

High Carbon from a Land Down Under

Quantifying CO₂ from Australia's fossil fuel mining and exports

Australia is the world's third biggest exporter and fifth biggest miner of fossil fuels by CO₂ potential. Its exports are behind only Russia and Saudi Arabia, and far larger than Iraq, Venezuela and any country in the EU. Yet Australia's economy is more diverse and less fossil fuel intensive than many other exporters. Australia has an opportunity and obligation to decarbonise its exports in line with the Paris Agreement.

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Tom Swann

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Summary

Australians pride themselves on their country's natural environment, and Australian governments have carefully curated a global image as an oasis of natural wonder. The reality, however, is far darker.

Australian government Ministers argue Australia's emissions are small on a global scale. They use this as an excuse for delaying effective action on climate. On any reasonable assessment of the data, Australia is a large emitter with a profound global obligation to reduce emissions, not to mention economic and security self-interest.

Australia has just 0.3% of the world population but produces 1.2% of world emissions, making it the 14th largest emitter globally. Australia emits more greenhouse gases than 40 countries that have bigger populations than Australia. Per capita, Australia's emissions are the highest in the OECD and globally behind only smaller petro-states like Qatar.

Australian domestic emissions are rising, not falling, and have hit levels not seen since 2011. Land sector aside, emissions have risen almost continuously for two decades. Yet these rising domestic emissions are only a fraction of Australia's role in fuelling the climate crisis.

Australia is a vast coal and gas exporter. From 2000 to 2015 Australian coal exports more than doubled and Liquefied Natural Gas (LNG) exports tripled, and since then LNG exports have nearly tripled again. Australia is the largest coal exporter in the world and on recent reports the largest LNG exporter too.

To quantify the climate impacts of Australia's fossil fuel exports, this report compiles the most recent complete International Energy Agency (IEA) datasets for coal, oil and gas production and exports from all countries. These data are multiplied by emissions factors from the Intergovernmental Panel on Climate Change (IPCC). The database is then used for descriptive analysis.

Australia is the fifth biggest miner of fossil fuel carbon, behind China, the USA, Russia and Saudi Arabia. Australia mines more fossil fuel carbon than Indonesia, India, Canada, Iran and Iraq. Australia makes up 4% of global fossil fuel mining by CO₂ potential.

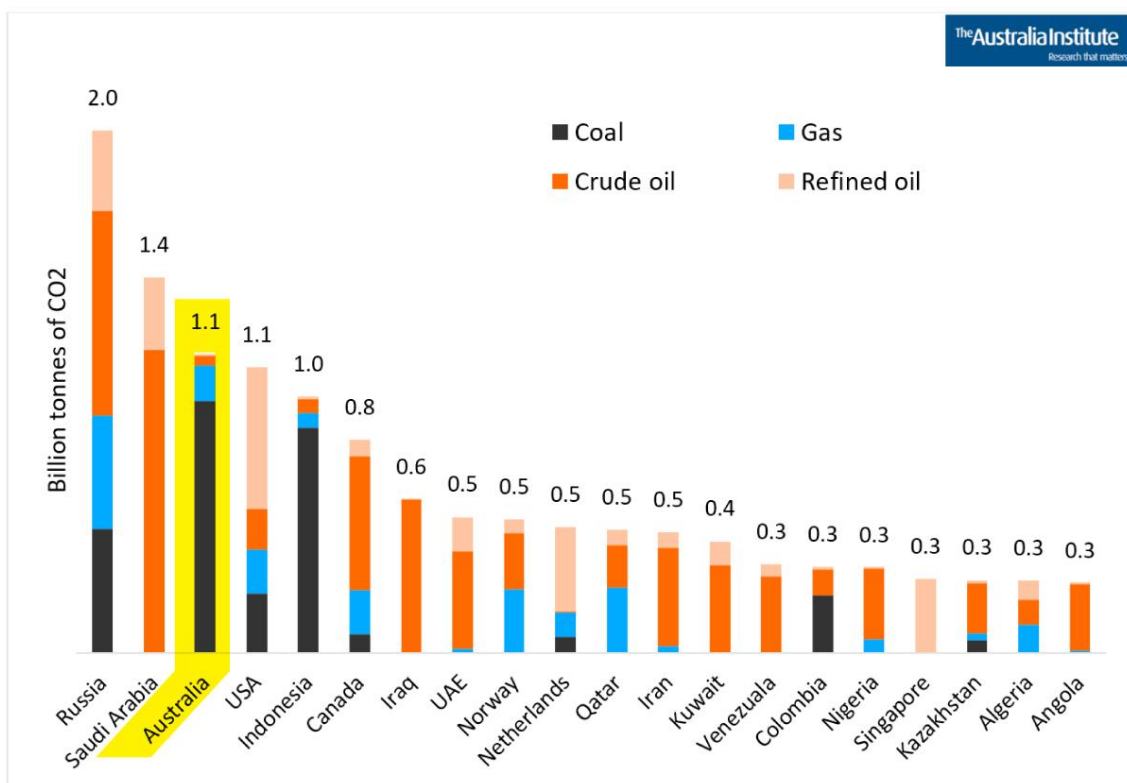
For every Australian, the country mines 57 tonnes of fossil fuel CO₂ per year. That is ten times greater than the world average.

While Australia mines large amounts of carbon per capita, the Australian *economy* is less fossil fuel intensive than other exporters, being diverse and based largely on services. Australia is the 29th most fossil fuel intensive considered in terms of GDP.

Most of Australia’s fossil fuel production is exported. The CO₂ potential of these exports is more than twice as much as the greenhouse gas emissions Australia emits domestically.

Australia is the third biggest fossil fuel exporter globally, in CO₂ potential.

Figure: World’s biggest fossil fuel exporters, CO₂ Gt potential of exports



Source: IEA (2018) *World Energy Balances*; IPCC (2006) *IPCC Guidelines*, as described in text; Commonwealth of Australia (2019) *Quarterly Update of Australia's National Greenhouse Gas Inventory for September 2018*

Australia comes behind only Russia and Saudi Arabia. Australia’s fossil fuel exports are bigger than exports from Indonesia, Canada, Iraq, UAE or Qatar, and nearly four times bigger than exports from Venezuela and Colombia.

On the most recent complete IEA data, Australian fossil fuel exports are just ahead of to those from the United States of America (USA). That is despite the USA having a population 13 times larger, GDP 15 times larger and export value 8 times larger.

Australia makes up 7% of all fossil fuel exports by CO₂ potential. Most traded fossil fuels are oil but, unusually, Australia's fossil fuel exports are dominated by coal. Australia makes up 29% of world coal trade by CO₂ potential. Australian gas exports are 6% of world gas trade.

Australia's fossil exports can also be compared with in various country groupings.

- In the **OECD**, Australia is the largest fossil fuel exporter in CO₂ potential, making up 20% of the OECD total.
- In the **G20**, Australia makes up 12% of fossil fuel exports, with the highest exports per capita and second highest production per capita.
- In the **Commonwealth**, Australia is the largest fossil fuel miner and exporter, with a full third of Commonwealth exports by CO₂ potential.
- Compared with the **European Union**, Australia's fossil fuel exports are 74% as large as all of those from all EU countries together, and more than twice as big as any EU country. Australia's fossil fuel production is one and a half times the size of the EU countries' production put together.
- Australia's exports are equal to a quarter of all the exports from the Organisation of the Petroleum Exporting Countries (**OPEC**).

Australia is a massive fossil fuel exporter, but its exports overall are far more diversified and less dominated by fossil fuel than many other exporting countries. Relative to the value of a country's overall exports, Australia is the 24th biggest fossil fuel exporter. Australian exports vastly more fossil fuel carbon than many exporting countries, despite its overall exports being vastly less fossil fuel intensive. Australia exports nearly twice as much CO₂ potential as Iraq and yet compared to the value of exports, Australian exports are half as CO₂ intensive as Iraq's.

Australia has a unique opportunity, and obligation, to face up to the climate crisis through policies to limit its carbon exports, starting with a moratorium on new coal mines. Coal makes up more than 80% of Australia's exported fossil fuel CO₂ potential.

Those in the global community making efforts to confront the climate crisis should understand the scale of Australia's fossil fuel exports and policies to expand them.

Exports are often ignored in official climate change policy. Treaties and status quo debate focuses on demand for carbon, rather than supply. This ignores the fact that increasing supply and supply infrastructure will tend to "lock in" increased emissions.

The scale of exports from countries like Australia bring into stark relief why efforts to reduce world emissions must limit both demand *and* supply.

Introduction

Australians pride themselves on their country's natural environment. Tourism Australia has long advertised the country as an oasis of natural wonder: pristine beaches and varied landscapes, capital cities cradled by clear blue waterways and covered by even bluer skies, with not a whiff of pollution in sight. Such an advertising campaign was even overseen by Australia's current Prime Minister Scott Morrison, in his former role as the head of Tourism Australia.

The careful curation of Australia's global image has been assisted by its large land mass and modest population. The reality is far darker.

Australia is a major greenhouse gas polluter, with higher emissions than 90% of countries and among the highest emissions per capita in the world. But this is only one small part of Australia's growing carbon footprint.

Australia extracts and exports vast amounts of coal and gas. The greenhouse gases from these exports are far bigger than emissions from within Australia, putting Australia among Russia and Saudi Arabia in terms of fossil fuel exports.

Australian governments are actively promoting *even greater* coal and gas exports. Australian politicians work hard to avoid confronting the climate impacts of Australian fossil fuel impacts, but the reality is those impacts are enormous.

Time to uncover its true size.

Australia's domestic emissions

In Australian political debate, those seeking to delay or limit climate action often argue that Australia produces a small share of global emissions. The Treasurer Josh Frydenberg, in his former role as Minister for Environment stated:

while Australia's share of the global carbon footprint is just 1.3 per cent, Australia is playing its part on the world stage through bilateral and multi-lateral initiatives and the ratification of the Paris Agreement to reduce our emissions by 26 to 28 per cent on 2005 levels by 2030 - one of the largest reductions on a per capita and GDP intensity basis in the G20.¹

The Treasurer's statement is misleading. Australia's current Paris targets not in per capita or per GDP terms, but absolute terms. Moreover, the data show that Australia's emissions per capita and per GDP are very high. This increases the obligation on Australia to cut emissions.

ABSOLUTE TERMS

Australia is a heavy emitter in terms of total domestic emissions.

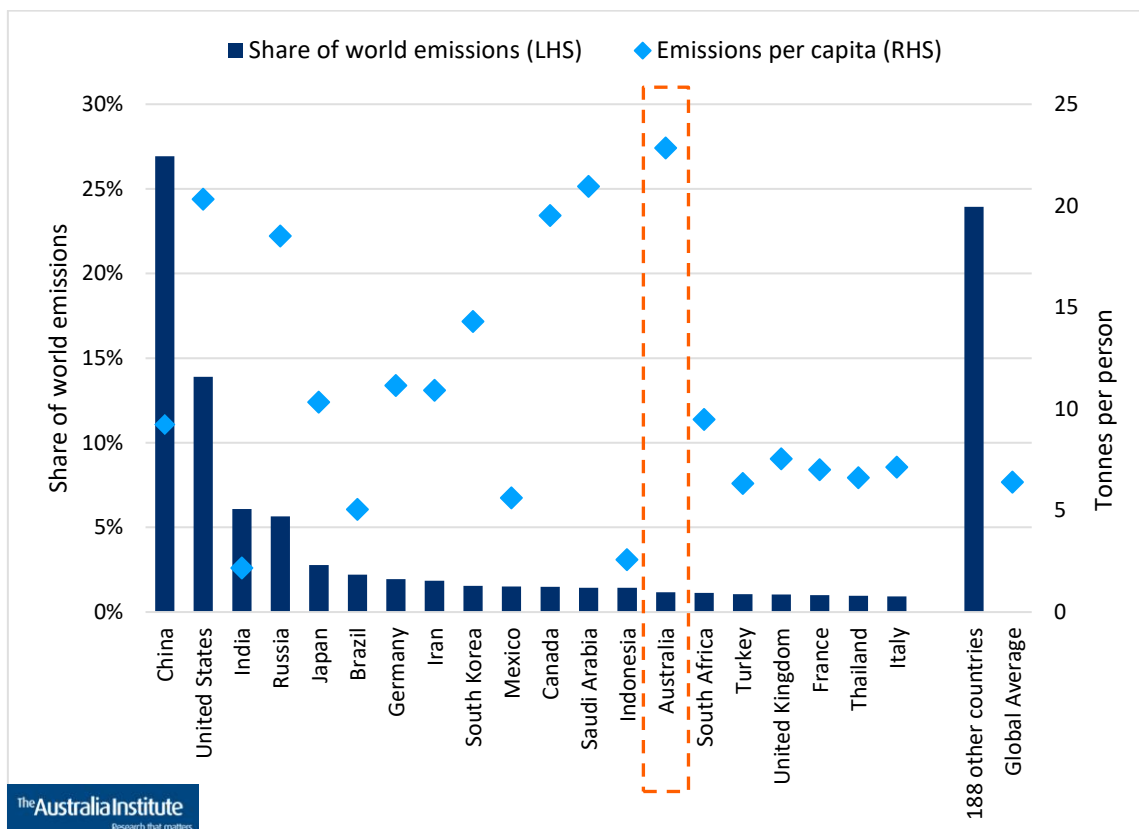
(Data in this section are from 2016, include all greenhouse gases but exclude the land sector.)

In 2016 Australia emitted 1.2% of world greenhouse gas emissions. This made Australia the world's 14th biggest emitter of greenhouse gas pollution,² despite having just 0.3% of world population. (See Figure 1).

¹ Minister for the Environment, the Hon Josh Frydenberg (2017) *Media Release: 2017 review of climate change policies final report released*, <http://www.environment.gov.au/minister/frydenberg/media-releases/mr20171219.html>

² All Kyoto GHG, excluding LULUCF, 2016 PIK data, accessed via WRI (2019) *Climate Watch*, <https://www.climatewatchdata.org/>

Figure 1: Top 20 biggest GHG emitting countries (2016, ex LULUCF)



Source: All Kyoto GHG, excluding LULUCF, 2016 PIK data, accessed via WRI (2019) *Climate Watch*, <https://www.climatewatchdata.org/>; World Bank (2017) *Population – 2016*, <https://data.worldbank.org/indicator/sp.pop.totl?end=2016&start=2016>

Australia’s 2016 emissions were greater than those of 190 countries.³ If Australia should not have to reduce emissions, then neither should these ‘lower’ emitting countries. These ‘lower’ emitting countries are home to 42% of the world population (3.1 billion people) that together emit 30% of world emissions.

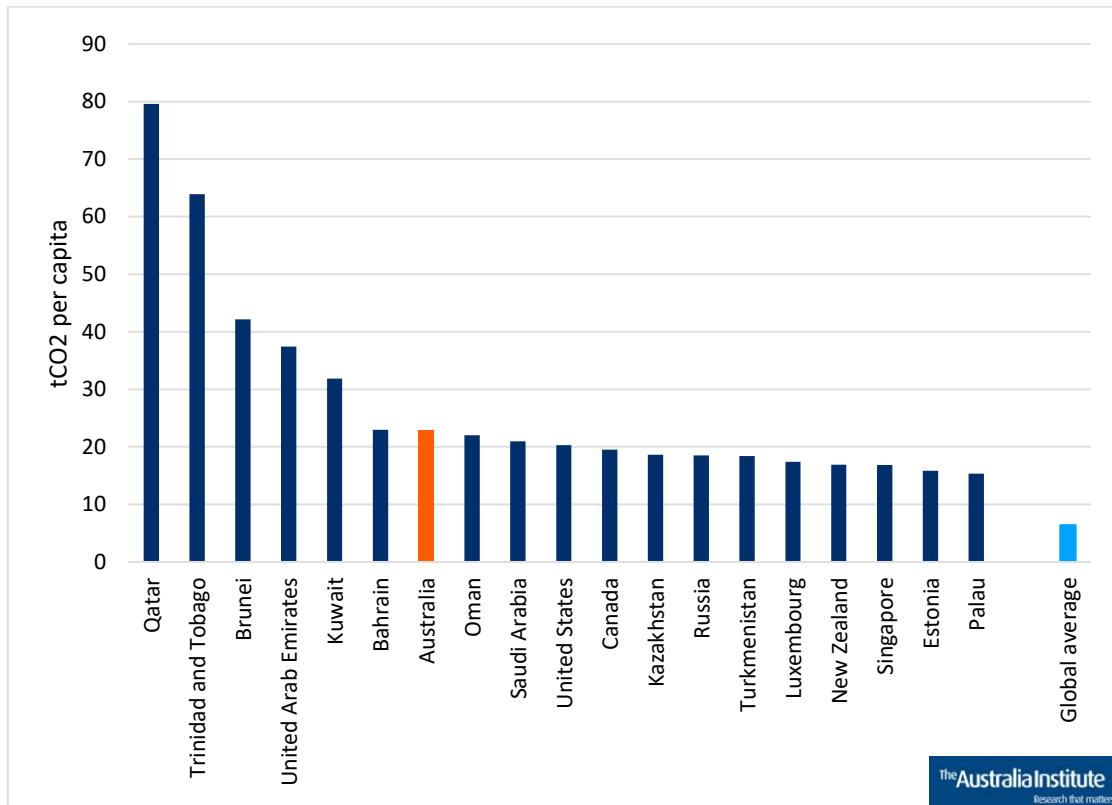
40 countries that emit less than Australia nonetheless have a bigger population than Australia. This includes Turkey, United Kingdom, France, Thailand, Italy and Pakistan.

PER CAPITA

Per capita, Australian emissions are the highest in the OECD and among the highest in the world. The only countries with higher per capita emissions than Australia are smaller petro-states like Kuwait, Qatar and UAE.

³ NB: Datasets differ on what counts as a country. This dataset includes some smaller territories that have some independence from the nation state with formal recognition at the United Nations.

Figure 2: Emissions per capita - top 20 countries



Source: All Kyoto GHG, excluding LULUCF, 2016 PIK data, accessed via WRI (2019) *Climate Watch*, <https://www.climatewatchdata.org/>; World Bank (2017) *Population – 2016*, <https://data.worldbank.org/indicator/sp.pop.totl?end=2016&start=2016>

EMISSIONS INCREASING

Though Australia has signed the Paris Agreement, its emission reduction target is an inadequate contribution to the global goal of limiting warming⁴ and Australia's government refuses to consider increasing it. Instead, Australia's government plans to cut the target in half by using 'carry-over' credits from the Kyoto Protocol, despite this being unauthorised under the Agreement and opposed by many other countries.⁵

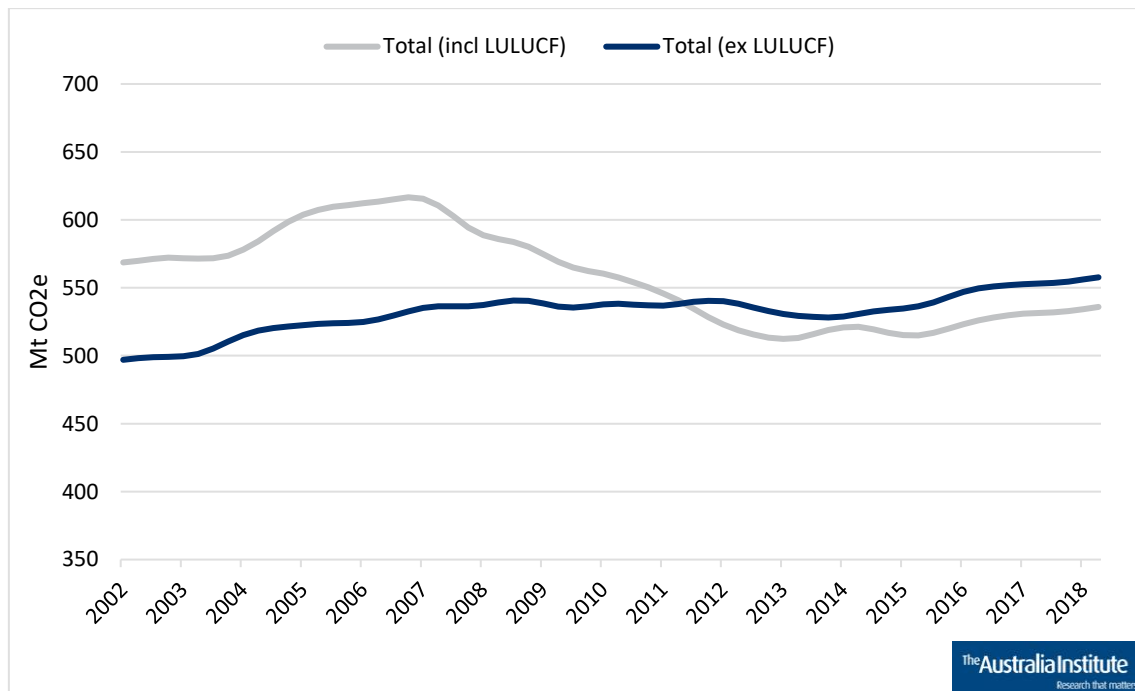
Even then, Australia is *not* on track to meet the target. Australian emissions are increasing, not decreasing.

⁴ Merzian and Campbell (2018) *Advance Australia's Fair Share*, <http://www.tai.org.au/content/advance-australias-fair-share>

⁵ Merzian (2019) *Taking Way Too Much Credit*, <http://www.tai.org.au/content/taking-way-too-much-credit>

Due to the lack of credible climate policy, Australia’s emissions have increased every year since 2015 and are now at levels not seen since 2011.⁶ Land sector aside, emissions have never been higher.

Figure 3: Australia's rising emissions - year to date, with and without land sector



Source: Commonwealth of Australia (2019) *Quarterly Update of Australia's National Greenhouse Gas Inventory for September 2018*

Over the past two decades, emissions fell from 2007 onwards due to changes in Land Use, Land Use Change and Forestry (LULUCF), also called the ‘land sector’. Changes to land clearing laws saw these emissions fall rapidly and the land sector is now a small sink (sequestering more greenhouse gases than it releases.)

However, the trend across the rest of the economy has been of emissions rising almost continuously, which has seen total emissions increase now for four years.

From 2012 to 2014, when Australia boasted a world-leading carbon price policy, emissions fell 2% and the economy grew by 5%.⁷ In 2014, a new conservative

⁶ Commonwealth of Australia (2019) *Quarterly Update of Australia's National Greenhouse Gas Inventory for September 2018*, <https://www.environment.gov.au/climate-change/climate-science-data/greenhouse-gas-measurement/publications#national>

⁷ Swann et al (April 2019) *Cold Shower on Economics of Global Warming*, <http://www.tai.org.au/content/analysis-130-billion-year-benefit-gdp-avoiding-climate-change>

government gave Australia the dubious distinction of being first country to repeal its carbon price.

Australia's electricity sector remains dominated by coal power. Under current policy, electricity emissions have fallen, due to increasing renewables. This trend has been more than overpowered by emissions growth in other sectors. Australia's vehicle fleet is also highly fuel-inefficient with a very low number of electric vehicles.

However, a key reason for Australia's increasing emissions is the large expansion in coal and gas production for export. These activities are emissions intensive in Australia, and the exports themselves produce far larger volumes of CO₂ overseas.

Australia's vast fossil fuel exports

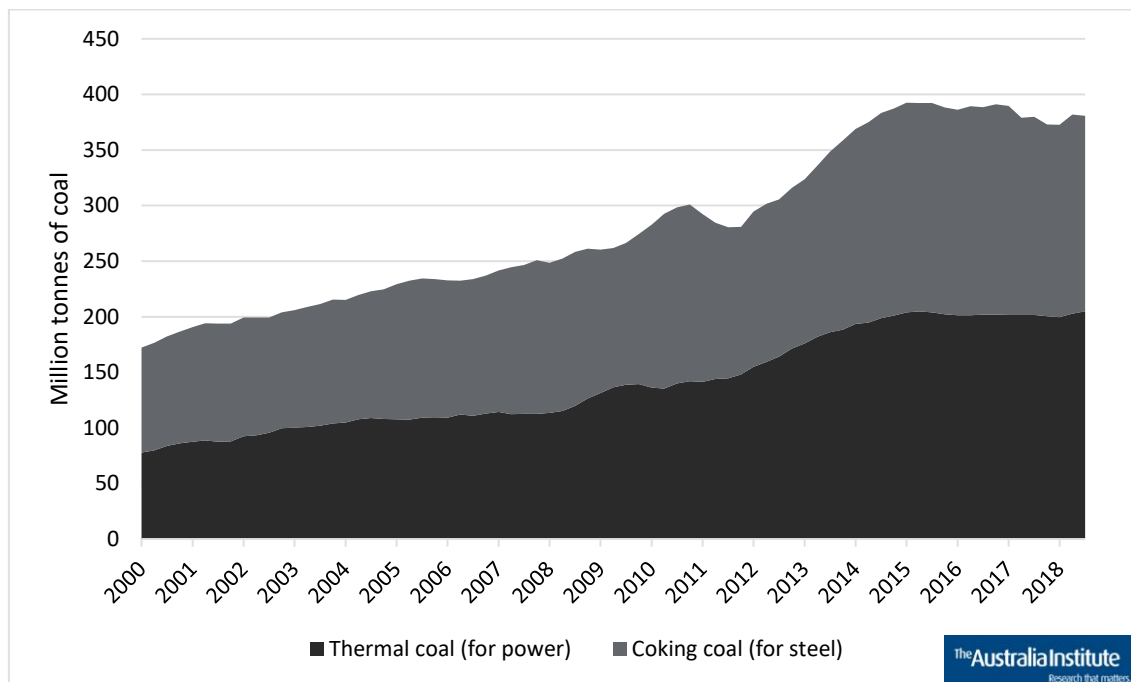
Discussion of climate impacts have traditionally ignored emissions in fossil fuel exports. Examples like Australia show why this needs to change.

COAL

Australia exports roughly equal volumes of thermal coal, for power plants (mostly from NSW), and coking coal, for making steel (mostly from Queensland).

Over the last two decades, Australian coal exports have more than doubled.

Figure 4: Coal exports from Australia, year to date, tonnes



Source: OCE (2018) *Resources and Energy Quarterly December 2018*, rolling annual exports

The data show total coal exports peaked in 2015 and have since levelled. However, government forecasters project exports to increase in coming years and there are plans for many new mines to export even more coal.

There are current proposals for 53 new coalmines in Australia, with total production of 415 million tonnes (Mt) a year.⁸ New coal from proposed new mines is even larger than current exports. There are also many proposals to expand existing mines, extending their mine life.

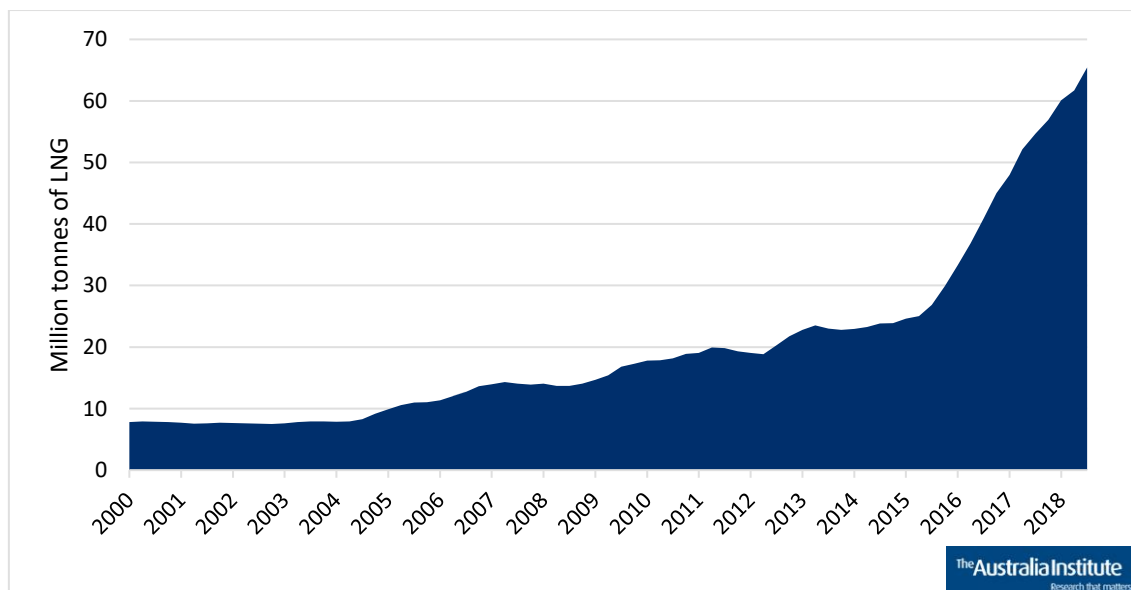
The focus of thermal coal expansion is the Galilee Basin in Queensland, where the frontrunner is the Adani Carmichael mine. The Adani mine has been subject to years of controversy about approvals and plans to subsidise it at every level of government. The Galilee Basin mines would produce thermal coal.

Despite the huge volumes of coal involved, coal mining in Australia employs less than 0.5% of Australia’s workforce, five times less than the arts and recreation sector employs.⁹

GAS

Australia has recently seen a very large expansion in liquid natural gas (LNG) exports, more than doubling in the decade to 2015, then to 2018 more than doubling again.

Figure 5: Australia’s exports of liquid natural gas (LNG)



⁸ OCE (2019) *Major Projects List – December 2018*, <https://publications.industry.gov.au/publications/resourcesandenergyquarterlymarch2019/documents/Resources-and-Energy-Quarterly-December-2018-Major-Projects-Data.xlsx>

⁹ ABS (2019) 6291.0.55.003 - *Labour Force, Australia, Detailed, Quarterly, Feb 2019*, <https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.003Feb%202019?OpenDocument>

Source: OCE (2018) *Resources and Energy Quarterly December 2018*, rolling annual exports

The increase in LNG will continue, with numerous large projects recently finishing construction and 19 proposals for new projects or expansions. Most of the current and proposed production is offshore from the north and north-west of the country. There is also a large onshore industry, increasingly 'fracked' unconventional gas, which has attracted staunch opposition. Australia also exports unrefined oil product, in particular gas condensate.

FOSSIL FUEL SUBSIDIES

Australian governments have a long tradition of subsidising mining. State governments have often built mining infrastructure, costing billions. The Adani coal mine has courted numerous taxpayer subsidies, including cash grants, unlimited water licenses, waived rehabilitation requirements and subsidised loans (including deferred royalty payments). Australia's export credit agency has funded numerous fossil fuel projects and its mandate was recently expanded to include funding infrastructure to assist Australia fossil fuel exports in current and new markets.¹⁰

¹⁰ Swann (May 2019) *Rushed through the Senate when no-one was looking*, <https://medium.com/@TheAustraliaInstitute/rushed-through-the-senate-when-no-one-was-looking-bf1bd2734df3>

Data and methods

This section describes the data and methods used in later sections to present data on CO₂ potential of fossil fuels produced, and exported, globally.

DATA

Energy data are from the International Energy Agency (IEA).¹¹ This data includes production, exports and imports of fossil fuels, broken down in the main fuel types:

- Coal and coal products
- Natural gas
- Crude, NGL and feedstocks ('primary oil')
- Oil products ('secondary oil' or 'refined')

The analysis uses the most recent complete data set for each fuel type from the 2018 release. 2017 data are used for coal and gas. 2016 data are used for oil.¹²

The IEA gives data in kilotonnes of oil equivalent (ktoe), a standardised energy unit. This data accounts for differing energy content of fuel types (e.g. higher vs lower energy content coal), which is the main factor in their emissions potential.

Emission CO₂ factors for each fuel type are from the Intergovernmental Panel on Climate Change (IPCC).¹³ The analysis uses representative default CO₂ factors for each fuel type and assumes full combustion.¹⁴ The calculations are shown in Table 1 below.

¹¹ IEA (2018) *World Energy Balances*, from OECD iLibrary

¹² The IEA 2019 statistics were put up for sale in the week prior to publication of this report. They are not yet available to The Australia Institute. The results presented here are unlikely to have changed greatly except where indicated in the text of the report.

¹³ IPCC (2016) *2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy*, https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

¹⁴ Bituminous coal, natural gas, crude oil, motor oil.

Table 1: IPCC emissions factors used in this report

Fuel type	kg CO ₂ / TJ	TJ / ktoe	kg CO ₂ / ktoe	t CO ₂ / ktoe
Coking / other bituminous	94,600	41.868	3,960,713	3,961
Natural Gas	56,100	41.868	2,348,795	2,349
Crude Oil	73,300	41.868	3,068,924	3,069
Motor Gasoline	69,300	41.868	2,901,452	2,901
<i>Reference</i>	<i>IPCC</i>	<i>IEA</i>	<i>Derived</i>	<i>Derived</i>

Source: IPCC (2016) *2006 IPCC Guidelines for National Greenhouse Gas Inventories V2 Energy*, https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf; IEA (2019) *Unit Converter*, <https://www.iea.org/statistics/resources/unitconverter/>

The IPCC gives default conversion factors for CO₂ potential in terms of energy content in different fuel types. This is given as kilograms of CO₂ per terajoule (TJ). Converting energy and mass units give gives tonnes of CO₂ per ktoe for each fuel type.

Note there are significant non-CO₂ ‘fugitive’ emissions from fossil fuel extraction, especially gas, which are not included here, as they are domestic emissions. Nearly all of emissions from fuel combustion are CO₂, which is the focus of this analysis.

Data on Gross Domestic Product (GDP) and the value of exports are from the World Bank in current \$US.¹⁵ Data on population are from the International Monetary Fund.¹⁶ Countries were also coded for membership of groups like the G20, OPEC and OECD.

ANALYSIS

All energy and socio-economic data were compiled into one database.

Using the conversion factors, data on each country’s coal, gas and oil production and exports were converted into CO₂ potential. Derived data for total exported CO₂ were checked against aggregate data from the United Nations indicators for the Sustainable Development Goals. There was a close correlation for nearly all countries.¹⁷

¹⁵ World Bank (2019) *World Bank Open Data*, <https://data.worldbank.org/>

¹⁶ IMF (2019) *IMFDataMapper*, <https://www.imf.org/external/datamapper/LP@WEO/OEMDC/ADVEC/WEOORLD>

¹⁷ The UN gives CO₂ potential of exports per capita; population data was used to extrapolate absolute emissions. Outliers in the UN data compared with the data derived here are primarily countries with major oil refinery industries, suggesting the UN data only includes primary oil exports. The UN data is also incomplete, missing key exporters such as Iran.

The database was used for descriptive analysis of fossil fuel extraction and export in terms of CO2 potential. Analysis included breakdowns by fuel type and by share of country group total, and per capita, per GDP and per export value.

ON PRIMARY AND SECONDARY OIL EXPORTS

Australia exports large amounts of coal and gas but relatively small amounts of oil. However, as shown below, most world fossil fuel exports are oil.

Care is needed with data on oil exports. Crude oil and other extracted hydrocarbons must generally be processed before use. The IEA provides separate data for 'primary' oil or as extracted and 'secondary' oil or as refined into products for use. Countries may do any of the following for different kinds of oil and in different markets:

- extract and export primary oil;
- extract primary oil, refine it and export refined product;
- extract, refine and consume domestically;
- import primary oil to refine and consume; or
- import primary oil to export refined product.

Refined oil is here excluded from analysis of *produced* or *extracted* fossil fuels. But taking this approach to exports would provide incomplete data.

As shown below, many oil extracting countries refine oil and export refined products alongside primary oil products, including Russia, Saudi Arabia, USA and Iraq. Focusing on primary oil exports and ignoring refined exports would ignore some of the oil extracted and exported from these countries.

For this reason, the analysis of *exported* fossil fuel CO2 potential here includes the separate data for primary and secondary oil. This approach avoids excluding oil that extracted and refined in the same country.

It also counts some oil flow as both primary export from one country and secondary export from another, via refineries in the latter country. Many countries import primary oil, refine it, and then export it. Singapore and the Netherlands are clear examples.

The approach is appropriate for the present purposes. Refineries are an essential part of the oil supply chain, in both extracting and intermediary countries. Including refined export data best reflects this role. However, it is important to note the export figures do not sum to a figure for 'total export consumption'.

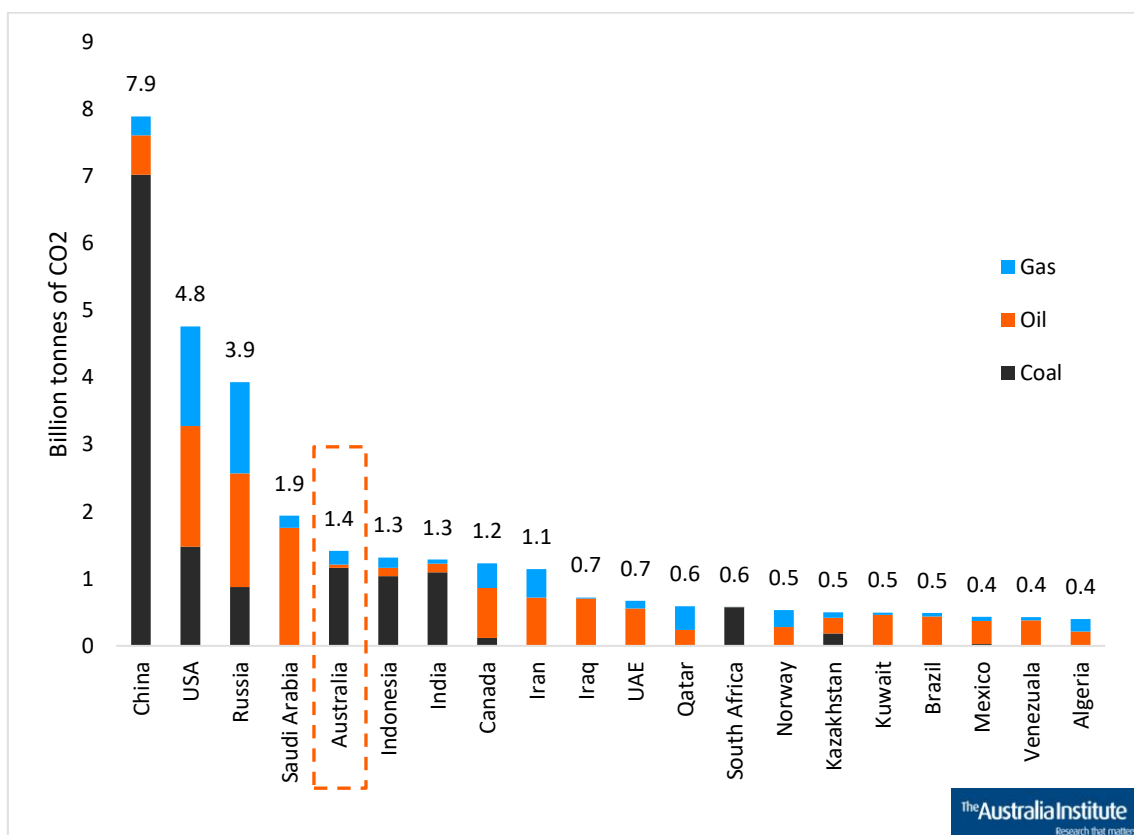
Australia: the world's fifth biggest miner of fossil fuels

Australia may be the 14th biggest emitter, but in terms of total fossil fuels mined, Australia's carbon footprint is far bigger.

The CO2 footprint of Australia's total fossil fuel production is exports is 1.4 billion tonnes (as of 2017).

This makes Australia the fifth biggest miner of fossil fuel carbon in the world.

Figure 6: World's biggest fossil fuel mining countries, by CO2 potential

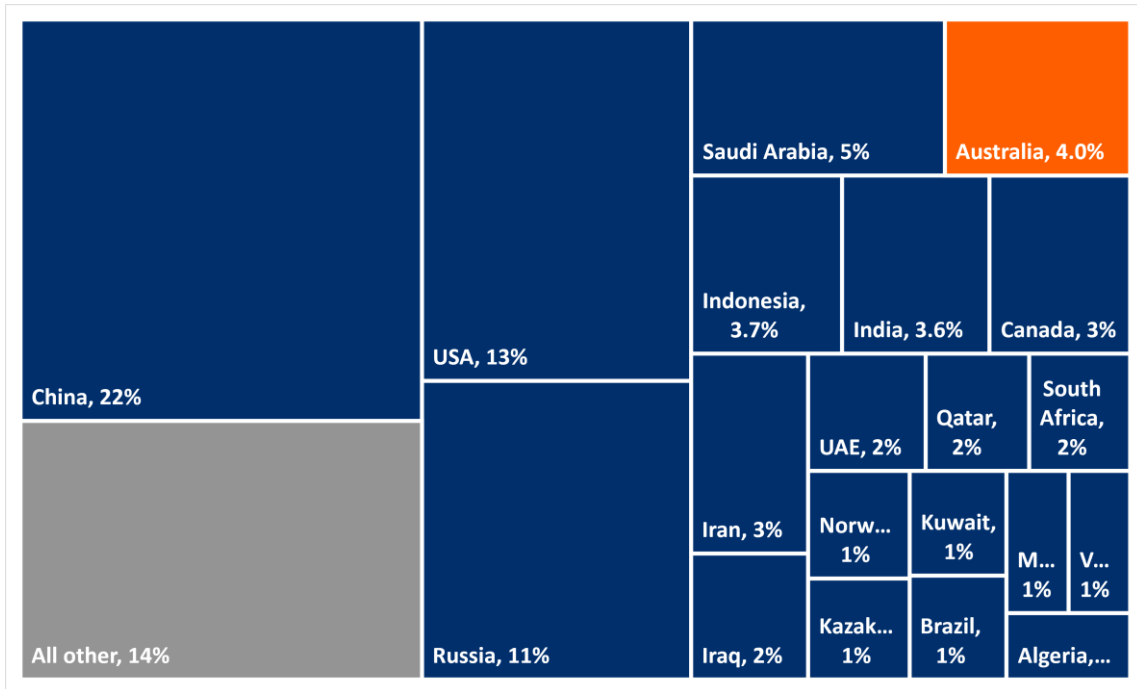


Source: IEA (2018) *World Energy Balances*; IPCC (2006) *IPCC Guidelines*, as described in text

Figure 6 shows that Australia's CO2 extraction is behind only China, USA, Russia and Saudi Arabia. It is ahead of Indonesia and India and far ahead of Iran, Iraq and Qatar.

Australia has 0.3% of the world population, but mines 4% of the world's fossil fuel CO2.

Figure 7: World’s biggest fossil fuel mining countries, by CO2 potential



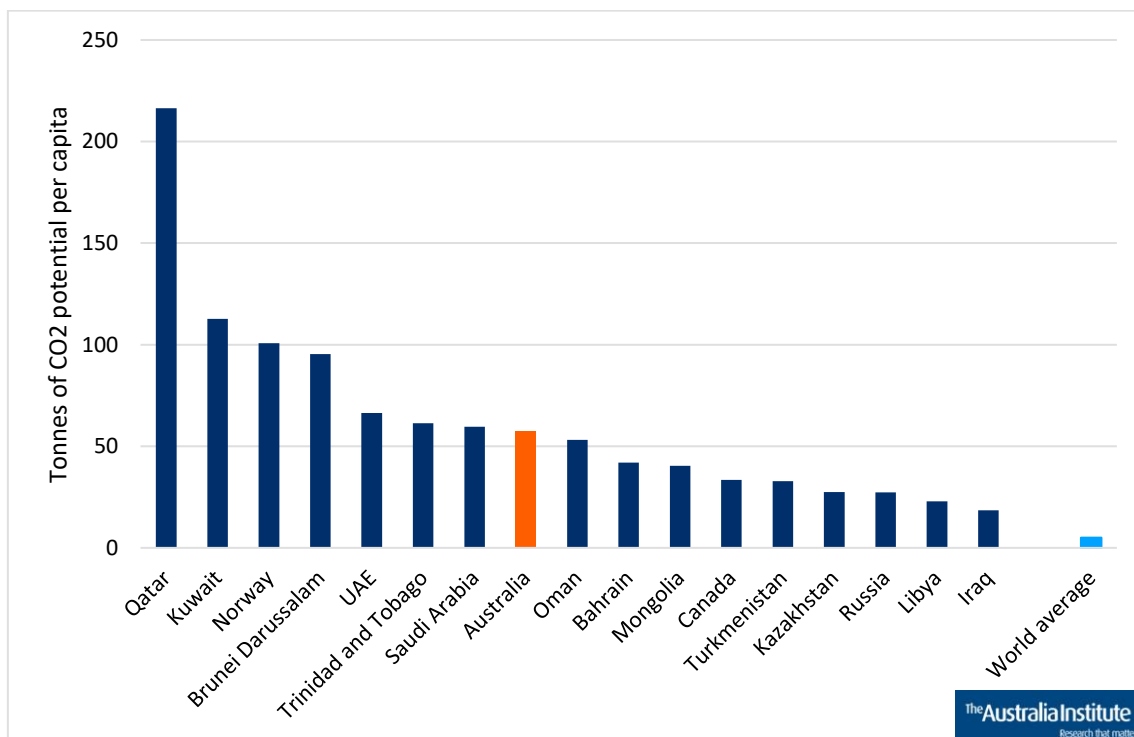
Source: IEA (2018) *World Energy Balances*; IPCC (2006) *IPCC Guidelines*, as described in text

CO2 MINED PER CAPITA

For every Australian, companies operating in Australia mine 57 tonnes of fossil fuel CO2 per year. That is ten times more than the world average.

To help put that in context, annual CO2 potential from Australian fossil fuel production weighs about the same as 100 cows or 35 mid-size cars per Australian.

Figure 8: OECD’s biggest fossil fuel mining countries, by CO2 potential per capita



Source: IEA (2018) *World Energy Balances*; IPCC (2006) *IPCC Guidelines*; World Bank (2017) *Population – 2016*; as described in text

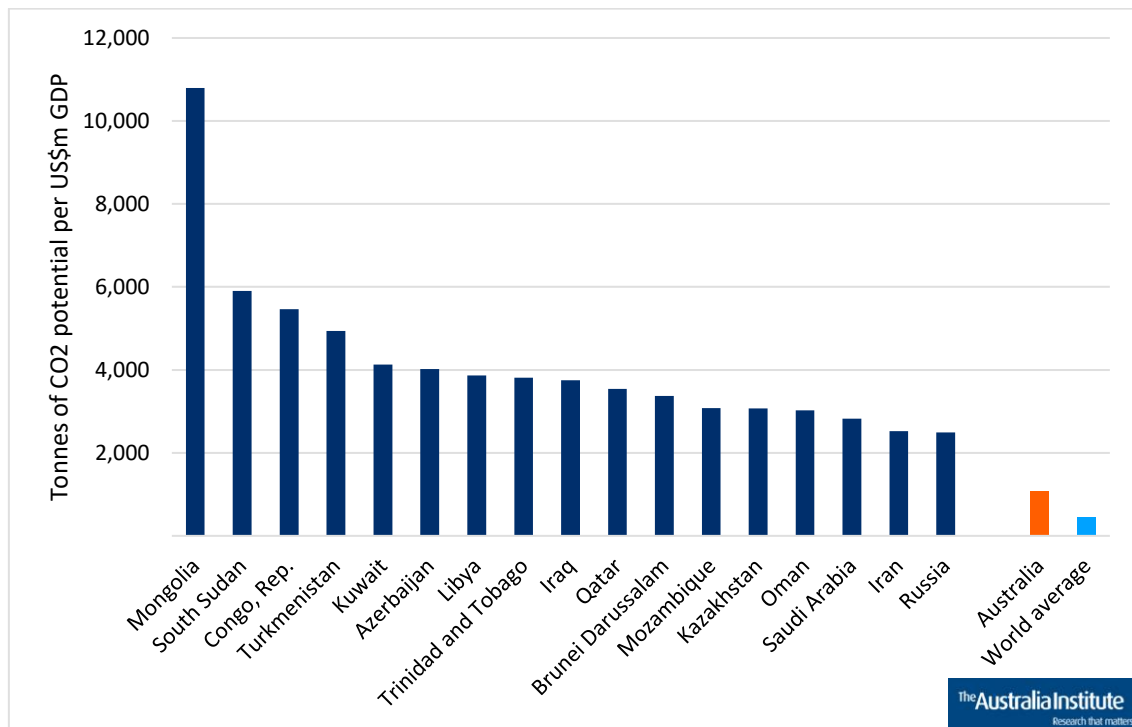
Per capita, Australia is the eighth most fossil fuel intensive country. Australia comes in behind only major oil countries, many with much smaller populations. Among medium sized countries (population 20 million or higher) Australia is second, just after Saudi Arabia.

The only OECD country that mines more fossil fuels per capita is Norway which, like many oil intensive countries, has a smaller population than Australia.

CO2 MINED PER GDP

Australia’s fossil fuel exports have a big impact on the climate but are a modest part of Australia’s diversified, services-based economy. Australia is the eighth largest fossil fuel emissions producer per capita (Figure 8 above), yet the 29th largest emissions producer per GDP (Figure 9).

Figure 9: World’s biggest fossil fuel mining countries, by CO2 potential per \$USm GDP



Source: IEA (2018) *World Energy Balances*; IPCC (2006) *IPCC Guidelines*, as described in text

Figure 9 shows that while Australia produces more fossil fuel CO2 *per capita* than countries like Iraq, Iran, Russia and Kazakhstan, Australia’s *economy* is far less dependent on fossil fuel CO2. In other words, Australia has a much more diverse economy than these other countries. Australia has many more sources of income and employment than fossil fuels, unlike countries such as Qatar and Libya, where GDP is dominated by oil and gas production.

Despite being a massive fossil fuel producer, in absolute terms and by population, Australia’s economy is far less dependent on fossil fuel carbon than other fossil fuel dependent countries.

This reflects the diverse nature of Australia’s economy. Most Australian jobs are in services. Coal mining in Australia employs less than 0.5% of Australia’s workforce, five times less than the arts and recreation sector employs.¹⁸ Despite this diversity, Australia is unsurprisingly well above most countries with CO2 per GDP twice the world average.

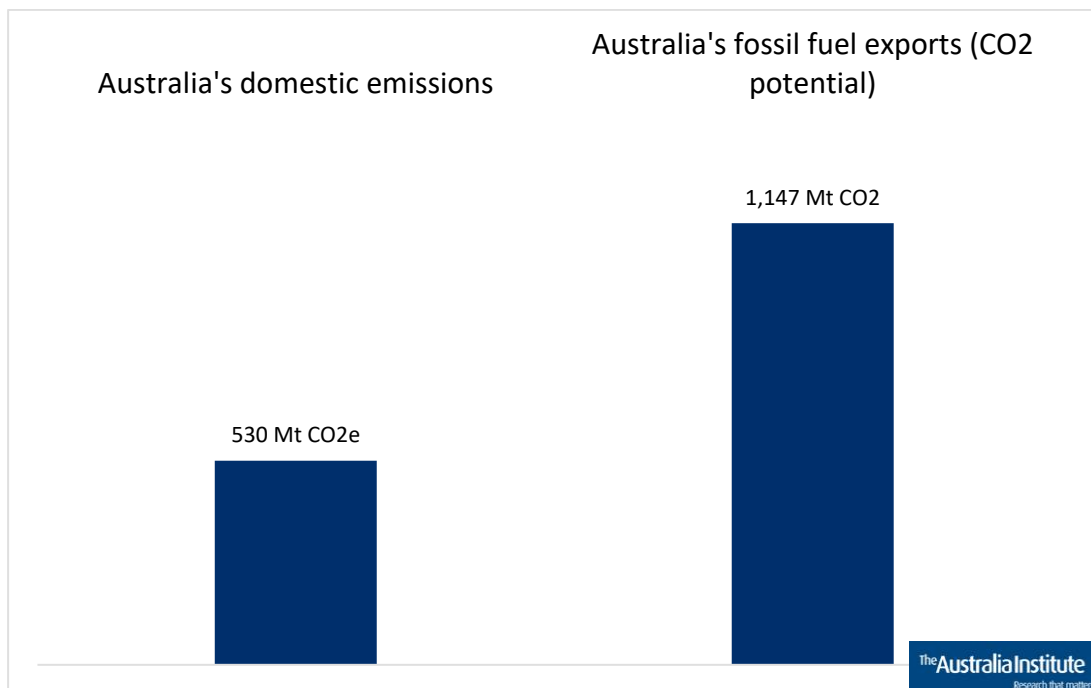
¹⁸ ABS (2019) 6291.0.55.003 - *Labour Force, Australia, Detailed, Quarterly, Feb 2019*, <https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.003Feb%202019>

Australia: the third biggest fossil fuel exporter

China and the USA both produce a large amount of fossil fuels, but with such large populations they consume much more of what they produce. Australia by contrast, produces fossil fuels well in excess of domestic consumption and most of what is produced is exported.

Australia exports fossil fuels equal to 1.1 billion tonnes of CO₂ a year. This is more than double Australia's domestic emissions, as shown in Figure 10 below:

Figure 10: Australia's domestic emissions vs fossil fuel exports

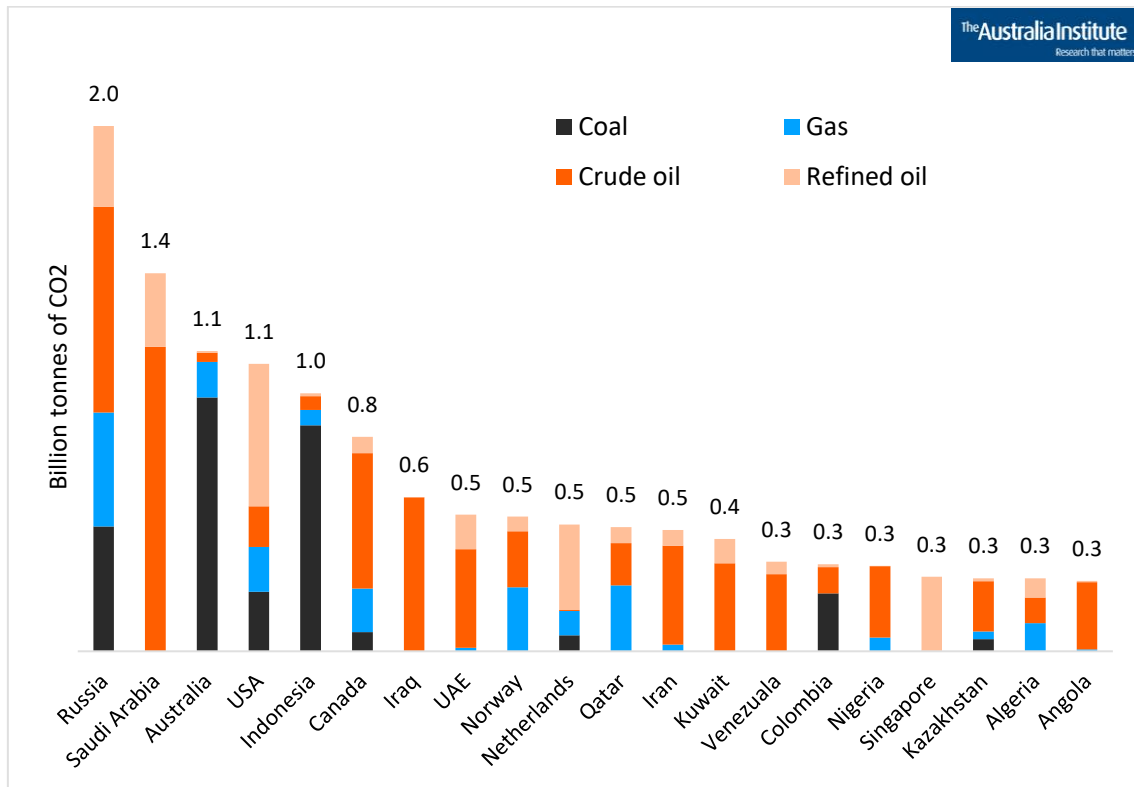


Source: IEA (2018) *World Energy Balances*; IPCC (2006) *IPCC Guidelines*, as described in text; Commonwealth of Australia (2019) *Quarterly Update of Australia's National Greenhouse Gas Inventory for September 2018*

Note the data compared above are from 2017. Both Australia's domestic emissions and its gas emissions are higher in 2019.

Compared with all other countries, Australia is third biggest fossil fuel exporter by CO₂ potential.

Figure 11: World's biggest fossil fuel exporters, CO2 Gt potential of exports



Source: IEA (2018) *World Energy Balances*; IPCC (2006) *IPCC Guidelines*, as described in text; Commonwealth of Australia (2019) *Quarterly Update of Australia's National Greenhouse Gas Inventory for September 2018*

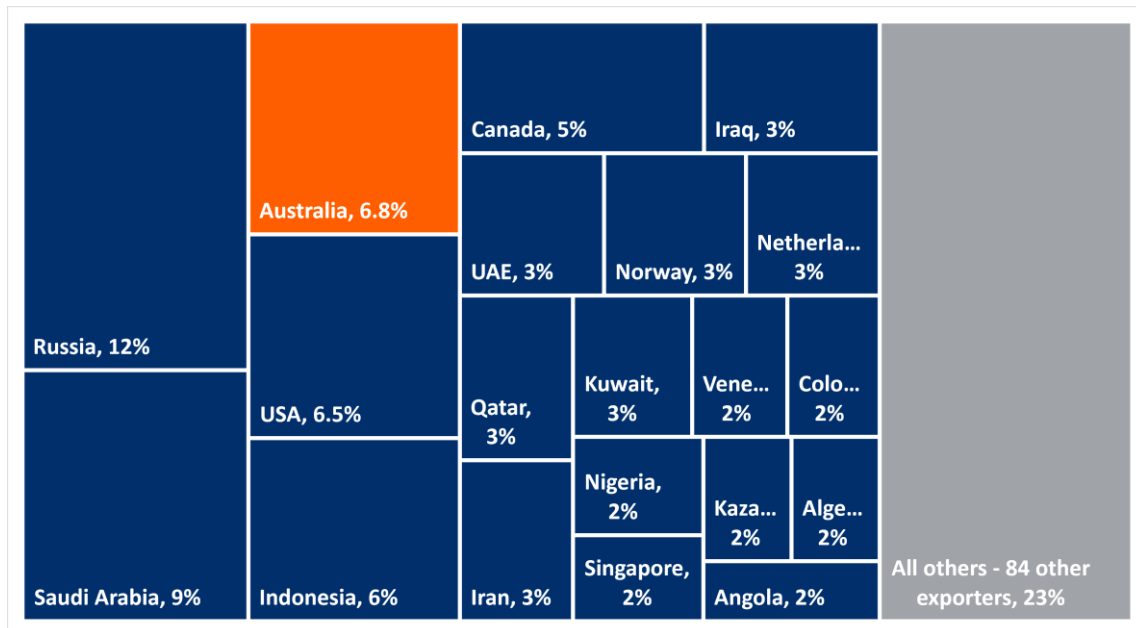
Australian fossil fuel exports come behind only Russia and Saudi Arabia.

Australian fossil fuel exports are comparable to those from the USA, despite Australia's population being 13 times smaller, its GDP 15 times smaller and its exports 8 times smaller.

Australia's fossil fuel exports are bigger than exports from Indonesia, Canada, Iraq, UAE or Qatar, and nearly four times bigger than Venezuela and Colombia.

Australia makes up 7% of global fossil fuel exports.

Figure 12: World’s biggest fossil fuel exporters, CO2 potential



Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

As discussed in the method section, the analysis here includes secondary or refined oil products and is based on the most recent complete IEA datasets for each fuel from the April 2019 release: 2017 for coal and gas and 2016 for oil.¹⁹

The USA has in recent years been exporting increasing amounts both refined and crude oil. Both of these increased in 2017. The USA may soon be a net exporter and may have overtaken Australia. At the same time, Australia’s gas exports have increased since 2017 and it is now the world’s largest exporter of Liquified Natural Gas (LNG). Complete data for more recent years is needed for this comparison.

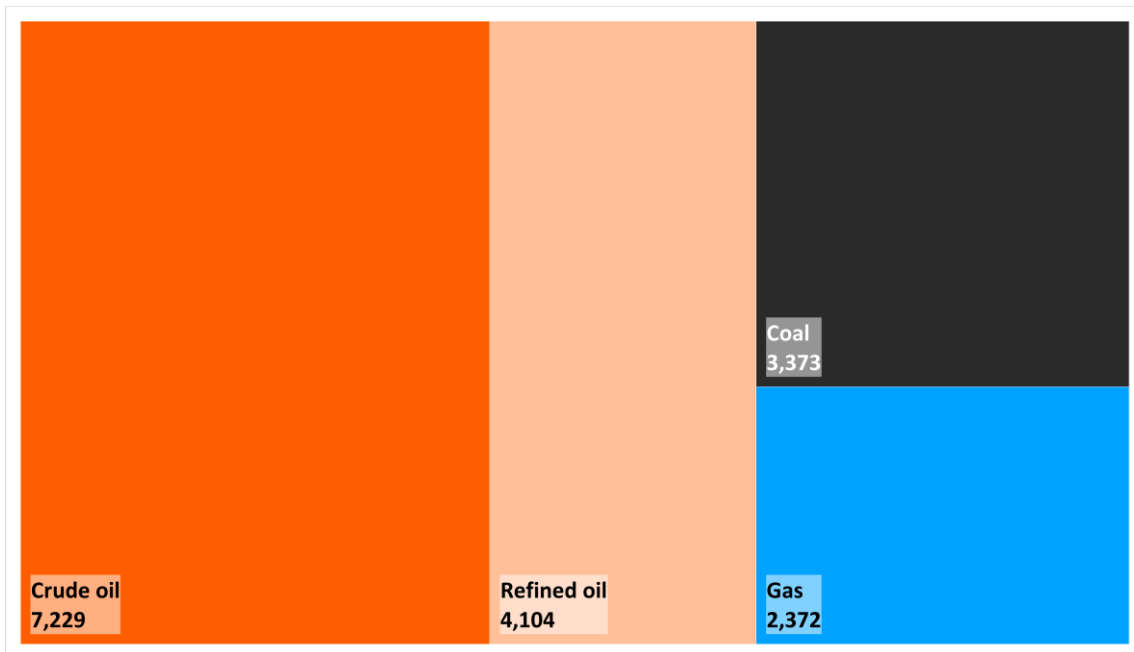
¹⁹ The analysis includes both oil products refined in the country of extraction and where imported for refining. The latter includes the USA, the Netherlands and Singapore. Excluding secondary oil sees these countries all fall much further down the list. The USA is unique among these countries: it is at the same time a major producer, a major exporter and a major importer of different forms of oil.

COMPARISON OF FUELS

Australia is unusual among fossil fuel exporting countries because Australia's exports are dominated by coal and gas. Globally, fossil fuel exports globally are dominated by oil – crude oil exports alone exceed both coal and gas.

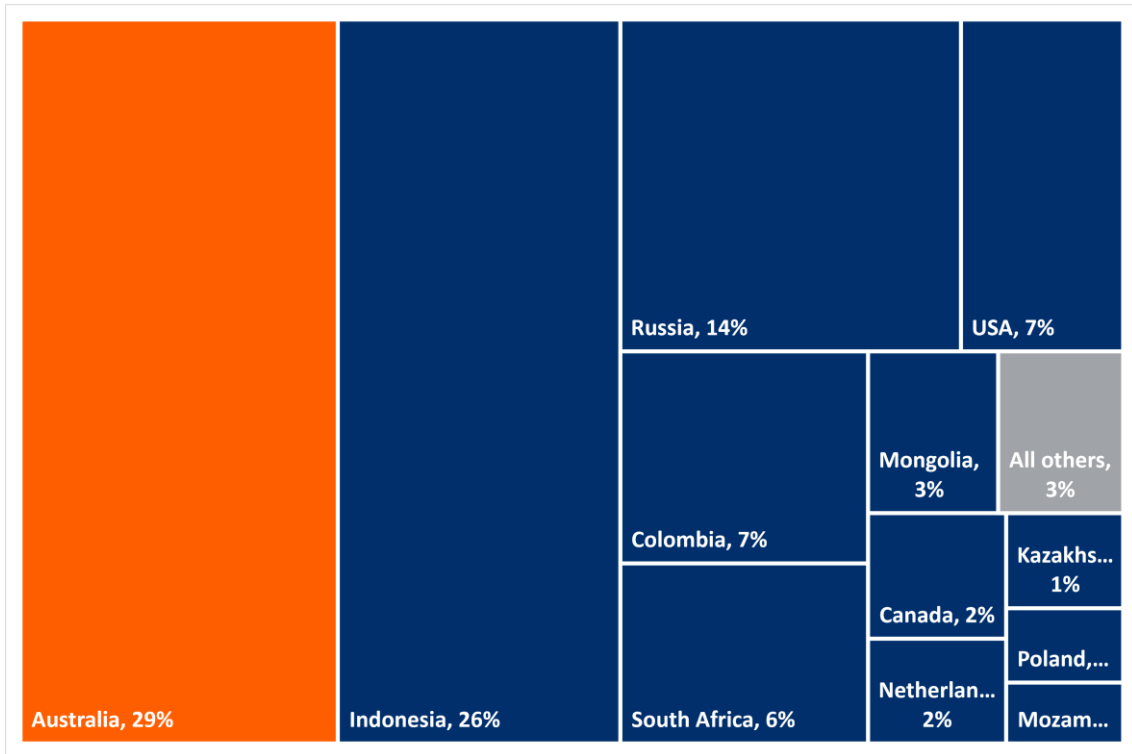
Australia is the world's largest coal exporter, responsible for more than a quarter (29%) of world trade.

Figure 13: Global fossil fuel exports by fuel (Mt CO2 potential)



Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

Figure 14: Share of global coal exports

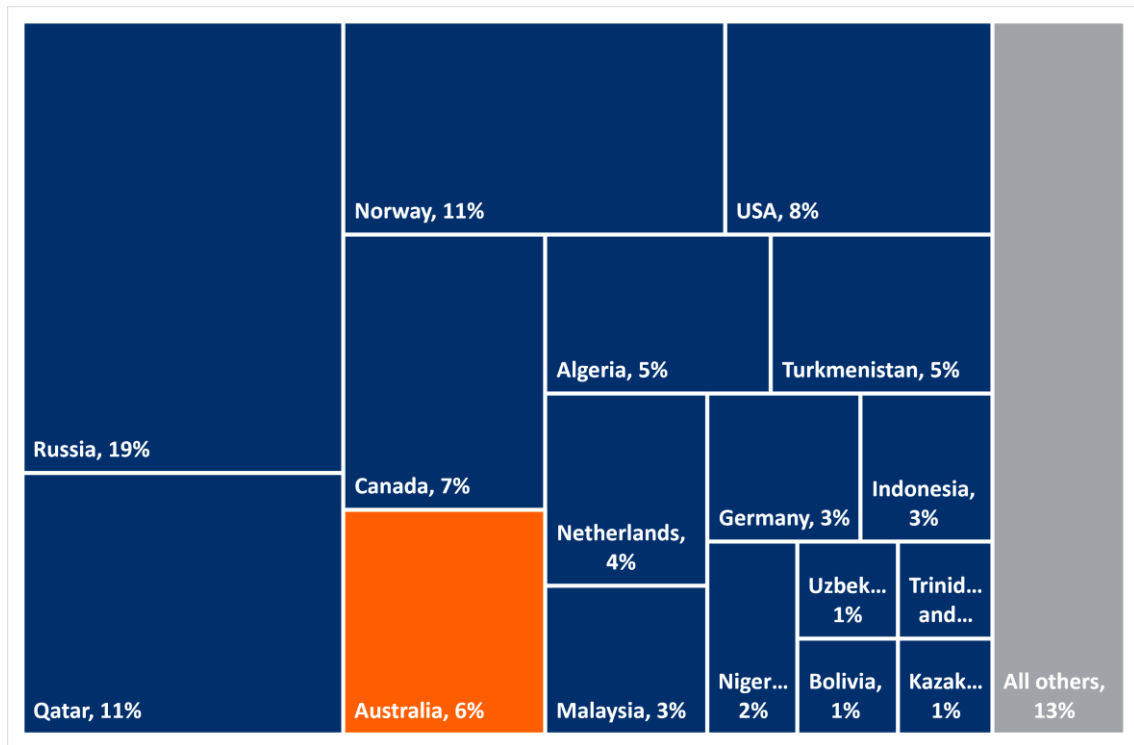


Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

On the 2017 data, Australia is the sixth biggest gas exporter in the world. Other gas producing countries, like Russia, use pipelines to export gas. Australia’s gas exports are LNG. As noted, Australia’s LNG exports have increased since 2017. Australia’s LNG exports overtook Qatar’s in late 2018, making Australia the world’s biggest LNG exporter.²⁰

²⁰ Jaganathan (2018) *Australia grabs world's biggest LNG exporter crown from Qatar in Nov*, <https://www.reuters.com/article/us-australia-qatar-lng/australia-grabs-worlds-biggest-lng-exporter-crown-from-qatar-in-nov-idUSKBN1O907N>

Figure 15: Share of global gas exports



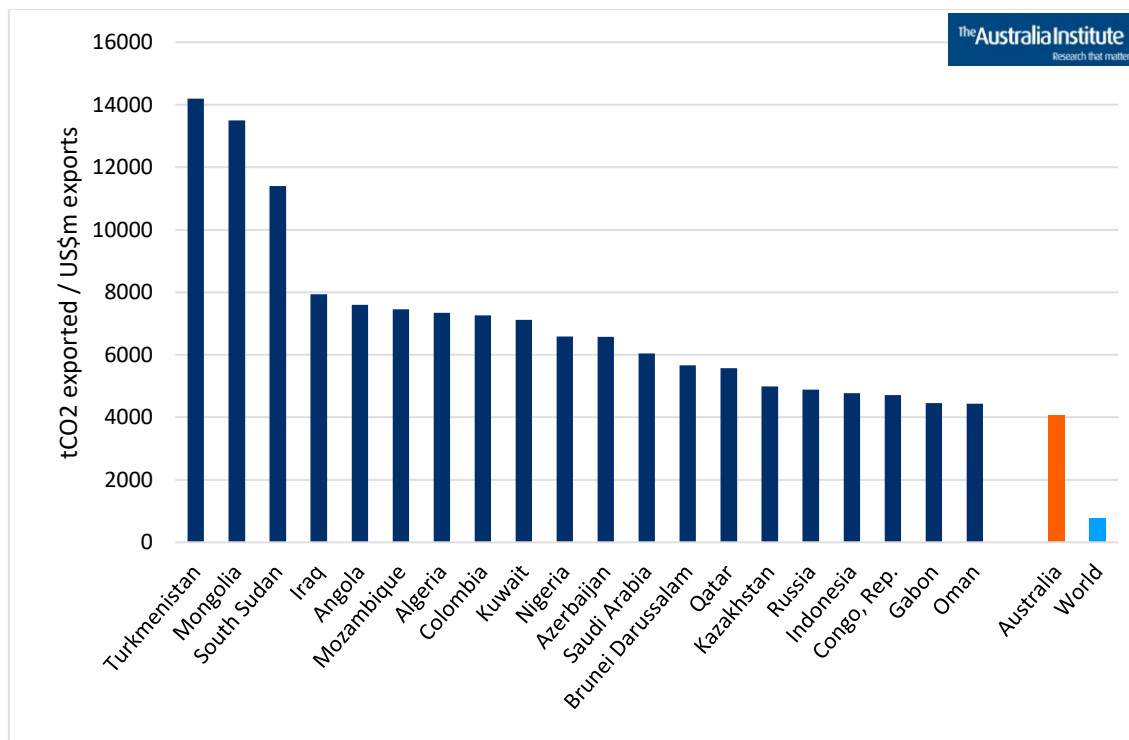
Source: IEA (2019) *World energy balances*

CO2 EXPORTED PER OVERALL EXPORT VALUE

Australia’s exports of fossil fuels are enormous by global standards, but Australia is far less economically reliant on fossil fuel exports than other exporting countries.

The following figures show CO2 exported per value of all exports, and per GDP.

Figure 16: Fossil fuel intensity of exports (tCO2 exported / US\$m exports)



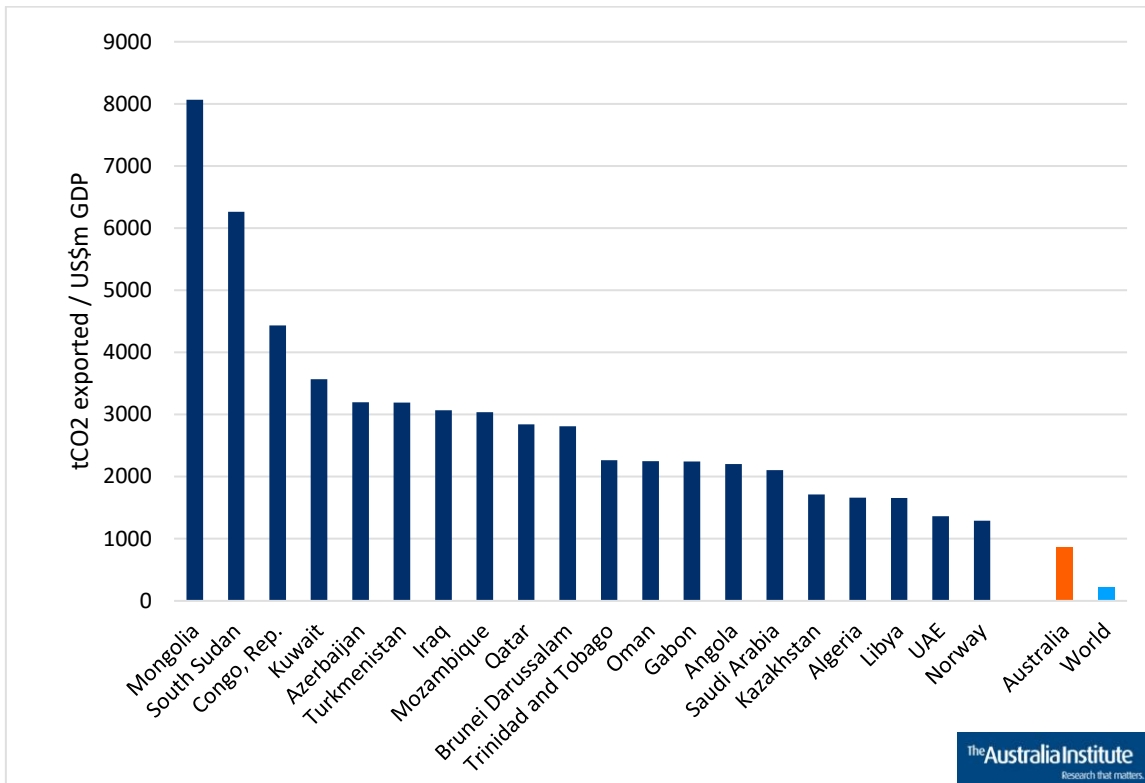
Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*; World Bank (2019) *World Bank Open Data*, as described in text

Despite being the third biggest fossil fuel exporter globally, Australia’s economy is less dominated by those exports than many other exporting economies.

Relative to exports overall, Australia is the 24th biggest fossil fuel exporter. Australia exports far more than Mongolia, Iraq, and Mozambique, but Australian exports overall are half as fossil fuel intensive as exports from these countries.

Similarly, relative to GDP, Australia’s economy is the 27th biggest fossil fuel exporter.

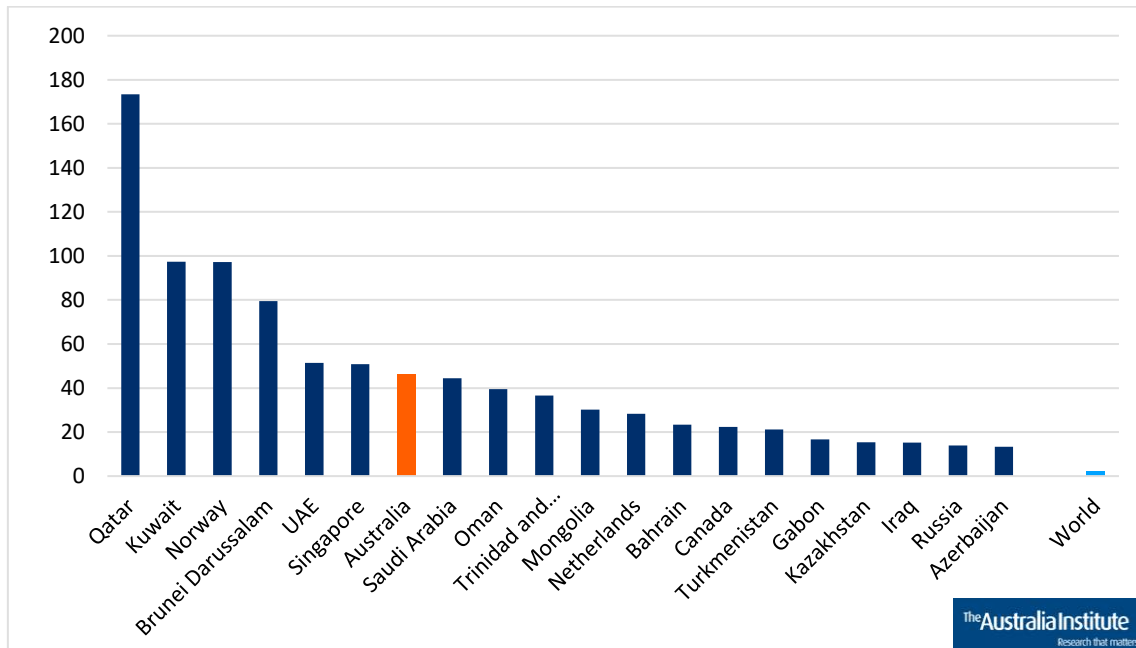
Figure 17: Fossil fuel export intensity of GDP (tCO2 exported / US\$m GDP)



Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*; World Bank (2019) *World Bank Open Data*, as described in text

These results are even more striking because Australia is the seventh biggest fossil fuel exporter per capita.

Figure 18: Fossil fuel exports per capita (tCO2 exported per capita)



Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*; IMF (2019) *IMFDataMapper*, as described in text

Again, despite very high per capita exported emissions, those exports play a far smaller role in Australia’s economy than they do for many other exporting nations.

Australia and friends

Australia is a huge fossil fuel exporter by world standards, but even bigger in the context of country groups that it is a member of: the OECD, the G20 and the Commonwealth.

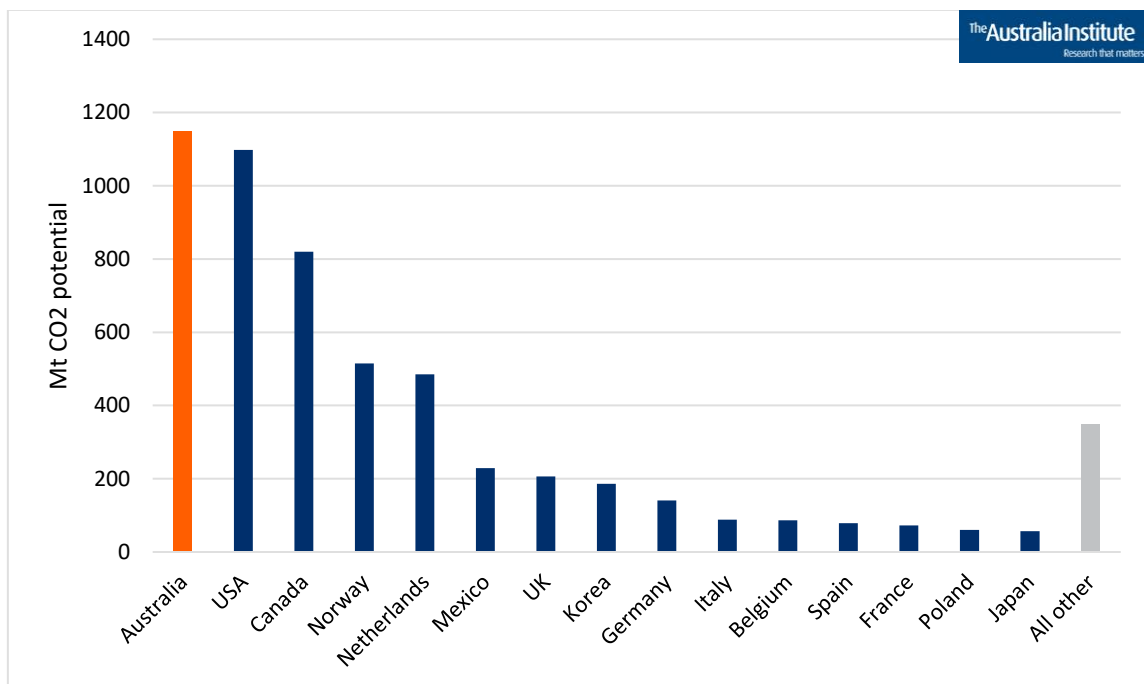
IN THE OECD

Australia is the biggest fossil fuel exporter in the OECD, just ahead of the USA.

Australia's fossil fuel exports make up 20% of OECD exports.

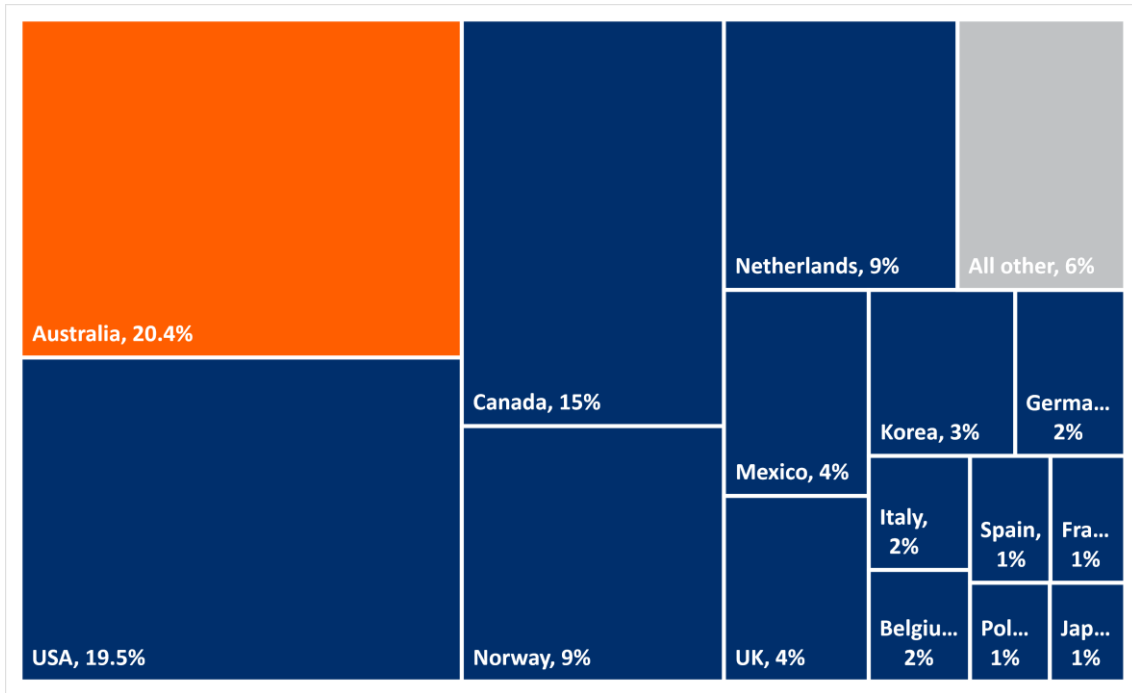
In per capita terms, Australia is the second biggest producer and exporter of fossil fuels in the OECD. The US is the twelfth largest exporter per capita, and the fourth largest producer per capita. Norway is the largest, due to nearly all its substantial oil production being exported, and its small population.

Figure 19: OECD fossil fuel exports (Mt CO2 potential)



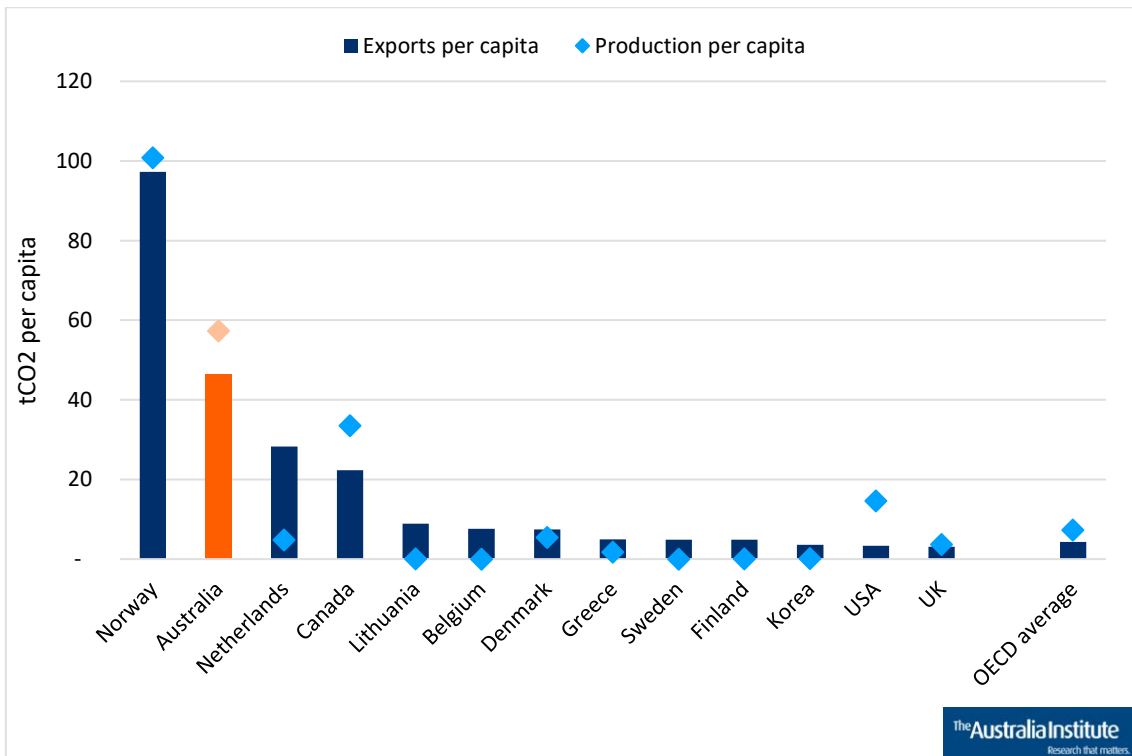
Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*

Figure 20: OECD fossil fuel exports, share of total



Source: IEA (2019) *World energy balances*, IPCC (2006) *Guidelines*, as described in text

Figure 21: OECD fossil fuel exports, share of total



Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*; IMF (2019) *IMFDataMapper*, as described in text

IN THE G20

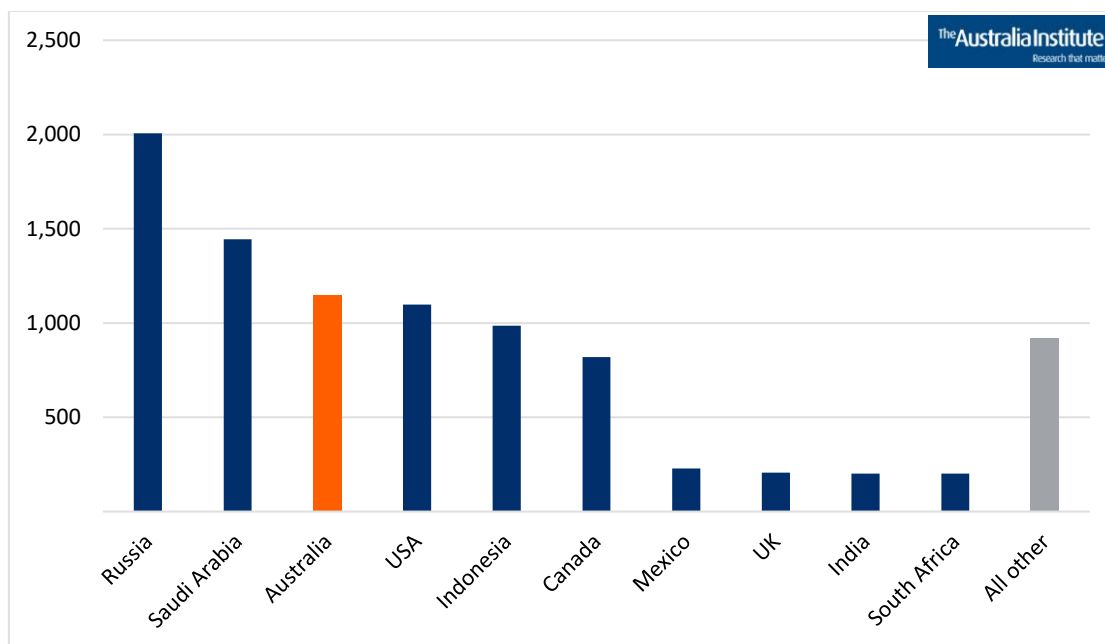
The Group of 20 (G20) includes the governments of nineteen countries, which together make up around 85% all of world economic activity (measured by GDP) and two thirds of the world's population.²¹ (Note it also includes the EU – here excluded.)

Australia makes up 12% of G20 fossil fuel exports.

The G20 includes the largest exporters, but leaves out many smaller countries with substantial exports. As a result, Australia's fossil fuel production and exports are a bigger share of the G20 than they are of the global total.

Australia ranks third in the G20, the same place it ranks in the world overall. G20 members Russia and Saudi Arabia are larger exporters than Australia.

Figure 22: G20 country fossil fuel exports – Mt CO2 potential



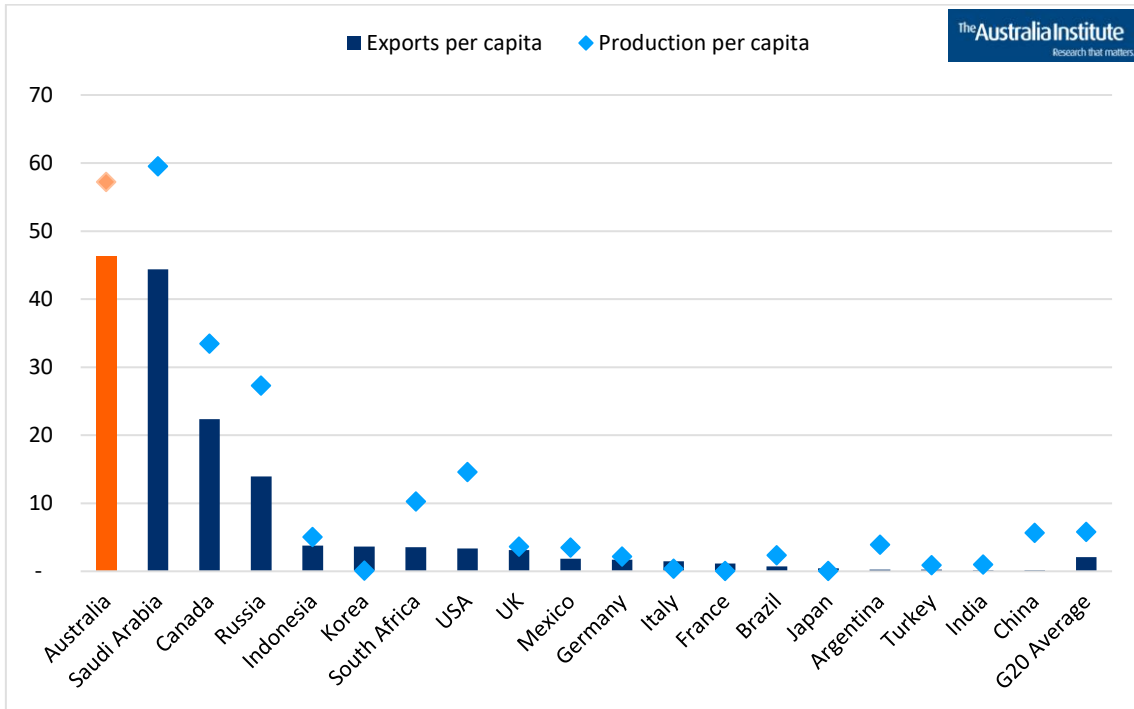
Source: IEA (2019) *World energy balances*, IPCC (2006) *Guidelines*, as described in text

In terms of fossil fuel production in the G20, Australia makes up 5% of G20 fossil fuel production. It comes in at fifth place, as it does globally.

In per capita terms, Australia is the largest exporter of fossil fuels in the G20, just ahead of Saudi Arabia, and the second largest producer of fossil fuels, just behind Saudi Arabia.

²¹ DFAT (2019) *The G20*, <https://dfat.gov.au/trade/organisations/g20/Pages/g20.aspx>

Figure 23: G20 country fossil fuel exports – Mt CO2 potential per capita

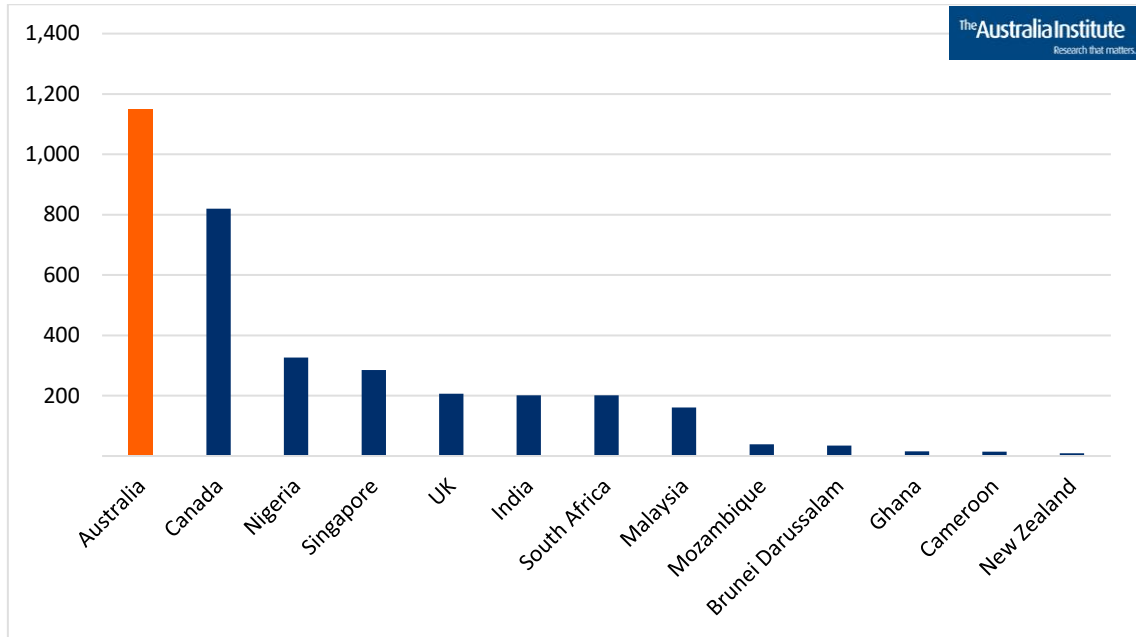


Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*; IMF (2019) *IMFDataMapper*, as described in text

IN THE COMMONWEALTH

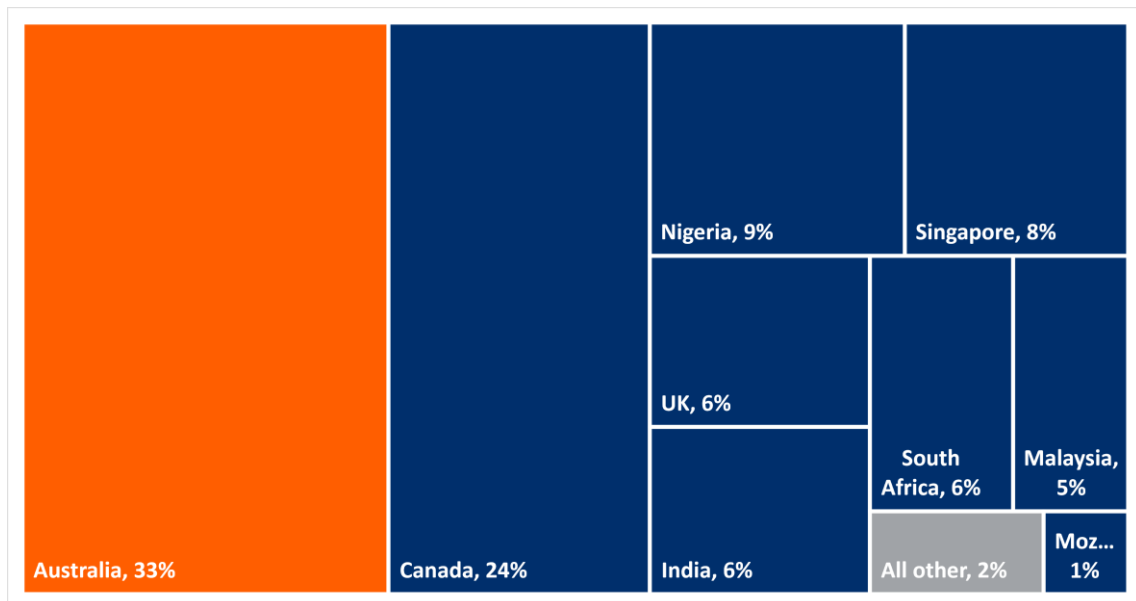
Australia is the biggest fossil fuel producer and exporter in the Commonwealth of Nations, responsible for 33% of Commonwealth fossil fuel exports. Australia is a bigger exporter than Canada.

Figure 24: Commonwealth country fossil fuel exports – Mt CO2 potential



Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

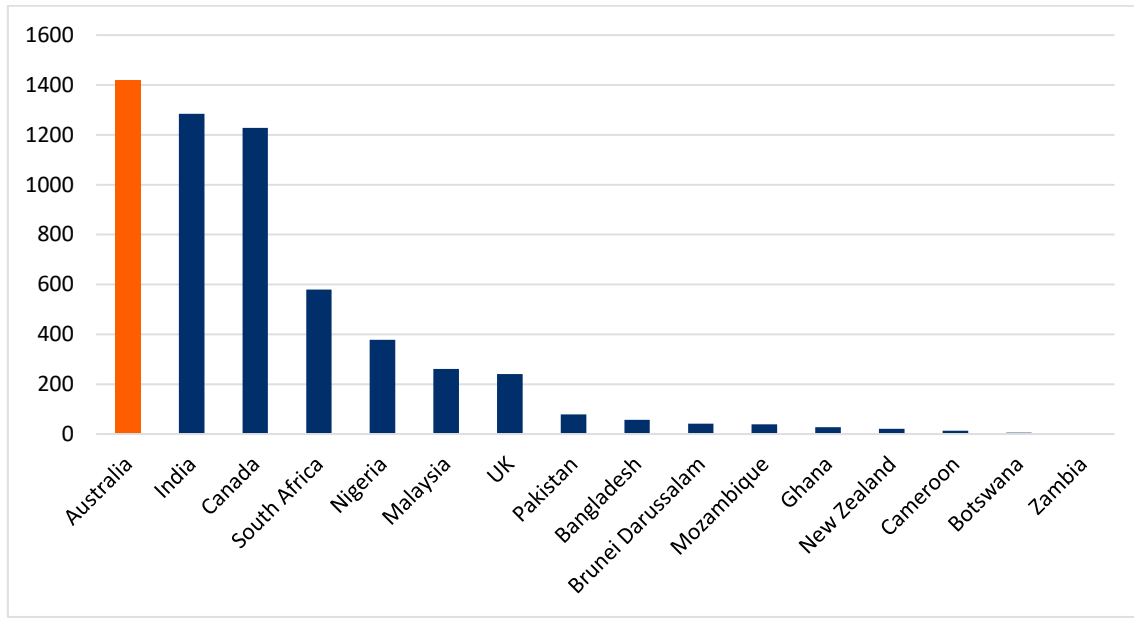
Figure 25: Commonwealth country fossil fuel exports – share of Mt CO2 potential



Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*; IMF (2019) *IMFDataMapper*, as described in text

Australia is also the largest producer of fossil fuels in the Commonwealth, producing 25%, more than India (23%) or Canada (22%).

Figure 26: Commonwealth country fossil fuel production – Mt CO2 potential

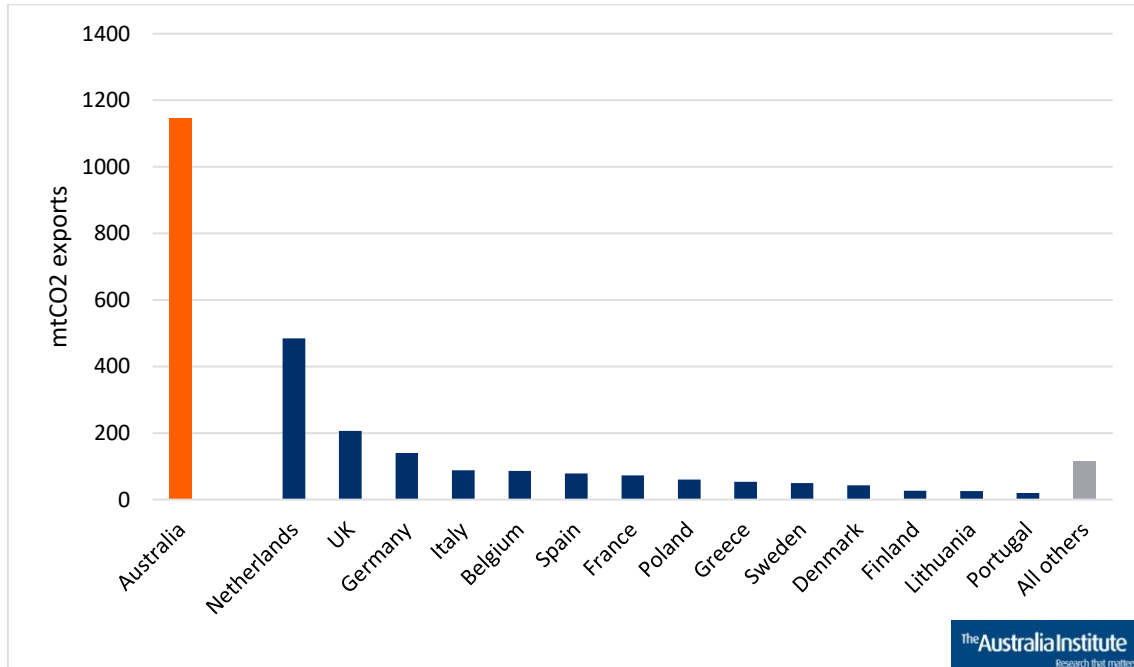


Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

VS EU

Australia fossil fuel exports are more than double any country in the European Union.²²

Figure 27: Australia vs EU country fossil fuel exports – Mt CO2 potential



Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

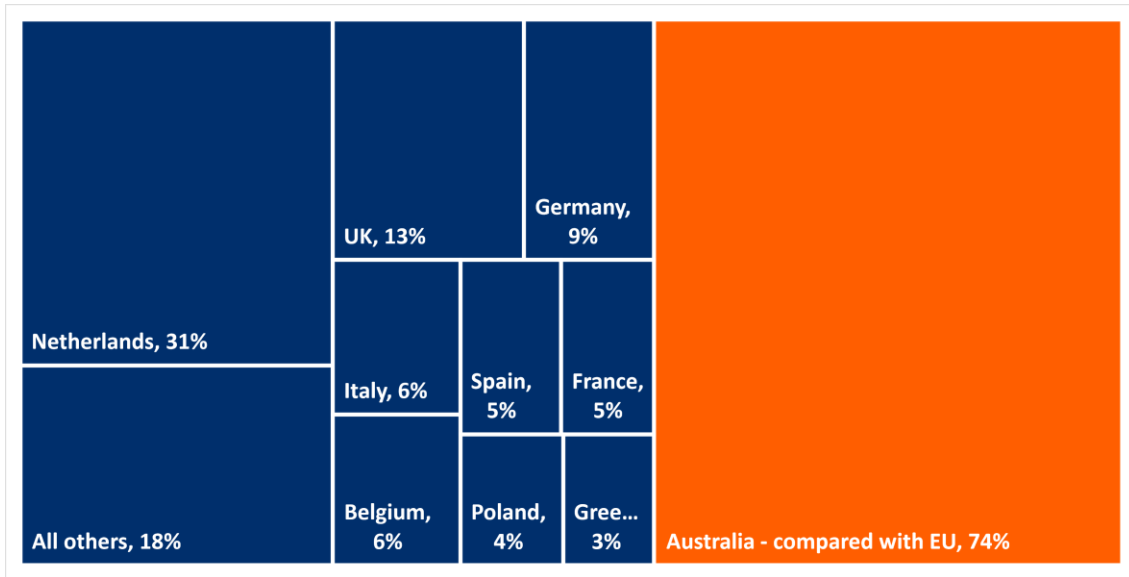
Australia's fossil fuel CO2 exports are 2.4 times bigger than the Netherlands', 5.6 times bigger than Germany's, and 8.2 times bigger than Germany's.

Australia's fossil fuel exports contain CO2 potential of 74% of the fossil fuel exports of the entire EU.

The EU has a population more than 20 times bigger than Australia and a combined GDP 13 times bigger than Australia's. Yet EU countries export only 1.35 times as much CO2 as Australia.

²² These figures include exports between countries within EU; they are not restricted to EU country exports out of the EU.

Figure 28: Australia vs EU country fossil fuel exports – Mt CO2 potential

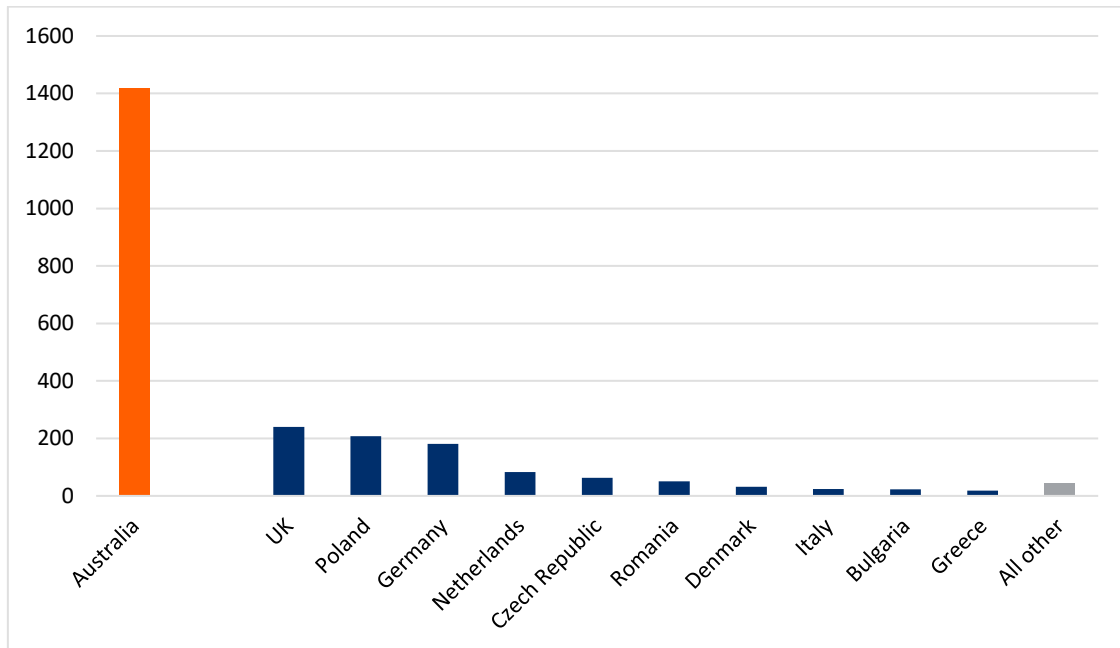


Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

The reason for this is that EU countries are not major fossil fuel producers, importing most of their consumption.

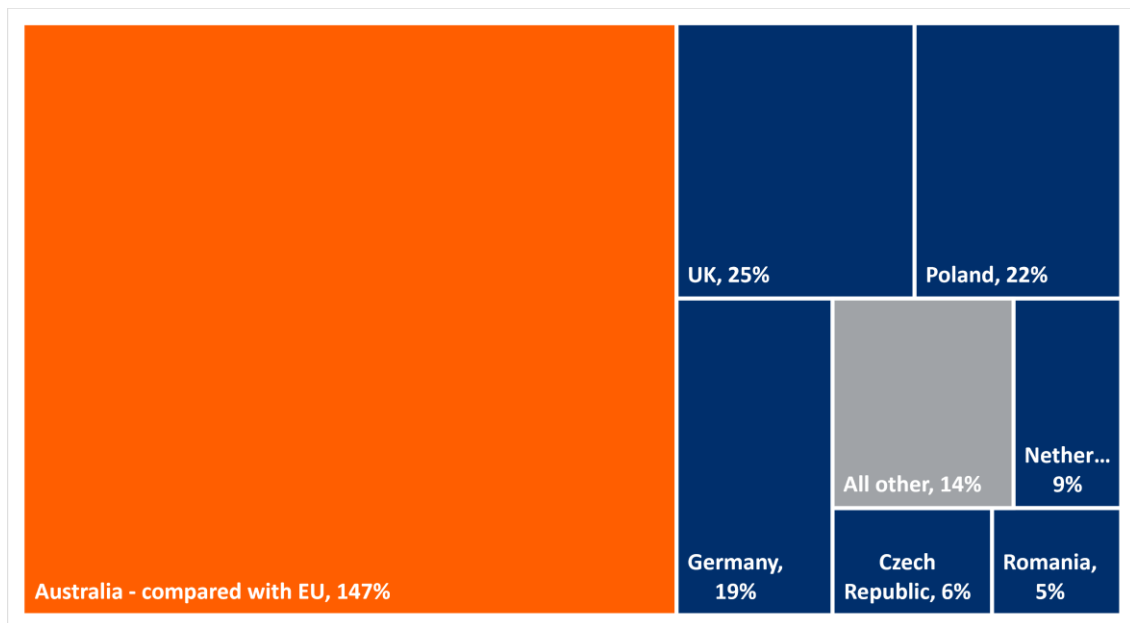
By production, the contrast is even greater. One and a half times as much fossil fuels, by CO2 potential, are mined in Australia as are mined in all the EU put together. Even countries like Poland and Germany, with substantial coal power sectors and high-profile debates about transition, mine far smaller volumes of fossil fuels.

Figure 29: Australia vs EU country fossil fuel production - Mt CO2 potential



Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

Figure 30: Australia vs EU country fossil fuel production – share of Mt CO2 potential



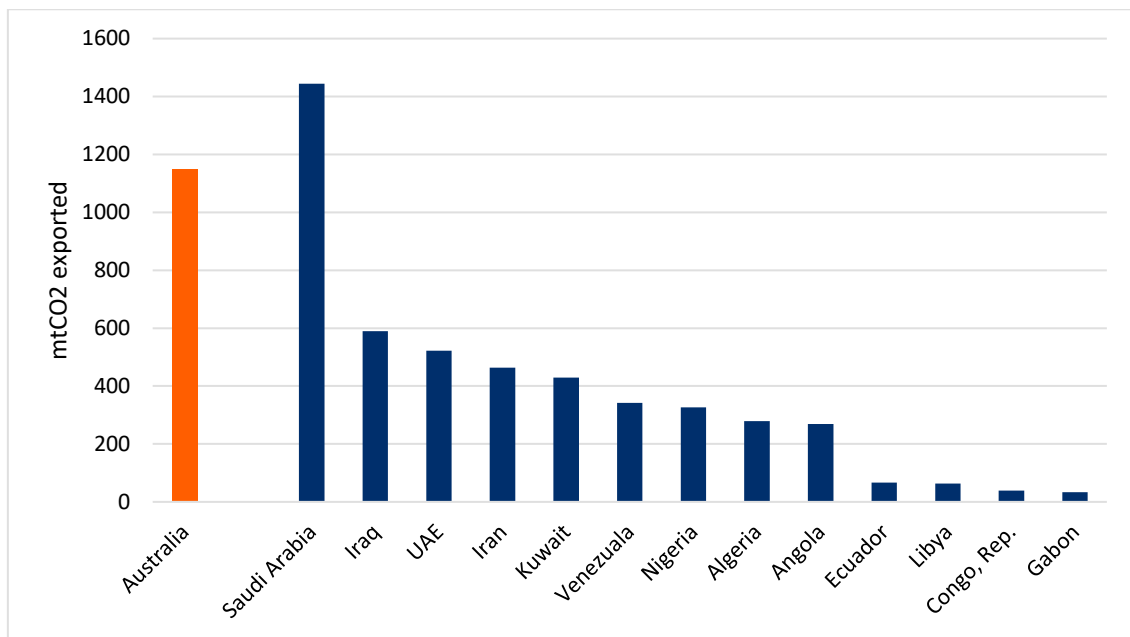
Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

EU countries are bigger exporters than they are producers, because many EU countries import crude, refine it and export it, especially to other EU countries. Around two thirds of EU country fossil fuel exports (by CO2 potential) are refined oil products. A third of the EU's refined oil exports come out of the Netherlands.

VS OPEC

If Australia was in OPEC, it would have the second biggest carbon exports, behind only Saudi Arabia. Australia's CO₂ exports are twice as big as Iraq's, the second biggest OPEC exporter.

Figure 31: Australia vs OPEC country fossil fuel exports – Mt CO₂ potential

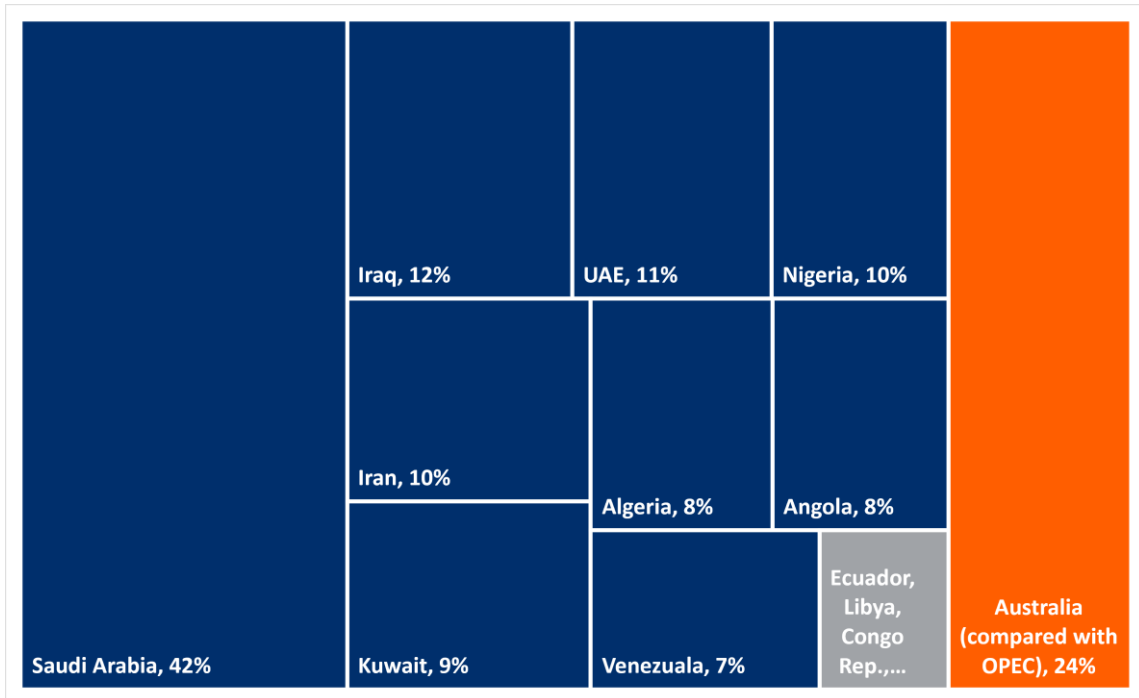


Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

Australia's carbon exports are 24% of the carbon exports from the 13 OPEC countries.²³

²³ NB: Equatorial Guinea is also an OPEC country with small exports by comparison to most OPEC countries. It is excluded as its IEA data is unavailable.

Figure 32: Australia vs OPEC country fossil fuel exports – share of Mt CO2 potential



Source: IEA (2019) *World energy balances*; IPCC (2006) *IPCC Guidelines*, as described in text

Why exports matter

For decades, climate policymakers have focused on reducing emissions within individual countries. Under UN emissions accounting, countries are responsible only for emissions from within their territory. Fossil fuels they mine and export are irrelevant.

This misses half the picture. Climate policy should cut with ‘both arms of the scissors’, addressing both fossil fuel demand *and supply*.²⁴

Basic principles of economics suggest that increasing supply of a good puts downwards pressure on the price of that good. By increasing the supply of coal, coal power becomes cheaper. This encourages increased coal consumption in both the short-term (increased generation) and in the longer term (new coal assets or delayed retirement) over other energy sources that do not cause the same harms.

Conversely, efforts to reduce consumption of fossil fuels lower prices, encouraging consumption in other markets. This can cause rebound effects that increase emissions elsewhere, as well as a ‘green paradox’ where resource owners race to exploit resources ahead of constraints on demand.

Stopping new supply puts upwards pressure on prices. It therefore secures revenue and employment in existing operations, while allowing sensible planning for the end of existing operations.

Building new high carbon assets ‘locks in’ emissions, allowing their operation at marginal costs lower than required to justify construction. Stopping new supply infrastructure stops lock-in, prevents stranded assets and redirects capital to low carbon alternatives.

Implementing and administering supply side policy costs relatively little. It is easy to stop new coalmines and to tell whether a country is building new ones.

Supply policy is easy to understand and mobilise support around. It can mobilise support both from those who would be impacted by new projects, and the owners of existing fossil fuel assets, who stand benefit from higher prices.

²⁴ This section summarises arguments in Green and Denniss (2018) *Cutting with both arms of the scissors: the economic and political case for restrictive supply-side climate policies*, <https://link.springer.com/content/pdf/10.1007%2Fs10584-018-2162-x.pdf>

Some countries and subnational jurisdictions have announced moratoria on new coal or oil production, including China and the US (both temporary and elapsed), France, New Zealand and Myanmar. There are moratoria on unconventional gas in many states of the USA and Australia.

Yet such supply side climate policy remains largely alien to official climate policy.

Words like ‘coal’ and ‘oil’ and ‘fossil fuels’ do not appear in the Paris Agreement nor in any previous treaties. There is no provision under the Paris Agreement for including supply side policies as part of Nationally Determined Contributions or ‘Paris pledges’. Indeed, there is no authoritative data set on the emissions from internationally traded fossil fuels.

On the economics of fossil fuels, official climate policy-making misses half the story – and for Australia, most of it.

MORE EXPORTS PUSH EMISSIONS DOWN?

Fossil fuel companies and most Australian politicians generally try to avoid talking about the climate implications of Australia’s exports. Pressed on the issue they have traditionally claimed either that the exports make no difference to world emissions or that they are not Australia’s responsibility.

Recently, many have changed approach. For example, the Minister for Energy and Emission Reduction welcomed rising domestic emissions from LNG exports because the gas will help countries transition away from coal.

The Australian government is now accepting the basic principle that what Australia does and does not export has an impact on world emissions. But this acceptance is selective and dubious.

Neither the government nor the gas industry have provided clear evidence as to whether and to what extent LNG is in fact displacing coal, rather than displacing other LNG producers, or renewables, or increasing overall energy consumption.

Moreover, Australian governments continue to reject responsibility for the vast scale of Australia’s exported emissions. Those arguing that LNG displaces coal have not supported a moratorium on new coal mines.

Conclusion

Australian government ministers argue Australia's emissions are small on a global scale. They use this as an excuse for delaying effective action on climate. But on any reasonable assessment of domestic emissions alone, Australia is a large emitter and Australia's emissions are rising, not falling.

Australia is in the top 10% of global emitters, and our emissions are climbing. Australia's domestic emissions are larger than forty other countries that have larger populations.

However, Australia's role in fuelling the climate crisis is far greater than even its large and rising domestic emissions would suggest.

Australia's fossil fuel industries already make it the third largest fossil fuel exporter in the world, and it plans to increase its coal and gas exports.

The Australian Parliament ratified the Paris Agreement less than a year after it was signed (a record speed for Australia's Parliament)²⁵ and the Agreement continues to have the support of most Australians.²⁶ The Paris Agreement's global goal requires countries to increase ambition over time to achieve large emissions cuts in the next decade and reach net zero emissions by mid-century. The Agreement calls on developed countries like Australia to lead the way. And Australia is well positioned to do so.

Australia's economy is far more diversified and less dominated by fossil fuels than many other major exporting countries.

Australia has the opportunity, and obligation, to face up to the climate crisis through policies to limit its carbon exports, starting with a moratorium on new coal mines.

Those in the global community making efforts to confront the climate crisis must understand the scale of Australia's fossil fuel existing exports and policies to increase Australia's fossil fuel exports even further.

²⁵ Foreign Minister Julie Bishop (2016) *Media Release – Paris Agreement Ratification*, https://foreignminister.gov.au/releases/Pages/2016/jb_mr_161110a.aspx?w=tb1CaGpkPX%2FISOK%2Bg9ZKEg%3D%3D

²⁶ Bennett (2018) *Climate of the Nation Report 2018*, <http://www.tai.org.au/content/climate-nation-2018>