



NATIONAL REPORT BY ICELAND

Emissions of Black Carbon and Methane in Iceland 1990-2016

2018

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1 Introduction

This report is Iceland's contribution to the Arctic Council Enhanced Black Carbon and Methane Emissions Reductions, an Arctic Council Framework of Action¹ that was approved at the ministerial meeting in Iqaluit, Canada, in April 2015. The report includes a summary of black carbon (BC) and methane emissions for the years 1990-2016.

The BC data in this report is in accordance to the Convention on Long-Range Transboundary Air Pollution (CLRTAP) guidelines as reported to CLRTAP under the Economic Commission for Europe of the United Nations (UNECE). BC emissions in Iceland were first estimated in 2015. The BC estimate has been improved significantly since the 2015 submission, several new emission sources have been estimated, and timeseries consistency improved.

The methane emission data in this report is in accordance with Iceland's commitments to United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol (KP) and the European Union (EU). Iceland's methane emission estimates have a broad coverage over all sectors and the whole timeseries (1990-2016). The methane estimates were done in accordance with Iceland's Climate Change Act No 70/2012, the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, and Kyoto Protocol.

The emissions, black carbon and methane are estimated, in accordance to the International Panel on Climate Change (IPCC) guidelines by sectors; Energy, Industrial Processes, Agriculture and Waste.

¹ https://oaarchive.arctic-council.org/bitstream/handle/11374/610/ACMMCA09_Iqaluit_2015_SAO_Report_Annex_4_TFBCM_Framework_Document.pdf?sequence=1&isAllowed=y

2 Summary of current black carbon emissions and future projections

2.1 Background

Reported BC data is taken from Iceland's National Informative Inventory Report (IIR) and Nomenclature for Reporting tables (NFR tables) reported to voluntarily in the framework of the CLRTAP under the UNECE for emissions in 1990-2016. Emission estimates are based on data from national or official activity data, that is collected from various institutions and companies, as well by the EAI directly, e.g. energy statistics, Green Accounting, Animal statistics, European Union Emissions Trading Scheme (EU ETS), import and export data from customs.

2.2 Iceland's BC inventory data

Black carbon emissions in Iceland were estimated and submitted for the first time in 2015 under CLRTAP. In the first submission BC emission were only estimated for a few sources, mostly for sources with existing emission estimates for particulate matter (PM) as the emission factor is often given as a % of PM. In the 2015 submission timeseries were not always complete, due to lack of data, but the emphasis was on estimating BC data for the year 2013 as it was used as a base year for the Arctic Council Expert Group on Black Carbon and Methane (EGBCM) recommendations. The EGBCM recommended that BC emissions be further collectively reduced by at least 25-33 % below 2013 levels by 2025.

Even though BC emissions data in Iceland has been improved significantly since the 2015 submissions, there is still need for further improvement and the data should be interpreted with caution.

The total estimated black carbon emissions in 2016 are 198 kt., with activities within the Energy sector contributing to almost 93,7% of the total BC emissions (Figure 2.2). Road transport and national fishing are the main sources of black carbon in the energy sector. Almost 100% of households in Iceland use either geothermal or hydroelectric sources for space heating. Wood burning for household heating is very limited in Iceland and the emissions have not been estimated. BC emissions from agriculture has not been estimated. BC emissions from waste have been decreasing since 1990, with 2016 emissions 91% below the 1990 and the reason is decrease in open burning of waste.

Table 1 Total Black emissions by sector (kt)

	1990	1995	2000	2005	2010	2013	2014	2015	2016	Change 1990 - 2016	Change 2013 - 2016
1. Energy	162,9	191,1	265,1	269,9	208,5	185,5	194,3	187,9	185,5	14%	0%
2. Industrial processes	2,2	2,4	3,9	4,8	8,0	7,8	7,7	8,4	6,3	182%	-19%
3. Agriculture	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
5. Waste	67,0	46,6	28,3	7,6	6,1	5,9	6,4	6,2	6,3	-91%	4%
Total BC emissions (kt.)	232,1	240,0	297,3	282,3	222,6	199,2	208,4	202,5	198,0	-15%	2%

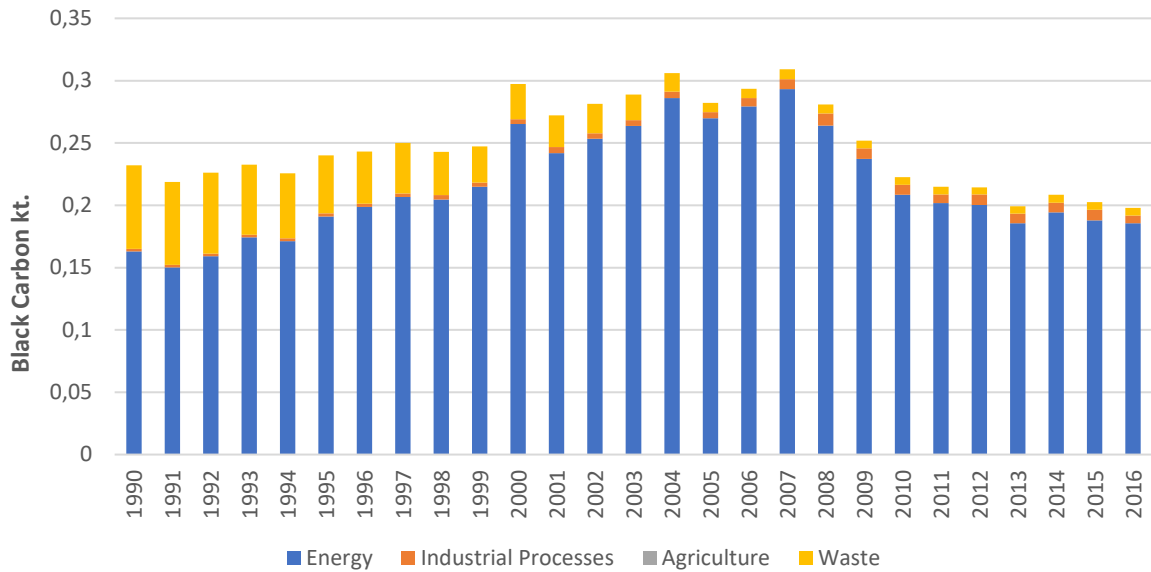


Figure 2.1 Black Carbon emissions (kt) by IPCC sector 1990-2016.

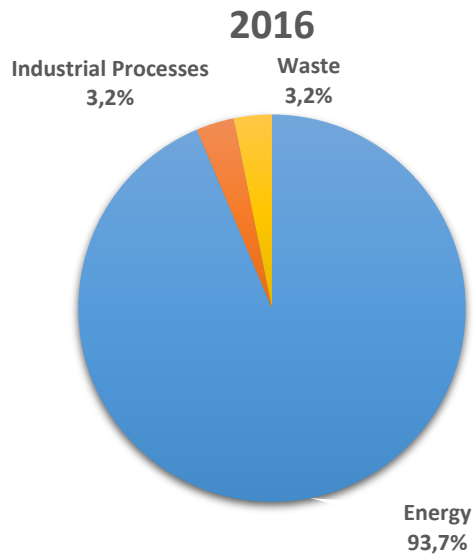


Figure 2.2 Total Black Carbon emissions in 2016 by IPCC sector.

2.3 Iceland's BC projections

Iceland is currently working on updating Iceland's projections for greenhouse gases, and will then update the air quality projections in accordance to the greenhouse gas projections, including projections for black carbon.

3 Summary of current methane emissions to UNFCCC and future projections

3.1 Background

Reported methane data is taken from Iceland's National Inventory Report(NIR)² and the Common Reporting Format tables (CRF)³ reported to the United Nations Framework Convention on Climate Change (UNFCCC) and the European Union (EU).

Emission estimates are based on data from national or official activity data, that is collected from various institutions and companies, as well by the EAI directly, e.g. energy statistics, Green Accounting, Animal statistics, European Union Emissions Trading Scheme (EU ETS), import and export data from customs. The NIR was prepared in accordance with Iceland's Climate Change Act No 70/2012, the IPCC Guidelines and Kyoto Protocol.

3.2 Iceland's methane inventory data

Methane (CH₄) emissions were 14,9% of Iceland's greenhouse gas emissions in 1990, and 12,7% in 2016, excluding emissions from land use, land-use change and forestry (LULUCF). Agriculture and waste treatment have been the main sources of CH₄ emissions in Iceland since 1990. In 2016 CH₄ emissions from agriculture accounted for 60,8% of Iceland's CH₄ emissions (excluding LULUCF), waste 37,3%, energy 1,4% and industrial processes 0,5% The main CH₄ source in the agriculture sector is enteric fermentation which accounted for roughly 51% of all CH₄ emissions in 2016.

Total CH₄ emissions from waste have increased by 33% between 1990 and 2016. The total CH₄ emissions from waste treatment increased sharply from 1990 to 2007 although the amount of waste landfilled had been oscillating between 300 and 350 kt. from 1986 to 2005. The increase was due to an increasing share of waste landfilled in well managed solid waste disposal sites which are characterised by a higher methane correction factors than unmanaged sites. The decrease in methane emissions from the waste sector since 2005 by 20% is due to a decrease in the amount of waste landfilled since 2005.

Table 2 Methane emissions by sector 1990-2016 (CO₂e)

	1990	1995	2000	2005	2010	2013	2014	2015	2016	Change 1990 - 2016
1. Energy	7,9	7,1	6,5	6,2	9,6	8,2	8,7	8,8	8,0	2%
2. Industrial processes	1,6	1,9	2,8	2,8	2,6	3,0	2,7	3,0	3,3	102%
3. Agriculture	367,2	346,7	335,8	325,6	346,8	336,4	352,5	357,9	361,7	-1%
5. Waste	166,0	230,9	256,8	268,0	277,1	238,4	235,3	229,4	221,6	33%
Total CH₄ emissions (CO₂e)	542,8	586,5	601,7	602,6	636,1	586,01	599,2	599,0	594,6	10%

² http://ust.is/library/Skrar/Einstaklingar/Loftgaedi/NIR%20Iceland%202017%20submission_May%20resub.pdf

³ Resubmitted during UNFCCC's review week 28 August 2017 – 2 September 2017, with updated emission estimates.

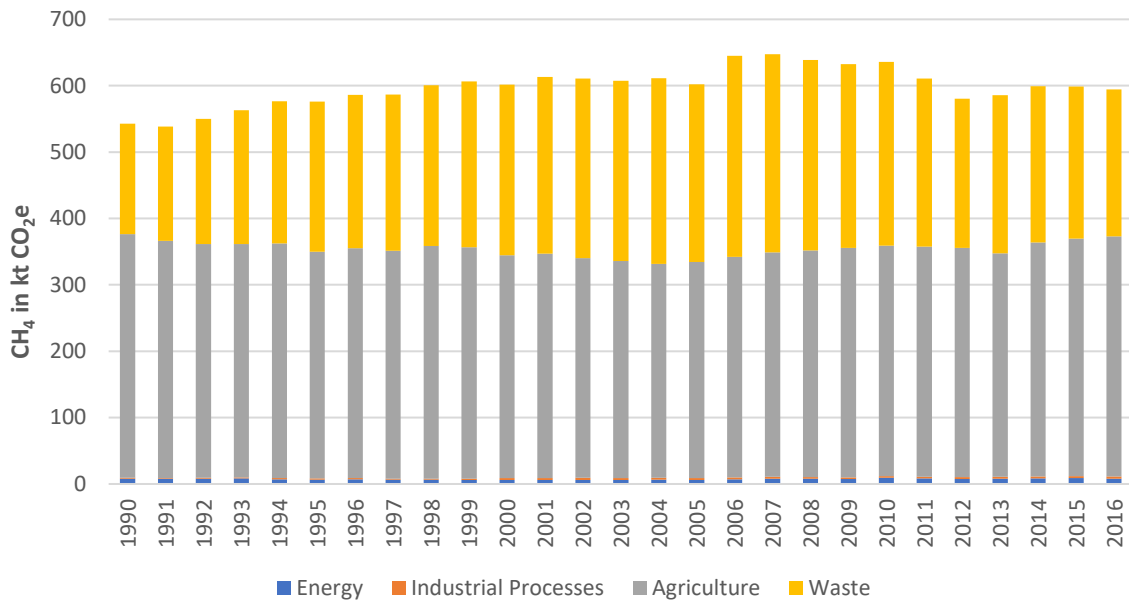


Figure 3.1 Methane emissions (kt CO₂e) in Iceland by IPCC sector 1990-2016.

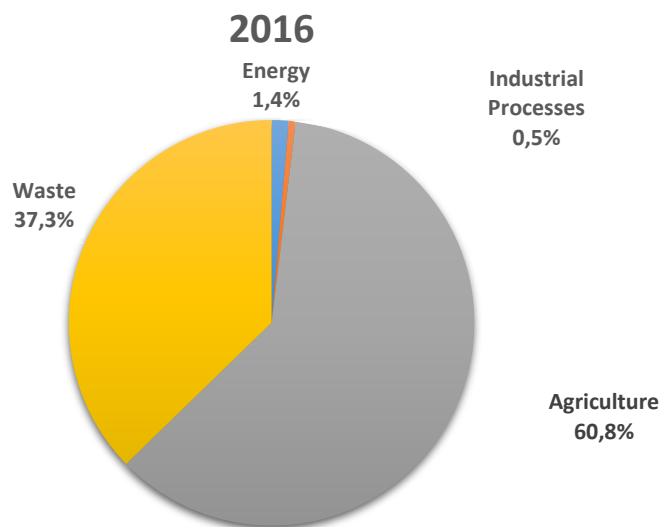


Figure 3.2 Total Methane emissions in 2016 by IPCC sector.

3.3 Iceland's methane projections

Iceland is currently working on updating Iceland's projections for greenhouse gases, including projections for CH₄.

4 Summary of national actions, national action plans, or mitigation strategies by sector

4.1 Cross-sectoral

Several initiatives have a positive effect across all sectors. The main initiatives taken in Iceland that reduce BC and CH₄ emissions, are listed in Table 3. Several initiatives have a positive effect across all sectors. The main initiatives taken in Iceland that reduce BC and CH₄ emissions, are listed in Table 3. Also, work is underway by the Icelandic government to evaluate and incorporate the new National Emissions Ceiling Directive (2016/2284) into the EEA agreement in addition to the initiatives mentioned in Table 3. Iceland-specific targets are yet to be determined, however, it is expected that the implementation of the Directive will lead to reduces PM emissions and thereby, reduced BC emissions.

Table 3 Initiatives that effect BC and CH₄ emissions across sectors.

Cross-sectoral			
Initiative and year of implementation	Content of initiative	Type of initiative	Pollutant
National Air Quality Action Plan (2018)	The plan is set forth to promote air quality and a healthy environment in Iceland by reducing ambient air pollution concentrations. The main objectives are to decrease yearly premature deaths attributable to PM _{2.5} as well as to reduce daily exceedances of traffic related PM ₁₀ . These actions inevitably reduce emissions from BC.	Action Plan	BC
Increased public transportation and cycling (2012)	Governmental support of public transport and construction of bike and walking paths. Reduces emissions from transport, including BC and CH ₄ .	Strategy	BC, CH ₄
Climate Change Act No (70/2012)	In June 2012 the Icelandic Parliament passed a new law on climate. In June 2012 the Icelandic Parliament passed a new law on climate change (Act No 70/2012). The objectives of the Act are the following: - To reduce greenhouse gas emissions efficiently and effectively, - To increase carbon sequestration from the atmosphere, - To promote mitigation to the consequences of climate change, and - To create conditions for the government to fulfil its international obligations regarding climate change.	Regulatory	BC, CH ₄
Green Accounting (2002)	Requires the industry sector to hold, and to publish annually, information on how environmental issues are handled, the amount of raw material and energy consumed, the amount of discharged pollutants, including greenhouse gas emissions, and waste generated.	Regulatory	BC, CH ₄
Climate Change implementation plan (2010)	An instrument for implementation of climate policies and monitoring of progress.	Action Plan	BC, CH ₄
National strategy for sustainable development 2002 - 2020 (2002)	A general framework for policies set by authorities in fields relating to sustainable development.	Strategy	BC, CH ₄
CO₂- neutral Iceland in 2050 (2017)	Iceland's government works on putting together an action plan to become CO ₂ -neutral by 2050. This will lead to reduced use of fossil fuels and therefore reduce both BC and CH ₄ emissions.	Action Plan	BC, CH ₄

4.2 Energy

The energy sector is the second smallest source of CH₄ emissions (1%) in Iceland, but the largest source of BC emissions (93,7%). Actions within the energy sector are therefore a key to reduce BC emissions in Iceland. In Table 4 are the main initiatives that should reduce BC and CH₄ emissions in Iceland. Besides the initiatives listed in Table 5, is the Icelandic government currently reviewing the tax system for fossil fuels with the aim to reduce emissions from fossil fuels.

Table 4 Initiatives taken in Iceland to reduce emissions from the Energy sector.

Energy			
Initiative and year of implementation	Content of initiative	Type of initiative	Pollutant
EU Emission Trading System (2008)	Cap is set on emissions from certain activities. The cap is reduced over time. EEA wide market with emission permits. Aims at reducing emissions from fossil fuels, should therefore reduce both BC and CH ₄ emissions.	Economic	BC, CH ₄
Oslo Declaration on Nordic Climate leadership (2017)	Declaration from the Nordic Ministers for Climate and the Environment on Nordic Climate leadership. Encourages further actions to reduce emissions of greenhouse gases, including CH ₄ .	Strategy	CH ₄
Energy change (2016)	The Icelandic government has put forward an action plan to reduce the use of fossil fuels. This will reduce BC and CH ₄ emissions.	Action plan	BC, CH ₄
Carbon Tax (2010)	Tax on liquid and gaseous fossil fuels. Aims at reducing emissions from fossil fuels and should reduce both BC and CH ₄ emissions.	Fiscal	BC, CH ₄
No VAT on zero -emission vehicles, with a cap (2012)	"Zero -emission" vehicles are exempted from VAT. This reduces all emissions from fossil fuel burning from transportation, including BC and CH ₄ .	Fiscal	BC, CH ₄
Exemption from excise duty and carbon tax for CO₂ neutral fuels (2010/2011)	No excise duty and carbon tax on CO ₂ neutral fuels. Reduces emissions from transport, including BC and CH ₄ .	Fiscal	BC, CH ₄
Reduced excise duty and semiannual car tax on methane vehicles (2011)	Reduced excise duty and semi-annual car tax on methane vehicles. Reduces emissions from transport, including BC and CH ₄ .	Fiscal	BC, CH ₄
Parking benefits for low emission vehicles (2007)	In the City of Reykjavík are low emission vehicles eligible for free parking. Reduces emissions from transport, including BC and CH ₄ .	Fiscal	BC, CH ₄
Renewables in fuel for transport (2014)	Requirement of blending fossil fuels with renewables. Reduces emissions from transport, including BC and CH ₄ .	Regulatory	BC, CH ₄
Public procurement of low-emission vehicles (2011)	The City of Reykjavík favours low emission vehicles in public procurement. Reduces emissions from transport, including BC and CH ₄ .	Regulatory	BC, CH ₄
Action Plan to reduce soot emissions from diesel motors and studded tires (2007)	Working group on particulate matter was established by the Ministry of Transport and Local Government and the Ministry for the Environment and Natural Resources put together an action plan on how to reduce soot emissions from diesel motors and studded tires. http://www.vegagerdin.is/vefur2.nsf/Files/MotvaegiSvifrykLo kaskVinnuhops/\$file/M%C3%B3tvaegiSvifryki%20-%20Lokask%C3%BDrsla.pdf	Action Plan	BC
EURO standards for type-approval of motor vehicles and their trailers	Iceland has implemented EU's legal framework on type-approval of motor vehicles and their trailers (EURO standards). This reduces emissions from transport, including BC and CH ₄ .	Regulatory	BC, CH ₄
Ban on idling vehicles to run their engines (2007)	Ban on letting idling vehicles run their engines. This reduces both BC and CH ₄ emissions (Icelandic Regulation No 1127/2007).	Regulatory	BC, CH ₄
Improved Public transport in the capital area	The goal is to develop a solid backbone of public transport in the main corridors in the Capital Area. The concept will be either bus rapid transit (BRT) or a light rail transit (LRT) – in both cases ensuring a high frequent, fast, and reliable transport option. This will reduce the use of fossil fuels and BC and CH ₄ emissions.	Project	BC, CH ₄

Sulphur requirements to marine fuels (2018)	Directive on sulphur content in marine fuels implemented into Icelandic law in 2015 (Icelandic Regulation No 124/2015). The regulation will lead to reduced sulphur and particulate matter emissions from shipping. Iceland has ratified the annex VI in MARPOL and entered into force 22 nd of February 2018.	Regulatory	BC
Annex VI in MARPOL- Requirements on energy efficiency for newly-built vessels (2018)	Iceland has ratified the annex VI in MARPOL that entered into force 22 nd of February 2018. The requirements on energy efficiency for newly-built vessels will be implemented into Icelandic law (Icelandic Regulation No 586/2017) in the beginning of March 2018.	Regulatory	BC
Use of shore side electricity in harbours	Harbours have provided with electricity to use by ships at berth. Emissions have been shown to reduce from ships, mostly in old harbours and in Akranes. http://www.faxafloahafnir.is/wp-content/uploads/Fork%C3%B6nnun-%C3%A1-aukinni-notkun-endurn%C3%BDjanlegra-orkugjafa-vi%C3%B0-Faxafloahafnir.pdf	Project	BC

4.3 Industrial Processes

The sector for industrial processes was only a source to 0,5% of Iceland's CH₄ emissions in 2016, and 3,2% of the BC emissions. In Table 5 are the main initiatives that should reduce BC and CH₄ emissions from industrial processes in Iceland presented.

Table 5 Initiatives taken in Iceland to reduce emissions from the Industrial Processes sector.

Industrial Processes			
Initiative and year of implementation	Content of initiative	Type of initiative	Pollutant
Industrial Emissions Directive 2010/75/EU	Best available technique (BAT) requirements for industrial processes according to the provisions of the Industrial Emissions directive. The EU Directive has been implemented into Icelandic law and aims at reducing emissions by using the BAT. This reduces both BC and CH ₄ emissions.	Regulatory	BC
EU Emission Trading System (2008)	Cap is set on emissions from stationary installations. The cap is lowered over time. EEA wide market with emission permits. Aims at reducing emissions from fossil fuels and, should reduce both BC and CH ₄ emissions.	Economic	BC, CH ₄

4.4 Agriculture

Agriculture accounted for 61% of Iceland's methane emissions in 2016. BC emissions have not been estimated from agriculture in Iceland. In Table 6 are the main initiatives that should reduce CH₄ emissions from agriculture in Iceland presented.

Table 6 Initiatives taken in Iceland to reduce emissions from the Agriculture sector

Agriculture			
Initiative and year of implementation	Content of initiative	Type of initiative	Pollutant
Directive on the Protection of the Environment, and particularly the soil, when sewage sludge is used in agriculture (86/278/EEC) (1999)	Regulation on treatment of sludge (Icelandic Regulation No 799/1999). The dumping of sludge is prohibited in these acts and the use of sludge in agriculture is encouraged. In a transitional period when the infrastructure for the handling of sludge for use is not in place can lead to a temporary increase in landfilling and therefore to an increase in methane production. With the reduction of landfilling and increased use of sludge the methane production is expected to decline.	Regulatory	CH ₄
The Directive concerning the protection of waters against pollution caused by Nitrates from agricultural sources (91/676/EEC) (1999)	Regulation on the protection against the contamination of nitrogenous substances from agriculture and other businesses (Icelandic Regulation No 804/1999). Although no sensitive areas have been defined in Iceland according to these acts a code of good agricultural practices has been published for voluntary use. Adhering to the code, farmers should be able to keep manure in storage over the winter time to be able to spread it only in periods without frost in the soil. This tends to increase the amount of manure stored and thus increase the production of CH ₄ .	Regulatory	CH ₄
CO₂- neutral sheep products (2017)	Sheep farmers in Iceland have agreed on an action plan to make Icelandic sheep products CO ₂ -neutral as soon as possible. This will lead to reduced CH ₄ emissions in Iceland.	Action Plan	CH ₄
Wetland restoration (2016)	The Ministry for the Environment and Natural Resource published an action plan for restoring wetlands in Iceland, to reduce greenhouse gas emissions. https://www.stjornarradid.is/media/umhverfisraduneyti-media/media/PDF_skrar/sk160307_endurheimt_votlendis.pdf	Action Plan	CH ₄

4.5 Waste

Waste is the second largest source of methane emissions in Iceland (37,3%), but only a source to 3,2% of the BC emissions in 2016. In Table 7 are the main initiatives that should reduce BC and CH₄ emissions from waste in Iceland.

Table 7 Initiatives taken in Iceland to reduce emissions from the Waste sector

Waste			
Initiative and year of implementation	Content of initiative	Type of initiative	Pollutant
EU Landfill Directive (EC/31/1999)	A directive on landfill was implemented in 2003. Also, in 2014, Iceland implemented national rules regarding landfill gas recovery at small landfills, as an addition to the general rules laid out in the Directive. Iceland received a 4-year derogation regarding the targets laid out in Article 4(2) of the Directive.	Regulatory	CH ₄
United Against Waste (2016)	Icelandic authorities published its first waste prevention programme in 2016, named United Against Waste (https://www.stjornarradid.is/media/umhverfisraduneyti-media/media/PDF_skrar/Saman-gegn-soun-2016_2027.pdf). The program aims at reducing the generation of waste and the focus is put on food, plastics, textiles, electrical, and electronic equipment, constructions, paper, by-products from meat and fish processing, beverage packaging and waste from heavy industry.	Action Plan	CH ₄
Waste management programme (2004, 2013)	Icelandic authorities published its first waste management programme in 2004. The program was revised and republished in 2013. The waste management plan aims at treating waste as a resource to prevent losses of valuable materials.	Action Plan	CH ₄
EU Waste Management Framework Directive (EC/98/2008)	Partially implemented in 2014 and fully implemented in 2017.	Regulatory	CH ₄

5 Highlights of best practices or lessons learned for key sectors

The greatest success in decreasing BC emission has been reach in the waste sector, were emissions in 2016 emissions were 91% below the 1990 emissions, due to a ban of open burning of waste.

Until the 1970s, the most common form of waste management outside the capital area was open burning of waste. In some communities, waste burning was complemented with landfills for bulky waste and ash. The existing landfill sites did not have to meet specific requirements regarding location, management, and aftercare before 1990 and were often just holes in the ground. Some communities also disposed of their waste by dropping it into the sea. Two of the biggest municipalities outside the capital area, opened municipal SWDS in the 1970s and 1980s. Before 1990, three waste incinerators were open in Iceland. In total they burned around 15 000 tonnes of waste annually. They operated at low or varying temperatures and the energy produced was not utilized. Proper waste incineration in Iceland started in 1993 with the commissioning of the incineration plant. Six more incineration plants were commissioned until 2006. In the beginning of 2012, a total of four waste incinerators were still operating. Some of the incineration plants recovered the burning energy and used it for either public or commercial heat production. By the end of 2012, all incineration plants, except one, had closed. Open burning of waste was banned in 1999 and is non-existent today. The last place to burn waste openly stopped doing so during 2010.

6 Other information if available

Detailed BC emissions data for Iceland reported voluntarily in the framework of the Convention on Transboundary Air Pollution on Long Distances (CLRTAP) under the Economic Commission for Europe of the United Nations (UNECE) is available at: http://www.ceip.at/ms/ceip_home1/ceip_home/status_reporting/.

Detailed methane emissions data and National Inventory Report for Iceland, reported to the United Nations Framework Convention on Climate Change (UNFCCC) and the European Union (EU) is available at: http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/10116.php