MEMO

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Emissions Inventory for the City of Reykjavík, 2021	

Introduction

The city of Reykjavík has been a party to the Global Covenant of Mayors for Climate and Energy (GCoM) and its predecessors since 2012. GCoM is an alliance for city climate leadership, a commitment from its signatories to reduce the emissions of greenhouse gases (GHG) within their regions. Over 12 500 cities and local governments are members of this alliance, hailing from six continents and 142 countries, representing around a billion people. Most of these cities are from Europe, or around 10.400 with a combined population around 287 million inhabitants. A part of the commitment made by these cities is the publishing numerical data on the emissions withing their regions. [1].

In this memo, the emissions inventory results for Reykjavík City for the year 2021 will be assessed and compared to values from previous years, adjusted to the methodology used today for comparability. The emissions inventory involves evaluating the greenhouse gas emissions, here using a methodology called the City Inventory Reporting and Information System (CIRIS). The methodology is based on the international standard, Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC), which is published by GHG Protocol. An emissions inventory for the city of Reykjavík was compiled using a similar methodology every other year between 2007 and 2019 and has been reported annually since then. With each publication, improvements have been made in calculations or in data collection so numerical data like overall emissions figures are not entirely comparable between these releases, but rather calculated and adjusted in this document using current data pathways. This facilitates comparing trends in overall emissions and individual emissions categories. For this reason, a dashboard now accompanies this memo where further comparisons can be made. In the inventory for the year 2020, steps were taken to improve categorization within waste management, with regards to its origin as well as its processing, include more waste management processes, including gas- and composting due to Sorpa's GAJA starting operations. More accurate data collection was performed in categories such as electricity and heat production and usage, including distribution losses of electricity that fall within scope 3. In the inventory for 2019 land use data was added, as well as information due to chemical use and industrial processes. Among alterations in this inventory is more calculations added for the construction industry, including stationary energy usage. In the inventory, gases that are considered are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) and from that, carbon dioxide equivalents are calculated according to constants reported in AR5, the Fifth Assessment

Report of the United Nations Intergovernmental Panel on Climate Change. The emissions constants are 28 kg/kg for methane and 265 kg/kg for nitrous oxide. In the newest report, AR6, the constant for nitrous oxide was changed to 273 kg/kg and this could be implemented in the inventory for 2022.

Greenhouse gas emissions are classified into three scopes depending on its source. Scope 1 are direct emissions within the city boundary due to activities within the city. Scope 2 is for emissions that occur due to use of energy within the city, such as electricity, heat, steam, or cooling distributed through a network from its production site. Scope 3 is for all other indirect GHG emissions that occur outside of the city due in some part to any activity that occurs within the city. These emissions can occur downstream or upstream within the value chain of an activity within the city. The results are further classified into levels of reporting frameworks; BASIC, BASIC+ and BASIC+ & Scope 3 in accordance with the GHG Protocol City Induced Framework. Reporting level BASIC covers scope 1 and scope 3 emissions from waste management as well as scope 1 and scope 2 emissions from stationary energy and transportation. On top of this reporting, BASIC+ adds emissions from industrial processes and product use (IPPU), agriculture, forestry, and other land use (AFOLU), as well as energy distribution losses. Reporting level BASIC+ & Scope 3 adds other scope 3 emissions and is therefore unlikely to encompass everything that should potentially belong there.

Table 1 shows a compiled list of major sources of GHG emissions due to activities within the boundaries of the city of Reykjavík. Scope 1 emissions total 529 557 tons CO_2 equivalents, or 562 151 tons within territorial reporting, where waste managed within Reykjavík but originating outside are counted. Scope 2 emissions include electricity and heating for the region, where production mainly takes place outside the city. Scope 3 emissions reporting can always be improved, but at this stage, the category includes losses within the electricity distribution network, incinerated waste in Kalka that originates within the city, food and beverage production, as well as construction materials, built on existing LCA reports.

TABLE 1 Summary of Reykjavík GHG emissions inventory, classified by the scope of the emissions sector.

LOSUN GHL [tCO_2 íg]	TOTAL	SCOPE 1	SCOPE 2	SCOPE 3
Energy	**33 880**	**9 885**	**23 720**	**274**
Electricity	6 250			
-Distribution losses	274			
Heating	17 744			
Construction – Stationary energy	9 885			
Transportation	**382 300**	**382 300**		
On-road	340 041			
Waterborne navigation	35 560			
Aviation	6 699			
Waste	**53 894**	**50 621**		**3 273**
Landfill	71 662			
Originating outside Reykjavík	31 244			
Composting	3 096			
Originating outside Reykjavík	1 350			
Incineration	3 273			
Wastewater discharge	8 457			
AFOLU	**48 076**	**48 076**		
Livestock farming	2 654			

Land use	45 422			
IPPU	**110 315**	**38 674**		**71 641**
Product use	38 674			
Construction material	64 948			
Other	6 693			
BASIC	**469 799**	**442 807**	**23 720**	**3 273**
BASIC+	**556 824**	**529 557**	**23 720**	**3 547**
BASIC+S3	**628 465**	**529 557**	**23 720**	**75 188**

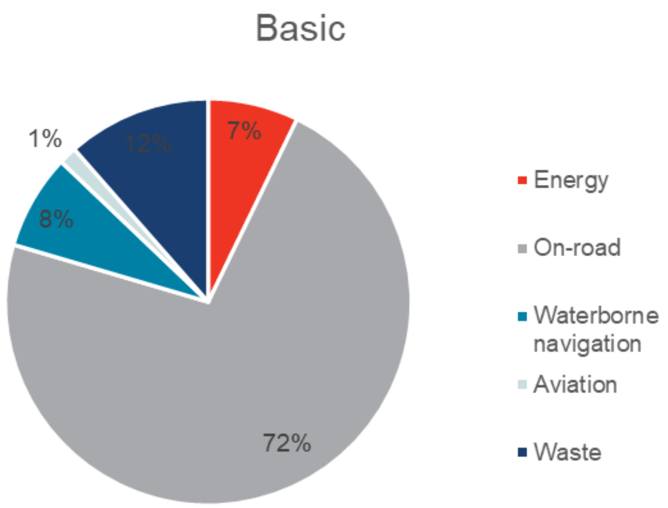

FIGURE 1 Summary of emissions in accordance with BASIC reporting.

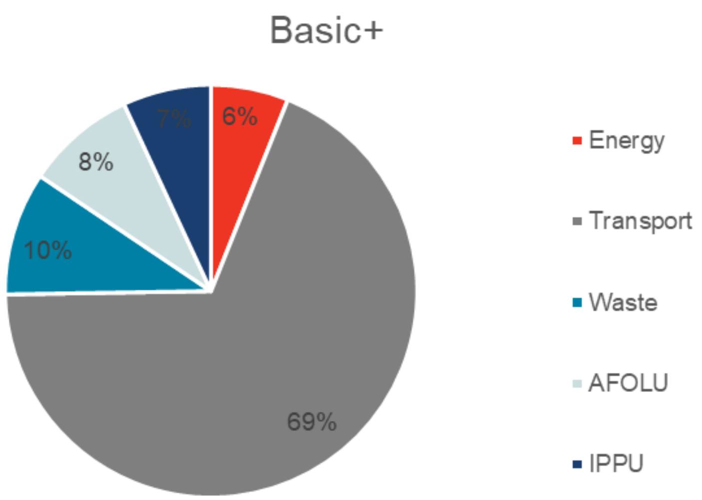

FIGURE 2 BASIC+ emissions reporting, including AFOLU and IPPU.

In total, emissions within the BASIC reporting framework are 469 799 tons CO_2 equivalent, or around 3.5 tons per capita as is shown in figure 1 and table 2.

TABLE 2 Summary of results based on reporting frameworks

	BASIC	BASIC+	BASIC+ & SCOPE 3
Energy	33 605	33 879	33 879
Transport	382 300	382 300	382 300
Waste	53 894	53 894	53 894
AFOLU		48 074	48 074
IPPU		38 674	38 674
Other scope 3			71 641
Emissions [tCO_2 eq]	469 799	556 824	628 465
Emissions per capita [tCO_2 eq]	3.53	4.18	4.72

Emissions sectors

In the next chapters, the major emissions sectors and sub-sectors for the emissions inventory will be explored in more detail.

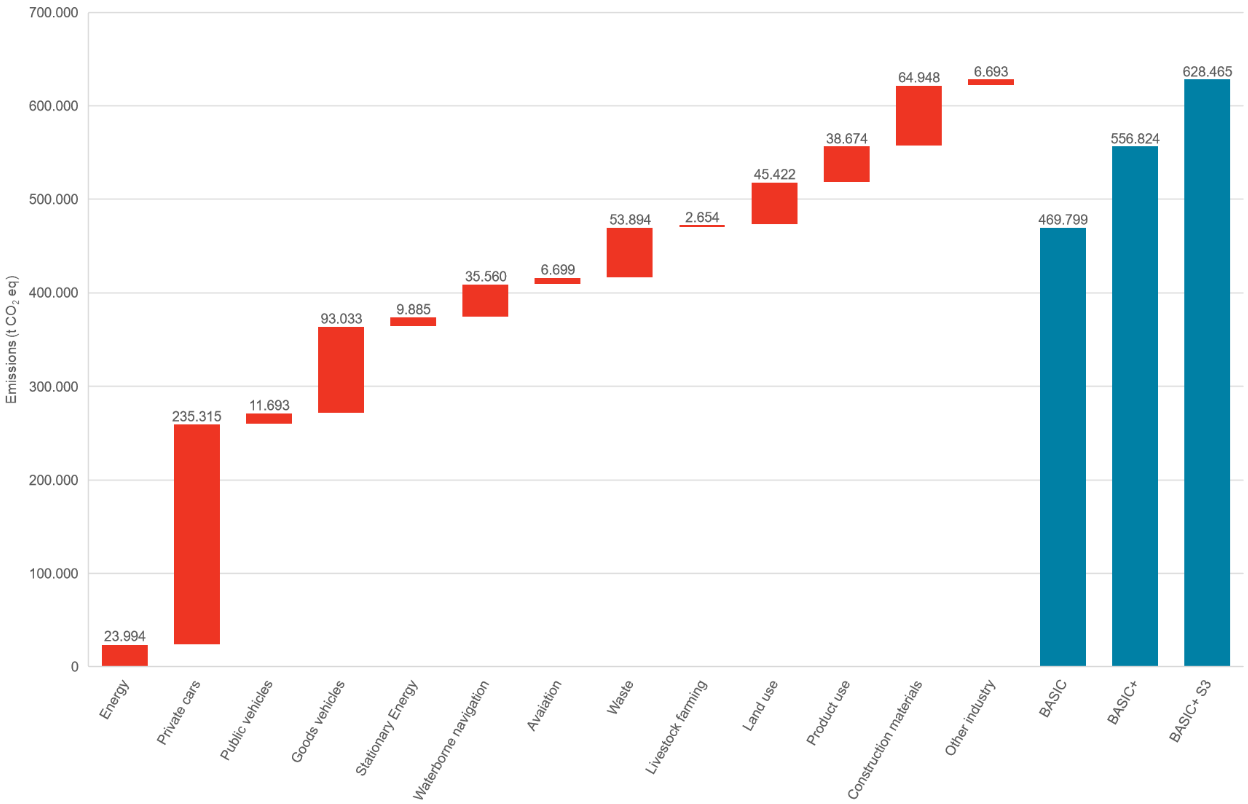

FIGURE 3 Reykjavík emissions inventory 2021, classified by its major sectors and sub-sectors, as well as summarizing reporting frameworks BASIC, BASIC+ og BASIC+ & Scope 3.

Energy

Energy consumption is categorized into three sub-sectors. As in earlier years, the sub-sectors of electricity consumption and heating are considered, but a third category has been added in the form of stationary energy use by the construction industry based on LCA reporting for an Icelandic reference house. Emissions from electricity and heating falls within scope 2 emissions as it does not involve direct combustion but is rather energy supplied to the city through transmission and distribution networks. Fuel consumption by the construction industry belongs to scope 1 emissions and stationary energy. Distribution losses through the electricity transmissions networks fall within scope 3 emissions and BASIC+ reporting framework

Electricity

The electricity consumption within the city is estimated from the Electricity Forecast 2020-2060, published by the National Energy Authority. [2] The forecast predicts consumption in Iceland to the year 2060, building on premises such as housing, population, GDP and production within individual industries. In the forecast, information about electricity distribution to each substation in the country.

Landsnet supplies electricity to Veitur Utilities through three substations in the capital region, that is Korpa, Rauðavatn and Hnoðraholt. Veitur then distribute to end users within their distribution region, including five municipalities within the capital region (Reykjavík, Kópavogur, Mosfellsbær, Garðabær and partially Seltjarnarnes) as well as Akranes. Totalling the electricity provided to Korpa and Rauðavatn does not provide entirely correct data on electricity consumption within Reykjavík however as it includes some use data for their neighbouring municipalities (2018: 947 GWh, 2019 971 GWh).

The forecast is built on usage classification reports that are divided into more accurate regions than the substations can provide, which includes Reykjavík. According to these reports the total energy consumption by end users in Reykjavík in 2021 was 776 GWh, but including distribution losses, the consumption is 812 GWh. This is a slight increase from the consumption in 2020, but overall emissions decrease as the emissions factor for electricity production decreases.

The emissions factor that is used for a produced unit of electricity is published in the environmental reporting in the annual report from Reykjavík Energy and for 2021, it is 7.7 g CO_2 eq/kWh [3]. Table 3 and figure 4 show the historical context for emissions due to electricity consumption and distribution losses over the last six years. Overall, emissions due to electricity consumption have been steady over this period, but in 2017 and 2016 emissions are overestimated due to data from substations being used rather than direct from usage classification reports.

TABLE 3 Estimated electricity consumption and emissions due to this sub-sector in Reykjavík between 2018 and 2021.

YEAR	ELECTRICITY [GWh]	EMISSIONS [tCO_2 eq]	DISTR LOSSES [GWh]	EMISSIONS [tCO_2 eq]
2021	776	5 975	36	274
2020	770	6 390	35	293
2019	797	6 373	28	224
2018	805	6 356	31	242

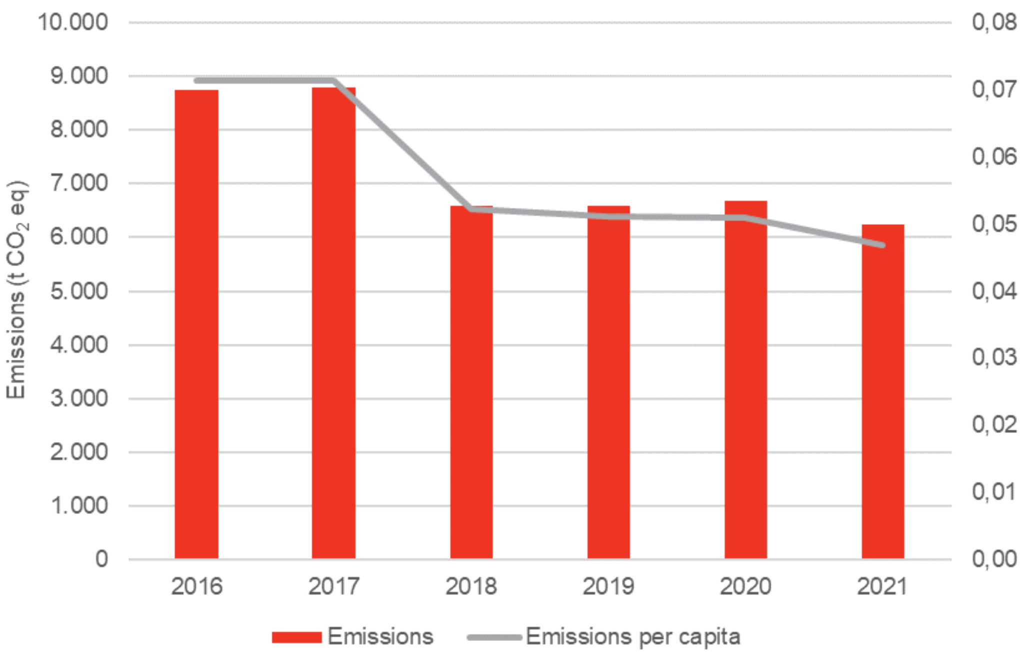

FIGURE 4 Emissions due to electricity consumption in Reykjavík. Figures from 2016 og 2017 are inflated.

Heating

Emissions due to heating was first included in Reykjavík emissions inventories in 2017. Veitur utilities have over the past years published reporting on heating in various regions of Iceland, among them in Reykjavík. For the year 2021, hot water production was 80.51 gigalitres and produced power was 478 MW_t. Despite being the second greatest production in history, this is a decrease from the record set in 2020 with 82.53 GL and 490 MW_t [4]. To convert this production into emissions, an emissions factor published in the environmental reporting in the annual report from Reykjavík Energy was used, which for the year 2021 was 3,8 g/kWst or around 220,4 g/m^3. Table 4 and figure 5 show the production of hot water in Reykjavík in 2021 as well as its associated GHG emissions figures.

TABLE 4 Hot water production for heating and associated GHG emissions in Reykjavík in 2021.

YEAR	WATER PRODUCTION [GL]	POWER [MW_T]	GHG EMISSIONS [tCO_2 eq]
2021	80.51	478.0	17 744
2020	82.53	489.7	18 668
2019	75.43	456.2	14 875
2018	77.52	472.6	15 287

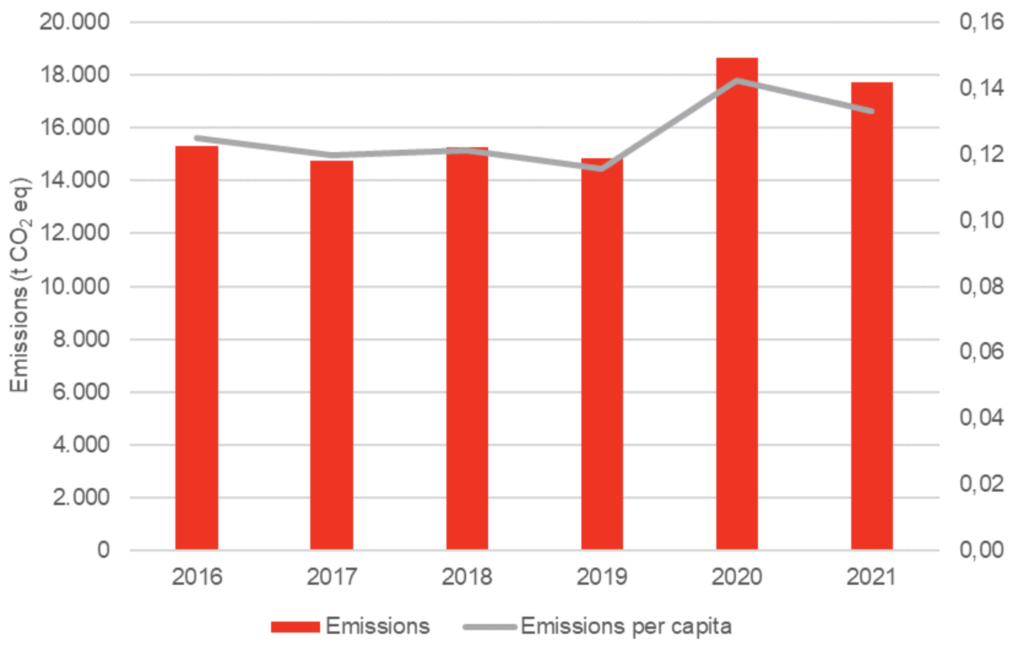

FIGURE 5 Emissions due to heating in Reykjavík. 2020 and 2021 are the highest on record for Reykjavík Energy.

Transport

Sub-sectors within transport include on-road transportation, aviation, including flights taking off and landing at Reykjavík Airport, as well as waterborne navigation at harbours within the city boundaries, that is Sundahöfn and the Old Harbour. There are no railways to report emissions from within Reykjavík.

On-Road Transport

The overall driving distance on roads within the city is categorized by vehicle type and GHG emissions are calculated from their fuel consumption. As is stated in the GHG Protocol for Cities, emissions from on-road transportation can also be calculated directly from fuel sold, however, as there is a lot of travelling between municipalities and significant amounts of fuel are purchased outside the municipality in which a majority of its combustion takes place, the potential variance was adjudged to be too great. When reporting is done for the capital region as a whole, this could be a more viable method. A traffic model of the capital region from 2012 has been used to estimate the total driven distance [5] and was 55% of the total distance assumed to be within Reykjavík. This figure is most likely low as proportionally more businesses and general service is within the city and have figures between 55-65% all been used at some point. Better data would be required for this distribution to be more accurate. Everyday traffic is turned to yearly statistics with the same methods as have been used, with assistance from counters at Ártúnsbrekka. Counters from the Icelandic Road and Coastal Administration at three locations is used to see the development in the increase of on-road traffic. During this time, the increase was 33% between 2012 and 2019, but only 4% between 2017 and 2019 [6]. A new traffic model that uses 2019 as a base year was used for the first time in the emissions inventory for 2020 and it shows an even greater overall increase from 2012 than the estimation made with the counters [7].

The vehicle classification of the total distance is made using data from the Icelandic Transport Authority that estimates the total kilometres driven by each category of vehicle, classified with regards to size, type and fuel used [8]. This data provides the distribution as it is for the country and here the assumption is made that this translates to the distribution as it is within Reykjavík, which is not completely accurate, as for example the proportion of electric vehicles is greater within the city than outside of it. Average fuel consumption of these vehicle types is estimated from the Fuel Forecast 2020, which causes an increase in overall emissions as compared to earlier versions of the inventory before 2020 [9]. Finally, emissions factors are used for each vehicle type corresponding to the emission factors used within Icelandic National Inventory Report submitted under the United Nations Framework Conventional on Climate Change and the Kyoto Protocol in 2021 [10] as well as with emission factors published as assisting documents with the NIR from the Environment Agency [11]. Figure 6 shows how GHG emissions from private cars has developed over the last few years.

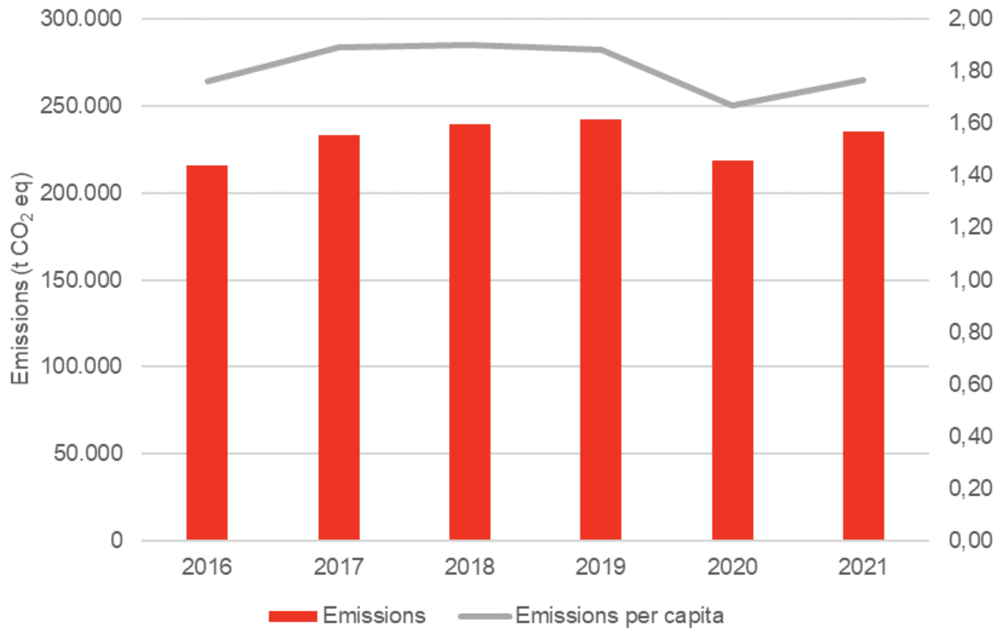

FIGURE 6 Development in GHG emissions due to on-road transportation of private cars in Reykjavík between 2016 and 2021

Emissions factors for the national accounting are calculated for TJ of energy used for every vehicle category, but published in the assisting documents are emission factors for mass and volume of fuel used as well as vehicle distance, which is ideally not used unless data on fuel consumption and vehicle type are missing.

Aviation

When estimating GHG emissions from aircraft coming to and going from Reykjavík Airport, flight statistics published by ISAVIA are used. [12]. The statistics include aircraft movements that take place within the airport. These movements decreased by 32% between 2019 and 2020 but increased again by 21% to the year 2021. The movements taken into account include scheduled flights, charter flights, private flights, instructional flights, and other touchdowns. Emissions due to flights is calculated using the landing- and take-off (LTO) cycle where aircraft taxiing for a certain time is included as well as fuel consumption during take-off, ascending, descending and landing, but not fuel consumption during regular flight. As the cycle includes take-off and landing, all aircraft movements are halved as they include every movement at the airport. Fuel consumption is calculated with a calculator from EMEP and the European Environment Agency (EEA) [13] and the emission factors are in accordance with the Icelandic National Inventory Report. Scheduled and charter flights is mostly from aircraft run by Air Iceland Connect (now Icelandair) [14] and Eagle Air [15] (Bombardier Q200, Bombardier Q400, Jetstream 31/32 and Dornier 328 are used for calculations). Their fuel consumption is calculated to be on average 130kg per LTO cycle. Touchdowns are mostly smaller aircraft used amongst other things for teaching. Their fuel consumption is calculated to be 3.5 kg/LTO cycle, by taking an average from four small airplanes active at Reykjavík Airport, Cessna Skyhawk 172, DA40 Diamond Star, Tecnam P2010 and Tecnam P2002 Sierra. Some touchdowns take place within Reykjavík, but outside of Reykjavík Airport, including helicopters and teaching near Bláfjöll, but this is not included in the inventory. Finally, other flight is the most difficult to assess, as aircraft that fall within this category can range from large scale private aircraft all the way down to a small Cessna 207 photography aircraft. Fuel consumption for this category was estimated at 110 kg/LTO cycle approximated with four different sized private aircrafts, Swearingen SJ30 Rockwell Sabre, Aerospatiale Corvette og Hawker Beechcraft Premier 1. As in many cases, with increased data come more accurate results. [13]

TABLE 5 GHG emissions due to aircraft movements at Reykjavík Airport.

	SCHEDULED/CHARTER FLIGHT	OTHER FLIGHT	TOUCHDOWNS	TOTAL
Aircraft movements 2021	16 047	18 469	13 614	49 012
GHG Emissions 2021 [t CO2 íg]	**3 445**	**3 180**	**75**	**6 699**

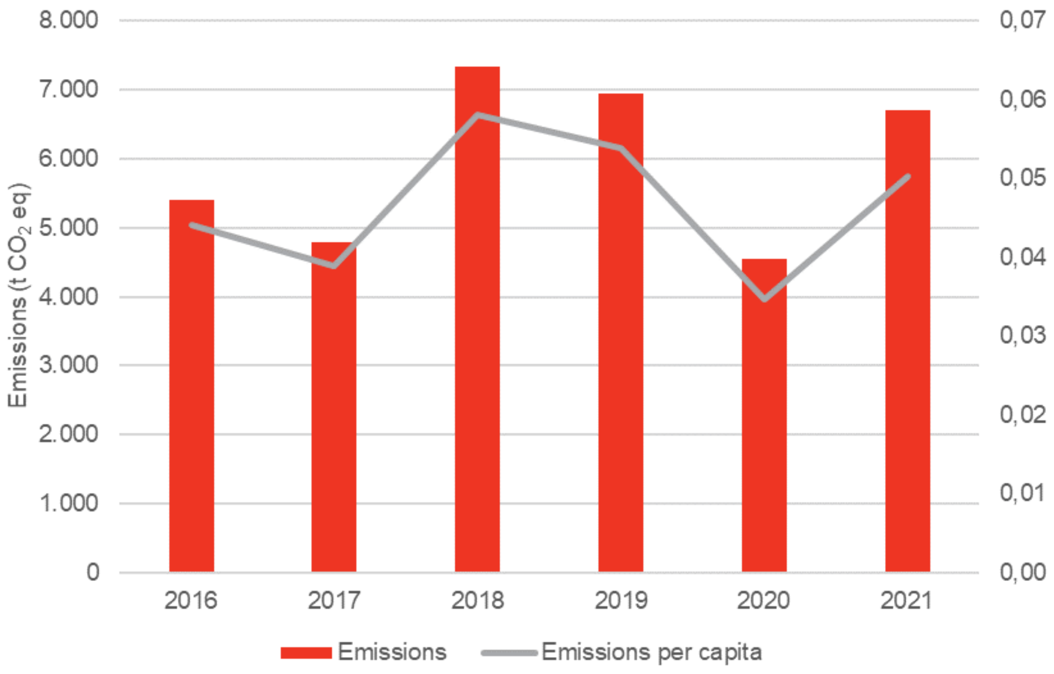

FIGURE 7 Historical development of GHG emissions due to aircraft movements at Reykjavík Airport.

Waterborne Navigation

Only emissions at the defined harbour area are taken into account for this inventory, but not emissions due to fuel consumption of ships outside of these zones. The assessment of GHG emissions due to ships at harbour within Reykjavík is taken from emissions reporting published by Faxaflóahafnir, which is made in accordance with GHG Protocol – Corporate Standard, which is an internationally recognized methodology. The emissions statistics presented there are divided into all harbours run by Faxaflóahafnir, two of which are within Reykjavík. [16]. Table 6 shows the emissions for these two harbours, Sundahöfn and the Old Harbour for CO_2, CH_4 og N_2O. These are the gases that are considered in this inventory, but emissions accounting from Faxaflóahafnir additionally includes NO_x and SO_2 emitted from ships at these quays, which can be important in its own right.

TABLE 6 GHG emissions from ships at harbour areas within Reykjavík in 2021 [16].

	GHG EMISSIONS [TCO_2 EQ]
Sundahöfn	24 898
Old harbour	10 662
Total	**35 560**

Figure 8 shows the development of this sub-sector in the recent years. Cruise ship arrivals increased to 58 in 2021 after decreasing from 165 to 7 in 2020.

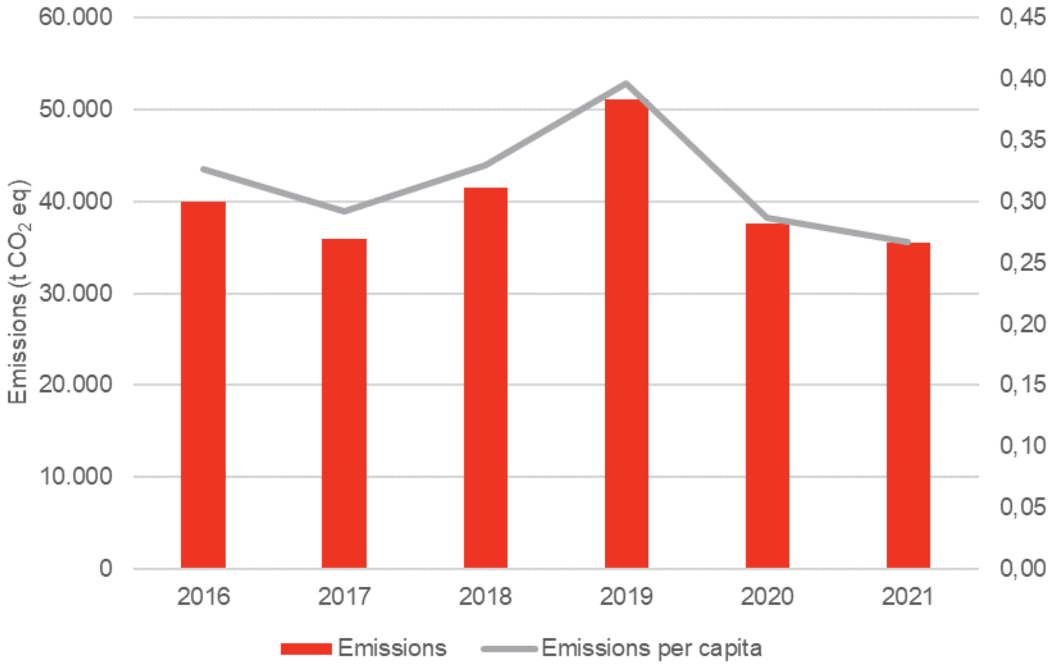

FIGURE 8 Emissions due to ships at harbour within Reykjavík

Waste

Waste management

Before 2019, the emissions inventory only considered emissions due to landfilling of waste. With the opening of GAJA, the biogas and composing plant, the proportion of waste going to the landfill is expected to drop and therefore the proportional GHG emissions due to waste management are expected to be increasingly diversified. Biogas production, composting as well as incineration of waste have therefore been entered into the inventory since then. Waste that goes to reuse or recycling is not considered here but is sent from various collecting parties to be processed outside of Reykjavík or even outside of Iceland. The emissions that occur due to these processes belong in scope 3 emissions in this inventory and will hopefully be included in the future, when mapping of these processes is more assured.

All waste that is landfilled at Álfsnes landfilling site is considered in the making of the inventory. Even if all emissions due to the landfilling take place within the city, in accordance with the GHG Protocol, these emissions should be distributed in a manner that better represents their origin. Landfilled waste in Reykjavík that originates within Reykjavík is a scope 1 emission source and belongs in the BASIC reporting framework, whereas waste originating outside Reykjavík would only be within accounting scope with territorial reporting. The distribution of waste between municipalities in the capital region is calculated from the amount collected from municipal waste streams for each municipality in 2019. [17] The assumption is made that the same proportion is true for commercial waste as well. The magnitude of the landfilled waste comes from the Annual Environmental Report, made by Sorpa [18]. Methane production from the landfill is assessed in accordance with emission factors calculated in a report made for five different landfill sites in Iceland in 2017 [19], but emissions of carbon dioxide are calculated from the composition of the released gas and the methane amount. The emission factor for composted waste is 0,172 g/gCO_2 eq in accordance with the Environment Agency of Iceland. [11]

TABLE 7 GHG emissions due to landfilling and composting of waste at Álfsnes.

	AMOUNT ORIGINATING IN REYKJAVÍK (T)	GHG EMISSIONS (TCO_2 EQ)	OVERALL AMOUNT (T)	GHG EMISSIONS (TCO_2 ÍG)
Landfilling	48 246	40 418	85 542	71 662
Composting	10 152	1 746	18 000	3 096

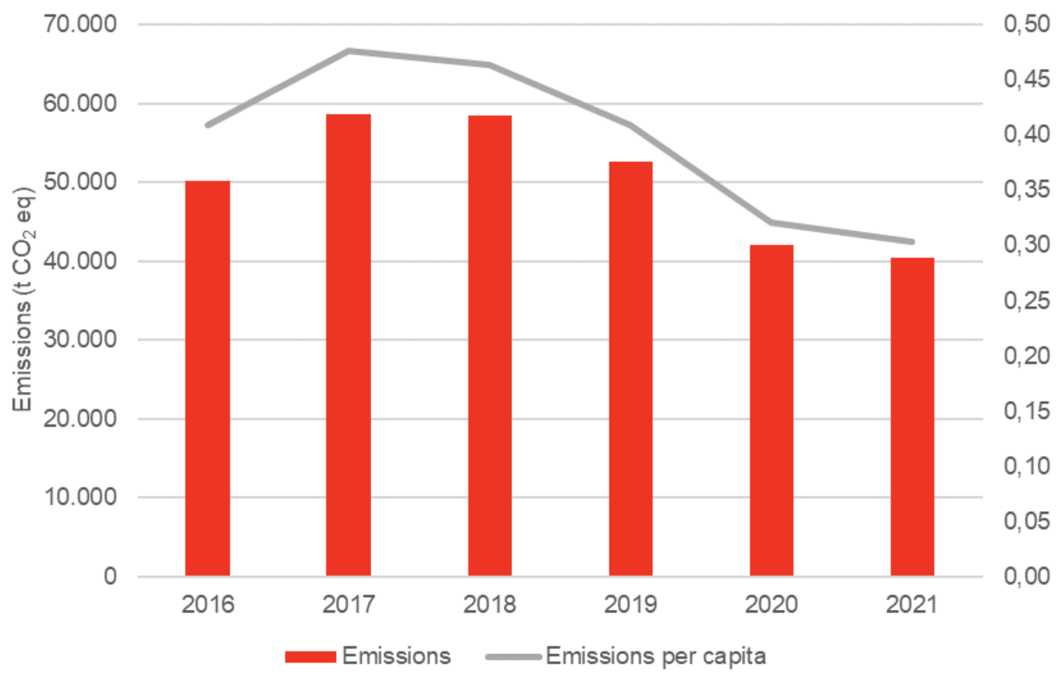

FIGURE 9 GHG emissions due to landfilling of waste.

Waste created within Reykjavík that must be incinerated, such as hospital waste is incinerated at Kalka, which is outside of Reykjavík. Therefore, emissions from this process fall within scope 3, despite belonging to the BASIC reporting framework. In 2021, Kalka incinerated 12 646 tons of waste [20] and distributing proportionally with population of the municipalities, emissions from incineration of waste originating in Reykjavík can be calculated, which is shown in table 8.

TABLE 8 GHG emissions due to incineration of waste originating in Reykjavík in Kalka incineration plant.

YEAR	INCINERATED WASTE [T]	GHG EMISSIONS [tCO_2 eq]
2021	7 132	3 273

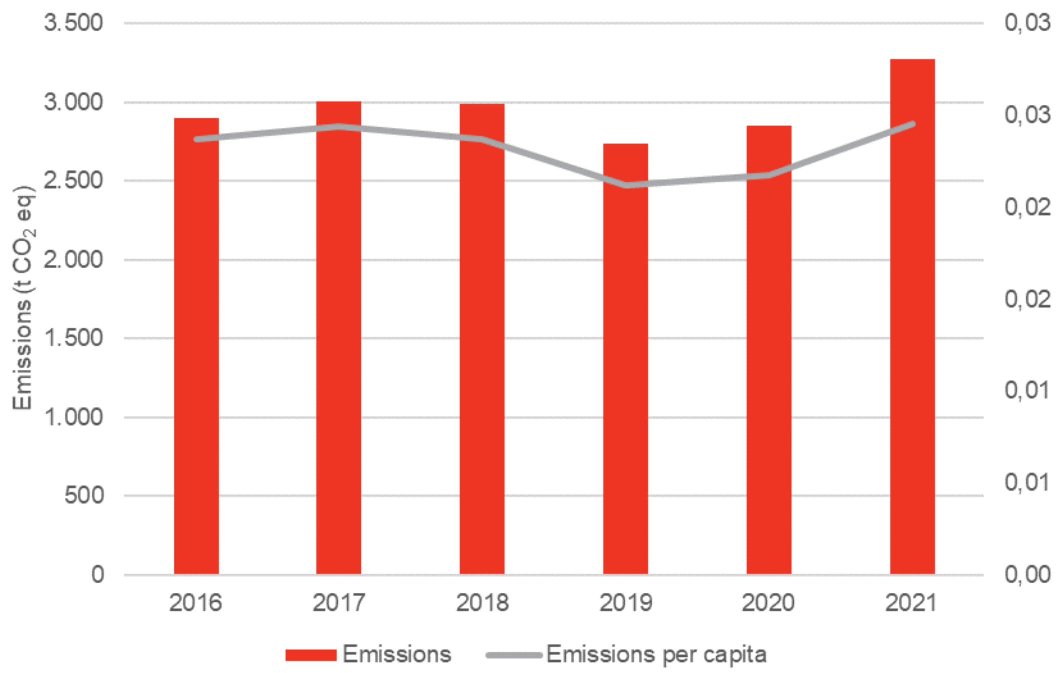

FIGURE 10 Emissions due to waste incinerated in Kalka incineration plant originating within Reykjavík.

Wastewater Discharge

Emissions due to wastewater discharge are divided into two categories, domestic wastewater calculated from organic waste in wastewater streams and how much oxygen it takes to break it down, ton BOD, where around 0.6 kg methane is released for each kg BOD as well as industrial wastewater where the only industry considered is fish processing. There, 13 m^3 of water is assumed to be used for every ton of fish processed and for each cubic meter of water 2.5 kg COD is assumed. This methodology is described and justified further in the National Inventory Report. [10]

TABLE 9 GHG emissions due to wastewater discharged from Reykjavík.

	GHG EMISSIONS [tCO_2 eq]
Domestic wastewater	6 812
Fish processing wastewater	1 645

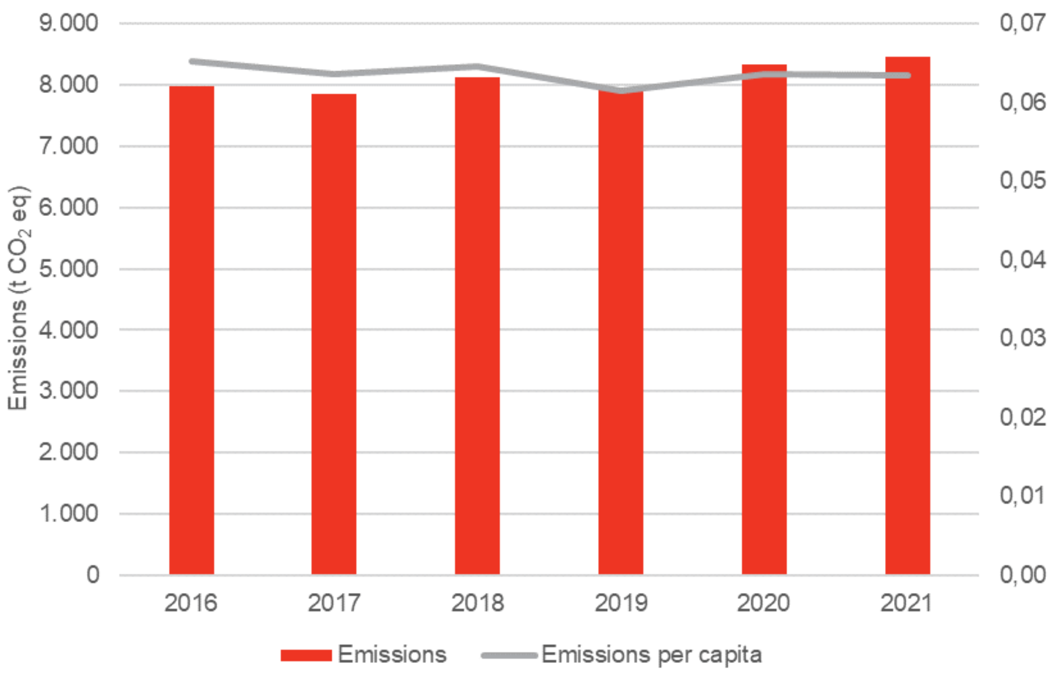

FIGURE 11 Development in emissions due to wastewater discharge. Changes are almost entirely due to the number of fish processed each year, as domestic wastewater is proportional to population.

Agriculture, Forestry, and Other Land Use (AFOLU)

Sub-sectors under the AFOLU sector explored in this inventory are livestock farming and emissions due to land use.

Direct GHG emissions due to livestock occurs due to methane production during fermentation within the bowels of the animals as well as due to storage of livestock fertilizer. Emissions from fertilizer are methane and nitrous originating from the nitrogen in the fertilizer. This is assessed directly and indirectly through the nitrogen excretion rate (NEX) whereby storage method impacts the emission magnitude. Distribution of storage methods are from an emissions analysis report made by Jón Guðmundsson on the Icelandic agriculture sector for the Agriculture University of Iceland (LBHÍ) in 2016. [21]

Pigs within Reykjavík are at pig farming sites run by Stjörnugrís in Kjalarnes, cows are mainly situated at Bakki, Kjalarnes which is the only cow farm within Reykjavík. These animals, as well as goats and other livestock are also present in some capacity at the Reykjavík Family Park and Zoo. Livestock statistics are collected by the Ministry of Food, Agriculture and Fisheries and published through a dashboard, which facilitates information flow well compared to earlier years. [22]. Emission factors are from the National Inventory Report, [10] as well as the reporting published by the Agriculture University of Iceland [21].

Emissions from drained wetland in the region are assessed to be 56 009 tons CO_2 eq annually and fixation due to recent forestry is 10 587 tons CO_2 eq. Therefore, net emissions of due to land use within the Reykjavík city boundaries in 45 422 tons CO_2 eq [23]. There is some uncertainty in the calculation of these figures due in part to rudimentary zoning of land into land-use classes and variations within every class that impacts emissions. No other emissions due to land use have been included in this emissions inventory.

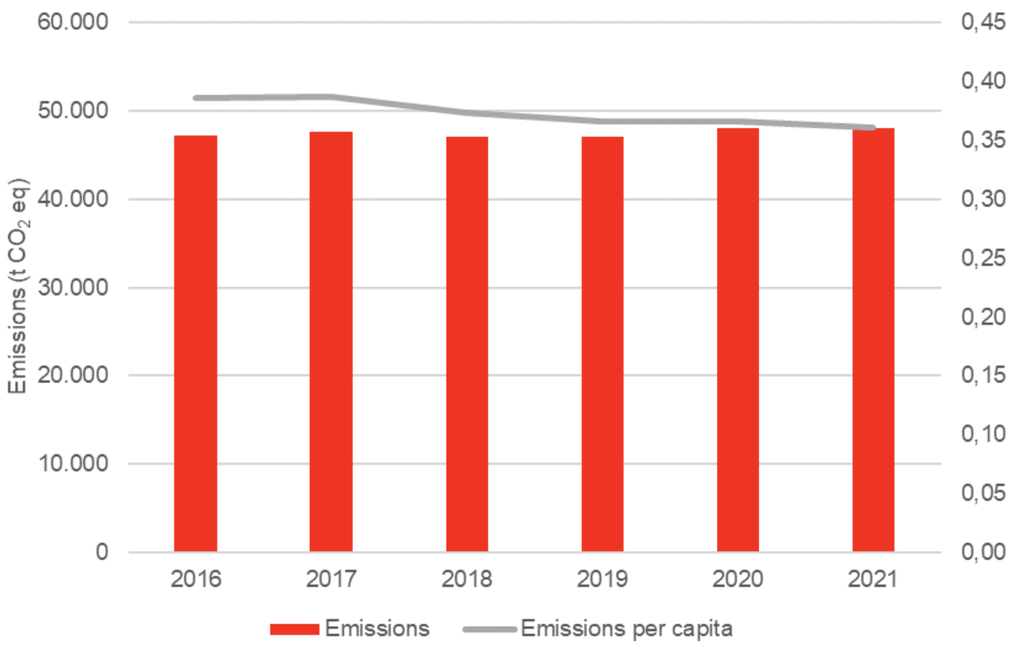

FIGURE 12 Emissions due to livestock farming and land-use. Changes between years are entirely due to number of livestock.

Industrial Processes and Product Use (IPPU)

The subsector of product use is considered within this sector. Utilization of various products is assessed in accordance with the National Inventory Report [10] approximated per capita according to the population of Reykjavík and of Iceland. As the National Inventory Report 2022 is for the year 2020, average values from the five previous years are used to estimate product use in 2021. The most significant portion of emissions due to product use stems from use of HFCs, but in that case, the portion used on fishing vessels was removed before adjusting the remainder by population. Due to many small users of these products, this becomes a good approximation of what is actually used within the city. As well as the products reported in the National Inventory Report, emissions due to the use of nitrous and steam production at Landspítali, the National University Hospital is taken into account from their environmental reporting in 2021, but due to specialized nitrous destruction equipment installed in 2019, emissions due to nitrous oxide usage has decreased from its maximum of 1 816 tons CO_2 eq in 2018 to around 409 tons CO_2 eq in 2021. [24].

TABLE 10 GHG Emissions due to product use within Reykjavík

	GHG EMISSIONS [tCO_2 eq]
Nitrous oxide and steam at Landspítali	**431**
Products from fuels and solvent use	**3.280**
LPG use	1.644
Lubricant use	821
Paraffin wax use	119
Other	1.332
Product use as substitutes for ODS	**34.326**
HFCs for refrigeration	33.990
Aerosols	337
Total	**38 674**

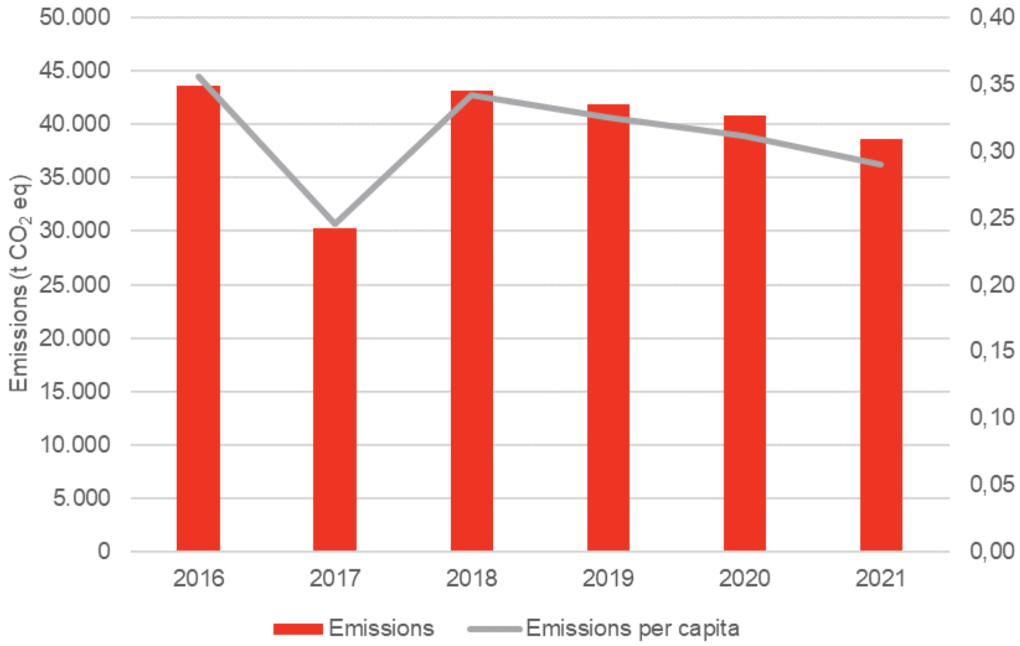

FIGURE 13 Emissions due to product use in Reykjavík.

Other Scope 3 Emissions

Emissions due to domestic food production as well as building materials used by the construction industry are examples of emission sources that can be reported under scope 3 without belonging to BASIC or BASIC+ reporting frameworks. Domestic food production has been approximated per capita based on average figures reported over the last several years in the National Inventory Report [10]. An average figure of housing commencing being built over the last five years is used to estimate the emissions from the construction industry within Reykjavík [25]. In earlier versions of this inventory, an international LCA study had been referenced to estimate an emission factor per square metre [26], but has now been substituted with a life cycle analysis report made specifically for an Icelandic refence house using real figures from the Icelandic construction industry. Emissions are reported in two separate sections in this inventory, construction materials and their production and international transportation belong in this chapter as a scope 3 emissions source, but fuel consumption is stationary energy use that goes into scope 1 emissions and the BASIC reporting framework. The LCA explores other aspects required to constructing the reference house, but sub-sectors such as electricity consumption, heating and waste production would already have been accounted for under various other emissions sectors in this inventory. Various other emissions sources could be reported as scope 3 emissions for Reykjavík and this sector is always growing with increased data collection, sharing and reporting in all aspects of life.

TABLE 11 GHG Scope 3 emissions

	GHG EMISSIONS [tCO_2 eq]
Domestic food production	6 693
Construction materials	64 948

Discussion

In this emissions inventory, greenhouse gas emissions that occur due to activities that occur within the city of Reykjavík are reported. The emissions themselves can take place either within the city boundaries (scope 1) or outside (scope 2 and 3). This geographic emissions inventory differs from operational climate accounting, where for example business flights from staff of Reykjavík City would have to be accounted for. Making the inventory yearly facilitates seeing trends in emissions, which in turn delivers more accurate data collection and easier calculations for any changes that impact results of the past. This is especially true of the most recent years, where the inventory shows clearly how Covid-19 has impacted various emissions sectors and how quickly everything returned to how its regular state, with traffic on-road, at sea and in the air, all making an immediate resurgence, along with the emissions that follow.

The year 2021 was the first whole operating year for GAJA that manufactures biogas and compost from organic waste and will with increased volumes deliver lower emissions from waste management due to less waste being left to release methane at landfill sites.

The largest emissions sector in the emissions inventory is transportation, with on-road transportation being by far the largest thereof. The Government's Action Plan against Climate Change declares that registration of new private cars that only drive on gasoline or diesel will not be allowed from 2030. It is probable that this development will occur more naturally and with more ease in Reykjavík than elsewhere in Iceland due to infrastructure for electric vehicles having come further along. Greater public transportation infrastructure being introduced in the next years will further facilitate the energy transformation.

There are still great opportunities present in data collection and reporting on emissions that belong to scope 3, which are a much larger share than presented today. That would in turn be followed with a greater overview of consumption driven indirect emissions that mostly occurs outside of the country. According to Kolefnisreiknir, the carbon calculator created by EFLA and Reykjavík Energy, consumption driven emission due to diet of the average Icelander is 3.54 tons CO_2 eq annually per capita and other consumption of products and services around 3.80 tons CO_2 eq. According to the population figures for Reykjavík, that would make around 472 000 tons and 506 000 tons CO_2 eq respectively annually, which is of a similar scale as the entire emissions within the BASIC reporting framework. A majority of these emissions are likely to occur outside of Reykjavík and even outside of the country, which mean that they will be outside of any traditional emissions inventory according to CIRIS and GHG Protocol for Cities, but that does not mean it is not important to map these sources in the future.

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