EUROPEAN COURT OF AUDITORS

EMAS
VERIFIED ENVIRONMENTAL MANAGEMENT
LU-000004

BC BILAN CARBONE®

Carbon Footprint Report

2016 Results

Calculation of the European Court of Auditors' carbon footprint using Bilan Carbone® methodology

This report has been prepared by EcoAct on behalf of the European Court of Auditors (ECA) using data provided by ECA.

EcoAct – S.A.S.

capital of 238.145 € – R.C.S. Paris 492 029 475 – N.I.I. : FR55 492 029 475 – APE 8299Z
35, rue de Miromesnil – 75008 Paris – France – www.eco-act.com – + 33 (0)1 83 64 08 70

Sabrina Giorgi, Senior consultant
sabrina.giorgi@eco-act.com
Phone: + 33 4 67 92 32 47

Valerie Morgan, Consultant
valérie.morgan@eco-act.com
Phone: + 33 1 83 64 12 56

Co-author: Natalia Krzempek (ECA)

Data collection contributors within the ECA:

Natalia Krzempek, EMAS Project manager
José Carrascosa Moreno
Heikki Kivisto
Philippe Bui Van
Véronique Machicote
Marion Kilhoffer

Contents

Tables

Figures

Introduction

The European Court of Auditors (ECA) is the EU institution established by the Treaty to audit EU finances. As the European Union's external auditor, it contributes to improving EU financial management and acts as the independent guardian of the financial interests of the Union's citizens. The ECA promotes accountability and transparency, and is committed to being an efficient organisation at the forefront of developments in public audit and administration.

Together with the other EU institutions, the ECA has a duty to apply EU policy measures designed to tackle climate change, for example by reducing the greenhouse gas (GHG) emissions generated by its activities.

To contribute towards reducing GHG emissions and their impact on the environment, the ECA is committed to applying the principles of sound environmental management in its values, mission and day-to-day decisions. The ECA introduced an environmental management system (EMAS project) in line with the EMAS Regulation, between 2014 and 2016.

Since 2014, the ECA has carried out a comprehensive assessment of its GHG emissions on an annual basis. The aim is to reduce its CO_2 emissions systematically as part of the broader EMAS project strategy, and thus to help honour the EU's commitment to the environment and achieve the Europe 2020 and 2030 growth strategy goal of sustainable development.

This report presents detailed results of the 2016 carbon footprint assessment. It also provides a comparative analysis of the 2014 - 2016 carbon footprint results (performance results from the first EMAS cycle).

The ECA is currently preparing a CO_2 offsetting strategy.

Executive summary

This report presents the results of the 2016 carbon footprint assessment for the European Court of Auditors and compares them with the results for 2014 and 2015.

Methodology used: For the 2016 carbon footprint assessment, the ECA continues to apply the Bilan Carbone® methodology developed by ADEME (France's Agency for Environmental and Energy Management).

Scope of the assessment: The scope of the carbon footprint assessment covers direct and indirect emissions from the activities of the ECA's staff and other employees, as well as those of the ECA's three buildings (K1, K2 and K3).

The following emission sources were considered for 2016: Energy in-house, non-energy in-house, transport of persons including employee commuting, business travel, visitor travel, purchased electricity and heating, purchased goods and services, transport of goods (from supplier to the ECA site), direct waste and sewage disposal, capital goods, and distribution losses from the transmission of electricity.

Carbon footprint results for 2016: GHG emissions in 2016 were estimated to be 10 495 tonnes of CO_2 equivalent (11.4 tCO_2e per occupant[1]), while the overall uncertainty of results was estimated at 1 063 tCO_2e (10% of the total amount).

Comparison of results for 2014 - 2016: Overall, the ECA's GHG emissions decreased by 3% (for the purpose of this comparison, the emission factors from 2016, version V7.7 of the Bilan Carbone®, were applied to update the 2014 and 2015 results).

Most significant ECA emission sources: Transport of persons (38%), capital goods (22%) and energy in-house (21%).

[1] Calculated as full-time equivalent (FTE).

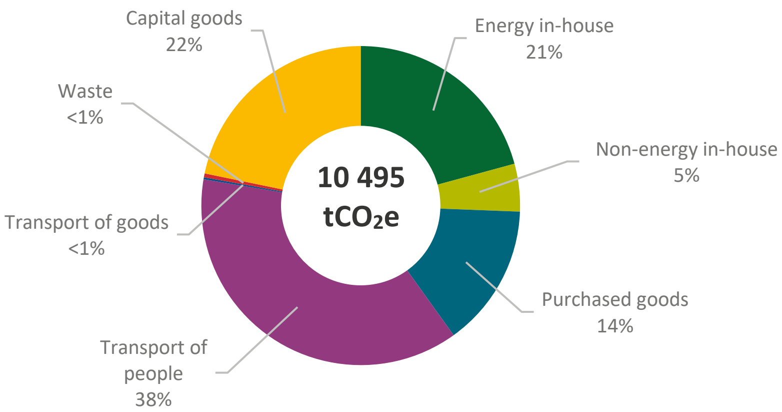
1. 2016 Carbon footprint - Overall results

The overall result of the ECA's 2016 carbon footprint was 10 495 tonnes CO_2e (carbon dioxide equivalent), or 11.4 tonnes CO_2e per FTE[2] (see Table 1). As Figure 1 shows, the largest source of the Court's carbon footprint was the transport of people (38%), followed by capital goods (22%), energy in-house (21%) and purchased goods (14%). Non-energy in-house, waste and transport of goods made up the remaining 5%. Total uncertainty amounted to 1 063 tCO_2e, or 10% of the calculation.

Table 1: Overview of GHG emissions, ECA breakdown for 2016

Recap tCO_2e	GHG emissions			Uncertainties of results	
	tCO_2e	%	tCO_2e per FTE	tCO_2e	%
Energy in-house	2180	21%	2.36	113.25	5.19%
Non-energy in-house	507	5%	0.55	152.44	30.07%
Purchased goods	1520	14%	1.65	336.71	22.15%
Transport of people	3941	38%	4.27	539.46	13.68%
Transport of goods	20	0%	0.02	5.42	26.53%
Waste	42	0%	0.05	9.64	23.14%
Capital goods	2285	22%	2.47	830.06	36.35%
Total	**10495**	**100%**	**11.4**	**1062.82**	**10.13%**

Figure 1: GHG emissions distributed by source - ECA carbon footprint for 2016



GHG emissions for the **transport of people (38% of total GHG emissions)** come from three areas: ECA business travel, visitor travel to the ECA and commuting by ECA employees. The main sources for **capital goods (22%)** are IT equipment and buildings. It is important to note that capital goods GHG emissions are those associated with the production/construction of goods, not their *use* (these GHG emissions come under 'energy use'). **Energy in-house (21%)** is the third largest source of GHG emissions (using the local emission factor for Luxembourg, as the

[2] The FTE for 2016 was 923.7.

Bilan Carbon® methodology recommends). These emissions are mainly from electricity (see section 2.3 'Energy in-house' for more details). The fourth emissions category in 2016 was **purchased goods and services (14%)**, with purchased services accounting for the majority of these GHG emissions. **Non-energy in-house (5%)** accounted for GHG emissions associated with refrigerants (in the ECA's case, refrigerants used for air-conditioning units and cooling devices). **Waste (<1%)** ranks second to last, with the majority of GHG emissions coming from food fats and oils, and household waste. **Transport of goods (<1%)** ranks last, accounting for GHG emissions associated with transportation by suppliers.

Reduction targets: As part of the 2017 - 2019 EMAS action plan (the second EMAS cycle), the ECA has set the following targets:

- Reduce CO_2 emissions from auditor travel by 3% per FTE within 3 years;
- Reduce CO_2 emissions from the ECA's car fleet by 10% within 3 years.

In the medium and long term, the ECA aims to reduce CO_2 emissions by 7% by 2020 and by 18% by 2030, when compared with 2014.

For information on the scope of emissions broken down by GHG Protocol category, see ANNEX 2 '*GHG emission sources according to the GHG Protocol*' for an overview of how emissions are separated by scope.

1.1. Results by building

The distribution of GHG emissions across buildings largely reflects the number of employees in each building. This is mainly because shares of GHG emissions were distributed by number of employees across buildings (see Table 3) for certain categories of GHG emissions. In a large number of cases, such as for transportation, waste and purchased goods and services, GHG emissions were allocated in proportion to the population of the buildings. Unsurprisingly, as K3 has the largest number of employees, it also has the largest share of GHG emissions (50%; see Figure 3). The cases where GHG emissions were not automatically distributed by building population were non-energy in-house, energy in-house: in these cases, raw data by building were used (Figure 2 and Table 2).

Table 2: Emissions results by building (tCO_2e)

	K1	K2	K3	Total K1 K2 K3
Energy in-house	662	531	987	**2 180**
Non-energy in-house	0	0	507	**507**
Capital goods	551	507	1 226	**2 285**
Purchased goods	460	365	695	**1 520**
Transport of goods	6	5	9	**20**
Transport of people	1192	947	1 802	**3 941**
Waste	13	10	19	**42**
TOTAL (tCO_2e)	**2 884**	**2 365**	**5 246**	**10 495**

Figure 2: Emissions results by building (tCO2e)

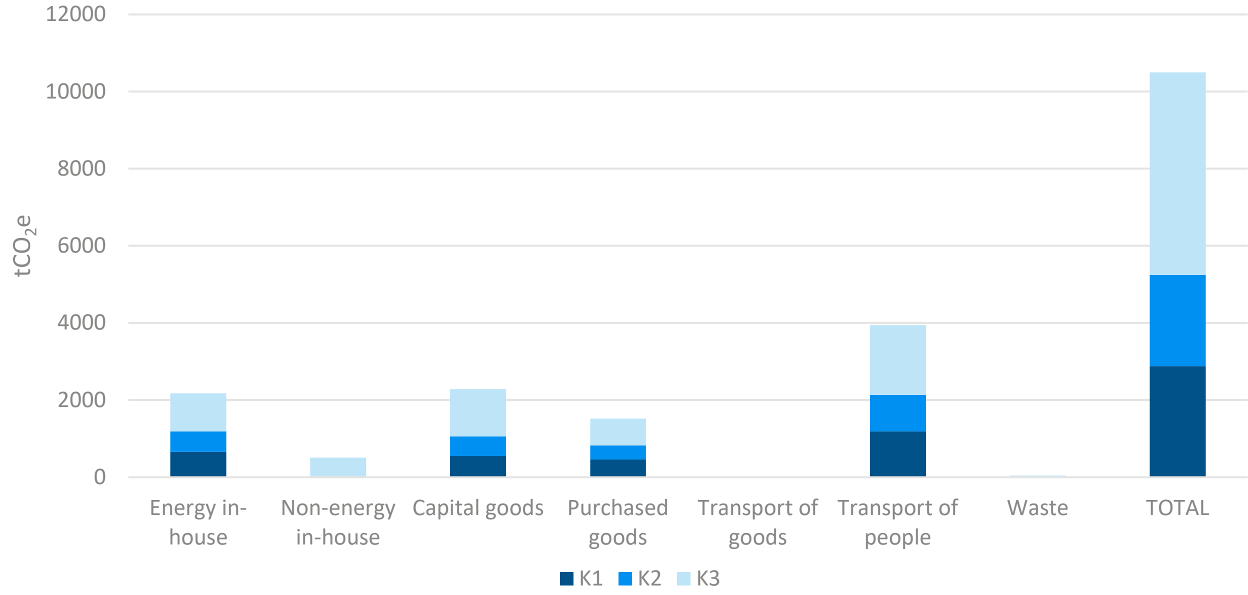


Figure 3: Distribution of GHG emissions by building (tCO_2e)

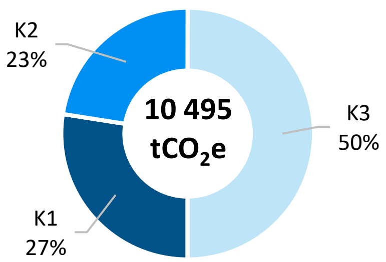


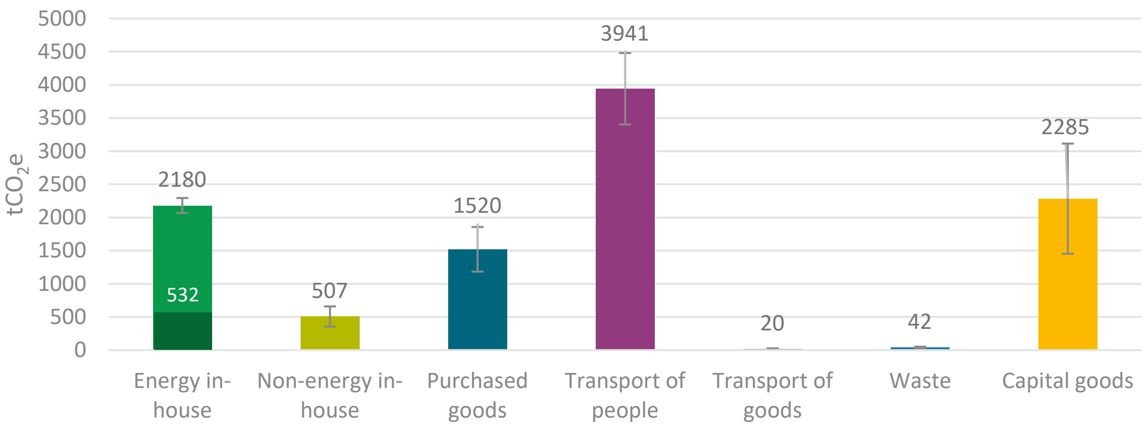
Table 3: Number of employees by building

	Number of employees	%
K1	301	30%
K2	239	24%
K3	455	46%
	995	

1.2. Uncertainty of results

Figure 4 shows the overall results with uncertainty lines. The overall uncertainty of the ECA carbon footprint is 10.13% (1 062.82 tCO_2e). This means that there is a reliable probability of at least 95% that the real carbon footprint lies within the range of 9 432 tCO_2e and 11 557 tCO_2e, where the calculated carbon footprint is 10 495 tCO_2e (see Table 1 for individual uncertainty for specific categories).

Figure 4: ECA's GHG emissions by category and corresponding uncertainties (tCO_2e)



The dark green shading represents the energy GHG emissions that would be associated with the ECA if the emission factor for the Guarantees of Origins (GOs) were used (this would total 532 tCO_2e; see section 2.3.4 for more information).

The 10.13% uncertainty is obtained by using the following formula:

$$\frac{\sqrt{(2180*5.19\%)^2+(507*30.07\%)^2+(1520*22.15\%)^2+(3941*13.68\%)^2+(20*26.53\%)^2+(42*23.14\%)^2+(2285*36.35)^2}}{10495}$$

2. Detailed results by emission source

2.1. Transportation of people

2.1.1. Data provided and assumptions

Use of official cars (owned and leased)

The use of official cars included business travel and non-business travel.

Data provided: Number of kilometres driven.

Calculation: The kilometres driven were multiplied by the emission factor for an average diesel/petrol vehicle.

Employee commuting

“Employee commuting” calculates the GHG emissions associated with travel by ECA employees from their homes to the ECA.

Data provided: The results were based on an extrapolation of the results of **a survey that was sent to all employees**.

Calculation: There were **527 responses** to the survey (just over half of all employees). The following assumptions were made: 200 working days per FTE (40 working weeks), with 21 071.5 days not commuted (due to teleworking days, flexidays and mission days), which is equivalent to **105.3 FTE**. The extrapolated FTE used for this calculation was therefore **818.34** (923.7 minus 105.3). The number of kilometres by mode of transport used was extrapolated on the basis of the number of total FTE, rather than by FTE per country (since these data were not available). The kilometres were then multiplied by the emission factor for the respective mode of transport.

Assumptions: carpooling meant two people in a vehicle.

Business travel

“Business travel” includes all GHG emissions associated with ECA employees travelling on business, e.g. on audit missions.

Data provided: Total kilometres per mode of transport used (excluding the use of official cars, which was accounted for under scope 1).

Calculation: The number of kilometres per mode of transport was multiplied by the respective emission factor.

Assumption: “Other” transport was assumed to be bus travel.

Visitor travel

Data provided: The number of visitors by country of origin (2 799 visitors, with 123 visits).

Assumptions: The following assumptions were made about the mode of travel, depending on the country of origin:

- **Short-haul aircraft** for visitors from Albania / Austria / Azerbaijan / Belarus / Bosnia / Bulgaria / Croatia / Cyprus / Denmark / Estonia / Finland / Greece / Hungary / Ireland / Italy / Latvia / Kosovo / Lithuania / the former Yugoslav Republic of Macedonia / Malta / Moldova / Montenegro / Poland / Portugal / Romania / Serbia / Slovakia / Slovenia / Spain / Sweden / Switzerland / United Kingdom / Turkey / Ukraine
- **Long-haul aircraft** for visitors from Argentina / Brazil / Canada / Cape Verde / Comoros / Ethiopia / Georgia / India / Japan / Kazakhstan / Malaysia / Nicaragua / Nigeria / Norway / Pakistan / Philippines / Russia / Singapore / South Africa / Sri Lanka / USA
- **Car** for visitors from BE / LU
- **Bus** for visitors from CZ / DE / NL
- **Train** for visitors from FR.

Calculation: The distances were calculated using an EcoAct internal distance-calculator tool between the countries of origin and Luxembourg, with the distance being multiplied by two to obtain round-trip distances.

2.1.2. Results

Transportation of people emitted 3 941 tCO_2e, or about 38% of total ECA emissions. Visitor travel, business travel and employee commuting each accounted for about one third of total transportation GHG emissions (see Figure 5 and Figure 6), with visitor travel being only marginally smaller than business travel and employee commuting, by about 100 tonnes. Each type of travel emitted around 1 300 tCO2e. Uncertainties for transportation of people totalled 540 tCO2e, or 14% of the calculation. In terms of distance, each type of transportation of people accounted for around 5.5 million kilometres (see Table 4).

Table 4: Transportation of people, GHG emissions and associated kilometres

Transport of people	tCO_2e	km
Business travel	1 345	5 746 003
Employee commuting	1 347	6 134 598
Visitor travel	1 249	5 484 392
Total	**3 941**	**17 364 993**

Figure 5: Transportation of people, total GHG emissions

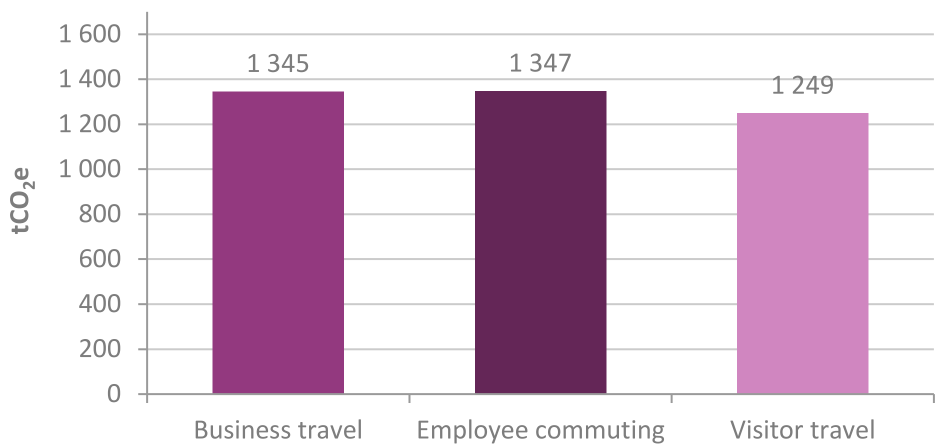
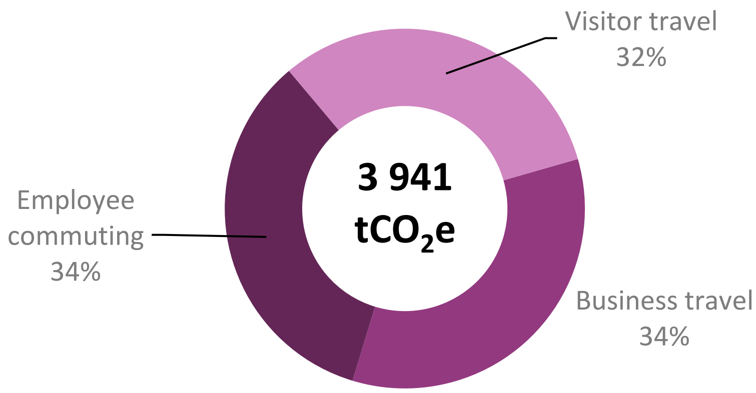


Figure 6: Transportation of people, share of total GHG emissions



2.1.3. Business travel

Business travel accounted for 34% of total transport GHG emissions. Air travel accounted for the majority of business travel GHG emissions (about 6 times more than the second largest source of emissions: cars (ECA and personal)). Air travel also accounted for the largest number of kilometres: (over 4.2 million) emitting 1094 tCO2e, or about 81% of business transport emissions (see Table 5 and Figure 8).

Cars (ECA and personal) were the second largest source of emissions with 186 tonnes, and over 700 000 kilometres. Train travel accounted for almost 600 000 kilometres, but only 24 tCO_2e, due to lower emissions by trains. In terms of GHG emissions, buses ranked fourth, followed by rental cars and boats (see Figure 7). Table 5 contains more detailed information on the kilometres covered by each mode of transport used for business travel.

Table 5: Business travel, GHG emissions and associated kilometres

Transport of people	tCO_2e	km
Air	1 094	4 229 964
Car (ECA and personal)	186	703 646
Train	24	596 318
Bus	22	140 525
Rental car	20	74 720
Boat	1	830
Total	**1 345**	**5 746 003**

Figure 7: Transportation of people GHG emissions, business travel

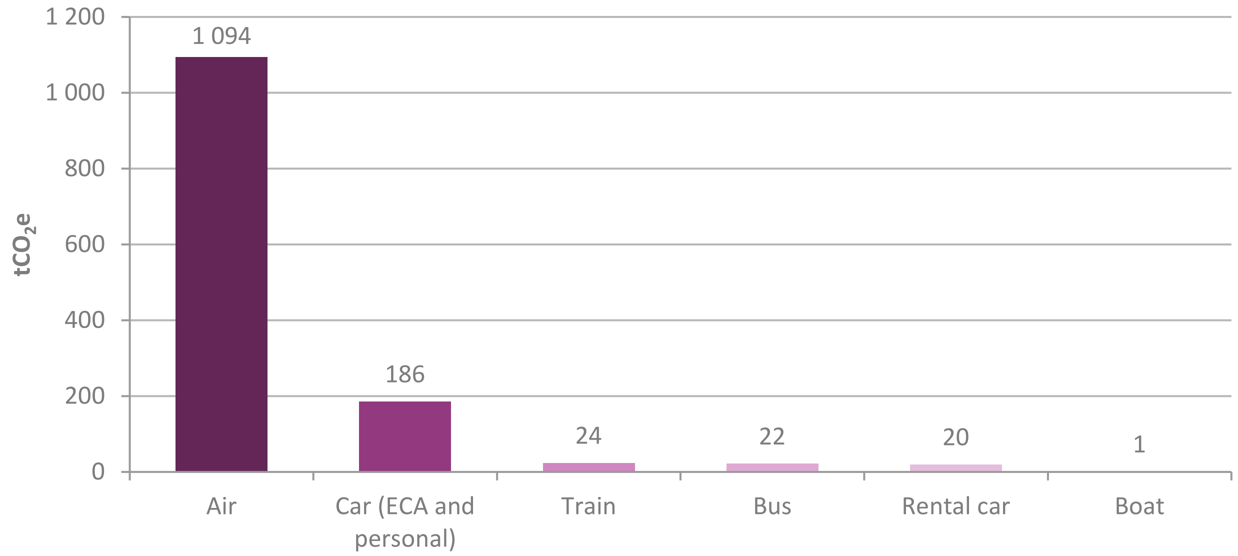
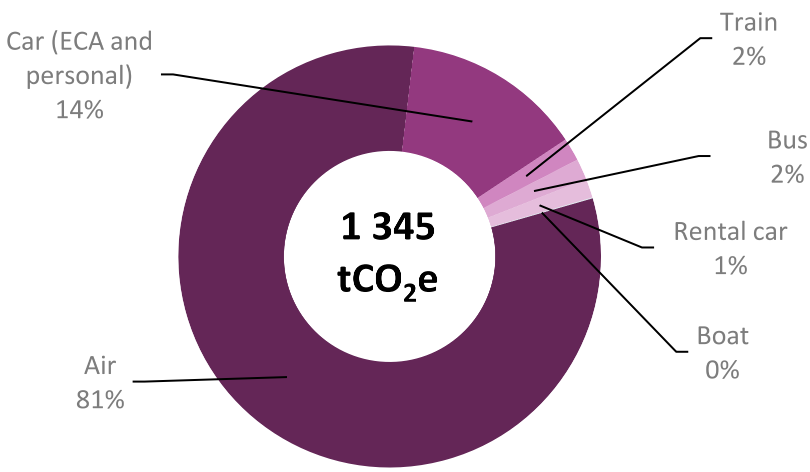


Figure 8: Transport of people, share of emissions from business travel



The average distance per mission in 2016 was **1 088 kilometres (round trip)**.

2.1.4. Employee commuting

Employee commuting accounted for about one third (34%) of the ECA's total transport GHG emissions. Table 6 provides an overview of the extrapolated results of the survey responses by 527 employees and a breakdown by type of travel. Cars (ECA-owned and personal) accounted for 81% of GHG emissions (1088 tCO_2e) as shown in Figure 10, and 70% kilometres travelled per employee (see Figure 11). This was followed by bus (183 tCO_2e), carpooling (55 tCO_2e), train (18 tCO_2e) and motorbike (3 tCO_2e). Travel by bicycle and on foot does not entail any emissions (Figure 9).

Table 6: GHG emissions and corresponding kilometres related to commuting

Type of commuting	tCO_2e	km
Car (ECA and personal)	1 088	4 273 920
Bus	183	1 009 049
Carpooling	55	215 036
Train	18	454 508
Motorbike	3	16 646
Bicycle	0	70 877
On foot	0	94 561
Grand Total	**1 347**	**6 134 598**

Figure 9: GHG emissions related to commuting

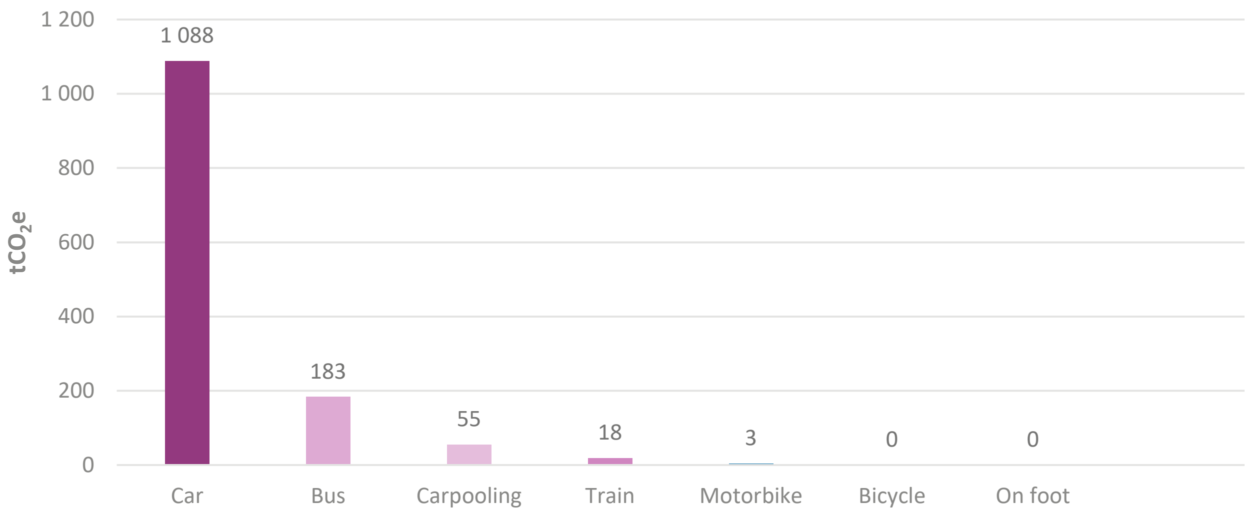


Figure 10: Distribution of commuting emissions

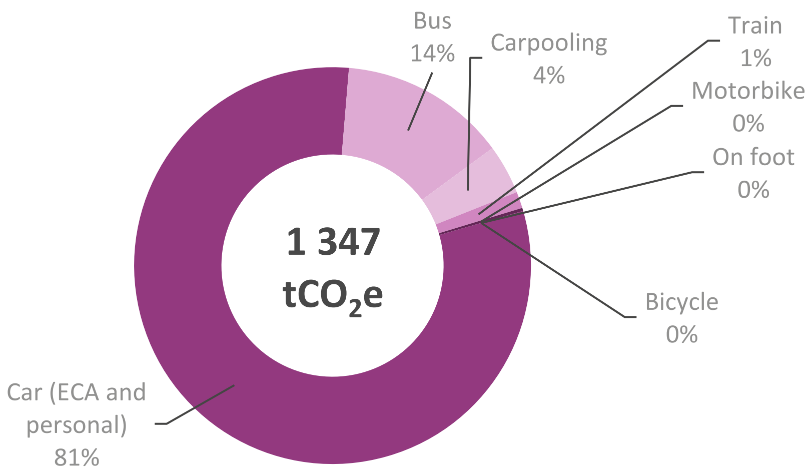
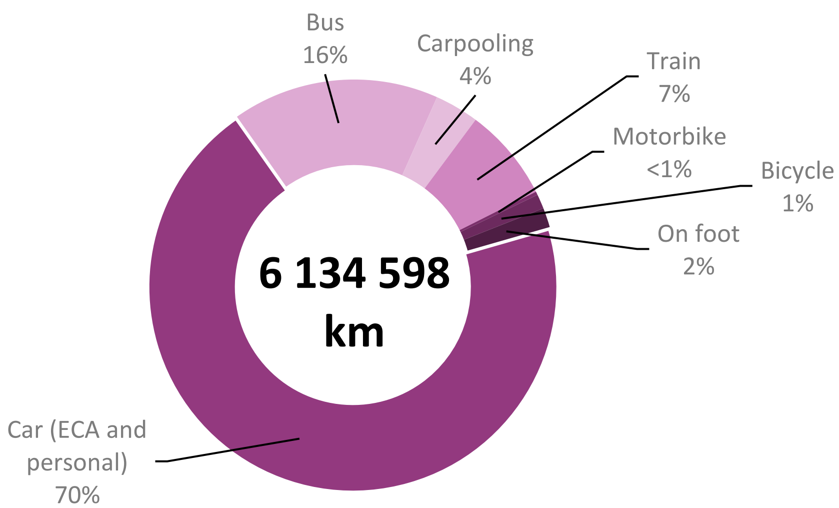


Figure 11: Distribution of commuting distance



On average, each ECA employee commuted **35 km per day** in 2016, with the majority of employees driving their own car. Figure 11 shows that over 4 million kilometres were travelled by car. Trains account for about 7% of total kilometres travelled but less than 1% of total emissions. This figure is interesting as it shows the relative emissions of different types of travel when compared with GHG emissions.

2.1.5. Visitor travel

Visitor travel accounted for about 32% of total transportation GHG emissions (1 249 tCO_2e; see Figure 6). As Figure 13 shows, almost half of emissions associated with visitor travel were from short-haul aircraft (48% of GHG emissions), followed by long-haul aircraft (37% of GHG emissions). Short-haul aircraft covered fewer kilometres, but short-haul aircraft emit more per passenger kilometre (see Table 7 and/or Figure 12).

The weighted average distance for visitors in 2016 was **3 611 kilometres**, one-way, with an average of 7 800 km for long-haul and 1 500 km for short-haul aircraft.

Table 7: Visitor travel GHG emissions and associated kilometres

Visitor travel	tCO_2e	km
Short-haul aircraft	602	1 918 116
Long-haul aircraft	465	2 223 710
Bus	122	790 452
Car	45	176 590
Train	15	375 524
Total	**1 249**	**5 484 392**

Figure 12: Total GHG emissions by mode of transport for visitor travel

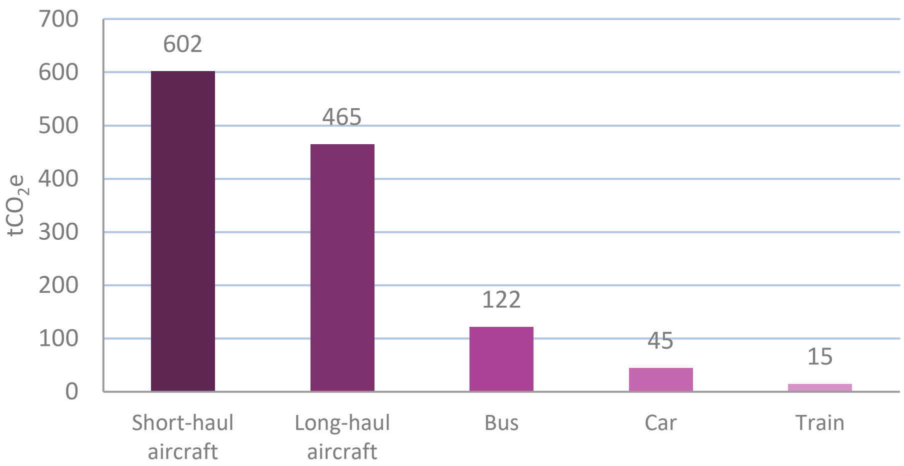
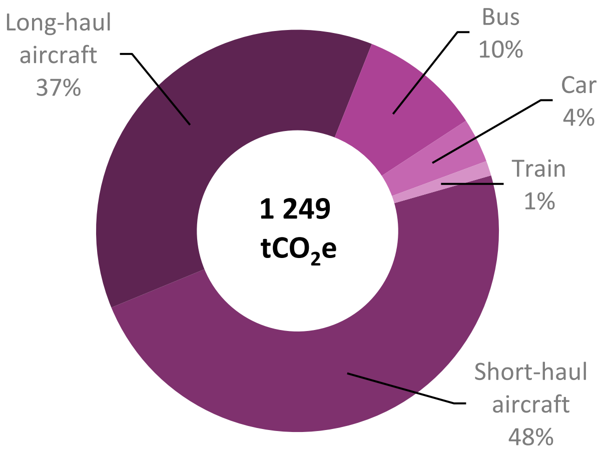


Figure 13: Distribution of GHG emissions of visitor travel by mode of transport



2.2. Capital Goods

2.2.1. Data provided and calculations

"Capital goods" accounts for GHG emissions associated with the ECA's durable goods (assets). These GHG emissions account for the *lifecycle* GHG emissions of durable goods, meaning that the GHG emissions associated with the manufacturing of a car (or the construction/renovation of a building) are included, but not the *use* of those assets (these GHG emissions are calculated elsewhere, such as under energy use, transportation, etc.).

Data provided:

- ***Buildings & outdoor spaces:*** m^2 of car parks and office space; depreciation period of 40 years.
- ***Vehicles owned/leased by the ECA:*** model of leased and owned vehicles allocated to all three buildings; depreciation period of 4 years.
- ***IT equipment (printers, screens, PCs etc.):*** IT inventory by type of goods; depreciation period of 4 years.
- ***Buildings assets:*** generators, kitchen assets, refrigerants and air conditioners were in units, while furniture, equipment, machines and tools were provided by purchase price; depreciation period of 8 years.

Calculation: The different capital goods have their own type of emission factor, whether by units (building assets and IT), price (building assets), weight (vehicles) or space (buildings and car parks). These emission factors take account of the lifecycle of capital goods, with the result then divided by years of depreciation (8 years for building assets, 40 years for buildings/car parks and 4 years for vehicles and IT).

2.2.2. Results

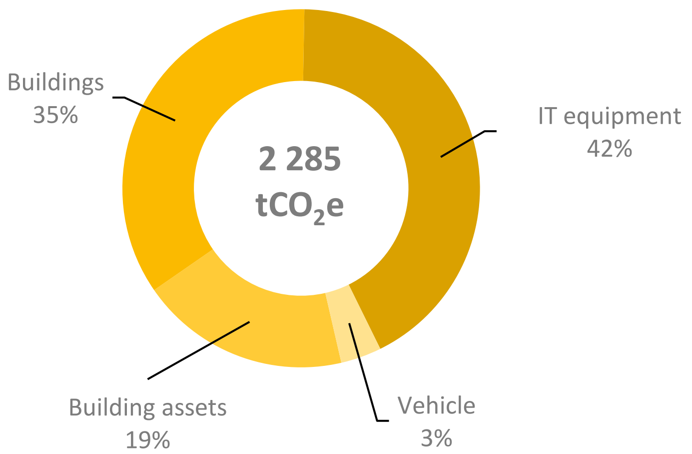
Capital goods were the second largest source of GHG emissions for the ECA in 2016, accounting for **22% of the total** (or 2 285 tCO_2e; see Table 8 and Figure 14). As Figure 15 shows, the majority of GHG emissions are from IT equipment (42%). Buildings (car parks, building materials, etc.) take second place with 35% of capital goods GHG emissions, with building assets and vehicles making up the remaining 22%.

Table 8: Capital goods and associated GHG emissions

Type of capital goods	tCO_2e
Building assets	434
Buildings	798
IT equipment	969
Vehicles	84
Total	**2 285**

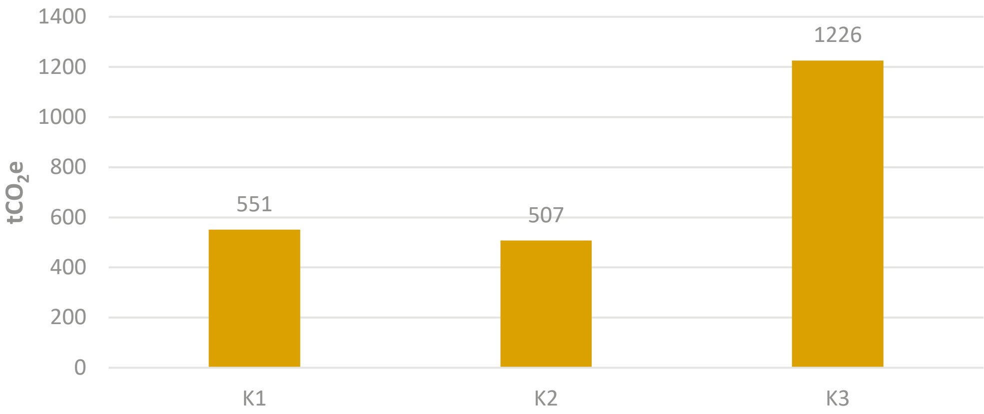
Figure 14: GHG emissions from capital goods

Figure 15: Distribution of GHG emissions, capital goods



The distribution of emissions by building (see Figure 16) reflects the fact that the largest building (K3) houses the majority of employees (46%), and the fact that K3 houses the canteen, which in itself has a lot of building assets (mainly kitchen assets).

Figure 16: Distribution of capital goods GHG emissions by building



Uncertainties for capital goods amount to 830 tCO_2e, or 36% of the calculation. This is due primarily to the fact that a substantial amount of capital goods were calculated by expenditure, which by definition gives a less accurate estimate in terms of GHG emissions, thus increasing uncertainty for this category (see Table 1).

2.3. Energy in-house

2.3.1. Data provided and calculations

"Energy in-house" includes GHG emissions associated with energy use: electricity (consumption and losses), fuel consumption and heat consumption.

Energy in-house accounted for about one fifth of the ECA's GHG emissions in 2016 (21%, or 2 180 tCO_2e).

Data provided:

- ***Green energy purchases:*** 2016 guarantee of origin (GO) certificates
- ***Electricity consumption & losses:*** 2016 consumption (kWh) for the K1, K2 and K3 buildings. Electricity losses are considered to be 9.33%.
- ***Fuel consumption (for electricity generator):*** purchased volume in litres, maximum capacity per generator and internal reservoir levels for the year.
- ***District heat consumption:*** kWh heat consumption for each building.

Calculation: Energy consumption was multiplied by the relevant emission factors, given the ECA's geographical location, plus 9.33% to account for electricity losses (considered as indirect emissions).

2.3.2. Results

As Figure 18 shows, 84% of GHG emissions associated with energy consumption are from electricity, 8% from electricity losses, 8% from heating, and <1% from fuel oil. Table 9 provides a detailed overview of consumption and associated GHG emissions by type of energy. Figure 17 shows that electricity (1840 tCO_2e) is the largest source of GHG emissions associated with electricity consumption, followed by electricity losses (172 tCO_2e), heating (165 tCO_2e) and fuel (4 tCO_2e).

Table 9: Energy consumption and associated GHG emissions, total and by building

	K1		K2		K3		TOTAL	
	tCO2e	units	tCO2e	units	tCO2e	units	**tCO2e**	**units**
Electricity (kWh)	557	1 357 735	442	1 078 068	841	2 052 390	**1840**	**4488193**
Fuel (litres)	2	600	1	385	1	165	**4**	**1150**
Heating (kWh)	52	1 090 630	47	985 320	67	1 408 720	**165**	**3484670**
Electricity losses (kWh)	52	126 677	41	100 584	79	191 488	**172**	**418748**
TOTAL							**2180**	

Figure 17: GHG emissions by energy source

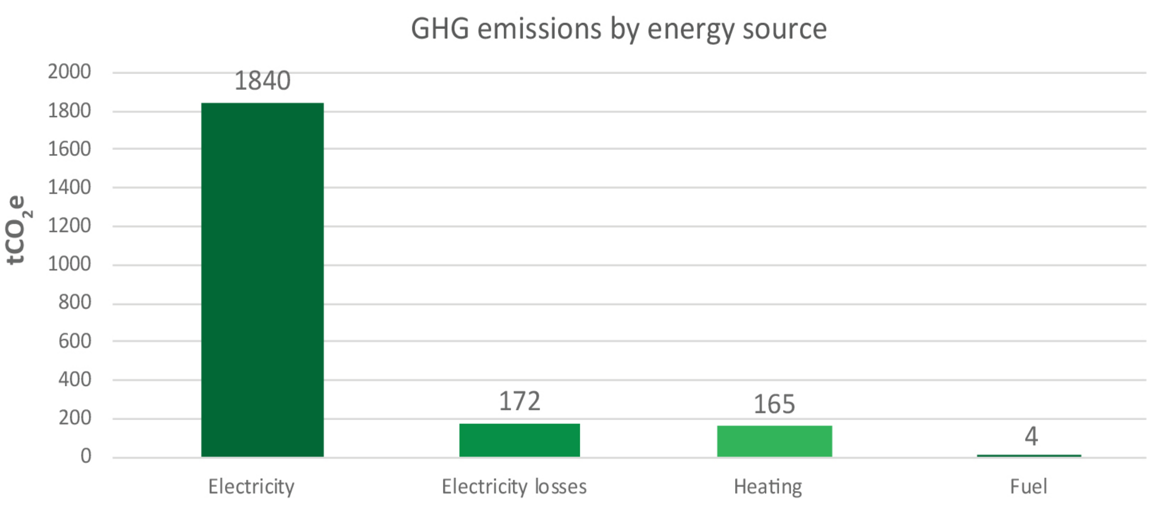
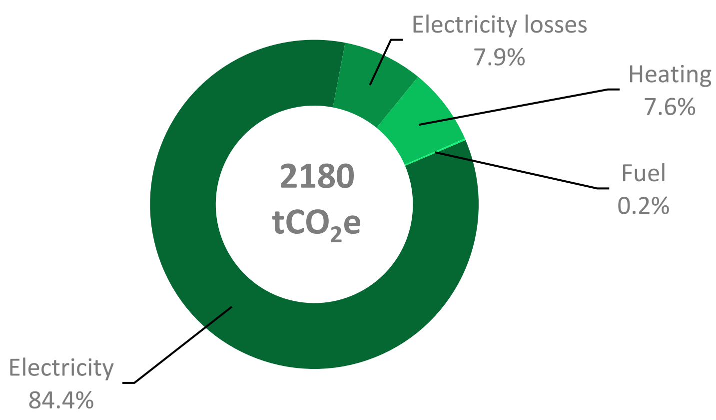


Figure 18: Distribution of GHG emissions by energy source



2.3.3. Results by building

Figure 19 provides an overview of the share of total emissions associated with energy consumption by building. K3 is the largest source of GHG emissions, accounting for about 45%: it has the largest energy consumption for both heating and electricity (see Figure 20). Although consumption for heating is lower than for electricity, it is a major source of energy for the ECA but has a much smaller impact (8%) on in-house energy GHG emissions when compared with electricity (84%; see Figure 20 and Figure 21) due to its smaller emission factor per kWh.

Figure 19: GHG emissions associated with energy consumption - Breakdown by building

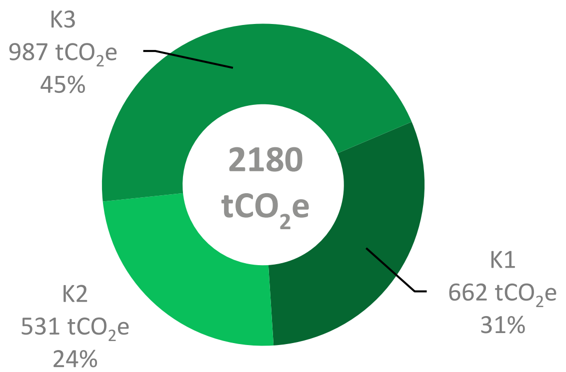


Figure 20: Heating and electricity consumption (kWh) by building

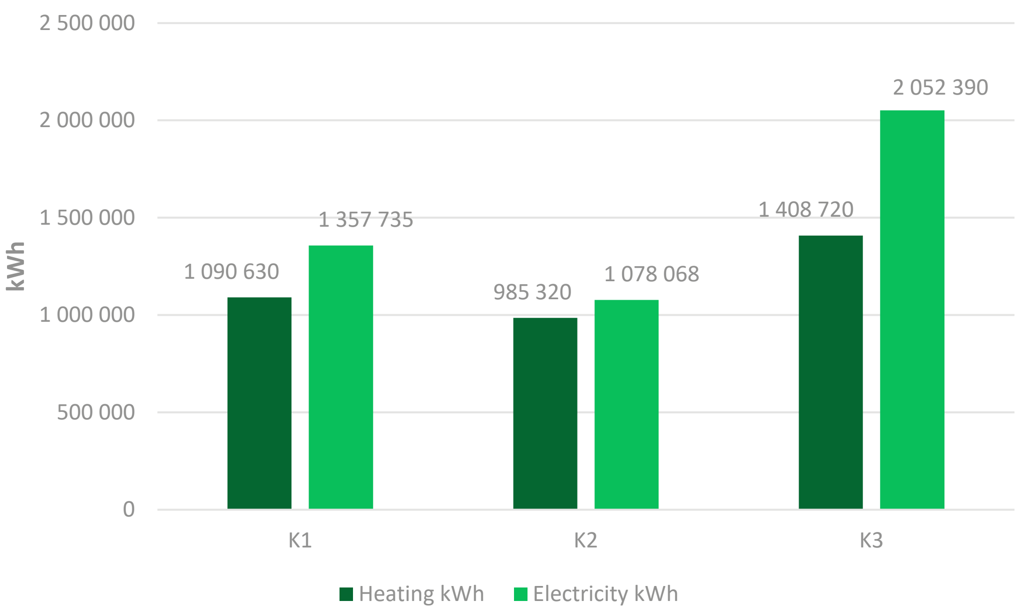
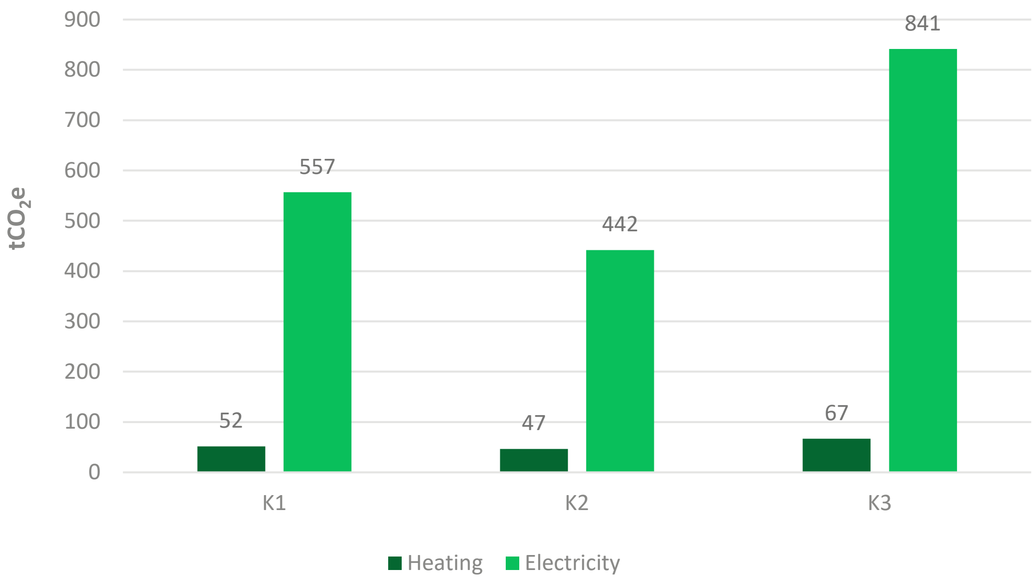


Figure 21: GHG emissions associated with heating and electricity (tCO_2e) - Breakdown by building



Uncertainties for energy in-house amount to 113 tCO_2e, or 5% of the calculation.

2.3.4. Emphasis on green energy

Organisations that wish to green their energy have different options available, e.g. installing solar panels on their roofs for direct green consumption. However, this is not always practical or feasible. Another common and effective way to purchase green electricity is through Renewable Energy Certificates (RECs) in North America, Guarantees of Origin (GOs) in Europe, and International RECs (IRECs). RECs, GOs and I-RECs are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable source. They can be traded on various markets and are "retired" when a purchaser makes a green energy claim. The ultimate goal of the green energy market is to send a clear message to the market and so create greater demand for certificates; this should eventually lead to greater renewable energy generation capacity across the world.

The ECA purchases GOs originating from hydroelectricity in Norway in an effort to "neutralise its GHG emissions". However, Bilan Carbone® methodology only considers the *real* electricity used from the national electricity grid, whereas the GHG Protocol allows this "market-based method" to use the emission factors from the various certificates. Last year, the carbon footprint report considered these emission factors, thus creating a large difference year-on-year. Nonetheless, the ECA's contribution and effort is significant and worth reporting, as the ECA purchases certificates to cover all its electricity consumption. The purchase of these certificates corresponds to 1 650 tCO_2e in GHG emissions avoided in terms of the ECA's electricity consumption.

2.4. Non-energy in-house

2.4.1. Data provided and calculations

This category of GHG emissions includes those associated with refrigerant gases. Non-energy in-house accounted for 5% of total ECA GHG emissions in 2016.

Data provided: Refills of refrigerant gases in cooling facilities in 2016 for each building. Refills were considered as leaks.

Calculation: The weight of refrigerant gases (in kg) was then multiplied by the relevant emission factor.

2.4.2. Results

In 2016, only the K3 building was concerned by refrigerant leaks, amounting to 390 kg of refrigerant with an associated 507 tCO_2e (0 tCO_2e for K1 and K2; see Table 10). Refrigerants have a very high global-warming potential, with 1 tonne of R134a being equivalent to 1 300 tCO_2e. For this reason, a small amount of refrigerant leakage can have a high carbon-equivalent impact.

Table 10: Refrigerant leaks

	Building	Leak	tCO_2eq
2016	K3	390 kg of R134a	**507**

Uncertainties for non-energy in-house amount to 152 tCO_2e, or 30% of the calculation.

2.5. Purchased goods and services

2.5.1. Data provided and calculations

"Purchased goods and services" account for (non-durable) purchases made by the ECA in 2016. This includes purchases of paper, office supplies, meals, gifts, services from third parties, water, and other miscellaneous goods and services.

- ***Paper:***

Data provided: Number of printed pages **of ECA reports** (assumption: all documents are printed on both sides of A4 paper) and number of **pages printed in-house** (office work). Assumption: 80% of paper is printed on both sides, 97% is recycled; 90% of paper is in A4 format and the other 10% is A3.

Calculation: Based on the assumption of the type of paper printed and the mode of printing (single- or double-sided), the number of pages was converted to an approximate weight (tonnage) of paper (one page is 5 grams), then multiplied by the relevant emission factor. (If pages were printed on both sides, then the number of pages was divided by two.)

- ***Purchased water:***

Data provided: Annual water consumption (in m^3).

Calculation: Multiplied by the emission factor for water consumption.

- ***Meals:***

Data provided: Number of meals served in the canteen; purchased quantities of meat (fish, pork, beef, chicken) divided into organic and non-organic.

Calculation: The quantities of meat provided were used to divide up the number of meals served by type of meal. The assumption was that 8% of meals were organic, with the remainder distributed according to the proportion of the quantities of meat purchased (29% chicken, 18% beef, 16% pork and 20% fish; 8% of meals were vegetarian).

- ***Gifts:***

Data provided: Quantity of gifts by type purchased in 2016.

Calculation: These gifts were broken down by material and transformed into weight, based on research on the products concerned and their material composition.

- ***Other purchased goods and services:***

Data provided: An inventory list of all goods and services purchased by the ECA (€).

Examples of services purchased: construction work, external software, advertising, health and social work, hotels and restaurants, insurance & pension services, etc.

Examples of goods purchased: consumables, CDs & books, clothing and accessories, etc.

Calculation: Purchased goods and services were declared in euros. The types of purchased goods and services were then linked to the corresponding Bilan Carbone® categories of goods and services, based on the nature of the goods or services. The Bilan Carbone® has an inventory of emission factors associated with every 1 000€ worth of goods or services for specific types of products and services. The values were then multiplied by the respective emission factors.

2.5.2. Results

The majority of GHG emissions from purchased goods and services correspond to purchased services (71% of GHG emissions, of about 1 000 tCO_2e; see Figure 22 and Figure 23). The second largest source of GHG emissions is split between meals and purchased goods (both 13%, or about 200 tCO_2e). Paper, gifts and water make up less than the remaining 4% of GHG emissions. Table 11 provides a more detailed breakdown of the data provided and the associated tCO_2e.

Table 11: Units and associated GHG emissions of purchased goods and services

Purchases	tCO_2eq	2016 Data
Purchased water	2	15 962 m^3
Gifts	8	12 300 units
Paper	33	36 015 kg
Purchased goods	198	€€€
Meals	201	100 255 meals
Purchased services	1 078	€€€
TOTAL tCO_2e	**1 520**	

Figure 22: GHG emissions from purchased goods and services

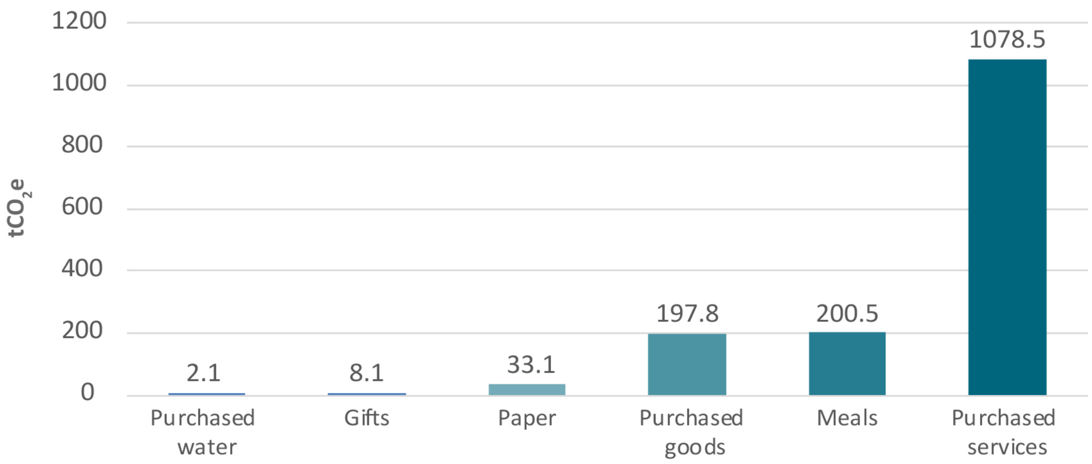
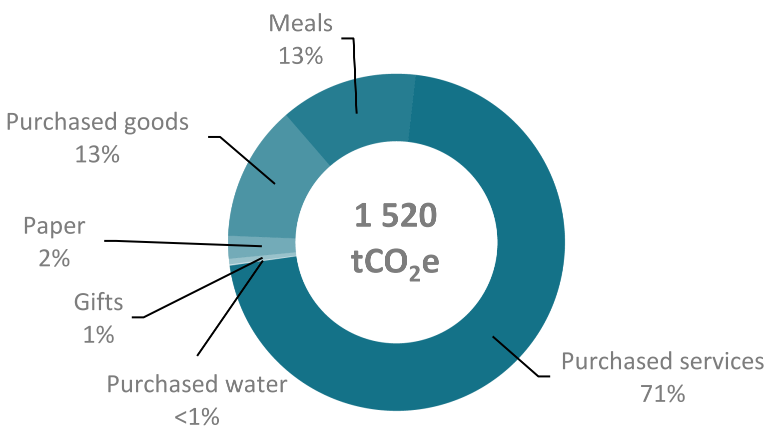


Figure 23: Breakdown of GHG emissions by type (purchased goods or services, gifts, water, etc.)

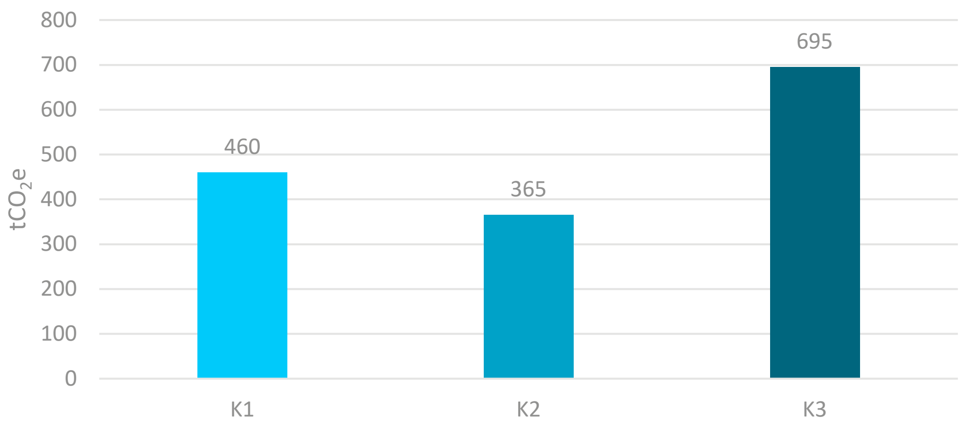


Uncertainties for purchased goods and services amount to 337 tCO_2e, or 22% of the calculation.

2.5.3. Results by building

As Figure 24 shows, the K3 building is the largest source of GHG emissions, with 695 tCO_2e. K1 is second with 460 tCO_2e and K2 third with 365 tCO_2e for associated purchased goods and services. This is because GHG emissions were allocated on the basis of the individual buildings' employee populations, with K3 accounting for the largest number of employees.

Figure 24: Total GHG emissions for purchased goods and services by building



2.5.4. Purchased services

Purchased services accounted for 1078 tCO_2e. As Figure 25 shows, the majority of GHG emissions came from "miscellaneous services" [3] (25%, 274 tCO_2e), "repair and installation services" (17%, 179 tCO_2e), "external software creation" (13%, 135tCO_2e) and "translation services" (8%, 91 tCO_2e). Other services accounted for less than 5% each, including "miscellaneous business services", "subscription services", "legal and accounting", "telecommunication services" etc. (see Table 12 for details).

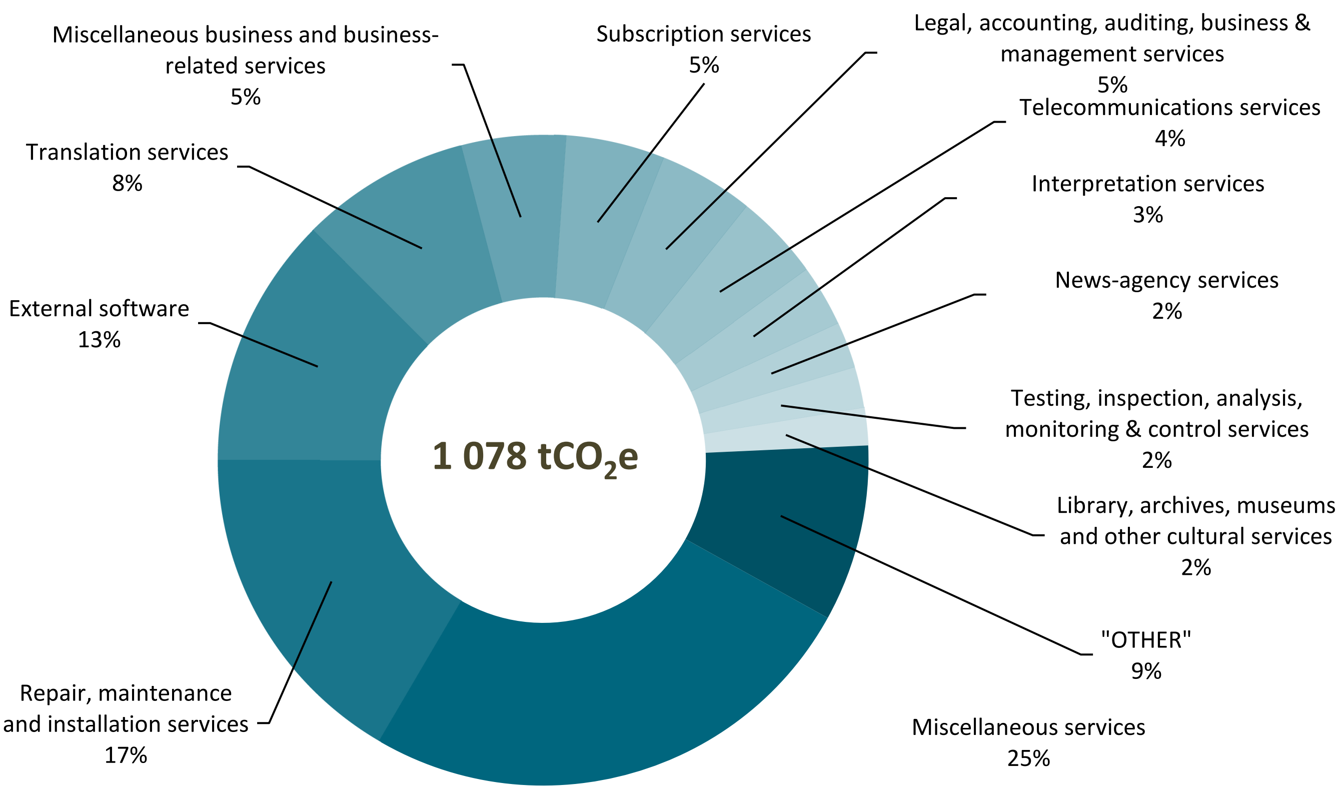
Table 12: Purchased goods and services, with associated GHG emissions

Types of service	tCO_2e	% of total GHG emissions
Miscellaneous services	274	25%
Repair, maintenance and installation services	179	17%
External software	135	13%
Translation services	91	8%
Miscellaneous business and business-related services	56	5%
Subscription services	53	5%
Legal, accounting, auditing, business & management services	51	5%
Telecommunications services	46	4%
Interpretation services	33	3%
News-agency services	25	2%

[3] Miscellaneous services were attributed an average services emission factor from the Bilan Carbone® database. These services ranged from renting material, training (language, etc.), painting, document destruction, etc. as defined by the ECA.

Testing, inspection, analysis, monitoring & control services	22	2%
Library, archives, museums and other cultural services	20	2%
"OTHER" (in graph)	**94.8**	**9%**
Advertising and marketing services	19	2%
Real estate services	17	2%
Architecture, engineering, construction & related consultancy	16	1%
Construction work	16	1%
Health and social services	6	1%
Labour recruitment and provision of personnel services	6	1%
Insurance & pension services	5	0.5%
Agricultural and gardening services	4	0.4%
Investigation and security services	4	0.4%
Motion picture and video services	1	0.1%
Supporting transport services; travel agency services	0.2	0.0%
Postal and courier services	0.2	0.0%
Radio and television services	0.2	0.0%
Hotel and restaurant services	0.1	0.0%
Cleaning services	0.1	0.0%
Grand Total	**1 078**	**100%**

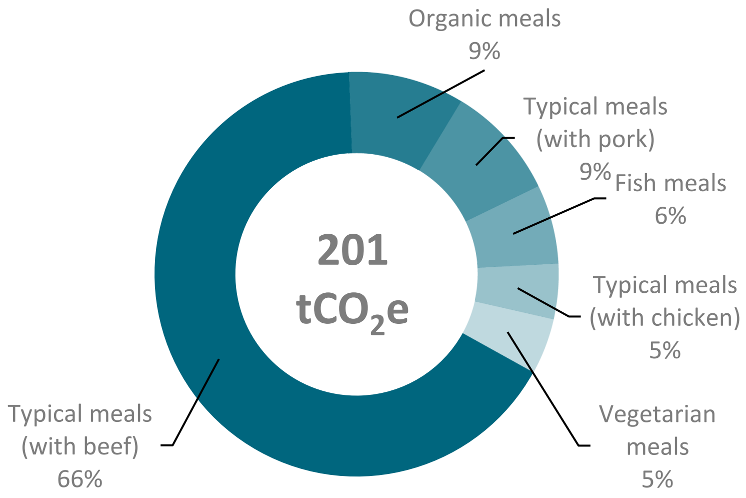
Figure 25: Distribution of GHG emissions associated with purchased services



2.5.5. Meals

Meals account for about 13% of GHG emissions (about **201 tCO_2e**) relating to purchased goods and services.

Figure 26: Types of meals served and distribution of associated GHG emissions



As Figure 26 shows, meals with beef account for the majority of GHG emissions (66%), even though beef makes up only about 30% of meals served. This is because a typical meal with beef is highly carbon-intensive (see Table 13). Organic meals were given the standard emission factor for an 'average meal', as a plate's GHG emissions are determined by its ingredients (meat, vegetarian) and whether those ingredients are locally produced or not. There is no conclusive evidence that an average organic meal accounts for fewer emissions (this can only be considered on a plate-by-plate basis). Table 13 provides more information on the per-unit emission factor for each type of meal and the number of meals served at the ECA in 2016.

Table 13: Emission factors for different types of meals, with associated total GHG emissions and number of meals served

	tCO_2e	$kgCO_2e$ per unit	Meals
Typical meals (with beef)	133	4.51	29 492
Organic meals	19	2.27	8 191
Typical meals (with pork)	18	1.01	18 124
Fish meals	13	0.8	15 953
Typical meals (with chicken)	9	1.1	8 020
Vegetarian meals	9	0.44	20 474
Total	**201**		**100 255**

2.5.6. Purchased goods

Purchased goods make up about 13% of the purchased goods and services category for the ECA's 2016 carbon footprint. "Consumables" make up the majority of these emissions (79%, see Figure 28), followed by supplies and accessories for printers, clothing and accessories, manufactured products and materials, and books, CDs and DVDs. As Table 14 and Figure 27 show, "consumables" emitted about 157 tCO_2e, about 7 times more than the second emissions category: "supplies and accessories for printers".

Table 14: Overview of categories of goods purchased by the ECA and associated emissions

Category of goods	tCO_2e
Books, CDs and DVDs	3
Clothing and accessories	10
Consumables	157
Manufactured products and materials	6
Medical, precision devices, pharm. & medical consumables	0.002
Radio, television, com., telecom equipment & supplies	0.002
Supplies and accessories for printers	21
Total	**198**

Figure 27: GHG emissions from purchased goods

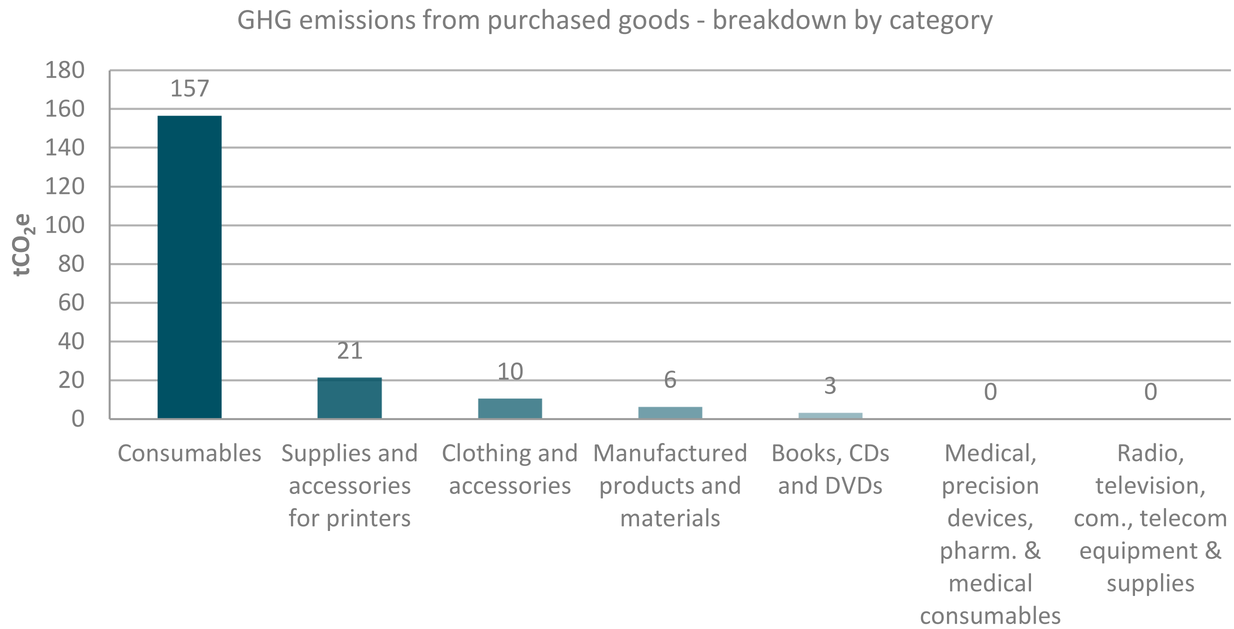
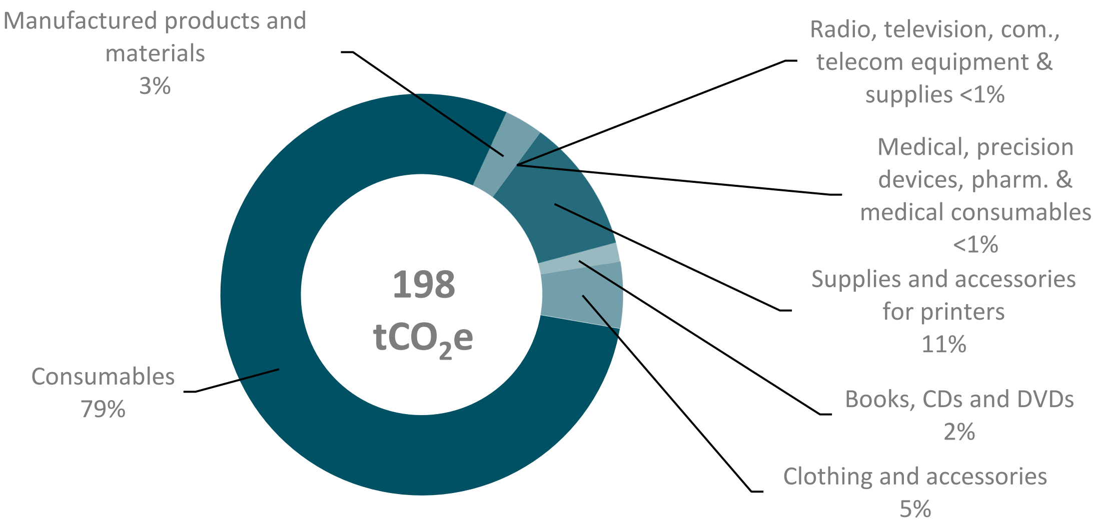


Figure 28: Distribution of emissions for purchased goods



2.5.7. Paper

GHG emissions from paper consumption account for about 2% (or 33 tCO_2e) of purchased goods and services.

Table 15: Annual paper consumption and related GHG emissions

Annual paper consumption	2016
Printed pages/FTE	11 930
Kg of paper /FTE	38.9
Kg of CO2e /FTE	35.8

As Table 15 shows, average paper consumption amounts to 12 000 pages per FTE employee, or 39 kilograms of paper. This equates to about 36 kilograms of CO_2e per FTE per year.

2.6. Transport of goods

2.6.1. Data provided and calculations

"Transport of goods" accounts for the transportation of goods purchased by the 21 identified ECA suppliers.

Data provided: Distance (km) and number of days of deliveries per 21 suppliers (main suppliers).

Calculation: The emission sources were calculated on the basis of the distance between the supplier's headquarters and the ECA (the 'last journey' of the supplies purchased by the ECA). The ECA did not have information on the type of lorry used, so the assumption was that a 3-tonne vehicle was used for each delivery. Data on tonnage was unavailable. The number of deliveries and distances for each delivery was multiplied to obtain the number of kilometres travelled per year by the supplier lorries. The number of kilometres was multiplied by an emission factor corresponding to a 3-tonne vehicle.

Assumption: On average, a 3-tonne lorry was used for each delivery.

2.6.2. Results

GHG emissions associated with this category amount to less than 1% of the ECA's total carbon footprint (20 tCO_2e). Transport of goods was not taken into account in 2015 (see Table 16).

Table 16: Total kilometres of transported goods and associated carbon GHG emissions

	Total kilometres	tCO_2e
Transport of goods	50 654	20

The average distance driven by **each** supplier per year is 2 412 kilometres. This is equivalent to driving from Luxembourg to Rome and back. Uncertainties for the transport of goods amount to 5 tCO_2e, or 27% of the calculation.

2.7. Waste

2.7.1. Data provided and calculations

The "Waste" category covers all the ECA's outflows, including water usage, and waste. Waste made up less than 1% of the ECA's carbon footprint.

Data provided: Quantities of waste by type (food fats, paper, batteries, etc., categorised as non-hazardous and hazardous waste), and wastewater (see Table 17).

Calculation: The type of waste is not the only variable that needs to be considered when calculating GHG emissions from waste: the way waste is treated, greatly impacts GHG results. The tonnage of waste is then multiplied by the emission factor associated with the tonnage of waste.

Assumptions: The type of waste was categorised by type of waste treatment (recycled, incinerated, etc.), based on the nature of the waste.

2.7.2. Results

Waste made up less than 1% of the ECA's total carbon footprint. As Figure 30 shows, hazardous waste made up over 50% of emissions for this category, with non-hazardous waste accounting for 40%. Sewage made up the remaining 10%. As Table 17 shows, food fats and oils make up almost half of GHG emissions associated with waste (both hazardous and non-hazardous), at about 20 tCO_2e.

Table 17: Waste data and associated GHG emissions

Hazardous waste	tonnes	tCO_2e
Batteries and accumulators	0.1	0.0
Food fats and oils	54.5	19.8
Lights and fluorescent tubes	0.1	0.0
Mud and sewage with hydrocarbons	7.7	1.0
Packaging waste with harmful products	0.1	0.1
Scrap metal	0.1	0.0
Waste electrical and electronic equipment	0.004	0.0
Non-hazardous waste	**tonnes**	**tCO_2e**
Food waste	22.5	1.1
Glass packaging waste	4.0	0.1
Household and similar waste	36.4	13.2
Paper and cardboard	63.8	2.1
Plastics waste (including packaging)	0.6	0.1
Various packaging waste	3.5	0.1
Water	**m3**	**tCO_2e**
Water	15 962.4	4.2
Total tCO_2e		**42**

Figure 29: GHG emissions from waste

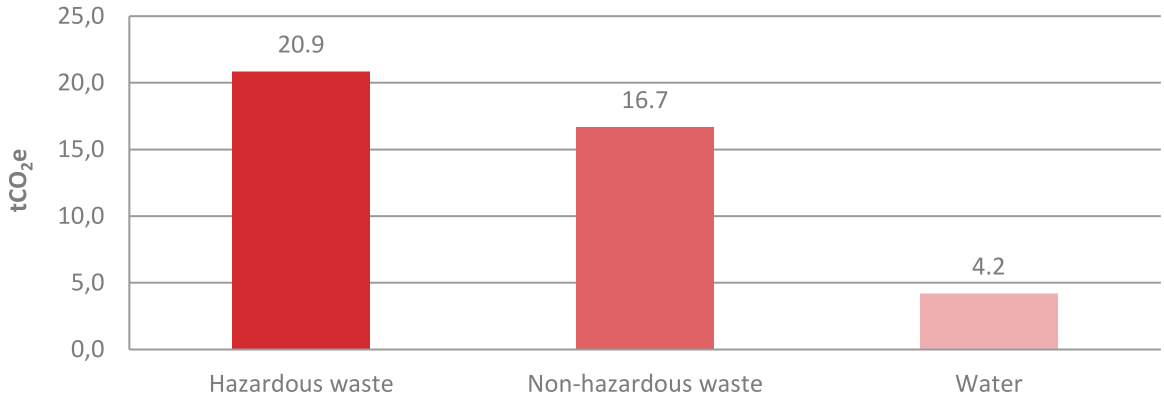
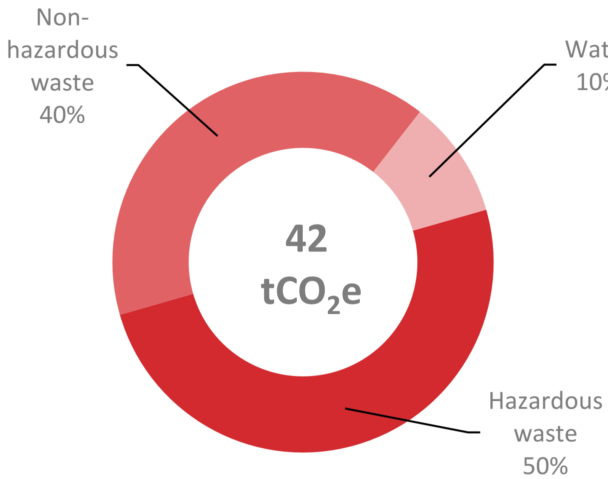


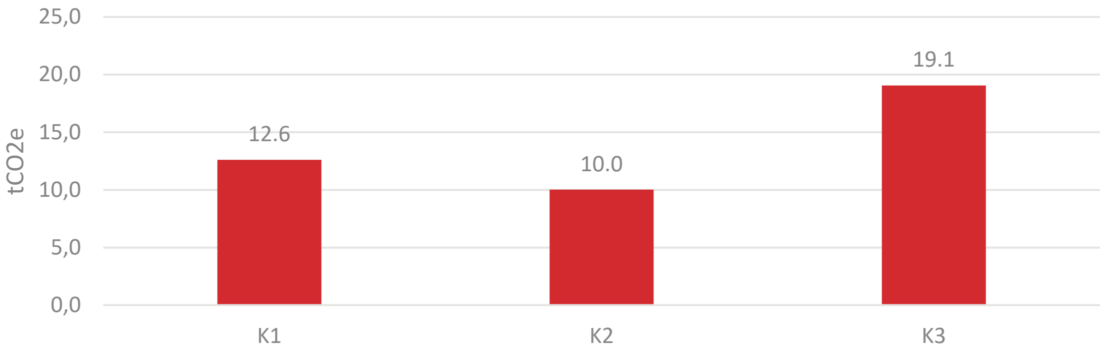
Figure 30: Distribution of GHG emissions from waste



2.7.3. Results by building

K3 has the most GHG emissions associated with waste, at 19 tonnes (see Figure 31). GHG emissions were allocated on the basis of building populations, which explains why K3 has the largest amount of GHG emissions.

Figure 31: Waste GHG emission distribution by building



Uncertainties for waste amount to 10 tCO_2e, or 23% of the calculation.

3. Comparison of results 2014 - 2016

To track emissions, it is important to make year-on-year comparisons. This may prove difficult when simply comparing Bilan Carbone® reports, as the scope may have changed or emission factors may have been updated. Such issues give a false impression that GHG emissions have moved up or down. As such, previous carbon footprints need to be analysed to determine if there have been any changes in scope and emission factors, and any such changes should be applied.

In order to compare the ECA's Bilan Carbone® between 2014 and 2016, the emission factors from the 2016 version V7.7 of the Bilan Carbone® were applied to the 2014 and 2015 database.

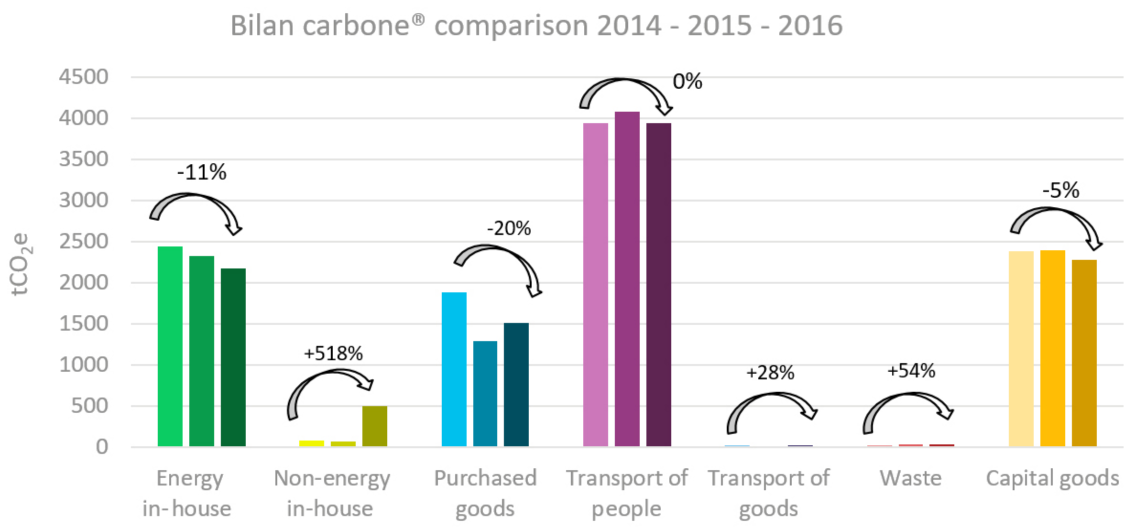
3.1. Results

Overall, the ECA's GHG emissions decreased by 3% between 2014 and 2016. The most notable GHG emission differences are from purchased goods (-20%) and the decrease in energy use (-11%). At the same time, non-energy in-house emissions increased by 518% due to the leak of refrigerant gas in the K3 building in 2016. GHG emissions from waste disposal also increased (+54%) between 2014 and 2016. GHG emissions from the transport of goods increased (+28%), but this could also be because more detailed data were provided and the estimation method changed in 2016. GHG emissions from capital goods and the transport of people remained more or less constant (see Table 18 and Figure 32).

Table 18: Bilan Carbone® results for 2014 - 2015 - 2016; Emission sources and associated GHG emissions

Comparison 2014 - 2015 - 2016				
Emission sources tCO_2e	**2014**	**2015**	**2016**	**Variation 2014 - 2016**
Energy in-house	2440	2327	2180	-11%
Non-energy in-house	82	69	507	518%
Purchased goods	1893	1298	1520	-20%
Transport of people	3950	4085	3941	0%
Transport of goods	16	-	20	28%
Waste	27	41	42	54%
Capital goods	2393	2398	2285	-5%
Total	**10800**	**10218**	**10495**	**-3%**

Figure 32: Bilan Carbone® results 2014 - 2015 - 2016: GHG emissions by category



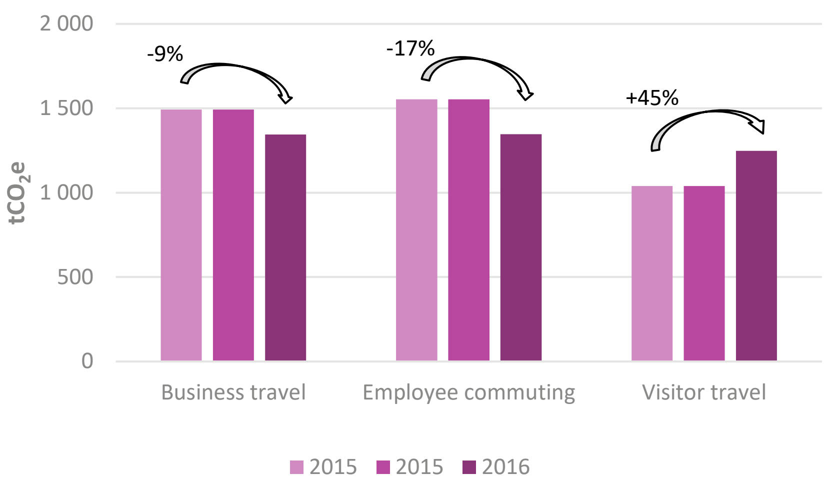
3.2. Transportation

Overall, transportation-related GHG emissions remained constant (see Table 19 and Figure 33). Business travel and use of official cars for business travel saw a decline in GHG emissions of 9%, while employee commuting and official car use in a personal capacity saw GHG emissions fall by almost 17%. However, this fall in GHG emissions was offset by the jump in GHG emissions from visitor travel, which grew by around 45%. Total kilometres of visitor travel increased by 29%, mainly due to the increase in air travel (short-haul and long-haul).

Table 19: Change in GHG emissions for transportation of people between 2014 and 2016

	GHG emissions tCO_2e			Variation
Transport of people	**2014**	**2015**	**2016**	**2014-2016**
Business travel	1 475	1 492	1 345	-9%
Employee commuting	1614	1553	1347	-17%
Visitor travel	860	1 039	1 249	45%
Total transportation (tCO2e)	**3950**	**4085**	**3941**	**0%**

Figure 33: Comparison of GHG emissions for the transport of people, 2014 – 2016



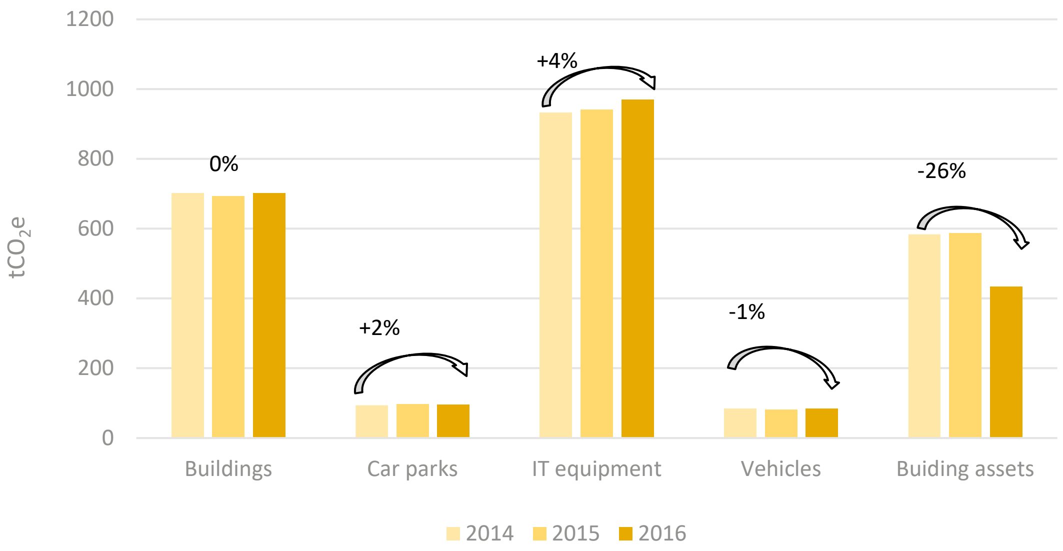
3.3. Capital goods

As Table 20 and Figure 34 show, GHG emissions associated with capital goods mostly remained constant over the period (with a decrease of only 5%). Car parks and buildings had variation of less than 2% (which can be explained by more precise estimates in 2016), while IT equipment increased slightly (by 4%) due to the increase in the amount of IT equipment (7 836 units in 2016 vs. 7 325 in 2014). Building assets decreased by 26%, which is explained mainly by the fact that the depreciation rate for such assets is 8 years, meaning that only building assets that have been acquired within those 8 years are considered.

Table 20: Evaluation of total GHG emissions for capital goods, 2014 - 2016

Type of capital goods	2014	2015	2016	Variation 2014- 2016
Buildings	702	693	702	0%
Car parks	94	97	96	2%
IT equipment	932	941	969	4%
Vehicles	85	82	84	-1%
Building assets	584	587	434	-26%
TOTAL Capital goods (tCO2e)	**2 396**	**2 400**	**2 285**	**-5%**

Figure 34: Comparison of GHG emissions for capital goods, 2014 - 2016



3.4. Energy in-house

Table 21 and Figure 35 show how GHG emissions decreased for all energy sources. This reflects the decrease in energy *usage* (see Table 22), showing the differences in energy consumption between 2014 and 2016.

Table 21: GHG emissions associated with energy consumption – change in results between 2014 and 2016

	GHG emissions (tCO_2e)			Variation 2014- 2016
	2014	2015	2016	
Heating	178	170	165	-7%
Electricity	2 060	1 969	1 840	-11%
Electricity losses	192	184	172	-11%
Fuel	10	4	4	-64%
TOTAL (tCO2e)	**2 440**	**2 327**	**2 180**	**-11%**

Figure 35: GHG emissions associated with energy consumption by category: comparison for 2014 - 2016

Table 22: Energy consumption: change between 2014 and 2016

	Energy consumption (kWh)			Variation 2014- 2016
	2014	2015	2016	
Heating (kWh)	3 762 880	3 600 150	3 484 670	-7%
Electricity (kWh)	5 024 031	4 801 550	4 488 193	-11%
Electricity losses (kWh)	452 163	432 140	418 748	-7%
Fuel (kWh)	31 474	13 087	11 454	-64%
TOTAL (kWh)	**9 270 547**	**8 846 927**	**8 403 065**	**-9%**

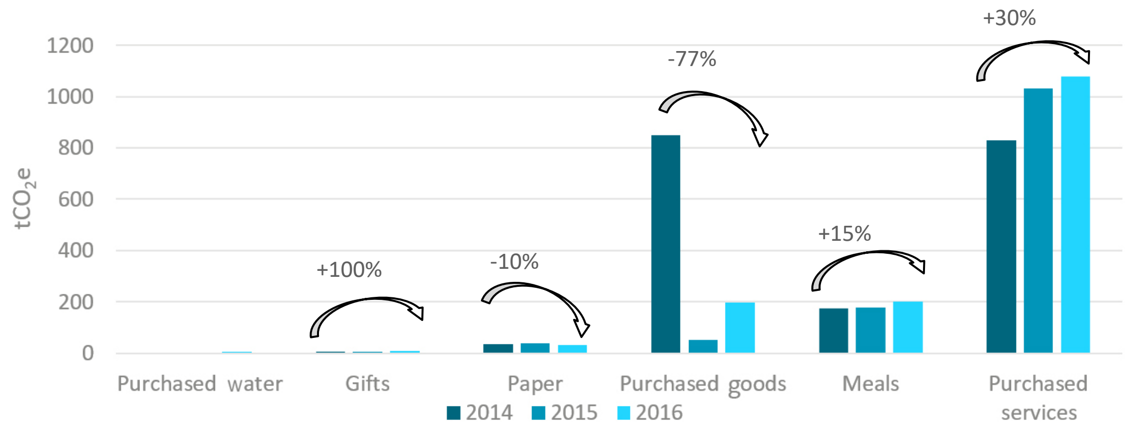
3.5. Purchased goods and services

Overall, GHG emissions associated with purchased goods and services decreased by 20% (see Table 23). This can be attributed primarily to the decrease in GHG emissions from purchased goods (-77%) and paper (-10%). However, GHG emissions from meals, gifts and purchased services increased (see Figure 36).

Table 23: Emissions associated with purchased goods and associated variation

	GHG emissions tCO_2e			Variation 2014 - 2016
Purchases	**2014**	**2015**	**2016**	
Purchased water[4]	-	-	2	-
Gifts	4	1	8	100%
Paper	37	37	33	-10%
Purchased goods	848	51	198	-77%
Meals	175	176	201	15%
Purchased services	828	1 033	1 078	30%
TOTAL (tCO2e)	**1 893**	**1 298**	**1 520**	-20%

Figure 36: Change in GHG emissions associated with purchased goods and services: comparison for 2014 - 2016



In terms of KPIs, the changes in paper usage between 2014 and 2016 are shown in Table 24.

Table 24: Paper consumption per FTE[5]

Annual paper consumption	2014	2015	2016
Printed pages/FTE	17 791	16 055	11 930
Kg of paper/FTE	58.8	58.7	38.9
Kg of CO2e/FTE	44.3	41.3	35.8

---

[4] *Water consumption was considered only in 2016*

[5] *923.7 in 2016, 916.78 in 2015 and 922.9 in 2014; paper includes ECA Journal, ECA reports, and printed pages (leaflets only in 2015 and 2014).*

3.6. Uncertainty of results

This study followed the uncertainty rules imposed by the previous ECA Bilan Carbone® for 2015 (as stated in the first chapter):

- 2% uncertainty when the activity data are reliable and no extrapolation is required;
- 10% uncertainty when the data are extrapolated (assumptions are made) or an allocation ratio is used;
- 30% uncertainty when the data are inaccurate either because several assumptions are used to obtain them or because they are extrapolated from other available data.

Uncertainties also depend on emission factors, and total uncertainty is a combination of data uncertainty and emission factor uncertainty (see ANNEX 1: Methodology).

Uncertainty levels for 2014 and 2015 are listed as 6% in total, and for 2016 the uncertainty level is 10% (see Table 25). There are various reasons for this, primarily the fact that emission factor uncertainties are revised each time there is a new Bilan Carbone® database. For example, the furniture, tooling and machines emission factor per €k increased from 50% to 80% in 2016 (this could partially explain why capital goods uncertainty rose). Furthermore, over and above data quality, certain categories require transformation: for example, even if an organisation closely monitors the number of cars in its fleet, the cars must be transformed into their equivalent steel weight. This increases the data uncertainty to 10%. However, accurate data collection has an impact: uncertainty for transportation decreased from 53% to 27%, primarily because of more precise data collection by the ECA.

Table 25: GHG emissions and corresponding uncertainties, 2014 - 2016

	2014				2015				2016			
	Emissions		Uncertainty		Emissions		Uncertainty		Emissions		Uncertainty	
	tCO_2e	Relative	tCO_2e	Relative	tCO_2e	Relative	tCO_2e	Relative	tCO_2e	Relative	tCO_2e	Relative
Energy	2 440	23%	130	5%	2 327	23%	121	5%	2 180	21%	113	5%
Non-energy	82	1%	22	27%	69	1%	21	30%	507	5%	152	30%
Purchase of goods and services	1 893	18%	319	17%	1 298	13%	253	20%	1 520	14%	337	22%
Transport of goods	16	0%	8	53%	-		-		20	0%	5	27%
Transport of people	3 950	37%	465	12%	4 085	40%	492	12%	3 941	38%	539	14%
Waste	27	0%	7	24%	41	0%	12	30%	42	0%	10	23%
Capital goods	2 393	22%	327	14%	2 398	23%	346	14%	2 284	22%	830	36%
Total	10 801	100%	665	6%	10 218	100%	664	6%	10 495	100%	1 063	10%

4. Offsetting

Today there is an urgent need to act: to stay well below 2°C, emissions must peak by 2020, and the world economy needs to be carbon-neutral by 2050. This idea, as expressed in the landmark Paris Agreement in 2015, is increasingly clear, and companies are being called upon to play their part.

Climate neutrality is the idea that organisations can offset the residual emissions they are unable to reduce, or are still in the process of reducing. Carbon offsetting is a system whereby an organisation purchases carbon ‘credits’ from verified projects that have proven to mitigate or sequester carbon. Beyond carbon, there is a range of carbon credits that provide other social and economic benefits for surrounding communities. These include projects that empower women by distributing better cookstoves, projects that ensure access to life-saving clean water, and others that protect endangered species by means of forest conservation.

Carbon neutrality may seem cumbersome, but it is feasible, especially when taken step by step. Instead of offsetting the entirety of their emissions, organisations can take the first step by choosing an emission scope.

For the ECA, a first step could be to use an offset approach to cover the largest sources of emissions: transportation of people (visitor travel, employee commuting and business trips). These emissions may be especially difficult to reduce in the short run, given the difficulties faced by airlines in reducing their carbon impact.

As such, the ECA could confidently inform its stakeholders that the emissions associated with travel are **carbon-neutral.** This would effectively offset 38% of the ECA’s 2016 emissions, which is a first - but important - step towards carbon neutrality. The choice of offsetting projects could be made by the ECA’s staff (e.g. via a web voting system) in order to raise awareness among employees.

The ECA is currently preparing a CO2 offsetting strategy.

ANNEX 1: Methodology

1.1. The Bilan Carbone® method

The ECA used the Bilan Carbone® method to assess its carbon footprint.

This method was developed by ADEME (Agence française de l'Environnement et de la Maîtrise de l'Energie, France's environment and energy management agency) in 2004 to quantify GHG emissions for organisations.

This method is currently coordinated and disseminated by the Bilan Carbone Association[6].

The primary aim of the Bilan Carbone® method is to estimate the magnitude of GHG emissions and report the associated levels of uncertainty. Every carbon footprinting procedure is subject to uncertainty levels. At national level in France, GHG emissions calculations have an average uncertainty level of 25%. However, in this assessment, all necessary measures were taken to minimise the level of uncertainty by ensuring a high level of data quality. Beyond these details (important as they are), the reader should keep the bigger picture of this assessment in mind, and the fact that **the order of magnitude of the emission sources is the main factor**.

The Bilan Carbone® method aims to cover the broadest possible scope of activity to account for GHG emissions *linked* to an activity, rather than just the GHG emissions *managed* by a company's activity. For example, a company does not control or manage the mode of transportation used by its employees. However, without such travel, its employees would not be able to work. Thus, a company's activity is dependent on these movements – and the corresponding GHG emissions – and so the assessment takes them into account.

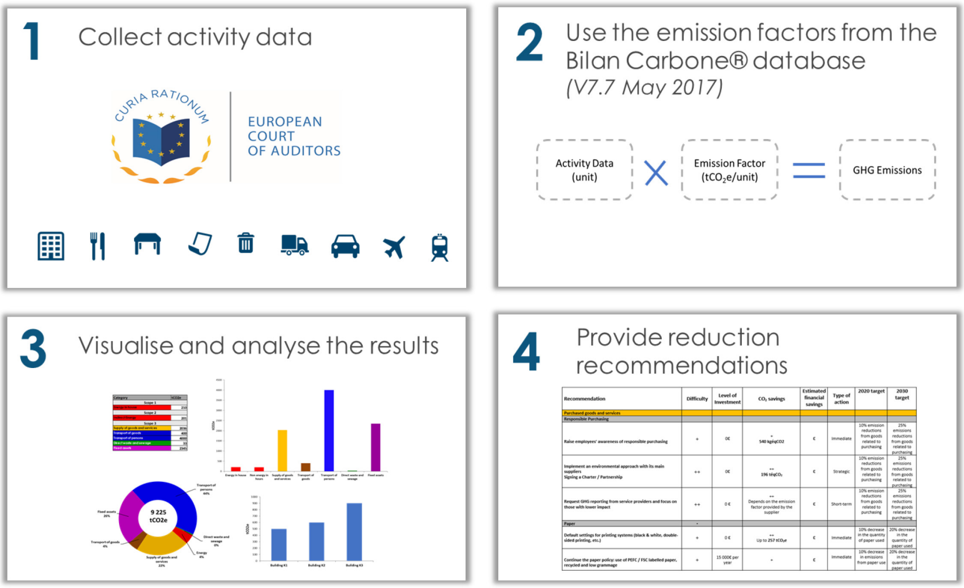
As well as defining the assessment's scope, the carbon footprint based on Bilan Carbone® methodology identifies and ranks the most significant sources of GHG emissions. This enables the relevant action plans to be scheduled accordingly (e.g. energy consumption, the modes of transport used by employees, the choice of clauses to be imposed on subcontractors and suppliers, etc.), the aim being to reduce the carbon footprint of the most significant emission sources.

1.2. Phases of the carbon footprint assessment

The Bilan Carbone® method is a comprehensive approach used to calculate an organisation's carbon footprint. In this report, the term 'carbon footprinting' is used interchangeably with the results of the Bilan Carbone®, unless specified otherwise for the GHG Protocol. The approach is undertaken in four phases, as Figure 37 illustrates:

[6] http://associationbilancarbone.fr/

Figure 37: Bilan Carbone® phases



Types of gases taken into account for the assessment

Bilan Carbone® is a methodology used to estimate anthropogenic GHG emissions associated with specific activities. The main GHGs taken into account for this study are listed in the Kyoto Protocol, and are the following:

Carbon dioxide (CO_2): High CO_2 levels in the atmosphere result from deforestation and the use of fossil fuels (coal, oil and gas). These CO_2 organic GHG emissions are responsible for 69% of the greenhouse effect resulting from human activities.

Methane (CH_4): Methane is generated by the fermentation of organic matter in the absence of oxygen (e.g. swamps and rice fields) but also by the use of fossil fuels such as natural gas or coal, or even by livestock. Methane is responsible for 18% of the greenhouse effect caused by human activities.

Nitrous oxide (N_2O): Nitrous oxide is a gas that results from the oxidation of nitrogenous compounds, with two-thirds of GHG emissions originating from dung and fertiliser. This gas is also used as a propellant in sprays, such as whipped cream. N_2O is responsible for 5% of the greenhouse effect caused by human activities.

"Industrial" gases (HFC, PFC, and SF_6): Industrial gases do not exist in a natural state but are produced by human activity alone. They are primarily used in cooling devices, such as air conditioners, refrigerators and other industrial systems. Although they are present at very low concentrations in the atmosphere, some of them have a very high global-warming potential (GWP). HFC-23, for example, has a GWP that is over 11 000 times that of carbon dioxide; in other words, one tonne of HFC-23 is equivalent to over 11 000 tonnes of carbon dioxide.

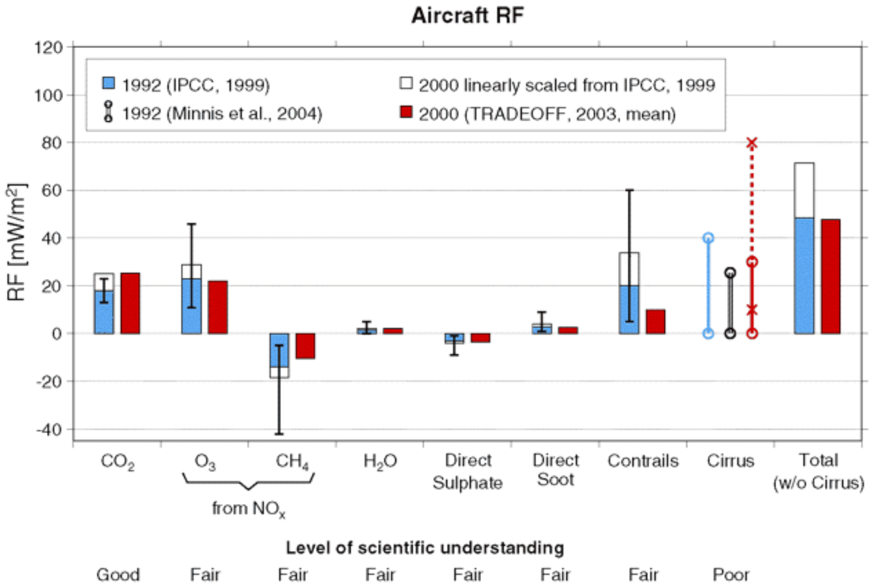
The other “non-Kyoto” gases in this study are taken into consideration in the following ways:

- Vapour GHG emissions that modify in a discernible way the radiative force of the gas under consideration, for example:
    - Direct GHG emissions of steam are excluded (as there is no impact on the greenhouse effect), except when released into the stratosphere (by aeroplanes).
    - CO2 GHG emissions from organic matter are excluded (as this is considered merely as a return of CO2 back into the atmosphere), except in the case of deforestation.
- Tropospheric ozone is excluded.

Notice on the radiative forcing (RF) of aeroplanes

As aeroplanes fly on the edge of the troposphere, they not only contribute to global warming through their CO_2 GHG emissions, but also through combustion occurring at high altitudes. This disturbs the cycles of other GHGs, such as vapour condensed in diverse forms, NOx and methane, all of which produce ozone. **The Bilan Carbone® approach takes radiative forcing into account.**

Figure 38: Radiative forcing



Source: **http://www.co2offsetresearch.org/aviation/RF.html**

In order to evaluate whether RF can be used as a metric for determining the climate footprint of an air travel passenger, it is important to understand the following characteristics of RF. RF is an instantaneous measure that expresses the climate forcing of a GHG at a particular point in time. RF also has a temporal component with a backward-looking metric because it measures the RF of a GHG that has accumulated in the atmosphere over a certain period of time (e.g. aviation GHG emissions over approximately 60 years in Figure 38).

Short-lived GHGs, such as ozone, do not accumulate over time because they decay rapidly. The RF given in Figure 38 therefore shows only the RF of current concentrations of short-lived gases, but does not show the RF of accumulated concentrations for long-lived GHGs[7].

Figure 38 illustrates the RF from aircraft GHG emissions in 1992 and 2000 and shows that "minor" gases and water vapour emitted by planes lead to *total* RF of 0.04 W/m^2 (the bars on the right of Figure 38). Meanwhile, CO_2 produced by aeroplanes produces only 0.02 W/m^2 (the bars on the left). In other words, the combination of water vapour, ozone, methane, direct sulphates, soot, contrails and the formation of cirrus clouds **can double the global-warming impact** when compared with a tonne of CO_2 alone at high altitudes.

[7] http://www.co2offsetresearch.org/aviation/RF.html

Calculating GHG emissions

Usually, it is not possible (or at least, very impractical) to measure GHG emissions from a specific activity directly. Although measuring the concentration of greenhouse gases is common practice, GHG emissions from a given activity can be directly measured only under exceptional circumstances. In any case, using this method to measure GHG emissions is by no means realistic for the average company.

Indeed, the only practical way to measure GHG emissions is to use a calculation method based on activity data (e.g. number of lorries, distance travelled, quantity of steel bought, etc.) The Bilan Carbone® method was developed to translate this type of activity data into estimated GHG emissions.

Figure 39 illustrates how an activity can be converted into GHG emissions, expressed in CO_2 equivalent (CO_2e), by using GHG emissions factors.

Figure 39: Calculating GHG emissions

Data (unit) × Emission factors (tCO_2e/unit) = Greenhouse gas emissions

Bilan Carbone® emissions factors take into account both direct and indirect GHG emissions, as listed in **the Bilan Carbone® database ('Base Carbone')**.

Uncertainties of results

Although this report provides the results of emission sources in order of magnitude, the respective levels of uncertainty must also be visible. With the Bilan Carbone® approach, these uncertainties are related to two factors:

- ***Uncertainty of data***

Some data are very reliable, such as energy consumption and litres of fuel used, as they have a high level of traceability and measurability, while other data are either estimated, self-reported or extrapolated from the results of a survey. This study followed the same uncertainty levels expressed by the previous carbon footprint report in order to remain as consistent as possible year on year:

- 2% uncertainty when the activity data are reliable and no extrapolation is required;
- 10% uncertainty when the data are extrapolated (assumptions are made) or an allocation ratio is used;
- 30% uncertainty when the data are inaccurate either because several assumptions have been used to obtain the data or because the data are extrapolated from other available data.

- ***Uncertainty of emission factors (EFs)***

The Bilan Carbone® uses ADEME's emission factors, which are aggregated average GHG emissions factors from various studies, such as various life-cycle analyses (LCAs). Uncertainty levels depend on the sources of the study, and range from 5% to 50%.

The percentage of uncertainty related to each line of data is explicitly expressed in the Excel calculation file. It is important to bear in mind that the main purpose of establishing a carbon footprint is to serve as a **springboard for mitigation measures**.

Activity uncertainties and total uncertainty

Uncertainties of emission factors and uncertainty levels of data can be combined to obtain total uncertainty. Assuming a Gaussian (normal) distribution of uncertainties and based on the principle of the propagation of uncertainties, the uncertainty related to specific **activity data** is calculated using the following formula:

$$U_{total} = \sqrt{U_{DA}^2 + U_{FE}^2}$$

Where:

- U_{total} is the total percentage of uncertainty associated with an activity;
- U_{DA} is the percentage of uncertainty associated with activity data, and U_{FE} is the uncertainty related to the emission factor.

This formula provides the uncertainty data for a specific activity. For example, an organisation estimates that for 1 000 litres of gas, there is a 5% uncertainty from the data and a 10% uncertainty from the emission factor. The total uncertainty for the usage of 1 000 litres of gas would be: $\sqrt{5\%^2 + 10\%^2} \sim 11.2\%$ or 282 $kgCO_2e$ (with an emission factor of 3.17 $kgCO_2e$/litre.)

For **the sum of uncertainties (uncertainties for different activities, or the sum of uncertainties for different categories),** the formula is the following:

$$U_{total} = \frac{\sqrt{(U_1 . x_1)^2 + (U_2 . x_2)^2 + \cdots + (U_n . x_n)^2}}{x_1 + x_2 + \cdots + x_n}$$

Where:

- U_{total} is the uncertainty associated with the sum of GHG emissions X_i;
- X_i is the sum of GHG emissions for a specific category (e.g. total GHG emissions for energy);
- U_i is the uncertainty associated with that category.

The potential for reduction

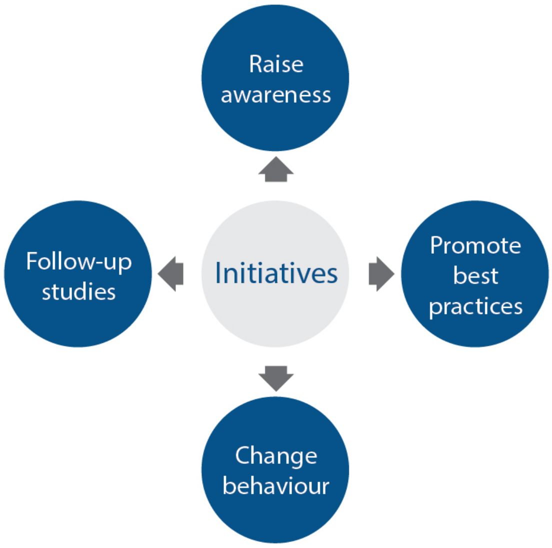
The carbon footprint (Bilan Carbone®) identifies the sources with the highest GHG emissions. Further to this calculation, and with the aim of reducing the carbon impact, various improvements are proposed.
Initiatives resulting from the study may have various objectives (see Figure 40), such as:

- **Increasing awareness and communication** about proposed action plans. The result and success of this kind of plan can motivate employees to become involved in various reduction projects.
- **Promoting best practices** by encouraging employees to favour activities with fewer GHG emissions (e.g. by occasionally choosing a vegetarian menu in the canteen).

- **Changing behaviour**. Some action plans aim to modify or change employees' behaviour. For example, an organisation can prioritise specific modes of transport (prioritising business travel on trains versus planes if the distance is below a certain threshold).

- **Undertaking follow-up studies.** Some proposed action plans will require follow-up studies beyond carbon footprinting to be carried out. These studies will allow an action plan to be drawn up to estimate and optimise possible savings.

Figure 400:
Initiatives that may result from this study



1.3. Scope of the study

1.3.1. Organisational scope

The scope of the carbon footprint covered the ECA's **three buildings (K1, K2 and K3;** 26 550 m^2, 21 500 m^2 and 34 000 m^2, respectively, on a total surface area of 1ha, 86a and 87 ca), taking into account the activities of the ECA's staff and other employees. On 31 December 2016, there were **995 staff in active service**.

1.3.2. Operational scope

The following operations, which are included in this study, are listed by GHG emissions (scope 1, 2 and 3). However, it is important to note that the Bilan Carbone® presents results by emission source.

- **Direct GHG emissions (scope 1)** are GHG emissions from sources owned or controlled by the ECA, and include:
  - Non-energy in-house: leakage of refrigerant gases in air-conditioning and cooling systems;
  - Energy in-house: burning of fuels for emergency generators;
  - Transport of persons: fuel used by the official car fleet.
- **Indirect GHG emissions (scope 2)** are GHG emissions from ECA activities, but which occur at sources owned or controlled by another organisation. These include **energy in-house**, in particular:
  - Purchased electricity and heating, distinguishing 'green' electricity from reported kWh.
- **Indirect GHG emissions (scope 3)** are other indirect GHG emissions not covered by scope 2. For the ECA, these GHG emissions include:
  - Transport of persons
    - ECA employees commuting between home and work
    - Business travel by ECA staff (excluding business travel with official cars – scope 1)
    - Travel between a visitor's place of origin and the ECA
  - Purchased goods
    - GHG emissions related to the extraction and manufacturing of purchased materials (e.g. office equipment, small kitchen materials, paper)
    - Food (meals served in the cafeteria, catered meals for events)

        - Embedded transportation of purchased goods (transport following raw material extraction, manufacturing, etc.)

    - Services provided by third parties
        - Catering, security, cleaning, IT services

    - Transport of goods (from suppliers to the ECA site)

    - Direct waste and sewage disposal
        - Treatment of different types of waste
        - Contamination of sewage

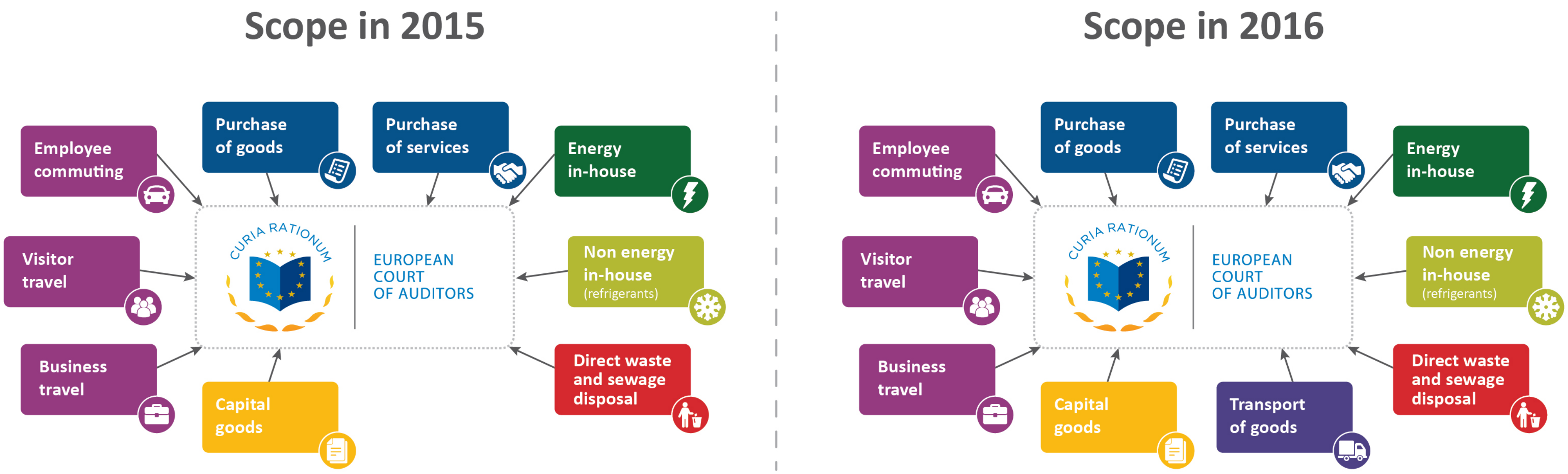
    - Capital goods
        - Buildings and car parks
        - Industrial machinery and equipment (print shop and kitchen equipment)
        - Office furniture
        - Vehicles owned and leased by the Court
        - IT hardware (computers, printers and servers)

    - Distribution losses from the transmission of electricity

1.3.3. Changes in operational scope between 2015 and 2016

Figure 41 shows the difference in operational scopes between 2015 and 2016.

Figure 41: Overview of emission sources considered in this study



The scope of the 2015 report did not include the transportation of goods between suppliers and the Court, but took account only of those GHG emissions associated with purchased goods. However, the emission factors for purchased goods do not take account of the GHG emissions associated with the delivery of those goods to their final user (the ECA). It is therefore important to include such factors and to continually improve data collection.

ANNEX 2: GHG emission sources according to the GHG Protocol

Figure 43 shows that the majority of GHG emissions come from scope 3 GHG emissions according to the GHG Protocol methodology, accounting for about 75% of the ECA's GHG emissions. Scope 1 accounted for about 6% of GHG emissions in 2016 and scope 2 GHG emissions for about 19%. It is important to note that the way emissions are broken down by scope in the GHG Protocol is not necessarily the same as the way the Bilan Carbone® categorises emissions. For example, the GHG Protocol splits up emission sources depending on whether they are under operational control (scopes 1 & 2) or not (scope 3). For this reason, energy is split between distribution losses (scope 3) and actual energy usage (scope 2). This is also true of the transportation of people, which is split between scope 1 and scope 3, depending on the type of transport used. Transportation (even business travel and employee commuting) using the ECA car fleet comes under scope 1, since the transportation used (cars) is under the ECA's operational control. However, other forms of transport (bus, train, plane, etc.) come under scope 3 (see Table 26).

Table 26: Emissions by scope (GHG Protocol)

Scope	tCO_2e
Scope 1	**636**
Energy in-house (burning of fuel, leakages of refrigerant gases)	3
Non-energy in-house	507
Transport of people (ECA car fleet)	126
Scope 2	**1 990**
Energy in-house (purchased electricity and heating)	1 990
Scope 3	**7 871**
Capital goods	2 315
Energy in-house (distribution losses)	219
Purchased goods	1 520
Transport of goods	20
Transport of people (business travel, visitor travel, employee commuting)	3 754
Waste	42

Figure 42: GHG emissions by scope (GHG Protocol)

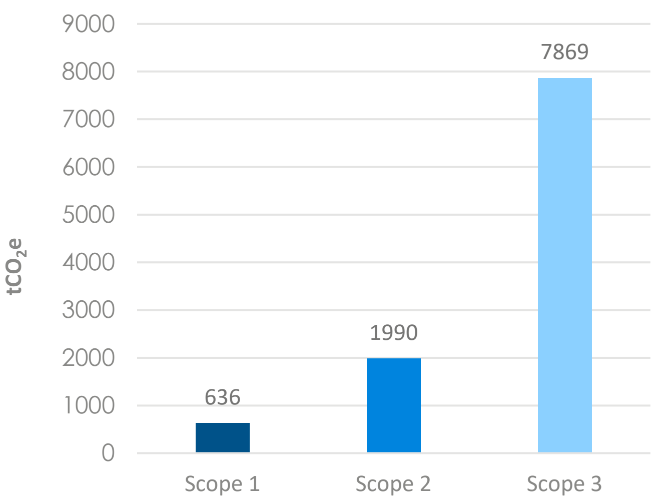
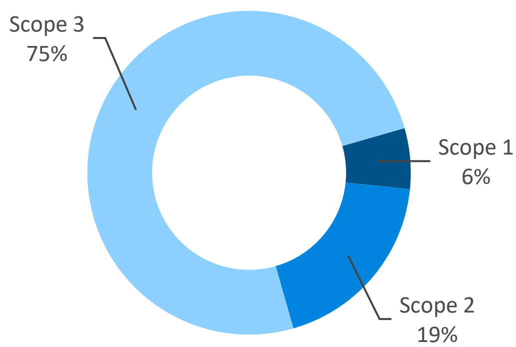


Figure 43: Breakdown of GHG emissions by scope (GHG Protocol)



EUROPEAN COURT OF AUDITORS

12, rue Alcide De Gasperi

1615 Luxembourg

LUXEMBOURG

Enquiries:
ECA-info@eca.europa.eu

Website:
eca.europa.eu