

November 2023

Global emissions from coal power plants

Introduction

High energy prices, inflation, war, and the ongoing economic recovery from the pandemic has highlighted the general worldwide demand for electricity, particularly in Asia and Europe. The growing demand for electricity on these two continents has led some electricity producing plants to rely increasingly heavily on coal as a power source.

The electricity sector accounts for 34 per cent of the world’s energy-related carbon dioxide (CO2) emissions. In this Fact Sheet, we detail recent trends in electricity production and demand across the globe as well as CO2 emissions from the electricity sector worldwide.

Carbon dioxide emissions from the world’s top ten emitters between 2000 and 2022

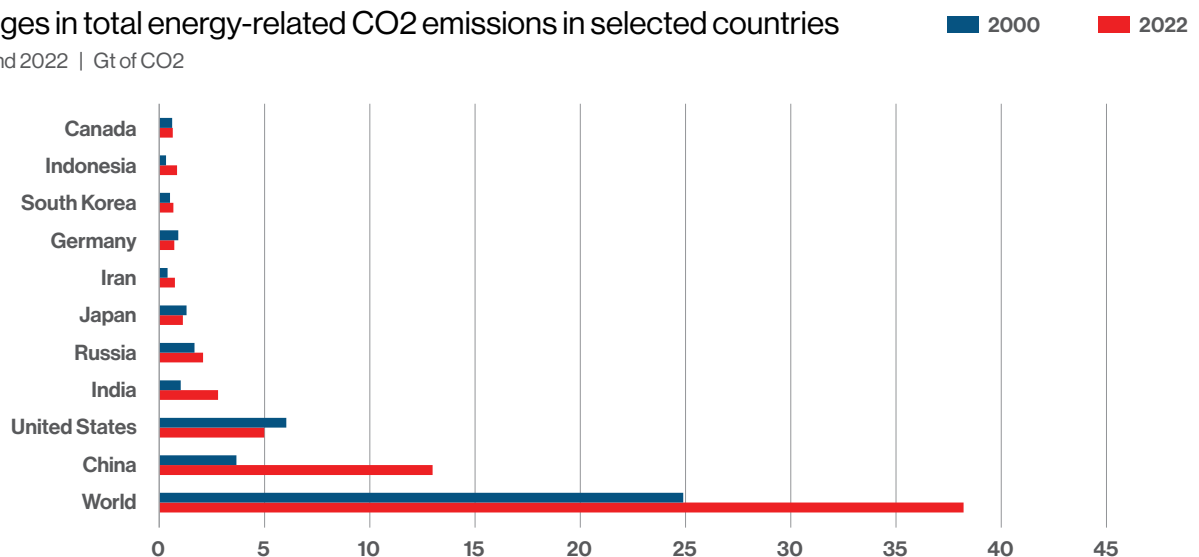
A total of 38.2 gigatonnes (Gt) of energy-related CO2 was emitted globally in 2022, an increase of 53 per cent from 2000. However, the increase is not consistent for all countries; between 2000 and 2023, CO2 emissions trends diverged. Emissions from China, India, and Indonesia more than doubled in the last two decades, whereas emissions for other countries remained relatively consistent or even declined.

In 2022, Canada’s total energy-related CO2 emissions were 0.62 Gt, or 1.6 per cent of the global total. That compares to emissions of 0.64 Gt in South Korea, 1.09 Gt in Japan, 2.8 Gt in India, 5.0 Gt in the United States, and 13.0 Gt in China (see Figure 1).

Figure 1

Changes in total energy-related CO2 emissions in selected countries

2000 and 2022 | Gt of CO2



Sources: IEA World Energy Statistics database and Enerdata.

Demand for electricity and sources of emissions

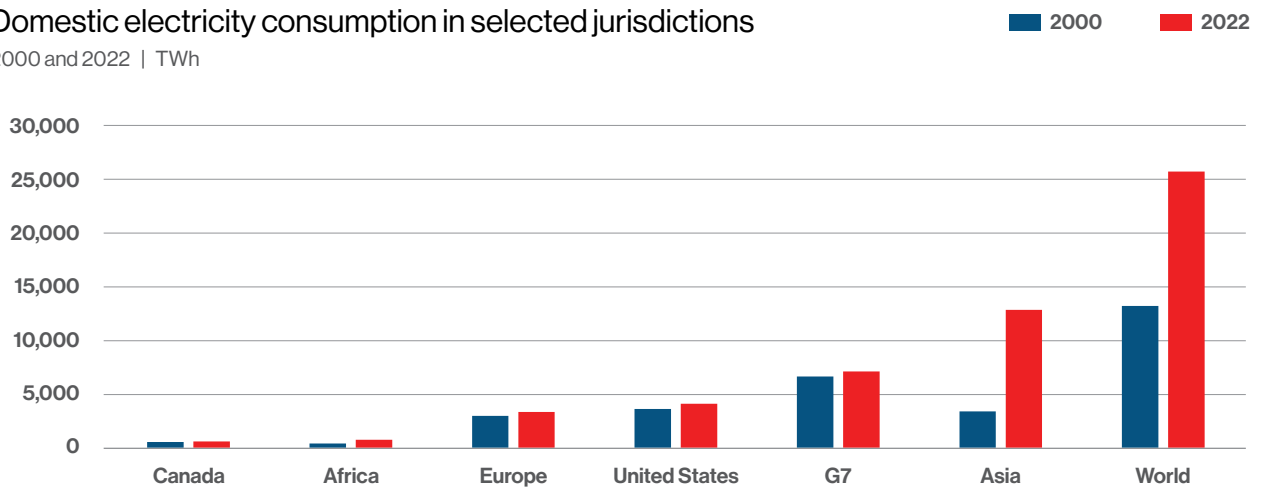
Global domestic electricity consumption increased from 13,188 terawatt-hours (TWh) in 2000 to 25,681 TWh in 2022 and estimates are that global demand for electricity will rise to 35,000 TWh by 2040.¹

That is a jump of 94 per cent, or 12,492 TWh, between 2000 and 2022. During the same period, electricity consumption in Asia rose a whopping 280 per cent. In Africa the demand for electricity increased by 90 per cent (see Figure 2). Coal remains the world's largest source of fuel for electricity generation, with approximately 10,317 terawatt-hours of electricity generated by coal-fired plants in 2022 (see Figure 3).

Figure 2

Domestic electricity consumption in selected jurisdictions

2000 and 2022 | TWh

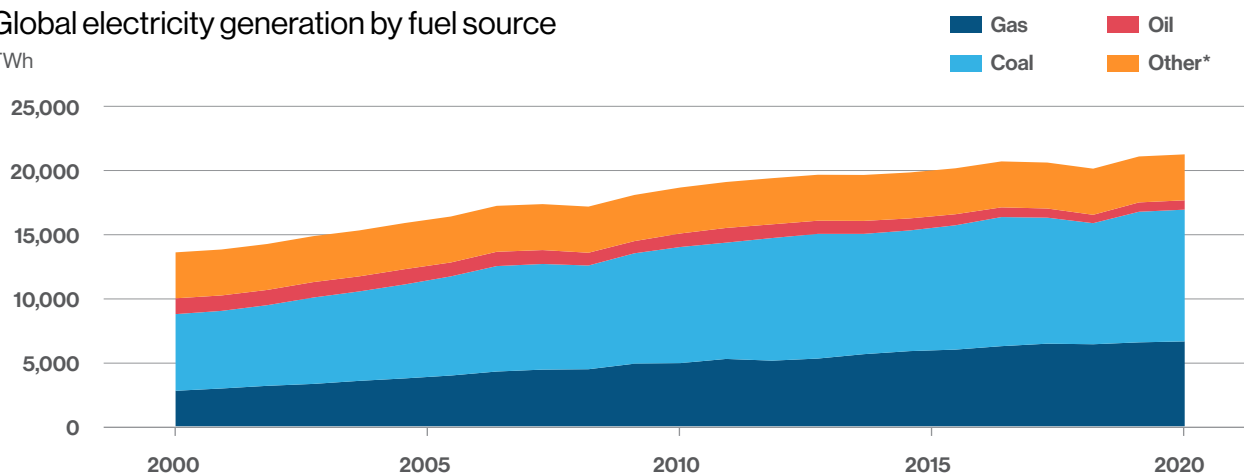


Sources: IEA World Energy Statistics database and Enerdata.

Figure 3

Global electricity generation by fuel source

TWh



*Includes Nuclear energy, Hydro electric, Renewables and sources not specified elsewhere e.g. pumped hydro, non-renewable waste and statistical discrepancies (which can be positive or negative).

Sources: IEA World Energy Statistics database and Enerdata.

1. The IEA's *Electricity Market Report 2022* states that nearly all of the increase is attributable to growing electricity consumption in developing countries across southeast Asia and Africa.

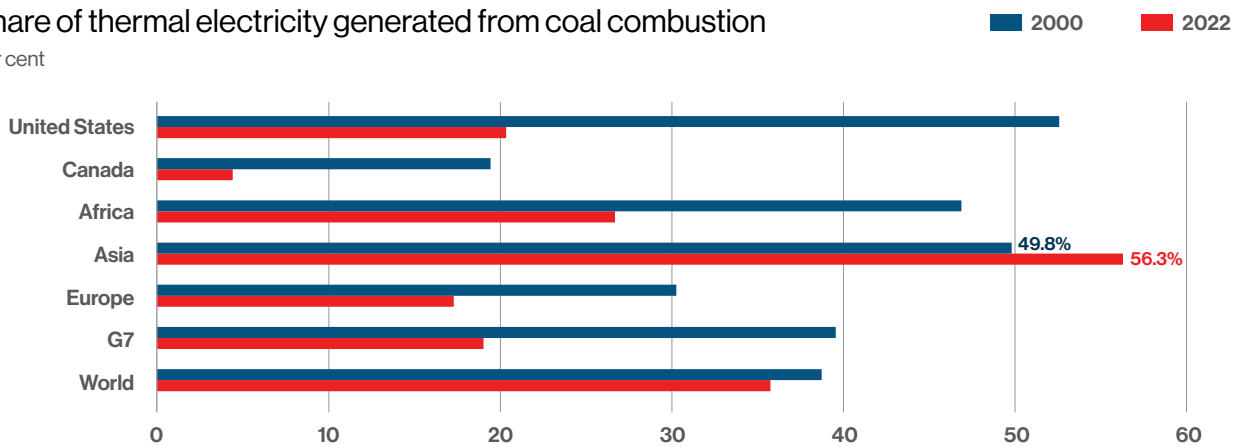
In recent years, electricity generated from the combustion of coal declined in Canada, the United States, Europe, and Africa. However, electricity generated from coal combustion has continued to grow in China, India, and other parts of Asia.

Between 2000 and 2022, the share of coal-powered electricity generation in Asia increased from 49.8 to 56.3 per cent, while in Canada it decreased from 19.4 per cent to less than 5 per cent.

Figure 4

Share of thermal electricity generated from coal combustion

Per cent



Sources: IEA World Energy Statistics database and Enerdata.

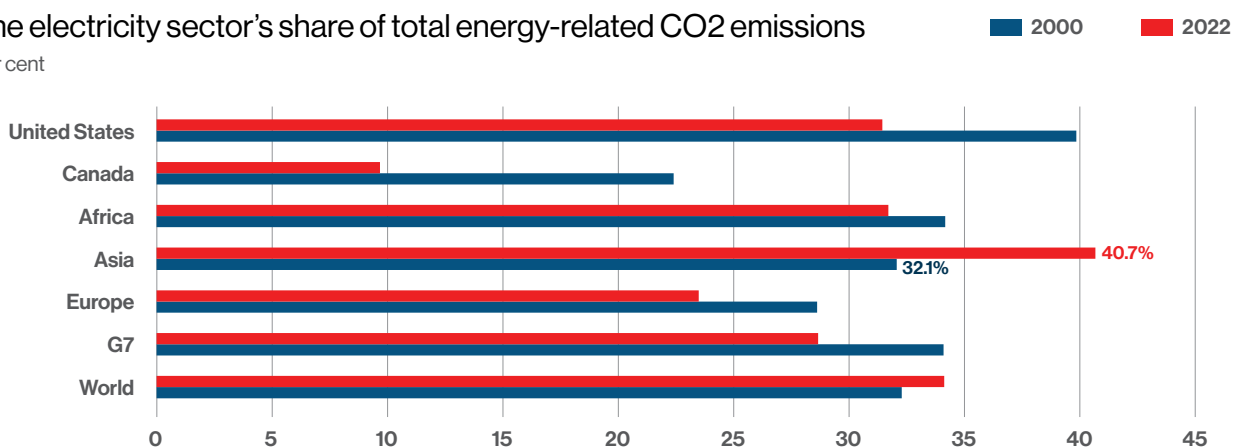
Source of emissions in the electricity sector

The electricity sector accounts for 34 per cent of the carbon dioxide emitted across the world. The sector emitted 13.05 gigatonnes of CO₂ in 2022, an increase of 5.01 Gt from 2000. In Asia, between 2000 and 2022, CO₂ emissions from the electricity sector increased from 2.5 Gt to 8.3 Gt and the sector's share of carbon dioxide (CO₂) emissions increased from just over 32 per cent to well over 40 per cent (see Figure 5).

Figure 5

The electricity sector's share of total energy-related CO₂ emissions

Per cent



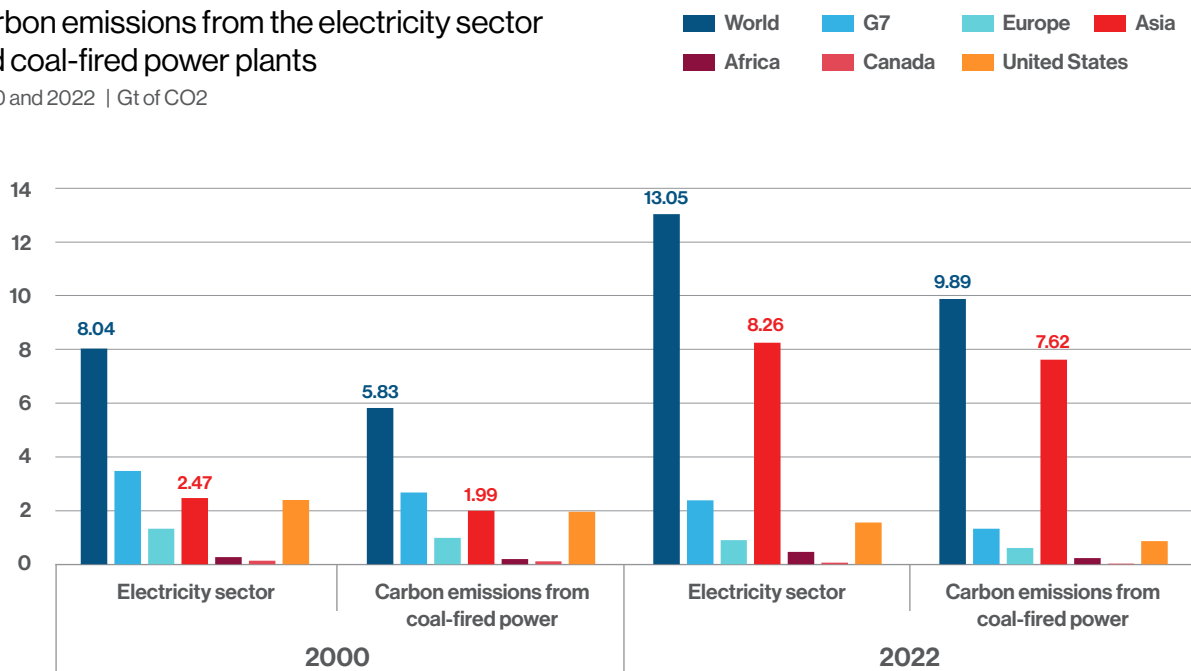
Sources: IEA World Energy Statistics database and Enerdata.

Coal burned to generate electricity accounts for the majority of the CO₂ emitted in power generation. In 2022, coal-fired electricity generation accounted for 9.89 Gt, or nearly 76 per cent of the worldwide CO₂ emissions from the electricity sector. The share was even higher in Asia where 92 per cent of emissions from the electricity sector come from coal combustion. Asian coal-fired plants accounted for 7.62 Gt of the total 8.26 Gt of emissions from the sector on that continent (see Figure 6).

Figure 6

Carbon emissions from the electricity sector and coal-fired power plants

2000 and 2022 | Gt of CO₂



Sources: IEA World Energy Statistics database and Enerdata.

Conclusion

The global electricity sector, and particularly the sector in Asia, is a major source of CO₂ emissions. Relative to Canada’s existing carbon emissions, emissions from the coal-fired power plants worldwide will make any reductions in Canada’s carbon emissions—and resulting job losses, higher taxes, and higher costs for consumers and businesses—meaningless.

As 56 per cent of the electricity in Asia is generated by coal-fired plants, a transition from coal- to gas-fired electricity generation in the region could lead to significant reductions in CO₂ emissions, reducing emissions by 50 per cent on average. The corollary is that there is a potential market in Asia for natural gas extracted in and exported from Canada. Canada has an opportunity to play a useful and meaningful role in reducing CO₂ emissions from the electricity sector by encouraging and contributing to the global natural gas market.

References (live as of November 2, 2023)

Canadian Energy Centre (November 7, 2022), Canadian LNG has massive opportunity in Asia: report <<https://tinyurl.com/2p9525j6>>; Enerdata (2022), Power Plant Tracker database <<https://bit.ly/3xfgOdF>>; IEA (2022), Electricity Market Report – January 2022 <<https://bit.ly/3M0723j>>; IEA (Undated), World Energy Statistics Database <<https://tinyurl.com/ytz789m4>> .

Notes

This CEC Fact Sheet was compiled by Ven Venkatachalam at the Canadian Energy Centre (www.canadianenergycentre.ca). The author and the Canadian Energy Centre would like to thank and acknowledge the assistance of an anonymous reviewer in reviewing the data and research for this Fact Sheet.

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