REPORT ON POLICIES, MEASURES AND PROJECTIONS

Projections of Greenhouse Gas emissions in Iceland til 2035

Submitted to the European Union under the bilateral agreement between Iceland and the EU regrading the second commitment period of the Kyoto Protocol

2019

DATA SHEET

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Report on policies, measures and projections: Projections of Greenhouse gas emissions in Iceland til 2035.

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Report pursuant to Article 12, 13 and 14 of Regulation (EU) No 525/2013 of the European Parliament and of the Council on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change.

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Abbreviations

BAT	Best Available Techniques
BaU	Business as Usual
EA	Environment Agency of Iceland (Umhverfisstofnun)
EEA	European Environment Agency
ESD	Effort Sharing Decision (Decision No 406/2009/EC)
EU ETS	European Union Emission Trading System
EV	Electric Vehicle
F-gas	Fluorinated gas
GHG	Greenhouse Gas
GDP	Gross Domestic Product
IPPU	Industrial Processes and Product Use
isk	Icelandic króna
kt CO_2e	Kilotonnes carbon dioxide equivalent
LPG	Liquid Petroleum Gas
LULUCF	Land Use, Land Use Change and Forestry
MCF	Methane Conversion Factor
MMR	Monitoring Mechanism Regulation
NA	Not Applicable
NE	Not Estimated
NIR	National Inventory Report
NO	Not Occurring
ODS	Ozone Depleting Substances
OECD	Organisation for Economic Co-operation and Development
PaMs	Policies and Measures
PFC	Perfluorocarbons
SCSI	Soil Conservation Service of Iceland
SOC	Soil Organic Carbon
SWDS	Solid Waste Disposal Sites
TR	Transport
WAM	With additional measures
WEM	With existing measures
UNFCCC	United Nations Framework Convention on Climate Change

Executive Summary

Iceland is submitting this report on policies and measures (PaMs) and greenhouse gas (GHG) projections for the first time in 2019 in line with the reporting obligations described in the **Sections 1**. A list of improvements planned for the next submission is included in **Section 1.4**. Iceland´s National System, including legal- and institutional arrangements, main institutions and data providers, improvements undertaken or planned to the national system and stakeholder engagement are described in **Section 3**.

The Ministry for the Environment and Natural Resources published a new Climate Action Plan in 2018, which forms the basis for the PaMs reported here. The Action Plan included 34 PaMs, all of which are described under the relevant chapters in this report. **Section 2.1** provides a brief introduction to the current (2018) and previous Action Plans. Five further PaMs which have had- or are expected to have a significant impact on GHG emissions from Iceland have been included: the MAC Directive, best available techniques for ferrous metal production, industries and the manufacture of glass, a high class public transport system in Reykjavik Capital Area (Borgarlína) and a new gas and compost plant.

GHG emissions savings from the following PaMs have been quantified for this submission: electrification of harbours and electrification of fishmeal factories (**Section 5.2.1**), electrification of ferries (**Section 6.2.1**), the new gas and composting plant (**Section 9.2.1**) and increased afforestation for carbon capture (**Section 10.1.2**). Most PaMs included in this report are considered to be part of the "with additional measures" (WAM) scenario. For this first submission, Iceland has, however, only included projections for the "with existing measures" (WEM) scenario.

Based on the Environment Agency´s (EA) calculations and assumptions, emissions from Iceland are expected to increase between 2015 and 2021, after which the total emissions begin to decrease until 2035 (see **Figure ES.0.1**).

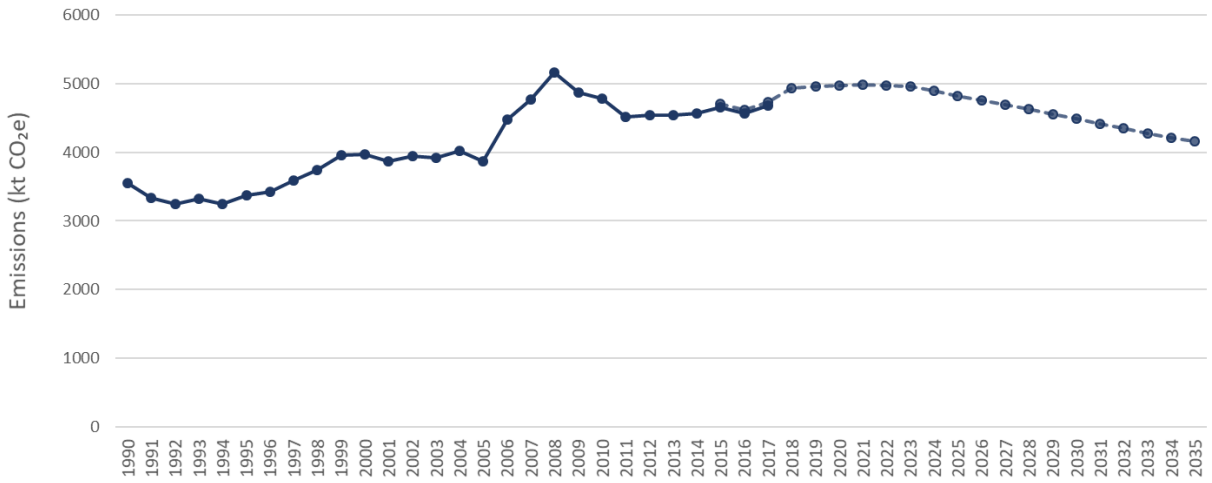


Figure ES.0.1 Total GHG emissions from 1990 to 2035 (excluding LULUCF)

It should be noted that the current projections do not include any carbon emissions or removals from the LULUCF sector as sufficient data was not available for integrating LULUCF PaMs into the projections. Carbon removal will, however, only be counted against Iceland's emissions if Iceland is in compliance with the requirements of the LULUCF Regulation (Regulation (EU) No 2018/841.

1 Introduction

1.1 Legal basis for reporting obligations

Iceland concluded a bilateral agreement[1] with the European Union and its Member States concerning Iceland's participation in the Joint Fulfilment Agreement for the second commitment period of the Kyoto Protocol (2013-2020). Article 4 and Annex 1 of the agreement include the implementation into Icelandic legislation of Regulation (EU) No. 525/2013[2], as well as the implementation of delegated and implementing acts. In accordance with Regulation (EU) No. 525/2013, Iceland reports to the European Commission the greenhouse gas (GHG) emissions by sources or enhanced removals by sinks, the information on policies and measures (PaMs) regarding climate change mitigation, as well as national projections of GHG emissions by sources and their removal by sinks for a sequence of 4 future years ending with 0 or 5 immediately following the reporting year.

Iceland is not reporting under the Effort Sharing Directive (Directive No. 406/2009/EC[1]) since it has concluded a bilateral agreement with the EU for the second commitment period of the Kyoto Protocol. Iceland and Norway are in the final phase of concluding an agreement with the EU on joining the commitment on -40% emission target for the Paris Agreement period (2021-2030). Therefore, Iceland will most likely be reporting under the Effort Sharing Regulation[2], the Land Use, Land Use Change and Forestry (LULUCF) Regulation[3], and selected provisions of the Governance of the Energy Union Regulation[4] (all provisions replacing Regulation No. 525/2013, which will be repealed by 1 January 2021). The target for Iceland will most likely be -29% compared to 2005 emission.

An EEA Joint Committee Decision, including these regulations with appropriate adaptions into the EEA Agreement, is currently being finalised and all the legal aspects should be clarified and finalised soon and publication of the Decision is expected later this year. This Decision will include the 2030 targets for Iceland under the Effort Sharing Regulation.

1.2 About this report

The report structure and provided information is in compliance with the Commission Implementing Regulation (EU) No 749/2014 of 30 June 2014 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) No 525/2013.

[1] http://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2010941%202014%20INIT

[2] Regulation (EU) No 525/2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC

[1] Directive No 406/2009/EC on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

[2] Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013

[3] Regulation (EU) 2018/841on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU

[4] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council

This report presents information on Iceland's national system for reporting on climate PaMs as well as GHG emission projections until 2035 pursuant to Article 12, Article 13 and Article 14 of Regulation (EU) No 525/2013 and under Article 20, 22 (and Annex XI) and 23 (and Annex XII) of Implementing Regulation (EU) No 749/2014. Article 4 of Regulation (EU) No 525/2013 on low-carbon development strategies was excluded from the bilateral agreement between Iceland and the EU, therefore Iceland is not reporting under Art. 4 of Regulation (EU) No 525/2013 nor under Article 21 of Implementing Regulation (EU) No 749/2014.

In accordance with these articles, this report contains the following items:

- Description of the legal basis and national system related to reporting on policies, measures and projections
- Description of PaMs that are implemented, adopted and planned.
- Projections of future emissions for the following scenario:
    - With existing measures (WEM), the national base scenario that includes all measures implemented or adopted

According to Art. 14 of Regulation (EU) No. 525/2013, the report should include the split between emissions falling under EU Emissions Trading System (ETS) Directive 2003/87/EC (which Iceland has incorporated; see also **Section 2.2**) and emissions falling under the Effort Sharing Directive No. 406/2009/EC ("ESD"). However, as mentioned above, Iceland is not reporting under the latter and the emissions that would fall under the ESD for the European Member States are part of the Joint Fulfilment Agreement with the EU. In order to avoid confusion when referring to the emissions outside the scope of the EU ETS, we refer to *Joint fulfilment "ESD"* as a consistent attribution of sectors.

1.3 Overview of reporting on emission projections

Iceland has completed WEM projections for the sectors: Energy (1), Industry (2), Agriculture (3) and Waste (5), as outlined in **Table 1.1**.

Table 1.1 Source and sink category for emission projections

Sector	*CO_2*	*CH_4*	*N_2O*	*HFC*	*PFC*	*SF_6*	*NF_3*
Total excluding LULUCF	✓	✓	✓	✓	✓	✓	NE
Total including LULUCF	NE	NE	NE	NE	NE	NE	NE
1A1a Public electricity and heat production	✓	✓	✓	NA	NA	NA	NA
1A1b Petroleum refining	NO	NO	NO	NO	NO	NO	NO
1A1c Manufacture of solid fuels and other energy industries	NO	NO	NO	NO	NO	NO	NO
1A2 Manufacturing industries and construction	✓	✓	✓	NA	NA	NA	NA
1A3a Domestic aviation	✓	✓	✓	NA	NA	NA	NA
1A3b Road transportation	✓	✓	✓	NA	NA	NA	NA
1A3c Railways	NO	NO	NO	NA	NA	NA	NA
1A3d Domestic navigation	✓	✓	✓	NA	NA	NA	NA
1A3e Other transportation	NO	NO	NO	NA	NA	NA	NA
1A4 Other sectors	✓	✓	✓	NA	NA	NA	NA
1A5 Other	NO	NO	NO	NA	NA	NA	NA
1B1 Solid fuels	NO	NO	NO	NA	NA	NA	NA
1B2 Oil and natural gas and other emissions from energy production	✓	✓	✓	NA	NA	NA	NA

1C CO2 transport and storage	NO	NO	NO	NA	NA	NA	NA
2A Mineral Industry	✓	✓	✓	NA	NA	NA	NA
2B Chemical industry	NO	NO	NO	NA	NA	NA	NA
2C Metal industry	✓	✓	✓	NA	✓	NA	NA
2D Non-energy products from fuels and solvent use	✓	NA	NA	NA	NA	NA	NA
2E Electronics industry	NO	NO	NO	NA	NA	NA	NA
2F Product uses as substitutes for ODS(2)	NA	NA	NA	✓	NE	NA	NA
2G Other product manufacture and use	✓	✓	✓	NA	NA	✓	NA
2H Other (please specify)	NO	NO	NO	NA	NA	NA	NA
3A Enteric fermentation	NA	✓	NA	NA	NA	NA	NA
3B Manure Management	NA	✓	✓	NA	NA	NA	NA
3C Rice Cultivation	NO	NO	NO	NO	NO	NO	NO
3D Agricultural Soils	NA	NA	✓	NA	NA	NA	NA
3E Prescribed burning of savannahs	NO	NO	NO	NO	NO	NO	NO
3F Field burning	NO	NO	NO	NO	NO	NO	NO
3G Liming	✓	NA	NA	NA	NA	NA	NA
3H Urea application	✓	NA	NA	NA	NA	NA	NA
3I Other carbon-containing fertilizers	✓	NA	NA	NA	NA	NA	NA
3J Other (please specify)	NO	NO	NO	NO	NO	NO	NO
4 Land Use, Land-Use Change and Forestry	NE	NE	NE	NE	NE	NE	NE
5A Solid Waste Disposal	NA	✓	NA	NA	NA	NA	NA
5B Biological treatment of solid waste	NA	✓	✓	NA	NA	NA	NA
5C Incineration and open burning of waste	✓	✓	✓	NA	NA	NA	NA
5D Wastewater treatment and discharge	NA	✓	✓	NA	NA	NA	NA
5E Other (please specify)	NA	NA	NA	NA	NA	NA	NA

Note: NO = not occurring, NA = not applicable, NE = not estimated

Due to changes in the National System and the responsibility for LULUCF reporting being moved between organizations within Iceland, in 2019 no projections for the LULUCF sector have been reported. However, available information on afforestation and soil reclamation is provided in **Section 10**. This will be improved for the next submission.

1.4 Improvement Actions

The 2019 submission is the first time Iceland has reported on its GHG PaMs and projections under the Monitoring Mechanism Regulation (MMR). Due to time and resource constraints, there are a number of areas which could be improved. **Table 1.2** contains the key improvement actions planned.

Table 1.2 Improvement Actions for PaMs and projections

Improvement ID	*Improvement Action*	*Priority*	*Status*
LULUCF projections	Include full LULUCF projections in collaboration with the Soil Conservation Service of Iceland and Icelandic Forest Service.	High	Started
Agricultural projections	Collect country specific projections for the agriculture sector - livestock numbers, yields, MCF, nitrogen excretion, feed characteristics, manure management systems, area of arable land and fertiliser application.	High	Started
Projections consistency with historical GHG inventory	There is a need to contact data providers to determine the causes/ corrected projected activity data. Inconsistencies between the	High	Not Started

	projected and historical activity data are causing step-changed in emissions between the base year and first year of projections.		
Create WAM projections	Use quantified WAM PaMs to create a WAM GHG projections scenario	Low	Not Started
Road Transport projected activity data	Projections of road transport are currently available from different stakeholders. Facilitate discussions with stakeholders to determine the most appropriate activity data for the WEM and WAM scenario as well as the impact of PaMs on the projections.	Medium	Not Started
LPG consumption projections	Iceland does not currently have any information on the future consumption of LPG within the energy sector. Stakeholder engagement is required to inform projections of LPG.	Medium	Not Started
Quantifying more PaMs	Set a target for quantifying more PaMs for the 2021 GHG Projections submission.	High	Not Started

2 Policy Background

2.1 Iceland's Climate Action

2.1.1 Past Action Plans

Iceland ratified the 1992 United Nations Framework Convention on Climate Change (UNFCCC) in 1993. In 1995 the government of Iceland adopted an implementation strategy based on the commitments of the Framework Convention. The domestic implementation strategy was revised in 2002, based on the commitments of the Kyoto Protocol and the provisions in the Marrakech Accords.

A new climate change strategy was adopted by the Icelandic government in February 2007 (Ministry for the Environment and Natural Resources, 2007). The Ministry for the Environment formulated the strategy in close collaboration with the ministries of Transport and Communications, Fisheries, Finance, Agriculture, Industry and Commerce, Foreign Affairs and the Prime Minister's Office. The long-term strategy was to reduce net GHG emissions in Iceland by 50 – 75 % by 2050, compared to 1990 levels. In the shorter term, the strategy aimed to ensure that emissions of GHGs would not exceed Iceland's obligations under the Kyoto Protocol. In November 2010, the Icelandic government adopted a Climate Action Plan (Ministry for the Environment and Natural Resources, 2010) in order to execute the strategy. However, little funding followed the plan and its implementation was not entirely successful.

In 2012, the Climate Act No. 70/2012 introduced the legal requirement for a Climate Action Plan. In 2016, in light of the Paris Agreement and the ongoing second commitment period of the Kyoto Protocol, the government published a new Climate Action Plan (Ministry for the Environment and Natural Resources, 2016) presenting 16 climate-related projects, with eight projects specifically aimed at reducing GHG emissions. This plan included funding earmarked for specific projects.

2.1.2 Current Action plan

In 2018 the government of Iceland published a new Climate Action Plan spanning the years 2018-2030 (Ministry for the Environment and Natural Resources, 2018), this time in association with significant funding earmarked for the implementation of and follow-through on the actions. This

plan was developed with the aim to achieve two major emission targets: Reaching Iceland's international 2030 target (for the non-ETS emissions: most likely 29% emission reduction compared to emissions in the year 2005 (see also Section 1.1 on Iceland's commitment for 2030)) and reaching carbon neutrality by the year 2040.

The plan includes 34 actions across all sectors. The actions listed in the plan are mostly centred around two main strategies:

1. Electrification of the energy sector, by substituting fossil fuel combustion with the use of renewable electricity;
2. Enhanced carbon removal by better land use and increased efforts in afforestation/reforestation.

A summary of the main actions is included below. All actions are included in this report and discussed in the relevant chapters.

Clean energy transfer in the energy sector

Since Iceland's electricity and district heating are almost entirely generated by renewable energy (hydroelectric powerplants, geothermal power plants and wind turbines), fossil fuel combustion for energy purposes is for the most part occurring in the transport and fishing sectors. Actions include:

- Incentives to buy electric or other environmentally friendly vehicles
- Increased domestic production of alternative fuels such as methane recovered from waste disposal sites and production of biofuels from plants and organic waste
- Improving public transport services
- Electrification of harbours and airports

Enhanced carbon removal

- Increased effort in afforestation and revegetation
- Reduction in wetland drainage and increased drainage rewetting

Other actions

Other actions include enhancing information to the public and education in schools, climate strategies for government offices, phasing out import and use of fluorinated gases, developing infrastructure for bicycles, taxes on waste, and so on.

The Climate Action Plan (2018) was submitted to public consultation in the fall of 2018. It will be updated later this year, taking into account results from the public consultation, further implementation work by the Climate Council and the Interministerial steering committee for Climate Action, as well as results of the calculations shown in this report on Policies, Measures and Projections.

2.2 EU ETS vs. Joint Fulfilment Emissions ("ESD")

2.2.1 Note on Terminology

Iceland is part of the EU ETS, and the ETS Directive (Directive 2003/87/EC establishing a scheme for GHG emission allowance trading within the Community and amending Council Directive 96/61/EC) was taken up into the European Environment Agency (EEA) Agreement through Decision of the EEA Joint Committee No 146/2007. The Directive was incorporated into Icelandic legislation through the Climate Change Act No. 70/2012.

For the European Member States, emissions not falling under the EU ETS are referred to as ESD emissions, with reference to the Effort Sharing Directive No. 406/2009/EC. However, as mentioned in **Section 0**, Iceland is not included in the ESD. Instead, the emissions outside the scope of the ETS directive are covered by the Joint Fulfilment Agreement between Iceland and the EU. We therefore refer to those emissions as *Joint Fulfilment ("ESD")*.

2.2.2 Policy background

One of the actions listed in the Climate Action Plan (2018) includes the continuation of Iceland's participation in the ETS. Iceland is currently working on the incorporation of the new EU ETS Directive (Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814) into the EEA Agreement. This Directive lays down the provisions for the fourth trading period.

The rest of the actions cover the Joint Fulfilment ("ESD") emissions.

2.2.3 Historical split between ETS and Joint Fulfilment ("ESD")

In recent years, the share of emissions falling under the scope of the EU ETS has been just below 40% of the total annual emissions excluding LULUCF and international bunkers, with just over 60% contributing to Iceland's emissions falling under the scope of the Joint Fulfilment Agreement with the EU.

Emissions falling under the scope of the EU ETS originate for the most part from metal production (primary aluminium, ferroalloys and silicon production). These emissions are largely dominated by process emissions, i.e. emissions related to the oxidation of carbon-containing fuels which in turn is linked to the reduction of raw materials into metal. Only a very small percentage belongs to emissions solely coming from fuel combustion.

In recent years, approximately two thirds of the emissions falling under the joint fulfilment agreement with the EU, originated from the energy sector. Half of the emissions from this sector were from road transport, while the fishing industry accounted for a large part of the rest. Approximately one fifth of the non-ETS emissions come from the agriculture sector, whereas F-gas emissions and solid waste disposal make up most of the rest of the emissions.

3 Information on National Systems for Policies and Measures and Projections

3.1 Legal Arrangements

Current legal arrangements for reporting on PaMs and Projections are based on the same legislation as is in place for the GHG inventory: Climate Act No 70/2012 (Lög um loftslagsmál 2012 nr. 70). The objectives of the Climate Act are the following:

- Reducing GHG emissions efficiently and effectively,
- To increase carbon sequestration from the atmosphere,
- Promoting mitigation and adaptation to the consequences of climate change, and
- To create conditions for the government to fulfil its international obligations regarding climate change.

Act No 70/2012 establishes the national system for the estimation of GHG emissions by sources and removals by sinks, a national registry, emission permits and establishes the legal basis for

installations and aviation operators participating in the EU ETS. It also serves as the legal basis for the development of national Climate Action Plans.

Article 5 of the Climate Change Act describes the obligation of the Minister for the Environment to see to the production of a Climate Action Plan; it also establishes the Interministerial steering committee for Climate Action, composed by members nominated by the Minister for the Environment as well as by Ministers from other ministries.

Article 6 of Act No 70/2012 addresses Iceland´s GHG inventory. It states that the Environment Agency (EA) is the responsible authority for the national accounting as well as for the inventory of emissions and removals of GHGs according to Iceland's international obligations. Act No 70/2012 established the form of relations between the EA and other bodies concerning data handling. This article also serves as the legal basis for Regulation No. 520/2017 "on data collection and information from institutions related to Iceland's inventory of greenhouse gases emissions and carbon removal".

Regulation No. 520/2017 serves both as the description of the Agency's and data providers' obligations related to the GHG inventory, and the implementation of Regulation (EU) No 525/2013. It specifies the obligations of the Agency in terms of reporting and information related to GHG emissions to other institutions, as well as listing the obligations of other agencies, institutions or other data providers. In addition, it specifies the timelines for data collection and reporting to the EU and gives the Agency the right to request additional data from any stakeholder provided it is necessary for the production of the GHG inventory. A summary of each article in Regulation No. 520/2017 can be found in Chapter 13 of Iceland's 2018 National Inventory Report (NIR).

Act No. 70/2012 is currently under revision at the Ministry for the Environment and Natural Resources, and the revision will be submitted for approval by the Icelandic parliament in the spring of 2019. Notable changes include the rewording of the act in order to specifically include provisions on reporting on PaMs and projections; another notable change is the legal establishment of Iceland's Climate Council and the definition of its role in advising the government regarding Iceland's Climate Action Plans.

Upon approval of the revised Climate Change Act by the parliament, Regulation No. 520/2017 will also be revised in order to reflect the changes in the Act and spell out more specifically the data requirements linked to reporting on PaMs and projections.

3.2 Institutional Arrangements

Figure 3.1 below shows a flow chart of the institutional arrangements and data flows in place for this year's submission of information on PaMs and projections.

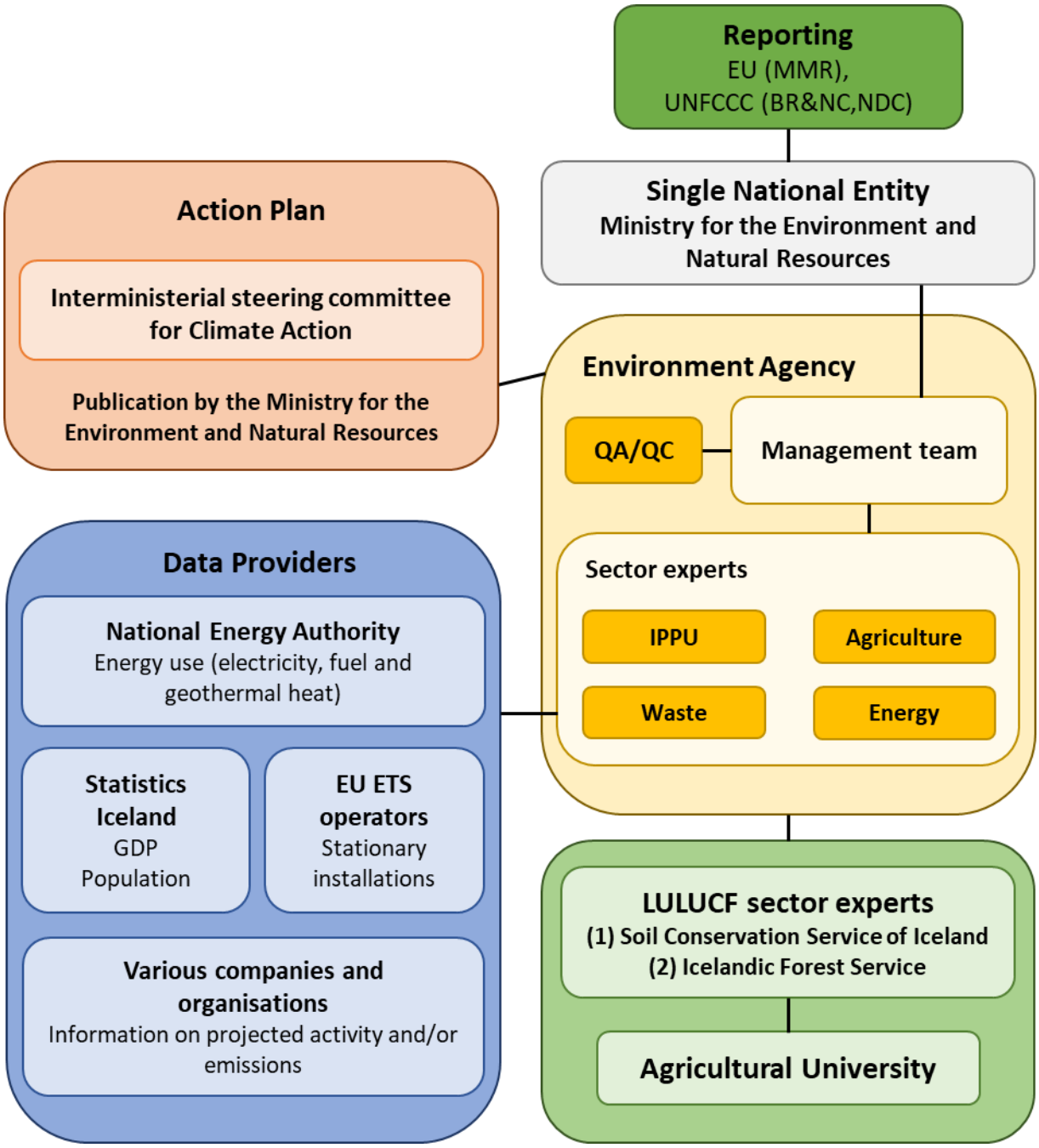


Figure 3.1 Information flow chart of institutional arrangements for PaMs and Projections reporting in Iceland

Note: MMR = Monitoring Mechanism Regulation, BR = Biennial Review, NC = National Communication, NDC = Nationally Determined Contribution

3.2.1 Main institutions and data providers

The main institutions and organisations playing a major role in climate policy and international reporting include:

- The Ministry for the Environment and Natural Resources (Umhverfis- og auðlindaráðuneytið)
    - The Ministry for the Environment and Natural Resources is Iceland´s principal environmental authority and is responsible for Iceland´s international climate obligations. It is, furthermore, responsible for setting Iceland´s national climate policies and implementing climate action and mitigation measures.
    - The Ministry for the Environment and Natural Resources is responsible for the implementation of the UNFCCC and coordinated national climate change policymaking in close cooperation with the Ministry of Industries and Innovation, Ministry of the Interior, Ministry of Finance, Ministry of Foreign Affairs and the Prime Minister's Office. Several public institutions and public enterprises, operating under the auspices of these ministries, also participated directly or indirectly in preparing the national implementation policy.
- Interministerial steering committee for Climate Action
    - The Climate Action Plan is compiled by the Interministerial steering committee for Climate Action. The Minister for the Environment nominates the chairman of the committee, whereas the committee members are nominated by various other ministers as well as the Icelandic association of local authorities.
- Iceland's Climate Council (Loftslagsráð)
    - The Climate Council was established in June 2018, with the aim to provide guidance and support to the government in its decisions, actions and policy making related to climate change. The tasks of the Council include:
        - Advising in the process of establishing and updating climate plans
        - Providing advice on monitoring and research of climate change
        - Providing advice on reduction of emissions and adaptation to climate change
        - Providing information on climate change
- The Environment Agency (EA) of Iceland (Umhverfisstofnun)
    - The EA is directly under the Ministry for the Environment and Natural Resources and is, as per Climate Act no. 70/2012, responsible for managing the GHG inventory process, compiling and submitting the National Inventory Report to the EU and UNFCCC. It is also the agency responsible for gathering information on policies, measures and projections, and for reporting to the EU. This data will also be included in Iceland's biennial reports and national communications to the UNFCCC.
- The Soil Conservation Service of Iceland (SCSI, Landgræðsla ríkisins) and the Icelandic Forest Service (Skógræktin)
    - The SCSI and the Icelandic Forest Service hold the responsibility of producing the inventory and projections related to the LULUCF sector. They obtain data and information from the Agricultural University of Iceland (Landbúnaðarháskóli Íslands) and other institutions.

The main data providers include:

- Statistics Iceland (Hagstofa), providing population projections
- The National Energy Authority (Orkustofnun), providing energy use projections (orkuspá). These projections include electricity use, fuel use, and geothermal heat use.

All data providers are listed and described in the relevant chapters.

3.2.2 Improvements undertaken or planned to the national system

As mentioned in **Section 3.1**, changes are underway in the legislation to facilitate data acquisition for PaMs and projections reporting. Furthermore, improvements are being implemented in the archiving of information, documentation of decision-making processes, as well as the general work process. Since this is the first PaMs and Projections report produced by Iceland, under the provisions of Regulation 525/2013, the process of information gathering, calculations and reporting is expected to improve in future submissions. Furthermore, the ever increasing importance and visibility of climate change matters in Iceland is hoped to lead to increased staff capacity in the various teams participating in the compilation of future inventory- and PaMs and projections reports.

3.2.3 Stakeholder Engagement

The work on gathering information on PaMs that have been implemented, adopted or planned in Iceland, as well as information on available projections data in each sector, began with a series of stakeholder workshops in May 2018. The EA organised an introductory meeting for informative purposes, to explain the work to be undertaken and how it relates to Iceland´s reporting obligations. This meeting was attended by a varied group of experts including industry, government and universities. Consequently, a series of workshops, each of which focused on one specific sector (divided into: Energy (excluding Transport), Transport, Industry, Agriculture, Waste and LULUCF), were organised and attended by stakeholders interested or working in related sectors.

Throughout the stakeholder workshops the EA collected information and suggestions for close to 200 PaMs to reduce GHG emissions from Iceland. A significant share was focused on energy change, both in transport and other sectors, waste reduction schemes or increasing carbon storage through afforestation or wetland and soil reclamation.

For the next submission, it is planned to re-engage with stakeholders in the aforementioned sectors to enable the EA to report more PaMs. Furthermore, future stakeholder engagement will improve and expand the available projected activity data, leading to the quantification of more PaMs.

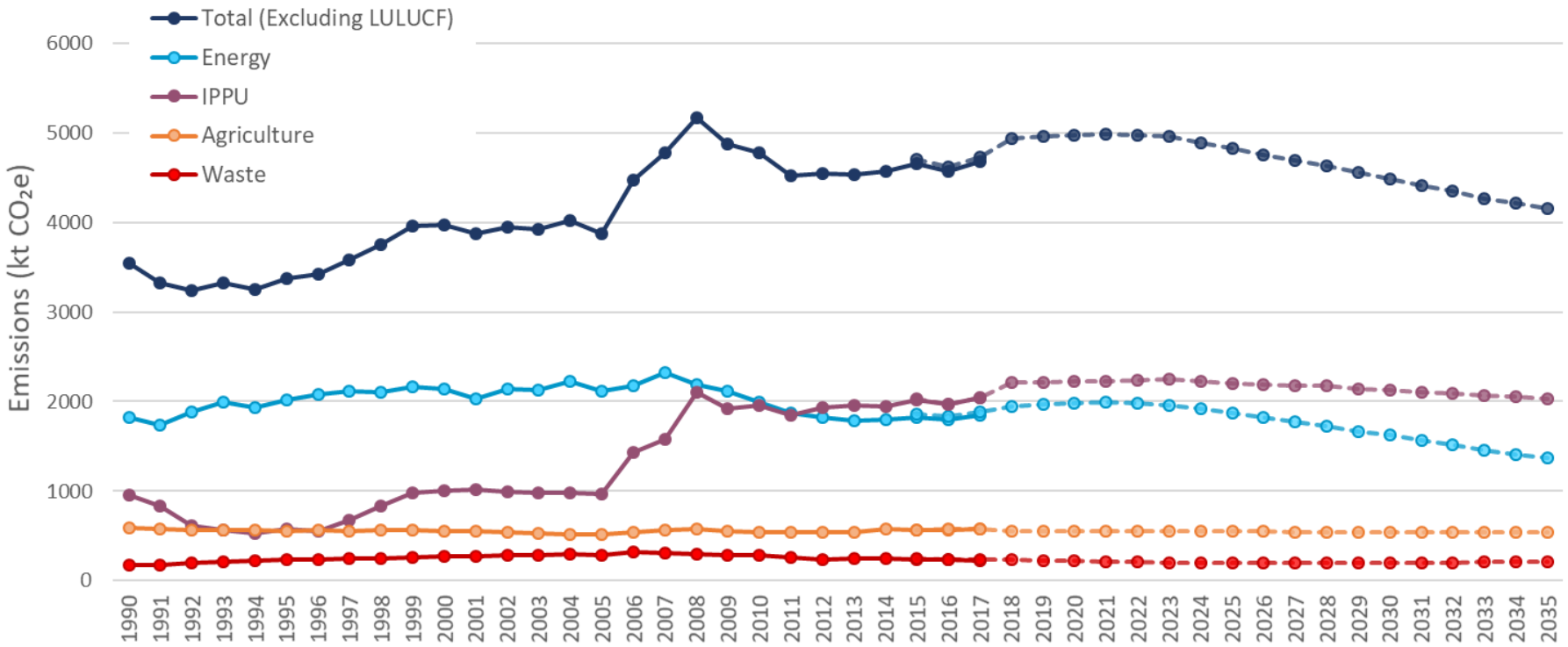
4 Summary of Projections

4.1 Total GHGs

Iceland´s total historical and projected emissions of GHGs are presented in **Figure 4.1** below, for the WEM scenario. The total emissions are projected to increase until they reach a peak in 2021, after which the total emissions begin to decrease. Emissions are projected to be higher in 2035 than they were in 1990 but will be below 2017 levels.

The main cause for the projected decrease in emissions is the impact of the electrification of the car fleet on energy emissions. Industrial Processes and Product Use (IPPU) and Agriculture emissions are also projected to decrease slightly. IPPU will mainly decrease because of a projected reduction in emissions from heavy industry and the newly implemented F-gas regulation which limits the import of F-gases. Agriculture will decrease because of a projected decrease in some livestock population numbers. Waste emissions will, on the other hand, decrease until 2027, after which they begin to increase again in line with a projected population increase.

For this submission no projections of LULUCF emissions were available and are, therefore, not discussed in this section. Only Total emissions excluding LULUCF are presented.



Emissions (kt CO_2e)

Sector	**1990**	**2015**	**2020**	**2025**	**2030**	**2035**
Energy (1)	1 823	1 855	1 978	1 871	1 621	1 371
IPPU (2)	958	2 032	2 226	2 206	2 122	2 036
Agriculture (3)	593	571	552	548	543	538
Waste (5)	172	245	218	198	200	213
Total excluding LULUCF	**3 546**	**4 702**	**4 974**	**4 822**	**4 486**	**4 158**

Figure 4.1 Total historical and projected GHG emissions (excluding LULUCF) in the WEM scenario 1990-2035, kt CO_2e

4.1.1 Total Joint Fulfilment ("ESD") and ETS GHG Projections

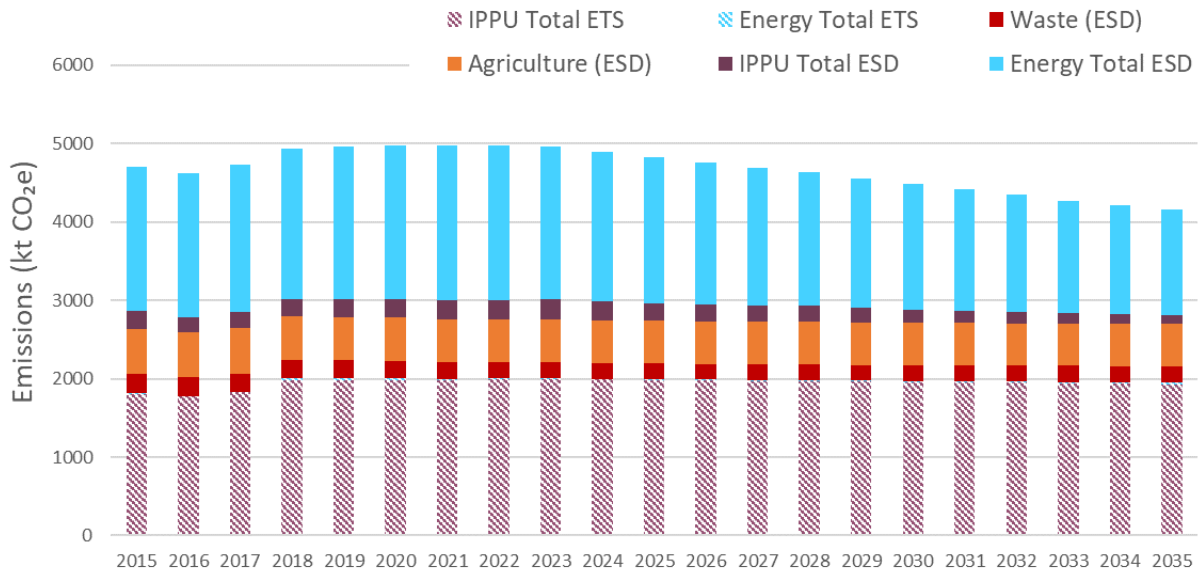
Iceland´s total historical and projected emissions, split into ETS and Joint Fulfilment ("ESD"), can be seen in

Figure 4.2 below for the WEM scenario. In Iceland, all emissions currently generated from the Production of Iron and Steel and Non-Ferrous Metals (1A2a and 1A2b) and industrial emissions from the Metal Industry (2C) are covered under the EU ETS. As can be seen in

Figure 4.2, emissions from ETS industry have increased between 2015 and 2020 due to the addition of a new ferrosilicon plant. ETS emissions are, however, projected to decrease again until 2035, mainly due to a projected decrease in GHG emissions from one ETS industry plant.

Based on the current projections, ETS emissions will increase by almost a quarter between 2005 and 2035. ESD emissions are, however, expected to decrease between 2005 and 2035 (see

Figure 4.2).



Emissions (kt CO_2e)

Sector	2005	2015	2020	2025	2030	2035
Total ETS	856	1 821	2 009	1 995	1 973	1 948
Total ESD (ktCO_2e)	3 091	2 881	2 965	2 827	2 513	2 210

Figure 4.2 Sectoral ETS and ESD GHG projections, WEM scenario

The projected joint fulfilment emissions ("ESD") for the year 2030 amount to approximately 2513 kt CO_2e, which corresponds to 19 % less than the year 2005. Iceland´s commitment for the year 2030 has yet to be finalised and the exact terms laid down in the EEA agreement (see also Section 1.1). Currently it is anticipated that Iceland´s target under the Effort Sharing Regulation (Regulation (EU) No 2018/842) will be to decrease its emissions by 29 %, or 10 % more ambitious than the current projections show.

The gap between projected emissions and Iceland's expected 2030 target is partly due to the fact that the effect of most of the actions in the Action plan 2018 could not be quantified or considered to be a part of the WEM projections scenario due to a lack of precise information or of a strategic implementation plan. This will hopefully be addressed as the Action plan 2018 will be revised later this year (see also **Section 2.1.2**), both taking into account the fact that actions need to be planned with more detail, and the fact that further and/or more stringent actions are needed.

Furthermore, these projections do not include any carbon removals from the LULUCF sector, as no sufficient data was available to integrate LULUCF PaMs into the projections. It has to be noted, though, that carbon removal will only be counted against Iceland's emissions if Iceland is in compliance with the requirements of the LULUCF Regulation (Regulation (EU) No 2018/841); additionally, according to the Effort Sharing Regulation, in the case the requirements for compliance with the LULUCF Regulation are met, there is nevertheless a cap on the quantity of removal units that may be used for compliance under the Effort Sharing Regulation. In Iceland´s case, that cap is 200 kt CO_2e for the period 2021-2030.

4.2 Methodology Overview

The methodologies used to calculate GHG projections are consistent with the latest NIR. For information on the sectoral methods see the NIR (2019). Where methodologies are not described within the sectoral chapters the method from the NIR has been followed. The following exceptions should be noted:

- Road transport emissions have been calculated using COPERT. COPERT will be used to calculate historical emissions for the first time in the 2020 historical GHG inventory. The use of COPERT to calculate projected GHG emissions has resulted in a small discrepancy (~ 3 %) in years reported in both the historical and projected inventories emissions for road transport.

5 Energy (excluding Transport)

The Energy Sector (1) contains all emissions from fuel combustion, energy production, and distribution of fuels. Historically, transport has contributed to approximately one fifth of Iceland´s GHG emissions (excluding LULUCF) and is therefore reported in a separate chapter (see **Section 6**).

Iceland almost exclusively uses renewable energy sources (hydropower, geothermal energy and wind power) for electricity and heat production, and therefore emissions from Public Electricity and Heat Production (1A1) are low (< 1 % of Iceland's emission from Energy) compared to other countries that utilize a higher share of fossil fuels.

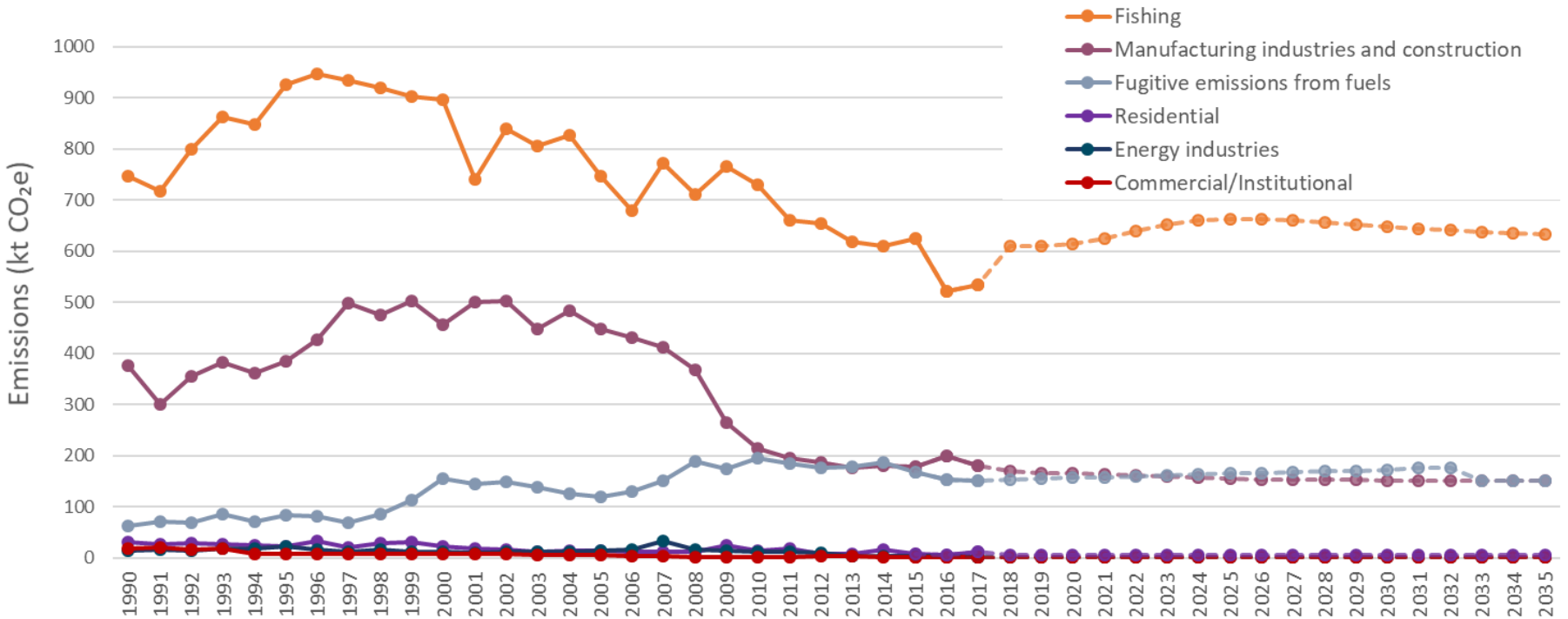
The largest contributor of GHG emissions from the Energy Sector (excluding Transport) is Fishing (1A4c). Emissions from fishing ships have accounted for approximately a third of total emissions from the Energy Sector in recent years, however emissions have been steadily decreasing over the past years.

Manufacturing Industries and Construction (1A2) and Residential Stationary Combustion (1A4b) combined account for approximately a third of emissions from the energy sector in Iceland in recent years.

5.1 Trends

The historical and projected trend for the Energy Sector (excluding Transport) can be seen in **Figure 5.1**. Overall, emissions from the Energy Sector (excluding Transport) have declined by approximately 20 % between 1990 and 2015. In contrast, only a small decline is currently projected up until 2035.

Emissions from Fishing (1A4c) have been steadily decreasing over the time period, with some annual variations. Emissions are projected to peak in 2025, and steadily decline between 2025 and 2035. The decline in emissions from fishing ships in 2016 is due to the lack of available historical fuel data for 2016 and 2017. No major changes are expected in the sector for the time period, however some emission savings are reported due to the electrification of harbours and fishmeal factories (see **Section 5.2.1**). There are, however, plans to increase the share of renewable fuels instead of fossil fuels in fishing (EC01), but because it is currently unclear which fuels will replace fossil fuels and in which quantities, this has not been included in the projections. Therefore, it is likely that the projected emissions from Fishing (1A4c) have been overestimated. Emissions from Manufacturing Industries and Construction (1A2) have also been decreasing over the historical time series but are projected to remain relatively constant until 2035. Emissions from geothermal energy (Fugitive Emissions 1B) have historically been increasing but are projected to remain steady until 2035. Other sectors are also projected to remain steady.



	Emissions (kt CO_2e)					
Sector	**1990**	**2015**	**2020**	**2025**	**2030**	**2035**
Energy industries (1A1)	14	4	1	1	1	1
Manufacturing industries and construction (1A2)	377	177	164	154	151	150
Commercial/Institutional (1A4a)	17	2	1	1	1	1
Residential (1A4b)	31	7	5	6	5	5
Fishing (1A4c)	746	624	615	663	647	632
Fugitive emissions from fuels (1B)	62	168	156	165	172	151
Energy excluding Transport (1A1,1A2,1A4,1B)	**1 247**	**982**	**944**	**991**	**978**	**941**

Figure 5.1 Energy (excluding Transport) Emissions of Total GHGs (kt CO_2e), WEM scenario

ESD vs EU ETS emissions in Energy

In Iceland, all emissions from the production of Iron and Steel and Non-Ferrous Metal (1A2a and 1A2b) are accounted for under the EU ETS. Overall, this contributes to approximately 1% of the total emissions from Energy (excluding Transport). The split between ESD and ETS emissions is projected to remain fairly constant over the time series (**Figure 5.2).**

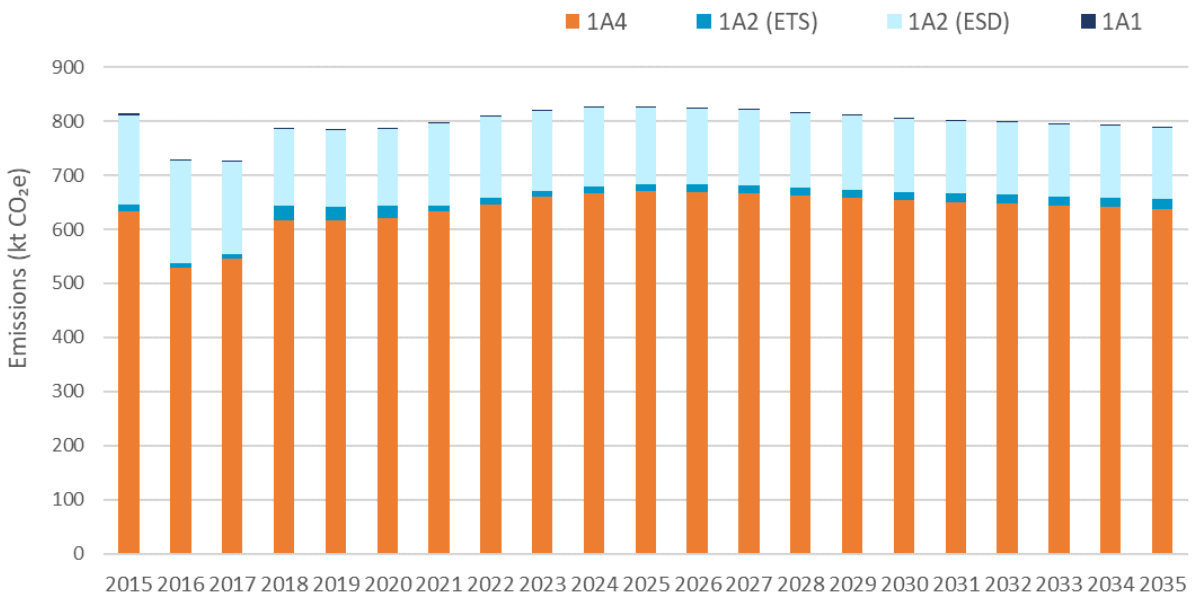


Figure 5.2 ETS and ESD GHG projections in the Energy Sector (excluding Transport), WEM scenario

5.2 PaMs

Four energy consumption (EC) PaMs are currently adopted or planned, with the objective of reducing GHG emissions (see **Table 5.1**). Currently there are no specific energy supply (ES) PaMs.

Table 5.1 Policies and Measures included in Energy

PaM Name	*GHG(s)*	*Instrument type*	*Status*	*Scenario*	*Ex-ante*	*Description*
Increased share of renewables in fishing (EC01)	CO_2, CH_4, N_2O	Economic	Planned	WAM	No	The share of renewable fuels in shipping will be increased with fiscal measures and quantified objectives will be set on a specified timeline.
Electrification of harbours (EC02)	CO_2, CH_4, N_2O	Fiscal, Planning	Adopted	WEM	Yes (1A3d, 1A4c)	Efforts will be made to increase the electricity supply and improve the infrastructure for ships in harbours in order to reduce fossil fuel use. The goal is to complete electrical connections which meet the electricity demands of all general ship operations in harbours by 2025.
Electrification of fishmeal factories (EC03)	CO_2, CH_4, N_2O	Economic, Planning	Planned	WAM	Yes (1A2)	Economic measures will be used to facilitate the electrification of fishmeal factories. The goal is for all fishmeal factories to switch

						completely over to electricity by 2030.
Phasing out fuel oil (EC04)	CO_2, CH_4, N_2O	Regulatory	Planned	WAM	No	The goal is to reduce the use of fuel oil off the Icelandic coast with adjusted laws and regulations. The final goal is to achieve the total phasing out of fuel oil.

All of the PaMs described in Table 5.1 above will impact emissions from Fishing (1A4c). The two that have been quantified; the impact of the electrification of harbours (EC02) and -fishmeal factories (EC03), are described in more detail in **Section 5.2.1**. Additional information on PaMs that have not been quantified is provided below.

Increased share of renewables in fishing (EC01)

Emissions from the fishing fleet have already declined significantly in the last decades, and opportunities to continue that positive development will be further examined. Work was recently completed on creating a Roadmap (Hafið & INE, 2018) on emissions from the fishing sector. The Roadmap proposes further projects to achieve energy change in fishing, which are likely to be adopted in the near future. When those projects have been decided on, this policy will become part of the WEM scenario and possibly quantifiable.

Phasing out of fuel oil (EC04)

The goal is to achieve the total phasing out of fuel oil off the Icelandic coast with adjusted laws and regulations. This is in line with provisions in the policy statement of the government parties, which aims to ban the use of fuel oil in the Icelandic economic zone. According to a recent analysis, which was conducted by the EA for the Ministry for the Environment and Natural resources, it is difficult to ban fuel oil in the Icelandic Economic zone entirely, because it requires the approval of the International Maritime Organisation. The Icelandic government can, however, set unilateral rules for a more limited ban, which would extend to 12 miles of territorial waters or to harbours and nearby fjords and areas. Proposals on those issues are currently in progress at the Ministry for the Environment Natural resources and the EA. When the implementation of the ban or limited ban is completed, this policy will become part of the WEM scenario and quantifiable.

For more information on these PaMs, see the 2018 Action Plan.

Stakeholder Engagement

As described in **Section 5.1**, a significant reduction in emissions from fishing has already been achieved in Iceland. There are, however, still great ambitions from the fishing industry itself (see Fisheries Iceland, 2017) and from the government to reduce these emissions further. Based on the previous success, the PaMs in the Climate Action Plan (2018) and stakeholder engagement in the EA´s May 2018 workshops, there is reason for optimism, and it is probable that emissions from this sector will be lower than the currently projected WEM scenario.

5.2.1 Quantified PaMs & Interlinkages with Projections

Electrification of harbours (EC02)

This policy aims to increase the electricity supply and improve the infrastructure for ships in harbours in order to reduce fossil fuel use. The goal is to complete electrical connections which meet the electricity demands of all general ship operations in harbours by 2025 (Hafið & INE, 2018). A special action plan on Energy change in harbours will be prepared with support from the government and in cooperation with relevant stakeholders.

The number of ships by ship type and tonnes of CO_2 emissions per ship type in 2015 were obtained from a report on energy change by Landsnet (2016). In the Business as Usual (BaU) scenario the number of ships were projected using Organisation for Economic Co-operation and Development (OECD) GDP as a proxy, whilst emissions per ship during time at harbour were kept constant. In the WEM scenario, the number of ships were projected using the same GDP proxy, but the emissions at harbour were reduced linearly from the start of the policy to 2025. This reflects the goal of the PaM to meet electricity demands of all general ship operations in harbours by 2025.

The fuel use by vessel type is calculated by dividing the tonnes of CO_2 emissions by the default gas/diesel oil CO_2 emission factor (IPCC, 2006). From this, default 2006 IPCC emission factors for gas/diesel oil for CH_4 and N_2O are applied, along with AR4 GWPs to estimate GHG emissions by vessel type by year in kt CO_2e.

The allocation of vessel types to IPCC sectors is in **Table 5.2** below.

Table 5.2 Allocation of vessel types to IPCC sectors

Vessel type	IPCC Sector
Cargo ships	1A3di(i)
Oil and product tankers	1A3di(i)
Cruise ships	1A3di(i)
Fishing vessels and trawlers	1A4ciii
Research and coast guard ships	1A3dii

Gas/diesel oil fuel use in International Navigation (1A3di(i)) and Fishing (1A4ciii) for the WEM scenario are linked to the PaM calculation file. This takes the total sector BaU fuel use, subtracts the BaU fuel use in harbours, and adds the WEM fuel use in harbours. To avoid double counting with PaM TR09 (see **Section 6.2.1**), the fuel savings at harbour for Domestic Navigation (1A3dii) are subtracted from the WEM gas/diesel oil fuel projections. This is because TR09 accounts for all fuel use by ferries, so the additional savings from the electrification of harbours in the rest of vessels in domestic navigation come under PaM EC02. Estimated ex-ante emissions savings from PaM EC02 are presented in **Figure 5.3**.

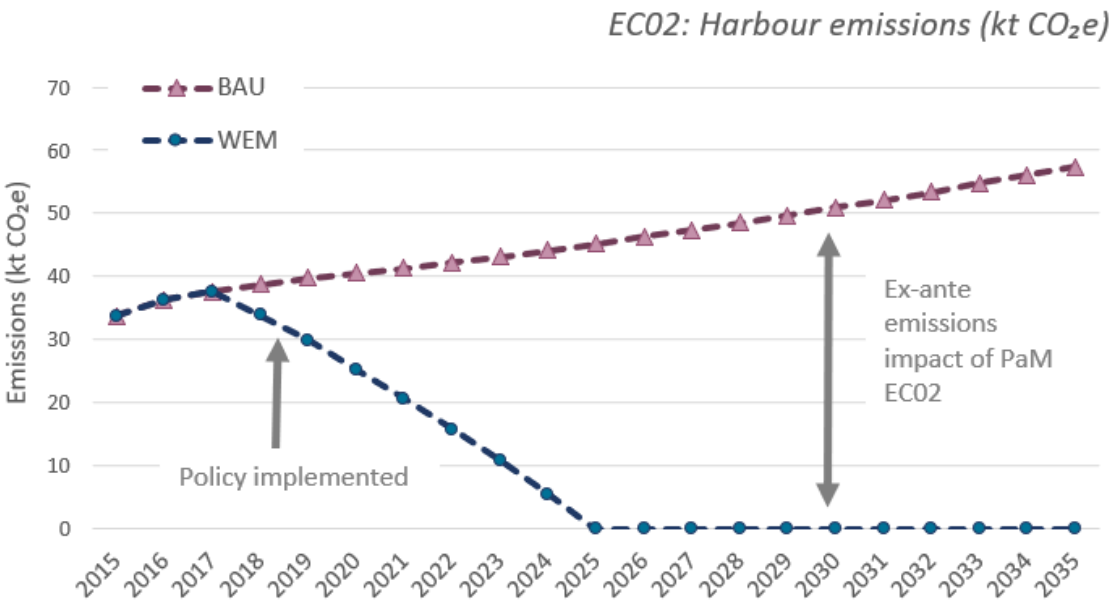


Figure 5.3 Quantified ex-ante emissions impact of PaM EC02: the electrification of harbours (kt CO_2e)

Electrification of fishmeal factories (EC03)

This PaM aims to ensure, to the extent possible, that it will be economically beneficial for fishmeal factories to use electricity instead of fossil fuels for its processes. The goal is for all fishmeal factories to switch completely over to electricity by 2030. Ways to facilitate this switch must be discussed by government, power companies and the fishmeal producers´ association. This is in line with the parliamentary resolution on energy change, which was approved in Parliament on May 31st, 2017.

Projections of total oil use in fishmeal factories are obtained from Fisheries Iceland (2017) to the year 2030. Total oil use has been kept the same to 2035. The ratios of residual fuel oil, diesel and waste oil from the WEM scenario are applied each year to the with additional measures (WAM) scenario. The same emission factors are used in both WEM and WAM scenarios. Iceland is not reporting a WAM projection scenario in 2019 so the effect of this PaM is not currently included in GHG projections.

In Iceland, manufacture emissions from Food Processing/Beverages/Tobacco (1A2e) consist solely of emissions from fishmeal factories. Emissions of 1A2e in the WEM and WAM scenarios are presented in **Figure 5.4**.

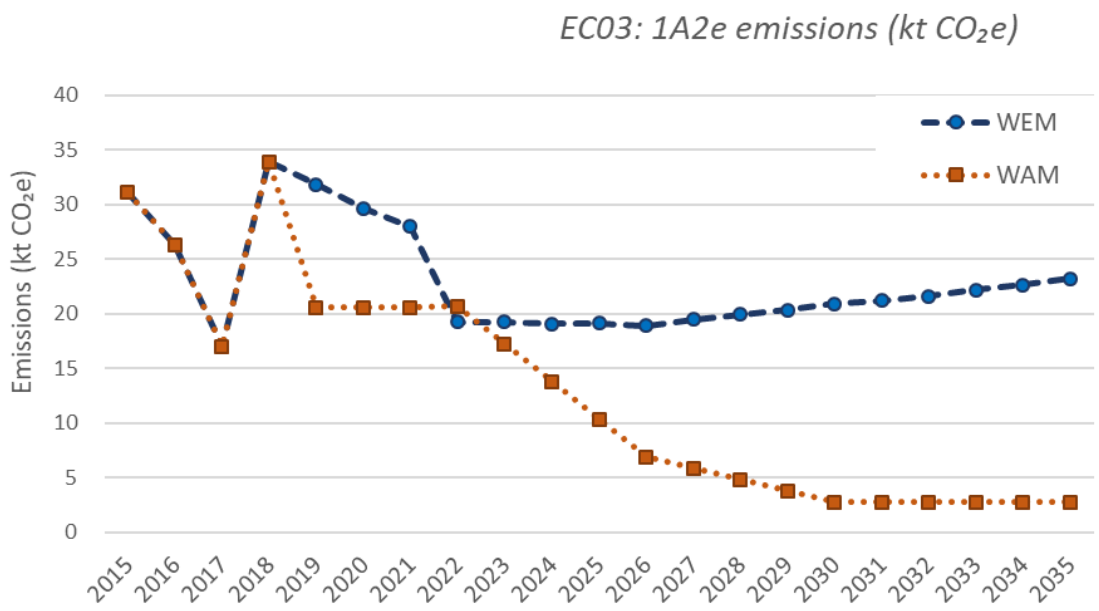


Figure 5.4 Quantified ex-ante emissions impact of PaM EC03: the electrification of fishmeal factories (kt CO_2e)

5.3 *Projections – WEM scenario*

The methodology used to generate projections for the Energy Sector (excluding Transport) are based on the historical inventory, see NIR (2019).

5.3.1 Data & Assumptions

An overview of the data and assumptions used as a basis for the energy projections is presented in **Table 5.3**. A further description is provided below.

Table 5.3 Basis for energy projections

Energy	**Basis for projections**
1.A.1 Energy industries	Fuel projections
1.A.2 Manufacturing industries and construction	Fuel projections
1.A.4 Other sectors	Fuel projections
1.B.1 Solid Fuels	Not relevant in Iceland
1.B.2 Oil and gas and other emissions from energy	Geothermal utilization projections (2003), fuel projections for Oil Distribution (1B2aiii)

Projections for the energy sector are based on fuel projections generated by the National Energy Authority (Orkustofnun, 2016). Fuel projections were available by fuel type and activity. In instances where fuel splits by activity were not available, the most recent historical split was used. This has only been applied to relatively small subsectors within Iceland and is therefore not considered to be a priority for improvement. In addition, no projections for the use of Liquified Petroleum Gas (LPG) in the energy sector were available. In 2017, approximately 2 kt of LPG were consumed in the energy sector, primarily in the residential sector. Currently, projections of LPG consumption have not been estimated. Future stakeholder engagement is planned to generate LPG projections. For a full list of Iceland's planned improvement see **Section1.4**.

Reductions in fuel use from quantified policies have been assumed not to be included in the fuel projections generated by the National Energy Authority. Therefore, fuel savings from quantified WEM policies have been subtracted from the projected fuel consumption for the WEM scenario.

6 Transport

The Transport Sector (1A3) in Iceland includes road transport, domestic aviation and domestic navigation. There are no railways in Iceland and, therefore, these are reported as not occurring (NO). Emissions from the transport sector have accounted for approximately half of the energy sector's total GHG emissions in Iceland in recent years and road transport has historically accounted for approximately 95% of the emissions in the transport sector. There is a link between Waste PaMs and the Transport Sector; PaMs described in **Section 9.2** include increased methane recovery, which in Iceland is primarily utilised as a vehicle fuel. Despite this, the uncertainties of how the increased methane captured will be used in the future (incl. for which types of vehicles) did not allow for the impact of increased methane recovery on transport emissions to be incorporated into the Transport projections.9.2.1

6.1 Trends

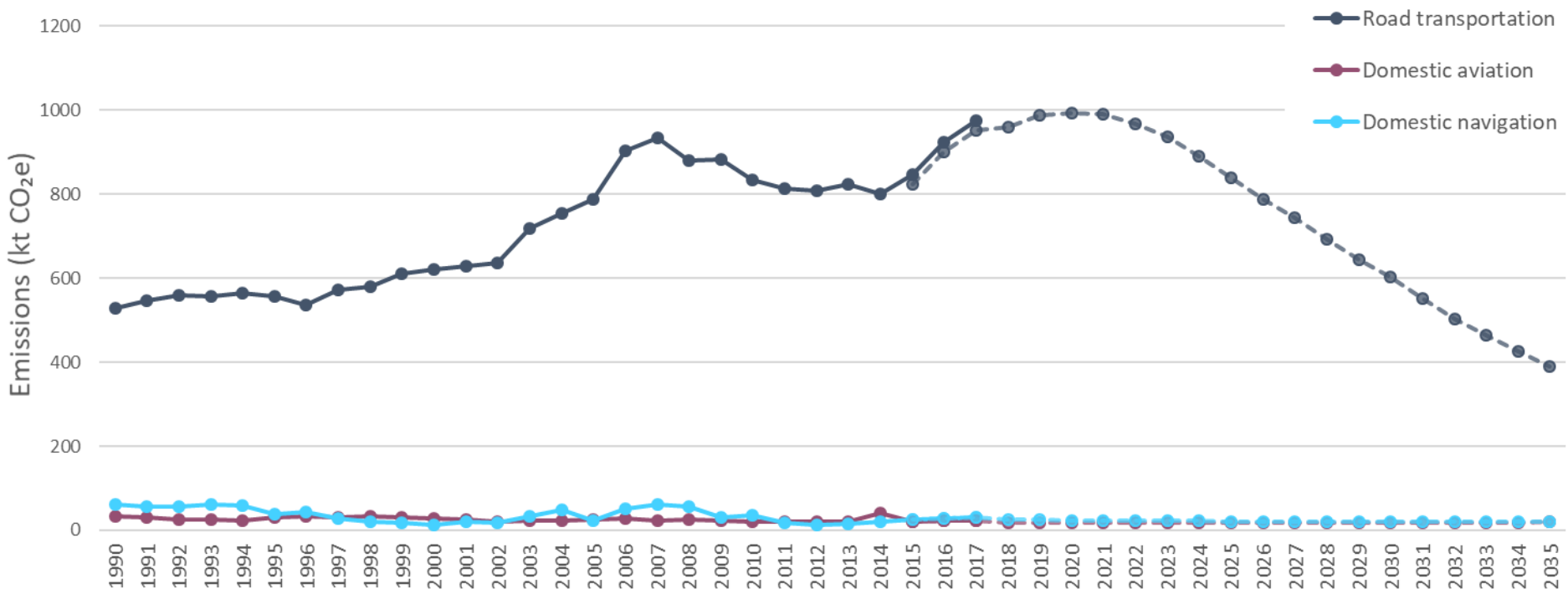
Figure 6.1 presents an overview of the historical and projected emissions from transport. The trend in transport emissions is dominated by the increase in road transport emission between 1990 and 2007. A marked increase in road transport emissions from 2014 can clearly be seen in the historical data. In the WEM scenario, emissions from road transport are projected to peak in 2020 and steadily decline after that, dropping below 1990 levels by 2035. This reduction in emissions is due to the rapid electrification of the vehicle fleet from 2015. By 2025 it is expected that approximately 20% of all road vehicles will be electric, rising to 55 % by 2035. A sensitivity analysis for the impact of electric vehicle (EV) infiltration of road transport emissions is presented in **Section 12.1.**

The cause for the small discrepancy (~ 3 %) in historical and projected emissions from road transport is due to the updated method applied in the projections (see **Section 6.3**). Road transport emissions split by vehicle type are presented in **Figure 6.2**. The majority of emissions are from passenger cars. However, the rate uptake of EVs is greatest in passenger cars and results in the most rapid decline in emissions. It is predicted that in 15 years, the proportion of EVs will rise from 4% in 2020 to 60% in 2035.

Fuel use for domestic aviation is projected to remain constant from 2017 and therefore a linear emissions trend has been projected.

A slight decline in fuel use in domestic navigation has been projected between 2017 and 2035. However, the projections presented in **Figure 6.1** consider additional reductions in fuel use in domestic navigation due to two policies in the WEM scenario (see **Section 6.2**):

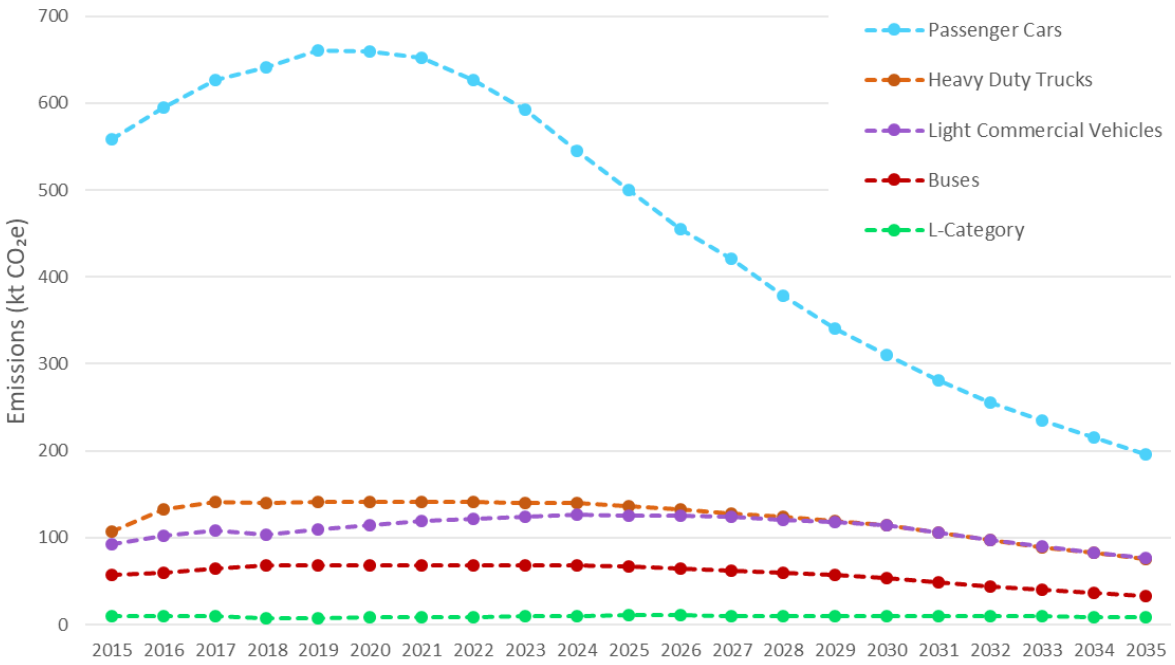
- The electrification for ferries (TR09, see **Section 6.2**)
- The electrification of harbours (EC02, see **Section 5.2**)



	Emissions (kt CO_2e)					
Sector	**1990**	**2015***	**2020**	**2025**	**2030**	**2035**
Domestic aviation (1A3a)	32	21	19	19	19	19
Road transportation (1A3b)	527	825	992	839	603	390
Domestic navigation (1A3d)	60	27	23	22	21	20
Transport (1A3)	**620**	**872**	**1034**	**880**	**643**	**430**

**Note: the 2015 value for Road Transport is taken from the projections data not the historical data. For other categories, the 2015 value is equal in the projections and historical data.*

Figure 6.1 Transport Emissions of Total GHGs (kt CO_2e), WEM scenario



	Emissions (kt CO_2e)				
Sector	**2015**	**2020**	**2025**	**2030**	**2035**
Passenger Cars	559	660	500	311	196
Heavy Duty Trucks	107	141	136	115	76
Light Commercial Vehicles	93	115	126	114	76
Buses	57	68	67	54	33
L-Category	10	8	11	10	9
Total	825	992	839	603	390

Figure 6.2 Road transport Emissions Total GHGs (kt CO_2e) by vehicle type

6.2 PaMs

Eleven Transport (TR) PaMs are currently implemented or planned with the objective of reducing GHG emissions, summarised in

Table 6.1 below. Six PaMs are related to the electrification or fuel change of the car fleet, three are to do with promoting public transport, cycling or walking, one is on the electrification of ferries and the final one has to do with electrification of vehicles in airports.

Table 6.1 Transport Policies and Measures

PaM Name	*GHG(s)*	*Instrument type*	*Status*	*Scenario*	*Ex-ante*	*Description*
Concessions for climate friendly vehicles and fuels (TR01)	CO_2	Economic, fiscal	Adopted	WEM	No	Further taxation fossil fuels and concessions for cars with zero or very low GHG emissions.
Support infrastructure for electrification /	CO_2	Economic, Fiscal, Voluntary/ negotiated agreements,	Adopted	WEM	No	Infrastructure improvements to achieve fuel change in transport in line with the parliamentary resolution on the

energy change of the vehicle fleet (TR02)		Regulatory, Planning				Action plan on energy change (approved on May 31st, 2017).
Improve construction and planning regulations on electric vehicle infrastructure (TR03)	CO_2	Regulatory, planning	Planned	WAM	No	Updated regulations on new buildings and planning will ensure that the installation of charging stations for electric vehicles will be considered.
Ban the registration of new diesel and gas vehicles after 2030 (TR04)	CO_2, CH_4, N_2O	Regulatory	Planned	WAM	No	The registration of new diesel- and gas cars will be banned after 2030.
Obsolescence of older vehicles: (TR05)	CO_2	Research	Planned	WAM	No	The benefits of accelerating the obsolescence of fossil fuel vehicles, in order to achieve fuel change in road transport as soon as possible, will be reviewed,
Infrastructure for electric bikes (TR06)	CO_2	Planning	Planned	WAM	No	A plan will be made to connect urban and business centres with bike paths in line with the Transport Plan (Samgönguáætlun) and improve infrastructure for electric bikes.
Promotion of public transport and car sharing (TR07)	CO_2	Regulatory, planning	Planned	WAM	No	Promote public transport and alternative transportation options in accordance with the Transport Plan (Samgönguáætlun).
Climate friendly vehicles at government entities (TR08)	CO_2,	Regulatory, planning	Adopted	WEM	No	Government entities are to lead the switch to sustainable cars and increase their share in the government´s car fleet as quickly as possible.
Electrification / fuel change of ferries (TR09)	CO_2, CH_4, N_2O	Planning	Adopted	WEM	Yes (1A3d)	A plan will be made for fuel change in ferries which are in regular operation, with the goal that the ferries use only carbon neutral energy sources no later than by their next renewal.
Airplanes connect to electricity at airports (TR10)	CO_2	Planning	Planned	WAM	No	All airplanes will be required to use electrical land connections when they are parked at the airport. This is in line with the parliamentary resolution on energy change, which was approved in Parliament on May 31st, 2017.
High class public transport in	CO_2	Planning	Planned	WAM	No	A new high class public transport system will be set up

Reykjavik Capital Area (TR11)	in Reykjavik Capital Area (Borgarlína).

All of the PaMs described in **Table 6.1**

Table 6.1 above will impact emissions from the transport sector. The PaM that has been quantified; the electrification / fuel change of ferries (TR09), is described in more detail in **Section 6.2.1**. Additional information on PaMs that have not been quantified is provided below. For more information on PaMs TR01-TR10, see the Climate Action Plan (2018). The last PaM, High class public transport in Reykjavik Capital Area (TR11), is a collaboration measure between the government and the municipalities in the capital area but was not directly included in the Climate Action Plan (2018).

Electrification or fuel change of the vehicle fleet

The accelerated uptake of electric vehicles or vehicles fuelled by renewable fuels has the possibility to significantly reduce Iceland´s GHGs emissions due to the country´s heavy dependency on cars for transport. The six PaMs that are to do with the electrification or energy change of the vehicle fleet in the 2018 Action Plan are the following: TR01, TR02, TR03, TR04, TR05, TR08. All except TR03, TR04 and TR05 are considered to fall under the WEM scenario and to contribute to the accelerated projected uptake of electric cars in the WEM scenario projections for transport. The impact of these PaMs was, however, not quantified as a group due to difficulties in isolating them from the large number of other smaller actions undertaken by individual organisations, companies and individuals to accelerate the electrification / fuel change of the vehicle fleet.

Promoting alternative methods of transportation

Alongside electrification or fuel change of the vehicle fleet, there will be a parallel effort to promote alternative methods of transportation, such as public transportation, car sharing, cycling and walking. Uptake of alternative methods of transportation has been slow in Iceland, with the main focus being on Reykjavik Capital Area. An analysis of the transport situation in the capital area, including different scenarios for improved public transport and other alternative transport, was published through a collaboration between the municipalities in the capital area (Mannvit, 2014). In order to facilitate the switch to alternative methods of transportation for the general public, a new high class public transport system (Borgarlína) has been planned to replace buses on the main commuting routes in the Capital Area. This plan has, however, not been fully funded yet and, therefore, it is still unknown when the new system will be finished. More information on the proposed plan can be found in *Borgarlína – High Class Public Transport in Reykjavik Capital Area* (COWI, 2017).

6.2.1 Quantified PaMs & Interlinkages with Projections

Electrification of ferries (TR09)

A plan will be made for fuel change in ferries which are in regular operation, with the goal of switching to ferries which use only carbon neutral energy sources no later than the next renewal.

Herjólfur, the biggest ferry in Iceland, is operated between Landeyjahöfn and Vestmannaeyjar. In certain weather conditions, the ferry needs to be diverted to Þorlákshöfn instead of Landeyjahöfn, which is a considerably longer journey. The impact of the electrification of the Herjólfur ferry has been considered in the fuel projections of domestic navigation (1A3d) in the WEM scenario.

The new Herjólfur, which will start sailing in April 2019, will be able to sail between Landeyjahöfn and Vestmannaeyjar on land electricity. There will, however, be a gas/diesel oil-powered electricity

generator on board which will generate electricity to power the ferry on longer journeys such as between Þorlákshöfn and Vestmannaeyjar. In the absence of this measure all trips made by the ferry would continue to run on gas/diesel oil.

The historic annual fuel use of the Herjólfur ferry, and the split between the shorter journey from Landeyjahöfn and the longer journey from Þorlákshöfn were obtained from the Icelandic Road and Coastal Service, Eimskip and a report by the research institute of the University of Akureyri (Rannsóknamiðstöð Háskólans á Akureyri – RHA, 2017). The number of annual trips up to 2035 has been projected based on population growth. The proportion of trips which must take the longer route due to bad weather conditions has been assumed to be constant at 10 % based on expert judgement. In addition, it has been assumed that all journeys from Vestmannaeyjar to Landeyjahöfn run on electricity from April 2020. The impact of this policy on fuel use in domestic navigation is presented in **Figure 6.3**.

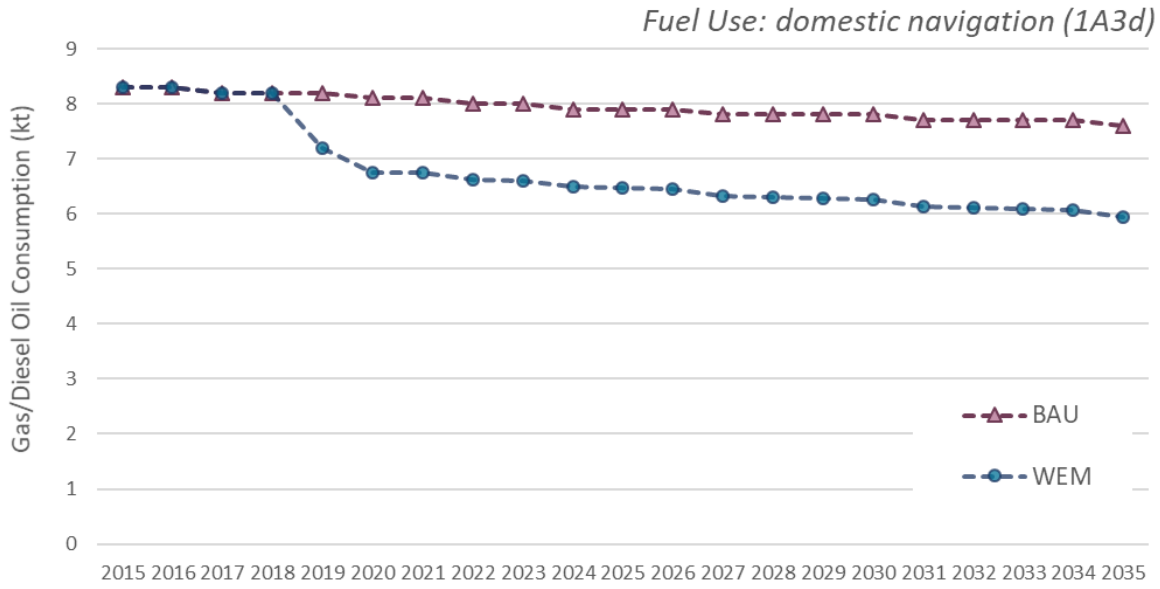


Figure 6.3 Domestic navigation fuel use (kt) in the BAU and WEM scenarios for PaM TR09: the electrification of ferries

Emissions from ferry trips running on gas/diesel oil have been calculated following the tier 1 IPCC methodology as is applied in the historical and projections GHG inventory. The impact of this policy on emissions from the Herjólfur ferry is presented in **Figure 6.4**. Emissions are projected to increase across the time series as the number of trips has been assumed to increase in line with population growth.

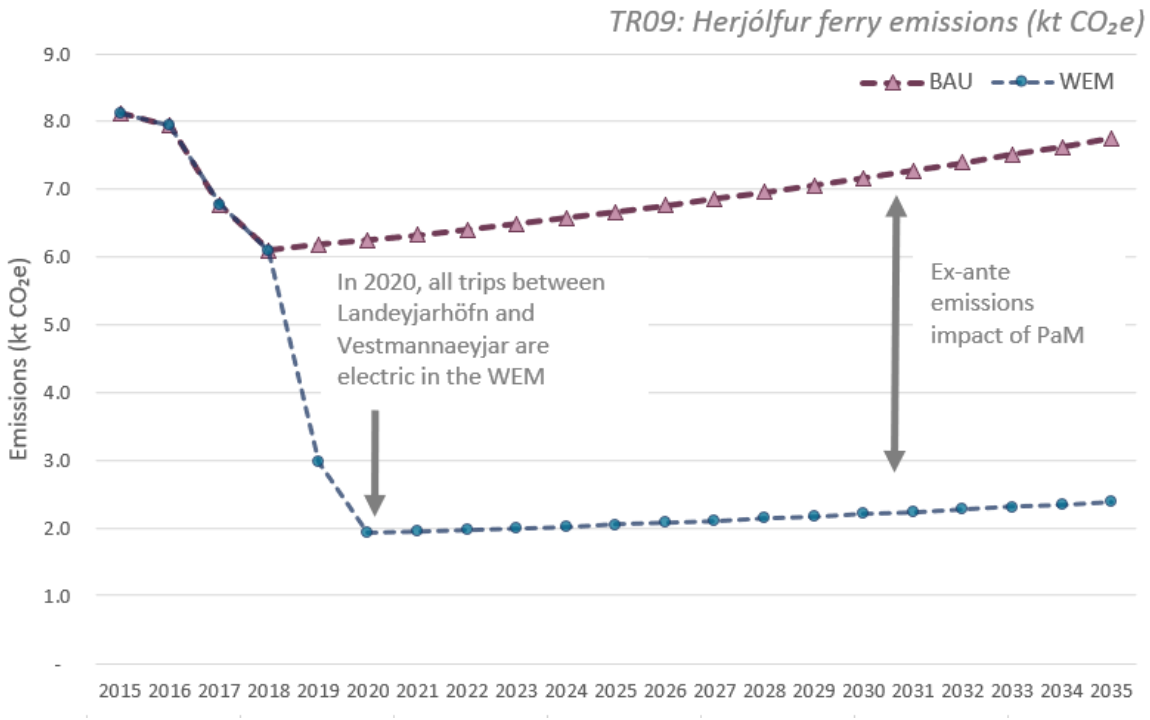


Figure 6.4 Quantified ex-ante emissions impact of PaM TR09: the electrification of ferries (kt CO_2e)

The plan is to switch all ferries which are operated by the government to electricity or renewable fuels by the next renewal of the fleet. Based on information received from the Icelandic Road and Coastal Administration (Vegagerðin) it is, however, still unknown when the other ferries which are operated will be renewed. Therefore, the calculation of this PaM currently only considers the electrification of Herjólfur.

6.3 Projections – WEM scenario

6.3.1 Methodology

With the exception of road transport, the methodology used to calculate projected emissions from transport are based on the historical inventory. For information on the methodology for aviation and navigation see NIR (2019).

There is a discrepancy in the historical and projected GHG inventories for road transport emission (see **Figure 6.1**). This is due to the projected data being based on COPERT. For the 2020 submission of the historical GHG inventory Iceland will use COPERT for road transport emissions, thus becoming consistent with projections.

6.3.2 Data & Assumptions

An overview of the data and assumptions used as a basis for the transport projections can be found in **Table 6.2**. A further description is provided below.

Table 6.2 Basis for Transport projections

Transport	**Basis for projections**
1.A.3.a Domestic Aviation	Fuel projections
1.A.3.b Road transportation	Fuel projections
1.A.3.c Railways	NA
1.A.3.d Domestic Navigation	Fuel projections

1.A.3.e Other transportation	Fuel projections
Memo items: international bunkers	
M. IB International Aviation	Fuel projections
M. IB International Navigation	Fuel projections

Projections for aviation and navigation are based on fuel projections generated by the National Energy Authority (Orkustofnun, 2016). Fuel projections were available by fuel type and activity. The fuel projections generated by the National Energy Authority for domestic navigation have been assumed not to consider the implementation of related quantified policies (see **Section 6.2.1**). Therefore, fuel savings from quantified WEM policies have been subtracted from the projected fuel consumption for the WEM scenario.

Road Transport

Projected vehicle numbers up to 2035 were obtained from the National Energy Authority. Projected information on electric vehicle (EV) numbers were obtained from the National Energy Authority and Reykjavik Energy. The projections on which the Reykjavik Energy EV numbers are based were made before the 2018 Action Plan was published and it is, therefore, uncertain whether any of the proposed Transport PaMs can be considered to have been included in the projections. The data provider, is, however, considered to be an expert authority on this matter and their projections considered the expectation that there would be more PaMs to accelerate the electrification of the car fleet in the near future. It was, therefore, assumed that TR1, TR2 and TR8 from the 2018 Action Plan are included in these projections, even though they were published after the projection was made.

Reykjavik Energy provided projections for EVs under three different scenarios for low/middle/high electric vehicle infiltration into the traffic fleet. The "mid" scenario has been applied to the WEM scenario. A sensitivity analysis considering the impact of the low and high EV infiltration scenarios on emissions is presented in **Section 12.1**. No information is available on the future phasing in / out of different Euro standards. Therefore, COPERT stock and activity projections have been made using expert judgement based on historical trends and applying rate of change curves from the UK fleet to Iceland data. Euro standards for petrol and diesel vehicles are modelled to be 100% Euro 6 2020+ for passenger cars, Euro 6 2021+ for light commercial vehicles, Euro VI for heavy duty vehicles and Euro 5 for L-Category vehicles by 2040, if not earlier. The projections of 'Fuel' and 'Segment' splits in each COPERT category was assumed to remain constant to an average of years 2014-2018 i.e. for lack of better information, it is assumed there will be no big changes between petrol and diesel or size of vehicles.

7 IPPU

Emissions from IPPU are dominated by the Metal Industry (2C), -specifically ferroalloys and aluminium production and the use of fluorinated gases (F-gases) in Products as Substitutes for Ozone Depleting Substances (ODS, 2F). Currently, there are two ferroalloy plants and three aluminium smelters operating in Iceland. The largest contributor to F-gas emissions is the fishing industry. There is no Electronics Industry (2E) in Iceland and therefore this is reported as NO.

It has been assumed that the number of aluminium and ferroalloy plants remains at 2017 levels for the projected years. Permits for more plants have been released, but due to a lack of information on whether or when these plants will begin operating, they are not included in the WEM projections. For more information on other possible GHG emissions projections scenarios for the heavy industry

sector, including a scenario considering the addition of two more ferrosilicon plants and the expansion of existing aluminium plants, see the University of Iceland´s report *Iceland and climate issues* (Hagfræðistofnun, 2017).

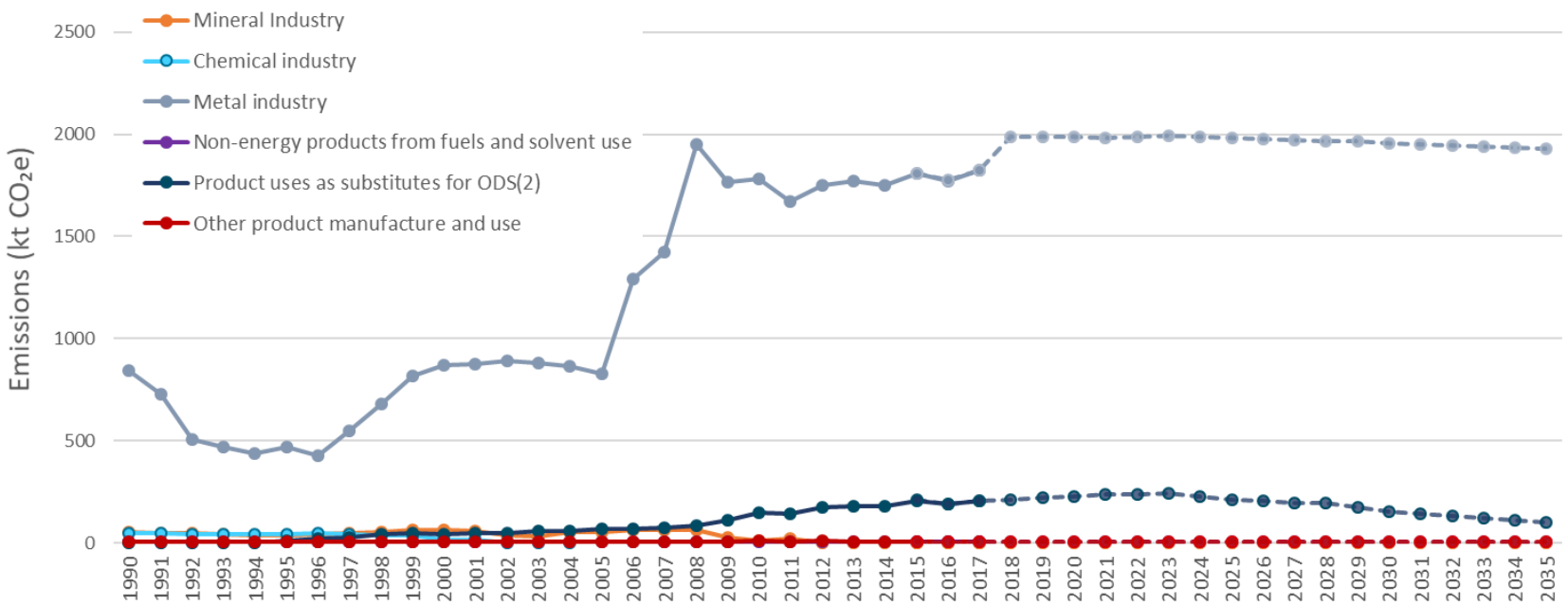
7.1 Trends

The historical and projected emissions trend in IPPU is presented in **Figure 7.1**. Emissions from the Metal Industry (2C) have increased considerably during the past 30 years due to the expansion of existing aluminium smelters and the addition of new smelter facilities. The most recent aluminium smelter started operating in 2007. CO_2 emissions increased linearly with production. In contrast, perfluorocarbons (PFC) emissions occur mostly during the first years of operation, causing the spike in emissions in 2008, and in case of increased voltage in the production line (anode effect). Two aluminium facilities are already producing close to the maximal operating allowance, indicating that the maximal CO_2 emissions from IPPU have been reached.

The Ferroalloys industry currently has two operating plants which produce ferrosilicon and silicon metal. One plant has operated since 1979, and the other one started operation in 2018. There is a third silicon metal plant which is currently not operating, and it is unclear whether operations are to be resumed. Due to this uncertainty, this plant was excluded from the projections.

The aluminium industry has already nearly reached maximal production capacity and the projections show a slight increase in emissions compared to 2017 emissions and relatively constant PFC emissions. The ferroalloys industry on the other hand, shows a decrease in the emissions, primarily due to the efforts of one company who communicated a decrease of their emissions of 130 kt CO_2e until 2035. Details about how the plant plans to achieve this decrease in emissions with constant production were not communicated to the EA.

F-gases are mostly used for refrigeration and air conditioning in Iceland. The biggest share in F-gas emissions derives from the fishing fleet, which relies on HFCs for the cooling and freezing systems on board. The EU Directive 517/2004 was implemented into the Icelandic Regulation system with Regulation No 1279 from 31/12/2018 defining a quota system on the amount of F-gases to be imported each year and steps for phasing it out. Applying this regulation in the projection of F-gas emissions shows that the peak of emissions will be reached in 2023 and from this point the emissions will decrease.



	Emissions (kt CO_2e)					
Sector	**1990**	**2015**	**2020**	**2025**	**2030**	**2035**
Mineral Industry (2A)	52	1	1	1	1	1
Chemical industry (2B)	47	NO	NO	NO	NO	NO
Metal industry (2C)	844	1 809	1 986	1 983	1 958	1 929
Non-energy products from fuels and solvent use (2D)	7	6	5	4	4	3
Electronics industry (2E)	NO	NO	NO	NO	NO	NO
Product use as substitutes for ODS(2 (2F)	1	212	228	212	155	98
Other product manufacture and use (2G)	7	5	5	5	5	5
Other (please specify) (2H)	NO	NO	NO	NO	NO	NO
IPPU (2)	**958**	**2 032**	**2 226**	**2 205**	**2 122**	**2 036**

Figure 7.1 IPPU Emissions Total GHGs (kt CO_2e), WEM scenario

7.2 PaMs

Four IPPU (IP) PaMs are currently implemented or planned with the objective of reducing GHG emissions, summarised in **Table 7.1**.

Table 7.1 Policies and Measures included in IPPU

PaM Name	GHG(s)	Instrument type	Status	Scenario	Ex-ante	Description
Phasing out of F-gases (IP01)	HFC, PFC	Regulatory	Implemented	WEM	No	Iceland has adopted the EU F-gas Regulation 517/2014 with Icelandic Regulation 1279/2018.
MAC Directive 2006/40/EC (IP02)	HFC, PFC	Regulatory	Implemented	WEM	No	Gradual ban of F-gases in passenger cars by enforcing the use of gases with a GWP lower than 150. Adopted in Icelandic Regulation 165/2008.
BAT for Non-Ferrous Metals Industries (IP03)	GHGs	BREF	Implemented	WEM	No	Operating permits for non-ferrous metals industries are required to include the Best Available Techniques (BAT) Reference Document (Art. 31(1) of the Directive 2010/75/EU on industrial emissions).
BAT for Manufacture of Glass (IP04)	GHGs	BREF	Implemented	WEM	No	Operating permits for the manufacture of glass are required to include the BAT Reference Document (Art. 31(1) of the Directive 2010/75/EU on industrial emissions).

The PaMs on reducing GHG emissions from IPPU in the 2018 Action Plan are predominantly focused on achieving the phasing out of F-gases.

Iceland adopted the F-gas Regulation 517/2014 in December 2018, in line with the 2018 Action Plan. This regulation limits the total amount of the most significant F-gases which can be sold, banning the use of F-gases in many new types of equipment where less harmful alternatives are available and preventing emissions of F-gases from existing equipment. The F-gas regulation is adapted to Icelandic conditions and the import quota differs from the values stated in the Annex V of the regulation.

Further possibilities for accelerating the phasing out of F-gases, such as taxes and subsidies, will be researched with the aim of achieving minimal emission levels in 2030. The EA has proposed the taxation of F-gases based on the taxation in Denmark.

Stakeholder Engagement

The stakeholder workshop on IPPU, organised by the EA in May 2018, was well attended by representatives from the industrial sector in Iceland. The largest industrial plants (aluminium and ferroalloy) all fall under the EU ETS and have plans to reduce their GHG emissions. The majority of companies have set environmental and or climate strategies, which will be included in the future as more information on direct actions to be undertaken becomes available. For this submission, the EA

only received information on planned GHG emissions reductions from one company, which is included in the projections.

7.2.1 Quantified PaMs & Interlinkages with Projections

The PaMs in the IPPU sector were not quantified individually. The Mobile Air-Conditioning Systems (MAC) directive has been in place since 2008 and is therefore considered to be part of the WEM projections scenario. The operating permits for non-ferrous metals industries and the production of glass are similarly assumed to be part of the WEM projections scenario because they are already included in operating permits.

The recently adopted EU F-gas Regulation 517/2014 (implemented with Icelandic Regulation 1279/2018) is, therefore, the measure which causes the biggest shift in the trend of emissions in the non-ETS IPPU emissions (see **Figure 7.2**). The quantification of this measure is however difficult, as the import of F-gases has been varying greatly over time and the emissions deriving from F-gases extend over the whole lifetime of the installation using F-gases. The projected emissions deriving from F-gases are based on the maximal allowed import quota for each year starting with 2019, but the import amount without the regulation could not be estimated for the future. Therefore, the direct GHG emissions savings from this measure have not been quantified.

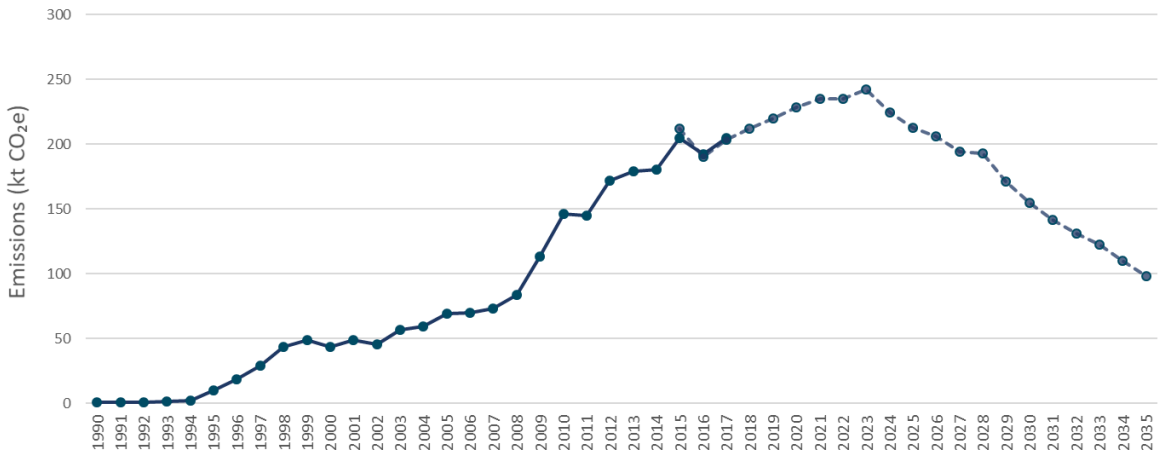


Figure 7.2 GHGs emissions from Product Uses as Substitutes for ODS (2F) due to the use of F-gases, WEM scenario

7.3 Projections – WEM scenario

The methodology used to generate projections for the IPPU Sector are based on the historical inventory, see NIR (2019).

7.3.1 Data & Assumptions:

An overview of the data and assumptions used as a basis for the IPPU projections can be found in **Table 7.2**. A further description is provided below.

Table 7.2 Basis for IPPU projections

IPPU	**Basis for projections**
2.A Mineral Industry	Activity data provided by the stakeholders
2.B Chemical Industry	Not relevant in Iceland
2.C Metal Industry	Activity/emission data provided by the stakeholders, trends over the past 5 years
2.D Non-energy products from fuels and solvent use	GDP, population projection
2.E Electronics Industry	Not relevant in Iceland
2.F Product uses as substitutes for ODS(2)	Legislation (Import quota)
2.G Other product manufacture and use	GDP, population projection, trends over the past 10 years

The main companies (mineral wool, ferroalloys and aluminium) were asked to provide a production and emission estimate until the year 2035 or to confirm or reject the calculated emission estimates based on historical inventory data. Half of the companies responded to the request and provided own emission and production estimates or rectified the calculated projections. Where companies did not respond a mixture of (1) activity data projected based on production trends, and (2) maximum production allowances according to valid permits, was applied to generate projections.

According to the Icelandic Ministry of Industries and Innovation, Department of Energy, Industry and Business affairs there are currently no plans for adding new aluminium smelters, ferroalloys plants or for resuming production of cement, fertilizer, diatomite or steel[3]. Therefore, the projections are based on the current production, have been increased to reflect the maximal permitted allowance according to the operation permits or to reach production amounts communicated by the individual companies.

The F-gas projections are based on the import allowance of HFCs. No information on the single blends and their use is available. The historical data show a strong fluctuation in the amount and composition of imported blends which does not correlate to any macroeconomic parameter. A simplified approach was chosen by applying initial emission factors, operation emission factors, recovery and lifetimes averaged from the inventory calculations of the 2F1 subsector. A comparison shows that in the subsector 2F1 the transport refrigeration (2F1d) is the most significant contribution to the F-gas emissions. Therefore, the emission factors of the transport refrigeration were applied to the whole time series. This resulted in a 1 % discrepancy between the historical and projected inventory which was considered satisfactory given the difficulty of obtaining activity data.

[3] [E-mail communication from 05/02/2019, Director General, Department of Energy, Industry and Business Affairs, Ministry of Industries and Innvoation]

8 Agriculture

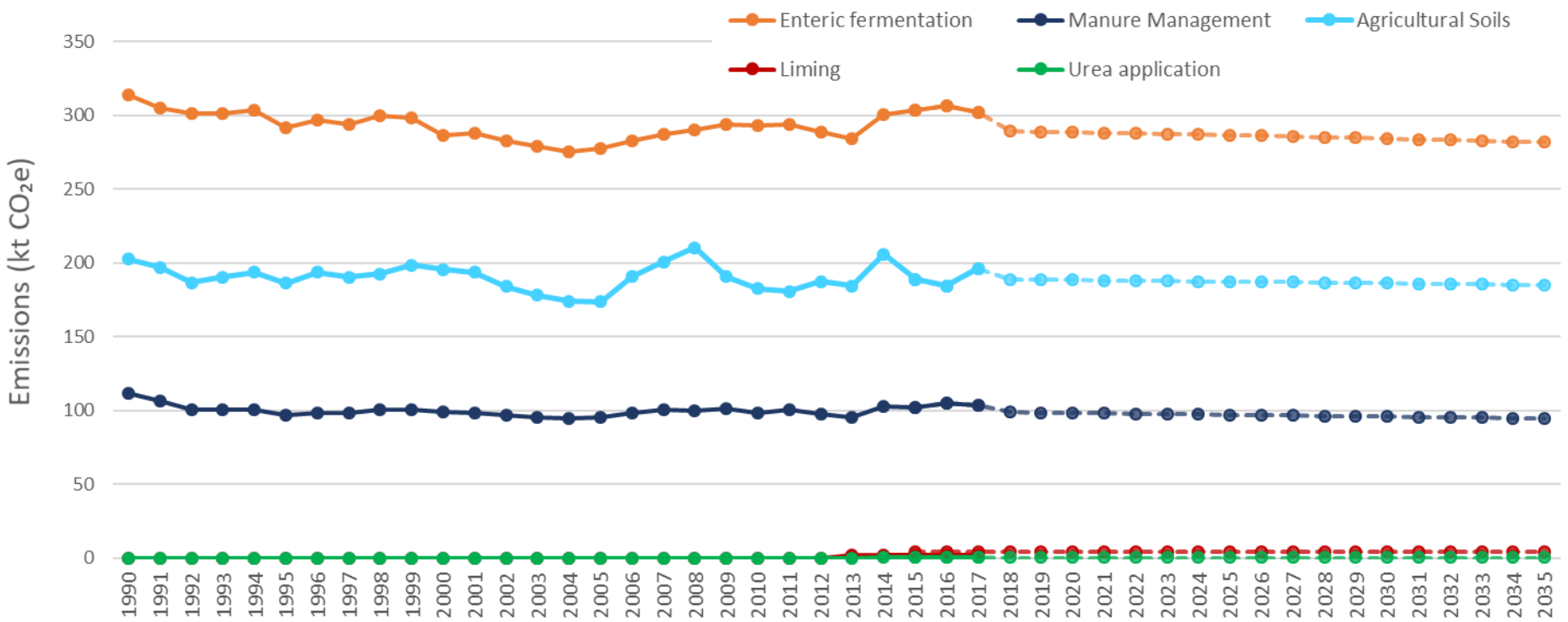
Iceland is self-sufficient in all major livestock products, such as meat, milk, and eggs. Traditional livestock production is grassland based and most farm animals are native breeds, i.e. dairy cattle, sheep, horses, and goats, which are all of an ancient Nordic origin, one breed for each species. These animals are generally smaller than the breeds common elsewhere in Europe and, therefore, the calculated emissions from these breeds based on default IPCC (2006) emission factors might be slightly overestimated. Beef production, however, is partly through imported breeds, as is most poultry and all pork production. There is not much arable crop production in Iceland, due to a cold climate and short growing season. Cropland in Iceland consists mainly of cultivated hayfields, although potatoes, barley, beets, and carrots are grown on limited acreage.

The total GHG emissions from Agriculture in 2017 were 4% below the 1990 level. The main sources of GHG emissions in agriculture are CH_4 emissions from enteric fermentation and manure management, and N_2O emissions from manure management and fertilizers. Emissions of CH_4 and N_2O have historically accounted for over 99 % of the total emissions from agriculture in Iceland, with less than 1 % arising from CO_2. In 2017, 85 % of CH_4 emissions were caused by enteric fermentation, the rest by manure management. In the same year, 80 % of N_2O emissions were caused by agricultural soils, the rest by manure management, i.e. storage of manure.

8.1 Trends

Historically the biggest source of GHG emissions from the agriculture sector in Iceland is enteric fermentation, although manure management and agricultural soils are also significant sources. The decrease of GHG emissions since 1990 is mainly due to a decrease in sheep livestock population, reducing methane emissions from enteric fermentation, and reduced fertilizer application reducing N_2O emissions from agricultural soils. The historical and projected trend can be seen in **Figure 8.1**. Emissions from agriculture are projected to decrease slightly due to a projected decrease in most livestock numbers. This reduces emissions from enteric fermentation and manure management. Emissions from liming and urea application remain steady however, in line with the historical trend.

Emissions from enteric fermentation and manure management are both projected to decrease by 7 % from the 2015 until 2035Emissions from agricultural soils are projected to remain relatively steady and only decrease by 2 %. Projections for Liming and Urea were based on the average emissions from 2013-2017 and are, therefore, constant for the projected time series and only slightly higher or lower than emissions in the base year.



	Emissions (kt CO_2e)					
Sector	**1990**	**2015**	**2020**	**2025**	**2030**	**2035**
Enteric fermentation (3A)	314	304	289	287	284	282
Manure Management (3B)	112	102	98	97	96	95
Agricultural Soils (3D)	203	189	188	187	186	185
Liming (3G)	IE	4	4	4	4	4
Urea application (3H)	0.1	1	1	1	1	1
Agriculture (3)	**628**	**599**	**580**	**576**	**571**	**566**

Figure 8.1 Agriculture Emissions Total GHGs (kt CO_2e), WEM scenario

8.2 PaMs

Three Agriculture (AG) PaMs are currently planned with the objective of reducing GHG emissions, summarised in **Table 8.1**.

Table 8.1 Policies and Measures included in Agriculture

PaM Name	*GHG(s)*	*Instrument type*	*Status*	*Scenario*	*Ex-ante*	*Description*
Reduced use of non-organic fertilizers (AG02)	CO_2, CH_4, N_2O	Regulatory	Planned	WAM	No	Reduce the import and use of non-organic fertilizers and simplify the use of domestic fertilizers by adjusting the regulatory framework.
Improved manure management (AG03)	CO_2, CH_4, N_2O	Research, Planning. Regulatory	Planned	WAM	No	Improved management and storage of animal manure. Possibilities for the development of biogas stations which process animal manure will be analysed.
Carbon neutral sheep (AG01)	CO_2, CH_4, N_2O	Fiscal, Planning	Planned	WAM	No	Collaborate with sheep farmers to reduce GHG emissions and increase carbon sequestration in farming and land use.

The PaMs described in the table above are all from the Climate Action Plan (2018). Two planned PaMs will directly impact emissions from the agriculture sector: reducing the use of non-organic fertilizers (AG02) and improving manure management (AG03). The three PaMs are still in the planning and/or research stage and have, therefore, not been included in the WEM projections.

Reduced use of non-organic fertilisers (AG02)

The first PaM is a proposed regulation change with the aim of reducing the import and use of non-organic fertilizers in Icelandic agriculture. By simplifying the use of domestic fertilizers through adjustments to the regulatory framework, imports of nitrogen fertilizers are expected to decrease. Reducing the use of nitrogen fertilizers would in turn result in lower fertilizer emissions from agriculture and could result in both monetary benefits and GHG emissions savings while maintaining the same crop rates.

Improved manure management (AG03)

The second PaM is a plan to research and report on the opportunities for reducing GHG emissions from animal manure through improved management and storage practices. This will include exploring the potential for developing biogas stations which process animal manure. Other methods to increase the efficiency of practices involving the use of animal manure, such as changed farming practices and timing of fertilizer application, will also be mapped. Improved utilization of animal manure would result in reduced GHG emissions from agriculture, while biogas production would increase the fertilizer value of animal manure. Regulations pertaining to this issue will need to be reviewed in this regard, such as whether it would be appropriate to retract a ban on the application of pig manure.

Carbon neutral sheep (AG01)

Apart from the aforementioned measures in the Climate Action Plan (2018), the Icelandic Sheep Farmer´s Association has plans for sheep farming to become carbon neutral by the year 2027. This is an ambitious goal, which they aim to achieve through a combination of carbon sequestration in land

use through soil reclamation, afforestation and wetland reclamation, as well as through energy change, improved farming practices and more. A report on possible ways for sheep farmers to achieve carbon neutrality has been completed (Environice, 2017), which includes suggested paths of action for sheep farmers to undertake in order to reach their shared goal.

The government wants to support these efforts and a cross-cutting policy in the Climate Action Plan (2018) states that it will collaborate with sheep farmers to achieve their target of carbon neutrality. A collaboration between the Ministry for the Environment and Natural Resources, the Ministry of Industries and Innovation, the Icelandic Agricultural Advisory Centre, the Icelandic Forest Service and the SCSI is already underway and will define the actions to be undertaken further. Based on the proposed measures in the carbon neutrality report, a significant part of sheep farmers´ emission reduction efforts (apart from reduced livestock numbers and improved farming practices) will, however, not be calculated in the Agriculture sector but be counted under LULUCF (soil- and wetland reclamation, forestry) and Energy (fuel and energy change). Furthermore, no final plan of action has been decided on and, therefore, it is currently not possible to quantify the impact of this policy.

8.3 Projections – WEM scenario

The methodology used to generate projections for the Agriculture Sector are based on the historical inventory, see NIR (2019).

8.3.1 Data & Assumptions:

An overview of the data and assumptions used as a basis for the Agriculture projections can be found in **Table 8.2**. A further description is provided below.

Table 8.2 Basis for Agriculture projections

Agriculture	**Basis for projections**
3.A Enteric fermentation	Historical trends
3.B Manure management	Historical trends
3.C Rice cultivation	Not relevant in Iceland
3.D Agricultural soils	Historical trends
3.E Prescribed burning of savannahs	Not relevant in Iceland
3.F Field burning	Not relevant in Iceland
3.G Liming	Historical trends
3.H Urea application	Historical trends
3.I Other carbon-containing fertilizers	Historical trends

The projections on how the agriculture sector will develop in Iceland have been based on historical trends, proxy projections and expert judgement.

The trend in livestock populations has been extrapolated forwards to 2035, based on the historical trend in populations between 1990 and 2017. Exceptions were made for a few livestock categories (foxes, rabbits, broilers in the chicken category and hens in the duck category), which were kept constant at 2017 livestock numbers, due to the trend over the time series being dominated by large, one-off drops/increases in some years, or the trend falling into sub-zero numbers.

Milk yield per dairy cow in kg/year was projected using the historical trend.

Table 8.3 Livestock number projections and milk yield per dairy cow (kg/year)

Category	2015	2020	2025	2030	2035	% change ´15-´35
Dairy Cattle	27 441	23 466	22 306	21 146	19 986	-27%
Milk yield	5 851	6 310	6 707	7 105	7 502	28%
Cattle	51 335	49 315	50 508	51 701	52 895	3%
Sheep	739 754	709 097	698 544	687 990	677 436	-8%
Goats	1 476	1 565	1 786	2 007	2 228	51%
Horses	75 450	77 473	77 869	78 265	78 661	4%
Swine	42 542	42 788	42 556	42 325	42 093	-1%
Poultry	718 935	889 531	983 279	1 077 027	1 170 775	63%

The livestock projections in **Table 8.3** show that the number of dairy cattle is projected to decrease by 27 % from 2015 until 2035, while the average annual milk yield per dairy cow is projected to increase by 28 %. This is comparable to the projected annual milk yield by other countries. This increase in productivity per dairy cow leads to an increase of gross energy (GE) intake and consequently higher CH_4 enteric fermentation emissions per dairy cow, offsetting the emissions reductions from lower population numbers which would otherwise have been more significant.

Emission factors and other key parameters have been held constant at 2017 values.

Historical livestock numbers on which the trends are based are from the Icelandic Food and Veterinary Authority (IFVA) and the same numbers which are used for agriculture calculations in the NIR (2019).

Projections of mineral fertiliser use and mineralisation of N from histosols are made by taking the average of the last 5 years of data (2014-2017) and using this fixed value for the whole projected series due to a lack of activity data.

9 Waste

This sector includes emission projections from Solid Waste Disposal (5A), Biological Treatment of Solid Waste (5B), Incineration and Open Burning of Waste (5C) and Wastewater Treatment and Discharge (5D).

For most of the 20th century Solid Waste Disposal Sites (SWDS) in Iceland were numerous, small, and located close to the locations of waste generation. In 1991 the SWDS Álfsnes was opened, which is currently the biggest SWDS site in Iceland and is serving the capital and all surrounding municipalities, where approximately two thirds of the population of Iceland lives. Currently a new biogas and composting plant is being built at Álfsnes and will start operating in 2020. The plant is expected to turn 25 kt of waste into compost and methane gas annually. The methane will mostly be used as fuel for vehicles, but this has not yet been incorporated into the transport projections (see **Section 6**). There was a trial to produce electricity from the recovered methane, but this could not compete with the cheaper electricity production from geothermal or hydropower, so the methane is mostly used for vehicle fuel.

Until the 1970s, the most common form of waste management outside the capital area was open burning of waste. However, this practice was banned in 1999 and is non-existent today. In the beginning of 2012, a total of four waste incinerators were operating. However, by the end of 2012 all incineration plants except one (Kalka) had closed; therefore, emissions from the single plant are

reported from 2013. Kalka mostly handles mixed general waste, but also clinical waste, hazardous waste, slaughterhouse waste and other waste categories in smaller quantities.

Recycling and biological treatment of waste started on a larger scale in the beginning of the 1990s. Their share of total waste management has increased rapidly since then and the amount of waste composted doubled between 2007 and 2017.

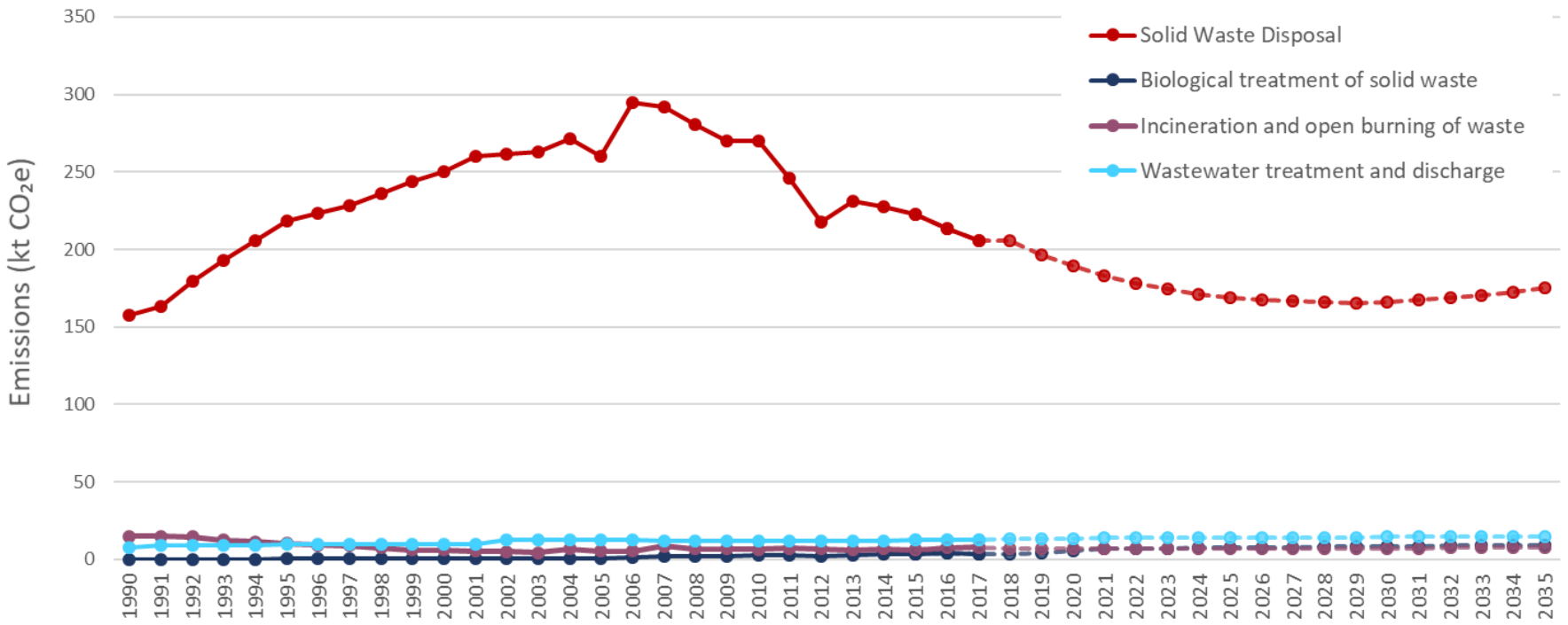
Wastewater treatment in Iceland consists mainly of basic treatment with subsequent discharge into the sea. In recent years, more advanced wastewater treatments have been commissioned in some smaller municipalities but their share of total wastewater treatment systems in Iceland does not exceed 2 %.

9.1 Trends

Historically 80 – 90% of GHG emission from the waste sector in Iceland have come from Solid Waste Disposal (5A). In recent years the emissions from SWDS have been decreasing due to reduced landfilling and increased methane collection. The historical and projected trend is presented in **Figure 9.1**.

The emissions from Solid Waste Disposal (5A) are projected to decrease until 2027 when they will begin to increase again. The decrease up to 2027 is due to the addition of the new gas and composting plant (see PaM WM04). After 2027, emissions are projected to increase again, this linked to increasing GDP (see **Section 9.3.1** for information on assumptions) and a projected increase in population whilst methane collection and the capacity of the gas and compost plant remains constant.

Figure 9.2 shows historical and projected emissions from the waste sector, excluding emissions from Solid Waste Disposal (5A). Biological Treatment of Waste (5B) and Wastewater Treatment and Discharge (5D) are projected to slightly increase whilst emissions from Incineration and Open Burning of Waste (5C) are projected to remain relatively steady.



	Emissions (kt CO_2e)					
Sector	**1990**	**2015**	**2020**	**2025**	**2030**	**2035**
Solid Waste Disposal (5A)	158	222	189	169	166	175
Biological treatment of solid waste (5B)	0	4	6	8	8	9
Incineration and open burning of waste (5C)	15	6	7	7	7	7
Wastewater treatment and discharge (5D)	8	12	14	14	14	15
Other (please specify) (5E)	NO	NO	NO	NO	NO	NO
Waste (5)	**181**	**245**	**218**	**198**	**200**	**213**

Figure 9.1 Waste Emissions Total GHGs (kt CO_2e), WEM scenario

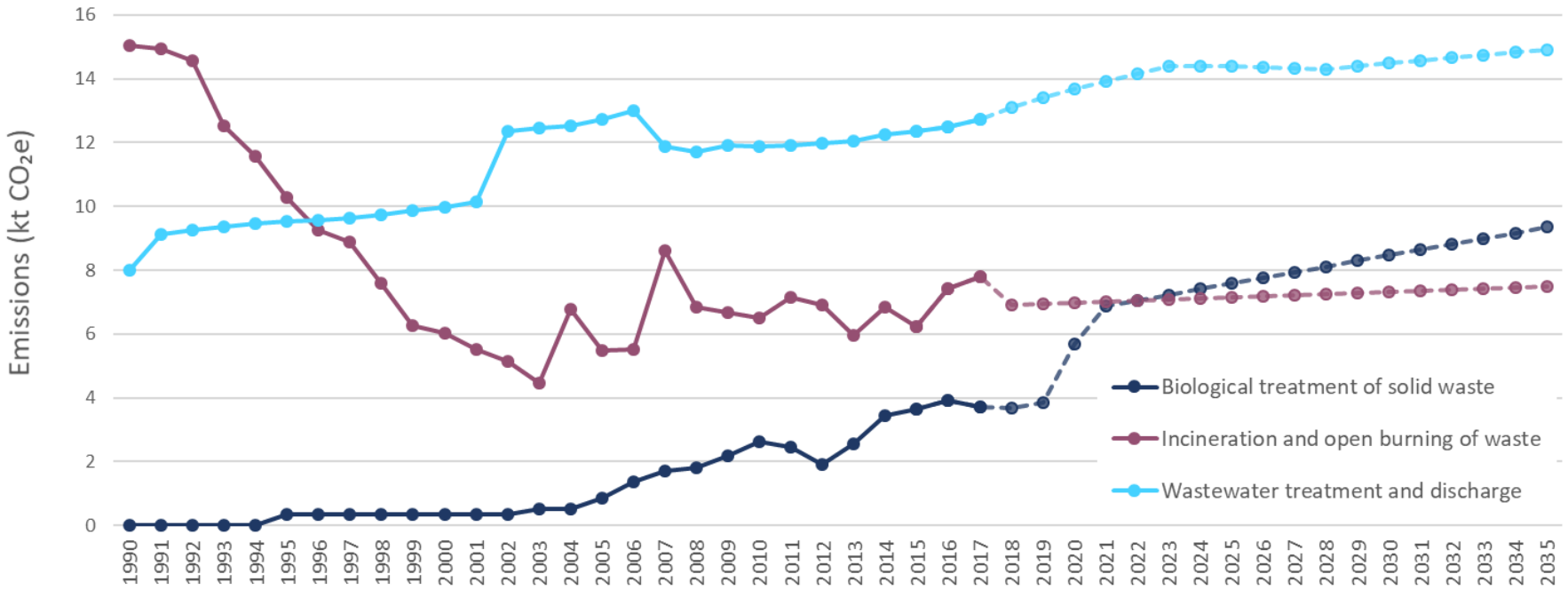


Figure 9.2 Waste Emissions Total GHGs (kt CO_2e), excluding Solid Waste Disposal (5A), WEM scenario

9.2 PaMs

Four waste management (WM) PaMs are currently implemented or planned with the objective of reducing GHG emissions. The WM PaMs are summarised in **Table 9.1**

Table 9.1 Policies and Measures included in Waste

PaM Name	GHG(s)	Instrument type	Status	Scenario	Ex-ante	Description
Increased methane recycling (WM01)	CH_4	Planning	Planned	WAM	No	Increased efforts to improve the recycling of methane emissions from landfill sites.
Tax on landfilling and ban on landfilling organic waste (WM02)	CH_4	Economic, Regulatory	Planned	WAM	No	A tax on landfilling general waste will be introduced and a ban on landfilling organic waste is proposed.
Reduced food waste (WM03)	CH_4	Fiscal	Planned	WAM	No	More funding will be provided for projects that aim to reduce food waste.
Gas & composting plant (WM04)	CH_4	Other	Implemented	WEM	Yes (5A1a)	A new gas and composting plant is being built and will start operating at Iceland´s largest landfill site in 2020.

The first three PaMs are from the 2018 Action Plan (WM01, WM02 and WM03). These PaMs have not been implemented yet and are, therefore, not included in the projected WEM scenario for the Waste Sector. All three are focused on reducing waste going to landfill and increasing methane capture and recycling.

Currently, methane is processed at two landfill sites in Iceland, by Sorpa and Norðurorka, and the resulting fuel is mainly used for passenger cars. There is, however, a significant potential to process more methane at the landfill sites as well as from agricultural waste and use the resulting fuel to fuel more cars and other vehicles. A more detailed description of these planned PaMs can be found in the Climate Action Plan (Ministry for the Environment and Natural Resources, 2018).

The fourth PaM in **Table 9.1** on the gas and composting plant has been quantified and is described further in **Section 9.2.1** below.

9.2.1 Quantified PaMs & Interlinkages with Projections

There is one quantifiable PaM included in the waste sector which is the new biogas and composting plant (WM04). The biogas and composting plant will start operating in 2020 and will be located at the largest landfilling site in Iceland. Data on the plant was received from Sorpa. It is expected that 25 000 tonnes/year of general waste, which would otherwise have been landfilled, will be processed at the plant. The plant's full capacity is 35 000 tonnes/year but Sorpa does not expect that level of waste to be processed in the coming years. The output of the plant is expected to be 12 000 tonnes of compost and 3 million Nm^3 of methane gas annually.

This PaM was included in the projected WEM scenario emissions for Solid Waste Disposal (5A). The amount of waste expected to feed into the gas and composting plant was subtracted from the projected waste going to landfill before the emissions were calculated. The gas and composting plant will produce some leakage of methane which is assumed to be 5 % based on IPCC 2006 guidelines. Consequently, this would increase emissions from the Biological Treatment of Waste (5B) by 2.7 kt CO_2e when the plant is in full production, decreasing the overall emission savings.

The projected saving, after leakage emissions have been subtracted, will gradually increase over the time series, reaching 26 kt CO_2e/year in 2035.

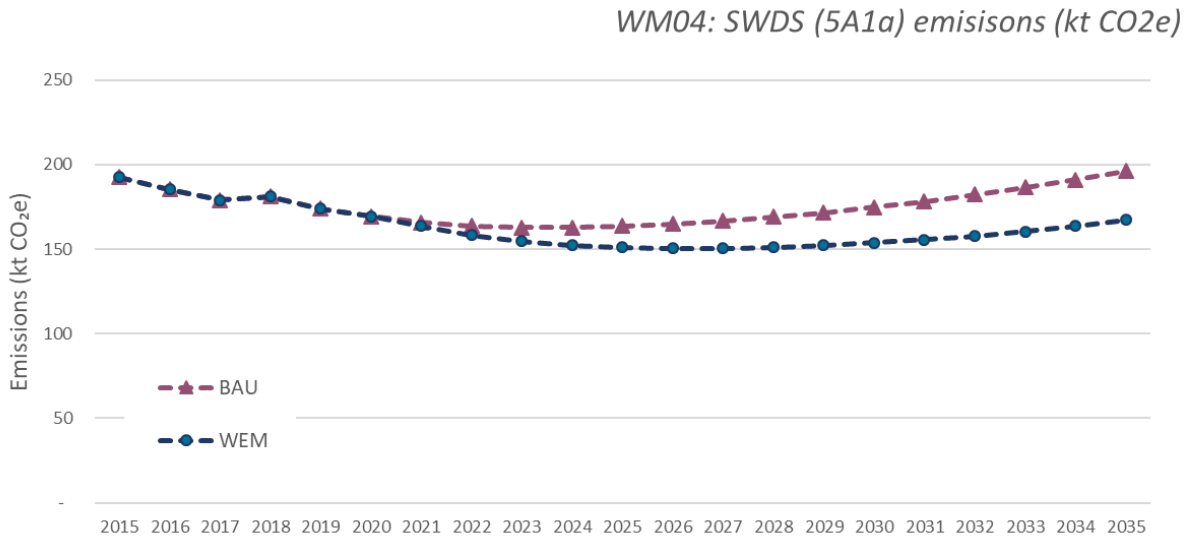


Figure 9.3 Quantified ex-ante impact of PaM WM04 on GHG emissions from Solid Waste Disposal Sites (SWDS): gas & composting plant (kt CO2e)

9.3 Projections – WEM scenario

The methodology used to generate projections for the Waste Sector are based on the historical inventory, see NIR (2019).

9.3.1 Data & Assumptions:

An overview of the data and assumptions used as a basis for the Waste projections can be found in **Table 9.2**. A further description is provided below.

Table 9.2 Basis for Waste projections

Waste	**Basis for projections**
5.A Solid Waste Disposal	GDP, methane recovery projections and gas and composting plants projections from stakeholders
5.B Biological treatment of solid waste	Historical trends
5.C Incineration and open burning of waste	Historical average
5.D Wastewater treatment and discharge	Population projections (Statistics Iceland)
5.E Other (please specify)	Not relevant in Iceland

For projections of emissions from Solid Waste Disposal (5A) the amount of waste going to landfills had to be projected. Proxy data analysis was preformed comparing the correlation of waste per capita with OECD GDP in one case and population in the second case. The result was that waste per capita is better correlated with GDP, which was then used as proxy data to project waste amounts

going to landfills. It was evident that there is decoupling between GDP and waste generation for more recent years in the historical timeseries, which will contribute to increased uncertainty of projected emissions. It is planned to improve the waste sector projections in future submissions by identifying improved proxy data rather than GDP for the projection of annual waste generation in Iceland.

10 LULUCF

In this sector emissions and removals related to land use, land use change and forestry (LULUCF), are reported. The categorization of land use is according to the 2006 IPCC guidelines (IPCC, 2006). This defines six main land use categories: forest land, cropland, grassland, wetlands, settlements, other land, and conversions between them. The Soil Conservation Service of Iceland and the Icelandic Forest Service are responsible for preparing the inventory for this sector.

Almost 90 % of the total area of Iceland is included in either "Other land" or Grassland. For this year's NIR, there are considerable changes in land use classification where some land previously classified as Grassland is now classified as "Other land" or Wetland. This shift in land classification is because of new data available in the first habitat type map for Iceland now available and applied as a base map for the 2017 land use map. This new data has both more categories and smaller mapping units. The new data and the consequent changes are discussed further in the NIR (2019). **Figure 10.1** shows the relative division of the area of Iceland to the six main land use categories reported in 2017.

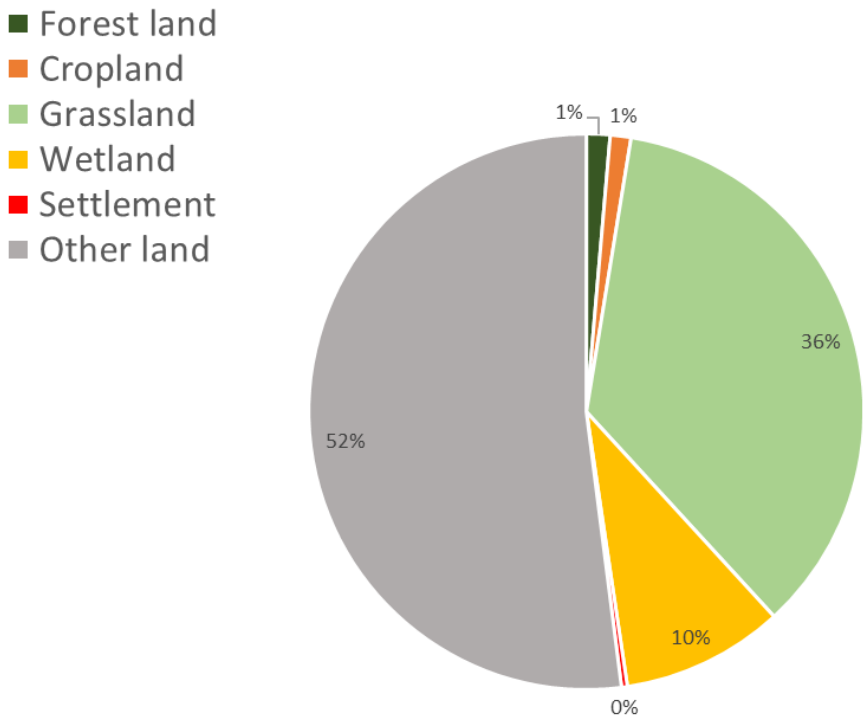


Figure 10.1 Relative size of land use categories in Iceland according to the Icelandic Geographic Land Use Database (IGLUD) land use map 2017 and other land use estimates available for the reporting

Both emissions from sources and removals by sinks are reported for this sector. The net contribution of the main land use categories in the year 2017 is summarized in **Figure 10.2.** More information on historical emissions/removals of land use categories is reported in the NIR (2019).

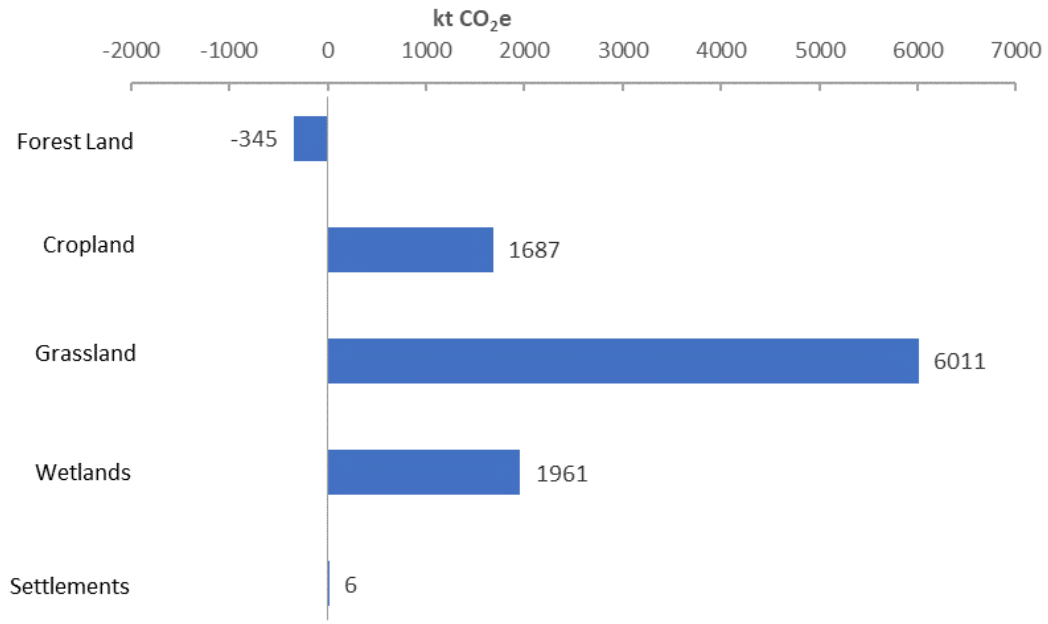


Figure 10.2 Net emission/removals of land use categories in kt CO_2e. N_2O emission from drained Grassland are reported under "Other Land", but included as Grassland emission here. The N_2O emission from Cropland management of organic soils is reported under Agricultural sector and not included here.

A large part of the government's Climate Action Plan, published in 2018, concerns LULUCF and increasing carbon sinks in Iceland. Furthermore, the government has expressed the goal to reach carbon neutrality by the year 2040; this underlines the importance of enhanced action in the area of carbon removal.

10.1.1 Trends

Due to changes in the National System and the responsibility for LULUCF reporting being moved between organizations within Iceland in 2018, projected emissions from the LULUCF sector will not be included in the report this year. This will be improved for the next submission.

10.1.2 PaMs

Four LULUCF PaMs are currently planned with the objective of reducing GHG emissions and are summarised in **Table 10.1.** The policies and measures included in this submission were all taken from the 2018 Action plan.

Table 10.1 Policies and Measures included in LULUCF

PaM Name	*GHG(s)*	*Instrument type*	*Status*	*Scenario*	*Ex-ante*	*Description*
Increased afforestation for carbon capture (LULUCF01)	CO_2, CH_4, N_2O	Fiscal	Planned	WAM	Yes (4A)	Reinforced forestry and afforestation through increased government funding.
Increased soil reclamation for carbon capture (LULUCF02)	CO_2, CH_4, N_2O	Fiscal	Planned	WAM	No	Efforts to increase carbon sequestration from land conservation and reclamation through

						increased government funding. Make a plan to prevent land erosion, protect existing organic soils and reduce emissions from vegetation and soils.
Wetlands: limit the draining of wetlands and increased inspection (LULUCF03)	CO_2, CH_4, N_2O	Fiscal, Planning, Regulatory	Planned	WAM	No	Improved inspection and monitoring of the draining of wetlands to ensure that existing protection laws are respected and further draining of wetlands is limited.
Increased wetlands restoration (LULUCF04)	CO_2, CH_4, N_2O	Fiscal, Planning	Planned	WAM	No	Wetland recovery through increased government funding.

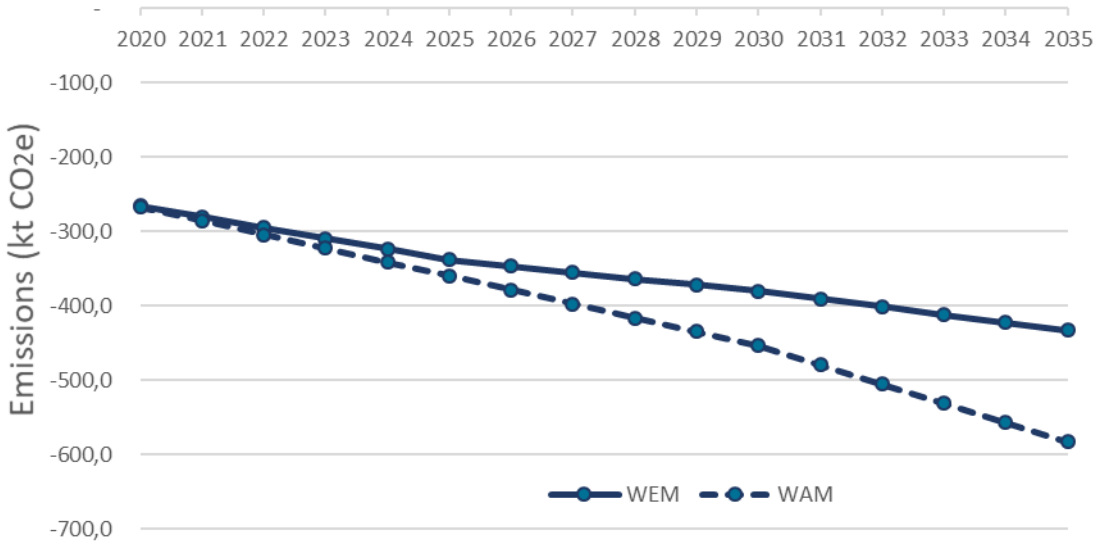
Stakeholder Engagement

In the LULUCF PaMs workshop which the EA organised last year, many further efforts and ideas to increase carbon sequestration through afforestation and increased reclamation of wetlands and soils were mentioned. The interest at this workshop demonstrated that there is a high level of public interest and a clear intention by government, companies, organisations and individuals to undertake action to increase carbon capture and storage in this sector, to reduce their carbon footprints and to prepare for the Icelandic government's goal of reaching carbon neutrality by 2040.

Afforestation

In the government´s Climate Action Plan (2018) there is great emphasis on increasing carbon capture and storage in forests through afforestation. Forestry and afforestation will be reinforced through greatly increased government funding. A plan on afforestation will be prepared on behalf of the government in line with the increased flexibilities afforded by higher financial contributions. Particular consideration will be given to how sheep farmers and other farmers can be included in the afforestation efforts and other efforts that affect land use, in line with the provisions of the government´s policy statement.

The Icelandic Forest Service has not yet estimated thoroughly the effect of increased government funding but preliminary estimated result in a quadrupling in afforestation. Expected increase in carbon capture and storage can be seen in **Figure 10.3**. The WEM scenario shows the projected level of carbon capture and storage from afforestation based on the current trend and the WAM scenario shows the projected level of carbon capture and storage from afforestation with increased government funding, starting from 2020.



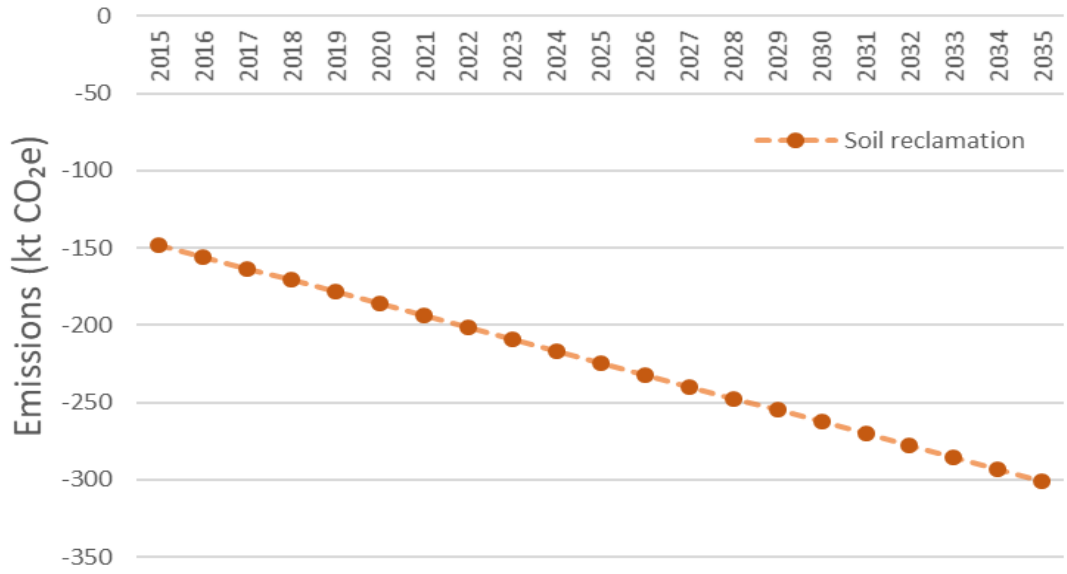
	2015	2020	2025	2030	2035
Afforestation WEM (kt CO2e)	-227	-266	-338	-380	-433
Afforestation WAM (kt CO2e)	-227	-267	-360	-454	-583
Total savings (kt CO2e)	0	2	22	73	150
Total savings (%)	0%	1%	6%	19%	35%

Figure 10.3 Quantified ex-ante impact of PaM LULUCF01 on increased afforestation for carbon capture

In the calculations, 1990 was used as the base year and only capture, storage and emissions from afforestation since 1990 was considered. Older forests and forestry are assumed to remain relative stable. Further information on the impact and quantification of a quadrupling in afforestation in Iceland can be found in the Icelandic Forest Association biannual publication *Skógræktarritið* (Snorrason and Brynleifsdóttir, 2018).

Soil Reclamation

According to the 2018 Action Plan there will be an emphasis on increasing land reclamation for carbon sequestration, among other direct benefits. This will be supported by significantly increased government funding. A plan will be developed on how increased land reclamation will be implemented, in which the emphasis will be placed on reverting land degradation, stopping land erosion, consequently reducing emissions from vegetation and soils. A special policy and action plan on reclaiming birch forests and willow scrub land will also be enforced. The emphasis will be to work on landscape scales and prioritize on degrading areas emitting carbon. The emphasis will, therefore, be on protecting and preserving soils with high soil organic material where it is still present. Organic fertilizers, such as meat meal, sludge or compost will be used as much as possible.



	2015	2020	2025	2030	2035
Soil conservation & reclamation WEM (kt CO2e)	-148	-186	-224	-263	-301

Figure 10.4 Quantified ex-ante impact of PaM LULUCF02 on increased soil reclamation for carbon capture

Figure 10.4 shows the projected WEM scenario for carbon capture and storage from soil conservation & land reclamation in Iceland made by The Soil Conservation Service of Iceland. The soil reclamation action areas of 2001 to 2017 was used for the projection and it is assumed that soil reclamation and conservation efforts will remain at remain at comparable levels. This projection does not include the policies and measures in the Climate Action Plan (2018), which currently fall under the WAM scenario. The PaMs on soil conservation and reclamation in the Climate Action Plan will be quantifiable when the final plans are defined by the relevant authority.

Wetlands

Increased wetland conservation and reclamation are issues which are highlighted in the 2018 Action Plan (2018). The plan is to improve the enforcement of current laws on the draining of wetlands. Municipal requests for development permits that require draining of wetlands will be monitored. Currently, close to 90% of wetlands in the lowlands have been drained and, therefore, it is difficult to justify further drainage unless absolutely necessary. According to the action plan, surveillance and monitoring of drainage will be improved, e.g. by using remote sensing data. In cases where wetlands are to be drained, possibilities for comparable wetland reclamation in the area will be requested.

Furthermore, a plan will be made for the recovery of wetlands and funding will be increased significantly. Projects that aim to map and categorize wetlands using machine learning, taking into account the current greenhouse gas emissions from land use, will receive government support. It is estimated that currently approximately 420 000 ha of wetlands have been drained. The benefits of reclaiming wetlands are not only reduced GHG emissions, but also various other ecosystem services.

11 Cross-Cutting

The PaMs from the Climate Action Plan (2018) which are cross-cutting and will affect more than one of the sectors presented in the previous chapters are listed in **Table 11.1** below. Short descriptions of each PaM are provided, with more information on some of the PaMs provided in separate subchapters below. Currently, the majority of the policies are still in the phase of planning and adoption and have yet to be implemented.

Table 11.1 Policies and Measures included in Cross-Cutting

PaM Name	*GHG(s)*	*Instrument type*	*Status*	*Scenario*	*Ex-ante*	*Description*
Higher carbon tax (CC01)	GHGs	Economic	Planned	WAM	No	Increase the carbon tax on fossil fuels.
Domestic fuel production from plants and waste (CC02)	GHGs	Research, Planning	Planned	WAM	No	Research the possibilities for producing fuel from plants and waste domestically to replace imported fossil fuels.
Climate fund (CC03)	GHGs	Fiscal	Planned	WAM	No	A climate fund will be established which will provide grants to support climate innovation starting from 2019.
Climate action plan for government operations (CC04)	GHGs	Planning	Planned	WAM	No	Plan of action to minimise GHGs emissions from government operations.
Participation in the updated ETS and CORSIA (CC05)	CO_2	Regulatory	Adopted	WEM	No	Iceland plans to continue to participate in the ETS and to implement CORSIA.
Education on climate issues in schools (CC06)	GHGs	Educational	Planned	WAM	No	Plan on climate education in schools in Iceland.
Climate education for the public (CC07)	GHGs	Educational	Planned	WAM	No	A plan will be prepared on climate education for the general public.
Green accounting (CC08)	GHGs	Regulatory	Planned	WAM	No	Regulations on green accounting will be amended and expanded.
Revised National Planning Policy (CC09)	GHGs	Planning	Planned	WAM	No	Policy and guidelines on climate issues for municipal planning purposes.

Higher Carbon Tax

There has been a carbon tax in place in Iceland since the 1st of January 2010 after the implementation of Law nr. 129/2009 on environmental- and natural resource taxes. The tax revenue from this tax for the years 2015-2017 can be seen in **Table 11.2** below.

Table 11.2 Tax revenue from the carbon tax 2015-2017 by category at the prices of each year.[4]

Tax revenue (million isk.)	*2015*	*2016*	*2017*
Gas and diesel	1 865	2 024	2 261
Petrol	946	931	988
Fuel oil	447	491	541
Mineral oil	16	17	17
Total	**3 274**	**3 464**	**3 806**

According to the Climate Action Plan (2018) the carbon tax will continue to increase in the next years. Carbon taxes tackle carbon emissions from fossil fuels, both from transport and other sources, comprehensively. At the beginning of 2018 carbon taxes were raised by 50 % and, in line with the government´s fiscal plan for 2019-2023, it was raised again by 10 % in January 2019. This will be followed by another 10 % increase in 2020. A report has furthermore been made by the Ministry of Finance and Economic Affairs which considered the costs and benefits of further fuel and vehicle taxes between 2020-2025 (Ministry of Finance and Economic Affairs, 2018).

Domestic fuel production from plants and waste

A detailed analysis will be undertaken to map the possibilities for producing fuel from plants and waste domestically to replace imported fossil fuels. The analysis will consider the factors below, both from a climate and macroeconomic perspective. In this context, it is necessary to keep in mind that the conditions for biofuels for the car fleet according to the European Directive are very strict, but less stringent for the use on ships.

- Rapeseed and other power plants: The opportunities for growing rapeseed and, where applicable, other "fuel" plants for biofuel production will be explored. The production of rapeseed in areas which are not suitable for food production, including plant-free areas and areas that have been cultivated with land reclamation plants, will be considered especially. Rapeseed oil is processed from rapeseed and may be used for mixing with diesel oil up to 20 %, while the pomace may be used as animal feed instead of imported feeds.
- Slaughterhouse waste: Slaughterhouse waste has a very high fat content and may, therefore, be used as fuel. This is also true for slaughterhouse waste in risk category 2. Fuel production is the only realistic way to recycle it. Fuel production from slaughterhouse waste has already begun on a small scale or on an experimental basis in 2-3 locations in Iceland. The possibilities in this category, which may result in GHG reductions, need to be analysed and mapped out.
- Plastic waste: Plastic packaging waste has been exported for recycling for years, but market conditions for plastic recycling have recently deteriorated. Production of fuel from plastic waste has been attempted on a small scale in Akureyri and there do not seem to be any barriers to promote such production. The opportunities in this category need to be thoroughly analysed for both fuel production from plastic packaging and other plastic waste. Regulations that pertain to

[4] https://www.althingi.is/altext/148/s/0996.html

this need to be re-evaluated because fuel production from plastic waste is currently not defined as recycling in the waste legislation.

Climate fund: support climate innovation

A climate fund will be established in accordance with the relevant provisions according to Climate Act No 70/2012 and will receive funding to provide grants starting from 2019. It is expected that the climate fund will mainly support projects in the field of climate-friendly technological innovation. Members have been appointed to the Board, which is now preparing the first call. It is expected that the fund will receive 50 m isk. in funding in 2019, and 100 m isk. In 2020.

Climate Plan of Action for the Ministries

A Climate Plan of Action will be prepared for the Ministries, where a clear vision on internal climate actions is set forward. Work on mapping current activities was started in May 2018 and actions to reduce GHG emissions will be defined accordingly. Emissions from vehicles, other transport, energy use, waste and other emitters are being analysed. Goals to achieve clear reductions in emissions from governmental operations and eventually carbon neutrality will be set. The government will also soon implement Green Accounting in the Ministries as well as other measures to reduce climate impacts. GHG accounts will be kept, which will be comparable to those of other Icelandic organisations and companies, which have achieved the greatest results in this field.

Participation in the Updated ETS and CORSIA

Iceland will continue to take part in the EU ETS. New regulations for the ETS period 2020-2030 will be adopted. These regulations are designed to reduce European GHG emissions by 43 % by 2030 compared to 2005. In Iceland, it is mainly heavy industries and air transport which are covered by the EU ETS. The regulations and implementation of the EU ETS in Iceland will need to be adjusted in accordance with the new period. Air transport is expected to be moved from the EU ETS in 2020 when the international trading system (CORSIA) takes over. Initially, it will be based on voluntary participation, but Iceland intends to take part in the system from the beginning. The CORSIA system will probably be implemented by alterations to the EU ETS regulations.

Education

The Climate Action Plan (2018) emphasizes the importance of increased education on climate issues, both in schools and for the general public. Climate education and information will be made more available to the public and a plan will be prepared on climate education in nursery-, primary- and high schools in Iceland, through a collaboration between schools and environmental associations. An emphasis will be placed on student participation in formulating solutions to climate and environmental issues and democratic and empowering education techniques. Environmental Associations have already done great work in environmental education and training in Icelandic schools.

Green Accounting

Regulations on green accounting will be amended so that companies who report green accounts must include information on their carbon footprint. The obligation to report green accounts will, furthermore, be extended so that it covers the government, government entities and all main industries who burn fossil fuels, such as contractors, fishing-, transport- and tourism.

12 Sensitivity Analysis

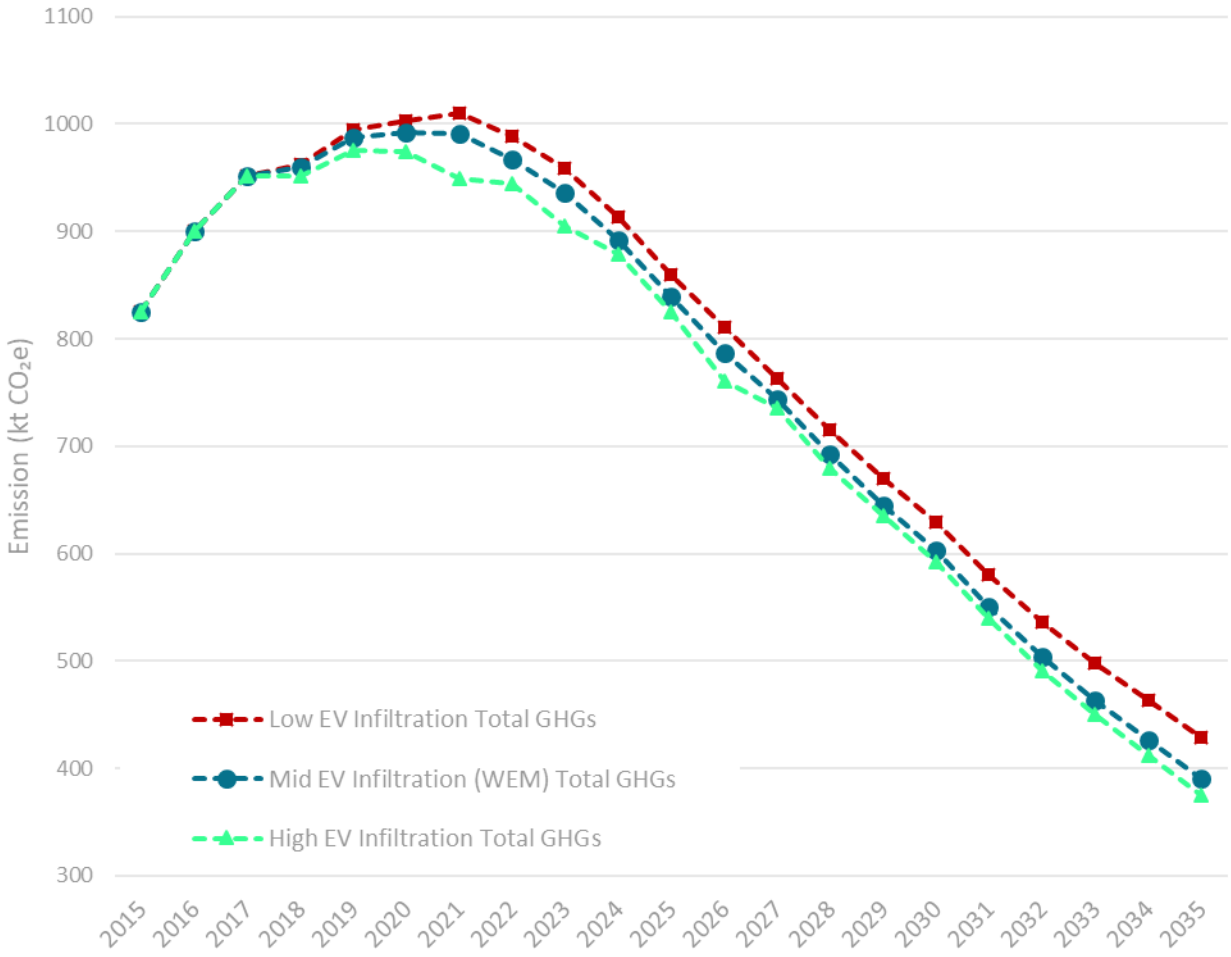
12.1 Road Transport – Fleet Electrification

Reykjavik Energy provided projections for electric vehicles (EVs) under three different scenarios for electric vehicle infiltration into the traffic fleet, referred to here as low, mid and high. A sensitivity analysis has been performed to assess the impact on GHG emissions from road transport emissions under the low and high EV infiltration scenarios compared to the mid scenario, which has been applied in the WEM scenario. Emissions have been estimates using the same method as in the road transport WEM scenario (see **Section 6.3**). The total number of projected vehicles under each scenario is presented in **Table 12.1**. In the low EV infiltration scenario, initially there is a greater rate of electrification until 2018, when there are projected to be more EVs in the mid and high scenarios.

Table 12.1 Number of Electric Vehicles Projected

Scenario	2015	2016	2017	2018	2019	2020	2025	2030	2035
Low EV Infiltration	0	5 286	4 685	5 153	7 278	9 313	50 484	121 903	187 332
Mid EV Infiltration (WEM)	0	2 823	2 875	5 852	8 930	12 106	57 662	132 990	204 370
High EV Infiltration	0	1 449	1 908	7 903	12 101	16 762	62 512	137 207	210 851

Figure 12.1 below shows the results of the sensitivity analysis. The low EV infiltration scenario is projected to results in approximately 10 % higher emissions in 2035 compared to the mid (WEM), or mid EV infiltration, scenario. This is due to an additional 17 000 EVs expected in the WEM scenario. Under the high scenario, emissions are projected to be approximately 4 % in 2025 compared to the WEM scenario.



	Emissions (kt CO_2e)				
Scenario	**2015**	**2020**	**2025**	**2030**	**2035**
Low EV Infiltration	825	1 003	860	630	429
Mid EV Infiltration (WEM)	825	992	839	603	390
High EV Infiltration	825	974	826	593	376

Figure 12.1 Sensitivity analysis results: total GHG emissions (kt CO_2e) in the electric vehicle infiltration scenarios

12.2 Agriculture – Livestock Activity Data

Livestock population projections were based on historical trends for all major livestock categories. These projections are the main determinants of GHG emissions from agriculture. A sensitivity analysis has been performed to assess the impact on emissions from Agriculture of applying different if proxy data to project livestock numbers compared to the extrapolated historical trends.

For the various sheep subcategories, the proxy data (varied between human population and GDP) that correlated best with the historical sheep population was selected to project livestock numbers for that category. This resulted in livestock numbers for sheep which were between 1-10% different from the projections based on trends (see **Table 12.2**).

Table 12.2 Number of sheep (1000s) projected using GDP/population projections (Proxy) and linear extrapolation (Trend)

Scenario	2018	2019	2020	2025	2030	2035
Mature sheep (Proxy population)	354	350	347	339	338	333
Mature sheep (Trend)	358	356	355	348	341	334
% difference	-1%	-2%	-2%	-2%	-1%	0%
Rams (Proxy population)	11	11	11	10	10	10
Rams (Trend)	11	11	11	11	10	10
% difference	-2%	-3%	-4%	-4%	-2%	-1%
Young sheep (Proxy GDP)	91	92	92	95	98	101
Young sheep (Trend)	88	89	89	90	91	91
% difference	3%	4%	4%	6%	8%	10%

For the various cattle subcategories, the proxy data (varied between human population and GDP) that was found to correlate best with the historical cattle population was selected to project livestock numbers for that category. This resulted in livestock numbers for sheep which were between 1-71% different from the projections based on trends (see **Table 12.3**).

Table 12.3 Number of cattle (1000s) projected using GDP/population projections (Proxy) and linear extrapolation (Trend)

Scenario	2018	2019	2020	2025	2030	2035
Dairy cows (Proxy GDP)	23	23	23	21	19	17
Dairy cows (Trend)	24	24	23	22	21	20
% difference	-3%	-4%	-4%	-6%	-9%	-14%
Heifers (Proxy population)	2	3	3	3	3	3
Heifers (Trend)	2	2	2	3	3	3
% difference	7%	11%	14%	14%	3%	-1%
Young cows (Proxy GDP)	5	5	5	4	2	1
Young cows (Trend)	6	6	6	5	4	4
% difference	-15%	-17%	-18%	-27%	-44%	-71%
Steers (Proxy population)	19	19	19	20	20	20
Steers (Trend)	19	19	20	20	20	21
% difference	-1%	-1%	-1%	-1%	-3%	-4%
Calves (Proxy GDP)	22	22	22	24	25	27
Calves (Trend)	21	22	22	23	24	25
% difference	-2%	-3%	-3%	-4%	-6%	-8%

Extrapolated trends were deemed to be more realistic than the proxy projections, which had relatively low correlations with livestock population numbers.

Table 12.4 below shows the results of the sensitivity analysis. In the proxy livestock projections scenario, emissions are projected to be approximately 2 % lower in 2035 compared to the WEM (based on historical trends).

Table 12.4 Sensitivity analysis results: total GHG emissions (kt CO_2e) in the livestock historical trends versus proxy projections scenarios

	Emissions (kt CO_2e)				
Scenario	**2015**	**2020**	**2025**	**2030**	**2035**
Cattle & sheep (Trend)	571	552	548	543	538
Cattle & sheep (Proxy)	571	546	540	534	526

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