

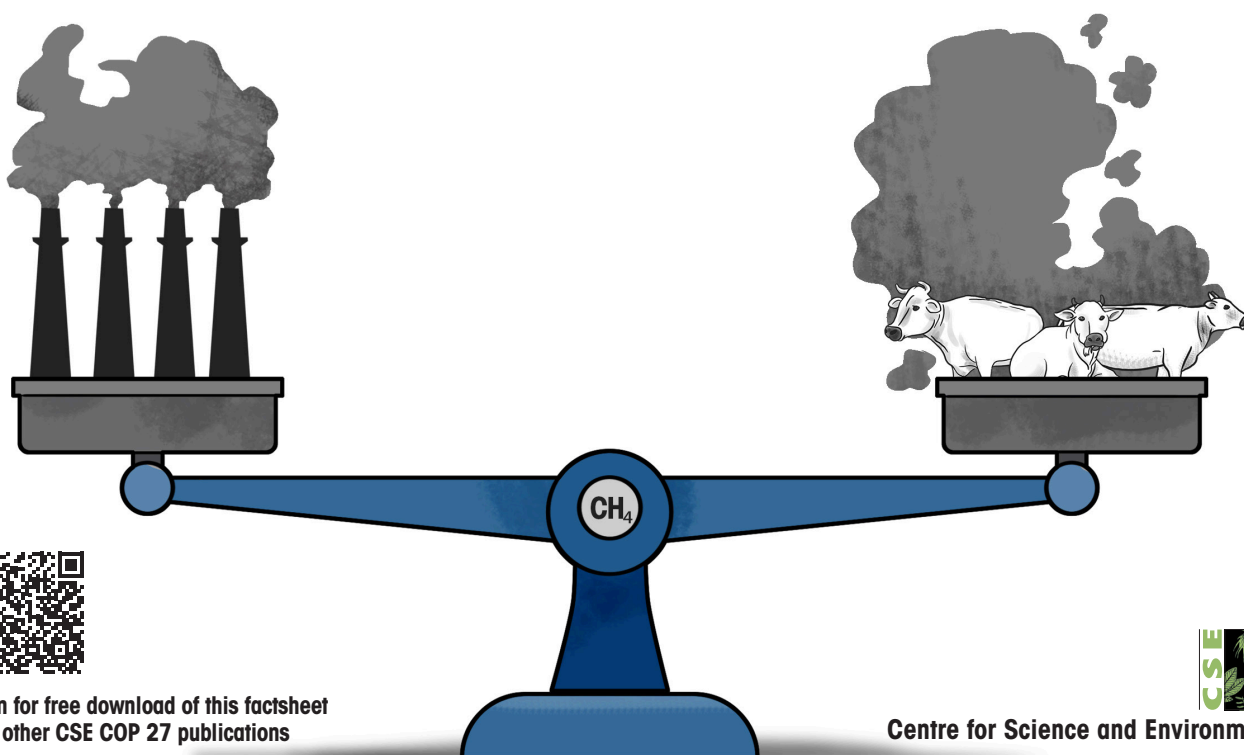
## 8

## METHANE EMISSIONS

Methane emissions have a higher warming impact on the planet than CO<sub>2</sub> but they remain in the atmosphere for comparatively lesser time

Attempts to curb methane emissions from agriculture may impact farmer livelihoods and incomes in the Global South

Methane emissions from oil and gas sector can be reduced with existing technologies by regulating infrastructure



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## METHANE EMISSIONS

### Why focus on methane emissions?

Methane has been the focus of climate mitigation policy ever since it was discovered that methane emissions have a higher warming impact on the planet than carbon dioxide (CO<sub>2</sub>).<sup>1</sup> In the first 20 years of its release into the atmosphere,

the warming impact of methane has been found to be 81.2 times stronger than CO<sub>2</sub>, and 27.9 times stronger than CO<sub>2</sub> over a 100-year period.<sup>2</sup> In 2019, the global level of methane emissions was 9.8 gigatonne of carbon dioxide equivalent (GtCO<sub>2</sub>e), which was 25 per cent higher than it was in 1990 (7.8 GtCO<sub>2</sub>e).<sup>3</sup>

Reducing methane emissions is frequently termed as a 'low-hanging fruit' in climate change mitigation.

Methane lasts in the atmosphere for about a decade before breaking down, unlike CO<sub>2</sub> which lasts for over 100 years. According to scientists, reducing methane emissions also lowers its atmospheric concentration simultaneously, thus reducing its warming impact almost immediately.<sup>4</sup> In comparison, even if CO<sub>2</sub> emissions reach zero or net zero, the accumulated CO<sub>2</sub> in the atmosphere will continue to warm the planet over the course of its lifetime. Moreover, the methods and technologies to reduce methane emissions, particularly in the fossil fuel sector, are mature and cheap, further strengthening the case for an immediate cutback.

### It is possible to reduce methane emissions by half within this decade

According to the United Nations Environment Programme (UNEP), methane emissions caused by humans could be reduced by approximately 180 million metric tonnes per year (Mt/yr) within this decade. This could avert nearly 0.3°C of global warming by 2045, helping to limit the global temperature rise to 1.5°C. This would make the targets set by the Paris Agreement more achievable.<sup>5</sup>

**While agriculture is the largest source of methane emissions, the biggest and cheapest opportunities to cut methane lie in the fossil fuel sector**

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## METHANE EMISSIONS

### Where is methane emitted from?

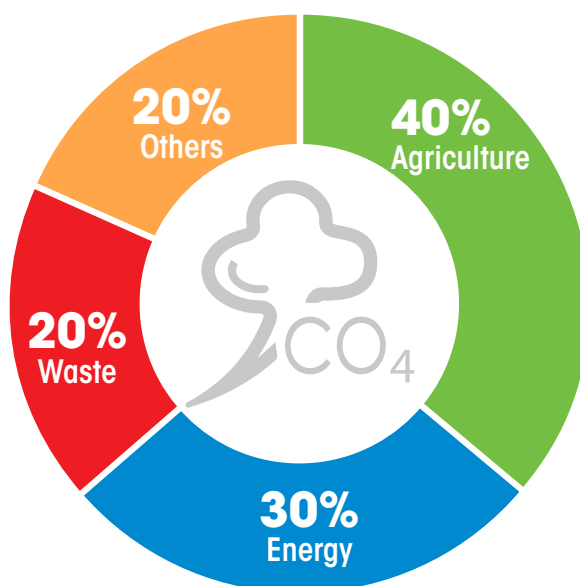
Methane emissions from agriculture come from livestock production—enteric fermentation in ruminant animals and manure management—and rice cultivation.<sup>6</sup> Livestock production contributes one-third of the total global anthropogenic methane emissions, making it the largest single source (see *Graph 1: Anthropogenic sources of methane emissions*).

Flooding of paddy fields for rice production cuts off oxygen to the soil allowing methane-producing microbes to thrive.<sup>7</sup> This leads to about eight per cent of global anthropogenic methane emissions, and is concentrated heavily in Asia—mainly India and China.

Methane emissions from the waste sector originate from landfills and wastewater handling, and constitute about 12 per cent of global anthropogenic methane emissions.

According to the IPCC AR6 WG III report, in 2019, global methane emissions from energy supply, primarily fugitive emissions from the production and transport of fossil fuels, accounted for about 18 per cent of global greenhouse gas (GHG) emissions from energy supply, 32 per cent of global methane emissions, and six per cent of global GHG emissions.

**Graph 1: Anthropogenic sources of methane emissions (2019)**



Source IEA

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According to the Global Energy Monitor (GEM), coal mines emit 52.3 million tonnes of methane per year.<sup>8</sup> According to the Global Methane Budget, leaks in coal mining occur during post-mining handling, processing and transportation.

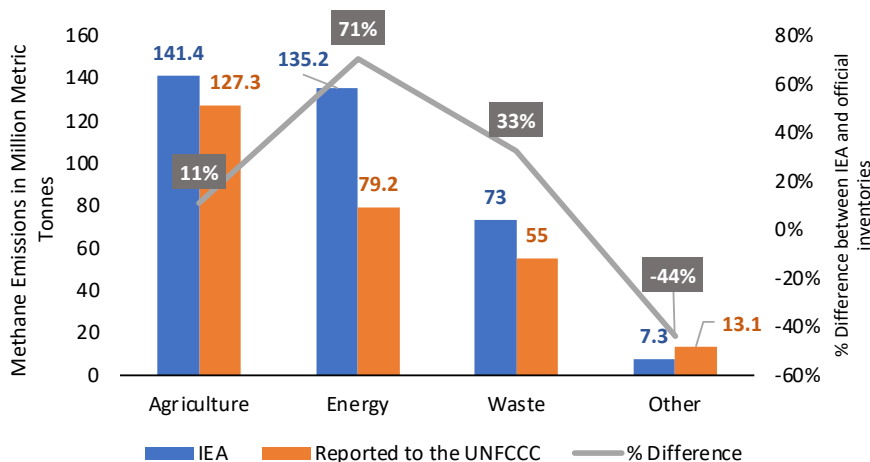
Methane is also emitted throughout the process of natural gas extraction and use.<sup>9</sup> Additionally, the fuel used during the process is itself composed primarily of methane. The Global Methane Tracker 2022, published by the International Energy Agency (IEA), stated in its headline statement that methane emissions from the global energy sector are 70 per cent higher than official figures, indicating that national inventories are under-reporting methane emissions<sup>10</sup> (see *Graph 2: Methane emissions vary*).

Sources differ on which countries have the highest methane emissions. The top five emitters produced close to half of global methane emissions in 2019, with China leading the list (see *Table 1: Top five countries with the highest methane emissions – 2019*). However, as the methane estimations from oil and gas is understood to be underreported, this data needs further work.

### Policy action on methane: survival vs luxury emissions

As of October 2021, among the total number of countries that submitted Nationally Determined Contributions (NDCs) under

**Graph 2: Methane emission estimates vary**



Source: Compiled by CSE; adapted from Global Methane Tracker 2022. International Energy Agency. Accessed at: <https://www.iea.org/reports/global-methane-tracker-2022>

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**Table 1: Top five countries with the highest methane emissions – 2019**

Source	Country	Annual methane emissions (GtCO <sub>2</sub> e)	% of world's annual methane emissions	Source	Country	Annual methane emissions (GtCO <sub>2</sub> e)	% of world's annual methane emissions
PBL 2020	China	1.18	14%	CAIT	China	1.62	16%
	United States	0.75	9%		India	0.87	9%
	Russia	0.69	8%		United States	0.68	7%
	India	0.66	8%		European Union	0.61	6%
	Brazil	0.44	5%		Brazil	0.54	5%

Source: Compiled by CSE; data from 1) Olivier J.G.J. and Peters J.A.H.W. (2020), Trends in global CO<sub>2</sub> and total greenhouse gas emissions: 2020 report. Report no. 4331. PBL Netherlands Environmental Assessment Agency, The Hague, and 2) Our World in Data based on Climate Analysis Indicators Tool (CAIT)

the Paris Agreement to the UNFCCC, 63.4 per cent had referenced methane.<sup>11</sup> In the same month, the UNEP and EU launched the International Methane Emissions Observatory at the G20 Summit, to produce a global public dataset of empirically verified methane emissions, starting with the fossil fuel sector.

In November 2021, at COP 26 in Glasgow, the Global Methane Pledge was announced by the US and EU where signatories promised to reduce their methane emissions by 30 per cent by 2030. The Pledge claimed to reduce warming by 0.2°C by 2050. As of October 2022, the Pledge has 122 signatories and has the potential to take important steps in achieving short-term climate benefits of methane reductions. However, scientists believe that the Pledge must go further and aim for cuts of around 50 per cent if it hopes to meet its target.<sup>12</sup> Moreover, the Pledge is non-binding, and the reduction targets are global with no specific national targets.

China, Russia and India did not join the Pledge. Australia—a major source of livestock, coal mining and gas-based methane emissions—did not participate in the Pledge under Prime Minister Scott Morrison's leadership. However, in October 2022, Anthony Albanese's government announced that Australia would join the Pledge.

At the individual country level, the European Union (EU) communicated its methane reduction strategy in 2020.<sup>13</sup> The following year, the EU drafted legislation to reduce methane emissions by forcing oil and gas companies to report their output, and find and fix methane leaks.<sup>14</sup> New Zealand plans to “reduce biogenic methane emissions by 10 per cent by 2030, and 24–47 per cent by 2050, both relative to 2017 levels,” while Nigeria and Cote d'Ivoire

have committed to reducing methane emissions from oil and gas sectors by 45 per cent by 2025 and 60–75 per cent by 2030 respectively.<sup>15</sup>

In 2016, the United States, under the Presidency of Barack Obama, sought to control methane emissions from the

oil and gas sector by announcing new emission standards, and leak detection and repair requirements.<sup>16</sup>

However, these were rolled back in 2019, under the Presidency of Donald Trump, who proposed eliminating regulatory requirements for oil and gas companies.<sup>17</sup> The Trump administration also proposed diluting some of the air pollution regulations for the oil and gas industry. This course has been reversed, at least in intention, by his successor Joe Biden,

who announced a target for reducing methane emissions by more than 50 per cent by 2030 during COP 26 in Glasgow. This would require certain upgrades, restrictions and monitoring parameters to be put in place for the industry.<sup>18</sup>

While agriculture is the largest human-driven source of excess methane, its association with livelihood and nutrition, particularly in the Global South, makes it a tricky sector to tackle. Moreover, according to the IPCC, mitigation of methane in the agriculture sector is “still constrained by cost, the diversity and complexity of agricultural systems, and by increasing demands to raise agricultural yields, and increasing demand for livestock products.”

In response to a query in the Lok Sabha (lower house of the Parliament) in December 2021, member of Parliament Ashwini Kumar Choubey mentioned that enteric fermentation and paddy cultivation are the primary sources of methane in India, and the Pledge could impact small farmer incomes.<sup>19</sup> According to Choubey, in the context of food security, India’s methane emissions were ‘survival’ emissions as opposed to luxury emissions. Since India is one of the largest producers and exporters of rice, attempts to

**Annual investment of around US \$13 billion would be required to mobilise methane abatement measures in the oil and gas sub-sector**

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#### **Cheapest methane abatement options lie in the fossil fuel sector**

While agriculture is the largest source, the biggest opportunities to cut methane lie in the fossil fuel sector. Oil and gas are the only sectors for which most emissions can be reduced in a cost-effective manner with technologies that exist today. On fossil fuel methane emissions, the IPCC's AR6 WG III report asserts that, "about 50–80 per cent of CH<sub>4</sub> emissions from these fossil fuels could be avoided with currently available technologies at less than USD50 tCO<sub>2</sub>-eq-1."

The IEA suggests that it is technically possible to avoid around three-quarters of today's methane emissions from global oil and gas operations. Annual investment of around US \$13 billion would be required to mobilise all methane abatement measures in the oil and gas sub-sector, it adds, which is less than the total value of the captured methane that could be sold. Thus, methane emissions could be reduced by almost 75 per cent at an overall savings to the global oil and gas industry. Technologies include leak detection, installing emissions control devices, and replacing components and devices that emit methane in their normal operations.

curb agricultural methane emissions could impact farmers' incomes, agricultural production, and India's trade and economic prospects.

Wealthy nations like the US and EU who have rallied support for methane reduction in recent years, are still deeply dependent on natural gas as a fuel. In its methane report, the UNEP clearly states that "without relying on future massive-scale deployment of unproven carbon removal technologies, expansion of natural gas infrastructure and usage is incompatible with keeping warming to 1.5°C."

Scientific consensus points to the fact that the oil and gas sector can cut methane emissions at the lowest costs using technologies that are readily available today. But these measures cannot be limited to plugging leaks in oil and gas equipment. Instead, it requires a complete shift away from oil and gas, and towards zero-carbon renewable energy, initially for countries who can afford it, and gradually for the Global South.

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## METHANE EMISSIONS



As journalist Amy Westervelt pointed out in the New York based magazine, *The Nation* in November 2021, intentional flaring and venting is much more common in the natural gas drilling, refining and distribution process, than accidental leaks. And the industry has not proved reliable when it comes to curbing these releases. Thus, the only reliable solution to the methane problem is to end new permits and regulate existing infrastructure.<sup>20</sup>



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