Actions for Scaling Up Mitigation of Methane Emissions from Coal Mines

Background

This document includes a list of actions to help scale up mitigation of methane emissions from coal mines that were identified based on need statements and ideas proposed by the Global Methane Initiative (GMI) Coal Mines Subcommittee and Project Network. The action items were compiled during the brainstorming session held at the Coal Mines Subcommittee meeting on 24 March 2023, in partnership with the United Nations Economic Commission for Europe (UNECE). Among almost 50 participants from 15 countries were representatives from policymakers, technology providers, coal mining industry, academia, international non-government organizations, and environmental think tanks.

Note: Not all of the identified products/actions listed below are within the scope, authority, or resources of the GMI Coal Mines Subcommittee, nor are they explicitly endorsed by the GMI Coal Mines Subcommittee. The Subcommittee plans to identify specific activities from this list that are best suited for GMI engagement and support. Other stakeholders, including organizations, companies, and governments, are invited to build on this list and identify specific actions that they can pursue.

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#	Potential Product/Action Needed	Purpose
1	Data repository on publicly accessible websites that: • provides mine-specific and/or country-level coal mine methane (CMM) and abandoned mine methane (AMM) emissions data; • ensures data products are downloadable and convertible to user-friendly formats (e.g., .csv, .xlsx, .docx, etc.); • provides clear assumptions on reported data (e.g., volume to mass, uncertainties, margin of error); • provides guidelines on how to interpret the data; • contains measured data (rather than emission factors) to the extent possible; • provides dynamic view vs static view of methane emissions/gas in place from coal mines (as it is variable source).	• To support analysis of emissions and emissions reduction data and to facilitate policy development to encourage greater emission reductions • To ensure that policymakers and the public are clear on the relevance and meaning of the data, including limitations and sources • To ensure project developers have access to more accurate data resulting in a better understanding of available methane resources
2	A map on publicly accessible websites that: • displays and has downloadable data on mine-specific and/or country-level CMM and AMM emissions; • provides clear assumptions on reported data (e.g., volume to mass, uncertainties, margin of error);	• To support analysis of emissions and emissions reduction data and to facilitate policy development to encourage greater emission reductions

	• provides guidelines on how to interpret the data; • contains measured data (rather than emission factors) to the extent possible; • provides dynamic view vs static view of methane emissions/gas in place from coal mines (as it is variable source).	• To ensure that policymakers and the public are clear on the relevance and meaning of the data, including its limitations and sources • To ensure project developers have access to more accurate data resulting in a better understanding of available methane resources
3	A guidance document on CMM data presentation that would recommend: • providing dynamic view vs static view of methane emissions/gas in place from coal mines (as it is variable source); • options for presenting data; • include information on the uncertainties and margin of error; • remote sensing companies share transparent, open-source algorithms to process top-down data including airborne and satellite data for coal areas to determine hot spots and emission rates.	• To standardize data review and presentation across countries and other jurisdictions • To ensure that data presented to the public is clear and can be easily understood and interpreted, with its values and limitations • To ensure project developers have access to more accurate data resulting in a better understanding of available methane resources • To ensure policymakers, companies, and the public develop better trust of data provided by the top-down methods (e.g., satellites)
4	An analysis of monitoring approaches used to measure and report CMM and AMM emissions information for relevant coal mining countries	• To ensure transparency in data gathering and reporting • To support the public and other stakeholders in providing feedback on data and monitoring approaches that might be inaccurate/misrepresented on public/official websites and processes for evaluating and incorporating that feedback
5	Guidance on best practices in organizing public comment	• To support the public and other stakeholders in providing feedback on data and monitoring approaches that might be inaccurate/misrepresented on public/official websites and processes for evaluating and incorporating that feedback
6	Informational resources for CMM/AMM/VAM [Ventilation Air Methane] investors/policymakers, showing the economic return but also emission reductions from CMM/AMM/VAM projects compared to projects in other sectors. The informational resources could: • show comparison of costs and scale of reductions for various mitigation technologies for CMM/VAM vs other GHG mitigation options (e.g., Direct Air Capture, CCUS); • show that CMM and VAM can have a significant impact (scale) at more attractive costs; • show cost/benefit and large scale of VAM and CMM;	• To provide better information for investors/policymakers as well as resources to fund R&D projects related to CMM mitigation

	• be based on case studies that show financial, environmental, and societal benefits of implemented projects; • demonstrate that climate benefit is an important consideration.	
7	A brief for policymakers that describes policies that support investments in CMM/AMM projects	• To provide better information on enabling policies for investors/policymakers, including a summary of resources to fund R&D projects related to CMM mitigation
8	A database or map of recently closed (and/or operating) coal mines and their recent and forecasted emissions	• To provide data on AMM reserves as mines close using methodologies for estimating reserves to support use and mitigation of AMM emissions • To ensure that everyone has access to information on forecasted CMM and AMM emissions and resources (in addition to historic data)
9	A publicly accessible and easy-to-navigate Wiki data system to include coal production data and other relevant information (e.g., isotherm adsorption data for coal). Aggregate data already contained in reports.	• To get a better estimate of the potential for emissions reductions
10	User-friendly template forms for coal mining companies to report CMM emissions using continuous emissions monitoring systems, periodic measurements, or emission factors	• To ensure reporting templates are consistent across jurisdictions and are easy for companies to navigate
11	A guidance document for verifying measured mine-level data, particularly when such data might be used to set caps/requirements for “carrot and/or stick” policies	• To ensure published data are accurate, transparent, verified, and consistently measured at mine level • To ensure that data facilitate an understanding of underlying policies when emissions are produced
12	A workshop that brings together experts to review existing measured CMM data and methodologies	• To review and improve data measurement methodologies • To get data to decisionmakers
13	A poll of international organizations with resources (CCAC/IMEO, UNECE, RMI, CATF, EMBER, EDF, etc.) on their willingness to work with countries on improving measurement and data transfer	• To review and improve global data and measurement methodologies related to CMM • To support consistency in measurement methodologies and reported data
14	A study (with supporting resources) that compares continuous emissions monitoring vs periodic monitoring with varying frequencies, including variability, costs, and logistics	• To review and improve global data and measurement methodologies related to CMM
15	A reservoir modeling software and/or a methodology for estimating AMM reserves at abandoned mines, recognizing the dynamic nature of AMM reserves	• To improve accuracy of AMM prefeasibility studies • To assist project developers and coal mines in proving the business case to financiers and in ensuring success in obtaining financing

16	Update the GMI technology database (available here) as well as add costs, examples, and suppliers; also make it more interactive	• To ensure policymakers, project developers, and other stakeholders have a reliable and timely resource to understand technologies available for mitigation • To develop technology profiles for the coal mining sector • To facilitate contact between suppliers and project developers
17	A forum that showcases past and existing projects and enables an exchange amongst stakeholders on developing and operating CMM emissions reduction projects	• To ensure transfer of practical experience in developing and operating CMM emission reduction projects
18	A forum for engineers and technical experts (mining engineers, geologists, and operators) to exchange information on best practices in methane management. This can also include the following activities and considerations: • to develop a list of technical topics for engineers/technical experts to discuss; • to develop a list of relevant events for technical experts to attend; • to set up an in-depth workshop on the topic of interest as a side event to another event; • to increase participation of technical experts in the dialogue by developing agenda topics more relevant to them; • to fund technical experts from developing countries, who normally cannot attend international meetings; • to hold events near coal mine locations; • to develop and moderate an online forum for professional exchange.	• To ensure exchange of best practices in methane management • To ensure technical experts in coal mining companies are in the loop on the best available methods to mitigate methane
19	A coordination mechanism for technical experts to survey their interest and preferred topics for review, analysis, and/or discussion	• To ensure exchange of best practices in methane management
20	Brief summaries of the UNECE/GMI Best Practice Guidance Reports in an easy-to-follow format	• To ensure that the technical information reaches a wider audience, including policymakers
21	A brief paper with recommendations on data/parameters from top-down monitoring methods (satellite, high altitude airborne, low altitude airbone, ground-based fenceline) should be included in regulations on monitoring and mitigation and appropriate technical specifications for guidelines, policies, and/or regulations	• To advance monitoring and mitigation policy • To advance trust of top-down data among policymakers, companies and the public • To facilitate integration of viable top-down methodologies in monitoring programs
22	Easy to follow training (webinars, online/interactive, in-person) on how emissions are estimated through top-down methods	• To advance monitoring and mitigation policy • To advance trust of top-down (satellite) data among policymakers, companies, and the public
23	Studies of methane leakage at the evase and other sources (such as fissures and cracks) at underground operating and abandoned coal mines	• To ensure that coal mine operators are aware of how much methane they are emitting and understand the impact of those emissions, but also the emissions reduction potential

24	Studies of emissions and improvements to emission estimates from surface coal mines (which are possibly underestimated based on recent satellite imagery)	• To ensure better understanding of the sector's methane emissions
25	Prefeasibility studies at select coal mines across the world to estimate emission reduction potential. All existing prefeasibility studies could be publicly available.	• To ensure that coal mine operators are aware of how much methane they are emitting and understand the impact of those emissions, but also the emissions reduction potential • To provide policymakers, mine operators, and the public with an understanding of the mitigation potential and economics of emission reduction projects
26	An alert system for high-volume methane emissions from coal mines paired with infrastructure within each coal mining company to enable response to alerts	• To ensure operators are aware of mine level of emissions at their facilities to support action • To raise awareness among policymakers on the amount of methane emitted by the sector • To ensure highest emission sources for the sector are mitigated
27	A report/paper on what regulatory methane control at coal mines would look like. The report should emphasize that policymakers need access to Continuous Emissions Monitoring Systems (CEMS) data and analysis of CEMS data to establish emission caps.	• To prioritize mitigation of methane emissions in improving Monitoring, Reporting, Verification (MRV)
28	Presentations on the importance and application of CEMS and produced data for creating a carbon market	• To prioritize mitigation of methane emissions in improving MRV • To prepare for carbon market and Article 6 of the Paris Agreement
29	A study on data needs vs costs for setting caps on emissions: frequently/weekly/daily sampled vs continuous emissions data	• To prioritize mitigation of methane emissions in improving MRV • To prepare for carbon market and Article 6 of the Paris Agreement
30	An analysis of enabling/incentivizing policies, particularly those already in place and how they have performed, to include specific country examples. Such analysis could consider: • using/adapting existing safety measurement data to report methane emissions; • improving existing regulations before adopting new ones; • requiring companies to share data from CEMS; • establishing a grant system to subsidize CAPEX for continuous emissions monitoring systems (CAPEX) in combination with requirements to report, tied to some other benefit;	• To ensure better implementation of existing regulations • To ensure existing regulations are used effectively before new regulations are in place creating additional burden on companies • To ensure any new regulations under development are effective • To ensure that CMM/AMM/VAM mitigation projects are more financially feasible

	• ensuring transparency of legal and regulatory policies on emissions mitigation and monitoring; • developing regulatory requirements to limit emissions to address higher-cost emissions reductions that have a large scale (incentives are okay for net negative, net zero, or low cost). VAM technologies offer large-scale emission reductions but are not financially recoverable. Drained gas often competes with low energy prices; • focusing on lower concentration emissions/shafts (incentives now only support the most favorable projects), but huge impact on climate; • ensuring stable, clear policy conditions that also ensure that conditions are favorable for investment (In the EU, there is no certainty about coal mines' future, which makes it challenging to install VAM technologies); • broadening existing incentives to encourage development of alternative technologies for CMM/AMM capture and use (not just power) and establishing incentives for CMM/AMM conversion to LNG, CNG or other uses (this is particularly needed in countries where the gas in stranded).	
31	An MRV training for countries to encourage development of better reporting practices. Such training could recommend: • requiring direct measurements at coal mines; • establishing third-party monitoring; • requiring coal mines to report; • exploring IMEO as source for data access and data validation.	• To ensure coal producing countries that rely on measured/empirical data (that subject to verification) rather than relying on emission factors • To ensure project developers can access quality measured data
32	A methodology/protocol for verifying inventory/reported data using remote sensing data	• To ensure utilization of the latest technology for estimating methane emissions and its coordination with bottom-up methods • To ensure coordinated reporting to UNFCCC
33	A newsletter on existing initiatives (DOE ARPA-E, CSIRO, etc) conduct R&D projects on CMM mitigation	• To ensure information is disseminated on R&D in CMM mitigation
34	A one-pager that is easy-to-read on the difference between CMM and CBM	• To ensure clarity on the difference between CMM and CBM
35	A roundtable with regulators on potential and proposed policies	• To facilitate a better understanding of impacts of proposed policies and regulations on the coal mining sector • To ensure projects are more financially feasible
36	Develop policy case studies	• To facilitate a better understanding of impacts of proposed policies and regulations on the coal mining sector

37	Brief white papers or fact sheets on legal & regulatory information for CMM that show the links between methane management practices & regulatory/legal requirements per geography (limit number of pages). The white papers should provide clear, easy-to-understand information on the legal rights and procedures in each country with significant CMM/AMM emissions.	• To ensure that policy makers understand their options and adopt policies aligned with best practices, but also that the information is easy for project developers to access. • To ensure project developers don't face expensive delays if policy development become mired in legal reviews
38	Country-specific fact sheets on regulatory issues around AMM as well as case studies	• To ensure that policy makers understand their options and adopt policies aligned with best policies, but also that the information is easy for project developers to access. • To ensure project developers do not face expensive delays if policy development become mired in legal reviews
39	Reports reviewing existing regulatory frameworks for CMM and AMM and outlining what regulatory options could exist for each country. Such reports could include: • diagrams to provide a visual model to help better convey the regulatory compliance assessment; • recommendations to incorporate AMM and mine closure at the initiation of permitting for coal mining.	• To ensure that policy makers understand their options and adopt policies aligned with best practices, but also that the information is easy for project developers to access.
40	A report or a discussion forum that summarizes ownership and liability issues in each country. Such report could recommend/share: • good practices; • include model contracts, principles, MOU, compensation/revenue-sharing model, limits on liabilities to project developers; • consider how international standardization of ownership and liability approaches could reduce costs for project development around the world; • clear regulations for coal extraction and gas extraction licenses; • options to enable transfer of the rights of gas and carbon credits and to establish a clear and appropriate licensing system; • recommendations to incorporate AMM and mine closure at the initiation of permitting for coal mining; • that AMM project developers do not inherit the liability issues with that come with closed/abandoned mines (sharing liabilities can be costly when developing a new project); • that default rights to methane at a coal mine to go to coal mining companies unless those rights are waived; • to ensure there is no conflict between coal and gas rights owners; • best practices from countries that have developed effective systems for closing mines and reducing AMM emissions, including Germany and UNECE AMM guidance;	• To assist scale up of AMM project development around the world

	• include UK as an example of a country that allowed flexibility in contracting to adjust to the market conditions for electricity from CMM/AMM; • include Germany as a good example of successful projects with favorable policies: 1) potential for emissions reductions; 2) legal conditions; 3) attractive financial conditions.	
41	A training module that reviews steps in planning a coal mine closure that recommends: • incentives for early action; • plan for investments; • reviewing potential for reusing installations for alternative development, including gas drainage and utilization equipment; • approaches for seeking investments	• Prepare the coal industry and surrounding communities for mine closure and industry restructuring • Support transition to AMM use and AMM emission reductions
42	A brief on measurement methodologies and associated data that could help identify methane content in coal seams (core samples), including example case studies, such as "Use at least 10 core samples from a coal basin, what the spacing should be, etc, define uncertainty"	• To ensure that environmental regulators are more familiar with subsurface resources and methane resources available at hand • To ensure there is a pathway for environmental regulators to identify resources
43	A report/map on ownership of coal mining assets in major coal mining countries that is made available to the public and updated on a regular basis	• To ensure clarity on ownership of coal and methane • To support connections between CMM project developers, technology suppliers, mine owner/operators, and policymakers
44	Case studies with Marginal Abatement Curves (MAC) and country specific analyses, case studies that show the economics of technological/policy solutions, and coal sector mitigation potential among those solutions	• To help countries prioritize CMM emission reductions as part of their economy-wide strategy
45	A document on the safety record of mitigation equipment, including on process safety for flares, gas engines, gas turbines, and VAM. This document could emphasize the importance of safety as a priority (financing entities are interested in safety and will not finance projects that are not safe).	• To ensure that mitigation projects can secure financing more easily
46	Conduct fora in major mining countries to ensure that regulatory agencies, mine operators, the public. and the environmental community understand benefits from methane monitoring, reporting, and verification and methane mitigation (climate, technology sale, etc.)	• To improve communication between mine operators, regulatory agencies, and the environmental community • Encourage engagement with stakeholders where mining, industry restructuring, and emission reduction projects have direct impact
47	An overview of existing methodologies for internalizing the cost of methane emissions (the social cost of carbon)	• To raise the profile for coal mine operators and policymakers • To understand the full impact of CMM emissions

48	A study on demand/premium price on “cleaner” metallurgical coal in steel manufacturing	• To identify and facilitate an understanding of markets for clean coal, especially for met coal mines, steel, and cement, and the potential impacts for CMM emissions and emissions mitigation
49	A forum on financing mitigation projects in the coal mining sector	• To ensure understanding of opportunities for the coal mining sector • To highlight current financing options for CMM projects • To connect project developers with potential finance sources
50	A briefing to assess technologies to abate emissions for low concentration ventilation shafts at working underground mines and emission abatement options for surface mines	• To prepare for the next stage of methane emission reductions in the coal sector • To highlight mitigation options at an early stage for policymakers