

NATIONAL REPORT BY NORWAY

APRIL 2020

Enhanced Black Carbon and Methane
Emissions Reductions

Arctic Council Framework for Action

National Report by Norway

April 2020

Enhanced Black Carbon and Methane Emissions
Reductions – Arctic Council Framework for Action

Content

1	Introduction	2
2	Black carbon emissions and future projections	3
3	Methane emissions and future projections	5
4	National mitigation strategies and action plans	6
4.1	National strategies	7
4.2	National action plans	7
	Black carbon	8
	Methane	8
5	International work	8
5.1	International and multilateral priorities	8
5.2	Aid and bilateral cooperation	9
6	Sector based plans and projects	9
6.1	Mobile and stationary diesel-powered sources (1a-1e)	9
6.2	Oil and gas (2a-2d)	11
6.3	Residential combustion (3a -3c)	13
6.4	Solid waste (4a-4c)	14
6.5	Agriculture and animal husbandry (5a-5c)	16
6.6	Management of wildfires (6a-6d)	18
7	Annexes	19

1 Introduction

Norway is pleased to submit its third National Report on Black Carbon and Methane to the Arctic Council. We stand firmly behind the Framework for Enhanced Action on Black Carbon and Methane Emissions Reductions and the collective goal to reduce emissions of Black Carbon by 25-33% from 2013 to 2025. The national reports are key to keep track of the progress. They are also well-fitted means to share knowledge and lessons learned between both member and observer countries.

The rapid melting of the Arctic is of great concern to Norway. We recognize the role Arctic countries play to the increasing warming of the Arctic. A study from 2013 found BC emitted within the Arctic has an almost five times larger Arctic surface temperature response (per unit of emitted mass) compared to emissions at midlatitudes.¹ The Arctic countries thus have a great responsibility to reduce the collective emissions. The largest total warming effect from Black Carbon in the Arctic, however, comes from other regions with higher emissions. Norway therefore welcome the commitment many observer states show to reduce their black carbon emissions. We encourage other countries also to commit to regional goals to reduce black carbon emissions. Such goals can have local and regional benefits on health and precipitation, as well as global benefits for the climate.

Reducing emissions from short-lived climate forcers (SLCFs), like BC and methane, is important. A key characteristic of SLCFs are that they affect the climate for a far shorter period than long-lived climate forcers such as CO₂. BC is in the atmosphere shorter than a week, and methane around 12 years. By reducing emissions of these forcers, it is possible to faster reduce the alarming speed of global warming. Organic carbon (OC) and sulphur dioxide (SO₂), which contribute to cooling, are co-emitted with short-lived climate forcers from some emission sources. Abatement of such emissions can still be warranted for various reasons (air quality and health), however, it could result in an increase in global temperatures, requiring additional efforts in other areas to reach the same target. Reductions in SLCFs are therefore a supplement to, not a replacement for reductions in CO₂ (and other long-lived gases).

Norway is constantly working to improve our knowledge about the role of SLCFs in national climate policies. The Norwegian Environment Agency is now working to analyze the short-term climate effects, health effects and environmental effects of the climate measures put forward in Klimakur 2030². Klimakur 2030 evaluated the potential for Norway to reduce emissions of greenhouse gases not included in the EU Emission Trading Scheme and measures that increases the uptake and reduce the emissions from forestry and other land-use (the FOLU sector). The Ministry of Climate and Environment seeks in this way to make it technically possible to integrate the approach on CO₂ and SLCFs. The aim is to know what effect climate policies and measures have on the climate, as well as health, both in a long and short-term perspective.

This report delivers an update on the areas covered in the last National Report on Black Carbon and Methane to the Arctic Council in 2017. On 11 May 2017, the Arctic Council Ministers adopted a set of

¹ Sand, M., Berntsen, T. K., Seland, Ø., and Kristjánsson, J. E.: Arctic surface temperature change to emissions of black carbon within Arctic or midlatitudes, *Journal of Geophysical Research: Atmospheres*, 118, 7788-7798, 10.1002/jgrd.50613, 2013.

² <https://www.miljodirektoratet.no/klimakur>

recommendations to reduce Black Carbon and methane emissions.³, ⁴. Some of these were updated by the Expert Group on Black Carbon and Methane in 2019.⁵ All are listed in Annex 3 of this report to show how Norway follows up on the recommendations.

2 Black carbon emissions and future projections

On 14th of February 2020 Norway reported historical emissions of black carbon (BC) to the Convention on Long-range Transboundary Air Pollution (CLRTAP). This was the fourth annual inventory submitted since 2017 and time series covering the years 1990-2018 are available here: https://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/2020_submissions/#N

On 21st of August 2019 Norway also reported updated projections of BC emissions to CLRTAP. These projections are based on an extension of measures and policies implemented by the beginning of 2018. The base year for the projections is 2016. Assumptions for the projections of BC can be found in chapter 9 Projections, in the Informative Inventory Report (IIR) 2020 Norway.

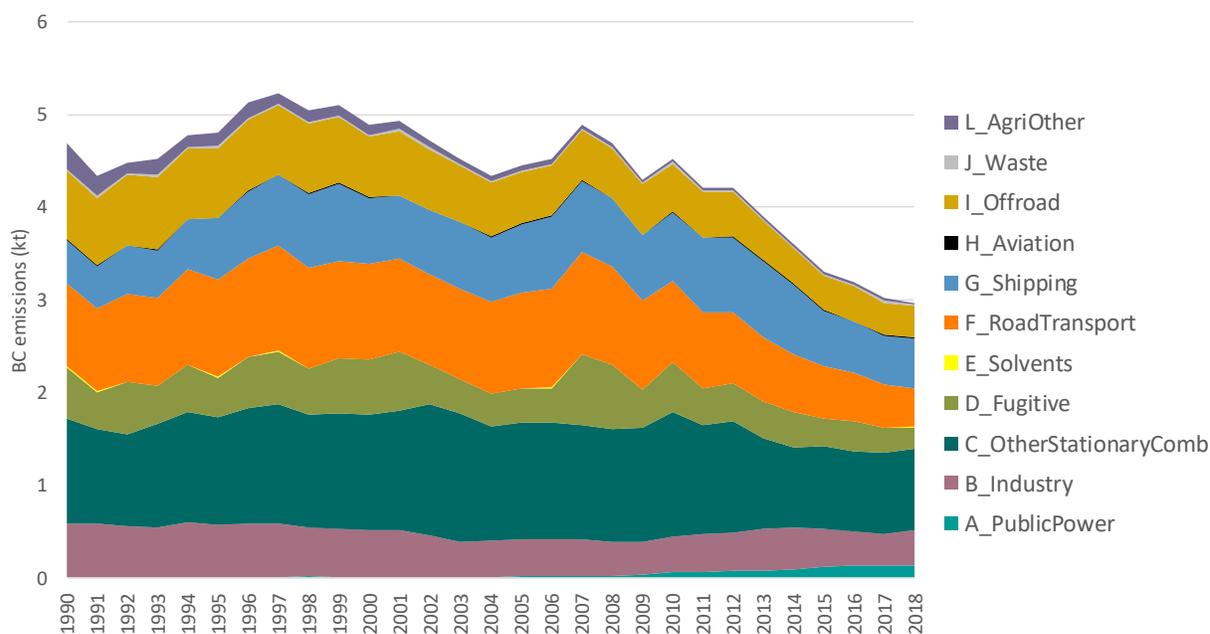


Figure 1. Historical emissions of black carbon in Norway 1990-2018.

Source: Norwegian Environment Agency and Statistics Norway

³ https://oarchive.arctic-council.org/bitstream/handle/11374/1936/EDOCS-4319-v1-ACMMUS10_FAIRBANKS_2017_EGBCM-report-complete-with-covers-and-colophon-lettersize.pdf?sequence=5&isAllowed=y

⁴ https://oarchive.arctic-council.org/bitstream/handle/11374/1910/EDOCS-4072-v5-ACMMUS10_FAIRBANKS_2017_Fairbanks_Declaration-2017.pdf?sequence=9&isAllowed=y

⁵ <https://oarchive.arctic-council.org/bitstream/handle/11374/2411/Expert%20Group%20on%20Black%20Carbon%20and%20Methane%20-%20Summary%20Progress%20and%20Recommendations%202019.pdf?sequence=1&isAllowed=y>

The emissions of black carbon amounted to around 2 970 tonnes in 2018, a total reduction of 37% since 1990 and 2% since 2017. The long term reduction is primarily due to a decrease in emissions from residential stationary plants, heavy duty vehicles and buses and venting and flaring (oil and gas). According to projections the emissions of black carbon are expected to be reduced further towards 2030.

In 2018, the most important aggregated (GNFR⁶) sector was "Other Stationary Combustion" (30% of total BC emissions). Within this sector 94% of emissions in 2018 originated from residential stationary plants, primarily due to wood combustion in private households. Emissions from "Other Stationary Combustion" have been reduced by 22% since 1990, and emissions are expected to be reduced further towards 2030.

In 2018, the second most important GNFR sector was "Shipping" (18% of total BC emissions). National navigation is the single source contributing to emissions within this sector. Emissions from "Shipping" have increased by 15% since 1990. However, according to projections the emissions are expected to be reduced towards 2030, to a level 35% below the 1990 emissions.

In 2018, the third most important GNFR sector was "Road Transport" (14% of total BC emissions). Within this sector the most prominent source of emissions in 2018 were passenger cars, followed by light duty vehicles and heavy duty vehicles and buses. Emissions from "Road Transport" have been reduced by 54% since 1990, and emissions are expected to be reduced further towards 2030. Emissions from passenger cars increased steadily between 1990 and 2007, but since 2007 emissions has been reduced year by year.

The three GNFR sectors mentioned above, along with the sectors "Industry" (13%), "Offroad" (11%), "Fugitive" (8%) and "Public Power" (5%), are covering most of Norway's 2018 black carbon emissions.

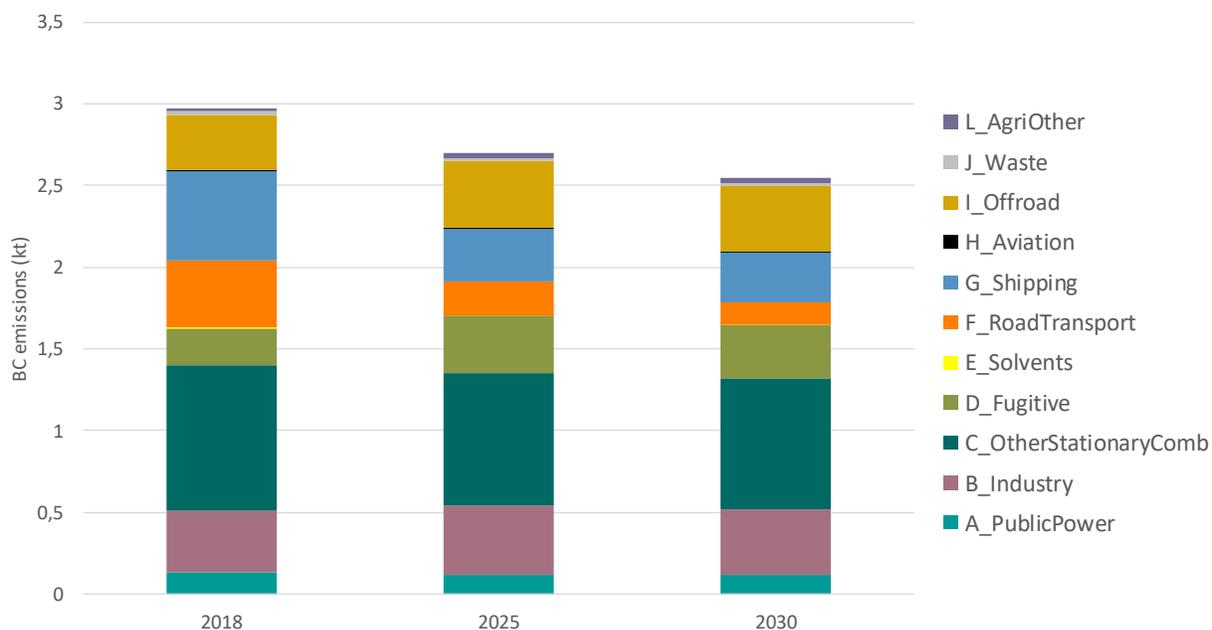


Figure 2. Historical emissions of black carbon in Norway 2018, and projections 2025, 2030. Source: Norwegian Environment Agency and Statistics Norway

⁶ Gridded Nomenclature for Reporting (GNFR) is the most aggregated format used to report emissions to the CLRTAP

3 Methane emissions and future projections

Methane emissions for 1990-2018 will be reported to UNFCCC by the 15th of April 2020. Emissions Reported data and National Inventory Report can be found at:

<https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2019>

Projections for 2020, 2025 and 2030 will be reported to EEA by the 1st of May 2020. Reported data can be found at: http://cdr.eionet.europa.eu/no/eu/mmr/art04-13-14_lcds_pams_projections/projections

Both emissions and projections were reported in Common Reporting Format (CRF).

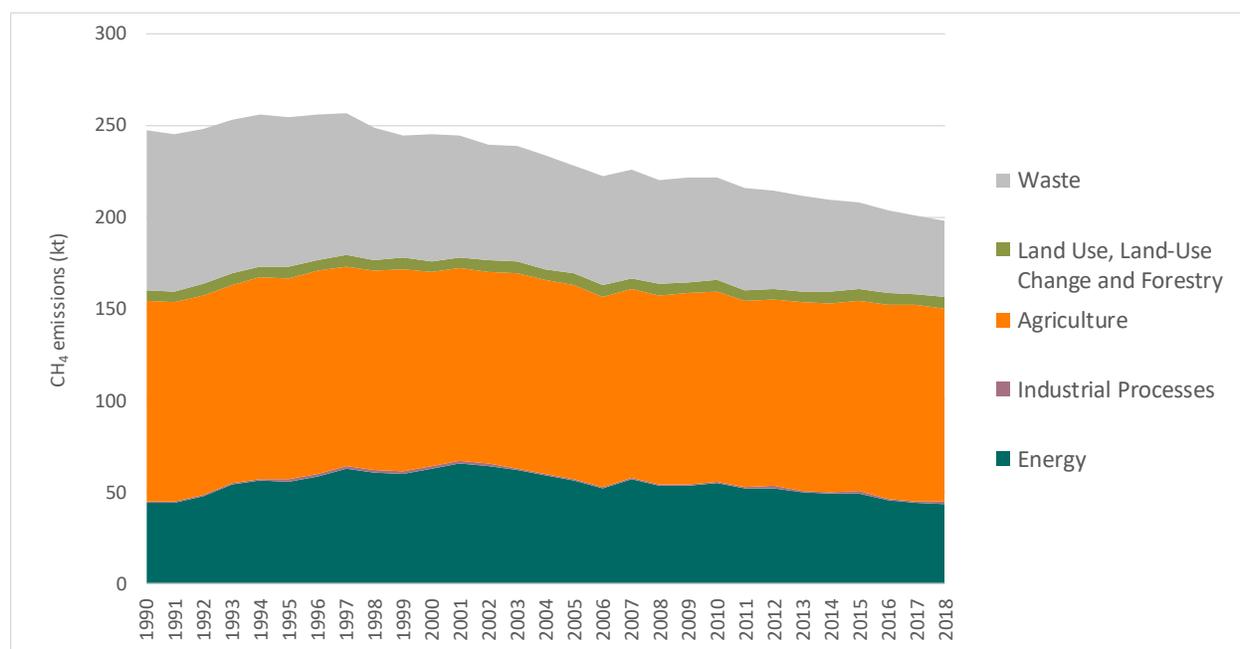


Figure 3. Historical emissions of methane in Norway 1990-2018 with LULUCF

Source: Norwegian Environment Agency and Statistics Norway

The emissions of methane without LULUCF amounted to 192,182 tonnes in 2018 while methane emissions with LULUCF amounted to 198,300 tonnes in 2018. In the following, only emissions without LULUCF will be presented.

Methane emissions have been reduced by 20% since 1990 and 1% since 2017. The long term reduction is primarily due to a decrease in emissions from waste treatment. According to projections the emissions of methane are expected to be further reduced towards 2030.

In 2018, 55% of methane emissions originated from agriculture. Emissions are dominated by releases from enteric fermentation, which accounted for 48% of Norway's total methane emissions in 2018. Emissions from agriculture have been reduced by 4% since 1990 but are expected to remain unchanged towards 2030. Mitigation measures introduced towards 2030 as a result of the recent climate agreement between the Government and the agricultural industry could however affect this outcome, but it is difficult to tell to what extent these emissions reductions will be from methane or other components.

In 2018, 23% of methane emissions originated from energy. The most prominent source of emissions within the energy sector is fugitive emissions from oil and gas extraction. Emissions from the energy sector have remained unchanged since 1990. However, according to projections the emissions are expected to be reduced towards 2030, to a level 9% below the 1990 emissions.

The waste sector accounted for 22% of Norway's methane emissions in 2018. Within this sector solid waste disposal on land (landfills) is the main source of emissions. Emissions from waste have been reduced by 51% since 1990, and emissions are expected to be further reduced towards 2030.

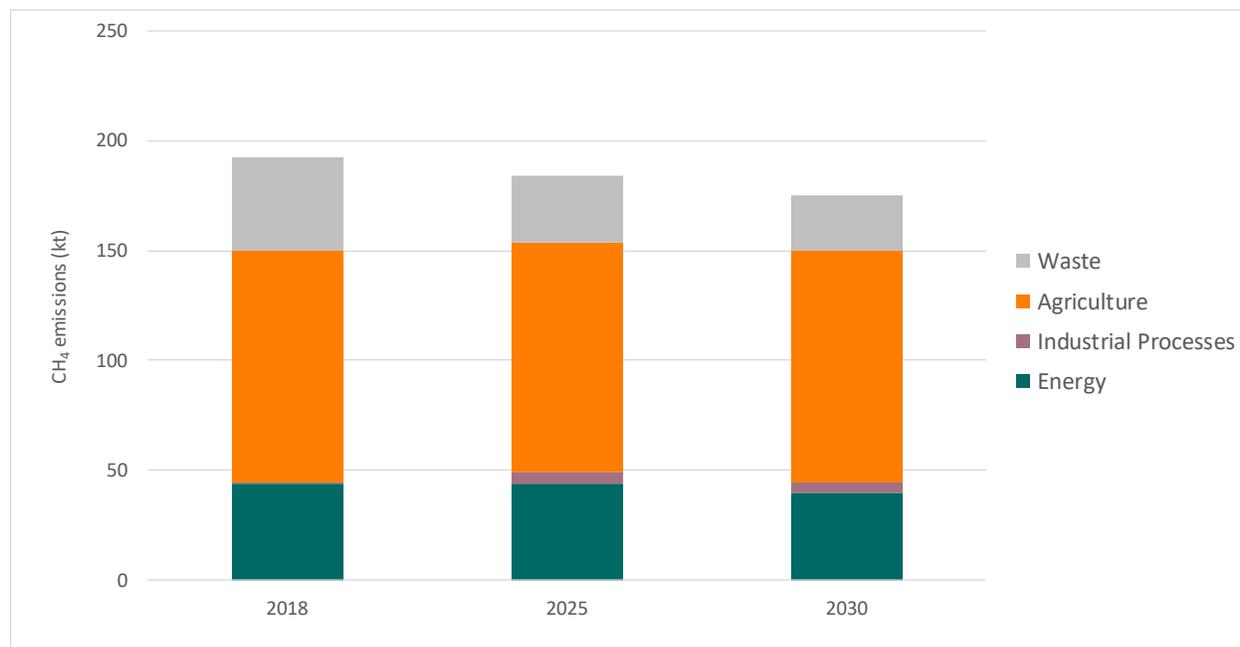


Figure 4. Historical emissions of methane in Norway 2018, and projections 2025, 2030. Without LULUCF. Source: Norwegian Environment Agency and Statistics Norway

4 National mitigation strategies and action plans

Climate change and emissions of greenhouse gases have been a concern of Norwegian policy since the late 1980s and has broad political backing. The polluter pays principle is a cornerstone of the policy framework on climate change. CO₂ taxes were introduced in 1991 as a step towards a cost-effective policy to limit emissions of greenhouse gases. The EU emission trading scheme covers 50% of our greenhouse gas emissions. Together with the Norwegian CO₂ tax, almost 80% of total greenhouse gas emissions are covered by economic measures.

When developing its climate policy, Norway also addresses drivers of climate change other than reduction of the greenhouse gases included in Annex A to the Kyoto Protocol. Measures towards certain sources of CO₂ emissions may also affect black carbon emissions and other short-lived climate forcers.

The Ministry of Climate and Environment has the overarching cross-sectoral responsibility for coordination and implementation of the Norwegian climate policy. Other Ministries are responsible for

developing and implementing policies in their respective sectors. The Ministry of Finance is responsible for the economic and tax policy, including green taxes.

4.1 National strategies

In June 2017, the Storting (the Norwegian Parliament) adopted the Climate Change Act relating to Norway's climate targets. The purpose of this was to promote Norway's long-term transformation to become a low-emission society by 2050.

In its White Paper on the 2030 climate strategy (Meld St. 41 (2016-2017)) the Government states that it will promote the use of cost-effective mitigation measures to meet the 2030 commitment (see below). If the CO₂ tax is not considered to be an adequate or appropriate instrument, other instruments that provide equally strong incentives to reduce emissions will be considered, including direct regulation under the Pollution Control Act and voluntary agreements.

In February 2020 Norway submitted an enhanced climate target under the Paris Agreement, number 2 in the following list of national mitigation targets:

1. Under the Kyoto Protocol, Norway will reduce global greenhouse gas emissions by the equivalent of 30% of its own 1990 emissions by 2020.
2. Under the Paris Agreement, Norway has conditionally undertaken a commitment to reduce emissions with at least 50%, and towards 55% by 2030 compared to 1990 levels. (increased from the previous at least 40% target)
3. Norway will be climate neutral by 2030. This means that from 2030, Norway must achieve emission reduction abroad equivalent to remaining Norwegian greenhouse gas emissions.
4. Norway has established by law a target of becoming a low-emission society by 2050.

Norway will cooperate with the EU and Iceland to fulfill our respective emission reduction targets of at least 40% reduction by 2030. This means that the target will be achieved by 1) Emissions reductions in Norway and 2) Cooperation with EU countries on emission reductions. Through the climate cooperation with EU and Iceland, Norway will have a commitment to reduce emissions not covered by the EU emission trading system (non-ETS emissions) by 40% in 2030 compared to 2005. In the Government's political platform (Granavolden-platform), it is stated that the government intends to reduce emissions in the non-ETS emissions by 45% in 2030 compared to 2005-levels, and the ambition is to do this through domestic emission reductions.

Methane, as one of the gases reported under the UNFCCC, is covered by the abovementioned policies and measures. The Ministry of Climate and Environment has instructed the Norwegian Environment Agency to analyse the measures referred to in Klimakur 2030 with a view to identify the short-term climate effects, health effects and environmental effects. All relevant short-lived climate forcers, including black carbon and methane will be included in this analysis. The analysis is foreseen to be published in the autumn 2020.

4.2 National action plans

Norway does not have specific national action plans for methane and black carbon as such. But in 2019 the Norwegian Environment Agency published an analysis of the short-term climate effects and health

effects from measures to reduce climate forcers in Norway.⁷ The type of analysis undertaken can be applied to put together a portfolio of measures that rapidly contribute to mitigate global warming and at the same time safeguard the long-term perspective of the Paris Agreement.

The main results from the analysis related to BC and methane were:

- BC could be reduced by 33% and methane by 16% between 2013 and 2025 if the analysed measures are implemented, compared to respectively 28% and 9% without such measures.
- The main measures to reduce these components additionally are for BC: Accelerated introduction of new stoves, best stoves and pellet burners and Electrification of ferries and passenger ships and for methane: Dietary shift to substitute meat with vegetable and fish, and Reduced food waste.
- Due to methane emission reductions, measures to reduce emissions from wood burning by replacing high emitting stoves with low emitting stoves are now regarded as a climate measure as well as a health measure.
- Many of the measures analysed are in the transport sector. Whereas measures such as electrification of ferries and passenger ships will contribute to substantial BC emissions reductions, additional road transport measures do not, because the BC emissions from this sector is projected to decline so rapidly (due to already adopted climate and air quality policies) that there will be limited emissions left in 2030. The situation could be different in other countries. However, CO₂-reductions from road transport measures helps mitigate climate change both in the short and long term.

Black carbon

When looking at new measures, it is relevant to note that Norway has reduced its total emissions of BC by 37% since 1990 and 2% since 2017. The reductions have been effects of policies not targeting BC directly.

See sector chapters on *Mobile and Stationary Sources, (Oil and gas), Management of wildfires and Residential combustion*.

Methane

See sector chapters on *Oil and gas, Agriculture and animal husbandry and Solid waste*.

5 International work

5.1 International and multilateral priorities

Norway joined the **Climate and Clean Air Coalition (CCAC)** in April 2012 and has been a key contributor to the Coalition Trust Fund. Norway is an active partner in the Coalition and has as a member of the steering committee contributed to the new 2030 vision⁸ and the Action Programme to Address the 1.5°C Challenge. Both documents benefited strongly by the work of the Global Pathway Approach Task Team that Norway was co-leading to 2019.

⁷ <https://www.miljodirektoratet.no/globalassets/publikasjoner/m1215/m1215.pdf>

⁸ <https://www.ccacoalition.org/en/content/our-2030-vision>

Norway puts great emphasis of the work that is being done on short lived climate forcers by the various working groups of the Arctic Council. Norway is currently co-leading the **Arctic Monitoring and Assessment Programme (AMAP)** SLCF Expert Group and leading the **Arctic Contaminants Action Program (ACAP)** with its four expert groups.

Norway was instrumental to the decision by the **IPCC-49 Plenary** to produce an IPCC Methodology Report on Short-lived Climate Forcers. The work is now well under way, and Norway is contributing with funds and participation in expert meetings.

5.2 Aid and bilateral cooperation

Oil for development. The Oil for development (OfD) Programme offers assistance to developing countries in their effort to manage petroleum resources in a sustainable manner. The Programme has been extended to currently 12 countries in Africa, Asia, the Middle East and South America. The last year the focus on building capacity on SLCF has increased, and we are e.g. arranging a workshop for the OfD-countries on methane emissions in the upstream oil and gas sector, including methodology to estimate emissions, establish inventories, best practices for emission reductions and considerations for policymaking.

Bilateral cooperation with China. The Norwegian Environment Agency is cooperating with the Chinese Research Academy for Environmental Sciences and the Chinese Academy for Environmental Planning on a three-year capacity building project (2020-2022) to control BC in Northern China. The project will strengthen the scientific knowledge on emissions, atmospheric processes, effects, and the co-benefits of reducing BC/OC and provide policy recommendations on emission reductions based on updated/new air quality and climate change information. In this way the project will raise the general awareness amongst policy makers in China on air quality, health, and climate co-benefits of BC/OC reductions, and improve the capacity in China to control emissions. The Norwegian Institute of Public Health and CICERO (Centre for International Climate Research) are also participating in the project on the Norwegian side.

6 Sector based plans and projects

Various instruments to reduce BC and methane emissions are described in this chapter of the report. Through the European Economic Agreement (EEA), Norway implements the EU Regulations and Directives for various sources and environmental qualities listed in this **chapter** in its national laws and regulations.

6.1. Mobile and stationary diesel-powered sources (1a-1e)

6.1.1. Specific national strategies

In order to reduce **black carbon emissions** through cleaner diesel fuels and vehicles, Norway aims for a rapid transition to zero and low emission transportation. This will reduce emissions of black carbon in addition to CO₂-emissions. Norway has the highest rate of electric vehicles in the world. In 2019, the marked share of zero emission cars amounted to 42% for new passenger car sales. This represents an increase of 20%age from 2017. The sale has increased considerably over the last years. Most of the policies to promote zero emission vehicles are described under “Best practices” in the [National Report from Norway 2017](#).

ENOVA SF is owned by the Norwegian Ministry of Climate and Environment. Enova makes financial contributions to individuals and businesses in order to start using the newest and most climate friendly technologies. ENOVA has support schemes for establishment of charging stations and zero emission technologies in the transport sector. In addition to these schemes, a zero emission fund for commercial transport was established in 2019, with a budget of 1 billion NOK for 2020. The Government has set ambitious targets for emission from new vehicles in 2025 and 2030. In its White paper on the National Transport Plan for 2018–2029⁹, the Government established several new targets:

- All new passenger cars and light vans sold in 2025 shall be zero-emission vehicles.
- All new urban buses sold in 2025 shall be zero emitters or use biogas.
- By 2030, all new heavy-duty vehicles, 75% of new long-distance coaches and 50% of new trucks shall be zero emission vehicles.
- The distribution of freight in the largest urban centres shall have almost zero emissions by 2030.

The Parliament adopted the White Paper on National Transport Plan 2018–2029 in June 2017. In June 2017 the Government also issued a White Paper on climate policies¹⁰, where the Government set a working target of a cut of 35-40% in greenhouse gas emissions from the transport sector by 2030 compared with 2005. Further, the Government said in the White Paper that it would build upon current policy measures to stimulate use of zero emission vehicles, and by that contribute to reaching the targets for zero emission vehicles in the National Transportation Plan 2018-2029. Depending on market development, the Government will consider necessary changes in policy measures. The Government also stated that it will facilitate to make zero emission cars competitive, and that economic measures should support this.

Norway has an action plan for fossil free public transport by 2025 and an action plan for infrastructure for alternative fuels. Furthermore, an action plan on fossil-free construction sites in the transport sector is being developed.

In terms of shipping, the Norwegian Government has launched its action plan for the maritime sector, where a key element is wider use of alternative fuels. The Norwegian Government's ambition for its domestic shipping and fishing vessels is to reduce emissions by 50% by 2030 and promote the development of zero- and low-emission solutions for all vessel categories. Norway's action plan for green shipping describes the status of the fleet and how Norway will work to speed up the pace of this transition.¹¹

6.1.2. Existing regulatory instruments

Several measures are affecting greenhouse gas emissions from the transport sector. The tax policy is central, and the most important measure is the CO2 tax, which is a cross-sectoral measure. In addition,

⁹ <https://www.regjeringen.no/en/aktuelt/a-national-transport-plan-for-better-and-safer-daily-travel/id2548623/>

¹⁰

<https://www.regjeringen.no/contentassets/7d3c209f821248da8d4727713ab9619c/no/pdfs/stm201620170041000dddpdfs.pdf>

¹¹ <https://www.regjeringen.no/contentassets/2ccd2f4e14d44bc88c93ac4effe78b2f/the-governments-action-plan-for-green-shipping.pdf>

Norway provides incentives for zero emission vehicles, including purchase incentives such as a VAT exemption and user incentives such as exemptions or reductions from road tolls and car ferry charges.

In addition to introducing zero emission vehicles, Norway has implemented the European emission standards for on-road vehicles (Euro 6/VI standards). The standards are expected to reduce BC emissions from new diesel vehicles.

A regulatory framework for public procurement (both specific and general regulations) entered into force January 2018. Particular requirements for emission are set out for vehicles, as well as an obligation to adapt best practice on environment for over all public procurement policy.

6.1.3. Follow up of EGBCM recommendation (1.a-1.e)

See table A1 in Annex 3.

6.2 Oil and gas (2a-2d)

6.2.1. Specific national strategies

In an effort to develop national RD&D (Research, Design and Development) strategies for the petroleum and the energy sector, the Ministry of Petroleum and Energy launched the OG21 (Oil and Gas in the 21st century) strategy in 2001 and the Energi21 strategy in 2008. The OG21 is updated every 5 years and aims to provide a unifying national technology strategy for the oil and gas industry and to contribute to an efficient and environmentally friendly value creation from the Norwegian continental shelf (NCS).

6.2.2. Existing regulatory instruments

CO₂ tax and greenhouse gas emission trading

A CO₂ tax regime was introduced on the NCS in 1991. The tax regime includes combustion of natural gas, oil and diesel in petroleum operations and on releases of CO₂ and natural gas (i.e. venting). The CO₂ tax has resulted in improvements in technology and emission-reducing measures, e.g. flare gas recovery ("closed flare system") and replacement of gas turbines with electricity from the onshore power grid.

For 2020, the tax rate in the national budget is NOK 1.15 per standard cubic metre of gas or per litre of oil or condensate. For combustion of natural gas, this is equivalent to NOK 491 per tonne of CO₂. For emissions of natural gas (from which the majority is methane), the tax rate is NOK 7.93 per standard cubic metre. This put the CO₂ tax for emissions of natural gas (i.e. venting) at the same level as the CO₂ tax for emissions of CO₂ from combustion of natural gas on the NCS (per CO₂ equivalent). In addition, installations on the NCS are included in the EU ETS and are subject to the same rules for emissions trading as those within the EU. The EU ETS enters into a fourth period from 2021. The new rules for the fourth period imply a tightening of the emissions trading system. More than 90% of the CO₂-emissions from oil and gas production are covered by the EU ETS. The combination of the CO₂ tax and the emissions trading system means that in 2020 companies on the NCS will pay approximately NOK 700 per tonne for their CO₂ emissions.

Permits and other requirements

Requirements for impact assessments and approval of plans for new developments (PDOs/ PIOs) are cornerstones of the petroleum legislation. Facilities onshore and within the baseline are also subject to the provisions of the Planning and Building Act.

For new field developments or large-scale modifications of existing facilities, the operators must as part of the PDO include an overview of energy needs and assessments of the costs of using power from shore rather than gas turbines to supply electricity.

Flaring of natural gas is only permitted when necessary for safety reasons. Permits for flaring are issued by the Ministry of Petroleum and Energy.

A permit under the Pollution Control Act is required for emissions from petroleum operations. Specific emission limit values are set on a case to case basis in individual permits, based on best available techniques (BAT) as defined nationally or in the EU. This include emission limit values on methane (venting and diffuse emissions). Permits for emissions are issued by the Norwegian Environmental Agency.

BAT is defined in the EU Directive 2010/75/EU on industrial emissions, Article 1 and Annex I and III. For upstream oil and gas industry a BAT guidance document on upstream hydrocarbon exploration and production was issued by EU in April 2019. The Guidance Document is a non-binding tool designed to support the industry and the Regulatory Authorities.

6.2.3. Follow up of EGBCM recommendation (2a-2d)

See table A2 in Annex 3.

6.2.4 Story box

Reporting of methane

Methane emissions from the upstream oil and gas industry is either caused by dedicated natural gas vents, by fugitive emission leaking out from valves, fittings and instruments in the hydrocarbon containing process systems, or from accidental leakages.

The method used for quantifying fugitive emissions of methane from facilities on the Norwegian Continental Shelf (NCS) has recently been reviewed. Fugitive emissions of methane are calculated using a so-called "bottom-up" method.

From the mid-1990s methane and NMVOC emissions were reported annually based on a generic methodology based on a set of predefined emission sources and simple emission factors. Hence, the relevance and accuracy of the methodology, as well as the results, were increasingly brought into question.

To improve the understanding of fugitive emissions of methane and NMVOC, the Norwegian Environment Agency conducted a study in October 2014 to March 2016, in close collaboration with the industry and the Norwegian Petroleum Directorate and the Petroleum Safety Authority Norway in order to:

1. Identify sources of direct methane and NMVOC emissions
2. Suggest new methods for quantifying emissions
3. Assess best available techniques (BAT)
4. Assess methods and techniques for emission reductions

"All" potential sources were registered, regardless of the magnitude of their emissions. As a result, several "new" emission sources were identified. Of equal importance was the discovery that many of the "old" sources consist of several partly or fully independent sub-sources. The study identified the importance of splitting some sources into such sub-sources – partly because the waste gas was handled differently and partly because some of the sub-sources account for significant emission quantities.

Based on the outcome of the study, dedicated methodologies are recommended for the individual emission sources (and sub-sources).¹² The study identified a total of 48 potential sources. This is partly because the 13 former emission sources have been broken down into sub-sources and partly because new sources have been identified. The contribution from several of the "new" potential emission sources was found to be insignificant.

The oil and gas facilities on the NCS have been assessed individually to identify and map their respective sources of methane emissions. The operators are required to use the new quantification methodologies in their annual report to the Norwegian Environment Agency from the 2017 reporting year.¹³

The new quantification methodologies have resulted in lower annual emissions from the upstream oil and gas sector than those reported using "old" methodologies. Significant uncertainties are still associated with the new methodologies. Despite this, the reported annual emissions are more accurate and more consistent than those calculated using the "old" method.

6.3 Residential combustion (3a -3c)

6.3.1. Specific national strategies

Some cities like Oslo and Bergen have exchange programs and give subsidies to residents who exchange their old wood stoves. Burn right campaigns are being organised all over the country in cooperation with the fire brigade. ENOVA SF have programs for energy efficiency, including enhanced home heating efficiency.

6.3.2. Existing regulatory instruments

The building code is the main legal instrument for improving energy efficiency. Norway introduced energy requirements for buildings in 1949. They have been revised and made stricter several times, most recently in 2016. The new and stricter requirements (passive house level) entered into force on 1 January 2016. The 2016 requirements were tightened such that dwellings became 26% more energy efficient and office buildings 38% more energy efficient compared to previous requirements. Energy performance certificates are mandatory for buildings that are to be sold or rented out. Among other things, the new energy requirements specify that installation of fossil fuel heating installations are not permitted. For specifications on the building code energy requirements see [Norway's Seventh National Communication under the UNFCCC \(2018\)](#).

¹² <https://www.miljodirektoratet.no/globalassets/publikasjoner/m515/m515.pdf>

¹³ <https://www.norskoljeoggass.no/contentassets/cd872e74e25a4aadac1a6e820e7f5f95/vedlegg-b---handbook-voc-emissions--english-version---guidelines-044---ver-17.pdf>

In June 2018 the Norwegian Government introduced a prohibition on the use of mineral oil for permanent heating of buildings from 2020 (from the 1st of January). Schemes to support households to phase out the use of mineral oil for heating of buildings have been in place for several years; the use of mineral oils for heating of buildings has been regulated through different measures such as CO₂-tax, mineral oil tax, standards in the building code and support schemes from Enova and municipalities.

Since 1998, enclosed wood heaters must be approved for sale and use in Norway according to Norwegian standard NS 3058. The stove and fireplaces have to meet the emissions requirements described in NS 3059 (10 g PM/kg dry wood). The Nordic Swan Ecolabel requires additional testing according to the Norwegian standard NS 3058/59, but with a stricter emission limit of 4 g/kg.

Eco design regulation (COMMISSION REGULATION (EU) 2015/1185) entered into force 1. January 2018 with new emission limits applicable from 2022 (5 g PM/kg dry wood). A side effect of the legislation targeting PM is reduced BC emissions.

Emissions of NO_x, OC and SO₂ lead to a cooling of the atmosphere, and cause warming when they are reduced. This is particularly important to take into account for emissions that contain a high proportion of cooling components, such as organic carbon from burning wood. The share of OC in a tonne of particles from road transport emissions for example is much lower than from wood burning, so that the combined climate benefit of reducing a tonne of BC emissions from road transportation is larger than for a tonne of BC emissions from burning wood and other biomass. The implication is that measures aimed at emission sources that also emit large quantities of cooling components are not necessarily good climate measures under all circumstances.

An analysis on measures to abate emissions from wood burning was published (in Norwegian) in 2017.¹⁴ The study identified six measures, some of which has been partly implemented/implemented in some counties: 1. Forced replacement from old (before 1998) to newer woodstoves. 2. Forced replacement from old (before 1998) to newer and best woodstoves and pellet stoves. 3. Better burning techniques for newer woodstoves. 4. Inspection and maintenance of newer woodstoves. 5. Electrostatic particle precipitators on newer woodstoves. 6. Better regulation of the air inlet by installation of a flu gas fan for newer woodstoves.

6.3.3. Follow up of EGBCM recommendation (3.a-3.c)

See table A3 in Annex 3.

6.4 Solid waste (4a-4c)

6.4.1. Specific national strategies

The main goal of the Norwegian waste policy is that waste is to cause the least possible harm to humans and the environment. Further, the growth in the quantity of waste generated is to be considerably lower than the rate of economic growth, and the resources found in waste are to be reutilised by means of waste recovery. Furthermore, the amount of hazardous waste is to be reduced and hazardous waste is to be dealt with in an appropriate way.

¹⁴ <http://www.miljodirektoratet.no/no/Publikasjoner/2017/Februar-2017/Tiltaksutredning-vedroende-utslipp-av-klimadrivere-fra-vedfyring/>

The waste strategy, *From waste to resource* (2013), and the white paper on waste in a circular economy, Meld. St. 45 (2016-2017), are the most relevant national strategic papers on waste policy. Besides these, the Norwegian waste management regulations follow from EU-regulations.

Food waste reduction is relevant for this report as it leads to reduced demand of, and therefore reduced methane emissions from, agricultural production. Furthermore, reducing food waste also reduces demand for food transportation and black carbon emissions associated with such activities. In June 2017 an agreement with the national authorities and food industry to reduce food waste, was signed. The goal is to halve the food waste within 2030 in line with the Sustainable Development Goals (SDG). The progress by 2020 will be presented in a report. The ongoing mapping of food waste across the food value chain is also important for this work.

6.4.2. Existing regulatory instruments

The measures to reduce greenhouse gas emissions from solid waste are to a large extent concurrent with measures to increase recycling and recovery. In the context of this report, the most relevant measures are:

- Regulations under the Pollution Control Act, including prohibition against depositing biodegradable waste and requirements regarding extraction of landfill gas (see below);
- Extended producer responsibility for specific waste fractions like packaging, electronics, vehicles etc. contributes to preparation for reuse and recycling, and reduced incineration (see below).

Prohibition of depositing wet organic waste

From 2002 landfilling of wet-organic waste was prohibited. This prohibition was replaced by the wider prohibition of depositing from 2009 that applies to all biodegradable waste. CH₄ production from landfills continues for several decades after the waste is deposited. Therefore, emissions will continue for many years, but the prohibition of depositing waste has reduced CH₄ emissions over time, and will continue to, as the amount of biodegradable waste is reduced.

Requirement to collect landfill gas

The Landfill Directive was incorporated into national law by the Norwegian Landfill Regulations of 21 March 2002, and states that all landfills with biodegradable waste must have a system for extracting landfill gas. The gas emissions are monitored by measuring boxes placed on the landfill surface. Also, visual inspection of the landfill surface for obvious leaks should be conducted regularly.

Extended producer responsibility

The systems of extended producer responsibility were in many cases based on voluntary agreements between the Government and relevant industries combined in some cases with requirements in the Waste Regulation and to some degree on tax incentives. Today the extended producer responsibility schemes are mainly regulated in the Waste Regulation. Agreements are made primarily to ensure that waste is collected and sent to approved treatment, and partly to fulfil national or EEA-wide targets for recycling. Regulations exist for packaging, electronic waste, end-of-life vehicles, batteries, tires and insulation window frames containing PCB.

Return scheme for beverage packaging

The return scheme for beverage packing combines the concept of a take-back system and a tax on beverage packaging. The producer/manufacturer or importer of beverage may choose a system that is suitable for them. They can reduce the tax by establishing a take-back system or by joining an existing

take-back system. The tax is reduced by the accepted recycling rate; each percentage of recycling reducing the tax one per cent.

6.4.3. Follow up of EGBCM recommendation (4.a-4.c)

See development of methane emissions in the waste sector in chapter 3 and Table A4 in Annex 3.

6.5 Agriculture and animal husbandry (5a-5c)

6.5.1. Specific national strategies

The Norwegian Ministry of Agriculture and Food presented a white paper on agricultural policies in December 2016; Change and development - A future oriented agricultural production (Meld. St. 11 (2016–2017)). Climate change and agriculture was thoroughly discussed in the paper.

In their adoption of the white paper, the Norwegian Parliament stated that the most important role for agriculture in the context of climate change is to reduce emissions per unit produced, increase the uptake of CO₂ and adapt the production to a changing climate.

Key emission sources from Norwegian agriculture include methane from livestock and manure, nitrous oxide from manure and fertilized soils, and losses of carbon- and nitrogen-compounds from soils, particularly organic soils. Such emissions may vary in relation to natural conditions such as precipitation patterns, temperature or soil properties. While abatement of such emissions is considered important, it is difficult to decouple the volumes of emissions from the volumes of production.

Emissions from livestock have been slightly reduced over the last decades, due to successes with animal breeding, welfare and feeding which have enabled increases in overall production i.e. output per animal has been increased. Budgetary allocations for different R&D programs to increase the productivity in plant production and improve the performances of animal husbandry, will contribute to further reduction in emissions per unit of product. There is ongoing investigation into livestock feeding strategies that may decouple production from emissions while allowing for continued or increased use of domestic feed resources. A specific budgetary allocation is made to a project run by the Norwegian cattle breeding organization (Geno) to research the potential for reducing methane emissions from milk cows by selective breeding. There are also allocations to the provision of advisory services to farmers and for developing tools for decision support on farm level which aims to more climate smart farming practices.

In June 2019 the Government signed an agreement with the national farmer's organisations which intends to reduce emissions and increase CO₂-uptake from agriculture. The goal is to reduce emissions by five million tons of CO₂ within 2030. The most relevant measures include improvements in livestock productions, handling of manure and mineral fertilizer, energy use and biogas production. Another part of the agreement includes shifts in food consumption that may lead to a corresponding shift in production and emission volumes from agriculture, i.e. reduction of food-waste and dietary choices. Improved consumption patterns and preservation of carbon sinks are also focal areas for Nordic co-operation under the Nordic Council of Ministers.

6.5.2. Existing regulatory instruments

Current policies and practices to control GHG emissions in Norwegian agriculture include a combination of regulatory, economic and inforatory measures. CO₂ from the use of fossil fuel in activities related to agriculture meets CO₂-taxation similar to other sectors, and the general prohibition on fossil fuels for heating buildings is imposed for agriculture from 2025. Emissions related to transport and energy are accounted for in other sectors. Direct emissions from agriculture are covered neither by the emissions trading system, nor subject to GHG taxation, rather they are covered by other measures as specified below. Policies and measures for controlling GHG fluxes in Norwegian agriculture and food systems are developed in close cooperation with stakeholders.

The *regulation concerning fertilizer etc. of organic origin* restricts where, when and how much manure and other organic fertilizer can be applied, in order to reduce emissions from manure. The regulation requires, *inter alia*, that farmers must have at least 8 months storage capacity, to enable appropriate temporal distribution of manure. The regulation is under revision and is due to be opened to public consultation on several factors including changes to better meet emissions targets for water and air.

Keeping livestock on pasture may help abate emissions from manure management compared to keeping animals in confinement. Naturally, most livestock in Norway must be kept indoors for part of the year during winter months. There are however requirements that cattle, sheep and goats should be free-range for minimum periods in summer, and additional support is paid for those who are kept outdoors for longer. Such practices reduce emissions from storage of manure.

Agricultural policies also include various agri-environmental support schemes. Few measures are directed primarily to abate GHG emissions, but several of the supported measures may have co-benefits for GHG emissions along with other emissions to air and water. Examples include support for environmentally friendly spreading of manure which was established in 2008 and was scaled up to a country-wide scheme from 2018.

A support scheme which encourages the delivery of manure to biogas plants was established in 2015. There is also investment support for construction of biogas plants. A recent report from a working group lead by the Norwegian Agricultural Agency considered different policy measures on how to increase the amounts of manure treated in biogas plants.

In order to preserve carbon sinks as recommended in 5a, the Norwegian Government will adopt an amendment which prevents cultivation of bog areas for agricultural purposes.

6.5.3. Follow up of EGBCM recommendation (5.a-5.c)

See Table A5 in Annex 3.

6.5.5 Story box

"Matfloken" – Detangling debates about sustainable food

From August 2019 to March 2020 the Norwegian Environment Agency and the Norwegian Agriculture Agency have participated together in "Matfloken" (translated: the food knot), which is an initiative led by Æra Strategic Innovation. The underlying idea is that societal challenges, like knots, cannot be solved

by single actors pulling in one direction by themselves. Societal challenges need to be worked on holistically and collaboratively.

Over the course of nine meetings, key actors from across the food chain have met to share insights and find solutions on how to provide a more sustainable food system in the future. Sustainability in this context relates to food being healthy, environmentally friendly, having a low carbon footprint and ensuring food security. Food also has to be tasty and keeping all these factors in mind this exercise has led to improved understanding between those involved and has resulted in a range of innovative concepts that will launch in Spring 2020. These concepts cover both new services and products, such as institutionalising a cross-sectoral forum for sustainable food and products that utilise food waste.

This new way of working – employing strategic innovation methods, business development and design thinking – has been a new and fruitful experience for the two participating governmental agencies, and supports Recommendation 5a (Promote food consumption patterns that utilise Arctic food chains sustainably and efficiently, support the preservation of carbon sinks, and minimise life-cycle emissions of methane.)

6.6 Management of wildfires (6a-6d)

Local authorities have the responsibility to manage wildfire response and prevention in Norway. In the case of high-intensity wildfires, additional resources such as helicopters are provided by national authorities together with incident commander support for the local fire officer. Amongst the main responsibilities of The Norwegian Directorate for Civil Protection (DSB) are emergency planning and fire safety, with important cooperation with other actors such as the Norwegian Civil Defence, the Emergency Planning College (NUSB), the Norwegian Fire Academy (Norges brannskole) and the Civil Defence Academy.¹⁵

See Table A6 in Annex 3 for the follow up of the EGBCM recommendations 6a-6d.

¹⁵ <https://www.dsb.no/menyartikler/om-dsb/about-dsb/>

7 Annexes

Annex 1: Black carbon emission table (kt)

GNFR	2013	2014	2015	2016	2017	2018	2025	2030
A_PublicPower	0,0816	0,0910	0,1179	0,1302	0,1353	0,1365	0,1158	0,1133
B_Industry	0,4464	0,4469	0,4056	0,3658	0,3324	0,3758	0,4279	0,4073
C_OtherStationaryComb	0,9838	0,8668	0,8926	0,8706	0,8852	0,8850	0,8086	0,8016
D_Fugitive	0,3892	0,3852	0,3066	0,3288	0,2704	0,2297	0,3484	0,3224
E_Solvents	0,0024	0,0027	0,0025	0,0025	0,0027	0,0026	0,0031	0,0030
F_RoadTransport	0,6993	0,6276	0,5639	0,5155	0,4666	0,4155	0,2106	0,1364
G_Shipping	0,8149	0,7423	0,5922	0,5507	0,5224	0,5402	0,3174	0,3052
H_Aviation	0,0089	0,0096	0,0093	0,0088	0,0089	0,0089	0,0061	0,0062
I_Offroad	0,4342	0,3900	0,3777	0,3712	0,3435	0,3390	0,4104	0,4049
J_Waste	0,0154	0,0132	0,0096	0,0198	0,0208	0,0227	0,0159	0,0165
L_AgriOther	0,0235	0,0301	0,0332	0,0324	0,0319	0,0162	0,0337	0,0318
Grand Total	3,8997	3,6052	3,3110	3,1965	3,0201	2,9720	2,6978	2,5487

Time series covering the years 1990-2018 are available here: https://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/2020_submissions/#N

Annex 2: Methane emission table (kt)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2025	2030
Energy	54,69	51,92	52,23	49,94	48,93	49,41	45,59	44,04	43,66	43,84	39,57
Industrial Processes	1,01	1,03	0,94	0,90	0,89	0,92	0,87	0,89	0,92	5,47	5,12
Agriculture	103,98	101,32	101,70	102,70	103,09	104,06	105,98	107,02	105,46	104,56	105,40
LULUCF	6,07	6,06	6,05	6,05	6,07	6,05	6,05	6,06	6,12	NE	NE
Waste	55,91	55,20	53,60	52,34	50,60	47,82	45,54	42,73	42,14	30,38	25,09
Other	-	-	-	-	-	-	-	-	-	-	-
Total	221,66	215,54	214,53	211,91	209,58	208,26	204,03	200,75	198,30	NE	NE
Total (without LULUCF)	215,59	209,48	208,49	205,87	203,51	202,21	197,98	194,69	192,18	184,24	175,18

Time series covering the years 1990-2018 are available here: <http://cdr.eionet.europa.eu/no/un/UNFCCC/envxmik2a>

Annex 3: Status and actions related to the recommendations enlisted in the [2019 Summary Report](#)

Mobile and stationary diesel-powered sources

Table A1: Table A1: Status of recommended actions 2019 related to the reduction of emissions from diesel engines.

Recommendation 1a: Reduce emissions from new diesel vehicles and engines by adopting and implementing world-class particulate matter exhaust emission standards and ensuring widespread availability of ultra-low sulphur fuels.	Adopted and implemented relevant Directives of the European Parliament and of the Council; Directive 2004/107/EC and 2008/50/EC on ambient air quality and cleaner air for Europe as the most significant. In addition, set out more ambitious national goals for NO ₂ , PM ₁₀ , SO ₂ and benzene.
---	---

	Rapid transition to electric mobility through incentives such as tax breaks and reduced toll fares.
Recommendation 1b: Reduce emissions from legacy diesel vehicles and engines by adopting targeted policies and programs.	From 2018 cash payment was introduced for scrapping motorcycles, mopeds, campers and caravans. Scrapyards get operational support for receiving these vehicles. Cash payment for scrapping passenger cars has been in place since 1978.
Recommendation 1c: Reduce black carbon by stimulating the shift to alternative vehicle technologies and modes of transportation, and through efficiency measures.	Proactive policies promoting electric mobility. Mainly electric vehicles, as well as initiatives in the maritime sector. The sale of electric vehicles has increased considerably over the last six years, emissions have decreased and air quality improved. A regulatory framework for public procurement entered into force January 2018. Requirements for emission are set out for vehicles, as well an obligation to adapt best practice on environment for over all public procurement policy. An increasing number of local and national authorities and agencies require, through public procurement, that mobile and stationary engines at construction sites do not use fossil fuels. The Norwegian Environment Agency manages a support scheme called <i>Klimasats</i> , supporting local initiatives on climate change mitigation, such as fossil free construction sites and more environmentally friendly ferries. ENOVA and Innovation Norway also offer economic support.
Recommendation 1d: Develop, as appropriate, and report on measures and best practices to reduce particulate matter and black carbon emissions from shipping.	The Norwegian government launched its action plan for green shipping in 2019, where a key element is wider use of alternative fuels.
Recommendation 1e: Reduce emissions from stationary diesel engines by adopting targeted policies and programs, including shift to new technologies and improved efficiency.	No policies or single programs targeted at this specifically, but ENOVA makes financial contributions so that individuals and businesses can start using the newest and most climate friendly technologies. See also 1c.

Oil and gas

Table A2: Status of the recommended actions 2019 to reduce emissions from on oil and gas production

Recommendation 2a: Adopt and implement oil and gas methane emission reduction strategies.	Emissions to air from the Norwegian offshore and onshore oil and gas sector are regulated through several acts; the Pollution Control Act and The Greenhouse Gas Emission Trading Act, the CO ₂ Tax Act (offshore) and the Sales Tax Act.
--	--

	<p>Pursuant to the Pollution Control Act, a number of special regulations have been issued. Specific emission limit values are set on a case to case basis in individual permits, based on best available techniques (BAT) as defined nationally or in the EU. In addition, local factors are considered when the emission limits are set (Ambient air quality guidelines).</p>
<p>Recommendation 2b: Encourage the adoption of best practices in reducing routine flaring and in improving gas capture.</p>	<p>Flaring of natural gas is only permitted when necessary for safety reasons. The CO₂ tax and the EU ETS has resulted in improvements in technology and emission-reducing measures, e.g. flare gas recovery ("closed flare system"). Implementation of flare gas recovery system is BAT for new field development projects. For large-scale modification projects on existing installation flare gas recovery is evaluated as part of the PDO, e.g. safety issues and cost.</p>
<p>Recommendation 2c: Urge firms to engage in international and domestic voluntary methane and black carbon emission reduction activities, including the implementation of methane management strategies.</p>	<p>Firms/oil companies operating on the Norwegian Continental Shelf are encouraged to engage in fora and programs. Examples of such important programs and forums are the Climate and Clean Air Coalition, the Global Methane Initiative, Global Gas Flaring Reduction Partnership (GGFR) and the Oil and Gas Climate Initiative (OGCI).</p>
<p>Recommendation 2d: Promote targeted and cost-effective measures at large methane emission sources, where relevant.</p>	<p>Recovery of waste gases is a well-proven technique. Many of the predominant emission sources can theoretically be recycled. Where new installations are concerned, waste gas recovery is BAT for emission sources/processes where recovery is feasible. In the case of existing installations, recycling waste gas currently being emitted to the air will require technical modifications. The associated costs may vary considerably from facility to facility. If the volumes of natural gas, which can be recycled, are small, the resulting income will be small, and the abatement cost high. Technical or cost-related restrictions on existing facilities without recovery may have made such action unfavourable.</p> <p>All the facilities on the NCS and onshore refineries and gas terminals are scanned with IR-cameras on an annual or semi-annual basis to detect leakage.</p>

Residential combustion

Table A3: Status of the recommended actions 2019 to reduce emissions from residential combustion

<p>Recommendation 3a: Reduce emissions from new solid fuel combustion appliances by accelerating deployment of cleaner and more efficient heating sources and by promoting proper operation and maintenance of appliances, including storage and treatment of fuels.</p>	<p>Enclosed wood heaters must be approved for sale and use according to Norwegian standard NS 3058. Stove and fireplaces must meet the emissions requirements described in NS 3059 (10 g PM/kg dry wood). The Nordic Swan Ecolabel requires additional testing with a stricter emission limit of 4 g/kg. Burn right campaigns are being organised all over the country in cooperation with the fire brigade.</p>
<p>Recommendation 3b: Reduce emissions from legacy solid fuel combustion appliances by accelerating replacement with cleaner and more efficient new heating sources and promoting proper operation and maintenance of appliances, including storage and treatment of fuels.</p>	<p>Some cities like Oslo and Bergen already have exchange programs and give subsidies to residents who exchange their old wood stoves. Burn right campaigns are being organised all over the country in cooperation with the fire brigade. A measure that combined accelerated exchange of wood stoves to the best wood stoves on the market and exchange of old wood stoves to electric heating was included in the report Klimakur 2030. With the current design of this measure it is estimated to reduce emission by 0,51 million CO₂ equivalents.</p>
<p>Recommendation 3c: Reduce emissions by promoting enhanced energy efficiency in residential dwellings reducing the need for heating, especially in buildings heated with oil or solid fuels.</p>	<p>In June 2018 the Norwegian Government prohibited the use of mineral oil for heating of buildings from January 2020. The prohibition covers the use of mineral oil for both main heating or additional heating in residential buildings, public buildings and commercial buildings. Schemes to support households to phase out the use of mineral oil for heating of buildings were in place for several years before the prohibition entered into force. Emissions from the consumption of fossil oils in the heating of households and businesses have declined by almost 60% since 1990. The prohibition on the use of mineral oil for heating of buildings means that residential, public and commercial buildings already in 2020 will have phased out emissions from such use, although there will still be some emissions from the use of gas and from wood burning. The prohibition will also accelerate the decline in the use of oil for heating in service industries.</p> <p>ENOVA makes financial contributions in order for individuals and businesses to start using the newest and most climate friendly technologies. They have programs for energy efficiency, including enhanced home heating efficiency.</p>

Solid waste

Table A4: Status of the recommended actions 2019 to reduce emissions from solid waste

<p>Recommendation 4a: Avoid methane emissions by preventing food waste and the landfilling of organic waste. Improve resource efficiencies as appropriate for Arctic conditions, including new ways of reusing organic material based on more efficient sorting of waste, composting and biogas production.</p>	<p>Landfilling of wet-organic waste was prohibited from 2002. This prohibition was replaced by the wider prohibition of depositing from 2009 that applies to all biodegradable waste.</p> <p>Agreement between national authorities and food industry to reduce food waste in line with the SDG target of 50% by 2030.</p>
<p>Recommendation 4b: Adopt regulations or incentives for landfill gas capture and control.</p>	<p>The Landfill Directive was incorporated into national law by the Norwegian Landfill Regulations of 21 March 2002, and states that all landfills with biodegradable waste must have a system for extracting landfill gas.</p>
<p>Recommendation 4c: Promote best practices for waste management in northern and remote communities.</p>	<p>NA</p>

Agriculture and animal husbandry

Table A5: Status of the recommended actions 2019 to reduce emissions from agriculture and animal husbandry

<p>Recommendation 5a: Promote food consumption patterns that utilise Arctic food chains sustainably and efficiently, support the preservation of carbon sinks, and minimise lifecycle emissions of methane.</p>	<p>Agreement between national authorities and food industry to reduce food waste in line with the SDG target of 50% by 2030.</p> <p>Agreement with the farmer's organizations to reduce emissions and increase CO₂-uptake from agriculture. The goal is to reduce emissions by five million tons of CO₂ within 2030. The most relevant measures include improvements in livestock productions, handling of manure and artificial fertilizer, energy use and biogas production. Another part of the agreement includes promotion of more advantageous consumption patterns. Improved consumption patterns and preservation of carbon sinks are also focal areas for Nordic co-operation under the Nordic Council of Ministers.</p> <p><i>The regulation concerning fertilizer etc. of organic origin restricts where, when and how much manure and other organic fertilizer can be applied, in order to reduce emissions from manure. This is under revision.</i></p>
--	--

	<p>A regulation demands farmers to ensure appropriate storage, handling and spreading of manure in order to reduce emissions from manure. In 2018 the agri-environmental payment scheme for environmentally friendly spreading of manure was upscaled to a country-wide scheme. Last year there was approximately a 30% increase in area adopting such low emission techniques.</p> <p>Requirements and support to keep livestock on pasture also abates emissions from manure management compared to keeping them in confinement where manure must be stored and spread on appropriate agricultural areas. The proportion of cattle on summer pasture has increased by approximately 10% since 2006.</p> <p>The proportion of manure treated in biogas plants has increased somewhat since a support scheme which encourages delivery of manure from farms to biogas plants was established in 2015, but there might be a need for stronger incentives. There is also investment support for biogas plants.</p> <p>The municipalities may also receive economic support through <i>Klimasats</i>, managed by the Norwegian Environment Agency, for local biogas projects and demand-side initiatives, such as promoting more climate friendly menus in their institutions.</p> <p>A recent working group report considered different policy schemes on how to increase the amounts of manure treated in biogas plants.</p>
<p>Recommendation 5b: Promote work on possibilities to reduce emissions of enteric methane under Arctic conditions, in co-operation with relevant organizations.</p>	<p>There is ongoing research into livestock feeding strategies that may decouple production from emissions while allowing for continued or increased use of domestic feed resources. Funding is provided for an R&D project run by the Norwegian cattle breeding organization (Geno) to investigate the potential for reducing methane emissions from milking cows by selective breeding. This is a long-term project and results are expected a few years from now.</p>
<p>Recommendation 5c: Develop agricultural policies and practices to reduce open burning of agricultural waste. Encourage studies and</p>	<p>The Pollution Act gives authority to the municipalities to prohibit to limit crop residue burning on the fields. This practice takes place to a</p>

piloting of innovative solutions that reduce the need for open burning.	small extent (almost negligible) and has a downward trend since 1990.
---	---

Management of wildfires

Table A6: Status of the recommended actions 2019 to reduce emissions from management of wildfires

Recommendation 6a: Build and maintain international mutual aid and resource exchange arrangements amongst Arctic nations that have specialised experience in wildfire management, suppression, and monitoring.	The Norwegian Directorate for Civil Protection (DSB) is the national contact towards the European Union Civil Protection Mechanism, under which the Arctic countries can ask for bilateral aid, e.g. as Sweden did to fight the great forest fires of 2014 and 2018.
Recommendation 6b: Develop region-specific public education campaigns on wildfire prevention and safety.	During the hot summer in 2018 DSB made an ambitious media strategy with educational campaigns to increase awareness on how to help prevent forest fires, such as promoting a prohibition on barbecues (that several municipalities enforced). According to a questionnaire by DSB 72% of the population took preventive measures as a consequence of the high fire risk that summer.
Recommendation 6c: Develop and implement regionally appropriate forest management practices that reduce the risk of severe wildfires.	Following the hot and dry summer of 2018, with its high number of forest fire incidents, DSB issued an evaluation report (Norwegian) ¹⁶ with lessons learned and recommendations for the future.
Recommendation 6d: Use the best available science to develop prediction models that can be used to examine fire risks at daily to decadal scales, to support drafting of prevention and emergency response plans.	The Norwegian Meteorological Institute has developed a wildfire hazard index for 100 locations in Norway. Monitoring is also done using aircraft, drones and satellites to detect wildfires at an early stage.

¹⁶ https://www.dsb.no/globalassets/dokumenter/rapporter/skogbrannsesongen_2018.pdf