OVERVIEW OF METHANE MITIGATION POLICIES IN GLOBAL KEY EMITTERS BEYOND THE UNITED STATES AND CHINA

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EXECUTIVE SUMMARY

Methane is a potent greenhouse gas and significantly contributes to global warming and air pollution, yet it has a relatively short atmospheric lifetime. Rapidly reducing methane emissions globally would yield significant outcomes in combating climate change and require collective efforts from all countries. This report builds upon our prior study, entitled Roadmap for US-China Methane Collaboration: Methane Emissions, Mitigation Potential, and Policies (Zhu et al., 2024), and investigates methane policy landscapes in top methane emitters beyond the US and China. Fifteen key emitters, including India, Russia, the EU, Brazil, Nigeria, Indonesia, Australia, Canada, Pakistan, Turkmenistan, Saudi Arabia, Mexico, Argentina, the UK, and Iran, are selected based on their overall methane emission level and emissions by sector. This study collected and reviewed a total of 276 methane-related policies from these 15 key emitters. It provides a comprehensive overview and comparison of their methane policy landscapes, and identifies policy gaps and good practices.

The key findings of this study are as follows:

▶ Policy efforts among the key emitters do not always align with their emission shares. Notably, policies in most key emitters are more focused on the energy sector, while the agriculture sector has received the least attention in existing methane-related policies despite its high emissions.

▶ There is uneven adoption of policy instruments across sectors. Strategies, as well as laws and regulations are the most common instruments, adopted by 14 and 13 key emitters, respectively. Strategies, such as Nationally Determined Contributions (NDCs),

often address methane emissions as part of broader climate challenges, whereas laws and regulations are primarily adopted to manage methane emissions from the oil and gas sector. Economic instruments, found in only seven emitters, are the least utilized policy tools, especially in the agriculture and waste sectors. There are limited policy instruments used in the agriculture sector, especially for methane emissions from rice cultivation activities.

▶ Significant ambition and implementation gaps exist across key emitters. Although most countries have pledged to reduce methane emissions, few have translated these commitments into concrete national plans and subsequent implementation measures.

▶ While significant gaps remain, a number of countries have made notable progress in methane mitigation. For instance, Canada, Australia, the EU, Nigeria, and Mexico have shown advancements in the energy sector; Brazil and Australia in the agriculture sector; and the EU and the UK in the waste sector.

▶ A series of best practices among these key emitters are summarized, including financial support, carbon emissions trading schemes, legislation, and the Measurements, Reporting, and Verification (MRV) systems.

▶ Among the key emitters, developed countries generally have made greater progress than developing ones, highlighting the importance of support from developed countries in capacity building and knowledge sharing.

BACKGROUND

Methane is a short-lived climate pollutant with an atmospheric lifetime of approximately 12 years (Smith et al., 2021). However, it is the second-largest source of greenhouse gasses (GHGs), accounting for around one-fifth of global anthropogenic emissions (IPCC, 2022). More importantly, it has a high global warming potential - 81.2 times greater than CO_2 emissions over a 20-year timescale (IPCC, 2021). Additionally, methane contributes to the formation of ground-level ozone, a major source of air pollution. Therefore, methane mitigation offers substantial opportunities to effectively limit global temperature rise within a short period of time, a proactive global response to reduce methane emissions as a crucial step towards keeping the world on track for net-zero. Since COP26 in 2021 in Glasgow, methane mitigation has increasingly attracted global attention. The U.S. and China have emphasized reducing methane emissions collaboratively in both the U.S.-China Joint Glasgow Declaration on Enhancing Climate Action in the 2020s (2021) and the most recent Sunnylands Statement on Enhancing Cooperation to Address the Climate Crisis (2023) and launched their national action plans on methane mitigation in 2021 and 2023, respectively (The White House, 2021; MEE, 2023). Additionally, a hundred and fifty-five countries have joined the Global Methane Pledge and committed to collectively reduce methane emissions by at least 30% below 2020 levels by 2030 (Global Methane Pledge, 2023). COP28 also put the spotlight on methane mitigation with a number of new initiatives including Oil and Gas Decarbonisation Charter (ODGC) being launched, helping global methane mitigation actions continue to gain momentum (IEA, 2024).

Human-induced methane emissions come from fossil fuels, waste, and agriculture, and are disproportionately distributed across countries, with the top 10 emitters - China, the United States, India, Russia, Brazil, the EU, Indonesia, Iran, Pakistan, and Nigeria - contributing to around 60% of the total global emissions (IEA, 2023b; EDGAR, 2023). Enhanced efforts by major emitters are indispensable for accelerating global methane emissions reduction, and the adoption and implementation of effective methane policies play a critical role. Olczak et al. (2023) assessed the effectiveness of global methane policies and found that the existing methane policies only covered 13% of emissions, and the effectiveness of these policies remains unclear (Olczak et al., 2023). More importantly, there is a general lack of studies on methane mitigation strategies and policies in the key emitters other than the U.S. and China. However, understanding the varied policy landscapes of these countries is also crucial for identifying action gaps and addressing the blind spots in global methane mitigation efforts. Moreover, different countries often encounter unique challenges due to diverse emission sources and varying socioeconomic development stages, which requires localized experiences and knowledge sharing. Key questions need to be addressed to better inform policy-makers and the broader community: (1) What types of policies have been adopted by the key emitters? (2) Which sectors are being targeted? (3) What are the existing policy gaps and challenges? And (4) What are the best policy-making practices and knowledge from these key emitters that can be shared globally?

Building on our previous methane policy analysis on the U.S. and China (Yu et al., 2022; Zhu et al., 2024), this study shifts its focus to the other global key emitters. It aims to answer the above questions through a systematic and comparative analysis of methane policies across other major methane-emitting countries. This analysis investigates 15 key emitters, excluding the U.S. and China[1]. These 15 key emitters

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[1] This research extends a prior study (Yu et al., 2022) that evaluated methane mitigation policies in the U.S. and China, by examining other high-emitting countries. Given the thorough analysis of best practices and policy gaps in the U.S. and China previously conducted, this report does not include these two countries in its current analysis.

account for around 39% of global methane emissions (EDGAR, 2023 This study has compiled a policy dataset with a total of 276 methane policy documents in the 15 key emitters for comprehensive and systematic policy analyses.

In the following sections, this study (1) provides an overview of the current status of methane emissions in key emitting countries; (2) performs a comparative analysis of methane policies in 15 countries, identifying policy gaps; (3) details the best practice case studies; (4) offers policy recommendations for enhancing methane mitigation efforts in the future.

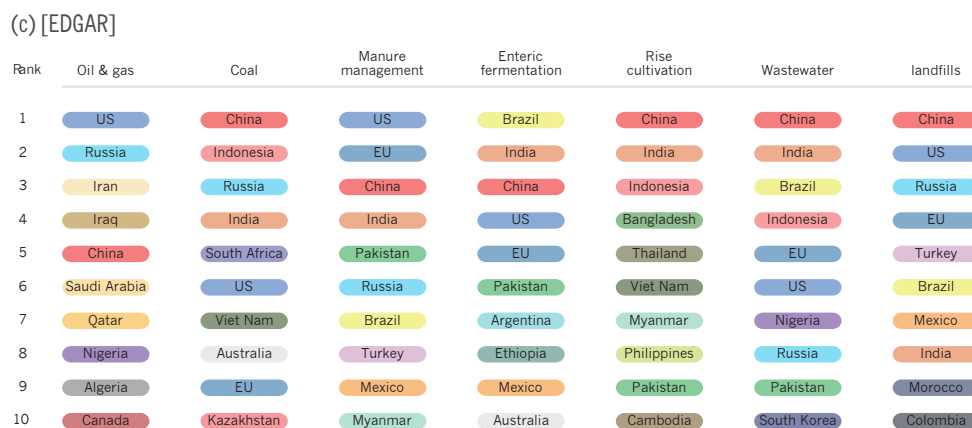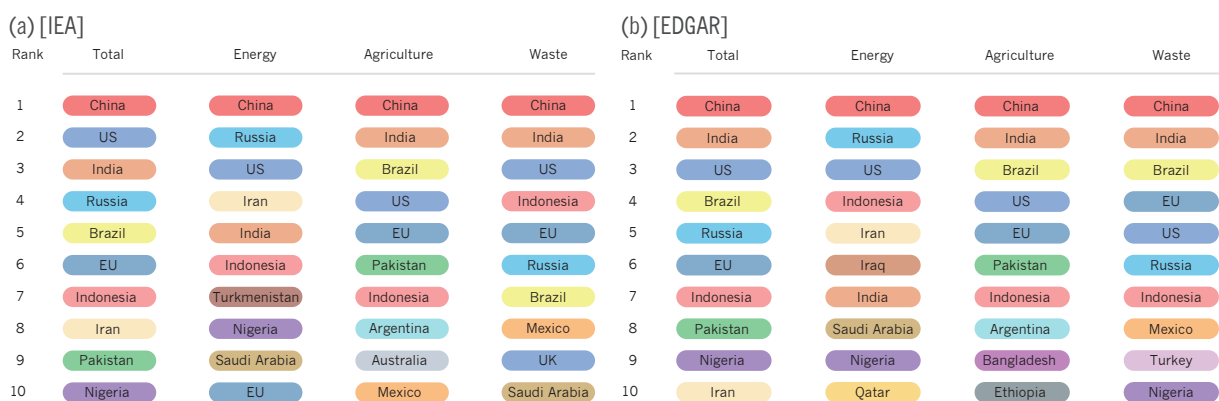# CURRENT STATUS OF METHANE EMISSIONS IN KEY EMITTERS

The world's top 10 largest methane emitters are China, India, the U.S., Brazil, Russia, the EU, Indonesia, Pakistan, Nigeria, and Iran (EDGAR, 2023; IEA, 2023b). The rankings vary slightly across data sources. Figure 1 demonstrates the top 10 emitters by total emissions and by sector/subsector from IEA and EDGAR, which are two major data sources for methane emission inventory.

FIGURE 1. TOP 10 METHANE EMITTERS BY TOTAL EMISSIONS AND BY SECTOR/SUBSECTOR IN 2022.

(a) Top 10 emitters by sector according to data from IEA; (b) Top 10 emitters by sector according to data from EDGAR; (c) Top 10 emitters by sub-sector according to data from EDGAR.
Data sources: EDGAR & IEA (EDGAR, 2023; IEA, 2023b).

(a) [IEA]

Rank	Total	Energy	Agriculture	Waste
1	China	China	China	China
2	US	Russia	India	India
3	India	US	Brazil	US
4	Russia	Iran	US	Indonesia
5	Brazil	India	EU	EU
6	EU	Indonesia	Pakistan	Russia
7	Indonesia	Turkmenistan	Indonesia	Brazil
8	Iran	Nigeria	Argentina	Mexico
9	Pakistan	Saudi Arabia	Australia	UK
10	Nigeria	EU	Mexico	Saudi Arabia

(b) [EDGAR]

Rank	Total	Energy	Agriculture	Waste
1	China	China	China	China
2	India	Russia	India	India
3	US	US	Brazil	Brazil
4	Brazil	Indonesia	US	EU
5	Russia	Iran	EU	US
6	EU	Iraq	Pakistan	Russia
7	Indonesia	India	Indonesia	Indonesia
8	Pakistan	Saudi Arabia	Argentina	Mexico
9	Nigeria	Nigeria	Bangladesh	Turkey
10	Iran	Qatar	Ethiopia	Nigeria

(c) [EDGAR]

| Rank	Oil & gas	Coal	Manure management	Enteric fermentation	Rise cultivation	Wastewater	landfills
1	US	China	US	Brazil	China	China	China
2	Russia	Indonesia	EU	India	India	India	US
3	Iran	Russia	China	China	Indonesia	Brazil	Russia
4	Iraq	India	India	US	Bangladesh	Indonesia	EU
5	China	South Africa	Pakistan	EU	Thailand	EU	Turkey
6	Saudi Arabia	US	Russia	Pakistan	Viet Nam	US	Brazil
7	Qatar	Viet Nam	Brazil	Argentina	Myanmar	Nigeria	Mexico
8	Nigeria	Australia	Turkey	Ethiopia	Philippines	Russia	India
9	Algeria	EU	Mexico	Mexico	Pakistan	Pakistan	Morocco
10	Canada	Kazakhstan	Myanmar	Australia	Cambodia	South Korea	Colombia

Beyond the U.S. and China, this study selected an additional 15 key emitters based on the rankings mentioned above and the extent of their methane mitigation efforts. These include India, Russia, Brazil, the EU, Indonesia, Iran, Pakistan, Nigeria, Mexico, Australia, Argentina, Turkmenistan, Canada, Saudi Arabia, and the UK. Figure 2 illustrates their methane emissions in 2022, including details by subsector.

FIGURE 2. METHANE EMISSIONS IN THE KEY EMITTERS BY SUBSECTORS IN 2022.

The U.S. and China are not included in the analysis of this report.
Data source: EDGAR v8.0 (EDGAR, 2023)
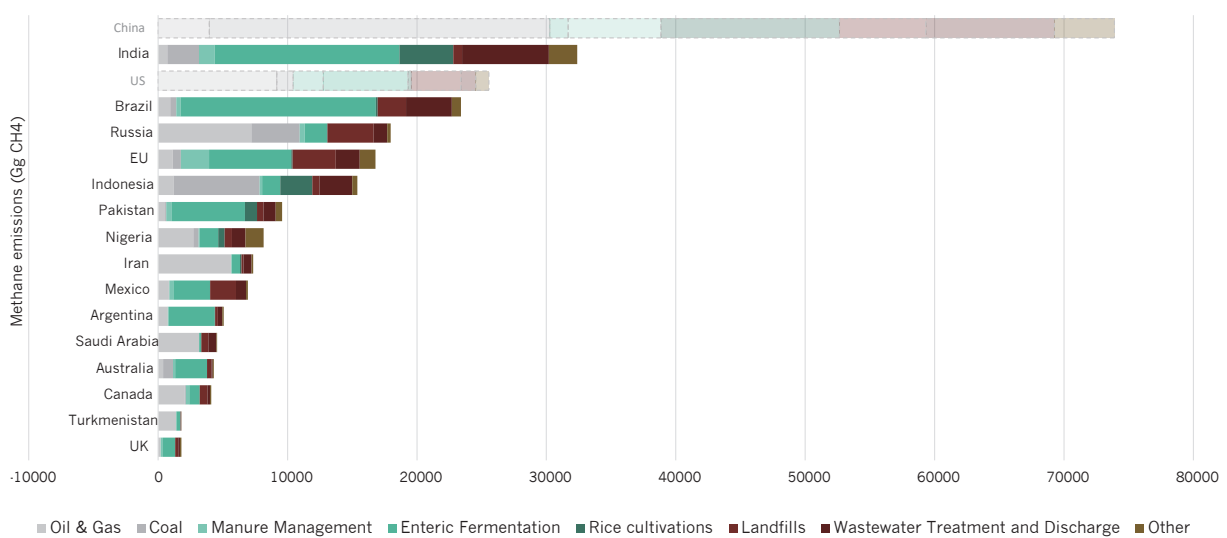
POLICY LANDSCAPES AND POTENTIAL GAPS

By December 2023, approximately 600 policy documents containing keywords "methane" and its synonyms, such as "coalbed methane" and "biogas", were gathered from government and international organization websites across the selected 15 key emitters. Out of the original 600 policy documents, 276 were selected for analysis based on their relevance to methane mitigation. These policies have potentially contributed to methane emissions reduction, despite variations in their strengths and coverage. It is worth noting that due to data limitations including damaged documents, inaccessible websites, incomprehensive raw databases, these collected policy documents may not necessarily reflect all policies that were issued. Even though this poses a notable challenge to the validity of the research findings, this study is nonetheless able to provide a general overview of the policy landscapes of these global key emitters.

Mismatch of methane emissions and policy efforts

The number of policies does not necessarily indicate their effectiveness; however, it generally implies the level of effort, attention, and preferences. This analysis shows that the policy efforts of these key emitters do not always align with their share of methane emissions. In 2022, the total anthropogenic methane emissions from the the energy, agriculture and waste sectors in these 15 key emitters are approximately 152 Mt (EDGAR, 2023). Specifically, emissions from the energy, agriculture, and waste sectors were 44

Mt, 72 Mt, and 36 Mt, respectively, representing 29%, 47%, and 24% of the total emissions from these sectors. However, the allocation of policy efforts does not reflect this distribution: 52% of the collected policies target the energy sector, exceeding those for the agriculture and waste sectors, which account for 19% and 29% of the policies, respectively (Figure 3). The discrepancy indicates a potential policy gap, as current measures predominantly focus on the energy sector, despite the agriculture sector's larger contribution to total emissions. It suggests that the agriculture sector has generally received less attention in the key emitters.

FIGURE 3. METHANE EMISSIONS IN 2022 FROM THE THREE MAIN SECTORS (THE INNER CIRCLE) AND METHANE POLICIES (THE OUTER CIRCLE) OF THE 15 KEY EMITTERS.

This figure shows the comparison of the overall methane emissions and the number of methane policies across the 15 emitters by sector. Data source: Asia Pacific Energy Portal, Climate Action policy, countries legislative websites, FAOLEX Database, IEA methane tracker, IEA policy database, UK Legislation, UNEP country profiles, UNFCCC NDC reports (Asia Pacific Energy Portal, 2023; Australian Government, 2023; Climate Action, 2023; EU, 2023; EDGAR, 2023; FAO, 2023a; Government of the UK, 2024; IEA, 2023c; Indian Government, 2023; UNEP, 2023; UNFCCC, 2023).
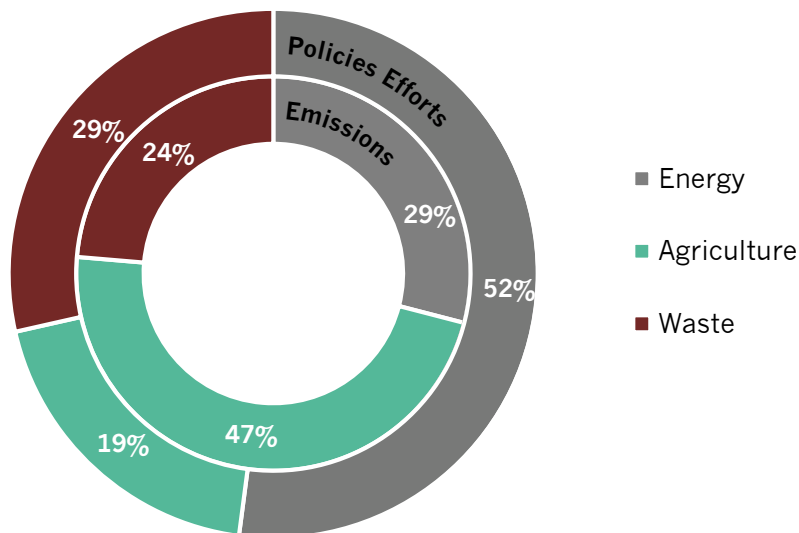
Additionally, there is a substantial gap in policy adoption, especially among developing countries (Figure 4). Though large gaps remain, developed countries, including the EU, Australia, Canada,

and the UK, generally have more comprehensive methane policy frameworks. The EU, in particular, has the most methane mitigation policies among the 15 key emitters, a significant effort

considering its level of emissions. However, this is not consistent across all major emitters. For instance, India and Russia, despite being top emitters, have comparatively fewer policies targeting methane emissions reduction. Iran faces a unique challenge, as no specific methane policies have been identified. The lack of specific methane policies in Iran can be attributed considerably to its disengagement from efforts to address climate change. This can also be reflected by its general absence in global climate discourse, highlighted by its non-signatory status to the Paris Agreement.

The analysis also highlights specific gaps in sectoral policy coverage by country. For example, Saudi Arabia and Turkmenistan, despite their high methane emissions in the energy sector, have very few relevant policies. Turkmenistan's approach is limited to general climate change policies, including its NDC, but lacks specific sectoral strategies. Similarly, Argentina, Mexico, and Indonesia, major emitters in the agriculture sector, lack targeted policies for agricultural methane emissions. In addition, Saudi Arabia has significant methane emissions from the waste sector, largely attributed to unregulated food waste, which substantially exceeds the world average (Rahman et al., 2021). Yet, few policies have been adopted to address the issue. These findings highlight a critical need for more focused and comprehensive policy frameworks, especially in countries with high emission levels, to effectively address global methane challenges.

FIGURE 4. NUMBER OF POLICIES VERSUS METHANE EMISSIONS BY SECTOR AND BY COUNTRY.

The broader bars in lighter shades represent methane emissions from the energy, agriculture, and waste sectors and their subsectors in 2022 (Gg CH$_4$). In contrast, the slimmer bars in darker shades correspond to the number of policy documents addressing methane in each respective subsector. Note that there may be overlaps in the counting of policy documents by sector.
Data source: Asia Pacific Energy Portal, Climate Action policy, countries legislative websites, FAOLEX Database, IEA methane tracker, IEA policy database, UK Legislation, UNEP country profiles, UNFCCC NDC reports (Asia Pacific Energy Portal, 2023; Australian Government, 2023; Climate Action, 2023; EU, 2023; EDGAR, 2023; FAO, 2023a; Government of the UK, 2024; IEA, 2023c; Indian Government, 2023; UNEP, 2023; UNFCCC, 2023).
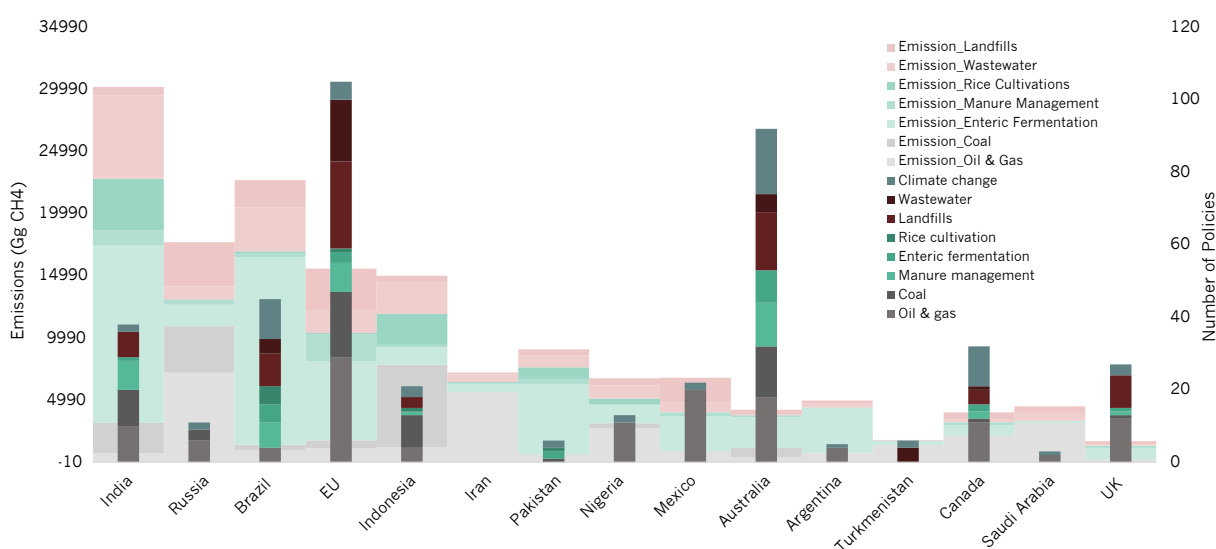
Uneven adoption of policy instruments across sectors

Policy instruments are government techniques to achieve policy goals by creating different incentives that may lead to various levels of policy effectiveness. This analysis categorized the collected policies into five policy instrument types, including strategies (e.g., action plans or Five-Year Plans), laws and regulations, standards and procedures, economic instruments (e.g., taxes and fees, carbon markets, tax credits, exemptions,

and subsidies) and voluntary programs (e.g., pilot projects and government-sponsored programs). Figure 5 presents the distribution of identified policy instruments across the selected key emitters. Strategies, as well as laws and regulations, are prevalent among key emitters, adopted by 14 and 13 key emitters, respectively. Comparatively, standards and procedures, economic instruments, and voluntary programs are less common. Only seven out of the 15 key emitters have adopted economic instruments to address methane emissions.

FIGURE 5. DISTRIBUTION OF POLICY INSTRUMENT TYPES ACROSS KEY EMITTERS.

The size of the circle reflects the number of policies in a given policy instrument type.

- ● Strategies ● Laws and regulations ● Standards and procedures ● Economic instruments
- ● Voluntary programs
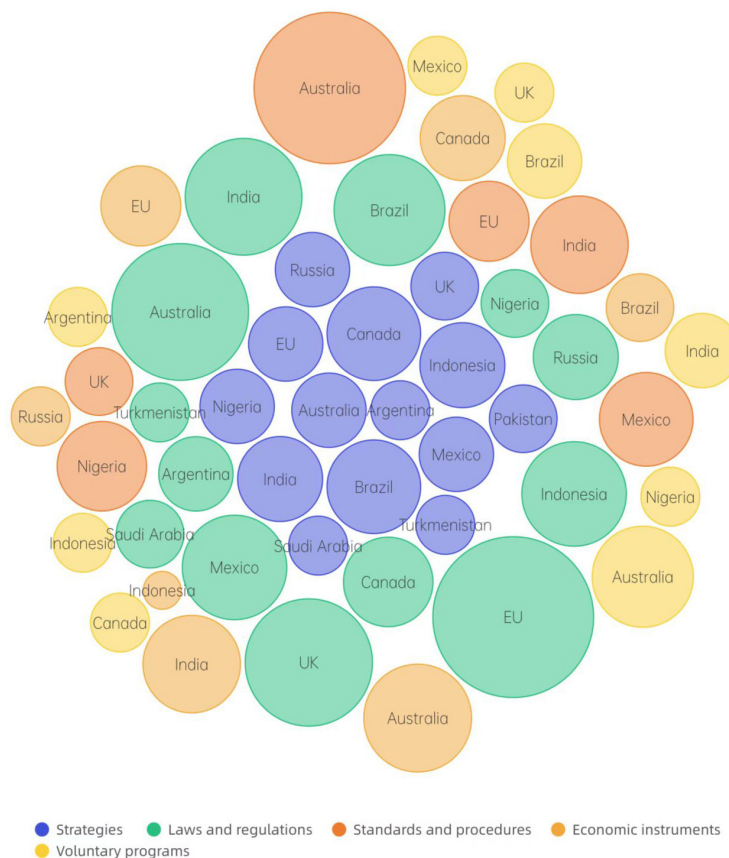
The collected policy documents were further categorized by sector: climate change (overarching), the energy sector (including coal mine and oil and gas), the agriculture sector (including manure management, enteric

fermentation, and rice cultivation), the waste sector (including landfills and wastewater), and others (including transportation, etc.) (Figure 6). The adoption and preferences of policy instruments vary significantly across sectors. For

example, strategies are adopted across all sectors, particularly to address methane emissions as part of climate challenges. Similarly, laws and regulations are commonly used to address methane-related issues in all sectors, especially in the oil and gas, as well as the landfill sectors. Economic instruments and voluntary programs are rarely employed in the rice cultivation and wastewater sectors. While the agriculture sector generally receives less attention, there is a broader application of policy instruments in manure management, in contrast to the few policies targeting methane emissions from rice cultivation.

FIGURE 6. POLICY DISTRIBUTIONS BY POLICY INSTRUMENT AND SECTOR.

See the Appendix for methodological details.
Data source: Asia Pacific Energy Portal, Climate Action policy, countries legislative websites, FAOLEX Database, IEA methane tracker, IEA policy database, UK Legislation, UNEP country profiles, UNFCCC NDC reports (Asia Pacific Energy Portal, 2023; Australian Government, 2023; Climate Action, 2023; EU, 2023; FAO, 2023a; Government of the UK, 2024; IEA, 2023b, 2023c; Indian Government, 2023; UNEP, 2023; UNFCCC, 2023).
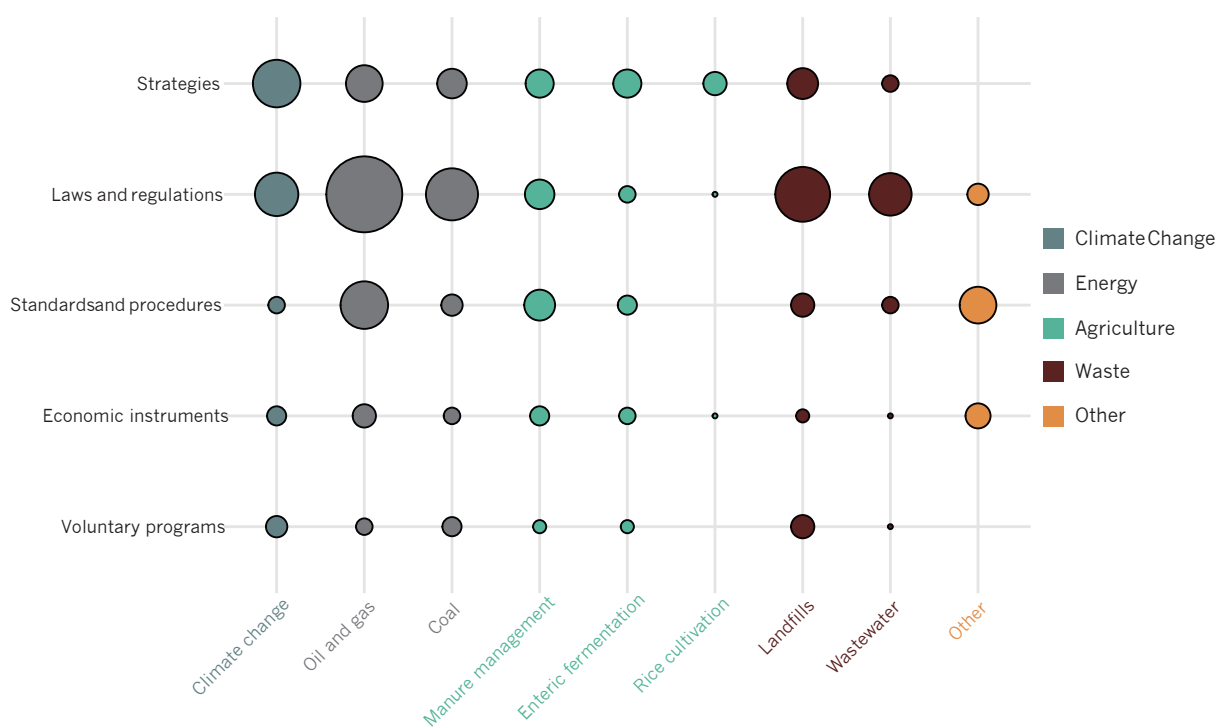
Notable ambition and implementation gaps across key emitters

The 15 key emitters have addressed methane emissions reduction at an uneven pace. Although a few developed economies have better institutionalized methane mitigation efforts, gaps remain in both enhancing ambition and strengthening implementation. We identified a set of critical policy elements essential for advancing methane mitigation, categorizing them into three stages of action:

▶ International commitments: This includes (1) the inclusion of methane emissions in the Nationally Determined Contributions (NDCs), and (2) formal international pledges for methane emissions reduction, such as participation in the Global Methane Pledge.

▶ Ambition: This stage includes (3) the issuance of national plans specifically targeting methane mitigation, and (4) the establishment of quantified emissions reduction targets.

▶ Implementation: This stage involves (5) the establishment of methane emission reporting mechanisms, (6) the presence of mandates specifically targeting methane emissions reduction as a greenhouse gas,

(7) the provision of government funds to support emissions reduction, (8) the existence of carbon markets or offsets, and (9) the prioritization of methane emission utilization. Despite substantial international commitments, key methane emitters, especially emerging economies, are falling short in translating those commitments into higher ambition and concrete policy actions (Figure 7).

FIGURE 7. SUMMARY OF CRITICAL POLICY ELEMENTS BY COUNTRY.

See the Appendix for detailed information. The * in the "Methane included in NDC" category indicates that Nigeria and Canada have specific methane targets in NDC, while other countries only include GHG targets that cover methane in their scopes.

Countries	International commitments		Ambition		Implementation				
	Methane mentioned in NDCs	Global Methane Pledge	Methane-specific national plan	Quantified targets	Reporting mechanism	Dedicated regulations	Government fund	Carbon market/offsets	Prioritizing utilization
India	No	No	No	No	No	No	No	No	Yes
Russia	Yes	No	No	No	No	No	No	No	No
Brazil	Yes	Yes	Yes	GMP target	No	No	Yes	No	Yes
Indonesia	Yes	Yes	No	GMP target	No	No	No	No	No
Iran	No	No	No	No	No	No	No	No	No
Pakistan	Yes	Yes	No	GMP target	No	No	No	No	No
Nigeria	Yes*	Yes	Yes	Beyond GMP target	No	No	No	No	No
Mexico	Yes	Yes	No	GMP target	No	No	No	No	No
Argentina	Yes	Yes	No	Yes	No	No	No	No	No
Turkimenstan	Yes	Yes	No	GMP target	No	No	No	No	No
Saudi Arabia	Yes	Yes	No	GMP target	No	No	No	Yes	No
EU	Yes	Yes	No	Beyond GMP target	Yes	Yes	No	No	Yes
Australia	Yes	Yes	No	GMP target	No	No	Yes	Yes	Yes
UK	Yes	Yes	Yes	Beyond GMP target	Yes	No	No	No	Yes
Canada	Yes*	Yes	Yes	Beyond GMP target	Yes	Yes	Yes	Yes	Yes

Legend: ● Yes ◉ Global Methane Pledge target ◉ Beyond Global Methane Pledge target ● No

The 15 key emitters have varied commitments to methane mitigation, with 12 of these countries being signatories of the Global Methane Pledge, with India, Russia, and Iran not signing the pledge. Most of these key emitters have included methane in their overall GHG emissions reduction targets in the Nationally Determined Contributions (NDCs), with the exceptions of India and, as previously noted, Iran. However, only five emitters have translated these commitments into specific national plans. For example, the Brazilian government developed and implemented the

"ABC" plan (Low-Carbon Agriculture Plan) from 2010 to 2020, aiming to promote climate-friendly agriculture and reduce GHG emissions, including methane, from livestock and other agricultural activities. This national plan has evolved into the updated "ABC+" plan (Brazilian Agricultural Policy for Climate Adaptation and Low Carbon Emission), which is in effect from 2020 to 2030. Nigeria issued the National Short-lived Climate Pollutants (SLCP) Action Plan in 2019, addressing the energy, agriculture, and waste sectors. Similarly, the EU introduced the Methane Strategy in 2020 and subsequently the EU Methane Action Plan in 2022. The UK released the United Kingdom Methane Memorandum, summarizing progress and future strategies for methane mitigation. Additionally, Canada launched its Methane Strategy in 2022, primarily targeting the oil and gas industry and the agricultural sector.

Quantified methane targets are essential for national climate ambition. Yet, apart from the Methane Global Pledge's goal of collectively reducing emissions to 30% below the 2020 level by 2030, most key emitters lack specific domestic emissions reduction targets. However, Nigeria, the UK, the EU, and Canada have established more ambitious or detailed targets. Nigeria, for instance, has set sector-specific reduction goals, including quantified targets for the oil and gas industry regarding leakage and flaring, landfill gas recovery, rice paddies, agricultural residuals, manure management, and enteric fermentation. Meanwhile, Canada has set a more ambitious domestic target, aiming for a 35% reduction in overall methane emissions below the 2020 level by 2030, and at least a 75% reduction in methane emissions in the oil and gas sector below 2012 levels by 2030 (Government of Canada, 2022c). The EU also set reduction targets in its methane action plan, mentioning an estimated 25% reduction in methane emissions between 2020 and 2030 (European Commission, 2023e). The UK mentioned in its methane memorandum that it aims to achieve zero routine flaring and venting targets by 2030 (Government of the UK, 2022).

There is a significant gap in fulfilling those commitments and targets for methane mitigation.

Actions taken to further curb methane emissions beyond existing sectoral policies – which primarily focus on operation safety, resource conservation, and pollution mitigation related to methane emissions – are significantly limited. First of all, there is also a general lack of established MRV systems across these key emitters, especially in developing countries in which methane reporting mechanisms are largely unavailable.

Secondly, even though regulatory policy instruments, such as laws and regulations, have been widely adopted throughout the key emitters, only four emitters, namely Nigeria, Mexico, the EU, and Canada, have direct regulations dedicated to curbing methane emissions. In addition to regulations on the oil and gas methane emissions in Mexico and Nigeria (IEA, 2022a, 2022b), Canada has recently announced the publication of strengthened oil and gas methane regulations (Environment and Climate Change Canada, 2023). The EU's new legislation mandates methane reporting from the energy industry actors and limits methane emissions in the oil and gas and coal extraction activities (European Commission, 2023a). However, these regulations are entirely focused on the energy sector.

Thirdly, regarding financial mechanisms, only a few emitters offer public or governmental funds for methane mitigation measures or have established carbon trading mechanisms. Examples of government funding include Brazil's "ABC" and "ABC+" plans, which support low-carbon agriculture projects through mechanisms such as low-interest loans. Additionally, the EU and its Member States have allocated a €175 million fund as part of the Methane Finance Sprint, a funding campaign announced by President Joe Biden to reduce methane emissions aligning with the Global Methane Pledge (CCAC, 2023). This initiative aims to accelerate methane reduction by fostering collaborative efforts among governments, industries, and philanthropic organizations across the energy sector. This includes enabling a methane data revolution through the deployment of new satellites. A notable example of a carbon trading mechanism is the Australian Carbon Credit Units (ACCUs), established by the Carbon Credits

(Carbon Farming Initiative) Act. ACCUs are traded or sold on the national environmental commodity market through carbon market agents, such as Green Energy Trading. Organizations seeking to offset their carbon footprint or fulfill emissions reduction obligations across various economic sectors, including energy, agriculture, and waste, utilize these units.

Despite these gaps, among all implementation actions, the utilization of methane emissions is favored by the majority of key emitters, with a primary focus on biogas production from manure management and landfills.

POLICY HIGHLIGHTS

This section provides a summary of the key characteristics of methane policies among the principal emitters in each sector.

Energy sector

The energy sector has attracted most of the governmental attention in reducing methane emissions across the key emitters, covering a diverse range of instruments, especially mandatory policies. Most recently, the EU reached an agreement to issue its first methane law, specifically targeting the energy sector, including coal as well as oil and gas (European Commission, 2023f). However, a significant portion of the existing policies in the key emitters are regulations, standards and procedures focusing on safety, resource conservation, and pollution control in fossil fuel production, rather than targeting climate mitigation. This is especially true for large fossil fuel producers such as India, Indonesia, Russia, and Saudi Arabia.

Coal mine: Methane emissions in the coal industry have been addressed in a number of countries, including major coal producers such as Australia, India, and Indonesia, yet with different policy preferences. For example,

Australia favors financial support for coal mine methane mitigation, including government funds and carbon credit schemes. Developing countries, such as India and Indonesia, prefer coal mine methane recovery and utilization as clean energy sources (e.g., coalbed methane). However, notable gaps remain in addressing methane emissions from coal production activities. No methane policy dedicated to the coal mine sector was found in the selected key emitters. More importantly, few policies have addressed abandoned coal mine methane (AMM) except for the EU, which requires companies in the coal industry to inventory closed, inactive, sealed, and abandoned assets such as wells and mines (European Commission, 2023a).

Oil and gas: Notable regulation examples include Canada's Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector) (2020), Indonesia's Regulation on Downstream Oil and Gas Activities (2004), and Nigeria's Guidelines for Management of Fugitive Methane and Greenhouse Gas Emissions in the Upstream Oil and Gas Operations (2022), and Mexico's Guidelines for the Prevention and Comprehensive Control of Methane Emissions from the Hydrocarbons Sector. In addition, a significant number of these policies are designed to regulate methane emissions associated with production activities, particularly venting and flaring, as well as leakage control (e.g., Leak detection and repair) in the oil and gas industry. The upcoming EU methane law requires the oil and gas industry to regularly report methane emissions, detect and repair leaks, and eliminate routine venting and flaring. Moreover, in late 2023, the EU also agreed on legislation to impose methane emission restrictions on oil and gas imports into Europe from 2030, pressuring international suppliers to reduce methane leakages (Reuters, 2023).

Agriculture sector

Livestock: Policies focused on livestock constitute the most substantial portion of methane-related measures in the agriculture sector among these

key emitters. Effective policies should encourage businesses to promote biogas recovery and utilization, modify feeding practices, update forage, add supplements, introduce new cattle breeds, and enhance manure storage (FAO, 2023b). Brazil is one of the first countries to address methane emissions from the agricultural sector. The Low-Carbon Agriculture Plan (the ABC plan), the Low-Carbon Agriculture Program (the ABC program), and the Plan for Adaptation and Low Carbon Emission in Agriculture (the ABC+ plan) were launched in 2010, 2012, and 2020, respectively, aiming to reduce GHG emissions and finance low-carbon technologies in both livestock and cultivation activities. The Brazilian government has provided substantial funding for a research network project known as "Pecus", specifically targeting livestock methane mitigation (Brazilian MAPA, 2021a).

Moreover, both Brazil and India have emphasized biogas recovery and utilization as a major approach to address manure methane emissions. Brazil has also promulgated laws to promote biogas recovery and utilization from animal waste (UNEP, 2018). India launched the National Biogas and Manure Management Program, which is a Central Sector Scheme, schemes entirely funded and implemented by the central government, primarily set up for rural and semi-urban households.

Additionally, Australia, Canada and the EU have incorporated livestock methane emissions into their carbon trading schemes. The Australian government has launched the Carbon Farming Initiative, which involves methane from piggery, beef cattle, and milking cows in the carbon offsets scheme. Canada announced its first cattle methane emissions reduction protocol - Reducing Enteric Methane Emissions from Beef Cattle in December 2023 under the Greenhouse Gas Offset Credit System (Government of Canada, 2023d). The EU has incorporated methane emissions from manure management and enteric fermentation into its Climate Monitoring Mechanism, guiding livestock owners to pay more attention to methane emissions (European Commission, 2023b). It also launched the European Agricultural Fund for

Rural Development (EAFRD), which gives financial support for mitigating emissions from livestock (European Commission, 2023d).

Rice cultivation: Targeted policies addressing methane emissions from rice paddies remain insufficient. Governments tend to provide financial incentives for reducing livestock methane emissions, with comparatively less focus on rice cultivation. In major rice-producing countries such as India and Indonesia, policies for mitigating methane emissions from rice cultivation are still in the early stages. They primarily acknowledge its importance and outline mitigation strategies, yet lack detailed regulations or concrete implementation steps. However, Brazil has taken more advanced steps with its "ABC" plan by funding emission reduction efforts in rice cultivation (IPAM, 2012). This includes improving irrigation methods, refining emissions factors, and enhancing MRV systems (Brazilian MAPA, 2021b).

Waste sector

Landfills: Food waste prevention, organic waste diversion, gas capture, and emission monitoring are common ways to address landfill methane emissions (Ayandele et al., 2022). For instance, the UK has introduced a voluntary initiative, the Courtauld Commitment (CC), supported by government funding. It aims to reduce per capita food waste throughout the supply chain, from manufacturing and retail to hospitality, food service, and households, thereby mitigating GHG emissions from landfills, including methane (WRAP, 2023). In addition, the UK has made great efforts to curb landfill emissions, focusing on reducing the volume of organic waste and enhancing the efficiency of methane capture from these sites (Government of the UK, 2022). In Indonesia, the Solid Waste Management policy introduced in 2016 mandates the separation of mixed waste into organic and inorganic components, facilitating organic recovery at landfill treatment facilities (MoEF, 2016). Additionally, Canada has developed the Landfill Methane Recovery and Destruction protocol under its Greenhouse Gas Offset Credit System. This

protocol involves the installation and operation of a system specifically designed to actively recover and destroy landfill gas using an eligible destruction device (Government of Canada, 2023c).

Wastewater: Policymakers, particularly in developing countries, tend to allocate less attention to wastewater methane policies (GCHA, 2023). However, efforts have been made in a number of key emitters to reduce wastewater methane emissions. For instance, Australia has integrated methane emissions from wastewater into its carbon crediting system, providing incentives to mitigate these emissions (Australian Government, 2015). Similarly, the EU also includes wastewater methane in its monitoring and reporting framework, enhancing regulation in this sector (EUR-Lex, 2012). Brazil, as a developing country, has developed the Arrudas WWTP project utilizing anaerobic digesters for sludge treatment, capturing the resulting biogas for heat and power generation (GMI, 2013).

In the following table, we list the key policies that serve an important role in building countries' methane mitigation policy frames and supporting their methane reduction actions.

TABLE 1. OVERVIEW OF THE KEY POLICIES AND INITIATIVES IN EFFECT IN EACH SECTOR.

Sector	Subsector	Key policies
Climate Change	Methane specific & included	▶ The National Zero Methane Program [Brazil, 2022] ▶ National Action Plan to Reduce Short-lived Climate Pollutants [Nigeria, 2019] ▶ European Union Methane Action Plan [EU, 2023] ▶ EU Methane Strategy [EU, 2020] ▶ Effort Sharing Regulation (ESR) [EU, 2018] ▶ National Greenhouse and Energy Reporting Act 2007 [Australia, 2007] ▶ United Kingdom Methane Memorandum [UK, 2023] ▶ Net Zero Strategy [UK, 2021] ▶ Greenhouse Gas Reporting Program (GHGRP) [Canada, 2004] ▶ Pan-Canadian Framework on Clean Growth and Climate Change [Canada, 2018] ▶ Greenhouse Gas Pollution Pricing Act (GGPPA) [Canada, 2021] ▶ Faster and Further: Canada's Methane Strategy [Canada, 2022] ▶ Canada's Greenhouse Gas Offset Credit System [Canada, 2022] ▶ Australia's long-term Emission Reduction Plan: A whole-of-economy Plan to achieve net zero emissions by 2050 [Australia, 2021]

Sector	Subsector	Key policies
Energy	Oil and gas	▶ Guidelines for Management of Fugitive Methane and Greenhouse Gases Emissions in the Upstream Oil and Gas Operations [Nigeria, 2022] ▶ Draft Methane Regulations to Support Cleaner Energy and Climate Action [Canada, 2023] ▶ Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector) [Canada, 2020] ▶ Pan-Canadian Framework on Clean Growth and Climate Change [Canada, 2016] ▶ Strategy of Socio-economic Development of Russia with a Low Level of Greenhouse Gas Emissions until 2050 [Russia, 2022]
	Coal	▶ Policy for Early Monetisation of Coal Bed Methane Gas Marketing and Pricing Freedom [India, 2017] ▶ Carbon Credits (Carbon Farming Initiative—Coal Mine Waste Gas) Methodology Determination 2015 [Australia, 2021]
	Overarching	▶ Energy Strategy of the Russian Federation for the Period up to 2035 [Russia, 2020] ▶ Guidelines for the prevention and comprehensive control of methane emissions from the hydrocarbons sector [Mexico, 2018] ▶ EU Strategy to Reduce Methane Emissions [EU, 2020] ▶ Provisional Political Agreement on a Regulation on Tracking and Reducing Methane Emissions in the Energy Sector [EU, 2023] ▶ Renewable Energy (Electricity) Regulations 2001 [Australia, 2001]
Agriculture	Livestock	▶ European Agricultural Fund for Rural Development (EAFRD) [EU, 2014] ▶ Pecus-A significant research network project [Brazil, 2021] ▶ New National Biogas and Organic Manure Programme (NNBOMP) [India, 2022] ▶ National Livestock Breed Improvement Programme (NALBIP) [Nigeria, 2023] ▶ Methane Emissions Reduction in Livestock (MERiL) [Australia, 2022]
	Rice cultivation	▶ Commission Implementing Regulation (EU) 2022/996 [EU, 2022] ▶ National Climate Change Policy [Pakistan, 2021] ▶ National Action Plan: Addressing Climate Change (2007) [Indonesia, 2007]
	Overarching	▶ Carbon Farming Initiative [Australia, 2015] ▶ Brazilian Plan for Adaptation and Low Carbon Emission in Agriculture (ABC+) Program [Brazil, 2021] ▶ National Plan on Climate Change [Brazil, 2007]
Waste	Landfills	▶ Commission Implementing Regulation (EU) 2018/2066 [EU, 2018] ▶ Landfill Methane Recovery and Destruction Protocol [Canada, 2022] ▶ Landfill Tax [UK, 1996] ▶ India Cooling Action Plan (ICAP) [India, 2019] ▶ The Solid Waste Management Rules [Indonesia, 2016]
	Wastewater	▶ Carbon Credits (Carbon Farming Initiative—Domestic, Commercial and Industrial Wastewater) Methodology Determination 2015 [Australia, 2022] ▶ The Fuel-testing Pilot Projects (Biogas Project) Regulations 2006 [UK, 2006]
	Overarching	▶ Commission Delegated Regulation 2023/262 [EU, 2023] ▶ Law No. 19.500 creating the State Policy on Biogas and Biomethane [Brazil, 2018] ▶ Federal Strategy to Incentive the Sustainable Use of Biogas and Biomethane [Brazil, 2022] ▶ The Renewables Obligation Order 2009 [UK, 2009] ▶ The Renewables Obligation Order 2015 [UK, 2015]

SUMMARY OF BEST PRACTICES

This study identified four types of best practices in methane policy-making based on the review of methane policies across the key emitters, namely financial support, carbon emissions trading schemes, legislation, and MRV systems. These policies are prevalent tools that policymakers from more progressive emitters have been using to mitigate methane emissions.

Financial support

Methane mitigation measures can encounter challenges such as high costs and low profitability, particularly when addressing methane emissions that are not easily recoverable or utilizable. To overcome these barriers, governments can direct funds towards a range of projects, programs, and initiatives, steering methane mitigation efforts in sectors that might otherwise be commercially unviable. In practice, financial support is multifaceted, both in form and focus. Three prevalent practices include:

Funding for methane mitigation R&D. This approach involves allocating financial resources to support the exploration and development of innovative technologies and methodologies for mitigating methane emissions.

The Australian government launched the Resources Methane Abatement Fund, which aims to bolster research institutions in their pursuit of pioneering methane abatement technologies, particularly within the coal and gas sectors (Australian Government, 2024). This fund has notably facilitated the work of Australia's national science agency, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), by providing the necessary support for the development of technologies targeting Ventilation Air Methane (VAM). Historically, VAM has posed significant challenges due to its low concentration and consequent difficulty in efficient oxidation. However, CSIRO's advancements in this area have

been noteworthy, leading to the development of technologies capable of oxidizing, on average, 96% of VAM methane (CSIRO, 2023).

Additionally, Canada's Strategic Innovation Fund (SIF), bolstered by an incremental budget of CAD 7.2 billion over seven years, has facilitated the expansion of projects that hasten the development of innovative technologies and processes to reduce GHG emissions, including methane in the oil and gas industry (Government of Canada, 2023f).

Funding for methane abatement projects: Governments can provide grants or subsidies to support the implementation of specific methane abatement projects. This direct funding can catalyze initiatives that may not be financially feasible without governmental intervention.

For example, Canada launched the Emissions Reduction Fund (ERF) in 2020, allocating a total of $750 million. This fund targets both onshore and offshore oil and gas companies, offering them financial support to implement technologies and processes that mitigate methane and other greenhouse gas (GHG) emissions (Government of Canada, 2022). The ERF's focus on green solutions and infrastructure involves a wide array of potential projects, ranging from the adoption of advanced methane leak detection and repair technologies to the installation of more efficient equipment that minimizes GHG emissions.

Although funding for the agriculture sector is limited in many countries, the EU has made it a priority. The EU has allocated the European Agricultural Fund for Rural Development (EAFRD), with a budget of €95.5 billion for the period 2021-2027, as one of the financial instruments aimed at enhancing the social, environmental, and economic sustainability of rural areas. This includes providing financial support for projects aimed at reducing methane emissions, particularly in mitigating emissions from livestock (European Commission, 2023d).

Low-interest loans for methane mitigation activities: Offering loans with favorable terms

can incentivize stakeholders to invest in methane mitigation activities. These loans make it more financially attractive for entities to engage in projects that reduce methane emissions, by reducing the cost of capital and therefore improving the project's overall profitability (IPAM, 2012).

For instance, Brazil's Low-Carbon Agriculture (ABC) program aims to reduce methane and other GHG emissions in the agricultural sector. It supports a range of mitigation projects to encourage sustainable practices such as no-till agriculture, rehabilitation of degraded areas, integration of crops, livestock, and forests, commercial forestry, biological nitrogen fixation, and treatment of animal waste. It facilitates these projects or activities by providing low-interest loans. Producers could access credits up to $500k at an annual interest rate of 5.5%, with repayment periods ranging from 5 to 15 years (IPAM, 2012).

Carbon emission trading schemes

Carbon emissions trading is widely utilized to incentivize the reduction of greenhouse gas (GHG) emissions, including methane, through market mechanisms. Several key emitters such as the US, Australia, the EU, and Canada have adopted this approach[2]. There are two primary mechanisms involved:

Voluntary carbon offsets: These represent a reduction in emissions made to compensate for emissions elsewhere. For instance, a company might invest in a reforestation project to offset the carbon emissions from its operations. Participation in these schemes is voluntary without compliance requirements.

For example, Australian Carbon Credit Units (ACCUs) are a fundamental component of Australia's approach to reducing greenhouse gas (GHG) emissions and fostering sustainable practices. Each ACCU represents one tonne of

CO2e stored or avoided by projects that are part of the Australian Government's Emissions Reduction Fund (ERF). ACCUs cover methane emissions from all sectors and subsectors, including coal mines, oil and gas, livestock, rice cultivation, landfills, and wastewater (Clean Energy Regulator, 2023a). ACCUs can be sold to the Australian Government through a carbon abatement contract or traded on the open market, providing an income stream for project developers and incentivizing further emission reduction activities. ACCUs can also be purchased by businesses and individuals looking to offset their own emissions voluntarily. For instance, the 'Coal Mine Waste Gas' method allows businesses to earn credit units by flaring, oxidizing, or converting underground coal mine methane, including Ventilation Air Methane (VAM), into electricity (Ember, 2022; IEA, 2023a).

In Jun 2022, Canada launched the Greenhouse Gas Offset Credit System - a voluntary carbon trading scheme to accelerate GHG emissions reduction, including methane (Government of Canada, 2023e). This system awards credits for projects, aligned with a specific protocol, that either prevents emissions or removes GHGs from the atmosphere. These credits are tradable and can be sold on the market, offering market-based financial incentives for methane reduction activities, primarily in the waste and agricultural sectors (Government of Canada, 2023e).

Cap-and-trade: Under this system, a cap is set on the total amount of emissions allowed. Companies receive or buy emission allowances, and those who reduce their emissions can sell their excess allowances to others. For instance, the European Union Emissions Trading System (EU ETS) is recognized as one of the most extensive and established carbon markets globally (European Commission, 2023c). Currently, it includes CO_2, N_2O, and PFCs emissions. However, plans are underway to broaden the EU ETS by 2026 to incorporate methane emissions from all large ships (European Commission, 2023g).

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[2] The U.S. is mentioned here for its important role in carbon emission trading schemes, despite not being among the 15 countries specifically focused on in this report.

Canada's Output-Based Pricing System (OBPS), a major component of the Greenhouse Gas Pollution Pricing Act (GGPPA) (Government of Canada, 2023b), requires facilities that emit GHGs to comply with emissions standards that are specific to their industry. These standards are based on the average performance of similar facilities. Facilities that emit less than the set limit earn credits they can sell, while those exceeding the limit must purchase credits or pay a carbon price for their excess emissions. It includes GHG emissions from fuel combustion, industrial processes, flaring, and certain venting and fugitive sources with a few exceptions (Government of Canada, 2018). In addition, Quebec's and Nova Scotia's cap-and-trade schemes cover methane emissions (IEA, 2013; Department of Environment of Nova Scotia, 2019).

Legislation and regulatory tools

By establishing a regulatory framework that sets standards, mandates emission reductions, and guides business activities, the legislative process creates a binding scheme that countries can adhere to in their methane mitigation efforts. This includes:

Methane emissions limits: These approaches set clear and enforceable limits on methane emissions from various sources. For example, both the EU and Canada are proposing new laws and regulations to ban venting and routine flaring in oil and gas production activities. In addition, the EU is also going to limit venting from thermal coal mines to reduce methane emissions (Environment and Climate Change Canada, 2023; European Commission, 2023a). Moreover, the EU has agreed to enact a law that will impose methane emission limits on oil and gas imports starting in 2030. The law introduces "maximum methane intensity values" to ensure that fossil fuel imports adhere to the stipulated environmental standards (Reuters, 2023).

Methane fee/Carbon tax: It is a fee imposed on methane emissions established through

legislation. Globally, the U.S. is the only country that applies methane fees in the oil and gas industry through the Inflation Reduction Act (IRA). However, there are a few carbon pricing mechanisms among the key emitters that regulate methane emissions.

For instance, Canada issued the Greenhouse Gas Pollution Pricing Act (GGPPA) in 2018, which introduces a federal pricing system for GHG emissions. It imposes a regulatory charge on fuels such as gasoline, diesel, natural gas, and coal that are consumed within Canada. Although the fuel charge is considered a carbon tax and does not directly apply to methane emissions, it indirectly affects methane by making natural gas more expensive, thereby incentivizing reductions in methane leaks and venting from natural gas systems.

Additionally, the UK introduced the Landfill Tax in October 1996, which is a less direct fee on methane (OBR, 2023). It aims to minimize waste being disposed of in landfills and reduce environmental problems such as pollution and the release of GHGs, including methane. The Landfill Tax has two main rates: a lower rate for inert or less-polluting wastes (like rocks, soil, and concrete) and a standard rate for other, more polluting types of waste. The rates are periodically reviewed and have generally increased over time to continuously incentivize the reduction of waste to landfills.

Procedural mandates: These involve mandatory protocols, such as mandatory reporting and environmental impact assessments, to ensure that potential methane emissions are evaluated and mitigated during the early stages of project planning and execution

For example, in 2013, the EU adopted the MMR repealing Decision 280/2004/EC, ensuring a robust GHG reporting mechanism in place (EU Monitor, 2021). Moreover, by incorporating successive amendments to regulation (EU) No 525/2013, this mechanism has been consolidated over the years (EUR-Lex, 2021).

In addition, the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA), serving as the government agency responsible for environmental protection and conservation, has issued a series of Normative Instructions focused on GHG mitigation. This action has contributed to the development of Brazil's legislative framework for methane mitigation (IBAMA, 2023). In particular, under Normative Instruction No. 12 of 2010, the IBAMA mandates the government to assess proposals from project proponents, which aim at mitigating the environmental impacts associated with GHG emissions (IEA, 2020).

MRV framework

MRV is a structured framework for measurement, reporting, and verification of greenhouse gas emissions, including methane (UNECE, 2019). It lays a concrete foundation for methane mitigation. The following outlines some of the key institutional elements to ensure a more effective MRV framework.

Business compliance: Accurate data and measures are essential for an effective MRV system. Consequently, business actors including fossil fuel facilities and operators, who generate methane emissions and possess detailed information, should have the obligation to monitor and report methane emissions from their own sites. The government should develop a set of rules for businesses to comply with.

For example, the Greenhouse Gas Reporting Program (GHGRP) in Canada is a mandatory policy for monitoring and reporting GHG emissions. It requires facilities that emit 10 kt or more of GHGs, including methane, to annually report their emissions (Government of Canada, 2023a). This program strengthens Canada's MRV system, particularly within the industrial sector, ensuring a more accurate database for mitigation strategies. Similarly, Australia has implemented the National Greenhouse and Energy Reporting (NGER) Scheme, a legislative framework that mandates corporations to report and publicly disclose information regarding greenhouse gas emissions, energy consumption, and production (Clean Energy Regulator, 2022). The NGER Scheme covers both CO_2 and non-CO_2 GHGs, including methane (Clean Energy Regulator, 2023b). Meanwhile, the EU's new methane law will require the fossil gas, oil, and coal industries to precisely measure, monitor, report, and verify their methane emissions in accordance with the highest monitoring standards.

Platform for data integration and management: Emissions and other related data are frequently required by various authorities for different purposes, including emissions trading. There is a need for a platform that consolidates and manages this data, aiming to eliminate redundancy and mismanagement and to ensure transparency. There are a couple of examples in which governments have adopted this strategy to better improve MRV systems.

For example, Brazil has developed an integrated data management called the ABC Plan Information System (SINABC), which is part of Brazil's broader initiative for climate-smart agriculture. This plan incorporates data from the ABC Plan Governance System (SIGABC), the System for Rural Credit Operations and Farming Insurance (Proagro-Sicor), as well as the multi-institutional platform for monitoring GHG emissions reductions from agriculture (ABC Platform) (FAO, 2021). The Brazilian government is aiming to enhance MRV through this approach, which allows for transparency and a solid mechanism of evaluation, monitoring and reporting.

Similarly, the Canadian government announced the establishment of a Methane Center for Excellence, which will improve understanding and reporting of methane emissions, with a focus on collaborative initiatives to support data and measurement.

Independent verification process: Ensuring that emission reduction results are subject to verification by an accredited third party is crucial for maintaining the credibility of MRV systems. This helps to validate the accuracy of reported data and the effectiveness of mitigation

actions, providing assurance to stakeholders and participants in carbon markets (The World Bank, 2022). This process involves the compilation of emission reduction results into a comprehensive report. Subsequently, this report undergoes a rigorous third-party verification process, conducted by an entity accredited in accordance with the specific standards applicable to the MRV system. A notable example of this practice is Mexico's initiative to strengthen its methane regulation framework. The country issued a call for third-party verifiers, setting forth detailed requirements that these independent entities must fulfill to be authorized as verifiers (IEA, 2019).

CASE STUDIES

Canada: Methane Mitigation in the Energy Sector

As a major oil and gas producer, Canada was one of the first countries to regulate methane emissions at the national level. Most recently, Canada has committed to reducing oil and gas methane emissions by at least 75% below 2012 levels by 2030 (Xinhua, 2023). A series of policy efforts has been made to support its methane mitigation actions in the oil and gas sector (IGSD, 2024).

The federal government has regulated methane emissions by setting requirements and regulations for specific production, transportation, and storage processes in the oil and gas industry. These include targeted interventions, such as inspecting equipment to prevent methane leaks (Konschnik & Reuland, 2020). For example, in 2018, Canada launched the Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector) to regulate methane emissions specifically from oil and gas (Government of Canada, 2024). It proposed operating and maintenance standards for the upstream oil and gas industry to help reduce fugitive and venting emissions where there is a high potential for emission.

Moreover, Canada has offered strong financial support to mitigate methane in the energy sector. Canada launched the Pan-Canadian Framework on Clean Growth and Climate Change (PCF) in 2016, which is Canada's major climate change plan (Government of Canada, 2016). The PCF was updated in late 2020 with a plan entitled, "A Healthy Environment and a Healthy Economy" (HEHE), indicating the federal government's commitment to accelerating methane emission reductions. This is supported by the $750 million Emissions Reduction Fund (ERF), which offers repayable funding to oil and gas companies (Government of Canada, 2022b). "In 2021, Canada further emphasized the ERF by launching a federal review of its national strategy for reducing oil and gas methane emissions. This review highlighted the ERF's role in driving further methane emission reductions and enhancing the quantification of fugitive methane emissions from oil and gas facilities (Government of Canada, 2022a).

Canada also employs carbon trading schemes to control methane in the oil and gas sector. Canada has developed the Output-Based Pricing System (OBPS), a regulatory trading system for industry to reduce GHG emissions established by the Greenhouse Gas Pollution Pricing Act (GGPPA). It covers methane emissions from fuel combustion, industrial processes, flaring, and some venting and fugitive sources in the oil and gas industry (Government of Canada, 2023c). In 2023, Canada launched the Regulatory Framework to Cap Oil and Gas Sector Greenhouse Gas Emissions, detailing the design of the planned cap-and-trade system set to take effect in 2025 (Government of Canada, 2023g). This system aims to create a market-based instrument that facilitates cost-efficient emissions reductions, ensuring that GHG emissions in this sector not only remain below a specified threshold but also decrease gradually.

Additionally, Canada has established a GHG reporting system through the Greenhouse Gas Reporting Program (GHGRP), which requires facilities to report their methane emissions annually from sources including fuel combustion, industrial processes, and fugitive emissions such as venting, flaring, or leakage (Government

of Canada, 2023b). This program strengthens Canada's MRV system for methane in the oil and gas industry, providing a concrete inventory foundation for further mitigation actions.

Brazil: Methane Mitigation in the Agriculture Sector

Brazil is considered a pioneer in agricultural methane mitigation. The agriculture sector in Brazil is responsible for around 70% of its total methane emissions (IEA, 2023b; EDGAR, 2023), with enteric fermentation being the primary contributor owing to Brazil's position as the second-largest cattle owner in the world. Other significant sources of methane emissions in this sector include manure management and rice cultivation. Given this situation, the Brazilian government has taken various initiatives to mitigate methane emissions.

In 2007, Brazil launched a comprehensive action plan for climate change, the National Plan on Climate Change (PNMC), which identified methane emission sources and coordinated actions that can be undertaken to mitigate GHGs in Brazil (Government of Brazil, 2008). The agriculture sector is one of the focus of this plan. It proposed several innovative measures, including increasing carbon storage in the soil, updating cattle raising, changing feeding structures, and improving crop and fertilization to reduce methane (Climate Change Laws of the World, 2008). The inclusion of agriculture methane in the national plan highlights a policy focus on addressing methane emissions in this sector and sets a general direction for future mitigation actions and policy making.

The Low-Carbon Agriculture program, known as the ABC plan, was launched in Brazil in 2010 to reduce greenhouse gas emissions from agricultural activities. By 2020, the ABC Plan had disbursed $3 billion to support various mitigation projects (WWF, 2022). These included initiatives such as nitrogen fixation to decrease methane emissions from rice paddies and integrating forests, crops, and livestock breeding. Based on

advances in science and technology, engagement from civil society, and support from the federal government, the ABC plan provided substantial financial backing, integrated the most efficient production technologies, and coordinated various branches of the plan to create co-benefits. This approach helped reduce risks and increase production, significantly contributing to the reduction of methane emissions (Brazilian MAPA, 2023).The program surpassed its initial targets, to reduce annual GHG emissions by 133 to 166 million tonnes of CO2eq relative to projected future levels, by 155% by 2020 (UNFCCC, 2022). Recognizing the program's success, the Brazilian government has launched a new initiative, the Plan for Adaptation and Low Carbon Emission in Agriculture (ABC+ Plan), which is set to continue the ABC Plan's efforts from 2020 to 2030. The ABC+ Plan helps maintain motivation for sustainable farming, strengthen research and technology development, offer financial support and tax incentives, and consolidate the MRV mechanisms, so as to build an integrated approach to decrease methane (Brazilian MAPA, 2021c). The ABC/ABC+ Plan, as a flagship policy within Brazil's sectoral approach, plays a crucial role in the country's efforts to address climate change (UNFCCC, 2022).

In addition, the Brazilian government has provided substantial funding for a research network project known as "Pecus" ("cattle" in English), which was initiated in 2011 with the primary goal of estimating the contribution of various livestock production systems to greenhouse gas dynamics in the country. By establishing the Pecus Research Network and engaging in related work, Brazil has significantly advanced its understanding of GHG dynamics in the livestock sector and enhanced the accuracy of calculation factors. Drawing from five Brazilian biomes that best represent the characteristics of each country's region, the Pecus project delivered accurate datasets and a glossary of key terminologies, thereby creating resources for future research and knowledge expansion (Brazilian Agricultural Research Corporation, 2011, 2015; Macedo et al., 2021; Madari et al., 2020).

In 2022, the Ministry of Environment of Brazil launched the Zero Methane Programme as a crucial component of the Federal Strategy to Incentivize the Sustainable Use of Biogas and Biomethane. This initiative aligns with Brazil's national commitments under the UNFCCC, the Glasgow Pact, and the Global Methane Pledge (IGSD, 2024). The program aims to promote the production and use of biomethane and biogas as energy and fuel, enhance methane reduction plans across sectors, and incentivize the carbon market, particularly methane credits. As part of this program, the federal government will provide financial support through public banks, offering specific financing options and a line of credit to foster technological advancements, scientific research, and international cooperation to mitigate methane emissions(The Government of Brazil, 2022).

The EU: Methane Mitigation in the Waste Sector

The waste sector accounts for 27% of the EU's methane emissions. In two decades, the policies implemented by the EU regarding waste management have undergone a clear progression, marked by the phases of gathering information, developing methodology and promoting implementation.

In the initial phase, spanning from 2006 to 2013, the EU focused primarily on information gathering, specifically monitoring and reporting, as a means of gaining insight into the nature of the waste problem. For example, the Commission Regulation (EU) No 601/2012 mainly focuses on building more consistent, transparent, and accurate monitoring and reporting of greenhouse gas emissions (EUR-Lex, 2012).

The second phase started from 2013 to 2016, when the government began exploring methodology that supports methane mitigation from waste. One major method is to allocate funds for the development of rural areas, the main source of waste. To deal with waste gas, the EU primarily relied on the collection and use of biogas or biomass to support its renewable energy initiatives. For example, Commission Implementing Regulation (EU) No 215/2014 laid the European Regional Development Fund, the European Social Fund, the Cohesion Fund, and the European Agricultural Fund for Rural Development to support rural area waste (EUR-Lex, 2014).

In the third phase after 2016, the EU shifted its attention to the actual implementation stage by promoting technologies, facilities and management methods to reduce emissions and collect biogas. For instance, Commission Delegated Regulation (EU) 2020/1208 mentioned specific waste management methods that can be adopted by landfill/wastewater sites, such as reducing demand, enhancing recycling, promoting methane collection, upgrading treatment technologies, improving landfill management facilities, integrating waste incineration with energy use, and facilitating wastewater management systems (EUR-Lex, 2020).

POLICY RECOMMENDATIONS

Bridging methane policy gaps. First of all, it is important to address the existing emission-policy mismatches. There is a significant gap between methane emissions and policy efforts, particularly in the agriculture sector. Therefore, a targeted approach to bolster policies in this sector is crucial. Secondly, policymakers need to diversify policy instruments across sectors. The adoption of policy tools is notably uneven across sectors. Encouraging a broader utilization of diverse policy instruments can lead to more comprehensive and effective methane mitigation strategies. This involves promoting a mix of regulatory measures, financial incentives, and voluntary programs tailored to the specific needs of each sector. Thirdly, the key emitters need to further narrow the existing ambition and implementation gaps. Significant ambition and implementation gaps exist across key emitters. Efforts should focus on not just setting ambitious

targets but also ensuring their translation into concrete actions. Strengthening mechanisms for monitoring, reporting, and verifying progress is vital for maintaining accountability and driving actual change.

Strengthening MRV systems. It is critical to establish robust MRV systems for methane emission, mitigation actions, and emissions reductions. Policymakers should provide more policy incentives to encourage business compliance, adopt accurate detection and measurement methods, develop integrated data platforms, and ensure independent verification processes, so as to promote data management and transparency and inform decision-making and policy development in return.

Diversifying policy instruments: To effectively enhance global methane mitigation, it is crucial to implement a comprehensive policy framework. Governments should offer a variety of financial incentives such as grants, subsidies, and low-interest loans to encourage research and development and to support mitigation efforts, particularly in sectors that face the greatest challenges. Additionally, establishing

carbon emission trading schemes—including both voluntary offsets and formal cap-and-trade systems—is critical for promoting market-driven solutions and improving economic efficiency, which in turn motivates further reductions in methane emissions. Legislative and regulatory measures are also essential, including enforceable limits on methane emissions, the implementation of methane fees or carbon taxes, and procedural mandates. These tools are fundamental to enforcing standards and procedures, providing a holistic framework for action.

Establishing a robust knowledge sharing mechanism. Sharing best practices is essential for strengthening global methane mitigation efforts. This involves creating platforms for exchanging best practices, insights, and lessons learned. Developed countries should actively engage in assisting developing countries through capacity building and climate finance. This involves enhancing the Global South-North collaboration mechanism on methane. Such cooperation can facilitate the transfer of technology, knowledge, and resources, ensuring that all countries have the means to combat methane emissions effectively.

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Stands For
ABC Plan	Low-Carbon Agriculture Plan
ABC+ Plan	Brazilian Agricultural Policy for Climate Adaptation and Low Carbon Emission
ACCS	Australia's Carbon Crediting Scheme
ACCUs	Australian Carbon Credit Units
AMM	Coal Mine Methane
CABIP	Cattle Breed Improvement Programme
CAD	Canadian Dollar
CC	Courtauld Commitment
CCAC	Climate and Clean Air Coalition
CEPA	Canadian Environmental Protection Act 1999
CO_2	Carbon Dioxide
CO2eq	Carbon Dioxide Equivalent
COP26	The 26th Annual United Nations Climate Change Conference
COP28	The 28th Annual United Nations Climate Change Conference
CPI	Climate Policy Initiative
CSIRO	The Commonwealth Scientific and Industrial Research Organisation
EAFRD	European Agricultural Fund for Rural Development
EDGAR	Emissions Database for Global Atmospheric Research
ERF	Emissions Reduction Fund
ESR	Effort Sharing Regulation
EU	The European Union
EU ETS	European Union Emissions Trading System
FAO	Food and Agriculture Organization of the United Nations
FAOLEX Database	Food and Agriculture Organization of the United Nations Policy Database
GCHA	The Global Climate and Health Alliance
GEM	Global Energy Monitor
GHGRP	Greenhouse Gas Reporting Program
GHGs	Greenhouse Gasses
GMI	Global Methane Initiative
GOBAR-Dahn	Galvanising Organic Bio-Agro Resources Dhan
HEHE	A Healthy Environment and a Healthy Economy
IBAMA	The Brazilian Institute of the Environment and Renewable Natural Resources
ICAP	India Cooling Action Plan
IEA	International Energy Agency
IGSD	Institute For Governance & Sustainable Development
IPAM	Amazon Environmental Research Institute

Acronym/Abbreviation	Stands For
IPCC	Intergovernmental Panel on Climate Change
MAPA	Ministry of Agriculture, Livestock and Food Supply (Brazil)
MEE	Ministry of Ecology and Environment of People's Republic of China
MERiL	Methane Emissions Reduction in Livestock
MMR	Monitoring Mechanism Regulation
MoEF	Ministry of Environment and Forestry (Indonesia)
MRV	Measurement, Reporting, and Verification
N_2O	Nitrous Oxide
NAEI	National Atmospheric Emissions Inventory
NAP	National SLCP Action Plan
NALBIP	National Livestock Breed Improvement Programme
NDC	Nationally Determined Contribution
NGER	National Greenhouse and Energy Reporting Scheme
NNBOMP	The New National Biogas and Organic Manure Programme
NUPRC	Nigerian Upstream Petroleum Regulatory Commission
NZS	Net Zero Strategy
OBPS	Output-Based Pricing System
OBR	Office of Budget Responsibilities
PCF	Pan-Canadian Framework on Clean Growth and Climate Change
PFCs	Perfluorochemicals
PNMC	National Plan on Climate Change
R&D	Research and Development
REACH	Authorisation and Restriction of Chemicals
RMI	The Rocky Mountain Institute
SIF	Strategic Innovation Fund
SIGABC	ABC Plan Governance System
SINABC	ABC Plan Information System
SLCP	National Short-lived Climate Pollutants Action Plan
The U.S.	The United States
UK	The United Kingdom
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VAM	Ventilation Air Methane
WRAP	Waste & Resources Action Programme
WWF	World Wildlife Fund
WWTP	Wastewater Treatment Plant

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APPENDIX

Methodology

Among policies collected, the majority (80%) were sourced from the official government websites and the IEA. While government websites with comprehensive databases are considered the most reliable sources, language barriers resulted in only 44% of the policies being obtained through this channel. This limitation was partially addressed by incorporating data from international organizations such as the IEA, United Nations Environment Programme (UNEP), Food and Agriculture Organization (FAO), United Nations Framework Convention on Climate Change (UNFCCC), and Asia Pacific Energy, which provide country policy profiles. However, it is important to acknowledge that these organizations may exhibit policy bias due to their specific missions and objectives. To minimize this deviation, international organizations representing diverse sectors were included in this study. For instance, the IEA, as a leading global authority on energy, offers reliable analysis, data, policy recommendations, and practical solutions to support countries in achieving secure and sustainable energy for all (IEA, 2023b). The UNEP adopts a more holistic perspective on the environment, with a particular focus on waste policies. The FAO focuses on the agriculture sector and it is an essential source of agricultural policy information. By integrating data from these organizations and others, this study aimed to establish a more comprehensive understanding of policies across different countries.

Case studies are selected based on the methane mitigation policies and methane emissions. Brazil, Canada, and the EU not only regulated methane emissions from their largest emission sources by publishing a large number of policies but also promulgated policies in other sectors, which also provided valuable practices that can be shared with other countries.

Some policies address methane emissions in overarching contexts instead of specific sectors. In this case, policies are categorized as "climate change". Policies are categorized in general sectoral categories, including "energy", "agriculture", or "waste" when their primary focus is on these sectors, and they include discussions on methane-related matters within these specific sectors. In addition to methane policies addressing emissions from the primary three sectors (energy, agriculture, and waste), there are policies that indirectly influence methane issues, like those in the transportation sector. Since these policies cannot be directly categorized within the primary sectors, we classify them in the "other" category. Typically, the policy types do not overlap, but there were some overlaps in the sectoral dimension because the same policy document can be categorized into different sectors if multiple sectors are mentioned in the same document.

Limitations

Our analysis only evaluated the top 10 countries using IEA and EDGAR v8.0 data, but other inventory estimates may suggest different high-emitting countries by sector. For the purposes of this study, we only looked at two emissions sources, but additional research could evaluate additional high-emitting countries that are identified by other analyses.

This report has collected past and current policies to reflect governmental efforts in mitigating methane emissions across various sectors. However, it primarily examines emissions as of a single time point (2022), without delving into the direct impact of policy changes on emissions over time. Future research should prioritize investigating how policy adjustments influence changes in emissions, both forwards and backwards, to provide a more comprehensive understanding of policy effectiveness.

The collected policies provide evidence of varying levels of confidence in the policies of different countries. The legislative websites of Australia and the EU were found to be highly comprehensive, with over 90% of policies sourced from these platforms, ensuring the comprehensiveness of

policies. For another, countries such as Canada, Nigeria, Indonesia, and Russia exhibited a relatively high level of confidence, as their energy sectors are the primary contributors to emissions, and their policies are sourced from the IEA and Asia Pacific Energy, ensuring the inclusion of as many relevant policies as possible. However, the policies of Argentina, Brazil, Mexico, and India are subject to higher levels of uncertainty due to their reliance on international organizations primarily focused on the energy sector. As a result, their policies in the agriculture sector may not be as representative as those obtained directly from the legislative websites, potentially leading to gaps in policy coverage and lower levels of confidence in the accuracy and comprehensiveness of

the policies. Future research should evaluate additional policy collection sources, especially for these countries.

This report is limited by the availability of policy data, which represents an inherent constraint. Despite this challenge, our research is grounded on the assumption that the presence of policies is indicative of the policy attention level. We have made concerted efforts to conduct a thorough policy search and have synthesized the available information to derive insightful conclusions. Despite the limitations, we believe that this provides a valuable contribution to understanding policy dynamics in global methane mitigation.

TABLE A1. CRITICAL POLICY ELEMENTS BY COUNTRY.

Country	Developed or developing	International Commitment		Ambition		Implementation			Utilization	Note
		NDC	Global methane pledge	National plan specifically on methane	Quantified national methane emissions reduction targets	Methane reporting (nationwide)	Financial support	Direct regulations on methane emissions		
India	developing	No	No	No	No	No	No	No	The New National Biogas and Organic Manure Programme (NNBOMP) promotes the use of biogas produced from cattle manure and other organic wastes available in rural areas; Waste-to-energy projects promote the recovery of energy from urban, industrial, and agricultural wastes; Waste-to-energy projects promote the recovery of energy from urban, industrial, and agricultural waste; Galvanising Organic Bio-Agro Resources Dhan (GOBAR-Dahn)	
Russia	developing	Yes	No	No	No	No	No	No	No	
Brazil	developing	Yes	Yes	ABC+; Brazilian Plan for Adaptation and Low Emission of Carbon in Agriculture (ABC+); The National Zero Methane Program.	Global Methane Pledge target	No	Direct funding: ABC plan; On March 21, 2022, the Brazilian Government launched a new package of incentive measures seeking to stimulate programs and actions to reduce methane emissions, particularly through the development of biogas and biomethane initiatives (Federal Strategy of Incentive to the Sustainable Use of Biogas and Biomethane); encourage the carbon market, especially methane credits; Brazil will stimulate and help sectors of the economy - such as agriculture and livestock - in the production and use of biomethane and biogas. Financial support will come from public banks, through specific financing and a line of credit.	No	Stimulate deployment of technologies that allow the use of biogas and biomethane as renewable energy and fuel sources.	Focus on ag, not the energy sector; biogas utilization is highly encouraged
Indonesia	developing	Yes	Yes	No	Global Methane Pledge target	No	No	No	No	
Iran	developing	NA	No	No	No	No	No	No	No	

Country	Developed or developing	International Commitment		Ambition		Methane reporting (nationwide)	Implementation			Note
		NDC	Global methane pledge	National plan specifically on methane	Quantified national methane emissions reduction targets		Financial support	Direct regulations on methane emissions	Utilization	
Pakistan	developing	Yes	Yes	No	No	No	No	No	No	
Nigeria	developing	Yes	Yes	National SLCP Action Plan (NAP)	Nigeria's emissions mitigation and reduction targets, including the elimination of routine gas flaring by 2030, and a 60% reduction in fugitive methane emissions/ leakages from oil and gas operations by 2031 (Guidelines); 100% of gas flaring eliminated by 2020 50% Methane Reduction by 2030(Fugitive emissions/leakages Control), 50% Methane Reduction by 2030 (Methane Leakage Reduction); 50% methane recovered from landfills by 2030; 50% reduction in open burning of waste by 2030; On Ag-rice, livestock, etc (FAO, 2018).	No	No	Guidelines for Management of Fugitive Methane and Greenhouse Gases Emissions in the Upstream Oil and Gas Operations in Nigeria (NUPRC, 2022).	Yes, The Cattle Breed Improvement Programme (CABIP) includes the construction of anaerobic digesters nationwide for domestic gas and electricity production. Awareness raising on the benefits of anaerobic digestion to the farmer Expansion of access to funding to start anaerobic digesters.	In 2023 Africa's largest oil and gas producer Nigeria made headlines through its bold action to further regulate methane emissions in the oil and gas sector (FAO, 2018).
Mexico	developing	Yes	Yes	No	Global methane pledge target; Mexico indicated plans to reduce oil and gas related methane emissions by 40–45% by the year 2025 relative to the 2012 levels	No notable policies identified	No notable policies identified	"Guidelines for the Prevention and Integral Control of Methane Emissions from the Hydrocarbon Sector"	No notable policies identified	Mexican energy companies lag methane emission rules, investigators say

Country	Developed or developing	International Commitment		Ambition		Methane reporting (nationwide)	Financial support	Implementation		Note
		NDC	Global methane pledge	National plan specifically on methane	Quantified national methane emissions reduction targets			Direct regulations on methane emissions	Utilization	
Argentina	developing	Yes	Yes	No notable policies identified	Global Methane Pledge target	No	No notable policies identified	No	No notable policies identified	Focusing more on the waste sector: Implemented by Argentina's Ministry of Environment and Sustainable Development, the project includes organic waste diversion and processing work in three pilot sites, as well as capacity building and training work across 41 municipalities nationally to date, with more municipalities expected to participate as the project continues (waste methane)
Turkmenistan	developing	Yes	Yes	No	Global Methane Pledge target	No	No	No	No	
Saudi Arabia	developing	Yes	Yes	only NDC	No	No	No	No	No	

OVERVIEW OF METHANE MITIGATION POLICIES IN GLOBAL KEY EMITTERS BEYOND THE UNITED STATES AND CHINA

Country	Developed or developing	International Commitment		Ambition		Methane reporting (nationwide)	Implementation		Utilization	Note
		NDC	Global methane pledge	National plan specifically on methane	Quantified national methane emissions reduction targets		Financial support	Direct regulations on methane emissions		
EU	developed	Yes		European Union Methane Action Plan (2023); EU Methane Strategy	The EU has reduction targets for 2030 for all greenhouse gasses, with anthropogenic methane emissions covered by binding national emission reduction targets under the Effort Sharing Regulation (ESR). The Climate Action Regulation, also known as the Effort Sharing Regulation (EU ESR) is Europe's tool to reduce the climate impact of sectors that are not covered by the EU's Emissions Trading System. Covering 60% of the EU's greenhouse gas emissions, the law sets binding national emission reduction targets for the 2021-2030 period for sectors such as transport, buildings, agriculture and waste management.; Global methane pledge target (Carbon Market Watch, 2023).	Climate Monitoring Mechanism; Currently, the level of monitoring and reporting varies considerably between sectors and Member States, with very few Member States consistently applying Tier 3 standards. One of the key objectives of this strategy is to make Tier 3 methane reporting by energy, chemical and agricultural companies more widespread across the EU, where possible.	The EU and its Member States announced €175 million in support of the Methane Finance Sprint to boost methane reduction at the Summit. These funds will help catalyze efforts from government, industry, and philanthropy to reduce methane emissions across the energy sector, including by enabling the methane data revolution with the use of new satellites.	It will oblige the fossil gas, oil and coal industries to properly measure, monitor, report and verify their methane emissions according to the highest monitoring standards, and take action to reduce them; As announced in the EU methane strategy, the Commission adopted on 15 December 2021 a proposal for a regulation aimed at reducing methane emissions in the energy sector; For oil and gas, companies would need to frequently survey their equipment to detect leaks. If found, they would need to be repaired immediately, mostly within 5 or 15 working days and monitored to ensure that repairs were successful. The proposal also bans venting and routine flaring, allowing venting only in exceptional or unavoidable circumstances for safety reasons. It allows flaring only if re-injection, utilization on-site or transport of the methane to a market are not technically feasible, with more restrictive rules for how it can be carried out (European Commission, 2023a). For coal, the proposal envisages a phase-out of venting and flaring of methane, ensuring that safety aspects in coal mines are accounted for. The proposal also obligates EU countries to establish mitigation plans in the case of abandoned coal mines and inactive oil and fossil gas wells.	Encouraged by Methane Strategy: Our methane strategy ensures emissions cuts in all sectors, especially agriculture, energy, and waste. It also creates opportunities for rural areas to produce biogas from waste; biogas utilization.	

Country	Developed or developing	International Commitment		Ambition		Implementation				Country Note
		NDC	Global methane pledge	National plan specifically on methane	Quantified national methane emissions reduction targets	Methane reporting (nationwide)	Financial support	Direct regulations on methane emissions	Utilization	
Australia	developed	Yes		No		National Greenhouse and Energy Reporting Act 2007	Market: Carbon credits (Carbon farming initiative); funding the $6 million Methane Emissions Reduction in Livestock (MERiL) Stage 1 program to support research and development of methane-reducing livestock feed technologies.	No	Yes, Renewable Energy (Electricity) Regulations 2001	
UK	developed	Yes		United Kingdom methane memorandum (2023)	The United Kingdom aims to achieve zero routine flaring and venting targets by 2030 or sooner; Waste sector: Methane emissions were reduced by 75%; Agriculture sector: Methane emissions were reduced by 15%; The memorandum also notes that through the Net Zero Strategy (NZS), the government plans to cut emissions by at least 68% by 2030 and approximately 77% (including international aviation and shipping) by 2035 compared to 1990 levels and is committed to reaching net zero by 2050 (IEA, 2022c).	National Atmospheric Emissions Inventory (NAEI)	No	No	The Renewables Obligation Order 2009 (waste)	

OVERVIEW OF METHANE MITIGATION POLICIES IN GLOBAL KEY EMITTERS BEYOND THE UNITED STATES AND CHINA

Country	Developed or developing	International Commitment		Ambition			Implementation				Note
		NDC	Global methane pledge	National plan specifically on methane	Quantified national methane emissions reduction targets	Methane reporting (nationwide)	Financial support	Direct regulations on methane emissions	Utilization		
Canada	developed	Yes		Faster and Further: Canada's Methane Strategy (2022)	In line with Canada's 2030 Emissions Reduction Plan, Canada issued a Methane Strategy in September 2022 outlining reduction measures and supporting programs to reduce domestic methane emissions by more than 35% by 2030, compared to 2020; This makes good on Canada's commitment when it became the first country in the world to set a target of reducing oil and gas methane emissions by at least 75 percent from 2012 levels by 2030.	Greenhouse Gas Reporting Program (GHGRP)	Market: Canada's Greenhouse Gas Offset Credit System; Canada also announced $30 million in funding for a Centre of Excellence, which will improve the understanding and reporting of methane emissions, with a focus on collaborative initiatives to support data and measurement.	Has published strengthened oil and gas methane regulations to cut emissions from this potent greenhouse gas (Environment and Climate Change Canada, 2023).	Canada's methane strategy: biogas (agriculture) and landfill gas		In line with Canada's 2030 Emissions Reduction Plan, Canada issued a Methane Strategy in September 2022 outlining reduction measures and supporting programs to reduce domestic methane emissions by more than 35% by 2030, compared to 2020. The strategy covers federal efforts to: (1) improve monitoring and reporting of methane emissions from the three main emitting sectors (oil and gas, agriculture, and waste); (2) mitigate actions for methane sources from oil and gas, landfills, agriculture, coal mining, buildings, and transportation; (3) create economic opportunities in the methane technology sector; (4) support early, ambitious and sustained international action to rapidly reduce global methane emissions and meet the Global Methane Pledge; (5) sustainably manage natural sources and sinks, for example, through protecting marine and coastal areas.