BRIEFING

Towards climate neutrality

European Parliament

Reducing methane emissions

A new EU strategy to address global warming

SUMMARY

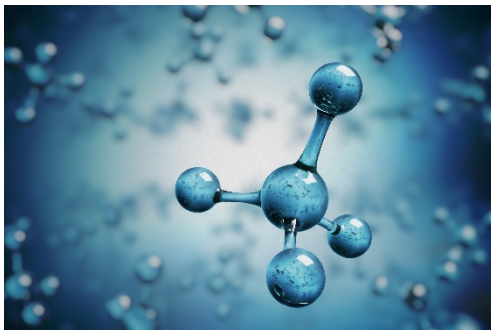
Methane, a short-lived greenhouse gas, has a global warming potential much higher than that of carbon dioxide, and is directly linked to air pollution through the formation of ozone. Methane emissions are derived from both natural sources and human activity. Energy, agriculture, waste and wastewater treatment are the biggest sources of anthropogenic methane emissions.

Globally, methane emissions increased by 24 % between 1990 and 2018. In the EU-27, methane emissions fell by 0.2 % between 2009 and 2018 and accounted for just over 10 % of total GHG emissions in 2018. The EU has been tackling methane through legislation, policies and strategies aimed at reducing emissions in Europe and internationally since 1996. The EU's methane emissions dropped by a third between 1990 and 2018. As a precursor to ozone, methane is a key factor in air quality and human health.

On 14 October 2020, the European Commission presented an EU strategy to reduce methane emissions. The document focuses on cross-sectoral actions within the EU, and builds on actions in the energy, agricultural, waste and wastewater sectors within the EU and internationally.

Stakeholders from the industry sector and environmental non-governmental organisations have given feedback on the strategic document and have welcomed the strategy while also highlighting aspects that could be strengthened.

In 2019, the European Parliament asked the Commission to address methane emissions reductions through a strategic plan by the end of the first half of its 2019-2024 term. In October 2020, when the strategy was presented, MEPs from the Committees on Industry, Research and Energy welcomed the document and also posed questions in respect of its scope. Parliament's response is currently being prepared by the Committee on the Environment, Public Health and Food Safety.



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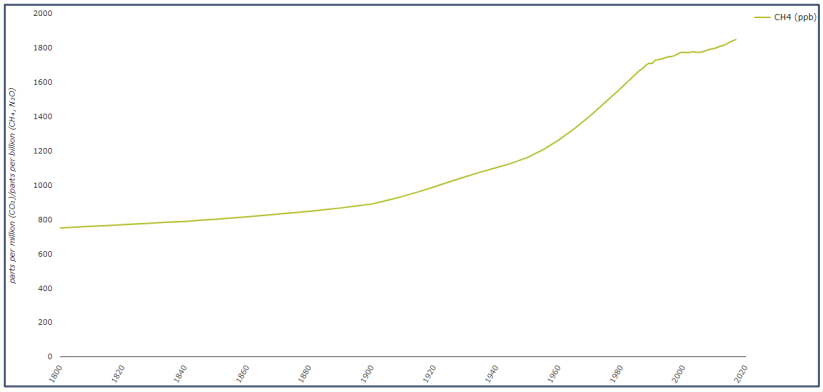
Methane: Greenhouse gas and air pollutant

Methane is the principal component of natural gas. Its concentration in the atmosphere has more than doubled since 1900, to reach 1 850 parts per billion (ppb), as can be seen in Figure 1.

Figure 1 – Trends in atmospheric concentrations of CH_4 (ppb), between 1800 and 2017



Source: EEA - Atmospheric greenhouse gas concentrations - Indicator Assessment.

The atmosphere[1] consists of a complex mix of gases in different percentages. The most concentrated gases are nitrogen, oxygen and argon, while carbon dioxide (CO_2), nitrous oxides, ozone and methane (CH_4) account for a thousandth of the total.

Gases such as CO_2, methane, nitrous oxide and fluorinated gases are able to trap heat in the atmosphere and are therefore referred to as greenhouse gases (GHG). CO_2 and methane, in this order, are the most abundant GHGs in the atmosphere.

The effect on climate change of each gas is mainly dependent on three factors: concentration, how long they last in the atmosphere and how strongly they impact it. For the latter factor, the most widely used metric is the 100-year global warming potential (GWP) indicator, but there are alternatives (see box).

In comparison to other GHGs, methane stays in the atmosphere for a relatively short time – around 12 years – thus being referred to as a 'short-term climate forcer' (by contrast, CO_2 stays in the atmosphere for between 300 to 1 000 years). Nevertheless, methane is a more powerful GHG, as it has a higher GWP than CO_2,

According to the International Energy Agency (IEA) report – Methane Tracker 2020 – an estimate for worldwide methane emissions to the atmosphere is close to 570 million tonnes (19.4 billion tonnes CO_2e) annually, while CO_2

Global-warming potential of methane

To compare the effects of different greenhouse gases on global warming, it is customary to compare their effect per tonne with the effect of a tonne of CO_2 over a 100-year period. This measure is called the global warming potential, measured in CO_2 equivalents (CO_2e). According to the latest Intergovernmental Panel on Climate Change (IPCC) assessment report, methane has a 100-year GWP of 34. Over a 20-year timeframe methane has a GWP of 86. The IPCC adapts the GWP to account for new scientific knowledge and changes in the composition of the atmosphere.

For the purposes of effort sharing, GHG reduction targets and reporting, the EU currently uses a GWP of 25 for methane; that is one tonne of methane is considered equivalent to 25 tonnes of CO_2. This value is based on previous IPCC assessment reports.

Alternatives to GWP

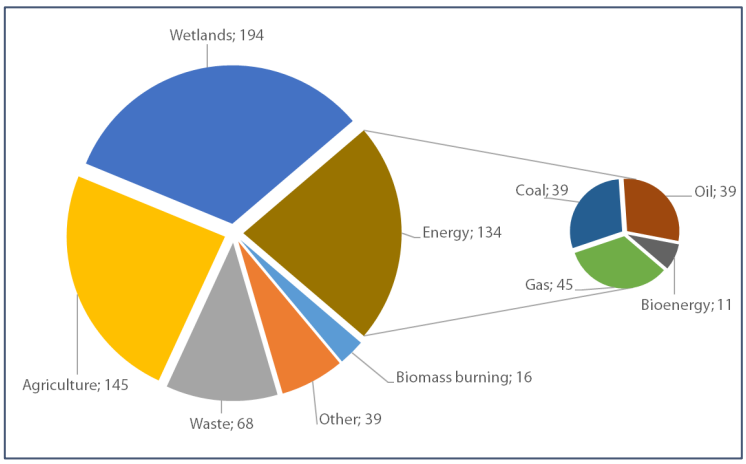
GWP has been criticised as a metric that may lead to insufficient policies to cut CO_2 emissions because cutting an equivalent (CO_2e) amount of short-lived climate forcers may be easier/cheaper, but will not have the same effects on long-term warming.

The global temperature potential (GTP), is the contribution of a GHG to global temperature rise at the end of a time period.

GWP* (GWP Star) takes into account the short-life time of methane in the atmosphere. Contrary to the GWP approach, GWP* makes use of temperature equivalence and is thus considered to better represent the temperature response towards methane emissions.

emissions are estimated to be close to 37.5 billion tonnes. Natural emissions account for around 41 % of the total, with the remaining 59 % of emissions coming from anthropogenic sources. Figure 2 gives a breakdown of emission sources by sector.

Figure 2 – Sources of methane emissions (million tonnes (Mt) of methane)



Data source: IEA - Methane Tracker 2020.

Methane emissions occur from different sources. These can be anthropogenic (agriculture, fossil fuel production and use – including transport – and waste), natural (wetlands, inland waters, geological, oceans, termites, wild animals, permafrost, vegetation), and they can also be from a combination of nature and human activities (biomass and biofuel burning).

In 2018, man-made GHG emissions associated with the agricultural sector in the EU 27 – the main source of non-CO_2 GHG emissions – totalled close to 5.5 % (214 Mt CO_2e) of total emissions, representing an increase of around 0.3 % compared with 2009.

Methane emissions from the EU agricultural sector come from a variety of sources. In 2018, those arising from enteric fermentation – microbial decomposition and fermentation of plant materials in the digestive tract of domesticated and wild ruminants – represented 80.6 % of the total. The remaining emissions were distributed as follows: manure management (17.3 %); rice cultivation (1.2 %); other agriculture emissions (0.6 %); and field burning of agricultural residues (0.2 %).

As Figure 2 above illustrates, the energy sector accounts for a big share of anthropogenic methane emissions, as methane is the main component of natural gas[2]. In this sector, emissions can come from methane leaks, venting of gas, failures in gas and oil wells, and coal mining (see box below). The methane linked to fossils fuels is defined as mineral.

The combustion of natural gas in the energy sector causes lower CO_2 emissions than the use of coal for the same amount of useful energy produced. However, methane leaks from natural gas systems can significantly increase the GHG emissions of natural gas production and use, up to the point where the climate benefits relative to coal are eliminated. Experts point out that there is considerable uncertainty about methane emissions from oil and gas infrastructure.

Landfills for household waste are another source of methane emissions, as are water reservoirs used for water management and/or hydropower.

Venting

Controlled release of gases into the atmosphere in the course of oil and gas production operations

Leaks

Emissions from faulty/unmaintained equipment in wells, compressors, pipelines, distribution networks and storage

Wetlands can be associated with the release of methane. Permafrost lands store large amounts of methane that may be released when temperatures rise. The same goes for frozen methane

(methane hydrates) in arctic oceans. Rising temperatures are leading to higher methane emissions, which are in turn contributing to global warming, creating a self-reinforcing feedback.

Between 1990 and 2018, methane emissions increased globally by 24 %, rising up to 9.7 gigatonnes CO_2e, with the 2018 growth at approximately 2 %. This growth rate was consistent with the 2017 rate but higher than in the previous four years, where methane emissions grew by 0.6 %. In the EU-27, methane emissions in 2018 represented a share of just over 10 % of total GHG emissions, representing a 0.2 % decrease from 2009 figures. EU-27 methane emissions fell by around 9 % between 2009 and 2018, from 433 Mt CO_2e to 395 Mt CO_2e.

Methane represents a 50 % share in the formation of background ozone (ozone originating from natural sources). Researchers have estimated the number of deaths linked with ozone to be between 1.04 and 1.23 million deaths per year, globally. Even if local ozone reductions from methane emissions reductions are small, it is crucial to know that the oxidation of methane is responsible for the majority of the ozone formation in the troposphere. As such, even if methane does not cause direct harm to human health, its precursor relationship with ozone makes methane a gas that must be considered in terms of its impact on human health.

The fact that methane emissions come from such a wide range of sectors/activities, and also the fact that, once in the atmosphere, methane blends well with other gases, makes it very difficult to measure and report methane emissions. Furthermore, uncertainty regarding GHG emissions is relatively high; for methane emissions, the level of uncertainty is 30 % or above, while for CO_2 it is close to 5 % for the Organisation for Economic Co-operation and Development (OECD) countries and 10 % for other countries.

Many methane emissions abatement technologies have already been developed and deployed in various sectors. To address emissions in the agricultural sector there are solutions to improve manure management, improved dietary options and feed for animals, inclusion of anaerobic digestion at farm level, to name but a few. Research has shown that subsidies can boost the wide uptake of such abatement measures in the EU, but that this would demand a considerable budget.

Dedicated abatement technologies in the energy sector include pre-mining degasification, identification and reduction of leakage from transmission and distribution pipelines, and recovery and usage of methane from the production of oil and gas, among others. The IEA estimates that nearly 40 % of total emissions could be curbed using currently available technology, at no net cost because methane is a valuable gas that can be captured and sold on the market. Furthermore, 84 % of methane abatement opportunities with zero net cost can be found in the energy supply chain.

Research conducted by the United States Environmental Protection Agency suggests that nearly 940 Mt CO_2e could be reduced at or below US$0/tonne CO_2e. This reduction doubles for actions priced between US$0 and US$60/tonne CO_2e[3].

Within the waste sector many abatement technologies exist; these can be deployed to collect, capture and use methane from landfills, to improve the collection and separation of biodegradable municipal waste and divert it from landfill to compost or production of bioenergy, and to proceed with gas recovery and overflow controls in the wastewater treatment sector.

EU legislation and policy on methane

As early as 1996, the European Commission presented a strategy paper for reducing methane emissions, suggesting measures in the areas of agriculture, energy and waste management.

Methane is subject to EU climate legislation – it is one of the six GHGs for which emissions are reported to the United Nations Framework Convention on Climate Change (UNFCCC) and which count towards the emission reduction targets (see below for more detail). Methane emissions are covered by legislation on effort-sharing (Regulation (EU) 2018/842), and legislation on reporting of GHG emissions (Regulation (EU) 525/2013), which will be repealed by the Regulation on the Governance of the Energy Union and Climate Action (Regulation (EU) 2018/1999). Regulation (EU)

2018/841 on including emissions/removals from land use, land use change and forestry in EU climate policy after 2020 concerns CO_2, methane and N_2O.

The EU Landfill Directive 1999/31/EC set and achieved the objective of reducing the volume of biodegradable waste in landfill by 65 % by 2018, reducing methane emissions from the EU waste sector. Between 1990 and 2018, as a result of the reduction in landfilled waste, methane emissions from landfills in the EU fell by 72 Mt CO_2e (46 %). The legislation was amended by Directive (EU) 2018/850. This directive provides that by 2035 the amount of municipal waste landfilled must be reduced to 10 % or less of the total amount of municipal waste generated (by weight).

Other policies influence methane emissions directly. The use of best available techniques (BAT) for industrial and agricultural facilities – power plants, refineries, large scale rearing of pigs and poultry and waste water treatment plants – that fall within the scope of the Industrial Emissions Directive (Directive 2010/75/EU) is an important example.

Reductions in methane emissions are also achieved by means of specific legislation (Stage I Directive 94/63/EC) addressing the handling, storage and distribution of liquid fuels and by reducing fugitive losses of volatile organics and hydrocarbons from such processes.

There is no specific EU legislation regarding methane emissions from agriculture, oil and gas production or coal-mining exploration. Fugitive methane emissions are often addressed in national legislation.

The non-binding Commission Recommendation 2014/70/EU on hydraulic fracturing for the exploration or production of shale gas/oil concerns environmental aspects with cross-border impacts. It asks Member States to ensure that operators capture methane and other gases for subsequent use, and minimise flaring and venting. Venting should be limited to exceptional cases necessary for safety reasons.

In 2013, the Commission proposed to set national emission ceilings for methane in the revision of the National Emission Ceilings Directive (Directive 2001/81/EC), as these emissions had not originally been covered by the directive. The objective was a 33 % reduction by 2030, compared with 2005 levels. However, the revised directive, adopted in 2016, does not include methane in its scope. The Commission subsequently issued a declaration, attached to the directive, in which it committed to consider measures for reducing methane emissions so as to be able to also reduce ozone concentrations in the Union, taking international developments into account.

Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action obliges the Commission to address methane emissions through a strategic plan, in the light of a long-term strategy for GHG emissions reduction.

International initiatives

The UNFCCC provides a global framework for reducing GHG emissions. Methane is one of the six principal GHGs (CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride) for which anthropogenic emissions by sources and removals by sinks are measured and reported by the parties to the UNFCCC. The UNFCCC adopted the Kyoto Protocol for GHG emissions reductions by developed nations in the period up to 2020, and the Paris Agreement for global emission reductions in the post-2020 period.

The European Commission and five EU Member States are part of the Global Methane Initiative, a group of 44 countries accounting for around 70 % of global anthropogenic methane emissions.

The Commission and 12 EU Member States are engaged in the Climate and Clean Air Coalition (CCAC) to reduce short-lived climate pollutants with a focus on reducing black carbon, hydrofluorocarbons (HFCs), and methane.

Recently, as a way to address the issue of poor monitoring and reporting of methane emissions, 62 companies representing the oil and gas industry worldwide and directly linked to close to 30 % of

total methane emissions agreed on a new framework to improve tracking and compare performance between them. This framework arose from an initiative by the CCAC run by the Commission, the United Nations (UN) Environmental Programme and the Environmental Defence Fund.

The new EU methane strategy

On 14 October 2020, as part of the European Green Deal, the European Commission introduced a new strategy to reduce methane emissions. The communication focuses on cross-sectoral actions, 24 in total, within the EU, and makes commitments in the energy, agricultural, waste and wastewater sectors within the EU and internationally with a view to cutting methane emissions.

The cross-sectoral actions will focus on supporting improvements in the measurement and reporting of methane emissions by companies, and the establishment of an independent international methane emissions observatory supported within the United Nations framework. In addition, the satellite-based detection and monitoring of methane emissions by the EU's Copernicus programme will be strengthened. At the same time, the Commission commits to review relevant EU climate and environmental legislation and to support the accelerated development of the market for biogas from sustainable sources.

The energy sector is the only one for which the Commission envisages new legislation derived directly from this strategy. In 2021 the Commission will present legislation linked to compulsory measurement, reporting and verification for all energy-related methane emissions, building on the Oil and Gas Methane Partnership (OGMP) methodology, so as to improve the quality of emissions data and its reporting. The Commission intends to legislate to make it obligatory to improve leak detection and repair of leaks on all fossil gas infrastructure, as well as any other infrastructure that produces, transports or uses fossil gas, including as a feedstock.

Furthermore, it will consider legislation on eliminating routine venting and flaring in the energy sector, covering the full supply chain, up to the point of production. Extension of the OGMP framework to more companies in the gas and oil industry upstream, midstream and downstream, and to the coal sector and closed/abandoned sites, and the promotion of remedial work under the initiative for Coal Regions in Transition, is also considered.

For the agricultural sector, the strategy includes the creation of an expert group to analyse life-cycle methane emissions metrics by the first semester of 2021. Furthermore, best practice and available technologies directed at innovative mitigating actions will be gathered in an inventory by the end of 2021. When it comes to quantitative calculation of GHG emissions and removals, the Commission will deliver a digital carbon navigator template and guidelines on common pathways. It will also promote the uptake of mitigation technologies through 'carbon farming' and propose targeted research, with a view to reducing methane emissions, as part of the 2021-2024 Horizon Europe strategic plan.

During the review of the Landfill Directive in 2024, at the waste and wastewater sector level the strategy will address sub-standard landfills by tackling unlawful practices and providing technical assistance, improving the management of landfill gas achieved and considering proposing targeted research, aiming at waste-to-biomethane technologies, as part of the 2021-2024 Horizon Europe strategic plan.

The strategy lists the Commission's international-level commitments, which include increasing EU participation in the Climate and Clean Air Coalition, the Arctic Council and the Association of Southeast Asian Nations, cooperating with international partners and contributing to international events building up to the UN General Assembly in New York in September 2021. In addition, the Commission intends to address methane emissions reductions in all relevant sectors with partner countries, promote global coordination with respect to energy-sector methane emissions, and

develop a methane supply index as part of the above-mentioned international methane emissions observatory.

Stakeholder positions

The European Environmental Bureau (EEB) regrets that the only sector concerned by 'real action' is the energy sector, thus excluding one of the main sectors responsible for methane emissions: agriculture. The EEB does not agree with the European Commission on the lack of real agricultural methane emissions data. They suggest that, as with the energy sector, super emitters need to be identified. In addition, the EEB criticises the failure to set binding reduction targets for total methane emissions.

The European Waste Management Association (FEAD) supports the strategy and states that it should work together with the circular economy action plan. In addition, FEAD encourages the Commission to address the effectiveness of existing legislation relating to landfills, as this would be in line with the methane emission reductions envisaged by the methane strategy.

EurEau, the European Federation of National Associations of Water Services, states that the strategy should have gone further than just mentioning the methane emissions from the wastewater sector and done more to acknowledge 'its substantial potential for biogas production'. EurEau calls for a support framework to back the willingness of the wastewater sector to act to both reduce methane emissions and increase biogas production.

The Climate and Clean Air Coalition (CCAC) welcomed the new methane strategy, and stated its readiness to work with the EU on the already existing solutions to reduce methane-related emissions, thus protecting the climate, human health and livelihoods.

In addition, several entities[4] representing the gas industry issued a declaration welcoming the methane strategy and making recommendations for future developments. They praise the inclusion of other sectors such as agriculture and waste in the document, with a view to achieving methane emission reductions through many sectors.

European Parliament

In its November 20219 resolution on the 2019 UN Climate Change Conference (COP25), the European Parliament refers to the legal obligation (set out in the Governance Regulation) on the European Commission to develop a strategic plan for dealing with methane emissions reduction and to propose appropriate legislation during the first half of its mandate.

The Commission communication on an EU strategy to reduce methane emissions has been referred to Parliament's Committee on Environment, Public Health and Food Safety (ENVI) while the Committees on Industry, Research and Energy (ITRE) and Agriculture and Rural Development (AGRI) will give opinions.

On 16 October 2020, Kadri Simson, European Commissioner for Energy, presented the methane strategy to the ITRE Committee. MEPs welcomed the strategy but also raised questions, for instance on why the focus of the document is mainly on the energy sector and how this strategy would play out at Member State level. Furthermore, they stressed the need to establish standards, or certification schemes, for gas imports.

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ENDNOTES

1 Layers of the atmosphere: troposphere, stratosphere, mesosphere, thermosphere, exosphere and ionosphere.

2 The combustion of methane leads to CO_2 emissions. In the energy sector, this occurs mainly through the use of natural gas for electricity generation and heating, but also through flaring, which is the controlled burning of excess natural gas in the course of routine oil and gas production.

3 The baseline emissions for calculations were: agriculture – 384 Mt CO_2e; coal mining – 784 Mt CO_2e; municipal solid waste – 959 Mt CO_2e; oil and gas – 2 113 Mt CO_2e; and waste water – 609 Mt CO_2e.

4 Gas Infrastructure Europe, GasNaturally, Eurogas, European Association for the Streamlining of Energy Exchange, European Biogas Association, Energy Community, European Network of Transmission System Operators for Gas, GEODE, International Association of Oil and Gas Producers, Natural & bio Gas Vehicle Association.

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