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Acknowledgement of Country

The Australian Government acknowledges the Traditional Owners of Country throughout Australia, and their continuing connection to land, sea and community. We pay our respects to them and their cultures, and to Elders both past and present.

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We welcome feedback and dialogue about this report. Please send all such correspondence to: nhsc.unit@health.gov.au.

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Executive Summary

This report provides baseline estimates of Australia's health system greenhouse gas emissions in 2021-22. These estimates are a foundational component of the work to achieve a sustainable, high-quality, **net zero** health system outlined in Australia's first National Health and Climate Strategy, published in December 2023. The commitment to achieving a net zero health system encompasses emissions across scopes 1, 2 and 3, as well as emissions from patient travel to and from health facilities. This report delivers Action 4.1 of the National Health and Climate Strategy, which outlines a commitment to publish a baseline estimate of health system emissions in 2024, and regular emissions estimates thereafter, to track progress in **mitigation** efforts.

The report adheres to international standards and methodologies, including the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories and the Greenhouse Gas Protocol (GHG Protocol), to estimate emissions generated by the health system.[1,2] Emissions estimates are categorised using the GHG Protocol guidance and ISO14064:2018, to align with existing international health system emissions reports.[3,4]

This report employs a hybrid emissions estimation methodology that combines bottom-up activity-based assessment and top-down expenditure-based assessment using **Environmentally Extended Input-Output methods**. The boundary for the health system is defined using Input-Output Industry Groups based on the Australia New Zealand Standard Industry Classification. By drawing on data from Australia's National Greenhouse Accounts and Australian System of National Accounts, and employing consistent methods and **emissions factors**, this report offers a robust foundation for future health system emissions reporting.[5,6] This report's emissions estimates are different to the previous estimates by Malik and coauthors which are based on how much is spent on the health system; by contrast, this report's estimates are based on what the health system spends money on i.e. its consumption of goods and services. This report's approach draws on more granular expenditure data and therefore, also when combined with use of a wide range of activity-based data sources, enables reporting at the level of emissions 'sources' such as fuel combustion, energy use, and various types of purchased goods and services.

The report leverages the best available data and presents emissions estimates in a way that supports all types of organisations within the Australian health system to reference and compare their own emissions with overall health system emissions. Where relevant, this report notes limitations and challenges posed by data gaps and the complexity of the health system's value chain – including difficulties in disaggregating emissions data into specific sectors, use of average emissions factors in some areas, and the need for more detailed activity data.

The report estimates the total greenhouse gas emissions by the Australian health system were 23.522 Mt CO_2-e in 2021-22, or 5.44% of Australia's greenhouse gas emissions.[7] Considering the three broad areas included in the health system, these emissions are divided between:

- Health Care Services: 13.790 Mt CO_2-e (59% of the total)
- Residential Care and Social Assistance Services: 7.806 Mt CO_2-e (33%)
- Human Pharmaceutical and Medicinal Product Manufacturing: 1.927 Mt CO_2-e (8%).

Disaggregating emissions by scope reveals the following:

- **Scope 1** (direct emissions, including natural gas and liquid fuels): 1.531 Mt CO_2-e (7% of the total) from sources such as stationary fuel use, **anaesthetic gases**, or fuel use in vehicles owned or leased by the health system.
- **Scope 2** (indirect energy-related emissions): 4.696 Mt CO_2-e (20%) from purchased energy.
- **Scope 3** (other indirect emissions): 15.887 Mt CO_2-e (68%) primarily from purchased goods and services.
- **Outside Scopes**: 1.409 Mt CO_2-e (6%) from patient travel to and from health facilities.

In publishing this report, the Australian Government demonstrates its commitment to building the evidence base to support informed prioritisation of efforts towards a net zero health system. Future work will focus on:

- Addressing identified limitations to refine emissions estimation methods
- Working with state and territory governments, and with private providers, to align approaches to health system greenhouse gas emissions estimation, and to make use of these estimates in national reporting

The comprehensive baseline emissions estimates provided in this report are a critical starting point for achieving the vision of a net zero health system, ultimately contributing to healthier, more sustainable communities.

1. Introduction

Climate change poses a significant threat to population health and the functioning of health systems worldwide. In response to this challenge, in December 2023 Australia published its first National Health and Climate Strategy (the Strategy), which sets out a whole-of-government approach to achieving the vision of healthy, climate-resilient communities and a sustainable, high-quality, net zero health system.[8]

One of the four objectives of the Strategy is to decarbonise the health system, minimising its environmental impact while continuing to deliver high-quality care. While the health system is not the biggest contributor to Australian greenhouse gas emissions, to achieve net zero by 2050 all sectors of the economy must play their part – and doing so aligns with the principle 'first do no harm'.

This report is a foundational component of achieving a net zero health system. It builds on the pioneering work of Malik and coauthors which provided the first overall estimate of the greenhouse gas emissions associated with Australian healthcare delivery.[9] This report delivers Action 4.1 of the Strategy, providing the first comprehensive baseline emissions estimates for Australia's health system, including public and private hospitals, primary and secondary health care, and aged care. The emissions estimates provided in this report include emissions across scopes 1, 2 and 3, as well as emissions from patient travel. This aligns to the scope of the Strategy, and therefore forms the starting point for regular reporting to track progress in achieving the Strategy's vision of a net zero health system. This report will also support delivery of additional actions in the Strategy, including Action 4.3 (agreeing a health system emissions reduction trajectory) and Action 4.4 (developing a health system decarbonisation roadmap).

The estimates presented in this report adhere to the Greenhouse Gas Protocol (GHG Protocol) guiding principles on emissions measurement and are derived from a wide range of sources, including Australia's National Greenhouse Accounts (NGA), the Australian System of National Accounts (the National Accounts), Services Australia transaction data (Medicare, prescribing), Australian Institute of Health and Welfare (AIHW) reports, data from peer-reviewed academic literature, and information provided by leading experts in climate and health. As the National Greenhouse Accounts adhere to Intergovernmental Panel on Climate Change (IPCC) Guidelines which do not use the framing of 'scopes' for emissions reporting, this report draws on the GHG Protocol and ISO14064:2018 to develop a categorisation system for scope 3 emissions, with IPCC reporting categories provided as references where applicable.[1,2,10,11,12] A glossary (Appendix A) provides definitions of terms and acronyms used throughout this report; terms included in the glossary are denoted in bold on first use in the main body.

While this report is an important starting point, it is limited in multiple respects due to gaps in the underlying data and challenges posed by the complexity of the health system's value chain. These limitations and challenges are noted throughout the report; Appendix B provides a consolidated list of these limitations as well as discussing other limitations not noted in the main body. The report addresses known limitations in the methods and data sources used to calculate health system emissions, and in so doing identifies opportunities for further work to improve data collection and estimation strategies. The information is presented in a way that is accessible for those new to emissions measurement while also providing sufficient detail for experts who may wish to apply these methods within their own organisations or jurisdictions.

The estimates are disaggregated by source, scope, and industry sector. The report provides emissions estimates across scopes 1, 2 and 3 – as well as for patient travel to and from health facilities – to provide a complete picture of emissions across the whole health system value chain. Including scope 3 emissions in the National Health and Climate Strategy's efforts to achieve a net zero health system is particularly important in supporting evidence-based procurement decisions. For example, if only scope 1 emissions were considered, switching from disposable to reusable hospital gowns would appear to result in an increase in emissions, because the emissions generated in production of the gowns would not be considered, and reusable gowns involve increased use of steam sterilisers which are currently largely powered by gas, which forms part of scope 1 emissions. However, considering emissions across scopes 1, 2 and 3 would reveal reusable gowns generate fewer emissions across the life cycle.

Industry sector is defined using the **Australia New Zealand Standard Industry Classification** (ANZSIC).[13] In the future, it is anticipated these emissions estimates will be further refined within industry sectors, and that state and territory breakdowns will also be provided. These refinements will also endeavour to reflect changes in key international accounting standards. This includes the System of the National Accounts 2025 update which presents economic statistics, as it will begin to present environmental measures.[14] This level of detail is crucial for understanding the emissions profile of the health system, identifying opportunities for targeted emissions reduction strategies, and tracking progress in emissions reduction initiatives over time.

This report estimates health system emissions in 2021-22, when the COVID-19 pandemic remained a significant challenge for the health system, affecting workforce, service delivery, supply chains, and market dynamics.[6,13,15] The exceptional nature of the COVID-19 pandemic has likely affected the emissions estimates provided in this report, implying that estimates in future years may differ significantly.

In publishing this report, the Australian Government demonstrates its commitment to building the evidence base to support informed prioritisation of efforts towards a net zero health system. As we move forward, regular updates to these emissions estimates will

ensure health system decarbonisation efforts remain on track and contribute to achievement of Australia's broader emissions reduction goals. Future work will focus on:

- Addressing identified limitations to refine emissions estimation methods
- Working with state and territory governments, and with private providers, to align approaches to health system greenhouse gas emissions estimation, and to make use of these estimates in national reporting.

1.1 Emissions reporting in Australia

The Department of Climate Change, Energy, the Environment and Water (DCCEEW) compiles Australia's NGA. The NGA are a suite of reports and datasets on Australia's greenhouse gas emissions and are used to fulfil Australia's domestic and international emission reporting obligations, track progress towards Australia's **Paris Agreement** emission reductions targets under the **United Nations Framework Convention on Climate Change (UNFCCC),** and inform and monitor government policy and future national emissions reduction targets. The NGA are compiled consistently with Paris Agreement rules and guidelines, including IPCC Guidelines for emission estimation.[1]

Within the NGA, the **National Inventory Report** provides estimates of scope 1 (production-based) emissions and removals in Australia, grouped under five sectors aligned to IPCC Guidelines.[12] These five sectors represent the main human activities that contribute to the release or capture of greenhouse gases into, or from, the atmosphere:

- Energy
- Industrial Process and Produce Use
- Agriculture
- Land Use, Land Use Change and Forestry
- Waste.

The sectors in the National Inventory Report represent emissions and removals categorised based on activity type, rather than by industry of ownership or responsibility for undertaking those activities. For example, 'Healthcare' is not a discrete sector under the IPCC Guidelines, but emissions from activities such as fuel combustion and waste disposal undertaken or induced by the health system will contribute to the whole-of-economy emissions estimates reported in the National Inventory Report.

To support integration with economic data, the NGA also include an annual National Inventory by Economic Sector (NIbES), which reports national production-based (scope 1) emissions by economic sector.[7] The NIbES is prepared by mapping estimates of activity-based scope 1 emissions from the National Inventory Report to responsible industries using data on the type and level of activities undertaken by those industries. The publicly available NIbES provides emission estimates based on ANZSIC codes, typically at the level of ANZSIC Divisions, Subdivisions or groups of Subdivisions – with health system emissions reported under 'H,P,Q Accommodation, Food Services, Education and Health Services'.[5] This report uses a more granular version of the NIbES provided by DCCEEW

that estimates scope 1 emissions for the 116 Input-Output Industry Groups (IOIGs) defined by the Australian Bureau of Statistics, which are an aggregation of ANZSIC codes (see Appendix C for further information). Estimates from the IOIG-level NIbES for 2021-22 (which cannot be published due to confidentiality provisions for data supplied under the *National Greenhouse and Energy Reporting Act* 2007) are a key input to the health system estimates in this report.

1.2 Health system emissions reporting in Australia

The Australian health system consists of multiple layers of funding, governance, management, and care delivery, all of which affect emissions measurement and reporting.[16] The system comprises a mix of public, private, and not-for-profit entities, with governance and funding responsibilities split between the Australian Government, state and territory governments, and various private and not-for profit providers.

Understanding the evolving regulations and reporting requirements facing corporate, non-corporate and not-for-profit health system organisations is crucial for estimating health system emissions. The regulatory environment, as well as the division of ownership and funding responsibilities, all influence how emissions data is collected, analysed, and reported. Accurately capturing the emissions profile of such a multifaceted system requires a comprehensive approach that accounts for the diverse and interconnected nature of the health system's value chain. Appendix D discusses these developments in further detail.

The Australian Government funds primary care services, including general practice and pharmaceutical benefits, as well as most aged care services. State and territory governments are responsible for public hospitals, ambulance services, and some aged care services. State and territory governments also have their own emissions reporting frameworks, often implemented at a 'whole-of-government' level, requiring all public sector departments within that jurisdiction to adhere to the same set of requirements.

This alignment of environmental reporting requirements at a whole-of-government level rather than at economic sector level creates challenges in estimating emissions consistently across jurisdictions. These frameworks, including the ownership of different health system services, may vary across jurisdictions, creating further challenges in producing a uniform national emissions estimate for the health system. For instance:

- The ACT Ambulance Service is part of the Justice and Community Services Directorate, meaning its fuel expenditure and emissions may be reported in IOIG 7701 'Public Order and Safety'. As a result, these emissions fall outside the boundary of analysis for this report, and cannot easily be mapped to the health system.[17]
- The SA Ambulance Service is integrated into SA Health, meaning its emissions are reported as scope 1 road transport emissions.[18]
- Queensland Retrieval Services outsources patient transport to third parties, where emissions are classified as scope 3 supply chain emissions.

2. Emissions estimation methodology

2.1 Estimation methodologies

Greenhouse gases emitted by the health system include carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and fluorinated gases – the latter including anaesthetic gases such as desflurane and sevoflurane, and the propellants in metered dose inhalers (MDIs). These emissions are often converted into **carbon dioxide equivalents (CO_2-e)** using **Global Warming Potential (GWP)** values.

An **emissions inventory**, or **emissions footprint**, is generated in two stages. First, emissions factors or intensities (which measure emissions per unit of activity or expenditure) are obtained or calculated for different sources such as fuels or individual items of expenditure. Emissions factors are available in the Australian NGA Factors publication or can be calculated using economic and environmental data to generate an **emissions intensity** per dollar of expenditure on a given source.[19,20] Second, emissions for each source are estimated by applying the emissions factor or intensity to the measure of activity or expenditure.

There are three broad approaches to estimating an emissions inventory:

1. Activity-based estimation, also referred to as bottom-up estimation.
2. Expenditure-based estimation, also referred to as top-down estimation.
3. A hybrid method.

The type of data available will often determine the approach used to produce the emissions inventory. Bottom-up activity-based assessment requires operational activity data from specific activities, such as fuel consumption, business travel, and energy use. This method provides a more precise and detailed measurement of emissions.

Top-down expenditure-based assessment, by contrast, makes use of expenditure data mapped to the same level of aggregation as the level at which emissions intensities are available. When emissions data are available on a production (scope 1) basis for each sector included in an Input-Output table, those emissions can be connected to consumption activity using Environmentally Extended Input-Output (EEIO) analysis, allowing the emissions associated with consumption activity, such as the purchase of products and services by a health care provider, to be estimated.[21]

Organisations that have a combination of activity and expenditure data may opt to use a hybrid approach involving elements of top-down and bottom-up estimation. A hybrid method leverages the strengths of both activity-based and expenditure-based approaches by using direct operational data where available (typically for scope 1 and scope 2 emissions, and

sometimes also a selection of scope 3 emissions) and expenditure-based methods for other areas to produce a comprehensive emissions estimate.

This report estimates the greenhouse gas emissions generated by the Australian health system using a hybrid EEIO-activity-based assessment method. Hybrid methods are accepted as the best emissions estimation method for large complex systems including national health systems, and have been used by the English National Health Service (NHS) and the French health system, amongst others.[3,4,22]

Table 1: Summary of bottom-up activity-based assessment

	Activity-Based (Bottom-Up) Assessment
Definition	An approach to estimating emissions that utilises activity-based data on sources of emissions, as measured for instance in physical units. Emissions factors are applied to these measures of activity to estimate emissions.
How it works	It works by gathering precise data on units of activity e.g. volume in litres of gas supplied and applying an emissions factor, which is sometimes derived from **Life Cycle Assessments (LCAs)**. Organisations may use environmental data management systems that include or link to published national and/or international emissions factors for common energy intensive goods such as fuel.
Data	Activity data measured in units of activity or product, or in volume e.g. litres of fuel.
Who does it	This approach is suitable for organisations with access to the detailed procurement, invoicing and activity data required for accurate measurement of activity.
Advantages	Based on detailed and specific data, allowing for more precise estimation of emissions and tracking of changes over time.
Limitations	Can be resource-intensive and may not capture the full spectrum of indirect emissions (upstream and downstream). May also result in underestimation from 'truncation errors' dependent on how the boundary has been defined when developing the associated emissions factor for that good or service.[3]
This report	Activity-based assessment was used to derive scope 1 and scope 2 emissions, as well as some scope 3 emissions sources (marked with an asterisk ('*') in Table 8).

Table 2: Summary of top-down expenditure-based assessment

	Expenditure-Based (Top-Down) Assessment
Definition	An approach to estimating emissions that aggregates financial data on expenditure to a suitable level and then applies an emissions intensity for that expenditure category to estimate the associated emissions. Emissions intensities for each expenditure category may be obtained from existing studies or from third party emissions software, tools and calculators. Alternatively they can be generated by applying EEIO methods to production-based (scope 1) emissions data and Input-Output tables, to map the emissions associated with consumption of goods and services from producing to consuming sectors.
How it works	This method involves sourcing organisational, entity, group or whole of system financial data, detailing the expenditure or 'inputs' over the reporting period, aligning these to standardised accounting codes and mapping them to emissions factor or intensity data. Typically, emissions are estimated as a function of expenditure.
Data	Expenditure data measured in dollars and emissions intensity data measured in kg CO_2-e per dollar of expenditure.
Who does it	National governments and large organisations often use EEIO analysis to get a comprehensive view of emissions across economic sectors or the whole organisation or economy. In addition, EEIO can be helpful to provide emissions estimates for organisations who may not have access to detailed activity and supplier data.
Advantages	Provides a broad overview of emissions, including indirect emissions, and can be less resource-intensive than an activity-based approach. Can identify hotspots in the supply chain.
Limitations	Price differences result in differences in estimated emissions which may bear no relationship to the underlying reality – for example a purchaser who negotiates a 50% price discount will report half the emissions of a purchaser who does not negotiate a price discount. It produces emissions intensities associated with different goods and services that fluctuate between annual reporting cycles based on changes in emissions and expenditure data, which may not reflect changes to underlying emissions.
This report	EEIO analysis was used to derive total health system emissions across scopes 1, 2 and 3.

Table 3: Summary of hybrid assessment

	Hybrid Assessment (Combining Bottom Up and Top Down)
Definition	This method combines activity-based and EEIO-based approaches to leverage the strengths of both.
How it works	Activity data is used where available, especially for scope 1 and 2 emissions. Expenditure data is used to estimate the remaining emissions. The guiding principle is that activity data should always take precedence when it is available, credible, transparent, and relevant. Activity and expenditure data are combined by producing an estimate of total (scope 1, 2 and 3) emissions using EEIO analysis, then 'subtracting out' the emissions corresponding to the sources estimated on an activity basis to avoid double counting.
Who does it	This approach is suitable for both individual organisations and larger systems, including whole of country, or whole of sector estimates, looking to balance detail and accuracy where possible with broad coverage.
Advantages	Provides a comprehensive and detailed view of emissions, ensuring all significant sources are captured. Balances the resource intensity of activity-based calculations with the broader scope of EEIO.
Limitations	Requires careful integration of different data types and methodologies to avoid double counting. Standardising data formats, ensuring consistency in time periods and carefully mapping boundaries between activity-based and expenditure-based emissions, with clear documentation and guidelines, can improve accuracy.
This report	A hybrid assessment was used to produce the emissions estimates provided in this report. Emissions were estimated on an activity basis where possible, and total emissions across scopes 1, 2 and 3 were estimated using EEIO analysis to produce a 'consumption inventory'. To avoid double counting, deductions are made from the consumption inventory estimates for emissions sources estimated on an activity basis.

2.2 Boundary definition

The first step in producing estimates of health system emissions is to establish the boundary, which involves defining the scope of the organisations or parts of the system to be included. This is influenced by the organisation of the available data.

As this report draws significantly on a version of NIbES that reports production-based (scope 1) emissions for 116 IOIGs, this report defines the boundary of the health system at IOIG level. We define the health system to include the following IOIGs:

- **IOIG 8401 (Health Care Services)**, including hospitals, general practice, and specialist medical services
- **IOIG 8601 (Residential Care and Social Assistance Services)**, including aged care residential services, other residential care services, and social assistance services.
- **IOIG 1801 (Human Pharmaceutical and Medicinal Product Manufacturing).**

Tables 4, 5 and 6 provide the ANZSIC codes included in each of these IOIGs, and Appendix C provides further information about ANZSIC and IOIGs. IOIG 8601 is included in our boundary definition to capture aged care emissions, but it is important to note that it also includes other sectors (e.g. social assistance services, and residential care for people with disabilities) that are outside the boundary of the health system defined in the National Health and Climate Strategy. Separating aged care emissions from these other emissions sources is a priority for future updates to the estimates provided in this report.

The following ANZSIC classes would ideally have been included in our health system boundary, but could not be included in the emissions estimates provided in this report because they are within IOIGs that largely lie outside the health system:

- Class 3720 Pharmaceutical and Toiletry Goods Wholesaling
- Class 4271 Pharmaceutical, Cosmetic and Toiletry Goods Retailing
- Class 2412 Medical and Surgical Equipment Manufacturing
- Class 6321 Health Insurance.

Including these economic sectors in health system emissions estimates is a priority for future updates to this report. The implications of excluding these sectors for our overall estimates are discussed in section 2.3 below.

The National Health and Climate Strategy's commitment to achieving a net zero health system encompasses patient travel to and from health facilities, in addition to encompassing scope 1, 2 and 3 emissions.[23] A focus on patient travel can highlight the advantages of shifting towards active transportation modes, such as cycling and walking, which (where appropriate given a patient's circumstances) result in health co-benefits. Furthermore, reducing reliance on fossil-fuel-powered vehicles not only lowers emissions but also enhances air quality and alleviates road congestion. This shift can contribute to a range of broader societal improvements, including fewer traffic accidents, reduced travel times, and improved overall health and quality of life.[24,25,26]

Table 4: ANZSIC codes for Health Care Services

ANZSIC codes within IOIG 8401 Health Care Services
Subdivision 84 Hospitals
Class 8401 Hospitals (except Psychiatric Hospitals)
Class 8402 Psychiatric Hospitals
Subdivision 85 Medical and Other Health Care Services
Group 851 Medical Services
Class 8511 General Practice Medical Services
Class 8512 Specialist Medical Services
Group 852 Pathology and Diagnostic Imaging Services
Group 853 Allied Health Service
Class 8531 Dental Services
Class 8532 Optometry and Optical Dispensing
Class 8533 Physiotherapy Services
Class 8534 Chiropractic and Osteopathic Services
Class 8539 Other Allied Health Services
Group 859 Other Health Care Services
Class 8591 Ambulance Services
Class 8599 Other Health Care Services nec (not elsewhere classified)

Table 5: ANZSIC codes for Residential Care and Social Assistance Services

ANZSIC codes within IOIG 8601 Residential Care and Social Assistance Services
Subdivision 86 Residential Care Services
Class 8601 Aged Care Residential Services
Class 8609 Other Residential Care Services
Subdivision 87 Social Assistance Services
Group 871 Childcare Services
Group 879 Other Social Assistance Services

Table 6: ANZSIC codes for Human Pharmaceutical and Medicinal Product Manufacturing

ANZSIC codes within IOIG 1801 Human Pharmaceutical and Medicinal Product Manufacturing
This IOIG is identical with the following ANZSIC class:
Class 1841 Human Pharmaceutical and Medicinal Product Manufacturing

2.3 Data sources

Once the boundary of the health system has been defined, the next step in obtaining an estimate of health system emissions is to gather the data required to undertake the hybrid analysis.

2.3.1 Activity data

The main source of activity-based emissions estimates in this report is the NIbES for 2021-22.[7] Specifically, this report uses a more detailed version of NIbES provided by DCCEEW, which includes production-based (scope 1) emissions estimates for 116 IOIGs. While the NIbES is described here as an activity-based emissions estimate, this is a simplification – the National Inventory Report reports activity-based estimates for five areas of economic activity, but NIbES then allocates these emissions to sectors of the economy on an expenditure basis using Input-Output tables. Furthermore, some emissions in the National Inventory Report are themselves estimated on an expenditure basis (for example, emissions from Mobile Air-Conditioning are estimated as a function of expenditure on road transport fuel).

Activity-based emissions data for medical nitrous oxide use (scope 1) and clinical waste incineration (scope 3) were obtained from DCCEEW, and for anaesthetic gases (scope 1) and respiratory inhalers (scope 3) from industry data and academic experts. Air transport emissions (scope 1) were estimated on an activity basis using published air ambulance data combined with other data sources. Estimates were validated through consultation with clinical and climate specialists.

The Australian Government does not currently publish estimates of scope 2 emissions (indirect emissions from purchased energy) by industry sector. To overcome this gap, this report estimates scope 2 health system emissions on an activity basis using data from the NIbES and the **National Greenhouse and Energy Reporting (NGER) Scheme**.[27] These estimates, and the assumptions underlying them, are presented in section 6.

Scope 3 employee commute emissions were calculated by combining on-road car emissions factors with the volume of employees, average reported days worked, and reported average driving distance to work, with an adjustment for electric vehicle use. To estimate the emissions associated with patient travel, on-road car emissions factors were applied to consultation volume data partitioned by consultation type and remoteness type, with data on travel distance to health services, and adjustments made for mode of transport (electric vehicles and public transport use) and use of telehealth services.

Table 7: Activity-based emissions data sources

Activity based emissions data collected	Report category	Data Source
Stationary Fuel Combustion	Scope 1: Built Environment	NIbES
Commercial Refrigeration and Stationary Air Conditioning	Scope 1: Built Environment	NIbES
Lubricants	Scope 1: Built Environment	NIbES
Mobile Air-Conditioning	Scope 1: Travel and Transport	NIbES
Road Transport Fuel Combustion	Scope 1: Travel and Transport	NIbES
Air Transport Fuel Combustion	Scope 1: Travel and Transport	Estimated based on publicly available air ambulance retrieval and transfer data.
Medical Nitrous Oxide	Scope 1: Anaesthetic Gases	Provided by DCCEEW based on estimates in the National Inventory Report 2022.
Fluorinated Anaesthetic Gases	Scope 1: Anaesthetic Gases	Estimated based on industry data provided by academic experts.
Respiratory Inhalers	Scope 3: Purchased Goods and Services	Estimated based on industry data provided by academic experts.
Clinical Waste Incineration	Scope 3: Water and Waste	Provided by DCCEEW based on estimates in the National Inventory Report 2022.
Employee Commute	Scope 3: Employee Commute	Australian Bureau of Statistics (ABS) and Bureau of Infrastructure Transport Research Economics (BITRE).
Patient Travel	Outside Scopes 1, 2 and 3	Medicare and total health consultation service volume data from AIHW, BITRE, ABS, the Australian Urban Observatory and academic literature on travel distance and access to health services, and unpublished data on travel distance to primary care.

2.3.2 Expenditure data

The expenditure data used in this report to generate top-down emissions estimates is drawn from the domestic component of the Input-Output tables published for 2021-22 as part of the National Accounts by the ABS.[28] These tables report the flow of money between industry sectors, households (consumption and wages), and government (expenditure and taxes), and include imports and exports (though these are not utilised in the present analysis). The data separately reports *expenditure by* each of the 116 IOIGs described in section 2.1. For each of the 116 IOIGs, the data reports *expenditure on* each IOIG, as well as on each code in the Input-Output Product Classification (IOPC, of which there are 923).

The emissions estimates provided in this report are based on expenditure by health system organisations on domestically produced goods and services combined with estimates of domestic emissions. Accordingly, they do not include emissions generated overseas which may be embodied in imported goods and services, whether purchased directly from overseas by health system organisations or from domestic suppliers of goods and services whose ultimate origin is outside of Australia. However, the complexity of health system supply chains means the possibility of our estimate including some emissions generated overseas cannot be entirely ruled out.

The previous leading estimate of Australian healthcare emissions by Malik and coauthors use the same EEIO methods used to produce this report, but they apply these methods in a slightly different way. While Malik and coauthors base their emissions estimates on how much is spent on the health system, this report's emissions estimates are based on what the health system spends money on i.e. its consumption of goods and services – combined with emissions estimates from activity-based data sources where available, with deductions from the expenditure-based estimates to avoid double counting. This report's approach draws on more granular expenditure data and therefore, when also combined with use of a wide range of activity-based data sources, enables reporting at the level of emissions 'sources' such as fuel combustion, energy use, and various types of purchased goods and services.

The differences between the methodology adopted in this report and that adopted by Malik and coauthors may explain why this report concludes the health system is responsible for around 5.44% of Australia's overall emissions, whereas Malik and coauthors arrive at a higher figure of around 7% (the fact that – unlike Malik and coauthors – this report's estimates are partially drawn from activity-based data sources does not help to explain this discrepancy, as these are mostly larger than the expenditure-based estimates they replace, as well as being a small contributor to total estimated emissions). As discussed in section 2.2 above, our health system boundary omits key parts of the health system such as medical device manufacturing, pharmacy retail and wholesale, and private health insurance. When organisations within the health system boundary used for this report (IOIGs 8401, 8601 and 1801) spend money on goods and services produced or sold by these economic sectors (e.g. on medical devices and pharmaceuticals), the emissions

associated with this expenditure will be included in the estimates provided in this report. However, when households spend money *directly* on goods and services produced or sold by economic sectors that should in theory be included in the health system boundary but that are omitted from the boundary used in this report due to data limitations (e.g. medical device manufacturing and pharmacy), this expenditure will not be included in the emissions estimates provided in this report – thus reducing our estimates of overall health system emissions. Future updates to this report will consider options for including this expenditure in our emissions estimates.

The omission of retail and wholesale pharmacy from the health system boundary used to produce the estimates provided in this report also informs our approach to the risk of double counting between IOIG 8401 (Health Care Services) and IOIG 8601 (Residential Care and Social Assistance Services) on the one hand, and IOIG 1801 (Human Pharmaceutical and Medicinal Product Manufacturing) on the other hand. When Health Care Services and Residential Care and Social Assistance Services entities purchase goods from Human Pharmaceutical and Medicinal Product Manufacturing entities, the emissions embodied in these goods will appear as scope 3 emissions for the purchasing entity, but the portion of these emissions directly produced by Human Pharmaceutical and Medicinal Product Manufacturing entities will also appear as scope 1 emissions for these manufacturing entities, potentially resulting in an overstatement of emissions across the total health system estimate. However, we see the inclusion of emissions from Human Pharmaceutical and Medicinal Product Manufacturing as a compensatory measure for the exclusion from our estimates of emissions related to *direct* household purchases from retail and wholesale pharmacy – though only a partial compensation, given over 90% of medicines consumed in Australia are imported.[29] If retail and wholesale pharmacy can be included in the health system boundary in future updates to this report, consideration will be given to making an adjustment to avoid double counting with Human Pharmaceutical and Medicinal Product Manufacturing.

2.4 Estimation process

After collecting all applicable data, the next step is to combine expenditure data from the National Accounts and national direct (production-based, scope 1) emissions data from NIbES using EEIO methods to produce a 'consumption inventory' – i.e. an estimate of total ('consumption-based') health system emissions across scopes 1, 2 and 3.

As ABS only reports *expenditure by* each economic sector down to IOIG level, we cannot disaggregate the economic sector incurring expenditure below this level. However, as ABS reports what each IOIG spends money on down to IOPC level, for each of the three IOIGs included in our health system boundary, it is possible to separately estimate emissions for each of the 923 IOPC codes (see Appendix B for discussion of a limitation in this approach).

Figure 1 shows the flow of data and calculations involved in estimating health system emissions using the hybrid method for this report.

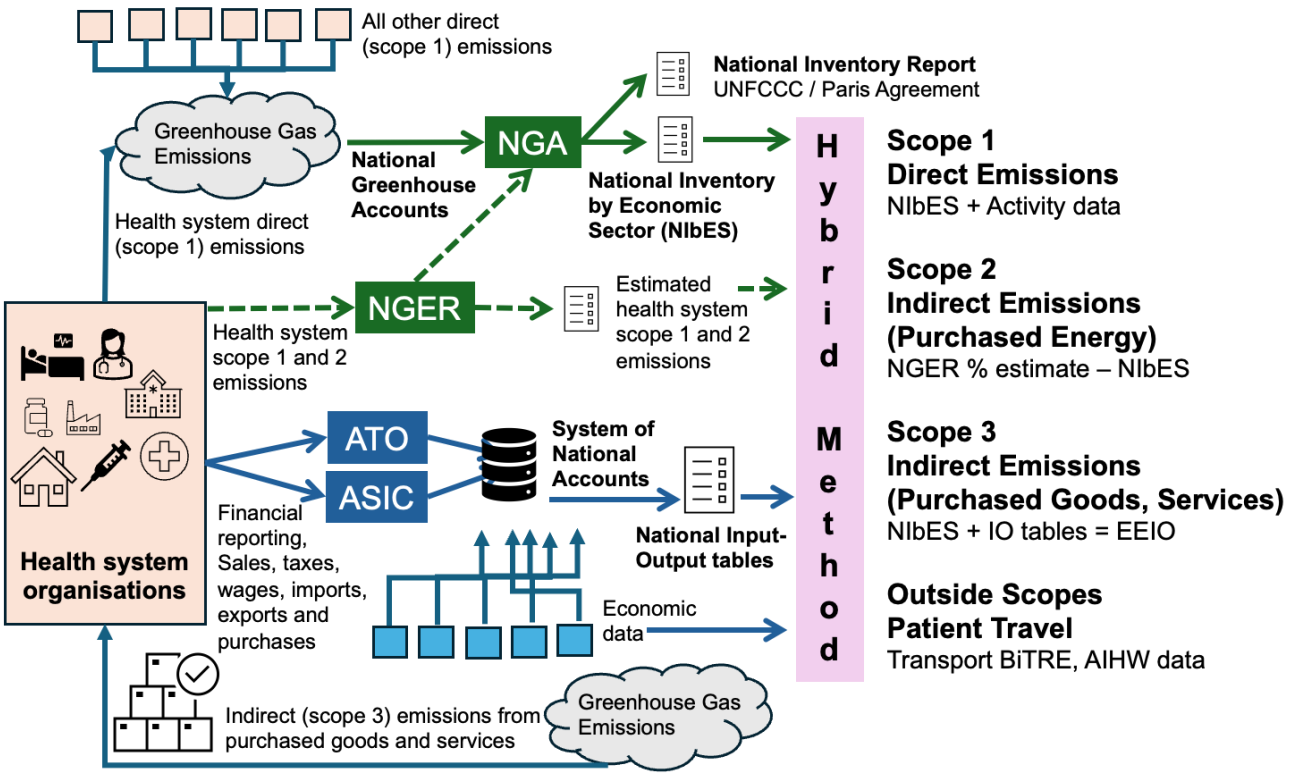

Figure 1: Schematic of hybrid method for estimating Australian health system emissions.

The output of the EEIO analysis is a 'direct' emissions intensity and a 'total' emissions intensity for expenditure in each of the 116 IOIGs. Direct intensities provide an estimate of emissions per dollar of expenditure for the first layer of the supply chain and can be used as a proxy for direct (scope 1) emissions from fuel and energy related sources, as well as for indirect (scope 2) emissions from purchased energy. In contrast, total intensities utilise interlinked data on consuming and producing sectors to estimate emissions per dollar of expenditure across the whole supply chain, enabling the calculation of **upstream** (embodied), and potentially also **downstream**, emissions associated with consumption of a product or service. By deducting the direct emission intensity from the total emission intensity wherever there are corresponding activity-based emissions estimates, we aim to balance the overestimation of previously reported scope 1 and 2 emission sources, with minimising underestimation of total emissions by retaining the indirect component of the emissions associated with that expenditure and reporting it under the corresponding scope 3 inventory item.

Scope 1 and 2 emissions, patient travel emissions, and a small number of scope 3 emissions are estimated using the activity-based sources listed in Table 7.

Scope 3 emissions are estimated in two stages. First, the 923 IOPC codes in the consumption inventory are grouped into 21 reporting categories using a mapping developed

in consultation with health, procurement and emissions measurement experts (see Appendix E for mapping). These 21 scope 3 reporting categories align with the 15 GHG Protocol scope 3 reporting categories and the ISO 14064-1:2018 standard for emissions reporting.[11,30,31] By aligning with these international standards, the report aims to facilitate comparison of its emissions estimates with those published by other health system entities.

Where relevant, the GHG Protocol scope 3 categories have been further refined into categories specific to the health system, such as Medical Devices and Equipment, and Laundry, Cleaning and Maintenance. For some of the 21 scope 3 reporting categories, IOPC codes are further divided into subcategories (e.g. clothing and footwear, eggs and dairy) to enable richer presentation of emissions hotspots. IOPC codes are not classified into subcategories exhaustively, nor are emissions estimates reported for all subcategories. Where the IOPC codes making up these categories or subcategories are contiguous or otherwise easily quoted, they are provided in the main body of the report.

Secondly, subtractions are made from emissions in the 21 scope 3 reporting categories to avoid double counting of scope 1 and 2 emissions, as well as to avoid double counting of scope 3 emissions sources that are estimated on an activity basis. Where a scope 3 reporting category has a corresponding scope 1 emissions source estimated on an activity basis, a deduction is made to avoid double counting. This is done by using the direct intensity component of the consumption inventory estimate as a proxy for scope 1 emissions. As direct intensities report emissions per dollar of expenditure for the first layer of the supply chain, this component is subtracted from the total emissions estimate for that reporting category. The remaining amount from the consumption inventory estimate is then interpreted as an estimate of scope 3 emissions for that reporting category.[32,33,34]

A similar method is applied to scope 2 emissions (indirect emissions associated with purchased energy). The direct intensity component of the consumption inventory estimate of energy emissions is taken to be a proxy for scope 2 emissions, and is subtracted from the total energy-related emissions in the consumption inventory estimate. The remaining amount is interpreted as scope 3 energy-related emissions (‘Upstream energy-related emissions’).

3. Australian health system emissions 2021-22

The estimate of Australian health system greenhouse gas emissions provided in this report is for the 2021-22 financial year. The estimate includes direct (scope 1) and indirect (scopes 2 and 3) emissions, as well as patient travel to and from health facilities. The estimates do not include emissions that occur overseas in the production of goods and services purchased and consumed by organisations within the Australian health system.

Australia's total health system greenhouse gas emissions for 2021-22 are estimated to be 23.522 Mt CO_2-e, or 5.44% of Australia's total greenhouse gas emissions. Health Care Services contribute the largest share at 13.790 Mt CO_2-e (59% of the total), with Residential Care and Social Assistance Services contributing 7.806 Mt CO_2-e (33%) and Human Pharmaceutical and Medicinal Product Manufacturing 1.927 Mt CO_2-e (8%).

Scope 3 emissions comprise 68% of total health system emissions (15.887 Mt CO_2-e), while scope 2 emissions comprise 20% (4.696 Mt CO_2-e), and scope 1 emissions comprise 7% (1.531 Mt CO_2-e). The balance, 1.409 Mt CO_2-e (6%), is made up by patient travel to and from health facilities. Detailed descriptions of emissions sources by scope are provided in the sections 4 to 7.

Every effort has been made to reduce uncertainty in the emissions inventory. However, it is important to note that a significant degree of uncertainty remains, particularly for minor emission sources. Where possible, figures have been cross-referenced using multiple data sources to provide the most accurate estimate and establish a baseline for future emissions reporting. Nonetheless, some areas required the use of averages and assumptions, which should be considered when interpreting the results.

Table 8. Australian health system emissions by Input-Output Industry Group, 2021-22

Table reports estimates in kt CO_2-e and as a percentage of Input-Output Industry Group	Health Care Services		Residential Care and Social Assistance Services		Human Pharmaceutical and Medicinal Product Manufacturing	
SCOPE 1: Direct emissions	kt CO_2-e	%	kt CO_2-e	%	kt CO_2-e	%
TOTAL SCOPE 1 ESTIMATE	**1,117**	**8.10**	**404**	**5.18**	**10**	**0.50**
Built Environment	**464**	**3.36**	**344**	**4.41**	**5**	**0.28**
Stationary Fuel Combustion*	306	2.22	297	3.81	5	0.28
Refrigeration and Stationary Air Conditioning*	158	1.15	45	0.58	N/A	N/A
Lubricants*	0	0.00	1	0.02	0	0.00
Travel and Transport	**328**	**2.38**	**60**	**0.77**	**4**	**0.22**
Road Transport Fuel Combustion*	216	1.56	59	0.76	4	0.22
Air Transport Fuel Combustion*	109	0.79	N/A	N/A	N/A	N/A
Mobile Air Conditioning*	3	0.02	1	0.01	0	0.00
Anaesthetic Gases	**325**	**2.36**	**N/A**	**N/A**	**N/A**	**N/A**
Medical Nitrous Oxide*	303	2.19	N/A	N/A	N/A	N/A
Fluorinated Anaesthetic Gases*	23	0.16	N/A	N/A	N/A	N/A
SCOPE 2: Purchased energy	kt CO_2-e	%	kt CO_2-e	%	kt CO_2-e	%
TOTAL SCOPE 2 ESTIMATE*	**2,932**	**21.26**	**1,734**	**21.21**	**30**	**1.58**
SCOPE 3: Other indirect emissions	kt CO_2-e	%	kt CO_2-e	%	kt CO_2-e	%
TOTAL SCOPE 3 ESTIMATE	**8,332**	**60.42**	**5,668**	**72.61**	**1,887**	**97.92**
Purchased Goods and Services	**4,368**	**31.67**	**4,089**	**52.39**	**1,644**	**85.30**
Pharmaceuticals and Chemicals (not Respiratory Inhalers)	309	2.24	120	1.54	931	48.34
Respiratory Inhalers*	404	2.93	N/A	N/A	N/A	N/A
Food and Catering	449	3.26	877	11.23	35	1.80
Laundry, Cleaning and Maintenance	325	2.36	899	11.52	21	1.08
Manufactured Goods	645	4.68	902	11.55	170	8.83
Business Services	1,273	9.23	778	9.97	99	5.11
Care and Social Assistance Services	154	1.12	32	0.41	4	0.18
Ambulance Services	27	0.20	0	0.00	0	0.00
Other Procurement	781	5.66	481	6.16	385	20.00
Capital Goods	**716**	**5.19**	**154**	**1.97**	**6**	**0.29**
Medical Devices and Equipment	551	3.99	32	0.41	0	0.00
Non-Medical Equipment	95	0.69	61	0.78	6	0.29
Construction	70	0.51	61	0.78	0	0.00

Table reports estimates in kt CO_2-e and as a percentage of Input-Output Industry Group	Health Care Services		Residential Care and Social Assistance Services		Human Pharmaceutical and Medicinal Product Manufacturing	
Fuel and Energy-Related Activities (not Included in Scopes 1 or 2)	**405**	**2.94**	**224**	**2.87**	**71**	**3.70**
Upstream Energy-Related Emissions	405	2.94	224	2.87	71	3.70
Upstream Transportation and Distribution	**432**	**3.13**	**343**	**4.39**	**114**	**5.92**
Freight, Courier and Post	432	3.13	343	4.39	114	5.92
Water and Waste	**1,322**	**9.59**	**419**	**5.36**	**41**	**2.13**
Water	124	0.90	90	1.15	24	1.24
Clinical Waste Incineration*	15	0.11	N/A	N/A	N/A	N/A
Non-Clinical Waste	1,183	8.58	328	4.21	17	0.89
Business Travel	**162**	**1.17**	**88**	**1.13**	**9**	**0.46**
Non-Air Business Travel	115	0.84	47	0.60	3	0.14
Air Business Travel	46	0.33	41	0.53	6	0.31
Employee Commute	**650**	**4.71**	**180**	**2.31**	**N/A**	**N/A**
Employee Commute*	650	4.71	180	2.31	N/A	N/A
Upstream Leased Assets	**278**	**2.01**	**172**	**2.21**	**2**	**0.12**
Leased Assets and Equipment Rental	278	2.01	172	2.21	2	0.12
OUTSIDE SCOPES	kt CO_2-e	%	kt CO_2-e	%	kt CO_2-e	%
Patient Travel*	**1,409**	10.22	**N/A**	**N/A**	**N/A**	**N/A**
TOTAL ESTIMATES	**13,790**	100	**7,806**	100	**1,927**	**100**

Total Health System Emissions Estimate **23,522 kt CO_2-e**

A star (*) denotes activity-based estimation. Due to rounding, percentages may not add up to 100 and component parts may not add up to their total. N/A indicates that either that the emissions source is not relevant for this IOIG, or that emissions data is not available (typically this is in cases when the source in question is not considered to make a material contribution to emissions).

Table 9. Total Australian health system emissions, 2021-22

Table reports estimates in kt CO_2-e for the Australian health system

SCOPE 1: Direct emissions	kt CO_2-e	%
TOTAL SCOPE 1 ESTIMATE	**1,531**	**6.51**
Built Environment	**813**	**3.46**
Stationary Fuel Combustion*	609	2.59
Refrigeration and Stationary Air Conditioning*	203	0.86
Lubricants*	1	0.01
Travel and Transport	**392**	**1.67**
Road Transport Fuel Combustion*	279	1.19
Air Transport Fuel Combustion*	109	0.46
Mobile Air Conditioning*	4	0.02
Anaesthetic Gases	**325**	**1.38**
Medical Nitrous Oxide*	303	1.29
Fluorinated Anaesthetic Gases*	23	0.10
SCOPE 2: Purchased energy	kt CO_2-e	%
TOTAL SCOPE 2 ESTIMATE*	**4,696**	**19.96**
SCOPE 3: Other indirect emissions	kt CO_2-e	%
TOTAL SCOPE 3 ESTIMATE	**15,887**	**67.54**
Purchased Goods and Services	**10,100**	**42.94**
Pharmaceuticals and Chemicals (not Respiratory Inhalers)	1,360	5.78
Respiratory Inhalers*	404	1.72
Food and Catering	1,361	5.78
Laundry, Cleaning and Maintenance	1,245	5.29
Manufactured Goods	1,717	7.30
Business Services	2,150	9.14
Care and Social Assistance Services	190	0.81
Ambulance Services	27	0.11
Other Procurement	1,646	7.00
Capital Goods	**875**	**3.72**
Medical Devices and Equipment	582	2.48
Non-Medical Equipment	162	0.69
Construction	132	0.56
Fuel and Energy-Related Activities (not Included in Scopes 1 or 2)	**700**	**2.98**
Upstream Energy-Related Emissions	700	2.98

Table reports estimates in kt CO_2-e for the Australian health system

Upstream Transportation and Distribution	**889**	**3.78**
Freight, Courier and Post	889	3.78
Water and Waste	**1,782**	**7.57**
Water	238	1.01
Clinical Waste Incineration*	15	0.06
Non-Clinical Waste	1,528	6.50
Business Travel	**259**	**1.10**
Non-Air Business Travel	166	0.71
Air Business Travel	93	0.39
Employee Commute	**830**	**3.53**
Employee Commute*	830	3.53
Upstream Leased Assets	**452**	**1.92**
Leased Assets and Equipment Rental	452	1.92
OUTSIDE SCOPES	kt CO_2-e	%
Patient Travel*	**1,409**	**5.99**
TOTAL ESTIMATES	**23,523**	**100**

Total Health System Emissions Estimate **23,522 kt CO_2-e**

A star (*) denotes activity-based estimation. Due to rounding, percentages may not add up to 100 and component parts may not add up to their total.

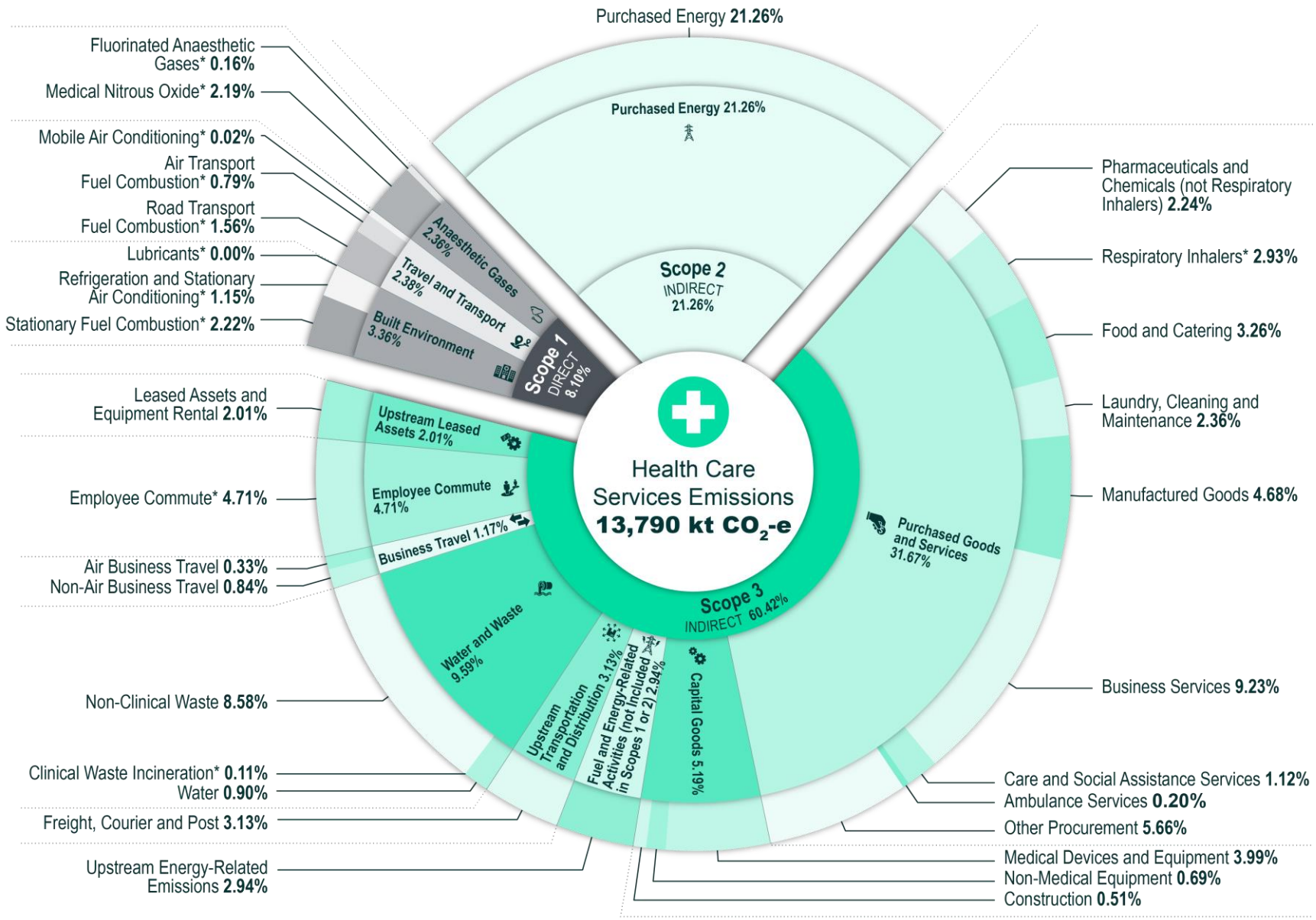

Figure 2: Sunburst diagram of emissions from Health Care Services, 2021-22

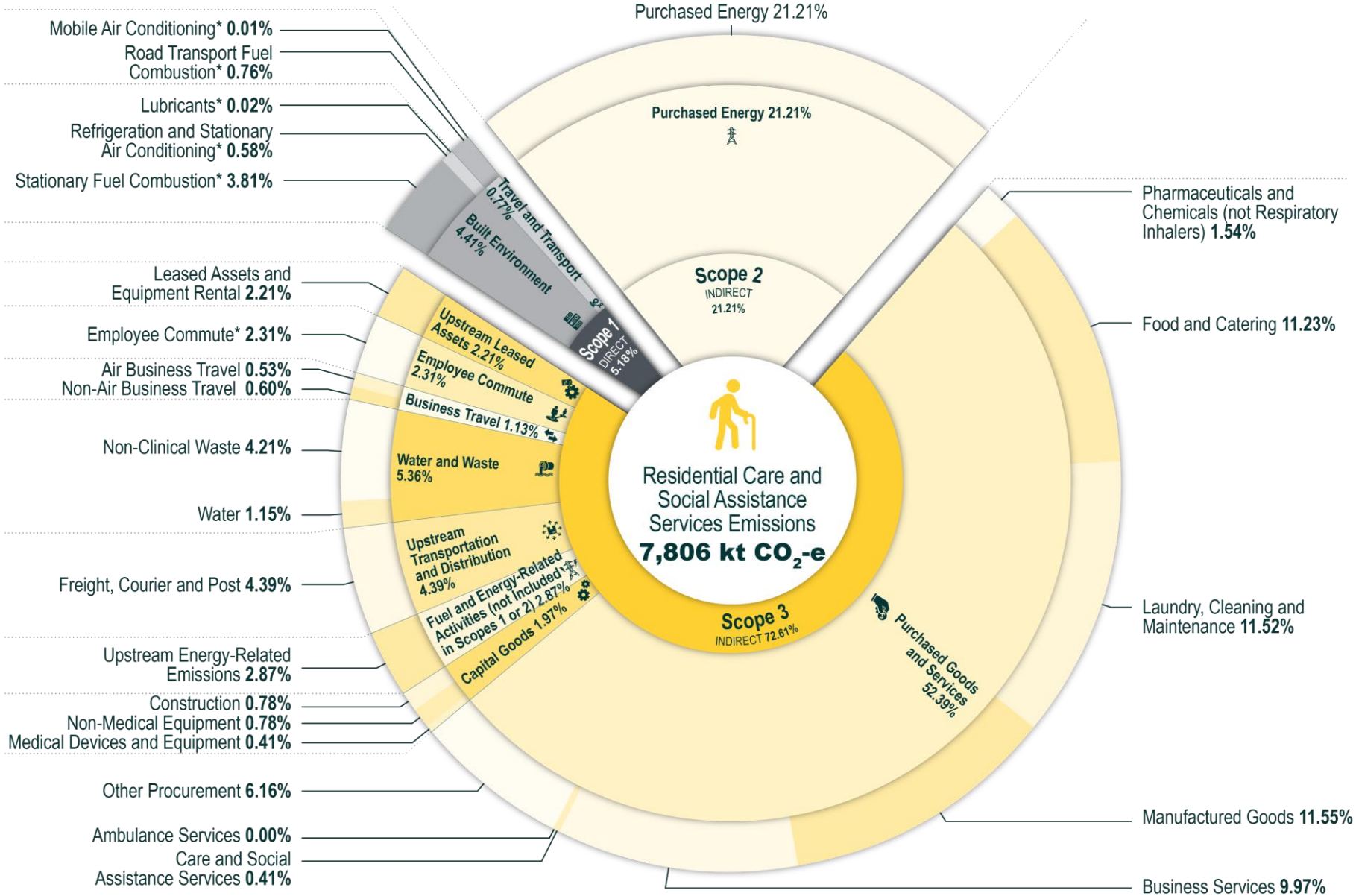

Figure 3: Sunburst diagram of emissions from Residential Care and Social Assistance Services, 2021-22

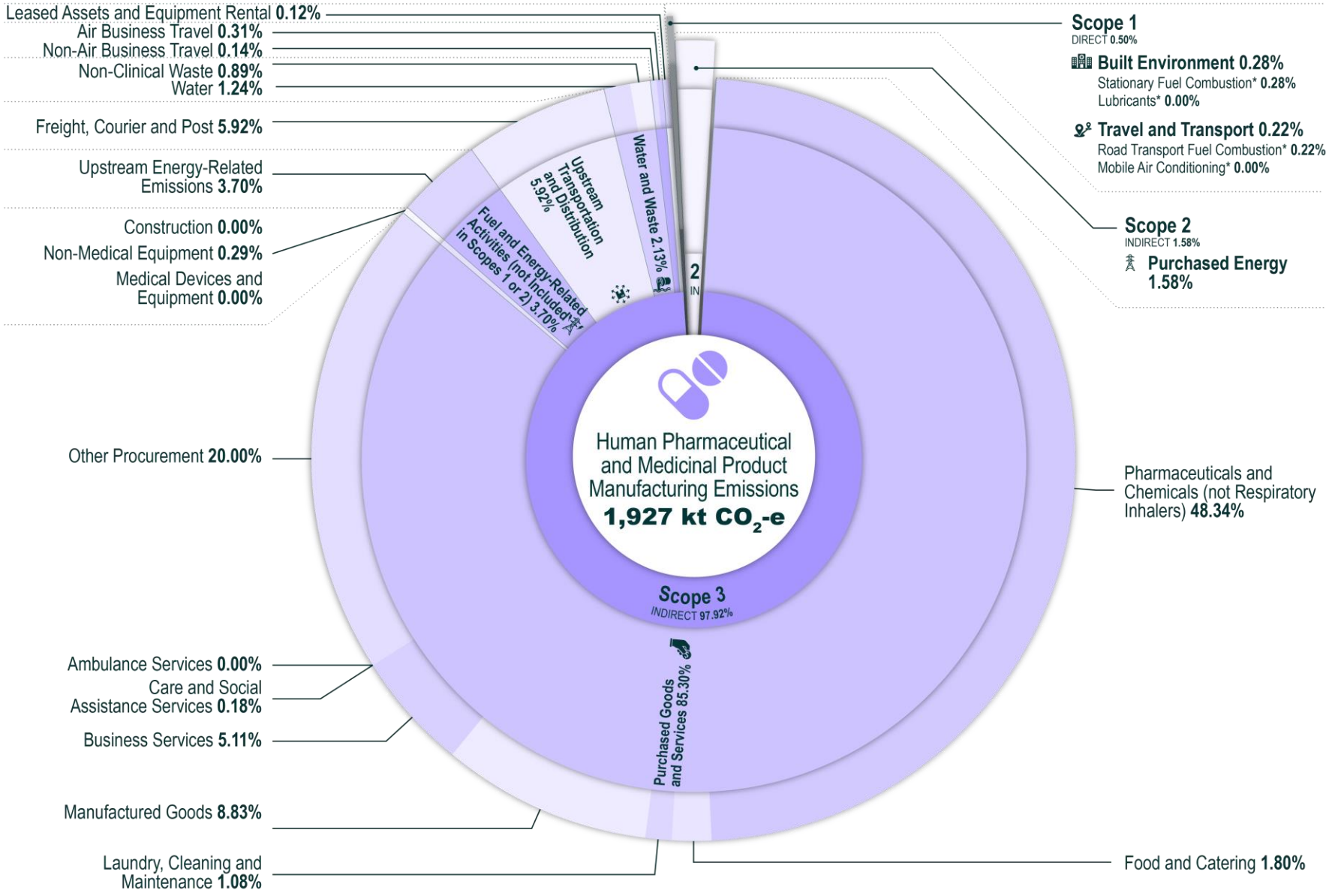

Figure 4: Sunburst diagram of emissions from Human Pharmaceutical and Medicinal Product Manufacturing, 2021-22

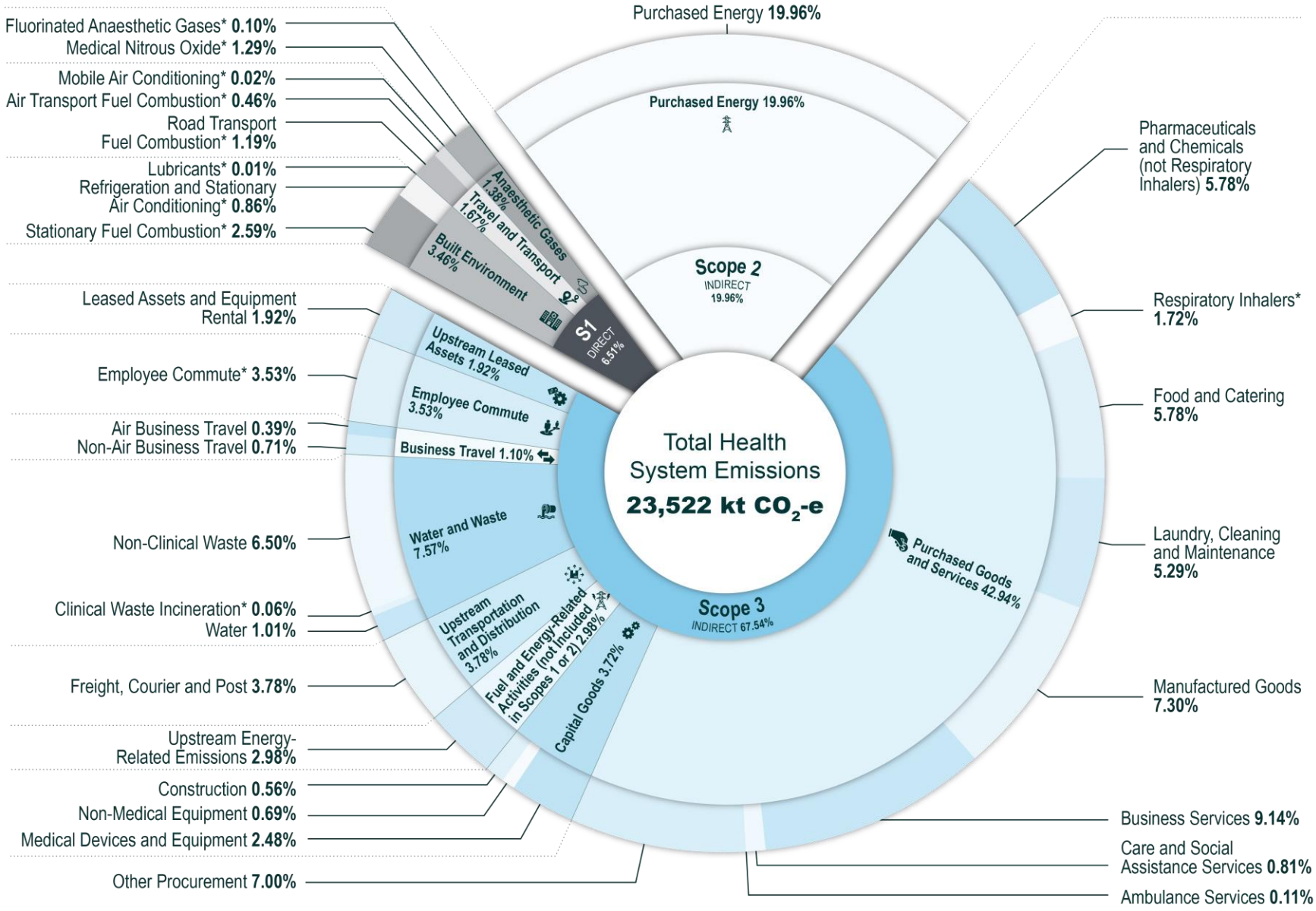

Figure 5: Sunburst diagram of total health system emissions, 2021-22

4. Scope 1 emissions sources

4.1 Built Environment

813 kt CO_2-e (3.46% of total health system emissions)

4.1.1 Stationary Fuel Combustion

609 kt CO_2-e (2.59% of total health system emissions)

Data source: NIbES. A share of emissions from Stationary Fuel Combustion (UNFCCC reporting category 1.A.4.a Commercial/Institutional) is allocated to the health system using expenditure on fuel products from the ABS Input-Output tables.

GHG Protocol category: Fuel combustion for stationary energy purposes.
GHG Protocol definition: Combustion of fuels in stationary equipment such as boilers, furnaces, burners, turbines, heaters, incinerators, engines, flares, etc.
ISO14064-1:2018 category: Included within Category 1: Direct emissions and removals. The burning of fuels (solid, liquid, or gas) in a fixed location to generate heat, steam, or usable energy that doesn't involve transportation.

Stationary fuels used by the health system include:

- **Natural Gas:** Used for heating, hot water, and sometimes electricity generation within buildings.
- **Coal:** Although less common in modern buildings, coal may still be used in some industrial or older heating systems.
- **Fuel Oil**: Includes diesel, kerosene and heating oil; used for heating, sterilisation and emergency power generation. Back-up generators that use fuel oil are more commonly utilised in rural and remote areas.
- **Liquefied Petroleum Gas:** Used for heating, cooking, and sometimes electricity generation in buildings.
- **Biomass:** Includes wood, wood pellets, and other organic materials used for heating.
- **Propane**: Used for heating and cooking in some buildings.

Fuel combustion for stationary energy constitutes the largest component of health system scope 1 emissions. Variation in fuel use across geographic locations significantly affects the emissions profile. For instance, Victoria relies on natural gas for heating and energy more than other jurisdictions.[35] Some rural and remote health facilities still rely on diesel-powered generators as their primary energy source due to the lack of consistent and reliable access to the electricity grid.[36] These differences highlight the importance of understanding local energy practices and fuel availability when developing targeted strategies to reduce emissions and improve energy efficiency across the Australian health system.

Building energy transition areas and challenges

Health and aged care facilities are increasingly looking to transition away from fossil fuels to **renewable energy** sources such as solar and wind. However, several challenges must be overcome to achieve a net zero health system built environment:

- **Energy density and heat requirements:** Boilers used in hospitals often require high energy density fuels to generate the heat necessary for sterilisation, space heating, and hot water supply. Renewable energy sources like solar and wind typically generate electricity, which then needs to be converted into heat, often through electric boilers or heat pumps. Adapting these technologies to meet hospitals' need for high, immediately available heat is a major focus of current innovation efforts.[37]
- **Infrastructure and investment:** The infrastructure for renewable energy in hospitals – which might include the installation of solar panels, wind turbines and battery storage systems – requires significant up-front investment. Many hospitals, especially older facilities, may not have the space or structural capabilities needed to support these installations. Additionally, integrating renewable energy systems with existing hospital infrastructure can be complex and costly.[37]
- **Backup and energy security:** Hospitals must have robust backup systems to handle power outages and ensure uninterrupted operation. While renewable energy systems can be paired with battery storage, current battery technologies, while rapidly advancing, may not provide sufficient duration and capacity for extended outages. The ability of diesel generators to store large quantities of energy for backup purposes provides a level of energy security that current renewable energy storage technologies do not yet fully match.[36,37]

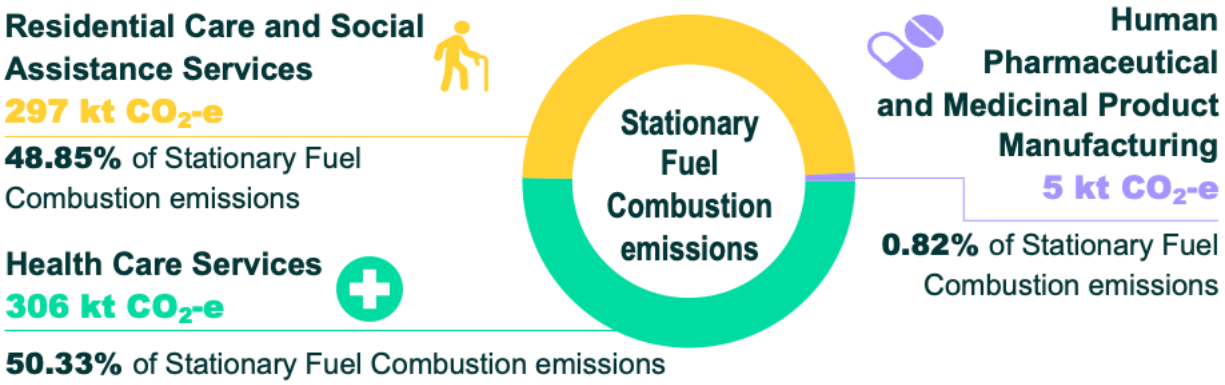

Figure 6: Emissions from Stationary Fuel Combustion

Table 10. Emissions from Stationary Fuel Combustion

IOIG	kt CO_2-e	% of scope 1 emissions for IOIG	% of total emissions for IOIG
Health Care Services	306	27.38%	2.22%
Residential Care and Social Assistance Services	297	73.59%	3.81%
Human Pharmaceutical and Medicinal Product Manufacturing	5	56.33%	0.28%

4.1.2 Refrigeration and Stationary Air-Conditioning

203 kt CO_2-e (0.86% of total health system emissions)

Data source: NIbES. A share of emissions from Stationary Commercial Air-Conditioning (UNFCCC reporting category 2.F.1.v.b) and Commercial Refrigeration (UNFCCC reporting category 2.F.1.i) is allocated to the health system using electricity consumption from the ABS Input-Output tables as an indicator of refrigerant use.

GHG Protocol category: Fugitive emissions.
GHG Protocol definition: Emissions of hydrofluorocarbons (HFCs) used in refrigeration and air conditioning result from leakage and service over the operational life of the equipment and from disposal at the end of the useful life of the equipment. The leakage of refrigerant gas is a small but significant source of emissions because of a high GWP associated with these gases.
ISO14064-1:2018 category: Included within Category 1: Direct emissions and removals.

Refrigeration and Stationary Air-Conditioning emissions are generated by many end uses, including medicines refrigeration, hospital air-conditioning, vaccine storage units, blood bank refrigerators, mobile medical unit cooling systems, laboratory chillers, pharmaceutical cold storage, and air conditioning systems in healthcare facilities. Historically, the air-conditioning and refrigeration industry used ozone-depleting substances (such as chlorofluorocarbons and hydrochlorofluorocarbons) as refrigerants.[38] These ozone-depleting substances are being phased out under the Montreal Protocol and are being replaced with hydrofluorocarbons (HFC).[39] While HFCs do not deplete the ozone layer, they are very harmful greenhouse gases, with 100-year GWPs between 140 and 11,700 times that of CO_2. HFC emissions from refrigeration and air conditioning result from the manufacturing process, from leakage over the operational life of the equipment, and from disposal at end of life.

Table 11: Emissions from Refrigeration and Stationary Air-Conditioning

IOIG	Refrigeration kt CO_2-e	Stationary air conditioning kt CO_2-e	kt CO_2-e	% of scope 1 emissions for IOIG	% of total emissions for IOIG
Health Care Services	136	22	158	14.16%	1.15%
Residential Care and Social Assistance Services	39	6	45	11.20%	0.58%
Human Pharmaceutical and Medicinal Product Manufacturing	Not provided in current reporting				

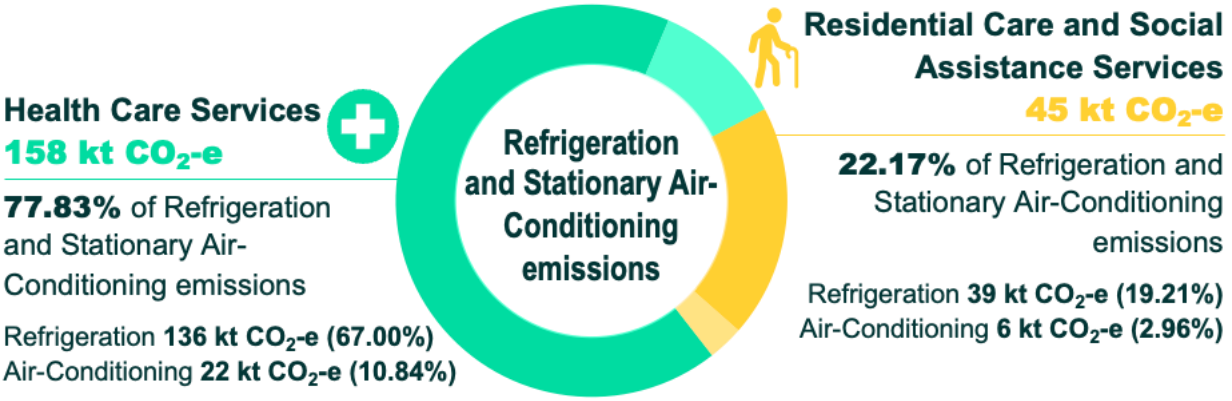

Figure 7: Emissions from Refrigeration and Stationary Air-Conditioning

4.1.3 Lubricants

1 kt CO_2-e (0.01% total health system emissions)

Data source: NIbES. A share of emissions from Lubricant Use (UNFCCC reporting category 2.D.1) is allocated to the health system using expenditure on IOPC code 17090041 ('Pitch, tars, jellies, waxes and other lubricants manufactured from petroleum') from the ABS Input-Output tables.

GHG Protocol category: Direct emissions from processes or material use, but not related to combustion.
GHG Protocol definitions: Lubricants are not directly classified in the GHG Protocol and may fall under different reporting categories depending on their use. Emissions from lubricants used in machinery and equipment are considered process emissions, or Scope 1: Direct emissions from processes or material use, but not related to combustion.
ISO14064-1:2018 category: Included within Category 1: Direct emissions and removals.

Lubricants are petroleum-based oils not used as fuel. Fuel is burned to generate power, while lubricants are used to reduce friction and wear.

Table 12: Emissions from Lubricants

IOIG	kt CO_2-e	% of scope 1 emissions for IOIG	% of total emissions for IOIG
Health Care Services	0	0.00%	0.00%
Residential Care and Social Assistance Services	1	0.32%	0.02%
Human Pharmaceutical and Medicinal Product Manufacturing	0	0.00%	0.00%

4.2 Travel and Transport

392 kt CO_2-e (1.67% of total health system emissions)

4.2.1 Road Transport Fuel Combustion

279 kt CO_2-e (1.19% of total health system emissions)

Data source: NIbES. A share of emissions from Road Transport (UNFCCC reporting category 1.A.3.b) is allocated to the health system using data on road transport fuel use from the ABS Energy Account and split by IOIG based on expenditure on fuel products from the ABS Input-Output tables.

GHG Protocol category: Mobile Combustion.
GHG Protocol definition: Direct emissions from the combustion of fuels in owned or leased transportation devices (e.g. automobiles, trucks, buses, trains, airplanes, boats, ships, barges, vessels) that are within the company's inventory boundaries.
ISO14064-1:2018 category: Included within Category 1: Direct emissions and removals.

Fuels used by the health system for road transport include:

- **Diesel:** Commonly used by ambulance and emergency response fleet and in regional, rural and remote fleet vehicles.
- **Petrol:** Commonly used for urban and regional fleet vehicles for clinical and care staff as well as pathology and urgent clinical courier goods and services.
- **Liquefied Petroleum Gas:** Limited or no use by Australia's health fleet (based on expenditure data as per DCCEEW modelling).

Electricity for electric vehicles is captured in section 5 of this report (Scope 2 emissions sources).

Table 13: Emissions from Road Transport Fuel Combustion

IOIG	kt CO_2-e	% of scope 1 emissions for IOIG	% of total emissions for IOIG
Health Care Services	216	19.32%	1.56%
Residential Care and Social Assistance Services	59	14.67%	0.76%
Human Pharmaceutical and Medicinal Product Manufacturing	4	42.99%	0.22%

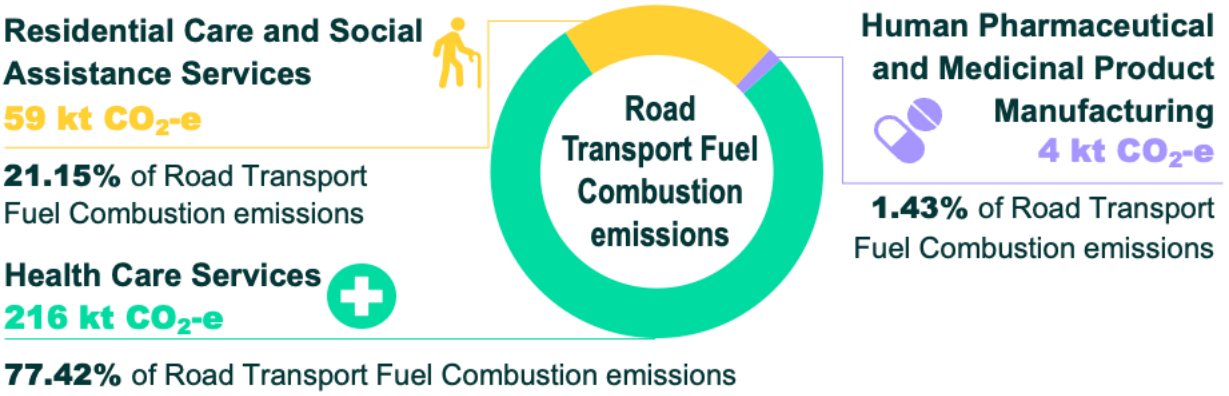

Figure 8: Emissions from Road Transport Fuel Combustion

4.2.2 Air Transport Fuel Combustion

109 kt CO_2-e (0.46% of total health system emissions)

Data sources: Publicly reported data from NSW Ambulance, SA Ambulance, Queensland Retrieval Services, and Royal Flying Doctor Service Western Operations.

GHG Protocol category: Mobile Combustion.
GHG Protocol definition: Direct emissions from the combustion of fuels in owned or leased transportation devices (e.g. automobiles, trucks, buses, trains, airplanes, boats, ships, barges, vessels) that are within the company's inventory boundaries.
ISO14064-1:2018 category: Included within Category 1: Direct emissions and removals.

Australia's National Inventory Report includes estimates of scope 1 emissions from fuel combustion for domestic aviation. The NIbES allocates all these emissions to IOIG 4901 'Air and Space Transport' as this industry is responsible for the overwhelming majority of domestic aviation emissions. However, the health system will in reality be responsible for some of these emissions as a result of patient transport activity undertaken in aircraft owned and operated by the health system or considered part of its fleet. This report therefore includes separate estimates of air transport emissions, which are reported here as scope 1 emissions (although in reality they will be a mix of scope 1 and scope 3 emissions due to the diversity of ownership and control arrangements across jurisdictions).

Publicly reported data on air ambulance, patient transfer and retrieval activities was obtained for NSW, Queensland, SA and WA.[40,41,42,43] After analysing these data and consulting with jurisdictional representatives, states and territories were categorised into two groups based on population density and average travel times for air ambulance retrieval. Group 1 (NSW, ACT, Tasmania and Victoria) and Group 2 (Queensland, WA, NT and SA) were assumed to have average patient retrieval flight times of 60 minutes and 90 minutes respectively.

Using national data on Emergency Department (ED) presentations by jurisdiction, the percentage of ED presentations arriving by air ambulance was calculated for NSW (0.3%), Queensland (1.1%), SA (1.3%), and WA (1.1%).[44] The NSW percentage was used as a proxy for other Group 1 jurisdictions, while a population-weighted average of the percentage for Queensland, SA and WA was used as a proxy for the remaining Group 2 jurisdiction (NT) – yielding a number of ED presentations arriving by air ambulance in every jurisdiction.

Air ambulance retrievals can be by rotary wing (helicopter) or fixed wing (aeroplane). The NSW percentage of air ambulance retrievals by rotary wing (54%) was used for all Group 1 jurisdictions, while the corresponding Queensland percentage (31%) was used for all Group 2 jurisdictions – resulting in an estimated number of rotary and fixed wing ED presentations for each jurisdiction. Using emissions factors of 1,368 kg CO_2-e per hour for rotary wing aircraft (based on the Agusta Westland AW139) and 1,558 kg CO_2-e per hour for fixed wing aircraft (based on the King Air B200) enabled calculation (when combined with the assumptions on retrieval time mentioned above) of total air ambulance emissions for each jurisdiction.[45,46,47] Aggregating across all jurisdictions resulted in total air transport fuel combustion emissions of 109.01 kt CO_2-e. This calculation was validated by a second estimation methodology which resulted in a similar estimate.

Table 14: Emissions from Air Transport Fuel Combustion

IOIG	kt CO_2-e	% of scope 1 emissions for IOIG	% of total emissions for IOIG
Health Care Services	109	9.76%	0.79%

4.2.3 Mobile Air-Conditioning

4 kt CO_2-e (0.02% of total health system emissions)

Data source: NIbES. A share of emissions from Mobile Air-Conditioning (UNFCCC reporting category 2.F.1.iv) is allocated to the health system using expenditure on road transport fuel use as an indicator of mobile air-conditioning use, with data drawn from the ABS Energy Account and split by IOIG based on expenditure on fuel products from the ABS Input-Output tables.

GHG Protocol category: Fugitive emissions.
GHG Protocol definition: Emissions of hydrofluorocarbons (HFCs) used in refrigeration and air conditioning result from leakage and service over the operational life of the equipment and from disposal at the end of the useful life of the equipment. The leakage of refrigerant gas is a small but significant source of emissions because of a high GWP associated with these gases.
ISO14064-1:2018 category: Included within Category 1: Direct emissions and removals.

Mobile Air-Conditioning emissions are generated by air conditioning systems in vehicles owned by the health system. Historically, the air conditioning industry used ozone-depleting substances (such as chlorofluorocarbons and hydrochlorofluorocarbons) as refrigerants.[38] These ozone-depleting substances are being phased out under the Montreal Protocol and are being replaced with hydrofluorocarbons (HFC).[39] While HFCs do not deplete the ozone layer, they are very harmful greenhouse gases, with 100-year GWPs between 140 and 11,700 times that of CO_2. HFC emissions from air conditioning result from the manufacturing process, from leakage over the operational life of the equipment, and from disposal at end of life.

In theory, heath system emissions from Mobile Air-Conditioning should include emissions from refrigerated transport of medicines (such as cold chain storage of vaccines). The way NIbES estimates Mobile Air Conditioning emissions as a function of road transport fuel use means the estimates provided in this report are unlikely to account for this special characteristic of the health system.

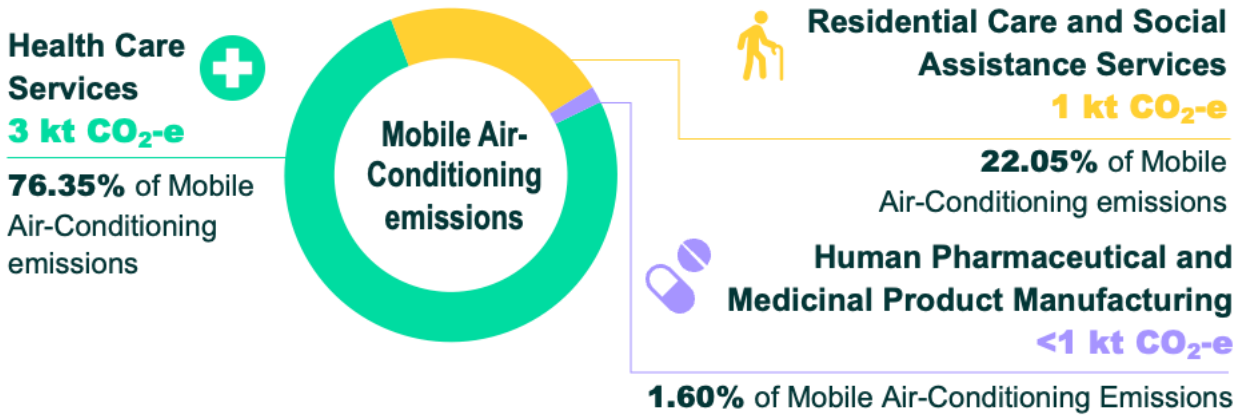

Figure 9: Emissions from Mobile Air-Conditioning

Table 15: Emissions from Mobile Air-Conditioning

IOIG	kt CO_2-e	% of scope 1 emissions for IOIG	% of total emissions for IOIG
Health Care Services	3	0.28%	0.02%
Residential Care and Social Assistance Services	1	0.23%	0.01%
Human Pharmaceutical and Medicinal Product Manufacturing	<1	0.69%	0.00%

4.3 Anaesthetic Gases

325 kt CO_2-e (1.38% of total health system emissions)

This section reports emissions from two classes of anaesthetic gas: nitrous oxide and fluorinated anaesthetic gases. The health system uses a range of additional gases, including methoxyflurane, oxygen, carbon dioxide, acetylene, argon, helium, hydrogen, and nitrogen. Some Australian state and territory health departments collect data on scope 1 emissions from a wider range of gases and it is hoped that future updates to this report will include reporting of these.

4.3.1 Medical Nitrous Oxide

303 kt CO_2-e (1.29% of total health system emissions)

Data source: National Inventory Report 2022.

GHG Protocol category: Nitrous Oxide (N_2O) is one of the seven greenhouse gases that must be reported under the GHG Protocol.[48] Separate reporting of N_2O as its own line item is not required; rather, it is to be reported wherever it is generated from a variety of activities, including activities (such as agricultural activities and combustion processes) outside the health system boundary.
ISO14064-1:2018 category: Included within Category 1: Direct emissions and removals.

The National Inventory Report 2022 estimates emissions for medical N_2O use from production data provided by industrial gas manufacturers (BOC and Air Liquide) up to the year 2007-08. From 2007-08 onwards, N_2O consumption is indexed to population growth; the limitations of this estimation approach are discussed in Appendix B.

N_2O is a widely utilised anaesthetic and analgesic in healthcare, specifically in obstetrics for labour pain management, operating theatres as part of general anaesthesia, and paediatric units for procedural sedation. N_2O offers rapid onset and ease of administration, making it an important component of clinical practice. However, the environmental impact of N_2O is

considerable, as it is a potent greenhouse gas (its GWP is 265 times that of CO_2) and contributes to ozone layer depletion. In addition to emissions from clinical use, emissions from N_2O occur during the manufacturing process, leakage during its use, and improper disposal.[49]

Table 16: Emissions from Medical Nitrous Oxide

IOIG	kt CO_2-e	% of scope 1 emissions for IOIG	% of total emissions for IOIG
Health Care Services	303	27.08%	2.19%

4.3.2 Fluorinated Anaesthetic Gases

23 kt CO_2-e (0.10% of total health system emissions)

Data source: Hospital purchasing data from IQVIA combined with AR5 GWPs and other information obtained from that academic literature.

GHG Protocol category: Not Included.
GHG Protocol definition: Emissions not covered by the Kyoto Protocol, e.g. chlorofluorocarbons, nitric oxide and nitrogen dioxide, etc. should be reported separately to scope 1.
ISO14064-1:2018 category: Included within Category 1: Direct emissions and removals.

Fluorinated anaesthetic gases (sevoflurane, desflurane and isoflurane), while historically a significant source of health system emissions, are not included in greenhouse gas reporting under the Paris Agreement. Consequently, they are not included in national inventories or other emissions reporting by national governments. However, they have been a source of significant interest for health system decarbonisation efforts because of their high GWP (in particular, desflurane has a GWP 1,790 times that of CO_2) and because use is in the direct control of clinicians. As well as reducing the use of desflurane, efforts to reduce emissions from fluorinated anaesthetic gases also include the development of filters that can trap and recycle these gases within anaesthetic machines, reducing costs and emissions.

This report estimates fluorinated anaesthetic gas emissions based on 2021-22 usage (in bottles) in Australia, across both the public and the private health systems, provided by IQVIA.[50] This usage data, combined with AR5 GWPs and evidence from the academic literature, yields the following:[51,52,53,54]

- Sevoflurane: 122,481 bottles * 250 mL/bottle * density 1.51 * GWP 216 = 9.97 kt CO_2-e
- Desflurane: 19,875 bottles * 240 mL/bottle * density 1.45 * GWP 1,790 = 12.41 kt CO_2-e
- Isoflurane: 879 bottles * 250 mL/bottle * density 1.50 * GWP 491 = 0.16 kt CO_2-e
- Total emissions from fluorinated anaesthetic gas use = 22.54 kt CO_2-e

The relatively small current contribution of fluorinated anaesthetic gas use to overall health system emissions is testament to the efforts of clinicians to reduce emissions from this source over the last decade. A 2019 academic study provides figures on fluorinated anaesthetic gas use in 2017 (148,808 bottles of sevoflurane, 62,630 bottles of desflurane, and 2,345 bottles of isoflurane) which indicate that emissions were equal to 51.8 kt.[51] These efforts to reduce fluorinated anaesthetic gas emissions have continued since 2021-22, and now include the removal of desflurane from the public hospital formulary in Western Australia in October 2023 and New South Wales in March 2024.[55,56] Desflurane is also being phased out of private health care. In March 2024, St John of God Health Care banned purchases of desflurane across its network of 17 private hospitals.[57] It is anticipated emissions from fluorinated anaesthetic gases will continue to fall in the coming years as these efforts continue.

Table 17: Emissions from Fluorinated Anaesthetic Gases

IOIG	kt CO_2-e	% of scope 1 emissions for IOIG	% of total emissions for IOIG
Health Care Services	23	2.02%	0.16%

5. Scope 2 emissions sources

Scope 2 emissions are indirect emissions generated to produce electricity, heating, cooling or steam that is consumed by the reporting entity, as a result of burning of fossil fuels outside the boundary of the reporting entity.[19]

5.1 Purchased Energy

4,696 kt CO_2-e (19.96% of total health system emissions)

Data source: NGER Scheme and NIbES.

GHG Protocol category: Scope 2: Emissions from Purchased Energy or acquired electricity, steam, heat and cooling.
GHG Protocol definition: Indirect emissions from the generation of purchased energy. These are considered an indirect emissions source because they are a consequence of activities of the reporting organisation but occur at sources owned and controlled by an outside entity (i.e. an energy utility).
ISO14064-1:2018 category: Category 2: Indirect emissions from imported energy.

Health and aged care facilities require substantial amounts of energy for lighting, heating, electronic equipment and devices, maintenance of essential medical equipment, ensuring comfortable indoor environments, and supporting round-the-clock operations. Hospitals have particularly high energy demands from advanced medical technologies; lighting; heating ventilation and air conditioning systems; diagnostic services, including pathology and radiology; meal preparation facilities; and laundry management facilities. Primary care and specialist private clinics, while smaller, still rely on purchased energy to operate diagnostic tools and electronic health records systems, and to provide patient care. The indirect emissions resulting from purchased energy are a key opportunity for health system emissions reduction, through grid decarbonisation coupled with strategies such as electrification, energy efficiency measures, and investment in renewable energy including on-site renewables.

Direct estimates of health system emissions from purchased energy are not currently available in Australia. To address this gap, emissions from purchased energy are estimated separately for the three IOIGs included within our health system boundary (Health Care Services, Residential Care and Social Assistance Services, and Human Pharmaceutical and Medicinal Product Manufacturing) using data from the NGER Scheme and NIbES.

Under the NGER Scheme, entities must report their scope 1 and 2 greenhouse gas emissions, energy production, and energy consumption if they meet certain thresholds at either facility level or corporate group level.[27] The facility thresholds are emissions across

scopes 1 and 2 of 25 kt CO_2-e or more, or production or consumption of 100 terajoules (TJ) or more of energy. The corporate group thresholds are emissions across scopes 1 and 2 of 50 kt CO_2-e or more, or production or consumption of 200 TJ or more of energy. Health system facilities and organisations that are defined as corporate entities and that exceed these thresholds must report their emissions under the NGER Scheme.

We estimate total health system scope 2 emissions by assuming that, for each of the three IOIGs within the health system boundary, the ratio of scope 1 to scope 2 emissions is the same for NGER Scheme reporting entities and for non-NGER-Scheme reporting entities. For each IOIG, we combine the ratio of scope 1 to scope 2 emissions from NGER Scheme reporting entities with the NIbES estimate of overall scope 1 emissions to estimate overall scope 2 emissions.

The calculation for Health Care Services is as follows (the calculation for Residential Care and Social Assistance Services and Human Pharmaceutical and Medicinal Product Manufacturing follows the same method):

- Scope 1 emissions as a percentage of total (scope 1 and scope 2) emissions for NGER Scheme reporting entities = 18.89%
- Overall scope 1 emissions from NIbES = 683 kt CO_2-e
- Estimated overall scope 2 emissions = (683/18.89%) – 683 = 2,932 kt

Table 18: Emissions from Purchased Energy

IOIG	kt CO_2-e	% of total emissions for IOIG
Health Care Services	2,932	21.26%
Residential Care and Social Assistance Services	1,734	22.21%
Human Pharmaceutical and Medicinal Product Manufacturing	30	1.58%

Figure 10: Emissions from Purchased Energy

6. Scope 3 emissions sources

Scope 3 emissions are emissions generated in the production, transportation and disposal of the (non-energy) goods and services purchased by the reporting entity. They arise as the result of activities from assets not owned or controlled by the reporting entity, but that the organisation indirectly affects in its value chain. ARUP estimate scope 3 emissions constitute approximately 71% of health system emissions globally.[58]

This section presents estimates of scope 3 emissions using the categorisation discussed in section 2.4 and Appendix E. Where applicable, key products and services contributing to these emissions (measured at IOPC level) are highlighted. We report the percentage contribution of each emissions category to scope 3 emissions and to total emissions. For Human Pharmaceutical and Medicinal Product Manufacturing, scope 3 emissions account for 97.92% of total emissions – hence each emissions category's percentage contribution to scope 3 emissions is similar to its percentage contribution to total emissions.

Green Procurement Guidelines

Several national health systems have introduced **green procurement** guidelines to encourage suppliers of goods and services to report and reduce their emissions, introduce more environmentally friendly products, and address other social and environmental impacts.

In England, the NHS Supplier Roadmap requires suppliers to publish emissions reduction plans and commit to achieving net zero emissions by 2050.[59] Several European countries, including the Netherlands and Sweden, have incorporated environmental sustainability into public sector procurement rules.[60,61] Similarly, the United Nations Development Programme has published guidelines for sustainable procurement of healthcare commodities and services that take account of environmental, social and economic impacts.[62] These guidelines advocate including life cycle costs and environmental impacts in procurement decisions.[59,62]

As many suppliers of goods and services to the Australian health system operate globally, international collaboration to establish common reporting requirements and procurement rules are critical for driving change and minimising red tape. To this end, the Australian Government has joined a consortium including the health systems of England, the United States, Ireland and Norway to collaborate on decarbonisation of health system supply chains.[63]

6.1 Purchased Goods and Services

10,100 kt CO_2-e (42.94% of total health system emissions)

Data source: Emissions from Respiratory Inhalers are estimated from Pharmaceutical Benefits Scheme data. All other estimates are from NIbES and National Accounts expenditure data combined using EEIO analysis to produce consumption inventory.

GHG Protocol category: Scope 3, Category 1: Purchased Goods and Services.
GHG Protocol definition: Extraction, production and transportation of goods and services purchased or acquired by the reporting company in the reporting year, not otherwise included in GHG Protocol Scope 3 Categories 2 to 8.
ISO14064-1:2018 category: Category 4: Indirect emissions from products an organisation uses.

Purchased Goods and Services includes:

- Pharmaceuticals and Chemicals (not Respiratory Inhalers)
- Respiratory Inhalers
- Food and Catering
- Laundry, Cleaning and Maintenance
- Manufactured Goods
- Business Services
- Care and Social Assistance Services
- Ambulance Services
- Other Procurement.

Emissions embedded in the total supply chain of purchased goods and services constitute the majority of scope 3 emissions across all three IOIGs in included in our health system boundary.

Figure 11: Emissions from Purchased Goods and Services

Table 19: Emissions from Purchased Goods and Services

IOIG	kt CO_2-e	% of scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	4,368	52.42%	31.67%
Residential Care and Social Assistance Services	4,089	72.14%	52.39%
Human Pharmaceutical and Medicinal Product Manufacturing	1,644	87.11%	85.30%

Transport and shipping routes are susceptible to disruptions caused by extreme weather events, climate change, and geopolitical unrest. Disruptions to supply chains can result in increased costs and emissions, e.g. due to longer shipping routes or substitution between transport modes. The impact of the COVID-19 pandemic means these disruptions likely affected the estimates reported here.

6.1.1 Pharmaceuticals and Chemicals (not Respiratory Inhalers)

1,360 kt CO_2-e (5.78% of total health system emissions)

This category includes emissions from Pharmaceuticals and Chemicals, excepting emissions from the propellant in Respiratory Inhalers, which are reported separately. As the estimates of emissions from pharmaceuticals provided in this section are based on expenditure by health system organisations, they will not encompass emissions associated with pharmaceuticals purchased by households, unless they were purchased from organisations that fall under the three IOIGs used to define the boundary of the health system for this report. Given over 90% of medicines in Australia are imported, the exclusion of emissions generated overseas from this report is important to hold in mind in interpreting the estimates provided in this section.[29]

Table 20: Emissions from Pharmaceuticals and Chemicals (not Respiratory Inhalers)

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	309	3.70%	2.24%
Residential Care and Social Assistance Services	120	2.12%	1.54%
Human Pharmaceutical and Medicinal Product Manufacturing	931	49.37%	48.34%

This category constitutes nearly half of all emissions from Human Pharmaceutical and Medicinal Product Manufacturing, reflecting the use of chemicals (with estimated emissions of 877 kt CO_2-e) as inputs to production. Chemicals are also the largest contributor to Residential Care and Social Assistance Services emissions in this category, with estimated

emissions of 62 kt CO_2-e – although 39 kt of these emissions are from IOPC 18120190 'Basic organic chemicals nec', some of which may be cleaning products.

Emissions in this category from Health Care Services are roughly evenly split between pharmaceuticals (IOPC 18410010 to 18421970), contributing an estimated 143 kt CO_2-e, and industrial gases (IOPC 18110090), contributing 136 kt CO_2-e. Some of the latter may include emissions from anaesthetic gases reported on an activity basis in section 4.3. However, as it is not possible to disaggregate expenditure in this IOPC code, and as expenditure on anaesthetic gases is likely to constitute only a small portion of overall expenditure on industrial gases, no adjustment is made to address any associated risk of double counting.

6.1.2 Respiratory Inhalers

404 kt CO_2-e (1.72% of total health system emissions)

Metered Dose Inhalers (MDIs) and Breath-Activated Inhalers (BAIs) are used to treat respiratory conditions such as asthma and chronic obstructive pulmonary disease. The propellants in MDIs and BAIs – either HFC-134a or HFC-227ea – are potent greenhouse gases.[64] The emissions associated with MDI and BAI use are not captured in the EEIO-based consumption inventory, as they are generated in the act of consumption, not in the act of production. This report's estimates of MDI and BAI propellant emissions are therefore added into the EEIO-based consumption inventory, without any accompanying deductions.

Data from the Pharmaceutical Benefits Scheme indicates that 6,588,496 MDI and BAI prescriptions were issued and dispensed in 2021-22.[50,65] For a subset of these prescriptions (4,229,861), it is possible to dispense two inhalers per prescription. As anecdotal evidence indicates this option is almost always exercised, we conservatively assume an average of 1.75 inhalers are dispensed where the option to dispense two exists – implying 9,760,892 inhalers were prescribed and dispensed. In addition, Short-Acting Beta Agonist (SABA) inhalers can be purchased over the counter (OTC, i.e. without a prescription) – industry estimates indicate around 50% of SABA inhalers are dispensed in this way.[66] Including these OTC SABA inhalers, 15,738,152 inhalers are estimated to have been dispensed in 2021-22.

The National Sustainable Asthma Care Roundtable Report – September 2024 provides estimates of **embodied emissions** across the entire life cycle for inhalers available on the Australian Pharmaceutical Benefits Scheme.[67] To isolate propellant emissions from whole-life-cycle emissions, we down-weight these emissions estimates using work by Jeswani and Azapagic (2019) indicating that propellant constitutes 98% of life cycle emissions for HFC-134a inhalers and 90% of life cycle emissions for HFC-227ea inhalers.[68] Combining these down-weighted emissions estimates with Pharmaceutical Benefits Scheme data and estimated OTC volumes results in estimated emissions from respiratory inhaler propellant equal to 404 kt CO_2-e in 2021-22. Robustness tests varying the percentage of SABA dispensed over the counter from 40% to 60%, and varying the average number of inhalers

dispensed when two is an option from 1.5 to 2, indicates a range between 305 kt and 550 kt CO_2-e.

Table 21: Emissions from Respiratory Inhalers

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	404	4.85%	2.93%

6.1.3 Food and Catering

1,361 kt CO_2-e (5.78% of total health system emissions)

Food and Catering emissions arise from various stages of the food supply chain, including production, transportation, storage, and waste management. Mercy Health, an Australian health and aged care provider, reported that food and catering were estimated to contribute 9.42% of total emissions.[69] International studies have found that food and catering can contribute anywhere between 1.9% and 30.3% of emissions from health and care organisations, with its proportionate contribution highest in inpatient hospital settings.[22]

Table 22: Emissions from Food and Catering

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	449	5.39%	3.26%
Residential Care and Social Assistance Services	877	15.47%	11.23%
Human Pharmaceutical and Medicinal Product Manufacturing	35	1.84%	1.80%

Meat and dairy products are the main contributors to Food and Catering emissions in both Health Care Services and Residential Care and Social Assistance Services. This contribution highlights the opportunity to reduce health system emissions by transitioning to lower-emissions diets, which are also associated with improved health.

- Eggs and dairy contribute an estimated 163 kt CO_2-e to Health Care Services emissions, and 251 kt CO_2-e to Residential Care and Social Assistance Services emissions.
- Meat products (including seafood) contribute an estimated 136 kt CO_2-e to Health Care Services emissions, and 214 kt CO_2-e to Residential Care and Social Assistance Services emissions.
- Coffee and tea (IOPC 11990010) contributes an estimated 139 kt CO_2-e to Residential Care and Social Assistance Services emissions.

6.1.4 Laundry, Cleaning and Maintenance

1,245 kt CO_2-e (5.29% of total health system emissions)

Laundry, Cleaning and Maintenance services are a critical component of health and aged care provider operations and a significant contributor to emissions. They encompass building cleaning services, cleaning products, gardening-related products and services, laundry and dry-cleaning services, and maintenance and repair services.

Health system laundry and cleaning emissions are primarily driven by the energy-intensive nature of washing, drying, and disinfecting textiles such as bed sheets and staff uniforms. Transport of items to and from off-site laundry facilities further adds to emissions.[70] Laundry services rely heavily on gas for heating water, drying, and providing hygienic cleaning services because of its effectiveness at generating heat quickly. However, reliance on gas contributes significantly to emissions, in ways that will not be mitigated by the rapid decarbonisation of the electricity grid currently underway in Australia.

Cleaning services in health and aged care settings have other environmental impacts. Traditional cleaning practices often rely on chemical disinfectants, which can harm indoor air quality and pose health risks to staff and patients. The shift towards 'green cleaning' aims to reduce these impacts by using environmentally friendly products and methods that maintain high hygiene standards without harmful side effects.

Health system emissions from maintenance and repair services include those generated by the upkeep and repair of electronic equipment, such as computers, precision machinery like imaging machines, and domestic appliances, such as washing machines. This includes emissions from transportation by repair technicians, energy consumption during maintenance processes, the use of replacement parts, and the disposal of non-repairable components or hazardous materials, such as refrigerants in appliances or chemicals in electronics. When considered through the lens of the circular economy – with principles such as refuse, reduce, reuse, repair and recycle – maintaining and repairing equipment is often more environmentally sustainable than discarding items and purchasing new ones. Repairing extends the life of machinery and appliances, reducing emissions from manufacturing and transportation of new goods, as well as from waste disposal.

Table 23: Emissions from Laundry, Cleaning and Maintenance

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	325	3.91%	2.36%
Residential Care and Social Assistance Services	899	15.86%	11.52%
Human Pharmaceutical and Medicinal Product Manufacturing	21	1.10%	1.08%

- Building cleaning services (IOPC 73110010 and 73120010) contribute an estimated 111 kt CO_2-e to Health Care Services emissions, and 107 kt CO_2-e to Residential Care and Social Assistance Services emissions.
- Laundry and dry-cleaning services (IOPC 95310010) contribute an estimated 103 kt CO_2-e to Health Care Services emissions. For Residential Care and Social Assistance Services emissions, it is estimated that only 18 kt CO_2-e of emissions are from laundry and dry-cleaning services but 63 kt CO_2-e are from cleaning products (IOPC 18500010 to 18521970) – presumably because most laundry cleaning is done in-house.
- Gardening-related products and services are the largest source of emissions from Residential Care and Social Assistance Services in this category, contributing an estimated 606 kt CO_2-e. Most of these emissions (575 kt CO_2-e) are from four IOPC codes (18310070 to 18310070) related to fertilisers, pest control and weedkillers – highlighting the potential emissions reductions from more sustainable gardening techniques.

6.1.5 Manufactured Goods

1,717 kt CO_2-e (7.30% of total health system emissions)

Manufactured Goods encompass 238 IOPC codes and include a wide range of products such as clothing, footwear, paper, plastic consumables and disposable items like gloves and other personal protective equipment. Manufactured Goods contribute substantially to health system emissions. The production, use and disposal of single-use plastic and paper products, such as gloves, aprons, syringes, and other medical devices, generate substantial emissions. Emissions from these sources are likely particularly high for 2021-22 due to the COVID-19 pandemic.

Table 24: Emissions from Manufactured Goods

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	645	7.74%	4.68%
Residential Care and Social Assistance Services	902	15.91%	11.55%
Human Pharmaceutical and Medicinal Product Manufacturing	170	9.01%	8.83%

- Clothing and footwear (IOPC 13400080 to 13521970) contribute an estimated 201 kt CO_2-e to Health Care Services emissions, and an estimated 195 kt CO_2-e to Residential Care and Social Assistance Services emissions.
- Tableware, furniture and domestic ware contribute an estimated 99 kt CO_2-e to Health Care Services emissions, and an estimated 237 kt CO_2-e to Residential Care and Social Assistance Services emissions. This includes 21 kt and 43 kt respectively from Plastic tableware and utensils (IOPC 19120160).
- Toys, sporting and recreational products (IOPC 25920090) contribute an estimated 149 kt CO_2-e to Residential Care and Social Assistance Services emissions.
- Sanitary paper products (IOPC 15240090) contribute an estimated 49 kt CO_2-e to Health Care Services emissions, and an estimated 47 kt CO_2-e to Residential Care and Social Assistance Services emissions. Dressings and bandages (IOPC 13340060 'Wadding, powder puffs, pads, cotton wool, gauze and bandages') contribute an estimated 54 kt CO_2-e to Health Care Services emissions.

6.1.6 Business Services

2,150 kt CO_2-e (9.14% of total health system emissions)

Business Services is a broad category encompassing 142 IOPC codes including accounting, law, management, real estate, recruitment, and scientific and technical areas. These services contribute a surprisingly large proportion of health system emissions. These services are often provided from large, energy-intensive office spaces and require employees to travel extensively. As knowledge-based industries, they rely heavily on information technology products such as laptops and mobile phones, and infrastructure services like data storage, which can be energy-intensive. Given the particularly large cross-section of Business Services, the sub-categories contributing most significantly to emissions are presented in

Table 25: Emissions from Business Services

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	1,273	15.28%	9.23%
Residential Care and Social Assistance Services	778	13.73%	9.97%
Human Pharmaceutical and Medicinal Product Manufacturing	99	5.22%	5.11%

Table 26: Breakdown of major sources of emissions from Business Services

Emissions in kt CO_2-e by subcategory of Business Services	Health Care Services	Residential Care and Social Assistance Services
Recruitment and labour supply services (IOPC 72110010 and 72120010)	239	84
Finance and insurance services (IOPC 62000010 to 64200010)	226	38
Data, computing and telecommunication services (IOPC 58000010 to 59221980 and 70000010 to 70000030)	128	115
Management and marketing services (IOPC 69000110 to 69000120 and 69000140 to 69000160)	123	36
Property and real estate services (IOPC 67120010 and 67200010)	121	123
Legal services (IOPC 69000090)	115	82

6.1.7 Care and Social Assistance Services

190 kt CO_2-e (0.81% of total health system emissions)

Care and Social Assistance Services includes health care services, residential care services, childcare services and social assistance services (IOPC 84010010 to 87900030 excepting IOPC 85910010 on Ambulance Services, which is reported separately in section 6.1.8). While not a large contributor to overall health system emissions, emissions from health system expenditure on related care sectors are separately reported here. The estimates provided in this section may include some degree of double counting, as expenditure by one part of the health system on another part of the health system may already be counted in another part of the footprint calculation.

Table 27: Emissions from Care and Social Assistance Services

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	154	1.85%	1.12%
Residential Care and Social Assistance Services	32	0.57%	0.41%
Human Pharmaceutical and Medicinal Product Manufacturing	4	0.19%	0.18%

6.1.8 Ambulance Services

27 kt CO_2-e (0.11% of total health system emissions)

Emissions in this category are associated with expenditure on IOPC 85910010 'Ambulance Services', which includes air and road transport services for acute and non-acute patient transport, retrieval and transfer. Section 4.2 provides estimates of scope 1 travel and transport emissions – including, but not limited, to ambulance transport. The emissions estimates reported in this section are associated with other aspects of the operation and management of Ambulance Services, including procurement and general operations costs.

Table 28: Emissions from Ambulance Services

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	27	0.32%	0.20%
Residential Care and Social Assistance Services	0	0.00%	0.00%
Human Pharmaceutical and Medicinal Product Manufacturing	0	0.00%	0.00%

6.1.9 Other Procurement

1,646 kt CO_2-e (7.00% of total health system emissions)

Other Procurement, encompassing 192 IOPC codes, includes any Purchased Goods and Services not classified under one of the previously presented categories.

Table 29: Emissions from Other Procurement

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	781	9.37%	5.66%
Residential Care and Social Assistance Services	481	8.48%	6.16%
Human Pharmaceutical and Medicinal Product Manufacturing	385	20.38%	19.96%

For Health Care Services and Residential Care and Social Assistance Services, the majority of emissions in this category (719 kt CO_2-e and 392 kt CO_2-e respectively) are from margins on wholesale and retail (IOPC 37001500 and 43001500). For Human Pharmaceutical and Medicinal Product Manufacturing, the majority of emissions in this category (317 kt CO_2-e) are associated with basic polymers (IOPC 18210010 to 18290040), reflecting their use for packaging (e.g. IOPC 18210030 Polyethylene, which alone contributes 208 kt CO_2-e) and elsewhere in the manufacturing process.

6.2 Capital Goods

875 kt CO_2-e (3.72% of total health system emissions)

Data source: NIbES and National Accounts expenditure data combined using EEIO analysis to produce consumption inventory.

GHG Protocol category: Scope 3, Category 2: Capital Goods.
GHG Protocol definition: Extraction, production, and transportation of capital goods purchased or acquired by the reporting company in the reporting year.
ISO14064-1:2018 category: Category 4: Indirect emissions from products an organisation uses.

Capital goods include:

- Medical Devices and Equipment
- Non-Medical Equipment
- Construction.

Capital goods are assets purchased for use in producing other goods or services. They are typically durable items – like buildings, vehicles, machinery and medical equipment – that a business purchases to operate efficiently over an extended period. They include imaging machines, X-ray equipment, surgical instruments and equipment, hospital beds, and technological infrastructure components like computers and air conditioning systems. The production, transportation, installation and disposal of capital goods involves substantial energy consumption. Medical devices and equipment are often produced using energy-intensive processes and contain materials with high embodied emissions.

Although expenditure-based EEIO analysis has been widely used to estimate health system emissions at regional and national levels, the lack of a direct relationship between price and emissions makes it less suitable for estimating emissions from specific devices and equipment. Therefore, transitioning to measuring emissions using process-based LCA – which estimates emissions by analysing each stage in a product's life cycle from raw materials extraction, to production, transportation, consumption and end of life – is likely to be particularly valuable for capital goods.[71]

Table 30: Emissions from Capital Goods

IOIG	kt CO_2-e	% of scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	716	8.59%	5.19%
Residential Care and Social Assistance Services	154	2.71%	1.97%
Human Pharmaceutical and Medicinal Product Manufacturing	6	0.30%	0.29%

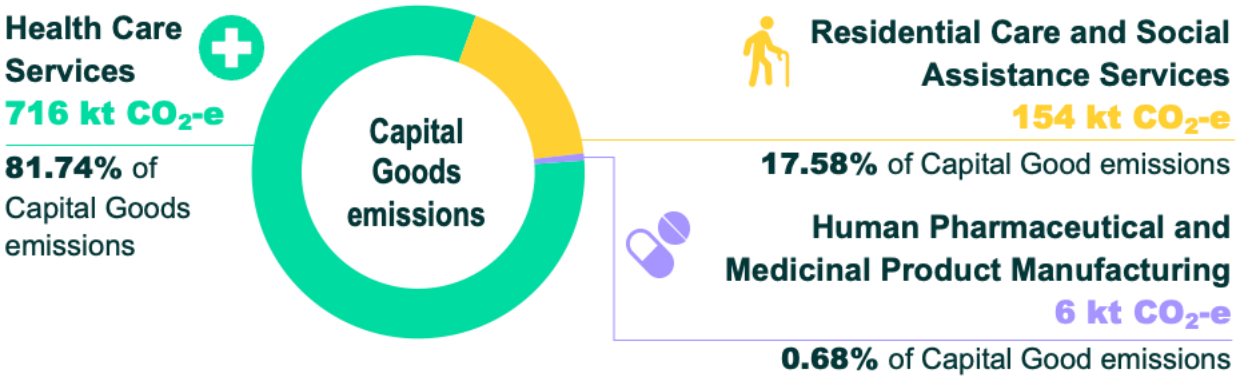

Figure 12: Emissions from Capital Goods

6.2.1 Medical Devices and Equipment

582 kt CO_2-e (2.48% of total health system emissions)

This section provides estimates of the emissions embodied in Medical Devices and Equipment purchased by the health system. It does not include estimates of the emissions from energy use by these goods, which is often substantial, especially for software-driven and digital health technologies.

Most Medical Devices and Equipment emissions (462 kt CO_2-e for Health Care Services and 30 kt CO_2-e for Residential Care and Social Assistance Services) are associated with a single IOPC code 24120090 'Medical aids, equipment (excl x-ray) and therapeutic appliances (including hearing aids)'. This IOPC code encompasses thousands of products, with significant variability in associated emissions. This situation contrasts starkly with other industries such as agriculture, where IOPC codes exist for individual products – pointing to potential benefits from more granular reporting of expenditure on Medical Devices and Equipment in the National Accounts.

Table 31: Emissions from Medical Devices and Equipment

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	551	6.61%	3.99%
Residential Care and Social Assistance Services	32	0.56%	0.41%
Human Pharmaceutical and Medicinal Product Manufacturing	0	0.00%	0.00%

All Medical Devices and Equipment must comply with strict Therapeutic Goods Administration quality and safety regulations. The Therapeutic Goods Administration regulates these goods throughout their lifecycle, from manufacturing to market monitoring and end of life.[72]

Economic evaluation such as cost-effectiveness analysis is integral to the regulation of health technology products in Australia. Health Technology Assessments compare the incremental costs and incremental health gains from new health technology products relative to existing products to inform approval and reimbursement decisions.[72] A number of commentators have argued that, to support health system sustainability and decarbonisation, environmental impacts – including embodied emissions – should be considered as part of Health Technology Assessment.[71] Action 5.1 of the National Health and Climate Strategy commits the Australian Government to review options for considering environmental impacts of health technology products, in collaboration and alignment with international best practice in comparable jurisdictions.[73]

6.2.2 Non-Medical Equipment

162 kt CO_2-e (0.69% total health system emissions)

Non-Medical Equipment encompasses a diverse range of products, including computers, telecommunication devices, professional scientific equipment and domestic appliances.

Table 32: Emissions from Non-Medical Equipment

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	95	1.14%	0.69%
Residential Care and Social Assistance Services	61	1.08%	0.78%
Human Pharmaceutical and Medicinal Product Manufacturing	6	0.30%	0.29%

The National Accounts do not report any expenditure by the health system on laptop and desktop computers (IOPC 24210030 and 24210040) and only marginal expenditure on Computer, printing and photocopying equipment (IOPC 24210030 to 24210190 plus IOPC 24291700) – emissions for which totalled only 2 kt CO_2-e for Health Care Services and 2 kt CO_2-e for Residential Care and Social Assistance Services. This could in part reflect a shift to leasing arrangements (emissions from which are reported in section 6.8 Upstream Leased Assets).

- Machinery (IOPC 24620080 to 24990190) was the biggest contributor to Non-Medical Equipment emissions, with Health Care Services emitting 43 kt CO_2-e and Residential Care and Social Assistance Services emitting 21 kt CO_2-e.

6.2.3 Construction

132 kt CO_2-e (0.56% of total health system emissions)

In the health system, construction emissions encompass the building of new health and aged care facilities, the expansion of existing buildings, and infrastructure maintenance. These emissions arise throughout the construction life cycle from both direct sources (e.g. from use of diesel and gasoline-powered machinery and from temporary on-site facilities that may use fossil fuels for heating, cooling, and power) and indirect sources (e.g. from production of materials, the supply chain, and waste management).

Construction of hospitals, clinics, and aged care facilities often involves complex and energy-intensive building processes. The installation of sophisticated medical equipment, such as an MRI machine, requires specialised building specifications and equipment, and may require sometimes significant structural modifications to existing buildings (e.g. mechanical, electrical, hydraulic and fire control modifications) to support the weight and operational requirements of such devices.

Table 33: Emissions from Construction

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	70	0.85%	0.51%
Residential Care and Social Assistance Services	61	1.08%	0.78%
Human Pharmaceutical and Medicinal Product Manufacturing	0	0.00%	0.00%

The estimated emissions from health system construction reported in Table 33 are unrealistically low. For instance, Yu and coauthors estimate that, when taking embodied emissions into account, construction accounted for 18.1% of Australia's total emissions in 2013[74] – it is unrealistic that construction's share of health system emissions could be as low as 0.56%. Future updates to this report will consider options for improving the estimates of construction emissions, including by better understanding how health system expenditure on construction is handled in the National Accounts. This would ideally include explicit accounting for emissions associated with construction waste, which would only appear here to the extent that they contribute to overall expenditure in the construction sector (or in waste disposal activities discussed in section 6.5 below).

6.3 Fuel- & Energy-Related Activities (not Included in Scopes 1 or 2)

700 kt CO_2-e (2.98% of total health system emissions)

Data source: NIbES and National Accounts expenditure data combined using EEIO analysis to produce consumption inventory.

GHG Protocol category: Scope 3, Category 3: Fuel and energy-related activities (not included in Scope 1 or Scope 2).
GHG Protocol definition: Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year, not already accounted for in scope 1 or 2.
ISO14064-1:2018 category: Category 4: Indirect emissions from products an organisation uses.

Indirect emissions associated with fuel and energy include:

- **Upstream emissions from purchased fuels**: Emissions from extraction, production, and transportation of fuels.
- **Upstream emissions from purchased electricity**: Emissions generated during the lifecycle of the fuels used to produce electricity before it is delivered to the grid. This includes activities such as mining or drilling, refining, and transporting the fuels to the electricity generation facility.
- **Transmission and distribution losses**: Emissions from energy lost during electricity transmission and distribution.

This category includes all emissions related to fuel and energy with the exception of direct (scope 1) emissions from fuel combustion on sites owned and operated by the health system, and indirect (scope 2) emissions from fuel combusted to generate energy. This category includes emissions from the entire life cycle of fuels used to generate energy. To avoid double counting between the expenditure-based emissions estimates and the activity-based scope 1 and 2 emissions estimates, this report deducts scope-1-related and scope-2-related emissions in the consumption inventory using direct intensities.
Most emissions from this source are associated with IOPC codes relating to Income from electricity-related products and income (IOPC 26110011 to 26401500), which contributes 298 kt CO_2-e to Health Care Services, 152 kt CO_2-e to Residential Care and Social Assistance Services, and 69 kt CO_2-e to Human Pharmaceutical and Medicinal Product Manufacturing.

Table 34: Emissions from Fuel- & Energy-Related Activities (not Included in Scopes 1 or 2)

IOIG	kt CO_2-e	% of scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	405	4.86%	2.94%
Residential Care and Social Assistance Services	224	3.95%	2.87%
Human Pharmaceutical and Medicinal Product Manufacturing	71	3.78%	3.70%

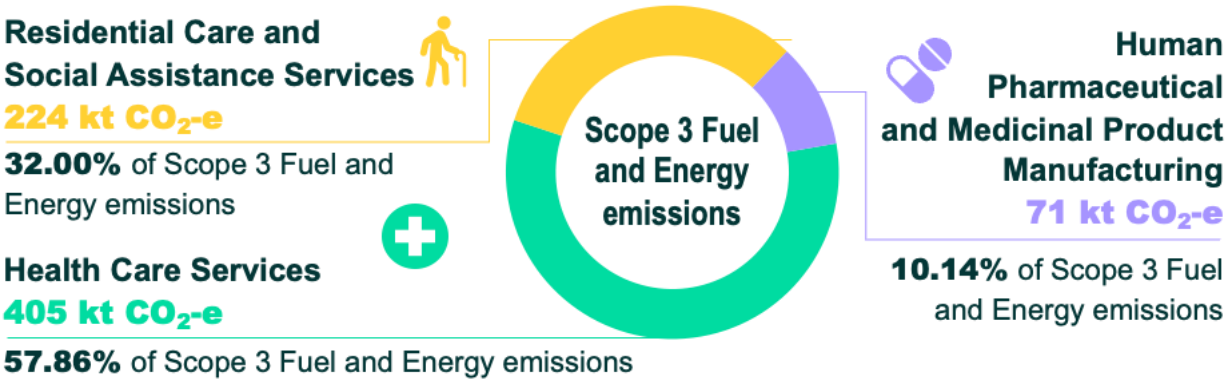

Figure 13: Emissions from Fuel- & Energy-Related Activities (not Included in Scopes 1 or 2)

6.4 Upstream Transportation and Distribution

889 kt CO_2-e (3.78% of total health system emissions)

Data source: NIbES and National Accounts expenditure data combined using EEIO analysis to produce consumption inventory.

GHG Protocol category: Scope 3, Category 4: Upstream transportation and distribution.
GHG Protocol definition: Transportation and distribution of products purchased by the reporting company in the reporting year between a company's tier 1 suppliers and its operations (in vehicles and facilities not owned or controlled by the reporting company). Transportation and distribution services purchased by the reporting company in the reporting year, including inbound logistics, outbound logistics (e.g. of sold products), and transportation and distribution between a company's own facilities (in vehicles and facilities not owned or controlled by the reporting company).
ISO14064-1:2018 category: Category 3: Indirect emissions from transportation.

Healthcare facilities rely heavily on efficient logistics to maintain their operations. Emissions from transportation and distribution can be significant, especially considering the high volume of goods moved and the often stringent requirements for transportation of medical supplies and pharmaceuticals. These activities offer opportunities for emissions reductions by optimising logistics and supply chain practices.

Upstream Transportation and Distribution emissions are generated from the transportation and distribution of products purchased by the health system – as distinct from Downstream Transportation and Distribution emissions, which are generated from the transportation and distribution of products sold by the health system.

Upstream Transportation and Distribution generates emissions from activities such as:

- Inbound logistics (movement of goods from suppliers to the company).

- Transportation between a company's own facilities using third-party transportation services not owned or controlled by the reporting company.
- Warehousing and storage of purchased goods before they are used in operations.

The Upstream Transportation and Distribution emissions estimates reported in this section are derived from expenditure on IOPC codes specifically related to Freight, Courier and Post. Therefore, these estimates will not include Upstream Transportation and Distribution emissions related to Purchased Goods and Services (section 6.1) and Capital Goods (section 6.2) where the associated costs have been recorded as expenditure on those items rather than as separate Freight, Courier and Post expenses.

Table 35: Emissions from Freight, Courier and Post

IOIG	kt CO_2-e	% of scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	432	5.18%	3.13%
Residential Care and Social Assistance Services	343	6.05%	4.39%
Human Pharmaceutical and Medicinal Product Manufacturing	114	6.04%	5.92%

Figure 14: Emissions from Freight, Courier and Post

- Freight transport services was the biggest generator of Upstream Transportation and Distribution emissions, with Health Care Services contributing an estimated 273 kt CO_2-e, Residential Care and Social Assistance Services contributing an estimated 203 kt CO_2-e and Human Pharmaceutical and Medicinal Product Manufacturing contributing an estimated 110 kt CO_2-e.
- Postal services (IOPC 51000010) was the next biggest generator, with Health Care Services contributing an estimated 144 kt CO_2-e and Residential Care and Social Assistance Services contributing an estimated 120 kt CO_2-e.

6.5 Water and Waste

1,782 kt CO_2-e (7.57% of total health system emissions)

Data source: Emissions estimates for clinical waste incineration are from the National Inventory Report 2022. All other estimates are from NIbES and National Accounts expenditure data combined using EEIO analysis to produce consumption inventory.

GHG Protocol category: Scope 3 Category 5. Waste generated in operations.
GHG Protocol definition: Disposal and treatment of waste generated in the reporting company's operations in the reporting year (in facilities not owned or controlled by the reporting company). This category includes emissions from the disposal of both solid waste and wastewater.
ISO14064-1:2018 category: Category 4: Indirect emissions from products an organisation uses.

The health system generates significant waste emissions. Understanding and managing waste emissions is crucial for developing effective strategies to reduce the health system's environmental impact. Health system waste includes:[75]

- **Clinical Waste**: Includes infectious, pathological, and sharps waste that requires special handling and disposal methods to prevent contamination and infection. This type of waste is often incinerated or treated using advanced technologies, contributing significantly to emissions.
- **Radioactive medical waste:** Most commonly generated by nuclear medicine technologies, radiation procedures and other oncology treatment options, and scanning technologies. The Environmental Protection Agency in each Australian state and territory regulates the management of radioactive medical waste.
- **Pharmaceutical waste:** Comprises expired, unused, and contaminated pharmaceutical products, including cytotoxic waste. Proper disposal is critical to prevent environmental contamination and reduce emissions from waste treatment processes.
- **Electronics/ e-waste:** Includes TVs, computers, mobile phones, batteries, printer cartridges and kitchen appliances. E-waste can be recycled to extract non-renewable resources such as plastic and precious metals, including gold, silver, platinum, nickel, zinc, aluminium and copper.
- **Food waste:** Generated from food services in health and aged care facilities. Effective management, including composting and waste reduction, can significantly reduce emissions.
- **General waste:** Includes non-hazardous waste such as packaging, paper, plastics, and office waste. Effective recycling and waste reduction can significantly reduce emissions.

In addition to wastewater treatment and incineration, waste treatment activities also include:

- **Landfilling:** Waste sent to landfill decomposes anaerobically (without oxygen), producing CH_4, a potent greenhouse gas. Landfill is a significant source of CH_4 emissions, mainly from organic waste like food and paper products

- **Incineration:** Waste incineration releases CO_2, CH_4 and N_2O into the atmosphere and has a high emissions footprint.
- **Autoclaving:** This method uses high-pressure steam to sterilise waste. While less emissions-intensive than incineration, it still consumes significant energy, often derived from non-renewable sources (e.g. gas).
- **Plasma gasification:** An advanced technology that converts waste into synthetic gas (syngas) at high temperatures. This can reduce waste volumes and generate energy, but it also involves high energy inputs that generate emissions.
- **Recycling and material recovery**: While recycling can reduce emissions by reducing the need for extraction and processing of raw materials, the recycling process itself involves energy consumption and therefore generates emissions.
- **Composting:** Organic waste, such as food and garden waste, generates CH_4 and CO_2 as it decomposes. Composting can mitigate some emissions by converting organic waste into valuable compost, but the process itself still releases emissions.
- **Wastewater treatment**: Treating wastewater generated by health system facilities involves energy-intensive processes that produce CO_2. Additionally, the biological treatment of wastewater can produce CH_4 and N_2O as by-products.

Table 36: Emissions from Water and Waste

IOIG	kt CO_2-e	% of scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	1,322	15.87%	9.59%
Residential Care and Social Assistance Services	419	7.38%	5.36%
Human Pharmaceutical and Medicinal Product Manufacturing	41	2.18%	2.13%

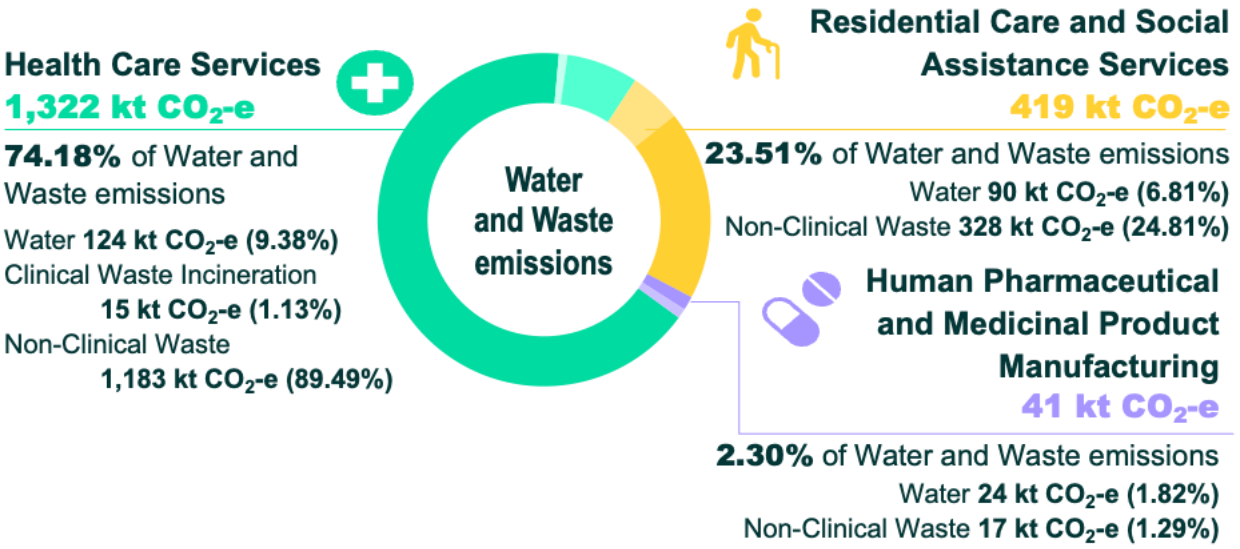

Figure 15: Emissions from Water and Waste

6.5.1 Water

238 kt CO_2-e (1.01% of total health system emissions)

Water generates emissions associated with the supply of water (IOPC 28110010) as well as with the provision of sewerage and drainage services (IOPC 28110010). Major sources of water-related emissions include wastewater treatment, which is energy-intensive and can also produce other greenhouse gases such as CH_4 and N_2O as by-products, and electricity used to pump water.[76,77]

Table 37: Emissions from Water

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	124	1.49%	0.90%
Residential Care and Social Assistance Services	90	1.59%	1.15%
Human Pharmaceutical and Medicinal Product Manufacturing	24	1.27%	1.24%

6.5.2 Clinical Waste Incineration

15 kt CO_2-e (0.06% of total health system emissions)

Clinical waste requires special handling and disposal methods to prevent contamination and infection. This type of waste is often incinerated or treated using advanced technologies, contributing significantly to emissions. Waste incineration releases CO_2, CH_4 and N_2O into the atmosphere and has a high emissions footprint. Definitions of clinical waste are typically set at state and territory government level, and jurisdictions have different entities responsible for clinical waste, and different requirements for its disposal.

Emissions from Clinical Waste Incineration are estimated in Australia's National Inventory Report 2022 to be 15.2 kt CO_2-e in 2021-22.[12] This estimate will include some scope 1 emissions, where incineration occurs at facilities owned and run by health system entities. However, it is not possible to distinguish these scope 1 emissions from scope 3 emissions generated by clinical waste incineration by third parties. As most clinical waste incineration in Australia is outsourced, all emissions from clinical waste incineration are included in the scope 3 estimate provided here.

Table 38: Emissions from Clinical Waste Incineration

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	15	0.18%	0.11%

6.5.3 Non-Clinical Waste

1,528 kt CO_2-e (6.50% of total health system emissions)

The emissions estimates reported in this section relate to expenditure on IOPC 29000010 'Waste collection (incl skip and portable toilet hire), treatment disposal remediation and materials recovery services'. The estimates for Health Care Services incorporate a deduction of 15.2 kt to reflect the separate reporting of emissions from Clinical Waste Incineration in section 6.5.2 above.

Table 39: Emissions from Non-Clinical Waste

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	1,183	14.19%	8.58%
Residential Care and Social Assistance Services	328	5.79%	4.21%
Human Pharmaceutical and Medicinal Product Manufacturing	17	0.91%	0.89%

6.6 Business Travel

259 kt CO_2-e (1.10% of total health system emissions)

Data source: NIbES and National Accounts expenditure data combined using EEIO analysis to produce consumption inventory.

GHG Protocol category: Scope 3, Category 6 Business Travel.
GHG Protocol definition: Transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by the reporting company).
ISO14064-1:2018 category: Category 4: Indirect greenhouse gas emissions from products an organisation uses.

Business travel encompasses transportation of employees for business-related activities. It may involve travel by air, rail, bus, and automobile (e.g. business travel in rental cars).

This category of emissions does not include the following:

- Emissions from transportation in vehicles owned or controlled by the reporting entity, including leased vehicles. These emissions are accounted for under either scope 1 (for fuel use) or scope 2 (for electricity use in electric vehicles).
- Emissions from leased vehicles not under the operational control of the reporting entity. These emissions are reported in section 6.8 below.
- Emissions from transportation of employees to and from work. These emissions are reported in section 6.7 below, unless they are in health system owned and operated vehicles in which case they are reported under scope 1.

- Emissions from patient and visitor travel to and from health facilities. Patient travel emissions are reported in section 7.

Business travel conducted by staff of public administrative entities such as jurisdictional Departments of Health is subject to a variety of governance and accounting arrangements, and may not therefore be included in the estimates reported in this section, and may instead be reported under IOIG 7501 'Public Administration and Regulatory Services', not under one of the IOIGs included in health system boundary definition used for this report.

Table 40: Emissions from Business Travel

IOIG	kt CO_2-e	% of scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	162	1.94%	1.17%
Residential Care and Social Assistance Services	88	1.56%	1.13%
Human Pharmaceutical and Medicinal Product Manufacturing	9	0.46%	0.46%

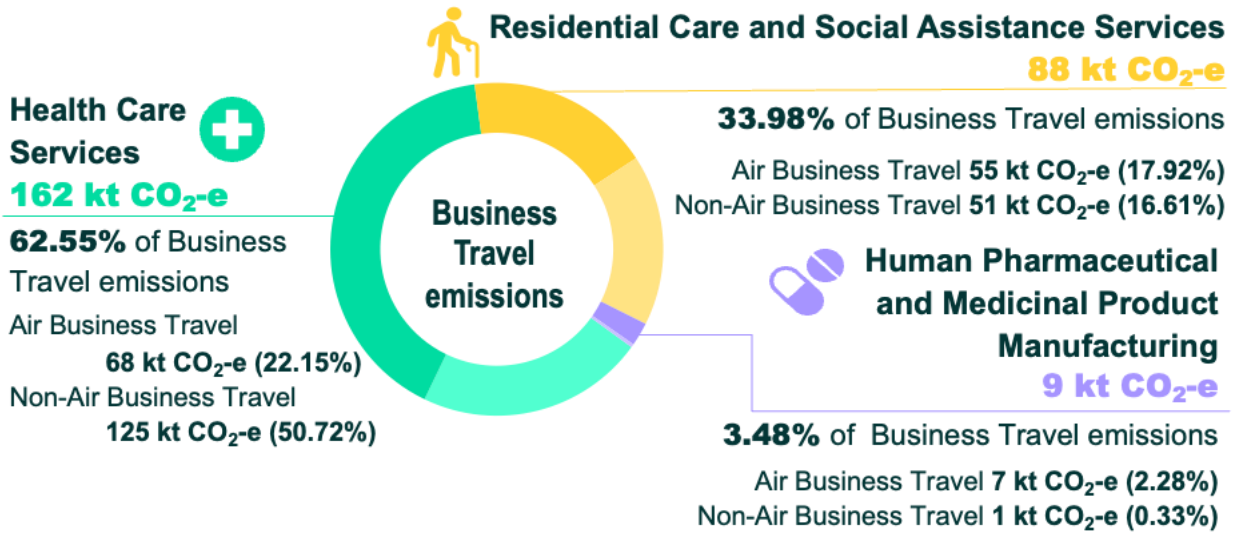

Figure 16: Emissions from Business Travel

6.6.1 Non-Air Business Travel

166 kt CO_2-e (0.71% of total health system emissions)

Health system Non-Air Business Travel expenditures include a variety of transportation arrangements such as bus and rail services for residential care excursions, travel for staff training, taxis for patients or staff, and rental car hire for staff to visit off-site facilities.

Table 41: Emissions from Non-Air Business Travel

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	116	1.39%	0.84%
Residential Care and Social Assistance Services	47	0.83%	0.60%
Human Pharmaceutical and Medicinal Product Manufacturing	3	0.15%	0.14%

With this category, the main source of emissions is bus and tram services (IOPC 46210010 and 46220010), which contributed 95 kt CO_2-e to Health Care Services emissions and 15 kt CO_2-e to Residential Care and Social Assistance Services emissions.

6.6.2 Air Business Travel

93 kt CO_2-e (0.39% of total health system emissions)

Health system expenditure on Air Business Travel includes expenditure on commercial flights as well as expenditure on smaller aircraft – for instance, for passenger retrieval and transfer. It is not possible to distinguish these two types of expenditure. For this reason, this report's estimate of scope 3 Air Business Travel emissions does not incorporate any deduction from the consumption inventory estimate to account for scope 1 air transport emissions, as performing such a deduction would only be appropriate if all scope 3 air travel emissions were for patient retrieval and transfer. While this approach may result in some small degree of double counting, we believe it will result in more accurate estimates than if a deduction were performed.

Table 42: Emissions from Air Business Travel

IOIG	kt CO_2-e	% of total scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	46	0.55%	0.33%
Residential Care and Social Assistance Services	41	0.72%	0.53%
Human Pharmaceutical and Medicinal Product Manufacturing	6	0.32%	0.31%

6.7 Employee Commute

830 kt CO_2-e (3.53% of total health system emissions)

Data source: BITRE commuting data combined with ABS data on health system employment, average commuting distance and average road vehicle fuel consumption.

GHG Protocol category: Scope 3, category 7. Employee commuting.
GHG Protocol definition: Transportation of employees between their homes and their worksites (in vehicles not owned or operated by the reporting company) during the reporting year.
ISO14064-1:2018 category: Category 3: Indirect emissions from transportation.

ABS estimates of employment numbers for Health Care Services and Residential Care and Social Assistance Services were combined with BITRE estimates of the share of employees driving to work to estimate the overall number of health system employees that drive to work.[78,79] This figure was adjusted downwards to account for the number of non-emitting vehicles in 2021-22 and was combined with ABS estimates of average commuting distance to calculate total distance travelled by health system employees in a year, assuming an average of 230 commuting days per year.[80,81] Multiplying by a road car emissions factor of 0.25863 kg CO_2-e per km yielded the estimates reported below.[82]

Table 43: Emissions from Employee Commute

IOIG	kt CO_2-e	% of scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	650	7.80%	4.71%
Residential Care and Social Assistance Services	180	3.18%	2.31%

Figure 17: Emissions from Employee Commute

6.8 Upstream Leased Assets

452 kt CO_2-e (1.92% of health system emissions)

Data source: NIbES and National Accounts expenditure data combined using EEIO analysis to produce consumption inventory.

GHG Protocol category: Scope 3, Category 8. Upstream leased assets.
GHG Protocol definition: Operation of assets leased by the reporting company (lessee) in the reporting year and not included in scope 1 and scope 2 – reported by lessee.

ISO14064-1:2018 category: Category 4: Indirect emissions from products an organisation uses.

Upstream Leased Assets are assets for which the health system is the lessee – as distinct from Downstream Leased Assets for which the health system is the lessor. Scope 3 emissions from Upstream Leased Assets include emissions from assets leased by the reporting entity for which the lessor retains operational control. If the reporting entity has operational control over the leased assets (e.g. the entity is responsible for the fuel used in leased vehicles), any associated emissions should be classified as scope 1.

While there can be a legitimate commercial case for leasing some assets, leasing can also obscure the environmental impact of leased assets, if emissions from operation and maintenance of leased assets are overlooked.

The biggest contributor to scope 3 emissions from Upstream Leased Assets is IOPC 66390010 ‘Goods and equipment rental hire nec (incl art works, household goods and office machinery)’ (126 kt CO_2-e for Health Care Services and 90 kt for Residential Care and Social Assistance Services), followed by IOPC 66310010 ‘Heavy machinery and scaffolding (excl erection) rental or hire (excl financial leases)’ (115 kt CO_2-e for Health Care Services and 58 kt for Residential Care and Social Assistance Services).

Table 44: Emissions from Upstream Leased Assets

IOIG	kt CO_2-e	% of scope 3 emissions for IOIG	% of total emissions for IOIG
Health Care Services	278	3.33%	2.01%
Residential Care and Social Assistance Services	172	3.04%	2.21%
Human Pharmaceutical and Medicinal Product Manufacturing	2	0.13%	0.12%

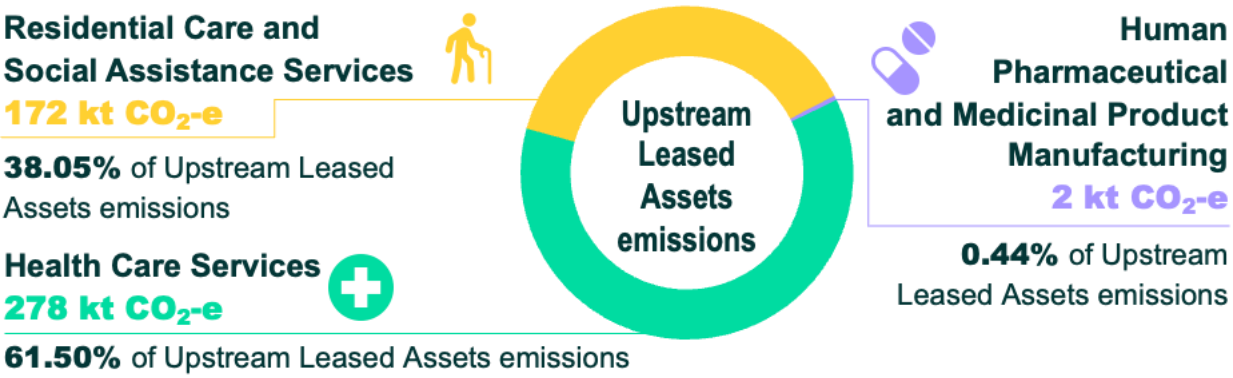

Figure 18: Emissions from Upstream Leased Assets

7 Patient travel emissions

1,409 kt CO_2-e (5.99% of health system emissions)

Data source: Data were sourced from AIHW, ABS, academic literature, Healthdirect, BITRE, and the Electric Vehicle Council. These data were analysed and applied to estimate emissions associated with patient travel.[83,84,85,86]

GHG Protocol and Reporting: Not included.

'Patient travel' means self-funded travel to and from health and aged care facilities. It includes travel in privately owned vehicles, or using public transport, or via active travel such as walking or cycling. Patient travel emissions are a significant contributor to health system emissions. The GHG Protocol does not currently include customer transport in its scope 3 categories. However, the English NHS includes patient and visitor transport emissions in its emission estimates and decarbonisation efforts, and the National Health and Climate Strategy likewise commits to including patient travel emissions in its health system decarbonisation efforts, in recognition that patient travel is an element of the functioning of the health system.[23]

In England, patient travel accounts for approximately 5% of the total NHS emissions footprint, with travel to outpatient appointments a significant contributor.[3] The proportionate contribution of patient travel emissions to overall health system emissions is likely to be higher in Australia than in England due to more dispersed geography and longer average travel distances, and higher access to and use of public transport in England. This will be especially true in rural and remote areas, where patients must sometimes travel hundreds of kilometres to see a specialist, with significant associated emissions.[87,88] While English and Australian people travel similar distances by car annually (11,265 km and 12,000 km respectively), the associated emissions are considerably higher in Australia because average emissions for Australian passenger vehicles in 2021 were estimated to be 48% higher than the average in other major international markets.[82,89,90]

To estimate emissions from patient travel to and from health care facilities, AIHW data was obtained on consultation volumes, aggregated to the five remoteness types reported in Table 45 for seven types of patient contact:[44,91]

- General Practitioner (GP) consultations
- Emergency Department (ED) presentations
- Hospital admissions (inpatient stays)
- Non-specialist outpatient consultations, such as provision of diagnostic procedures, district and community nursing services, and mental health and alcohol and drug services delivered from hospitals for non-admitted patients
- Specialist outpatient consultations

- Specialist consultations in the community
- Allied health attendances.[92]

ED presentations involving conveyance by ambulance were removed from the total count of ED presentations to avoid double counting with ambulance emissions estimates provided elsewhere in this report. Data on conversion rates from ED presentation to inpatient admission were also used to deduct from hospital admission volumes to avoid double counting.[93]

The volume of GP consultations, non-specialist outpatient consultations, and both types of specialist consultations was adjusted using ABS data on rates of remote delivery (e.g. telemedicine, virtual care) to derive the number of patient contacts involving patient travel.[94,95] In addition, using BITRE data on mode of transport as well as data on electric vehicle registrations and use, for each consultation type and remoteness type, a deduction was made to remove trips via public transport or a non-emitting form of transport, leaving only the number of patient contacts involving patient travel in a private emissions-producing vehicle.[79,81]

A range of sources were used to obtain average travel distances, partitioned by state/territory and remoteness type, for GP consultations, ambulance conveyances to ED and other types of patient contact.[82,83,86,96] Average travel distances for ambulance conveyance to ED were used as a proxy for travel distances to other types of consultation in hospital settings, while travel distances for other types of patient contact were used for specialist consultations in the community. After consulting with industry experts, average travel distances to allied health attendances were estimated as the midpoint between travel distances to GP consultations and to other types of patient contact.[83,84,85,86,97,98]

Finally, estimates of average travel distances and consultation volumes involving patient travel in an emissions-producing vehicle were combined to estimate total kilometres travelled for each consultation type and remoteness type. These distances were combined with a road car emissions factor of 0.25863 kg CO_2-e per km to obtain the estimates reported in Table 45, which imply overall patient travel emissions of 1,409 kt CO_2-e.[82]

Table 45: Emissions from Patient Travel by consultation type and remoteness type

Emissions in kt CO_2-e by Consultation Type	Major cities	Inner regional	Outer regional	Remote	Very remote	Total
GP	70	151	117	19	26	384
ED (non-ambulance)	23	39	41	11	11	125
Hospital admission	33	52	61	15	21	181
Outpatient non-specialist service	75	117	141	43	40	417
Specialists consult at a hospital	23	37	44	14	13	130
Specialist appointment in community	24	28	18	3	3	76
Allied health attendance	25	35	26	4	4	96
TOTAL	273	459	449	109	119	1,409

Appendix A: Glossary

ABS: Australian Bureau of Statistics.

AIHW: Australian Institute of Health and Welfare.

Anaesthetic gases: Gases used to anaesthetise patients during medical procedures, e.g. nitrous oxide, desflurane and sevoflurane. These gases often contribute significantly to climate change due to their high global warming potential (GWP).

AR5: The Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change.

Australia New Zealand Standard Industrial Classification: See Appendix C below**.**

BAI: Breath-Activated Inhaler, a type of inhaler for the treatment of respiratory conditions that transmits the active ingredient via a propellant that is issued in response to inhalation of breath. Breath-Activated Inhalers typically generate fewer emissions per actuation than Metered Dose Inhalers.

BITRE: Bureau of Infrastructure Transport Research Economics.

Carbon dioxide equivalent (CO_2-e): A standard unit used to compare the emissions of various greenhouse gases based on their global warming potential (GWP). It expresses the contribution of different gases to climate change relative to the equivalent amount of CO_2.

DCCEEW: Department of Climate Change, Energy, the Environment and Water.

Delphi method: A method for generating a consensus position from a group of experts through an iterative process of questionnaire interspersed with controlled feedback.

Direct emissions: Emissions associated with sources owned or controlled by the reporting entity.

Downstream emissions: Emissions resulting from the use or disposal of a business's products or services.

ED: Emergency Department.

Embodied emissions: Emissions associated with producing, transporting, and constructing a product or service, from extraction of raw materials to end of life.

Emissions factor: A value applied to estimate the amount of greenhouse gas emissions produced by a specific activity, such as burning fuel or consuming electricity, typically expressed in mass of carbon dioxide equivalent (CO_2-e) per unit of activity (e.g. litre of fuel).

Emissions footprint: The total amount of greenhouse gases, measured in carbon dioxide equivalent (CO_2-e), generated by an individual, organisation, or product, often used interchangeably with emissions inventory, carbon footprint or greenhouse gas footprint.

Emissions intensity: The amount of greenhouse gas emissions produced per unit of economic output or per product manufactured, typically expressed in mass of carbon dioxide equivalent (CO_2-e) per dollar of economic output.

Emissions inventory: A comprehensive list of greenhouse gas emissions sources and their associated emissions, usually categorised by sector or type of activity, within a specific geographic area or organisation.

Environmentally Extended Input-Output (EEIO) model: An economic tool that combines traditional input-output analysis typically using economic data with environmental data to estimate the environmental impacts associated with production and consumption of goods and services across different sectors of an economy. It helps quantify emissions throughout entire supply chains, linking economic activities to their environmental footprints.

Fugitive emissions: Emissions that occur due to the leakage of gases from equipment, pipelines, or storage during processes such as transportation or refrigeration, without being emitted from a defined point like a smokestack.

Global Warming Potential (GWP): A metric that compares the impact of different greenhouse gases on global warming relative to carbon dioxide over a specific time period, usually 100 years.[15] GWP allows for the aggregation of emissions of different greenhouse gases into a single value, facilitating comparison of total emissions. Emissions estimates presented in this report are prepared using GWPs from the IPCC Fifth Assessment Report, consistent with rules agreed under the Paris Agreement.

Greenhouse gas emissions: Gases that trap heat in the atmosphere and contribute to climate change. These gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases, which are released through activities such as energy production, transportation, agriculture, industrial processes, and delivery of respiratory inhalers and anaesthetic gases for clinical use.

Greenhouse Gas Protocol (GHG Protocol): Globally recognised standards, guidance, tools and education to help governments and businesses monitor and report their greenhouse gas emissions.

HFC: Hydrofluorocarbon, a class of greenhouse gases.

Indirect emissions: Emissions arising as a result of the activities of the reporting entity but associated with sources not owned or controlled by the reporting entity. May be either Scope 2 emissions or Scope 3 emissions (see these definitions for further information).

IOIG: Input Output Industry Group, based on the Australian and New Zealand Standard Industrial Classification (See Appendix C). Further information can be found on page 11.

IOPC: Input-Output Product Category, an industry of origin product classification defined in terms of characteristic products of industry sectors. Further information can be found on page 21.

IPCC: Intergovernmental Panel on Climate Change.

ISO: International Organization for Standardization.

Life cycle assessment (LCA): A method used to evaluate the environmental impacts of a product or service throughout its entire life cycle, from raw material extraction ('cradle') to disposal ('grave'), including stages like production, transportation, use, and disposal.

MDI: Metered Dose Inhaler, a type of inhaler for the treatment of respiratory conditions that transmits the active ingredient via a propellant that is issued in response to the patient pressing on the device.

Mitigation: Actions aimed at preventing or reducing the emission of greenhouse gases, often through energy efficiency improvements, transition to low-carbon alternative products or services, the adoption of renewable energy, and in health the transition to prevention and reduction in need for more intensive and acute care provisioning. Often used interchangeably with 'decarbonisation'.

National Inventory Report: An annual report that fulfils Australia's international greenhouse gas inventory reporting requirements under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. The estimates in the National Inventory Report are prepared in line with IPCC Guidelines. UNFCCC categories represent groupings of related emitting activities and processes, for example, fuel combustion for electricity generation or the decomposition of waste in landfill.

National Greenhouse and Energy Reporting (NGER) Scheme: Australia's single national framework established by the NGER Act whereby companies that meet certain activity thresholds must report information about scope 1 and 2 greenhouse gas emissions, energy production and energy consumption.

NGA: National Greenhouse Accounts. Further information can be found on page 11.

Net zero emissions: A condition where the amount of greenhouse gas emissions produced is balanced by the amount removed from the atmosphere, through carbon sequestration, carbon offset projects, or other removal technologies.

NIbES: National Inventory by Economic Sector. Further information can be found on page 11.

OTC: Over The Counter.

Paris Agreement: An international treaty adopted in 2015 under the UNFCCC that commits parties to reducing greenhouse gas emissions to limit global warming to well below 2°C above pre-industrial levels, and to pursuing efforts to limit the increase to 1.5°C.

Renewable energy: Energy derived from natural sources that are replenished more quickly than they are consumed, such as solar, wind, hydro, and geothermal energy.

SABA: Short-Acting Beta Agonist.

Scope 1 emissions: See Direct emissions.

Scope 2 emissions: Indirect emissions associated with generation of purchased energy.

Scope 3 emissions: All non-energy indirect emissions in a company's value chain, such as those embodied in purchased goods and services, business travel and supply chain activities.

United Nations Framework Convention on Climate Change (UNFCCC): An international environmental convention established in 1992, which provides the foundation for global cooperation in addressing climate change by setting guidelines for monitoring, reporting, and reducing greenhouse gas emissions. It entered into force in 1994 and 197 countries have now ratified the Convention and are called Parties to the Convention.

Upstream emissions: Indirect emissions that occur in the supply chain during the production of goods and services that are consumed/purchased by an organisation.

Appendix B: Limitations

Table 46 provides a consolidated list of limitations to the emissions estimates provided in this report.

Table 46: Limitations to emissions estimates provided in this report

Limitation	Description
Section 1: Mixed funding	Certain costs may be co-funded by the health sector and public sector outside of health, such as large capital works and construction. In addition, some expenditure may be attributed to whole-of-government arrangements and therefore reported under public administration Input Output Industry Groups (IOIGs) rather than under IOIGs included in the boundary of the health system used for this report. This may lead to underestimation of health system emissions.

Section 2: Reporting level of National Accounts Input-Output tables and National Inventory by Economic Sector	The National Accounts provide Input-Output tables mapping production to consumption for 116 Input-Output Industry Groups (IOIGs). This places a significant limitation on the granularity with which health system emissions can be reported, in two ways. First, the National Inventory Report is combined with the National Accounts Input-Output tables to produce the National Inventory by Economic Sector (NIbES) which reports greenhouse gas emissions by producing (scope 1) sector. The fact the Input-Output tables are provided at IOIG level means that NIbES also cannot be reported below IOIG level. Secondly, NIbES is combined with the Input-Output tables to map direct (scope 1) emissions to consuming sectors. This reliance on IOIG-level Input-Output tables, combined with the fact NIbES itself is reported at IOIG level, means it is not possible to generate consumption inventory estimates for a lower reporting level than IOIG. This limitation places the following constraints on the estimates provided in this report:
	• IOIG 8401 Health Care Services combines ANZSIC 84 Public Hospitals and 85 Medical and Other Health Care Services, but we would ideally like to report emissions separately for the component parts of this IOIG – e.g.:
	  • ANZSIC 84 Hospitals
	  • ANZSIC 8511 General Practice Medical Services
	  • ANZSIC 852 Pathology and Diagnostic Imaging Services
	• IOIG 8601 Residential Care and Social Assistance Services combines ANZSIC 86 Residential Care Services and 87 Social Assistance Services, but we would ideally like to only report emissions for ANZSIC 8601 Aged Care Residential Services, as the following ANZSIC codes are partly or wholly outside the boundary of the health system:
	  • ANZSIC 8609 Other Residential Care Services
	  • ANZSIC 87 Social Assistance Services

	• Inclusion of IOIG 1801 Human Pharmaceutical and Medicinal Product Manufacturing in our health system boundary will introduce some double counting from scope 3 Purchased Goods and Services estimated for IOIG 8401 and IOIG 8601. However, it is included on the basis that it partly compensates for the exclusion of wholesale and retail pharmacy from our health system boundary. If wholesale and retail pharmacy can be included in the health system boundary in future updates to the estimates provided in this report, greater attention will be given to eliminating double counting between these sectors, IOIG 1801, and IOIGs 8401 and 8601.
	• We would ideally like to report emissions for the following ANZSIC codes, but cannot currently do so as they are contained within IOIGs that largely lie outside the health system boundary:
	  • ANZSIC 3720 Pharmaceutical and Toiletry Goods Wholesaling
	  • ANZSIC 4271 Pharmaceutical, Cosmetic and Toiletry Goods Retailing
	  • ANZSIC 2412 Medical and Surgical Equipment Manufacturing
	  • ANZSIC 6321 Health Insurance.

Section 2: Emissions intensity categories	For each of the three Input-Output Industry Groups (IOIGs) in our health system boundary, expenditure is reported separately for each of the 923 Input-Output Product Categories (IOPCs). However, the EEIO methods used to derive emissions intensities for each expenditure category make use of ABS Input-Output tables which are provided at IOIG level, meaning that emissions intensities can only be calculated for the 116 IOIGs. This means emissions reported at IOPC level are estimated by multiplying IOPC-level expenditure by average emissions intensity for the whole IOIG. This may lead to inaccurate emissions estimates, especially when the goods produced by entities within an IOIG are very heterogeneous. For instance, IOIG 2401 ('Professional, scientific, computer and electronic equipment manufacturing') encompasses 25 IOPCs from x-ray machines to televisions, laptops, mobiles phones and large complex scientific machines. As they are grouped in one IOIG category, one emissions intensity is applied for all expenditure within that category.
Section 2: Emissions generated overseas embodied in imported goods and services	The estimates of health system emissions in this report are based on estimates of the emissions intensities of different goods and services using Australian data, combined with expenditure by health system organisations on domestically produced goods and services. Health system organisations are also responsible for emissions generated overseas through the purchase of goods and services wholly or partly produced in other countries. For instance, over 90% of medicines consumed in Australia are imported.[29] Quantifying emissions generated overseas and embodied in purchased goods and services will be important for quantifying the benefits of future work to develop green procurement guidelines, which will by necessity apply to both domestic and international suppliers.
Section 2: Capital depreciation	A limitation of using expenditure data to derive emissions estimates arises when accounting for depreciation of capital. Accountants spread the costs of capital assets over multiple years, which can distort the relationship between

	expenditure and emissions. This method fails to capture the true time period when emissions from the production and use of capital goods occur, leading to potential under- or over-estimation of emissions in any given year.
Section 4.2.3: Air Transport Fuel Combustion	Multiple different emissions factors for the air transport fleet used have been reported in the literature ranging from 1,474 to 2,870 kg CO_2-e per hour. In addition, there is a significant variation in reported data of air ambulance use and presentation to ED at a national and state level, with some flights having multiple passengers, and some trips accounting for the return to base and others not.
Section 4.3 Anaesthetic Gases	This section reports emissions from two classes of anaesthetic gas: nitrous oxide and fluorinated anaesthetic gases. The health system uses a range of additional gases, including methoxyflurane, oxygen, carbon dioxide, acetylene, argon, helium, hydrogen, and nitrogen. Some Australian state and territory health departments collect data on scope 1 emissions from a wider range of gases and it is hoped that future updates to this report will include reporting of these.
Section 4.3.1: Medical Nitrous Oxide	Emissions of N_2O from aerosol products and anaesthesia are based on production data provided by the industrial gas manufacturers (BOC and Air Liquide) up to 2007-08. N_2O consumption since then is indexed to population growth, which may not reflect actual changes in use.
Section 5: Scope 2 Purchased Energy	Scope 2 Purchased Energy emissions are not currently reported separately by economic sector. To address this limitation, this report estimates health system scope 2 emissions using NIbES, which reports estimates of overall health system scope 1 emissions, and data on the ratio of scope 1 to scope 2 emissions for entities required to report under the National Greenhouse and Energy Reporting (NGER) Scheme. Overall health system scope 2 emissions are estimated by assuming the ratio of scope 1 to scope 2 emissions is the same for NGER Scheme entities and entities not required to report under the NGER Scheme. This is a limitation compared to the ideal of reporting actual scope 2 emissions data, especially when the number of entities subject to the NGER Scheme is relatively low. The NGER Scheme currently receives data for 271 entities classified under IOIG 8401 Health Care Services and 51 entities classified under IOIG 8601 Residential Care and Social Assistance Services. However, it currently receives data from only 25 entities classified under ANZSIC codes 1841, 3720, and 4271 – which are collectively taken as a proxy for IOIG 1801 Human Pharmaceutical and Medicinal Product Manufacturing, for the purpose of estimating scope 2 emissions.
Section 6.1.1: Pharmaceuticals and Chemicals (not Respiratory Inhalers)	Some Health Care Services emissions associated with expenditure on industrial gases (IOPC 18110090), contributing 136 kt CO_2-e, may include emissions from anaesthetic gases reported on an activity basis in section 4.3. However, as it is not possible to disaggregate expenditure in this IOPC code, and as expenditure on anaesthetic gases is likely to constitute only a small portion of overall expenditure on industrial gases, no adjustment is made to address any associated risk of double counting.

Section 6.1.7: Care and Social Assistance Services Emissions	The scope 3 emissions category ‘Care and Social Assistance Services’ includes emissions related to expenditure by the health system on itself. This may result in some double counting of emissions, as the funds received by the producing organisation are likely to be spent on other goods and services and may already be counted in another part of the footprint calculation.
Section 6.1.8: Ambulance Emissions	Ambulance services have differing ownership and control arrangements in different states and territories. Some jurisdictions own and operate their own ambulance fleets, in which case ambulance emissions will be included in scope 1 emissions under Road Transport Fuel Combustion. When services are outsourced to third-party providers like the Royal Flying Doctor Service or St John of God, it will appear as expenditure on Ambulance Services in the National Accounts and the emissions intensity of this expenditure will be based on the average emissions intensity for IOIG 8401 Health Care Services of which it is a part. This emissions intensity may not be an accurate proxy for the emissions intensity of ambulance services in particular.
Section 6.5.2: Clinical Waste Incineration	The National Inventory Report 2022 estimates emissions from clinical waste incineration are based on data from a 2006 study, adjusted for population change.[99,100] It therefore assumes that clinical waste generated per capita has remained unchanged over the period since then. This estimate is likely to be outdated, as there is evidence that clinical waste volumes per capita have increased significantly in recent years.[101]

Appendix C: ANZSIC, IOIGs and the health system boundary

The 2006 Australian and New Zealand Standard Industrial Classification (ANZSIC) is a standard classification jointly developed by the Australian Bureau of Statistics (ABS) and Statistics New Zealand and aligned to the International Standard Industrial Classification of All Economic Activities. An individual business entity (any organisation undertaking productive activities, including companies, non-profit organisations, government departments and enterprise) is assigned to an industry classification and code based on its predominant activity.

The ANZSIC is a hierarchical classification with four levels, namely Divisions (the broadest level, represented by a letter), Subdivisions (2-digit), Groups (3-digit) and Classes (4-digit, the finest level). The main purpose of the Divisional level is to enable aggregation up to a limited number of categories which provide a broad overall picture of the economy and are suitable for the publication of summary tables in official statistics. The Subdivision, Group and Class levels provide increasingly detailed dissections of these categories for the compilation of more specific and detailed statistics.

The hierarchical structure of the ANZSIC is illustrated below.

Division C Manufacturing
Subdivision 11 Food Product Manufacturing
Group 111 Meat and Meat Product Manufacturing
Class 1111 Meat Processing

Input-Output Industry Groups (IOIGs) are a particular aggregation of ANZSIC codes into 116 categories. IOIGs can correspond to a single ANZSIC class (4 digits), such as 1801 Human Pharmaceutical and Medicinal Product Manufacturing, which corresponds exactly to ANZSIC Class 1841 of the same name. However, there is not an IOIG group for every ANZSIC class. For instance, there is an IOIG 8401 (Health Care Services) that combines ANZSIC Subdivisions 84 (Hospitals) and 85 (Medical and Other Health Care Services). This creates a potentially confusing situation in which IOIG 8401 refers to Health Care Services, encompassing ANZSIC Subdivisions 84 (Hospitals) and 85 (Medical and Other Health Care Services), but ANZSIC Class 8401 (Hospitals (except Psychiatric Hospitals)) is a sub-categorisation of ANZSIC Subdivision 84 (Hospitals).

In this report, the boundary of the health system is defined at IOIG level because of limitations in the available data. Table 47 below provides a list of ANZSIC codes that would ideally be included future updates to estimates of health system emissions.

Table 47: Proposed health system boundary for future emissions estimates

It is proposed future updates to estimates of health system emissions include the disaggregated reporting of following ANZSIC codes:
Class 1841 Human Pharmaceutical and Medicinal Product Manufacturing
Class 2412 Medical and Surgical Equipment Manufacturing
Class 3720 Pharmaceutical and Toiletry Goods Wholesaling
Class 4271 Pharmaceutical, Cosmetic and Toiletry Goods Retailing
Class 6321 Health Insurance
Subdivision 84 Hospitals
Subdivision 85 Medical and Other Health Care Services
Class 8601 Aged Care Residential Services

Appendix D: Emissions reporting obligations

Health system emissions in Australian Government reporting

Commonwealth Climate Disclosure is the Australian Government's policy for Commonwealth entities and Commonwealth companies to publicly report on their exposure to climate risks and opportunities as well as their actions to manage these climate risks and to decarbonise their activities.[102] All non-corporate and corporate Commonwealth entities were required to report on scope 1 and 2 emissions from their operations in Australia or Australia's external territories in annual reports from 2022-23. This was expanded to include reporting by Commonwealth companies from 2023-24, providing a picture of scope 1 and 2 emissions from operations across all Commonwealth entities and companies, and helping to prepare for the phased implementation of the Commonwealth Climate Disclosure initiative. This initiative is a critical step towards improving emissions transparency in the public sector, including the Department of Health and Aged Care, and agencies such as Medicare and the Australian Institute for Health and Welfare.

Private and not-for-profit entity emissions reporting

Privately run health organisations, including those operated by charities and not-for-profits, are a critical part of the Australian health system. Emissions measurement and reporting governance decisions vary greatly amongst these organisations. Mercy Health, for example, has committed to measure and report beyond what is currently required under the mandatory climate disclosures for corporate emissions reporting.[69]

The Australian Government has recently (9 September 2024) passed the Treasury Laws Amendment (Financial Market Infrastructure and Other Measures) Bill 2024, establishing mandatory climate-related financial disclosures. The Australian Sustainability Reporting Standards, based on the International Sustainability Standards Board's International Financial Reporting Standards S2, will become effective from 1 January 2025. These standards apply to both profit and not-for-profit entities. However not-for-profit entities registered under the Australian Charities and Not-for-profits Commission are largely exempt unless required to report under the National Greenhouse and Energy Reporting (NGER) Act. Specifically, CAN registered entities are exempt from lodging financial reports under Chapter 2M of the Corporations Act, which includes the sustainability reporting requirements. Not-for-profit entities required to report under Chapter 2M, such as larger industry groups or entities registered under the NGER Act, will need to comply with these obligations.

Under the Australian Sustainability Reporting Standards framework, there will be a phased implementation based on the size and type of entity:

- Group 1 entities (with consolidated revenue of A$500 million or more, consolidated gross assets of A$1 billion or more, or 500 or more employees) will be required to report from 2025
- Group 2 entities (with revenue of A$200 million or more, assets of A$500 million or more, or 250 or more employees) will be required to report from 2026-27
- Group 3 entities, including smaller organisations and those with revenue of A$50 million or more, will be required to report from 2027-28.

Scope 1 and 2 emissions must be reported by Group 1 entities from the first year, while reporting of scope 3 emissions will be phased in, with leniency in the first reporting period. Organisations that do not meet the reporting criteria may still be required to provide emissions data as part of supply chain obligations.

International Context

Globally, similar initiatives are underway. For example, the European Union's Corporate Sustainability Reporting Directive mandates that large enterprises, including those based outside the EU, disclose scope 1, 2, and 3 emissions starting in 2024. Additionally, the United Kingdom's Streamlined Energy and Carbon Reporting policy requires energy and greenhouse gas emissions data to be included in annual reports.

In addition to corporate disclosures, emerging environmentally preferrable purchasing frameworks are coming into force internationally. For example, the English National Health Service will require all suppliers to publish targets, emissions and a Carbon Reduction Plan for global emissions aligned to the NHS net zero target, for all of their scope 1, 2 and 3 emissions, from April 2025.

Appendix E: Sector classifications

The categorisation of emissions used in this report is based on the ABS Input-Output Product Classification (IOPC). The 923 IOPC codes have been aggregated to 21 scope 3 emissions categories that were co-designed with health, procurement and emissions measurement experts using the Delphi method, with the aim of aligning with health system general ledger reporting. These 21 scope 3 reporting categories align with the 15 GHG Protocol scope 3 reporting categories and the ISO 14064-1:2018 standard for emissions reporting.[2,11,31] They will be reviewed following further consultation with health and aged care representatives, and will evolve as emissions measurement and reporting matures.

The experts consulted as part of the Delphi method to develop the emissions categories used in this report advised that health system organisations were unlikely to lease out assets to any significant extent, and therefore that GHG Protocol Scope 3 Category 13: Downstream Leased Assets could be excluded from our taxonomy of emissions sources.

The 21 scope 3 categories used in this report are as follows (GHG Protocol categories denoted in bold):

1. **Purchased Goods and Services:** Pharmaceuticals and Chemicals (not Respiratory Inhalers)
2. **Purchased Goods and Services:** Respiratory Inhalers
3. **Purchased Goods and Services:** Food and Catering
4. **Purchased Goods and Services:** Laundry, Cleaning and Maintenance
5. **Purchased Goods and Services:** Manufactured Goods
6. **Purchased Goods and Services:** Business Services
7. **Purchased Goods and Services:** Care and Social Assistance Services
8. **Purchased Goods and Services:** Ambulance Services
9. **Purchased Goods and Services:** Other Procurement
10. **Capital Goods:** Medical Devices and Equipment
11. **Capital Goods:** Non-Medical Equipment
12. **Capital Goods:** Construction
13. **Fuel- and Energy-Related Activities (not Included in Scope 1 or 2):** Upstream Energy-Related Emissions
14. **Upstream Transportation and Distribution:** Freight, Courier and Post
15. **Water and Waste:** Water
16. **Water and Waste:** Clinical Waste Incineration
17. **Water and Waste:** Non-Clinical Waste
18. **Business Travel:** Non-Air Travel
19. **Business Travel:** Air Travel
20. **Employee Commute**: Employee Commute
21. **Upstream Leased Assets**: Leased Assets and Equipment Rental

Table 48 maps IOPC codes to the 21 scope 3 emissions categories.

Table 48: IOPC codes and scope 3 emissions categories

IOPC code	IOPC name	Scope 3 category
01110010	Nursery plants - grown undercover nec	Other Procurement
01120010	Nursery plants - grown outdoors nec	Other Procurement
01120020	Orchard and vineyard growing	Other Procurement
01130010	Turf	Other Procurement
01140010	Flowers (incl cut flowers) and flower seeds - grown undercover	Other Procurement
01150010	Flowers (incl cut flowers) and flower seeds - grown outdoors	Other Procurement
01210010	Mushrooms - fresh or chilled	Food and Catering
01210020	Mushroom spawn	Food and Catering
01220010	Lettuces - grown undercover	Food and Catering
01220020	Tomatoes - grown undercover	Food and Catering
01220030	Vegetables nec - grown undercover	Food and Catering
01230010	Lettuces - grown outdoors	Food and Catering
01230020	Tomatoes - grown outdoors	Food and Catering
01230030	Potatoes, sweet potatoes and edible roots and tubers nec - grown outdoors	Food and Catering
01230040	Beans, french and runner; peas - green or blue grown outdoors	Food and Catering
01230050	Cabbages, brussels sprouts, cauliflowers and headed broccoli - grown outdoors	Food and Catering
01230060	Carrots - grown outdoors	Food and Catering
01230070	Onions - grown outdoors	Food and Catering
01230080	Vegetable seeds	Food and Catering
01230090	Other vegetables (incl melons) - fresh or chilled grown outdoors	Food and Catering
01310010	Grapes - table	Food and Catering
01310020	Grapes - wine	Food and Catering
01310030	Grapes - sun-dried or for drying	Food and Catering
01320010	Kiwi fruit	Food and Catering
01330010	Strawberries	Food and Catering
01330020	Berries nec - fresh and sun-dried	Food and Catering
01340010	Apples - fresh and sun-dried	Food and Catering
01340020	Pears and quinces - fresh and sun-dried	Food and Catering
01350010	Stone fruit - fresh and sun-dried	Food and Catering
01360010	Citrus fruit - fresh and sun-dried	Food and Catering
01370010	Olives - fresh and sun-dried	Food and Catering
01390010	Bananas - fresh and sun-dried	Food and Catering
01390020	Orchard fruit nec - fresh and sun-dried	Food and Catering
01390030	Almonds and macadamias	Food and Catering

01390040	Edible nuts (excl peanuts) nec; Fruit nec - fresh and sun-dried	Food and Catering
01400010	Sheep and lambs	Other Procurement
01400020	Wool - shorn and dead	Other Procurement
01400030	Sheep and lamb products nec	Other Procurement
01400040	Sheep and beef cattle agistment services	Other Procurement
01400050	Beef cattle and calves	Other Procurement
01400060	Beef cattle and calves products (excl milk) nec	Other Procurement
01400070	Rice - in the husk	Other Procurement
01400080	Wheat (incl spelt) and meslin - unmilled	Other Procurement
01400090	Barley - unmilled	Other Procurement
01400100	Oats - unmilled	Other Procurement
01400110	Sorghum - for grain	Other Procurement
01400120	Lupins - white or yellow for grain	Other Procurement
01400130	Oilseeds (incl canola)	Other Procurement
01400140	Legumes for grain nec	Other Procurement
01400150	Cereal grains nec	Other Procurement
01510010	Sugar cane - for planting or crushing	Other Procurement
01520010	Cotton (excl ginned)	Other Procurement
01590010	Forage sorghum	Other Procurement
01590020	Forage products nec	Other Procurement
01590030	Tobacco	Other Procurement
01590040	Beverage and spice crops	Other Procurement
01590050	Grass, lucerne and clover seed	Other Procurement
01590060	Hay, cereal grasses and fodder	Other Procurement
01590090	Peanuts	Food and Catering
01590110	Natural rubber	Other Procurement
01590120	Crops nec	Other Procurement
01600010	Whole milk - chilled but otherwise untreated	Food and Catering
01600020	Dairy cattle	Other Procurement
01710010	Poultry - for slaughtering	Other Procurement
01720010	Eggs	Food and Catering
01720020	Poultry - for eggs	Other Procurement
01800010	Deer	Other Procurement
01910010	Thoroughbred horses	Other Procurement
01910020	Horse stud and breeding services; horses nec	Other Procurement
01910030	Horse agistment services	Other Procurement
01920010	Pigs	Other Procurement
01930010	Unblended honey and beeswax	Other Procurement
01990010	Pet breeding and live animals nec	Other Procurement
01990020	Livestock products nec	Other Procurement
02000010	Farmed oysters (incl pearl), pearls, paua and molluscs nec; cultured pearls	Food and Catering
02000040	Farmed prawns and crustaceans nec	Food and Catering
02000060	Farmed fish, fish hatchery products and seaweed; aquaculture nec	Food and Catering

02031980	General government consumption of fixed capital (0201-0203)	Other Procurement
03010010	Natural gums and resins (incl oleoresins)	Other Procurement
03010020	Softwoods (conifers) - growing	Other Procurement
03010030	Hardwoods, brushwoods and scrubwoods - growing	Other Procurement
03010040	Forest products nec	Other Procurement
03020010	Softwoods (conifers) - logs	Other Procurement
03020020	Hardwoods, brushwoods and scrubwoods - logs; hewn timber and timber nec (incl firewood)	Other Procurement
03020030	Logging services	Other Procurement
03021980	General government consumption of fixed capital (0301-0302)	Other Procurement
04110010	Rock lobsters and crabs	Food and Catering
04120010	Prawns	Food and Catering
04130010	Fish and squid - line fishing	Food and Catering
04140010	Fish - trawling or netting	Food and Catering
04190010	Oysters and aquatic invertebrates nec - live, fresh or chilled (excl farmed); natural pearls	Food and Catering
04190020	Coral and similar; shells of molluscs; natural animal sponges; algae - fresh or dried (excl farmed)	Food and Catering
04190030	Freshwater fish and aquatic animals nec	Food and Catering
04200080	Hunting and trapping services; raw skins from hunting or trapping; game meat from hunting or trapping	Other Procurement
04201980	General government consumption of fixed capital (0411-0420)	Other Procurement
05100010	Forestry support services nec	Other Procurement
05210010	Cotton - ginned; cotton seed, waste from cotton and cotton ginning services	Other Procurement
05220010	Shearing services	Other Procurement
05290030	Fishing support services nec	Other Procurement
05290060	Agriculture support services nec	Other Procurement
05291980	General government consumption of fixed capital (0510-0529)	Other Procurement
06000010	Black coal	Upstream Energy-Related Emissions
06000020	Brown coal/lignite and peat (excl horticultural)	Upstream Energy-Related Emissions
07000010	Crude oil (incl condensate)	Upstream Energy-Related Emissions
07000020	Liquefied natural gas	Upstream Energy-Related Emissions
07000030	Natural gas - in the gaseous state	Upstream Energy-Related Emissions
07000050	Coal seam gas	Upstream Energy-Related Emissions

07000060	Other naturally occurring gases	Upstream Energy-Related Emissions
07000070	Liquefied petroleum gas from the well head	Upstream Energy-Related Emissions
08010090	Iron ore (incl treatment)	Other Procurement
08020010	Bauxite and Aluminium Ores	Other Procurement
08030010	Copper concentrates, oxides and ores	Other Procurement
08040010	Gold ores	Other Procurement
08050010	Beneficiated ilmenite, ilmenite and leucoxene concentrates	Other Procurement
08050020	Rutile concentrates	Other Procurement
08050030	Monazite, xenotime and zircon concentrates; mineral sand ores nec	Other Procurement
08060010	Nickel ores and concentrates	Other Procurement
08070010	Lead ores and concentrates	Other Procurement
08070030	Silver ores and concentrates	Other Procurement
08070040	Zinc ores and concentrates (incl silver-lead-zinc combined concentrates)	Other Procurement
08090010	Tin, tin-copper and tin-tantalite concentrates	Other Procurement
08090020	Uranium concentrates	Other Procurement
08090030	Manganese ores	Other Procurement
08090040	Non-ferrous metallic ores and concentrates nec (incl tungsten)	Other Procurement
09110010	Gravel	Other Procurement
09110020	Sand	Other Procurement
09190010	Dimension stone	Other Procurement
09190020	Pebbles, broken or crushed stone and macadam; tarred macadam; granules, chippings and powder of stone	Other Procurement
09190030	Limestone (incl shell and coral)	Other Procurement
09190040	Clays nec (incl brick, pipe, tile and shale)	Other Procurement
09190050	Construction materials (mined) nec (incl decomposed rock, residues etc) (excl crushed and broken stone and dimension stone)	Other Procurement
09900010	Salt	Other Procurement
09900020	Precious and semi-precious gemstones (incl garnet concentrate)	Other Procurement
09900030	Gypsum; anhydrite; calcareous stone of a kind used for the manufacture of lime or cement (excl limestone)	Other Procurement
09900040	Silica	Other Procurement
09900050	Natural phosphates and phosphate rock - unground	Other Procurement
09900090	Chemical and fertiliser minerals nec; non-metallic minerals nec	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
10110010	Petroleum exploration	Other Procurement
10120010	Mineral exploration	Other Procurement
10900010	Mining support services nec	Other Procurement

10901980	General government consumption of fixed capital (1011-1090)	Other Procurement
11110010	Fresh meat - chilled or frozen (excl kangaroo or horse meat, other than for human consumption)	Food and Catering
11110020	Fresh kangaroo or horse meat, other than for human consumption	Other Procurement
11110070	Raw hides and skins - from manufacturing	Other Procurement
11110080	Meat (excl fresh) for human consumption	Food and Catering
11110160	Edible offals (excl poultry offals) and tallow (excl refined); other animal products nec	Food and Catering
11110170	Blood meal and inedible meat	Other Procurement
11110180	Meat products nec	Food and Catering
11120010	Poultry and poultry products (incl canned)	Food and Catering
11130090	Cured meat and smallgoods	Food and Catering
11131700	Meat and meat products - manufacturing services on a commission basis (ANZSIC Classes 1111-1113)	Food and Catering
11200080	Fish - fresh, canned, frozen or otherwise processed and fish products	Food and Catering
11200090	Seafood nec - chilled, frozen, preserved or otherwise prepared (incl crustaceans)	Food and Catering
11201700	Processed seafood - manufacturing services on a commission basis	Food and Catering
11201980	General government consumption of fixed capital (1120)	Food and Catering
11310030	Milk and cream	Food and Catering
11320010	Ice cream and frozen confections	Food and Catering
11330010	Flavoured whole milk drinks	Food and Catering
11330020	Sour cream, yoghurt and other cultured milk products	Food and Catering
11330050	Butter	Food and Catering
11330060	Cheese and curd	Food and Catering
11330100	Dairy products nec	Food and Catering
11331700	Dairy products - manufacturing services on a commission basis (ANZSIC Classes 1131-1133)	Food and Catering
11400020	Fruit juices - single strength or concentrated	Food and Catering
11400090	Vegetable juices (incl mixtures, incl tomato); mixtures of vegetable and fruit juices	Food and Catering
11400180	Preserved fruits (incl dried and jams) and fruit products nec	Food and Catering
11400190	Vegetables - frozen, prepared (incl salads) or preserved (incl dried or shelled); pickles and chutney; tomato pulp, puree and paste	Food and Catering
11400200	Fruit and vegetable processing products nec	Food and Catering
11401700	Fruit and vegetable products - manufacturing services on a commission basis	Food and Catering
11500020	Refined and processed animal or vegetable oils and fats (incl tallow) (excl neatsfoot, wool grease and lanolin)	Food and Catering
11500050	Crude vegetable oils (incl crude soya oil, margarine)	Food and Catering

11501700	Oils and fats - manufacturing services on a commission basis	Food and Catering
11610010	Wheat and other cereal flours (incl self-raising)	Food and Catering
11610050	Glucose, glucose syrup (incl dextrose) and modified starches (incl dextrins)	Food and Catering
11610100	Rice - husked, semi-milled or wholly milled	Food and Catering
11610110	Rice groats, meals and pellets; worked cereal grains and products nec	Food and Catering
11610140	Grain mill, root and cereal products nec; prepared baking mixes (excl rice based)	Food and Catering
11610150	Malt and malt extracts	Food and Catering
11620010	Cereal foods (incl breakfast foods)	Food and Catering
11620020	Grain Mill and Cereal products nec (incl custard powder)	Food and Catering
11620030	Pasta	Food and Catering
11621700	Grain mill and cereal products - manufacturing services on a commission basis (ANZSIC Classes 1161-1162)	Food and Catering
11700010	Bread and bread rolls (excl dough)	Food and Catering
11700040	Meat pies	Food and Catering
11700090	Bakery products nec	Food and Catering
11700100	Bread dough (incl frozen)	Food and Catering
11701700	Bakery products - manufacturing services on a commission basis (ANZSIC Classes 1171-1174)	Food and Catering
11810010	Raw and refined sugar in solid form (incl brown sugar) (excl icing sugar)	Food and Catering
11810090	Sugar nec, molasses, syrups, artificial honey, starch and sugar products	Food and Catering
11820010	Chocolate confectionery (excl chocolate coated biscuits and white chocolate)	Food and Catering
11820090	Chewing gums, white chocolate, non-chocolate cocoa products and confectionery nec	Food and Catering
11821700	Sugar and confectionery - manufacturing services on a commission basis (ANZSIC Classes 1181-1182)	Food and Catering
11910090	Potato, corn and other crisp products	Food and Catering
11920011	Dog and cat food	Other Procurement
11920090	Prepared animal and bird feed (excl dog and cat foods)	Other Procurement
11990010	Coffee and tea (incl substitutes)	Food and Catering
11990190	Food products nec (incl jelly crystals, meat pastes, spices and condiments)	Food and Catering
11990200	Prepared meals and bakers' wares	Food and Catering
11991700	Other food products - manufacturing services on a commission basis (ANZSIC Classes 1191-1199)	Food and Catering
11991970	Scrap waste from the manufacture of food and food products (1111-1199)	Food and Catering
11991980	General government consumption of fixed capital (1191-1199)	Food and Catering
12110100	Soft drink, cordial and syrup (incl waters)	Food and Catering

12111700	Soft drink, cordial and syrup - manufacturing services on a commission basis	Food and Catering
12120090	Beer, ale and stout	Food and Catering
12121700	Beer - manufacturing services on a commission basis	Food and Catering
12130030	Whisky, brandy, rum, gin and other distilled spirits, liqueurs, and other fortified spirits	Food and Catering
12130040	Alcoholic mixed drinks (excl wine based); distilled alcoholic beverages nec	Food and Catering
12140030	Vinegar from wine	Food and Catering
12140050	Cider, perry, mead and fermented beverages nec	Food and Catering
12140090	Wine and wine-based mixed drinks	Food and Catering
12141700	Wine, spirits and other alcoholic beverages - manufacturing services on a commission basis (ANZSIC Classes 1213-1214)	Food and Catering
12141970	Scrap waste from the manufacture of beverages (incl alcohol) (1211-1214)	Food and Catering
12200010	Cigarettes, cigars, cheroots and tobacco	Other Procurement
12201700	Cigarette and tobacco products - manufacturing services on a commission basis	Other Procurement
12201970	Scrap waste from the manufacture of tobacco products (1220)	Other Procurement
13110090	Wool scouring product	Manufactured Goods
13120090	Natural textile products	Manufactured Goods
13130100	Synthetic textile products	Manufactured Goods
13131700	Textiles - manufacturing services on a commission basis (ANZSIC Classes 1311-1313)	Manufactured Goods
13131970	Scrap waste from the manufacture of textiles (1311-1313)	Manufactured Goods
13200060	Leather or leather substitute articles nec (incl saddlery and harness of any material) (excl leather belts or gloves)	Manufactured Goods
13200080	Bags of leather or leather substitute (incl toiletry bags, purses, wallets, excl bags for packaging)	Manufactured Goods
13200090	Leather, prepared skins and furs	Manufactured Goods
13201700	Tanned leather, dressed fur and leather products - manufacturing services on a commission basis	Manufactured Goods
13201970	Scrap waste from the manufacture of dressed fur and leather products (1320)	Manufactured Goods
13300040	Carpets, textile and felt floor coverings (excl underfelt)	Manufactured Goods
13300050	Textile products nec	Manufactured Goods
13300060	Textile tarpaulins (incl canvas), sails, tents, pneumatic mattresses and motor vehicle covers; rope, cable and products thereof (incl netting)	Manufactured Goods
13330080	Bags (for packaging), sacks and packets of textile or canvas	Manufactured Goods
13340060	Wadding, powder puffs, pads, cotton wool, gauze and bandages	Manufactured Goods

13340070	Textile finishing nec (incl binding, printing, garment dyeing) (excl labels, badges)	Manufactured Goods
13341700	Textile products - manufacturing services on a commission basis (ANZSIC Classes 1331-1334)	Manufactured Goods
13341970	Scrap waste from the manufacture of textile products (1331-1334)	Manufactured Goods
13341980	General government consumption of fixed capital (1331-1334)	Manufactured Goods
13400070	Knitted or crocheted fabrics (excl wearing apparel)	Manufactured Goods
13400080	Knitted or crocheted wearing apparel	Manufactured Goods
13401700	Knitted products - manufacturing services on a commission basis	Manufactured Goods
13401970	Scrap waste from the manufacture of knitted products (1340)	Manufactured Goods
13510200	Clothing (excl knitted or crocheted)	Manufactured Goods
13511700	Clothing - manufacturing services on a commission basis	Manufactured Goods
13511970	Scrap waste from the manufacture of clothing (1351)	Manufactured Goods
13520100	Footwear	Manufactured Goods
13521700	Footwear - manufacturing services on a commission basis	Manufactured Goods
13521970	Scrap waste from the manufacture of footwear (1352)	Manufactured Goods
14110010	Undressed sawn timber from logs sawn at same establishment (incl treated) (excl impregnated sleepers or resawn); shooks	Other Procurement
14110090	Treated wood in the rough (excl sawn timber - dressed or undressed); impregnated railway sleepers; ground bark	Other Procurement
14120010	Woodchips - softwood	Other Procurement
14120020	Woodchips - hardwood	Other Procurement
14130010	Resawn/seasoned timber (incl kiln dried) (excl sleepers, palings and shingles; chemically preserved)	Other Procurement
14130020	Dressed timber and mouldings of a thickness up to and including 6mm	Other Procurement
14130030	Dressed timber and mouldings of a thickness exceeding 6mm	Other Procurement
14130040	Chemically preserved re-sawn or dressed timber.	Other Procurement
14131700	Sawmill products - manufacturing services on a commission basis (ANZSIC Classes 1411-1413)	Other Procurement
14910010	Prefabricated or transportable wooden buildings	Other Procurement
14920010	Doors - wooden (excl fire doors)	Other Procurement
14920020	Roof trusses - wooden	Other Procurement
14920030	Wooden wall and window (incl complete with glass) frames	Other Procurement
14920040	Custom made built-in wooden furniture	Other Procurement
14920050	Wooden builders joinery and carpentry nec	Other Procurement
14930010	Veneers (incl laminated)	Other Procurement
14930020	Plywood	Other Procurement
14930030	Glued laminated lumber	Manufactured Goods

14940010	Fibreboard (excl fibre paperboard and particle board)	Manufactured Goods
14940020	Cellular wood panels	Manufactured Goods
14940030	Particle board (incl laminated) and similar board of wood or other ligneous materials	Manufactured Goods
14940040	Laminates of timber and non-timber materials	Manufactured Goods
14940050	Boards manufactured from wood nec (incl densified wood in block or other shape)	Manufactured Goods
14990010	Parquetry strips etc - assembled into panels; shingles and shakes	Manufactured Goods
14990100	Other wood product manufacturing nec	Manufactured Goods
14991700	Other wood products - manufacturing services on a commission basis (ANZSIC Classes 1491-1499)	Manufactured Goods
14991970	Scrap waste from the manufacture of wood product manufacturing (1411-1499)	Manufactured Goods
15100070	Pulp, newsprint and paper stock	Manufactured Goods
15100080	Paper and paperboard	Manufactured Goods
15101700	Paper - manufacturing services on a commission basis	Manufactured Goods
15200010	Corrugated paperboard sheeting, paperboard containers and paper bags	Manufactured Goods
15200020	Paper stationery products	Manufactured Goods
15240090	Sanitary paper products	Manufactured Goods
15290010	Paper and paperboard trays, dishes, plates, cups, cones, egg containers and box files	Manufactured Goods
15290090	Paper and paperboard products nec	Manufactured Goods
15291700	Paper products - manufacturing services on a commission basis (ANZSIC Classes 1521-1529)	Manufactured Goods
15291970	Scrap waste from manufacture of pulp and paper product manufacturing (1510-1529)	Manufactured Goods
15291980	General government consumption of fixed capital (1521-1529)	Other Procurement
16110070	Trade advertising material or commercial catalogues printed but not published by this business; printed matter nec	Other Procurement
16110100	Printing (excl trade advertising material or commercial catalogues)	Other Procurement
16120090	Printing support services	Other Procurement
16200090	Reproduced recorded media products	Other Procurement
16201970	Scrap waste from the printing trade and media reproduction services (1611-1620)	Other Procurement
16201980	General government consumption of fixed capital (1611-1620)	Other Procurement
17010010	Automotive petrol; gasoline refining or blending; motor spirit (incl aviation spirit)	Upstream Energy-Related Emissions
17010020	Kerosene (incl kerosene type jet fuel)	Upstream Energy-Related Emissions

17010050	Liquefied petroleum gas - produced at refineries	Upstream Energy-Related Emissions
17010070	Secondary feedstocks and topped/enriched crude for use in further refining and manufacturing (incl bituminous feedstocks) (excl scrap waste)	Upstream Energy-Related Emissions
17010120	Diesel (excl biodiesel)	Upstream Energy-Related Emissions
17010130	Gas oil or fuel oils nec	Upstream Energy-Related Emissions
17090120	Bituminous mixtures and other articles of asphalt	Upstream Energy-Related Emissions
17090130	Petroleum and coal products nec	Upstream Energy-Related Emissions
17090140	Coal coke and coke products, retort carbon and char (excl bone char)	Upstream Energy-Related Emissions
17090150	Pitch, tars, jellies, waxes and other lubricants manufactured from petroleum	Upstream Energy-Related Emissions
17090160	Petroleum based solvents and chemical feedstocks	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
17090190	Brake and hydraulic fluid; rust arresting compound	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
17091700	Petroleum and coal products - manufacturing services on a commission basis (ANZSIC Classes 1701-1709)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
17091970	Scrap waste from the manufacture of petroleum and coal products (1701-1709)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18110040	Liquefied natural gas - other than from the well head	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18110090	Industrial gases (excl liquefied natural gas)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18120070	Ethyl alcohol (incl ethanol)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18120090	Plasticiser; mixed alkylbenzenes and alkylnaphthalenes nec;	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18120190	Basic organic chemicals nec	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18130010	Hydrochloric, chlorosulphuric, sulphuric (incl oleum), diphosphorous pentaoxide, phosphoric and polyphosphoric acids	Pharmaceuticals and Chemicals (not Respiratory Inhalers)

18130020	Nitric, sulphonitric and other inorganic acids; inorganic oxygen compounds of non-metals (excl industrial gases)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18130090	Other inorganic chemicals nec	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18130100	Basic inorganic chemicals	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18210010	Synthetic rubber	Other Procurement
18210020	Polystyrene	Other Procurement
18210030	Polyethylene	Other Procurement
18210040	Polyvinyl chloride	Other Procurement
18210050	Polypropylene	Other Procurement
18210060	Polyvinyl acetate and synthetic resins nec (excl adhesives) in primary forms, not mixed/compounded (excl regranulated)	Other Procurement
18210070	Rosin and resin acids and derivatives thereof; rosin spirit and rosin oils; run gums	Other Procurement
18210080	Plastics in primary forms, mixed/compounded with other substances; regranulated, single thermoplastic scrap material	Other Procurement
18290010	Cellulose fibre or filament	Other Procurement
18290020	Non-cellulose fibre or filament	Other Procurement
18290030	Synthetic fibre or filament nec	Other Procurement
18290040	Basic polymers nec	Other Procurement
18310070	Ammonias - for fertilisers	Laundry, Cleaning and Maintenance
18310080	Fertilisers	Laundry, Cleaning and Maintenance
18310090	Phosphate agrochemicals	Laundry, Cleaning and Maintenance
18320010	Insecticides, pesticides, fungicides, weedkillers and pest control chemicals nec	Laundry, Cleaning and Maintenance
18321700	Basic chemicals - manufacturing services on a commission basis (ANZSIC Classes 1811-1832)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18321970	Scrap waste from the manufacture of basic chemicals (1811-1832)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18410010	Pharmaceutical goods for human use (excl wadding, gauze, bandages and surgical sutures)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18411700	Human pharmaceutical and medicinal products - manufacturing services on a commission basis	Pharmaceuticals and Chemicals (not Respiratory Inhalers)

18411970	Scrap waste from the manufacture of pharmaceutical goods for human use (1841)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18420090	Veterinary pharmaceuticals and animal feed supplements	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18421700	Veterinary pharmaceutical and medicinal products - manufacturing services on a commission basis	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18421970	Scrap waste from the manufacture of pharmaceutical goods for veterinary use (1842)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18500010	Soap, perfumes and toiletry products	Laundry, Cleaning and Maintenance
18510170	Glycerol and candles	Laundry, Cleaning and Maintenance
18510180	Laundry products (incl bleach)	Laundry, Cleaning and Maintenance
18510190	Cleaning compounds nec	Laundry, Cleaning and Maintenance
18521700	Cleaning compounds and toiletry preparations - manufacturing services on a commission basis (ANZSIC Classes 1851-1852)	Laundry, Cleaning and Maintenance
18521970	Scrap waste from the manufacture of cleaning compounds and toiletry preparations (1851 -1852)	Laundry, Cleaning and Maintenance
18910010	Photographic film, cloth, plates (sensitised), photographic chemicals and photographic paper (sensitised)	Other Procurement
18920090	Explosives and blasting systems	Other Procurement
18990090	Chemical products nec	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18991700	Other basic chemical products - manufacturing services on a commission basis (ANZSIC Classes 1891-1899)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18991970	Scrap waste from the manufacture of other basic chemical products (1891-1899)	Pharmaceuticals and Chemicals (not Respiratory Inhalers)
18991980	General government consumption of fixed capital (1891-1899)	Other Procurement
19110050	Textile fabrics (excl tyre cord) impregnated, coated, covered or laminated with plastics	Other Procurement
19110090	Polymer film and sheet packaging materials	Manufactured Goods
19120080	Plastic pipes	Manufactured Goods
19120090	Plastic fittings for tubes, pipes and hoses (incl joints, elbows and flanges)	Manufactured Goods
19120120	Polycarbonate sheets	Manufactured Goods
19120130	Plastic blow moulded products nec	Manufactured Goods

19120140	Rigid or semi-rigid plastic injection moulded products nec (excl toys, games and fibre reinforced products)	Manufactured Goods
19120150	Rigid and semi-rigid polymer products nec (excl fibre reinforced plastic products)	Manufactured Goods
19120160	Plastic tableware and utensils	Manufactured Goods
19120170	Plastic domestic furniture and parts	Manufactured Goods
19120180	Plastic non-domestic (incl medical, dental, surgical and veterinary) furniture and parts	Manufactured Goods
19120190	Plastic taps, valves, drums and crates	Manufactured Goods
19130010	Foam and sponge plastic sheets, plates and strip (incl foam insulation and padding)	Manufactured Goods
19130020	Plastic foam products nec	Manufactured Goods
19140090	Tyres and tyre products nec (incl pneumatic tyres for buses and lorries)	Manufactured Goods
19140100	Tyres and tubes - pneumatic (excl for buses and lorries)	Manufactured Goods
19150010	Adhesives (excl bituminous) and glues	Manufactured Goods
19160010	Architectural and decorative paints (incl coatings for use on buildings), enamels and clears (excl heavy duty coatings)	Manufactured Goods
19160040	Inks	Manufactured Goods
19160050	Filler or putty, caulking compound	Manufactured Goods
19160090	Paints and coatings nec (incl automotive, industrial, marine and enamels and clears)	Manufactured Goods
19190030	Plastic wall or ceiling coverings (excl tiles)	Manufactured Goods
19190040	Linoleum and other floor coverings with a textile base; plastic floor coverings (incl paper or paperboard base), wall or ceiling tiles	Manufactured Goods
19190060	Rigid fibre reinforced plastic articles (incl swimming pool shells and tanks)	Manufactured Goods
19190070	Other plastic injection moulded products nec (excl rigid or semi-rigid)	Manufactured Goods
19190090	Synthetic rubber products and other polymer products nec (excl rigid or semi-rigid)	Manufactured Goods
19190150	Other polymer products nec	Manufactured Goods
19191700	Polymer products - manufacturing services on a commission basis (ANZSIC Classes 1911-1919)	Manufactured Goods
19191970	Scrap waste from the manufacture of polymer products (1911-1919)	Manufactured Goods
19200030	Rubber tubes, pipes and hose	Manufactured Goods
19200040	Rubber sheets, strips, plates, rods, profile shapes and primary forms (excl cellular)	Manufactured Goods
19200050	Sponge and foam rubber	Manufactured Goods
19200060	Natural rubber products nec	Manufactured Goods
19200070	Synthetic rubber products	Manufactured Goods
19201700	Natural rubber products - manufacturing services on a commission basis	Manufactured Goods

19201970	Scrap waste from the manufacture of natural rubber products (1920)	Manufactured Goods
20100010	Float, surface ground/polished glass - in sheets; cast and rolled glass - in sheets or profiles; but not otherwise worked	Manufactured Goods
20100030	Glass containers, bottles or jars; glass stoppers; glass inners for vacuum vessels	Manufactured Goods
20100050	Glassware nec	Manufactured Goods
20100090	Safety glass (incl windscreens and laminated sheet glass) and rear-view mirrors	Manufactured Goods
20101700	Glass and glass products - manufacturing services on a commission basis	Manufactured Goods
20210010	Clay bricks (excl refractory bricks)	Manufactured Goods
20290010	Refractory products (incl bricks, cement and clay)	Manufactured Goods
20290020	Ceramic roofing, flooring and wall tiles (incl terracotta) and ceramic construction goods nec	Manufactured Goods
20290030	Ceramic wash basins and permanent fixture type sanitary ware	Manufactured Goods
20290040	Tableware, ornamental pottery and domestic ware nec	Manufactured Goods
20290050	Ceramic goods nec	Manufactured Goods
20291700	Ceramic products - manufacturing services on a commission basis (ANZSIC Classes 2021-2029)	Manufactured Goods
20310010	Cement (incl hydraulic and portland) (excl adhesive or refractory)	Manufactured Goods
20310020	Lime (incl hydraulic, quick, hydrated, slaked and agricultural)	Manufactured Goods
20320010	Plaster boards, sheets, panels, tiles, cornices and other articles of plaster (excl ornamental)	Manufactured Goods
20320020	Plasters (incl plaster of paris) (excl dental plasters)	Manufactured Goods
20330010	Ready mixed concrete and mortar (incl dry mix concrete)	Manufactured Goods
20331700	Cement, lime and ready-mixed concrete - manufacturing services on a commission basis (ANZSIC Classes 2031, 2033)	Manufactured Goods
20340010	Concrete, cement, fibrous-cement or artificial stone pipes; concrete box culverts	Manufactured Goods
20340020	Concrete, cement and artificial stone bricks, blocks, building boards and tiles; concreate products nec	Manufactured Goods
20340030	Concrete or predominantly concrete prefabricated and transportable buildings	Manufactured Goods
20341700	Plaster and concrete products - manufacturing services on a commission basis (ANZSIC Classes 2032, 2034)	Manufactured Goods
20900010	Worked monumental or building stone	Manufactured Goods
20900020	Glass fibre and glass wool products	Manufactured Goods
20900030	Ground limestone	Manufactured Goods
20900070	Non-refractory mortars and concretes other than ready mixed; articles of asbestos-cement and cellulose fibre-cement nec	Manufactured Goods

20900150	Ground clay (excl limestone), micas	Manufactured Goods
20901700	Other non-metallic mineral products - manufacturing services on a commission basis	Manufactured Goods
20901970	Scrap waste from the manufacture of non-metallic mineral products (2010-2090)	Manufactured Goods
21100010	Basic iron, pig iron, sponge iron and spiegeleisen; iron or steel granules and powders	Manufactured Goods
21100020	Ferro-alloys (incl manganese, silicon or chrome)	Manufactured Goods
21100030	Iron or steel primary forms (incl ingots) and semi-finished products	Manufactured Goods
21100040	Iron or non-alloy steel flat-rolled products (excl clad, plated or coated)	Manufactured Goods
21100050	Clad, plated or coated iron or non-alloy steel flat-rolled products	Manufactured Goods
21100060	Alloy steel flat-rolled products	Manufactured Goods
21100070	Iron and steel bars, rods, angles, shapes and sections (incl sheet piling)	Manufactured Goods
21100080	Iron or steel wire for further processing (excl fencing, stranded or barbed)	Manufactured Goods
21100090	Painted, varnished or coated steel sheet, profile decking or cladding (incl steel sheeting for fencing)	Manufactured Goods
21100100	Iron or steel rails, rail fastenings or other rail accessories	Manufactured Goods
21100110	Iron or steel expanded metal	Manufactured Goods
21100190	Organic by-products of iron and steel manufacturing	Manufactured Goods
21210090	Cast and iron and steel products	Manufactured Goods
21220090	Iron or steel pipes and tubes (excl castings)	Manufactured Goods
21221700	Iron and steel - manufacturing services on a commission basis (ANZSIC Classes 2110-2122)	Manufactured Goods
21221970	Scrap waste from the manufacture of iron and steel (incl slag, dross, sealings) (2110-2122)	Manufactured Goods
21310010	Alumina	Manufactured Goods
21320010	Aluminium and aluminium alloys (excl purchased scrap)	Manufactured Goods
21320020	Aluminium secondary recovery from purchased scrap	Manufactured Goods
21320030	Aluminium castings and die castings	Manufactured Goods
21321970	Aluminium scrap from the manufacture of alumina, aluminium and aluminium alloys (2131-2132)	Manufactured Goods
21330010	Silver primary and secondary recovery (excl from purchased scrap)	Manufactured Goods
21330020	Copper (incl brass) primary and secondary recovery (excl from purchased scrap)	Manufactured Goods
21330030	Lead primary and secondary recovery (excl from purchased scrap)	Manufactured Goods
21330040	Zinc primary and secondary recovery (excl from purchased scrap)	Manufactured Goods
21330050	Silver, copper (incl brass), lead and zinc recovery from purchased scrap	Manufactured Goods

21330060	Zinc alloys; copper matte; cement copper; unwrought copper and nickel	Manufactured Goods
21330070	Sulphuric acid from the smelting of copper, silver, lead and zinc.	Manufactured Goods
21390010	Platinum primary and secondary recovery (excl from purchased scrap)	Manufactured Goods
21390020	Nickel and tin primary recovery and secondary recovery from drosses, ashes or other waste materials (excl from purchased scrap)	Manufactured Goods
21390030	Nickel and tin recovery from purchased scrap	Manufactured Goods
21390040	Gold - primary and secondary (excl from purchased scrap)	Manufactured Goods
21390050	Antimony and other non-ferrous basic metals nec - primary and secondary recovery	Manufactured Goods
21390090	Other basic non-ferrous metals	Manufactured Goods
21391700	Basic non-ferrous metals - manufacturing services on a commission basis (ANZSIC Classes 2131-2139)	Manufactured Goods
21391970	Scrap waste from the smelting and refining of non-ferrous metals (incl precious) (2133-2139)	Manufactured Goods
21410010	Non-ferrous metal (excl aluminium) castings and die castings	Manufactured Goods
21420010	Aluminium and aluminium alloy bars, rods (incl wire rod) and profiles (incl decking and cladding)	Manufactured Goods
21420020	Aluminium foil	Manufactured Goods
21420030	Rolled, drawn or extruded aluminium pipes, tubes, plates, sheets, strip and wire products; aluminium powders and flakes	Manufactured Goods
21490010	Copper, copper alloy, nickel, lead, zinc and tin rolled, extruded and semi-finished products	Manufactured Goods
21490090	Non-ferrous metal products nec	Manufactured Goods
21491700	Basic non-ferrous metal products - manufacturing services on a commission basis (ANZSIC Classes 2141-2149)	Manufactured Goods
21491970	Scrap waste from the manufacture of non-ferrous metal products (incl precious) (2141-2149)	Manufactured Goods
22100090	Iron and steel forging	Manufactured Goods
22101700	Forged iron or steel products - manufacturing services on a commission basis	Manufactured Goods
22101900	Repairing and servicing - forged iron or steel products (incl repair of iron or steel valves)	Manufactured Goods
22101970	Scrap waste from the manufacture of forged iron and steel products (2210)	Manufactured Goods
22210010	Fabricated and prefabricated construction steel (incl scaffolding, perforated plate and ready made parts for structures)	Construction
22210020	Reinforcing steel rods or bars	Manufactured Goods
22210030	Reinforcing welded steel mesh	Manufactured Goods

22220010	Prefabricated metal or metal framed buildings (excl aluminium) and other transportable buildings	Manufactured Goods
22220020	Aluminium or aluminium framed prefabricated buildings	Manufactured Goods
22230010	Aluminium/aluminium framed doors (incl roller/concertina) and windows (incl glass); door/window frames; roller grilles	Manufactured Goods
22230020	Aluminium fire doors	Manufactured Goods
22230030	Aluminium combined door-window units	Manufactured Goods
22230040	Architectural aluminium products (excl sheet metal) for building nec	Manufactured Goods
22230050	Aluminium roofing and guttering	Manufactured Goods
22230060	Articles of aluminium (excl ladders) nec	Manufactured Goods
22240010	Metal roofing and guttering (excl aluminium)	Manufactured Goods
22290010	Iron or steel window-frames; metal (excl aluminium) door or door frames	Manufactured Goods
22290020	Wooden fire doors	Manufactured Goods
22290030	Iron or steel fire doors; fabricated iron or steel stairs, balustrades and other architectural products (excl aluminium)	Manufactured Goods
22291700	Structural metal products - manufacturing services on a commission basis (ANZSIC Classes 2221-2229)	Manufactured Goods
22291970	Scrap waste from the manufacture of structural metal products (2221-2229)	Manufactured Goods
22310150	Boiler, tank and other heavy gauge metal containers	Manufactured Goods
22390090	Metal containers nec	Manufactured Goods
22400010	Sheet metal ducting	Manufactured Goods
22400020	Sheet metal sinks, wash-basins, baths and other sanitary ware	Manufactured Goods
22400040	Sheet metal non-electric tableware, kitchenware or other household articles and parts (excl containers and sanitary ware)	Manufactured Goods
22400090	Sheet metal products nec	Manufactured Goods
22401700	Metal container and sheet metal products - manufacturing services on a commission basis (ANZSIC Classes 2231-2240)	Manufactured Goods
22401970	Scrap waste from the manufacture of sheet metal products (2231-2240)	Manufactured Goods
22910040	Nails, tacks, staples, spiked cramps, studs, spikes and pins (incl drawing and cotter pins) (excl metallic dowel pins)	Manufactured Goods
22910050	Woven or linked wire fabric (excl mattress supports)	Manufactured Goods
22910100	Springs (incl leaves for springs); domestic metal wire products; copper cloth, grill, netting and fencing; barbed wire; wire products nec	Manufactured Goods
22910110	Iron or steel fencing wire, cables, wire fabric, gates and chains	Manufactured Goods

22920010	Metal nuts, bolts (incl expansion), screws, rivets, washers, dowel pins, masonry anchors and turnbuckles	Manufactured Goods
22930010	Metal coating and finishing	Manufactured Goods
22990030	Cutlery, kitchen ware and table ware (excl solid silver or gold) nec	Manufactured Goods
22990090	Munitions and ammunition (incl cartridges)	Manufactured Goods
22990140	Firearms (incl parts)	Manufactured Goods
22990200	Fabricated metal products (incl ladders) nec	Manufactured Goods
22990290	Fabricated metal hand tools; fire extinguishers	Manufactured Goods
22990300	Fabricated metal household goods nec	Manufactured Goods
22990310	Fabricated metal products (excl ladders) nec	Manufactured Goods
22991700	Other fabricated metal products - manufacturing services on a commission basis (ANZSIC Classes 2291-2299)	Manufactured Goods
22991900	Repairing and servicing - Fabricated Metal Products	Manufactured Goods
23110010	Finished motor vehicles with less than 10 persons capacity	Manufactured Goods
23110020	Finished motor vehicles with 10 or more persons capacity	Manufactured Goods
23110030	Finished trucks, truck type vehicles, utilities and panel vans	Manufactured Goods
23110090	Unassembled motor vehicles nec; chassis with engines for motor vehicles; engines nec, for motor vehicles or tractors	Manufactured Goods
23119000	Second hand motor vehicles	Manufactured Goods
23120090	Motor vehicle body and semi-trailers	Manufactured Goods
23120100	Caravans and trailers	Manufactured Goods
23120110	Body panels for trucks and buses; parts nec - for motor vehicle trailers and semi-trailers	Manufactured Goods
23130100	Automotive electrical component manufacturing products	Manufactured Goods
23190070	Motor vehicle and tractor parts and equipment nec	Manufactured Goods
23190090	Motor vehicle transmission assemblies and parts, pumps, gaskets and body panels	Manufactured Goods
23910010	Vessels of 50 tonnes gross and over (incl floating structures)	Manufactured Goods
23920090	Boats and watercraft (under 50 tonnes)	Manufactured Goods
23921700	Ships and boats - manufacturing services on a commission basis (ANZSIC Classes 2391-2392)	Manufactured Goods
23921900	Repairing and servicing - Ships and Boats	Laundry, Cleaning and Maintenance
23930010	Locomotives and trams (incl underframes); railway rolling stock	Manufactured Goods
23931700	Railway rolling stock - manufacturing services on a commission basis	Manufactured Goods
23931900	Repairing and servicing - Locomotives and trams	Manufactured Goods
23940010	Aircraft and aircraft parts	Manufactured Goods
23941700	Aircraft - manufacturing services on a commission basis	Manufactured Goods
23941900	Repairing and servicing - Aircraft	Manufactured Goods

23990030	Repairing and servicing - Motor vehicle manufacturing (incl factory motor vehicle engine repair or replacements) (excl automotive repair services)	Manufactured Goods
23990090	Motorised tanks and other armoured fighting vehicles and parts; transport equipment, parts and accessories nec (incl motorcycles and motor scooters)	Manufactured Goods
23991700	Motor vehicles, other transport equipment and parts - manufacturing services on a commission basis (ANZSIC Classes 2311-2319, 2399)	Manufactured Goods
23991970	Scrap waste from the manufacture of transport equipment (2311-2399)	Manufactured Goods
24110030	Objective lenses, filters and other mounted optical elements; microscopes (excl optical) and diffraction apparatus and parts nec	Medical Devices and Equipment
24110050	Ophthalmic instruments and appliances	Medical Devices and Equipment
24110090	Cameras, image projectors and parts; photographic goods nec (excl sensitised photographic film, paper, plates and chemicals)	Non-Medical Equipment
24110100	Spectacle and contact lenses; sunglasses and frames	Medical Devices and Equipment
24120020	X-ray medical equipment and parts or accessories	Medical Devices and Equipment
24120090	Medical aids, equipment (excl x-ray) and therapeutic appliances (including hearing aids)	Medical Devices and Equipment
24190040	Watches (incl metal watch straps), watch cases, clocks and parts	Non-Medical Equipment
24190070	Surveying, physical or chemical analysis and other measuring, checking and testing instruments, appliances and parts	Non-Medical Equipment
24190090	Optical fibres, fibre bundles and cables (excl insulated)	Non-Medical Equipment
24190190	Professional and scientific equipment nec	Non-Medical Equipment
24191700	Professional and scientific equipment - manufacturing services on a commission basis (ANZSIC Classes 2411-2419)	Non-Medical Equipment
24191980	General government consumption of fixed capital (2411-2419)	Non-Medical Equipment
24210030	Laptops, notebooks, personal digital assistants and other portable computers	Non-Medical Equipment
24210040	Desktop computers (PCs)	Non-Medical Equipment
24210070	Computer hardware, computer peripherals and accessories nec	Non-Medical Equipment
24210130	Printing and photocopying machinery and parts	Non-Medical Equipment
24210190	Mainframe, server and super-computers; computer peripheral devices	Non-Medical Equipment
24210200	Vending, monetary, office machinery	Non-Medical Equipment
24220100	Communication equipment (excl mobile phones)	Non-Medical Equipment

24220110	Mobile phones and other phones nec (excl parts)	Non-Medical Equipment
24290010	Television receiving sets (excl parts)	Non-Medical Equipment
24290190	Telecommunication and audio visual equipment nec	Non-Medical Equipment
24290200	Video games, poker machines and other coin or disc operated games; electronic equipment and parts nec	Non-Medical Equipment
24291700	Computer and electronic equipment - manufacturing services on a commission basis (ANZSIC Classes 2421-2429)	Non-Medical Equipment
24291980	General government consumption of fixed capital (2421-2429)	Non-Medical Equipment
24310010	Uninsulated copper and aluminium stranded wire, ropes, cables, plaited bands and slings	Non-Medical Equipment
24310090	Electric cable, wire and strip	Non-Medical Equipment
24320010	Electric light or lamp bulbs or tubes (incl filament or fluorescent) (excl automotive)	Non-Medical Equipment
24320020	Light fittings	Non-Medical Equipment
24320030	Cold, discharge, arc, ultra violet, infra-red and other electric lights, torches and fittings nec	Non-Medical Equipment
24320050	Illuminated signs, name-plates and sign-plates having a permanently fixed light source	Non-Medical Equipment
24390020	Automotive wet cell batteries	Non-Medical Equipment
24390060	Electric motors, generators, electric generating sets and rotary converters (incl parts) (excl automotive)	Non-Medical Equipment
24390100	Electrical apparatus to switch, protect or connect circuits (incl boards and cabinets equipped with such) (excl inductors)	Non-Medical Equipment
24390190	Dry cell batteries, batteries nec and battery components	Non-Medical Equipment
24390200	Electrical equipment nec	Non-Medical Equipment
24391700	Electrical equipment - manufacturing services on a commission basis (ANZSIC Classes 2431-2439)	Non-Medical Equipment
24410020	Domestic stoves, ovens and rangehoods (incl gas, electric, solid fuel, oil or spirit fired)	Non-Medical Equipment
24410030	Domestic refrigerators and freezers	Non-Medical Equipment
24410040	Compressors for domestic refrigeration equipment	Non-Medical Equipment
24410050	Domestic clothes washing machines, drying cabinets, tumble driers and dishwashing machines	Non-Medical Equipment
24410090	Solid fuel or gas barbecues; domestic food waste disposal units	Non-Medical Equipment
24490010	Domestic gas, electric, solid fuel, oil, spirit fired space heaters and non-electric warm air furnaces	Non-Medical Equipment
24490020	Domestic soil heating apparatus	Non-Medical Equipment
24490030	Domestic solar hot water collectors, systems and parts (incl systems with conventional backup sources)	Non-Medical Equipment
24490040	Domestic gas and other non-electric water heaters and hot water systems (excl solar) and parts	Non-Medical Equipment

24490050	Domestic electric water heaters or hot water systems and parts	Non-Medical Equipment
24490060	Domestic room air conditioners and coolers (excl fans)	Non-Medical Equipment
24490070	Compressors for domestic air conditioning equipment	Non-Medical Equipment
24490190	Other domestic appliances nec	Non-Medical Equipment
24491700	Domestic appliances - manufacturing services on a commission basis (ANZSIC Classes 2441-2449)	Non-Medical Equipment
24510090	Pump and compressor (excl domestic refrigeration and air conditioning)	Non-Medical Equipment
24520010	Complete air conditioning units nec (incl ducting etc); air conditioning compressors or parts (commercial or industrial)	Non-Medical Equipment
24520060	Space heating equipment (commercial or industrial) (incl parts) nec	Non-Medical Equipment
24520090	Fixed space heating, cooling and ventilation equipment nec	Non-Medical Equipment
24610100	Agricultural tractors, harvesting, dairy and dispersing machinery	Non-Medical Equipment
24610110	Agricultural machinery; garden tools and equipment (powered)	Non-Medical Equipment
24620010	Construction and earthmoving wheeled tractors	Non-Medical Equipment
24620020	Front end shovel loaders; mechanical shovels, excavators and shovel loaders with a 360 degree revolving superstructure	Non-Medical Equipment
24620030	Bulldozers and other moving, grading, scraping, excavating, compacting or extracting construction machinery nec	Non-Medical Equipment
24620040	Buckets, shovels, grabs, grips, blades, bodies and cabs for construction vehicles and other construction and earthmoving machinery parts	Non-Medical Equipment
24620060	Machinery for crushing, grinding, mixing or kneading earth, stones, ores or other mineral substances in solid form	Non-Medical Equipment
24620070	Mineral substances sorting, screening, separating, washing, mixing or kneading machinery and parts	Non-Medical Equipment
24620080	Mining or drilling machinery and parts (incl coal or rock cutters, boring, sinking or tunnelling machinery)	Non-Medical Equipment
24630190	Machine tool and parts	Non-Medical Equipment
24690030	Distilling/rectifying plant; heat exchange units; centrifuges nec; gas liquefying or beverages filtering machinery	Non-Medical Equipment
24690200	Specialised machinery and equipment nec	Non-Medical Equipment
24691700	Specialised machinery and equipment - manufacturing services on a commission basis (ANZSIC Classes 2461-2469)	Non-Medical Equipment
24910090	Lifting equipment	Non-Medical Equipment
24910100	Material handling equipment	Non-Medical Equipment
24990050	Engines nec, turbines and water wheels and parts	Non-Medical Equipment

24990190	Machinery and equipment nec	Non-Medical Equipment
24991700	Other machinery and equipment - manufacturing services on a commission basis (ANZSIC Classes 2451-2452, 2491-2499)	Non-Medical Equipment
25110090	Wooden furniture and upholstered seats	Manufactured Goods
25120190	Metal furniture	Manufactured Goods
25130090	Mattresses	Manufactured Goods
25190090	Furniture nec (excl wooden, metal or plastic)	Manufactured Goods
25191700	Furniture - manufacturing services on a commission basis (ANZSIC Classes 2511-2513, 2519)	Manufactured Goods
25900090	Badges, coins and medals; sheet metal; umbrellas	Manufactured Goods
25910100	Jewellery and silverware	Manufactured Goods
25920090	Toys, sporting and recreational products	Manufactured Goods
25990010	Paint brushes or rollers, accessories and parts	Manufactured Goods
25990070	Musical instruments (incl parts and accessories)	Manufactured Goods
25990190	Metal ornaments and articles of precious metal (excl jewellery)	Manufactured Goods
25990200	Pens, pencils, crayons and chalk; typewriter ribbons and ink pads	Manufactured Goods
25990210	Manufacturing products nec	Manufactured Goods
25991700	Manufacturing products nec - manufacturing services on a commission basis	Manufactured Goods
26110011	Electricity generated from coal	Upstream Energy-Related Emissions
26110012	Electricity generated from natural gas	Upstream Energy-Related Emissions
26110013	Electricity generated from other fossil fuels	Upstream Energy-Related Emissions
26120010	Hydro-electricity	Upstream Energy-Related Emissions
26190010	Electricity generation nec	Upstream Energy-Related Emissions
26400010	Electricity service income nec	Upstream Energy-Related Emissions
26401500	Margin - electricity transmission, distribution and on selling	Upstream Energy-Related Emissions
27000010	Gas service income nec	Upstream Energy-Related Emissions
27001500	Margin - gas distribution and on selling	Upstream Energy-Related Emissions
28110010	Water supply	Water
28120010	Sewerage and drainage services	Water
28121980	General government consumption of fixed capital (2811, 2812)	Non-Clinical Waste

29000010	Waste collection (incl skip and portable toilet hire), treatment disposal remediation and materials recovery services	Non-Clinical Waste
29221980	General government consumption of fixed capital (2911-2922)	Non-Clinical Waste
30100010	Residential building construction	Construction
30109010	Second hand residential buildings	Construction
30200010	Non-residential building construction	Construction
30201980	General government consumption of fixed capital (3020)	Construction
30209010	Second hand non-residential buildings	Construction
31010010	Road and bridge construction (excl repair and maintenance)	Construction
31010020	Repair and maintenance - roads and bridges	Construction
31019010	Second hand roads and bridges	Construction
31090010	Non-building construction nec	Construction
31090020	Repair and maintenance - non-building construction nec	Construction
31091980	General government consumption of fixed capital (3101-3109)	Construction
31099010	Second hand non-building construction nec	Construction
32000010	Trade services repair and maintenance	Construction
32000020	Other construction trade services	Construction
32001980	General government consumption of fixed capital (3211-3299)	Construction
37000010	Non-margin - wholesaling services (excl repairing and servicing)	Other Procurement
37001400	Margin on reexports - wholesaling services	Other Procurement
37001500	Margin - wholesaling services	Other Procurement
38000020	Auction room operations; electronic procurement brokering services	Other Procurement
38001800	Wholesale services provided on a commission basis	Other Procurement
38001980	General government consumption of fixed capital (3311-3800)	Other Procurement
43000010	Non-margin - retailing services (excl repairing and servicing)	Other Procurement
43001500	Margin - retailing services	Other Procurement
43001800	Retail services provided on a commission basis	Other Procurement
43001980	General government consumption of fixed capital (3911-4320)	Other Procurement
44000010	Accommodation services	Other Procurement
45000010	Meal preparation and presentation	Food and Catering
45000020	Beverage serving service	Food and Catering
45000030	Takeaway food	Food and Catering
45000040	Catering services	Food and Catering
45000050	Net losses from gambling - clubs, pubs, taverns and bars (hospitality)	Other Procurement

45001500	Margin - restaurant hotel and club (food and beverage) services	Other Procurement
46001600	Margin - transport services	Other Procurement
46100020	Road freight transport services (incl rental or hire of trucks with driver)	Freight, Courier and Post
46100030	Road vehicle towing services	Freight, Courier and Post
46101600	Margin - road freight transport services	Freight, Courier and Post
46210010	Interurban or non-metropolitan bus transport services (incl long distance, charter and rural)	Non-Air Travel
46220010	Urban or metropolitan bus and tramway transport services (incl short distance, airport and school)	Non-Air Travel
46230010	Taxi transport services	Non-Air Travel
46230090	Rental or hire of passenger cars and road vehicles nec (incl buses and coaches) with driver	Non-Air Travel
46230100	Road passenger transport services nec	Non-Air Travel
47100020	Railway freight transport services nec (incl rental or hire of train with operator)	Freight, Courier and Post
47101600	Margin - railway freight transport services	Freight, Courier and Post
47200010	Urban railway (incl monorail) passenger transport services	Non-Air Travel
47200020	Interurban railway passenger transport services	Non-Air Travel
48100020	Ocean and inland water freight transport services	Freight, Courier and Post
48101600	Margin - water freight transport services	Freight, Courier and Post
48200010	Local water transport services for passengers	Non-Air Travel
48200020	Long distance water transport services for passengers	Non-Air Travel
48200030	Rental or hire of water vessel with operator	Non-Air Travel
49000020	Air and space freight transport services	Freight, Courier and Post
49000030	Air passenger transport services	Air Travel
49000040	Rental or hire of aircraft with operator	Air Travel
49001600	Margin - air and space freight transport services	Freight, Courier and Post
50100010	Scenic and sightseeing transport services	Non-Air Travel
50210010	Pipeline transport services	Freight, Courier and Post
50211600	Margin - pipeline transport services	Freight, Courier and Post
50290010	Transport services nec (incl ski lift operation)	Non-Air Travel
50291980	General government consumption of fixed capital (5010-5029)	Non-Air Travel
51000010	Postal services including hire of post boxes and courier services	Freight, Courier and Post
51021980	General government consumption of fixed capital (5101-5102)	Freight, Courier and Post
52100030	Stevedoring and port handling services (5211-5219)	Freight, Courier and Post
52100040	Support services to water transport nec (5211-5219)	Non-Air Travel
52101400	Margin on reexports - services to water transport (5211-5219)	Non-Air Travel
52101600	Margin - services to water transport (5211-5219)	Non-Air Travel

52200010	Airport operations and other air transport support services nec	Air Travel
52910010	Customs agency services	Freight, Courier and Post
52920010	Freight forwarding agency services	Freight, Courier and Post
52990010	Transport support services nec	Non-Air Travel
52990020	Support services for road transport nec (incl taxi radio base and road vehicle driving service)	Non-Air Travel
52990030	Support services for railway transport nec (incl station and terminal operations)	Non-Air Travel
52991980	General government consumption of fixed capital (5211-5299)	Other Procurement
53010010	Grain storage services	Other Procurement
53090010	Warehousing and storage services nec	Other Procurement
53091980	General government consumption of fixed capital (5301-5309)	Other Procurement
54110030	Newspapers - advertising services	Business Services
54110040	Copyright leasing - newspapers	Business Services
54110090	Newspaper publishing (incl printed and published by the same business)	Business Services
54120010	Magazine and other periodical publishing (incl printed and published by the same business)	Business Services
54120030	Magazines and other periodicals - advertising services	Business Services
54120040	Copyright leasing - magazines and other periodicals	Business Services
54130010	Book publishing (incl textbooks, encyclopedias, travel guides and atlases) (incl printed and published by the same business)	Business Services
54130030	Books - advertising services	Business Services
54130040	Copyright leasing - books	Business Services
54140010	Directory, mailing list, collection or compilation publishing (incl printed and published by the same business)	Business Services
54140030	Directory, mailing list, collection or compilation - advertising services	Business Services
54190010	Publishing nec (incl maps, greeting cards, postcards and calendars) (incl printed and published by the same business)	Business Services
54190030	Other publishing - advertising services	Business Services
54190040	Copyright leasing nec	Business Services
54200010	Software publishing services (non-customised)	Business Services
54200020	Copyright leasing - software (non-customised)	Business Services
54201980	General government consumption of fixed capital (5411-5420)	Business Services
55110010	Motion picture and video production	Business Services
55120010	Motion picture and video distribution services (incl discs)	Business Services
55120020	Copyright leasing - motion pictures and videos	Business Services
55130010	Motion picture theatre services	Business Services

55140010	Post-production services and other motion picture and video activities	Business Services
55210010	Music publishing nec (incl sheet music)	Business Services
55210030	Music copyrights - acquiring, registering and selling	Business Services
55220010	Music and other sound recording studios operation (incl pre-recorded radio programming services)	Business Services
55221980	General government consumption of fixed capital (5511-5522)	Business Services
56100010	Radio broadcasting services	Business Services
56210010	Free-to-air television broadcasting services	Business Services
56220010	Cable (pay TV) and other subscription broadcasting services	Business Services
56221980	General government consumption of fixed capital (5610-5622)	Business Services
57000010	Internet publishing and broadcasting services (incl radio, television, books, newspapers and magazines)	Business Services
57000020	Internet publishing - advertising services	Business Services
57001980	General government consumption of fixed capital (5700)	Business Services
58000010	Telecommunication network services (excl equipment)	Business Services
58090010	Telecommunications services nec	Business Services
58091980	General government consumption of fixed capital (5801-5809)	Business Services
59100010	Internet access (incl ISPs) and internet search services	Business Services
59210020	Data processing and web hosting services	Business Services
59220010	Information storage and retrieval services	Business Services
59221980	General government consumption of fixed capital (5910-5922)	Business Services
60100010	Library and archive services	Business Services
60200010	Other information services nec (incl radio and television new collection and telephone based recorded information services)	Business Services
60201980	General government consumption of fixed capital (6010-6020)	Business Services
62000010	Bank services - financial intermediation services indirectly measured	Business Services
62000020	Bank services nec	Business Services
62220020	Building society services nec	Business Services
62230020	Credit union services nec	Business Services
62290010	Other depository financial services - financial intermediation services indirectly measured	Business Services
62290030	Other depository financial services nec	Business Services
62300010	Non-depository finance services (incl securitiser services and central borrowing authorities) - financial intermediation services indirectly measured	Business Services
62300020	Non-depository finance services nec (incl securitiser services and central borrowing authorities)	Business Services

62400010	Financial asset investors	Business Services
63100010	Life insurance provision	Business Services
63210010	Health insurance provision	Business Services
63220010	Fire and industrial special risks insurance provision	Business Services
63220020	Houseowner and household insurance provision	Business Services
63220030	Motor vehicle comprehensive and compulsory third party insurance provision	Business Services
63220040	Public liability, product liability and professional indemnity insurance provision	Business Services
63220060	Marine insurance provision (non-margin); aviation hull/cargo insurance provision	Business Services
63220070	Employers liability insurance provision	Business Services
63220080	Insurance provision (incl travel insurance) nec.	Business Services
63221500	Margin - marine insurance provision	Business Services
63300010	Superannuation fund services	Business Services
63301980	General government consumption of fixed capital (6310-6330)	Business Services
64110010	Financial asset broking services	Business Services
64190010	Insurance fund management service	Business Services
64190020	Auxiliary services to finance and investment nec	Business Services
64200010	Services to insurance nec	Business Services
66110010	Passenger car rental or hire (incl cars and minibuses) (excl financial leases)	Non-Air Travel
66190010	Other motor vehicle rental or hire (incl caravans and trailers) (excl financial leases) nec	Non-Air Travel
66190020	Transport equipment rental or hire (incl ships and boats) nec	Leased Assets and Equipment Rental
66200010	Farm animal and bloodstock leasing	Leased Assets and Equipment Rental
66310010	Heavy machinery and scaffolding (excl erection) rental or hire (excl financial leases)	Leased Assets and Equipment Rental
66320010	Video and other electronic media rental or hire	Leased Assets and Equipment Rental
66390010	Goods and equipment rental hire nec (incl art works, household goods and office machinery)	Leased Assets and Equipment Rental
66400010	Non-financial intangible assets (excl copyrights) leasing	Leased Assets and Equipment Rental
66401980	General government consumption of fixed capital (6611-6640)	Other Procurement
67110030	Imputed rent for owner-occupiers	Other Procurement
67110040	Actual rent for housing	Other Procurement
67110050	Imputed rent for owner-occupiers: residential caravan park operation and residential property body corporate or strata corporation services	Other Procurement

67110060	Actual rent for housing: residential caravan park operation and residential property body corporate or strata corporation services	Other Procurement
67111980	General government consumption of fixed capital (6711)	Other Procurement
67120010	Non-residential property operator services (incl non-residential property body corporate or strata corporation services)	Business Services
67200010	Real estate agent services	Business Services
67200020	Agricultural or pastoral property broking, leasing, renting or valuing	Leased Assets and Equipment Rental
67201980	General government consumption of fixed capital (6712-6720)	Leased Assets and Equipment Rental
69000020	Architectural services	Business Services
69000030	Surveying and mapping services	Business Services
69000040	Quantity surveying services	Business Services
69000050	Engineering design and consulting services	Business Services
69000060	Commercial art and display services	Business Services
69000070	Specialised design services nec (incl fashion, interior and jewellery design)	Business Services
69000080	Scientific testing and analysis services	Business Services
69000090	Legal services	Business Services
69000100	Accounting services	Business Services
69000110	Advertising services	Business Services
69000120	Market research services	Business Services
69000130	Statistical services	Business Services
69000140	Corporate head office management	Business Services
69000150	Management services (incl business, artists, entertainers and sporting professionals)	Business Services
69000160	Management advice and consulting services nec (excl financial and computer consulting)	Business Services
69000170	Veterinary services	Business Services
69000180	Photography services nec (incl video filming of weddings etc)	Business Services
69000190	Meteorology services	Business Services
69000200	Interpreting and translating services	Business Services
69000210	Research and development services	Business Services
69000220	Own account research and development	Business Services
69000230	Professional, scientific or technical services nec	Business Services
69001980	General government consumption of fixed capital (6910, 6921-6950, 6961-6999)	Business Services
70000010	Computer systems, hardware and software design and development services	Business Services
70000030	Computer support services	Business Services
70001980	General government consumption of fixed capital (7000)	Business Services
72110010	Employment placement and recruitment services (incl casting agency services)	Business Services

72120010	Labour supply services	Business Services
72200010	Travel agency and tour arrangement services	Business Services
72910010	Periodical subscription service	Business Services
72910020	Office administration services nec (incl clerical, billing, record-keeping and payroll services)	Business Services
72920010	Document preparation services nec (incl word processing, stenography, typing, transcription and resume writing)	Business Services
72930010	Credit rating, credit investigation and collection agency services	Business Services
72940010	Call centre operation	Business Services
72990010	Tourist information centre operation	Business Services
72990020	Theatre, concert and sport ticketing and booking services	Business Services
72990030	Event management or promotion (incl sport, art or similar); fund raising services (fee based) or administration services nec	Business Services
72991980	General government consumption of fixed capital (7211-7299)	Business Services
73110010	Building and industrial cleaning services nec (incl gutters, drains, roads, beaches, swimming pools and toilets)	Laundry, Cleaning and Maintenance
73120010	Pest control services	Laundry, Cleaning and Maintenance
73130010	Gardening services	Laundry, Cleaning and Maintenance
73200010	Crating or packing services for transport	Freight, Courier and Post
73200020	Packaging of fresh produce or groceries; bottling or rebottling services and packaging services nec	Freight, Courier and Post
73201980	General government consumption of fixed capital (7311-7320)	Other Procurement
75000010	Government administration and regulatory services	Business Services
75400010	Judicial services (incl operation of law, arbitration, bankruptcy, industrial relations and children's courts; royal, conciliation and arbitration commissions; and judicial authorities)	Business Services
75510010	Domestic government diplomatic and consular services	Business Services
75521980	General government consumption of fixed capital (7510-7552)	Business Services
76000010	Defence services	Business Services
76001980	General government consumption of fixed capital (7600)	Business Services
77110010	Police services	Business Services
77120010	Investigative and security services (incl locksmiths) (excl police)	Business Services
77130010	Fire brigade services (incl forest fire fighting)	Business Services
77140010	Correctional and detention centres (incl juvenile)	Business Services
77190010	Public order and safety services (incl coastwatch and country border) nec	Business Services

77201980	General government consumption of fixed capital (7711-7720)	Business Services
80100010	Preschool education services	Business Services
80200010	Primary education services	Business Services
80200020	Secondary education services	Business Services
80200030	Special school education services	Business Services
80201980	General government consumption of fixed capital (8010-8024)	Business Services
81010010	Technical, vocational and non-tertiary education services nec	Business Services
81020010	Tertiary higher education services (incl undergraduate and postgraduate)	Business Services
81021980	General government consumption of fixed capital (8101-8102)	Business Services
82110010	Sports or physical recreation instruction services (incl ski or snowboard) nec	Business Services
82120010	Arts education services (excl vocational)	Business Services
82190030	Adult, community and education services nec	Business Services
82200010	Educational support services	Business Services
82201980	General government consumption of fixed capital (8211-8220)	Business Services
84010010	Hospital services (excl psychiatric hospitals)	Care and Social Assistance Services
84020010	Psychiatric Hospitals services	Care and Social Assistance Services
85110010	General practice medical services	Care and Social Assistance Services
85120010	Specialist medical services	Care and Social Assistance Services
85200010	Pathology and diagnostic imaging services	Care and Social Assistance Services
85310010	Dental services	Care and Social Assistance Services
85320010	Optometry and optical dispensing	Care and Social Assistance Services
85330010	Physiotherapy services	Care and Social Assistance Services
85340010	Chiropractic and osteopathic services	Care and Social Assistance Services
85390030	Allied health services nec	Care and Social Assistance Services
85910010	Ambulance services	Ambulance Services
85990010	Health services nec	Care and Social Assistance Services
85991980	General government consumption of fixed capital (8401 - 8599)	Care and Social Assistance Services

86010010	Residential care services for the elderly (aged care)	Care and Social Assistance Services
86010020	Residential care services for the disabled	Care and Social Assistance Services
86090010	Residential care services (incl mental health illnesses or substance abuse) nec	Care and Social Assistance Services
87100010	Child care services	Care and Social Assistance Services
87900030	Social assistance services nec (incl elderly, disabled, marriage and adoption services)	Care and Social Assistance Services
87901980	General government consumption of fixed capital (8601 - 8790)	Other Procurement
89100010	Museum and art gallery services	Other Procurement
89210010	Zoological and botanical services	Other Procurement
89220010	Nature reserve and conservation park services	Other Procurement
89221980	General government consumption of fixed capital (8910-8922)	Other Procurement
90010010	Performing arts operation nec (incl theatre restaurants and circuses)	Other Procurement
90020010	Services of independent creative artists, writers and performers	Other Procurement
90020020	Theatre lighting, costume design and set design services	Other Procurement
90030010	Performing arts venue operation	Other Procurement
90031980	General government consumption of fixed capital (9001-9003)	Other Procurement
91110010	Gymnasia or fitness centre operation	Other Procurement
91120090	Sports and physical recreation clubs operation and sports professionals	Other Procurement
91130010	Sports grounds and similar recreational facilities operation nec (excl gymnasia or fitness centres)	Other Procurement
91140030	Sport and physical recreation administrative services	Other Procurement
91210010	Horse and dog racing, administration and track operation	Other Procurement
91290010	Horse or dog training and stable (kennel) operation	Other Procurement
91310010	Amusement parks and centres operation	Other Procurement
91390010	Recreational activities nec	Other Procurement
91391980	General government consumption of fixed capital (9111-9139)	Other Procurement
92010010	Casinos operation	Other Procurement
92020010	Lottery operation	Other Procurement
92090010	Totalisator agency services	Other Procurement
92090020	Gambling services nec	Other Procurement
92091980	General government consumption of fixed capital (9201-9209)	Other Procurement
94110090	Automotive electrical services	Laundry, Cleaning and Maintenance

94120010	Car wash and cleaning services	Laundry, Cleaning and Maintenance
94120020	Automotive body, paint and interior repair services	Laundry, Cleaning and Maintenance
94190010	Automotive repair services nec	Laundry, Cleaning and Maintenance
94191980	General government consumption of fixed capital (9411-9419)	Laundry, Cleaning and Maintenance
94210010	Domestic appliance repair and maintenance	Laundry, Cleaning and Maintenance
94220010	Electronic and precision equipment repair and maintenance (excl domestic appliance)	Laundry, Cleaning and Maintenance
94290010	Machinery and equipment repair and maintenance nec	Laundry, Cleaning and Maintenance
94910010	Clothing and footwear repair	Laundry, Cleaning and Maintenance
94990010	Repair and maintenance nec	Laundry, Cleaning and Maintenance
94991980	General government consumption of fixed capital (9421-9499)	Business Services
95110010	Hairdressing and beauty services (incl massage services nec)	Other Procurement
95200090	Funeral, crematorium and cemetery services	Other Procurement
95300010	Personal services nec (incl weight reduction centres and prostitution services)	Other Procurement
95310010	Laundry and dry-cleaning services	Laundry, Cleaning and Maintenance
95320010	Photographic film processing	Business Services
95330010	Parking services	Business Services
95391980	General government consumption of fixed capital (9511-9539)	Other Procurement
95400010	Religious services	Other Procurement
95510010	Business and professional association services	Business Services
95520010	Labour association services	Business Services
95590010	Interest groups nec (incl welfare fundraising services)	Business Services
95590020	Services to students at post-secondary institutions by their sports and student unions	Business Services
95591980	General government consumption of fixed capital (9540-9559)	Business Services
96000010	Domestic services of private household employees	Business Services

Appendix F: Deductions from consumption inventory estimates to avoid double counting

This appendix outlines, for each emissions source estimated on an activity basis, the deductions made from the consumption inventory to avoid double counting when reporting scope 3 emissions.

Stationary Fuel Combustion

Deductions are made by subtracting direct from total intensities from the consumption inventory estimate using reported expenditure adjusted to industry (Irwin method)[103] for the following IOPC codes:

- 07000030 ‘Natural gas - in the gaseous state’
- 07000050 ‘Coal seam gas’
- 07000070 ‘Liquefied petroleum gas from the well head’
- 17010050 ‘Liquefied petroleum gas - produced at refineries’
- 17010120 ‘Diesel (excl biodiesel)’
    - These fuels can also be used as Road Transport Fuel Combustion
- 17010070 ‘Secondary feedstocks and topped/enriched crude for use in further refining and manufacturing (incl bituminous feedstocks) (excl scrap waste)’
    - These materials are typically used as inputs in industrial processes or for further refining in stationary facilities, such as refineries or manufacturing plants, or for further processing into other petroleum-based products.

Refrigeration and Stationary Air-Conditioning

A deduction is not currently feasible for this emissions source due to the categorisation of IOPC expenditure. Fugitive emissions from the use of refrigeration and stationary air conditioning are estimated indirectly, using electricity consumption as a proxy for refrigerant usage. However, the emissions intensity for electricity as estimated through EEIO methods does not include associated fugitive emissions, therefore the approach does not suggest an actionable risk of double-counting the reported scope 1 emissions from this source.

Lubricants

Deductions are made by subtracting direct from total intensities from the consumption inventory estimate using reported expenditure adjusted to industry (Irwin method) for the following IOPC codes:

- 17090150 ‘Pitch, tars, jellies, waxes and other lubricants manufactured from petroleum’

Mobile Air-Conditioning

As for Refrigeration and Stationary Air-Conditioning.

Road Transport Fuel Combustion and Air Transport Fuel Combustion

Deductions are made by subtracting direct from total intensities from the consumption inventory estimate using reported expenditure adjusted to industry (Irwin method) for the following IOPC codes:

- 17010010 ‘Automotive petrol; gasoline refining or blending; motor spirit (incl aviation spirit)’
- 17010020 ‘Kerosene (incl kerosene type jet fuel)’
- 17010050 ‘Liquefied petroleum gas - produced at refineries’
- 17010120 ‘Diesel (excl biodiesel)’
- 17010130 ‘Gas oil or fuel oils nec’

Medical Nitrous Oxide

We do not remove direct intensities or a proxy of scope 1 reported medical nitrous oxide emissions from our consumption inventory because we lack detailed expenditure data on pharmaceuticals at a sufficiently granular level to isolate specific spending on nitrous oxide. As a result, the emissions intensity for pharmaceuticals is based on an average value across various pharmaceutical products, which is likely to be significantly less intensive than that of nitrous oxide alone. Consequently, deducting scope 1 nitrous oxide emissions from the consumption inventory estimate of pharmaceutical would risk underestimating the true emissions associated with this specific source.

Some Health Care Services emissions associated with expenditure on industrial gases (IOPC 18110090), reported in section 6.1.1, may include emissions from use of medical nitrous oxide and fluorinated anaesthetic gases. However, as it is not possible to disaggregate expenditure in this IOPC code, and as expenditure on anaesthetic gases is likely to constitute only a small portion of overall expenditure on industrial gases, no adjustment is made to address any associated risk of double counting.

Fluorinated Anaesthetic Gases

No deduction is required, as emissions from fluorinated anaesthetic gases are not reportable under the Paris Agreement. As a consequence, they are not included in production-based NIbES estimates, and they are not therefore translated to consuming sectors in the consumption inventory. See section on Medical Nitrous Oxide above for note regarding potential double counting with emissions associated with expenditure on industrial gases (IOPC 18110090).

Purchased Energy

Deductions are made from by subtracting direct from total intensities from the consumption inventory estimate using the following IOPC codes:

- 26110011 ‘Electricity generated from coal’
- 26110012 ‘Electricity generated from natural gas’
- 26110013 ‘Electricity generated from other fossil fuels’

Respiratory Inhalers

No deduction is required, as propellant emissions are generated in consumption not production, and will not therefore be included in the consumption inventory, which is a mapping from production-based (scope 1) NIbES estimates to consuming sectors.

Clinical Waste Incineration

The activity-based emissions estimate for Clinical Waste Incineration is subtracted from the estimate of scope 3 Waste emissions for Health Care Services.

Employee Commute

We do not deduct the scope 1 road transport emissions estimate from our scope 3 employee commuting emissions estimate because we lack specific data on how many employees use fleet vehicles for commuting. Most health system fleet vehicles are used for operational purposes – such as emergency response, community health visits, or transporting equipment – and are not typically for employee commuting. Therefore, to ensure a comprehensive scope 3 estimate, we include all commuting emissions based on travel distance and staff volume, without attempting to adjust for potential overlaps with scope 1 road transport emissions.

Summary

Table 49 lists the IOPC codes for which deductions were considered or made using direct intensities to produce an estimate of scope 3 emissions that does not double count scope 1 emissions estimated on an activity basis. For each IOPC code, it lists the scope 1 emissions source(s) that the deduction was made in relation to in order to avoid double counting.

Table 49: IOPC codes for which deductions were made to avoid double counting

IOPC code	IOPC name	Scope 1 emissions source that deduction was made in relation to
06000010	Black coal	No expenditure – therefore no deduction
06000020	Brown coal/lignite and peat (excl horticultural)	No expenditure – therefore no deduction
07000010	Crude oil (incl condensate)	No expenditure – therefore no deduction
07000020	Liquefied natural gas	No expenditure – therefore no deduction
07000030	Natural gas - in the gaseous state	Stationary Fuel Combustion
07000050	Coal seam gas	Stationary Fuel Combustion
07000060	Other naturally occurring gases	No expenditure – therefore no deduction
07000070	Liquefied petroleum gas from the well head	Stationary Fuel Combustion
17010010	Automotive petrol; gasoline refining or blending; motor spirit (incl aviation spirit)	Road Transport Fuel Combustion Air Transport Fuel Combustion
17010020	Kerosene (incl kerosene type jet fuel)	Road Transport Fuel Combustion Air Transport Fuel Combustion
17010050	Liquefied petroleum gas - produced at refineries	Road Transport Fuel Combustion Air Transport Fuel Combustion Stationary Fuel Combustion
17010070	Secondary feedstocks and topped/enriched crude for use in further refining and manufacturing (incl bituminous feedstocks) (excl scrap waste)	Stationary Fuel Combustion
17010120	Diesel (excl biodiesel)	Road Transport Fuel Combustion Air Transport Fuel Combustion Stationary Fuel Combustion
17010130	Gas oil or fuel oils nec	Road Transport Fuel Combustion Air Transport Fuel Combustion
17090120	Bituminous mixtures and other articles of asphalt	No expenditure – therefore no deduction
17090130	Petroleum and coal products nec	No expenditure – therefore no deduction
17090140	Coal coke and coke products, retort carbon and char (excl bone char)	No expenditure – therefore no deduction
17090150	Pitch, tars, jellies, waxes and other lubricants manufactured from petroleum	Lubricants
26110011	Electricity generated from coal	Purchased Energy
26110012	Electricity generated from natural gas	Purchased Energy
26110013	Electricity generated from other fossil fuels	Purchased Energy

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