September 2025

Iceland's first Biennial Transparency Report

under the Paris Agreement

Government of Iceland
Ministry of the Environment, Energy and Climate

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Iceland's Biennial Transparency Report

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Forword

This report is Iceland´s first Biennial Transparency Report, submitted pursuant to the modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement (annex to decision 18/CMA.1)

When the preparation of this report was at its final stage, Iceland decided to undertake a structural revision of its NDC for 2030. The revision clarifies Iceland's climate targets and their relation to cooperation with the EU and the implementation of climate policy within the European Economic Area. The revised NDC was submitted in September 2025. See Annex 1.

The NDC revision process halted the final preparation of the report, hence the late submission.

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Chapter 1: Summary of Iceland´s greenhouse gas emission and removals. Iceland submitted the National Inventory Report as a stand-alone report.

Chapter 2: Information necessary to track progress made in implementing and achieving the nationally determined contribution. The information includes national circumstances and institutional arrangements, description of Iceland's Climate policy, description of Iceland´s NDC, information necessary to track process and information on mitigation policy and measures.

Chapter 3: Information related to climate change impacts and adaptation under Article 7 of the Paris Agreement. That includes impacts, risks and vulnerabilities and adaptation strategies.

Chapter 4: Information on financial, technology development and transfer and capacity building support provided and mobilized under Articles 9–11 of the Paris Agreement.

Chapter 5: Information on reporting improvements over time

Annex 1: Iceland's Revised 2030 NDC, submitted in September 2025.

Changes in the institutional structure worth noticing:

- In 2021, The name of the ministry changed from the Ministry for the Environment and natural resources to the Ministry of the Environment, Energy and Climate.
- On January first, 2025, The Environment Agency of Iceland, EAI (Umhverfisstofnun) and the National Energy Authority, NEA (Orkustofnun) merged in a new institution; The Icelandic Environment and Energy Agency (IEEA).
- On January first, 2024, the Soil Conservation Service of Iceland (Landgræðslan) and the Icelandic Forest Service (Skógræktin) merged in new institution, Land and Forest Iceland, LaFI (Land og skógur).

1. National Inventory Report

The United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement require Parties to develop and to submit annually to the UNFCCC national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol. Rules and guidelines on reporting to the UNFCCC and the Paris Agreement are detailed in Decision 18/CMA.1.

The National Inventory Report includes the national inventory document (NID) and the common reporting tables (CRT). The 2024 document covers the years 1990-2022 and was submitted as a stand-alone document. It can be found at:
https://unfccc.int/sites/default/files/resource/NID%202024_Iceland_Submitted%20to%20UNFCCC.pdf

Overview of greenhouse gas emissions and removals in Iceland

The GHG emissions profile for Iceland is unusual in many respects:

- Emissions from the generation of electricity and from space heating are very low owing to the use of renewable energy sources (geothermal and hydropower).
- Approximately 90% of emissions from the Energy sector stem from mobile sources (Transport, Mobile Machinery, and commercial fishing vessels; excluding emissions from International Aviation and Navigation).
- Emissions from the Land Use, Land-use Change, and Forestry (LULUCF) sector are high in comparison to other sectors and to other parties. Recent research has indicated that there are significant emissions of CO_2 from drained organic soils. These emissions can be attributed to drainage of wetlands in the latter half of the 20th Century, which had largely ceased by 1990. These emissions of CO_2 continue for a long time after drainage.
- Individual sources of industrial process emissions have a significant proportional impact on emissions at the national level. Expansion in existing metal production capacity, as well as the start of new operations, is reflected in the country's emission profile, such as the start of two new aluminium smelters in 1998 and 2007, respectively.
- All electricity and heat prouction is derived from renewable energy, hydro and geothermal.

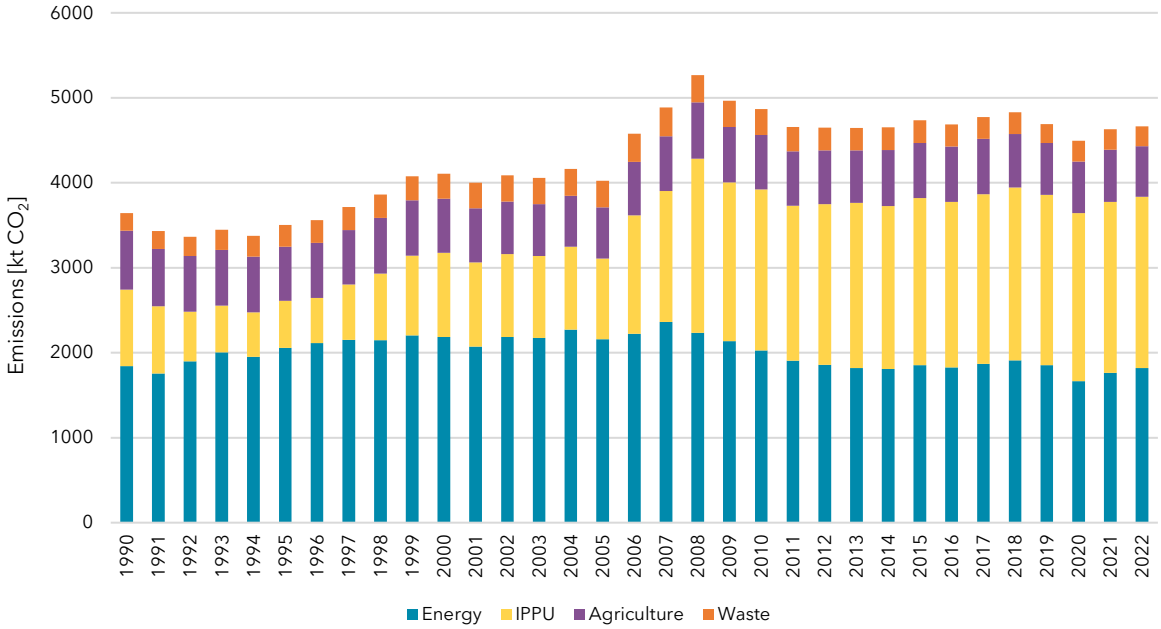

Figure 1.1. Emissions of GHG by sector, without LULUCF, since 1990, [kt CO2e, calculated using GWP from AR5]

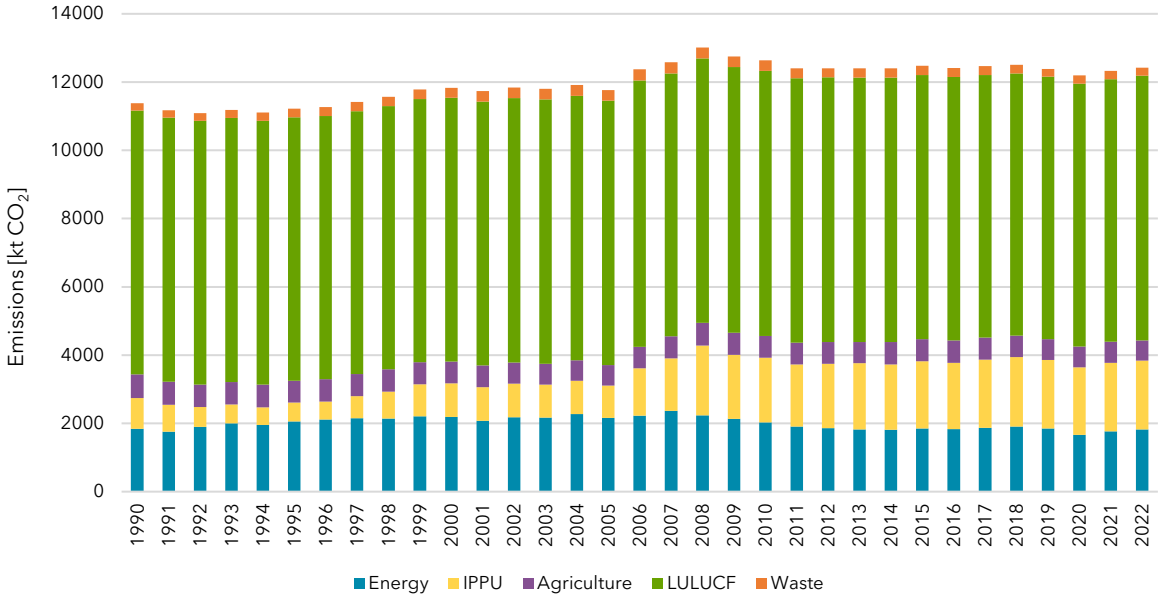

Figure 1.2: Emissions of GHG by sector, with LULUCF, since 1990, [kt CO_2e, calculated using GWP from AR5]

Table 1.1. Emissions of GHG by sector, since 1990, , [kt CO2e, calculated using GWP from AR5]

	1990	1995	2000	2005	2010	2015	2020	2021	2022	Change 1990-2022	Change 2021-2022
1 Energy	1841	2058	2185	2158	2027	1854	1665	1764	1819	-1.2%	3.1%
2 Industrial Processes	903	553	992	950	1896	1966	1977	2012	2017	123%	0.24%
3 Agriculture	694	638	637	604	640	650	609	613	596	-14%	-2.7%
4 Land Use, Land Use Change and Forestry	7732	7715	7723	7746	7767	7739	7702	7699	7757	0.3%	0.8%
5 Waste	207	255	293	310	306	265	244	243	234	12.6%	-3.7%
Total with LULUCF	**11377**	**11219**	**11830**	**11768**	**12635**	**12474**	**12197**	**12330**	**12423**	**9.2%**	**0.8%**
Total without LULUCF	**3645**	**3504**	**4107**	**4022**	**4868**	**4734**	**4495**	**4631**	**4666**	**28%**	**0.75%**

Overview of trends in GHG emissions and removals.

Energy: Emissions from fuel combustion dominated by carbon dioxide (CO_2) released from the conversion of carbon in fuel to CO_2 and the generation of heat. The Energy sector also includes emissions of nitrous oxide (N_2O), methane (CH_4) and other carbon-rich volatile organic compounds associated with fugitive emissions from fuel production and storage. In many countries, this sector is dominated by big fossil fuel users, including Electricity Generation and Road Transport. This is, however, somewhat different in Iceland due to most electricity being produced by hydroelectric and geothermal sources, and the Energy sector is dominated by Road Transport and the fishing industry.

Industrial Processes and Product Use (IPPU): Non-fuel related emissions from industrial processes and use of products. In recent years, this sector has been largely dominated by CO_2 emissions from metal production. Emissions also occur due to the use of fluorinated substitutes for Ozone Depleting Substances (ODS), otherwise referred to as "F-gases," from air conditioning and refrigeration, and sulphur hexafluoride (SF_6) from electrical equipment.

Agriculture: Non-energy use emissions from livestock and crop production. This category can be broadly split into emissions from livestock and emissions from agricultural soils. The main sources of emissions from livestock are from gases released from animals (enteric fermentation), a digestive process in herbivores which emits CH_4, and from the management of animal manure, which contains and emits CH_4 and N_2O. The methods of storage and treatment of manure impact the quantity of CH_4 and N_2O emitted. The application of organic manure and synthetic fertiliser to land results in both direct and indirect N_2O from soils. Finally, liming and the application of carbon-containing fertilisers release CO_2. It is worth mentioning that emissions from fuel consumption in machinery used in agriculture, such as tractors, for instance, are not reported in this chapter; they are reported in the Energy sector.

Land Use, Land-Use Change, and Forestry (LULUCF): Emissions and removals from land use. This sector focuses on the different carbon pools: living biomass, dead organic matter divided into litter and deadwood, soil organic matter, and harvested wood products. Removals occur through carbon sequestration driven mostly by revegetation and afforestation activities, whereas emissions are dominated by land-management practices such as the drainage of mineral and organic soils. Land is categorised into one of six land uses: Forest Land, Cropland, Grassland, Wetland, Settlements, and Other Land.

Waste: Non-energy use emissions associated with the management of solid and liquid waste. Emissions from waste are Disposal, Biological Treatment of Solid Waste, Incineration and Open Burning of Waste, and Wastewater Treatment and Discharge. The main gases emitted are CH_4 through the anaerobic (absence of oxygen) decomposition of solid or liquid waste, N_2O from the oxygenation of protein-rich compounds (e.g., foods) in the waste streams and CO_2 from the incineration of fossil-based waste materials (e.g., plastic). CH_4 is emitted in solid waste disposal sites where organic matter decays over a period of many years, at a declining rate. Anaerobic conditions in wastewater treatment also produce CH_4. The biological treatment of waste, such as composting, also results in CH_4 emissions (from anaerobic decomposition) and N_2O emissions from oxidation of nitrogen-rich materials (e.g., protein). Incineration and open burning of fossil-based wastes (e.g., plastics in increasing volumes) are the most important sources of CO_2 emissions from waste incineration activities.

Memo: Emissions which are not included in the national totals in accordance with international reporting agreements, include International Navigation, International Aviation, and CO_2 from biomass (bio-CO_2).


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2. Information necessary to track progress made in implementing and achieving NDCs

2.1 National circumstances and institutional arrangements

2.1.1 National circumstances

In this chapter, information is provided on national circumstances and their relevance to the implementation of climate actions.

Government Structure

Iceland is a constitutional republic with a multi-party parliamentary system of government. The Constitution was adopted on 17 June 1944, when the Republic was established. Legislative power is vested in Parliament (Althingi) and the president, in that bills of legislation are passed by Parliament and submitted to the president for confirmation. Upon confirmation by the president's signature, the bill in question acquires the force of law. The Government must be supported by a majority of Parliament in order to remain in power. The 63 members of Parliament are elected from six constituencies based on proportional representation, for a term of four years. Over the past thirty years, the participation of women in politics has increased significantly, and their share of seats in Parliament has increased from 15% to the current number of 44.4%. The president is the head of state and is elected for a term of four years by a direct vote of the electorate.

General elections are generally held every four years, but the Constitution allows for early dissolution of Parliament, which triggers early elections. The most recent election was held on November 30th, 2024. The coalition government of the Social Democratic Alliance, the Liberal Reform Party and the People's Party took office in December 2024 with a total of 36 members out of 63 in the Parliament.

Although not a member of the EU, Iceland has, since 1994, been part of the European Union's internal market through the Agreement on the European Economic Area (EEA Agreement). The objective of the EEA Agreement is to strengthen trade and economic relations between the EEA/EFTA States and the EU Member States, based on a level playing field throughout the EEA. Parties to the EEA agreement are the EU Member states, Iceland, Norway, and Liechtenstein.

One of the central features of the EEA Agreement, and the one which distinguishes it most from other international agreements under public international law, is that its common rules are continuously updated by adding new EU legislation.

A practical implication of the EEA agreement is that Iceland adopts the same legislation as the EU where relevant.

Population profile

The population of Iceland was 383.726 on 1 January 2024. See Figure 2.1. With only 3 inhabitants per square kilometre, Iceland is one of the least densely populated countries in Europe. Population growth from 2023-2024 was 2.3%. Around 64% of the population (over 244 thousand) live in the capital city of Reykjavík

and its surrounding municipalities. In 1990, this same ratio was 57%, demonstrating higher population growth in the capital area than in smaller communities and rural areas.

The largest town outside the capital area is Akureyri, located in North Iceland, with a population of almost 20 thousand. Most of the remaining inhabitants live in small towns along the coast.

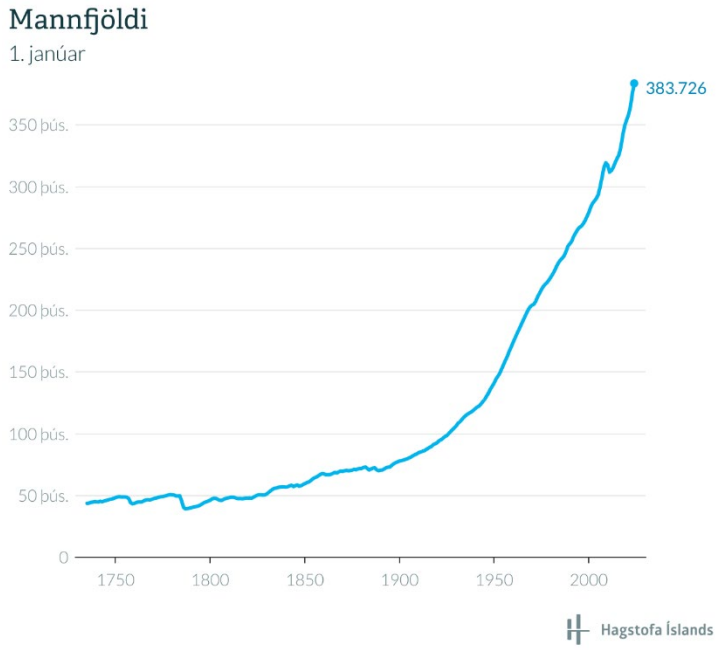


Figure 2.1 Population in Iceland 1750-2024

Geographical profile

Iceland is in the North Atlantic between Norway, Scotland, and Greenland. It is the second-largest island in Europe and the third largest in the Atlantic Ocean, with a land area of some 103 thousand square kilometres, a coastline of 4.970 kilometres and a 200-nautical-mile exclusive economic zone extending over 758 thousand square kilometres in the surrounding waters. Iceland enjoys a warmer climate than its northerly location would indicate since a part of the Gulf Stream flows around the southern and western coasts of the country. In Reykjavík, the average temperature is nearly 11°C in July and just below zero in January.

Geologically speaking, the country is very young and bears many signs of still being in the making. Iceland is mostly mountainous and of volcanic origin. The Mid-Atlantic Ridge runs across Iceland from the southwest to the northeast. This area is characterized by volcanic activity, which also explains the abundance of geothermal resources. Glaciers are a distinctive feature of Iceland, covering about 10% of the total land area. The largest glacier, also the largest in Europe, is Vatnajökull in Southeast Iceland with an area of 8,300 km^2. Glacial erosion has played an important part in giving the valleys their present shape, and in some areas, the landscape possesses alpine characteristics. Regular monitoring has shown that all glaciers in Iceland are presently receding - they are melting faster, which has resulted in significant changes in the areas closest to the glaciers.

Rivers and lakes are numerous in Iceland, covering about 6% of the total land area. Freshwater supplies are abundant, but the rivers flowing from the highlands to the sea also provide major potential for hydropower development. Geothermal energy is another domestic source of energy.

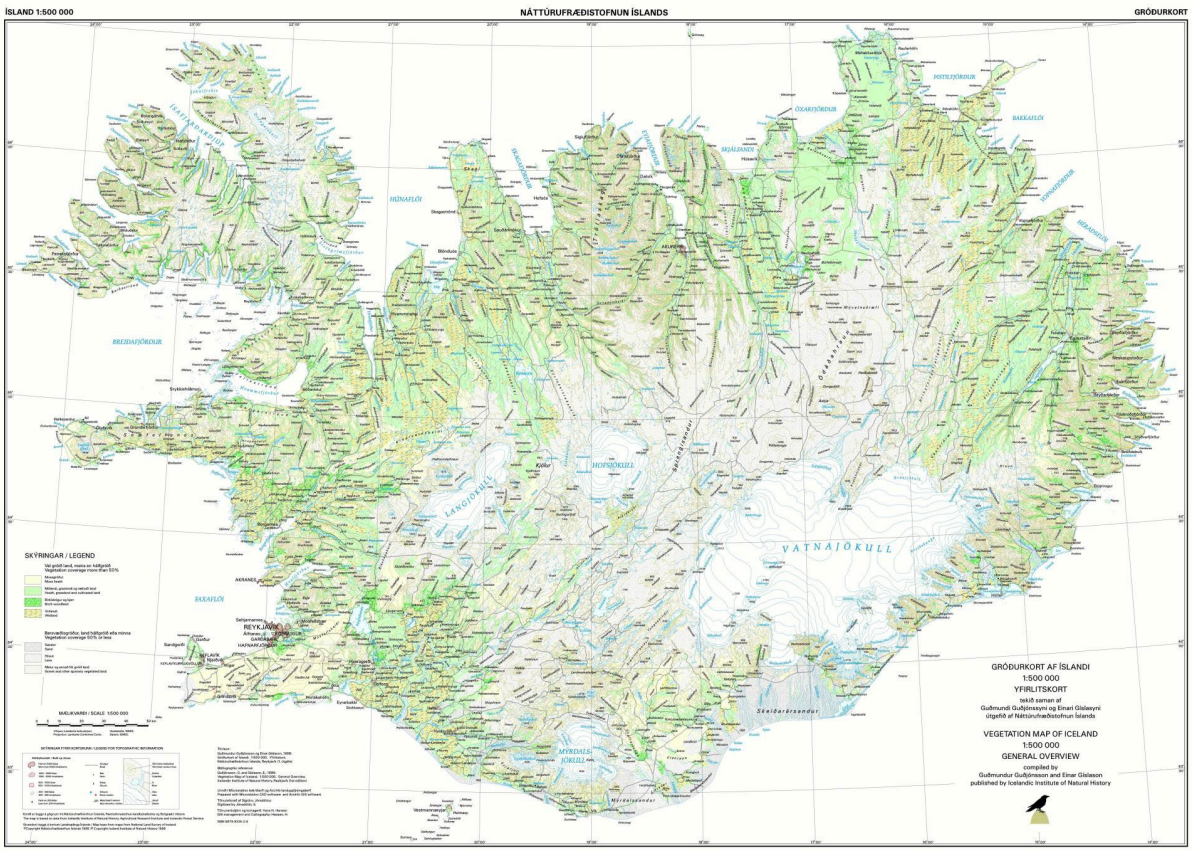


Figure 2.2 Vegetation map of Iceland

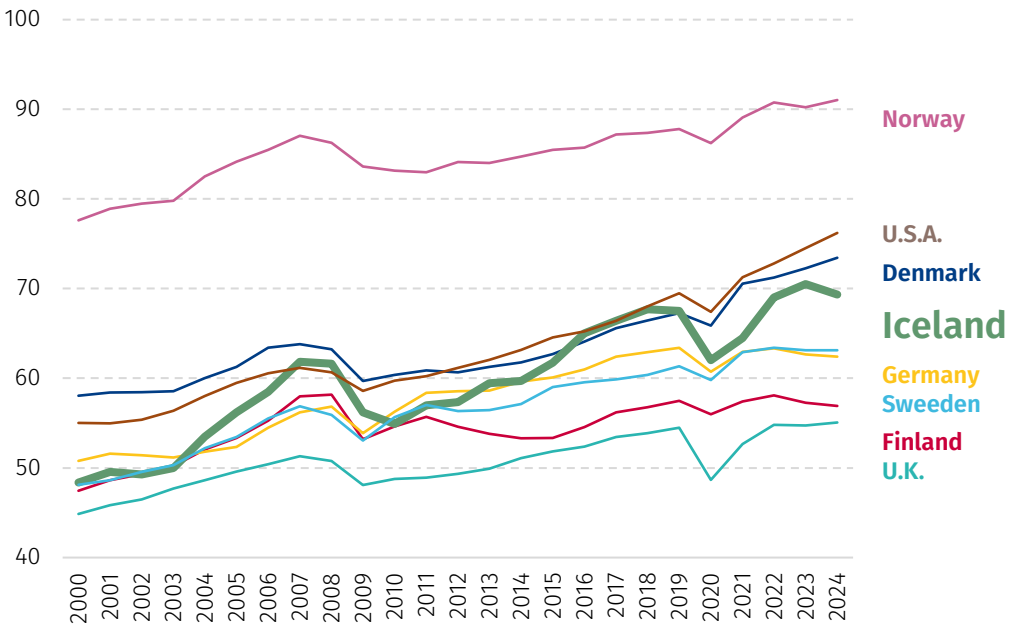
Soil erosion and desertification presents a problem in Iceland. Over half of the country's vegetation cover is estimated to have disappeared due to erosion since the settlement period. This is particularly due to the clearing of woodlands and overgrazing, which have accelerated the erosion of the sensitive volcanic soil. Remnants of the former woodlands now cover less than 1,200 km^2, or only about 1% of the total surface area. Around 60% of the vegetation cover is dry land vegetation and wetlands. Arable and permanent cropland amounts to approximately 1,300 km^2. Systematic revegetation and land reclamation began more than a century ago with the establishment of the Soil Conservation Service of Iceland in 1907, which is a governmental agency. Reforestation projects have also been numerous in the last decades, and especially noteworthy is the active participation of the public in both soil conservation projects and reforestation projects.

Iceland has access to rich marine resources in the country's 758,000-km^2 exclusive economic zone. The abundance of marine plankton and animals results from the influence of the Gulf Stream and the mixing of the warmer waters of the Atlantic with cold Arctic waters. Approximately 270 fish species have been found within the Icelandic 200-mile exclusive economic zone; about 150 of these are known to spawn in the area.

Economic profile

Iceland is a small, open economy. The country is endowed with natural resources that include the fishing grounds around the island within and outside the country's 200-mile Exclusive Economic Zone, as well as hydroelectric and geothermal energy resources. The Icelandic economy is an advanced economy, with high income levels and a relatively large services sector. Its distinguishing features are its large marine and energy sectors based on ample resources, a growing tourism sector, and a high labour participation

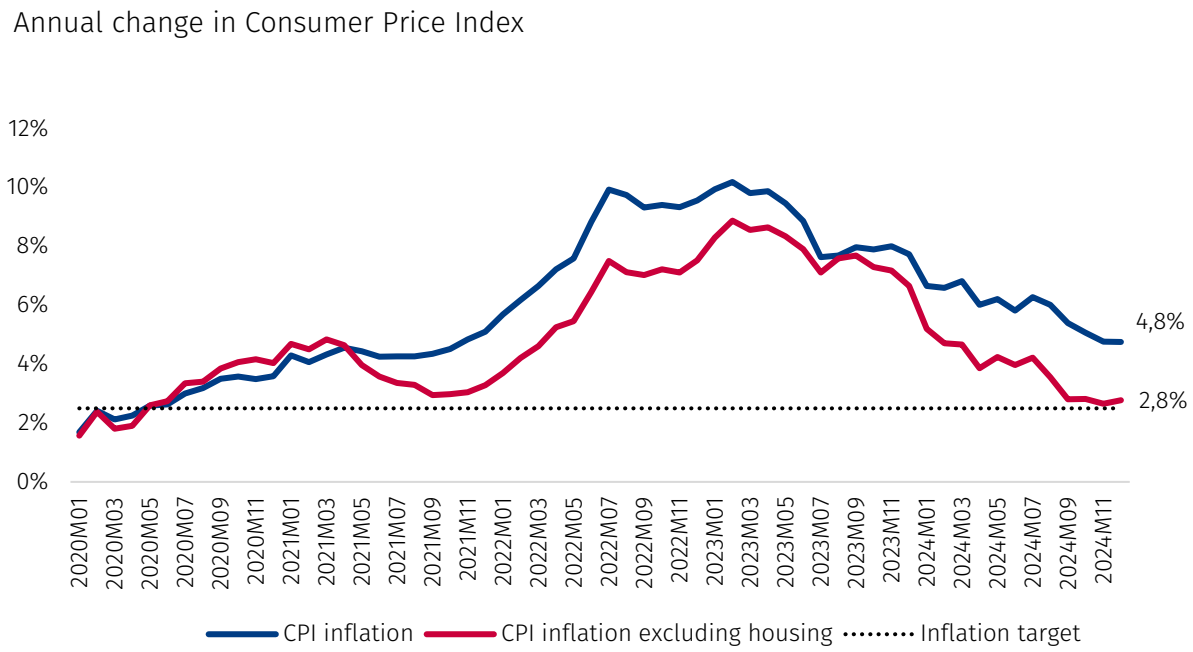
rate. Iceland's heterogeneity in exports has increased substantially in recent years, as exports in e.g., aquafarming, pharmaceuticals and biotechnology have been increasing.



Source: International Monetary Fund

Figure 2.3 GDP per capita, thousands ($) PPP

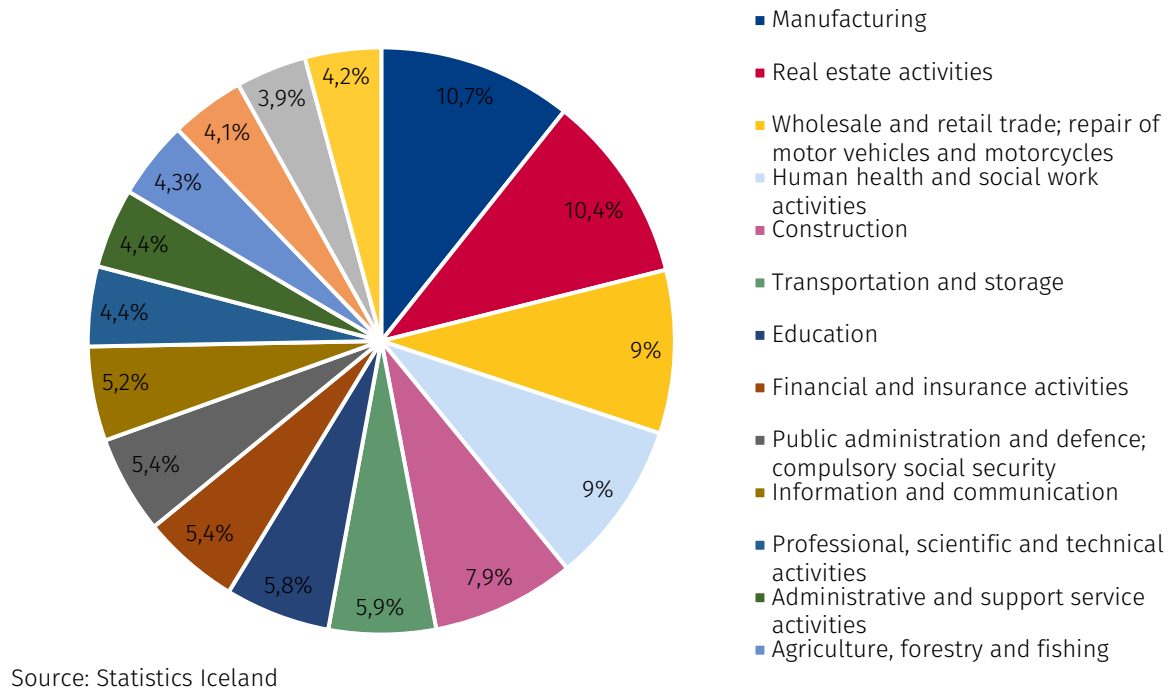
Inflation increased significantly in Iceland, like in other countries, following the global pandemic and the invasion of Russia in Ukraine. As a result, the Central Bank increased interest rates significantly. The inflation has declined steadily since 2023, following the tight fiscal stance. In December 2024, the inflation was 4.8% which is well over the 2.5% inflation target. The inflation is expected to decline further in the next months and pave the way for further interest rate cuts. Estimated inflation, which excludes housing, is lower than the headline inflation, as the estimated cost of housing accounts for a large proportion of the headline inflation.



Source: Statistics Iceland

Figure 2.4 CPI inflation has declined and is expected to decline further in the coming months

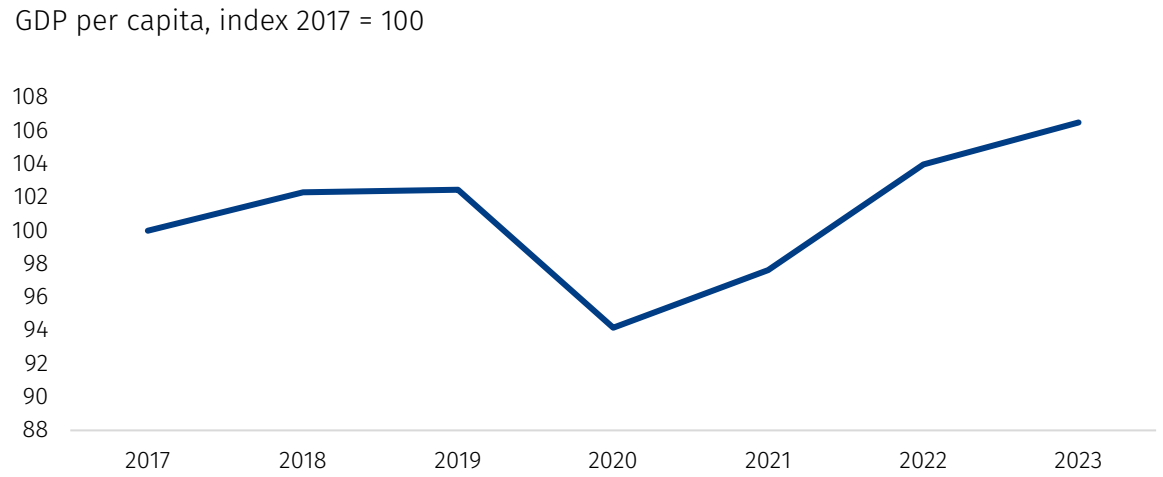
In 2023, exports constituted about 44 percent of GDP. Around 25 per cent of the workforce are employed in the public sector in November 2024.



Source: Statistics Iceland

Figure 2.5 Contribution to GDP by sector in 2023

The pandemic-related collapse of foreign tourism and international travel during Covid affected Iceland's GDP which was –8.1% per capita in 2020 but bounced back to 3.7% in 2021. The following figure shows that the economy had fully recovered to 2019 levels in 2022 after the global pandemic. See Figure 2.6 for a breakdown of GDP in 2017.



Source: Statistics Iceland

Figure 2.6 The economy recovered quickly from the global pandemic

The annual national accounts for 2023 show a 5% increase in Gross Domestic Product (GDP) in real terms compared with a 9% increase in the previous year. Due to a greater increase of imports than of exports, the contribution of external trade to economic growth during the period was negative.

Exports increased by 6.3% in real terms in 2023 compared with the previous year. Due to a greater increase in imports than the increase in exports, the contribution of external trade, as a whole, to economic growth during the period was negative. The deficit in the balance of payments in goods and services amounted to ISK 20,298 million in 2023, compared with a deficit of ISK 5,424 million in 2022, at current prices.

Table 2.1 Iceland's annual national account for 2023 (GDP)

2023	GDP (billion ISK)	Share of Total GDP	Employment (per 1,000 persons)	Share of total employment
Iceland	4,321	100%	216.4	100%
Public sector	1,257*	29.1%	54.5	25%
Other than public sector	3,064	70.9%	162	75%

*Public consumption plus government investment

Climate profile

Iceland is situated just south of the Arctic Circle. The mean temperature is considerably higher than might be expected at this latitude. The relatively high annual mean temperature is explained by heat transfer both by ocean and atmospheric currents from south to north. Relatively mild winters and cool summers characterize Iceland's maritime climate. The average monthly temperature varies from -3 to +3 °C in

January and from +8 to +15°C in July. Storms and rain are frequent, with annual precipitation ranging from 400 to 4000 mm on average. The frequency of low-pressure areas and storms is due to proximity to the polar front, the area in the North Atlantic where cold and dry arctic air masses meet warmer, moist air masses from the equator. The contrast between the air masses produces violent storms, and the location of the island is often in the path of those storms, with the much larger landmass of Greenland to the west and continental Europe to the east.

The amount of daylight varies greatly between the seasons. For two to three months in the summer, there is almost continuous daylight; early spring and late autumn enjoy long twilight, but from November until the end of January, the daylight is limited to only three or four hours.

2.1.2 Sectoral Details

Since 1990, Iceland's total GHG emissions have increased by more than a quarter (excluding LULUCF). This trend of increasing emissions is dominated by: • The expansion of the metal production sector, in particular the aluminium sector; • Increases in emissions from geothermal energy utilisation due to an increase in electricity production, which increased 21-fold between 1990 and 2022; and • The Road Transport sector CO2 emissions almost doubling since 1990 due to increases in population, number of cars per capita, more mileage driven, and an increase in the share of larger vehicles; these changes can partly be attributed to a significant increase in the number of tourists in Iceland in the last 10 years. In contrast, annual emissions have seen an overall decline since 1990 from commercial fishing, with GHG emissions reducing by approximately 38% over the time series. Emissions from both domestic flights and navigation have also declined since 1990. LULUCF net emissions have been mostly constant across the whole time series, and this is explained by emissions from organic soils already drained before 1990; Removals by forests and revegetation have been steadily increasing across the time series.

Carbon tax

The Icelandic carbon tax (official name: Kolefnisgjald á kolefni af jarðefnauppruna) is part of the Environmental and Resource tax. The tax was introduced as part of the government's tax reform on vehicles and fuels to encourage the use of environmentally friendly vehicles, save energy, reduce GHG emissions and increase the use of domestic energy sources. The carbon tax is levied on liquid and gaseous fossil fuels. The tax rate is indexed each year by expected inflation.

Energy

Iceland ranks first among OECD countries in the per capita consumption of primary energy. However, the proportion of domestic renewable energy in the total energy budget is approx. 85%, which is a much higher share than in most other countries, with close to 100% of the electricity demand covered by hydro, geothermal, and wind power. The cool climate and sparse population have high energy and transportation needs.

When it comes to electricity consumption per capita, Iceland ranks very high compared to other European countries, with 53 MWh/capita in 2022, next comes Norway with 23 MWh/capita (2020) and Finland with 15MWh/capita (in 2022). See Figure 2.7.

Iceland has extensive domestic energy sources in the form of hydro and geothermal energy. The development of energy sources in Iceland may be divided into three phases. The first phase covered the electrification of the country, the utilization of hydropower and harnessing the most accessible geothermal fields, especially for space heating. In the second phase, steps were taken to harness the

resources for the power-intensive industry by building larger hydropower plants. This began in 1966 with the signing of agreements on the building of an aluminium plant, and in 1979, a ferrosilicon plant began production. In the third phase, following the oil crisis of 1973-74, efforts were made to use domestic sources of energy to replace oil, particularly for space heating and fishmeal production in recent years. Oil has almost disappeared as a source of energy for space heating in Iceland. Domestic energy has replaced oil in industry and other fields where such replacement is feasible and economically viable.

- CO2 emissions from the Energy sector are dominated by emissions from Road Transport and the fishing industry. CO2 emissions from geothermal energy exploitation have increased since 1990 with the opening of new geothermal power plants. Carbon capture and storage projects are ongoing to capture CO2 emissions from geothermal plants and mineralize them underground for permanent storage.
- The Energy sector includes emissions from electricity and heat production. Iceland relies heavily on renewable energy sources for electricity and heat production, thus emissions from this sector are very low (accounting for just >1% of the sector's total emissions for the whole timeseries). The sources of emissions from electricity and heat production are:
- Electricity produced with fuel combustion occurs at two locations (two small and very densely populated islands, Flatey and Grímsey), which are located far from the distribution system.
- Backup systems in some electricity facilities using fuel combustion are to be used if problems occur in the distribution system.
- Electric boilers to produce heat from electricity are used at some district heating facilities that lack access to geothermal energy sources. They depend on curtailable energy. These heat plants have back-up fuel combustion in case of an electricity shortage or problems in the distribution system.
- Emissions from the Energy Industry sector have generally decreased since 1990.
- Unusual weather conditions during the winters can lead to unfavourable water conditions for the hydropower plants. This has created a shortage of electricity, which is then met by burning oil for electricity and heat production. In 2007, a new aluminium plant was established.

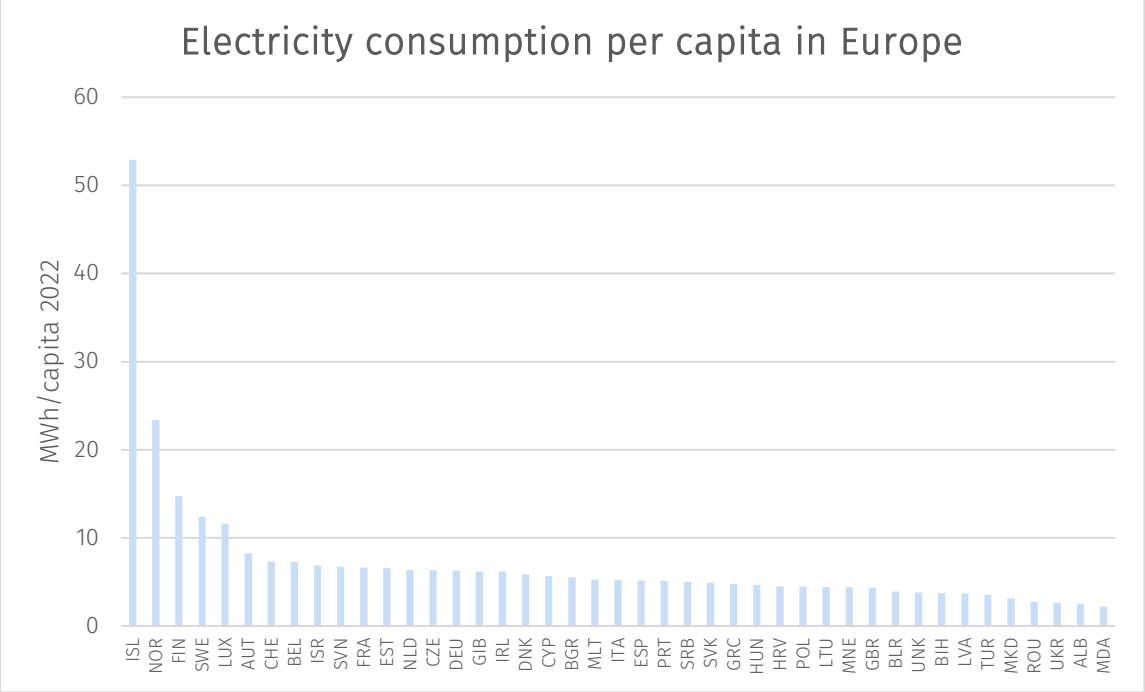


Figure 2.7 Electricity consumption per capita in European countries 2022 (IEA).

Renewable energy sources, primarily hydroelectric and geothermal, account for 99.9% of electricity production (see electricity produced by source in Figure 2.8), and 99.7% of space heating.

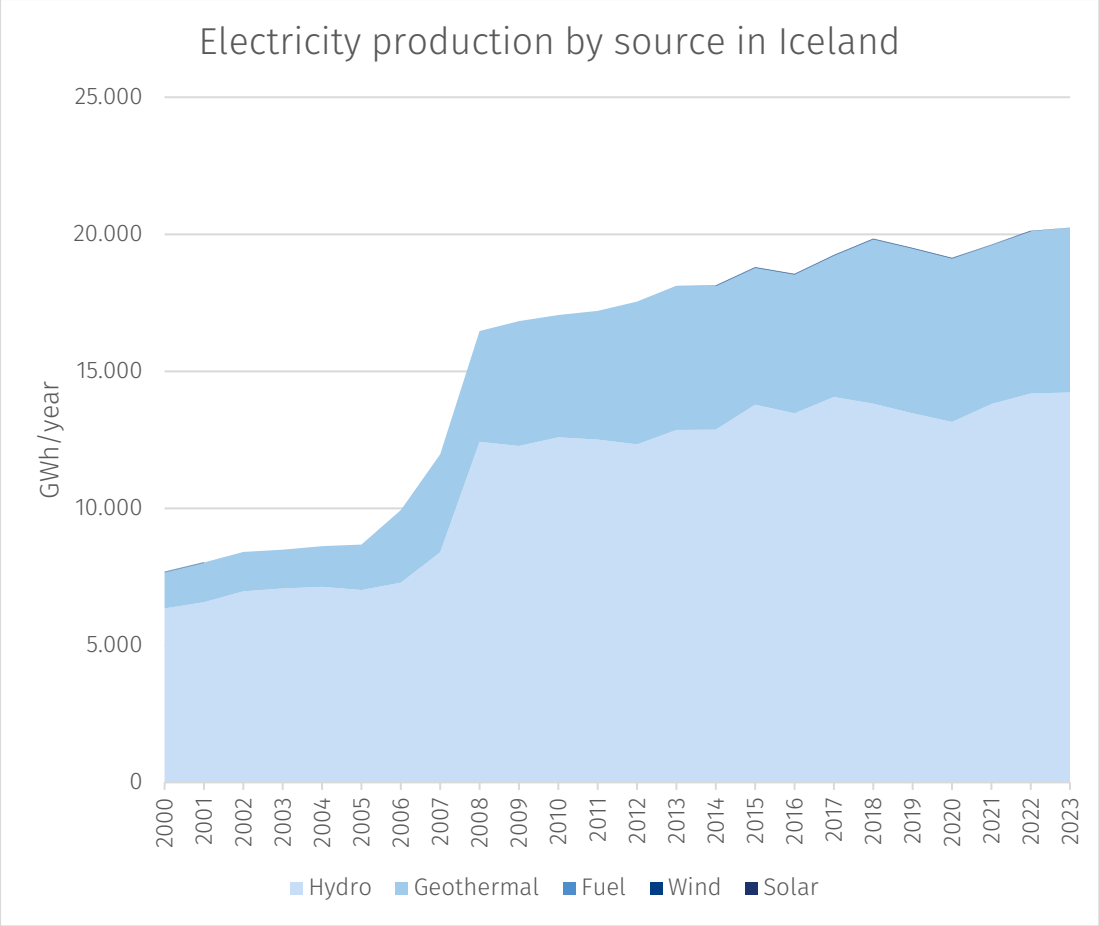


Figure 2.8 Electricity production by sources 2000-2023

The majority of electricity consumption in Iceland has historically been in the energy-intensive industry.

The consumption of energy-intensive industries is split between aluminium smelters, the ferroalloy industry, and data centres. The total consumption of heavy industries was 15,683 GWh in 2022.

The remaining consumption, referred to as general usage in the graphs, includes residential use, utilities, services, fisheries, agriculture, and other industries. The total consumption of these groups was 4,445GWh in 2022, with other industry, service and residential use being the largest consumption groups.

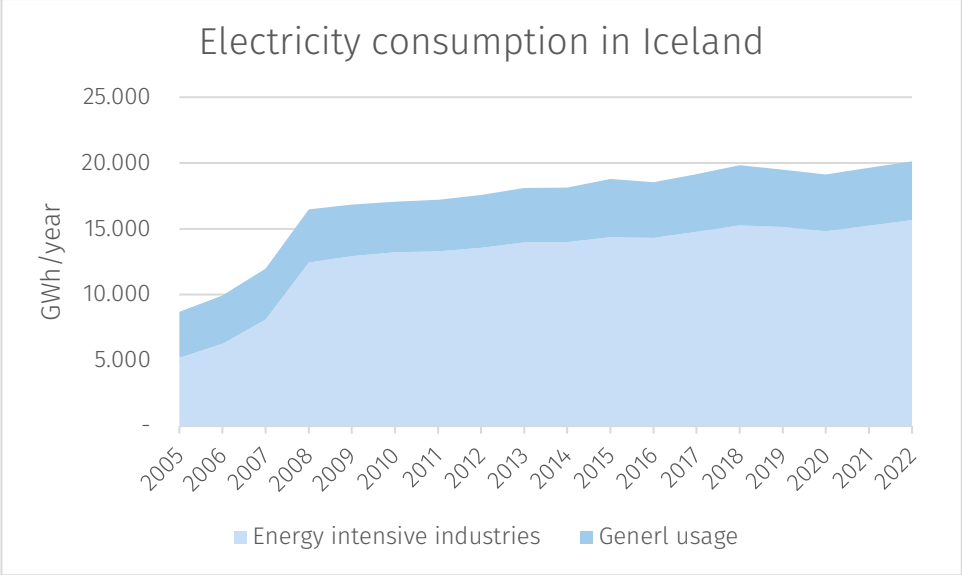


Figure 2.9 Electricity consumption in Iceland 2005-2022.

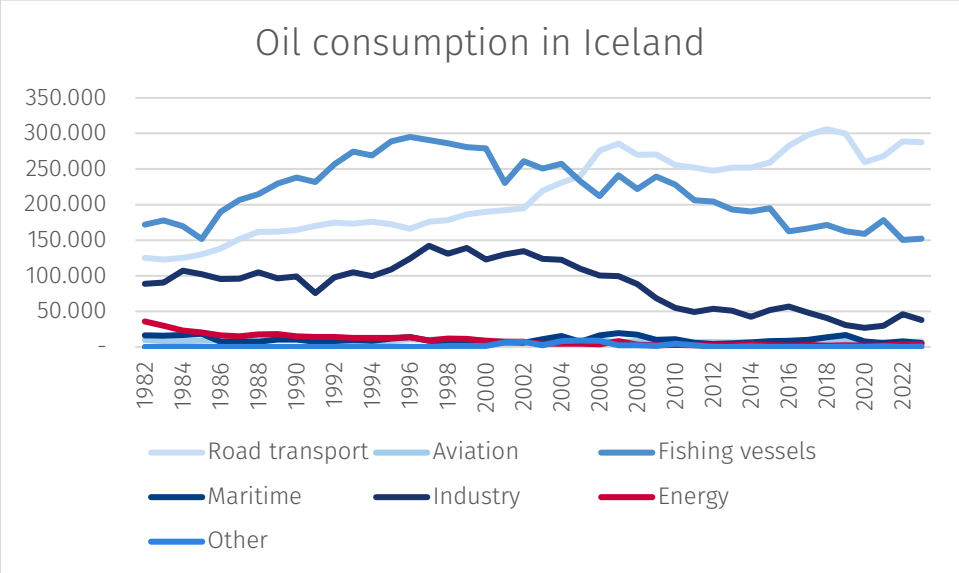


Figure 2.10 Domestic oil consumption in Iceland 1982 –2023.

Geothermal heat and hydropower account for around 85% of the country's primary energy consumption in 2022.

Hydro power developments can have various environmental impacts. The most noticeable is usually connected with the construction of reservoirs, which are necessary to store water for the winter season. Such reservoirs affect the visual impact of uninhabited wilderness areas in the highlands and may inundate vegetated areas. Other impacts may include disturbance of wildlife habitats, the disappearance or alteration of waterfalls, reduced sediment transportation in glacial rivers downstream from the reservoirs and changed conditions for freshwater fishing. Geothermal developments may also have environmental impacts, among them the drying up of natural hot springs. Development of high-temperature fields causes air pollution by increasing the natural H_2S emissions from the fields. Geothermal power plants associated with steam stack exhaust and transmission pipelines for geothermal

water create visual impacts in the environment. Noise is associated with boreholes, power generation and water pumps, and pumping water underground at geothermal power plants can lead to earthquakes.

Transport

The domestic transportation network consists of roads and air transportation. Public transportation is mainly in the capital area and in a few of the bigger towns. Public transportation outside the main urban areas is primitive and has been difficult to operate, due to sparse population and widespread private car ownership. In 2023, the Icelandic public owned 235,000 registered passenger cars (1-8 passengers, M1), excluding cars owned by car rentals and other industry and companies. A significant increase in vehicles that run on clean energy is the result of governmental subsidies towards clean energy vehicles since 2021. See Figure 2.11. National roads totalled 12,950 km in 2023, of which 4,912 km are classified as major roads.

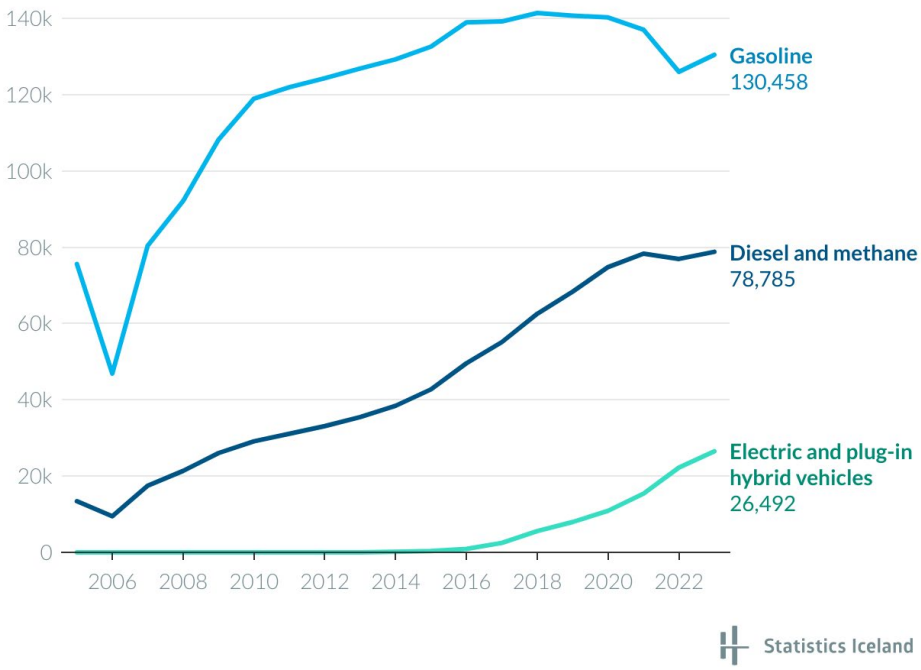


Figure 2.11 Household vehicle ownership by type of energy.

Aviation

Aviation plays a key role in Iceland. The country's geographical location makes undisturbed international air transportation imperative. Domestic aviation is also important because of long travel distances within the country, combined with a small population. An investment in a railway system is therefore not a viable option.

In 2023, the total number of passengers travelling through Icelandic airports was 8.5 million, which is an increase of 24.4% since 2022. 2.15 million of those were transit passengers, and domestic passengers were 665 thousand, which is an increase of 3.1 % from the previous year. Most Icelandic airports experienced an increase in the number of passengers, apart from the Egilsstaðir Airport, which had a decrease of 7.5%.

Just over 198,000 aircrafts passed through Icelandic airspace in 2023, an increase of around 15.9% from 2022. A total of over 262 million kilometres were flown in the Icelandic air traffic control area, or more

than 15% more than the previous year. Just over a third of all air traffic over the North Atlantic crosses the Icelandic air traffic control area.[1]

Iceland has numerous harbours large enough to handle international ship traffic, which are free of ice throughout the year. The two main shipping lines operate regular liner services to the major ports of Europe and the US.

Industrial processes and product use (IPPU)

The production structure of Iceland's manufacturing sector is unique among industrialised countries in many respects. First, the manufacturing sector is dominated by two sub-sectors, food processing and aluminium production. Second, production of machinery and other investment goods is relatively limited. Food production is directed partly at the domestic market, but a larger share focuses on seafood production for export. Other less important sub-sectors are machinery equipment production, building materials production, and pharmaceuticals/chemical products.

Tourism

Tourism has increased rapidly in Iceland in recent years. In 2023, the total number of foreign overnight visitors to Iceland was 7.8 million nights, and domestic overnight stays in registered accommodation were 2.15 million, which is an 16.4% increase from 2022 and an 18.4% increase from 2019[2].

Around 2,210,000 tourists came on flights through Keflavík International Airport in 2023, or 98.9% of the total number of visitors. Around 19,000 came with the ferry Norræna through Seyðisfjörður, or around 0.8% of the total. Around 3500 came on flights through Reykjavík Airport or Akureyri Airport. It must be assumed that there are variations in counts at Keflavik International Airport, as they cover all departures, including foreign nationals resident in Iceland.

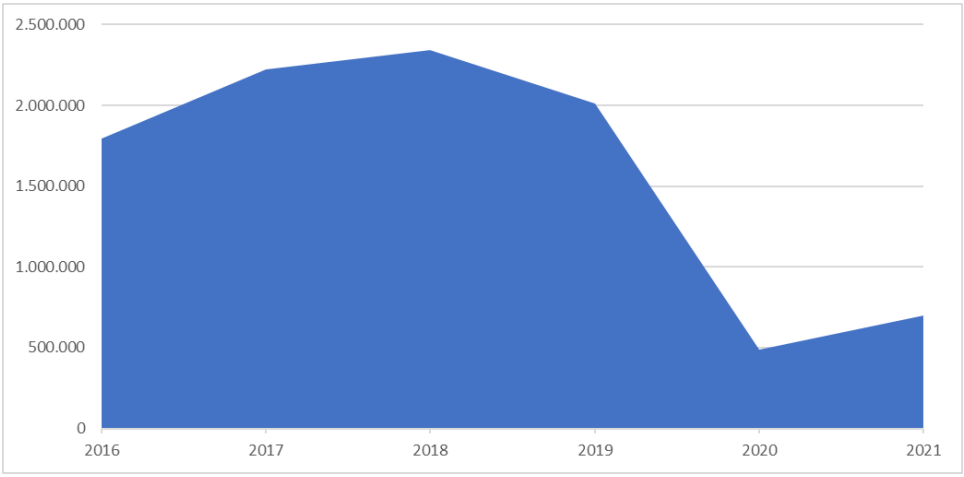


Figure 2.12 Foreign visitors' arrivals by air and sea to Iceland 2016-2021.

In 2024, roughly 31500 persons were employed in tourism in Iceland. This was an increase from the years of the pandemic, when persons working in tourism temporarily fell rapidly.

[1] https://www.kefairport.is/fyrirtaekid/samstaedan

[2] https://hagstofa.is/utgafur/frettasafn/ferdathjonusta/skammtimahagvisar-ferdathjonustu-i-november-2024/

Waste

Waste management in Iceland has undergone impressive changes in the 21st century, with increased separate collection of waste for recovery purposes. There was a steady increase in the total amounts of waste up to 2008, when there was a peak and then a fast decrease following the economic crisis. The total waste per capita reached 2008 levels again around 2013. It reached a peak in 2016 but has been decreasing ever since. From the year 1995, the amount of waste destined for landfill or other final disposal has decreased by more than 70% while there has been a fast increase in the amount of waste for recovery.

In recent years, emissions from the Waste sector have been dominated by CH4 emissions from Solid Waste Disposal.

Since 2002, there has been great development in the composition of waste, where mixed non-household waste has decreased very fast due to increased separation by the industry. More separation of waste has provided possibilities for increased waste recovery.

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, e.g., dairy cattle, sheep, horses, and goats, which are of an ancient Nordic origin, one breed for each species. These animals are generally smaller than the breeds common elsewhere in Europe. 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, but potatoes, barley, beets, and carrots are grown on limited acreage. Emissions from agriculture are closely coupled with livestock population sizes, especially cattle and sheep. Another factor that has a considerable impact on emission estimates is the amount of nitrogen in fertiliser applied annually to agricultural soils. A decrease in livestock population size of sheep between 1990 and 2005 was partly counteracted by increases in livestock population sizes of horses, swine, and poultry, but led to overall emission decreases and resulted in a decrease of total agriculture emissions during the same period. In 2005-2018, increased fertiliser use led to higher emissions from agriculture. However, a sharp decrease in sheep livestock numbers since 2016 and a slight decrease in fertiliser use since 2018 have led to decreased emissions again. The emissions from Agriculture have yet stayed relatively stable since 1992; hence, it is difficult to state whether the recent decrease in emissions will continue or not.

Land use, land-use change and forestry (LULUCF)

Approximately 6% of the total land area of Iceland is suitable for agriculture. A higher percentage is usable for grazing livestock, but 25% of the country lies beneath 200 m above sea level. The production of meat and dairy products is mainly for domestic consumption. The principal crops have been hay, potatoes, and other root vegetables. Cultivation of other crops, such as barley and oats, has increased significantly, especially for fodder, but is still heavily dependent on favourable summers. There is also a lot more variety in horticultural crops. The cultivation of vegetables and flowers is mainly carried out in greenhouses heated with geothermal water and lit with electricity in winter.

- In Iceland, the human impact on ecosystems is strong. The entire island was estimated to be about 65% covered with vegetation at the time of settlement in the year 874. Today, Iceland is only about 25% vegetated. This reduction in vegetative cover is the result of a combination of harsh climate and intensive land and resource utilization by a farming and agrarian society over 11 centuries. Estimates

vary as to the percentage of the island originally covered with forest and woodlands at settlement, but a range of 25 to 30% is plausible.

- Organized forestry is considered to have started in Iceland in 1899. Afforestation through planting did increase considerably during the 1990s from an average of around 1 million seedlings annually in the 1980s to 4 million in the 1990s. Planting reached a high of about 6 million seedlings per year during 2007 – 2009 but was reduced after the financial crisis to about 3.5 million seedlings in 2012. Around 1100-1900 ha was afforested annually in the period of 1990-2007. Planting of native birch has been increasing proportionate to the total afforestation, comprising 24% of seedlings planted in the period 1990-2007. From its limited beginnings in 1970, state-supported afforestation on farms and privately-owned land has become the main channel for afforestation activity in Iceland, comprising about 80% of the afforestation effort today. The total area of forest and other wooded land is 1840 km2, covering 1.8% of the surface of Iceland. Native birch forest and woodland cover 1460 km2 and cultivated forest covers 380 km2.
- The Soil Conservation Service of Iceland, an agency under the Ministry of Food, Agriculture and Fisheries, was founded in 1907. The main tasks of the agency are combating desertification, sand encroachment and other soil erosion, the promotion of sustainable land use and the reclamation and restoration of degraded land. A pollen record from Iceland confirms the rapid decline of birch and the expansion of grasses in 870-900 AD, a trend that continued to the present. As early as around 1100, more than 90% of the original Icelandic forest was gone, and by 1700 about 40% of the soils had been washed or blown away. Vast gravel-covered plains were created where once there was vegetated land. Ecosystem degradation is one of the largest environmental problems in Iceland. Vast areas have been decertified after over-exploitation, and the speed of erosion is often magnified in certain areas by volcanic activity and harsh weather conditions.
- Land reclamation activities focused in the beginning on areas in the south and southwest of Iceland where problems of drifting sand were most evident in threatening farms and fishing villages. After World War, II the reclamation effort was spread more widely but still with a focus on south Iceland. With increased resources after 1974, reclamation activity was extended to many inland locations that were prime sources of sand along major rivers or near outlets of rivers. With detailed information acquired from mapping of erosion severity, recent reclamation activity has become wider spread, more selective and targeted. [3]

2.1.3 Institutional arrangements

The administration framework regarding climate issues is set through Climate Act No 70/20124 for emissions covered by the ESR and the LULUCF regulation, and through ETS Act No 96/2023.

The Climate Act prescribes clear directions on arrangements for the work on the Climate Action Plan and how it should be updated and reviewed. Moreover, it has provisions on the advisory role of Iceland's Climate Council. It also provides a framework for adaptation to climate change, as well as guidelines regarding the scientific reporting on the impact of climate change on Iceland. According to the Climate

[3] Land og skógur Land and Forest Iceland (LaFI – joint institution resulting from the merge, which took effect on 1 January 2024, of what previously were the Soil Conservation Service of Iceland (Landgræðslan) and the Icelandic Forest Service (Skógræktin)).

[4] https://www.althingi.is/lagas/nuna/2012070.html

Act, the Climate Action Plan is to be reviewed at least every four years, considering international commitments and the stated objectives of the government. The Climate Action Plan was last reviewed in 2024, with a 2025-2026 implementation plan approved by the cabinet in September 2025. The work on the Climate Action Plan was carried out by a standing inter-ministerial climate change committee, with the Association of Local Authorities also represented, led by the Ministry for the Environment, Energy and Climate.

In 2021, the target for carbon-neutral Iceland, no later than 2040, was added to the Climate Act.

Regulation 786/2024 on the inter-ministerial climate change committee further defines the arrangement for the work on the Climate Action Plan and Iceland's National Adaptation Plan. Regulation 334/2024 on Iceland's Climate Council further defines its governance and role as an advisory body to the development and implementation of climate policy in Iceland according to the Climate Act. The Climate Council is an independent body whose role is to hold authorities accountable and provide advice on policy objectives and specific measures related to climate change.

The ETS Act transposes all the requirements of the EU ETS legislative framework, as incorporated into the EEA Agreement, into Icelandic law.

The Ministry of the Environment, Energy and Climate[5] has the overarching cross-sectoral responsibility for coordination and implementation of climate actions, whereas different ministries are responsible for actions that fall under their respective sectors, for example, the Ministry for Finance is responsible for tax schemes and the Ministry of Industries for measures on Agriculture.

The coordination is carried out by an inter-ministerial working group, led by the Ministry of the Environment, Energy and Climate, where the Association of Local Authorities is also represented.

The Climate law also establishes the national system for the estimation of greenhouse gas emissions by sources and removals by sinks and the national registry. The legal basis for installations and aviation operators participating in the EU ETS is established by Act No 96/2023.

In accordance with this Act, the Environment Agency of Iceland (Umhverfisstofnun)[6], an agency under the auspices of the Ministry of the Environment, Energy, and Climate (Umhverfis-, orku- og loftslagsráðuneytið), carries the overall responsibility for the national inventory. From January 1, 2025, the EAI and the National Energy Authority (Orkustofnun) merged in a new institution the Icelandic Environment and Energy Agency (IEEA).

The IEEA compiles and maintains the GHG emission inventory, except for the LULUCF sector, which is compiled by Land and Forest Iceland (LaFI – Land og skógur, a joint institution resulting from the merger, which took effect on 1 January 2024, of what previously were the Soil Conservation Service of Iceland (Landgræðslan) and the Icelandic Forest Service (Skógræktin).

The NEA reports to the UNFCCC and to the EU, as well as to the EFTA (European Free Trade Association).

[5] The name of the Ministry changed in 2021 from the Ministry for the Environment and Natural Resources, to Ministry of the Environment, Energy and Climate.

[6] Since January 1 2025, the Environment Agency and the Energy Agency have been merged to "The Icel Environment and energy Agency"

Through the climate cooperation with the European Union and Norway, the EU's climate regulations on Effort Sharing (ESR), Land use, land use change and forestry (LULUCF) and Emission Trading System (ETS), have been implemented, covering all emissions and sectors.

In 2011, Iceland ratified the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the Aarhus Convention), which links human rights and environmental rights.

Iceland also supported the adoption of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

2.2 Iceland's climate policy and targets

The cornerstone of Iceland´s climate policy is based on the United Nations Framework Convention on Climate Change and the Paris Agreement.

With an amendment to the Climate Act in 2019, a target for carbon-neutral Iceland, no later than 2040, was added to the Climate Act.

Cooperation with the EU on Climate targets

Iceland has maintained a longstanding collaboration with the EU on climate targets, and the two have been close partners in implementing governance and policy structures in accordance with global climate agreements under the UNFCCC.

The cooperation was established in the preparation for the second commitment period of the Kyoto Protocol (KP2) when Iceland incorporated the EU Emission Trading system, hereafter referred to as the EU ETS, into its legislation based on the EEA Agreement. Under KP2, the EU and Iceland agreed on joint fulfilment of commitments between the European Union, its Member States and Iceland. This arrangement was inscribed in the Doha Amendments to the Kyoto Protocol.

Since then, EU climate legislation has been a cornerstone of Iceland´s climate policy, as evidenced by the alignment of climate regulations for the Icelandic industry and other relevant sectors with those of other European countries, ensuring a homogenous European Economic Area.

Paris Agreement

It was decided to continue the cooperation under the Paris Agreement, and in October 2019, an agreement was finalized on climate cooperation between Iceland, Norway and the EU, with the Decision of the EEA Joint Committee No 269/2019, which amended Protocol 31 to the EEA Agreement.[7]

Iceland submitted an updated Nationally Determined Contribution (2nd NDC) under the Paris Agreement in February 2021, where it is stated that Iceland's target of a 55% reduction in 2030 (compared to 1990) is to be reached by acting jointly with the European Union and its Member states. This target was set with reference to Decision of the EEA Joint Committee No 269/2019, from October 2019, on climate cooperation between Iceland, Norway and the EU. The agreement covers the period 2021-2030. At the time of signing the Decision in 2019, the overall target was -40%, corresponding to the INDC at the time.

Based on decision of the EEA Joint Committee No 269/2019, Iceland takes part in three key climate mitigation legislative frameworks: the European Emissions Trading System (EU ETS), which inter alia includes emissions from the heavy industry and aviation sectors in Iceland; Effort Sharing Regulation, which sets binding targets for non-ETS emissions for individual countries (EU Member states, Iceland and Norway); and LULUCF, which covers emissions and carbon removals from the Land Use, Land Use Change and Forestry.

[7] Decision of the EEA Joint Committee No 269/2019 of 25 October 2019, amending Protocol 31 to the EEA Agreement

With this arrangement, it was understood that Iceland was contributing towards the joint fulfilment target, comparable in effort and governed by the same set of rules as set for the Member States of the European Union. Specifics of the arrangements were still to be finalized in 2019.

Since 2024, Iceland has sought to clarify how its climate target, put forward in its NDC, is in relation to the cooperation between Iceland and the EU.

Following a review in 2025 of Iceland's NDC submitted in 2021, it became clear that the cooperation under the 2019 agreement cannot be defined as acting jointly in accordance withing to the Paris Agreement, as had been stated. Therefore, it was deemed necessary to submit a revised NDC for 2030, which was done in September 2025. In the revised submission, the cooperation with the EU is clarified in more details as well as how Iceland's quantified target and its overall target fit within the framework of Iceland, Norway and the EU's cooperation on emission reductions until 2030.

In the revised NDC submitted in September 2025, Iceland has explicitly defined quantified economy-wide targets for 2030 and clarified that the cooperation to reach them does, however, not involve acting jointly according to Article 4.16 of the Paris Agreement.

This adjustment does not reflect a change in ambition and seeks to explain more precisely the nature of the ongoing cooperation, which has not changed in its nature nor ambition since the last NDC update.

Climate action plan

In June 2020, a Climate Action Plan was published, outlining 48 mitigation actions across various sectors aimed at meeting commitments for net emissions reduction. By 2023, most of the actions were implemented to some degree, and in June 2024 the action plan was updated, introducing 150 measures targeting different sectors. These actions were at various stages, ranging from pre-pipeline ideas to nearly fully implemented and ongoing measures. In 2025, the inter-ministerial climate change committee further analysed and developed the updated action plan with the goal of implementing a few larger mitigation actions that have the potential to decrease the emission of greenhouse gases and enhance carbon sequestration for the next 5-10 years. Five sectors were specifically targeted, energy transition in the transport sector with emphasis on energy transition in rental cars, which are disproportionately high percentage of cars in Iceland, as well as ongoing energy transition of private cars, busses and heavy transportation trucks: Restoration of wetlands and ecosystems; Investments in green agriculture; Investments in innovation and technological development within the EU-ETS sector; and Better data and increased knowledge on emissions from the LULUCF sector.

A new approach has been adopted for presenting the mitigation action plan. Instead of producing traditional reports, all information and data are now uploaded to the website www.co2.is. This makes the information more accessible and allows for easy updates and changes.

The Action Plan reflects comments and suggestions received during public hearings as well as conclusions of a consultation process with stakeholders and civil society. The work on the Climate Action Plan is carried out by an inter-ministerial climate change committee, with the help of experts from different institutions and ministries.

According to the Climate Act No 70/2012, the inter-ministerial climate change committee shall, in addition to the Climate Action Plan, also prepare an annual progress report on the status of implementation of the climate plan and its measures, emissions development and whether or not the development is in accordance with the Climate Plan.

Such status reports were issued in 2021 and 2022, but due to the extensive work during the updating of the climate action plan, no such reports were issued in 2023 and 2024. The status report of 2025 will be published this fall.

2.3 Description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates

Iceland's NDC (Revised in 2025)

Iceland is committed to a target of 41% net reduction of greenhouse gas emissions by 2030 compared to 2005, in the sectors covered by the scope of the EU's Effort Sharing Regulation (ESR), including emissions from road transport, energy production, fisheries, product use, agriculture and waste management. Iceland cooperates with the European Union and Norway on this target, within the framework of their climate cooperation agreement. The other sectors are regulated by the LULUCF regulation and the EU Emissions Trading System (EU-ETS) directive; thus Iceland's overall target is economy-wide, as the combination of the three pillars of the climate cooperation (ESR, LULUCF, EU-ETS) covers emissions from all sectors and greenhouse gases.

The NDC target of reducing emissions by at least 41% in 2030 compared to 2005 is a revision to Iceland's 2030 NDC submitted in 2021. The reason for the revision is to clarify how Iceland's quantified target and its overall (national) target fit within the framework of Iceland, Norway and the EU's cooperation on emission reductions until 2030.

- Iceland submitted its Intended Nationally Determined Contribution (INDC) in 2015, which became its Nationally Determined Contribution (NDC) upon Iceland's ratification of the Paris Agreement on 24 September 2016. There, Iceland announced its intention of being part of a collective delivery by European countries to reach a target of a 40% reduction of greenhouse gas emissions by 2030 compared to 1990.
- In October 2019, the EU, Iceland and Norway formally agreed to cooperate on climate action, with the incorporation of the Effort Sharing Regulation (ESR) and the LULUCF Regulation into Protocol 31 of the EEA Agreement. The ESR and the LULUCF Regulation were set to implement the EU's overall target of 40% emission reduction by 2030 relative to 1990.
- Iceland announced in December 2020 at the Climate Ambition Summit that it would increase its level of ambition to reflect the EU's updated target, which was increased from 40% emissions cuts by 2030 relative to 1990 to 55% or more, acting in cooperation with the EU and Norway to achieve this enhanced target.
- Cabinet approval in December 2020.
- The Parliament´s Standing Committee for Environment and Communication was consulted in the planning process before the announcement in December 2020.
- Following a review of Iceland's NDC in 2024 and 2025, it was decided in 2025 to revise the NDC to clarify how Iceland's quantified target and its overall target fit within the framework of Iceland, Norway and the EU's cooperation on emission reductions. This revision does not reflect a change in ambition but seeks to explain more precisely the nature of the ongoing cooperation, which has not changed in its nature nor ambition since the submission of the updated NDC 2021.

- The revision of Iceland's NDC was made to clarify how Iceland's quantified target and its overall target fit within the framework of Iceland, Norway and the EU's cooperation on emission reductions. This adjustment does not reflect a change in ambition and seeks to explain more precisely the nature of the ongoing cooperation, which has not changed in its nature nor ambition since the last NDC update.

The administration framework regarding climate issues is set through Climate Act No 70/2012 for emissions covered by the ESR and the LULUCF regulation, and through ETS Act No 96/2023.

A Target(s) and description, including target type, as applicable	Iceland is committed to a target of 41% net reduction of greenhouse gas emissions by 2030 compared to 2005, in the sectors covered by the scope of the EU's Effort Sharing Regulation (ESR), including emissions from road transport, energy production, fisheries, product use, agriculture and waste management. Iceland cooperates with the European Union and Norway on this target, within the framework of their climate cooperation agreement. The other sectors are regulated by the LULUCF regulation and the EU Emissions Trading System (EU-ETS) directive; thus Iceland's overall target is economy-wide, as the combination of the three pillars of the climate cooperation (ESR, LULUCF, EU-ETS) covers emissions from all sectors and greenhouse gases.
Target type	Economy-wide net emission reduction,
Target year	Single year target in 2030
Reference point(s), level(s), baseline(s), base year(s) or starting point(s), and their respective value(s);	2005 The reference indicator will be quantified based on greenhouse gas emissions covered by the Effort Sharing Regulation (ESR, Regulation (EU) 2018/842). These emissions are calculated as the national total greenhouse gas emissions without LULUCF as reported by the National Inventory Document and excluding emissions from stationary installations under Directive 2003/87/EC, as well as CO2 emissions from 1.A.3.a civil aviation. The base year emissions in 2005 are 3109.329 kt CO2eq, and the 2030 target is 1834.504 kt CO2eq.
Implementation period	2021 – 2030
Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases;	Sectors covered: 1. Energy Aviation: Emissions from civil aviation are included only in respect of CO_2 emissions from flights subject to effective carbon pricing through the EU ETS. These comprise flights within the European Economic Area, departing flights to Switzerland and departing flights to the United Kingdom. International navigation: Emissions from international navigation are included only with respect to CO_2 emissions subject to effective carbon pricing through the EU ETS. Other energy source categories in accordance with IPCC guidelines. 2. Industrial processes and product use 3. Agriculture

	4. Waste 5. Land Use, Land Use Change and Forestry (LULUCF) Gases covered: Gases covered: Carbon Dioxide (CO_2) Methane (CH_4) Nitrous Oxide (N_2O) Hydrofluorocarbons (HFCs) Perfluorocarbons (PFCs) Sulphur hexafluoride (SF_6) Nitrogen trifluoride (NF_3)
Intention to use cooperative approaches that involve the use of internationally transferred mitigation outcomes under Article 6 towards NDCs under Article 4 of the Paris Agreement.	Iceland seeks to fulfil the NDC through climate cooperation with the European Union and Norway. Final accounting towards the target at the end of the NDC implementation period may depend on further arrangements in Iceland's cooperation with the EU and Norway. Any use of internationally transferred mitigation outcomes will be included in Iceland's accounting, consistent with the approach used by the EU and Norway and accounted for in a way that avoids double counting. This approach is yet to be fully defined and agreed upon by all involved parties. A decision on the use of voluntary cooperation under Article 6 of the Paris Agreement is pending.
Any updates or clarifications of previously reported information (e.g., recalculation of previously reported inventory data, or greater detail on methodologies or use of cooperative approaches).	Final accounting towards the target at the end of the NDC implementation period may depend on further arrangements in Iceland's cooperation with the EU and Norway. Any use of internationally transferred mitigation outcomes will be included in Iceland's accounting, consistent with the approach used by the EU and Norway and accounted for in a way that avoids double counting. This approach is yet to be fully defined and agreed upon by all involved parties.

Table 2.2 Description of Iceland's nationally determined contribution under Article 4 of the Paris Agreement, with updates

2.4 Information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement (paras. 65–79 of the MPGs)

The inventory figures presented in Iceland´s NID are the base for accounting and tracking progress and are central in the implementation of the NDC.

Final accounting towards the target at the end of the NDC implementation period may depend on further arrangements in Iceland's cooperation with the EU and Norway. Any use of internationally transferred mitigation outcomes will be included in Iceland's accounting, consistent with the approach used by the EU and Norway and accounted for in a way that avoids double counting. This approach is yet to be fully defined and agreed upon by all involved parties.

Indicators name	Description
ESR	The reference indicator will be quantified based on greenhouse gas emissions covered by the Effort Sharing Regulation (ESR, Regulation (EU) 2018/842). These emissions are calculated as the national total greenhouse gas emissions without LULUCF as reported by the National Inventory Document and excluding emissions from stationary installations under Directive 2003/87/EC, as well as CO2 emissions from 1.A.3.a civil aviation.
Information for the reference point(s), level(s), baseline(s), base year(s) or starting point(s), as appropriate	The base year emissions in 2005 are 3109.329 kt CO2eq, and the 2030 target is 1834.504 kt CO2eq
Definitions needed to understand the indicator	Iceland's main quantified indicator pertains to emissions falling under the scope of the EU's Effort Sharing Regulation (Regulation (EU) 2018/842). It covers emissions from domestic transport (except aviation), buildings, energy generation, product use, agriculture and waste. The ESR emissions in the year 2005 are fixed to the value of 3109.329 kt CO2eq, as per the decision of the EEA joint committee No 29/2022. Iceland's ESR 2030 target is 41% below the 2005 value. Emissions under the scope of the EU Emission Trading System (ETS) concern industrial plants, commercial aviation and navigation within the European Economic Area. As the EU ETS operates across borders to reduce emissions collectively, emissions from operators registered in Iceland are not included in the national reference indicator. However, by participating in the system, Iceland continues to contribute to overall emission reductions within the ETS framework. Iceland participates in the EU regulatory framework for Land Use, Land-Use Change and Forestry (LULUCF). Within the climate cooperation with Norway and the European Union, emissions and removals from the land sector will be accounted for based on specific accounting rules for the different land categories in regulation (EU) 2018/841, Art 6-8 and Annex IV. Due to the specific characteristics of the LULUCF sector, no separate indicator is provided for it.
Updates in accordance with any recalculation of the GHG inventory, as appropriate	Values of the reference indicator may be updated due to methodological improvements to the greenhouse gas inventory. Base year and target year emissions are fixed

Table 2.3 Structured summary: Description of selected indicators.

How the reference indicators, baseline(s) and/or reference level(s), including, where applicable, sector-, category- or activity-specific reference levels, are constructed, including, for example, key parameters, assumptions, definitions, methodologies, data sources and models used;	Assumptions and methodological approaches are in accordance with methodologies and common metrics assessed by the IPCC. Accounting for emissions and removals from LULUCF follows specific rules depending on the land accounting category in accordance with Regulation (EU) 2018/841. Afforested Land and Deforested Land use baseline zero (gross-net accounting). Managed Grassland, Managed Cropland and Managed Wetland use as baseline the average emissions between 2005 and 2009 (net-net accounting). Managed Forest Land uses as baseline a Forest Reference Level based on continuation of Forest Management Practices between 2000 and 2009 and taking into account the age-class structure of forests, projected through the compliance period. The mere presence of carbon stocks is excluded from accounting. LULUCF Categories: Emissions and removals occurring on reported categories of forest land, cropland, grassland, and wetland, including land use change between these categories, and between these categories and settlements and other land. LULUCF Pools: Above-ground biomass; Below-ground biomass; Litter; Dead wood; Soil organic carbon; Harvested wood products.

Table 2.4 Structured summary: Description of selected indicators

Description	2021	2022
kt CO2 equivalent	ESR – Greenhouse gas emissions from non-ETS sectors, excluding LULUCF, in kt CO_2eq	ESR – Greenhouse gas emissions from non-ETS sectors, excluding LULUCF, in kt CO_2eq
Supporting information (if applicable)		
Where applicable, total GHG emissions and removals consistent with the coverage of the NDC (para. 77(b) of the MPGs) (in kt CO_2 equivalent)	2767,066	2766,84
Contribution from the LULUCF sector for each year of the target period or target year, if not included in the inventory time series of total net GHG emissions and removals, as applicable (para. 77(c) of the MPGs) (in kt CO_2 equivalent)	7699,037	7757,026

Table 2.5 Structured summary – Targets and indicators

Achievement	
Assessment of the achievement of the Party's NDC under Article 4 of the Paris Agreement (para. 70 of the MPGs):	
Restate the target of the Party's NDC:	At least a 41% reduction in greenhouse gas emissions covered by ESR by 2030 compared to 2005 levels.
Information for reference point(s), level(s), baseline(s), base year(s), or starting point(s):	The reference indicator will be quantified based on greenhouse gas emissions covered by the Effort Sharing Regulation (ESR, Regulation (EU) 2018/842). These emissions are calculated as the national total greenhouse gas emissions without LULUCF as reported by the National Inventory Document and excluding emissions from stationary installations under Directive 2003/87/EC, as well as CO2 emissions from 1.A.3.a civil aviation. The base year emissions in 2005 are 3109.329 kt CO2eq, and the 2030 target is 1834.504 kt CO2eq.
Final information for the indicator for the target year/period, including the application of the necessary corresponding adjustments consistent with chapter III, annex, decision 2/CMA.3 (Corresponding adjustments) and consistent with future decisions from the CMA (para. 23(l), annex to decision 2/CMA.3):	Final information for the accounting towards the target year 2030 is not yet available. Iceland seeks to fulfil the NDC through climate cooperation with the European Union and Norway. Final accounting towards the target will depend on any further arrangements in Iceland's cooperation with the European Union and Norway. These arrangements are still under discussion and will ensure that no double counting occurs.
Comparison:	ESR emissions in 2021 and 2022 were around 11% below 2005 levels, compared to the NDC target of –41% by 2030.
Achievement of NDC:	
{yes/no, explanation}	No. Current ESR emissions in 2021 and 2022 are around 11% below 2005 levels, while the NDC requires a 41% reduction by 2030. Further reductions are needed.

Table 2.6 Achievement

2.5 Mitigation policies and measures, actions and plans,

2.5.1 Iceland's Climate Action

Cost-Benefit Analysis of Climate Action

A cost-benefit analysis of climate action is the best way to prioritize action for implementation.

In 2020, 23 of the climate actions from the Climate Action plan were analyzed for cost-benefit by The Institute of Economic Studies at the University of Iceland. A second cost-benefit analysis of the LULUCF-sector was commissioned by the same institution in November of 2023, and a cost-benefit analysis for the ESR and ETS actions, for use in the 2025 implementation plan is being worked on at the time of writing. As was the case with the first cost-benefit analysis, restoration of wetlands seems to carry the most benefit.

LULUCF Mitigation Plan

In July 2019, the Icelandic government published a mitigation plan in the LULUCF sector (government of Iceland, June 2019), outlining concrete measures and funding in accordance with the 2018 Climate Action Plan. The LULUCF mitigation plan outlines efforts to increase carbon sequestration and to decrease carbon emission from soils and vegetation. After a review process by EFTA, the ministry updated the LULUCF Mitigation plan and long term strategy

In August 2022 the Icelandic government published an action plan for soil conservation and forestry for 2022-2026 (*Government of Iceland, 2022*[50]*).* This action plan includes 27 measures which aim to protect ecosystems, increase biodiversity and promote sustainable land use.

Iceland is using land (ecosystem) restoration, reforestation, and afforestation as mitigation efforts against climate change. These efforts are carried out in collaboration with farmers and other landowners, NGO's and local authorities and include restoring native vegetation in degraded areas, restoring drained wetlands and afforestation to create a woodland resource.

The Icelandic government has increased these efforts with the aim to restore ecosystems to conserve and enhance biological diversity, increase ecosystem resilience against natural disasters and increase the potential of rural societies, relying on these ecosystems to sustain their livelihoods.

Iceland's Long-Term Low Emission Development Strategy

Iceland communicated its first Long-Term Low Emission Development Strategy "On the Path to Climate Neutrality"[51] (hereafter called "Strategy"), based on the encouragements in the Paris Agreement, in October 2021. The Strategy declares that Iceland is committed to reducing its overall GHG emissions and reaching climate neutrality no later than 2040 and become fossil fuel free by 2050, which should set Iceland on a path to net negative emissions. The foundation and various milestones that have been reached on the path to climate neutrality are described in the Strategy. Key documents and policies are introduced, and insight is given into context and framing of overarching climate targets and commitments.

Updated ETS for Aviation and CORSIA

Iceland is part of the EU Emissions Trading System (EU ETS), through its commitments under the EEA agreement. The ETS is an important tool in achieving the EU´s aim of reducing emissions cost-effectively by at least 55% by 2030, compared to 1990 levels. In 2023 changes were made to the ETS Directive to align

the system with that target. In Iceland, it is mainly heavy industries, aviation and maritime transport which are covered by the EU ETS.

The EU ETS implements the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). in line with the EU's 2030 climate objectives. Initially, CORSIA is based on voluntary participation. Iceland has taken part in the system from the beginning, the pilot phase from 2021-2023 and in the first phase from 2024-2026.

2.5.2 EU ETS vs. Effort Sharing Regulation ("ESR")

Note on Terminology

Iceland is part of the EU ETS, and the EU ETS Directive 2003/87/EC establishing a scheme for GHG emission allowance trading within the EEA-Area, was incorporated into the EEA Agreement with EEA Joint Committee Decision No 146/2007. The EU ETS Directive is implemented into Icelandic legislation through Act No 96/2023 on the EU emission trading system, and the directive has been applied in Iceland since 2013.

For the EU Member States, emissions (outside of LULUCF) not falling under the EU ETS are referred to as ESR emissions, with reference to the Effort Sharing Regulation (EU) 2018/842; for emissions that occurred during the period 2013-2020, the term „ESD" emissions is sometimes used, with reference to the Effort Sharing Decision No 406/2009/EC of the European Union; The scope of the ESR regulation and of the ESD decision are the same.

Policy Background

One of the actions listed in the Climate Action Plan (2020) includes the continuation of Iceland's participation in the ETS. Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018, that amends Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, was incorporated into the EEA Agreement with EEA Joint Committee Decision No 112/2020 and implemented into Icelandic legislation through amendments of the Climate Change Act No 70/2012. The Directive lays down the provisions for the fourth trading period in the EU ETS (Phase IV).

Two other actions in the Climate Action Plan (2020) fall outside of the scope of ESR emissions: Carbon capture from heavy industry and participation in the international system for mitigating emissions from aviation (ETS and CORSIA).

All the other actions cover ESR or LULUCF emissions.

Historical Split Between ETS and ESR

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 ESR.

Emissions from stationary operators 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 from metal production, 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 ESR, 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.

2.5.3 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 (excl. LULUCF) and is therefore reported in a separate chapter.

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

The largest contributor of GHG emissions from the Energy Sector (excl. 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.

Energy industries (1A1), Manufacturing Industries and Construction (1A2) and Other sectors including fishing ships (1A4) combined, account for approximately a third of emissions from the energy sector in Iceland in recent years.

Nine energy consumption (EC) PaMs are currently implemented or adopted with the objective of reducing GHG emissions (see Table 2.6). Currently there are no specific energy supply (ES) PaMs.

Table 2.6 Energy Policies and Measures

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Start year of implementation	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2eq)					
							2025	2030	2035	2040	2045	2050
Energy transition in fisheries (101)	Reduced fossil fuel use of fishing ships by 50-60% in 2030 compared to 2005	CO_2, CH_4, N_2O	Economic, Planning, Regulatory, Research, Voluntary/ negotiated agreements	2021	Implemented	Ministry of Finance and Economic Affairs (FJR)	Estimate of impact not available.					
Electrical infrastructure in ports (102)	Reduction in emissions from ships at harbour in 2030	CO_2, CH_4, N_2O	Fiscal, Planning	2019	Implemented	Ministry of Industries and Innovation (ANR)	Estimate of impact not available.					
Electrification of fishmeal production plants (103)	Reduction in emissions from fishmeal production plants in 2030	CO_2, CH_4, N_2O	Economic, Planning, Voluntary/ negotiated agreements	2019	Implemented	Ministry of Industries and Innovation (ANR)	70	57	56	56	56	56
Ban on use of heavy fuel oil (104)	A regulation will be issued tightening fuel requirements which effectively bans the use of heavy fuel oil in the	CO_2, CH_4, N_2O	Regulatory	2021	Implemented	Ministry for the Environment, Energy and Climate	5.5	4.8	4.3	3.5	2.6	1.8

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Start year of implementation	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2eq)					
	territorial sea of Iceland.											
Carbon capture from geothermal energy plants (105)	Reduction in emissions from geothermal energy plants in 2030	CO_2	Planning, Research	2021	Implemented	Ministry for the Environment, Energy and Climate	16	44	57	57	58	58
Energy transition in manufacturing industries (106)	Changing from fossil fuels in manufacturing industries by subsidising new equipment which uses renewable energy	CO_2, CH_4, N_2O	Economic, Planning, Voluntary	2022	Implemented	Ministry for the Environment, Energy and Climate	Estimate of impact not available.					
Carbon tax (701)	The goal is for the carbon tax and other road transport policies to reduce emissions by 51 kt CO_2e in 2030 compared to a baseline scenario.	CO_2	Fiscal	2010	Implemented	Ministry of Finance and Economic Affairs (FJR)	Estimate of impact not available.					

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Start year of implementation	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2eq)
Domestic renewable fuels (702)	Domestic renewable fuel production will be reviewed for environmental benefit and cost effectiveness. Small-scale production is present now, including rapeseed oil and recycled cooking oil.	CO_2, CH_4, N_2O	Research	2021	Implemented	Ministry of Industries and Innovation (ANR)	Estimate of impact not available.
Climate impact of the construction industry (710)	CO_2 emissions from the construction industry will be reduced through various incentives.	CO_2	Planning, Regulatory	2020	Implemented	Ministry of Social Affairs and Labour	Estimate of impact not available.

Three PaMs have been quantified; electrification of fishmeal production plants (103), ban on use of heavy fuel oil (104) and carbon capture from geothermal energy plants (105). Additional information on the PaMs is provided below. For more information on PaMs, see the Climate Action Plan (2020) and the Progress Report (2022).

Energy Transition in Fisheries (101)

Systematic measures will be undertaken to achieve an energy change in the fishing industry to reduce greenhouse gas emissions. The Icelandic fishing sector has already achieved significant results in reducing emissions in recent years, but there are still many opportunities for improvement. It is crucial to seize those opportunities in order for Iceland to reach its climate targets. Creating a defined framework for the sector to be able to do its part to reduce greenhouse gas emissions is a joint venture between the government and the fishing sector. A working group with representatives from five ministries, led by the Ministry of Finance and Economic Affairs, was appointed to work towards this goal. This working group finished a report in 2021[8] proposing a target 50% decrease in emissions from fishing ships in 2030 compared to 2005.

Electrical Infrastructure in Ports (102)

Ports across the country will be further electrified systematically. Since 2020 grants have been provided for infrastructure projects regarding electrical connection and connection to district heating whilst ships are at harbour, in order to reduce reliance on fossil fuels while ships are at harbour. This will be useful for medium sized ships, large trawlers, ferries, and service boats.

Tourism companies will also have the opportunity to apply for grants as there are many possibilities for electrification in that sector. Whale watching boats and other smaller boats, which sail shorter distances with tourists, to and from the same port, could, for example, possibly be electrified. Unlike the larger fishing ships, tourism boats which do many trips a day, would need access to fast charging stations, which are currently not very common.

Until now, the main focus for the electrification of ports has been to set up low voltage infrastructure, which most fishing ships and other small ships can use whilst at harbour. There is, however, not much infrastructure in place for ships with a power requirement above 500 kW, such as cruise ships. The possibilities for setting up high voltage infrastructure at ports need to be analysed, based on the cost and benefit potential of such infrastructure, because there is more uncertainty based around the cost efficiency of such projects. Furthermore, the cost-efficiency of reserve power to offset volatile demand needs to be analysed. Possibly, it could be met by hydrogen.

A report on the status of electrification of harbours and next steps was published in 2021[9]. It concluded that the status of electrification is generally good, but there are certain types of ships that cannot use electricity while at port. Future grants should focus on building infrastructure for those types of ships.

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[8] *Green steps in fisheries (Græn skref í sjávarútvegi*) (2021). https://www.stjornarradid.is/library/02-Rit--skyrslur-og-skrar/Gr%c3%a6n%20skref%20%c3%ad%20sj%c3%a1var%c3%batvegi%20-%20sk%c3%bdrsla%20starfsh%c3%b3ps.pdf

[9] *Verkís*. "Electrification of harbours in Iceland" ("Rafvæðing hafna á Íslandi").

https://www.stjornarradid.is/library/01--Frettatengt---myndir-og-skrar/ANR/Orkustefna/Rafv%C3%A6%C3%B0ing%20hafna%20%C3%A1%20%C3%8Dslandi.pdf

The measure is managed by the project management group on energy change in collaboration with municipalities and harbour management.

Electrification of Fishmeal Plants (103)

The energy change in fishmeal factories will be finalised in collaboration with the operators. In the past years, fishmeal factories have been quite successfully electrified at the operators' own initiative. It is important to complete this switch to electricity where it is technologically feasible. Emissions from fishmeal factories are volatile in nature, but the overall trend over the last few years is downward. In 1997, emissions from fishmeal factories were at their highest, at 209 kt CO_2e. They had, however, been reduced to 5 kt CO_2e in 2019, but have increased somewhat again since then. In 2022 the amount of fish processed doubled from the previous year and an electricity shortage, due to a water shortage in hydroelectric dams, caused the fishmeal factories to receive small amounts of electricity compared to previous years due to the curtailable nature of the contracts with the electricity supplier. Therefore 2022 is an outlier in the dataset but serves as a good indicator for what may happen in future years as electricity supply is not ensured. It must be ensured that the electrification does continue and does not suffer from further setbacks. The use of fossil fuels in fishmeal factories must be stopped completely.

One of the measures that will be taken is establishing how electricity security can be increased in the places where fishmeal factories are operating, how other technological hindrances can be overcome, and how it can be ensured that the electricity prices to fishmeal factories are cost-competitive compared to oil.

Significant development in terms of electrification of fishmeal factories has been ongoing before the existence of the Climate Action Plan, where measure 103 is introduced. Electrification of fishmeal factories has been an ongoing effort, initiated by the National Power Company and the fishmeal factories, for over a decade. In 2017, the National Power Company of Iceland (Landsvirkjun) and the Association for Fishmeal Factories (AFF) signed a letter of intent to make it economically feasible to utilise electricity for fishmeal factories. Consequently, the WEM case regarding fuel use of fishmeal factories is based upon the main assumption that fishmeal factories were somewhat on a trajectory towards electrification before the Climate Action Plan's efforts were announced. Moreover, the WEM trajectory is partly due to measure 103, but also due to the abovementioned cooperation between the Landsvirkjun and the AFF.

Quantification

A "without measures" (WOM) scenario has been created to contrast all measures, actions, and plans associated with the electrification of fishmeal factories. This scenario is based upon the main assumption that without all measures, both governmental and non-governmental, regarding electrification of fishmeal factories, no electricity would have been utilised throughout the timeline. To estimate the amount of fuel used in this scenario, information and data were gathered from the AFF regarding the amount of fish received for processing every year since 2010. Furthermore, the AFF provided data on the amount of electricity and oil utilised to process the fish. Subsequently, the energy used to process one unit of fish was calculated for both oil and electricity. Energy intensity was assumed to be commensurable between plants utilising electricity and those utilising oil. This assumption could be improved, however, only a few plants have run their operations purely on electricity for an entire year, and therefore, energy losses due

to different energy carriers and technologies could not be analysed for this assessment. The average energy intensity over a 6-year period was 466 kWh/t of processed fish. Subsequently, the amount of fish was assumed to be processed with fossil fuels only, while the energy intensity of 466 kWh/t was used as a proxy for estimating the potential fuel use in the WOM scenario.

A hypothetical WAM scenario was created where the main assumption was that best available technology would be reached in 2025, i.e., full electrification of all fishmeal factories. Moreover, this scenario is based upon the assumption that fishmeal factories buy contracts for non-curtailable electricity or that electricity supply will never be reduced for these factories. Subsequently, all fishmeal processers that have yet to realize full electrification potential through adequate infrastructure will do so in this scenario. The WAM scenario was created to reflect technologically viable possibilities but would require significant infrastructure investments. Adequate power lines would need to be constructed to fishmeal factories that have yet to be connected to the power grid for their operations. This scenario does not reflect additional measures that have been implemented or adopted but rather a plausible outcome given general technological prospects in this sector.

The WEM scenario is based on two main factors i.e., electricity utilisation as a proportion of total energy utilisation for fish processing and amount of fish processed. These two variables are projected into the future to calculate the amount of fossil fuel use for fish processing and subsequently emissions and emission abatement relative to other scenarios. The proportion of electricity utilisation has varied significantly between the years 2010 and 2020, from 34%-94%. The maximum electricity utilisation was reached in 2014 but the lowest was in 2012. In the WEM scenario an average electricity utilisation from the years 2014-2022 is calculated as these years are more indicative of the possible electricity utilisation than the years prior; where it is assumed that today's electrification potential had not been reached given the low utilisation of electricity, i.e., 38-60%. The average electricity utilisation rate used for the projection is 77%. In December 2021, Landsvirkjun announced that all fishmeal operations utilising interruptible electricity would cease to receive energy for and undecided amount of time due to a shortage of electricity supply which is a result of sub-optimal water level conditions in hydroelectric power plants. This explains the unusually low electricity utilisation in 2022. The projected electricity utilisation ratio of 77% under the WEM scenario reflects the possibility of some interruption in electricity supply in the future.

The amount of fish projected is based upon historical fraction of fishmeal fish in the context of total catch. The relationship between fishmeal processing and total catch is relatively strong with a $R^2 > 0,8$. Total catch is projected by the Marine and Freshwater Research Institute which forms the basis of total processed fish between 2023-2050. Total catch projections are utilised in the Energy Projections (National Energy Authority, 2022). The results of the WOM and WEM scenarios show that with all current existing measures (WEM scenario) total CO_2e savings amounted to 30 to 76 kt CO_2e p.a. throughout the timeline 2010 to 2050, when compared to the WOM scenario (Figure 2.13)

The Ex-ante emission reduction impact (orange area in Figure 2.14) of the WAM scenario compared to the WEM scenario is approximately 0-20 kt CO_2e p.a, see Table 2.7. However, this abatement would rely on

significant investment costs, and not only on availability of cost-competitive electricity as a few of the fishmeal factories have yet to receive sufficient electrical infrastructure.

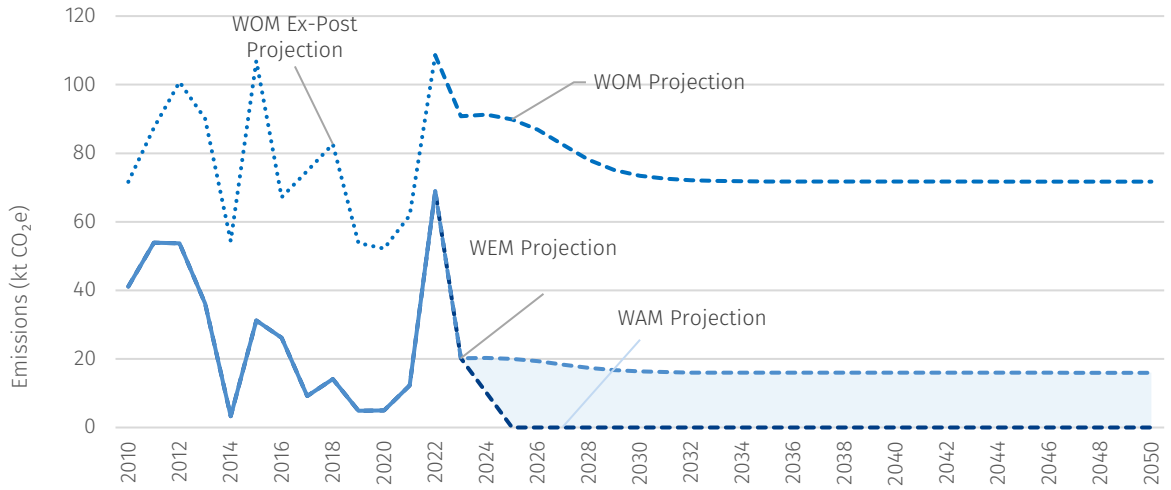

Figure 2.13 Quantified ex-ante and ex-post emissions impact of a group of measures, including measure 103: the electrification of fishmeal factories [kt CO_2e].

Table 2.7 Comparison of emissions between the WEM, WAM and WOM scenarios for the electrification of fishmeal factories, [kt CO2e].

kt CO_2eq	2023	2024	2025	2030	2035	2040	2045	2050
WEM	20.2	20.3	20.0	16.3	16.0	16.0	16.0	16.0
WOM	90.8	91.2	89.9	73.4	71.8	71.7	71.7	71.7
WAM	20.2	10.1	0.0	0.0	0.0	0.0	0.0	0.0
Ex-ante emission impact of WEM compared to WOM	70.6	70.9	69.9	57.1	55.8	55.8	55.8	55.8
Ex-ante emission impact of WEM compared to WAM	0.0	10.2	20.0	16.3	16.0	16.0	16.0	16.0

Ban on Use of Heavy Fuel Oil (104)

The requirements on fuels used in the Icelandic coastal zone will become stricter, to reduce the use of fuel oil. Fuel oil is a denominator for heavy oils with certain properties and can contain a high level of sulphur. Fuel oil is, among other fuels, used in shipping, and when it burns a high level of soot and air pollutants are released into the atmosphere.

The policy has been expanded since the first publication of the Climate Action Plan (2018). In December 2019, the *Minister of Environment and Natural Resources* signed a regulation on the sulphur content of particular liquid fuels. On 1 January 2020, a requirement came into force in the Icelandic Coastal Zone,

which is a similar requirement as that which is in place in Emission Control Areas (ECAs)[10] in the Baltic and North seas, where the restrictions on fuel oil are some of the strictest. After these regulation changes, the permitted Sulphur content of marine fuel in Iceland is only 0.1% in the Icelandic Coastal Zone and internal waters. Previously, the Sulphur content was permitted to be up to 3.5%. This effectively prohibits the burning of fuel oil unless ships use approved methods to limit emissions of Sulphur dioxide[11]. The Environment Agency of Iceland (EAI) has a monitoring role with this regulation and restrictions will be increased if it is deemed necessary. Since 2020, no heavy fuel oil has been used for domestic navigation (1A3d) or fishing (1A4ciii).

Ban on use of heavy fuel oil, is accounted for in the WEM scenario in the fuel projections (2022) from the NEA. This measure has been quantified individually.

Quantification

There are two categories which are affected by the ban, 1A4ciii Fishing and 1A3d Domestic navigation.

- For the WEM scenario fuel projections from 2022 are used, as it assumes that no residual fuel oil (RFO) is used on ships from 2020 and onwards.
- For the WOM scenario:
    - The energy used is the same as in the WEM scenario, but RFO is still a part of the mix.
    - Proportion of RFO for the two CRF categories of total energy use (TJ) is calculated.
    - The average of the latest 5 years before the measure was implemented (2015-2019) is used to estimate the proportion of RFO into the future.

The GHG emission savings due to this measure can be seen in Table 3 and Figure 3. These are combined emissions for CRF categories 1A4ciii Fishing and 1A3d Domestic navigation. The annual emission savings in the WEM scenario are 0.89% compared to the WOM scenario. These emission savings are due to the fact that the emission factor in t CO_2/TJ is slightly higher for RFO than for Gas/Diesel Oil.

Table 2.7 Comparison of emissions between the WEM and WOM scenarios for the ban on use of heavy fuel oil, [kt CO_2e].

kt CO_2eq	2023	2024	2025	2030	2035	2040	2045	2050
WEM	564.9	560.6	554.3	482.6	434.1	356.1	262.1	181.0
WOM	570.5	566.2	559.9	487.4	438.5	359.6	264.8	182.8
Ex-ante emissions impact of WEM compared to WOM	5.6	5.6	5.5	4.8	4.3	3.5	2.6	1.8

[10] Emission Control Areas (ECAs) or Sulphur Emission Control Areas (SECAs) are sea areas in which stricter controls were /established to minimise airborne emissions from ships as defined by Annex VI of the 1997 MARPOL Protocol.

[11] Incorporated into Icelandic law in December 2019 through an update to Regulation No 124/2015 on the Sulphur content of certain liquid fuels. https://island.is/reglugerdir/nr/0124-2015

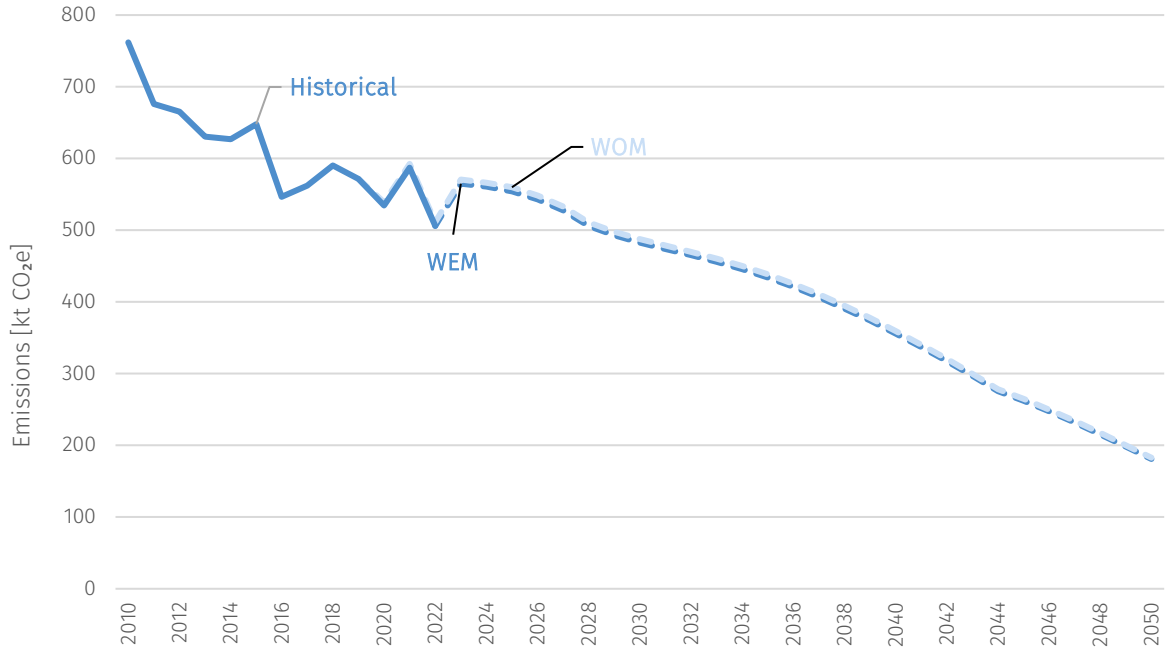

Figure 2.14 Comparison of emissions between the WEM and WOM scenarios for the ban on use of heavy fuel oil, [kt CO_2e].

Carbon Capture from Geothermal Energy Plants (105)

This measure aims at reducing emissions from geothermal power plants by increased carbon capture. Although fossil fuels are not used as an energy source in geothermal power plants, they still emit CO_2. The CO_2 is dissolved in the geothermal fluid but gasses out as the fluid is extracted and the pressure decreases. In 2022, geothermal power plants were the source of 10% of the energy emssions in Iceland.

In the past years, emissions from geothermal power plants have decreased significantly due to measures by Orka náttúrunnar (ON) at the geothermal plant Hellisheiðarvirkjun. Reykjavík Energy (Orkuveita Reykjavíkur) developed the “CarbFix,” or “gas-into-rock” method in collaboration with the University of Iceland (Háskóli Íslands) and foreign collaborators (see measure 306: Carbon capture from heavy industry) and it has received widespread interest.

The geothermal power companies have shown a great deal of initiative in their plans to reduce emissions from their power plants. As well as reducing emissions through re-injecting CO_2 into the basaltic rock, HS Orka has been exploring various other solutions and the possibilities to capture CO_2 and use it for producing fuel or in other types of industrial production. The companies are working on this measure on their own initiative, but the government will follow future developments and consult with them.

According to the Climate Action Plan the goal is for emissions from geothermal power plants to be reduced by at least 47% by 2030 compared with 2005. This measure relates to measure 306 on carbon capture from heavy industry.

Carbon capture from geothermal plants, is accounted for in the WEM scenario based on data obtained from the geothermal power companies. This measure has been quantified individually.

Quantification

Only one category is affected by this measure, 1B2d Geothermal Energy.

- The WEM scenario is based on projections numbers coming directly from the power companies. However, they could not all provide concrete plans in terms of exact numbers for emission reduction. In that case the average emissions from the past 5 years was assumed to continue into the future despite there being plans to reduce emissions.
- The WOM scenario is based on if current and past re-injection did not occur and no re-injection happens in the future. For the company that has already started re-injection we use the average emissions over the earliest available 5-year period where they had full operation and little or no re-injection. In other cases, we use the average for the past 5 years.
- The WAM scenario is based on if we assume that the power companies match the percentage change from the company with the greatest reduction in the WEM scenario but with a delay. The matching of percentage change starts in 2027 but with a 2-year delay in the case where the company has their own re-injection plans, otherwise a 4-year delay.

A comparison of the CO_2 quantified emission savings between the scenarios can be seen in Table 2.9 and Figure 2.15.

Table 2.9 Quantified emission impacts of the measure: Carbon capture from geothermal energy plants, CRF Geothermal Energy 1B2d, [kt CO_2].

Carbon capture from geothermal energy plants	2015	2020	2025	2030	2035	2040	2045	2050
WOM	167.0	186.6	181.8	181.8	181.8	181.8	181.8	181.8
WEM	163.1	174.9	166.2	137.4	124.9	124.6	124.3	124.0
WAM	163.1	174.9	166.2	48.9	9.1	8.1	7.2	6.2
Ex-ante emissions impact of WEM compared to WOM	3.9	11.7	15.6	44.4	56.9	57.2	57.5	57.8
Ex-ante emissions impact of WAM compared to WOM	3.9	11.7	15.6	132.9	172.7	173.7	174.6	175.6

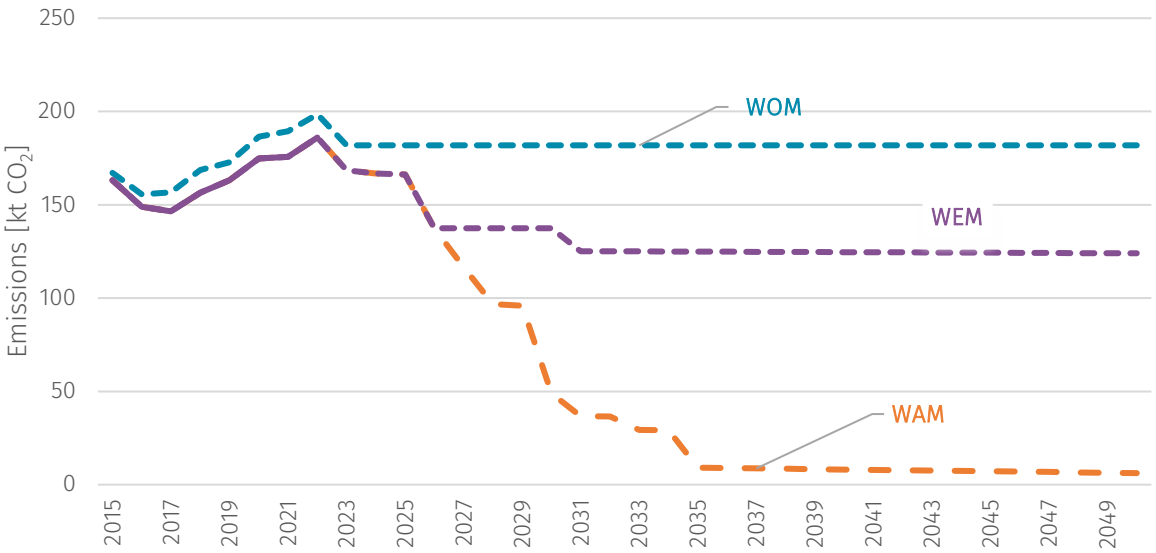

Figure 2.15 Comparison of emissions between the WEM, WAM, and WOM scenarios for the carbon capture from geothermal energy plants, [kt CO_2e].

Energy Transition in Manufacturing Industries (106)

There are many opportunities for energy transition from fossil fuel to renewable fuel in different sectors of manufacturing industries, such as food production and industries linked to fisheries. In 2021, the Energy Fund provided grants for 18 different projects related to manufacturing industries[12].

Carbon Tax (701)

There has been a carbon tax in place in Iceland since 1 January 2010, after the implementation of Law No 129/2009 on Environmental- and Natural Resource taxes[13]. The carbon tax amount, per ton CO_2, can be seen for different fuel types in Table 2.10 below.

Table 2.10 The carbon tax amount per ton CO_2 for different fuel types[14]

Carbon tax [ISK/ton CO_2]	2010	2015	2020
Petrol	1,504	2,503	4,359
Gas and diesel oil	1,499	2,561	4,460
Residual Fuel oil	1,486	2,533	4,388

As can be seen in Table 2.10 the carbon tax has been increasing over the past decade. 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 to 2023, it was raised again by 10% in January 2019, and by another 10% in 2020. Most recently it was raised in 2023.

The Institute of Economic Studies (*Hagfræðistofnun*) at the University of Iceland, published an analysis of the impact of a carbon tax on the fossil fuel use of Icelandic homes and businesses in 2020, at the request of the *Ministry of the Environment and Natural Resources*[15]. The analysis indicates that it is possible to reduce the consumption of fossil fuels, and thereby greenhouse gas emissions from fossil fuel consumption, by imposing a carbon tax. According to the analysis, homes reduce their fossil fuel consumption by approximately 0.35% when the price increases by 1%. The tax results in homes using 1 to 2% less fossil fuels. Businesses reduce their fossil fuel consumption by approximately 0.3% when the price increases by 1%.

Domestic Renewable Fuels (702)

General climate measures such as a higher fossil fuel prices because of the carbon tax and concessions for climate friendly vehicles are in part aimed to increase the demand for sustainable fuels, and in that way, support the domestic production of sustainable fuels. In Measure 101 on the energy transition in the fisheries, it will be mapped out whether requiring a mixture of sustainable fuels and other fuels to be used on ships would be possible, and whether it would be possible to use domestically produced sustainable fuels for this.

[12] Energy fund (Orkusjóður). https://orkustofnun.is/orkuskipti/orkusjodur/uthlutanir-2021

[13] *Parliament (Althingi).* Law No 129/2009 on Environmental- and Resource Taxes. https://www.althingi.is/lagas/nuna/2009129.html

[14] Overview of Carbon tax from 2010 to 2021. *Parliament (Althingi).* https://www.althingi.is/altext/151/s/1220.html

[15] *The Institute of Economic Studies*. "The impact of a carbon tax on the fossil fuel use of homes and businesses" ("Áhrif kolefnisgjalds á eldsneytisnotkun"). https://ioes.hi.is/files/2021-04/Ahrif_kolefnisgjalds_a_eldsneytisnotkun.pdf

An assessment will be undertaken of the cost-effectiveness and environmental benefits of domestic fuel production. In the cost-benefit analysis, an emphasis will be placed on ensuring that all EU requirements on such production, including lower greenhouse gas emissions, will be fulfilled. Hydrogen, methane, methanol, ethanol, and biodiesel are among the possibilities which will be explored.

The report on domestic fuel production by the Ministry of Industries and Innovation, which was mentioned in the first edition of the Climate Action Plan (2018), was submitted to Icelandic parliament in April 2019. It contains an overview of domestic fuel production and knowledge of the industry, and the possibilities for domestic production until 2030 were assessed. In 2021, a report was published (Icefuel) which analysed the feasibility of the production of e-fuels in Iceland. An additional analysis to determine the cost-efficiency of domestic fuel production and map the obstacles to utilising it will be undertaken. The results will be used to build a foundation for a guide to sustainable fuels in Iceland, i.e., which fuels are most cost-effective to use in which industry/operation, such as heavy transport and in ships, and to determine where more research is necessary. The project management team on energy change will receive the analysis and propose the next steps.

Climate Impact of the Construction Industry (710)

In September 2020, a joint project between the government and the business sector was launched, called "Building a Greener Future" ("Byggjum grænni framtíð")[16] . The project involved the creation of a roadmap to environmentally friendly construction until 2030. It estimated the annual emissions from the construction industry and set measures and targets for reducing greenhouse gas emissions and other environmental impacts of the construction sector.

A great emphasis was placed on the project being carried out in broad collaboration between companies from the construction industry and the government. Considering this, a project group was set up, the members of which were appointed by representatives from the Federation of Icelandic Industries, the Green Building Council of Iceland (Grænni byggð), the EAI, the Icelandic Road and Coastal Administration (Vegagerðin), the Icelandic Association of Local Authorities (Samband íslenskra sveitarfélaga), the Ministry of Culture and Business Affairs. The purpose of the group is to manage the "Building a Greener Future" project.

The results were published in early 2022. The emissions from the construction industry were estimated, where it was concluded that building materials are the largest contributor to emission from the industry. Emissions from the construction site, use during building lifetime and end-of-life were also estimated and measures were put forth to tackle each area of emissions, a total of 74 policies and measures.

This measure has not been quantified, as there is not enough available data. As most of the emissions from the construction industry occur abroad, this measure would not have significant effect on emissions in Iceland.

[16] Building a Greener Future (Byggjum grænni framtíð). https://byggjumgraenniframtid.is/

2.5.4 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 international aviation and navigation are accounted for but they do not count towards the national total.

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 accounted for 90% - 95% of the emissions in the transport sector.

Thirteen transport PaMs are currently implemented or planned with the objective of reducing GHG emissions. They are summarised in Table2.11. Seven PaMs are related to the electrification or fuel change of the car fleet, three are to do with promoting public transport, cycling or walking, two are on the electrification of ferries and the final one has to do with mitigation of emissions from aviation.

Table 2.11 Transport Policies and Measures

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Start year of implementation	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2eq)					
							2025	2030	2035	2040	2045	2050
Participation in an international system for mitigating emissions from aviation (ETS and CORSIA) (705)	According to an estimate by the International Civil Aviation Organization (ICAO) international air carriers will need to carbon offset 2.5 million kt CO_2e to achieve carbon neutral growth between the years 2021-2035	CO_2	Economic, Regulatory	2019	Implemented	Ministry of Finance and Economic Affairs, Ministry for the Environment, Energy and Climate	Estimate of impact not available.					
Incentives for low- and zero emission vehicles (201)	Reduction in emissions from road transport in 2030	CO_2, CH_4, N_2O	Fiscal	2019	Implemented	Ministry of Finance and Economic Affairs	Estimate of impact not available.					
Infrastructure for low- and zero emission vehicles (202)	Reduction in emissions from road transport in 2030	CO_2, CH_4, N_2O	Economic	2019	Implemented	Ministry of Industries and Innovation	Estimate of impact not available.					

Legislation and regulations for clean energy transition (203)	Reduction in emissions from road transport in 2030	CO_2, CH_4, N_2O	Regulatory, planning	2019	Implemented	Ministry of Industries and Innovation	Estimate of impact not available.					
Ban on new registration of diesel and gasoline vehicles after 2030 (204)	Ban new registration of passenger cars fuelled by diesel or gas from 2030	CO_2, CH_4, N_2O	Regulatory	2030	Planned	Ministry of Transport and Local Government	13.5	25.6	28.8	26.0	1.6	1.9
Infrastructure for active mobility (205)	Reduction in emissions from road transport in 2030	CO_2, CH_4, N_2O	Fiscal, Planning	2019	Implemented	Ministry of Finance and Economic Affairs	Estimate of impact not available.					
Encouraging public transport (206)	Reduction in emissions from road transport in 2030	CO_2, CH_4, N_2O	Economic, Regulatory, planning	2019	Implemented	Ministry of Finance and Economic Affairs	Estimate of impact not available.					
Low emission vehicles in government and state enterprises (207)	Reduction in emissions from road transport in 2030	CO_2, CH_4, N_2O	Fiscal, Regulatory, planning	2019	Implemented	Ministry of Finance and Economic Affairs	Estimate of impact not available.					

Energy transition of ferries (208)	Reduction in emissions from ferries in 2030	CO_2, CH_4, N_2O	Fiscal, Planning	2020	Implemented	Ministry of Transport and Local Government	5.7	6.5	6.6	6.6	6.6	6.6
Incentives for active mobility (209)	Reduction in emissions from road transport in 2030	CO_2, CH_4, N_2O	Economic, Fiscal, Information, Planning	2020	Implemented	Ministry of Finance and Economic Affairs	Estimate of impact not available.					
Energy transition in heavy transport (210)	Transitioning 15-25% of heavy transport vehicles to clean fuels in 2030 and achieving a reduction in emissions from heavy transport in 2030	CO_2, CH_4, N_2O	Fiscal, Planning	2021	Implemented	Ministry of Industries and Innovation	Estimate of impact not available.					
Low emission rental cars (211)	Transitioning 30-50% of rental cars to sustainable fuels in 2030 and achieving a reduction in emissions from rental cars in 2030	CO_2, CH_4, N_2O	Economic, Fiscal, Planning	2021	Implemented	Ministry of Industries and Innovation	Estimate of impact not available.					
Energy transition of state-owned vessels (212)	The action aims to reduce the use of fossil fuel in state owned vessels other than ferries.	CO_2, CH_4, N_2O	Fiscal, planning	2024	Planned	Ministry of Industries and Innovation	Estimate of impact not available.					

Measures from Table 6 above will impact emissions from the Transport sector. Two policies have been quantified; ban on new registration of diesel and gasoline vehicles after 2030 (204) and the electrification of ferries (208), and they are described in more detail. Additional information on PaMs that have not been quantified is provided below. For more information on PaMs, see the Climate Action Plan (2020).[17] and the Progress Reports from 2021 and 2022.

Electrification or Fuel Change of the Vehicle Fleet (201-204, 207, 210, 211)

The accelerated uptake of electric vehicles or vehicles fuelled by renewable fuels has the possibility to significantly reduce Iceland's greenhouse gas emissions due to the country's heavy dependency on cars for transport. The seven PaMs that are to do with the electrification or energy change of the vehicle fleet in the 2020 Action Plan are the following: 201-204, 207, 210, 211. All except 204 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 WEM 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.

Quantification

The ban of new registrations of diesel and gasoline passenger cars after 2030, which is a WAM measure, was quantified individually.

In the WEM fuel projections from the NEA (National Energy Authority, 2022) it is projected that new registration of electric passenger vehicles used by households and companies will have reached 100% by 2030, but car rental vehicles will not reach 100% until 2042. For the quantification of this measure the year of new registration of car rental vehicles reaching 100% was set at 2030, but it is assumed that the ban will have an impact on new registrations earlier. All other factors and parameters are the same as in the WEM projections. This measure only effects emissions from 1A3bi Passenger Cars. The comparison between the WEM and WAM scenarios can be seen in Table 7 and Figure 5.

Table 2.12 Quantified emission impacts of the measure: Ban on new registrations of fossil fuel passenger cars by 2030, [kt CO_2e].

kt CO_2e	2022	2025	2030	2035	2040	2045	2050
1A3bi Passenger Cars WEM	599.7	566.8	421.4	267.3	117.5	23.0	7.0
1A3bi Passenger Cars WAM	599.7	553.3	395.8	238.6	91.5	21.4	5.1
Emission impact of WAM compared to WEM	0.0	13.5	25.6	28.8	26.0	1.6	1.9

[17] *Government of Iceland (Stjórnarráð Íslands).* Climate Action Plan. https://www.stjornarradid.is/library/02-Rit--skyrslur-og-skrar/Adgerdaaetlun%20i%20loftslagsmalum%20onnur%20utgafa.pdf

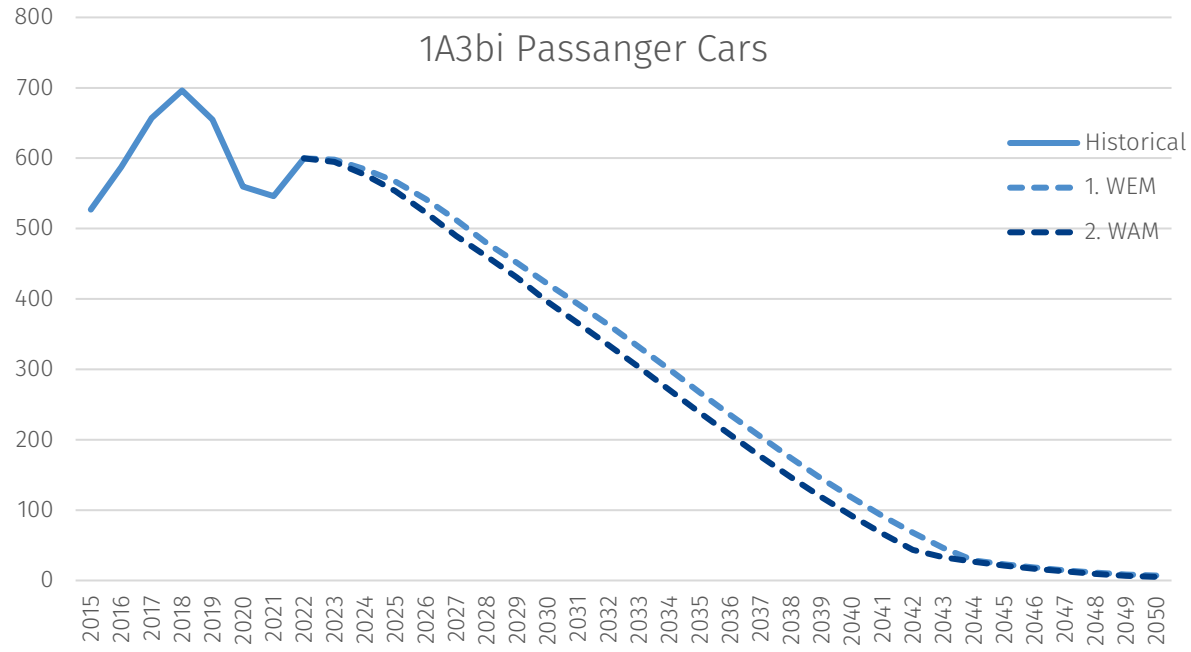

Figure 2.16 Quantified emission impacts of the measure: Ban on new registrations of fossil fuel passenger cars by 2030, [kt CO_2e]. Unbroken lines represent historical emissions, broken lines projected emissions.

Promoting Alternative Methods of Transportation (205, 206, 209)

Alongside electrification or fuel change of the vehicle fleet, there has been a parallel effort to promote alternative methods of transportation, such as public transportation, cycling and walking. Biking- and walking paths have been improved systematically, to increase the share of active modes of transportation and enable more people to choose that option. Support for biking paths has been increased, both in urban areas and to connect urban areas.

In the Capital Area, the transportation agreement between the government and six municipalities, which was signed in September 2019[18], will be followed. The agreement includes, inter alia, a substantial effort to build new biking paths in the Capital Area (approximately 70 to 100 km of paths), as well as new walking bridges and underpasses. Simultaneously, work on bike paths between urban areas will be continued according to the Transport Plan (*Samgönguáætlun*) 2020-2034 and in cooperation with the relevant municipalities.

Temporary tax subsidies which encourage people to use active modes of transportation, such as biking and walking, have been used to change people's commuting behaviour. Laws have already been updated and VAT on all bikes, electric bikes and electric scooters has been cancelled. The changes went through on 1 January 2020 and will stay in force until the end of 2024. The updated law states that all types of

[18] *Government of Iceland (Stjórnarráð Íslands).* https://www.stjornarradid.is/library/02-Rit--skyrslur-og-skrar/Samgongusattmali_undirritadur.pdf

bikes should be subsidised if they will promote increased outdoor activity, improve public health, and reduce road transport.

The government and six municipalities in the capital signed a treaty in September 2019 with an ambitious plan to build up transport infrastructure and public transportation in the capital area in the next 15 years.[19] The treaty contains the most extensive transportation construction plan in the history of Iceland. The goal is to greatly boost public transport, improve transport for all modes of transportation, reduce GHG emissions to reach the government's and municipalities' climate goals, reduce traffic jams etc. *Borgarlínan*, a new public transportation system in the Capital Area, is a part of the agreement and the preparations for construction are currently underway. It is planned that the first line of *Borgarlína*n will be operational in 2026.

Three measures on alternative modes of transport have been implemented (205, 206, 209). However, since very limited data is available on the effectiveness of such measures in Iceland, their potential impact on emissions has not been estimated nor included in the WEM scenario projections.

Participation in an International System for Mitigating Emissions from Aviation (ETS and CORSIA) (705)
Iceland participates in the international system, CORSIA (e. Carbon Offsetting and Reduction Scheme for International Aviation), by the International Civil Aviation Organization (ICAO), which is meant to reduce greenhouse gas emissions from aviation. The goal of CORSIA is to achieve a carbon neutral growth in international aviation from 2020 with carbon offsetting through certain project certifications. The scope of CORSIA encompasses flight operators which emit more than 10 kt CO_2 from international aviation from aircrafts, with a maximum take of weight of over 5,700 kg.

CORSIA will be implemented in a few steps. Participation is voluntary, and Iceland will choose to participate from the beginning along with other countries that are a part of the European Civil Aviation Conference (ECAC). First, emissions from 2019 will be used as a baseline for emissions, and it will be mandatory to carbon offset all emissions that are in excess of the baseline in the following years. Then two three-year periods begin (2021-2023 and 2024-2026) when all countries can participate voluntarily before participation becomes binding. Currently, 88 countries have committed themselves to participate voluntarily from 2021 to 2026. From the start of 2019, flight operators from these countries have been monitoring CO_2 emissions from international aviation.

Energy Transition of State-Owned Vessels (212)
The aim of this measure is to reduce fossil fuel use by state owned ships, other than ferries. The use of fossil fuels in state owned ships will be systematically reduced and ways to improve sustainability will be evaluated. The possibilities for energy change in the Icelandic Coast Guard (Landhelgisgæsla Íslands) patrol ship Þór are already being analysed. The analysis consists of looking at possible alterations to the equipment, so that the electricity production of the ship can be used to power its sailing. The goal of this is to change the patrol ship to a hybrid. The share of sustainable fuels, such as biodiesel will also be increased.

[19] A Treaty on Transport in the Capital Area (Sáttmáli um samgöngur á höfuðborgarsvæðinu). *Government of Iceland (Stjórnarráð Íslands).* https://www.stjornarradid.is/verkefni/samgongur-og-fjarskipti/samgonguaaetlun/sattmali-um-samgongur-a-hofudborgarsvaedinu/

Furthermore, a new marine research ship is being built which will be called Þórunn Þórðardótir. It will be a hybrid ship with electric propellers. The main energy source is oil, but there are also large batteries on board that contribute to increased energy efficiency.

A plan will be prepared on energy change in other state-owned ships.

Electrification of Ferries (208)

The aim of this measure is to achieve an energy change in ferries which are in regular operation, and which are categorised as a part of the national highway system. Energy sources in ferries which are in regular operation will be switched out for more sustainable non-fossil fuelled options where technological development allows it.

There are five ferries currently in operation in Iceland, three of those are state owned:

- Herjólfur, the biggest ferry in Iceland, sails multiple times per day as the primary connection between Vestmannaeyjar (Westman Islands, which has a population of approximately 4,200) and the Icelandic mainland. The new Herjólfur is a hybrid, and it is expected that the ship will sail completely on electricity from the Icelandic coast to Vestmannaeyjar. The first fully electrified sailing of Herjólfur occurred on 22 August 2020. In certain weather or oceanic conditions, the ferry needs to be diverted to Þorlákshöfn instead of Landeyjarhöfn, 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 projection scenario.
- Sævar, the ferry to Hrísey. The ferry will be renewed as an electric ferry. It is expected that the design process can begin late in 2024.
- Sæfari, the ferry to Grímsey. When the ferry needs to be renewed alternative energy sources than fossil fuels will be considered.

Two ferries are privately owned:

- The ferry in Mjóifjörður. This is a small ferry which the owner is interested in electrifying.
- Baldur, the ferry in Breiðafjörður. This is a ferry owned by the company Eimskip/Sæferðir. The ferry trips across Breiðafjörður are supported by government funding for nine months of the year, but during the summer, Baldur´s operations are supported by market conditions. When the next description for tender for the sailing of the ferry will be made, energy change will be encouraged.

Quantification

This measure has been quantified. A new ferry was constructed and started sailing regular trips between Vestmannaeyjar and the southern coast of Iceland (Landeyjarhöfn) in 2019. In 2020, the construction of charging stations at each port (Vestmannaeyjar and Landeyjarhöfn) was finished and the ferry could begin regular journeys using only electricity for fuel.

However, Landeyjarhöfn experiences relatively frequent closures throughout the year for routine dredging or for volatile, unsafe meteorological or oceanic conditions that are common in the area. During these times when the harbour is closed, *Herjólfur* must sail instead to the harbour at Þorlákshöfn, which is a significantly longer journey (three hours between Vestmannaeyjar and Þorlákshöfn compared to 40 minutes between Vestmannaeyjar and Landeyjarhöfn). During these trips, the ferry needs to run the hybrid engine on diesel, as the journey is too long to only use electricity.

For the quantification of this measure, data was obtained from the operator of *Herjólfur*, both for historical fuel use, from before the ferry started using electricity, and future projections of fuel use. The historical data for 2011-2018 represent the fuel used on the old *Herjólfur* ferry, which was not electric/hybrid. In 2019, the new ferry started operating but did not start using electricity until 2020. In 2019, it used diesel fuel to power the hybrid engines. From 2023 (WEM scenario) and onwards it is expected to use some amount of diesel annually, due to trips to Þorlákshöfn.

Historical data on the old *Herjólfur* ferry's fuel use from 2011 was used to calculate the WOM scenario to 2050. Fuel use was projected to increase linearly to 2031 when it would reach the maximum possible fuel usage. The maximum possible fuel usage was calculated based on the maximum number of trips that the ferry could possibly make. Emissions from ferry trips running on gas/diesel oil were calculated following the Tier 1 IPCC (2006) methodology as is applied in the historical and projected greenhouse gas inventory. The impact of this policy on emissions from the *Herjólfur* ferry is presented in Figure 2.16 Emissions are projected to increase across the time series as the number of trips has been assumed to increase until it reaches a maximum in 2031.

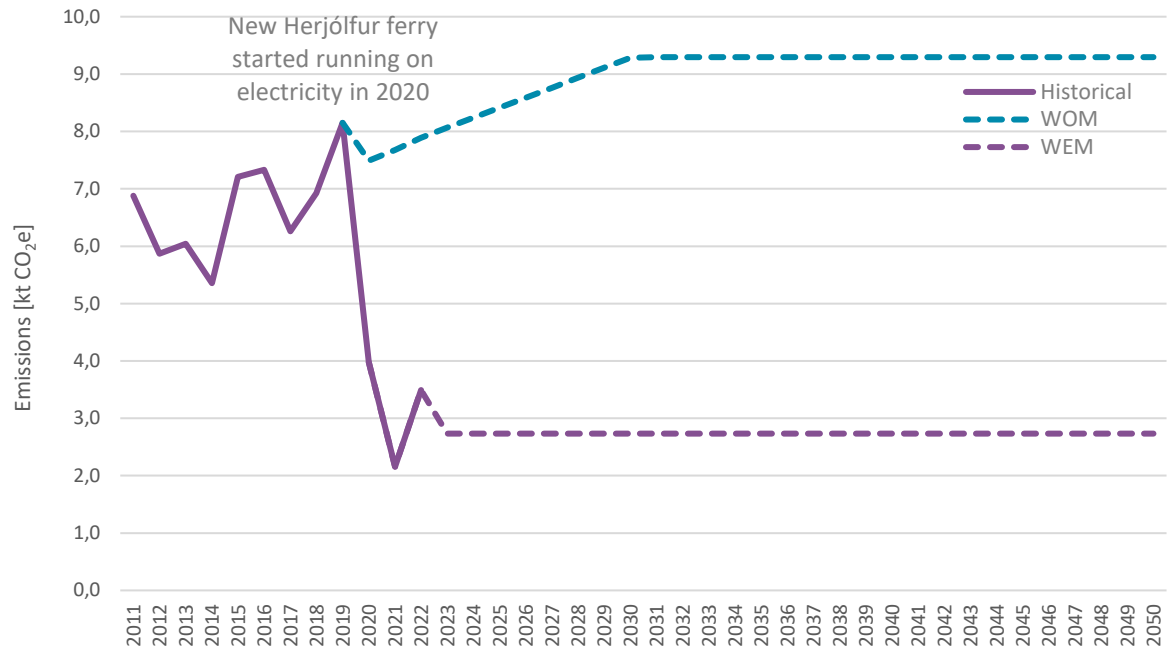

Figure 2.17 Quantified ex-ante emissions impact of the electrification of ferries on emissions from 1A3d Domestic Navigation, [kt CO_2e].

Emission savings in CO_2e and % from WOM can be seen in Table 2.13 Emissions for the WEM scenario for 2020-2022 are based on data received from the operator of *Herjólfur*, and it shows that the emissions savings in 2022 are estimated at 4.4 kt CO_2e.

Table 2.13 Quantified ex-ante emissions impact of measure 208 with emissions savings, [kt CO2e].

kt CO_2e							
Herjólfur ferry WOM	7.5	8.4	9.3	9.3	9.3	9.3	9.3
Herjólfur ferry WEM	4.0	2.7	2.7	2.7	2.7	2.7	2.7
Emission impact of WEM compared to WOM	3.5	5.7	6.5	6.6	6.6	6.6	6.6

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, it is, however, still unknown when the other ferries which are operated will be renewed. Therefore, the calculation of this measure currently only considers the electrification of *Herjólfur*.

2.5.5 Industrial Processes and Product Use (PPU)

Emissions, including projected emissions, from IPPU are dominated by the Metal industry (2C), specifically ferroalloys and aluminium production. The use of fluorinated gases (F-gases) in products as substitutes for Ozone Depleting Substances (ODS, 2F), mostly in the fishing industry, industrial refrigeration and commercial refrigeration, also contributes significantly to emissions from the IPPU sector. There is no Electronics industry (2E) in Iceland and therefore this is reported as NO.

PaMs with the objective of reducing GHG emissions relevant for the IPPU sector, both implemented and adopted, are summarised in Table 2.14.

Table 2.14 IPPU Policies and Measures

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Start year of implementation	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2eq)					
							2025	2030	2035	2040	2045	2050
Regulation on F-gases (301)	Stepwise reduction of import of HFCs from 271 kt CO_2e/year (baseline) to 16.3 kt CO_2e/year in 2036 (6% of baseline).	HFC, PFC	Economic, Regulatory	2019	Implemented	Ministry of the Environment, Energy and Climate	Estimated with the measure Taxation of F-gases (305).					
MAC Directive 2006/40/EC (302)	From 1 January 2017, the use of fluorinated greenhouse gases with a GWP higher than 150 in all new vehicles put on the EU market will be totally banned.	HFC, PFC	Regulatory	2008	Implemented	Ministry of Infrastructure	Estimate of impact not available.					
BAT for Non-Ferrous Metals	Operating permits for non-	GHGs	Regulatory	2010	Implemented	Ministry of the Environment, Energy and Climate	Estimate of impact not available.					

Industries (303)	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 (304)	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).	GHGs	Regulatory	2010	Implemented	Ministry of the Environment, Energy and Climate	Estimate of impact not available.

Taxation of F-gases (305)	Reduction of amount of import of F gases, no quantified objective available.	HFC, PFC	Fiscal	2020	Implemented	Ministry of Finance and Economic Affairs	76	117	137	143	141	137
Carbon capture from heavy industry (306)	CO_2 emissions from heavy industry will be reduced through carbon capture, for example using the Carbfix method.	CO_2	Regulatory	2025	Adopted	Ministry of the Environment, Energy and Climate	Estimate of impact not available.					
Updated Regulation under the Emission Trading System (ETS) (307)	43% decrease of emissions within ETS in 2030 compared to 2005.	CO_2, PFC	Regulatory	2021	Implemented	Ministry of the Environment, Energy and Climate	Estimate of impact not available.					
Environmental data reporting (708)	Regulation will be issued for better environmental data reporting, on, e.g., material	GHGs	Regulatory	2025	Adopted	Ministry of the Environment, Energy and Climate	Estimate of impact not available.					

use, GHG
emissions among
other pollutants.

The PaMs on reducing greenhouse gas emissions from IPPU in the 2020 Action Plan and 2022 Progress Report are predominantly focused on achieving the phasing out of F-gases. The phasing out of F-gases is primarily achieved through the implementation of the F-gas regulation and the MAC directive (both included in the WEM scenario). Further measures to reduce the use of F-gases are the implementation of a taxation system based on the GWP of the F-gases imported in bulk. The effect of the taxation is estimated with the effect of the phasing out.

Regulation on F-Gases (301)

This measure has been expanded since the first Climate Action Plan in 2018 Climate Action Plan and has become a separate measure. The goal was the implementation of EU Regulation No 517/2014 on F-gases with import quotas to reduce gradually the amount of F-gases coming to the country until 2036. 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 EU Regulation. The first regulation was adopted in December 2018 (Icelandic Regulation No 1279/2018) and repealed in 2019 with Icelandic Regulation 2019/1066. A stricter quota was twice adopted through amendments (Regulation 1425/2020 and Regulation 1446/2023) to Regulation 1066/2019 on F-gases which took effect in January 2021 and January 2024, further accelerating the decrease in F-gas emissions in Iceland (see Table 10). Certain other provisions are made in the regulation which aim to further reduce F-gas emissions, such as limits on their marketing and use. Refilling big systems with F-gases which have a very high global warming potential (maximum 2,500 GWP) are banned since 1st of January 2020. This regulation is an important step in reducing greenhouse gas emissions from the use of F-gases in Iceland. The Environment Agency of Iceland is in charge of monitoring the regulation in line with provisions in the chemical law. Restrictions will be further increased if deemed necessary. This measure has been quantified with the measure Taxation of F-Gases (305). The description and impact estimation of the quantification can be seen in the chapter about the measure Taxation of F-Gases (305).

Table 2.15 Comparison between steps in phasing out the bulk import of F-gases between Regulation No 1279/2018 and Regulation No 1446/2023.

	Regulation No 1279/2018 (repealed)			Regulation No 1446/2023 (in force)		
Steps	Years	Percentage compared to baseline	kt CO_2e	Years	Percentage compared to baseline	kt CO_2e
1 step	2019-23	90%	243.9	2019-20	90%	243.9
2 step	2024-28	60%	162.6	2021-23	35%	94.9
3 step	2029-33	30%	81.3	2024-26	12%	32.5
4 step	2034-35	20%	54.2	2027-29	10%	27.1
Final/ 5 step	2036	15%	40.6	2030-35	8%	21.7
Final				2036	6%	16.3
Baseline			271			271

MAC Directive 2006/40/EC (302)

Gradual ban on F-gases in passenger cars by enforcing the use of gases with a GWP lower than 150. The MAC directive is implemented into Icelandic law with Regulation 377/2013 amending Regulation 822/2004.

The Mobile Air-Conditioning Systems (MAC) Directive (302) has been in force since 2008 and is therefore considered to be part of the WEM projections scenario. Data collected directly from the main car importers carried out in 2020 showed that since R-134a has been replaced by lower GWP HFOs (Halo olefines) if the cars are aimed for the European market, a development which started in 2016. However, some cars are imported to Iceland from non-EU countries, so a small percentage of cars using F-gases (3% of yearly new registrations) are still considered in both historical and projected emission calculations. This measure has not been quantified separately.

BAT for Non-Ferrous Metals Industries (303)

Operating permits for non-ferrous metals industries are required to consider the Best Available Techniques (BAT) Reference Document (Art. 31(1) of the Directive 2010/75/EU on industrial emissions). This measure has not been quantified separately.

BAT for Manufacture of Glass (304)

Operating permits for the manufacture of glass are required to consider the Best Available Techniques (BAT) Reference Document (Art. 31(1) of the Directive 2010/75/EU on industrial emissions). This measure has not been quantified separately.

Measures 303 and 304, that is the application of BAT for the non-ferrous metal industry and the glass industry, respectively, are part of the WEM scenario, as the best available techniques are part of the current operation permits. The BAT directive aims to reduce negative environmental impact, which includes minimizing emissions of greenhouse gases. Emission limits are set based on the BAT and emissions should not exceed these limits.

Taxation of F-Gases (305)

The policy has been expanded since the first publication of the Climate Action Plan (2018) and has become a separate measure. The goal of this measure it to accelerate the process of phasing out F-gases by taxing imports of F-gases. The taxation was implemented into Icelandic legislation with Act on environmental and resource taxes in 2020 with an amendment (Act No 135/2019) to Act No 129/2009 on Environmental and Resource Taxes. The tax is based on the polluter pays principle which stipulates that those who are responsible for pollution pay for the consequences of it. A similar approach is used in Iceland as has been used in Denmark, where a certain price is added per kilogram of F-gases for every tonne CO_2e that it emits, up to a price ceiling of 10,000 ISK per kilogram. A taxation on F-gases can have a significant impact in a short span of time because more sustainable solutions are already available and it is fairly simple to phase out F-gases, technologically. This measure is a part of the WEM projection scenario and has been quantified with the measure Regulation on F-Gases (301).

Regulation on F-Gases (301) and Taxation of F-Gases (305) - Quantification

Measure 301 and 305 were quantified together, and a comparison made between the import quota according to Regulation No 1446/2023 and the current tax (WEM) and with no import quota and no tax (WOM). The calculation and results are presented below. These measures (301 and 305) cause the biggest shift in the trend of emissions in the non-ETS IPPU emissions. The WOM and WEM scenarios are described as follows:

The WOM scenario assumes that there was no regulation put in place on the import of F-gases and that the taxation was not implemented. This means that the WOM scenario starts deviating from the WEM scenario in 2018. The import of F-gases is projected based on calculating the line that best fits the import data from 2008-2017 using the "least squares" method for each blend.

The WEM scenario takes into account the effect of Regulation No 1446/2023 as seen in Table 2.15 which phases out the import of F-gases and the effect of the taxation. The average ratio of the real import to the quota was found for the years 2019-2022. The same ratio was assumed to apply to future years to project the total import. We note that for WEM we cannot predict which blends will be imported in the future, and in light of quick developments in this sector (low GWP drop-ins and replacements), for each blend, the average percentage of all imported blends for 2020-2022 was calculated and the projected import was allocated accordingly; the import quota is expressed as CO_2e, and no further indications are given.

For both scenarios the methodology for the calculation of the greenhouse gas emissions is the same as applied for the historical emissions as explained in the most recent edition of the National Inventory Report (NIR).

Figure 2.18 shows the comparison between the two scenarios and clearly illustrates that a rapid phasing out of F-gases, achieved the import quota, and the taxation will drive further emission reductions from this category. Under both scenarios, some increase is still expected in certain years, due to the import fluctuations in the past and different lifetime of equipment. Table 2.16 shows the quantified emission impacts and the difference between the scenarios. The negative emission impact effect the first years after the deviation of the scenarios is due to hight imports in 2018 that is believed partly to originate in stock up of F-gases prior to the quota.

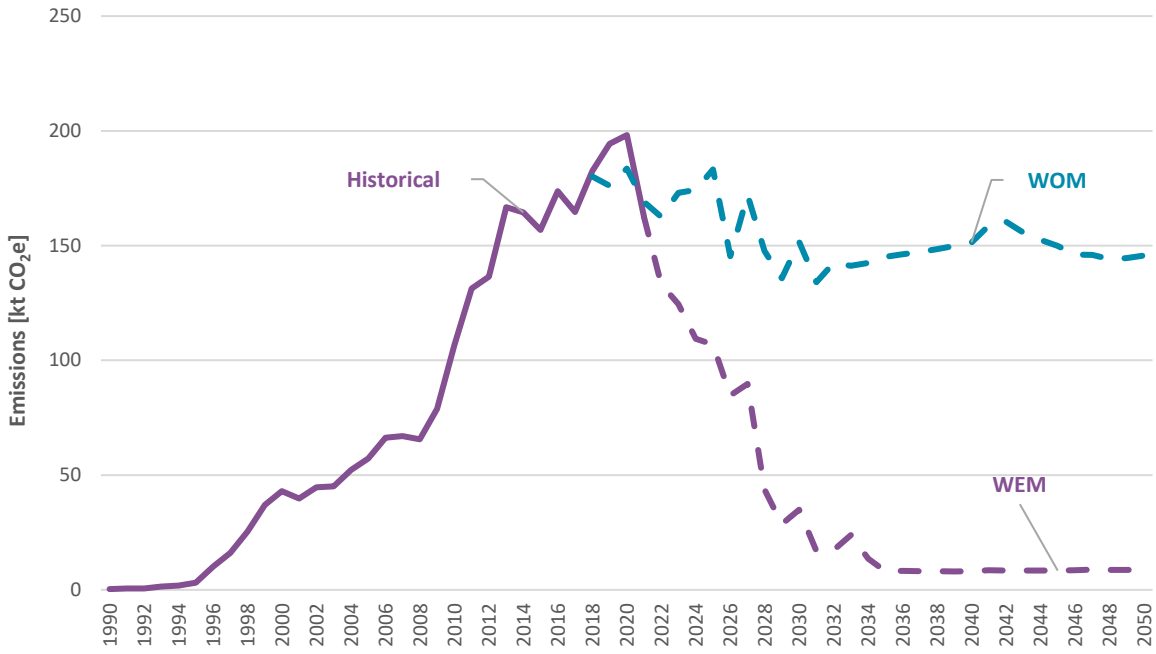

Figure 2.18 Greenhouse gas emissions in kt CO_2e from Product Uses as Substitutes for ODS (2F) due to the use of F-gases, WEM scenario compared to a WOM scenario.

Table 2.16 Quantified emission impacts of the policies: Regulation on F-gases and Taxation of F-Gases, Product Uses as Substitutes for ODS (2F), [kt CO2e].

Regulation on F-gases	2018	2020	2025	2030	2035	2040	2045	2050
Regulation on F-gases WEM	182	198	107	35	8.1	8.1	8.4	8.7
Regulation on F-gases WOM	180	184	183	152	145	151	150	146
Emissions impact of WEM compared to WOM	-2	-15	76	117	137	143	141	137

Carbon Capture from Heavy Industry (306)

The *Carbfix*[20] method will be explored further to determine whether it is a realistic option to capture CO_2 emissions from heavy industry in Iceland. Reykjavík Energy (*Orkuveita Reykjavíkur*) has developed the method in collaboration with the University of Iceland and foreign stakeholders and it has received widespread attention around the world. The method involves capturing CO_2 from geothermal emissions. The CO_2 dissolves in water under pressure and the water is subsequently pumped to a depth of 500-800 meters into the basalt strata, where the CO_2 is permanently mineralised. The gas is, in this way, turned into rock. ON, a subsidiary of Reykjavík Energy, has used the method for the last years to reduce emissions from Hellisheiði power plant with good results.

According to a declaration of intent[21], which was signed in 2019 by *Reykjavík Energy*, *Elkem*, *Alcoa Fjarðaál*, *Rio Tinto Iceland*, *Norðurál*, *PCC Bakki*, and the government, an analysis of the possibilities to use the same method in heavy industries in Iceland will be undertaken to see if it is possible for them to capture CO_2 directly from their processes and pump it into basalt rock. The project is extensive and will span five to ten years. Development of methods is planned to separate the density of CO_2 in emissions from heavy industry so that similar cleaning measures can be used as in the Hellisheiði power plant. Equipment to experiment with the filtering and pumping down of CO_2 from heavy industry must be designed and built, and consequently real, full-scale equipment must be made.

Iceland implemented into Icelandic law Act No 12/2021, an Icelandic adaptation of Directive 2009/31/EC (the CCS Directive), with an amendment to Climate Act No 70/2012 and Act No. 7/1998, with the aim to enable the EU ETS industry in Iceland to utilise the Carbfix method within the CCS. The development of capturing CO_2 from heavy industry is still in early stages and therefore this measure is not a part of a projection scenario and has not been quantified separately.

[20] *Carbfix*. https://www.carbfix.com/

[21] Declaration of intent by the Government, the heavy industry sector and Reykjavík Energy on carbon sequestration (Viljayfirlýsing stjórnvalda, stóriðjunnar og OR um hreinsun og bindingu kolefnis). *Government of Iceland (Stjórnarráð Íslands).* https://www.stjornarradid.is/library/01--Frettatengt---myndir-og-skrar/FOR/Fylgiskjol-i-frett/VIljayfirl%c3%bdsing%20undirritu%c3%b0.pdf

Updated regulations according to the Emission Trading System (EU ETS) for Phase 4 (307)

Iceland will continue to participate in the EU ETS. New regulations took effect when the fourth period (2021-2030) of the system started in 2021. The stricter rules were designed to return a 43% decrease in emissions within the ETS in 2030 compared to 2005, start of the EU ETS. The goal has been further increased to 62% with the Fit for 55 package in December 2022. The trading system is the EU's main instrument in climate issues and is meant to create an economic incentive to reduce greenhouse gas emissions.

The ETS is based on making certain operations in the European Economic Area (EEA) dependent on emission allowances. A certain limited total of emission allowances is allocated to the whole EEA per year, and the total allowances decrease each year. Emission allowances are in part allocated to operators and flight operators for free, and in part auctioned off. If operators and flight operators have managed to reduce their emissions to the extent that they have more emission allowances than they need, they can sell the excess allowances on the market. In the same way they have to buy emission allowances if their emissions exceed their allocated free emission allowances. In this manner, the trading system creates a financial incentive to reduce greenhouse gas emissions from operations, for example by investing in more environmentally friendly technology or optimising operations in other ways.

Since the ETS was set afoot, it has been expanded every few years so that more sectors are included in the system and the rules have become stricter. The third period of the ETS came to an end by the end of 2020 and the fourth period, which covers the next 10 years, has taken over. With Act No 35/2021 the relevant changes on the Climate Act No 70/2012 were made to implement the appropriate EU regulations regarding the fourth period. In December 2023 a new Act No 96/2023 was introduced into Icelandic law about the emission trading system covering the implementation of the EU-ETS directive and related regulations and therefore replacing its implementation in the Climate Act No 70/2012.

Measure 307, that is being part of the EU ETS is also estimated in the WEM scenario, as all main industrial emitters fall into the ETS system. Within the whole ETS system, emissions from installations have declined since 2005. Currently, no significant decrease is occurring within the EU ETS Industry in Iceland and in general the emissions are quite steady. The reason is the start-up of new installations during the time Iceland has participated in the EU ETS and the fact that most of the emissions comes from the industrial processes themselves but not the burning of fossil fuels for energy. The possibilities that the operators in EU ETS industry must decrease emissions lies within the use of renewable energy/biofuels but first and foremost in the permanent removal of emitted CO_2 from the source streams. This measure has not been quantified individually.

Since the technology to reduce emissions within the industrial processes themselves is not available, the possibilities to reduce emissions from EU ETS industries in Iceland lies mostly within carbon capture and storage (CCS), measure 306.

Environmental Data Reporting (708)

The measure has been expanded since the first edition of the Climate Action Plan (2018). The aim of this measure is to improve reporting on environmental data and information by operators in Iceland, including data on the use of raw materials, air pollutant- and greenhouse gas emissions. A regulation on the reporting of environmental data will be developed to coordinate information and simplify the reporting process for operators. In 2019, Act No 7/1998 on Public Health and Pollution Prevention was amended; an obligation to report a special "green account" (*grænt bókhald*), is planned to be cancelled

and instead operators have to report certain environmental data. This environmental data includes similar information as was previously reported through the “green accounting,” such as emissions of polluting substances and resource use. The work on this regulation has already begun. The goal with this amendment is to receive more detailed data from the operators that are bound to report environmental data, to have better information on resource use and pollution in Iceland.

A regulation on “emissions accounts” (*útstreymisbókhald*), Regulation No 990/2008, will build on the same base as the Regulation on Green Accounts No 851/2002 and weave in further provisions to ensure that all data that the EAI needs to fulfil its legal obligations, such as reporting to EFTA's regulatory agency and the UNFCCC, is gathered and reported. The reporting obligation contained within the Regulation on Environmental Data is expected to apply to businesses that currently fall under the Act on Public Health and Pollution Prevention. This includes metal production, chemical industry, energy industry, fish-meal factories, asphalt plants, oil warehouses, power plants, sewage treatment plants, poultry and pig farming, and smaller operations, such as dry cleaners and gas stations. The draft on the Regulation on Environmental Information reporting was presented in the Government’s consultation portal in Juny 2024. This measure has not been quantified separately but is included in the WEM scenario.

2.5.6 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 with 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 projections encompass emissions from Enteric Fermentation (3A), Manure Management (3B), Agricultural Soils (3D), Liming (3G), Urea (3H), and Other Carbon-Containing Fertilisers (3I). A number of Agriculture categories are not occurring in Iceland and have therefore not been included in the projections, e.g., Rice Cultivation (3C), Prescribed Burning of Savannas (3E), and Field Burning of Agricultural Residues (3F).

The total GHG emissions from Agriculture in 2022 were 14% 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 agricultural soils. 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 2022, 84% of CH_4 emissions were caused by enteric fermentation, the rest by manure management. In the same year, 94% of N_2O emissions were caused by agricultural soils, the rest by manure management, i.e., storage of manure.

Five Agriculture PaMs are currently planned with the objective of reducing GHG emissions, summarised in Table 2.17.

Table 2.17 Agriculture Policies and Measures

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Start year of implementation	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2eq)			
							2025	2030	2035	2040
Climate-friendly agriculture (401)	Comprehensive education and counselling for farmers on how to reduce *GHG emissions and increase carbon sequestration from their farm and land.	CO_2, CH_4, N_2O	Information, Education, Planning	2020	Implemented	Ministry of the Environment, Energy and Climate	Estimate of impact not available.			
Improved feeding of livestock to reduce enteric fermentation (402)	Research shows that supplements can reduce enteric fermentation in livestock, resulting in lower CH_4 emissions; these possibilities will be explored in the Icelandic context.	CO_2, CH_4, N_2O	Research	2023	Adopted	Ministry of Food, Agriculture and Fisheries	Estimate of impact not available.			
Improved use and handling of fertilisers (403)	Knowledge building and access to information for farmers about the use and handling of manure and synthetic fertiliser.	CO_2, CH_4, N_2O	Education, Planning, Regulatory	2021	Implemented	Ministry of Food, Agriculture and Fisheries	Estimate of impact not available			

Carbon-neutral beef production (404)	Emissions arising from beef production will be reduced and carbon sequestration enhanced to aim for carbon neutral beef production in 2040.	CO_2, CH_4, N_2O	Education, Planning, Regulatory	2021	Implemented	Ministry of Food, Agriculture and Fisheries	Estimate of impact not available.
Increased domestic vegetable production (405)	Domestic vegetable production will be increased and the objective of carbon neutral vegetable production set for 2040.	CO_2, CH_4, N_2O	Planning, Regulatory	2021	Implemented	Ministry of Food, Agriculture and Fisheries	Estimate of impact not available.

The PaMs described in the table above are all from the Climate Action Plan (2020) and the Progress Report (2022).

The PaMs in this sector, as proposed by the Climate Action Plan (2020), are mostly regarding education for farmers to reduce their GHG emissions within their daily farming activities and/or through carbon sequestration (401, 404). Therefore, a quantification in terms of emissions, as calculated in the historical inventory, is difficult and any efforts of carbon sequestration by rewetting drained wetlands or increase afforested areas on farmland would fall into the LULUCF sector. Nevertheless, the Ministry of the Environment, Energy, and Climate (MEEC) plans to measure the effects of these educational policies with the number of participating farms.

Climate-Friendly Agriculture (401)

The measure has been expanded since the first Climate Action Plan (2018), where it was called "Collaboration with sheep farmers on carbon sequestration/Carbon neutral sheep". The aim of this measure is to provide farmers with comprehensive counselling and education on how they can reduce their GHG emissions and increase carbon sequestration on their farms and land through a project called "Climate-Friendly Farming" (*Loftslagsvænni landbúnaður*). The goal is to reduce GHG emissions from farming and land use and increase carbon sequestration in soils and vegetation. In the first edition of the Climate Action Plan (2018), a collaboration project with sheep farmers, with the goal to reduce GHG emissions and increase carbon sequestration in farming and land use, was described. The preparation of the project has been managed by the Icelandic Agricultural Advisory Centre (*Ráðgjafarmiðstöð landbúnaðar*) (IAAC), the Icelandic Forestry Association (*Skógræktin*) and the SCSI, in collaboration with the Icelandic Sheep Farmers Association (*Landssamtök sauðfjárbænda*), the Icelandic Farmers Association (*Bændasamtök Íslands*), the MEEC and the MFAF.

The Climate-Friendly Farming project began in February 2020 with an open meeting for all farmers. Voluntary participants receive guidance on future planning, that focuses on reducing the carbon footprint of their farms and is based on data from each individual farm. Participation starts with an introductory course which covers the basics of climate issues in agriculture, following by monthly remote lectures and participators and advisors also meet annually at on-site workshops. Each participating farm sets its own climate action plan in which its conditions, capabilities and possibilities are considered. The action plans are revised annually and includes a list of actions divided into three categories, A) actions to reduce emissions, B) actions on carbon sequestration and C) other actions. Actions in category A include improved use of fertilisers, consideration of growing N-binding plants, less fossil fuel use, soil conservation, wetland restoration and reduction of enteric fermentation. Actions in category B include revegetation, reforestation, forestry and cultivation of shelterbelts and grazing forests. As for the category C, farmers are encouraged to think outside the box and come up with new actions. The aim is to gradually expand the "toolbox" (the action plan).

The MEEC is responsible for the project, including its funding. By 2022, the MEEC has allocated 20 million ISK to the project. Additionally, the MEEC allocates up to 500,000 ISK as a support payment annually to each participating farm.

In 2020, 13 sheep farms participated in the project. In 2021, the project became available to cattle farmers. In 2022, the number of participators has reached to 54. The project aims to include different types of farms in the future and reach around 100 participating farms in 2023. This measure is interlinked to measure 404 on Carbon-Neutral Beef Production.

It is currently impossible to estimate the impact this measure has on GHG emissions. The potential reduction in emissions is expected to come from the improved use and handling of fertiliser, improved livestock feeding and managing, improvement in the use of machines and equipment, carbon sequestration projects and improved land use.

Improved Feeding of Livestock to Reduce Enteric Fermentation (402)

The measure has the aim to reduce GHG emissions from enteric fermentation in ruminants through improved feeding. The goal is set at 23 kt CO_2e reduction by 2030. The measure is still in preparation and is neither included in the projection scenario nor being quantified.

Reduced emissions from the enteric fermentation of ruminants will be achieved by improved feeding practices, which will be carefully monitored. Enteric fermentation is the process that causes CH4 emissions from the digestive system of livestock. It is the main source of GHG emissions from livestock and animal husbandry. When the livestock chew and process food they belch out CH4. Research, that has been conducted abroad, indicates that it is possible to reduce CH4 production in the digestive system of livestock in various ways, such as through using substances made from algae. Whether it is possible to reduce emissions from enteric fermentation in Iceland through such means will be explored, and domestic research and development will be supported. The implementation of this policy is aligned with policy 401 on climate-friendly agriculture and policy 404 on carbon-neutral beef production, part of which is to assess the status and development of research on enteric fermentation. The project management team on the progress of climate action in agriculture will consequently be in charge of monitoring developments in this field and recommending measures that are suitable for Icelandic conditions when appropriate.

Measure 402 proposes to look into innovative feeding systems to reduce CH_4 emissions from enteric fermentation from ruminants, e.g., with the use of seaweed. This is only on an experimental level and is not included in any projections. The Icelandic Food and Biotech R&D (*Matís*) is participating in the research project *SeaCH4NGE*[22], financed by EIT Food. However, according to first results from December 2022, seaweed collected in Iceland does not seem promising for reducing CH4 emissions from enteric fermentation.

Improved Use and Handling of Fertilisers (403)

This measure has been expanded since the first edition of the Climate Action Plan (2018). The measures "reduced use of non-organic fertiliser" and "improved manure management" have been combined into one policy. The aim is to reduce GHG emissions (CH_4 and N_2O) from fertiliser use in agriculture through improvement in manure management practices and reduction in the use of inorganic fertilisers. An emphasis will be placed on increasing farmers' knowledge and access to information on how best to reduce GHG emissions from their practices. The goal is set at 10% less emissions in 2030 compared to the WOM scenario, which would mean approximately 25 kt CO_2e less cumulative GHG emissions up to that point from fertiliser use. The measure is interlinked with Climate-Friendly Agriculture (401), Carbon-

[22] Seaweed supplementation to mitigate methane (CH_4) emissions by cattle (SeaCH4NGE) *EitFood*. https://www.eitfood.eu/projects/seaweed-supplementation-to-mitigate-methane-ch4-emissions-by-cattle-seach4nge

Neutral Beef Production (404) and Increased Domestic Vegetable Production (405). At this point, the measure is part of measure 401 and 404.

An important aspect of this effort is to enforce the regulation on protection against water pollution due to nitrogen compounds (NOx) from agriculture and other operations (Icelandic regulation No 796/1999). According to the regulation, the size of a manure storage should be based on a holding capacity of at least six months of manure, or the possibility of using the manure in a reasonable manner as organic fertiliser on soil. The policy scope includes the fertiliser use of all farmers, starting with cattle and sheep farmers since measures in those fields have already begun (see policies 401 and 402). Through those measures, farmers will, among other things, be provided with advice that aims to improve the use of manure, and it will be researched systematically how farmers use their manure. Knowledge and experience from this work will highlight the possibilities that exist to reduce GHG emissions with improved fertiliser use and lay a foundation for increased training and information sharing to other farming sectors. Consequently, it will be the responsibility of the project management group on climate action in agriculture to implement the policy for all farmers.

In 2020, a working group on climate and beef production prepared a number of measures and recommendations for carbon-neutral beef production. Regarding fertiliser use, the group proposed an improvement in the registry of fertiliser use in agriculture. The registration would potentially give an overview on fertiliser use which would highlight the opportunities for improvements. According to the regulation on the general support in agriculture (Icelandic regulation No 430/2021), registration on fertiliser is one of the conditions for farmers to receive agricultural subsidies.

As for progress, special effort in providing counselling on fertiliser use and for making fertilising plan was launched in 2021 following the increase in fertiliser price. In 2022, the fertiliser registration had been established and there is an on-going strategic planning to improve the utilisation of organic resource (e.g. for fertiliser use).

It is currently not deemed reasonable to force a 10% decrease in fertiliser emissions in 2030 in the WEM scenario. Therefore, a historical trend is used to predict emissions from fertiliser use and this PaM is not quantified. The potential reduction in emissions is expected to come from the improved use and handling of fertiliser, including better manure storage.

Carbon-Neutral Beef Production (404)

This measure aims to reduce the GHG emissions from beef production and increase carbon sequestration. The target carbon-neutral beef production by 2040. An emphasis will be placed on reducing GHG emissions from cattle breeding and increasing carbon sequestration at cattle farms. To reach the target, research, counselling, and education for farmers will be increased, starting with building up knowledge for farmers on carbon emissions and sequestration, improved feeding, and manure management techniques. The foundation will be knowing the possibilities of each plot of farmland and to build up a transparent and certified framework for the project. This measure is interlinked with the Climate-Friendly Agriculture (401), Improved Feeding of Livestock to Reduce Enteric Fermentation (402); and Improved Use and Handling of Fertilisers (403).

The beef production agreement (*nautgripasamningur*), an agreement on the operation conditions in beef production, was reviewed and signed in 2019[23]. The agreement includes the target for carbon-neutral beef production by 2040. A working group on climate and beef production was formed in February 2020 following the signing of the agreement, with representatives from the MFAF, the MEEC and the Farmer Association of Iceland (*Bændasamtök Íslands*) appointed by the Minister of Fisheries and Agriculture. The group received the task of making a project and financial plan targeting carbon-neutral beef production. In May 2020, the group, in consultation with the IAAC, the Agricultural University of Iceland (*Landbúnaðarháskóli Íslands*), Icelandic Food and Biotech R&D and other, has proposed seven measures and eight recommendations for the achievement of carbon-neutral beef production. The group emphasised that until the next review of the agricultural contracts (*búvörusamningar*) in 2023, available funds should be utilised in two matters, to improve the foundational data for the carbon inventory for cattle farming and to increase training and education for farmers on the possibilities to reduce their GHG emissions. The group also emphasised that the funds that would be available after the 2023 review should be utilised in direct climate measures on the farms. The project management team on the agricultural contracts will be responsible for the financial allocation and will follow through on the projects.

On the progress, according to the Climate Action Plan 2022 Status Report, the registration of fertiliser use has been established, cattle farmers are now among participants in the Climate-Friendly Agriculture project and a research facility has been set up at the Agricultural University of Iceland for the study on the emissions from the Icelandic cattle.

The number of participating cattle farms in the Clime-Friendly Agriculture project[24] is used as an indicator to monitor and evaluate progress of this measure. The project launched in 2020 and became available for cattle farmers to apply in 2021. 14 cattle farms participated in 2021 and 27 in 2022.

It is currently impossible to estimate the impact this measure has on GHG emissions. The potential reduction in emissions is expected to come from the improved use and handling of fertiliser, improved livestock feeding and management, improvement in the use of machines and equipment, carbon sequestration projects and improved land use.

Increased Domestic Vegetable Production (405)

This measure has the aim to increase vegetable production in Iceland and promote carbon neutrality in Icelandic horticulture. Three climate goals were agreed upon during the review of the horticulture contract[25] (*garðyrkjusamningur*) in May 2020[26]. The goals include a 25% increase in the production of Icelandic vegetables between 2020-2023 compared to the average production between 2017-2019, increase

[23] *Government of Iceland (Stjornarráð Íslands).* https://www.stjornarradid.is/efst-a-baugi/frettir/stok-frett/2019/10/25/Endurskodun-nautgripasamnings-i-hofn-Islensk-nautgriparaekt-verdi-ad-fullu-kolefnisjofnud-og-greidslumark-afram-vid-lydi/

[24] *Icelandic Agricultural Advisory Centre (RML).* Loftslagsvænn landbúnaður. https://rml.is/radgjof/loftslag-og-umhverfi/loftslagsvaenn-landbunadur

[25] *The horticulture contract or garðyrkjusamningur is a contract for the operation conditions of horticulture production.*

[26] *Government of Iceland (Stjornarráð Íslands).* https://www.stjornarradid.is/library/01--Frettatengt---myndir-og-skrar/ANR/Landbunadur/r04siol_22.5.2020_08-43-29.pdf

in financial support for organic vegetable production as well as making efforts for carbon neutral Icelandic horticulture by 2040.

To support the goal of carbon neutrality in Icelandic horticulture, a part of the funding for the horticulture contract will be spent specifically on climate action. A work has begun on building up knowledge on GHG emissions and sequestration, improving the treatment and use of resources and fertilisers, reducing waste, and strategic cultivation. An emphasis will be placed on effective agriculture, increased sustainability, and other actions that support the target of carbon neutral farming. Furthermore, a holistic approach will be undertaken where climate policy, energy, employment, regional affairs, food production and other significant factors will coincide with climate actions. Farmers' knowledge on climate issues, possibilities for reduction of GHG emissions, and increased carbon sequestration will be further improved, e.g., by increased access to direct council and education. The emphasis will be on knowing the possibilities of each individual horticultural farm directly, and to build up a transparent and certified framework for the project.

Regarding the financing, additional 200 million ISK is allocated to the horticulture contract yearly between 2020-2026 to support this measure, e.g. for direct payment for electricity, climate actions, development projects and more diverse vegetable cultivation. Simultaneously, another 15 million ISK is allocated to the horticulture contract to directly support the project on carbon neutral Icelandic horticulture. The executive committee of the agricultural contracts is responsible for the allocation of the funds and will base the allocation on the recommendation from the Icelandic Association of Horticulture Producers (*Samband garðyrkjubænda*) (IAHP). At the end of 2020, the MFAF and the IAHP agreed to fund two specific projects. One involves vegetation in the city while the other involves carbon sequestration. Both projects focus on increasing knowledge, public interest, and participation in cultivation in order to increase carbon sequestration. The IAHP is responsible for project management.

The amount of vegetables produced is used as an indicator to monitor and evaluate the progress of this measure. Although being implemented in 2020, the evaluation started in 2021 as it was the first full executive year of measure. The total amount of produced vegetable in 2021 was 12,903 tons which is 8% lower than the average amount between 2017-2019. The decrease in total amount is due to crop failure in potato and turnip.

The measure has not been quantified, as greenhouses for vegetable farming do not produce any GHG emissions (except for very low fugitive emissions from geothermal power production) according to the National Inventory Report. Greenhouses in Iceland are heated by geothermal heat and the electricity derives from renewable sources; that is hydropower plants and geothermal power plants. It can be assumed that fertiliser use might increase slightly, but in comparison to the animal farming sector, vegetable production in Iceland is very small and should not lead to significant increases of GHG emissions. On an international level, increased domestic vegetable production in Iceland may reduce the need for international transportation of goods to Iceland, thus reducing emissions.

2.5.7 Land Use, Land-Use Change, and Forestry (LULUCF)

In this sector, emissions and removals related to Land Use, Land-Use Change, and Forestry (LULUCF) are reported. The categorisation of land use is according to the 2006 IPCC guidelines (IPCC, 2006). This defines six land-use categories and conversions between them. Emissions and removals of GHGs are reported for all managed land within these categories according to guidelines given in Volume 4: Agriculture, Forestry, and Other Land Use of the 2006 Guidelines (IPCC, 2006), hereafter named 2006 AFOLU Guidelines, and the

2013 Supplement to the 2006 Guidelines: Wetlands (IPCC, 2014), hereafter named 2013 Wetlands Supplement. Land and Forest Iceland (LaFI) (joint institution of the Soil Conservation Service of Iceland and the Icelandic Forest Service as of January 1st, 2024) is responsible for preparing the inventory for this sector.

Almost 90 % of the total area of Iceland is included in two land-use categories; these are Other Land and Grassland. Figure 2.19 shows the relative division of the area of Iceland to the six mainland-use categories reported. Both emissions from sources and removals by sinks are reported for this sector.

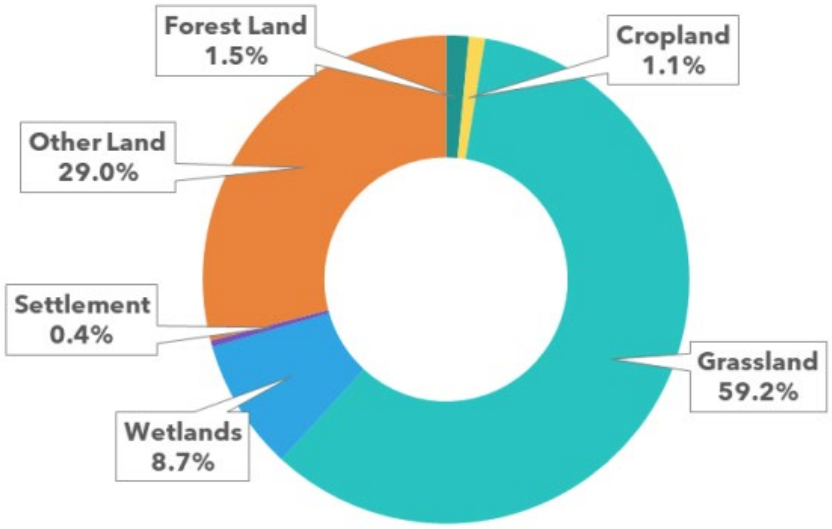

Figure 2.19 Relative size of land-use categories in Iceland.

A large part of the government's Climate Action, updated in 2025 concerns LULUCF, in particular, because the contribution of emissions from LULUCF to the emissions of Iceland are disproportionately high. Reclamation of ecosystems is a priority measure of the government where focus will be on reclamation on state owned lands. Sustainable management practices in the LULUCF sector can contribute to climate change mitigation in several ways, by reducing emissions and maintaining and enhancing sinks and carbon stocks. Furthermore, the government has implemented through law that Iceland is to achieve carbon neutrality by the year 2040; this underlines the importance of enhanced carbon sequestration and GHG reduction action.

Between 1990 and 2023 there is a net 1.9% decrease in in emissions from LULUCF of around 157.2 kt CO2e. this decrease is driven by 237.5 kt CO2e more carbon removals from Forest land in 2023 compared to 1990.

Six LULUCF PaMs are currently ongoing with the objective of reducing GHG emissions and increasing removals and are summarised in Table 2.18. The PaMs on reducing GHG emissions from LULUCF Climate Action Plan (2024) are predominantly focused on enhancing carbon sequestration through afforestation, land reclamation and restoration of wetlands, and reduction in carbon emissions through recovery and conservation of wetlands.

Table 2.18 LULUCF Policies and Measures

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Start year of implementation	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO_2eq)			
							2025	2030	2035	2040
L.1.A.2. (601)	Incentives in the state support system for private land	CO_2, CH_4	Fiscal	2024	Implemented	Ministry of the Environment, Energy and Climate	Estimate of impact not available.			
L.1.B.1. (602)	Revegetation of wetlands on state-owned land	CO_2, CH_4	Planning	2025	Planned	Ministry of the Environment, Energy and Climate	Estimate of impact not available.			
L.1.C.1. (603)	Protection and restoration of birch forests on state-owned and public lands. .	CO_2, CH_4	Regulatory, Voluntary Agreement	2025	Planned	Ministry of the Environment, Energy and Climate	Estimate of impact not available.			
L.1.C.3 (604)	Restoration of ecosystems on disturbed state-owned and public lands.	CO_2, CH_4	Research, Planning	2025	Planned	Ministry of the Environment, Energy and Climate	Estimate of impact not available.			

L.1.C.6. (605)	Improved expertise and sustainable utilisation of wood products.	CO_2, CH_4	Information, Research, Planning	2024	Implemented	Ministry of the Environment, Energy and Climate	Estimate of impact not available.

Incentives in the State Support System for Private Land (601)
The active participation of individuals, non-governmental organizations, corporations, and institutions in the planning and execution of land reclamation and forestry initiatives is essential for achieving climate and biodiversity protection goals within the land use sector. Consequently, it is important to evaluate and establish a more efficient funding system to support climate-related actions on private land. Furthermore, it is necessary to clarify how policies related to land reclamation and forestry can incentivize participation across societal sectors, thereby enhancing the contributions of non-governmental organizations and individuals

Restoration of Wetlands on State-Owned Land (602)
The action entails the strategic reclamation of wetlands on state-owned lands in accordance with the state implementation plan. Restoring these wetlands presents significant potential for mitigating greenhouse gas emissions. As outlined in the government's land reclamation and forestry policy, Land and Life, it is projected that 15,600 ha of disturbed wetlands — approximately 6% — will be restored by 2031. By 2030, it is projected that approximately 6% of the wetlands disturbed by human activities will have undergone reclamation and restoration efforts, representing a notable improvement compared to the state of these ecosystems in 2022. This progress highlights a growing commitment to addressing environmental degradation and restoring critical habitats for biodiversity, water regulation, and carbon storage.

Protection and Restoration of Birch Forests on State-Owned and Public Lands. (603)
Natural birch forests cover approximately 1.5% of Iceland’s land area in recent years, hence, there is significant potential to expand this coverage and enhance carbon sequestration. Achieving this potential requires the implementation of targeted protection and restoration strategies. Ensuring the conservation of these ecosystems is essential, along with the development of an action plan that incorporates measures such as afforestation and seedbed enhancement, aligned with forest landscape restoration principles and an ecosystem-based approach. It is crucial that the state establishes a clear framework that facilitates greater access to state-owned land for initiatives aimed at protecting and restoring birch forests.

Restoration of Ecosystems on Disturbed State-Owned and Public Lands. (604)
The Icelandic Treasury owns nearly 430 parcels of land, many of which present potential opportunities for dryland ecosystem restoration. It is crucial to assess the suitability of these parcels for restoration efforts, develop and establish a prioritization framework, and define the specific actions necessary to achieve optimal ecological outcomes.

The goal is to restore 100,000 hectares of degraded dryland by 2030, revitalizing these vital ecosystems through sustainable efforts. This ambitious initiative will focus on improving soil health, promoting biodiversity, and enhancing water retention to combat land degradation. By implementing sustainable land management practices and soil regeneration techniques, Iceland aims to not only reverse environmental damage but also boost local resilience against climate change. Moreover, the restoration efforts will support both ecological balance and the livelihoods of communities.

Improved Expertise and Sustainable Utilization of Wood Products (605)
This measure is twofold, on one hand to promote long-term carbon storage in wood products, and on the other hand to promote the use of wood to replace fossil fuels. Ensuring sustained and long-term carbon

sequestration in wood products is of fundamental importance. This initiative involves enhancing expertise and establishing incentives to promote the increased production and use of Icelandic wood products. These efforts contribute to greater carbon sequestration in wood products. Another use of timber is to replace fossil fuels (e.g. in industry) to reduce greenhouse gas emissions from fossil fuel consumption and the need for fossil fuel imports, although this would not contribute to long-term carbon storage.

2.5.8 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 in Iceland and is serving the Capital Region, where approximately two thirds of the population of Iceland lives. A new biogas and composting plant called GAJA has been built at Álfsnes and started operating in the second half of 2020. According to the operation permit[27] issued by the EAI, the plant is expected to turn up to 30-40 kt of waste into compost and methane gas annually. The methane will mostly be used as fuel for vehicles, and therefore the emissions from methane produced in GAJA is included in the Road Transport sector (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 plants, so the methane is mostly used for vehicle fuel. Other plans to utilise the methane produced in GAJA include asphalt production, where it would be replacing diesel oil, and coffee roasting, where it would be replacing propane gas[28].

Until the 1970s, the most common form of waste management outside the Capital Region 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 from the four municipalities that own it and from Iceland's main international airport. To a smaller extent it handles clinical waste, hazardous waste, slaughterhouse waste, and other waste categories.

Biological treatment of waste started in the 1990s and has increased slowly but steadily since then.

In the early 1990s only a small percentage of reported waste was recycled or reused. Their share of total waste management increased steadily since then and has been around 80% for the last five years. However, the total reported waste amounts in the last five years are also 3-4-fold compared to the 1990 amount.

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

[27] *EAI*. https://ust.is/library/sida/atvinnulif/starfsleyfi-og-eftirlitsskyrslur/Starfsleyfi%20undirrita%c3%b0.pdf, in Icelandic

[28] *Sorpa*. https://www.sorpa.is/frettir/malbikstodin-og-sorpa-undirrita-viljayfirlysingu-um-kaup-a-metani, https://www.sorpa.is/frettir/sorpa-og-te---kaffi-undirrita-samning-um-kaup-a-metani, in Icelandic

municipalities, but their share of total wastewater treatment systems in Iceland does not exceed 2% of domestic wastewater and 9% of industrial wastewater.

Five waste management PaMs are currently implemented or planned with the objective of reducing GHG emissions and are summarised in Table 2.19.

Table 2.19 Waste Policies and Measures

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Start year of implementation	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2eq)					
							2025	2030	2035	2040	2045	2050
Ban on landfilling of organic waste (501)	Landfilling of separately collected organic waste will be banned from 2023 and a ban on landfilling all biodegradable waste will be added at a later date, assumed to start from 2025.	CH_4	Regulatory	2023	Implemented	Ministry of the Environment, Energy and Climate	Estimated together with Gas and compost plant (504) as a GROUP (507)					
Landfill tax (502)	Greenhouse gas emissions from landfill will be reduced with the application of a tax on landfilling.	CH_4	Fiscal	2025	Planned	Ministry of the Environment, Energy and Climate	Estimate of impact not available.					

Reduction in food waste (503)	Various projects will be conducted with the aim of reducing food waste.	CH_4	Education, Information	2021	Implemented	Ministry of the Environment, Energy and Climate	Estimate of impact not available.
Gas and compost plant (504)	A new gas and composting plant GAJA started operating at Iceland's largest landfill site in 2020.	CH_4	Regulatory, Voluntary Agreement	2020	Implemented	SORPA Municipal Association	Estimated together with Ban on landfilling of organic waste (501) as a GROUP (507) .
Pay-as-you-throw system (505)	Local authorities are obliged to collect a fee as close as possible to the actual cost of waste treatment.	CH_4	Economic, Regulatory	2023	Adopted	Local government	Estimate of impact not available.
Extended producer's responsibility (506)	Extended manufacturer's warranty on all packaging and many plastic products.	CO_2, CH_4	Regulatory	2023	Adopted	Local government	Estimate of impact not available.

No landfilling of organic waste (507, GROUP 501&504)	No landfilling of organic waste due to a ban on landfilling of organic waste (501), gas and compost plant (504) and the expiration of the SWDS operation permit.	CH_4	Regulatory, Other	2020		Implemented	Ministry of the Environment, Energy and Climate , SORPA Municipal Association	44	79	96	114	128	139

Three PaMs are from the 2020 Action Plan (501, 502 and 503) and two are from the Ministry for the Environment and Natural Resources' waste strategy, *Towards a Circular Economy*, from 2021[29] (505 and 506). The measures listed here from the Action Plan, and many others, are also included in the waste strategy. Twelve measures from the waste strategy were incorporated into legislation in 2021 with an amendment to Act No 55/2003 on Waste Management [30]. Most of them aim to decrease waste production and improve sorting, which will in turn decrease greenhouse gas emissions.

The ban on landfilling of organic waste (501) and the gas and compost plant (504) are included in the projected WEM scenario for the Waste sector and have been quantified together as a group (507).

Currently, methane is processed at two landfill sites in Iceland by Sorpa and Norðurorka, and the resulting fuel is mainly used for passenger cars. Two other sites collect and flare landfill gas. More detailed descriptions of these planned PaMs can be found in the sections below, in the Climate Action Plan (Ministry for the Environment and Natural Resources, 2020), the Progress Report (Ministry for the Environment and Natural Resources, 2021) and in Towards a circular economy (Ministry for the Environment and Natural Resources, 2021).

Ban on Landfilling of Organic Waste (501)

The measure has been expanded upon since the first edition of the Climate Action Plan (2018) and is now an individual measure. The measure is twofold. The first part announces a separate collection of bio waste and a ban on landfilling any waste that has been collected separately. Bio waste contains food-, kitchen- and garden waste which can biodegrade. The second part declares that landfilling all biodegradable waste will be banned in Iceland as a main rule. The first part of the measure is implemented from 1 January 2023, according to an amendment in 2021 to Act No 7/1998 on Public Health and Pollution Control and Act No 55/2003 on the Treatment of Waste[31]. However, since the communities around Iceland were mostly not ready for this change, a nationwide separate collection of food waste will probably not be afoot until late 2023 or early 2024. The measure is meant to lead to the sorting of bio waste from other waste in the whole country and it being prepared for reuse or recycling, in line with how the treatment of waste is prioritised. In the capital area, bio waste will be partly diverted to the gas and composting plant GAJA, but in rural areas it is more likely that bio waste will be used for composting as a rule. The measure also includes banning the landfilling of biodegradable waste, though that regulation has not been approved yet by the Icelandic parliament. Biodegradable waste contains all waste that can decompose through the agency of microorganisms, such as waste from slaughterhouses, fishing, breweries, domestic animals, timber, fish oil, paper, sewage, and bio waste. Local authorities will also be obliged to set up a separate collection of household waste, which shall cover at least paper and cardboard, metals, plastics, glass, organic waste, textiles, and hazardous waste. Individuals and legal entities will be required to sort household waste. A general prohibition will be on landfilling or incineration of the types of waste that have been collected separately, except for waste residues that are not suitable for reuse or recycling.

[29] Towards a circular economy (Í átt að hringrásarhagkerfi). *Government of Iceland (Stjórnarráð Íslands).* https://www.stjornarradid.is/library/02-Rit--skyrslur-og-skrar/UAR_stefnaI_att_ad_hringrasarhagkerfi.pdf

[30] *Parliament (Alþingi).* https://www.althingi.is/lagas/nuna/2003055.html

[31] *Parliament (Alþingi).* https://www.althingi.is/altext/stjt/2021.103.html

Landfill Tax (502)

This measure has been expanded since the previous Climate Action Plan (2018) and defined as an individual measure. Waste sent to landfills will be taxed, to direct it to other treatment pathways which release less GHG emissions. The purpose of the tax is to encourage a decrease in the amount of waste that is currently sent to landfill in Iceland. The aim of the tax is to decrease total waste generation as well as encourage sorting. It is proposed that the tax should be 15 ISK/kg of landfilled general waste, with the exception of inert waste for which 0.5 ISK/kg of landfilled waste is proposed. The Ministry of Finance and Economic Affairs is currently collaborating with the Ministry of the Environment, Energy, and Climate on a bill to change the law on environmental and resource taxes, under which the tax on landfilling waste will be legislated. The Association of Icelandic Local Authorities will be consulted on the issue.

The landfill tax (502) measure has not been implemented yet in the legislative system and is also not quantifiable due to a lack of data, thus, it is not included in the WEM projections scenario.

Reduction in Food Waste (503)

The goal of this measure is to systematically reduce food waste by encouraging several short-term and long-term projects. In the past years, several projects have been undertaken by the government, NGOs, and companies to reduce food waste, such as the creation of various educational material, the organisation of events to raise public awareness, school projects and discount systems in stores for food products that are nearing the expiration date, innovation in using by-products from food production, a defined government policy, and courses on the better use of food products.

The EAI will continue to raise awareness on how much food is currently going to waste, education on food waste received 15 million ISK per year in funding in 2020-2023. The continued running of the Icelandic website on food waste[32] will be ensured and an analysis will be undertaken of possible unnecessary regulatory requirements on food products that have no impact on food safety but may be causing food waste. A survey on Icelanders' attitudes towards food waste has been undertaken to track changes in local public opinion. Additionally, the EAI is currently conducting an investigation into food waste in the Icelandic food value chain, as requested by regulation 2008/98/EU, to be better able to reduce food waste in the value chain. The results should be published in August 2023.

The Minister of the Environment and Natural Resources formed a project team on food waste to create a holistic plan on effective measures against food waste. The team (which consists of representatives from consumers, the business sector, NGOs, young people, and the government) submitted a report including 24 proposed food waste reduction measures in June 2020[33]. Out of the propositions, the government will be responsible for implementing 14 of the measures and the business sector will be responsible for the remainder. The goal is to reduce food waste throughout the entire value chain by 30% in 2025 and by 50% in 2030.

[32] *Food Waste (Matarsóun).* https://samangegnsoun.is/matarsoun/

[33] Proposals for actions against food waste ("Tillögur um aðgerðir gegn matarsóun"). *Food Waste (Matarsóun).* https://www.stjornarradid.is/library/02-Rit--skyrslur-og-skrar/Minni%20matars%C3%B3un%20-%20A%C3%B0ger%C3%B0a%C3%A1%C3%A6tlun%20gegn%20matars%C3%B3un.pdf

The measures to reduce food waste (503), the pay-as-you-throw system (505), and the extended manufacturer's warranty (506) have been adopted. However, since very limited data is available on the effectiveness of such measures in Iceland, their potential impacts on emissions have not been estimated nor included in the WEM scenario projections.

Gas and Compost Plant (504)

A new gas and composting plant, GAJA, started operating at a small scale in the second half of 2020. It is the first plant of its kind in Iceland, and it will process municipal solid waste from households from the entire Capital Region, which contains around two thirds of Iceland's population. From 2025, the plant should process 30 kt of organic waste every year (max capacity: 40 kt, of which 10 kt is liquid waste) and produce 10 to 12 kt of compost and 850,000 Nm^3 of CH_4 each year.

Pay-as-you-Throw System (505)

Local authorities will be obliged to collect a fee for waste treatment as close as possible to the actual cost of the service in question, e.g., by targeting the amount of waste, type of waste, frequency of discharge, waste disposal or other factors affecting the cost of waste treatment. At the same time, municipalities will be allowed to transfer real costs between waste categories in order to promote a circular economy. In this way, municipalities could encourage increased recycling by transferring the costs of collection and other treatment of recyclables to charging for the treatment of mixed waste. If a waste holder reduces his waste volume or sorts it properly, it will lead to a lower cost for him. This measure is included in an amendment in 2021 to Act No 7/1998 on Public Health and Pollution Control and took effect in January 2023.

Extended Producer's Responsibility (506)

In January 2023, an extended manufacturer's warranty was introduced to all packaging that is not already under extended manufacturer's warranty, as well as on many other plastic products. These new items are, e.g., glass and metal packaging not intended for beverages, all timber packaging, and single-use plastics.

No Landfilling of Organic Waste (507, GROUP 501&504)

There are two quantifiable PaMs included in the Waste sector which are the new biogas and composting plant (504) and the ban on landfilling of organic waste (501). As these two PaMs are linked, e.g., organic waste which cannot be landfilled anymore due to the ban needs to go to the anaerobic digester; the effect of both measures was calculated together as a group (507). The closing of the SWDS Álfsnes is included in them WEM scenario and not in the WOM scenario since it is coupled with measure 501. Though the main reason for the closure is that the municipality closest to the site is not willing to extend the SWDS' operation permit in the form it is now, it is likely that a new SWDS would have been created if the ban would not be in place.

At all times we make sure that projections are in harmony with the mass balance and treatment pathway/plant capacities. Methane production data is obtained from GAJA and is, alongside GAJA's operation permit, used to estimate the future methane emissions from GAJA.

Quantification

The comparison between the WOM and WEM scenarios is best seen in Figure 2.20, where the changes for category 5A Solid Waste Disposal Sites and 5B Biological Treatment of Solid Waste is reported in separate graphs. While the emissions in 5A show a significant decrease by 2050 (173 kt CO2e lower than the WOM

scenario emissions in 2050), the emissions in 5B increase, due to increased composting and the addition of GAJA. The increase in this category, however, is rather limited (+6 kt CO2e by 2050 when compared with the WOM scenario). Table 20 reports the emissions decrease and increase for both categories over the projected time series.

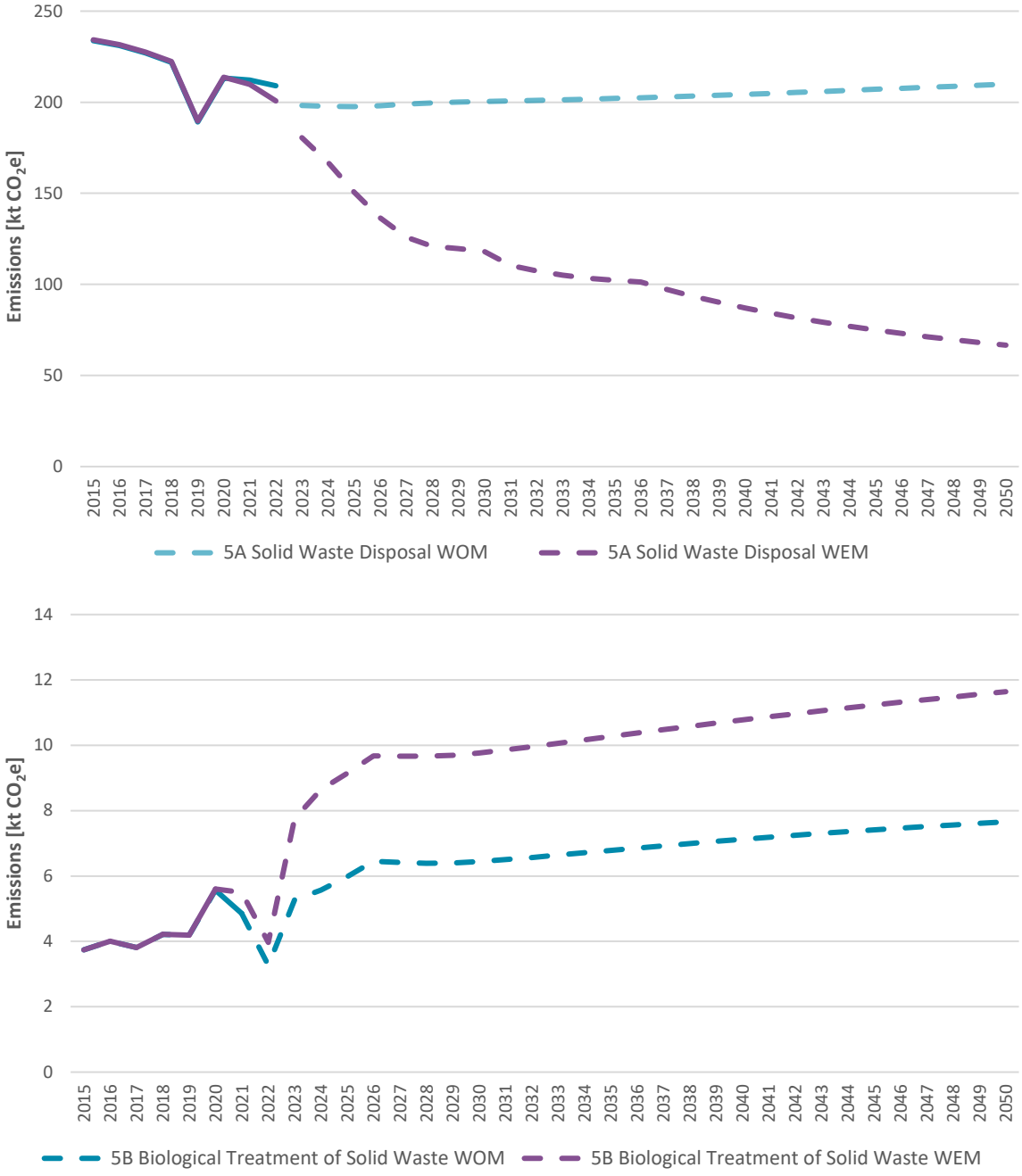

Figure 2.20 Quantified ex-ante impact of the GROUP of PaMs (507), consisting of PaMs 504 and 501 and the closing of the SWDS Álfsnes. The top graph shows the impact on GHG emissions from Solid Waste Disposal Sites (5A), while the bottom graph shows the impact on Biological Treatment of Waste (5B), [kt CO_2e].

Table 2.20 Comparison of emissions from 5A – Solid Waste Disposal sites and 5B – Biological Treatment of Solid waste, ex-ante impact of the GROUP of PaMs (507) and the closing of the SWDS Álfsnes, WOM and WEM scenarios.

Sector	Emissions [kt CO_2e]							
	2015	2020	2025	2030	2035	2040	2045	2050
5A, 5B – WOM	238	219	204	207	209	211	214	218
5A, 5B – WEM	238	219	160	128	113	98	86	78
Difference WEM-WOM	0	1	44	79	96	114	128	139
% Difference	0%	0%	21%	38%	46%	54%	60%	64%

Other Ongoing Initiatives

Besides the abovementioned PaMs, there are several other smaller initiatives being prepared or already underway that may reduce greenhouse gas emissions from the Waste sector in the future. A few of these initiatives are outlined in 2.21

Table 2.21 Other initiatives that may impact GHG emissions from the Waste sector

Initiative	Description
The Green Steps Program87	This program is developed for government agencies in Iceland with the overall aim of minimising the environmental impact of daily operations in the public sector. The program was established in 2014 and the EAI oversees it and assists and guides government agencies in its implementation. Waste sorting and waste reduction is one category of this program.
Together against waste88	This initiative has been run by the EAI since 2016 with the goal of prioritising a circular economy. It focuses on better efficiency, creating less waste as well as increasing education to prevent waste generation. Every couple of years the focus is on a particular waste category such as: food, plastic, textiles, electronics, construction, or paper.
Bokashi experiment in the Rangárvellir municipality	In 2020, *Jarðgerðarfélagið*, the Rangárvallasýsla waste processing plant and the SCSI started working on an experimental project to see if Bokashi composting can work on a municipal level. The compost created from the process can subsequently be used to fertilise plants and in soil conservation efforts. If this experiment is successful, other municipalities may follow suit.
Decreased GHG emissions with increased treatment of wastewater 89	In 2021, the EAI had an analysis done on the scope of emissions from wastewater in Iceland and the possibilities of decreasing those emissions. The results showed that there are opportunities in increased wastewater treatment and the use of

	sludge for land reclamation and restoration. [34] A regulation on grants for municipalities to improve wastewater treatment systems was implemented in 2020.[35]
Other measures in Towards a Circular Economy	Funds were allocated by the Ministry of the Environment, Energy, and Climate to a number of other initiatives, i.e., for the development of necessary infrastructure that can contribute to the implementation of a circular economy in Iceland, the promotion of domestic waste recycling, support for home composting, the strengthening of repair and maintenance services, abolition of VAT on the resale of used goods, improved waste statistics, support for infrastructure development for waste incineration and more. Some of these measures have already begun while others are still in planning.
Waste Management Handbook and Website	A handbook on waste management was published in 2022. It is mainly intended for municipality leaders and explains how municipalities can and should improve their waste management according to the measures in Towards a Circular Economy.[36] The EAI also created a website, which is supposed to work in junction with the handbook as well as providing general information and statistics on waste management in Iceland.[37]

2.5.9 Cross-Cutting

The PaMs from the Climate Action Plan (2020) which are cross-cutting and will affect more than one of the sectors presented in the previous chapters are listed in Table 2.22 below. Short descriptions of each policy or measure are provided, with more information on all the PaMs provided in separate subchapters below. Currently, the majority of the policies have been implemented, although none of them have been quantified or included in the WEM projections scenario.

[34] *EAI.* https://ust.is/library/sida/haf-og-vatn/Greinarger%c3%b0%20um%20aukna%20s%c3%b6fnun%20seyru%20og%20losun%20GHL%20161220%20-%20Copy%20(1).pdf, in Icelandic

[35] Ministry of Environment, Energy and Climate. https://island.is/reglugerdir/nr/1424-2020, in Icelandic.

[36] The Association of Icelandic Local Authorities and the EAI. https://ust.is/library/sida/graent/Handb%C3%B3k%20%C3%BArgangur_j%C3%BAn%C3%AD2022.pdf?, in Icelandic.

[37] The EAI. https://urgangur.is, in Icelandic.

Table 2.22 Cross-Cutting Policies and Measures.

Name of policy or measure	Objective and/or activity affected	GHG affected	Type of instrument	Start year of implementation	Status	Implementing entity or entities	Estimate of mitigation impact (not cumulative, in kt CO2eq)			
							2025	2030	2035	2040
Climate fund (703)	Climate projects will be supported through the Icelandic Climate Fund, which has been allocated to grant 500 million ISK between 2019-2023.	GHGs	Economic	2019	Implemented	Ministry of Finance and Economic Affairs (FJR), Ministry for the Environment, Energy and Climate	Estimate of impact not available.			
Climate strategy of Government Offices (704)	A climate strategy has been introduced for government offices. Various measures aim to reduce GHG emissions and remaining emissions will be offset.	GHGs	Economic	2019	Implemented	Ministry for the Environment, Energy and Climate	Estimate of impact not available.			
Climate education in schools (706)	Climate education in schools will be reinforced.	GHGs	Education	2019	Implemented	Ministry for the Environment, Energy and Climate	Estimate of impact not available.			
Information on climate change for the public (707)	Information on climate issues, the effects of climate change, mitigation and adaptation will be supported through various means.	GHGs	Economic, Education	2019	Implemented	Ministry for the Environment, Energy and Climate	Estimate of impact not available.			
Climate action planning (709)	Climate issues will be addressed through Iceland's National Planning Strategy.	GHGs	Planning	2021	Implemented	Ministry for the Environment, Energy and Climate	Estimate of impact not available.			

Issuing of green bonds (711)	Evaluation will be made on the feasibility of issuing green bonds in order to raise green investor interest in traditional state loans.	GHGs	Economic	2021	Implemented	Ministry of Finance and Economic Affairs (FJR)	Estimate of impact not available.
Sustainable public procurement (712)	Environmental and climate issues will be evaluated in all government purchasing with a new policy on sustainable public procurement.	GHGs	Economic	2021	Implemented	Ministry of Finance and Economic Affairs (FJR)	Estimate of impact not available.
Climate strategy of other public agencies (713)	All other public agencies will need to set a Climate Strategy. The same applies to local government.	GHGs	Regulatory, Voluntary/ Negotiated agreements	2020	Implemented	Ministry for the Environment, Energy and Climate	Estimate of impact not available.
Climate impact assessment of legislation (714)	The climate impact of all new legislation will be evaluated.	GHGs	Regulatory	2020	Implemented	Ministry for the Environment, Energy and Climate	Estimate of impact not available.

Climate Fund (703)

In the first edition of the Climate Action Plan (2018) a measure on the establishment of a Climate Fund (*Loftslagssjóður*) was proposed. This action was continued in the 2020 Climate action plan. The fund formally started operating in 2019 and the Climate Act (Law no. 70/2012) has been updated and altered to further define and formalise its purpose. The Icelandic Centre for Research (*Rannís*) has been entrusted with the management of the fund, a board has been established and allocation rules have been defined. The main purpose of the fund is to support and encourage climate education, research, and innovation.

The fund began accepting applications in November 2019 and the first grants were allocated to 10 innovation and 22 education projects in May 2020. The Climate Fund received 158 applications for the second allocation of funding in 2021. In total, 170 million ISK was allocated in grants to 24 projects: 12 educational projects and 12 innovation projects. In 2022 the fund received 85 applications, of which 12 projects were funded. The total amount allocated was 88 million ISK.

The fund was allocated 500 million ISK in grants to various such educational and climate innovation projects for the years 2019-2023. Further information on the Climate Fund can be found on its website (https://www.rannis.is/sjodir/rannsoknir/loftslagssjodur/).

For previous allocations the grants have been focused on innovation and educational projects but for the allocation in 2023 there has been a change is it emphasis. It will now focus on funding projects that will:

- result in a reduction in Effort sharing emissions.
- utilize existing knowledge that has the potential to be used as widely as possible and are aimed at entities that have considerable potential to reduce emissions.

An overview of the projects which received grants from the fund in 2020-2022 can be seen in Table 2.23. This measure is connected to policy 706 and 707 on education on climate issues for the public and in schools.

Table 2.23 Overview of allocations from the Climate fund from 2020-2022.

	2020	2021	2022
Total Amount (million ISK)	165	170	88
Number of Innovation projects	10	12	6
Number of Education projects	22	12	6

Climate Strategy of Government Offices (704)

The government aims to set an example in climate policy and be a positive role model for organisations, businesses, and the public. The government's Climate Strategy (*Loftslagsstefna Stjórnarráðsins*) is designed to reduce GHG emissions from all government operations and Ministries significantly and carbon offset the remaining emissions generously.

The Icelandic government approved their Climate Strategy in April 2019 (government of Iceland) and there is an emphasis on reducing emissions from flights, vehicles, waste, energy use and cafeteria meals. The preparation for an updated Climate Strategy has started.

The policy directs the spotlight to the importance of organisations and companies reducing their carbon footprint and developing a climate policy. Furthermore, it increases demand for climate friendly solutions, such as sustainable taxis and rental cars, and effective transport contracts. A portal to connect emissions from flights to goals regarding reducing GHG emissions is also being developed and will be available to

all government agencies. This measure is directly connected to the climate strategy of other public agencies (see measure 713).

Climate Education in Schools (706)

Since the first edition of the Climate Action Plan (2018) was released the education material which is already available in Iceland has been mapped, with the goal of determining what kind of material is missing and where improvements can be made. The Ministry of Education and Children will use the mapping and further direct it to the Directorate of Education to use it to develop and revise education materials. It is expected that various educational projects will be presented in the near future (see measure 707 on climate education for the public), and that a part of them will be useful for the entire educational system. NGO's such as *Landvernd* and The Icelandic Youth Environmentalist Association (*Ungir Umhverfissinnar*) have, furthermore, been effective sustainability and environmental educators and have provided educational materials and presentations around the country.

When the education system's curricula are reviewed next, climate change education will be made a priority and educational grants will be allocated by the Ministry of Education and Children to climate education projects. Education on climate change will be increased at all educational levels and provided through various educational channels. The goal is for schools to be able to offer varied and comprehensive education on climate change, its consequences and what we can do to combat it, in line with the sustainability principle which lays at the core of all education. Sustainability education, environmental awareness, community spirit, and climate issues are all important issues for educators to raise in schools. Climate matters are complex and overlap with many other societal issues. It is important to ensure that quality education material, which touches on the science behind climate change and the impacts of a changing climate on the environment, communities, democracy, equality, and human rights, exists. It is also essential that the education material is appropriate or adjustable for different education levels.

The young generation has already made a difference in climate issues in Iceland and has been active in climate panels and protests. A contract has been signed with the NGO *Landvernd* on creating educational material on climate change and climate issues for schools, in light of its experience in creating education material on sustainability and environmental issues. The education material is connected to the project Eco-Schools Iceland (*Skólar á grænni grein*)[38], which has been running in Iceland since 2001 and currently reaches over 200 schools at all education levels, ranging from preschools to universities. The distribution of participating schools around the country can be seen in Figure 2.21 below. *Landvernd's* education on climate issues is for all schools, independent of whether they are participating in Eco-Schools Iceland or not. The goal is for more schools to participate in the project in the future. The project is part of to the world's largest environmental education organisation, the Foundation for Environmental Education (FEE)[39].

[38] *Landvernd – Icelandic Environment Association*. https://landvernd.is/graenfaninn/

[39] *The Foundation for Environmental Education*. https://www.fee.global/

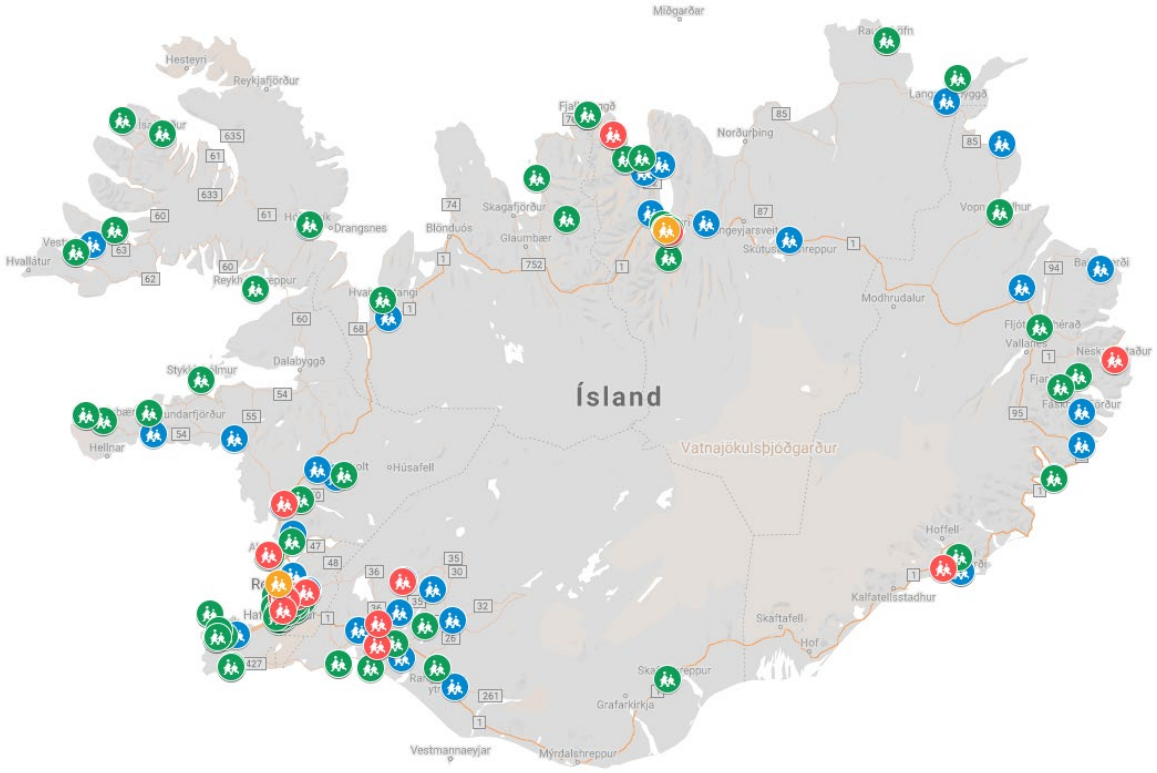

Figure 2.21 Schools participating in the Eco-Schools Iceland project. Green represents preschools, blue represents primary schools, red represents secondary schools, and orange represents universities[40].

Information on Climate Change for the Public (707)

Education on climate issues will be supported in a variety of ways. Since the first edition of the Climate Action Plan (2018) was published, several new projects have been set afoot. The education system plays an important role in raising awareness in the younger generations and collaboration with education authorities is essential. Ways to further support education on climate issues, the impacts of consumerism and waste, will be explored. A mapping of the education material that is currently available to the public in Iceland has been undertaken by the Ministry of Education and Children and will lay the foundations for this.

One of the roles of the Climate Fund, which was established in the autumn of 2019 (see measure 703), is to support education on climate issues and the impacts of climate change. When project grants were being allocated by the Ministry of the Environment, Energy, and Climate for the second time in February 2020, an emphasis was placed on supporting collaboration projects between NGOs, the public and others regarding strengthening the circular economy and supporting climate issues, in line with the aims of the previous Climate Action Plan (2018).

[40] *Landvernd – Icelandic Environment Association*. https://landvernd.is/graenfaninn/um-skola-a-graenni-grein/

In the Science and Technology Policy for the years 2020-2022[41], there is a measure aimed at creating a framework and plan for how the public's access to evidence-based information and science is guaranteed in Iceland in the long term. Special efforts will be made to communicate knowledge in the field of climate issues with the aim to developing methods that can later be used in other fields.

The government has, furthermore, directly funded several educational projects on climate issues and will continue to do so. This includes the television series "What have we done?" ("*Hvað höfum við gert?*") which was shown on national television (*RÚV*) in 2019[42]. A second season, "What can we do?" ("*Hvað getum við gert?*") was subsequently aired on national television in 2021[43]. The emphasis of the second season is on what actions individuals, businesses, and the government can undertake to combat climate change.

The project "Retreating glaciers" ("*Hörfandi jöklar*") also received funding from the government. The impacts of climate change on glaciers in Iceland is well known and has been monitored and researched by scientists for decades. The impacts on Vatnajökull, Europe's largest glacier, can be seen in Figure 2.22 below. The Retreating glaciers project aims to increase awareness of the impact of climate change in Iceland and in the rest of the world. Information on the retreating glaciers in Iceland, based on monitoring by the Icelandic Meteorological Office (*Veðurstofa Íslands*) and the University of Iceland's Institute of Earth Sciences (*Jöklahópur Jarðvísindastofnunar Háskóla Íslands*), through Vatnajökull National Park (*Vatnajökulsþjóðgarður*), has been made more accessible for the public through their educational website[44].

[41] *Vísinda- og Tæknistefna 2020-2022.* https://www.stjornarradid.is/library/03-Verkefni/Visindi/V%C3%ADsinda-%20og%20t%C3%A6knistefna%202020-2022.pdf

[42] *RÚV.* https://www.ruv.is/sjonvarp/spila/hvad-hofum-vid-gert/27624

[43] *RÚV.* https://www.ruv.is/sjonvarp/spila/hvad-getum-vid-gert/30574

[44] *Vatnajokull National Park (Vatnajökulsþjóðgarður).* https://www.vatnajokulsthjodgardur.is/is/svaedin/horfandi-joklar

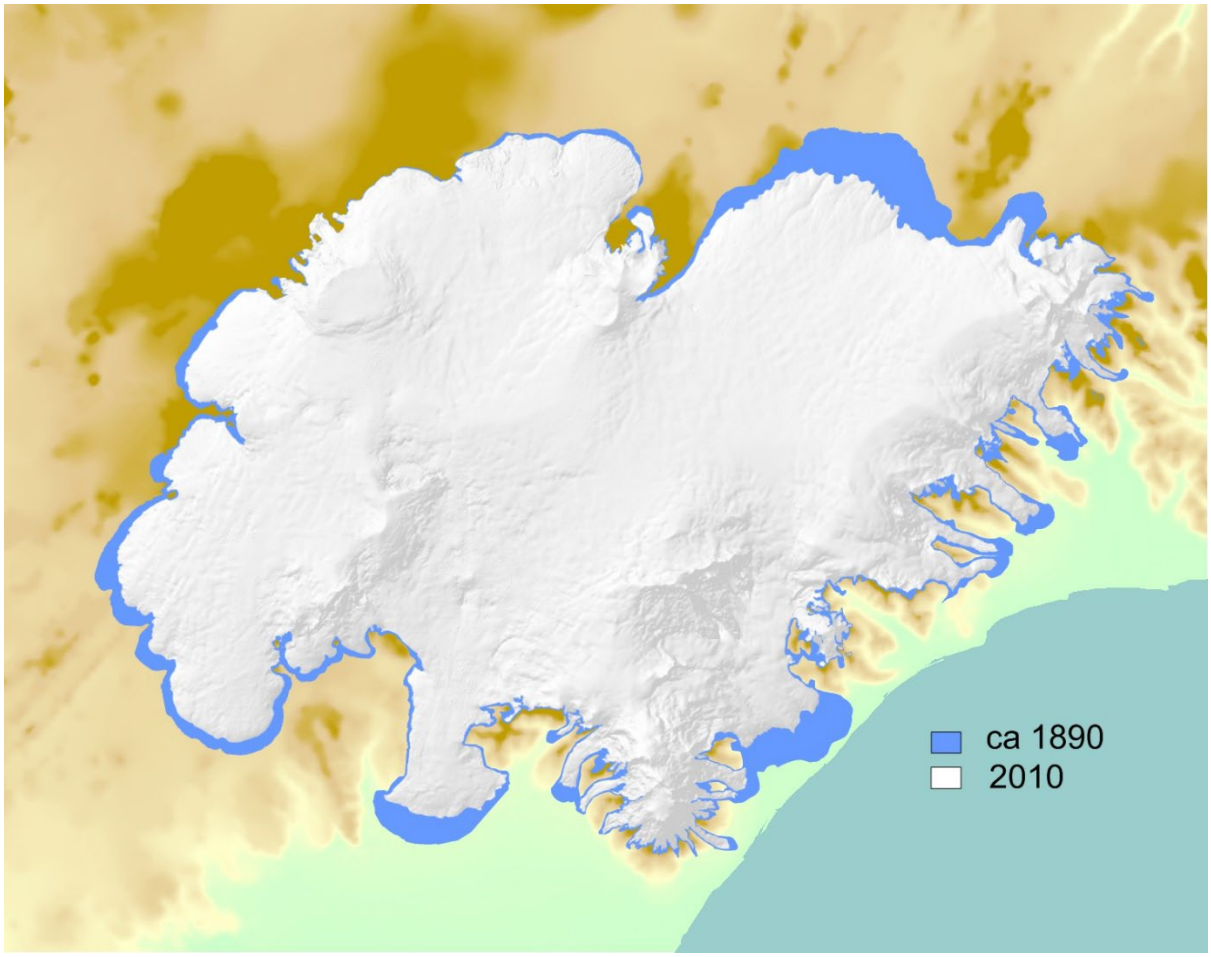

Figure 2.22 The outline of Vatnajökull Glacier, c.a. 1890 and 2010. Sources: the Icelandic Meteorological Office and the University of Iceland 's Institute of Eart Sciences.[45]

Many education projects, organised by the government, organisations, NGOs, youth organisations, the media, and others are well underway. The EAI, for example, manages extensive environmental education for the public, other organisations and businesses which is directly connected to climate issues. The Icelandic Climate Council (*Loftslagsráð*) has a monitoring role of the dissemination of information and education.

Climate Action Planning (709)

In 2018, the Minister of the Environment, Energy, and Climate entrusted the National Planning Agency (*Skipulagsstofnun*) with proposing an update to the National Planning Strategy (*Landsskipulagsstefna*) 2015-2026 (National Planning Agency, 2016) where a clearer policy on climate issues, landscape and public health would be defined in regard to planning operations. The National Planning Agency's proposal was presented to the minister in the spring of 2021 (National Planning Authority, 2021).

[45] *Vatnajokull National Park (Vatnajökulsþjóðgarður).* https://www.vatnajokulsthjodgardur.is/is/svaedin/horfandi-joklar/joklarannsoknir/43-utlinur-jokla-og-yfirbordskort

The National Planning Strategy contains the government's policy and guidance for municipalities' planning. The policy update focuses on how the planning of municipalities can purposefully support the achievement of the government's climate, landscape, and public health targets. In the update, guidance is proposed on how municipalities can use long-term planning strategies to shape the development of land use and the built environment, both in rural and urban areas. The policy expects municipalities to form a policy on climate focused planning, for planning to support the achievement of carbon neutrality, and to strengthen resilience against climate change through various adaptation measures. In climate focused planning, climate goals are prioritised when settlements and land-use changes are being planned. In this way, planning can be used to support improved commuting behaviour, climate friendly construction, and the preservation and sequestration of carbon in soils and flora, for example[46].

The measure is connected to various other measures in the Action Plan, such as Measures 601, 602, and 604 on supporting forestry, land, and wetland reclamation, and measures 205, 206, and 209 on changed travel habits, active modes of transportation, and the strengthening of the public transport system.

During the changes in the cabinet in 2021, planning issues were transferred to the Ministry of Infrastructure. The Minister of Infrastructure has decided to review the National Planning Policy 2015-2026 and has proposed annex on climate, landscape, and public health.

Issuing of Green Bonds (711)

The feasibility of issuing green government bonds and opening pathways to green investors for conventional government loans will be explored. There are possibilities to finance well defined sustainable projects through issuing certain green government bonds. This would send a clear signal to investors about the importance of environmental issues and how the finance sector could support climate change prevention. Issuing green bonds is for the most part similar to issuing other bonds. The main difference is, however, that the money goes to environmentally friendly projects. The issuing of green bonds has been increasing on international markets in the past years and there has been more pressure on investors to direct investment to projects that support reaching long term sustainability and climate targets.

The Icelandic Treasury has hitherto not issued green bonds, but a project management group set up by the Minister of Finance and Economic Affairs is now assessing what possibilities are available. The group was set up in June 2020 and consists of representatives from the Ministry of Finance and Economic Affairs, the Ministry for Foreign Affairs, the Ministry of the Environment, Energy, and Climate, the Prime Minister's Office, and the Central Bank of Iceland. Furthermore, the group will participate in work on an independent Environmental, Social, Governance (ESG) investment certification for the Icelandic treasury, if that is the course that is decided to be taken. This is an international certification that focuses on emphasising environmental and social issues as well as good management practices and can possibly facilitate green investment in traditional government bonds. Although the Icelandic Treasury has not yet issued green

[46] *National Planning Authority (Skipulagsstofnun).* https://www.landsskipulag.is/um-landsskipulagsstefnu/frettir/landsskipulagstillaga-afhent-umhverfis-og-audlindaradherra

bonds, the City of Reykjavík has become the first party to design a Green Bond Framework in Iceland in 2019[47] to fund projects that align with its climate policy[48].

In 2021, the Ministry of Finance and Economy issued a financing framework for sustainable financing of the treasury and received a "dark green" rating from CICERO, an internationally recognized and independent certification body. Issuance of green treasury bonds under the sustainable financing framework is under consideration.

Sustainable Public Procurement (712)

Sustainability will be taken into account in all public procurement as a main rule. The Central Public Procurement (*Ríkiskaup*) developed a new public procurement policy on sustainable procurement (*Sjálfbær innkaup – Stefna ríkisins*) which was published in January 2021. The government procures goods and services for 117 billion ISK every year, which allows for many opportunities to form a clear environmental policy regarding procurement. Creating a demand for more environmentally friendly goods and services can have significant direct and indirect effects on the market and help pave the way for other businesses or organisations to do the same thing.

The key topics regarding sustainable public procurement policy for the next years are:

1. To achieve economical and sustainable procurement that ensures long-term sustainability;
2. To increase the professional capacity of public procurers to support an efficient performance of government services;
3. To ensure sufficient competition in the market and stimulate recruitment and innovation through increased cooperation with the market;
4. Use digital procurement solutions and information technology systematically for data analysis and joint procurement.
5. Ensure that the public and companies have easy access to information on government procurement.

It is possible to be more environmentally conscious in the purchasing of several procurement categories, such as in contracts for purchasing painting and construction material, cleaning supplies, paper goods, writing equipment, printing, electronics, and other machinery. The carbon footprint can also be significantly decreased by improving the design of buildings, using sustainable concrete, and improving other construction practices.

The Icelandic government furthermore purchases food for approximately 3 billion ISK per year and can, as a big buyer, have a significant impact on food demand, support sustainable procurement, reduce the carbon footprint, and support innovation. In the procurement policy for food for government agencies (government of Iceland, March 2019), which the Ministry of Higher Education, Science and Innovation published in May 2019, an emphasis is placed on altering procurement processes so that cafeterias have access to package free food and that a public calculator for the carbon footprint of food will be designed.

[47] *City of Reykjavík (Reykjavíkurborg).* https://reykjavik.is/graen-skuldabref-green-bonds

[48] *City of Reykjavík (Reykjavíkurborg).* https://reykjavik.is/sites/default/files/reykjavik_green_bond_framework_2019_-_baeklingur.pdf

It has been declared that the goal is to keep the consumption of red meat in moderation. It has been ensured that the procurement policy for food and the policy on sustainable government purchasing will work together.

The Ministry of Finance and Economy issued a new procurement policy in April 2021[49]. It stipulates that the government's procurement is progressive and sustainable and takes environmental and climate considerations into account.

Climate Strategy of Other Public Agencies (713)

All government and public entities will be exemplary in climate policies. The government's climate policy, which was approved in May 2019, puts a requirement on all government agencies, which was expanded further with updated climate legislation in June 2019. All government agencies, municipalities and government majority owned companies shall, by law, develop a climate policy and set itself a GHG emission reduction target.

The EA has set out guidelines for the creation and implementation of climate policies for government agencies and companies majority owned by the state. The instructions are divided into three parts:

- Making climate policy with an overarching goal
- Target setting for each emission sector
- Creation of an action plan to ensure that emission reduction targets are met

Government organisations and government majority owned companies have the possibility to sign up for the project "Green steps in government operations" ("*Græn skref í ríkisrekstri*")[50]. The EA has integrated the creation of a climate policy with the project *Green steps in government operations* and provides advice to government bodies on that level. Green accounting is useful with making a climate strategy, as government bodies can get a estimate of the emission of greenhouse gases in their operations. Various other aids have also been published on the Green Steps website to facilitate the process.

By August 2021, 24 out of 199 government bodies had completed the creation of a climate policy, or 12%. The action was further strengthened last year, and in June 2022, 68 parties have submitted fully completed climate policies with target setting for each emission sector.

A similar project has been developed for municipalities[51]. The Association of Icelandic Municipalities in collaboration with the EA published the "Municipal Climate Toolkit" in September 2021. The purpose of the toolkit is to promote and support municipalities in working out action-oriented climate policy for their operations, follow it up and monitor their results to prepare guidelines for municipalities on the creation of a climate policy for the operation of individual municipalities. The project is carried out in connection with the amendment of law no. 70/2012 on climate matters from June 2019, when local governments were

[49] *Innkaupastefna ríkisins.* https://www.rikiskaup.is/is/innkaup_og_utbod/samfelagslega-abyrg-innkaup/vistvaen-innkaup/innkaupastefna-rikisins

[50] *Grænskref.* https://graenskref.is/

[51] *Loftslagsvænni sveitarfélög.* https://loftslagsstefna.is/sveitarfelog/um-verkfaerakistuna/

obliged to adopt a climate policy and targets for the reduction of greenhouse gas emissions. There are opportunities in greater cooperation between the state and local governments on actions.

Climate Impact Assessment of Legislation (714)

Legislative proposals will be specifically assessed based on their climate impact. To begin with, this will be done with selected bills in the Ministry of Environment and Natural Resources, but later it is aimed that this will apply to all bills that will be submitted to the parliament.

Currently, ministries must assess the impact of the legislation that are being proposed. It considers a variety of factors, such as financial factors for the government, changes in income, changes in expenditure and whether the financial effects that may result from the approval of the bill have been anticipated. The economic impact of the bill is assessed, its impact on the finances of municipalities, non-governmental organizations, administration, the status of certain social groups and more. Likewise, the impact of the bill on gender equality is assessed, according to a guide for assessing equality effects. Effects on the environment and sustainable development are also assessed, but climate effects are not specifically assessed.

It is important that the impact of legislation on the climate is assessed, and in this measure it is assumed that bills will be assessed specifically with regard to their climate impact, which includes a more detailed assessment of the impact on the environment and sustainable development.

The Ministry of the Environment, Energy and Climate has begun work on a guidance criteria that are expected to be used to assess the climate impact of bills. It is proposed that each ministry evaluates its bills with regard to their impact on the emission of greenhouse gases. Thresholds, guidelines and methodologies that will be used to estimate annual greenhouse gas emissions will be established.

2.6 II.E Summary of greenhouse gas emissions and removals (para. 91 of the MPGs)

This chapter gives a brief overview of the greenhouse gas emissions in Iceland 1990-2022. A detailed description of emissions trends can be found in the National Inventory Document as submitted to the UNFCCC in 2024.

Iceland reports emissions of CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6. NF_3 is not used in Iceland and has not been imported as such. In addition, no industry potentially using NF_3 (e.g., semiconductors, LCD manufacture, solar panels, and chemical lasers) is present in Iceland.

Emissions that are reported in CO_2 equivalents are calculated using Global Warming Potentials (GWPs) based on the 100-year time horizon GWPs presented in the Fifth Assessment Report (AR5) of the IPCC, as per Decision 18/CMA.1 and Commission Delegated Regulation (EU) 2020/1044.

The distribution of reported greenhouse gas emissions over the UNFCCC sectors excluding LULUCF since 1990 is shown in Figure 2.23 and including LULUCF in Figure 2.4. The Energy sector and Industrial Processes contribute approximately 80% of emissions to the national total (excluding LULUCF). The emissions from the Agriculture and Waste sectors are considerably smaller.

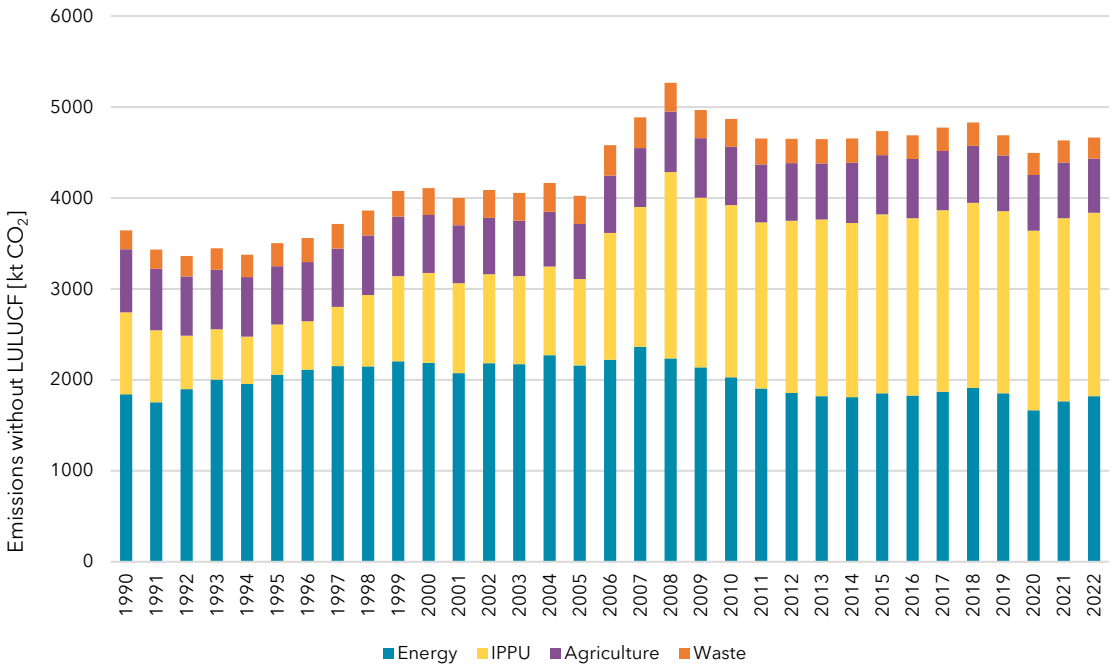

Figure 2.23 Emissions of GHG by sector, without LULUCF, since 1990, [kt CO_2e, calculated using GWP from AR5]

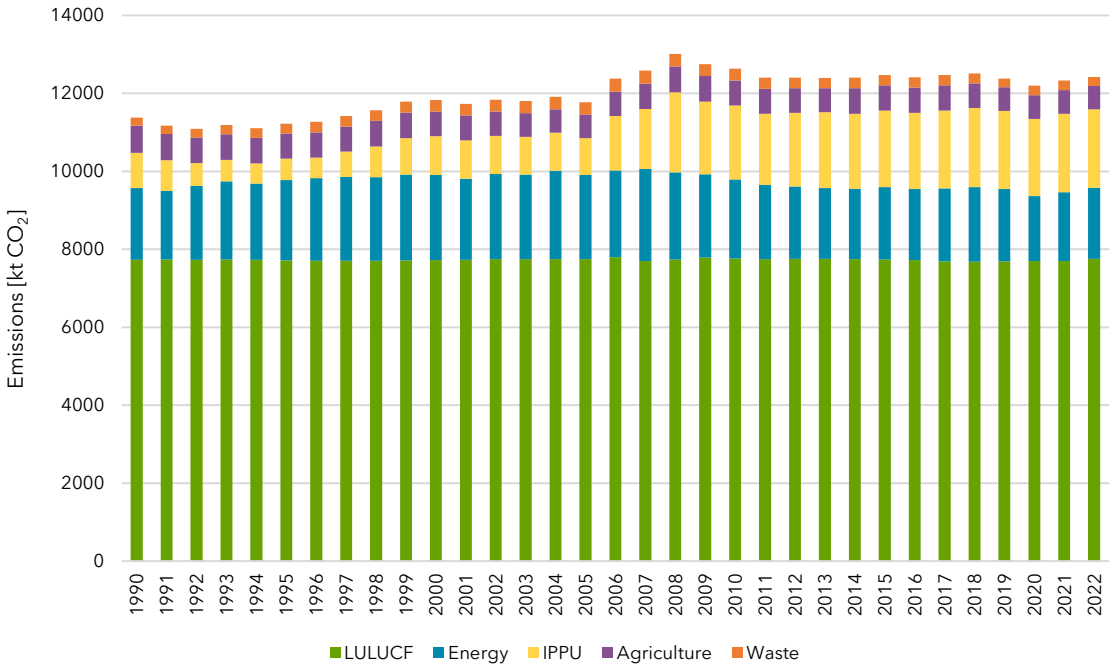

Figure 2.24 Emissions of GHG by sector, with LULUCF, since 1990, [kt CO_2e, calculated using GWP from AR5]

A summary of Iceland's national emissions for selected years since 1990 is presented in Table 2.24. LULUCF is the largest sector, with emissions of more than double the combined emissions from the other sectors across the time series. Total GHG emissions (excluding LULUCF) increased by 28% from 1990 to 2022. LULUCF emissions have remained relatively constant since 1990. The greatest change in the trend over the time series is the increase in the contribution of Industrial Processes to total emissions. This is primarily due to the increased metal production in Iceland, which is a highly energy-intensive process.

Table 2.24 Emissions of GHG by sector, since 1990, [kt CO_2e, calculated using GWP from AR5]

	1990	1995	2000	2005	2010	2015	2020	2021	2022	Change 1990-2022	Change 2021-2022
1 Energy	1841	2058	2185	2158	2027	1854	1665	1764	1819	-1.2%	3.1%
2 Industrial Processes	903	553	992	950	1896	1966	1977	2012	2017	123%	0.24%
3 Agriculture	694	638	637	604	640	650	609	613	596	-14%	-2.7%
4 Land Use, Land Use Change	7732	7715	7723	7746	7767	7739	7702	7699	7757	0.3%	0.8%

	1990	1995	2000	2005	2010	2015	2020	2021	2022	Change 1990-2022	Change 2021-2022
and Forestry											
5 Waste	207	255	293	310	306	265	244	243	234	12.6%	-3.7%
Total with LULUCF	11377	11219	11830	11768	12635	12474	12197	12330	12423	9.2%	0.8%
Total without LULUCF	3645	3504	4107	4022	4868	4734	4495	4631	4666	28%	0.75%

The largest contributor by far to total GHG emissions without LULUCF and with LULUCF is CO_2, followed by CH_4, N_2O, and fluorinated gases (PFCs, HFCs, and SF_6). Over the time series, emissions of CO_2 have increased the most, and PFCs and N2O emissions have decreased significantly.

The GHG emissions profile for Iceland is unusual in many respects:

- Emissions from generation of electricity and from space heating are very low owing to the use of renewable energy sources (geothermal and hydropower).
- Approximately 85% of emissions from the Energy sector stem from mobile sources (Transport, Mobile Machinery, and commercial fishing vessels; excluding emissions from International Aviation and Navigation).
- Emissions from the Land Use, Land-use Change, and Forestry (LULUCF) sector are high in comparison to other sectors and to other parties. Recent research has indicated that there are significant emissions of CO2 from drained organic soils. These emissions can be attributed to drainage of wetlands in the latter half of the 20th Century, which had largely ceased by 1990. These emissions of CO2 continue for a long time after drainage.
- Individual sources of industrial process emissions have a significant proportional impact on emissions at the national level. Expansion in existing metal production capacity as well as start of new operations is reflected in the country's emission profile, as for instance the start of two new aluminium smelters in 1998 and 2007, respectively.

2.7 Projections of greenhouse gas emissions and removals, as applicable (paras. 92–102 of the MPGs)

2.7.1 Total GHGs by sector

Iceland's total historical and projected emissions of GHGs excluding LULUCF are presented in Figure 13 below, for the WEM scenario. The total emissions are expected to have reached their final peak in 2018 and to follow a downward trend until 2050. Iceland's GHG emissions will be 22% lower in 2050 than they were in 1990, but they will be 40% lower than they were in 2015.

The main cause for the projected decrease in emissions from the energy sector is the impact of the energy transition in road transportation, which is changing rapidly from predominantly fossil fuel vehicles to electric vehicles, as well as a substantial decrease in emissions from fishing. IPPU will mainly change because of a projected decrease in emissions from F-gases due to the newly implemented F-gas regulation which limits the import of F-gases. Emissions reductions from IPPU will remain relatively low, however, due to an expected increase in emissions from the metal industry. Agriculture emissions will decrease because of a projected decrease in some livestock population numbers. Waste emissions are expected to have reached their peak in 2020 and subsequently decrease significantly due to better practices in solid waste disposal and the treatment of biological waste.

Iceland's total historical and projected emissions of GHGs including LULUCF emissions are not available for this submission of Iceland's first Biennial Transparency Report.

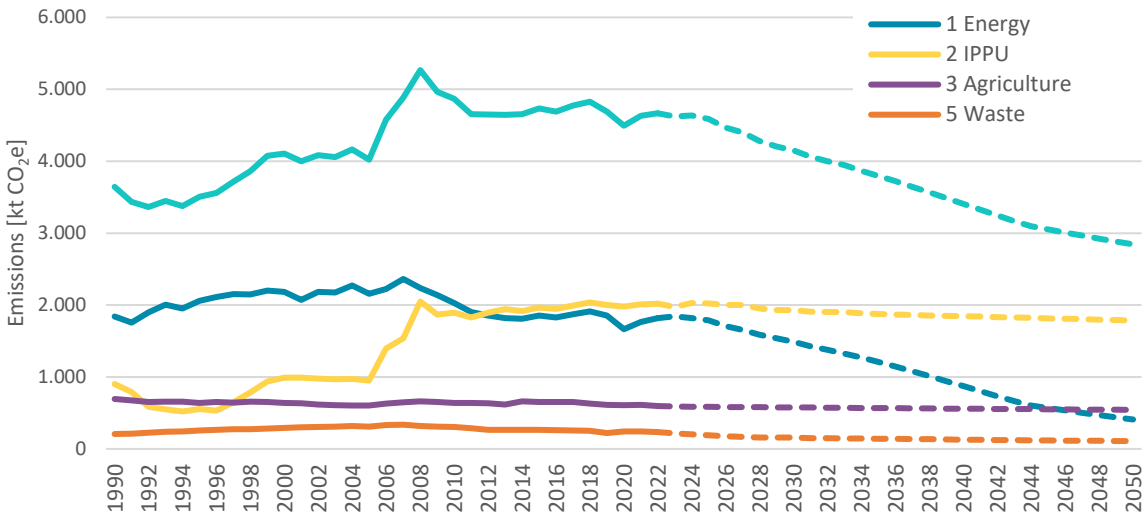

Figure 2.251 Total historical and projected GHG emissions (excluding LULUCF) in the WEM scenario 1990-2050, kt CO_2e.

Table 2.25 Total historical and projected GHG emissions (excluding LULUCF) in the WEM scenario 1990-2040, kt CO_2e.

	Emissions [kt CO_2e]								
Sector	1990	2015	2020	2025	2030	2035	2040	2045	2050
Energy	1,841	1,854	1,665	1,789	1,488	1,209	874	569	409
IPPU	903	1,966	1,977	2,024	1,931	1,874	1,845	1,815	1,785
Agriculture	694	650	609	585	576	568	559	551	542
Waste	207	265	244	189	158	143	128	117	109
Total excluding LULUCF	3,645	4,734	4,495	4,588	4,153	3,794	3,406	3,051	2,845

2.7.2 Total Effort Sharing ("ESR") and ETS (stationary installations) GHG Projections

Iceland's total historical and projected emissions, split into ETS industry (emissions from stationary installations falling under the scope of Directive 2003/87/EC – EU ETS) and ESR (emissions falling under the scope of the Effort Sharing Regulation (Regulation (EU) 2018/842)), can be seen in Figure 2.26 below for the WEM scenario. In Iceland, all emissions currently generated from the Production of Iron and Steel (Iron alloys and silicon metal – 1A2a) and Non-Ferrous Metals (Aluminum - 1A2b) and industrial emissions from the Metal Industry (2C) are covered under the EU ETS.

As can be seen in Figure 2.26, emissions from ETS industry have remained reasonably steady from 2015. Based on the current projections, ETS emissions increase by 107% between 2005 and 2540 (see 2.27). ESR emissions are, however, expected to decrease by 66% between 2005 and 2050.

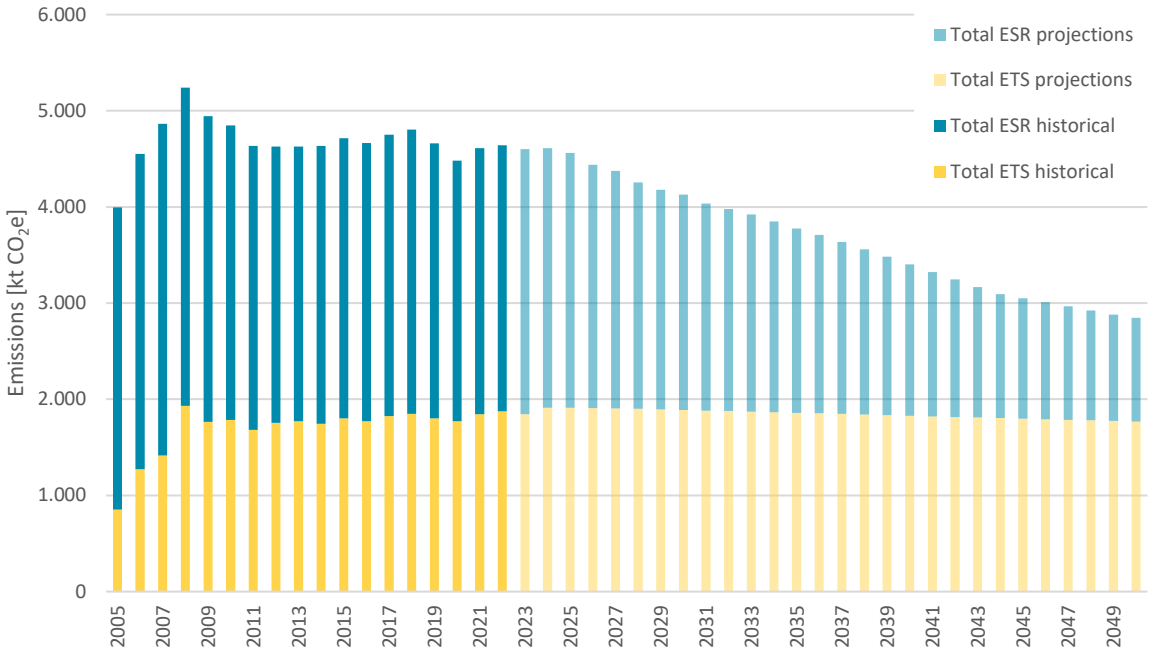

Figure 2.26 ETS (stationary installations) and ESR GHG projections, WEM scenario, kt CO_2e.

Table 2.26 ETS (stationary installations) and ESR GHG projections, WEM scenario, kt CO2e.

	Emissions [kt CO_2e]								
Sector	2005	2015	2020	2025	2030	2035	2040	2045	2050
Total ETS (stationary inst.)	3,143	2,912	2,712	2,651	2,238	1,918	1,573	1,252	1,077
Total ESR	853	1,802	1,770	1,910	1,889	1,859	1,829	1,798	1,768

The projected ESR emissions for the year 2030 amount to approximately 2,238 kt CO2e, which corresponds to 29% lower emissions than in 2005. This corresponds to Iceland's target according to the current implementation of the ESR in the EEA Agreement, as per JCD 269/2019.

ESR emission projections per sector can be seen in Figure 2.27. Most of the emission reduction until 2050 occurs in the Energy sector, and a proportionally high emission reductions can also be observed in the

IPPU sector (the reduction is predominantly derived from reduced F-gas imports). Lower emission reductions occur in Agriculture and Waste.

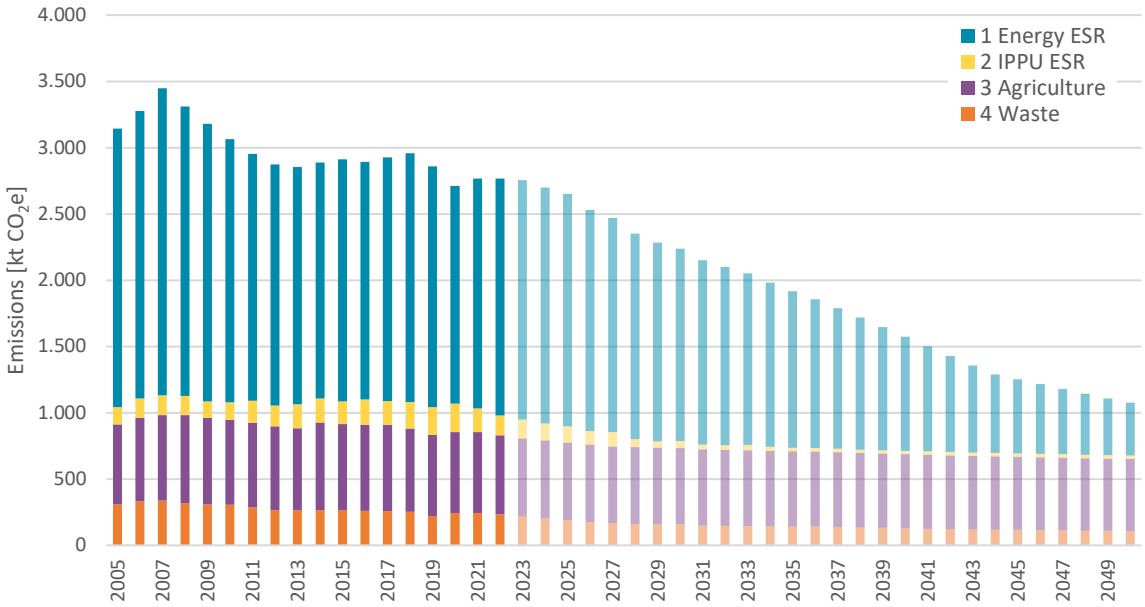

Figure 2.27 2 ESR emission projections split by sector, WEM scenario, kt CO_2e.

2.7.3 Total GHGs by gases

Iceland's total historical and projected emissions of GHGs excluding LULUCF by gases are presented in Figure 5.5. for the WEM scenario. The main greenhouse gas is (CO_2) following by methane (CH_4). Iceland's total historical and projected emissions of GHGs including LULUCF emissions by gases are presented in Figure 2.28 and Table 2.27. The main greenhouse gas is (CO_2) following by methane (CH_4).

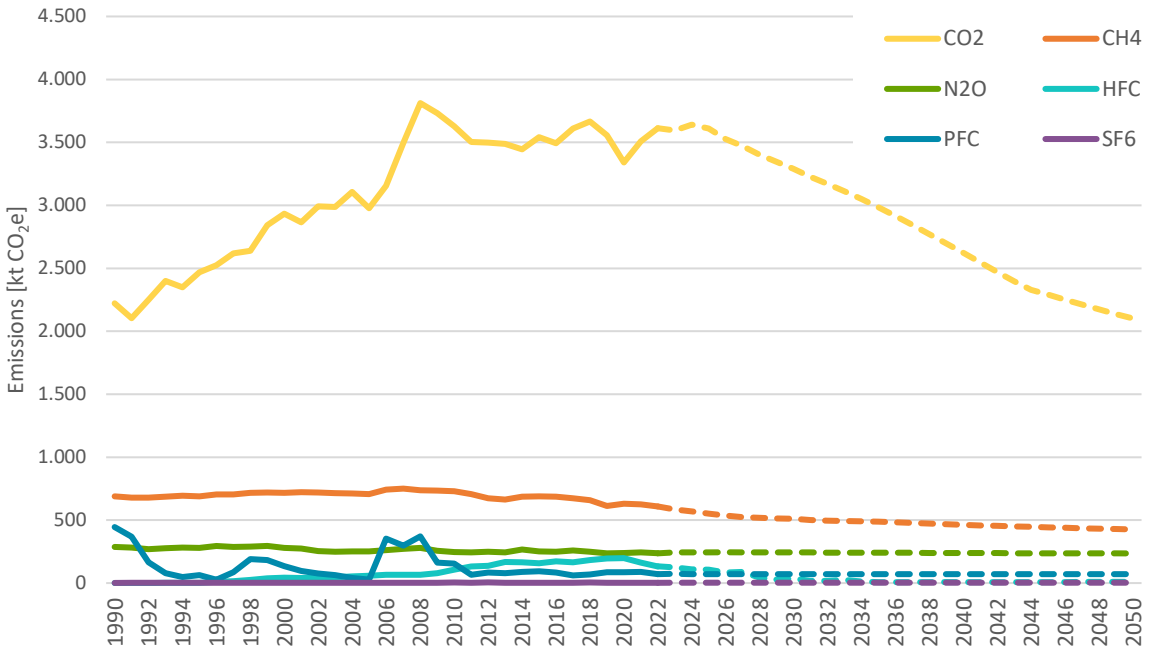

Figure 2.283 Total historical and projected GHG emissions (excluding LULUCF) in the WEM scenario, kt CO_2e.

Table 2.27 Total historical and projected GHG emissions (excluding LULUCF) in the WEM scenario, kt CO_2e.

	Emissions [kt CO_2e]								
Greenhouse gas	1990	2015	2020	2025	2030	2035	2040	2045	2050
CO_2	2,222	3,541	3,341	3,611	3,290	2,984	2,622	2,290	2,101
CH_4	689	690	629	552	511	487	463	442	426
N_2O	287	252	239	244	243	241	239	236	235
HFC	0	157	198	107	35	8	8	8	9
PFC	445	93	86	71	71	71	71	71	71
SF_6	1	2	3	3	3	3	3	3	3
Total excluding LULUCF	3,645	4,734	4,495	4,588	4,153	3,794	3,406	3,051	2,845

2.7.4 Methodology Overview

The methodologies used to calculate GHG projections are consistent with Iceland's 2024 NIR and the most recent report on Policies and Measure and Projections which was submitted to the EU in 2025. For information on the sectoral methods see the NIR (2024). Where methodologies are not described within the sectoral chapters the method from the NIR has been followed.

Since the submission of the 7th National Communication in 2018 (NC7 there have been extensive changes in the reporting of projections by Iceland. In the NC7 the arrangement for projections of greenhouse gases in Iceland had not been properly in place and no authority had the formal responsibility for greenhouse gas projections. In 2017, the Economic Institute of the University of Iceland (HHÍ), published a study of Iceland´s mitigation potential and options in the report Iceland and climate issues (Ísland og loftslagsmál), which was used as the basis for projections in the NC7. Although the projections were not fully in compliance with the UNFCCC projection guidelines, it was thought to give a broad picture of the status of the emission profile and what to expect until 2030.

In 2018 the Environment Agency of Iceland, which is responsible for the NIR, was given role of submitting a report on Policies, Measure and Projections to the EU in accordance with EU Regulation 525/2013 which has been implemented in Iceland. The first submission was in 2019 and subsequent submissions will be at least every other year. These projections are in accordance with UNFCCC requirements and based on the same methodology and assumptions as the historical greenhouse gas inventory.

Only WEM (with existing measures) projections are reported in this Biennial Transparency Report. Work is in progress to produce WAM (with additional measures) projections. Currently there are no plans to produce WOM (without measures) projections, due to lack of reliable information on how emissions would evolve if no measures were set in place.

2.7.5 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 (excl. LULUCF) and is therefore reported in a separate chapter. An overview of the historical and projected total emissions for the Energy sector within Iceland excluding transport is given within Table 2.28.

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

The largest contributor of GHG emissions from the Energy Sector (excl. 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.

Energy industries (1A1), Manufacturing Industries and Construction (1A2) and Other sectors including fishing ships (1A4) combined, account for approximately a third of emissions from the energy sector in Iceland in recent years.

The projections for the Energy sector are based on fuel projections until 2060 which were published by the National Energy Authority (NEA) 2022[52], except for geothermal projections which are based on information from the geothermal operators in Iceland. The impact of seven PaMs (102, 103, 104, 105, 106, 701 and 702) in the energy sector (see details about each PaM in chapter about mitigation policies and measures of this report) is represented in the WEM scenario. These results are represented as the WEM scenario for the Energy sector in this report.

The historical and projected trend for the Energy Sector (excl. Transport) can be seen in Figur 2.29. Overall, emissions from the Energy Sector (excl. Transport) have declined by 31% between 1990 and 2022. Emissions are projected to decrease by 71% in 2050 compared to 1990.

Within the Energy sector (excl. Transport) the largest sources are Manufacturing Industries and Construction (1A2), Fishing (1A4c) and Geothermal Energy Production (1B2d), as can be seen in Table 2.28.

Emissions from Fishing (1A4c) have been steadily decreasing since 1996, with some annual variations. Emissions are projected to steadily decline from 2023 to 2050. No major changes are expected in the sector for the time period. Some emission savings are reported, however, due to an increased share of renewable energy used in fishing. In the projections, it is assumed that biodiesel is the most probable fuel to replace fossil fuels and the emissions have been calculated based on that assumption.

Emissions from Manufacturing Industries and Construction (1A2) have also been decreasing over the historical time series and are projected to continue to decrease until 2050. Emissions from Geothermal Energy (Fugitive Emissions 1B) have historically been increasing but are projected to decrease up until 2035 due to increased injections of CO_2 into basaltic rock[53]. Other sectors are projected to remain relatively steady.

[52] *National Energy Authority (Orkustofnun).* https://orkustofnun.is/orkuskipti/orkuskiptaspa

[53] *Carbfix*. https://www.carbfix.com/

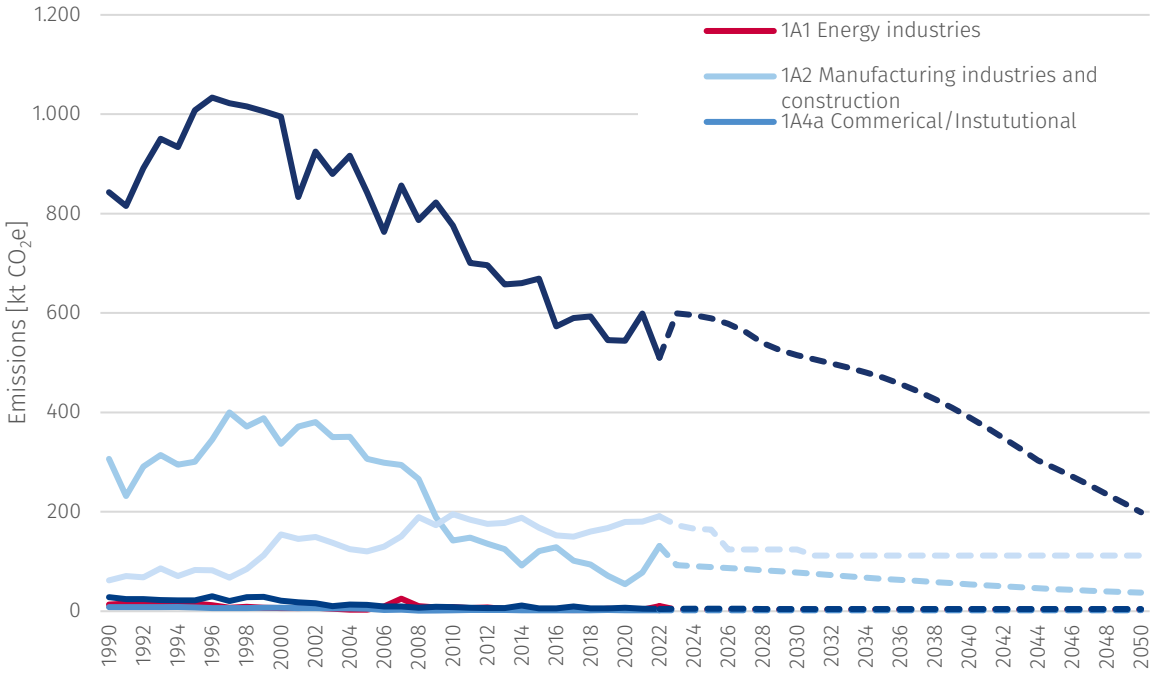

Figure 42.29 Energy (excluding Transport) Emissions of total GHGs, WEM scenario, kt CO_2e.

Table 2.28 Historical and projected emissions in the Energy sector, kt CO_2e.

	Emissions [kt CO_2e]								
Sector	1990	2015	2020	2025	2030	2035	2040	2045	2050
Energy industries (1A1)	14	4.2	2.6	3.2	3.2	3.2	3.2	3.2	3.2
Manufacturing industries and construction (1A2)	306	121	54	89	78	65	54	45	37
Commercial/Institutional (1A4a)	8.1	2.1	1.6	1.9	1.9	2.0	2.0	2.1	2.1
Residential (1A4b)	28	5.9	6.7	4.9	4.5	4.4	4.4	4.4	4.4
Fishing (1A4c)	807	661	536	583	509	464	384	281	192
Geothermal (1B)	62	168	180	164	124	112	112	112	112
Energy excluding Transport (1A1,1A2,1A4,1B)	1,225	963	781	846	721	650	560	447	351

ESR vs EU ETS emissions in Energy

In Iceland, all emissions from the production of Iron and Steel and Non-Ferrous Metal (Iron alloys and silicon - 1A2a and aluminum - 1A2b) are accounted for under the EU ETS, including emissions from fuel combustion for energy. Overall, this contributes to less than 1% of the total emissions from Energy (excl. Transport). The split between ESR and ETS emissions is projected to remain reasonably constant over the time series (see Figure 2.30).

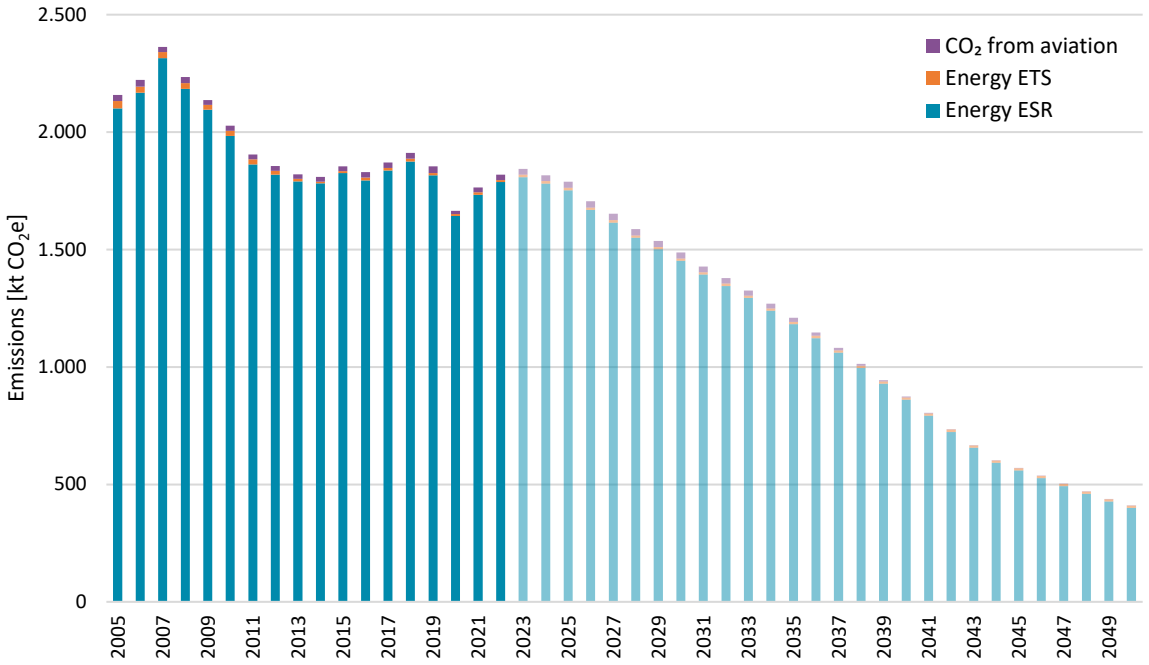

Figure 2.305 ETS and ESR GHG projections in the Energy Sector (excl. Transport), WEM scenario, kt CO_2e.

Methodology of projections

The methodology used to generate projections for the Energy Sector (excluding Transport) is based on the historical inventory, see NIR (2024) and fuel projections from the National Energy Authority (2022)[54]

An overview of the data and assumptions used as a basis for the energy projections is presented in Table 18. A further description is provided below.

Table 2.29 Activity data basis for energy projections.

Energy	Basis for projections
1.A.1 Energy industries	Fuel projections (2022)
1.A.2 Manufacturing industries and construction	Fuel projections (2022)
1.A.4 Other sectors	Fuel projections (2022)
1.B.1 Solid Fuels	Not relevant in Iceland
1.B.2 Geothermal	Emission projections from all operators of geothermal power plants in Iceland

[54] *National Energy Authority (Orkustofnun).* https://orkustofnun.is/orkuskipti/orkuskiptaspa

Projections for the energy sector are based on fuel projections generated by the *Energy transition model* by the National Energy Authority, except for emission projections for geothermal power which were obtained from the geothermal power companies. Fuel projections were available by fuel type and activity.

2.7.6 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 international aviation and navigation are accounted for but they do not count towards the national total.

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 accounted for 90% - 95% of the emissions in the transport sector.

The projections for the Energy sector are based on fuel projections until 2060 which were published by the National Energy Authority (NEA) 2022[55]. The impact of 11 PaMs (705, 201, 202, 203, 205, 206, 207, 208, 209, 210 and 211) in the transport sector (see chapter about mitigation policies and measures) is represented in the WEM scenario produced.

Figure 2.31 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. This is followed by a decrease in road transport emissions because of the financial crisis in 2008. After 2014 there is a significant increase in emissions from road transport, mainly due to increased tourism. The effect of increased tourism can also be seen in the emissions from international aviation.

Emissions projections from international bunkers (aviation and navigation), in comparison with emissions from other transport subsectors, can also be seen in Figure 2.31. As stated before, emissions from international bunkers are not included in the national total.

Historical emissions from road transport decreased significantly in 2020, partly due to the COVID-19 pandemic. In the WEM scenario, emissions from the road transport sector are projected to drop below 1990 levels by 2035. This reduction in emissions is due to the rapid electrification of the vehicle fleet since 2015. It is predicted that in 15 years, the proportion of electric vehicles (EVs) will rise from 11% in 2022 to 80% in 2040.

A slight decline in fuel use in domestic navigation and domestic aviation has been projected between 2023 and 2030, but the emissions are projected to decrease significantly by 2050.

[55] *National Energy Authority (Orkustofnun).* https://orkustofnun.is/orkuskipti/orkuskiptaspa

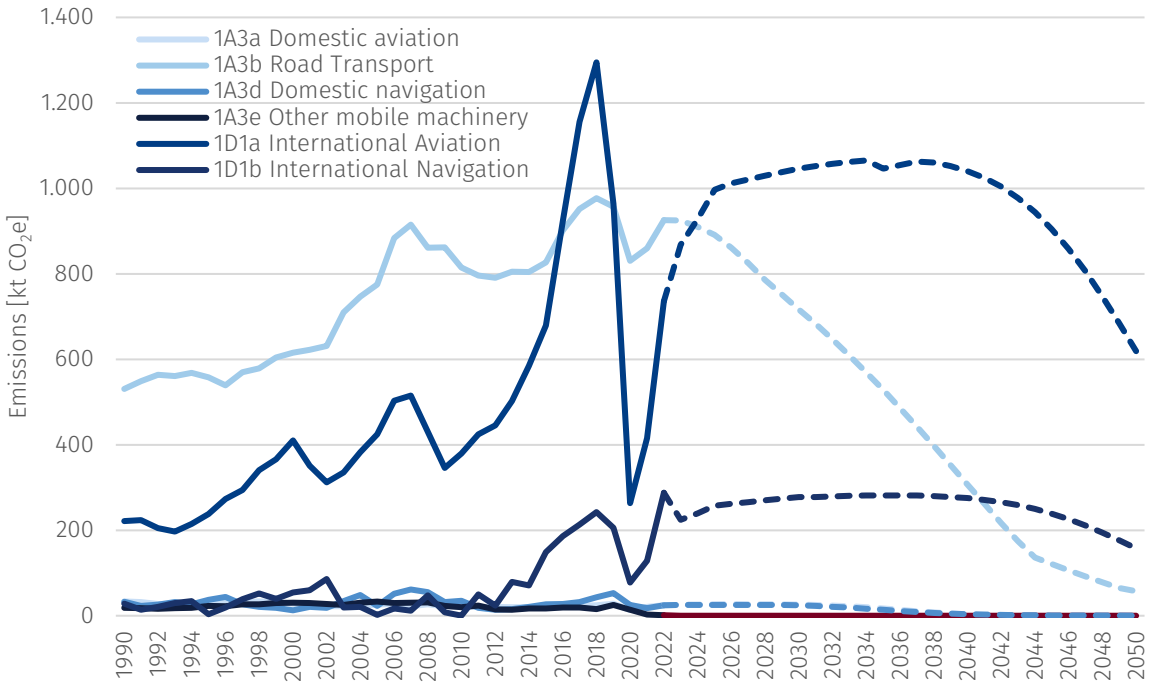

Figure 2.31 6Transport Emissions (including international bunkers), Total GHGs, WEM scenario, kt CO_2e.

Table 2.30 Transport Emissions (including international bunkers), Total GHGs, WEM scenario, kt CO_2e

	Emissions [kt CO_2e]								
Sector	1990	2015	2020	2025	2030	2035	2040	2045	2050
Domestic aviation (1A3a)	34	21	13	27	26	17	3.5	0.4	0.05
Road transportation (1A3b)	531	827	831	891	717	528	307	121	57
Domestic navigation (1A3d)	33	27	25	25	24	14	3.6	0.6	0.1
Other mobile machinery (1A3e)	19	17	14	-	-	-	-	-	-
Transport (1A3)	616	891	883	943	767	559	314	122	58
International Aviation (memo)	221	679	263	997	1,046	1,046	1,040	905	619
International Navigation (memo)	28	149	78	258	278	282	275	239	158

Methodology of Projections

The methodology used to calculate projected emissions from transport are based on fuel projections from the *Energy transition model*[56] by the National Energy Authority, which is available by fuel type and activity. In addition to the Fuel Projection, data from sibyl baseline[57] was purchased to run COPERT 5.5.1 (same methodology as historical emission calculations, see 2024 National Inventory Document).[58]

An overview of the data and assumptions used as a basis for the transport projections can be found in Table 2.31. A further description is provided below.

Table 1 Basis for Transport projections.

Transport	Basis for projections
1.A.3.a Domestic Aviation	Fuel projections (2022)
1.A.3.b Road transportation	Fuel projections (2022), sybil baseline data
1.A.3.c Railways	NA
1.A.3.d Domestic Navigation	Fuel projections (2022)
1.A.3.e Other transportation	Fuel projections (2022)
Memo items: international bunkers	
M. IB International Aviation	Fuel projections (2022)
M. IB International Navigation	Fuel projections (2022)

[56] *National Energy Authority (Orkustofnun).* https://orkustofnun.is/orkuskipti/orkuskiptaspa

[57] *Emisia.* https://www.emisia.com/utilities/sibyl-baseline/

[58] COPERT. https://www.emisia.com/utilities/copert/

2.7.7 Industrial Processes and Product Use (IPPU)

Emissions, including projected emissions, from IPPU are dominated by the Metal industry (2C), specifically ferroalloys and aluminium production. The use of fluorinated gases (F-gases) in products as substitutes for Ozone Depleting Substances (ODS, 2F), mostly in the fishing industry, industrial refrigeration and commercial refrigeration, also contributes significantly to emissions from the IPPU sector. An overview of the historical and projected total emissions for the IPPU sector within Iceland can be found in Table Table 2.32 and Figure 2.32. There is no Electronics industry (2E) in Iceland and therefore this is reported as NO.

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. Currently, there are two ferroalloy plants and three aluminium smelters operating in Iceland. It has been assumed that the number of aluminium and ferroalloy plants remains at current 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 and due to the current worldwide economic situation, they are not included in the WEM projections.

The most recent aluminium smelter started operating in 2007 and CO_2 emissions from Aluminium production increased in a strong correlation with production. In contrast, perfluorocarbon (PFC) emissions occur mostly during the first years of operation, causing the spike in emissions in 2008. They occur in case of increased voltage in the production line (anode effect). Two aluminium facilities are already producing close to the maximal operating allowance. The projections show only a slight increase in emissions compared to 2022 emissions and relatively constant PFC emissions, since a prediction of PFC emissions is difficult to achieve. The aluminium smelters in Iceland are currently operating using the best available technology, following the best practices set out in the Directive 2006/21/EC (BAT Directive). They do, therefore, not foresee any possibilities to reduce emissions until there is a change in technology. The ELYSIS technology, developed through a partnership between the aluminium companies Alcoa and Rio Tinto, has the potential to drastically reduce GHG emissions from the aluminium industry worldwide. This technology is, however, still in the development stage. The aim is to scale-up the process and demonstrate the technology commercially[59].

The Ferroalloys industry currently has two operating plants which produce ferrosilicon and silicon metal. The previously mentioned BAT Directive 2006/21/EC also covers the manufacture of ferroalloys. One plant has been in operation since 1979, but the other one started operation in 2018. The ferroalloys industry shows a decrease in emissions, primarily due to the efforts of one company to become carbon neutral by 2040[60].

F-gases are mostly used for refrigeration and air conditioning in Iceland. The biggest source in F-gas emissions derives from transport refrigeration (including the fishing fleet, which relies on HFCs for the cooling and freezing systems on board) and industrial refrigeration. The emissions show some variation which can partly be explained by the nature of the calculation method. All 2F1 subcategories have different lifetimes, so end-of-life emissions occur a certain number of years after the import of the gases. The calculation is also based on the import amounts of one calendar year. If a shipment is coming late in

[59] *ELYSIS*. https://www.elysis.com/en

[60] *Elkem* (2019). https://www.elkem.is/frettir/elkem-island-fagnar-40-ara-afmali/

the year, the F-gases might be stockpiled and not used immediately in the same year, even though it appears so from the calculation method. Regulation (EU) 517/2004 is implemented into Icelandic legislation with Regulation No 1066/2019, defining a quota system on the amount of F-gases to be imported each year and steps for phasing it out. This quota system was revised in 2020 and 2023, and revised Regulation No 1066/2019 defines a new quota with a quicker phase out of these compounds. The WEM scenario includes the revised regulation along with the taxation of F-gases and the MAC directive 2006/40/EC. A quantification of the policies on Regulation on F-Gases (301) and Taxation of F-Gases (305) can be found in the chapter about mitigation policies and measures.

The Mineral industry (2A) has seen a big drop in emissions as the only cement production plant in Iceland closed in 2011. The projections are based on a single facility producing mineral wool, which is having a fairly constant production target (based on communication from the facility), and therefore, constant emissions over time. The Chemical industry (2B) is insignificant in the Icelandic inventory, with no emissions reported under this sector since 2005. In the past, there were a fertiliser production plant, which stopped production in 2001, and a diatomite production plant, which stopped production in 2004. There is no information on plans of opening new production facilities in these two sectors.

Table 2.32 Historical and projected emissions, kt CO_2e in the IPPU sector.

Sector	1990	2015	2020	2025	2030	2035	2040	2045	2050
Mineral Industry (2A)	52	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Chemical industry (2B)	42	NO	NO	NO	NO	NO	NO	NO	NO
Metal industry (2C)	795	1,797	1,766	1,904	1,884	1,854	1,824	1,794	1,764
Non-energy products from fuels and solvent use (2D)	7.2	6.3	6.5	6.6	6.5	6.2	6.2	6.2	6.2
Electronics industry (2E)	NO	NO	NO	NO	NO	NO	NO	NO	NO
Product use as substitutes for ODS (2F)	0.3	157	198	107	35	8.1	8.7	8.4	8.7
Other product manufacture and use (2G)	6.6	4.6	5.8	5.5	5.5	5.6	5.6	5.6	5.6
Other (please specify) (2H)	NO	NO	NO	NO	NO	NO	NO	NO	NO
IPPU (2)	903	1,966	1,977	2,024	1,931	1,874	1,846	1,815	1,785

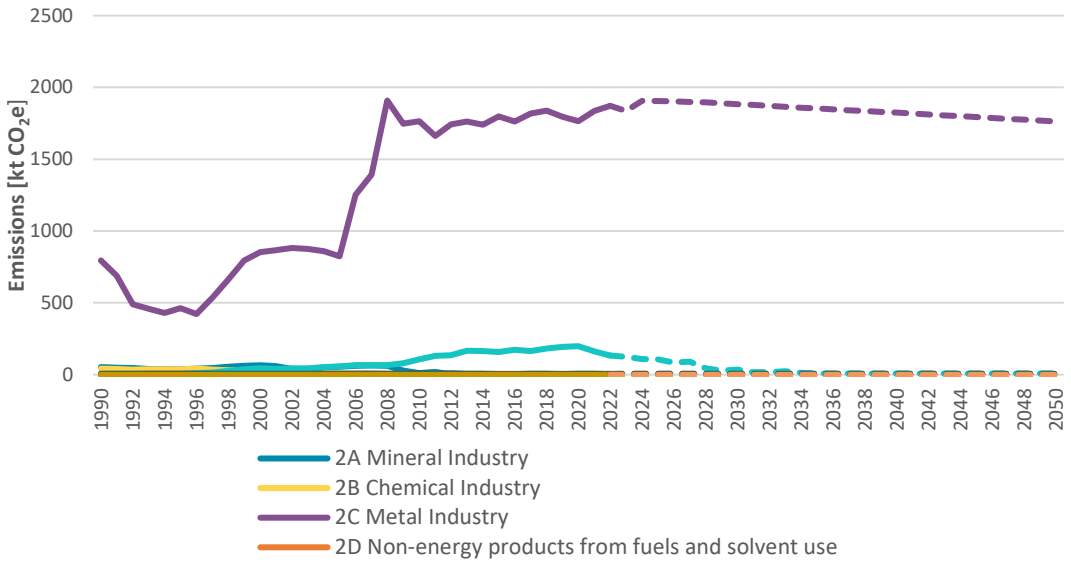

Figure 2.327 IPPU Emissions Total GHGs, kt CO_2e, WEM scenario. Unbroken lines represent historical emissions, broken lines projected emissions.

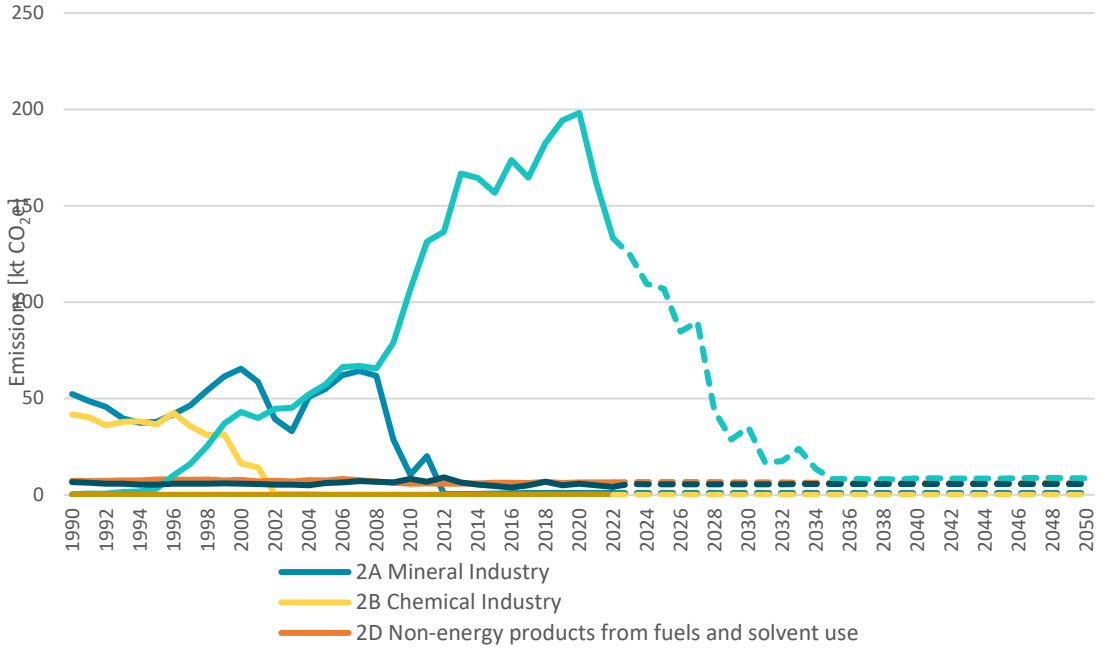

Figure 2.338 IPPU Emissions without the metal sector (2C), kt CO_2e, WEM scenario. Broken lines represent projected emissions.

ESR vs EU ETS emissions in Industry

In Iceland, process emissions from the 2C Metal Industry, that is ferroalloys and aluminium production are accounted for under the EU ETS (Directive 2003/87/EC). Overall and historically, this contributes to approximately 90% of the total emissions from the industry sector. The projections under the WEM scenario show that the EU ETS contribution will increase up to 99% as the emissions for the Metal sector (2C) are fairly constant while the ESR part, especially the F-gases (2F) are expected to decrease substantially (Figure 2.34).

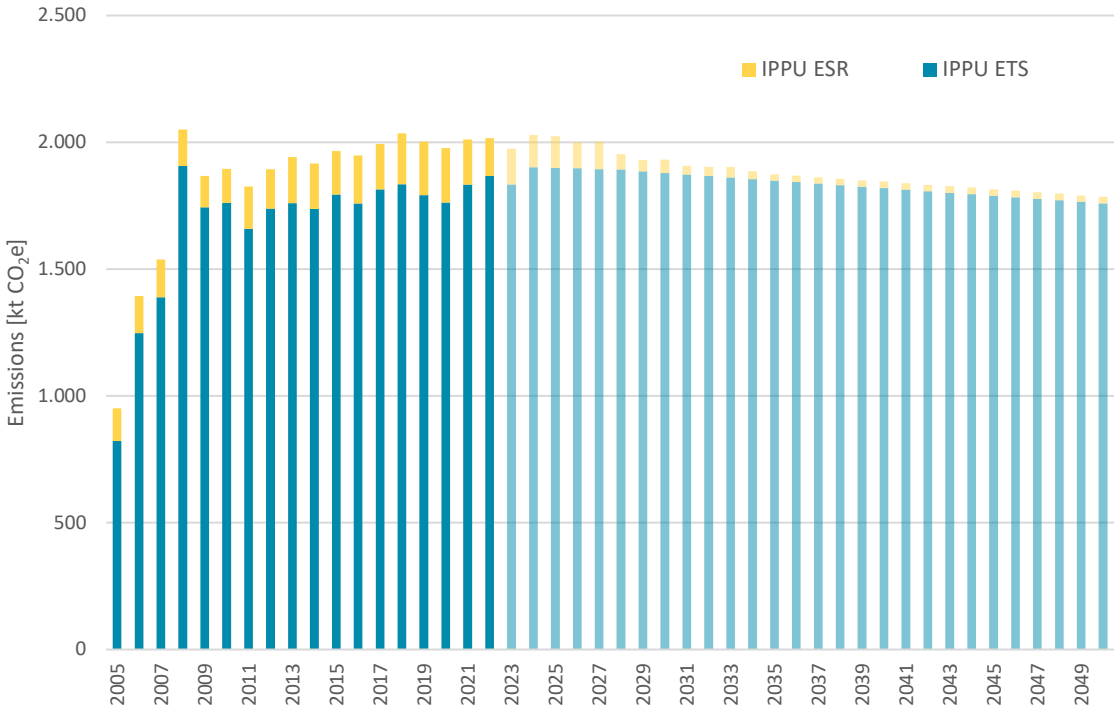

Figure 2.349 ETS and ESR GHG projections in the industry sector, WEM scenario, kt CO_2e.

Methodology of projections

The methodology used to generate WEM projections for the IPPU sector are based on the historical inventory, meaning the activity data is projected and the same methodology is used to calculate emissions as in the historical inventory. Please refer to the 2024 edition of the National Inventory Report where information about activity data and emission factors is collected. Only a WEM scenario has been calculated for the entire IPPU sector.

The impact of six PaMs (301, 302, 303, 304, 307 and 708) in the IPPU sector (see chapter about mitigation policies and measures) is represented in the WEM scenario produced.

An overview of the activity data and assumptions used as a basis for the IPPU projections can be found in Table 2.33. The emission factors are calculated following the methodology in the historical inventory. Where the application of default or tier 3 facility specific emission factors was not possible due to the lack of data, averages of historical data were used to provide implied emission factors. A further description is provided below.

Table 2 Activity data basis for IPPU projections.

IPPU	Basis for projections
2.A Mineral Industry	Activity data provided by the operators.
2.B Chemical Industry	Not relevant in Iceland.
2.C Metal Industry	Activity/emission data provided by the operators.
2.D Non-energy products from fuels and solvent use	GDP, population, fuel projection, trends over the past years.
2.E Electronics Industry	Not relevant in Iceland.
2.F Product uses as substitutes for ODS	Legislation (import quota), mass balance to allocate imported amounts to different sectors.
2.G Other product manufacture and use	GDP and population projection, trends over the past years.

2.A Mineral Industry and 2.C Metal Industry

The main companies (mineral wool, ferroalloys, and aluminium) were asked to provide a production and emission estimate. This data has been used. Slight emission reduction is projected but no big changes are expected in these subsectors.

There are currently no plans for adding new aluminium smelters, ferroalloys plants, or for resuming production of cement, fertiliser, diatomite, or steel. Therefore, the projections are based on the current production and the production amounts communicated by the individual companies, also taking into account the maximal permitted allowance according to the operation permits.

The impact of EU-ETS (307) in the IPPU sector (see chapter about mitigation policies and measures) is represented in the WEM scenario produced. The impact of Carbon Capture and Storage (306) was not

considered since the utilisation of this technique within the industry in Iceland is still in a developmental stage.

2.F Product uses as substitutes for ODS

The projected emissions deriving from F-gases (sector 2F1) take into account the effect of Icelandic Regulation No 1446/2023 which phases out the import of F-gases and the effect of the taxation. The average ratio of the real import to the quota was found for the years 2019-2022. The same ratio was assumed to apply to future years to project the total import. See chapter about Policies and Measures.

2.7.8 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 with 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 projections encompass emissions from Enteric Fermentation (3A), Manure Management (3B), Agricultural Soils (3D), Liming (3G), Urea (3H), and Other Carbon-Containing Fertilisers (3I). A number of Agriculture categories are not occurring in Iceland and have therefore not been included in the projections, e.g., Rice Cultivation (3C), Prescribed Burning of Savannas (3E), and Field Burning of Agricultural Residues (3F).

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 the sheep livestock population, reducing methane emissions from enteric fermentation, and reduced fertiliser application, reducing N_2O emissions from agricultural soils. The historical and projected trend can be seen in Figure 27. Emissions from agriculture are projected to decrease by 17% (108 kt CO_2e) in 2050 as compared to 2015. This is due to a projected decrease in livestock numbers, mostly sheep and dairy cattle, which are key categories in methane emissions from enteric fermentation and nitrous oxide emissions from manure management.

CH_4 emissions from enteric fermentation are projected to decrease by 23% in 2050 compared to 2015, and the total CH_4 and N_2O from manure management are projected to decrease by 30%. Emissions from the category agricultural soils are projected to decrease by 3% in 2050 compared to 2015. Projections for CO_2 emissions from liming and the use of urea and other carbon containing fertilisers were based on the historical emissions 1990-2022 interpolated linearly to reach 2050. These emissions, which are a very small proportion of total agriculture emissions, are predicted to increase by 162% in 2050 compared to 2015.

The projections performed for the agricultural sector include only a WEM scenario. There is currently not enough data on additional PaMs available to perform projections for a WAM scenario.

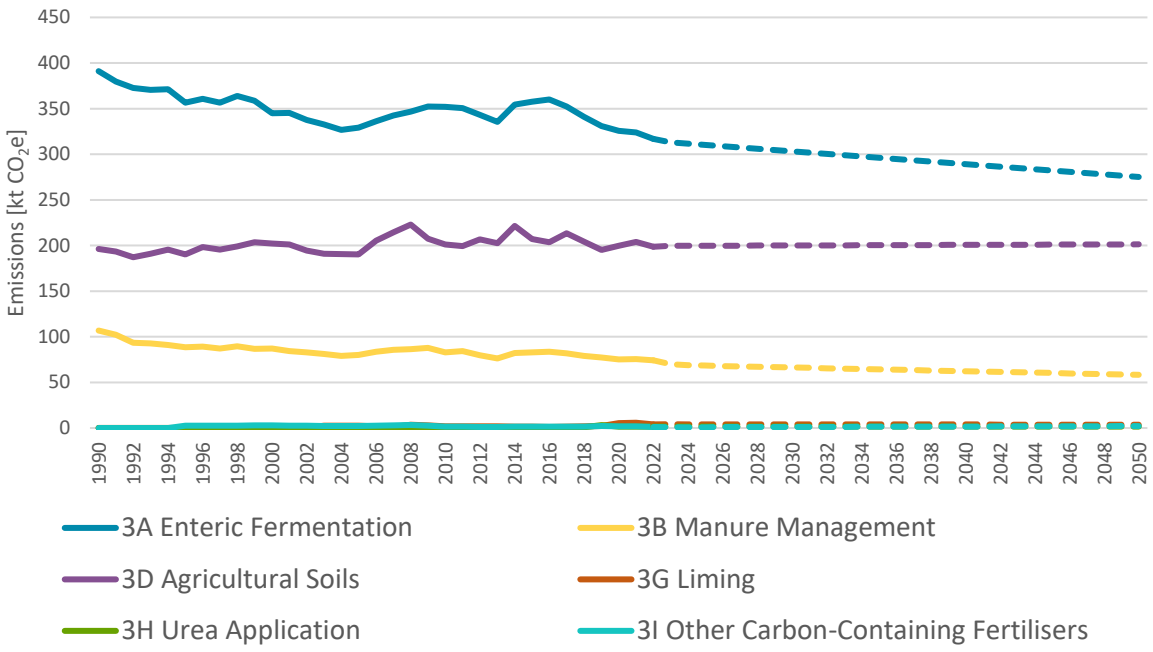

Figure 2.3510 Agriculture Emissions of Total GHGs, WEM scenario, kt CO_2e. Unbroken lines represent historical emissions, broken lines projected emissions.

Table 3 Historical and projected emissions in the Agriculture sector, kt CO_2e.

	Emissions [kt CO_2e]								
Sector	1990	2015	2020	2025	2030	2035	2040	2045	2050
Enteric fermentation (3A)	391	358	326	310	303	296	289	282	275
Manure Management (3B)	107	83	75	68	66	64	62	60	58
Agricultural Soils (3D)	196	207	200	200	200	200	201	201	201
Liming (3G)	0.0	1.3	5.3	4.1	4.0	3.9	3.8	3.7	3.6
Urea application (3H)	NO	0.0	1.7	1.6	1.6	1.6	1.6	1.6	1.6
Other carbon-containing fertilisers	NO	1.4	1.9	1.0	1.2	1.4	1.6	1.9	2.1
Total	694	650	609	585	576	568	559	551	542

Methodology of projections

The methodology used to generate projections for the Agriculture sector is based on the historical inventory, see NIR (2024). For more detail, refer to the latest edition of the National Inventory Report (NIR) where information about activity data and emission factors is collected. Only a WEM scenario has been calculated for the entire Agriculture sector, no data on WAM PaMs were available to calculate a WAM scenario.

The projections on how the Agriculture sector will develop in Iceland are based on historical trends and expert judgement. An overview of the data and assumptions used as a basis for the agriculture projections is presented in Table 2.35. A further description is provided below.

Table 4 Activity data basis for agriculture projections.

Agriculture	Basis for Projections
Livestock population projections	Linear extrapolation of historical trends, expert judgement
3.A Enteric Fermentation	Linear extrapolation of historical trends, expert judgement
3.B Manure Management	Linear extrapolation of historical trends
3.C Rice Cultivation	Not relevant in Iceland
3.D Agricultural Soils	Linear extrapolation of historical trends
3.E Prescribed Burning of Savannahs	Not relevant in Iceland
3.F Field Burning	Not relevant in Iceland
3.G Liming	Linear extrapolation of historical trends
3.H Urea Application	Linear extrapolation of historical trends
3.I Other Carbon-Containing Fertilisers	Linear extrapolation of historical trends

Livestock Population

The trend in livestock populations has been predicted by extrapolation to 2050 based on the available historical data. The historical data is collected from the Ministry of Food, Agriculture, and Fisheries (MFAF) and are the same numbers as are used for agriculture calculations in the 2024 NIR. To assess the best possible trends considering the variability of the historical data, agricultural experts at MFAF and Iceland's Agricultural University were consulted. Those experts determined the most representative livestock projections for the Tier 2 livestock categories, cattle and sheep, based on their expectation of future developments in these agricultural sectors. Impacts of agricultural contracts, consumer behaviour and the level of imports of agricultural goods were also considered. The agricultural contracts will be renegotiated in 2026, at which point the projections in these livestock categories may change. The conclusion was that livestock numbers for both cattle and sheep were linearly projected based on the historical timeseries (1990-2022).

Livestock characterisation

All parameters necessary for livestock characterisation (pregnancy rates, days on pasture/in housing, weight, etc.) were kept constant over the projected time series and correspond to the values used in the 2024 NIR, except a historical trend is used to predict feed digestibility and ash content of feed for the Tier 2 livestock categories cattle and sheep.

High producing dairy cows in Iceland are already producing 9,000 kg/year and the EU-27 average is 7,682 kg/year. Based on expert judgment, taking into consideration genetic improvements, improved feeding practices, and more, the historical trend (1990-2022) is used to predict the development of annual milk yield per dairy cow (expert judgement, the Icelandic Agricultural Advisory Centre). Changes in outside factors, such as increased prices of feed and fertiliser, import restrictions, climatic changes etc. could, however, impact this projection significantly.

The emission factors are the same as those which are used in the 2024 NIR inventory and could not be projected due to a lack of data and their high uncertainty.

Agricultural Soils

Other sources of emissions, such as the use of organic and inorganic N-fertilisers, liming, and the use of urea are predicted by linear interpolation of historical trends. The areas in hectares [ha] for the calculations of N_2O emissions from drained organic soils are communicated from the SCSI, which calculates projections for the LULUCF sector.

2.7.9 Land Use, Land-Use Change, and Forestry (LULUCF)

Since Iceland's last submission of the 8th National Communication and 5th Biennial Report, in which projections were based on the most recent Policies, measures and projections report (2023), significant improvements and updates have been performed for the historical LULUCF inventory. However, as the inventory team is currently updating the projections for the next report on policies, measures and projections, to be reported to the EU every odd year on the 15th of March, it was not deemed practical to be updating the LULUCF projections to include the latest historical year (2022) in line with the 2023 Policies, measures and projections report (on which this chapter of the BTR is based) , since its methodology is already outdated.

2.7.10 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).

Historically, 80-90% of GHG emissions 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 projected total emissions from the Waste sector show a decrease until 2050 (-59% compared to 2015 emissions), predominantly due to the imminent closure of the SWDS Álfsnes and two major policies and measures which have been quantified in the current report (507, GROUP 501&504). The historical and projected emissions are reported in Table 2.36.

Figure 2.36 reports the emission trends for all Waste subsectors. The emissions from Solid Waste Disposal (5A) are projected to decrease rapidly until 2028, after which they will decrease more slowly until 2050. The decrease until 2028 is driven by the decision to export all mixed waste from the capital area for incineration abroad, to almost landfill inert waste only at Álfsnes after 2023, as well as the increased operation of the new gas and composting plant, GAJA (see PaM 504), and the subsequent ban on

landfilling organic and biodegradable waste (see PaM 501). These actions will decrease the amount of waste that is landfilled. During that time, there is also steady methane recovery from the landfill sites. These two factors (less waste and high methane recovery) coupled together cause the steep decrease in emissions from solid waste disposal.

After 2028, there is a slower decrease in emissions due to a rapidly decreasing methane recovery from the two largest SWDS, as less methane is produced there. However, lower amounts of organic waste landfilled will lead to lower emissions further along the projected timeline.

Figure 2.36 shows historical and projected emissions from the Waste sector, and Figure 2.37 shows historical and projected emissions from the Waste sector excluding emissions from Solid Waste Disposal (5A). Emissions from Biological Treatment of Waste (5B) are projected to increase due to the addition of GAJA and an increase in composting. The small step change between 2019 and 2020 is due to the beginning of operations at GAJA, which began operating at a small scale in the second half of 2020. The plant was unable to operate fully in 2021, and consequently the expected step wise increase in its operational scale was delayed slightly. From 2025 the plant is expected turn 30 kt of waste into compost and methane gas annually.

In Iceland, only one incineration plant is operative, and no additional plants are expected to be built during the projected timeline. The current incineration plant is already running at full capacity. Therefore, it is expected that the emissions in the subcategory Incineration and Open Burning of Waste (5C) will be stable over the projected timeline. The emissions of Wastewater Treatment and Discharge (5D) are projected to slightly increase in accordance with the expected increase in population.

The projections performed for the sector include only a WEM scenario. There is currently not enough data on additional PaMs available to perform projections for a WAM scenario.

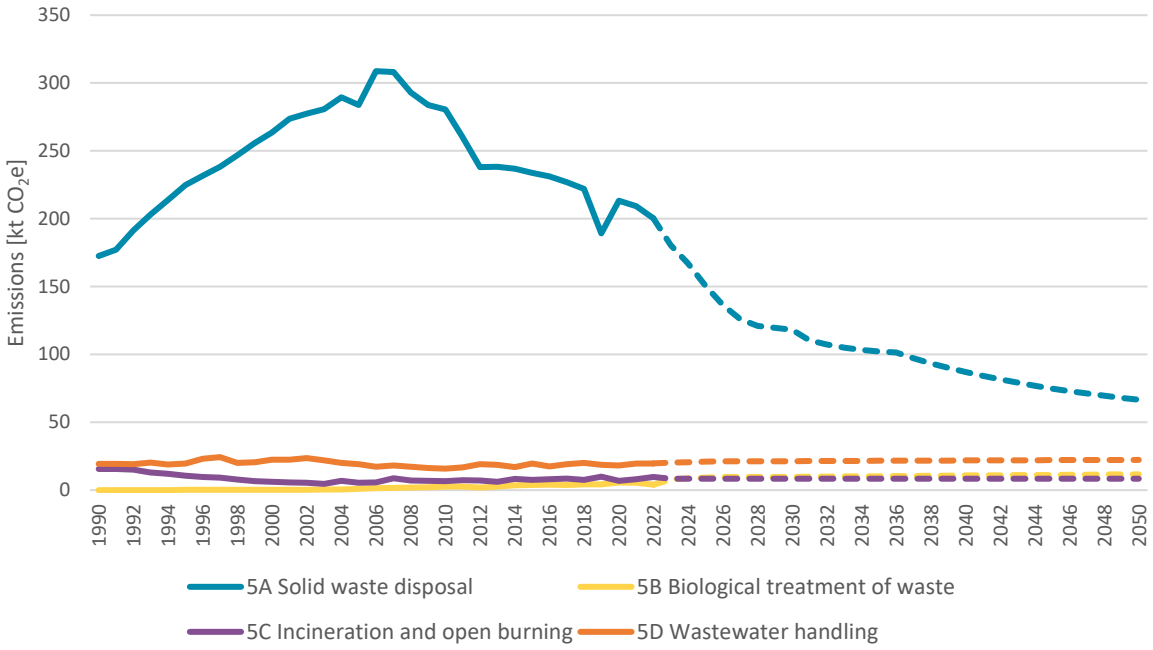

Figure 2.3611 Waste Emissions of Total GHGs, WEM scenario, kt CO_2e. Unbroken lines represent historical emissions, broken lines projected emissions.

Table 2.36 Historical and projected emissions in the Waste sector, kt CO_2e.

	Emissions [kt CO_2e]								
Sector	1990	2015	2020	2025	2030	2035	2040	2045	2050
Solid Waste Disposal (5A)	173	234	213	151	118	102	87	75	67
Biological Treatment of Solid Waste (5B)	NO	3.7	5.6	9	10	10	11	11	12
Incineration and Open Burning (5C)	16	7.6	7.0	8.4	8.4	8.4	8.4	8.4	8.4
Wastewater handling (5D)	19	19	18	21	21	22	22	22	22
Total	207	265	244	189	158	143	128	117	109

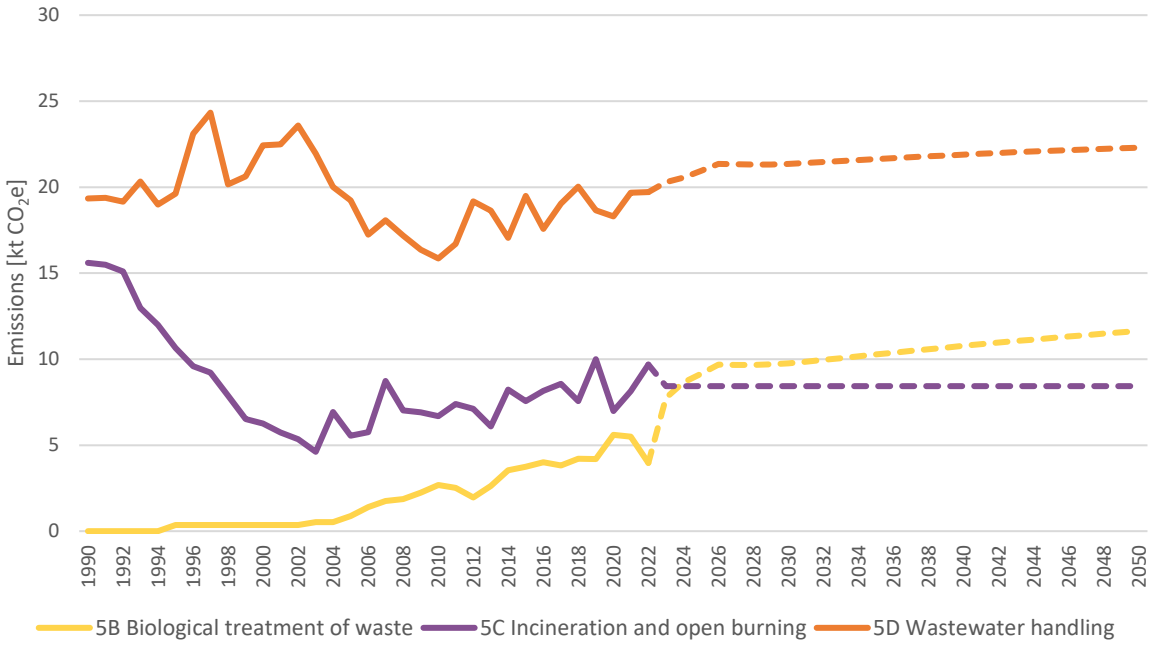

Figure 2.3712 Waste Emissions of Total GHGs excluding 5A Solid Waste Disposal Sites, kt CO_2e. Unbroken lines represent historical emissions, broken lines represent projected emissions.

Methodology of projections

The methodology used to generate projections for the Waste sector is based on the historical inventory, see NIR (2024). Please refer to the latest edition of the NIR where information about activity data and emission factors is collected. Only a WEM scenario has been calculated for the entire Waste sector, no data on WAM PaMs was available to calculate a WAM scenario.

An overview of the data and assumptions used as a basis for the Waste projections can be found in Table 2.37. A further description is provided below.

Table 2.37 Activity data basis for waste projections.

Waste	Basis for Projections
5A Solid Waste Disposal	Population projections (Statistics Iceland), methane recovery projections from stakeholders, waste export plans of Iceland's largest waste management company and the plans of almost only landfilling inert waste at the SWDS Álfsnes after 2023. National plan to collect separately: food waste, paper, and plastics. Ban on landfilling separately collected waste. Allocation based on mass balance and average past allocations taking export plans and separate collection into account.
5B Biological Treatment of Solid Waste	Mass balance allocation, which is coupled to projections for 5A, data from the first years of

Waste	Basis for Projections
	operation (2020-2022) and the operation permit of the gas and composting plant, GAJA, methane collection communicated by operating company.
5C Incineration and Open Burning of Waste	Operation permit of incinerator
5D Wastewater Treatment and Discharge	Population projections (Statistics Iceland) and projections for fish processing in Iceland
5E Other (please specify)	Not relevant in Iceland

Waste management in Iceland is changing drastically, which mainly affects subcategories Solid Waste Disposal (5A) and Composting (5B1). The largest landfill site in Iceland, Álfsnes, intends to mostly landfill inert waste after the year 2023, though some burnable waste might be landfilled as well. This will be accomplished by exporting all mixed waste abroad for incineration with energy recovery, diverting separately collected organic household waste to the gas and compost plant GAJA, and other organic waste not suitable for composting to incineration or meat meal and fat production.

Alongside these changes, a ban on landfilling separately collected waste, was enacted on 1 January 2023. Unfortunately, most municipalities were not ready to implement the ban at that time, so the effects of the ban will probably only be slightly visible until 2024. This ban will move more organic waste to composting.

The effects of the separate collection of food waste from homes will depend on people's participation. As a first assumption the food waste in the mixed household waste is estimated to decrease by 30% and that number is increased by 1% a year. This assumption will be used until real data is available.

Slaughterhouse waste is also not supposed to be landfilled. However, because of a lack of other treatment pathways, it is assumed in the projections that part of it will have to be landfilled.

The projections for the subcategories Anaerobic Digestion at Biogas Facilities (5B2) and Incineration and Open Burning of Waste (5C) are based on operation permits as well as communications between the EAI and the companies in question regarding planned operation into the future.

The category Wastewater Treatment and Discharge (5D) is mostly based on the projection of population numbers. However, the methane emissions from Industrial Wastewater (5D2) are based on projections of fish processing in Iceland.

In the WEM scenario, the waste amount going to SWDS until 2050 is estimated by correlating historical waste amounts going to SWDS, as reported in the NIR (2024), with population projections. A population projection until the year 2060 was made available by Statistics Iceland. Subsequently, the projected waste amounts going to SWDS are estimated by assuming a 30% decrease of food waste in mixed waste as a result of the ban of landfilling separately collected waste and organic waste going to GAJA (5B2) and mixed waste exported abroad from the capital area is subtracted.

Application of greenhouse calculations is according to the approach described in the National Inventory Report (2024); the same parameters and emission factors are applied throughout the whole projected time series 2023-2050.

2.7.11 Sensitivity Analysis

Agriculture

Livestock Activity Data

Livestock population projections are based on historical trends or the trend of the past 10 years for all major livestock categories, using linear extrapolation. These projections are the main determinants of GHG emissions from the Agriculture sector. A sensitivity analysis has been performed to assess the impact on emissions from agriculture of applying different trends to project livestock numbers.

For the various sheep subcategories, livestock projections for the WEM scenario are based on the historical trend. Projections based on the 10-year trend were used for the sensitivity analysis. Projections based on 10-year trend show significantly smaller livestock numbers compared to projections based on historical trend. The difference between the two scenarios, for the total sheep population, is over 55% in 2040 and almost 95% in 2050 (see Table 2.38). A visual comparison between the different sheep projection scenarios can be seen in Figure 2.38.

Table 2.38 Projected number of sheep (1,000s) using linear extrapolation: 10-year trend versus historical trend.

	Scenario	2022	2030	2040	2050
Mature sheep	Sensitivity Analysis: 10-year trend	290	217	115	13
	WEM: Historical trend	290	273	250	226
	Difference %	0%	-20.7%	-54.1%	-94.4%
Rams	Sensitivity Analysis: 10-year trend	11	10	9	7
	WEM: Historical trend	11	10	10	9
	Difference %	0%	-4.8%	-10.9%	-17.8%
Young sheep	Sensitivity Analysis: 10-year trend	68	48	21	0
	WEM: Historical trend	68	67	65	64
	Difference %	0%	-28.4%	-67.3%	-100.0%
Lambs	Sensitivity Analysis: 10-year trend	218	161	83	9
	WEM: Historical trend	218	205	187	168
	Difference %	0%	-21.4%	-55.5%	-94.9%
Total	Sensitivity Analysis: 10-year trend	586	436	228	29

	Scenario	2022	2030	2040	2050
	WEM: Historical trend	586	556	512	467
	Difference %	0%	-21.6%	-55.5%	-93.8%

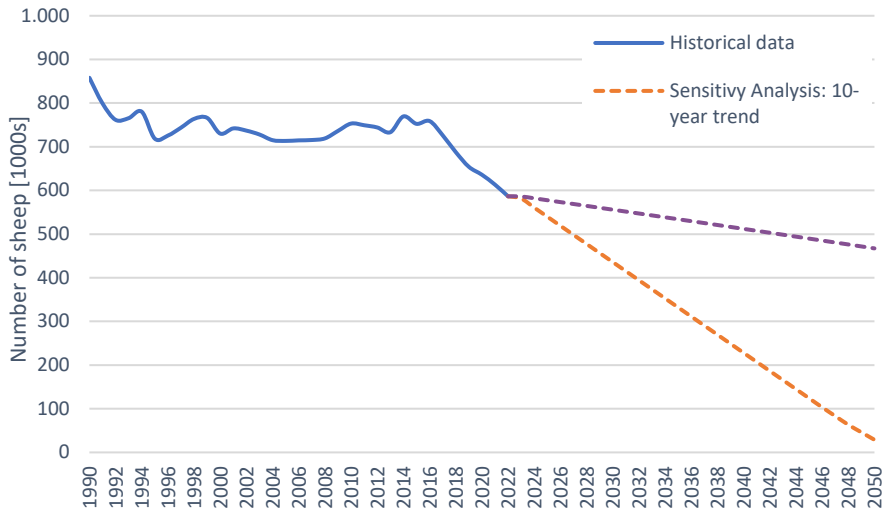

Figure 132.38 Comparison between the number of sheep projected by using the historical trend versus the 10-year trend.

For the various cattle subcategories, livestock projections for the WEM scenario are based on the historical trend. Projections based on the 10-year trend were used for the sensitivity analysis. Projections based on 10-year trend show higher livestock numbers compared to projections based on historical trend. The differences grew significantly larger as the projections stretched further into the future, reaching almost 30% difference in 2050 (see Table 2.38). A visual comparison between different cattle projection scenarios can be seen in Figure 2.39.

Table 5 Projected number of cattle (1,000s) using linear extrapolation: 10-year trend versus historical trend.

	Scenario	2022	2030	2040	2050
Dairy cows	Sensitivity Analaysis: 10-year trend	25.8	26.7	27.2	27.6
	WEM: Historical trend	25.8	23.4	21.7	20.1
	Difference %	0%	14.0%	24.8%	37.4%
Heifers	Sensitivity Analaysis: 10-year trend	5.9	5.2	4.1	3.0
	WEM: Historical trend	5.9	4.8	3.7	2.5
	Difference %	0%	8.9%	12.0%	17.7%
Steers	Sensitivity Analaysis: 10-year trend	22.6	29.1	35.2	41.3

	Scenario	2022	2030	2040	2050
	WEM: Historical trend	22.6	23.7	25.4	27.1
	Difference %	0%	22.4%	38.4%	52.3%
Calves	Sensitivity Analaysis: 10-year trend	21.9	24.8	27.2	29.5
	WEM: Historical trend	21.9	24.3	26.6	28.8
	Difference %	0%	2.0%	2.3%	2.5%
Total	Sensitivity Analaysis: 10-year trend	76.3	85.8	93.6	101.4
	WEM: Historical trend	76.3	76.3	77.4	78.5
	Difference %	0%	12.5%	20.9%	29.1%

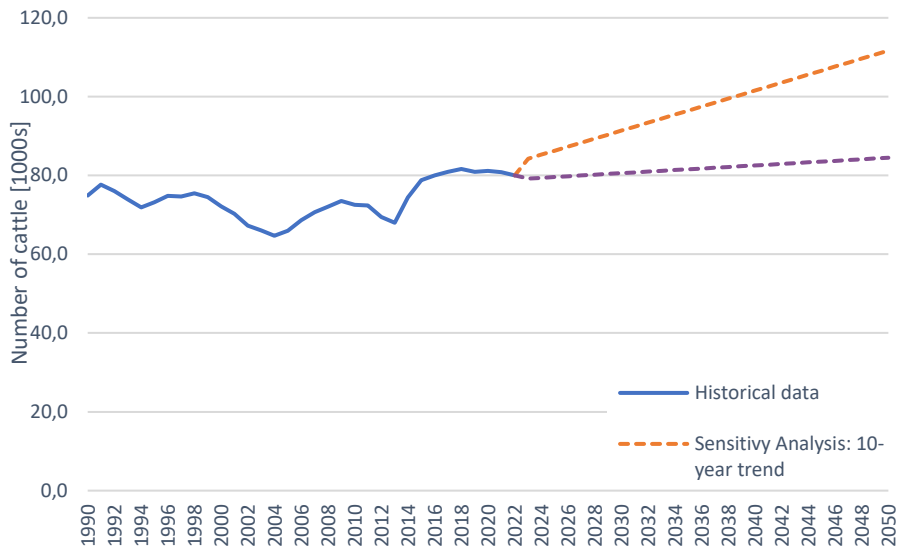

Figure 142.39 Comparison between the number of cattle projected by using the historical trend versus the 10-year trend.

Table 2.40 below shows the results of the sensitivity analysis. In the sensitivity analysis scenario, using 10-year trends to project sheep and livestock populations instead of historical trends, emissions from the Agriculture sector are projected to be 8.6% higher in 2050 compared to the WEM projections scenario used for the sector. The total emissions from the Agriculture sector in the different scenarios can be seen in Figure 2.38 and Figure 2.39 below. The sensitivity analysis scenario, emissions from the Agriculture sector remain very stable throughout the projected time series. The impact of the increase in the number of cattle counteracts the impact of the reduction in the number of sheep, resulting in a minimal change in emissions.

Table 2.40 Sensitivity analysis result: total GHG emissions [kt CO_2e] from Agriculture by projections scenario.

Scenario	2022	2025	2030	2035	2040	2045	2050
Sensitivity Analysis: 10-year trend	612.7	594.9	593.5	592.2	590.9	589.7	588.5
WEM: Historical trend	612.7	585.0	576.4	567.7	559.1	550.6	542.1
Difference in kt CO_2e	0	9.9	17.2	24.5	31.8	39.1	46.5
Difference in %	0%	1.7%	3.0%	4.3%	5.7%	7.1%	8.6%

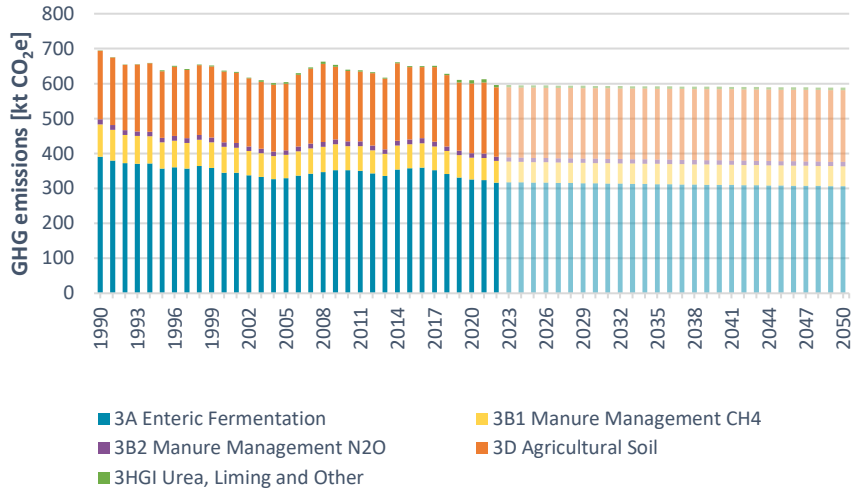

Figure 2.4015 Historical and projected GHG emissions [kt CO_2e] from the Agriculture sector in the sensitivity analysis scenario.

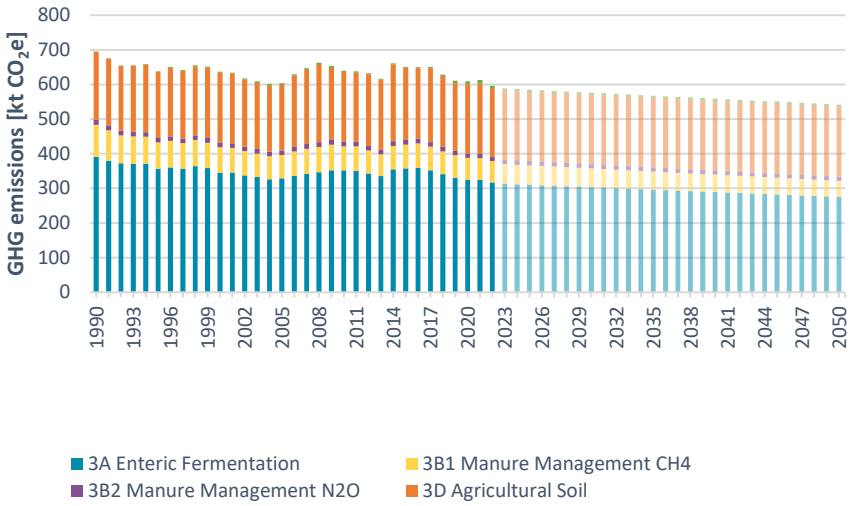

Figure 162.41 Historical and projected GHG emissions [kt CO_2e] from the Agriculture sector in the WEM scenario.

In the WEM scenario, emissions from the Agriculture sector are projected to decrease due to the impact of the reduction in the number of sheep which outweighs the impact of the increase in the number of cattle.

Inorganic N-Fertilizer Activity Data

For the Agriculture sector, Inorganic N-Fertilizer alone is responsible for approximately 8% of GHG emissions from the sector in 2022 and is projected to increase to 10%. For this submission, the WEM projections are based on historical trends, using linear extrapolation. In this chapter, a sensitivity analysis has been performed to assess the impact on emissions from Agriculture of applying a different trend, i.e. a 10-year trend, to the amount of inorganic N-fertilizer use.

The projection based on 10-year trend shows a lower amount of inorganic N-fertilizer use compared to the projections based on the historical trend. The differences grew significantly larger as the projections stretched further into the future, reaching an almost 38% difference in 2050 (see Table 2.41). A visual comparison between different fertilizer use projection scenarios can be seen in Figure 2.44.

Table 2.41 Projected use of inorganic N-fertilizer [t] using linear extrapolation: 10-year trend versus historical trend.

Scenario	2022	2030	2040	2050
Sensitivity Analaysis: 10-year trend	11,185	10,106	8,734	7,361
WEM: Historical trend	11,185	11,803	11,804	11,805
Difference %	0%	-14.4%	-26.0%	-37.6%

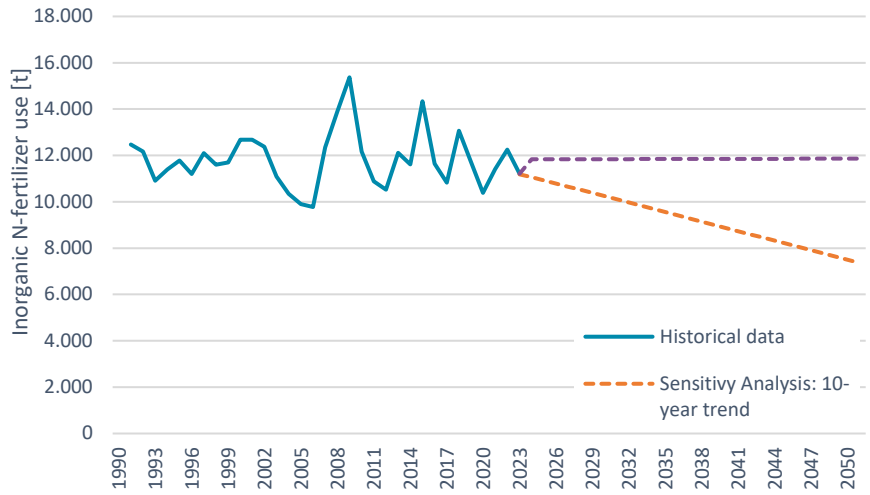

Figure 172.44 Comparison between the projected use of inorganic N-fertilizer: Historical trend versus 10-year trend.

Table 2.42 below shows the results of the sensitivity analysis. Both the sensitivity analysis and WEM scenario show a decrease in emissions from the Agriculture sector throughout the projected time series with the sensitivity analysis showing slightly lower emissions in general, or down to 3.6% lower in 2050. The total emissions from the Agriculture sector in the sensitivity analysis can be seen in Figure 2.45 below while the total emissions in the WEM scenario have already been shown in previous chapter (Figure 2.44).

Table 2.42 Sensitivity analysis results: total GHG emissions [kt CO_2e] in the inorganic N-fertilizer use projections scenario.

Scenario	2021	2030	2040	2050
Sensitivity Analaysis: 10-year trend	612.7	568.9	545.7	522.6
WEM: Historical trend	612.7	576.4	559.1	542.1
Difference %	0	-7.5	-13.5	-19.4
Difference in %	0%	-1.3%	-2.4%	-3.6%

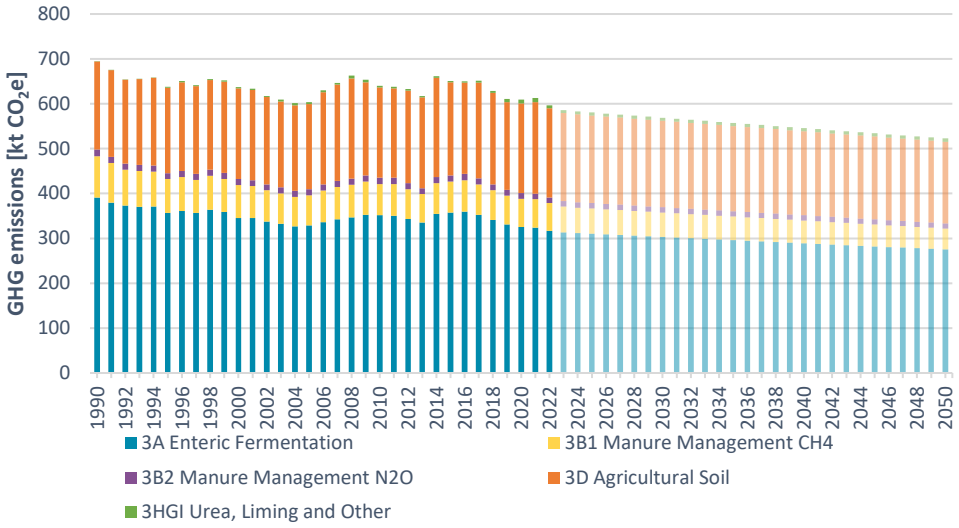

Figure 2.4518 Historical and projected GHG emissions form the Agriculture sector in the sensitivity analysis scenario.

Waste

Waste amount proxy data

Solid Waste Disposal (5A) and Biological Treatment of Solid Waste (5B) are together accountable for 87% of GHG emissions from the Waste sector in 2022. In this chapter, a sensitivity analysis has been performed to assess the impact of applying different proxy data to project the total amount of generated waste, which is one of the key parameters when calculating emissions from the waste sector. For this submission, the total amount of waste for the WEM scenario is projected using a proxy data tool where the projected population growth is used as a parameter, but in the sensitivity analysis the projected GDP is used as a parameter instead.

In the sensitivity analysis scenario, the emissions are projected to be slightly higher than in the WEM scenario. This is because the GDP is projected to keep growing through the timeline, whereas the rate of population growth is projected to slow down after 2026. As the proxy data tool assumes that the amount of generated waste will either follow the trend of GDP or the population growth, the sensitivity analysis scenario resulted in a higher amount of generated waste and, therefore, higher projected emissions.

The difference between scenarios grows larger as the projections stretch further into the future, reaching about a 35% difference in 2050. A visual comparison between the two projection scenarios can be seen in Figur 2.46. Table 2.43 shows the results of the sensitivity analysis for the Solid Waste Disposal (5A) and Biological Treatment of Solid Waste (5B). In the sensitivity analysis scenario, emissions from 5A and 5B are projected to be 51% higher in 2050 compared to the WEM projections scenario used.

Table 2.43 Projected emissions [kt CO_2e] from from Solid Waste Disposal (5A) and Biological Treatment of Solid Waste (5B) using waste amounts calculated based on proxy extrapolation: GDP versus Population.

	Scenario	2022	2030	2040	2050
5A1 Managed waste disposal sites	Sensitivity Analysis: GDP proxy	182.3	114.6	95.6	88.5
	WEM: Population proxy	182.3	106.0	79.0	60.8
	Difference %	0%	8%	21%	45%
5A2 Unmanaged waste disposal sites	Sensitivity Analysis: GDP proxy	17.9	11.9	7.7	5.4
	WEM: Population proxy	17.9	12.1	8.0	5.8
	Difference %	0%	-1%	-4%	-6%
5B1 Composting	Sensitivity Analysis : GDP proxy	3.3	6.5	8.5	10.8
	WEM : Population proxy	3.3	9.0	10.0	10.9
	Difference %	0%	-27%	-15%	-1%

5B2 Anaerobic Digestion	Sensitivity Analysis	0.7	0.8	0.8	0.8
	WEM	0.7	0.8	0.8	0.8
	Difference %	0%	0%	0%	0%
Total	Sensitivity Analysis	204	134	113	105
	WEM	204	128	98	78
	Difference %	0%	5%	15%	35%

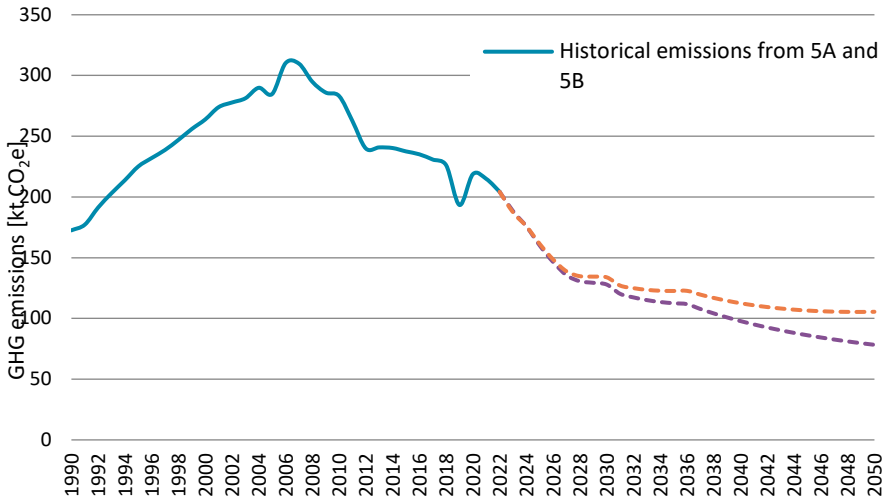

Figure 2.4619 Comparison of the projected GHG emissions [kt CO2e] from Solid Waste Disposal (5A) and Biological Treatment of Solid Waste (5B) using waste amounts calculated based on proxy extrapolation: GDP versus Population.

Table 2.44 below shows the result of the sensitivity analysis. In the sensitivity analysis scenario, emissions from the Waste sector are projected to be 25% higher in 2050 compared to the WEM projections scenario used for the sector. The total emissions from the Waste sector in the different scenarios can be seen in Figure 2.47 and Figure 2.48 below.

Table 2.44 Sensitivity analysis result: total GHG emissions [kt CO_2e] from Waste by projections scenario.

	2022	2030	2040	2050
Sensitivity Analysis:	233.6	163.6	142.8	136.2
WEM:	233.6	157.7	128.1	109.0
Difference in kt CO_2e	0	6.0	14.7	27.2
Difference in %	0%	3.8%	11.5%	25.0%

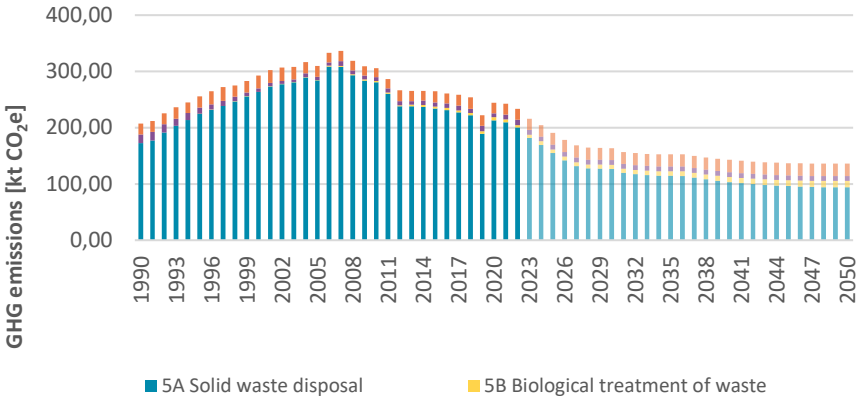

Figure 2.4720 Historical and projected GHG emissions [kt CO_2e] from the Waste sector in the sensitivity analysis scenario.

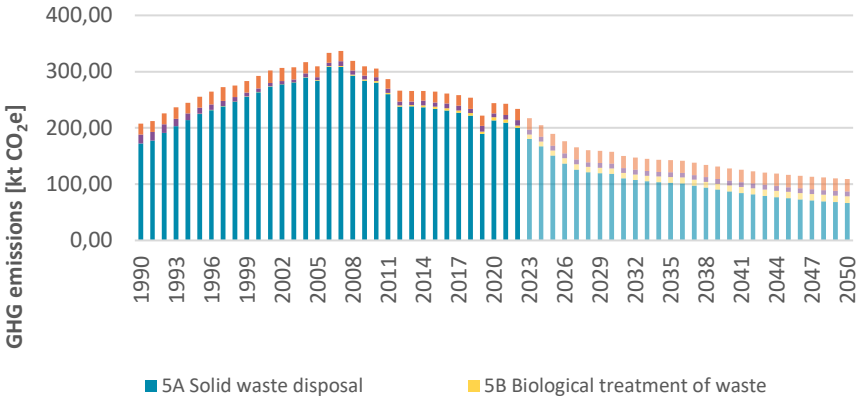

Figure 2.4821 Historical and projected GHG emissions [kt CO_2e] from the Waste sector in the WEM scenario.

Wastewater Activity Data

Projections from Wastewater Treatment and Discharge (5D) are based predominantly on population and on wastewater treatment. As the allocation of treatment pathways is a big determinant of GHG emissions from 5D, a sensitivity analysis has been performed to assess the impact on emissions of applying different trends to the allocation of treatment pathways. In the WEM scenario the allocation of treatment pathways is kept constant, based on the numbers in the 2020 status report on wastewater treatment in Iceland (EAI, 2022), whereas projections based on the historical trend of wastewater pathways is used in the sensitivity analysis.

In the sensitivity analysis, the emissions are slightly lower than the WEM scenario as the linear trends are slowly moving towards better treatment systems. The differences grew larger as the projections stretched further into the future, reaching about -0.09% difference in 2050 (see **Table 2.45).** A visual comparison between the two projection scenarios can be seen in Figure 2.49.

Table 2.45 Projected emissions [kt CH_4] from Municipal Wastewater (5D1) using data from the last historical year as a constant versus a linear extrapolation of the historical trend.

	Scenario	2022	2030	2040	2050
5D1 Municipal wastewater kt CH_4	Sensitivity Analysis: linear extrapolation	0.226	0.255	0.265	0.274
	WEM: constant	0.226	0.255	0.266	0.274
	Difference %	0%	-0.02%	-0.05%	-0.09%

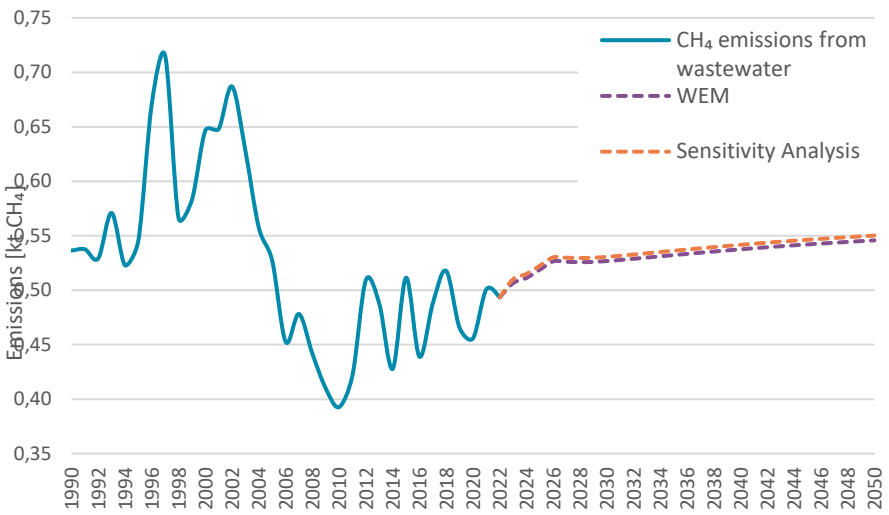

Figure 2.4922 Comparison of the projected emissions [kt CH_4] from Municipal Wastewater (5D1) using data from the last historical year as a constant versus a linear extrapolation of the historical trend.

Table 2.46 shows the results of the sensitivity analysis for Wastewater Treatment and Discharge (5D). In the sensitivity analysis scenario, emissions from 5D are projected to be only 0.1% lower in 2050 compared to the WEM projections scenario used. Since the difference in total emissions is so slight, no visual comparison has been included.

Table 2.46 Sensitivity analysis result: total GHG emissions [kt CO_2e] from Waste by projections scenario.

	2022	2030	2040	2050
Sensitivity Analysis [kt CO_2e]	233.6	157.8	128.2	109.1
WEM [kt CO2e]	233.6	157.7	128.1	109.0
Difference [kt CO2e]	0	0.1	0.1	0.1

3. Information related to climate change impacts and adaptation under Article 7 of the Paris Agreement

Iceland is committed to addressing the impacts of climate change in alignment with Article 7 of the Paris Agreement, focusing on adaptation measures that respond to its unique national circumstances. Under the framework of the Paris Agreement, particularly as outlined in paragraphs 13-14 and 106-117 of the Modalities, Procedures, and Guidelines (MPGs).

Iceland has started to evaluate the impacts, risks, and vulnerabilities (para. 107), identifying adaptation priorities and barriers (para. 108), and developing strategies, policies, plans, and actions to integrate adaptation into national policies (para. 109). Additionally, Iceland is dedicated to monitoring and evaluating its adaptation efforts, which will be implemented through the process of developing the National Adaptation Plan currently underway (paras. 112–114). Iceland is actively working to avert, minimize, and address loss and damage associated with climate change impacts (para. 115).

Iceland emphasizes cooperation, sharing good practices, and learning from international experience (para. 116), while also providing additional relevant information related to climate change adaptation under Article 7 of the Paris Agreement (para. 117). Iceland has a comprehensive strategy on adaptation that aims to enhance resilience, minimize climate-related vulnerabilities, and ensure sustainable development in the face of evolving environmental challenges.

1. National circumstances, institutional arrangements, and legal frameworks

National circumstances and institutional arrangements

Iceland is a large island located at the confluence of the North Atlantic and Arctic Oceans with a land area of some 103 thousand square kilometers, a coastline of 4,970 kilometers, and a 200-nautical-mile exclusive economic zone extending over 758 thousand square kilometers in the surrounding waters. Iceland is prone to a multitude of hazards, including extreme storms, floods, earthquakes, volcanic eruptions, landslides, and avalanches.

Climate change is contributing to shifts in the magnitude and scale of hazards and the emergence of risks in areas where they were previously unknown.

The economy relies inter alia on fisheries and tourism, and therefore potential impacts on these industries because of climate change are of high importance.

The Ministry of the Environment, Energy and Climate is responsible for the issue of climate change adaptation.

According to a new regulation (no. 786/2024) on the Interministerial Climate Change Committee (ICCC) [61], consisting of representatives from all ministries and a representative from the Association of Local

[61] https://island.is/reglugerdir/nr/0786-2024

Authorities in Iceland (ALAI), is responsible for formulating actions for the National Adaptation Plan and ensuring their implementation.

The Icelandic Met Office operates the national knowledge center for climate change adaptation (NKCCCA) supported by an Office for Climate Services and Adaptation, which is responsible for the coordination and communication of information related to the impacts of climate change. The center also strives to generate knowledge and build tools for the municipalities to develop adaptation measures.

One of its ongoing projects is the creation of the Icelandic Climate Atlas providing recognized scenarios of how climate change will affect Iceland. Alongside the creation of the Atlas, the Center is taking part in a project that involves a pilot program with four municipalities to create guidelines for adaptation planning at the municipal level.

Following recommendations from the Ministry for the Environment, Energy and Climate, the Icelandic Meteorological Office is preparing a preliminary vulnerability assessment for Iceland, expected to be completed by March 2025. This assessment will serve as a foundation for Iceland's adaptation plan. Simultaneously, the Meteorological Office is developing a comprehensive, long-term project plan for vulnerability and risk assessment in Iceland, which will span multiple years and include contributions from various institutions.

Moreover, an Office for Natural Hazards at the Met Office oversees monitoring of many climate-related natural hazards and frequently in collaboration with the Icelandic Avalanche and Landslide Disaster Fund operated by the Ministry of the Environment, Energy and Climate. In addition, many governmental research institutes also play a role in monitoring the impacts of climate change, such as the Marine and Freshwater Research Institute and the Icelandic Institute of Natural History.

In October 2023, the Icelandic scientific committee published the fourth scientific report on the impacts of climate change in Iceland. This report marked the conclusion of the fourth assessment cycle for Iceland, and the committee completed its duties. The new National Committee on Scientific Work Regarding Climate Change, appointed in December 2024, is responsible for making a proposal to the minister concerning the activities and composition of scientific working groups for the next reports, following the model of the IPCC working groups.

In June 2024, a new Climate Council was appointed in line with a new regulation (no. 334/2024)[62], which, among other things, sets provisions regarding the maximum number of appointed representatives and competency criteria. The Climate Council is now composed of nine representatives. These individuals have extensive experience and knowledge in climate issues and collectively meet all the established competency criteria.

The Climate Council shall provide the government with oversight and advice on strategic decisions and Iceland's objectives related to climate issues. The Climate Council shall maintain impartiality and operate independently in its work. Representatives on the Climate Council shall be bound only by their own

[62] 334/2024 – Reglugerð um loftslagsráð.

judgment. All these actors and stakeholders are key to the design of adaptation measures that are built on the best available science.

3.1.1 Impacts, risks, and vulnerabilities, as appropriate

a) Current and projected climate trends and hazards

The Icelandic Meteorological Office (IMO) is a governmental institute responsible for producing regular and specific weather forecasts. It conducts monitoring and scientific studies of geohazards and hazard zoning in Iceland. It is involved with several kinds of research within the fields of meteorology, hydrology, and geosciences, and has a leading role in climate change studies in Iceland both in research and in its role as an advisory body to the government. It conducts glaciological measurements and modelling with a special focus on glacio-hydrology. Both the Marine and Freshwater Research Institute (MFRI) and the Icelandic Meteorological Office (IMO) contribute to ocean climate observations.

Temperature in Iceland exhibits large inter-decadal variations. The longest continuous temperature record comes from Stykkishólmur on the west coast of Iceland. Statistical treatment of data from this station and of non-continuous measurements at other locations in Iceland, allows this record to be extended back to 1798. This record shows that during the 19th century, temperatures were cooler than in the 20th century, and that the magnitude of inter-annual variations in temperature were larger. Since the 1980s, Iceland has undergone significant warming, with the first two decades of the 21st century displaying notably higher mean temperatures compared to the decades of the 20th century (3.1). While there are pronounced inter-decadal temperature swings in Iceland, the long-term warming rate is similar to the global average, suggesting that the rapid warming in the recent decades is a combination of local variability and large-scale background warming. Since the late 19th century, temperatures have increased by approximately 1°C per century, with a more pronounced rise during winter (1.4°C per decade) compared to summer (0.7°C per decade). Additionally, there has been an increase in precipitation, leading to extreme events such as floods and landslides.

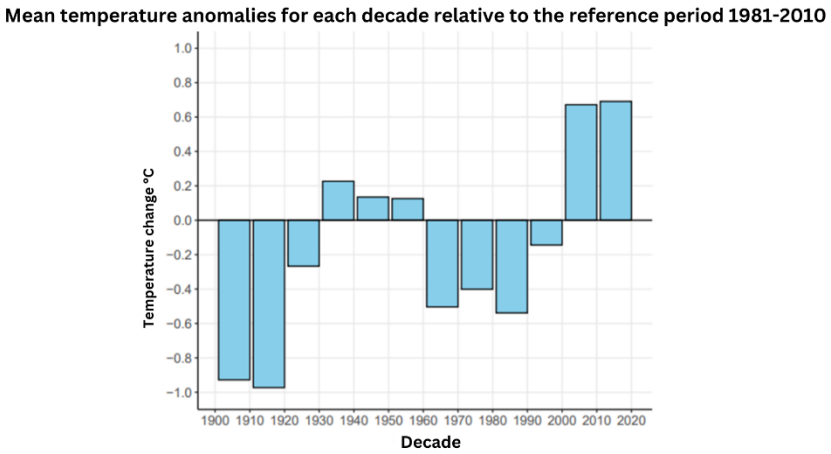

Figure 3.1 Mean temperature anomalies in Iceland from the beginning of the 20th century. The picture shows the mean temperature for each decade relative to the reference period 1981-2010. The picture shows data from seven meteorological stations around Iceland (source: Icelandic Scientific Committee on Climate Change 2023)[63].

The IMO has taken part in research projects where downscaling is used to generate projections of future climate change. In these studies, a numerical weather forecast model, or a regional climate model is used to refine for a limited area the projected climate changes from a global climate model.

Climate modelling has simulated the warming observed in Iceland and its surroundings over recent decades, considering the historical rise in greenhouse gases. When models are run with greenhouse gas concentrations held constant, they do not replicate the warming that has taken place in recent years. The projected warming by mid-century ranges from 1.0 to 1.7°C (with a range of -1.1 to 2.6°C) relative to the reference period of 1986-2015. Up until mid-century, there is not significant difference in warming among the various greenhouse gas emission scenarios.

As we approach the end of the century, the differences between the various scenarios increase. In the warmest scenario, projected warming in Iceland and surrounding areas could reach 3.5°C (ranging from 2.3 to 5.4°C), while the coldest scenario predicts a rise of only 1.0°C (with a range of -1.0 to 4.1°C). Of the four scenarios analysed, the warmest and coldest are unlikely to materialize. For the intermediate scenarios, the expected warming by the end of the century ranges from 2.0 to 2.8°C (with a potential range of 0.0 to 5.4°C) (Figure 3.2).

[63] Loftslagsbreytingar

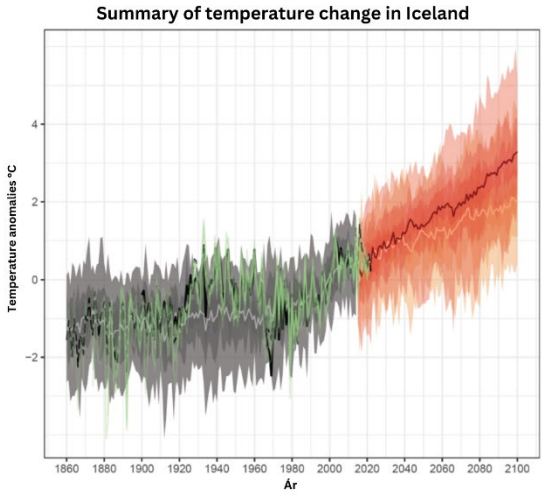

Figure 3.2 Summary of temperature changes in Iceland. Historical runs, intermediate scenarios (SSP2-4.5 and SSP3-7.0). Actual temperature changes (BEST and ERA20C) are marked in black and weather stations in Iceland are in green. Temperature anomalies are calculated based on the period 1986–2015. (source: Icelandic Scientific Committee on Climate Change 2023).

Models show disagreement regarding changes in precipitation by the end of the century; however, a 1% increase in precipitation is anticipated for each degree of warming. Results suggest that the increase will be more pronounced in autumn, while late winter will see the smallest rise. Additionally, precipitation intensity is expected to increase, with extreme precipitation potentially rising by 5 to 15%. This translates to an increase of approximately 4 to 15 mm of rainfall every 24 hours compared to current levels in most areas, with even larger increases in regions that already experience the highest extremes.

In warmer climate scenarios, the frequency of what is currently considered a 100-year precipitation event will increase, reducing the return period to just 12 to 17 years. Climate models indicate that warming will be more pronounced in the north, while less intense in the south. Although warming is projected in all scenarios throughout the century, some areas may experience localized cooling, particularly in southern Iceland. This cooling is expected to be less common and shorter in duration in the warmer scenarios.

The North Atlantic has experienced significant warming over the past few decades, but sea temperature fluctuations around Iceland have been more variable. In the early 2000s, there was a notable cooling trend southwest of Iceland, though this cooling is no longer as prominent today.

Icelandic glaciers have lost 19% of their total area since their maximum extent at the end of the 19th century. A few glaciers have completely disappeared, and as the glaciers continue to retreat, existing lagoons have expanded, while new ones have formed in the areas left behind.

Calculations based on climate change scenarios predict that, even if the Paris Agreement targets are met, Iceland's glaciers could still retreat by 40-50%. If greenhouse gas emissions are not reduced as outlined in the agreement, the glacial retreat will be even more severe.

Sea level changes around Iceland will be influenced by several factors: changes in land elevation, ocean warming, and the mass loss from the Antarctic and Greenland ice sheets. A major source of uncertainty lies in the future behaviour of the Antarctic ice sheet, especially from the 21st century onward, which could significantly impact global sea levels.

By the end of the century, relative sea levels around Iceland could rise by as much as 1.2 meters in areas experiencing the most land subsidence. Conversely, in regions where the land is rising, relative sea levels could decrease by up to 1.5 meters.

Great uncertainty is about the development of global sea levels and the sea levels around Iceland after 2100. Worst case scenarios show a rise of up to many meters after 2150, but the median values of the sea level rise are around 1-2 meters around Iceland and less than one meter in some places.

There is significant uncertainty regarding the development of global and local sea levels around Iceland after 2100. In the worst-case scenarios, sea levels could rise by several meters by 2150. However, median projections suggest a sea level rise of around 1-2 meters around Iceland, with some areas potentially experiencing less than one meter of rise.

b) Observed and potential impacts of climate change, including sectoral, economic, social and/or environmental vulnerabilities.

The Minister of Environment, Energy and Climate has since 2000 appointed ad-hoc scientific committees, headed by the Icelandic Meteorological Office, tasked with evaluating the effects of climate change in Iceland. The most recent report, issued in October 2023, maintains the tradition of addressing climate change effects on glaciers, agriculture, land management, forestry, and terrestrial ecosystems, as seen in previous reports. Notably, this latest report amplifies its focus on the influence of climate change on social factors within the context of culture and education, the healthcare system, public health, and various sectors, surpassing the level of attention given in earlier reports. Additionally, the report recognizes the diverse risks that Iceland confronts due to climate change, particularly in terms of cascading and systematic risks, with a special emphasis on cross-border risks. Identifying gaps in knowledge, research, and monitoring pertaining to climate change impacts, the report also advocates for actions to foster further development in the field.

3.1.2 Observed impacts

Terrestrial

Climate change has had significant effects on the distribution of species. For example, the warming climate has contributed to enabling imported insect species to establish themselves here and has led to changes in the distribution of native species.

Short-term weather extremes can, in some cases, have a greater impact than long-term average changes. An example of this in Iceland is the negative effects of weather extremes on the presence of ptarmigan and falcon. The significant increase in the fox population in recent decades has been linked to a warming climate. In recent years, there have been indications of a decline in the species' presence in certain areas, which could possibly be attributed to climate-driven changes in its food sources.

Freshwater ecosystems

The population of Arctic char is declining in most regions, while the populations of trout are increasing, and salmon populations remain relatively stable. Warming is considered an important factor, as Arctic char is a cold-water species and thrives at lower optimal temperatures than the other two species.

There are indications that the warming of the sea is contributing to the increase in the number of lumpfish in the North Atlantic. In Iceland, there has been a considerable rise in lumpfish catches.

Oceanic ecosystems

Rising temperatures on the Icelandic continental shelf have led to changes in the distribution of many fish species. Species like cod, which have been at the northernmost limits of their range in Icelandic waters, primarily found in warmer waters to the south and west of the country, have expanded their range to the northeast. At the same time, the population sizes of cold-water species such as haddock, capelin, and herring have decreased, and their distribution areas have shifted.

Since 2006, the feeding grounds of mackerel have expanded from the Norwegian Sea to Icelandic waters. At the same time, the summer feeding grounds of capelin have shifted westward from the Icelandic Sea, up to the continental shelf off East Greenland.

The recruitment of many warm-water species, such as lobster, blue whiting, and skate, has significantly decreased in recent years. This negative trend can be attributed, among other factors, to changed environmental conditions in the sea over the past 20 years. These are species that mainly inhabit warm waters along the southern and western coasts.

There has been a shift in the distribution of many whale species around the country, along with an increase in population sizes. The minke whale is now mainly found further offshore to the north of the country, rather than on the continental shelf. The population of most baleen whale species has increased in the past 20 to 30 years due to environmental changes and reduced fishing pressures. The decline in seal populations can be attributed to heavy fishing pressures.

The populations of seabirds around the country have been declining in recent years. In some cases, this can be indirectly linked to environmental changes in the surrounding sea. Changes in the populations of prey species, such as sand eel and capelin, have led to poor breeding success for seabirds.

Public health

In Iceland, there is already considerable knowledge about the effects of natural disasters on individuals and communities. According to a recent study, around 20% of adults reported experiencing significant environmental anxiety, with the highest percentage found in the age group of 30 years and younger. It is essential to increase knowledge about the impacts of climate change on public health in the broadest sense within the Icelandic context for various climate scenarios. This refers to various impact factors that are well-known cornerstones of public health, including changes in disease burdens and well-being.

Infrastructure

Climate change is already affecting various infrastructures in Iceland, prompting responses from institutions and businesses.

Changes in precipitation, increased weather fluctuations, more thaw days, and rising groundwater and sea levels are affecting the functionality of drainage systems. There is also an interaction of factors, such as when higher sea levels and increased rainfall intensity raise the likelihood of backflow in pipes. For combined drainage systems, the effects can be worse than in separated systems, where stormwater and sewage are not in the same pipes. Blue-green stormwater solutions have proven important in reducing flood risk associated with heavy rainfall.

Flood events in Iceland, caused by rainfall falling on frozen ground or snow, are an increasing problem for drainage systems, with the associated flood risk.

Glacier retreat due to climate change has a significant impact on hydroelectric power generation in Iceland. The increase that has already occurred has been utilized in the current hydroelectric systems and their reservoirs. The development of further increases is uncertain, but its utilization depends on the infrastructure development in line with the resource's evolution.

Natural hazards
The latest report indicates that climate change is intensifying natural hazards. These include more extreme precipitation, stronger storms, an increased risk of flooding in rivers and glacial lagoons, more frequent landslides, and sea floods, as well as a higher likelihood of volcanic eruptions and wildfires.

3.1.3 Potential impacts and vulnerabilities

Natural hazards
Changes in sea level, along with an increase in natural hazards such as storms, river floods, landslides, and forest fires, can significantly impact communities and their ability to adapt. Additionally, glacial retreat introduces new risks, as unstable slopes collapsing into glacial lagoons can trigger tsunamis.

Fresh water
Climate change can impact access to clean water and its quality. Factors such as droughts, heavy rainfall, unpredictable weather patterns, floods, and rising sea levels can disrupt water supply, collection, and distribution, ultimately affecting drinking water availability. These changes also increase the risk of contamination by pathogens and saline intrusion, as well as shifts in groundwater levels. Smaller water systems are particularly vulnerable to these challenges.

Drainage systems
Shifts in precipitation patterns, greater weather fluctuations, an increased number of thaw days, rising groundwater levels, and sea level rise all impact the effectiveness of sewage systems. These challenges are particularly pronounced for combined drainage systems. Additionally, rainfall on snow is becoming an increasingly problematic issue for drainage infrastructure.

Planning
Rising sea levels and the increase in natural hazards can severely impact properties and infrastructure, leading to significant consequences for individuals, businesses, and communities.

Transport
Climate change leads to higher road maintenance demands and a reduced lifespan for road surfaces. The risk of flooding poses a growing threat to transport infrastructure of all kinds. For aviation infrastructure, the impacts are particularly related to increased flooding risks, potential damage from rising sea levels, and a greater frequency of storm surges.

Buildings
Climate change impacts the design, construction, and maintenance of buildings and their surroundings, whether for new developments or refurbishments. Key challenges include heightened flood risks, increased precipitation, more frequent freeze-thaw cycles, and greater weather intensity.

Insurance
Weather-related damage significantly impacts the operations of insurance companies, as such events often result in increased claims for personal injuries or property damage. The frequency and severity of these damages are expected to rise, with shorter intervals between natural disasters. Additionally, climate-related events in other countries can affect domestic insurers through reinsurance agreements with foreign companies, creating a broader financial risk.

Energy
Climate change affects the reliability and efficiency of energy systems. Glacial retreat, droughts, and seasonal shifts in precipitation patterns, including changes in the ratio of rain to snow, significantly impact hydroelectric power generation. Variations in storm frequency can influence wind power productivity, while rising summer temperatures may enhance the potential for cultivating energy crops. Additionally, climate change can disrupt the energy grid, reducing its overall efficiency and resilience.

Agriculture
A warming climate could improve growing conditions for agriculture and forestry in Iceland. However, it also poses several risks, such as more variable and extreme weather events, and the spread of pests and diseases. Icelandic livestock is especially vulnerable, as it relies heavily on imported fodder, making it susceptible to supply chain disruptions.

Fishing industry and fish farming
Marine ecosystems are already being affected by climate change alongside other pressures. Changes will continue, with rising temperatures likely to change species and their distribution. The changes will present both threats and opportunities to our commercial fisheries and aquaculture. The challenges for aquaculture include local changes in the growth rate of aquaculture species, new diseases and parasites, and changes in productivity.

Tourism
The impact of climate change on tourism is driven by changes in the natural environment, landscape, natural hazards, and shifts in demand. Travel to northern countries may increase, although climate action and negative attitudes toward long-distance travel may simultaneously reduce demand.

Financial sector
Financial activities can be affected by climate change. The impacts can be divided into physical risks, such as damage to assets, and transition risks arising from actions to reduce greenhouse gas emissions or adaptation measures. Climate change can influence pricing, financial stability, and the security of the financial system. Climate risks in general banking activities involve increased financial uncertainty, risks, and higher costs related to investments and lending.

National economy and labour market
The consequences of climate change can impact the safety and livelihoods of individuals and families. Economic reliance on a narrow range of industries increases the likelihood that the effects of climate change on specific sectors may lead to economic shocks and/or displacement effects within the economy, with corresponding impacts on the national economy and labour market, thereby increasing systemic risks to the economy in the event of disruptions. The effects of climate change abroad also create significant

systemic risks domestically, for example, through impacts on supply chains, food security, and public health.

Public health

Climate change can increase the prevalence of both infectious and non-infectious diseases. It is only a matter of time before tick-borne diseases begin to spread to humans in Iceland. Higher concentrations of pollen in the air can exacerbate existing allergy cases and lead to new ones. Vulnerable and marginalized groups are generally at a greater disadvantage when it comes to the impacts of climate change.

Ecosystems and biodiversity

Climate change affects the health of the natural environment. The impacts of climate change on Iceland's nature are evident and widespread, with all indications pointing to their continued intensification. Ongoing warming will alter ecosystems. Native species may struggle and even disappear, while non-native species will find it easier to spread. It is almost certain that some of these will become invasive in the country's natural environment.

Transboundary risks

The effects of increased instability in the global commodity market due to weather-related extreme events impact the supply and pricing of goods. Icelandic agriculture and food security are vulnerable to disruptions in supply chains abroad. The impacts of climate change abroad create significant systemic risks domestically, such as through effects on supply chains, food security, and public health.

c) Approaches, methodologies, and tools, and associated uncertainties and challenges, in relation to paragraph 107 (a) and (b) above.

The Office for Climate Services and Adaptation at the Icelandic Meteorological Office is currently working on the Icelandic Climate Atlas, aimed at all sectors of society, regardless of the field, to gain insights into the future. It is particularly valuable for assessing risks and vulnerabilities to climate change, thus supporting decision-making and policy development in light of a changing future.

The atlas is based on scenarios from the Intergovernmental Panel on Climate Change (IPCC) and presents recalculations of these scenarios for Iceland and the surrounding seas. The scenarios outline the impacts of global climate change on Iceland and its surrounding waters, providing an idea of what conditions may arise in relation to global warming through the 21st century.

The atlas offers access to information on key variables such as temperature, precipitation, and sea level, for various future time periods. These variables are presented for three different emission scenarios of greenhouse gases.

The government is actively involving municipalities and regions to facilitate the integration of the adaptation policy cycle at the municipal level. Presently, the Icelandic Regional Development Institute is leading a collaborative project with the Met Office and the National Planning Agency. This project aims to pilot an approach for assessing local climate change impacts and vulnerability while establishing climate change adaptation within the municipal governance structure. The evaluation tools are derived from various tools developed by countries and regions for assessing regional risks, in addition to the Regional Adaptation Support Tool (RAST) developed by the EU.

Furthermore, Iceland is embarking on a project to assess vulnerability across different sectors as part of its work on its first NAP.

3.1.4 Adaptation priorities and barriers (para. 108 of the MPGs)

a) Domestic priorities and progress towards those priorities

Iceland recently re-appointed its inter-ministerial Climate Change Committee, and for the first time, the appointment includes a mandate on supervising the creation of Iceland's first National Adaptation Plan, which the committee intends to approve for cabinet approval in June 2025. Iceland sees this committee as key in establishing its formal adaptation priorities.

A preparatory report on the structure and content of Iceland's National Adaptation Plan proposed 93 recommended actions across 14 sub-categories to guide the development of adaptation measures and the monitoring of progress. Current and planned initiatives emphasize enhanced climate services, natural hazard management, and support for municipalities as key priorities in Iceland's adaptation efforts. Sector-specific priorities are expected to become clearer once the first National Adaptation Plan is approved.

To streamline the categorization of adaptation measures and facilitate applications for EU funding, Iceland has grouped its measures into three main domains: Environment, Wellbeing, and Safety. These overarching domains will encompass the previously defined sub-categories and serve as a framework for monitoring and evaluation.

b) Adaptation challenges and gaps, and barriers to adaptation

The Scientific Committee on Climate Change identifies challenges and gaps, and barriers to adaptation.

Regular monitoring and analysis of nature, biodiversity, and society are currently insufficient to track the changes brought about by climate change. There is a gap in securing adequate funding and resources, which is essential for this task. While collaboration between different scientific groups and open access to data are key factors, these practices are not yet fully established to ensure that results are widely applicable. Securing funding for climate action, including adaptation, remains a significant challenge.

The effects of climate change on terrestrial ecosystems are already evident and widespread, with measurements indicating that these impacts are continuously increasing. However, research is not keeping pace with these rapid changes, and there is a lack of collaboration between groups in terms of measurements, monitoring, analysis, and modelling to address this.

The committee points out the importance of planning in the cultivation of new recreational developments, agriculture, and forestry. When assessing new areas, consideration of neighbouring regions, the spread of introduced species, and impacts on biodiversity is often overlooked.

The effects of climate change and ocean acidification are expected to place increasing stress on marine ecosystems in the coming decades. Effective fisheries management is hindered by the lack of continuous research and monitoring, which is necessary to ensure sustainability.

Risk assessment and risk management remain underdeveloped components of climate change adaptation. Climate risks across sectors and social groups have not been adequately identified, hindering the implementation of appropriate mitigation actions. The financial and insurance sectors have a crucial role, but they are not sufficiently integrated into the adaptation process.

Municipalities in Iceland are currently not equipped to address the challenges posed by climate change. They lack the necessary funding, data, and tools to fulfil their responsibilities. The absence of increased collaboration between the government and municipalities further limits their capacity to act effectively.

The lack of clear objectives, guidelines, incentives, and support for local planning authorities highlights a gap in establishing the foundations for climate-resilient planning. Additionally, insufficient consideration of increasing natural hazards in planning processes presents a significant barrier to effective adaptation and risk management.

A comprehensive understanding of the economic, industrial, and societal impacts of climate change remains limited, hindering the ability to implement effective and well-informed climate actions. There is a notable lack of research focused on the economic effects of climate change and the appropriate responses to mitigate them, which presents a significant barrier to strategic planning.

Climate change is already exerting pressure on various built infrastructure systems, such as transportation networks, water supply systems, wastewater management, and energy production and distribution. Smaller water supply systems, along with the communities that depend on them, are particularly exposed and vulnerable. The absence of thorough evaluations of changes in demand, risk exposure, and prioritization processes for necessary interventions highlights a critical gap in preparing these systems for future challenges.

Knowledge of systemic risks related to climate change, including the impacts in other countries and their consequences for Icelandic society, is severely lacking. The development and implementation of response plans to address these risks are therefore inadequate.

The understanding of the social and cultural dimensions of climate change is also limited, posing a barrier to ensuring justice, supporting democracy, and enhancing climate action. The lack of research in this area is significant, making it urgent to strengthen studies and data collection to better address these issues.

There is a notable gap in understanding the impacts of climate change on public health, the healthcare system, and society at large. Although global awareness is increasing, and there is a growing understanding of health determinants in Iceland, the necessary research and knowledge-building efforts remain insufficient. Demographic changes, including population trends and the impact of climate refugees, have not been sufficiently considered in this context.

3.1.5 Adaptation strategies, policies, plans, goals and actions to integrate adaptation into national policies and strategies (para. 109 of the MPGs)

Legal frameworks

In 2019, Iceland adopted new provisions to its 2012 Climate Change Act on the preparation of a plan on the adaptation of Icelandic society to climate change. As a first step towards this end, Iceland adopted its first National Adaptation Strategy (NAS) in 2021, following a white paper on climate change adaptation produced by an expert working group on the issue. The work was furthermore based on Iceland's reports on the impacts of climate change in Iceland and a discussion paper on adaptation by Iceland's Climate Council.

In fall 2023, a steering group finished its work on a proposal to the Minister of Environment, Energy and Climate on the governance and modalities of the National Adaptation Plan. The plan was formed through stakeholder engagement, with expert workshops used to aggregate risks and identify potential adaptation measures in different sectors of society, based on the NAS.

Iceland is closer to finalizing its first National Adaptation Plan with the appointment of the Interministerial Climate Change Committee (ICCC). In line with regulation no. 786/2024, the committee is responsible for

developing proposals for the adaptation plan and overseeing their implementation. The adaptation plan shall establish a policy with the government's long-term vision for adapting to climate change.

The committee shall consider risks and vulnerabilities resulting from the impacts of climate change on the adaptation plan's sectors, with regard to the resilience of infrastructure, population groups, ecosystems, and in line with reports from scientific committees on climate change in Iceland.

The adaptation plan shall cover a five-year period and be comprehensively reviewed at least every four years.

Vulnerability analysis

The Icelandic scientific reports on climate change, published in 2000, 2008, 2018, and 2024, have offered a mapping of potential vulnerabilities because of impacts from climate change.

Member states of the European Union are required to submit a report on climate change adaptation through the European Environment Agency's data submission portal, in accordance with Regulation (EU) 2018/1999. Provisions regarding this submission were not included in the EEA Agreement and have therefore not been incorporated into Icelandic legislation.

As a result, it is optional for Iceland to submit information on adaptation through the portal. The reporting is linked to the presentation of information on the status of adaptation across Europe. Since Iceland has drawn on European adaptation work for the organization of its data and plans, information on adaptation was submitted on a voluntary basis through the European portal in 2023. This submission was viewed as an experiment to familiarize Iceland with the system and assess the benefits of participating in formal reporting. The next submission to the portal will take place in 2025.

Following recommendations from the Ministry for the Environment, Energy and Climate, the Icelandic Meteorological Office is preparing a preliminary vulnerability assessment for Iceland based on requirements in the Reportnet database, expected to be completed by March 2025. This assessment will serve as a foundation for Iceland's adaptation plan. Simultaneously, the Meteorological Office is developing a comprehensive, long-term project plan for vulnerability and risk assessment in Iceland, which will span multiple years and include contributions from various institutions.

Avalanche and landslide risk

The framework for the avalanche and landslide risk assessments is structured through laws and regulations.

The Icelandic Avalanche and Landslide Committee is an advisory committee under the authority of the Minister of the Environment, Energy and Climate. It oversees the preparation of hazard assessments and decision-making regarding protection measures in urban residential areas that are at risk from avalanches and landslides. These projects are primarily funded by the Icelandic Avalanche and Landslide fund. The fund is financed by the government.

The role of the Icelandic Avalanche and Landslide Committee, according to the Act on Protective Measures Against Avalanches and Landslides, is:

- To discuss and take a position on local government proposals for the construction of defensive structures in dangerous areas.

- Taking a stand on proposals for the purchase or transfer of real estate or other valuables instead of building fortifications or using other defensive measures.
- To make proposals to the Minister of the Environment, Energy and Climate for financial support from the Avalanche and Landslide Fund for the projects mentioned above.

The municipal constructions discussed by the Icelandic Avalanche and Landslide Committee must be approved by the Minister of the Environment, Energy and Climate. Thus, municipalities cannot incur financial obligations before the approval is available. Construction projects are prioritized in consultation with the relevant municipality, the Icelandic Meteorological Office, and advisors, on the bases of a comprehensive assessment of the vulnerability in urban areas and needs for avalanche protection in Iceland from 1996.

Since the Icelandic Avalanche and Landslide Fund was established in 1996, avalanche and landslide protections, including the purchase of properties that will not be protected, have been constructed in a total of 15 urban areas, and 8 of them have been completed. It is the government's policy that all avalanche and landslide prevention projects shall be completed by 2035. The project is however never fully completed, since re-design, repair and maintenance will be needed in the future, with advances in numerical modelling of landslides and avalanches, and events that may shed a new light on the design of protection measures. Unexpected future avalanches and landslides may also lead to additional protection measures.

Defence structures can be financed up to 90% of the total cost by the Avalanche and Landslide Fund, whereas the maintenance of the structures can be financed up to 60% of the total cost.

In addition to financing risk assessments and defensive structures in urban areas that are at risk of avalanches and landslides, the fund also finances research related to avalanches and landslides and other issues that are intended to enhance the risk assessment and adaptation measures.

Hazard and risk assessments are conducted upon request by The Icelandic Meteorological Office. The Icelandic Institute of Natural History collects data on landslides and hazards caused by them in collaboration with the Icelandic Meteorological Office. A temporary authorization has been granted to pay the cost of risk assessment due to volcanic eruptions, river and flash flooding and coastal flooding, which are extremely urgent projects from the Icelandic Avalanche and Landslide Fund.

The municipalities use the hazard and risk assessments for their land-use planning and contingency plans.

The Icelandic Meteorological Office also monitors the local risk of urban avalanches, as well as sending out general avalanche warnings and issuing evacuation orders.

An avalanche is the only type of natural hazard where the decision to evacuate is made by the Icelandic Met Office. The decision is made in close collaboration with the local authorities. Evacuation decisions for other types of natural hazards are made by the National Commissioner of the Icelandic Police.

Intended adaptation efforts

Iceland is planning to introduce its first formal portfolio of adaptation measures alongside the establishment of its first National Adaptation Plan, which is mandated by law and is currently scheduled for approval by the end of 2025.

Adaptation-related research

Climate change impacts on infrastructure sectors are the subject of ongoing studies. While the results of these studies show that significant impacts can be expected, plans for adaptation to climate change are, in most cases, not well developed. The most notable exception is the National Power Company (Landsvirkjun), but the likely impacts of expected climate change are taken fully into account in their operational strategies and investment planning. Rising sea level and consequent changes in ocean floods have also been taken into account in the planning of harbour infrastructure and some coastal settlements by the Icelandic Road and Coastal Administration (IRCA), and its predecessor, the Icelandic Maritime Administration (IMA), following recommendations from a 1992 report on expected sea-level rise. Some coastal communities have also in recent years carried out studies of the impacts of rising sea level on ocean flood hazard but so far, the results have not been formalized as recommendations for explicit adaptation measures in the area plans for the respective communities.

3.1.6 Progress on implementation of adaptation

Parallel to the long-term development of the National Adaptation Plan, the government has begun the planning and implementation of capacity building adaptation measures. A key element in Iceland's climate change adaptation policy is the Office for Climate Services and Adaptation located at the Met Office. Moreover, the Government has specifically been engaging the municipalities and regions to facilitate the integration of the adaptation policy cycle on the municipal level. Currently, the Icelandic Regional Development Institute is heading a project in collaboration with the Met Office and the National Planning Agency to pilot an approach to establish climate change adaptation within the municipal governance structure.

3.1.7 Monitoring and evaluation of adaptation actions and processes

Iceland foresees the development of an M&E system for adaptation as part of the development of the National Adaptation Plan. The current National Adaptation Strategy has as its goal that adaptation measures will be systematically monitored and evaluated based on a diverse set of criteria.

A new regulation on the inter-ministerial climate change committee and climate action plans (no. 786/2024) mandates taking stock biannually of the National Adaptation Plan as part of an annual report on the work of the committee.

3.1.8 Information related to averting, minimizing, and addressing loss and damage associated with climate change impacts

The Iceland Catastrophe Insurance (NTÍ) is a public institution tasked with insuring key assets against natural disasters.

The Avalanche and Landslide Fund (Icelandic: *Ofanflóðasjóður*) is a public fund established under Icelandic law to support preventive measures against snow avalanches and landslides. Its primary role is to finance protective structures and other actions designed to safeguard residents in high-risk areas. The fund operates based on the *1997 Act on Protective Measures Against Avalanches and Landslides* (No. 49), emphasizing prevention and safety for communities in vulnerable regions.

Regulation 505/2000 on hazard assessment for avalanches and the classification and utilization of hazard zones stipulates that the Icelandic Meteorological Office (IMO) is responsible for conducting hazard assessments upon request from municipal governments, provided the assessment has been approved by

the Hazard Assessment Committee. The IMO also prepares localized hazard assessments for avalanche risks in ski areas. The cost of these hazard assessments is covered by the Avalanche Fund.

The Relief Fund (Bjargráðasjóður) is an independent state-owned institution that provides financial assistance to individuals and organizations to compensate for significant direct losses caused by natural disasters. The Iceland Catastrophe Insurance (NTÍ) manages the administration of the Relief Fund.

The fund provides grants to compensate for damages to fences, fields, and hay caused by unusual cold, drought, persistent wet conditions, and frost damage.

3.1.9 Cooperation, good practices, experience and lessons learned

Iceland is deeply committed to international collaboration in addressing the challenges of climate change. By engaging in diverse initiatives and partnerships, Iceland exemplifies the spirit of shared responsibility and mutual support that is essential for building a sustainable future. Its participation in global and regional climate efforts underscores the importance of collective action and the value of exchanging knowledge and expertise across borders.

Iceland is actively involved in the work of the Intergovernmental Panel on Climate Change (IPCC), contributing to the scientific foundation that informs global climate policies and strategies. Additionally, Iceland participates in informal Nordic collaborative groups, fostering closer ties and cooperation among neighboring countries on climate-related issues. These groups provide a platform for dialogue, innovation, and coordinated action on shared priorities.

Iceland is also actively involved in the Nordic adaptation network under the Nordic Council of Ministers, which facilitates Nordic cooperation on climate adaptation. This network aims to promote the exchange of data, knowledge, and experience between the Nordic countries regarding climate adaptation, with a particular focus on the regional and local levels.

Iceland’s active participation in these networks and initiatives reflects its strong commitment to leveraging regional cooperation for climate resilience. By contributing to shared projects and fostering cross-sector partnerships, Iceland supports the development of innovative solutions to mitigate and adapt to the impacts of climate change, while also strengthening the Nordic region’s collective capacity to address transboundary climate risks.

Iceland is also a participant in the European Union's Destination Earth (DestinE) initiative, a flagship program aimed at developing a high-precision digital model of the Earth. This "digital twin of the Earth" will monitor and simulate natural and human activity, enabling the development and testing of scenarios for more sustainable development and supporting European environmental policies. By engaging in the Destination Earth Coordination Group, Iceland contributes to fostering cooperation and synergies between Member States and the EU on the implementation of this ambitious initiative.

Furthermore, Iceland is actively involved in the Global Goal on Adaptation (GGA) work program and has an expert participating in its technical efforts. This participation highlights Iceland’s dedication to contributing expertise to the global adaptation framework, which focuses on enhancing resilience and adaptive capacity worldwide. By engaging in this initiative, Iceland plays a vital role in shaping policies and strategies that address the multifaceted challenges posed by climate change on a global scale.

In alignment with Iceland's commitment to fostering international collaboration for climate resilience, the country has partnered with Denmark and Norway on the development of an open-source solution for

national Climate Atlases. This initiative exemplifies the spirit of Nordic cooperation, where shared expertise and resources are leveraged to address climate challenges more effectively. This collaboration underscores the mutual benefits of Nordic partnerships. By pooling technical knowledge and resources, the participants advanced the development of tools that enhance climate data accessibility and usability. These tools aim to support better-informed decision-making and climate adaptation strategies across the region. The project not only accelerates progress on Iceland 's Climate Atlas but also aligns with broader Nordic goals of fostering innovation and resilience in the face of a changing climate. It highlights the critical role of shared scientific efforts in achieving global and regional adaptation objectives and demonstrates Iceland's dedication to international cooperation as a cornerstone of its climate strategy.

4. Information on financial, technology development, and transfer and capacity building support provided and mobilized under Articles 9–11 of the Paris Agreement

In accordance with Article 13, paragraph 9, of the Paris Agreement and the applicable modalities, procedures, and guidelines (MPGs), Iceland presents information in this chapter and accompanying common tabular format (CTF) regarding the financial support, technology development and transfer, and capacity-building assistance provided and mobilized under Articles 9-11 of the Paris Agreement. For reasons of clarity and consistency, this chapter is organized in accordance with the relevant MPGs (Decision 18/CMA.1, para. 118-129).

4.1.1 A. National circumstances and institutional arrangements

National circumstances and institutional arrangements

For provision and mobilization of support in climate action for the years 2021 and 2022, Iceland was guided by its policy on international development cooperation 2019-2023 (hereafter referred to as "the policy"). The policy presented a vision for 2030 and was based on the Sustainable Development Goals (SDGs) and the Paris Agreement, as well as other international agreements that Iceland is either party to, has approved or ratified, in relation to international obligations relating to development financing.

The overarching goal of the policy was to reduce poverty and hunger and promote general well-being based on human rights, gender equality, and sustainable development. The policy contained two subgoals: 1) building social infrastructure and working towards peace, 2) protecting the earth and ensuring the sustainable use of natural resources. Under the second subgoal, the policy states that resilience of communities should be increased and emphasis placed on stimulating economic growth based on equitable and sustainable use of natural resources, including action on climate change. In order to work towards this goal, Iceland aimed to: a) Expand the use of geothermal energy and other renewable energy sources (in line with SDG 7), b) Protect and sustainably use oceans and waters (in line with SDG 14), c) Restore land quality and reduce land degradation (in line with SDG 15), d) Strengthen the resilience and adaptive capacity of communities to the impacts of climate change (in line with SDG 13) and e) Achieve sustainable economic growth and decent work for all (in line with SDG 8).

When it comes to strengthening the mitigation capacity of developing countries, Iceland emphasizes increased use of and access to renewable energy sources to reduce dependence on fossil fuels. When it comes to strengthening the adaptive capacity of developing countries, Iceland emphasizes climate-resilient infrastructure, climate-resilient water, sanitation and hygiene services and the strengthening of weather observation systems due to the increase in extreme weather events. Human rights and gender equality as well as environmental and climate-related matters were categorized as cross-cutting focus areas in the policy.

In the policy, the Government of Iceland underlined the importance of participation in international cooperation on climate issues in accordance with the provisions of the Paris Agreement, in addition to

placing strong emphasis on the participation of women and gender equality in climate action, with a focus on mitigation measures and damage control.

Iceland’s current policy on international development cooperation 2024-2028 was adopted in December 2023. While the reporting period for this report does not extend to that policy, it is worth noting that the policy places great emphasis on climate action, which remains both a specific and a cross-cutting focus area.

It should be mentioned that a government formation process was underway at the end of 2024 and the beginning of 2025, when this chapter was still being prepared. It is therefore difficult to predict Iceland's future direction and impact on climate action. These circumstances need to be kept in mind when reading and reviewing this chapter.

The Ministry for Foreign Affairs of Iceland is responsible for the programming and planning of climate action support in developing countries, including through capacity building and technical assistance. Climate change related matters fall under the Directorate of International Development Cooperation at the Ministry for Foreign Affairs.

All projects funded by Iceland place human rights, gender equality, and environmental and climate considerations at the forefront, as well as respect for international commitments. Iceland recognizes that women and youth play an important role in the fight against climate change and serve as agents of change in the energy transition.

Iceland continues to utilize a wide variety of modalities in the implementation of climate action within its international development cooperation efforts, to facilitate progress toward the climate objectives outlined above. Mainly, these modalities include cooperation with Iceland’s bilateral partner countries, multilateral organizations, GRÓ - International Centre for Capacity Development, Technical Assistance Program and with the private sector through the Sustainable Development Goals Fund. Mutual responsibility and trust guide cooperation with a diverse set of partners to advance progress of the SDGs.

With increased effectiveness and efficiency as a guiding principle, emphasis is placed on increasing the synergy between bilateral and multilateral development cooperation, humanitarian aid and peace efforts. In line with best practices, Iceland’s support to multilateral partners is based on predictable and flexible contributions, with an emphasis on core support. Iceland places local ownership at the forefront in its international development cooperation and selects partners that also prioritize it.

As a small donor, Iceland’s approach to partnerships is focused. Key partners are selected based on Iceland’s priorities and areas where Iceland’s support and participation can add value.

In bilateral development cooperation, Iceland focuses on the least developed countries. Iceland’s three bilateral partner countries are Malawi, Uganda and Sierra Leone. In line with best practices in development cooperation and the OECD Development Cooperation Committee's (DAC) guidelines, Iceland’s approach is based on close cooperation with local communities and their needs, imformed by detailed needs assessments. Local ownership, up-to-date methods, and transparency are foundations for all climate action activities.

In multilateral development cooperation, Iceland’s main partners include the Green Climate Fund, the Adaptation Fund, the Nordic Development Fund, the Systematic Observations Financing Facility (SOFF),

SEforALL, IRENA and UNEP. Iceland is a board member of the Nordic Development Fund and SEforALL and a steering committee member of UNDP Climate Promise and SOFF.

Other main pillars of Iceland's climate action are GRÓ - International Centre for Capacity Development, which comprises four programmes aimed at providing capacity building in developing countries, including in geothermal energy utilization (See section 128). Another pillar is the "Technical Assistance Program" (TAP), which aims to use Icelandic expert knowledge to the benefit of developing countries (see section 126). Finally, the Sustainable Development Goals Fund is Iceland's main means of mobilizing private climate finance during this reporting period (see section 119 c and 121 o).

As stipulated in the Policy for Iceland's International Development Cooperation 2024-2028, the Government of Iceland is committed to reach the UN target of 0.7% of gross national income (GNI) dedicated to official development assistance (ODA) through a slow but steady increase in ODA. ODA increased from 0.21% of GNI in 2014 to 0.28% in 2021 with a slight decrease to 0.26% in 2020 despite a nominal increase of 300 million ISK. In 2022, ODA amounted to 0.34% of GNI, largely explained by Iceland's humanitarian and economic support to Ukraine.

Iceland considers climate action to be an integral part of development cooperation and sustainable development. Accordingly, Iceland has consistently increased its climate finance each year by allocating more resources to climate action and enhancing integration of climate objectives into development cooperation.

The Ministry for Foreign Affairs is currently developing a specific environmental and climate change policy, which will provide clearer guidance for climate action and environmental mainstreaming in all development cooperation.

Iceland's financial share of climate specific contributions was USD 19,053,394 in 2021 and USD 25,198,086 in 2022.

Iceland's contributions to climate actions show a balance when it comes to mitigation and adaptation. In 2021, contributions towards mitigation were USD 5,216,489 and USD 5,089,840 in 2022. Contributions towards adaptation in 2021 were USD 7,334,067 and in 2022 they were USD 6,765,595. Part of Iceland's climate action contributes simultaneously to mitigation and adaptation (cross-cutting), or USD 4,667,538 in 2021 and USD 9,947,916 in 2022.

Purely private climate finance contributions are not included in this report, as the Ministry does not have such information. The only contributions reported which contain in part mobilized private climate finance, are those coming from the "Sustainable Development Goals Fund". Mobilized climate private finance was 0,37% (USD 70,358) in 2021 and 0,87% (USD 219,029) in 2022.

Over the course of the last 10 years, Iceland's contributions to climate finance have shown an overall upward trend, despite some setbacks, such as during the height of the Covid-19 pandemic, as can be seen in the following chart:

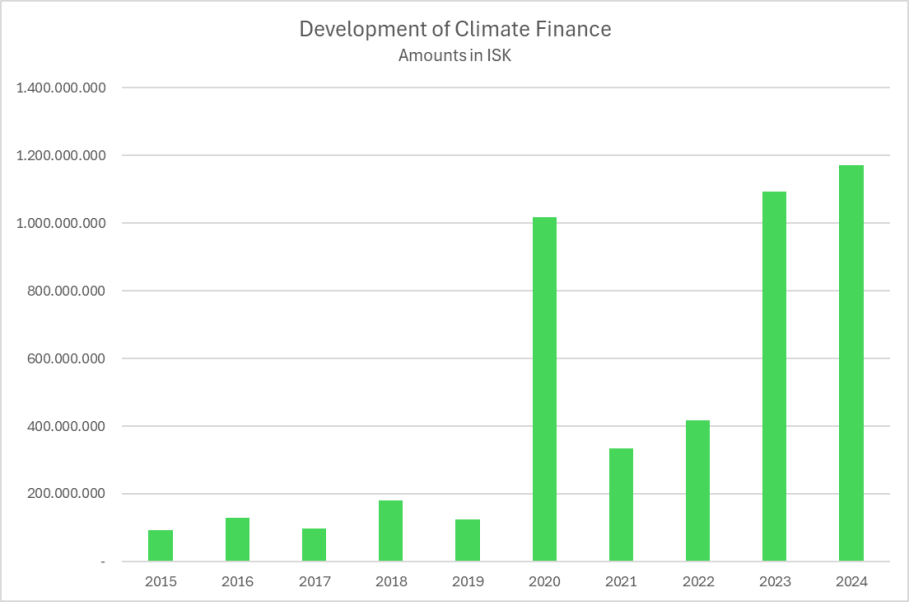

Figure 4.1 Development of Climate Finance.

119. a Description of the systems and processes used to identify, track, and report on support provided and mobilized through public interventions

The Ministry for Foreign Affairs of Iceland is responsible for the identification, tracking, and reporting on the provision (i.e., public climate finance) and mobilization of climate finance through public interventions. The Directorate of International Development Cooperation and the Directorate of Finance are responsible for tracking and reporting on climate finance.

It is important to ensure follow-up on Iceland's contributions, as this is part of comprehensive performance management in Iceland's international development cooperation. Active participation in international cooperation is part of such follow-up, both to ensure that the contributions result in effective development cooperation and to ensure that Iceland's priorities align with trends and policies on climate issues, as there can be major changes in this area.

Follow-up is also carried out through evaluations of development cooperation projects, which follow an evaluation policy based on annual evaluation plans. Evaluations are carried out on all work and projects that the Ministry for Foreign Affairs supports in international development cooperation, including climate action related projects. All audits are available on the Icelandic Government's website to ensure transparency. In bilateral development cooperation, Iceland follows its evaluation policy, annual evaluation action plan, and applies OECD DAC principles and standards to evaluations of its development cooperation. All bilateral efforts are subject to robust monitoring efforts and external evaluations. External evaluations shall be conducted at a minimum at mid-term and at the end of the project cycle. The Unit of Internal Affairs at the Ministry for Foreign Affairs of Iceland has the mandate to conduct evaluations and may conduct other evaluations, whether thematic, impact evaluations, financial audits or other types at its discretion.

When it comes to contributions to multilateral organizations, Iceland relies on audit reports received from multilateral organizations, as well as reports and other data from meetings. Iceland also follows up on its contributions to multilateral organizations through participation in committees within them.

Iceland participates in donor country consultative groups when such opportunities arise. In the field of environment, climate, and energy, mention may be made of the OECD DAC special working group on environmental issues, “ENVIRONET”, where DAC donor countries communicate and work towards coordination of environmental priorities in development cooperation.

Iceland’s performance management aims to monitor results and identify the added value of Iceland's contribution. An important aspect of performance management is the collection and recording of information. Data on Iceland's contributions to international development cooperation can be found in the OECD DAC databases. When it comes to climate action specifically, Iceland uses the "Rio markers" which are part of the OECD DAC methodology. These markers are used to tag projects Iceland supports to show what impact the projects are intended to have on mitigation and adaptation to climate change, protection of biodiversity and mitigation of desertification.

For further information on the methodologies used for measuring and reporting public and mobilized private climate finance, please consult the appropriate sections below.

119. b Challenges and limitations

Iceland is a small donor country in the international context, and that entails challenges and limitations that larger donor countries do not necessarily face. Iceland has limited human resources which naturally means that Iceland’s climate action project portfolio is smaller than those of larger donor countries. Although the size of the project portfolio does not tell the whole story about Iceland's impact on climate action, it can influence it.

Iceland’s limited human resources also mean that it is more difficult for Iceland to participate actively in the various climate funds and to be more involved in the work of multilateral organizations, although Iceland makes an effort to participate actively in areas where it has expertise, such as geothermal utilization, in order to make the greatest impact.

Another important challenge Iceland has faced, which was also raised in the OECD DAC peer review of 2023, is the need for a more holistic approach when it comes to its climate action, environment and biodiversity. Likewise, integration of biodiversity has proven to be a challenge, in part because biodiversity is not an area in which Iceland has particular expertise. However, as has been mentioned, Iceland is currently developing a specific strategy on environmental and climate matters in its development cooperation, which will assist in making Iceland’s approach in these areas more holistic.

There is still potential for improvements in the measurement and reporting of climate action. The process of assigning OECD DAC – Rio markers to projects and programs is subjective and therefore the use of the markers is at best an approximation and not entirely accurate. Considering the limitations in both institutional and human resource capacities, and the absence of widely accepted methodologies for assessing the climate relevance of programs in finer detail, we believe that this remains the best option available for the time being.

119. c Experience and good practices in relation to public policy and regulatory frameworks to incentivize further private climate financing and investment

Iceland’s international development cooperation policy for the period 2019-2023 stipulated that Iceland would engage with the private sector in climate action. An important step in Iceland’s development cooperation portfolio when it comes to collaborating with the private sector, is the establishment of the Sustainable Development Goals Fund.

Since the establishment of the fund, Iceland has been developing its collaboration with the private sector in development cooperation. There are only a few Icelandic companies large enough to withstand the risks involved in working in developing countries where the need for impact is greatest. Through the Sustainable Development Goals Fund, Iceland has not specifically called for climate projects, as collaboration with the private sector it is still at a very early stage. Iceland follows the development of OECD DAC rules on mobilizing private finance.

In November 2024, Iceland joined the International Mobilization Collaboration Alliance (IMCA)[64] and will continue to develop this collaboration in the coming year. In collaboration with IcelandSIF, which is an independent organization acting as a forum for discussion and education on sustainable investment, IMCA will introduce the framework to Icelandic investors. This will help Iceland mobilize more private finance at acceptable levels of risk for pension funds.

Furthermore, Iceland is currently developing a specific strategy which further outlines its collaboration with the private sector in development cooperation.

119. d Efforts taken to enhance comparability and accuracy of information reported on financial support provided and mobilized through public interventions, such as through use of international standards or harmonization with other countries, institutions, and international systems.

Iceland aligns its reporting with the OECD Rio Markers and Methodologies. Additionally, it is actively and consistently engaged in conversations within the OECD and other relevant organizations to further improve the comparability and accuracy of reported information on both public and mobilized private climate finance, as well as on capacity building, technology development, and transfer.

In bilateral development cooperation, Iceland ensures that all interventions are in line with international standards and with its commitments under the Paris Agreement. In addition, Iceland takes into account each partner country's strategies and policies regarding the environment and climate change, including national climate change policies. All three bilateral partner countries are signatories to the Paris Agreement and have submitted their NDCs. Iceland ensures that activities planned are in line with each country's NDC as it gives an overview of the national priorities, both for climate change adaptation and mitigation.

For public-private climate finance, Iceland registers data in the OECD DAC database. In the database, the relevant sector is reported but the Rio markers have not been applied.

120. National circumstances and institutional arrangements for the provision of technology development and transfer and capacity-building support.

Information on this section is provided in narrative format (see sections 126 and 128) and tabular format (see tables III4 and III.5).

[64] See further https://www.worldclimatefoundation.org/imca

4.1.2 B. Underlying assumptions, definitions, and methodologies (paras. 121–122 of the MPGs)

121. a-n Underlying assumptions, definitions, and methodologies

The information contained in this report covers Iceland's climate action financing and projects for the calendar years 2021 and 2022.

The conversion between the Icelandic króna and the United States dollar is based on the OECD DAC's given exchange rate at the time of the reporting, 1 USD = 127.05 ISK in 2021 and 135.27 in 2022 respectively.

Every year, Iceland's contributions to development cooperation, including climate action, are assessed by the government and subsequently presented in the state budget. Thus, despite the numerical goals set out in Iceland's official development cooperation policy, contributions are always assessed annually, taking into account other items in the state budget.

The climate finance reported in this report, is to be considered disbursed.

Funds for bilateral programmes in Iceland's partner countries have been transferred to the relevant bilateral partner country, either delivered through appropriate line-ministries directly to relevant district governments, or directly to multilateral organizations (either as core contributions or earmarked for specific projects), on the basis of partnership agreements. Funding for GRÓ - International Centre for Capacity Development is based on service contracts with relevant institutions and agencies in Iceland in the fields of fisheries, gender equality, geothermal energy and land restoration regarding the hosting of its four training programmes. The payments thus go directly between the MFA and the hosting institutions that manage the training programmes. The GRÓ Fisheries Training Programme (GRÓ FTP) is hosted by the Marine and Freshwater Research Institute. The GRÓ Gender Studies and Training Programme (GRÓ GEST) is hosted by the University of Iceland. The GRÓ Geothermal Training Programme (GRÓ GTP) is hosted by Iceland GeoSurvey. The GRÓ Land Restoration Training Programme (GRÓ LRT) is hosted by the Agricultural University of Iceland.

This report does not include financing committed or disbursed in previous biennial reports.

Iceland's channels of funding in climate action are both bilateral and multilateral.

Iceland's main funding source for climate finance is official development assistance (ODA) as adopted by the OECD's Development Assistance Committee (DAC).

Iceland's main financial instruments in climate finance are grants in the form of contributions to multilateral international organizations, and programmatic funding through bilateral development cooperation.

Iceland seeks to provide support to both mitigation and adaptation measures. Apart from core funding, reporting on climate-specific finance through multilateral institutions is identified based on an application of Rio markers in the same manner as bilateral climate-specific finance. Climate-specific projects are those with climate change mitigation and climate change adaptation markers, marked as having significant or principal objective in applicable category. Additional are cross–cutting projects which have more than one climate category with marked either significant or principal marker. While core funding to multilateral institutions is not marked with Rio Markers or accounted for in the OECD DAC marker, Iceland puts forth these contributions in CTF table III.2. Contributions to multilateral organizations whose main mandate is climate action, such as SEforALL and the Green Climate Fund, are included in this report. With

respect to core funding to multilateral organizations that do not have an explicit climate change mandate, although possible to retrieve information on climate relevant proportions of the projects they support from OECD DAC, these contributions are not part of the information provided in the total climate-related summary in this report.

Iceland's contributions to climate finance are already selected within the definition of ODA, as defined by OECD DAC. When reporting for sectors, Iceland applies OECD DAC definitions. For the subsector, Iceland is using the 5-digit OECD DAC Creditor Reporting System's (CRS) purpose code in accordance with the CRS-method for reporting.

Iceland emphasizes climate action in its international development cooperation policy, and efforts are made toward capacity- and knowledge-building, and technological assistance in developing countries. For example, Iceland has championed the use of solar powered water pumps to provide piped water to rural communities in Iceland's partner countries, Sierra Leone, Uganda and Malawi. However, it is difficult to precisely define the projects or parts of the projects that relate to technology assistance and capacity- and knowledge building, as goals related to these aspects cross-cut Iceland's climate action.

Iceland determines the climate relevance of programmes by using OECD DAC Rio markers. In 2012, Iceland began the process of implementing the OECD DAC CRS statistical reporting methods, including the use of the Rio Markers as a methodology for tracking finance for adaptation, mitigation, desertification, and biodiversity. While the Rio Markers have guidelines and technical eligibility criteria agreed within OECD DAC, the process of assigning markers to projects and programs is subjective and can vary between institutions and the quantification of climate-relevant contribution can equally vary between countries. Iceland currently reports all programs or projects as 100% climate-relevant finance if it has been marked with either Rio-marker 1 ('Significant") or Rio-marker 2 ("Principal"). While core funding to multilateral institutions is not marked with Rio Markers or accounted for in the OECD DAC marker, Iceland puts forth these contributions in BR-CTF 7a. Contributions to multilateral agencies whose main mandate is climate action, such as SEforALL and the Green Climate Fund, are included in this report.

For the year 2021, projects marked with a significant or principal objective for adaptation were approximately 38.49% of Iceland's climate ODA or about ISK 931,793,180. Mitigation was marked for approximately 27.38% of Iceland's climate ODA, or 662,754,963 million ISK as a significant or principal objective. Cross-cutting was approximately 24.50% of Iceland's climate ODA or about ISK 593,010,757, with more than one marker as significant or principal objective.

Concurrently, during 2022, projects marked with a significant or principal objective for adaptation were approximately 26.85% of Iceland's climate ODA or about ISK 915,203,057. Mitigation was marked at approximately 2.,20% of Iceland's climate ODA, or 688.518.404 million ISK as a significant or primary objective. Cross-cutting was marked for approximately 39.48% of Iceland's climate ODA or about ISK 1,345,685,403, with more than one marker as significant or principal objective, a substantial increase from the year before.

When it comes to the avoidance of double counting, it can be confirmed that Iceland does not report the overall contributions but rather its own inflow share. Contributions towards funds or projects that benefit multiple countries, are distinguished from bilateral cooperation projects and therefore not added to the bilateral cooperation projects.

The Icelandic Government's only channel for mobilization of private finance during 2021 and 2022 was through the Sustainable Development Goals Fund and the Development Seeds Fund. Avoidance of double counting can therefore be confirmed as contributions through these funds solely come from within Iceland. It can also be mentioned that in the contracts between the Ministry for Foreign Affairs of Iceland and the companies, it is stated that the company may not accept grants from other countries for projects that the fund has supported.

Iceland has not yet pursued Article 6 of the Paris Agreement to reach its climate objectives or for any other purpose. Iceland's participation in Article 6 is currently under review.

Iceland funds specific climate related projects where the reporting on multiple recipient countries is done on a country-by-country basis. Iceland participates in WASH projects in its partner countries, i.e. Malawi, Uganda and Sierra Leone, through multilateral international organizations such as UNICEF.

Funds are considered public finance if they have been allocated to the Ministry for Foreign Affairs for international development cooperation (ODA) from the government's budget for the relevant calendar year. Public-private climate funding is considered funding, stemming from the private sector, primarily companies, through the intervention of the Icelandic government.

121. o How private finance was assessed as mobilized through public interventions

The projects for which funding is applied for through the Sustainable Development Goals Fund do not have government support. It is necessary to obtain such support for the company to be able to reduce the risk of taking the first steps in the projects, especially those projects located in the least developed countries.

Iceland called for grants through the Sustainable Development Goals Fund three times a year during 2021 and 2022. The applications are assessed by independent experts according to certain criteria, including financial capacity, competence of the parties, competence of partners and development impact of the project. Part of the criteria is that the projects do not have a negative environmental impact and contribute to achieving the sustainable development goals (mainly goal no. 8). Ministry grants do not exceed 50% of the cost of implementing the project. There is also a maximum amount which was EUR 200,000 during the years 2021 and 2022 for a three-year period. Progress reports must be submitted every six months to receive the next payment. Approximately two to three months pass between application and first payment.

The Sustainable Development Goals Fund gives grants to private companies to set up projects in developing countries. The grant recipients must contribute at least 50% of their own funds. They report to the MFA on progress of their projects semi-annually and the Ministry monitors their contributions through those reports. The 50% provided by the MFA adheres to the OECD DAC principles and is processed through the same methodologies as other contributions.

121. p How it seeks to ensure that support provided and mobilized through public interventions effectively addresses the needs and priorities of developing country Parties for the implementation of the Paris Agreement, as identified in country-driven strategies and instruments, such as biennial transparency reports, NDCs and national adaptation plans;

Human rights, gender equality and environmental and climate related matters are both specific and cross-cutting objectives for Iceland's international development cooperation. Low-income countries are addressing multifaceted challenges where the poorest and the most vulnerable are hit the hardest. This

includes climate related shocks and economic impacts such as inflation and increasing debt. There is an urgent need to avoid a backward slide in development by contributing to more inclusive and resilient societies. Iceland aims to optimize the use of its financial and human resources while following the principles of effective international development cooperation, to achieve positive long-term outcomes in line with Agenda 2030 and Iceland's partners' climate priorities.

Iceland's international development cooperation relies on international practices and principles, including the Paris Declaration, the outcomes of the Conference of the Parties (COP) of the UNFCCC, Accra Agenda for Action, Busan Partnership for Effective Development Cooperation, and OECD DAC international principles and standards for development cooperation. In its bilateral cooperation, Iceland aims to assist low-income countries in working towards inclusive development with a strong focus on poor and marginalized communities as well as vulnerable groups. Iceland values and supports democratic processes in its work and believes that all voices must be heard, emphasizing empowerment and meaningful participation by all. Iceland endeavours to be a responsible and reliable partner, working with partner countries and organizations toward measurable and sustainable results. Programmes are based on identified needs and are in line with local development plans and priorities, both at the national and the district level. Programmes are aligned with national adaptation plans, where available (Malawi and Sierra Leone) and have supported the development of District Climate Change Action Plans (DCCAPs) in Uganda, which are then integrated into programme initiatives. Iceland uses its size and flexibility as a strength to be a partner who adds real value, focusing on sectors, themes, and areas where its presence can make a difference. This is partly done through financial support but also by working with partner countries and international organizations, providing technical assistance and capacity building toward innovative approaches and sustainable competence, e.g. within the renewable energy sector.

Increased emphasis is placed on responding to climate change, with Iceland's efforts guided by the Paris Agreement

121. q How it seeks to ensure that support provided and mobilized through public interventions is in line with the long-term goals of the Paris Agreement

According to Iceland's official international development cooperation, all of Iceland's climate action must be in line with the long-term goals of the Paris Agreement. Iceland's development cooperation relies on international practices and principles, including the Paris Declaration, Accra Agenda for Action, Busan Partnership for Effective Development Cooperation, and OECD DAC international principles and standards for development cooperation.

121. r An indication of what new and additional financial resources have been provided, and how such resources have been determined to be new and additional; (s) How the information provided reflects a progression from previous levels in the provision and mobilization of finance under the Paris Agreement

The financial resources, as detailed in this report and the CTF tables submitted, are regarded as new and/or additional to the financial disbursements documented in the previous Biennial Reports and National Communication.

121. t Information on the reporting of multilateral finance

Multilateral finance reported by Iceland is based on its contribution (inflow) to the respective multilateral institutions.

Multilateral finance has been reported as being climate-specific by using international standards and definitions by the organizations themselves. With regard to core contributions to international organizations, Iceland does not report using the Rio Markers, as climate core contributions of multilateral organisations are gathered separately by the OECD.

Multilateral finance has been reported as core, with the understanding that the actual climate finance amount it would transfer into depends on the programming choices of the multilateral institutions. Attributions for Iceland's multilateral climate finance were, at the time of initial CRS reporting, determined by dividing the funds contributed (inflow) to the multilateral institution by the climate percentage/share estimated by OECD DAC.

122. A description of the underlying assumptions, definitions and methodologies used to provide information on technology development and transfer and capacity-building support.

Iceland contributes to strengthened capacity building in developing countries to enhance mitigation and adaptation efforts. Iceland has committed resources that are creating enabling environments for private sector investment, strengthening national and regional institutional and regulatory frameworks, and assisting developing countries to take practical actions to cut emissions. Recognizing that climate change disproportionally affects developing countries and aligned with Iceland’s emphasis on LDCs in its development cooperation strategy, the Government of Iceland focuses its technology transfer and capacity building in low-income countries.

Financial resources and the transfer of technology for the purposes of adaptation to and mitigation of climate change have in recent years been channelled mainly through the public sector and not through the private sector. However, Iceland recognizes the role the private sector can have in achieving the SDGs and is taking decisive steps for improvement in this area, including in its draft development cooperation strategy. Iceland is well-known for its technical expertise and multi-stakeholder partnerships, particularly in geothermal energy, and will build on this comparative advantage when engaging further with the private sector, especially in climate-related activities.

Iceland’s support for technology transfer in relation to the implementation of the UNFCCC includes a broad spectrum of activities. These activities comprise the transfer of both hard and soft technologies. The extent of this technology transfer is significant and cannot be clearly separated from other activities in Iceland’s international development cooperation, including financial flows. In fact, many development projects funded by Iceland include both technology transfer and capacity building components. Since they form an integral part of a project, it is not possible to accurately account for them separately.

Iceland’s measures related to the promotion, facilitation and financing of the transfer of, or access to, environmentally-sound technologies, are focused on renewable energy. Sustainable utilization of natural resources is a priority area in Iceland’s development cooperation, where Icelandic technical expertise, extensive knowledge and experience of utilization of geothermal energy contributes to the SDGs. The Gró Geothermal Training Program (GRÓ-GTP) has for many years played an important role in this regard. In addition to providing financial support in climate action, Iceland also endeavours to share and provide support to developing countries with capacity building support and technology development and transfer.

GRÓ’s Theory of Change explains the underlying assumptions of the work of the four GRÓ programmes. The GRÓ programmes work with specific partner organisations, putting great care into the selection of the

partner institution, and building a partnership with them, to ensure that the maximum impact can be reached by the training and activity undertaken by GRÓ and that the right candidates are nominated.

4.1.3 Information on the financial support provided and mobilized under Article 9 of the Paris Agreement (paras. 123–125 of the MPGs)

123. Bilateral, regional and other channels

Detailed information on public climate finance from bilateral, regional and other channels are presented in CTF Table III.1.

124. Multilateral channels

Detailed information on public climate finance from multilateral channels are presented in CTF Table III.2.

125. Information on finance mobilized through public interventions

The Sustainable Development Goal Partnership fund was established by the Ministry for Foreign Affairs in 2018, and the first allocation from the funds was made in 2019.

The purpose of the fund is to encourage participation and contribution to development cooperation by the private sector, with the objective of reducing poverty and supporting job creation and sustainable growth in the world's most impoverished countries, in accordance with the SDGs. Projects should provide benefits and generate revenue in developing countries and have clear linkages to one or more of the UN SDGs.

Support from the SDG Fund is limited to the business community, namely: privately held companies; private and publicly listed limited liability corporations; partnerships and cooperatives; and private foundations.

Grant allocations to private sector companies can amount to a maximum of 200,000 Euros over a three-year period and a minimum counterpart contribution percentage of 50 % is required by the companies. Compliance with the EEA Agreement's state aid rules regarding "de minimis" support must be ensured.

Projects must be conducted in collaboration with partners in a chosen developing country. Additional partners, such as universities and civil society organizations are able to take part in projects.

Eligible applicants include business community entities such as those listed above, and the application evaluation process looks towards the company's overall knowledge and capacity, quality of technical solutions, competence, and financial capabilities to undertake projects of transnational cooperation.

Applicants must meet certain basic requirements, such as the payment of public fees and pensions. Furthermore, it is expected that businesses have endorsed good business practices, for example, through membership of the UN Global Compact, or in relation to other international benchmarks, such as the UN Guiding Principles on Business and Human Rights and the OECD Guidelines for Multinational Enterprises.

Eligible collaborating countries range from the least developed to lower middle-income countries as per OECD DAC's definition, plus higher middle income SIDS states.

The SDG Fund has not called for thematic specific projects, climate or from other sectors. Below is a list of the six climate related projects that the fund has provided with grants in 2021 and 2022.

The narrow scope of the SDG fund in terms of time, target group, and geography naturally limits the scale of outcomes that can be expected. Nevertheless, if assessed as an effort contributing to the SDGs using the private sector as a channel and additional resource for development cooperation, the private sector portfolio represents a respectable one.

Iceland also mobilizes private climate finance through the Development Seeds Fund (Þróunarfræ), which is a grant framework managed by the Icelandic Centre for Research (Rannís) providing grant funding for project preparatory and innovation activities. The fund was established in 2021 with the intent to encourage innovators to work on projects in developing countries. The maximum grant is ISK 2,000,000 and it has not attracted much interest from Icelandic start-ups.

The low amount of each grant gives little opportunity to build projects large enough to have a significant impact on climate. This creates problems for assessing their outcomes.

Other programs engaging with the private sector include the Technical Assistance Program (TAP), which offers advisory services through Icelandic consultants to international organisations. The TA Facility has been in operation since 2017.

As the Ministry is growing its experience in working with the private sector, all these schemes were evaluated by external evaluators at the end of 2022. Since then, the Ministry has been working on implementing many of their recommendations, including improved monitoring and reporting.

Table 4.2 Climate and energy related projects supported by the SDG fund and the DS fund 2021- 2022.

Climate and energy related projects supported by the SDG fund and the DS fund 2021-2022							
	Grant recipient	Project name	Land	Sector	Grant in ISK	Status	Year
1	BBA//Fjeldco and Intellecon	Multiple use of geothermal energy to improve food security	Kenya	Geothermal	5,415,000	finished	2022
2	Verkís hf	Direct geothermal usage Lake Assai	Djibouti	Geothermal	4,000,000	finished	2022
3	Reykjavik Geothermal	Geothermal research facility	Ethiopia	Geothermal	27,900,000	Cancelled due to the unrest in Ethiopia	2022
4	Ecoscopy	Scalable solar cells on agricultural land (Þróunarfræ)	Uganda	Solar Power	2,000,000	finished	2022
5	GEG ehf.	Using geothermal heat to power coolers for apple harvesting in the Himalayas	India	Geothermal	28,020,000	finished	2021
6	BBA//Fjeld-co ehf.	Writing up legal framework for renewable energy usage	Comoros	Renewable energy	6,383,000	finished	2021

D. Information on the support for technology development and transfer provided under Article 10 of the Paris Agreement

126. Technology development and transfer provided under Article 10 of the Paris Agreement

Iceland's measures related to the promotion, facilitation and financing of the transfer of, or access to, environmentally sound technologies, focus on renewable energy. The sustainable utilization of natural resources is a priority in Iceland's development cooperation, where Icelandic technical expertise, extensive knowledge and experience of utilization of geothermal energy contributes to the SDGs.

Through the Technical Assistance Programme (TAP), Iceland pushes to leverage its comparative advantages in gender, renewable energy, fisheries and land restoration. This is reflected both in Iceland's bilateral and multilateral co-operation with the TAP being one of the vehicles.

The TAP aims to use Icelandic expert knowledge to the benefit of developing countries. The TAP was initiated in 2017 with a focus on renewable energy (geothermal) through the World Bank's Energy Sector Management Assistance Program (ESMAP) and fisheries/blue economy (2018) through the Bank's PROBLUE trust fund. The first MoU was signed with the World Bank in 2017. In 2020, the TAP was expanded to include hydropower, land management/restoration and gender equality expertise. Currently there are five expert rosters in all.

The TAP modality enables for access to and funding for technical experts in various fields. Experts provide on-demand high quality technical assistance (TA) to assist partner institutions in the preparation and implementation of projects. The rosters consist of consultants from private and public entities, who may be called upon for assignments on short notice.

Technology-transfer and knowledge-sharing through the TAP modality take place within the format of projects implemented by partner organizations such as the World Bank. Depending on the project, these typically consist of technical support and advise on renewable energy projects in developing countries.

Energy Sector Management Assistance Programme (ESMAP), a World Bank trust fund focused on renewable energy, assists governments in developing countries with knowledge, policy support and project preparation to accelerate the energy transition and achieve universal access to energy. Iceland has long supported ESMAP and provided annual financial contributions of 400,000 USD in both 2021 and 2022.

Table 4.3. Relevant TAP projects in 2021

Title	Recipient entity	Type of support	Sector	Type of technology	Status of measure or activity	Public or private sector
LS optimization; Feasibility and Environment & Social Assessment Studies of the Priority Generation Investment Project	World Bank, ESMAP, Liberia	Feasibility study	Renewable energy	Hydropower	Completed	Private

Technical Assistance for Contador Hydropower Project	World Bank, ESMAP, São Tomé é Príncipe	Technical assistance	Renewable energy	Hydropower	Completed	Private
Solar Hydro Hybrids	World Bank, ESMAP Global	Technical assistance	Renewable energy	Hydro, solar	Completed	Private
Socio Economic Benefits for Hydropower and Geothermal development	WB ESMAP, Global	Technical assistance	Renewable energy	Hydro, geothermal	Completed	Private
Legal, Regulatory and Institutional Review of Kazakhstan's Geothermal Sector	World Bank, ESMAP, Kazakhstan	Review	Renewable energy	Geothermal	Completed	Private
Increasing Power Generation from Geothermal Resources. Technical support for the confirmation of geothermal resources in the San Vicente and Chinameca geothermal fields	World Bank, ESMAP, El Salvador	Technical support	Renewable energy	Geothermal	Completed	Private
Direct utilization of Geothermal resources	WB ESMAP, Global	Technical assistance	Renewable energy	Geothermal	Completed	Private

Table 4.4 Relevant TAP projects in 2022.

Title	Recipient entity	Type of support	Sector	Type of technology	Status of measure or activity	Public or private sector
Geothermal project in El Salvador	World Bank, ESMAP, El Salvador	Workshop	Renewable energy	Geothermal	Completed	Private
Hydropower project in São Tomé é Príncipe	World Bank, ESMAP, São Tomé é Príncipe	Technical assistance	Renewable energy	Hydropower	Completed	Private

4.1.4 E. Information on capacity-building support provided under Article 11 of the Paris Agreement (paras. 128–129 of the MPGs)

128. Information on capacity-building support provided under Article 11 of the Paris Agreement

Iceland contributes to strengthened capacity-building in developing countries to enhance mitigation and adaptation efforts. Iceland has committed resources that are creating enabling environments for private sector investment, strengthening national and regional institutional and regulatory frameworks, and assisting developing countries to take practical actions to cut emissions. Recognizing that climate change disproportionally affects developing countries and aligned with Iceland's emphasis on LDCs in its development cooperation strategy, the Government of Iceland focuses its capacity building on low-income countries.

Through GRÓ - International Centre for Capacity Development, Iceland provides capacity-building support to climate change adaptation and mitigation in LDCs and low- and middle-income countries. GRÓ is a UNESCO Category 2 Centre in Iceland. GRÓ's four training programmes were operated as UNU training programmes until the establishment of GRÓ in 2020. These four programmes provide training in fields where Iceland has expertise, having been instrumental for sustainable development in Iceland. In particular, two of the programmes are working specifically on mitigation and adaptation, whereas the other two programmes contribute to societal resilience against climate change through their work in enhancing human capacity regarding natural resource management and societal changes, in addition to occasionally working on projects contributing to mitigation.

The GRÓ Geothermal Training Program (GRÓ GTP) is aimed at capacity strengthening within geothermal exploration and development, thereby increasing the sustainable use of geothermal energy. The GRÓ Land Restoration Training Program (GRÓ LRT) focuses on reclaiming land and fighting desertification, where particular attention is given to the interaction of climate change and land degradation. The GRÓ Gender Equality Studies and Training Program (GRÓ GEST) includes a special module examining the role of gender in the context of environment with a focus on climate change, analysing the transformative potential of gender equality to advance environmental sustainability as well as resilience, vulnerability, mitigation, and adaptation to global environmental change. Many of the fellows in the GRÓ Fisheries Training Program (GRÓ FTP) undertake research projects related to the impacts of climate change on fisheries systems and the communities that depend on aquatic resources. Futhermore, the program has been working on climate friendly solutions for smoking fish.

All four programs are directly linked to national and public institutions in Iceland and draw on their experts for the lecturing and training of fellows who come from LDCs and other developing countries.

The Programmes collaborate with specific partner institutions in developing countries, who are facing challenges targeted by the specific GRÓ Training Programme and who need further capacities to address them. GRÓ identifies local organisations that have a strong mandate in their respective field, the potential and ambition to contribute to necessary changes in collaboration with the respective GRÓ Programme's field of expertise. The institutions nominate fellows to attend the GRÓ training. To maximize impact, each programme is flexible and adapts over time in the selection of partner countries and partner organisations within each country.

The fellows selected to join the programme from nominations from GRÓ partner institutions are trained in applicable science and conduct research relevant to their home countries. This method of working with key institutions in GRÓ partner countries on the challenges they are facing and where the fellows return to

their home institutions after training is a key component of GRÓ's Theory of Change and in ensuring the training is relevant for the institutions. By training professionals from the same organisations and countries over many years, the intention is to build a critical mass within each organisation and country. With their enhanced knowledge, skills, and ability for teamwork, it is assumed that this mass of people can more easily promote change than if the GRÓ resources were more scattered.

Within its bilateral development cooperation, capacity building is an integral part of Iceland's approach. The key modality for development cooperation in Malawi and Uganda is the district-level approach, which relies on close and long-term partnerships with districts. Programmes are in line with priorities within district development plans, as well as Iceland's development priorities. District climate change and climate action plans do feed into programme development; however, over the reporting period, district climate change plans were not available for Iceland's partner districts. Plans were being developed in Uganda with support from Iceland, but such plans are currently not in place in Malawi and Sierra Leone. In light of Iceland's commitments and as all three countries are increasingly impacted by the consequences of climate change, the integration of both mitigation and adaptation measures into programme modalities was and is a constant consideration, nonetheless. In the district-level approach, moreover, implementation is at the hands of local authorities and institutions. Programmes are developed with local stakeholders, based on their priorities, and implemented through local structures, thereby supporting local ownership, sustainability and increased capacity of local actors. Capacity building is therefore integrated across Iceland's development programmes, in addition to the specific capacity building components that are identified in collaboration with local stakeholders.

The development of the District Climate Change Action Plans (DCCAPs) for Buikwe and Namayingo Districts is an example of a specific capacity building intervention supported by Iceland promoting both the sharing of lessons learned and best practices. Uganda adopted its National Climate Change Act in 2021, which provides for the development of DCCAPs. The DCCAPs for both Buikwe and Namayingo have been formally approved by the Ministry of Water and Environment and the respective district authorities. Each plan outlines 12 priority adaptation sectors, along with 85 and 110 strategic adaptation and resilience actions, and 113 and 130 indicators, respectively, to be implemented by the districts by 2030. The development of the DCCAPs for Buikwe and Namayingo served as a pilot exercise involving stakeholders at both the ministry and district levels, through which a blueprint for the development of DCCAPs was developed and tested. The DCCAPs now serve as key guidance documents, outlining prioritized climate actions within each district's jurisdiction, and can act as guides for the ministry and other districts that have yet to develop their own DCCAPs.

Likewise in Uganda, over the period 2021-2022 the WASH project in Namayingo, through the Namayingo District Development Plan (NDDP), contributed to environmental protection through the protection of wetlands and other ecosystems, such as protected lakeshores and swamps. Three wetland/water catchment management plans for three sub-counties were developed, and five communities around wetlands and in catchment areas were sensitised on environmental protection and climate change. Three dialogue meetings with civil society and the private sector were held to promote environmental protection. 15 youth were trained as trainers of trainers (TOTs) in the construction of energy-saving stoves using local materials and in turn the TOTs trained 120 households on the construction of such stoves, while also providing information on alternative sources of firewood in order to reduce the pressure on the natural ecosystem. The promotion of energy-saving cooking stoves was aimed at reducing deforestation, carbon emissions, and smoke in cooking areas. The capacity of local mechanics and WASH (Water,

Sanitation, and Hygiene) committees was also strengthened to support the operation and maintenance (O&M) of WASH facilities, resulting in improved functionality and management of these facilities.

Since 2019, Iceland has supported an integrated water, sanitation and hygiene (WASH) project in rural fishing communities in Sierra Leone in cooperation with UNICEF and the Government of Sierra Leone (GoSL). In the first phase of the project (2019-2022), approx. 60.000 people in three communities benefitted from the project. The project contributes to the Government's commitment to climate action as the project helped to improve access to water and sanitation services in rural fishing communities, who are particularly vulnerable to the effects of climate change. This in turn helps to reduce the risk of waterborne diseases and improve the resilience of these communities. In terms of capacity building, focus has been on strengthening the capacity of community-based organisations such as WASHCOMs (WASH committees) to ensure the sustainability of WASH facilities. This includes providing training in basic technical skills to enable WASHCOMs to effectively carry out their roles and responsibilities, which is in line with the Government's approach to the operation and maintenance of rural water supply and sanitation facilities.

The Icelandic MFA also provides grants to civil society organisations to implement both development projects and humanitarian response. Adaptation and resilience of affected communities is a priority across CSOs working with the Icelandic MFA, with mitigation measures integrated into project initiatives, i.e. through the introduction of fuel-saving stoves and solar-powered solutions. Two projects exemplify capacity building within climate mitigation projects; both are projects managed by the Icelandic Red Cross. Through funding from the Icelandic MFA, the Icelandic Red Cross supported the IFRC for sub-Saharan Africa's Tree Planting and Care Initiative, which aims to plant and nurture 500 million trees per year for ten years, the objective being to mitigate climate change. In 2022, the Icelandic Red Cross decided to provide a delegate to serve as project coordinator, thereby facilitating the launch of the initiative. The delegate served one year with the IFRC regional office in Sierra Leone, but the Icelandic Red Cross has since continued its support of the role with MFA funding. The coordinator's role includes capacity building and knowledge sharing, as well as technical support. Likewise, the Community Based Forest Landscape Restoration for Environmental Sustainability in Sierra Leone, launched in 2022, takes an approach that prioritises community engagement and capacity building. The project aims to restore degraded lands among 62 communities in Sierra Leone by introducing nurseries within the communities, which will in turn result in the planting of economic and multipurpose trees. The restored forest will, besides providing economic benefits, contribute to protecting biodiversity, increase food and water security, improve human health and wellbeing, and improve resilience to climate change. The Red Cross works closely with communities at the grassroots, building capacity and know-how to ensure sustainability and long-term impact.

The following tables contain examples of Iceland's capacity-building projects during the years 2021-2022 (also included in CTF tables III.5).

Table 4.5 Examples of Iceland's capacity-building projects during the years 2021-2022

Title	Recipient entity	Description and objectives	Type of support (Mitigation, adaptation or cross-cutting	Status of measure or activity

Integrated UNICEF WASH project in rural fishing communities	UNICEF Sierra Leone	The project aims to improve the living conditions of poor and marginalized fishing communities through a holistic approach to improve access to water and sanitation in 17 fishing communities, reaching 60,000 people. Emphasis is on supporting improved landing facilities with access to clean water to improve the handling of catches and increase the quality of fish products. Throughout the programme, environmental and climate issues are integrated into all the project's actions. Specific activities aim to reduce plastic pollution on the beaches through the establishment of recycling centres and improve the residents' environmental awareness. The implementing partners are UNICEF in collaboration with the authorities in Sierra Leone and non-governmental organizations in the country.	Mitigation (through solar powered water systems) Adaptation (through awareness raising).	Implementation ongoing. Phase I finished at the end of 2021 with Phase II being implemented from 2022-2025.
Tree planting and care coordinator	Icelandic Red Cross, IFRC regional office for Sub-Saharan Africa	One of IFRC's four key initiatives is aimed at addressing key needs within sub-Saharan Africa. The Tree Planting and Care Initiative aims to plant and nurture 500 million trees per year for ten years in line with regional plans. The role of the coordinator includes capacity building and knowledge sharing.	Mitigation (Tree planting and care)	Ongoing
Community-Based Forest	Icelandic Red Cross, Sierra	This project undertook concrete actions to	Mitigation	Phase I was extended until

Landscape Restoration for Environmental Sustainability in Sierra Leone	Leone Red Cross Society, IFRC, Finnish Red Cross 2022-2025	restore some degraded lands in Sierra Leone by nursing and planting economic and multipurpose trees in each of the 62 communities. The restored forest will, besides providing economic benefits, contribute to protecting biodiversity, increase food and water security, improve human health and wellbeing, and improve resilience to climate change.	(Through restoration of the forest ecosystems and the introduction of the energy-saving stoves)	end March 2025, and a second phase is planned to launch in April 2025.
Namayingo – Iceland Development Partnership for WASH development in Fishing communities 2021-2023.	Namayingo District Government	Project support to Namayingo district's access to water supply and sanitation facilities. The key activities carried out by the Water and Sanitation sector include, but are not limited to: resource planning, designing and construction of water and sanitation infrastructures, ensuring efficient and effective operation and maintenance of water, sanitation and hygiene (WASH) facilities, putting into perspective cross-cutting issues such as HIV/AIDS, environment, and persons with disabilities. Focus on climate-smart infrastructure, and environmental assessments carried out. The priority of the WASH project is to create awareness about the dangers of environmental degradation and climate change to awaken the community to make concerted efforts to minimise	Adaptation	Concluded in 2023.

		forest and wetland degradation and restore and protect the natural resources ecosystems, particularly the water catchment ecosystems. During the project implementation, 62 waterpoints were rehabilitated or built, serving 17,400 people in the district. Climate change agents, who are volunteers, travel around the district educating communities on the importance of climate action and assist people in building energy-saving cookstoves in their homes.		
District Climate Change Plans for Buikwe and Namayingo	Buikwe and Namayingo District Government, Uganda Ministry for Environment	Iceland supported its partner districts, Buikwe and Namayingo, to develop the first District Climate Change Action Plans (DCCAP) in Uganda. The DCCAPs provide comprehensive guidance on priorities for each district, set by the Uganda NDC and guiding local climate action.	Mitigation	Concluded in 2022.
Energising Development (EnDev) in Mangochi within the Mangochi Basic Services Programme (MBSP), Phase II	GIZ-Energizing Development (EnDev)	Iceland has partnered with GIZ-Energizing Development (EnDev) both in Mangochi and Nkhotakota districts, focusing on providing access to clean energy, improving efficient use of energy and increasing demand and use of improved cookstoves and small-scale solar appliances for off-grid households. In addition, solar energy is being provided to social	Mitigation	Currently in implementation with a no-cost extension due to delays in implementation.

		institutions and infrastructure such as schools and health facilities.		
GRÓ GTP 6-month programme (2021-22)	Total of 48 fellows from: Algeria, China, Colombia, Djibouti, Dominica, Ecuador, El Salvador, Ethiopia, Guatemala, India, Indonesia, Iran, Kenya, Montserrat, Nicaragua, Peru, Philippines, Tanzania, Uganda	Six-month annual training for practicing professionals from developing countries with significant geothermal potential. Priority is given to countries where geothermal development is underway to maximize technology transfer.	Mitigation	Concluded each year.
GRÓ LRT 6-month programme (2021-22)	Total of 36 fellows from: Ethiopia, Ghana, Kyrgyzstan, Lesotho, Malawi, Mongolia, Nigeria, Tajikistan, Uganda, Uzbekistan	GRÓ LRT assists low- and middle-income countries to combat land degradation, promote sustainable land management and restore degraded land through targeted capacity building for individuals and institutions.	Mitigation and adaptation	Concluded each year
GRÓ FTP 6-month training programme (2021-22)	Total of 27 fellows from: Belize, Cape Verde, Costa Rica, Dominica, El Salvador, Indonesia, Jamaica, Kenya, Liberia, Malawi, Mauritania, Namibia, New Zealand, Nicaragua, Nigeria, Papua New Guinea,	The GRÓ Fisheries Training Programme provides applied postgraduate training for fisheries professionals. Some undertake research projects related to the impacts of climate change on fisheries systems and the communities that	Cross-cutting	Concluded each year.

	Saint Lucia, Seychelles, Sierra Leone, South Africa, Sri Lanka, Tanzania, Uganda	depend on aquatic resources. Also, the programme has been working on climate-friendly solutions for smoking fish.		
GRÓ GEST 5-month programme (2021-22)	Total of 43 fellows from: Bosnia and Herzegovina, China, Egypt, Ghana, India, Iraq, Kenya, Kosovo, Malawi, Mexico, Moldova, Mongolia, Namibia, Nepal, Nigeria, Pakistan, Palestine, Russia, Serbia, Sri Lanka, Uganda, Zimbabwe	The GRÓ Gender Equality Studies and Training Program (GRÓ GEST) includes a special module examining the role of gender in the context of the environment with a focus on climate change, analyzing the transformative potential of gender equality to advance environmental sustainability as well as resilience, vulnerability, mitigation, and adaptation to global environmental change. Some of the fellows do research in this field for their final project.	Cross-cutting	Concluded each year.
GRÓ Post Graduate Scholarship Programme (Scholarships for GRÓ alumni to pursue Master or PhD studies) (2021-22)	In 2021 31 alumni were studying on a GRÓ scholarship and 33 alumni in 2022. Scholarship recipients came from: Angola, Bolivia, China, Djibouti, DR Congo, Ecuador, El Salvador, Ethiopia, Ghana, Guyana, India, Indonesia, Jamaica, Kenya, Liberia, Malawi,	GRÓ Alumni can apply for scholarships to pursue postgraduate studies in Icelandic universities in the fields of geothermal sciences or engineering, sustainable fishing, ecosystem restoration and sustainable land management and gender equality.	Mitigation and adaptation, cross-cutting	Continuous project.

	Mongolia, Namibia, Nicaragua, Nigeria, Philippines, Tanzania, Uganda			
GRÓ GTP online courses on geothermal energy in Africa (2021), LAC (2022) and Asia/Pacific (2022)	Africa: 64 participants from 11 countries, LAC: 146 participants; 20 countries. Asia/Pacific: 140 participants; 14 countries.	An online course aimed at assisting countries in Africa to strengthen their capacity on geothermal exploration and development	Mitigation	Concluded
Virtual forum and tour on geothermal direct use (2021)	Public and private sector professionals; World Bank government client counterparts.	GTP organized and managed 12 presentations focusing on geothermal for the ESMAP program of the World Bank.	Mitigation	Concluded
GRÓ GTP Short course in Kenya on exploration and development of geothermal resources, in cooperation with Kenyan energy companies (2021 and 2022)	50 participants from 14 African countries in 2021. 43 participants from 11 African countries in 2022	SDG Workshop held in cooperation with Kenyan partners. With these efforts, GRÓ GTP can reach a much larger audience. The short courses have led to significant cooperation between neighbouring countries, both in geothermal project development and in the transfer of technology and human resources.	Mitigation	Concluded
GRÓ GTP short course held in El Salvador (2022)	46 participants from 17 countries in Latin America and the Caribbean	SDG Workshop held in cooperation with El Salvadorian partners for the region. With these efforts, GRÓ GTP can reach a much larger audience. The short	Mitigation	Concluded

		courses have led to significant cooperation between neighbouring countries, both in geothermal project development and in the transfer of technology and human resources.		
The GRÓ GTP supported a 22 weeklong geothermal diploma course in El Salvador held in cooperation with local partners (2022).	27 participants from 8 countries in Latin America and the Caribbean	Support to a diploma course held in El Salvador for countries in Latin America aimed at assisting them strengthen their capacity within geothermal exploration and development	Mitigation	Concluded
ARENA programme (2022)	12 participants from 4 countries.	A week-long program in Iceland tailored to participants from the Arctic region.	Mitigation	Concluded
Short Course 1 on Low- to Medium-Temperature Geothermal Resources and Direct Utilization (2022)	19 participants from 8 countries.	A two-day short course held in Djibouti in conjunction with the ARGeo-C9 bi-annual regional geothermal conference.	Mitigation	Concluded
GRÓ LRT sponsored an online course carried out and developed by three of GRÓ LRT's long-standing partner institutions in Mongolia	25 local decision makers and environmental experts from Mongolia	The aim of the course, was to support sustainable management of ecosystems	Cross-cutting	Concluded

(2021)				
The GRÓ LRT sponsored, in cooperation with local partners, a five-day training course in Ethiopia (2022)	20 Ethiopians participated	Capacity development programme in the field of land restoration and sustainable land management	Cross-cutting	Concluded
GRÓ GEST held a short course on gender and climate change in Malawi	23 district officials from Mchinji district	This short course seeks to empower women as agents of change, improve agricultural resilience, and foster cross-sector collaboration, ensuring that gender and climate change issues are addressed in a sustainable manner.	Adaptation	Concluded

5. Improvements in reporting over time

5.1 Areas of improvement identified by the Party and technical expert review team

- Improvements have been made on reporting on financial support, after very positive communication between experts and the review team, during the in-country review of the 8th Biennial Report.

  More focus has been given on work on adaptation, which has led to improved information on adaptation.

5.2 How the Party is addressing or intends to address areas of improvement

- Iceland is constantly working on improving the reporting process and the cooperation between the different actors that are involved in providing information.
- The projection process is under constant review for further improvement.

5.3 Parties' domestic plans and priorities

- Iceland strives to improve the reporting quality over time and timely submissions.

Annex 1 – Iceland’s NDC 2030

Revision of Iceland’s 2030 Nationally Determined Contribution

Communicated to the UNFCCC on September 12, 2025.

Grammatical corrections made on September 25, 2025

The revised NDC target of reducing emissions by at least 41 per cent in 2030 compared to 2005 represents a revision to the first update to Iceland's NDC submitted in 2021. The reason for the adjustment is to clarify Iceland's quantified target within the framework of Iceland, Norway and EU's cooperation on emission reductions until 2030.

While the revision does not reflect a change in ambition for this NDC since its initial submission in 2021, the revised NDC better promotes transparency, accuracy, completeness, comparability, and consistency in accordance with article 4.13 of the Paris Agreement.

Iceland submitted an updated Nationally Determined Contribution (2nd NDC) under the Paris Agreement in February 2021 where it is stated that Iceland’s target of 55% reduction in 2030 (compared to 1990) is to be reached by acting jointly with the European Union and its Member state. This target was set with reference to Decision of the EEA Joint Committee No 269/2019, from October 2019, on climate cooperation between Iceland, Norway and the EU. The agreement covers the period 2021-2030. At the time of signing the Decision in 2019, the overall target was -40%, corresponding to the INDC at the time.

Based on decision of the EEA Joint Committee No 269/2019, Iceland takes part in three key climate mitigation legislative frameworks: the European Emissions Trading System (EU ETS), which inter alia includes emissions from the heavy industry and aviation sectors in Iceland; Effort Sharing Regulation, which sets binding targets for non-ETS emissions for individual countries (EU Member states, Iceland and Norway); and LULUCF, which covers emissions and carbon removals from the Land Use, Land Use Change and Forestry.

With this arrangement, it was understood that Iceland was contributing by acting jointly towards the target, comparable in effort and governed by the same set of rules as set for the Member States of the European Union. Specifics of the arrangements were still to be finalized in 2019.

Since 2024, Iceland has sought to clarify how its climate target put forward in its NDC is in relation to the cooperation between Iceland and the EU. With this revised NDC, Iceland aims to explicitly define quantified economy-wide targets for 2030 and clarify that the cooperation to reach them does however not involve acting jointly implementation according to article 4.16 of the Paris Agreement.

Iceland’s Nationally Determined Contribution, 2030

Iceland is committed to a target of 41 per cent net reduction of greenhouse gas emissions by 2030 compared to 2005, in the sectors covered by the scope of the EU's Effort Sharing Regulation (ESR), including emissions from road transport, energy production, fisheries, product use, agriculture and waste management. Iceland cooperates with the European Union and Norway on this target, within the framework of their climate cooperation agreement. The other sectors are regulated by the LULUCF regulation and the EU Emissions Trading System (EU-ETS) directive, thus Iceland's overall target is economy-wide, as the combination of the three pillars of the climate cooperation (ESR, LULUCF, EU-ETS) covers emissions from all sectors and greenhouse gases.

Information necessary for clarity, transparency and understanding of (ICTU) of Iceland´s Nationally determined contribution to 2030

1	Quantifiable information on the reference point (including, as appropriate, a base year):	
1a	Reference year(s), base year(s), reference period(s) or other starting point(s);	2005
1b	Quantifiable information on the reference indicators, their values in the reference year(s), base year(s), reference period(s) or other starting point(s), and, as applicable, in the target year;	The reference indicator will be quantified based on greenhouse gas emissions covered by the Effort Sharing Regulation (ESR, Regulation (EU) 2018/842). These emissions are calculated as the national total greenhouse gas emissions without LULUCF as reported by the National Inventory Document and excluding emissions from stationary installations under Directive 2003/87/EC as well as CO_2 emissions from 1.A.3.a civil aviation. The base year emissions in 2005 are 3109.329 kt CO_2eq, and the 2030 target is 1834.504 kt CO_2eq.
1c	For strategies, plans and actions referred to in Article 4, paragraph 6, of the Paris Agreement, or polices and measures as components of nationally determined contributions where paragraph 1(b) above is not applicable, Parties to provide other relevant information;	Not applicable.
1d	Target relative to the reference indicator, expressed numerically, for example in percentage or amount of reduction;	At least 41% per cent reduction in greenhouse gas emissions covered by ESR by 2030 compared to 2005 levels. (ESR, Regulation (EU) 2018/842)
1e	Information on sources of data used in quantifying the reference point(s);	The ESR emissions in the year 2005 are fixed to the value of 3109.329 kt CO_2eq. as per the decision of the EEA joint committee No 29/2022.
1f	Information on the circumstances under which the Party may update the values of the reference indicators.	Values of the reference indicator may be updated due to methodological improvements to the greenhouse gases inventory. Base year and target year emissions are fixed.
2	Time frames and/or periods for implementation:	
2a	Time frame and/or period for implementation, including start and end date, consistent with any further relevant decision adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA);	From 1 January 2021 to 31 December 2030.

2b	Whether it is a single-year or multiyear target, as applicable.	Single year target, 2030.
3	Scope and coverage:	
3a	General description of the target;	Iceland will fulfil its NDC through domestic measures and in cooperation with the European Union and Norway. The climate cooperation is established within the European Economic Area Agreement (EEA Agreement) which establishes a single market for the EU Member States and three of the European Free Trade Association (EFTA) States, Iceland, Norway and Liechtenstein. The main pillars of the climate cooperation (Fit for 55) are the following three legislative acts: a) The Effort Sharing Regulation (ESR): Regulation (EU) 2018/842 of the European Parliament and of the Council. The ESR regulates emissions excluding LULUCF not covered by the EU ETS, and sets binding national targets. These targets can be fulfilled through domestic emission reductions and/or by use of flexible mechanisms within the EU framework. The ESR regulation was incorporated into the EEA Agreement through addition of the regulation to Protocol 31 of the Agreement, by Joint Committee Decision No 269/2019. b) The Land Use, Land-Use Change and Forestry (LULUCF): Regulation (EU) 2018/841 of the European Parliament and of the Council. The (LULUCF) Regulation regulates emissions and removals for the land use, land use change and forestry sector. For 2021-2025 the regulation sets a national commitment to ensure that net emissions do not exceed emissions for either a reference period or a reference value depending on the land use categories. For 2026-2030, the regulation sets binding national targets. The targets can be fulfilled through domestic net emission reductions and/or by use of flexible mechanisms within the EU framework. The LULUCF regulation was incorporated into the EEA Agreement through addition of the regulation to Protocol 31 of the Agreement, by Joint Committee Decision No 269/2019. c) The EU Emission Trading System (EU ETS): Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading. The EU ETS regulates emissions from industrial plants, power plants, the petroleum industry and aviation and navigation within the European Economic Area. Iceland has been a part of the ETS since 2008 on the same terms as EU Member States. The ETS Directive was incorporated into the EEA Agreement through the addition of the Directive to Annex XX of the Agreement, by Joint Committee Decision No 146/2007 and subsequent Decisions reflecting updates to the Directive. Emissions from operators falling under the ETS directive are subjected to very rigorous monitoring plans and data quality requirements, with annual emission figures verified by accredited bodies as defined in the ETS directive and delegated/implementing acts. The reduction target under the system is collective for the whole system, hence no national reduction targets are set under the system.

		Whilst Iceland‘s quantified target pertains to the sectors covered by the scope of the ESR, Iceland's target is economy-wide, as the combination of the three acts mentioned above covers emissions from all sectors and greenhouse gases.
3b	Sectors, gases, categories and pools covered by the nationally determined contribution, including, as applicable, consistent with Intergovernmental Panel on Climate Change (IPCC) guidelines;	Sectors covered: 1. Energy Aviation: Emissions from civil aviation are included only in respect of CO_2 emissions from flights subject to effective carbon pricing through the EU ETS. These comprise flights within the European Economic Area, departing flights to Switzerland and departing flights to the United Kingdom. International navigation: Emissions from international navigation are included only in respect of CO_2 emissions subject to effective carbon pricing through the EU ETS. Other energy source categories in accordance with IPCC guidelines. 2. Industrial processes and product use 3. Agriculture 4. Waste 5. Land Use, Land Use Change and Forestry (LULUCF) Gases covered: Gases covered: Carbon Dioxide (CO_2) Methane (CH_4) Nitrous Oxide (N_2O) Hydrofluorocarbons (HFCs) Perfluorocarbons (PFCs) Sulphur hexafluoride (SF_6) Nitrogen trifluoride (NF_3) Further information will be given in accordance with the IPCC guidelines and the relevant UNFCCC Decisions in the Biennial Transparency Reports and the National Inventory Report.
3c	How the Party has taken into consideration paragraph 31(c) and (d) of decision 1/CP.21;	Since Iceland’s NDC is economy-wide with all sectors covered, it complies with this provision. Iceland's national inventory document (NID) describes the sources considered insignificant and reported as not estimated. The NID provides justifications for exclusion.
3d	Mitigation co-benefits resulting from Parties’ adaptation actions and/or economic diversification plans, including description of	Not applicable.

	specific projects, measures and initiatives of Parties' adaptation actions and/or economic diversification plans.	
4	Planning processes:	
4a	Information on the planning processes that the Party undertook to prepare its nationally determined contribution and, if available, on the Party's implementation plans, including, as appropriate;	The NDC target of reducing emissions by at least 41 per cent in 2030 compared to 2005 is a revision to Iceland's 2030 NDC submitted in 2021. The reason for the revision is to clarify how Iceland's quantified target and its overall (national) target fit within the framework of Iceland, Norway and EU's cooperation on emission reductions until 2030. • In October 2019 the EU, Iceland and Norway formally agreed to cooperate on climate action, with the incorporation of the Effort Sharing Regulation (ESR) and the LULUCF Regulation to the Protocol 31 of the EEA Agreement. The ESR and the LULUCF Regulation were set to implement the EU's overall target of 40 percent emission reduction by 2030 relative to 1990. • Iceland announced in December 2020 at the Climate Ambition Summit that it would increase its level of ambition to reflect the EU's updated target, which was increased from 40 per cent emissions cuts by 2030 relative to 1990 to 55 per cent or more, acting in cooperation with the EU and Norway to achieve this enhanced target. • Cabinet approval in December 2020. • The Parliament´s Standing Committee for Environment and Communication was consulted in the planning process before the announcement in December 2020. • Following a review of Iceland's NDC in 2024 and 2025, it was decided in 2025 to revise the NDC to clarify how Iceland's quantified target and its overall target fit within the framework of Iceland, Norway and EU's cooperation on emission reductions. This revision does not reflect a change in ambition, but seeks to explain more precisely the nature of the ongoing cooperation – which has not changed in its nature nor ambition since the submission of the updated NDC 2021.
4ai	Domestic institutional arrangements, public participation and engagement with local communities and Indigenous Peoples, in a gender-responsive manner;	Institutional arrangements: The administration framework regarding climate issues is set through Climate Act No 70/2012 for emissions covered by the ESR and the LULUCF regulation, and through ETS Act No 96/2023. The Climate Act prescribes clear directions on arrangements for the work on the Climate Action Plan and how it should be updated and reviewed. Moreover, it has provisions on the advisory role of Iceland's Climate Council. It also provides a framework on adaptation to climate change, as well as guidelines regarding the scientific reporting on the impact of climate change on

Iceland. According to the Climate Act, the Climate Action Plan is to be reviewed at least every four years, taking into account international commitments and the stated objectives of the government. The Climate Action Plan was last reviewed in 2024, with a 2025-2026 implementation plan approved by cabinet in September 2025. The work on the Climate Action Plan was carried out by a standing inter-ministerial climate change committee, with the Association of Local Authorities also represented, led by the Ministry for the Environment, Energy and Climate.

Regulation 786/2024 on the inter-ministerial climate change committee further defines the arrangement for the work on the Climate Action Plan and Iceland’s National Adaptation Plan.

Regulation 334/2024 on Iceland’s Climate Council further defines its governance and role as an advisory body to the development and implementation of climate policy in Iceland.

The ETS Act transposes all the requirements of the EU ETS legislative framework, as incorporated into the EEA Agreement, into Icelandic law.

The Ministry of Environment, Energy and Climate has the overarching cross-sectoral responsibility for coordination and implementation. The Ministry of Finance is responsible for the tax schemes and the other ministries are responsible for policies in their respective sectors. Further details on institutional arrangements are found in Iceland's National Communication to the UNFCCC and will be updated in Iceland's Biennial Transparency Reports under the Enhanced Transparency Framework of the Paris Agreement.

In accordance with the Climate Act No 70/2012, stakeholders are to be consulted in the preparation of the Climate Action Plan. An inter- ministerial working-group, responsible for developing proposals for actions and overseeing their implementation, was appointed by the minister for the environment, energy and climate. Additionally, the Association of Local Authorities in Iceland nominates one representative. The working-group are to submit an annual report to the minister on the progress of the action plan.

In 2011, Iceland ratified the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the Aarhus Convention), which links human rights and environmental rights.

Iceland supported the adoption of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

4aii	Contextual matters, including, inter alia, as appropriate:	
4aiia	National circumstances, such as geography, climate, economy, sustainable development and poverty eradication;	Information on national circumstances can be found in Iceland's Biennial Transparency Report (BTR) and National Inventory Document (NID).
4aiib	Best practices and experience related to the preparation of the nationally determined contribution;	Iceland’s Climate Council has the role of providing oversight and advice to the government on strategic decisions and Iceland’s climate-related goals.
4aiic	Other contextual aspirations and priorities acknowledged when joining the Paris Agreement;	Integration of just transition and gender equality is fundamental. The Constitution states that all shall be equal before that law and enjoy human rights without regard to sex, religion, opinion, national origin, race, colour, financial status, parentage and other status. Men and women shall have equal rights in every respect. Act on equal gender right and gender equality No 150/2020 is to prevent gender discrimination and to create and maintain equal rights and opportunities for all genders in all aspects of the community.
4b	Specific information applicable to Parties, including regional economic integration organizations and their member States, that have reached an agreement to act jointly under Article 4, paragraph 2, of the Paris Agreement, including the Parties that agreed to act jointly and the terms of the agreement, in accordance with Article 4, paragraphs 16–18, of the Paris Agreement;	Not applicable.
4c	How the Party’s preparation of its nationally determined contribution has been informed by the outcomes of the global stocktake, in accordance with Article 4, paragraph 9, of the Paris Agreement;	Not applicable.
4d	Each Party with a nationally determined contribution under Article 4 of the Paris Agreement that consists of adaptation action and/or economic diversification plans resulting in mitigation co-benefits consistent with Article 4, paragraph 7, of the Paris Agreement to submit information on: i. How the economic and social consequences of response measures have been	Not applicable.

	considered in developing the nationally determined contribution; ii. Specific projects, measures and activities to be implemented to contribute to mitigation co-benefits, including information on adaptation plans that also yield mitigation co-benefits, which may cover, but are not limited to, key sectors, such as energy, resources, water resources, coastal resources, human settlements and urban planning, agriculture and forestry; and economic diversification actions, which may cover, but are not limited to, sectors such as manufacturing and industry, energy and mining, transport and communication, construction, tourism, real estate, agriculture and fisheries.	
5	Assumptions and methodological approaches, including those for estimating and accounting for anthropogenic GHG emissions and, as appropriate, removals:	
5a	Assumptions and methodological approaches used for accounting for anthropogenic GHG emissions and removals corresponding to the Party's nationally determined contribution, consistent with decision 1/CP.21, paragraph 31, and accounting guidance adopted by the CMA;	Assumptions and methodological approaches are in accordance with methodologies and common metrics assessed by the IPCC (see 5 (d), below). Final accounting towards the target at the end of NDC implementation period may depend on further arrangements in Iceland's cooperation with the EU and Norway. Any use of internationally transferred mitigation outcomes will be included in Iceland's accounting, consistent with the approach used by the EU and Norway and accounted for in a way that avoids double counting. This approach is yet to be fully defined and agreed upon by all involved parties.
5b	Assumptions and methodological approaches used for accounting for the implementation of policies and measures or strategies in the nationally determined contribution;	Not applicable.
5c	If applicable, information on how the Party will take into account existing methods and guidance under the Convention to account for anthropogenic	Iceland's current greenhouse gas inventory is in accordance with Decision 18/CMA.1 and hence the IPCC 2006 Guidelines, the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (IPCC 2013 KP Supplement), the 2013 Supplement to

	emissions and removals, in accordance with Article 4, paragraph 14, of the Paris Agreement, as appropriate;	the 2006 IPCC Guidelines for the National Greenhouse Gas Inventories: Wetlands (IPCC 2013 Wetlands Supplement) and the 2019 Refinements to the 2006 IPCC Guidelines.
5d	IPCC methodologies and metrics used for estimating anthropogenic GHG emissions and removals;	IPCC 2006 guidelines, IPCC 2013 KP Supplement, the IPCC 2013 Wetlands Supplement and the 2019 Refinements to the 2006 IPCC Guidelines are used for estimating greenhouse gas emissions and removals. Global warming potentials (GWP) for a 100-year time horizon from the IPCCs fifth Assessment Report are used to calculate CO_2 equivalents.
5e	Sector-, category- or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance, as appropriate, including, as applicable:	Information in Section 5(e)(i-iii) and 5(f)(i) refers to the legal framework in force at the time of this submission. Iceland´s LULUCF policy framework builds on IPCC guidance, TACCC principles and existing accounting rules, updating and improving them for the period from 2021 to 2030. The framework identifies net accounted emissions and removals, contributing to the aim of enhancing Iceland´s net land sinks in the long-term.
5ei	Approach to addressing emissions and subsequent removals from natural disturbances on managed lands;	Approach to addressing emissions and removals from natural disturbances on afforested land and managed forest land is according to Art 10 and Annex VI of Regulation (EU) 2018/841. Iceland has not decided if emissions resulting from natural disturbances will be excluded.
5eii	Approach used to account for emissions and removals from harvested wood products;	Production Approach is used to account for emissions and removals from harvested wood products, as defined in IPCC Guidelines; see also Art 9 and Annex V of Regulation (EU) 2018/841.
5eiii	Approach used to address the effects of age-class structure in forests;	Within the context of Iceland's climate cooperation with the European Union and Norway, emissions and removals in managed forests in the period 2021-2030 will be accounted for as the deviation from a projected forward-looking forest reference level, with regards to dynamic age-related forest characteristics, as in accordance with Art 8 and Annex IV of Regulation (EU) 2018/841. Projected reference levels for Managed Forest Land (Forest Land remaining Forest Land) take into consideration age-class structure of forest so that changes in management practices are accounted; see also Art 8 and Annex IV of Regulation (EU) 2018/841. The approach is described in Iceland's national inventory document (NID).
5f	Other assumptions and methodological approaches used for understanding the nationally determined contribution and, if applicable, estimating corresponding emissions and removals, including:	N/A
5fi	How the reference indicators, baseline(s) and/or reference level(s), including, where applicable, sector-, category- or activity-specific reference levels, are constructed, including, for example, key parameters, assumptions, definitions, methodologies, data sources and models used;	Under the revised Effort Sharing Regulation (ESR), the EU legislation sets enhanced binding national reduction targets for greenhouse gas emissions not covered by the existing EU ETS, namely domestic transport (except aviation), buildings, agriculture, waste and small industries. The emissions reduction target for Iceland of 41% in 2030 compared to 2005 is in line with the individual targets of the EU member states. The ESR emissions in the year 2005 are fixed to the value of 3109.329 kt CO_2eq. as per the decision of the EEA joint committee No 29/2022.

		Emissions under the scope of the EU Emission Trading System (ETS) concerns industrial plants, commercial aviation and navigation within the European Economic Area. As the EU ETS operates across borders to reduce emissions collectively, emissions from operators registered in Iceland are not included in the national reference indicator. However, by participating in the system, Iceland continues to contribute to overall emission reductions within the ETS framework. Iceland participates in the EU regulatory framework for Land Use, Land-Use Change and Forestry (LULUCF). Within the climate cooperation with the European Union and Norway, emissions and removals from the land sector will be accounted for based on specific accounting rules for the different land categories in regulation (EU) 2018/841, Art 6-8 and Annex IV. Due to the specific characteristics of the LULUCF sector, no separate indicator is provided for it. For the period 2021-2025, following accounting rules are used: • Accounting for emissions and removals from LULUCF follows specific rules depending on the land accounting category in accordance with Regulation (EU) 2018/841. • Afforested Land and Deforested Land use baseline zero (gross-net accounting). Managed Grassland, Managed Cropland and Managed Wetland use as baseline the average emissions between 2005 and 2009 (net-net accounting). • Managed Forest Land uses as baseline a Forest Reference Level based on continuation of Forest Management Practices between 2000 and 2009 and taking into account the age-class structure of forests, projected through the compliance period. The mere presence of carbon stocks is excluded from accounting. LULUCF Categories: Emissions and removals occurring on reported categories of forest land, cropland, grassland, and wetland, including land use change between these categories, and between these categories and settlements and other land. LULUCF Pools: Above-ground biomass; Below-ground biomass; Litter; Dead wood; Soil organic carbon; Harvested wood products. Accounting rules and targets for the period 2026-2030 are pending uptake of the updated regulation into the EEA Agreement and the LULUCF target for Iceland is still not known. Therefore, a quantified target for LULUCF emissions is not set in this NDC and respective emissions are not included in the national reference indicator.
5fii	For Parties with nationally determined contributions that contain non-greenhouse-gas components, information on assumptions and methodological approaches used in relation to those components, as applicable;	Not applicable.

5fiii	For climate forcers included in nationally determined contributions not covered by IPCC guidelines, information on how the climate forcers are estimated;	Not applicable.
5fiv	Further technical information, as necessary;	Not applicable.
5g	The intention to use voluntary cooperation under Article 6 of the Paris Agreement, if applicable.	Iceland seeks to fulfil the NDC through the climate cooperation with the European Union and Norway. Final accounting towards the target at the end of NDC implementation period may depend on further arrangements in Iceland's cooperation with the EU and Norway. Any use of internationally transferred mitigation outcomes will be included in Iceland's accounting, consistent with the approach used by the EU and Norway and accounted for in a way that avoids double counting. This approach is yet to be fully defined and agreed upon by all involved parties. A decision on the use of voluntary cooperation under Article 6 of the Partis Agreement is pending.
6	**How the Party considers that its nationally determined contribution is fair and ambitious in the light of its national circumstances:**	
6a	How the Party considers that its nationally determined contribution is fair and ambitious in the light of its national circumstances;	Iceland's projected emission reduction in 2030, at the time of this revision estimates a reduction of -28% compared to 2005 in sectors pertaining to its quantified target. Yet, Iceland aims for reducing emissions by 41% in respective sectors compared to 2005. These projections already build on and take into account significant progression in vehicle electrification and waste management. Moreover, these targets are to a backdrop of Iceland's pre-2005 full transition of its energy production and district heating to renewable sources (hydro and geothermal).
6b	Fairness considerations, including reflecting on equity;	Iceland regards its nationally determined contribution to represent its fair share of the efforts to achieve the global long-term goal of the Paris Agreement.
6c	How the Party has addressed Article 4, paragraph 3, of the Paris Agreement;	Neither Iceland's INDC (1st NDC) submitted in 2016 nor its update submitted in 2021 detailed Iceland's respective fair share in the EU's climate targets which they set out to collectively deliver. In this revised NDC, Iceland establishes a specific target for emissions in sectors that correspond to its expected fair share under the EU Effort Sharing Regulation. By setting a clear quantified target, Iceland believes its revised NDC more clearly represents a progression from the INDC which only states the intent to collectively deliver the EU's climate targets.
6d	How the Party has addressed Article 4, paragraph 4, of the Paris Agreement;	By having an economy-wide target, Iceland complies with this provision.

6e	How the Party has addressed Article 4, paragraph 6, of the Paris Agreement	Not applicable.
7	**How the nationally determined contribution contributes towards achieving the objective of the Convention as set out in its Article 2:**	
7a	How the nationally determined contribution contributes towards achieving the objective of the Convention as set out in its Article 2;	Iceland considers its enhanced NDC to be in line with the objective of the UNFCCC and long-term goal of the UNFCCC Paris Agreement, as explained in 6a.
7b	How the nationally determined contribution contributes towards Article 2, paragraph 1(a), and Article 4, paragraph 1, of the Paris Agreement.	See further 6a and 7a.