PACTEAM EUROPE Corporate Carbon Footprint Assessment (2022)

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EXECUTIVE SUMMARY: PTEU'S TOTAL CARBON FOOTPRINT

This executive summary provides an overview of the **Carbon Footprint Assessment conducted for PTEU's office for the year 2022**. The assessment aimed to quantify and analyze the greenhouse gas (GHG) emissions associated with the office's activities and operations,

The methodology followed for establishing the Scope and Boundaries of the assessment (in other words, the choice of PTEU's activities to include) and selecting applicable Emission Factories was the one outlined by **Bilan Carbone®.** To report the obtained results, the **GHG-Protocol Corporate Standard** was followed, as the two standards are compatible and the latter ensures a wider compatibility with the common carbon disclosure schemes.

As such, emissions from PTEU's activities were divided into Scope 1 (direct emissions from fossil fuels combustion), Scope 2 (indirect emissions from electricity consumption) and Scope 3 (indirect emissions from other activities).

The total estimated Carbon Footprint for the office was calculated to be **217 tons** of CO_2-equivalent (CO_2e). Scope 1 emissions accounted for **35%** of the total, Scope 2 emissions accounted for **0%**, and Scope 3 emissions accounted for the majority share of **65%**.

The largest single contributor to the Carbon Footprint was identified as **internal freight** (Scope 3) activities. This finding indicates that the transportation of goods (samples, prototypes) within the office's value chain has a significant impact on emissions. Strategies to optimize logistics, **reduce packaging weight**, and explore more sustainable transportation options should be considered to address this emission source.

Business travel (Scope 3) and **employees commuting** (Scope 3) combined to represent the largest contributor to emissions. This suggests that the office's travel practices have a substantial carbon impact. Implementing measures such as promoting virtual meetings, utilizing video conferencing technology, and encouraging alternative modes of transportation can help reduce these emissions while maintaining business efficiency.

To reduce emissions from employees commuting, PTEU could evaluate hybrid working schedule (in office and remotely) or offer incentives to use public transportation for commuting to office.

The consumption of **natural gas for heating purposes** (Scope 1) was identified as another significant emission source. To address this, energy efficiency measures, such as improving insulation, optimizing heating systems, and exploring renewable energy alternatives, should be considered to mitigate emissions associated with space heating.

Finally, it is important to note that **Scope 2 emissions accounted for 0%** of the total, indicating that the office's electricity consumption does not contribute to its carbon footprint directly. This is since all the electricity supplied to PTEU's comes from **100% certified renewable energy sources**.

Table 1: PTEU's Corporate Carbon Footprint (2022) under GHG-Protocol Corporate Standard reporting scheme

Scopes & Activities	GHG Emissions (Tons CO_2e)
Scope 1	**75.3**
❖ Company-owned Diesel vehicles	26.9
❖ Gas consumption for heating	48.4
Scope 2	**0.0**
❖ Electricity Consumption	0.0
Scope 3	**141.7**
❖ Internal freight	53.2
❖ Business travel	15.5
❖ Employees' commuting	41.1
❖ Emissions related to fuels and energy (not included in Scope 1 and Scope 2)	16.2
❖ Material inputs	15.7
Total emissions	**217.0**

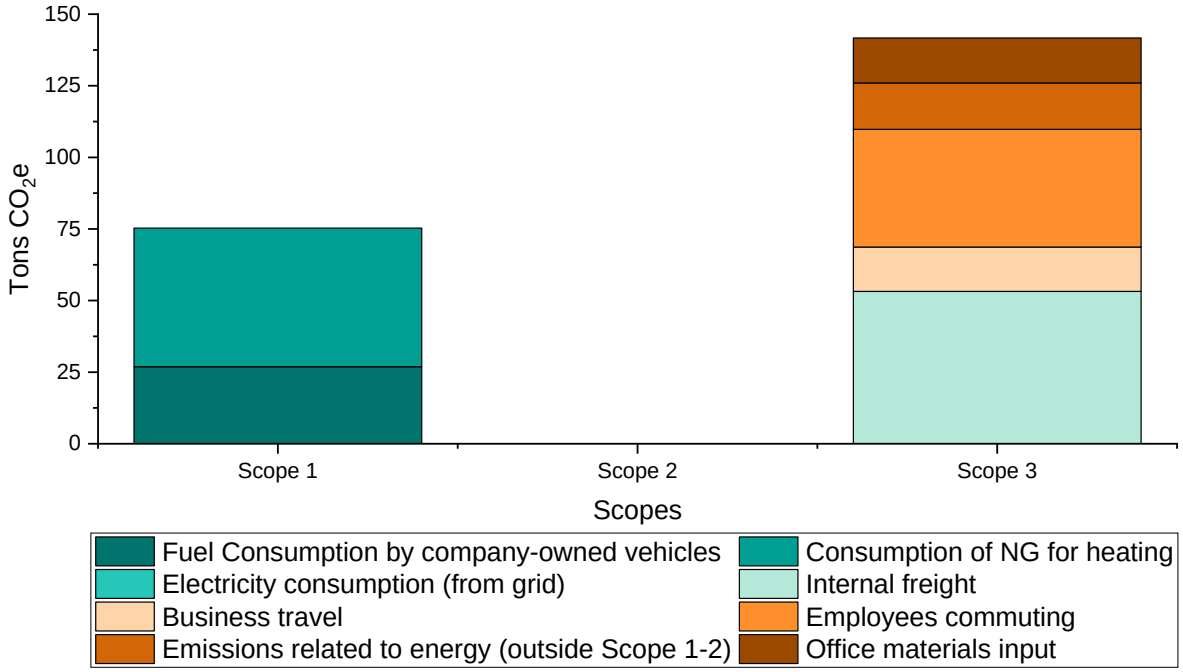

Figure 1: Corporate Carbon Footprint for PTEU (2022)

To effectively manage and reduce the office's carbon footprint, the following general key recommendations are proposed:

1. **Develop a comprehensive sustainability strategy**: Establish clear goals, targets, and action plans to guide emission reduction efforts across all scopes. Engage stakeholders, communicate the strategy, and foster a culture of sustainability within the office.

2. **Optimize internal freight and business travel**: Implement measures to reduce the environmental impact of internal freight and business travel, such as promoting telecommuting, using video conferencing, encouraging sustainable transportation modes, and optimizing supply chain logistics.

3. **Enhance energy efficiency**: Identify opportunities to improve energy efficiency within the office, especially in relation to heating systems.

4. **Monitor and report progress**: Implement a robust monitoring and reporting system to track emission reductions, evaluate the effectiveness of implemented measures, and demonstrate the office's commitment to sustainability.

By implementing these recommendations and actively addressing emission sources identified in this assessment, PTEU's office can make significant progress toward reducing its carbon footprint, achieving sustainability goals, and contributing to the global effort to mitigate climate change.

A list of Key Performance Indicators (KPIs), actionable suggestions to reduce emissions from PTEU's activities and the estimation of the corresponding Emission Mitigation Potential is outlined in the attached **PTEU Emissions Mitigation Recommendations**.

PRELIMINARY NOTES

This Corporate Carbon Footprint Assessment was conducted to estimate CO_2 emissions associated with the business activities of PACTEAM Europe (**PTEU**) in the year 2022.
Following a brief introduction of the concept of Corporate Carbon Footprint, the international standards followed, and the activities included during this Assessment.

INTRODUCTION OF THE ENTITY SUBJECT TO THE ASSESSMENT

PACTEAM Europa Srl (PTEU) is based in Nova Milanese (Italy) since 1999 and is part of PACTEAM's global business (PACTEAM Group). While PACTEAM's products include luxury packaging, display furniture and alike, PTEU is focused on creative design & product development, logistics & after sales in the European and Italian market. Manufacturing of the designed products is carried out by other entities in PACTEAM Group. Therefore, as it pertains to the scope of this Assessment, PTEU 's activities are comparable to an office & warehouse setting.
As of 2022, PTEU's premises include a 500 sqm office and a 2,000 sqm warehouse, with a total of 25 employees.

INTRODUCTION TO THE CORPORATE CARBON FOOTPRINT ASSESSMENT

The concept of a Corporate Carbon Footprint Assessment refers to the task of estimating the CO_2 emissions from a variety of activities undertaken by the entity subject to the analysis.
Establishing and maintaining an inventory of emissions can serve several business goals, including:

- Managing emissions-related risks and identifying reduction opportunities
- Public reporting and participation in voluntary climate programs
- Participating in mandatory reporting programs
- Participating in Carbon Markets
- Disclosing climate-related information to clients and other stakeholders

Several CO_2 accounting tools, standards and models are currently available on the market: this Assessment was undertaken following the **Bilan Carbone®**[1] methodology. At the same time, the obtained quantitative results are also in line with reporting under the **ISO 14069 and GHG-Protocol standards**[2] , dividing the accounted emissions in Scope 1, Scope 2 and Scope 3. To ensure the compatibility of the reported results with the most common carbon emissions disclosure programs, the Assessment results are reported directly under the GHG-Protocol standard and related Scopes.
The perimeter of the Assessment was decided following the Operational Control approach, thus accounting for 100% of the emissions (direct and indirect) from the operation over which PTEU has operational control.

Introduction of Scope 1 GHG emissions

In general, Scope 1 GHG emissions for an office refer to the direct greenhouse gas (GHG) emissions that occur from sources owned or controlled by the office itself. These emissions are generated from activities or processes that take place within the office premises or are directly under the office's operational control.

Some common sources of Scope 1 GHG emissions in an office setting include:

- Combustion of fossil fuels: This includes emissions from burning natural gas, diesel, gasoline, or other fossil fuels for activities like heating, cooling, and operating equipment within the office.

- On-site power generation: If the office has its own power generation system, such as a diesel generator or a combined heat and power (CHP) unit, the emissions resulting from the combustion of fuel to produce electricity or heat fall under Scope 1.

[1] **Source:** https://bilans-ges.ademe.fr/en/accueil/contenu/index/page/calculation_methods/siGras/0
[2] **Source:** https://ghgprotocol.org/corporate-standard

- Company-owned or controlled vehicles: If the office operates a fleet of vehicles for business purposes, such as delivery trucks or company cars, the emissions from these vehicles are considered Scope 1 emissions. This includes both the fuel combustion emissions and any fugitive emissions from the vehicles.

- Process emissions: Certain office activities or processes might release GHGs as byproducts. For example, if the office has refrigeration or air conditioning systems that use hydrofluorocarbons (HFCs), which are potent greenhouse gases, the emissions from leaks or venting of these gases would be considered Scope 1 emissions.

Scope 1 emissions are considered direct because they are produced from sources that are owned or controlled by the office itself. It is important for offices to measure and track their Scope 1 emissions as part of their overall greenhouse gas accounting and climate change mitigation efforts. By understanding and managing these emissions, offices can identify opportunities for reduction, improve energy efficiency, explore alternative energy sources, and contribute to mitigating climate change.

Introduction of Scope 2 GHG emissions

Scope 2 GHG emissions for an office refer to the indirect greenhouse gas emissions that occur from the generation of purchased electricity, heat, or steam consumed by the office. These emissions are produced off-site at the facilities where the energy is generated but are associated with the office's energy consumption.

Key points about Scope 2 emissions:

- Electricity consumption: The most common source of Scope 2 emissions for an office is the electricity it consumes from the grid. When fossil fuels are burned at power plants to generate electricity, GHG emissions are released. These emissions are considered indirect because they occur outside the office's boundaries but are associated with its energy consumption.

- Heat and steam consumption: If an office relies on external sources for heating or steam, such as district heating systems, the emissions resulting from the production of that heat or steam would fall under Scope 2.

- Emission factors: The calculation of Scope 2 emissions requires the use of emission factors provided by the electricity or energy supplier. These factors represent the average emissions intensity associated with the energy generated. Emission factors can vary depending on the energy mix of the supplier, including the proportion of renewable and non-renewable sources.

- Renewable energy purchases: If an office procures renewable energy through power purchase agreements (PPAs) or renewable energy certificates (RECs), it can reduce its Scope 2 emissions. By offsetting its electricity consumption with renewable sources, the office effectively lowers its indirect emissions.

Tracking and managing Scope 2 emissions allows an office to understand the environmental impact of its energy consumption. It also provides an opportunity to explore cleaner energy sources and actively support renewable energy projects. Offices can consider energy efficiency measures, on-site renewable energy generation, or the purchase of renewable energy credits to reduce their Scope 2 emissions and contribute to a more sustainable energy future.

Introduction of Scope 3 GHG emissions

Scope 3 GHG emissions refer to all indirect greenhouse gas emissions that occur as a result of an office's activities but are not classified under Scope 1 or Scope 2 emissions. These emissions occur along the entire value chain of the office's operations, both upstream and downstream. Scope 3 emissions are often the largest and most challenging category to measure and mitigate, as they encompass a wide range of activities and involve multiple stakeholders.

Key aspects of Scope 3 emissions:

- Supply chain emissions: Scope 3 emissions include the emissions associated with the extraction, production, and transportation of goods and services purchased by the office. This involves considering the emissions generated by suppliers, contractors, and other business partners. It includes raw material extraction, manufacturing processes, transportation of goods, and disposal of waste.

- Business travel: Emissions from employee travel, both domestic and international, fall under Scope 3. This includes air travel, road transportation, and rail travel. The emissions are calculated based on distance traveled and the type of transportation used.

- Employee commuting: Emissions resulting from employees' daily commute to and from the office are also considered Scope 3 emissions. This includes emissions from personal vehicles, public transportation, or other modes of transportation used by employees.

- Waste management: The emissions associated with waste generated by the office, including its disposal and treatment, are considered Scope 3 emissions. This encompasses activities such as landfilling, incineration, and recycling.

- Product use and end-of-life: If the office's products or services have a significant impact on GHG emissions during their use or after they are discarded, those emissions fall under Scope 3. For example, if an office manufactures electronic devices, the emissions resulting from the energy consumption of those devices during their lifetime and their disposal would be included in Scope 3.

Tracking and addressing Scope 3 emissions requires collaboration with suppliers, customers, and other stakeholders throughout the value chain. While the office may have limited control over these emissions, understanding and managing them can help identify opportunities for sustainable procurement, efficient transportation, waste reduction, and product innovation. By taking action to reduce Scope 3 emissions, offices can enhance their sustainability performance and contribute to mitigating climate change across their entire operations.

SCOPES AND ACTIVITIES INCLUDED IN THE ASSESSMENT OF PTEU

Following a specific list of the activities included in the Carbon Footprint Assessment of PTEU, divided in different Scopes, as defined by international standards (GHG Protocol[3]):

- **Scope 1 (Direct emissions):** Consumption of fossil fuels by company-owned vehicles, consumption of natural gas for heating purposes

- **Scope 2 (Indirect emissions for electricity consumption):** Consumption of electricity (e.g., by office equipment, lighting). No heat/steam is purchased by PTEU.

- **Scope 3 (Indirect emissions):** Business travel, employees commuting, material inputs (i.e., office consumables and equipment), internal freight (transportation of prototypes and samples between PTEU and factories controlled by PACTEAM) and emissions related to fuels and energy (not included in Scope 1 and Scope 2).

The above boundaries of the assessment were deciding according to data availability and after a preliminary estimation of the significance of the GHG emissions resulting from the activities commonly included in Scope 1, Scope 2 and Scope 3 for entities sharing similar business operations with PTEU.
Collected and estimated activity data was then coupled with the relative **emission factor**, provided by various sources outlined on pg. 25(Sources of emission factors).
An emission factor is a numerical value that represents the amount of greenhouse gas (GHG) emissions released per unit of activity or product. It provides a standardized measure of emissions associated with a specific process, fuel, or activity.

[3] **Source:** https://ghgprotocol.org/corporate-standard

Emission factors are typically expressed as the amount of CO_2-equivalent emissions per unit of activity, such as kilograms or metric tons of CO_2-equivalent emissions per kilowatt-hour of electricity generated, per liter of fuel burned, or per km traveled.
Emission factors are used in GHG accounting and reporting to estimate emissions from various sources, including energy consumption, industrial processes, transportation, and waste management. They serve as a crucial component in calculating emissions inventories and assessing the environmental impact of specific activities.

The values of emission factors are determined through scientific measurements, data analysis, and modeling techniques. They can vary depending on multiple factors, such as the type of fuel or energy source, the combustion efficiency, the technology used, and the geographical location. Emission factors are often developed and updated by governmental agencies, international organizations, and research institutions based on the latest scientific knowledge and data.

By applying emission factors to activity data (e.g., energy consumption or fuel usage), organizations can calculate the total emissions associated with their operations. These calculations enable them to track and report their GHG emissions, set reduction targets, and identify opportunities for emission mitigation strategies.

It's important to note that emission factors are not fixed values and can vary over time as technologies improve, energy sources change, or more accurate data becomes available. Therefore, using up-to-date and region-specific emission factors is crucial for accurate and reliable emission calculations.

In this Assessment, as required by **Bilan Carbone® and GHG-Protocol** Standards, all emissions resulting by applying the chosen EF (Sources) were converted into CO_2eq. for the final reporting of the results. A breakdown of GHG gases is available upon request.

SCOPE 1 EMISSIONS BREAKDOWN

This chapter focuses on Scope 1 emissions, which are direct greenhouse gas (GHG) emissions resulting from activities and sources owned or controlled by PTEU's office. The assessment identified two significant contributors to Scope 1 emissions: GHG emissions from company-owned diesel vehicles and GHG emissions from natural gas consumption for heating.

Table 2: Scope 1 emissions for PTEU

Emissions Sources	Activity data's quality	Consumption	Total direct emissions from combustion (tons/COe_2)
Company-owned Diesel vehicles	Measured data	10,703 litres/year	**26.9**
Gas consumption for heating	Measured data	236,229 kWh/year	**48.4**

GHG emissions from company-owned diesel vehicles were estimated to be **26.9 tons of CO2e**. These emissions are associated with the combustion of diesel fuel used for transportation purposes within the office's operations. To address this emission source, PTEU should consider implementing the following measures:

- **Fleet optimization:** Evaluate the efficiency of the company-owned diesel vehicles and explore opportunities to optimize the fleet. This may involve replacing older vehicles with more fuel-efficient models and encouraging the use of public transportation or electric vehicles where feasible.

- **Driver training and behavior:** Implement driver training programs focused on fuel-efficient driving techniques, such as reducing idling time, maintaining proper tire pressure, and practicing smooth acceleration and deceleration. Encourage drivers to adopt eco-friendly behaviors that can contribute to reducing emissions.

- **Alternative fuel options:** Investigate the feasibility of transitioning some or all of the company-owned diesel vehicles to alternative fuels with lower emissions,

such as biodiesel or compressed natural gas (CNG). Evaluate the infrastructure requirements, cost-effectiveness, and environmental benefits of alternative fuel options before making any decisions.

Direct GHG emissions from natural gas consumption for heating were estimated to be **48.4 tons of CO2e**. These emissions result from the combustion of natural gas used to provide heating within the office premises. To address this emission source, PTEU should consider implementing the following measures:

- **Energy efficiency improvements:** Conduct an energy audit to identify opportunities for energy efficiency improvements within the office. This may include optimizing insulation, sealing air leaks, upgrading heating systems to more efficient models, and installing programmable thermostats to better control heating.

- **Renewable energy integration:** Explore the feasibility of integrating renewable energy sources, such as solar thermal systems or geothermal heating, to supplement or replace natural gas for heating purposes. Investigate available incentives, financing options, and the long-term cost benefits of transitioning to renewable heating solutions.

- **Behavioral changes:** Promote energy-conscious behavior among employees, such as encouraging them to dress appropriately for the season, setting temperature guidelines to optimize comfort and energy savings, and educating them about the importance of energy conservation.

Regular monitoring and tracking of Scope 1 emissions will allow PTEU to evaluate the effectiveness of implemented measures, identify areas for further improvement, and demonstrate the office's commitment to reducing its environmental impact. By addressing GHG emissions from company-owned diesel vehicles and natural gas consumption for heating, PTEU can make significant progress in mitigating its Scope 1 emissions and working towards a more sustainable future.

SCOPE 2 EMISSIONS BREAKDOWN

This chapter focuses on Scope 2 emissions, which represent indirect greenhouse gas (GHG) emissions associated with the consumption of purchased electricity, heat, or steam by PTEU's office. However, in the case of this assessment, it has been determined that the company's **Scope 2 emissions are zero**[4]. This is since all electricity consumed by the company comes from renewable sources.

Table 3: Scope 2 emissions for PTEU

Emissions Sources	Activity data's quality	Consumption	Total emissions (tons/CO_2)
Electricity Consumption	Measured data	28,684 kWh/year	**0.0**

The sourcing of electricity from renewable sources is a commendable achievement for PTEU. By relying entirely on renewable energy, the company has effectively eliminated the GHG emissions associated with its electricity consumption. This not only demonstrates a strong commitment to sustainability but also contributes to the reduction of carbon emissions and supports the transition to a clean energy future.

By choosing renewable energy sources, PTEU has helped to avoid the release of CO_2 and other GHG emissions that would have occurred if electricity had been sourced from fossil fuel-based power plants. This action significantly reduces the overall carbon footprint of the office and showcases a positive environmental stewardship approach.

Maintaining zero Scope 2 emissions will require ongoing efforts to ensure that the company continues to procure electricity exclusively from renewable sources. PTEU should regularly verify and document its renewable energy sourcing, ensuring transparency and accuracy in reporting its carbon footprint.

[4] **The Assessment's boundaries do not include indirect emissions arising from the management of the national/European grid delivering the electricity to PTEU.**

While the absence of Scope 2 emissions is an outstanding achievement, it is essential for PTEU to continually monitor the electricity supply and stay informed about any changes in the renewable energy certificates (RECs) or power purchase agreements (PPAs) to ensure ongoing compliance with renewable sourcing.

By effectively eliminating Scope 2 emissions, PTEU sets a remarkable example for other companies in the industry and demonstrates environmental leadership. The commitment to renewable energy contributes to a sustainable and low-carbon future while positively impacting the overall environmental performance of the office.

It is crucial to document and communicate the company's zero Scope 2 emissions to stakeholders, clients, and employees to showcase the office's dedication to sustainability and encourage others to follow suit. This achievement should be highlighted in sustainability reports, company communications, and any relevant public platforms to inspire and promote sustainable practices within the industry and beyond.

In summary, PTEU has successfully achieved zero Scope 2 emissions by sourcing all its electricity from renewable sources. This remarkable accomplishment highlights the company's commitment to environmental stewardship and sustainability while significantly reducing its carbon footprint. Continued monitoring and transparent reporting will be essential to maintain this achievement and inspire others to adopt similar sustainable energy practices.

SCOPE 3 EMISSIONS BREAKDOWN

Table 4: Scope 3 CO_2 emissions for PTEU

Emissions Sources	Activity data's quality	Activity data type	Total emissions (tons/CO_2)
Internal freight	Measured data	Tonnes.km	**53.2**
Business travel	Measured data/estimation	Passenger.km	**15.5**
Employees' commuting	Measured data	Passenger.km	**41.1**
Material inputs	Measured data/estimation	Euros spent	**15.7**
Emissions related to fuels and energy (not included in Scope 1 and Scope 2)	Measured data/estimation	kWh	**16.2**

Internal freight

Transportation of prototypes and samples from PACTEAM's factories in Dongguan (Guangdong province, China) to PTEU's office is the most significant source of indirect GHG emissions in this Assessment.

This is due to the transportation distance (total of around 9,200 km) and mode (plane and delivery truck on road).Accordingly, the total emissions for PTEU's internal freight (operated by third party) are calculated at **53.2 tons CO_2e, 25% of PTEU's total GHG emissions in 2022 (38% of Scope 3 emissions).**

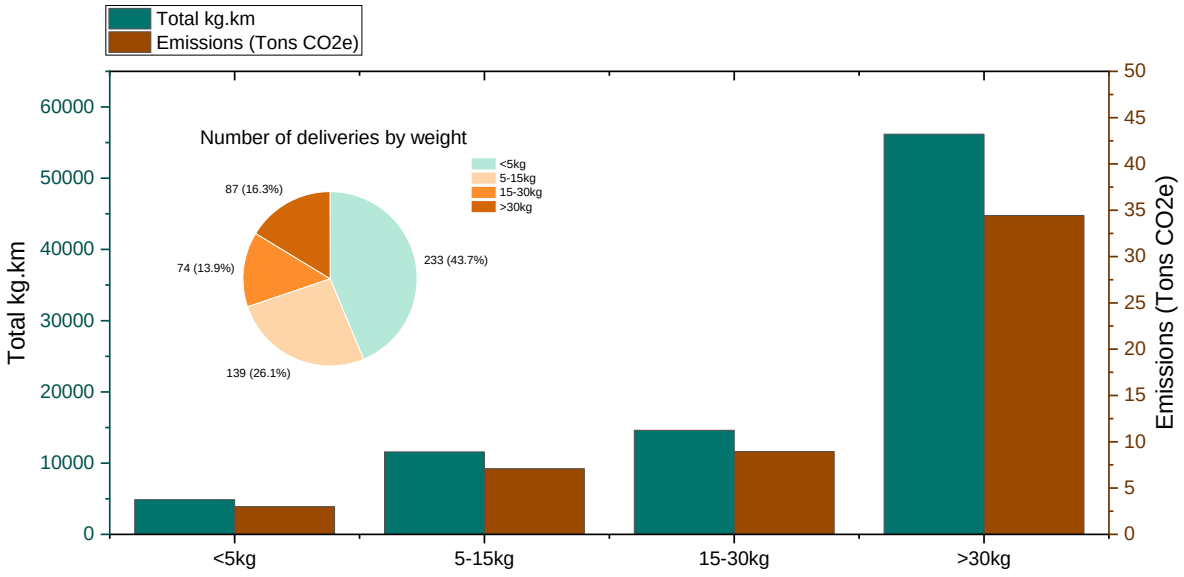

Figure 2: Scope 3 GHG emissions from PTEU's internal freight activities

Business travel

PTEU's business travels in 2022 were carried out by plane, train, taxi/uber and car rental. The findings revealed a total of **15.5 tons of CO2e** associated with these travel practices. The largest contributor to emissions was flights, totaling 13.7 metric tons, followed by train rides, which accounted for 0.5 metric tons. Further examination of the data uncovered that car rentals contributed 0.5 tons of CO2e, while taxi and Uber rides accounted for 0.8 metric tons.

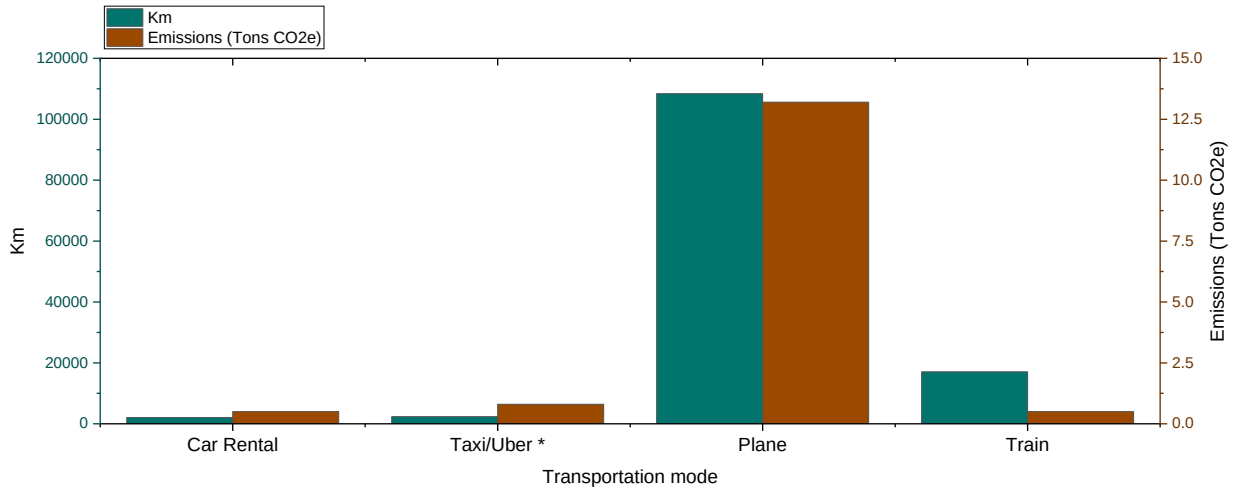

Figure 3: Scope 3 GHG emissions for PTEU's business travel, by transportation mean. (*) The activity data (km.vehicle) for business travel by taxi/uber was estimated from the monetary expenditure for each trip.

These emissions quantities were directly linked to the distances traveled using each mode of transportation. Notably, car rentals covered 2,044 km, while taxi and Uber rides spanned 2,348 kilometers. The extensive **air travel conducted reached a total distance of 108,409 kilometers (around 138,000 passenger.km)**, while train rides accounted for 17,070 kilometers. These findings underscore the significant impact of air travel on the overall carbon footprint associated with PTEU's business operations.

These findings can be further analyzed by looking at average trip distance and corresponding emissions intensity. Business travels by plane were carried out with an **average distance of 2,211 km**, which highlights the relatively appropriate usage of plane mostly for long-distance travel. Nevertheless, trips for about **19,100 passenger.km were**

done by choosing short-distance flights (>1000km) over less emission-intensive means such as high-speed train.

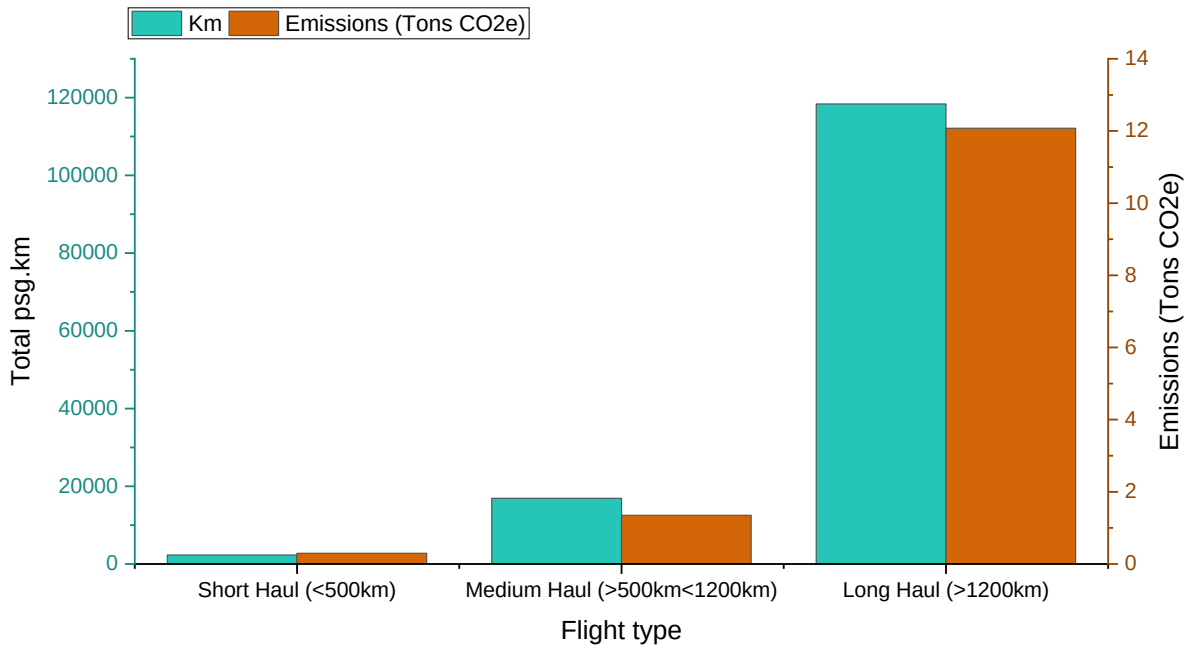

Figure 4: Breakdown of business travel by plane, by flight distance and relative emissions

Taxi or uber rides were limited to extremely short trips on average (about 40 km distance), while data on car rental only allowed to list the total distance covered by each rental, resulting in an average trip length of 680 km. As such, the EF applied to taxi/uber rides were slightly higher than the ones applied to car rental, as it was assumed that the former was chosen for urban trips while the latter was preferred for mixed trips (urban/rural/highway), which are less carbon intensive per km travelled.

It is relevant to note that the activity data (km.vehicle) for business travel by taxi/uber was estimated from the monetary expenditure for each trip, as direct data on trips length was not available for the Assessment. As such, the cost of each trip was used to estimate the corresponding travelled distance according to a set of sources available online (Taxifarefinder.com, Numbeo.com, Taxihowmuch.com). Such estimation carries

a significant amount of uncertainty, but it is not believed to affect the overall results of this Assessment, as emissions from this type of activity are low among other Scope 3 emissions sources.

On a positive note, regular travelling between Milan-Rome-Florence was mostly carried out by high-speed train, for an **average trip distance of about 570km in 30 trips**, thus saving a considerable amount of emissions compared to a scenario where company-owned or private cars were the preferred transportation mode.

Employees' commuting

Employees' commuting data was collected based on a total of 24 employees of PTEU. The predominant mode of transportation chosen by the employees was their private car, with only one worker daily commuting to work by bicycle.

Average yearly commuting distance was 5,872 km and total commuting distance was just above 135,000 km, most of which was covered by diesel or petrol fuel-powered cars. Only 3 workers drove cars powered by LPG/methane, which are considerably less GHG-intensive. No employee drove an electric vehicle to work nor anyone relied on public transportation to get to PTEU's office.

According to the collected data, the GHG emissions from employees commuting at PTEU in 2022 were **41.2 tons CO_2e**, 94% of which caused by diesel/petrol fuel-powered cars.

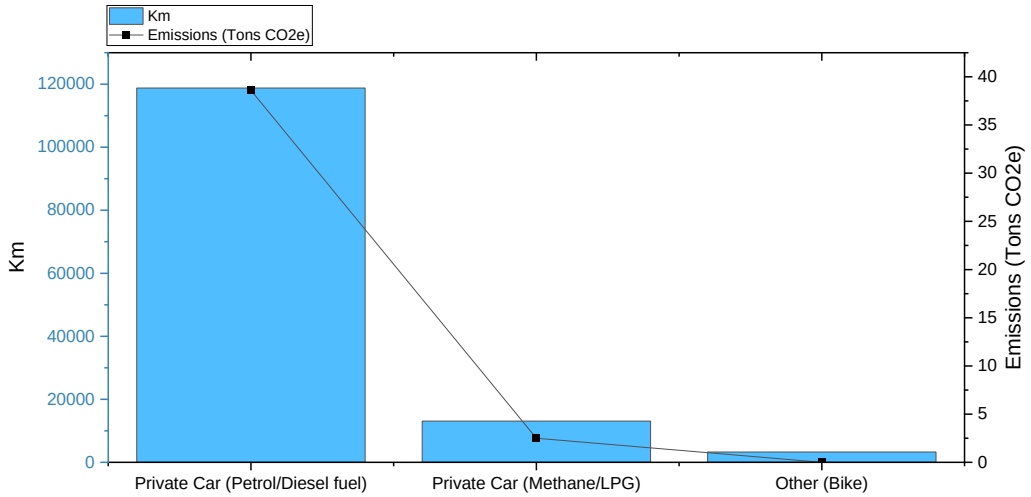

Figure 5: Scope 3 GHG emissions from PTEU's employees commuting to work.

Material inputs

To calculate the emissions arising from materials inputs (office consumables and equipment), the use of monetary ratios instead of detailed data on purchased materials was chosen. This is to simplify the assessment and it was decided after a preliminary estimation of the overall significance of such activities in the overall PTEU's carbon footprint.

Thus, the total expenditure in 2022 on such materials was calculated and coupled with the appropriate Emission Factor (EF) as suggested by ADEME **Bilan Carbone®** methodology (see Sources of emission factors, page 25).

By applying the appropriate EF, PTEU's Scope 3 emissions from the input of office consumables (paper, pens, printing consumables etc....) and equipment (computers, printers, furniture etc....) were estimated at **2.4 tons CO_2e** and **13.2 tons CO_2e** respectively.

It is important to note that the chosen method to calculate such emissions contains a significant amount of uncertainty (50% uncertainty on the EF as outlined by ADEME Bilan Carbone®).

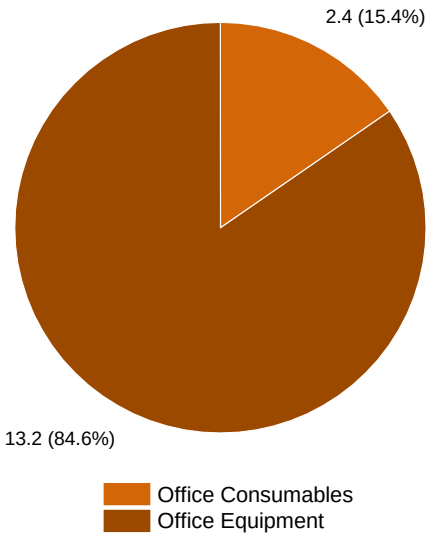

Figure 6: GHG emissions from material input (office consumables and equipment). Note: Monetary expenditure was chosen as the activity data for the calculation

Emissions related to fuels and energy (not included in Scope 1 and Scope 2)

According to the boundaries defined for this Assessment, only the upstream emissions related to fossil fuels use by PTEU are included.
Examples of such emissions include:

- Upstream emissions from fuel extraction and production: These are emissions associated with the extraction and production of fuels that PTEU uses, such as emissions from oil and gas extraction or natural gas processing. These emissions occur before the fuel reaches the organization and are considered Scope 3.

- Fuel transportation and distribution emissions: Emissions arising from the transportation and distribution of fuels to the organization. This includes emissions from the transportation of natural gas and other fuels via pipelines, ships, trucks, or trains.

- Refining or processing emissions: Emissions resulting from the refining or processing of fuels before they are supplied to the organization. This includes emissions generated during the refining of crude oil into diesel, or other refined products.

Thus, Scope 3 emissions related to energy and fuels use for PTEU in 2022 amount to **16.2 tons CO_2e**, of which about **7.1 tons CO_2e** from the diesel fuel's supply chain and **9.1 tons CO_2e** from upstream activities in the natural gas input.

Sources of emission factors

SCOPE 1			
Activity	**Emission factor (Combustion)**	**Unit(s)**	**Source**
Consumption of diesel fuel	2.511	Kg CO_2/l	**ADEME Base Carbone® V11.2, IPCC Guidelines for National GHG inventories**
Consumption of NG (heating)	0.205	Kg CO_2/kWh	**ADEME Base Carbone® V11.2**
SCOPE 2			
Activity	**Emission factor**	**Unit(s)**	**Source**
Consumption of electricity	0.0	Kg CO_2/kWh	**IPCC Guidelines for National GHG inventories**
SCOPE 3			
Activity	**Emission factor**	**Unit(s)**	**Source**
Business travel (short haul)	0.129	Kg CO_2/km.passenger	**US EPA- https://www.epa.gov/climateleadership/ghg-emission-factors-hub**
Business travel (medium haul)	0.080	Kg CO_2/km.passenger	**US EPA- https://www.epa.gov/climateleadership/ghg-emission-factors-hub**
Business travel (long haul)	0.102	Kg CO_2/km.passenger	**US EPA- https://www.epa.gov/climateleadership/ghg-emission-factors-hub**
Business travel (train, ITALY)	0.0317	Kg CO_2/km.passenger	**ADEME Base Carbone® V11.2 (EU ClimFoot Project)**
Business travel (taxi, various countries)	0.325	Kg CO_2/km	**ADEME Base Carbone® V11.2 (EU ClimFoot Project)**
Business travel (private car/car rental)	0.256	Kg CO_2/km.passenger	**ADEME Base Carbone® V11.2 (EU ClimFoot Project)**
Employees commuting (private car, diesel)	0.256	Kg CO_2/km.passenger	**ADEME Base Carbone® V11.2 (EU ClimFoot Project)**
Employees commuting (LPG)	0.194	Kg CO_2/km.passenger	**ADEME Base Carbone® V11.2 (EU ClimFoot Project)**
Internal freight – road transportation	0.204	Kg CO_2/ton.km	**US EPA- https://www.epa.gov/climateleadership/ghg-emission-factors-hub**
Internal freight – international flight	0.613	Kg CO_2/ton.km	**US EPA- https://www.epa.gov/climateleadership/ghg-emission-factors-hub**
Material Inputs: office consumables	0.367	Kg CO_2/EUR spent	**ADEME Base Carbone® V11.2 (EU ClimFoot Project)**
Materials Inputs: computers and office equipment	0.917	Kg CO_2/EUR spent	**ADEME Base Carbone® V11.2 (EU ClimFoot Project)**
Upstream emissions from fossil fuel use (Diesel fuel)	0.655	Kg CO_2/l	**ADEME Base Carbone® V11.2 (EU ClimFoot Project)**
Upstream emissions from fossil fuel use (Natural Gas)	0.039	Kg CO_2/l	**ADEME Base Carbone® V11.2**

EMISSION REDUCTION RECOMMENDATIONS

PTEU's corporate carbon footprint can be reduced by applying a range of key performance indicators (KPIs) to the main emission sources (heating, business travel and internal freight) and plan emission mitigation strategies accordingly for the short, medium, and long-term.
The purpose of implementing KPIs is to gain a better understanding of emission sources, monitoring them on monthly basis, and discovering new mitigation strategies to adopt.
Mitigation strategies serve the goal of reducing PTEU's emissions: their impact should be monitored by repeating the corporate carbon footprint assessment on a year-to-year base, with this report serving as baseline.
Following a list of recommendations, divided in the three scopes in which emissions fall into.
IMPORTANT DISCLAIMER: the mitigation potentials (avoided emissions of GHGs) listed in the following pages are general estimates, which could dramatically vary depending on PTEU's setting. It is advised to consider such estimates as a screening to evaluate GHG mitigation measures to be further investigated with detailed analysis.

SCOPE 1: Company vehicles and heating

KPI(s)

Emissions in Scope 1 for PTSA are limited to consumption of fuel for company vehicles (diesel) and heating (natural gas).
Suggested KPI(s) to implement and monitor:

1.A - Company vehicles:

i. Average fuel consumption for company vehicles (km/l)
ii. Number of separate trips per month

iii. Average length of trips (monthly)[5]
iv. % of EVs in company-owned fleet

1.B – Heating:

i. Consumption of energy for heating purposes, yearly (kWh/y)
ii. Annual energy consumption per person (kWh/(person*year))
iii. Annual energy consumption per floor area (kWh/(m2*year))
iv. Difference between temperature maintained in PTEU's premises (°C) and outside temperature (sampled 2 times per week, morning and afternoon), when heating system is on.

Possible mitigation measures

Emissions from company-owned vehicles:

- ✓ *Switching diesel-powered company-owned fleet to LPG or electricity-powered vehicles (EVs)*. LPG vehicles emit 30-40% CO_2/km[6] compared to diesel-powered vehicles, while electric vehicles' emissions depend on local energy grid's composition. Should PTEU set up charging stations on its premises for its vehicles and use the 100% renewable energy mix that supplies its office and warehouse, emissions from company-owned EVs would be nullified (potentially removing about 8% of total GHGs emissions).

Emissions from heating:

To reduce Scope 1 emissions from heating PTEU's 500 sqm office with natural gas, PTEU can consider the following strategies:

[5] **Literature shows that short trips (<25km) s in an urban environment have a higher environmental impact/km than longer trips**
[6] **GHG Protocol https://ghgprotocol.org/corporate-standard**

- ✓ **Improve Energy Efficiency:** Enhance the insulation of the building to minimize heat loss and improve energy efficiency. This can include insulating walls, ceilings, and floors, as well as sealing any gaps or leaks.

- ✓ **Upgrade Heating System:** Install a more efficient natural gas heating system. Consider replacing an older, less efficient boiler with a newer condensing boiler, which can significantly reduce fuel consumption and emissions.

- ✓ **Smart Heating Controls:** Utilize smart thermostats and heating controls to optimize the heating system's operation. These devices can adjust temperature settings based on occupancy patterns, ensuring that heating is only provided when needed.

- ✓ **Zoning and Timers:** Divide the office into zones and utilize timers or programmable thermostats to control heating in different areas separately. This way, you can avoid heating unoccupied spaces or keeping the temperature too high during off-peak hours.

- ✓ **Renewable Energy Integration:** Explore the possibility of integrating renewable energy sources into your heating system. For example, you could consider installing solar thermal panels to supplement the natural gas heating during sunny periods.

- ✓ **Heat Recovery:** Implement heat recovery systems to capture and reuse waste heat from various processes or equipment in the office. This could involve heat recovery ventilation, which preheats incoming fresh air using the waste heat from exhaust air.

- ✓ **Employee Awareness and Behaviour:** Raise awareness among employees about the importance of energy conservation and encourage them to adopt energy-saving practices. This includes reminding them to turn off heating when leaving for the day and encouraging them to dress appropriately for the season.

- ✓ **Regular Maintenance and Inspections:** Ensure that the heating system receives regular maintenance and inspections to keep it operating at peak efficiency. This includes cleaning and servicing the boiler, checking for leaks, and optimizing its performance.

- ✓ **Consider Alternative Heating Options:** Evaluate alternative heating options that have lower emissions, such as district heating systems or heat pumps powered by renewable electricity. These options may require initial investments but can significantly reduce or eliminate natural gas usage.

The range of reduction in Scope 1 emissions can vary depending on several factors, including the efficiency of the existing natural gas boiler, the energy consumption of the office, and the implementation of energy-saving measures. However, here are some general estimates of potential emission reductions compared to a baseline of heating with a conventional natural gas boiler:

1. **Efficiency Improvements:** By upgrading to a more efficient natural gas boiler, such as a condensing boiler, it is possible to achieve energy savings of around **10% to 30%**. This improvement in efficiency would result in corresponding reductions in emissions.
2. **Building Insulation:** Enhancing the insulation of the office building can lead to energy savings of approximately **10% to 20%**. The reduced energy demand would result in lower emissions from the natural gas boiler.
3. **Smart Heating Controls:** Implementing smart heating controls and zoning strategies can help achieve energy savings of around **10% to 20%.** By optimizing heating patterns and avoiding unnecessary heating in unoccupied areas, emissions can be reduced.
4. **Renewable Energy Integration:** Integrating renewable energy sources into the heating system, such as solar thermal panels, can significantly reduce natural gas consumption. Depending on the size of the installation and solar resources, emission reductions of **20% to 50% or more** may be possible.

5. **Heat Recovery Systems:** Implementing heat recovery systems can capture waste heat and reuse it for heating purposes, leading to energy savings of approximately **5% to 15%.** This would result in emissions reductions from the natural gas boiler.

It's important to note that these estimates are approximate and can vary depending on specific circumstances and the extent of implementation. It's recommended to conduct a detailed energy audit and consult with energy experts to assess the potential for emissions reduction in PTEU's particular setting.

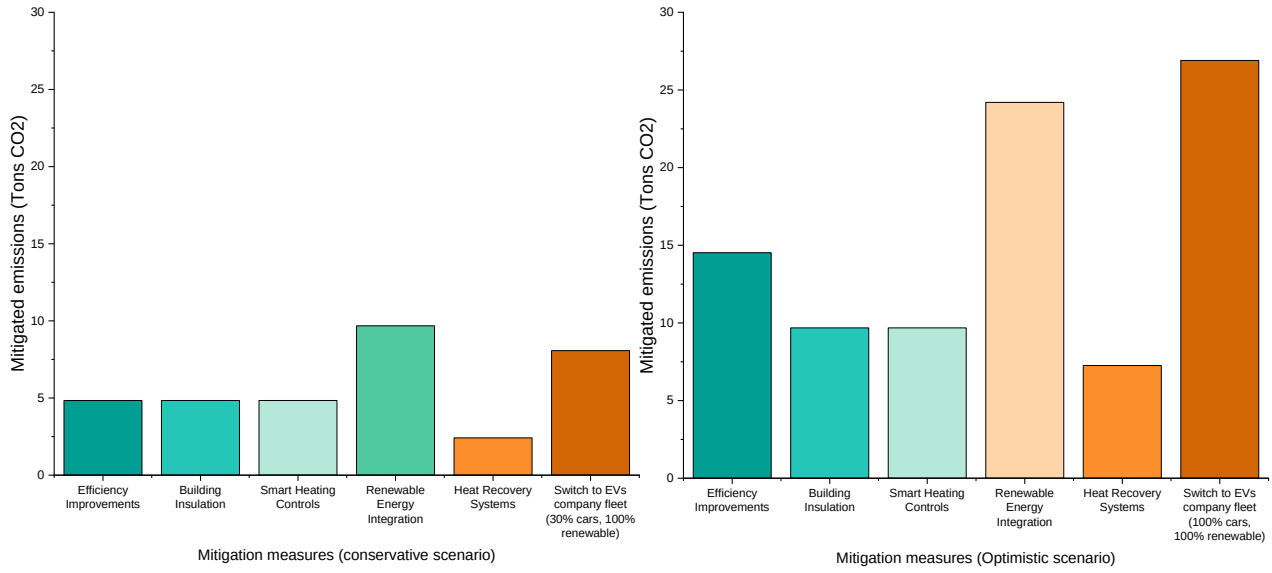

Figure 7: Emissions mitigation potential of Scope 1 emissions reduction measures. Please note: the mitigation potentials are approximates and could vary dramatically depending on PTEU's settings.

Scope 2: Electricity consumption

PTEU's has already adopted a best practice to mitigate Scope 2 emissions, as it sources its electricity from a certified 100% renewable sources mix.

Therefore, at this stage it is suggested to prioritize the other Scopes when planning procedures to mitigate GHGs emissions from the company's operations.

Scope 3: Business travel and employees commuting

It is suggested to maintain a KPIs database related to business travel and commuting, so that the frequency and intensity of such activities can be properly monitored and planned, to effectively mitigate the resulting GHGs emissions when appropriate. Following the suggested KPIs:

KPIs

3.A – Business travel

i. % of trips done using emission-intensive transportation means (plane, car) over total number of trips, yearly
ii. % of trips in the 300km-1000km distance interval for which **train** was used over plane, car
iii. Number of long-haul flights (>4000km), yearly
iv. Total number of business trips, detailed by means of transportation, number of participants and total km

Note: depending on company policy, both 3.A-i and 3.A-ii KPIs could be also calculated on an employee basis and shared yearly, for intrinsic motivation by peer comparison

3.B – Employee commuting

i. % of employees regularly using public transport for commuting
ii. % of employees using EVs for commuting
iii. Average employee commuting distance (km/year)

Possible mitigation measures

- ✓ Regarding **business travel**, one mitigation measure for PTEU would be to extend its already commendable use of high-speed train to short business trips (<1000km) currently conducted by plane. The maximum mitigation potential of such a measure could reach about **15% of PTEU's Scope 3-business travel emissions**.

Another applicable mitigation measure would be to encourage the use of remote meetings over long-distance flights, thus reducing the number of 4000km + plane trips. For example, a **60% reduction in such flights would translate in a 50% reduction in PTEU's overall Scope 3-business travel emissions**.

- ✓ Emissions arising from employees commuting could be reduced by implementing a hybrid work schedule (remote and in-office) based on the commuting distance.
- ✓ Encourage employees to purchase EVs. This can be done by various measures such as company incentives, trainings to sensibilize the positive effects of EVs on the environment.

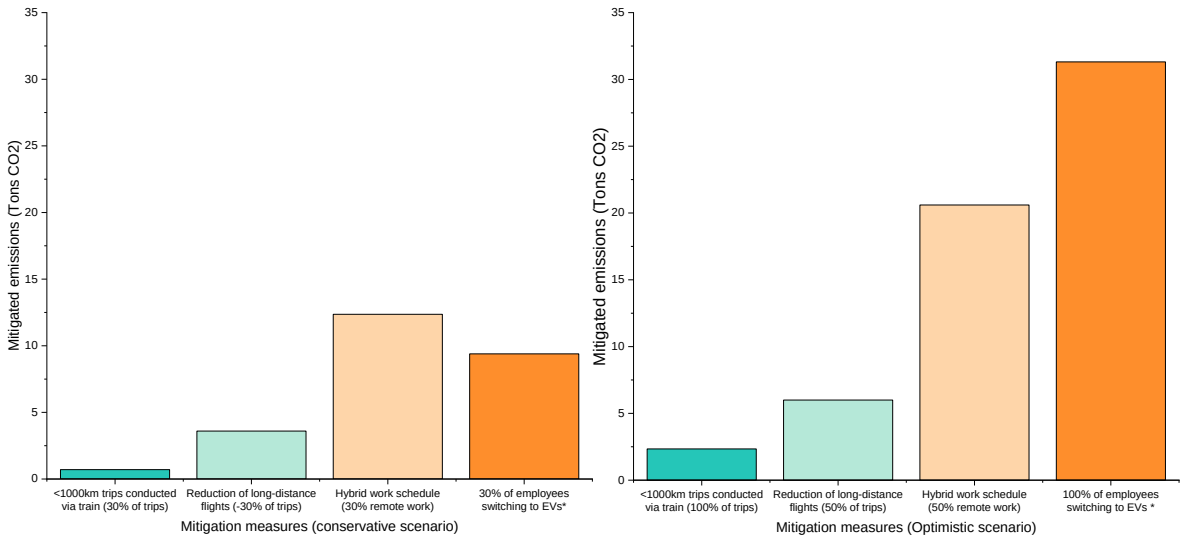

Figure 8: Emissions mitigation potential of Scope 3 (business travel & commuting) emissions reduction measures. Please note: the mitigation potentials are approximates and could vary dramatically depending on PTEU's settings. (*) The emission factor of EVs (kg CO2/km) is not 0, as it is unrealistic to assume that employees would always charge their cars at PTEU. Therefore, Italian EF for electricity supply is applied to generate this graph.

Scope 3: Internal freight/haulage

Scope 3 emissions from internal freight are the prime source of GHGs arising from PTEU's activities, mostly due to the distance between PTEU's area of operations and the manufacturing point in China. While it is difficult to effectively tackle this issue, as PTEU does not operate nor control the shipping operator (international currier), PTEU should consider the following GHG mitigation KPIs and strategies:

KPIs

3.C – Internal freight

i. **Emissions Intensity per Unit**: Calculate emissions intensity by dividing the total emissions from internal freight by a relevant unit, such as revenue generated. This helps assess emissions efficiency relative to business metrics.
ii. **Modal Shift**: Track the percentage of freight that has shifted to lower-emission transportation modes, such as rail or water transport, compared to the baseline.
iii. **Packaging Optimization**: Measure the reduction in packaging material weight or volume to assess the effectiveness of efforts to optimize packaging and reduce emissions associated with freight transportation.

Possible mitigation measures

- ✓ **Mode Shifting:** Shift transportation modes to those with lower emissions. Whenever feasible, PTEU should consider using rail or water transport instead of road/air transport, as they generally have lower emissions per ton-kilometer.

- ✓ **Sustainable Packaging:** Optimize packaging materials to reduce weight and volume, which can lead to more efficient transportation with fewer trips required. Use recyclable or biodegradable packaging materials to reduce environmental impact.

- ✓ **Measurement and Reporting:** Implement robust measurement and reporting systems to track and monitor your internal freight emissions. Regularly assess your progress, set reduction targets, and communicate your efforts transparently to stakeholders.

Since at the time of this Assessment there was no available data on packaging weight, an appropriate estimate of the mitigation potential of such measures should be calculated after the implementation of the KPI 3.C-iii.

Scope	KPI name	KPI target	Unit
1 - Company vehicles	1.A-i	Average fuel consumption for company vehicles	Km/l
1 - Company vehicles	1.A-ii	Number of separate trips per month	N
1 - Company vehicles	1.A-iii	Average length of trips (monthly, yearly)	Km
1- Company vehicles	1.A-iv	% of EVs in company-owned fleet	%
1- Heating	1.B-i	Consumption of energy for heating purposes, yearly	kWh/y
1- Heating	1.B-ii	Annual energy consumption per person	kWh/(person*year)
1- Heating	1.B-iii	Annual energy consumption per floor area	kWh/(m2*year)
1- Heating	1.B-iv	Difference between temperature maintained in PTEU's premises (°C) and outside temperature (sampled 2 times per week, morning and afternoon), when heating system is on	°C
3 – Business travel	3.A-i	% of trips done using emission-intensive transportation means (plane, car) over total number of trips, yearly	%
3 – Business travel	3.A-ii	% of trips in the 300km-1000km distance interval by train over plane, car	%
3 – Business travel	3.A-iii	Number of long-haul flights (>4000km), yearly	N
3 – Business travel	3.A-iv	Total number of business trips, detailed by means of transportation, number of participants and total km	various
3 – Employees Commuting	3.B-i	% of employees regularly using public transport for commuting	%
3 – Employees Commuting	3.B-ii	% of employees using EVs for commuting	%
3 – Employees Commuting	3.B-iii	Average employee commuting distance	Km/year
3 – Internal freight/haulage	3.C-i	Average weight of packaging	kg
3 – Internal freight/haulage	3.C-ii	Emission intensity per unit (CO2 per unit of revenue generated)	Kg CO_2/EUR
3 – Internal freight/haulage	3.C-iii	Percentage of deliveries done by using water/railway over total	%