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**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

on an EU strategy to reduce methane emissions

I. INTRODUCTION

Methane is a powerful greenhouse gas, second only to carbon dioxide in its overall contribution to climate change. On a molecular level, methane is more powerful than carbon dioxide. Although it remains for a shorter time in the atmosphere, it has a significant effect on the climate¹ and contributes to tropospheric ozone formation, a potent local air pollutant which itself causes serious health problems². Reducing methane emissions therefore contributes to both slowing down climate change as well as improving air quality. Significant portions of methane emissions can be mitigated cost-effectively.

The Regulation on the Governance of the Energy Union and Climate Action³ calls on the Commission to deliver a strategic plan for reducing methane emissions. Furthermore, in the European Green Deal Communication⁴, the Commission indicated that energy-related methane emissions needed to be addressed as part of the commitment to reach climate neutrality by 2050. In this way, policy action to reduce methane emissions will contribute to both the EU's decarbonisation efforts towards the 2030 Climate Target Plan and the EU's zero-pollution ambition for a toxic-free environment.

Current policies for non-CO₂ emissions are projected to reduce methane emissions in the EU by 29% by 2030 compared to 2005 levels⁵. Nevertheless, the 2030 climate target plan's impact assessment⁶ found methane will continue to be the EU's dominant non-CO₂ greenhouse⁷. It concluded that stepping up the level of ambition for reductions in greenhouse-gas emissions to at least 55% by 2030 compared to 1990 would also require an accelerated effort to tackle methane emissions, with projections indicating a step up needed to 35% to 37% methane emission reductions by 2030 compared to 2005. At a global level, reducing methane emissions associated with human (anthropogenic) activity by 50% over the next 30 years could reduce global temperature change by 0.18 degrees Celsius by 2050⁸.

The EU has reduction targets for 2030 for all greenhouse gases, with anthropogenic methane emissions covered by binding national emission reduction targets under the Effort Sharing Regulation (ESR)⁹. However, there is currently no policy dedicated to the reduction of anthropogenic methane emissions. Approximately 41% of global methane emissions come from natural sources (biogenic), like wetlands or wildfires¹⁰. The remaining 59% are

¹ IPCC AR5, (2014). IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

² European Environment Agency (EEA), (2016). Premature deaths attributable to air pollution (EU 28). <https://www.eea.europa.eu/media/newsreleases/many-europeans-still-exposed-to-air-pollution-2015/premature-deaths-attributable-to-air-pollution>. In the EU, premature deaths due to ozone exposure are estimated at between 14,000 and 16,000 per year for the years 2015 to 2017. JRC modelling results estimate that by 2030, depending on levels of methane concentrations, the difference in associated premature deaths would be between 1,800 and 4,000, annually. These results are likely under-estimates as they do not take into account recent re-evaluations of mortality risks associated with long-term ozone exposure, which suggest a factor 2.3 times higher.

³ (EU) 2018/1999.

⁴ COM(2019) 640 final.

⁵ EU 2030 climate target plan Impact Assessment, https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_2&format=PDF.

⁶ EU 2030 climate target plan Impact Assessment, https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_2&format=PDF.

⁷ Significant quantities of non-CO₂ greenhouse gases are still being emitted in the EU today, representing around 20% of total emissions. In 2015, methane represented around 60% of total non-CO₂ greenhouse gas emission, followed by nitrous oxides and F-gas emissions (EU 2030 climate target plan Impact Assessment).

⁸ Climate and Clean Air Coalition Scientific Advisory Panel, (2020).

⁹ Regulation, (EU) 2018/842.

¹⁰ International Energy Agency (IEA), World Energy Outlook, (2018), https://edgar.jrc.ec.europa.eu/overview.php?v=50_GHG.

anthropogenic, of which the largest sources are agriculture (40-53%) – in particular linked to intensive production, fossil fuel production and use (19-30%), and waste (20-26%). In the EU, 53% of anthropogenic methane emissions come from agriculture, 26% from waste and 19% from energy¹¹. The reported distribution of emissions per sector continues to evolve as reporting and data collection improve. Nevertheless, these three sectors account for up to 95% of global anthropogenic methane emissions, and should therefore be the focus of mitigating action¹².

The EU should also play a role in ensuring methane emission reductions at global level. While the EU contributes only to 5% of global methane emissions¹³, it can use its position as the largest global importer of fossil fuels and as a strong player in the agriculture sector to support similar action from global partners. The EU is also a technical leader in satellite imagery and methane emission leak detection through the Copernicus program and can lead international collaboration to improve the monitoring and mitigation of global methane emissions.

The Communication sets out a strategy for reducing methane emissions. It outlines a comprehensive policy framework combining concrete cross-sectoral and sector-specific actions within the EU, as well as promoting similar action internationally. While in the short-term, the strategy encourages global level voluntary and business-led initiatives to immediately close the gap in terms of emissions monitoring verification and reporting, as well as reduce methane emissions in all sectors, it foresees EU level legislative proposals in 2021 to ensure widespread and timely contributions towards the EU decarbonisation objectives.

II. A NEW STRATEGY TO REDUCE METHANE EMISSIONS: COMBINING CROSS-SECTOR AND SECTOR-SPECIFIC ACTIONS

The EU first addressed methane emissions with a strategy adopted in 1996¹⁴. In the following years, the EU adopted regulatory initiatives that contributed to methane emission reductions in key sectors¹⁵. Relative to 1990 levels, energy-sector methane emissions have halved, while emissions from waste and agriculture have fallen by a third and just over a fifth respectively¹⁶. Nevertheless, methane emissions remain a significant challenge in each of these sectors.

In the energy sector, methane leaks from fossil fuel production sites, transmission systems, ships and distribution systems. Methane is also vented (released intentionally) into the atmosphere. Even when flared (burnt), carbon dioxide is released and methane can still escape during flaring as a result of incomplete combustion¹⁷. According to current estimates, 54% of

¹¹ European Environment Agency (EEA), (2018). EEA greenhouse gas - data viewer. https://www.eea.europa.eu/ds_resolveuid/f4269fac-662f-4ba0-a416-c25373823292.

¹² Climate and Clean Air Coalition (CCAC) Scientific Advisory Panel, (2020).

¹³ Climate Watch Data, (2016).

¹⁴ Strategy paper for reducing methane emissions. Communication from the Commission to the Council and to the European Parliament. COM (96) 557 final, 15 November 1996.

¹⁵ Such as in the waste sector - to address site management, including landfill gas – but which also contributed to mitigating methane emissions. Also, methane emissions are covered by the binding national greenhouse gas targets set under the effort sharing legislation (Decision No. 406/2009/EC).

¹⁶ In depth analysis in support of the Commission Communication COM(2018) 773

¹⁷ Flaring and venting occurs at coal, oil and fossil gas production sites. It also occurs (to a much lesser extent) at landfill gas and biogas facilities. Flaring is the controlled burning of gases produced or released in association with: fossil-fuel extraction and transportation; and certain agricultural and waste practices. Venting is the controlled release of unburned gases directly into the atmosphere. Venting is arguably more harmful to the environment as the released gas typically contains high-levels of CH₄, whereas flaring converts the CH₄ into less

methane emissions in the energy sector are fugitive emissions from the oil and gas sector, 34% fugitive emissions from the coal sector and 11% from residential and other final sectors¹⁸. The EU's climate target plan impact assessment indicates that the most cost-effective methane emission savings can be achieved in the energy sector. Upstream oil and gas operations generally have a variety of mitigation options that have no net costs¹⁹, or near zero costs²⁰.

Agriculture is the second sector with the highest potential in overall benefits for reducing methane emissions²¹. There are also potential synergies and trade-offs for mitigating the cost of emission reductions in agriculture through the reduction of nutrient losses in animal feed by enteric fermentation²² and by producing biogas²³. Methane emissions from livestock originate mainly from ruminant species (enteric fermentation) (80.7%), manure management (17.4%), and rice cultivation (1.2%). Sources of methane emissions are often diffuse in the agriculture sector, which can make measurement, reporting and verification challenging. They also differ noticeably across the EU. Nevertheless, technologically feasible mitigation practices do exist, and their deployment should be facilitated, along with reporting on their effects.

In the waste sector, the main identified sources of methane are uncontrolled emissions of landfill gas in landfill sites, the treatment of sewage sludge and leaks from biogas plants due to poor design or maintenance. Emissions from the landfilling of waste fell by 47% between 1990 and 2017²⁴, following better compliance with EU waste legislation on emissions from landfill. This was achieved primarily by diverting biodegradable waste to other waste-treatment options higher in the waste hierarchy²⁵ such as composting and anaerobic digestion, as well as ensuring the stabilisation of biodegradable waste before disposal. However, more stringent compliance practices are needed to further reduce methane emissions from waste.

An effective EU strategy to reduce methane emissions must therefore provide stronger measures to address methane emissions in each sector, but also take greater advantage of synergies across sectors and policy areas. Adopting a holistic approach brings clear advantages, as it allows for more cost-effective and evidence-based mitigation of methane emissions. It also makes it possible to build an enabling framework and strengthen the business case for capturing methane emissions. Given the high share of methane emissions in agriculture that result from livestock, lifestyle and diet changes can also contribute

harmful CO₂. Nevertheless, the process of flaring can release other emissions such as SO₂ and NO₂ which, when combined with moisture in the atmosphere, can form acid rain.

¹⁸ Climate and Clean Air Coalition (CCAC) Scientific Advisory Panel, (2020).

¹⁹ International Energy Agency (IEA), (2020). Methane Tracker 2020, <https://www.iea.org/reports/methane-tracker-2020/methane-abatement-options>.

²⁰ EU 2030 climate target plan Impact Assessment, https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_2&format=PDF.

²¹ EU 2030 climate target plan Impact Assessment, https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_2&format=PDF.

²² Formation of methane by microbes in the gut of animals. Ruminant animals are a subset of mammals that ferment food in their 'rumen' (first stomach) using bacteria, before further digestion in subsequent stomachs. This 'enteric fermentation' generates methane, which the animal releases. The largest sources of methane emissions in the EU agricultural sector are from cows and sheep.

²³ [EU 2030 climate target plan Impact Assessment, https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_2&format=PDF.

²⁴ <https://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2020>

²⁵ The waste hierarchy generally lays down a priority order of what constitutes the best overall environmental option in waste legislation and policy. Further details in , Directive 2008/98/EC and <https://ec.europa.eu/environment/waste/framework/>

significantly to reducing EU methane emissions. Beyond reducing emissions, the strategy will also provide for opportunities to generate additional revenue streams and development and investment in rural areas.

1. CROSS-SECTORAL ACTIONS WITHIN THE EU

a. Reporting

A priority objective of the strategy is to ensure that companies apply considerably more accurate measurement and reporting methodologies for methane emissions, across sectors, than is currently the case. This will contribute to a better understanding of the problem and better inform subsequent mitigation measures²⁶.

The United Nations Framework Convention on Climate Change (UNFCCC) has a three-tier reporting framework for methane emissions, which is applicable across all relevant emitting sectors. Tier 1 constitutes the most basic approach, involving simple estimations based on activity data and emission factors. Tier 3 is the most demanding in terms of methodological complexity and data requirements, involving complex modelling based on multiple data sources or specific, individual measurement. Tier 2 is intermediate in complexity and may combine elements of both Tiers 1 and 3.

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. This would allow Member States to move to higher tier reporting when submitting national emissions data to the United Nations Framework Convention on Climate Change (UNFCCC), for example. Nevertheless, a certain level of flexibility in reporting is required to account for the different challenges to improving monitoring and reporting across the different sectors, as well as to concentrate reporting efforts on key categories of sources, in line with the International Panel on Climate Change (IPCC) guidelines²⁷.

In the energy sector, Tier 3 reporting is achievable for industry and will therefore be the EU target standard. Widespread adoption of the measurement and reporting framework developed under the Climate and Clean Air Coalition (CCAC) Oil and Gas Methane Partnership (OGMP)²⁸ will accelerate this transition (see more details under actions in the energy section). The new OGMP standard (OGMP 2.0) commits participating companies to increase the accuracy and granularity of their methane emissions reporting for operated and non-operated assets in 3 and 5 years respectively.

In the agricultural sector, the challenges associated with a higher number of different actors involved in adjusting to new targets justifies a temporary objective of applying Tier 2 approaches, with improving disaggregation of emission factors and a final objective of achieving Tier 3. In the waste sector, the quality of reporting is already robust for waste

²⁶ Measurement, reporting, verification (MRV), integrity and validation (IV).

²⁷ Intergovernmental Panel on Climate Change (IPCC), 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, https://www.ipcc.ch/site/assets/uploads/2019/12/19R_V0_01_Overview.pdf

²⁸ Climate and Clean Air Coalition (CCAC) Oil and Gas Methane Partnership (OGMP).

<https://ccacoalition.org/en/activity/ccac-oil-gas-methane-partnership#:~:text=The%20Climate%20and%20Clean%20Air,New%20York%20in%20September%202014.>

disposal in landfills sites (under the scope of Directive 2010/75/EC²⁹) through the European Pollutant Release and Transfer Register³⁰. Conversely, as regards the wastewater sector, improvements are needed.

b. Establishing an international methane emissions observatory

Currently, there exists no independent, international body which collects and verifies methane emissions data. In partnership with the United Nations Environmental Programme (UNEP), the Climate and Clean Air Coalition (CCAC)³¹ and the International Energy Agency, the Commission will support the establishment of an independent international methane emissions observatory, tasked with collecting, reconciling, verifying and publishing anthropogenic methane emissions data at a global level. The observatory would be anchored in a United Nations framework. The observatory would build on a number of work streams such as the Oil and Gas Methane Partnership (OGMP) and the global methane science studies³² as part of the Climate and Clean Air Coalition.

Initially, the observatory would cover methane from the oil and fossil gas sectors as robust methodologies that can deliver credible data are already well defined, for example through OGMP 2.0. The Commission envisages extending the scope of the observatory to cover coal, waste and agricultural activities once comparably reliable monitoring and reporting methodologies are established for those sectors. Actions to define these methodologies should start immediately.

For the purpose of data verification and reconciliation of energy related methane emissions, company reporting needs to be complemented with data from national emission inventories, scientific research, as well as satellite observations and other remote sensing technologies verified by ground-level observations. The observatory would also be tasked with testing new monitoring and reporting technologies and assessing how these technologies could be used within existing methodologies, as well as assessing the level of improvement these technologies provide to the quality of data submitted by companies. The Commission expects that the observatory would help to improve understanding of the sources of emissions also within sectors, for example regarding differences in methane emissions from intensively reared livestock versus pasture raised livestock³³.

The Commission is ready to mobilise funding from the Horizon 2020 programme to kick-start the establishment of such an international methane emissions observatory. In cooperation with the United Nations Environmental Programme and the Climate and Clean Air Coalition, the

²⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0075>

³⁰ <https://prtr.eea.europa.eu/#/home>

³¹ The **Climate and Clean Air Coalition (CCAC)** is a voluntary partnership of governments, intergovernmental organizations, businesses, scientific institutions and civil society organizations committed to improving air quality and protecting the climate through actions to reduce short-lived climate pollutants. <https://ccacoalition.org/en/content/who-we-are>. The **United Nations Environment Programme (UNEP)** is the leading global environmental authority that sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system, and serves as an authoritative advocate for the global environment. <https://www.unenvironment.org/about-un-environment>.

³² Climate and Clean Air Coalition (CCAC) methane science studies <https://ccacoalition.org/en/activity/oil-and-gas-methane-science-studies>.

³³ Knapp, et al., (2014). Enteric methane in dairy cattle production: Quantifying the opportunities and impact of reducing emissions, <https://www.sciencedirect.com/science/article/pii/S0022030214002896>

Commission envisages organising a donor conference to encourage national governments to contribute towards the financing of the observatory.

c. Satellite detection, Copernicus and aerial monitoring

The EU's Copernicus programme for earth observation is contributing to improved indirect air surveillance and the monitoring of methane emissions. In particular, Copernicus can contribute to an EU-coordinated capability for detecting and monitoring global super-emitters³⁴, principally via its Copernicus Atmosphere Monitoring Service (CAMS)³⁵. Globally, 5% of methane leaks in the coal, oil and fossil gas sectors contribute to 50% of the energy sector's emissions³⁶ and based on a first analysis of EU emissions data, a similar pattern emerges for the EU³⁷. Satellite technology is key to identifying these hotspots and guiding leak detection and repair on the ground as well as reconciling bottom-up data from company reporting.

When launched in 2025, the Copernicus CO₂-monitoring (CO2M) mission, which involves a constellation of three satellites, will support the identification of smaller and more prevalent sources of emissions. It will also be able to monitor global atmospheric methane. This will represent significant additional capacity to the capabilities of the Copernicus Atmosphere Monitoring Service and the Tropospheric Monitoring Instrument (TROPOMI), two existing Copernicus capabilities on board of the Sentinel 5P satellite, that are able to detect larger emission sources.

Improved top-down data from satellites will help to target bottom-up leak detection on the ground as well as aerial monitoring. There have been significant technological advances made in these areas in recent years with improved accuracy and cost-effectiveness. For example, the use of drones makes it possible to survey large amounts of infrastructure and facilitates more widespread use of aerial monitoring as well as increased frequency, which is key to addressing intermittent leaks. Sophisticated analytical programs allow for the reconciliation of data at different levels and can guide abatement efforts. The Commission intends to support the sharing of information and technology across stakeholders to enhance access and catalyse abatement efforts.

d. Review and possible revisions of relevant environmental and climate legislation

In the European Green Deal, the Commission announced that in 2021 it would review EU legislation, with the overall aim of delivering increased climate ambition as contained in the 2030 climate target plan impact assessment. A number of pieces of legislation are within the scope of this review which have a bearing on methane emissions. This includes the EU Emissions Trading System (ETS) and the Effort Sharing Regulation (ESR), the latter covering all methane emissions in the EU next to all other greenhouse gases not covered by the

³⁴ The term 'super-emitter' in this general context refers to a specific site or facility with disproportionately high-emissions for a site or facility of that kind. In specific sectors, there are individual definitions of super-emitters. For example, in the fossil gas supply chain the term can refer to sites with the highest proportional loss rates, i.e. the greatest loss of methane emitted for methane produced/processed (Zavala-Araiza, et al., 2015).

³⁵ CAMS analyses global fluctuations in methane emissions on a daily and monthly basis. It can also provide full emissions datasets with comparisons between the main global and regional inventories. To derive more accurate data, CAMS methane products are reconciled with other independent measurement sources, such as surface-monitoring stations, ships, and aircraft programmes.

³⁶ Brandt, Cooley, Heath, (2016) (DOI: 10.1021/acs.est.6b04303).

³⁷ 10-20% of sites are responsible for 60-90% of emissions. Source: 'Tackling energy-related methane emissions', 2020. Consortium led by Wood Environment & Infrastructure Solutions GmbH.

emissions trading system. The assessment supporting the 2030 climate target plan underlined that also for these gases increased incentives will be required to reduce emissions further. The achievement of this strengthening of ambition will benefit from the sectoral actions in this strategy.

Revision of environmental legislation will include measures to address pollution. The Commission will for instance assess whether the role of the Industrial Emissions Directive (IED)³⁸ in preventing and controlling methane emissions could be enhanced. This could be both from expanding the scope of the IED to cover methane emitting sectors not yet included in its scope and a greater focus on methane during the reviews of Best Available Techniques (BAT) Reference Documents (BREF). This would mean ensuring that techniques to reduce methane emissions are identified in BREF reviews and methane BAT-associated emission levels (BAT-AELs) are included in BAT conclusions. The Commission will also assess the potential to expand the sectoral scope of the European Pollutant Release and Transfer Register (E-PRTR) Regulation³⁹ to report methane emissions.

The Commission will consider including methane in the zero-pollution monitoring framework to be developed under the Zero Pollution Action Plan announced for 2021 and the third edition of the EU Clean Air Outlook in 2022. The Commission will also review the National Emission Reduction Commitments (NEC) Directive by 2025 and, as part of this review, explore the possible inclusion of methane among the regulated pollutants.

e. Opportunities in biogas production

Non-recyclable human and agricultural waste (i.e. manure) and residue streams can be utilised in anaerobic digesters to produce biogas or in biorefineries to produce bio-materials and intermediate bio-chemicals. When used for biogas production, such raw materials can effectively contribute towards reducing methane emissions from anaerobic decomposition processes in nature. Simultaneously, biogas production can also generate additional revenue streams for farmers and provide opportunities for development and investment in rural areas. To that end, cooperation with and amongst farmers and local communities is essential, with opportunities to improve local economies and promote circularity. This cooperative approach in promoting opportunities for rural areas will also be part of the Long Term Vision for Rural Areas the Commission will put forward in 2021.

The biogas resulting from such feedstocks is a source of highly sustainable and useful renewable energy with multiple applications, while the material that remains after anaerobic digestion (digestate) can, after further processing, be used as a soil improver. This in turn reduces the requirement for alternative soil improving products, such as synthetic fertilisers of fossil origin. Moreover, in line with the waste hierarchy, the waste-based biodegradable input into biorefineries and biogas plants can count towards municipal waste recycling targets as set out in Directive 2018/98/EC. The role of sustainable biogas production in contributing to the EU's decarbonisation objectives has been recognised in the recently published EU strategies for energy-system integration and hydrogen⁴⁰.

According to the EU's long-term decarbonisation strategy⁴¹, by 2050, the EU's annual consumption of biogases (biogas and biomethane) is projected to grow to between 54 and 72 Mtoe, from around 17 Mtoe in 2017. This growth in production will contribute towards the

³⁸ Directive 2010/75/EU.

³⁹ Regulation (EC) No 166/2006 on the establishment of a European Pollutant Release and Transfer Register.

⁴⁰ COM(2020) 299 and 301; https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1259.

⁴¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0773>

EU's renewable energy and climate targets modelled in the long-term strategy. Biogas from agricultural waste or residues can also cost-effectively mitigate methane emissions in the agriculture and the waste sectors. Conversely, biogas derived from food or feed crops increases methane emissions, and thus can undermine the mitigation benefits of biogas. It is therefore essential for biogas developments to be based primarily on waste or residues.

The collection and use of high methane emitting organic wastes or residues from farming as biogas substrates should be further incentivised. This can be achieved, for example, through identifying best practices for collection and/or harvesting of sustainable wastes and residues or by incentivising the use of digestate as a sustainable soil improver in lieu of mined fertilisers. Sequential cropping can also be used in combination with manure as feedstock for sustainable biogas production, while contributing to sustainable farming practices, and as such could also be further incentivised⁴². National strategic plans for the Common Agricultural Policy (CAP), among other instruments and in line with the objectives set out in the national energy and climate plans, should encourage an integrated intervention that may encompass support for suitable agricultural practices, sustainable use of digestate and nutrients therein, investments in efficient installations, and services such as advisers, training and innovation. To that end the Commission will address this issue in specific Member State recommendations by the end of 2020.

As announced in the EU strategy for energy-system integration²⁷, the Commission will re-examine the gas market regulatory framework to facilitate the uptake of renewable gases, including by considering issues such as the connection to infrastructure and the market access for distributed and locally connected production of renewable gases. In addition, the upcoming revision of the Renewable Energy Directive in June 2021, will present opportunities for further targeted support to accelerate the development of the market for biogas.

Any measures to support biogas production must be carefully assessed to avoid perverse incentives that could lead to an overall increase in emissions from the waste, land and agricultural sectors, as well as to avoid an increase in the landfilling of unutilised digestate as soil improvers. Actions promoted under the methane strategy should be in line with the general sustainability criteria for bioenergy developed in the context of renewable energy legislation and with the taxonomy regulation⁴³.

Cross-sectoral actions

1. The Commission will support **improvements in measurement and reporting of methane emissions by companies** across all relevant sectors, including through sector-specific initiatives.
2. The Commission will support the establishment of an **independent international methane emissions observatory** anchored in the United Nations framework, in cooperation with international partners. The observatory would be tasked with collecting, reconciling, verifying and publishing anthropogenic methane emissions data at a global level.
3. The Commission will strengthen **satellite-based detection and monitoring of methane emissions** through the EU's Copernicus programme, with a view to

⁴² These and other recommendations were conveyed by stakeholders at a workshop organised by the Commission on 17 July 2020 entitled 'The opportunities and barriers to achieving methane emission reductions in waste and agriculture through biogas production'.

⁴³ Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088.

contribute to an EU-coordinated capability for detecting and monitoring global super-emitters.

4. In order to deliver on the increased climate ambition of the 2030 climate target plan impact assessment, the Commission will **review relevant EU climate and environmental legislation** to more effectively address methane-related emissions notably the Industrial Emissions Directive and the European Pollutant Release and Transfer Register.
5. The Commission will provide targeted support to **accelerate the development of the market for biogas from sustainable sources** such as manure or organic waste and residues via upcoming policy initiatives. This will include the future gas market regulatory framework and the upcoming revision of the Renewable Energy Directive. The Commission will propose a pilot project to support rural areas and farming communities in building biogas projects and accessing funds for biogas production from agricultural waste.

2. ACTIONS IN THE ENERGY SECTOR

The scope of actions for energy-related methane covers the entire oil, gas and coal supply chains. It includes liquefied natural gas (LNG), gas storage and biomethane introduced into gas systems. Achieving emissions savings in this sector is feasible, with at least one third of reductions possible at no net cost to industry⁴⁴. The greatest benefits in net economic, environmental and social terms would be achieved by reducing venting and flaring, reducing leaks in fossil gas and oil production, transmission and combustion, and reducing methane emissions from coalmines⁴⁵. Venting and routine flaring should be restricted to unavoidable circumstances, for example for safety reasons, and recorded for verification purposes.

Supporting voluntary initiatives

In the energy sector, the approach of the Commission is to support voluntary initiatives while simultaneously preparing legislation to build on and consolidate the progress made through voluntary actions.

As part of this approach, the Commission is actively promoting the widespread implementation of the measurement and reporting framework devised by the Oil and Gas Methane Partnership (OGMP) measurement and reporting framework. The OGMP is a voluntary initiative that currently covers oil and gas upstream companies. In cooperation with the United Nations Environment Programme (UNEP) and the Climate and Clean Air Coalition, the Commission is working to extend the OGMP framework to more companies in the gas upstream, midstream and downstream, as well as to the coal sector and closed or abandoned sites⁴⁶. The OGMP framework is the best existing vehicle for improving measurement, reporting and verification capability in the energy sector.

In addition, the Commission calls on companies in the oil, gas and coal sectors to set up more robust leak detection and repair (LDAR) programmes to prepare for upcoming proposals for legislation that would make such programmes mandatory (more details in the next section).

Legislative action

⁴⁴ International Energy Agency (IEA), Methane Tracker, (2020).

⁴⁵ Unintended leaks from all equipment.

⁴⁶ Ongoing coordination with relevant stakeholders is supporting the development of revised MRV methodologies, adapted for these sectors and sections of supply chains.

The Commission will table in 2021 a legislative proposal on compulsory measurement, reporting and verification for all energy-related methane emissions, building on the Oil and Gas Methane Partnership (OGMP) methodology. Improving the quality of emissions data through mandatory higher-tier reporting by companies will also help Member States to improve their reporting to the United Nations Framework Convention on Climate Change (UNFCCC). It may therefore also lead to an increased share of higher-tier reporting for the concerned key categories in the EU inventory.

In addition, such legislation should include an obligation to improve leak detection and repair (LDAR) of leaks on all fossil gas infrastructure, as well as any other infrastructure that produces, transports or uses fossil gas, including as a feedstock. In an effort to tackle emissions from venting and flaring, LDAR obligations will address flaring efficiency as a priority. Furthermore, the Commission will examine options as regards possible methane emission reduction targets or standards or other incentives on fossil energy consumed and imported in the EU.

Upstream gas companies have a certain but limited financial incentive to implement LDAR programmes, as they can sell the gas that they prevent from leaking⁴⁷. Transmission, storage, and distribution systems operators (including many LNG terminals) are regulated businesses and do not own the gas. For this reason, the Commission will promote the recognition by National Regulatory Authorities (NRAs) of LDAR and methane reduction investments as allowed costs for regulated entities in transmission, storage and distribution, including through possible guidance to regulators.

The proposed revision of the Non-Financial Reporting Directive (NFRD) could lead to the development of European non-financial-reporting standards. To ensure appropriate alignment, the development of such standards could take account of the pre-existing Oil and Gas Methane Partnership (OGMP) standards for supply chains in oil, fossil gas and coal supply chains.

The Commission will examine the options available in view of proposing legislation on eliminating routine venting and flaring in the energy sector covering the full supply chain, up to the point of production.⁴⁸ This would complement the 2030 objectives of the World Bank's Zero Routine Flaring initiative⁴⁹, which the Commission intends to support alongside its support for the World Bank's Global Gas Flaring Reduction Partnership⁵⁰. The Commission will also make it a priority to explore a more precise standard for flaring efficiency, with the objective of further reducing both fugitive emissions and emissions from incomplete combustion of fuels. These mitigation options are generally cost-effective, and a key component of methane-emission mitigation in the energy sector, with combustion accounting for a significant portion of EU emissions⁵¹.

Address coalmines and abandoned production sites

⁴⁷ However, this would only reduce leakage if (and to the extent that) the cost of abatement is lower than the additional sale price achievable. However, as these companies do not own the resource they are using (those are generally owned by the country of production) and not accountable for losses, they often have little interest in reducing them. Also, oil producers often have little or no incentive (other than regulatory) to reduce their emissions of methane or other gases that are not in their core business.

⁴⁸ This would exclude flaring that is necessary, for example for safety reasons.

⁴⁹ <https://www.worldbank.org/en/programs/zero-routine-flaring-by-2030#1>

⁵⁰ <https://www.worldbank.org/en/programs/gasflaringreduction>

⁵¹ EU 2030 climate target plan Impact Assessment, https://eur-lex.europa.eu/resource.html?uri=cellar:749e04bb-f8c5-11ea-991b-01aa75ed71a1.0001.02/DOC_1&format=PDF.

The Commission encourages remedial work to eliminate methane emissions from the EU's active or unused coalmines and abandoned oil and gas sites. Experience in non-EU countries and certain Member States shows that these sites can have significant levels of emissions⁵². However, at present, there are no EU-wide rules on checking, measuring or utilising methane leakage or emissions from coalmines or oil and gas wells after their closure. The forthcoming Commission proposal to reform the Research Fund for Coal and Steel also supports research in this field. The initiative for Coal Regions in Transition, now part of the Just Transition Platform, can serve as a forum for discussing good practices and best available techniques.

The Commission will support either the effective closure and sealing of coalmines or their utilisation for residual energy production (collecting methane for local use). Technologies to achieve this are available and already operational in certain parts of Europe. This will require the local workforce to be trained in these areas, funds to be allocated to underpin non-commercial definitive closure and opportunities to be developed for commercial companies to collect methane from abandoned sites. The Commission will bring forward recommendations for best practices and/or enabling legislation if necessary.

Actions in the energy sector

6. The Commission will deliver **legislative proposals in 2021** on:
 - Compulsory **measurement, reporting, and verification** (MRV) for all energy-related methane emissions, building on the Oil and Gas Methane Partnership (OGMP 2.0) methodology.
 - Obligation to **improve leak detection and repair** (LDAR) of leaks on all fossil gas infrastructure, as well as any other infrastructure that produces, transports or uses fossil gas, including as a feedstock.
7. The Commission will consider legislation on eliminating routine venting and flaring in the energy sector covering the full supply chain, up to the point of production.
8. The Commission will work to **extend the OGMP framework to more companies in the gas and oil upstream, midstream and downstream as well as to the coal sector and closed as well as abandoned sites**.
9. The Commission will promote **remedial work under the initiative for Coal Regions in Transition**. Best-practice recommendations and/or enabling legislation will be brought forward if necessary.

3. ACTIONS IN THE AGRICULTURAL SECTOR

Overall, methane emissions from EU agriculture have decreased by approximately 22% since 1990, mainly due to a reduction in ruminant livestock numbers. However, in the past 5 years, herd sizes have increased again, leading to a slight upturn in methane emissions in that period. The methane emissions intensity of meat and milk (in terms of methane emissions per weight of meat or milk) has also decreased over time as a result of changes in production methods. Further decreases can be achieved by more sustainable production through innovation and technology on the one hand and by more sustainable diets on the other hand. Therefore a strategic vision needs to be based on a balance of technologies, markets and dietary changes, reduced fossil hydrocarbon inputs and that ensure a livelihood and sustainable business

⁵² Kholod, et al., (2020). (<https://doi.org/10.1016/j.jclepro.2020.120489>).

opportunities for farmers while upholding the fundamentals of the EU's food policy, as described in the Farm to Fork strategy⁵³.

There are inherent complexities involved in achieving methane emissions reductions in agriculture as well as in accurately monitoring, verifying and reporting these emissions in that sector. Trade-offs in mitigation actions must be minimised. For example, increasing the use of confinement housing for livestock typically leads to reduced methane emissions. However, it could increase carbon dioxide emissions through increased energy use inside the housing. Other questions to be taken into account include that benefits from grazing ruminants especially in terms of carbon sequestration and biodiversity in grassland and pastures would be lost.

A range of mitigation technologies and practices are available that have the potential to deliver emission reductions decoupled from production. These are mainly related to improvement of animal diets, herd management, manure management (notably its use in fertilisers and biogas generation), breeding, herd health and animal welfare.

The most-effective ways of reducing emissions from enteric fermentation⁵⁴ include improving the health and fertility of the herds, improving animal diets (mix of feed materials), feed additives, and feeding techniques. Approximately 7-10% of the energy in the feed of ruminants is metabolised into methane. The biggest potential for reducing emission intensity is in novel approaches to feeding, as mentioned in the Farm to Fork Strategy, which can achieve very substantial methane reductions⁵⁵. In addition to reducing emissions, these actions could also benefit farmers and animals by contributing to reduced costs and improved animal welfare.

Actions that lead to reduced emissions from manure provide additional income to farmers. Through cooperation among farmers as well as within communities, waste and residue streams from agriculture and waste sectors through anaerobic digestion should be valorised. Barriers such as insufficient knowledge and expertise that prevent their wider uptake should be addressed⁵⁶. This underlines the need for the systemic promotion of the related expertise and enabling frameworks, taking into account the specificities of different Member States and production systems.

Methane emissions from rice fields can be reduced by rewetting, drying, and other appropriate agricultural practices. The high costs of these practices, and the reorganisation of farm management they require, need to be addressed.

To promote wider uptake of methane-reducing approaches in agriculture, by the end of 2021 the Commission will develop an inventory of best practices, available technologies and innovative technologies. The Commission will update this inventory with technologies gradually coming onto the market. The development and updating of the inventory will be carried out in cooperation with sectoral experts, key stakeholders and Member States.

⁵³ COM(2020) 381.

⁵⁴ <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/economic-assessment-ghg-mitigation-policy-options-eu-agriculture-ecampa-2>

⁵⁵ One novel approach to feeding that holds great promise is incorporating seaweed into cattle feed. One in vitro study found that seaweed could powerfully inhibit methane production even at very low levels. See <https://www.publish.csiro.au/an/AN15576>.

⁵⁶ https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_fg_livestock_emissions_final_report_2017_en.pdf

In the first half of 2021, the Commission will support setting up an expert group to analyse life-cycle methane emissions metrics. This group will look at livestock, manure and feed management, feed characteristics, new technologies and practices and other issues, based on relevant international work⁵⁷. This life cycle analysis will seek to distinguish to what extent (1) specific livestock management and animal welfare choices; (2) imported or domestic feeds and (3) intensive or pastoral farming choices affect methane emissions. The Commission will also introduce this topic into the CCAC Agriculture programme as a work stream and will consult the CCAC Scientific Advisory Board for its appreciation. Moreover, to help data collection and measurement, by 2022 the Commission will propose a digital carbon-navigator template and will encourage the development and use of such templates at farm level. This will also improve farmers' awareness of greenhouse gas emissions and of the effects of mitigation technologies on their farms.

Other initiatives stemming from the Green Deal and a reformed Common Agricultural Policy (CAP) will further contribute to an effective and steady decrease in the overall methane emissions from the EU livestock sector. In line with the 2030 Climate Target Plan the Effort Sharing Regulation (ESR) (which covers methane emissions from agriculture), will now be reviewed to reflect the increased carbon reduction target providing for increased incentives to reduce methane emissions.

The Commission will encourage Member States to include methane reduction schemes in their strategic plans for the CAP such as carbon farming initiatives. These can help to develop a new green business model by rewarding farmers for applying farming practices that remove CO₂ from the atmosphere and contribute to the climate neutrality objective (including in the animal sector), as mentioned in the Farm to Fork strategy⁵⁸. Strategic plans for the CAP and the national recovery and resilience plans can also support investments in biogas plants, as well as cooperation among farmers and local communities to maximise added value. Such investments can contribute to the EU's economic recovery and increase quality of life in rural areas.

Technical mitigation measures will complement other important developments for the sector and rural areas, in particular an expected societal shift to more balanced diets, with less red and processed meat, more fruits, vegetables and plant-based protein sources, in line with the EU Farm to Fork Strategy. These lifestyle changes can 'not only reduce the risks of life-threatening diseases, they can also reduce the environmental impact of the food system'⁵⁹. Finally, the Commission will advance its research agenda in this area, and in particular through targeted research in its Strategic Plan 2021-2024 for Horizon Europe.

Actions in the agricultural sector

10. In the first half of 2021, the Commission will support setting up **an expert group to analyse life-cycle methane emissions metrics**. This group will look at livestock, manure and feed management, feed characteristics, new technologies and practices and other issues. It will also work in setting up a life cycle methodology on the overall emissions for livestock.

11. By the end of 2021, the Commission – in cooperation with sectoral experts and Member States – will develop an **inventory of best practices and available**

⁵⁷ The LEAP Partnership (Livestock Environmental Assessment and Performance) under the auspice of FAO

⁵⁸ Farm to Fork Strategy (COM(2020) 381).

⁵⁹ Farm to Fork Strategy (COM(2020) 381).

technologies to explore and promote the wider uptake of innovative mitigating actions. These actions will have a special focus on methane from enteric fermentation.

12. To encourage carbon-balance calculations at farm level, the Commission will by 2022 provide a **digital carbon navigator template and guidelines on common pathways for the quantitative calculation of greenhouse gas emissions and removals**.
13. The Commission will promote the uptake of **mitigation technologies** through the wider deployment of ‘carbon farming’ in Member States and their Common Agricultural Policy Strategic Plans, as from 2021.
14. In the Horizon Europe strategic plan 2021-2024, the Commission will consider proposing **targeted research** on the different factors that effectively lead to methane emission reductions, focusing on technology and nature based solutions as well as on the factors leading to dietary shift.

4. ACTIONS IN THE WASTE AND WASTEWATER SECTOR

In waste management, the Landfill Directive⁶⁰ adopted in 1999, requires landfill operators to manage landfill gas by either using it to generate energy or flaring it. Flaring still generates pollutants and CO₂. According to the waste hierarchy, landfilling is the least preferable option and should be limited to the necessary minimum. In 2018, 24% of all municipal waste generated in the EU was landfilled⁶¹, with significantly higher shares in a number of Member States due to legal and investment shortcomings. Biodegradable waste is responsible for the generation of landfill gas.

Recent changes to EU waste legislation (2018) introduced an obligation to collect biodegradable waste separately by 2024, and set a new target of a maximum 10% landfilling of waste by 2035. As a result of these changes, it is expected that methane emissions from landfills will decrease further. Minimising the disposal of biodegradable waste in landfills and its utilisation for climate-neutral circular bio-based materials and chemicals is critical to avoid the formation of methane, whilst providing a substitute for fossil and carbon intensive products. For these reasons, Member States should more strictly enforce existing legal requirements such as the landfill diversion targets for biodegradable waste and the treatment of biodegradable waste prior to disposal to neutralise its degradability⁶². Member States should also clamp down on the operation of illegal landfill sites. Enhanced monitoring, reporting and verification in this field is also necessary to forecast the impacts these measures will have on the climate ambitions for 2030 and beyond.

More data and information is necessary to ascertain the need for and scope of further action. Ideally, all landfill sites should use the gas they produce until the energy content drops below

⁶⁰ Directive 1999/31/EC.

⁶¹ Eurostat, env_wasmun.

⁶² As interpreted by the EUCJ ruling Case C-323/13, European Commission v. Italian Republic. <http://curia.europa.eu/juris/liste.jsf?language=en&num=C-323/13>.

a useful value. Once it is no longer viable to utilise landfill gas, it may be recommended to use bio-oxidation technology⁶³ in ‘hot spots’ identified across the site to neutralise the remaining methane.

With respect to the treatment and use of wastewater and sewage sludge under the current regulatory framework, namely the Urban Waste Water Treatment Directive and the Sewage Sludge Directive, emissions of greenhouse gases are not specifically tackled. Over the past 29 years, the implementation of the Urban Waste Water Treatment Directive has helped to prevent significant methane emissions due to the collection and treatment of wastewater in efficient centralised facilities. These facilities emit significantly less methane and other greenhouse gases than alternative treatment approaches.

The Sewage Sludge Directive, adopted more than 30 years ago, regulates the use of sewage sludge to protect the environment, and in particular soil, against the harmful effects of contaminated sludge when used in agriculture. The Urban Waste Water Treatment Directive is currently being reviewed⁶⁴. In parallel to the impact assessment on the Urban Waste Water Treatment Directive, starting in the third quarter of 2020, the Commission will carry out a study to support the evaluation of the Sewage Sludge Directive. It will also carry out an additional study that will assess the scope for further action on greenhouse-gas emissions, including methane from sewage sludge. Based on the outcomes of the evaluation of the Sewage Sludge Directive and further research and the impact assessment for the revision of the Urban Waste Water Treatment Directive, the Commission will consider taking measures to limit the emission of greenhouse gases from sewage sludge.

In the review of the Landfill Directive required for 2024, the Commission will consider several actions related to landfill gas management. Firstly, it will consider new techniques to reduce methane emissions. This may include aeration of landfill mass to inhibit the generation of methane, increasing the use of landfill gas to generate energy, or when neither option is possible, the use of techniques that effectively oxidise the methane such as bio-oxidation or flaring. Secondly, the Commission will consider enhanced monitoring, reporting and verification, which is key to gauge impacts and improve performance in this field over time. Following on from the above actions and where necessary, the existing guidance document on the implementation of the Landfill Directive on gas control requirements⁶⁵ will be updated accordingly.

New technologies for better conversion of waste to biomethane can be effective in further reducing methane emissions in the sector. In this respect, the Commission will support targeted research on technology-based solutions in its Strategic Plan 2021-2024 of Horizon Europe.

⁶³ LIFE Project RE MIDA - Innovative Methods for Residual Landfill Gas Emissions Mitigation in Mediterranean Regions LIFE14 CCM/IT/000464. The project demonstrated the technical and economic viability of two technologies (biofiltration and biowindows) implemented to biologically oxidise landfill biogas with low calorific value. The technologies resulted in gains related to: oxidation efficiency, abatement of odorous compounds, minimisation of the risk associated with emissions of carcinogenic compounds and reductions in the cost of landfill post treatment when compared to a conventional combustion system.

⁶⁴ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12405-Revision-of-the-Urban-Wastewater-Treatment-Directive>.

⁶⁵ <https://ec.europa.eu/environment/waste/landfill/pdf/guidance%20on%20landfill%20gas.pdf>.

Actions in the waste and wastewater sector

15. The Commission will continue to **tackle unlawful practices and provide technical assistance** to Member States and regions. This assistance will address issues such as sub-standard landfills. The Commission will also help Member States and regions to stabilise biodegradable waste prior to disposal and its increasing use for the production of climate-neutral, circular bio-based materials and chemicals, and divert this waste to biogas production.
16. In the **review of the Landfill Directive in 2024**, the Commission will consider further action to improve the management of landfill gas, minimise its harmful climate effects, and harness any of its potential energy gains.
17. In the Strategic Plan 2021-2024 of Horizon Europe, the Commission will consider proposing **targeted research** on waste to biomethane technologies.

III. INTERNATIONAL ACTION

The EU will seek to tackle methane emissions in the energy, agriculture and waste sectors in cooperation with partner countries and international organisations. This work will build on existing partnerships in international fora, such as through the Climate and Clean Air Coalition (CCAC), the Arctic Council and the Association of Southeast Asian Nations (ASEAN). The EU will also engage with international organisations.

As the largest importer of oil and gas, the EU has the leverage to promote energy-related methane emission reductions globally. Estimates show that the external carbon or methane emissions associated with EU fossil gas consumption (i.e. the emissions released outside the EU to produce and deliver fossil gas to the EU) are between three to eight times the quantity of emissions occurring within the EU⁶⁶. The Commission therefore intends to mobilise a coalition of key import countries to coordinate efforts on energy sector methane emissions.

Moreover, the EU will leverage its leadership in the circular economy and its advanced agricultural practices that balance animal welfare with productivity to accelerate international action. The Commission will also support international data sharing on methane emissions through the foreseen international methane emissions observatory as well as by making EU satellite data available to global partners. In this way, the EU will lead by example in international collaboration on data sharing. These cross-sectoral actions will be complemented by specific actions in each sector, as described below.

1. ENERGY

a. Reach out to international energy supplier and buyer countries and support multilateral cooperation

The EU will lead a diplomatic outreach campaign to fossil fuel producer countries and companies, and encourage them to become active in the Oil and Gas Methane Partnership (OGMP)⁶⁷. The EU will also pursue closer cooperation with the US, Canada and Mexico

⁶⁶ Environmental Defense Fund (EDF), (2019).

⁶⁷ Current members are: BP, Ecopetrol, Eni, Equinor, Neptune Energy International SA, Pemex, PTT, Repsol, Shell, and Total.

(countries with existing methane-regulation and country-level methane-reduction targets) to share experiences and identify joint actions. Through its bilateral dialogues, the EU will advocate for the need to properly measure and reduce methane emissions at a global level.

The Commission will explore the possibility of providing partner countries with **technical assistance** in gas and oil production so these countries can improve their methane regulatory frameworks and their capacity in monitoring, reporting and verification.

The scope for coordinated international action among **fossil fuel buyer countries** in reducing methane emissions in the fossil gas sector is particularly significant. The EU, together with China, South Korea and Japan account for more than 75% of the global trade in fossil gas⁶⁸. The EU will reach out to these partners to create a coalition among buyer countries to support an ambitious international monitoring, reporting and verification standard, thus promoting the global uptake of emission-reduction technologies.

Moreover, the international methane emissions observatory would be tasked with compiling and publishing a **methane-supply index (MSI)** at EU and international level. Initially, the index could be composed using existing and reported data from countries' emissions inventories as submitted to the UNFCCC, empowering buyers to make informed choices when purchasing fuels. With time, the index could benefit from global data supplied by the international methane emissions observatory.

In order to incentivise accurate measurement, reporting and verification (MRV) on fossil gas (including imports), the Commission will propose to use a default value for volumes that do not have adequate MRV systems in place. The default value will be applied where necessary until a compulsory MRV framework for all energy-related methane emissions building on the OGMP 2.0 methodology is implemented. These steps will increase transparency in international gas trade flows.

Minimum methane emission standards, targets or other such incentives based on robust scientific analysis can play an effective role to ensure methane emission reductions in the EU and globally. The Commission will examine all the options available, informed by the work of the foreseen independent international methane emissions observatory - building on the **methane supply index**. In the absence of significant commitments from international partners on methane emissions reductions, the Commission will consider proposing legislation on targets, standards or other incentives to reduce methane emissions from fossil energy consumed and imported in the EU. This will be based on an impact assessment which will comprehensively assess the implications of putting such an instrument in place, including in terms of the independent verification and compliance checks that will be required to effectively enforce it, and in terms of potential contributions towards overall reductions in global methane emissions. This impact assessment will be conducted in close consultation with international partners, civil society and key stakeholders.

The EU will also join and actively support initiatives, including the international public-private Global Methane Initiative, the World Bank's Global Gas Flaring Reduction initiative, and the World Bank's initiative on Zero Routine Flaring by 2030. EU collaboration with the United Nations Environment Programme (UNEP), the IEA and the Climate and Clean Air Coalition (CCAC) on the international emissions observatory is a core component of multilateral efforts across these organisations to tackle global methane emissions in the short-term.

⁶⁸ International Energy Agency (IEA), (2019).

The Commission will contribute to a series of key international events in the build up to the UN General Assembly in New York in September 2021, with the objective of securing at that meeting a UN-based pathway to reduce methane emissions in the years 2021-2031. The goal will be to provide support for the coordination of international actions to rapidly reduce global atmospheric methane and promote longer-term action, notably through the creation of a legally-binding framework at international level for methane emission reduction.

b. Satellite data sharing on super-emitters

Addressing super-emitters both in the EU and internationally is a cost-effective action that is feasible with currently available data and with established leak-detection and repair (LDAR) measures. Methane leakages from coalmines are often also very significant and more data is required to understand this area in detail⁶⁹.

The EU will promote the worldwide extension of the capability to detect and monitor super-emitters in the foreseen international methane emissions observatory. The EU will offer this capability to international partners and take energy-diplomacy action to monitor and work to achieve reductions in emissions from super-emitters globally. This information will be based on satellite data reconciled with bottom-up detection processes. As of 2021, this detection and monitoring capability will form the basis for the establishment of a procedure that alerts the EU and national governments both within the EU and internationally about major emission sources. Further improvements in detection capability will be available starting in 2023⁷⁰.

The EU is a technical leader in satellite imagery and methane emission leak detection through Copernicus, in particular the global and freely available CAMS and Sentinel 5P products. Other satellites will be launched by the EU and by the US and Japan in the coming years covering the same spectrum as Sentinel 5P. Data sharing among international actors will set an example of international collaboration to improve the monitoring of global methane emissions.

2. AGRICULTURE

A significant share of global methane emissions in the agricultural sector originates outside of the EU, and this share is projected to increase. An international vision and the promotion of mitigation actions is therefore paramount. The Commission and Member States have been, and will continue to be, very active in various international fora for reducing emissions from agricultural and agro-food systems.

The EU will intensify collaboration with non-EU countries as part of the Koronivia Joint Work on Agriculture⁷¹ (KJWA) under the United Nations Framework Convention on Climate Change (UNFCCC). This framework covers a range of interrelated topics such as soil, livestock, nutrient and water management, food security, the socioeconomic impacts of climate change across agriculture and methods for assessing climate change. At COP 26, the EU will work to extract best practices and knowledge from the KJWA work programme to help make the global food system more sustainable.

⁶⁹ Saunois et al. (2019)

⁷⁰ The launch of satellites Sentinel 4 and 5 will provide higher-frequency observations, increasing the likelihood of capturing intermittent sources.

⁷¹ <https://unfccc.int/topics/land-use/workstreams/agriculture>

The EU is an active member of the Thematic Working Group on Agriculture⁷², which is led by the UN's Food and Agriculture Organization. In this role, the EU will help to foster both collaboration and the exchange of knowledge and best practices to improve implementation of climate action in agriculture. This work will cover livestock and focus on improving the implementation of Nationally Determined Contributions (NDCs) pledged by countries as part of the Paris Agreement.

The Climate and Clean Air Coalition (CCAC) agriculture initiative⁷³ also aims to increase the ambition of NDCs. It focuses on reducing emissions of methane from livestock (from enteric fermentation and manure management) and paddy rice production. As a main partner in this initiative, the Commission will ensure that it continues to help non-EU countries with knowledge exchange, best practices, and the setting up of pilot projects to better manage and mitigate methane emissions from agriculture. Future work will focus on best practices and technologies to reduce enteric fermentation globally.

The EU's-international partnerships on research and cooperation will continue to support climate action in agriculture-related projects. These projects will cover livestock management, grazing land management and forestry⁷⁴. Forestry-based actions relevant to methane abatement include initiatives to reduce the conversion, draining and burning of peatland forests⁷⁵, managing and restoring forests in a way that reduces the incidence and severity of uncontrolled forest fires⁷⁶, and reducing firewood and charcoal use (switching to non-biomass fuels for cooking)⁷⁷. Other target areas are cropland manure management as well as other land uses and ecosystems (managing prescribed/controlled fires, agricultural development in urban and peri-urban areas, and drying of wetlands).

The Commission will also promote the mitigation potential in the rice-cultivation sector in Asia through cooperation projects. These projects will be set up and monitored according to EU climate-tracking procedures and in line with NDCs and national adaptation plans.

3. WASTE

The Commission is actively participating in the revision of guidance on the landfilling of waste (including landfill-gas management) under the Basel Convention⁷⁸. The guidance has been aligned with existing EU waste legislation

International actions

18. The EU will step-up its contribution to the work of **international fora**, such as through the Climate and Clean Air Coalition (CCAC), the Arctic Council and the Association of Southeast Asian Nations (ASEAN).
19. As part of the EU's **diplomatic and external relations** action, the Commission will address methane emission reductions in all relevant sectors with partner countries

⁷² <http://www.fao.org/climate-change/our-work/what-we-do/ndcs/twg/en/>

⁷³ <https://ccacoalition.org/en/resources/ccac-agriculture-initiative-infosheet>

⁷⁴ EU Communication on Stepping up EU Action to Protect and Restore the World's Forests; 23 July 2019

⁷⁵ IPCC, (2019).

⁷⁶ Forest conservation and sustainable management also reduce flood risks, and thereby reduce the methane emissions associated with flooding.

⁷⁷ From the perspective of methane emissions, a switch to other biomass fuels, even if they are sustainably produced, is not ideal as all biomass burning generates methane.

⁷⁸ Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal <https://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-e.pdf>.

and promote **global coordination** of efforts to address energy-sector methane emissions.

20. The Commission will seek **increased transparency** in the energy sector by working with international partners to develop a **Methane Supply Index** in the foreseen international methane emissions observatory.
21. The Commission will consider methane emission reduction **targets, standards or other incentives** for fossil energy consumed and imported in the EU in the absence of significant commitments from international partners.
22. The Commission will support the establishment of a **detection-and-alert process for methane super-emitters using EU satellite capability**, and share this information internationally through the foreseen international methane emissions observatory.
23. The Commission will support cooperation with international partners, including the Global Methane Initiative, the World Bank's Global Gas Flaring Reduction initiative, and the World Bank's initiative on Zero Routine Flaring by 2030, as well as the International Energy Agency.
24. The Commission will contribute to a series of key **international events** in the build up to the UN General Assembly in New York in September 2021, with the objective of securing a UN based pathway on coordinated actions at international level to reduce methane emissions.

IV. CONCLUSIONS

This strategy identifies a set of actions that will achieve significant reductions in methane emissions across the energy, agriculture and waste management sectors at EU and international level. These measures will help to deliver on the EU's commitments under the European Green Deal and the Paris Agreement towards climate neutrality, as well as reducing air pollution. Effective emission reductions will require resolute action by EU Member States, non-EU countries and stakeholders.

The Commission will continue to monitor progress in relation to methane emission reductions in the EU greenhouse gas inventories, while reporting under the United Nations Framework Convention on Climate Change (UNFCCC) and United Nations Environment Programme (UNEP) frameworks will monitor progress at international level.

The Commission invites the European Parliament, Council, Committee of the Regions, European Economic and Social Committee, Member States, non-EU countries, international organisations and stakeholders at EU and international level to support and cooperate on the further development of this strategy to urgently address methane emissions across the energy, agriculture and waste management sectors.