NATIONAL REPORT BY ITALY

Enhanced Black Carbon and Methane

Emissions Reductions

Arctic Council Framework for Action

Report to the Arctic Council by Italy
on emissions reduction of
black carbon and methane

1   Introduction

Italy, as an Observer State, welcomes and supports the Arctic Councils' initiatives, in particular those on black carbon and methane emission reduction. In fact, the reduction of black carbon and methane emissions on a global scale is of critical importance to tackle climate change in a fragile region like the Arctic.

The Italian National Energy and Climate Plan (NECP 2030), released in December 2019, identifies two national priorities: the transition towards a decarbonized economy and the New Green Deal, which foresees the environment as a promoter of the economic and social development. These goals will eventually lead to the reduction of climate-relevant emissions, including those of black carbon and methane. Specifically, the objectives of the coordinated national environmental, climate, and energy policies are to reduce green house gases (GHG) emissions by 33% in 2030 compared to 2005, and to reduce $PM_{2.5}$ emissions (linked to black carbon emissions) by 40% over the same time frame. The GHG reduction targets are defined by the Climate Energy package, in the frame set by the United Nation Framework Convention on Climate Change (UNFCCC), the Kyoto protocol, the Doha protocol, and the Paris Agreement. The reduction of air pollutant emissions was first promoted by the Convention on Long Range Transboundary Air Pollution (CLRTAP) in 1979 in the framework of the United Nation Economic Commission for Europe (UNECE). The actual reduction targets are defined in line with the European Union Air Quality Package (2013), and described by Directive 2016/2284/EU.

Black carbon emission estimates are reported by the national emission inventory, submitted annually under the UNECE-LRTAP convention, while methane emissions are reported by the GHG national emission inventory, submitted annually under the UNFCCC. The Institute of Environmental Protection and Research (ISPRA) compiles both national and GHG emission inventory. Emission data and emission projections used for the preparation of this report are consistent with those submitted to the UNECE-LRTAP and the UNFCCC.

2 Black carbon (BC) emissions and future projections

2.1 Historical BC emissions and projections.

BC emissions here reported have been submitted to the CLRTAP on March 21, 2020, and are calculated as a fraction of $PM_{2.5}$ emissions. Submitted time series can be found at:

https://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/2020_submissions/

National BC emissions decreased by about 60% from 1990 to 2018, going from 47 kt (in 1990) to 19 kt (in 2018). Figure 1 illustrates emission trends grouped according to GNFR (Gridding Nomenclature for Reporting) sectors over the period 1990-2018. In 2018 the main sectors contributing to BC emissions were stationary combustion (C) and road transport (F), accounting for 44% and 29% of the total, respectively. The large share of stationary combustion was mainly due to residential combustion emissions (8 kt in 2018). Off-road (I) and waste (J) sectors accounted both for 9% of total BC emissions.

Over the period 1990-2018, road transport emissions decreased by 76%, mainly due to the implementation of European directives controlling and limiting exhaust emissions. Similarly, off-road emissions dropped by 86%. Partially counteracting the effect of reduction in the transport sectors, stationary combustion and waste emissions were characterized by increasing trends (57% and 20%, respectively). Within the stationary combustion sector, the increment of residential combustion emissions was equal to 58%, with a sharp increase in 2005-2008.

Although BC emission projections are not available, Figure 2 reports the emission projections for $PM_{2.5}$ (data submitted on March 14, 2019). Baseline scenario is defined using the model GAINS-Italy. The energy scenario, required by GAINS as input, is produced using TIMES, while input energy data are consistent with the National energy strategy adopted in 2017. Further details on "with measure" (WM) scenario assumptions and projection calculations can be found at:

https://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/2019_submissions/

In Figure 2 emissions are grouped based on NFR (Nomenclature for Reporting) sectors. The civil sector accounts for about 60% of $PM_{2.5}$ emissions in both 2013 and 2025. According to the present emission projections, $PM_{2.5}$ reduction target should be met in 2020 already in the WM scenario, while additional measures need to be adopted to attain the 2030 emission reduction target. In future updates, a new "with additional measure" (WAM) scenario, coming from measures and policies of the NECP 2030, will be analysed.
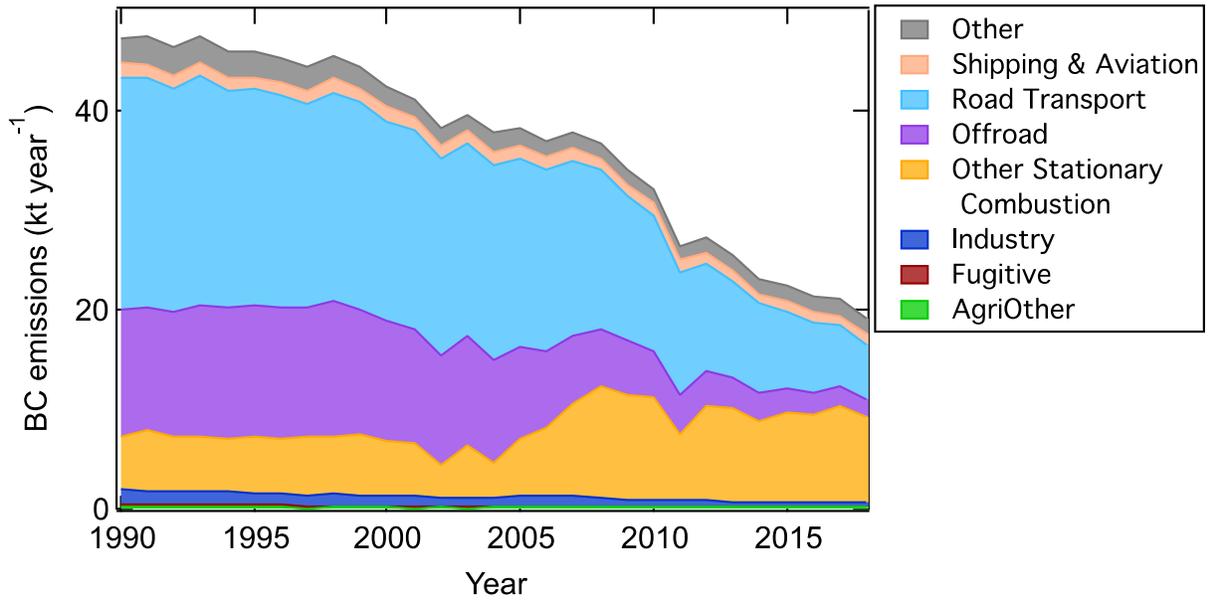
2.2 Informative graphs.

Figure 1. Historical emissions in 1990-2018 of BC in Italy, split by aggregated GNFR sectors, as described in Annex 1.
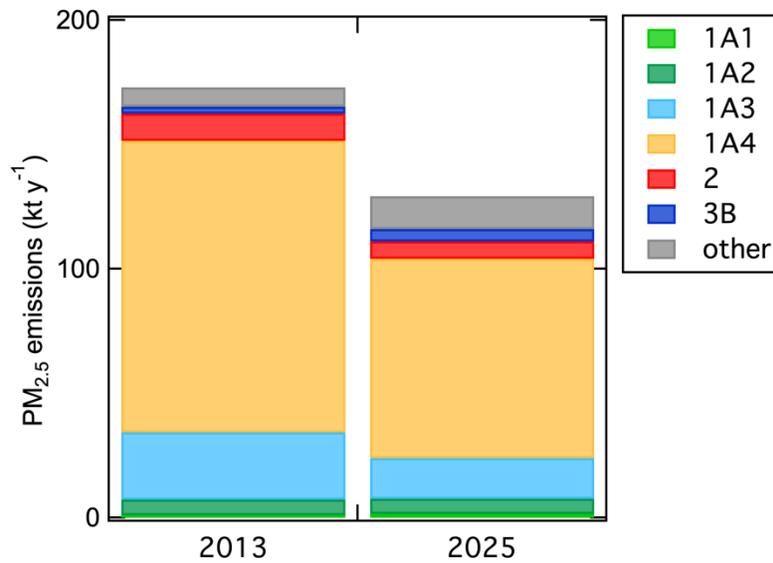

Figure 2. Comparison of 2013 $PM_{2.5}$ emissions (CLRTAP emission inventory) and 2025 emission projections based on "With Measures" (WM) scenario. Emissions are grouped based on NFR sectors.

3 Methane emissions and future projections

3.1 Historical methane emissions and projections.

Methane emissions here reported have been submitted to the UNFCCC in March 2020. Methodologies, parameters and used emission factors are presented in the last National Inventory Report (NIR) available here:

https://unfccc.int/ghg-inventories-annex-i-parties/2020

National total methane emissions decreased by about 13% from 1990 to 2018, going from 1977 kt (in 1990) to 1728 kt (in 2018). Figure 3 illustrates methane emission trends over the period 1990-2018. In 2018 the main sectors contributing to methane emissions were agriculture and waste, which accounted for 45% and 38% of total emissions, respectively. The large share of agriculture emissions was mainly due to enteric fermentation (74% of sector emissions) and manure management (18% of sector emissions), while waste emissions were dominated by solid waste disposal (84% of sector emissions). Energy was the third sector for relevance, accounting for 17% of the total.

The most significant emission reductions over the period 1990-2018 were observed for LULUCF and industrial processes, with a decrease of 86% and 66%, respectively. Decrease of agriculture emissions, equal to 10%, were mainly due to reduction in livestock and recovery of methane for biogas production. Energy emissions change (-34%) resulted from the reduction of energy industry, transport, and fugitive emissions (46%, 78%, and 49%, respectively) and the increase of "other" sectors emissions (104%). Conversely, waste emissions increased by about 5%, mainly due to the increment of solid waste disposal emissions (12%).

The latest GHG emission projections are presented by the Biennial Report, submitted in December 2019 to the UNFCCC. The projections use the assumptions employed by the European Commission for PRIMES 2016 Reference scenario. The base year for the projection is 2016 and the WM scenario considers policies and measures implemented before December 31, 2016. Further details on WM scenario assumptions and projection calculations can be found at:

https://unfccc.int/documents/208353
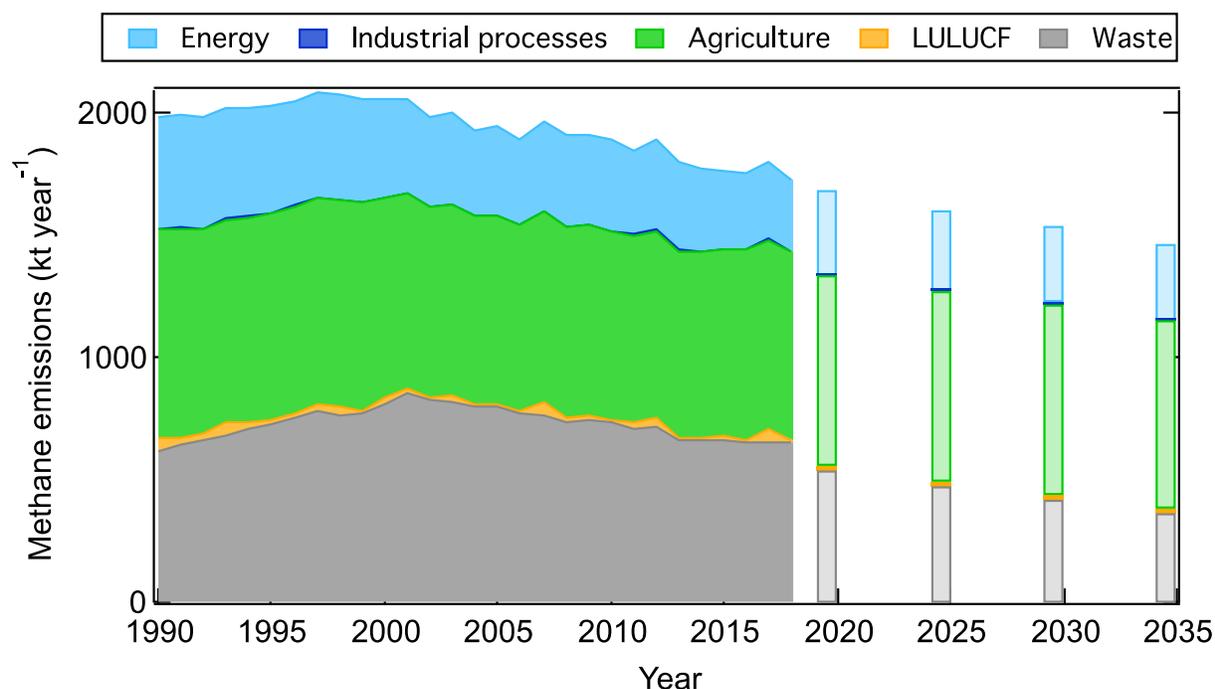
3.2 Informative graphs

Figure 3. Historical emissions of methane from 1990 to 2018 (solid colors) and emission projections in 2020, 2025, 2030, 2035 (light color bars) based on WM scenario.

4 National strategies and action plans

4.1 Short overview on governance structure

The national strategy to control and reduce air pollution is described by the National Plan for Atmospheric Air Pollution Control [1]. Although the plan does not target directly black carbon, it addresses particulate matter emissions (PM$_{2.5}$), which are linked to black carbon. Indeed, national inventory estimates black carbon as a fraction of PM$_{2.5}$ emissions. In agreement with Legislative Decree 81/2018 [2], which transposes Directive 2016/2284/EU, the Ministry of the Environment, Land and Sea develops the National Plan for Atmospheric Air Pollution Control with the technical support of the Institute for Environmental Protection and Research (ISPRA) and the National Agency for New Technologies, Energy, and Sustainable Economic Development (ENEA). The plan implementation is in charge of a coordinating committee, composed by representatives of the Prime Minister, the Ministry of the Environment, Land and Sea, the Ministry of Economic Development, the Ministry of Infrastructures and Transport, the Ministry of Agricultural, Food and Forestry Policies, the Ministry of Health, regional and local authorities, and a representative of the National Service for Environmental Protection (SNPA). National, regional, and local administrations will be in charge of measure implementation, based on their relative territorial authority. Every year, ISPRA compiles and updates the emission inventory of atmospheric pollutants. Every two

years, ISPRA communicates the projection trends and the activity data levels to ENEA, which updates the emission projections. Finally, regional authorities are responsible for air quality evaluation and management. Thus, bad air quality conditions observed at local levels are specifically addressed by regional plans.

The Ministry of Economic Development, together with the Ministry of the Environment, Land and Sea, and the Ministry of Infrastructures and Transport develops the Integrated National Energy and Climate Plan (NECP) [3], in compliance with EU regulation 2018/1999 of the European Parliament and of the Council. The latest plan (NECP 2030) defines the national targets to be reached by 2030 concerning energy efficiency, renewable energy, and reduction of GHG emissions. In addition, the plan defines the measures to be adopted for reaching the expected targets, classified in five dimensions: decarbonization, energy efficiency, energy safety, energy internal market, and research and innovation. The Ministry of Environment, Land and Sea appoints ISPRA to compile and update annually the GHG national emission inventory, in compliance with Legislative Decree 30/2013 [4].

4.2 National strategies

National strategies to reduce air pollutant emissions, including $PM_{2.5}$ and black carbon, and GHG, including methane, are designed with a coherent approach.

The national strategies addressing black carbon emissions are part of a wider action to reduce air pollutant emissions, including particulate matter. The strategies are designed both at national and local levels. The National Plan for Atmospheric Air Pollution Control [1] has the goal to reduce $PM_{2.5}$ emissions by 10% in 2020 and by 40% in 2030, relative to 2005 levels. Although the 2020 target is reachable, the 2030 reduction is challenging. National $PM_{2.5}$ emissions decreased by 19% from 2005 to 2018, nevertheless residential heating emissions increased by 37%, mainly due to wood burning combustion. Interestingly, the widespread use of wood as energy source, mainly due to its low cost compared to gas, helped to increase the share of renewable energy consumption. Thus plans to reduce $PM_{2.5}$ and other pollutants need to consider climate and energy strategies, as well.

Concerning particulate matter, $PM_{2.5}$ and PM_{10} in northern Italy (Po Basin) frequently exceed the air quality limits set by Legislative Decree 155/2010. As a consequence, the regional governments of the Po Basin area signed in 2013 the Regional Air Quality Plan, together with the Ministry of the Environment, Land and Sea, the Ministry of Infrastructures and Transport, the Ministry of Economic Development, the Ministry of Health, and the Ministry of Agricultural, Food and Forestry Policies [5]. The agreement supports the implementation of coordinated measures to reduce emissions specifically from energy sector, transportation, residential heating, and agriculture. The agreement between the regional governments and the Ministry of the Environment, Land and Sea was renewed in 2017, to further strengthen the set of air quality measures to be implemented [6].

National strategies to reduce methane emissions are described by the NECP 2030 [3]. The Italian national targets for GHG emissions reduction are 13% and 33% of 2005 emissions by 2020 and by 2030, respectively, excluding Emission Trading System (ETS) sector. The main objectives of the plan are decarbonization of the economic system, promotion of energy auto-consumption, transition from a centralized to a distributed energy system based on renewable sources, support for conventional energy supply to guarantee energy safety, promotion of electric energy use in residential and transport sectors, and support for increased energy efficiency in all sectors.

At local level, 149 Italian territories with more than 50.000 inhabitants are participating to the Global Covenant of Mayors for Climate and Energy, to develop local strategies for climate change adaptation and mitigation, including GHG emissions reduction. In addition, following the experience of the Regional Air

Quality Plan, in 2015 the Ministry of the Environment, Land and Sea, the regional governments, and the National Association of Municipalities signed a memorandum of understanding [7] to tackle air pollutants and GHG emissions, with a particular focus on metropolitan cities (administrative divisions composed by a large core city and surrounding linked municipalities).

4.3 National action plans

The National Plan for Atmospheric Air Pollution Control [1] targets $PM_{2.5}$, and thus only indirectly black carbon. The plan lists measures aiming at reducing atmospheric pollutant emissions, and simultaneously reaching the targets set by the National Energy Strategy (SEN 2017) [8] concerning renewable energy, energy efficiency, and GHG. The main measures will include decommissioning of coal thermal power plants by 2025, increasing the share of renewable energy in electric energy up to 55% by 2030, introducing about 5 million electric vehicles in the car-fleet, promoting the use of natural gas for on-road and off-road transport, and reducing GHG emissions from non-ETS sectors by 33% compared to 2005. Specific measures targeting $PM_{2.5}$ and black carbon are listed in section 6.

The National Energy and Climate Plan 2030 [3] describes the measures that will be implemented to reduce emissions of GHG, including methane. The plan is also designed to reach the targets set for energy efficiency, electricity interconnection, and use of renewable energy sources. Specific measures addressing emissions reduction include emission regulations and actions in the following sectors: renewable electric energy, renewable thermal energy, renewable energy in transport sector, energy efficiency in transport sector, and energy efficiency not in transport sector. Specific measures targeting methane emissions are listed in section 6.

5 International work

5.1 Main priorities for international work and major changes since the 2017 national reporting.

In the framework of the NECP 2030 [3], Italy started a cooperation dialogue on the topic of energy and climate with the neighboring countries, including Austria, Slovenia, Croatia, and Hungary. The cooperation could further develop in the future with bilateral agreements specifically related to: exchange of good-practices of alternative fuels and renewable energy sources, islands as laboratories for development of renewable energy sources, smart-grid experiments, infrastructural trans-boundary projects, efficient integration of energy market and governance, shared risk-management plans concerning electric and gas system, energy poverty, and hydrogen deployment.

In September 2019 a first meeting with the Malta government representatives allowed the definition of common interest areas, including: development of the Italian electric market, gas-price projections, best-practices exchange concerning bio methane, renewable energy targets in heating and cooling sectors, development of innovative research projects concerning renewable energy sources through European funding schemes, exchange of statistical data on renewable energy sources.

In November 2019 the Italian Ministry of Economic Development and the Greek Ministry of Energy and Environment signed a Memorandum of Cooperation to support industrial partnerships promoting sustainability and energy safety.

Beyond the European initiatives, the Africa Centre for Climate and Sustainable Development (ACSD) was established in Rome in partnership with the United Nations Development Programme (UNDP), the Food and Agriculture Organization of the United Nations (FAO), and the Ministry of the Environment, Land and

Sea. The purpose of the ACSD is to promote initiatives in Africa related to climate change impacts, environmental degradation on agricultural production, food security, water availability, as well as on stability and economic growth of the region.

In addition, the Ministry of the Environment, Land and Sea is strengthening the existing partnerships with the Small Pacific Islands, the Caribbean, the Maldives and the Comoros, favouring the involvement of the private sector together with the local communities, and sharing experiences acquired at national level, to implement adaptation strategies for the most vulnerable populations to climate change.

5.2 List of international work.

During the period 2017-2018, the bilateral cooperation activities promoted by the Ministry of the Environment, Land and Sea led to the signature of 20 new bilateral agreements to support mitigation and adaptation actions, to facilitate access to climate finance, and to provide capacity building and technology transfer. The agreements involved Sub-Saharan Countries (Eswatini, Kenya, Mali, Zambia, Mauritius, Sao Tome and Principe, Seychelles), an Intergovernmental organization (Lake Chad Commission), MENA region countries (Tunisia, Jordan, Unites Arab Emirates), Eastern Europe region (Kazakhstan, Kurdistan, Russian Federation, Georgia), Central/Latin America region (Argentina, Cuba, Paraguay) and Asian countries (India, Vietnam). Priority actions have been confirmed on eight specific areas: management of extreme events, promotion of renewable energy and energy efficiency, water resources management, waste management, air quality, forest degradation, land rehabilitation and soil improvement, and sustainable mobility (https://unfccc.int/documents/208353).

In addition, Italy participates to the following international activities, aiming at reducing long term and short term climate forcer emissions:

CORSIA project (Carbon Offsetting Reduction Scheme for International Aviation). The project goal is to regulate GHG emissions from international civil aviation, but it does not concern black carbon. It will start the pilot phase in 2021.

ISGAN (Implementing Agreement for a Co-operative Programme on smart grids). The initiative, promoted by the International Energy Agency, has the goal to support high-level government attention and action for the accelerated development and deployment of smarter and cleaner electricity grids around the world.

6   Sector based plans and projects

6.1. Mobile and stationary sources

6.1.1. Specific national strategies

One of the key points of the national strategy concerning mobile and stationary sources is the preparation of the ministerial decree transposing the Renewable Energy Directive (RED II), which promotes the use of energy from renewable sources. A specific decree will be dedicated to support the use of biofuels in airplane and maritime transport [1].

Furthermore, emission reduction will be achieved by promoting public transportation system and reducing private mobility system. The transition will be supported by strengthening the public transportation system and renovating bus-fleet with less polluting vehicles, including electric buses. A

national sustainable mobility plan will include integration of public transport plan in urban requalification plans, integration of sustainable mobility system with smart parking, promotion of shared mobility, and financial incentives for public transportation users [1].

A series of measures will be implemented to gradually modify the private mobility system to reduce pollutant emissions, like promoting the use of electric and hybrid vehicles in urban areas, and changing taxation system to promote renovation of private vehicle-fleet [1].

Additional measures will include the promotion of Intelligence Transport System for goods and progressive replacement of duty-vehicles with less polluting solutions, including maritime transport [1].

6.1.2. Existing regulatory instruments

The emission of black carbon from road transport decreased by 76% from 1990 to 2018, mainly due to the adoption of European directives, controlling and limiting PM emissions at the car exhaust pipe.

At national level, the memorandum of understanding signed in 2015 among the Ministry of the Environment, Land and Sea and the local governments promotes the transition towards a cleaner transportation system, favoring the introduction of low-emitting vehicles in the public system, and the installation of recharging network for electric vehicles. In addition, financial incentives are proposed to favor the transition towards electric mobility and the use of public transportation system [7].

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

See Annex 3

6.1.4. Best practices and projects (Toolbox)

NA

6.2 Oil and Gas (O&G, 2a -2d)

6.2.1. Specific national strategies

Progressive phase-out of coal for energy production by 2025 is one of the main measures to reduce $PM_{2.5}$ and black carbon emissions in the energy sector. This process will be realized gradually to guarantee energy safety, and organization of the market and services, to fully integrate the energy system with renewable energy sources [1].

In addition, the Italian energy company Eni is committed to reduce its emissions in upstream operated assets. The main measures are flare elimination, reduction of fugitive methane emissions, and implementation of energy efficiency projects. Eni intends to minimise gas flaring, which can occur either for safety reasons or when there are no infrastructures available to market the gas. The latter is referred to as process flaring. Since 2014 Eni participates to the "Worldbank Zero Routine Flaring Initiative by 2030", committing to bring flaring to zero by 2025. In addition, technological solutions are being evaluated to reduce safety flaring, as well. In the O&G industry, methane emissions are primarily concentrated in the upstream value chain and are caused by unburnt methane from flaring and process venting, or by maintenance and fugitive emissions. Eni announced a monitoring campaign for fugitive emissions with the goal to reduce them by 80% between 2014 and 2025. Leak, Detection, and Repair (LDAR) programs are implemented on all assets, including those located in the Arctic area.

6.2.2 Existing regulatory instruments

First limitations to the O&G sector emissions were set by Ministerial Decree 12 July 1990, defining limits for particulate matter emissions and defining a time frame for industrial plant technical improvements for pollution reduction. Following, Legislative Decree 372/1999 transposed Directive 96/61/EC, and introduced the Integrated Environmental Authorization for existing plants, while Legislative Decree 59/2005 extended the Integrated Environmental Authorization to new and renovated plants. Legislative Decree 152/2006 set new emission thresholds and limited the validity of the Integrated Environmental Authorization up to 5 years. At the moment, emissions from the O&G industry are regulated by Legislative Decree 46/2014, which transposes the most recent Directive 2010/75/EU (Industrial Emission Directive IED). Relative to previous regulation, this decree extends the Integrated Environmental Authorization to additional sectors, increases sanction severity, and defines the expected environmental performance associated to the Best Available Technology (BAT) for pollutant abatement (BAT Conclusion). In addition, the validity of the Integrated Environmental Authorization is extended to at least 10 years.

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

See Annex 3

6.2.4. Best practices and projects (Toolbox)

Eni is partner of the Oil and Gas Climate Initiative (OGCI) and the Climate and Clean Air Coalition (CCAC). In the framework of the OGCI initiatives, Eni financially supports the development of new technological solutions to measure and mitigate methane emissions, and to improve accuracy of GHG emission inventories in the O&G sector. Among the CCAC's initiatives, Eni participates to:

- Oil and Gas Methane Partnership (CCAC-OGMP, https://ccacoalition.org/en/activity/ccac-oil-gas-methane-partnership), to mitigate and disclose methane emissions;
- Oil and Gas Methane Science Studies (https://ccacoalition.org/en/activity/oil-and-gas-methane-science-studies), to support scientific studies on methane emissions, under the coordination of the Environmental Defence Fund;
- Global Methane Alliance (https://ccacoalition.org/en/activity/global-alliance-significantly-reduce-methane-emissions-oil-and-gas-sector-2030), to promote the implementation of methane reduction targets among governments.

6.3 Residential combustion (3a -3c)

6.3.1. Specific national strategies

In 2017, renewable energy sources produced 11.2 Mtoe (millions of tons of oil equivalent) of thermal energy, accounting for 20% of total thermal energy consumption. The main renewable energy source employed was wood (7.5 Mtoe). Although the classification as "renewable source", wood combustion is critical for its impacts on the environment and health, especially due to the high levels of $PM_{2.5}$ and black carbon emissions. The NECP 2030 promotes the installation of new combustion plants with higher efficiency, and considers the opportunity to limit the installation of new devices in areas characterized by critical air quality conditions [3].

In addition, national strategies to reduce emissions from residential combustion focus on promoting energy source transition and increasing building energy efficiency. Specific measures towards this goals

include the obligation to install photovoltaic power system in new or renovated buildings, and to promote hybrid energy production system for residential heating. In addition, replacement of old wood burning appliances with low-emitting appliances will be promoted, while acquisition of inefficient heat generators will be discouraged by introducing more stringent requirements for financial incentives. Concerning building energy efficiency, the minimum efficiency requirements for private and public new buildings will be increased, financial support will be given to support renovation of older and energy-inefficient buildings, and custom awareness, concerning energy consumption, will be promoted [1].

6.3.2. Existing regulatory instruments

Ministerial Decree 186/2017 defines the criteria to classify residential heating appliances using solid biofuels, including wood. The classification, depending on the appliance type, efficiency, and emission levels, is the first step towards the introduction of limitations for less performing heating systems [9]. According to the decree, poorly efficient appliances are identified by one star out of five, while highly efficient devises are distinguished by five stars. The Air Quality Regional Plan [6] introduces the ban to install heating devices characterized by three or less stars and the ban to use devices with one or two stars, starting from the end of 2019.

Finally, Legislative Decree 183/2017 [10], transposing Directive 2015/2193/EU, sets particulate matter emission limits for medium combustion appliances.

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

See Annex 3

6.3.4. Best practices and projects (Toolbox)

BB-Clean is a three-year project (2018-2021) supported by the Interreg Alpine Space program of the European Union, and led by the regional environmental protection agency of Valle d'Aosta. The goal of the project is the development of transnational policies for a sustainable use of biomass for domestic heating in the Alpine region. Together with the Italian partners, BB-Clean involves institutions from France, Germany, Austria, and Slovenia. The project started in 2018 with a measurement campaign to investigate the impacts on air quality of wood combustion from residential heating. Increasing public awareness was an additional goal of the campaign, in fact people were asked to wear air quality sensors to measure personal exposure, getting to know the impact of everyday activities on the air they breath.

Link to the project webpage: https://www.alpine-space.eu/projects/bb-clean/en/home

6.4 Solid waste (4a-4c)

6.4.1. Specific national strategies

In agreement with Directive 2008/98/EC, Ministerial Decree 7 October 2013 introduces the National Plan for Waste Reduction [11]. The plan aims at reducing waste amount, environmental and health impacts, and toxic substances in material and products. The final goal is to detangle economic growth from waste production environmental impacts.

A detailed description of the solid waste treatment at national and regional level is presented in the report on urban waste, prepared by ISPRA [12]. In 2018, about 30 million tons of urban waste were produced in total, with 22% buried in landfills and 21% delivered to biological treatment plants. Although the similar

shares, the historical trends are divergent, showing an increase in the amount of waste delivered to biological treatment plants. In addition, the number of plants for biological treatment with biogas production are progressively increasing and extending to different regions of the national territory. In 2018, 23 plants for anaerobic digestion were producing 67.1 million Nm^3 of biogas. Biogas is also produced by integrated aerobic/anaerobic plants, 5 of which were already operating in 2018, 7 were under conversion, and 6 under construction.

6.4.2. Existing regulatory instruments

According to the National Plan for Waste Reduction, the regional governments have to integrate the national objectives into the regional plans for waste management. Although regional plans differ from each other, a few territories are setting the structural conditions to allow the use of collected organic waste for biogas production through anaerobic digestion and integrated aerobic/anaerobic plants, thus avoiding waste delivery to landfills, and the consequent methane emissions in the atmosphere.

Law number 117 of 4 October 2019, article 15 [13], delegates the government to transpose Directive 2018/850/EU, defining the need to set new criteria for landfill waste disposal. The goal is to reduce the amount of waste delivered to landfills, and to set a limit to the maximum amount of organic urban waste that could be disposed of in landfills.

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

See Annex 3

6.4.4. Best practices and projects (Toolbox)

NA

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

6.5.1. Specific national strategies

Methane and black carbon emissions from agriculture and animal husbandry are associated with manure management, rice farming, enteric fermentation, and waste burning. Following the discussion promoted by the Regional Air Quality Plan in 2013, the Ministry of Agricultural, Food and Forestry Policies defined guidelines for reducing atmospheric pollutant emissions from agriculture and animal husbandry [14]. The guidelines, released in 2016, identify technical measures to reduce air pollutant emissions, and simultaneously recommend methane emission measures as win-win options. Suggested measures include the use of organic acids as feed additives to reduce emissions from enteric fermentation, and the capture of methane from livestock manure to produce biogas. Concerning the reduction of black carbon emissions, the guidelines solicit the application of current legislation to limit crop burning activity, when possible, while the National Plan for Atmospheric Air Pollution Control [1] foresees the modification of Legislative Decree 152/2006 to progressively ban open waste burning.

6.5.2. Existing regulatory instruments

The Common Agricultural Policy (PAC), at European level, has been the main tool shaping political and financial management of the agriculture sector since 1962. PAC 2014-2020 introduces the sustainable development concept for this sector, and the *greening* criteria, consisting of an additional financial incentive (30%) if specific climate and environmental requirements are fulfilled. PAC 2014-2020 identifies

two focus areas that tackle directly GHG emissions, i.e. 5D – reduction of GHG and ammonia emissions from agriculture, and 5E – promotion of carbon conservation and sequestration in agriculture and forestry sectors. Concerning black carbon measures, focus area 5C discourages the open burning of agricultural waste, promoting their use as renewable energy source. Measures to address the PAC focus areas are defined at national and regional levels by the Development Rural Plans, and consist mainly in financial incentives. The new Common Agricultural Policy package (PAC 2021-2027) will be more ambitious compared to the previous version, for example requiring more stringent environmental constraints for financial support.

Finally, the SEN 2017 [8] and Interministerial Decree 2 March 2018 [15] promote the reduction of methane emissions from manure, though the financial support of firms producing biogas from anaerobic digestion of animal husbandry waste.

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

See Annex 3

6.5.4. Best practices and projects (Toolbox)

NA

6.6 Management of wildfires (6a-6d)

6.6.1. Specific national strategies

Italian protected areas are more than 1000 and cover about 13% of the national territory. According to the wilderness registry (2013), only a limited number of them show properties typical of wilderness areas. Due to historical reasons, often Italian protected areas are characterized by man-made infrastructures and small villages inside their boundaries, thus wildfire contrast is extremely important. Nevertheless, fire management takes into account that small size fires with a limited front are likely not leading to serious damages, while high intensity and large size fires are difficult to be extinguished and might have serious economic and environmental impacts. Fire management plans are designed at regional and national levels, to cover parks under regional and national competence, respectively. The common strategy is to promote fire prevention, rather than active contrast. Thus, fire management plans are characterized by four stages: fire event characterization, risk analysis, definition of objectives, and intervention measures.

6.6.2. Existing regulatory instruments

Wildfire management is regulated by law 353/2000, which gives to the national and regional authorities the role to design fire management plans describing the strategies to forecast, prevent, and control wildfires [16].

6.6.3. Follow up of EGBMC recommendation (6a-6d)

See Annex 3

6.6.4. Best practices and projects (Toolbox)

NA

7 Annexes

Annex 1: Black carbon emission table

BC (kt)	2013	2014	2015	2016	2017	2018	2025
A_PublicPower	0.02	0.02	0.01	0.01	0.01	0.01	NA
B_Industry	0.41	0.38	0.41	0.40	0.52	0.52	NA
C_OtherStationaryComb	9.59	8.28	9.10	8.81	9.62	8.45	NA
D_Fugitive	0.10	0.09	0.09	0.08	0.07	0.07	NA
E_Solvents	0.01	0.01	0.01	0.01	0.01	0.01	NA
F_RoadTransport	9.69	8.95	7.73	7.09	6.21	5.64	NA
G_Shipping	0.99	0.98	0.93	0.93	0.94	0.96	NA
H_Aviation	0.02	0.02	0.02	0.02	0.02	0.03	NA
I_Offroad	3.11	2.79	2.46	2.27	1.95	1.81	NA
J_Waste	1.46	1.44	1.52	1.67	1.66	1.64	NA
L_AgriOther	0.11	0.11	0.12	0.12	0.11	0.11	NA
Grand Total	25.52	23.07	22.41	21.42	21.13	19.25	NA

Annex 2: Methane emission table

Methane (kt)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2020	2030
Energy	376.82	342.47	366.97	359.99	336.93	322.44	310.10	317.19	296.68	345.94	320.72
Industrial Processes	2.39	2.65	2.53	2.03	1.92	1.70	1.91	1.77	1.76	1.73	1.73
Agriculture	765.68	767.82	763.98	767.56	760.85	767.41	772.45	776.47	770.01	781.46	781.20
Land Use, Land-Use Change and Forestry	12.37	19.92	40.52	5.67	10.52	10.68	11.85	53.89	6.82	19.29	16.35
Waste	734.31	709.84	713.25	661.26	656.49	663.80	651.51	650.89	652.85	541.04	426.17
Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total	1891.57	1842.70	1887.24	1796.50	1766.70	1766.03	1747.82	1800.21	1728.13	1689.47	1546.19
Total (without LULUCF)	1879.20	1822.78	1846.73	1790.83	1756.19	1755.34	1735.97	1746.32	1721.31	1670.18	1529.84

Annex 3: List of actions relative to the recommendations in the 2019 Summary Report. "Regional" refers to regional actions, "National" refers to national measures, while "Private" refers to private company initiatives.

Mobile and stationary diesel-powered sources
Table A1: Status of recommended actions 2017 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 wide-spread availability of ultra-low sulphur fuels.	
Recommendation 1b: Reduce emissions from legacy diesel vehicles and engines by adopting targeted policies and programs.	Regional: progressive ban of euro 5 Diesel and lower standards in urban areas with more than 30.000 inhabitants from 2025 during the week-days of the cold season. National: Economical incentives to replace older Diesel vehicles with newer low emitting vehicles.
Recommendation 1c: Reduce black carbon by stimulating the shift to alternative vehicle technologies and modes of transportation, and through efficiency measures.	Regional: Economical incentives to promote alternative transportation modes, including biking, walking, and car-sharing. National: promoting public transportation system and reducing private mobility system. The transition will be supported by strengthening the public transportation system and renovating bus-fleet with less polluting vehicles, including electric buses. A national sustainable mobility plan will include integration of public transport

	plan in urban requalification plans, integration of sustainable mobility system with smart parking, promotion of share-mobility, and economic support to public transportation users. National: modify the private mobility system to reduce pollutant emissions, promoting the use of electric and hybrid vehicles in urban areas and changing taxation system to promote change of private vehicle-fleet
Recommendation 1d: Develop, as appropriate, and report on measures and best practices to reduce particulate matter and black carbon emissions from shipping.	
Recommendation 1e: Reduce emissions from stationary diesel engines by adopting targeted policies and programs, including shift to new technologies and improved efficiency.	

Oil and gas

Table A2: Status of the recommended actions 2017 to reduce emissions from on oil and gas production.

Recommendation 2a: Adopt and implement oil and gas methane emissions reduction strategies.	Private: 66% reduction of methane fugitive emissions from 2014 to 2018, mainly through Leak Detection and Repair program (LDAR) Optimization of monitoring and reporting processes to reduce fugitive emissions by 80% in 2025 compared to 2014.
Recommendation 2b: Encourage the adoption of best practices in reducing routine flaring and in improving gas capture.	Private: Bring to zero process flaring by 2025 through production of electricity for local populations, distribution for domestic consumption or export, and eventually reinjection systems in natural gas reservoirs.
Recommendation 2c: Urge firms to engage in international and domestic voluntary methane and black carbon emissions reduction activities, including the implementation of methane management strategies.	
Recommendation 2d: Promote targeted and cost-effective measures at large methane emission sources, where relevant.	

Residential Combustion

Table A3: Status of the recommended actions 2017 to reduce emissions from residential combustion.

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.	Regional: introduction of obligation to use high-quality pellets for residential heating (class A1 relative to UNI EN ISO 17225-2).
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.	Regional: Ban from 1 January 2020 to install wood stoves characterized by lower emission standards (classified with 3 or less stars out of 5 stars). Ban to use wood stoves characterized by 1 or 2 stars. National: Replacement of old wood burning appliances with low-emitting appliances and introduction of more stringent requirements for financial incentives, to acquire biomass heat generators.
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.	National: Obligation to install photovoltaic power system in new or renewed buildings, to promote hybrid energy production system for residential heating. National: Minimum efficiency requirements for private and public new buildings will be increased, financial support for renovation of older and energy-inefficient buildings, and promotion of custom awareness concerning energy consumption.

Solid Waste Disposal

Table A4: Status of the recommended actions 2017 to reduce emissions from solid waste disposal.

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.	National: Construction of anaerobic digestion plants to produce biogas from urban solid waste, avoiding landfill disposal.
Recommendation 4b: Adopt regulations or incentives for landfill gas capture and control.	
Recommendation 4c: Promote best practices for waste management in Northern and remote communities.	

Agriculture and Animal Husbandry

Table A5: Status of the recommended actions 2017 to reduce emissions from agriculture and animal husbandry.

Recommendation 5a: Promote food consumption patterns that utilize Arctic food chains sustainably and efficiently, support the preservation of carbon sinks, and minimize life-cycle emissions of methane.	
Recommendation 5b: Promote work on possibilities to reduce emissions of enteric methane under Arctic conditions, in co-operation with relevant organizations.	
Recommendation 5c: Develop agricultural policies and practices to reduce open burning of agricultural waste. Encourage studies and piloting of innovative solutions that reduce the need for open burning.	Regional: Ban of any open burning activity in areas with altitude below 300 m in winter. Regional: Rural development plans - focus area 5C (financial incentives).

Wildfires

Table A6: Status of the recommended actions 2017 to reduce emissions from wildfires.

Recommendation 6a: Build and maintain international mutual aid and resource exchange arrangements amongst Arctic nations that have specialized experience in wildfire management, suppression, and monitoring in boreal forests.	
Recommendation 6b: Develop region-specific public education campaigns on wildfire prevention and safety.	
Recommendation 6c: Develop and implement regionally appropriate forest management practices that reduce the risk of severe wildfires.	National and regional fire management plans are updated periodically. The most recent national plan was released in 2018.
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.	

Annex 4: Action plans and regulatory instruments cited in the report.

[1] Programma Nazionale di Controllo dell'Inquinamento Atmosferico, March 2019.

[2] https://www.gazzettaufficiale.it/eli/id/2018/07/02/18G00096/sg.

[3] Piano Nazionale Integrato per l'Energia ed il Clima. December 2019. https://www.mise.gov.it/images/stories/documenti/PNIEC_finale_17012020.pdf

[4] https://www.minambiente.it/sites/default/files/archivio/normativa/dlgs_13_03_2013_30.pdf.

[5] Accordo di Programma per l'Adozione Coordinata e Congiunta di Misure per il Miglioramento della Qualità dell'Aria nel Bacio Padano, December 2013.
http://www.mit.gov.it/mit/mop_all.php?p_id=17599

[6] Nuovo Accordo di Programma per L'Adozione Coordinata e Congiunta di Misure per il Miglioramento della Qualità dell'Aria nel Bacino Padano, June 2017.
https://www.minambiente.it/sites/default/files/archivio/allegati/inquinamento_atmosferico/accordo_bacino_padano_09_06_2017.pdf

[7] Protocollo di Intesa per Migliorare la Qualità dell'Aria, Incoraggiare il Passaggio a Modalità di Trasporto Pubblico a Basse Emissioni, Disincentivare l'Utilizzo del Mezzo Privato, Abbattere le Emissioni, Favorire Misure Intese a Aumentare l'Efficienza Energetica, December 2015.

[8] Strategia Energetica Nazionale, https://www.mise.gov.it/images/stories/documenti/Testo-integrale-SEN-2017.pdf

[9] https://www.gazzettaufficiale.it/eli/id/2017/12/18/17G00200/sg.

[10] https://www.gazzettaufficiale.it/eli/id/2017/12/16/17G00197/sg.

[11] Programma Nazionale di Prevenzione dei Rifiuti, October 2013.
http://www.pdc.minambiente.it/sites/default/files/progetti/now_programma_nazionale_prevenzione_rifiuti.pdf

[12] Rapporto ISPRA 313/2019. http://www.isprambiente.gov.it/it/pubblicazioni/rapporti/rapporto-rifiuti-urbani-edizione-2019

[13] https://www.gazzettaufficiale.it/eli/id/2019/10/18/19G00123/sg

[14] Linee guida per la riduzione delle emissioni in atmosfera provenienti dalle attività agricole e zootecniche, secondo quanto previsto dall'Art. 5, comma 1, lettera b dell'Accordo di programma per l'adozione coordinata e congiunta di misure di risanamento della qualità dell'aria nel Bacino Padano del 19 dicembre 2013, March 2016.

[15] https://www.mise.gov.it/index.php/it/normativa/decreti-interministeriali/2037836-decreto-interministeriale-2-marzo-2018-promozione-dell-uso-del-biometano-nel-settore-dei-trasporti.

[16] https://www.camera.it/parlam/leggi/00353l.htm