



CO₂ emissions by fuel

Coal, oil, gas or flaring: where do our CO₂ emissions come from? How are emissions from these fuels changing over time?

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and [Max Roser](#)

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2020. We made minor changes to the text
in January 2024.*

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Carbon dioxide (CO₂) emissions from energy and material production can arise from various sources and fuel types: coal, oil, gas, cement production, and gas flaring.

As global and national energy systems have transitioned over centuries and decades, the contribution of different fuel sources to CO₂ emissions has changed both geographically and temporally.

In this article we look at the breakdown of CO₂ emissions by fuel type, looking at the largest emitters of the past; the largest emitters today; and how these compare when we look at per capita adjustments.

CO₂ emissions by fuel type

Coal, oil, gas, cement: where do CO₂ emissions come from?

Carbon dioxide emissions associated with energy and industrial production can come from a range of fuel types. The contribution of each of these sources has changed significantly through time and still shows large differences by region. In the chart we see the absolute and relative contribution of CO₂ emissions by source, differentiated between coal, gas, oil, flaring, and cement production.

At a global level, we see that early industrialization was dominated by the use of solid fuel.

Coal-fired power at an industrial scale was the first to emerge in Europe and North America during the 1700s. It wasn't until the late 1800s that we began to see a growth in emissions from oil and gas production. Another century passed before emissions from flaring and cement production began.

Today, solid and liquid fuels dominate, although contributions from gas production are also notable. Cement and flaring at the global level remain comparably small.

CO₂ emissions by fuel or industry type, World

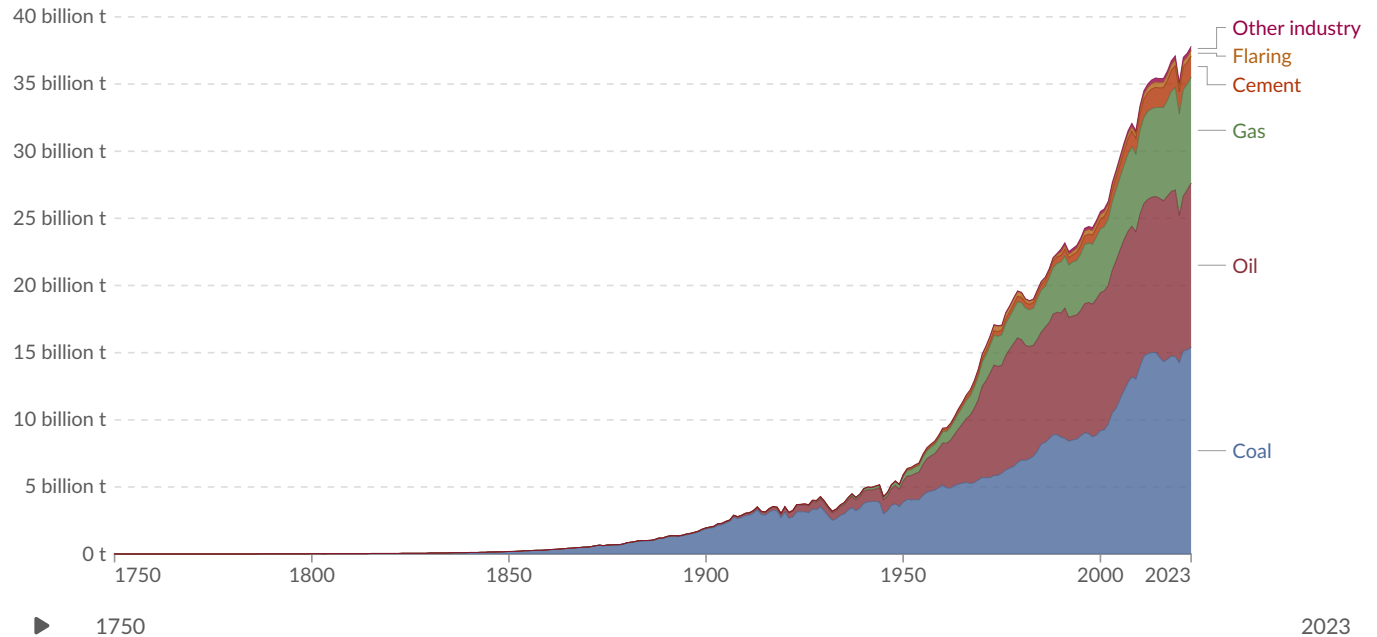
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The trends vary significantly by region. Overall patterns across Europe and North America are similar: early industrialization began through solid fuel consumption, however, through time this energy mix has diversified. Today, CO₂ emissions are spread fairly equally between coal, oil, and gas. In contrast, Latin America and the Caribbean's emissions have historically been and remain a product of liquid fuel—even in the early stages of development coal consumption was small.¹

Asia's energy remains dominant in solid fuel consumption and has notably higher cement contributions relative to other regions.²

Africa also has more notable emissions from cement and flaring; however, its key sources of emissions are a diverse mix of solid, liquid, and gas.

CO₂ emissions by fuel or industry

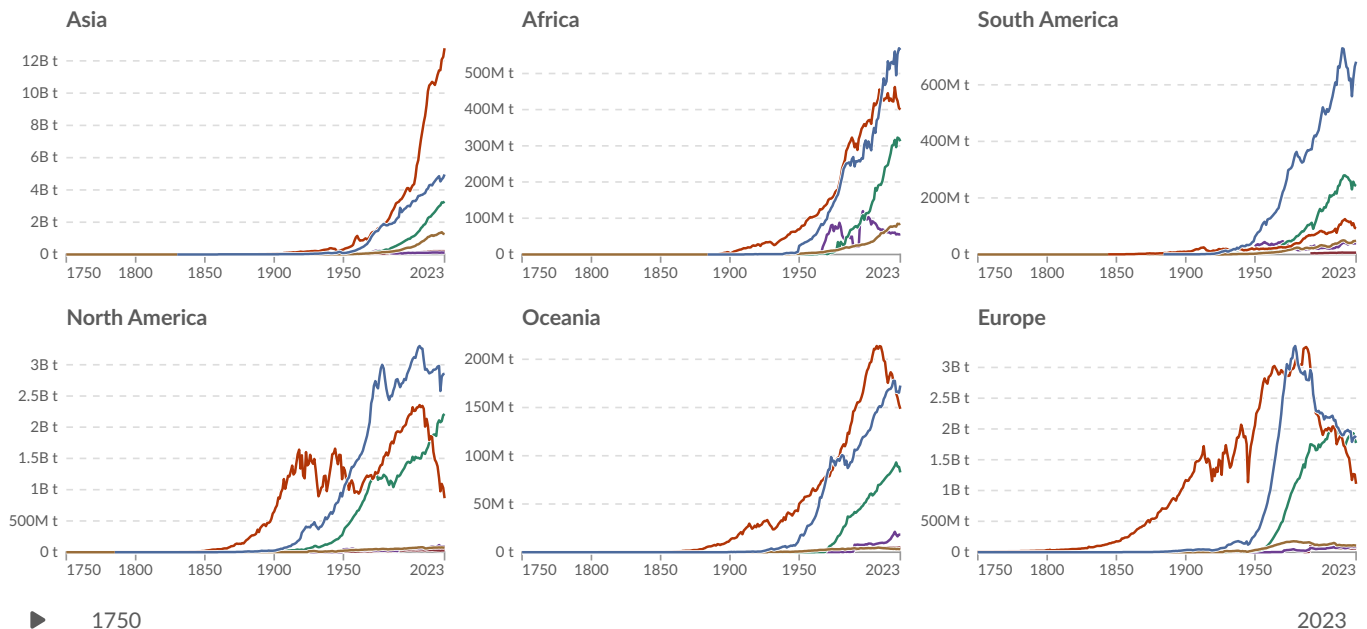
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Cement Coal Flaring Gas Oil Other industry



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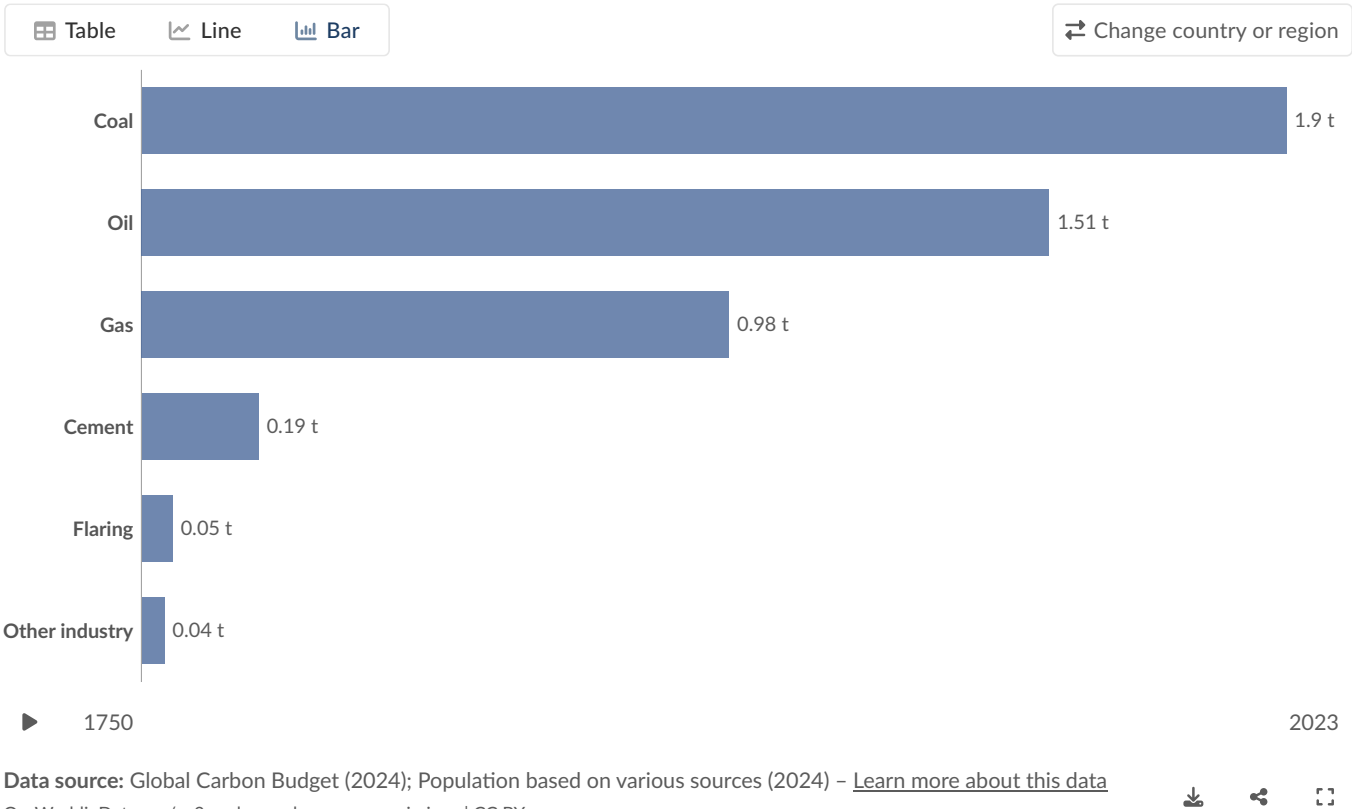
Per capita: How do coal, oil, gas, and cement emissions compare?

Total emissions from different sources – coal, oil, gas, and cement – largely reflect the population of a given country.

How do these figures compare when we look at them on a per capita basis? This chart shows per capita CO₂ emissions from coal, oil, gas, flaring, and cement, measured in tonnes of CO₂ per year.

The distribution across different fuel sources is very dependent on energy production and mix in a given country. In the US or the UK, for example, oil followed by gas are the largest contributors. In China and India, coal is much more dominant. In Russia, it's gas.

Per capita CO₂ emissions by fuel type, World, 2023



Per capita CO₂ emissions by source, 2019

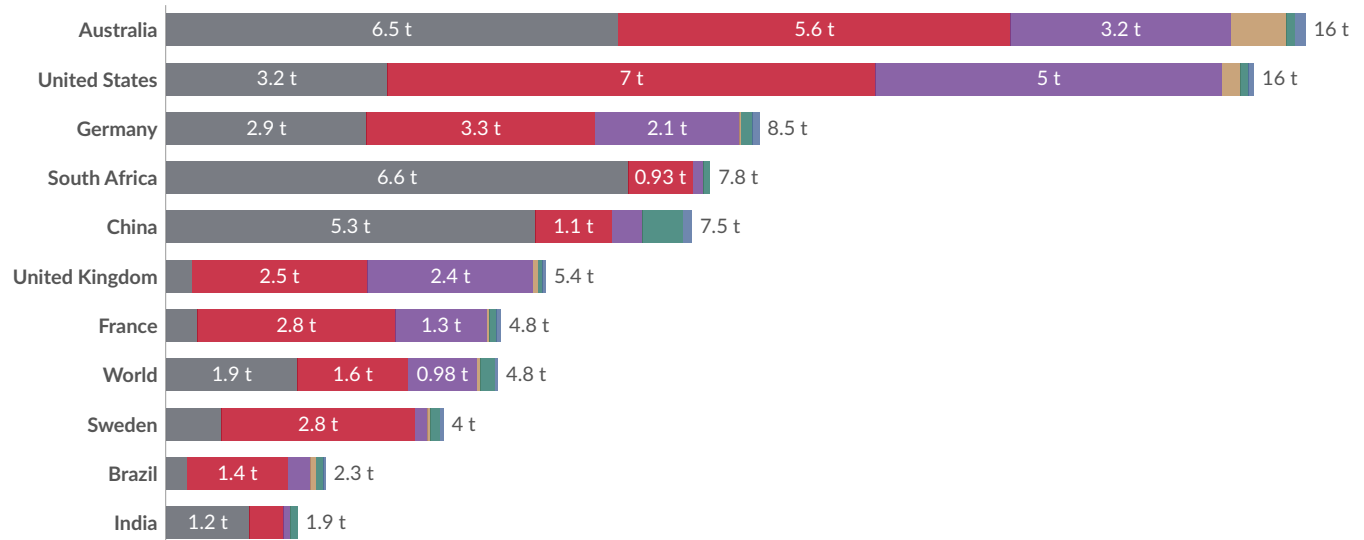
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Coal Oil Gas Flaring Cement Other industry



1750

2023

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Emissions from coal

Annual CO₂ emissions from coal

Which countries are the largest CO₂ emitters from coal production?

This interactive chart shows annual emissions from coal production by country, over time.

What becomes clear when we look across countries is how coal production has shifted over time. Throughout the 19th and 20th centuries, coal production was dominant across countries in Europe (predominantly the UK) and the United States. However, energy transitions in these countries have resulted in significant declines in recent decades.

Emissions from coal have since shifted elsewhere: in recent decades we have seen a rapid rise in emissions from industrializing economies such as China, India, and South Africa.

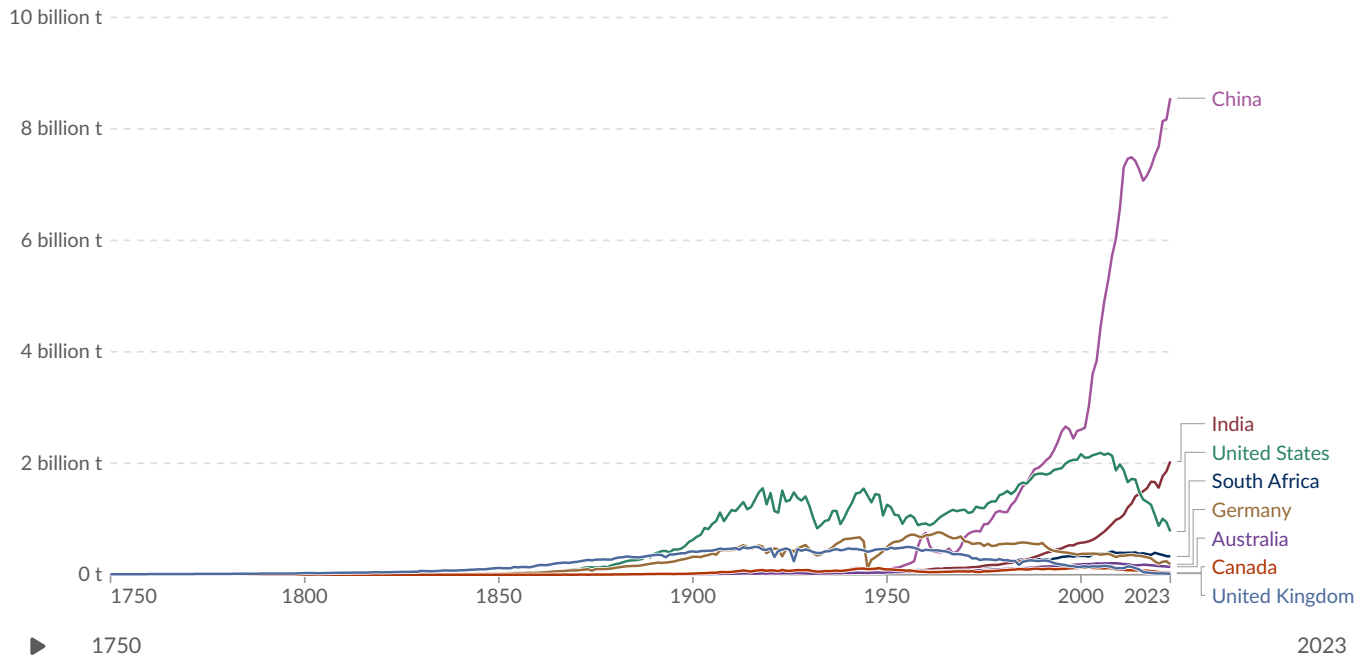
Annual CO₂ emissions from coal

Annual emissions of carbon dioxide (CO₂) from coal, measured in tonnes.

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Per capita CO₂ emissions from coal

How do emissions from coal compare when we adjust for population?

This interactive chart shows per capita CO₂ emissions from coal, measured in tonnes per person per year.

Per capita CO₂ emissions from coal, 2023

Annual emissions of carbon dioxide (CO₂) from coal, measured in tonnes per person.

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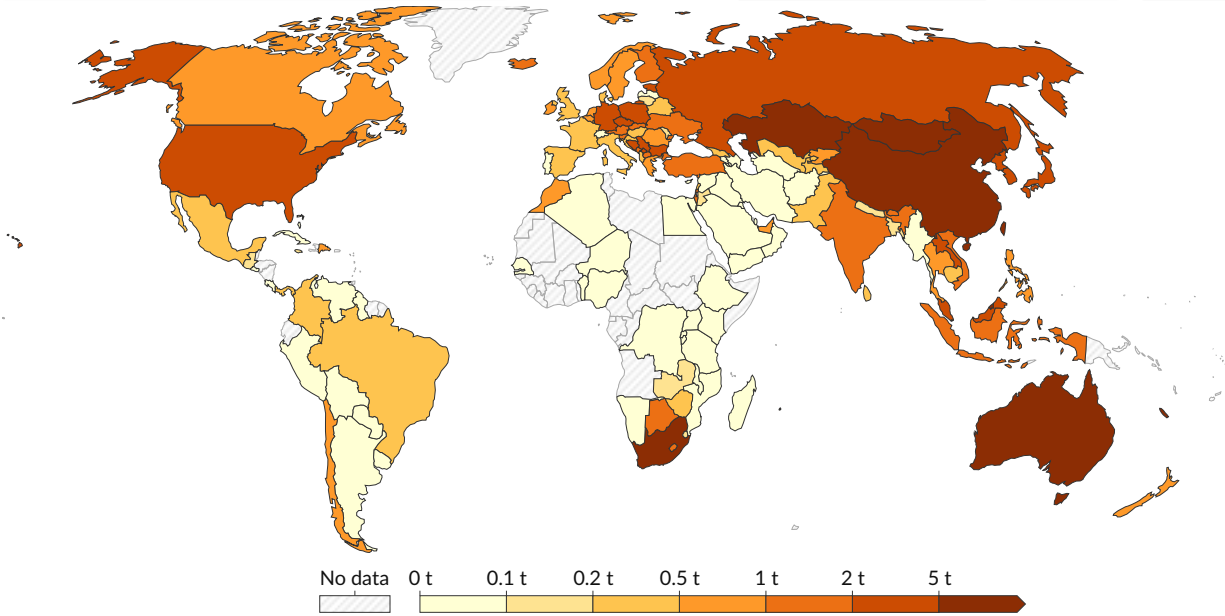
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▶ 1750

2023

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Emissions from oil

Annual CO₂ emissions from oil

Which countries are the largest CO₂ emitters of oil?

This interactive chart shows annual emissions from oil by country, over time.

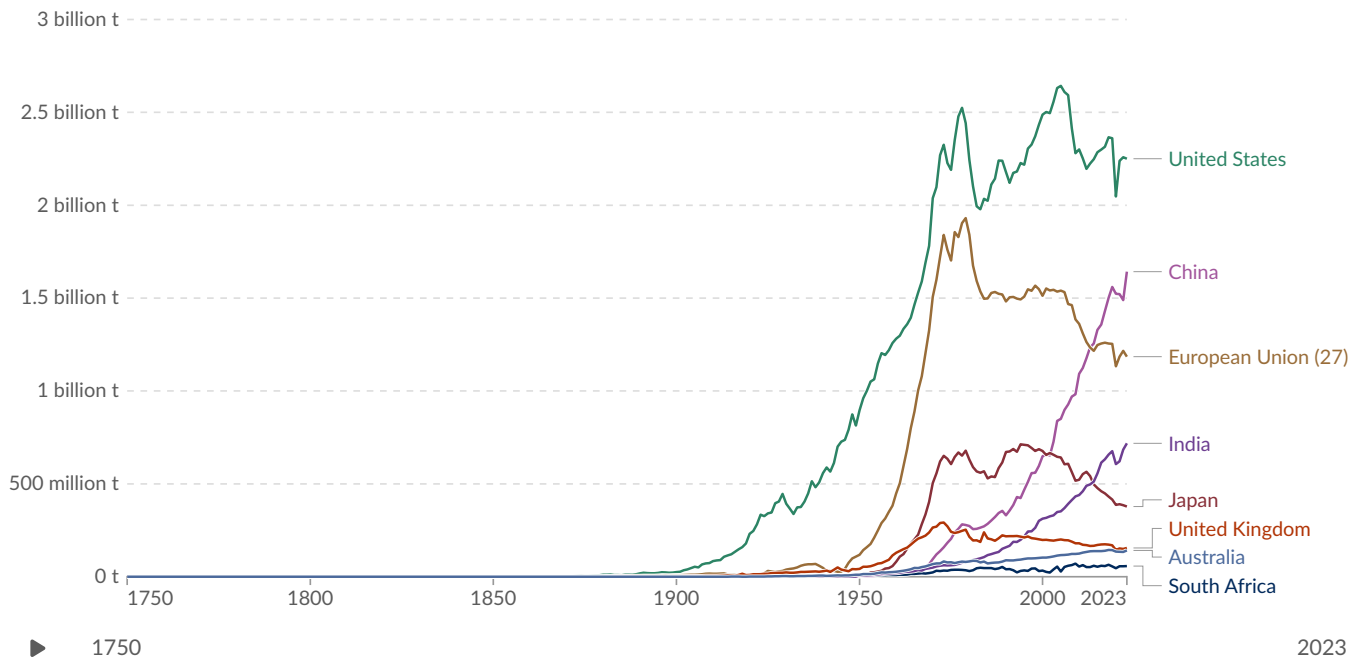
Annual CO₂ emissions from oil

Annual emissions of carbon dioxide (CO₂) from oil, measured in tonnes.

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Per capita CO₂ emissions from oil

How do emissions from oil compare when we adjust for population?

This interactive chart shows per capita CO₂ emissions from oil, measured in tonnes per person per year.

Per capita CO₂ emissions from oil, 2023

Annual emissions of carbon dioxide (CO₂) from oil, measured in tonnes per person.

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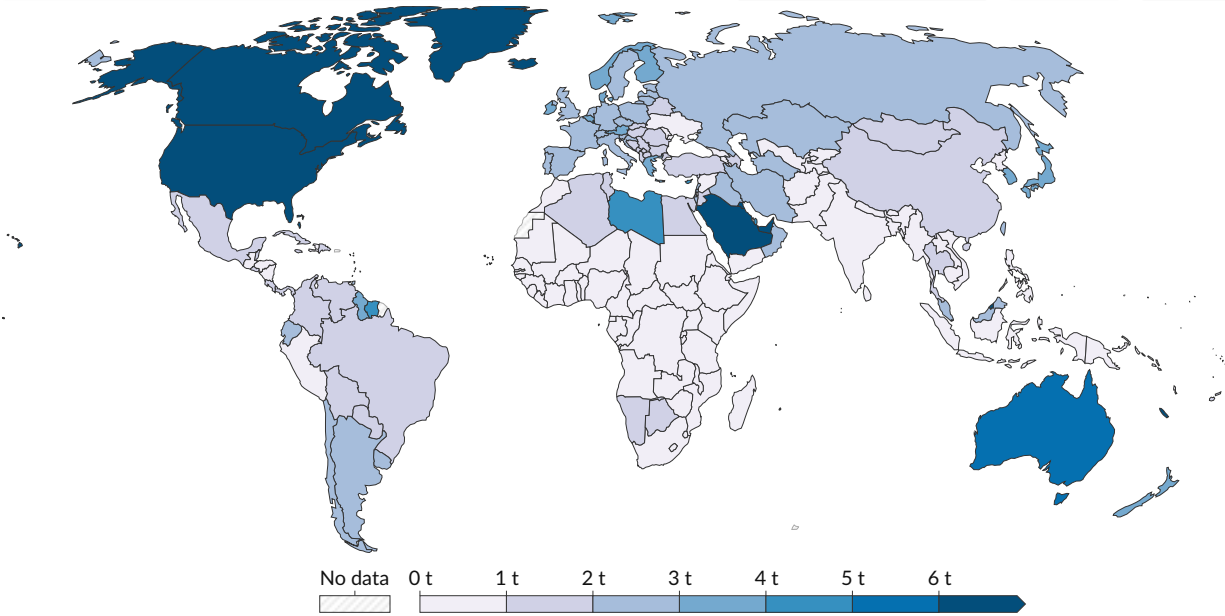
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Emissions from gas

Annual CO₂ emissions from gas

Which countries are the largest CO₂ emitters of gas?

This interactive chart shows annual emissions from gas by country, over time.

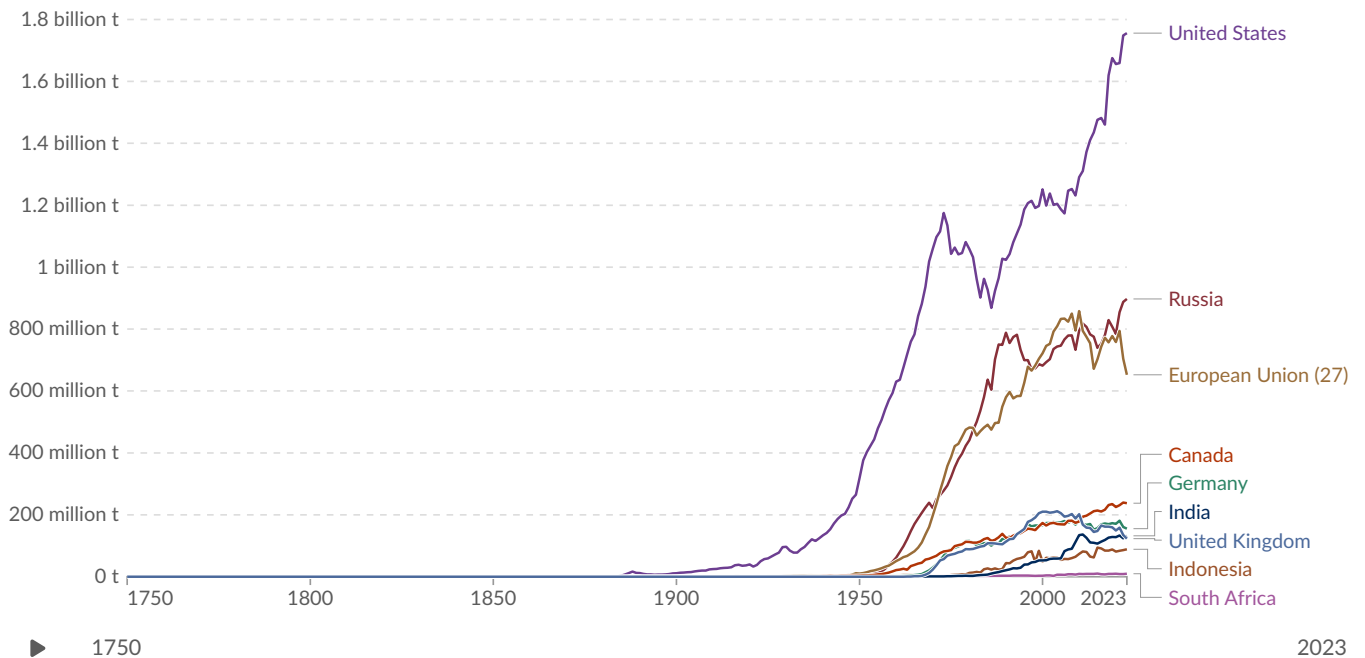
Annual CO₂ emissions from gas

Annual emissions of carbon dioxide (CO₂) from gas, measured in tonnes.

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Per capita CO₂ emissions from gas

How do emissions from gas compare when we adjust for population?

This interactive chart shows per capita CO₂ emissions from gas, measured in tonnes per person per year.

Per capita CO₂ emissions from gas, 2023

Annual emissions of carbon dioxide (CO₂) from gas, measured in tonnes per person.

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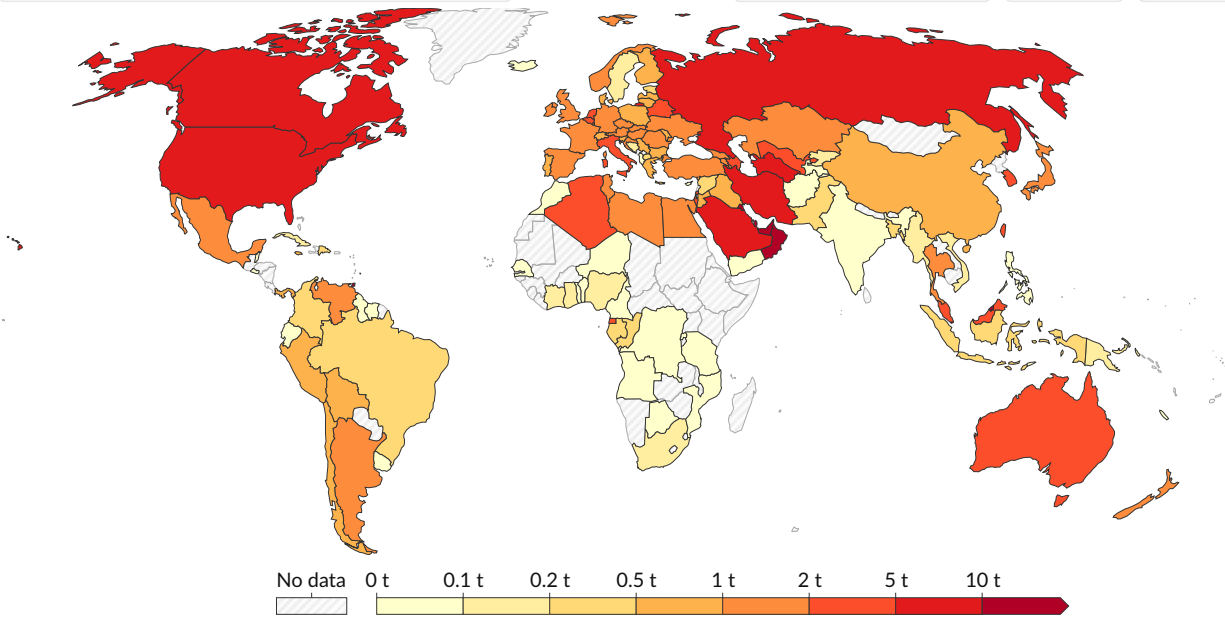
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1750

2023

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Emissions from cement production

Annual CO₂ emissions from cement

Which countries are the largest CO₂ emitters from cement production?

This interactive chart shows annual emissions from cement production by country, over time.

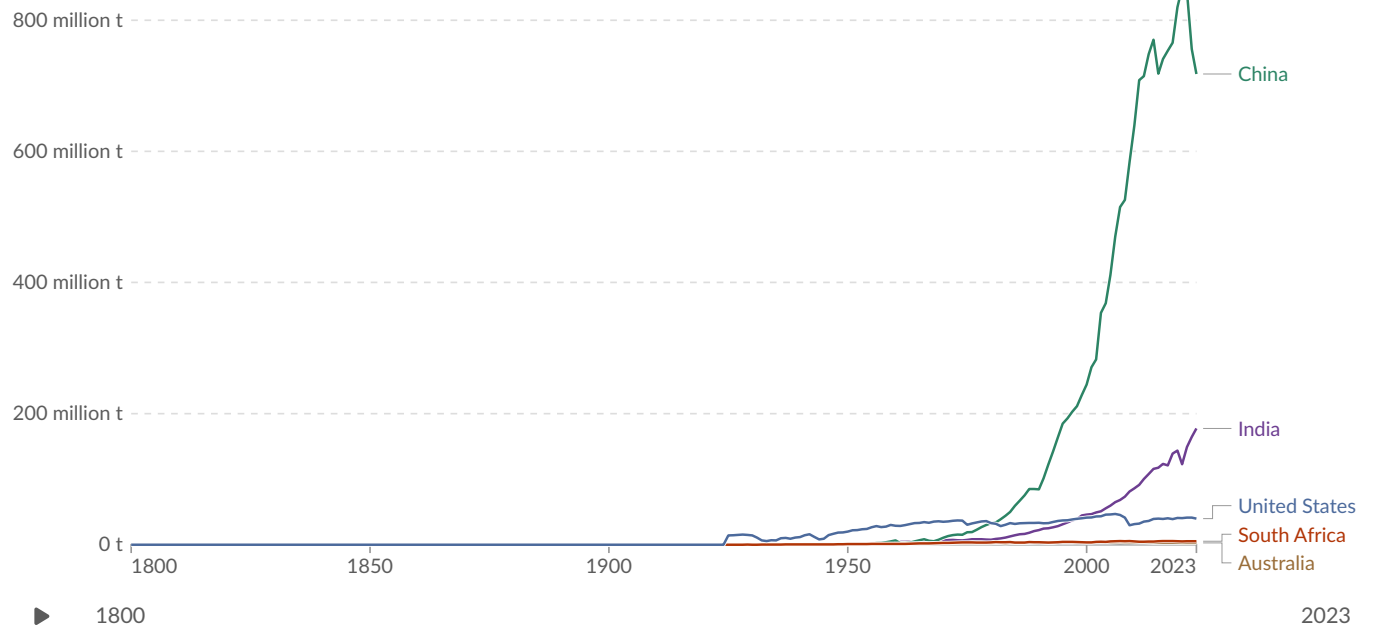
Annual CO₂ emissions from cement

Annual emissions of carbon dioxide (CO₂) from cement, measured in tonnes.

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Per capita CO₂ emissions from cement

How do emissions from cement production compare when we adjust for population?

This interactive chart shows per capita CO₂ emissions from cement production, measured in tonnes per person per year.

Per capita CO₂ emissions from cement, 2023

Annual emissions of carbon dioxide (CO₂) from cement, measured in tonnes per person.

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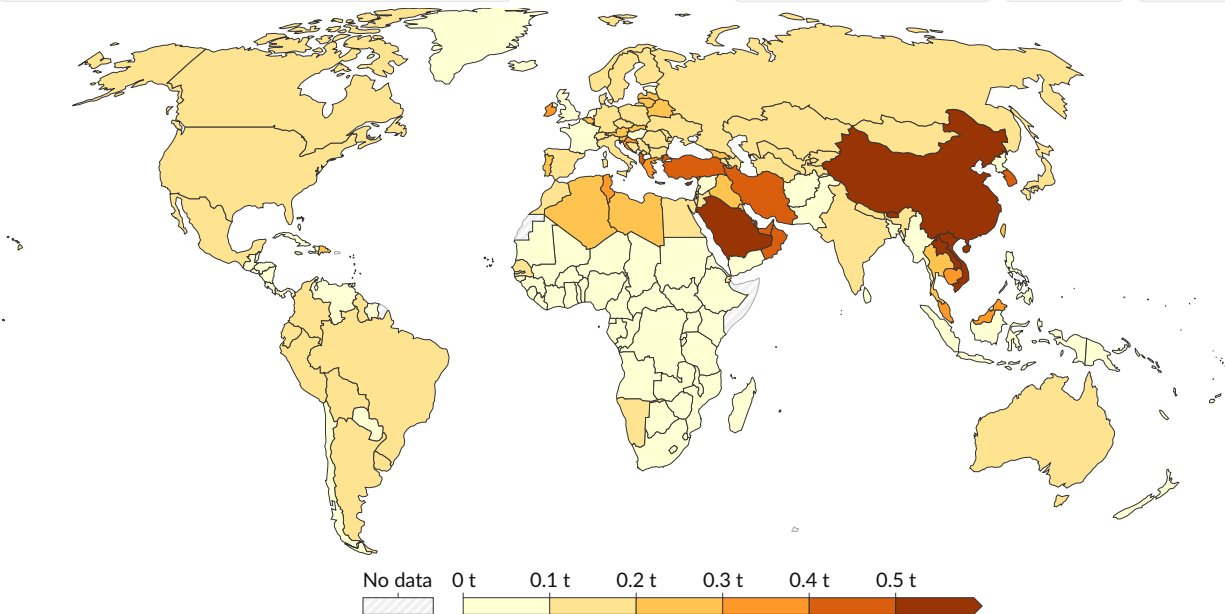
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1750

2023

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Emissions from gas flaring

Annual CO₂ emissions from gas flaring

Which countries are the largest CO₂ emitters from gas flaring?

This interactive chart shows annual emissions from gas flaring by country, over time.

What is gas flaring?

Gas flaring is the burning of natural gas, often on oil or gas extraction sites.

Gas can be produced as a by-product during oil extraction and refining. If there are no on-site uses for the gas, refineries can either inject it back into the ground, let it vent to the atmosphere, or burn (i.e. flare) it. This flaring process produces greenhouse gas emissions.

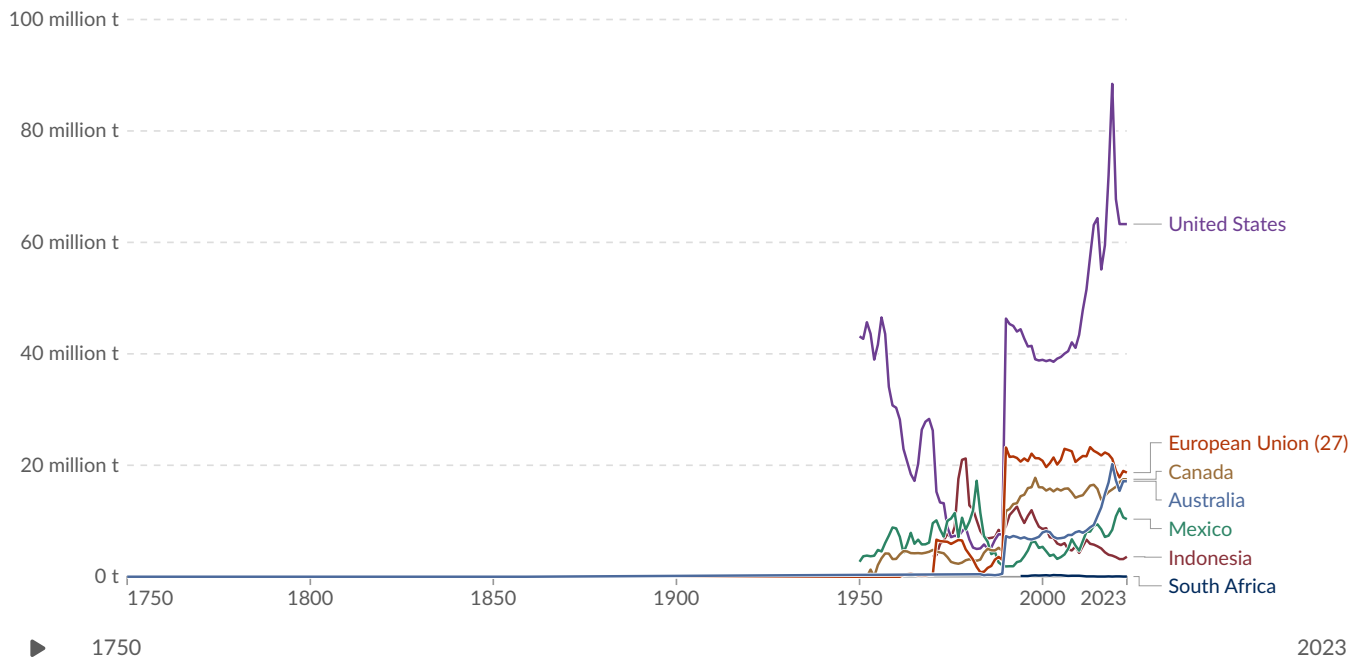
Annual CO₂ emissions from flaring

Annual emissions of carbon dioxide (CO₂) from flaring, measured in tonnes.

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Per capita CO₂ emissions from gas flaring

How do emissions from gas flaring compare when we adjust for population?

This interactive chart shows per capita CO₂ emissions from gas flaring, measured in tonnes per person per year.

Per capita CO₂ emissions from flaring, 2023

Annual emissions of carbon dioxide (CO₂) from flaring, measured in tonnes per person.

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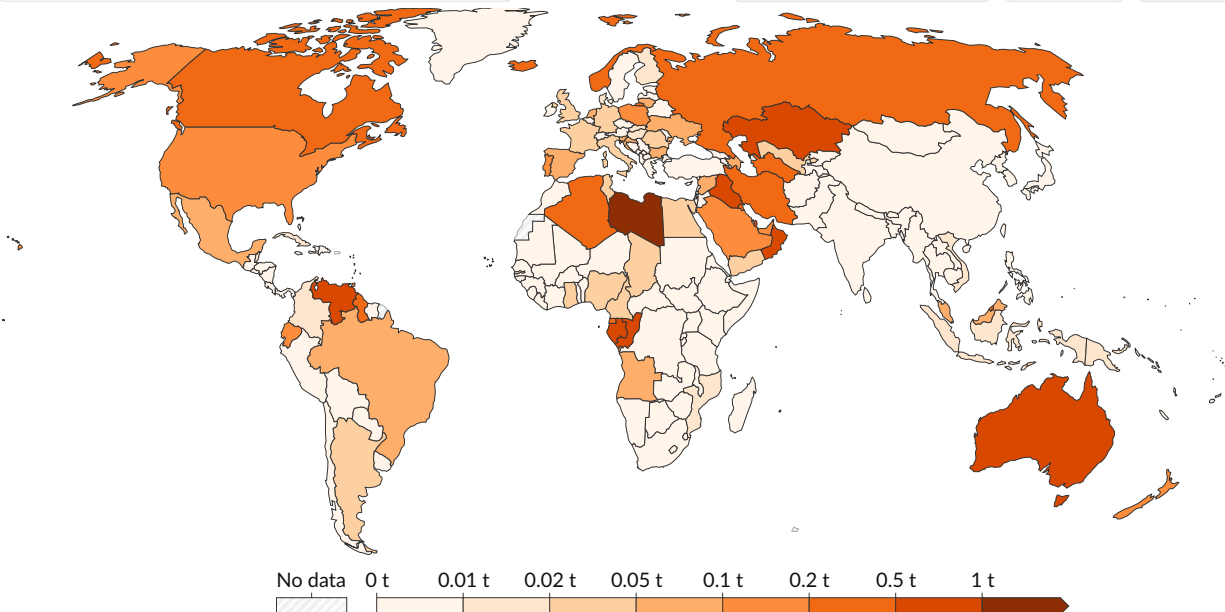
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1750

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ENDNOTES

1. Zilio, M., & Recalde, M. (2011). GDP and environment pressure: the role of energy in Latin America and the Caribbean. *Energy Policy*, 39(12), 7941-7949. Available at: doi.org/10.1016/j.enpol.2011.09.049
2. Ali, M. B., Saidur, R., & Hossain, M. S. (2011). A review on emission analysis in cement industries. *Renewable and Sustainable Energy Reviews*, 15(5), 2252-2261. Available at: doi.org/10.1016/j.rser.2011.02.014

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