



## Global Methane Tracker 2022

# Overview

The 2022 update of the IEA Global Methane Tracker for the first time includes emissions from the coal sector, creating a complete set of emission estimates for the energy sector and cementing the Tracker’s indispensable role in the fight to bring down methane emissions and implement the new Global Methane Pledge.

A rapid and sustained reduction of methane emissions is both achievable and essential to limit the rise in global average temperatures. According to the Intergovernmental Panel on Climate Change, today’s concentrations of methane in the atmosphere are higher than at any time in at least 800 000 years, and methane has contributed around 30% of observed global warming to date.

## **Methane emissions from the global energy sector rebounded by almost 5% in 2021**

We estimate that the global energy sector was responsible for around 135 million tonnes of methane emitted into the atmosphere in 2021. Following the Covid-induced decline in 2020, this represents a year-on-year increase in energy-related methane emissions of almost 5%, largely due to higher fossil fuel demand and production as economies recovered from the shock of the pandemic.

The inclusion in the Global Methane Tracker of country-by-country estimates for coal activities, alongside those for oil and gas operations, makes the People’s Republic of China (hereafter “China”) the largest source of global energy-related methane emissions, with

28 million tonnes (Mt), followed by Russian Federation (hereafter “Russia”) (18 Mt) and the United States (17 Mt).

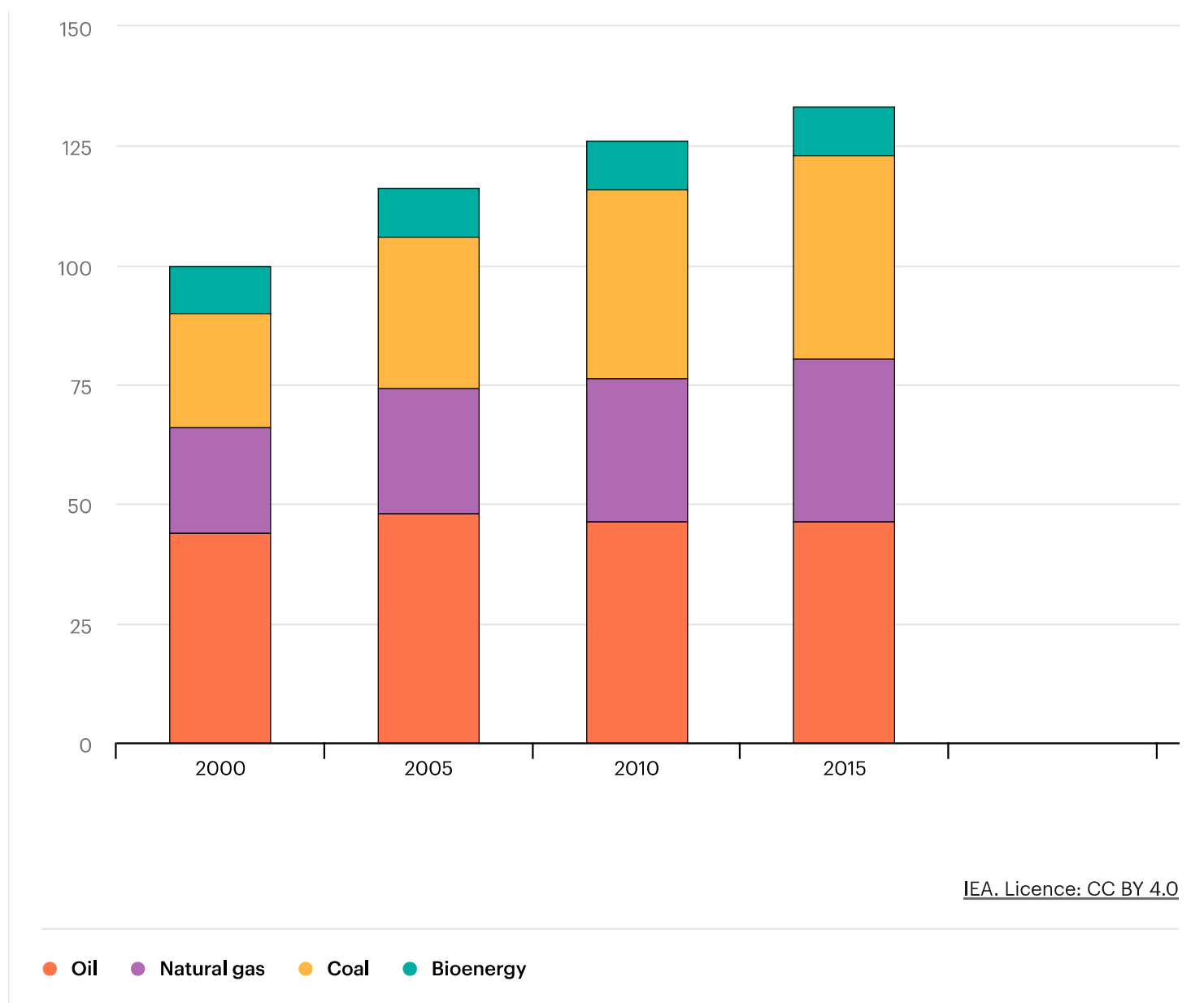
The energy sector is responsible for around 40% of total methane emissions attributable to human activity, second only to agriculture. Of the 135 million tonnes of energy-related emissions, an estimated 42 Mt are from coal mine methane, 41 Mt from oil, 39 Mt are from extracting, processing and transporting natural gas, 9 Mt from the incomplete combustion of bioenergy (largely when wood and other solid biomass is used as a traditional cooking fuel), and 4 Mt leaks from end-use equipment.

The wasteful leakage of methane, the main component of natural gas, is all the more striking given today’s backdrop of very tight and volatile gas markets. Methane leaks in 2021 from fossil fuel operations, if captured and marketed, would have made an additional 180 billion cubic metres of gas available to the market, an amount similar to all the gas used in Europe’s power sector. This would have been comfortably enough to ease today’s price pressures.

### Global methane emissions from the energy sector over time, 2000-2021

**Open** ↗

Mt methane



## Today's elevated natural gas prices make an overwhelming case for strong action on abatement

The most cost-effective opportunities for methane abatement are in the energy sector, especially in oil and gas operations. Based on recent elevated natural gas prices, almost all of the options to reduce emissions from oil and gas operations worldwide could be implemented at no net cost. Such a strong alignment of cost, reputational and environmental considerations should push the oil and gas sector to lead the way with

methane emissions reductions. Forward-leaning companies need to move beyond intensity targets and adopt a zero-tolerance approach.

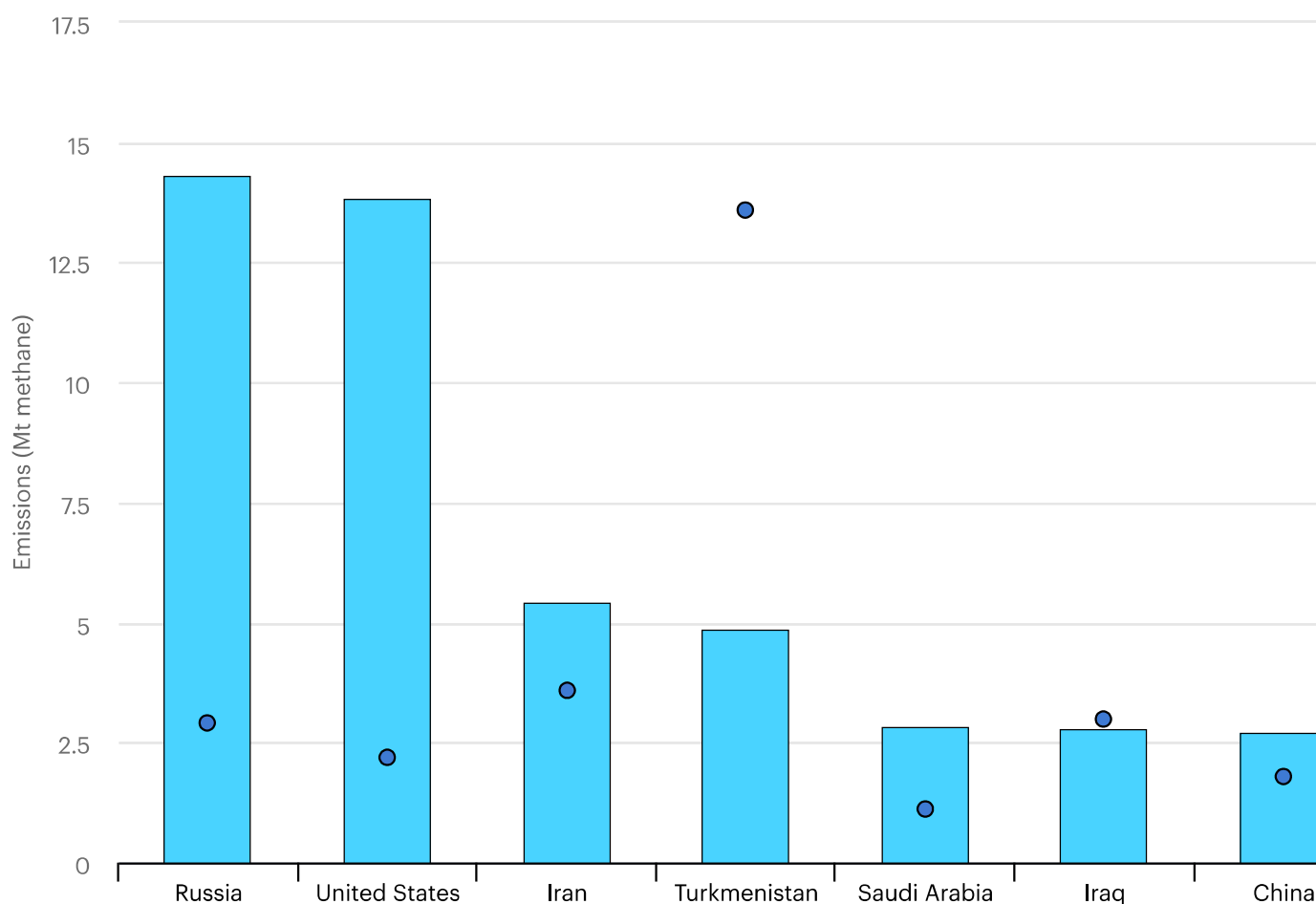
## **If all countries were to perform as well as Norway, global methane emissions from oil and gas operations would fall by more than 90%**

The best companies and countries are showing what can be done to reduce emissions from oil and gas operations, but the intensity of methane emissions (emissions per unit of production) ranges widely. The best performing countries are more than 100 times better than the worst. Norway and the Netherlands have the lowest emissions intensities in our updated Tracker, and countries in the Middle East such as Saudi Arabia and the United Arab Emirates also have relatively low emissions intensities; Turkmenistan and Venezuela have the highest. If all producing countries were to match Norway's emissions intensity, global methane emissions from oil and gas operations would fall by more than 90%.

Increased attention to methane abatement in recent years, including new measurement campaigns and technologies, may be having some effect. The estimated rise in energy-related methane emissions in 2021 leaves them slightly below where they were in 2019, even though overall energy demand and fossil fuel production are both back above pre-crisis levels. However, the limited availability of measured data for most countries means we cannot state with confidence where and how abatement efforts might actually be reducing emissions.

**Total methane emissions and methane intensity of production in selected oil and gas producers, 2021**

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● Emissions ● Intensity

## Methane emissions from the energy sector are about 70% higher than reported in official data

Our emissions estimates, which are based on the latest available scientific studies and measurement campaigns, are significantly higher than the picture provided by official data. As more measured data becomes available, it becomes ever clearer that almost all the national inventories have been underreporting emissions. Emissions claimed for individual

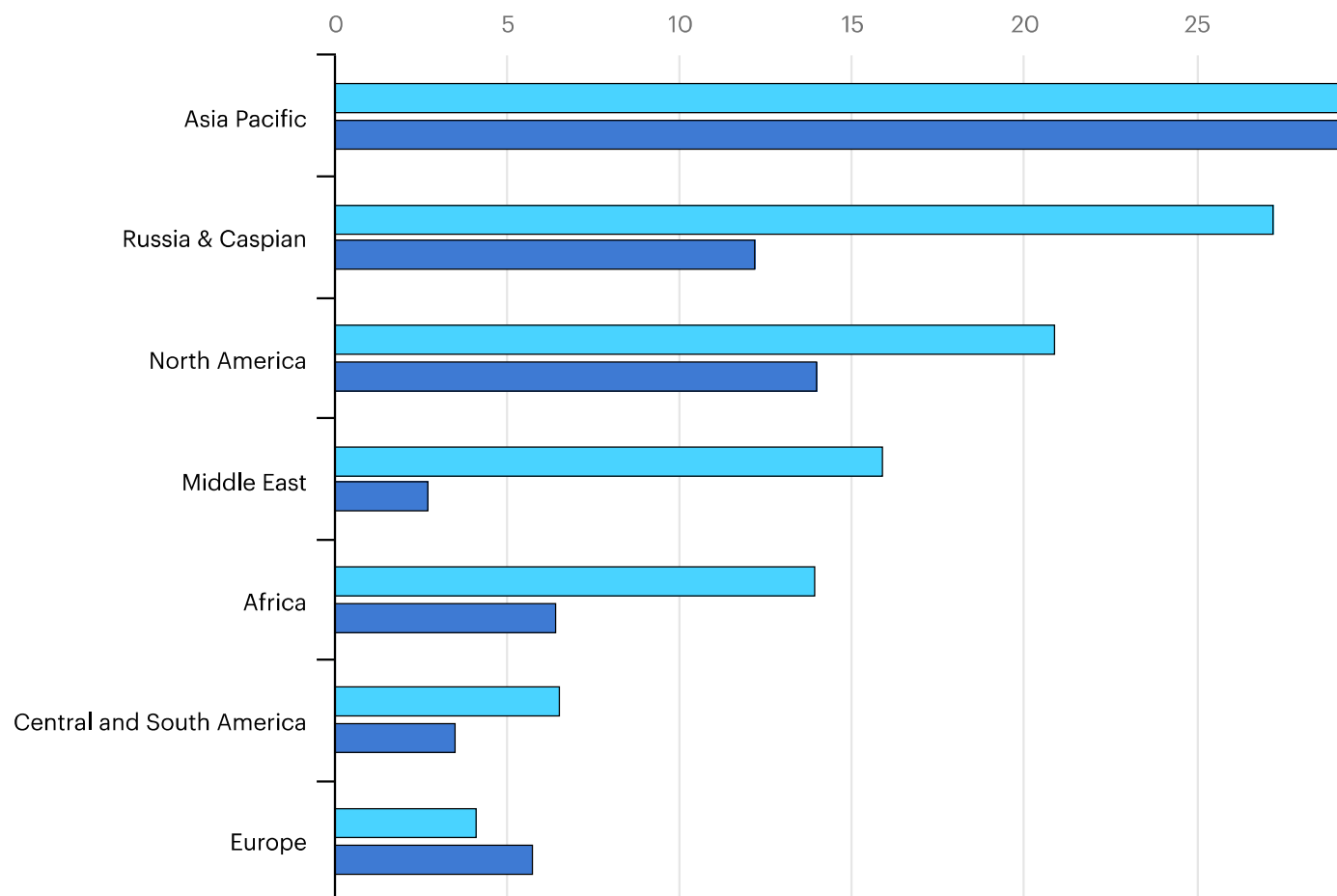
producing basins, fields and facilities are also typically lower than those observed once systematic monitoring and measurement systems are put in place.

Globally, our analysis finds that methane emissions from the energy sector are about 70% greater than the sum of estimates submitted by national governments. Much more needs to be done to enable a better understanding of emissions sources and to allow for comprehensive methane management.

### Global energy-related methane emissions by region reported to the UNFCCC and estimates from the IEA, 2021

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Mt methane



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- International Energy Agency
- Reported to the UNFCCC

## **Satellites are providing much-needed transparency on super-emitting methane leaks**

Satellites are providing a major boost to overall efforts to increase transparency on emissions sources, especially for very large leaks. Satellites are contributing important insights into the size and duration of large leaks in places such as the Middle East and North Africa, Central Asia and across the United States, including the main US shale plays.

### **Satellite-detected methane leaks from human activities, 2021**

The areas open to observation by satellite are increasing but the coverage they provide is still far from complete: existing satellites do not provide measurements over equatorial regions, northern areas (including the main Russian oil and gas producing areas) or for offshore operations. Other measurement-based campaigns will remain essential, and the optimal system will combine satellite measurements with drone-based and other aerial surveys, ground-based sensors and surveys, and continuous monitoring devices.

Large leaks from oil and gas operations were detected by satellite in 15 countries in 2021, with significant emissions from the Permian basin in Texas and very large leaks in parts of Central Asia. Turkmenistan alone was responsible for one-third of the very large emissions events seen by satellites in 2021. Relatively few major leaks were seen among the major onshore producers in the Middle East. In the 15 countries where observations were made, around 6% of our total estimate of methane emissions from oil and gas operations in 2021 were ultra-emitting events seen by satellites.

## **The new Global Methane Pledge is a vital step forward, although some major emitters remain outside it**

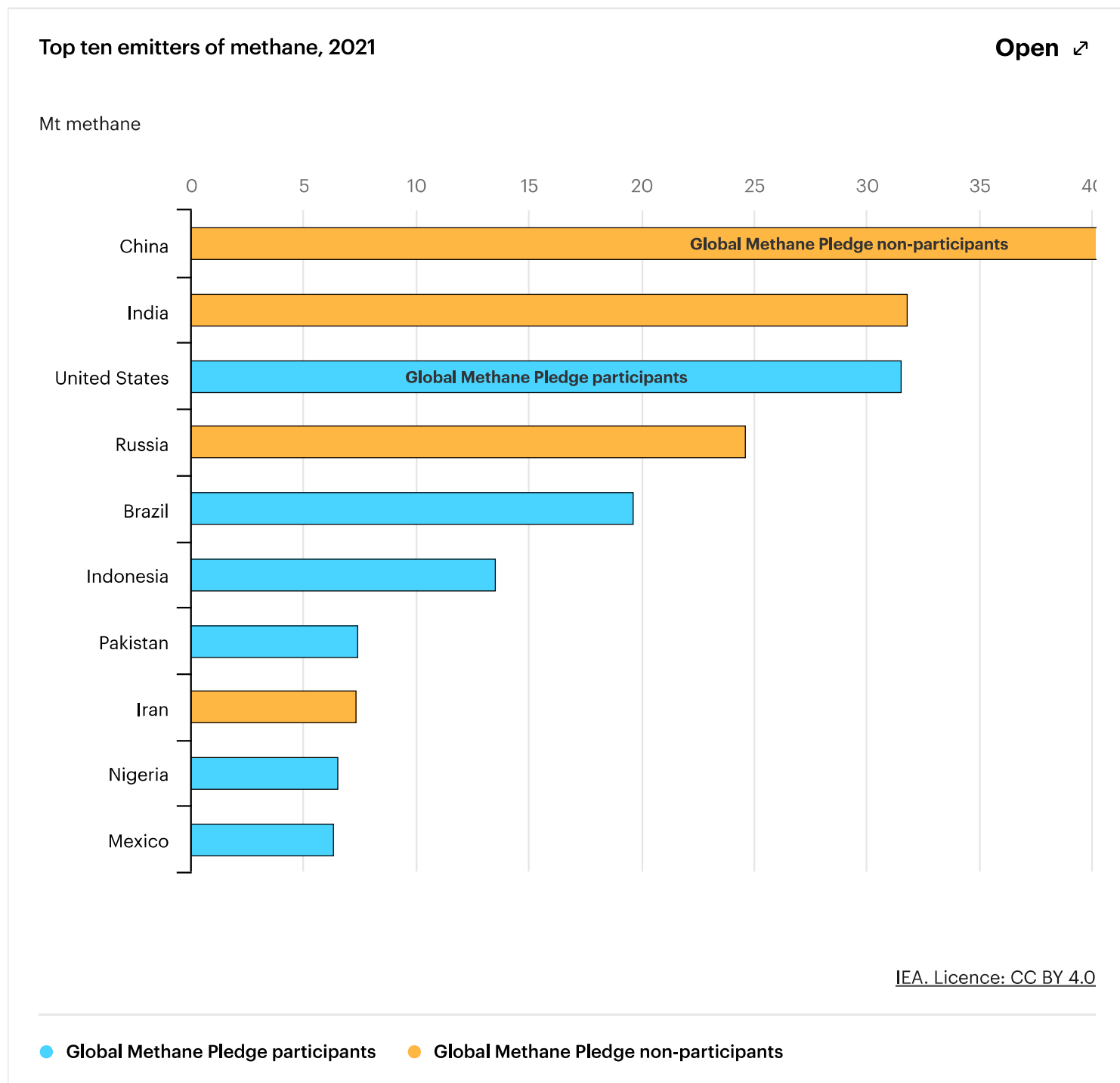
The Global Methane Pledge was launched by the United States and the European Union in November at the 26th UN Climate Change Conference of the Parties (COP26). Over 110 countries have now committed to a collective goal of reducing global methane emissions from human activity (across all sources, not limited to energy) by at least 30% compared with 2020 levels by 2030.

Cutting the world's methane emissions by 30% over the next decade would have the same effect on global warming by mid-century as immediately shifting the global transport sector to net zero CO<sub>2</sub> emissions. Achieving this goal requires countries to move rapidly from high-level commitments to country-level strategies, policies and action plans. The IEA's [Regulatory Roadmap](#) and Toolkit provides a step-by-step guide for countries seeking to drive down methane leaks from the oil and gas industry.

Broadening the coalition of countries committed to ambitious methane reductions is essential. The world's five largest methane emitters (from all sources) are China, India, the



United States, Russia and Brazil. Together, they are responsible for close to half of all methane emissions globally. Of these, only the United States and Brazil are part of the Global Methane Pledge. Looking only at energy-related emissions, the five largest emitting countries are China, Russia, the United States, Iran and India. Of these, only the United States is part of the Pledge.



## If all countries adopted tried and tested abatement policies, this would cut oil and gas methane leaks by half

Uncertainty over emissions levels is no reason to delay action on methane. If all countries implemented tried and tested policies that have already been used effectively in multiple settings, it would cut global methane emissions from oil and gas operations in half. These include banning non-emergency flaring, imposing mandatory leak detection and repair programmes, and introducing equipment standards. Many hydrocarbon producing countries have policies in place they can build on.

Our broad reviews of policies and regulations reveal some success stories that other countries can look to for inspiration. The United States and Canada have both implemented key tried and tested approaches, although there is still room to strengthen their requirements and expand coverage further. Norway and the Netherlands have gone the furthest towards adopting a comprehensive regime, as they have robust measurement and reporting requirements, ensure best industry practice, and economic incentives that encourage abatement action. Actions under the EU Methane Strategy will broaden these efforts across Europe.

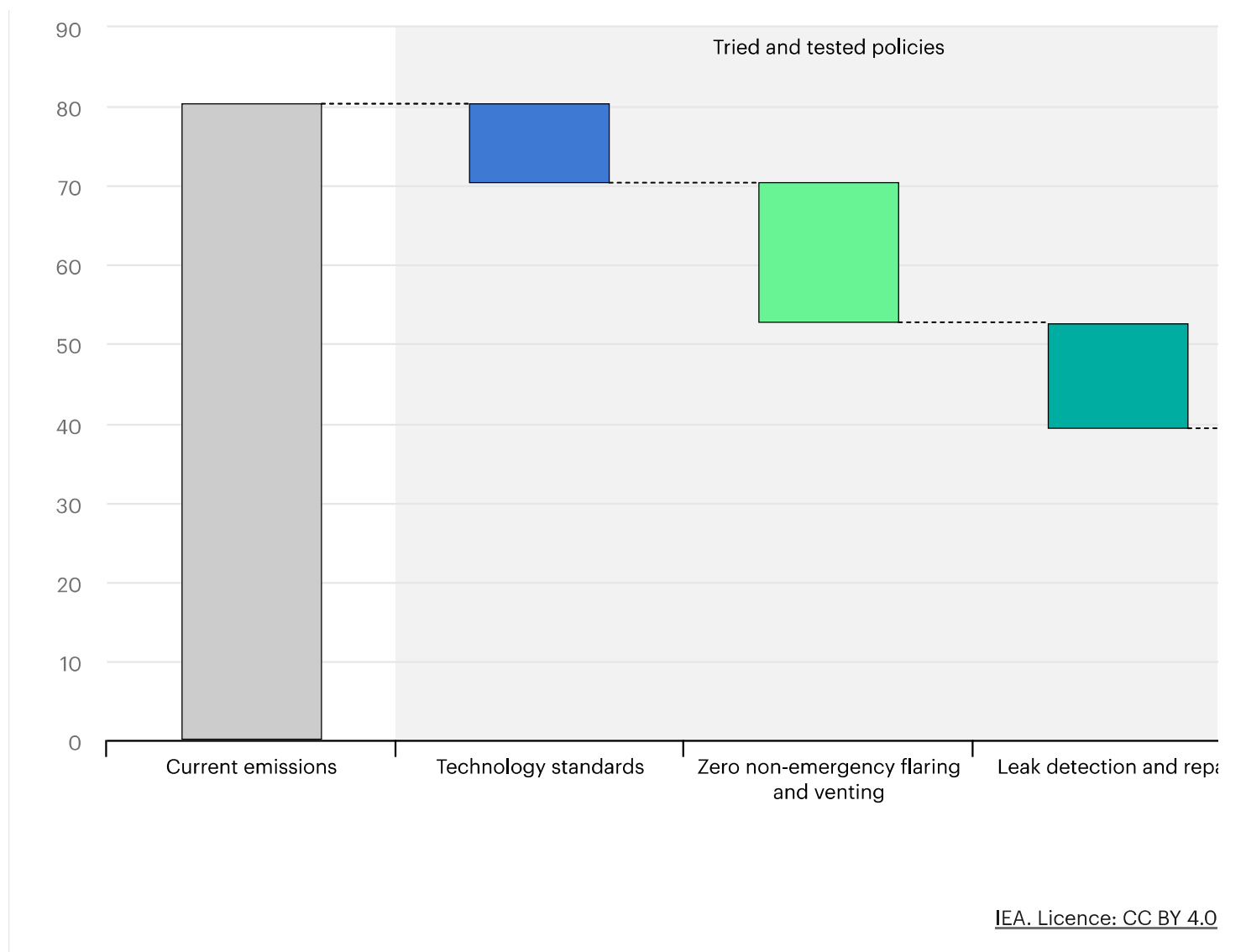
Tackling methane emissions from coal mines – included for the first time in this year's Tracker – is more challenging than tackling emissions from oil and gas operations, but it cannot be ignored. Coal-related methane emissions from China, the world's largest coal producer and emitter of coal mine methane, are equivalent to total CO<sub>2</sub> emissions from international shipping. Significant opportunities remain to reduce methane emissions from coal mines based on existing technology, which could be essential given the risk that coal demand remains high in the coming years.

Emissions from bioenergy are largely due to the incomplete combustion of solid biomass used as a cooking fuel in many developing economies. Accelerated progress towards universal access to clean cooking fuels would dramatically cut these emissions.

**Methane abatement potential of policy measures**

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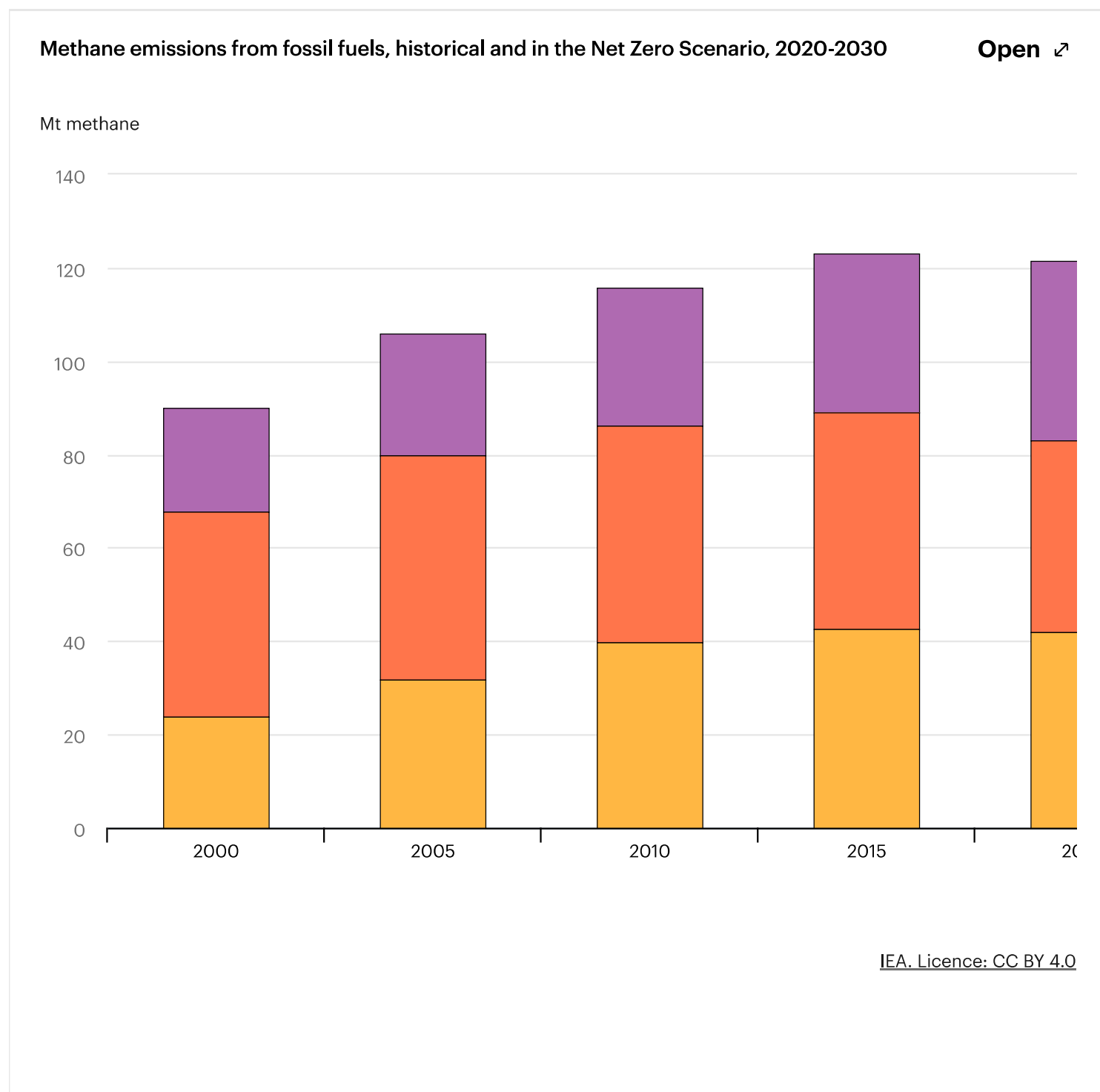
Mt methane



## A redoubled effort on methane is integral to the pathway to net zero emissions

The pathway set out in the IEA's *Net Zero by 2050 Roadmap* – which would give the world an even chance of limiting the rise in global temperatures to 1.5 °C and avoiding the worst effects of climate change – requires energy-related methane emissions to fall by 75% by 2030. Reducing fossil fuel demand alone will not do the job quickly or effectively enough, which means early and concerted abatement efforts by governments and industry are essential. By 2030, all fossil fuel producers would need to reduce their emissions intensities down towards the level of the world's best operators today.

The launch of the Global Methane Pledge needs to be a watershed moment for accelerated action on methane, building on the leadership that some countries and companies have already shown. Increased transparency on the sources of emissions – encouraged by initiatives like the International Methane Emissions Observatory – is essential. The IEA has been a longstanding champion of stronger action in this area. Methane emissions are avoidable, the solutions are proven and even profitable in many cases. And the benefits in terms of limiting near-term global warming are huge.



● Coal ● Oil ● Natural gas

# Next Methane and climate change