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2015 National Submission to the Arctic Council

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INTRODUCTION

This document is the Finnish national submission to the Arctic Council reporting the emissions of black carbon and methane according to the Framework document "ENHANCED BLACK CARBON AND METHANE EMISSIONS REDUCTIONS, AN ARCTIC COUNCIL FRAMEWORK FOR ACTION" that was decided to be implemented in the declaration on the occasion of the Ninth Ministerial meeting of the Arctic Council. The framework document included guidance for the preparation of the national submissions (Annex 1), which has been used in preparing this document.

1 Summary of current black carbon emissions to CLRTAP, where appropriate, and future projections

Finland has submitted historical BC emission data 2000-2013 to CLRTAP in February/March 2015. The detailed submission can be accessed from: http://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/2015_submissions/.

Fig 1 shows the historical emissions in 2000-2013 of black carbon in Finland split by aggregated sectors. The main sectors emitting black carbon are transport and residential combustion. The emissions from the transport sector have declined as a result of the gradually stricter emission limits (EURO-standards), whereas the emissions from the residential sector have increased as a result of increasing wood use for heating (see also Table 1). The emission summary in Fig. 1 has been created based on the national submissions with following aggregation: 1) The NFR level emission data was aggregated to GNFR level. 2) the GNFR level emission data was further aggregated based on information in Annex 2 and is presented in a table in Annex 3.

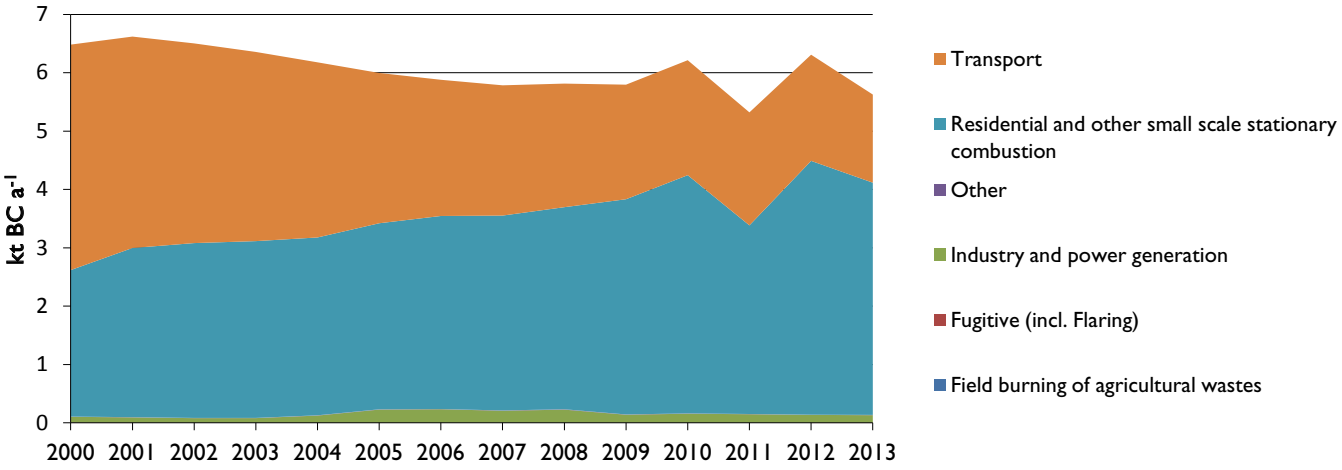

Figure 1. Historical emissions in 2000-2013 of black carbon in Finland split by aggregated sectors.

Fig. 2 shows the black carbon emission projections as estimated by the Finnish Regional Emission Scenario model, FRES, (Karvosenoja, 2008) for the current (2013) Finnish governments' energy and climate strategy's WAM scenario. The scenario anticipates emission of black carbon to reduce by 2030 mainly due to stricter emission legislation in the transport sector and the penetration of vehicles with efficient emission abatement technologies. Emission reductions are modeled also for the residential sector, where the scenario assumes less heating need in buildings as a result of the energy efficiency measures. The assessment of future development is estimated to be relatively sensitive to uncertainty especially in wood use estimates that influences *Residential and other small scale stationary combustion* sector (Suoheimo et al. 2015). The wood use data is currently under review. The FRES model is maintained and hosted at the Finnish Environment Institute (SYKE) and it is serving as an official tool in the UNECE TFIAM and the Arctic Council. The FRES model has also been used for analyzing effects of Finnish governments' energy strategies to emissions of several air pollutants.

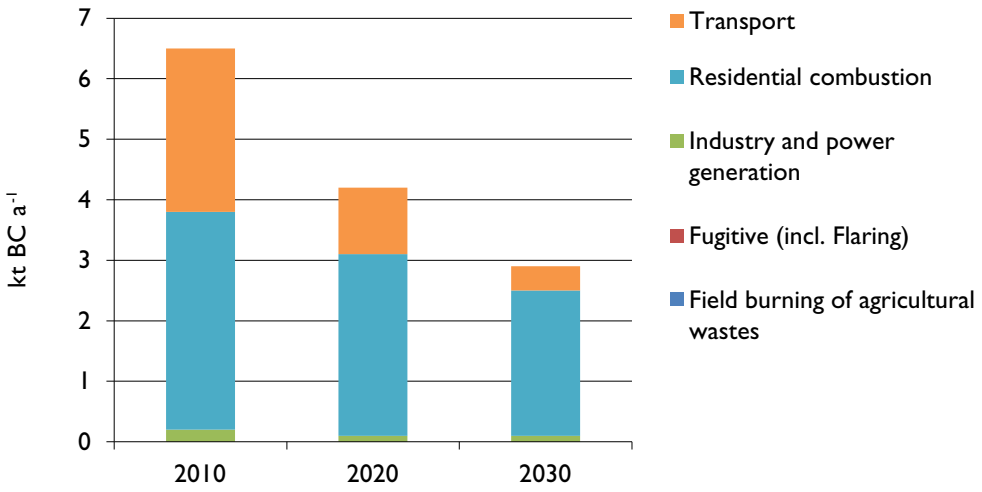

Figure 2. Black carbon emissions 2010 (base year), 2020 and 2030 following the WAM scenario of the Finnish governments' climate and energy climate strategy.

2 Summary of current methane emissions to UNFCCC and future projections

Finland has submitted CH4 emission trend data 1990-2012 in CRF format to UNFCCC in April 2014. The detailed submission can be accessed from: https://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php.

The emissions in Fig. 3 are shown by main sector and based on the national submissions based on data provided on Tables 10s2, 10s2.2 and 10s2.3. The data is presented in a table in Annex 4. Waste, agriculture and energy sectors are most important emitters of methane. Landfills are mostly responsible for CH4 emissions in the Waste sector. The emissions have decreased because the landfilled amounts of municipal solid waste have decreased following the increasing energy use of wastes and recovery of methane (see Table 2).

In the Agriculture sector emissions have remained relatively stable, since the reductions in the number of cattle have been offset by increasing methane emissions from manure management practices (See Table 2). Energy is a relatively minor sector in total CH4 emissions compared with Waste and Agriculture. Largest emission sources are transport and residential sector. Emissions in transport sector have reduced significantly following the improvements in engine technologies, but emissions from the residential sector have increased following the increasing wood use.

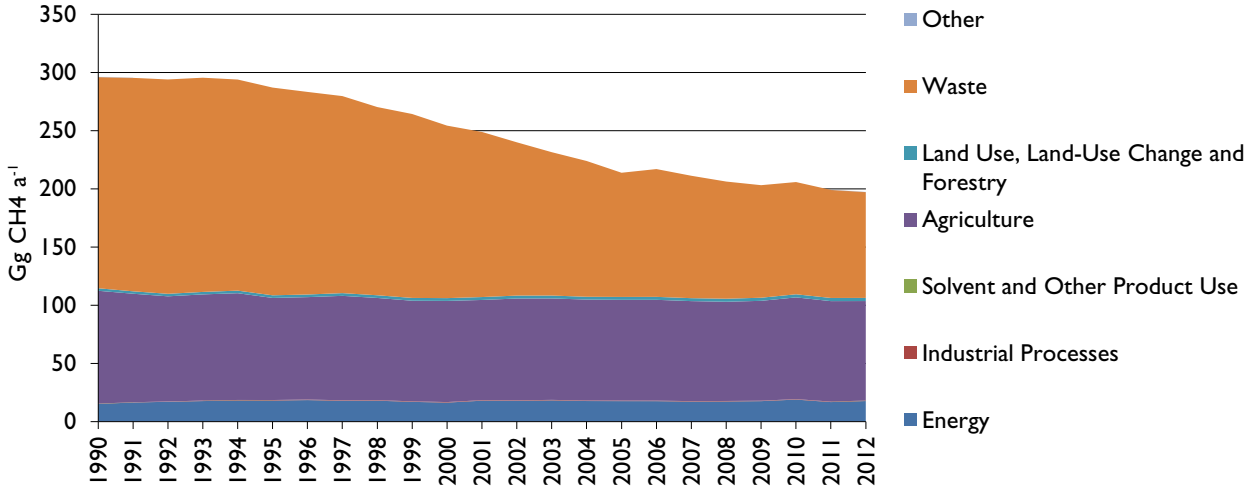

Figure 3. Methane emissions in 1990-2012 in Finland by aggregated sector.

Fig. 4 shows the methane emission projections as presented by Suoheimo et al. (2015). The estimate follows the current (2013) Finnish governments' climate and energy climate strategy's WAM scenario.

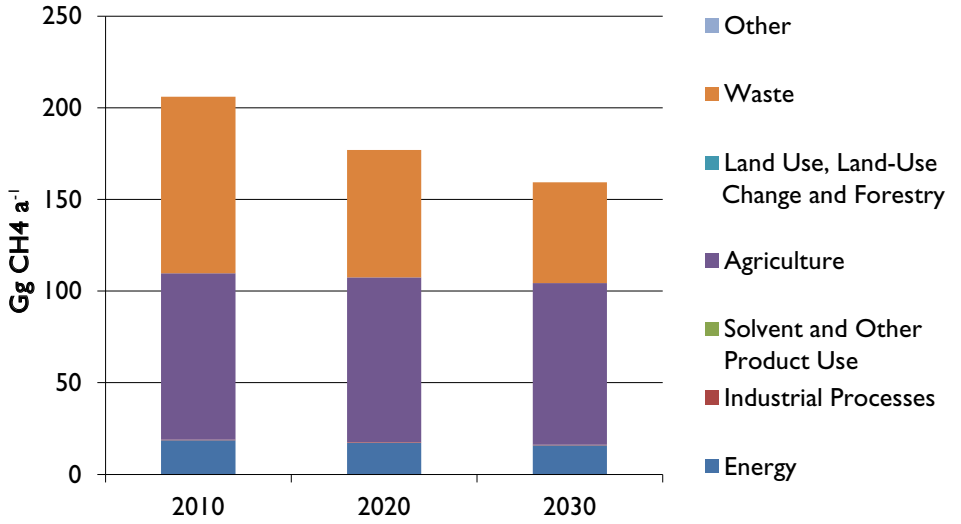

Figure 4. Methane emissions 2010 (base year), 2020 and 2030 following the WAM scenario of the Finnish governments' climate and energy climate strategy.

3 Summary of National Actions, National Action Plans, or Mitigation Strategies by sector

The Government and Parliament make the major decisions concerning Finland's energy and climate policy. The ministerial working groups have been responsible for preparing and updating the national strategies on energy and climate policy, completed in 2001, 2005, 2008 and 2013. The strategy will be updated in the near future and the work is foreseen to start in fall 2015.

Finland adopted a national Climate Act in 2015. According to the act, a long-term plan for climate change mitigation will be made once every ten years, and a medium-term plan once per parliamentary electoral term. The medium-term plan covers sectors outside emissions trading scheme (transport, housing and agriculture) and aims to set more concrete and detailed measures than the long-term plan.

Table 1 lists major activities that address black carbon in Finland. There is no specific legislation or actions to reduce emissions of black carbon alone for the time being. However, the existing legislation to reduce emissions of air pollutants, especially emissions of particulate matter is expected to reduce emissions of black carbon as well.

Table 1. Summary of activities to address black carbon.

Sector	List of activities
Transportation	Current European legislation on emissions from transport is covered by a series of amendments to the 1970 Directive 70/220/EEC that have introduced stringent requirements for emissions. The particulate matter limit values have reduced in all stages and the latest amendment introducing the stages, e.g. the Euro 5 (2008/9) and Euro 6 (2014) for light passenger and commercial vehicles, eventually introduces particle filters for diesel vehicles, which are expected to reduce the emission levels significantly (as an example an 80% reduction between the Euro 4 and Euro 5 levels for diesel vehicle emissions). Equivalent standards are in force for heavy duty vehicles as well as for off-road vehicles and machinery. Following the introduction of the emission limits and consequently diesel particulate filters, significant reductions are expected in PM and black carbon emissions in the transport sector. To ensure that the emissions remain on a relatively low level is important to assure that the current technologies deliver the reductions also in the long term and that the legislation is introduced in a timely basis. Finland has been and is implementing the European vehicle emission standards according to the agreed timetable as well as by participating for further development of the European emission standards for non-road engines.

Sector	List of activities
Transportation	Ministry of Transport and Communications published in 2013 its Environmental Strategy for Transport (2013-2020), which aims to achieve sustainable and technically advanced transport in Finland. The Environmental Strategy also contains an update of the Ministry's Climate Policy Programme (ILPO). The key measures expected to reduce emissions of greenhouse gases and air pollutants, including black carbon, are: • Promoting the use of alternative fuels and low-emission vehicle technologies • Updating the passenger car fleet (i.e. the government has allocated 3 M€ for a scrappage program in 2015. Citizens can get a compensation of up to 1500€ (1000€ government share, 500€ importer share) for the purchase of a new car with CO^2 emissions less than 120 g/km, provided that their old car of over 10 years of age is handed over for scrapping) • Improving the energy efficiency in transport • Directing the growth of passenger traffic volumes in urban areas to more environmentally friendly transport modes
Residential and other small scale stationary combustion	The European Union's Ecodesign directive (2009/125/EC) has introduced a pan-European regulation on solid fuel boilers (LOT 15) and room heaters using solid fuels (LOT 20) that includes emission limit values. The directive is expected to be beneficial from the particulate matter, including black carbon. Information campaigns aimed at influencing how people store wood fuel and operate their stoves can be a cost efficient way to raise people's awareness about emissions and impacts of small scale combustion and to guide people towards operating their stoves right and as a results reduce the emissions, including black carbon. Such campaigns are often carried out by regional and local actors and the motivation has been local air quality and health effects of particulate matter. First information campaigns were conducted in 2007-2013: • 2012–2013 Information campaign in the Helsinki region (Helsinki Region Environmental Services Authority) • 2008 Manual for wood combustion (National Supervisory Authority for Welfare and Health, Valvira) • 2007 Public information events in several locations in Finland (Organization for Respiratory Health in Finland, Heli ry) After these campaigns the Helsinki Region Environmental Authority, Finnish Environment Institute and the Central Association of Chimney Sweeps developed web portal with guidance for municipalities on how to conduct a burn right campaign. The portal has been included to the web pages of the Association of Finnish Local and Regional Authorities. Chimney sweeps play an active role in handing out guidance documents and instructing people on how to use their stoves appropriately. Several municipalities and regions utilized the material and conducted their own campaigns in all over the country. Acknowledging the importance of the residential sector, inter-ministerial work has been initiated to consider additional measures to reduce emissions from residential combustion. Measures to enhance energy-efficiency of buildings can be expected to indirectly influence emissions of black carbon (reduce the need of fuel). Such measures are included in the National Energy and Climate Strategy (latest update 2013) following the European Union's Energy Efficiency Directive (EED).

Table 2 highlights major national activities to address methane emissions from major sources in Finland. The information is collected from Statistics Finland (2014) and Suoheimo et al. (2015), which include also more detailed information.

Sector	List of activities
Waste	Landfills are mostly responsible for CH4 emissions in the Waste sector. The emissions have decreased about 50% in the period 1990-2012 because: (1) the landfilled amounts of municipal solid waste have decreased following the increasing energy use of wastes (this trend is expected to continue in future), and (2) the amounts of recovered methane have increased significantly, especially at the beginning of 2000 following the regulations of landfill gas recovery (Council of State Decree 861/1997 on Landfills). The government decree on landfills (331/2013) prohibits the disposal of organic waste to landfills from 2016 onwards. The waste legislation sets additional targets for recycling and recovery of certain other waste streams (municipal waste, construction and demolition waste, packaging waste, waste paper, waste from electrical and electronic equipment, batteries as well as end-of-life vehicles).
Agriculture	Cattle produce the major part of the emissions from enteric fermentation in Finland, thus the 33% decrease in the number of cattle since has influenced both emissions from enteric fermentation. Methane emissions from manure management have increased by 24% between 2012 and 1990, despite the decrease in the number of animals. This is mostly due to an increase in the number of cattle and swine kept in slurry-based manure management systems, which have tenfold methane emissions compared with solid storage or pasture. The Ministry of Agriculture and Forestry has prepared a climate programme in 2014 (MMM, 2014). It presents a list of actions that aim to guide the agriculture sector to reduce its greenhouse gas emissions, ao. CH4. Most relevant measures for CH4 suggest energy efficiency measures and the use of renewable fuels and in farm production of biogas for energy production in farms. Additionally the programme points out dietary changes for milk cows as an additional potential measure. Some of the actions promoting energy efficiency and use of renewables for energy production in agricultural sector listed in the climate programme are already included in the Rural Development Plan (RDP) for the Finnish Agriculture for 2014-2020 that was approved by the European Commission in December 2014. The programme is enforced via a number of legislation and decrees issued by the government of Finland.
Energy	Energy is a relatively minor sector in total CH4 emissions compared with Waste and Agriculture. Largest emission sources are transport and residential sector. Emissions in transport sector have reduced significantly since 1990's following the improvements in engine technologies, including exhaust after treatment and energy efficiency. Emissions from the residential sector have increased due to increased activity. Measures to enhance energy-efficiency of buildings can be expected to indirectly influence emissions of methane (reduce the need of fuel). Such measures are included in the National Energy and Climate Strategy (latest update 2013) following the European Union's Energy Efficiency Directive (EED).

International Activities

In the 2012 revision of the multi-pollutant protocol of the UN/ECE Convention on Long-range Transboundary Air Pollution, Finland was in favour of including legal elements for black carbon. Finland also contributes actively to the work on short-lived climate pollutants launched by the Arctic Council and the Nordic Council of Ministers as well as the Climate and Clean Air Coalition (CCAC), where Finland will participate in the heating and cooking stove initiative. Finland is also a participant in development cooperation projects within the framework of the Global Alliance for Clean Cookstoves as well as a partner country in the Global Methane Initiative (GMI).

4 Highlights of best practices or lessons learned for key sectors

Burn right information campaigns

Information campaigns aimed at influencing how people store wood fuel and operate their stoves can be a cost efficient way to raise people's awareness about emissions and impacts of small scale combustion and to guide people towards operating their stoves right and as a results reduce the emissions, including black carbon. Many municipalities and regions all over the country have conducted such campaigns utilizing material collected to a centralized web portal. The utilization of chimney sweeps in handing out the guidance documents and instructing people on how to use their stoves appropriately has been considered good, since people generally acknowledge and value the expertise of the chimney sweeps. Additional information is included in Table 1.

Use of integrated assessment of multiple pollutants and impacts in formulating national policies

Finland has been active in developing emission inventories of black carbon and methane as well as integrated assessment tools to estimate future emissions, impacts and mitigation costs of different policy options. Such frameworks have been useful in identifying the relevant source sectors and potential mitigation measures, including their costs, to support formulation of policies in both national and international fora.

5 Projects relevant for the Arctic

During the last decade several research projects and programmes have included individual projects on fine particulates and black carbon also extending to their health and climate effects have been conducted. For example the state research institutes - the Finnish Environment Institute (SYKE), the Finnish Meteorological Institute (FMI), VTT Technical Research Centre and the National Institute for Health and Welfare (THL) - and the universities of Helsinki and Eastern Finland have participated in several of these studies. These institutes have also participated in international or EU-wide projects. Example of a recently finalized project focusing on black carbon is the MACEB project (Mitigation of Arctic warming by controlling European black carbon emissions, 2010-2013) that received funding from the EU Life+ programme (more information http://www.maceb.fi/).

The Finnish Climate Panel

The Finnish Climate Panel (http://www.ilmastopaneeli.fi/fi/in-english/) is an independent, interdisciplinary think tank of top-level Finnish scholars. The Panel provides scientific advice for policy-making and reinforces interdisciplinary insight in the operation of different sectors. The Panel also serves as an advisor to the Finnish ministerial working group on energy and climate policy. The panel has initiated several research projects, ao. "Black Carbon as Radiative Forcing: The Global and Regional Effects of Emissions and Possible Emission Reductions" in 2014.

Current major national research Programmes

The Academy of Finland's Arctic Academy Programme (ARKTIKO, 2014–2018, Academy of Finland funding share: 15M€, http://www.aka.fi/arktiko) aims to study and understand the change factors affecting the development of the Arctic region, the transformation process, and the dynamics of change. Examples of projects relevant for black carbon and methane:

- Keeping the Arctic White: Regulatory Options for Reducing Short-Lived Climate Forcers in the Arctic (WHITE)
- Carbon Balance under Changing Processes of Arctic and Subarctic Cryosphere (CARB-ARC)
- Long-Term Effects of Fire on Carbon and Nitrogen Pools and Fluxes in the Arctic Permafrost and Subarctic Forests (ARCTICFIRE)

Tekes – the Finnish Funding Agency's "Arctic Seas" programme (2014-2017, TEKES funding share 45 M€, http://www.tekes.fi/en/programmes-and-services/tekes-programmes/arctic-seas/). Project relevant for black carbon and methane:

- Shipping Emissions in the Arctic (Black Carbon) (SEA-EFFECTS BC)

Atmospheric measurements in the Arctic area

Finnish Meteorological Institute (FMI) operates a measurements station in Pallas, Finland, which is part of the Global Atmospheric Watch (GAW) Program of the World Meteorological Organization (WMO). Black carbon and methane are part of the extensive measurement infrastructure of the Pallas station. FMI co-operates with AARI (Russia) and NOAA (United States) to maintain a measurement station in Tiksi, Russia. Black carbon and methane measurements have been part of the measurement program. FMI and AARI are extending the black carbon and methane measurements to Cape Baranov, Russia.

6 Finnish studies on health and climate effects

Health effects

Specific studies on estimating the health effects of black carbon in Finland have not been conducted. However, Ahtoniemi et al (2010) studied the health effects of fine particle emissions in Finland for the year 2000 and concluded following:

- The effects caused by primary fine particle emissions from domestic wood combustion and traffic were estimated to be over 1000 premature deaths annually.
- The emission-exposure relationship, expressed as intake fraction, showed that the traffic emissions have higher potential to expose people than domestic wood combustion emissions. The differences between different domestic wood combustion sub-sectors, e.g. the use of wood stoves and small heating boilers, were also significant.

Climate effects

Two recent national projects have studied the effect of Finnish black carbon emissions on Arctic and global climate (the MACEB project, Finnish Climate Panel project on black carbon, Laaksonen et al 2014, see also Ch. 5). The projects reported following findings:

- Finnish emissions have a significant influence on black carbon surface air concentrations over most of the southern Finland. Outside Finland, the contribution of Finnish emission to black carbon surface air concentrations and black carbon burden is in practice minor or negligible.
- According to climate simulations the climate effect of Finnish emissions of black carbon occurs mostly due to earlier melt of snow and ice.
- The relative contribution of Finnish black carbon emissions to the global snow albedo effect is estimated to be about 1%, whereas to the global indirect and direct climate effects about 0.1%.
- Emission reductions occurring during winter are more effective in reducing the climate effects than reductions during summer. Additionally the cooling effect of organic carbon and sulphates is practically negligible during winter.

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Annex 1. Guidance for National Submissions

This guidance is intended to provide clarity for the initial launch and implementation of the Arctic Council Framework. As this Framework creates a first-time reporting and review function that will occur periodically over multiple chairmanship cycles of the Arctic Council, this initial guidance is intentionally simple and flexible, and may need to be further refined and clarified over time as more experience is gained.

Arctic States and participating Arctic Council Observer States are requested to provide information following this guidance, taking into account national circumstances.

Each Arctic State, and participating Arctic Council Observer States, should submit, to the degree possible, the following to the Arctic Council Secretariat:

1. Summary of current black carbon emissions to CLRTAP, where appropriate, and, if available, future projections
2. Summary of current methane emissions to UNFCCC and, if available, future projections
3. Summary of National Actions, National Action Plans, or Mitigation Strategies by sector
4. Highlights of best practices or lessons learned for key sectors
5. Projects relevant for the Arctic
6. Other information if available (e.g., climate, health, environmental, economic effects of emissions and mitigation)

Further guidance for each of these elements is provided here:

Summary of current black carbon emissions to CLRTAP, as appropriate, and, if available, future projections

In the national submission to the Arctic Council Secretariat, each Arctic State and participating Arctic Council Observer States should have the option of including: a) a high-level summary of their black carbon emissions as submitted to CLRTAP or that is generally consistent with relevant guidelines under CLRTAP; b) the same submission as provided to CLRTAP; or c) notification to the Secretariat that the black carbon emission inventory has been submitted to CLRTAP and where it can be collected from CLRTAP's public website. The sectoral breakout of black carbon emissions is expected to be consistent with relevant CLRTAP guidelines, where applicable. States not submitting inventories to CLRTAP may wish to provide a high-level summary of national black carbon emissions. Future black carbon emission projections, if available, should generally cover the same sectors as provided in the emissions inventory, and should extend from the latest available baseline year out to the next 10-30 years.

Summary of current methane emissions to UNFCCC and, if available, future projections

In the national submission to the Arctic Council Secretariat, each Arctic State and participating Arctic Council Observer States should have the option of including: a) a high-level summary oftheir methane emissions as submitted to UNFCCC; b) the same inventory as submitted to UNFCCC; or c) notification to the Secretariat that the greenhouse gas (including methane) inventory has been submitted to UNFCCC and where it can be collected from UNFCCC's public website. The sectoral breakout of methane emissions is expected to be consistent with the inventories submitted to UNFCCC.

Future anthropogenic methane emission projections, if available, should generally cover the same sectors as provided in the emissions inventory, and should extend from the best available baseline year out to the next 10-30 years.

Summary of National Actions or National Action Plans or Mitigation Strategies by sector

Each Arctic State and participating Arctic Council Observer States should provide brief information about key mitigation actions occurring in each sector, but should have flexibility in how such information is summarized. For example, information on national actions, brief summaries of action plans, or brief descriptions of mitigation strategies can be included. Summaries of methane mitigation actions contained in National Communications to the UNFCCC may be used for this purpose.

Highlights of best practices or lessons learned for key sectors

In the national submission to the Arctic Council Secretariat, each Arctic State and participating Arctic Council Observer States may wish to highlight successes, progress, and/or lessons learned in reducing emissions and implementing mitigation strategies for particular sources and sectors.

Projects relevant for the Arctic

In the national submission to the Arctic Council Secretariat, each Arctic State and participating Arctic Council Observer States may wish to highlight particular demonstration, research, atmospheric modeling, or mitigation projects that address either emissions characterization, emission reduction potential, mitigation implementation feasibility, mitigation costs, and/or environmental, health, and climate effects. This may include projects occurring under the Arctic Council or projects occurring outside of Arctic Council Working Groups, including in other multi-national fora.

Other information if available (e.g., climate, health, environmental, economic effects of emissions and mitigation)

In the national submission to the Arctic Council Secretariat, each Arctic State and participating Arctic Council Observer States may wish to highlight particular analyses and assessments that could contribute to improved understanding of climate, health, environmental and/or economic effects of current or projected levels of emissions, and the effects of mitigating emissions.

Annex 2. Aggregation used in summarizing the Finnish national submission to CLRTAP on historical emission of black carbon

Aggregated sectors	NFR Aggregation for Gridding and LPS (GNFR)
Industry and power generation	A_PublicPower
Industry and power generation	B_Industry
Residential and other small scale stationary combustion	C_OtherStationaryComb
Fugitive (incl. Flaring)	D_Fugitive
Other	E_Solvents
Transport	F_RoadTransport
Transport	G_Shipping
Transport	H_Aviation
Transport	I_Offroad
Other	J_Waste
Other	K_AgriLivestock
Field burning of agricultural wastes	L_AgriOther
Other	M_Other

Annex 3. Emission of Black Carbon in Finland 2000-2013 (Source: CLRTAP inventory 2015. http://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/2015_submissions/

Gg BC a^{-1}	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Field burning of agricultural wastes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fugitive (incl. Flaring)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industry and power generation	0.10	0.09	0.08	0.08	0.12	0.23	0.23	0.20	0.22	0.14	0.16	0.15	0.13	0.13
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.01
Residential and other small scale stationary combustion	2.51	2.90	3.00	3.03	3.05	3.19	3.31	3.34	3.46	3.69	4.08	3.23	4.35	3.98
Transport	3.86	3.62	3.42	3.24	3.00	2.58	2.33	2.23	2.12	1.96	1.97	1.94	1.82	1.51
Total	6.48	6.62	6.50	6.36	6.18	6.00	5.88	5.78	5.81	5.80	6.21	5.32	6.31	5.63

Annex 4. Emissions of Methane in Finland 1990-2012 (Source: UNFCCC inventory 2014. https://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php

Gg CH4 a^{-1}	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Energy	15.1	16.3	17.0	17.6	18.1	18.0	18.4	17.8	17.9	16.9	16.3	17.9	17.7	18.1	17.6	17.5	17.5	17.1	17.2	17.5	18.8	16.7	17.6
Industrial Processes	0.2	0.2	0.2	0.4	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Solvent and Other Product Use	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Agriculture	97.0	93.2	90.4	91.2	91.7	87.7	88.0	89.7	87.8	86.5	86.9	86.1	87.5	87.2	86.7	86.6	86.6	85.9	85.3	85.8	87.4	86.3	85.5
Land Use, Land-Use Change and Forestry	2.2	2.1	2.2	2.1	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.4	2.5	2.5	2.5	2.6	2.7	2.7	2.7	2.7
Waste	181.4	183.4	184.2	184.1	181.4	178.5	174.1	169.3	161.7	158.0	148.2	141.9	131.7	123.2	116.7	106.7	109.8	105.2	100.7	96.7	96.4	92.9	90.9
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	296.0	295.3	293.9	295.4	293.9	287.0	283.2	279.7	270.2	264.3	254.3	248.8	239.9	231.4	223.9	213.8	216.9	211.2	206.2	203.1	205.8	199.0	197.2

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Title of publication	**Emissions of Black Carbon and Methane in Finland. 2015 National Submission to the Arctic Council**			
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Theme of publication				
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Abstract	The Arctic air continues to warm at twice the global average rate. Loss of Arctic snow/ice cover and thawing of permafrost accelerate warming on a global basis, and melting of land-based ice contributes to global sea-level rise. In other words the rapid warming of the Arctic has profound consequences not only for the Arctic region but also worldwide. What happens in the Arctic doesn't stay in the Arctic. To slow the pace of warming over the next two to three decades – globally and in the Arctic – reducing emissions of short-lived climate pollutants such as black carbon and methane is essential, along with action to reduce CO_2, emissions. Not only do these short-lived substances persist in the atmosphere for far shorter periods than CO_2, but they also trap more heat on a per-unit basis. In addition, black carbon that falls on Arctic ice or snow reduces reflectivity and increases heat absorption, further accelerating melting and warming. In April 2015 the Ministers of the Arctic Council adopted a Framework for Enhanced Action to Reduce Black Carbon and Methane Emissions. The Framework lays out a common vision for enhanced action to accelerate the decline of black carbon emissions and significantly reduce methane emissions. As an important step towards achieving this vision the Framework provides an "ambitious, aspirational and quantitative collective goal on black carbon" would be adopted at the 2017 ministerial. An Expert Group, chaired by the Arctic state holding the Council chair for that two-year cycle, is tasked to periodically assess progress of the implementation of the Framework, and to inform policy makers from Arctic states and for participating Arctic Council Observer states of the status. This includes preparing, on a once every two-year cycle of the Arctic Council chairmanship, a high level "Summary of Progress and Recommendations" report, with appropriate conclusions and recommendations. To support the process Arctic States agreed to submit biennial national reports on their existing and planned actions to reduce black carbon and methane, national inventories of these pollutants and projections of future emissions, where available. All Arctic States, seven Observer States and the European Union submitted national reports. Several countries' reports contain their first-ever national black carbon inventory. This report presents the Finnish national report to the Arctic Council.			
Keywords	Arctic Council, Black Carbon, Methane			
Financier/ commissioner	Ministry of the Environment			
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Tekijä(t)	Elina Rautalahti ja Kaarle Kupiainen			
Julkaisun nimi	**Emissions of Black Carbon and Methane in Finland. 2015 National Submission to the Arctic Council** (Mustahiili- ja metaanipäästöt Suomessa Vuoden 2015 kansallinen raportti Arktiselle neuvostolle)			
Julkaisusarjan nimi ja numero	Ympäristöministeriön raportteja 19en | 2016			
Julkaisun teema				
Julkaisun osat/ muut saman projektin tuottamat julkaisut				
Tiivistelmä	Arktinen ilmasto lämpenee edelleen kaksi kertaa maailmanlaajuista keskiarvoa nopeammin. Arktisen lumi- ja jääpeitteen menetys ja ikiroudan sulaminen kiihdyttävät ilmaston lämpenemistä kautta maailman. Lisäksi maapohjaisen jään sulaminen nostaa merenpintaa kaikkialla. Toisin sanoen arktisen alueen nopea lämpeneminen aiheuttaa merkittäviä seurauksia myös muualla maailmassa. Se mitä tapahtuu pohjoisilla leveysasteilla ei jää pelkästään paikallisten murheeksi. Jotta lämpenemistä saataisiin hidastettua seuraavien kahden tai kolmen vuosikymmenen aikana arktisilla alueilla ja koko maailmassa, on hiilidioksidipäästöjen vähentämisen ohella ehdottoman tärkeää suitsia myös lyhytikäisten ilmansaasteiden, kuten mustan hiilen ja metaanin, päästöjä Nämä lyhytikäiset aineet säilyvät ilmakehässä selvästi vähemmän aikaa kuin hiilidioksidi, mutta ne sitovat enemmän lämpöä yksikkökohtaisesti. Lisäksi arktiselle jäälle ja lumelle laskeutuva musta hiili alentaa heijastavuutta ja lisää näin lämmönimeytymistä, mikä taas kiihdyttää sulamis- ja lämpenemisprosessia. Huhtikuussa 2015 Arktisen neuvoston ministerit hyväksyivät puiteasiakirjan tehostetuista toimista mustahiili- ja metaanipäästöjen vähentämiseksi. Puitteissa määritellään yhteinen visio tehostetulle toiminnalle, jolla voidaan kiihdyttää mustahiilipäästöjen karsimista ja merkittävästi pienentää metaanipäästöjä. Tärkeänä askeleena kohti vision toteuttamista puiteasiakirja määrittää mustan hiilen vähentämiselle kunnianhimoisen määrällisen yhteistavoitteen, joka otetaan käyttöön ministerien tapaamisessa vuonna 2017. Hanketta varten on perustettu asiantuntijaryhmä, jota johtaa kaksivuotiskauden ajan puheenjohtajuutta pitävä arktinen valtio. Ryhmän tehtävänä on arvioida puiteasiakirjan toteutusta säännöllisesti sekä tiedottaa arktisten valtioiden päätöksentekijöitä ja hankkeeseen osallistuvia Arktisen neuvoston tarkkailijavaltioita toteutuksen tilasta. Tähän sisältyy asianmukaisia johtopäätöksiä ja suosituksia sisältävän edistymis- ja suositusyhteenvedon laatiminen kerran neuvoston puheenjohtajuuskauden aikana. Hankkeen tueksi arktisen alueen valtiot sitoutuivat laatimaan kahden vuoden välein raportin olemassa olevista ja suunnitelluista toimistaan mustan hiilen ja metaanin vähentämiseksi sekä kartoittamaan mainittuja saasteita kansallisella tasolla ja arvioimaan tulevia päästöjä mahdollisuuksien mukaan. Kansalliset raportit saatiin kaikilta arktisen alueen valtioilta, seitsemältä tarkkailijavaltiolta ja Euroopan unionilta. Useiden maiden kohdalla raportista löytyy niiden ensimmäinen kansallisen tason mustahiiliselvitys. Tässä raportissa esitetään Suomen kansallinen raportti Arktiselle neuvostolle.			
Asiasanat	Arktinen neuvosto, musta hiili, metaani			
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