THE LANDSCAPE OF INTERNATIONAL COOPERATION FOR METHANE MITIGATION

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Harvard Initiative on Reducing Global Methane Emissions

The Harvard Initiative on Reducing Global Methane Emissions — a Research Cluster of the Salata Institute for Climate and Sustainability at Harvard University — seeks meaningful and sustained progress in global methane-emissions reductions through research and effective engagement with government policymakers — and with key stakeholders in business, nongovernmental organizations, and international institutions. Methane-emissions abatement can, in the near term, significantly reduce the magnitude of climate change and its impacts — giving the world time to "bend the curve" on CO_2 emissions, conduct research on carbon removal, and, more generally, to implement longer-term strategies to mitigate and adapt to climate change.

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The Harvard Initiative on Reducing Global Methane Emissions is one of seven University-wide, multi-disciplinary research clusters inspired and supported by the Salata Institute. Other clusters address corporate net-zero targets, adaptation in South Asia, adaptation in the Gulf of Guinea, urban mobility, sustainable building, and approaches to strengthening communities in the United States that have been adversely affected by the energy transition.

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Abstract

Methane is responsible for roughly one-third of observed warming since the pre-industrial era and offers one of the most effective opportunities for near-term climate mitigation. In recent years, governments, international organizations, industry coalitions, and civil society have launched a rapidly growing number of initiatives to reduce methane emissions across the energy, agriculture, and waste sectors. Yet the proliferation of these efforts raises a central question: does the expanding ecosystem of international methane cooperation form a coherent system capable of delivering meaningful emissions reductions?

This paper reviews the evolution of international methane initiatives. It introduces a functional framework for analyzing their roles in the emerging global methane mitigation landscape, with the primary functions being commitments, standard-setting and certification, policy support, data provision, and funding and finance. Applying this framework to 44 international initiatives highlights both strengths and gaps in the current system. While political attention, scientific capability, and institutional activity around methane have expanded significantly, the landscape remains fragmented, with uneven sectoral coverage, and overlapping mandates. The analysis suggests that the key challenge for international methane cooperation is not the absence of initiatives but the need to coordinate existing institutions better and align them around credible, measurement-informed emissions reductions.

1. Introduction

Methane (CH_4) is the second most significant greenhouse gas after carbon dioxide (CO_2), responsible for roughly one-third of the warming observed since pre-industrial times. Unlike CO_2, which persists in the atmosphere for centuries, methane remains in the atmosphere for only about a decade. This shorter atmospheric lifetime, combined with its exceptionally strong absorption properties, gives methane a far greater near-term warming impact relative to carbon dioxide.[1]

The Intergovernmental Panel on Climate Change (IPCC) captures this dynamic through the Global Warming Potential (GWP) metric, which enables comparisons of climate impacts of different greenhouse gases. According to the IPCC's Sixth Assessment Report (IPCC, 2021, 2022, 2023), a single molecule of methane has the same climate impact as ~30 molecules of CO_2 over a 100-year time horizon, and ~83 molecules of CO_2 over 20 years.[2] For policymakers, this means that cutting methane emissions is one of the most effective strategies for rapidly slowing warming over the next one to two decades (Collins *et al.*, 2018; IPCC, 2018).

1 Based on the Global Warming Potential (GWP), defined as the cumulative radiative forcing (heat trapping) of a greenhouse gas over a given time horizon (e.g., 100-years) divided by the cumulative radiative forcing of carbon dioxide over that same time horizon. See Footnote 2 below as well.

2 Note the GWP described here encapsulates CO_2-equivalency (CO_2e) based on *physical* and *chemical* properties of greenhouse gases. From an economic perspective, the appropriate CO_2e to use is the ratio of the Social Cost of Carbon to the Social Cost of Methane, i.e., the ratio of the present discounted values of two infinite streams of current and future damages. For methane, this results in a value quite close to the conventional 100-year equivalence. There are many additional climate metrics beyond those discussed here (e.g., see Mallapragada and Mignone, 2020).

Over the past decade, rapid advances in methane science, notably in remote sensing, combined with sustained advocacy from civil society, have helped elevate methane mitigation to a central priority in global climate policy (Olczak *et al.*, 2023). Governments, multilateral institutions, and non-state international partnerships are now mobilizing around methane reduction, accelerating efforts across the three sectors responsible for the majority of human-caused methane emissions:[3] energy, agriculture, and waste, contributing approximately 20%, 42%, and 38% of global emissions, respectively (United Nations Environment Programme, 2025). As these efforts have expanded, the international methane landscape has become increasingly complex, with a growing number of institutions, partnerships, and initiatives operating across overlapping domains. For policymakers and practitioners, understanding how these actors relate to one another and how their roles collectively contribute to effective mitigation has become difficult. This proliferation raises an important question: whether the growing ecosystem of methane initiatives constitutes a coherent system capable of delivering measurable emissions reductions, or whether fragmentation risks diluting impact.

This paper provides an overview of international cooperative efforts focused on reducing methane emissions across major human-caused emitting sectors. The rapid expansion of methane initiatives has produced a complex institutional ecosystem in which multiple organizations operate across overlapping domains. In such a landscape, clearly defined functional roles and responsibilities among initiatives become increasingly important to avoid duplication of effort and to ensure that different actors contribute complementary capabilities to the broader mitigation effort. Rather than simply cataloguing initiatives, this paper introduces a functional framework to organize the roles of different institutions in the international methane mitigation landscape. By classifying initiatives by their dominant functions (commitments, standard-setting and certification, policy support, data provision, and funding and finance), this framework clarifies how initiatives relate to one another and where gaps or overlaps may emerge.

Drawing on a model used to map the voluntary oil- and gas-initiative landscape (Isidoro *et al.*, 2023), we highlight illustrative examples of international collaboration and catalog a broader set of initiatives in our online Supplementary Material. We have limited our scope to initiatives that involve international cooperation among governments, NGOs, civil society, and/or industry. We do not include domestic policies, which are well documented elsewhere (e.g., Olczak *et al.*, 2023),[4] nor, for the most part, international initiatives carried out by individual NGOs, governments, or companies.[5]

3 Here, energy is inclusive of emissions from across the value chains of coal, oil, and gas. Agricultural emissions arise from ruminants (livestock), manure management, and rice production, primarily. The waste sector includes emissions from wastewater and degradation of organic material in landfills.

4 Here, "domestic policies" includes policies of the European Union (EU); thus, the EU Methane Rule (EUMR) is out of scope.

5 For the purposes of this paper, we only include non-governmental organizations (NGOs) or business and industry NGOs (BINGOs) and trade organizations if their membership includes entities from multiple countries. Thus, important individual methane-relevant NGOs such as the Clean Air Task Force (CATF), Rocky Mountain Institute (RMI) and Carbon Mapper are excluded, as are influential national-level BINGOs, such as the American Petroleum Institute's (API) Environmental Partnership.

Figure 1

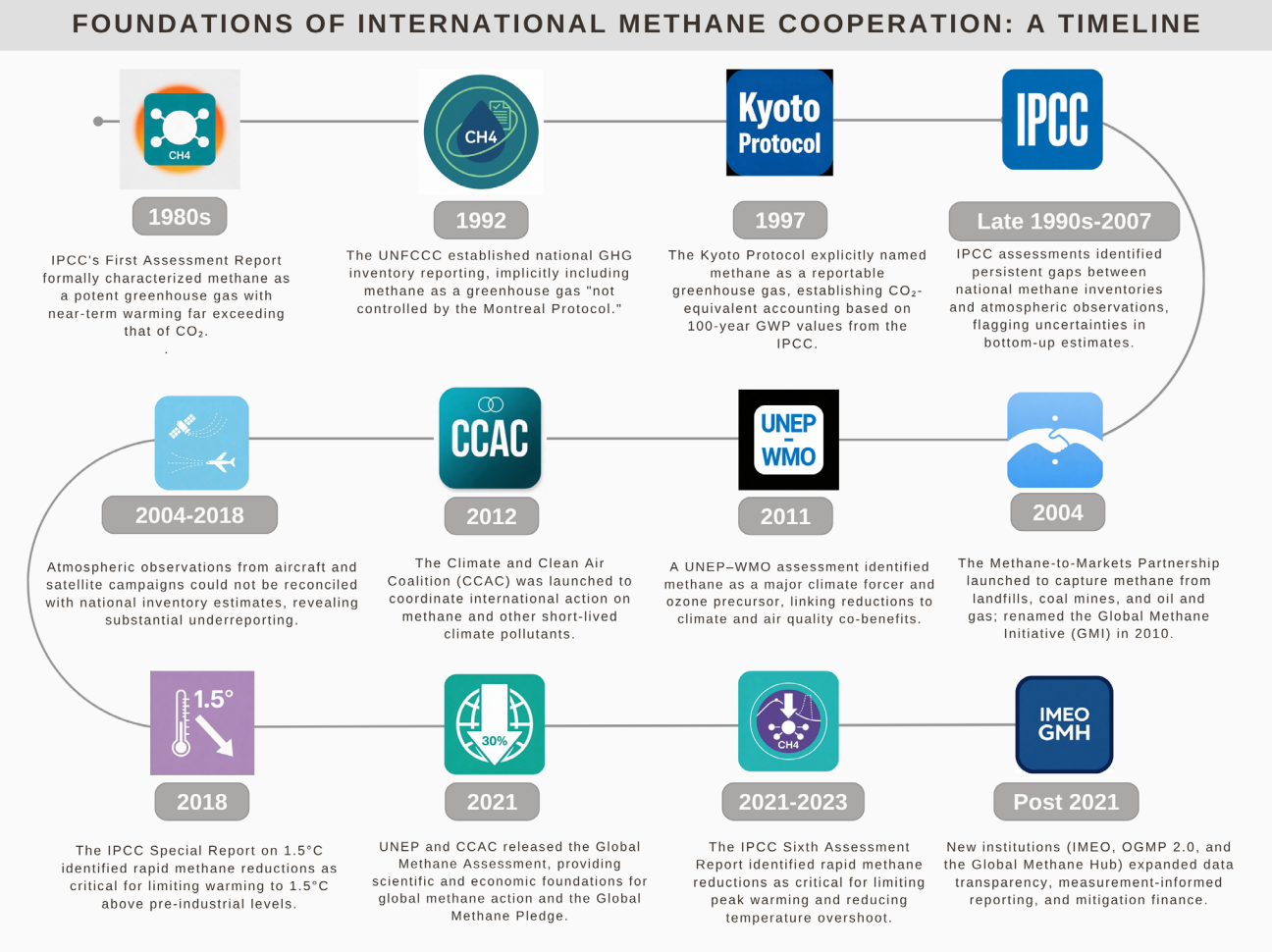

Figure 1: Timeline of key scientific and institutional milestones shaping today's international methane cooperation landscape. Developments are organized chronologically to illustrate how advances in methane science, the emergence of global frameworks, and the proliferation of dedicated initiatives have collectively built the foundation for the functional ecosystem analyzed in this paper.

We begin by grounding the discussion in two foundational areas: the scientific understanding of methane and the historical developments that have shaped today's institutional architecture. To orient the reader, **Figure 1** maps these developments as a timeline, tracing the arc from early scientific recognition to today's crowded institutional landscape. These elements provide essential context for understanding why methane has emerged as a priority greenhouse gas and how international responses have evolved. With this foundation, we then present our structural framework, explain its logic, and demonstrate how a diverse array of international initiatives align within it. We conclude by examining the future of international cooperation on methane, identifying gaps, opportunities for scaling and integration, and ways that scientific, policy, and geopolitical developments may shape international cooperation on methane in the coming years.

2. Foundations for Today's International Methane Cooperation Landscape

Methane's importance as a greenhouse gas[6] has long been recognized by both scientific (e.g., Ramanathan *et al.*, 1985) and policy communities It was implicitly included among the reportable gases from the inception of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992,[7] which defined "reportable gases" as "all greenhouse gases not controlled by the Montreal Protocol" (UNFCCC, 1992).[8] Since the UNFCCC's Second Conference of the Parties (COP2) and the subsequent Kyoto Protocol (UNFCCC, 1997), which explicitly named methane as a reportable gas,[9] emissions and reductions have been reported using CO_2-equivalent (CO_2e) values based on the 100-year Global Warming Potential (GWP100),[10] defined in the IPCC's First Assessment Report (FAR; IPCC, 1990) (Mar *et al.*, 2022).[11]

However, applying GWP100 to methane has well-documented shortcomings. GWP100 undervalues methane's intense short-term warming, leads inventories to understate emissions from methane-intensive sectors, biases mitigation benefit-cost analyses toward CO_2, and can steer strategies away from actions that deliver rapid near-term temperature benefits. Despite longstanding critiques (e.g., O'Neill, 2000; Shine, 2009; Fuglestvedt *et al.*, 2003) and proposals for alternative metrics (e.g., Shine *et al.*, 2005; Tol *et al.*, 2012; Lauder *et al.*, 2013), parties to the UNFCCC continue to use GWP100 values from the IPCC's Fifth Assessment Report (IPCC, 2013, 2014) for official reporting.[12]

In the 1990s, the IPCC acknowledged methane's significance as a climate forcer while also emphasizing substantial uncertainty in global methane emissions, limiting the feasibility of targeted mitigation policies (IPCC 1990, 1995). By the Third Assessment Report (TAR; IPCC, 2001), advances in atmospheric measurements from expanding long-term monitoring networks had reduced some uncertainties. Later, observations from regional aircraft

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6 Defined by Article 1(5) of the Convention (UNFCCC, 1992) "'Greenhouse gases' means those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation."

7 Note that "UNFCCC" can refer to the Convention, which is the treaty addressing climate change adopted in 1992, or the institution that manages the various treaty obligations, importantly including the annual Conferences of the Parties (COPs) and the Secretariat, based in Bonn, Germany.

8 UNFCCC Article 4.2.a-b.

9 The Kyoto Protocol's Annex A lists six greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

10 Beginning with values reported in the IPCC Second Assessment Report (SAR; IPCC, 1995) and updated in subsequent assessments, GWP100 values were to be used under the Kyoto Protocol Article 5 for calculation of CO_2e (Mar *et al.*, 2022).

11 IPCC FAR states: *"It is useful to know the relative radiative effect (and, hence, potential climate effect) of equal emissions of the greenhouse gases. The concept of relative Global Warming Potentials (GWP) has been developed to take into account the differing times that gases remain in the atmosphere. The index defines the time-integrated warming effect due to an instantaneous release of unit mass (1 kg) of a given greenhouse gas in today's atmosphere, relative to that of carbon dioxide."*

12 Decision 7/CP.27, adopted by the Twenty-Seventh Conference of the Parties to the UNFCCC.

field campaigns, tower networks,[13] and, importantly, early satellite instruments such as SCIAMACHY[14] (e.g., Houweling *et al.*, 2014; Kort *et al.*, 2014), combined with inverse modeling,[15] revealed substantial discrepancies between these atmospheric, observation-based "top-down" emissions estimates[16] and the "bottom-up" emissions inventories reported under the UNFCCC and derived using methodologies from, for example, the *IPCC 1996 Guidelines for National Greenhouse Gas Inventories* (IPCC, 1996). These discrepancies were particularly pronounced at the sector level.

These discrepancies between "top-down" and "bottom-up" emissions estimates highlighted the inherent complexity of quantifying methane emissions. Methane sources are geographically dispersed, episodic, and highly variable in magnitude, ranging from diffuse biological processes in agriculture and waste systems to intermittent high-emitting events in fossil fuel infrastructure. Emissions estimates, therefore, often depend on a combination of measurement approaches, including engineering-based activity data, facility-level measurements, atmospheric observations, and inverse modeling. Each approach captures different aspects of the emissions system and carries distinct uncertainties, spatial scales, and temporal coverage.

Because of this complexity, no single methodology has proven sufficient for characterizing methane emissions across all sectors and regions. This technical complexity has contributed to the proliferation of initiatives focused on measurement, reporting, data integration, and standards development, as governments, scientists, industry, and civil society have sought to improve the credibility, comparability, and policy relevance of methane emissions information.

By the time of the IPCC's Fourth Assessment Report (IPCC, 2007), methane was increasingly recognized as a high-value, low-cost mitigation opportunity capable of delivering significant near-term climate benefits.[17] This report also reaffirmed persistent gaps between top-down and bottom-up estimates, suggesting that emissions in several key sectors were likely underestimated. Long-term observational networks, such as NOAA's Global Monitoring Laboratory, documented rising atmospheric methane concentrations throughout much of the 1990s. Although methane growth temporarily stabilized in the early 2000s (e.g., Nisbet

13 For example, the NOAA Global Greenhouse Gas Reference Network (GGGRN) operated by the Global Monitoring Laboratory (GML).

14 The Scanning Imaging Absorption SpectroMeter for Atmospheric CHartographY (SCIAMACHY) instrument flew aboard the European Space Agency's (ESA's) Envisat satellite from 2002 until 2012; it measured from the ultraviolet (UV) to near-infrared (NIR) (240 nm – 2380 nm) enabling detection of methane.

15 Inverse modeling is a method for estimating methane emissions from observed atmospheric methane concentrations by adjusting source strengths to optimize a match between predicted (modeled) and observed atmospheric concentrations. See Jacob *et al.* (2016, 2022) for more details.

16 Here, "top-down" emissions estimates are derived from ambient atmospheric observations (e.g., satellite, aircraft, or *in situ* measurements) combined with models or empirical relationships that convert observed concentrations into emissions estimates. "Bottom-up" estimates are derived from engineering- or process-based calculations or from applying emissions factors (emissions per source per unit time) to activity data such as equipment counts or production levels.

17 Other early examples of work recognizing the importance of methane include Reilly *et al.*, (1999) and Hayhoe *et al.*, (1999).

et al. 2019), concentrations began increasing again by the mid-2000s, providing additional evidence that, in subsequent years, contributed to renewed scientific and policy urgency around methane mitigation.

It was also during this period, in 2004, that the first major global partnership dedicated specifically to methane mitigation was launched, the Methane-to-Markets public–private initiative (Global Methane Initiative, 2010).[18] This voluntary partnership, renamed the Global Methane Initiative (GMI) in 2010, initially brought together 14 national governments (eventually expanding to 31), along with private companies, nongovernmental organizations (NGOs), researchers, and development institutions. Its stated goal was to reduce anthropogenic methane emissions by promoting and financing recovery technologies and projects that captured methane from energy systems and municipal waste (particularly landfills) and used it as a resource rather than allowing it to escape to the atmosphere.

Because methane contributes to climate change (as a powerful greenhouse gas) and to air pollution (as a precursor to tropospheric ozone, which affects human health and agriculture), reducing methane emissions can deliver both climate and air-quality benefits. By the early 2010s, methane's value as a pollutant whose mitigation could both "avoid rapid warming and improve air quality" was underscored by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in their 2011 *Integrated Assessment of Black Carbon and Tropospheric Ozone* (UNEP & WMO, 2011). The conclusions of this assessment, further highlighted in the scientific literature (e.g., Shindell *et al.*, 2012), strengthened the case for rapid methane reductions to slow near-term warming and deliver substantial health and agricultural benefits.

UNEP and a coalition of countries sought to capitalize on this dual benefit by launching the Climate and Clean Air Coalition (CCAC) in 2012.[19] The CCAC's mission was to reduce Short-Lived Climate Pollutants (SLCPs),[20] including methane, black carbon, and hydrofluorocarbons (HFCs), through actions focused on policy development, capacity building, fundraising, and strengthening scientific understanding of impacts and mitigation options. Analysts noted that the CCAC's structure offered a strategic advantage over broader treaty-based frameworks: because membership rested on a political agreement rather than formal ratification, expanding the coalition was far more feasible than instruments like the Kyoto Protocol, which the United States had never ratified (Stowe, 2012). However, critics pointed out a significant limitation at launch: the largest emitters of HFCs, methane, and black carbon were not

18 Methane to Markets Partnership Accomplishments 2004–2009; GMI Timeline of Key Events.

19 A press release for the CCAC launch can be found here.

20 Short-lived climate pollutants (SLCPs): Atmospheric pollutants with shorter lifetimes than CO_2 and strong near-term warming effects, including methane, black carbon (particulate matter), tropospheric ozone, and hydrofluorocarbons. Because SLCPs cycle out of the atmosphere relatively quickly, reducing them delivers rapid climate benefits alongside air-quality, human health, and agricultural co-benefits. Methane is a notable example: with an atmospheric lifetime of ~10 years and ~83 times the warming impact of CO_2 over 20 years, it is also a key precursor to tropospheric ozone, itself a harmful air pollutant with well-documented effects on human health and crop yields.

among the founding members, raising questions about whether the coalition could achieve meaningful emissions reductions without them (Stowe, 2012).

As international attention to methane's climate importance grew, prominent environmental NGOs, notably the Environmental Defense Fund (EDF), partnered with scientists and industry to conduct large-scale measurement campaigns focused on oil and gas emissions. Between 2012 and 2018, EDF led sixteen coordinated studies across the United States that showed that methane emissions from the oil and gas sector were approximately 60% higher than estimates reported by the U.S. Environmental Protection Agency (EPA). These campaigns identified previously unrecognized emission sources, refined estimates of known sources, defined cost-effective mitigation options, and spurred innovation in detection and abatement technologies.

These studies, together with public attention following the massive Aliso Canyon gas-storage leak in October 2015, measured by aircraft (Conley *et al.*, 2016) and detected from space by NASA's Hyperion instrument (Thompson *et al.*, 2016), helped galvanize political and public momentum for methane action. Additional satellite observations, including the detection of unexpectedly high methane concentrations over the Four Corners region[21] by the SCIAMACHY instrument (Kort *et al.*, 2014), further underscored the scale of underreported "bottom-up" emissions in the energy sector. This growing body of empirical evidence contributed directly to the development of support for new methane-focused policies and regulations in the years that followed (Olczak *et al.*, 2023).

By the late 2010s, the *IPCC Special Report on Global Warming of 1.5°C* (IPCC, 2018) made it clear that meeting the Paris Agreement goal of limiting warming to 1.5°C without overshoot requires methane emissions to fall by roughly one-third between 2010 and 2050.[22] The report also emphasized that keeping the 1.5°C target "within reach" depends on pathways that pair mitigation of methane (and other short-lived climate pollutants) with significant reductions in CO_2. These conclusions were reinforced in the IPCC Sixth Assessment Report (IPCC, 2022), which stated with high confidence that "deep GHG emissions reductions by 2030 and 2040, particularly reductions of methane emissions, lower peak warming, reduce the likelihood of overshooting warming limits, and lead to less reliance on net negative CO_2 emissions to reverse warming in the latter half of the century."[23]

Another landmark report, released in May 2021 by UNEP and the CCAC, was the *Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions* (Ravishankara *et al.*, 2021). The *Assessment* marked an important turning point in the international treatment of methane mitigation. Earlier efforts to address methane, which ranged from national regulations and voluntary industry initiatives to multilateral forums, had highlighted

21 The region that surrounds the point at which four states (Arizona, New Mexico, Colorado, and Utah) meet and where there are significant methane emissions from both the oil and gas sector and livestock.

22 See C.1.2 of the Summary for Policymakers.

23 See C.2 of the Summary for Policymakers of the AR6 Working Group III report.

methane's climate significance but had not yet produced a widely shared quantitative case for rapid global action. The *Assessment* synthesized the latest atmospheric science, sectoral mitigation analyses, and economic estimates to demonstrate that existing, cost-effective measures could reduce global methane emissions by roughly 45 percent during the 2020s, avoiding about 0.3°C of warming by the 2040s while delivering major health benefits through reduced ozone pollution.

The coevolution of methane science, policy, and advocacy that began in the 1990s culminated with the launch of the Global Methane Pledge (GMP) at COP26 in Glasgow in November 2021 (Olczak *et al.*, 2023). Under the GMP, governments agreed to undertake voluntary, cross-sectoral actions to help achieve a collective 30% reduction in global methane emissions by 2030 relative to 2020 levels. Now comprising 159 member countries,[24] the GMP has spurred a new wave of international cooperation on methane, including the establishment of the Global Methane Hub (GMH) and the UNEP International Methane Emissions Observatory (IMEO).

3. Evaluation of Existing International Initiatives on Methane

The international landscape of methane cooperation is defined by the distinct functional roles initiatives play. The following subsections use illustrative examples to show how each role operates in practice and what, together, they reveal about the broader institutional architecture.

3.1 Functional Categories for International Methane Initiatives

Our functional approach is inspired by a series of reports published by Highwood Emissions Management (2021, 2022, 2023), which catalogued and classified voluntary methane-reduction initiatives within the oil and gas sector.[25] In contrast, our scope extends across all major emitting sectors (energy, agriculture, waste) and is not limited to voluntary initiatives. In our categorization scheme, initiatives may fall under multiple functional roles. **Table 1** provides the functional categories and definitions. While the framework is designed to capture the range of functional roles present across the landscape, it may not represent every function performed by all initiatives, nor fully characterize the complete set of activities undertaken by any individual organization. **Figure 2** summarizes the categorization of all 44 initiatives, illustrating how roles are distributed across the landscape and where initiatives cluster or overlap.

Our objective is to provide a practical framework for describing, in broad terms, how various initiatives operate within the current international methane cooperation landscape. Applying this framework allows patterns to emerge across initiatives that may not be apparent when examining institutions individually. In an increasingly crowded institutional

24 When launched at COP26 in 2021, the GMP included 103 countries. Thus, over a four-year period, membership increased by over 50%.

25 To maintain continuity with Highwood Emissions Management (2022, 2023), we adopt three of their core categories and expand their previously broad "other initiatives" category into several more precise functional types relevant to this work. For voluntary oil and gas initiatives already categorized by Highwood (and included in this work due to their relevant scope), we retain their original classifications for consistency, adding additional functions only when they clearly fit within our expanded framework.

landscape, distinguishing these functional roles clarifies how various initiatives contribute to methane mitigation and highlights where coordination or a clearer division of responsibilities may be needed.

3.2 Identification of International Methane Initiatives

We have identified 44 examples of international cooperation initiatives (see online Supplementary Material and **Figure 2**). Each initiative is assigned one or more functional categories based on its work. Initiatives were also classified by primary organizational type[26] (**Table 2**) based on their governance: intergovernmental (including United Nations and bilateral or multilateral initiatives), nongovernmental organizations (NGOs), or industry (including business-oriented NGOs, or BINGOs, and trade associations). We also document the major anthropogenic methane-emitting sectors addressed by each initiative: Energy, Waste, Agriculture, or all three (All).

When examined by organizational type, most surveyed initiatives (23, or 52%) involve international government-to-government cooperation. Of the remaining initiatives, 12 (27%) are industry-led, and 9 (21%) are led by international nongovernmental organizations. While organizational type has important implications for governance structures and how organizations operate, it is less determinative of an initiative's functional role, which is the primary focus of this analysis. With respect to sectoral scope, 14 initiatives (32%) address methane emissions across all major sectors, whereas approximately 39%, 11%, and 18% focus specifically on the energy, waste, and agriculture sectors, respectively.

26 Organizational type is a function of governance structure rather than membership composition. An initiative may draw members from across sectors (governments, NGOs, and industry alike) but its classification reflects the entity that holds primary ownership and decision-making authority.

Figure 2

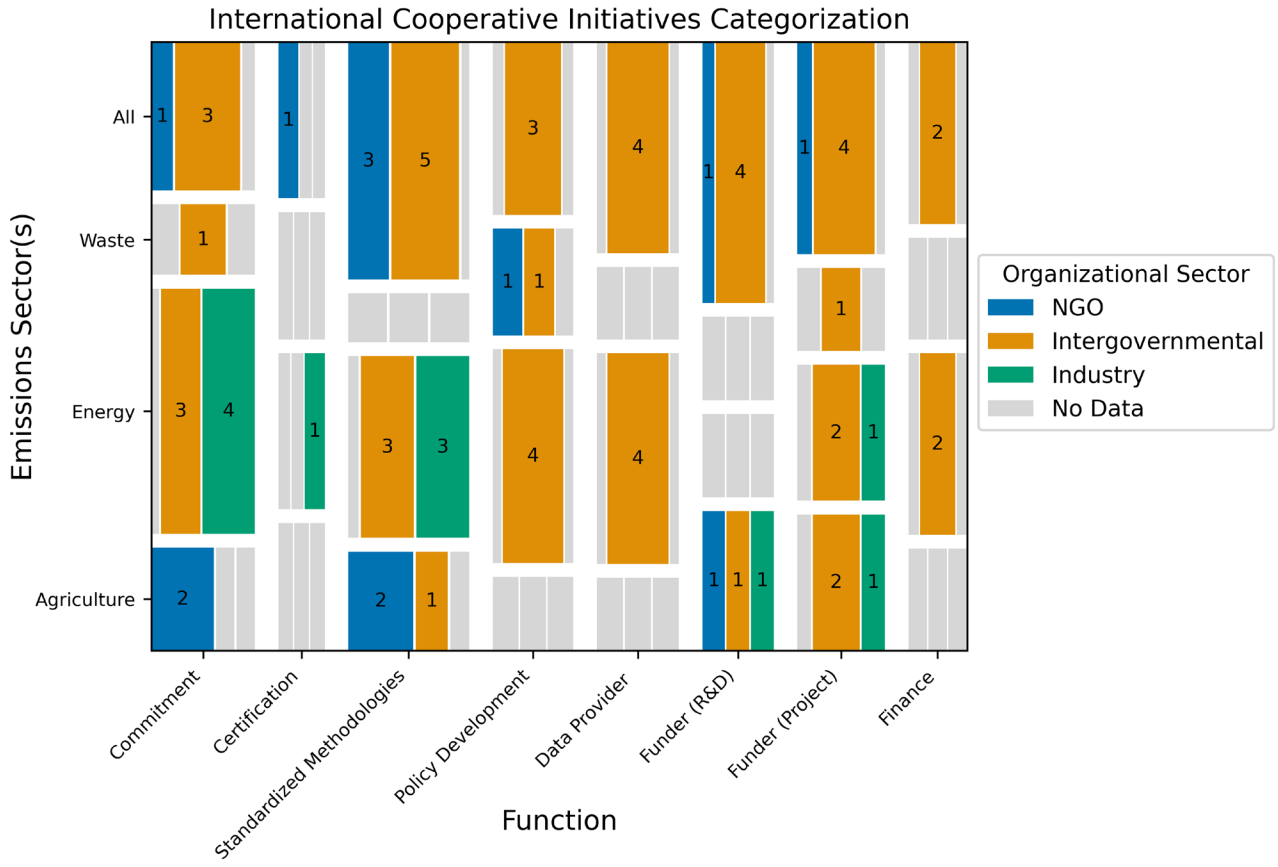

Figure 2: Distribution of 44 surveyed international methane initiatives across functional categories and emissions sectors. Each tile in this mosaic plot represents a function–sector combination, with tile area proportional to the number of initiatives present. Within each tile, color indicates organizational type (blue = NGO; orange = intergovernmental; green = industry), displayed in that fixed order from left to right, with counts labeled. Grey tiles indicate gaps where no surveyed initiative operates. Since individual initiatives may span multiple functional categories, aggregate counts exceed 44.

In the remainder of this section, we examine each functional classification and present illustrative examples drawn from the surveyed initiatives. While not all initiatives are discussed in detail, comprehensive descriptions of all surveyed initiatives (including links to the relevant organizations where available) are provided in the online Supplementary Material. Although many initiatives span multiple functional categories under the rubric presented in **Table 1,** the examples below are discussed according to the functional role we identify as most salient. The "Advocacy" functional category is not discussed here, as advocacy activities are a common component of most industry- and NGO-led initiatives. Similarly, relatively few initiatives were identified that fit exclusively within the "Finance" category; these are therefore discussed below together with the "Funder" category. The "Standardized Methodologies" and "Certification" categories are also discussed together due to their interdependence.

3.2.1 Commitments

Within the commitments functional category, we consider both legally binding and non-binding (voluntary) commitments that articulate publicly stated targets, goals, or obligations. Among the initiatives surveyed, the only example of a legally binding, treaty-based commitment that explicitly encompasses methane is the UNFCCC, together with the Kyoto Protocol (UNFCCC, 1997) and Paris Agreement (UNFCCC, 2015). The UNFCCC creates a legally binding framework under which greenhouse gases (see footnote 6) are systematically accounted for, reported, and addressed through nationally determined actions. As a framework convention designed to evolve, the UNFCCC has enabled the adoption of subsequent associated treaties, notably the Kyoto Protocol and the Paris Agreement. It has also established international cooperation, transparency, and institutional processes that underpin most, if not all, of the methane-focused initiatives examined here, many of which emerged directly from or were catalyzed by annual meetings of the Convention's governing body, the Conference of the Parties (COP).

Among the remaining international methane-relevant cooperation initiatives classified under the commitments category, most are voluntary commitments, including those undertaken by national governments (3), subnational governments (1), and industry coalitions (9). The most prominent of these is the Global Methane Pledge (GMP), launched at COP26 in 2021, which, as of March 2026, includes 159 participating countries and the European Commission. GMP participants commit to undertaking voluntary actions in support of a collective objective to reduce global methane emissions by at least 30% from 2020 levels by 2030, explicitly articulated as an aggregate, voluntary (rather than nationally binding) reduction target.[27]

While the GMP is multilateral in nature, bilateral government commitments have also emerged, including, for example, an agreement between the European Union and Japan, which formalizes cooperation to strengthen methane-emissions mitigation across the liquefied natural gas (LNG) value chain.[28] In addition, the Subnational Methane Action Committee (SMAC), a coalition of subnational governments, has begun to articulate methane-specific commitments and seeks to coordinate methane mitigation action and policy leadership among member states and regions.

The Global Methane Pledge has acted as a catalyst for a range of methane-focused cooperation initiatives examined in this paper. One example of a post-GMP, industry-led voluntary commitment is the Oil and Gas Decarbonization Charter (OGDC), first announced at COP28 in 2023. The OGDC has been signed by a coalition of oil and gas companies (34 national oil companies (NOCs) and 22 international oil companies and independent operators) operating in approximately 100 countries, collectively representing roughly 40% of global oil production (and about 35% of global oil and gas production combined). Directly

27 The full text of the GMP can be found here.

28 The EU-Japan dedicated-dialogue description can be found here and here.

relevant to methane mitigation, the OGDC includes commitments to achieve near-zero upstream methane emissions by 2030 and to eliminate routine flaring by 2030.[29]

The Oil and Gas Climate Initiative also contributed to the design and launch of the OGDC. OGCI is a CEO-led initiative founded in 2014 comprising 12 major international oil and gas companies. OGCI has its own set of voluntary commitments and, in part through peer-to-peer voluntary support to reduce methane emissions, has been an important factor in addressing methane emissions in the oil and gas industry. OGCI provides administrative and technical support for OGDC. OGDC advances OGCI's underlying mission, in part, by engaging NOCs, which do not participate in OGCI.

Still within the energy sector, but led by intergovernmental organizations, the UNEP-convened Oil and Gas Methane Partnership 2.0 (OGMP 2.0) commits member companies to measurement-based public emissions reporting. With over 150 companies from 90 countries representing the full oil and gas value chain, OGMP 2.0 emissions reporting now covers 42% of the world's oil and gas production. Finally, within the oil and gas sector, another intergovernmental institution, the World Bank, hosts the Zero Routine Flaring (ZRF) initiative, a longstanding, voluntary industry commitment to end routine flaring across oil and gas operations worldwide.[30]

Within the agriculture sector, the Pathways to Dairy Net Zero initiative and the Dairy Methane Action Alliance represent the primary examples of international industry-led methane commitments in our survey. Spearheaded by the Environmental Defense Fund (EDF), the Dairy Methane Action Alliance centers on company commitments to transparent, public disclosure of methane emissions and the development of comprehensive action plans to reduce methane across dairy supply chains, an approach analogous to the measurement- and transparency-driven objectives of OGMP 2.0 in the energy sector. In contrast, Pathways to Dairy Net Zero is a broader, industry-led commitment encompassing both small and large dairy actors and structured around six guiding principles (COP29 Presidency, 2024) that address greenhouse gas mitigation, including methane, across diverse production systems.

Finally, in the waste sector, methane commitments surveyed are led primarily by governments rather than industry coalitions. A prominent example is the *COP29 Declaration on Reducing Methane from Organic Waste* (COP29 Presidency, 2024), announced in 2024 and endorsed

29 The OGDC pledges include "Aim to implement the action and practices needed to achieve near-zero methane emissions by 2030 at upstream operations under their [*sic*: signatories'] control and, as applicable, engage with joint operating partners to achieve near-zero methane emissions" and "Aim to implement the action and practices needed to eliminate routine flaring by 2030 on all operations under their control and leverage their influence to achieve the same in their non-operated portfolio." Note that flares, when unlit or inefficient, are a major source of methane emissions for oil and gas operations.

30 Combusting methane (flaring), the major component of natural gas, converts it to CO_2, a less potent warming agent, leading to the argument that flaring is preferable to direct atmospheric release (venting). In practice, however, flaring combustion is often incomplete, resulting in substantial residual methane emissions. The Zero Routine Flaring (ZRF) initiative and related efforts therefore focus on enabling producers to capture and market natural gas, and not vent it, thereby avoiding flaring altogether.

by approximately 30 countries. Under this declaration, signatories commit to establishing sectoral targets to reduce methane emissions from organic waste streams (e.g., landfills and food waste) within their climate plans, alongside associated policies, roadmaps, and implementation actions.

Complementing this declaration is the Lowering Organic Waste Methane (LOW-Methane) initiative, launched at COP28 by a coalition of international partners to accelerate action on waste-sector emissions, which account for roughly 20 percent of global methane emissions from human activities. LOW-Methane, administered by the CCAC, works with subnational jurisdictions to help them identify ambitious actions and unlock implementation support and investment across data, finance, policy, and operations. LOW-Methane has an overall ambition to deliver at least 1 million metric tons of annual waste-sector methane reductions by 2030.

Taken together, these initiatives illustrate how methane commitments have expanded rapidly in recent years, particularly following the launch of the Global Methane Pledge. However, most commitments remain voluntary and vary widely in scope, sectoral coverage, and accountability mechanisms. As a result, commitments have proven effective at mobilizing political attention and signaling ambition, but less effective at ensuring consistent implementation across sectors and regions.

3.2.2 Standardized Methodologies and Certification

We next consider initiatives that fall within two closely related functional categories: (a) international bodies that develop standardized methodologies (e.g., for methane emissions estimation, measurement, and reporting and verification or MMRV) and (b) initiatives that assess, validate, or otherwise provide assurance of adherence to those standards. Together, these initiatives span a range of standard types, from consensus-based methodological guidance to industry-led voluntary standards to programmatic (or proprietary) standards with various approaches to certification or verification.[31]

At the international level, the most prominent consensus-based methodological standard setter is the Task Force on National Greenhouse Gas Inventories (TFI), a standing task force of the IPCC. Through its guidance, the TFI develops internationally agreed methodologies for estimating and reporting greenhouse gas emissions, including methane, across sectors. These methodologies, which encompass tiered approaches, sectoral definitions, uncertainty management, and QA/QC procedures, are formally adopted for use under UNFCCC reporting processes. While explicitly policy-relevant, the TFI is not policy-prescriptive and does not certify inventories or set mitigation requirements; authority over targets, compliance, and regulation remains with parties to the UNFCCC and its subsequent agreements.

31 For this analysis, *standards* are classified by how they are developed, governed, and assured. *Consensus-based standards* are produced through formal, multi-stakeholder processes with transparent procedures and broad agreement (e.g., IPCC methodologies); they typically do not include certification functions. *Programmatic (or proprietary) standards* are developed and governed by a single initiative, with authority derived from market uptake rather than formal consensus; assurance may be provided internally or by an affiliated entity (e.g., SBTi). *Industry-led voluntary standards* are created by sectoral coalitions or associations to harmonize practices and reporting within an industry and generally do not involve formal certification (e.g., IPIECA guidance).

Several commitment-focused initiatives establish consensus standards for participating members and incorporate defined oversight approaches (programmatic review) rather than formal verification or assurance processes. An important example is OGMP 2.0, convened by UNEP, which provides a common, measurement-based reporting framework for oil and gas companies, structured around a five-level, stepwise framework in which companies advance as they adopt increasingly robust methane measurement and emissions reporting practices. Unlike programmatic standards, such as those discussed next, OGMP2.0 allows for greater methodological flexibility and considers itself "principles-based" rather than "rules-based" in its emissions reporting.

In contrast to such consensus standards, programmatic standards for corporate emissions and climate targets (including methane) are set by international bodies. Among the most important examples are the Science Based Targets initiative (SBTi) and the International Organization for Standardization (ISO). SBTi defines criteria for science-based climate targets and validates compliance through a legally distinct subsidiary. In parallel, ISO and the European Committee for Standardization (CEN) are developing technical standards[32] for methane measurement, reporting, and verification (MRV), including leak detection and repair (LDAR) and venting and flaring methodologies. These standards are being developed in part to support implementation of the European Union Methane Regulation (EUMR) and are designed to align with the measurement-informed reporting framework of OGMP2.0. Once finalized, they will provide standardized methodologies that can be independently verified and certified by accredited third-party auditors.

Several additional initiatives play a secondary standard-setting role, typically through consensus-based or industry-led voluntary guidance, without formal certification. For example, the Committee on Earth Observation Satellites (CEOS) and the Coordination Group for Meteorological Satellites (CGMS) (along with national-level standard-setting bodies) have recently published consensus standards for quantifying methane emissions from plumes detected via remote sensing. OGCI (2025) has issued a *Satellite Methane Detection Response Playbook* to guide industry responses to third-party satellite detections. IPIECA, a global oil and gas industry association focused on advancing environmental and social performance, has also produced widely referenced voluntary guidance, including *Recommended practices for methane emissions detection and quantification technologies — upstream* (IPIECA, 2025) and *Sustainability reporting guidance for the oil and gas industry* (IPIECA et. al., 2025). These efforts aim to harmonize practice and improve comparability, but do not include independent certification or verification mechanisms.

The growing number of methodological and certification initiatives reflects increasing demand for credible methane measurement and reporting. In recent years, many frameworks have begun to move toward *measurement-informed inventories,* which combine traditional, "bottom-up" engineering-based estimates with empirical "top-down" observations from facility

32 A reference for the upcoming ISO/CEN standards can be found here.

measurements, aerial surveys, or satellite data to better capture the real-world variability in methane emissions. This shift reflects growing recognition that generic emissions factors often fail to represent the conditions of individual facilities, companies, or regions.

However, greater reliance on empirical measurements can also introduce challenges for consistency and comparability, as various measurement technologies, sampling approaches, and reporting boundaries can yield different emissions estimates. As a result, the coexistence of multiple standards and verification approaches risks fragmentation, particularly where frameworks define methane intensity or reporting boundaries differently. Continued convergence among standards becomes increasingly important as methane data are integrated into regulatory systems, certification programs, financial markets, and emerging methane-intensity standards.

3.2.3 Policy Development

Our survey includes several international initiatives that support national and sub-national governments in developing methane-relevant public policies to meet both voluntary commitments and statutory obligations. Rather than establishing binding requirements, these initiatives provide policy analysis, technical guidance, and capacity-building support that inform the design and implementation of methane mitigation policies across sectors. A primary example is the Climate and Clean Air Coalition (CCAC), a voluntary international partnership convened by UNEP and led by national governments that targets reductions in short-lived climate pollutants (SLCPs), including methane, to deliver near-term climate and air quality benefits. CCAC supports governments in integrating methane and other non-CO_2 pollutants into the Nationally Determined Contributions, associated with the Paris Agreement, and delivers sector-specific policy support through programs such as Lowering Organic Waste Methane (LOW-Methane) for the waste sector.

In parallel, sector-specific policy support is provided by other international and sub-national initiatives. In the energy sector, the International Energy Agency (IEA) develops policy-relevant analysis, regulatory roadmaps, and abatement toolkits (e.g., IEA, 2021) to support methane mitigation across oil, gas, and coal supply chains. The Organization for Economic Cooperation and Development (OECD) provides complementary guidance on regulatory design, economic instruments, and institutional arrangements. The Subnational Methane Action Committee (SMAC) supports methane policy development and coordination among states and regions, reflecting the growing role of sub-national authorities in methane mitigation.

These initiatives highlight the growing role of international cooperation in translating methane commitments and scientific understanding into concrete policy frameworks. By providing analytical tools, regulatory roadmaps, and technical assistance, these organizations function as an intermediary layer between high-level commitments and national implementation. However, their influence remains inherently indirect. While they can accelerate policy development and facilitate knowledge transfer, the adoption, design, and enforcement of methane regulations ultimately depend on domestic political priorities, regulatory capacity,

and sectoral conditions. As a result, progress in methane policy development has been uneven across countries and sectors, reflecting broader differences in institutional capacity and regulatory ambition.

3.2.4 Data Provision

This functional category encompasses initiatives that generate, curate, or disseminate original methane-relevant data, either through direct data acquisition (e.g., satellite or *in situ* observations) or through proprietary analysis and integration of externally sourced information (e.g., reported emissions data). These initiatives play a distinct role in the international methane cooperation landscape by providing primary, policy-relevant evidence (rather than guidance or standards) to support policy design, regulatory targeting, and mitigation action. We note at the outset that, by focusing on international cooperation initiatives, this review necessarily omits many methane-relevant data providers, including commercial and national actors, some of whose data products contribute materially to the initiatives discussed here, and whose data may be global in scope (e.g., national space and environmental agencies such as NASA and ESA; NGOs such as Carbon Mapper, WasteMap, and Climate TRACE; and individual companies such as GHGSat, Bridger Photonics, and Insight M).

At the international level, the most prominent methane-focused data initiative is the International Methane Emissions Observatory (IMEO), hosted by the United Nations Environment Programme (UNEP). IMEO's mission is to improve the accuracy, transparency, and public availability of global methane emissions data to accelerate mitigation. To this end, IMEO aims to integrate multiple data streams (including field campaign data, satellite observations, national emissions inventories, and industry-reported emissions) within a unified analytical framework. Key IMEO products include satellite-detected emission events disseminated through the Methane Alert and Response System (MARS), company-reported, measurement-based emissions data from OGMP 2.0 participants, and aircraft and *in situ* data from their sponsored Methane Science Studies. All this data is made publicly available via the Eye on Methane platform. Collectively, these products position IMEO as a central hub for actionable methane information for governments, regulators, and other stakeholders.

Additional methane-relevant data are provided through a combination of satellite-derived datasets and analytical syntheses. The World Bank, through its Global Flaring and Methane Reduction (GFMR) partnership, publishes global gas-flaring volume estimates dating back to 2012, based on empirically derived relationships between satellite-observed radiant heat and flared gas volumes (Elvidge *et al.*, 2016). While these data are primarily focused on flaring rather than methane emissions (see footnote 30), they are widely used as indicators of associated methane emissions and as a basis for mitigation opportunities.

The International Energy Agency (IEA) contributes complementary methane-relevant data through analytical integration rather than direct observation. Its *Global Methane Tracker* (IEA, 2025) compiles and analyzes primary datasets from inventories, measurement studies,

and satellite observations to produce globally consistent estimates of methane emissions, abatement potential, and policy-relevant mitigation pathways.

Several international bodies also play an enabling role by coordinating the development and harmonization of methane-relevant observing systems, even where they do not directly generate methane datasets. The Committee on Earth Observation Satellites (CEOS) and the Coordination Group for Meteorological Satellites (CGMS) align priorities across international space agencies for satellite missions, calibration and validation practices, and data interoperability relevant to atmospheric methane.[33] Similarly, the World Meteorological Organization (WMO), through its Global Atmosphere Watch (GAW) and the emerging Global Greenhouse Gas Watch (G3W), provides the institutional backbone for long-term, *in situ* greenhouse gas concentration measurements and emissions modeling, functioning as an indirect but essential data-provisioning actor within the global methane data ecosystem.[34]

The rapid expansion of methane data, particularly those based on satellite observations, represents one of the most dynamic areas of progress in the international methane cooperation landscape. However, translating observational data into policy-relevant emissions estimates remains technically complex and institutionally contested. As a result, much of the current effort focuses on reconciling measurement approaches and improving the integration of observational and inventory-based data. As methane monitoring increasingly informs regulatory systems and financial markets, the credibility and interoperability of these data systems will likely become a central determinant of policy effectiveness.

3.2.5 Funding and Finance

The final categories in our framework concern institutions that provide financial support to other actors across the international methane-cooperation landscape. Within the Funder category, we distinguish between research and development (R&D) funders and project-based funders. R&D funding is intended to generate new knowledge, methods, technologies, or proof-of-concepts relevant to methane detection, quantification, abatement, or mitigation. These activities are typically small to medium in scale (ranging from thousands to low millions of dollars) and produce knowledge-based outputs, such as peer-reviewed publications, datasets, or technology patents.

In contrast, project-based funding is generally of medium scale (on the order of millions to tens of millions of dollars). It is intended to implement discrete methane mitigation actions within specific regions, countries, or sectors, with clearly defined scopes, outputs, and

33 For example, CEOS has recently (2024) published a *Roadmap for the coordinated implementation of carbon dioxide and methane monitoring from space,* which is intended to guide and align member institutions' Earth observation activities and support the development of future satellite capabilities that will generate methane-relevant data.

34 G3W focuses on coordinating the delivery of monthly, global fluxes of methane and two other greenhouse gases (CO_2 and N_2O) at 1 by 1 degree resolution using inverse modeling methods with satellite- and global ground-station based data. GAW coordinates 100 countries to provide a network of high-quality greenhouse gas *in situ* monitoring stations to support efforts such as G3W.

timelines. The Finance category is treated separately to reflect large-scale investments (often tens to hundreds of millions of dollars or more) designed to support system-level or sector-wide methane abatement, typically through capital-intensive infrastructure and associated institutional or policy reforms.

Among internationally relevant, multi-institutional funders, the Global Methane Hub (GMH) has emerged as a central actor in methane mitigation. Established shortly after the launch of the Global Methane Pledge, GMH was created to coordinate and channel philanthropic capital to address critical gaps in funding, capacity, and collaboration needed to accelerate methane mitigation at scale. With more than USD 300 million in committed capital, GMH supports both project-based and R&D-focused initiatives across the energy, waste, and agriculture sectors. In the energy sector, for example, GMH supports the Latin American Energy Organization (OLADE) and its regional methane emissions observatory, Observatorio de Emisiones de Metano de América Latina y el Caribe (OEMLAC); in waste, initiatives such as WasteMAP; and in agriculture, efforts including the Rice Methane Action Alliance (2025). Complementing these investments, GMH also funds global research through programs such as its Enteric Fermentation R&D Accelerator. Beyond funding, GMH plays a broader role as a global convener and partnership builder, exemplified by its recent memorandum of understanding with the Government of Kazakhstan[35] to support national methane planning, monitoring, and regulation.

Among the initiatives surveyed, many (particularly those led by NGOs or industry coalitions) provide some degree of project-level support as part of their broader missions, often in service of advocacy, capacity building, or pilot implementation. However, larger-scale and more sustained project-level financing is typically provided by intergovernmental initiatives and multilateral funds. Notable examples include the Climate and Clean Air Coalition (CCAC), which supports country- and sector-specific methane mitigation projects, as well as multilateral finance institutions such as the International Fund for Agricultural Development (IFAD) and the Green Climate Fund (GCF),[36] which provide project-based support linked to broader development and climate objectives.

In contrast, relatively few initiatives in the survey focus primarily on dedicated research and development (R&D) funding to generate new, methane-specific knowledge, methods, or technologies. Beyond the Global Methane Hub (GMH), which plays a central role in coordinating and deploying philanthropic R&D funding, a prominent exception is the International Methane Emissions Observatory (IMEO) hosted by the United Nations Environment Programme (UNEP). Through its Methane Science Studies portfolio, IMEO supports targeted research to advance methane measurement, attribution, and data integration, thereby strengthening the scientific evidence base underpinning policy and mitigation efforts.

35 See press note here.

36 CCAC-funded projects can be found here. GCF project portfolio is here, and IFAD's projects are here.

Finally, within the Finance category, our survey indicates that large, infrastructure-scale financing relevant to methane abatement is provided primarily by multilateral development banks, most notably the World Bank. This financing is typically directed to national governments, state-owned enterprises (including national oil companies), or large utility operators (e.g., wastewater treatment authorities). It is commonly embedded within broader development, energy, or urban infrastructure programs rather than being explicitly methane- or climate-focused. Compared with project-based funding, which often entails greater technical or implementation risk, development bank finance generally supports capital-intensive, long-lived infrastructure or system upgrades that deliver methane abatement as a co-benefit with relatively low technical risk. Examples include modernizing flaring equipment in aging oil and gas infrastructure (in part to improve combustion efficiencies), expanding gas capture and utilization systems, or upgrading wastewater treatment facilities. In addition to the World Bank, other development finance institutions provide similar financing that indirectly supports methane mitigation, even when methane reduction is not the primary objective of the investment, including the International Finance Corporation and regional development banks.

While small-to-medium scale funding (R&D and project-based) has expanded rapidly, large-scale financing for methane abatement infrastructure remains comparatively limited relative to the scale of mitigation potential. This imbalance highlights a broader transition underway in the methane mitigation ecosystem: from knowledge generation and capacity building toward capital-intensive implementation.

3.2.6 Summary of Functional Categories

When examined through the functional framework introduced above, the surveyed initiatives reveal several structural patterns in the evolution of international methane cooperation that are not readily visible when initiatives are considered individually (**Figure 2**). First, the landscape has expanded rapidly over the past decade, particularly following the launch of the Global Methane Pledge, with new initiatives emerging across nearly every functional category. Second, institutional development has been uneven across functions: data generation, measurement methodologies, and voluntary commitments have expanded rapidly, while large-scale financing and sectoral coverage in agriculture and waste remain comparatively limited. Third, the landscape remains fragmented, with multiple initiatives operating in overlapping domains such as methane measurement, standards, and data provision. While this institutional diversity has enabled experimentation and rapid progress in some areas, it also underscores the importance of improving coordination and clarifying roles among initiatives as the focus shifts from knowledge generation and voluntary commitments toward measurable emissions reductions and large-scale mitigation implementation.

4. The Future of International Cooperation on Methane

The rapid expansion of international methane initiatives over the past decade reflects growing recognition of methane's importance for near-term climate mitigation. Using the functional framework developed in this paper, we identify how responsibilities for commitments, standards, data, policy support, funding, and finance are distributed across institutions and where this architecture remains incomplete. The analysis presented in this paper suggests that the central challenge for international methane cooperation is no longer the absence of initiatives, but rather how to organize an increasingly complex institutional landscape around credible and sustained emissions reductions.

Since 2020, global atmospheric methane concentrations have continued to rise, reaching approximately 1,929 ppb in 2024, up from 1,879 ppb in 2020, an increase of roughly 3% over four years (NOAA Global Monitoring Laboratory, 2026). Consistent with this trend, He *et al*. (2025) estimate that between 2019 and 2024, satellite observations of dry-air column methane mixing ratios increased by about 0.7% per year, with increased emissions accounting for roughly one quarter of the observed growth alongside variability in atmospheric sinks. Applying an atmospheric inversion framework using satellite observations from TROPOMI and GOSAT, two important space-based methane-monitoring platforms, the study further shows that emissions reductions in some sectors, notably oil and gas and rice cultivation, have been offset by increases in others, particularly livestock and waste. Notably, the study finds that the global methane emission rate in 2019 was approximately the same as in 2024. Taken together, these findings indicate that progress toward the objectives of the Global Methane Pledge remains uneven and, in aggregate, insufficient to place global emissions on a trajectory consistent with a 30% reduction by 2030. With fewer than four years remaining, mitigation efforts will need to accelerate substantially and extend across all major emitting sectors if this target is to be met.

This paper has reviewed the landscape of international cooperation on methane abatement using a functional framework that classifies initiatives according to their dominant functional roles. Applying this framework clarifies how a diverse, increasingly dense ecosystem of institutions contributes to global methane mitigation. The analysis highlights several strengths of the current system, including heightened political attention following the launch of the Global Methane Pledge.

Several elements of the current system are gaining momentum. Measurement and monitoring capabilities, particularly satellite-based detection and measurement-informed reporting frameworks, are advancing rapidly and are increasingly shaping regulatory and corporate-emissions-reporting systems. At the same time, important weaknesses persist. Institutional coverage remains uneven, with comparatively less attention to agriculture and waste emissions than to fossil energy. In addition, many initiatives operate in overlapping domains such as data provision, standards development, and capacity building, sometimes duplicating efforts or advancing inconsistent approaches.

Implementation challenges also remain significant. Limited regulatory follow-through, underfunded mitigation efforts, and the slow diffusion of available abatement technologies continue to constrain progress (Olczak *et al.*, 2023; U.S. Department of Energy, 2025; Jiang *et al.*, 2024). Our functional mapping also reveals an institutional landscape characterized by varied organizational structures, overlapping mandates, and dispersed financial support. While this diversity has enabled experimentation and rapid scaling in areas such as methane measurement, data integration, and sectoral commitments, fragmentation risks diluting impact and dispersing already limited political and financial capital (UNEP, 2025). Concerns have also been raised about potential conflicts of interest in voluntary and industry-led initiatives (Davydov, 2022) and the misalignment of donor and philanthropic funding across parallel initiatives (Zabeida and Arangão, 2025).

Looking ahead, future progress will depend less on launching new initiatives and more on aligning existing ones. Strengthening coordination and harmonization through clearer divisions of labor among governments, philanthropies, and multilateral institutions, interoperable measurement systems, and financing mechanisms capable of supporting large-scale mitigation may yield greater benefits than creating additional initiatives (Zabeida and Arangão, 2025). Ensuring that initiatives focus on areas where they add distinct value, and that resources are pooled rather than dispersed, will therefore be an important priority as the international methane cooperation landscape continues to evolve.

Taken together, these findings suggest that the central task for international methane cooperation over the coming decade is to organize the existing system around concrete and verifiable emissions reductions. This will require closer alignment between international initiatives and methane-specific national policies and targets; greater reliance on observation-informed emissions estimates for benchmarking and progress tracking (Olczak *et al.*, 2023); and stronger linkages among data providers, certifiers, standards setters, and funders. It also underscores the importance of scaling finance for durable, infrastructure-scale abatement, particularly in underserved sectors and regions.

Methane now occupies a central place in climate policy because of its large near-term warming impact and the relatively rapid climate benefits achievable through mitigation. Over the past two decades, governments, firms, and civil society have built a dense ecosystem of international initiatives to accelerate methane reductions. Whether this architecture can deliver on its promise will depend on international cooperation evolving from proliferation toward coherence, anchoring ambition in credible data, aligning institutions around complementary roles, and translating commitments into sustained, system-wide emissions reductions. If these conditions are met, methane mitigation can deliver near-term climate benefits that are increasingly indispensable for achieving the objectives of both the Paris Agreement and the Global Methane Pledge.

Table 1: Functional Categories for International Methane Initiatives

Category Name	Definition
Commitment	Initiatives in which participants make pledges to achieve one or more publicly stated future goals (Highwood Emissions Management, 2022, 2023). Note that pledges can be formal and legally binding (such as in treaties) or informal (voluntary).
Standardized Methodologies	Initiatives that develop and set frameworks, standards, principles, and/or tools to help achieve abatement goals through consistent, repeatable approaches (Highwood Emissions Management, 2022, 2023). This includes technical guidance documents and consensus standards.
Certifications	Initiatives involving formal processes in which a product, service, system, individual, or organization is independently evaluated against pre-defined criteria or standards (Highwood Emissions Management, 2022, 2023).
Policy Development	Initiatives that support national or subnational governments directly or indirectly in designing public policies to meet stated methane-related goals. Includes implementation and technical assistance (capacity building, training, etc.).
Data Provision	Initiatives that procure, generate, or publish original methane-relevant data, or original analyses generated from others' data.
Funder	Initiatives that provide funding for methane-related projects. These projects can be focused on either research and development (R&D, i.e. publishable in the scientific literature or resulting in technological patents) or demonstration- or implementation-oriented projects focused on specific abatement goals in particular countries or regions.
Advocacy	Initiatives that actively support, promote, or argue for specific ideas, policies, or technologies to influence decision-makers, public opinion, or methane-related outcomes.
Finance	Initiatives that deliver longer-term financial mechanisms to support methane abatement in a specific sector, country, or region. To distinguish them from the Funder category, these initiatives typically fund, for example, high-priced infrastructure projects that result in methane emissions reductions.

Table 2: Definition of Organizational Type

Organizational Type	Definition
Intergovernmental	Organizations whose primary members are national or sub-national governments (e.g., cities, provinces, states). These may be bilateral or multilateral in nature and can include United Nations affiliated or UN-hosted bodies.
Non-governmental Organizations (NGOs)	Independent, non-profit organizations or consortia operating outside formal government structures, including advocacy, policy, and research organizations. Within the scope of this work, we focus on international collaborations of two or more that may encompass public–private partnerships in which governments are not the primary governing members.
Industry	International trade associations and business-oriented non-governmental organizations (BINGOs) whose membership is primarily composed of private-sector companies which operate across multiple countries.

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Acronyms

The Landscape of International Cooperation for Methane Mitigation

Acronym	Definition
AR4	IPCC Fourth Assessment Report (2007)
AR6	IPCC Sixth Assessment Report (2021–2023)
CCAC	Climate and Clean Air Coalition
CEN	European Committee for Standardization
CEOS	Committee on Earth Observation Satellites
CGMS	Coordination Group for Meteorological Satellites
CH_4	Methane (chemical formula)
CO_2	Carbon dioxide (chemical formula)
CO_2e	Carbon dioxide equivalent
COP	Conference of the Parties (UNFCCC)
COP26	26th Conference of the Parties (Glasgow, 2021)
COP28	28th Conference of the Parties (Dubai, 2023)
COP29	29th Conference of the Parties (Baku, 2024)
EDF	Environmental Defense Fund
ESA	European Space Agency
EUMR	European Union Methane Regulation
FAR	IPCC First Assessment Report (1990)
G3W	Global Greenhouse Gas Watch (WMO)
GAW	Global Atmosphere Watch (WMO)
GCF	Green Climate Fund
GFMR	Global Flaring and Methane Reduction Partnership (World Bank)
GHG	Greenhouse gas

Acronym	Definition
GMH	Global Methane Hub
GMI	Global Methane Initiative
GMP	Global Methane Pledge
GOSAT	Greenhouse Gases Observing Satellite (Japan)
GWP	Global Warming Potential
GWP100	100-year Global Warming Potential
HFC	Hydrofluorocarbon
IEA	International Energy Agency
IFAD	International Fund for Agricultural Development
IMEO	International Methane Emissions Observatory (UNEP)
IPCC	Intergovernmental Panel on Climate Change
IPIECA	Global oil and gas industry association for environmental and social performance
ISO	International Organization for Standardization
LDAR	Leak detection and repair
LNG	Liquefied natural gas
LOW-Methane	Lowering Organic Waste Methane initiative
MARS	Methane Alert and Response System (UNEP/IMEO)
MMRV	Methane measurement, reporting, and verification
MRV	Measurement, reporting, and verification
N_2O	Nitrous oxide (chemical formula)
NASA	National Aeronautics and Space Administration (U.S.)
NGO	Non-governmental organization
NOAA	National Oceanic and Atmospheric Administration (U.S.)

Acronym	Definition
OECD	Organisation for Economic Co-operation and Development
OEMLAC	Observatorio de Emisiones de Metano de América Latina y el Caribe (Latin American and Caribbean Methane Emissions Observatory)
OGCI	Oil and Gas Climate Initiative
OGDC	Oil and Gas Decarbonization Charter
OGMP 2.0	Oil and Gas Methane Partnership 2.0 (UNEP)
OLADE	Latin American Energy Organization
ppb	Parts per billion
QA/QC	Quality assurance / quality control
R&D	Research and development
RMA	Rice Methane Action Alliance
RMI	Rocky Mountain Institute
ROC	Randles Ozkul Consulting LLC
SAR	IPCC Second Assessment Report (1995)
SBTi	Science Based Targets initiative
SCIAMACHY	Scanning Imaging Absorption Spectrometer for Atmospheric Chartography (ESA)
SLCP	Short-Lived Climate Pollutant
SMAC	Subnational Methane Action Coalition
TAR	IPCC Third Assessment Report (2001)
TFI	Task Force on National Greenhouse Gas Inventories (IPCC)
TROPOMI	Tropospheric Monitoring Instrument (ESA/Copernicus)
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

Acronym	Definition
USD	United States dollar
VIIRS	Visible Infrared Imaging Radiometer Suite (NOAA/NASA)
WMO	World Meteorological Organization
ZRF	Zero Routine Flaring by 2030 (World Bank)

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