% between 2021 and 2022 (**Table 11**). Between 1990 and 2022, all sources of transport emissions decreased except for light-duty trucks. Although the transport sector was heavily impacted by the COVID-19 pandemic in 2020, recovery has resulted in increased emissions from passenger cars from 92,257 tCO_2eq in 2020 to 98,160 tCO_2eq in 2021. Among all transport modes, the largest increase between 2021 and 2022 was for domestic aviation (40.9%) due to the rebound in airline travel across the last two years.

Table 13 Transport sector emissions by sub-sector with percentage changes

Tonnes of carbon dioxide equivalent (tCO_2eq)	1990	2021	2022	% change 1990-2022	% change 2021-2022
1A3a Domestic aviation	54,495	34,410	48,490	-11.0%	40.9%
1A3bi Cars	126,211	98,160	93,685	-25.8%	-4.6%
1A3bii Light duty trucks	2,806	5,613	5,283	88.3%	-5.9%
1A3biii Heavy duty trucks and buses	2,012	314	295	-85.3%	-6.0%
1A3biv Motorcycles	145	103	100	-31.3%	-3.5%
1A3d Domestic navigation	12,811	7,634	8,610	-32.8%	12.8%
1A4ciii Fishing	2,372	1,304	1,268	-46.6%	-2.7%
2D3 Non-energy products from fuels and solvent use: Other		0.8	0.8	-	-5.3%
Grand Total	**200,852**	**147,539**	**157,732**	**-21.5%**	**6.9%**

4.7.2 Gases

Transport sector emissions are predominantly carbon dioxide (CO_2). CO_2 emissions account for 99.3% of total emissions in 2022 with nitrous oxide (N_2O) making up 0.7% and methane (CH_4) less than 0.1%. CO_2 emissions have decreased by 20.6% between 1990 and 2022 and increased by 6.9% between 2021 and 2022 (**Figure 27**).

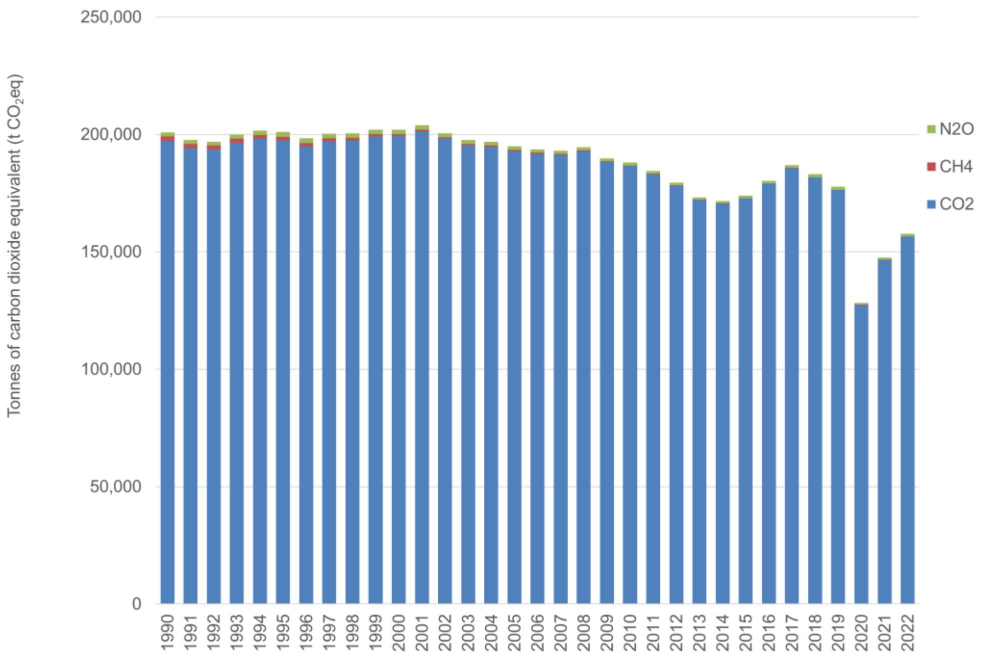

Figure 27 Transport sector emissions by greenhouse gas 1990-2022

4.7.3 Methodologies

Activity data

Road transport: Fuel consumption split by fuel type is taken from the 'Jersey Energy Trends' report. Vehicle data is provided annually by the Government's Department of

Infrastructure, Housing and the Environment (Driver and Vehicle Standards), for the GHG inventory reporting. For the 1990-2018 and subsequent inventories, this data was updated to take account of an updated assumption regarding vehicle numbers in 2019 made in the ‘Quantitative analysis of carbon neutrality by 2030’ report[12]. The relative mileage of each vehicle type is required to allocate fuel consumption to each vehicle type. UK relative mileage representing non-London urban travel is used.

Aviation: Detailed aviation activity data is provided by the UK Civil Aviation Authority (CAA), including aircraft movements broken down by airport, aircraft type and destination. Deliveries of aviation spirit and aviation turbine fuel are provided in the Digest of UK Energy Statistics (DUKES).

Shipping: For 2014 the UK inventory used data from high-resolution Automatic Identification System (AIS) to provide detailed data on vessels and vessel movements. For other years, shipping mode-specific proxy data (including port statistics provided by the Department for Transport) are used to generate a timeseries.

Emission factors

Road transport: UK vehicle emission factors by vehicle type (and by euro standard) are applied to Jersey and the properties of the fuel are assumed to be the same as the UK and are therefore taken from DUKES. The factors used assume that petrol and diesel for road transport are 100% mineral.

Aviation: A UK specific emission factor for carbon is applied to Jersey. For non-CO_2 emissions, default emission factors from the 2016 EMEP/EEA Guidebook are used.

Shipping: For carbon and N_2O, shipping specific factors from the International Maritime Organisation (2015) are used. For methane, the emission factor is taken from a 2004 study by IVL (Swedish Environmental Research Institute).

Assumptions

Road transport: Fleet mix, in terms of the age distribution of vehicles, is assumed to be the same as that of the UK. Updated 2019 vehicle numbers provided in the ‘Quantitative analysis of carbon neutrality by 2030’ report were used and extrapolated for 2022. The 2022 data assumes that vehicles registered before 2000 are no longer operational. This is because official data on vehicle numbers does not take account of deregistered vehicles and therefore does not reflect the actual number of operational vehicles.

Aviation: The aviation estimates are generated by a model compiled for the purposes of the UK inventory, which is considered to be detailed and of good quality. International flights that first stop at a domestic airport are accounted as having a domestic leg and an international leg.

Shipping: The main assumption in the shipping sector concerns the allocation of vessel movements to domestic or international, where a cargo or passenger vessel starts or finishes in a UK port when it goes out of AIS signal range. The shipping estimates are

[12] https://www.gov.je/SiteCollectionDocuments/Environment%20and%20greener%20living/R-Oxera%20Quantitative%20analysis%20of%20carbon%20neutrality%20by%202030%2020200401%20HL.pdf

generated by a model compiled for the purposes of the UK inventory, which is considered to be detailed and of good quality.

Recent improvements to the inventory

Road transport: The UK relative mileage proportions were updated to use distances travelled in UK non-London urban areas. Previous estimates overestimated distances travelled in HGVs for Jersey; this update aims to represent road transport mileage more accurately. There were minor recalculations throughout the timeseries due to updated DUKES conversion factors, used to convert the activity data to energy units (TJ).

Shipping: There have been no improvements between the 1990 – 2021 inventory and 1990 – 2022 inventory.

4.8 Waste management

The waste management sector includes emissions from domestic wastewater treatment, waste incineration, and composting. Emissions generated by the Energy Recovery Facility (incineration of municipal solid waste) are accounted for under the energy supply sector. However, for a period in 2021 and 2022 the steam (recovery) turbines at La Collette were not functioning and needed repairs, resulting in municipal waste being incinerated and not used to generate electricity for the first time. Therefore, the sub-sector non-biogenic municipal solid waste has been added to the 1990 – 2021 and 1990-2022 inventories.

4.8.1 Sector and sub-sector trends

Emissions from the waste management sector accounted for 5.2% of total GHG emissions in the 2022 inventory. Emissions from the waste management sector have increased by 74.3% across the timeseries and 10.3% between 2021 and 2022 (**Figure 28**).

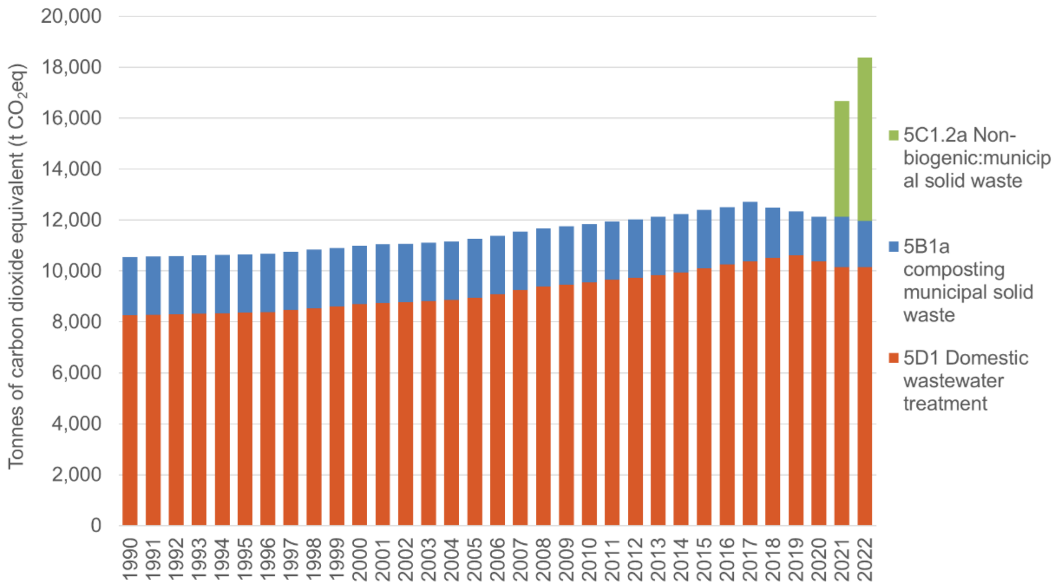

Figure 28 Waste management sector emissions by sub-sector 1990-2022

Across the entire timeseries, there has been a steady increase in total emissions from 10,544 tCO_2eq in 1990 to 12,494 tCO_2eq in 2017, and steady decrease since then to 12,139 tCO_2eq 2020 until MSW is burnt. The emission reached 18,383 tCO_2eq in 2022. The main source of emissions from the waste management sector for Jersey is from the domestic wastewater treatment sector (**Table 12**). Emissions have increased as population has increased. Emissions from waste incineration are not expected to remain beyond 2022 as they were caused by a fault at the Energy Recovery Facility in late 2021 which was fixed in spring of 2022.

Table 14 Waste management sector emissions by sub-sector with percentage changes

Tonnes of carbon dioxide equivalent (tCO_2eq)	1990	2021	2022	% change 1990-2022	% change 2021-2022
5D1 Domestic wastewater treatment	8,252	10,160	10,160	23.1%	0.0%
5B1a Composting municipal solid waste	2,293	1,967	1,797	-21.6%	-8.7%
5C1.2a Non-biogenic: municipal solid waste		4,541	6,426	-	41.5%
Grand Total	**10,544**	**16,669**	**18,383**	**74.3%**	**10.3%**

4.8.2 Gases

Methane, (CH_4) accounts for 33.5% of waste management sector emissions in 2022, whilst CO_2 accounts for 30.5% and N_2O accounts for 36.1%. Between 1990 and 2022, CH_4 and N_2O emissions have steadily increased by 18.3% and 18.2% respectively. Between 2021 and 2022, CH_4 emissions have increased by 1.7% but N_2O emissions decreased by 0.5% (

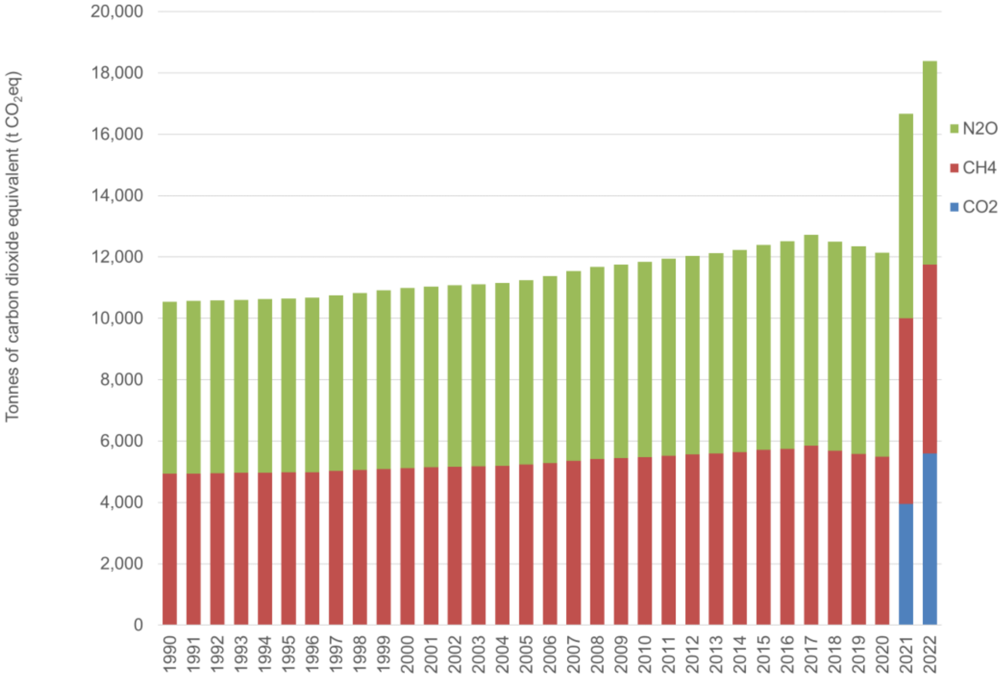

Figure *29*).

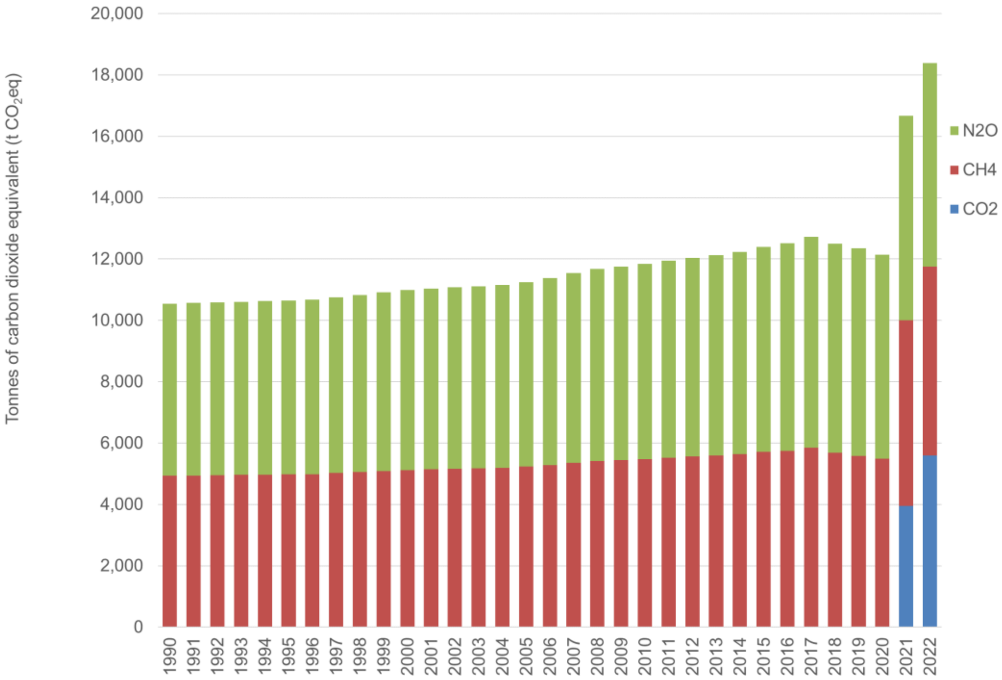

Figure 29 Waste management sector emissions by greenhouse gas 1990-2022

4.8.3 Methodologies

Activity data

Domestic wastewater treatment: Emissions from domestic wastewater treatment are estimated using UK data, scaled by population. Population estimates are sourced from Government of Jersey publications, most recently 'Report on the 2021 Jersey Census'. Per capita protein consumption (kg/person/year) was provided by FAOSTAT in 2011 and is used to calculate the total amount of nitrogen in effluent. This has not been updated since 2011 and is assumed to be static from the 2011 number.

Composting: Emissions from composting are estimated using the quantity of waste composted. This information was sourced from the Government of Jersey, Department for Growth, Housing and Environment as part of the waste management statistics provided in Jersey in Figures[13].

Waste incineration: Emissions from waste incineration are estimated using tonnages of waste incinerated. Waste tonnage data was provided by Jersey Government.

Emission factors

Domestic wastewater treatment: Current emission factors for wastewater are default values taken from the relevant literature such as the IPCC Guidebook.

Composting: Current emission factors for composting are default values taken from the IPCC Guidelines.

Waste incineration: Current implied emission factors are derived using default parameters from the IPCC Guidelines and waste composition that is Jersey-specific.

Assumptions

It is assumed that domestic wastewater management practices are comparable to those of the UK.

It is assumed that the amount of waste composted has remained constant from 1990 – 2015.

Recent improvements to the inventory

Between the 1990 – 2021 inventory and the 1990 – 2022 inventory, a calculation error for population estimates were corrected, resulting in recalculations to emissions from domestic wastewater treatment.

Between the 1990-2021 inventory and the 1990-2022 inventory there was a correction to the methodology used to calculate a Jersey-specific emission factor for municipal waste incinerated at the Energy Recovery Facility – a conversion factor was applied to convert carbon to CO_2 and corrections to the unit conversion for CH_4 and N_2O were made.

[13] https://www.gov.je/Government/JerseyInFigures/Environment/Pages/WasteManagement.aspx

5 Annex 1 Inventory Detail

5.1 GHG inventory sub-sector descriptions and data sources

Sector	Sub-sector	Description	Data sources
Agriculture	3F Field burning	Emissions from open burning of agriculture residues. It is assumed that this activity stopped in Jersey in 1993, in line with the UK.	Land area surveys from Centre for Ecology and Hydrology (CEH) and activity data from Rothamsted
	3G1 Liming	Emissions from the use of lime in agricultural soils	Activity data and estimated emissions from liming from CEH
	3H Urea application	Emissions from the application of urea to agricultural soils	Land area surveys from CEH and implied emission factors from Rothamsted
	3J Livestock	Emissions from enteric fermentation (digestive process in ruminant animals) and manure management for livestock, and managed soil from fertiliser application. Also indirect emissions from agricultural soils.	Agricultural Statistics
Business	1A2gviii Other manufacturing industries and construction	Emissions from the use of kerosene in commercial settings	Energy Trends report
	1A4ai Commercial/Institutional	Fuel combustion in industrial and commercial buildings, for example fuel combustion for heating	
	2F1a Commercial refrigeration	F-gas emissions released during the operation of commercial refrigeration units	Population data from Jersey Resident Population and census reports
	2F1b Domestic refrigeration	F-gas emissions released during the operation of domestic refrigeration units	Population data from Jersey Resident Population and census reports
	2F1d Transport refrigeration	Emissions from refrigeration during transport, for example refrigerated trucks and refrigerated containers on ships	Vans and trucks: Population data from Jersey Resident Population and census reports Marine vessels: GVA for the agriculture sector (which includes fishing) from Measuring Jersey's Economy report
	2F1e Mobile air conditioning	Emissions from mobile air conditioning source, for example F-gas emissions released during the use of vehicle air conditioning systems	Number of vehicles data from the Jersey Government
	2F1f Stationary air conditioning	Emissions released during the use of stationary air conditioning units	GVA data for the service sector from Measuring Jersey's Economy report

Sector	Sub-sector	Description	Data sources
	2F2a Closed foam blowing agents 2F2b Open foam blowing agents	HFCs are being used as replacements for CFCs and HCFCs in foams, particularly in closed-cell insulation applications. The processes and applications for which these various HFCs are being used include insulation boards and panels, pipe sections, sprayed systems and one-component gap filling foams	GDP data from Measuring Jersey's Economy report
	2F3 Fire Protection	Emissions from firefighting.	
	2F6b Other Applications: Contained-Refrigerant containers	Emissions from leakage of refrigerants from containers during transport and repackaging	
	2F6b Other Applications: Contained-Refrigerant processing	Emissions from leakage from contained refrigerants during processing, for example during reclamation. Note this has the same subsector code as above	
	2G3a Medical applications	Emissions from the use of N_2O as an anaesthetic	Population data from Jersey Resident Population report
Energy supply	1A1ai Public electricity and heat production: Energy from Waste	Emissions from the burning of municipal solid waste for electricity generation	Energy Trends report
	1A1ai Public electricity and heat production: Other fuels	Emissions from the burning of all fuels except municipal solid waste for electricity generation	Energy Trends report
Land use change	4 Indirect N_2O emissions	Indirect emissions from nitrogen leaching and run-off associated with land use and land use change	Land surveys and activity data held by CEH
	4B2_2 Grassland converted to cropland	Emissions and removals from grassland that is converted to cropland (carbon stock change and N mineralisation/immobilisation)	
	4C2_2 Cropland converted to grassland	Emissions and removals from cropland that is converted to grassland (carbon stock change)	
	4E2_2 Cropland converted to settlements	Emissions and removals from cropland that is converted to settlements (carbon stock change and N mineralisation/immobilisation)	
	4D2 Land converted to Wetlands	Emissions and removals from grassland converted to flooded land (carbon stock change)	
	4A1 Forest Land remaining Forest Land	Emissions and removals from forest land that remains forest land, specifically from biomass burning through wildfires	

Sector	Sub-sector	Description	Data sources
	4C1 Grassland remaining Grassland	Emissions and removals from grassland that remains grassland, specifically from biomass burning through wildfires	
	4C2_4 Settlements converted to Grassland	Emissions and removals from settlements converted to grassland (carbon stock change)	
Residential	1A4bi Residential stationary	Emissions from all fuel combustion in households, for heating and cooking	Energy Trends report
	2F4a Metered dose inhalers 2F4b Aerosols: Other	Most aerosol packages now contain hydrocarbon (HC) as propellants but, in a small fraction of the total, HFCs and PFCs may be used as propellants or solvents. The 5 main sources are metered dose inhalers (MDIs), personal care products (e.g. hair care, deodorant, shaving cream), household products (e.g. air-fresheners, oven and fabric cleaners), industrial products (e.g. special cleaning sprays such as those for operating electrical contact, lubricants, pipe-freezers) and other general products (e.g. silly string, tire inflators, claxons)	Population data from Jersey Resident Population report
Transport	1A3a Domestic aviation	Emissions from flights that depart and arrive in the same country. For Jersey this includes flights between the UK and Crown Dependencies (take-off and landing and cruise)	Activity data from the UK Civil Aviation Authority and fuel data from Digest of UK Energy Statistics
	1A3bi Cars	Emissions from passenger cars	Fuel data from Jersey's energy balance, number of vehicles data from the Jersey Government and 'Quantitative analysis of carbon neutrality by 2030' report
	1A3bii Light duty trucks	Emissions from light duty trucks – vehicles designed to transport light weight cargo or equipped with special features such as four-wheel drive for off-road operation	
	1A3biii Heavy duty trucks and buses	Emissions from buses and coaches, HGVs rigid and HGVs articulated	
	1A3biv Motorcycles	Emissions from vehicles designed to travel with no more than three wheels in contact with the ground, including mopeds (<50cc 2st), motorcycle (>50cc 2st) and motorcycle (>50cc 4st)	
	1A3d Domestic navigation	Emissions from fuels used by vessel of all flags that depart and arrive in the same country. For Jersey this includes journeys between to and from the UK	
	1A4ciii Fishing	Emissions from fuels combusted for inland, coastal and deep-sea fishing	AIS data and UK Sea Fisheries Annual Statistics
	2D3 Non-energy products from fuels and solvent use: other	This includes urea consumption by road transport. Some catalytic converters, particularly in diesel vehicles, use urea as a reducing agent	GDP and GVA for industrial and agricultural sectors from Measuring Jersey's Economy report, population data from

Sector	Sub-sector	Description	Data sources
			Jersey Resident Population report, number of vehicles data from the Jersey Government and number of households data from census
Waste management	5B1a Composting of municipal solid waste	Emissions from the decomposition of organic waste into compost	Waste management statistics from Jersey Facts and Figures
	5C1.2a Incineration of municipal solid waste	Emissions from the burning of waste without energy recovery	La Collette Energy Recovery Facility
	5D1 Domestic wastewater treatment	Emissions from the treatment of liquid waste and sludge from housing and commercial sources. This includes sewage sludge decomposition	Population data from Jersey Resident Population report
Industrial processes	2G3b N_2O from product use: Other	Emissions from the use of N_2O as a propellant in squirty cream	GDP data from Measuring Jersey's Economy report

6 Useful links

Tackling the climate emergency

Carbon Neutral Strategy

Carbon Neutral Roadmap

Report of Jersey's Citizen's Assembly on Climate Change

Sustainable Transport

Young people and the climate emergency

GHG emissions from Waste – A guide for Jersey

Development of an emission factor for imported electricity

Considering the Channel Islands' indirect GHG emissions

Carbon Neutrality by 2030

Quantitative analysis of carbon neutrality by 2030

Further info on Jersey's greenhouse gas emissions

Carbon sequestration and the role of soil and crops

Climate emergency additional information

Blue Carbon Resources: An Assessment of Jersey's Territorial Seas

7 About the authors

Kathryn Hampshire: Kathryn is a Principal Consultant specialising in emissions inventories, Monitoring, Reporting, and Verification (MRV) and transparency, and data visualisation. She manages Aether's work on the UK National Atmospheric Emissions Inventory programme (NAEI) and is responsible for QA/QC and sign off of the Overseas Territories and Crown Dependencies (OTCD) greenhouse gas inventories. She has also managed a number of projects with Jersey in the past including net zero modelling, development of technical reports, and development of data visualisation.

Katie King: Katie is a Company Director at Aether and has been involved in the compilation of emissions estimates for 15 years, focused in particular at the local level through spatial mapping of emissions. Katie is Knowledge Leader for Local Authority carbon emission data as part of the UK NAEI programme, overseeing the production of the LA level CO_2 dataset for DECC each year. Katie has much experience in data evaluation for emissions estimates, advising on and reviewing the work of the National Atmospheric Emissions Inventory emissions mapping team covering many sectors.

Courtney Szanto: Courtney is a consultant with experience in GHG and air pollutant inventory compilation. She is project manager for the compilation of Jersey's greenhouse gas inventory, alongside five other UK Overseas Territories and Crown Dependencies. Courtney also assists in the compilation of emissions from energy and industrial sectors. She has experience in developing GHG emission inventories and decarbonisation pathways to show the impact of climate action through her work supporting local authorities in their progress towards net zero.

Yuchen Gu: Yuchen is an assistant consultant in Aether. She has experience in GHG and air pollutant inventory compilation. Yuchen has experience working for Jersey's GHG inventory and supporting writing the Inventory Guide. She has strong skills in data manipulation, processing, visualisation, and analysis. Yuchen also has experience in inventory review of the NECD (National Emission reduction Commitments Directive) as technical lead in QA/QC and analysing the submissions.

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