A Practical Proposal on Methane for 2022: From Climate Pledges to Action

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While countries face daunting political challenges in the race against time to fulfill the climate pledges made at COP26 in Glasgow, some policy initiatives are easier than others. Cutting methane emissions by reducing wasteful flaring of natural gas stands out as an immediate political opportunity and a straightforward means to reduce atmospheric emissions. Tackling methane is especially significant since doing so meets other development priorities, such as generating government revenue (by taxing methane emissions), improving health (by reducing air pollution), and helping deliver greater energy access (by using rather than wasting the gas). Moreover, given the slow pace at which climate finance is being pledged for developing countries, the relatively small initial costs and effort involved in reducing methane emissions by wasting less gas should make it an attractive opportunity for the private sector, and for donors and oil- and gas-producing countries looking for quick wins before the Sharm El-Sheikh COP27 meeting in November 2022.[1] As the International Energy Agency notes, *"reducing methane emissions from oil and gas operations is among 'the lowest of the low hanging fruit' for mitigating climate change."*[2]

KEY ACTIONS FOR 2022

This note sets out why reducing methane emissions is so important, and how technological advances and recent pioneering work in Nigeria and Norway demonstrate feasible technologies for achieving reductions. It also sets out what could be done by natural gas producing countries, donors, and other key actors in 2022, with actions by the Spring G20 and IMF-World Bank meetings. In summary:

- **Oil and gas producing countries** could volunteer to apply new technology to measure—and remote sensing (satellite) fiscal policies to disincentivize—methane emissions from wasteful gas flaring (expanding on Nigeria's example with gas flaring[3]) and also volunteer to pilot new gas capture technology (following the example of Norway). Egypt (COP27 chair) and Indonesia (G20 chair) could take leadership roles in this initiative.

1 Mahmoud Mohieldin: https://www.wider.unu.edu/publication/summits-solutions-what-success-means-cop26, October 2021.
2 IEA, 'Global Methane Emissions from Oil and Gas: Insights from the Updated IEA Methane Tracker'. Accessed 03/31/2020.
3 https://www.opml.co.uk/blog/gas-oil-emissions-what-could-be-done-now.

- **Multilateral development banks (MDBs) and other donors** should help developing countries take advantage of the available technology in pursuit of country objectives, as the UK's FCDO (formerly DFID) did in Nigeria.

- **Countries hosting satellite data companies** should ensure that data on emissions is placed in the public domain on a timely basis, and not kept private.

- **The IMF** should urge, in its annual consultations, each oil and gas producing country to adopt the IMF's innovative fiscal policy advice of applying penalties for excess methane emissions, on a deemed basis by the emitters themselves.

The decision to flare or vent natural gas by oil and gas companies is often based on commercial criteria that exclude externalities such as air quality, health, and climate impact. These proposed steps aim to address this issue using an integrated approach. Together, they would improve the commercial considerations for oil and gas companies to eliminate wasteful emissions. Legislatures and civil society would also gain valuable new information to hold governments to account: for example, for delivering the benefits of higher revenues, improved health, and greater energy access.

WHY IS METHANE EMISSIONS REDUCTION SO IMPORTANT?

Reducing methane emissions in the energy sector provides an unusual and attractive combination: significant contributions to the *global* public good of emissions reduction as well as to the *local* public good in many developing countries. Moreover, action to realize these benefits can be taken quickly.

Methane's impact on global warming has been seriously underplayed. So far, methane has contributed as much as 0.5 degrees of the 1.1 degrees Celsius increase in global temperature since the pre-industrial era. The Global Methane Assessment[4] estimates that methane emissions can be reduced by up to 45 percent this decade, and doing so would avoid nearly 0.3 degrees Celsius of global warming by 2045. This would help mitigate further temperature rises. Cutting methane emissions is the fastest opportunity we have to immediately slow the rate of global warming, even as we decarbonize our energy systems. Moreover, *any* reprieve over the next decade from reaching a global temperature rise—and potential tipping point—of 1.5 degrees Celsius is vital while more challenging policy commitments are implemented. Most publicized of these commitments is to sharply reduce longer-lasting carbon emissions by 2030, before eliminating them on a net basis by mid-century.

The energy sector is by far the most promising target for immediate reduction of methane emissions. It is responsible for at least 35 percent of methane emissions from human activity,[5] including from the estimated 7.5 percent of natural gas (of which four-fifths is methane) that is wasted each year by flaring and venting. (Natural gas flaring in the oil and natural gas industry is the controlled combustion of natural gas for operational, safety, or commercial reasons. Natural gas venting is the direct release of natural gas into the atmosphere, creating methane and other chemical emissions. Emissions from venting are harder to detect than gas flaring.) The other main possible target is agriculture, responsible for some 40 percent of global methane emissions from human activity. However, the wholesale

4 United Nations Environment Programme and Climate and Clean Air Coalition (2021). Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions. Nairobi: United Nations Environment Programme.

5 More than half of global methane emissions stem from human activities in three sectors: fossil fuels (35 per cent of human-caused emissions), waste (20 per cent) and agriculture (40 per cent). Global Methane Assessment 2021.

restructuring of the global food industry—which while feasible, necessary, and urgent—is less amenable to a swift improvement than is gas flaring and venting.

The scope for reducing methane lies disproportionately within developing countries, who also stand to benefit most from such reduction. Most wasted gas from emissions occurs in the more than 30 low- and middle-income countries that are highly dependent on oil and gas production;[6] and the World Bank estimates that 85 percent of total gas flared since 2005 comes from developing countries.[7] Moreover, the 100 largest "super-emitter" flares that account for a quarter of total gas flares globally are all located in low- and middle-income countries.[8]

Fiscal innovations and technological advances now present great opportunities for all countries, including some high-income significant gas flarers, to measure, capture, and use the otherwise wasted gas. The IMF has devised a novel way to tackle methane emissions.[9] In the absence of metering of emissions, taxes can be levied assuming default leakage rates, with rebates given to operators that demonstrate, via continuous monitoring, lower leakage. This creates incentives for operators to reduce gas flaring and venting volumes, as these improve the commercial returns for gas. Remote sensing technologies now make it possible to locate and measure the size of flares. This information can be used to identify the scale and location of potential investments, as well as to prioritise the options to aggregate, process, and utilise natural gas for local economic use that can stimulate further benefits for communities, such as local energy access and transportation fuel.

These steps together would significantly improve the commercial considerations for oil and gas companies to act on their own flares. The gains could be huge. For example, if three-quarters of global gas now wasted by flaring and venting could be captured and used, this could provide an additional gas sales value of no less than US$40 billion each year, at an assumed average gas price of US$4 per MMBtu (million British thermal units).

The benefits to developing countries from reducing methane emissions go way beyond the gains from greater energy access and higher revenues; the social cost of emissions is also reduced sharply, with benefits especially for human health. The beneficial development impact of reduced emissions, beyond its contribution to the reduction of global warming, can now be estimated. Estimates of the social costs of atmospheric release (SCAR) by Romsom and McPhail, based on methodology developed by Shindell,[10] include climate, agriculture, and health effects by integrating into a single measure the economic impact from four areas: global climate change, regional changes in water cycles induced by aerosols, health impacts from climate changes, and health impacts from air quality.[11] Among the chemicals emitted by flaring and venting, methane (CH_4) has a far greater social cost than carbon

6 For the data on dependence, see Roe and Dodd (chapter 2) in Addison, T., and A.R. Roe (2018). 'Extractive Industries: The Management of Resources as a Driver of Sustainable Development'. WIDER Studies in Development Economics. Oxford: Oxford University Press. The low- and middle- income countries in this list include Nigeria, Ghana, Bolivia, Chad, Congo, Cameroon, Egypt, and Sudan.

7 World Bank (2020). 'Zero Routine Flaring by 2030: Q&A'. Available at: https://www.worldbank.org/en/programs/zero-routine-flaring-by-2030#7 (accessed 30 October 2020).

8 VIIRS Nightfire satellite data for 2017, see Romsom and McPhail (2021b), `Capturing economic and social value from hydrocarbon gas flaring and venting: solutions and actions'. WIDER Working Paper 2021/6. Helsinki :UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/2021/940-2.

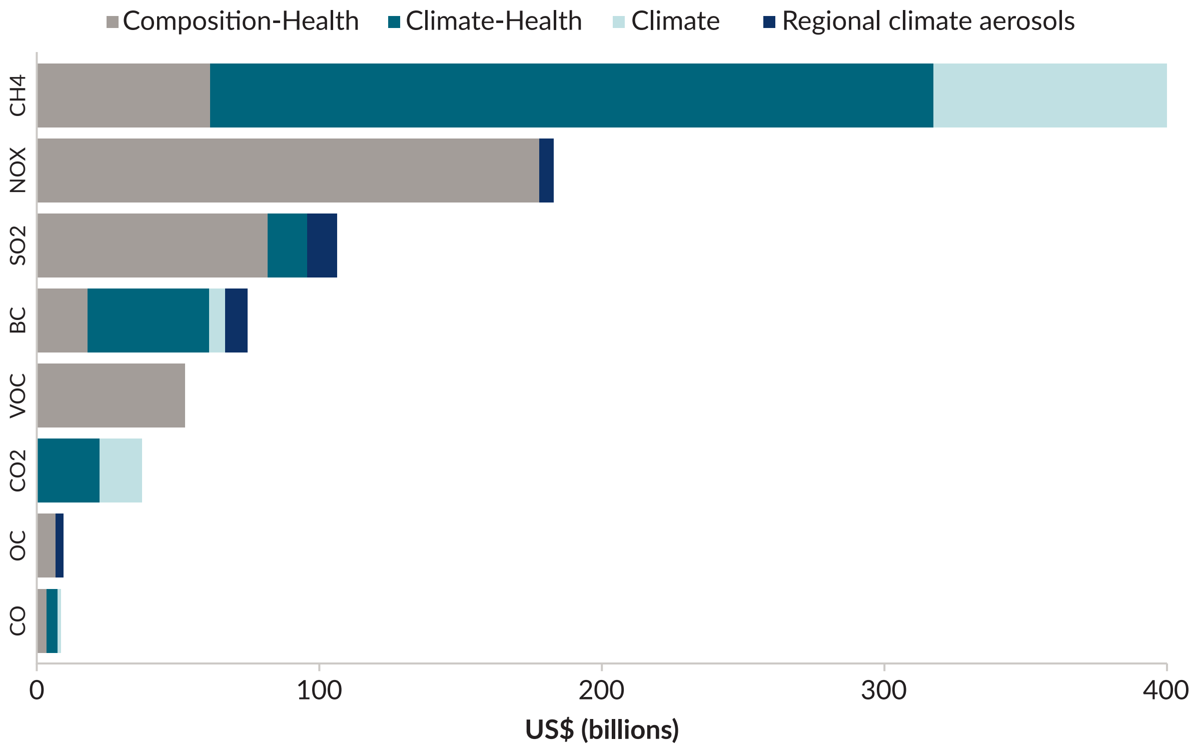
9 IMF, 'Fiscal Policies for Paris Climate Strategies: From Principle to Practice'. Policy Paper 19/010. Washington, DC.

10 Shindell, D.T. The social cost of atmospheric release. Climatic Change 130, 313–326 (2015). https://doi.org/10.1007/s10584-015-1343-0.

11 Romsom and McPhail (2021a). `Capturing economic and social value from hydrocarbon gas flaring: evaluation of the issues'. WIDER Working Paper 2021/5. Helsinki: UNU-WIDER. https://doi.org/10.35188/UNU-WIDER/2021/939-6.

dioxide (CO_2) (Figure 1). Poor quality flaring operations, as evidenced regularly by remote sensing, dramatically worsen the impact shown in Figure 1, as the emission of toxic chemicals increases by orders of magnitude. So reducing these emissions by curbing gas flaring and venting provides a great opportunity to reduce the negative impacts on human health as well as on global warming.

Figure 1. Methane emissions contribute most to the global social costs of atmospheric release from upstream flaring and venting (estimates for 2019 by impact category and gas/chemical emissions)



Notes: Costs are discounted at 3 percent and expressed in 2019 US$ per gas or chemical: CH_4 (methane), NO_x (nitrogen oxide), SO_2 (sulphur dioxide), BC (black carbon), VOC (volatile organic compounds), CO_2 (carbon dioxide), OC (organic carbon), and CO (carbon monoxide).

Source: Authors' illustration based on Figure 25 from Romsom and McPhail, (2021b) `Capturing economic and social value from hydrocarbon gas flaring and venting: solutions and actions,' WIDER Working Paper 2021/6 (2021), https://doi.org/10.35188/UNU-WIDER/2021/940-2.

The local benefits arise from improved air quality, given fewer damaging particulates and toxic chemical emissions; less toxic chemical absorption in the food chain; improved crop yields because of lower methane levels; and less ground water pollution. These benefits together make political support for emissions far more compelling than just contributing to global reduction targets.

HOW HAVE RECENT TECHNOLOGICAL ADVANCES AND PIONEERING WORK IN NIGERIA AND NORWAY PAVED THE WAY TO MAKE REDUCING METHANE EMISSIONS FEASIBLE?

An increased focus on methane in recent years culminated at COP26 with the launch of the Global Methane Pledge, signed by over 100 countries. The Pledge aims to reduce global methane emissions by 30 percent by 2030 from 2020 levels. Methane was also mentioned explicitly in the US-China Joint

Glasgow Declaration on Enhancing Climate Action in the 2020s.[12] Beyond this overarching statement of support for *"the single most effective strategy to keep the goal of limiting warming to 1.5 degrees C within reach,"*[13] three developments in recent years greatly increase the opportunity for developing countries to tackle methane emissions by reducing natural gas flaring and venting.

First, satellite data on natural gas flares worldwide are now publicly available by VIIRS Nightfire, originally developed by NASA in the US.[14] Though some flaring is done for safety reasons, much of the observed flaring in routine operations would be avoided if the full costs were apparent. Analysis of the data by the size and concentration of individual emissions can identify "super-emitter" flares. In 2017, more than 60 percent of all gas flared globally came from just 6.6 percent of flares. This insight means that targeting just the largest flares would of itself yield major reductions in greenhouse gas emissions. Significant methane emissions occur because of methane slip and incomplete combustion at gas flaring sites. In contrast to most other methane emission sources (such as leaking pipes), the precise locations of gas flares are also well known. So there is a clear opportunity first to measure, and then to act to reduce methane emissions at these known gas flare locations using a separate source: existing high-resolution methane-detecting satellites, owned by Canadian companies. When the data sets are overlaid, a striking picture emerges. Not only are methane emissions higher than indicated by earlier rule-of-thumb estimates made on the ground,[15] but analysis of the data by concentration of emissions per super-emitter flare also now enables estimation of their differential impact on health and livelihood.

Second, Nigeria's successful application of the new satellite technology to pinpoint gas flares has demonstrated the feasibility of such an approach for other countries. Publicly available satellite technologies successfully identifies and measures volumes of natural gas burned by individual gas flares in Nigeria. This "decision-useful" information then enables the Nigerian regulators to identify the specific producing assets and companies that are responsible. In turn, they are able to impose taxes on the gas that is wasted. Applying these new data to reduce emissions at source has allowed Nigeria to benefit directly from its own emission reduction efforts. Companies see clear incentives (notably in lowering tax penalties) to reduce waste, and the government generates substantial fiscal revenues (an estimated US$270 million in 2020[16]). Flaring emissions have declined significantly and lower emissions, using Shindell's methodology, would imply collateral benefits for the health of local communities.

Third, Norway, the world's third largest natural gas exporter, has successfully deployed a multifaceted approach that combines measurement of emissions, reporting frameworks, and regulatory and fiscal policies to motivate the oil and gas industry to implement technologies for small-scale gas development and monetization. These pioneering technologies can be adopted in many other countries. Satellite technologies can first help identify commercial opportunities for natural gas monetization technologies as a profitable alternative to gas flaring, by measuring flare size and distance to market that are the two key criteria for success. Opportunities for gas aggregation and development primarily exist in countries with the largest number of large flares and the largest gas volumes consumed by large flares. Small-scale gas development from previously wasted gas also raises the prospect of greater local energy access. Moreover, reducing flaring and venting has a significant positive impact on human health, particularly in communities that are located near to flares and vents.

12 https://www.state.gov/u-s-china-joint-glasgow-declaration-on-enhancing-climate-action-in-the-2020s/.

13 Op cit, footnote 4.

14 For data from Visible Infrared Imaging Radiometer Suite (VIIRS) Nightfire, see https://ncc.nesdis.noaa.gov/VIIRS/.

15 McPhail and Romsom https://www.wider.unu.edu/publication/reducing-wasted-gas-emissions-opportunity-clean-air-and-climate.

16 Hedley, T., 'Nigeria Takes Aim against Gas Flaring in 2020'. Africa Oil and Power, 4 September 2020. https://www.africaoilandpower.com/2020/09/04/nigeria-takes-aim-against-gas-flaring-in-2020 (accessed 17 November 2020).

WHAT NEEDS TO BE DONE IN 2022?

With practical and financial support from donors, many developing countries stand to gain from implementing an integrated approach to reducing wasteful natural gas emissions, including methane. This integrated approach combines four elements:

1. improved measurement of vent and flare gas production and emissions
2. improved accountability, transparency, and reporting of gas production and emissions
3. the development of programs for small-scale gas development and monetization technologies
4. reformed regulation and fiscal measures[17]

Adopting this multi-pronged approach can enable oil and gas producing countries to capture significant economic and the social value from reducing natural gas flaring and venting.

Actions for 2022 to advance the integrated approach outlined above include:

Oil and natural gas producing countries could volunteer to apply remote sensing (satellite) technology to measure methane emissions from wasteful gas flaring, especially from "super-emitter" flares (following Nigeria's example). Eight of the largest gas flarers are members of the G20.[18] Indonesia, as chair of the G20, and Egypt, as chair of COP27—both major oil and gas producers—could take leadership roles in this initiative.

Additionally, and following the model already proposed by the IMF, penalties could be applied to companies that failed to curtail emissions.[19]

Finally, countries could volunteer to implement existing gas capture technology from targeted flares (following Norway's example).

MDBs and donors should agree by the April IMF-World Bank meetings to provide immediate financial support and technical assistance to help developing countries take advantage of the available technologies (as the UK FCDO (formerly DFID) did in Nigeria) to target emissions reductions and to support pilots to demonstrate how repurposing flare gas can benefit local communities.

Countries hosting satellite data companies should convene by the April G20 and IMF-World Bank meetings to agree how best to ensure that emissions data remain in the public domain.

The IMF should ensure with immediate effect that it urges, in its annual (Article IV) consultation with each oil and gas producer, its innovative fiscal policy advice of applying penalties for excess methane emissions.

17 For a description of this integrated approach: `Diamond Model', see Romsom and McPhail, (2021b), op cit, footnote 8.
18 In 2017, the 20 largest gas flarers included Russia, US, Mexico, Saudi Arabia, Indonesia, India, China, and Canada.
19 Op cit, footnote 9.

Time is of the essence if the global climate targets agreed at COP26 are to be achieved. The actions proposed in this Note to reduce methane emissions in the energy sector in 2022 would deliver relatively easy wins with very large pay-offs and much-needed tangible progress for the first annual meeting of the Global Methane Pledge and the COP27 meeting in Sharm El-Sheikh in November.

The authors are grateful to Mark Plant, Tony Addison, and Alan Roe for very helpful comments. All errors are the authors' alone.

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