

2021

CARBON FOOTPRINT REPORT

EUROPEAN STABILITY MECHANISM

August 2022



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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.

This 2022 publication is the fourth in a continuing series. The report provides a comprehensive account of the ESM's carbon footprint arising from its operations in Luxembourg City, covering the full year of 2021. It also compares the 2021 performance against previous years as well as its 2018 baseline year performance.

As in previous years, carbon footprint estimates are based on an extensive review of internal and external documentation and activity data, as well as exchanges with external data providers. The report is prepared in accordance with the *International Greenhouse Gas Protocol – a Corporate Accounting and Reporting Standard*. Furthermore, teleworking emissions were estimated following best practices as set out by EcoAct in their *2020 Homeworking emissions Whitepaper*,¹ as done in the 2020 report.

The calculations are performed with the assistance of KPMG Luxembourg Société Anonyme. KPMG N.V. Netherlands conducted an additional review of the calculations and assumptions, following the four-eyes principle.

The ESM is committed to producing a carbon footprint report on an annual basis to monitor its progress in decreasing its carbon footprint. In the spirit of transparency, the report is made available to the public.

In line with the 2020 Carbon Footprint Report, the present report also takes into account teleworking-related emissions linked to prolonged Covid-19 restrictions in 2021, based on estimates.

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 greenhouse gas emissions in 2020 and a further modest decrease in 2021.

¹ [Homeworking Emissions Whitepaper 2020.pdf \(eco-act.com\)](#)

Covid-19 containment measures continued to affect the ESM's business operations throughout 2021, leading for example to a significant decline in business travel. Furthermore, as of 16 March 2020, the ESM introduced social distancing measures within its premises that remained in place during 2021. Although the ESM largely maintained energy requirements for the ESM premises to keep the building operational and available to a reduced number of staff members, occupancy was restricted with teleworking continuing to be the default approach for most of 2021. The ESM expects greenhouse gas emissions to rise again in 2022 in line with the relaxation of Covid-19 measures and corresponding return to office presence and pre-pandemic practices.

The ESM is, however, committed to monitoring the emission sources related to these new working patterns and to finding solutions to mitigate them. To effectively understand the impact of teleworking, the ESM added to this report a separate chapter with estimates on teleworking-related emissions and a section further analysing and contextualising the impact of teleworking on gross and net emissions (Chapter 2.3).

Overall 2021 carbon footprint performance

As part of its effort to protect the environment, the ESM continued implementing measures aimed at strengthening its environmental practices and commitments.

For example, in line with the Zero Single-Use Plastic Manifesto signed in 2019, the ESM advanced in its pledge to eliminate single-use plastics by substituting disposable plastic items and utensils in the canteen, kitchenettes, and vending machines with sustainable alternatives. Steps have also been taken to reduce paper and water consumption, including a full replacement of paper towel dispensers with recycled materials, and the introduction of contactless taps and hand-towel dispensers as well as waterless bathroom devices.

To ensure technology equipment is used to its full capacity, and to reduce consumption and waste, the ESM held its annual staff charity auction of decommissioned information technology (IT) equipment. Under the guidance of the ESM's 'Making a Difference' values group, the proceeds from the 2021 auction were donated to various charitable causes.

Additionally, to further the reduction in mobility-related carbon emissions, the ESM Travel Policy has been revised to encourage staff to consider the environmental impact of their work-related travel. To facilitate this process, information on estimated carbon emissions will be systematically made available to ESM staff when choosing travel options. The ESM is also working to reduce its digital carbon footprint through the migration from physical data servers to cloud storage spaces.

In 2021, the ESM continued to exchange information and ideas on sustainability and environmental best practices with peer institutions through the EcoNet 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 and is therefore considering climate change issues in a broader context, beyond corporate efforts. In this spirit, the ESM joined the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) as an observer at the beginning of 2022. 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 Platform on Sustainable Finance as an observer, and as a member in the International Capital Market Association's Social Bond Working Group.

Table 1
ESM carbon footprint evolution, 2018–2021
 (gross and net)

	2018 (baseline)	2020	2021	Net variation vs. 2020	Variation vs. baseline
Total gross emissions (tCO ₂ e)	1,176.6	310.9	288.9	↓ 7%	↓ 73.5%
Total net emissions (tCO ₂ e)	1,084.1	260.0	247.3	↓ 4.9%	↓ 75.6%
Staff	179.0	203.0	221.0	↑ 8.9%	↑ 23.5%
Carbon intensity (Net tCO ₂ e/staff member)	6.1	1.3	1.1	↓ 12.6%	↓ 79.7%

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 greenhouse gas (GHG) emissions for 2021 amounted 288.9 metric tonnes (t) of CO₂e² (tCO₂e) on a gross basis and 247.3 tCO₂e on a net basis,³ which represents an overall emission decrease of 7% on a gross basis and 4.9% on a net basis with respect to 2020. ESM staff numbers increased by 8.9% during this period. The decline in the GHG emissions from 2021 is linked both to the reduction in building-related emissions – by 9.4% on a gross basis and 5.4% on a net basis – and in mobility-related emissions – by 9.6% on a gross/net basis. By contrast, GHG emissions related to teleworking increased by 31.2% on a gross and net basis as a result of the continued Covid-19 containment measures that required staff to work from home for extended periods of time.

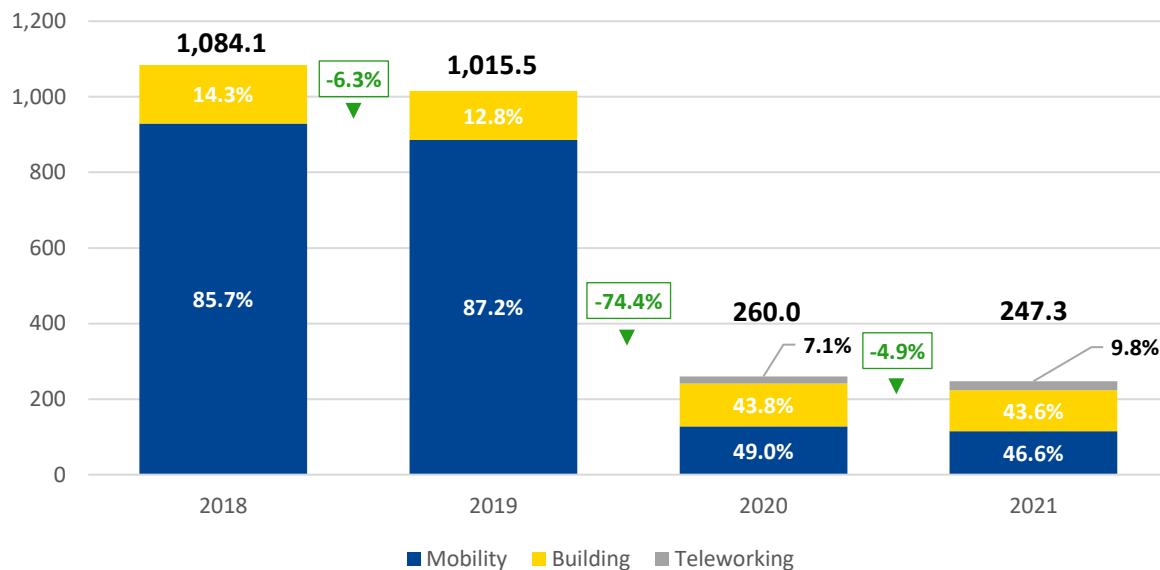
In 2021, 39.9% of gross emissions were related to staff mobility (2020: 41%), while 51.7% (2020: 53%) stemmed from building use. On a net basis, mobility-related emissions accounted for 46.6% of total net emissions (2020: 49%), while building-related emissions accounted for 43.6% (2020: 43.9%). Estimated GHG emissions deriving from teleworking accounted for 8.4% of total gross emissions (2020: 6%) and 9.8% of total net emissions (2020: 7.1%).⁴

² CO₂e 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 CO₂e.

³ 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.

⁴ Differently from 2020, the office occupancy rate adopted for calculating the teleworking emissions relied on the data collected through the ESM badging system instead of the data collected through the desk reservation app as done in 2020. Please refer to chapter 2.3. for further details on the methodology applied.

Figure 1
ESM emissions evolution, 2018–2021
 (net tCO_{2e})



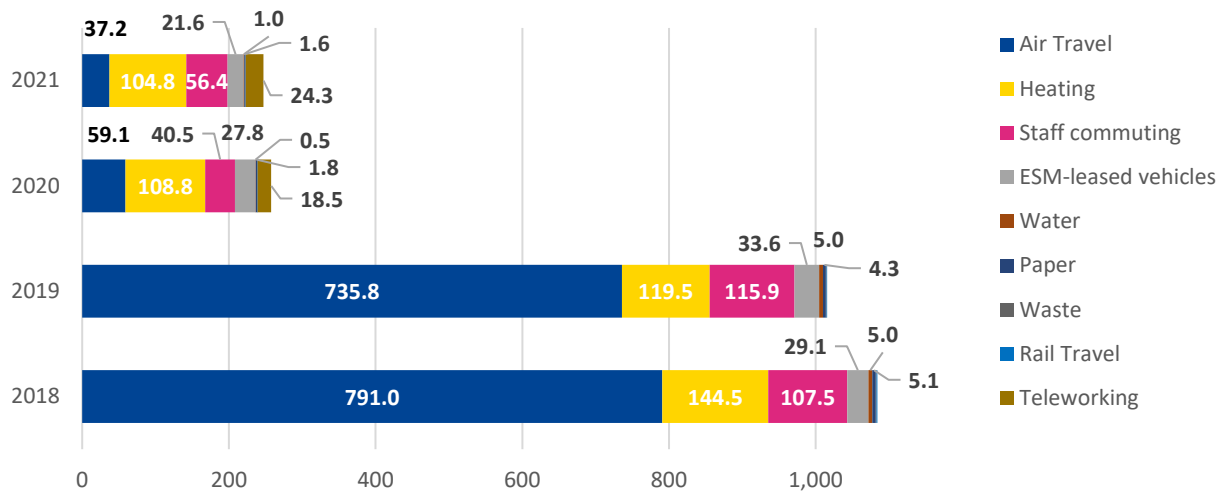
Source: ESM

In 2021, the main contributions to net emissions were again linked to staff mobility, which included both business travel and staff commutes to work. For the first time in 2021, emissions related to staff commute took over the largest share of mobility-related emissions, overtaking air travel emissions. Staff commute accounted for 22.8% of total net emissions (2020: 15.6%) while air travel-related emissions amounted to 15% of total net emissions (2020: 22.7%).

Other mobility-related activities represented a smaller share of total net emissions. The use of ESM-leased vehicles in 2021 amounted to 8.7% of total net emissions (2020: 10.7%), while emissions related to business travel by train were less than 1% (2020: less than 1%) of total emissions, both on a net and gross basis.

As far as building-related emissions were concerned, the heating of the ESM premises was the main contributor of total emissions, amounting to 36.3% of total emissions on a gross basis (2020: 35%) and 42.4% on net basis (2020: 41.9%). Electricity-related emissions accounted for 14.4% of total ESM emissions on a gross basis (2020: 16.4%), but for 0% on a net basis since the ESM continued to purchase electricity entirely from renewable sources as in previous years. Other sources of emissions such as paper and water consumption and waste production represented a far smaller share of the ESM carbon footprint: collectively producing 1.2% of total gross and net emissions (2020: 1.7% gross and 2% net).

Figure 2
Evolution of the breakdown of net emissions by source, 2018–2021
 (tCO₂e)



Source: ESM

1 Methodology

1.1 Methodology used to calculate ESM's carbon footprint

The ESM reports its GHG emissions in accordance with the *International Greenhouse Gas Protocol – a Corporate Accounting and Reporting Standard*⁵ revised edition.

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 accounting, reporting, and quantifying of GHG emissions.

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

Emission estimates in relation to teleworking were not based on activity data but rather estimated according to the following methodology and assumptions. Teleworking-related heating and electricity emissions were estimated based on the methodology and assumptions set out by EcoAct in their *2020 Homeworking emissions Whitepaper*. Teleworking-related water and waste emissions were estimated through publicly available data from official statistics⁶ such as Eurostat and Statec.lu.

In addition, emission factors for Luxembourg and surrounding areas were leveraged, where appropriate, to achieve more precise estimates (see Chapter 1.4)

The present report uses the terms “carbon footprint”, and “GHG emissions” synonymously and interchangeably as they refer to the GHG inventory of the ESM.

The calculations are performed with the assistance of KPMG Luxembourg Société Anonyme and KPMG N.V. Netherlands conducted an additional review of the calculations and assumptions, following the four-eyes principle. As per reporting best practice, two emission totals are disclosed – gross emissions

⁵ World Business Council for Sustainable Development & World Resources Institute, *The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard*, revised edition, 2004.

⁶ Publicly available data from Statec.lu was used for the estimations of emissions stemming from staff teleworking in Luxembourg. For the estimations of emissions stemming from staff teleworking in France, Belgium, and Germany, publicly available data from Eurostat was used.

and net emissions.

- “Net” emissions classify consumption from renewable energy or purchased services that are directly offset as zero emissions and are considered carbon neutral.
- “Gross” emissions include emissions from these sources, calculated on the basis of national averages.

1.2 Reporting period

The reporting period covers 1 January 2021 to 31 December 2021. Regarding the analysis of trends, the baseline year is set at 2018 given that 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, the first step in a carbon footprint assessment is for an organisation to select one of two approaches for consolidating GHG emissions, by defining the **organisational boundaries** for reporting purposes. Given that organisations can be set up as various legal entities, they can exercise different types and degrees of control over their operations.

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

1. the reporting entities can choose to report either the emissions from operations over which they have financial or operational control (control approach); or
2. the emissions from operations according to their share of equity within the operation (equity share approach).

For its carbon footprint report, the ESM uses the operational control approach. Under this approach, the ESM accounts for the GHG emissions of the operations over which it has operational control (see Figure 3). This covers ESM operations in Luxembourg City. The office space in Brussels and the disaster recovery site in Luxembourg are excluded; the impact of these facilities is expected to be non-material given their relatively small size and infrequent use. For further information on the report’s exclusions, please see Annex 5.

For the calculation of certain ratios, the ESM factors in the number of permanent staff members employed in 2021 – an average of 221 persons⁷ (2020: 203). In 2021, the office space rented by the ESM increased slightly by 1.3% in December 2021 to 8495,38m² (2020: 8381,54m²).

For the calculations of 2021 teleworking-related emissions, the ESM relied on a daily average office occupancy rate calculated using the data collected through the ESM badging system. The 2021 calculation methodology represents a slight deviation from the previous year, as in 2020 this rate relied on the data obtained from the ESM desk reservation application. The change in calculation methodology is due to the higher reliability of ESM badging system as source of office occupancy data for the year 2021 given that mandatory usage of the desk reservation application was only in place in the context of pandemic sanitary protocols with view to social distancing. The teleworking emissions results between 2020 and 2021 may therefore be slightly affected by the adoption of different calculation methodologies between the two years. As such, the daily average office occupancy rate in 2021 increased to 28.14% from 19.88% in 2020.

According to the International GHG Protocol, the second step consists of setting up **operational boundaries** to distinguish between direct and indirect emissions. Direct emissions are defined as emissions originating from sources owned or controlled by the reporting entity. Indirect emissions are generated as a consequence of the reporting entities' activities but originate from sources owned or controlled by another entity.

The direct and indirect emissions are split into three scopes:

- **Scope 1:** All direct GHG emissions from sources that are owned or controlled by the reporting entities;
- **Scope 2:** Indirect GHG emissions from the purchase of electricity, heat, steam, or cooling; and
- **Scope 3:** Other indirect emissions.

The International GHG Protocol requires entities to report a minimum of Scope 1 and 2 emissions, while reporting on Scope 3 emissions is optional.

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

- **Scope 1:** ESM-leased vehicles;
- **Scope 2:** Electricity and heating purchased for the ESM premises; and

⁷ Please note that the number of staff members relies on a conservative approach in the calculation of per staff emissions, as this number does not include temporary staff, interns, and other persons working from the ESM premises on a temporary basis.

- **Scope 3:** Business travel of ESM staff, commuting of staff to work, paper and water consumption, waste generated at ESM premises, and teleworking-related emissions.

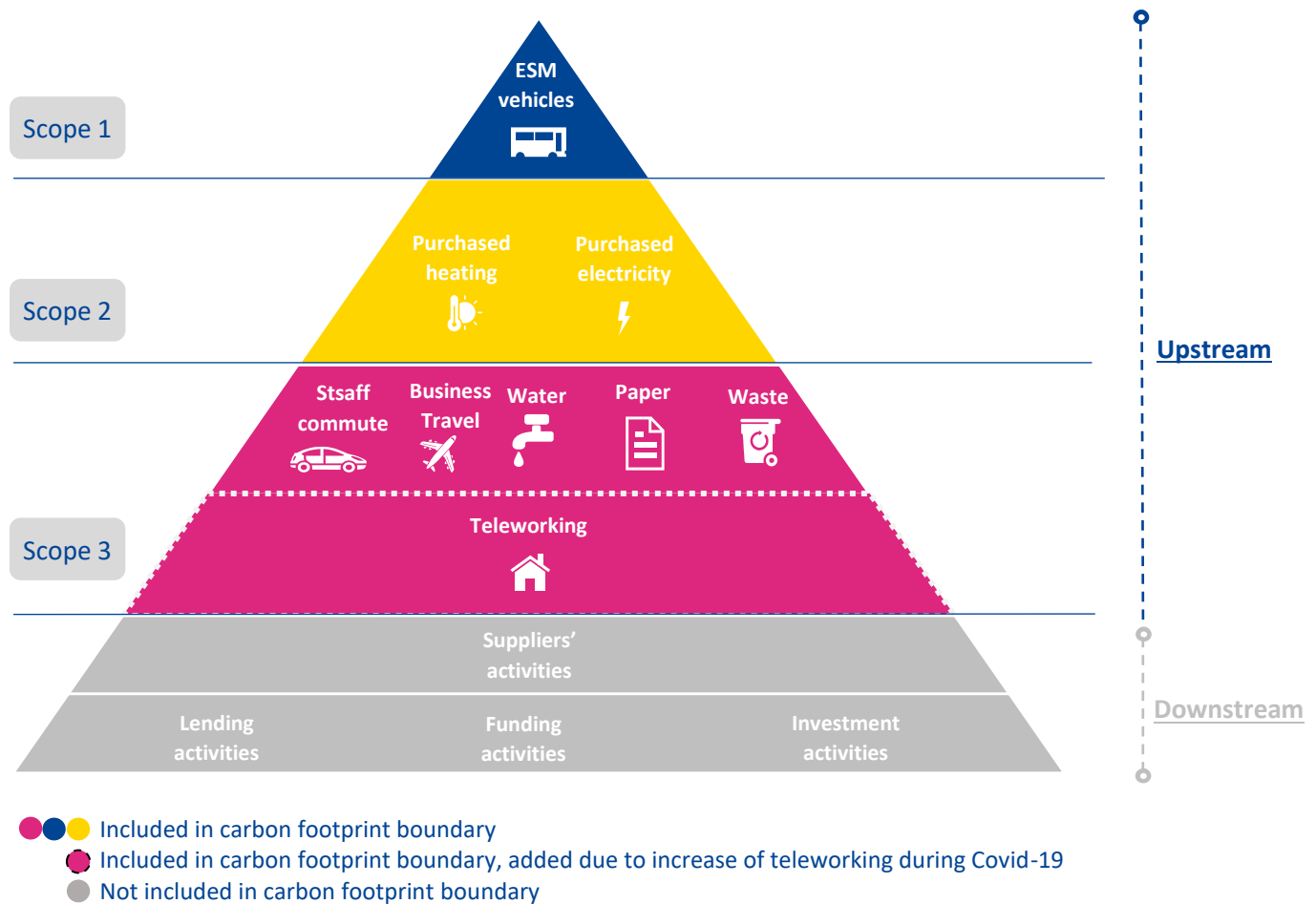
In light of the teleworking environment, and in line with the above definition of Scope 3 elements, the ESM continued to report the below Scope 3 activities following the 2020 methodology to ensure reliability of information and comparability of results.

- Estimated teleworking-related emissions: Teleworking estimates include the incremental increase in electricity, heating, and water consumed, and waste produced by ESM staff while working from home. Teleworking-related heating and electricity were introduced according to the EcoAct Whitepaper methodology. Teleworking-related water and waste emissions were estimated based on national statistics (Statec.lu and Eurostat) to substantiate the underlying assumptions of the estimates.
- Furthermore, with the objective of having a more precise breakdown of emission sources related to waste, hazardous waste generated at ESM premises was added to Scope 3 starting in 2020.

The GHG emissions sources are also categorised from the life cycle perspective into: upstream emissions (resulting from the processing and production of a product up to the point of sale), or downstream emissions (occurring after the sale of a product, through its distribution, storage, use, and end-of-life). From a value-chain perspective and by transposing this logic to the nature of ESM activities, the emissions the ESM considers to be in scope are all upstream. Currently, the institution does not assess the carbon footprint of its lending, funding or investment activities, given the complexities of retrieving this data. See Figure 3 for a diagram of which ESM activities are included in the 2021 ESM carbon footprint report.

Figure 3

Breakdown of sources of emissions by Scope



Source: ESM

1.4 Data collection and calculation

To estimate GHG emissions, organisations need to collect data that quantifies activities resulting in GHG emissions. Such activity data can, for instance, include kilowatt-hours of electricity consumed or kilometres travelled by staff.

For the purposes of this report, the emission factors are derived from established sources, such as the UK government’s Department for Environment, Food & Rural Affairs (Defra), the French Agency for Ecological Transition (Ademe), and the International Energy Agency.⁸

For most of the report is calculated using primary activity data, interpreting it in light of documented

⁸ Refer to Annex 3 for further information on emission factors.

evidence, such as energy or heating invoices. However, distance travelled by staff commuting to work and resulting emissions are estimated based on several underlying assumptions, such as the type of car or fuel used, as described in Annex 4. This information helps to determine which emission factor to apply to convert the activity data into GHG emissions.

The ESM estimated teleworking-related emissions for electricity and heating by following the methodology developed by the EcoAct *Homeworking emissions Whitepaper*. For emissions related to water consumption and waste production from teleworking, the ESM used national and European statistics (Statec and Eurostat) to substantiate the underlying assumptions of the estimates. To ensure comparability and consistency between the ESM's teleworking and building-related emissions, the same methodology was used (i.e., the same emission factors).

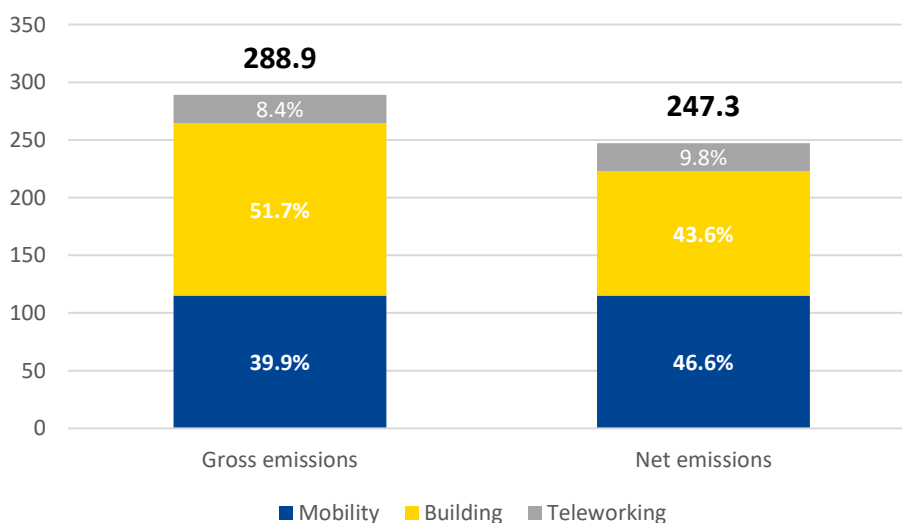
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Carbon footprint results

- *Total GHG emissions generated by the ESM in 2021 amounted to 288.9 tCO₂e on a gross basis (2020: 310.9 tCO₂e) and 247.3 tCO₂e on a net basis (2020: 260 tCO₂e).*
- *These results represented a decrease of 7% on a gross basis and of 4.9% on a net basis compared to 2020. Compared to the baseline year (2018), they represent a decrease of 73.5% on a gross basis and of 75.6% on a net basis.*
- *The stark decrease in emissions during 2021 compared to 2018 can mostly be attributed to the Covid-19 pandemic, which significantly altered ESM operations.*

The analysis of emissions sources brought to light that, since the pandemic, building-related emissions became the largest contributor to total emissions on a gross basis, while, on a net basis, mobility-related emissions remained higher. On a gross basis, building-related emissions amounted to 51.7% (2020: 53%) and mobility-related emissions to 39.9% (2020: 41%). On a net basis, mobility-related emissions accounted for 46.6% (2020: 49%) and building-related emissions for 43.6% (2020: 43.9%). Teleworking emissions accounted for the smallest share of emissions, with 8.4% (2020: 6%) of total gross emissions and 9.8% (2020: 7.1%) of total net emissions.

Figure 4
Total gross vs net emissions, 2021
 (gross/net tCO₂e)



Source: ESM

During 2021, the main emitting source was linked to heating, contributing to 104.8 tCO₂e or 42.4%

(2020: 41.9%) of total net emissions and 36.3% of total gross emissions (2020: 35%). This represented a 3.7% decrease compared to 2020 (2020: 108.8 tCO₂e).

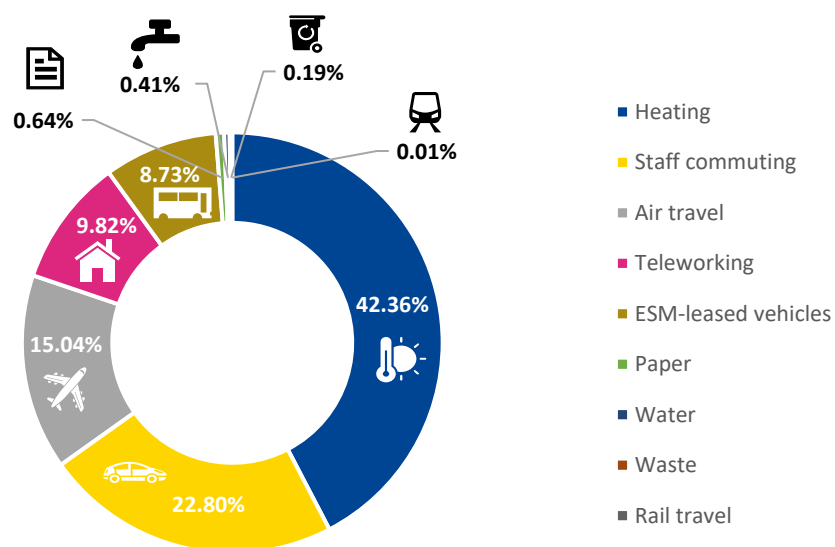
Staff commuting was the second largest contributor, representing 56.4 tCO₂e or 22.8% of total net emissions (2020: 40.5 tCO₂e; 15.6%); showing a 39.3% increase compared to 2020.

Business travel by air was the third largest emitting source, differently from the pre-pandemic years where it represented the main emitting activity. Air travel contributed to 37.2 tCO₂e or 15% of total net emissions. Air travel thus decreased by 37.1% with respect to 2020 (2020: 59.1 tCO₂e; 22.7%). This can be attributed to pandemic-related remote working patterns and restricted travel being maintained throughout 2021.

The electricity delivered to ESM premises is derived entirely from renewable sources and confirmed by a green Guarantee of Origin. Therefore, there are no net emissions linked to electricity.

Figure 5

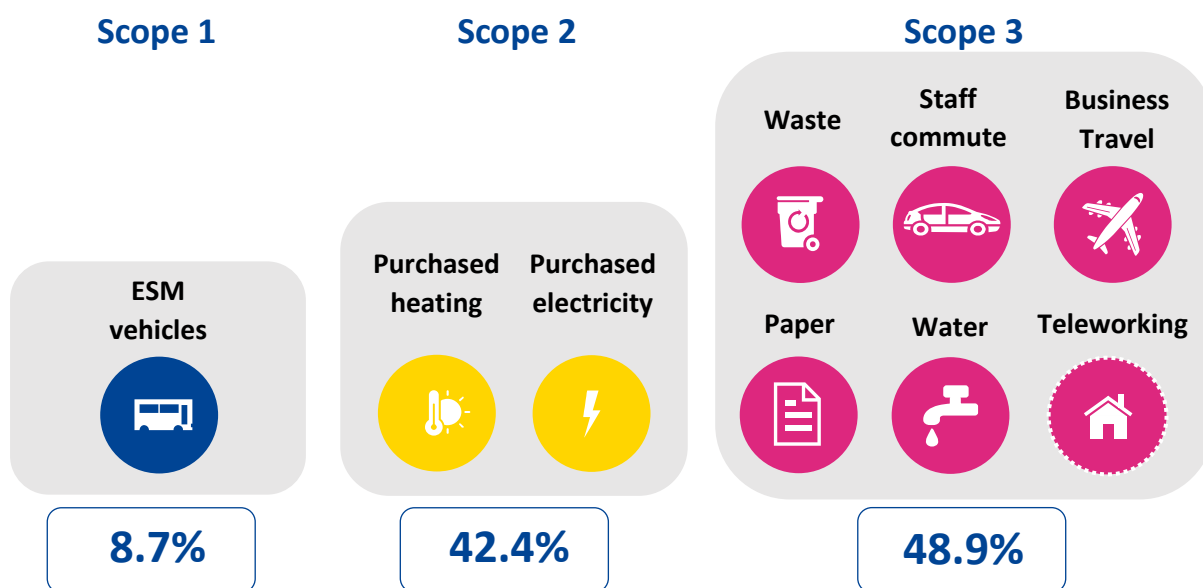
Percentage breakdown of net emissions by source, 2021
(tCO₂e)



Source: ESM

Looking at the breakdown between Scopes 1, 2, and 3 as defined by the International GHG Protocol, the ESM's 2021 carbon footprint results reveal that Scope 3 remained the largest with 48.9% of total net emissions (2020: 47.5%). Nevertheless, in relative terms, the share of Scope 3 emissions declined significantly compared with pre-pandemic years, from 85% in 2019 to less than 50% since 2020, reflecting the continuous shift in working and travel patterns due to the Covid-19 pandemic.

Figure 6
Breakdown of ESM emissions per Scope
 (net)



Source: ESM

2.1 Mobility-related emissions

- **Mobility-related emissions represented the largest share of the ESM carbon footprint in 2021 on a net basis.**
- **They amounted to 115.2 tCO₂e on a gross/net⁹ basis (2020: 127.5 tCO₂e), accounting for 39.9% of total gross emissions (2020: 41%) and 46.6% of total net emissions (2020: 49%).**
- **Mobility-related emissions decreased by 9.6% on a gross/net basis compared to 2020.**

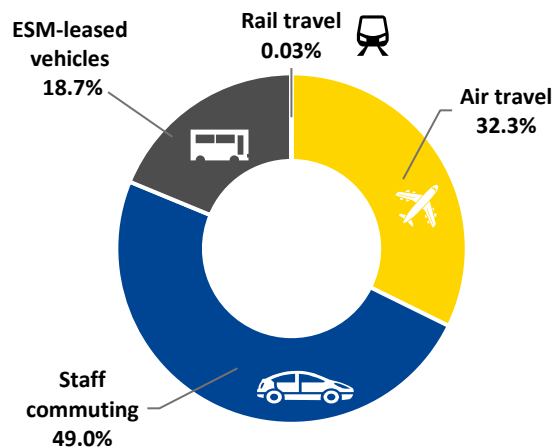
Unlike the pre-pandemic years, during which air travel accounted for most of the mobility-related emissions, in 2021 staff commute took over the biggest share of emissions linked to mobility. As a matter of fact, staff commuting contributed to 56.4 tCO₂e (2020: 40.5 tCO₂e) on a gross/net basis, representing 49% of total mobility-related gross/net emissions (2020: 31.8%).

Travel by air was the second largest mobility-related source of emissions, with 37.2 tCO₂e (2020: 59.1 tCO₂e) representing 32.3 % (2020: 46.4%) of total mobility-related gross/net emissions. The remaining share of mobility-related emissions was linked to the use of ESM-leased vehicles (including the ESM minivan used for group travel) with 21.6 tCO₂e, accounting for 18.7% of mobility gross/net emissions

⁹ "Net" emissions classify consumption from renewable energy or purchased services that were directly offset as zero emitting. Given that consumption of this nature took place with regard to mobility related emissions, the figures for gross and net emissions are identical for this category.

(2020: 21.8%). Emissions linked to business travel by rail were very limited in 2021, with 0.03 tCO₂e or 0.03% of gross/net emissions (2020: 0.1%).

Figure 7
Breakdown of mobility-related emissions by source, 2021
(gross/net tCO₂e)



Source: ESM

Since the Covid-19 outbreak in 2020, business travel has been severely restricted. However, given the nature of the ESM mandate, and despite the Covid-19 pandemic, air travel was conducted on limited occasions in line with national and international health and safety recommendations.

Ongoing efforts

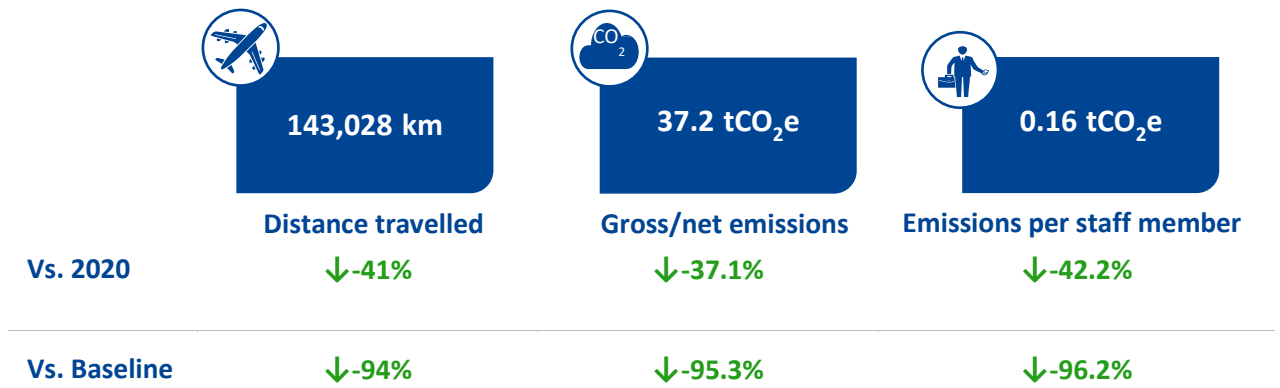
- Four electric car charging stations were made available at the ESM premises to encourage staff to utilise electric vehicles to commute to work.
- The ESM Travel Policy was being updated in 2021 and will encourage staff to consider the environmental impact of their business travel operations, and to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

2.1.1 Air travel

- Air travel accounted for 12.9% of the total gross emissions (2020: 19%) and 15% of the total net emissions (2020: 22.7%). Air travel also amounted to 32.3% of mobility-related emissions on a gross/net basis (2020: 46.4%).

- *Gross/net emissions resulting from air travel further decreased to 37.2 tCO₂e in 2021 from 59.1 tCO₂e in 2020, a reduction of 37.1% due to the limited business travel activity during the Covid-19 pandemic.*

Figure 8
Evolution of air travel related emissions

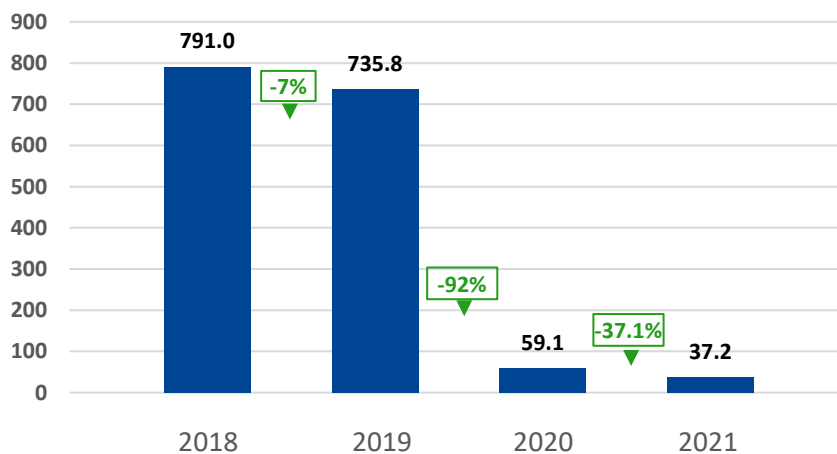


Source: ESM

Distance travelled by air amounted to around 143,028 kilometres, a 41% reduction from the 242,604 kilometres registered in 2020. The resulting emissions totalled 37.2 tCO₂e, or 0.16 tCO₂e per ESM staff member in 2021, i.e., a reduction of 37.1% of gross/net emissions compared to 2020 (2020: 59.1 tCO₂e). Overall, business travel by air reached 32.3% of gross/net mobility-related emissions (2020: 46.4%).

In 2021, the ESM maintained the same calculation methodology as used in previous years in which the emissions associated with each leg of an individual flight were calculated based on the fare class and distance travelled.

Figure 9
Evolution of air travel related emissions 2018–2021
(tCO₂, gross/net)

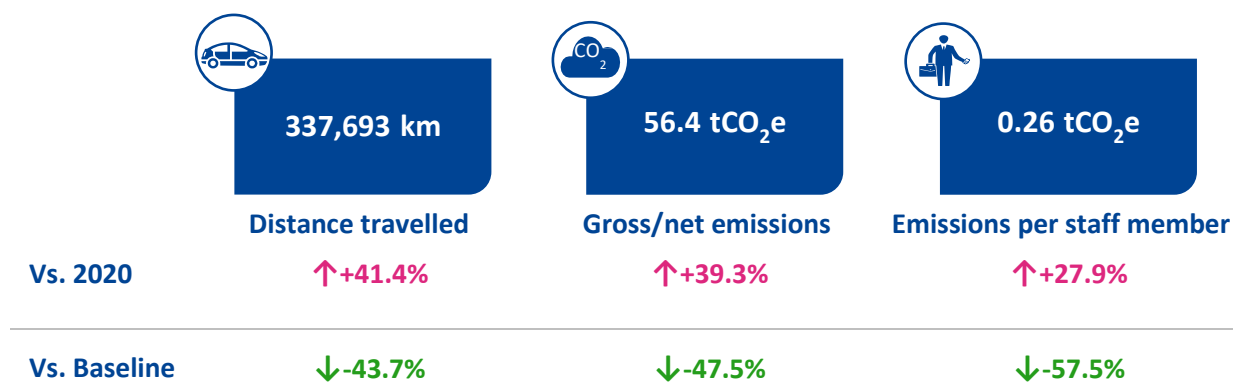


Source: ESM

2.1.2 Staff commuting

- Emissions resulting from staff commute amounted to 19.5% of total ESM gross emissions (2020: 13%) and to 22.8% of total net emissions (2020: 15.6%).
- Additionally, staff commuting totalled 49% of mobility-related emissions on a gross/net basis (2020: 31.8%).
- Gross/net emissions associated to staff commuting increased to 56.4 tCO₂e in 2021 from 40.5 tCO₂e in 2020, or by 39.3% due to a progressive return to office presence in line with national safety guidelines.

Figure 10
Evolution of staff commute related emissions



Source: ESM

For 2021, it is estimated that ESM staff commuted around 337,693 kilometres by car, a 41.4% increase from 238,742 kilometres in 2020. The resulting emissions totalled 56.4 tCO₂e (2020: 40.5 tCO₂e), leading to a 39.3% increase in related emissions compared to the previous year. This translates to 0.26 tCO₂e (2020: 0.2 tCO₂e) per staff member.

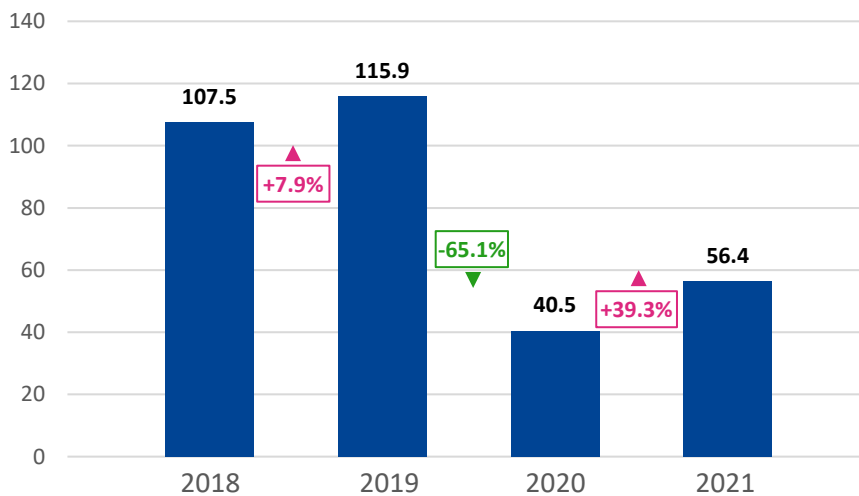
The increase in emissions is likely to be explained by staff members choosing to commute to office by car given the pandemic circumstances resulting in a ESM parking occupancy rate¹⁰ of 25% in 2021 compared to 19.3% in 2020; as well as an increase of distance travelled overall. ESM staff members commuted an average of 1,528 kilometres per staff member (2020: 1,176 km), representing an increase of 29.9% from the previous year.

The commute of ESM staff to work represented 49% of mobility-related emissions (2020: 31.8%).

¹⁰ 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.

Starting from 2019, the ESM consolidated its methodology for the calculation of emissions resulting from staff commute, relying on a conservative approach assuming that most staff members commute by car. As such, the distances from the respective home addresses to the office were calibrated together with information from the badging system of the ESM parking space and number of business days.¹¹ In addition, the ESM leveraged on national statistics on vehicles in use in Luxembourg, broken down by type of fuel used on average.

Figure 11
Evolution of staff commute related emissions 2018–2021
 (tCO₂, gross/net)



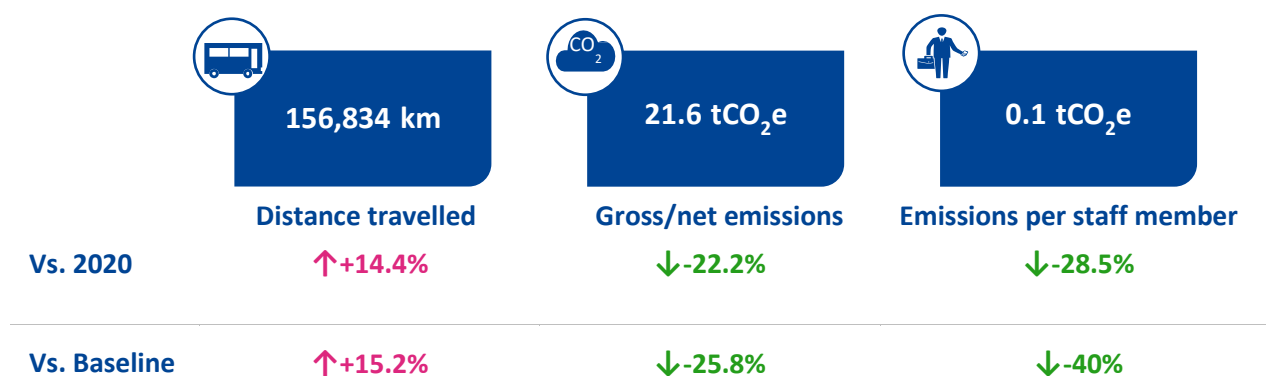
Source: ESM

2.1.3 ESM-leased vehicles

- *The emissions generated by ESM vehicles represented 7.5% of total ESM gross emissions (2020: 8.9%) and 8.7% of total net emissions (2020: 10.7%). ESM-leased vehicles represented 18.7% of mobility-related emissions on a gross/net basis (2020: 21.8%).*
- *Gross/net emissions resulting from the use of ESM-leased vehicles decreased to 21.6 tCO₂e in 2021 from 27.81 tCO₂e in 2020, declining by 22.2% since 2020.*

¹¹ 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.

Figure 12
Evolution of ESM-leased vehicles related emissions



Source: ESM

The ESM leased and operated eight vehicles¹² in 2021. This included a minivan used to drive staff members to business events in and outside of Luxembourg and four hybrid cars.

The aggregated distance travelled by ESM-leased vehicles in 2021 amounted to 156,834 kilometres, representing an increase of 14.4% compared to 2020 (2020: 137,132 kilometres).

In 2021, the emissions generated by the use of ESM-leased vehicles amounted to 21.6 tCO₂e, or 0.1 tCO₂e per staff member, a 22.2% decrease compared to the previous year (2020: 27.8 tCO₂e).

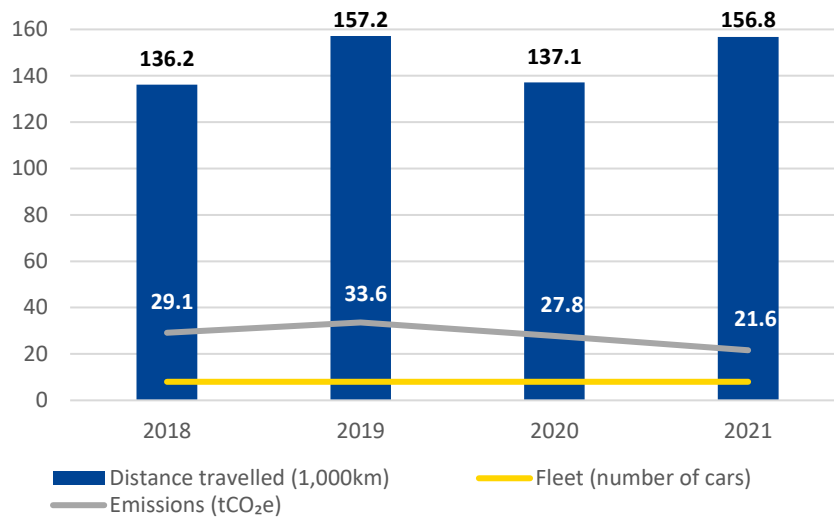
Opportunities to introduce environmentally friendly alternatives are continuously assessed by the ESM, taking into account market developments. The emissions associated with the use of ESM-leased vehicles continued to decrease from 2019 onwards despite fluctuations in the distance travelled. This is explained by changes in the composition of the car fleet: in 2020 two hybrid cars were introduced to the fleet, with two more in 2021.

In 2021, 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 appropriate emission factor for the car's type of fuel to obtain the total CO₂ equivalent for the year.

¹² During 2020, ESM changed its car leasing provider, however the total amount of leased cars remained at a total of eight during the entire year.

Figure 13

Evolution of ESM-leased vehicles related emissions, 2018–2021



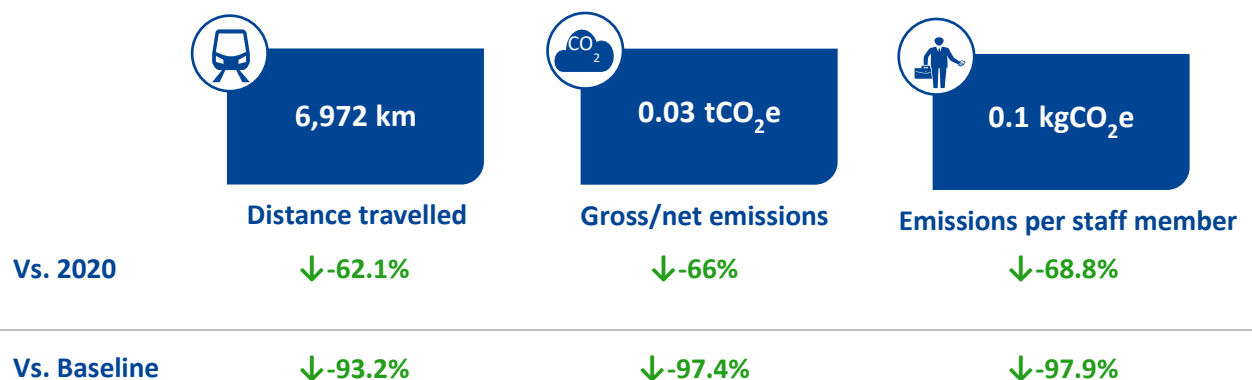
Source: ESM

2.1.4 Rail travel

- *ESM business travel by rail represented less than 1% of total ESM gross/net emissions (2020: less than 1%) and less than 1% of mobility-related emissions (2020: less than 1%).*
- *Gross/net emissions generated by rail travel decreased to 0.03 tCO₂e in 2021 from 0.09 tCO₂e in 2020 – a 66% drop compared to 2020.*

Figure 14

Evolution of rail travel related emissions



Source: ESM

Business travel by rail represented a marginal share (less than 0.1%) of staff mobility in 2021 (2020: less than 0.1%). In 2021, the total distance travelled by train experienced a 62.1% decrease compared to 2020 (2020: 18,411 kilometres). The associated emissions dropped by 66% from 2020 to 0.03 tCO₂e

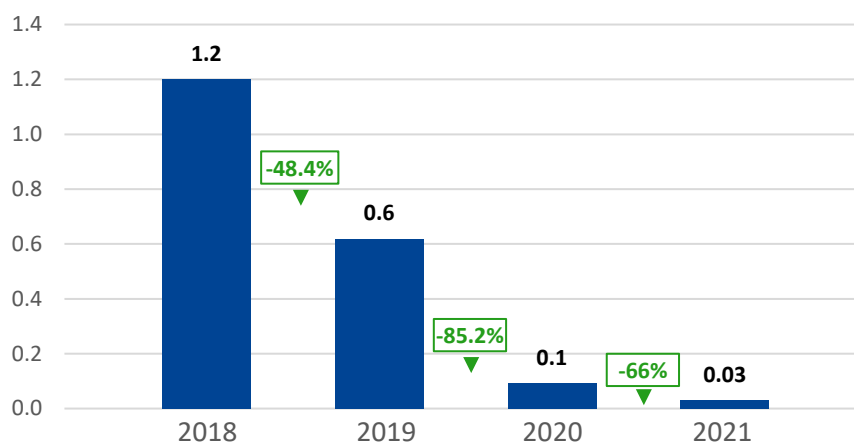
(2020: 0.09 tCO₂e), or 0.1 kgCO₂e, per staff member. The reduced use of trains for business travel can be explained by the pandemic-related travel restrictions, however historically ESM staff could not effectively leverage on rail travel because of the limitations of the rail connections in Luxembourg.

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 15

Evolution of rail travel related emissions 2018–2021

(tCO₂, gross/net)



Source: ESM

2.2 Building-related emissions

- *Building-related emissions amounted to 149.5 tCO₂e on a gross basis (2020: 164.9 tCO₂e) and 107.8 tCO₂e on a net basis in 2021 (2020: 114 tCO₂e).*
- *This represented 51.7% of total ESM carbon footprint emissions on a gross basis (2020: 53%) and 43.6% on a net basis (2020: 43.9%).*
- *Gross/net building-related emissions decreased by 9.4% and 5.4% respectively, compared to 2020.*

Figure 16
Breakdown of building-related emissions, 2021
 (gross tCO₂e)

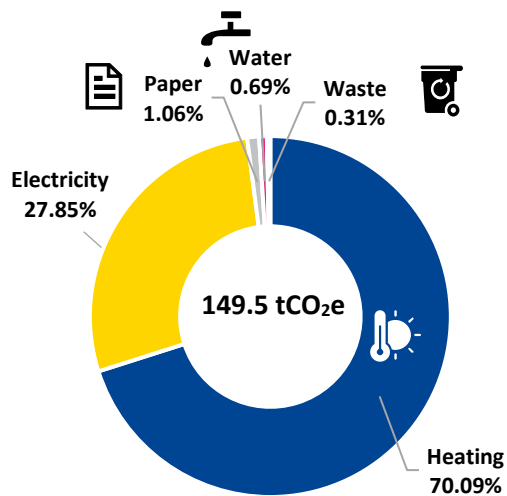
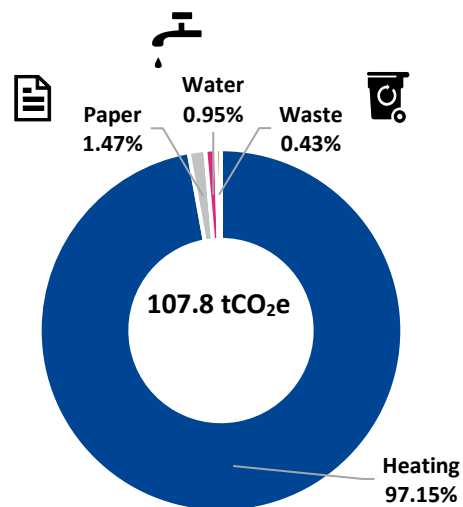


Figure 17
Breakdown of building-related emissions, 2021
 (net tCO₂e)



Source: ESM

In 2021 heating remained the main source of building-related emissions, contributing 70.1% of total gross building-related emissions (2020: 66%) and 97.1% of total net building-related emissions (2020: 95.5%).

On a gross basis, electricity represented the second largest source of building-related emissions with a share of 27.9% (2020: 30.9%). However, since the ESM purchased 100% of its electricity from renewable energy sources (hydropower) covered by green Guarantees of Origin, electricity consumption was reported as zero emissions on a net basis. Electricity-related emissions are the differentiator between gross and net emissions.

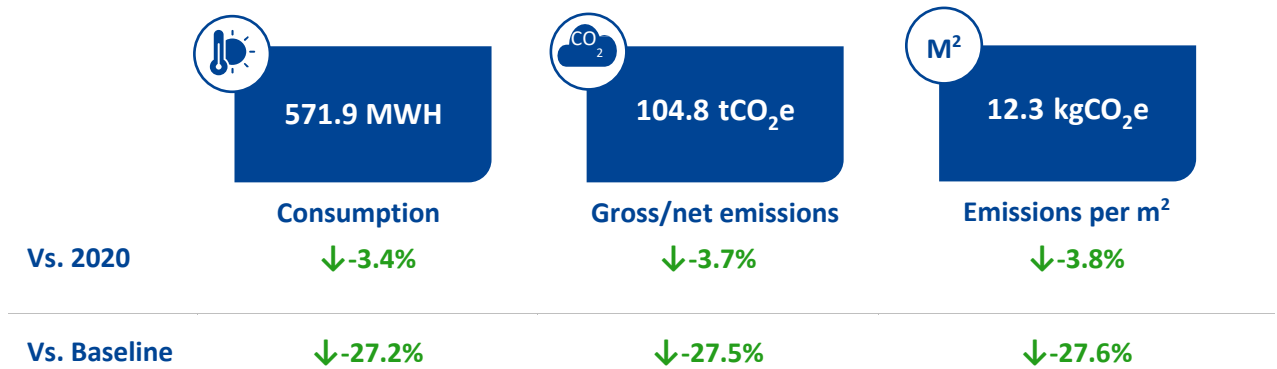
The remaining sources of emissions represented a significantly smaller share of total gross building-related emissions (2.1%), total net building-related emissions (2.9%). The calculation method of all building-related emissions followed the same approach as in 2020, with consumption data being multiplied by the appropriate emission factor to obtain the annual carbon emissions.

2.2.1 Heating

- Overall, heating represented the largest emitting ESM activity in 2021, with a 36.3% share of total gross emissions (2020: 35%) and 42.4% of total net emissions (2020: 41.9%). Heating accounted for 70.1% of ESM gross building-related emissions (2020: 66%) and 97.1% of net building-related emissions (2020: 95.5%).**

- The ESM consumed 571.9 MWh in natural gas/heating in 2021 (2020: 591.9 MWh).
- Heating-related gross/net emissions decreased by 3.7% compared to 2020.

Figure 18
Evolution of heating related emissions



Source: ESM

In 2021, the heating of the ESM premises remained the highest emitting building-related activity and became the largest contributor to total ESM emissions. The ESM premises were heated by natural gas.

The ESM consumed 571.9 MWh of heating in 2021, a 3.4% reduction compared to the previous year (2020: 591.9 MWh). Generated emissions followed the same trend, declining to 104.8 tCO₂e in 2021, a 3.7% decrease compared to 2020 (2020: 108.8 tCO₂e), and 12.3 kgCO₂e per square meter. In addition to the reduced usage of ESM premises due to Covid-19 restrictions, the decrease in heating consumption can be also explained by the fact that the winter months were milder than normal.

Figure 19
Evolution of heating consumption, 2018–2021 (MWh)

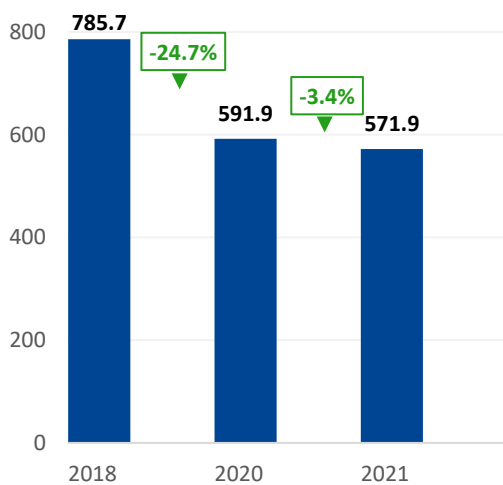
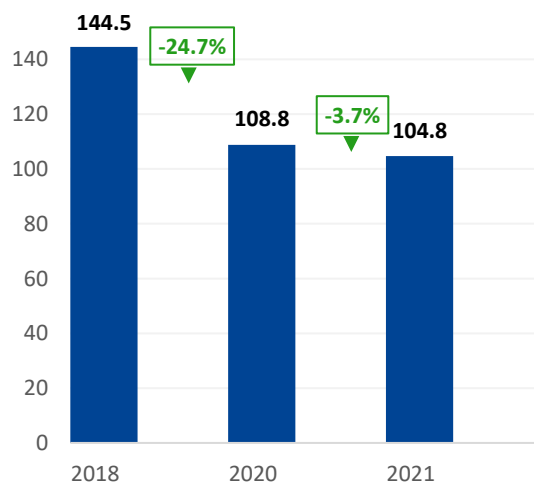


Figure 20
Evolution of heating emissions, 2018–2021 (gross/net tCO₂e)

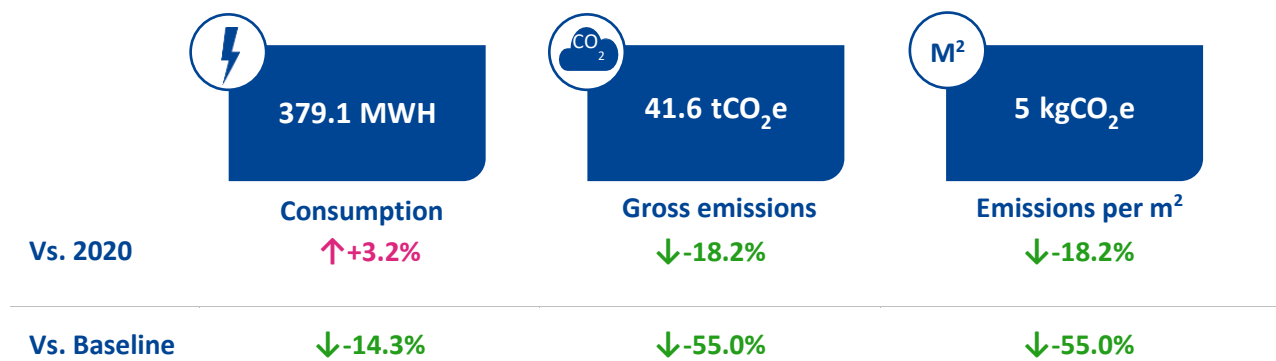


Source: ESM

2.2.2 Electricity consumption

- *The ESM consumed 379.1 MWh of electricity in 2021 (2020: 367.3 MWh).*
- *The resulting emissions represented 14.4% (2020: 16.4%) of total ESM gross emissions and 0% on a net basis, as electricity was derived entirely from renewable sources. Electricity-related emissions accounted for 27.9% of building-related gross emissions (2020: 30.9%) and were 0 on a net basis.*
- *Electricity-related gross emissions amounted to 41.6 tCO₂e, a decrease of 18.2% compared to 2020.*

Figure 21
Evolution of electricity related emissions



Source: ESM

In 2021, ESM's electricity consumption amounted to 379.1 MWh, an increase of 3.2% from the previous year (2020: 367.3MWh). The increase in electricity consumption can be attributed to a variety of factors, including a relaxation in Covid-19 containment measures and an increased office presence, an increased number of ESM staff members, and the utilisation of air purifier machines to prevent the spread of Covid-19.

In 2021, gross electricity-related emissions amounted to 41.6 tCO₂e, dropping by 18.2% since 2020 (2020: 50.9 tCO₂e). This evolution is mainly due to the change of the emission factor recommended by the International Energy Agency. This represented 27.9% of gross ESM building-related emissions (2020: 30.9%). Given that the electricity purchased for the ESM premises was derived entirely from renewable sources, the net emissions were considered to be zero.

Ongoing efforts


 To decrease energy consumption, a stand-by function for water dispensers and coffee machines was installed in the ESM canteen and kitchenettes.

Figure 22
Evolution of electricity consumption, 2018–2021
 (MWh)

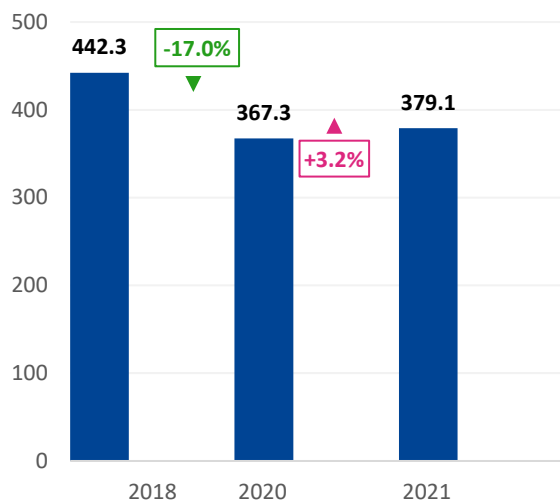
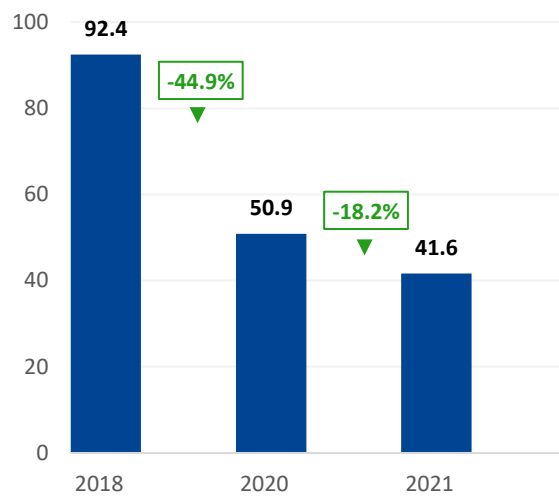


Figure 23
Evolution of electricity emissions, 2018–2021
 (gross tCO₂e)

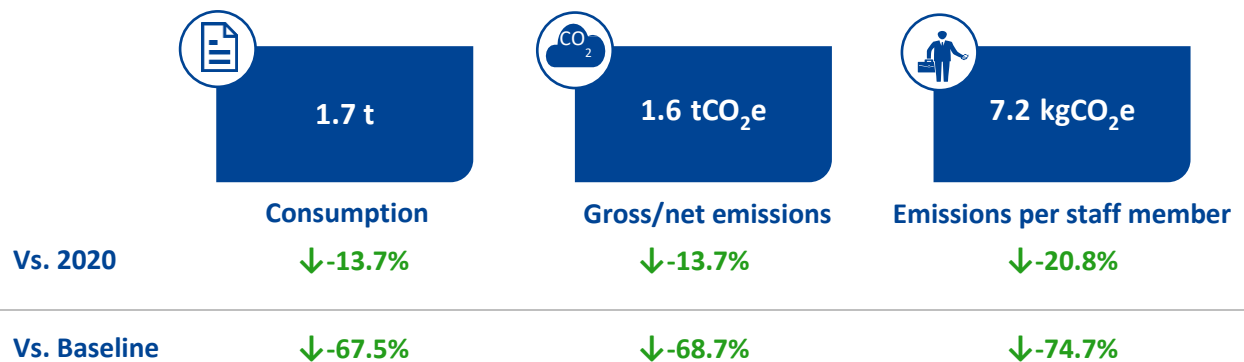


Source: ESM

2.2.3 Paper consumption

- *The ESM consumed 1.7 tonnes of paper in 2021 (2020: 2 tonnes).*
- *The emissions amounted to 0.6% of total ESM gross emissions (2020: 0.6%) and 0.6% of total net emissions (2020: 0.7%). Their share of total building-related emissions was 1.1% on a gross basis (2020: 1.1%) and 1.5% on a net basis (2020:1.6%).*
- *Paper-related gross/net emissions decreased by 13.7% compared to 2020.*

Figure 24
Evolution of paper related emissions



Source: ESM

In 2021, the ESM consumed around 1.7 tonnes of paper, 13.7% less than in 2020 (2020: 2 tonnes). The

decreased consumption resulted in a reduction in paper-related emissions to 1.6 tCO₂e (2020: 1.8 tCO₂e) in 2021 with respect to 2020. This equals to 7.2 kgCO₂e per staff member. Overall, emissions resulting from paper consumption represented 1.1% of total building-related gross emissions (2020: 1.1%) and 1.5% of total building-related net emissions (2020: 1.6%).

Figure 25
Evolution of paper consumption, 2018–2021
(tonnes)

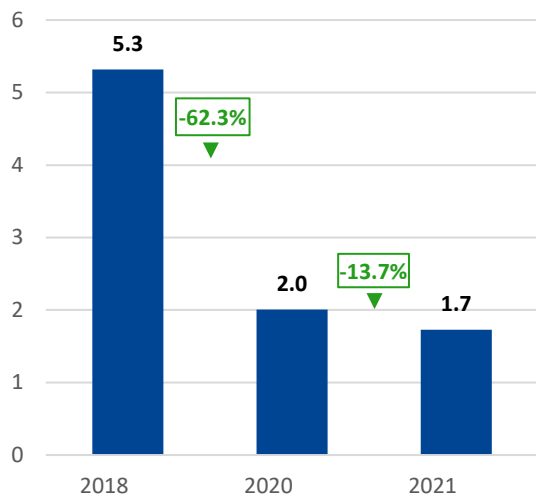
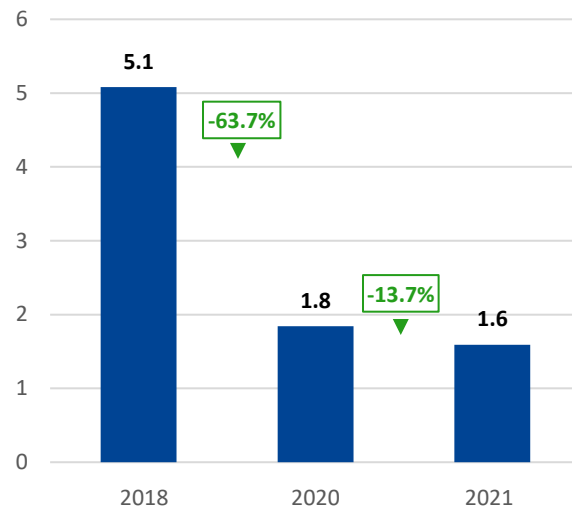




Figure 26
Evolution of paper emissions, 2018–2021
(gross/net tCO₂e)



Source: ESM

The digitalisation of communications as well as the reduced office presence due to the Covid-19 pandemic, coupled with awareness-raising campaigns and the technical measures implemented, contributed to decreasing office paper consumption. Going forward, the ESM will continue to leverage sustainable sources in its paper consumption and has already obtained a provider for recycled materials.

Ongoing efforts

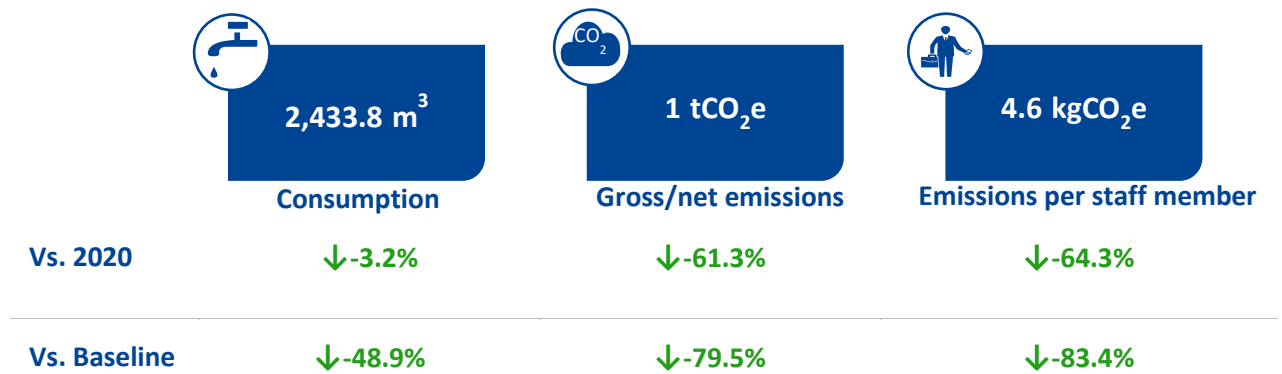
-  During 2021, paper towel dispensers were substituted by recycled materials.
-  ESG considerations were included in contracts with office supply providers in 2021 and will be implemented during 2022. These considerations include: cardboard material used for packaging will be at least 30% recycled; printing paper will be 100% recyclable from responsibly managed silviculture.

2.2.4 Water consumption

- **ESM water consumption amounted to around 2,433.8 m³ in 2021 (2020: 2,514.9 m³).**

- *In 2021, the resulting emissions amounted to 0.4% of total gross emissions (2020: 0.9%) and 0.4% of total net emissions (2020: 1%). Their share in total building-related emissions was 0.7% on a gross basis (2020: 1.6%) and 1% on a net basis (2020: 2.3%).*
- *Water-related gross/net emissions decreased by 61.3% compared to 2020.*

Figure 27
Evolution of water related emissions



Source: ESM

The amount of water consumed by the ESM in 2021 amounted to 2,433 m³, a 3.2% decrease from the previous year (2020: 2,515 m³). This can mainly be explained by a substantial change in the emissions factor provided by Defra: 0.421 kgCO₂e per m³ in 2021 (2020: 1.052 kgCO₂e per m³), a 60% decrease. In addition, the ESM continued to implement further water-saving measures as well as teleworking measures e.g., the reduced usage of the gym facility at the ESM premises.

The gross/net water emissions amounted to 1 tCO₂e in 2021 (2020: 3.2 tCO₂e), a 61.3% decrease from 2020. In relative terms, this represents 4.6 kgCO₂e (2020: 13 kgCO₂e) per ESM staff member, a 64.3% decrease over the previous year.

Ongoing efforts



In 2021, a testing phase was conducted for contactless and waterless devices for ESM sanitary rooms. The initiative has been fully implemented in 2022.

Figure 28
Evolution of water consumption, 2018-2021
 (m³)

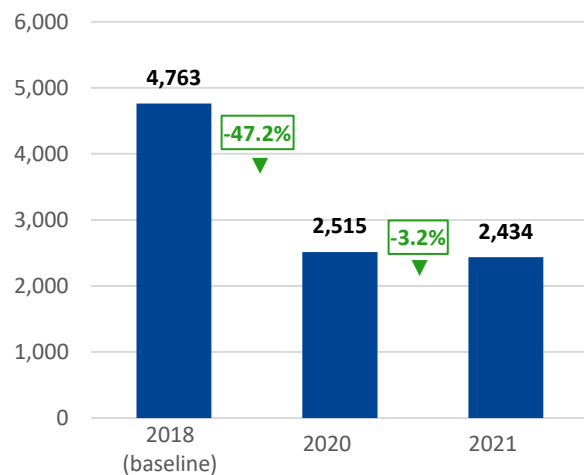
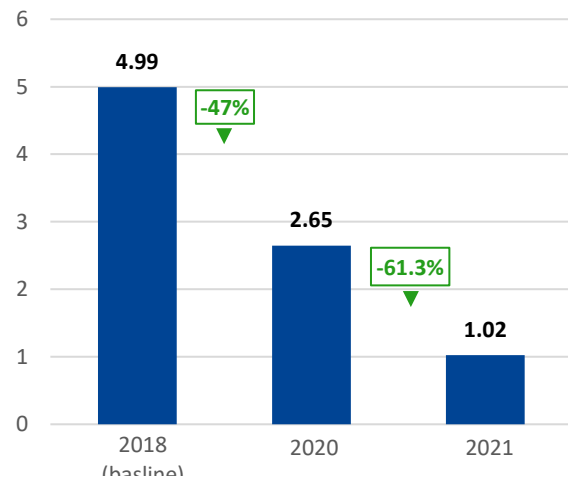


Figure 29
Evolution of water emissions, 2018-2021
 (gross/net tCO₂e)

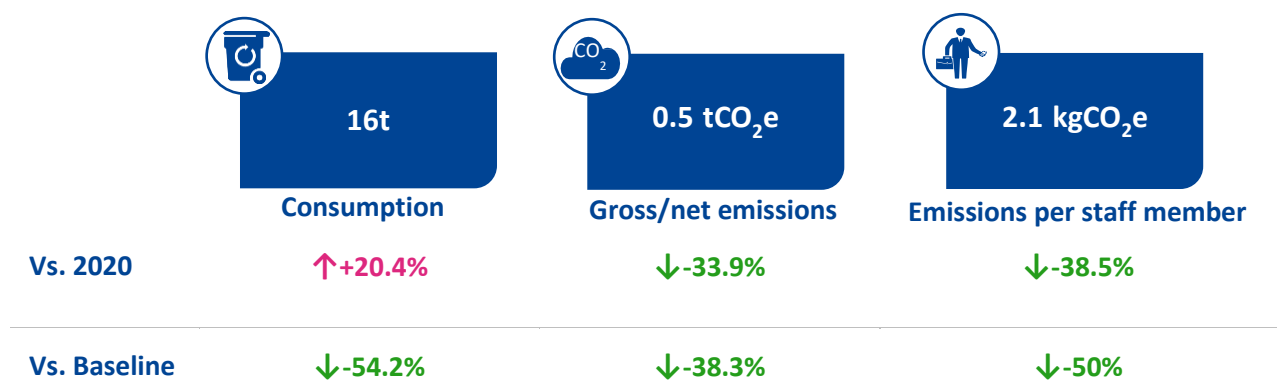


Source: ESM

2.2.5 Waste generated

- *The ESM generated 16 tonnes of waste in 2021 (2020: 13.3 tonnes).*
- *Emissions related to waste generation represented a minor share of the ESM’s total carbon footprint, at 0.2% of total gross emissions (2020: 0.2%) and 0.2% of total net emissions (2020: 0.3%). The share of waste-related emissions stood at 0.3% of total building-related emissions on a gross basis (2020: 0.4%) and at 0.4% on a net basis (2020: 0.6%).*
- *Waste-related gross/net emissions decreased by 33.9% compared to 2020. Hazardous waste was added to the reporting scope in 2021 as in 2020.*

Figure 30
Evolution of waste related emissions



Source: ESM

The waste generated by ESM activities continued to represent a minor source of ESM building-related emissions, accounting for 0.5 tCO₂e of gross/net emissions (2.1 kgCO₂e per ESM staff member); 33.9% less than the previous year (2020: 0.7 tCO₂e). The amount of waste generated totalled 16 t in 2021 (2020: 13.3t). Two different conversion factors were used to calculate the emissions of the different types of waste: Bilan GES (Ademe)¹³ for hazardous waste and Defra for the remaining waste. The hazardous waste component was added to the scope of this report for the first time in 2020 to present a more accurate figure of ESM's waste-related emissions. Since then, the hazardous waste includes polystyrene, plastic waste, high-density polyethylene bottles, and various bulky waste objects.

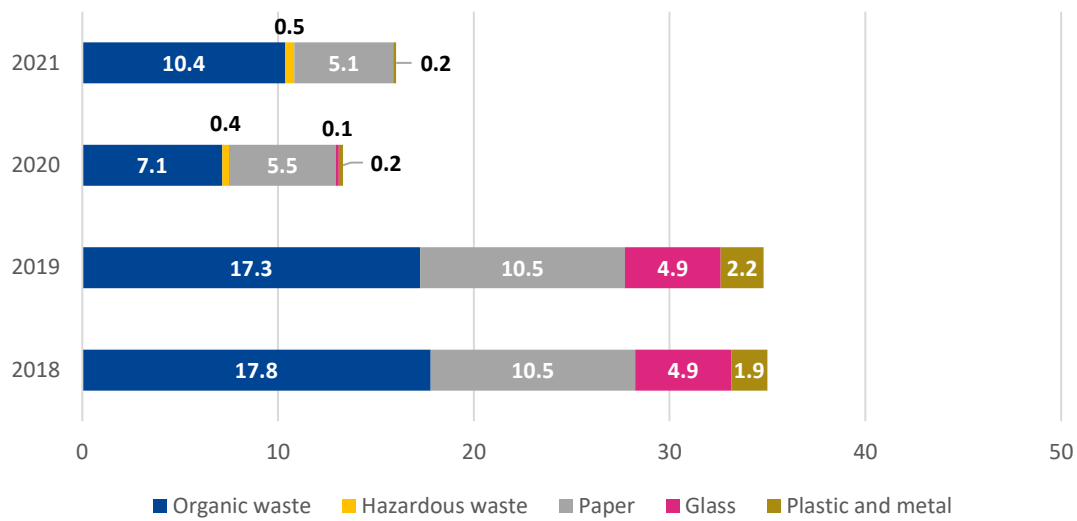
The volume of non-hazardous waste amounted to 15.6 tonnes, while the volume of hazardous waste amounted to 0.5 tonnes. Regarding non-hazardous waste, a closer look reveals that the main sources remained organic waste (10.4 t), followed by paper (5 t), plastics and metal (0.2 t). This shift away from hazardous waste is the main reason why waste-related emissions decreased even though there was a net increase in the consumption.

The ESM obtained the Luxembourg SuperDrecksKëscht® fir Betriber green label for its internal waste recycling practices for the ninth consecutive year in 2021. Waste was separated in-house in line with these requirements.¹⁴ The SuperDrecksKëscht® fir Betriber label was certified in accordance with the internationally accepted International Organization for Standardization (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 14024.

¹³ Refer to Annex 3 for further information on emission factors.

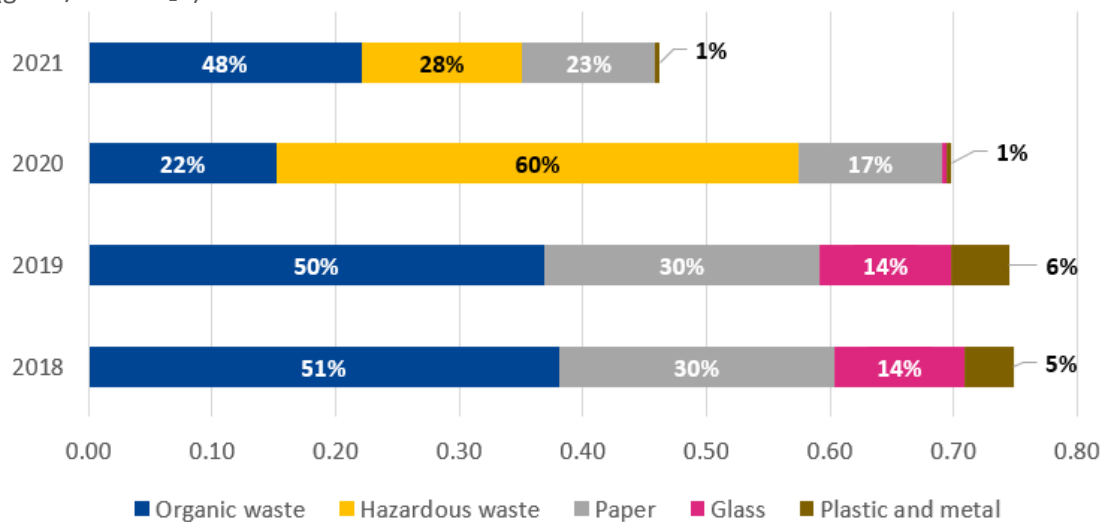
¹⁴ For further information on the requirements to obtain the label SuperDrecksKëscht® fir Betriber, refer to the official website: <https://superdreckskescht.com/index.php/en/environmental-policy>

Figure 31
Evolution of the breakdown of consumed waste generation, 2018–2021
 (tonnes)



Source: ESM

Figure 32
Evolution of the breakdown of emissions from waste generation, 2018-2021
 (gross/net tCO₂e)



Source: ESM

Ongoing efforts

-  *In line with the Zero Single-Use Plastic Manifesto signed in 2019, plastic utensils (straws, cutlery, cups, etc.) were removed from the canteen and kitchenette areas and substituted with sustainable alternatives. In addition, the presence of plastic bottles in vending machines has been significantly reduced. The ESM is working alongside its vending machine supplier to find a suitable solution for plastic reduction.*
-  *The ESM held its annual staff charity auction of decommissioned IT equipment, including laptops, mobile phones, and related accessories. This effectively complied with the “three Rs of waste management”; it recycled IT equipment by reusing and extending the lifecycle of IT equipment, thus reducing the purchase of new accessories with hazardous waste such as batteries and cabling. The ESM’s ‘Making a Difference’ values group steers this initiative, and the auction proceeds are donated to humanitarian causes.*
-  *Eco labelled cleaning agents were used at the ESM premises whenever feasible.*
-  *ESG considerations were included in the contract with the plant maintenance service provider. All plant-care products and materials are organic, environmentally friendly, and are eco-labelled.*

2.3 Teleworking-related emissions

- ***Telework-related emissions amounted to 24.3 tCO₂e on a gross/net basis (2020: 18.5 tCO₂e)***
- ***This represented 8.4% of total ESM carbon footprint emissions on a gross basis (2020: 6%) and 9.8% on a net basis (2020: 7.1%).***
- ***Gross/net telework-related emissions increased by 31.2% compared to 2020. However, compared to pre-pandemic years, the shift to teleworking led to a significant decrease in total CO₂ emissions.***

In 2021, the ESM continued following the sanitary protocols recommended by national authorities supplemented with ESM-specific measures. While office presence varied throughout the year depending on pandemic circumstances and national guidelines, ESM staff mostly worked remotely in 2021 which impacted the overall organisation’s carbon footprint performance. Despite teleworking measures, the ESM office remained operational throughout 2021, owing to the presence of staff members, service personnel, or third-party service providers (e.g., security guards, cleaners, canteen personnel, IT desk). Compared to pre-pandemic years, the shift to teleworking led to a significant decrease in total CO₂ emissions – total gross emissions continued decreasing in 2021, registering a 7% drop compared to the previous year, after a significant 73.5% decrease in 2020.

Figure 33
Breakdown of teleworking emissions, 2021
 (m³)

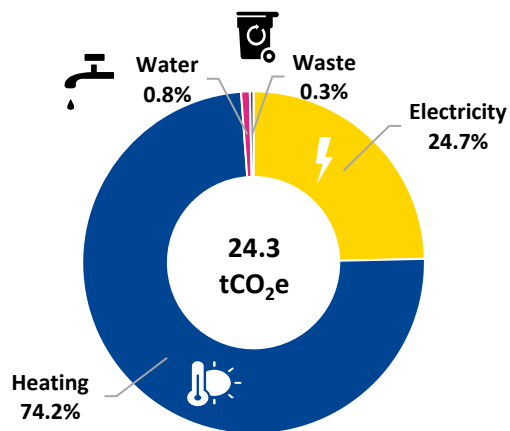
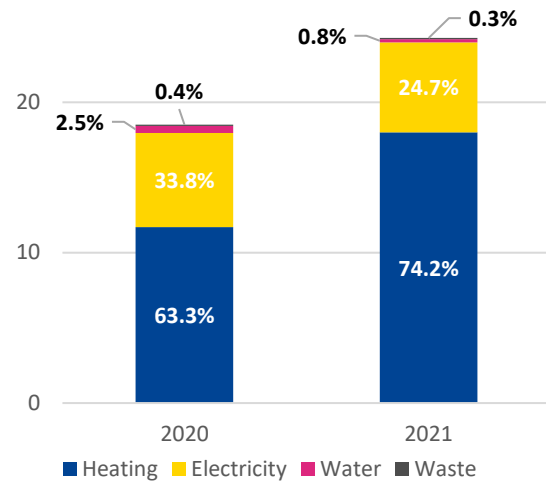


Figure 34
Teleworking emissions evolution, 2020-2021
 (gross/net tCO₂e)



Source: ESM

To provide a more accurate estimate of the emissions related to its own operations, the ESM continued to consider the emissions resulting from teleworking. In 2021, teleworking-related emissions showed an increase by 31.2% on a gross/net basis versus 2020. This increase is mainly due to the fact that teleworking was in place for the entire year of 2021, which was not the case for 2020 where the teleworking measures only started from mid-March that year.

Heating remained the main source of teleworking-related emissions as it registered a 53.8% increase in emissions on a gross/net basis with respect to 2020, representing 74.2% of total teleworking-related gross/net emissions (2020: 63.3%). The second-largest emitting source was electricity, which showed a 4.4% decrease in emissions on a gross/net basis with respect to 2020, covering the 24.7% of total teleworking-related emissions (2020: 33.8%). Emissions related to water and waste represented only a small share of the total teleworking gross/net emissions, 1.1% altogether (2020: 3%).

To estimate teleworking-related emissions, the EcoAct Whitepaper methodology was used. For 2021, the office occupancy rate for the calculations of teleworking emissions relied on the data collected through the ESM badging system, instead of the data collected through the desk reservation app, as done for 2020. A change in methodology took place in 2021 as new sources of more-reliable data became available through the refinement of the building's badging system (please see Chapter 1 for further detail). This change in data source and methodology may slightly affect the difference in final teleworking emissions results, and consequently the comparability in total ESM emissions, between 2020 and 2021.

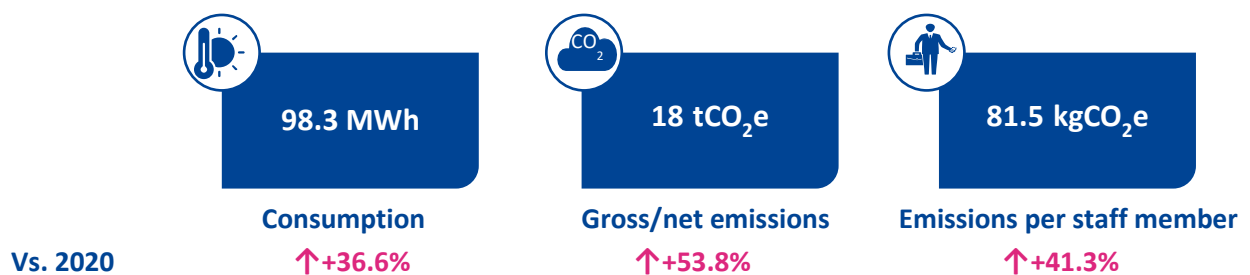
In addition, publicly available statistics and general assumptions were used to complement the Eco Act

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 and waste production are linked to teleworking.

2.3.1 Teleworking-related heating emissions

- *Domestic heating consumption amounted to 98.3 MWh in 2021 (2020: 72 MWh).*
- *Estimated teleworking-related heating emissions represented 6.2% of total gross emissions (2020: 3.8%) and 7.3% of total net emissions (2020: 4.5%).*
- *Teleworking-related heating emissions accounted, however, for 74.2% of ESM gross/net teleworking-related emissions (2020: 63.3%).*

Figure 35
Evolution of teleworking heating related emissions



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 neighbouring regions 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 have the ability to regulate heating by room when working from home, as opposed to a whole house.

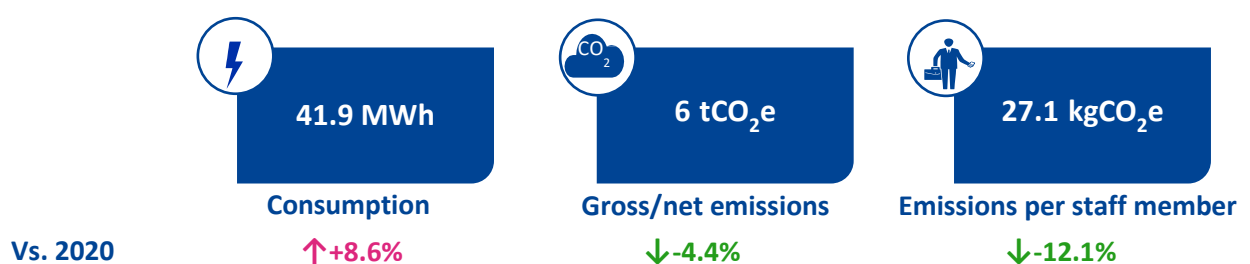
Furthermore, according to the EcoAct Whitepaper methodology, it was assumed that the average heating energy source was natural gas.

Considering these factors, this analysis has been able to estimate the incremental domestic heating consumption. As such, in 2021, heating was the highest-emitting teleworking-related activity, although still only a minor contributor to total ESM emissions. ESM staff consumed 98.3 MWh of telework-related heating (2020: 72 MWh), accounting for 18 tCO₂e gross/net emissions (2020: 11.7 tCO₂e) and 81.5 kgCO₂e per ESM staff member (2020: 58 kgCO₂e).

2.3.2 Teleworking-related electricity emissions

- **Estimated teleworking-related electricity consumption represented 41.9 MWh in 2021 (2020: 38.6 MWh).**
- **The resulting emissions represented 2.1% of total ESM gross emissions and 2.4% on a net basis (2020: 2% and 2.4% respectively).**
- **Electricity-related emissions accounted for 24.7% of the teleworking-related gross/net emissions (2020: 33.8%).**

Figure 36
Evolution of teleworking electricity related emissions



Source: ESM

In 2021, teleworking-related electricity use amounted to just over 41.9 MWh (2020: 38.6MWh), a minor 2.1% share of total ESM gross emissions (2020: 2%) and 2.4% on a net basis (2020: 2.4%). However, teleworking-related electricity consumption accounted for 24.7% of total teleworking-related gross/net emissions (2020: 34.1%).

In line with the EcoAct Whitepaper¹⁵ methodology, the additional daily electricity consumption resulting from an average teleworker's use of home office equipment 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 these emissions, the International Energy Agency electricity emission factors for Luxembourg and surrounding areas were factored in to allow for more accurate estimates.

Furthermore, in line with the EcoAct Whitepaper¹⁶ methodology, it is estimated that an average of 140W was consumed per workstation and 10W for lighting during the eight hours of use per working day.

It is also assumed that a working day – during which the additional teleworking-related electricity consumption occurs – is eight hours. This is based on a typical working day from 9:00 to 18:00 – with a one-hour break. 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.

2.3.3 Teleworking-related water emissions

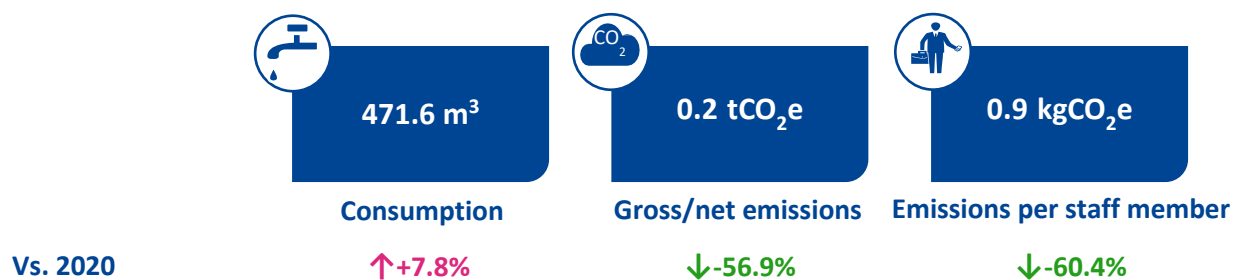
- ***Estimated teleworking-related water consumption amounted to 471.6 m³ in 2021 (2020: 437.5 m³).***
- ***The resulting emissions represented 0.1% of total ESM gross/net emissions (2020: 0.1%). Water-related emissions accounted for 0.8% of the teleworking-related gross/net emissions (2020: 2.5%).***

¹⁵ <https://info.eco-act.com/en/homeworking-emissions-whitepaper-2020>.

¹⁶ See footnote 24.

Figure 37

Evolution of teleworking water related emissions



Source: ESM

The amount of water ESM staff consumed while teleworking in 2021 was estimated at 471.6 m³ (2020: 437.5 m³). The gross/net emissions amounted to 0.2 tCO₂e (2020: 0.46 tCO₂e) and 0.9 kgCO₂e (2020: 2.3 kgCO₂e) per ESM staff member. We can take note of the fact that water-related emissions from teleworking decreased even though consumption increased. This mismatch between water consumption and emissions is similar to that observed under water-related emissions stemming from the ESM building and can be explained through the stark decrease of this year's emissions factor from Defra: 0.421 kgCO₂e per m³ in 2021 (2020: 1.052 kgCO₂e per m³), a 60% decrease.

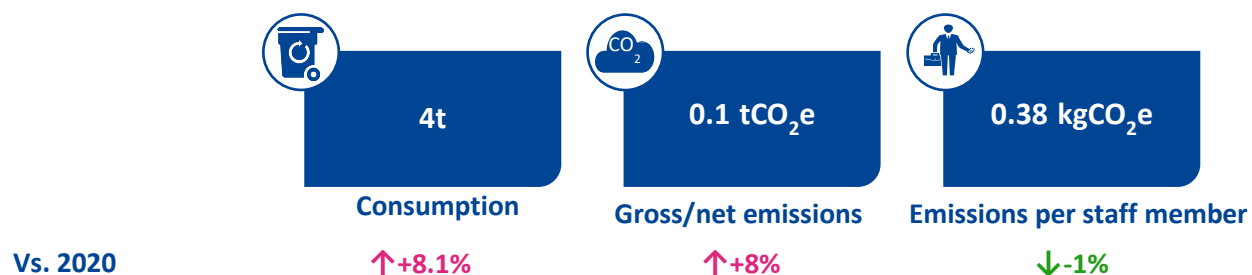
Water-related emissions arising from teleworking were estimated based on publicly available official statistics¹⁷ and the general assumptions that were taken in the EcoAct Whitepaper methodology, which suggests that household water consumption during pandemic increased by 20% due to teleworking.

2.3.4 Teleworking-related waste emissions

- **Teleworking-related waste generation was estimated at 4 tonnes in 2021 (2020: 3.7 tonnes).**
- **The resulting emissions represented 0.03% of total ESM gross emissions (2020: 0.03%) and 0.04% of total ESM net emissions (2020: 0.04%).**
- **Waste-related emissions accounted for 0.3% of the teleworking-related gross/net emissions (2020: 0.5%).**

¹⁷ To estimate teleworking-related water and waste emissions, publicly available data from Eurostat and Statec.lu was used. For more detail see section 1.1: Methodology used to calculate ESM's carbon footprint.

Figure 38
Evolution of teleworking waste related emissions



Source: ESM

The amount of waste generated by ESM staff during teleworking in 2021 was estimated at four tonnes (2020: 3.7 tonnes). In 2021, the gross/net emissions amounted to 0.1 tCO₂e (2020: 0.1 tCO₂e), accounting for 0.3% of total teleworking-related gross/net emissions (2020: 0.4%).

The waste-related emissions coming from teleworking were estimated based on the publicly available official statistics and the general assumptions¹⁸ that were taken in the EcoAct Whitepaper methodology, which suggests that household waste production during the pandemic increased by 26.6% due to teleworking.

2.3.5 Covid-19 pandemic impact on carbon footprint trends

As the table below and Figure 39 and 40 illustrate, in 2021, the ESM continued to register important savings linked to the emissions from its own operations. Despite the 5.8 tCO₂e or 31.2% in 2021 increase in teleworking-related emissions compared to 2020, overall, the building- and staff mobility-related emissions registered a larger decrease, which resulted in a positive carbon footprint performance. The decrease in teleworking-related emissions savings is mainly due to the fact that teleworking-related emissions were calculated for the entire period of 2021, whereas they were only calculated starting in mid-March in 2020.¹⁹

The overall ESM carbon footprint decreased, as the decline in building-related emissions more than compensated for the increase of teleworking emissions, despite the increase in emissions generated from teleworking compared to 2020. Compared to 2020, mobility-related emissions decreased by 12.3

¹⁸ To estimate teleworking-related water and waste emissions, publicly available data from Eurostat and Statec.lu was used. For more detail see section 1.1: Methodology used to calculate ESM's carbon footprint.

¹⁹ This was specifically impactful for teleworking-related heating emissions as these are only calculated during the "cooling-months" as per the EcoAct Whitepaper Methodology i.e., from October to March of each year. Therefore, the calculation period of teleworking-related heating emissions effectively doubled as the full six months were included compared to three and a half months for 2020.

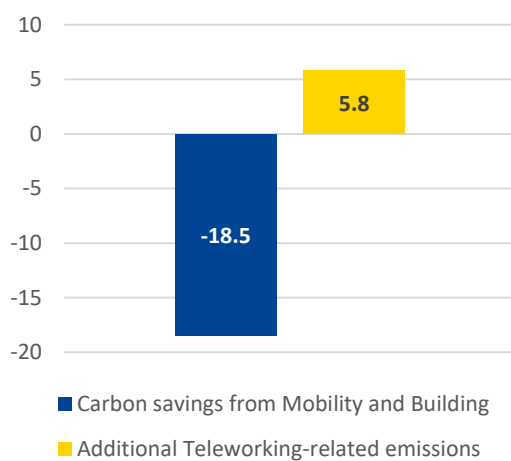
tCO₂e, a 9.6% decrease, and net building-related emissions decreased by 6.2 tCO₂e, a 5.4% decrease. Therefore, taking into account the 5.8 tCO₂e of incremental teleworking emissions from 2020 to 2021, and superimposing it on the carbon savings from building and mobility for the same years, 12.7 tCO₂e were still registered as ‘savings’. Moreover, compared to 2019, overall emissions also decreased in 2021, irrespective of the additional 24.3 tCO₂e coming from teleworking. When taking into account the 792.5 tCO₂e decrease in mobility and building emissions, in 2021 compared to 2019, the ESM still ‘saved’ 768.2 tCO₂e between 2019 and 2021. As such, the emissions continued to decrease from 2020 to 2021 albeit less dramatically than from 2019 to 2020, as this was the first year impacted by the pandemic (as illustrated in Figure 40).

Table 2
Carbon footprint savings in 2021 compared to 2020
 (net)

	Total emissions 2021	Total emissions 2020	Difference	% change	Carbon footprint performance/staff
Mobility	115.2 tCO ₂ e	127.5 tCO ₂ e	↓-12.3 tCO ₂ e	↓-9.6%	↓-0.06 tCO ₂
Building	107.8 tCO ₂ e	114 tCO ₂ e	↓-6.2 tCO ₂ e	↓-5.4%	↓-0.03 tCO ₂
Teleworking	24.3 tCO ₂ e	18.5 tCO ₂ e	↑+5.8 tCO ₂ e	↑+31.2%	↑+0.03 tCO ₂

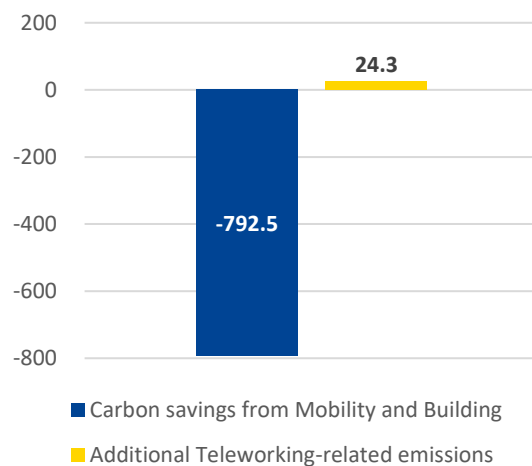
Source: ESM

Figure 39
Total carbon savings in 2021 vs 2020
 (gross/net tCO₂e)



Source: ESM

Figure 40
Total carbon savings in 2021 vs 2019
 (gross/net tCO₂e)



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 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
Estimated teleworking-related emissions sources			
Scope 3	Teleworking – Electricity	kWh	Annual, by estimates on EcoAct Whitepaper ²⁰ methodology and ESM badging system ²¹
	Teleworking – Heating	kWh	Annual, by estimates on EcoAct Whitepaper methodology and ESM badging system
	Teleworking – Water	m ³	Annual, by estimates on national statistics ²² and ESM badging system
	Teleworking – Waste	tonnes	Annual, by estimates on national statistics and ESM badging system

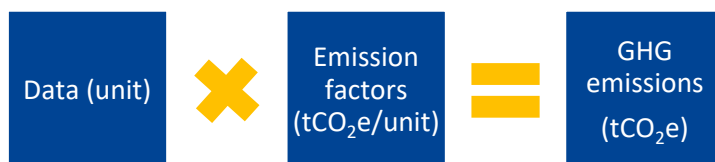
²⁰ See footnote 1 on page 3.

²¹ For 2021 the ESM badging system was used to calculate the teleworking-related emissions.

²² To estimate teleworking-related water and waste emissions, publicly available data from Eurostat and Statec.lu was used. For more detail see section 1.1: Methodology used to calculate ESM's carbon footprint.

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 various sources.



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.

Emissions source	Emission factors	Unit	Variation vs.2020	Source of emission factors
Mobility-related emissions factors				
ESM-leased vehicles	From 0.07684 to 0.21174	kgCO ₂ e/km per type of car and fuel type	From -0.7% to +6.5%	Defra 2021
Business travel – Air	0.14787 to 0.42882	kgCO ₂ e/passenger km	From -1.3% to +1.2%	Defra 2021
Business travel –Rail	0.00446	kgCO ₂ e/passenger km	-10.3%	Defra 2021
Staff commuting	From 0 to 0.17431	kgCO ₂ e/km per type of car and fuel type	From 0% to +3.4%	Defra 2021
Building- and teleworking-related emissions factors				
Electricity (Luxembourg)	0.1098	kgCO ₂ e/kWh	-37.6%	International Energy Agency 2021
Heating	0.18316	kgCO ₂ e /kWh (gross CV)	-0.4%	Defra 2021
Water	0.421	kgCO ₂ e/m ³	-60%	Defra 2021, the emission factor is a sum of the watersupply and the water treatment emission factors
Waste	From 880 to 21.294	kgCO ₂ e/t	From -5.6% to 0.3%	Defra 2021
Paper consumption	919.396	kgCO ₂ e/t	0.0%	Defra 2021

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 of business 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 the given year, based on Statec information. Parking occupancy rate registered by the ESM Employee Badge System (parking)
Building-related data quality				
Scope 2	Purchased electricity	Primary data	■	
	Purchased heating	Primary data	■	
	Paper	Primary data	■	Number of sheets printed
	Water	Primary data	■	
	Waste	Primary data	■	
Estimated Teleworking-related data quality				
	Teleworking - Heating	Average heating and estimated hours spent teleworking office	■	Estimates based on EcoAct Whitepaper ²⁴ methodology and ESM badging system
	Teleworking - Electricity	Average “in use” power load per desk and estimated hours spent teleworking	■	Estimates based on EcoAct Whitepaper ²⁵ methodology and ESM badging system
	Teleworking - Water	National statistics (Eurostat and Statec) and estimated hours spent teleworking	■	Estimates based on national statistics on daily consumption and ESM badging system
	Teleworking - Waste	National statistics (Eurostat and Statec) and estimated 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

²³ For 2021 the ESM badging system was used to calculate the teleworking-related emissions.

²⁴ <https://info.eco-act.com/en/homeworking-emissions-whitepaper-2020>

²⁵ See footnote 38.

²⁶ <https://info.eco-act.com/en/homeworking-emissions-whitepaper-2020>

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 conservative approach 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.

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