Fossil Fuel Methane Primer: Critical Role of Reducing Fossil Fuel Methane Emissions to Address the Climate Emergency

15 July 2026

Institute for Governance & Sustainable Development

Suggested citation
Institute for Governance & Sustainable Development (2026) FOSSIL FUEL METHANE PRIMER: CRITICAL ROLE OF REDUCING FOSSIL FUEL METHANE EMISSIONS TO ADDRESS THE CLIMATE EMERGENCY.

Purpose
This *Primer* concentrates on methane mitigation opportunities available within the fossil fuel sector. It establishes an understanding of the urgent need to cut methane emissions and of the how the fossil fuel sector is an important source human-driven methane emissions. Within this sector, there are available methane mitigation technologies and tried-and-tested policies, which are seen and advocated in national and international efforts. Together, the need, the available solutions, and the growing consensus and ambition point toward a binding international agreement on methane emissions.

Lead authors
Fielding Burnette

Reviewers
Alyssa Hull, Dan Kim, Julie Miller, Katie Super, Madelyn Zuckerman, Rebecca Mitchell, Sebastian Luengo, & Trina Chiemi

Additional Guidance
Maas Goote, Richard Ferris, Sean Dennis, & Xiaopu Sun

Acknowledgements
We thank readers for comments that have allowed us to continue to update and improve this *Primer*.

Institute for Governance & Sustainable Development

Unless otherwise indicated, all content in the *Primer on Cutting Methane* carries a Creative Commons license, which permits non-commercial re-use of the content with proper attribution. Copyright © 2024 Institute for Governance & Sustainable Development.

About the Institute for Governance & Sustainable Development (IGSD)

IGSD's mission is to ensure fast cuts to the non-carbon dioxide climate pollutants and other fast climate mitigation strategies to slow near-term global warming and self-amplifying climate feedbacks, avoid or at least delay catastrophic climate and adverse societal tipping points, and limit global temperature to 1.5 °C—or at least keep this temperature guardrail in sight, limit overshoot, and return to a safe temperature as fast as possible.

IGSD's research confirms that decarbonization alone is insufficient to slow near-term warming to keep us below 1.5 °C or even the more dangerous 2 °C guardrail, and that the fastest and most effective strategy is to combine the marathon to zero out carbon dioxide (CO_2) emissions from decarbonizing the energy system *with* the sprint to rapidly cut non-CO_2 super climate pollutants and protect carbon sinks. The super climate pollutants include four short-lived climate pollutants (SLCPs)—methane (CH_4), hydrofluorocarbons (HFCs), black carbon soot, and tropospheric ozone (O_3)—as well as the longer-lived nitrous oxide (N_2O).

Combining the fast mitigation sprint with the decarbonization marathon also helps address the ethical issues of intra-generational equity by giving societies urgently needed time to build resilience and adapt to unavoidable changes. The latest science suggests that the window for exceeding the 1.5 °C guardrail could close as soon as 2030, making this the decisive decade for fast action to slow warming.

The fastest way to reduce near-term warming in the next two decades is to cut SLCPs. Because they only last in the atmosphere from days to 15 years, reducing them will prevent most of their predicted warming within a decade. Strategies targeting SLCP reductions can avoid about 0.6 °C by 2050 and 1.2 °C by 2100, which is three to four times more warming at 2050 than targeting CO_2 alone. Cutting methane emissions can avoid nearly 0.3 °C of this by the 2040s, with the potential for significant more avoided warming from emerging technologies to remove atmospheric methane faster than the natural cycle. Reducing HFCs can avoid nearly 0.1 °C of warming by 2050 and up to 0.5 °C by the end of the century. The initial HFC phasedown schedule in the Kigali Amendment to the Montreal Protocol will capture about 90 percent of this. Parallel efforts to enhance energy efficiency of air conditioners and other cooling appliances during the HFC phasedown can double the climate benefits at 2050.

Combining the fast mitigation sprint with the decarbonization marathon would reduce the rate of global warming by half from 2030 to 2050, slow the rate of warming a decade or two earlier than decarbonization alone, and make it possible for the world to keep the 1.5 °C guardrail in sight and reduce overshoot. It would also reduce the rate of Arctic warming by two-thirds. This would help slow self-amplifying climate feedbacks in the Arctic, and thus avoid or at least delay the cluster of projected tipping points beyond 1.5 °C. Reducing climate risks and staying within the limits to adaptation are critical to building resilience.

IGSD's approach to fast mitigation includes science, technology, law and policy, and climate finance. IGSD works at the global, regional, national, and subnational levels.

Fossil Fuel Methane Primer: Critical Role of Reducing Fossil Fuel Methane Emissions to Address the Climate Emergency

15 July 2026

Table of Contents

I. INTRODUCTION TO FOSSIL FUEL METHANE EMISSIONS AND EFFORTS TO CURB THEM 1

II. FOSSIL FUEL METHANE EMISSIONS AND LARGE, COST-EFFECTIVE MITIGATION STRATEGIES 5

A. Methane Mitigation Strategies in the Oil & Gas Sector 6

B. Methane Mitigation Strategies in the Coal Sector 8

C. Transparency and Accountability 9

1. Accountability Systems 10
2. Measurement, Monitoring, Reporting, and Verification 11
3. Data Provision: Satellite Monitoring and Observational Systems 11

a. Key Satellite Initiatives 12

i. Satellite operators 12
ii. Data aggregators and platforms 13

b. Additional Monitoring Initiatives 14

c. Performance Rating and Certification Initiatives 14

III. THE CURRENT LANDSCAPE OF MITIGATION: FROM NATIONAL REGULATORY FRAMEWORKS TO MULTILATERAL INITIATIVES AND INDUSTRY-LED ACTIONS 15

A. National Efforts to Address Fossil Fuel Methane Emissions 15

1. Leak Detection and Repair Requirements 16
2. Venting and Flaring Requirements 17
3. Measurement, Monitoring, Reporting, and Verification (MMRV) 18
4. Methane Intensity 19
5. Decommissioning Requirements 22
6. Equipment Standards and Phasing-In Zero-Emitting Technologies 22
7. Economic Policy 23

B. International Efforts to Address Fossil Fuel Methane Emissions 23

1. Growing Global Consensus on Methane Regulation 23

a. Statements from Island Nations and Climate Vulnerable States 24

b. G7, G20, and Major Economies 25

c. The Sunnylands Statement 26

d. The Joint Glasgow Declaration 27

2. Governmental and Quasi-governmental Organizations and Initiatives 27

a. ASEAN Energy Sector Methane Leadership Program 27

b. The Breakthrough Agenda 27

c. The Climate & Clean Air Coalition to Reduce Short-Lived Climate Pollutants 28

d. International Working Group to Establish Universal Approach to Measuring, Monitoring, Reporting, and Verifying Greenhouse Gas Emissions Across the Natural Gas Supply Chain 30
e. Net-Zero Producers Forum 30
f. World Bank Global Gas Flaring Reduction Partnership and Zero Flaring Initiative/Global Flaring and Methane Reduction (GFMR) 31
g. World Bank Global Methane Reduction Platform for Development (CH4D) 31
h. United Nations Economic Commission for Europe (UNECE) 31
3. Industry-led initiatives 32
a. American Petroleum Institute Methane Action Plan 32
b. Coalition for LNG Emission Abatement Towards Net Zero (CLEAN) 32
c. Global Methane Initiative 32
d. Methane Abatement in Maritime Innovation Initiative (MAMII) 33
e. The Methane Guiding Principles 33
f. Oil and Gas Climate Initiative (OGCI) 33
g. Oil and Gas Decarbonization Charter (OGDC) 33
h. Oil and Gas Methane Partnership 34

IV. GLOBAL ENERGY MARKETS: HOW SUPPLY SURPLUSES CREATE OPPORTUNITIES FOR METHANE MITIGATION WITHOUT COMPROMISING ENERGY SECURITY 34

A. Natural Gas Markets 35
B. Crude Oil Markets 35
C. Coal Markets 36

V. FINANCIAL AND PHILANTHROPIC ORGANIZATIONS CAN PROVIDE FINANCIAL SUPPORT FOR METHANE AMBITION AND ACTION 36

A. Global Methane Hub 39
B. The Methane Finance Sprint 40
C. International Monetary Fund-World Bank Climate Advisory Group 40
D. International Monetary Fund 40
E. Resilience and Sustainability Trust 40
F. World Bank Group 41
G. Country Climate and Development Report 42
H. Private Investment 43
I. Debt Financing for Methane Abatement: The Methane Finance Working Group 43
J. Global Methane Tax/Fee 44
K. A Global Financial Strategy to Tackle the Climate Emergency, Including Methane 45

VI. FROM PLEDGE TO PROTOCOL: THE CASE FOR A BINDING INTERNATIONAL METHANE AGREEMENT 46

A. Designing an International Methane Agreement That Works 47
1. Lessons from Successful Agreements: What a Methane Treaty Could Learn 47
2. Successful Features of Global Governance As Seen in the Montreal Protocol 48
a. Core Principles for an International Methane Agreement 49

i. Purpose and Scope 49
ii. Content and Standards 50
iii. Capacity and Support 50
b. Governance and Institutions *50*
VII. CONCLUSION **51**
REFERENCES **52**

List of Figures and Tables

Figure 1. Contributions to observed warming in 2010–2019 relative to 1850–1900 1
Figure 2. Avoided warming from simultaneous mitigation of CO_2 and methane compared with CO_2-only mitigation 3
Table 1. Methane tracking technologies 9
Box 1. 0.2% Methane Intensity Import Standard 21

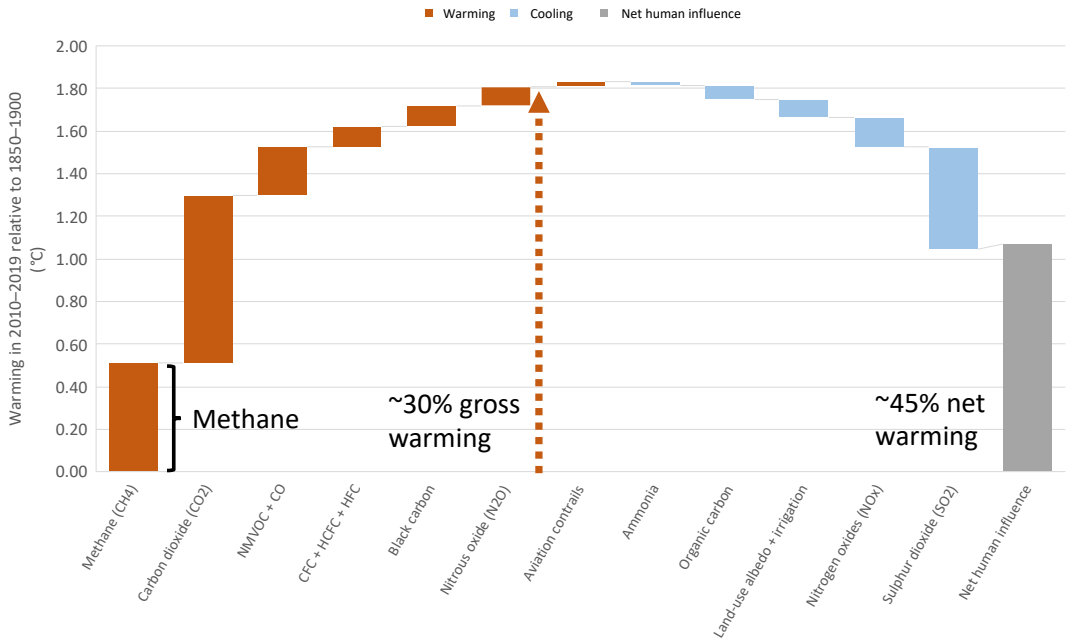
I. Introduction to Fossil Fuel Methane Emissions and Efforts to Curb Them

The current climate emergency requires fast-acting solutions that move beyond a paradigm of inadequacy. We are already experiencing the climate emergency, with extreme events occurring sooner and with greater severity than anticipated. It is all but inevitable that we will soon see long-term temperatures stay above the 1.5 °C guardrail of the Paris Agreement.[1] Global warming is on track to exceed 1.5 °C by 2030[2] and +2 °C before 2050.[3] The window to slow warming is closing, and every year of delay locks in a higher peak and greater risk.[4]

Ending dependence on fossil fuels through the decarbonization of the energy system protects the climate and ensures peace and security. Yet, this transition takes time, and speed must become the key factor in the selection of climate solutions. We need measures that can begin within two to three years, be substantially implemented within five to ten years, and produce a climate response within the next decade or two.[5] The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) affirms methane mitigation as this solution in stating that "[s]trong, rapid and sustained reductions in methane emissions can limit near-term warming and improve air quality by reducing global surface ozone. (*high confidence*)."[6]

Methane (CH_4) is a super-potent planet-warming greenhouse gas with over 80 times the warming power of carbon dioxide (CO_2) over 20 years.[7] As described in the *Financial Times*, "[i]f you think of fossil fuel emissions as putting the world on a slow boil, methane is a blow torch that is cooking us today It is responsible for 0.51°C of the 1.06°C of observed warming in 2010–2019, measured against 1850–1900 (**Figure 1**).[8] As a major precursor of tropospheric ozone, it also causes premature deaths, billions of dollars' worth of crop losses annually,[9] and degradation of carbon sinks.[10]

Figure 1. Contributions to observed warming in 2010–2019 relative to 1850–1900



Adapted from Intergovernmental Panel on Climate Change (2021) *Summary for Policymakers*, *in* 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., *et al.* (eds.), Data for Figure SPM.2 (v20210809). *See also* NERC EDS Centre for Environmental Data Analysis (2021).

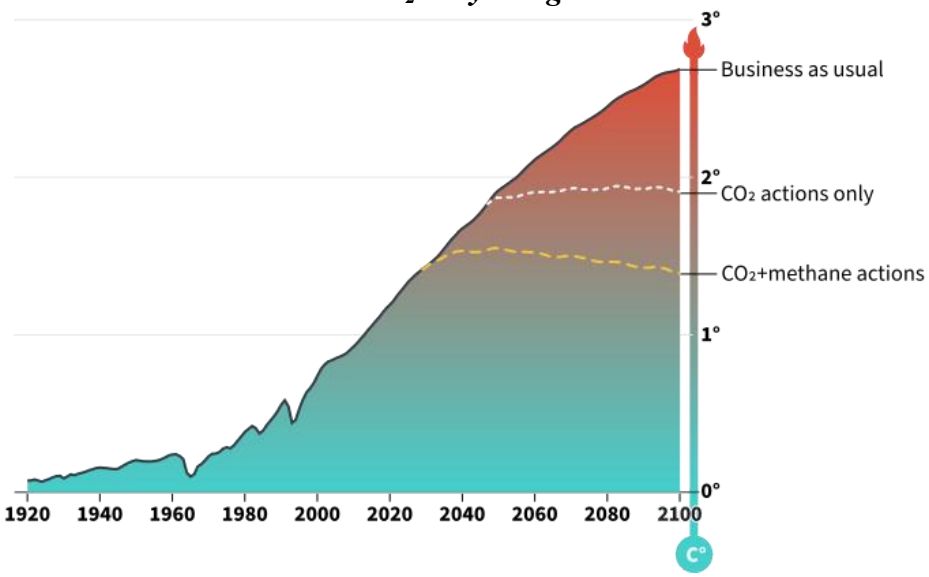
Cutting methane emissions is the fastest and best strategy to slow warming and keep 1.5 °C within reach.[11] The *Global Methane Assessment* from the Climate & Clean Air Coalition (CCAC) and United Nations Environment Programme (UNEP) concluded in 2021 that currently available mitigation measures could reduce human-caused methane emissions by 45% by 2030, compared to projected business-as-usual 2030 scenarios.[12] In 2025, UNEP released its *Global Methane Status Report*, whose findings show that full implementation of maximum technically feasible reductions could reduce human-caused methane emissions by 32% by 2030 compared to 2020 levels, avoiding 0.2 °C of warming by 2050.[13] Pursuing these reductions is the only way to avoid this level of near-term warming using readily available and scalable technologies. Every decade of delay in methane mitigation after 2040 would add roughly 0.1 °C to peak warming.[14]

Aggressive methane action today would lower risks of triggering irreversible tipping points, which are greater beyond the 1.5 °C guardrail.[15] Tipping points are thresholds whose crossing leads to self-perpetuating, irreversible, and abrupt impacts.[16] Current warming already risks triggering five of the Earth's irreversible tipping points,[17] and past the 1.5 °C guardrail, three more systems become vulnerable.[18] Domino-like interactions among these systems risk triggering a global cascade of tipping points[19] that current climate models either ignore or under-estimate.[20] A prestigious group of climate scientists, in their 2019 *Nature* Comment, *Climate Tipping Points—Too Risky to Bet Against*, explain that "the clearest emergency would be if we were approaching a global cascade of tipping points" and that such "cascading effects might be common."[21] (For a regularly updated and comprehensive discussion of self-propagating feedbacks and tipping points, please refer to IGSD's *Background Note: The Need for Fast Near-Term Climate Mitigation to Slow Feedbacks and Tipping Points*.)

While decarbonizing the energy system and reaching net-zero CO_2 remains key to climate stabilization and keeping warming below 1.5 °C by the end of this century,[22] phasing out CO_2-emitting fossil fuels, such as coal and diesel, also stops emissions of co-emitted cooling aerosols such as sulfur dioxide.[23] These aerosols currently mask up to 0.5 °C of actual warming.[24] Unlike CO_2, which remains in the atmosphere for decades to centuries, these cooling aerosols fall out of the atmosphere within days to months. The loss of this cooling effect will offset reductions in warming from decarbonization until around 2050 and *likely even accelerate warming over the first decade of decarbonization or longer*.[25] Even without accounting for the unmasked warming from reducing cooling aerosols, peaking CO_2 emissions by 2030 and reaching neutrality by the 2060s would only avoid 0.1 °C of warming by 2050.[26]

To counter unmasked warming and avoid near-term warming, rapid cuts to non-CO_2 super pollutants, primarily methane, as the *Global Methane Assessment,* IPCC AR6, and *Global Methane Status Report* indicate, are necessary (**Figure 2**).[27]

Figure 2. Avoided warming from simultaneous mitigation of CO_2 and methane compared with CO_2-only mitigation



Source: Reproduced from Gordon D., Irakulis-Loitxate I., & Dreyfus G. (17 September 2024) *Two Carbon Co-Conspirators Need to Be Stopped to Tackle Climate Change*, RMI, using modeled data from Reisinger A. (2024) *Why addressing methane emissions is a non-negotiable part of effective climate policy*, FRONT. SCI. 2: 1–5.

As noted, in addition to warming, methane is a major precursor to tropospheric ozone.[28] This causes warming and drives significant human respiratory and cardiovascular morbidity and mortality,[29] as well as agricultural crop damage.[30] Implementing the maximum technically feasible reductions to achieve a 32% decrease in global methane emissions by 2030, compared to current legislation achieving an 8% decrease, would prevent an additional 180,000 premature deaths, 560,000 asthma-related hospital visits, 53 billion hours of lost labor from extreme heat, and 19 Mt of crop losses annually.[31] The gross benefits of methane abatement exceed US$1 trillion per year in 2050, with the net value of methane abatement totaling US$17.5 trillion, when including both climate and air quality health benefits.[32] Each tonne of methane reduced generates US$7,381 in health, productivity, and other benefits.[33]

Momentum has been building on methane action at the international level. At the United Nations Framework Convention on Climate Change (UNFCCC)'s 26th Conference of the Parties (COP26), the European Union and the United States launched the Global Methane Pledge, marking the first time that Heads of State committed to acting on methane emissions.[34] Its participation has expanded to 159 countries plus the European Union, which together commit to reducing global methane emissions by at least 30% from 2020 levels by 2030.[35]

At COP28, Parties agreed to the first Global Stocktake that had identified "the need for deep, rapid, and sustained reductions" in GHG emissions to stay below 1.5 °C, including accelerating and substantially reducing methane emissions by 2030.[36] COP28 saw the first *Summit on Methane and Non-CO2 Greenhouse Gases*, convened by the United States, China, and the United Arab Emirates.[37] At the Summit, Parties further recognized the essential role of cutting methane to ensure peak-warming reduction and limit the likelihood of overshooting 1.5 °C.[38]

As ambition was further operationalized at COP29 with the second *Summit on Methane and Non-CO2 Greenhouse Gases* (convened by the United States, China, and Azerbaijan),[39] the launch of the *Methane Abatement Partnerships Roadmap*,[40] and the *Summit to Accelerate Actions to Cut Emissions of Methane and other CO_2 Greenhouse Gases*,[41] the focus shifted

decisively by 2025 toward global mandatory actions. Barbados Prime Minister Mia Mottley and French President Emmanuel Macron asserted that voluntary pledges must evolve into a binding international agreement akin to the Montreal Protocol.[42]

At COP30, the United Kingdon led eleven countries endorsed a joint statement on drastically reducing methane emissions in the global fossil fuel sector.[43] While a call joined by more than 80 States to write a fossil-fuel phase-out roadmap into the COP30 text was blocked, Colombia and the Netherlands convened a Conference on Transitioning Away from Fossil Fuels in Santa Marta in April 2026.[44] At this conference, a coalition of the willing convened and fed their ambition into a COP presidency-led roadmap, for which curbing fossil methane emissions must feature as the immediate step, according to the Insights from the Synthesis Report workstream of the Academic Dialogue to the Conference.[45]

On 4 May 2026 under its G7 Presidency, France convened a high-level multi-stakeholder methane event at which the interventions converged on three propositions. First, methane mitigation is now understood not only as a climate priority but also as a matter of energy security and economic competitiveness.[46] Second, voluntary frameworks have reached their limits.[47] Finally, enough countries are now willing to accept binding international rules to form a coalition that can move forward, even if not every country joins at the outset.[48] Less than a month later, in June 2026, United Nations Secretary-General António Guterres gave an address at London Climate Action Week, during which he launched a Call to Action on Methane and argued for "a special focus on the sector that is the root cause of the twin crises facing our world … and where the most immediate gains can be made – coal, oil and gas."[49] While emphasizing that "voluntary action is no longer enough," he reminded us that the "world phased out leaded gasoline" and "eliminated ozone-depleting chemicals;" therefore, "[m]ethane pollution must be next."[50]

These developments build upon an increasingly strong foundation for methane mitigation in the fossil fuel sector at the domestic and international levels. Many of these efforts are discussed in this *Primer*, including:

- Domestic efforts to implement methane regulations;
- Governmental, quasi-governmental, and private sector methane initiatives;
- Key international financial initiatives addressing methane mitigation.

Yet, the majority of existing efforts to cut methane are neither mandatory nor sufficient to cut warming quickly enough[51] to avoid tipping points that would lock in devastating global warming.[52] Governments must fully implement[53] and build upon existing efforts to further open the door for a global methane agreement, drawing inspiration from treaties such as the Montreal Protocol[54] and responding to a growing chorus of calls for such actions.[55]

This *Primer* first overviewed the science underpinning the need for fast climate-mitigation this decade and explained why cutting methane emissions in the fossil fuel sector is the most feasible, fastest, and best way to slow climate change in the near term. A summary of existing fossil methane mitigation technologies follows, coupled with a discussion of the accountability and transparency measures necessary to support methane mitigation. Then the *Primer* outlines domestic and international fossil fuel methane mitigation efforts and reviews the methane-abatement-related activities of governmental, quasi-governmental, and industry-led organizations and initiatives. This survey is followed by a snapshot of the global fossil fuel market and an introductory discussion of methane abatement finance. Finally, the *Primer* concludes with an appeal for a global methane agreement.

II. Fossil Fuel Methane Emissions and Large, Cost-Effective Mitigation Strategies

The energy sector offers the largest and most cost-effective methane mitigation opportunity. More than 35% of human-caused methane emissions come from energy production activities related to oil, gas, coal, and bioenergy, accounting for 144 Mt (megatonnes) of methane emissions in 2025.[56] These emissions consist of roughly 44 Mt from oil, 34 Mt from natural gas, more than 39 Mt from coal, 20 Mt from bioenergy, and 7.5 Mt from abandoned facilities.[57]

Oil and gas operations release methane during both upstream operations (exploration, well drilling and operations) and downstream operations (refining, manufacturing, and transportation/distribution). Nearly 85% of emissions occur upstream through fugitive emissions (gas that escapes across the supply chain), flaring (intentional burning of natural gas for safety or economic reasons), and venting (releasing gas to the atmosphere).[58] Venting harms the environment more than flaring by releasing more methane alongside unabated volatile organic compounds (VOCs) and toxic pollutants.[59] The remaining 15% comes from gas transportation and other downstream operations, where emissions intensity rises with distance because of 'boil-off.'[60] On average, half of the oil and gas industry's emissions footprint comes from methane.[61]

Coal production activities in both surface and underground mines result in methane emissions. For surface mines, the main methane sources are seepage from coal seams (gas is released when layers of coal-bearing rock are disturbed by mining) and drainage systems. For underground mines, ventilation and drainage systems are the primary sources.[62] In addition, abandoned or closed mines emit methane through vents, pipes, boreholes, and fissures.[63] Recent analysis of coal mine emissions from Australia, including surface mines, found that methane emissions had been underestimated by more than 80% compared to official reporting.[64] Even in the face of forecasted declining coal production,[65] methane from coal is expected to remain an important focus of mitigation efforts because closed and abandoned mines emit methane for decades after their closure.[66] When evaluated based on their contribution to warming over the next 20 years, methane from the world's operating coal mines in 2020 has a larger impact than the European Union's combined CO_2 emissions.[67] Coal power generation would need to be reduced by 75% by 2030 to limit warming to 1.5 °C.[68]

Approximately 70% of fossil methane emissions (85 Mt) originate in just ten countries; China is the largest single emitter, driven principally by coal followed by the United States and the Russian Federation.[69] For coal, the methane emissions are even more concentrated, where 94% of global coal mine methane emissions originate in seven countries.[70] Data also reveals a wide reporting gap: global energy-related methane emissions run about 80% higher than national governments report.[71] For example, satellite observations recently revealed that oil and gas methane emissions were found to be 4.8 times higher than reported in Venezuela and 3.8 times higher in Turkmenistan.[72]

The fossil fuel sector comprises approximately 70% of the total technical methane mitigation potential available for anthropogenic methane sources through 2030.[73] Oil, gas, and coal operations provide the fastest achievable reductions this decade via mitigation measures available now.

In the International Energy Agency (IEA) Net Zero Emissions by 2050 Scenario, methane emissions from fossil fuels are reduced by 75% by 2030, and by around 85% by 2035 compared with current levels, with mitigation measures costing less than 2% of the fossil fuels industry's

net income.[74] The world remains far off-track from this scenario. The GLOBAL METHANE STATUS REPORT identified that current legislation will result in 2030 emissions nearly four times higher than the IEA's scenario.[75] Achieving this scenario requires that the global average upstream methane emissions intensity of oil and gas production drop from roughly 1% in 2024 to 0.2% in 2030, while the intensity of coal operations would need to decrease from over 1% to 0.5%.[76] In this scenario, more than a third of the reduction comes at no net cost because the costs of abatement measures are less than the market value of the captured methane gas that would be sold or used.[77] To provide perspective, in 2025, if operators had recovered methane that was burned during non-emergency flaring and otherwise leaked and vented throughout upstream and downstream activities, an additional 200 billion cubic meters (bcm) of natural gas would have been available to markets, equivalent to nearly double the quantity of gas passing through the Strait of Hormuz annually.[78]

To repeat, the technical mitigation potential remains substantial and economically viable. Currently available abatement technologies could lower fossil fuel methane emissions by approximately 70% (equivalent to 85 Mt), including three-quarters of emissions from oil and gas and about half of coal emissions.[79] More than 35 Mt could be eliminated at no net cost at 2025 energy prices because the capital and operating costs of abatement fall below the market value of the captured gas. The cost-benefit analysis strengthens further in 2026 as the Middle East conflict places upward pressure on fuel prices.[80] More than 60 Mt of oil and gas methane abatement would be cost-effective at a carbon price of approximately US$20 per tonne of carbon dioxide equivalent.[81]

A. Methane Mitigation Strategies in the Oil & Gas Sector

The greatest potential for mitigating methane emissions is in the oil and gas sector, where the technical mitigation potential in 2030 is 67 Mt/yr (56 Mt/yr at low-cost[82] with nearly 30 Mt/yr at no net cost[83]) and where realizing this potential would deliver half of the reductions needed to meet the Global Methane Pledge.[84] The upstream segment holds nearly 80% of this potential.[85] Success depends on critical measures such as the extended recovery of vented gas and the elimination of unintended leaks via regular leak detection and repair (LDAR) inspections.[86] Equipment upgrades are also vital; according to 2022 data on U.S. onshore production, gas-powered pneumatic controllers remain the single largest source of methane in the production segment (67%).[87] Operators should therefore replace gas-powered pumps, controllers, pneumatics, and engines with electric, air, or lower-release systems and upgrade compressor seals and rods.[88] The upstream segment has a global average methane intensity of approximately 1%; yet, intensities vary by two orders of magnitude between countries.[89] If all producing countries matched Norway's methane emissions intensity of 0.01%, global oil and gas methane emissions would fall by more than 90%.[90]

Downstream and midstream mitigation relies on LDAR programs across refineries, distribution networks, and transmission pipelines.[91] These pair with extended flaring controls at refineries, PE or PVC piping to modernize distribution networks, and compact non-leak flanges and pipeline refurbishment for long-distance transport and storage.[92] Deploying all available technologies to reduce emissions at just natural gas processing and transport facilities would lower the global average methane intensity of downstream operations from over 0.4% to less than 0.2%.[93]

Eliminating wasteful practices across the value chain is another priority. Prohibiting the venting of associated gas at oil wells can reduce emissions by 95%.[94] The World Bank's Global Flaring and Methane Reduction (GFMR) Partnership estimates that 167 bcm of gas were wastefully

flared in 2025.[95] This is the highest level since 2019 and a third consecutive annual increase, roughly matching Africa's annual gas consumption and exceeding all LNG shipped through the Strait of Hormuz that year, worth an estimated US$54 billion.[96] GFMR classifies flaring into three categories with materially different regulatory implications: *routine* refers to flaring of gas during normal operations, or inability to store or market the gas due to lack of facilities for utilization; and *non-routine* covers all other causes of flaring, including *safety* which refers to flaring required to ensure safe operation of facilities.[97] The commercial case for eliminating routine flaring has also strengthened as gas-to-value conversion technologies have matured.[98]

Targeting marginal assets may prove effective for mitigation. According to satellite data from MethaneSAT, 40% of methane emissions in production-only portions of the 8 top oil and gas basins in the United States came from areas responsible for less than 7% of production.[99] A subsequent analysis of MethaneSAT observations of the Permian Basin during 2024–2025 found that methane intensity on the New Mexico side of the Delaware Sub-Basin was approximately 1.2%, compared to 3.1% in Texas.[100] Researchers associated the difference with New Mexico's emissions control standards implemented beginning in 2021.[101] Despite production growth exceeding 100% in New Mexico since 2020, against roughly 20% in Texas, and despite similar well-age profiles (about 40% of wells under five years old, accounting for 70% of production) and closely aligned total gas production, New Mexico's lower methane intensity meant more gas was captured and sold rather than lost.[102] Researchers estimate this yielded an additional US$125 million in marketed natural gas annually, generating US$27 million in royalties and taxpayer revenue.[103] Even so, at more than 1%, New Mexico's intensity remains well above the 0.2% target, and the Permian Basin as a whole is estimated to emit approximately 440 metric tons of oil and gas methane per hour, representing more than $577 million in wasted gas annually.[104]

A study by RMI and Purvis Advisors, analyzing a 12-month period ending in late 2024, estimated that gas waste in Texas was 3 to 4.5 times higher than operators self-reported.[105] Through venting and flaring, operators wasted the equivalent of the annual greenhouse gas emissions from 100 million light-duty vehicles.[106] The gap is driven primarily by underreported venting rather than flaring.[107] Low-rate oil wells, those producing fewer than 10 barrels per day, account for roughly half of all methane emissions while routinely reporting zero associated gas production–a physical impossibility.[108] This pattern is not unique to Texas. A national, facility-level analysis found that the well sites responsible for just 10% of U.S. oil and gas production in 2021 accounted for 67-90% of total well-site methane emissions.[109]

Cutting methane from oil and gas first requires better monitoring to locate hotspots and super-emitters. That matters because emissions from the sector are probably far higher than official figures suggest, particularly where those rest on inventory methods built from emissions factors.[110] An airborne survey of the Permian Basin in New Mexico, for instance, put emissions at 6.5 times the level implied by a factor-based inventory.[111] Between 2019 and 2020, satellites detected more than 1,800 "ultra-emitters," mostly in oil and gas production.[112] Together, they account for 8–12% of emissions from global oil and gas output, or roughly 8 Mt of methane a year.[113] Newer global inversions confirm the gap. From analysis of satellite observations against governmental reports, it can be shown that worldwide man-made methane emissions 15% above what countries tell the UNFCCC, and 32% above for oil and gas alone, with more than a quarter of countries under-reporting by over half. Such under-reporting in national pledges flatters the record and strengthens the case for independent monitoring.[114] Under-reporting of methane emissions in NDCs can also lead to an underestimation of methane emissions, which in turn justifies greater monitoring efforts.[115]

Satellite data sharpen the picture of where the worst emissions sit. The 25 oil and gas sites with the highest measured hourly emission rates in 2025 cluster in a handful of countries, the majority in Turkmenistan, with others in Venezuela, Iran, Pakistan, and the United States.[116] Researchers from RMI, Stanford University, the University of Calgary, and Koomey Analytics developed the Oil and Climate Index Plus (OCI+) tool, which determined that the most climate-damaging oil and gas fields were in Russia's Astrakhanskoye field, Turkmenistan's South Caspian Basin, and the U.S. Permian Basin in Texas.[117] One challenge to reconciling these estimates is identifying how to integrate "top-down" measurements with "bottom-up" approaches to estimating methane emissions to allow for a more accurate depiction of overall emissions.[118]

Additionally, the reporting gap between operated and non-operated assets represents a structural deficiency in the current reporting systems. Non-operated assets account for approximately half of oil and gas production for many leading international operators, yet flaring and associated methane emissions from these assets remain systematically underreported.[119] A 2026 analysis of the twenty highest-flaring fields globally in which at least one Oil and Gas Climate Initiative member holds an equity interest documented the scale of the gap; those twenty fields collectively flared 12.5 bcm in 2024, equivalent to approximately US$2 billion in lost revenue at notional 2024 prices.[120] Across the principal voluntary frameworks, reporting coverage falls materially below total flared volume: only 44% of volume is reportable under the World Bank Zero Routine Flaring framework, 39% under the Oil and Gas Climate Initiative and the Oil and Gas Decarbonization Charter, and 29% under OGMP 2.0; combined coverage across at least one initiative reaches only 46%.[121]

B. Methane Mitigation Strategies in the Coal Sector

Measures to cut coal methane emissions can provide additional mitigation of 27 Mt/yr (25 Mt/yr at low-cost).[122] Methane released due to mining activity can come from a coalbed, a production method that taps coal seams, or a coal mine.[123] Coalbed methane can be linked to leakage in gas supply chains, while coal mine methane is attributed to coal production systems.[124] The IEA estimates that eliminating the worst-performing quartile of operating coal mines would remove about 25 Mt CH_4 by 2050 in a scenario in which coal use drops by 55% by 2030.[125]

The economic case for coal-sector abatement diverges materially from oil and gas. Methane captured at coal mines is generally less commercially valuable than methane recovered from oil and gas operations, and in most cases, the revenue earned from captured gas does not justify the abatement cost on purely economic grounds.[126] The priority nevertheless remains compelling, especially for metallurgical (coking) coal, where substitution options are more constrained than for steam coal and where the underground mining environment makes abatement more technically feasible.[127] Underground mines also present fewer potential point sources than surface mines or oil and gas operations, and monitoring equipment is already widely deployed in ventilation shafts for safety, which simplifies data collection and supports mine-level capture or abatement planning.[128] The primary methods for reducing coal emissions from active underground coal mines are oxidation of ventilation air methane through regenerative thermal oxidizers and the recovery and use of methane through pre-mining degasification.[129] Methane is recoverable before mining begins, but mine methane is diluted and thus costlier to use.[130] Full abatement across ventilation air methane oxidation, drainage systems, and other measures has been estimated at less than US$4 billion, just 16% of annual industry profits.[131] Ventilation air methane oxidation alone, requiring approximately US$2.5 billion of investment, could cut emissions by 24%, equivalent to 9.5 Mt.[132] Drainage station

capture offers a further 7.5 Mt of abatement potential, of which approximately 62% is available at negative net cost because the value of captured methane exceeds the cost of implementation.[133]

Additionally, abandoned mines continue to leak methane, accounting for nearly 4.5 Mt of methane in 2025, with 60% originating in China.[134] The CCAC thus recommends eliminating these emissions by flooding abandoned coal mines or sealing and equipping them with drainage systems where flooding is not safe or technically feasible.[135] In some situations, abandoned mine methane can be recovered and used before flooding occurs.[136] Unutilized drainage methane from Polish mines in 2024 could have met the heating needs of 14.5 million Polish households for a week.[137] Efforts to mitigate methane emissions from abandoned mines also can ameliorate negative health and environmental impacts for the local community.[138]

C. Transparency and Accountability

Credible methane mitigation requires a transparent accountability system. Regulators, regulated entities, and others estimate methane emissions under overlapping regimes and protocols.[139] Advances in satellite remote sensing, aircraft technologies, and ground-level infrared monitoring have made once-invisible emissions.[140] Detection limits have tightened, geographic coverage has broadened, and observation frequencies have increased. Parallel advances in data processing have improved both the speed and accuracy of subsequent analysis.[141]

Nonetheless, improving transparency across the value chain requires globally accepted standards for measurement and reporting frameworks so that data may be comparable, reliable, and verifiable. While frameworks now exist to standardize how methane emissions are quantified and verified, they differ in levels of rigor and scope.[142] The more robust approaches go beyond default emission factors. Instead, they are measurement-based, rely on empirical data, and cover the full scope of assets. These, alongside an accountability and enforcement strategy, will ensure the world is on track to secure maximum reductions in methane emissions.

Table 1. Methane tracking technologies

Technology family	Typical scale covered	Purpose	Key limitations
Global satellites	Regional	Flagging hot spot basins, long term trends, inventory checks	Miss most individual leaks; attribution is coarse only
Targeted imaging satellites	Basin to facility	Finding large super emitters at named facilities	Limited small leak sensitivity; tasking capacity finite
Aircraft mounted sensors	Basin to facility	Measuring total emissions from clusters, validating satellites	Costly and episodic; needs planning and aviation access
UAV/drones	Facility	Checking priority sites, verifying fixes, mapping plumes	Weather, airspace rules, battery limits
Ground-based tower	Field to facility	Quantify methane fluxes and high temporal precision	Placement constraints; overlapping sources
Mobile labs (vehicles)	Facility	Estimating source strengths along roads, checking networks	Limited off road reach; depends on road access and traffic
Handheld and on-site instruments	Components	Pinpointing leaks, confirming repair, compliance checks	Very local; needs trained staff on the ground

International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 51.

These developments yield two findings of consequence for the regulatory architecture addressed in Section III of this *Primer*. First, effective methane management requires multi-scale measurement frameworks that combine space-based, airborne, and ground-based data, explicitly account for super-emitters, and rely on dynamic inventories revised as new observations emerge. Second, no single detection technology suffices: the technical case for the regulatory layering discussed rests on the parallel reality that no single measurement modality covers the full range of relevant emission sources or scales.

Following brief introductions to transparent accountability systems and MMRV, below is a non-comprehensive list of initiatives aimed at improving methane monitoring and accounting. These examples suggest how a combination of public and private monitoring services could provide a "system of systems" for companies, regulators, researchers,[143] and citizens interested in tracking and mitigating methane emissions.[144]

1. Accountability Systems

Effective accountability and response systems to tackle emissions sources would include several components, namely: inventory by emissions total, sector, and location; baseline emissions level by jurisdiction; reduction goal by emissions total and sector; and monitoring and reporting, providing for full transparency. These systems also must have the capacity to identify and alert responsible operators, inform regulatory agencies, and deliver emissions data to civil society, media, and affected communities in an accessible and timely manner.

An effective accountability and enforcement strategy should incorporate "carrot" (incentive) and "stick" (e.g., regulatory, "name and shame") mechanisms. The strategy should encompass operators of methane sources, responsible government agencies, including prosecutors, civil society, and affected communities. Further, the strategy should identify solutions for addressing detected emissions and connect operators to technical capacity and financial resources, as appropriate. Additional capacity building, including training, is needed for stakeholders involved in the accountability aspects of the strategy. Such stakeholders include emissions-source operators, regulatory agencies, financial risk agencies, and watchdogs.

An effective strategy should incorporate both incentive-based and enforcement-based mechanisms, encompassing operators, government agencies, and civil society. It should identify solutions for detected emissions and connect operators to technical capacity and financing. Such a strategy could include:

- an asset map with geospatial coordinates and operator contacts;
- a directory of control agents by location and asset type;
- a mechanism for converting monitoring data into usable formats for accountability actors; and
- a civil-society coordination network organized by region and jurisdiction.

The National Academies of Sciences, Engineering, and Medicine published a framework advocating six pillars for evaluating greenhouse gas information: usability and timeliness, transparency, evaluation and validation, completeness, inclusivity, and communication.[145]

National Methane Offices or equivalent units could develop and maintain emissions inventories, monitor key source points, and liaise with subnational agencies to build effective accountability systems. These Offices would be organized regionally to encourage cooperation and share mitigation strategies. The CCAC's Technology and Economic Assessment Panel

(TEAP) is a valuable tool to assess and recommend technology solutions on a regular basis to encourage continued innovation and support for implementation of best practices.

2. *Measurement, Monitoring, Reporting, and Verification*

Methane measurement, monitoring, reporting, and verification (MMRV) is an information-based framework requiring operators to quantify methane emissions through either direct measurement or estimation for subsequent reporting and verification.[146] The measurement and monitoring component encompasses the observation, identification, and assessment of methane sources.[147] Reporting functions as a mechanism for companies to transmit this data to regulators or others to support compliance enforcement and the establishment of emission baselines.[148] Verification, or auditing, is the process by which independent entities observe and report on the validity of the information provided by operators.[149] A comprehensive verification goes beyond a desktop auditing of methodology to include the assessment of actual emissions measurements where feasible.[150]

Implementation requires the installation of metering systems, such as flow meters on vent heads, to ensure the direct measurement of emissions sources wherever possible. For non-metered sources, emissions are calculated based on source-specific emission factors or estimates derived from accepted engineering practices.[151] Implementation frameworks, such as OGMP 2.0, require companies to transition from generic emission factors to reporting based on direct measurements of all material sources across the value chain.[152] This process involves the development of granular equipment inventories and the quantification of emissions arising from specific components, well operations, and pneumatic instruments.[153] Broadly, these measurement approaches fall into two categories, which should be reconciled within a robust MMRV program: bottom-up, where inventories are built by applying emission factors to activity data, and top-down, where emissions are inferred from atmospheric measurements.[154]

Discrepancies between top-down atmospheric observations and bottom-up inventories have persisted. These discrepancies reflect the inherent complexity of quantifying methane: sources are geographically dispersed, episodic, and highly variable.

3. *Data Provision: Satellite Monitoring and Observational Systems*

Space-based instruments can be an enhanced tool for monitoring. They can spot emissions at different spatial scales with near-global reach, providing new streams of data to help public officials and operators monitor and verify emissions.[155] There are two main classes of satellites. On one hand, point-source imagers, such as Carbon Mapper and GHGSat, identify and quantify emissions from specific sources like individual facilities.[156] On the other hand, area flux mappers, such as Sentinel-5P and GOSAT, measure average methane concentrations over large areas to provide a broad regional understanding.[157] Additionally, satellite data support the detection of leaks and super-emitter events: the United Nations Environment Programme's Methane Alert and Response System (MARS) integrates data from a network of over a dozen satellites to detect major emission events and notify governments and companies.[158] MARS uses artificial intelligence to process over 200,000 satellite images annually, allowing for the rapid identification of plumes, then published on the Eye on Methane data platform.[159]

Notably, the Oil and Gas Climate Initiative (OGCI) has developed for operators a *Satellite Methane Detection Response Playbook* that outlines a six-step framework: 1) initial assessment and location review; 2) source investigation and identification; 3) repair prioritization; 4) post-mitigation validation; 5) response documentation; and 6) continuous improvement. For

regulators, the International Energy Agency developed a technical guidance document, *Responding to Satellite Notifications from the Methane Alert and Response System*, to assist governments reacting to MARS notifications. They propose a five-step sequential process for responding to MARS notifications: 1) receive, assign, and classify the notification; 2) notify the operator associated with the emission event; 3) operator responds to the notification; 4) verify the operator's response and follow-up; and 5) review and document information on the event.

a. Key Satellite Initiatives

i. Satellite operators

Carbon Mapper is a science-driven non-profit coalition of public and private partners, including Planet, NASA's Jet Propulsion Laboratory, the State of California, the University of Arizona, Arizona State University, and RMI, that utilizes a multi-tier observation system to identify, quantify, and track methane point-source emissions.[160] For the fossil fuel sector, Carbon Mapper integrates hyperspectral data from the Tanager satellite constellation and airborne platforms to detect discrete plumes.[161] All findings are hosted on the Carbon Mapper Data Portal, an open-access web platform and API that allows stakeholders to visualize active methane plumes, monitor emission persistence over time at specific facilities, and download georeferenced datasets for independent analysis and mitigation tracking. For example, with Carbon Mapper's 2025 data, the UCLA Stop Methane Project identified 4,400 significant plumes, each emitting more than 100 kg of methane per hour, and, unlike prior detection efforts, identified probable operators behind each super-emitting site.[162]

Copernicus is the EU's Earth observation program that provides information services with data drawn from satellite observation and *in-situ* (non-space) systems.[163] The European Commission manages Copernicus and implements the program in partnership with Member States, European agencies, and centers.[164] In addition to collecting information from *in-situ* systems, the EU will place a constellation of about 20 satellites in orbit before 2030.[165] Among the six information services, the Copernicus Atmosphere Monitoring Service,[166] the Copernicus Land Monitoring Service,[167] and the Copernicus Climate Change Service[168] are closely relevant to methane monitoring. The Copernicus program includes the TROPOMI instrument on the Sentinel-5P satellite, used for detecting methane and other atmospheric gases, and its data is a key input for IMEO's MARS program.[169] These capabilities are centralized in the Copernicus Data Space Ecosystem, which provides free access and visualization of methane concentrations and plumes via the CAMS Methane Hotspot Explorer.

The National Aeronautics and Space Administration developed the Earth Surface Mineral Dust Source **(EMIT)** mission to map key minerals in deserts and advance understanding of the effect of airborne dust on climate, but it also detects methane.[170] Since being installed on the International Space Station in July 2022, EMIT identified more than 50 methane super-emitters in Central Asia, the Middle East, and the Southwestern United States.[171] Observational coverage and forecasts are available through the EMIT Open Data Portal, while georeferenced methane plume data is integrated and hosted on both the Carbon Mapper and IMEO data platforms to support public research and mitigation tracking.

The EDF's **MethaneSAT** program launched a methane satellite in March 2024 to provide regular monitoring of global oil and gas operations.[172] MethaneSAT was an area flux mapper, designed to measure average methane concentrations over large areas, providing a broad understanding of emissions across regions like the Permian Basin.[173] In June 2025, contact with the satellite was lost due to a non-recoverable loss of power; however, the program continues

to process and release a significant backlog of scenes retrieved during its operation.[174] All processed findings, including high-resolution emissions heatmaps and regional-scale data, are available through the MethaneSAT Data Portal.

The Japanese Ministry of Environment, National Institute for Environmental Studies, and the Japanese Aerospace Exploration Agency jointly manage the Greenhouse Gas Observing Satellite **(GOSAT)** program, consisting of two satellites that have already been launched (GOSAT ["Ibuki"] and GOSAT-2) and a third (Global Observing Satellite for Greenhouse gases and Water cycle "GOSAT-GW") launched in June 2025.[175] The satellites are used for GHG emissions monitoring and meteorological studies.[176] Its data may be accessed on Jaxa Satellite Data.

ii. Data aggregators and platforms

Climate TRACE is a non-profit coalition of over 100 organizations, including nonprofits, tech companies, universities, researchers, and climate experts, that maintains a timely, independent, and open inventory of global greenhouse gas emissions.[177] The system harnesses artificial intelligence and machine learning to analyze more than 90 trillion bytes of data from over 300 satellites and 11,000 sensors.[178] This methodology integrates satellite imagery ground truthing with sensor data to provide detailed emissions estimates for over 660 million individual assets, including fossil fuel operations, power plants, and mobile sources like ships and planes.[179] As of March 2025, the platform releases monthly updates with a 60-day lag, covering carbon dioxide, nitrous oxide, and methane, for which it reported 33.83 Mt in October 2025.[180] The platform offers free data access and tools like an emission reduction roadmap that calculates decarbonization potential for every asset worldwide.

Launched in October 2021 at the G20 Summit, the **International Methane Emissions Observatory (IMEO)** is a UNEP initiative with support from the European Commission and other governments that will integrate methane emission data from multiple sources into a coherent dataset that will describe the confidence in each data element.[181] UNEP hosts the IMEO, with public funding support of €100 million over five years (including funding from the European Commission as a founding member).[182] IMEO coordinates with the CCAC, among other organizations, including on incorporating and analyzing data from OGMP 2.0.[183] The IMEO publishes annual reports, *An Eye on Methane*, which describe progress on OGMP 2.0 and remaining challenges in methane monitoring and measurement.[184] In November 2022, UNEP and IMEO launched the Methane Alert and Response System (MARS) to enhance the detection of methane super-emitters, alert relevant stakeholders, and support and track methane mitigation progress.[185] MARS is supported by data from various stakeholders, including, for example, Kayrros, a global technology company acting as a platform to access consolidated data from methane-detecting satellites into one platform.[186]

At COP28, results of the MARS pilot period went live, publicly sharing satellite data for notified emissions events.[187] As a result of the work of the IMEO, a large methane leak in Argentina has been halted.[188] However, as of 2025, almost 90% of satellite-detected emission events flagged by UNEP still go unaddressed by governments and companies.[189] As of April 2026, MARS has still enabled and confirmed the mitigation of 41 major methane sources—mitigated sources together released an estimated 1.2 Mt of methane prior to intervention, a climate impact comparable to nearly 24 million fuel-powered vehicles driven for one year.[190] United Nations Secretary-General António Guterres advocated in his call to action on methane for governments and companies to achieve a response rate of 80% to MARS alerts before 2030.[191]

In May 2026, IMEO announced a substantial expansion of MARS coverage. Satellite alerting now extends beyond oil and gas to coal mines and waste facilities.[192] IMEO and the International Energy Agency concurrently released the *MARS Response Blueprint*, a procedural framework that directs governments through verification of detected emissions, operator mobilization, and mitigation tracking.[193] Through its IMEO's Steel Methane Programme, IMEO simultaneously launched its Coal Methane Database, which provides mine-level emissions estimates for nearly 250 coal mines, covers more than half of global metallurgical coal production, and integrates over 23,000 satellite observations with scientific research and official inventories into a single dataset, attributing detected plumes to individual mines and emission sources.[194] Coverage reached close to half of global oil and gas production with the May 2026 accession of Libya's National Oil Corporation, Pakistan's Oil and Gas Development Company Limited, and Angola's Sonangol, accelerating the framework's shift toward independently verified, asset-level measurement across operated and joint-venture assets.[195]

b. Additional Monitoring Initiatives

The **International Energy Forum (IEF) Methane Initiative**, launched in 2021 in partnership with Kayrros, has developed a methane emissions measurement methodology to standardize data collection.[196] This methodology integrates top-down atmospheric measurements from the European Union's Sentinel-5P satellite with bottom-up company reporting and country contextual data to track three core metrics: methane intensities, super-emitter events, and flaring intensities.[197]

Researchers from RMI, Stanford University, the University of Calgary, and Koomey Analytics developed the **Oil and Climate Index Plus (OCI+)** tool as a response to opaque, self-reporting of GHG emissions from the oil and gas sector.[198] The OCI+ presents a full life-cycle assessment of GHG emissions for half of global oil and gas production. The OCI+ tool and the accompanying report conclude that significant fossil fuel emissions occur not only at the point of combustion but also at the wellhead, and during processing, refining, and transportation.[199]

The United States launched the **Greenhouse Gas Center** at COP28. The Center will serve as a hub for collaboration between agencies across the U.S. government as well as non-profit and private sector partners.[200] Data, information, and computer models from observations from the International Space Station, various satellite and airborne missions, and ground stations are available online. The Center's data catalogue includes a curated collection of data sets that provide insights into greenhouse gas sources, sinks, emissions, and fluxes.[201]

c. Performance Rating and Certification Initiatives

Growing awareness of fugitive emissions has intensified demand for lower-methane-intensity gas, spurring a proliferation of certification programs. These programs vary in their methodological rigor, transparency, and scope, underscoring the need for clear credibility criteria and robust validation frameworks for methane intensity claims.[202] Despite variation, certification has expanded. In 2024, approximately 320 bcm of produced natural gas was certified, representing roughly 7.5% of global natural gas production, though nearly all certified facilities remain concentrated in North America.[203]

RMI and **SYSTEMIQ** established **MiQ**, an independent not-for-profit organization that developed a certification system based on methane intensity that grades natural gas volumes produced and producer performance. MiQ incorporates the Natural Gas Sustainability Initiative protocol and other "robust alternative methodologies" for calculating methane intensity.[204] It

requires monitoring at source and facility level, and it specifies frequencies and minimum detection levels for such monitoring, with grade increases linked to "more robust emissions management." Qualification for certification is based on company practices, monitoring technology deployment, and methane intensity, which must be less than or equal to 2% to qualify.[205] MiQ indicates that it is the only major certification system based largely on bottom-line methane intensity, and estimates that it already certifies 5% of the global gas market.[206] MiQ maintains a digital registry of these certificates to avoid double-counting.[207] In 2025, MiQ announced a collaboration with the Oil and Gas Methane Partnership 2.0 (OGMP 2.0) to enable third-party verification of OGMP 2.0 Level 5 emission estimates across full supply chains. [208]

Equitable Origin (EO) operates a standard that certifies energy sites against a wide range of ESG criteria.[209] Currently, approximately 130 bcm of annual natural gas production is certified under both EO and MiQ, while 38 bcm is certified solely under EO. [210]

Other initiatives include the **Natural Gas Sustainability Initiative (NGSI)**, which developed the NGSI Methane Emissions Intensity Protocol as a voluntary approach for companies to calculate methane emissions intensity. [211] GTI created a series of protocols to ensure adequate assessment of methane from natural gas.[212] The Veritas protocols provide a guiding framework for operators across the natural gas supply chain to use measurements to estimate their methane emissions.[213]

However, the landscape faces challenges regarding consistency and trust. For example, in February 2024, seven U.S. Senators wrote to the Federal Trade Commission expressing concerns that certified natural gas could serve as a "greenwashing scheme" due to a lack of transparency and independent verification standards.[214]

III. The Current Landscape of Mitigation: From National Regulatory Frameworks to Multilateral Initiatives and Industry-Led Actions

A. National Efforts to Address Fossil Fuel Methane Emissions

National and subnational governments are increasingly implementing methane mitigation measures,[215] but these efforts must be expanded and strengthened to achieve the 50% reduction in methane emissions by 2050 assumed in the remaining carbon budget for 1.5 °C.[216] By December 2025, 91% of parties to the Paris Agreement had folded methane into the overall greenhouse-gas targets of their Nationally Determined Contributions (NDCs), and more than 83% had included specific methane measures. But naming methane in an NDC is a pledge, not a binding domestic rule.[217] Targeted methane mitigation policies—those aimed directly at cutting methane, rather than treating it as one gas within a broader emissions target—covered only about 13% of global methane emissions in 2023, and many of these merely monitor emissions or rely on voluntary action rather than mandatory pricing or regulation.[218]

Effective regulations to address methane emissions follow diverse approaches,[219] although they typically leverage prescriptive requirements,[220] performance-based requirements,[221] economic instruments,[222] and/or information-based requirements.[223] These approaches provide mechanisms for governments to drive methane abatement across the fossil fuel sector, often by changing the cost-benefit analysis for firms to internalize the societal cost of pollution.[224] As part of the CCAC's Fossil Fuel Regulatory Programme (FFRP), the CCAC and Clean Air Task Force released a Blueprint for a Comprehensive Oil and Gas Methane Regulation, which recommended a 'layered approach' to regulation to achieve short-, medium-, and long-term goals simultaneously.[225] This strategy involves: implementing prescriptive equipment and work

practice standards for immediate reductions; establishing rigorous compliance and emissions reporting to verify progress; and layering performance-based or economic instruments on top of these foundations to drive deeper, continuous improvements over the long term.[226]

A regularly updated survey of specific methane mitigations measures in select jurisdictions will be annexed to this *Primer*. These countries' regulations included because of their status as major emitters or noteworthy ambition in the context of methane mitigation. The IEA also produced useful Regulatory Roadmaps and Toolkits on *Driving Down Methane Leaks from the Oil and Gas Industry*[227] and on *Driving Down Coal Mine Methane Emissions*.[228] The IEA policies database includes methane abatement policies from its member countries around the world. The IEA is currently preparing guidance on the implementation and enforcement of methane policies and regulations in the oil and gas sector.

Described below are the key themes of methane regulations with examples drawn from national and subnational regulations. These themes cover: 1) LDAR requirements, 2) requirements on venting and flaring, 3) MMRV requirements, 4) methane intensity related policies, 5) decommissioning requirements, 6) market mechanisms, and 7) economic policies.

If every country were to implement these tried-and-tested policies, global methane emissions from oil and gas operations would shrink by an estimated more than half.[229] If additional policies that rely on more precise emissions data, such as, emissions pricing, financing instruments, and performance standards, were also adopted globally, methane emissions from oil and gas could be cut by more than 75%.[230]

1. Leak Detection and Repair Requirements

The main mechanism for mitigating fugitive methane along the entire value chain is leak detection and repair (LDAR). Regulations requiring operators to create or join LDAR programs generally have five elements:

1) the scope of facilities and equipment subject to inspection;
2) the authorized detection technologies, ranging from handheld optical gas-imaging devices to aerial drones and satellites;
3) the inspection frequency;
4) the detection thresholds that trigger repair within set timeframes; and
5) the recordkeeping and reporting that document leaks and repairs for regulators.[231]

Frequency matters most: annual inspections mitigate only 40% of fugitive emissions, quarterly 70%, and continuous monitoring 90%.[232] Were the world to adopt tried-and-tested LDAR policies, global oil and gas methane emissions could fall by 21%.[233]

Jurisdictions diverge widely on inspection frequency, repair timelines, and regulatory sophistication. Canada's 2025 *Enhanced Methane Regulations* give upstream operators two compliance pathways: prescriptive (Part 1) or performance-based (Part 2).[234] Part 1 uses a risk-based approach that sorts facilities into three classes: Type 1 (higher-risk activities), Type 2 (all other active facilities), and inactive.[235] It then layers three inspection types. Comprehensive inspections, run by trained technicians using purpose-built equipment such as OGI instruments, occur quarterly for Type 1 facilities and annually for Type 2, subject to a narrow low-production exemption.[236] Screening inspections, which detect emissions above 10 kg/h, occur monthly whenever operators are on site.[237] Annual third-party inspections, run by an independent auditor, must use a method with at least a 90% probability of detecting a minimum leak of 10 kg/hr.[238] Repair deadlines scale with emission rate: 24 hours at 100 kg/h or more, 7

days from 10 from 10 to 100 kg/h, 30 days from 1 to 10 kg/h, and 90 days below 1 kg/h. Small leaks may be scheduled later if repairing them would release more methane than leaving them.[239]

The EU Methane Regulation also distinguishes two survey types. Type 1 surveys detect leaks at 7,000 ppm or 17 g/h; Type 2 surveys apply stricter thresholds of 500 ppm or 1 g/h for aboveground components.[240] Because Type 2 is more sensitive, operators may run it in place of a required Type 1 survey. Operators had to submit an LDAR programme by 5 May 2025 for existing sites, or within six months of start-up for new ones, and complete the first Type 2 survey by 5 August 2025.[241] Later surveys follow the minimum frequencies in Annex I. Repairs must be attempted immediately, or as soon as possible and no later than five days after detection, and completed within thirty days.[242]

Some subnational programs show how granular performance-based tiering can be. Alberta (Canada) requires triannual surveys for sweet gas plants and annual surveys for other facilities,[243] with a thirty day general repair window, lowered to twenty-four hours due to leaks causing off-lease odors, arising out of an unlit flare, or posing safety issues.[244] Colorado (U.S.) employs a granular, tiered inspection schedule whereby, for well production facilities, frequencies range from annual for low emitters up to bimonthly for facilities located within 1,000 feet of a disproportionately impacted community.[245] Repairs then must generally be attempted within five working days and completed within thirty days.[246] California (U.S.)[247] imposes mandatory quarterly testing[248] plus, for health-protection-zone facilities, continuously operating detection systems with immediate alarm capability by 2030,[249] and a strict three-tiered repair timeline.[250]

Developing-country frameworks build in capacity ramp-ups. For example, Nigeria has a phased ramp-up from annual to triannual inspections,[251] with leak-size prioritized repair.[252]

The trajectory is toward frequent, risk-differentiated, measurement-informed regimes. Advanced frameworks layer prescriptive baselines with performance-based flexibility; developing-country frameworks such as Nigeria's build in capacity ramp-ups but converge on the same endpoints.

2. Venting and Flaring Requirements

Flaring is the controlled combustion and disposal of the associated gas produced alongside oil. It occurs for several reasons: emergencies, the absence of equipment to capture and sell the gas, or gas that is uneconomical to sell. Venting, by contrast, is the release of unburned natural gas straight into the atmosphere when operators bypass closed systems and normal practice.

The aim of regulation is to end intentional releases of methane and to ensure that any unavoidable release is flared efficiently.[253] Rather than resting on a single rule, these regimes generally build a hierarchy of obligations. At the top sits elimination of routine venting and flaring; below it sits limits on non-routine venting and flaring, flare-efficiency standards, duties to identify alternative uses for the gas, and economic instruments such as taxes on flared or vented volumes.[254] Regulations share recurring features:

- a baseline prohibition with narrow enumerated exceptions rather than a general allowance;
- a flare-over-vent hierarchy sitting beneath a conservation-over-flare hierarchy, often with an investigation duty whose burden falls on the operator;

- a destruction-efficiency standard;
- an ignition-assurance requirement of an auto-igniter or continuous pilot;
- a no-visible-emissions combustion-quality standard;
- equipment-specific controls on chronic small emitters;
- a volumetric or intensity cap as a backstop;
- a target date for ending routine flaring, commonly 2030; and
- a fee or tax on venting and flaring.

Were the world to eliminate non-emergency flaring and venting, global oil and gas methane emissions could fall by 18%.[255]

The World Bank's Global Flaring and Methane Reduction Partnership (GFMR) urges regulators to tailor rules to local industrial conditions, design and implement them in layers, assess the economics of gas utilization, and tackle barriers outside the upstream sector.[256] It recommends treating flaring and venting as negative externalities whose abatement costs belong in total project expenditure.[257] This approach works only when applied consistently and backed by legal targets and standards that give operators clarity.[258] The GFMR favors a hybrid model that phases prescriptive rules into performance standards, under the threat of economically dissuasive penalties.[259]

Regulatory desion varies widely. Norway has banned non-emergency flaring since 1971, requires annual flaring permits, and reinforces both with an offshore carbon tax.[260] Canada's *Enhanced Methane Regulations* ban routine venting and ban routine flaring, except where energy recovery is proven infeasible via annually reassessed engineering studies.[261] In Alberta (Canada) and New Mexico (U.S.), where venting and flaring are viewed as waste, conservation is considered the best alternative.[262] New Mexico goes on to impose a general duty to maximize the gathering of gas while setting progressively tighter statewide gas capture targets.[263]

Mexico requires a 98% gas utilization rate within three years of production,[264] prohibits venting except in emergencies,[265] and mandates 98% destruction efficiency for flares;[266] any unapproved flaring is considered an economic loss to the nation, and operators must maintain financial resources to cover the resulting damages or losses.[267] The EU Methane Regulation prohibits routine flaring and bans venting except in exigent circumstances.[268] When venting is required, operators must provide proof to competent authorities that flaring was not technically feasible due to a lack of flammability or safety risks.[269] For the limited permitted instances of flaring, the regulation mandates the use of devices with a design destruction and removal efficiency of at least 99% and requires the installation of auto-igniters or continuous pilot burners.[270] Operators must notify authorities of major venting or flaring events without delay and submit comprehensive annual reports quantifying the volumes of methane released.[271]

Algeria shows the limits of rules without enforcement: its flaring restrictions and penalties resemble Norway's, yet outcomes differ.[272] Domestic gas prices subsidized below cost leave operators unable to recover the cost of capture infrastructure, so regulators grant exceptions rather than force oil production to shut in.[273] In effect, restrictions and penalties can only be effective when paired with a commercial framework that provides operators with a real economic choice between capturing gas for a viable market and paying a meaningful penalty.[274]

3. Measurement, Monitoring, Reporting, and Verification (MMRV)

MMRV requirements, an information-based regulatory approach, build the foundation of transparency in the understanding of the extent of government and company emissions profiles

and those profiles' progress towards emissions reduction targets. First, measurement and monitoring constitute the process by which methane sources are identified, observed, and assessed; second, reporting is then the operator's requirement to share the collected data with regulators to support compliance follow-up and assess progress; finally, verification is an audit completed by an accredited third-party verifier or relevant regulator to ensure the validity of data.[275]

To avoid the suboptimal outcomes of fragmented methodologies, governments can align their requirements with established reporting standards and templates to ensure the consistency, comparability, and usability of emissions data across different jurisdictions.[276] The UN Environment Programme's International Methane Emissions Observatory released, as part of the CCAC's FFRP, a blueprint on how countries can build OGMP 2.0-aligned reporting into MRV methane regulations.[277] See the discussion of the Oil and Gas Methane Partnership 2.0 below.

The EU Methane Regulation, aligned with OGMP 2.0 level 5, requires source-level quantification by 5 August 2025,[278] escalating to site-level measurements with mandatory reconciliation by 5 February 2027 for operated assets and by 5 August 2028 for non-operated assets.[279] To ensure data integrity, all emissions reports must be assessed by independent, accredited verifiers before submission to competent authorities.[280] Canada's *Enhanced Methane Regulations'* performance pathway (Part 2) requires continuous emission monitoring with sensors capable of detecting flow rates of 1 kg/h,[281] recording at least every 15 minutes for Type 1 facilities and every 12 hours for Type 2 facilities,[282] annual third-party inspection, and reporting to the Minister of the Environment by June 30.[283] Colombia requires monitoring per U.S. EPA's *Method 21 for volatile organic compound leaks*[284] with monthly flare-, vent-, and fugitive volume reporting.[285] Nigeria mandates quarterly GHG reporting[286] under increasing robust methodologies[287] with regulator-discretionary third-party verification.[288] Alberta (Canada) relies continuous metering, periodic testing, or engineering estimates based on accepted practices.[289]

A clear spectrum emerges. The EU and Canadian federal regimes represent the most stringent end, requiring measurement-informed reconciliation, independent verification, and near-real-time monitoring. Alberta, Colombia, and Nigeria occupy intermediate positions with progressively less prescriptive measurement and verification requirements. The convergence toward OGMP 2.0 alignment suggests that OGMP 2.0 is becoming the *de facto* international benchmark for fossil-fuel-sector MMRV.

4. Methane Intensity

Methane intensity serves as the leading metric for tracking and evaluating emissions performance comparatively across the global oil and gas industry.[290] While the concept is universal, regulatory definitions vary. Key definitional considerations include how the intensity is standardized in terms of production (covering both oil and gas or gas only) and the units of output (as energy, volume, or mass).[291] These choices materially affect reported values and can introduce biases that penalize certain operators based on their size, location, and ratio of gas-to-oil production.

Other methodological choices are also under consideration in policy design, including the scope of production activities to include, whether to standardize against total production versus marketed product, the level of granularity, ranging from facility to country level, and whether

to include other greenhouse gases in a composite intensity. The impacts of these decisions need to be better understood in the context of specific policy plans.

Finally, methane intensity standards do not set a limit on absolute methane emissions.

The regulations now in force or pending show how differently the same metric can be built. Strictly, no jurisdiction has a true methane-intensity standard in force; the closest analogues are Canada's facility hydrocarbon emission intensity and Colorado's greenhouse-gas intensity metrics, neither of which is methane-specific. This gap is one reason United Nations Secretary-General António Guterres, in his call to action on methane, advocated a common, internationally recognized methane intensity benchmark as a precondition to establishing a marketplace for near-zero-methane-emissions fossil fuels.[292]

Colorado (U.S.) employs a "greenhouse gas intensity" metric, calculated as the sum of preproduction and production greenhouse gas emissions (measured in metric tons of carbon dioxide equivalent) divided by the total production of hydrocarbon liquids and natural gas (measured in thousands of barrels of oil equivalent) for a calendar year.[293] Operators must calculate this intensity using a measurement-informed inventory that adjusts reported methane emissions based on direct measurement or state default intensity verification factors derived from atmospheric monitoring.[294] Although the intensity calculation includes carbon dioxide and nitrous oxide, the state default factors are specifically developed to account for differences between monitored and reported methane emissions. Operators file a measurement-informed inventory, the first covering 2025 and due by 30 June 2026, and may swap in their own monitoring once they can show the defaults misjudge their sites.[295] Once calculated, this metric must fall below mandatory, declining intensity targets set for benchmark years 2025, 2027, and 2030; these targets impose significantly stricter limits on larger "majority" operators than on "minority" operators, while new facilities face an entirely separate, tighter set of limits that are especially stringent if located within disproportionately impacted communities.[296]

Canada keeps the metric purely volumetric. Its "facility emission intensity" metric is a ratio, expressed in percent, calculated by dividing the total volume of hydrocarbon gas emissions from a facility in a 365-day period by the volume of hydrocarbon gas produced, processed, or transported at that facility.[297] This definition requires the denominator to be the greatest of the volumes produced, processed, or transported to ensure the intensity reflects the primary function of the specific upstream facility.[298] Operators undertaking the performance standard must maintain intensities below specific thresholds: 0.2% for production, 0.05% for processing, and 0.11% for transmission.[299]

The EU Methane Regulation has yet to establish specific methodologies for calculating this intensity at the level of the producer, but the Commission will set out these methodologies through delegated acts to ensure it accounts for different production processes and site conditions.[300] Nonetheless, the Regulation will require the determination of methane intensity of the production of crude oil, natural gas, and coal placed on the Union market.[301] These values reported will populate a transparency database and performance profiles, allowing buyers to make informed supply decisions based on the emissions performance of producers and importers.[302] From August 2028 importers and domestic producers must report this intensity;[303] from August 2030 every new or renewed supply contract must fall below intensity limits set by the Commission.[304]

Box 1. 0.2% Methane Intensity Import Standard

More than 40% of global crude oil and 25% of natural gas and coal are traded internationally.[305] For many importers, most of the emissions associated with their fossil fuel consumption originate in upstream operations abroad. The methane emissions from domestic production in the European Union, the United Kingdom, Japan, Korea, and China (5 Mt in 2024) pale in comparison to the upstream emissions tied to their imported oil and gas (15 Mt in 2024).[306] However, the upstream methane emissions intensities associated with oil and gas imports differ across each country: average intensities are around 1% for the European Union and United Kingdom, 0.6% for Japan and Korea, and 1.3% for China.[307]

Reducing these intensities to 0.2% would cut global methane emissions by more than 12 Mt, or around 20% of total upstream oil and gas methane emissions.[308] The intensity metric used here by the IEA is defined as total methane emissions from upstream operations divided by marketed oil and gas production, assuming methane has an energy density of 55 megajoules per kilogram.[309] The threshold itself originates with the Oil & Gas Climate Initiative, which calculates it as methane emissions from operated upstream assets over marketed gas volumes, expressed as a percentage, and treats 0.2% as an international good-practice benchmark.[310] Based on different methane intensity metrics, a separate analysis from Climate Analytics estimates this reduction at 6.8 Mt.[311]

Were exporters to those same markets also to eliminate flaring and methane emissions across all shipments, more than 25 bcm of additional natural gas would become available to importers.[312]

The real-world impact of an import standard would depend on its design, enforcement, and compliance. To name only a few challenges: where import penalties fall below abatement costs, exporters and importers will rationally elect non-compliance; or where exporters retain market power, they may redirect low-intensity volumes to regulated markets through physical reallocation or tradeable certificates while channeling higher-intensity production to unregulated buyers, an outcome that reduces emissions only marginally where compliance volumes require active abatement (2 Mt under export sorting compared to 12 Mt under full compliance).[313] Conversely, where exporters extend abatement beyond the volumes destined for regulated markets, spillover reductions arise: if exporters to the five-market coalition above achieved 0.2% upstream intensity as defined by the IEA[314] across all exports regardless of destination, global emissions would fall by 17 Mt rather than 12 Mt.[315]

Effective standard design rests on five elements. First, phased compliance timelines give producers, exporters, and importers time to adjust, with explicit guidance on whether the standard governs existing contracts or only those signed after a specified date.[316] Second, measurement and reporting rules must specify how importers quantify and disclose the methane intensity of imported fuels.[317] Third, regulators must specify the permissible compliance pathways, including which certification schemes constitute proof of compliance.[318] Fourth, enforcement must be sufficiently robust to drive exporter abatement; pairing standards with technical and financial assistance to exporting jurisdictions facilitates compliance and reduces the risk of trade displacement.[319] Fifth, coordination across importing jurisdictions harmonizes requirements and streamlines compliance for producers serving multiple regulated markets.[320]

5. *Decommissioning Requirements*

Decommissioning requirements prevent methane emissions from abandoned, inactive, or orphaned wells and coal mines. There are an estimated 8 million abandoned onshore oil and gas wells globally.[321] In the United States alone, there are thought to be almost 4 million abandoned wells and more than 250 000 abandoned coal mines.[322] Regulations often mandate that operators establish financial security funds during the productive life of an asset to ensure that closure and reclamation costs are covered even if the company becomes insolvent. Conversely, regulation can impose an orphan well levy on active operators to fund the decommissioning of wells and mines left by insolvent companies, such as the practice for orphan wells in Alberta (Canada) and abandoned mines in Western Australia (Australia).[323] Further, the EU Methane Regulation mandates Member States to publish inventories of all inactive and abandoned wells and mines and to assume responsibility for remediating, reclaiming, and permanently plugging sites where no responsible operator can be identified.[324]

Additionally, on orphan wells (those without a responsible operator for remediation), a 2026 consensus study confirmed that plugging these wells is an effective method of reducing leaks and emissions and recommends that the jurisdiction continue plugging in line with best practices and accepted industry standards.[325] To ensure plugs perform as intended, the study recommends that regulators require a barrier verification plan with defined acceptance criteria in every approved plugging plan, specify when permanent barriers must be verified and the minimum inspection and testing methods to be used, and place an agency representative on site to witness critical operations, with results documented in post-plugging reports.[326]

6. *Equipment Standards and Phasing-In Zero-Emitting Technologies*

Equipment and technology standards mandate the installation or replacement of high-emitting components with cleaner alternatives. They can be prescriptive, performance-based, or both. On the one hand, a prescriptive approach is particularly effective because it does not always require precise emissions quantification before action can be taken; however, this approach does limit flexibility and may slow response time to rapidly developing technology.[327] On the other hand, a performance-based approach, being technology agnostic, gives operators the flexibility to choose methods of compliance, which may increase technology innovation through incentivizing the deployment of the latest, cost-effective technologies; nonetheless, this approach relies on accurate emissions monitoring and enforcement.[328] A current trend is the phasing-in of zero-emitting technologies, such as replacing natural gas-driven pneumatic controllers with compressed air or electric systems, and replacing wet centrifugal compressor seals with dry gas seals.[329] Were the world to set specific guidelines for equipment, technologies, or procedures, including mandates to replace components known to emit significant volumes of methane, global oil and gas methane emissions could fall by 19%.[330]

The regulations share the same design features. They cover a common set of equipment: pneumatic controllers and pumps, centrifugal and reciprocating compressors, glycol dehydrators, storage tanks, and flowlines. They differentiate by vintage, setting a strict prescriptive design standard for new or refurbished equipment and a more flexible control-or-retrofit obligation for existing equipment.

For example, in Mexico, the methane regulations provide that, during the design phase of new oil and gas facilities, the operator must select pneumatic pumps driven by compressed air or electric pumps; then, they further mandate that for new installations, operators must select centrifugal compressors that use dry seals.[331] In British Columbia (Canada), regulatory

provisions encourage the replacement of pneumatic pumps over time;[332] yet, in Nigeria, the mandate is immediate for facilities with grid access, but a 5-year phase-in for facilities without access.[333] Finally, the EU Methane Regulation requires operators to install commercially available zero-emitting pneumatic devices, compressors, and dry gas seals for any new, replaced, or refurbished sites.[334]

7. Economic Policy

Economic incentives are financial tools that induce action by applying rewards or penalties to alter the cost-benefit analysis of methane emissions. While reward components include direct public financial support, low-interest loans, and cost-recovery provisions where abatement expenses are treated as tax-deductible operational costs or "cost oil,"[335] the penalty components include emissions taxes, fees for gas disposal (flaring/venting), and royalties on wasted gas.[336]

For support, Alberta (Canada) has developed the Alberta Methane Emissions Program to support methane emission reductions in the oil and gas industry.[337] This program is funded by Alberta's Technology Innovation and Emissions Reduction Fund.[338] The Alberta Methane Emissions Program is a three-year US$17 million initiative to promote technology and data sharing for the purpose of developing methane-efficient technology for the oil and gas sector.[339]

The 2022 Inflation Reduction Act (IRA) was key to wider U.S. efforts on climate mitigation, including methane. The IRA contains nearly US$370 billion in climate funding, including US$1.55 billion to monitor and reduce emissions from oil and gas.[340] The legislation includes a Methane Emission Reduction Program, with a methane waste fee (called the Waste Emissions Charge) of up to US$1,500 per tonne of methane by 2026,[341] and raises royalty fees for oil and gas extracted from federal lands and waters, including fees on gas avoidably lost by non-emergency flaring or venting.[342] However, the regulatory implementation timeline shifted in July 2025 with the passage of the One Big Beautiful Bill Act, which postponed the methane charge's effective date by 10 years to 2034.[343] Congress also used the Congressional Review Act to repeal the Environmental Protection Agency's rule implementing the charge.[344]

B. International Efforts to Address Fossil Fuel Methane Emissions

High-level methane pledges now cover approximately 80% of global fossil fuel production, up from approximately 50% in 2021.[345]

Section III.A showed how individual jurisdictions regulate methane. This section turns to the cooperation among them. Public and private actors are converging on methane mitigation through pledges, coalitions, joint statements, and industry initiatives. That cooperation matters for two reasons. It accelerates reductions where national regulation is absent or weak, and it builds the shared expectations that make binding rules possible.

1. Growing Global Consensus on Methane Regulation

Global consensus is shifting from voluntary commitments toward calls for mandatory, binding measures. The driver is a simple recognition: methane reduction is the fastest lever available to curb near-term warming.

The tone of recent statements reflects this shift. Rita Schwarzelühr-Sutter, Parliamentary State Secretary for Germany, argued that while engagement is good, "engagement and regulation are better," calling for a fossil fuel industry that operates without flaring, venting, or leaks.[346] Ruth

Davis, the UK Special Representative for Nature, reminded the global community that cutting methane acts as a "climate emergency brake" capable of avoiding approximately 0.2–0.3°C of warming by 2050, declaring that "decisive action is needed now."[347]

United Nations Secretary-General António Guterres made the point forcefully. Launching his Call to Action on Methane at London Climate Action Week, he declared that voluntary action is no longer enough and called on producer and consumer governments alike to set a new global standard for the fossil fuel sector.[348] The accompanying report addresses fossil fuel, waste, and agriculture through nine actions by 2030, the first three of which target fossil fuels.[349] Action 1 requires governments to ban routine flaring and cold venting, replace high-emitting equipment, mandate leak detection and repair across the value chain, and treat super-emitters with zero tolerance, lifting the response rate to satellite alerts to at least 80%.[350] Action 2 requires direct, asset-level measurement aligned with OGMP 2.0, made public and independently assured, so markets can separate high performers from laggards.[351] Action 3 calls for a science-based global methane standard, an internationally recognized intensity benchmark whose compliance becomes a condition for financing, procurement, and long-term market access.[352] Each action maps onto a regulatory theme surveyed above: the prescriptive and performance standards of Sections III.A.1, III.A.2, and III.A.6, the MMRV requirements of Section III.A.3, and the methane-intensity and import-standard regimes of Section III.A.4.

That same day, Canada, the United Kingdom, and the European Commission issued a *Joint Statement on Methane abatement in the energy sector as a pillar of energy security*.[353] It called on all fossil fuel producers and operators worldwide to adopt rigorous, measurement-based abatement practices aligned with OGMP 2.0, urging countries to implement the *Joint Statement on Drastically Reducing Methane Emissions in the Global Fossil Fuel Sector* and the Global Methane Pledge, and seeking financial and technical support for abatement, particularly in the Global South.[354]

Leaders increasingly reach for the Montreal Protocol as a template. At the Roundtable on Reducing Methane Emissions from the Energy Sector, held on the tenth anniversary of the Paris Agreement, Prime Minister Mia Mottley of Barbados argued that the world must treat that protocol's success as the model for methane.[355] In a later exchange with French President Emmanuel Macron, she said that when producers stop flaring gas or fixing pipes, they stop "burning cash," calling this alignment of economic and environmental interest a "win-win platform."[356] Secretary-General Guterres echoed the analogy, noting that the world eliminated ozone-depleting chemicals under the Montreal Protocol and phased out leaded gasoline, so "[m]ethane pollution must be next."[357]

a. Statements from Island Nations and Climate Vulnerable States

Leaders from small island developing states and climate-vulnerable nations continue to be vocal proponents for the shift from voluntary pledges to binding measures.

Prime Minister Mia Mottley of Barbados has continued to be at the forefront of this advocacy, declaring that "this is another 'ozone layer' moment" and asserting that the oil and gas industry must be legally bound to cut methane emissions because "with climate tipping points approaching, time is running out."[358] Mottley has argued that while CO_2 reduction is essential, its impact is medium- to long-term, whereas eliminating easily avoidable methane emissions could avoid up to nearly 0.3°C of warming by the 2040s.[359] Mottley contends that voluntary pledges like the Global Methane Pledge are insufficient because current measures would only reduce emissions by 8% by 2030, necessitating a binding agreement similar to the Montreal

Protocol.[360] Consistently over the years, she has been warning that "unless there is a global methane agreement that is compulsory, we're not going to get where we need to go."[361] In the lead-up to COP30,[362] she called for a "Coalition of the Willing" to negotiate this binding agreement, arguing that "waste is a form of injustice" and preventing it is "not too much to ask."[363]

This urgency is shared by the Climate Vulnerable Forum (CVF) and V20. In September 2025, CVF-V20 leaders called for urgent adaptation finance and rapid emissions reductions as the world "hurtled past" the 1.5°C limit.[364] Prime Minister Mottley, speaking as Chair of the CVF-V20 Presidency, urged member countries to support a global methane agreement, which could lower global emissions without threatening the fossil fuel sector.[365]

Leaders from the Pacific have been equally adamant regarding the legal and moral necessity of methane mitigation. The President of the Federated States of Micronesia, Wesley Simina, stated that the world must pull the "methane emergency brake" while arguing that current voluntary initiatives are failing to reduce emissions as producers continue to pour investment into exploration rather than repairs.[366] He called for binding, sector-specific standards in the oil and gas sector and a transition from voluntary promises to enforceable obligations.[367] Similarly, Prime Minister Feleti Teo of Tuvalu, referring to the International Court of Justice's 2025 Advisory Opinion on Climate Change, stated that inaction is "not just immoral, it is unlawful," and called on major emitters to step up methane action with binding commitments.[368] Collectively, the Pacific Islands Forum Leaders reaffirmed that climate change remains the single greatest threat to the livelihoods of Pacific peoples and called for all countries to take individual and collective action to prevent near-term warming by addressing short-lived climate pollutants, particularly methane emissions.[369]

b. G7, G20, and Major Economies

Major economies forums have progressively hardened their stance on methane. In 2021 leading up to the Global Methane Pledge's launch at COP26, the G20 Leaders acknowledged the significant contribution of methane emissions to climate change and recognized its reduction as one of the quickest, most feasible, and cost-effective ways to limit near-term warming.[370] By 2022, G7 Ministers committed to implementing the Global Methane Pledge[371] while further identifying a need to reduce global methane emissions by 34% by 2030 and 44% by 2040 relative to 2019 levels to limit global warming to 1.5°C.[372]

Progress continued in 2023, with G7 Climate, Energy, and Environment Ministers in Sapporo committing to pursue a collective effort towards a 75% reduction by 2030 in global methane emissions from fossil fuels, including the reduction of methane intensity of oil and gas operations.[373] G7 Leaders in Hiroshima subsequently emphasized the importance of accurate emissions data and called for the improvement of MMRV mechanisms.[374]

By 2024, G7 Leaders in Apulia reinforced their commitment, pledging to tackle methane emissions in line with a global reduction level of at least 35% by 2035.[375] They reiterated the goal of a 75% reduction in global methane emissions from fossil fuels and committed to reducing the methane emissions intensity of oil and gas operations by 2030.[376] G7 Climate, Energy, and Environment Ministers in Torino further called on G7 gas suppliers to significantly reduce domestic routine flaring and venting by 2030.[377]

Alongside these commitments, French President Emmanuel Macron has been a vocal proponent for binding measures, by demanding "binding objectives on methane" and calling it

a reachable goal as well as a G7 priority.[378] He argued that the fight on methane is key to accelerating climate action and that a coalition must be built to achieve it because "methane is very effective, there is more consensus, we must go very fast and very strong."[379] In a bilateral capacity, France and China issued a joint statement in late 2025 recognizing the importance of controlling and reducing methane emissions and mobilizing technological collaboration.[380]

On 4 May 2026, France convened, under its G7 Presidency, a high-level multi-stakeholder methane event, at which the interventions converged on three propositions: methane mitigation has matured from a climate obligation into a question of energy security and economic competitiveness; voluntary frameworks have reached their limits; and the political coalition prepared to act through binding international architecture exists, even where universal participation remains absent.[381]

c. The Sunnylands Statement

The *Sunnylands Statement* underscores the United States and China's commitment to climate leadership announced in advance of COP28.[382] This commitment was also reflected in China hosting, with the U.S. and the UAE, the *COP28 Methane Summit*.[383] The *Sunnylands Statement* is an important additional step to implement the new climate architecture that President Biden and his then climate envoy John Kerry articulated at the Major Economies Forum on Energy and Climate in April 2023.[384]

Importantly, the *Sunnylands Statement* paves the way for U.S.-China engagement and cooperation on key climate priorities, starting with the run-up to COP28. The "Sunnylands legacy" includes the meeting in 2013 between President Obama and President Xi, which helped build the consensus needed to adopt the Kigali Amendment to the Montreal Protocol on HFCs in 2016 and chart a path toward eventual HFC phaseout.[385] In the same way, the *Sunnylands Statement* reflects a "start and strengthen" approach to address the climate crisis.[386]

At the 15 November 2023 meeting between President Biden and President Xi Jinping, "[t]he two leaders underscored the importance of working together to accelerate efforts to tackle the climate crisis in this critical decade. They welcomed recent positive discussions between their respective special envoys for climate, including on national actions to reduce emissions in the 2020s, on common approaches toward a successful COP28, and on operationalizing the Working Group on Enhancing Climate Action in the 2020s to accelerate concrete climate actions."[387]

To realize the potential of the *Sunnylands Statement* to address the climate emergency, there is still a massive amount of work to be done. The *Statement* identifies opportunities for further understanding and ambition-strengthening actions in these top two GHG-emitting countries, including on the energy transition from fossil fuels,[388] the mitigation of methane, HFCs, N_2O, and other non-CO_2 climate pollutants,[389] the development of resource efficiency and a circular economy,[390] the synergistic control of GHGs and other air pollutants,[391] on climate cooperation at the subnational level,[392] on combating deforestation,[393] and on 2035 NDCs.[394]

In addition to actions adopted at the national and subnational levels, the *Sunnylands Statement* underscores the role of multilateralism in solving the climate crisis.[395] It echoes the provisions on strengthening global methane governance and cooperation in the China Methane Emissions Control Action Plan.[396] It also points to the importance of international advocacy, including discussions at the COP28 Methane and Non-CO_2 GHGs Summit and other activities, which can build the foundation for commitments that can contribute to a binding global methane agreement.[397]

d. The Joint Glasgow Declaration

Earlier, at COP26 on 10 November 2021, the United States and China issued the *Joint Glasgow Declaration*, which commits the two largest economies and emitters of climate pollutants to jointly tackle the climate crisis through "accelerated actions in the critical decade of the 2020s,"[398] including additional measures to reduce methane emissions. This *Declaration* provides key background for understanding the *Sunnylands Statement.* For example, in the *Declaration*, China agreed to develop a "comprehensive and ambitious National Action Plan" to achieve methane emissions control and reductions in the 2020s.[399] The United States and China also committed to "cooperate to enhance the measurement of methane emissions," to meet during the first half of 2022 to focus on methane measurement and mitigation issues,[400] and to establish a Working Group on Enhancing Climate Action in the 2020s to address the climate crisis, which would meet regularly.[401] Further, the United States and China indicated their intention to communicate 2035 NDCs in 2025,[402] which helps reinforce the *Sunnylands Statement* reference that "both countries' 2035 NDCs will be economy-wide, include all GHGs, and reflect the reductions aligned with the Paris temperature goal of holding the increase in global average temperature to well below 2 degrees C and pursuing efforts to limit the temperature increase to 1.5 degrees C."[403]

China's announcement in the *Declaration* of a National Action Plan on methane to reduce methane emissions in the 2020s,[404] later released on 7 November 2023,[405] reflected at the time significant progress towards achieving the objectives of the Global Methane Pledge, although China has not joined the Global Methane Pledge.[406] Notwithstanding, as a result of the *Sunnylands Statement* and the *Joint Glasgow Declaration*, national and subnational methane-mitigation activities that Global Methane Pledge countries undertake will serve as models to help inform and potentially strengthen the implementation of China's Methane Emissions Control Action Plan. It is also significant that both China's updated NDCs and Mid-Century Strategy list policy actions for reductions of non-CO_2 GHGs, including methane.[407]

2. Governmental and Quasi-governmental Organizations and Initiatives

a. ASEAN Energy Sector Methane Leadership Program

The ASEAN Energy Sector Methane Leadership Program, established in July 2023, is an 18-month initiative delivered through masterclasses and workshops. It focuses on building the capacity of ASEAN energy companies to strengthen their plans, targets, and financing options for reducing methane.[408] PETRONAS launched it with ASEAN energy operators, government agencies, and international organizations. In October 2024, under the theme "Turning Capacity into Action," ASEAN launched the Methane Leadership Program 2.0 to tighten reduction targets and improve government-industry coordination.[409]

b. The Breakthrough Agenda

Initially launched at COP26 by a coalition of 45 world leaders, the Breakthrough Agenda aims to halve global emissions by 2030 through a multi-country clean technology plan. Countries endorsed goals to make clean technologies and sustainable practices more affordable, accessible, and attractive than their alternatives by 2030 in the power, road transport, steel, hydrogen, and agriculture sectors. At COP28, it was announced that the Breakthrough Agenda goals now also cover the buildings and cement sectors.[410] The Breakthrough Agenda has an annual cycle to track developments towards these goals, identify where further coordinated international action is needed to galvanize public and private international action to make these

transitions quicker, cheaper, and easier.[411] At COP27, leaders set 28 priority actions within this framework and agreed to review and share progress and improvements on these actions. The 2023 Breakthrough Agenda report assessed annual progress on these priority actions and found that only modest progress had been made in strengthening international collaboration in critical areas. The report's recommendations span financial assistance, research and development, demand-creation, infrastructure, and standards, and trade, to accelerate the transition in each of the seven sectors.[412]

c. The Climate & Clean Air Coalition to Reduce Short-Lived Climate Pollutants

The CCAC facilitates methane mitigation and information sharing at all levels, including through the publication of leading science. The CCAC is a voluntary partnership with over 80 State and regional partners, and a similar number of non-state partners as of the end of 2023.[413]

As of September 2023, the CCAC acts as the Secretariat for the Global Methane Pledge.[414] The CCAC assists countries with developing plans to reduce SLCPs.[415] The CCAC also helps countries increase the ambition of the SLCP-reduction targets that they include in their NDCs under the Paris Agreement. Increasing support and funding for the CCAC would strengthen information-sharing and technical support for countries, leading to a concerted increase in ambition. This could include further ambition concerning methane reporting under the CCAC's Oil and Gas Methane Partnership.

This could also include coordinating support for "National Methane Offices" and other methane mitigation architecture, adopting the institutional strengthening approach that has been "a major factor in the success" of developing countries achieving the Montreal Protocol.[416] The November 2022 Ministerial communiqué raised the possibility of establishing a Technology and Economic Assessment Panel on Methane (since established),[417] to advise partners on "innovative methane mitigation technologies, including methane removal and sector-specific methane reduction technologies."[418]

In November 2021, the CCAC Ministerial launched the CCAC Methane Flagship, "which, starting in 2022, fosters and strengthens high-level commitments to reduce methane, amplifies and raises awareness, supports planning and delivery of strategies and plans, provides analysis and tools to support action, and scales up financing."[419] The CCAC's efforts, resulting in the *Global Methane Assessment*, raised awareness of and brought political attention to the opportunities of methane abatement.[420] In addition to their work with the *Global Methane Assessment*, the CCAC's work with Shindell's group at Duke University resulted in a publicly accessible, online methane mitigation tool.[421] The CCAC plans to improve this tool to make it more user-friendly, including by continuously updating methane emissions and existing metrics for quantifying co-benefits. This enables a national-level overview of the relevant measures and related co-benefits, including job creation.

The CCAC is also planning to develop a *Global Methane Policy/Implementation Tracker* to record and quantify progress on the implementation of methane-related measures, policies, and regulations. In addition, the CCAC is hosting three hubs that work with governments and other stakeholders on agriculture, waste, and oil and gas. Notably, the UN Economic Commission for Europe (UNECE) joined the CCAC in 2015 with the aim of contributing to CCAC's work by sharing experience, knowledge, and best practices, including with respect to UNECE's amended Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol) to LRTAP.[422] This relationship can help inform efforts to develop a binding global methane agreement to address the climate emergency and promote peace and security.

In September 2022, the CCAC and the Global Methane Initiative (GMI) convened a Global Methane, Climate and Clean Air Forum with the goal of bringing together policymakers, industry leaders, technical experts, and researchers from around the world.[423] Discussion included opportunities to protect the climate and improve air quality, with a special focus on methane, in all emitting sectors. Several announcements of new financing projects were made following this forum. Discussion highlighted the need for science-based fast climate action "given the narrow window to achieve the goals of the Paris Agreement on climate change,"[424] policy approaches that catalyze adoption of mitigation technology, and financial support to make the necessary transitions.

In November 2022, the CCAC hosted a ministerial meeting at COP27, wherein ministers and leaders of CCAC partners reaffirmed and renewed their commitment to reduce methane and other SLCPs and to launch new collaborative actions to further drive emissions reductions.[425] The CCAC partners welcomed the possibility of exploring the formation of a Technology and Economic Assessment Panel on Methane to advise them on methane mitigation technologies[426] and requested the CCAC Scientific Advisory Panel to develop a proposal to highlight and better calculate near-term climate benefits of methane action.[427] The CCAC board has since approved the formation of a pilot Technology and Economic Assessment Panel (TEAP) on Methane to develop and share knowledge with countries about promising, innovative, and underfinanced SLCP mitigation strategies.[428] The TEAP launched its first report in November 2023.[429] The CCAC is also continually strengthening its Scientific Advisory Panel (SAP) to provide needed support, including on methane mitigation science.[430]

In October 2023, the CCAC co-released a report with the IEA on *The Imperative of Cutting Methane from Fossil Fuels*. The report outlined in detail the necessity of rapid cuts to methane from fossil fuels, as well as the benefits for health and climate of such reductions.[431]

In December 2023, the CCAC co-hosted the Global Methane Pledge Ministerial at COP28.[432] The Global Methane Pledge Ministerial showcased national actions and catalytic grant funding to deliver on the goal to cut methane at least 30% by 2030. Among the announcements made were over US$1 billion in new grant funding for methane action mobilized since COP27, the full launch of the Methane Alert and Response System, a new Data for Methane Action Campaign, and a new platform to better track waste methane emissions in cities around the world. Also announced was the joining of Canada, Federated States of Micronesia, Germany, Japan, and Nigeria as Global Methane Pledge Champions, while Turkmenistan, Kazakhstan, Kenya, Kosovo, Romania, and Angola joined the Global Methane Pledge.[433]

The CCAC also hosted the CCAC Ministerial at COP28, which focused on financing SLCPs as well as immediate action to reduce methane and other SLCPs. Ministers announced the pilot work of the new TEAP, which highlights context-specific, practical mitigation measures aimed at closing finance gaps.[434] The ministerial meeting also announced that a global assessment on the cost of inaction on SLCPs and an assessment on the integrated agriculture and food systems would be prepared in advance of COP30, now delayed.[435] Additionally, Ministers called for increased efforts to support highly vulnerable Small-Island Developing States (SIDS), especially in the context of rapid mitigation of methane and black carbon to slow sea level rise and increasing frequency and intensity of climate-exacerbated weather events.[436] Further contributions to the CCAC Trust Fund were announced from the European Commission, Finland, Germany, Ireland, Japan, Monaco, and Sweden, amounting to an estimated US$15 million.[437]

In addition, CCAC launched the CCAC Clean Air Flagship at COP28. The Flagship brings more attention to the global air pollution crisis, highlight readily available solutions, elevate

ongoing regional collaboration, amplify and strengthen multi-level government cooperation, and offer direct support to countries including through policy and integrated climate and clean air planning activities and sector-specific action via CCAC Sector Hubs, and capacity support for integrated inventories, monitoring and air pollution modelling, and implementation of related priority measures and action plans.[438] The Flagship supports science cooperation and information-sharing initiatives, especially with respect to methane,[439] and strengthens and supports regional and sub-regional cooperation, and the implementation of political commitments to achieve the WHO Air Quality Guidelines and GMP.[440]

To further bridge the gap between policy commitment and implementation, the CCAC launched the Fossil Fuel Regulatory Programme (FFRP) in partnership with the Clean Air Task Force (CATF) and UNEP's IMEO in 2024 to provide targeted, ODA-eligible support to up to 20 governments between 2024 and 2027.[441] This program focuses on capacity building, regulatory framework development, and compliance enforcement to address the needs of developing countries, which comprise two-thirds of top methane emitters in the energy sector.[442] Complementing this initiative, the Methane Regulator-to-Regulator Network (MR2R) was launched in conjunction with the International Energy Agency to facilitate peer-to-peer learning and adaptation to evolving regulatory landscapes.[443]

During COP30 in Belem, the United Kingdom and Brazil launched the Climate and Clean Air Coalition's *Super Pollutant Country Action Accelerator* to drive super pollutant emissions reductions in developing countries through improved measurement, ending routine flaring of gases, shifting to cleaner technologies, and cutting waste and agricultural emissions.[444] The initiative, which is modelled after the successful Montreal Protocol, begins with US$25 million for seven countries (Brazil, Cambodia, Indonesia, Kazakhstan, Mexico, Nigeria, and South Africa), scaling up to US$150 million.[445]

d. International Working Group to Establish Universal Approach to Measuring, Monitoring, Reporting, and Verifying Greenhouse Gas Emissions Across the Natural Gas Supply Chain

At COP28, the United States, the European Commission, and 12 other gas-importing and exporting countries formed an international working group to develop comparable, reliable information on methane and carbon dioxide emissions across the natural gas supply chain and drive global reductions.[446]

e. Net-Zero Producers Forum

In April 2021, Canada, Norway, Qatar, Saudi Arabia, and the United States announced their intention to establish the Net-Zero Producers Forum, which held its first ministerial in March 2022.[447] The Forum develops pragmatic net-zero strategies, including methane abatement, the circular carbon economy, clean-energy and carbon capture deployment, and diversification from hydrocarbon revenues, each in line with national circumstances.[448] The UAE joined in May 2022.[449] At COP28, the Forum launched the Upstream Methane Abatement Toolkit, a resource highlighting current measures and lessons learned in deploying abatement technologies.[450] Saudi Aramco, a founding member, has set internal targets to cut upstream carbon intensity, including a stated 15% reduction by 2025.[451] Yet Saudi Arabia currently reports 0% participation in OGMP 2.0, showing the gap between corporate ambition and independently verifiable measurement.[452]

f. World Bank Global Gas Flaring Reduction Partnership and Zero Flaring Initiative/Global Flaring and Methane Reduction (GFMR)

At COP28, the World Bank re-launched the Global Gas Flaring Reduction Partnership as the Global Flaring and Methane Reduction Partnership, a multi-donor trust fund focused on helping developing countries cut carbon dioxide and methane from the oil and gas industry.[453]

FMR develops country-specific flaring reduction programs, conducts research, shares best practices, secures commitments to end routine flaring, and advances flare measurement and reporting.[454] Access to its project development and financing support is conditioned on a commitment to report through OGMP 2.0, to reach near-zero absolute methane emissions by 2030 by cutting intensity below 0.2%, and to achieve zero routine flaring by 2030.[455] The partnership holds US$255 million in new grant funding from the UAE, the United States, Norway, BP, ENI, Equinor, Occidental, Shell, and TotalEnergies.[456]

GFMR also seeks commitments to the Zero Routine Flaring by 2030 Initiative, under which participating governments and companies pledge to end routine flaring by 2030.[457] The initiative is supported by 34 governments, 54 oil and gas companies, and 15 development organizations.[458] GFMR has developed a Global Gas Flaring Tracker Report and Dashboard, an online platform providing real-time global flaring data, built with the U.S. National Oceanic and Atmospheric Administration and the Payne Institute at the Colorado School of Mines.

In its first annual progress report in 2025, the partnership noted that, backed by over US$200 million in pledges, it had expanded to 17 countries representing more than a quarter of global oil and gas methane emissions and nearly two-fifths of global flaring.[459] Drawing on an improved methodology, the 2026 report finds that the top nine flaring countries (Russia, Iran, Iraq, Venezuela, Mexico, Libya, Algeria, Nigeria, and the United States) accounted for 83% of global flare volumes in 2025 while producing only 46% of the world's oil.[460]

g. World Bank Global Methane Reduction Platform for Development (CH4D)

At COP28, the World Bank launched the Global Methane Reduction Platform for Development to help low- and middle-income countries realize the "methane triple wins" of cutting emissions, building resilience, and improving livelihoods. Through partnerships, including the CCAC Methane Roadmap Action Programme, CH4D mobilizes expertise, affordable technologies, and catalytic finance for abatement in the agriculture and waste sectors.[461]

h. United Nations Economic Commission for Europe (UNECE)

Coal-sector methane governance at the international level rests chiefly on the UNECE Group of Experts on Coal Mine Methane and Just Transition. It works to promote a sustainable transition along the coal value chain through three streams: cutting methane across active, closed, and abandoned mines; supporting a just transition for affected communities; and ensuring safe operations and responsible mine closure.[462] The Group has produced the principal international coal-sector methane policy literature, including the BEST PRACTICE GUIDANCE FOR EFFECTIVE MANAGEMENT OF COAL MINE METHANE AT NATIONAL LEVEL: MONITORING, REPORTING, VERIFICATION AND MITIGATION (2021, developed with the Global Methane Initiative); BEST PRACTICE GUIDANCE FOR EFFECTIVE METHANE DRAINAGE AND RECOVERY IN COAL MINES (2016); BEST PRACTICE GUIDANCE FOR EFFECTIVE METHANE RECOVERY AND USE FROM ABANDONED COAL MINES (2019); and BEST PRACTICE GUIDANCE ON VENTILATION AIR METHANE MITIGATION (2025).

3. *Industry-led initiatives*

a. American Petroleum Institute Methane Action Plan

In 2023, the American Petroleum Institute released its Methane Action Plan.[463] The Plan highlights the work done by the oil and gas industry's Environmental Partnership to reduce methane. The Environmental Partnership aims to reduce methane through the following actions:[464]

- Reducing flaring through facility design, takeaway capacity planning, and alternative beneficial use.
- Replacing, removing, or retrofitting high-bleed pneumatic controllers with low- or zero-emitting devices.
- Monitoring manual liquids unloading to minimize emissions by ensuring all wellhead vents are closed to the atmosphere.
- Minimizing compressor emissions by implementing design and operation changes.
- Detecting and repairing leaks through regular component inspections.
- Minimizing pipeline blowdown emissions through operational changes, prioritizing alternative beneficial use of gas that would otherwise be vented.

b. Coalition for LNG Emission Abatement Towards Net Zero (CLEAN)

In July 2023, the European Commission, alongside the United States, Japan, South Korea, and Australia, agreed to form a new monitoring mechanism for methane emissions from the LNG sector.[465] The Coalition for LNG Emission Abatement Towards Net Zero (CLEAN) was announced at a conference in Tokyo.[466] The Coalition of LNG buyers—including the Korean Gas Corporation (KOGAS) and JERA—will ask major LNG producers to provide basic data on emissions, such as volume and intensity, as well as reduction targets and measures being taken.[467] Participation will be voluntary, and the results will be disclosed by the government-backed Japan Organization for Metals and Energy Security (JOGMEC).[468]

The Coalition's second annual report describes its growth and role in advancing LNG methane transparency and abatement.[469] It has expanded from two founding members in 2023 to 27 participating companies as of October 2025, handling 105 million tons of LNG, 25.5% of global exports, and 90% of Japan and South Korea's imports.[470] The report provides IMEO-validated weighted-average intensity targets set by suppliers (0.15% for Japan, 0.17% for Korea), results from CLEAN's 2025 survey of upstream projects, and an overview of global methane management across markets.[471] Around 90% of Korea and Japan's LNG imports are covered by OGMP 2.0, with roughly 30% of related supply already having reached OGMP 2.0 Level 5 in 2024.[472]

c. Global Methane Initiative

The Global Methane Initiative is a public-private partnership spanning energy, agriculture, and waste that promotes methane capture and use.[473] It facilitates international information exchange and technical assistance. Its 46 member countries represent around 75% of the world's anthropogenic methane emissions, including the United States, Canada, Argentina, Brazil, Russia, China, India, and Australia.[474] The Initiative reports that its support has helped partner countries cut methane by more than 670 Mt CO_2e since 2004.[475]

d. Methane Abatement in Maritime Innovation Initiative (MAMII)

Launched in September 2022 by a coalition of shipping leaders, the Methane Abatement in Maritime Innovation Initiative aims to reduce the environmental impact of LNG in shipping. It identifies, accelerates, and advocates for technologies that let the maritime industry measure and manage methane.[476] In February 2024, TotalEnergies, Chevron, and gas carrier Seapeak joined, bringing membership above 20.[477]

e. The Methane Guiding Principles

The 50 oil and gas industry signatories to the Methane Guiding Principles have committed to reporting publicly on how they are meeting the intent of five principles: including continual reduction of methane emissions; improving the accuracy of emissions data; advocating sound policy and regulations on methane emissions; and increasing transparency.[478] The commitment to reducing methane emissions includes implementing LDAR programs and reducing venting and fugitive emissions. The group also released a toolkit for policymakers.[479]

At COP28, along with the International Association of Oil and Gas Producers, the Oil and Gas Climate Initiative, and the Environmental Defense Fund, the Methane Guiding Principles announced an intention to build a framework to share expertise to help companies reduce methane emissions and flaring in line with the Oil and Gas Decarbonization Charter (i.e. achieving near-zero methane emissions and eliminating routine flaring by 2030).[480] In addition, the Methane Guiding Principles launched the Advancing Global Methane Reductions initiative, which aims to accelerate 20 countries' methane emissions reductions.[481]

f. Oil and Gas Climate Initiative (OGCI)

The Oil and Gas Climate Initiative (OGCI) is a CEO-led initiative in which member companies agree to several commitments and principles. Members committed to a collective average upstream methane intensity well below 0.20% by 2025, down from a 2017 baseline of 0.30%, to cut aggregate upstream carbon intensity from 23 to 17 kg of GHG per barrel of oil equivalent by 2025, and to support Zero Routine Flaring by 2030.[482] In 2022, OGCI launched the Aiming for Zero Methane Emissions Initiative, with plans to eliminate the oil and gas industry's methane footprint by 2030,[483] and OGCI member companies reported a collective upstream methane intensity of 0.14% in 2023.[484] The Chair of the OGCI Executive Committee, Bjorn Otto Sverdrup, underscored the need for further action at Global Energy Transition in June 2023: "It's time to move beyond incremental improvement," Sverdrup said, pointing to "zero-tolerance" policies already in place for oil spills and safety incidents. "Let's try to deploy that mindset. All methane emissions can and should be avoided."[485] OGCI, together with industry associations IPIECA and IOGP, has released a recommended practices guide to help operators select and deploy methane detection and quantification technologies.[486] At COP28, it announced an expansion of its Satellite Monitoring Campaign to target large methane plumes and flares.[487] In 2025, members reported that their aggregated upstream operated methane intensity had fallen to 0.12% and routine flaring had dropped 72% below 2018 levels.[488]

g. Oil and Gas Decarbonization Charter (OGDC)

At COP28, companies representing more than 40% of global oil production signed the Oil and Gas Decarbonization Charter, a voluntary initiative. Signatories pledged net-zero operations by 2050 at the latest, an end to routine flaring by 2030, and near-zero upstream methane by 2030.[489] Several NGOs have criticized the Charter for not imposing mandatory targets or

standards.[490] According to its 2025 status report, thirty-one signatories have established concrete near-zero action plans covering 86% of the group's total production, marking a shift from capacity building to implementation.[491]

h. Oil and Gas Methane Partnership

The Oil and Gas Methane Partnership (OGMP), a CCAC initiative (with UNEP, the European Commission, and EDF), advances methane emissions reporting, including through the OGMP 2.0 Reporting Framework. This framework requires companies to report methane emissions from sources across the entire oil and gas value chain with a target to reduce emissions by 60–75% by 2030.[492] OGMP 2.0 members are expected to provide continually updated implementation plans showing continuous improvement in measurement, coverage, and technical guidelines.[493] The EU is building its energy-sector MRV requirements on this framework.[494] To reach the OGMP 2.0 Gold Standard, the highest tier, a company must show an explicit and credible path to the required reporting levels within the required period.[495]

As of March 2026, the partnership had expanded to nearly 160 companies covering roughly 45% of global oil and gas production,[496] with assets in more than 90 countries on five continents.[497] In 2024, 7% of global production (238 assets) reached Level 5, at an average methane intensity of 0.1%. Level 5, the highest tier, requires reconciliation of source-level emissions with site-level measurements and offers the best available data quality in the sector.[498] On a conservative no-new-membership basis, Level 5 production is projected to reach about 25% of global output by 2027 and 30% by 2030.[499] Assets on track for Level 5 by 2030 represent around 1,000 bcm of natural gas supply, more than the EU, China, Japan, and South Korea imported combined in 2025, and more than 1,300 million tonnes of oil equivalent, roughly two-thirds of global net oil exports.[500] By 2030, coverage will exceed 80% in Qatar, Norway, and Australia and reach 45% in the United States, though Saudi Arabia, Kuwait, and Iran remain at 0% participation.[501]

IV. Global Energy Markets: How Supply Surpluses Create Opportunities for Methane Mitigation Without Compromising Energy Security

Despite growing calls for a fossil fuel phaseout and the necessity of a phase-down to meet long-term climate stability, a structural shift towards supply surpluses defines the current global fossil energy market. Global oil production is forecast to rise through 2030, global gas production is forecast to rise through 2030 into a glut, and global coal production remains at an all-time high.[502] In an oversupplied market, fossil fuel companies should bear the cost of new methane regulations, since the average annual spending required is less than 2% of the industry's annual net income.[503]

Methane abatement also works as a near-term supply instrument with a measurable energy-security payoff. The Middle East crisis is currently disrupting roughly 20% of global LNG trade flows, with about 110 bcm of gas transiting the Strait of Hormuz in 2025, so abatement-derived supply serves as both a climate measure and a hedge against geopolitical disruption.[504] The IEA estimates that approximately 100 bcm of natural gas could be made available annually through global abatement of methane emissions in oil and gas operations, with a further 100 bcm unlocked through the elimination of non-emergency flaring.[505] In the near term, abatement across upstream and downstream operations in countries with spare export capacity could yield roughly 15 bcm, comprising over 8 bcm from exporters with spare capacity (Turkmenistan, Algeria, Nigeria, Indonesia, Malaysia, and Australia) and nearly 6 bcm from importers, quickly enough to provide market relief.[506]

A. Natural Gas Markets

Due to a massive influx of capacity, the global gas market is entering a period of structural looseness , driven by around 300 bcm per year of new LNG export capacity by 2030.[507] Liquefaction expansions in the United States account for roughly half of that new capacity and Qatar for 20%.[508] As U.S. capacity climbs above 350 bcm by 2035, the United States will become the largest exporter by the end of the decade, which could push up its domestic energy costs.[509] With global LNG supply rising 50% by 2030,[510] an oversupplied market is projected between 2028 and 2032 as new liquefaction outpaces demand.[511] Recent analysis suggests the glut may arrive even earlier, since export capacity is expected to grow by 113 bcm between 2025 and 2026, outpacing global demand growth by 26 bcm. [512] Extra capacity does not automatically translate into energy security, and the cost of methane regulation does not automatically pass through to consumers. Most suppliers are price takers: they sell at the prevailing market price set by overall supply and demand rather than setting prices themselves, so in an oversupplied market they cannot pass higher compliance costs to buyers without losing sales to cheaper competitors.[513]

For a major importer like the EU, which imports 116 bcm each year (20% of global LNG production), security of supply looks robust even while meeting methane-regulated climate goals, and without major price impacts.[514] If countries currently exporting gas to the EU eliminated non-emergency flaring and cut methane, they could raise gas exports by more than 45 bcm using existing infrastructure, equivalent to almost a third of Russian gas exports to the EU in 2021.[515] A December 2025 analysis commissioned by the Environmental Defense Fund found that the EU Methane Regulation's measurement requirements will have a negligible effect on the EU gas price, adding as little as 0.01 to 0.02 $/MMBtu in market-clearing cost.[516] This minimal increase reflects the roughly 600 bcm of OGMP 2.0 Level 5 gas projected to be available by 2027, twice the EU's forecast demand, and the more than 60 upstream operators committing to full compliance with the EU MRV requirements.[517]

A March 2026 cost study by Carbon Limits, also commissioned by the Environmental Defense Fund, confirms this at the operator level. Achieving full EU MRV compliance, including advancing from no prior methane reporting to OGMP 2.0 Level 5 within three years, requires only 0.03% to 0.6% of production value.[518]

Criticism of the EU Methane Regulation often invokes energy security, arguing that methane standards on imported fuels risk supply disruptions or supplier defection. Recent events expose this framing as misplaced. Recent events show this framing is misplaced. When conflict in the Middle East escalated in March 2026, oil and gas prices rose within days, swings that dwarf any conceivable methane compliance cost.[519]

A later Environmental Defense Fund report in June 2026 examined whether closure of the Strait of Hormuz and the wider conflict would undermine the Regulation, and concluded it would not: enough OGMP 2.0 Level 5 gas is expected to reach EU buyers in 2027 even without any Middle Eastern supply.[520] Level 5 gas is projected to reach roughly three times the EU's 2025 imports by 2027, with the United States alone expected to have enough to cover the EU's entire import demand.[521]

B. Crude Oil Markets

The global oil market is structurally oversupplied, even where a geopolitical shock has temporarily masked it. World oil production capacity is projected to rise by 5.1 to 114.7 million

barrels per day by 2030, while demand rises only 2 million barrels per day from 2024 to 2030, plateauing around 105.5 million barrels per day by the end of the decade.[522] That structural surplus has just been stress-tested. The market was already in surplus heading into the March 2026 Strait of Hormuz crisis, and although the disruption shut in more than fourteen million barrels per day of Gulf supply, an unprecedented shock, the effective supply-demand gap stayed far narrower than the headline losses imply.[523]

The implication for EU methane regulation is straightforward. If the global system can absorb the loss of fourteen million barrels per day without supply failing to reach buyers, the marginal compliance cost of methane measurement and abatement (as little as 0.03%–0.6% of production value)[524] cannot plausibly threaten the EU's access to crude. Oil's ease of transport and trade across regions reinforces that flexibility.[525] As with gas, the global supply of OGMP 2.0 Level 5 oil is roughly twice the EU's forecast demand.[526] The Environmental Defense Fund's June 2026 analysis reaches the same conclusion under a Hormuz shortfall: by 2027, expected Level 5 crude volumes are around three times the EU's 2025 imports and cover demand across every major grade, with the United States, Brazil, and Guyana each offering volumes far exceeding their historical exports to the bloc.[527]

C. Coal Markets

Coal remains a dominant emissions source, but global demand is effectively plateauing and will gradually decline through 2030.[528] Global production in 2025 is projected to hold at the all-time high reached in 2024, roughly 9.1 Bt, while demand is expected to fall about 8% by 2035 as power-sector use declines.[529] International trade in coal is shrinking, projected to decline 16% by 2030: this drop in trade does not mean coal use is falling everywhere, as it reflects India and China ramping up domestic production to displace imports rather than any decline in consumption.[530]

China drives continued demand. It consumes 30% more coal than the rest of the world combined, produces more than all other countries combined, and imports the most coal in the world.[531] New analysis shows that in 2025, coal power generation fell in both China (1.6%) and India (3.0%) for the first time in 52 years, driven by additions of clean energy.[532]

V. Financial and Philanthropic Organizations can provide financial support for methane ambition and action

Securing adequate funding is necessary to support governments and organizations committed to fast methane reductions. Private philanthropies, multilateral banks, governments, and other financial actors all have a role to play in enabling the rapid mitigation the climate emergency demands. A stable climate system is a precondition for a stable global financial system, so investment in methane mitigation at scale makes financial sense. Capturing the full temperature benefit of methane mitigation is the best insurance available to secure those investments.

The IEA estimates that a 75% cut in fossil fuel methane would require about US$28 billion in average annual spending through 2035: US$22 billion in oil and gas and US$7 billion in coal, split between US$21 billion in capital expenditure and US$7 billion in operating costs.[533] Cumulative spending across low- and middle-income countries over the same period would also total roughly US$28 billion. Fossil fuel companies bear primary responsibility for this outlay, which equals less than 2% of the industry's annual net income.[534]

Methane mitigation nonetheless remains severely underfunded.[535] In February 2024, the President of the World Bank said methane is 80 times more dangerous than CO_2 yet receives 2% of climate financing, and concluded that something is not right when something so much more dangerous gets so little.[536] The COP28 announcements described above are promising, but far more is needed across all sources of climate finance to mitigate methane at the required scale and speed.

The scale of the gap is well documented. A first-of-its-kind assessment of the landscape of methane mitigation finance from the Climate Policy Initiative tracked about US$11.6 billion in annual 2019/2020 investments, just 2% of total tracked climate finance (public development finance and private climate-related finance, excluding philanthropy), and 10 times less than the US$119 billion needed each year through 2050 based on the cost of readily available mitigation measures consistent with a 2 °C warming scenario.[537] Among sectors receiving funding, the agriculture and energy sectors collectively receive about 33% of available financing.[538] Increased investments to reduce methane emissions in the energy and agricultural sectors are essential as these two sectors emit around 82% of anthropogenic methane.[539]

Ahead of COP28, the Climate Policy Initiative released its 2023 version of its landscape of methane abatement finance report. The report found that, at US$13.7 billion, methane abatement finance is at its highest level yet, but annual flows need to be at least 3.5 times larger until 2030.[540] A 2023 report by the Clean Air Task Force identified that a lack of donor interest in methane mitigation financing, the absence of a dedicated international methane funding mechanism, and the failure to prioritize methane mitigation projects are all barriers to the ability to ensure adequate and available financing to mitigate methane at scale.[541] The IEA's *Global Methane Tracker 2025* estimates that around US$260 billion in spending is needed to deliver methane mitigation in fossil fuel production to stay below 1.5 °C (around US$175 billion in the oil and gas sector and US$85 billion in the coal sector).[542]

At the highest level, multilateral development banks can support countries to achieve at least 30% of methane reduction consistent with the Global Methane Pledge and the *Global Methane Assessment*, including through the following:

- Ensure the availability of financing mechanisms for projects that reduce methane emissions from fossil fuels, waste, and agriculture;
- Promote an evaluation of climate risk that includes climate tipping points and feedbacks;[543]
- Avoid investments that will precipitate climate tipping points and are not aligned with keeping global temperature under 1.5 °C in the next decade;
- Introduce GWP_{20} in climate impact evaluation to more accurately value near-term temperature impacts of action to reduce methane and other SLCPs;
- Assess the best way to leverage private finance for methane mitigation, including methane markets, policies, and regulations; *and*
- Assess how a global methane agreement can facilitate methane mitigation finance.

While integrating these climate emergency responses into bank processes, multilateral financial institutions can immediately build on their existing commitments to help countries invest in methane abatement. For example, the European Bank for Reconstruction and Development (EBRD) endorsed the GMP.[544] The EBRD already finances green projects in large methane-emitting sectors, including energy and agribusiness.[545] At the launch of the GMP, EBRD committed to assisting its countries of operation with efforts to reduce methane, including through technical assistance and funding for methane abatement projects.[546] The European

Investment Bank and Green Climate Fund also committed to providing technical assistance and project finance to support the GMP.[547]

In September 2022, during a high-level breakfast held on the margins of the 18th African Ministerial Conference on the Environment, the U.S. government announced a US$5 million grant to the African Development Bank to support efforts to abate methane emissions across Africa. The CCAC and Global Methane Hub also promised US$1.2 million and US$5 million, respectively.[548] At the conference, the Vice President of Power, Energy, Climate and Green Growth at the African Development Bank stated:

> "With the support of the U.S. government, and other donors and non-state actors, we intend to create a dedicated pillar of activities within our Africa Climate Change Fund to support methane abatement including working with countries to include methane in their Nationally Defined Contributions and develop pipelines of methane abatement projects for further investment."[549]

During COP27, the African Development Bank released a high-level assessment of anthropogenic methane emissions in Africa that outlines the methodology for quantifying methane in Africa to develop 2020 baselines for each country and sector, as well as case studies on possible abatement options and costs.[550]

Donor governments will also need to provide financial support, including through a dedicated mechanism similar to the Montreal Protocol's Multilateral Fund. Support from the Multilateral Fund for "institutional strengthening" that finances dedicated national ozone units in developing-country governments "is recognized as a major factor in the success of [developing countries] achieving compliance with the Montreal Protocol's control measures."[551] A similar model supporting a network of National Methane Offices could rapidly build the capacity of governments to assess and act on methane mitigation opportunities across sectors and countries, including developing methane emission baselines, tracking and inventorying emitters, providing methane education, implementing national methane action plans, and providing a linkage to global and other major methane mitigation funding.

Philanthropy also has an important role to play in facilitating countries' achievement of the Global Methane Pledge. Soon after the Global Methane Pledge was launched, more than 20 leading philanthropies pledged over US$328 million in support of efforts to drastically reduce methane emissions, including diplomatic efforts building on the Pledge.[552] The philanthropies are committed to quickly deploying grants and ensuring that funding is flexible.[553] As a result, the Global Methane Hub was launched in March 2022 to "support and sustain action from civil society, government, and private industry" in the countries that have signed onto the GMP by "meaningfully investing in methane reduction solutions."[554]

Numerous new methane funding announcements were made at the COP28 Methane Summit, including that the Global Methane Pledge secured over US$1 billion in new grant funding. In addition, international financial institutions have approved over US$3.5 billion in new investments for methane-reducing projects since COP27.[555] These approvals included US$375 million from the Green Climate Fund and partners, over US$1.9 billion from the European Investment Bank, over US$218 million from the European Bank for Reconstruction and Development, and US$372.5 million from the Inter-American Development Bank.[556]

COP29 in Baku saw the establishment of the *Baku Finance Goal*, specifically the effort to mobilize the broader climate finance to US$1.3 trillion per year for developing countries.[557] Also at COP29, the European Commission, with support from Canada, Germany, Italy, Japan,

the United Kingdom, and the United States, as well as several civil society organizations and international organizations, launched the *Methane Abatement Partnership Roadmap*, which, in addition to calling on both fossil fuel importers and exporters to accelerate the reduction of methane emissions, strived to secure the necessary investment for these actions through partnerships with the World Bank, Global Flaring and Methane Reduction trust fund, and private investors.[558] Later at COP30, there was a Joint Declaration on *Drastically Reducing Methane Emissions in the Global Fossil Fuel Sector*, which commits signatories to "[s]upport industry action, innovation, and investment including the adoption of best practices and performance goals in line with the Methane Abatement Partnerships Roadmap launched at COP29, our national goals and deliver on existing initiatives."[559]

Building on this momentum, as well as private action described below, the United Kingdom and Brazil launched the Climate and Clean Air Coalition's *Super Pollutant Country Action Accelerator* to drive super pollutant emissions reductions in developing countries through improved measurement, ending routine flaring of gases, shifting to cleaner technologies, and cutting waste and agricultural emissions.[560] The initiative, which is modelled after the successful Montreal Protocol, begins with US$25 million for seven countries (Brazil, Cambodia, Indonesia, Kazakhstan, Mexico, Nigeria, and South Africa), scaling up to US$150 million.[561]

The efforts of key financial institutions and philanthropic organizations to address methane mitigation are discussed below, along with proposals for methane taxes and fees and reform of the global climate finance architecture.

A. Global Methane Hub

The Global Methane Hub was launched in March 2022 with the mandate "to support and sustain action from civil society, government, and private industry to achieve the Global Methane Pledge through targeted and effective investment in methane mitigation solutions."[562] As of December 2023, the Global Methane Hub had raised over US$200 million in pooled funds from more than 20 of the largest climate philanthropies to accelerate methane mitigation.[563] At COP28, the Global Methane Hub formally launched the Enteric Fermentation R&D Accelerator with US$200 million in funding, making it the largest ever globally coordinated research effort into livestock methane reduction.[564]

In addition, the Global Methane Hub announced funding initiatives to deliver resources to governments, businesses, and local climate organizations as they implement their methane mitigation strategies.[565] For example, the Hub supported the Data to Methane Action Campaign in collaboration with the UNEP International Methane Emissions Observatory and its partners. The Global Methane Hub also provided US$10 million in funding to help support governments and businesses identify and reduce methane leaks through better data monitoring.[566]

At COP30, the Global Methane Hub launched a Global Methane Pledge-aligned partnership, titled "Catalyzing Green Growth: A Multi-Sector Strategy for Significant Methane Emissions Abatement," with the Global Green Growth Institute (GGGI), to drive large-scale reductions in methane in developing economies across the agricultural, energy, and waste sectors.[567] The partnership functions through country initiatives, including US$300 million targeted through Nigeria's gas-flare recovery program with improved MRV and carbon finance access.[568]

B. The Methane Finance Sprint

Launched by Major Economies Forum members in April 2023 and run partly by the World Bank and the Global Methane Hub, the Methane Finance Sprint aimed to raise at least US$200 million in new public and philanthropic grants by COP28.[569] It blew past the target: governments, the European Commission, philanthropies, and industry announced over US$1 billion in new grants since COP27, including US$255 million to relaunch the World Bank's Global Flaring and Methane Reduction Partnership, US$200 million for the Enteric Fermentation Accelerator, and support for the CCAC and IMEO.[570]

C. International Monetary Fund-World Bank Climate Advisory Group

Since September 2023, the IMF and World Bank have met every two months as a Climate Advisory Group to coordinate global and country-level engagements, including the results of Country Climate and Development Reports (CCDRs), country-level climate analytical work, and the pipeline of key projects and lending (*see below*).[571] In addition, the IMF and WBG committed to incorporating climate considerations into their revised joint *Low Income Country Debt Sustainability Framework*.[572] These regular meetings between the IMF and World Bank present an opportunity to regularly coordinate and consider ways to better facilitate methane mitigation measures across the IMF's and WBG's efforts to address the climate emergency.

D. International Monetary Fund

The IMF treats climate change as a structural threat to balance-of-payments stability.[573] Its staff judge methane cuts essential to a stable climate and argue that finance must form part of any international methane agreement, since the costs fall disproportionately on emerging economies.[574]

E. Resilience and Sustainability Trust

In August 2021, the IMF approved a US$456 billion allocation of Special Drawing Rights (SDRs, worth about US$605 billion), but its quota system sends most of them to rich countries.[575] The G7 had already pledged to redirect US$100 billion to those most in need.[576] At the G20's Rome summit in October 2021, leaders asked the IMF to create a Resilience and Sustainability Trust (RST) to provide affordable long-term finance to low-income and vulnerable middle-income countries—the first time the G20 cast the Fund in a climate role.[577]

The IMF's board established the RST in April 2022, sized at SDR 33 billion (about US$45 billion).[578] It lends to longer-term structural challenges, backing reforms that cut macro-critical climate risks and building fiscal buffers.[579] By April 2023, five countries had drawn loans, and 44 had expressed interest;[580] by the end of 2023, 18 countries had pledged the equivalent of US$42.8 billion,[581] with a further US$200 million promised by the UAE at COP28[582] and US$20 million appropriated by the US Congress.[583] A 2024 review found reserves adequate but demand strong enough to require about SDR 7 billion in fresh fundraising, with a fuller review due in 2026;[584] the G20's Rio declaration encouraged channeling SDRs to multilateral banks as hybrid capital.[585]

The RST can finance green investment, transitions to clean technology, and just-transition measures such as social support as carbon subsidies unwind.[586] Loans run 20 years with a 10.5-year grace period, are capped at SDR 1 billion, and reach about three-quarters of the membership.[587] The trust does not mention methane explicitly, but its language is broad enough

to cover it,[588] and the Fund and its members should be pressed to direct funding to methane policy reform.[589] It could help middle-income countries catalyse low-cost private finance for the Pledge and mobilise capital for just transitions in high-emitting sectors—without adding to recipients' debt. With 26 country arrangements now running,[590] the RST should put climate science at its core, using GWP_{20} and counting methane's climate, economic and health benefits; IMF staff have themselves called for an international agreement on methane pricing.[591] National climate-risk scenarios should be tied to the 1.5 °C and Pledge goals rather than run in isolation.

F. World Bank Group

The World Bank Group (WBG) is the largest provider of climate finance for developing countries. In 2018, the WBG announced a new set of climate targets for 2021–2025, "doubling its current 5-year investments to around US$200 billion in support for countries to take ambitious climate action."[592] The US$200 billion consists of "approximately US$100 billion in direct finance from the World Bank, and approximately US$100 billion in combined direct finance" from the International Finance Corporation, the Multilateral Investment Guarantee Agency, and WBG-mobilized private capital.[593] As part of this action plan, the WBG committed to align all of its financing operations with the Paris Agreement. The World Bank announced it was on track to align 100% of new operations with the Paris Agreement goals from 1 July 2023. For the International Finance Corporation and Multilateral Investment Guarantee Agency, 85% of new operations will be aligned from 1 July 2023 and 100% from 1 July 2025.[594]

The latest IPCC reports offer an opportunity for the WBG to review its Climate Action Plan (2021–2025) and to ensure its portfolio aligns with the 1.5 °C temperature goal of the Paris Agreement, focusing on the climate emergency, tipping points, and feedback loops, and prioritizing investments in fast mitigation strategies as essential to build resilience and reduce climate risk.[595] The WBG could also begin incorporating the use of metrics that capture the near-term temperature impacts of methane and other SLCPs, such as GWP_{20}, in all its work to promote carbon markets.[596]

In 2012, the G8 agreed to commission the WBG to evaluate innovative pay-for-performance mechanisms to address methane.[597] A report by the Methane Finance Study Group supported the establishment of a methane facility.[598] In its design and development phase, the Pilot Auction Facility for Methane and Climate Change Mitigation (PAF) benefited from the support of the Climate & Clean Air Coalition.[599] The PAF completed three auctions to allocate a guaranteed price for future carbon credits in the form of a tradable put option, two for the abatement of methane emissions from the waste sector and one for the abatement of nitrous oxide emissions from nitric acid production.[600] The three auctions allocated up to US$54 million, resulting in abatement of up to 20.6 million metric tons of CO_2e (using GWP_{100}, thus undervaluing methane climate impact). The main PAF contributors were Germany, Sweden, Switzerland (through a joint contribution of the State Secretariat of Economic Affairs and the Climate Cent Foundation), and the United States.[601] The GMP might provide an opportunity to further explore this kind of finance mechanism.

The International Finance Corporation, the WBG's private sector arm, finances methane mitigation projects. For example, in 2021, the International Finance Corporation also announced it had supported one of the largest gas flaring reduction projects in the world in Iraq by arranging a US$360 million loan.[602] Their Green Bond Program offers financing for methane reduction projects focusing on livestock, aquaculture, gas flaring, and waste-to-energy, among the list of projects eligible for financing.[603] However, the International Finance

Corporation could do more and update its Performance Standards on Environment and Social Sustainability (last updated in 2012) and its Definitions and Metrics on Climate Related Activities (last updated in 2017) with the latest climate emergency science, including climate tipping points and feedback loops in its definition of climate risk so that its financing offerings remain current.

The WBG's International Development Association also funds methane mitigation projects. The International Development Association works in 74 countries and aims to reduce poverty by providing financing and policy advice that boost economic growth, build resilience, and improve the lives of people in the world's lowest-income countries.[604] In addition, the Multilateral Investment Guarantee Agency, a WBG member that provides long-maturity guarantees,[605] can support quick and permanent adoption of methane emissions solutions. Many of the actions to reduce methane emissions involve long-term investment. The Multilateral Investment Guarantee Agency could produce a plan to scale up its capital optimization product to support a range of methane mitigation loans and deploy a strategy to attract commercial bank partnerships in key projects.

At COP27, the World Bank hosted an event titled "It's Time to Sprint: Targeting Methane Emissions."[606] Since COP27, the WBG has increased its support of methane mitigation. In addition to direct lending or investment, WBG's support includes analytical work, capacity building, support on regulatory reform, leak detection and monitoring, and investment feasibility studies.[607] At COP28, the WBG announced that since COP27 it had approved at least US$700 million in investments.[608] The WBG also launched at COP28 the Global Methane Reduction Platform for Development (CH4D) to support low- and mid-income countries to realize the "methane triple-wins" of abating emissions, enhancing resilience, and empowering livelihoods.[609] The World Bank also re-launched the Global Gas Flaring Reduction Partnership (GGFR) as the Global Flaring and Methane Reduction (GFMR) Partnership, a new multi-donor trust fund focused on helping developing countries cut carbon dioxide and methane emissions generated by the oil and gas industry.[610] By June 2025, the GFMR Partnership has secured US$234.3 million in total contributions and endorsed over US$40.3 million in grants to accelerate action in 17 countries.[611]

G. Country Climate and Development Report

As part of the RST architecture, the IMF and World Bank agreed on "Broad Principles for Bank-Fund Coordination in RST Operations."[612] One of the key tools of this collaboration is the World Bank's CCDR. The CCDRs are a relatively new WBG diagnostic tool (announced at COP26)[613] that integrates climate change and development considerations and helps countries prioritize the most impactful actions that can reduce greenhouse gas emissions, including methane, and boost adaptation.[614] As public documents, CCDRs aim to inform governments, citizens, the private sector, and development organizations to engage and implement a climate and development agenda.[615] The CCDRs may complement the IMF's Climate Macroeconomic Assessments Programs, which is the successor to the Climate Change Policy Assessments (CCPAs).[616]

Each year, key insights from the CCDRs are summarized by the WBG in an annual report.[617] The 2023 annual report released at COP28 combined results from the CCDRs in 42 countries and highlighted cost-effective opportunities to reduce methane emissions included in numerous CCDRs.[618] The CCDRs present an opportunity to identify countries' methane mitigation measures that align with meeting the Global Methane Pledge commitments. By the release of the 2024 annual report ahead of COP29, CCDR coverage expanded to 72 economies

responsible for 70% of low- and middle-income country GHG emissions.[619] Ahead of COP30, the 2025 annual report, now covering 93 economies, quantified the labor risks of phasing down fossil fuels in contrast with the benefits of low-emission development in climate impacts and poverty reduction.[620]

H. Private Investment

At COP28, the United Arab Emirates announced the launch of Alterra, a private investment fund for global climate solutions focusing on emerging markets and developing countries.[621] Alterra seeks to bridge the climate financing gap by raising and investing up to US$250 billion of institutional and private capital by 2030. The fund operates in collaboration with BlackRock, Brookfield, and TPG as inaugural partners and had US$6.5 billion in committed climate investments, including investments in the Global South, as of December 2023.[622] The size and focus of this investment fund should facilitate countries' compliance with the Oil and Gas Decarbonization Charter. Then, in November 2025, Bloomberg Philanthropies announced a US$100 million investment in Methane Response Basecamps and an expanded satellite constellation to find and fix leaks faster.[623]

The IEA notes that investors and insurers are beginning to establish methane performance requirements as a condition on future lending. This includes underwriting standards that include methane reductions. For example, Barclays announced that starting from 2026, energy clients will be required to have 2030 methane emissions reduction targets and a commitment to end all routine venting and flaring by 2030.[624]

In October 2025, a coalition of investors representing over €4.85 trillion in global assets urged European policymakers to reject legislative delays to the EU Methane Emissions Regulation, asserting that strict implementation and alignment with international frameworks like the Oil and Gas Methane Partnership 2.0 are essential for mitigating portfolio risks and assessing companies' operational excellence.[625]

I. Debt Financing for Methane Abatement: The Methane Finance Working Group

Where retained earnings are insufficient to fund methane abatement projects and external support is needed, fossil fuel companies can tap into debt markets. Debt structuring that incorporates methane abatement integrates methane emission reduction targets and performance indicators into debt instruments, including green bonds, sustainability-linked bonds, and conventional loans, issued by oil and gas companies. This approach leverages labeled financing structures (use-of-proceeds and KPI-linked instruments) and conventional transactions with embedded covenants to mobilize capital for methane reduction projects and operational improvements across the value chain. These mechanisms create financial incentives for companies to meet quantifiable methane reduction targets through instruments such as interest-rate discounts upon achievement or coupon step-ups upon non-compliance, thereby addressing the sector's capital deployment gap while aligning investor capital with climate objectives.

The Methane Finance Working Group emerged from COP28 in Dubai as one of three complementary initiatives designed to prioritize methane abatement in the oil and gas sector, alongside the Oil & Gas Decarbonization Charter and the World Bank's Global Flaring and Methane Reduction Partnership.[626] The Working Group was launched to create a blueprint for scaling financing and driving investments in methane abatement projects that simultaneously support the fulfillment of Charter commitments and amplify Partnership capital.[627]

In June 2025, the Working Group published its first deliverable, *Guidance for Including Methane Abatement in Oil and Gas Debt Structuring*.[628] The Guidance consolidates the Working Group's findings and recommendations on three financing structures: key performance indicator (KPI)-linked instruments, use-of-proceeds (UoP) instruments, and conventional (unlabeled) instruments with embedded methane covenants.[629] It aligns with the International Capital Market Association's Green, Social, and Sustainability-Linked Bond Principles and incorporates relevant components of the Climate Transition Finance Handbook.[630] The Guidance targets short- to mid-term real-economy emissions reductions and applies to bond markets, loan markets, private credit, and project finance.[631] Preparatory materials include technical recommendations on performance targets, qualifying activities, data quality, auditing and verification protocols, and structural recommendations on covenant design, greenwashing mitigation, and accountability mechanisms calibrated to issuer type and jurisdiction.[632]

The Guidance accommodates the full range of oil and gas capital seekers but applies with particular force to NOCs, who produce more than half of global oil and gas output, hold nearly 60 percent of global reserves, and carry approximately US$1 trillion in outstanding debt alongside US$3 trillion in public equity.[633] NOCs have issued limited sustainable debt to date, rendering methane abatement financing through thematic instruments a substantially underutilized channel.[634] Because many NOCs align capital allocation with national priorities rather than shareholder returns, and because their financial health directly affects sovereign borrowing capacity, the Guidance prescribes tailored pathways for NOC engagement.[635] These pathways include: incorporation of methane-related KPIs into sovereign bonds where an NOC does not borrow directly from capital markets; inclusion of methane emission reduction targets in the NDCs of sovereigns hosting NOCs; conditioning sovereign lending or refinancing on NOC membership in recognized methane initiatives such as the Oil and Gas Methane Partnership 2.0 and the Oil & Gas Decarbonization Charter; and pairing UoP sovereign bonds for methane abatement with associated infrastructure investments to achieve benchmark issuance size.[636]

J. Global Methane Tax/Fee

The IMF has modelled the implementation of a methane tax or fee in the top 35 methane-emitting countries.[637] This tax or fee would work by integrating an initial fee of US$10 per tonne of CO_2 equivalent, rising to US$70 per tonne of CO_2-equivalent in 2030 into existing fiscal regimes.[638] The European Union's CBAM (Carbon Border Adjustment Mechanism), designed to prevent the outsourcing of carbon-intensive industries and incentivize sustainable practices abroad,[639] does not address imported methane. Some have called for methane to be addressed in future measures,[640] although concerns have been voiced about the imposition of border adjustment mechanisms from a global trade law and policy perspective.[641] CBAM entered into effect on a transitional basis in October 2023, only applying during this transitional phase to imports of cement, iron and steel, aluminum, fertilizers, electricity, and hydrogen.[642] CBAM may evolve in time to allow for broader EU-U.S. alignment on a global methane border adjustment mechanism.[643] The European Union's first-ever methane regulation, however, includes ambitious monitoring and abatement criteria for both domestically produced and imported fossil oil, gas, and coal, and establishes a progressive methane import standard by 2030.[644] Separately, the Peterson Institute for International Economics has proposed a new global methane border adjustment mechanism where countries would be expected to align with such regulations or pay a methane border adjustment tax.[645]

K. A Global Financial Strategy to Tackle the Climate Emergency, Including Methane

At COP26, Prime Minister Mia Mottley from Barbados presented a financial plan to tackle the climate emergency. Prime Minister Mottley, who is also Co-Chair of the Development Committee of the World Bank and the IMF, noted that:

> "The central banks of the wealthiest countries engaged in 25 trillion dollars of quantitative easing in the last 13 years. 25 trillion. Of that, $9 trillion was in the past 18 months – to fight the pandemic. Had we used that $25 trillion to purchase bonds to finance the energy transition, or the transition of how we eat, or how we move ourselves in transport, we would now, today, be reaching that 1.5 degree limit that is so vital to us."[646]

Prime Minister Mottley proposed an annual increase in the SDRs of US$500 billion a year for twenty years to be put in a trust to finance the transition. She pointed out that US$500 billion is just 2% of the US$25 trillion that central banks from the wealthiest countries have engaged in the last 13 years.[647] The proposal includes a US$500 billion trust that would operate on an auction basis for the greatest climate mitigation and include the private sector in its eligibility criteria. Prime Minister Mottley continues to advocate for the creation of this trust, which, to truly attenuate the climate emergency, must prioritize methane emissions reductions.[648] In her address at COP28, Prime Minister Mottley continued to emphasize the need for a different approach to the global capitalization of international financial institutions, including for non-state actors to contribute to this capitalization. She also noted that we have yet to see the global methane agreement that the world needs as part of a change of course on climate action.[649]

At COP28, major international financial institutions and countries made new commitments to offer climate-resilient debt clauses (CRDCs) in their lending. These clauses allow debt service to be paused to give countries breathing space after climate disasters.[650] The use of CRDCs was supported by over 70 countries and new commitments to expand the use of CRDCs were made by the UK, France, World Bank, Inter-American Development Bank, European Investment Bank, European Bank for Reconstruction and Development, and African Development Bank.[651] The IDB announced it had already offered US$1.2 billion of loans covered by CRDCs.[652] Also at COP28, Japan and France announced they would co-lead in supporting the African Development Bank's facility to leverage IMF SDRs for climate and development.[653]

Earlier, in 2022, Barbados hosted the Bridgetown Initiative with key stakeholders and developed the Bridgetown Agenda.[654] While the Bridgetown Agenda does not specifically include methane, if implemented, it might present an important opportunity for methane mitigation within the global finance system.

Building upon the Bridgetown Agenda as well as other climate finance flagship initiatives, the UAE Leaders' Declaration on a Global Climate Finance Framework was launched at the start of COP28.[655] The Declaration seeks to reform the global climate finance architecture by making climate finance available, accessible, and affordable.[656] The principles in the Declaration emphasize the need for reform of MDBs to better address climate change, the widening of concessional finance, and the reform of global private and public financial architecture to be made "fit for more frequent, profound shocks" including through wider use of CRDCs and rechanneling IMF SDRs through the RST.[657] Barbados, Germany, France, Ireland, the Philippines, Colombia, Ghana, Kenya, India, Senegal, the UAE, the UK, and the United States signed the Declaration.[658] While the Declaration does not specifically address

methane, the high-level principles it contains are a useful framework to unlock public and private finance to fund methane mitigation globally at the scale and speed required.

The financial architecture for methane mitigation matured through 2024 and 2025. COP29 in Baku laid additional foundation with the launch of the *Methane Abatement Partnerships Roadmap*[659] and a broader commitment to mobilize US$1.3 trillion per year for climate finance in developing countries by 2035.[660] In the lead-up to COP30 in Belém, a new tone arose emphasizing the operationalization of commitments, driven by leaders like Barbados Prime Minister Mia Mottley, who reframed the narrative by characterizing abatement not as a cost, but as an immediate economic opportunity for the industry to "stop burning cash."[661] Then, at COP30, the United Kingdom and Brazil launched the *Super Pollutant Country Action Accelerator* to fast-track reductions in developing nations,[662] alongside a Joint Declaration on *Drastically Reducing Methane Emissions in the Global Fossil Fuel Sector*, which commits signatories to "[s]upport industry action, innovation, and investment including the adoption of best practices and performance goals in line with the Methane Abatement Partnerships Roadmap launched at COP29, our national goals and deliver on existing initiatives."[663]

VI. From Pledge to Protocol: The Case for a Binding International Methane Agreement

Methane emissions from any source, anywhere, affect the global climate as well as public health and the environment. Mitigation by all countries is therefore the best way to achieve aggressive reductions wherever emissions occur.

Numerous international instruments, commitments, pledges, and initiatives have sought to strengthen bilateral and multilateral efforts to cut methane, as described above. Key international efforts include the Global Methane Pledge (now endorsed by 159 countries and the European Union),[664] the majority of NDCs referencing methane targets with more than two-thirds of all NDCs integrating methane measures,[665] and bilateral and multilateral efforts such as the *Methane Abatement Partnerships Roadmap and Joint Declaration on Drastically Reducing Methane Emissions in the Global Fossil Fuel Sector*.[666] The *COP28 Methane Summit* recognized methane's essential role in rapidly cutting methane emissions to ensure peak-warming reduction and limit the likelihood of overshooting 1.5 °C.[667] COP28's Global Stocktake, including recognition of the urgent need to accelerate and substantially reduce "non-carbon-dioxide emissions globally … in particular methane emissions by 2030," further illustrates the inevitability of a global methane agreement.[668] International efforts build upon impressive and increasingly strong domestic efforts to curb methane, detailed in this *Primer*.

Yet the majority of wider methane international commitments, including the Global Methane Pledge, are not mandatory. As Barbados Prime Minister Mia Mottley stated candidly,

> "[t]he European Commission helped launch the global methane pledge at Glasgow's COP26 in 2021, where today it and 159 other countries are supporting emission cuts of 30% by 2030 from 2020 levels. However, this is voluntary, and the UN has reported that current measures, even if fully implemented, would only reduce emissions by 8% by 2030 from 2020 levels. The urgency of the climate demands mandatory measures."[669]

Voluntary commitments are not sufficient to quickly cut warming and avoid tipping points that would lock in devastating global warming and make it much more difficult to avoid an existential threat to a livable planet Earth.[670] There is therefore a growing chorus of support for binding national and international commitments.[671] Because cutting methane emissions is the

single most important action humanity can take to slow near-term warming, it is critical to move from a pledge to mandatory measures with bilateral, plurilateral, and regional efforts as the foundation for a binding global methane agreement. Governments must fully implement and build on the existing commitments and initiatives to open the door for a binding global methane agreement.[672]

The Montreal Protocol provides inspiration for a global methane agreement.[673] Negotiated in nine months,[674] the Montreal Protocol not only solved the first great threat to the global atmosphere by putting the stratospheric ozone layer on the path to recovery by 2065, but also has done more to avoid climate warming than any other agreement,[675] avoiding an amount of warming that otherwise would have equaled or even exceeded the warming that CO_2 is causing today.[676]

The Gothenburg Protocol to the UNECE Convention on Long-Range Transboundary Air Pollution is currently under revision, and Parties are considering the formal integration of methane mitigation commitments. In March 2026, the Scientific Advisory Panel at the CCAC identifies several options, including embedding the Global Methane Pledge's collective 30% reduction target in the Protocol's operative text, establishing individual Party emission reduction commitments through amended annexes, and introducing mandatory monitoring and reporting requirements.[677] Formally recognizing the Pledge within the Protocol would constitute the first incorporation of methane commitments into a binding regional air quality agreement, thereby hardening otherwise voluntary obligations. The Brief recommends that Parties adopt a UNECE-specific collective aspirational methane target extending to 2035 or 2040, beyond the Pledge's 2030 horizon, and that substantive commitments be paired with mandatory monitoring and reporting provisions to strengthen accountability.[678]

A. Designing an International Methane Agreement That Works

1. Lessons from Successful Agreements: What a Methane Treaty Could Learn

No blueprint exists for an international agreement that fits current geopolitical realities, but prior agreements point toward design features more likely to produce durable, scalable, and effective outcomes. The following recommendations draw on the record of successful multilateral instruments, above all the Montreal Protocol, and suggest what could work rather than a rigid template.

Start with a willing coalition, even a small one. Readiness to make progress despite diverging interests, and early alignment on core principles, are key to success. The 1997 Ottawa Treaty banning anti-personnel landmines is instructive: rather than waiting for universal consensus, a committed core of about fifty states, led by Canada and a coalition of NGOs, negotiated outside established channels and produced a treaty in under fourteen months that has since attracted more than 160 parties. The Montreal Protocol followed the same logic, as an initial agreement among a small group of willing nations, including the United States and the European Community, created the political gravity that eventually drew in reluctant states. For methane, a founding coalition of major producing and consuming nations, even a handful, could establish the standards, institutions, and trust that make broader participation progressively more attractive.

Take a sectoral perspective. A focused mandate allows targeted solutions and clearly defined stakeholders, and step-by-step development will largely determine success. The Montreal Protocol exemplifies this "start and strengthen" approach. Beginning with controls on

chlorofluorocarbons in 1987, it was deepened through successive amendments in London (1990), Copenhagen (1992), Beijing (1999), and Kigali (2016), each expanding the controlled substances and tightening phase-out schedules as science advanced and alternatives emerged. This iterative structure let states build confidence in the agreement's institutions before accepting harder obligations. The 1979 Convention on Long-Range Transboundary Air Pollution offers a further illustration: rather than tackling all pollutants at once, it developed sectoral protocols over four decades, addressing sulfur dioxide, nitrogen oxides, volatile organic compounds, heavy metals, and persistent organic pollutants in turn, each calibrated to what data, technology, and political will could sustain. A methane agreement starting with oil and gas, but built to extend to agriculture, waste, and coal, would follow the same proven logic.

Keep decision-making and implementation connected. This should include mechanisms that provide compliance assistance and strengthen national implementation, so the gap between what is agreed internationally and achieved on the ground narrows systematically.

Build on and strengthen national legislation, including model legislation. Existing frameworks in the European Union, Canada, Mexico, Nigeria, Norway, and elsewhere provide a ready baseline that an international agreement can reference, build upon, and help extend to countries that have yet to develop regulatory capacity.

Allow transparent procedures that solicit input from civil society, the private sector, the scientific community, and other non-state actors. Broad participation in implementation and review strengthens both the technical quality and the political legitimacy of decisions.

Include mechanisms that deliver scientific, economic, and technological assessments for decision-making. The Montreal Protocol's Technology and Economic Assessment Panel is a particularly instructive model. Composed of independent experts from industry, government, and academia, it evaluates the availability, performance, and cost of alternatives without government censorship or political interference. That independence has allowed the Protocol to set technically credible phase-out schedules and has given governments and industry the forward-looking information needed to plan transitions and drive innovation. A comparable panel for methane, assessing detection and measurement technologies, abatement costs, and best practices, could perform the same function.

Recognize differences in capacity and development, and allow different speeds, but avoid rigid categorization. Differentiated timelines and financial support, modeled on the Montreal Protocol's approach to developing-country Parties, can broaden participation without sacrificing ambition, provided all Parties move in the same direction and the categories stay flexible enough to reflect changing circumstances.

2. Successful Features of Global Governance As Seen in the Montreal Protocol

The Montreal Protocol, the world's most successful environmental agreement, provides inspiration and a model for a mandatory, sector-focused global methane agreement.[679] Beyond healing the ozone layer, it has delivered substantial climate benefits: its phase-out of ozone-depleting substances, many of them potent greenhouse gases, has already done more to slow warming than almost any other measure, and the 2016 Kigali Amendment to phase down hydrofluorocarbons is expected to avoid up to 0.5°C of warming this century.[680] Several of the Protocol's features can be replicated in a global methane agreement, even if the approach must differ because methane emissions are tied to fossil fuel production and consumption rather than to a discrete class of manufactured chemicals.[681] That precedent is now drawing explicit

attention: marking the tenth anniversary of the Kigali Amendment, Rwanda's Minister of Environment, Dr Bernadette Arakwiye, told the Climate and Clean Air Coalition that the success of Kigali should inspire the Coalition to explore how its lessons can help tackle methane emissions.[682]

First, the Protocol imposes mandatory obligations on all Parties, both those from the developed countries, and those from developing countries, although according the principle of "common but differentiated responsibilities and respective capabilities."[683] In practice, developing-country Parties receive a grace period, often five or ten years, before requiring them to phase out or phase down a controlled substance.[684] The dedicated funding mechanism, the Multilateral Fund, where developed countries pay the "agreed incremental costs" that developing countries incur when implementing controlled-substance phaseouts and phasedowns, also gives effect to the principle.[685] In addition to support for replacement technologies, the Protocol provides financial support to strengthen the National Ozone Units that operate in every one of the 147 developing-country Parties.[686] The UNEP OzonAction office also provides regular training and capacity-building for developing-country Parties.

Another successful features of the Protocol are its assessment panels, i.e., the Scientific Assessment Panel (SAP), which assesses the status of the ozone-layer depletion,[687] and the Technology and Economic Assessment Panel (TEAP), which reviews technological and economic alternatives to the phase-out of chemicals by bringing together experts from industry, government, and academia to find solutions and report independently without government censorship.[688]

a. Core Principles for an International Methane Agreement

i. Purpose and Scope

Methane is a potent greenhouse gas with a high short-term warming impact, and rapid abatement is among the fastest ways to slow near-term warming, slow self-amplifying feedback loops, and avoid or delay irreversible tipping points.

An international Methane Agreement will be a legally binding sectorally-focused instrument providing a mandatory framework to achieve near-zero methane emissions on a short timeline, starting with the oil and gas sector. The Agreement will be inspired by the success of the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer and built upon existing goals of voluntary initiatives, including the COP26 Global Methane Pledge, the COP28 Oil & Gas Decarbonization Charter, the Coalition for LNG Emission Abatement (CLEAN) Initiative, and the Oil & Gas Methane Partnership 2.0 (OGMP 2.0), as well as national and regional legislation like the European Union's Methane Regulation, Canada's *Enhanced Methane Regulations*, and regulations adopted in Nigeria, Mexico, Colombia, Norway, and subnational jurisdictions including Colorado, California, New Mexico, and British Columbia.

The Agreement will deliver tangible and cost-efficient methane emission reductions, support investment and market stability, provide regulatory certainty, and help establish a low-methane-intensity global energy market, recognizing that methane mitigation is increasingly viewed as an indicator of management quality, operational excellence, process safety, and long-term competitiveness. In addition to generating clear action pathways to reduce methane emissions in the oil and gas sector, the Agreement will support delivery of reductions through the mechanisms of related international agreements, including the implementation of NDCs of the Paris Agreement.

The Agreement must not be construed to require any new or additional oil and gas production or to promote the expanded use of oil and gas from fossil resources, and is not intended to interfere with efforts to reduce the use of oil and gas or increase the production and use of renewable energy. As decarbonization strategies alone are insufficient to slow near-term warming to keep us below the 1.5 °C guardrail, the Agreement focuses on targeted methane mitigation to complement longer-term decarbonization efforts. Therefore, the Agreement must include a clear plan for a fair, fast, and funded fossil fuel phaseout to avoid a "business-as-usual" approach that would extend the life of existing fossil fuel infrastructure. By eliminating methane waste from existing operations, the Agreement pulls a critical near-term emergency brake, minimizing harm from current production while building the political momentum needed for a phaseout.

The Agreement will follow a "start and strengthen" approach, by which standards gradually advance in line with operational capabilities and expanded technical feasibility. The structure of the Agreement will allow for the inclusion of other relevant sectors, including waste and agriculture.

ii. Content and Standards

Using existing regional and national frameworks as minimum reference baselines and enabling convergence and mutual recognition among Parties, the Agreement would set minimum standards on: banning routine and non-emergency venting and flaring; plugging abandoned and orphaned wells; mandating LDAR programs; requiring robust, OMGP 2.0-aligned MMRV standards; eliminating emitting-by-design equipment; establishing super-emitter response protocols with public notification and third-party detection recognition; mandating a maximum methane intensity value; and requiring equivalent import standards on MMRV and methane intensity. To implement these, Parties would commit to enact binding national legislation. Parties would be encouraged to set stricter standards, and the Agreement would provide a platform for additional bilateral or regional arrangements to accelerate implementation. Parties would also establish effective, proportionate, and dissuasive penalties scaled to emission volumes, including administrative fines per tonne of methane and orders to curtail operations.

iii. Capacity and Support

The Agreement would move beyond voluntary pledges to binding obligations in a fair, phased, capacity-building manner, incorporating common but differentiated responsibilities and respective capabilities and allowing differentiated implementation schedules, with developed countries moving first. It would include supporting mechanisms: a Methane Transition Fund modeled on the Montreal Protocol's Multilateral Fund, capacity-building programs, cooperation frameworks, and model legislation. It should also complement the Montreal Protocol and the Gothenburg Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution.[689]

b. Governance and Institutions

The Agreement would establish a low-maintenance institutional structure, with an annual meeting of Parties as the highest decision-making authority and a small Secretariat, preferably hosted by an existing organization. The structure would include a Technology and Implementation Panel of government and independent experts to continuously assess best-available technologies and practices, develop model legislation, maintain technology cost curves and abatement potentials, and benchmark regulatory performance; and a Scientific

Assessment Panel of government and independent scientists to continuously assess global methane trends, atmospheric observations, and related scientific questions. Both panels are modeled on their Montreal Protocol counterparts. The Agreement's institutions would seek partnership with existing recognized bodies to avoid duplication.

VII. CONCLUSION

Methane is a short-lived super pollutant, and cutting its emissions from the fossil fuel sector is the fastest, most cost-effective way to slow near-term warming. Rapid abatement can avoid or delay catastrophic climate and societal tipping points, keep the 1.5°C guardrail in sight, limit overshoot, and shorten the return to a safe temperature. No other lever available today acts on the climate this quickly.

The tools to do it are proven, available, and often pay for themselves. This *Primer* has surveyed them across the value chain: leak detection and repair, bans on routine flaring and non-emergency venting, robust measurement and verification, methane intensity standards, and equipment rules that phase out emitting-by-design hardware. Jurisdictions as different as the European Union, Canada, Mexico, Nigeria, Colombia, and several U.S. states have already put these measures into force, and their regimes are converging on a common set of design features. Industry has moved in the same direction, with OGMP 2.0 emerging as the *de facto* measurement standard and initiatives such as the Oil and Gas Decarbonization Charter translating ambition into concrete action plans. A workable regulatory template now exists.

Market conditions make action easier, not harder. Oil, gas, and coal are all structurally oversupplied, compliance costs amount to a small fraction of production value and industry income, and abatement itself frees up gas that strengthens energy security rather than threatening it. The familiar objection, that methane standards on imported fuel endanger supply, does not survive contact with the evidence: recent geopolitical shocks have moved prices far more than any conceivable compliance cost, and enough independently verified low-methane supply is already coming to market to meet demand.

Voluntary frameworks have reached their limits, and even full implementation of current pledges would cut emissions only marginally by 2030. As a result, methane emissions have continued to rise even as the solutions have matured. The gap between what is technically achievable and what is delivered is now a governance gap, not a technical one.

Closing it requires moving from pledge to protocol. A binding, sector-focused international agreement, built on existing national regimes and modeled on the proven architecture of the Montreal Protocol, could harden voluntary commitments into enforceable standards, extend regulatory capacity to the countries that need it most, and lock in the near-term climate benefits that methane action uniquely offers. The science is clear, the technology is ready, the economics align, and the political coalition is forming. The remaining task is to act on that consensus with the urgency the moment demands.

REFERENCES

[1] Rohde R. (14 January 2026) *Global Temperature Report for 2025*, Berkeley Earth ("Given recent rates of warming is [sic] may take only less than 5 years for our long-term trend to reach 1.5 °C (2.7 °F). The Paris Agreement on Climate Change aims to keep the long-term average global temperature rise to well below 2 °C (3.6 °F) and encourages parties to strive for warming of no more than 1.5 °C (2.7 °F). It has been clear for sometime that the 1.5 °C (2.7 °F) goal will not be achieved. Too little time remains and efforts at mitigation fall far short of what would have been needed to meet that target."). *See also* Future Earth, The Earth League, & World Climate Research Programme (WCRP) (2025) 10 NEW INSIGHTS IN CLIMATE SCIENCE 2025/2026, 14 ("Current levels of global temperature are consistent with a continued acceleration of global warming, and surpassing the 1.5°C threshold above pre-industrial conditions seems inevitable. Once again, the evidence underscores how essential rapid and massive cuts in greenhouse gas emissions are for limiting further warming and associated impacts on societies and ecosystems."); Bevacqua E., Schleussner C.-F., & Zscheischler J. (2025) *A year above 1.5 °C signals that Earth is most probably within the 20-year period that will reach the Paris Agreement limit*, NAT. CLIM. CHANG.: 1–4, 2 ("On the basis of multiple observational datasets, climate model simulations and an idealized experiment, our analyses demonstrate that, unless ambitious emissions cuts are implemented, the world's first year at 1.5 °C warming is virtually certain (~99% on average; Fig. 1b) to fall within the 20-year period that reaches the 1.5 °C warming level."); Foster G. & Rahmstorf S. (2026) *Global Warming Has Accelerated Significantly*, GEOPHYS. RES. LETT. 53(5): 1–8, 7 ("[I]f the warming rate of the past 10 years continues, the Paris Agreement 1.5°C warming limit will be breached by ~2030."); Hansen J. E., *et al.* (2025) *Global Warming Has Accelerated: Are the United Nations and the Public Well-Informed?*, ENVIRON. SCI. POLICY SUSTAIN. DEV. 67(1): 6–44, 24 ("Global warming of 0.2 °C from ship aerosol reduction will grow slowly beyond year 5 of forcing initiation (Figure 14), but it will prevent global temperature from falling much below +1.5 °C relative to preindustrial (late 19th century) time. Thus, our prediction is that global temperature averaged over the El Niño/ La Niña cycle has already reached the +1.5 °C threshold."); *and* Rogelj J. & Rajamani L. (2025) *The pursuit of 1.5°C endures as a legal and ethical imperative in a changing world*, SCIENCE, 238–240, 238 ("Global warming might already be at 1.5°C today (3), and our central estimate is that it will exceed 1.5°C over the next decade, with ambitious near-term emission reductions instrumental in limiting the estimated likelihood and magnitude of overshoot but unable to categorically avoid it.").

[2] Hansen J. E., *et al.* (2025) *Global Warming Has Accelerated: Are the United Nations and the Public Well-Informed?*, ENVIRON. SCI. POLICY SUSTAIN. DEV. 67(1): 6–44, 24 ("Global warming of 0.2 °C from ship aerosol reduction will grow slowly beyond year 5 of forcing initiation (Figure 14), but it will prevent global temperature from falling much below +1.5 °C relative to preindustrial (late 19th century) time. Thus, our prediction is that global temperature averaged over the El Niño/ La Niña cycle has already reached the +1.5 °C threshold."). *See also* Forster P. M., *et al.* (2025) *Indicators of Global Climate Change 2024: annual update of key indicators of the state of the climate system and human influence*, EARTH SYST. SCI. DATA 17(6): 2641–2680, 2663 ("Note that the 50 % RCB [remaining carbon budget] estimate of 130 $GtCO_2$ would be exhausted in a little more than 3 years if global CO_2 emissions remain at 2024 levels (42 $GtCO_2$ yr^{-1}; see Table 1). This is not expected to correspond exactly to the time that 1.5 °C global warming level is reached due to uncertainty associated with committed warming from past CO_2 emissions (the ZEC [zero emissions commitment]) as well as ongoing warming and cooling contributions from non-CO_2 emissions. For comparison, our estimate of 2024 anthropogenic warming (1.36 °C) and the recent rate of increase (0.27 °C/decade) would suggest that continued emissions at current levels would cause human-induced global warming to reach 1.5°C in approximately 5 years."); Foster G. & Rahmstorf S. (2026) *Global Warming Has Accelerated Significantly*, GEOPHYS. RES. LETT. 53(5): 1–8, 7 ("[I]f the warming rate of the past 10 years continues, the Paris Agreement 1.5°C warming limit will be breached by ~2030."); Diffenbaugh N. S. & Barnes E. A. (2023) *Data-driven predictions of the time remaining until critical global warming thresholds are reached*, PROC. NAT'L. ACAD. SCI. 120(6): 1–9, 2 ("For 1.5 °C, the observed pattern of annual temperature anomalies in 2021 leads to a predicted time-to-threshold of 2035 (2030 to 2040) in the High scenario, 2033 (2028 to 2039) in the Intermediate scenario, and 2033 (2026 to 2041) in the Low scenario (Fig. 3)."); Ludescher J., Yuan N., Schellnhuber H. J., & Bunde A. (2025) *Natural variability-focused assessment of climate overshoot timing*, COMMUN. EARTH ENVIRON. 6: 1–8, 4 ("Figure 4 shows the times when the thresholds 1.5 °C and 2.0 °C will be passed, as a function of the probability q. For the 1.5 °C threshold, the best estimates and very likely ranges are 2031 [2019–2052] (Berkeley) and 2035 [2022–2057] (HadCRUT). … The probability that the 1.5 °C-threshold has already been passed at present (June 2025) is 21.8% for the Berkeley and 10.9% for the HadCRUT record."); *and* Hausfather Z. (13 June 2024) *Analysis: What record global heat means for breaching the 1.5C warming limit*, CARBON BRIEF ("There is no single best way to assess when the world will likely pass 1.5C. But both Carbon Brief's approach and those of other groups all agree it will most likely happen in the late 2020s or early 2030s in a world (SSP2-4.5) where global emissions remain around current levels.").

[3] Hansen J. E., *et al.* (2025) *Global Warming Has Accelerated: Are the United Nations and the Public Well-Informed?*, ENVIRON. SCI. POLICY SUSTAIN. DEV. 67(1): 6–44, 35 ("A declining solar irradiance may dampen warming for several years, but global warming in the next two decades is likely to be about 0.2-0.3 °C per decade, leading to global temperature +2 °C by 2045."). *See also* Diffenbaugh N. S. & Barnes E. A. (2023) *Data-driven predictions of the time remaining until critical global warming thresholds are reached*, PROC. NAT'L. ACAD. SCI. 120(6): 1–9, 2 ("For 2 °C, the observed pattern of annual temperature anomalies in 2021 leads to a predicted time-to-threshold of 2050 (2043 to 2058) in the High scenario, 2049 (2043 to 2055) in the Intermediate scenario, and 2054 (2044 to 2065) in the Low scenario."); Ludescher J., Yuan N., Schellnhuber H. J., & Bunde A. (2025) *Natural variability-focused assessment of climate overshoot timing*, COMMUN. EARTH ENVIRON. 6: 1–8, 4 ("Figure 4 shows the times when the thresholds 1.5 °C and 2.0 °C will be passed, as a function of the probability q. … For the 2.0 °C threshold, the best estimates and very likely ranges are 2056 [2039–2086] (Berkeley) and 2060 [2042–2091] (HadCRUT). For the likely ranges, the estimates are [2046–2071] (Berkeley) and [2049–2075] (HadCRUT). We would like to note that these results are based on surrogate data Set II, which takes into account the effect of ENSO."); *and* Hausfather Z. (13 June 2024) *Analysis: What record global heat means for breaching the 1.5C warming limit*, CARBON BRIEF (*see* table labelled "Projected year of 2C breach," showing 50th percentile year of 2 °C threshold breach as 2048 for the composite dataset using Berkeley Earth, HadCRUT5, NASA GISTEMP, and NOAA GlobalTemp).

[4] Xu Y., Ramanathan V., & Victor D. G. (2018) *Global warming will happen faster than we think*, Comment, NATURE 564(7734): 30–32, 30–31 ("But the latest IPCC special report underplays another alarming fact: global warming is accelerating. Three trends—rising emissions, declining air pollution and natural climate cycles—will combine over the next 20 years to make climate change faster and more furious than anticipated. In our view, there's a good chance that we could breach the 1.5 °C level by 2030, not by 2040 as projected in the special report (see 'Accelerated warming'). The climate-modelling community has not grappled enough with the rapid changes that policymakers care most about, preferring to focus on longer-term trends and equilibria."). Since Xu, Ramanathan, and Victor Comment was published, the IPCC has updated its estimate for when 1.5 °C will be exceeded: *see* Arias P. A., *et al.* (2021) *Technical Summary*, *in* 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., *et al.* (eds.), TS-9 ("Timing of crossing 1.5°C global warming: Slightly different approaches are used in SR1.5 and in this Report. SR1.5 assessed a likely range of 2030 to 2052 for reaching a global warming level of 1.5°C (for a 30-year period), assuming a continued, constant rate of warming. In AR6, combining the larger estimate of global warming to date and the assessed climate response to all considered scenarios, the central estimate of crossing 1.5°C of global warming (for a 20-year period) occurs in the early 2030s, ten years earlier than the midpoint of the likely range assessed in the SR1.5, assuming no major volcanic eruption. (TS.1.3, Cross-Section Box TS.1)"). *See also* Matthews H. D., Tokarska K. B., Rogelj J., Smith C. J., MacDougall A. H., Haustein K., Mengis N., Sippel S., Forster P. M., & Knutti R. (2021) *An integrated approach to quantifying uncertainties in the remaining carbon budget*, COMMUN. EARTH ENVIRON. 2(7): 1–11, 5 ("It is worth noting however, that the spread of our [remaining carbon budget (RCBs)] estimate does include negative values, with a 17% chance that the RCB for 1.5 °C is less than zero (i.e. is already exceeded). This outcome could arise due to current and/or unrealised future warming being at the higher end of their respective distributions, or in the case that the current non-CO_2 forcing fraction is small or negative owing to very strong current aerosol forcing. In this case, we would expect 1.5 °C to be exceeded even in the absence of additional emissions, and any future emissions between now and the time of net-zero CO_2 emissions would cause temperatures to rise further above this threshold.").

[5] Molina M., Zaelke D., Sarma K. M., Andersen S. O., Ramanathan V., & Kaniaru D. (2009) *Reducing abrupt climate change risk using the Montreal Protocol and other regulatory actions to complement cuts in CO_2 emissions*, PROC. NAT'L. ACAD. SCI. 106(49): 20616–20621, 20616 ("Current emissions of anthropogenic greenhouse gases (GHGs) have already committed the planet to an increase in average surface temperature by the end of the century that may be above the critical threshold for tipping elements of the climate system into abrupt change with potentially irreversible and unmanageable consequences. This would mean that the climate system is close to entering if not already within the zone of 'dangerous anthropogenic interference' (DAI). Scientific and policy literature refers to the need for 'early,' 'urgent, 'rapid,' and 'fast-action' mitigation to help avoid DAI and abrupt climate changes. We define "fast-action" to include regulatory measures that can begin within 2–3 years, be substantially implemented in 5–10 years, and produce a climate response within decades."). *See also* Molina M., Ramanathan V. & Zaelke D. (2020) *Best path to net zero: Cut short-lived climate pollutants*, BULLETIN OF THE ATOMIC SCIENTISTS ("And let us be clear: By "speed," we mean measures—including regulatory ones—that can begin within two-to-three years, be substantially implemented in five-to-10 years, and produce a climate response within the next decade or two.").

[6] Intergovernmental Panel on Climate Change (2023) *Summary for Policymakers*, *in* AR6 SYNTHESIS REPORT: CLIMATE CHANGE 2023, *Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Arias P., Bustamante M., Elgizouli I., Flato G., Howden M., Méndez C., Pereira J., Pichs-Madruga R., Rose S. K., Saheb Y., Sánchez R., Ürge-Vorsatz D., Xiao C., & Yassaa N. (eds.), 27 ("Strong, rapid and sustained reductions in methane emissions can limit near-term warming and improve air quality by reducing global surface ozone. (*high confidence*)"). *See also* Intergovernmental Panel on Climate Change (2023) AR6 SYNTHESIS REPORT: CLIMATE CHANGE 2023, *Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Arias P., Bustamante M., Elgizouli I., Flato G., Howden M., Méndez C., Pereira J., Pichs-Madruga R., Rose S. K., Saheb Y., Sánchez R., Ürge-Vorsatz D., Xiao C., & Yassaa N. (eds.), 59 ("Mitigation actions will have other sustainable development co-benefits (*high confidence*). Mitigation will improve air quality and human health in the near-term notably because many air pollutants are co-emitted by GHG emitting sectors and because methane emissions leads to surface ozone formation (*high confidence*) The benefits from air quality improvement include prevention of air pollution-related premature deaths, chronic diseases and damages to ecosystems and crops. The economic benefits for human health from air quality improvement arising from mitigation action can be of the same order of magnitude as mitigation costs, and potentially even larger (*medium confidence*). As methane has a short lifetime but is a potent GHG, strong, rapid and sustained reductions in methane emissions can limit near-term warming and improve air quality by reducing global surface ozone (*high confidence*).").

[7] ***Time and temperature methane metrics: GWP_{20} is an improvement, temperature is even better!***
Reducing the risks associated with accelerating warming requires mitigation strategies that can slow warming in the near term, like cutting methane emissions. Assessing how strategies affect near-term warming requires considering individual emissions by pollutant in units of mass, as required under the United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines and recommended by climate scientists.[7] It also requires accounting for co-emissions by source, since policies act on sources, not on individual pollutants.

An ideal option for assessing temperature impact is to convert emissions by source in terms of pollutant and co-emissions to temperature impacts using tools such as the Assessment of Environmental and Societal Benefits of Methane Reductions Tool or the CCAC Temperature Pathway Tool. Alternatively, using the 20-year global warming potential (GWP_{20}) better captures near-term warming impact than the 100-year GWP, in addition to being more aligned with meeting the 1.5 °C target.[7] While the UNFCCC currently requires using the GWP_{100} metric when reporting aggregated emissions or removals, which systematically undervalues the near-term climate impact of methane, reporting Parties may use other metrics in addition, such as GWP_{20} or absolute temperature potentials.[7] Indeed, using GWP_{100} alone systematically underestimates the importance of methane emissions and "can lead to suboptimal policies and priorities by misleading climate actors from the top levels of governments (e.g., U.S. NDC) to grassroots organizations."[7]

IPCC AR6 has updated the metrics for methane as follows: GWP_{20} is 81.2 and GWP_{100} is 27.9.[7] The Table below summarizes GWP values for methane from IPCC reports.

GWP values for methane from IPCC reports

		AR6	AR5		AR4	TAR	SAR
Methane (CH_4)	**GWP_{20}**	81.2	84	86*	72	62	56
	GWP_{100}	27.9	28	34*	25	23	21
Fossil CH_4	**GWP_{20}**	82.5 ± 25.8	85		--	--	--
	GWP_{100}	29.8 ± 11	30		--	--	--
Non-fossil CH_4	**GWP_{20}**	80.8 ± 25.8	--		--	--	--
	GWP_{100}	27.2 ± 11	--		--	--	--

* With carbon cycle feedback. All methane AR6 values include carbon cycle feedback.
AR6 = 2021 Sixth Assessment Report WGI (Table 7.SM.7; Table 7.15); **AR5** = 2013 Fifth Assessment Report WGI (Table 8.A.1; Table 8.7); **AR4** = 2007 Fourth Assessment Report (Table 2.14); **TAR** = 2001 Third Assessment Report (Table 6.7); **SAR** = 1995 Second Assessment Report (Table 2.9).

Most aggregation metrics are designed for comparison with long-lived CO_2. Metrics such as CO_2-equivalence in terms of GWP and GWP* ("GWP star") are based on mathematical relationships that are intended to make SLCPs like methane comparable to the longer-term warming impact of CO_2 emissions.[7]

These aggregate metrics generally ignore co-emitted pollutants with significant near-term climate impacts such as cooling aerosols. The GWP* metric seeks to account for the shorter lifetime of methane by differentiating historical emissions from changes in the rate of emissions.[7] One criticism of this approach is that it essentially "grandfathers" historical emissions, so when applied at the scale of regional or individual methane emitters, sources with high historical emissions can claim negative GWP* by reducing their rate of emissions. This is the case even if their emissions in a given year are equivalent to a new source with no historical emissions. This has led to misuse of these metrics to claim that some sectors with large historical emissions and stable or decreasing current rates of emissions have contributed less to global warming.[7]

[8] Intergovernmental Panel on Climate Change (2023) AR6 Synthesis Report: Climate Change 2023, *Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Arias P., Bustamante M., Elgizouli I., Flato G., Howden M., Méndez C., Pereira J., Pichs-Madruga R., Rose S. K., Saheb Y., Sánchez R., Ürge-Vorsatz D., Xiao C., & Yassaa N. (eds.), 6 ("[FOOTNOTE 10] Contributions from emissions to the 2010-2019 warming relative to 1850-1900 assessed from radiative forcing studies are: CO2 0.8 [0.5 to 1.2]°C; methane 0.5 [0.3 to 0.8]°C; nitrous oxide 0.1 [0.0 to 0.2]°C and fluorinated gases 0.1 [0.0 to 0.2]°C."). *See also* Intergovernmental Panel on Climate Change (2021) *Summary for Policymakers*, *in* 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., *et al.* (eds.), Figure SPM.2.

[9] Feng Z., Xu Y., Kobayashi K., Dai L., Zhang T., Agathokleous E., Calatayud V., Paoletti E., Mukherjee A., Agrawal M., Park R. J., Oak Y. J., & Yue X. (2022) *Ozone pollution threatens the production of major staple crops in East Asia*, Nat. Food 3: 47–56, 47 ("East Asia is a hotspot of surface ozone (O_3) pollution, which hinders crop growth and reduces yields. Here, we assess the relative yield loss in rice, wheat and maize due to O_3 by combining O_3 elevation experiments across Asia and air monitoring at about 3,000 locations in China, Japan and Korea. China shows the highest relative yield loss at 33%, 23% and 9% for wheat, rice and maize, respectively. The relative yield loss is much greater in hybrid than inbred rice, being close to that for wheat. Total O_3-induced annual loss of crop production is estimated at US$63 billion."). *See also* United Nations Environment Programme & Climate & Clean Air Coalition (2021) Global Methane Assessment: *Benefits and Costs of Mitigating Methane Emissions*, 68 ("Methane also plays a significant role in reducing crop yields and the quality of vegetation. Ozone exposure is estimated to result in yield losses in wheat, 7.1 per cent; soybean,12.4 per cent; maize, 6.1 per cent; and rice, 4.4 per cent for near present-day global totals (Mills et al. 2018; Shindell et al. 2016; Avnery et al. 2011a)"); *and* Shindell D., Faluvegi G., Kasibhatla P., & Van Dingenen R. (2019) *Spatial Patterns of Crop Yield Change by Emitted Pollutant*, Earth's Future 7(2): 101–112, 101 ("Our statistical modeling indicates that for the global mean, climate and composition changes have decreased wheat and maize yields substantially whereas rice yields have increased. Well-mixed greenhouse gasses drive most of the impacts, though aerosol-induced cooling can be important, particularly for more polluted area including India and China. Maize yield losses are most strongly attributable to methane emissions (via both temperature and ozone).").

[10] Mar K. A., Unger C., Walderdorff L. & Butler T. (2022) *Beyond CO_2 equivalence: The impacts of methane on climate, ecosystems, and health*, Environ. Sci. Policy 134: 127–136, 129 ("Methane is an important contributor to the formation of tropospheric O_3. In addition to acting as a greenhouse gas and being directly harmful to human health (see Section 3.3), it also harms plants by causing cellular damage within the leaves, adversely affecting plant production, reducing the rate of photosynthesis, and requiring increased resource allocation to detoxify and repair leaves (Ashmore, 2005, Sitch et al., 2007). This results in an estimated $11-$18 billion worth of global crop losses annually (Avnery et al., 2011). Beyond this, however, O_3 damage to plants may significantly reduce the ability of terrestrial ecosystems to absorb carbon, negating some of the enhanced carbon uptake due to CO_2 fertilization that is expected to partially offset rising atmospheric CO_2 concentrations (Sitch et al., 2007, Ciais et al., 2013, Arneth et al., 2010, Ainsworth et al., 2012).").

[11] United Nations Environment Programme & Climate & Clean Air Coalition (2021) Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions, 17 ("Mitigation of methane is very likely the strategy with the greatest potential to decrease warming over the next 20 years."), 21 ("This is because a realistically paced phase-out of fossil fuels, or even a rapid one under aggressive decarbonization, is likely to have minimal net impacts on near-term temperatures due to the removal of co-emitted aerosols (Shindell and Smith 2019). As methane is the most powerful driver of climate change among the short-lived substances (Myhre et al. 2013), mitigation of methane emissions is very likely to be the most powerful lever in reducing near-term warming. This is consistent with other assessments; for example, the Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC AR5) showed that methane controls implemented between 2010 and 2030 would

lead to a larger reduction in 2040 warming than the difference between RCPs 2.6, 4.5 and 6.0 scenarios. (The noted IPCC AR5-era scenarios are called representative concentration pathways (RCPs, with the numerical value indicating the target radiative forcing in 2100 (Kirtman et al. 2013)).”). *See also* Shindell D., Sadavarte P., Aben I., Bredariol T. de O., Dreyfus G., Höglund-Isaksson L., Poulter B., Saunois M., Schmidt G. A., Szopa S., Rentz K., Parsons L., Qu Z., Faluvegi G., & Maasakkers J. D. (2024) *The methane imperative*, FRONT. SCI. 2: 1–28, 9–10 (“Given the smaller role of other non-CO_2 climate pollutants, methane emission cuts therefore provide the strongest leverage for near-term warming reduction (Figure 5)(13, 95). Achievement of methane reductions consistent with the average in 1.5°C scenarios could reduce warming by ~0.3°C by 2050 in comparison with baseline increases (4). A hypothetical complete elimination of anthropogenic methane emissions could avert up to 1°C of warming by 2050 relative to the high emissions Shared Socioeconomic Pathway [SSP; (96)] SSP3–7.0 scenario (97). This large near-term impact partly reflects methane’s short lifetime; >90% of increased atmospheric methane would be removed within 30 years of an abrupt cessation of anthropogenic emissions compared with only ~25% of increased CO_2 following CO_2 emission cessation (98).”); Ripple W. J., Wolf C., Gregg J. W., Rockström J., Mann M. E., Oreskes N., Lenton T. M., Rahmstorf S., Newsome T. M., Xu C., Svenning J.-C., Pereira C. C., Law B. E., & Crowther T. W. (2024) *The 2024 state of the climate report: Perilous times on planet Earth*, BIOSCI.: 1–13, 11 (“In addition [to cutting CO_2], pricing and reducing methane emissions is critical for effectively mitigating climate change. Methane is a potent greenhouse gas, and unlike carbon dioxide, which persists in the atmosphere for centuries, methane has a relatively short atmospheric lifetime, making reductions impactful in the short term (Shindell et al. 2024). Drastically cutting methane emissions can slow the near-term rate of global warming, helping to avoid tipping points and extreme climate impacts.”); *and* Intergovernmental Panel on Climate Change (2023) AR6 SYNTHESIS REPORT: CLIMATE CHANGE 2023, *Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Arias P., Bustamante M., Elgizouli I., Flato G., Howden M., Méndez C., Pereira J., Pichs-Madruga R., Rose S. K., Saheb Y., Sánchez R., Ürge-Vorsatz D., Xiao C., & Yassaa N. (eds.), 33, 57 (“Global warming will continue to increase in the near term in nearly all considered scenarios and modelled pathways. Deep, rapid and sustained GHG emissions reductions, reaching net zero CO_2 emissions and including strong emissions reductions of other GHGs, in particular CH_4, are necessary to limit warming to 1.5°C (>50%) or less than 2°C (>67%) by the end of century (*high confidence*). … All global modelled pathways that limit warming to 2°C (>67%) or lower by 2100 involve reductions in both net CO_2 emissions and non-CO_2 emissions (see Figure 3.6) (*high confidence*). For example, in pathways that limit warming to 1.5°C (>50%) with no or limited overshoot, global CH_4 (methane) emissions are reduced by 34% [21–57%] below 2019 levels by 2030 and by 44% [31–63%] in 2040 (*high confidence*). Global CH_4 emissions are reduced by 24% [9–53%] below 2019 levels by 2030 and by 37% [20–60%] in 2040 in modelled pathways that limit warming to 2°C with action starting in 2020 (>67%) (*high confidence*). (CrossSection Box.2).”).

[12] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 8 (“Reducing human-caused methane emissions is one of the most cost-effective strategies to rapidly reduce the rate of warming and contribute significantly to global efforts to limit temperature rise to 1.5°C. Available targeted methane measures, together with additional measures that contribute to priority development goals, can simultaneously reduce human-caused methane emissions by as much as 45 per cent, or 180 million tonnes a year (Mt/yr) by 2030. This will avoid nearly 0.3°C of global warming by the 2040s and complement all long-term climate change mitigation efforts. It would also, each year, prevent 255 000 premature deaths, 775 000 asthma related hospital visits, 73 billion hours of lost labour from extreme heat, and 26 million tonnes of crop losses globally.”).

[13] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 18 (“Meeting the 2030 GMP target will require further raising of ambition to the full implementation of the maximum technically feasible reductions (MTFR) globally, with mitigation potential varying between countries and across the three main emitting sectors: energy, agriculture, and waste by 2030 – a short timeframe. With full implementation of all technical measures globally, annual methane emissions in 2030 could be reduced by 131 Mt below CLE 2030 levels, representing a 32 per cent reduction compared with 2020 emissions levels. This level of action would deliver substantial benefits, including avoiding 0.2°C of warming by 2050 (averaged over 2040–2070). It would also avoid over 180,000 premature deaths, and nearly 19 Mt of avoided crop losses annually by 2030. The value of these benefits is estimated to exceed US$330 billion annually by 2030. When factoring in the broader social cost of methane, the benefit would be even greater.”).

[14] Nzotungicimpaye C. M., MacIsaac A. J., & Zickfeld K. (2023) *Delaying methane mitigation increases the risk of breaching the 2 °C warming limit*, COMMUN. EARTH. ENVIRON. 4(250): 1–8, 2–3 (“For every 10-year delay in CH_4 mitigation, our model simulates an additional peak warming of ~0.1 °C (Fig. 2d). Delaying CH_4 mitigation to or around mid-century will increase the peak warming by 0.2–0.3 °C relative to a CH_4 mitigation initiated at

present-day…. In our model simulations, SAT changes are influenced by biogeochemical feedbacks in addition to the timing of CH_4 mitigation. In particular, we find that the feedback of SAT changes on the atmospheric CO_2 concentration (referred to as the carbon-climate feedback) contributes to increasing peak SAT differences between early and delayed CH_4 mitigation. While we prescribe the same anthropogenic CO_2 emissions in all our model simulations (See Methods), atmospheric CO_2 levels are projected to be higher for delayed CH_4 mitigation scenarios than for early CH_4 mitigation scenarios (Fig. 2c). In comparison to early CH_4 mitigation, delayed CH_4 mitigation results in high [CH_4] levels that lead to high SAT levels. Enhanced global warming results in high [CO_2] levels, which in turn contribute to increase the SAT differences between early and delayed CH_4 mitigation scenarios. Such feedbacks between SAT and [CO_2] involve the response of natural CO_2 sinks to global warming and climate change. For instance, increased SAT enhances the release of CO_2 through soil respiration and weakens the uptake of atmospheric CO_2 by oceans through the solubility pump, resulting in enhanced [CO_2] and an amplification of global warming14. Overall, we deduce that the carbon-climate feedback amplifies the SAT response in late versus early CH_4 mitigation scenarios (Fig. 2d and Fig. 3). To quantify the contribution of the carbon-climate feedback to additional peak warming from delayed CH_4 mitigation, we performed additional model simulations with prescribed CO_2 concentration from the early mitigation scenario (i.e. Early CH_4 Mitig SSP1-2.6). These model simulations suppress the warming signal from delayed CH_4 mitigation that is due to the carbon-climate feedback, and their difference with our standard model simulations allows to quantify the magnitude of the feedback. According to our results, the contribution of the carbon-climate feedback to the peak warming increases for every 10-year delay in CH_4 mitigation (Fig. 3). The peak warming attributable to the feedback ranges from ~0.03 °C for CH_4 mitigation initiated in 2020 to ~0.06 °C for CH_4 mitigation initiated in 2050 (Fig. 3).").

[15] United Nations Environment Programme (2025) EMISSIONS GAP REPORT 2025, xii ("Global warming projections based on current policies have declined from just below 4°C at the time of adoption of the Paris Agreement, to just below 3°C today. Similarly, temperature projections based on the conditional and unconditional nationally determined contributions (NDCs) have fallen from 3–3.5°C to 2.3–2.5°C in this year's report. Although direct comparisons of the warming projections are challenged by changes in the methodological approach over the past 10 years, there has been a significant lowering of projected warming. The proportion of global emissions covered by net-zero emission pledges by around the middle of the century has increased from zero in 2015 to about 70 per cent today. At the same time, climate governance frameworks, policies and legislation have advanced substantially, while low-carbon technology costs have plummeted. … However, due to the continued delay in deep emission cuts, 1.5°C pathways now imply higher temporary exceedance of this temperature target."). *See also* Lenton T. M., *et al.* (eds.) (2025) GLOBAL TIPPING POINTS REPORT 2025, 138 ("Multiple systems of the Earth system could have their tipping point below 2°C of global warming and for some it could be below 1.5°C (Lenton et al., 2023; Armstrong-McKay et al., 2022; see Figure 2; Chapter 2.2). From a Monte Carlo analysis, even under the most optimistic emission scenarios of limiting warming to 1.5°C and stabilizing temperatures at this level, it is considered as likely as not (33-66% probability) that three tipping systems will tip (Figure 3a). One of these systems will virtually certainly (>99% probability) tip - this is the warm-water coral reefs, given the upper range of their tipping point is 1.5°C (Figure 2). Other candidates that are vulnerable to tipping include the North Atlantic Subpolar Gyre, Land Permafrost, and the Green land and West Antarctic ice sheets. Delayed climate action and stabilising global warming at 2°C would change the probability of five systems tipping from very unlikely (<10% probability) to as likely as not (33-66% probability), and mountain glaciers, boreal forests and the AMOC are the additional tipping systems that risk being tipped."); 141 ("This means that five (the warm-water coral reefs, the land permafrost, the Greenland and the West Antarctic Ice Sheets and the North Atlantic subpolar gyre) systems of the Earth system may reach their tipping points below 1.5°C of global warming, and up to eight (in addition: the mountain glaciers, the boreal forests and the AMOC) below 2.0°C of global warming."); *and* Stoerk T., Rising J., Shindell D., & Dietz S. (2025) *Global methane action pays for itself at least six times over*, SCIENCE 390(6772): 1–9, 4, 5 ("By 2050, however, the effect of methane action on tipping points becomes clearer. AIS [Antarctic Ice Sheet] and GIS [Greenland Ice Sheet] tipping intensity decreases by 2.5%, the likelihood of AMOC [Atlantic meridional overturning circulation] slowdown decreases by 3%, the likelihood of AMAZ [Amazon rainforest] decreases by 8%, and ISM [Indian summer monsoon] and PCF [permafrost carbon feedback] tipping intensity falls by 13%." ; "Therefore, methane action has its largest effect on these by the end of the century, reducing tipping intensity by ~5.5% [Antarctic Ice Sheet] (AIS) and 9.5% [Greenland Ice Sheet] (GIS).").

[16] Lenton T. M., *et al.* (eds.) (2025) GLOBAL TIPPING POINTS REPORT 2025, 48 ("A tipping point is colloquially where a small change makes a big difference to a system (Figure 1). More precisely, a tipping point is defined as occurring when change in part of a system becomes selfperpetuating beyond a threshold, leading to substantial, widespread, frequently abrupt and often irreversible impact(s). Self-perpetuation of change means that it comes

from within the system and will continue even without any external forcing, until a new state is reached. Abruptness means that the change is rapid relative to any drivers forcing it. Irreversibility means that the change is difficult to reverse, and typically takes more effort to reverse (it is harder to push the ball back up the hill in Figure 1). Some forcing of a system is usually needed to bring it to a tipping point, and a shifting balance of feedback within the system is usually behind the tipping point.").

[17] Lenton T. M., *et al.* (eds.) (2025) GLOBAL TIPPING POINTS REPORT 2025, 138 ("Multiple systems of the Earth system could have their tipping point below 2°C of global warming and for some it could be below 1.5°C (Lenton et al., 2023; Armstrong-McKay et al., 2022; see Figure 2; Chapter 2.2). From a Monte Carlo analysis, even under the most optimistic emission scenarios of limiting warming to 1.5°C and stabilizing temperatures at this level, it is considered as likely as not (33-66% probability) that three tipping systems will tip (Figure 3a). One of these systems will virtually certainly (>99% probability) tip - this is the warm-water coral reefs, given the upper range of their tipping point is 1.5°C (Figure 2). Other candidates that are vulnerable to tipping include the North Atlantic Subpolar Gyre, Land Permafrost, and the Greenland and West Antarctic ice sheets. Delayed climate action and stabilising global warming at 2°C would change the probability of five systems tipping from very unlikely (<10% probability) to as likely as not (33-66% probability), and mountain glaciers, boreal forests and the AMOC are the additional tipping systems that risk being tipped.").

[18] Lenton T. M., *et al.* (eds.) (2025) GLOBAL TIPPING POINTS REPORT 2025, 141 ("This means that five (the warm-water coral reefs, the land permafrost, the Greenland and the West Antarctic Ice Sheets and the North Atlantic subpolar gyre) systems of the Earth system may reach their tipping points below 1.5°C of global warming, and up to eight (in addition: the mountain glaciers, the boreal forests and the AMOC) below 2.0°C of global warming.").

[19] Lenton T. M., Rockstrom J., Gaffney O., Rahmstorf S., Richardson K., Steffen W., & Schellnhuber H. J. (2019) *Climate tipping points—too risky to bet against*, Comment, NATURE 575(7784): 592–595, 594 ("In our view, the clearest emergency would be if we were approaching a global cascade of tipping points that led to a new, less habitable, 'hothouse' climate state 11. Interactions could happen through ocean and atmospheric circulation or through feedbacks that increase greenhouse-gas levels and global temperature."). *See also* Wunderling N., Donges J. F., Kurths J., & Winkelmann R. (2021) *Interacting tipping elements increase risk of climate domino effects under global warming*, EARTH SYST. DYN. 12(2): 601–619, 614 ("In this study, we show that this risk increases significantly when considering interactions between these climate tipping elements and that these interactions tend to have an overall destabilising effect. Altogether, with the exception of the Greenland Ice Sheet, interactions effectively push the critical threshold temperatures to lower warming levels, thereby reducing the overall stability of the climate system. The domino-like interactions also foster cascading, non-linear responses. Under these circumstances, our model indicates that cascades are predominantly initiated by the polar ice sheets and mediated by the AMOC. Therefore, our results also imply that the negative feedback loop connecting the Greenland Ice Sheet and the AMOC might not be able to stabilise the climate system as a whole."); *and* Rocha J. C., Peterson G., Bodin Ö., & Levin S. (2018) *Cascading regime shifts within and across scales*, SCIENCE 362(6421): 1379–1383, 1383 ("A key lesson from our study is that regime shifts can be interconnected. Regime shifts should not be studied in isolation under the assumption that they are independent systems. Methods and data collection need to be further developed to account for the possibility of cascading effects. Our finding that ~45% of regime shift couplings can have structural dependence suggests that current approaches to environmental management and governance underestimate the likelihood of cascading effects.").

[20] McIntyre M. E. (2023) *Climate tipping points: A personal view*, PHYSICS TODAY 76(3): 44–49, 45–46 ("Nearly all the climate system's real complexity is outside the scope of any model, whether it's a global climate model that aims to represent the climate system as a whole or a model that only simulates the carbon cycle, ice flow, or another subsystem…. Changes taking only a few years are almost instantaneous from a climate-system perspective. They're a warning to take seriously the possibility of tipping points in the dynamics of the real climate system.[9] The warning is needed because some modelers have argued that tipping points are less probable for the real climate system than for the simplified, low-order climate models studied by dynamic-systems researchers.[3] Other researchers, however, have suggested that such a tipping point may be reached sometime in the next few decades or even sooner.[6,7] Some of its mechanisms resemble those of the Dansgaard–Oeschger warmings and would suddenly accelerate the rate of disappearance of Arctic sea ice. As far as I am aware, no such tipping points have shown up in the behavior of the biggest and most sophisticated climate models. The suggested tipping-point behavior depends on fine details that are not well resolved in the models, including details of the sea ice and the layering of the upper ocean. Also of concern are increases in the frequency and intensity of destructive weather extremes. Such increases have already been observed in recent years. Climate scientists are asking how much further the increases will go and precisely how they will develop. That question is, of course, bound up with the question of tipping points. A failure to simulate many of the extremes themselves, especially extremes of surface

storminess, must count as another limitation of the climate models. The reasons are related to the resolution constraints of climate models."). *See also* Spratt D. (19 April 2023) *Faster than forecast, climate impacts trigger tipping points in the Earth system*, BULLETIN OF THE ATOMIC SCIENTISTS ("While observed warming has been close to climate model projections, the impacts have in many instances been faster and even more extreme than the models forecasted. William Ripple and his co-researchers show that many positive feedbacks are not fully accounted for in climate models…. In September 2022, Stockholm University's David Armstrong McKay and his colleagues concluded that even global warming of 1-degree Celsius risks triggering some tipping points, just one data point in an alarming mountain of research on tipping points presented in the last year and a half. … Speaking in 2018, Steffen said that the dominant linear, deterministic framework for assessing climate change is flawed, especially at higher levels of temperature rise. Model projections that don't include these feedback and cascading processes "become less useful at higher temperature levels… or, as my co-author John Schellnhuber says, we are making a big mistake when we think we can 'park' the Earth System at any given temperature rise – say 2°C – and expect it to stay there."); *and* Spratt D. & Dunlop I. (2017) *What lies beneath? The scientific understatement of climate risks,* Breakthrough & The National Centre for Climate Restoration, 21 ("As discussed above, climate models are not yet good at dealing with tipping points. This is partly due to the nature of tipping points, where a particular and complex confluence of factors abruptly change a climate system characteristic and drive it to a different state. To model this, all the contributing factors and their forces have to be well identified, as well as their particular interactions, plus the interactions between tipping points. Researchers say that "complex, nonlinear systems typically shift between alternative states in an abrupt, rather than a smooth manner, which is a challenge that climate models have not yet been able to adequately meet.").

[21] Lenton T. M., Rockstrom J., Gaffney O., Rahmstorf S., Richardson K., Steffen W., & Schellnhuber H. J. (2019) *Climate tipping points—too risky to bet against*, Comment, NATURE 575: 592–595 ("In our view, the clearest emergency would be if we were approaching a global cascade of tipping points that led to a new, less habitable, 'hothouse' climate state11. Interactions could happen through ocean and atmospheric circulation or through feedbacks that increase greenhouse-gas levels and global temperature. Alternatively, strong cloud feedbacks could cause a global tipping point12,13.
We argue that cascading effects might be common. Research last year14 analysed 30 types of regime shift spanning physical climate and ecological systems, from collapse of the West Antarctic ice sheet to a switch from rainforest to savanna. This indicated that exceeding tipping points in one system can increase the risk of crossing them in others. Such links were found for 45% of possible interactions14.").

[22] Intergovernmental Panel on Climate Change (2022) *Summary for Policymakers*, *in* CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE, *Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Shukla P. R., Skea J., Slade R., Al Khourdajie A., van Diemen R., McCollum D., Pathak M., Some S., Vyas P., Fradera R., Belkacemi M., Hasija A., Lisboa G., Luz S., & Malley J. (eds.), SPM-22 ("In pathways that limit warming to 1.5°C (>50%) with no or limited overshoot global net CO_2 emissions are reduced compared to modelled 2019 emissions by 48% [36–69%] in 2030 and by 80% [61-109%] in 2040; and global CH_4 emissions are reduced by 34% [21–57%] in 2030 and 44% [31-63%] in 2040. There are similar reductions of non-CO_2 emissions by 2050 in both types of pathways: CH_4 is reduced by 45% [25–70%]; N_2O is reduced by 20% [-5 – 55%]; and F-Gases are reduced by 85% [20–90%]. [FOOTNOTE 44] Across most modelled pathways, this is the maximum technical potential for anthropogenic CH_4 reductions in the underlying models (*high confidence*). Further emissions reductions, as illustrated by the IMP-SP pathway, may be achieved through changes in activity levels and/or technological innovations beyond those represented in the majority of the pathways (*medium confidence*). Higher emissions reductions of CH_4 could further reduce peak warming. (*high confidence*) (Figure SPM.5) {3.3}"). *See also* Intergovernmental Panel on Climate Change (2018) *Summary for Policymakers*, *in* GLOBAL WARMING OF 1.5 °C, *Special Report of the Intergovernmental Panel on Climate Change*, Masson-Delmotte V., *et al.* (eds.), SPM-15 ("In model pathways with no or limited overshoot of 1.5 °C, global net anthropogenic CO_2 emissions decline by about 45% from 2010 levels by 2030 (40–60% interquartile range), reaching net zero around 2050 (2045–2055 interquartile range).... Modelled pathways that limit global warming to 1.5 °C with no or limited overshoot involve deep reductions in emissions of methane and black carbon (35% or more of both by 2050 relative to 2010).").

[23] Szopa S., Naik V., Adhikary B., Artaxo P., Berntsen T., Collins W. D., Fuzzi S., Gallardo L., Kiendler-Scharr A., Klimont Z., Liao H., Unger N., & Zanis P. (2021) *Chapter 6: Short-lived climate forcers*, in 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., *et al.* (eds.), 6-8 ("Additional CH_4 and BC mitigation would contribute to offsetting the additional warming associated with SO_2 reductions that would accompany decarbonization (*high confidence*)."). *See also* Intergovernmental Panel on Climate Change (2022) *Summary for Policymakers*, *in* CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE, *Contribution of*

Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Shukla P. R., Skea J., Slade R., Al Khourdajie A., van Diemen R., McCollum D., Pathak M., Some S., Vyas P., Fradera R., Belkacemi M., Hasija A., Lisboa G., Luz S., & Malley J. (eds.), SPM-31 ("In modelled global low emission pathways, the projected reduction of cooling and warming aerosol emissions over time leads to net warming in the near- to mid-term. In these mitigation pathways, the projected reductions of cooling aerosols are mostly due to reduced fossil fuel combustion that was not equipped with effective air pollution controls.").

[24] Lelieveld J., Klingmüller K., Pozzer A., Burnett R. T., Haines A., & Ramanathan V. (2019) *Effects of fossil fuel and total anthropogenic emission removal on public health and climate*, PROC. NAT'L. ACAD. SCI. 116(15): 7192–7197, 7194 ("Finally, our model simulations show that fossil-fuel-related aerosols have masked about 0.51(±0.03) °C of the global warming from increasing greenhouse gases (Fig. 3)."). *See also* Intergovernmental Panel on Climate Change (2021) *Summary for Policymakers*, *in* 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., *et al.* (eds.), SPM-2 (Figure SPM.2c shows that Sulfur dioxide (SO_2) contributes –0.49 °C (–0.10 to –0.93 °C) to observed warming in 2010–2019 relative to 1850–1900).

[25] Dreyfus G. B., Xu Y., Shindell D. T., Zaelke D., & Ramanathan V. (2022) *Mitigating climate disruption in time: A self-consistent approach for avoiding both near-term and long-term global warming*, PROC. NAT'L. ACAD. SCI. 119(22): 1–8, 1 ("We find that mitigation measures that target only decarbonization are essential for strong long-term cooling but can result in weak near-term warming (due to unmasking the cooling effect of co-emitted aerosols) and lead to temperatures exceeding 2°C before 2050. In contrast, pairing decarbonization with additional mitigation measures targeting short-lived climate pollutants (SLCPs) and N_2O, slows the rate of warming a decade or two earlier than decarbonization alone and avoids the 2°C threshold altogether. These non-CO_2 targeted measures when combined with decarbonization can provide net cooling by 2030, reduce the rate of warming from 2030 to 2050 by about 50%, roughly half of which comes from methane, significantly larger than decarbonization alone over this timeframe."). *See also* Ramanathan V. & Feng Y. (2008) *On avoiding dangerous anthropogenic interference with the climate system: Formidable challenges ahead*, PROC. NAT'L. ACAD. SCI. 105(38): 14245–14250, 14248 ("Switching from coal to ''cleaner'' natural gas will reduce CO_2 emission and thus would be effective in minimizing future increases in the committed warming. However, because it also reduces air pollution and thus the ABC [Atmospheric Brown Cloud] masking effect, it may speed up the approach to the committed warming of 2.4°C (1.4–4.3°C)."); Hansen J. E. & Sato M. (2021) *July Temperature Update: Faustian Payment Comes Due* ("It follows that the global warming acceleration is due to the one huge climate forcing that we have chosen not to measure: the forcing caused by imposed changes of atmospheric aerosols... We should expect the global warming rate for the quarter of a century 2015-2040 to be about double the 0.18°C/decade rate during 1970-2015 (see Fig. 2), unless appropriate countermeasures are taken."); *and* Dvorak M. T., Armour K. C., Frierson D. M. W., Proistosescu C., Baker M. B., & Smith C. J. (2022) *Estimating the timing of geophysical commitment to 1.5 and 2.0 °C of global warming*, NAT. CLIM. CHANGE 12: 547–552, 547 ("Following abrupt cessation of anthropogenic emissions, decreases in short-lived aerosols would lead to a warming peak within a decade, followed by slow cooling as GHG concentrations decline. This implies a geophysical commitment to temporarily crossing warming levels before reaching them. Here we use an emissions-based climate model (FaIR) to estimate temperature change following cessation of emissions in 2021 and in every year thereafter until 2080 following eight Shared Socioeconomic Pathways (SSPs). Assuming a medium-emissions trajectory (SSP2–4.5), we find that we are already committed to peak warming greater than 1.5 °C with 42% probability, increasing to 66% by 2029 (340 $GtCO_2$ relative to 2021). Probability of peak warming greater than 2.0 °C is currently 2%, increasing to 66% by 2057 (1,550 $GtCO_2$ relative to 2021). Because climate will cool from peak warming as GHG concentrations decline, committed warming of 1.5 °C in 2100 will not occur with at least 66% probability until 2055.").

[26] Xu Y. & Ramanathan V. (2017) *Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes*, PROC. NAT'L. ACAD. SCI. 114(39): 10315–10323, Supplemental Information (Table S1). *See also* Dreyfus G. B., Xu Y., Shindell D. T., Zaelke D., & Ramanathan V. (2022) *Mitigating climate disruption in time: A self-consistent approach for avoiding both near-term and long-term global warming*, PROC. NAT'L. ACAD. SCI. 119(22): 1–8, 5 ("Aggressive decarbonization to achieve net-zero CO_2 emissions in the 2050s (as in the decarb-only scenario) results in weakly accelerated net warming compared to the reference case, with a positive warming up to 0.03 °C in the mid-2030s, and no net avoided warming until the mid-2040s due to the reduction in co-emitted cooling aerosols (Figure 3a). By 2050, decarbonization measures result in very limited net avoided warming (0.07°C), consistent with Shindell and Smith (43), but rise to a likely detectable 0.25°C by 2060 and a major benefit of 1.4°C by 2100 (Table S5). In contrast, pairing decarbonization with mitigation measures targeting CH_4, BC, HFC, and N_2O (not an SLCP due to its longer lifetime) independent from decarbonization are essential to slowing the rate of warming by the 2030s to under 0.3°C per decade (Table 1, Figure 3b), similar to the 0.2°C

to 0.25°C per decade warming prior to 2020 (38, 53). Recent studies suggest that rate of warming rather than level of warming controls likelihood of record-shattering extreme weather events (54, 55). By 2050, the net avoided warming from the targeted non-CO_2 measures is 0.26°C, almost 4 times larger than the net benefit of decarbonization alone (0.07°C) (Table S5).").

[27] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 17 ("Mitigation of methane is very likely the strategy with the greatest potential to decrease warming over the next 20 years.").

[28] Fiore A. M., Jacob D. J., Field B. D., Streets D. G., Fernandes S. D., & Jang C. (2002) *Linking ozone pollution and climate change: The case for controlling methane*, GEOPHYS. RES. LETT. 29(19): 25-1–25-4, 25-1 ("Methane is a known major source of the tropospheric O_3 background, but is not generally considered a precursor to regional O_3 pollution episodes in surface air because of its long lifetime (8–9 years).... Our global 3-D model analysis shows that reducing CH_4 emissions enables a simultaneous pursuit of O_3 air quality and climate change mitigation objectives. Whereas reductions in NO_x emissions achieve localized decreases in surface O_3 concentrations, reductions in CH_4 emissions lower the global O_3 background and improve surface air quality everywhere."). *See also* United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT, 45 ("Next, the linearity of the response to different magnitudes of methane concentration change was examined. At the national level, population weighted ozone changes are extremely linear across a range of methane increases and decreases (Figure 3.4). Though the response itself varies from country to country (i.e. the slopes are different), the ozone change at the national level is directly proportional to the methane concentration change regardless of the ozone metric chosen. This result is consistent with prior studies which also indicate that the ozone/methane relationship is approximately linear (Fiore *et al*. 2008) but its magnitude depends on the local availability of nitrogen oxides, and, through nitrogen oxides, of hydroxyl (West *et al*. 2006; Wang and Jacob 1998).").

[29] Turner M. C., Jerrett M., Pope C. A., Krewski D., Gapstur S. M., Diver W. R., Beckerman B. S., Marshall J. D., Su J., Crouse D. L., & Burnett R. T. (2016) *Long-Term Ozone Exposure and Mortality in a Large Prospective Study*, AM. J. RESPIR. CRIT. CARE MED. 193(10): 1134–1142, 1134 ("We observed significant positive associations between long-term O_3 and all-cause, circulatory, and respiratory mortality with 2%, 3%, and 12% increases in risk per 10 ppb, respectively, in this large-scale study with 22 years of follow-up."). *See also* Global Climate and Health Alliance (2023) MITIGATING METHANE: A GLOBAL HEALTH STRATEGY, 7 ("Methane emissions are directly detrimental to human health by contributing to the formation of tropospheric, or ground-level ozone, an air pollutant and GHG. Tropospheric ozone can damage airways, trigger asthma attacks, and aggravate lung diseases. Long-term exposure to tropospheric ozone can lead to premature mortality from respiratory illnesses, cardiovascular diseases, and cancer1. The 2022 Global Methane Assessment identified a linear relationship in tropospheric ozone responses to methane concentrations — as methane concentrations increase, so does ozone. An estimated 1.04 to 1.23 million respiratory deaths in adults over 30 years old are associated with exposure to ground-level ozone.").

[30] Feng Z., Xu Y., Kobayashi K., Dai L., Zhang T., Agathokleous E., Calatayud V., Paoletti E., Mukherjee A., Agrawal M., Park R. J., Oak Y. J., & Yue X. (2022) *Ozone pollution threatens the production of major staple crops in East Asia*, NAT. FOOD 3: 47–56, 47 ("East Asia is a hotspot of surface ozone (O_3) pollution, which hinders crop growth and reduces yields. Here, we assess the relative yield loss in rice, wheat and maize due to O_3 by combining O_3 elevation experiments across Asia and air monitoring at about 3,000 locations in China, Japan and Korea. China shows the highest relative yield loss at 33%, 23% and 9% for wheat, rice and maize, respectively. The relative yield loss is much greater in hybrid than inbred rice, being close to that for wheat. Total O_3-induced annual loss of crop production is estimated at US$63 billion.").

[31] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 11, 17, 45 (Refer to Table 2.5, page 45, on annual benefits of global reductions in methane emissions from the MTFR and the MTFR low-cost scenarios compared to the CLE scenario, 2030).

[32] Stoerk T, Rising J, Shidell S., & Dietz S. (2025) *Global methane action pays for itself at least six times over*, SCIENCE 390:6772, 3-4 ("Focusing on 2050, the central methane action scenario reduces damages by 0.4 percentage points, from 3.5% of global consumption to 3.1%. In absolute money terms, this reduction in damages—the gross benefit of global methane action—equates to a little more than $1 trillion/year in 2050 (in 2020 prices).… The net present value (NPV) of the central methane scenario ranges from $0.6 trillion to $5.2 trillion without climate benefits, $7.0 trillion to $11.5 trillion including climate benefits, and $13.0 trillion to $17.5 trillion additionally including air-quality cobenefits (2.5% discount rate)… Alternatively, a conservative approach

would be to place particular emphasis on the two scenarios with positive abatement costs, EPA high and Harmsen et al. (8). The latter scenario explicitly assumes there are no negative-cost measures. However, again, the benefits of methane action far exceed the costs, giving an NPV of $4.4 trillion to $4.5 trillion ($10.4 trillion to $10.5 trillion including air-quality cobenefits), or equivalently, a benefit-cost ratio of three (six including air-quality cobenefits.").

[33] Stoerk T, Rising J, Shidell S., & Dietz S. (2025) *Global methane action pays for itself at least six times over*, SCIENCE 390:6772, 1 ("Finally, we provide estimates of the "social cost of methane" [the monetary value of future damages from 1 metric ton of methane emissions (tCH4)], finding a global average of $7381/tCH4, with higher domestic values for economies such as the US, EU, China, and India— implying strong economic self-interest in methane reductions.").

[34] Global Methane Pledge, About the Global Methane Pledge (last visited 20 December 2025) ("The Global Methane Pledge (GMP) was launched at COP26 by the European Union and the United States who have been joined by many countries. The GMP today counts 159 participating countries and the European Commission. Since its launch, the GMP has generated unprecedented momentum for methane mitigation, with major work underway in six action areas including: the Energy Pathway, the Waste Pathway, the Food and Agriculture Pathway, Methane Plans and Policies, Data for Methane Action, and Finance for Methane Abatement. Such work is being supported by a broad range of leading international actors such as the Global Methane Initiative (GMI), the Global Methane Hub (GMH), the International Energy Agency (IEA), the United Nations Economic Commission for Europe (UNECE), and the World Bank. visual Participants joining the Pledge agree to take voluntary actions to contribute to a collective effort to reduce global methane emissions at least 30 percent from 2020 levels by 2030. This is a global, not a national reduction target.").

[35] Global Methane Pledge, About the Global Methane Pledge (last visited 20 December 2025) ("The Global Methane Pledge (GMP) was launched at COP26 by the European Union and the United States who have been joined by many countries. The GMP today counts 159 participating countries and the European Commission. Since its launch, the GMP has generated unprecedented momentum for methane mitigation, with major work underway in six action areas including: the Energy Pathway, the Waste Pathway, the Food and Agriculture Pathway, Methane Plans and Policies, Data for Methane Action, and Finance for Methane Abatement. Such work is being supported by a broad range of leading international actors such as the Global Methane Initiative (GMI), the Global Methane Hub (GMH), the International Energy Agency (IEA), the United Nations Economic Commission for Europe (UNECE), and the World Bank. visual Participants joining the Pledge agree to take voluntary actions to contribute to a collective effort to reduce global methane emissions at least 30 percent from 2020 levels by 2030. This is a global, not a national reduction target.").

[36] United Nations Framework Convention on Climate Change (2023) *First global stocktake, Proposal by the President Draft decision -/CMA.5 Outcome of the first global stocktake*, S28 ("Further recognizes the need for deep, rapid and sustained reductions in greenhouse gas emissions in line with 1.5 °C pathways and calls on Parties to contribute to the following global efforts, in a nationally determined manner, taking into account the Paris Agreement and their different national circumstances, pathways and approaches." (f) "Accelerating and substantially reducing non-carbon-dioxide emissions globally, including in particular methane emissions by 2030.").

[37] United Nations Environment Programme (2 December 2023) *Bending the warming curve through action on non-CO2 gases at COP28 Summit*. *See also* United States Department of State (2 December 2023) *Accelerating Fast Mitigation: Summit on Methane and Non-CO2 Greenhouse Gases,* Fact Sheet ("The United States, People's Republic of China, and United Arab Emirates today convened a Summit to accelerate actions to cut methane and other non-CO2 greenhouse gases as the fastest way to reduce near-term warming and keep a goal of limiting global average temperature increase to 1.5 degrees Celsius within reach.").

[38] United Nations Environment Programme (2 December 2023) *Bending the warming curve through action on non-CO2 gases at COP28 Summit*. *See also* United States Department of State (2 December 2023) *Accelerating Fast Mitigation: Summit on Methane and Non-CO2 Greenhouse Gases,* Fact Sheet ("The United States, People's Republic of China, and United Arab Emirates today convened a Summit to accelerate actions to cut methane and other non-CO2 greenhouse gases as the fastest way to reduce near-term warming and keep a goal of limiting global average temperature increase to 1.5 degrees Celsius within reach.") *and* Escudero J. (18 December 2023) *COP28: "The Methane COP"*, LEGAL PLANET ("In a high-profile event at the main stage of COP28, the U.S., China, and United Arab Emirates hosted the Summit on Methane and non-CO2 Greenhouse Gases that called on the parties of the Paris Agreement to include methane and other GHGs in their nationally determined contributions

(NDC). This statement is relevant since the parties did not always inform methane emissions; therefore, they were usually ignored in the actions that followed Nationally Determined Contributions, or NDCs. Another significant announcement from the Summit was the incorporation of Turkmenistan – one of the world's top emitters- Kazakhstan, Angola, Kenya, and Romania to the Global Methane Pledge, a commitment to reduce methane emissions by 30% from 202 levels by 2030. With these incorporations, 156 countries have joined the pledge, notably not China. In addition, Kazakhstan and the U.S. announced a cooperation partnership to help the Central Asian country meet the Global Methane Pledge's goals by developing national standards to eliminate non-emergency venting of methane, among other actions.").

[39] Climate & Clean Air Coalition (11 November 2024) *The Sprint to Cut Climate Super Pollutants: COP 29 Summit on Methane and Non-CO2 GHGs Fact Sheet* ("The United States, People's Republic of China, and Azerbaijan today convened a Summit to accelerate actions to cut emissions of methane and other non-CO2 greenhouse gases, which account for half of today's climate change but receive far less than half of global climate attention.").

[40] (2024) *Statement of Methane Abatement Partnership Roadmap*, 1-2 ("The European Commission, with support from Canada, Germany, Italy, Japan, the United Kingdom, and the United States, as well as Carbon Limits, Clean Air Taskforce, Environmental Action Germany, Environmental Defense Fund, Environmental Investigation Agency, European Bank for Reconstruction and Development, Global Methane Hub, ICA Finance, International Energy Agency, Methane Matters Coalition, and the Organisation for Economic Co-operation and Development, present at the 29th UN Climate Change Conference (COP29), gathered under the presidency of the Government of Azerbaijan, launches the Methane Abatement Partnership Roadmap… We urgently call for collaboration among countries, both fossil fuel importers and exporters, to accelerate the reduction of methane emissions associated with fossil energy production and consumption, by collaborating and aiming to implement a Methane Abatement Partnership roadmap. The objective of this roadmap is to minimize emissions of methane throughout the oil and natural gas supply chain.").

[41] Climate and Clean Air Coalition (2024) THE SPRINT TO CUT CLIMATE SUPER POLLUTANTS: COP 29 SUMMIT ON METHANE AND NON-CO2 GHGS FACT SHEET ("The United States, People's Republic of China, and Azerbaijan today convened a Summit to accelerate actions to cut emissions of methane and other non-CO2 greenhouse gases, which account for half of today's climate change but receive far less than half of global climate attention. These super pollutant greenhouse gases—including methane, hydrofluorocarbons, nitrous oxide, and tropospheric ozone—are dozens, hundreds, or even thousands of times more potent than carbon dioxide. Reducing emissions of these super pollutants is the fastest way to tackle climate change and a critical complement to reducing carbon dioxide to limit global warming to 1.5 degrees Celsius. This year, partners announced: Finance: Over $2 billion in total international grant funding mobilized in the last three years to tackle super pollutants, and billions in additional investment deployed. Policy: New policy and regulatory steps to reduce methane emissions in the oil and gas and landfill sectors including by five of the top 20 waste sector methane emitters. Science: The launch of the first-ever Global Nitrous Oxide Assessment, which demonstrates that global N2O emissions can be reduced by 40 percent, and new efforts to track and reduce the climate impacts of tropospheric ozone, the third-largest contributor to climate change.").

[42] Paris Peace Forum (2025) *10th anniversary of the Paris Agreement Roundtable Reducing Methane Emissions from the Energy Sector* ("Two years ago in Dubai … we felt that if we are really to be successful and do what the scientists have advised us to do, then we need to have a legal construct that obligates each country to be able to find near-zero methane. We have the example of the Montreal Protocol. It's probably the most successful climate agreement that we've ever had. … If I am flaring gas, I'm burning cash. If I am not fixing pipes, I am losing cash. So if we start from that first perspective, it ought to be a win-win platform. … [T]he scientists have advised that we can reverse the temperature by half a degree … [which] can buy time to address what has been clearly a difficult point: supersizing and scaling up decarbonizing technology for oil on a commercial scale. … I think the first platform for it being made possible is that it is a love language that is common to both the oil and gas sector and to the people who want to save the planet. There's no division.").

[43] (2025) *Statement: Drastically Reducing Methane Emissions in Global Fossil Fuel Sector* ("Preamble We, the undersigned governments and international organisations, are committed to drastically reducing global methane emissions. This decisive action is needed now to keep the goals of the Paris Agreement in reach, and protect people, economies, and the planet. Urgently tackling these emissions will give us more time to counteract climate change, while delivering immediate benefits for air quality, public health, food security, and sustainable development. Methane is responsible for roughly one-third of current warming and reducing it is the fastest and most effective way to slow temperature rise. Proven solutions are within reach, especially in the oil and gas sector

where operational practices exist to drastically cut emissions by up to 75% by 2030, providing an opportunity to lower global temperatures by 0.1°C by 2050. Tackling methane emissions in the oil and gas sector can also enhance returns on investment and competitiveness. Building on global momentum, increasing political ambition and existing initiatives like, the Global Methane Pledge and others such as the Oil and Gas Methane Partnership 2.0, the Global Flaring and Methane Reduction Partnership, and the CCAC's Fossil Fuel Regulatory Programme, the IEA's Global Methane Engagement Programme, the Oil and Gas Climate Initiative, the Oil and Gas Decarbonisation Charter, the UNFCCC's MMRV Frameworks and IPCC reporting guidelines we are committed to accelerating action and implementing a new approach, built on shared responsibility and mutual accountability between producing and consuming countries, underpinned by market signals that reward ambitious action.").

[44] Harvey F. & Watts J (18 November 2025) *More than 80 countries at Cop30 join call for roadmap to fossil fuel phase-out*, THE GUARDIAN ("More than 80 countries have joined a call for a roadmap to phasing out fossil fuels, in a dramatic intervention into stuck negotiations at the UN Cop30 climate summit."). *See* Fossil Fuel Treaty, *THE FIRST CONFERENCE ON TRANSITIONING AWAY FROM FOSSIL FUELS* (*last visited* 12 June 2026) ("In April 2026, Colombia and the Netherlands will convene the First Conference on Transitioning Away from Fossil Fuels in Santa Marta. The conference is the first of a "series of conferences" agreed to by the 18 nation-states participating in the development of a Fossil Fuel Treaty, and will be a solutions-focused forum operating outside the auspices of traditional international climate architecture. The current wars in Ukraine and the Middle East, fueled by a thirst for fossil fuel revenues, do not sideline the transition debate; they radically reinforce its necessity. Because fossil fuel production is so structurally embedded in global markets, financial systems, and geopolitics, no single country can manage this transition alone. Coordinated international cooperation, grounded in equity and justice, is essential to prevent disorderly phase-outs, economic downturns, and new forms of energy inequality.").

[45] Santa Marta Action Repertoire (SMART) (27 April 2026) *Insights from the Synthesis Report workstream of the Academic Dialogue to the Santa Marta conference on Transitioning Away from Fossil Fuels*, 8 ("Action Insight 5: Take immediate measures to prevent future emissions. Ban new fossil infrastructure, mandate deep legally binding cuts to methane emissions in the energy sector, accelerate electrification of energy end uses. Inscribe fossil fuel phase down targets in NDCs while supporting renewable energy pathways in low- and middle-income countries.").

[46] *See, e.g.*, Prime Minister Mia Mottley of Barbados (2026) *Intervention at G7 International High-Level Multi-Stakeholder Event on Methane Action* ("…the sector is not the enemy. The enemy is the emissions … I'm told by the scientists that we can in fact potentially reverse temperatures by 0.3 to 0.5 degrees in the near future. … The Montreal Protocol that allowed us to get rid of HCFCs is still the most successful climate agreement in terms of change of behavior … what is needed now is an international treaty that does bring together those countries that are prepared to act.")

[47] *See, e.g.*, Prime Minister Mia Mottley of Barbados (2026) *Intervention at G7 International High-Level Multi-Stakeholder Event on Methane Action* ("…the sector is not the enemy. The enemy is the emissions … I'm told by the scientists that we can in fact potentially reverse temperatures by 0.3 to 0.5 degrees in the near future. … The Montreal Protocol that allowed us to get rid of HCFCs is still the most successful climate agreement in terms of change of behavior … what is needed now is an international treaty that does bring together those countries that are prepared to act.")

[48] *See, e.g.*, Prime Minister Mia Mottley of Barbados (2026) *Intervention at G7 International High-Level Multi-Stakeholder Event on Methane Action* ("…the sector is not the enemy. The enemy is the emissions … I'm told by the scientists that we can in fact potentially reverse temperatures by 0.3 to 0.5 degrees in the near future. … The Montreal Protocol that allowed us to get rid of HCFCs is still the most successful climate agreement in terms of change of behavior … what is needed now is an international treaty that does bring together those countries that are prepared to act.")

[49] UN Secretary-General António Guterres (23 June 2026) *Secretary-General's special address at London Climate Action Week*, speech ("That is why today, I am launching a global Call to Action on Methane. It spotlights three sectors. The waste sector -- including decisive steps to reduce food waste, end open dumping, and capture emissions from landfills and wastewater. The agriculture sector -- driving down emissions with proven solutions to advance food security and protect farmers' livelihoods. And a special focus on the sector that is the root cause of the twin crises facing our world … and where the most immediate gains can be made – coal, oil and gas. I am urging the fossil fuel industry to step up and do what is long overdue. The International Energy Agency found that around 70 per cent of oil and gas methane emissions can be eliminated using existing technology – much of

it at low or no net cost. Yet in 2025 alone, some 167 billion cubic metres of gas were flared into the sky – as much as Africa consumes in a year. UN Environment's Methane Alert and Response System has issued more than 5,000 alerts across 33 countries. Yet the global response rate stands at just 12 per cent.").

[50] UN Secretary-General António Guterres (23 June 2026) *Secretary-General's special address at London Climate Action Week*, speech ("This is why voluntary action is no longer enough. The world phased out leaded gasoline. We eliminated ozone-depleting chemicals. Methane pollution must be next.").

[51] *See generally* Kayrros (2025) *The Global Methane Pledge at Mid Point: Setbacks and Opportunities*, 2 ("In aggregate, the GMP signatory countries under review are now 8.5% above their 2020 emission level. This lack of progress means that they now must collectively cut emissions by 35% versus 2024 levels, or 5.9% per year until 2030, to meet their goal.").

[52] Lenton T. M., Rockstrom J., Gaffney O., Rahmstorf S., Richardson K., Steffen W., & Schellnhuber H. J. (2019) *Climate tipping points—too risky to bet against*, Comment, NATURE 575(7784): 592–595, 594 ("In our view, the clearest emergency would be if we were approaching a global cascade of tipping points that led to a new, less habitable, 'hothouse' climate state[11]. Interactions could happen through ocean and atmospheric circulation or through feedbacks that increase greenhouse-gas levels and global temperature. Alternatively, strong cloud feedbacks could cause a global tipping point[12,13].We argue that cascading effects might be common.. … If damaging tipping cascades can occur and a global tipping point cannot be ruled out, then this is an existential threat to civilization. No amount of economic cost–benefit analysis is going to help us. We need to change our approach to the climate problem. … In our view, the evidence from tipping points alone suggests that we are in a state of planetary emergency: both the risk and urgency of the situation are acute.…"). *See also* Steffen W., *et al.* (2018) *Trajectories of the Earth System in the Anthropocene*, PROC. NAT'L. ACAD. SCI. 115(33): 8252–8259, 8254 ("This analysis implies that, even if the Paris Accord target of a 1.5 °C to 2.0 °C rise in temperature is met, we cannot exclude the risk that a cascade of feedbacks could push the Earth System irreversibly onto a "Hothouse Earth" pathway. The challenge that humanity faces is to create a "Stabilized Earth" pathway that steers the Earth System away from its current trajectory toward the threshold beyond which is Hothouse Earth (Fig. 2). The human-created Stabilized Earth pathway leads to a basin of attraction that is not likely to exist in the Earth System's stability landscape without human stewardship to create and maintain it."); Energy Secretary Ed Miliband of United Kingdom (2026) *Intervention at G7 International High-Level Multi-Stakeholder Event on Methane Action* ("And as we often say, if decarbonizing our energy sectors and economies more widely is a marathon, then tackling methane emissions is the essential sprint because, as you all know, reducing methane emissions remains one of the best things we can do to slow global warming while cleaning up our air, improving public health, and increasing our energy security. That's why the UK is so determined to work with other countries to drive global action from the methane statement we launched alongside others at COP 30 to our long-standing commitment to the Climate and Clean Air Coalition. … And with nearly 160 countries now participating in the global methane pledge, there is a global coalition of countries that wants to act and believes we can drive progress together."); Director General & Chief Scientific Advisor for the Department for Energy Security and Net Zero, Emily Shuckburgh of United Kingdom (2026) *Intervention at G7 International High-Level Multi-Stakeholder Event on Methane Action* ("As Secretary of State Ed Miliband highlighted in his message, if carbon dioxide is a marathon, methane is a sprint, and the finish line is in 2030. … Cutting methane emissions is necessary to combat climate change, but it is also about securing global energy security. … Cutting methane benefits everyone. It is in our shared global interest to reduce emissions, supporting the climate, strengthening energy security, and delivering economic and health co benefits."); Ambassador Hideo Suzuki of Japan (2026) *Intervention at G7 International High-Level Multi-Stakeholder Event on Methane Action* ("As one of the world's leading energy importers, Japan is actively working to reduce methane emissions across the whole energy value chain, primarily through two initiatives. One is data sharing between producers and importers. Second is rigorous international cooperation and harmonization. …Japan is also working with Asian energy producers to conduct demonstration projects on methane emission management. Based on the results of these projects, we will actively engage in the development of global standards. … This autumn, the 15th Energy Producers Consumer Conference will be held in Tokyo, bringing together energy stakeholders from both producing and consuming countries. By providing such a forum for dialogue among stakeholders, Japan will continue to lead efforts to build momentum for methane emission reduction."); Dr. Tenioye Majekodunmi, Director General, National Council on Climate Change, Presidency of Nigeria (2026) *Intervention at G7 International High-Level Multi-Stakeholder Event on Methane Action* ("")

[53] United States Department of State (11 October 2021) *Joint U.S.-EU Statement on the Global Methane Pledge*, Press Release ("Successful implementation of the Pledge would reduce warming by at least 0.2 degrees Celsius by 2050."). It would also keep the planet on a pathway consistent with staying within 1.5 °C, according to the

Global Methane Assessment. United Nations Environment Programme & Climate & Clean Air Coalition (2021) *Briefing on the Global Methane Pledge* ("The Global Methane Pledge is a strong first step as the first-ever Heads-of State global commitment to cut methane emissions at a level consistent with a 1.5 C pathway."). *See also* United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 9 ("Currently available measures could reduce emissions from these major sectors by approximately 180 Mt/yr, or as much as 45 per cent, by 2030. This is a cost-effective step required to achieve the United Nations Framework Convention on Climate Change (UNFCCC) 1.5° C target. According to scenarios analysed by the Intergovernmental Panel on Climate Change (IPCC), global methane emissions must be reduced by between 40–45 per cent by 2030 to achieve least cost-pathways that limit global warming to 1.5° C this century, alongside substantial simultaneous reductions of all climate forcers including carbon dioxide and short-lived climate pollutants. (Section 4.1)."). Deploying all available and additional measures could lead to a 45% reduction below 2030 levels to achieve nearly 0.3 °C in avoided warming by the 2040s.[53] Further, implementing the GMP would provide additional benefits, including prevention of approximately 200,000 premature ozone-related deaths, avoidance of ~580 million tons of yield losses of staple crops like rice and maize annually, avoidance of ~$500 billion per year in losses due to non-mortality health impacts, and impacts on forestry and agriculture, and avoidance of ~1,600 billion hours of work per year due to heat exposure. Nearly 85% of targeted measures have benefits that outweigh the net costs. United Nations Environment Programme & Climate & Clean Air Coalition (2022) GLOBAL METHANE ASSESSMENT: *2030 BASELINE REPORT SUMMARY FOR POLICYMAKERS*, 11 ("Using the results from the 2021 Global Methane Assessment, we calculate that Global Methane Pledge would provide additional benefits worldwide =through 2050, beyond keeping the planet cool, including: - Prevention of roughly 200,000 premature deaths per year due to ozone exposure - Avoidance of ~580 million tonnes of yield losses to wheat, maize (corn), rice and soybeans per year - Avoidance of ~$500 billion (2018 US$) per year in losses per year due to non-mortality health impacts, forestry and agriculture - Avoidance of ~1,600 billion lost work hours per year due to heat exposure."). According to the International Energey Agency, total methane emissions from human activity are reduced by 45% and the energy sector by 75% between 2020 and 2030, costing less than 3% of net income from oil and gas in 2022. International Energy Agency (2023) *Credible pathways to 1.5 °C - Four pillars for action in the 2020s*, 1–15, 11 ("In the NZE Scenario, methane emissions from the energy sector fall by around 75% between 2020 and 2030 and total methane emissions from human activity fall by around 45%. The IEA's latest update of its Global Methane Tracker found that methane emissions from oil and gas alone could be reduced by 75% with existing technologies. Around $100 billion in total investment is needed over the period to 2030 to achieve this reduction—equivalent to less than 3% of oil and gas net income in 2022. To addre ss methane emissions from fossil energy production and consumption, countries covering over half of global gas imports and over one-third of global gas exports released a Joint Declaration from Energy Importers and Exporters on Reducing Greenhouse Gas Emissions from Fossil Fuels at COP27 calling for minimizing flaring, methane, and CO_2 emissions across the supply chain to the fullest extent practicable.").

[54] (16 September 1987) Montreal Protocol on Substances that Deplete the Ozone Layer, 26 I.L.M. 1541 (entered into force 1 January 1989). For a discussion of the Montreal Protocol on Substances that Deplete the Ozone Layer, *see generally* Miller A. S., Zaelke D., & Andersen S. O. (2021) RESETTING OUR FUTURE: *CUT SUPER CLIMATE POLLUTANTS NOW! THE OZONE TREATY'S URGENT LESSONS FOR SPEEDING UP CLIMATE ACTION*, John Hunt Publishing; *and* Andersen S., Zaelke D., Taddonio K., Ferris R., & Sherman N. (2021) *Ozone Layer, International Protection*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, Oxford University Press, Peters A., & Wolfrum R. (eds.).

[55] *See, e.g.*, Volcovici V. (27 November 2023) *COP28 climate summit puts spotlight on turning methane pledges into action*, REUTERS ("'If it's just a pledge, it will land with a thump,' said Rachel Kyte, the World Bank's former climate envoy. 'The UAE needs to commit companies and countries to sit down and negotiate a binding agreement to x-out methane' and 'there are a lot of pieces coming together,' said Durwood Zaelke, president of the Institute for Governance and Sustainable Development, a Washington, D.C.-based think tank. 'With major emitters like the U.S., China and EU announcing new rules, the time is right for an agreement.'"). *See also* International Chamber of Commerce (23 November 2023) *Strengthening the Global Methane Pledge to keep 1.5 °C within reach* ("While businesses across our network are firmly committed to reducing methane emissions, clear policy signals from governments – backed by strong accountability measures within the GMP framework – are urgently needed to scale-up the mitigation efforts that are ultimately required by the end of this decade."); *and* Climate & Clean Air Coalition (9 December 2023) *Ministers Unite for Immediate Action on Climate and Clean Air, Urging Bold Financing and Swift Measures on Non-CO2 Super Pollutant Greenhouse Gases* ("As CCAC High-level Advocate for Finance Rachel Kyte, who moderated the session, said in her closing: "It's 2023. With peak oil, peak coal, and peak emissions, we are also 'peak-pledge'." This Coalition has proven to turn ambition into action, it set out as the Coalition of the Working.").

[56] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 4 ("Oil, gas and coal production output reached record highs in 2025, and the International Energy Agency (IEA) estimates that methane emissions from these activities total 124 million tonnes (Mt) a year: oil is the largest source at 45 Mt, followed by coal at 43 Mt, and natural gas at 36 Mt. A further 20 Mt comes from bioenergy production and consumption, largely from the incomplete combustion of traditional biomass used for cooking and heating in developing economies.").

[57] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 4 ("Oil, gas and coal production output reached record highs in 2025, and the International Energy Agency (IEA) estimates that methane emissions from these activities total 124 million tonnes (Mt) a year: oil is the largest source at 45 Mt, followed by coal at 43 Mt, and natural gas at 36 Mt. A further 20 Mt comes from bioenergy production and consumption, largely from the incomplete combustion of traditional biomass used for cooking and heating in developing economies."); 15 ("International Energy Agency (IEA) analysis suggests the energy sector emitted nearly 150 Mt of methane in 2025. Coal production was responsible for 39 Mt, while inactive mines accounted for around 4 Mt and end-use equipment about 1 Mt. Oil operations accounted for around 44 Mt and natural gas activities for close to 34 Mt, while abandoned wells added a further 3.5 Mt. End-use equipment contributed an additional 2.5 Mt of methane leakage. Incomplete combustion of bioenergy – mainly from traditional biomass – generated about 18 Mt, with modern bioenergy adding another 2 Mt. The Global Methane Tracker documentation provides information on data uncertainties and the IEA's methane estimation approaches.").

[58] International Energy Agency (2025) GLOBAL METHANE TRACKER 2025, 17 ("In the oil and gas industry, upstream operations account for nearly 85% of methane emissions, with gas transportation and other downstream operations responsible for the remaining 15%. Upstream sources include all emissions from production, gathering and processing at both onshore and offshore facilities. Most downstream emissions come from gas transportation, including emissions from transmission and distribution via pipelines or as liquefied natural gas (LNG) and regasification. Other downstream sources include storage, refining and oil transport.").

[59] Hope M. (2014) *Explained: Fugitive methane emissions from natural gas production*, CARBONBRIEF ("Natural gas is mainly methane, some of which escapes during the drilling, extraction, and transportation process. Such outbreaks are known as fugitive emissions."); *see also* Picard D. (2000) *Fugitive emissions from oil and natural gas activities*, Background Paper in IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories ("In general, fugitive emissions from oil and gas activities may be attributed to the following primary types of sources: • fugitive equipment leaks; • process venting; • evaporation losses; • disposal of waste gas streams (e.g., by venting or flaring), and • accidents and equipment failures."); Clean Air Task Force, *Oil and Gas Mitigation Program* (*last visited* 23 January 2026) ("Venting is even more harmful than flaring, since methane warms the climate so powerfully, and VOC and toxic pollutants are released unabated. Venting of this gas should be prohibited in all cases as an absolutely unnecessary source of harmful air pollution"); Buzcu-Guven B. & Harris R. (2014) *Extent, impacts and remedies of global gas flaring and venting*, Carbon Management, 3(1), 95-108, 96 ("Raw natural gas that emerges from oil wells, referred to as 'associated gas', is a mixture of hydrocarbons, primarily CH4, ethane, propane, butanes and pentanes. Associated gas also contains water vapor, H2S, CO2, helium, nitrogen and other minor compounds. Since CH4 is the major component of associated gas, direct venting of gas releases a significant amount of CH4 into the atmosphere along with H2S and volatile organic compounds (VOC). The amount of these contaminants depends on the chemical composition of the associated gas, which typically shows significant site-to-site variations. Flaring of associated gas, on the other hand, mainly emits CO2 and CO along with a variety of air pollutants, such as VOCs, including carcinogens and air toxics, nitrogen oxides (NOx), SO2, toxic heavy metals and black carbon soot. The flaring process is often inefficient, resulting in a mix of constituents that can range between vented natural gas and the ideal combustion the flared gas. Emissions of potentially toxic air pollutants are highly dependent on the combustion efficiency of the flaring system. Combustion efficiency is largely determined by energy density of the flare gas stream, design of the flare system, composition of flare gas and environmental conditions such as ambient temperature, wind speed and wind direction Citation[3]. Kostiuk et al. found that the flaring of propane-rich gas produced measurable amounts of soot emissions with polycyclic aromatic hydrocarbons (PAH), including naphthalene, acenaphthalene, fluorene, phenanthrene, fluoranthene and pyrene Citation[3]. An Alberta Research Council study found more than 150 VOC and PAH species in the plume of flare products in Alberta oil fields Citation[4]. The amounts emitted were higher for gas streams with a greater content of liquid hydrocarbons, which had combustion efficiencies as low as 62%. The most abundant compounds detected in flare emissions in all conditions were benzene, styrene, ethyl benzene, toluene, xylenes, acenaphthalene, biphenyl and fluorene.").

[60] International Energy Agency (2025) GLOBAL METHANE TRACKER 2025, 17 ("In the oil and gas industry, upstream operations account for nearly 85% of methane emissions, with gas transportation and other downstream

operations responsible for the remaining 15%. Upstream sources include all emissions from production, gathering and processing at both onshore and offshore facilities. Most downstream emissions come from gas transportation, including emissions from transmission and distribution via pipelines or as liquefied natural gas (LNG) and regasification. Other downstream sources include storage, refining and oil transport."). *See generally* Mainak Mukherjee et. al. (2025) *Greenhouse gas emissions from the US liquefied natural gas operations and shipping through process model based life cycle assessment*, 6 COMMUNICATIONS EARTH & ENVIRONMENT, 2 ("The gate-to-gate GHG emissions for the Sabine Pass and Cove Point scenarios are shown in Fig. 2a, b. The bottom-up approach (Methods) presents GHG contributions from different sources (process combustion, flaring, 'acid gas removal' or AGR CO2 venting, and methane vents and fugitives). Process combustion in both scenarios is the most important, at nearly 0.192 tonne CO2e/tonne LNG, which is 87% of the total emissions for Sabine Pass, and 0.232 tonne CO2e/tonne LNG, which is 86% of the total emissions from Cove Point. AGR CO2 venting is the second most prominent contributor after process combustion at 8% and 6% for Sabine Pass and Cove Point, respectively, demonstrating similar values because of the uniform natural gas composition considered. Also, regarding the flaring share, the contribution to total liquefaction emissions was 4% (0.0089 tonne CO2e/tonne LNG) for Sabine Pass and 6% (0.0179 tonne CO2e/tonne LNG) for Cove Point. Lastly, the contribution from methane vents and fugitives was about 0.03% (0.0007 tonnes CO2e/tonne LNG) from Sabine Pass and 0.04% (0.0001 tonnes CO2e/tonne LNG) from Cove Point. The estimated total carbon intensity at Sabine Pass is 0.220 tonne CO2e/tonne LNG (220 kgCO2e/tonne LNG), while for Cove Point the value is 0.269 tonnes CO2e/tonne LNG (269 kgCO2e/tonne LNG), a 20% difference between the two terminals (Fig. 2a, b). When compared with the literature, the estimated values show considerable agreement with Roman-White (0.26 tonne CO2e/tonne LNG on a gate-to-gate basis), while it is 96% of NETL's value (0.271 tonnes CO2e/tonne LNG), and 89% of Gan et al.'s value (0.290 tonne CO2e/tonne LNG)12. Note: these comparisons are conducted for Cove Point at 0.269 tonne CO2e/tonne LNG and for the Sabine Pass at 0.220 tonnes CO2e/tonne LNG, which is almost 75–81% of the literature as shown by Fig. 2c.").

[61] Alvarez A.R. et al., (2018) *Assessment of methane emissions from the U.S. oil and gas supply chain*, SCIENCE 361,186-188, 188 ("Indeed, our estimate of CH4 emissions across the supply chain, per unit of gas consumed, results in roughly the same radiative forcing as does the CO2 from combustion of natural gas over a 20-year time horizon (31% over 100 years)."); *see also* Gordon D., Schmeisser L., Chaney C., & Bylsma (2025) *Establishing Measures to Achieve Near-Zero Methane Waste from Global Oil and Gas Assets*, RMI ("Oil and gas co-exist underground together and are normally produced together. As such, it's rare for gas to be extracted alone. Even "dry" gas stores can consist of liquid hydrocarbons that make plastics, liquid petroleum gas for cooking, petrol, and jet fuel. On average, one-half of the petroleum industry's emissions footprint comes from methane. However, equivalent barrels of oil and gas emit varying amounts of methane that vary by over an order of magnitude, as plotted below. Further differentiation finds that assets that primarily produce gas (leftmost bars) as well as those assets that primarily produce oil along with associated gas (rightmost bars) have a significant share of their emissions intensity from methane waste. As such, future policies must attend to venting, fugitives, and flaring along both the oil and gas supply chain to be effective.").

[62] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 16 ("Methane emissions linked to coal production vary by mine type and conditions. In underground operations, ventilation air is typically the main source, along with drainage systems. In surface mines, emissions tend to come from drainage operations, exposed coal seams and other disturbed areas. Additional releases occur during coal handling, processing, storage and transport, as methane continues to escape from the coal itself.").

[63] United States Environmental Protection Agency, *About Coal Mine Methane* (*last visited* 5 February 2023) ("CMM is released by different types of mines: Active underground mines, which release methane through degasification systems (drainage system methane) and ventilation systems (ventilation air methane or VAM); Abandoned or closed mines release abandoned mine methane (AMM) from diffuse vents, ventilation pipes, boreholes, or fissures in the ground; Surface mines emit less methane than underground mines, but because surface mines produce large volumes of coal, some surface mines can also emit methane in large quantities.").

[64] New South Whales Net Zero Commission (2025) COAL MINING EMISSIONS SPOTLIGHT REPORT, 33 ("Studies using emerging top-down atmospheric measurement methods have suggested that reported emissions from Australian coal mines are significantly underestimated, perhaps by more than 80% (Climate Change Authority, 2023b; Shen et al., 2023). These studies suggest that inaccuracies are particularly pronounced for open cut mines and would indicate that current NGER estimation methods are inaccurate."); *see also* Horner R. & Assan S. (2026) GLOBAL COAL MINE METHANE REVIEW 2026, EMBER, 28 ("Australia's official data report falling methane intensity and low emissions along with falling coal production. Using Australia's most recently reported emissions submitted to the UNFCCC in 2023, CMM emissions were estimated at around 0.9 million tonnes in 2024. The

IEA emission estimates were 80% higher in 2024, while East et al. emission estimates were consistent with the UNFCCC-derived figure. Australia's reported emission intensity has fallen by 0.1 tCH4/kt over the past decade, mainly due to a greater share of surface mining, historically believed to have lower emission intensity than underground mines. Previous analysis found that emissions from Australia's coal industry dropped to a record low even as production doubled. However, numerous recent examples of satellite data suggest this may not always be the case. TROPOMI satellite plume detections indicate around 40% more methane from Australian coal mines than is reported in national inventories. Australia has begun reviewing its methods for estimating methane from open-cut mines.").

[65] International Energy Agency (2025) COAL 2025, 7 ("Global coal demand is expected to effectively plateau over the coming years, showing a very gradual decline through to 2030 in our latest forecast. By that year, consumption is forecast to ease by 3% compared with 2025, taking it below its 2023 level. Global power generation from coal is forecast to sink below its 2021 level by the end of this decade.").

[66] Kholod N., Evans M., Pilcher R. C., Roshchanka V., Ruiz F., Coté M., & Collings R. (2020) *Global methane emissions from coal mining to continue growing even with declining coal production*, J. CLEAN. PROD. 256(120489): 1–12, 9–10 ("The results show that regardless of future coal production scenario used by the model, [abandoned mine methane (AMM)] emissions will increase in the future. AMM emissions accounted for 17% of the total methane from coal mining in 2010. For comparison, data reported to the United Nations Framework Convention on Climate Change (UNFCCC) from key coal producing countries show that the share of AMM in total methane emissions from coal mining in the latest available year (2015) was 1% in Germany, 2% in each Australia and Poland, 11% in the United States and 34% in the United Kingdom (UNFCCC, 2017). AMM emissions can be difficult to inventory because of ownership issues, measurement problems, the extent of mine flooding, and other factors. Because AMM emissions grow faster than [coal mine methane (CMM)], the share of AMM in total methane emissions may increase to 23% by 2050 and 27% in 2100 in the reference scenario.").

[67] Smirnov A. (2 November 2021) *Why the world must act on coal mine methane*, EMBER ("The IEA estimates that 40.5 million tonnes (MT) of methane leaked from global operational coal mines in 2020. Using a multiplier of 86, as recommended by the IPCC to assess the short-term climate impact of methane, this means coal mines leak methane equivalent to 3,490 million tonnes of CO_2 each year. This is much bigger than the multiplier of 30 used by the IEA when they calculated coal mine methane's impact was already bigger than aviation and shipping combined. This means coal mine methane's short-term climate impact – at 3,490 million tonnes CO_2e – is greater than the EU-27's CO_2 emissions, which were 2,920 million tonnes in 2019. … The IEA's Net Zero by 2050 report shows that coal power generation needs to fall by two thirds this decade – a massive 67% fall from 2020 to 2030 – to keep warming to 1.5 degrees.").

[68] International Energy Agency (2021) NET ZERO BY 2050: A ROADMAP FOR THE GLOBAL ENERGY SECTOR, 104 ("In the NZE, total methane emissions from fossil fuels fall by around 75% between 2020 and 2030, equivalent to a 2.5 gigatonne of carbon-dioxide equivalent ($GtCO_2$-eq) reduction in GHG emissions (Figure 3.5).").").

[69] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 6 ("Around 70% of fossil-fuel methane emissions come from the top 10 emitting countries. While uncertainty remains high, the IEA estimates that more than 85 Mt of emissions tied to fossil fuels operations in 2025 came from the 10 biggest emitters of methane. China is the largest emitter, driven by coal operations, followed by the United States and the Russian Federation (hereafter "Russia").."); 6 (In order from greatest to lowest, the top 10 methane emitting countries are China, USA, Russia, Iran, Turkmenistan, India, Indonesia, Kazakhstan, and Iraq).

[70] Horner R. & Assan S. (2026) GLOBAL COAL MINE METHANE REVIEW 2026, EMBER, 15 ("Seven countries account for nearly all CMM emissions Most CMM comes from a handful of major coal producers. Our UNFCCC-derived data show that almost all (94%) of CMM emissions originate from just seven countries: China, the United States, Russia, India, Australia, Poland and Ukraine. China alone accounted for 76% of global CMM emissions in 2023 and around half of global coal production.").

[71] International Energy Agency (2025) GLOBAL METHANE TRACKER 2025, 4 ("As more measured data has become available, it appears that most national inventories are underreporting emissions: our estimate of total energy-related methane emissions globally is about 80% higher than the total reported by countries to the UN Framework Convention on Climate Change (UNFCCC). This gap is narrowest in Europe, where countries regularly submit inventories and some producers report emissions based on measured data.").

[72] James D. East et. al. (2025) *Worldwide inference of national methane emissions by inversion of satellite observations with UNFCCC prior estimates*, 16 NATURE COMMUNICATIONS, 4 ("Figure 3 shows the top 15 emitting countries from our TROPOMI inversion and the breakdown of anthropogenic emissions by sector. China (59 (49–60) Tg a−1), the U.S. (36 (31–37) Tg a−1), India (28 (24–29) Tg a−1), and Brazil (22 (15–23) Tg a−1) account for 39% of global anthropogenic emissions. Additional contributions from individual countries flatten out so that the top 15 countries account for 61% of global emissions. Among the countries in Fig. 3, the largest corrections from the inversion are in the US (+8.0 Tg a−1), Venezuela (+6.4 Tg a−1), India (+6.0 Tg a−1), and Turkmenistan (+5.4 Tg a−1), and the largest decreases are in Russia (−4.8 Tg a−1) and Indonesia (−0.7 Tg a−1). In the U.S., increases are mainly from oil-gas (13.2 (10.5–13.8) Tg a−1 posterior, up from 8.5 Tg a−1) and livestock (11.8 (10.6–12.2) Tg a−1 posterior, up from 9.1 Tg a−1). In China, decreases to coal (14.0 (13.1–14.6) Tg a−1 posterior, down from 21.2 Tg a−1) offset oil-gas and waste increases. We find that large relative increases are associated with oil-gas emissions, particularly in Venezuela and Turkmenistan, where the oil-gas sector is 4.8 and 3.8 times larger, respectively, than UNFCCC prior estimates, along with additional increases from livestock in both countries. In Russia, decreases are spread across sectors, while oil-gas emissions are similar to their UNFCCC report. However, the inversion ensemble shows particularly large uncertainty in our results over Russia because of sparse TROPOMI observations at high latitudes. As a result, we cannot rule out an emissions increase in Russia.").

[73] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 43-45, Table 2.5 (At the sectoral level, in year 2030, 72 per cent of the total mitigation potential from the MTFR measures lies in the energy sector, 18 per cent in the agriculture sector and 10 per cent in the waste sector. The reduction potential from MTFR measures in 2030 compared to CLE 2030, is estimated at 78 per cent (94 Mt per year) for the energy sector, 15 per cent (24 Mt per year) for the agricultural sector, and 16 per cent (13 Mt per year) for the waste sector combined. This translates in net reductions in annual emissions in 2030 under the MTFR scenario, compared to 2020 levels, of 73 per cent for the energy sector, 8 per cent in the agricultural sector and 5 per cent in the waste sector. In the agricultural sector and solid waste subsector sectors, low net reduction potentials are partly explained by growth in underlying drivers such as increased demand for food and waste generation in response to population and economic development, and partly by technical limitations to control emissions, in particular within this decade. Practical concerns regarding feed apportionment, for example, constrain the applicability and effectiveness of feed additives to control enteric fermentation emissions from livestock, and breeding schemes typically need years to run for full effect on emissions. This speaks to a need for further research and development of methane abatement technology, particularly in the agricultural sector.")

[74] International Energy Agency (2025) GLOBAL METHANE TRACKER, 21, 43 ("In the IEA's Net Zero Emissions by 2050 (NZE) Scenario, methane emissions from fossil fuels fall by around 75% by 2030, and by around 85% by 2035 compared with current levels…Fossil fuel companies should carry the primary responsibility for abating methane emissions, as the average annual spending required represents less than 2% of the net income the industry generates annually. To encourage methane abatement, companies could integrate methane-specific performance indicators into their financial and operational strategies (such as tying them to employee and executive compensation). They might also consider establishing an internal price for methane when making capital investment decisions related to both new and existing projects."); International Energy Agency (2025) WORLD ENERGY OUTLOOK, 343 ("Methane is responsible for around 30% of the rise in global temperatures that has taken place since the industrial revolution (IPCC, 2021a). Rapid and sustained reductions in methane emissions are key to limit near-term global warming and to improve air quality. Methane has a much shorter atmospheric lifetime than CO_2, around 12 years for methane versus centuries for CO_2, but it absorbs much more energy while it remains in the atmosphere. Today the concentration of methane in the atmosphere is over two-and-a-half times above pre-industrial levels. Atmospheric records show that, in relative terms, methane concentrations have been rising more quickly than those of all other major GHGs, and at a rate faster than in any period since recordkeeping began. The energy sector, including oil, natural gas, coal and bioenergy, accounts for more than 35% of methane emissions from human activity. The fossil fuel sector offers significant potential for rapid and low-cost reductions in methane emissions. In the NZE Scenario, methane emissions from the energy sector fall by more than 80% by 2035 as all available mitigation measures are deployed across energy supply chains.").

[75] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 45, Table 2.7 (Referring to energy total for 2030 emissions under current legislation).

[76] International Energy Agency (2025) GLOBAL METHANE TRACKER, 21 ("In the IEA's Net Zero Emissions by 2050 (NZE) Scenario, methane emissions from fossil fuels fall by around 75% by 2030, and by around 85% by 2035 compared with current levels. Most of this decline stems from the explicit deployment of methane abatement technologies, and all fossil fuel producers in 2030 achieve an emissions intensity close to that of the best

performers today. The global average upstream methane emissions intensity of oil and natural gas production falls from around 1% in 2024 to 0.2% in 2030 and the intensity of coal operations falls from just over 1% to 0.5% over the same time period.")

[77] International Energy Agency (2025) GLOBAL METHANE TRACKER, 10 ("Around 35 Mt of total methane emissions from oil, gas and coal could be avoided at no net cost, based on average energy prices in 2024 (a slight decrease from our 2023 estimate, mostly due to lower gas prices and the addition of abandoned facilities to our estimates). This is because the required outlays for abatement measures are less than the market value of the additional methane gas captured and sold or used.").

[78] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 5 ("The ongoing crisis in the Middle East is reshaping the global energy system and disrupting around 20% of global liquefied natural gas (LNG) trade flows (around 110 bcm of gas passed through the Strait of Hormuz in 2025). … We estimate that nearly 100 billion cubic metres (bcm) of natural gas could be made available annually through a global effort to cut methane from oil and gas operations, with a further 100 bcm unlocked through the elimination of non-emergency flaring worldwide.").

[79] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 8 ("Around 30% of methane emissions from fossil fuel operations could be reduced at no cost. Around 70% of methane emissions from fossil fuels – nearly 85 Mt – can be abated with existing technology, including three-quarters of emissions from oil and gas and about half of coal emissions. More than 35 Mt could be avoided at no net cost, based on average energy prices in 2025. This is because the required capital and operating costs of abatement are lower than the market value of the gas captured and sold or used. The economics look even more attractive in 2026, as fuel prices come under upward pressure from the conflict in the Middle East."). *See also* United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 43-45, Table 2.7 (At the sectoral level, in year 2030, 72 per cent of the total mitigation potential from the MTFR measures lies in the energy sector, 18 per cent in the agriculture sector and 10 per cent in the waste sector. The reduction potential from MTFR measures in 2030 compared to CLE 2030, is estimated at 78 per cent (94 Mt per year) for the energy sector, 15 per cent (24 Mt per year) for the agricultural sector, and 16 per cent (13 Mt per year) for the waste sector combined. This translates in net reductions in annual emissions in 2030 under the MTFR scenario, compared to 2020 levels, of 73 per cent for the energy sector, 8 per cent in the agricultural sector and 5 per cent in the waste sector. In the agricultural sector and solid waste subsector sectors, low net reduction potentials are partly explained by growth in underlying drivers such as increased demand for food and waste generation in response to population and economic development, and partly by technical limitations to control emissions, in particular within this decade. Practical concerns regarding feed apportionment, for example, constrain the applicability and effectiveness of feed additives to control enteric fermentation emissions from livestock, and breeding schemes typically need years to run for full effect on emissions. This speaks to a need for further research and development of methane abatement technology, particularly in the agricultural sector.")

[80] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 8 ("Around 30% of methane emissions from fossil fuel operations could be reduced at no cost. Around 70% of methane emissions from fossil fuels – nearly 85 Mt – can be abated with existing technology, including three-quarters of emissions from oil and gas and about half of coal emissions. More than 35 Mt could be avoided at no net cost, based on average energy prices in 2025. This is because the required capital and operating costs of abatement are lower than the market value of the gas captured and sold or used. The economics look even more attractive in 2026, as fuel prices come under upward pressure from the conflict in the Middle East.").

[81] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 41 ("Tackling methane emissions from fossil-fuel operations is one of the quickest and cheapest ways to curb global greenhouse gas emissions. Most of the methane abatement measures available today [over 60 Mt] in the oil and gas sector would be cost-effective at a carbon price of about USD 20 per tonne of carbon dioxide equivalent (tCO2-eq).").

[82] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 46-47 (Refer to table 2.7 on pages 46-47. This table summarizes changes annual emissions and abatement costs in 2030 in scenarios NDCs and MAPs, MTFR, and MTFR low-cost relative CLE in 2030. The maximum technical methane mitigation at low-cost in the oil and gas sector in 2030 combines the value in Mt/yr for the upstream and downstream segments, 55 and 0.9 respectively. Together, these values sum to roughly 56 Mt/yr.).

[83] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 9 ("Nearly 30 Mt of upstream oil and gas emissions could be abated at no net cost under 2025 energy prices.").

[84] United Nations Environment Programme & Climate & Clean Air Coalition (2022) GLOBAL METHANE ASSESSMENT: *2030 BASELINE REPORT*, 10 (Figure ES6: "Illustrative example of the GMP-consistent methane emissions reduction pathway to 2030. Mitigation in all three main anthropogenic sectors is required to achieve the GMP target in 2030 with slightly more than half of the mitigation expected to come from the fossil fuels sector.").

[85] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 46-47 (Refer to table 2.7 on pages 46-47. This table summarizes changes annual emissions and abatement costs in 2030 in scenarios NDCs and MAPs, MTFR, and MTFR low-cost relative CLE in 2030. The maximum technical methane mitigation in the oil and gas sector in 2030 combines the value in Mt/yr for the upstream and downstream segments, 56 and 11 respectively. Together, these values sum to roughly 67 Mt/yr.).

[86] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 46-47 (Refer to table 2.7 on pages 46-47. It lists the following methane mitigation measures for the upstream oil and gas segment. Extended recovery and utilization of vented gas: capturing associated gas from oil wells; blowdown capture; and recovery and utilization of vented gas using vapor recovery units and well plungers. Addressing unintended equipment leaks through leak detection and repair (LDAR) programs: regular inspection and repair; replacing pressurized gas pumps and controllers with electric or air-driven systems; replacing gas-powered pneumatic devices and gasoline or diesel engines with electric motors; early replacement of devices with lower-emitting versions; and replacing compressor seals or rods. Capping unused wells and plugging abandoned oil and gas wells.)

[87] Hellgren L., LaCount R., & Martin J. (2024) BENCHMARKING METHANE AND OTHER GREENHOUSE GAS EMISSIONS OF OIL & NATURAL GAS PRODUCTION IN THE UNITED STATES, Ceres & Clean Air Task Force, 3 ("Pneumatic controllers were the largest source of total reported production-segment methane emissions, making up 67% of total reported methane emissions.").

[88] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 46, Table 2.7 (Mitigation measures include extended recovery and utilization of vented gas: capture of associated gas from oil wells; blowdown capture; recovery and utilization of vented gas with vapor recovery units and well plungers; addressing unintended leaks from equipment through leak detection and repair programs (LDAR): regular inspections (and repair); replace pressurized gas pumps and controllers with electric or air systems; replace gas-powered pneumatic devices and gasoline or diesel engines with electric motors; early replacement of devices with lower-release versions; replace compressor seals or rods; cap unused wells; and plug abandoned oil and gas wells.).

[89] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 8 ("Stopping upstream emissions from oil and gas operations is among the most effective ways to reduce methane. More than 50 Mt can be abated with existing technology. Implementing these measures would lower the global average upstream methane emissions intensity of oil and natural gas production to less than 0.2% from around 1% in 2025."). *See also* International Energy Agency (2025) GLOBAL METHANE TRACKER, 21 ("In the IEA's Net Zero Emissions by 2050 (NZE) Scenario, methane emissions from fossil fuels fall by around 75% by 2030, and by around 85% by 2035 compared with current levels. Most of this decline stems from the explicit deployment of methane abatement technologies, and all fossil fuel producers in 2030 achieve an emissions intensity close to that of the best performers today. The global average upstream methane emissions intensity of oil and natural gas production falls from around 1% in 2024 to 0.2% in 2030 and the intensity of coal operations falls from just over 1% to 0.5% over the same time period."); *and* James D. East et. al. (2025) *Worldwide inference of national methane emissions by inversion of satellite observations with UNFCCC prior estimates*, 16 NATURE COMMUNICATIONS, 4.

[90] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 17 ("If all countries matched Norway's emissions intensity, global methane emissions from oil and gas operations would fall by more than 90%."). *See* International Energy Agency (4 May 2026) *Methane Tracker* (According to the International Energy Agency's database of country and regional estimates for methane emissions and abatement options, the upstream methane energy intensity of Norway is 0.01%.).

[91] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 46, Table 2.7 (Methane mitigation measures downstream and midstream include: leakage control through LDAR programs; extended flaring; consumer gas distribution networks: leakage control through LDAR programs; upgrade to PE or PVC networks; and long-distance gas transmission pipelines and storage: leakage control through LDAR programs; equipping all new pipelines with compact (non-leak) flanges; refurbishment or replacement of existing pipelines.). *See also* Alex Ostridge & Mark Davis (2025) GLOBAL QUANTIFICATION OF FLARING AND OPERATIONAL

PERFORMANCE OF LNG LIQUEFACTION PLANTS THROUGH SATELLITE ANALYTICS, Society of Petroleum Engineers (While often overlooked in reporting frameworks, LNG liquefaction plants flare 1.5–2 BCM of gas annually. This accounts for roughly 0.9% of all global flaring, occurring adjacent to monetization infrastructure where capture is most technically feasible.).

[92] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 46, Table 2.7 (Methane mitigation measures downstream and midstream include: leakage control through LDAR programs; extended flaring; consumer gas distribution networks: leakage control through LDAR programs; upgrade to PE or PVC networks; and long-distance gas transmission pipelines and storage: leakage control through LDAR programs; equipping all new pipelines with compact (non-leak) flanges; refurbishment or replacement of existing pipelines.). *See also* Alex Ostridge & Mark Davis (2025) GLOBAL QUANTIFICATION OF FLARING AND OPERATIONAL PERFORMANCE OF LNG LIQUEFACTION PLANTS THROUGH SATELLITE ANALYTICS, Society of Petroleum Engineers (While often overlooked in reporting frameworks, LNG liquefaction plants flare 1.5–2 BCM of gas annually. This accounts for roughly 0.9% of all global flaring, occurring adjacent to monetization infrastructure where capture is most technically feasible.).

[93] International Energy Agency (2025) GLOBAL METHANE TRACKER, 38 ("Several solutions exist for reducing emissions in the downstream segment, and many companies are working to improve methane monitoring and reduce emissions. In 2024, for example, Cheniere Energy completed measurement studies and set a target for annual methane emissions intensity of 0.03% per tonne of LNG produced. Terega, which manages more than 5 000 km of pipelines in France, reported a 36% reduction in methane emissions from 2017 levels. If all the abatement technologies available today were to be deployed at natural gas processing and transport facilities, the global average methane intensity of downstream natural gas operations would fall from more than 0.4% to below 0.2%.").

[94] Clean Air Task Force, *Oil and Gas Mitigation Program* (*last visited* 5 February 2023) ("Venting is even more harmful than flaring, since methane warms the climate so powerfully, and VOC [volatile organic compounds] and toxic pollutants are released unabated. Venting of this gas should be prohibited in all cases as an absolutely unnecessary source of harmful air pollution. There are numerous low-cost (and usually profitable) ways to utilize natural gas from oil wells. Flaring should be a last resort: only in the most extreme cases should oil producers be allowed to flare gas, and it should be strictly a temporary measure. Rules prohibiting venting of natural gas can easily reduce emissions by 95%.").

[95] Global Flaring and Methane Reduction Partnership (2026) GLOBAL GAS FLARING TRACKER REPORT, 21 ("Key Findings 1. Global gas flaring increased from 157 bcm in 2024 to 167 bcm in 2025, a 6 percent increase, the highest level since 2019 and the third consecutive annual increase, while oil production grew by only 3.3 percent, meaning flaring rose at a faster rate than output. 2. Flaring volumes in 2025 were larger than LNG exports via the Strait of Hormuz, and matched Africa's annual gas consumption. […] 5. The gas flared in 2025 was worth an estimated US$54 billion, roughly three quarters of the estimated cost of ending routine flaring entirely. Yet despite the tools needed to end routine flaring being well established, it persists; what holds back progress is not technical but structural — inadequate regulation, insufficient capital, limited market infrastructure, and a failure by operators and governments to treat reduction as a priority.")

[96] Global Flaring and Methane Reduction Partnership (2026) GLOBAL GAS FLARING TRACKER REPORT, 21 ("Key Findings 1. Global gas flaring increased from 157 bcm in 2024 to 167 bcm in 2025, a 6 percent increase, the highest level since 2019 and the third consecutive annual increase, while oil production grew by only 3.3 percent, meaning flaring rose at a faster rate than output. 2. Flaring volumes in 2025 were larger than LNG exports via the Strait of Hormuz, and matched Africa's annual gas consumption. […] 5. The gas flared in 2025 was worth an estimated US$54 billion, roughly three quarters of the estimated cost of ending routine flaring entirely. Yet despite the tools needed to end routine flaring being well established, it persists; what holds back progress is not technical but structural — inadequate regulation, insufficient capital, limited market infrastructure, and a failure by operators and governments to treat reduction as a priority.")

[97] Global Gas Flaring Reduction Partnership (2016) GAS FLARING DEFINITIONS, 1-2 ("
1. ROUTINE FLARING
DEFINITION
- Routine flaring of gas at oil production facilities is flaring during normal oil production operations in the absence of sufficient facilities or amenable geology to re-inject the produced gas, utilize it on-site, or dispatch it to a market.
- Routine flaring does not include safety flaring, even when continuous.

EXAMPLES
- Flaring from oil/gas separators;
- Flaring of gas production that exceeds existing gas infrastructure capacity;
- Flaring from process units such as oil storage tanks, tail gas treatment units, glycol dehydration facilities, produced water treatment facilities, except where required for safety reasons.

2. SAFETY FLARING
DEFINITION
Safety flaring of gas is flaring to ensure safe operation of the facility.
EXAMPLES
- Gas stemming from an accident or incident that jeopardizes the safe operation of the facility;
- Blow-down gas following emergency shutdown to prevent over-pressurization of all or part of the process system;
- Gas required to maintain the flare system in a safe and ready condition (purge gas / make-up gas / fuel gas);
- Gas required for a flare's pilot flame;
- Gas produced as a result of specific safety-related operations, such as safety testing, leak testing, or emergency shutdown testing;
- Gas containing H2S, including the volume of gas added to ensure good dispersion and combustion;
- Gas containing high levels of volatile organic compounds other than methane.

3. NON-ROUTINE FLARING
DEFINITION
- Non-routine flaring of gas is all flaring other than routine and safety flaring.
- Non-routine flaring is typically intermittent and of short duration. It iseither planned or unplanned.
EXAMPLES
- Temporary (partial) failure of equipment that handles the gas during normal operations, until their repair or replacement, e.g. failure of compressors, pipeline, instrumentation, controls;
- Temporary failure of a customer's facilities that prevents receipt of the gas;
- Initial plant/field startup before the process reaches steady operating conditions and/or before gas compressors are commissioned;
- Startup following facility shutdowns;
- Scheduled preventive maintenance and inspections;
- Construction activities, such as tie-ins, change of operating conditions, plant design modifications;
- Process upsets when process parameters fall outside the allowable operating or design limits and flaring is required to stabilize the process again;
- Reservoir or well maintenance activities such as acidification, wire line interventions;
- Exploration-, appraisal-, or production-well testing or cleanup following drilling or well work-over.").

[98] Pomerantz D. (22 July 2024) *When flaring's not an option: What to do with associated gas?*, SLB 100 ("It may look mysterious, but it actually covers options using a bunch of technologies that are being deployed more and more often. "Other useful purpose" refers to converting the associated gas to another commodity such as fuels, for example, compressed natural gas (CNG) or synthetic crude oil chemical feedstocks, for example, hydrogen or methanol raw material, for example, carbon fiber or fertilizer").

[99] MethaneSAT, *Project Update* (*last visited* 12 February 2026) ("Low-producing wells contribute an outsized share of emissions: Using MethaneSAT's unique high precision, high resolution measurements, we calculate that 40 percent of methane emissions in production-only portions of eight top oil and gas basins in the U.S. came from areas responsible for less than seven percent of production."). *See also* Williams P.J. et al. (2026) *Methane intensity and emissions across major oil and gas basins and individual jurisdictions using MethaneSAT observations*, ACP, 26, 5961-5981 (estimating that New Mexico's loss rate falling from roughly 4.5% in 2019 to 2.1% in 2023, a decline researchers tie in part to state rules requiring operators to cut methane intensity below 2% by 2026).

[100] Environmental Defense Fund, *MethaneSAT observations reveal lower methane intensity in New Mexico's Permian Basin associated with emissions control* (*last visited* 1 June 2026) ("According to nine separate observations collected and aggregated, during 2024-2025, across the Permian Basin that includes the Delaware Sub-Basin, the methane intensity in New Mexico is around 1.2%, whereas in Texas it is 3.1%. Methane intensity is the amount of methane emitted compared to the amount of gas that is produced and sold. It is an accepted industry standard for tracking and analyzing methane performance.").

[101] Environmental Defense Fund, *MethaneSAT observations reveal lower methane intensity in New Mexico's Permian Basin associated with emissions control* (*last visited* 1 June 2026) ("According to nine separate observations collected and aggregated, during 2024-2025, across the Permian Basin that includes the Delaware Sub-Basin, the methane intensity in New Mexico is around 1.2%, whereas in Texas it is 3.1%. Methane intensity is the amount of methane emitted compared to the amount of gas that is produced and sold. It is an accepted industry standard for tracking and analyzing methane performance.").

[102] Environmental Defense Fund. *MethaneSAT observations reveal lower methane intensity in New Mexico's Permian Basin associated with emissions control* (*last visited* 1 June 2026) ("Since 2020, oil and gas production in this region of the Permian has increased ~20% in Texas and more than 100% in New Mexico. Both regions have young well populations — about 40% under five years old — which account for 70% of current production. Total gas production was also closely aligned, suggesting that other mechanisms, beyond production characteristics, likely explain the observed differences in methane intensities. Researchers associate this to the implementation of effective emissions reduction strategies, which New Mexico began implementing in 2021 under the leadership of Gov. Michelle Lujan Grisham.").

[103] Environmental Defense Fund, *MethaneSAT observations reveal lower methane intensity in New Mexico's Permian Basin associated with emissions control* (*last visited* 1 June 2026) ("Based on this analysis, New Mexico's lower methane intensity generated an additional $125 million in natural gas captured annually, adding $27 million in royalties and revenue for taxpayers.").

[104] Environmental Defense Fund, *MethaneSAT observations reveal lower methane intensity in New Mexico's Permian Basin associated with emissions control* (*last visited* 1 June 2026) ("Although methane intensity in the Delaware Sub-Basin is significantly lower in New Mexico than in Texas, at more than 1% it is still appreciably high. Continued efforts are needed to reduce intensity down to 0.2% of production in order to align oil and gas industry commitments. Cumulatively, it is estimated that the Permian Basin emits approximately 440 metric tons of oil and gas methane per hour. This equates to more than $577 million of wasted gas and ranks the Permian as the most wasteful oil- and gas-producing region in the country.").

[105] Dwayn P., Gauthier K., Gordon D., Chaney C., Schmeisser L., & Calderwood C. (16 March 2025) *Drilling Down on Methane Loss A framework for correcting self-reported oil and gas data finds that, in Texas, significantly more methane is wasted than is currently recorded — and this may be common practice elsewhere*, RMI ("Texas requires oil and gas operators to report information about how much gas they vent and flare each month. These self-reported figures form the official record of how much gas is wasted in the state. But when we analyzed a 12-month subset of data in Texas ending late 2024, we found that the reported numbers did not add up. Operators self-reported about 120 billion cubic feet (Bcf) of gas vented and flared during our study period. However, our analysis suggests the true total may be as high as 551 Bcf — four and a half times higher. Most of the difference appears to come from underreported venting of gas. This gap represents both environmental harm and economic loss. If up to 551 Bcf of gas was wasted, that translates to 7.6 million metric tons of methan e emissions. To put this in perspective, the natural gas wasted in Texas in a single year had greenhouse gas emissions equivalent to 100 million cars, SUVs, and pickups — 40% of the light-duty vehicles driven in the US in 2024.").

[106] Purvis Dwayn, Gauthier K., Gordon D., Chaney C., Schmeisser L., & Calderwood C. (16 March 2025) *Drilling Down on Methane Loss A framework for correcting self-reported oil and gas data finds that, in Texas, significantly more methane is wasted than is currently recorded — and this may be common practice elsewhere*, RMI ("Texas requires oil and gas operators to report information about how much gas they vent and flare each month. These self-reported figures form the official record of how much gas is wasted in the state. But when we analyzed a 12-month subset of data in Texas ending late 2024, we found that the reported numbers did not add up. Operators self-reported about 120 billion cubic feet (Bcf) of gas vented and flared during our study period. However, our analysis suggests the true total may be as high as 551 Bcf — four and a half times higher. Most of the difference appears to come from underreported venting of gas. This gap represents both environmental harm and economic loss. If up to 551 Bcf of gas was wasted, that translates to 7.6 million metric tons of methan e emissions. To put this in perspective, the natural gas wasted in Texas in a single year had greenhouse gas emissions equivalent to 100 million cars, SUVs, and pickups — 40% of the light-duty vehicles driven in the US in 2024.").

[107] Dwayn P., Gauthier K., Gordon D., Chaney C., Schmeisser L., & Calderwood C. (16 March 2025) *Drilling Down on Methane Loss A framework for correcting self-reported oil and gas data finds that, in Texas, significantly more methane is wasted than is currently recorded — and this may be common practice elsewhere*, RMI ("Most of the difference appears to come from underreported venting of gas.").

[108] Dwayn P., Gauthier K., Gordon D., Chaney C., Schmeisser L., & Calderwood C. (16 March 2025) *Drilling Down on Methane Loss A framework for correcting self-reported oil and gas data finds that, in Texas, significantly more methane is wasted than is currently recorded — and this may be common practice elsewhere*, RMI ("As a second pattern, with or without consideration of unreported gas releases, the exhibit above demonstrates the large and inherent discrepancy between the economically driven treatment of methane loss from oil wells and gas wells. When gas is the primary product of commerce, much less of it is wasted. Among wells that produce more oil, gas is more disposable. Consequently, it is not a measure of progress to say that gas-dominated operations more regularly meet waste targets. Combining oil and gas wells together to measure overall performance can distort the outcome as intrinsically low-emission production dilutes and obscures a high methane emissions subset. If the segments in the exhibit above were measured by produced oil volume instead of wells, then the segment measuring implied waste would show 3.4% of oil produced in the state comes from leases without any reported gas production. This implies a strong dependence of emissions on oil production rate, and Exhibit 4 below demonstrates this major observation by breaking down the emissions intensity of oil leases by their daily oil production rate. Each bar in the graph below represents a different range of oil and gas production rates, and the ranges scale exponentially. The color-coding and segment proportions are the same as Exhibit 3. It demonstrates that the incomplete and geologically implausible production of gas becomes more prevalent as lease production rate decreases. Below about 10 barrels of oil per day (bopd), more than half of the wells in the state are not selling gas.").

[109] Williams J. P., Omara M., Himmelberger A., Zavala-Araiza D., MacKay K., Benmergui J., Sargent M., Wofsy S. C., Hamburg S. P., & Gautam R. (2025) *Small emission sources in aggregate disproportionately account for a large majority of total methane emissions from the US oil and gas sector,* ATMOS. CHEM. PHYS. 25(3): 1513–1532, 1528 ("In conclusion, our work highlights several key aspects of oil–gas methane emission rate distribution curves in the CONUS for 2021, which include the following:

1. A large majority (70 %) of total national continental oil–gas methane emissions in the US originate from lower-emitting facilities (<100kgh^{-1}).
2. Emission rate distributions vary among different oil–gas basins, but among the top nine producing basins we consistently find that most methane emissions (60 %–86 %) originate from oil–gas facilities emitting at rates <100kgh^{-1}.
3. Production well sites were found to be responsible for 70 % of regional oil–gas methane emissions, from which the sites that accounted for only 10 % of national oil and gas production in 2021 disproportionately accounted for 67 %–90 % of the total well site emissions.
4. Our results were consistently found to be in close agreement with those from independent aerial/satellite remote sensing estimates, both in comparing contributions from discrete emission rate thresholds and continuous emission distribution curves, emphasizing the importance of the large majority contribution of small emitting methane sources to total oil–gas methane emissions.

Our results highlight and quantify the significant contributions of the large number of low-emitting oil–gas facilities to total regional, basin, or local oil–gas methane emissions in the CONUS for 2021. In addition to the CONUS, the small oil–gas methane sources are likely a significant component of total regional emissions in other countries as well, as recent data suggest from Romania and Canada (Stavropoulou et al., 2023; Tyner and Johnson, 2021); this would need to be further investigated to build a comprehensive assessment of small emitting methane emissions and their relative contributions to total oil–gas methane emissions globally. This work emphasizes the need for multi-scale approaches to quantify total regional oil–gas methane emissions and at the same time to characterize and account for the large contribution from small emission sources dispersed across a wide area, in addition to incorporating data on high-emitting point sources for producing overall robust methane emission quantification.").

[110] Alvarez R. A., *et al.* (2018) *Assessment of methane emissions from the U.S. oil and gas supply chain*, SCIENCE 361(6398): 186–188, 186 ("Methane emissions from the U.S. oil and natural gas supply chain were estimated by using ground-based, facility-scale measurements and validated with aircraft observations in areas accounting for ~30% of U.S. gas production. When scaled up nationally, our facility-based estimate of 2015 supply chain emissions is 13 ± 2 teragrams per year, equivalent to 2.3% of gross U.S. gas production. This value is ~60% higher than the U.S. Environmental Protection Agency inventory estimate, likely because existing inventory methods miss emissions released during abnormal operating conditions. Methane emissions of this magnitude, per unit of natural gas consumed, produce radiative forcing over a 20-year time horizon comparable to the CO_2 from natural gas combustion. Substantial emission reductions are feasible through rapid detection of the root causes of high emissions and deployment of less failure-prone systems.").

[111] Chen Y., Sherwin E.D., Berman E.S.F., Jones B.B., Gordon M.P., Wetherley E.B., Kort E.A., & Brandt A.R. (2022) *Quantifying Regional Methane Emissions in the New Mexico Permian Basin with a Comprehensive Aerial Survey*, ENVIRON. SCI. TECHNOL. 57(7): 4317-4323, 4321 ("Compared to an EPA GHGI estimate aligned to our study area and time period (Figure 4a), this study suggests total methane emissions from upstream and midstream O&G activities in the New Mexico Permian to be 6.5 (+2.4/–2.3) times larger. It is important to explore further a key strength of our method compared to prior bottom-up studies: very large study sample size. We explore this by simulating the impact of small sample sizes on total emissions estimates (Figure 4b).").

[112] Lauvaux T., Giron C., Mazzolini M., d'Aspremont A., Duren R., Cusworth D., Shindell D., & Ciais P. (2022) *Global assessment of oil and gas methane ultra-emitters*, SCIENCE 375(6580): 557–561, 557 ("Ultra-emitters are primarily detected over the largest O&G basins throughout the world. With a total contribution equivalent to 8 to 12% (~8 million metric tons of methane per year) of the global O&G production methane emissions, mitigation of ultra-emitters is largely achievable at low costs and would lead to robust net benefits in billions of US dollars for the six major O&G-producing countries when considering societal costs of methane.").

[113] Lauvaux T., Giron C., Mazzolini M., d'Aspremont A., Duren R., Cusworth D., Shindell D., & Ciais P. (2022) *Global assessment of oil and gas methane ultra-emitters*, SCIENCE 375(6580): 557–561, 557 ("Ultra-emitters are primarily detected over the largest O&G basins throughout the world. With a total contribution equivalent to 8 to 12% (~8 million metric tons of methane per year) of the global O&G production methane emissions, mitigation of ultra-emitters is largely achievable at low costs and would lead to robust net benefits in billions of US dollars for the six major O&G-producing countries when considering societal costs of methane.").

[114] East J. D., Jacob D. J., Jervis D., Balasus N., Estrada L. A., Hancock S. E., Sulprizio M. P., Thomas J., Wang X., Chen Z., Varon D. J., & Worden J. R. (2025) *Worldwide inference of national methane emissions by inversion of satellite observations with UNFCCC prior estimates*, NAT COMMUN 16(1): 11004, 1 ("Here we optimize 2023 national emissions at up to 25 km grid resolution for 161 countries with a globally consistent opensource framework for inverse analysis of Tropospheric Monitoring Instrument (TROPOMI) satellite observations, using UNFCCC reports for prior estimates together with point source information from GHGSat and other satellites. We find global anthropogenic emissions to be 15% higher than UNFCCC reporting (32% for oil-gas), with national emissions more than 50% higher than reporting for a quarter of the countries."). *See also* International Energy Agency (2025) GLOBAL METHANE TRACKER 2025, 4 ("As more measured data has become available, it appears that most national inventories are underreporting emissions: our estimate of total energy-related methane emissions globally is about 80% higher than the total reported by countries to the UN Framework Convention on Climate Change (UNFCCC). This gap is narrowest in Europe, where countries regularly submit inventories and some producers report emissions based on measured data.").

[115] Shen L., Jacob D. J., Gautam R., Omara M., Scarpelli T. R., Lorente A., Zavala-Araiza D., Lu X., Chen Z., & Lin J. (2023) *National quantifications of methane emissions from fuel exploitation using high resolution inversions of satellite observations*, NAT. COMMUN. 14(4948): 1–9, 1 ("We find global emissions of 62.7 ± 11.5 (2σ)Tga−1 for oil-gas and 32.7 ± 5.2 Tg a−1 for coal. Oil-gas emissions are 30% higher than the global total from UNFCCC reports, mainly due to under-reporting by the four largest emitters including the US, Russia, Venezuela, and Turkmenistan. Eight countries have methane emission intensities from the oil-gas sector exceeding 5% of their gas production (20% for Venezuela, Iraq, and Angola), and lowering these intensities to the global average level of 2.4% would reduce global oil-gas emissions by 11 Tg a−1 or 18%.").

[116] UCLA's STOP METHANE PROJECT (14 November 2025) *Spotlight on the Top 25 Plumes in '25: Oil and Gas Sector* ("The 2025 data show more than 3,100 methane plumes observed at more than 1,900 oil and gas sector sites, worldwide. These are sites in dozens of countries of all income levels and in all world regions. The sources on our "Top 25" list are responsible for the most acute hourly emission rates seen by these instruments globally – with emission rates ranging from 3.7 to 10 tons of methane per hour. Notably, the sources on this Top 25 list are concentrated in just a few countries, with the majority of the list consisting of oil and gas sites in Turkmenistan. Top 25 sites are also located in Venezuela, Iran, Pakistan, and the United States."

[117] RMI, *Profiling Supply Chain Emissions* (*last visited* 5 February 2023) ("Russian Federation Astrakhanskoye Total Emissions Intensity 1,060 kg CO_2 eq./barrel oil equivalent; Turkmenistan South Caspian Basin Total Emissions Intensity 1,010 kg CO_2 eq./barrel oil equivalent; United States Permian TX Total Emissions Intensity 908 kg CO_2 eq./barrel oil equivalent"). *See also* Malik N. S. (23 June 2022) *World's Dirtiest Oil and Gas Fields Are in Russia, Turkmenistan and Texas*, BLOOMBERG (Graph, "The Worst Offenders"); *and* Gordon D., Koomey J., Brandt A., & Bergerson J. (2022) KNOW YOUR OIL AND GAS: *GENERATING CLIMATE INTELLIGENCE TO CUT PETROLEUM INDUSTRY EMISSIONS*, RMI.

[118] Dreyfus G. & Ferris T. (2023) *Metrics and Measurement of Methane Emissions*, *in* INNOVATIVE TECHNOLOGIES FOR GREENHOUSE GAS EMISSIONS AND CARBON SEQUESTRATION MONITORING, China Council for International Cooperation on Environment and Development, 32 ("Direct measurement and verification are essential to accurate and credible emissions quantification. A key challenge in the methane monitoring space in the O&G sector is integrating different measurement and monitoring techniques and approaches to provide accurate, comprehensive, and timely quantification of emissions with source attribution. Multiple research efforts are underway to develop methodologies for integrating bottom-up and top-down approaches to address this challenge (e.g., Energy Emissions Modeling and Data Lab, Veritas). In June, MiQ-Highwood released an index for integrating inventory and direct measurement data for national-level emissions intensity quantification."). *See also* Tibrewal K., *et al.* (2024) *Assessment of methane emissions from oil, gas and coal sectors across inventories and atmospheric inversions*, COMMUN. EARTH ENVIRON. 5: 1–12, 1 ("Larger disagreement in emissions exists for the oil/gas sector across the inventories compared to coal, arising mostly from disparate data sources for emission factors. Moreover, emissions reported to the United Nations Framework Convention on Climate Change are lower than other bottom-up and inversion estimates, with many countries lacking reporting in the past decades."), 8 ("Overall, total fossil emissions averaged over 2011–2020 from bottom-up inventories is within the range estimated by atmospheric inversions for countries examined here. Disagreements largely arise from the oil and gas sector, in both emissions magnitudes averaged over the last decade (2011–2020) and trends from 2000 to 2020. Disagreements exist not only between estimates from bottom-up inventories and inversions but also among the various bottom-up inventories. For Russia, Kazakhstan, Iran and countries under Arabian Peninsula, the spread of the bottomup inventories is larger than that of atmospheric inversions. Given the large contribution from fossil sectors to global methane emissions, using a single inventory may overestimate or underestimate the evaluation of future emissions reductions under methane pledge."). *See generally* Daniels S.W., Wang J.L., Ravikumar A.P., Harrison M., Roman-White S.A., George F.C., & Hammerling D.M. (2023) *Toward Multiscale Measurement-Informed Methane Inventories: Reconciling Bottom-Up Site-Level Inventories with Top-Down Measurements Using Continuous Monitoring Systems*, ENVIRON. SCI. TECHNOL. 57(32): 11823–11833, 11823 ("Government policies and corporate strategies aimed at reducing methane emissions from the oil and gas sector increasingly rely on measurement-informed, site-level emission inventories, as conventional bottom-up inventories poorly capture temporal variability and the heavy-tailed nature of methane emissions. This work is based on an 11-month methane measurement campaign at oil and gas production sites. We find that operator-level top-down methane measurements are lower during the end-of-project phase than during the baseline phase. However, gaps persist between end-of-project top-down measurements and bottom-up site-level inventories, which we reconcile with high-frequency data from continuous monitoring systems (CMS). Specifically, we use CMS to (i) validate specific snapshot measurements and determine how they relate to the temporal emission profile of a given site and (ii) create a measurement-informed, site-level inventory that can be validated with top-down measurements to update conventional bottom-up inventories. This work presents a real-world demonstration of how to reconcile CMS rate estimates and top-down snapshot measurements jointly with bottom-up inventories at the site level. More broadly, it demonstrates the importance of multiscale measurements when creating measurement-informed, site-level emission inventories, which is a critical aspect of recent regulatory requirements in the Inflation Reduction Act, voluntary methane initiatives such as the Oil and Gas Methane Partnership 2.0, and corporate strategies.").

[119] Capterio (2026) OUT OF BOUNDS, OUT OF REPORT: THE NON–OPERATED PROBLEM AND HOW TO FIX IT, 2 ("So-called "non-operated assets" account for roughly half of oil and gas production for many leading companies, yet remain a major blind spot in emissions oversight. Limited data access, inconsistent reporting and challenged governance mean flaring and associated emissions are often systematically underreported.").

[120] Capterio (2026) OUT OF BOUNDS, OUT OF REPORT: THE NON–OPERATED PROBLEM AND HOW TO FIX IT, 4 ("To quantify the gap, Capterio examined 2024 data for the top 20 flaring assets globally in which at least one Oil and Gas Climate Initiative company (OGCI)4 held an equity stake. According to the World Bank, these fields flared 12.5 BCM of gas in 2024, equivalent to around $2 billion in lost revenue. We then assessed how much of this volume should have been reported by the operator, either through the World Bank's Zero Routine Flaring (ZRF5)by 2030 initiative, OGCI disclosures or the Oil and Gas Decarbonisation Charter (OGDC6).").

[121] Capterio (2026) OUT OF BOUNDS, OUT OF REPORT: THE NON–OPERATED PROBLEM AND HOW TO FIX IT, 4 ("To quantify the gap, Capterio examined 2024 data for the top 20 flaring assets globally in which at least one Oil The results are stark. At best, less than half of the flared volume appears to be reported and, under some frameworks, coverage falls below one-third (Figure 2). Specifically, because only 12 of the 20 operators of the Top 20 fields participate in either the World Bank's Zero Routine Flaring initiative or the OGCI/OGDC frameworks, our analysis indicates that only around 5.8 BCM, or 46% of the total 12.5 BCM flared in 2024, can

reasonably be expected to be reported. In other words, more than half of the flared volume associated with the OGCI's Top 20 assets is not captured by any reporting framework.

Coverage is lower still when assessed against individual initiatives: 44% of volume is reported to the World Bank framework, 39% to OGCI/OGDC, and only 29% to OGMP. These gaps are not the result of immaterial emissions, nor do they depend on the underlying flaring intensity of the assets. Rather, they arise because, in many cases, the operator, often a joint venture or national oil company, either has no formal reporting obligation or does not consider itself bound by one. While this analysis uses a limited dataset, the pattern is consistent with our wider experience.").

[122] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 21 (Refer to table ES 1 on page 21.).

[123] Gordon D., Reuland F., Jacob D. J., Worden J. R., Shindell D., & Dyson M. (2023) *Evaluating net life-cycle greenhouse gas emissions intensities from gas and coal at varying methane leakage rates*, ENVIRON. RES. LETT. 18(8): 1–10, 2 ("Methane can be emitted from both coal and gas operations, including coal mines and conventional and unconventional gas systems. Unconventional gas includes coalbed methane (CBM), a production method that taps coal seams. Coal mine methane (CMM) is attributed to coal production systems, while leakage from CBM is attributable to gas supply chains."). For best practice on managing and mitigating coal mine methane, *see* United Nations Economic Commission for Europe (2021) BEST PRACTICE GUIDANCE FOR EFFECTIVE MANAGEMENT OF COAL MINE METHANE AT NATIONAL LEVEL.

[124] Gordon D., Reuland F., Jacob D. J., Worden J. R., Shindell D., & Dyson M. (2023) *Evaluating net life-cycle greenhouse gas emissions intensities from gas and coal at varying methane leakage rates*, ENVIRON. RES. LETT. 18(8): 1–10, 2 ("Methane can be emitted from both coal and gas operations, including coal mines and conventional and unconventional gas systems. Unconventional gas includes coalbed methane (CBM), a production method that taps coal seams. Coal mine methane (CMM) is attributed to coal production systems, while leakage from CBM is attributable to gas supply chains.").

[125] International Energy Agency (2022) GLOBAL METHANE TRACKER 2022, 29–30 ("In the IEA's Net Zero Emissions by 2050 Scenario, coal use drops by 55% from 2020 to 2030, and by almost 90% by 2050. This decline would significantly cut methane emissions from coal mines as well as emissions of CO_2 and other air pollutants; emissions reductions would be even larger if concentrated on the worst-performing coal assets. For example, removing the worst-performing quartile of production would remove around 25 Mt of methane while removing the best performing quartile would only remove about 4 Mt.").

[126] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 42 ("At over 40 million tonnes (Mt), methane emissions from coal are similar to oil. Although capturing and using methane is sometimes economically viable, in most cases the revenue earned would not justify the costs from a purely economic perspective."). *See generally* United Nations Economic Commission for Europe (2025) BEST PRACTICE GUIDANCE ON VENTILATION AIR METHANE (VAM) MITIGATION, 15 ("In 2024, the only technically and commercially proven type of technology to successfully process VAM emissions are Regenerative Thermal Oxidation (RTO) installations. They have proven capable of sustaining operations on methane concentrations as low as 0.2%, effectively handling typical operational swings in concentrations. In addition, when methane concentration is around +0.5% or more, RTO installations allow for utilization of the energy released in the VAM oxidation process as an extremely lean fuel for energy production"); 51 ("Experienced RTO providers typically expect around 98% cleaning efficiency and 96% availability (i.e., 4% downtime is reserved for service).").

[127] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 42 ("Even so, cutting these emissions remains a priority – especially for coking coal, which is harder to replace than steam coal and is often mined underground, where abatement is more feasible.").

[128] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 42 ("underground mines also have fewer potential point sources of emissions than surface mines or oil and gas operations. Monitoring equipment is already widely used in ventilation shafts for safety, making data easier to collect. That, in turn, can support mine-level plans to use or abate the gas.").

[129] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 107 ("Coal mining: pre-mining degasification; air methane oxidation with improved ventilation."). *See also* DeFabrizio S., Glazener W., Hart C.,

Henderson K., Kar J., Katz J., Pratt M. P., Rogers M., Tryggestad C., & Ulanov A. (2021) CURBING METHANE EMISSIONS: *HOW FIVE INDUSTRIES CAN COUNTER A MAJOR CLIMATE THREAT*, McKinsey Sustainability, 22 ("Levers such as full ventilation and degasification of underground mines are standard coal mine methane (CMM) abatement technology but would likely see adoption rates of only 0.5 to 1.0 percent by 2030 and 2 to 4 percent by 2050. Other levers—such as ventilation air methane (VAM) capture and utilization, capture of abandoned mine gas, degasification of surface mines, and predrainage of surface mine—are less technically challenging but are expensive. They could see 2 to 16 percent adoption rates in 2030, growing to 20 to 30 percent adoption rates by 2050."); *and* United States Environmental Protection Agency (2019) GLOBAL NON-CO_2 GREENHOUSE GAS EMISSION PROJECTIONS & MITIGATION 2015-2050, EPA-430-R-19-010, 14 ("In 2030, VAM oxidation is the leading emission abatement measure, but using degasification for power generation presents the largest abatement potential at prices below \$0/tCO_2e. The two technologies combined contribute 90% of potential abatement in 2030.").

[130] DeFabrizio S., Glazener W., Hart C., Henderson K., Kar J., Katz J., Pratt M. P., Rogers M., Tryggestad C., & Ulanov A. (2021) CURBING METHANE EMISSIONS: *HOW FIVE INDUSTRIES CAN COUNTER A MAJOR CLIMATE THREAT*, McKinsey Sustainability, 22 ("Levers such as full ventilation and degasification of underground mines are standard coal mine methane (CMM) abatement technology but would likely see adoption rates of only 0.5 to 1.0 percent by 2030 and 2 to 4 percent by 2050. Other levers—such as ventilation air methane (VAM) capture and utilization, capture of abandoned mine gas, degasification of surface mines, and predrainage of surface mine—are less technically challenging but are expensive. They could see 2 to 16 percent adoption rates in 2030, growing to 20 to 30 percent adoption rates by 2050."). *See also* United States Environmental Protection Agency (2019) GLOBAL NON-CO_2 GREENHOUSE GAS EMISSION PROJECTIONS & MITIGATION 2015-2050, EPA-430-R-19-010, 15 ("In 2030, the top 3 mitigation technologies globally are the use of stand-alone VAM, degasification for power generation, and degasification for pipeline injection. Using stand-alone VAM can abate up to 443 MtCO2e (76% of coal mining's total abatement potential), although it is one of the most expensive abatement options in coal mining because of three key factors: (1) the equipment itself is large and costly; (2) there is no revenue source; and (3) only a handful of technologies have been demonstrated at a commercial scale and, as such, economies of scale in production have not been realized. Technology improvements have the potential to reduce the costs of VAM oxidation technology, making more of the potential abatement economically feasible for mine operators.").

[131] Horner R. & Assan S. (2026) GLOBAL COAL MINE METHANE REVIEW 2026, EMBER, 45 ("4.3 Cutting coal mine methane in half would cost just 16% of annual industry profits Full abatement of coal mine methane would cost less than \$4 billion USD, spread across ventilation air methane (VAM) oxidation, drainage systems and other measures. Drainage systems stand out as the most cost-effective option, with the majority of their abatement potential available at no net cost. VAM oxidation requires the largest upfront investment but delivers the greatest overall emissions reductions.").

[132] Horner R. & Assan S. (2026) GLOBAL COAL MINE METHANE REVIEW 2026, EMBER, 46 ("The IEA estimates that investing roughly \$2.5 billion USD in VAM oxidation alone could cut CMM by 23.7% compared to 2024 emissions, reducing emissions by 9.5 million tonne"); 47 ("According to the IEA, drainage systems offer around 7,460 kilotonnes of abatement potential globally. Crucially, around 62% is available at negative net cost, meaning capture and utilisation generates more revenue than it costs to implement. This accounts for 95% of all negative cost abatement opportunities across the entire coal mine methane sector.").

[133] Horner R. & Assan S. (2026) GLOBAL COAL MINE METHANE REVIEW 2026, EMBER, 47 ("According to the IEA, drainage systems offer around 7,460 kilotonnes of abatement potential globally. Crucially, around 62% is available at negative net cost, meaning capture and utilisation generates more revenue than it costs to implement. This accounts for 95% of all negative cost abatement opportunities across the entire coal mine methane sector.").

[134] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 19 ("Emissions from abandoned coal mines amounted to around 4.5 Mt, with China accounting for 60% of the total.").

[135] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, Table 4.1 ("Coal mining: flooding abandoned mines.").

[136] United Nations Economic Commission for Europe (2019) BEST PRACTICE GUIDANCE FOR EFFECTIVE METHANE RECOVERY AND USE FROM ABANDONED COAL MINES, ECE Energy Series No. 64, iii ("Closed mines can provide a small but significant opportunity to exploit a clean energy resource, known as Abandoned Mine Methane (AMM), that can be extracted and used. AMM capture and use offers many benefits, such as improved

safety, air quality and health, energy supply and environmental performance. Technology exists that can recover methane from abandoned coal mines."); 3 ("Technologies and management practices allow methane from abandoned mines to be extracted, providing significant environmental, economic, social and public safety benefits. The methods for extracting gas from abandoned mines differ from those employed to capture and recover gas from working mines. Once a mine is sealed from the atmosphere, gas from all underground sources becomes potentially available for extraction at a single production location. Methane concentrations recovered from a well-sealed former gassy mine typically range from 15% to 90%, and with no oxygen. The other major gaseous components may be nitrogen, including de-oxygenated air, and carbon dioxide. Low concentrations of carbon monoxide and trace hydrocarbons such as ethane are sometimes present.").

[137] Assan S. and Liepa A. (2026) EU COAL MINES STILL VENT METHANE: SATELLITE FINDINGS FROM POLAND, Ember, 2 ("Methane reportedly vented from drainage systems - if captured - could keep 14.5 million Polish houses warm for a week. In 2024, Polish coal mines used 70% of captured drainage methane, emitting 57,000 unutilised tonnes to the atmosphere. This drainage gas, rich in methane, could instead be used as an energy source.").

[138] Zhu R., Khanna N., Gordon J., Dai F., & Lin J. (2023) ABANDONED COAL MINE METHANE REDUCTION: LESSONS FROM THE UNITED STATES, CALIFORNIA-CHINA CLIMATE INSTITUTE, 18 ("AMM can explode, posing hazards to residential and commercial buildings. AMM is also a precursor of air pollutants including volatile organic compounds, benzene (a carcinogen), and ozone. Mitigating AMM is therefore an important component of addressing health and safety issues on lands around abandoned coal mines, known as "abandoned mine lands" (AML)."). Note that this report focuses on U.S. federal and state examples of Abandoned Coal Mine Methane Regulation. For the Biden Administration's announcement of $725 million to fund the reclaiming of abandoned coal mine lands, as part of a broader total of $11.3 billion in abandoned mine land (AML) funding being provided over 15 years, *see* United States Department of the Interior (1 June 2023) *Biden-Harris Administration Announces Availability of $725 Million from Investing in America Agenda to Clean Up Legacy Pollution*, Press Release ("The Department of the Interior today announced that nearly $725 million from President Biden's Bipartisan Infrastructure Law is available to 22 states and the Navajo Nation to create good-paying jobs and catalyze economic opportunity by reclaiming abandoned coal mine lands. The law provides a total of $11.3 billion in abandoned mine land (AML) funding over 15 years, which will help communities clean up dangerous environmental conditions and pollution caused by past coal mining. This funding is expected to enable reclamation of the majority of current inventoried abandoned mine lands in this country.").

[139] For an overview of new measurement techniques and technologies in the oil and gas sector, *see generally* Dreyfus G. & Ferris T. (2023) *Metrics and Measurement of Methane Emissions*, *in* INNOVATIVE TECHNOLOGIES FOR GREENHOUSE GAS EMISSIONS AND CARBON SEQUESTRATION MONITORING, China Council for International Cooperation on Environment and Development.

[140] For an overview of new measurement techniques and technologies in the oil and gas sector, *see generally* Dreyfus G. & Ferris T. (2023) *Metrics and Measurement of Methane Emissions*, *in* INNOVATIVE TECHNOLOGIES FOR GREENHOUSE GAS EMISSIONS AND CARBON SEQUESTRATION MONITORING, China Council for International Cooperation on Environment and Development.

[141] Lee M. (25 October 2021) *The key for EPA rules? Inside the methane tech revolution*, E&E NEWS ("The laboratory, known as the Methane Emissions Technology Evaluation Center (METEC), was built five years ago at Colorado State University with a grant from the Energy Department. It has since become a central player in a boom of methane detection companies — a surge being driven partly by corporate pressure to cut emissions and looming EPA regulations. In the past four years, the number of such firms has doubled, with many testing their specialized drones and cutting-edge sensors on staged gas releases at METEC.").

[142] Coalition for LNG Emissions Abatement Toward Net-Zero (November 2025) ANNUAL REPORT, 20.

[143] *For example, see* Clarke A. (29 September 2023) *The Climate Sleuth Uncovering Methane Leaks for the United Nations*, BLOOMBERG ("The 27-year-old Ph.D. student isn't a detective but she may be the closest thing the world has to climate police. She's one of the world's foremost remote sensing scientists who uses satellite observations to identify some of the most damaging emissions.").

[144] Duran R. (2021) *Towards a multi-scale methane monitoring system of systems* (Carbon Mapper presentation at Day 2 of U.S. EPA Methane Detection Technology Workshop on August 24, 2021, starting at 5:05:00).

[145] National Academies of Sciences, Engineering, and Medicine (2022) GREENHOUSE GAS EMISSIONS INFORMATION FOR DECISION MAKING: A FRAMEWORK GOING FORWARD, The National Academies Press, 4 ("As more GHG emissions information becomes available and as more decision makers use this information, a common evaluation framework can help users determine what information products best meet their needs and understand the limitations of that information. A common framework can also provide guidance to researchers for designing more useful and trusted data and information. The Committee has identified six criteria or "pillars" that form a common framework to evaluate current and future GHG emissions information: 1. usability and timeliness: information is comparable and responsive to decision maker needs and available on timescales relevant to decision-making; 2. information transparency: information is both publicly available and traceable by anyone; 3. evaluation and validation: review, assessment, and comparison to independent datasets; 4. completeness: comprehensive spatial and temporal coverage of GHG emissions information; 5. inclusivity: who is involved in GHG emissions information creation and who is covered by the information; and 6. communication: methodologies and assumptions are described in understandable forms, well documented, and openly accessible.").

[146] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 37 ("Methane measurement, monitoring, reporting, and verification (MMRV) requirements are critical in order for governments and companies to understand the extent of their emissions profile, to monitor progress toward emissions reduction targets, and to design robust methane regulations. In this respect, MMRV requirements are an information-based regulatory approach, where regulated entities must quantify their emissions, either by measuring or estimating, and then report that data to the regulator").

[147] *See generally* International Energy Agency (2021) DRIVING DOWN METHANE LEAKS FROM THE OIL AND GAS INDUSTRY: A REGULATORY ROADMAP AND TOOLKIT.

[148] Mohlin, K. et al. (2022), *Policy instrument options for addressing methane emissions from the oil and gas sector*, ENVIRONMENTAL DEFENSE FUND, ("For any policy instrument such as a methane emission fee or a methane emission performance standard that, in contrast to the work practice and technology standards discussed in Section 2, is based on quantities of methane emissions, a methodology for the quantification of these emissions needs to be adopted. To enable the implementation of such policy instruments, this methodology also needs to be codified as a regulation for mandatory methane monitoring, reporting, and verification (MRV) that specifies how entities responsible for methane emissions should measure and report their emissions to the authorities. Such a supporting MRV regulation is a necessary prerequisite for any of the policy instruments discussed in Section 4. To be able to track sector-wide methane emissions, a measurement-based MRV regulation would ideally obligate all entities along the oil and gas supply chain to report their methane emissions to the relevant regulatory agency. A robust measurement-based methane MRV regulation would thereby not only enable new policy instrument options, but also provide the opportunity to improve national GHG inventory data, which for methane are currently largely based on calculations using static emission factors (which in turn are multiplied by activity or component data to arrive at emission estimates). Static emissions factors are known to be both inaccurate and imprecise (Lackner et al., 2021) and typically result in underestimated emission estimates. Several empirical studies of U.S. methane emissions, for instance, indicate that the EPA Greenhouse Gas Reporting Program (GHGRP), which requires firms to estimate and report methane emissions from individual components (EPA, 1996), underestimates production emissions by as much as half of the actual total — and are extremely imprecise (Allen, 2014; Brandt et al., 2014; Zavala-Araiza et al., 2015; Alvarez et al., 2018).").

[149] *See generally* International Energy Agency (2021) DRIVING DOWN METHANE LEAKS FROM THE OIL AND GAS INDUSTRY: A REGULATORY ROADMAP AND TOOLKIT.

[150] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 40 ("Governments should require the installation of metering systems for emissions sources where possible (e.g. flow meters on vent heads) while for non-metered sources emissions should be calculated based on emission factors. For example, in Alberta, Directive 060 provides that methane emissions may be quantified using continuous metering, periodic testing, or estimates based on accepted engineering practices.")

[151] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 40 ("Governments should require the installation of metering systems for emissions sources where possible (e.g. flow meters on vent heads) while for non-metered sources emissions should be calculated based on emission factors. For example, in Alberta, Directive 060 provides that methane emissions may be quantified using continuous metering, periodic testing, or estimates based on accepted engineering practices.")

[152] OGMP2.0 (last visited 19 December 2025), Frequently Asked Questions ("Level 5 should be reported at the asset level, with facility information, as the reconciliation of source-level quantification and site-level measurements will be done for a specific facility. Site-level measurements will be performed in a representative sample of facilities. Findings and lessons learned will be extrapolated to ensure the completeness of the reporting in similar assets.")

[153] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 38 (In terms of existing reporting standards and templates, UNEP's Oil & Gas Methane Partnership 2.0 (OGMP 2.0) represents the only comprehensive measurement-based reporting framework covering all material sources of methane emissions, from both operated and non-operated assets across all segments of the value chain. OGMP 2.0 sets out a framework for its member companies to report annually on their methane emissions (Scope 1) based on direct measurements, as opposed to using generic emission factors. However, reporting at OGMP 2.0 Level 3 involves the development of granular equipment inventory, with the estimation of asset-level emissions through the use of generic, but source-specific emission factors – an important first step – particularly for under-resourced developing countries and which can provide a basis for future measurements to be prioritised. OGMP 2.0 includes not only a company's operated assets, but also its joint ventures (UNEP, 2023[4]) – see Table 2.1 for an overview of OGMP 2.0 Reporting Levels.)

[154] Shen L., Jacob D. J., Gautam R., Omara M., Scarpelli T. R., Lorente A., Zavala-Araiza D., Lu X., Chen Z., & Lin J. (2023) *National quantifications of methane emissions from fuel exploitation using high resolution inversions of satellite observations*, NAT. COMMUN. 14(4948): 1 ("National emission inventories submitted by individual countries to the United Nations Framework Convention on Climate Change (UNFCCC) under the Paris Agreement follow bottom-up approaches in which emission factors are applied to activity data, sometimes with additional facility-specific information. But these national inventories are typically uncertain by a factor of two or more6 and often by more than an order of magnitude for the oil-gas sector5. This uncertainty hinders the setting and tracking of mitigation goals for methane emissions. Top-down approaches apply inverse methods to infer emissions from measurements of atmospheric methane. They use prior information from the bottom-up inventories and provide an independent way of improving these inventories.").

[155] *See generally* UC Berkeley Center for Law, Energy & the Environment & UCLA School of Law Emmet Institute on Climate Change & the Environment (2025) HUNTING METHANE USING SATELLITES A GUIDE FOR POLICYMAKERS, 6, 18

[156] UC Berkeley Center for Law, Energy & the Environment & UCLA School of Law Emmet Institute on Climate Change & the Environment (2025) HUNTING METHANE USING SATELLITES A GUIDE FOR POLICYMAKERS, 9 ("Methane monitoring satellites vary in their spatial coverage and resolution. There are two main classes of satellites: 1. Point source imagers, like GHGSat and Carbon Mapper, identify and quantify emissions from specific sources (e.g., a given facility). 2. Area flux mappers, such as MethaneSAT, Sentinel-5P, and GOSAT, are designed to measure average methane concentrations over large areas, providing a broad understanding of methane emissions across regions (e.g., the Permian Basin in the United States). Point source imagers allow observers to identify leaks, accidents, and new sources of methane from individual sources such as oil and gas facilities and landfills—or to verify that previously detected leaks have been fixed. Within the limits of their orbital flight path, they can be aimed to measure emissions from specific locations. Area flux mappers are best used to estimate emissions at larger regional or jurisdictional levels, across broader swaths of territory. Area flux mappers can be very accurate in estimating total methane abundance in a given area. When flown over the same region repeatedly, these systems can track changes in total emissions resulting from policy, management, or other factors").

[157] UC Berkeley Center for Law, Energy & the Environment & UCLA School of Law Emmet Institute on Climate Change & the Environment (2025) HUNTING METHANE USING SATELLITES A GUIDE FOR POLICYMAKERS, 9 ("Methane monitoring satellites vary in their spatial coverage and resolution. There are two main classes of satellites: 1. Point source imagers, like GHGSat and Carbon Mapper, identify and quantify emissions from specific sources (e.g., a given facility). 2. Area flux mappers, such as MethaneSAT, Sentinel-5P, and GOSAT, are designed to measure average methane concentrations over large areas, providing a broad understanding of methane emissions across regions (e.g., the Permian Basin in the United States). Point source imagers allow observers to identify leaks, accidents, and new sources of methane from individual sources such as oil and gas facilities and landfills—or to verify that previously detected leaks have been fixed. Within the limits of their orbital flight path, they can be aimed to measure emissions from specific locations. Area flux mappers are best used to estimate emissions at larger regional or jurisdictional levels, across broader swaths of territory. Area flux mappers can be very accurate in estimating total methane abundance in a given area. When flown over the same region repeatedly, these systems can track changes in total emissions resulting from policy, management, or other factors").

[158] *See generally* United Nations Environment Programme (2025) AN EYE ON METHANE 2025: FROM MEASUREMENT TO MOMENTUM, 17-25.

[159] United Nations Environment Programme (2025) AN EYE ON METHANE 2025: FROM MEASUREMENT TO MOMENTUM, 18, 36 (Eye On Methane data platform). ("IMEO has deployed artificial intelligence (AI) to allow timely analysis of this vast amount of data. To date, this has allowed MARS to process over 200,000 satellite images3 in 2025—a task that would've taken far longer if performed without the use of specially trained AI algorithms backed by human validation.").

[160] Carbon Mapper, Product Guide: Data Definition & Specification (*lasted visited* 22 December 2025) ("Carbon Mapper is a non-profit organization developing a global observation system to monitor large-scale, human-caused methane and carbon dioxide emissions. We are supported by a unique coalition of private and public partners, including Planet, NASA's Jet Propulsion Laboratory, the State of California, the University of Arizona, Arizona State University, and RMI (formerly the Rocky Mountain Institute). This broad coalition brings together the expertise and resources needed to deploy a science-driven, sustained, and impactful decision support system. Carbon Mapper utilizes a combination of satellites and aircraft to provide daily to weekly observations of emissions from point sources, such as oil and gas facilities, solid waste, coal, and agricultural operations. This data is freely available to the public and serves as a valuable resource for governments, businesses, and organizations seeking to reduce emissions and combat climate change.").

[161] Carbon Mapper, Product Guide: Data Definition & Specification (*lasted visited* 22 December 2025) ("Carbon Mapper utilizes a combination of satellites and aircraft to provide daily to weekly observations of emissions from point sources, such as oil and gas facilities, solid waste, coal, and agricultural operations. This data is freely available to the public and serves as a valuable resource for governments, businesses, and organizations seeking to reduce emissions and combat climate change. The Carbon Mapper open data platform plays a crucial role in making emissions data accessible to all interested parties. Originally developed at NASA's Jet Propulsion Laboratory, the platform processes data from a range of satellite and airborne hyperspectral systems, including Planet's Tanager constellation, which is central to Carbon Mapper's vision of a global observation system. It also integrates data from NASA's EMIT sensor, airborne sources like NASA's AVIRIS-NG, AVIRIS-3, and Arizona State University's Global Airborne Observatory.").

[162] UCLA's STOP METHANE PROJECT, *Spotlight on the Top 25 Methane Plumes in 2025: Oil & Gas* (*last visited* 11 June 2026) ("The 2025 data show 4,404 plumes observed at 2,489 oil and gas sector sites worldwide. These are sites in dozens of countries of all income levels and in all world regions. The sources on our "Top 25" list are responsible for the most acute hourly emission rates seen by these instruments globally – with emission rates ranging from 3.7 to 10.5 tonnes (metric tons) of methane per hour. Notably, the sources on this Top 25 list are concentrated in just a few countries, with the majority of the list consisting of oil and gas sites in Turkmenistan. Top 25 sites are also located in Venezuela, Iran, Pakistan, and the United States.").

[163] Copernicus, *About Copernicus* (*last visited* 22 December 2025) ("Copernicus is the European Union's Earth observation programme, looking at our planet and its environment to benefit all European citizens. It offers information services that draw from satellite Earth Observation and in-situ (non-space) data.").

[164] Copernicus, *About Copernicus* (*last visited* 22 December 2025) ("The European Commission manages the Programme. It is implemented in partnership with the Member States, the European Space Agency (ESA), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), the European Centre for Medium-Range Weather Forecasts (ECMWF), EU Agencies and Mercator Océan, the European Environment Agency (EEA), the Joint Research Center (JRC).").

[165] Copernicus, *Copernicus in detail* (*last visited* 22 December 2025) ("Copernicus is served by a set of dedicated satellites (the Sentinel families) and contributing missions (existing commercial and public satellites). The Sentinel satellites are specifically designed to meet the needs of the Copernicus services and their users. Since the launch of Sentinel-1A in 2014, the European Union set in motion a process to place a constellation of almost 20 more satellites in orbit before 2030.").

[166] Copernicus, *Atmosphere* (*last visited* 22 December 2025) ("The service focuses on five main areas: 1. Air quality and atmospheric composition; 2. Ozone layer and ultra-violet radiation; 3. Emissions and surface fluxes; 4. Solar radiation; 5. Climate forcing.").

[167] Copernicus, *Land* (*last visited* 22 December 2025) ("It supports applications in a variety of domains such as spatial and urban planning, forest management, water management, agriculture and food security, nature conservation and restoration, rural development, ecosystem accounting and mitigation/adaptation to climate change.").

[168] Copernicus, *Climate Change* (*last visited* 22 December 2025) ("The C3S mission is to support adaptation and mitigation policies of the European Union by providing consistent and authoritative information about climate change. We offer free and open access to climate data and tools based on the best available science. We listen to our users and endeavour to help them meet their goals in dealing with the impacts of climate change.").

[169] UC Berkeley Center for Law, Energy & the Environment & UCLA School of Law Emmet Institute on Climate Change & the Environment (2025) HUNTING METHANE USING SATELLITES A GUIDE FOR POLICYMAKERS, 9, 12.

[170] National Aeronautics and Space Administration Jet Propulsion Laboratory (25 October 2022) *Methane 'Super-Emitters' Mapped by NASA's New Earth Space Mission* ("NASA's Earth Surface Mineral Dust Source Investigation (EMIT) mission is mapping the prevalence of key minerals in the planet's dust-producing deserts – information that will advance our understanding of airborne dust's effects on climate. But EMIT has demonstrated another crucial capability: detecting the presence of methane, a potent greenhouse gas.").

[171] National Aeronotics and Space Administration Jet Propulsion Laboratory (25 October 2022) *Methane 'Super-Emitters' Mapped by NASA's New Earth Space Mission* ("In the data EMIT has collected since being installed on the International Space Station in July, the science team has identified more than 50 "super-emitters" in Central Asia, the Middle East, and the Southwestern United States. Super-emitters are facilities, equipment, and other infrastructure, typically in the fossil-fuel, waste, or agriculture sectors, that emit methane at high rates.").

[172] MethaneSAT, *Purpose* (*last visited* 9 March 2024) ("MethaneSAT will located and quantify methane emissions from oil and gas operations almost anywhere on Earth and track progress over time. The free data will enable both companies and countries to identify, manage and reduce their emissions, and allow investors, gas buyers and the public to see and compare results."). Google Cloud will provide computing capabilities to process the information and create a map of oil and gas infrastructure to be used with the MethaneSAT DATA. *See* Google Sustainability (14 February 2024) *How satellites, algorithms and AI can help map and trace methane sources* ("EDF's new satellite, MethaneSAT, will map, measure and track methane with unprecedented precision, offering a comprehensive view of methane emissions. Launching in early March on a SpaceX Falcon 9 rocket, MethaneSAT will orbit the Earth 15 times a day at an altitude of over 350 miles. It will measure methane levels in the top oil and gas regions in the world for regular analysis. MethaneSAT is highly sophisticated; it has a unique ability to monitor both high-emitting methane sources and small sources spread over a wide area. To calculate the amount of methane emitted in specific places and track those emissions over time, EDF developed algorithms powered by Google Cloud in collaboration with scientists at Harvard University's School of Engineering and Ap plied Science and its Center for Astrophysics, and scientists at the Smithsonian Astrophysical Observatory.").).

[173] UC Berkeley Center for Law, Energy & the Environment & UCLA School of Law Emmet Institute on Climate Change & the Environment (2025) HUNTING METHANE USING SATELLITES A GUIDE FOR POLICYMAKERS, 9.

[174] MethaneSAT (*last visited* 22 December 2025) PROJECT UPDATE MethaneSAT loses contact with satellite ("On Friday, June 20, the MethaneSAT mission operations lost contact with MethaneSAT. After pursuing all options to restore communications, we learned this morning that the satellite has lost power, and that it is likely not recoverable. While this is difficult news, it is not the end of the overall MethaneSAT effort, or of our work to slash methane emissions.").

[175] GOSAT Project, *Home* (*last visited* 7 February 2024) ("The Greenhouse Gases Observing Satellite "IBUKI" (GOSAT) is the world's first spacecraft to measure the concentrations of carbon dioxide and methane, the two major greenhouse gases, from space. The spacecraft was launched successfully on January 23, 2009, and has been operating properly since then. Through analyzing the GOSAT observational data, scientists will be able to ascertain the global distribution of carbon dioxide (CO2) and methane (CH4), and how the sources and sinks of these gases vary with seasons, years, and locations. These new findings will enhance scientific understanding on the causes of global warming. Also, they will serve as fundamental information for improving climate change prediction and establishing sound plans for mitigating global warming. The GOSAT Project is a joint effort of the Ministry of the Environment (MOE), the National Institute for Environmental Studies (NIES), and the Japan Aerospace Exploration Agency (JAXA).").GOSAT-GW, *News* (last visited 5 December 2025).

[176] GOSAT Project, *Home* (*last visited* 7 February 2024).

[177] Climate Trace, About the Coalition (*last visited* 22 December 2025) ("Climate TRACE is a non-profit coalition of organizations building a timely, open, and accessible inventory of exactly where greenhouse gas emissions are coming from.").

[178] Climate Trace About the Coalition (*last visited* 22 December 2025) ("Until now, most emissions inventories have been based on self-reported, often years-late data that often had to rely on rough estimates, opaque methods, and inaccessible reporting. Government officials, scientists, investors, executives, and activists ne ed better data to support the creation of policies, programs, and campaigns aimed at limiting global temperature rise to 1.5°C as agreed to under the Paris Climate Agreement. That's where Climate TRACE comes in. We're harnessing technologies like artificial intelligence (AI) and machine learning (ML) to analyze over 90 trillion bytes of data from more than 300 satellites, more than 11,000 sensors, and numerous additional sources of emissions information from all over the world. The result is a groundbreaking approach to emissions monitoring… one that is independent, transparent, and timely.").

[179] Climate Trace About the Coalition (*last visited* 22 December 2025) ("Climate TRACE's global emissions inventory, released in September 2021, provided the first comprehensive accounting of GHG emissions based primarily on direct, independent observation. In November 2022, the coalition began monitoring the largest 500 emitting assets in each emitting sector worldwide. In December 2023, we released a nearly comprehensive global analysis of over 350 million emitting assets worldwide. In November 2024 we increased out coverage to 660 million assets worldwide and also provided non-GHG emissions for all assets. In 2025, we release emissions data monthly (year-to-date data with a 2 month lag). We also launched a new tool that shows how PM2.5 particles disperse from industrial sources and travel to communities. We also launched a first-of-its-kind emission reduction roadmap tool that calculates the emission reduction potential from applying mature and commercially available solutions at every single asset worldwide."); Climate Trace (*last visited* 22 December 2025) Approach ("hen we gather what's known as "ground truth" data (snippets of precisely measured emissions or activity from highly reliable sources such as on-the-ground sensors verified by a third party). The advantage of ground truth data is that they are highly accurate. But the disadvantage is that most emitting facilities worldwide don't have such highly accurate data, or it can't easily be verified by a third party. So, we then train artificial intelligence algorithms using satellite imagery of specific locations, paired with ground truth data about those locations. We only keep algorithms that pass our quality control measures (measured by how accurately they predict ground truth data).").

[180] Climate Trace (2025) Climate TRACE Releases October 2025 Emissions Data ("December 18, 2025 – Today, Climate TRACE reported that global greenhouse gas (GHG) emissions for the month of October 2025 totaled 5.03 billion tonnes CO_2e. This represents an increase of 0.40% vs. October 2024. Total global year-to-date emissions are 50.31 billion tonnes CO_2e. This is 0.55% higher than 2024's year-to-date total. Global methane emissions in October 2025 were 33.83 million tonnes CH_4, an increase of 0.07% vs. October 2024.").

[181] United Nations Environment Programme (2021) *An Eye on Methane: International Methane Emissions Observatory 2021* Report, VI ("IMEO's Theory of Change - IMEO has a clear proposition to catalyze change in the reality of the political economy. At the heart of IMEO's Theory of Change is the need for an independent and trusted entity to integrate data from multiple sources, such as companies, satellites, scientific studies and national inventories. Using scientific insights, IMEO will integrate these multiple sources of heterogeneous data into a coherent and policy relevant dataset that highlights the confidence of each data ele ment.").

[182] United Nations Environment Programme, *International Methane Emissions Observatory* (*last visited* 5 February 2023) ("Launched at the G20 Summit, the International Methane Emissions Observatory (IMEO) is a data-driven, action-focused initiative by the UN Environment Programme (UNEP) with support from the European Commission to catalyse dramatic reduction of methane emissions, starting with the energy sector.").

[183] United Nations Environment Programme (31 October 2021) *Methane Observatory launched to boost action on powerful climate-warming gas*, Press Release ("Critical to this effort are data collected through OGMP 2.0, launched in November 2020 in the framework of the Climate and Clean Air Coalition. OGMP 2.0 is the only comprehensive, measurement-based reporting framework for the oil and gas sector, and its 74 member companies represent many of the world's largest operators across the entire value chain, with assets that account for over 30 per cent of all oil and gas production.").

[184] *See generally* United Nations Environment Programme (2021) AN EYE ON METHANE: INTERNATIONAL METHANE EMISSIONS OBSERVATORY 2021 REPORT; United Nations Environment Programme (2022) AN EYE ON

METHANE: INTERNATIONAL METHANE EMISSIONS OBSERVATORY 2022 REPORT; *and* United Nations Environment Programme (2023) AN EYE ON METHANE: INTERNATIONAL METHANE EMISSIONS OBSERVATORY 2022 REPORT.

[185] United States Department of State (17 November 2022) *Fact Sheet, Global Methane Pledge: From Moment to Momentum* (describing progress on the Global Methane Pledge Energy Pathway).

[186] Kayrros Methane Watch, *FAQ* (*last visited* 18 December 2023) ("Our primary collaboration is with the UNEP's International Methane Emission Observatory (IMEO), where we serve as a key data provider for the Methane Alert and Response System (MARS)"). *See also* Kayrros Methane Watch, *Kayrros Methane Watch* (*last visited* 18 December 2023) ("Access consolidated data from multiple satellite constellations into a single platform, allowing you to access real-time insights and make informed decisions.").

[187] United Nations Environment Programme, *MARS* (*last visited* 2 December 2023) ("UNEP's International Methane Emissions Observatory launched the Methane Alert and Response System (MARS) at COP27, a new initiative to accelerate implementation of the Global Methane Pledge by transparently scaling up global efforts to detect and act on major methane emissions sources. At COP28 results of the MARS pilot period have gone live, publicly sharing satellite data for notified emissions events.").

[188] Clarke A. (1 December 2023) *Methane Leak in Argentina Halted After Satellite Observation*, BLOOMBERG ("Scientists working for the United Nations' International Methane Emissions Observatory in March spotted a leak in satellite data in Argentina, and relayed that information to government officials who quickly shared the data with the responsible operator. The energy company, which wasn't identified, found that a heat exchanger had suffered ruptured tubes causing the potent greenhouse gas to leak and quickly conducted repairs. "This is the first example of how we really can make this data actionable,'' Manfredi Caltagirone, the head of IMEO, said in an interview referring to a new wave of satellites that are allowing scientists to track global methane emissions. "It's just the first of what we expect is going to be many use cases that this data and these capabilities will be giving us.'').

[189] United Nations Environment Programme (2025) AN EYE ON METHANE 2025: FROM MEASUREMENT TO MOMENTUM, 17 ("Despite a more than tenfold increase in response to MARS alerts, almost 90 per cent of alerts still go unanswered.").

[190] Methane Alert and Response System (2026) SNAPSHOT: TOP 50 EMITTERS, COUNTRY RESPONSES AND MITIGATION, UNITED NATIONS ENVIRONMENT PROGRAMME, 1 ("To date, MARS has enabled and confirmed mitigation of 41 major methane sources. Each mitigation involved issuing a MARS notification, evaluating the response for technical accuracy and confirming through subsequent satellite data that no further emissions have been detected. Together, the sources mitigated following MARS notifications are estimated to have released 1,200,000 tonnes of methane. This is comparable in climate impact to nearly 24 million gasoline-powered cars driven for one year.").

[191] *See generally* United Nations (2026) SECRETARY-GENERAL'S CALL TO ACTION ON METHANE: THREE SECTORS, NINE ACTIONS BY 2030, 13 ("The world can now see methane emissions and mitigation as they happen. Governments and companies can and should achieve a response rate to alerts from MARS of at least 80 per cent before 2030. Multilateral Development Banks (MDBs) and international partners must support developing countries with capacity limitations to increase response rates and enable mitigation through technical assistance and targeted finance.").

[192] United Nations Environment Programme (2026) *Satellite methane alerts expanded to coal and waste sectors, UNEP announces at G7 Presidency event* ("The UN Environment Programme (UNEP) International Methane Emissions Observatory (IMEO) announced today a major expansion of its global methane detection system, enabling satellites to track emissions from coal mines and waste facilities for the first time.").

[193] United Nations Environment Programme (2026) *Satellite methane alerts expanded to coal and waste sectors, UNEP announces at G7 Presidency event* ("To ensure alerts result in real-world fixes, IMEO and the International Energy Agency (IEA) today released a new MARS Response Blueprint, providing governments with a clear, step-by-step playbook for verifying emissions, mobilizing operators, and tracking mitigation. IMEO and partners will support countries with hands-on technical assistance to turn alerts into measurable emissions cuts.").

[194] United Nations Environment Programme (2026) *Satellite methane alerts expanded to coal and waste sectors, UNEP announces at G7 Presidency event* ("UNEP's IMEO also launched its Coal Methane Database, delivering

unprecedented mine-level transparency for a sector long characterized by data gaps. The database provides emissions estimates for nearly 250 coal mines, covering more than half of global metallurgical coal production, and integrates satellite observations, scientific research and official inventories into a single dataset. IMEO experts analysed over 23,000 satellite observations, attributing detected methane plumes to individual mines and emission sources.").

[195] United Nations Environment Programme (2026) *Satellite methane alerts expanded to coal and waste sectors, UNEP announces at G7 Presidency event* ("National oil companies join UNEP framework, pushing global coverage toward 50% In a further signal of rising political and market momentum on methane, UNEP announced that Libya's National Oil Corporation, Pakistan's Oil and Gas Development Company Limited (OGDCL), and Angola's Sonangol have joined UNEP's OGMP 2.0.").

[196] International Energy Forum, *IEF Methane Initiative: Methane Measurement Methodology Project* (*last visited* 5 February 2023) (The International Energy Forum (IEF) launched the IEF Methane Initiative in June 2021 to develop a methane emissions measurement methodology, enabling its member countries to collect standardized data to mitigate methane emissions from the energy industry and address its share of climate change goals."); IEF Methane Initiative (2021) METHANE MITIGATION IN THE ENERGY SECTOR, 2 ("The International Energy Forum (IEF) partnered with Kayrros, a leading geospatial analytics company, to develop a common approach for accurately estimating methane emissions in the energy sector. The production and transport of hydrocarbons is the second largest source of anthropogenic emissions, and energy-related methane is widely considered the low-hanging fruit of climate action.").

[197] IEF Methane Initiative (2021) METHANE MITIGATION IN THE ENERGY SECTOR, 2 ("The proposed standardized methodology, built through a series of consultations with IEF member countries, considering their specific circumstances, empowers countries to estimate emission levels more accurately. It enables them to present credible mitigation plans in their Nationally Determined Contributions (NDC), while supporting industry initiatives to integrate top-down and bottom-up technologies. Eighty percent of countries have included methane in their greenhouse gas targets of their NDC, but only five percent have set specific targets for methane reductions. It is critical for the proposed methodology to be low cost. This initiative used data from the European Union's Sentinel-5P. As a public satellite, raw atmospheric measurements are provided free of charge. This data set can be complemented with ground sensors, aerial campaigns, and commercial satellites, but deploying these technologies at scale along the entire supply chain can be cost prohibitive. By prioritizing public satellite data, the methodology is affordable and can be widely adopted."); 10 ("The methodology described in this report is focused on defining three quantitative metrics whose evolution can be measured over time: the methane intensity of production, the number of superemitters, and the flaring intensity. These metrics were designed so that: • A first assessment can be run with satellite measurements, helping build a baseline without requiring higher-cost surveillance tools • Realistic actions can be put in place for mitigation and the effectiveness of these actions can be measured • These metrics can be refined by running an integrated model and by ground-truthing").

[198] Gordon D., Koomey J., Brandt A., & Bergerson J. (2022) *Know Your Oil and Gas: Generating Climate Intelligence to Cut Petroleum Industry Emissions*, RMI, 8–9 ("The OCI+ model offers a way forward. This life-cycle assessment model was first unveiled in 2015 by the Carnegie Endowment. The OCI+ has since received significant attention and use by governments, industry, nongovernmental organizations, and academics.[ii] The OCI+ offers an alternative to opaque and overly simplistic emissions assessments done by countries and companies using equipment counts and basic emissions factors. Instead, the OCI+'s suite of advanced models, together with operational inputs and satellite data, estimates GHG emissions through the entire oil and gas supply chain. Emissions intensities can be parsed in different ways—by resource category, region, operation, pollutant, and more—to identify significant reduction potential."). Access the Oil Climate Index plus Gas tool at: ociplus.rmi.org.

[199] Malik N. S. (23 June 2022) *World's Dirtiest Oil and Gas Fields Are in Russia, Turkmenistan and Texas*, BLOOMBERG (Created by researchers at RMI, Stanford University, the University of Calgary and Koomey Analytics, the OCI+ tool and an accompanying report conclude that significant fossil-fuel emissions occur not just at the point of combustion, but directly at the wellhead and during processing, refining, and transportation.").

[200] The U.S. Greenhouse Gas Center, About (*last visited* 8 April 2026) ("The U.S. Greenhouse Gas Center (US GHG Center) is a multi-agency effort consolidating greenhouse gas (GHG) information from observations and models. Scientific experts from NASA, EPA, NIST, and NOAA worked together to curate this catalog of GHG datasets and analysis tools. The goal is to better understand GHG fluxes and emissions from natural and human-caused sources. The US GHG Center helps researchers, climate change mitigation practitioners, policymakers,

data service providers, and concerned citizens understand GHG datasets and put them to use. The initial two-year demonstration phase focused on three GHG areas of study: human-caused GHG emissions; natural GHG sources and sinks, fluxes, and patterns; and large methane emission leak events. The US GHG Center portal is built using open source principles and techniques allowing users to access, explore, analyze, and download data and products and learn about the latest information. It provides access to a curated and evolving list of foundational GHG data, including sources such as: ground observations from NASA, NIST, and NOAA; data collected from space-borne (ex. EMIT and OCO-2/3), airborne (ex. AVIRIS-NG), and ground-based platforms (ex. NIST tower data); and model-derived data and analyses. The US GHG Center includes curated EPA regulatory and research datasets as well as research data from NASA, NIST, and NOAA. The portal features stories that introduce themes, topics, data and discoveries. User support is within reach via data exploration, Jupyter notebooks, and an analysis hub for authorized users to perform advanced cloud data analysis with computational resources. All code supporting the US GHG Center system is fully open sourced and available for examination. […] Numerous stakeholder engagement activities continue to help scope and prioritize the evolution of the US GHG Center during continued development and implementation.").

[201] The U.S. Greenhouse Gas Center, Data Catalog (*last visited* 8 April 2026) ("This dashboard is for exploring key datasets that provide insight into greenhouse gas sources, sinks, emissions, fluxes, and events.").

[202] *See generally* Lackner M. & Mohlin K. (2022) *Certification of Natural Gas With Low Methane Emissions: Criteria for Credible Certification Programs*, ENVIRONMENTAL DEFENSE FUND; *and* Hmiel B., Lyon D. R., Warren J. D., Yu J., Cusworth D. H., Duren R. M., & Hamburg S. P. (2023) *Empirical quantification of methane emission intensity from oil and gas producers in the Permian basin*, ENVIRON. RES. LETT. 18(2): 024029. *See also* Ball J. (30 January 2023) *Inside the high-dollar race to sell natural gas as low-carbon*, CANARY MEDIA.

[203] International Energy Agency (2025) PROSPECTS FOR NATURAL GAS CERTIFICATION, 6 ("Certified natural gas is natural gas whose environmental and social attributes – such as GHG emissions performance, water use, local community impacts and worker safety – have been independently verified against defined criteria or benchmarks. In 2024, around 320 billion cubic metres (bcm) of produced natural gas was certified – coming entirely from North America – equivalent to 7.5% of global natural gas production.").

[204] MiQ, *What is the MiQ standard for operators* (*last visited* 25 January 2023) ("What requirements does MiQ's Standard look at? Methane Intensity – The MiQ Standard uses the Natural Gas Sustainability Initiative (NGSI) protocol for calculating the methane intensity of natural gas, or robust alternative methodologies. Company Practices – The MiQ Standard requires operators to deploy monitoring technology at source and facility level (bottom up and top down) to detect unintended methane emissions, specifying frequencies and minimum detection levels. Monitoring Technology – The MiQ Standard requires operators to deploy monitoring technology at source and facility level to detect unintended methane emissions. As the grading increases, operators will be required to implement best practices, leading to more robust methane emissions management.").

[205] MiQ (2022) *Main Document – Onshore Production v1.0*, 15 (Table 2).

[206] MiQ, *Why Methane & Certification* (*last visited* 2 February 2026) ("We are already certifying over 5% of global natural gas supply, which includes over 20% of US production.").

[207] MiQ, *Welcome to the MiQ Registry* (*last visited* 25 January 2023) ("An MiQ Certificate represents the methane emissions performance attributes of 1 MMBtu of natural gas. Each certificate, which has a unique identifier, evidences where and when the gas was produced and the methane intensity of production. Unlike other frameworks that assess emissions at the national or company level, MiQ Certification is based on an independent Standard that is assessed at the facility or platform level. This more granular assessment by a third party provides transparent metrics for practically comparing gas supplies based on their methane emissions performance.").

[208] International Energy Agency (2025) PROSPECTS FOR NATURAL GAS CERTIFICATION, 19 ("In 2025, MiQ announced a collaboration with the Oil and Gas Methane Partnership 2.0 (OGMP 2.0) to enable third-party verification of OGMP 2.0 Level 5 emission estimates across full supply chains, aligning certification with global best practices on MRV.").

[209] International Energy Agency (2025) PROSPECTS FOR NATURAL GAS CERTIFICATION, 17 ("Founded in 2009 and based in the United States, Equitable Origin (EO) is a nonprofit organisation that aims to promote responsible energy development through high ESG standards. In 2012, EO launched its flagship framework, the EO100™ Standard for Responsible Energy Development ("EO Standard"), designed to recognise and certify energy sites

that demonstrate best practices across a wide range of ESG criteria, including human rights, Indigenous Peoples' rights, fair labour and working conditions, and environmental impacts. The first site certified under EO was an oil production facility in Colombia in 2014.").

[210] International Energy Agency (2025) PROSPECTS FOR NATURAL GAS CERTIFICATION, 25 ("We estimate that approximately 320 bcm of gas produced in 2024 was certified under one or more of the existing certification schemes, representing roughly 7.5% of global gas production. Gas certified in downstream facilities accounted for an additional 20 bcm (although there is some potential overlap with gas already certified at the upstream level). Approximately 125 bcm of gas (across all segments of the supply chain) is presently certified solely under MiQ, 38 bcm is certified solely under EO and 130 bcm is currently certified under both schemes.").

[211] American Gas Association, *Natural Gas Sustainability Initiative (NGSI)* (*last visited* 5 February 2023) ("NGSI is a voluntary, industry-wide approach for companies to calculate methane emissions intensity by segment—the Methane Emissions Intensity Protocol (Protocol). This consistent, transparent and comparable method for measuring and reporting methane emissions throughout the natural gas supply chain will improve the quality of information available and will help companies more effectively identify ways to reduce methane emissions and communicate progress.").

[212] GTI Energy, *GTI Energy's Methane Emissions Measurement and Verification Initiative* (*last visited* 3 November 2023) ("Veritas, GTI Energy's Methane Emissions Measurement and Verification Initiative, is meeting the urgent need for credible, comparable methane emissions measurement and accelerating actions that reduce methane emissions reductions. The standardized, science-based, technology-neutral, and measurement-informed protocols were built to assemble methane emissions inventories that are verified by direct field measurements.").

[213] Moore C., Weller Z., Blanton E., Rai S., Harmon A., Van Wagener D., Merino Guerrero M., Salahshoor S., Wong H. X., Harrison M., Rufael T., Van Horne J., Shumlich J., & Fox T. (2023) *Veritas Demonstrations: Results, Challenges, and Implications for Creation of Measurement Informed Inventories Veritas*, GTI ENERGY, 1 ("The Veritas protocols provide a guiding framework for operators across the natural gas supply chain to use measurements to estimate their methane emissions. As part of protocol development, 14 operators from across the natural gas supply chain participated in pilot demonstrations of the protocols in 2022. These operators executed draft versions of the protocols to examine their expected emissions and deploy a variety of detection and quantification technologies, from handheld instruments to aircraft surveys.").

[214] United States Senators Blumenthal, Booker, Markey, Merkley, Sanders, Warren & Whitehouse (2024) *Letter to The Honorable Lina M. Khan Chair of the Federal Trade Commission* ("The gas industry has already engaged in a greenwashing campaign simply by labeling gas as "natural" and promoting it as a "bridge" between fossil fuels and renewables — a public relations effort that fails to acknowledge the negative short- and long-term consequences of gas.5 Now, another dangerous greenwashing scheme is at play: the past decade has seen a proliferation of third-party "gas certifiers" that evaluate methane emissions and proclaim certain gas as "certified" or "responsible," and therefore preferable from a climate perspective.6 Oil and gas producers pay the certifiers for this designation, price their gas higher than non-certified gas, and tout its environmental benefits in their marketing materials. For example, Chevron promotes its "responsibly sourced gas" as "natural gas produced at facilities that have undergone an assessment by a third-party certifier" and which meets the "highest environmental and community standards."7 The costs associated with this purportedly premium gas are then passed on to consumers through higher utility rates.8").

[215] The UCLA Emmett Institute has published a global survey of existing, and imminent, methane regulations as part of the Advancing Methane Regulation Project to help guide policymakers to develop effective methane regulations: UCLA Law, *Advancing Methane Regulation* (*last visited* 11 April 2024) ("The UCLA Emmett Institute launched the Advancing Methane Regulation Project to help guide policymakers as they develop regulations to hunt and halt super-polluting methane. In October 2023, the Emmett Institute convened a meeting on the UCLA campus of more than two-dozen experts in science, technology, law, and policy to inform the goals of the project. To inform the project's launch, we produced a global survey of existing, and imminent, methane regulations.") *See* UCLA Emmett Institute on Climate Change & the Environment, *The State of Methane Regulation: A Global Survey* (*last visited* 11 April 2024).

[216] Rogelj J. & Lamboll R. D. (2024) *Substantial reductions in non-CO_2 greenhouse gas emissions reductions implied by IPCC estimates of the remaining carbon budget*, COMMUN. EARTH ENVIRON. 5: 1–5, 2 ("RCB estimates in line with limiting warming to 1.5 °C assume 1.5 °C-compatible CH_4 reductions from 2020 to 2050 of 51% (47–60%, range between 25th and 75th quantile regressions at 1.5 °C of global warming across scenarios, see Fig. 1,

panel a).”), 4 (“Assuming global CH_4 emissions do not decline but instead are kept constant at 2020 levels would reduce the RCB by 431, 370, and 280 $GtCO_2$-we for RCBs compatible with 1.5 °C, 1.7 °C, and 2 °C, respectively. In other words, choosing not to reduce CH_4 emissions and correctly adjusting for this decision in RCB estimates would cause 1.5 °C-compatible RCBs to be exhausted as of today (Fig. 1b, Table 1, Supplementary Tables S2, S5), in effect putting the 1.5 °C ambition of the Paris Agreement out of reach. Even a global 40% reduction between 2020 and 2040 would cause a 1.5 °C-compatible RCB reduction of about 60 $GtCO_2$-we, highlighting the importance of deep reductions in CH_4.”).

[217] United Nations Framework Convention on Climate Change, *NDC Registry* (*last visited* 31 December 2025); *see also* United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 58, 62 (“Since the GMP was established, there has been substantial growth in the inclusion of methane mitigation actions within NDCs. As of June 2025, 127 countries (65 per cent) list methane measures in their NDCs. Among these, 115 countries include waste methane measures (59 per cent), 85 include agricultural methane measures (44 per cent), and 35 (18 per cent) identify measures to cut fossil fuel methane. This represents increases of 58 per cent, 89 per cent, and 52 per cent respectively compared with pre-2020 NDCs. These results match broader NDC trends: the waste and agricultural sectors are more often addressed than the fossil-fuel sector. Many countries, however, do not produce fossil fuels, so measures in this sector are not relevant for them. This is discussed in more detail in Section 3.2.3.1. Since June (to 30 September 2025) an additional 42 countries have submitted their final or draft NDC 3.0. Increasing the number of countries including methane mitigation measures to 130 (67 per cent). An additional 4 countries include waste methane measures, however the number of countries including fossil fuel and agriculture methane measures has fallen by 4 and 1 respectively. This decline can be explained by a number of countries who have submitted drafts of their NDC 3.0, stating that additional details will be communicated in their final submission… As outlined in the previous sections, many countries include action to reduce methane in their NDCs as part of their overall climate targets. The magnitude of methane emissions to be reduced is, however, often unclear or not specified. Methane-specific targets, building block three, should clearly stipulate how much methane a country intends to reduce. Despite more than 150 countries participating in the GMP, only six have defined methanereduction targets directly comparable with the GMP targets, i.e., reductions by 2030 relative to 2020. A number of countries have established methane-relevant targets within their NDCs, though these vary in clarity and ambition. The majority, 181, of countries who are Parties to the Paris Agreement include methane within their overall greenhouse gas targets, an increase of more than 20 per cent compared with pre-2020 NDCs.”).

[218] Olczak M., Piebalgs A., & Balcombe P. (2023) *A global review of methane policies reveals that only 13% of emissions are covered with unclear effectiveness*, ONE EARTH 6(5): 519–535, 520 (“Only ~13% (minimum [min.] 10%, maximum [max.] 17%) of global methane emissions are covered by direct methane mitigation policies, while limited policy stringency and reliance on inaccurate emission estimates remain barriers to effective policy. These findings suggest that a consistent approach for accurate identification, quantification, and verification of methane emission sources alongside greater pol- icy coverage and stringency (e.g. measurable objectives and enforcement) must be put into place to realize significant methane emission reduction opportunities”).

[219] *See generally* International Energy Agency (2023) DRIVING DOWN COAL MINE METHANE EMISSIONS A REGULATORY ROADMAP AND TOOLKIT, 18; International Energy Agency (2021) Driving Down Methane Leaks from the Oil and Gas Industry A Regulatory Roadmap and Toolkit, 11.

[220] **Prescriptive regulations,** often referred to as command-and-control requirements, direct regulated entities to undertake or not to undertake specific actions or procedures. This approach focuses on setting procedural, equipment, or technological requirements, such as the installation or replacement of specific devices. For example, LDAR requirements mandate the implementation of fugitive emissions management plans, addressing the specific equipment used, the frequency of inspection, and the leak thresholds that trigger repair obligations. Restrictions on flaring or venting limit the amount of gas disposal allowed or prescribe specific equipment processes, potentially banning such activities in routine proceedings or requiring prior authorization. Technology standards outline the equipment or procedures that must be employed in a regulated activity, such as requiring the use of no-bleed pneumatic devices or vapor recovery units.

[221] **Performance-based regulations** establish a mandatory target for regulated entities but do not dictate how the target must be achieved. This approach allows the regulated entity the leeway to decide how it will comply, freeing the company to seek the most cost-effective solution. National or sectoral reduction targets define goals, including baselines and intermediate objectives, to assess progress at an economy-wide or industry level. Flaring or venting standards limit the amount of disposal allowed through performance metrics, such as minimum gas utilization rates or admissible volume as a percentage of output. Process or equipment emissions standards limit emissions through metrics set at the equipment level, such as requiring glycol dehydration units to control emissions by a

specific percentage or requiring flares to be designed for a specific removal efficiency. Facility or company emissions standards limit emissions through performance metrics set at the aggregate level, such as requiring a company to reduce emissions by a certain percentage on a per-unit basis.

[222] **Economic instruments** induce action by applying financial penalties or incentives, allowing firms to choose among different strategies to address emissions and effectively changing the cost curve of abatement. For example, taxes or charges can be levied on emissions, including carbon taxes applied to methane, or royalties and fees imposed on fugitive emissions and gas disposal. On the other hand, financial incentives induce firms to invest in reduction measures through grants or loans or allow cost recovery for abatement costs via reductions in royalties, taxes, or fees. Another economic instrument is an emissions trading schemes, such as a cap-and-trade system, which sets an industry emission limit and allocates allowances that be traded among companies.

[223] **Information-based regulations** are designed to improve the transparency of emissions and bridge information gaps by requiring that regulated entities estimate, measure, and report their emissions to public bodies. Measurement requirements mandate data collection for activities, equipment, or production flows to support the definition of specific activity or emission factors. Reporting requirements oblige regulated entities to record and submit information, such as emissions monitoring data, key events like accidents, or the operational state of facilities. Emissions estimates and quantification requirements mandate the estimation of methane emissions through the use of activity and emission factors. Public disclosure requirements mandate that regulated entities share specified methane information with the public, such as publishing emission reports online, undertaking public information campaigns, or disclosing information upon request.

[224] *See generally* International Energy Agency (2023) DRIVING DOWN COAL MINE METHANE EMISSIONS A REGULATORY ROADMAP AND TOOLKIT, 15; International Energy Agency (2021) DRIVING DOWN METHANE LEAKS FROM THE OIL AND GAS INDUSTRY A REGULATORY ROADMAP AND TOOLKIT, 9. For an interactive database of country and regional estimates for methane emissions and abatement options, the International Energy Agency provides a Methane Tracker.

[225] Climate & Clean Air Coalition & Clean Air Task Force (2026) BLUEPRINT FOR A COMPREHENSIVE OIL AND GAS METHANE REGULATION, 3 ("While it is useful to understand each regulation type, as we discuss below, a layered approach that incorporates elements from each type will be most effective in meeting short-, medium-, and long-term methane mitigation goals (see Figure 3): ■ Short-term goal: Achieve immediate reductions through equipment and work practice standards ■ Medium-term goal: Report and demonstrate compliance and emissions ■ Long-term goal: Continuously improve to drive deeper reductions We do not put specific timeframes on these goals, because the timeframes will vary from jurisdiction to jurisdiction, and it is not a strictly linear process. Nevertheless, it is useful to frame the challenge in this way to ensure that methane mitigation is as quick and effective as possible.").

[226] Climate & Clean Air Coalition & Clean Air Task Force (2026) BLUEPRINT FOR A COMPREHENSIVE OIL AND GAS METHANE REGULATION, 4-5 ("Given the urgency for action on methane as well as to realize the benefits associated with methane capture and monetization, it is essential overseeing Ministries, Ministry-affiliated agencies, and operators move forward with mitigation as quickly as possible. This can be done utilizing information currently available and international best practices to develop prescriptive regulations that achieve immediate reductions…. There are two types of reporting that are different but complementary in nature. They are 1) compliance reporting that demonstrates if and how an operator or reporting entity meets regulatory requirements, and 2) emission reporting that identifies the quantity of emission over a reporting period and associated descriptions of methodology and how data has been verified. While there can be overlap between these two types of reports—i.e., accurate, verifiable emissions reporting can be part of compliance reporting—it is important to understand how these types of reporting are distinct.…Furthermore, as it becomes feasible for operators to rigorously report at OGMP 2.0 Level 5, performance based and/or economics-based regulatory approaches – which potentially allow deeper emissions reductions than equipment and work-practice standards – can be layered on top of existing prescriptive and information-based regulatory approaches. Operators would continue to comply with equipment and work practice emission standards, but they would have full flexibility to decide how best to reach the deeper performance target. An example of this is Colorado, which developed an intensity standard (the GHG Intensity Verification Rule) on top of existing equipment and work practice standards to help it meet state-mandated emission reduction targets.").

[227] International Energy Agency (2021) DRIVING DOWN METHANE LEAKS FROM THE OIL AND GAS INDUSTRY: A REGULATORY ROADMAP AND TOOLKIT.

[228] International Energy Agency (2023) Driving Down Coal Mine Methane Emissions: A regulatory roadmap and toolkit.

[229] International Energy Agency (2026) Global Methane Tracker 2026, 10 ("If every country were to implement these tried-and-tested policies, we estimate that global methane emissions from oil and gas operations would shrink by more than half.").

[230] International Energy Agency (2026) Global Methane Tracker 2026, 10 ("If additional policies that rely on more precise emissions data – such as emissions pricing, financing instruments and performance standards – were also adopted globally, methane emissions from oil and gas could be cut by more than 75%.").

[231] OECD Development Policy Tools (2024) Methane Abatement in Developing Countries, 58 ("Alongside equipment and technology standards, governments should set out robust and effective leak detection and repair (LDAR) programmes to identify and address sources of fugitive methane emissions as they arise. The main elements of a robust and effective LDAR programme include: • Scope of facilities to be inspected – LDAR requirements may specify which facilities and equipment are subject to inspection requirements • Authorised LDAR equipment and technologies – LDAR requirements may direct operators to use a combination of traditional on-site techniques (e.g. optical gas imaging) or advanced techniques – including aircraft, unmanned aerial vehicles (drones), mobile ground labs, and satellites • Frequency of inspections – the more frequent that monitoring is carried out (by the operator), the more effective the LDAR programme will be in identifying and repairing sources of fugitive methane emissions (Mohlin et al., 2022[2]) • Detection threshold and repair requirements – this may include a leak threshold that triggers the obligation to repair and the allowance timeframe for carrying out those repairs • Reporting and recordkeeping – LDAR requirements may require companies to keep records of their surveys, detected leaks, and repair actions, and to report to competent authorities (CLDP, 2023[11]).").

[232] International Energy Agency (2025) Global Methane Tracker Documentation, 22 ("Leak detection and repair (LDAR) programmes are the main mechanisms for mitigating fugitive emissions along the production, transmission and distribution segments of the value chain. The costs of carrying out inspections and undertaking repairs differ depending on the segment in question, since it takes longer to inspect a compressor on a transmission pipeline than in a production facility. It is assumed that inspections can be carried out annually, twice a year, quarterly, daily, or be based on continuous monitoring systems, with each option included as a separate mitigation option in the marginal abatement cost curves. Daily LDAR is used to tackle emissions from large leaks that occur sporadically such as those detected by satellites. Annual inspections are assumed to mitigate 40% of fugitive emissions, biannual inspections mitigate 60%, quarterly inspections mitigate 75%, and a continuous LDAR programme reduces fugitive emissions by 90%; based on current technology, it is assumed that the remaining 10% cannot be avoided.").

[233] International Energy Agency, *Methane Tracker* (*last updated* 4 May 2026) (Several regulatory measures can be applied to oil and gas methane. The tried-and-tested ones, with well-established precedents across multiple settings, are effective, straightforward to administer, and require only basic quantification and reporting rather than advanced compliance tools; they also sit at the low end of the abatement cost curve, making them the most cost-effective. Leak detection and repair (LDAR) mandates, which require companies to locate and fix fugitive leaks, would cut global methane emissions by 16,982 kt, roughly 21%.).

[234] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, § 2.2(1-2) ("2.2 (1) Part 1 does not apply to an upstream oil and gas facility to which Part 2 applies. Application of Part 2 (2) If the operator of an upstream oil and gas facility provides the Minister with notice of the use of an emission monitoring system at the facility in accordance with section 2.3, Part 2 applies in respect of that facility beginning on the day specified in the notice.").

[235] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, §§ 2(1), 8.1 (Under the prescriptive pathway, Part 1, the Enhanced Methane Regulations build on the concept of Leak Detection and Repair (LDAR) programs by mandating a "Detection of Fugitive Emissions and Repair Program." Methane Regulations, Part 1. Operators must initiate a coordinated inspection regime to understand all emission sources on their sites. Methane Regulations, §§ 8.1, 8.11, 8.12 (comprising comprehensive, screening, and annual inspections). This regime will categorize venting sources to be controlled or recognized under exceptions, identify residual emissions from fuel combustion and other gas destruction equipment, and set up management of extraordinary conditions and small, miscellaneous emissions sources through a fugitive emission management program that records specific data "for

each fugitive emission detected," including "the unique identifier" and "a description of the equipment component." Methane Regulations, §§ 8.1–8.18. The Enhanced Methane Regulations apply a risk-based approach with differentiated inspection tiers applied to three classifications of facilities. Methane Regulations, §§ 2(1), 8.1. Facilities undertaking higher-risk activities such as compressing natural gas or storing liquid hydrocarbons are more likely to have fugitive methane emissions and so are classified as Type 1 facilities; all other active facilities are classified as Type 2 facilities. Methane Regulations, § 2(1) (The three classifications of facilities are Type 1, Type 2, and inactive.). Facilities that have not produced, processed or transported hydrocarbons for at least one year are classified as inactive facilities. Methane Regulations, § 2(1).).

[236] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, §§ 8.1, 8.11, 8.12, 8.13 (Comprehensive inspections are structured site visits to detect methane emissions, undertaken by technicians who have "received training in the calibration, maintenance and operation of the instruments," using equipment specifically designed to see small emissions such as an "optical gas-imaging instrument." Methane Regulations, §§ 8.1(4)–(6), 8.13. Type 1 facilities are required to maintain a quarterly schedule for comprehensive inspections. Methane Regulations, § 8.1(1)(a). Type 2 facilities must maintain an annual schedule. Methane Regulations, § 8.1(1)(b). Inactive facilities are not required to conduct comprehensive inspections. Methane Regulations, § 8.1(2)(a). Despite the facility classification, some existing facilities may be excluded from these requirements if they have low production and only a low volume of gas on site. Methane Regulations, § 8.1(2)(b) (specifically if "the volume of crude oil produced did not exceed 600 m³" and "the combined volume of hydrocarbon gas produced and received did not exceed 12 000 m³" in the previous calendar year).).

[237] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, §§ 8.1, 8.11, 8.12, 8.13 (Screening inspections are site visits, integrating methane inspection requirements into normal operating routines, using less precise detection equipment than required for comprehensive inspections to facilitate operator intervention. Methane Regulations, §§ 8.11(1), 8.11(3). All facilities must undertake monthly screening inspections when operators are present on the site, which must be supported with monitoring instrumentation capable of detecting large emissions estimated to be streaming at more than 10 kilograms per hour (kg/h). Methane Regulations, §§ 8.11(1), 8.11(3).).

[238] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, §§ 8.1, 8.11, 8.12, 8.13 (Annual inspections are confirmation inspections conducted by an independent third-party auditor. Methane Regulations, § 8.12(1). They are comprehensive but allow for the use of less precise monitoring tools, provided the method "under standard conditions, provides a 90% or greater probability of detecting a fugitive emission that has a flow rate of 10 kg/h or more." Methane Regulations, § 8.12(4) (aerial, drone or vehicle-mounted systems for example). All facilities must have one annual inspection. Methane Regulations, § 8.12(1).).

[239] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, § 8.15 (Upon detection of emissions, whether during an inspection or otherwise, fugitive emissions must be addressed within a repair timeline that is dependent on the emission rate. Methane Regulations, §§ 8.15(1), 8.15(3). Emission rates of 100 kg/h or more will need to be addressed within 24 hours. Methane Regulations, § 8.15(3)(d). Emission rates of 10 kg/h to 100 kg/h will need to be addressed within 7 days. Methane Regulations, § 8.15(3)(c). Emission rates of less than 10 kg/h should be managed within 30 days (or 90 days for rates <1 kg/h) but can be scheduled for repair over longer periods if the repair process causes more emissions than a small fugitive problem. Methane Regulations, §§ 8.15(3)(a)–(b), 8.15(6).).

[240] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 2(26-27) ("(26)'type 1 leak detection and repair survey' or 'type 1 LDAR survey' means a leak detection and repair survey carried out in accordance with the requirements set out under Article 14(2), (7) and (8) and Part 1 of Annex I for type 1 LDAR surveys; (27)'type 2 leak detection and repair survey' or 'type 2 LDAR survey' means a leak detection and repair survey carried out in accordance with the requirements set out under Article 14(2), (7) and (8) and Part 1 of Annex I for type 2 LDAR surveys;").

[241] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, ANNEX I, Part 1 ("Leak detection and repair surveys as referred to in Article 14…For all aboveground and

underground components, excluding distribution and transmission networks LDAR surveys shall be carried out at the following minimum frequency…").

[242] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 14(13) ("13. Without prejudice to the reporting obligations pursuant to paragraph 14, operators shall record all identified leaks, irrespective of their size, and shall regularly survey them and ensure that they are repaired in accordance with paragraph 9. Operators shall keep the record for at least 10 years and shall provide that information to competent authorities upon their request.").

[243] Alberta Energy Regulator (2025) Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting, table 5.

[244] Alberta Energy Regulator (2025) Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting, 8.10.4 ("1) The duty holder must repair sources of fugitive emissions or take other action to eliminate fugitive emissions within 24 hours of identification if fugitive emissions a) are causing off-lease odours, b) are the result of a failed pilot or ignitor on a flare stack, incinerator, or enclosed combustor, or c) have the potential to cause safety issues. 2) The duty holder must repair all other sources of fugitive emissions or take other action to eliminate fugitive emissions within 30 days unless any of the following applies: a) A major shutdown is required to complete the repair and there are no safety issues. • Repair at the next planned shutdown or as directed by the AER. b) The fugitive emissions, measured using US EPA Method 21, have a hydrocarbon concentration less than 10 000 ppm. • No repair is required; however, these emissions must be quantified at each subsequent survey until the source is repaired. c) The fugitive emissions are from surface casing vent flow or gas migration. • Manage in accordance with the timelines in Directive 087: Well Integrity Management.").

[245] Code of Colorado Regulations, Regulation 7: Control of Emissions from Oil and Gas Emissions Operations, 5 CCR 1001, Table 4.

[246] Code of Colorado Regulations, Regulation 7: Control of Emissions from Oil and Gas Emissions Operations, 5 CCR 1001, II.E.7 (".E.7.a. Except as provided in Section II.E.7.b., the first attempt to repair a leak must be made no later than five (5) working days after discovery and repair of a leak discovered on or after January 1, 2018, completed no later than thirty (30) working days after discovery, unless parts are unavailable, the equipment requires shutdown to complete repair, or other good cause exists.").

[247] CAL. PUB. RES. CODE § 3270(a) (2025) ; CAL. CODE REGS. tit. 17, § 95669(d)(1) (2025).

[248] CAL. PUB. RES. CODE § 95669(g) (2025).

[249] CAL. CODE REGS. tit. 17, § 3283(a), (a)(2) (2025).

[250] CAL. PUB. RES. CODE § 95669(h)(1)–(3) (2025).

[251] Nigerian Upstream Petroleum Regulatory Commission (2022) Guidelines for Management of Fugitive Methane and Greenhouse Gases Emissions in the Upstream Oil and Gas, 3.2.2 ("1. Onshore Oil and Gas facilities: i. In the first year after implementation of these guidelines, an operator shall conduct one inspection at each facility. ii. In the second year after implementation of these guidelines, an operator shall conduct two inspections at each facility, with each inspection performed at least five months after the previous inspection. iii. In the third and subsequent years after implementation of these guidelines, an operator shall conduct four inspections at each facility, with each inspection performed at least 2 months after the previous inspection. iv. Notwithstanding the provisions of (i-iii), at the discretion of the Commission Chief Executive, operators with multiple facilities (more than 10) may be permitted to conduct a phase inspection that will cover 50% of their facilities within a twoyear period. 2. Offshore Oil and Gas facilities: i. Manned offshore platforms shall comply with same inspection frequency schedule as onshore facilities. ii. Unmanned offshore platforms shall conduct LDAR inspections whenever on-site maintenance activities are planned, up to the frequency schedule outlined for onshore facilities.").

[252] Nigerian Upstream Petroleum Regulatory Commission (2022) Guidelines for Management of Fugitive Methane and Greenhouse Gases Emissions in the Upstream Oil and Gas, 3.2.4 ("1. First repair attempt shall be within the below timeframes: i. Larger leaks (50,000 parts per million by volume (ppmv) shall be repaired within 5 working days of discovery. ii. Small leaks (5,000ppmv) shall be repaired within 14 days of discove ry.").

[253] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 47 ("Flaring and venting of natural gas from the upstream oil and gas sector is a significant contributor to global methane and other GHG emissions. Methane emissions primarily arise from venting – i.e. the intentional release of gas into the atmosphere, as well as from flaring – where incomplete combustion of natural gas also releases methane. According to the IEA, the prevention of non-emergency, routine flaring and venting is the most important mitigation measure countries can take as this would avoid almost 20% of oil and gas methane emission globally (IEA, 2023[2]). In fact, the impact of flaring on global methane emissions may be higher than originally thought, as flare efficiency (the percentage of gas that is successfully burned) is often assumed by regulators to be 98%. However, flare efficiency ratios can drop to as low as 10–90% based on impure gas compositions, variable flowrates, remote locations, harsh weather, and poor maintenance practices (Gordon et al., 2022[3]).").

[254] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 47 ("Flaring and venting of natural gas from the upstream oil and gas sector is a significant contributor to global methane and other GHG emissions. Methane emissions primarily arise from venting – i.e. the intentional release of gas into the atmosphere, as well as from flaring – where incomplete combustion of natural gas also releases methane. According to the IEA, the prevention of non-emergency, routine flaring and venting is the most important mitigation measure countries can take as this would avoid almost 20% of oil and gas methane emission globally (IEA, 2023[2]). In fact, the impact of flaring on global methane emissions may be higher than originally thought, as flare efficiency (the percentage of gas that is successfully burned) is often assumed by regulators to be 98%. However, flare efficiency ratios can drop to as low as 10–90% based on impure gas compositions, variable flowrates, remote locations, harsh weather, and poor maintenance practices (Gordon et al., 2022[3]).").

[255] International Energy Agency, *Methane Tracker* (*last updated* 4 May 2026) (Several regulatory measures can be applied to oil and gas methane. The tried-and-tested ones, with well-established precedents across multiple settings, are effective, straightforward to administer, and require only basic quantification and reporting rather than advanced compliance tools; they also sit at the low end of the abatement cost curve, making them the most cost-effective. Zero non-emergency flaring and venting policies, which prohibits these practices or mandate specific processes and procedures that result in less flaring and venting, would cut global methane emissions by 14,446 kt, roughly 18%.).

[256] The World Bank Global Gas Flaring Reduction Partnerships (2022) GLOBAL FLARING AND VENTING REGULATIONS: A COMPARATIVE REVIEW OF POLICIES, 3.

[257] The World Bank Global Gas Flaring Reduction Partnerships (2022) GLOBAL FLARING AND VENTING REGULATIONS: A COMPARATIVE REVIEW OF POLICIES, 22 ("For the economic assessment of associated gas utilization, the integrated approach has proven effective, as it assumes that the utilization of associated gas is part of the overall development rather than a separate project. Flaring and venting are therefore considered negative externalities, and all related abatement costs become an integral part of the entire project expenditure. • Consistent application of the integrated approach across the oil and gas sector is key to allowing comparability across different projects and approaches.").

[258] The World Bank Global Gas Flaring Reduction Partnerships (2022) GLOBAL FLARING AND VENTING REGULATIONS: A COMPARATIVE REVIEW OF POLICIES, 22-23 ("Consistent application of the integrated approach across the oil and gas sector is key to allowing comparability across different projects and approaches.… Alignment of targets through legal and regulatory requirements and standards is important to provide clarity and direction to the oil and gas operators. Given the breadth of areas touched on by flaring and venting, interagency coordination is essential. It can be achieved through dedicated liaison officers.").

[259] The World Bank Global Gas Flaring Reduction Partnerships (2022) GLOBAL FLARING AND VENTING REGULATIONS: A COMPARATIVE REVIEW OF POLICIES, 11 ("Development of an effective regulatory framework requires monitoring, measuring, and enforcement capabilities that may need to be phased in over time. Accurate and timely data are essential for designing efficient regulations. Absent monitoring and enforcement capacity, a comprehensive regulatory framework cannot achieve the desired results. Where such capacity is weak, setting different deadlines for bringing new projects and existing facilities into compliance with new regulations can be effective. Jurisdictions need to establish fit-for-purpose methods for measuring the volume of gas flared and vented (by metering or using engineering estimates) and to require reporting and disclosure. Except for Nigeria and countries in North America and Europe, few countries have provisions requiring producers to measure or estimate all flaring and venting volumes and submit the information to the regulator on a regular basis. The quality

of public disclosure of data on flaring and venting volumes varies widely across jurisdictions, and relevant information is often missing. Disclosure of the requisite information can help strengthen existing regulations and build trust in the industry with the affected communities, civil society, and the public at large. As part of the approval process for new projects, countries are advised to require plans for eliminating routine flaring and venting. These plans should employ a thorough technical and economic evaluation of alternative uses of associated gas and include the costs of reducing flaring and venting in assessing the viability of new oil field developments. The application and approval procedures for intermittent flaring and venting of associated gas should be an integral part of the overall license (or contract) for upstream oil field development and subsequent production plans. Routine gas flaring and venting should be avoided by using or monetizing associated gas. Penalties should be established at a sufficiently high level to make the alternative of investing in flaring and venting reduction more attractive than paying the penalty. They should not be so high that ceasing oil production becomes the only viable option for many operators. Mandatory payments such as fines, penalties, and sanctions for noncompliance appear to have a limited effect on improving compliance mainly because they tend to be minor compared with the commercial value of oil production and are often not evenly enforced for fear of losing oil production. Few jurisdictions have explicit rules prescribing accurate gas flaring and venting records and regular reporting requirements. Few regulators have introduced detailed auditing procedures or enforce sanctions for noncompliance.").

[260] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 73 ("Norway was one of the first countries to introduce an offshore carbon tax in 1990 through the adoption of the Act 21 December 1990 no 72 relating to tax on discharge of CO2 in the petroleum activities on the continental shelf (hereafter "the Act"). Although the primary target of this tax was CO2 due to the high CO2 content in the Sleipner field, the tax also applies to methane emissions resulting from offshore oil and gas production. Sections 1, 2, and 4 of the CO2 Tax Act, 1990, require operators to pay on behalf of all licensees a carbon dioxide tax payment for flared or vented natural gas and any other carbon dioxide discharged to the atmosphere during the production and transport of oil and gas unless otherwise exempted by the parliament. Section 3 of the Norwegian Petroleum Act, 1996 coherently allocates to the licensees the ownership of all oil and gas produced, including gas that is flared or vented. Under the Norwegian Petroleum Act, 1996, flaring in excess of what is needed for safe operations is prohibited and subject to a fine, as is the wilful or negligent submission of incorrect or incomplete documentation or any other breach of provisions or decisions contained in or issued by virtue of the CO2 Tax Act, 1990. Several factors were influential in the implementation of this tax, including: • Upstream operations on the Norwegian Continental shelf account for about 95% of the total methane emissions from the oil and gas sector. • Operators use similar equipment which facilitates procedures for consistently calculating emissions across companies. The Act requires oil and gas companies to install metering systems to obtain methane measurements for tax purposes. Direct measurements (such as flow meters on vent heads) account for around two-thirds of emissions, while operators must follow recognised quantification models and methods to compute emissions for the remaining one-third. • Norwegian regulators held extensive consultations with industry, research institutions, and other actors during the development of guidelines for emission data collection and reporting. Since 1991, the CO2 tax level has been increased and extended from offshore to other onshore industry sectors. The tax rate in 2021 was NOK 8.76 per standard cubic metre of emissions of natural gas, which is equivalent to approximately USD 1 600 or EUR 1 500 per tonne of methane. The imposition of the CO2 tax has encouraged investment in CO2 and methane mitigation technologies, specifically the deployment of carbon capture and storage in natural gas production. The CO2 tax was one of the main business drivers for Equinor to separate CO2 offshore and inject it into deeper geological layers. Due to the Norwegian CO2 emissions tax, it was more economical to store the CO2, once captured, than venting it. Had this process not been adopted and the CO2 produced been allowed to escape to the atmosphere the licensees of the Sleipner West field would have had to pay around NOK 1 million/day in Norwegian CO2 taxes. Source: (OECD, 2022[1]); (IEA, 2021[20]); (Mohlin et al., 2022[21]); (Vernon et al., 2022[22]); (World Bank, 2024[23]).").

[261] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, §§ 46-49 (Under the prescriptive pathway, Part 1, the Enhanced Methane Regulations prohibit venting of hydrocarbon gas to the environment, with certain exceptions. Methane Regulations, § 49(1). Operators are allowed to temporarily vent hydrocarbon gas under certain conditions listed in subsection (2):
"(a) it is vented as part of planned equipment maintenance or a planned temporary depressurization of equipment or a pipeline and measures are taken to minimize the volume of hydrocarbon gas that is vented;
(b) it is necessary to avoid serious risk to human health or safety arising from an emergency situation;
(c) the heating value of the hydrocarbon gas or its flow rate are insufficient to sustain continuous destruction of the gas by hydrocarbon gas destruction equipment;

(d) the use of hydrocarbon gas destruction equipment or hydrocarbon gas conservation equipment would prolong an interruption of the hydrocarbon gas supply to the public."
A limited exception will also apply to facilities that began operation before January 1, 2028, where "crude oil is produced," and where "in the calendar year before the one in which the venting is to occur," the facility produced 600 m3 or less of crude oil and vented 12 000 m3 or less of hydrocarbon gas, allowing them to continue to vent up to "no more than" 12 000 m3 of hydrocarbon gas per year as long as that limit is not exceeded and provided "the venting is not from a pneumatic device." Methane Regulations, §§ 49(2)(e), 49(3).

Under the prescriptive pathway, Part 1, the Enhanced Methane Regulations permit flaring of gas in emergency situations where it is necessary to prevent serious risk to human health or safety. Methane Regulations, § 46(1). For all other situations, flaring must be supported by an annually reassessed engineering study that concludes that the use of hydrocarbon gas to produce useful heat or energy is not feasible in the circumstances. Methane Regulations, §§ 46(1)(2).

Flaring systems utilized for gas destruction to comply with the Enhanced Methane Regulations have to achieve a minimum carbon conversion efficiency of at least 98%. Methane Regulations, § 47(1)(a)(ii). The system will be required to operate continuously, maintaining "stable combustion... without generating any visible emission." Methane Regulations, § 47(1)(a)(i). The Enhanced Methane Regulations require that combustion systems have either an automatic flame failure detection system or undergo "visual" inspections "at least once every seven days." Methane Regulations, § 47(2). A way to relight the system when needed, such as a pilot flame or an automatic ignition device, is also required. Methane Regulations, § 48(2)(b)(i). Alternatively, a catalytic oxidation system can be utilized. Methane Regulations, § 47(1). If using a catalytic oxidation system, the device must be operated in accordance with manufacturer recommendations in order to achieve the highest practicable efficiency. Methane Regulations, § 47(3).)

[262] Alberta Energy Regulator (2025) Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting, 2.1(3) ("The AER considers conservation the best alternative to reduce flare, incineration, enclosed combustion, and vent volumes, followed by combustion to reduce vent volumes. If venting is the only feasible alternative, refer to section 8 for additional requirements."); New Mexico Administrative Code, 19.15.28.7 ("OBJECTIVE: To regulate the venting and flaring of natural gas from natural gas gathering systems to prevent waste and protect public health and the environment.").

[263] New Mexico Administrative Code, 19.15.28.8-10 ("19.15.28.8 VENTING AND FLARING OF NATURAL GAS: A. Venting or flaring of natural gas from a natural gas gathering system that constitutes waste as defined in 19.15.2 NMAC and is prohibited. The operator has a general duty to maximize the gathering of natural gas by minimizing the waste of natural gas through venting and flaring. The operator may vent or flare natural gas only as authorized in Subsection B of 19.15.28.8 NMAC. In all circumstances, the operator shall flare rather than vent natural gas except when flaring is technically infeasible or would pose a risk to safe operations or personnel safety and venting is a safer alternative than flaring.… STATEWIDE NATURAL GAS CAPTURE REQUIREMENTS: A. Statewide natural gas capture requirements. Commencing April 1, 2022, the operator of a natural gas gathering system shall reduce the annual volume of vented and flared natural gas in order to capture no less than ninety-eight percent of the natural gas gathered in each of two reporting areas, one north and one south of the Township 10 North line, by December 31, 2026. The division shall calculate and publish on the division's website each operator's baseline natural gas capture rate based on the operator's fourth quarter 2021 and first quarter 2022 quarterly reports as per Paragraph (2) of Subsection G of 19.15.28.8 NMAC. In each calendar year between January 1, 2022 and December 31, 2026, the operator shall increase its annual percentage of natural gas captured in each reporting area in which it operates based on the following formula: (baseline loss rate minus two percent) divided by five, except that for 2022 only, an operator's percentage of natural gas captured shall not be less than seventy-five percent of the annual gas capture percentage increase (2022 baseline loss rate minus two percent divided by five times 0.75), and the balance shall be captured in 2023.").

[264] Comisión Nacional de Hidrocarburos (2016) DISPOSICIONES Técnicas para el aprovechamiento del gas natural asociado, en la exploración y extracción de hidrocarburos, Art. 14(II)(a) ("II. In the case of extraction activities, the Target shall be defined in accordance with the following bases: a) The Operator shall achieve and maintain a sustained annual utilization level of 98%; This Target shall be achieved in the case of conventional deposits, preferably within three years of the start of activities. The foregoing shall be based on the Best Practices identified by the Oil Operators and in accordance with the evaluation carried out by the Commission for this purpose, within the procedure established in the Guidelines for the approval and supervision of the Plans.").

[265] Comisión Nacional de Hidrocarburos (2016) DISPOSICIONES Técnicas para el aprovechamiento del gas natural asociado, en la exploración y extracción de hidrocarburos, Art. 6(II) ("The Petroleum Operator may carry out the Controlled Destruction of Natural Gas, as a consequence of Hydrocarbon Exploration and Extraction activities, in the following cases: … II. When there are circumstances of unforeseen events or force majeure that imply a risk to the safe operation of the facilities and personnel. The foregoing, in accordance with the provisions issued by the Agency for this purpose").

[266] Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector Hidrocarburos (2018) DISPOSICIONES Administrativas de carácter general que establecen los Lineamientos para la prevención y el control integral de las emisiones de metano del Sector Hidrocarburos, Art. 67 ("Article 67. Regulated entities that carry out the activities included in section I of article 2 of these Provisions must incorporate Destruction equipment whose efficiency is equal to or greater than 90%; while, for the activities included in sections II and III of the aforementioned article, Regulated entities must incorporate Destruction equipment whose efficiency is equal to or greater than 98%.").

[267] Comisión Nacional de Hidrocarburos (2016) DISPOSICIONES Técnicas para el aprovechamiento del gas natural asociado, en la exploración y extracción de hidrocarburos, Art. 7 ("The destruction of associated natural gas outside the approved Natural Gas Utilization Program will result in the loss or impairment of the nation's assets, as it is a non-renewable resource with economic value. The Oil Operator must have the necessary economic resources or contingent financial provisions, without prejudice to the provisions of the guarantee contained in the corresponding contract or assignment, to cover the damages or losses caused to the Nation, due to causes attributable to the Oil Operator. The above is in addition to any sanctions provided for in any other legal system on the matter.").

[268] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 15(1-2) ("Venting shall be prohibited except in the circumstances provided for in this Article. Routine flaring shall be prohibited…Venting or flaring shall be allowed only in case of an emergency or malfunction.").

[269] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 15(4) ("Where venting is allowed pursuant to paragraphs 2 and 3, operators shall vent only where flaring is not technically feasible due to lack of flammability or inability to sustain a flame, risks endangering safety of operations or personnel or where it would have a worse environmental impact in terms of emissions. In such a situation, as part of the reporting obligations set out in Article 16, operators shall notify and provide evidence to the competent authorities of the necessity to use venting instead of flaring.").

[270] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 17 ("1. Where a site is built, replaced or refurbished in whole or in part, or where new flare stacks or other combustion devices are installed, operators shall install only flare stacks or combustion devices with an auto-igniter or continuous pilot burner and with a destruction and removal efficiency by design level of at least 99 %. 2. Operators shall ensure that all flare stacks or other combustion devices comply with the requirements of paragraph 1 by 5 February 2026. 3. Operators shall inspect flare stacks or other combustion devices every 15 days in accordance with Annex IV, except where they are not used on a regular basis. Where flare stacks or other combustion devices are not used on a regular basis, operators shall inspect them before each use. As an alternative to regular inspections, subject to the approval of the competent authorities, operators may use remote or automated monitoring systems, as specified in accordance with points (1) and (2) of Annex IV. Where irregularities are detected, operators shall investigate the cause of the irregularity and remedy it within 6 hours or, in the case of severe weather events or other extreme conditions, within 6 hours after the conditions return to normal. 4. Where auto-igniters or continuous pilot burners are used, operators shall use flame supervision equipment to constantly monitor the main flare flame or the pilot flame to ensure that venting does not occur due to a flame-out condition.").

[271] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 16 ("1. Operators shall notify the competent authorities of venting events and flaring events: (a) caused by an emergency or a malfunction; or (b) lasting a total of 8 hours or more within a 24-hour period from a single event. The notification referred to in the first subparagraph shall be made without delay after the event and at the latest within 48 hours from the start of the event or the moment the operator became aware of it, in accordance with the

elements set out in Annex III. By derogation from the first subparagraph, controlled flaring that occurs during shutdowns, shall be reported in the annual report. 2. Operators shall submit to the competent authorities annual reports on all venting events and flaring events, referred to in paragraph 1 of this Article and in Article 15, in accordance with the elements set out in Annex III and as part of the relevant report referred to in Article 12.").

[272] Capterio (2025) IGNITING ACTION TO REDUCE GAS FLARING: REAL OPPORTUNITIES. REAL PROJECTS. REAL RESULTS., 43 ("It is striking that Algeria restricts flaring and imposes flaring penalties that are similar to those in Norway (equivalent to $2.6 per MMbtu in Algeria, compared with $3.6 per MMBtu in Norway as of June 202353), but the two countries have had starkly different experiences, including with penalty enforcement.").

[273] Capterio (2025) IGNITING ACTION TO REDUCE GAS FLARING: REAL OPPORTUNITIES. REAL PROJECTS. REAL RESULTS., 43 ("Both countries have pipelines connecting to the EU market, with available capacity, and yet Algeria flares significant volumes of gas (in addition to venting methane), while Norway has very limited flaring. It is understandable, however, that Algerian authorities are willing to forego applying flaring restrictions and collecting flaring penalties (which we think could be up to $900 million per year). This would ostensibly apply exceptions for gas flared where infrastructure is lacking, because it would be impossible for Sonatrach to recover investments in such infrastructure (or to finance such investments) from the domestic sale of gas at regulated prices.").

[274] Capterio (2025) IGNITING ACTION TO REDUCE GAS FLARING: REAL OPPORTUNITIES. REAL PROJECTS. REAL RESULTS., 43 ("This shows that restrictions and penalties can be part of the solution, but only where operators have a real economic choice between capturing, processing, and selling gas at reasonable prices and paying flaring penalties.").

[275] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 38 ("Measurement / monitoring encompasses systematic observation, identification and assessment of methane sources, including purposeful venting, unlit flares, releases due to emergency situations, and fugitive emissions. Reporting provisions require companies to send information to the regulator. Reporting requirements support compliance follow-up and help understand whether progress is being made. They are particularly relevant for the establishment of emission baselines. Verification (or auditing) is a process where independent organisations or professionals observe and report on the validity of the information provided by oil and gas operators. This may include the use of accredited third-party verifiers or where the relevant regulatory agency (e.g. the country's environmental protection agency) carries out the verification and auditing itself. Source: Adapted from (IEA, 2021[2]) and (Mohlin et al., 2022[3]).").

[276] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 38 ("To avoid such suboptimal outcomes, governments can collaborate to develop MRV frameworks or can incorporate existing reporting standards and templates into their regulatory frameworks, in particular when seeking to align reporting requirements with those from importing jurisdictions to facilitate consistency, comparability and usability of reported data. In terms of existing reporting standards and templates, UNEP's Oil & Gas Methane Partnership 2.0 (OGMP 2.0) represents the only comprehensive measurement-based reporting framework covering all material sources of methane emissions, from both operated and non-operated assets across all segments of the value chain. OGMP 2.0 sets out a framework for its member companies to report annually on their methane emissions (Scope 1) based on direct measurements, as opposed to using generic emission factors. However, reporting at OGMP 2.0 Level 3 involves the development of granular equipment inventory, with the estimation of asset-level emissions through the use of generic, but source-specific emission factors – an important first step – particularly for under-resourced developing countries and which can provide a basis for future measurements to be prioritised. OGMP 2.0 includes not only a company's operated assets, but also its joint ventures.

[277] *See generally* United Nations Environment Programme (2025) A BLUEPRINT FOR MRV: HOW COUNTRIES CAN BUILD OGMP 2.0-ALIGNED REPORTING INTO MRV METHANE REGULATIONS .

[278] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Article 12(1-2) ("1. By 5 August 2025, operators shall submit a report to the competent authorities containing the quantification of source-level methane emissions estimated using at least generic emission factors for all sources. That report may contain quantification of source-level methane emissions in accordance with the requirements set out in paragraph 2 for some or all sources. 2. Operators and undertakings established in the Union shall submit a

report to the competent authorities of the Member State where the asset is located containing quantification of source-level methane emissions: (a) for operated assets, by 5 February 2026; and (b) for non-operated assets, by 5 February 2027, where those assets have not been reported under point (a). Where direct measurement is not possible, reporting shall involve the use of specific emission factors based on source-level quantification or sampling.").

[279] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Article 12(1-2) ("1. By 5 August 2025, operators shall submit a report to the competent authorities containing the quantification of source-level methane emissions estimated using at least generic emission factors for all sources. That report may contain quantification of source-level methane emissions in accordance with the requirements set out in paragraph 2 for some or all sources. 2. Operators and undertakings established in the Union shall submit a report to the competent authorities of the Member State where the asset is located containing quantification of source-level methane emissions: (a) for operated assets, by 5 February 2026; and (b) for non-operated assets, by 5 February 2027, where those assets have not been reported under point (a). Where direct measurement is not possible, reporting shall involve the use of specific emission factors based on source-level quantification or sampling.").

[280] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 8 ("1. Verifiers shall carry out verification activities to assess the conformity of the emissions reports submitted to them by operators, undertakings, mine operators or importers, with the requirements of this Regulation. Those verification activities shall include the review of all data sources and methodologies used in order to assess the reliability, credibility and accuracy of the emissions reports, in particular the following: (a) the choice and employment of emission factors; (b) the methodologies, calculations, samplings or statistical distributions leading to the determination of methane emissions; (c) any risk of inappropriate measuring or reporting; (d) any quality control or quality assurance systems applied by the operators, undertakings, mine operators or importers.").

[281] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, § 52(1) ("An emission monitoring system must be operating at all times, except for any period during which all or part of the system is undergoing preventive maintenance."); § 53(1)(d) ("it must generate an alert when the total flow rate of hydrocarbon gas emissions detected at the facility exceeds the facility emission rate by 1 kg/h or more.").

[282] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, § 53(1)(b) ("(b) its sensors must take readings (i) in the case of a Type 1 facility, at least once every 15 minutes, and (ii) in the case of a Type 2 facility or an inactive facility, at least once every 12 hours;").

[283] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, § 53.3 ("53.3 On or before June 30 in each year, an annual report must be provided to the Minister that contains the following information and documents in respect of the upstream oil and gas facility for the preceding calendar year:").

[284] Ministerio de Minas y Energia (2022) Resolución 40066/2022, Art. 43, para. 2 ("The detection and quantification of natural gas leaks shall be carried out in accordance with Reference Method 21 of the United States Environmental Protection Agency, or any other method that has been previously authorized by the Supervisory Authority.").

[285] Ministerio de Minas y Energia (2022) Resolución 40066/2022, Art. 24, 39 ("All natural gas flaring volumes must be measured and reported by the Operator on a monthly basis to the Supervisory Entity, using the attached Form 30 SEE or its equivalent…Operators with technology for collecting intentional vent gas from tanks or gun barrels must measure these volumes daily using instruments calibrated and certified by calibration laboratories accredited under ISO/IEC 17025 by ONAC, or by an accreditation body that is a member of the ILAC recognition agreements. The Operator shall be responsible for recording and tracking this information.").

[286] Nigerian Upstream Petroleum Regulatory Commission (2022) Guidelines for Management of Fugitive Methane and Greenhouse Gases Emissions in the Upstream Oil and Gas, 2.1 ("Methane (CH4) and other GHG (CO2 and Nitrous oxide (N2O) emissions are gases with significant implications for climate change. In the upstream oil and gas industry, the operator/licensee shall ensure as follows at the minimum: i. During design,

installation, and modification of the facilities. a. The submission of GHG management plan as part of Field Development Plan (FDP), Concept and Front-End Engineering Design (FEED) application for approval and as may be requested by the Commission. b. Ensure the Installation and retrofitting of equipment to reduce emissions In line with section 3.0 of these Guidelines. ii. Proper tracking of the key activities and operations that emit methane and fugitive emissions from operations such as gas flaring, venting, and fugitive emissions/leaks from the process equipment. Fugitive emission and leaks occur through process equipment such as: a. Compressors b. Pneumatics Controllers and Pumps c. Glycol Dehydrators d. Valves/Flanges e. Vent of Large Storage Tanks f. Cold Venting and Flares iii. Put in place a system for identifying, classifying, and quantifying methane emissions from process equipment, components and other sources of emissions in their operations. iv. Submission of fugitive emissions and GHG monitoring reports to the Commission on a quarterly basis.").

[287] Nigerian Upstream Petroleum Regulatory Commission (2026) Directive on Implementing on Standardised Templates and Transitioning to Measurement-Based Methane and GHG Reporting, ("In line with provisions of Section 4.0 of the Guidelines for Management of Fugitive Methane and Greenhouse Gases in Upstream Oil & Gas, operators shall, at a minimum, report emissions using IPCC Tier 2 methodologies from third quarter 2026, and by January 2027, transition fully to IPCC Tier 3 (its equivalent or high-level methods under other frameworks) measurement-based MRV systems.").

[288] Nigerian Upstream Petroleum Regulatory Commission (2022) Guidelines for Management of Fugitive Methane and Greenhouse Gases Emissions in the Upstream Oil and Gas, 4.1(ii)(d) ("The reporting of GHG emissions shall be in line with the IPCC standard and the data submitted shall be subject to quality control validation by multi-disciplinary team of the Commission and operators. A third-party verifier may be appointed to validate the data as may be determined by the Commission. See appendix E for tier1 data reporting template.").

[289] Alberta Regulation 244/2018 Methane Emissions Reduction Regulation, § 4 ("For the purposes of section 3, the volume of gas produced, received, vented and destroyed at an upstream oil and gas facility must be determined in accordance with the applicable methods set out in Directive 017."); Alberta Energy Regulator (2025) Directive 060, § 8.2 ("Methane emissions may be quantified using continuous metering, periodic testing, or estimates based on accepted engineering practices. Directive 017 identifies when vent gas from a site must be quantified using continuous metering or periodic testing, as well as acceptable testing methods. Manual 015: Estimating Methane Emissions provides guidance on how to estimate vent gas and fugitive emissions."). *See generally* Alberta Energy Regulator (2024) Directive 017, 2 ("This directive specifies • what and how volumes must be measured, • what, where, and how volumes may be estimated, • if accounting procedures must be performed on the determined volumes and what they are, • what data must be kept for audit purposes, and • what resultant volumes must be reported to the AER.").

[290] *See generally* Johnson M. R., Conrad B., Zimmerle D. J., & Kleinberg R. L. (2025) *Methane by the Numbers: The Need for Clear and Comparable Methane Intensity Metrics*, EARTH ARXIV (*preprint*); Seymour S., Xie D., Kang M. *et al.* (2025) *Methane emission intensity metrics: unmasking the trade-offs*, RESEARCH SQUARE (*present*).

[291] Carbon Limits & Clean Air Task Force (2026) METHANE INTENSITY FOR OIL AND GAS PRODUCTION: KEY METHODOLOGICAL CONSIDERATIONS, 9-31("Methane intensity is a clear concept, but there are a number of different specific ways of calculating that intensity.3,4 While these various approaches are all relatively straightforward, it is nonetheless important to explore the different approaches, which can have differing impacts. Hence, the purpose of this white paper is to inform relevant parties about the key methodological considerations for defining a specific methane intensity formula, in order to have a consistent methodology across producers. It explores the various approaches, evaluating their advantages, limitations, and implications for stakeholders. The analysis considers critical trade-offs, including simplicity, accuracy, and applicability, while examining challenges such as granularity, allocation methods, or units of output.").

[292] *See generally* United Nations (2026) SECRETARY-GENERAL'S CALL TO ACTION ON METHANE: THREE SECTORS, NINE ACTIONS BY 2030, 17 ("Effective methane and energy transition strategies depend on clear returns on investment and monetization opportunities, in addition to regulatory mechanisms. Essentially, fossil fuel producers require well-designed signals and incentives to act. Creating a marketplace for low-methane-intensity products would be one such incentive. A pre-condition for such a marketplace would be a common, internationally recognized methane intensity benchmark. A shared methane intensity benchmark would define what qualifies as near-zero methane production, ensure comparability across producers, prevent greenwashing and enable buyers, financiers and regulators to link performance to capital and contracts.").

[293] Code of Colorado Regulations, Regulation 7: Control of Emissions from Oil and Gas Emissions Operations, 5 CCR 1001-9, VIII.A.11 (""Greenhouse gas intensity" means the sum of preproduction emissions and production emissions in a calendar year in mtCO2e divided by the kBOE for that calendar year, calculated pursuant to Sections VIII.D. and VIII.F.").

[294] Colorado Air Pollution Control Division (2024) Oil and Natural Gas Methane Intensity Verification Protocol, 5 ("Each upstream segment4 oil and gas operator in Colorado is required to participate in the Regulation 7, Part B, Section VIII program to reduce preproduction and production emissions of greenhouse gases (GHG). This Oil and Natural Gas Methane Intensity Verification Protocol provides Air Pollution Control Division instructions for verifying and reporting methane emissions5 and calculated GHG intensities required by Regulation 7, Part B, Sections VIII.F. and VIII.G. The upstream segment includes all preproduction and production operations.6 The division will review this protocol annually. Any revisions to this protocol will be published by June 30 and will apply in the following calendar year. The division currently requires oil and gas (O&G) owners or operators to annually7 report emissions from all covered facilities to the Oil and Natural Gas Annual Emissions Inventory Reporting (ONGAEIR) program. To assess progress toward meeting established GHG reduction targets for the upstream segment, this inventory must accurately reflect GHG emissions as measured by empirical methods. An accurate inventory depends on an understanding of the routine sources of GHG emissions and the frequency, distribution, and magnitudes of emission events that occur at upstream O&G facilities. Academic studies utilizing empirical measurements in the atmosphere over the past decade8 generally find emission inventories underestimate methane emissions from the production and gathering segments. To improve and verify the accuracy of the GHG emission inventory with respect to methane, upstream operators must create a measurement-informed inventory of their methane emissions. A measurement-informed inventory adjusts an operator's calculated emissions of methane to more accurately account for methane emissions observed by quantitative measurements and facility monitoring. A measurement-informed inventory is created by using direct measurement and, optionally, parametric monitoring in accordance with Regulation 7, Part B, Section VIII and this protocol.").

[295] Code of Colorado Regulations, Regulation 7: Control of Emissions from Oil and Gas Emissions Operations, 5 CCR 1001-9, VIII.F.3.b (The operative provisions in Regulation 7 require that "Intensity operators must comply with either Section VIII.F.3.a or Section VIII.F.3.b to develop a measurement-informed inventory used to demonstrate compliance." 5 Colo. Code Regs. § 1001-9, pt. B, § VIII.F.3. This provides two compliance pathways: (1) apply a "State Default Intensity Verification Factor" developed by the APCD to reported emissions (Id. at § VIII.F.3.a.), or (2) develop an "Operator-Specific Program" that includes a detailed "measurement strategy" and a periodic third-party audit (Id. at § VIII.F.3.b.). An operator choosing an operator-specific program must submit a "summary of the measurement strategy" by "September 30 of 2024 through 2029 for the next calendar year." 5 Colo. Code Regs. § 1001-9, pt. B, § VIII.G.1. All operators must then submit "annual verifications on a Division-approved form" by "June 30 of 2024 through 2031 for the previous calendar year." *Id.* at § VIII.G.2. For benchmark years 2025, 2027, and 2030, operators using an operator-specific program must undergo a third-party audit, with summarized reports due to the Division by "December 31, 2026, for calendar year 2025," and subsequent deadlines for the other benchmark years. *Id.* at § VIII.G.5.).

[296] Code of Colorado Regulations, Regulation 7: Control of Emissions from Oil and Gas Emissions Operations, 5 CCR 1001-9, VIII.B.2–VIII.B.4 (establishing declining greenhouse gas intensity targets for 2025, 2027, and 2030, differentiating between "Majority Operators" [e.g., 10.94 mtCO2e/kBOE in 2025 dropping to 6.80 by 2030] and "Minority Operators" [e.g., 34.39 mtCO2e/kBOE in 2025 dropping to 21.38 by 2030], while exempting operators with less than 45 kBOE); VIII.C.2–VIII.C.4 (establishing separate, stricter targets for well production facilities commencing operation after December 31, 2022, requiring further intensity reductions if the facility is located in both the 8-hour Ozone Control Area and a disproportionately impacted community).

[297] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, § 1(5) ("facility emission intensity, in respect of an upstream oil and gas facility, means the ratio, expressed in percent, that is calculated by dividing the total volume of hydrocarbon gas emissions from the facility in the 365-day period preceding the day on which the calculation is made by the greatest of the following volumes:

(a) the volume of hydrocarbon gas produced at the facility during that period,

(b) the volume of hydrocarbon gas processed at the facility during that period, and

(c) the volume of hydrocarbon gas that is equal to the volume of hydrocarbon gas transported from the facility during that period minus the sum of the volumes of hydrocarbon gas referred to in paragraphs (a) and (b). (intensité d'émission)").

[298] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, § 1(5) ("facility emission intensity, in respect of an upstream oil and gas facility, means the ratio, expressed in percent, that is calculated by dividing the total volume of hydrocarbon gas emissions from the facility in the 365-day period preceding the day on which the calculation is made by the greatest of the following volumes:

(a) the volume of hydrocarbon gas produced at the facility during that period,

(b) the volume of hydrocarbon gas processed at the facility during that period, and

(c) the volume of hydrocarbon gas that is equal to the volume of hydrocarbon gas transported from the facility during that period minus the sum of the volumes of hydrocarbon gas referred to in paragraphs (a) and (b). (intensité d'émission)").

[299] Regulations Amending the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector): SOR/2025-280, §§ 2(1), 2.3(1), 51(1) ("facility emission reference standard means

(a) in respect of an inactive facility, 0%; and

(b) in respect of any other upstream oil and gas facility, one of the following values:

(i) 0.2%, if, during the 365-day period referred to in the definition facility emission intensity, the volume of hydrocarbon gas produced at the facility is greater than the volume of hydrocarbon gas processed at the facility and the volume of hydrocarbon gas transported from, but not produced or processed at, the facility, respectively,

(ii) 0.05%, if, during the 365-day period referred to in the definition facility emission intensity, the volume of hydrocarbon gas processed at the facility is greater than the volume of hydrocarbon gas produced at the facility and the volume of hydrocarbon gas transported from, but not produced or processed at, the facility, respectively,

(iii) 0.11%, if, during the 365-day period referred to in the definition facility emission intensity, the volume of hydrocarbon gas transported from, but not produced or processed at, the facility is greater than the volume of hydrocarbon gas produced at the facility and the volume of hydrocarbon gas processed at the facility, respectively. (étalon de référence)").

(a) the volume of hydrocarbon gas produced at the facility during that period,

(b) the volume of hydrocarbon gas processed at the facility during that period, and

(c) the volume of hydrocarbon gas that is equal to the volume of hydrocarbon gas transported from the facility during that period minus the sum of the volumes of hydrocarbon gas referred to in paragraphs (a) and (b). (intensité d'émission)").

[300] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 29(4) ("4. By 5 August 2027, the Commission shall adopt a delegated act in accordance with Article 34 to supplement this Regulation by setting out the methodology for calculating, at the level of the producer, the methane intensity of the production of crude oil, natural gas and coal placed on the Union market. That methodology shall take into account different production processes and site conditions, as well as existing international methodologies and best practice for calculating methane intensity. That methodology shall be non-discriminatory and based on transparent and objective criteria. When preparing such delegated acts, the Commission shall inform the Coordination Group for oil and petroleum products, the Gas Coordination Group, the Electricity Coordination Group and other relevant stakeholders.").

[301] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art.

29 (“1. By 5 August 2028 and every year thereafter, for the supply contracts concluded or renewed on or after 4 August 2024, Union producers and, pursuant to Article 27(1), importers shall report to the competent authorities of the Member State in which they are established the methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market calculated in accordance with the methodology set out pursuant to paragraph 4 of this Article.

For supply contracts concluded before 4 August 2024, Union producers and, pursuant to Article 27(1), importers shall undertake all reasonable efforts to report to the competent authorities of the Member State in which they are established the methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market calculated in accordance with the methodology set out pursuant to paragraph 4 of this Article. From 5 August 2028, Union producers and importers placing crude oil, natural gas or coal on the Union market shall report annually to the competent authorities of the Member State in which they are established of the results of such efforts.

2. By 5 August 2030 and every year thereafter, Union producers and importers placing crude oil, natural gas and coal on the Union market under supply contracts concluded or renewed after 5 August 2030 shall demonstrate to the competent authorities of the Member State in which they are established that the methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market, calculated in accordance with the methodology set out pursuant to paragraph 4, is below the maximum methane intensity values established in accordance with paragraph 6 to promote the global methane emissions reductions for those products.

3. The competent authorities of the Member States shall protect the confidentiality of the information received from Union producers and importers under this Article, in accordance with Union law. The competent authorities shall provide that information to the Commission, which shall protect the confidentiality of such information, in accordance with Union law.

4. By 5 August 2027, the Commission shall adopt a delegated act in accordance with Article 34 to supplement this Regulation by setting out the methodology for calculating, at the level of the producer, the methane intensity of the production of crude oil, natural gas and coal placed on the Union market. That methodology shall take into account different production processes and site conditions, as well as existing international methodologies and best practice for calculating methane intensity. That methodology shall be non-discriminatory and based on transparent and objective criteria. When preparing such delegated acts, the Commission shall inform the Coordination Group for oil and petroleum products, the Gas Coordination Group, the Electricity Coordination Group and other relevant stakeholders.

5. By 5 August 2029, the Commission shall assess the potential impact of various levels of maximum methane intensity values associated with crude oil, natural gas and coal placed on the Union market at the level of the producer, and present a report to the European Parliament and to the Council. That report shall include an assessment of the potential reduction of global methane emissions, of the impact on the security of energy supply at Union and national level and on the competitiveness of the Union’s economy, and of the potential global and regional market distortions. That report shall also include a market assessment with regard to the methane intensity of current and future supplies to the Union until 2049 through both long-term contracts and spot purchases. That assessment shall analyse the situation per Member State, taking into account contractual commitments entered into before 4 August 2024, energy infrastructure capacities and potential constraints.

6. On the basis of the assessment referred to in paragraph 5 and on objective criteria, the Commission shall adopt delegated acts in accordance with Article 34 to supplement this Regulation by setting out the maximum methane intensity values associated with crude oil, natural gas and coal placed on the Union market at the level of the producer. Those delegated acts shall be consistent with the methodology for calculating the methane intensity of the production of crude oil, natural gas and coal placed on the Union market set out in accordance with this Article. Those delegated acts shall also specify different methane intensity classes for crude oil, natural gas and coal. Those maximum methane intensity values shall be determined separately for crude oil, natural gas and coal, covering the best performing class or classes. Those maximum methane intensity values and methane intensity classes shall take into account the different sources, production processes and site conditions and shall be set at levels that promote reductions of the global methane emissions in relation to the crude oil, natural gas and coal placed on the Union market, while preserving the security of energy supply at Union and national level, ensuring a balanced distribution of the volumes of crude oil, natural gas and coal placed on the Union market as well as non-discriminatory treatment, and protecting the competitiveness of the Union’s economy.”).

[302] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, recital 69 ("Therefore, importers of crude oil, natural gas and coal to the Union should be required to provide to the relevant competent authorities information on measures related to measurement, reporting, verification and mitigation of methane emissions undertaken by exporters to the Union and third-country producers, in particular on the application of regulatory or voluntary measures to control the methane emissions of the third-country producers supplying crude oil, natural gas or coal, such as LDAR surveys or measures to control and restrict venting events and flaring events. The levels of measurement and reporting set out in the information requirements applied to importers should correspond to the ones applied to Union operators. Furthermore, the obligation on importers to provide information on measures taken to control methane emissions should not be more burdensome than the corresponding obligation on Union operators. Member States should communicate the information on those measures to the Commission. On the basis of that information, the Union should set up and manage a methane transparency database, containing, inter alia, information reported by Union undertakings and by importers of crude oil, natural gas and coal. Such a database would serve as a source of information for the purchasing decisions of importers of crude oil, natural gas and coal, as well as for other stakeholders and the public. In addition to the methane transparency database, the Commission should develop methane performance profiles, containing the methane emissions data related to crude oil, natural gas and coal placed on the Union market. Those profiles should also include an assessment of the efforts undertaken by Union producers, importers and third-country producers and exporters of fossil energy to the Union to measure and report, as well as reduce, their methane emissions. Those profiles should further include information on the regulatory actions regarding the measurement, reporting, verification and mitigation taken by third countries where crude oil, natural gas and coal is produced.").

[303] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 29 ("1. By 5 August 2028 and every year thereafter, for the supply contracts concluded or renewed on or after 4 August 2024, Union producers and, pursuant to Article 27(1), importers shall report to the competent authorities of the Member State in which they are established the methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market calculated in accordance with the methodology set out pursuant to paragraph 4 of this Article.

For supply contracts concluded before 4 August 2024, Union producers and, pursuant to Article 27(1), importers shall undertake all reasonable efforts to report to the competent authorities of the Member State in which they are established the methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market calculated in accordance with the methodology set out pursuant to paragraph 4 of this Article. From 5 August 2028, Union producers and importers placing crude oil, natural gas or coal on the Union market shall report annually to the competent authorities of the Member State in which they are established of the results of such efforts.

2. By 5 August 2030 and every year thereafter, Union producers and importers placing crude oil, natural gas and coal on the Union market under supply contracts concluded or renewed after 5 August 2030 shall demonstrate to the competent authorities of the Member State in which they are established that the methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market, calculated in accordance with the methodology set out pursuant to paragraph 4, is below the maximum methane intensity values established in accordance with paragraph 6 to promote the global methane emissions reductions for those products.

3. The competent authorities of the Member States shall protect the confidentiality of the information received from Union producers and importers under this Article, in accordance with Union law. The competent authorities shall provide that information to the Commission, which shall protect the confidentiality of such information, in accordance with Union law.

4. By 5 August 2027, the Commission shall adopt a delegated act in accordance with Article 34 to supplement this Regulation by setting out the methodology for calculating, at the level of the producer, the methane intensity of the production of crude oil, natural gas and coal placed on the Union market. That methodology shall take into account different production processes and site conditions, as well as existing international methodologies and best practice for calculating methane intensity. That methodology shall be non-discriminatory and based on transparent and objective criteria. When preparing such delegated acts, the Commission shall inform the Coordination Group for oil and petroleum products, the Gas Coordination Group, the Electricity Coordination Group and other relevant stakeholders.

5. By 5 August 2029, the Commission shall assess the potential impact of various levels of maximum methane intensity values associated with crude oil, natural gas and coal placed on the Union market at the level of the producer, and present a report to the European Parliament and to the Council. That report shall include an assessment of the potential reduction of global methane emissions, of the impact on the security of energy supply at Union and national level and on the competitiveness of the Union's economy, and of the potential global and regional market distortions. That report shall also include a market assessment with regard to the methane intensity of current and future supplies to the Union until 2049 through both long-term contracts and spot purchases. That assessment shall analyse the situation per Member State, taking into account contractual commitments entered into before 4 August 2024, energy infrastructure capacities and potential constraints.

6. On the basis of the assessment referred to in paragraph 5 and on objective criteria, the Commission shall adopt delegated acts in accordance with Article 34 to supplement this Regulation by setting out the maximum methane intensity values associated with crude oil, natural gas and coal placed on the Union market at the level of the producer. Those delegated acts shall be consistent with the methodology for calculating the methane intensity of the production of crude oil, natural gas and coal placed on the Union market set out in accordance with this Article. Those delegated acts shall also specify different methane intensity classes for crude oil, natural gas and coal. Those maximum methane intensity values shall be determined separately for crude oil, natural gas and coal, covering the best performing class or classes. Those maximum methane intensity values and methane intensity classes shall take into account the different sources, production processes and site conditions and shall be set at levels that promote reductions of the global methane emissions in relation to the crude oil, natural gas and coal placed on the Union market, while preserving the security of energy supply at Union and national level, ensuring a balanced distribution of the volumes of crude oil, natural gas and coal placed on the Union market as well as non-discriminatory treatment, and protecting the competitiveness of the Union's economy.").

[304] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 29 ("1. By 5 August 2028 and every year thereafter, for the supply contracts concluded or renewed on or after 4 August 2024, Union producers and, pursuant to Article 27(1), importers shall report to the competent authorities of the Member State in which they are established the methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market calculated in accordance with the methodology set out pursuant to paragraph 4 of this Article.

For supply contracts concluded before 4 August 2024, Union producers and, pursuant to Article 27(1), importers shall undertake all reasonable efforts to report to the competent authorities of the Member State in which they are established the methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market calculated in accordance with the methodology set out pursuant to paragraph 4 of this Article. From 5 August 2028, Union producers and importers placing crude oil, natural gas or coal on the Union market shall report annually to the competent authorities of the Member State in which they are established of the results of such efforts.

2. By 5 August 2030 and every year thereafter, Union producers and importers placing crude oil, natural gas and coal on the Union market under supply contracts concluded or renewed after 5 August 2030 shall demonstrate to the competent authorities of the Member State in which they are established that the methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market, calculated in accordance with the methodology set out pursuant to paragraph 4, is below the maximum methane intensity values established in accordance with paragraph 6 to promote the global methane emissions reductions for those products.

3. The competent authorities of the Member States shall protect the confidentiality of the information received from Union producers and importers under this Article, in accordance with Union law. The competent authorities shall provide that information to the Commission, which shall protect the confidentiality of such information, in accordance with Union law.

4. By 5 August 2027, the Commission shall adopt a delegated act in accordance with Article 34 to supplement this Regulation by setting out the methodology for calculating, at the level of the producer, the methane intensity of the production of crude oil, natural gas and coal placed on the Union market. That methodology shall take into account different production processes and site conditions, as well as existing international methodologies and best practice for calculating methane intensity. That methodology shall be non-discriminatory and based on transparent and objective criteria. When preparing such delegated acts, the Commission shall inform the Coordination Group for oil and petroleum products, the Gas Coordination Group, the Electricity Coordination Group and other relevant stakeholders.

5. By 5 August 2029, the Commission shall assess the potential impact of various levels of maximum methane intensity values associated with crude oil, natural gas and coal placed on the Union market at the level of the producer, and present a report to the European Parliament and to the Council. That report shall include an assessment of the potential reduction of global methane emissions, of the impact on the security of energy supply at Union and national level and on the competitiveness of the Union's economy, and of the potential global and regional market distortions. That report shall also include a market assessment with regard to the methane intensity of current and future supplies to the Union until 2049 through both long-term contracts and spot purchases. That assessment shall analyse the situation per Member State, taking into account contractual commitments entered into before 4 August 2024, energy infrastructure capacities and potential constraints.

6. On the basis of the assessment referred to in paragraph 5 and on objective criteria, the Commission shall adopt delegated acts in accordance with Article 34 to supplement this Regulation by setting out the maximum methane intensity values associated with crude oil, natural gas and coal placed on the Union market at the level of the producer. Those delegated acts shall be consistent with the methodology for calculating the methane intensity of the production of crude oil, natural gas and coal placed on the Union market set out in accordance with this Article. Those delegated acts shall also specify different methane intensity classes for crude oil, natural gas and coal. Those maximum methane intensity values shall be determined separately for crude oil, natural gas and coal, covering the best performing class or classes. Those maximum methane intensity values and methane intensity classes shall take into account the different sources, production processes and site conditions and shall be set at levels that promote reductions of the global methane emissions in relation to the crude oil, natural gas and coal placed on the Union market, while preserving the security of energy supply at Union and national level, ensuring a balanced distribution of the volumes of crude oil, natural gas and coal placed on the Union market as well as non-discriminatory treatment, and protecting the competitiveness of the Union's economy.").

[305] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 11 ("More than 40% of global oil and 25% of natural gas and coal is traded internationally. For many importers, most of the emissions associated with their fossil fuel consumption originate abroad. In the European Union, the United Kingdom, Japan, Korea, and China, the methane tied to imported oil and gas (15 Mt in 2024) dwarfs that from domestic production (5 Mt in 2024).").

[306] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 34 ("There is increasing interest in many countries in reducing the greenhouse gas (GHG) emissions linked to their fossil fuel imports. For some of the largest oil and gas importers – the European Union, the United Kingdom, Japan, Korea and China – such emissions (15 million tonnes in 2024) far exceed those from domestic oil and gas operations and infrastructure (5 million tonnes in 2024).").

[307] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 34 ("Upstream methane emissions intensities associated with oil and gas imports differ across countries. According to International Energy Agency (IEA) estimates, average intensities are around 1% for the European Union and United Kingdom, 0.6% for Japan and Korea, and 1.3% for China.").

[308] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 34 ("By reducing these intensities to 0.2% – a level that could be achieved worldwide using all currently available technologies – global methane emissions would fall by more than 12 million tonnes (Mt), or around 20% of total upstream oil and gas methane emissions.").

[309] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 9, fn 1 ("Methane intensity is calculated here in energy terms as total methane emissions from upstream operations divided by marketed oil and gas production, assuming methane has an energy density of 55 megajoules per kilogram (MJ/kg).").

[310] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 9, fn 1 ("Methane intensity is calculated here in energy terms as total methane emissions from upstream operations divided by marketed oil and gas production, assuming methane has an energy density of 55 megajoules per kilogram (MJ/kg). This metric is not directly comparable with the OGCI definition, which is calculated as the ratio of methane emissions from operated upstream assets to marketed gas volumes, expressed as a percentage.").

[311] Kanduth A. & Forner C. (2026) *How import rules can cut global methane emissions*, CLIMATE ANALYTICS, (In comparing the IEA's compliance scenario with China and the Climate Analytics analysis for only oil and gas import standards for EU, Korea, Japan, UK, and China, the results are the following: the IEA estimated a ~12 Mt

reduction while Climate Analytics estimated a ~6.8 Mt. According to Climate Analytics, the estimated annual reductions in methane emissions from imported oil, gas, and coal with an import standard are the following scenarios (based on 2023 trade data and 2024 emissions intensity data, applied to the EU, Japan, Korea, UK, China, India, and Canada):

1. **3.1 Mt under an EU 0.2% methane intensity import standard**
2. **3.6 Mt under a China 0.2% methane intensity import standard**
3. **4.4 Mt under a 0.2% methane intensity import standard across the EU, the United Kingdom, Korea, and Japan,** *nearly 4 Mt without a coal import standard*
4. **10.3 Mt under a 0.2% methane intensity import standard across the EU, Korea, Japan, the UK, China, India, and Canada** *~8 Mt without a coal import standard*.

Sawyer S. & Stiebert S. (2026) *Assessing the emissions reduction potential of methane import standards Technical report*, CLIMATE ANALYTICS, 9-11 (Climate Analytics measures upstream emission intensity (EI) as a simple ratio: the methane emitted in bringing a fuel to market, divided by the amount of that fuel actually marketed.

$$EI = \frac{\text{Upstream Emissions (kt } CH_4\text{)}}{\text{Net Market Production (boe)}}$$

The numerator is total national upstream methane emissions, in kilotonnes of methane; the denominator is *net market production* — the volume of product sold rather than total production, expressed in barrels of oil equivalent (boe), a common energy unit that lets oil, gas and coal be compared on the same basis. The intensity is calculated separately for crude oil, natural gas and coal in each of the 24 countries studied. Dividing emissions by the product that reaches market, rather than by gross output, means the metric captures how much methane is lost per unit of useful fuel delivered.

Expressed this way the figure is a mass-per-energy ratio, but it can be restated as a percentage "leakage rate" — the share of produced gas that escapes as methane — by assuming methane carries an energy content of 55 MJ/kg. That conversion makes the Climate Analytics number comparable to the percentage-style intensities used elsewhere (such as the OGCI and IEA benchmarks).

Liquefied natural gas is treated as a special case, because turning gas into LNG adds emissions that ordinary pipeline gas does not incur. Climate Analytics starts from a country's natural-gas intensity on an equivalent-energy basis, then scales the upstream figure up by 5% and adds a further 0.075 kg CH_4/boe to cover the methane released in processing and liquefaction at LNG plants. The boundary is deliberately "well-to-border": emissions from shipping the LNG and regasifying it at the destination are counted as downstream and left out. The liquefaction adjustment is small in absolute terms — on the order of 0.12 kg CO_2e/boe globally, and between 0.10 and 0.14 kg CO_2e/boe across the six countries for which the gas-versus-LNG comparison was made.).

[312] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 36 ("If countries that currently export fuel to the European Union, Japan, Korea or the United Kingdom were to cut flaring and methane emissions across all their exports, this could make more than 25 billion cubic metres (bcm) of additional gas available to importers.").

[313] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 36 (See the table in which the IEA estimated potential reductions in methane emissions from imported oil and gas with an import standard of 0.2% methane intensity (based on 2024 trade and emissions intensity data, applied to a coalition of the EU, the UK, Japan, Korea, and China)).

[314] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 9, fn 1 ("Methane intensity is calculated here in energy terms as total methane emissions from upstream operations divided by marketed oil and gas production, assuming methane has an energy density of 55 megajoules per kilogram (MJ/kg).").

[315] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 35 ("Conversely, an import standard could drive deeper methane cuts in exporting countries if companies extended abatement beyond the volumes destined for regulated markets. Such spillovers could arise if the countries or companies affected by the standard reduced the emissions intensity of a greater share of their oil and gas production. For example, if exporters to the European Union, United Kingdom, Japan, Korea and China achieved a 0.2% upstream intensity across all exports, regardless of the destination, global methane emissions would fall by 17 Mt.").

[316] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 36 ("Regulators considering methane-related import standards can pursue several strategies to avoid pitfalls and maximise impact. Effective design begins with clear timelines for compliance. Import requirements can be phased in gradually to give producers, exporters and importers time to adjust. Clear guidance is also needed on whether the standard applies to existing contracts or only to those signed after a specified date.").

[317] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 36-37 ("Designing an effective import standard also requires clear and consistent implementation rules. Regulators need to specify how importers need to measure and report the methane intensity of imported fuels. Once reliable data is available, regulators will need to determine whether imported fuels are to be subject to a maximum methane intensity threshold, and if so, how fuels exceeding that threshold will be handled. Several approaches exist for reporting upstream methane intensities and complying with a performance threshold, and countries need to decide which methods and certification schemes will be accepted as proof of compliance.")

[318] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 38 ("Countries or regions seeking to introduce an import standard may wish to adopt a phased approach, starting with a book-and-claim approach at the basin level. Under this arrangement, regulated importers would comply by purchasing tradeable certificates, but only those issued within the same basin or region as the physical origin of the imported fuel. To enforce this geographic constraint, information on origin could be attached to certificates at the point of issuance and embedded within digital trading platforms through which importers acquire them. As data reporting, verification and traceability improve over time, regulators could then transition to a trace-and-claim system, which is likely to deliver greater emission reductions in producing countries.")

[319] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 38 ("To unlock meaningful emission reductions, the enforcement mechanisms of import standards need to be sufficiently robust to encourage exporting countries or companies to adopt methane abatement measures. Importing countries can pair the introduction of such standards with technical assistance and financial support for exporting countries, helping to facilitate compliance with the new requirements.").

[320] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 38 ("Regulators could further enhance effectiveness by coordinating with other jurisdictions that have already implemented similar standards, working together to harmonise import requirements and streamline compliance for both producers and buyers.").

[321] International Energy Agency (2025) GLOBAL METHANE TRACKER DOCUMENTATION, 12 ("Abandoned facilities emit more methane than some of the largest fossil fuel producers Abandoned facilities constitute a significant source of methane emissions. Based on the limited data that is currently available, we estimate that there are around 8 million abandoned onshore oil and gas wells globally, as well as a large number of abandoned coal mines. Most properly plugged wells emit negligible amounts of methane. But wells that were not appropriately decommissioned, or that have vents, can continue emitting methane for many years. Globally, we estimate that abandoned coal mines emitted nearly 5 Mt of methane in 2024 and abandoned oil and gas wells released just over 3 Mt. Combined, these sources would be the world's fourth-largest emitter of fossil fuel methane. Most emissions result from mines and wells that have recently been abandoned – which makes timely action critical for effective mitigation. Options include plugging and monitoring wells that are no longer operational, sealing abandoned coal mines, and directing methane flows to energy use or oxidation technologies.").

[322] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 19 ("Although data coverage remains incomplete, current estimates suggest there are around 8 million abandoned onshore oil and gas wells globally, along with a substantial number of closed coal mines. In the United States alone, there are thought to be almost 4 million abandoned wells and more than 250 000 abandoned coal mines. Emissions from abandoned coal mines amounted to around 4.5 Mt, with China accounting for 60% of the total. Methane released from abandoned oil and gas wells contributed around 3.5 Mt, 40% of which came from the United States.").

[323] Alberta Energy Regulator (2025) Directive 11: Estimated Liabilities, § 9 ("The orphan fund is fully funded by licensees through a levy administered annually by the AER to pay for the costs of providing reasonable care and measures and costs to suspend, abandon, remediate, and reclaim a well, facility, or pipeline if a licensee or WIP becomes insolvent or defunct. Wells, facilities and pipelines have their estimated liability included in the calculation of the annual orphan fund levy unless otherwise indicated in appendix 1."); West Australia (2023) Mining Rehabilitation Fund Act 2012, Part 2, § 6(1) ("The main purpose of the Fund is to provide a source of funding for the rehabilitation of abandoned mine sites and other land affected by mining operations carried out in, on or under those sites."); Part 4, Division 1, § 11(1) ("A levy called the mining rehabilitation levy is payable in respect of each mining authorisation that is in force.").

[324] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, Art. 18 ("1. By 5 August 2025, Member States shall establish and make publicly available an inventory of all inactive

wells, temporarily plugged wells and permanently plugged and abandoned wells on their territory or under their jurisdiction that are recorded or where information or evidence on their location is available or where their location can be identified with all reasonable efforts. That inventory shall include at least the elements set out in Part 1 of Annex V . Member States shall maintain and keep up to date that inventory, including by taking all reasonable efforts to locate and document all identified inactive wells, temporarily plugged wells and permanently plugged and abandoned wells located on their territory or under their jurisdiction, based on a robust assessment taking into account the most up-to-date scientific findings and best available techniques…9. By 5 August 2026, Member States or the party responsible pursuant to paragraph 8, shall prepare a mitigation plan to remediate, reclaim and permanently plug inactive wells and temporarily plugged wells including at least the elements set out in Part 2 of Annex V , and implement it within 12 months from the submission of the first report referred to in paragraph 3.").

[325] National Academies of Sciences, Engineering, and Medicine (2026) TECHNOLOGIES AND PRACTICES FOR PLUGGING AND REMEDIATING ORPHAN OIL AND GAS WELLS, 3 ("Recommendation 3-2: Plugging orphan wells is effective for reducing leaks and emissions, and states should continue to focus on plugging orphan wells following best practices and accepted industry standards.").

[326] National Academies of Sciences, Engineering, and Medicine (2026) TECHNOLOGIES AND PRACTICES FOR PLUGGING AND REMEDIATING ORPHAN OIL AND GAS WELLS, 14 ("Recommendation 3-1: Regulatory agencies involved in plugging and abandonment should require a barrier verification plan with defined acceptance criteria in the approved plugging plan. Agencies should specify when permanent barriers must be verified and the minimum methods to be used for inspection and testing (for example, tagging, pressure testing, and logging). An agency representative should be on site to witness critical operations and confirm compliance, and verification results should be documented in post-plugging reports.").

[327] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 56 ("The use of either prescriptive or performance-based regulatory instruments will vary across jurisdictions depending on the nature of the industry and capabilities and resources of regulatory agencies. On the one hand, prescriptive instruments are not based on emission quantification and therefore, the required technologies can be put in place before methane quantification methods have been implemented (Mohlin et al., 2022[2]). As such, they are less difficult to enforce as compliance is linked to equipment used at a facility. However, the prescriptive approach is by its nature less flexible and less able to respond to rapidly evolving technologies. For example, Nigeria's 2022 methane guidelines impose a number of equipment- specific standards on operators in the upstream oil and gas sector applicable to new and existing oil and gas facilities. Section 3.4.1 sets out requirements for centrifugal compressors, and specifies that operators route oil degassing unit emissions either to a vapor recovery or a combustion device. Alternatively, operators can design/retrofit the compressor using dry seals. In addition, in order for prescriptive regulations to be effective, governments will need to undertake sufficient upfront investigation to understand where emissions are coming from in order for the regulations to be correctly targeted.").

[328] Olczak M., Piebalgs A., & Balcombe P. (2023) *A global review of methane policies reveals that only 13% of emissions are covered with unclear effectiveness*, ONE EARTH 6(5): 529 ("One of the recommendations suggested in the literature focusing on the oil and gas sector is use of performance-based instead of prescriptive regulations.81,99 By setting performance-based leakage targets (e.g., mass-based [absolute emissions cap] or rate-based [based on system throughput]) combined with an appropriate incentive structure, the operators are expected to reduce methane emissions faster. Outcome-oriented regulations may be more cost effective because they are technology agnostic and so can support technology innovation. However, performance-based regulations rely on accurate emission monitoring (characterization of baseline emissions, accurate quantification of emissions, and third-party verification of compliance), which may limit their wide application.").

[329] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 56 ("Governments should ensure that regulations require the replacement of old equipment with technologies that are zero emitting. For example, the EU's Regulation to reduce energy sector methane emissions provides that where a site is built, replaced or refurbished in whole, operators shall utilise only commercially available zero-emitting pneumatic devices, compressors, atmospheric pressure storage tanks, sampling and measurement devices and dry gas seals (European Commission, 2023[6.").

[330] International Energy Agency, *Methane Tracker* (*last updated* 4 May 2026) (Several regulatory measures can be applied to oil and gas methane. The tried-and-tested ones, with well-established precedents across multiple settings, are effective, straightforward to administer, and require only basic quantification and reporting rather than advanced compliance tools; they also sit at the low end of the abatement cost curve, making them the most

cost-effective. Technology standards set specific guidelines for equipment, technologies or procedures, including mandates to replace components known to emit significant volumes of methane. These technology standards would cut global methane emissions by 15,463 kt, roughly 19%.).

[331] Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector Hidrocarburos (2018) DISPOSICIONES Administrativas de carácter general que establecen los Lineamientos para la prevención y el control integral de las emisiones de metano del Sector Hidrocarburos, art. 41 ("Article 41. During the design phase of new facilities for hydrocarbon sector projects, regulated entities must select pneumatic pumps powered by compressed air or electric pumps, including photovoltaic pumps."); art. 43 ("Article 43. During the design phase of new facilities for hydrocarbon sector projects, regulated entities shall select centrifugal compressors that use dry seals. Likewise, when determining the use of hermetic reciprocating compressors, these shall be connected to the SRV."); art. 47 ("Article 47. During the design phase of new facilities for hydrocarbon sector projects, regulated entities that select pneumatic controllers must include one or more of the following practices: I. Incorporate the use of compressed air, replacing the use of natural gas, and II. Select controllers that are electrically powered, including photovoltaic, solenoid, and servo motors."); art. 50 ("Article 50. During the design phase of new facilities for hydrocarbon sector projects, regulated entities must select desiccant dehydrators.").

[332] British Columbia Energy Regulator (2025) Drilling and Production Regulation, § 52.05(1-4.4) ("52.05 (1)In this section: "large compressor station" means a compressor station at which the total power of all compressors is 3 MW or greater; "pneumatic device" does not include a pneumatic pump, a pneumatic compressor starter or an emergency shutdown device. (2)A facility permit holder of a facility that began operations on or after January 1, 2021 must not use at the facility a pneumatic device that emits natural gas. (3)A facility permit holder of a gas processing plant, or a large compressor station, that began operations before January 1, 2021 must not use at the facility a pneumatic device that emits natural gas. (4)A facility permit holder of a facility that began operations before January 1, 2021, other than a gas processing plant or a large compressor station, must not use at the facility a pneumatic device that vents natural gas unless the emissions of natural gas from the device do not exceed 0.17 m3 per hour. (4.1)Beginning on January 1, 2028, a facility permit holder referred to in subsection (4) who makes a modification to a facility must not use at the facility a pneumatic device that vents natural gas unless it is permitted under section 52.021. (4.2)Subsection (4.1) does not apply to well facilities. (4.3)This subsection and subsections (4) to (4.2) are repealed on December 31, 2034. (4.4)Beginning on January 1, 2035, a facility permit holder of a facility must not use at the facility a pneumatic device that vents natural gas unless it is permitted under section 52.021.").

[333] Nigerian Upstream Petroleum Regulatory Commission (2022) Guidelines for Management of Fugitive Methane and Greenhouse Gases Emissions in the Upstream Oil and Gas, 3.4.2(1)(ii)(b)(v) ("Within five years of implementation of present guidelines, operator shall ensure that all pneumatic pumps are nonemitting, using one of the control options listed in 3.4.2, 1(i).").

[334] REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942, art. 15 (Operators in the oil and gas sectors within Union territory must replace venting-by-design equipment with non-emitting alternatives where these alternatives are commercially available and meet the standards or technical prescriptions established under Article 32. Furthermore, where a site is built, replaced or refurbished in whole, these operators must install and use commercially available zero-emitting pneumatic devices, compressors, atmospheric pressure store tanks, sampling and measuring devices and dry gas seals (where in part, operators must do so in that party only).).

[335] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 66-67 (describing reward components for methane abatement—direct public financial support, cost-recovery provisions under production sharing agreements, and market-based mechanisms—and noting that, per Guiding Principle VII of the 2020 OECD Guiding Principles for Durable Extractive Contracts, compliance costs should be treated as tax-deductible operational costs recoverable from "cost oil" or "cost gas").

[336] OECD Development Policy Tools (2024) METHANE ABATEMENT IN DEVELOPING COUNTRIES, 72 ("To incentivise compliance, the incentives discussed above should be combined with financial charges, such as fees or taxes, to penalise companies that fail to comply with regulations on methane emissions abatement. For fees and taxes to be effective in encouraging compliance, the cost of compliance with emissions regulations should be lower than any imposed charges.").

[337] Government of Alberta, *Reducing methane emissions* (*last visited* 16 November 2023) ("Examples of current and previously implemented programs to support technology and innovation related to methane emissions reductions include: Current programs: Alberta Methane Emissions Program (AMEP): $17-million to support investigating and testing alternative approaches to detection and quantification of fugitive and vented emissions.")

[338] Government of Alberta (2023) *Alberta emissions reduction and energy development plan*, 27 ("The Methane Technology Implementation Program has supported projects at oil and gas sites that are anticipated to reduce methane emissions by 17 Mt over the lifetime of the technologies. This program is supported by $25 million from Alberta's TIER fund").

[339] Government of Alberta, *Reducing methane emissions* (*last visited* 16 November 2023) ("Using funds from the industry-supported TIER system, the Government of Alberta is to providing continued support for methane technology and innovation approaches across the oil and gas sector."). *See also* Alberta Methane Emissions Program (2023) *Supporting innovation to reduce methane emissions*, Government of Alberta.

[340] Inflation Reduction Act of 2022, Pub. L. No. 117-169 (2022) § 60113 ("(a) INCENTIVES FOR METHANE MITIGATION AND MONITORING.—In addition to amounts otherwise available, there is appropriated to the Administrator for fiscal year 2022, out of any money in the Treasury not otherwise appropriated, $850,000,000, to remain available until September 30, 2028. … In addition to amounts other wise available, there is appropriated to the Administrator for fiscal year 2022, out of any money in the Treasury not otherwise appropriated, $700,000,000, to remain available until September 30, 2028, for activities described 21 in paragraphs (1) through (4) of subsection (a) at marginal conventional wells."). For broader support of monitoring provisions for methane under IRA *see* Senator Whitehouse., Senator Carpenter., & Congressman Pallone. (30 November 2023) *Letter to EPA*, ("We write to express our strong support for the Environmental Protection Agency's (EPA) proposal to amend requirements for oil and natural gas systems to report emissions under EPA's Greenhouse Gas Reporting Program (GHGRP). We also urge EPA to strengthen the final rule in several specific ways to meet Congress' directive in the Inflation Reduction Act (IRA) to ensure that oil and gas operators more accurately report their methane emissions. More accurate emissions reports are critical to support the deep, near-term reductions in methane emissions necessary to avoid the worst consequences of climate change."),

[341] Inflation Reduction Act of 2022, Pub. L. No. 117-169 (2022) § 60112 ("(e) Charge Amount.--The amount of a charge under subsection (c) for an applicable facility shall be equal to the product obtained by multiplying— "(1) the number of metric tons of methane emissions reported pursuant to subpart W of part 98 of title 40, Code of Federal Regulations, for the applicable facility that exceed the applicable annual waste emissions threshold listed in subsection (f) during the previous reporting period; and "(2)(A) $900 for emissions reported for calendar year 2024; "(B) $1,200 for emissions reported for calendar year 2025; or "(C) $1,500 for emissions reported for calendar year 2026 and each year thereafter."). *See also* United States Senate (28 July 2022) *Summary of the Energy Security and Climate Change Investments in the Inflation Reduction Act of 2022*; *discussed in* Friedman L. & Plumer B. (28 July 2022) *Surprise Deal Would Be Most Ambitious Climate Action Undertaken by U.S.*, THE NEW YORK TIMES ("The bill would also crack down on leaks of methane, a powerful greenhouse gas, from oil and gas wells, pipelines and other infrastructure. By 2026, polluters would face a penalty of $1,500 per ton of methane that escaped into the atmosphere in excess of federal limits. The methane fee will raise $6.3 billion from the oil and gas industry over a decade, much of which will be reinvested in measures to help prevent methane leaks.").

[342] Inflation Reduction Act of 2022, Pub. L. No. 117-169 (2022) §§ 50261–50263 ("For all leases issued after the date of enactment of this Act, except as provided in subsection (b), royalties paid for gas produced from Federal land and on the outer Continental Shelf shall be assessed on all gas produced, including all gas that is consumed or lost by venting, flaring, or negligent releases through any equipment during upstream operations.").

[343] Jenks C. Dewey S., and Dunne C.D. (2025) *Research Brief: Recent History of U.S. Methane Regulation*, HARVARD METHANE INITIATIVE, 3 ("The methane waste emissions charge is a fee program established by the Inflation Reduction Act of 2022, which added section 136 to the Clean Air Act.14 This provision directs EPA to impose an annual charge on excess methane emissions from oil and natural gas facilities that report over 25,000 metric tons of CO2 -equivalent emissions per year.15"). *See generally* One Beautiful Bill Act of 2025, Pub. L. No. 119-2 (2025).

[344] Jenks C. Dewey S., and Dunne C.D. (2025) *Research Brief: Recent History of U.S. Methane Regulation*, HARVARD METHANE INITIATIVE, 3 ("Additionally, Congress repealed the EPA rule implementing the charge using the Congressional Review Act.18").

[345] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 25 ("High-level methane pledges now cover around 80% of global fossil fuel production, up from around 50% in 2021. This includes the Global Methane Pledge (GMP), which today includes more than 150 countries and covers more than 50% of emissions from human activity worldwide. Most GMP signatories are yet to take concrete action to introduce policies or to reduce emissions. The detailed policies and regulations in place today would cut oil and gas emissions by only around 20% by 2030 and 26% by 2035, well short of the GMP's economy-wide reduction target of a 30% cut by 2030. In the coal sector, ambition is even more limited, and the implementation gap is larger. Current policies and regulations would reduce coal-related methane emissions by 12% by 2030 and 22% by 2035.").

[346] Rita Schwarzelühr-Sutter, Parliamentary State Secretary, Germany Federal Ministry for the Environment (2025) *10th anniversary of the Paris Agreement Roundtable Reducing Methane Emissions from the Energy Sector* (24:30 minute mark) ("We need a fossil fuel industry that operates more effectively across the board without flaring and venting and with practically no leaks. And I think engagement is good, but engagement and regulation are better.").

[347] Ruth Davis, United Kingdom Special Representative for Nature (2025) *10th anniversary of the Paris Agreement Roundtable Reducing Methane Emissions from the Energy Sector* (36:07 minute mark) ("I will just finish by reminding ourselves that cutting human-caused methane emissions could act as a climate emergency brake. Reducing global methane levels by 30% by 2030 would avoid approximately 0.2 to 0.3ºC of warming by 2050. That is a precious amount of ambition that we could potentially capture. Decisive action is needed now.").

[348] UN Secretary-General António Guterres (23 June 2026) *Secretary-General's special address at London Climate Action Week*, speech ("That is why today, I am launching a global Call to Action on Methane. It spotlights three sectors. The waste sector -- including decisive steps to reduce food waste, end open dumping, and capture emissions from landfills and wastewater. The agriculture sector -- driving down emissions with proven solutions to advance food security and protect farmers' livelihoods. And a special focus on the sector that is the root cause of the twin crises facing our world … and where the most immediate gains can be made – coal, oil and gas. I am urging the fossil fuel industry to step up and do what is long overdue. The International Energy Agency found that around 70 per cent of oil and gas methane emissions can be eliminated using existing technology – much of it at low or no net cost. Yet in 2025 alone, some 167 billion cubic metres of gas were flared into the sky – as much as Africa consumes in a year. UN Environment's Methane Alert and Response System has issued more than 5,000 alerts across 33 countries. Yet the global response rate stands at just 12 per cent. This is why voluntary action is no longer enough. The world phased out leaded gasoline. We eliminated ozone-depleting chemicals. Methane pollution must be next. I call on producer and consumer governments alike to set a new global standard for the oil and gas sector: near-zero methane emissions across the value chain.").

[349] *See generally* United Nations (2026) SECRETARY-GENERAL'S CALL TO ACTION ON METHANE: THREE SECTORS, NINE ACTIONS BY 2030.

[350] *See generally* United Nations (2026) SECRETARY-GENERAL'S CALL TO ACTION ON METHANE: THREE SECTORS, NINE ACTIONS BY 2030, 4 ("ACTION 1: Fix leaks and eliminate routine flaring and cold venting ► Adopt and enforce regulations that ban routine flaring and cold venting and require early leak detection and repair across the entire oil and gas value chain. ► Replace and upgrade high-emitting equipment. ► Adopt a zero-tolerance approach to super-emitter events using satellite monitoring and other detection systems to ensure a rapid response. ► Commit to improving the response rate to methane alerts issued through the UNEP Methane Alert and Response System to at least 80 per cent as a first step towards full response and compliance. ► Make methane mitigation a standard industry practice in coal mining.").

[351] *See generally* United Nations (2026) SECRETARY-GENERAL'S CALL TO ACTION ON METHANE: THREE SECTORS, NINE ACTIONS BY 2030, 4 ("ACTION 2: Make methane measurable, reportable and verifiable ► Adopt and enforce regulations that require direct asset-level measurement of methane emissions across oil and gas operations (aligned with the Oil and Gas Methane Partnership 2.0). ► Make verifiable data publicly available and subject it to independent assurance so regulators, investors and markets can distinguish high-performing operators from those failing to control methane emissions. ► Support reporting of domestic methane emissions in national greenhouse gas inventory reports and include it in the Nationally Determined Contributions.").

[352] *See generally* United Nations (2026) SECRETARY-GENERAL'S CALL TO ACTION ON METHANE: THREE SECTORS, NINE ACTIONS BY 2030, 4 ("ACTION 3: Adopt a science-based global methane standard that establishes a marketplace for near-zero-methane fossil fuels ► Establish a common, internationally recognized methane

intensity benchmark. Make compliance a condition for financing, procurement and long-term market access through a process involving producers and consumers.").

[353] *See generally* (2026) *Joint Statement by United Kingdom, European Commission & Canada on Methane abatement in the energy sector as a pillar of energy security*.

[354] (2026) *Joint Statement by United Kingdom, European Commission & Canada on Methane abatement in the energy sector as a pillar of energy security* ("Today, we are joining forces to restate our unwavering commitment to accelerating the abatement of methane emissions in the energy sector. In the current geopolitical situation marked by high energy prices and increasingly tight markets, the need for reliable, affordable, and lower-emission energy sources has never been more critical.

Methane is the second greatest contributor to climate change, responsible for approximately one-third of global warming to date. Due to its short atmospheric lifetime and the relatively low cost of many methane abatement measures, rapid reductions in methane emissions can deliver measurable climate benefits within a decade, making it one of the single fastest and most cost-effective levers available to limit near-term warming.

Two energy crises in less than five years have highlighted the enormous cost of wasted gas. The International Energy Agency estimates that over 350 billion cubic metres of gas were lost to flaring, venting, and leakage worldwide in 2024 alone: three times the supply that the closure of the strait of Hormuz has removed from global markets. Reducing methane leakage and eliminating routine venting and flaring from oil and gas operations can directly expand available gas supply, assist in reducing price volatility, and help strengthen the resilience of energy systems. For major importing countries, credible methane performance from suppliers is increasingly a prerequisite for long-term supply agreements and market confidence as we transition to clean energy systems.

In response to the crisis:

- We call on all fossil fuel producers and operators worldwide to set and implement quantified methane abatement objectives to ensure efficient use of existing resources and affordable energy supply.
- We call on all fossil fuel producers and operators to adopt rigorous, measurement-based practices in line with the Oil and Gas Methane Partnership 2.0 (OGMP 2.0) or other equally credible approaches for driving transparent, measurement-based accountability.
- We will continue our unwavering commitment to sound methane policies, including by implementing our regulatory frameworks in a pragmatic and robust manner, thus ensuring our energy security and environmental protection.
- We invite the international community to advance progress on the Global Methane Pledge goal to reduce anthropogenic methane emissions by at least 30% below 2020 levels by 2030. In this regard, we invite countries, particularly major fossil fuel producers and consumers, to collaboratively implement the COP30 Statement on Drastically Reducing Methane Emissions in the Global Fossil Fuel Sector as we chart a path toward near-zero methane intensity and secure fossil fuel markets.
- We call on all partners to provide financial and technical support for methane abatement, especially in the Global South. We recognize the important role that financial and regulatory toolkits can play in this context.

The tools exist. The case is proven. The time to act is now.").

[355] Prime Minister of Barbados Mia Mottley (2025) *10th anniversary of the Paris Agreement Roundtable Reducing Methane Emissions from the Energy Sector* (2:40 minute mark) ("…I recognize all who are here to discuss this most vital of matters. Two years ago in Dubai, I believe there was a voluntary group—and Patrick, you will probably speak more to that than I can—that came together to see how we could work on the reduction of methane. We felt then, and I said it to the president, Sultan Al Jaber, at the time, that we welcome the progress, but we felt that if we are really to be successful and do what the scientists have advised us to do, then we need to have a legal construct that obligates each country to be able to find near-zero methane. We have the example of the Montreal Protocol. It's probably the most successful climate agreement that we've ever had. But let's get into the reality of why. If I am flaring gas, I'm burning cash. If I am not fixing pipes, I am losing cash. So if we start from that first perspective, it ought to be a win-win platform. Having had discussions with Patrick, I'm satisfied that there are examples of companies that have in fact taken this approach. The problem with most things is that if you leave everything to the market, you don't necessarily get the resolution that you want. It becomes that of those who can and who are mighty, and those who cannot. The most perfect example of it, and we were just talking about it again, is access to insurance. I speak to you this morning as Hurricane Melissa is devastating the Caribbean. Jamaica has been totally decimated in the western corridors, from agriculture to buildings to people to

infrastructure. It's hitting Cuba as we speak. Haiti has also suffered. The bottom line is that if you want to get access to insurance in certain parts of the world, it's either inflated in cost or access is denied. That's because there is no obligation for persons to provide that access. We feel that having a legal agreement will help the world. If in the next 12 to 15 years, we can have an agreement where everyone says we're going to look for the methane—whether it is oil and gas, the coal sector, or agriculture, which may be a bad word in Europe, but the truth is that you just have a different approach to deal with the agricultural sector, whether it is rice paddy farming or livestock, because they don't have the balance sheets that the oil and gas sector may have to make the adjustment on their own—and then, of course, changing how we do waste management. It is not beyond us. If you doubt why it is necessary, as I said, Hurricane Melissa has become the worst hurricane ever in Jamaica. There is debate as to whether the sea was 2 to 2.5 degrees warmer, hence the intensification into a Category 5 storm within 24 hours. But the same thing happened to Barbados, Grenada, and St. Vincent with Hurricane Beryl last year. So, how many times are we going to recognize that this is happening and that we do have options? The options allow us to speak the love language of those who want to save the planet and the love language of those who need to make returns for their shareholders. I'll end on this last point. We've been talking in COPs about capacity and commitment year after year. For the last six or seven years, I've been making the simple point that capacity must match commitment. If not, you're going to create first-class and second-class citizens in terms of countries. The reality is that you also have countries that have access to resources that can allow them to finance their way to net zero responsibly. But if you don't allow them, you're not going to have them being able to meet the basic development platforms that they need. We believe that with methane and the commitments to methane, the scientists have advised that we can reverse the temperature by half a degree as opposed to propelling the temperatures forward. If you can buy that time with the reduction of temperatures by half a degree, then you can buy time to address what has been clearly a difficult point: supersizing and scaling up decarbonizing technology for oil on a commercial scale. Why do we need it? Because you're going to still need fossil fuels as well as renewables if all of the countries of the earth are to have a fair chance at development within the time frame that we need. It makes it a complex discussion. It is not a TikTok discussion. It is a discussion that requires us to be able to accept that there are nuances we have to accept and that it is possible. I think the first platform for it being made possible is that it is a love language that is common to both the oil and gas sector and to the people who want to save the planet. There's no division. Curiously, I learned just recently that even with the big, beautiful bill, there are things in there that are designed to help with the carbon costs—the cost of carbon—which actually help those who want to save the planet. So, sometimes gifts come in strange forms and formats. Thank you.").

[356] Prime Minister of Barbados Mia Mottley (2025) *10th anniversary of the Paris Agreement* (35:00 minute mark) ("I say this because we come, year after year, to say the same thing. The Paris Agreement has become the defining reference point, the moment when the world started to take these ambitions seriously. That doesn't mean there haven't been concerns. For the last six or seven years, I have said that we have confused commitment with capacity. While we come to conferences and talk about commitments, we don't necessarily address whether we have the capacity to meet them. I speak as a small island developing state that would have wanted, for example, to be much further ahead with our own targets. But we are constrained by access to batteries, by the cost of batteries, and by the resulting cost of electricity to consumers. I'm not sure we have found the right way to ensure that what we discuss on these stages becomes a reality on the ground. At the same time, to ignore this is to do so at our peril. I fear what we saw with Hurricane Melissa, moving over a Caribbean Sea with warming temperatures of two to two-and-a-half degrees, is a sign of things to come. This provides more fuel, so much so that people are now asking if we should create a new category of hurricane—a Category 6—because what we are facing is so much more virulent and awful than anything we've known before. I believe strongly, and you know this, Emmanuel, that we need to pull the methane brake. The scientists have told us that the opportunity to pull back temperatures—not just stop at 1.5 degrees, but actually reverse them by anywhere between 0.2 to 0.5 degrees by 2050—comes predominantly from two things: one, controlling deforestation immediately, and two, most importantly, cutting super-pollutants like methane. Methane is 80 to 100 times more dangerous than carbon but only stays in the atmosphere for 12 to 15 years. If we can give ourselves a chance, a near-zero methane world can exist by 2040. But to get there, let's talk the "love language," because we have people who like the Paris Agreement and people who hate it. And what is that common love language? Well, if I stop flaring gas, I stop burning cash. If I fix my pipes, I stop losing cash. So, you speak the love language of the shareholders of oil and gas companies. As I said recently, they are not the enemy; the emissions are the enemy. At the same time, you meet the objective of those of us who want to save the planet and create a chance for people to live on it. Hence the "4P's" (People, Planet, Prosperity, and Peace) position. There are other sources of methane, but the technology and new practices to address them exist. They may not have the same balance sheets as the oil and gas companies, but it is easier for us to deal with human-made methane emissions than we are currently doing. If we can do that, here's what it accomplishes: It buys time for the same oil and gas sector to seriously invest in R&D and commercially scale up the decarbonizing technology needed for them to become a permanent part of the energy solution—not at 20% by 2050, but perhaps at 30%, 35%, or 40%. Why? Because the reality is, I do not believe that in the next 25 years we

will have enough capacity to allow everyone to make a just transition purely on renewable energy. And what does that mean for populations? It means people will suffer, because if you deprive them of access to affordable energy, what are you condemning them to in terms of development? That is the genius of why people and planet must never be separated.").

[357] UN Secretary-General António Guterres (23 June 2026) *Secretary-General's special address at London Climate Action Week*, speech ("This is why voluntary action is no longer enough. The world phased out leaded gasoline. We eliminated ozone-depleting chemicals. Methane pollution must be next.").

[358] Prime Minister of Barbados Mia Mottley (2025) *This is another 'ozone layer' moment. Now, we must urgently target methane* ("The oil and gas industry must be legally bound to cut methane emissions. With climate tipping points approaching, time is running out").

[359] Prime Minister of Barbados Mia Mottley (2025) *This is another 'ozone layer' moment. Now, we must urgently target methane* ("Cutting methane emissions is the fastest and simplest way to slow near-term warming and prevent triggering more tipping points. We must also reduce carbon-dioxide emissions as quickly as possible, although much of the impact on climate will take effect in the medium to long term. In contrast, we could avoid up to nearly 0.3C of warming by the 2040s by eliminating the easily avoidable methane emissions, starting with those of the oil and gas sector. Combined with a tripling of renewables and doubling of energy efficiency, this could cut the rate of warming by a third in 10 years and halve it by 2040, keeping the 1.5C goal in sight.").

[360] Prime Minister of Barbados Mia Mottley (2025) *This is another 'ozone layer' moment. Now, we must urgently target methane* ("The European Commission helped launch the global methane pledge at Glasgow's Cop26 in 2021, where today it and 159 other countries are supporting emission cuts of 30% by 2030 from 2020 levels. However, this is voluntary, and the UN has reported that current measures, even if fully implemented, would only reduce emissions by 8% by 2030 from 2020 levels. The urgency of the climate demands mandatory measures.").

[361] Phil McKenna (2023) *Government, Corporate and Philanthropic Interests Coalesce On Curbing Methane Emissions as Calls at COP28 for Binding Global Methane Agreement Intensify* ("Speaking at COP28 in Dubai, Barbados Prime Minister Mia Mottley echoed the concerns of environmental advocates and called for a binding emissions reduction agreement. 'Unless there is a global methane agreement that is compulsory, we're not going to get where we need to go,' Mottley said, noting that some large companies including Chevron, have not joined the voluntary, industry-led OGDC effort. 'The science is clear, clear, clear. If you want to be able to turn down the heat, you've got to control methane.'").

[362] Prime Minister of Barbados Mia Mottley (2025) *Belém Climate Summit: Opening of the General Plenary of Leaders* (7:10:30 minute mark) ("Thank you very much, Mr. President. It is always a joy to be in Brazil, and particularly for us from Barbados, where we have done things together historically, agriculturally, and environmentally. May I remind you that after the Rio Summit of 1992, the Barbados Programme of Action for Small Island Developing States came in 1994. But I've come here this evening to speak on one issue. I'm not going to address the issue of finance, for you well know what the Bridgetown Initiative requires of us in terms of making financing more accessible and affordable for all. I'm not going to speak on the issue of the Loss and Damage Fund, because all of us should hold our heads down in shame. Having established this fund a few years ago in Sharm el-Sheikh, its capital base is still under 800 million dollars, while Jamaica reels from damage in excess of 7 billion US—not to mention Cuba, Haiti, or the Bahamas. Those things ought to be embedded in our soul already and should be prickling our conscience. I have come here, however, this afternoon to speak on one issue, and that is methane. The scientists advise that this is the main way that we can not stall the increase in temperatures, but reverse the temperature increase that we have seen across the planet. The reality is that methane is more destructive, as we know, 80 times more destructive than carbon. And yet, we continue to see methane flowing in the atmosphere without significant actions to stop it. The good news is that while it is more destructive, it lasts only for 12 to 15 years in the atmosphere, while carbon lasts for centuries. We believe that the world must pull the methane brake. It is an emergency brake that can, in truth and in fact, buy us more time without having to solve the ideological differences that face the world geopolitically. It allows those who are involved, for example, in the oil and gas sector to be able to ensure that as they stop flaring gas, they stop burning cash. And as they start to fix the pipes, they stop losing money from the gas that is going through the leaky pipes. It is a win-win situation that speaks the love language of the oil and gas sector, while speaking the love language of those of us who want to save the planet. But I go further. In so doing, it buys the sector time enough to be able to invest in a serious research framework to allow them to scale up the decarbonizing technology. Because one of the things that we have noticed year after year at COP is that while we make commitments, we have not appropriately accessed the capacity of countries to make the transition in order to meet the commitments which they are given. This buys us

the time. In addition, there are two other sectors that contribute to methane. One is the agricultural sector, whether in terms of livestock farming or in terms of rice paddy farming. I understand the nervousness of those that come from countries with strong farming communities. I understand the nervousness of Europe. I understand the nervousness of Latin America. I understand the nervousness of some countries in Asia. But let us also deconstruct the issue. While the oil and gas sector can take actions to stop flaring and to fix pipes and have the balance sheet so to do, we are not asking farmers to carry the cost of the transition to new farming practices in the livestock industry or new farming practices in rice paddy farming that will allow the world not to suffer from the harmful effects of methane. We are asking farmers to make a transition for a global public good, and therefore the financing of the transition in how they farm ought to come from global financing and not from the farmers' balance sheets themselves. And the third sector, of course, is waste management. And we all know that we can convert waste to gas—whether we do it after it goes into the ground or, better still, whether we can convert it to avoid it going into the ground. We have a unique opportunity that by COP 31, we don't only rest on the voluntary agreement that was made in Dubai by the oil and gas sector to be able to start to control methane. We need a global agreement like the Montreal Protocol, which allowed us to fix the issues of the ozone. It is perhaps the most successful climate agreement ever. And the only thing that stands in our way from dealing with this is the political will of countries and companies to make it happen. This is the only chance that we have to reverse the temperatures. And the world, my friends, has never been changed by spectators and naysayers. The world is changed by people of action. Do we need everybody acting at the same time? That would be ideal. But if we don't, then we must construct a "coalition of the willing" and show everyone what they stand to benefit while we fight for the prosperity and stability of people and planet. I'm obliged to you. Thank you").

[363] Prime Minister of Barbados Mia Mottley (2025) *This is another 'ozone layer' moment. Now, we must urgently target methane* ("The Montreal protocol, signed in 1987, can provide the inspiration. Besides putting the protective ozone layer on the road to recovery, that binding agreement has done more than any other to combat the climate crisis, mainly because the ozone-depleting chemicals it reduces are also powerful warmers. The protocol is on course to avoid 2.5C of warming by the end of the century, a massive contribution. It was negotiated by a small coalition of willing countries, and concluded in less than a year after formal diplomatic negotiations opened…Preventing methane energy waste makes sense for industry, and it makes sense for people and the planet. As Aristotle taught us, waste is a form of injustice. Preventing it is not too much to ask.").

[364] Climate Vulnerable Forum (2025) *Leaders Declaration*, 1 ("The human family is living through another year of records. Another year when global temperatures, melting of glaciers in the mountains and sea level rise have spiked, moving the world perilously close to an irreversible breach of the 1.5 degrees Celsius survival limit. This is a year when tropical cyclones and droughts sparked by warming temperatures have triggered horrific floods and landslides, including glacial lake outburst floods triggered by melting glaciers, fires and droughts, destroying even more lives, livelihoods and property around the world. Climate change has now become the largest driver of displacement worldwide. As of 31 December 2023, at least 7.7 million people in 82 countries and territories were living in internal displacement due to climate disasters, including events from previous years. In 2023 alone, of the 46.9 million new internal displacements registered, 56% were triggered by disasters. In 2024, an estimated 45.8 million disaster displacements were recorded across 163 countries and territories, 54% of which were triggered by cyclones. This is nearly double the annual average of the past decade.").

[365] Climate Vulnerable Forum (2025) *As World 'Hurtles' Past 1.5, Climate Vulnerable Nations Demand Urgent Adaptation Finance* ("Call for a Global Methane Agreement Prime Minister Mottley also urged CVF-V20 nations to support rapid emissions reductions, particularly through a global methane agreement. She stressed that such measures could significantly reduce global emissions without threatening key fossil fuel or livestock sectors. 'I suggest that if CVF member countries were to support a global methane agreement, we could lower global emissions to all our benefit, stop the rising heat levels and buy ourselves more time,' Prime Minister Mottley said. 'More specifically, such an agreement must recognise that our agriculture and livestock sectors should stand to be the first beneficiaries of access to finance, technology, and transition support' she added.").

[366] President of the Federated States of Micronesia Wesley Simina (2025) *Climate Summit 2025* (2:59:20 minute mark) ("Excellencies, distinguished colleagues, we gather at a moment of profound consequence for humanity. In the words of the honorable Secretary General, "We are on a highway to climate hell with our foot on the accelerator." Today, in this room, we will discuss the most powerful "emergency brake" available – methane. An option that, if seized, will slow near-term warming, buying time for critical decarbonization and adaptation efforts to advance. Pulling the methane emergency brake – starting with the oil and gas sector where solutions are practical, affordable, and within our immediate reach – can rapidly put the world onto a safer road toward the future. In its recent Advisory Opinion, the International Court of Justice confirmed the legal duty of States and

industries to take mandatory climate measures. The Pacific Islands championed this Opinion, and we will continue to raise the alarm with our small but powerful voice: The world must act now.")

[367] President of the Federated States of Micronesia Wesley Simina (2025) *Climate Summit 2025* (2:59:20 minute mark) ("And yet – despite the solution at hand – we have not yet pulled the break. Current initiatives are failing to reduce methane emissions. Many producers continue to pour investment into new exploration, rather than making cost-saving repairs throughout their leaking pipelines and plants. They continue to treat the world as if it has infinite resources and we have infinite time to waste, fueling destruction of our climate system and hurtling the planet toward danger. The problem is not technical—it is political. Voluntary methane pledges are failing to reduce emissions. Markets cannot align, and polluters cannot be held accountable, without stronger mandatory measures at national, regional, and global level. We need clear, predictable, mandatory approaches to ensure success. Today, we hope among to hear ambitious proposals: •To establish binding, sector-specific standards in the oil and gas sector • To transition from voluntary promises to binding, enforceable obligations • To provide finance and technology for rapid, fair implementation • And to send strong market signals that reward low-methane producers and compel laggards to clean up their act Excellencies, friends, we have done this before. When the ozone layer was in crisis, leaders forged the Montreal Protocol—a binding, enforceable system that saved lives, created markets, and restored balance. We must summon that same courage for methane. This is not about charity for small island states—it is about survival for all nations. Methane action is the single most powerful step we can take this decade to slow warming and avoid catastrophic tipping points. It is science-based. It is cost-effective, and it is our moral and our legal obligation. Let us pull the emergency brake together the journey we're making on the highway to hell takes us over the cliff of tipping points. Let us build a binding governance system for methane, beginning with oil and gas, that protects our people, our economies, and our shared future.").

[368] Prime Minister of Tuvalu Feleti Teo (2025) *Climate Summit 2025* (1:19:10 minute mark) ("Tuvalu therefore calls on major emitters to ... step up methane action with binding commitment. … The ICJ Advisory Opinion on Climate Change has made it crystal clear that inaction is not just immoral, it is unlawful. Together we must rise to the challenge of honoring both legal and moral responsibility in safeguarding our shared future and pulling the emergency brake on methane. Cutting methane is the fastest scalable way to slow global warming, avoiding up to 0.3 degrees centigrade of warming by 2040 and buying critical time for long term CO2 decarbonization strategies to take effect.").

[369] Pacific Islands Forum (2025) *Forum Communiqué*, 8 ("CLIMATE CHANGE AND DISASTER 43. Recognising the grave and irreversible threat that climate change poses to Pacific peoples, economies, and cultures, Leaders called for all countries to take individual and collective action to prevent near-term warming by addressing short-lived climate pollutants, in particular, methane emissions. Leaders further committed to advocating for and supporting action to reduce methane emissions so as to safeguard the shared future of the Blue Pacific.").

[370] G20 (2021) *G20 Rome Leaders' Declaration*, 9 ("26. We commit to significantly reduce our collective greenhouse gas emissions, taking into account national circumstances and respecting our NDCs. We acknowledge that methane emissions represent a significant contribution to climate change and recognize, according to national circumstances, that its reduction can be one of the quickest, most feasible and most cost-effective ways to limit climate change and its impacts. We welcome the contribution of various institutions, in this regard, and take note of specific initiatives on methane, including the establishment of the International Methane Emissions Observatory (IMEO). We will further promote cooperation, to improve data collection, verification, and measurement in support of GHG inventories and to provide high quality scientific data.").

[371] G7 (2022) *G7 Climate, Energy and Environment Ministers' Communiqué*, 27-28 ("65. Methane: We highlight that in order to keep 1.5 °C within reach and to reduce the likelihood of overshoot, significant methane emission reductions must be achieved globally by 2030. In this context and in the light of the latest findings of the IPCC, we highlight the need to reduce global methane emissions by 34 percent by 2030 and by 44 percent by 2040 relative to the 2019 level to limit global warming to 1.5 °C by 2100 with no or limited overshoot. We therefore reaffirm our commitment made at COP26 to implement the Global Methane Pledge, whose endorsers are committed to collectively reduce global anthropogenic methane emissions by at least 30 percent below 2020 levels by 2030. In order to accelerate its implementation, those of us who have not already done so endeavour to implement domestic methane emission reductions by developing national climate plans and strategies and implementing accompanying measures, and we encourage those who do not yet have such plans to develop them. We stand ready to support the Climate and Clean Air Coalition as a core implementing partner of the Pledge. While the generation of waste is not encouraged, we recognise the opportunities to mitigate methane emissions

from the waste sector, primarily by diversion of organic waste from landfills through best management practice and processes aiming at material and energy recovery and as appropriate by sound management of landfill sites as well as by using waste-to-fuel technologies to produce renewable methane from organic waste, agricultural residues and biomass that does not depend on arable land or cannot be utilised in a better way. The waste sector can contribute to a reduction in atmospheric methane emissions if the infrastructure in place to transport the renewable methane does not allow for intentional or unintentional venting of methane. We also recognise the opportunities to mitigate methane emissions from the energy sector by capturing and using methane from the oil and gas sector that would otherwise have been vented, wasted, flared or lost in transport, and by using best practices to minimise methane from coal mining. We further recognise that more efforts are needed to reduce agricultural methane emissions. We recognise the need to continuously improve emissions measurement, reporting and verification to inform national emissions inventories and the work of the International Methane Emissions Observatory (IMEO), launched during G20 2021 by the UN Environment Programme (UNEP) with the support from the European Union, in collecting, reconciling and verifying anthropogenic methane emissions data at a global level and encourage continued cooperation with relevant stakeholders such as the International Energy Agency. In addition to our national efforts, we highlight the importance of reducing the methane emissions associated with energy production and consumption. We therefore will consider providing increased support to methane reduction and elimination projects in developing and emerging economies. In particular, we are committed to working with other oil and gas producing countries to accelerate flaring and methane abatement projects and strengthen policies to reduce methane emissions in the oil and gas sector.").

[372] G7 (2022) *G7 Climate, Energy and Environment Ministers' Communiqué*, 27-28 ("65. Methane: We highlight that in order to keep 1.5 °C within reach and to reduce the likelihood of overshoot, significant methane emission reductions must be achieved globally by 2030. In this context and in the light of the latest findings of the IPCC, we highlight the need to reduce global methane emissions by 34 percent by 2030 and by 44 percent by 2040 relative to the 2019 level to limit global warming to 1.5 °C by 2100 with no or limited overshoot. We therefore reaffirm our commitment made at COP26 to implement the Global Methane Pledge, whose endorsers are committed to collectively reduce global anthropogenic methane emissions by at least 30 percent below 2020 levels by 2030. In order to accelerate its implementation, those of us who have not already done so endeavour to implement domestic methane emission reductions by developing national climate plans and strategies and implementing accompanying measures, and we encourage those who do not yet have such plans to develop them. We stand ready to support the Climate and Clean Air Coalition as a core implementing partner of the Pledge. While the generation of waste is not encouraged, we recognise the opportunities to mitigate methane emissions from the waste sector, primarily by diversion of organic waste from landfills through best management practice and processes aiming at material and energy recovery and as appropriate by sound management of landfill sites as well as by using waste-to-fuel technologies to produce renewable methane from organic waste, agricultural residues and biomass that does not depend on arable land or cannot be utilised in a better way. The waste sector can contribute to a reduction in atmospheric methane emissions if the infrastructure in place to transport the renewable methane does not allow for intentional or unintentional venting of methane. We also recognise the opportunities to mitigate methane emissions from the energy sector by capturing and using methane from the oil and gas sector that would otherwise have been vented, wasted, flared or lost in transport, and by using best practices to minimise methane from coal mining. We further recognise that more efforts are needed to reduce agricultural methane emissions. We recognise the need to continuously improve emissions measurement, reporting and verification to inform national emissions inventories and the work of the International Methane Emissions Observatory (IMEO), launched during G20 2021 by the UN Environment Programme (UNEP) with the support from the European Union, in collecting, reconciling and verifying anthropogenic methane emissions data at a global level and encourage continued cooperation with relevant stakeholders such as the International Energy Agency. In addition to our national efforts, we highlight the importance of reducing the methane emissions associated with energy production and consumption. We therefore will consider providing increased support to methane reduction and elimination projects in developing and emerging economies. In particular, we are committed to working with other oil and gas producing countries to accelerate flaring and methane abatement projects and strengthen policies to reduce methane emissions in the oil and gas sector.").

[373] G7 (2023) *G7 Climate, Energy and Environment Ministers' Communiqué*, 2, 21-22 ("Urgent action at all levels: We call for urgent and enhanced action at all levels across all sectors to achieve the transformation towards net zero, circular and nature positive economies. We recognize the need to mobilize and implement all available measures and tools including legislations, economic and fiscal policies and market-based and voluntary approaches to realize the full potential of reducing emissions of GHGs, including methane from waste, agricultural and energy sectors, globally towards net zero by 2050, halting and reversing biodiversity loss by 2030, mainstreaming climate-risk and nature-related risk into investment decisions and decision making, reducing pollution, and improving resource efficiency and circularity to achieve sustainable consumption and production.

Together with the G20 Presidency and other members and countries, we also promote and encourage sustainable choices to achieve a transformation of consumption and production patterns across all relevant sectors, including in fashion and tourism, and substantially reduce waste generation. Moreover, we will take concrete actions at all levels working with all countries, in particular G20 partners and developing and emerging countries, to address the triple crisis and an ongoing global energy crisis… 58. Collective action: We reaffirm the critical importance of collective action, and engagement with other developing and emerging countries, particularly within the G20, to accelerate emission reduction, including by supporting their transition to net-zero GHG emissions through various and practical pathways taking into account national circumstances. In particular, we recognize the significant role of sectoral, issue and regional-specific initiatives to this transition, including those that support efforts to develop, demonstrate and deploy clean and renewable energy solutions and other efforts for innovation. We welcome overarching initiatives such as, the Breakthrough Agenda, the Climate Club, Clean Energy Ministerial (CEM), and Mission Innovation (MI), and their achievements: For the Breakthrough Agenda, signatory countries shared the view on 2023 priority actions across the power, road transport, steel, hydrogen, and agriculture breakthroughs and we recognize the progress made towards launching the Buildings Breakthrough and Cement Breakthrough. For CEM/MI, the Global Clean Energy Action Forum (GCEAF), a joint convening of the 13th CEM and the 7th MI ministerial, was held in Pittsburgh last September, where discussions were held to promote RD&D in clean energy, looking forward to advancing discussion in the 14th CEM and the 8th MI ministerial in India this year. We welcome sector/issue specific initiatives such as the Global Methane Pledge, International Aviation Climate Ambition Coalition's Declaration, International Energy Efficiency Hub, International Partnership for Hydrogen and Fuel Cells in the Economy(IPHE), the NDC Partnership, and ZEV Transition Council, and recognize the Cities Climate Finance Leadership Alliance (CCFLA), Climate Investment Fund's Industry Decarbonization Program, Energy Management Action Network (EMAK), First Movers Coalition, the Global Alliance for Buildings and Construction (Global ABC), Global Carbon Pricing Challenge, Global Climate Action Partnership Industrial Deep Decarbonisation Initiative (IDDI), International Methane Emissions Observatory (IMEO), the Joint Declaration from Energy Importers and Exporters on Reducing Global GHG Emissions from Fossil Fuels, Leadership Group for Industry Transition (LeadIT), Minerals Security Partnership, MOU on Zero Emission Medium and Heavy Duty Vehicles, The Oil & Gas Methane Partnership 2.0 (OGMP 2.0), the Powering Past Coal Alliance (PPCA), and the Super-efficient Equipment and Appliance Deployment initiative, Net Zero Government Initiative and the Greening Government Initiative. We welcome regional and global outreaching initiatives such as Just Energy Transition Partnerships (JETPs) and welcome progress achieved on JETPs, with South Africa with the adoption of the Investment Plan, as well as with Indonesia and Vietnam, launched respectively at the G20 Bali Summit and in December 2022. We are committed to continuing efforts to swiftly implement JETPs. We take note of initiatives carried out both individually and in partnership with others that are intended to support decarbonization and energy transition in countries around the world, such as Asia Zero Emission Community (AZEC) initiative, 2050 Pathways Platform, and Net Zero World (NZW), and underscore the importance of actions taken through such initiatives being aligned with a 1.5°C pathway. 61. Methane: We stress the urgency to take further actions to reduce methane emissions by 2030. We reaffirm our commitment to taking domestic actions and working with other countries towards collectively reducing global anthropogenic methane emissions by at least 30 percent below 2020 levels by 2030, in line with the Global Methane Pledge. We highlight the importance of taking progressive actions especially in waste, agriculture, and energy sectors, establishing national action plans, policies, and regulations to reduce methane emissions, and the importance of continuous improvement of emissions measurement, reporting, and verification to inform national emissions inventories, including collecting, reconciling, and verifying anthropogenic methane emissions data at a global level. We recognize that the fossil energy sector must achieve the fastest and deepest emissions reductions in order to keep a limit of 1.5°C temperature rise within reach and reduce the likelihood of reaching climate tipping points. We will work with the relevant stakeholders to develop an internationally aligned approach for measurement, monitoring, reporting, and verification of methane and other GHG emissions to create an international market that minimizes GHG emissions across oil, gas, and coal value chains, including by minimizing flaring and venting, and adopting best available leak detection and repair solutions and standards. This internationally aligned approach would aim to improve the accuracy, availability, and transparency of emissions data at the cargo, portfolio, operator, jurisdiction and basin level, including consideration of accepted protocols and tools such as independent verification that can support robust data collection and reporting. We will also support the development of policies, measures, and industry efforts to reduce methane and other GHG emissions from fossil energy production, consumption, and international trade. Working with development finance partners, we will endeavor to increase support for methane abatement in developing countries.").

[374] G7 (2023) *G7 Hiroshima Leaders' Communiqué*, 8-9 ("<Climate Change> 18. Our planet is facing unprecedented challenges from the triple global crisis of climate change, biodiversity loss and pollution as well as from the ongoing global energy crisis. We are steadfast in our commitment to the Paris agreement, keeping a limit of 1.5°C global temperature rise within reach through scaled up action in this critical decade, halting and

reversing biodiversity loss by 2030, and ensuring energy security, whilst leveraging synergies and recognizing the interdependent nature of these challenges. While Russia's war of aggression against Ukraine impacts energy markets and supply chains globally, our goal to achieve net-zero greenhouse gas (GHG) emissions by 2050 at the latest remains unchanged. We emphasize our strong concern, amplified by the latest finding of the Intergovernmental Panel on Climate Change (IPCC) and its Sixth Assessment Report (AR6), at the accelerating and intensifying impacts of climate change, and highlight the increased urgency to reduce global GHG emissions by around 43 percent by 2030 and 60 percent by 2035, relative to the 2019 level, in light of its latest findings. We reiterate our commitment made in Elmau last year to rapidly implement domestic mitigation measures aimed at achieving our Nationally Determined Contribution (NDC) targets and to increase our ambition including, for example, by adopting or strengthening sectoral targets, by developing non-CO2 sub targets, and by adopting stringent implementation measures. Mindful of our leadership role, and noting that emissions have already peaked in all G7 countries, we recognize the critical role of all major economies in limiting increases in global temperature over this critical decade and in subsequent decades. In this context, we underscore that every major economy should have significantly enhanced the ambition of its NDC since the Paris Agreement; already peaked its GHG emissions or indicated that it will do so no later than 2025; and in particular, included economy-wide absolute reduction targets and that cover all GHGs in its NDC. Accordingly, we call on all Parties - especially major economies - whose 2030 NDC targets or longterm low GHG emission development Strategies (LTSs) are not yet aligned with a 1.5°C pathway and net zero by 2050 at the latest, to revisit and strengthen the 2030 NDC targets and publish or update their LTSs as soon as possible and well before UNFCCC-COP28, and to commit to net zero by 2050 at the latest. Furthermore, we call on all Parties to commit at UNFCCC-COP28 to peak global GHG emissions immediately and by no later than 2025. We reaffirm our commitment to the Global Methane Pledge and we will step up efforts to collectively reduce global anthropogenic methane emissions by at least 30 percent below 2020 levels by 2030. We commit to actively contributing to securing the most ambitious outcomes of the first global stocktake (GST) at UNFCCC-COP28, which should result in enhanced, immediate and ambitious actions across mitigation, adaptation, means of implementation and support. We call on all Parties to submit their next round of NDCs and LTSs well ahead of UNFCCC-COP30 that are informed by the outcomes of the GST, reflecting economy-wide absolute reduction targets including all GHGs, sectors and categories. These should reflect significantly enhanced ambition aligned with a 1.5°C pathway and should also include their revisited and strengthened 2030 targets.").

[375] G7 (2024) *Apulia G7 Leaders' Communiqué*, 17 ("We reaffirm that the transition to a net-zero economy by 2050 at the latest should be inclusive and leave no one behind, and should be an opportunity for enhancing social development and economic growth, maximizing positive benefits for local economies while addressing negative social or economic impacts that may arise from climate action. Recognizing that cutting methane emissions from fossil fuel operations by means of already existing technologies is largely feasible and costeffective for oil and gas operations, we will intensify efforts to tackle methane emissions in line with the global reduction level of at least 35 percent in methane emissions by 2035. We commit to pursue a collective effort towards a 75 per cent reduction in global methane emissions from fossil fuels, including by reducing the methane emissions intensity of oil and gas operations by 2030, through developing a robust methodology and use of measure data, and work with non-G7 oil and gas producing countries particularly in Africa, to deliver deep cuts to methane emissions. Reaffirming our commitments in the 2023 Hiroshima Leaders' Statement, we note that G7 countries have made significant progress in reducing dependency on Russian fossil fuels, including through energy savings and gas demand reduction in a manner consistent with our Paris Commitments and address the global impact of Russia's war on energy supplies, gas prices and inflation, and people's lives, recognizing the primary need to accelerate the clean energy transition. We recognize that restricting Russian energy revenues is an essential part of our support to Ukraine and are pursuing to end significant dependency on, and to work on transitioning away from imports of Russian gas as soon as possible. In this context, we stress the important role that increased deliveries of LNG can play and acknowledge that investment in the sector can be appropriate in response to the current crisis and to address potential gas market shortfalls provoked by the crisis. In the exceptional circumstance of accelerating the phase-out of our dependency on Russian energy, publicly supported investments in the gas sector can be appropriate as a temporary response, subject to clearly defined national circumstances, if implemented in a manner consistent with our climate objectives without creating lock-in effects, for example by ensuring that projects are integrated into national strategies for the development of low-carbon and renewable hydrogen.").

[376] G7 (2024) *Apulia G7 Leaders' Communiqué*, 17 ("We reaffirm that the transition to a net-zero economy by 2050 at the latest should be inclusive and leave no one behind, and should be an opportunity for enhancing social development and economic growth, maximizing positive benefits for local economies while addressing negative social or economic impacts that may arise from climate action. Recognizing that cutting methane emissions from fossil fuel operations by means of already existing technologies is largely feasible and costeffective for oil and gas operations, we will intensify efforts to tackle methane emissions in line with the global reduction level of at

least 35 percent in methane emissions by 2035. We commit to pursue a collective effort towards a 75 per cent reduction in global methane emissions from fossil fuels, including by reducing the methane emissions intensity of oil and gas operations by 2030, through developing a robust methodology and use of measure data, and work with non-G7 oil and gas producing countries particularly in Africa, to deliver deep cuts to methane emissions. Reaffirming our commitments in the 2023 Hiroshima Leaders' Statement, we note that G7 countries have made significant progress in reducing dependency on Russian fossil fuels, including through energy savings and gas demand reduction in a manner consistent with our Paris Commitments and address the global impact of Russia's war on energy supplies, gas prices and inflation, and people's lives, recognizing the primary need to accelerate the clean energy transition. We recognize that restricting Russian energy revenues is an essential part of our support to Ukraine and are pursuing to end significant dependency on, and to work on transitioning away from imports of Russian gas as soon as possible. In this context, we stress the important role that increased deliveries of LNG can play and acknowledge that investment in the sector can be appropriate in response to the current crisis and to address potential gas market shortfalls provoked by the crisis. In the exceptional circumstance of accelerating the phase-out of our dependency on Russian energy, publicly supported investments in the gas sector can be appropriate as a temporary response, subject to clearly defined national circumstances, if implemented in a manner consistent with our climate objectives without creating lock-in effects, for example by ensuring that projects are integrated into national strategies for the development of low-carbon and renewable hydrogen.").

[377] G7 (2024) *Climate, Energy and Environment Ministers' Meeting Communiqué*, 9-10 ("h) Methane emissions – Noting with concern that methane concentration in the atmosphere is still increasing, we underline that reducing methane emissions that account for about a third of the warming we experience today, is key to keep a limit of warming of 1.5°C within reach and avoid climate tipping points and limit temperature overshoot. We therefore recognise that methane emissions need to be reduced in all emitting sectors. We also underline that according to IEA's net-zero scenario reductions in the emission intensity and consumption of oil and gas results in a 60 percent reduction in GHG emissions from oil and gas operations from 2030 to limit warming to 1.5°C. We highlight that oil, coal and gas demand reduction is essential to reduce overall CO2 and methane emissions to limit warming to 1.5°C. Considering the high potential of the fossil energy sector to lead towards tangible methane emission reductions in the short and mid-term, we recognize that cutting methane emissions from fossil fuel operations by means of already existing technologies is largely feasible and cost-effective for oil and gas operations, and it should play a central role in national efforts to reduce such emissions along with the development of a global market for hydrocarbons associated with lower methane emissions. We also note the need to improve measurement and reporting of methane emissions from oil and gas industry operations using globally recognised frameworks such as Oil and Gas Methane Partnership OGMP 2.0 and call on the private sector to take effective voluntary measures by strengthening international frameworks on measurement and reporting. We highlight that G7 countries are putting in place measures to collectively deliver reductions in methane emissions across all sectors, including energy, waste, and agriculture, aligned with the Global Methane Pledge's collective goal of at least 30 percent reduction by 2030. We acknowledge the importance of taking practical actions to reach this goal with a view to identifying best practices, regulatory options and measures. We call on the IEA to further monitor the methane mitigation efforts and results at country level and develop concrete recommendations for reaching the 2030 collective global methane pledge. To further accelerate these efforts, We commit to i. pursue collective effort towards a 75 per cent reduction in global methane emissions from fossil fuels, including by reducing methane emissions intensity of oil and gas operations by 2030, through developing a robust methodology and use of measured data, and work with non G7 producing countries to reduce the methane emission intensity of imported fuels recognizing the IEA's emission reduction scenario; ii. accelerate methane measures in line with the global reduction level of at least 35 per cent in methane emissions by 2035 reflected in 1.5°C IPCC scenarios; iii. accelerate methane emission measures as well as support developing countries in reducing methane emissions from waste sector including through advancing resource efficiency and circular economy approaches, and improving landfill management, to contribute to achieving the available global methane emission reduction potential estimated from waste sector by 30-35 per cent by 2030; iv. explore options for regulatory approaches and market-based instruments to support methane emission reduction actions; v. enhance data transparency and accuracy, by utilizing satellite observation data, and supporting the work of the UNEP's International Methane Emissions Observatory; vi. significantly reducing all domestic routine flaring and venting by 2030; and call G7 gas suppliers to do so.").

[378] President of France Emmanuel Macron (2025) *Climate Summit* (1:45:29 minute mark) ("we need binding objectives on methane. We know that this is a reachable goal…. This is the best way to reduce our emissions and it's also a G7 priority….").

[379] President of France Emmanuel Macron (2025) *10th anniversary of the Paris Agreement* (42:20 minute mark) ("The Paris COP and the Paris Agreement made it possible to stop a train that was going at full speed. The

trajectory at the time was above 4 degrees. And so, we collectively put in place a process that very strongly slowed down that train. We should be on the path to 1.5°C with the goal of carbon neutrality by 2050. We are not there today, but we have already slowed down a lot. I say this because it is important to remain mobilized today. Something irreversible has been created thanks to the Paris Agreement. Now, I want to focus on three things, in exact continuity with what Mia Mottley just said. First, where should we concentrate our efforts? At Belém, we will bring our 2035 trajectory, and the Europeans will be there. At the international level, I believe we have two essential fights. The fight on methane, Mia Mottley just mentioned it, is key to accelerating. We know it affects a few sectors, a few countries, but we now have the technologies to achieve it. It's a coalition where we can get the United States back on board. So methane is very effective, there is more consensus, we must go very fast and very strong. The second is carbon. We still have several rich countries that are large emitters. We have emerging countries that have not yet reached their peak. Everything we can do to help phase out coal faster... and sometimes even going from coal to gas is a huge step forward in many of these countries. Obviously, moving to nuclear and renewables is even better. But the withdrawal from coal is a key battle. The third key fight is obviously financing. The European Union is a leader, but we must mobilize much more private financing. And what we have done in recent years with the One Planet Summits, especially for sovereign wealth funds, is key: creating asset classes that are identifiable by private actors and that allow for the redirection of private international liquidity. Besides that, this is my second category of remarks. We have a huge issue with biodiversity. This issue is not at all anecdotal; it is a completely twinned issue, because our biodiversity is one of the solutions to emissions. From mangroves to primary forests and our oceans, they are carbon sinks. They are also levers for adaptation. I also want to extend my thoughts to our colleagues in the Caribbean. Mia is here with us, which is an immense privilege while all her neighbors have been hit by absolutely terrible hurricanes. And indeed, for our friends in Haiti, Jamaica, and Cuba, I want to offer a very special thought. The heart of the battle is, of course, all reforestation policies, but also the conservation policies for primary forests and mangroves. In these primary forests, we have biodiversity reserves, more than three-quarters of the world's biodiversity, and 14% of irrecoverable carbon. If we destroy them, we go back several steps. The last fight is exactly what Mia Mottley said: the people and the planet are not opposed. In 2023, with about sixty countries from around the world, we built the Pact for People, Prosperity, and the Planet. The method is a vibrant discourse from middle-income countries affected by climate change, who were being asked every day by rich countries, "You must address the climate, but renounce development policies." It was inaudible; it was a divisive factor. The reconciliation that works is a global strategy that is then declined into national strategies, a reconciliation of a climate, biodiversity, and development agenda, and therefore the fight against inequalities.").

[380] (2025) *Joint Statement between the French Republic and the People's Republic of China on Cooperation in Addressing Global Climate and Environmental Challenges* ("They welcome the efforts undertaken by the Brazilian presidency of the COP30 of the UNFCCC and the commitments made in Belém, including the new Nationally Determined Contributions (NDCs) while striving to do better collectively and cooperatively. They reaffirm the Paris Agreement temperature goal of holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that achieving this would significantly reduce the risks and impacts of climate change. The two countries reaffirm their commitment to jointly fostering a supportive and open international economic system. They continue to enhance cooperation on accelerating the global renewable energy deployment, including making continuous contribution to the global efforts to transition away from fossil fuels in energy systems, in a just, orderly and equitable manner, and actively pushing forward green and low-carbon socio-economic transformation, and continue to strengthen their engagement on topics such as carbon pricing, climate investment and financing, methane, carbon footprint methodologies, and adaptation. They recognize the importance of controlling and reducing methane emissions and in particular of mobilizing the technological and innovative solutions available.").

[381] *See, e.g.*, Prime Minister Mia Mottley of Barbados (2026) *Intervention at G7 International High-Level Multi-Stakeholder Event on Methane Action* ("Bonjour. Thank you very much, Madame Barbut, Monsieur Fabius, ministers who are also gathered here, chief executive officers, scientists, everyone. There's nothing like an idea whose time has come. And the two previous speakers have spoken eloquently and have laid out for us why this is the moment for us to take action. Whether it is the reality that across the entire world, people need relief from the immediate consequences of the madness that has taken place this year that has cut off countries from affordable energy and affordable pharmaceuticals and affordable food. Whether it is as a result of the fact that we, as we heard just now, that 210 billion cubic feet of natural gas may be released into the market at a time when the escalating costs driven not only by the skittish market, but by actual loss of production capacity in the Middle East. We need new and increased of gas in order to be able to ease the burden across many countries.

At the same time, it is easier probably to fix leak pipes, leaking pipes, but definitely easier to stop flaring gas. I ask this question because decisions have to be made by all. And one of the benefits of this conference here, structured as it is, bringing together oil and gas, bringing together financiers, bringing together those in waste management, bringing together those in farming and agriculture, and of course those in public policy, is that we have in this one place all of the players who are required to make decisions that can literally improve the lives of many. And I start therefore by the simple question what's in it for reason because regrettably we live in a world where that is the question that is more often asked rather than what is in it for the planet. We are at that point where mature conversations must take place and the mature conversation therefore will start from people identifying their peculiar interests.

I have started with what is topical—the fact that the world and many countries in particular are in dire need of affordable energy. I started by speaking in these terms because in my own country the impact of not having access to it is effectively adding the cost of 3 to 4% of GDP on our country's ability to maintain stable supplies for our people if we are of course also to shield them from the worst of the worst. But let us leave the oil and gas sector and move to the others. The most difficult one of course is that of the farming and agricultural community, not just here in Europe, but also in Brazil and other countries across the world. And if the truth be told, COP 30 in my view failed in one material respect, which was it failed to face frontally the possibility of turning the corner with a legal agreement for the control of the emissions of methane. Why is this important to farmers? We have been advised that we are reaching a tipping point with the Atlantic Meridian Overturning Circulation (AMOC), an appropriate phrase because the world can be left amok when we are over with failing to act. But this tipping point spells disaster for farmers and for those interested in food security, not just in West Africa, not just in Asia, but indeed in Latin America. The possibilities of increased droughts, the possibilities of declining food supply, declining capacity to farm and the consequences that flow to insecurity at the level of the farmer, at the level of the community, at the level of the society are really dire. And one only needs to look at the consequences in West Africa and across Africa of the lack of access to water and what it has done to fare communities there and how it has led to great insecurity at the level of those countries and communities who continue to fight on a daily basis to preserve the existence for farmers whose livelihoods have been threatened by lack of access to water and lack of access to proper conditions.

I put it in this context because it is important to understand that while it is expected that oil and gas companies and those who manage waste management facilities will find it possible to raise the financing to make the adjustment, it must be made clear at the outset that governments and large private sector entities have to shoulder the burden in the agricultural sector in a way that cannot be expected to be borne by small or medium-sized farmers. This has to be made clear such that we do not get lost in an unnecessary political debate in circumstances where you are simply trying to sustain the livelihoods and the possibilities for those farmers that would otherwise be constrained during the course of this century as a result of those tipping points being there. And as it relates to waste management, I've never seen a private sector person walk away from the possibility of additional revenue for doing something which they are already doing.

I set out these points for each of these three sectors because unless I'm missing something, it is a win-win situation. There is no point of division. The oil and gas sector earns more money. It starts to enter a global debate that causes people to recognize that what we should have said all along, what I've been saying for the last two years: that the sector is not the enemy. The enemy is the emissions and if we can with laser-like focus recognize that it is the emissions that we must deal with, we begin to also solve another problem which has been ignored by those that just want to reduce everything to two column inches or sixty seconds of news and sound bites. Now what is that other problem? The world does not have the capacity to guarantee a just transition on renewable energy to every country in the world such that its citizens can appropriately acquire and attain the sustainable development goals for the benefit of their population.

On current track, some countries will succeed and many will fail. On current track, many of the developing countries that still have not seen a new global deal for financing will end up not being able to make the transition. And in many instances, many of them are endowed with fossil fuels and therefore the question is how do they finance their way to net zero? Recognizing that the International Energy Agency for years recognized that net zero at 2050 still means 20% fossil fuels in the mix through clean energy. So that we have to have a mature conversation because countries in West Africa, countries in Latin America, countries in the Caribbean are being asked to, as recent arrivals at the game of fossil fuels, to abandon all while others who have been doing it for decades continue to find ways and accept that it is possible for them to continue if especially they can deal with the issue of decarbonizing technology at commercial scale.

I raise this because human beings are not one-issue people. When we finish dealing with this issue of climate, we have to deal with security issues. We have to deal with health issues. We have to deal with development issues and therefore the ability to bring into one place an appreciation of what is at risk is at the center of this discussion. If we can reduce the impact of this climate crisis by controlling methane emissions in a manner that is credible, as you heard Madame Barbut said with the appropriate standards and regulations and capacity to monitor, actions taken if companies fail to take the appropriate action, I'm told by the scientists that we can in fact potentially reverse temperatures by 0.3 to 0.5 degrees in the near future.

Now if that is possible while still allowing the oil and gas sector to make money and giving them the possibility of a potential long-term future because it buys them time to continue to do at warp speed the research necessary for decarbonized technology to be applied at scale across the world, then it means that developing countries who fear that they will be at the losing end of the just transition to renewable energy may now have the possibility of a future. And what do I mean by that? Small countries like mine place small orders. Small orders do not get noticed by large companies. No matter how much political will we have, our numbers will always be small. And therefore, in spite of wanting to do the right thing and being in the right place at the right time to do it, we are still victims of a global supply chain that regrettably is constrained in major ways.

One may argue that the geopolitical context within which we are living now will make those battles even more difficult and scarcity more a commodity to be traded rather than one to benefit all of us by its elimination. I therefore say to you today that the only thing left for us to do is to act. I want to thank President Macron for stepping up to the plate and for using his presidency of the G7 to convene this session. We met last on it when we were in Nice for the Oceans Conference and that culminated a number of discussions that we had because I am of the firm view that if we wait for the entire world to move, we shall lose this battle. But if we act now, those who are prepared to walk together, recognizing that even though Europe has put regulations in place, Europe does not constitute the world, and therefore, what is needed now is an international treaty that does bring together those countries that are prepared to act.

Recognizing that almost every major development in history does not start with everyone, but it starts with a few. And if we can galvanize those countries that are prepared to act while persuading those sectors that are at the center of the solution that they stand to win and to bet against the odds of what they stand to face if they don't take action, then I believe that the combined solidarity of those countries plus these three sectors acting in their own deliberate long-term interests while benefiting in the short term as well, then I believe we have a pathway that is possible. The Montreal Protocol that allowed us to get rid of HCFCs is still the most successful climate agreement in terms of change of behavior. I hope that we can leave Paris today recognizing that what is required now is not more talk but action: Action by those countries that are ready to stand up and be counted through international treaty obligations; Action by those oil and gas companies who want to give a better deal to their shareholders rather than being complacent and acting at a time when the world is seeing shortages of supply of gas. A better deal for those who are in the business of waste management, ensuring that they do not leave for the atmosphere that which they should put on their balance sheets. And a better deal ultimately for farmers who more than any group of persons do not want to become migrants and do not want to be forced to leave their lands because there is no water or there is no possibility of survival. They already face the difficult reality that the scientists have also warned them that the quality of their soils is degrading at such a rapid rate, that food insecurity is a real global concern in the next few decades. We can talk or we can act. I am here today to tell you that while my country does not have convenient power like President Macron does, that my country has voice and my country has commitment.

We are not zealots. We are practical and we want to be able to have a practical solution that serves planet, that serves people, that serves inclusive growth globally. Because if we can save the planet but see our people suffer still, then we have gained nothing. So let us leave Paris today, please, recognizing that this is an idea whose time has come and that the only thing left for us to do is to work out where we want to sign a very simple treaty committing all of us, all of us, to act in the deliberate self-interest of not just the planet, the people, the businesses and the inclusive growth of us all. I thank you.")

[382] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis*.

[383] United States Department of State (2 December 2023) *Accelerating Fast Mitigation: Summit on Methane and Non-CO2 Greenhouse Gases,* Fact Sheet ("*The United States, People's Republic of China, and United Arab Emirates today convened a Summit to accelerate actions to cut methane and other non-CO2 greenhouse gases as*

the fastest way to reduce near-term warming and keep a goal of limiting global average temperature increase to 1.5 degrees Celsius within reach.").

[384] United States White House (21 April 2023) *Chair's Summary of the Major Economies Forum on Energy and Climate Held by President Joe Biden*, Statements and Releases ("Argentina, Australia, Brazil, Canada, People's Republic of China, Egypt, the European Commission, France, Germany, India, Indonesia, Italy, Japan, the Republic of Korea, Mexico, the Kingdom of Saudi Arabia, Türkiye, the United Arab Emirates, the United Kingdom, the United Nations Secretary General, and the International Energy Agency Director participated in the virtual meeting." "MEF participants Canada, the European Union, France, Germany, Japan, and the United States, as well as Ireland and Norway, joined in launching the Methane Finance Sprint, which aims to scale up methane finance. This includes mobilizing, by COP 28, at least $200 million in new public and philanthropic support for methane abatement activities, with a view to developing a pipeline of projects. Philanthropies have committed $100 million in new funding through the Global Methane Hub towards the $200 million goal.")

[385] United States White House (8 June 2013) *United States and China Agree to Work Together on Phase Down of HFCs,* Press Release ("Today, President Obama and President Xi agreed on an important new step to confront global climate change. For the first time, the United States and China will work together and with other countries to use the expertise and institutions of the Montreal Protocol to phase down the consumption and production of hydrofluorocarbons (HFCs), among other forms of multilateral cooperation. A global phase down of HFCs could potentially reduce some 90 gigatons of CO2 equivalent by 2050, equal to roughly two years' worth of current global greenhouse gas emissions."). *See also* Sun X. & Ferris T. (2018) *The Kigali Amendment's and China's Critical Roles in Evolving the Montreal Protocol*, Natural Resources & Environment, American Bar Association ("China filled a key role in bringing about the global consensus that resulted in the Kigali Amendment's adoption. U.S. and China agreements reflected this diplomatic leadership, initially during the meeting between President Obama and President Xi in Sunnylands, California.").

[386] Hunter D., Salzman J., & Zaelke D. (2021) INTERNATIONAL ENVIRONMENTAL LAW AND POLICY, Foundation Press, (6th Ed.), 545 ("With 24 nations and the EU signing in Montreal, the Protocol was universally hailed as a diplomatic triumph. Starting from low or no expectations in Vienna, within eighteen months strict international controls had been negotiated that would be refined and changed over time with the benefit of more scientific and technical knowledge. This structured evolution, employing first a framework convention followed by a protocol, marked a new feature of international environmental law following the "start and strengthen" strategy put forward by UNEP Executive Director Mostafa Tolba, who is often referred to as the father of the Montreal Protocol."); *see also* Andersen S. O., Zaelke D., Taddonio K., Ferris R., & Sherman N. (2021) *Ozone Layer, International Protection*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, Oxford University Press, Peters A. & Wolfrum R. (eds.).

[387] United States White House (15 November 2023) *Readout of President Joe Biden's Meeting with President Xi Jinping of the People's Republic of China*, Press Release ("The two leaders underscored the importance of working together to accelerate efforts to tackle the climate crisis in this critical decade. They welcomed recent positive discussions between their respective special envoys for climate, including on national actions to reduce emissions in the 2020s, on common approaches toward a successful COP 28, and on operationalizing the Working Group on Enhancing Climate Action in the 2020s to accelerate concrete climate actions. President Biden stated that the United States stands ready to work with the PRC to address transnational challenges, such as health security and debt and climate finance in developing countries and emerging markets.").

[388] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis* ("4. The United States and China decide to operationalize the Working Group on Enhancing Climate Action in the 2020s, to engage in dialogue and cooperation to accelerate concrete climate actions in the 2020s. The Working Group will focus on the areas of cooperation that have been identified in the Joint Statement and the Joint Declaration, including on energy transition, methane, circular economy and resource efficiency, low-carbon and sustainable provinces/states & cities, and deforestation, as well as any agreed topics. … 6. Both countries support the G20 Leaders Declaration to pursue efforts to triple renewable energy capacity globally by 2030 and intend to sufficiently accelerate renewable energy deployment in their respective economies through 2030 from 2020 levels so as to accelerate the substitution for coal, oil and gas generation, and thereby anticipate post-peaking meaningful absolute power sector emission reduction, in this critical decade of the 2020s. 7. Both sides agree to restart the U.S.-China Energy Efficiency Forum to deepen policy exchanges on energy-saving and carbon-reducing solutions in key areas including industry, buildings, transportation, and equipment. 8. The United States and China intend to recommence bilateral dialogues on energy policies and strategies, carry out exchanges on mutually agreed topics, and facilitate track II activities to enhance pragmatic cooperation. 9. The

two countries aim to advance at least 5 large-scale cooperative CCUS projects each by 2030, including from industrial and energy sources. … 24. Both countries are committed to working with each other and with other Parties to adopt a consensus Global Stocktake decision. In the view of both countries, the decision … should take account of equity and be informed by the best available science, including the most recent IPCC reports; … should send signals with respect to the energy transition (renewable energy, coal/oil/gas), carbon sinks including forests, non-CO2 gases including methane, and low-carbon technologies, etc.").

[389] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis* ("4. The United States and China decide to operationalize the Working Group on Enhancing Climate Action in the 2020s, to engage in dialogue and cooperation to accelerate concrete climate actions in the 2020s. The Working Group will focus on the areas of co operation that have been identified in the Joint Statement and the Joint Declaration, including on energy transition, methane, circular economy and resource efficiency, low-carbon and sustainable provinces/states & cities, and deforestation, as well as any agreed topics. … 10. The two countries will implement their respective national methane action plans and intend to elaborate further measures, as appropriate. 11. The two countries will immediately initiate technical working group cooperation on policy dialogue, technical solutions exchanges, and capacity building, building on their respective national methane action plans to develop their respective methane reduction actions/targets for inclusion in their 2035 NDCs and support each country's methane reduction/control progress. 12. The two countries intend to cooperate on respective measures to manage nitrous oxide emissions. 13. The two countries intend to work together under the Kigali Amendment to phase down HFCs and commit to ensure application of ambit ious minimum efficiency standards for all cooling equipment manufactured.").

[390] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis* ("14. Recognizing the importance of developing circular economy and resource efficiency in addressing the climate crisis, relevant government agencies of the two countries intend to conduct a policy dialogue on these topics as soon as possible and support enterprises, universities, and research institutions of both sides to engage in discussions and collaborative projects. 15. The United States and China are determined to end plastic pollution and will work together and with others to develop an international legally binding instrument on plastic pollution, including the marine environment.").

[391] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis* ("20. Both countries intend to cooperate in promoting relevant policies and measures and the deployment of technologies to enhance synergy of controlling GHG emissions and air pollutants, including NOx, VOCs, and other tropospheric ozone precursors.").

[392] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis* ("16. The United States and China will support climate cooperation among states, provinces, and cities with regard to areas including, inter alia, the power, transportation, buildings, and waste sectors. … 17. The United States and China intend to hold a high-level event on subnational climate action in the first half of 2024. 18. Both sides welcome with appreciation existing subnational cooperation between the two countries and encourage states, provinces, and cities to promote practical climate cooperation.").

[393] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis* ("19. Both sides commit to advance efforts to halt and reverse forest loss by 2030, including by fully implementing through regulation and policy, and effectively enforcing, their respective laws on banning illegal imports. They intend to engage in discussions and exchanges, including under the Working Group, on ways to improve efforts to strengthen implementation of this commitment.").

[394] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis* ("21. Reaffirming the nationally determined nature of NDCs, and recalling Article 4.4 of the Paris Agreement, both countries' 2035 NDCs will be economy-wide, include all greenhouse gases, and reflect the reductions aligned with the Paris temperature goal of holding the increase in global average temperature to well below 2 degrees C and pursuing efforts to limit the temperature increase to 1.5 degrees C.").

[395] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis* ("3. The United States and China … stress the importance of COP 28 in responding meaningfully to the climate crisis during this critical decade and beyond. They are aware of the important role they play in terms of both national responses and working together cooperatively to address the goals of the Paris Agreement and promote multilateralism. They will work together and with other Parties to the Convention and

the Paris Agreement to rise up to one of the greatest challenges of our time for present and future generations of humankind.").

[396] China Ministry of Ecology and Environment, Ministry of Foreign Affairs, National Development and Reform Commission, Ministry of Science and Technology, Ministry of Industry and Information Technology, Ministry of Finance, Ministry of Natural Resources, Ministry of Housing and Urban-Rural Development, Ministry of Agriculture and Rural Affairs, Ministry of Emergency Management, and National Energy Administration, *China Methane Emissions Control Plan* [甲烷排放控制行动方案] (7 November 2023) (hyperlink to original Chinese). *See also* Institute for Governance & Sustainable Development, annotated English reference translation of the China Methane Emissions Control Plan (8 November 2023).

[397] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis* ("22. The United States and China, with the United Arab Emirates, invite countries to a Methane and Non-CO2 Greenhouse Gases Summit at COP 28.").

[398] United States Department of State (10 November 2021) *U.S.-China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s*, Press Release ("2. The United States and China, alarmed by reports including the Working Group I Contribution to the IPCC Sixth Assessment Report released on August 9th, 2021, further recognize the seriousness and urgency of the climate crisis. They are committed to tackling it through their respective accelerated actions in the critical decade of the 2020s, as well as through cooperation in multilateral processes, including the UNFCCC process, to avoid catastrophic impacts.").

[399] United States Department of State (10 November 2021) *U.S.-China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s*, Press Release ("8(C)(II). In addition to its recently communicated NDC, China intends to develop a comprehensive and ambitious National Action Plan on methane, aiming to achieve a significant effect on methane emissions control and reductions in the 2020s.").

[400] United States Department of State (10 November 2021) *U.S.-China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s*, Press Release ("8(D). The United States and China intend to convene a meeting in the first half of 2022 to focus on the specifics of enhancing measurement and mitigation of methane, including through standards to reduce methane from the fossil and waste sectors, as well as incentives and programs to reduce methane from the agricultural sector.").

[401] United States Department of State (10 November 2021) *U.S.-China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s*, Press Release ("16. The two sides intend to establish a 'Working Group on Enhancing Climate Action in the 2020s,' which will meet regularly to address the climate crisis and advance the multilateral process, focusing on enhancing concrete actions in this decade. This may include, inter alia, continued policy and technical exchanges, identification of programs and projects in areas of mutual interest, meetings of governmental and non-governmental experts, facilitating participation by local governments, enterprises, think tanks, academics, and other experts, exchanging updates on their respective national efforts, considering the need for additional efforts, and reviewing the implementation of the Joint Statement and this Joint Declaration.").

[402] United States Department of State (10 November 2021) *U.S.-China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s*, Press Release ("15. Both countries intend to communicate 2035 NDCs in 2025.").

[403] United States Department of State (14 November 2023) *Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis* ("21. Reaffirming the nationally determined nature of NDCs, and recalling Article 4.4 of the Paris Agreement, both countries' 2035 NDCs will be economy-wide, include all greenhouse gases, and reflect the reductions aligned with the Paris temperature goal of holding the increase in global average temperature to well below 2 degrees C and pursuing efforts to limit the temperature increase to 1.5 degrees C.").

[404] United States Department of State (10 November 2021) *U.S.-China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s*, Press Release ("In addition to its recently communicated NDC, China intends to develop a comprehensive and ambitious National Action Plan on methane, aiming to achieve a significant effect on methane emissions control and reductions in the 2020s.").

[405] China Ministry of Ecology and Environment, Ministry of Foreign Affairs, National Development and Reform Commission, Ministry of Science and Technology, Ministry of Industry and Information Technology, Ministry of Finance, Ministry of Natural Resources, Ministry of Housing and Urban-Rural Development, Ministry of Agriculture and Rural Affairs, Ministry of Emergency Management, and National Energy Administration, *China*

Methane Emissions Control Plan [甲烷排放控制行动方案] (7 November 2023) (hyperlink to original Chinese); *see also* Institute for Governance & Sustainable Development, annotated English reference translation of the China Methane Emissions Control Plan (8 November 2023).

[406] At COP27, China Special Envoy on Climate Change, Xie Zhenhua, announced that China "attaches great importance to methane" emissions reduction and has completed a draft National Action Plan on strictly controlling methane emissions from key sectors, including energy (oil, gas, and coal), agriculture, and waste. In separate remarks provided at the Global Methane Pledge Ministerial on 17 November 2022, at the invitation of U.S. Presidential Climate Envoy John Kerry, Xie noted that the Plan is currently undergoing administrative and legislative processes (necessary before the Plan's public release). At the time, Special Envoy Xie also mentioned that China's ability to control methane emissions remained "relatively weak," and the plan focuses on preliminary goals like improving monitoring capabilities and measurement, reporting, and verification (MRV) mechanisms, and promoting resource utilization efficiency. *See* World Bank (8 November 2022) *It's Time to Sprint: Targeting Methane Emissions* (COP27 Side Event). In early January 2023, China's Ministry of Ecology and Environment (MEE) announced progress that on laying the foundation for a National Action Plan on methane. In particular, MEE described work on greenhouse gas data access and monitoring and evaluation pilot projects, including pilot projects exploring preliminary technical methodologies for methane emissions data access and analysis. *See* Institute for Governance & Sustainable Development (17 January 2023) *China Announces Progress in Methane Monitoring and Evaluation In Preparation for the Release of Its National Action Plan on Methane* ("China's Ministry of Ecology and Environment (MEE) highlighted progress on carbon dioxide and other greenhouse gas monitoring and evaluation pilot projects aimed at answering critical questions on 'what to measure,' 'where to measure,' and 'how to measure.' This includes pilot projects exploring preliminary technical methodologies for methane leakage detection. In particular, MEE noted that the oil and gas industry pilots have established a methane leakage detection mechanism by implementing an integrated "satellite + unmanned aerial vehicle + cruise" monitoring system for tracking methane leakage in production processes. For the coal mining industry pilots, MEE observed that a collaborative methane emissions monitoring technology has been developed using existing coal mine safety monitoring systems. Last but not least, MEE commented that it has established a preliminary understanding of the concentrations and the spatial and temporal distributions of global methane emissions through analysis of satellite remote sensing data.").

[407] People's Republic of China (2021) *China's Achievements, New Goals and New Measures for Nationally Determined Contributions*, submission to the Secretariat of the UNFCCC. *See also* Institute for Governance & Sustainable Development (28 October 2021) *Ahead of COP 26, China Submits Update to NDC and Mid-Century Development Strategy* (listing actions to address non-CO2 greenhouse gases (GHGs) incorporated into China's updated NDCs.).

[408] PETRONAS (27 June 2023) *PETRONAS Collaborates with Partners to Accelerate Methane Emissions Reduction*. *See also* Eco Business (11 August 2023) *Cutting methane emissions is key to slowing down climate change: EDF president Fred Krupp* ("When I was in Kuala Lumpur [to attend the Energy Asia conference], the Asean Methane Leadership Programme was announced in Malaysia. This 18-month initiative, in which EDF is a key stakeholder, will focus on capacity building to help strengthen Asean companies' plans, targets and financing options in reducing methane emissions.").

[409] ASEAN Centre for Energy (2024) *ASEAN Methane Leadership Program (MLP) 1.0 Wrap-up & MLP 2.0 Launching Ceremony, and the MLP 2.0 Technical Workshop*.

[410] United Nations Environment Programme (6 December 2023) *The Buildings Breakthrough: Global push for near-zero emission and resilient buildings by 2030 unveiled at COP28* ("The Governments of France and Morocco, together with the UN Environment Programme (UNEP), launched the Buildings Breakthrough today at COP28, which will see countries joining forces to accelerate the transformation of the sector – which accounts for 21 per cent of global greenhouse gas emissions – with a view to making near-zero emissions and climate resilient buildings the new normal by 2030. Twenty-seven countries have so far pledged their commitment to the Buildings Breakthrough."). *See also* Global Cement and Concrete Association (6 December 2023) *Canada launches the Cement & Concrete Breakthrough initiative at COP28* ("Today, the Honourable François-Philippe Champagne, Minister of Innovation, Science and Industry, and His Excellency Omar Ahmed Suwaina Al Suwaidi, Undersecretary of the Ministry of Industry and Advanced Technology in the United Arab Emirates (UAE), announced the launch of the Cement & Concrete Breakthrough initiative at COP28 in Dubai. This initiative reaffirms Canada's commitment to working with countries, businesses and international partner organizations to accelerate investments in the technologies, tools and policies that the cement and concrete industry needs to realize net-zero solutions by 2050.").

[411] International Energy Agency, International Renewable Energy Agency, & United Nations Climate Change High Level Champions (2023) *The Breakthrough Agenda Report 2023*, 3 ("The Breakthrough Agenda was launched by 45 world leaders at COP 26 and is a commitment to work together this decade to accelerate innovation and deployment of clean technologies, making them accessible and affordable for all this decade. To kick-start this Agenda, countries endorsed Breakthrough goals to make clean technologies and sustainable practices more affordable, accessible and attractive than their alternatives by 2030 in the power, road transport, steel, hydrogen and agriculture sectors. This report also covers the buildings and cement sectors, where new breakthroughs are being considered. The Breakthrough Agenda establishes an annual cycle to track developments towards these goals, identify where further co-ordinated international action is urgently needed to accelerate progress and then galvanise public and private international action behind these specific priorities in order to make these transitions quicker, cheaper and easier for all.").

[412] Climate Champions (14 September 2023) *Breakthrough Agenda Report 2023: Stronger international cooperation in high emissions sectors crucial to get on track for 1.5C climate goal*, Race to Resilience ("The second annual report assesses progress made since 2022 in priority areas for international collaboration, and sets out a series of recommendations for countries to work together in each sector to help reduce emissions over the next decade and stave off the worst effects of climate change … The report's recommendations span financial assistance, research and development, demand-creation, infrastructure, standards and trade, to accelerate the transition in each sector. Coordinated actions in each of the seven sectors will help mobilise investment, and can create the economies of scale required to bring down the price of crucial technologies and sustainable agriculture solutions. The report found that in the past year, only modest progress has been made in strengthening international collaboration in the areas where it is most needed. Progress has been made in expanding financial assistance to developing countries in some sectors, and in joint research and development initiatives.").

[413] Climate & Clean Air Coalition, *Our Partners* (*last visited* 5 February 2023) ("The Coalition is a voluntary partnership led by states and regional integration organisations. These partners have committed to accelerate action to reduce short-lived climate pollutants through their participation in the Coalition's activities and local action.").

[414] Climate & Clean Air Coalition, *Global Methane Pledge* (*last visited* 12 December 2023) ("As of September 2023, the Climate and Clean Air Coalition (CCAC) provides secretariat services to the Global Methane Pledge (GMP). This function reinforces the CCAC's core mandate to address methane as part of its broader goal to reduce short-lived climate pollutants while responding to GMP countries' need for support to deliver on their commitment. As the GMP secretariat, CCAC will work with GMP countries and supporters to strengthen engagement and coordination, track progress, monitor policy actions and project successes, maintain and update resources, provide direct support through one-on-one advice, engage participants and supporters through CCAC hubs, meetings, and the Scientific Advisory Panel, and ministerial engagements.").

[415] Climate & Clean Air Coalition, *National policy and planning support* (*last visited* 5 February 2023) ("Since 2013, the CCAC has helped 16 countries develop national plans that integrate climate and clean air objectives through actions to reduce short-lived climate pollutants (SLCPs). Eight of these plans have received national endorsement and are moving towards implementation."). *See also* Climate & Clean Air Coalition, *Increasing Ambition of NDCs* (*last visited* 5 February 2023) ("As countries update their Nationally Determined Contributions (NDCs) and enhance ambition to achieve the Paris Agreement temperature goals, the Climate and Clean Air Coalition is encouraging and supporting them to include short-lived climate pollutant (SLCP) and air pollution actions into their climate commitments.").

[416] United Nations Environment Programme (2021) *September 2021 Report of the Technology and Economic Assessment Panel, Volume 6: Assessment of the Funding Requirement for the Replenishment of the Multilateral Fund for the Period 2021-2023*, 59 ("The funding approved for IS support has played a paramount role in establishing and maintaining the capacity of national ozone units and is recognized as a major factor in the success of A5 parties achieving compliance with the Montreal Protocol's control measures.120"), *citing* Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol (17 April 2015) *Review of Funding of Institutional Strengthening Projects (Decision 61/43(b)*, UNEP/OzL.Pro/ExCom/74/51, ¶¶ 11–13.

[417] Climate & Clean Air Coalition, *Technology and Economic Assessment Panel* (*last visited* 15 December 2023) ("In 2023, the CCAC established its Technology and Economic Assessment Panel (CCAC-TEAP) to develop and share knowledge with countries about promising, innovative and underfinanced short-lived climate pollutant (SLCP) mitigation measures which can improve both climate and air quality outcomes.").

[418] Climate & Clean Air Coalition (15 November 2022) *Sharm el-Sheikh Communiqué* ("We will seek to expand our work with the private sector and state-owned enterprises. We welcome exploring the formation of a Technology and Economic Assessment Panel on Methane, or similar, as suggested by Senegal, to better understand and advise CCAC Partners on the landscape of innovative methane mitigation technologies, including methane removal and sector-specific methane reduction technologies.").

[419] Climate & Clean Air Coalition (9 November 2021) *Climate and Clean Air Coalition Ministers approve strategy to significantly cut short-lived climate pollutants this decade,* Press Release ("Ministers approved the implementation of a Methane Flagship, which, starting in 2022, will foster and strengthen high level commitments to reduce methane, amplify and raise awareness, support planning and delivery of strategies and plans, p rovide analysis and tools to support action, and scale up financing. There was strong and broad support for the recently launched Global Methane Pledge and ministers welcomed the CCAC having a leadership role in supporting its implementation.").

[420] *See generally* Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT; *and* Climate & Clean Air Coalition (2022) GLOBAL METHANE ASSESSMENT: 2030.

[421] Explore mitigation amounts and impacts at: http://shindellgroup.rc.duke.edu/apps/methane/.

[422] Economic Commission for Europe (8 September 2015) *UNECE joins Climate and Clean Air Coalition*, Press Release ("At a Working Group meeting in Paris (8–9 September), CCAC welcomed UNECE to the Coalition. By joining the Coalition, UNECE gains access to a broad network of experts and partners. Drawing on its long-standing expertise, UNECE will contribute through exchanges of experiences, knowledge and best practices, particularly as they relate to the work under the Committee on Sustainable Energy and the Convention on Long-Range Transboundary Air Pollution, including its amended Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol).").

[423] *See Global Methane, Climate and Clean Air Forum* (*last visited* 5 February 2023) ("The Global Methane, Climate and Clean Air Forum is a joint event sponsored by the Global Methane Initiative (GMI) and the Climate & Clean Air Coalition (CCAC). The Forum is a premier global event that brings together policymakers, industry leaders, technical experts, and researchers from around the world to discuss opportunities to protect the climate and improve air quality with a special focus on methane.").

[424] Climate & Clean Air Coalition Secretariat (7 October 2022) *At The Global Methane, Climate and Clean Air Forum, Experts Stress the Need for #FastClimateAction* ("**Martina Otto, Head of Secretariat, CCAC**, stated that joint efforts and methane action must be taken 'right' now given the narrow window to achieve the goals of the Paris Agreement on climate change. She also reminded participants of several initiatives funded by the CCAC Trust Fund, especially on methane source sectors.").

[425] Climate & Clean Air Coalition (15 November 2022) *Ministerial Communique*, 1 ("In a year in which the devastating and horrendous impacts of climate change have become ever-more apparent around the globe, and when the UN General Assembly recognized the right to a clean, healthy and sustainable environment (Res. 76/300), we the Ministers and Leaders of the Climate and Clean Air Coalition (CCAC) have met today to: … Reaffirm and renew our commitment to reduce emissions of methane and other short-lived climate pollutants (SLCPs) quickly and decisively – as a complement to scaled-up action on carbon dioxide (CO_2) – noting that reducing SLCP emissions is the most effective pathway to avoid 0.6 ℃ of predicted global warming in the near term[i] and slow sea-level rise by 20% by mid-century,[ii] slowing the rate of Arctic warming by up to two-thirds[iii] and the rate of global warming by half; … Launch new collaborative actions to further drive emissions reductions, as a concrete and practical affirmation of our commitment, noting the importance of mobilizing financing to deliver results.").

[426] Climate & Clean Air Coalition (15 November 2022) *Ministerial Communique*, 3 ("We welcome exploring the formation of a Technology and Economic Assessment Panel on Methane, or similar, as suggested by Senegal, to better understand and advise CCAC Partners on the landscape of innovative methane mitigation technologies, including methane removal and sector-specific methane reduction technologies.").

[427] Climate & Clean Air Coalition (15 November 2022) *Ministerial Communique*, 4 ("And, we request the CCAC Scientific Advisory Panel to put forward a proposal on how we can highlight and better calculate the near-term

climate benefits of our methane commitments, for instance through the use of GWP20 or temperature change over time in our NDCs.[vii]").

[428] Climate & Clean Air Coalition, *Technology and Economic Assessment Panel* (*last visited* 15 December 2023) ("In 2023, the CCAC established its Technology and Economic Assessment Panel (CCAC-TEAP) to develop and share knowledge with countries about promising, innovative and underfinanced short-lived climate pollutant (SLCP) mitigation measures which can improve both climate and air quality outcomes.").

[429] Climate & Clean Air Coalition (13 June 2023) *At the Climate and Clean Air Conference 2023, Nations Call for Action*, News and Announcements ("A pilot CCAC Technology and Economic Assessment Panel (TEAP), which will provide guidance and support to countries on which best available technologies exist for implementation of SLCP reductions in different contexts – focusing initially on methane.").

[430] *See generally* Climate & Clean Air Association (undated) *Science Policy*.

[431] *See generally* Climate & Clean Air Coalition & International Energy Agency (2023) THE IMPERATIVE OF CUTTING METHANE FROM FOSSIL FUELS.

[432] Climate & Clean Air Coalition, *CCAC at COP28* (*last visited* 30 January 2024) ("The Climate and Clean Air Coalition is participating in and co-organizing events during COP28. Our governance meeting, the Climate and Clean Air Ministerial, will also meet on the margins of the Conference, and we will be co-hosting the Global Methane Pledge (GMP) Ministerial.").

[433] Clean Air Task Force (8 December 2023) *Turning pledges into action: COP28 Global Methane Pledge Ministerial*, ("This year, Global Methane Partners announced: Over $1 billion in new grant funding for methane action mobilized since COP27, more than triple current levels, which will mobilize billions in investment to reduce methane. New national commitments and legislation from top oil and gas methane emitters alongside decisive action on waste, food, and agriculture – including strong methane emissions standards for oil and gas from the U.S. and new methane regulations from Canada. Transformational data tools including the full launch of the Methane Alert and Response System, a new Data for Methane Action Campaign, and a new platform to better track waste methane emissions in cities around the world. New members and expanded leadership. Canada, Federated States of Micronesia, Germany, Japan, and Nigeria joined the United States and European Union as Global Methane Pledge Champions. Turkmenistan, Kazakhstan, Kenya, Kosovo, Romania, and Angola joined the Global Methane Pledge, bringing total participation to 156 governments.").

[434] Climate & Clean Air Coalition (9 December 2023) *Ministers Unite for Immediate Action on Climate and Clean Air, Urging Bold Financing and Swift Measures on Non-CO2 Super Pollutant Greenhouse Gases* ("Over one hundred ministers, heads of agencies and non-state partners came together in the Climate and Clean Air Ministerial to unveil groundbreaking initiatives, commitments and a call to action during the 28th Conference of Parties of the UNFCCC (COP28). The 2023 Ministerial was focused on financing for short-lived climate pollutants (SLCPs). State partners showed up, making new commitments to climate and clean air and calling for further action and support.").

[435] Climate & Clean Air Coalition (9 December 2023) *Ministers Unite for Immediate Action on Climate and Clean Air, Urging Bold Financing and Swift Measures on Non-CO2 Super Pollutant Greenhouse Gases* ("The Coalition also announced the initiation of a landmark assessment on nitrous oxide (N2O) to be delivered in advance of COP29, which will expose impacts of the often-overlooked greenhouse gas. This proactive approach aims to ensure that no opportunities are missed in the pursuit of a 1.5 degrees Celsius future. A global assessment on the cost of inaction on short-lived climate pollutants and an assessment on the integrated agriculture and food systems will be prepared in advance of COP30.").

[436] Climate & Clean Air Coalition (9 December 2023) *Ministers Unite for Immediate Action on Climate and Clean Air, Urging Bold Financing and Swift Measures on Non-CO2 Super Pollutant Greenhouse Gases* ("Ministers also called for increased efforts to support highly vulnerable Small-Island Developing States (SIDS), especially in the context of rapid mitigation of methane and black carbon to slow sea level rise and increasing frequency and intensity of climate-exacerbated weather events.").

[437] International Institute for Sustainable Development (2023) *Climate and Clean Air Coalition's Ministerial Meeting: Immediate Action on Climate and Clean Air, Bold Financing and Swift Measures on Non-CO2 Super Pollutant Greenhouse Gases* ("Germany pledged EUR 20 million for the GMP, EUR 8 million of which will go

to the CCAC's budget… Ireland announced EUR 2 million in support of the CCAC… Monaco reported a contribution of EUR 500,000 for 2024.. Sweden announced a pledge of USD 180,000 to support the CCAC."). For a full outline of all funding provided to the CCAC, *see* Climate & Clean Air Coalition, *CCAC Trust Fund* (*last visited* 14 February 2024).

[438] Climate & Clean Air Coalition (2023) *Clean Air Flagship* ("At the Climate and Clean Air Ministerial 2022, CCAC Partners requested a new effort to achieve clean air across the world. At the Climate and Clean Air Ministerial 2023, the CCAC launched the "Clean Air Flagship" to mobilise the partnership and 'move the needle' on this important topic. It is aimed at: Saving lives: Supporting governments to achieve cleaner air as quickly as possible, consistent with improved WHO air quality interim targets. Slowing climate change: Taking full advantage of win-win opportunities to reduce the emissions of short-lived climate pollutants simultaneously with other harmful pollutants. Maximizing co-benefits: Improving agricultural productivity, economic development and the overall quality of life.").

[439] Climate & Clean Air Coalition (2023) *Clean Air Flagship 2024-2026*, 6 ("Support science cooperation and information-sharing initiatives within the regional frameworks, especially with respect to tropospheric ozone, black carbon, and methane (See Annex 1).").

[440] Climate & Clean Air Coalition (2023) *Clean Air Flagship 2024-2026*, 4 ("Strengthen and support regional and sub-regional cooperation and the implementation of political commitments to achieve the WHO Air Quality Guidelines and Global Methane Pledge.").

[441] Climate and Clean Air Coalition, *Fossil Fuel Regulatory Programme (FFRP)* (*last visited* 2 February 2026) ("The Fossil Fuel Regulatory Programme will support up to 20 developing country governments from mid-2024 to mid-2027, with tailored support for capacity development, regulatory frameworks, and enforce compliance with existing frameworks. The CCAC will work in partnership with the Clean Air Task Force (CATF) to implement projects focused on methane abatement policies and regulations, following a rigorous assessment, approval, and monitoring process for each project. Projects will be developed based on requests for support received from ODA-eligible national governments. Funding support will be evaluated per national government request, depending on the size of the industry and country ambition.").

[442] Climate and Clean Air Coalition, *Fossil Fuel Regulatory Programme (FFRP)* (*last visited* 2 February 2026) ("The CCAC will work in partnership with the Clean Air Task Force (CATF) to implement projects focused on methane abatement policies and regulations, following a rigorous assessment, approval, and monitoring process for each project. Projects will be developed based on requests for support received from ODA-eligible national governments.").

[443] Climate and Clean Air Coalition, *Methane Regulator-to-Regulator Network* (*last visited 2* February 2026) ("The Methane Regulator-to-Regulator (MR2R) Network is designed for government regulators responsible for methane emissions from the oil, gas, and coal sectors. As countries implement commitments under the Global Methane Pledge and respond to rising expectations for low-emissions energy, regulators are increasingly required to design and enforce new methane frameworks, often with limited access to peers or tested regulatory models. The MR2R Network provides a trusted, closed-door environment where regulators can connect, learn, and collaborate. The network complements the CCAC's Fossil Fuel Regulatory Programme (FFRP), which offers tailored support to developing countries governments for capacity development, regulatory frameworks, and compliance. Through MR2R, regulators can engage in continuous dialogue with peers at different stages of the regulatory journey, share real-world experiences, discuss challenges, and co-develop solutions to accelerate the effective design and implementation of methane regulations. The network supports regulators through activities such as annual in-person meetings, technical webinars, mentorships, panel participation, co-authored publications, and a rapid peer-support hotline, enabling members to strengthen regulatory capacity and leadership in methane abatement.").

[444] Climate and Clean Air Coalition, *CCAC Super Pollutant Country Action Accelerator* (*last visited 16* December 2025) ("At COP30, the Climate and Clean Air Coalition launched the Super Pollutant Country Action Accelerator, a new 3-year, programme to help governments in ODA-eligible countries to drive deep and sustained reductions in super pollutant emissions.").

[445] Climate and Clean Air Coalition, *CCAC Super Pollutant Country Action Accelerator* (*last visited* 16 December 2025) ("Building on lessons from the success of the Montreal Protocol, the programme applies its proven implementation model to accelerate action on super pollutants. The Accelerator aims to engage up to 30 countries

by 2030 and to mobilise an estimated USD 150 million in grant funding and complementary finance from development partners. The first cohort of seven countries—Brazil, Cambodia, Indonesia, Kazakhstan, Mexico, Nigeria, and South Africa—was announced at COP30 by Marina Silva, Brazil's Minister of the Environment and Climate, and the Rt. Hon. Ed Miliband, UK Secretary of State for Energy Security and Net Zero. These countries were selected for their strong political commitment, readiness for policy and regulatory action, and regional leadership. They will collectively receive an initial support package of $25 million to advance their efforts.").

[446] Climate & Clean Air Coalition (4 December 2023) *Highlights from 2023 Global Methane Pledge Ministerial* ("The United States, the European Commission, and twelve other natural gas importing and exporting countries formed an international working group to advance comparable and reliable information about methane and CO2 emissions across the natural gas supply chain to drive global emissions reductions.").

[447] United States Department of Energy (9 March 2022) *U.S. Secretary of Energy Jennifer M. Granholm Hosts The First Net-Zero Producers Forum Ministerial in Houston* ("U.S. Secretary of Energy Jennifer M. Granholm, together with Energy Minsters from Canada, Norway, Qatar, and Saudi Arabia, today formally launched the Net-Zero Producers Forum (NPF) through an inaugural ministerial meeting. During the meeting, Ministers endorsed the initiative's Terms of Reference, which codifies the objectives and framework of the NPF.").

[448] United States Department of Energy (23 April 2021) *Joint Statement on Establishing a Net-Zero Producers Forum between the Energy Ministries of Canada, Norway, Qatar, Saudi Arabia, and the United States* , Press Release ("Canada, Norway, Qatar, Saudi Arabia, and the United States, collectively representing 40 percent of global oil and gas production, will come together to form a cooperative forum that will develop pragmatic net-zero emission strategies, including methane abatement, advancing the circular carbon economy approach, development and deployment of clean-energy and carbon capture and storage technologies, diversification from reliance on hydrocarbon revenues, and other measures in line with each country's national circumstances.").

[449] United States Department of Energy (13 May 2022) *The United Arab Emirates Joins as Sixth Member of the Net-Zero Producers Forum* ("The United States, Canada, Norway, Qatar, and Saudi Arabia welcome the United Arab Emirates as the sixth member of the Net-Zero Producers Forum (NPF). Collectively representing 45 percent of global oil production and 40 percent of natural gas production, the NPF is focusing on accelerating the scale and speed of reaching net-zero emissions.").

[450] United States Office of International Affairs (4 December 2023) *Net-Zero Producers Forum - Launch of the Upstream Abatement Toolkit* ("The "Upstream Methane Abatement Toolkit" is a resource developed by Net-Zero Producers Forum (NPF) member countries highlighting measures to date and lessons learned regarding the implementation of methane abatement technologies. NPF members will update the toolkit, adding new resources and revisiting the description of existing programs on an annual basis to show increasing action. This toolkit intends to highlight existing and planned methane abatement policies, resources, and initiatives across the member countries for the benefit of the group and for others who are interested in learning from our experiences with methane abatement, which is critical to ensuring we begin to slow and eventually reverse the impacts of climate change.").

[451] Farmonaut, *Aramco Vision: Saudi Aramco Vision and Mission 2026 – Shaping a Sustainable Energy Future* (*last visited* 24 March 2026) ("'By 2025, Saudi Aramco aims to cut upstream carbon intensity by 15%, advancing its sustainability vision.'").

[452] United Nations Environment Programme International Methane Emissions Observatory (2026) *OGMP 2.0 on track to deliver measurement-based methane emissions reporting for one-third of global oil and gas supply by 2030*, 5, table 1.

[453] World Bank (5 December 2023) *GGFR to evolve to the Global Flaring & Methane Reduction Partnership* ("Today the World Bank launched the Global Flaring and Methane Reduction (GFMR) Partnership, a new multi-donor trust fund focused on helping developing countries cut carbon dioxide and methane emissions generated by the oil and gas industry. GFMR will provide more than $250 million and mobilize billions from the private sector to support those countries with the least capacity and resources to address these emissions. The partnership will focus on providing grant funding, technical assistance, policy and regulatory reform advisory services, institutional strengthening, and mobilizing financing to support action by governments and operators.").

[454] World Bank, *Global Gas Flaring Reduction Partnership (GGFR), About the Partnership* (*last visited* 5 February 2023) ("GGFR helps identify solutions to the array of technical and regulatory barriers to flaring reduction. To achieve this, we develop country-specific flaring reduction programs, conduct research, share best practices, raise awareness, secure global commitments to end routine flaring, and advance flare measurements and reporting."). *See also* World Bank (5 December 2023) *GGFR to evolve to the Global Flaring & Methane Reduction Partnership* ("GFMR will establish eligibility criteria so that support drives long term emissions reduction projects and initiatives. For example, access to project development and financing support through GFMR will be subject to a commitment to measure and report emissions through the Oil and Gas Methane Partnership 2.0 framework, achieve near-zero absolute methane emissions by 2030 by reducing methane intensity to below 0.2%, and achieve zero routine flaring by 2030.").

[455] World Bank (5 December 2023) *GGFR to evolve to the Global Flaring & Methane Reduction Partnership* ("GFMR will establish eligibility criteria so that support drives long term emissions reduction projects and initiatives. For example, access to project development and financing support through GFMR will be subject to a commitment to: measure and report emissions through the Oil and Gas Methane Partnership 2.0 framework, achieve near-zero absolute methane emissions by 2030 by reducing methane intensity to below 0.2%, and achieve zero routine flaring by 2030.").

[456] Climate & Clean Air Coalition (4 December 2023) *Highlights from 2023 Global Methane Pledge Ministerial* ("The World Bank launched its Global Flaring and Methane Reduction Partnership (GFMR) with $255 million in new grant funding to catalyze oil and gas methane and flaring reduction in developing countries. The GFMR is supported by financial contributions from the United Arab Emirates, United States, Norway, BP, ENI, Equinor, Occidental, Shell, and TotalEnergies.").

[457] World Bank, *Zero Routine Flaring By 2030 (ZRF) Initiative* (*last visited* 5 February 2023) ("Launched in 2015, the ZRF Initiative commits governments and oil companies, to end routine flaring no later than 2030.").

[458] World Bank, *Zero Routine Flaring by 2030, Initiative Endorsers* (*last visited* 5 February 2023) (List of endorsers).

[459] Global Flaring and Methane Reduction Partnership (2025) ANNUAL PROGRESS REPORT, iv-v ("The Global Flaring and Methane Reduction (GFMR) Partnership's first year of operations delivered a strong global footprint and measurable results. Covering fiscal year 2025 (July 1, 2024–June 30, 2025), this report highlights progress in helping developing countries address gas flaring and methane emissions from oil and gas operations. In just one year, GFMR has engaged in 17 countries representing more than a quarter of global methane emissions from oil and gas and nearly two-fifths of global gas flaring… Partner confidence is reflected in strong financial commitments. By June 2025, governments and corporate partners had pledged $234.4 million, with $42 million paid in.1 A total of $40.3 million was endorsed for grants, including $8 million allocated to 20 active grants.").
[460] Global Flaring and Methane Reduction Partnership (2026) GLOBAL GAS FLARING TRACKER REPORT, 21 ("3. Global average flaring intensity rose 2.7 percent, from 5.3 to 5.4 m^3/barrels of oil produced (bbl), and has remained essentially unchanged for fifteen years, a signal that associated gas management is not being built into production planning at the scale required. 4. Nine countries (Russia, Iran, Iraq, Venezuela, Mexico, Libya, Algeria, Nigeria, and the United States) accounted for 83 percent of global flare volumes in 2025 while producing only 46 percent of the world's oil. Targeted action by a small number of governments could yield disproportionate and significant results.

[461] Climate & Clean Air Coalition Secretariat (4 December 2023) *Highlights from 2023 Global Methane Pledge Ministerial* ("The World Bank launched the Global Methane Reduction Platform for Development (CH4D) to support low-and mid-income countries to realize the 'methane triple-wins' of abating emissions, enhancing resilience, and empowering livelihoods. Through partnerships, including with the CCAC Methane Roadmap Action Programme (M-RAP), CH4D will mobilize expertise, affordable technologies, and catalytic finance for methane abatement in the agriculture and waste sectors.").

[462] United Nations Economic Commission for Europe, Group of Experts on Coal Mine Methane and Just Transition (*last visited* 14 May 2026) ("The Group of Experts on Coal Mine Methane and Just Transition (formerly known up until September 2021 as the Group of Experts on Coal Mine Methane and prior to November 2010 as the Ad Hoc Group of Experts on Coal Mine Methane and prior to June 2005 as Ad Hoc Group of Experts on Coal in Sustainable Development) is responsible for the promotion and further development of the efficient environmentally sustainable transition of industries along the coal value chain ensuring the reduction of associated greenhouse gas emissions and social equity of the process. Areas of Work

1. Reduction and management of methane emissions through for example recovery and use of methane from active, closed, and/or abandoned coal mines aimed at reducing the risks of explosions, mitigating climate change, and supporting sustainable development;
2. For those countries or regions/states that choose to cease coal mining and related activities, offering support on request on preparation of coal mines and coal mining regions and communities for mine closure and reorientation of the local economies; and
3. Environmentally sustainable transition and repurposing of mines and existing mining infrastructure and facilitating development of new profiles of economic activity and business models that preserve social cohesion and cultural heritage of the affected localities.").

[463] American Petroleum Institute (2023) *Methane Action Plan*, 1 ("6 actions industry is taking to tackle methane emissions through The Environmental Partnership's programs:

1. Reducing Flaring through facility design, takeaway capacity planning and alternative beneficial use. In 2022, there was a 14% reduction in total flare volumes and a 2.4% reduction in flare intensity from the previous year.
2. Replacing, Removing or Retrofitting High-bleed Pneumatic Controllers with low- or zero-emitting devices. Since the program started in 2017, more than 14,100 zero-emissions controllers have been installed and more than 114,000 gas-driven controllers have been replaced.
3. Monitoring Manual Liquids Unloading to minimize emissions by ensuring all wellhead vents are closed to atmosphere. In 2022, participants monitored more than 23,100 liquid unloading events.
4. Minimizing Compressor Emissions by implementing design and operation changes. In 2022, participants facilitated rod packing changes on more than 10,000 reciprocating compressors.
5. Detecting and Repairing Leaks through regular component inspections. In 2022, companies implemented detection and monitoring plans that resulted in a 0.07% leak occurrence rate (or less) across more than 202 million components at 157,000 sites.
6. Minimizing Pipeline Blowdown Emissions through operational changes prioritizing alternative beneficial use of gas that would otherwise be vented. In 2022, emission reduction practices were implemented during 3,600 pipeline blowdowns.").

[464] American Petroleum Institute (21 September 2023) *API Releases Methane Action Plan Highlighting Industry Actions, Key Policy Priorities for Effectively Reducing Methane Emissions*, Press Release ("Through The Environmental Partnership's focus on facility design, innovative technology, and operational practices, Partnership members are: Reducing flaring through facility design, takeaway capacity planning and alternative beneficial use. Replacing, removing or retrofitting high-bleed pneumatic controllers with low- or zero-emitting devices. Monitoring manual liquids unloading to minimize emissions by ensuring all wellhead vents are closed to atmosphere. Minimizing compressor emissions by implementing design and operation changes. Detecting and repairing leaks through regular component inspections. Minimizing pipeline blowdown emissions through operational changes prioritizing alternative beneficial use of gas that would otherwise be vented.").

[465] Inagaki K. (17 July 2023) *Big LNG buyers and producers to tighten methane monitoring*, FINANCIAL TIMES ("Japan, the US, the EU, Australia and South Korea have agreed the creation of a mechanism for monitoring methane emissions that will bring together some of the world's largest buyers and producers of liquefied natural gas to combat global warming. People directly involved in the discussions said the public-private initiative would involve setting up a database of real-time methane pollution data on individual LNG projects, a move backers hope will accelerate the reduction of emissions of the potent global warming gas.").

[466] Inagaki K. (17 July 2023) *Big LNG buyers and producers to tighten methane monitoring*, FINANCIAL TIMES ("Japan, the US, the EU, Australia and South Korea have agreed the creation of a mechanism for monitoring methane emissions that will bring together some of the world's largest buyers and producers of liquefied natural gas to combat global warming. People directly involved in the discussions said the public-private initiative would involve setting up a database of real-time methane pollution data on individual LNG projects, a move backers hope will accelerate the reduction of emissions of the potent global warming gas.").

[467] Japan Ministry of Economy, Trade, and Industry (19 July 2023) *Joint Statement on Accelerating Methane Mitigation from the LNG Value Chain*, Press Release ("To support the Coalition, Japan and the European Commission expressed their vision to create a globally aligned methane emission assessment of LNG projects and to incentivize methane mitigation by LNG producers by facilitating the information collection process of methane leakage counter measures and methane reduction targets announced by LNG producers, moving toward collection of methane emissions and emissions intensity data at the cargo, portfolio, and operator level"). *See also JERA* (18 July 2023) *Launch of the methane emission reduction initiative (CLEAN) by KOGAS and JERA* ("Korea Gas Corporation ("KOGAS") and JERA Co., Inc. ("JERA") today launched an initiative of the "Coalition for

LNG Emission Abatement toward Net-zero ("CLEAN")". CLEAN is an initiative taken by LNG buyers, together with LNG producers, to reduce methane emissions in the LNG value chain. In accordance with the Memorandum of Understanding regarding cooperation in the LNG Business concluded in April 2023, KOGAS and JERA as the world's largest LNG buyers, have confirmed that they will strengthen their strategic relationship and work to ensure a stable supply of energy for both Korea and Japan.").

[468] Japan Ministry of Economy, Trade, and Industry (19 July 2023) *Joint Statement on Accelerating Methane Mitigation from the LNG Value Chain*, Press Release ("Within Japan, JOGMEC will provide support mechanisms for LNG producers and consumers by creating an initiative that collects methane measures and best practices, complementing the work of other existing platforms such as the OGMP 2.0. Japan also resolved to provide support for accelerated methane measurement and mitigation by LNG producers, especially in Asian countries, by leveraging its expertise from ongoing support on emission assessment and reduction in gas and LNG projects.").

[469] *See generally* Coalition for LNG Emissions Abatement Toward Net-Zero (November 2025) ANNUAL REPORT.

[470] Coalition for LNG Emissions Abatement Toward Net-Zero (November 2025) ANNUAL REPORT, 24 ("According to data from Kpler, the LNG volume handled by Japanese and South Korean CLEAN participants totaled more than 105 million tons, equivalent to 25.5% of global LNG exports in 2024 and 90% of total LNG imports in Japan and South Korea").

[471] Coalition for LNG Emissions Abatement Toward Net-Zero (November 2025) ANNUAL REPORT, 7 ("According to the UNEP-IMEO, the weighted average performance targets set by suppliers in Japan and South Korea for methane intensity were 0.15% and 0.17%, respectively. This is a stark improvement over the previous CLEAN report of 0.2% for Japan and 0.19% for South Korea. Additionally, there was a significant improvement in the average reporting level. Of Japan's LNG supply reported under Oil and Gas Methane Partnership 2.0 (OGMP 2.0) in 2024, 40% was measured at Levels 4 and 5, or the highest standard. In the previous year, this rate was 11%. Similarly, of South Korea's LNG supply reported under OGMP 2.0 in 2024, 58% was measured at Levels 4 and 5, whereas it was 29% in the previous year."); 29 ("To understand the current landscape of the LNG value chains toward Japan and South Korea, the CLEAN Secretariat, on behalf of JERA and other CLEAN member companies in Japan, and KOGAS conducted a survey (CLEAN Survey 2025).").

[472] United Nations Environment Programme International Methane Emissions Observatory (2026) *OGMP 2.0 on track to deliver measurement-based methane emissions reporting for one-third of global oil and gas supply by 2030*, 3 ("In 2024, 7 per cent of global production reached Level 5, corresponding to 238 assets. Some companies are showing leadership and going further. The 2025 report from the Coalition for LNG Emission Abatement toward Net-zero (CLEAN) highlights that many LNG projects are moving towards Level 5 reporting and near-zero methane intensities, including the largest producer of LNG in the United States of America and several major LNG projects in Australia. Around 90 per cent of the Republic of Korea and Japan's LNG imports are covered by OGMP 2.0, with roughly 30 per cent of related supply already having reached Level 5 in 2024.").

[473] Global Methane Initiative, *About the Global Methane Initiative* (*last visited* 5 February 2023) ("Launched in 2004, the GMI is an international public-private initiative that advances cost-effective, near-term methane abatement and recovery and use of methane as a clean energy source in three sectors: biogas (including agriculture, municipal solid waste, and wastewater), coal mines, and oil and gas systems. Focusing collective efforts on methane emission sources is a cost-effective approach to reduce greenhouse gas (GHG) emissions and increase energy security, enhance economic growth, improve air quality and improve worker safety.").

[474] Global Methane Initiative, *Partner Countries* (*last visited* 5 February 2023) ("GMI Partner Countries account for approximately 70 percent of global manmade methane emissions. These countries offer special expertise and interest in developing solutions for mitigating methane emissions and using methane as a renewable energy source. As members of the GMI, Partner Countries are encouraged to develop and submit to the Secretariat action planning documents that outline key country activities and priorities, and provide a mechanism to advance cooperation among Partners.").

[475] Global Methane Initiative, *GMI Fact Sheet* (*last visited* 10 Jjul 2026) ("GMI provides technical support to deploy methane-to-energy projects around the world. Since 2004, GMI support has enabled Partner Countries to launch hundreds of methane recovery and use projects, with 670 MMTCO2 e of associated emission reductions.").

[476] Safety4Sea (17 March 2022) *Seven companies join the Methane Abatement in Maritime Innovation Initiative* ("The Methane Abatement in Maritime (MAM) Innovation Initiative, launched on September 6th, 2022 by a coalition of shipping leaders, aims to reduce the environmental impact of liquefied natural gas (LNG) in shipping while assisting the transition to future fuel solutions. MAMII's current members include Maran Gas Maritime, Mediterranean Shipping Company, Carnival Corporation & Plc, Seaspan Corporation, Shell, Lloyd's Register and Knutsen Group. New members of the MAMII include CoolCo, United Overseas Management, Capital Gas, Celsius Tankers, Global Meridian Holdings, Mitsui O.S.K. Lines, and TMS Cardiff Gas. Led by Safetytech Accelerator, MAMII was formed to identify, accelerate and advocate technology solutions for the maritime industry to measure and manage methane emissions activity. In doing so, it aims to minimize the environmental impact of liquefied natural gas (LNG) in shipping, whilst aiding the transition to future fuel solutions.").

[477] Manifold Times (28 February 2024) *Chevron, TotalEnergies, Seapeak join maritime methane reducing initiative* ("The three companies join the now more than 20 members of MAMII, emphasising its pivotal role in addressing methane abatement within the maritime sector. Chevron, a global energy company, Seapeak, an owner-operator of liquefied gas vessels, and TotalEnergies, the world's third largest LNG player, will bring their valuable insights and commitment to MAMII's mission: tackling the critical challenge of 'methane slip'. The initiative also announced that it has selected four providers to produce feasibility studies on the technologies which will reduce methane emissions from ships, with further details to be released soon.").

[478] Methane Guiding Principles, *The Methane Guiding Principles* (*last visited* 15 November 2023) ("1. Continually reduce methane emissions. … 2. Advance strong performance across the gas supply chain. … 3. Improve accuracy of methane emissions data. … 4. Advocate sound policy and regulations on methane emissions. … 5. Increase transparency."). Shell Corporation initiated the Methane Guiding Principles in 2017: *see* Shell (2019) *Shell Sustainability Report 2019* ("We encourage industry-wide action on methane emissions reduction by participating in a number of voluntary initiatives, including: the Methane Guiding Principles coalition, which we initiated in 2017."); *and* Methane Guiding Principles (30 November 2023) *The Methane Guiding Principles launches initiative supporting 20 countries on methane emissions reduction* ("The Methane Guiding Established in 2017, the MGP is a senior-executive-led methane coalition counting 50 members today. It focuses on five key areas of action to drive down methane emissions").

[479] Methane Guiding Principles, *Oil and Gas Sector Toolkit for the Global Methane Pledge* (*last visited* 3 February 2024) ("In line with the fourth Methane Guiding Principle, this Oil and Gas Sector Toolkit supports policy makers as they develop sound policy and regulation to drive down oil and gas methane emissions. Fulfilling the Global Methane Pledge will require widespread implementation efforts, including policies aimed at reducing flaring, venting and fugitive emissions. This toolkit connects policy makers and regulators to key resources and institutions supporting these policy efforts.").

[480] Methane Guiding Principles (4 December 2023) *Leading technical experts team up to help oil and gas companies meet OGDC methane emissions and flaring goals | Methane Guiding Principles* ("The International Association of Oil and Gas Producers (IOGP), Methane Guiding Principles (MGP), Oil and Gas Climate Initiative (OGCI) and Environmental Defense Fund (EDF) today announced their intention to build a framework to share expertise to help companies reduce methane emissions and flaring in line with the Oil & Gas Decarbonization Charter (OGDC) ambitions.").

[481] Methane Guiding Principles (30 November 2023) *The Methane Guiding Principles launches initiative supporting 20 countries on methane emissions reductions* ("The Methane Guiding Principles (MGP) launched the Advancing Global Methane Reduction (AGMR) initiative which aims to instigate and accelerate country-level methane emissions reductions.Under the AGMR, MGP members are currently working with governments and industry in 20 countries representing more than 25% of global oil and gas production, informing methane policies and regulations and disseminating best practice. The AGMR follows on the Oil and Gas sector toolkit for the Global Methane Pledge developed under the MGP in 2022. The toolkit connects policymakers and regulators with resources and institutions to support methane policy and regulation development in countries that joined the Global Methane Pledge.").

[482] Oil and Gas Climate Initiative, *About Us* (*last visited* 5 February 2023) ("OGCI member companies commit to: **Methane Intensity** -> By 2025, reduce the collective average methane intensity of aggregated upstream oil and gas operations to well below 0.20%, from a 2017 baseline of 0.30%. **Carbon Intensity** -> Reduce member companies' aggregate upstream carbon intensity from 23 kg of greenhouse gases per barrel of oil or gas in 2017 to 17 kg by 2025. **CCUS Kickstarter** -> By 2030, help to decarbonize multiple industrial hubs and kickstart a commercial CCUS industry that can have a significant impact on greenhouse gas emissions. **OGCI Climate**

Investments -> Invest OGCI's $1B+ fund over a ten-year period to deliver a tangible impact on greenhouse gas emissions through accelerated innovation across the energy and industrial sectors. **Zero Routine Flaring** -> Support explicitly the aims of Zero Routine Flaring by 2030.").

[483] Aiming for Zero Methane Emissions Initiative, *About Us* (*last visited* 25 January 2023) ("The Aiming for Zero Methane Emissions Initiative aims to eliminate the oil and gas industry's methane footprint by 2030. It calls for an all-in approach that treats methane emissions as seriously as the oil and gas industry already treats safety: aiming for zero and striving to do what is needed to get there. Aiming for Zero acts as a complement for key initiatives such as the Methane Guiding Principles, the Oil and Gas Methane Partnership 2.0 and the Global Methane Alliance.").

[484] Oil and Gas Climate Initiative (2024) PROGRESS REPORT 2024, 9 ("ACCORDING TO OGCI'S AGGREGATED PERFORMANCE DATA FOR 2023: … OGCI MEMBER COMPANIES' COLLECTIVE UPSTREAM METHANE INTENSITY WAS 0.14%, A 54% DECREASE VERSUS 2017. TOTAL OPERATED UPSTREAM METHANE EMISSIONS WAS 0.89 MT, 55% LOWER THAN IN 2017.").

[485] Craft L. (9 June 2023) *OGCI Shifts Methane Focus from Location to Elimination*, Energy Intelligence ("Tackling methane emissions — and actually slashing them all the way down to zero — is the best opportunity for the industry to advance on its decarbonization goals, Oil and Gas Climate Initiative Chairman Bjorn Otto Sverdrup said Thursday.").

[486] Oil and Gas Climate Initiative (2023) RECOMMENDED PRACTICES FOR METHANE EMISSIONS DETECTION AND QUANTIFICATION TECHNOLOGIES – UPSTREAM, 7 ("This document and an accompanying set of technology data sheets2 provide oil and gas operators with guidelines for selecting and deploying methane emissions detection and quantification technologies tailored to the situation at their sites, with the aim of improving upstream methane management and emissions reporting.").

[487] Climate & Clean Air Coalition (4 December 2023) *Highlights from 2023 Global Methane Pledge Ministerial* ("The Oil and Gas Climate Initiative (OGCI) is expanding its Satellite Monitoring Campaign to provide actionable data to reduce emissions from large-magnitude methane plumes and flares, supported by in-kind contributions from OGCI companies. ExxonMobil also intends to provide up to $25 million in in-kind assistance to address capability shortcomings to reduce methane emissions.").

[488] Oil and Gas Climate Initiative (2025) PROGRESS REPORT 2025, 4 ("OGCI'S AGGREGATE PROGRESS IN 2024 • Upstream operated carbon intensity: 17.2 kg CO2e/boe – a 24% decrease since 2017, close to our 17.0 kg CO2e/boe ambition by 2025. • Upstream operated methane intensity: 0.12% – a 62% decrease since 2017, well below our 0.20% ambition. • Routine flaring: 72% below 2018 levels, demonstrating clear progress to OGCI's ambition to end routine flaring by 2030.2 • Low-carbon investment: $30 billion in 2024, including projects, acquisitions and R&D, bringing the cumulative total since 2017 to $125 billion.3 • CCUS projects: Our companies are involved in developing more than 50 projects, with the potential to reduce and/or remove as much as 500 Mt of CO2 a year,4 by 2030. • Additional progress: Expanded efforts to reduce transport emissions and advance high-quality, internationally tradeable carbon credits for natural climate solutions projects.").

[489] COP28 (2 December 2023) *Oil & Gas Decarbonization Charter launched to accelerate climate action* ("To date, 50 companies, representing more than 40 percent of global oil production have signed on to the OGDC, with National Oil Companies representing over 60 percent of signatories - the largest-ever number of NOCs to commit to a decarbonization initiative. COP28 President Dr. Sultan Al Jaber said, "The launch of the OGDC is a great first step - and whilst many national oil companies have adopted net-zero 2050 targets for the first time, I know that they and others, can and need to do more. We need the entire industry to keep 1.5C within reach and set even stronger ambitions for decarbonization." Signatories have committed to net-zero operations by 2050 at the latest, and ending routine flaring by 2030, and near-zero upstream methane emissions."). See also Gupte E. (2 December 2023) *COP28: Fifty oil and gas companies sign net zero, methane pledges,* S& P ("Some 50 oil and natural gas producers, including Saudi Aramco and 29 other national oil companies, have signed an agreement to reduce their carbon emissions to net zero by 2050 and curb methane emissions to near-zero by 2030, the COP presidency of the UN Climate Change Conference in Dubai said Dec. 2."). *See generally* (7 December 2023) *Big oil agrees to slash methane emissions*, THE ECONOMIST.

[490] Oil Change International (1 December 2023) *Open Letter: The World Needs A Transformational Outcome, Not More Voluntary Pledges* ("By refusing to commit to address the emissions from oil and gas being burned and to end fossil fuel expansion, the proposed 'Global Decarbonization Accelerator' would serve as a smokescreen to

hide the reality that we need to phase out oil, gas, and coal. Voluntary commitments are a dangerous distraction from what is needed at COP28. Oil and gas companies meeting to sign a pledge that only deals with their operational emissions is like a group of arsonists meeting to promise to light fires more efficiently.").

[491] Oil and Gas Decarbonization Charter (2025) OGDC 2025 STATUS REPORT: IMPLEMENTING ACTION, 13 ("On near-zero methane and routine flaring, respectively, 31 signatories (86% of OGDC operated production) and 33 signatories (81% of OGDC operated production) reported action plans in 2024").

[492] United Nations Environment Programme (24 November 2020) *Oil and Gas Industry commits to new framework to monitor, report and reduce methane emissions*, Press Release ("Crucially, the OGMP 2.0 includes not only a company's own operations, but also the many joint ventures responsible for a substantial share of their production. The OGMP 2.0 framework applies to the full oil and gas value chain, not only upstream production, but also midstream transportation and downstream processing and refining – areas with substantial emissions potential that are often left out of reporting today.... In order to support the realization of global climate targets, OGMP 2.0 aims to deliver a 45 per cent reduction in the industry's methane emissions by 2025, and a 60-75 per cent reduction by 2030.").

[493] Climate and & Clean Air Coalition (2020) *Oil and Gas Methane Partnership (OGMP) 2.0 Framework* ("To achieve 'gold standard', a company must demonstrate an explicit and credible path to the required reporting levels (according to 4.3.2) within the required period (according to 4.2.2 and 4.4). The path should be demonstrated through a multi-year plan that shows how the company plans to achieve these objectives. For clarity, 'gold standard' includes the credible path towards the agreed endpoint within the agreed timeline, rather than just the endpoint itself.").

[494] European Commission (14 October 2020) *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions on an EU Strategy to Reduce Methane Emissions*, 11 ("The Commission will deliver legislative proposals in 2021 on: • Compulsory measurement, reporting, and verification (MRV) for all energy related methane emissions, building on the Oil and Gas Methane Partnership (OGMP 2.0) methodology. • Obligation to improve leak detection and repair (LDAR) of leaks on all fossil gas infrastructure, as well as any other infrastructure that produces, transports or uses fossil gas, including as a feedstock. 7. The Commission will consider legislation on eliminating routine venting and flaring in the energy sector covering the full supply chain, up to the point of production. 8. The Commission will work to extend the OGMP framework to more companies in the gas and oil upstream, midstream and downstream as well as to the coal sector and closed as well as abandoned sites. 9. The Commission will promote remedial work under the initiative for Coal Regions in Transition. Best-practice recommendations and/or enabling legislation will be brought forward if necessary.").

[495] United Nations Environment Programme (24 November 2020) *Oil and Gas Industry commits to new framework to monitor, report and reduce methane emissions*, Press Release ("Crucially, the OGMP 2.0 includes not only a company's own operations, but also the many joint ventures responsible for a substantial share of their production. The OGMP 2.0 framework applies to the full oil and gas value chain, not only upstream production, but also midstream transportation and downstream processing and refining – areas with substantial emissions potential that are often left out of reporting today.... In order to support the realization of global climate targets, OGMP 2.0 aims to deliver a 45 per cent reduction in the industry's methane emissions by 2025, and a 60-75 per cent reduction by 2030."). OGMP 2.0 signatories are expected to provide continually updated implementation plans showing continuous improvement in measurement, coverage, and technical guidelines. *See* Climate & Clean Air Coalition (2020) *Oil and Gas Methane Partnership (OGMP) 2.0 Framework* ("To achieve 'gold standard', a company must demonstrate an explicit and credible path to the required reporting levels (according to 4.3.2) within the required period (according to 4.2.2 and 4.4). The path should be demonstrated through a multi-year plan that shows how the company plans to achieve these objectives. For clarity, 'gold standard' includes the credible path towards the agreed endpoint within the agreed timeline, rather than just the endpoint itself.").

[496] United Nations Environment Programme International Methane Emissions Observatory (2026) *OGMP 2.0 on track to deliver measurement-based methane emissions reporting for one-third of global oil and gas supply by 2030*, 1 ("OGMP 2.0 has expanded to nearly 160 companies and increased its coverage of global oil and gas production to around 45 per cent (see Figure 1). The partnership is continuously growing, with three new members joining in the first quarter of 2026 alone. Many companies are in discussions with UNEP's International Methane Emissions Observatory (IMEO), showing interest in joining this partnership that has set the global standard for methane emissions reporting. If companies that have already signaled the intention to join OGMP 2.0 confirm their membership, coverage would reach well over half of global oil and gas production."). *See also* United

Nations Environment Programme (2025) AN EYE ON METHANE 2025: FROM MEASUREMENT TO MOMENTUM, 1 ("OGMP 2.0 has grown to 153 member companies in its fifth year, spanning 90 countries and covering 42 per cent of global oil and gas production."); United Nations Environment Programme (2025) A BLUEPRINT FOR MRV: HOW COUNTRIES CAN BUILD OGMP 2.0-ALIGNED REPORTING INTO MRV METHANE REGULATIONS , 2 ("In 2025, OGMP 2.0 membership covered 42 per cent of the world's oil and gas production, as well as more than 85 per cent of liquified natural gas flows. As a result, countries considering implementing methane regulations will likely find a share of their domestic production already under the scope of OGMP 2.0. Leveraging the availability of these emissions data, and of their structure, can substantially accelerate the impact of regulations, as well as reduce the cost of compliance for companies.").

[497] United Nations Environment Programme (2025) AN EYE ON METHANE 2025: FROM MEASUREMENT TO MOMENTUM, 1 ("OGMP 2.0 has grown to 153 member companies in its fifth year, spanning 90 countries and covering 42 per cent of global oil and gas production."); United Nations Environment Programme (2025) A BLUEPRINT FOR MRV: HOW COUNTRIES CAN BUILD OGMP 2.0-ALIGNED REPORTING INTO MRV METHANE REGULATIONS , 2 ("In 2025, OGMP 2.0 membership covered 42 per cent of the world's oil and gas production, as well as more than 85 per cent of liquified natural gas flows. As a result, countries considering implementing methane regulations will likely find a share of their domestic production already under the scope of OGMP 2.0. Leveraging the availability of these emissions data, and of their structure, can substantially accelerate the impact of regulations, as well as reduce the cost of compliance for companies.").

[498] United Nations Environment Programme International Methane Emissions Observatory (2026) *OGMP 2.0 on track to deliver measurement-based methane emissions reporting for one-third of global oil and gas supply by 2030* ("OGMP 2.0 has expanded to nearly 160 companies and increased its coverage of global oil and gas production to around 45 per cent (see Figure 1). The partnership is continuously growing, with three new members joining in the first quarter of 2026 alone. Many companies are in discussions with UNEP's International Methane Emissions Observatory (IMEO), showing interest in joining this partnership that has set the global standard for methane emissions reporting. If companies that have already signaled the intention to join OGMP 2.0 confirm their membership, coverage would reach well over half of global oil and gas production."). *See also* United Nations Environment Programme (2025) AN EYE ON METHANE 2025: FROM MEASUREMENT TO MOMENTUM, 1 ("OGMP 2.0 has grown to 153 member companies in its fifth year, spanning 90 countries and covering 42 per cent of global oil and gas production."); United Nations Environment Programme (2025) A BLUEPRINT FOR MRV: HOW COUNTRIES CAN BUILD OGMP 2.0-ALIGNED REPORTING INTO MRV METHANE REGULATIONS , 2 ("In 2025, OGMP 2.0 membership covered 42 per cent of the world's oil and gas production, as well as more than 85 per cent of liquified natural gas flows. As a result, countries considering implementing methane regulations will likely find a share of their domestic production already under the scope of OGMP 2.0. Leveraging the availability of these emissions data, and of their structure, can substantially accelerate the impact of regulations, as well as reduce the cost of compliance for companies.").

[499] United Nations Environment Programme International Methane Emissions Observatory (2026) *OGMP 2.0 on track to deliver measurement-based methane emissions reporting for one-third of global oil and gas supply by 2030*, 2 ("Members' reports for 2024 data indicated that close to a third of global oil and gas production was at Gold Standard Reporting or on track to get there in one or two years. Under a conservative scenario that assumes no change in OGMP 2.0 membership and considers current company implementation plans, oil and gas production reported at Level 5 would reach around 25 per cent of global output by 2027 and approximately 30 per cent by 2030 (see Figure 2).").

[500] United Nations Environment Programme International Methane Emissions Observatory (2026) *OGMP 2.0 on track to deliver measurement-based methane emissions reporting for one-third of global oil and gas supply by 2030*, 3 ("Assets responsible for around 1,000 billion cubic meters (bcm) of natural gas supply in 2025 are on track to reach Level 5 by 2030. This volume is roughly the same as the global net trade of natural gas and represents more than all the natural gas imported in 2025 by the European Union, China, Japan and the Republic of Korea combined (see Figure 3). OGMP 2.0 coverage in leading exporters is above average, reaching 45 per cent of natural gas supply in the United States and more than 80 per cent in Qatar, Norway and Australia."); 4 ("Assets responsible for more than 1,300 million tonnes of oil equivalent of oil supply in 2025 are on track to reach Level 5 by 2030. That corresponds to roughly two-thirds of global net oil exports. Many of the top exporting countries have a large share of their production covered by OGMP 2.0 reporting, including the United States, Brazil and the United Arab Emirates (see Figure 4).").

[501] United Nations Environment Programme International Methane Emissions Observatory (2026) *OGMP 2.0 on track to deliver measurement-based methane emissions reporting for one-third of global oil and gas supply by 2030*, 5, table 1.

[502] International Energy Agency (2025) COAL 2025, 7 ("Global coal demand is expected to effectively plateau over the coming years, showing a very gradual decline through to 2030 in our latest forecast. By that year, consumption is forecast to ease by 3% compared with 2025, taking it below its 2023 level. Global power generation from coal is forecast to sink below its 2021 level by the end of this decade.").

[503] International Energy Agency (2025) GLOBAL METHANE TRACKER 2025, 43 ("We estimate that around USD 260 billion in spending is needed through to 2030 to implement all of the methane abatement measures required to reach a 75% reduction in methane emissions. This includes USD 175 billion from the oil and gas sector and USD 85 billion from the coal sector. Roughly USD 215 billion would take the form of new capital expenditure, while USD 45 billion represents operational expenditures. A significant share of this investment is linked to properly closing abandoned facilities, with just over USD 100 billion needed to monitor and plug abandoned wells with significant levels of emissions. Fossil fuel companies should carry the primary responsibility for abating methane emissions, as the average annual spending required represents less than 2% of the net income the industry generates annually. To encourage methane abatement, companies could integrate methane-specific performance indicators into their financial and operational strategies (such as tying them to employee and executive compensation). They might also consider establishing an internal price for methane when making capital investment decisions related to both new and existing projects.").

[504] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 5 ("The ongoing crisis in the Middle East is reshaping the global energy system and disrupting around 20% of global liquefied natural gas (LNG) trade flows (around 110 bcm of gas passed through the Strait of Hormuz in 2025).").

[505] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 5 ("While not all of this waste can be recovered, reducing flaring and methane emissions has the potential to bring significant additional volumes to market … We estimate that nearly 100 billion cubic metres (bcm) of natural gas could be made available annually through a global effort to cut methane from oil and gas operations, with a further 100 bcm unlocked through the elimination of non-emergency flaring worldwide.").

[506] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 5 ("It would take time to deploy the equipment and infrastructure needed to achieve cuts of this magnitude. But in the immediate future, if countries with spare export capacity and gas importers were to implement abatement measures across their upstream and downstream operations, we estimate that nearly 15 bcm could be made available in a sufficiently short period of time to provide some relief to gas markets."). The 15 bcm is the combination of over 8 bcm of total potential additional supply from abatement of gas-related methane emissions for exporting countries [Turkmenistan; Algeria and Nigeria; and Indonesia, Malaysia, and Australia] with spare capacity (2025) plus nearly 6 bcm potential additional natural gas supply from abatement of gas-related methane emissions for importing countries [China; Other Asia; and European Union] (2025).

[507] International Energy Agency (2025) GAS 2025, 6 ("Around 300 billion cubic metres per year of new liquefied natural gas (LNG) export capacity is expected to be added worldwide by 2030, primarily supported by liquefaction capacity expansions in the United States and Qatar. This wave of new LNG production capacity is set to profoundly transform global gas market dynamics. The scaling up of LNG supply will play a key role in enhancing supply security and improving the affordability of natural gas – including in price-sensitive emerging import markets.").

[508] International Energy Agency (2025) GAS 2025, 6 ("Around 300 billion cubic metres per year of new liquefied natural gas (LNG) export capacity is expected to be added worldwide by 2030, primarily supported by liquefaction capacity expansions in the United States and Qatar. This wave of new LNG production capacity is set to profoundly transform global gas market dynamics. The scaling up of LNG supply will play a key role in enhancing supply security and improving the affordability of natural gas – including in price-sensitive emerging import markets.").

[509] Environmental Defense Fund (2025) THE EU METHANE REGULATION: THE 2027 MRV REQUIREMENT'S IMPACT ON EU OIL AND GAS SUPPLY, 4, 10 ("To deliver growth, the US liquefaction capacity is expected to increase to more than 350 BCM by 2035, up from today's 150 BCM. This expansion reinforces the US's position as the marginal supplier to the EU gas market"); U.S. DEPARTMENT OF ENERGY (2024) ENERGY, ECONOMIC, AND

ENVIRONMENT ASSESSMENT OF U.S. LNG EXPORTS, 34 ("Under the Defined Policies scenario with reference U.S. supply assumptions, a 32.6 Bcf/d increase in U.S. LNG exports in 2050 from existing and FID levels (23.7 Bcf/d) leads to a $1.09/MMBtu (31%) increase in Henry Hub prices in 2050, from $3.53/MMBtu to $4.62/MMBtu. This equates to an increase of $0.03/MMBtu for every Bcf/d of increased U.S. LNG export above existing and FID levels. This increase corresponds to a 4% increase in residential natural gas prices. Increased LNG exports also lead to a 18% increase in power sector natural gas prices, and a 18% increase in industrial sector natural gas prices in 2050. Delivered price increases are lower than Henry Hub price increases, and they reflect average U.S. prices as opposed to prices at the Henry Hub, which is a distribution hub in Louisiana and frequent benchmark for gas contracts.").

[510] International Energy Agency (2025) WORLD ENERGY OUTLOOK 2025, 22 ("Final investment decisions for new LNG projects have surged in 2025, adding to the expected wave in natural gas supply in coming years and promising lower international prices. Since Russia's cut to pipeline deliveries to Europe, LNG has become the preferred way of trading gas over long distances, reshaping global gas trade and bolstering energy security. There is now an unprecedented 300 billion cubic metres (bcm) of new annual LNG export capacity scheduled to start operation by 2030, a 50% increase in available global LNG supply. Around half is being built in the United States, and a further 20% in Qatar, followed by Canada and others.").

[511] Environmental Defense Fund (2025) THE EU METHANE REGULATION: THE 2027 MRV REQUIREMENT'S IMPACT ON EU OIL AND GAS SUPPLY, 5, 18 ("Around 600 BCM of OGMP2.0 Level 5 gas supply is projected to be available by 2027, twice the EU's forecasted demand. The challenge lies in key current suppliers, such as Algeria and Qatar, being at risk of non-compliance and facing penalties").

[512] Fulwood M. (2026) THE LNG WAVE IN 2026/2027: WHERE WILL IT GO?, The Oxford Institute for Energy Studies, 7 ("The LNG wave has finally arrived, and over the next two years available LNG export capacity is expected to grow by some 113 bcm from 593 bcm in 2025 to 707 bcm in 2027. Underlying LNG import demand is projected to grow by 87 bcm – a shortfall, compared to supply, of 26 bcm. Asia drives most of the growth in LNG demand, followed by Europe. There are risks to this outlook, on both the upside and downside. The growth in available LNG export capacity could be weaker, if projects don't come on and ramp up as anticipated, and/or there are unexpected technical outages. On the other hand, demand growth in Asia especially could be weaker than expected. 2026 has got off to a strong start, however, in terms of supply growth and is finding matching demand growth.").

[513] Clean Air Task Force (2024) IMPACT OF A OR METHANE IMPORT PERFORMANCE STANDARD, 14 ("Most suppliers are "price takers," and rising costs will reduce producer profits. Price increases on the marginal (highest-cost) suppliers could be passed on in the form of higher prices. The price increase on marginal suppliers represents the maximum price impact").

[514] *See generally* Environmental Defense Fund (2025) THE EU METHANE REGULATION: THE 2027 MRV REQUIREMENT'S IMPACT ON EU OIL AND GAS SUPPLY, 4 ("The EU was the largest LNG importer in 2024, with 116 BCM in imports, 20% of global LNG production, as it continued to diversify away from Russian gas.").

[515] International Energy Agency (2022) THE ENERGY SECURITY CASE FOR TACKLING GAS FLARING AND METHANE LEAKS, 4 ("If countries that currently export natural gas to the European Union were to implement these two measures, they could increase gas exports by more than 45 bcm using existing infrastructure, equivalent to almost one third of Russian gas exports to the EU in 2021. If all other liquefied natural gas (LNG) exporters – such as Egypt and Australia – were to do the same, they could provide an additional 8 bcm to global gas markets without needing to construct any new LNG liquefaction terminals.").

[516] Environmental Defense Fund (2025) THE EU METHANE REGULATION: THE 2027 MRV REQUIREMENT'S IMPACT ON EU OIL AND GAS SUPPLY, 5 ("Around 600 BCM of OGMP2.0 Level 5 gas supply is projected to be available by 2027, twice the EU's forecasted demand. The challenge lies in key current suppliers, such as Algeria and Qatar, being at risk of non-compliance and facing penalties"); 21 ("0.01-0.02 $/MMBtu is the market clearing add-on cost by implementing methane measurements").

[517] Environmental Defense Fund (2025) THE EU METHANE REGULATION: THE 2027 MRV REQUIREMENT'S IMPACT ON EU OIL AND GAS SUPPLY, 18 ("More than 60 upstream operators are committed to achieving full compliance with the EU MRV requirements, including multiple of the majors.").

[518] Carbon Limits (2025) EDF – EU MR MRV COMPLIANCE COSTS, 9 ("Achieving full EU MRV compliance requires only 0.03-0.6% of production value. This equates to 4-80 kUSD/PJ produced. (for companies with no methane reporting reaching OGMP 2.0 Level 5 within 3 years)").

[519] *See generally* Climate Action Network Europe (2026) *Five Reasons Why The EU Methane Regulation Matters*, 1 ("The war in Iran and the wider region is a dramatic human tragedy that is also triggering a renewed global fossil fuel crisis. Once again, it exposes Europe's structural dependence on imported fossil fuels traded on volatile global markets, particularly Liquefied "Natural" Gas (LNG), and contributes to rising energy prices across the continent. These recurring crises highlight the urgent need to strengthen Europe's energy security by reducing fossil fuel dependency through renewable energy, energy efficiency, renewables-based electrification, and sustained gas demand reduction. Only by addressing this structural dependence can Europe durably shield its economy and citizens from external shocks and geopolitical instability."); 2 ("Against this backdrop, the EU Methane Regulation stands at the intersection of climate ambition, energy security, and geopolitical resilience. In a world marked by intensifying fossil-fuelled wars, volatile energy markets, and accelerating climate risks, methane mitigation represents one of the fastest and most cost-effective opportunities to deliver security, climate and economic benefits simultaneously. Its success will not only determine the EU's credibility as a global climate leader but also influence the stability of its energy system and its capacity to reduce reliance on imported fossil fuels.").

[520] Environmental Defense Fund (2026) EU ENERGY SECURITY CONSIDERATIONS IN LIGHT OF EU MER & THE MIDDLE EAST CONFLICT, 3 ("Sufficient OGMP 2.0 L5 supply expected to be available in '27, even with Hormuz shortfall"); 3 ("The Middle East conflict has impacted gas and crude markets, no signs of it materially impacting implementation feasibility of E MER").

[521] Environmental Defense Fund (2026) EU ENERGY SECURITY CONSIDERATIONS IN LIGHT OF EU MER & THE MIDDLE EAST CONFLICT, 13-14 (noting that, on Rystad's modelling, global OGMP 2.0 Level 5 gas availability in 2027 is projected at roughly threefold the EU's 2025 import volume—approximately 900 bcm against imports of some 310 bcm—and that this surplus holds even where Middle Eastern supply is excluded; observing further that the United States is expected to become the single largest Level 5 supplier, with available volumes of about 482 bcm against EU imports of 85 bcm—a coverage ratio of some 569%—such that US Level 5 gas alone could theoretically cover the EU's entire import demand; and that Norway (140% coverage), Qatar (1186%, though constrained by the Strait of Hormuz), Azerbaijan (233%), and Nigeria (129%) are likewise each expected to supply Level 5 volumes exceeding their historical exports to the EU—even as Algeria (6%) and Russia (0%) offer little or none—leaving aggregate Level 5 supply comfortably in excess of demand notwithstanding this uneven supplier-by-supplier performance.)

[522] International Energy Agency (2025) OIL 2025, 7, 9 ("Global oil demand is forecast to rise by 2.5 mb/d from 2024 to 2030, reaching a plateau around 105.5 mb/d by the end of the decade. However, annual growth slows from roughly 700 kb/d in 2025 and 2026 to just a trickle over the next several years, with a small decline expected in 2030, based on today's policy settings and market trends. This is driven by below-trend economic growth, weighed down by global trade tensions and fiscal imbalances, and the accelerating substitution away from oil in the transport and power generation sectors… World oil production capacity is forecast to rise by 5.1 mb/d to 114.7 mb/d by 2030, led by Saudi Arabia and the United States – significantly outpacing the projected 2.5 mb/d increase in global oil demand. Mirroring demand trends, supply capacity growth is heavily frontloaded, slipping from 1.8 mb/d in 2025 to contraction after 2029 as the pipeline of non-OPEC+ projects wanes.").

[523] International Energy Agency (2026) OIL MARKET REPORT - MAY 2026, 5 ("With Hormuz tanker traffic still restricted, cumulative supply losses from Gulf producers already exceed 1 billion barrels with more than 14 mb/d of oil now shut in, an unprecedented supply shock. The current supply-demand gap is significantly smaller, however, as the market was already in surplus heading into the crisis while producers and consumers alike are responding to market signals.").

[524] Carbon Limits (2025) EDF – EU MR MRV COMPLIANCE COSTS, 9 ("Achieving full EU MRV compliance requires only 0.03-0.6% of production value. This equates to 4-80 kUSD/PJ produced. (for companies with no methane reporting reaching OGMP 2.0 Level 5 within 3 years)").

[525] Environmental Defense Fund (2025) THE EU METHANE REGULATION: THE 2027 MRV REQUIREMENT'S IMPACT ON EU OIL AND GAS SUPPLY, 23-25 ("Crude volumes likely available as supply increase rapidly and market face less trade constraints… Oil can easily be transported and traded across regions, giving producers and buyers flexibility in where they source supply").

[526] Environmental Defense Fund (2025) THE EU METHANE REGULATION: THE 2027 MRV REQUIREMENT'S IMPACT ON EU OIL AND GAS SUPPLY, 2 for two charts, one concerning OGMP 2.0 crude oil supply development 2020-2024 and 2027 and the other concerning 2027 crude oil demand to the EU and OGMP 2.0 level 5 crude production.

[527] Environmental Defense Fund (2026) EU ENERGY SECURITY CONSIDERATIONS IN LIGHT OF EU MER & THE MIDDLE EAST CONFLICT, 20 ("OGMP 2.0 Level 5 oil supply across suppliers and grades expected to exceed EU import demand"); 21 (projecting Level 5 crude availability of around three times the EU's 2025 imports by 2027, covering all major grades, with the United States, Brazil, and Guyana each offering volumes far exceeding historical exports to the EU.).

[528] International Energy Agency (2025) COAL 2025, 7 ("Global coal demand is expected to effectively plateau over the coming years, showing a very gradual decline through to 2030 in our latest forecast. By that year, consumption is forecast to ease by 3% compared with 2025, taking it below its 2023 level. Global power generation from coal is forecast to sink below its 2021 level by the end of this decade."). 9 ("Global coal production is forecast to remain at similar level in 2025 to the all-time high it reached in 2024. In the first half of 2025, China's coal output grew 6% compared with the same period in 2024, but abundant stocks, low prices and safety campaigns have led to declines since July. For the whole year, we expect Chinese coal production to rise by 1%. In India, amid weak demand and challenging working conditions due to heavy rains, the growth in coal production seen in recent years came to a halt in 2025. Meanwhile, in Indonesia, coal production is expected to decline in 2025 for the first time since the onset of the Covid-19 pandemic due to shrinking international coal trade. In the United States, coal production is set to increase, spurred by domestic demand and policy support. Looking ahead, given healthy coal stocks in most regions and sluggish global demand, we forecast that global coal production will decline slightly through 2030. Among major producers, India is forecast to have the highest output growth, based on strong domestic demand and favourable government policies. The biggest uncertainty is in China, where even small policy changes or demand fluctuations can affect coal output sufficiently to have an impact on international markets.").

[529] International Energy Agency (2025) COAL 2025,

[530] International Energy Agency (2025) COAL 2025, 68 ("Global thermal coal trade is projected to decline by 174 Mt to 936 Mt by 2030. Between 2025 and 2030, global thermal coal import patterns are expected to undergo a significant transformation, marked by pronounced regional differences. China is anticipated to reduce its thermal coal imports by 21% to 286 Mt, reflecting its ongoing energy transition while emphasising domestic coal production. However, as shown above, imports into China play an important role in ensuring competitive supply to the coastal region, so a balance between domestic and imported coal to that region will remain for some time. India's imports are expected to fall by 8% to 146 Mt in 2030. Our analysis shows a floor of over 100 Mt of imports per year for India, as over 18 GW of coal capacity is designed to use imported coal, while some industries such as sponge iron prefer imported coal and other plants require imported coal for blending due to the quality of domestic coal. Japan and Korea are projected to reduce thermal coal imports by 35% and 31%, respectively, reaching a total of 132 Mt in 2030, reflecting efforts to decarbonise and shifts in the electricity sector.").

[531] International Energy Agency (2025) COAL 2025, 68 ("Global thermal coal trade is projected to decline by 174 Mt to 936 Mt by 2030. Between 2025 and 2030, global thermal coal import patterns are expected to undergo a significant transformation, marked by pronounced regional differences. China is anticipated to reduce its thermal coal imports by 21% to 286 Mt, reflecting its ongoing energy transition while emphasising domestic coal production. However, as shown above, imports into China play an important role in ensuring competitive supply to the coastal region, so a balance between domestic and imported coal to that region will remain for some time. India's imports are expected to fall by 8% to 146 Mt in 2030. Our analysis shows a floor of over 100 Mt of imports per year for India, as over 18 GW of coal capacity is designed to use imported coal, while some industries such as sponge iron prefer imported coal and other plants require imported coal for blending due to the quality of domestic coal. Japan and Korea are projected to reduce thermal coal imports by 35% and 31%, respectively, reaching a total of 132 Mt in 2030, reflecting efforts to decarbonise and shifts in the electricity sector.").

[532] Myllyvirta L. (2026) *Analysis: Coal power drops in China and India for first time in 52 years after clean-energy records*, CARBON BRIEF ("Coal power generation fell in both China and India in 2025, the first simultaneous drop in half a century, after each nation added record amounts of clean energy. The new analysis for Carbon Brief shows that electricity generation from coal in India fell by 3.0% year-on-year (57 terawatt hours, TWh) and in China by 1.6% (58TWh). The last time both countries registered a drop in coal power output was in

1973. The fall in 2025 is a sign of things to come, as both countries added a record amount of new clean-power generation last year, which was more than sufficient to meet rising demand. Both countries now have the preconditions in place for peaking coal-fired power, if China is able to sustain clean-energy growth and India meets its renewable energy targets. These shifts have international implications, as the power sectors of these two countries drove 93% of the rise in global carbon dioxide (CO2) emissions from 2015-2024. While many challenges remain, the decline in their coal-power output marks a historic moment, which could help lead to a peak in global emissions.").

[533] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 43 ("We estimate that achieving a 75% reduction in methane emissions from fossil fuels would require around USD 28 billion in spending per year, on average, through 2035. Of this, close to USD 22 billion would be in oil and gas and USD 7 billion in coal. Around USD 21 billion would take the form of capital expenditure and USD 7 billion would be operating costs. In low- and middle-income countries, achieving these reductions would require about USD 28 billion in cumulative spending over the same period.").

[534] International Energy Agency (2026) GLOBAL METHANE TRACKER 2026, 43 ("Fossil fuel companies carry primary responsibility for abating methane emissions, as the average annual spending required amounts to less than 2% of the industry's annual net income. Yet few companies currently disclose how much they invest in methane abatement across their operations.").

[535] Rosane P., Naran B., Pastor A. O., Connolly J., & Wignarajah D. (2022) *The Landscape of Methane Abatement Finance*, Climate Policy Initiative & Global Methane Hub, 9 ("Methane abatement solutions are severely underfunded considering their climate change mitigation potential. While also underfunded, other climate change solutions with similar mitigation potential, such as low-carbon transport, received 15 times the investment of methane abatement measures, while solutions such as solar and wind received 26 times the investment. Wind and solar energy have an average of 8.35 $GtCO_2e$ mitigation potential (CO_2) by 2030, and received USD 296 billion in 2019/2020, while targeted methane abatement solutions received only USD 6.3 billion with an average mitigation potential of 3.3 $GtCO_2e$ – the ratio of investment flows to mitigation potential was almost 20 times lower than that of the renewable energy sector (Figure 4). Estimated mitigation potential of methane abatement solutions is 3 $GtCO_2e$ by 2030 over a 100-year timeframe (GWP_{100}). However, if a 20-year timeframe (GWP_{20}) is considered, the mitigation potential would be substantially higher.").

[536] Banga A. (5 February 2024) *A Fireside Chat with World Bank President Ajay Banga* ("Methane is 80 times more dangerous than carbon dioxide. It gets 2% of climate financing. When something that is 80 times more dangerous gets 2% of financing, something is not right. In addition to flaring and the leaks in pipelines which is a real big issue with methane, there is rice paddy cultivation, waste management, agricultural and dairy methane, things the bank knows and has run for years. Getting those to scale is what I've committed to doing in these coming 18 months, and then try to fight methane in the atmosphere.").

[537] Rosane P., Naran B., Pastor A. O., Connolly J., & Wignarajah D. (2022) *The Landscape of Methane Abatement Finance*, Climate Policy Initiative & Global Methane Hub, 8 ("Total tracked targeted methane abatement finance amounted to USD 11.6 billion in 2019/2020. Although methane emissions are responsible for almost half of global warming, targeted methane abatement finance represented about 2% of total climate finance tracked in CPI's Global Landscape of Climate Finance (Buchner et al., 2021). Even with data gaps factored in (see discussion on data limitations in Chapter 2), this initial stocktake indicates that actions to reduce methane are not in line with necessary actions to meet climate goals (Figure 3)."); 11 ("Estimates suggest targeted methane abatement finance falls well short of the average USD 119 billion needed each year through 2050 under a +2C of warming scenario (Harmsen et al., 2019): a 10-fold increase from currently tracked investments. Fossil fuel, at USD 32 billion per year, and AFOLU, at USD 43 billion per year, are the two sectors where the gap with current levels is the greatest."); *citing* Harmsen J. H. M., van Vuuren D. P., Nayak D. R., Hof A. F., Höglund-Isaksson L., Lucas P. L., Nielsen J. B., Smith P., & Stehfest E. (2019) *Long-term marginal abatement cost curves of non-CO_2 greenhouse gases*, ENVIRON. SCI. POLICY 99: 136–149.

[538] Rosane P., Naran B., Pastor A. O., Connolly J., & Wignarajah D. (2022) *The Landscape of Methane Abatement Finance*, Climate Policy Initiative & Global Methane Hub, 10 ("As shown in Figure 6, almost two-thirds of methane abatement funding is concentrated in the waste and water sector, whereas 82% of emission sources comes from the AFOLU and energy sectors which only received 33% of the total tracked funding."), 11 ("As shown in Figure 6, almost two-thirds of methane abatement funding is concentrated in the waste and water sector, whereas 82% of emission sources comes from the AFOLU and energy sectors which only received 33% of the total tracked funding."; "Estimates suggest targeted methane abatement finance falls well short of the average USD 119 billion

needed each year through 2050 under a +2C of warming scenario (Harmsen et al., 2019): a 10-fold increase from currently tracked investments. Fossil fuel, at USD 32 billion per year, and AFOLU, at USD 43 billion per year, are the two sectors where the gap with current levels is the greatest.").

[539] Rosane P., Naran B., Pastor A. O., Connolly J., & Wignarajah D. (2022) *The Landscape of Methane Abatement Finance*, Climate Policy Initiative & Global Methane Hub, 11 ("As shown in Figure 6, almost two-thirds of methane abatement funding is concentrated in the waste and water sector, whereas 82% of emission sources comes from the AFOLU and energy sectors which only received 33% of the total tracked funding. … Estimates suggest targeted methane abatement finance falls well short of the average USD 119 billion needed each year through 2050 under a +2C of warming scenario (Harmsen et al., 2019): a 10-fold increase from currently tracked investments. Fossil fuel, at USD 32 billion per year, and AFOLU, at USD 43 billion per year, are the two sectors where the gap with current levels is the greatest.").

[540] Climate Policy Initiative (2023) LANDSCAPE OF METHANE ABATEMENT FINANCE 2023, 7 ("At 13.7 billion, methane abatement finance is at its highest level yet, but annual flows need to be at least 3.5 times larger until 2030. Despite increased methane reduction pledges and their status among the most powerful contributors to global temperature rise, methane emissions continue to increase. Methane abatement is one of the most effective mitigation investments, but finance is still far below the global estimated needs of USD 48 billion annually by 2030 Funding for methane abatement has seen a small improvement of 18% since 2019/20: the annual average increased from USD 11.6 billion in fiscal years 2019/20 to USD 13.7 billion in 2021/22. Estimated needs are set to grow significantly from 2030 to 2050 there is urgent need to accelerate finance at a continuously increasing rate. Even considering data gaps, this implies that current methane emissions reduction measures fall short of those needed to meet climate goals.").

[541] Clean Air Task Force (2023) BARRIERS AND SOLUTIONS TO SCALING-UP METHANE FINANCE (Figure 5 "Constraints to Scaling Methane Mitigation.").

[542] International Energy Agency (2025) GLOBAL METHANE TRACKER 2025, 43 ("We estimate that around USD 260 billion in spending is needed through to 2030 to implement all of the methane abatement measures required to reach a 75% reduction in methane emissions. This includes USD 175 billion from the oil and gas sector and USD 85 billion from the coal sector. Roughly USD 215 billion would take the form of new capital expenditure, while USD 45 billion represents operational expenditures. A significant share of this investment is linked to properly closing abandoned facilities, with just over USD 100 billion needed to monitor and plug abandoned wells with significant levels of emissions.").

[543] Dietz S., Rising J., Stoerk T., & Wagner G. (2021) *Economic impacts of tipping points in the climate system*, PROC. NAT. ACAD. SCI. 118(34): 1–9, 1 ("We provide unified estimates of the economic impacts of all eight climate tipping points covered in the economic literature so far using a meta-analytic integrated assessment model (IAM) with a modular structure. The model includes national-level climate damages from rising temperatures and sea levels for 180 countries, calibrated on detailed econometric evidence and simulation modeling. Collectively, climate tipping points increase the social cost of carbon (SCC) by ~25% in our main specification. The distribution is positively skewed, however. We estimate an ~10% chance of climate tipping points more than doubling the SCC. Accordingly, climate tipping points increase global economic risk. A spatial analysis shows that they increase economic losses almost everywhere. The tipping points with the largest effects are dissociation of ocean methane hydrates and thawing permafrost. Most of our numbers are probable underestimates, given that some tipping points, tipping point interactions, and impact channels have not been covered in the literature so far; however, our method of structural meta-analysis means that future modeling of climate tipping points can be integrated with relative ease, and we present a reduced-form tipping points damage function that could be incorporated in other IAMs."); 2 ("Combining all eight tipping points increases the expected SCC by 24.5%. As discussed below, this should be seen as a probable underestimate, given the literature we synthesize has yet to cover some tipping points, and misses possible impact channels and interactions even for those it does cover. Fig. 1 shows that the distribution of expected increases in the SCC is positively skewed. The median percentage increase in the SCC from all tipping points combined is 18.8%; the 75th percentile is 22.5%, and the 99.5th percentile is 132.2%.").

[544] Bennett V. (2 November 2021) *World Leaders in Global Methane Pledge*, European Bank for Reconstruction and Development ("President Odile Renaud-Basso endorsed the declaration on behalf of the European Bank for Reconstruction and Development (EBRD), saying: 'The Bank is supporting the economies in which it invests in increasing their environmental sustainability, including by supporting methane abatement across the agribusiness,

waste and energy sectors. We are committed to working closely with the signatories of the Global Methane Pledge to help achieve the important target it sets.'").

[545] Bennett V. (2 November 2021) *World Leaders in Global Methane Pledge*, European Bank for Reconstruction and Development ("The EBRD has been at the forefront of efforts to reduce methane gas emissions. The Bank has historically financed projects of around €650 million per year in sub-sectors that are directly responsible for the vast majority of methane emissions, including energy and natural resources, municipal infrastructure and agribusiness.").

[546] Renaud-Basso O. (2 November 2021) *Launch of Global Methane Pledge* ("Today, we are committing to supporting our countries of operation to advance their domestic methane emission reduction efforts. We will provide technical assistance to support the development of effective inventories, policies, regulations, and standards. And we stand ready to provide funding for methane abatement projects across key sectors of the economy. You can count on our support.").

[547] European Commission (2 November 2021) *Launch by United States, the European Union, and Partners of the Global Methane Pledge to Keep 1.5 Within Reach*, Statement ("The U.S. and EU are also proud to announce a significant expansion of financial and technical support to assist implementation of the Pledge. Global philanthropies have committed $328 million in funding to support scale up of these types of methane mitigation strategies worldwide. The European Bank for Reconstruction and Development, the European Investment Bank, and the Green Climate Fund have committed to support the Pledge through both technical assistance and project finance. The International Energy Agency will also serve as an implementation partner.").

[548] African Development Bank (15 September 2022) *US government announces $5 million grant to support African Development Bank in tackling methane emissions,* Press Release ("The United States government has announced it will provide a $5 million grant to the African Development Bank to support efforts to abate methane gas emission, across Africa… Additional funding was also promised by the Climate and Clean Air Coalition (CCAC) and the Global Methane Hub to tackle methane emissions in African countries. The Global Methane Hub will contribute $5 million dollars over the next three years. The Hub funds methane mitigation efforts. The Coalition, a voluntary partnership of governments, intergovernmental organizations, businesses, and research institutions, will provide $1.2 million.").

[549] African Development Bank (15 September 2022) *US government announces $5 million grant to support African Development Bank in tackling methane emissions,* Press Release ("Welcoming the contributions, African Development Bank Vice President for Power, Energy, Climate and Green Growth, Kevin Kariuki said the Bank planned to create activities within the ACCF to support methane abatement. "With the support of the U.S. government, and other donors and non-state actors, we intend to create a dedicated pillar of activities within our Africa Climate Change Fund to support methane abatement including working with countries to include methane in their Nationally Defined Contributions and develop pipelines of methane abatement projects for further investment," Kariuki said.").

[550] African Development Bank (2022) METHANE IN AFRICA*: A high-level assessment of anthropogenic methane emissions in Africa with case studies on potential evolution and abatement*.

[551] United Nations Environment Programme (2021) REPORT OF THE TECHNOLOGY AND ECONOMIC ASSESSMENT PANEL, *Volume 6: Assessment of the Funding Requirement for the Replenishment of the Multilateral Fund for the Period 2021-2023*, 59 ("The funding approved for IS support has played a paramount role in establishing and maintaining the capacity of national ozone units and is recognized as a major factor in the success of A5 parties achieving compliance with the Montreal Protocol's control measures.[120]"); *citing* Paragraphs 11 to 13 of UNEP/OzL.Pro/ExCom/74/51 (Review of Funding of Institutional Strengthening Projects (Decision 61/43(b)) (April 2015)).

[552] William and Flora Hewlett Foundation (2 November 2021) *20+ philanthropies join to provide $328M to dramatically reduce methane emissions* (Remarks by Larry Kramer, "The speed with which the pledge came together has been remarkable—something for which we must thank the extraordinary leadership of Presidents Biden and von der Leyen. Now we must match that speed with similar speed in implementing and fulfilling it. And for that, I am proud (and humbled) to speak on behalf of the more than 20 philanthropies that likewise came together quickly to compile a fund well in excess of $325 million to assist nations that have taken the pledge. This flexible philanthropic aid can be used to provide technical assistance to countries that need it and to develop and deploy innovative new solutions. This means grant dollars that can be moved quickly and nimbly for feasibility

studies, project development, and other efforts needed to create the conditions to scale investment in methane reduction now.").

[553] William and Flora Hewlett Foundation (2 November 2021) *20+ philanthropies join to provide $328M to dramatically reduce methane emissions* (Remarks by Larry Kramer, "The speed with which the pledge came together has been remarkable—something for which we must thank the extraordinary leadership of Presidents Biden and von der Leyen. Now we must match that speed with similar speed in implementing and fulfilling it. And for that, I am proud (and humbled) to speak on behalf of the more than 20 philanthropies that likewise came together quickly to compile a fund well in excess of $325 million to assist nations that have taken the pledge. This flexible philanthropic aid can be used to provide technical assistance to countries that need it and to develop and deploy innovative new solutions. This means grant dollars that can be moved quickly and nimbly for feasibility studies, project development, and other efforts needed to create the conditions to scale investment in methane reduction now.").

[554] Global Methane Hub (4 April 2022) *The Global Methane Hub Donates $10 Million to the Climate and Clean Air Coalition (CCAC) for Immediate Action to Reduce Methane Emissions* ("The $10M donation is part of the Hub's commitment to support and sustain action from civil society, government, and private industry, including the more than 100 countries that have signed on to the Global Methane Pledge by meaningfully investing in methane reduction solutions.").

[555] Climate & Clean Air Coalition (4 December 2023) *Highlights from 2023 Global Methane Pledge Ministerial* ("In addition to the over $1 billion in new grant funding, international financial institutions approved over $3.5 billion in new investments for methane-reducing projects since COP27. Approvals include $375 million from the Green Climate Fund and partners, over $1.9 billion (€1.78 billion) from the European Investment Bank, over $218 million (€200 million) from the European Bank for Reconstruction and Development, and $372.5 million from the Inter-American Development Bank. The World Bank approved at least $700 million in investments, including a $255 million for rice project in China, $300 million for landfill methane reduction in Cote d'Ivoire, and $145 million for wastewater methane reduction in Malawi.").

[556] Climate & Clean Air Coalition (4 December 2023) *Highlights from 2023 Global Methane Pledge Ministerial* ("In addition to the over $1 billion in new grant funding, international financial institutions approved over $3.5 billion in new investments for methane-reducing projects since COP27. Approvals include $375 million from the Green Climate Fund and partners, over $1.9 billion (€1.78 billion) from the European Investment Bank, over $218 million (€200 million) from the European Bank for Reconstruction and Development, and $372.5 million from the Inter-American Development Bank. The World Bank approved at least $700 million in investments, including a $255 million for rice project in China, $300 million for landfill methane reduction in Cote d'Ivoire, and $145 million for wastewater methane reduction in Malawi.").

[557] United Nations Framework Convention on Climate Change Secretariat (2024) *COP29 UN Climate Conference Agrees to Triple Finance to Developing Countries, Protecting Lives and Livelihoods* ("the UN Climate Change Conference (COP29) closed today with a new finance goal to help countries to protect their people and economies against climate disasters, and share in the vast benefits of the clean energy boom. With a central focus on climate finance, COP29 brought together nearly 200 countries in Baku, Azerbaijan, and reached a breakthrough agreement that will:

- Triple finance to developing countries, from the previous goal of USD 100 billion annually, to USD 300 billion annually by 2035.
- Secure efforts of all actors to work together to scale up finance to developing countries, from public and private sources, to the amount of USD 1.3 trillion per year by 2035.").

[558] (2024) *Statement of Methane Abatement Partnership Roadmap* 2 ("5. Secure the investments needed for emissions reduction projects in producing countries, together with relevant operators, utilising measurement and reporting to target abatement measures. The World Bank could be one of the key financial partners for developing countries through the new Global Flaring and Methane Reduction trust fund, and private investors may provide capital through sustainability instruments.").

[559] (2025) STATEMENT: DRASTICALLY REDUCING METHANE EMISSIONS IN GLOBAL FOSSIL FUEL SECTOR ("Actions
We, the undersigned governments and international organisations, support the following actions to make methane reduction across the fossil fuel sector a defining pillar of global climate ambition:

1. Implement robust Measurement, Monitoring, Reporting, and Verification (MMRV), building on the Oil and Gas Methane Partnership 2.0 and based on best available science and economic technologies, considering independent forms of verification. Promote the publication of methane emission data where possible to enhance transparency and promote consistent and coherent practices to ensure interoperability of data across jurisdictions.
2. Collaborate around mitigation measures including effective use of market signals to accelerate methane emission reduction, eliminate routine flaring and venting, and reward producers who act quickly and transparently, to achieve near zero methane intensity. Support low and middle-income producer countries with policy and technical capacity building, to reach near zero methane intensity.
3. Recognise the importance of effective methane policies and pursue efforts to near zero methane emission intensity in the Fossil Fuel Sector – including clear policies to end routine venting and flaring by 2030 and hold operators accountable. Integrate methane policies into the implementation of Nationally Determined Contributions or national climate strategies.
4. Support industry action, innovation, and investment including the adoption of best practices and performance goals in line with the Methane Abatement Partnerships Roadmap launched at COP29, our national goals and deliver on existing initiatives.
5. Strengthen partnerships and shared responsibility between producing and importing countries and knowledge transfer and capacity building. Work to establish collaborative mechanisms between the fossil fuel sector and technical experts to accelerate action.").

6. Establish a panel of governments from signatories to this statement, supported by existing structures, to work towards the development of near zero methane intensity marketplace to announce and report progress in 2026. This mechanism will turn our shared vision into practical action, the fastest and most effective way to reduce rising temperatures in the near term.").

[560] Climate and Clean Air Coalition, *CCAC Super Pollutant Country Action Accelerator* (*last visited* 16 December 2025) ("At COP30, the Climate and Clean Air Coalition launched the Super Pollutant Country Action Accelerator, a new 3-year, programme to help governments in ODA-eligible countries to drive deep and sustained reductions in super pollutant emissions.").

[561] Climate and Clean Air Coalition, *CCAC Super Pollutant Country Action Accelerator* (*last visited* 16 December 2025) ("Building on lessons from the success of the Montreal Protocol, the programme applies its proven implementation model to accelerate action on super pollutants. The Accelerator aims to engage up to 30 countries by 2030 and to mobilise an estimated USD 150 million in grant funding and complementary finance from development partners. The first cohort of seven countries—Brazil, Cambodia, Indonesia, Kazakhstan, Mexico, Nigeria, and South Africa—was announced at COP30 by Marina Silva, Brazil's Minister of the Environment and Climate, and the Rt. Hon. Ed Miliband, UK Secretary of State for Energy Security and Net Zero. These countries were selected for their strong political commitment, readiness for policy and regulatory action, and regional leadership. They will collectively receive an initial support package of $25 million to advance their efforts.").

[562] Global Methane Hub (23 March 2022) *Former environment minister of Chile, Marcelo Mena, named CEO of the newly formed Global Methane Hub* ("Funding from The Global Methane Hub will support and sustain action from civil society, government, and private industry, including in the more than 100 countries that have signed on to the Pledge by meaningfully investing in methane reduction solutions. Initiatives have already begun by developing sector-based strategies for waste, agriculture, and fossil fuels. In addition, The Global Methane Hub is currently forming a comprehensive Monitoring, Evaluation, and Learning (MEL) framework for strategy and grantmaking applications. This approach will focus on monitoring performance, evaluating activities, and supporting continuous learning."). *See also* Global Methane Hub (2022) ANNUAL IMPACT REPORT, 17 ("Most of our funding has focused on cross-cutting emissions in the highest methane emitting regions and sources around the globe. We believe directing efforts to where emissions are greatest is the most effective way to mitigate methane and meet our reduction targets.").

[563] Global Methane Hub (1 December 2023) *Global Methane Hub Spearheads Transformative Climate Action at COP28* ("The Global Methane Hub organizes the field of philanthropists, experts, nonprofits, and government organizations to ensure we unite around a strategy to maximize methane reductions. We have raised over $200 million in pooled funds from more than 20 of the largest climate philanthropies to accelerate methane mitigation across the globe.").

[564] Climate & Clean Air Coalition (4 December 2023) *Highlights from 2023 Global Methane Pledge Ministerial* ("The Global Methane Hub formally launched the Enteric Fermentation R&D Accelerator with $200 million in funding, making it the largest ever globally coordinated research effort into livestock methane reduction.").

[565] Global Methane Hub (19 December 2023) *COP28 Reflections* ("Alongside our project launches, we announced additional funding initiatives that will deliver necessary and critical resources to governments, businesses, and local climate organizations as they implement their methane mitigation strategies. One initiative was the Data to Methane Action Campaign on which we collaborated with UNEP's IMEO and its partners. GMH provided $10 million in funding to help support governments and businesses identify and reduce methane leaks through better data monitoring. GMH also supported the International Fund for Agriculture Development's Reducing Agricultural Methane Program (RAMP), along with the U.S. State Department, which will develop agricultural methane strategies in 25 countries, helping pave a path forward for more sustainable agriculture.").

[566] Global Methane Hub (19 December 2023) *COP28 Reflections* ("Alongside our project launches, we announced additional funding initiatives that will deliver necessary and critical resources to governments, businesses, and local climate organizations as they implement their methane mitigation strategies. One initiative was the Data to Methane Action Campaign on which we collaborated with UNEP's IMEO and its partners. GMH provided $10 million in funding to help support governments and businesses identify and reduce methane leaks through better data monitoring. GMH also supported the International Fund for Agriculture Development's Reducing Agricultural Methane Program (RAMP), along with the U.S. State Department, which will develop agricultural methane strategies in 25 countries, helping pave a path forward for more sustainable agriculture.").

[567] Global Methane Hub (2025) *The Global Methane Hub and Global Green Growth Institute Launch Strategic Partnership to Accelerate Methane Emission Reductions in Developing Economies* ("On the opening day of COP30, the Global Methane Hub (GMH) and the Global Green Growth Institute (GGGI) announced "Catalyzing Green Growth: A Multi-Sector Strategy for Significant Methane Emissions Abatement," new partnership to catalyze large-scale methane reduction across the agriculture, energy, and waste sectors in developing countries. The collaboration was formally launched during a bilateral meeting between GGGI Executive Director Sang-Hyup Kim and GMH CEO Marcelo Mena held in Belem, Brazil.").

[568] Global Methane Hub (2025) *The Global Methane Hub and Global Green Growth Institute Launch Strategic Partnership to Accelerate Methane Emission Reductions in Developing Economies* ("Under this partnership, GMH and GGGI will implement the initiative with a focus on Mexico, Nigeria, and Senegal, demonstrating scalable models that integrate methane-smart practices into national financial systems and infrastructure investment frameworks. The initiative will: Support Mexico's agricultural National Development Bank (FIRA) to leverage AI to embed methane mitigation into its lending and Environmental and Social Management Systems (ESMS), mobilizing an estimated $100 million (USD) in methane-smart agriculture finance. Strengthen Nigeria's gas flare recovery program by developing robust measurement, reporting, and verification (MRV) systems and enabling access to carbon finance, targeting up to $300 million in investment. Work with Senegal's Bureau de Mise à Niveau (BMN) to integrate methane reduction into industrial upgrading and waste valorization programs, mobilizing $20 million in climate-smart investments.").

[569] United States White House (21 April 2023) *Chair's Summary of the Major Economies Forum on Energy and Climate Held by President Joe Biden*, Statements and Releases ("MEF participants Canada, the European Union, France, Germany, Japan, and the United States, as well as Ireland and Norway, joined in launching the Methane Finance Sprint, which aims to scale up methane finance. This includes mobilizing, by COP 28, at least $200 million in new public and philanthropic support for methane abatement activities, with a view to developing a pipeline of projects. Philanthropies have committed $100 million in new funding through the Global Methane Hub towards the $200 million goal.")

[570] Climate & Clean Air Coalition (4 December 2023) *Highlights from the 2023 Global Methane Pledge Ministerial* ("President Biden launched the Methane Finance Sprint in April 2023 at the Major Economies Forum, with the aim of raising at least $200 million in new high-impact grant funding by COP28. Today, governments, the European Commission, philanthropies, and the private sector significantly exceeded that target, announcing over $1 billion in new grant funding committed since COP27, which more than triples previous annual methane grant funding and will leverage billions more in urgently needed project investment. These funds will support cutting methane emissions across all sectors with a focus in low- and middle-income countries. The Sprint includes $255 million for the re-launch of the World Bank Global Flaring and Methane Reduction Partnership, $200 million for the launch of the Enteric Fermentation Accelerator, and additional support for the Climate and Clean Air Coalition (CCAC), the International Methane Emissions Observatory (IMEO), and other programs, elaborated below.").

[571] World Bank (7 September 2023) *Enhancing IMF-World Bank Collaboration* ("Joint Statement of the IMF Managing Director and of the World Bank President … The two institutions will further strengthen coordination and focus on results. We will formalize the regular meetings of the new Bank-Fund Climate Advisory Group, tasked with ensuring coordination of our climate related work streams. The group will meet every two months to discuss global and country level engagements, including the results of CCDRs, country level climate analytical work, and the pipeline of key projects and policy-based lending (World Bank's DPLs and Fund's RST engagements). We will also incorporate climate considerations in our ongoing work on debt sustainability, including through the revised joint Low Income Country Debt Sustainability Framework.").

[572] World Bank (7 September 2023) *Enhancing IMF-World Bank Collaboration* ("Joint Statement of the IMF Managing Director and of the World Bank President … The two institutions will further strengthen coordination and focus on results. We will formalize the regular meetings of the new Bank-Fund Climate Advisory Group, tasked with ensuring coordination of our climate related work streams. The group will meet every two months to discuss global and country level engagements, including the results of CCDRs, country level climate analytical work, and the pipeline of key projects and policy-based lending (World Bank's DPLs and Fund's RST engagements). We will also incorporate climate considerations in our ongoing work on debt sustainability, including through the revised joint Low Income Country Debt Sustainability Framework.").

[573] International Monetary Fund (18 April 2022) *Proposal to Establish a Resilience and Sustainability Trust,* 11–12 ("The RST adds to the lending toolkit by helping members address risks to prospective BoP stability stemming from select macro-critical longer-term structural challenges. While not necessarily posing imminent BoP problems, longer-term challenges such as climate change make countries more prone to severe BoP problems in the longer run by raising the likelihood and impact of future shocks and undermining growth prospects. Policy inaction—including on account of scarce financing—to address these challenges could increase these risks and jeopardize *prospective BoP stability,* as defined in ¶9. Helping member countries to address such risks through policy support and financing is consistent with the Fund's mandate to support members' BoP stability.").

[574] Parry I. W. H., Black S., Minnett D. N., Mylonas V., & Vernon N. (2022) How to Cut Methane Emissions, International Monetary Fund, 15 ("Global and national strategies for cutting methane emissions need to be fleshed out, but the GMP provides a potential platform for discussion. Some countries will pursue pricing and others non-pricing approaches. Thus, operational methodologies for comparing efforts across countries need to be approved. Continued refinement of methane monitoring technologies is needed, particularly atmospheric measures that can better map readings to specific emission sources. Successful methane abatement programs, such as Norway's methane tax, need to be disseminated, along with the lessons that can be drawn for other countries. Financing would need to be part of an international agreement, given that mitigation costs would fall disproportionately on emerging market economies. Last, dialogue is needed on design issues for internationally coordinated mitigation regimes as well as strategies for advancing critical methane abatement technologies.").

[575] As of 4 June 2026, the SDR exchange rate of reference was 0.731200 SDR per USD.

[576] United States White House (13 June 2021) *Carbis Bay G7 Summit Communiqué*, Statements and Releases ("65. We welcome the agreement by G7 Finance Ministers and Central Bank Governors to support a new $650 billion allocation of IMF Special Drawing Rights, urging implementation by the end of August 2021 accompanied by transparency and accountability measures. We encourage the IMF to work quickly with all relevant stakeholders to explore a menu of options for channeling SDRs to further support health needs, including vaccinations, and to help enable greener, more robust recoveries in the most affected countries, supporting the poorest and most vulnerable countries in tackling these urgent challenges. G7 countries are actively considering options that we can take as part of a global effort to magnify the impact of this general allocation for countries most in need, especially in Africa, including through voluntarily channeling SDRs and/or budget loans, in line with national circumstances and legal requirements. This includes scaling up financing to the IMF's Poverty Reduction and Growth Trust and the IMF's review of concessional financing and policies to strengthen its capacity to support low-income countries. To support our aim to reach a total global ambition of $100 billion, we call for contributions from other countries able to do so, alongside the G7. We task G7 Finance Ministers and Central Bank Governors to urgently consider the detail of this, including by working with the G20 and other stakeholders.").

[577] G20 (31 October 2021) *Rome Leaders' Declaration*, 4 ("10. Support to vulnerable countries. We welcome the new general allocation of Special Drawing Rights (SDR), implemented by the International Monetary Fund (IMF) on 23 August 2021, which has made available the equivalent of USD 650 billion in additional reserves globally. We are working on actionable options for members with strong external positions to significantly magnify its

impact through the voluntary channeling of part of the allocated SDRs to help vulnerable countries, according to national laws and regulations We welcome the recent pledges worth around USD [45] billion, as a step towards a total global ambition of USD 100 billion of voluntary contributions for countries most in need. We also welcome the ongoing work to significantly scale up the Poverty Reduction and Growth Trust's lending capacity and call for further voluntary loan and subsidy contributions from countries able to do so. We also call on the IMF to establish a new Resilience and Sustainability Trust (RST) – in line with its mandate – to provide affordable long-term financing to help low-income countries, including in the African continent, small island developing states, and vulnerable middle-income countries to reduce risks to prospective balance of payments stability, including those stemming from pandemics and climate change. The new RST will preserve the reserve asset characteristics of the SDRs channeled through the Trust. Our Finance Ministers look forward to further discussion of surcharge policy at the IMF Board in the context of the precautionary balances interim review.").

[578] International Monetary Fund (18 April 2022) *IMF Executive Board Approves Establishment of the Resilience and Sustainability Trust*, Press Release ("Challenges from the pandemic, spillovers from geopolitical shocks, and long-standing structural problems pose an enormous impediment for balance of payments stability and resilient and sustainable growth, especially for low-income and vulnerable middle-income countries. In this context, on April 13, 2022, the Executive Board of the International Monetary Fund (IMF) approved the establishment of the Resilience and Sustainability Trust (RST) with effect from May 1, 2022.The RST will complement the IMF's existing lending toolkit by focusing on longer-term structural challenges— including climate change and pandemic preparedness—that entail significant macroeconomic risks and where policy solutions have a strong global public good nature.").

[579] International Monetary Fund (11 April 2022) *Proposal to Establish a Resilience and Sustainability Trust,* 8 ("The proposed RST would complement the IMF's existing lending toolkit by focusing on longer-term structural challenges. The RST's goal is to enhance economic resilience and sustainability thereby contributing to prospective balance of payments stability. This will be achieved by providing eligible members affordable, longer-maturity financing to (i) support reforms (including by covering BoP costs associated with them) that reduce macro-critical risks associated with select longer-term structural challenges and (ii) augment policy space and financial buffers to mitigate the risks arising from such longer-term structural challenges. This financing would complement traditional IMF support that focuses on resolving more near-term balance of payments difficulties.").

[580] International Monetary Fund (7 April 2023) *IMF Executive Board Concludes the 2023 Review of the Resource Adequacy of the Poverty Reduction and Growth Trust, Resilience and Sustainability Trust, and Debt Relief Trusts* ("In relation to the recently established RST, the review highlighted strong and frontloaded demand for arrangements under the Resilience and Sustainability Facility (RSF). To date, five RSF arrangements have been approved since RST operationalization on October 12, 2022, and the pipeline of potential requests is building up quickly."); *and* Lawder D. (10 April 2023) *IMF's Georgieva says 44 countries interested in new resilience trust loans,* REUTERS ("International Monetary Fund (IMF) Managing Director Kristalina Georgieva said on Monday that 44 countries have expressed interest in borrowing from its $40 billion Resilience and Sustainability Trust after an initial five had arranged loans.... Georgieva said the facility's current resources of around $40 billion were "modest in size." Rwanda, Barbados, Costa Rica, Bangladesh and Jamaica have reached agreements for loan programs from the facility, which come with certain economic policy requirements such as meeting fiscal targets.").

[581] *See* International Monetary Fund, *Resilience and Sustainability Trust* (*last visited* 1 February 2024) ("RST Funding Status (as of end December 2023) Total pledges In SDR Billions 31.9 In USD billions 42.8"); *and* International Monetary Fund (2023) RESILIENCE AND SUSTAINABILITY TRUST-2023 CONTRIBUTION AGREEMENTS WITH ITALY, LUXEMBOURG, OMAN, AND THE UNITED KINGDOM ("This paper presents for the information of Executive Directors four Resilience and Sustainability Trust (RST) contribution agreements finalized between April 2023 and September 15, 2023. Shortly after the Executive Board's April 2022 approval of the establishment of the RST, the Managing Director wrote to 35 members with strong external positions who were identified as potential RST contributors seeking their contributions in a total amount of at least SDR 33 billion. To date, the Fund has received total pledges amounting to SDR 31.2 billion from 18 members, of which SDR 26.1 billion are pledged contribution packages to all three RST accounts (i.e., the Loan Account (LA), Deposit Account (DA) and the Reserve Account (RA)) that count toward the SDR 33 billion target, corresponding to 78 percent of the targeted loan contributions and projected demand for loan resources. The Fund has concluded contribution agreements with 15 members (or their institutions), eleven of which were already reported to the Executive Board in January 2023 and April 2023, and the remaining and most recent four are presented in this paper." (citations omitted)).

[582] COP28 (4 December 2023) *COP28 Finance Day unlocks innovative financial mechanisms to support vulnerable countries fight climate change*, Press Release ("At the COP28 World Climate Action Summit, the UAE committed $200 million USD to help low-income and vulnerable countries fight climate change through the International Monetary Fund Resilience and Sustainability Trust (RST)"). In December 2022, the U.S. Congress approved a contribution of US$20 million to the Poverty Reduction and Growth Trust or the Resilience and Sustainability Trust.[582]

[583] Consolidated Appropriations Act, 2023, P.L. 117-328, 117th Cong., Title V ("For contribution by the Secretary of the Treasury to the Poverty Reduction and Growth Trust or the Resilience and Sustainability Trust of the International Monetary Fund, $20,000,000, to remain available until September 30, 2031.").

[584] International Monetary Fund (2024) IMF Policy Paper Interim Review of the Resilience and Sustainability Trust and Review of Adequacy of Resources, 1, 2, 5 ("The Executive Board of the International Monetary Fund (IMF) completed the interim review of the Resilience and Sustainability Trust (RST) and review of Adequacy of RST Resources on May 8, 2024. The interim review takes stock of experience with the RST since it became operational in October 2022. Demand for the RST has been high. To date, 18 arrangements have been approved—all seeking to help countries tackle challenges stemming from climate change— and most less than a year old. Though most arrangements are at early stages, the Executive Board approved fine-tuning of a few elements of RST design to enhance its effectiveness. These include facilitating early disbursements for reform measures completed ahead of schedule and allowing for continuity of an RSF arrangement when there is a need to switch across qualifying concurrent Upper Credit Tranche (UCT)-quality programs. The review also provides an assessment of the adequacy of the Trust's resources and finds that increased near-term fundraising will be needed to meet strong demand. The Trust's reserves remain adequate in the baseline and under a range of risk scenarios. A more comprehensive review of the RST is planned for 2026.").

[585] G20 (2024) *Rio de Janeiro Leaders' Declaration,* 73 ("We welcome the landmark achievement of the global ambition of USD 100 billion of voluntary contributions (in SDRs or equivalent) in pledges for countries most in need and call for the swift delivery of pending pledges. We will continue to invite countries that are willing and legally able to explore channeling Special Drawing Rights (SDRs) to MDBs, while respecting the reserve asset status of the resulting SDR-denominated claims and ensuring their liquidity, in order to strengthen MDBs´ financial capacity to support SDGs and address global challenges, including the goals of the Global Alliance against Hunger and Poverty.")

[586] International Monetary Fund (18 April 2022) *Proposal to Establish a Resilience and Sustainability Trust*, 12 ("Longer-term structural challenges create a range of possible BoP needs. These needs that could be financed under the RST are typically multidimensional and can materialize over the short-, medium- or longer-term. In the case of climate change, potential sources of such needs—associated with adaptation, transition, and mitigation policies including energy security policies—include, *inter alia*[10]: • Costs of climate-related public and/or private investments, such as green energy generation, coastal protection infrastructure, energy-efficient retrofitting of existing building; • Costs associated with climate-focused reforms, such as transitioning to green technologies; • Offsetting the costs of policies typically required to enable a just transition, such as augmenting targeted social assistance in tandem with the unwinding of carbon subsidies;[11] and, • Building up policy space and buffers necessary to mitigate risks to longer-term BoP stability, such as establishing and augmenting disaster funds, establishing and financing a multi-layered financial framework for disaster resilience, and augmenting international reserves to face financial stability implications of climate change.").

[587] International Monetary Fund (18 April 2022) *Proposal to Establish a Resilience and Sustainability Trust*, 63–64 ("RST measures would be informed and expected to be consistent with country diagnostics developed in both institutions relevant to the RST's purposes. On climate change, the Bank's Country Climate and Development Reports (CCDR), if available, will be a critical input, complemented with other products such as the Fund's Climate Change Policy Assessments (CCPAs) and its potential successor instrument, Climate Macroeconomic Assessments Programs (CMAPs). In practice, Bank and Fund staff will coordinate the production of CCDRs and CMAPs to complement and ensure consistent advice between the two products for member countries, in line with the agreed coordination between Bank and Fund staff on CCDRs and CMAPs. Fund staff are expected to discuss with their Bank counterparts areas of the CCDR or other diagnostics that they intend to include in the RST program to ensure complementarity. In instances where countries already have an advanced climate change framework, Fund staff could use these inputs flexibly as part of the analytics informing the RST program."); International Monetary Fund (18 April 2022) *IMF Executive Board Approves Establishment of the Resilience and Sustainability Trust*, Press Release ("The RST will be a loan-based trust, with resources mobilized on a voluntary basis. About three quarters of the IMF's membership will be eligible for longer-term affordable financing from the RST,

including all low-income countries, all developing and vulnerable small states, and lower middle-income countries. Access will be based on the countries' reforms strength and debt sustainability considerations and capped at the lower of 150 percent of quota or SDR 1 billion. The loans will have a 20-year maturity and a 10½-year grace period, with borrowers paying an interest rate with a modest margin over the three-month SDR rate, with the most concessional financing terms provided to the poorest countries."); International Monetary Fund (*updated* July 2023) *The Resilience Sustainability Facility (RSF)* ("Repayment: 20-year maturity and a 10½-year grace period during which no principal is repaid. … Access: Overall cumulative access cap set at 150 percent of quota or SDR 1 billion, whichever is smaller.").

[588] International Monetary Fund (18 April 2022) *Proposal to Establish a Resilience and Sustainability Trust*, 14 ("The RST would focus on downside scenarios associated with select longer-term challenges. It would aim to lower the probability of such scenarios and/or reduce the severity of the BoP problems that would materialize should such a scenario come to pass. The recognition of these risks does not mean that the UCT program becomes inadequate in achieving its short- to medium-term goals"); 15 ("RST support for the development and implementation of overarching policy frameworks such as green public financial management would improve the integration of climate in policy formulation and enhance governance, thereby giving more comfort to other public and private lenders and donors to provide project financing and technical assistance.").

[589] The IMF, in a joint statement with the World Bank, indicated that RST engagements will be informed by the World Bank's CCDRs. *See* World Bank (7 September 2023) *Enhancing IMF-World Bank Collaboration* ("Joint Statement of the IMF Managing Director and of the World Bank President … The two institutions will further strengthen coordination and focus on results. We will formalize the regular meetings of the new Bank-Fund Climate Advisory Group, tasked with ensuring coordination of our climate related work streams. The group will meet every two months to discuss global and country level engagements, including the results of CCDRs, country level climate analytical work, and the pipeline of key projects and policy-based lending (World Bank's DPLs and Fund's RST engagements). We will also incorporate climate considerations in our ongoing work on debt sustainability, including through the revised joint Low Income Country Debt Sustainability Framework.").

[590] International Monetary Fund, Resilience and Sustainability Trust (*last visited* 11 December 2025) (Here is the list of current RSF arrangements:
Bangladesh: SDR 1 billion (94% of quota) – Approved Jan 30, 2023
Barbados: SDR 142 million (150% of quota) – Approved Dec 7, 2022
Benin: SDR 149 million (120% of quota) – Approved Dec 14, 2023
Cabo Verde: SDR 24 million (100% of quota) – Approved Dec 11, 2023
Cameroon: SDR 138 million (50% of quota) – Approved Jan 29, 2024
Costa Rica: SDR 554 million (150% of quota) – Approved Nov 14, 2022
Côte d'Ivoire: SDR 976 million (150% of quota) – Approved Mar 15, 2024
Democratic Republic of Congo: SDR 800 million (75% of quota) – Approved Jan 15, 2025
Egypt: SDR 1 billion (49% of quota) – Approved Mar 10, 2025
The Gambia: SDR 47 million (75% of quota) – Approved Jun 18, 2025
Jamaica: SDR 574 million (150% of quota) – Approved Mar 1, 2023
Jordan: SDR 515 million (150% of quota) – Approved Jun 25, 2025
Kenya: SDR 407 million (75% of quota) – Approved Jul 17, 2023
Kosovo: SDR 62 million (75% of quota) – Approved May 25, 2023
Madagascar: SDR 244 million (100% of quota) – Approved Jun 21, 2024
Mauritania: SDR 193 million (150% of quota) – Approved Dec 19, 2023
Moldova: SDR 129 million (75% of quota) – Approved Dec 6, 2023
Morocco: SDR 1 billion (112% of quota) – Approved Sep 28, 2023
Niger: SDR 99 million (75% of quota) – Approved Jul 5, 2023
Pakistan: SDR 1 billion (49% of quota) – Approved May 9, 2025
Papua New Guinea: SDR 197 million (75% of quota) – Approved Dec 11, 2024
Paraguay: SDR 302 million (150% of quota) – Approved Dec 19, 2023
Rwanda: SDR 240 million (150% of quota) – Approved Dec 12, 2022
Senegal: SDR 243 million (75% of quota) – Approved Jun 26, 2023
Seychelles: SDR 34 million (150% of quota) – Approved May 31, 2023
Tanzania: SDR 597 million (150% of quota) – Approved Jun 20, 2024).

[591] Parry I. W. H., Black S., Minnett D. N., Mylonas V., & Vernon N. (2022) *How to Cut Methane Emissions*, INTERNATIONAL MONETARY FUND, 15 ("Differentiated pricing and financial/technological support are likely to be key elements of an international agreement on minimum methane pricing. Varying methane taxes according to

broad country groupings classified by development level would promote a more progressive distribution of emission reductions and mitigation costs. Support from high-income countries would also likely be needed to entice emerging market and developing economies into a minimum pricing regime. This might take the form, for example, of donor support (linked to verifiable emission reductions or technology adoption) and/or international transfer of methane mitigation technologies.").

[592] World Bank (3 December 2018) *World Bank Group Announces $200 billion over Five Years for Climate Action*, Press Release ("The World Bank Group today announced a major new set of climate targets for 2021-2025, doubling its current 5-year investments to around $200 billion in support for countries to take ambitious climate action. The new plan significantly boosts support for adaptation and resilience, recognizing mounting climate change impacts on lives and livelihoods, especially in the world's poorest countries. The plan also represents significantly ramped up ambition from the World Bank Group, sending an important signal to the wider global community to do the same.")).

[593] World Bank (3 December 2018) *World Bank Group Announces $200 billion over Five Years for Climate Action*, Press Release ("The $200 billion across the Group is made up of approximately $100 billion in direct finance from the World Bank (IBRD/IDA), and approximately $100 billion of combined direct finance from the International Finance Corporation (IFC) and the Multilateral Investment Guarantee Agency (MIGA) and private capital mobilized by the World Bank Group.").

[594] World Bank, *The World Bank Group and Paris Alignment* (*last visited* 1 February 2024) ("The World Bank Group made a commitment to align all its financing operations with the goals of the Paris Agreement in its Climate Change Action Plan 2021-2025. The Paris Alignment of the Bank Group's new financing flows is the most comprehensive institutional undertaking ever done by the Bank Group to reconcile development and climate. The World Bank is on track to align 100% percent of new operations, starting from July 1, 2023. For IFC and MIGA, 85% of new operations will be aligned starting July 1, 2023, and 100% from July 1, 2025. This is part of a broader multilateral development bank (MDB) vision to align financing flows with the objectives of the Paris Agreement.").

[595] World Bank Group (2021) CLIMATE ACTION PLAN, 13 ("Climate change and ecosystems degradation combined, in turn, push the planet ever closer to irrevocable tipping points.").

[596] Abernethy S. & Jackson R. B. (2022) *Global temperature goals should determine the time horizons for greenhouse gas emission metrics*, ENVIRON. RES. LETT. 17(2): 1–10, 7 ("Although NDCs and long-term national pledges are currently insufficient to keep warming below 2 °C, let alone 1.5 °C [50–52], the time horizons used for emission metrics should nevertheless be consistent with that central goal of the Paris Agreement. We therefore support the use of the 20 year time horizon over the 100 year version, when binary choices between these two must be made, due to the better alignment of the former with the temperature goals of the Paris Agreement. The 50 year time horizon, not yet in widespread use but now included in IPCC AR6, is in fact the only time horizon that the IPCC presents that falls within the range of time horizons that align with the Paris Agreement temperature goals (24–58 years). However, to best align emission metrics with the Paris Agreement 1.5 ° C goal, we recommend the use of the 24 year time horizon, using 2045 as the end point time, with its associated $GWP_{1.5°C}$ = 75 and $GTP_{1.5\,°C}$ = 41.").

[597] United States White House (19 May 2012) *Fact Sheet: G-8 Action on Energy and Climate Change*, Statements and Releases ("Commission the World Bank to prepare a report on ways to integrate reduction of near-term climate pollution into their activities and ask the World Bank to bring together experts from interested countries to evaluate new approaches to financing projects to reduce methane, including through pay-for-performance mechanisms.").

[598] World Bank (2013) METHANE FINANCE STUDY GROUP REPORT: USING PAY-FOR-PERFORMANCE MECHANISMS TO FINANCE METHANE ABATEMENT, 19 ("The Study Group encourages all interested donors to consider this innovative and highly attractive approach which combines immediate impact and maximum cost-effectiveness. Various implementation options can be envisaged. A fund could be established within an international financial institution, allowing interested funders to pool resources for maximum efficiency. A number of bilateral donors have developed deep in-house expertise on methane mitigation and carbon offsets and could implement such mechanisms rapidly. A sub-theme of the Green Climate Fund private sector facility may also be devoted to these approaches.").

[599] Pilot Auction Facility, *About the PAF* (*last visited* 1 February 2024) ("In 2013, the G8 requested for innovative pay-for-performance approaches to addressing methane. A report by the Methane Finance Study Group supported the establishment of the facility. In its design and development phase, the facility benefited from the support of the Climate and Clean Air Coalition. … The PAF auctions are supported by Germany, Sweden, Switzerland (through a joint contribution of the State Secretariat of Economic Affairs (SECO) and the Climate Cent Foundation), and the United States.").

[600] Pilot Auction Facility, *About the PAF* (*last visited* 1 February 2024) ("The PAF completed three auctions to allocate a guaranteed price for future carbon credits in the form of a tradable put option. Two auctions (July 2015 and May 2016) addressed methane abatement from landfill, animal waste, and wastewater sites, and one auction (January 2017) addressed nitrous oxide emissions from nitric acid (not adipic acid) production. The three auctions allocate up to $54 million with the potential to abate 20.6 million metric tons of CO_2 equivalent.").

[601] Energy Sector Management Assistant Program (ESMAP) is another example. ESMAP is the home for the Sustainable Cooling Facility that received $157 million from the GCF for work in nine countries. *See* Green Climate Fund, *Projects & Programmes: FP177 Cooling Facility* (*last visited* 1 February 2024).

[602] World Bank (29 June 2021) *IFC Provides Landmark Loan to Reduce Gas Flaring, Boost Energy Access, and Power More Homes and Businesses Across Iraq*, Press Release ("IFC is investing in Basrah Gas Company (BGC) to support one of the largest gas flaring reduction projects in the world, helping to improve energy access, prevent associated greenhouse gas (GHG) emissions and support a more resilient, sustainable energy sector in Iraq. BGC is an Iraqi joint venture created to treat and process associated gas that would otherwise be flared. The project is expected to increase BGC's processing capacity, thereby avoiding more unnecessary flaring and associated GHG emissions by around 10 million tons per annum. It will support Iraq's transition to a lower carbon path and improve access to a domestic energy source, helping the country meet its growing power needs. IFC, a member of the World Bank Group, is the lead arranger of the five-year, $360 million loan to BGC.").

[603] International Finance Corporation (2022) *Green Bond Framework*, 5–8 (*see* table of activities that are "potentially eligible for IFC Green Bond finance").

[604] World Bank (12 September 2022) *What is IDA?* ("The World Bank's International Development Association (IDA) is one of the largest and most effective platforms for fighting extreme poverty in the world's lowest income countries.
•IDA works in 74 countries in Africa, East Asia & Pacific, South Asia, Europe & Central Asia, Latin America & Caribbean, and Middle East & North Africa. • IDA aims to reduce poverty by providing financing and policy advice for programs that boost economic growth, build resilience, and improve the lives of poor people around the world. •More than half of active IDA countries already receive all, or half, of their IDA resources on grant terms, which carry no repayments at all. Grants are targeted to low-income countries at higher risk of debt distress. •Over the past 62 years, IDA has provided about $458 billion for investments in 114 countries. IDA also has a strong track record in supporting countries through multiple crises.").

[605] Multilateral Investment Agency (2021) *Annual Report — 2021*, 28 ("To increase its climate action, the World Bank Group announced a new Climate Change Action Plan (CCAP) to guide its interventions from 2021 through 2025. The CCAP provides a bold strategic road map for tackling climate change and helping client countries to fully integrate their climate and development goals. MIGA's products have helped cross-border investors protect their long-term investments in climate mitigation and adaptation activities across diverse markets and regions. As one of the few institutions that provides long-maturity guarantees, MIGA will be instrumental in fostering the lock-in of transformational climate action.").

[606] World Bank Group (8 November 2021) *It's Time to Sprint: Targeting Methane Emissions*, COP27 Side Event, Sharm El-Sheikh, Egypt.

[607] World Bank (19 September 2022) *World Bank Group Is Leading the Effort on Methane Emissions Reduction with Impactful Projects and Initiatives* ("The WBG is ramping up support to clients to reduce methane emissions. WBG support can include a wide range of interventions including analytical work, capacity building, support on regulatory reforms, leak detection/monitoring, investment prefeasibility studies, and direct lending or investment.").

[608] Climate & Clean Air Coalition (4 December 2023) *Highlights from 2023 Global Methane Pledge Ministerial* ("In addition to the over $1 billion in new grant funding, international financial institutions approved over $3.5

billion in new investments for methane-reducing projects since COP27. Approvals include $375 million from the Green Climate Fund and partners, over $1.9 billion (€1.78 billion) from the European Investment Bank, over $218 million (€200 million) from the European Bank for Reconstruction and Development, and $372.5 million from the Inter-American Development Bank. The World Bank approved at least $700 million in investments, including a $255 million for rice project in China, $300 million for landfill methane reduction in Cote d'Ivoire, and $145 million for wastewater methane reduction in Malawi.").

[609] Climate & Clean Air Coalition (4 December 2023) *Highlights from 2023 Global Methane Pledge Ministerial* ("The World Bank launched the Global Methane Reduction Platform for Development (CH4D) to support low- and mid-income countries to realize the 'methane triple-wins' of abating emissions, enhancing resilience, and empowering livelihoods. Through partnerships, including with the CCAC Methane Roadmap Action Programme (M-RAP), CH4D will mobilize expertise, affordable technologies, and catalytic finance for methane abatement in the agriculture and waste sectors.").

[610] Global Flaring and Methane Reduction Partnership (2025) ANNUAL PROGRESS REPORT, 6 ("The World Bank announced GFMR at COP28 in the United Arab Emirates. The Partnership builds on the work of the Global Gas Flaring Reduction (GGFR) Partnership, widening its mandate to include addressing methane venting and leaks. GFMR is active in over a dozen countries, which account for over a quarter of the O&G sector's methane emissions, and nearly two-fifths of global gas flaring.").

[611] Global Flaring and Methane Reduction Partnership (2025) ANNUAL PROGRESS REPORT, 6 ("As of FY25, total commitments by development partners to the GFMR program amount to $234.4 million (table A.1). Of this, $41.95 million (18 percent) has been received as paid-in contributions (table A.2), while $192.42 million (82 percent) remains outstanding and is expected to be paid in over the coming years in line with agreed-upon contribution schedules. GFMR partners include Norway, the United Arab Emirates, the United States, bp, Eni, Equinor, Occidental, Shell, TotalEnergies, and the World Bank Group…. In FY25, GFMR endorsed a total of $40.33 million in grants.1 Of this amount, $8 million has been allocated to 20 active grants, with the remaining allocations expected to be approved throughout FY26. The portfolio spans six regions as well as global and analytics activities, reflecting a strong pipeline of opportunities supported by a growing demand for technical assistance and country engagement (table A.3).").

[612] International Monetary Fund (18 April 2022) *Proposal to Establish a Resilience and Sustainability Trust,* 63-66.

[613] World Bank (2021) *COP26 Climate Brief: Country Climate and Development Reports (CCDRs).*

[614] World Bank (19 September 2022) *World Bank Group Is Leading the Effort on Methane Emissions Reduction with Impactful Projects and Initiatives* ("WBG support can include a wide range of interventions including analytical work, capacity building, support on regulatory reforms, leak detection/monitoring, investment prefeasibility studies, and direct lending or investment. Methane reduction is also a key focus of a number of upcoming Country Climate and Development Reports, or CCDRs, which are new WBG core diagnostic reports that integrate climate change and development considerations and help countries prioritize the most impactful actions that can reduce greenhouse gas (GHG) emissions and boost adaptation.").

[615] World Bank, *Country Climate and Development Reports (CCDRs)* (*last visited* 14 February 2024) ("The World Bank Group's Country Climate and Development Reports (CCDRs) are a core diagnostic that integrates climate change and development. They help countries prioritize the most impactful actions that can reduce greenhouse gas (GHG) emissions and boost adaptation and resilience, while delivering on broader development goals. CCDRs build on data and rigorous research and identify main pathways to reduce GHG emissions and climate vulnerabilities, including the costs and challenges as well as benefits and opportunities from doing so. The reports suggest concrete, priority actions to support the low-carbon, resilient transition. As public documents, CCDRs aim to inform governments, citizens, the private sector and development partners and enable engagements with the development and climate agenda. CCDRs feed into other core Bank Group diagnostics, country engagements and operations, and help attract funding and direct financing for high-impact climate action.").

[616] *See* International Monetary Fund (18 April 2022) PROPOSAL TO ESTABLISH A RESILIENCE AND SUSTAINABILITY TRUST, 39 ("on climate change, the Bank's Country Climate and Development Reports (CCDR), if available, will be a critical input, complemented by other products such as the Fund's Climate Change Policy Assessments (CCPAs) and its potential successor instrument, Climate Macroeconomic Assessments Programs (CMAPs), Climate Public Investment Management Assessment (C-PIMA), and Disaster Resilience Strategies (DRS)."); *and*

International Monetary Fund (2023) Review of the Climate Macroeconomic Assessment Program Pilots, 5 ("This paper reviews the two Climate Macroeconomic Assessment Program (CMAP) pilots and proposes a way forward. It builds on the experience of the previous six Climate Change Policy Assessment (CCPA) pilots, and the recent rollout of the World Bank's Country Climate and Development Report (CCDR). It also accounts for early experience with countries requesting support under the Fund's Resilience and Sustainability Trust (RST). The review's main findings are that: (1) the pilot country authorities find the ma cro-fiscal section of the CMAP most valuable, but such a comprehensive assessment can be burdensome when there is limited capacity, (2) a CMAP involves a much higher resource cost than a typical CD mission and some of its tools can be further improved, and (3) the CMAP complements CCDRs in the areas of Fund's comparative advantage, while there are some overlaps. Staff proposes to: (1) streamline the CMAP to focus on the Fund's comparative advantage in the areas of mitigation, PFM, and macro-fiscal impact of climate change policies; (2) provide a streamlined CMAP only in exceptional circumstances; and (3) expand more targeted CD in particular in support of RST countries. This focused and tailored approach would benefit members as it is more agile, allows the Fund to serve more members within the same resource envelope, and enhances synergies with other Fund products and the WB's CCDR. … This CMAP review responds to a request of Executive Directors made at the time of the CCPA review. Six CCPA pilots in small developing states (SDS) were conducted jointly with the World Bank between 2017-2020. The CCPA review drew lessons from these pilots and presented the results of a stakeholder survey. It also proposed to develop an IMF-only CD product, the "CMAP," because the World Bank had decided to launch its own climate assessment, the Country Climate and Development Report (CCDR). Directors asked that staff test-run two CMAP pilots and report back to the Board.").

[617] World Bank (2022) *Climate and Development: An Agenda for Action*; *and* World Bank (2023) *The Development, Climate, and Nature Crisis : Solutions to End Poverty on a Livable Planet - Insights from World Bank Country Climate and Development Reports covering 42 economies*.

[618] World Bank (2023) *The Development, Climate, and Nature Crisis : Solutions to End Poverty on a Livable Planet - Insights from World Bank Country Climate and Development Reports covering 42 economies* ("There are cost-effective opportunities to reduce methane emissions At the global level, methane emission reductions offer opportunities for no- or low-cost GHG emissions reductions in three key sectors: agriculture, oil and gas, and waste management … In Cambodia, methane emissions from rice production account for 65 percent of all GHG emissions from agriculture. The shift from continuously flooded irrigation to irrigation with one single drainage could reduce the emissions intensity of rice by 40 percent, bring about up to 30 percent in water savings, and reduce fertilizer use. The Kenya CCDR explores options to reduce methane emissions from cattle. By improving animal feed and breeds, it would be possible to achieve the same levels of meat and milk prod uction with 13 million rather than 28 million head of cattle, meeting a per capita milk/ beef consumption of 180 liters/30kg per person, per day, with better rangeland quality, using less water, and reducing methane emissions by 21–36 percent. Farmers in Cambodia are already using waste from livestock farms as input for biodigesters, providing biogas for clean cooking and organic fertilizer for better crops and healthier soil while reducing GHG emissions. This practice should be encouraged and supported to scale. The International Energy Agency estimates that almost 45 percent of oil and gas methane emissions can be avoided with measures that would come at no or negative net cost. Effective established policies include leak detection and repair requirements for fugitive sources, equipment mandates for sources known to emit significant volumes of methane, and measures designed to limit nonemergency flaring and venting, including energy efficiency measures, electrification and integration of renewable energy in operations, displacement of high-carbon fuels with low-carbon heat and power processes, improved operations and maintenance protocols, and carbon capture and storage. Côte d'Ivoire can reduce upstream methane emissions from the oil and gas sector. In 2022, it emitted close to 40 kilotonnes of methane—roughly equivalent to 1.2 million tonnes of carbon dioxide equivalent (MtCO2e). Of this, 63 percent was from venting, 30 percent from fugitive emissions, and 4 percent from incomplete flaring of natural gas. At 2.33 cubic meters of gas flared per barrel of oil produced, flaring intensity in Côte d'Ivoire in 2022 had dramatically improved over the past 10 years, and was well below world average of 4.72. In Azerbaijan, total fugitive emissions (mainly methane leakage in oil and gas operations and gas distribution and carbon dioxide emissions from natural gas flaring) have almost tripled since 2000 and today account for about a quarter of the country's total GHG emissions. Natural gas losses in the distribution network also remain far above international benchmarks (7.4 percent in 2021), despite improvements since 2015 and a recently announced effort to further reduce them. The Republic of Congo could reduce gas flaring by about 50 percent at no cost over a 10- year horizon, and optimized flaring performance could generate over $50 million per year in extra overall revenues.").

[619] World Bank Group (2024) People in a Changing Climate: From Vulnerability to Action Insights from World Bank Group Climate and Development Reports covering 72 economies, ("This report presents a selection of key findings from the first three years of CCDRs, with 58 reports covering 72 countries

and economies published by November 2024 (figure 1). The CCDRs now cover 60 percent of the population of low- and middle-income countries (LICs and MICs) and 73 percent of their gross domestic product (GDP) (figure 2). In terms of resilience and adaptation, coverage is also improving: 67 percent of disaster losses in LICs and MICs since 2000 occurred in countries with published CCDRs, and 70 percent of LIC and MIC GHG emissions are emitted in CCDR countries. CCDRs also include two high-income countries (HICs), Romania and Poland.").

[620] Page 14, 34 cop 30 World Bank Group (2025) JOBS IN A CHANGING CLIMATE INSIGHTS FROM WORLD BANK GROUP COUNTRY CLIMATE AND DEVELOPMENT REPORTS COVERING 93 ECONOMIES, 1, 4, 14-17 ("The World Bank Group's Country Climate and Development Reports (CCDRs) provide a crosscutting look at how countries' development prospects—and the job opportunities they offer to their people— can be threatened by climate impacts and supported by climate policies. Climate change and policies affect jobs through impacts on productivity, energy and material efficiency, and physical, human, and natural capital. They can also transform employment opportunities, especially through complementary measures that help workers and firms adapt to and benefit from new technologies and production practices. Prepared by the World Bank, the International Finance Corporation (IFC), and the Multilateral Investment Guarantee Agency (MIGA), CCDRs integrate country perspectives, climate science and economic modeling, private sector information, and policy analysis to assess how countries can successfully grow and develop their economies and create jobs despite increasing climate risks and while achieving their climate objectives and commitments.").

[621] Alterra, *About Altérra* (*last visited* 9 March 2024) ("ALTÉRRA has the ambition to activate and grow a new global climate economy, stimulating innovation, multiplying private capital and reducing barriers to investment in emerging markets and developing economies (EMDEs). With a focus on actionable investments, ALTÉRRA and its partners are committed to the rapid deployment of capital in high-impact projects across emerging markets. Alterra Management Limited is an Asset Manager incorporated in the ADGM, regulated by the ADGM Financial Services Regulatory Authority that manages the Alterra Climate Vehicles."). *See* Energy Connects (1 December 2023) *Explained: what is Alterra, the $30 billion fund launched at COP28?* ("The UAE on Friday announced the launch of Alterra, a groundbreaking US $30 billion investment fund for transformative climate partnerships at COP28, providing a major impetus to finance the energy transition on the second day of the UN climate summit. The launch of the investment vehicle is a "defining moment" in the history of global climate finance, said COP28 President Dr Sultan Al Jaber – who will also be the Board Chairman of Alterra.When was the fund announced? The creation of Alterra was announced at the opening of the World Climate Action Summit on the second day of COP28 on Friday.").

[622] Energy Connects (1 December 2023) *Explained: what is Alterra, the $30 billion fund launched at COP28?* ("The UAE on Friday announced the launch of Alterra, a groundbreaking US $30 billion investment fund for transformative climate partnerships at COP28, providing a major impetus to finance the energy transition on the second day of the UN climate summit.The launch of the investment vehicle is a "defining moment" in the history of global climate finance, said COP28 President Dr Sultan Al Jaber – who will also be the Board Chairman of Alterra.When was the fund announced?The creation of Alterra was announced at the opening of the World Climate Action Summit on the second day of COP28 on Friday. "I am pleased to announce the establishment of a $30 billion fund for global climate solutions. This fund is designed to bridge climate finance gap," President His Highness Sheikh Mohamed Bin Zayed Al Nahyan said in his address to the Summit."When we committed to hosting COP28, we pledged to bring the world together to unite, build and to deliver," he added.What is the concept of Alterra?As the largest of its kind investment vehicle, Alterra seeks to bridge the climate financing gap by raising and investing a corpus of up to $250 billion of institutional and private capital by 2030. In collaboration with BlackRock, Brookfield and TPG as the inaugural launch partners, Alterra has already committed $6.5 billion to climate-dedicated funds for global investments, including in the Global South, according to a COP28 statement. Alterra will work with an increasing number of global partners to mobilise capital from other institutional investors and global entities.").

[623] Bloom Philanthropies (2025) *Michael R. Bloomberg Launches Unprecedented End-to-End Global Methane Emissions Reduction Effort – From Space Detection to Rapid Response* ("Belém, Brazil, and New York, NY – UN Secretary-General's Special Envoy on Climate Ambition and Solutions Michael R. Bloomberg today announced a new $100 million investment to accelerate global efforts to cut methane emissions – one of the most potent greenhouse gases and air pollutants. The Bloomberg Philanthropies initiative will build on growing international momentum to tackle methane, which has more than 80 times the warming power of carbon dioxide. There is broad agreement across science, public health, business, and industry that reducing methane emissions is one of the fastest, most cost-effective, and high-impact levers to make real progress. The new initiative will aim to deliver immediate benefits by improving air quality and protecting public health, while reducing waste in the energy system, which costs companies money.

'We know how to measure methane, and we know how to stop it. What's needed now is the infrastructure to do it everywhere,' said Michael R. Bloomberg, UN Special Envoy on Climate Ambition and Solutions and founder of Bloomberg L.P. and Bloomberg Philanthropies. 'Cutting methane is one of the most powerful and cost-effective ways we can slow global warming this decade — and this investment helps build the system to deliver results, fast.'").

[624] International Energy Agency (2024) GLOBAL METHANE TRACKER 2024 ("Investors and insurers are also starting to establish methane performance requirements as a condition for future lending. This includes requests for improved disclosures to promote transparency on emissions reporting and underwriting standards that include methane reductions. For example, Chubb's insurance coverage is now contingent on clients adopting evidence-based plans to reduce methane emissions, while Barclays announced that starting from 2026, energy clients will be required to have 2030 methane emissions reduction targets and a commitment to end all routine venting and flaring by 2030."). *See also* Barclays, *Addressing Climate Change* (*last visited* 19 March 2024) "From January 2026, to access financing, energy clients will be required to have 2030 methane emissions reduction targets, a commitment to end all routine/non-essential venting and flaring by 2030, and near-term net-zero aligned Scope 1 and 2 emissions reduction targets. The energy clients unable or unwilling to reduce their emissions or play a role in the energy transition may find it increasingly difficult to access financing from Barclays.").

[625] (2025) *Re: Support for a strong and properly implemented EU Methane Regulation*, ("We, the undersigned investors representing more than EUR 4.85 trillion in assets globally, are writing to express strong support for the EU Methane Emissions Regulation (EU MER). We urge the European Commission, European Parliament, and all Member States to maintain and implement the Regulation as adopted – including its timeline and core provisions. The EU MER outlines sensible objectives with a phased approach to implementation, providing investors with valuable regulatory certainty. Reopening the regulation – via an omnibus or other process with unclear timing and scope – would introduce unpredictability and undermine companies and investors actively working toward compliance. What is needed now is consistency and clarity. The EU MER should not be reopened at this critical stage. As prudent fiduciaries, we recognise the economic and financial risks of climate change and the comprehensive response it demands. Reducing oil and gas methane emissions is one of the fastest, lowest-cost ways to limit near-term global warming. Legal compliance requirements like those included in the EU MER, supported by international frameworks such as the Oil and Gas Methane Partnership 2.0 (OGMP 2.0), have helped elevate methane to a strategic issue for company boards – helping mitigate key portfolio risks and support decarbonisation objectives. Strong mitigation of methane emissions, and accountability via robust measurement, reporting and verification – as required by the EU MER – also benefits the oil and gas industry and its financial stakeholders. Performance on methane is increasingly viewed as an indicator of the quality of management teams, operational excellence, process safety, and companies' long-term competitiveness. This recent progress should not be reversed. We believe the EU should continue to play a leadership role on this issue, leveraging its position as one of the largest importers of oil and gas globally. We strongly encourage the European Commission, European Parliament and all Member States to: • Avoid re-opening the EU MER via any upcoming omnibus initiatives and any potential legislative delays to the phase-in timeline. Legitimate challenges importers may face in meeting requirements can be addressed through Member State implementation – ensuring the overall timeline is maintained while allowing for flexibility as needed. • Ensure consistent implementation of the EU MER across competent authorities, to encourage predictability and clarity while preventing unequal competition through regulatory arbitrage, including: o Strict standards for country-level equivalencies for non-EU jurisdictions – third countries seeking equivalency determinations need to enact and enforce monitoring, reporting and verification requirements at least as rigorous as those required for domestic EU operations, or aligned with OGMP 2.0's Level 5 reporting; and o A practical gas tracing approach that preserves the regulation's integrity and intent, while maintaining market flexibility and minimising consumer impacts. In conclusion, we urge the European Commission, European Parliament and Member States to uphold the Regulation as adopted and focus on delivering timely, harmonised implementation.").

[626] Methane Finance Working Group, *About* (*last visited* 23 April 2026) ("Launched at COP28, the Working Group is a multi-stakeholder initiative with a mission to collaboratively create market-tested financing structures to drive capital toward methane and flaring reductions at scale across the oil and gas sector, in line with the IEA's net- zero scenarios.").

[627] Methane Finance Working Group, *About* (*last visited* 23 April 2026) ("The Working Group has developed robust, science-based technical Guidance that aligns with established market principles like those from the International Capital Market Association (ICMA). The Guidance provides clear pathways for debt structures such as Use of Proceeds instruments, where funds are dedicated to specific abatement projects, and KPI-linked

instruments, where financing terms are tied to achieving pre-defined emissions reduction targets."); ("The Working Group aims to broaden awareness among investors, banks, and oil and gas companies, especially national oil companies (NOCs), about the financial case and debt structuring opportunities for methane abatement. By fostering active participation from the financial industry and sharing our Guidance, we aim to facilitate the flow of capital toward projects that deliver real-world emission reductions."); ("Our goal is to enable methane and flaring reductions at a scale that significantly contributes to meeting global climate targets. We focus on solutions applicable across a diverse oil and gas value chain, including NOCs, international oil companies (IOCs), and independent producers (IPs), to help achieve the IEA's recommended 75% cut in oil and gas methane emissions by 2030.").

[628] *See generally* Methane Finance Working Group (June 2026) GUIDANCE FOR INCLUDING METHANE ABATEMENT IN OIL AND GAS DEBT STRUCTURING A PRODUCT OF THE METHANE FINANCE WORKING GROUP.

[629] Methane Finance Working Group (June 2026) GUIDANCE FOR INCLUDING METHANE ABATEMENT IN OIL AND GAS DEBT STRUCTURING A PRODUCT OF THE METHANE FINANCE WORKING GROUP, 2 ("The three main parts of this document—the Introduction, the Use of Proceeds Guidance, and the KPI-Linked Instruments Guidance—are designed to be read as related but self-contained sections.").

[630] Methane Finance Working Group (June 2026) GUIDANCE FOR INCLUDING METHANE ABATEMENT IN OIL AND GAS DEBT STRUCTURING A PRODUCT OF THE METHANE FINANCE WORKING GROUP, 15 ("GSSS markets have already been pivotal in encouraging the deployment of capital toward decarbonization efforts in many high-emitting sectors, including power generation, heavy industry, and infrastructure. The ICMA-administered GSSS Bond Principles and the Climate Transition Finance Handbook have helped lower greenwashing risks and provided assurance to investors through their recommendations for annual reporting, along with pre-issuance and post-issuance external verifications.29 This Guidance provides a technical basis for the inclusion of methane emissions abatement activities into existing recommendations from ICMA, taking past market successes and the specific challenges of this sector into account. By adapting thematic or labeled instruments to include specific features targeting flaring and methane emission reduction, the goal is for the market to move quickly to facilitate transactions that prioritize spending on methane abatement.").

[631] Methane Finance Working Group (June 2026) GUIDANCE FOR INCLUDING METHANE ABATEMENT IN OIL AND GAS DEBT STRUCTURING A PRODUCT OF THE METHANE FINANCE WORKING GROUP, 6 ("The framework focuses on short- to mid-term emissions reductions required by 2030 but also outlines considerations for longer-dated projects and maturities to allow flexibility for both capital seekers and capital providers. While it primarily aligns with ICMA GSSS bond guidance, the recommendations are also broadly applicable to private credit, project finance, and loans.").

[632] *See generally* Palacios L., Jain G., & Jenarthan P. (June 2025) *A Roadmap to Catalyze Methane Abatement in the Oil and Gas Sector Using Debt Financing Background Research to Support the Guidance for Including Methane Abatement in Oil and Gas Debt Structuring, Proposed by the Methane Finance Working Group*, CENTER ON GLOBAL ENERGY POLICY AT COLUMBIA UNIVERSITY.

[633] Palacios L., Jain G., & Jenarthan P. (June 2025) *A Roadmap to Catalyze Methane Abatement in the Oil and Gas Sector Using Debt Financing Background Research to Support the Guidance for Including Methane Abatement in Oil and Gas Debt Structuring, Proposed by the Methane Finance Working Group*, CENTER ON GLOBAL ENERGY POLICY AT COLUMBIA UNIVERSITY, 27 ("NOCs are state-owned enterprises that dominate the oil and gas landscape, collectively accounting for more than half of the world's oil and gas production and holding nearly 60 percent of global reserves.44 NOCs often align their capital allocation strategies with national priorities, such as enhancing energy security, creating jobs, and generating government revenue, which drives economic development, especially in emerging and frontier economies. The focus on broader economic development for low- and middle-income petrostates is a key differentiator from public companies, which tend to focus solely on profit maximization and shareholder value creation.45 NOCs as a group are quite heterogeneous, as they possess diverse financial structures and varying levels of creditworthiness, which influence their ability to access capital, including funding initiatives such as methane abatement or other low-carbon investments.46 Since many NOCs are major revenue generators for their governments, their financial health directly affects the sovereign's ability to access capital and service debt.47").

[634] Palacios L., Jain G., & Jenarthan P. (June 2025) *A Roadmap to Catalyze Methane Abatement in the Oil and Gas Sector Using Debt Financing Background Research to Support the Guidance for Including Methane Abatement in Oil and Gas Debt Structuring, Proposed by the Methane Finance Working Group*, CENTER ON

GLOBAL ENERGY POLICY AT COLUMBIA UNIVERSITY, 27 ("Given their large share of global oil and gas production and relatively slower progress on climate commitments than IOCs, NOCs need to play a pivotal role in reducing methane emissions. While NOCs have around $1 trillion in outstanding debt—double that of seven Western majors—and $3 trillion in public equity,48 they have issued a limited amount of sustainable debt, making methane abatement financing via thematic bonds a new option to consider for many.").

[635] Palacios L., Jain G., & Jenarthan P. (June 2025) *A Roadmap to Catalyze Methane Abatement in the Oil and Gas Sector Using Debt Financing Background Research to Support the Guidance for Including Methane Abatement in Oil and Gas Debt Structuring, Proposed by the Methane Finance Working Group*, CENTER ON GLOBAL ENERGY POLICY AT COLUMBIA UNIVERSITY, 31 ("Low incentives for NOCs in methane abatement projects: Some capital providers believe that for NOCs, even the possibility of issuing sustainable debt with a "greenium"—the ability to issue sustainable debt at a lower interest rate and, therefore, lower cost relative to conventional bonds of the same maturity—might not be su-cient to incentivize greater adoption of such instruments. They also shared that most of these NOCs have limited access to capital and technical resources, further compounded by competing sovereign-level priorities, which makes investing in methane abatement projects often a low priority for them. These investors believe that NOCs will likely require a monetary incentive to invest in methane abatement. By opening up multilateral nancing mechanisms to the oil and gas sector, NOCs would not only have greater access to the funds necessary to support methane abatement initiatives and their transition to a low-carbon economy but would also be able to raise their ambition further in reducing methane emissions more rapidly.").

[636] Palacios L., Jain G., & Jenarthan P. (June 2025) *A Roadmap to Catalyze Methane Abatement in the Oil and Gas Sector Using Debt Financing Background Research to Support the Guidance for Including Methane Abatement in Oil and Gas Debt Structuring, Proposed by the Methane Finance Working Group*, CENTER ON GLOBAL ENERGY POLICY AT COLUMBIA UNIVERSITY, 31 (". Reporting challenges of methane emissions complicate the use of thematic structures: Monitoring, measuring, and reporting methane emissions remain a challenge, which plays a part in how the KPIs are dened and nancial incentives are structured. Some investors suggested that one approach would be to start with simple structures: developing covenants linked to methane to be inserted into existing conventional bond structures, with other metrics, such as membership of OGMP 2.0, to further support methane reduction. (Chapter 4 of this working paper builds on this concept.) Another step could be to provide funding with technical assistance to abate methane. The structure should be a win-win for the capital seekers and providers, with simple guidelines and scalable solutions to help NOCs drive real impact."); 37 ("Similarly, one approach for NOCs could be for the petrostate to issue a UoP sovereign bond that pairs methane abatement initiatives with infrastructure projects, such as captured gas power generation, which can easily scale the size of the capital program. These transactions would benet from clear guardrails and assurances from methane abatement experts to ensure their scalability and success, which is the objective of the Guidance").

[637] Parry I. W. H., Black S., Minnett D. N., Mylonas V., & Vernon N. (2022) *How to Cut Methane Emissions*, INTERNATIONAL MONETARY FUND, 13 ("A policy scenario is considered, with a fee starting in 2024 at $10 per tonne of CO2e and increasing $10 per tonne each year to reach $70 per tonne by 2030. The scenario applies to the top 35 methane-emitting countries (henceforth "T35"). This includes the top 25 overall emitters plus an additional 5 large emitters (each for extractives and agriculture). T35 countries account for 85 percent of BAU global methane emissions in 2030. The scenario involves methane taxes for the extractive and agricultural sectors and a regulation that reduces landfill emissions (with a shadow price or incremental mitigation cost equal to $70 per tonne).").

[638] Parry I. W. H., Black S., Minnett D. N., Mylonas V., & Vernon N. (2022) *How to Cut Methane Emissions*, INTERNATIONAL MONETARY FUND, 13 ("A policy scenario is considered, with a fee starting in 2024 at $10 per tonne of CO2e and increasing $10 per tonne each year to reach $70 per tonne by 2030. The scenario applies to the top 35 methane-emitting countries (henceforth "T35"). This includes the top 25 overall emitters plus an additional 5 large emitters (each for extractives and agriculture). T35 countries account for 85 percent of BAU global methane emissions in 2030. The scenario involves methane taxes for the extractive and agricultural sectors and a regulation that reduces landfill emissions (with a shadow price or incremental mitigation cost equal to $70 per tonne).").

[639] European Parliament (13 December 2022) *Deal reached on new carbon leakage instrument to raise global climate ambition*, Press Release ("According to the deal reached, an EU Carbon Border Adjustment Mechanism (CBAM) will be set up to equalise the price of carbon paid for EU products operating under the EU Emissions Trading System (ETS) and the one for imported goods. This will be achieved by obliging companies that import into the EU to purchase so-called CBAM certificates to pay the difference between the carbon price paid in the

country of production and the price of carbon allowances in the EU ETS. The law will incentivise non-EU countries to increase their climate ambition and ensure that EU and global climate efforts are not undermined by production being relocated from the EU to countries with less ambitious policies.").

[640] Smirnov A. (6 September 2021) *Coal mine methane: a missed opportunity for EU's CBAM*, EURACTIV ("One of the many included proposals is the carbon border adjustment mechanism (CBAM), which seeks to prevent greenhouse gas emissions 'leaking' over the border by taxing carbon-intensive imports from regions with less stringent emissions policies. However, the CBAM applies mostly to carbon dioxide (CO2) emissions, excluding other climate-warming gases such as methane — a missed opportunity in the fight to address climate change.").

[641] XV BRICS Summit (23 August 2023) *Johannesburg II Declaration*, 19 ("We oppose trade barriers including those under the pretext of tackling climate change imposed by certain developed countries and reiterate our commitment to enhancing coordination on these issues. We underline that measures taken to tackle climate change and biodiversity loss must be WTO-consistent and must not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade and should not create unnecessary obstacles to international trade. Any such measure must be guided by the principle of common but differentiated responsibilities and respective capabilities (CBDR-RC), in the light of different national circumstances. We express our concern at any WTO inconsistent discriminatory measure that will distort international trade, risk new trade barriers and shift burden of addressing climate change and biodiversity loss to BRICS members and developing countries."). Work is underway to design effective border GHG adjustment mechanisms that could align global trade and climate change law and policy. *See generally* Dominioni G. & Esty D. C. (2023) *Designing Effective Border Carbon Adjustment Mechanisms: Aligning the Global Trade and Climate Change Regimes*, ARIZONA L. REV 65: 1–41.

[642] European Commission (29 September 2023) *Carbon Border Adjustment Mechanism (CBAM) starts to apply in its transitional phase* ("This Sunday, 1 October, the Carbon Border Adjustment Mechanism (CBAM) will enter into application in its transitional phase. CBAM is the EU's landmark tool to fight carbon leakage and one of the central pillars of the EU's ambitious Fit for 55 Agenda. It will equalise the price of carbon between domestic products and imports. This will ensure that the EU's climate policies are not undermined by production relocating to countries with less ambitious green standards or by the replacement of EU products by more carbon-intensive imports. CBAM is a WTO-compatible measure that encourages global industry to embrace greener and more sustainable technologies. In its transitional phase, CBAM will only apply to imports of **cement, iron and steel, aluminium, fertilisers, electricity and hydrogen. EU importers of these goods** will have to report on the volume of their imports and the greenhouse gas (GHG) emissions embedded during their production, but without paying any financial adjustment at this stage.") (emphasis in original). *See also* Sholli S. (2 October 2023) *EU carbon border tax enters transitional phase*, International Tax Review, KPMG.

[643] Clausing K., Garicano L., & Wolfram C. (2023) *How an international agreement on methane emissions can pave the way for enhanced global cooperation on climate change*, PETERSON INSTITUTE FOR INTERNATIONAL ECONOMICS. *See also* Salata Institute for Climate and Sustainability (2023) METHANE AND TRADE: *PAVING THE WAY FOR ENHANCED GLOBAL COOPERATION ON CLIMATE CHANGE*, Research Brief ("As a first step, the United States, the European Union, and partner countries can work to coordinate their methane reduction policies, with an eye toward the eventual imposition of border adjustments on imports from countries that fail to raise their standards. The Biden administration could work with Congress on next steps for implementing a US methane border adjustment, while simultaneously leading efforts with the European Union, the G7, and other potential coalition members to develop a framework for a multilateral agreement. Ideally, a proposed framework could be presented at the 28th Conference of the Parties to the UN Framework Convention on Climate Change (COP28) in Dubai in late 2023.").

[644] Council of Europe (15 November 2023) *Climate action: Council and Parliament reach deal on new rules to cut methane emissions in the energy sector* ("The Council and the Parliament agreed on three implementation phases. The first phase will focus on data collection and the creation of a methane emitters global monitoring tool and a super emitter rapid reaction mechanism. In the second and third phases, equivalent monitoring, reporting and verification measures should be applied by exporters to the EU by 1 January 2027, and maximum methane intensity values by 2030. The competent authorities of each member state will have the power to impose administrative penalties if these provisions are not respected.").

[645] Clausing K., Garicano L., & Wolfram C. (2023) *How an international agreement on methane emissions can pave the way for enhanced global cooperation on climate change*, PETERSON INSTITUTE FOR INTERNATIONAL ECONOMICS, 2 ("Building on these parallel approaches, this Policy Brief proposes transatlantic coordination that

uses an import charge as a lever to seek similarly ambitious regulatory reforms in the oil and gas sectors abroad. Specifically, oil and gas exporters can be encouraged to adopt regulations comparable to those in the United States and the European Union or, if they fail to implement regulations, pay a border adjustment fee on exports to the two jurisdictions. With time, most major energy importers would ideally join the coalition of countries cooperating on both stringent domestic regulations on oil and gas production (if applicable) and border adjustments on any dirty, nonregulating exporters."). The Inflation Reduction Act includes a Methane Emission Reduction Program that imposes a methane waste fee of up to $1,500 per ton of methane emitted by 2026, and raises royalty fees for oil and gas extracted from federal lands and waters, including fees on gas avoidably lost by emergency flaring or venting. *See* Inflation Reduction Act of 2022, Pub. L. No. 117-169 (2022) § 60112 ("(e) Charge Amount.--The amount of a charge under subsection (c) for an applicable facility shall be equal to the product obtained by multiplying—"(1) the number of metric tons of methane emissions reported pursuant to subpart W of part 98 of title 40, Code of Federal Regulations, for the applicable facility that exceed the applicable annual waste emissions threshold listed in subsection (f) during the previous reporting period; and "(2)(A) $900 for emissions reported for calendar year 2024; "(B) $1,200 for emissions reported for calendar year 2025; or "(C) $1,500 for emissions reported for calendar year 2026 and each year thereafter."). *See also* United States Senate (28 July 2022) *Summary of the Energy Security and Climate Change Investments in the Inflation Reduction Act of 2022*; *discussed in* Friedman L. & Plumer B. (28 July 2022) *Surprise Deal Would Be Most Ambitious Climate Action Undertaken by U.S.*, THE NEW YORK TIMES ("The bill would also crack down on leaks of methane, a powerful greenhouse gas, from oil and gas wells, pipelines and other infrastructure. By 2026, polluters would face a penalty of $1,500 per ton of methane that escaped into the atmosphere in excess of federal limits. The methane fee will raise $6.3 billion from the oil and gas industry over a decade, much of which will be reinvested in measures to help prevent methane leaks."); *and* Inflation Reduction Act of 2022, Pub. L. No. 117-169 (2022) §§ 50261–50263 ("For all leases issued after the date of enactment of this Act, except as provided in subsection (b), royalties paid for gas produced from Federal land and on the outer Continental Shelf shall be assessed on all gas produced, including all gas that is consumed or lost by venting, flaring, or negligent releases through any equipment during upstream operations.").

[646] Austin S. (1 November 2021) *Prime Minister Mottley: Closing of Gaps Required*, Barbados Government Information Service.

[647] Austin S. (1 November 2021) *Prime Minister Mottley: Closing of Gaps Required*, Barbados Government Information Service.

[648] *For example, see* the support provided by the Bahamas to the efforts of Prime Minister Mottley: Office of the Prime Minister of the Bahamas (2 October 2023) *Prime Minister Davis' Remarks at the Climate Finance in The Americas Meeting's Opening Session* ("First, we need to drive progress on managing risks to investing in climate action in developing countries. Where risk is real, we need to deploy at scale the risk reduction instruments – such as guarantees, insurance, and local currency hedging and financing – necessary to unlock capital. Where risk is perceived, we need to address the biases that hinder investment at scale, and the expectation of high financial returns when engaging on climate change Second, we need to drive progress on financing a just and equitable transition. We need to develop transparent transition plans that shift investment portfolios over time, and that enable ramp-ups in climate investments to the same extent as we see a phasing out of harmful investments. Third, we need to drive progress on managing the debt crisis. We need to develop a shared understanding of climate-fiscal-debt links and ensure no country builds up excessive debt because of climate action.").

[649] Prime Minister Motley (2 December 2023) *Barbados' National Statement at COP28* (video of Statement).

[650] COP28 (4 December 2023) *COP28 Finance Day unlocks innovative financial mechanisms to support vulnerable countries fight climate change*, Press Release ("Major international financial institutions and countries made new commitments to offer climate-resilient debt clauses (CRDCs) in their lending. These clauses allow debt service to be paused to provide breathing space when countries are hit by climate catastrophes. The UK, France, World Bank, Inter-American Development Bank (IDB), European Investment Bank (EIB), European Bank for Reconstruction and Development (EBRD) and African Development Bank (AfDB) made new commitments to expand CRDCs in their lending. In total 73 countries called on donors to expand the use of these clauses by 2025.").

[651] COP28 (4 December 2023) *COP28 Finance Day unlocks innovative financial mechanisms to support vulnerable countries fight climate change*, Press Release ("Major international financial institutions and countries made new commitments to offer climate-resilient debt clauses (CRDCs) in their lending. These clauses allow debt service to be paused to provide breathing space when countries are hit by climate catastrophes. The UK, France, World Bank, Inter-American Development Bank (IDB), European Investment Bank (EIB), European Bank for

Reconstruction and Development (EBRD) and African Development Bank (AfDB) made new commitments to expand CRDCs in their lending. In total 73 countries called on donors to expand the use of these clauses by 2025.").

[652] COP28 (4 December 2023) *COP28 Finance Day unlocks innovative financial mechanisms to support vulnerable countries fight climate change*, Press Release ("Throughout COP28 Finance day, other announcements included: … • The IDB announced it had already offered $1.2 billion of loans covered through CRDCs.").

[653] COP28 (4 December 2023) *COP28 Finance Day unlocks innovative financial mechanisms to support vulnerable countries fight climate change* ("Japan and France announced a commitment to support the African Development Bank's facility to leverage Special Drawing Rights (SDRs) for climate and development.").

[654] Office of the Prime Minister of Barbados (23 September 2022) *Urgent and Decisive Action Required for an Unprecedented Combination of Crises The 2022 Bridgetown Agenda for the Reform of the Global Financial Architecture*, Press Release.

[655] COP28 (2023) *UAE Leaders' Declaration on a Global Climate Finance Framework* ("Seizing the opportunity: Investing $5-7tn annually in greening the global economy by 2030 will be critical to achieving our shared climate goals. Our collective efforts to pursue the goals of the Paris Agreement present the opportunity to accelerate local, regional and global low-carbon, climate resilient, and nature-positive growth and inclusive economies, strengthening delivery of the Sustainable Development Goals(SDGs). We urge global leaders to seize this unprecedented economic opportunity for inclusive and shared prosperity so that no country has to choose between fighting poverty and fighting climate change. We need to build on flagship initiatives such as the Paris Pact for People and Planet (4P), Bridgetown Initiative, Accra Marrakesh Agenda, G20 New Delhi Leaders' Declaration, and African Leaders' Nairobi Declaration on Climate and Call to Action.".).

[656] COP28 (4 December 2023) *COP28 Finance Day unlocks innovative financial mechanisms to support vulnerable countries fight climate change*, Press Release ("This marks significant progress to reform the global climate finance architecture by making climate finance available, accessible, and affordable. This has been the central vision of the COP28 UAE Declaration on a Global Climate Finance Framework launched at the World Climate Action Summit at the beginning of COP28. … The Declaration is endorsed by India, France, Barbados, Kenya, Ghana, Germany, UK, USA, Senegal, and Colombia. It lays out defining principles for a climate finance architecture that delivers for all.").

[657] COP28 (2023) *UAE Leaders' Declaration on a Global Climate Finance Framework* ("3. Freeing up fiscal space for climate action: The international financial architecture, public and private, needs to be made fit for more frequent, profound shocks. This can be done through: wider use of climate-resilient debt clauses; consideration of debt-for-climate swaps; and sustainability linked bonds. Additional voluntary IMF Special Drawing Rights (SDRs) should be rechanneled, subject to national legal frameworks, including through the Resilience and Sustainability Trust. … 4. Widening the sources of concessional finance for climate action: Mitigating climate change and adapting and responding to climate impacts will require significant additional finance, including concessional finance. Laying the foundations for climate-smart growth in many geographies and sectors may not always offer returns compatible with private sector models. Efforts are needed to bridge these gaps, particularly for adaptation, which often requires non-debt financing. Innovative mechanisms to explore include: better use of hybrid capital; policy-based guarantees; portfolio guarantees of MDB loans; global philanthropy; re-channeling of inefficient subsidies; and emissions pricing and taxation mechanisms, as applicable and in line with national circumstances, and we note forthcoming initiatives in this regard. … 7. Building better, bigger, and more effective MDBs : Recognizing the Report of the G20 Independent Expert Group on Strengthening MDBs, the MDBs need to enhance operating models, improve responsiveness and accessibility, and increase financial capacity so that they can better address global challenges such as climate change. They need to work as a system, including through common country platforms, and collaborating with the multilateral funds to streamline access to finance, including local currency financing and making a difference in public adaptation finance.").

[658] COP28 (2023) *UAE Leaders' Declaration on a Global Climate Finance Framework* ("LIST OF COUNTRIES
Barbados
Federal Republic of Germany
French Republic
Ireland
Republic of the Philippines
Republic of Colombia

Republic of Ghana
Republic of Kenya
Republic of India
Republic of Senegal
United Arab Emirates
United Kingdom of Great Britain and Northern Ireland
United States of America".)

[659] (2024) *Statement of Methane Abatement Partnership Roadmap*, 1-2 ("The European Commission, with support from Canada, Germany, Italy, Japan, the United Kingdom, and the United States, as well as Carbon Limits, Clean Air Taskforce, Environmental Action Germany, Environmental Defense Fund, Environmental Investigation Agency, European Bank for Reconstruction and Development, Global Methane Hub, ICA Finance, International Energy Agency, Methane Matters Coalition, and the Organisation for Economic Co-operation and Development, present at the 29th UN Climate Change Conference (COP29), gathered under the presidency of the Government of Azerbaijan, launches the Methane Abatement Partnership Roadmap… We urgently call for collaboration among countries, both fossil fuel importers and exporters, to accelerate the reduction of methane emissions associated with fossil energy production and consumption, by collaborating and aiming to implement a Methane Abatement Partnership roadmap. The objective of this roadmap is to minimize emissions of methane throughout the oil and natural gas supply chain.").

[660] United Nations Framework Convention on Climate Change Secretariat (2024) *COP29 UN Climate Conference Agrees to Triple Finance to Developing Countries, Protecting Lives and Livelihoods* ("he UN Climate Change Conference (COP29) closed today with a new finance goal to help countries to protect their people and economies against climate disasters, and share in the vast benefits of the clean energy boom. With a central focus on climate finance, COP29 brought together nearly 200 countries in Baku, Azerbaijan, and reached a breakthrough agreement that will:

- Triple finance to developing countries, from the previous goal of USD 100 billion annually, to USD 300 billion annually by 2035.
- Secure efforts of all actors to work together to scale up finance to developing countries, from public and private sources, to the amount of USD 1.3 trillion per year by 2035.").

[661] Barbados Prime Minister Mia Mottley (2025) *Belém Climate Summit: Opening of the General Plenary of Leaders* ("…I have come here, however, this afternoon to speak on one issue, and that is methane. The scientists advise that this is the main way that we can not stall the increase in temperatures, but reverse the temperature increase that we have seen across the planet. The reality is that methane is more destructive, as we know, 80 times more destructive than carbon. And yet, we continue to see methane flowing in the atmosphere without significant actions to stop it. The good news is that while it is more destructive, it lasts only for 12 to 15 years in the atmosphere, while carbon lasts for centuries. We believe that the world must pull the methane brake. It is an emergency brake that can, in truth and in fact, buy us more time without having to solve the ideological differences that face the world geopolitically. It allows those who are involved, for example, in the oil and gas sector to be able to ensure that as they stop flaring gas, they stop burning cash. And as they start to fix the pipes, they stop losing money from the gas that is going through the leaky pipes. It is a win-win situation that speaks the love language of the oil and gas sector, while speaking the love language of those of us who want to save the planet…").

[662] Climate and Clean Air Coalition (*last visited* 16 December 2025) *CCAC Super Pollutant Country Action Accelerator* ("At COP30, the Climate and Clean Air Coalition launched the Super Pollutant Country Action Accelerator, a new 3-year, programme to help governments in ODA-eligible countries to drive deep and sustained reductions in super pollutant emissions.").

[663] (2025) STATEMENT: DRASTICALLY REDUCING METHANE EMISSIONS IN GLOBAL FOSSIL FUEL SECTOR ("Actions
We, the undersigned governments and international organisations, support the following actions to make methane reduction across the fossil fuel sector a defining pillar of global climate ambition:
1. Implement robust Measurement, Monitoring, Reporting, and Verification (MMRV), building on the Oil and Gas Methane Partnership 2.0 and based on best available science and economic technologies, considering independent forms of verification. Promote the publication of methane emission data where possible to enhance transparency and promote consistent and coherent practices to ensure interoperability of data across jurisdictions.
2. Collaborate around mitigation measures including effective use of market signals to accelerate methane emission reduction, eliminate routine flaring and venting, and reward producers who act quickly and transparently,

to achieve near zero methane intensity. Support low and middle-income producer countries with policy and technical capacity building, to reach near zero methane intensity.
3. Recognise the importance of effective methane policies and pursue efforts to near zero methane emission intensity in the Fossil Fuel Sector – including clear policies to end routine venting and flaring by 2030 and hold operators accountable. Integrate methane policies into the implementation of Nationally Determined Contributions or national climate strategies.
4. Support industry action, innovation, and investment including the adoption of best practices and performance goals in line with the Methane Abatement Partnerships Roadmap launched at COP29, our national goals and deliver on existing initiatives.
5. Strengthen partnerships and shared responsibility between producing and importing countries and knowledge transfer and capacity building. Work to establish collaborative mechanisms between the fossil fuel sector and technical experts to accelerate action.").
6. Establish a panel of governments from signatories to this statement, supported by existing structures, to work towards the development of near zero methane intensity marketplace to announce and report progress in 2026. This mechanism will turn our shared vision into practical action, the fastest and most effective way to reduce rising temperatures in the near term.").

[664] Global Methane Pledge (last visited 20 December 2025) About the Global Methane Pledge, (Albania, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Barbados, Belgium, Belize, Benin, Bosnia and Herzegovina, Brazil, Bulgaria, Burkina Faso, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, Colombia, Comoros, Democratic Republic of the Congo, Republic of the Congo, Cook Islands, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Estonia, Eswatini, Ethiopia, European Union, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guyana, Haiti, Honduras, Iceland, Indonesia, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Republic of Korea, Kosovo, Kuwait, Kyrgyzstan, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Malta, Marshall Islands, Mauritania, Mexico, Federated States of Micronesia, Moldova, Monaco, Mongolia, Montenegro, Morocco, Mozambique, Namibia, Nauru, Nepal, Netherlands, New Zealand, Niger, Nigeria, Niue, North Macedonia, Norway, Oman, Pakistan, Palau, Panama, Papua New Guinea, Peru, Philippines, Portugal, Qatar, Romania, Rwanda, Saint Kitts and Nevis, Saint Lucia, Samoa, San Marino, São Tomé and Príncipe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, Somalia, Spain, Sri Lanka, Sudan, Suriname, Sweden, Switzerland, Tajikistan, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkmenistan, Tuvalu, Ukraine, United Arab Emirates, United Kingdom of Great Britain and Northern Ireland, United States of America, Uruguay, Uzbekistan, Vanuatu, Vietnam, Yemen, and Zambia).

[665] United Nations Environment Programme (2025) GLOBAL METHANE STATUS REPORT, 58, 62 ("Since the GMP was established, there has been substantial growth in the inclusion of methane mitigation actions within NDCs. As of June 2025, 127 countries (65 per cent) list methane measures in their NDCs. Among these, 115 countries include waste methane measures (59 per cent), 85 include agricultural methane measures (44 per cent), and 35 (18 per cent) identify measures to cut fossil fuel methane. This represents increases of 58 per cent, 89 per cent, and 52 per cent respectively compared with pre-2020 NDCs. These results match broader NDC trends: the waste and agricultural sectors are more often addressed than the fossil-fuel sector. Many countries, however, do not produce fossil fuels, so measures in this sector are not relevant for them. This is discussed in more detail in Section 3.2.3.1. Since June (to 30 September 2025) an additional 42 countries have submitted their final or draft NDC 3.0. Increasing the number of countries including methane mitigation measures to 130 (67 per cent). An additional 4 countries include waste methane measures, however the number of countries including fossil fuel and agriculture methane measures has fallen by 4 and 1 respectively. This decline can be explained by a number of countries who have submitted drafts of their NDC 3.0, stating that additional details will be communicated in their final submission… As outlined in the previous sections, many countries include action to reduce methane in their NDCs as part of their overall climate targets. The magnitude of methane emissions to be reduced is, however, often unclear or not specified. Methane-specific targets, building block three, should clearly stipulate how much methane a country intends to reduce. Despite more than 150 countries participating in the GMP, only six have defined methane reduction targets directly comparable with the GMP targets, i.e., reductions by 2030 relative to 2020. A number of countries have established methane-relevant targets within their NDCs, though these vary in clarity and ambition. The majority, 181, of countries who are Parties to the Paris Agreement include methane within their overall greenhouse gas targets, an increase of more than 20 per cent compared with pre-2020 NDCs.").

[666] (2024) *Statement of Methane Abatement Partnership Roadmap*, 1-2 ("The European Commission, with support from Canada, Germany, Italy, Japan, the United Kingdom, and the United States, as well as Carbon Limits, Clean

Air Taskforce, Environmental Action Germany, Environmental Defense Fund, Environmental Investigation Agency, European Bank for Reconstruction and Development, Global Methane Hub, ICA Finance, International Energy Agency, Methane Matters Coalition, and the Organisation for Economic Co-operation and Development, present at the 29th UN Climate Change Conference (COP29), gathered under the presidency of the Government of Azerbaijan, launches the Methane Abatement Partnership Roadmap… We urgently call for collaboration among countries, both fossil fuel importers and exporters, to accelerate the reduction of methane emissions associated with fossil energy production and consumption, by collaborating and aiming to implement a Methane Abatement Partnership roadmap. The objective of this roadmap is to minimize emissions of methane throughout the oil and natural gas supply chain."); (2025) STATEMENT: DRASTICALLY REDUCING METHANE EMISSIONS IN GLOBAL FOSSIL FUEL SECTOR ("Actions
We, the undersigned governments and international organisations, support the following actions to make methane reduction across the fossil fuel sector a defining pillar of global climate ambition:
1. Implement robust Measurement, Monitoring, Reporting, and Verification (MMRV), building on the Oil and Gas Methane Partnership 2.0 and based on best available science and economic technologies, considering independent forms of verification. Promote the publication of methane emission data where possible to enhance transparency and promote consistent and coherent practices to ensure interoperability of data across jurisdictions.
2. Collaborate around mitigation measures including effective use of market signals to accelerate methane emission reduction, eliminate routine flaring and venting, and reward producers who act quickly and transparently, to achieve near zero methane intensity. Support low and middle-income producer countries with policy and technical capacity building, to reach near zero methane intensity.
3. Recognise the importance of effective methane policies and pursue efforts to near zero methane emission intensity in the Fossil Fuel Sector – including clear policies to end routine venting and flaring by 2030 and hold operators accountable. Integrate methane policies into the implementation of Nationally Determined Contributions or national climate strategies.
4. Support industry action, innovation, and investment including the adoption of best practices and performance goals in line with the Methane Abatement Partnerships Roadmap launched at COP29, our national goals and deliver on existing initiatives.
5. Strengthen partnerships and shared responsibility between producing and importing countries and knowledge transfer and capacity building. Work to establish collaborative mechanisms between the fossil fuel sector and technical experts to accelerate action.").

[667] United States Department of State (2 December 2023) *Accelerating Fast Mitigation: Summit on Methane and Non-CO2 Greenhouse Gases,* Fact Sheet ("*The United States, People's Republic of China, and United Arab Emirates today convened a Summit to accelerate actions to cut methane and other non-CO2 greenhouse gases as the fastest way to reduce near-term warming and keep a goal of limiting global average temperature increase to 1.5 degrees Celsius within reach.").*

[668] United Nations Framework Convention on Climate Change (2023) *Draft decision -/CMA.5 Outcome of the first global stocktake* ("Further recognizes the need for deep, rapid and sustained reductions in greenhouse gas emissions in line with 1.5 °C pathways and calls on Parties to contribute to the following global efforts, in a nationally determined manner, taking into account the Paris Agreement and their different national circumstances, pathways and approaches").

[669] Prime Minister of Barbados Mia Mottley (2025) *This is another 'ozone layer' moment. Now, we must urgently target methane* ("The European Commission helped launch the global methane pledge at Glasgow's Cop26 in 2021, where today it and 159 other countries are supporting emission cuts of 30% by 2030 from 2020 levels. However, this is voluntary, and the UN has reported that current measures, even if fully implemented, would only reduce emissions by 8% by 2030 from 2020 levels. The urgency of the climate demands mandatory measures.").

[670] *See generally* (3 December 2021) *Methane matters*, Editorial, NAT. GEOSCI. 14: 875. *See also* Lenton T. M., Rockstrom J., Gaffney O., Rahmstorf S., Richardson K., Steffen W., & Schellnhuber H. J. (2019) *Climate tipping points—too risky to bet against*, Comment, NATURE 575(7784): 592–595, 594 ("In our view, the clearest emergency would be if we were approaching a global cascade of tipping points that led to a new, less habitable, 'hothouse' climate state[11]. Interactions could happen through ocean and atmospheric circulation or through feedbacks that increase greenhouse-gas levels and global temperature. Alternatively, strong cloud feedbacks could cause a global tipping point[12,13].We argue that cascading effects might be common.. … If damaging tipping cascades can occur and a global tipping point cannot be ruled out, then this is an existential threat to civilization. No amount of economic cost–benefit analysis is going to help us. We need to change our approach to the climate problem. … In our view, the evidence from tipping points alone suggests that we are in a state of planetary emergency: both the risk and urgency of the situation are acute…."); *and* Steffen W., *et al*. (2018) *Trajectories of*

the Earth System in the Anthropocene, PROC. NAT'L. ACAD. SCI. 115(33): 8252–8259, 8254 ("This analysis implies that, even if the Paris Accord target of a 1.5 °C to 2.0 °C rise in temperature is met, we cannot exclude the risk that a cascade of feedbacks could push the Earth System irreversibly onto a "Hothouse Earth" pathway. The challenge that humanity faces is to create a "Stabilized Earth" pathway that steers the Earth System away from its current trajectory toward the threshold beyond which is Hothouse Earth (Fig. 2). The human-created Stabilized Earth pathway leads to a basin of attraction that is not likely to exist in the Earth System's stability landscape without human stewardship to create and maintain it.").

[671] *See, e.g.*, Volcovici V. (27 November 2023) *COP28 climate summit puts spotlight on turning methane pledges into action*, REUTERS ("'If it's just a pledge, it will land with a thump,' said Rachel Kyte, the World Bank's former climate envoy. 'The UAE needs to commit companies and countries to sit down and negotiate a binding agreement to x-out methane' and 'there are a lot of pieces coming together,' said Durwood Zaelke, president of the Institute for Governance and Sustainable Development, a Washington, D.C.-based think tank. 'With major emitters like the U.S., China and EU announcing new rules, the time is right for an agreement.'"). *See also* International Chamber of Commerce (23 November 2023) *Strengthening the Global Methane Pledge to keep 1.5 °C within reach* ("While businesses across our network are firmly committed to reducing methane emissions, clear policy signals from governments – backed by strong accountability measures within the GMP framework – are urgently needed to scale-up the mitigation efforts that are ultimately required by the end of this decade."); Climate & Clean Air Coalition (9 December 2023) *Ministers Unite for Immediate Action on Climate and Clean Air, Urging Bold Financing and Swift Measures on Non-CO2 Super Pollutant Greenhouse Gases* ("As CCAC High-level Advocate for Finance Rachel Kyte, who moderated the session, said in her closing: "It's 2023. With peak oil, peak coal, and peak emissions, we are also 'peak-pledge'." This Coalition has proven to turn ambition into action, it set out as the Coalition of the Working."); Clausing K., Garicano L., & Wolfram C. (2023) *How an international agreement on methane emissions can pave the way for enhanced global cooperation on climate change*, Peterson Institute for International Economics, 2 ("Under the IRA, the United States has for the first time implemented a methane emissions fee as a backstop to new methane regulations in the oil and gas sectors. The European Union is also implementing new methane regulations on fossil energy, and the European Parliament proposal would penalize imports from countries that do not meet certain regulatory standards. Building on these parallel approaches, this Policy Brief proposes transatlantic coordination that uses an import charge as a lever to seek similarly ambitious regulatory reforms in the oil and gas sectors abroad. Specifically, oil and gas exporters can be encouraged to adopt regulations comparable to those in the United States and the European Union or, if they fail to implement regulations, pay a border adjustment fee on exports to the two jurisdictions. With time, most major energy importers would ideally join the coalition of countries cooperating on both stringent domestic regulations on oil and gas production (if applicable) and border adjustments on any dirty, nonregulating exporters."); *and* Salata Institute for Climate and Sustainability (2023) RESEARCH BRIEF*: METHANE AND TRADE: PAVING THE WAY FOR ENHANCED GLOBAL COOPERATION ON CLIMATE CHANGE* ("As a first step, the United States, the European Union, and partner countries can work to coordinate their methane reduction policies, with an eye toward the eventual imposition of border adjustments on imports from countries that fail to raise their standards. The Biden administration could work with Congress on next steps for implementing a US methane border adjustment, while simultaneously leading efforts with the European Union, the G7, and other potential coalition members to develop a framework for a multilateral agreement. Ideally, a proposed framework could be presented at the 28th Conference of the Parties to the UN Framework Convention on Climate Change (COP28) in Dubai in late 2023.").

[672] United States Department of State (11 October 2021) *Joint U.S.-EU Statement on the Global Methane Pledge*, Press Release ("Successful implementation of the Pledge would reduce warming by at least 0.2 degrees Celsius by 2050."). It would also keep the planet on a pathway consistent with staying within 1.5 °C. *See* United Nations Environment Programme & Climate & Clean Air Coalition (2021) *Briefing on the Global Methane Pledge* ("The Global Methane Pledge is a strong first step as the first-ever Heads-of State global commitment to cut methane emissions at a level consistent with a 1.5 C pathway.").

[673] (16 September 1987) Montreal Protocol on Substances that Deplete the Ozone Layer, 26 I.L.M. 1541 (entered into force 1 January 1989). For a discussion of the Montreal Protocol on Substances that Deplete the Ozone Layer, *see generally* Miller A. S., Zaelke D., & Andersen S. O. (2021) Resetting Our Future: *Cut Super Climate Pollutants Now! The ozone treaty's urgent lessons for speeding up climate action*, John Hunt Publishing; *and* Andersen S., Zaelke D., Taddonio K., Ferris R., & Sherman N. (2021) *Ozone Layer, International Protection*, *in* Max Planck Encyclopedia of Public International Law, Oxford University Press, Peters A., & Wolfrum R. (eds.).

[674] Weiss E. B. (2009) *Introductory Note on the Vienna Convention for the Protection of the Ozone Layer and Montreal Protocol on Substances that Deplete the Ozone Layer*, United Nations Audiovisual Library of International Law ("A working group under UNEP began negotiations on a protocol, and the Montreal Protocol

was concluded in September, 1987, only nine months after the formal diplomatic negotiations opened in December, 1986. It went into effect on January 1, 1989.").

[675] Velders G. J. M., Andersen S. O., Daniel J. S., Fahey D. W., & McFarland M. (2007) *The importance of the Montreal Protocol in protecting climate*, PROC. NAT'L. ACAD. SCI. 104(12): 4814–4819, 4814 ("The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer is a landmark agreement that has successfully reduced the global production, consumption, and emissions of ozone-depleting substances (ODSs). ODSs are also greenhouse gases that contribute to the radiative forcing of climate change. Using historical ODSs emissions and scenarios of potential emissions, we show that the ODS contribution to radiative forcing most likely would have been much larger if the ODS link to stratospheric ozone depletion had not been recognized in 1974 and followed by a series of regulations. The climate protection already achieved by the Montreal Protocol alone is far larger than the reduction target of the first commitment period of the Kyoto Protocol. Additional climate benefits that are significant compared with the Kyoto Protocol reduction target could be achieved by actions under the Montreal Protocol, by managing the emissions of substitute fluorocarbon gases and/or implementing alternative gases with lower global warming potentials.").

[676] Young P. J., Harper A. B., Huntingford C., Paul N. D., Morgenstern O., Newman P. A., Oman L. D., Madronich S., & Garcia R. R. (2021) *The Montreal Protocol protects the terrestrial carbon sink*, NATURE 596: 384–388, 384 ("Overall, at the end of the century, worldAvd warms by an additional 2.5 K (2.4–2.7 K) above the RCP 6.0 baseline in worldProj. Of this warming, 1.7 K comes from the previously explored[19] additional radiative forcing due to the higher CFC concentrations in worldProj. Newly quantified here is the additional warming of global-mean air temperature of 0.85 K (0.65–1.0 K)—half as much again—that arises from the higher atmospheric CO_2 concentrations due to the damaging effect of UV radiation on terrestrial carbon stores.").

[677] Scientific Advisory Panel (2026) *Methane & Air Quality: Addressing Methane Emissions in the Gothenburg Protocol*, CLIMATE & CLEAN AIR COALITION, 1 ("Formally recognising the Global Methane Pledge's (GMP) collective goal of reducing global methane emissions by at least 30% from 2020 levels by 2030 within the Gothenburg Protocol could help harden the commitment. Parties could also go beyond the GMP goal by suggesting a more ambitious collective emission reduction target beyond 2030. Such a collective goal should consider the choice of base and target years, but also ensure consistency with the GMP.").

[678] Scientific Advisory Panel (2026) *Methane & Air Quality: Addressing Methane Emissions in the Gothenburg Protocol*, CLIMATE & CLEAN AIR COALITION, 4 ("Linked to recognition of the GMP, Parties have expressed some support for a collective goal on methane: the December 2025 EB meeting invited its Working Group on Strategies and Review to consider the proposal for setting a UNECE-specic collective aspirational goal for methane. In developing such a collective goal, consideration should be given to the choice of base and target years, and to ensuring consistency with the GMP. The timeline of the UNECE goal should go beyond the Pledge's goal and extend to 2035 or 2040."); 9 ("The various options outlined in the preceding sections could – and in some cases should – be combined. First, substantive commitments, such as emission reduction targets, and monitoring and reporting requirements can be important complements, with the latter offering an opportunity to demonstrate progress towards the achievement of the former. To the extent that substantive commitments are voluntary, moreover, the 'hardening' of monitoring and reporting provisions (i.e., making them mandatory) can help to build trust between Parties and strengthen accountability. Second, although methane-specic amendments can be made, it is sensible to combine them with revisions related to other pollutants where there are clear synergies (e.g., addressing ammonia and methane emissions from agricultural sources).").

[679] Velders G. J. M., Andersen S. O., Daniel J. S., Fahey D. W., & McFarland M. (2007) *The importance of the Montreal Protocol in protecting climate*, PROC. NAT. ACAD. SCI. 104(12): 4814–4819, 4816 ("In contrast, without the early warning of the effects of CFCs (MR74 scenario), estimated ODS emissions would have reached 24–76 $GtCO_2$-eq yr^{-1} in 2010. Thus, in the current decade, in a world without ODS restrictions, annual ODS emissions using only the GWP metric could be as important for climate forcing as those of CO_2.").

[680] Xu Y., Zaelke D., Velders G. J. M., & Ramanathan V. (2013) *The role of HFCs in mitigating 21st century climate change*, ATMOS. CHEM. PHYS. 13(12): 6083–6089, 6083 ("Here we show that avoiding production and use of high-GWP (global warming potential) HFCs by using technologically feasible low-GWP substitutes to meet the increasing global demand can avoid as much as another 0.5 ºC warming by the end of the century. This combined mitigation on SLCPs would cut the cumulative warming since 2005 by 50% at 2050 and by 60% at 2100 from the CO_2-only mitigation scenarios, significantly reducing the rate of warming and lowering the probability of exceeding the 2 ºC warming threshold during this century."). For an updated assessment of HFC mitigation from policy adopted in the lead-up to the Kigali Amendment and locked-in with the entry into force of

the Kigali Amendment, *see* Velders G. J. M., Daniel J. S., Montzka S. A., Vimont I., Rigby M., Krummel P. B., Muhle J., O'Doherty S., Prinn R. G., Weiss R. F., & Young D. (2022) *Projections of hydrofluorocarbon (HFC) emissions and the resulting global warming based on recent trends in observed abundances and current policies*, ATMOS. CHEM. PHYS. 22(9): 6087–6101, 6099 ("Projected mixing ratios, radiative forcing, and globally averaged temperature changes are calculated from the projected HFC emissions. The 2050 radiative forcing is 0.13 –0.18 Wm^{-2} in the current policies K-I scenario and drops to 0.08–0.09 Wm^{-2} when the additional Kigali Amendment controls are considered (in KA-2022). In the current policies K-I scenario, the HFCs are projected to contribute 0.14–0.31 °C to the global surface warming in 2100, compared to 0.28–0.44 °C without policies. Following the Kigali Amendment, the surface warming of HFCs is reduced to about 0.05 °C in 2050 and 0.04 °C in 2100 (KA-2022. In a hypothetical scenario with a full phaseout of HFCs production and consumption in 2023, the contribution is reduced to about 0.01 °C in 2100."). *See also* World Meteorological Organization, United Nations Environment Programme, National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration, & European Commission (2022) SCIENTIFIC ASSESSMENT OF OZONE DEPLETION: 2022, Global Ozone Research and Monitoring Project–Report No. 278, WMO, 3 ("Compliance with the 2016 Kigali Amendment to the Montreal Protocol, which requires phase down of production and consumption of some hydrofluorocarbons (HFCs), is estimated to avoid 0.3–0.5 °C of warming by 2100. This estimate does not include contributions from HFC-23 emissions.").

[681] (16 September 1987) Montreal Protocol on Substances that Deplete the Ozone Layer, 26 I.L.M. 1541 (entered into force 1 January 1989). For a discussion of the Montreal Protocol on Substances that Deplete the Ozone Layer, *see generally* Miller A. S., Zaelke D., & Andersen S. O. (2021) RESETTING OUR FUTURE: *CUT SUPER CLIMATE POLLUTANTS NOW! THE OZONE TREATY'S URGENT LESSONS FOR SPEEDING UP CLIMATE ACTION*, John Hunt Publishing; *and* Andersen S., Zaelke D., Taddonio K., Ferris R., & Sherman N. (2021) *Ozone Layer, International Protection*, *in* MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, Oxford University Press, Peters A. & Wolfrum R. (eds.). *See also* Zaelke, D., Bledsoe P., Dreyfus G. (9 November 2022) *COP27: A global methane agreement can prevent climate catastrophe*, THE HILL; *and* Zaelke D. & Murphy A. (16 December 2022) *A global methane agreement can prevent climate chaos*, ONE EARTH.

[682] Rwanda's Minister of Environment, Dr Bernadette Arakwiye (20 June 2026) *CCAC Strategy Board Meeting | High Level Super Pollutant Retreat Remarks by Minister of Environment Dr Bernadette Arakwiye*, speech ("The story of Kigali reminds us that what may seem politically impossible today can become politically inevitable tomorrow when countries come together with determination and a shared vision. As we look to the future, may the success of the Kigali Amendment inspire us once again. May it encourage this Coalition also to explore how the lessons of Kigali can help us tackle methane emissions, one of the greatest remaining opportunities to slow near-term warming including through a multilateral agreement on mandatory sectorial methane mitigation The world needed a Kigali moment ten years ago. The world needs that same spirit of ambition today.").

[683] (16 September 1987) Montreal Protocol on Substances that Deplete the Ozone Layer, 26 I.L.M. 1541 (entered into force 1 January 1989). *See also* United Nations General Assembly (1992) REPORT OF THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT (Rio Declaration on Environment and Development), A/CONF.151/26 (Vol. I), Principle 7 ("States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command."); *and* (9 May 1992) United Nations Framework Convention on Climate Change, 1771 U.N.T.S. 107, 31 I.L.M. 849, Art. 3(1) ("The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof.").

[684] (16 September 1987) Montreal Protocol on Substances that Deplete the Ozone Layer, 26 I.L.M. 1541 (entered into force 1 January 1989).

[685] Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (1990) Decision II/8: Financial Mechanism. *See also* Miller A. S., Zaelke D., & Andersen S. O. (2021) RESETTING OUR FUTURE: *CUT SUPER CLIMATE POLLUTANTS NOW! THE OZONE TREATY'S URGENT LESSONS FOR SPEEDING UP CLIMATE ACTION*, John Hunt Publishing, 83 ("The Multilateral Fund is replenished every three years by the developed countries, most recently at around $550 million. The fund has been extremely cost-effective. Considering only the climate benefits, the Multilateral Fund has reduced CO_2 at a cost of less than $0.10 a ton.").

[686] United Nations Environment Programme, *National Ozone Officers' Capacity Building* (*last visited* 20 December 2025) ("Since 1991, UN Environment OzonAction has devoted itself to supporting and strengthening National Ozone Units in all 147 developing countries. The Compliance Assistance Programme (CAP) uses a participatory approach that draws on the experience of numerous NOOs, guidance from international agencies and individual experts. UN Environment promotes learning and skill growth through sharing the collective wisdom of the wider community of Ozone Officers who are leading National Ozone Units.").

[687] United Nations Environment ProgrammeOzone Secretariat, *Scientific Assessment Panel (SAP)* (*last visited* 5 February 2023) ("The Scientific Assessment Panel (SAP) assesses the status of the depletion of the ozone layer and relevant atmospheric science issues. Pursuant to Article 6 of the Montreal Protocol on Substances that Deplete the Ozone Layer, a report is prepared every three or four years by the SAP which consists of hundreds of top scientists from around the world.").

[688] Parson E. (2006) *Chapter 11: Ground for Hope: Assessing Technological Options to Manage Ozone Depletion*, *in* ASSESSMENTS OF REGIONAL AND GLOBAL ENVIRONMENTAL RISKS: DESIGNING PROCESSES FOR THE EFFECTIVE USE OF SCIENCE IN DECISIONMAKING, Resources for the Future, Farrell A. & Jager J. (eds.), 231 ("A series of design decisions made in these initial consultations were decisive for the subsequent effectiveness of the panels. Most importantly, organizational decisions made in the interests of fast work had the effect of substantially reducing the political control over the panels from what was originally envisioned in Protocol negotiations. Rather than authorizing a political body to supervise and integrate the work ... each of these four gro ups operated with substantial independence under its chair."). *See also* Kuijpers L., Tope H., Banks J., Brunner W., & Woodcock A. (1998) *Scientific Objectivity, Industrial Integrity, and the TEAP Process*, *in* PROTECTING THE OZONE LAYER: LESSONS, MODELS, AND PROSPECTS, Springer, Le Prestre P. G., Reid J. D., & Morehouse E. T. (eds.), 167 ("The principles of scientific objectivity and industrial integrity are critical to the TEAP's ability to provide useful policy-relevant, technical information to the Parties to the Montreal Protocol. … Reports are developed through a consensus approach and this leads to the quality technical data on which the parties can rely. … In many cases members are drawn from industry with direct experience in the use of ODS and their alternatives. It is important to have individuals with the integrity to remain independent despite the funding they receive from their sponsoring organisations or companies.").

[689] Methane is the last remaining major ozone precursor not explicitly controlled under the Gothenburg Protocol, as currently amended.