2022 CARBON FOOTPRINT REPORT

EUROPEAN STABILITY MECHANISM

September 2023

Table of Contents

Foreword

As an international financial institution with a public mandate, the European Stability Mechanism (ESM) strives to implement environmental, social, and governance (ESG) best practices within its operations.

In line with the ESM's continued commitment to improving its ESG considerations, this 2023 Carbon Footprint Report marks the fifth publication of the series. The report provides a comprehensive account of the ESM's carbon footprint arising from its operations in 2022. It also compares the 2022 performance against previous years as well as its 2018 baseline year performance.

The calculations are performed with the assistance of Deloitte Luxembourg (*Société à Responsabilité Limitée)*, which also conducted an additional review of the calculations and assumptions, following the four-eyes principle. The four-eyes principle ensured that the computation of ESM's carbon emissions and their review were independently performed by two distinct teams.

As in previous years, carbon footprint estimates are based on an extensive review of internal and external documentation and activity data, as well as on exchanges with external data providers. The report is prepared in accordance with the guidelines from the International Greenhouse Gas Protocol - a Corporate Accounting and Reporting Standard (International GHG Protocol). Additionally, using the same methodology applied to the previous two reports as set out by EcoAct, a separate chapter with estimates on teleworking-related emissions has been included in this report (Chapter 2.3). This allows for more comparable measurement of the carbon footprint of day-to-day operations, particularly given that remote working has become more regular following the Covid-19 pandemic.

With the objective of generating more transparent and accurate reporting, the ESM continuously reviews and updates its carbon footprint methodology. As such, new emission categories such as fugitive emissions linked to refrigeration, emissions linked to electronic equipment obtained during the reporting year, and electricity emissions from ventilation, shared building consumption, and the fitness facility were added to the reporting scope. Naturally, such expansions in reporting scope also led to an increase in reported greenhouse gas (GHG) emissions.

During the Covid-19 pandemic, numerous national and ESM-specific measures were implemented to contain the spread of the pandemic and ensure the safety of staff members. These measures significantly altered the ESM's business operations, initially leading to a strong decline in the institution's GHG emissions in 2020 and a further modest decrease in 2021. In line with the easing of

Covid-19 containment measures and corresponding return to office and pre-pandemic mobility practices during 2022, GHG emissions linked to the ESM's activities saw a proportional increase over this reporting year. Given these circumstances, reporting categories affected by Covid-19 restrictions, such as mobility-related emissions, have significantly increased compared to the previous year. However, compared to pre-pandemic emission figures, the ESM has maintained a trend of continued reduction of its overall consumption and GHG emissions.

Environmental practices and commitments in 2022

The ESM continued implementing measures aimed at strengthening its environmental practices. For example, to ensure technology equipment is used to its full capacity, and to reduce consumption and waste, the ESM staff held two charity auctions of decommissioned information technology (IT) equipment in 2022. Under the guidance of the ESM's 'Making a Difference' values group, the auctions' proceeds were donated to various charitable causes. Furthermore, the ESM continued replacing non-recyclable plastic materials with sustainable alternatives in line with the ESM's 2019 pledge under the Zero Single-Use Manifesto, an initiative by the Luxembourgish sustainability network Inspiring More Sustainability. The ESM was also awarded the SuperDrecksKëscht® fir Betriber label for the 10th consecutive year for its internal waste recycling practices.

In addition, the ESM has also incorporated environmental considerations into contracts with office supply providers, and as of 1 May 2023 updated its procurement policy to include ESG principles to ensure a more systematic approach in this context.

The ESM also implemented various energy efficiency measures in 2022 aimed at reducing the ESM's building emissions. These include the reduction of office temperatures to 20°C from 23°C during winter and turning off non-essential devices such as air purifiers in public spaces, gym equipment, and display screens in selected locations of its premises.

Furthermore, the ESM is currently in the process of building its new headquarters together with some administrative units of the Luxembourg government. The building project, with expected completion in 2029, will follow an efficient life-cycle cost approach to create a sustainable, high-quality, modern, and flexible working environment. With this objective in mind, the project aims to achieve a Deutsche Gesellschaft für Nachhaltiges Bauen Platinum[1] certificate. The project will also conform to a number

[1] Deutsche Gesellschaft für Nachhaltiges Bauen Platinum (DGNB) - The "Global Benchmark for Sustainability" certification systems for sustainable buildings and districts.

of official environmental standards, such as WELL building criteria (an international system that measures, monitors, and certifies a series of features to promote occupant wellbeing), the EU Taxonomy (a classification system established to clarify which economic activities are environmentally sustainable), and the Eco-Management and Audit Scheme (EMAS).

To further reduce mobility-related carbon emissions, the ESM has revised its Travel Policy to encourage staff to consider the environmental impact of their work-related travel. To facilitate this, information on estimated carbon emissions has been systematically made available to ESM staff when choosing travel options. Moreover, measures have recently been put in place to more accurately capture emissions data related to business travel via car, which will be used in the next carbon footprint reporting cycle to more precisely calculate such emissions and help the ESM work towards reducing said emissions in the future. These efforts were adopted in conjunction with other practical initiatives, such as the addition of four electric car changing stations at the ESM premises, and the revision of ESM's leased car fleet resulting in the gradual addition of three hybrid vehicles to the fleet. Additionally, steps have now been taken to ensure that all leased cars in the ESM's fleet will be electric or hybrid models in the coming years.

The ESM is also actively endeavouring to decrease its digital carbon footprint by transitioning its business applications from conventional physical servers to cloud-based solutions by 2025. Cloud computing resources are shared across many organisations, enabling a more efficient use of computing power. In addition, large cloud providers have the resources to invest in the latest technology to create data centres powered by greener energy sources, reduce overall energy consumption and improve recycling of equipment. As such the ESM already leverages, for example, the Microsoft 365 and Dynamics suites to reduce its carbon footprint.

In 2022, the ESM continued to exchange information and ideas on sustainability and environmental best practices with peer institutions through the EcoNet[2] working group, a platform for EU institutions and agencies in Luxembourg. As a public institution, the ESM is also committed to being an active contributor in the journey towards a low-carbon transition in Europe and globally in a wider sense and is, therefore, contributing to the work of the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) in line with its observer status. The NGFS is a group of central banks and supervisors willing to contribute to the development of environmental and climate risk management in the financial sector and to mobilise mainstream finance to support the transition towards a sustainable economy. Additionally, the ESM continued its participation in the European Commission's

[2] Inter-institutional Environmental Network made up of EMAS coordinators from various Union institutions in Luxembourg which liaises with the College of Secretaries General and Heads of Administration in Luxembourg – CaLux.

Platform on Sustainable Finance as an observer, and as a member of the International Capital Market Association's Social Bonds Working Group.

Finally, in the spirit of increased transparency beyond environmental commitments, the ESM published an ESG summary report in 2022 for the first time. This report covers not only the ESM's internal environmental efforts, but also its ESG efforts in relation to its investment and funding activities, along with its climate risk management work.

Overall 2022 carbon footprint performance

Table 1
ESM carbon footprint evolution 2018–2022
(gross and net)

	2018 (baseline)	2021	2022	Net variation vs. 2021	Variation vs. baseline
Total gross emissions (tCO_2e)	1,176.6	288.9	573.5	↑ +98.5%	↓ -51.3%
Total net emissions (tCO_2e)	1,084.1	247.3	501.3	↑ +102.7%	↓ -53.8%
Staff	179	221	225	↑ +1.8%	↑ +25.7%
Carbon intensity (Net tCO_2e/staff member)	6.1	1.1	2.2	↑ +99.6%	↓ -63.2%

Notes: The percentage changes are calculated relying on the full figures and not on the rounded-up figures displayed in the report. Carbon intensity is calculated by dividing the total net emissions per total number of ESM staff members.
Source: ESM

The ESM's total GHG emissions for 2022 amounted to 573.5 metric tonnes (t) of CO_2e (tCO_2e)[3] on a gross basis and to 501.3 tCO_2e on a net basis.[4] Compared to 2021, both net and gross emissions have nearly doubled. However, compared to the 2018 base year, total emissions have more than halved, declining by 54% in net terms and 51% in gross terms. This increase in GHG emissions in 2022

[3] CO_2e is the shorthand for carbon dioxide equivalents. It is the standard unit in carbon accounting to quantify greenhouse gas emissions. The Intergovernmental Panel on Climate Change maintains global warming potentials for known GHGs that convert these gases in terms of CO_2e.
[4] In line with reporting best practices, two emissions totals are disclosed – gross emissions and net emissions. "Net" emissions classify consumption from renewable energy or purchased services that were directly offset as zero emitting. "Gross" emissions include emissions from these sources, considered on the basis of national averages. Please refer to Chapter 1.1. for further details on the methodology applied.

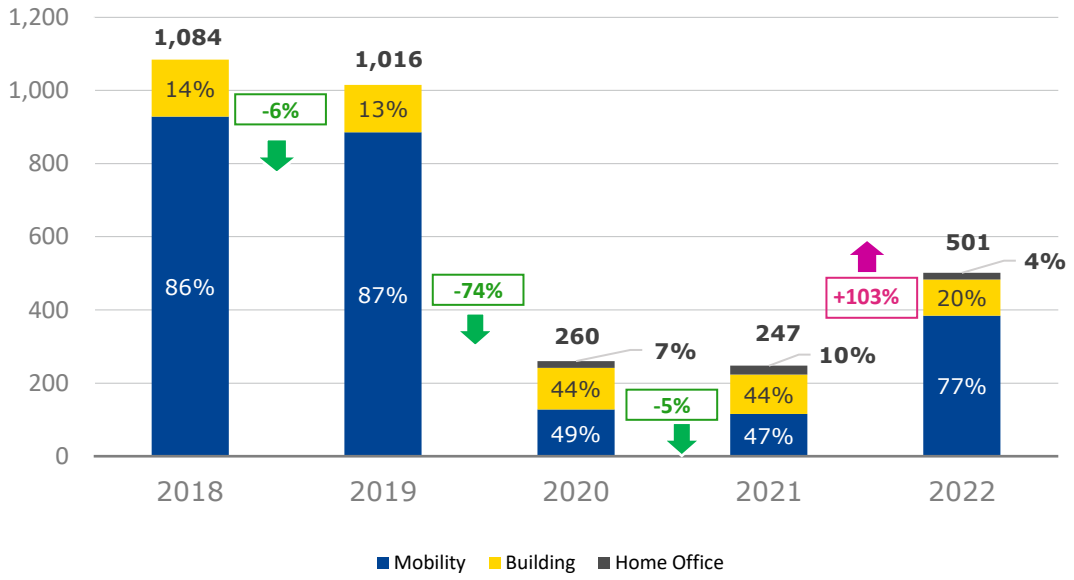
compared to 2021 is driven by two main factors:

1) **The increase of mobility-related activities in light of relaxed Covid-19 restrictions.** Emissions related to mobility have more than tripled in 2022 compared to 2021. This spike was the result of most Covid-19 restrictions being relaxed, both within and outside the ESM, leading to an increase in air business travel and staff commuting. Still, in 2022 air travel-related emissions are much lower than during pre-pandemic years, having decreased by 63% compared to the 2018 base year. This trend indicates the effectiveness of the ESM's efforts to reduce air business travel. Nevertheless, with a return to pre-pandemic business practices a further increase of emissions is to be expected in the coming year.
2) **The inclusion of new emissions categories which were not in scope in previous years.** These new categories were the fugitive emissions resulting from refrigeration, the emissions resulting from the production of electronic equipment, and electricity-related emissions resulting from ventilation, shared building consumption, and the ESM fitness facility. These new categories accounted for 10.4% of total gross emissions, but only 2.8% of total net emissions in 2022.

Breakdown of emissions

In line with the developments outlined above, the breakdown of emissions between mobility-related and building-related activities changed significantly in 2022 compared to 2021, both on a gross and net basis. On a gross basis, mobility-related emissions contributed to 67% (2021: 39.9%) of total gross emissions and 77% (2021: 46.6%) of total net emissions. This was followed by building-related emissions, which accounted for 30% (2021: 51.7%) of total gross emissions and 20% on a net basis (2021: 43.6%). Lastly, teleworking-related emissions, made up for 3% (2021: 8.4%) of total gross emissions and 4% (2021: 9.8%) of total net emissions. These breakdowns reflect the increase in business travel and staff commuting, due to increased office presence following the pandemic.

Figure 1
ESM emissions evolution 2018–2022[5]
(net tCO_2e)



Source: ESM

Within the mobility category, emissions linked to air travel were evidently the most significant, representing 76% (2021: 31.3%) of total mobility-related net/gross emissions. Emissions resulting from staff commuting made up 18.5% (2021: 49%) of total mobility-related emissions. Building-related emissions accounted for 20% (2021: 43.7%) of total net emissions. On a net basis, building-related emissions mainly resulted from heating the ESM premises, which made up 70.7% (2021: 97.1%) of the total building-related emissions.

[5] Please note that the sums of some figures and graphs may exceed 100% due to the rounding up of numbers.

1 Methodology

1.1 Methodology used to calculate ESM's carbon footprint

The ESM reports its GHG emissions in accordance with the International GHG Protocol. The International GHG Protocol was developed through a partnership between the World Resources Institute and the World Business Council for Sustainable Development and is the most widely recognised international standard in the field of GHG accounting and reporting.

The data used to evaluate the impact of ESM activities is collected in an environmental inventory updated annually to reflect changes in staff numbers, office space and occupancy, and internal activities, as well as best practices and standards. Collecting, assessing, and monitoring this information is key to identifying and planning relevant measures to achieve the ESM's environmental, social, and governance priorities.

The emissions related to teleworking were not based on activity data. Teleworking-related heating and electricity consumption were estimated based on the methodology set out by EcoAct in their 2020 Homeworking emissions Whitepaper.

Emission factors were taken from several sources, which are further explained in Chapter 1.4 of this report.

The calculations are performed with the assistance of Deloitte Luxembourg (*Société à Responsabilité Limitée)*, which also conducted an additional review of the calculations and assumptions, following the four-eyes principle. The four-eyes principle ensured that the computation of ESM's carbon emissions and their review were independently performed by two distinct teams.

This report uses the terms "carbon footprint", and "GHG emissions" synonymously and interchangeably as they refer to the GHG inventory of the ESM. As per reporting best practice, two categories of emissions are disclosed, gross emissions and net emissions:

- Net emissions classify consumption from renewable energy as carbon-neutral, i.e. resulting in zero emissions.
- Gross emissions include emissions from these sources.

1.2 Reporting period

The reporting period ranges from 1 January 2022 to 31 December 2022. For the analysis of trends, the baseline year is set at 2018 because this was the first year for which all required data was available and validated. The emissions calculated for the baseline year will serve as a benchmark for further reports.

1.3 Reporting scope

According to the International GHG Protocol, there are two main steps needed to assess an organisation's carbon footprint:

1. **Set organisational boundaries**
2. **Set operational boundaries**

Organisations can be set up as various legal entities and can exercise different types and degrees of control over their operations.

Organisational boundaries allow an organisation to select an approach for consolidating GHG emissions and consistently apply it to define those businesses and operations that constitute the organisation for the purpose of accounting and reporting GHG emissions.

Two distinct approaches can be used to determine such organisational boundaries:

1. The **equity share approach**: an organisation accounts for the GHG emissions resulting from its operations according to its share of equity in the operations.
2. The **control approach**: an organisation accounts for all the GHG emissions resulting from operations over which it has financial or operational control. In this context, financial control refers to the organisation's ability to direct financial and operating policies of the operations with a view to gaining economic benefits from them. Operational control on the other hand refers to the organisation's authority to introduce and implement operating policies.

For its carbon footprint report, the ESM uses the **operational control approach**. This approach is consistent with the current accounting and reporting practice of many companies that report on emissions from the facilities they operate. Under this approach, the ESM accounts for the GHG emissions of the operations over which it has operational control (see figure 3 below) in its headquarters in Luxembourg City. The office space in Brussels and the disaster recovery site in

Luxembourg are excluded as the impact of these facilities is expected to be non-material given their relatively small size and infrequent use. For further detail on the report's exclusions, see Annex 5.

For the calculation of certain ratios, the ESM factors in the number of permanent staff members employed at full-time in 2022 – an average of 225 people[6] (compared to 221 in 2021). In 2022, the office space rented by the ESM corresponded to 8,495.38 m^2.

To calculate the 2022 teleworking-related emissions, the ESM relied on a daily average office occupancy rate determined using the data collected through the ESM badging system, which was found to be the most accurate estimation methodology. Due to the easing of Covid-19 restrictions, the average daily office occupancy rate in 2022 rose to 43.2%, compared to 28.1% in 2021.

In setting **operational boundaries**, organisations firstly categorise emissions as direct and indirect and secondly choose the scope of accounting and reporting for indirect emissions. **Direct emissions** are those originating from sources owned or controlled by the reporting entity, whereas **indirect emissions** are generated as a consequence of the reporting entities' activities but occur at sources owned or controlled by another entity.

For GHG accounting and reporting standards, direct and indirect emissions are split into three scopes:

- **Scope 1**: Direct GHG emissions that occur from sources owned or controlled by the reporting organisation;
- **Scope 2**: Indirect GHG emissions from the generation of purchased electricity, heat, steam, or cooling consumed by the reporting company;
- **Scope 3**: All other indirect emissions that are a consequence of the activities of the organisation but occur from sources not owned or controlled by the organisation.

The International GHG Protocol requires entities to report, at minimum, on Scope 1 and 2, while reporting on Scope 3 is optional. To work towards more transparent and accurate carbon reporting, the ESM continuously reviews and updates its carbon footprint scope and methodology.

After a mapping exercise, the ESM decided to include the following activities under the ESM carbon footprint:

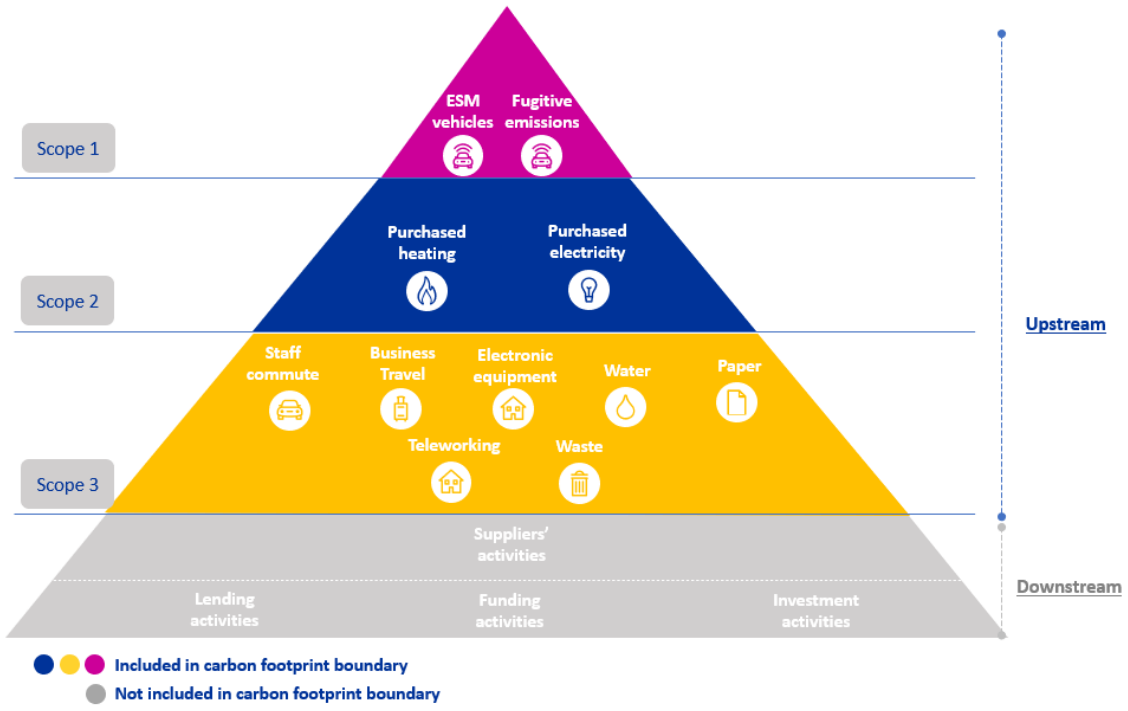
- **Scope 1**: ESM-leased vehicles and fugitive emissions;
- **Scope 2**: Purchased electricity and heating for ESM premises;
- **Scope 3**: Business travel of ESM staff (via air and rail); commuting of staff to work; paper and

[6] The number of staff members relies on a conservative approach in the calculation of per staff emissions, as it does not include temporary staff, interns, and other persons working from the ESM premises on a temporary basis. This may lead to higher per capita emissions.

water consumption; waste generation; emissions linked to electronic equipment and; teleworking-related emissions.

GHG emission sources can also be categorised from a life cycle perspective into **upstream emissions** (resulting from the processing and production of a product up to the point of sale) and **downstream emissions** (occurring after the sale of a product, through its distribution, storage, use, and end-of-life). By transposing this logic to the nature of ESM activities, the emissions the ESM considers to be in its scope are all upstream emissions. Currently, the ESM does not assess the carbon footprint of its lending, funding, or investment activities, given the complexities of retrieving this data. Figure 2 shows the ESM scope of activities included in the 2022 ESM Carbon Footprint Report.

Figure 2
Breakdown of sources of emissions by Scope



Source: ESM

1.4 Updates to reporting scope and methodology

To generate more transparent and accurate reporting, the ESM continuously reviews and updates its carbon footprint methodology. As a result, new emission categories such as fugitive emissions linked to refrigeration, emissions linked to IT equipment, and electricity emissions from ventilation, shared

building consumption for spaces shared with other tenants, and the fitness facility were added to the scope. Naturally, such expansions in reporting scope have led to a marked increase in reported GHG emissions for the relevant categories compared to previous years, particularly in gross terms.

Additionally, following the ESM's annual carbon footprint methodology review, the ESM changed its water emissions methodology for 2022, moving away from relying on invoices for consumption figures to use water meter readings instead.

1.5 Data collection and calculation

To calculate their carbon footprint, organisations need to collect activity data that quantifies activities resulting in GHG emissions e.g. kilowatt-hours of electricity consumed or kilometers travelled by staff.

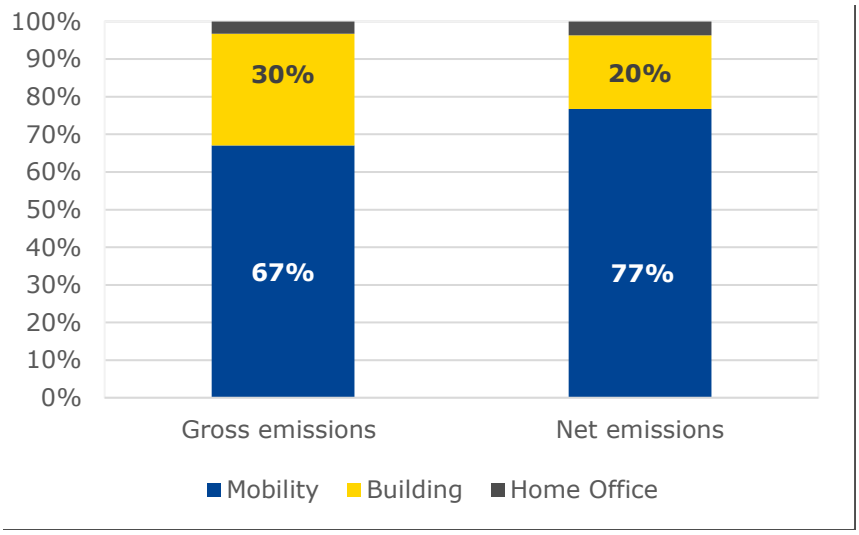
Most results included in this report are obtained using primary activity data, interpreted from documented evidence derived, for example, from energy and heating invoices. Other results, however, are estimated based on established methodologies and several underlying assumptions (an overview of data quality and completeness is presented in Annex 4 of this report). While the ESM used a conservative approach for such assumptions they may nevertheless have an impact on the total GHG emissions.

As a last step, the resulting activity data is multiplied with emission factors that are specific to certain sectors, activities, or geographical areas. The emission factors used in this report are retrieved from established sources, such as the International Energy Agency (IEA), the UK government's Department for Environment, Food & Rural Affairs (Defra), and the French Agency for Ecological Transition (Ademe). Annex 3 of this report contains further information regarding the emission factors used and their specific sources.

2 Carbon footprint results

- ***Total GHG emissions generated by the ESM in 2022 amounted to 573.5 tCO_2e on a gross basis (2021: 288.9 tCO_2e) and to 501.3 tCO_2e on a net basis (2021: 247.3 tCO_2e).***
- ***These results represented nearly a doubling of emissions, with an increase of 98.5% on a gross basis and of 103% on a net basis compared to 2021. Compared to the baseline year (2018), they represent a decrease of 51.3% on a gross basis and of 53.8% on a net basis.***
- ***The increase in emissions that occurred in 2022 is mainly due to two factors: the sharp increase in mobility-related emissions in light of eased Covid-19 restrictions, and the inclusion of new categories of emissions into the calculations.***

Figure 3
Composition Gross vs net emissions, 2022
(gross/net tCO_2e)



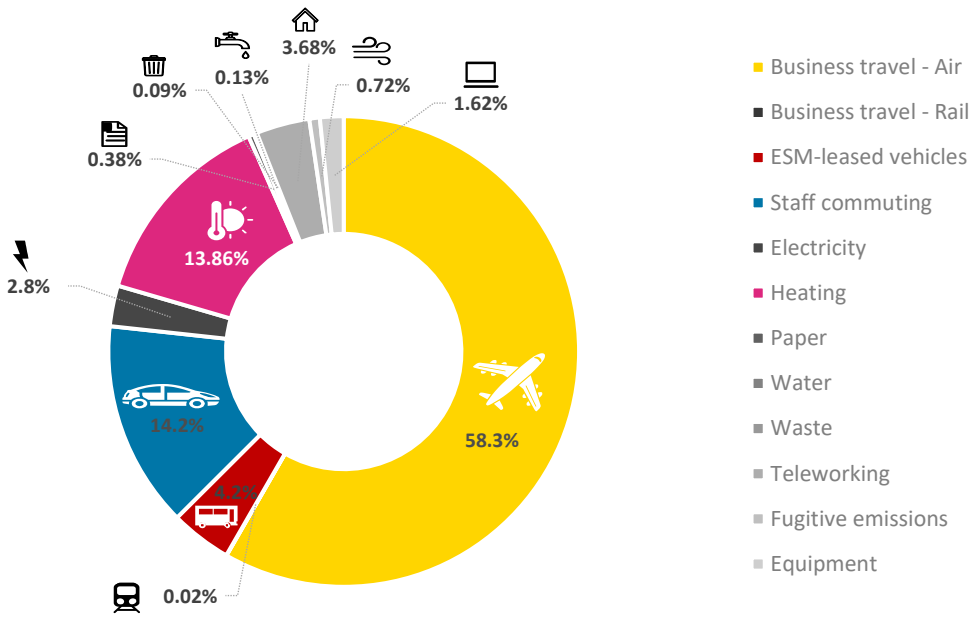
Source: ESM

During 2022, mobility-related emissions were the largest contributor to total emissions on both a gross and a net basis. They accounted for 67% of total gross emissions (2021: 39.9%) and 77% (2021: 46.6%) of total net emissions. On a gross basis, building-related emissions amounted to 30% (2021: 51.7%), and 20% on a net basis (2021: 43.6%). This was followed by emissions linked to teleworking, which made up for 3% (2021: 8.4%) of total gross emissions and 4% (2021: 9.8%) of total net emissions

Figure 4

Percentage breakdown of net emissions by source, 2022

(tCO_2e)



Source: ESM

The largest emitting source was business travel by air, which contributed to 292.3 tCO_2e or 60% (2021: 15.1%) of the total net emissions in 2022. This represents a 686% increase in emissions for air travel from 2021 (2021: 37.2 tCO_2e). As previously outlined, this was mostly due to the rise in emissions linked to air travel by ESM employees following the lifting of Covid-19 restrictions. Despite this, it should be noted that, compared to the 2018 base year, air travel emissions have decreased by 63%.

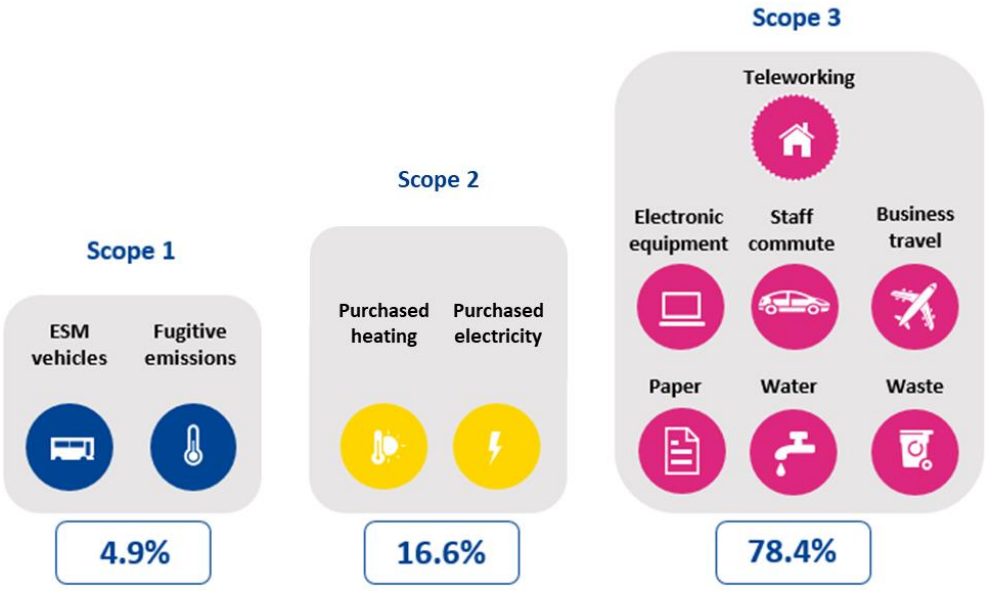
Staff commute was the second largest contributor, representing 71.2 tCO_2e or 14.2% of total net emissions (2021: 56.4 tCO_2e; 22.8%). This was a 26.2% increase compared to 2021 and can again be explained by a return to the office following the lifting of Covid-19 restrictions.

Heating was the third largest emitting source on a net basis, contributing to 69.5 tCO_2e or 13.9% (2021: 104.8 tCO_2e; 42.4%) of total net emissions. Due to ongoing internal awareness campaigns on energy efficiency and the office's stable temperature being adjusted to 20°C from 23°C for the winter, heating decreased by 33.7% on both a gross and net basis.

Electricity-related emissions accounted for 50.6% of the total building-related gross emissions and 15% of total ESM gross emissions in 2022, while they accounted for 14.2% of the total building-related net emissions and 2.8% of total ESM net emissions in 2022.

Looking at the breakdown between Scopes 1, 2 and 3 as defined by the International GHG Protocol, the ESM's 2022 carbon footprint results reveal that Scope 3 emissions represent the highest share of total net emissions, i.e. 78.4% of total net emissions (2021: 48.9%). Again, this result is driven by the rise in emissions related to air travel and staff commuting, which respectively make up for 58.3% and 14.2% of total net emissions. They are followed by Scope 2 emissions, which represent 16.6% of total net emissions (2021: 42.5%). They correspond to emissions resulting from heating the ESM's premises and electricity, which respectively make up for 13.9% and 2.8% of total net emissions. Finally, Scope 1 emissions account for 4.9% of total net emissions and are driven by the emissions resulting from the use of ESM-leased vehicles and fugitive emissions. Overall, this scope breakdown is quite different from that seen in 2021. This change is driven by two main factors: the increase in Scope 3 emissions in 2022, mostly due to the rise in emissions resulting from air travel, and the decrease in Scope 2 emissions in 2022, driven by the reduction in heating-related emissions from 104.8 tCO_2e to 69.5 tCO_2e.

Figure 5
Breakdown of ESM emissions per scope
(net)



Source: ESM

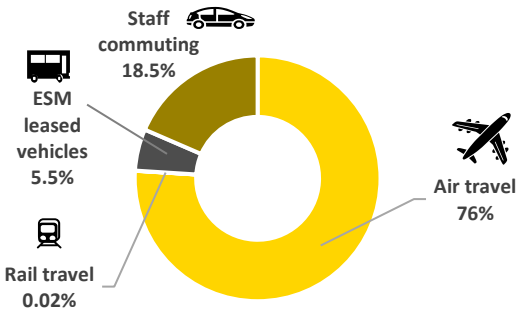
2.1 Mobility-related emissions

- ***In 2022, mobility-related emissions represented the largest share of the ESM carbon footprint on both gross/net basis.***
- ***Mobility-related emissions amounted to 384.7 tCO_2e on both gross/net basis (2021: 115.2 tCO_2e), hence making up for 67.1% of total gross emissions (2021: 12.9%) and 76.7% (2021: 15.1%) of total net emissions.***
- ***Mobility-related emissions increased by 233.9% on both gross/net basis compared to 2021 as a result of Covid-19 restrictions being relaxed.***
- ***Compared to the 2018 base year, mobility emissions decreased by 58.6% on a gross/net basis.***

In 2021, the peak year of the pandemic, staff commute took over as the biggest share of mobility emissions. In 2022, business travel via air returned as the largest mobility-related emission source with 292.3 tCO_2e compared to 37.2 tCO_2e in 2021 on both gross and net basis, representing 76% of total mobility-related gross and net emissions. However, emissions related to air travel were much lower in 2022 than in pre-pandemic times, decreasing by 63% compared to 2018, showing the positive results of the ESM's efforts to reduce business air travel.

Staff commute followed as the second largest mobility-related emission source of emissions, resulting in 71.2 tCO_2e (2021: 56.4 tCO_2e) on both gross and a net basis, representing 18.5% of total mobility-related gross/net emissions. The use of ESM-leased vehicles including the ESM minivan used for group travel contributed to 21.1 tCO_2e (2021: 21.6 tCO_2e), i.e. 5.5% of total gross and net mobility-related emissions. The remaining share of mobility emissions was linked to rail travel contributing 0.09 tCO_2e (2021: 0.03 tCO_2e) and representing less than 0.1% of total gross and net mobility-related emissions.

Figure 6
Breakdown of mobility-related emissions by source, 2022



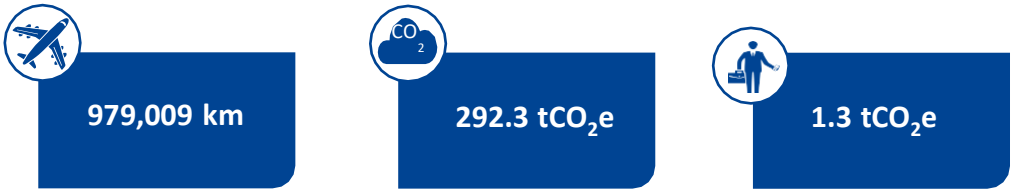
Source: ESM

The following efforts were initiated to reduce the footprint: Four electric car charging stations were made available at the ESM premises to encourage staff to utilise electric vehicles to commute to work. The ESM Travel Policy was updated in 2021 to encourage staff to consider the environmental impact of their business travel operations and to pursue travel arrangements with lower carbon emissions. In addition, information on the potential carbon footprint of various travel options was systematically made available to all staff at the time of travel request.

2.1.1 Air travel

- ***Air travel accounted for 51% of total gross emissions and 58.3% of total net emissions. Air travel also amounted to 76% of total mobility-related emissions on both gross/net basis (compared to 32.3% in 2021).***
- ***Gross/net emissions resulting from air travel increased to 292.3 tCO_2e in 2022 (2021: 37.2 tCO_2e), a rise of 686% that is due to the lifting of Covid-19 travel-related restrictions and the return to pre-pandemic levels of business travel.***
- ***Compared to the 2018 base year, air travel-related emissions decreased by 63%, both on a gross/net basis.***

Table 2



Evolution of air travel related emissions

	Distance travelled staff	Gross/net emissions	Emissions per staff
Vs. 2021	↑ +584.5%	↑ +686%	↑ +672%
Vs. Baseline	↓ -58.6%	↓ -63%	↓ -70.6%

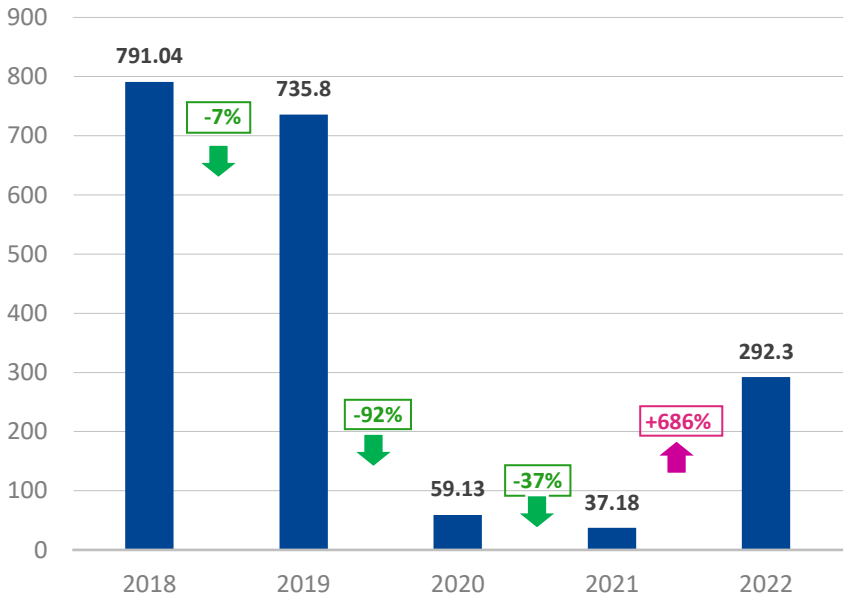
Source: ESM

Due to the Covid-19 outbreak, business travel has been severely restricted throughout 2020 and 2021. In those years, business travel – in particular air travel – was only conducted on very limited occasions and in line with national and international health and safety recommendations. In 2022, however, most of the Covid-19 restrictions were relaxed and ESM employees resumed travel for business-related reasons. This led to a sharp increase in both distance travelled and (air) travel-related emissions.

Figure 7

Evolution of ESM emissions related to air travel, 2018–2022

(tCO_2e)



Source: ESM

Distance travelled by air amounted to 979,009 km in 2022, representing a 584.5% increase (2021: 143,028 km). The resulting emissions totaled 292.3 tCO_2e or 1.3 tCO_2e per ESM staff member, (2021: 37.2 tCO_2e). This represents a rise in air travel-related emissions by 686% and by 672% in emissions per employee, compared to 2021.

In 2022, the ESM maintained the same calculation methodology used in previous years, in which the emissions associated with each flight were calculated based on the fare class and distance travelled and on travel-specific emission factors.

The results are a reflection of the easing of Covid-19 restrictions and the consequent return to pre-pandemic levels of business travel. However, as previously mentioned and as shown in Figure 7, emissions related to air travel decreased by 63% between 2018 and 2022, meaning that the ESM's level of business air travel did not return to pre-pandemic levels.

2.1.2 Staff commuting

- ***Emissions resulting from staff commute amounted to 12.4% (2021: 19.6%) of total ESM gross emissions and 14.2% (2021: 22.9%) of total net emissions.***
- ***Staff commute totalled 18.5% of mobility-related emissions on a gross/net basis (2021: 49% in 2021).***
- ***Gross/net emissions associated with staff commuting increased to 71.2 tCO_2e in 2022 (2021: 56.4 tCO_2e), or by 26.2%, given a progressive return to office presence in line with national safety guidelines.***
- ***Compared to the 2018 base year, staff commuting-related emissions have decreased by 33.7% on a gross basis, and by 33.8% on a net basis.***

Table 3

Evolution of staff commute related emissions

	Distance travelled	Gross/net emissions	Emissions per staff member
Vs. 2021	↑ +26.7%	↑+26.2%	↑+29.8%
Vs. Baseline	↓-28.7%	↓-33.7%	↓-44.8%

Source: ESM

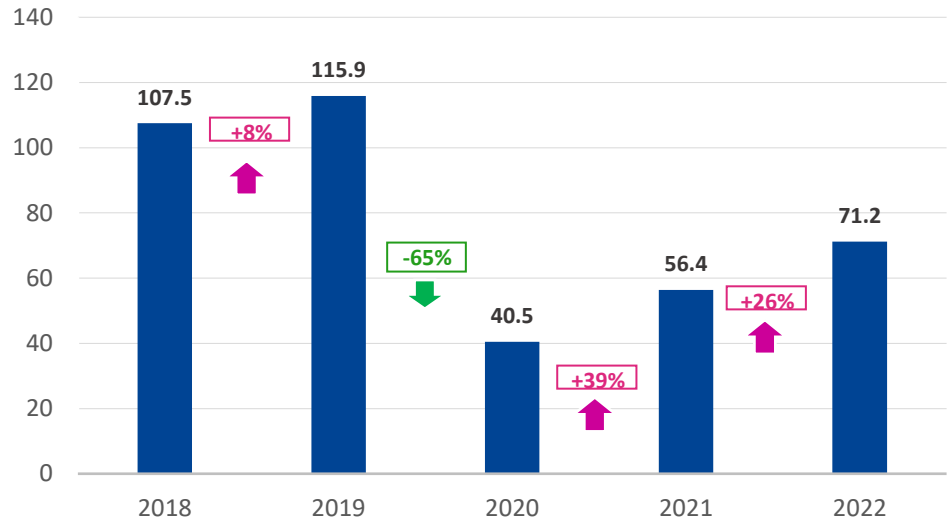
These rises in distance travelled to commute to the office by car and in the related emissions can be explained by an increasing number of staff members returning to the office with the average daily office occupancy rate in 2022 rising to 43.2%, compared to 28.1% in 2021. This was also reflected in a higher ESM parking occupancy rate,[7] which rose to 29% in 2022 from 25% in 2021. ESM staff members commuted an average of 1,990 km per staff member (2021: 1,528 km per staff member), representing an increase of 30% from the previous year.

[7] The parking occupancy rate is obtained through the ESM badging system for its parking garage. A total of 131 parking spots are available to ESM staff.

Figure 8

Evolution of ESM emissions related to staff commute, 2018–2022

(tCO_2e)



Source: ESM

Emissions stemming from the commute of ESM staff to work represented 18.5% of mobility-related emissions (2021: 49%). In terms of calculation methodology, the ESM calibrates the distances from the respective staff home addresses to the office together with the ESM parking space occupancy rate and the number of business days.[8] In addition, to estimate the distribution of different types of cars among ESM employees, the ESM leveraged national statistics on vehicles in use in Luxembourg City. Furthermore, sector-specific emission factors broken down by type of car and type of fuel were used to estimate emissions from staff commuting.

2.1.3 ESM-leased vehicles

- ***The emissions generated by ESM-leased vehicles represented 3.7% of total ESM gross emissions and 4.2% of total ESM net emissions.***
- ***ESM-leased vehicles represented 5.5% of total mobility-related emissions on both a gross/net basis (2021: 18.7%).***
- ***Gross/net emissions resulting from the use of ESM-leased vehicles decreased to 21.1 tCO_2e in 2022 (2021: 21.6 tCO_2e), representing a 2.3% decline.***

[8] Annex 1 lists the measurements considered for the estimate of distance travelled by staff to commute to work and for the calculation of related carbon emissions.

- ***Compared to the 2018 base year, ESM leased vehicles-related emissions decreased by 27.6% on a gross basis, and by 27.5% on a net basis.***

Table 4

Evolution of ESM-leased vehicle-related emissions

	Distance travelled	Gross/net emissions	Emissions per staff member
Vs. 2021	↑+1.1%	↓-2.3%	↓-4.1%
Vs. Baseline	↑+16.4%	↓-27.6%	↓-42.4%

Source: ESM

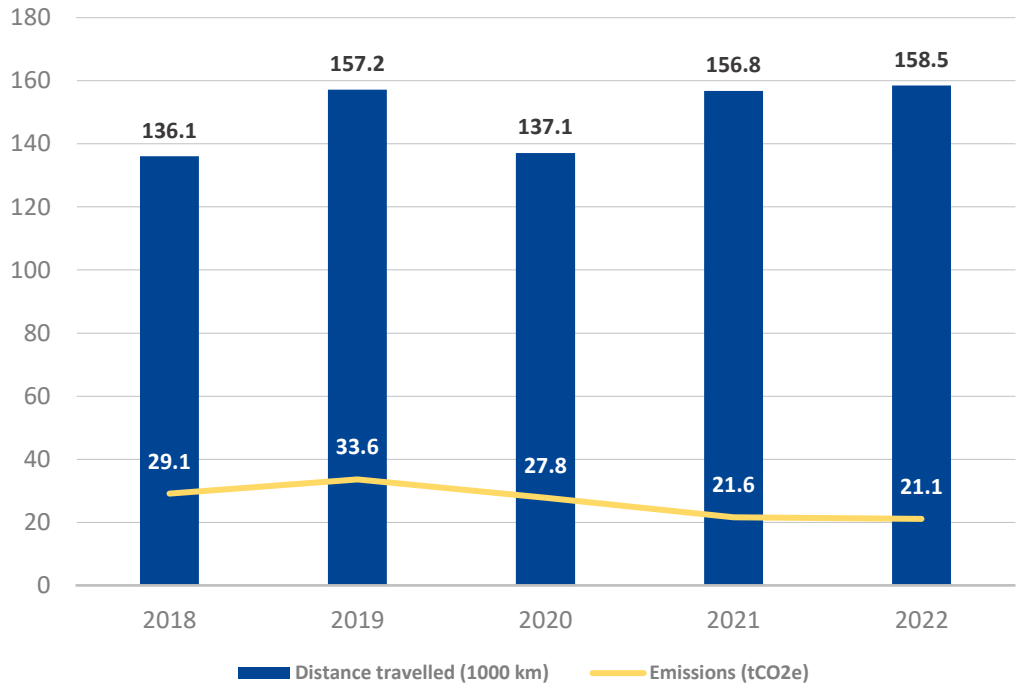
Opportunities to introduce environmentally friendly alternatives are continuously assessed by the ESM, taking into account market developments. The emissions associated with the use of ESM-leased vehicles continued to decrease from 2019 onwards despite fluctuations in the distance travelled. This is explained by changes in the composition of the car fleet: three hybrid cars were introduced to the fleet.

In 2022, the ESM leased and operated eight vehicles, including a minivan used to drive staff members to business events in and outside of Luxembourg. The aggregated distance travelled by ESM-leased vehicles amounted to 158,501 km (2021: 156,834 km), representing an increase of 1.1% compared to 2021. In 2022, the emissions generated by the use of ESM-leased vehicles amounted to 21.1 tCO_2e (2021: 21.6 tCO_2e) or 0.09 tCO_2e per staff member, a 2.3% decrease compared to 2021.

In 2022, the ESM maintained the same methodology for calculating emissions resulting from the use of leased cars: the mileage travelled by each car was multiplied by the respective emission factor for the car's type of fuel, to obtain the total CO_2 equivalent for the year.

The following graph shows the evolution of emissions generated by the use of ESM-leased vehicles from 2018, the base year, to 2022, the current reporting year.

Figure 9
Evolution of ESM emissions related to ESM-leased vehicles, 2018–2022
(tCO_2e)



Source: ESM

In 2022, the ESM maintained the same methodology for calculating emissions resulting from the use of leased cars: the mileage travelled by each car was multiplied by the respective emission factor for the car's type of fuel, to obtain the total CO_2 equivalent for the year.

Figure 9 shows the evolution of emissions generated by the use of ESM-leased vehicles from 2018, the base year, to 2022, the current reporting year.

2.1.4 Rail travel

- ***As in the previous year, in 2022 ESM business travel by rail represented less than 1% of total ESM gross and net emissions and less than 1% of mobility-related emissions.***
- ***Gross/net emissions generated by rail travel increased to 0.088 tCO_2e in 2022 (2021: 0.031 tCO_2e) – a 181.9% rise.***
- ***Compared to the 2018 base year, rail travel-related emissions have decreased by 92.9% on a gross basis, and by 92.7% on a net basis.***

Table 5

Evolution of rail travel related emissions

	19,651 km Distance travelled	0.088 tCO_2e Gross/net emissions	0.39 $kgCO_2e$ Emissions per staff member
Vs. 2021	↑+181.9%	↑+181.9%	↑+176.8%
Vs. Baseline	↓-80.8%	↓-92.9%	↓-94.3%

Source: ESM

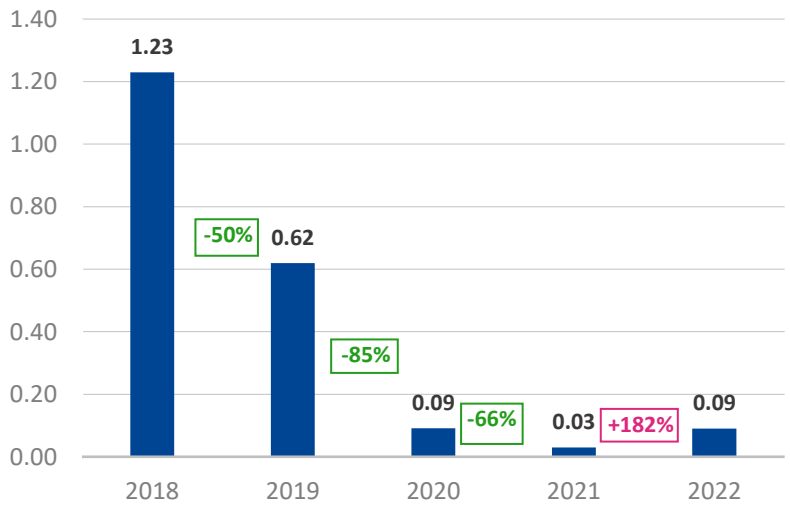
Business travel by rail represented a marginal share (less than 0.1%) of staff mobility in 2022. This is mainly due to the fact that the majority of ESM business travel cannot feasibly be completed by rail travel, either as a result of distances being too great to be time efficient, or a limitation of rail connections in Luxembourg.

In 2022, the total distance travelled by train increased to 19,651 km travelled (2021: 6,972 km), hence resulting in a 181.9% increase. From 2021 to 2022, the associated emissions also increased by 181.9% to 0.088 tCO_2e in 2022 (2021: 0.031 tCO_2e). This rise is due to the return to pre-pandemic levels of business travel, including by train, which was a result of the lifting of most Covid-19 restriction.

Figure 10

Evolution of ESM emissions related to rail travel, 2018–2022

(tCO_2e)



Source: ESM

The ESM used the same methodology to estimate emissions resulting from rail travel as that used for business travel by air or by ESM-leased vehicles: distance travelled was multiplied by the appropriate conversion factor to obtain total GHG emissions for the year.

Figure 10 shows the evolution of emissions resulting from rail travel between 2018, the base year, and 2022, the current reporting year.

2.2 Building-related emissions

- ***Building-related emissions amounted to 170.4 tCO_2e on a gross basis (2021: 149.5 tCO_2e) and 98.2 tCO_2e on a net basis in 2022 (2021: 107.8 tCO_2e).***
- ***This represented 29.7% (2021: 51.8%) of total ESM emissions on a gross basis and 19.6% (2021: 43.7%) on a net basis.***
- ***Starting in 2022, both fugitive emissions and emissions from electronic equipment were added to scope accounting for a combined 12% of total building-related net emissions.***
- ***Compared to the 2018 base year, building-related emissions have decreased by 31.2% on a gross basis, and by 36.8% on a net basis.***

In 2022, the emissions related to the use of the ESM's building amounted to 170.4 tCO_2e on a gross basis (2021: 149.5 tCO_2e) and 98.2 tCO_2e on a net basis (2021: 107.8 tCO_2e). They were responsible for 29.7% of total ESM emissions on a gross basis and 19.6% on a net basis.

Figure 11
Breakdown of building-related gross emissions, 2022
(gross tCO_2e)

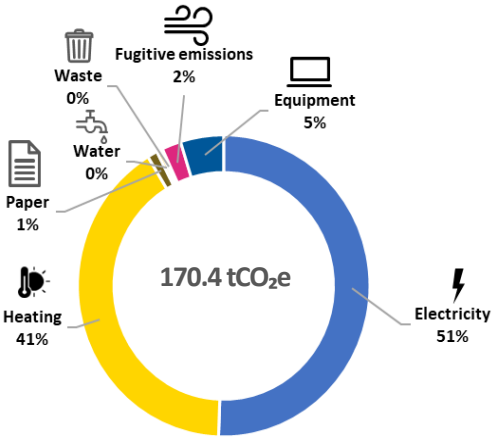
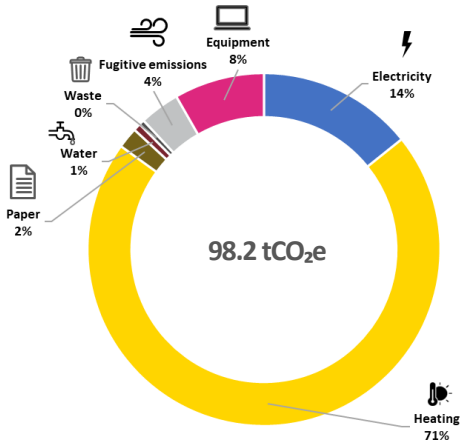


Figure 12
Breakdown of building-related net emissions, 2022
(net tCO_2e)



Source: ESM

Figure 11 displays, in gross terms, that the electricity makes up for the largest share of building-related emissions, i.e. 51%. It is followed by the emissions resulting from heating, which make up for 41% of total building-related emissions.

In net terms, emissions resulting from heating account for 71% of total building-related emissions. They are followed by electricity and electronic equipment, which account for 14% and 8% respectively. The remaining sources of emissions represented a significantly smaller share of total gross and net building-related emissions. ESM is actively trying to minimise its net emissions from electricity, by purchasing part of its electricity from renewable energy sources (hydropower) covered by Guarantees of Origin.

The calculation method of all building-related emissions followed the same approach as in 2021, with consumption data obtained from invoices being multiplied by the appropriate emission factors to obtain the resulting annual carbon emissions.

2.2.1 Fugitive emissions

- ***In 2022, fugitive emissions were added as a new emissions category accounting for 2.1% of total gross building-related emissions and 3.7% of total net building-related emissions.***
- ***They represented 0.6% of the ESM's total gross emissions and 0.7% of the ESM's total net emissions.***

To continually improve the ESM's carbon footprint reporting and reduction efforts, fugitive emissions were added to the scope for the first time in 2022.

In 2022, fugitive emissions linked to refrigeration amounted to 3.6 tCO_2e, accounting for 2.1% of total gross building-related emissions and 3.7% of total net building-related emissions. The main contributor to total fugitive emissions is a cold room[9] that is operated in the ESM facilities, contributing more than 99.0% of total gross and net fugitive emissions.

As fugitive emissions are being included within the ESM's Carbon Footprint Report for the first time in 2022, comparisons with previous reporting years cannot be made. Fugitive emissions were calculated according to the International GHG Protocol methodology using equations from the International Panel on Climate Change guidelines combined with emission factors of the commonly used refrigerant.

[9] 'Cold room' as referred to by the ESM is a separate room next to the ESM canteen, where the food is stored securely

2.2.2 Electronic equipment

- ***In 2022, emissions from electronic equipment were added to the report as a new emissions category accounting for 4.8% of total gross building-related emissions and 8.3% of total net building-related emissions.***
- ***They represented 1.4% of the ESM's total gross emissions and 1.6% of the ESM's total net emissions.***

In 2022, emissions relating to electronic equipment obtained during this reporting year amounted to 8.1 tCO_2e in 2022. They accounted for 4.8% of total gross building-related emissions and 8.3% of total net building-related emissions.

As electronic equipment emissions are being included within the ESM's Carbon Footprint Report for the first time in 2022, comparisons with previous reporting years cannot be made. Electronic equipment emissions were calculated according to the International GHG Protocol methodology using the total weight of electronics acquired during the reporting year combined with an emission factor from Defra's 'material use' subsection. These emissions have no relation to the use of electronic items, referring solely to the emissions resulting from the production of said electronic equipment. However, the usage of such electronic equipment is captured in the electricity consumption subsection 2.2.4.

Also, to ensure technology equipment is used to its full capacity, and to reduce consumption and waste, the ESM held two staff charity auctions of decommissioned IT equipment during the last reporting year. Under the guidance of the ESM's 'Making a Difference' values group, the proceeds from the 2022 auctions were donated to various charitable causes.

2.2.3 Heating

- ***Overall, heating represented 12.1% (2021: 36.3%) of the ESM's total gross emissions and 13.9% (2021: 42.5%) of the ESM's total net emissions.***
- ***In 2022, heating accounted for 40.8% (2021: 70.1%) of total gross building-related emissions and 70.7% (2021: 97.1) of total net building-related emissions.***
- ***The ESM consumed 380.6 MWh (2021: 571.9 MWh) in natural gas for heating purposes in 2022. This represented a 33.5% drop between 2021 and 2022.***
- ***Heating-related emissions were 69.5 tCO2e in 2022 (2021: 104.8 tCO2e). This represents a 33.7%***

decrease on both a net and a gross basis between 2021 and 2022, due primarily to the introduction of energy-saving measures during 2022.

- ***Compared to the 2018 base year, heating-related emissions have decreased by 51.9%, both on a gross/net basis.***

Table 6

Evolution of heating related emissions

	Consumption	Gross/net emissions	Emissions per m²
Vs. 2021	↓-33.5%	↓-33.7%	↓-33.5%
Vs. Baseline	↓-51.6%	↓-51.9%	↓-52.6%

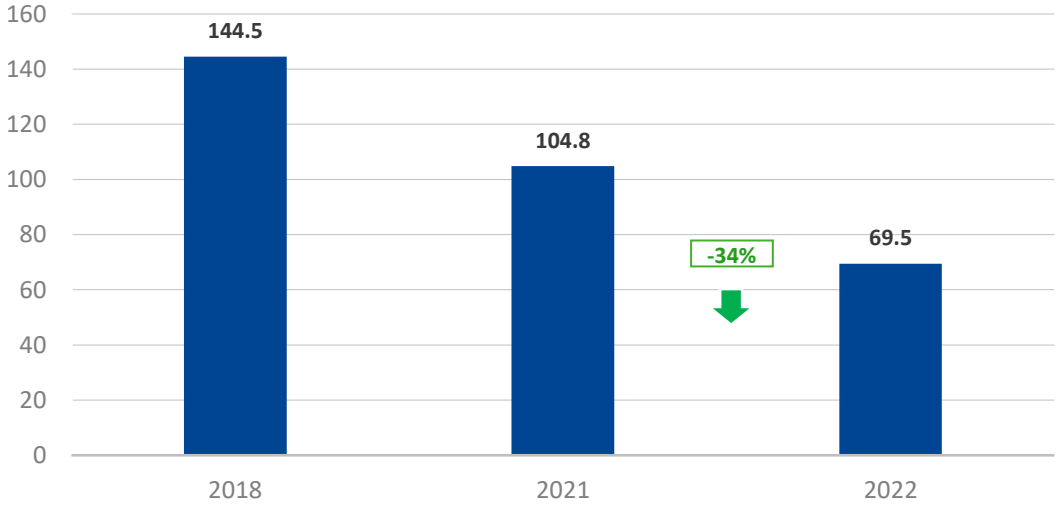
Source: ESM

Overall, heating represented 12.1% of the ESM's total gross emissions and 13.9% of the ESM's total net emissions.

Figure 13

Evolution of ESM emissions related to heating, 2018–2022

(tCO_2e)



Source: ESM

In 2022, the heating of the ESM premises was the third largest contributor on a net basis to the ESM's total carbon footprint, after air travel and staff commuting. The ESM premises was heated by natural gas and, in 2022, consumption reached 380.6 MWh (2021: 571.9 MWh), resulting in a 33.5% reduction from 2021. The resulting emissions amounted to 69.5 tCO_2e (2021: 104.8 tCO_2e), i.e. a 33.7% drop. This decline

is due to ongoing internal awareness campaigns on energy efficiency and resource consumption that were further enhanced during the energy crisis caused by the war in Ukraine.

Figure 13 displays the evolution of heating consumption and of the resulting emissions between 2018, the base year, and 2022, the current reporting year.

2.2.4 Electricity consumption

- ***The ESM consumed 871.2 MWh of electricity in 2022 (2021: 379.1 MWh).***
- ***The resulting emissions represented 15% (2021: 14.4%) of total ESM gross emissions and 2.8% (2021: 0%) of total net emissions.***
- ***Electricity-related emissions accounted for 50.6% (2021: 27.9%) of total building-related gross emissions and 14.2% (2021: 0%) of total building-related net emissions.***
- ***Electricity-related gross emissions amounted 86.2 tCO_2e (2021: 41.6 tCO_2e), a 107% increase compared to 2021, driven by the new components of electricity consumption added to this year's reporting scope. This also led electricity-related net emissions to increase to 14 tCO_2e (2021: 0 tCO_2e) as some of additional electricity consumption was not covered by Guarantees of Origin, which ESM intends to purchase for the next reporting year.***

Table 7

Evolution of electricity related emissions

	871.2 MWh	86.2 tCO_2e	10 kg CO_2e
	Consumption	Gross emissions	Emissions per m^2
Vs. 2021	↑129.8%	↑107%	↑104%
Vs. Baseline	↑97%	↓6.8%	↓8%

Source: ESM

In 2022, ESM's electricity consumption amounted for 871.2 MWh (2021: 379.1 MWh), representing a 129.8% increase from 2021. The resulting gross emissions amounted to 86.2 tCO_2e (2021: 41.6 tCO_2e), representing a 107% increase between 2021 and 2022. As such, the share of electricity consumption emissions represented 15% (2021: 14.4%) of total ESM gross emissions in 2022 and 2.8% (2021: 0%) of total net emissions.

Figure 14

Evolution of ESM electricity consumption, 2018–2022

(MWh)

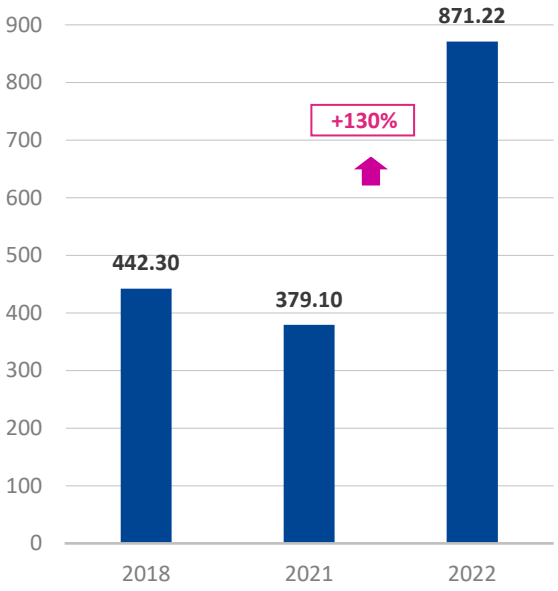
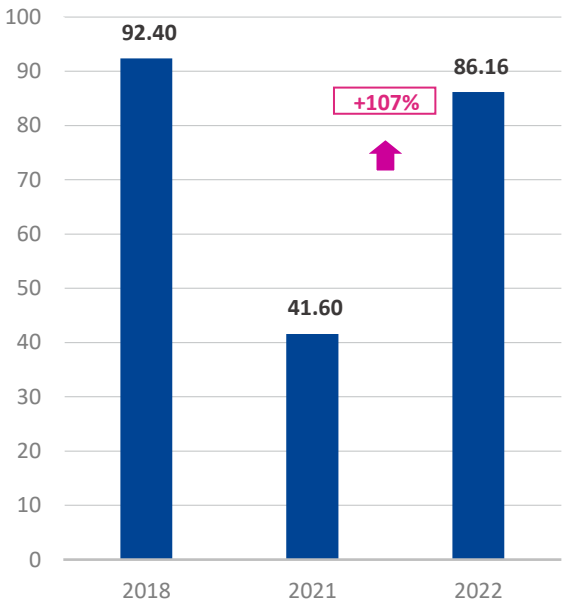


Figure 15

Evolution of ESM emissions related to electricity consumption, 2018–2022

(tCO_2e)



Source: ESM

As described in Figures 14 and 15, the notable increase in gross terms is due to the inclusion of an additional 48 tCO_2e of emissions resulting from electricity consumption for ventilation, shared building consumption, and fitness facility, which were measured and reported for the first time in 2022 following the ESM's annual carbon footprint methodology review. The additional electricity from ventilation, shared building consumption, and fitness facility accounted for 56% (35.7%, 16.2%, and 4.1% respectively) of total electricity consumed by the ESM. Even with addition of new emission categories, the ESM's electricity emissions in gross terms have still seen a 6.8% decrease against the baseline year.

As part of the ESM energy-saving efforts, the following measures were implemented during the reporting year: fresh-air-ratio from continuous air exchange adjusted; tower air purifiers in public spaces turned off; non-essential devices switched off (displays in some locations, ice-cube machine, etc.); power-on/off switches for the machines in the gym installed; and a stand-by function for water dispensers and coffee machines was installed in the ESM canteen and kitchenettes.

With the addition of 'shared building consumption' to the reporting scope in 2022, the ESM reported 14 tCO_2e net emissions from electricity this year. The remaining 72.2 tCO_2e, which accounts for 83.8% of electricity emissions, was derived from renewables through purchase of Guarantees of Origin. In order to decrease the net emissions for the next reporting year, ESM aims to cover the remaining 16.2% shared building electricity emissions by purchasing additional Guarantees of Origin. However, minor net emissions are possible in the event of unexpected power outages as current building is backed by diesel-powered genset.

2.2.5 Paper consumption

- ***The ESM consumed 2.1 tonnes of paper in 2022 (2021: 1.7 tonnes).***
- ***The emissions amounted to 0.3% (2021: 0.6%) of total ESM gross emissions and 0.4% (2021: 0.6%) of total ESM net emissions. Their share of total building-related emissions was around 1.1% (2021: 1.1%) on a gross basis and 1.9% (2021: 1.5%) on a net basis.***
- ***Paper-related gross/net emissions increased by 18.8% compared to 2021.***
- ***Compared to the 2018 base year, paper-related emissions have decreased by 62.8%, both gross and net basis.***

Table 8
Evolution of paper related emissions

	Consumption	Gross emissions	Emissions per staff member
Vs. 2021	↑+18.8%	↑+18.8%	↑+16.7%
Vs. Baseline	↓-61.4%	↓-62.8%	↓-70.4%

Source: ESM

In this report, paper consumption is defined as the amount of paper that was printed during the reporting year by ESM employees. Therefore, the paper consumption figures result from a printer usage analysis, which aggregates the printing-related data from all of the ESM's printers for the reporting year.

In 2022, the ESM consumed around 2.1 tonnes (2021: 1.7 tonnes) of paper, 18.8% more than in 2021. The increased paper consumption resulted in a rise in paper-related emissions to 1.9 tCO_2e in 2022 (2021: 1.6 tCO_2e). Emissions resulting from paper consumption represented 1.1% of total building-related gross emissions and 1.9% on a net basis.

Figure 16
Evolution of ESM paper consumption, 2018–2022
(tonnes)

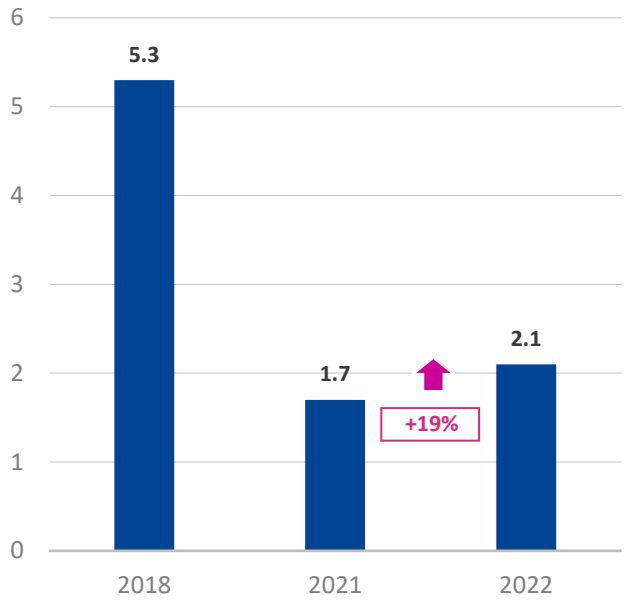
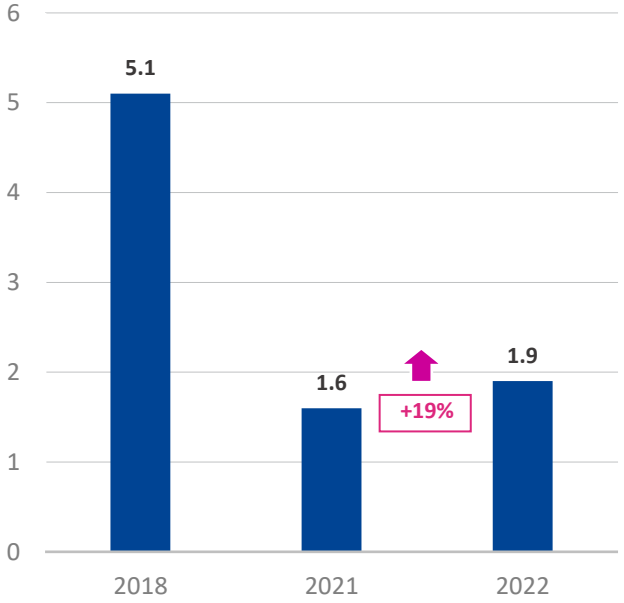


Figure 17
Evolution of ESM emissions related to paper consumption, 2018–2022
(tCO_2e)



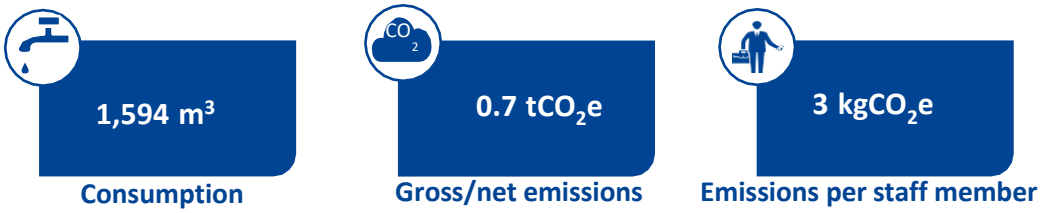
Source: ESM

As visible in Figures 16 and 17, despite the slight increase in paper consumption and related emissions in 2022, the digitalisation of communications as well as several awareness-raising campaigns and technical measures implemented, contributed to decreasing the ESM paper consumption over the years. The increase in paper consumption registered in 2022 is most likely a result of the ESM staff returning to the office after the relaxation of Covid-19 restrictions. In any case, going forward, the ESM will continue to leverage sustainable sources in its paper consumption and has already obtained a provider for recycled materials. Since 2021, ESG considerations are being included in contracts with office supply providers. These considerations were implemented in 2022 and included factors such as a focus on using recycled packaging.

2.2.6 Water consumption

- ***ESM water consumption amounted to around 1,594 m³ in 2022 (2021: 2,434 m3).***
- ***In 2022, the resulting emissions amounted to 0.1% (2021: 0.4%) of the ESM total gross and net emissions. Their share of total building-related emissions was around 0.4% (2021: 0.7%) on a gross basis and 0.7% (2021: 1%) on a net basis.***
- ***Water-related consumption decreased by 34.5% between 2021 and 2022.***
- ***Compared to the 2018 base year, water-related emissions have decreased by 86.6%, both on a gross/net basis.***

Table 9
Evolution of water related emissions



Vs. 2021	↓-34.5%	↓-34.5%	↓-35.7%
Vs. Baseline	↓-66.5%	↓-86.6%	↓-89.3%

Source: ESM

In 2022, the ESM consumed around 1,594 m^3 of water (2021: 2,434 m^3), 34.5% less than in 2021. The reduction in water consumption resulted in a drop in water-related emissions to 0.7 tCO_2e in 2022 (2021: 1 tCO_2e). This reduction is mainly due to the fact that, in previous reporting years, water consumption was over-reported by the ESM given its conservative approach when leveraging estimations based on invoices. Following the ESM's annual carbon footprint methodology review, the ESM changed its water emissions methodology for 2022, moving away from relying on invoices for consumption figures, to using water meter readings instead. Furthermore, in 2022, contactless and waterless devices were installed in ESM sanitary rooms to reduce water use. In addition, the significant reduction is also partially driven by water-saving measures implemented by the ESM during the years and the persistence of limited teleworking as a working mode during 2022.

Figure 18
Evolution of ESM water consumption, 2018–2022
(m3)

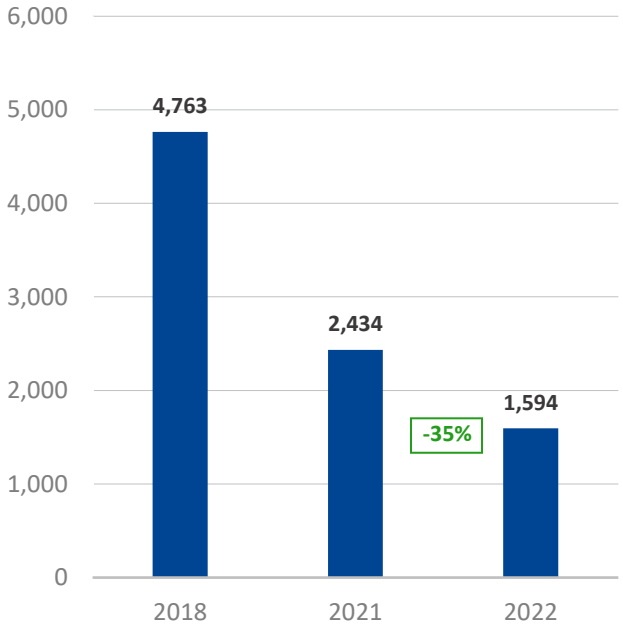
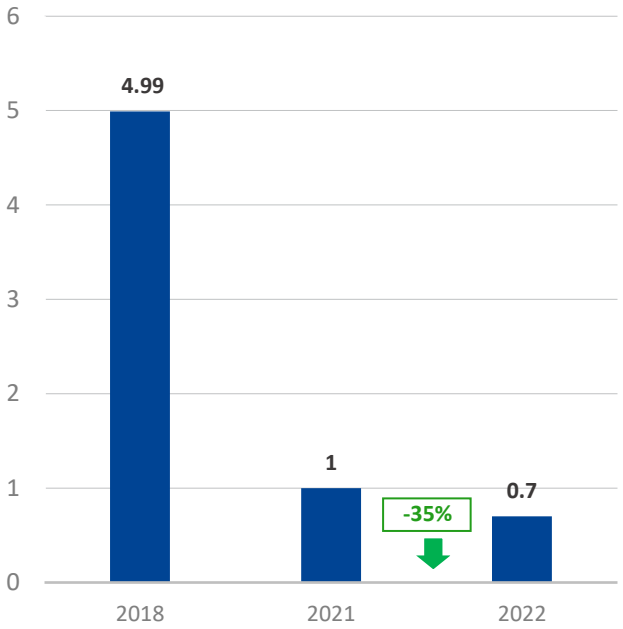


Figure 19
Evolution of ESM emissions related to water consumption, 2018–2022
(tCO_2e)



Source: ESM

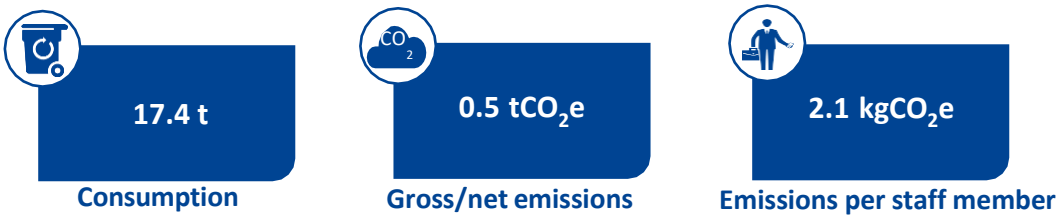
Figures 18 and 19 display the evolution of water consumption and of the resulting emissions between 2018, the base year, and 2022, the current reporting year.

2.2.7 Waste generated

- ***The ESM generated 17.4 tonnes of waste in 2021 (2021: 16 tonnes).***
- ***Emissions related to waste generation represented a minor share of the ESM's total carbon footprint, i.e. 0.1% of total gross emissions and 0.1% of total net emissions (2021: 0.2%). The share of waste-related emissions stood at 0.3% (2021: 0.3%) of total building-related emissions on a gross basis and at 0.5% (2021: 0.4%) on a net basis.***
- ***Waste-related gross and net emissions increased by 2.4% compared to 2021, reaching 0.5 tCO2e.***
- ***Compared to the 2018 base year, waste-related emissions have decreased by 36.8%, both on a gross/net basis.***

Table 10

Evolution of waste related emissions



Vs. 2021	**↑+8.4%**	**↑+2.4%**	**↑+0.6%**
Vs. Baseline	**↓-50.3%**	**↓-36.8%**	**↓-49.7%**

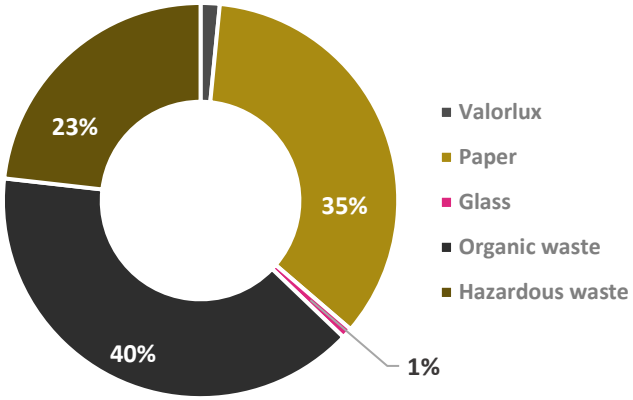
Source: ESM

In 2022, the waste generated by ESM activities continued to represent a minor source of ESM building-related emissions, accounting for 0.5 tCO_2e on both a gross and a net basis (i.e. 2.4% more than 2021). The amount of waste generated totaled 17.4 tonnes in 2022 (2021: 16 tonnes), which is an increase of 8.4% compared to 2021.

For the calculation of emissions resulting from waste generation, two different conversion factors were used, based on the type of waste: the Bilan GES (Ademe)[10] emission factors were used for polystyrene and plastic waste (i.e. hazardous waste, included in the calculations since 2020), while Defra was used for residual and bulky waste.

[10] Refer to Annex 3 for further information on emission factors.

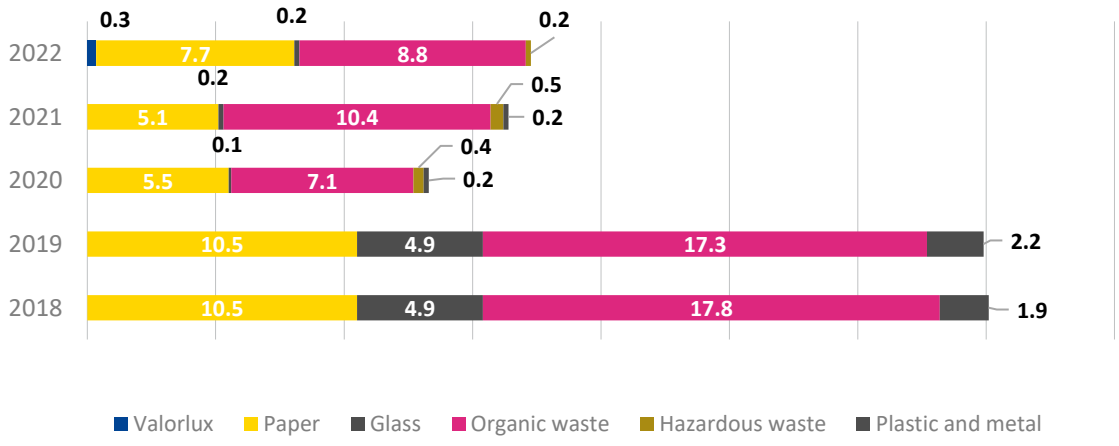
Figure 20
Waste-related emissions by type of waste, 2022



Source: ESM

Looking at the tonnes consumed of different types of waste, as shown in Figure 19, organic waste is still the largest, accounting for 51% (2021: 48%) of all waste, followed by paper, which accounts for 45% (2021: 23%) of all waste. It should be noted that the paper-related waste figures appearing in this section are different from the paper consumption ones covered in chapter 2.2.3. Indeed, in this section, paper-related waste refers to the amount of waste generated by the ESM in 2022 that was classified as paper. On the other hand, paper consumption in Chapter 2.2.3 refers to the amount of paper printed by ESM printers during the reporting year.

Figure 21
Evolution of breakdown of waste generated, 2018–2022
(tonnes)

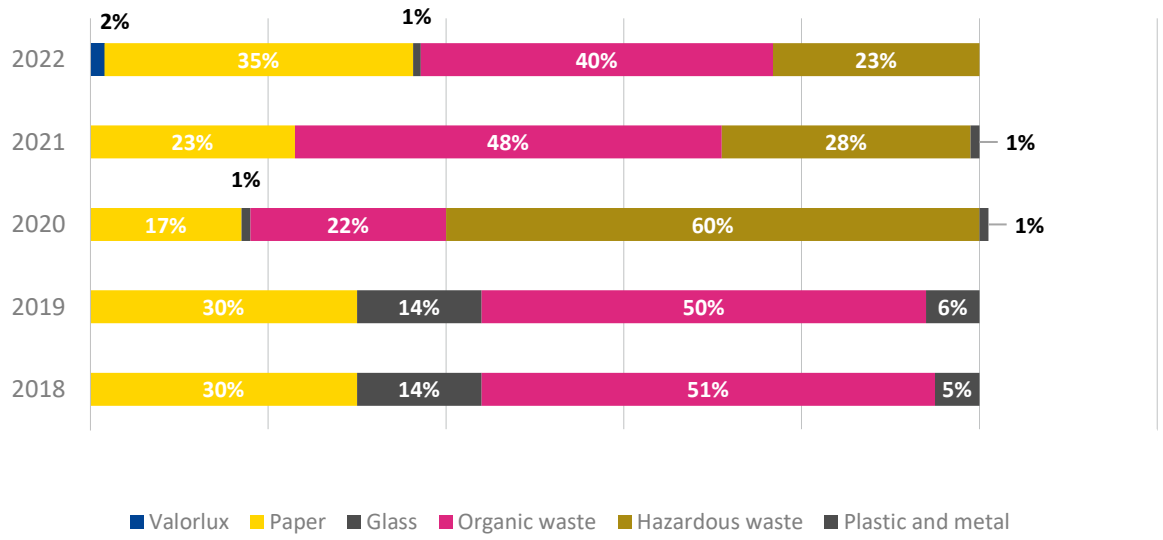


Source: ESM

Figure 22

Evolution of emissions related to waste generation, 2018–2022

(tCO_2e)



Source: ESM

The above mentioned Figures (21 and 22) show the evolution of the breakdown of emissions and weight of waste generated by ESM activities, between 2018, the base year, and 2022, the current reporting year.

As in previous years, the ESM obtained the Luxembourg SuperDrecksKëscht® fir Betrieber11 green label for its internal waste recycling practices. Waste was separated in-house in line with these requirements. The SuperDrecksKëscht® fir Betriber label was certified in accordance with the internationally accepted the International Organisation for Standardisation ISO 14024:2000 standard. During annual reviews, the inspectors applied the same control procedures and requirements as the ISO standard. ESM waste management is therefore conducted in accordance with the requirements for ISO 1402.

[11] For further information on the requirements to obtain the label SuperDrecksKëscht® fir Betrieber, refer to the official website: https://superdreckskescht.com/index.php/en/environmental-policy.

2.3 Teleworking-related emissions

- ***Telework-related emissions amounted to 18.4 tCO_2e on a gross/net basis (2021: 24.3 tCO_2e).***
- ***Telework-related emissions made up for around 3.2% (2021: 8.2%) of total ESM gross emissions and 3.7% (2021: 9.6%) of total ESM net emissions.***
- ***Gross and net telework-related emissions decreased by 22.1% compared to 2021, reflecting the 53.7% increase in average daily office occupancy rate to 43.2% (2021: 28.1%) during this same period.***

Starting in March 2020, when the pandemic began to affect Luxembourg, until the end of 2021, ESM staff were required to telework in compliance with government health regulations. Since 2022, ESM staff have been able to return to the office. As such, the easing of Covid-19 restrictions has led to the average daily office occupancy rate in 2022 rising to 43.2% (2021: 28.1%). As teleworking remained an option for all ESM employees for several days per week in 2022, the ESM continues to calculate and disclose emissions generated by ESM employees working from home to provide a more accurate estimate of the emissions related to its own operations.

In 2022, teleworking-related emissions decreased by 22.1% on a gross and net basis compared to 2021. This decrease is mainly due to the fact that, in 2022, staff returned to the office as a result of the relaxation of Covid-19 restrictions.

The second largest driver of telework-related emissions was electricity, which made up for 21.2% of telework-related emissions (2021: 24.7%). However, emissions generated by electricity related to homeworking decreased by 27.3% between 2021 and 2022.

Emissions related to water and waste generated due to teleworking represented only a small share of the total teleworking gross and net emissions, i.e. 1.2% (same as 2021).

To estimate teleworking-related emissions, the EcoAct Whitepaper methodology was used. Internal data such as the office occupancy rate, collected through the ESM badging system was used to substantiate these calculations. Publicly available statistics and general assumptions were used to complement the Eco Act Whitepaper methodology and estimate teleworking-related water and waste emissions. The publicly available statistics that were used are (1) Eurostat, the official EU statistics agency, and (2) Statec.lu, the official national statistics agency in Luxembourg.

Additionally, the following general assumptions were taken: (1) an 8-hour working day, (2) 248 working days during the calendar year, and (3) an average of 20% of hourly household water consumption was linked to teleworking.

2.3.1 Teleworking-related heating emissions

- ***Estimated telework-related heating consumption amounted to 78.4 MWh in 2022 (2021: 98.3 MWh). This represents a drop of 20.3% compared to 2021.***
- ***Estimated emissions from telework-related heating amounted to 14.3 tCO2e (2021: 18 tCO2e), both on a gross/net basis. This represents a drop of 20.5% compared to 2021.***
- ***Estimated emissions from telework-related heating accounted for 77.6% of all telework-related emissions (2021: 74.2%).***

Table 11

Evolution of teleworking estimated heating-related emissions

	Consumption	Gross/net emissions	Emissions per staff member
Vs. 2021	↓-20.3%	↓-20.5%	↓-21.9%

Source: ESM

Following the EcoAct Whitepaper methodology, it is assumed that the heating season is from October to March of each year. In addition, the methodology assumes that heating cannot generally be restricted to a small working area, and thus that time spent at home during the heating season requires the whole heating system to be active. A "typical - medium" household therefore consumes an estimated 12,000kWh per year for domestic gas used for heating and is in use for an average of 10 hours per day. To account for domestic heating energy consumption, average national data of Luxembourg and its neighboring countries was used factoring in staff's residential postcodes to more accurately reflect the different domestic heating sources used.

The estimates also took into account the average house and room sizes of teleworkers in each country, and the proportion of homes that can regulate heating by room when working from home, as opposed to a whole house.

On such basis, estimated emissions from telework-related heating accounted for 77.6% of all estimated

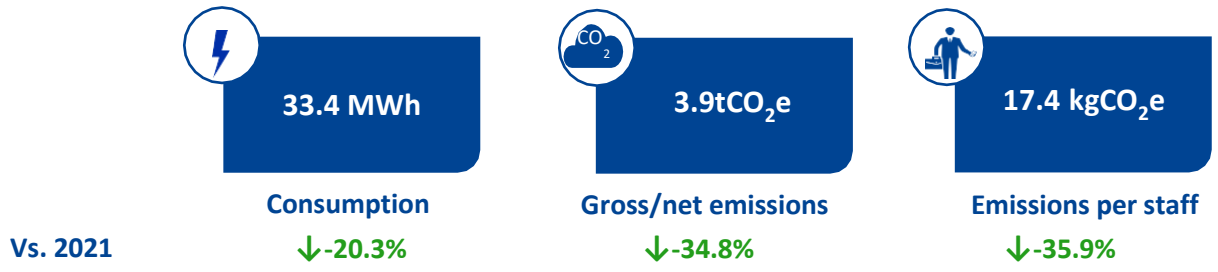
telework-related emissions (2021: 74.2%).

Estimated telework-related heating consumption amounted to 78.4 MWh in 2022 (2021: 98.3 MWh), representing a drop of 20.3% compared to 2021. Resulting emissions due to incremental heating used amounted to 14.3 tCO_2e (2021: 18 tCO2e), resulting in a 20.5% reduction compared to 2021. These reductions are due to the general decrease in homeworking as ESM employees returned to the office, due to the lifting of Covid-19 restrictions during 2022.

2.3.2 Teleworking-related electricity emissions

- ***Estimated teleworking-related electricity consumption represented 33.4 MWh in 2022 (2021: 41.9 MWh). This represents a 20.3% drop.***
- ***Estimated emissions from telework-related electricity amounted to 3.9 tCO2e (2021: 6 tCO2e), both on a gross/net basis. This represents a 34.8% drop. Electricity-related emissions accounted for 21.2% of total teleworking-related gross and net emissions (2021: 24.7%).***

Table 12
Evolution of teleworking electricity-related emissions



Source: ESM

Overall, teleworking-related electricity emissions accounted for 21.2% of total teleworking-related gross and net emissions (2021: 24.7%).

In 2022, teleworking-related electricity use amounted to 33.4 MWh (2021: 41.9 MWh), resulting in a 20.3% reduction between 2021 and 2022. The resulting emissions amounted to 3.9 tCO_2e (2021: 6 tCO_2e), i.e. a 34% drop compared to 2021. As mentioned, these reductions are driven by the lifting of Covid-19 restrictions in 2022 and the subsequent increased return to the office by ESM employees.

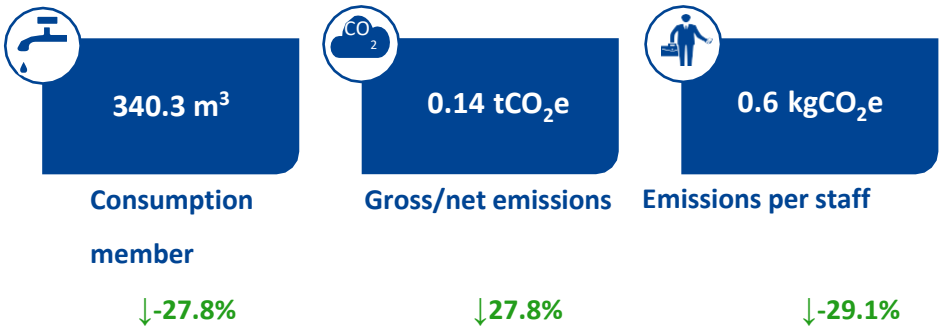
In line with the EcoAct Whitepaper methodology, the additional daily electricity consumption resulting

from an average teleworker was calculated based on an average "in use" power load per desk. This includes the power consumed for laptops, secondary screens, printers, and lighting. To calculate the emissions resulting from electricity use due to teleworking, the International Energy Agency electricity emission factors for Luxembourg and surrounding areas were factored in to allow for more accurate estimates. Additionally, the methodology estimates that an average working station consumes 140W for electricity and 10W for lighting during the eight hours of use per working day. With the additional daily energy consumption from home office equipment per teleworker derived, this figure was then multiplied by a country-specific electricity grid emission factor to calculate the average additional emissions per day per staff member when working from home. In addition, this was then multiplied by the number of days per year on average that staff worked from home.

2.3.2 Teleworking-related water emissions

- ***Estimated water consumption due to teleworking amounted to 340.3 m³ in 2022 (2021: 471.6 m³), i.e. a 27.8% reduction.***
- ***The resulting estimated emissions amounted to 0.14 tCo_2e in 2022 (2021: 0.2 tCo_2e), both on a gross and net basis. This represents a 27.8% drop.***
- ***They made up for 0.8% of total teleworking-related gross and net emissions (similar share as in 2021).***

Table 13
Evolution of teleworking water-related emissions



Source: ESM

The amount of water ESM staff consumed while teleworking in 2022 was estimated at 340.3 m³ (2021: 471.6 m³), i.e. a 27.8% decrease between 2021 and 2022. The resulting gross and net emissions amounted to 0.14 tCO_2e (2021: 0.2 tCO_2e), i.e. a 27.8% drop between 2021 and 2022.

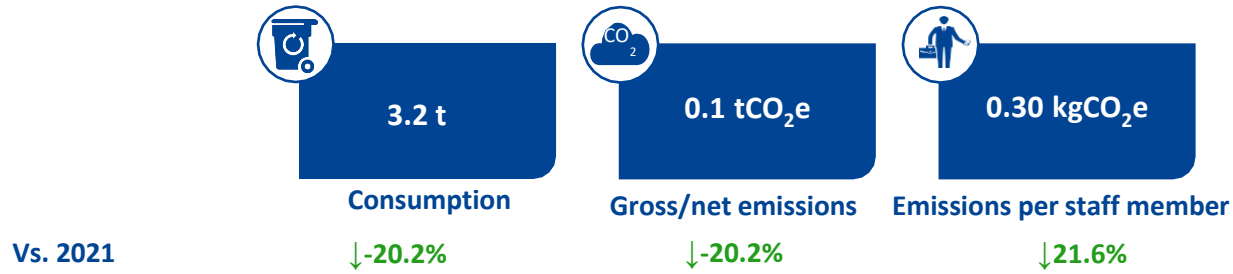
Water-related emissions arising from teleworking were estimated based on a publicly available study conducted by Phyn. The results of these studies were then complemented with official statistics, i.e. Eurostat and Statec.lu, regarding water consumption in Luxembourg and with specific conversion factors, to obtain an estimate of the emissions resulting from water use during teleworking days.

2.3.3 Teleworking-related waste emissions

- ***Estimated teleworking-related waste generation was estimated at 3.2 tonnes in 2022 (2021: 4 tonnes), i.e. a 20.2% reduction.***
- ***The resulting estimated emissions accounted for 0.4% of total teleworking-related gross and net emissions (the same result as 2021).***
- ***Waste-related emissions accounted for 0.4% of the teleworking-related gross/net emissions (2021: 0.4%).***

Table 14

Evolution of teleworking waste-related emissions



Source: ESM

The amount of waste generated by ESM staff during teleworking in 2022 was estimated at 3.2 tonnes(2021: 4 tonnes), representing a 20.2% drop. In line with the declining trend outlined for other teleworking emission categories, the resulting estimated emissions from teleworking waste also decreased to 0.07 tCO_2e in 2022 (2021: 0.08 tCO_2e), i.e. a 20.2% reduction.

The waste-related emissions coming from teleworking were estimated based on the publicly availableofficial statistics on waste generation, such as Eurostat and Statec.lu. These were then combined with specific emission factors to estimate waste-related emissions.

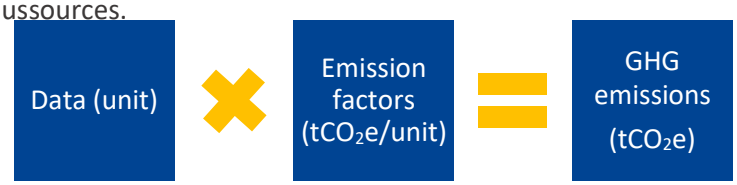
3 Annexes

Annex 1: Emission sources and activity data

Scope	Source of GHG emissions	Units	Measurement
Mobility-related emissions sources			
Scope 1	ESM-leased vehicles	km	Annual by vehicle
Scope 3	Business travel – Air	km	By flight leg including class and distance
	Business travel – Rail	km	By journey
	Staff commuting	km	By share of cars per fuel type in use in Luxembourg
			Through parking badging information
			By average daily distance travelled by ESM staff to home address By number of business days
Building-related emissions sources			
Scope 1	Fugitive emissions	n. of items	Annual
Scope 2	Purchased electricity	kWh	Monthly
	Purchased heating	kWh	Annual/monthly
Scope 3	Building – Paper	sheets of paper	Annual, by paper size and weight
	Building – Water	m^3	Annual
	Building – Waste	tonnes	Annual, by waste type and volume
	Electronic equipment	weight of items	Annual
Estimated teleworking-related emissions sources			
Scope 3	Teleworking – Electricity	kWh	Annual, by estimates on EcoAct Whitepaper methodology and ESM badging system
	Teleworking – Heating	kWh	Annual, by estimates on EcoAct Whitepaper methodology and ESM badging system
	Teleworking – Water	m^3	Annual, by estimates on national statistics and ESM badging system
	Teleworking – Waste	tonnes	Annual, by estimates on national statistics and ESM badging system

Annex 2: Calculation methodology

The absolute GHG emissions from ESM internal operations were calculated by applying the emission factors to the respective activity data, and subsequently aggregating the GHG emissions from varioussources.



Annex 3: Emission factors

The emission factors are representative values expressing the GHG emission intensity of an activity. They enable the estimation of emissions from various sources.

Scope	Source of GHG emissions	Emission factors	Unit	Source of emission factors	Variation since 2021
Scope 1	ESM-leased cars	0,20296	kg CO2e per km per type of car	Defra 2022 - Passengers vehicles - Cars (by market segment) - Dual purpose 4*4 - Diesel	-0,4%
		0,21243	kg CO2e per km per type of car	Defra 2022 - Passenger vehicles - Cars (by market segment) - Luxury - Diesel	0,3%
		0,17784	kg CO2e per km per type of car	Defra 2022 - Passenger vehicles - Cars (by market segment) - MPV (Multi Purpose Vehicle) -Diesel	1,6%
		0,07471	kg CO2e per km per type of car	Defra 2022 - Passenger vehicles - Cars (by market segment) - Dual purpose 4*4 - Plug-in Hybrid	-2,8%
	R134a refrigerant emission factor	1430	kgCO2e per unit	US EPA 2014	/
Scope 2	Electricity	0,0989	kg CO2e/kWh	IEA 2022 - Luxembourg	-9,9%
	Heating - gas	0,18254	kg CO2e/kWh	Defra 2022 - Fuels - Gaseous fuels - Natural gas	-0,3%
Scope 3	Business travel – air	0,15102	kg CO2e per km per passenger	Defra 2022 - Business travel - Air - Economy Short Haul	0,0%
		0,14787	kg CO2e per km per passenger	Defra 2022 - Business travel - Air - Economy Long Haul	0,0%
		0,22652	kg CO2e per km per passenger	Defra 2022 - Business travel - Air - Business Short Haul	0,0%
		0,42882	kg CO2e per km per passenger	Defra 2022 - Business travel - Air - Business Long Haul	0,0%
	Business travel – rail	0,00446	kgCO2e per km per passenger	Defra 2022 - Business travel - Rail - International rail	0,0%
	Equipment	24.865,95	kgCO2e per t of electrical item	Defra 2022 - Material use - Electriccal items - IT	/
	Staff commute	0,17048	kg CO2e per km per type of car	Defra 2022 - Passenger vehicles - Cars (by size) - Average car - Petrol	-2,2%
		0,17082	kg CO2e per km per type of car	Defra 2022 - Passenger vehicles - Cars (by market segment) - Average car - Diesel	1,4%
		0,12004	kg CO2e per km per type of car	Defra 2022 - Passenger vehicles - Cars (by size) - average car - Hybrid	0,4%
		0,0684	kg CO2e per km per type of car	Defra 2022 - Passenger vehicles - Cars (by size) - average car- Plug-in Hybrid Electric Vehicle	-3,7%
		0	kg CO2e per km per type of car	Defra 2022 - Passenger vehicles - Cars (by size) - average car- Battery Electric Vehicle	0,0%
		0,17148	kg CO2e per km per type of car	Defra 2022 - Passenger vehicles - Cars (by size) - average car- Unknown	0,0%
	Water consumption	0,421	kgCO2e per m3	Defra 2022 - Water supply - kg CO2e per cubic meter + Defra 2022 - Water treatment - kg CO2e per cubic meter	0,0%
	Waste produced	21,294	kgCO2e per tonnes	Defra 2022 - Waste disposal - Refuse - Household residual waste - Open-loop	0,0%
		2967	kgCO2e per tonnes	Bilan GES - Déchets Plastique PS (Polystyrene waste)	0,0%
		880	kgCO2e per tonnes	Bilan GES - Déchets Plastique Moyen (Plastic waste (big bags)	0,0%
		21,28019	kgCO2e per tonnes	Defra 2022 - Waste disposal - Bulky Waste	-0,1%
	Paper consumption	919,396	kgCO2e per tonnes	Defra 2022 - Material used - Paper-Paper and board: paper	0,0%

Annex 4: Data quality and completeness

Scope	Source of GHG emissions	Activity	Data quality	Underlying assumptions
		Mobility-related data quality		
Scope 1	ESM-leased vehicles	Inferred from km per vehicles		
Scope 3	Business travel – Air	Primary data		
	Business travel – Rail	Primary data		
	Staff commuting	Inferred from number ofbusiness days and parking and desk reservation[23] occupational rate, average distance travelled, and staff residential address		Share of cars per fuel type in use in Luxembourg in thegiven year, based on Statec information. Parking occupancy rate registered by the ESM Employee Badge System (parking)
		Building-related data quality		
Scope 1	Fugitive emissions	Primary data		No new refrigeration equipment was installed nor disposed of in 2022
Scope 2	Purchased electricity	Primary data		MWh of electricity consumed
	Purchased heating	Primary data		MWh of heating consumed
Scope 3	Paper	Primary data		Number of sheets printed
	Water	Primary data		m^3 of water consumed
	Waste	Primary data		t of waste generated
	Electronic equipment	Primary data		n. of items used
		Estimated Teleworking-related data quality		
	Teleworking - Heating	Average heating and estimated hours spent teleworking office		Estimates based on EcoAct Whitepaper methodologyand ESM badging system
	Teleworking - Electricity	Average “in use” power load per desk and estimated hours spent teleworking		Estimates based on EcoAct Whitepaper methodologyand ESM badging system
	Teleworking - Water	National statistics (Eurostat and Statec) andestimated hours spent teleworking		Estimates based on national statistics on daily consumption and ESM badging system
	Teleworking - Waste	National statistics (Eurostat and Statec) andestimated hours spent teleworking		Estimates based on national statistics on daily consumption and ESM badging system
	Teleworking - Heating	Average heating and estimated hours spent teleworking office		Estimates based on EcoAct Whitepaper[26] methodology and ESM badging system

Priority for improvement Could be improved No change required

Annex 5: Exclusions

The ESM's carbon footprint covers the institution's operations within the building, mobility, and

telework, but excludes the impact on its funding, investment portfolios, and lending activities.

Furthermore, due to limited data availability or use, this report does not include emissions resulting from data centres, online meetings, the ESM office located in Brussels, or the disaster recovery site. The impact of these elements is expected to be non-material. Nevertheless, additional efforts will be made in subsequent reporting years to better understand their respective emissions contribution.

The ESM used the number of permanent staff members to calculate certain ratios. In some instances,adding the trainees, consultants, and contractors could have resulted in lower ratios (e.g. for paper and water consumption and waste disposal). It was, however, decided to follow a more conservativeapproach and only use the number of ESM permanent staff members to ensure consistency.

Paper consumption for teleworking was not covered in the emissions calculations, considering that the increase of paper consumption due to teleworking was estimated as non-material. The report also does not take account of those teleworking emissions related to electricity covering potential additional electricity consumption from small home appliances as these were deemed non-material.