

MAKING PROGRESS ON CANADIAN AVERAGE**UPSTREAM OIL AND GAS CO₂ EMISSIONS****INTENSITY OVER THE PAST DECADE****Benchmarking average CO₂ emissions intensity in the upstream oil and gas sector among peer countries****Overview**

There has been considerable discussion about Canadian upstream oil and gas CO₂ emissions intensity but little attempt to benchmark intensity versus other peer oil and gas producing countries. This is a crucial element towards evaluating the Canadian upstream oil and gas sector emissions intensity performance.

In this CEC Fact Sheet, we use custom data obtained from the Rystad Energy EmissionsCube to compare the average CO₂ emissions intensity of the Canadian upstream oil and gas industry versus 29 other peer countries between 2010 and 2020.

The views expressed in this Fact Sheet do not represent those of Rystad Energy.

Background on the Rystad Energy EmissionsCube

Rystad Energy is an independent energy research company providing data, analytics, and consultancy services to clients around the globe.

Rystad's EmissionsCube enables the study of CO₂ emissions from upstream activity down to the asset level. Through the EmissionsCube, countries, companies, assets, basins and fields can be benchmarked when it comes to upstream emissions and emissions intensity.

Benchmarking CO₂ emissions intensity

Upstream activities include exploration, drilling, and extraction. Upstream oil and gas CO₂ emissions are defined as those originating from oil and gas combustion, which includes both extraction and flaring emissions.

CO₂ emissions intensity is defined in this Fact Sheet as the amount of CO₂ emitted (expressed in kilograms) per barrel of oil equivalent (boe) produced (i.e., kg CO₂ per boe produced). A declining CO₂ emission intensity figure means that less CO₂ is being created per boe produced.

Focusing on emissions per boe produced is a realistic means of establishing a meaningful target for the upstream oil and gas industry in Canada. And benchmarking emissions intensity of the Canadian upstream oil and gas sector versus peer countries is a valuable tool for evaluating and comparing performance over time.

Canadian average upstream oil and gas (including oil sands) CO₂ emissions intensity remains steady over the past decade

Among the 30 major oil and gas producing countries examined, in 2020, the Canadian upstream oil and gas sector recorded a CO₂ emissions intensity of 33 kg per boe produced.

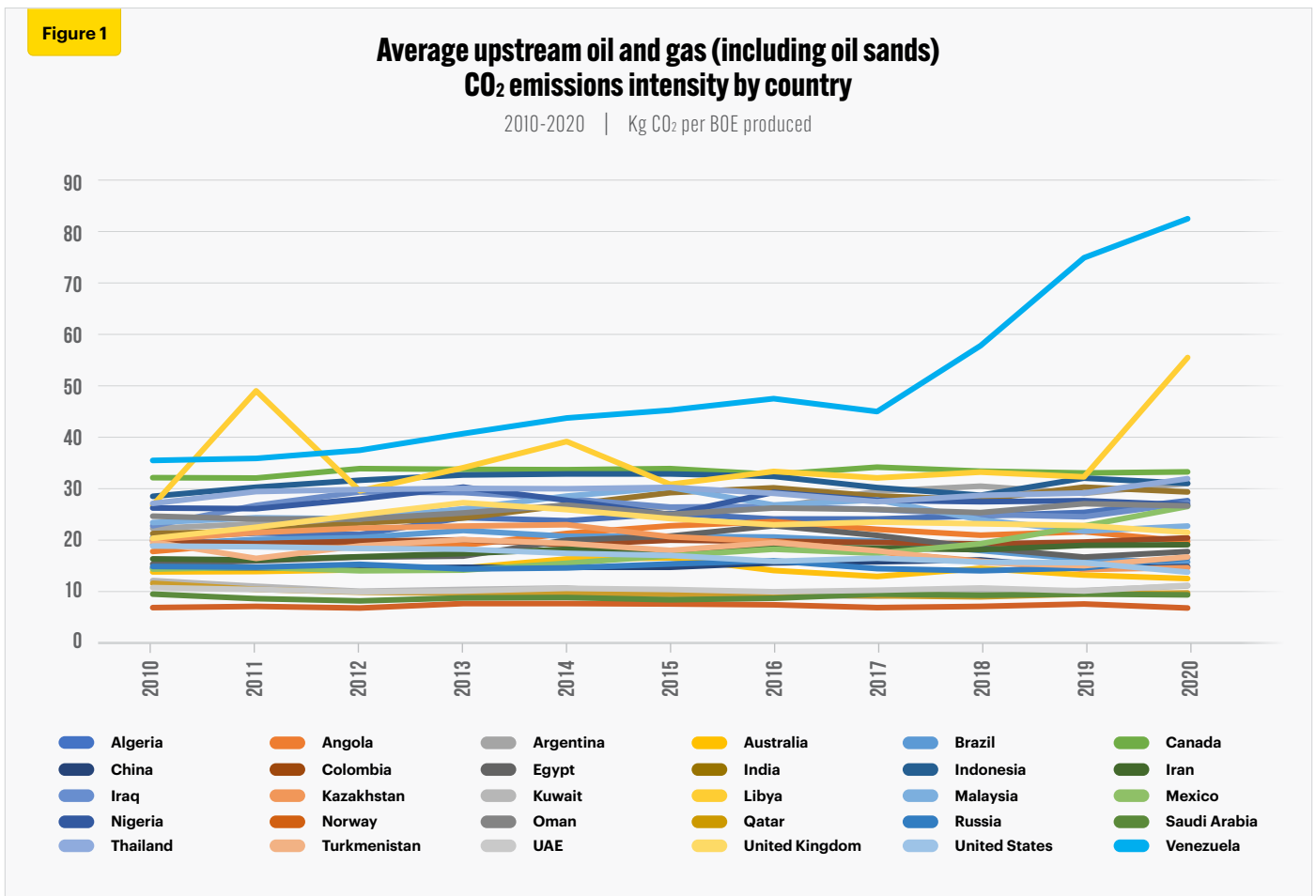
Canada was closely followed by Thailand (32 kg per boe produced), Indonesia (31 kg per boe produced), Argentina (31 kg per boe produced), India (29 kg per boe produced), Algeria (28 kg per boe produced), Nigeria (27 kg per boe

produced), Iraq (27 kg per boe produced), Oman (27 kg per boe produced), and Mexico (27 kg per boe produced). Meanwhile, Australia had an emissions intensity of 13 kg per boe produced, while the United States was at 14 kg per boe produced, both lower than Canada (see Figure 1).

Canada’s high CO₂ emissions intensity among its peers is the result of a significant share of its upstream oil and gas production (an estimated 35 per cent in 2020) coming from the energy-intensive oil sands sector. Canada’s oil and gas production, with its high oil sands content, is therefore unique among peer countries. As we shall see, Canada’s oil sands sector has made considerable progress in reducing its CO₂ emissions intensity over the past decade.

A key measure for benchmarking countries on upstream oil and gas emissions intensity is to focus on the rate of change, on a historical basis, in this case between 2010 and 2020. The rate of change measure tracks country performance in lowering emissions per boe produced over time.

During the period between 2010 and 2020, Canadian upstream oil and gas (including oil sands) kg CO₂ emissions per boe produced increased by just 3 per cent. At the same time, Canadian upstream oil and gas production increased by 41 per cent, according to Rystad Energy data.



Source: Derived from Rystad Energy EmissionsCube

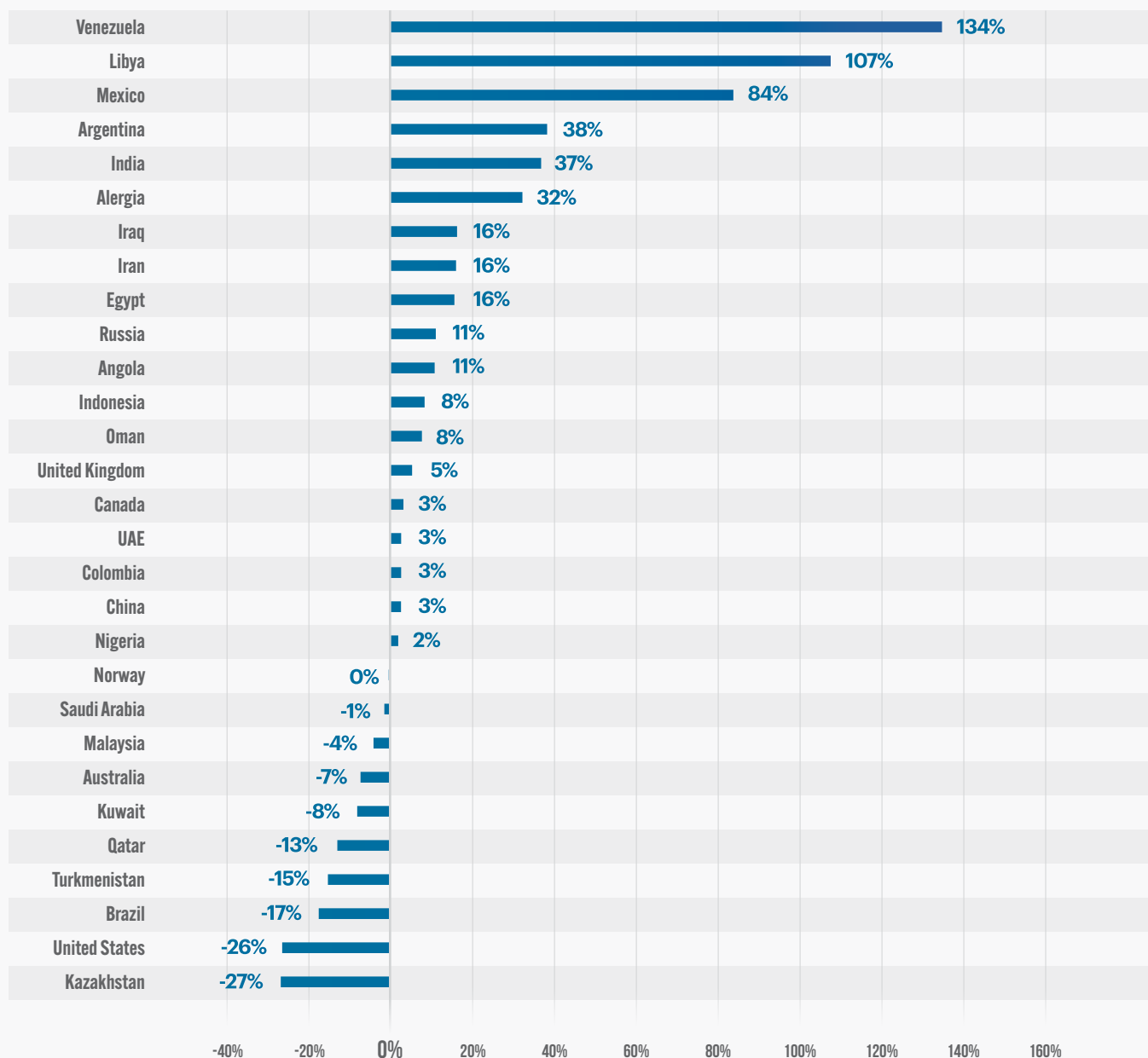
Canada's rate of change in average upstream oil and gas kg CO₂ per boe produced at 3 per cent was better than a number of peer countries, including Algeria (32 per cent), Angola (11 per cent), India (37 per cent), Iran (16 per cent), Iraq (16 per cent), Mexico (84 per cent), Oman (8 per cent), Russia (11 per cent), and the United Kingdom (5 per cent).

Peer countries that performed better than Canada on the rate of change in average upstream oil and gas kg CO₂ per boe produced, included the United States (-26 per cent), Brazil (-17 per cent), Kazakhstan (-27 per cent), Kuwait (-8 per cent), Australia (-7 per cent), Saudi Arabia (-1 per cent), Turkmenistan (-15 per cent) and Norway (-0.4 per cent) (see Figure 2).

Figure 2

Per cent change in average upstream oil and gas (including oil sands) CO₂ emissions intensity by country

2020 versus 2010 | %



Source: Derived from Rystad Energy EmissionsCube.

Canadian average upstream oil and gas (not including oil sands) CO₂ emissions per barrel produced declined by nearly 12 per cent over the past decade

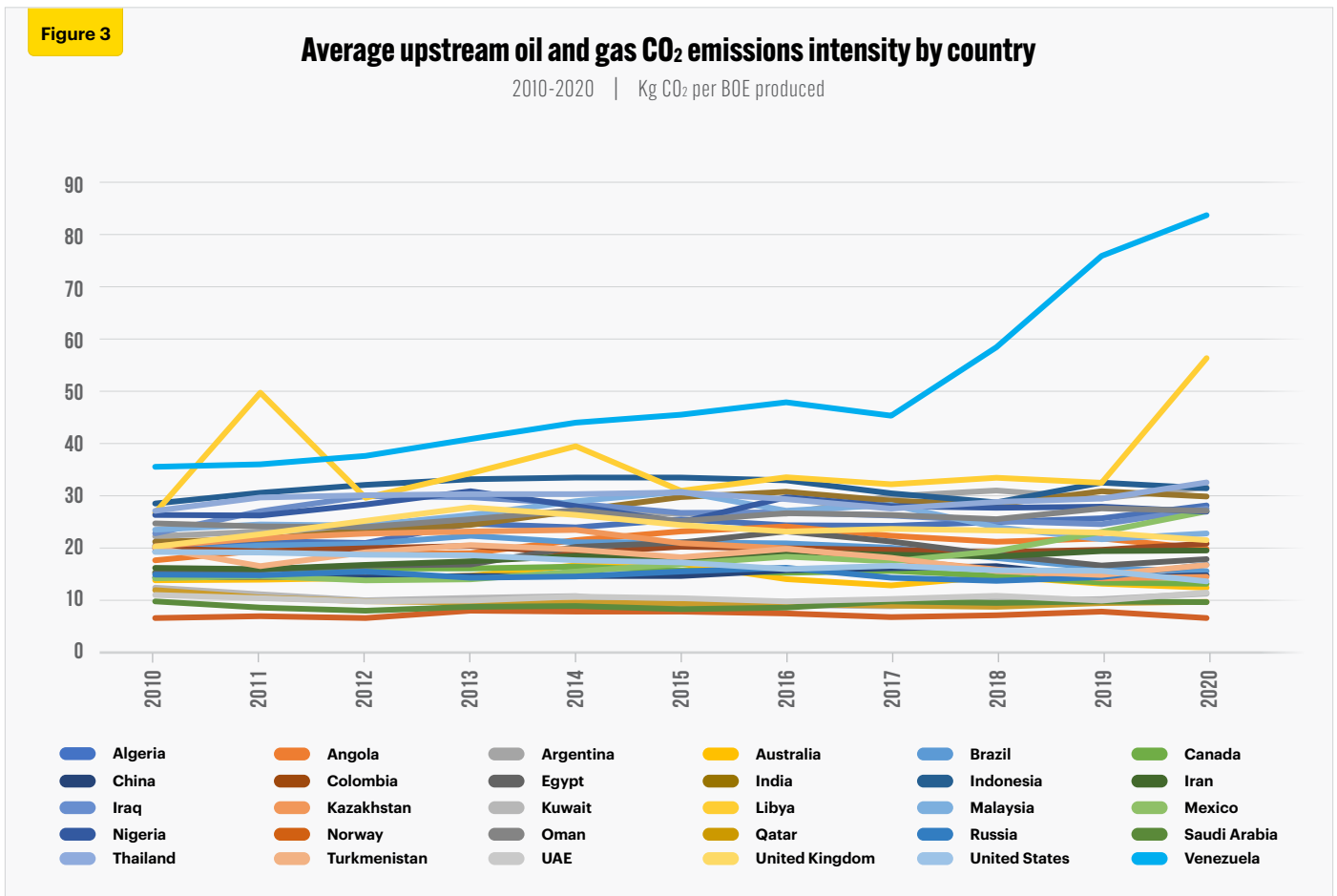
When we separate out the oil sands sub-sector and look at average upstream oil and gas emissions intensity performance, Canada’s CO₂ emissions intensity was just 13 kg per boe produced in 2020.

This is lower than many peer countries, including Indonesia (31 kg per boe produced), Algeria (27 kg per boe produced), India (29 kg per boe produced), Nigeria (27 kg per boe produced), Mexico (27 kg per boe produced), Oman (27 kg per boe produced), the United Kingdom (22 kg per boe produced), and Iran (19 kg per boe produced). The United States was at 14 kg CO₂ of boe produced, while Australia was at 13 kg CO₂ per boe produced, better than Canada (see Figure 3).

When we focus on the rate of change during the same period, Canadian upstream oil and gas (not including oil sands) kg CO₂ emissions per boe produced fell by nearly 12 per cent between 2010 and 2020, the six highest decline among 29 other peer countries, behind only the United States (-26 per cent), Kazakhstan (-26 per cent), Brazil (-17 per cent), Qatar (-13 per cent), and Turkmenistan (-15 per cent).

Canada at (-12 per cent) is followed by Australia (-7 per cent), Kuwait (-8 per cent), Malaysia (-4 per cent), Saudi Arabia (-1 per cent), and Norway (-0.4 per cent), among others.

Those countries whose rate of change in upstream oil and gas (not including oil sands) kg CO₂ per boe increased between 2010 and 2020, including Algeria (32 per cent), Angola (11 per cent), India (37 per cent), Indonesia (8 per cent), Iran (16 per cent), Iraq (16 per cent), Mexico (84 per cent), Nigeria (2 per cent), Oman (8 per cent), Russia (10 per cent), and the UAE (3 per cent) (see Figure 4).

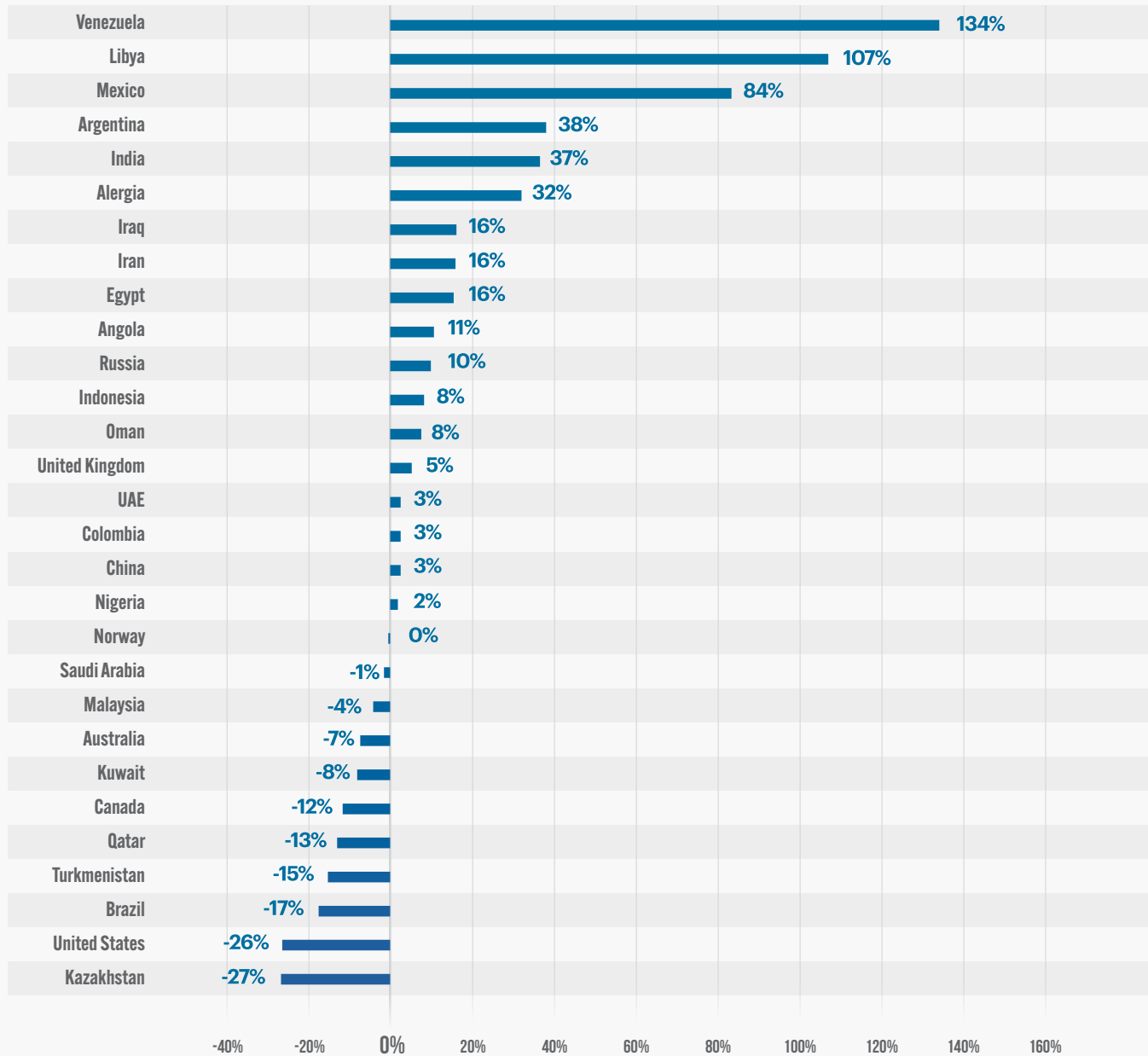


Source: Derived from Rystad Energy EmissionsCube

Figure 4

Per cent change in average upstream oil and gas (not including oil sands) CO₂ emissions intensity by country

2020 versus 2010 | %



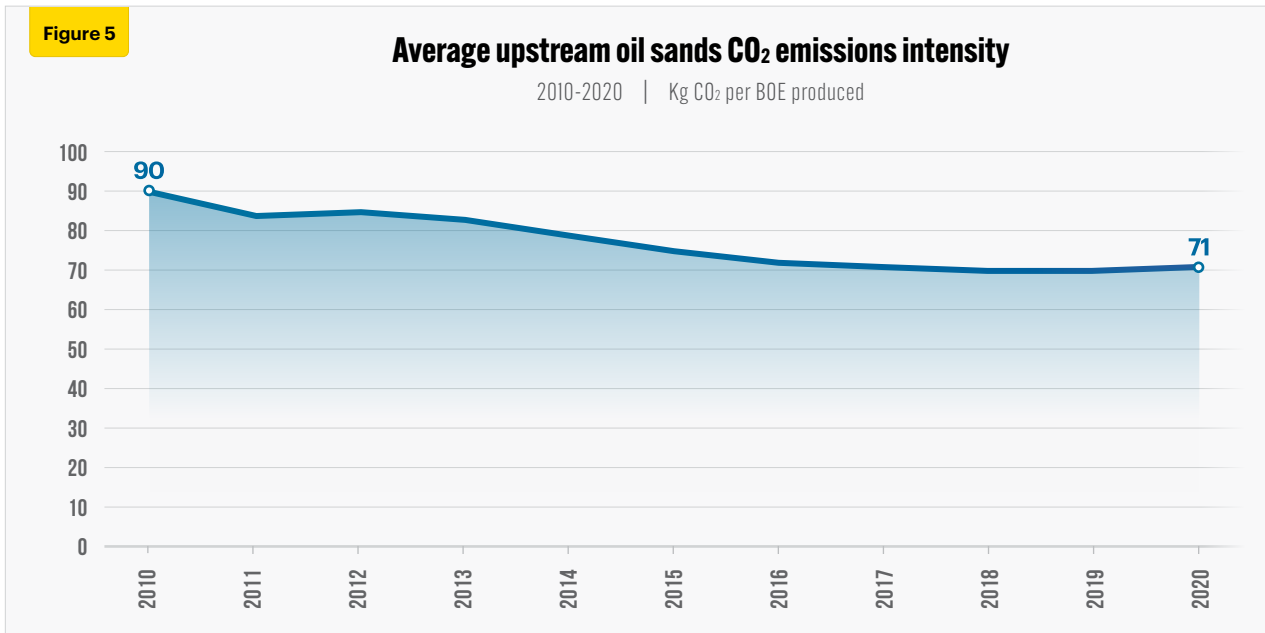
Source: Derived from Rystad Energy EmissionsCube.

Canadian average oil sands CO₂ emissions per barrel produced declined by over 21 per cent over the past decade

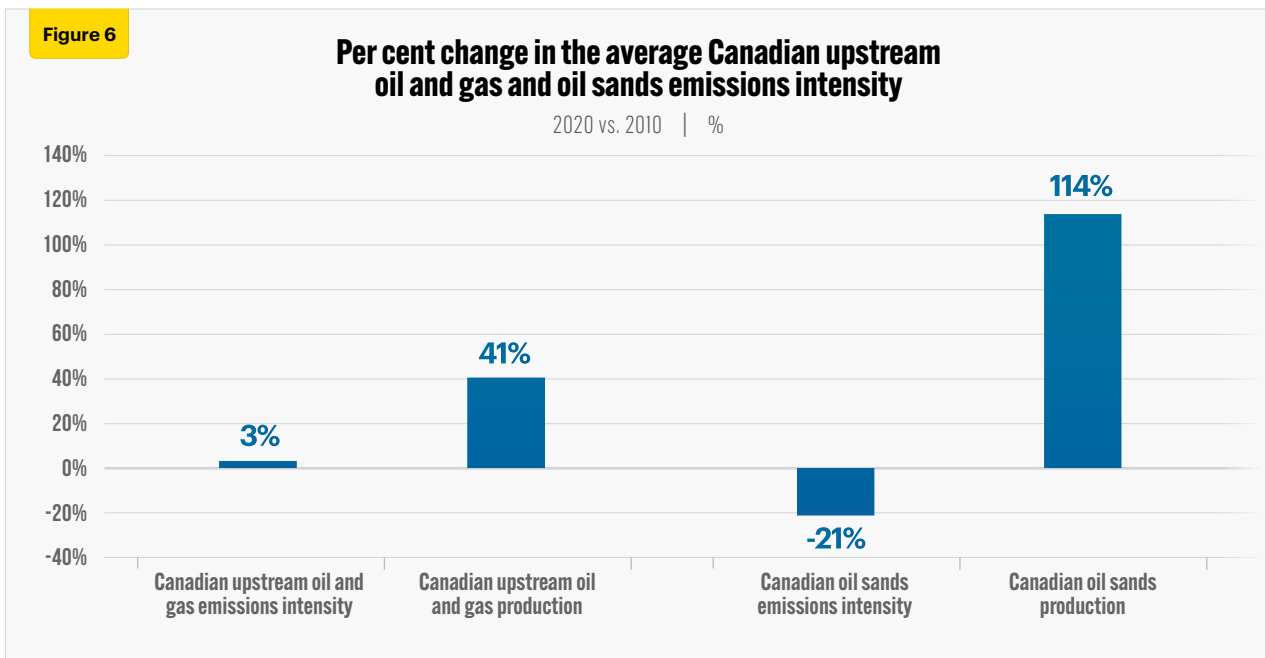
Canada’s oil sands sector has made considerable progress in reducing its CO₂ emissions intensity over the past decade, falling to 71 kg CO₂ per boe produced (see Figure 5).

In fact, between 2010 and 2020, kg CO₂ per boe fell by over 21%, a significant improvement in performance (see Figure 6). At the same time, Canadian oil sands production increased by 114 percent, according to Rystad Energy data.

As noted earlier, during the period between 2010 and 2020, Canadian upstream oil and gas (including oil sands) kg CO₂ emissions per boe produced increased by just 3 per cent. At the same time, Canadian upstream oil and gas production increased by 41 per cent, according to Rystad Energy data (Figure 6).



Source: Derived from Rystad Energy EmissionsCube



Source: Derived from Rystad Energy EmissionsCube

Conclusion

The Canadian upstream oil and natural gas sector is making steady progress versus many peer countries on its CO₂ emissions per boe produced.

Between 2010 and 2020, Canadian upstream oil and gas CO₂ emissions intensity, expressed as kg CO₂ per boe produced, remained relatively steady in a band between 32 to 34 kgCO₂ per boe produced, settling in at 33 kgCO₂ per boe produced in 2020. In fact, average upstream oil and gas emissions intensity rose by just 3% over the past decade, a much better performance than a number of other peer countries. At the same time, Canadian upstream oil and gas production increased by 41 per cent, according to Rystad Energy data.

The Canadian upstream oil and gas emissions intensity is influenced by higher levels of emissions intensity found in the sands sector. When the oil sands is separated out, the emissions intensity of the Canadian upstream oil and gas sector falls to just 13 kg CO₂ per boe produced, lower than many peer countries. And average upstream oil and gas (not including oil sands) fell by nearly 12 percent over the past decade, the six highest rate of decline among 30 peer countries.

Canada's upstream oil sands sector is making considerable process in reducing its emissions intensity. According to Rystad data between 2010 and 2020, Canadian average oil sands CO₂ emissions per boe produced declined by over 21 percent in the past decade, while production increased by 114 per cent.

Notes

This CEC Fact Sheet was compiled by Lennie Kaplan at the Canadian Energy Centre (www.canadianenergycentre.ca). The author and the Canadian Energy Centre would like to thank and acknowledge the assistance of two anonymous reviewers in reviewing the original data and research for this Fact Sheet. Image credits: Coastal GasLink

References (as of September 20, 2022)

Rystad Energy, August and September 2022. EmissionsCube. <<https://bit.ly/3eAylAs>>.

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