Landsvirkjun

Climate Account 2020

Climate Account 2020

I hereby confirm the results of our 2020 carbon footprint and climate account.

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23. March 2021

Hörður Arnarson, CEO

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Key Figures

The climate account contains statistical information on our carbon emissions in 2020.

Carbon footprint
16,453 tonnes ↓25%

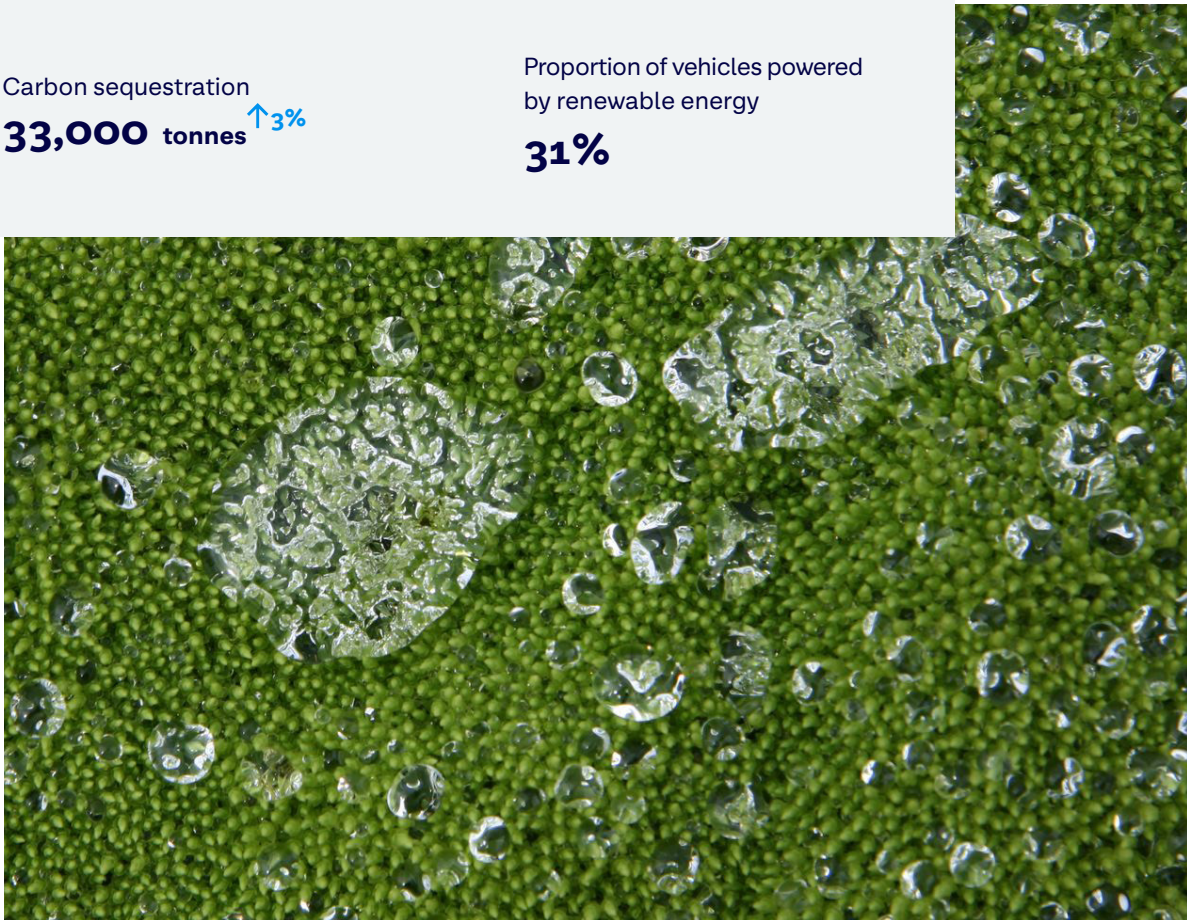
Carbon footprint per energy unit
1.2 g/kWh ↓25%

Greenhouse gas emissions
49,453 tonnes ↓6%

Carbon intensity
3.7 g/kWh ↓5%

Carbon sequestration
33,000 tonnes ↑3%

Proportion of vehicles powered by renewable energy
31%



Carbon Footprint

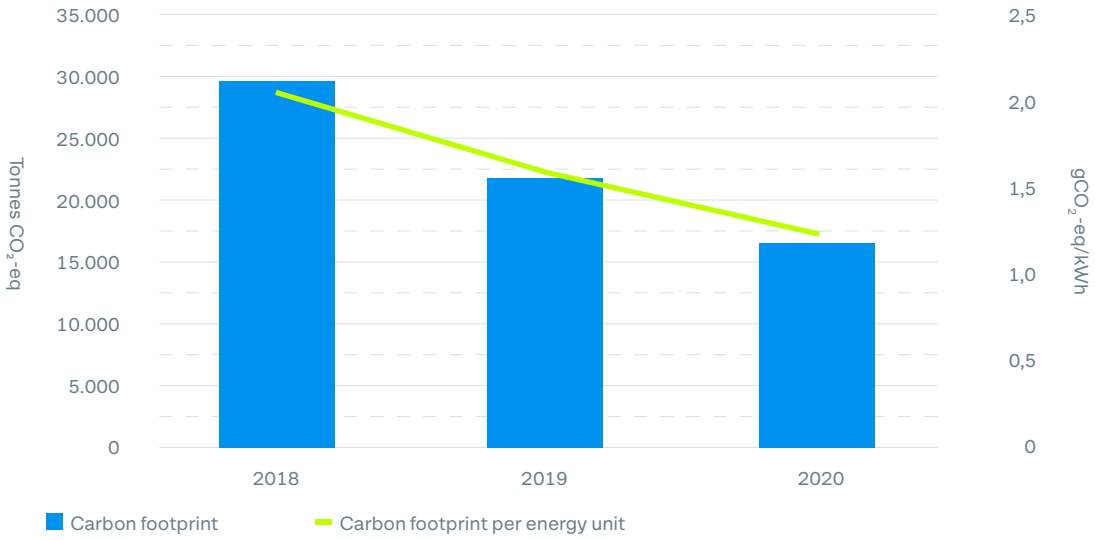
Landsvirkjun's carbon footprint in 2020 was around 16,5 thousand tonnes CO2-eq, whereas in 2019, the carbon footprint amounted to 22 thousand CO2-eq. Compared to 2019, the carbon footprint has therefore decreased by 25%. The decrease is explained both by a reduction of greenhouse gas emissions as well as increased carbon sequestration in both soil and vegetation.

Landvirkjun's carbon footprint accounts for annual greenhouse gas emissions resulting from the company's operations, calculated using the methodology of the Greenhouse Gas Protocol, including organic carbon emissions from reservoirs, after subtracting estimated carbon sequestration.

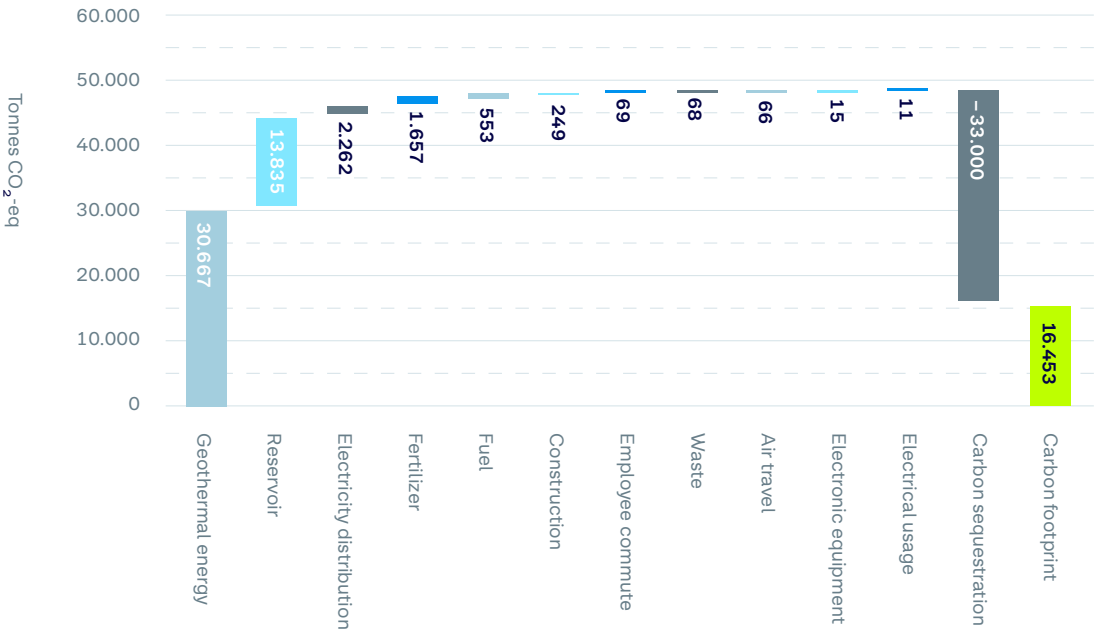
Carbon footprint = GHG emissions + biogenic CO2 emissions – sequestrated carbon

Geothermal emissions (30,667 tonnes CO_2-eq) and emissions from hydropower reservoirs (13.835 tonnes $_2$-eq) account for the largest part in total emissions.

↓ **Carbon footprint**



↓ Carbon footprint



Emissions from geothermal power plants are higher than emissions from hydropower stations. Direct geothermal emissions stem from the release of gases into the atmosphere while direct hydropower emissions are composed of emissions from reservoirs. Other emissions are the sum of other factors, e.g. burning of fossil fuel, distribution of electricity, air travel, office waste, along with other waste, which is categorized in the table as other emissions.

The carbon footprint per energy unit was 1.2 g CO_2-eq/kWh but amounted to 1,6 g CO_2-eq/kWh in 2019.

↓ Carbon intensity by energy source (gCO_2-eq/kWh)

	2018	2019	2020	Change from 2019
Geothermal power	36,0	30	32	7%
Hydropower	1,1	1,3	1,1	–15%
Total electricity emissions	3,8	3,5	3,3	–6%
Other emissions	0,5	0,4	0,3	–25%
Total emissions	**4,2**	**3,9**	**3,7**	**–5%**
Carbon sequestration	**–2,2**	**–2,3**	**–2,5**	**9%**
Carbon footprint	**2,1**	**1,6**	**1,2**	**–25%**

The table lists emissions by energy source. Direct emissions depend on the energy source in question. For example, direct geothermal emissions stem from the release of gases into the atmosphere while direct hydropower emissions are composed of emissions from reservoirs. Other emissions are the sum of other factors, e.g. burning of fossil fuel, SF_6, air travel, office waste, along with other waste, which is categorized in the table as other emissions.

Our Method for Climate Accounting

Our climate account is based on the methodology of the Greenhouse Gas Protocols[1] (GHGP), which is a leading international corporate standard for accounting and reporting greenhouse gas emissions.

Our climate account has been reviewed by external auditors, making Landsvirkjun the first Icelandic company to invite external auditors to review its climate account. This means that our scope 1, 2, and 3 GHG emissions data as stated in this report has been reviewed and verified by Bureau Veritas, an international company specialized in testing, inspection and certification, to the ISAE 3000 Revised assurance standard (limited level).

A definition of Landsvirkjun's impact
Our climate account covers almost every aspect of the company's operations as well as subsidiary companies directly operated by Landsvirkjun, i.e. Landsvirkjun Power and Icelandic Power Insurance. This excludes companies in which Landsvirkjun owns shares but where it is not directly involved in daily operations.

Operational scope
The operational scope is here taken to refer to the definition of factors responsible for the company's greenhouse gas emissions. It can refer to either "direct emissions" (Scope 1) or "indirect emissions" (Scope 2 and 3). The difference between the categories is as follows:

- Scope 1 refers to emissions that we are directly responsible for, i.e. emissions from the operations that we control directly. Any decision to reduce specific emissions (e.g. if we cease fossil fuel consumption or implement technology to capture CO_2 from the geothermal fluid), will lead to direct reduction in emissions.

- Scope 2 and 3 refers to to emissions stemming from activities that our operations indirectly impact in our value chain. We can influence our consumption, but we are not responsible for the ways in which the production, services or waste disposal are conducted by the companies offering those products. Scope 2 and 3 account for emissions from companies we deal with, but do not direct. We can indirectly influence these emissions through our selection of business partners or by making certain environmental demands with relevant suppliers and service providers.

1 www.ghgprotocol.org/corporate-standard

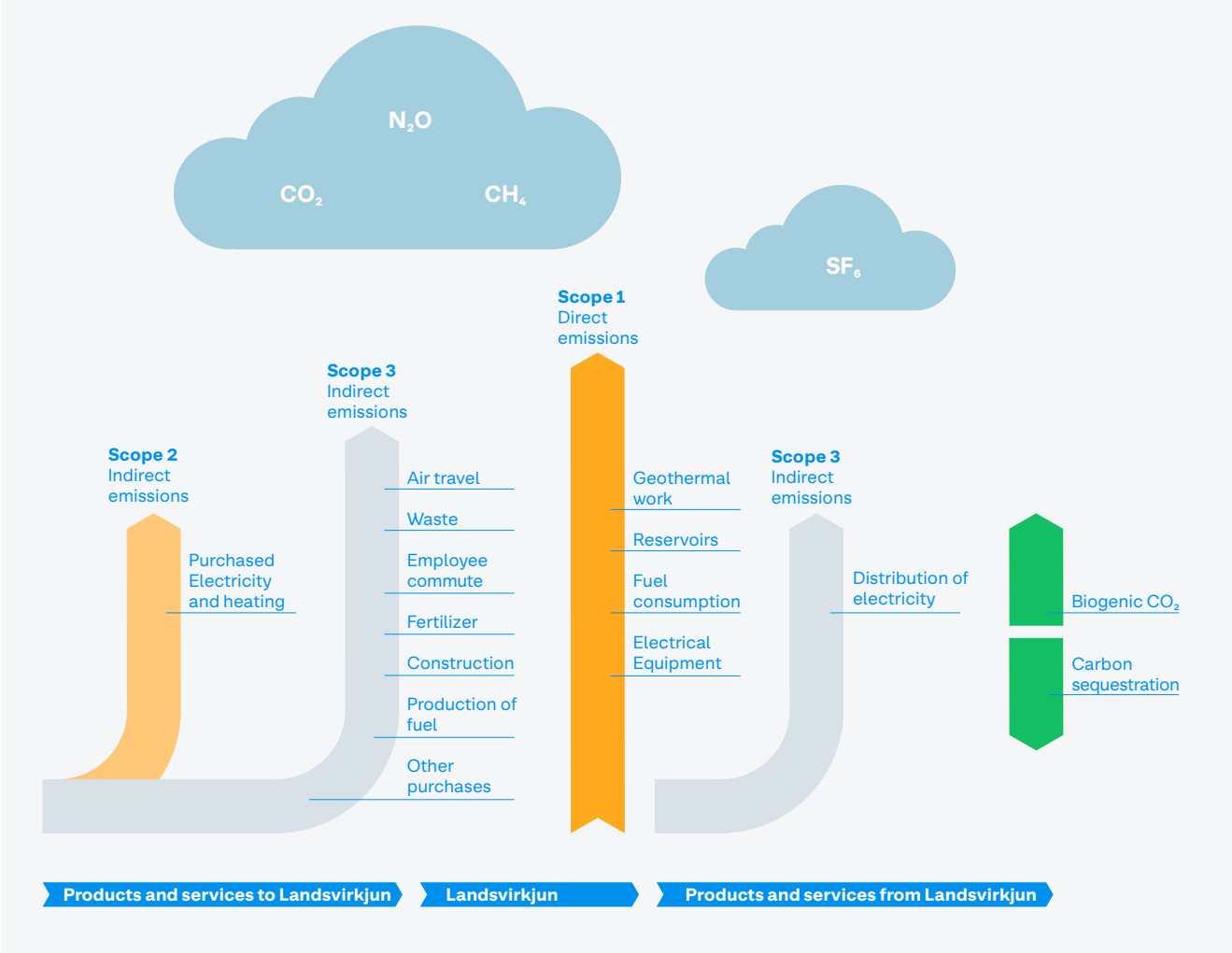
The reason for the classification

If Landsvirkjun were to only address and report direct emissions (Scope 1), the company would solely account for emissions from geothermal plants, reservoirs, fossil fuel consumption by our vehicle fleet, and the release of sulphur hexafluoride (SF_6) from equipment owned by us. This means that all emissions from other companies from which we purchase products and services, or rely on for waste disposal, would not figure into our climate account. As a result, there would be no incentive to recycle or minimize air travel and we could reduce emissions increasing our use of rental cars instead of our own vehicles. In this way, we could show a reduction of emissions in our climate account without an actual decrease of emissions.

By reporting on Scope 2 and 3 emissions we are taking responsibility for the emissions that take place in our value chain instead of only accounting for direct emissions. We therefore seek to adopt a holistic perspective on greenhouse gas emissions to prevent the responsibility of emissions being passed from one company to another. The incentive is here created to carefully select suppliers, with the aim of encouraging our business partners to do their utmost for the environment.

Landsvirkjun has a certified environmental management system, which operates in accordance with the international standard ISO 14001:2015.

↓ **Greenhouse gases in Landsvirkjun's operations**

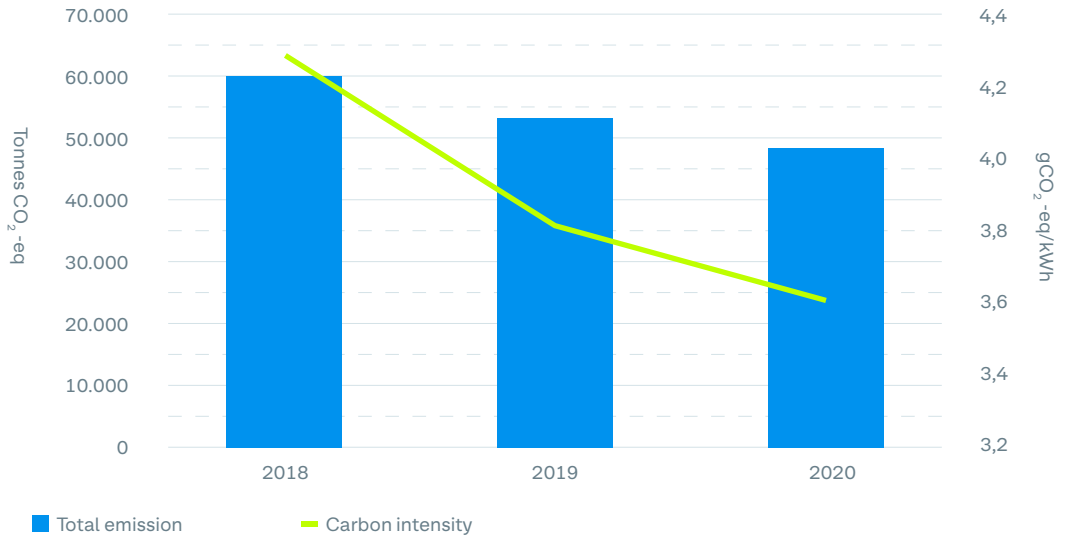


Greenhouse Gas Emissions

Landsvirkjun's greenhouse gas emissions for 2020, as defined within the GHGP scopes, was around 43 thousand tonnes CO_2-eq. The greatest emissions result from Scope 1 (89%), followed by Scope 3 emissions (11%).

The total greenhouse gas emissions from Landsvirkjun's operations in 2020 was around 49.5 thousand tonnes CO_2-eq. A vast portion of these emissions come from geothermal energy, almost 31 thousand tonnes, then emissions from reservoirs, which was close to 14 thousand tonnes, thereof 6.4 thousand tonnes due to organic carbon dioxide emissions from reservoirs. Total emissions decreased by 7% between years, where energy unit emissions (carbon intensity) went from 3.9 g/kWh in 2019 to 3.7 g/kWh in 2020.

↓ Our emissions

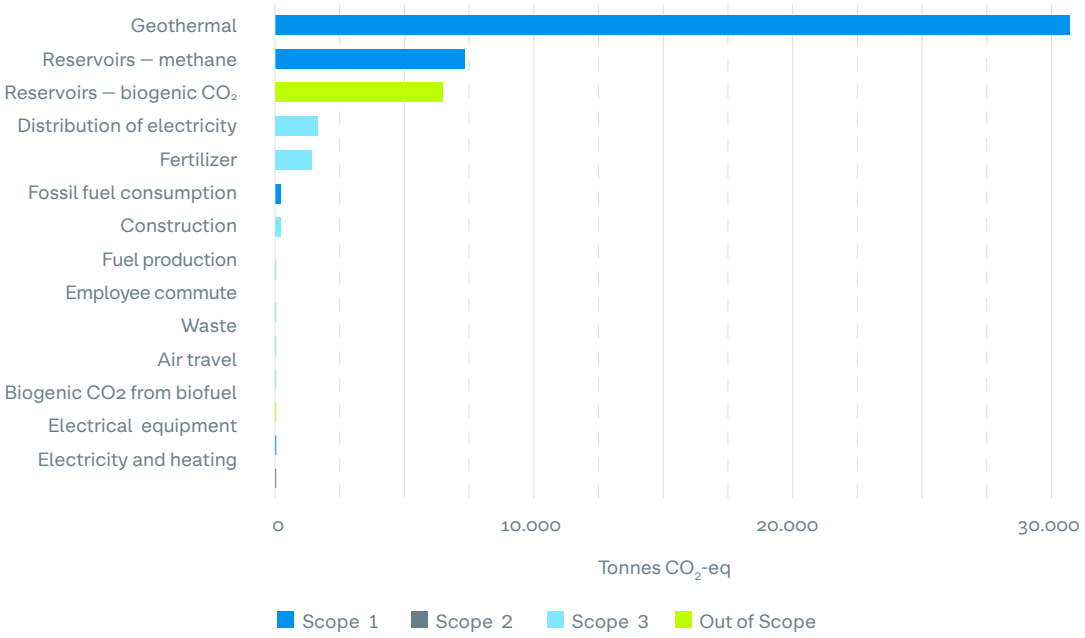


A major part of the reduction can be traced to a decrease in energy production, varying production capacities of the geothermal power plants, as well as the water level of the reservoirs and the duration of ice on the Blöndulón reservoir. Most smaller factors contributing to Landsvirkjun's emissions also reduced between years. In this regard COVID-19 likely played an influential part.

↓ Our emissions (tonnes CO2-eq)

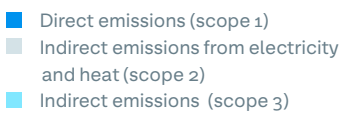
	2018	2019	2020	Change from 2019
Direct emissions (Scope 1)	48.918	41.607	38.436	–8%
Electricity and heating (Scope 2)	12	9	11	22%
Indirect emissions (Scope 3)	5.520	4.070	4.523	11%
Total emissions (Scopes 1–3)	**54.450**	**45.686**	**42.970**	**–6%**
Total emissions including out of scope emissions	**60.971**	**53.372**	**49.453**	**–7%**

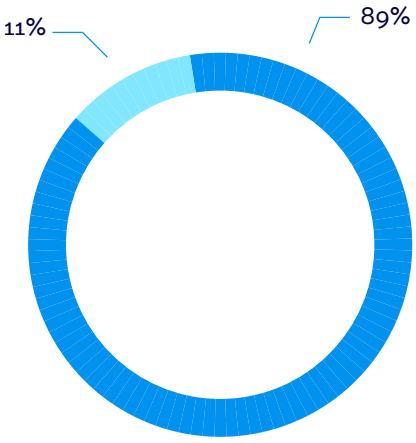
↓ Emissions by scopes



Geothermal energy accounts for a vast majority of emissions. Methane emissions from reservoirs at hydropower stations are also a large part of total emissions. Both are categorized as direct emissions (Scope 1). Biogenic carbon dioxide emissions from reservoirs also play a considerable role. However, biogenic CO_2 emissions fall out of the scopes according to GHGP standards and are therefore not defined as part of Landsvirkjun's direct greenhouse gas emissions. Carbon dioxide emissions from the burning of biodiesel are likewise not included in the scopes. With regard to indirect emissions (Scope 3), the insulating medium SF_6 used in the power grid plays the biggest role. Emissions from the distribution of electricity is categorized as indirect emissions in our climate account and the volume of SF_6 is proportional to the company's energy production as part of Iceland's total electricity production. Emissions due to the consumption, production or transportation of fuel, as well as the use of fertilizers in soil conservation and reforestation projects, comes in second. It should be noted that the use of fertilizers can positively impact vegetation growth and carbon sequestration. Employee commute, air travel, generation of waste and emissions from electrical equipment, in fact has a negligible impact toward Landsvirkjun's total emissions.

↓ Emissions by scopes

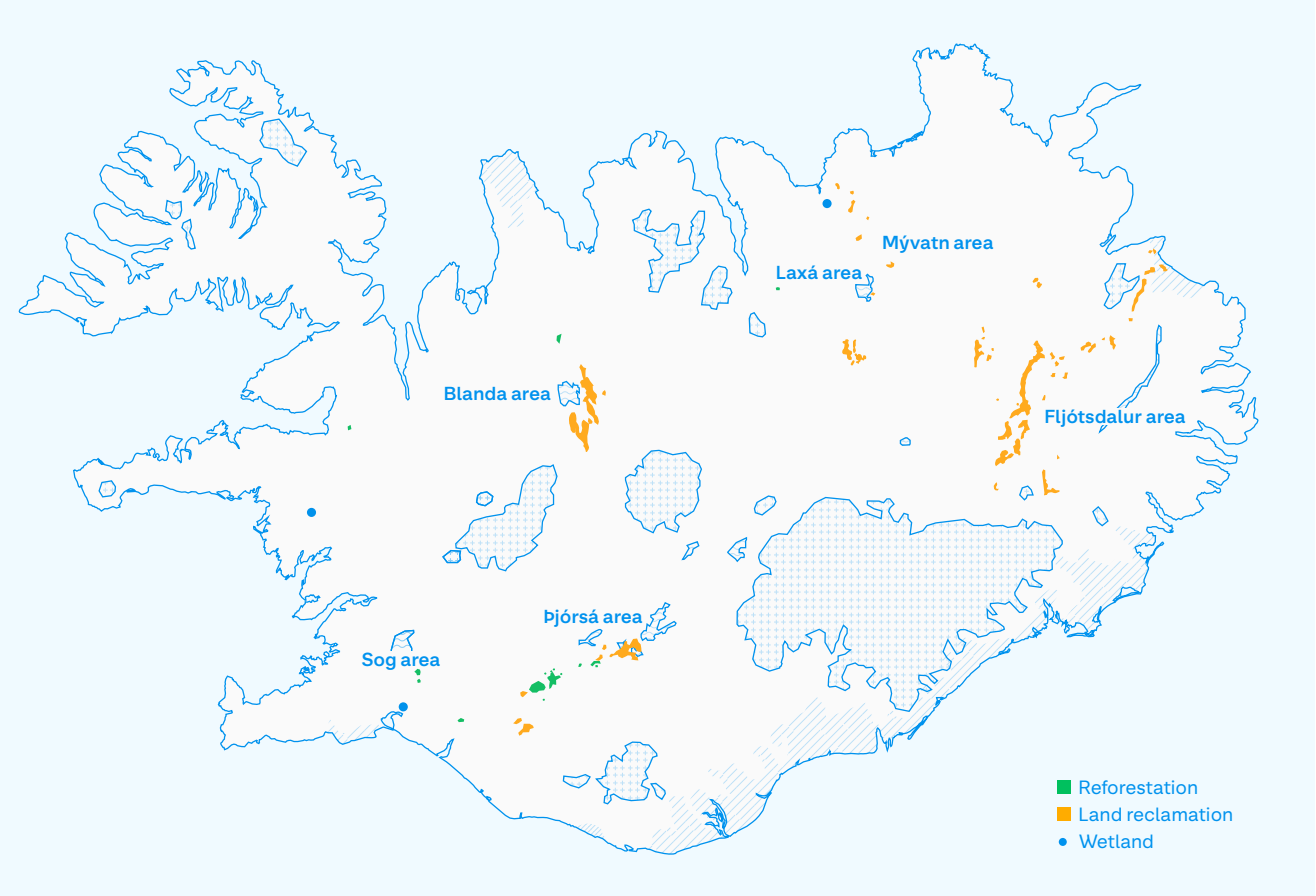




According to GHGP standards, 89% of Landsvirkjun's emissions are categorized as direct emissions, whereas 11% count as indirect emissions.

Carbon Sequestration

Landsvirkjun's total carbon sequestration amounted to approximately 33,000 tonnes CO_2-eq in 2020. Sequestration in our projects was an estimated 29,400 tonnes CO_2-eq in land reclamation, 2100 tonnes CO_2-eq in reforestation and 500 CO_2-eq for wetland reclamation. An additional 1000 tonnes CO_2-eq were sequestered in collaboration with Kolviður.



↓ Projects relating to land reclamation, reforestation, and wetland reclamation, led by Landsvirkjun or in cooperation with other companies.

↓ Carbon sequestration (tonnes CO_2-eq)

	2018	2019	2020	Change from 2019
Land reclamation	−28.400	−28.800	−29.400	2%
Reforestation	−1.850	−2.000	−2.100	5%
Wetland reclamation	–	−100	−500	400%
Carbon funds	−1.035	−1.000	−1.000	0%
Total carbon sequestration	**−31.285**	**−31.900**	**−33.000**	**3%**

Since the 1960s, Landsvirkjun has undertaken comprehensive projects toward soil conservation and forestry in areas surrounding its power stations in cooperation with both professionals and land owners. The year 2011 saw the onset of collaborative projects with the Soil Conservation Service of Iceland and the Icelandic Forest Service aimed at carbon sequestration, with wetland reclamation added to the list in 2019. Furthermore, a portion of Landsvirkjun's operations has also been offset through the carbon fund Kolviður. In 2020, Landsvirkjun introduced a sharper focus in its operations and at the same time updated aims in relation to soil conservation and land and wetland reclamation. In 2020 we made the decision to only use domestic species in all new and future reforestation projects, the projects already well underway will be completed on schedule.

The land reclamation projects in the Blanda area and Fljótsdalur area have been the most comprehensive. Considerable reforestation projects have also been initiated in the Þjórsá area as well as the Sog area, and around Blanda. Land reclamation projects, with specific emphasis on carbon sequestration, are located at Rangárvellir and Hólasandur. Soil conservation projects are also underway on Eiðisstaðir by Blanda power station, along with Belgsá in Fnjóskadalur valley, Laxaborg in Haukadalur valley, Skarfanes in Landsveit and Skálmholtshraun in Flóahreppur. Moreover, wetland reclamation work has been carried out in Sogn in Ölfus and Ytri-Hraundalur in Mýrar, all aimed at reducing greenhouse gas emissions.

The Soil Conservation Service of Iceland and the Icelandic Forest Service estimate carbon sequestration in forest plantations and reclamation projects that are applied by Landsvirkjun. Sampling points have been laid out where trees, vegetation and soil are studied. We estimate that wetland reclamation decreases emmission of greenhouse gases by 20 tonn CO_2/ha/year.

Climate Action Plan

In 2019, Landsvirkjun launched its climate action plan for the year 2030. The action plan sets a goal of the company becoming carbon neutral in 2025. And in 2030 the aim is to offset significantly more carbon than the company emits. The action plan is grounded on extensive research of Landsvirkjun's carbon footprint. The plan charts a direction toward reducing carbon emissions and binding more carbon in soil and vegetation than produced by the company.

Landsvirkjun's central goal is to reduce direct emissions by 50%, compared to the year 2008. In order to facilitate this goal, Landsvirkjun intends to reduce geothermal emissions and reduce the use of fossil fuels. In addition, Landsvirkjun aims to reduce emissions connected to employee travel, as well as increasing carbon sequestration in soil and vegetation.

The priorities of the shaping and implementation of the action plan

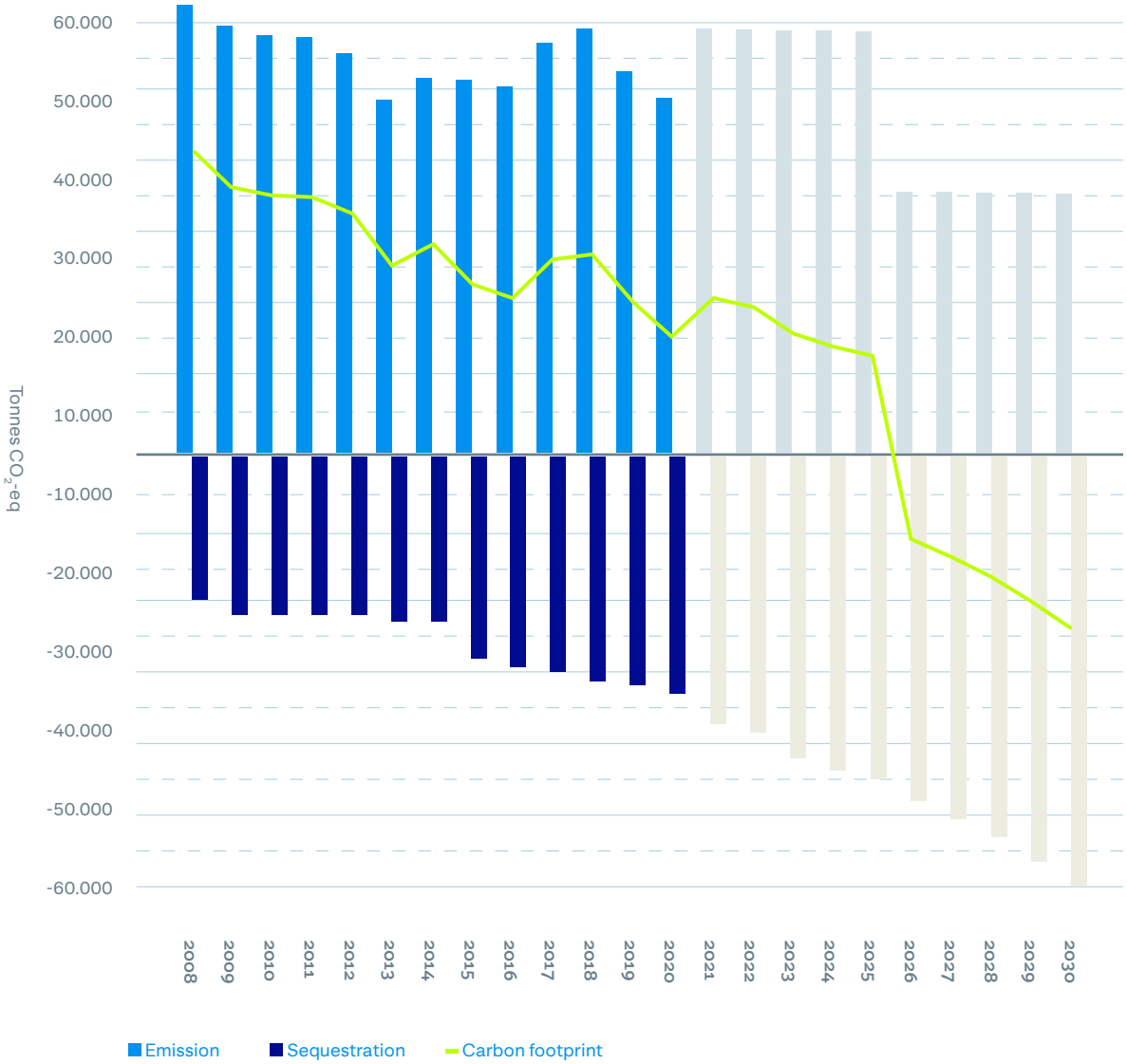
1. Prevent new emissions
2. Reduce current emissions
3. Mitigation measures

Action plan objectives for achieving carbon neutrality

- 50% reduction in direct emissions in 2025, compared to 2008
- 60% reduction in geothermal emissions in 2025, compared to 2008
- Eliminate fossil fuel consumption by 2030
- Emissions from air travel 30% less in 2030 than in 2018
- Emissions from employee work-related travel 60% less in 2030 than in 2018
- Soil and vegetation sequestration three times greater in 2030 than in 2008

For more information, visit Landsvirkjun's website.[2]

↓ Landsvirkjun's targets to reduce emissions



2 www.landsvirkjun.com/sustainability/carbon-neutrality

Our Operations

Landsvirkjun is the national power company of Iceland. The company produces electricity by using renewable energy sources; hydropower, geothermal energy and wind energy. Landsvirkjun generates 70% of Iceland's total electricity production, making it the largest electricity producer in the country. The company is also leading in the use of renewable energy resources, and constantly promotes increased knowledge, innovation and technological development.

Environmental protection has figured into our guiding principles since the very beginning. It was soon clear that Landsvirkjun's operations called for comprehensive knowledge regarding the environmental impact. Calls for environmental action are growing and we are determined to place ourselves at the forefront regarding these challenges. Landsvirkjun's vision is a sustainable world powered by renewable energy. We take the issue of global warming very seriously and we believe that our greatest contribution toward facilitating sustainable development lies in how we take responsibility for climate change, since energy issues are climate issues.

↓ Overview of our energy generation, losses and own energy use (GWh)

	2018	2019	2020	Change from 2019
Total energy production	14.342	13.958	13.437	–4%
Energy losses	148	51	49	–4%
Own use	–	91	83	–4%
Energy sales	**14.194**	**13.816**	**13.305**	**–4%**

Capacity
13.305 GWh

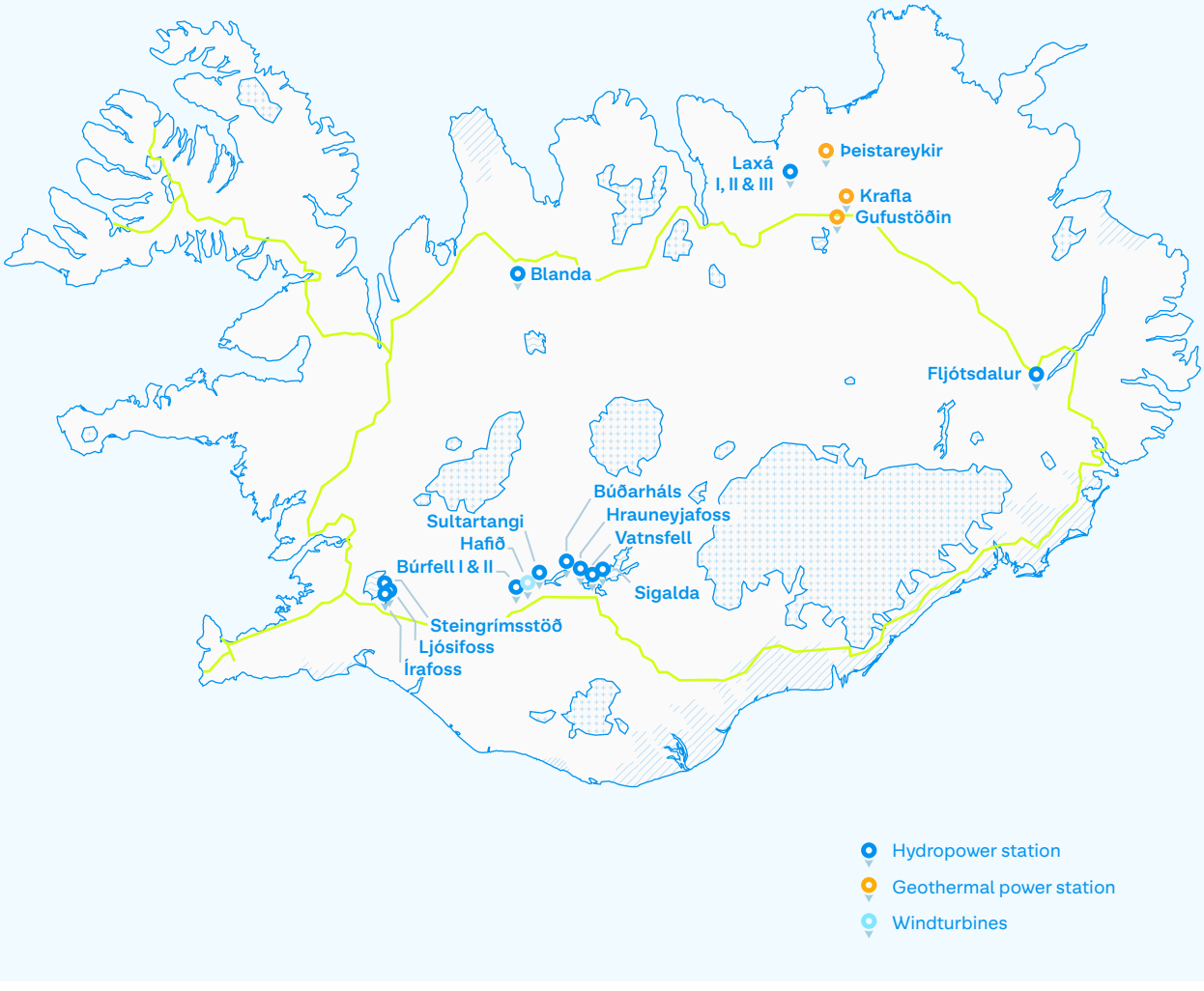
Hydropower
1.991 MW

Number of staff
270 people

Geothermal energy
153 MW

Power stations
19 stations

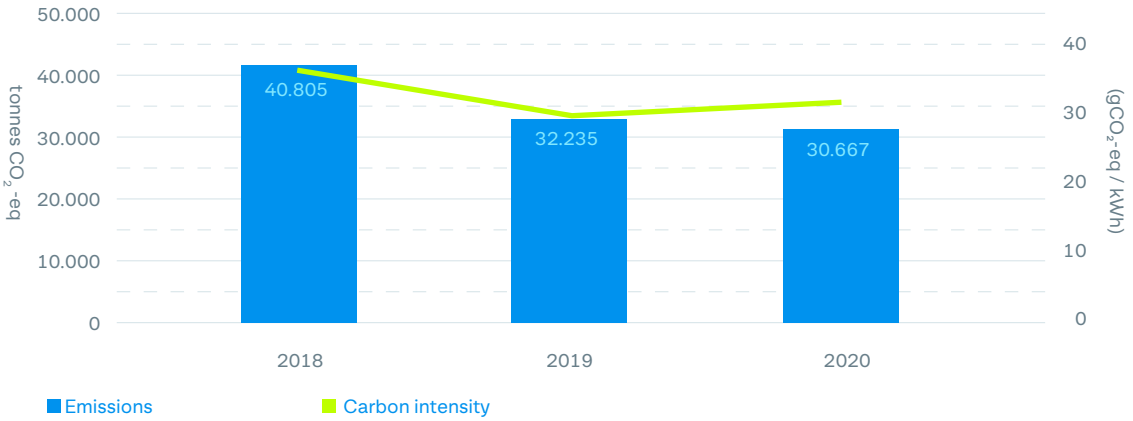
Wind power
2 MW



Emissions by Sources

Geothermal Energy

Emissions from geothermal power plants changed between years with 30,667 tonnes CO_2-eq for 2020, a 5% decrease from 2019. The carbon intensity of our geothermal energy generation increased slightly, from 30 g/kWh in 2019 to 31.5 g/kWh in 2020.



↓ Greenhouse gas emissions from geothermal energy generation

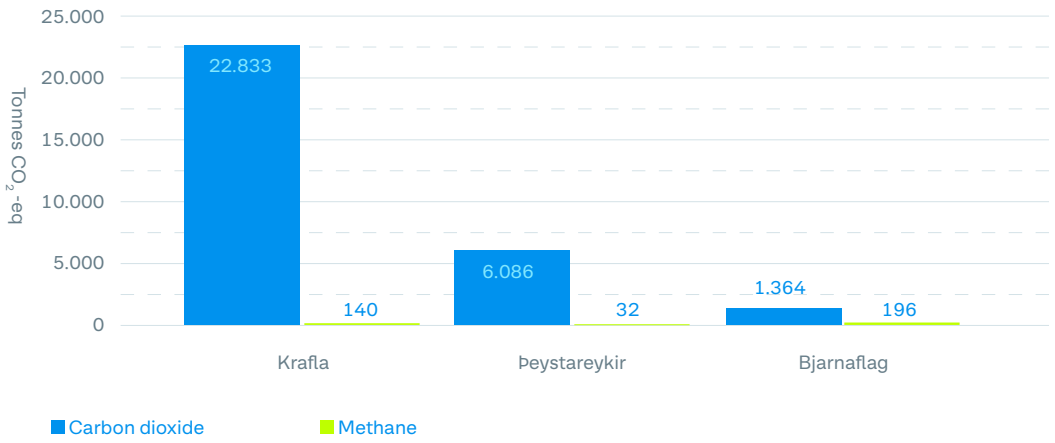
The decrease between 2019 and 2020 is explained by lower energy production in 2020. Looking at 2018, however, the difference between years is more clearly visible, where the reduction in geothermal emissions in 2020 was 25% lower than in 2018, explained by lower energy production and increased use of hydropower due to more favourable water levels in reservoirs.

The most significant part of our emissions come from the generation of geothermal energy in Kröflustöð power plant. Emissions from the Þeistarreykir and Bjarnarflag geothermal power plant are considerably lower. The difference in emissions is explained by the unique attributes of the geothermal systems utilized by each power plant, despite Þeistareykir being our largest geothermal power plant.

↓ Carbon dioxide and methane emissions from geothermal (tonnes CO_2-eq)

	2018			2019			2020		
Power plant	**CO_2**	**CH_4**	**Total**	**CO_2**	**CH_4**	**Total**	**CO_2**	**CH_4**	**Total**
Krafla	32.462	183	**32.645**	23.738	163	**23.901**	22.833	140	**22.997**
Þeistareykir	7.827	82	**7.909**	6.612	68	**6.680**	6.086	32	**6.123**
Bjarnaflag	171	79	**250**	1.503	151	**1.654**	1.364	196	**1.547**
Total	**40.460**	**344**	40.804	**31.853**	**381**	32.235	**30.283**	**368**	30.667

↓ Geothermal emissions by power plant

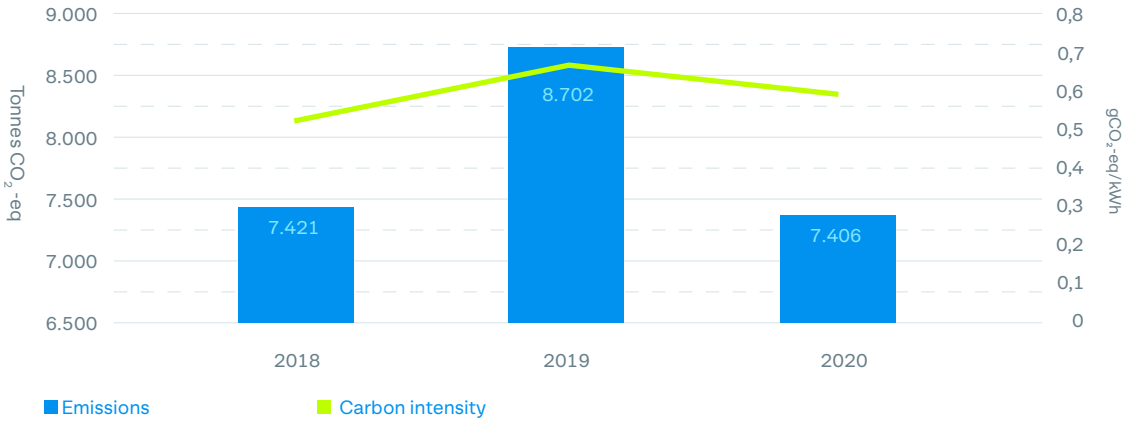


Greenhouse gas emissions from geothermal power plants is calculated for each borehole. A chemical analysis is conducted from every borehole annually in order to establish e.g. the level of greenhouse gas present in the geothermal fluid. The level of greenhouse gases in each borehole is multiplied by the total annual amount of geothermal fluid carried by the borehole, which yields information about the level of greenhouse gas emissions that results from the geothermal energy generation.

Hydropower

> Direct emissions (Scope 1) from reservoirs was 7.406 tonnes CO_2-eq in 2020, a 15% reduction from 2019.

↓ Greenhouse gas emissions from hydro power reservoirs



The reason for such a dramatic reduction between years is how early ice began to melt on the Blanda and Fljótsdalur reservoirs in 2019. As can be seen, the emissions in 2020 are comparable to 2018.

↓ Carbon dioxide and methane emissions from our reservoirs (tonnes CO2-eq)

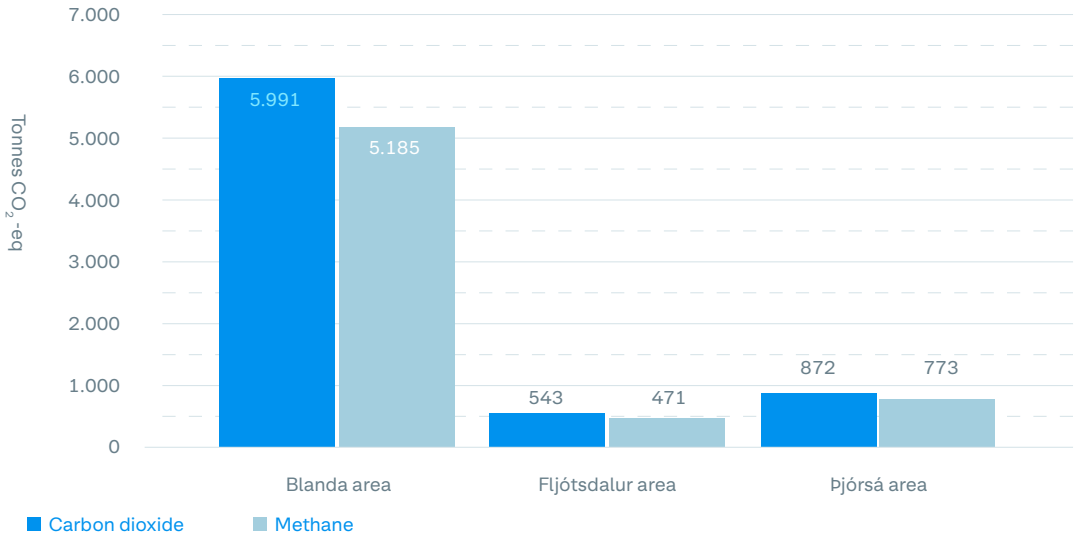
Area	Reservoirs	Number of ice-free days
Blanda area	Blöndulón	156
	Gilsárlón	160
Fljótsdalur area	Grjótárlón	215
	Hálslón	171
	Kelduárlón	141
	Ufsárlón	135

↓ Carbon dioxide and methane emissions from our reservoirs (tonnes CO_2-eq)

	2018			2019			2020		
Area	CO_2	CH_4	**Total**	CO_2	CH_4	**Total**	CO_2	CH_4	**Total**
Blanda area	5.122	5.930	11.052	6.250	7.169	13.419	5.185	5.991	11.176
Fljótsdalur area	491	563	1.054	528	605	1.133	471	543	1.014
Þjórsá area	908	928	1.836	908	928	1.836	773	872	1.645
Total emissions	**6.521**	**7.421**	**13.942**	**7.686**	**8.702**	**16.388**	**6.429**	**7.406**	**13.835**

5.991 5.185

↓ Reservoir emissions by operating area



The largest part of emissions from Landsvirkjun's reservoirs can be traced to Blanda power station (81%), where relatively vast amounts of organic matter were submerged as the reservoir was formed.

Vegetation and soil are submerged under water when reservoirs are formed, where they begin to decompose. The decomposition process of organic matter then releases the greenhouse gases carbon dioxide, methane and nitrous oxide. Greenhouse gas emissions from reservoirs therefore vary and are largely dependent on the total amount of organic matter that is submerged underwater at any given time.

According to GHGP standards, methane emissions from reservoirs belong to Scope 1. However, CO_2 emissions are not included in the scopes, because, during its life cycle, the vegetation has managed to bind an equal amount of CO_2 as when it decomposes. There is no available information concerning how much biogenic carbon, as it decomposes from vegetation and soil underwater, is released into the atmosphere and how much is bound to the reservoir itself. Until that information becomes available, we have decided to include these emissions in our annual total emissions and carbon footprint.

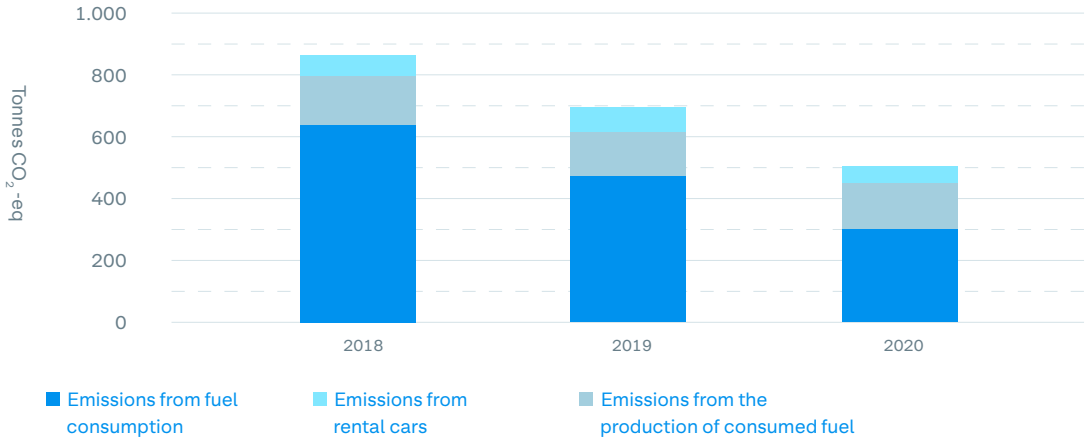
There are no emissions from reservoirs when they are covered with ice. Changes to the ice cover of Blanda and Fljótsdalur reservoirs are monitored and ice-free days are documented. For other reservoirs, where considerably less amounts of carbon went underwater, the number of ice-free days were not recorded, but instead we approximate 215 days for the period. Greenhouse gas emissions (CO_2 and CH_4) from reservoirs is calculated by multiplying the number of ice-free days with specific emissions factors, based on numerous studies and peer-reviewed articles. These emissions factors are also used in the climate accounts of the National Inventory Report.[3]

3 National Inventory Report, Iceland 2020

Fuel Usage and SF_6

> Total emissions from fuel usage was 501 tonnes CO_2-eq in 2020, a 30% reduction from 2019. Emissions due to SF_6 leaks from electrical equipment was 15,3 tonnes CO_2-eq.

↓ Emissions from fuel usage



A significant part of the reduction was caused by the COVID-19 situation but Landsvirkjun's zero fossil fuel policy also delivered tangible results in this regard resulting in 18% reduction in fuel consumption when comparing January 2020 to January 2019.

↓ Fuel consumption (liters)

				Change
	2018	**2019**	**2020**	**from 2019**
Petrol for vehicles	18.430	13.102	16.150	23%
Diesel for vehicles	206.442	144.062	112.032	–22%
Diesel for standby power units	21.095	20.656	2.032	–90%
Biodiesel vehicles	7.844	32.284	22.478	–30%
Total	**253.811**	**210.103**	**152.692**	**–27%**

In 2020, Landsvirkjun purchased 152.692 litres of fuel. Fossil fuels were 130.214 litres and biodiesel 22,478 litres. Landsvirkjun's fossil fuel consumption decreased by 27% from 2019. The difference in biodiesel was less, with a 30% reduction.

↓ Emissions from fuel usage (tonnes CO2-eq)

				Change
	2018	**2019**	**2020**	**from 2019**
Petrol for vehicles	41	30	37	23%
Diesel for vehicles	542	387	301	–22%
Diesel for standby power units	55	56	5	– 91%
Biodiesel vehicles	20	5	4	–20%
Total emissions from fuel consumption	**658**	**478**	**348**	**–27%**
Total emissions from fuel production (scope 3)	**156**	**139**	**90**	**– 35%**
Total emissions from rental cars (scope 3)	**66**	**82**	**63**	**–23%**

Emissions from fossil fuel consumption in Landsvirkjun's operations decreased by 27% between years, amounting to 344 tonnes CO_2-eq in 2020, and falls under direct emissions (Scope 1). Emissions from biodiesel consumption reduces between years and was 53 tonnes in 2020, of which only 4 tonnes are considered to increase the amount of greenhouse gases in the atmosphere (according to GHGP). Emissions from the production and transportation of the fossil fuel in question totalled 90 tonnes CO_2-eq, categorized as indirect emissions (Scope 3). Emissions from fossil fuel consumption connected to rental cars, production and transportation, amounted to 63 tonnes CO_2-eq, also classified as indirect emissions (Scope 3).

We have consistently made use of biodiesel in our operations, due to it having a smaller carbon footprint. Emissions from burning, production and transportation of biodiesel was 65 tonnes CO_2-eq. Of those emissions 81% was biogenic carbon dioxide, which is not considered to increase the amount of greenhouse gases in the atmosphere (according to GHGP).

Emissions from the use of biodiesel in the diesel generators amounted to just about 6 tonnes CO_2-eq, which is considerably lower than the previous year, or a 90% reduction. The reason for such a great difference is largely due to the fact that emissions are calculated relative to the amount of fuel purchases annually. The manner in which power stations and backup power generators are used can cause some discrepancies in measurements between years. Diesel power stations are used for the operation of areas where electronic networks are unavailable and as backup generators.

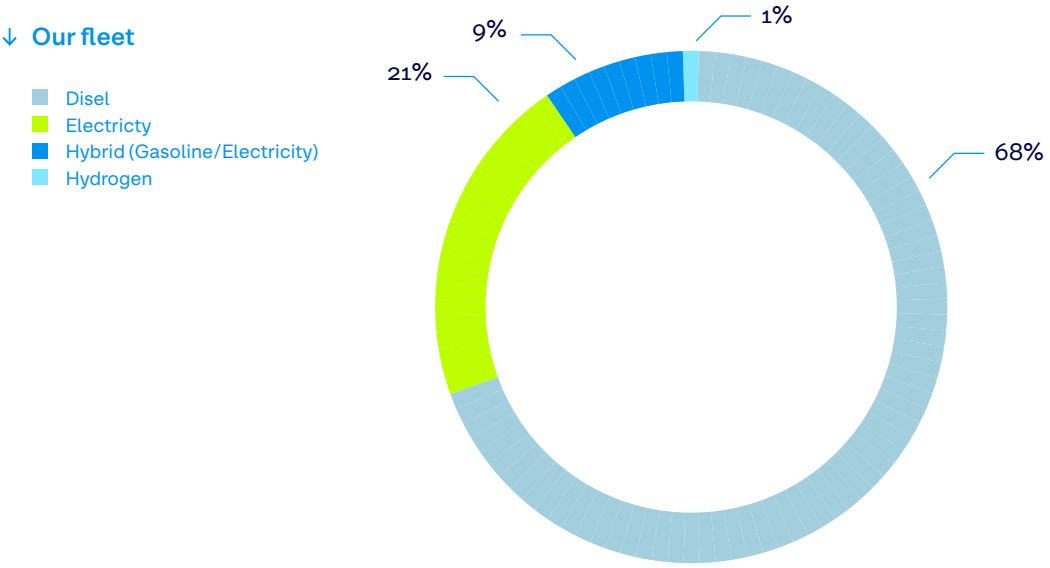
↓ Emissions from fuel consumption

	2020
Fossil carbon dioxide, t CO_2	338
Biogenic carbon dioxide, t CO_2	57
Methan, t CH_4	0,01
Nitrous Oxide, t N_2O	0,03
Emissions from burning of fuel (Scope 1), t CO_2-eq	**348**

The numbers for fuel emissions in 2019 have been updated between years because of updated emissions factors, the amount is therefore higher than in last year's climate account.

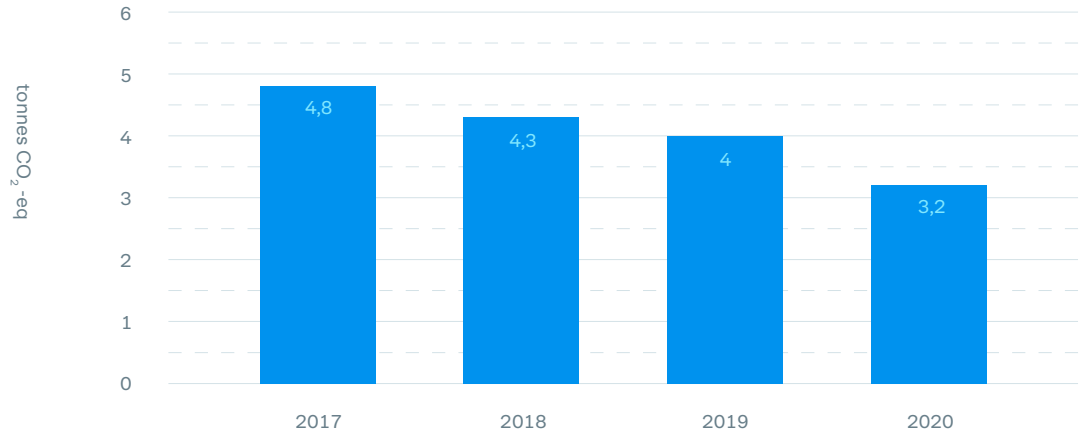
In 2020, Landsvirkjun owned a fleet of 107 cars, of which 68% are diesel cars, 21% electric cars, 9% plug-in hybrids and 1% hydrogen cars. Domestic energy sources were used to power 31% of our car, mostly or entirely.

Our fleet



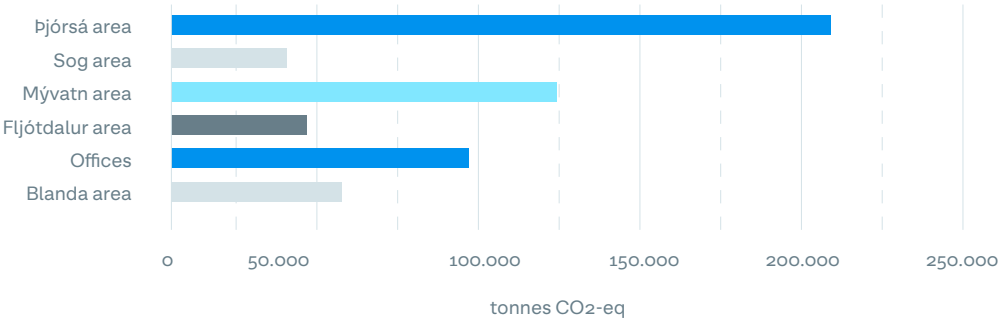
Average emissions from our vehicles amounted to 3.2 tonnes CO_2-eq in 2020, and continues to decline between years.

Average annual emissions per vehicle



Emissions from fuel consumption vary between our operating areas. Þjórsá area, which is our largest operating area with seven hydropower stations and two wind farms, accounted for the largest portion of fuel consumption.

Emissions from fuel consumption in our operating areas



Emissions due to SF_6 leaks from electrical equipment in the Þjórsá area and Fljótssdalur area was 0.7 kg. In light of the fact that SF_6 is a powerful greenhouse gas the leaks equal 15.3 tonnes CO_2-eq.

↓ Emissions from electrical equipment (tonnes CO_2-eq)

	2018	2019	2020	Change from 2019
Emission due to SF_6 leaks	35	192	15	–92%

When renewing equipment in Hrauneyjafoss power station last year (2019), Landsvirkjun's procedures were not followed. The SF_6 that was removed from the equipment was transferred to Landsnet's stock instead of Landsvirkjun's. The registration of SF_6 emissions for the year 2019 has therefore been updated with the worst possible scenario in mind, ie. complete leakage, even though that was not the case. Landsvirkjun has reviewed procedures following the incident in cooperation with Landsnet.

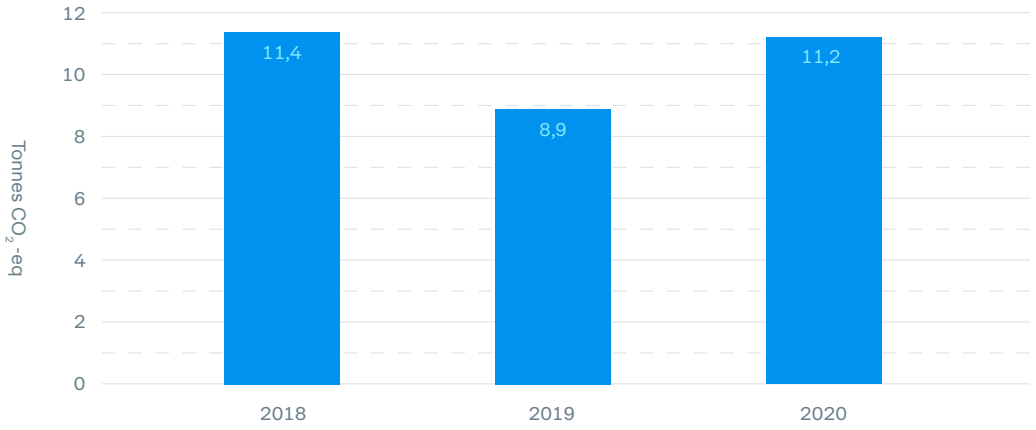
We thoroughly document the amount of fuel that we purchase and use. Greenhouse gas emissions are calculated per litre of fuel using formal emissions factors. We also calculate emissions of all vehicles, machinery and electric equipment. The data are simultaneously processed into the environmental dashboard. British emissions factors are used when measuring emissions from fuel consumption as well as from use of other materials and chemicals[4].

Every few years the insulating medium sulphur hexafluoride (SF_6) needs to be added to electrical equipment due to its slow leak from the equipment. Supply and refueling requirements are closely observed, to provide oversight over emissions from SF_6 leaks. SF_6 leaks are measured in kg SF_6, using formal emissions factors (IPCC), which transfers values into tonnes CO_2-eq.

4 www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

Purchased Electricity and Heating

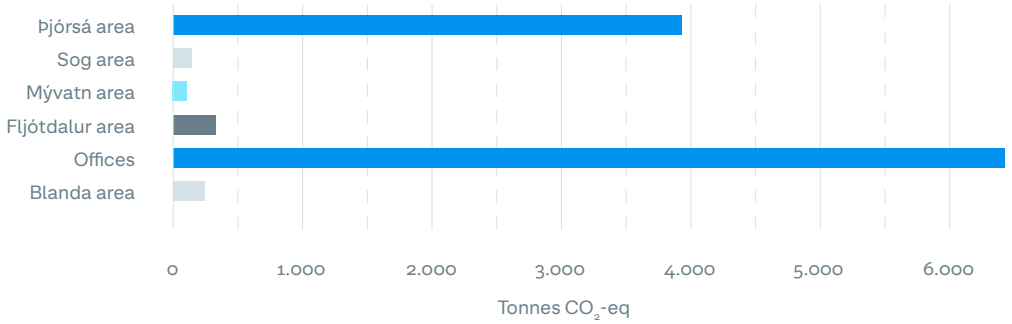
Emissions from purchased electricity and heating were 11.2 tonnes in 2020, increasing between years.



↓ Emissions from purchased electricity and heating

The emissions from purchased electricity and heating distributes over Landsvirkjun's operating areas. The vast portion of our electricity consumption is generated by our power plants in our operating areas and not included here. Further information about the power stations' consumption of their own production can be found in the chapter "Our Operations".

↓ Emissions from purchased electricity and heating at our operating areas



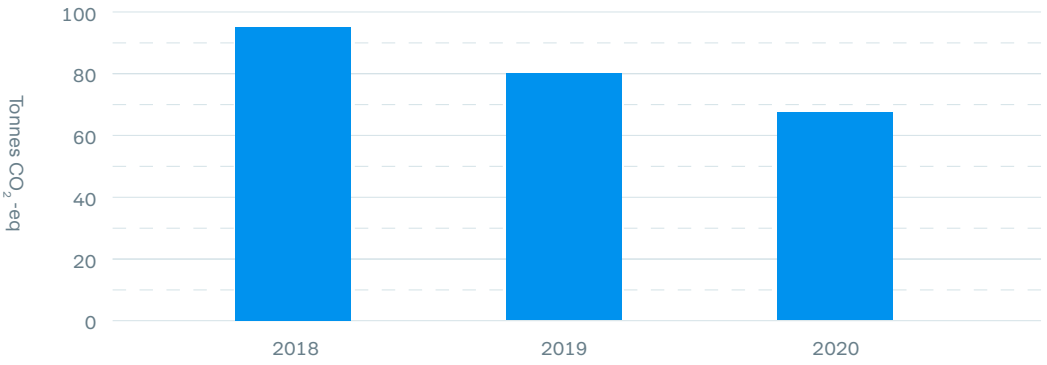
Emissions from purchased electricity (kWh) and heating (m3) in our operations are measured by the amount purchased. The calculation is made by multiplying the amount of electricity and water with emission factors from the Environment Agency of Iceland. Landsvirkjun's emissions from purchased energy was 9.8 CO_2-eq/kWh in 2020, based on the domestic average for energy production.[5]

5 www.ust.is/loft/losun-grodurhusalofttegunda/losunarstudlar/

Waste

> Emissions from the waste generated in our operations in 2020 amounted to 68 tonnes CO2-eq, a 17% reduction from 2019. Recycled waste was 85% in 2020, growing slightly between years.

↓ Emissions from generated waste



↓ Proportion of waste categoried for recycling

	2018	2019	2020
Sorted	80%	84%	85%
Unsorted	20%	16%	15%

The decrease between years is due to less waste, the total amount of waste decreased by 8% between 2019 and 2020. The amount of unsorted waste decreased by 23% between years and recycled metals decreased by 48%. The amount of bulky waste increased by 86% between 2019 and 2020, due to maintenance and repair work of Landsvirkjun's Reykjavík office. The amount of organic waste increased by 78% between years, mostly due to the fact that employees were prohibited to take leftover food from the canteen to prevent the spread of COVID-19. Looking at the period between 2019 and 2020, there are noticeable fluctuations of the amount of bulky and inert waste, as well as metals and timber, which is explained by repair and maintenance work carried out in 2020.

↓ Waste generated in our operations (tonnes)

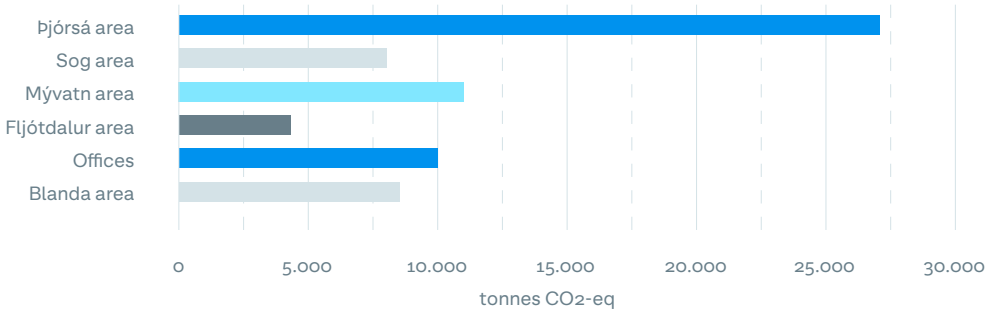
	2018	2019	2020	Change from 2019
Unsorted general waste	40	39	30	−23%
Recyclables (paper)	18	15	3	−80%
Recyclables (plastics)	1	2	1	−50%
Bulky waste	27	7	13	86%
Organic waste	19	18	32	78%
Metals and scrap	45	109	57	−48%
Inert waste (glass, soil and rocks)	10	0	14	0%
Electronic devices	0	0	1	0%
Batteries	0	0	0,1	0%
Hazardous waste	7	11	22	100%
Wood (painted)	31	27	19	−30%
Wood (unpainted)	3	18	12	−33%
Total	**200**	**246**	**204**	**−17%**

↓ Emissions from waste (tonnes CO_2-eq)

	2018	2019	2020	Change from 2019
Unsorted general waste	52	51	39	−24%
Recyclables (paper)	1	0	0	0%
Recyclables (plastics)	0	0	0	0%
Bulky waste	13	3	6	100%
Organic waste	3	3	5	67%
Metals and scrap	1	2	1	−50%
Inert waste (glass, soil and rocks)	0,01	0,00	0,01	0%
Electronic devices	0,00	0,00	0,03	0%
Batteries	0,00	0,00	0,003	0%
Hazardous waste	0,15	0,23	0,47	104%
Wood (painted)	26	22	16	−27%
Wood (unpainted)	0	0	0	0%
Samtals	**95**	**81**	**68**	**−16%**

The numbers for waste emissions in 2019 have been updated between years because of changed emissions factors and the amount is therefore higher than in last year's climate account. Before, we only used British[6] emission factors but we have now implemented emission factors from the Environment Agency of Iceland for general unsorted waste and organic waste.

↓ Emissions from waste generated at our operating areas



The Þjórsá area accounted for the highest emissions from waste, which is Landsvirkjun's largest operation area.

Waste generated at Landsvirkjun's operations is documented and its amount calculated. Data regarding our waste are either collected through calculations or through data connections with service providers. These numbers are then multiplied with formal emissions factors. Emissions factors from the Environment Agency[7] of Iceland are used for unsorted waste and organic waste for composting. For other waste categories, we apply British emission factors.[8]

6 www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
7 www.ust.is/loft/losun-grodurhusalofttegunda/losunarstudlar/
8 www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

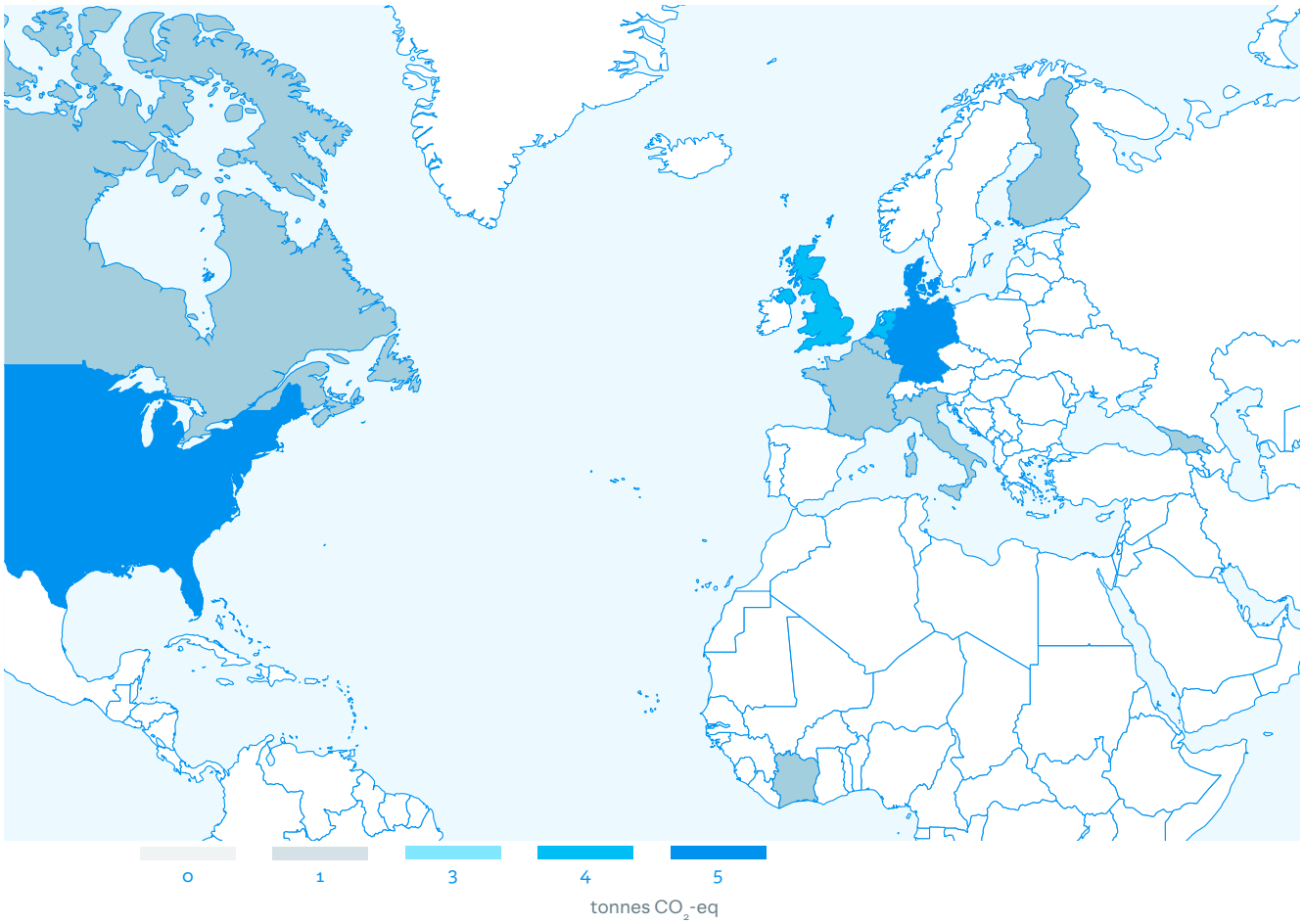
Air Travel

> Emissions from air travel was 66.1 tonnes CO_2-eq in 2020 and decreased by 80% between years. The reduction is a direct result of the COVID-19 travel restrictions.

↓ Emissions from air travel (tonnes CO_2-eq)

	2018	2019	2020	Change from 2019
Domestic	236	158	42	–73%
International	174	158	24	–85%
Total	**410**	**315**	**66**	**–79%**

↓ Greenhouse gas emissions from air travel in 2020 by destination

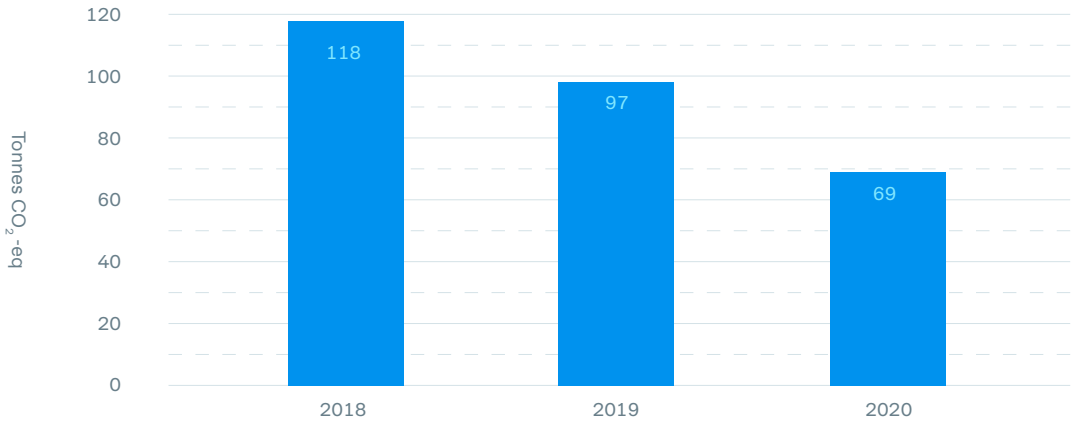


The calculation of air travel emissions is carried out using findings from a recent study on airplane emissions. Air travel emissions are calculated per seat kilometre which varies depending on flight length and type of aircraft. As an example, short flights in aircraft with few passengers produce higher emissions than long flights carrying a large number of passengers. The impact of distance on seat kilometre can be explained by the high volume of emissions that occur during takeoff and landing. These emissions amount to the same regardless of distance travelled.

Employee Commute

Emissions from employee commute decreased considerably between years, or by 29%. In 2019, the emissions from these types of travel totalled 97 tonnes CO_2-eq, but were 69 tonnes CO_2-eq in 2020.

↓ Emissions from employee commute



Greenhouse gas emissions from employee commute was estimated using a travel habits survey which is sent to all of our employees.

Fertilizers

Emissions from fertilizer use in soil conservation and land reclamation projects amounted to 1.6 thousand tonnes CO2-eq, increasing significantly between years.

↓ Emissions from fertilizers use (tonnes CO_2-eq)

	2018	2019	2020	Change from 2019
Fertilizers	826	958	1.657	73%

The increase in fertilizer emissions is due to more extensive data collection concerning the use of fertilizers as well as more detailed calculations of emissions. In the 2020 calculations, the entire lifecycle of fertilizers is taken into account, from production and transportation to use, along with emissions in soil.

When we purchase fertilizers we request information regarding greenhouse gas emissions stemming from the production, transportation and use of the fertilizers. The information then figures into our decision on the selection of appropriate fertilizer as well as calculations concerning emissions in the purchasing process.

Distribution of Electricity

> Emissions from the insulating medium and greenhouse gas SF_6 was 2.262 tonnes CO2-eq in 2020, which counts as the largest component of our indirect emissions.

↓ Emissions from distribution of electricity (tonnes CO_2-eq)

	2018	2019	2020	Change from 2019
Landsnet	2.430	1.442	2.262	57%

Emissions regarding distribution of electricity for the year 2019 has been updated and is lower than it was in the Climate account for 2019. These emission numbers come from Landsnet's emission account for 2019.

Construction Projects

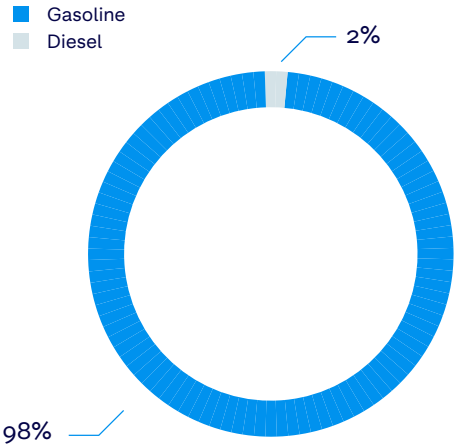
> Emissions from fossil fuel consumption in our construction projects was 231 tonnes CO_2-eq in 2020 and emissions from waste was 18 tonnes CO_2-eq.

Ongoing construction projects in 2020

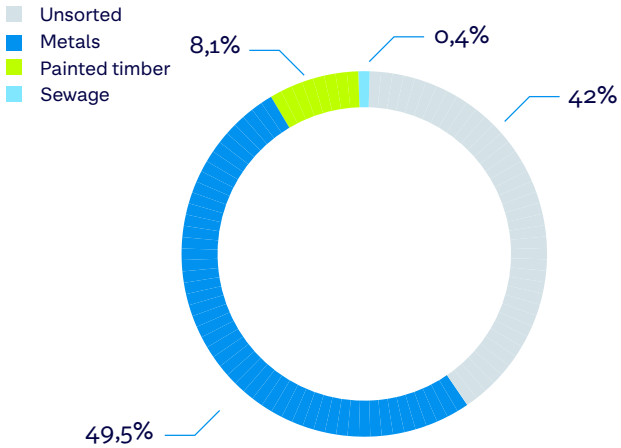
- **Footbridge over Þjórsá river**
- **Refurbishment of Sultartangi canal**
- **Þeistareykjavegur road (south)**

↓ Emissions from fossil fuel consumption and waste in our construction projects

	Liters	Tonnes CO_2-eq
Fuel	367.344	231



	Liters	Tonnes CO_2-eq
Waste	28	18



↓ Emissions from constructions

	2018	2019	2020	Change from 2019
Fuel consumption and waste generation	1.496	755	249	-67%

Emissions from our construction projects has reduced between years as the amount of constructions has reduced. The Footbridge over Þjórsá river and the construction of Þeistareykjavegur road are part of the constructions of our two most recent power plants, Þeystareikir and Búrfell II. More in-depth analysis of the climate impact of these power plants can be found in their Life Cycle Analysis reports[9,10].

Contractors working on large construction projects record and report data to Landsvirkjun concerning the amount of fuel consumption and waste. Emissions factors from the Environment Agency of Iceland[11] along with British emission factors[12] are used to convert the volume of waste and fuel consumption to greenhouse gas emissions.

9 Búrfell II power plant LCA report http://gogn.lv.is/files/2020/2020-035.pdf
10 Þeistareykir power plant LCA report http://gogn.lv.is/files/2020/2020-034.pdf
11 www.ust.is/loft/losun-grodurhusalofttegunda/losunarstudlar/
12 www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

Independent Limited Assurance Statement

Introduction and objectives of work
Bureau Veritas UK Limited ('Bureau Veritas') has been engaged by Landsvirkjun to provide limited assurance of its Greenhouse Gas (GHG) emissions data for inclusion in its Climate Account 2020 report ('the Report'). This Assurance Statement applies to the related information included within the scope of work described below.

Scope of Work
The scope of our work was limited to assurance over the following GHG information included within the Climate Account 2020 for the period January 1 to December 31 2020 ('the Selected Information'):

- Scope 1 emissions
- Scope 2 emissions
- Selected Scope 3 emissions
    - Purchased goods and services
    - Fuel and energy related activities
    - Waste generated in operations
    - Business travel
    - Employee commuting
    - Downstream transportation and distribution
- Performance compared to 2019 and 2018 as a percentage change for the above datasets listed in this section.

Reporting criteria
The Selected Information needs to be read and understood together with the methodology set out in the Report for each category of emissions.

Limitations and Exclusions
Excluded from the scope of our work is any verification of information relating to:

- Activities outside the defined verification period;
- Positional statements (expressions of opinion, belief, aim or future intention by Landsvirkjun) and statements of future commitment;
- Any other information included in the Climate Account 2020 not listed in the Scope section above

This limited assurance engagement relies on a risk based selected sample of sustainability data and the associated limitations that this entails. The reliability of the reported data is dependent on the accuracy of metering and other production measurement arrangements employed at site level, not addressed as part of this assurance. This independent statement should not be relied upon to detect all errors, omissions or misstatements that may exist.

Responsibilities

This preparation and presentation of the Selected Information in the Report are the sole responsibility of the management of Landsvirkjun.

Bureau Veritas was not involved in the drafting of the Report or of the Reporting Criteria. Our responsibilities were to:

- obtain limited assurance about whether the Selected Information has been prepared in accordance with the Reporting Criteria;
- form an independent conclusion based on the assurance procedures performed and evidence obtained; and
- report our conclusions to the Directors of Landsvirkjun.

Assessment Standard

We performed our work in accordance with International Standard on Assurance Engagements (ISAE) 3000 Revised, Assurance Engagements Other than Audits or Reviews of Historical Financial Information (effective for assurance reports dated on or after December 15, 2015), issued by the International Auditing and Assurance Standards Board.

Summary of work performed

As part of our independent verification, our work included:

- Conducting interviews with relevant personnel and external Consultants of Landsvirkjun;
- Reviewing the data collection and consolidation processes used to compile Selected Information, including assessing assumptions made, and the data scope and reporting boundaries;
- Reviewing documentary evidence provided by Landsvirkjun;
- Agreeing a selection of the Selected Information to the corresponding source documentation;
- Reviewing Landsvirkjun systems for quantitative data aggregation and analysis;
- Assessing the disclosure and presentation of the Selected Information to ensure consistency with assured information;
- Reperforming a selection of aggregation calculations of the Selected Information;
- Reperforming greenhouse gas emissions conversions calculations;
- Comparing the Selected Information to the prior year amounts taking into consideration changes in business activities, acquisitions and disposals.

The scope of a limited assurance engagement is substantially less than for reasonable assurance both in terms of the risk assessment procedures and in performing the procedures to address the identified risks.

Conclusion

On the basis of our methodology and the activities described above nothing has come to our attention to indicate that the Selected Information is not fairly stated in all material respects.

Verified GHG Emissions
Scope 1
Scope 2 (Market-based and Location-based)
Scope 3

Statement of Independence, Integrity and Competence

Bureau Veritas is an independent professional services company that specialises in quality, environmental, health, safety and social accountability with over 190 years history. Its assurance team has extensive experience in conducting verification over environmental, social, ethical and health and safety information, systems and processes.

Bureau Veritas operates a certified[13] Quality Management System which complies with the requirements of ISO 9001:2015, and accordingly maintains a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

Bureau Veritas has implemented and applies a Code of Ethics, which meets the requirements of the International Federation of Inspections Agencies (IFIA)[14], across the business to ensure that its employees maintain integrity, objectivity, professional competence and due care, confidentiality, professional behaviour and high ethical standards in their day-to-day business activities.

The assurance team for this work does not have any involvement in any other Bureau Veritas projects with Landsvirkjun.

Bureau Veritas UK Limited
London
22 February 2021

13 Certificate available on request
14 International Federation of Inspection Agencies – Compliance Code – Third Edition

Greenhouse Gases in our operations

CO_2 Carbon dioxide is produced in Landsvirkjun's operations mainly through fossil fuel consumption and decomposition of organic matter in reservoirs. CO_2 is a geothermal gas. CO_2 emissions are represented by a carbon dioxide equivalent (CO_2-eq).

CH_4 Methane is produced in Landsvirkjun's operations through the decomposition of organic material in reservoirs, landfill waste disposal and fossil fuel consumption. CH_4 is also a geothermal gas. As a greenhouse gas, methane is 28 times more powerful than carbon dioxide.

N_2O Nitrous oxide is produced in Landsvirkjun's operations through fossil fuel consumption and in the use of fertilizers. As a greenhouse gas, nitrous oxide is 265 times more powerful than carbon dioxide.

SF_6 Sulphur hexafluoride is a manmade gas used as an insulating medium for electrical equipment. SF_6 can leak from equipment used by Landsvirkjun and Landsnet. As a greenhouse gas, SF_6 is 23,500 times more powerful than carbon dioxide.