CO_2 and Greenhouse Gas Emissions

By: Hannah Ritchie, Pablo Rosado, and Max Roser

Human emissions of greenhouse gases are the primary driver of climate change today.[1]

CO_2 and other greenhouse gases like methane and nitrous oxide are emitted when we burn fossil fuels, produce materials such as steel, cement, and plastics, and grow the food we eat. If we want to reduce these emissions, we need to transform our energy systems, industries, and food systems.

At the same time, we need to tackle energy poverty, low standards of living, and poor nutrition, which all remain enormous problems for billions of people.

Technological advances could allow us to do both. The prices of solar, wind, and batteries have plummeted in recent decades, increasingly undercutting the cost of fossil fuel alternatives. Further progress could allow us to provide cheap, clean energy for everyone. Political change is essential to create a system that supports rapid decarbonization.

Emissions are still rising in many parts of the world. However, several countries have managed to cut their emissions in recent decades. With affordable low-carbon technologies, other countries can increase their living standards without the high-carbon pathway that rich countries followed in the past.

On this page, you can find our data, visualizations, and writing on CO_2 and other greenhouse gas emissions.

Key Insights on CO_2 and Greenhouse Gas Emissions

Human greenhouse gas emissions have increased global average temperatures

Global emissions have increased rapidly over the last 50 years and have not yet peaked

Current climate policies will reduce emissions, but not enough to keep temperature rise below 2°C

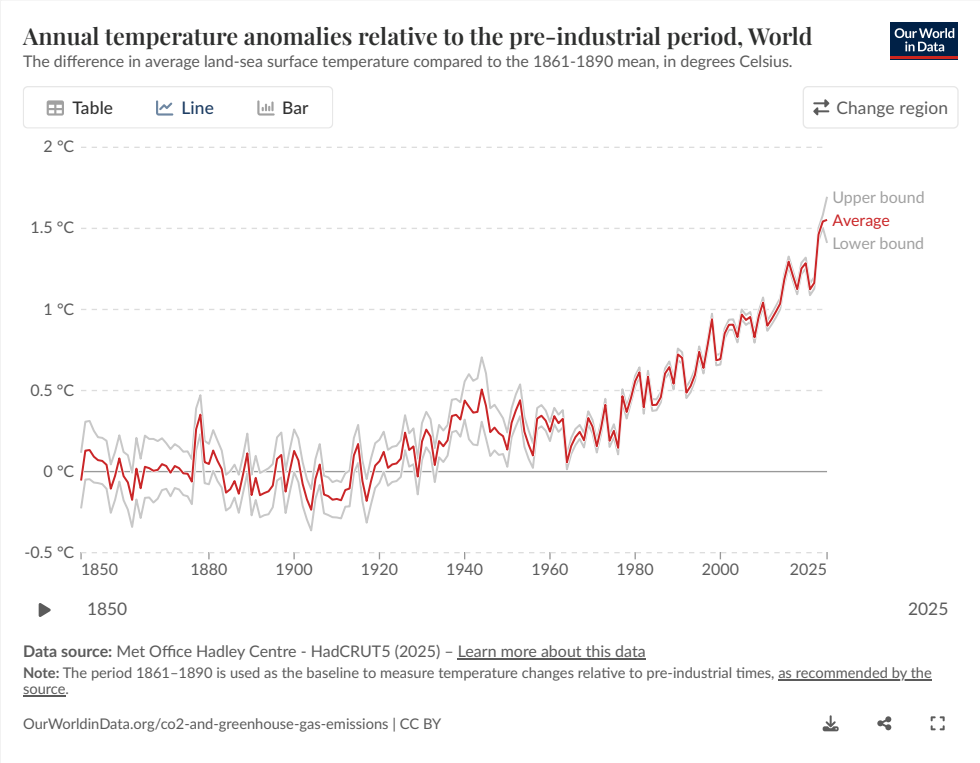
There are large in emissions a world

see this distribution in maps published by Berkeley Earth.

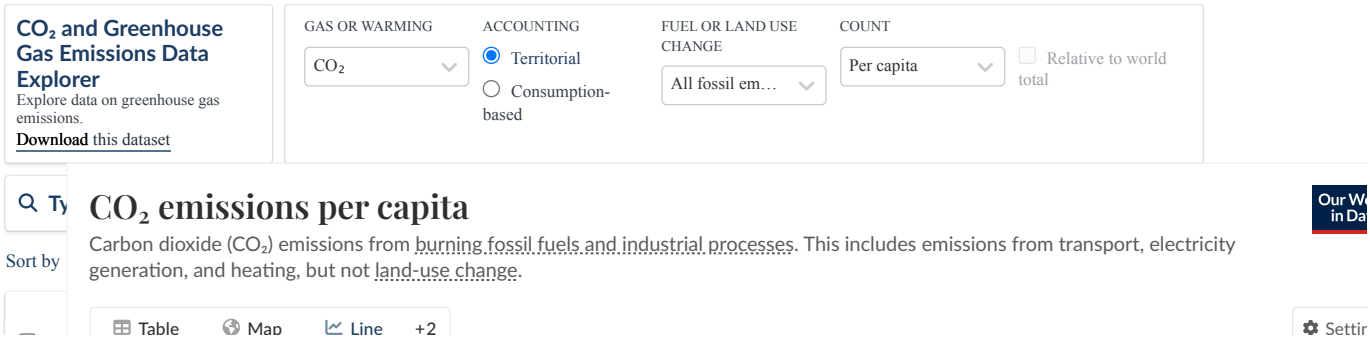
Human emissions have been the main driver of this change. Aerosols have played a slight cooling role in global climate, and natural variability has played a minor role. This article from Carbon Brief explains this very well, with interactive graphics showing the relative contributions of different factors to the climate.

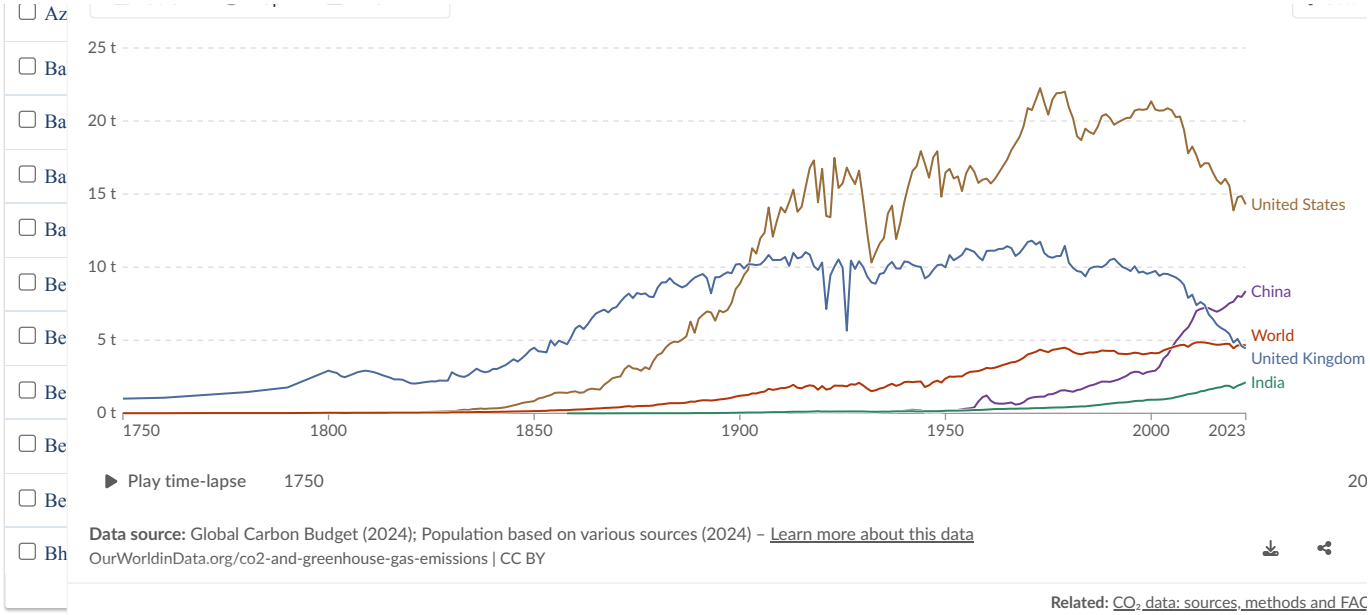
WHAT YOU SHOULD KNOW ABOUT THIS DATA

- This data comes from the United Kingdom's Met Office and combines air and sea surface temperatures in the Northern and Southern Hemispheres. It is called the "HadCRUT" (Hadley Centre/Climatic Research Unit Temperature) dataset.[3]
- It measures temperature anomalies across the world at high resolutions.
- There is very strong agreement in temperature trends across the large global datasets measured and produced by other leading institutions.

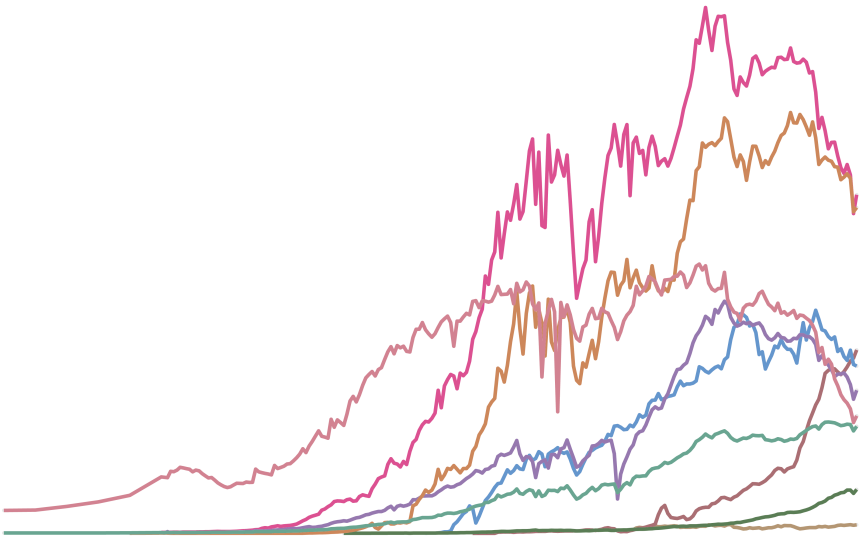


Explore Data on CO_2 and Greenhouse Gas Emissions





Research & Writing



September 27, 2023

Per capita, national, historical: how do countries compare on CO2 metrics?

There are many ways to measure countries' contributions to climate change. What do they tell us?

Hannah Ritchie, Pablo Rosado, and Max Roser

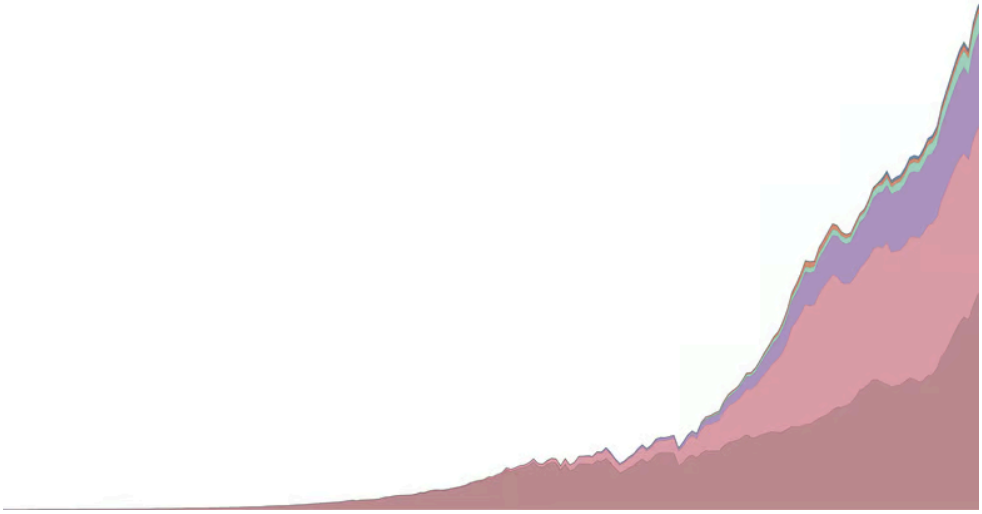
December 01, 2021

Many countries have offshored productio

It is possible to reduce emi

Hannah Ritchie

Overview Articles



June 23, 2020

CO_2 emissions by fuel

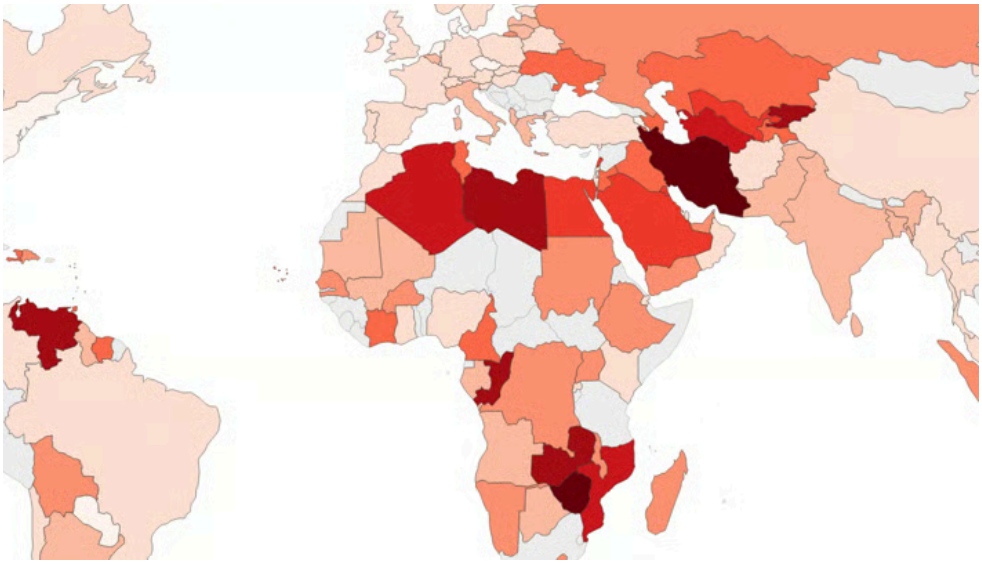
Hannah Ritchie, Pablo Rosado, and Max Roser

June 10, 2020

Greenhouse gas emi

Hannah Ritchie, Pablo Rosac

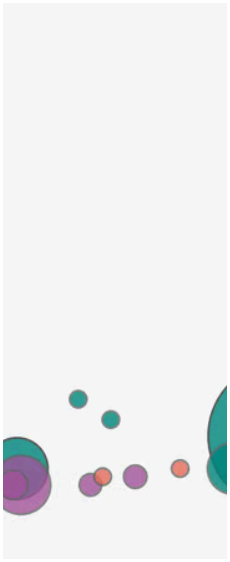
Emissions from Energy



November 03, 2021

Fossil fuel subsidies: If we want to reduce greenhouse gas emissions we should not pay people to burn fossil fuels

Max Roser

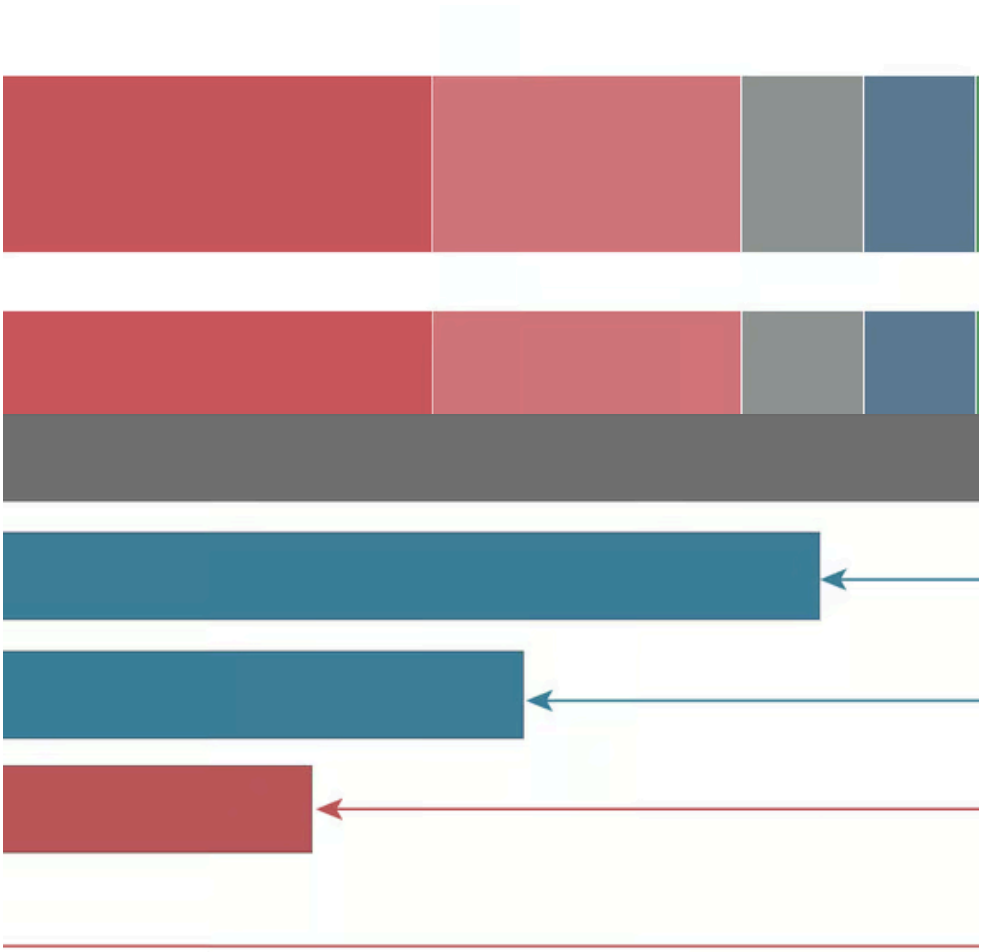


December 10, 2020

The world's energy p

Max Roser

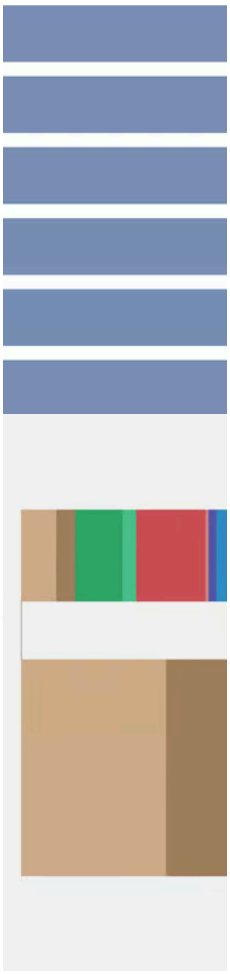
Emissions from Transport



June 10, 2021

Emissions from food alone could use up all of our budget for 1.5°C or 2°C – but we have a range of opportunities to avoid this

Hannah Ritchie



November 06, 2019

Food production is r

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More Key Articles on Greenhouse Gas Emissions

June 01, 2021

The argument for a carbon price

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October 14, 2022

Which countries hav

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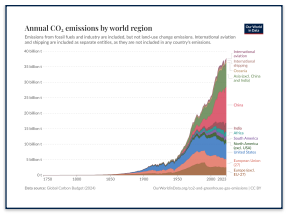
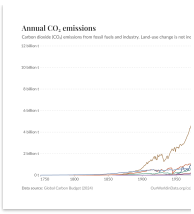
Key Charts on CO_2 & Greenhouse Gas Emissions



Annual CO_2 emissions by world region



Annual CO_2 emissions

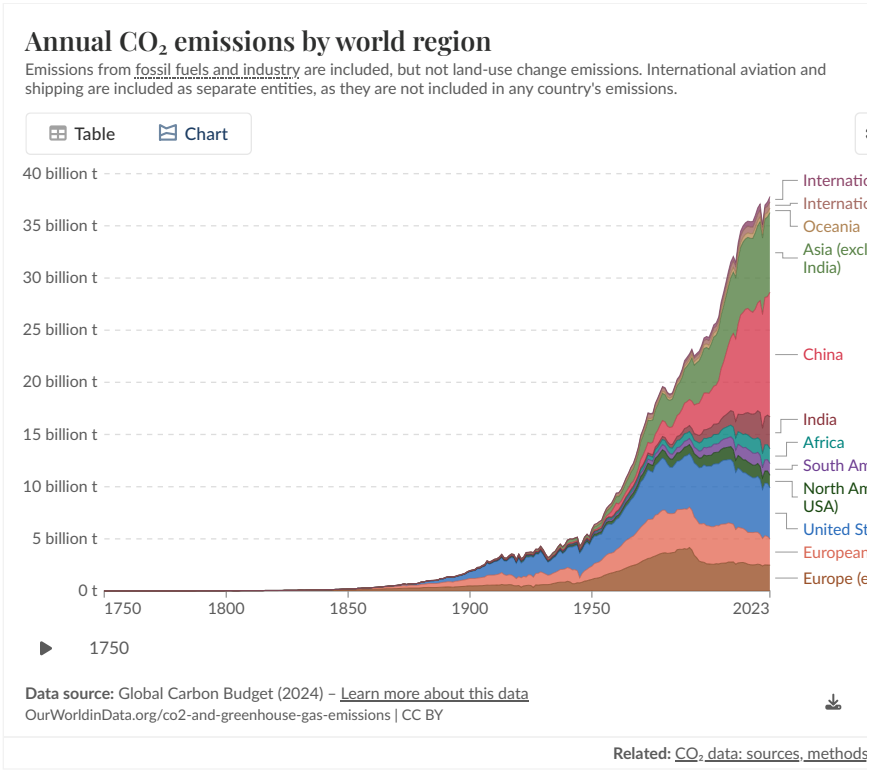


Chart 1 of 158

See all charts on this topic

ENDNOTES

1. IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, In press, doi:10.1017/9781009157896.

2. Lacis, A. A., Schmidt, G. A., Rind, D., & Ruedy, R. A. (2010). Atmospheric CO_2: Principal control knob governing Earth's temperature. Science, 330(6002), 356-359.

3. Morice, C.P., J.J. Kennedy, N.A. Rayner, J.P. Winn, E. Hogan, R.E. Killick, R.J.H. Dunn, T.J. Osborn, P.D. Jones and I.R. Simpson (in press) An updated assessment of near-surface temperature change from 1850: the HadCRUT5 dataset. Journal of Geophysical Research (Atmospheres) doi:10.1029/2019JD032361 (supporting information).

4. The underlying data for this chart is sourced from the Climate Action Tracker – based on policies and pledges as of April 2022.

Cite this work

Our articles and data visualizations rely on work from many different people and organizations. When citing this topic page, please also cite the underlying data sources. This topic page can be cited as: