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FEASIBILITY AND SCOPING STUDY FOR THE COMMISSION TO BECOME CLIMATE NEUTRAL BY 2030

FINAL REPORT

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LIST OF ACRONYMS AND ABBREVIATIONS

ABC: Association Bilan Carbone
ACP: African, Caribbean and Pacific Group of States
AD: Action Domain
ADEME: Agence de la transition écologique de la République française
API: Application Programming Interface
BMS: Building Management System
BX: Brussels
CAPEX: Capital expenditure
CER: Certified Emission Reduction
CFP: Carbon footprint
CHAFEA: Consumers, Health, Agriculture and Food Executive Agency
CO_2: Carbon dioxide
COP: Coefficient of performance
COVID: Coronavirus disease
DG BUDG: Directorate-General "Budget"
DG DEVCO: Directorate-General "Development and Cooperation - EuropeAid"
DG DIGIT: Directorate-General "Informatics"
DG HR: Directorate-General "Human Resources and Security"
DG MARE: Directorate-General "Maritime Affairs and Fisheries"
DG REGIO: Directorate-General "Regional Policy"
DG RTD: Directorate-General "Research"
DG SANTE: Directorate-General "Health and Food Safety"
DG SCIC: Directorate General "Interpretation"
DG(s): Directorate(s) General
EACEA: Education, Audiovisual and Culture Executive Agency
EASME: The Executive Agency for Small and Medium-sized Enterprises
EEAS: European External Action Service
EIC: European Innovation Council
EIT: European Institute of Innovation & Technology
EMAS: Eco-Management and Audit Scheme
EMI: The Reimbursement File Application
EPB: Energy Performance of Buildings
ERCEA: European Research Council (ERC) Executive Agency
ES2018: Environmental Statement 2018
EU: European Union
EU ETS: European Union Emission Trading System
FTE: Full time equivalent
GBT: Global Business Travel
GE: Geel
GHG(s): Greenhouse gas(es)
GPP: Green Public Procurement

GR: Grange
GWP: Global warming potential
ICAO: International Civil Aviation Organisation
ICT: Information and Communication Technologies
INEA: Innovation and Networks Executive Agency
IPCC: Intergovernmental Panel on Climate Change
IRR: Internal Rate of Return
IS: Ispra
ISO: International Organization for Standardization
IT: Information technology
JMO2: Jean Monnet 2 building
JRC: Joint Research Centre
KA: Karlsruhe
KIT: Karlsruhe Institute of Technology
KPI: Key Performance Indicators
LCA: Lifecycle analysis
LX: Luxembourg
M€: Million €
MFF: Multi-Annual Financial Framework
MIPS: Computer application for the management of missions (Mission Integrated Processing system)
NPV: Net present value
NWOW: New Ways of Working
OECD: Organisation for Economic Co-operation and Development
OIB: Office for Infrastructures and Logistics in Brussels
OIL: Office for Infrastructures and Logistics in Luxembourg
OPEX: Operational expenditure
OS: Operating System
EPBPE: Petten
PV: Photovoltaic
PMO: Pay Master's Office (part of IOB)
REA: Research Council Agency
RFI: Radiative Forcing Index
SE: Seville
SME(s): Small and Medium-sized Enterprise(s)
tCO_2e: Tonnes of CO_2 equivalent

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EXECUTIVE SUMMARY

Towards climate neutrality in 2030

In the European Green Deal Communication, adopted in December 2019, the European Commission proposed an ambitious roadmap to "transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use."

High ambitions for policy in the fight against climate change also call for the European Commission to act as an example and reach climate neutrality in the short term. As stated in the European Green Deal Communication,

> *"the Commission is also keen to reduce its environmental impact as an institution and as an employer. It will present a comprehensive action plan in 2020 to implement itself the objectives of the Green Deal and to become climate neutral by 2030. It calls on all the other institutions, bodies and agencies of the EU to work with it and come forward with similar ambitious measures."*

The Communication also states that

> *"[p]ublic authorities, including the EU institutions, should lead by example and ensure that their procurement is green."*

According to the Intergovernmental Panel on Climate Change (IPPC)[1] special report "Global Warming of 1.5°C", climate neutrality is the concept of a state in which human activities result in no net effect on the climate system. Achieving such a state would require balancing of those emissions that cannot be avoided with removal of greenhouse gas emissions (GHG), accounting also for regional or local bio-geophysical effects of human activities that, for example, affect surface albedo[2] or local climate.

To reach economy-wide climate neutrality, it is not possible to rely on carbon removal only, and all pathways towards climate neutrality require significant emissions reduction. To be consistent with economy-wide requirements, also for climate-neutrality of an organisation, reducing emissions should be the priority, since the contributions of Bioenergy with Carbon Capture and Storage (BECCS) and removals in the Agriculture, Forestry and Other Land Use (AFOLU) sector are constrained by technological and earth absorption limitations.

Scope of the European Commission's GHG emissions

The carbon footprint of the European Commission is the total greenhouse gas (GHG) emissions caused by the Commission's operation expressed in their carbon dioxide equivalent. It includes all emissions – direct and indirect, upstream and downstream – resulting from the operations of the Commission, as an organisation that employs staff, uses buildings, consumes goods (including food and office supplies) and services (including travels), and organises meetings. However, it does not include GHG emissions from other organisations or individuals in its service value chain or outside this value chain; in other words, the impacts of

[1] The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.

[2] Albedo is a measure of the amount of light hitting a surface that is reflected without being absorbed.

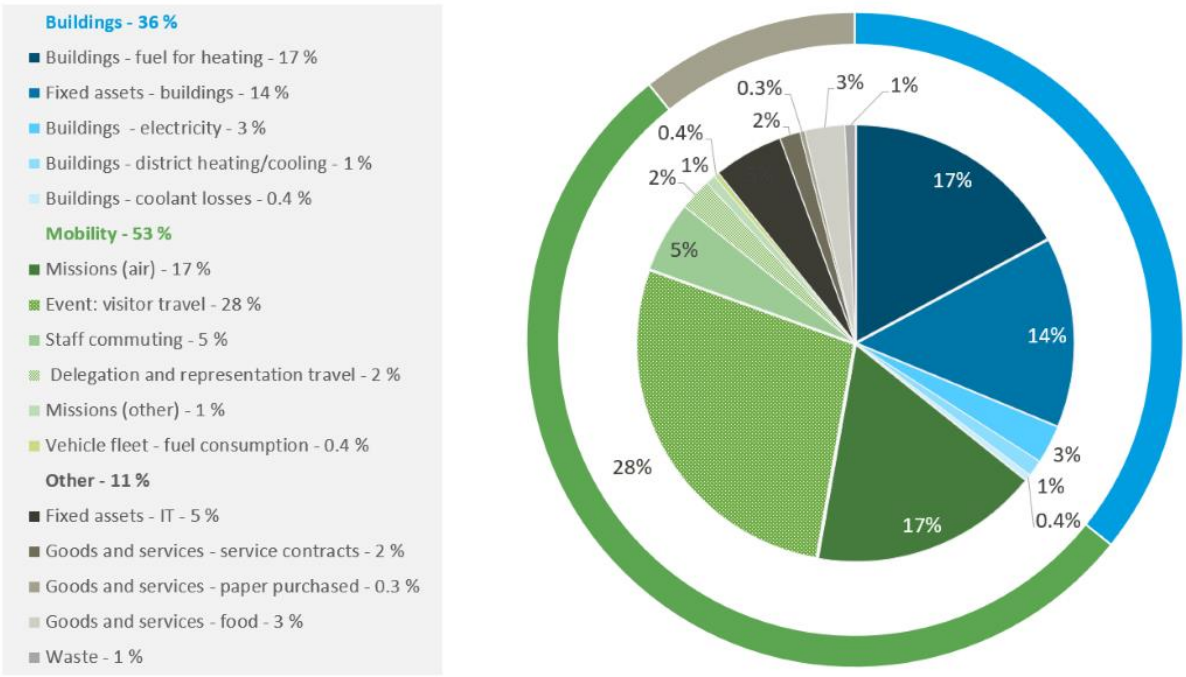
the European Commission's policies, including of those on reducing GHG emissions, is outside the scope.[3]

The carbon footprint of the European Commission in 2018 amounted to 260,000 tCO_2e (tonnes of CO_2 equivalent), i.e. around 7 tCO_2e per staff member[4]. Following recommendations from the study's Steering Board, the consultant recalculated this carbon footprint in 2020 for 2018, based on a revised operational and organisational scope, and it increased very significantly. A considerable share of the increase is due to our estimation of the emissions from travels of visitors (experts attending committee meetings, evaluators of research proposals, etc.) to Commission meetings and events, based on the (limited) available data set. However, the consultant is convinced that the new scope provides a strong basis for the European Commission's action plan towards climate neutrality, as it includes almost all relevant sources of emissions, i.e. emission sources on which the Commission has at least some leverage and for which some data are available. In terms of organisational scope, this includes all sites of the European Commission in Brussels, Ispra, Luxembourg, Karlsruhe, Geel, Grange, Petten, and Seville; it also includes executive agencies such as EASME and REA. However, it does not include Commission Representations in Member States, nor Delegations of the EU to third countries which are under the responsibility of the European External Action Service (EEAS), which is a different institution; it also does not include decentralised agencies, since they are largely independent. In terms of operational scope, it includes emissions related to meetings, conferences and events organised by the European Commission (including committees organised by the Commission, and evaluation and monitoring sessions organised by REA, EASME and DG RTD for the various research, innovation and entrepreneurship programmes managed by the European Commission), as well as Commission staff business trips (including to/from the Commission Representations to Member States and the Delegations of the EU to third countries).

[3] The Commission's Secretariat General manages the assessment of the environmental and climate impact of EU policies and strategies proposed and coordinated by the EC according to the Environmental Impact Assessment Directive (85/337/EEC).

[4] As a comparison, in 2018, the average GHG emissions per capita in the European Union (27 countries) amounted to 8.7 tCO_2e and to 10.8 tCO_2e in Belgium (Eurostat from the European Environment Agency, https://ec.europa.eu/eurostat/databrowser/view/t2020_rd300/default/table?lang=en).

Figure 0.1 The European Commission's carbon footprint in 2018



The main sources of emissions are mobility (53%) and buildings (36%) while other sources of emissions such as IT assets (5%) and food (3%) are less significant. This accounts for both embodied carbon (whole life-cycle emissions related to materials used in an asset or product, e.g. construction and demolition of a building) and operational carbon (emissions related to the use-phase of an asset or product, e.g. heating and cooling of a building).

Since 2005, the European Commission has implemented the Eco Management and Audit Scheme (EMAS). It was developed in 1993 by the European Commission as a voluntary environmental management instrument. It enables organisations to assess, manage and continuously improve their environmental performance. The Commission was the first EU institution to be registered under EMAS, and a further 12 institutions (representing 80% of the EU institutions' and bodies' staff) have followed suit. EMAS has been key in reducing emissions within the Commission since its implementation.

Also since 2005, as part of its EMAS, the Commission has monitored its carbon footprint and it has been decreasing over time. This is due both to energy efficiency measures that have enabled the Commission to reduce the amount of fossil fuels used to heat the buildings, and to a progressive switch to green electricity contracts.

Action domains and measures for the European Commission to become climate neutral

The organisational benchmarking conducted in the study shows that an increasing number of public and private institutions are committing to and setting targets to reduce their emissions. They are source of inspiration for the Commission. Overall, the comparison indicates that a climate neutrality target of 2030 with a significant in-house emissions reduction is aligned with the best in class. So it appears that the European Commission has the opportunity to set clearer and more ambitious targets than most of its peers. However, variations in scope, base year and target year make the comparison very difficult.

A screening and analysis of relevant concepts and instruments shows that a large toolbox is available for the Commission to become climate neutral. Examples relate *inter alia* to sustainable building design, green and collaborative procurement, new ways of working in public administration, corporate carbon budgets, valuation of productive travel time, internal carbon fees for mobility, active mobility support systems, communication and collaboration with peers, and collaborative change. While the European Commission already implements some of them under EMAS, these concepts and instruments can inspire the European Commission to increase its level of ambition. However, their applicability to the Commission needs to be carefully assessed, to ensure that the Commission can implement the concept or instrument successfully, taking account of its current practices as well as potential barriers and opportunities.

The consultant identifies six action domains and 45 measures that have the potential to be included in the Commission's climate neutrality action plan. They are listed in the table below. They are also described in detail in a comprehensive and computable Excel table delivered to the Commission. They address all emission sources identified in the scoping exercise.

Table 0.1 List of action domains and mitigation measures proposed to the European Commission

Action domain	Code	Measure
AD#1: Design sustainable buildings and working space	1.1	Optimise office space
	1.2	Improve meeting room occupancy
	1.3	Use low-carbon materials in construction and renovation
	1.4	Increase vegetation in the built environment
	1.5	Relocate to green and sustainable buildings
AD#2: Optimise energy consumption and systems	2.1	Close offices during holiday periods
	2.2	Optimise energy regulation systems
	2.3	Improve building insulation and passive protection
	2.4	Communicate on energy consumption and behaviours
	2.5	Conduct internal energy audits
	2.6	Optimise energy systems at replacement time
	2.7	Install on-site renewable energy production for heating/cooling
	2.8	Install on-site PV production
	2.9	Use cloud computing services
	2.10	Use new fuel sources for heating
	2.11	Purchase green electricity for all sites
	2.12	Switch to heat pumps
AD#3: Avoid air travel and promote low carbon travel modes	3.1	Develop remote meeting attendance for staff through enhanced videoconference facilities
	3.2	Implement a bonus/malus fee in mission booking process
	3.3	Implement carbon threshold on missions
	3.4	Improve booking criteria for missions
	3.5	Develop remote meeting attendance and promote low carbon travel for visitors
	3.6	Implement mandatory train transport up to a set distance
	3.7	Implement priority rules for the purchase of flight economy class tickets
AD#4: Reduce commuting emissions	4.1	Limit parking space and introduce parking fee
	4.2	Improve teleworking rules and practice
	4.3	Improve the commuting service helpdesk
	4.4	Improve carpooling in isolated zones
	4.5	Implement a commuting fee
	4.6	Promote active mobility
	4.7	Install chargers for electric 2-wheeled vehicles
AD#5: Reduce purchase and consumption GHG emissions	5.1	Ban single-use plastic
	5.2	Optimise food order quantities
	5.3	Promote low carbon menus in canteens and events
	5.4	Reduce and change IT equipment
	5.5	Optimise the lifecycle of IT devices
	5.6	Install centralised recycling and waste points
	5.7	Optimise internet data consumption
	5.8	Develop green and collaborative procurement
AD#6: Manage & communicate	6.1	Exchange and cooperate with peers
	6.2	Conduct frequent feedback surveys
	6.3	Provide guidance and reporting tools
	6.4	Promote good practices
	6.5	Break down targets
	6.6	Provide GHG monitoring tools

The measures identified differ significantly in terms of their GHG emissions reduction potential, cost-efficiency, level of investment required, and length of implementation. For example, measure 3.5 *Develop remote meeting attendance and promote low carbon travel for visitors*, has the highest mitigation potential, with 13.4% of the initial baseline in the central scenario.[5] Measure 1.1 *Optimise office space*, appears to be the most cost-efficient measure, with a negative cost of -2,800 €/tonne of CO_2e. This is due to the savings generated by a reduction in the number of buildings occupied by the European Commission (so-called payback). This measure however requires the highest initial investment (CAPEX), with an investment estimated at 400 M€ by 2030. To what extent such an investment will actually be feasible will depend on the budget availability under the multiannual financial framework (MFF) for the years 2021-2027, for which the final decision is pending. Measure 5.1 *Ban single-use plastic*, is the measure with the lowest cost-efficiency ratio (3,900 €/tonne of CO_2e), due to the fact that its mitigation potential is rather insignificant; however, this measure nonetheless has a role to play, as it provides a relevant "signalling effect" to trigger behavioural change. Finally, some measures have a very short period of implementation and could come into effect almost immediately, such as measure 5.3 *Promote low carbon menus in canteens and at events*, while other measures need the full period until 2030 to reach their mitigation potential, such as measure 2.3, *improve building insulation and passive protection.*

The study proposes an alternative model to a mere prioritisation according to the volume and costs of opportunities to reduce emissions in a given year in a Marginal Abatement Costs Curve. Instead, the European Commission should also take other parameters into consideration: timing (the horizon of 2030 provides very limited time for implementing mitigation measures); financing (the ceilings for administrative expenditure under the multiannual financial framework, annual budget allocations and the Financial Regulation of the European Commission limit the possibility for upfront investments); preparation (some measures appear to be very complex and require further analysis before the European Commission can implement them); role model (the European Commission has an interest in setting up a plan that is comprehensive, credible, and exemplary).

The study identifies four categories of measures:

(i) The "low-hanging fruit" are measures which are relatively easy to implement, low-cost (low initial CAPEX or savings), or provide significant mitigation potential; this category typically includes measures related to mobility, purchase and consumption.

(ii) The measures falling under the category "lever effect" are those which are also relatively easy to implement and low-cost (low initial CAPEX or savings), and which, although providing only limited mitigation potential, are enablers for other measures or provide a positive signal; this category includes management, communication and monitoring activities.

(iii) the measures falling under the category "more preparation needed" are measures with a high mitigation potential but for which extra effort is needed, either in terms of investment support (potentially involving the Budget Authority) or planning (complex implementation which requires feasibility studies); this categories relates essentially to buildings and facilities.

(iv) "other" measures are those where the net-climate benefits is not ensured and requires further analysis and careful considerations; this category includes teleworking, which is a debated measure due to significant rebound effects that require due consideration to ensure environmental benefits and other co-benefits; this category also includes the purchase of

[5] The central scenario consists in 50% in-house GHG emissions reduction and 50% purchased CO2-removal credits. It was initially used to identify and design measures and to assess their mitigation potential, with a GHG emissions reduction objective of 2030 that is considered ambitious but feasible.

new fuel sources, which is another controversial measure that requires careful implementation to ensure that the environmental benefit of the measures is additional to that provided by existing sources).

Decarbonisation pathways for the European Commission to become climate neutral by 2030

The consultant has designed and implemented a scenario analysis methodology to help the European Commission understand what the possible decarbonisation pathways are and what differences they entail. The methodology builds on a very detailed analysis of each measure and the tool enables their dynamic combination for estimating emissions reduction and costs over time, taking into account preparation, implementation and interlinkages. Needs for additional human resources are considered. Site specificities are also considered. Capital expenditure and operational expenditure are estimated, allowing cash flow analysis. A level of uncertainty is calculated for each scenario.

A scenario is defined by an overall objective of GHG emissions reduction by 2030. This objective is expressed as a percentage of the Commission's carbon footprint in 2018 (base year). **This means that all scenarios reach climate-neutrality by 2030 but differ in terms of the share of in-house GHG reduced in 2030 compared to 2018, and the share of carbon removal credits purchased in 2030.** For a different objective of GHG emissions reduction by 2030, each scenario then also differs from the others in terms of the set of measures for GHG emission reduction it includes. Moreover, the underlying emissions reduction objective of each of these measures differs from one scenario to another.

Three scenarios are identified for further assessment.

The 50% in-house GHG emissions-reduction & 50% purchased CO_2-removal credits scenario combines all measures analysed at their central level of ambition (defined as ambitious but technically and operationally feasible).

The 30% in-house GHG emissions-reduction & 70% purchased CO_2-removal credits scenario sets lower ambitions on some measures that require high levels of CAPEX that may be more difficult to accommodate, given budgetary constraints. This concerns mainly measures from *AD#1 Design sustainable buildings and working space* and *AD#2 Optimise energy consumption and systems*.

The 65% in-house GHG emissions-reduction & 35% purchased CO2-removal credits scenario sets the highest GHG emissions reduction objective at 2030 and focuses on measures that have the highest mitigation potential, independent of financial considerations. Measures in *AD#1*, *AD#2* and *AD#3 Avoid air travel and promote low carbon travel modes* contribute the most to this objective, with high levels of ambition.

The three scenarios differ in terms of the measures they include and, to a larger extent, in terms of the level of ambition of each measure. Table 0.2 provides an overview of the scenarios and how they differ in terms of the measures they contain.

Table 0.2 Scenario comparison: measures

#	Measure description	Description of the objective	30% in-house GHG emissions reduction scenario	50% in-house GHG emissions reduction scenario	65% in-house GHG emissions reduction scenario
1.1	Optimise office space	% Reduction of average office building gross surface[6] per employee Office space optimisation in BX LX SE & GR and space reduction mainly applicable in BX.	10% reduction in terms of m^2/staff 32 m^2/staff	30% reduction in terms of m^2/staff 24 m^2/staff	50% reduction in terms of m^2/staff 18 m^2/staff
1.3	Use low-carbon materials in construction and renovation (based on LCA, see LEVEL(s))	Renovation with % of low carbon and sustainably sourced biomaterials	Renovation with 20% of low carbon and sustainably sourced biomaterials	Renovation with 50% of low carbon and sustainably sourced biomaterials	Renovation with 70% of low carbon and sustainably sourced biomaterials
1.5	Relocate to green and sustainable buildings	% of staff relocated to new buildings	4% in BX Circa 100% in SE & LX	10% in BX Circa 100% in SE & LX	20% in BX Circa 100% in SE & LX
2.2	Optimise energy regulation systems	% of buildings monitored	50%	100%	100%
2.3	Improve building insulation and passive protection	% of buildings with no relocation possible	10%	30%	30%
2.10	Use new fuel sources for heating	% of remaining natural gas consumption for heating covered by biogas certificates	Not implemented	25%	100%
2.12	Switch to heat pumps	% of gas and fuel replaced by heat pumps	5%	25%	25%
3.1	Develop remote meeting attendance for staff through enhanced videoconference facilities	% of travel trip distance replaced by videoconference	20%	50%	75%
		# videoconference devices	1,000	2,000	3,000

[6] The objective is based on the average *gross* (i.e. including walls, staircases, floors, space for technical equipment, parking, …) surface of buildings with office space per capita in Brussels, which is the building surface divided by the relevant number of staff members. Based on EMAS reporting, this surface is currently equal to 36m²/capita. Its relation to workplace surface/capita is explained in more detail in the report.

#	Measure description	Description of the objective	30% in-house GHG emissions reduction scenario	50% in-house GHG emissions reduction scenario	65% in-house GHG emissions reduction scenario
3.5	Develop remote meeting attendance and promote low carbon travel for visitors	% of air travel trip distance avoided for meetings	15%	35%	65%
3.4	Improve booking criteria for missions	Sum of total % switch to more efficient airlines, use of biofuels and fewer connecting flights	Not implemented	20% of flights switch to more efficient airlines 10% of flights use biofuels 30% of connecting flights become direct flights	20% of flights switch to more efficient airlines 10% of flights use biofuels 30% of connecting flights become direct flights

The three scenarios differ in terms of the total GHG emissions reduced and in terms of the total cost incurred. They also differ in terms of the total GHG emissions to offset in 2030, and the related cost.

In all scenarios, mobility and buildings are the main drivers of in-house GHG reduction. This is expected because they are also the main source of GHG emissions in the European Commission.

For mobility, the main contribution to in-house GHG emissions reduction is less air travel, both for staff and for visitors who attend conferences and meetings organised by the Commission. Such travel will have to be significantly reduced to reduce GHG emissions, keeping in mind the different travel needs of specific Commission services. In general, measures related to travel by plane can easily be financed as they generate savings as soon as they are implemented.

For buildings, the main source of reduction is the redesign of office buildings and space, which involves a reduction of surface through optimisation of the work environment. This in turn generates a reduction of embodied carbon (lifecycle emissions related to construction) on the one hand, and a reduction of energy consumption on the other hand. These measures are more difficult to finance, as they require significant investment in the first years of their implementation and generate savings only in the longer run.

Both reduction drivers have a significant impact on the way of working at the European Commission, as they will require less travel, more remote meetings and more flexibility in the way office space is used on a daily basis. The more ambitious the scenario, the more substantial the change.

Other measures matter but less significantly. For instance, measures related to food or office supply have a signalling effect on staff and visitors, but they are expected to have limited direct impact in terms of GHG emissions reduction.

A target year of 2030 enables the European Commission to focus on measures with short- to medium-term effect. Long-term (flagship) measures such as the construction of a new highly sustainable building (Loi130) are less relevant within this time horizon. However, they remain highly relevant to show leadership in the short run, and effectively reduce GHG emissions in the longer run and towards 2050.

All scenarios generate savings in the short and medium term (so-called payback) which can help to finance the climate neutrality action plan, conditional on the ability to spread the investment over several years e.g. through loans, insofar as this is legally possible. Thanks to these savings (e.g. reduction of office costs, reduction of travel costs), all scenarios can be self-financed and break even by 2037 or 2038. The main budgetary constraint is to finance large upfront investments, and the degree of constraint will become clearer only when there is an agreement on the next multiannual financial framework.

Table 0.3 Scenario comparison - GHG reductions/removals and costs

Scenarios	Unit	30% in-house reduction	50% in-house reduction	65% in-house reduction
Emissions reduction				
Total GHG abated	tCO_2e	82,517	128,158	168,982
Contribution of each sector: **- Buildings** **- Mobility** **- Other**	%	- 32% - 53% - 14%	- 35% - 55% - 9%	- 34% - 59% - 7%
Average annual CAPEX needs 2022-2030	M€	-28	-70	-102
Average annual OPEX 2022-2030 - Operating costs (-) /Savings (+)	M€	12	29	42
Total cost of reduction by 2030	M€	151	370	541
Internal Rate of Return (IRR) at 2040	%	3	4	4
Date of budget neutrality	Year	2038	2037	2037
Emissions removals (offsetting)				
Total GHG to be offset in 2030	tCO2e	177,006	131,365	90,541
Price range of offsetting in 2030 in ACP countries[7]	M€	1.8 – 2.7	1.3 – 2.0	0.9 – 1.4
Price of offsetting in 2030 in European countries	M€	8.8	6.6	4.5

[7] The consultant provides a price range for offsetting in ACP countries, as the higher geographical and sector disparities of projects here leads to more important differences than in European countries.

Conclusions of the scenario analysis

The analysis shows that the 30% in-house GHG emissions reduction scenario would potentially be more feasible financially than the other scenarios as it entails the lowest investment costs. However, this scenario reaches budget neutrality one year later than the other two scenarios (in 2038 instead of 2037).

In the longer run, the 50% in-house GHG emissions reduction scenario and the 65% in-house GHG emissions reduction scenario provide significantly higher GHG emissions reductions, and they also generate higher financial savings. Both scenarios present a sensibly higher return on investment and a slightly shorter payback period than the 30% scenario. The comparison with the 30% in-house GHG emissions reduction scenario becomes even more favourable when a longer period of time is taken into consideration.

The 65% in-house emissions reduction scenario appears to be highly beneficial from both an environmental and a financial point of view. It would reduce GHG emissions by 169 $ktCO_2e$ per year as of 2030 and would generate more than 84 M€ in financial benefits on average per year from 2035. This scenario would require overcoming budgetary constraints to allow for higher investments in the short term, possibly through long-term loans.[8] It would also require significant changes in working practices at the Commission. However, this scenario would echo the Commission's ambition and political message that:

> *"the European Green Deal is […] a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy. […] The EU must be at the forefront of coordinating international efforts towards building a coherent financial system that supports sustainable solutions.* ***This upfront investment is also an opportunity to put Europe firmly on a new path of sustainable and inclusive growth****."*

The 50% in-house emissions reduction scenario is a well-balanced scenario in terms of financial return and environmental impact. It would achieve an annual reduction in GHG emissions by 128 $ktCO_2e$ per year as of 2030 and deliver net financial benefits of 56 M€ per year from 2037.

More preparatory work is needed to develop specific plans for key measures, particularly those related to buildings. For instance, the consultant acknowledges that more work is needed to operationalise further the measures relating to buildings, as technical and market constraints are high and required investments are large. The present study has tried to provide as much detail and accuracy as possible, taking into consideration the characteristics of the current buildings' portfolio, but a building-per-building assessment may be needed before action can be taken. Also, while extra effort has been put into the consideration of site specificities, more work is needed to adapt the action plan for sites outside Brussels. Finally, a few measures would deserve dedicated studies for detailed design in order to confirm their mitigation potential: this is the case for measures encouraging teleworking, for example, which remain debatable[9]. The scenario analysis accounts for such a preparation period, but **it clearly highlights the need for the European Commission to start preparing and implementing measures as soon as possible.**

[8] Under the current Financial Regulation, only loans related to the acquisition of buildings are possible. This also includes "structural renovation and/or demolition + re-building".

[9] See 4.2.3 New ways of working in public administrations (including teleworking)

1. INTRODUCTION

1.1 About the study

The present document is a Draft Final report of the "feasibility and scoping study for the European Commission to become climate neutral by 2030", implemented by Ramboll and CO2 Logic, on behalf of the European Commission, Directorate-General for Climate Action.

The study was conducted in a context of rapid policy changes and rising ambition to tackle climate change, calling for the European Commission to act as an example as stated in the Green Deal:[10]

> *The Commission is also keen to reduce its environmental impact as an institution and as an employer. It will present a comprehensive action plan in 2020 to implement itself the objectives of the Green Deal and to become climate neutral by 2030. It calls on all the other institutions, bodies and agencies of the EU to work with it and come forward with similar ambitious measures.*

In this context, the present report aims to provide the foundation for the Commission's action plan towards climate neutrality in 2030.

This report is the result of eight months of intensive research and consultation with experts and practitioners within and outside the Commission, as well as expert knowledge from Ramboll and CO2Logic. Various services of the European Commission were involved, contributing expertise and data. A Commission steering board accompanied the work, with members from OIB, OIL, JRC, DG HR, SG, DG ENER, DG MOVE, DG ENV, DG BUDG, DG DIGIT, DG SANTE, DG MARE, DG RTD and observers from DG SCIC, EEAS and REA. In addition, the EMAS Steering Committee regularly reviewed and commented on the draft findings. Finally, a series of targeted interviews and technical meetings were organised by the consultant to discuss specific issues, relating for example to buildings or mobility.

As requested by the terms of reference, the outcomes of the study include:

- Recommendations to improve the existing monitoring systems and tools, including a revised methodology and scope for assessing the European Commission's carbon footprint;
- Recommendations on feasible Commission-wide greenhouse gas neutrality targets to be achieved by 2030, with relevant system boundaries for emissions measurement, and appropriate balance between in-house actions, targeted procurement and compensation;
- Recommendations on possible actions that can be taken to achieve carbon neutrality, including a comprehensive set of emissions reduction measures applicable to the European Commission, an assessment of their mitigation potential, costs and drivers, and a timeline for their implementation;
- A set of feasible decarbonisation pathways, in the form of scenarios, which help the European Commission to understand the different options that are available to reach climate neutrality by 2030.

[10] Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. The European Green Deal. 11 December 2019. COM/2019/640 final.

1.2 About the methodology

The methodology consisted of three interrelated tasks, as summarised below:

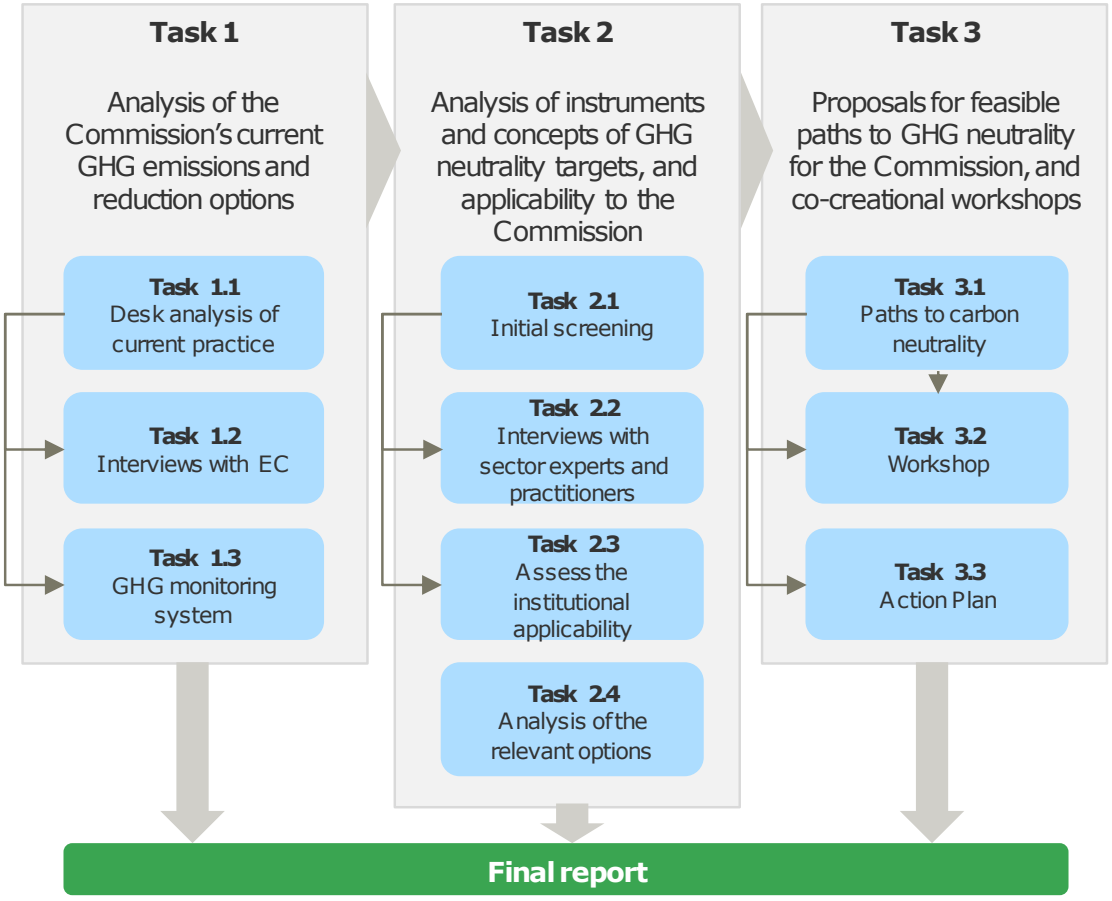
Task 1 was an analysis of the European Commission's GHG emissions profile, of the potential for further mitigation measures, and of the fitness-for-purpose of the current GHG monitoring system to cover all emissions from the European Commission's own operations. On the basis of this assessment, Task 1 formulated recommendations for a revised scope and enhanced monitoring system enabling the Commission to track and communicate progress towards GHG neutrality.

Task 2 started with a survey and analysis of existing concepts and instruments of climate neutrality targets, and an assessment of their applicability to the European Commission, learning from the understanding of the Commission's GHG emissions profile and monitoring system built in Task 1. Additionally, and in close cooperation with the Commission's services, relevant action domains and measures were identified and assessed, to form the backbone of the European Commission's action plan towards climate neutrality.

Task 3 built on a tailored methodology and tool for GHG emissions reduction scenario analysis to develop pathway options towards climate neutrality. This task also involved a series of consultations with the Commission, and several computations of the model. The task delivered three possible scenarios which integrate actions with priorities, costs and benefits, and timelines, for the European Commission to achieve GHG neutrality by 2030.

Figure 1.1 is an overview of the methodology, showing linkages between tasks.

Figure 1.1 Overview of linkages between tasks of the project.



1.3 About this report

This report presents the final results of the study in great detail, providing the European Commission with all the necessary information to build its action plan. It is structured as follows:

- **Chapter 2: The European Commission's carbon footprint** provides a description and critical assessment of the initial carbon footprint of the European Commission and formulates recommendations for an appropriate and credible scope. Based on the new scope thus defined, the chapter provides a new estimation of the current carbon footprint of the European Commission.
- **Chapter 3: Monitoring system** focuses on the monitoring system and tools of the European Commission to track and report on GHG emissions. It provides recommendations for an enhanced monitoring system suitable for more ambitious targets.
- **Chapter 4: Analysis of relevant concepts and instruments** presents a set of selected concepts and tools for climate neutrality. They are assessed to understand if and how they could be applied to the European Commission. This section aims to inspire the Commission's action plan.
- **Chapter 5: Proposed actions for a climate neutral Commission** describes the proposed GHG emissions reduction measures for the European Commission to become climate neutral. Each measure is described in great detail so that the reader can understand its content, costs and benefits, drivers and timing. Offsetting measures to compensate residual emissions (i.e. emissions that cannot be reduced) are also discussed.
- **Chapter 6: Recommendations towards an action plan** provides high-level recommendations to the European Commission towards a climate neutrality action plan, considering management and communication issues, among others.
- **Chapter 7: Scenario analysis: methodology** describes the methodology of the scenario analysis. It provides the necessary concepts and definitions to understand the results of the scenario analysis.
- **Chapter 8: Scenario analysis: results** finally presents three different scenarios towards climate neutrality, each scenario corresponding to a different emissions reduction target. For each scenario, an analysis of the necessary measures and investments is provided. A comparison between scenarios sheds light on the decisions that the European Commission will have to make when preparing its action plan to become climate neutral by 2030.

As previously mentioned, this report is the result of close cooperation and numerous interactions with the Commission services. It uses all available data and considers all feedback received but also represents the authors' best assessment within the limitations of the study.

1.4 Looking ahead

The team of consultants has done its very best to ensure rigorous analysis and provide the necessary details for helping the Commission prepare a comprehensive action plan.

A challenge, however, was the breadth of scope and the diversity of measures that had to be addressed. The analysis had to deal with a great variety of emissions sources related to buildings, energy, travels, commuting, IT equipment, food, and so on, which all have their own specific characteristics. Moreover, the Commission is divided into several entities, spread over multiple locations and buildings all over Europe and beyond, and encompassing various functions, ways of working, and needs.

For these reasons, it was not possible to always provide all necessary details for a turnkey action plan. For instance, the authors acknowledge that more work is needed to operationalise further the measures relating to buildings, as technical and market constraints are high and required investments are large. In addition, while extra effort has been put into the consideration of site

specificities, more work is needed to adapt the action plan for sites outside Brussels. Finally, a few measures would deserve dedicated studies of detailed design in order to confirm and secure their mitigation potential: this is the case for measures encouraging teleworking, for example, which remains of debatable benefit[11].

That said, this report provides high-level orientations but also clear indications as to how the Commission can reach climate neutrality, at what cost, under which conditions, and for what benefits. It will help the Commission define priorities and select actions. A natural follow-up to this report would include consultation with management and staff, as well as targeted studies to provide the necessary details for the most complex measures.

For the European Commission, this report can be seen a first, essential step towards achieving its ambition to become climate neutral by 2030.

[11] See section 4.2.3 New ways of working in public administrations (including teleworking)

2. THE EUROPEAN COMMISSION'S CARBON FOOTPRINT

This chapter presents the European Commission's carbon footprint, defined as the total greenhouse gas (GHG) emissions caused by the institution. It includes:

- A description of the methodology used for the calculation of the carbon footprint;
- A critical assessment of the operational and organisational scopes that the European Commission has used to assess its carbon footprint so far;
- A set of recommendations for future improvements including the potential incorporation of additional emissions categories in the scope;
- A new estimate of the European Commission's carbon footprint based on the recommendations;
- A description of the initiatives that the European Commission has already implemented to reduce its GHG emissions.

This chapter corresponds to sub-task 1.1 and sub-task 1.2 of the terms of reference.

2.1 Methodological introduction to carbon footprint calculation principles

2.1.1 Carbon footprint calculation methodology used

The European Commission's carbon footprint is calculated in accordance with the Bilan Carbone® Methodology (developed by the French environment agency ADEME[12]) and the GHG Protocol (developed by the World Resources Institute and the World Business Council for Sustainable Development). Both methodologies are in line with the ISO 14064 Standard on GHG validation and verification.

These methodologies are applicable to all types of organisation (industries, public administration, tertiary sector), and also to territories (countries, regions and cities). They consist in reviewing all physical flows of an organisation or territory (of persons, materials, and energy) and categorising them according to the emissions they generate. The calculations multiply activity data collected by the organisation (kWh, km driven, amount of food distributed, etc.) by a corresponding emissions factor (expressed in kgCO2e/kWh, kgCO2e/km, kgCO2e/litre, etc.).

GHG emissions are thus mapped according to activity. These methods enable the identification of all GHG emissions that occur, whether directly (i.e. on an organisation's premises), or indirectly, for instance on the premises of service providers (airlines, subcontractors, caterers, etc.).

Greenhouse gases taken into account

The calculation takes into account all GHGs from the Kyoto protocol as well as non-Kyoto gases and water vapour due to aviation activities (as recommended by the Bilan Carbone method and the GHG Protocol). In the GHG Protocol the use of non-Kyoto gases is not mandatory but allowed (they should however be reported separately), while it is mandatory in the Bilan Carbone methodology. The European Commission includes these gases in its reports, as they also contribute to climate change.

[12] ADEME : Agence de l'Environnement et de la Maitrise de l'Energie

Table 2.1. Greenhouse gases inventory

Greenhouse gases	Bilan Carbone®
Kyoto-gas (CO_2, CH_4, N_2O, HFC, PFC, SF_6)	X
Non-Kyoto gas (CFC, Halon, HCFC, CCl_4, CH_3Br, CH_3CCl_3, HFE, PFPE, HC)	X
Water vapour (aircraft)	X

Conversion to tonnes of CO_2 equivalents [tCO_2 e]

All GHGs, such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and refrigerants (HFCs, PFCs, CFCs),[13] are converted to CO_2 equivalents using the Intergovernmental Panel on Climate Change (IPCC) 100-year global warming potential (GWP) coefficients. They therefore do not need to be reported separately.

One tonne of CO_2 equivalent (tCO_2e) is scientifically defined as "the amount of CO_2 emission that would cause the same radiative forcing as an emitted amount of a well-mixed greenhouse gas or a mixture of well-mixed greenhouse gases, all multiplied with their respective GWPs to take into account the differing times they remain in the atmosphere" (IPCC).

Table 2.2. Global warming potential of main GHGs

Gas	GWP 100-year time horizon, IPCC AR 5 (2014)
Carbon Dioxide (CO_2)	1
Methane (CH_4) Biogenic	28
Methane (CH_4) Fossil	30
Nitrous Oxide (N_2O)	265
Sulfur Hexafluoride (SF6)	23500

Direct and indirect/upstream emissions

The CO_2 emissions are calculated from data and emission factors. The most accurate way of calculating emission factors is by using lifecycle analysis (LCA). An LCA takes into account all emissions from production, transportation, use and disposal.

Within this context carbon accountants often talk about "direct" and "indirect" emissions. The latter are also called "upstream" emissions. The Bilan Carbone® uses the following definition:

1. Direct emissions: direct emissions from fossil fuel combustion, physical-chemical processes and GHG leakages;
2. Indirect or upstream emissions: emissions due to the production and transport of fossil fuels and lifecycle emissions other than combustion emissions and direct leakages of GHG.

In this report, the indirect emissions from fossil fuel combustion are the emissions from the production and transport of those fossil fuels, also called "well to tank emissions".

[13] Water vapour (H_2O) is a GHG but is not directly influenced by human activity. Therefore, it is excluded from the GHG accounting methodologies.

2.1.2 Introduction to the operational and organisational scopes

When considering GHG emissions, two scopes are defined: the operational scope and the organisational scope.

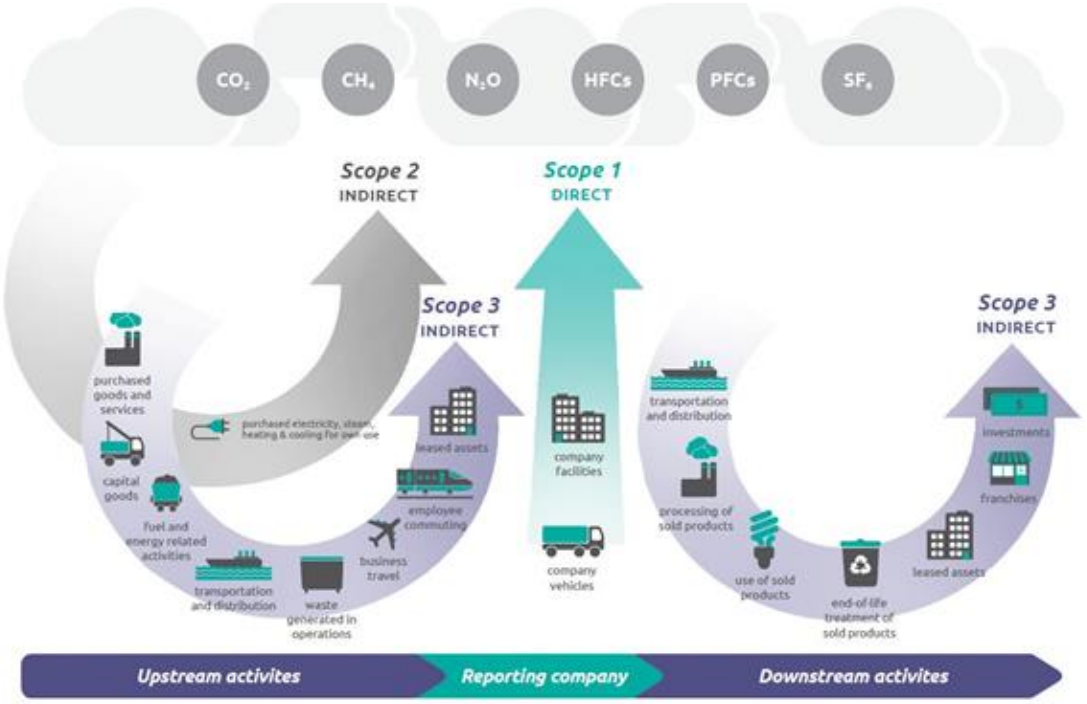
The operational scope refers to the sources of emissions such as energy consumption, business travel, commuting, etc. Carbon accounting often refers to three different types of emission sources, also called scopes. For instance, the GHG Protocol,[14] which is the most widely-used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions, defines three scopes of emissions:

- **Scopes 1 and 2 relate to direct emissions, i.e. those that occur from sources owned or controlled by the organisation**:
    - Scope 1 contains direct emissions within the company or related to the organisation itself, i.e. the combustion of natural gas to heat buildings;
    - Scope 2 includes emissions from electricity, and from bought heat or steam, which are not produced on site but are directly related to the consumption of electricity or heat.;
- **Scope 3, the largest scope, encompasses all other indirect emissions, i.e. those that are a consequence of the activities of the reporting organisation, but are produced by sources that it does not own or control**. The GHG Protocol has defined an exhaustive list of 15 possible sources of indirect emissions.

The figure below represents all sources of emissions distributed among the three different scopes.

[14] http://ghgprotocol.org/; the GHG Protocol establishes comprehensive global standardised frameworks to measure and manage greenhouse gas (GHG) emissions from private and public sector operations, value chains and mitigation actions.

Figure 2.1 Overview of GHG Protocol scopes and emissions across the value chain (source: Figure 1.1 of Scope 3 Standard, GHG Protocol)



The organisational scope refers in this case to all of the European Commission's organisational structures (including all Directorates-General (DGs), the different Joint Research Centre (JRC) sites, and the executive agencies and all activities over which the European Commission has influence or control (such as business travel for staff employed by the Commission but stationed in representations in the Member States, or in delegations outside the European Union).

This study takes as its basis the initial 2018 EMAS scope, i.e. the scope taken into consideration for the EMAS certification of the European Commission (see below). This report provides a description of the EMAS scope. Limitations of the scope are also highlighted, and recommendations are provided to extend the scope and to encompass all relevant sources of emissions and activities of the European Commission in the ambitious but credible objective of reaching climate neutrality by 2030.

Table 2.3 Initial EMAS scope (√ = "considered and reported"; N.R.="not reported"; N.A. = "not applicable")

Scope	Sources of GHG emissions			Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Sevilla	JRC Karlsruhe	JRC Ispra	Grange
Scope 1 – Own direct fuel consumption and direct losses (Activities and emissions on site)	**Buildings fuel consumption (gas and fuel)**			√	√	√	√	√	N.A.	√	√
	Vehicle fleet (diesel, petrol, other fuel)			√	√	√	√	√	√	√	N.A.
	Coolant losses			√	√	√	√	N.R.	N.R.	√	√
Scope 2 – Purchased energy (Activities on site and emissions off site)	**Electricity**			√	√	√	√	√	√	√	√
	Distric heating/ cooling			N.A.	√	N.A.	√	N.A.	√	N.A.	N.A.
Scope 3 – Other "indirect" sources (Activities and emissions off site)	**Upstream activities**	**Purchased goods and services**									
		Security contracts		√	√	√	√	N.R.	N.R.	√	√
		Cleaning contracts		√	√	√	√	N.R.	N.R.	√	√
		Consultancy		N.R.	N.R.	√	√	N.R.	N.R.	N.R.	√
		Translation		√	N.R.	√	√	N.R.	N.R.	N.R.	N.R.
		Other service contracts		N.R.	N.R.	N.R.	√	N.R.	N.R.	N.R.	N.R.
		Purchased paper, used or new		√	√	√	√	N.R.	N.R.	√	√
		Catering food (beef, pork, chicken, milk, yoghurt and butter)		N.R.	N.R.	N.R.	√	N.R.	N.R.	√	N.R.
		Coffee		N.R.	N.R.	N.R.	√	N.R.	N.R.	√	N.R.
		Capital goods									
		Buildings (acording to construction material and general purpose)		√	√	√	√	N.R.	N.R.	√	√
		IT	PC desktop	√	√	√	√	N.R.	N.R.	√	√
			CRT screen	√	√	√	√	N.R.	N.R.	√	√
			Flat screen	√	√	√	√	N.R.	N.R.	√	√
			Laptop	√	√	√	√	N.R.	N.R.	√	√
			Individual printers	√	√	√	√	N.R.	N.R.	√	√
			Detwork printers & copiers	√	√	√	√	N.R.	N.R.	√	√
			Fax machines	√	√	√	√	N.R.	N.R.	√	√
			Scanners	√	√	√	√	N.R.	N.R.	√	√
			Telephone (simple, smartphones and fixed)	√	√	√	√	N.R.	N.R.	√	√
			Servers, switches, routers	√	√	√	√	N.R.	N.R.	√	√
			Projectors	√	√	√	√	N.R.	N.R.	√	√
			Videoconference installations	√	√	√	√	N.R.	N.R.	√	√
			Televisions	√	√	√	√	N.R.	N.R.	√	√
			Other small IT devices	√	√	√	√	N.R.	N.R.	√	√
		Fuel and energy related activities (not included in Scope 1 or 2)									
		Buildings fuel consumption		√	√	√	√	√	N.A.	√	√
		Vehicle fleet		√	√	√	√	√	√	√	N.A.
		Electricity		√	√	√	√	√	√	√	√
		Business travel									
		Air		√	√	√	√	√	√	√	√
		Non air travel (Rail, bus, automobiles, other modes of travel)		√	√	√	√	√	√	√	√
		Staff commuting		√	N.R.	N.R.	√	√	√	√	√
		Waste generated in operations									
		Incinerated waste	Domestic waste	√	√	√	√	N.R.	N.R.	√	√
			Food	√	√	√	√	N.R.	N.R.	√	√
		Methanisation	food	√	√	√	√	N.R.	N.R.	√	√
		Recycled/ reused	Paper	√	√	√	√	N.R.	N.R.	√	√
			Cardboard	√	√	√	√	N.R.	N.R.	√	√
			Wood	√	√	√	√	N.R.	N.R.	√	√
			Glass	√	√	√	√	N.R.	N.R.	√	√
			Plastic PMC	√	√	√	√	N.R.	N.R.	√	√
			Others	√	√	√	√	N.R.	N.R.	√	√
		Hazardous waste (all type)		√	√	√	√	N.R.	N.R.	√	√
		Landfill		√	√	√	√	N.R.	N.R.	√	√

√	Considered and reported
N.R.	Considered and not recorded (N.R.)
N.A.	Not applicable to the site

2.2 Description and assessment of the scope

This section describes the initial operational and organisational scopes of the 2018 carbon footprint and assesses its relevance and completeness.

2.2.1 Operational scope

1) Initial operational scope

The operational scope initially considered by EMAS was as follows:

- **Scope 1 – Own direct fuel consumption and direct losses (activities and emissions on site)**
    1. Buildings fuel consumption
        - Gas, heating fuel
    2. Own fleet
        - Diesel, petrol, other fuel
    3. Refrigerant losses

- **Scope 2 – Purchased energy (activities on site and emissions off site)**
    1. Electricity[15]
    2. District heating/cooling

- **Scope 3 – Other indirect sources (activities and emissions off site)**
    - Upstream activities (cradle-to-gate)[16]
        1. Purchased goods and services
            - Security contracts
            - Cleaning contracts
            - Consultancy contracts
            - Translation contracts
            - Other service contracts[17]
            - Purchased paper
            - Catering food: beef, pork, fish, chicken, milk, butter, yoghurt, coffee
        2. Fixed assets:[18]
            - Buildings:[19] according to construction material and type of building
                - Type of material construction: unspecified, steel, concrete
                - Type of building: office, underground parking, industrial and restaurant
            - IT:

[15] The additionality of the purchased RES power (hierarchy between on-site production, PPAs, guarantees of Origin, etc.) is addressed in section 4.2.11.

[16] As per the GHG Protocol definition, upstream activities involve a flow of the materials consisting of raw materials, components and energy that are needed to deliver the goods from the suppliers to the organisation where the activities will take place. In downstream activities, goods are sent to distribution sites and from there to retailers or customers. The latter category is not relevant to European Commission activities.

[17] This category includes consultants, translators, and other intellectual services such as lawyers and advisory services.

[18] In this study fixed assets are treated as capital goods (Category 2 of Scope 3 from the GHG Protocol). This category includes all upstream (i.e., cradle-to-gate) emissions from the production of capital goods (or fixed assets) purchased or acquired by the reporting company in the reporting year. Capital goods are final products that have an extended life and are used by the company to manufacture a product, provide a service, or sell, store, and deliver merchandise. In financial accounting, capital goods are treated as fixed assets or as plant, property, and equipment (PP&E). Examples of capital goods include equipment, machinery, buildings, facilities, and vehicles.

[19] These emissions reflect the construction of the buildings, amortised on a lifetime. It takes into account all types of contract (lease, property,..), etc.) during the period of use by the Commission. The lifetime of building under EMAS, different lifetime values of up to 60 years are used. It is recommended by ADEME (Agence de la transition écologique francaise) is 50 years and includes the maintenance and replacement of products during the entire lifetime of the building.

    - PC desktop
    - CRT screen
    - Flat screen
    - Laptop
    - Individual printers
    - Network printers & copiers
    - Fax machines
    - Telephone (simple, smartphones and fixed)
    - Servers, switches, routers
    - Projectors
    - Videoconference installations
    - Televisions
    - Other small IT devices
3. Fuel and energy related activities (not included in Scope 1 or 2). Upstream emissions from:
    - Buildings' fuel consumption[20]
    - Vehicle fleet[21]
    - Electricity[22]
    - District heating[23]
4. Business travel paid for by the Commission (covering staff in the eight sites and in the delegations and representations, as well as experts):
    - Air:[24] Radiative Forcing Index[25] (RFI) = 2
    - Non-air travel (rail, bus, automobiles, other modes of travel)
5. Employee commuting (this is also linked to work patterns)
6. Waste generated by operations:
    - Incinerated waste
        - domestic waste
        - food
    - Methanisation (food)
    - Recycled/reused
        - Cardboard
        - Wood
        - Glass
        - Plastic PMC
        - Other
    - Hazardous waste (all types)
    - Landfill

[20] Upstream emissions (cradle-to-gate) of purchased fuels (extraction, production and transportation of fuels consumed).
[21] Upstream emissions (cradle-to-gate) of purchased fuels (extraction, production and transportation of fuels consumed).
[22] Upstream emissions of purchased electricity (extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling consumed) and transmission and distribution losses.
[23] Upstream emissions of purchased district heating and transmission and distribution losses.
[24] We estimate 43.881 tCO2e emitted from missions undertaken by staff at the EMAS sites. Estimations were calculated using data from the Commission's proprietary management system along with data reported by the Commission's travel agency.
[25] For long-distance flights, when aircraft fly close to the tropospheric boundary, they contribute to radiative forcing (the cause of future climate change) via their CO2 emissions. High-altitude combustion also disturbs other greenhouse gas cycles: water vapour, condensed water in various forms, NOx and methane, which together produce ozone etc (source: ADEME).

2) Critical assessment of the initial scope

The table below shows the evaluation status[26] of each Scope 3 category, according to the 15 categories of possible sources of indirect emissions defined by the GHG Protocol. It is useful to conduct a first screening of this list, in order to assess which Scope 3 sources are relevant or not to the European Commission.

Table 2.4 Overview of the GHG Protocol Scope 3 emissions adapted to the European Commission situation

Sources of Scope 3 emissions	Evaluation status[27] (in EC EMAS)	Explanation
Purchased goods and services	Relevant, calculated for some categories and for some sites only	Currently, security contracts, cleaning contracts and some other consultancy contracts are already included. Nevertheless, the emission estimations are only based on the number of FTE or EUR spent related to these contracts.
Fixed Assets	Relevant, calculated	
Fuel-and-energy-related activities (not included in Scope 1 or 2)	Relevant, calculated	
Upstream transportation and distribution	Relevant, but not yet calculated	This category may include the following activities: mail distribution, furniture moving services, any other logistics services paid by the Commission.
Waste generated in operations	Relevant, calculated	
Business travel	Relevant, calculated	MIPS does not yet generate and collect the necessary data. Currently, data are provided by the contractor GBT and extended to the number of travels provided by MIPS.
Employee commuting	Relevant, calculated	Included, but not all sites report.
Upstream leased assets	Not relevant, see explanation	As per the definition from the GHG Protocol, this category includes emissions from the operation of assets that are leased by the European Commission in the reporting year and not yet included in the reporting company's Scope 1 or Scope 2 inventories. All the emissions from direct energy consumption are already accounted under Scopes 1 and 2.
Downstream transportation and distribution	Relevant for some specific cases, see explanation	Relevant when the Commission pays for the travel and accommodation of experts for specific meetings (project evaluation and monitoring under Horizon 2020, speakers who attend a conference, etc.).
Processing of sold products	Not relevant, see explanation	Not relevant to the Commission's activities, as it is only JRC Petten that sells industrial reference materials, and this has a negligible impact.

[26] The evaluation status includes two components: whether a Scope 3 source is relevant to the European Commission and what has been done to investigate that source.

[27] A source of emissions is considered as relevant if it is part of the activity of the European Commission. It is also based on an assessment of the contribution to the total GHG emissions. When not relevant an explanation is given.

Sources of Scope 3 emissions	Evaluation status[27] (in EC EMAS)	Explanation
Use of sold products	Not relevant, see explanation	Not relevant to the Commission's activities.
End of life treatment of sold products	Not relevant, see explanation	Not relevant to the Commission's activities.
Downstream leased assets	Not relevant, see explanation	This category consists of emissions from the operation of assets that are owned by the reporting company (acting as lessor) and leased to other entities in the reporting year that are not already included in Scope 1 or Scope 2. This might be applicable if the European Commission leases assets to other entities for which the emissions are not already taken into account.
Franchises	Not relevant, see explanation	Not relevant to the Commission's activities.
Investments	Relevant but not evaluated, see explanation	A general aspect that cannot be addressed within the limited resources of this study is the climate impact of capital funds (e.g. in the context of the Joint Sickness Insurance System, or as guarantee products linked to financial instruments/programmes) that are managed by the European Commission.

Overall, relevant scope 3 emissions were calculated in the initial 2018 EMAS scope and carbon footprint. There are however important areas for improvement.

The operational scope was not homogenous across all sites. Some sites of the European Commission and Executive Agencies[28] have not reported purchased goods and services, IT materials, employee commuting and waste generated in operations. This is generally because these categories were only introduced into the scope in 2019, and it often takes some time to streamline the data collection process for new categories.

Some elements of the initial scope were "considered", meaning that the EMAS correspondents were aware of them, but the data have not yet been collected, due to a lack of resources or a lack of data from the subcontractor. This is the case for food-related emissions in canteens[29] and at events (catering).[30]

The GHG emissions of food are not included in the initial scope at several sites, but it is already planned to consider them in future. At the moment, some catering/canteen suppliers do not provide the necessary data for the calculation of catering emissions. A new tender for catering services is being launched in 2020 in Brussels, and the European Commission's objective is to contractually require the contractor to collect the necessary data, in order to calculate in the most accurate way possible the emissions related to catering. Currently, the EMAS team requests reporting for a list of food types encompassing various types of meat, milk and dairy products, and coffee. Ultimately, the scope shall integrate more types of vegetables and beverages, as well as packaging.

[28] Executive Agencies do not report individually.
[29] The consumption of vegetables is indirectly considered, as if their consumption goes up, replacing the covered, more GHG-intensive foods, the current monitoring would capture this, assuming the overall demand for meals remains somewhat stable.
[30] Only two sites out of eight have reported data for catering-related parameters in 2018.

The GHG emissions related to meetings, conferences and other events, organised by the European Commission are not fully included in the initial scope. Every year, the European Commission is responsible for the organisation of hundreds of meetings, conferences and other events, both on Commission premises and outside those premises. The GHG emissions caused by these events are distributed across different GHG Protocol categories, such as:

- Purchased goods and services: catering; promotional items; hotel accommodation; custom-made goods like exhibition stands;
- Downstream transportation: visitor travel to the event site (distinct from the category "Business Travel", which only concerns European Commission staff);
- Waste generated during the events.

These were not included in the scope or monitored by EMAS, except for the catering of, and waste generated by, events that take place on Commission premises. Additionally, the internal guidelines on the organisation of sustainable events are not compulsory.

The activities of executive agencies such as EASME and REA (see also organisational scope below) in support of the implementation of the EU programme are not fully included in the scope. The executive agencies, together with responsible DG's, organise evaluations of proposals and project monitoring for different programmes such as Horizon 2020, which require experts and beneficiaries to travel from all over Europe to Brussels or other places.

3) Suggestion to extend the operational scope

The initial 2018 EMAS operational scope already includes a wide range of parameters. However, some sources are not included in the initial 2018 EMAS operational scope. They have been assessed in order to make recommendations on the possible scope of the Commission's future greenhouse gas (GHG) neutrality strategy. These include:

- Additional food categories (including vegetables), beverages and snacks,[31] to ensure that all sites report on the existing basic food categories, and to add further categories;
- Mail distribution,[32] furniture moving services, and any other logistics services paid for by the Commission;[33]
- Cloud services and digital communication (web streaming): these are purchased services;[34]
- Clothing;[35]
- Furniture and other equipment such as small cafeteria machines or vending machines;
- Flights for staff in the delegations;
- Meetings, conferences and other events organised by the European Commission: transportation of participants, catering, and waste.[36]

A general aspect that cannot be addressed within the limited resources of this study is the climate impact of capital funds (e.g. in the context of the Joint Sickness Insurance System, or as guarantee products linked to financial instruments/programmes) that are managed by the European Commission.

[31] Source: OIB OS4 for Brussels + EMAS coordinators of other sites.
[32] Source: OIB OS1 for Brussels + EMAS coordinators of other sites.
[33] Source: OIB OS2 for Brussels + EMAS coordinators of other sites. This includes only the activities covered by OIL, OIB and other logistics services. The movements of all contractors are already included under the category "Purchased goods and services".
[34] Note that environmental criteria are mentioned in the tenders.
[35] A 2018 article in Nature Climate Change states that around 5% of total global emissions come from the fashion industry: https://www.nature.com/articles/s41558-017-0058-9; a 2018 report from Quantis (https://quantis-intl.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf) assesses that the apparel and footwear sectors combined accounted for 8 percent of global carbon emissions in 2016. The fact that "Clothing" is listed in this report does not mean that the final report will necessarily make elaborate and concrete recommendations for action on this issue; the assessment may also lead to it being recommended e.g. as a future area for "general awareness-raising action".
[36] Source: DG SCIC, REA, EASME.

In order to appraise the relevance of these emissions sources for the scope of the European Commission's carbon footprint, the study analysed these sources against a combination of criteria:

- Data availability;
- Impact on the total GHG footprint[37]: expressed as a % of the "adjusted carbon footprint" calculated by EMAS
  - Less than 1% of the total footprint: low
  - Between 1% and 3%: medium
  - More than 3%: high;
- Action and leverage: qualitative assessment based on interviews;
- Potential GHG reduction impact: qualitative assessment of the relative GHG mitigation potential based on interviews and literature review.

This analysis enabled the consultant to select among the following options:

Exclude or include these sources from/in the scope of the future Commission's greenhouse gas (GHG) neutrality strategy, and if included:

- If possible, include them directly in the current calculation (for instance: flights for staff in the delegations, if data are readily available at PMO);
- Include the source in the future, if data are easily available (for instance, flights of experts participating into the evaluation of proposals and monitoring of projects for different programs, which require experts and consortia members to travel from all over Europe to Brussels);
- Give recommendations and draft an approach for collecting data in future, if these are not easily available (for instance, by including a clause in future tenders that would oblige contractors to provide the necessary data to calculate the GHG footprint of their goods and services).

Food, beverages and snacks (Scope 3: Purchased goods and services)

- ***Data availability***: this category was calculated in 2018 for the sites of Geel and Ispra only. However, in Brussels, a new call for tender is being launched in 2020 for all catering activities (cafeterias, restaurants, catering services for events organised in European Commission venues in Brussels). Strong environmental criteria will be included in the terms of reference. These criteria will be fully aligned with the GoodFood Label[38] of the Brussels Region. It will be also required that contractors provide data for the quantities of food served (by type) on an annual basis. An environmental coordinator will also be appointed by the subcontractor. S/he will be the key person of contact for all environmental topics.

- ***Share of the total carbon footprint***: based on a first estimation and compared with other European Institutions: high (more than 3% of the total carbon footprint). Only Geel and Ispra are currently reporting on food consumption. An estimation based on GHG emissions of food (550.73 tCO_2e) and staff in both sites (2,544 staff) shows that the GHG emissions per staff and per year is 0.217 tCO_2e. As reported to the EMAS staff, this represents 7,705.46tCO_2e.

[37] Based on the "Adjusted Carbon Footprint", as described in Table 2.20, which corresponds to the footprint calculated by the EMAS unit in 2018, with the some corrections/adjustments done.

[38] www.goodfood.brussel

Table 2.5 Extrapolation used for food-related emissions

	tCO_2e related to food	Share of the initial 2018 CFP reported by EMAS	Staff	tCO_2e/staff
Geel	31.20		259	0.120
Ispra	519.53		2,285	0.227
Geel + Ispra	**550.73**	0.32%	**2,544**	**0.217**
All EMAS staff	**7,705.46**	**4.42%**	35,594	0.217
All staff	8,021.95	4.60%	37,056	0.217
Estimation of additional GHG emissions of the initial 2018 CPF				
All EMAS[39] staff excluding Geel and Ispra	**7,154.73**	**+4.11%**	**34,512**	**0.217**
All staff excluding Geel and Ispra	7,471.22	+4.29%	33,050	0.217

- ***Action and leverage***: high – through the new contract in Brussels from 2020 and in future at other sites, the European Commission will have a strong lever to enable staff to choose more locally-sourced, organic and plant-based or vegetarian meals. Other actions can also be undertaken regarding the phasing out of single-use plastics and waste management.

- ***Potential GHG reduction impact***: high – thanks to an increase of plant-based or vegetarian meals, and the promotion of local products. This can also be achieved through awareness-raising campaigns, and by displaying the climate impact of each meal in restaurants and cafeterias.

- ***Conclusion****:* this category should be included in the carbon footprint and in the GHG neutral strategy. For this purpose, the precise quantity of food should be reported by caterers at all sites on a yearly basis (please note that this is already the case for JRC Geel and Ispra).

- **Data to be monitored**:

  - Option 1 (preferred): the exact quantities of food purchased by the caterers. The following list is not exhaustive (reporting is currently requested for the first seven categories and is undertaken at some sites)

Table 2.6. List (Option 1) of type of food data and unit

Type of data	Unit
Meat type 1 – beef	kg
Meat type 2 – pork	kg
Meat type 4 – fish	kg
Meat type 3 – chicken	kg
Milk	kg
Other dairy products (yoghurt and butter)	kg
Coffee	kg
Vegetables and fruit: local and seasonal	kg
Vegetables and fruit: local in greenhouses	kg
Vegetables and fruit: imported by boat or by truck	kg
Vegetables and fruit: imported by plane	kg
Olive oil	kg
Water (PET bottle of 50 cl)	litre

[39] Staff considered in the EMAS scope.

Type of data	Unit
Soda	litre
Orange juice	litre
Coffee (ready to drink)	litre
Tea (to be infused)	kg
Biscuits	kg
Chocolate	kg
Chips	kg

- Option 2: If option 1 is not possible, the following information can be collected by the caterers:

Table 2.7. List (Option 2) of type of food data and unit

Type of data	Unit
Vegetarian meals	Number
Vegan meals	Number
Meals with beef	Number
Meals with chicken	Number
Meals with fish	Number
Water (PET bottle of 50 cl)	litre
Soda	litre
Orange juice	litre
Coffee (ready to drink)	litre
Tea (to be infused)	kg
Biscuits	kg
Chocolate	kg
Chips	kg

Mail distribution, furniture moving services, and any other logistics services paid for by the Commission (Scope 3: Upstream transportation and distribution)

- ***Data availability***: for Brussels, the data are owned by OIB OS1 (mail distribution services) and OIB OS2 (logistics services). After discussion, it was determined that only data related to furniture moving services between different buildings should be collected, as the GHG emissions related to mail distribution are expected to be very low. One single contractor (Mozer) is in charge of the furniture moving service and it uses dedicated vehicles exclusively for the European Commission. Therefore, information regarding the specifications of the fleet (type of vehicle, Euro 5 or 6, maximum payload) as well as the total fuel consumption (expressed in litres) and the total distance driven is available and has been requested from the contractor.

- ***Share of the total carbon footprint***: low (less than 1%) – the total distance since 3 January 2018 has been provided by Mozer: 145,194 km (information received on 21 January 2020). It is therefore assumed that 50% of travels were driven in 2018 (72,597 km). This corresponds to total emissions of approximately 49 tCO_2e (assuming 45 m3 trucks).

- ***Actions and leverage***: medium – through the contract, the fleet should fulfil certain minimum requirements (Euro 6 vehicles only). In the future, electric or CNG vehicles could also be included as criteria in the tender.

- ***Potential GHG reduction impact***: low-to-medium.

- ***Conclusion***: as the data are available, this category could be included for the sake of being exhaustive. However, its impact on the carbon footprint is very low.

- ***Data to be monitored***:

  - Option 1: litres of fuel consumed (diesel/unleaded petrol);
  - Option 2: total distance driven, overview of the vehicle fleet, and average payload of the vehicles (in tonnes).

Cloud and web streaming services (Scope 3: Purchased goods and services)

- ***Data availability***: DG SCIC provided data regarding web streaming of conferences. Cloud data regarding the GB amount of data stored and emails sent were requested from DG DIGIT but were not available.

- ***Share of the total carbon footprint***: low - less than 1% of the total carbon footprint (341 tCO_2e in 2018[40]). The following information has been collected by DG SCIC regarding the web streaming of events in 2018:
  - Stored data: 17.75 TB;
  - Transferred data: 205 TB, which is equivalent to 26 years of watching time (227,777 hours). As a conference has an average time of 6 hours, this corresponds to 37,962 participants that avoided travelling.[41] The volume of this data is increasing, as more and more conferences are web-streamed, leading to lower travel emissions.[42]

- ***Actions and leverage***: high – through Green Procurement Criteria, only service providers using 100% renewable energy can be selected. This will considerably lower the carbon footprint of this purchased service.

- ***Potential GHG reduction impact***: high – emissions reduction can be achieved through the use of green electricity ; moreover the use of web streaming service as an additional channel for broadcasting virtual conferences has a leverage effect on decreasing emissions related to the travel of participants to events and conferences.

- **Conclusion**: depending on the availability of the data, this could be added to the carbon footprint, given the high leverage the Commission has to select contractors with a low impact.

- ***Data to be monitored***:

  - Total amount of data transferred (TB);
  - Total amount of data stored (TB);
  - Type of energy used by the contractor (green/grey electricity).

[40] Taking into account an average energy requirement of 5 kWh/Gb (Adamson J., Carbon and the Cloud: Hard facts about data storage, Stanford Magazine, May 15, 2017) and an average European electricity grid emission factor of 303 gCO2e/kWh (IEA 2019).
[41] Information provided by DG SCIC.
[42] Please see 5.2.3.

Clothes (Scope 3: Purchased goods and services)

- ***Data availability***: no data are available concerning staff clothing.
- ***Share of the total carbon footprint***: not known.
- ***Actions and leverage***: currently low — as there is no particular code of conduct regarding the carbon footprint of staff clothing. However, this can change over time, as the European Commission can encourage staff to establish a more sustainable culture, and provide information on how staff can decrease the climate impact of clothing through awareness-raising activities.
- ***Potential GHG reduction impact***: low, through communication and awareness-raising campaigns.
- ***Conclusion***: as the Commission does not directly purchase staff clothing, this category falls under no specific GHG Protocol Scope 3 category. Therefore, this should be excluded from the GHG neutral strategy, but can be included in any awareness-raising campaign.

Furniture and other equipment such as small cafeteria machines or vending machines (Scope 3: Fixed assets)

- ***Data availability***: the consultant requested an inventory of furniture and other small equipment to OIB OS2 but could not obtain the data.
- ***Share of the total carbon footprint***: not known.
- ***Actions and leverage***: currently medium – the contract's specification stipulates that contractors must meet certain environmental criteria. In future, tenders could incorporate more stringent environmental criteria (including reused or second-hand furniture, for example).
- ***Potential GHG reduction impact***: not evaluated, as information regarding the volume of furniture and the carbon footprint is currently not available.[43]
- ***Conclusion***: the requirement to provide a certified carbon footprint calculation for the purchased item might be considered in future contracts.
- ***Data to be monitored***:
  - As a first step, an inventory of current furniture:

[43] In all new large contracts, OIB includes the obligation for the contractor to have an environmental coordinator.

Table 2.8. Data needed for furniture and equipment

Type of data	Unit	Depreciation year
Chairs	Number	Number of years
Office tables	Number	Number of years
Office cupboards	Number	Number of years
Washing machines	Number	Number of years
Coffee machines	Number	Number of years
Restaurant fridges	Number	Number of years
Restaurant vending machines	Number	Number of years

- As a second step: if possible, in new contracts request that the supplier provide the lifecycle emission factor of any new acquisition.

Flights for staff in the delegations and representations (Scope 3: Business travel)

- ***Data availability***: readily available at PMO through the information provided by Global Business Travel (GBT, formerly American Express). Based on GBT data, Atmosfair[44] calculated the related GHG emissions. When a filter is applied to focus on the workplace cities, the result is 5,281 tCO_2e (RFI2). Based on the data registered in MIPS,[45] which contains all available information regarding the trips, it is estimated that the carbon footprint information provided by GBT covers only 86% of the total trips. Therefore, the extrapolated emissions amount to 6,140 tCO_2e.

- ***Share of the total carbon footprint****:* high – 4% of the total carbon footprint (6,140 tCO_2e).

- ***Actions and leverage***: high, as any internal policy decision regarding the limitation of flights will reduce GHG emissions.

- ***Potential GHG reduction impact***: high – any decision to take a flight or not has a direct impact on GHG emissions.

- ***Conclusion***: considering the above-mentioned elements, this source should be taken into account.

- ***Data to be monitored***:

  - Option 1 (preferred): As all the bookings are made through MIPS, take the exact information from the system, and apply the correct emission factor:
    - Distance travelled (km)
    - Means of transportation (aeroplane, train, car, bus)
    - Class: Business/Economy
  - Option 2: take the GHG calculation provided by GBT (calculated by Atmosfair), and extrapolate it to the total amount of flights, based on the information available in MIPS.

[44] Atmosfair is a non-profit organisation that actively contributes to CO_2 mitigation for GHG emissions from aircraft, cruise ships, long-distance coaches, and events.
[45] Computer application used by the European Commission for the management of missions.

Meetings, conferences and other events organised by the EC: transport of the participants, catering, waste (Scope 3: mostly downstream transportation and distribution, purchased goods and services, and waste)

- ***Data availability***:
  - The travel information of the experts from the Member States that take part in the Committees has been provided by PMO and is available in the reimbursement tool. The provided data include the location of the meeting, the departure point and the mode of transport for 57,290 participants in 2018. The emissions related to these travels have been estimated at 31,216 t CO_2e.
  - Estimations have been made based on information provided by DG SCIC to estimate the emissions related to the transportation of participants to conferences and events organised with involvement of DG SCIC. It appears that approximately 6,500 tCO_2e were emitted through the transportation of 22,218 participants to 68 events in 2018.
  - The consultant estimated emissions from other visitors' travel, such as to events organised by DGs other than those organised with involvement of DG SCIC. Based on data provided by DG MARE (around 360 staff), data were extrapolated to all staff of political DGs (16,906 staff), increasing the estimate by an additional 23,165 tCO_2e.
  - In addition, some executive agencies provide support services for the European Commission. This is the case of REA, which is responsible for contracting and payment of independent experts involved in the proposal evaluation process under H2020 as well as of experts contracted for project monitoring of the part of H2020 programmes delegated to REA. Experts usually are required to travel to Brussels from different countries within and outside the European Union, with reimbursement of travel arrangements. We received information regarding the point of departure and the means of transportation to Brussels. This led to a total estimated footprint of 6,980 tCO_2e for the evaluators. For the monitors of the H2020 projects, DG RTD provided the point of departure and the means of transportation for the following implementing bodies programmes: SESAR JU, FCH2 JU, EASME and ERCEA. Since the location of the meetings is not indicated in the data, it has been assumed that the experts on each journey go to Brussels.[46] This leads to an estimated total carbon footprint of 2,800 tCO_2e for monitors.
  - EASME is responsible for the implementation of the IEC accelerators for SMEs. As part of this programme, several sessions are organised in Brussels in which SMEs present their activities to a jury. EASME pays for the travel arrangements of the members of the jury and the representatives of the SMEs. Based on the information received, the total amount of these travels is equal to 1,319 tCO_2e.
  - The total amount of emissions due to visitor travels for meetings, conferences and other events is estimated to be approximately 71,984 tCO_2e.
  - The following table summarises the above-mentioned data:

Table 2.9 Overview of additional sources of emissions for events and meetings

No	CO2e (tonnes)	Source	Comment – assumptions
Experts attending Committees	31,216	PMO.5 AGM database of experts for 2019: 57,289 individual missions, mostly by air (99%)	Based on calculations using origin–destination data
Events	6,500	GHG consultants made estimates based on	Local participants

[46] This will change with the new Horizon Europe Programme, in which where the location place of the meeting will be recorded in the reimbursement file.

No	CO2e (tonnes)	Source	Comment – assumptions
organised with involvement of DG SCIC		information from DG SCIC for 68 events with 22,218 participants in 2018	average 50% of total. Assume average one-way distance by aeroplane 1,500 km, train 300 km and 80%/20% split (aeroplane/ train). Based on partial data, better breakdown for 2018
Events organised directly by DGs	23,165	Events organised by the DGs. The consultant used data on visitor travel from DG MARE (360) to give a pro rata estimate of the total for visitors to the political DGs (16,906 staff)	Detailed information (origin/destination/mode of transport) available at each DG, but no consolidation yet.
REA evaluation support for H2020 projects	6,980	We made estimates based on transportation means and point of departure	Information on point of departure for experts (7,912 trips by air; 1,199 by train; 203 by car)
Monitors of H2020	2,800	RTD supplied data for monitors of H2020: SESR, FCH2, EASME and ERCEA. We made estimates based on transportation means and point of departure, assuming that the meetings take place in Brussels	Monitor trips by agency air/train/private car – EASME 89/12/2; SESAR 3/0/1; FCH2 36/16/1; GSA 48/10/0; ERCEA 172// (flights are from capital city to Brussels)
EASME jury members and SMEs	1,319	EASME jury members assessing the SMEs under the IEC accelerator programme. EASME pays for jury members and SME employees to participate. We made estimates based on received information	1,950 flights, emissions based on capital city of country of departure to Brussels
Total	**71,984**		

- ***Share of the total carbon footprint*:** high – 41% of the total adjusted carbon footprint (174,242 tCO_2e).
- **Actions and leverage**: high – by the promotion of web streamed conferences, the proposition of alternative travel arrangements, etc.
- ***Potential GHG reduction impact***: high.
- ***Conclusion***: this category should be taken into account.
- ***Data to be monitored*:**
  - When a participant registers to attend a meeting, conference or other event in-person, request the following information:

- From which city s/he is travelling;
- To which city s/he is travelling after the event;
- The mode of transportation (aeroplane, car, train);
- Class (Business, Economy, First).

- When the reimbursement is registered in the system (for AGM or Horizon Europe, for instance), calculate the information directly (please see Chapter 3 *Monitoring System*).

2.2.2 Organisational scope

The European Commission's directorates/services are spread over eight main European sites located in seven Member States: Belgium (Brussels and Geel), Luxembourg (Luxembourg), Italy (Ispra), Germany (Karlsruhe), the Netherlands (Petten), Ireland (Grange) and Spain (Seville). They constitute the core of the relevant organisational scope of the Commission's carbon footprint.

Some agencies and other bodies work closely alongside the European Commission. These include the Executive Agencies (EACEA,[47] EASME,[48] ERCEA,[49] REA,[50] CHAFEA[51] and INEA[52]), as well as the Decentralised Agencies, Agencies under Common Securities and Defence, the European External Action Service (EEAS), the European Institute of Innovation & Technology (EIT), and the Joint Undertakings. This chapter considers the relevance of these organisations for the scope of the Commission's carbon footprint.

1) Initial organisational scope

The initial 2018 EMAS organisational scope includes all European Commission DGs, including the site of DG SANTE in Grange (IE), the six sites of the DG Joint Research Centre (Brussels, Petten, Geel, Sevilla, Karlsruhe, Ispra), and the sites that host the following executive agencies: EACEA, EASME, ERCEA, REA, and CHAFEA. It represents 35,594 staff and an area of more than 1,580,000 m².

The EMAS' perimeter is based upon *buildings* (in Brussels and Luxembourg, where each building has its own environmental permit) and *location* (each JRC and DG SANTE in Grange are considered as entire individual entities, regardless of the number of buildings), but not upon Directorates-General (DGs). Furthermore, new buildings are formally registered under EMAS a year after the acquisition. To be consistent in terms of data and indicators, a building must be occupied for at least one full year before it enters the EMAS scope. The EMAS perimeter also considers buildings of which the Commission uses only a part.

Consequently, 3.9% of staff and 4% of area offices of the European Commission are currently out of the EMAS scope. This is shown in the tables below, which provide a detailed outline of the initial organisational scope.

[47] EACEA: Education, Audiovisual and Culture Executive Agency.
[48] EASME: The Executive Agency for Small and Medium-sized Enterprises.
[49] ERCEA: European Research Council (ERC) Executive Agency.
[50] REA: Research Executive Agency.
[51] CHAFEA: Consumers, Health, Agriculture and Food Executive Agency.
[52] INEA: Innovation and Networks Executive Agency.

The European Commission

Table 2.10. Number of staff, buildings and area (in m², defined as a useful surface of office and non-office space defined in the Energy Performance of Buildings (EPB) certificates) of offices of the total European Commission and the EMAS scope

Indicator	Total	EMAS perimeter	% not considered
# staff	37,056	35,594	3.9%
# buildings	518	510	1.5%
useful surface area (in m²)	1,653,660 m²	1,587,460 m²	4.0%

Of which:

- **Brussels**

Brussels is the European Commission's main administrative centre (with over 40 Directorates and Services and 5 Executive Agencies), with buildings located in the Brussels Region and on the near outskirts of Brussels but in the Flanders Region.[53]

Table 2.11 Number of staff, buildings and area (in m², defined as a useful surface of office and non-office space defined in the Energy Performance of Buildings (EPB) certificates) of offices in Brussels and the EMAS scope

Indicator	Total	EMAS perimeter	% not considered
# staff	28,410	27,687	2.5%
# buildings	61	58	4.9%
useful surface area (in m²)	1,079,786 m²	1,042,037 m²	3.5%

Following the European Commission Environmental Statement (report for 2018, Annexe A: Brussels), the EMAS perimeter in Brussels includes staff working for Executive Agencies that are located in buildings managed by the Commission and within the EMAS scope (EACEA, EASME, ERCEA and REA). EMAS applies to the whole of the Brussels site. Three buildings were not registered under EMAS in 2018 in Brussels:

- PALM, which will undergo major refurbishment;
- MERO, recently occupied by the Commission in Brussels for less than one year, which will be included in 2020 – referring to 2019 data;
- MO15, recently occupied by the Commission in Brussels for less than one year, which will be included in 2020 – referring to 2019 data.

- **Luxembourg**

Luxembourg is the European Commission's second administrative centre including one Executive Agency.

53 The two buildings in the Flanders Region (on the outskirts of Brussels) are part of the EMAS scope, but do not have environmental permits from the Brussels Region, and do not have the same legal obligations. Furthermore, although Geel is part of the Flanders Region, it is excluded from the Brussels site since it is not located on the outskirts of Brussels.

Table 2.12 Number of staff, buildings and area (in m², defined as a useful surface of office and non-office space defined in the Energy Performance of Buildings (EPB) certificates) of offices in Luxembourg and the EMAS scope

Indicator	Total	EMAS perimeter	% not considered
# staff	5,016	4,277	14.7%
# buildings	18	14	22.2%
useful surface area (in m²)	180,906 m²	152,455 m²	15.7%

Following the European Commission Environmental Statement (report for 2018, Annex B: Luxembourg), the EMAS perimeter in Luxembourg includes staff working for the Executive Agency CHAFEA located in buildings managed by the Commission and within the EMAS scope. Four buildings were not registered under EMAS in 2018 in Luxembourg:

- FISCHER, which will be included in 2021;
- CPE 1 & 2 (to be replaced);
- MERCIER (to be replaced);
- MAEU (to be replaced).

❖ **The five Joint Research Centre sites (excluding JRC HQ in Brussels) and DG SANTE (located in Grange)**

➢ **Petten** (Netherlands)

Table 2.13 Number of staff, buildings and area (in m², defined as a useful surface of office and non-office space defined in the Energy Performance of Buildings (EPB) certificates) of offices in Petten and the EMAS scope

Indicator	Total	EMAS perimeter	% not considered
# staff	248	248	0%
# buildings	13	12	7.7%
useful surface area (in m²)	19,996 m²	19,996 m²	0%

According to the Environmental Statement, only buildings that have water, electricity and gas consumption are reported as operational. There are 26 buildings in total, but only 13 are categorised as operational. The remaining 13 are used for storage and distribution. One of them is a gas storage facility and is not included in the EMAS perimeter.

➢ **Geel (Belgium)**

Table 2.14 Number of staff, buildings and area (in m², defined as a useful surface of office and non-office space defined in the Energy Performance of Buildings (EPB) certificates) of offices in Geel and the EMAS scope

Indicator	Total = EMAS perimeter	% not considered
# staff	259	0%
# buildings	16	0%
useful surface area (in m²)	50,499 m²	0%

- **Sevilla (Spain)**

Table 2.15 Number of staff, buildings and area (in m², defined as a useful surface of office and non-office space defined in the Energy Performance of Buildings (EPB) certificates) of offices in Sevilla and the EMAS scope

Indicator	Total = EMAS perimeter	% not considered
# staff	342	0%
# buildings	1	0%
useful surface area (in m²)	7,580 m²	0%

- **Karlsruhe (Germany)**

Table 2.16 Number of staff, buildings and area (in m², defined as a useful surface of office and non-office space defined in the Energy Performance of Buildings (EPB) certificates) of offices in Karlsruhe and the EMAS scope

Indicator	Total = EMAS perimeter	% not considered
# staff	317	0%
# buildings	4	0%
useful surface area (in m²)	43,170 m²	0%

- **Ispra (Italy)**

Ispra is the JRC's largest site and administrative centre.

Table 2.17 Number of staff, buildings and area (in m², defined as a useful surface of office and non-office space defined in the Energy Performance of Buildings (EPB) certificates) of offices in Ispra and the EMAS scope

Indicator	Total = EMAS perimeter	% not considered
# staff	2,285	0%
# buildings	402	0%
useful surface area (in m²)	261,713 m²	0%

- **Grange (Ireland)**

The Facility of the Directorate General of Health and Food Safety (DG SANTE) is located at Grange in Ireland

Table 2.18 Number of staff, buildings and area (in m², defined as a useful surface of office and non-office space defined in the Energy Performance of Buildings (EPB) certificates) of offices in Grange and the EMAS scope

Indicator	Total = EMAS perimeter	% not considered
# staff	179	0%
# buildings	3	0%
useful surface area (in m²)	10,010 m²	0%

2) Critical assessment of the initial 2018 EMAS organisational scope

The initial EMAS scope does not include decentralised agencies, agencies under Common Securities and Defence, the executive agency INEA, and other organisations such as EEAS, EIT and the Joint Undertakings. These organisations represent more than 12,530 staff. This choice was made because staff in these organisations are not paid by the European Commission and because of the lack of levers held by the European Commission regarding their internal management. Furthermore, the management of these organisations is independent of the European Commission (they have an autonomous management structure).

The Executive Agency INEA is currently also out of scope because it is hosted in a building that it is not part of the EMAS scope.

Table 2.19 Number of staff from unconsidered organisations

Name of the unconsidered organisations	Number of staff
Decentralised agencies	< 8,100
Agencies under Common Securities and Defence	279
INEA (building W910 not included in EMAS perimeter)[54]	~ 300
EEAS	3,606
EIT	49
Joint Undertakings	246
Total	**< 12,530**

Data collected in October 2019

Commission Representations to Member States are not included in the organisational scope. Some Commission staff at the Commission Representations to Member States are shared with the European Parliament. The two bodies often have separate floor space within the same building. It could be worthwhile to include them in the organisational scope, as the European Commission has levers on emissions related to the energy consumption in the buildings, the mobility of the staff, etc. However, given the complexity of the necessary data collection (due to the high number of sites and the fact that most of these buildings are rented), it was decided not to include them in the scope. Regarding the GHG Protocol source of Scope 3 emissions "business travel", initially only the missions of the European Commission staff located in the eight sites of the EMAS registration were considered. However, some European Commission staff are based in EU delegations outside the European Union. DEVCO allocates some budget lines for mission costs, and along with other Commission DGs it takes decisions on mission allocations for staff in each delegation every year. Moreover, the mission budget under each budget line depends on the budget agreed with DG BUDG during the budgetary procedure. The information regarding this type of mission is available at PMO for most delegations.

In coming years, buildings not yet included could be integrated into the scope. EMAS considers a new building the year after its acquisition and does not consider buildings and staff that are not managed significantly by the European Commission. Consequently, 1,462 European Commission staff and contractors were not included in the initial 2018 EMAS scope.

3) Suggestions to extend the organisational scope

The initial 2018 EMAS organisational scope was already very comprehensive. However, some potential gaps have been identified in relation to satellite organisations, such as executive agencies, decentralised agencies and delegations.

The criteria used to assess whether an organisation should be part of the scope are the following:

- Management: are the staff paid and/or managed by the European Commission?
- Leverage: does the European Commission have a lever on the organisation's activities, in order to implement GHG emissions reduction measures/actions?
- Relevance: is the estimated carbon footprint relevant among the total carbon footprint of the European Commission (this can be estimated based on the number of staff and/or occupied area)?
- Feasibility: are the data already available or easy to collect?

[54] INEA has an autonomous management structure

Executive agencies:

- *Management*: Executive Agencies depend on Commission Directorates/services and as such are supervised by them. However, they are autonomous organisations, and incorporating them into the scope of the GHG neutral strategy would require several formal agreements. Some executive agencies, such as REA, are responsible for the administrative and logistical support services of a number of EU programmes. Therefore, GHG emissions estimates based on data provided by them regarding the travel of experts should be considered as a business process of the European Commission,and should not refer to the specific GHG emissions of the executive agency.
- *Leverage*: see above.
- *Relevance*: some of the activities of REA and EASME on behalf of the European Commission have been evaluated, such as the organisation of meetings for the evaluation of research proposals of funding programmes (e.g. Horizon 2020). They are considered relevant (please refer to 2.2.1).
- *Feasibility*: data for the energy consumption of buildings and commuting are already part of the EMAS scope. The business travel of staff is part of the same contract held by the European Commission with American Express GBT, and is therefore readily available.
- *Conclusion*: these emissions should be taken into account. INEA should be added to the scope.

Decentralised agencies, Agencies under Common Securities and Defence, European External Action Services (EEAS), European Institute of Innovation & Technology (EIT):

- *Management*: the staff are not paid or managed by the European Commission.
- *Leverage*: the European Commission has little leverage over organisational decisions.
- *Relevance*: 12,540 staff (compared to 35,964 in the initial 2018 EMAS scope).
- *Feasibility*: not currently feasible, as each organisation's management is independent, and should be fully involved in order to dedicate resources to execute the data collection and footprint calculation, and to coordinate the strategy.
- *Conclusion*: these organisations are out of scope.

Commission Representations to Member States and Delegations of the EU to third countries:

- *Management*: full management of the European Commission for the representations, and shared management with EEAS for the delegations.
- *Leverage*: high for the representations. Medium for the delegations, as the management is shared with EEAS.
- *Relevance*: Not evaluated.
- *Feasibility*: There are over 27 representations in the Member States, and more than 100 delegations all over the world. The data should be collected for each of these sites, which would be difficult to accomplish.
- *Conclusion*: due to the difficulty of the data collection, and following discussion with DG Climate Action, it was decided to leave this out of scope. However, this could change over time, with the representations being added first, and then gradually the delegations.

2.3 Updated 2018 Commission's carbon footprint

2.3.1 Update of the 2018 Commission's corporate[55] carbon footprint

The European Commission's carbon footprint (CFP) was calculated for the first time in 2005. Since 2011, it has been calculated and improved each year. The eight sites have been considered since 2014. This needs to be kept in mind when considering the availability and use of historical emissions data. The last European Commission's Carbon Footprint (2018), calculated by the EMAS team and adjusted during the course of this study,[56] amounted to 174,242 tCO_2e.

At constant scope, a decrease of 17% was recorded between 2014 and 2018 due to increased energy efficiency and decreased heating fuel consumption in buildings (buildings – fuel for heating), and also to a switch to the use of electricity from renewable sources at most sites (buildings – electricity).

In 2018, the initially calculated emissions went up compared to previous years, due to a scope extension. The Commission extended the operational scope to include more indirect emissions (Scope 3), such as fixed assets (emissions related to the manufacturing and components of IT materials and buildings), purchased goods and services, waste and upstream energy emissions. As the European Commission's resources dedicated to the management of the climate impact of internal organisation are restricted, not all sites have been able to report these additional categories yet.

Following the assessment and recommendations presented in this report, the consultant proposes to take into account additional sources of emissions for 2018, which results in a significant increase of the Commission's carbon footprint. These include staff travel to/from the delegations[57] and representations in other Member States, visitor travel, and food, collectively comprising an additional 85,278 tCO_2e within a total of 259,520 tCO_2e. This represents a 49% increase on the initial 2018 EMAS carbon footprint. Details are shown in Table 2.20 below.

[55] The term "corporate" is borrowed from the Environmental Statement of the European Commission, . It includes results aggregated from the eight sites (Brussels, Luxembourg, Geel, Petten, Seville, Karlsruhe, Grange and Ispra).

[56] The original 2018 corporate carbon footprint of the European Commission reported 180,983 tCO_2e but certain corrections, such as the modification of emissions factors, double counting or forgotten counting were pointed out during the EMAS audit and the deep data analyses made by our team. The total difference of these two CPF figures is a reduction of 6,741 tCO_2e. Details of these modifications can be found in Appendix 3 (proposed corrections to the initial 2018 carbon footprint).

[57] These GHG emissions might be slightly underestimated as AMEX/GBT does not capture all of this information.

Table 2.20 Overview on the proposed added categories (Add.) and adjusted carbon footprint (Adj.) to the carbon footprint of 2018 from the environmental statement (ES2018) (*)

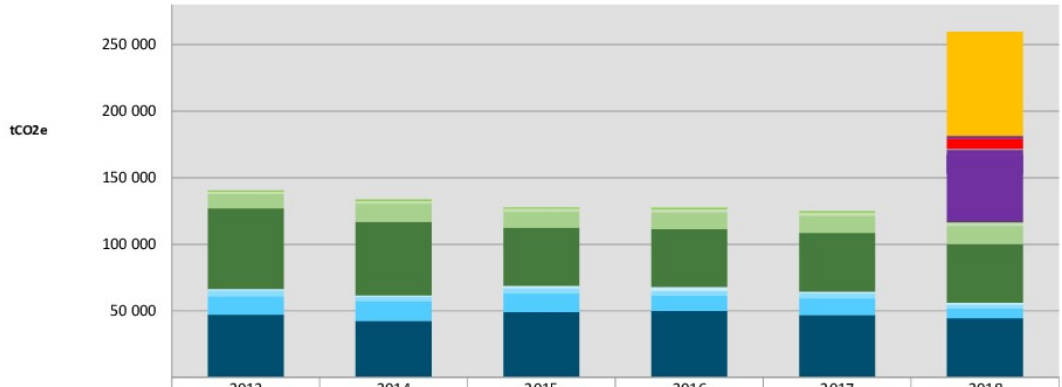
Organisation						
Scope	**Sources of emissions**	**ES2018**	**Adj.**	**Add.**	**ES2018 + Add.**	**Adj. + Add.**
Scope 1	Buildings – fuel for heating	44,419	44,419		44,419	44,419
Scope 1	Vehicle fleet – fuel consumption	949	949		949	949
Scope 1	Buildings – coolant losses	1,154	1,154		1,154	1,154
Scope 2	Buildings – electricity	8,193	7,340		8,193	7,340
Scope 2	Buildings – district heating/cooling	3,415	3,159		3,415	3,159
Scope 3	Missions (air)	43,881	44,453		43,881	44,453
Scope 3	Missions (air): delegation and representation travel			6,140	6,140	6,140
Scope 3	Missions (other)	1,971	1,643		1,971	1,643
Scope 3	Staff commuting	13,498	13,611		13,498	13,611
Scope 3	Fixed assets – buildings	36,699	36,699		36,699	36,699
Scope 3	Fixed assets – IT	19,743	13,451		19,743	13,451
Scope 3	Goods and services: service contracts	3,923	3,923		3,923	3,923
Scope 3	Goods and services: paper purchased	889	889		889	889
Scope 3	Goods and services: food	247	551	7,154	7,401	7,705
Scope 3	Waste	2,003	2,003		2,003	2,003
Scope 3	Event: visitor travel			71,984	71,984	71,984[58]
Total		**180,983**	**174,242**	**85,278**	**266,261**	**259,523**

ES2018: Carbon Footprint from Environmental Statement 2018 (in tCO2e)
Adj.: Carbon Footprint adjusted (in tCO2e)
Add.: Proposed additions (in tCO2e)

All of these additions are included in the 2018 Carbon Footprint and base year for the elaboration of GHG emissions reduction scenarios for the European Commission to become climate neutral by 2030. Figure 2.2 below shows the evolution of the carbon footprint between 2013 and 2018. The emissions highlighted in purple correspond to the sources of emissions added to the scope by EMAS in 2018. The emissions highlighted in red (food) and orange (visitor travel and delegation travel) correspond to sources of emissions estimated and added by the consultant in the context of the present study.

[58] This information is based on some extrapolation, as described in Table 11.

Figure 2.2 Emissions of GHG (tCO2e) generated by the Commission from 2014 to 2018



	2013	2014	2015	2016	2017	2018
Total (tCO2e)	140,427	133,528	127,779	127,463	124,729	259,523
Delegation and representation travel						6,140
Event: visitor travel						71,984
Waste	0	0	0	0	0	2,003
Goods and services - food	0	0	0	0	0	7,705
Goods and services - paper purchased	0	0	0	0	0	889
Goods and services - service contracts	0	0	0	0	0	3,923
Fixed assets - IT	0	0	0	0	0	13,451
Fixed assets - buildings	0	0	0	0	0	36,699
Vehicle fleet - fuel consumption	952	967	978	1,003	948	949
Missions (other)	1,635	2,005	2,321	2,353	2,189	1,887
Staff commuting	10,850	13,691	12,061	12,725	13,086	13,611
Missions (air)	60,446	55,111	43,530	43,320	44,169	44,209
Buildings - coolant losses	1,258	1,121	1,840	2,962	1,182	1,154
Buildings - district heating/cooling	4,226	3,125	4,120	3,652	3,728	3,159
Buildings - electricity	13,891	15,044	13,784	11,575	12,575	7,341
Buildings - fuels for heating	47,170	42,465	49,145	49,873	46,852	44,419

2.3.2 Analysis of the updated 2018 carbon footprint

In 2018 the carbon footprint of the European Commission amounted to 259,500 tCo2e. This corresponds to 7 tCo2e per staff member. Due to differences in scope and methods, a comparison with other organisations is not possible. The carbon footprint per capita in the European Union (27 countries) in 2018 amounted to 8.7 tCO2e/capita and in Belgium it amounted to 10.8 tCO2e/capita[59]. **Almost 87% of the total GHG emissions of the European Commission are due to six sources of GHG emissions** (see Figure 2.3 Emissions of GHG per category (%) generated by the European Commission in 2018 below). These six largest contributors are, in decreasing order:

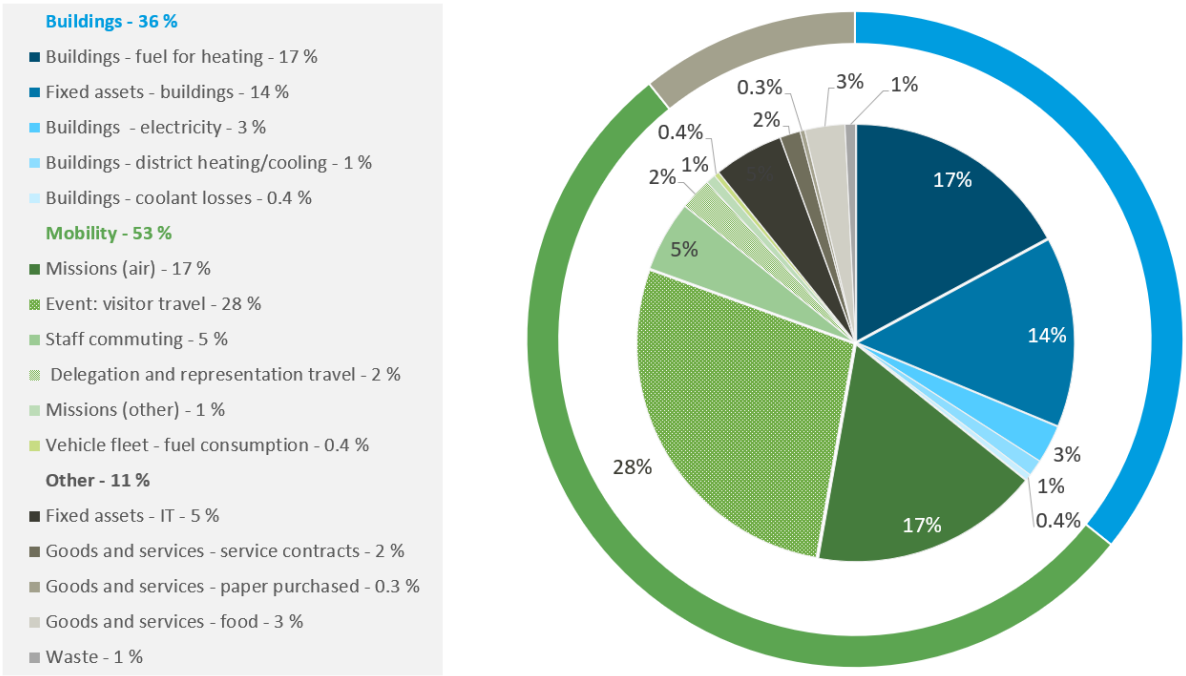
- Event: Visitor travel (newly proposed; 27,7%; Scope 3)
- Fuel used for heating of buildings (17,1%; Scopes 1 & 3)
- Air travel for missions (17%; Scope 3)
- Fixed assets of buildings construction (or capital goods of buildings) (14,1%; Scope 3)
- Staff home-work commuting (5,2%; Scope 3)
- Fixed assets of IT equipment (5,2%; Scope 3)

Overall, buildings-related emissions (36% of the global carbon footprint) and mobility-related emissions (53% of the global carbon footprint) matter the most, and mitigation actions and measures in these categories are expected to have the largest influence on the carbon footprint. While other categories could be increasingly relevant in coming years, currently – since these other categories have either not yet been fully reported or because most

[59] Source: Eurostat from the European Environment Agency, https://ec.europa.eu/eurostat/databrowser/view/t2020_rd300/default/table?lang=en

prominent sources of emissions within them are declining – the relative importance of different GHG emissions sources is not expected to change drastically before 2030.

Figure 2.3 Emissions of GHG per category (%) generated by the European Commission in 2018



About 96% of the total GHG emissions of the European Commission are due to four sites, setting aside the emissions that are not specifically related to a site (delegation-related emissions and visitor travels for events, which account for 29.6% of the global carbon footprint):

- Brussels (65.3% - 28,410 staff – 4.17 tCO_2e/capita)
- Ispra (17.8% - 2,285 staff – 14.10 tCO_2e/capita)
- Luxembourg (9.1% - 5,016 staff – 3.28 tCO_2e/capita)
- Karlsruhe (4.0% - 317 staff – 22.98 tCO_2e/capita)

The JRC's sites display higher GHG emissions intensities (expressed as tCO_2e/capita), especially Ispra and Karlsruhe, as indicated in Table 2.21. These sites are dedicated to more energy-intensive activities, such as nuclear safety research activities, whereas Brussels and Luxembourg are mostly offices. Nevertheless, two sites, Karlsruhe and Seville, were not reporting the same way as the other sites, as they have not yet calculated their full Scope 3 emissions. Their emissions are consequently expected to increase from next year, when reporting will be more comprehensive.

Figure 2.4. Emissions of GHG (excluding delegation travel and visitor travel) per site (%) generated by the European Commission in 2018

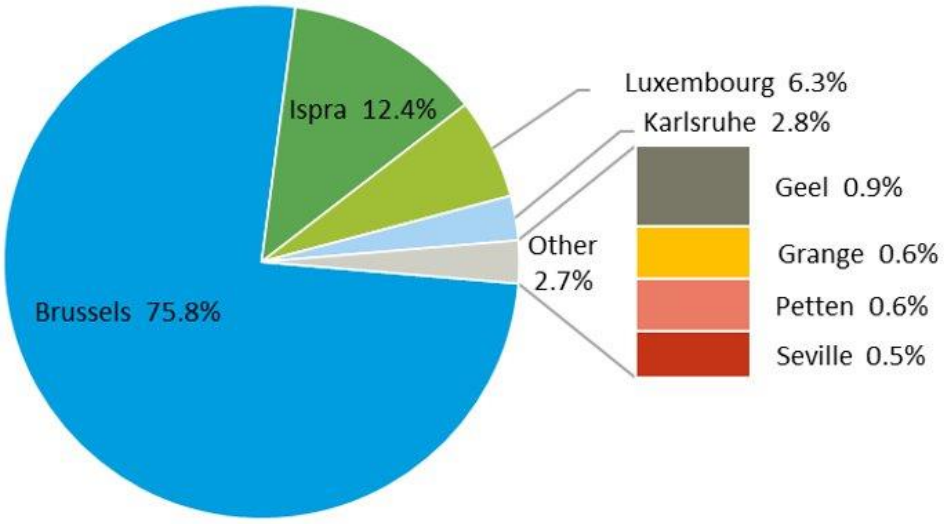


Table 2.21 GHG emissions per capita, site by site

Site	GHG emissions per capita (tCO_2e/capita)
European Commission[1]	7.0
Brussels	4.2
Luxembourg	3.3
Petten	6.3
Geel	9.3
Seville	4.1
Karlsruhe[2]	23.0
Ispra[2]	14.1
Grange	8.8

[1]Including delegation and visitor travel related emissions.
[2]Ispra and Karlsruhe are distinct cases, using laboratories and testing facilities with high energy consumption (e.g. cooling chambers, high-voltage facilities, electric-vehicle charging laboratories).

The tables below provide a site by site overview. More information on the underlying data can be found in Appendix 1 (2018 carbon footprint site by site). The details on the adjustments made to the figures in the Environmental Statement 2018 (ES) can be found in Appendix 3.

Table 2.22. 2018 Carbon footprint of the European Commission (organisational) and site by site for Brussels, Luxembourg, Petten and Geel

	Organisational			Brussels			Luxembourg			Petten			Geel		
2018	ES2018	Adj.	**Adj.+add.**	ES2018A	Adj.	Adj.+add.	ES2018B	Adj.	Adj.+add.	ES2018C	Adj.	Adj.+add.	ES2018D	Adj.	Adj.+add.
Buildings – fuel for heating	44,419	44,419	**44,419**	20,302	17,181	**17,181**	4,442	4,443	**4,443**	755	755	**755**	378	390	**390**
Vehicle fleet – fuel consumption	949	949	**949**	626	625,93	**626**	204	204	**204**	16	16	**16**	7	7	**7**
Buildings – coolant losses	1,151	1,154	**1,154**	820	820	**820**	191	191	**191**	28	28	**28**	98	98	**98**
Buildings - electricity	8,193	7,341	**7,341**	1,176	477	**477**	0	0	**0**	0	0	**0**	185	157	**157**
Buildings – district heating/cooling	3,415	3,159	**3,159**	0	0	**0**	532	275	**275**	0	0	**0**	564	564	**564**
Missions (air)	43,881	44,453	**44,453**	38,466	38,793	**38,793**	1,830	1,830	**1,830**	211	211	**211**	378	378	**378**
Missions (other)	1,971	1,643	**1,643**	1,092	764	**764**	587	588	**588**	14	14	**14**	1	7	**7**
Staff commuting	13,498	13,611	**13,611**	11,565	11,565	**11,565**	0	0	**0**	0	0	**0**	246	246	**246**
Fixed assets – buildings	36,699	36,699	**36,699**	28,466	28,466	**28,466**	0	4,278	**4,278**	190	190	**190**	246	246	**246**
Fixed assets – IT	19,743	13,451	**13,451**	231	8,345	**8,345**	0	3,181	**1,308**	169	136	**136**	292	254	**254**
Goods and services	5,059	5,363	**5,363**	4,072	4,072	**4,072**	0	382	**1,308**	163	163	**217**	19	37	**37**
Service contracts	*3,923*	*3,923*	***3,923***	*0*	*3,296*	***3,296***	*0*	*309*	***309***	*160*	*160*	***160***	*2*	*2*	***2***
Paper purchased	*889*	*889*	***889***	*0*	*776*	***776***	*0*	*73*	***73***	*3*	*3*	***3***	*3*	*3*	***3***
Food	*247*	*551*	***7,705***	*0*	*0*	***5,994***	*0*	*0*	***926***	*0*	*0*	***54***	*14*	*31*	***31***
Waste	2,003	2,003	**2,003**	461	1,391	**1,391**	0	157	**157**	6	6	**6**	31	31	**31**
Delegation travel			**6,140**												
Event: visitor travel			**71,984**												
Other emissions															
Total (tCO2e)	180,986	174,242	**259,523**	103,205	112,502	**118,496**	7,786	15,528	**14,581**	1,552	1,519	**1,573**	2,445	2,414	**2,414**

ES2018 X: Carbon Footprint from Environmental Statement 2018, Annex X (in tCO2e)
Adj.: Carbon Footprint adjusted (in tCO2e)
Adj.+add.: Carbon Footprint adjusted plus additional sources of emissions

	Organisational			Brussels			Luxembourg			Petten			Geel		
2018	ES2018	Adj.	**Adj.+add.**	ES2018A	Adj.	Adj.+add.	ES2018B	Adj.	Adj.+add.	ES2018C	Adj.	Adj.+add.	ES2018D	Adj.	Adj.+add.
Buildings – fuel for heating	44,419	44,419	**44,419**	20,302	17,181	**17,181**	4,442	4,443	**4,443**	755	755	**755**	378	390	**390**
Vehicle fleet – fuel consumption	949	949	**949**	626	625,93	**626**	204	204	**204**	16	16	**16**	7	7	**7**
Buildings – coolant losses	1,151	1,154	**1,154**	820	820	**820**	191	191	**191**	28	28	**28**	98	98	**98**
Buildings - electricity	8,193	7,341	**7,341**	1,176	477	**477**	0	0	**0**	0	0	**0**	185	157	**157**
Buildings – district heating/cooling	3,415	3,159	**3,159**	0	0	**0**	532	275	**275**	0	0	**0**	564	564	**564**
Missions (air)	43,881	44,453	**44,453**	38,466	38,793	**38,793**	1,830	1,830	**1,830**	211	211	**211**	378	378	**378**
Missions (other)	1,971	1,643	**1,643**	1,092	764	**764**	587	588	**588**	14	14	**14**	1	7	**7**
Staff commuting	13,498	13,611	**13,611**	11,565	11,565	**11,565**	0	0	**0**	0	0	**0**	246	246	**246**
Fixed assets – buildings	36,699	36,699	**36,699**	28,466	28,466	**28,466**	0	4,278	**4,278**	190	190	**190**	246	246	**246**
Fixed assets – IT	19,743	13,451	**13,451**	231	8,345	**8,345**	0	3,181	**1,308**	169	136	**136**	292	254	**254**
Goods and services	5,059	5,363	**5,363**	4,072	4,072	**4,072**	0	382	**1,308**	163	163	**217**	19	37	**37**
Service contracts	*3,923*	*3,923*	***3,923***	*0*	*3,296*	***3,296***	*0*	*309*	***309***	*160*	*160*	***160***	*2*	*2*	***2***
Paper purchased	*889*	*889*	***889***	*0*	*776*	***776***	*0*	*73*	***73***	*3*	*3*	***3***	*3*	*3*	***3***
Food	*247*	*551*	***7,705***	*0*	*0*	***5,994***	*0*	*0*	***926***	*0*	*0*	***54***	*14*	*31*	***31***
Waste	2,003	2,003	**2,003**	461	1,391	**1,391**	0	157	**157**	6	6	**6**	31	31	**31**
Delegation travel			**6,140**												
Event: visitors travel			**71,984**												
Other emissions															
Total (tCO2e)	180,986	174,242	**259,523**	103,205	112,502	**118,496**	7,786	15,528	**14,581**	1,552	1,519	**1,573**	2,445	2,414	**2,414**

ES2018 X: Carbon Footprint from Environmental Statement 2018, Annex X (in tCO2e)
Adj.: Carbon Footprint adjusted (in tCO2e)
Adj.+add.: Carbon Footprint adjusted plus additional sources of emissions

Table 2.23. Carbon footprint for 2018 of Seville, Karlsruhe, Ispra and Grange

	Seville			Karlsruhe			Ispra			Grange			Not site specific
2018	ES2018D	Adj.	Adj.+add.	ES2018D	Adj.	Adj.+add.	ES2018D	Adj.	Adj.+add.	ES2018D	Adj.	Adj.+add.	Additional
Buildings – fuel for heating	0	331	**331**	0	0	**0**	0	0	**0**	0	0	**0**	
Vehicle fleet – fuel consumption	0	0	**0**	0	0	**0**	532	532	**532**	0	0	**0**	
Buildings – coolant losses	0	6.673	**6.673**	0	434	**434**	0	0	**0**	0	0	**0**	
Buildings - electricity	0	756	**756**	0	499	**499**	204	162	**162**	16	12	**12**	
Buildings – district heating/cooling	0	1.154	**1.154**	0	820	**820**	191	191	**191**	28	28	**28**	
Missions (air)	0	7.657	**7.657**	0	3.121	**3.121**	0	807	**807**	0	137	**137**	
Missions (other)	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**	
Staff commuting	0	74	**74**	0	0	**0**	0	0	**0**	0	0	**0**	
Fixed assets – buildings	0	194	**194**	0	127	**127**	0	42	**42**	0	3	**3**	
Fixed assets – IT	0	667	**667**	0	43	**43**	0	0	**0**	0	0	**0**	
Goods and services	0	0	**74**	0	0	**69**	0	0	**0**	0	0	**252**	
Service contracts	*0*	*43.881*	***43.881***	*0*	*38.466*	***38.466***	*1.830*	*1.830*	***1.830***	*211*	*211*	***211***	
Paper purchased	*0*	*197*	***197***	*0*	*157*	***157***	*5*	*5*	***5***	*2*	*2*	***2***	
Food	*0*	*633*	***74***	*0*	*123*	***69***	*-1.835*	*424*	***424***	*0*	*0*	***39***	
Waste	0	813	**813**	0	484	**484**	158	158	**158**	12	12	**12**	
Delegation travel													**6.140**
Event: visitor travel													**71.984**
Other emissions							8551	0	**0**				
Total (tCO2e)	0	63.030	**62.471**	0	44.275	**44.220**	9.636	4.152	**4.152**	269	406	**445**	**78.124**

ES2018 X: Carbon Footprint from Environmental Statement 2018, Annex X (in tCO_2e)
Adj.: Carbon Footprint adjusted (in tCO_2e)
Adj.+add.: Carbon Footprint adjusted plus additional sources of emissions

2.4 Ongoing efforts to reduce the Commission's carbon footprint

Considerable improvements in performance on several parameters were recorded in 2018, compared to 2014, as shown in Table 2.24 below. The internal audit report for 2018[60] explains that the most important reasons for these good results relate to energy consumption and CO_2e emissions from buildings, including vacating the old JMO building (Luxembourg) and switching to renewably-sourced electricity with guarantees of origin (Geel, Petten and Luxembourg).[61] Moreover, the targets related to office paper consumption are on track and will probably be met in 2020; an individual monitoring system was implemented[62] and most individual printers were removed.

Table 2.24 Performance summary for core indicators linked to GHG emissions

No	Indicator	Commission performance (%)	
		Performance 2014-2018 (1)	Target 2014-2020 (2)
1a	Total energy consumption (48ummar); MWh/p	-9%	-5%
1a	Total energy consumption (48ummar); kWh/m²	1%	-5%
1c	Non-renewable energy (48ummar); %	-7%	-3%
1e	Office paper consumption; Sheet/p/day	-32%	-34%
1e	Office paper consumption; t/p	-31%	-34%
2a	CO2 emissions (48ummar.); tCO_2/p	-24%	-5%
2a	CO2 emissions (48ummar.); $kgCO_2/m^2$	-16%	-5%
2c	CO2 emissions (vehicles); gCO_2/km (manufacturer spec.)	-16%	-14%
2c	CO2 emissions (vehicles); gCO_2/km (actual)	1%	-5%
3a	Non-hazardous waste ; t/p	-15%	-10%
3b	Hazardous waste; t/p	103%	-3%
3c	Separated waste (%)	1%	6%

(1) from the Environmental Statement 2018
(2) from the Global Annual Action Plan 2019
Target met
Target not met

A large number of measures and initiatives have already been implemented by the European Commission to reduce its GHG emissions. A broad documentary research project and survey involving more than 40 staff members of the European Commission (see Appendix 2 – List of interviews) identified an impressive number of measures, listed in Table 2.2 below.

[60] Arcadis (2018) Internal Audit Report – Carbon footprint of the European Commission.
[61] Brussels has been using 95% of its total electricity consumption from renewable sources since August 2009.
[62] Based on individual accounts, staff can monitor how many pages they print.

Table 2.25 List (non-exhaustive) of current measures implemented by the European Commission and their reduction potential

No.	Category of emissions	Description of the measure	Type	Measured reduction (%)
Organisational				
1	All	Green Public Procurement (GPP): Overall, 29% of contracts in 2018 were either green by nature or had some degree of GPP[63]	Internal policy	Not applicable
2	All	EMAS Action Plan 2019: 44 actions linked to reducing CO2e emissions to air, and to other pollutants[64]	Internal policy	Not yet evaluated
3	All	EMAS Action Plan 2019: 24 actions linked to Promotion of Green Procurement	Internal policy	Not applicable
4	Other	Use of Green Public Procurement (GPP) criteria	Internal policy	Not evaluated
5	S1 & 2 – Energy	EMAS Action Plan 2019: 164 actions linked to more efficient resource use, including the closing of some offices during holydays	Internal policy	2% GHG emissions saved per year for gas used in Brussels 3% of GHG emissions saved per year for electricity used in Brussels
6	S1. 2. Own fleet	Reduction of the size of the vehicle fleet since 2015 by 30%	Internal policy	Reduction of 3% of the global GHG emissions since 2015
7	S3 – Other indirect sources (activities and emissions off site)	Guide of good practice for events: - Plastic-free events - Public transport - Certified venue as sustainable (Green Key) - Sustainable catering	Internal policy	Not evaluated
8	S3.2.2. Fixed assets: IT material	The policy is to replace all desktop computers with laptops	Internal policy	Regarding the emissions factor provided by ADEME, a 70% reduction is expected for each desktop (without screen) replaced by a laptop[65]
9	S3.4. Business travel	Increase the number of VC facilities to reduce the number of missions	Investment	Not yet evaluated; will be evaluated when data are provided by European Commission

[63] Green by nature refers to the highest grade used, in the 2018 Environmental Statement, to show the degree to which tenders incorporate sustainability. The five grades are, from the lowest to the highest: "not green", "light green", "green", "very green" and "green by nature". The 2018 Environmental Statement refers to the scale recommended in the Annex to the European Court of Auditors Special Report 14.

[64] In the EMAS annual action plan there are actions that target reducing energy consumption (and are categorised as such), but they also reduced GHG emissions. theyThey are therefore allocated instead to reducing resource consumption, as GHG reduction is a secondary benefit.

[65] Based on the emission factors provided by the Base Carbon (from Association Bilan Carbone): 513kgCO2/unit for desktop computers, and 156 kgCO2/unit for laptops.

No.	Category of emissions	Description of the measure	Type	Measured reduction (%)
Organisational				
10	S3.4. Business travel	Mission under 400 km, train is first option	Internal policy	When high-speed train is used instead of charter flights, 95% of GHG emissions are avoided per trip. This leads to a total of 2% avoided in 2018
11	S3.4. Business travel	Mission trip under 6 hours, only economy class	Internal policy	50% per short-haul flight
12	S3.6. Waste generated in operations	EMAS Action Plan 2019: Reduction of single-plastic use with 49 actions across the 8 EMAS sites	Internal policy	Not yet evaluated. First year of evaluation in 2018
13	S3.6. Waste generated in operations	EMAS Action Plan 2019: 74 actions linked to the reduction and management of waste	Internal policy	Not yet evaluated. First year of evaluation in 2018
14	S3.6. Waste generated in operations	Adoption of the circular economy package to reduce waste generation	Internal policy	75% of recycling packaging waste and a reduction of 10% of landfill. Furthermore, 1 tonne of plastic recycled to avoid 67% of emissions compared to 1 tonne of plastic incinerated
15	S3.6. Waste generated in operations	Communication on Waste Reduction Campaign: Less Waste More Action	Communication	Not applicable
Brussels				
16	S1 & 2 – Energy	Office closure during winter holidays to optimise the heated area: 65% of occupied area (or m²) were closed	Internal policy	Not yet evaluated
17	S1. 2. Own fleet	Increased the number of charging points to 13, with further installations ongoing	Investment	Not applicable
18	S2. 1. Electricity	Computer automatic shutdown after a certain hour (20h). This shutdown procedure (after closing office hours) is not currently running on laptops.	Internal policy	Not evaluated
19	S2. 1. Electricity	Measurement of device power consumption	Investment	Not evaluated
20	S2. 1. Electricity	Green electricity contracted	Internal policy	Electricity emissions reduction of 97%. Global reduction of 15% on Brussels' CFP
21	S3. 5. Employee commuting	Pool of bicycles available: 300 regular and 35 electric bicycles to use between the Brussels sites	Investment	Not evaluated
22	S3. 5. Employee commuting	50% reimbursement of public transportation tickets if the staff member gives up parking access.	Internal policy	Not evaluated

No.	Category of emissions	Description of the measure	Type	Measured reduction (%)
Brussels (continued)				
23	S3. 5. Employee commuting	Free public transport ticket provided for professional meetings in Brussels or Brussels surroundings	Internal policy	Not evaluated
24	S3. 5. Employee commuting	Campaign to promote active mobility: Safe cycling 3-hour training; bicycle project campaign (try it before buying it); Velo Mai; Green week; Multimodal visits	Communication	Not evaluated
25	S3.1 Purchased goods and services	EMAS coordinator appointed by the contractors for: catering services (for the future catering contract starting in 2021), building maintenance services, cleaning services	Capacity building	Not applicable
26	S3.1 Purchased goods and services	Reduction of delivery frequencies of supplies and furniture from the warehouse (1/day – 1/week)	Internal policy	Not evaluated
27	S3.1 Purchased goods and services	Small office supplies: reduction of items available in the catalogue with at least 50% "Ecolabel" certified	Internal policy	Not applicable
28	S3.1 Purchased goods and services	Paper supplies: 80 g/m² replaced by 75g/m² office paper	Internal policy	6%
29	S3.4. Business travel	Web streaming of conferences, to reduce participant travel	Communication	Not evaluated
30	S3.6. Waste generated in operations	European Commission try to phase out plastic in catering offer	Internal policy	Not evaluated
31	S3.6. Waste generated in operations	Work with a social enterprise to reuse or to upcycle furniture	Internal policy	Not applicable
32	S3.6. Waste generated in operations	Contract with NGO for waste removal and recycling for humanitarian purposes. DIGIT aims to reuse on average at least 70% of units collected	Internal policy	Not applicable
33	S3.6. Waste generated in operations	Printing measures implementation: Reduction of the number of personal printers Introduction of printing upon authentication Black and white and double-sided printing by default	Behaviour	Reduction of paper expenses in Brussels by 24% since 2015
Luxembourg				
34	S1 & 2 – Energy	Newly-owned highly-efficient building construction JMO2 (2023-2024)	Investment	Planned but not yet implemented. It will replace the old JMO (1975) and most of the rented office buildings (DRB, HTC, BECH, ARIANE, LACC and T2)
35	S1. 1. Buildings fuel consumption for heating	Biomass boiler in CPE5 (No replicable for other buildings)	Investment	41%

No.	Category of emissions	Description of the measure	Type	Measured reduction (%)
Luxembourg (continued)				
36	S2. 1. Electricity	Green electricity contracted	Internal policy	Electricity emissions reduction of 100%. Global reduction of 27% on Luxembourg's CFP
37	S3. 5. Employee commuting	Subsidised public transport card and pass (public transport will be free in 2020)	Internal policy	Not yet monitored
Ispra				
38	S1 & 2 – Energy	Tri-generation plant	Investment	Not applicable, as implemented in 2004
39	S1 & 2 – Energy	Implementation of an automatic energy management system to monitor energy consumption of single buildings	Investment	Not evaluated
40	S1. 2. Own fleet	Increase in the number of electric vehicles from 3 to 36 (2014-2018)	Investment	8%
41	S2. 1. Electricity	PV installation	Investment	11%
42	S3. 5. Employee commuting	Free bus service for home-working commuting	Investment	Not evaluated
43	S3. 5. Employee commuting	Shuttle to airport and train station	Investment	Not evaluated
44	S3. 5. Employee commuting	Management of 127 service bicycles, a service bicycle repair shop and many bicycle fostering events	Capacity building	Not evaluated
45	S3.6. Waste generated in operations	"Kill plastic" campaign	Communication	Not evaluated
46	S3.6. Waste generated in operations	Reuse or upcycle furniture	Capacity building	94% of furniture was reused in 2018 and 78% in the last 4 years
47	S3.6. Waste generated in operations	Contract with NGO for waste removal and recycling for humanitarian purposes.	Internal policy	Not evaluated
Geel				
48	S1. 1. Buildings fuel consumption	Insulation of Building 060 in 2016	Investment	Not evaluated
49	S1. 1. Buildings fuel consumption for heating	District heating supplied from geothermal origin	Investment	Reduction of 50% on emissions of gas consumption
50	S1. 1. Buildings fuel consumption for heating	Improvement of control of technical installations (pumps, valves, boilers, etc.) by the Building Management System	Investment	Not evaluated
51	S1. 2. Own fleet	Currently 3 electric vehicles (for security services, and on-site delivery of goods)	Investment	Not yet evaluated. First year of evaluation in 2018
52	S2. 1. Electricity	Green electricity contract	Internal policy	Electricity emissions reduction of 94%. Global reduction of 54% on Geel's CFP

No.	Category of emissions	Description of the measure	Type	Measured reduction (%)
Geel (continued)				
53	S2. 1. Electricity	Replacement of existing lighting with LED lighting	Investment	Consumption of lighting can be reduced by up to 85% when halogen lighting replaced by LED
54	S3. 5. Employee commuting	bicycle promotion: Velo Mai during May	Communication	Not evaluated
Grange				
55	S3. 5. Employee commuting	Bus from the city centre of Dublin to site	Investment	Not evaluated
Karlsruhe				
56	S2. 1. Electricity	Replacement of existing lighting with LED lighting	Investment	Not evaluated
57	S3. 5. Employee commuting	Velo Mai mobility challenge and car-sharing inter-institutional portal	Communication	Not evaluated
58	S3. 5. Employee commuting	Free tickets for public transport	Internal policy	Not evaluated
Petten				
59	S2. 1. Electricity	Photovoltaic installation produced 217 MWh in 2018	Investment	In 2018, solar panels produced 217 MWh, equivalent to 7,5% of the electrical energy used
60	S2. 1. Electricity	Purchase of Green electricity in 2018	Internal policy	Electricity emissions reduction of 100%. Global reduction of 49% on Petten's CFP
Seville				
61	S1 & 2 – Energy	New building construction: exact timeline and definition of environmental criteria still to be defined	Investment	Not applicable
62	S1. 1. Buildings fuel consumption for heating	Two boilers changed in 2018	Investment	Not yet evaluated
63	S3. 5. Employee commuting	Velo Mai mobility challenge	Communication	Not evaluated

The EMAS Action Plan (the EMAS Global Annual Action Plan) is one of the key measures identified. It contains 500 actions[66] (already implemented or being implemented) across all sites and seeks to improve the Commission's environmental performance on various topics. Energy use and GHG emissions are part of it, but other topics are also addressed, such as water use, other air pollutants and biodiversity.

The efforts made and the progress achieved so far, especially in terms of energy efficiency and renewable energy, are remarkable. However, they do not appear to be enough, given the severity of the climate crisis and the commitment to reach climate neutrality by 2030. The following chapters will provide inspiration and information to support a higher level of ambition.

66 Some actions are already included in Table (below)Table 1.27.

3. MONITORING SYSTEM

This chapter provides a description and analysis of the current monitoring system of the European Commission. It assesses whether an alternative or additional GHG monitoring system is needed, in light of the Commission's new ambition to become climate neutral by 2030. Finally, it provides guidance for a new GHG monitoring system to better track and report on the Commission's progress according to an established scenario, which is presented in Chapter 4.

This chapter corresponds to sub-task 1.3 of the terms of reference.

3.1 Description and assessment of the current monitoring system

3.1.1 Description of the current monitoring system and tool

The EMAS coordination team, based in Brussels at DG HR D2, coordinates the data collection. For that purpose, every year, it prepares the data collection template for the annual environmental reporting exercise for all environmental parameters and sends it to all the EMAS site coordinators.

The coordination team proposes emission factors that the site coordinators should use, and incorporates updates based on external consultants' advice. Although for uniformity of approach (and simplicity) the site coordinators are strongly recommended to use factors provided, they may – should it be deemed necessary, in occasional and specific circumstances – use another factor, as long as it is clearly justified and documented (reporting at site level is the responsibility of EMAS site coordinators, and EMAS site coordination sets the guidelines).

In relation to emissions from the electricity grid, site coordinators report the factors relating to their specific contract, and the EMAS coordination also supplies the national electricity grid emission factors for comparison.

To support this process, the coordination team also manages and maintains the Excel tool:

A. Factors

One sheet of the file is dedicated to factors, and is updated as described above, each year, to take into account any changes. The "Factor" sheet gives an overview, year by year, of the recommended emission and conversion factors. HR D2 communicates these factors to EMAS site coordinators. The "Factors" sheet also reads directly from the individual data reporting sheet for each of the eight sites, indicating the values of emission and conversion factors used in order to trace whether recommended values have been adopted.

B. Site reporting

- *Template for each site*. Each site receives a data template (files BX, LX, PE, GE, SE, KA, IS, GR respectively), and these are almost identical in structure (containing the same rows and cells). These sheets contain the following lines (types) of input, and can be filtered accordingly:
    - Input factors: emission factors or conversion factors;
    - Input data: activity data (kWh of energy consumed, litres of diesel consumed, etc.), general parameters (number of staff, total area, etc.) and other specific parameters (% of electricity from renewable sources, fleet efficiency, etc.);
    - Auto-data and auto-data (%): automatic calculations of indicators and parameters, and their evolutions compared to previous years (such as kWh/m2, kWh/person);

- Objective and objective (%): indication of the different 2020 EMAS objectives, and their respective % of completion.

- *Annex sheet for each site*. The data sheets for each site (BX, LX, etc.) generate graphics and tables, and report output in a second sheet (Annex A BX, Annex B LX, etc.). These sheets only read data from the data sheets and serve as a "canvas" for making the figures and tables that are included in each site's environmental report. There are eight of these, and each one is an annex to the Environmental Statement. The sheets should not contain any new data, they should only reference data contained in the site templates (BX, LX, etc.).

C. Commission-level reporting

While the eight site annexes to the environmental statement make up most of the environmental statement by volume with most data from the EMAS sites, the site-level information is aggregated into two sheets in the excel file which provide the graphics for Chapters 1 and 2 of the Environmental Statement, collectively known as the Corporate Summary.

Chapter 2 deals with aggregating the data for the sites, and most of the lines of data on this sheet serve to calculate weighted data averages (Commission values) that are linked directly to the site data templates. This sheet should generally not reference data that are not contained in the individual site data templates.

3.1.2 Assessment of the current monitoring system and options for future improvement

Based on a critical assessment of the current monitoring system, possible improvements have been identified.

Currently, all of the sheets of the monitoring tool are used as working sheets; the first suggestion is to centralise and simplify the data collection (see 1. Centralised data collection). Secondly, a list of possible corrections of the current calculation, in a site by site basis, is proposed (see 2. List of proposed corrections to the initial 2018 carbon footprint). Finally, recommendations are formulated to include new parameters to monitor, to ensure more robust monitoring on any future measures to be implemented.

These recommendations are further detailed below.

3) *Centralised data collection*

"Factors" sheet:

Current practice: HR D2 recommends annually what factors the site coordinators should use as listed in the factor's sheet.

Proposition: HR D2 should create a direct link from the factors sheet to all the site datasheets, so that the recommended values become the default values in the site data sheets (BX, LX, etc.). By doing this, site coordinators would have to change the value to override the default. This will be easier when there is a single point of access and a single mastersheet that everyone can access and update.

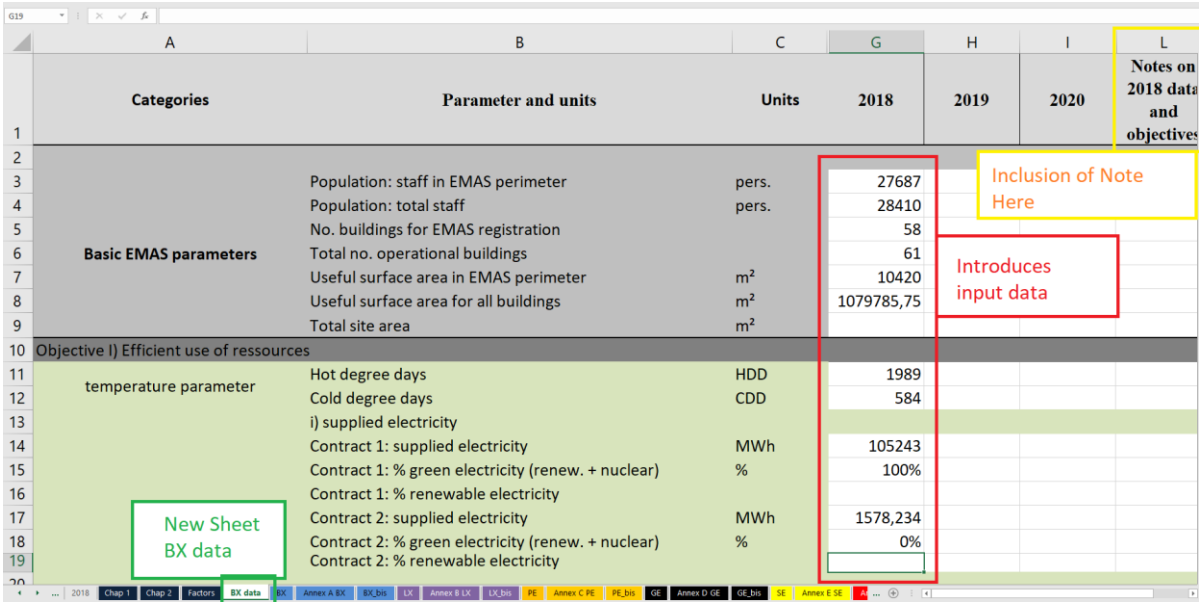
Example: In the "Factors" sheet, the emission factor for "1 kWh of electricity (national average) – combustion" for Brussels is taken from the "BX" sheet (data related to Brussels site). The case Q94 in the "Factors" sheet is "=BX!Q231". This case should be "=0,172", and case Q231 should be "=Factors!Q94".

Data collection sheet of reference per site:

Currently, the data and results of each site are reported in a data sheet where all auto-data are calculated and where emissions factors are already included. All graphics and tables are included in another file (Annex "Site"). The suggestion is to add a new sheet per site, e.g. "data BX" solely for data collected in Brussels, where the data collector will input all the raw activity data (kWh of electricity consumed, litres of diesel consumed by the fleet, etc.). This sheet will be the reference sheet. The analyses, graphics and tables will still be done in the annex sheet (i.e. Annex A BX).

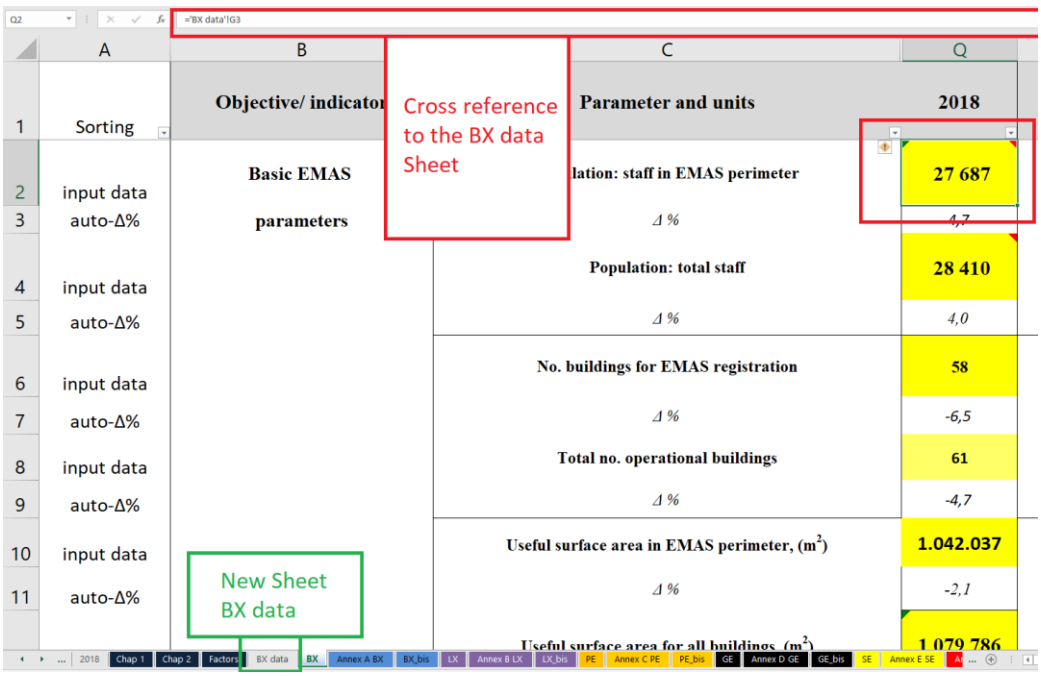
The site sheet, i.e. "BX" for the Brussels site, containing the analysis (tables, graphs) used for the Annex of the Environmental Statement, will only refer to the data sheet "data BX", and new data will never be added into the site sheet (i.e. "BX"). See the two figures below. This enables a better understanding of which data need to be collected.

Figure 3.1 Example of the data collection sheet "BX data"



	A	B	C	G	H	I	L
1	**Categories**	**Parameter and units**	**Units**	**2018**	**2019**	**2020**	**Notes on 2018 data and objectives**
2							
3		Population: staff in EMAS perimeter	pers.	27687			
4		Population: total staff	pers.	28410			
5		No. buildings for EMAS registration		58			
6	**Basic EMAS parameters**	Total no. operational buildings		61			
7		Useful surface area in EMAS perimeter	m²	10420			
8		Useful surface area for all buildings	m²	1079785,75			
9		Total site area	m²				
10	Objective I) Efficient use of ressources						
11	temperature parameter	Hot degree days	HDD	1989			
12		Cold degree days	CDD	584			
13		i) supplied electricity					
14		Contract 1: supplied electricity	MWh	105243			
15		Contract 1: % green electricity (renew. + nuclear)	%	100%			
16		Contract 1: % renewable electricity					
17		Contract 2: supplied electricity	MWh	1578,234			
18		Contract 2: % green electricity (renew. + nuclear)	%	0%			
19		Contract 2: % renewable electricity					

Figure 3.2 Example of the site sheet "BX"



2) List of proposed corrections to the initial 2018 carbon footprint

During the analysis of the 2018 results of the Environmental Statement and the MasterdataES2019 Excel file, some errors or misunderstandings were identified, many of which had already been noted under the EMAS internal audit procedure, and which have or will be addressed. The analysis was focused only on data related to GHG emissions and concerns the following matters (see detail in Appendix 3 – Proposed corrections to the initial 2018 carbon footprint):

- General comments on the reporting
- General clarifications related to the treatment of electricity (Scope 2)
- Proposition of the modification of some emission factors
- Corporate carbon footprint modifications
- Site by site carbon footprint modifications

While working on one master Excel spreadsheet comprising separate elements for each site provides a flexible approach, considerable care is required at all times to ensure that the latest versions of all site and corporate data are referenced. The Commission should consider developing a more robust tool or database which can be accessed from all site locations and which would reduce the need to send and incorporate new files, such as Sharepoint.

3) Improvement on existing categories in the current master file

With the objective for the current GHG monitoring tool to capture in a more precise way the improvements proposed to implement a GHG neutral Commission strategy, we would recommend the additional following improvements:

- **Business travel of staff (including staff located in the delegations and representations in Member States)**: as this is the second-highest source of emissions at the European Commission, we would recommend monitoring the related GHG emissions in the Excel-based monitoring tool in a more precise way. Currently, only two parameters are inputted, site by site:

- The total emissions provided by GBT;
- The coverage (%) of the flights covered by GBT's data.

In a first step, we would recommend reporting the following information, based on the GBT data:

- Total distance (km) by flight:
  - short haul (<2.500 km) in economy class
  - short haul (<2.500 km) in business class
  - long haul (>2.500 km) in business class
  - long haul (>2.500 km) in economy class
- Total distance (km) by train: if possible, by type of train (Thalys, Eurostar, etc.).

This will enable monitoring and annual reporting on the evolution of the distances travelled by aeroplane and by train. Another potential parameter would be **the evolution of the number of videoconferences**, in order to analyse the correlation between the total distance travelled and the use of videoconference facilities. JRC Seville already monitors this, along with the number of missions.

In a second step, future developments in the **MIPS platform** can be considered. As the mission guide will be updated by 2022, an upgrade of MIPS will be needed. This represents an opportunity to include a module that directly calculates distances and GHG emissions, through an API,[67] in order to directly provide:

- the GHG emissions for 100% of the flights of staff and experts;
- the GHG emissions of the different travel options available to the mission performer to help them decide which travel to book.

- **Staff commuting:** as this represents 5.3% of the total proposed carbon footprint, it is recommended to monitor it in a more precise way, to detect any increase in the use of active mobility, days of teleworking, use of public transport, car sharing etc. We therefore recommend to report the following information, based on the mobility survey:

Table 3.1 Data needed regarding staff commuting

Mean of transportation	Unit
Diesel vehicles	person.km
Gasoline vehicles	person.km
Hybrid vehicles	person.km
Electric vehicles	person.km
Non-specified vehicles	person.km
Motorbikes	person.km
Train	person.km
Bus	person.km
Metro	person.km
Tramway	person.km
Foot	person.km
Bicycle	person.km
Electric bicycle and electric stand-up scooter	Person.km
Carpooling diesel	person.km
Carpooling gasoline	person.km
Carpooling hybrid	person.km

[67] For example, by including an API from the platforms www.greentripper.org or www.atmosfair.de.

Mean of transportation	Unit
Carpooling non-specified	person.km

This information is already available in the mobility survey for Brussels. In 2020, Luxembourg will launch its first mobility survey, based on the survey conducted in Brussels. Therefore, this information will be readily available from 2020, and can easily be inputted to the GHG monitoring tool. However, it is recommended to also add an option in the mobility survey to indicate multimodal commuting to work, by adding a question for a secondary mode of transportation.

3.1.3 New categories to be created in the current calculation and reported in the master file

As described in Chapter 2, important new GHG emissions categories are proposed to be included in the annual carbon footprint calculation, which will feed the master data file managed by the EMAS team:

- **Conferences and other events organised by the European Commission and registered in the Events Database**: in order to collect the necessary data to calculate the related carbon footprint, a few questions should be added to the visitor registration portal of the event:
    i. City of departure
    ii. City of destination (or location of the event)
    iii. Means of transportation (aeroplane, train, bus, car, public transport)
    iv. Class (Economy/Business)

The calculation of the emissions can be carried out directly in the portal, and the possibility to offset could also be integrated. Information regarding the number of participants attending the event by video conference can also be recorded.

- **Meetings of Member States experts, "Committees"**: through AGM (the reimbursement platform managed by PMO.5), most of the necessary information is already included:
    i. Departure city
    ii. Place of the committee: the venue is indicated, but the city should be clearly mentioned
    iii. Means of transportation (aeroplane, train, bus, car, public transport)
    iv. Class (Economy/Business)
    ⇨ A module to calculate train and car distances (macro to link the platform with Google Maps) and an API to calculate the air distance between two airports should be integrated. The GHG emissions calculation can be easily added based on this information.

- **Meetings for the evaluation of research proposals, in the framework of European programmes (such as Horizon 2020):** in the reimbursement file application (EMI), the following information can be included:
    i. Departure city
    ii. City of the evaluation process (mostly Brussels and Luxembourg)
    iii. Means of transportation (aeroplane, train, bus, car, public transport)
    iv. Class (Economy/Business)

⇨ As explained above under "Meetings of Member States experts", a module and an API can be implemented to calculate travel distances. This information should be collected by the Executive Agencies in charge of the administrative and logistical support to the organisation of these programmes (such as REA and EASME).

3.2 New tool to monitor/track progress against the GHG emissions reduction target

3.2.1 High-level principles

The purpose of this proposed monitoring tool would be to track progress against performance targets. Indeed, once a particular pathway is decided, a very close monitoring (at least annual) will be needed in order to prevent the European Commission from any deviation from the pathway.

The monitoring tool should therefore enable measurement of the performance of the different implemented measures, by calculating key performance indicators (KPIs) that need to be formulated in order to appraise the impact of the measures (kWh/m², m²/staff, share of car use for home-work commuting, etc.). An important early step would be to expand the existing indicators in order to cover the entire carbon footprint.

The monitoring tool needs to offer enough granularity to provide clear and precise indications to analyze performance and, if necessary, to correct the trajectory. The monitoring tool should provide different levels of granularity:

- "Sector of emissions" level: buildings (embodied carbon and energy consumption), mobility (staff missions, commuting, events and committees, etc.), and others (purchased goods and services, IT material, etc.);
- "Site" level: to foster more initiatives and independence the monitoring tool should offer a view on the progress for each site individually, and inform on the different actions to be undertaken at site level;
- "DG or Unit" level: for different GHG emissions categories, the monitoring tool will enable the actions to be undertaken at DG, Executive Agency or Unit level (missions, events and conferences, etc.).

The monitoring tool should be built up and fed by existing tools (EMAS' master data file, MIPS for staff missions, AGM reimbursement file for Committees).

The monitoring tool should also be easy to understand, use and communicate. It should give a clear indication of where the Commission stands on each sector of emissions, and how to correct the trajectory by identifying measures that should be further implemented or lag behind the established planning.

Furthermore, it should allow monitoring of the investments made to achieve the GHG emissions reductions so that the figures can be checked against the estimated costs and savings.

Finally, this tool should make climate performance easily accessible at different levels of management (DG, Directorate, Unit), as part of general resources management at all levels.

3.2.2 Recommendations on the architecture of the tool

In accordance with the above-mentioned principles, it is proposed to develop, as part of the measure AD6.5 of the action plan, a monitoring tool in Excel with an architecture that can fulfill the different functions.

The architecture of this tool is inspired by different existing tools that have been developed by recognised organisations to monitor GHG emission reduction action plans such as:

- Action Plan tool from the Association Bilan Carbone (ABC) at organisational level, developed to help organisations follow their GHG emissions reduction action plans;
- GHG monitoring tool developed by the Walloon Region for the monitoring of the Local Climate Action Plan at city level, in the framework of the Covenant of the Mayors;
- Corporate GHG calculator of the Walloon Climate and Air Agency, developed to help organisations calculate and reduce their carbon footprint.

Three different inter-related modules are proposed:

a. **Overview/results module**: Overview tables directly fed by the master data file from the EMAS Unit, summarising the results per site of the reported year against the decided pathway. Two different levels of aggregation in the tables are proposed:
   i. Source of emissions level;
   ii. "Sector" level (aggregation of sources of emissions per high-level category: buildings, mobility and others).

   This module should clearly highlight the status of the different sources of emissions or sectors which are i. ahead of schedule (in green), ii. On track (yellow) or iii. Lag behind (red). The following figures illustrate an example of actual versus theoretical results for 2022.

Figure 3.3. Overview/results module with the status of each source of emissions (ahead of schedule – green; on track – yellow; lagging behind – red)[68]

		Reported emission (tCO2e) for the following year	emissions target (tCO2e) for the reported year	Baseline emissions	emissions target for 2030	Variation (%) with current emission		Target	
		2022	2022	2018	2030	Reported vs target emissions of	2018 vs 2022 reported emissions	2018 vs 2022	2018 vs 2030
S1.1	Scope 1; Fuel for bldgs	14.060	14.060	14.060	2.671	0%	0%	0%	-81%
S1.2	Scope 1; Commission vehicle fleet	499	499	499	499	0%	0%	0%	0%
S1.3	Scope 1; Refrigerant leaks	800	820	820	475	-3%	-2%	0%	-42%
S2.1	Scope 2; External electricity supply	450	434	434	-	4%	4%	0%	-100%
S2.2	Scope 2; District heating		-	-	144	0%	0%	0%	0%
S3.1	Scope 3; Service and supply contracts	7.800	6.768	6.768	3.907	13%	15%	0%	-42%
S3.1.1	Scope 3; Service and supply contracts - Contra	4.500	3.296	3.296	2.307	27%	37%	0%	-30%
S3.1.2	Scope 3; Service and supply contracts - Paper	800	776	776	543	3%	3%	0%	-30%
S3.1.3	Scope 3; Service and supply contracts - Food	2.500	2.695	2.695	1.056	-8%	-7%	0%	-61%
S3.2.1	Scope 3; Fixed assets - buildings	30.000	28.466	28.466	21.568	5%	5%	0%	-24%
S3.2.2	Scope 3; Fixed assets - IT	9.000	8.345	8.345	5.232	7%	8%	0%	-37%
S3.3.1	Scope 3; Fuel for bldgs	3.250	3.121	3.121	984	4%	4%	0%	-68%
S3.3.2	Scope 3; Commission vehicle fleet	100	127	127	127	-27%	-21%	0%	0%
S3.3.3	Scope 3; External electricity supply	40	43	43	-	-9%	-8%	0%	-100%
S3.4.1	Scope 3; Business travel: air	38.700	38.793	38.793	15.711	0%	0%	0%	-60%
S3.4.2	Scope 3; Business travel: rail	750	764	764	497	-2%	-2%	0%	-35%
S3.5	Scope 3; Commuting	11.560	11.565	11.565	6.869	0%	0%	0%	-41%
S3.6	Scope 3; Own waste	1.400	1.391	1.391	979	1%	1%	0%	-30%
S3.7	Scope 3; Delegation travel	5.400	5.281	5.281	5.149	2%	2%	0%	-2%
S3.8	Scope 3; Visitors travel	15.833	15.834	15.834	7.917	0%	0%	0%	-50%
	total	139.642	136.312	136.312	72.730				

Mobility	**72.842**	**72.864**	**72.864**	**36.769**	0%	0%	0%	-50%
Staff commuting	11.560	11.565	11.565	6.869	0%	0%	0%	-41%
Missions (excluding air)	38.700	38.793	38.793	15.711	0%	0%	0%	-60%
Missions (air, RFI 2)	750	764	764	497	-2%	-2%	0%	-35%
Vehicle fleet - fuel consumption	599	626	626	626	-4%	-4%	0%	0%
Delegation and Visitor travel	21.233	21.115	21.115	13.066	1%	1%	0%	-38%
Buildings	**48.600**	**46.945**	**46.945**	**25.842**	3%	4%	0%	-45%
Buildings - coolant losses	800	820	820	475	-3%	-2%	0%	-42%
Buildings - Energy	17.800	17.658	17.658	3.799	1%	1%	0%	-78%
Fixed assets - buildings	30.000	28.466	28.466	21.568	5%	5%	0%	-24%
Other	**18.200**	**16.504**	**16.504**	**10.119**	9%	10%	0%	-39%
Fixed assets - IT	9.000	8.345	8.345	5.232	7%	8%	0%	-37%
Goods and service contracts	7.800	6.768	6.768	3.907	13%	15%	0%	-42%
Own waste	1.400	1.391	1.391	979	1%	1%	0%	-30%
Total	**139.642**	**136.312**	**136.312**	**72.730**				

[68] The numbers for 2018 correspond to the adjusted carbon footprint of Brussels only, where delegations' travels and visitors' travels have been added, for illustration purpose only.

b. **KPI Module**: In order to ease understanding of where differences are for each emissions category or sector, a KPI table will need to be developed, adopted and filled in. The granularity will depend on the indicator:
    i. Buildings (embodied carbon and energy consumption): site level
    ii. Mobility:
        1. Staff home-work commuting: site level
        2. Staff missions: DG level
        3. Meetings and conferences: hybrid
    iii. Other categories (food, IT, etc.): site level

    The theoretical KPIs for the pathway of the year of reporting will be automatically reported.

Figure 3.4 KPI Module

Indicator		Value of reference (2018)	Current (year of repporting)		Target (2030)	Sources/data owner
denomination	Unit		Current Value	Pathway Value		
Energy consumption for heating per surface unit	kWh(fuel)/m²	72	1	5	Need to be established (NBE)	Already calculated in Master data / EMAS
Energy consumption for heating per staff	kWh(fuel)/FTE	2 746		NBE	NBE	Already calculated in Master data / EMAS
Energy consumption for electricity per surface unit	kWh(elec.)/m²	99		NBE	NBE	Already calculated in Master data / EMAS
Energy consumption for electricity per staff	kWh(elect.)/FTE	3 760		NBE	NBE	Already calculated in Master data / EMAS
Refrigerant leaks	kg	495		NBE	NBE	Already calculated in Master data / EMAS
Office area	m²(office)			NBE	NBE	OIB/OIL/EMAS coordinator at JRC
Office area per staff	m²(office)/FTE	36		NBE	24	OIB/OIL/EMAS coordinator at JRC
Number of Video-conference facilities	VC	906		NBE	2 439	Already calculated in Master data / EMAS
Number of staff per Video-conference facilities	FTE/VC	31		NBE	12	Already calculated in Master data / EMAS
Proportion of low embodied carbon in buildings structure (rented or owned buildings)	% low embodied carbo	0		NBE	NBE	OIB/OIL/EMAS coordinator at JRC
On-site production of electricity from renewable energy	%ren. elec. prod.	0		NBE	100%	Already calculated in Master data / EMAS
Consumption of electricity from renewable energy	%ren. elec. Cons.			NBE	NBE	OIB/OIL/EMAS coordinator at JRC
On-site production of renewable energy for heating	%ren. heat. prod.			NBE	NBE	OIB/OIL/EMAS coordinator at JRC
Consumption of new fuel sources for heating	%ren. fuel. Cons.			NBE	NBE	OIB/OIL/EMAS coordinator at JRC
Percentage of surface where energy use is monitored	% m² monitored			NBE	NBE	OIB/OIL/EMAS coordinator at JRC
Number of day closed during holiday periods	Day closed			NBE	NBE	OIB/OIL/EMAS coordinator at JRC/DG HR
Percentage of surface closed during holiday periods	% closed office surface			NBE	NBE	OIB/OIL/EMAS coordinator at JRC/DG HR
Share of car commuter (main transport mode)	%car			NBE	NBE	OIB/OIL/EMAS coordinator at JRC/DG HR
Share of non-thermic transport mode excluding public transport and electric car	%soft mobility			NBE	NBE	OIB/OIL/EMAS coordinator at JRC/DG HR
Share of public transport users in commuting	%public transport			NBE	NBE	OIB/OIL/EMAS coordinator at JRC/DG HR
Share of carpooling commuter	%carpooling			NBE	NBE	OIB/OIL/EMAS coordinator at JRC/DG HR
Number of available bicycle for employees	bicycles			NBE	NBE	OIB/OIL/EMAS coordinator at JRC/DG HR
Quantity of bike trips on commission bikes	trips	20 013		NBE	NBE	Already in Master data / EMAS
Number of missions by flight per employee	#flight missions/FTE	Need to be collected (NBC)		NBE	NBE	MIPS/PMO
% of missions made by plane	% mission plane	NBC		NBE	NBE	MIPS/PMO
% of missions made by train	% mission train	NBC		NBE	NBE	MIPS/PMO
Number of missions under 500 km travelled by plane	# flight<500 km	NBC		NBE	NBE	MIPS/PMO
Average of teleworking days per week	days/week	NBC		NBE	NBE	DG HR
Number of electric car charger	-	NBC		NBE	NBE	OIB/OIL/EMAS coordinator at JRC
Number of electric bicycle charger	-	NBC		NBE	NBE	OIB/OIL/EMAS coordinator at JRC
Share of economy class flights of missions travel by airplane	%economy class	NBC		NBE	NBE	MIPS/PMO
Share of virtual participants to event organised by the European Commission	%virtual participants	NBC		NBE	NBE	DG SCIC/PMO/SEC GEN
Share of EU funded project evaluation made remotely	% evalution made remotely	NBC		NBE	NBE	DG RTD/REA/EASME
Quantity of waste	tonnes	5 269		NBE	NBE	Already in Master data / EMAS
Quantity of food waste	tonnes	213		NBE	NBE	Already in Master data / EMAS
Quantity of domestic waste	tonnes	2 351		NBE	NBE	Already in Master data / EMAS
Share of recycling or reusing	tonnes	0		NBE	NBE	Already in Master data / EMAS
Share of low carbon menus proposed	low carbon menu/week	20%		NBE	80%	Already in Master data / EMAS
Quantity of printer and scanners per Staff	printers and scanners/FTE	8 162		NBE	NBE	Already in Master data / EMAS
Quantity of desktop	desktop	14 847		NBE	1 485	Already in Master data / EMAS
Share of Green Public Procurment (GPP) contract	%GPP			NBE	1	
Lifecycle of IT devices	year	4		NBE	5	Already in Master data / EMAS
Paper and cardboard recycling	tonnes	2 072		NBE	NBE	Already in Master data / EMAS
share of recycling	tonnes	144		NBE	NBE	Already in Master data / EMAS
IT devices recycling	tonnes or #devices			NBE	NBE	DG DIGIT
internet data consumption	MB/year	1		NBE	1	Already in Master data / EMAS
use of cloud computing (%)	% cloud computing			NBE	1	DG DIGIT

This table contains some indicators that are already collected by EMAS during the annual reporting of the Commission's performance (FTE, m2, % renewable energy, quantities of waste, etc.). But there are a few additional KPIs that will need to be calculated.

We suggest that the data be collected by the EMAS coordination team from the different data owner during the annual carbon footprint calculation. The different data owners are indicated in Figure 3.4 next to the KPI (OIB, DIGIT, DG SCIC, etc.). These annual calculated KPIs should be assessed against the theoretical KPIs that need to be derived from each scenario, as part of measure 6.5.

On a yearly basis, this table illustrates (through colour coding) the emissions categories in which the European Commission lags behind, according to the established pathway:

- Green: ahead of schedule;
- Orange: on track or small deviation from the pathway (the % of deviation is yet to be determined);
- Red: lagging behind the pathway. The reasons should be further investigated through the next module.

c. **Link between KPIs and measures**: for the "red code" KPIs, the tool will help to identify measures that would assist in correcting the trajectory. Therefore, a third tab links the measures to the KPIs they have an impact on.

Figure 3.5 Link between KPIs and measures

		Energy consumption for heating per surface unit	Energy consumption for heating per staff	Energy consumption for electricity per surface unit	Energy consumption for electricity per staff	Refrigerant leaks	Office area	Office area per staff	Number of Video-conference facilities	Number of staff per Video-conference facilities
		kWh(fuel)/m²	kWh(fuel)/FTE	kWh(elec.)/m²	kWh(elect.)/FTE	kg	m²(office)	m²(office)/FTE	VC	FTE/VC
1.1	Redesign the current existing building surface to reduce the average surface, reduce the number of buildings and relocate staff in existing buildings	x	x	x	x		x	x		
1.2	Improve meeting rooms occupancy			x	x					
1.3	Use low carbon materials for new construction work in existing and future buildings									
1.4	Use bioclimatic principles on existing buildings (trees, green roof)					x				
1.5	Relocate staff to new green and sustainable buildings	x	x	x	x	x	x	x		
2.1	Close office zones during holiday periods									
2.2	Optimise the regulation of systems (ventilation / temperature / light) with BMS systems	x	x			x				
2.3	Improve building insulation and passive protection	x	x	x	x	x				
2.4	Set up communication campaigns on the use of energy									
2.5	Conduct internal buildings energy audits and yearly monitoring									
2.6	Optimise the energy performance and size of energy systems at replacement time	x	x	x	x	x				
2.7	Install on-site renewable energy production capacity (geothermal, thermal solar)									
2.8	Install on-site renewable energy production capacity (photovoltaics) (this measure overlaps with green electricity)									
2.9	Use cloud computing services to reduce data server consumption									
2.10	Use new fuel sources in existing systems (synthetic fuels/sustainable biogas)									
2.11	Purchase green electricity for all Commission's sites (considering Power Purchase Agreement)									
2.12	Replace gas & diesel boilers with heat pumps	x	x	x	x					
3.1	Implement new or improved videoconference facilities and develop remote event attendance for staff								x	x

Hence, if the European Commission is not on track to meet the established pathway (scenario), it will be able to quickly understand why it is lagging behind and react accordingly, taking appropriate corrective actions. This tab will also indicate, via the status of each indicator, which measures need to be pushed further, and which ones are on track. The final aim is to identify the different reasons for the red code, which could fall into one of these possibilities:

a. The measure has not been implemented yet: understand why it has not been implemented, and check the current status of the measure (delay in the preparatory period, lack of budget, etc.);
b. The measure has been implemented, but with a lower implementation rate than indicated in the planning: understand the reasons why, among others:
    I. Technical difficulties, in the case of more technical measures (such as *AD1 Design sustainable buildings and working spaces* and *AD2 Optimise energy consumption and systems*);

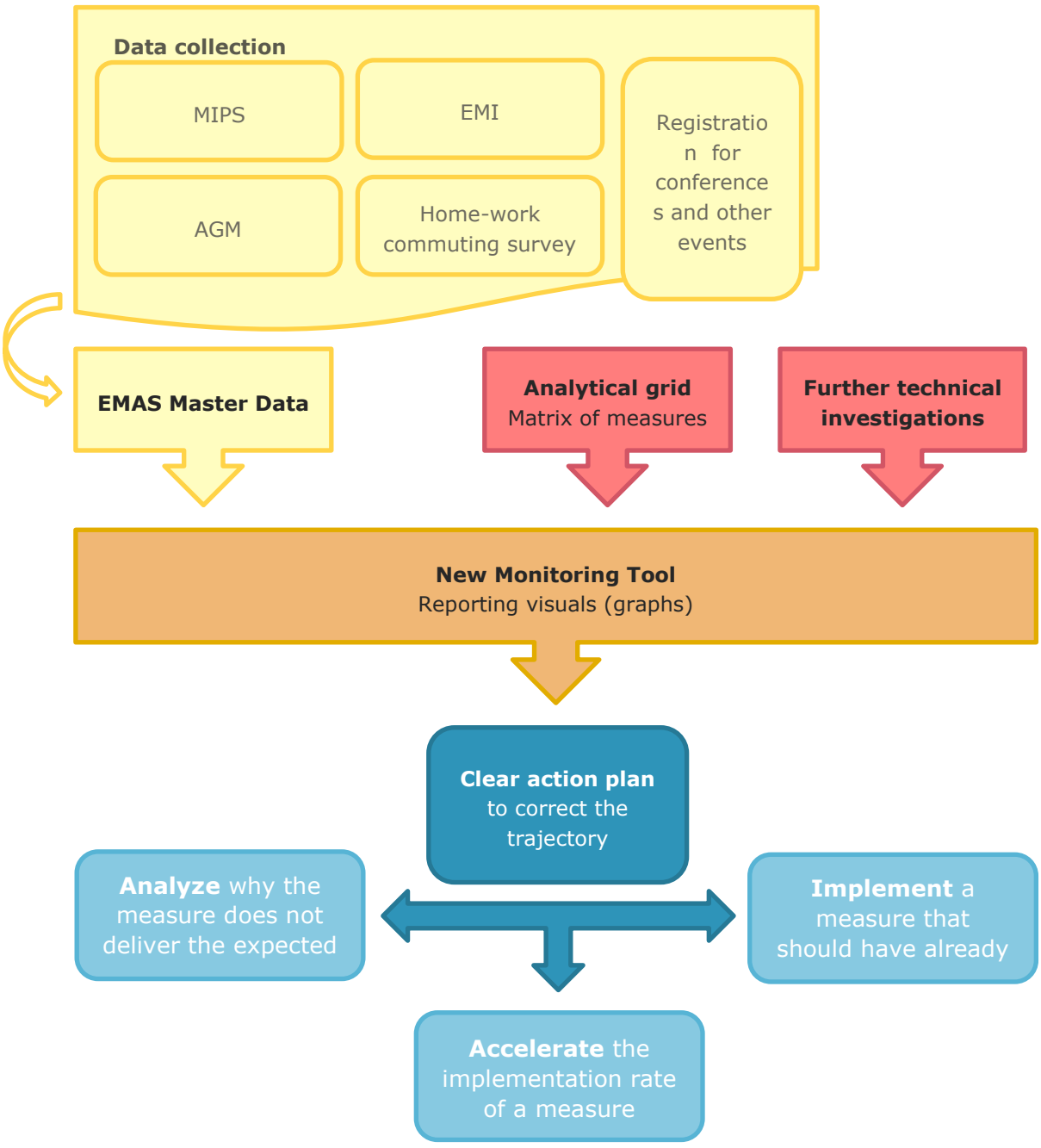
II. Lack of staff responsiveness (e.g. for home-work commuting-related measures, food-related measures);
III. Budget lower than expected.

c. The measure has been implemented but does not deliver the expected results, due to a change in other parameters (colder winters may affect the natural gas consumption for heating despite energy efficiency measures, etc.).

3.2.3 Overview of the interaction between the different tools

Figure 3.6 illustrates the interaction between the different systems, and how they feed each other, in order to constitute an easy-to-use tool that is able to monitor the progress and ensure the achievement of the climate neutral goal of the European Commission:

Figure 3.6 Architecture of the GHG monitoring tool



4. ANALYSIS OF RELEVANT CONCEPTS AND INSTRUMENTS

This chapter presents an analysis of existing concepts and instruments for climate neutrality strategies. It builds on a review of current practice at the Commission, desk research, interviews with European Commission's staff, other institutions and independent experts, as well the consultant's own expertise.

This chapter corresponds to the first part of Task 2 in the terms of reference.

4.1 Overview of relevant concepts and instruments

This section identifies concepts and instruments for the climate neutrality target. They are described and analysed, with the aim of inspiring the Commission. Following extensive research and consultation, the most promising or inspiring concepts were selected and analysed, including internal policies, frameworks, or pioneering ideas. As per the terms of reference of this study, the following aspects were considered: targets, milestones and monitoring process used; achievements and lessons learned; and applicability to the Commission. Where relevant, specific instruments supporting the concepts were identified, including practical tools like software or legislation, information and communication media.

Applicability is a key criterion. It is understood here as the potential for the Commission to implement the concept or instrument successfully, taking account of its current practice as well as potential barriers and opportunities. A detailed and systematic assessment of applicability is provided for specific measures in Chapter 5, which reviews possible action domains and measures. There, applicability is translated into a share of the Commission's buildings, staff or activities to which measures can be applied, and the associated opportunities, drivers, barriers and risks.

The collection of concepts and instruments was used to inform the European Commission's action plan. The group of concepts and instruments identified in this chapter were translated into measures applicable to the European Commission. In total, more than 100 measures were considered. After this longlist of measures was sorted, considering duplicates, out-of-scope and unclear options, 45 measures were finally selected. They are presented in Chapter 5.

Table 4.1 below provides an overview of the concepts and instruments analysed in this report, including a summary description and a summary of their applicability to the Commission.

Table 4.1 Overview of concepts and instruments, and their applicability to the Commission (elaborated in the next section)

Concept	Summary description of the concept	Summary of applicability to the Commission
Sustainable building design	Building design and use practices accounting for embodied and operational carbon emissions over the whole lifecycle of buildings, and the implementation of circular economy principles.	High potential to implement good practices from the Loi 130 project to other new projects, and to adopt other new sustainable building design and use approaches.
Collaborative procurement	Innovative forms of procurement (including competitive dialogue) where the procurement authorities actively engage with the market to draw out the highest possible sustainability performance for a project.	High potential to implement collaborative procurement, particularly as regards large projects where the market is not ready to offer high quality 'green' solutions through standard procurement.

Concept	Summary description of the concept	Summary of applicability to the Commission
New ways of working in public administration (including teleworking)	New ways of working enable flexibility in the time and location at which staff can carry out their tasks, in order to potentially allow for better autonomy, productivity and work-life balance while potentially reducing the individual carbon footprint of staff members through reduced space needs and commuting. However, in the case of teleworking, a rebound effects have to be considered as they significantly reduce its mitigation potential or might even lead to increased net GHG emissions[69].	Potential to implement some new ways of working at the Commission as long as are tailored to the working culture of different Commission units, rebound effects are addressed, they receive support from management, and they can be gradually implemented.
Corporate carbon budget	Carbon budgeting limits emissions from designated activities by putting a cap on the emissions of staff (either individuals or organisational units).	Potentially applicable to different activities and goods/services consumption, in particular mission travel via integration into MIPS.
Internal carbon fee	Internal carbon fees place a monetary value on emissions from activities paid by the organisation or its employees, to be reused to finance climate change mitigation or adaptation projects internally to the organisation, or externally. Carbon shadow pricing is an alternative which does not necessary suggest payment but adds an additional cost to any purchase or investment depending on related GHG emissions.	Applicable conditional to changes in budgetary principles and procedures, which need to be addressed to implement an internal carbon fee.
Productive travel time	Productive travel time accounts for the time worked during travel as theoretically deductible from travel fares or the value of staff time needed for the journey, and is particularly relevant when comparing air travel with other travel options.	Applicable in principle to mission travel via integration into MIPS. It may be applicable to commuting trips particularly in other sites of the Commission than Brussels.
Active mobility support systems	Active mobility support systems relate to tools and approaches to encourage active mobility, such as accessible showers, bicycle rental, reduced car parking, etc.	Potential to improve existing active mobility support systems and reduce car parking at the Commission.
Information and campaigns	Information and campaigns enable staff and decision-makers to make sustainable choices by providing simple information and encouraging behavioural change.	Already implemented, but could be more widely used to enhance measures' effectiveness.
Ecosystemic communication	An ecosystemic communication emphasises the interaction between an organisation and the larger social context in which it operates to foster collective action on climate change mitigation.	Highly applicable to the Commission and in line with the ambition to lead by example.

[69] In the case of teleworking, rebound effects may be due to increased energy consumption at home (from non-green power consumption, increased heating and cooling needs) and over time possible choice of more remote locations associated with longer distances for work and non-work trips and more floor spaces for housing (due to lower property costs/rents).

Concept	Summary description of the concept	Summary of applicability to the Commission
Collaborative change	Collaborative change involves an organisation's staff in design, testing, communication, and monitoring of sustainable initiatives' implementation to allow problems to be better understood and for solutions to be tailored to organisational needs and practices, as opposed to top-down change.	Applicable to the Commission, where staff have expressed ideas about how to improve the Commission's environmental footprint and top-down initiatives may not always be successful.
Power purchase agreements	Power purchase agreements are energy procurement contracts between two parties, one which generates electricity (the seller) and one which is looking to purchase electricity (the buyer). A PPA is the principal agreement that defines the revenue and credit quality of a generating project and is thus a key instrument of project finance.	Applicable to the Commission, where green electricity procurement is already widely used, and for which an evolution in terms of procurement rules may have an impact on environmental performance and price control.

4.2 List of relevant concepts and tools

4.2.1 Sustainable building design

Definition

Sustainable building design or 'green construction' refers to using processes that are environmentally responsible and resource-efficient throughout a building's lifecycle. These processes reduce the embodied carbon impact of buildings as well as operational carbon impact relating to energy use.

These measures' effects are best assessed with GHG accounting and lifecycle analysis (LCA) in order to comparatively measure the impact of different building options. LCA is particularly useful to achieve an optimal level of embodied versus operational emissions, as reducing one can sometimes be at the expense of the other (e.g. using triple-glazed windows improves insulation and therefore reduces operational energy use, but increases embodied carbon emissions compared to single or double glazing).

Sustainable building design generally abides by the waste hierarchy and circular economy principles to 'reduce, reuse, recycle',[70] which can be associated with significant GHG emissions reduction benefits.[71]

Furthermore, sustainable building design also entails opting for materials and products which achieve an optimal trade-off between low embodied carbon emissions and high added value in terms of building insulation to reduce energy use. The use of new steel (produced from raw materials, as opposed to reused or recycled), and the use of new and conventional cement types (such as Portland cement with its high share of clinker, as opposed to recycled or innovative cement/concrete types with lower clinker shares or with low energy requirements for production),

[70] The waste hierarchy is described in the Waste Framework Directive (2008/98/EC).

[71] See for instance the study by Material Economics (2018, p.156) estimating a potential 34% CO2 emissions reduction by 2050 from buildings in a circular scenario. Material Economics. (2018). The Circular Economy a Powerful Force for Climate Mitigation.

are key drivers of buildings' embodied carbon emissions. There are high potential gains in substituting such high embodied carbon emission materials with more sustainable materials.

Case example

Figure 4.1. United Nations Headquarters, New York

Source: World Building Design Guide[72]

In 2007, the United Nations launched the Capital Master Plan, a multi-year renovation plan aimed at improving building comfort and facilities (conference rooms, IT facilities, office space) at its New York City headquarters.[73] As a key international policymaking body with a large body of policy initiatives addressing environmental issues, the UN also intended to lead by example in reducing its environmental footprint. The Capital Master Plan contained sustainable design performance targets defined using the US Green Building Council's LEED rating system, aiming for a LEED Gold rating for the campus and a LEED Platinum rating for the Secretariat. The objectives included reducing operational energy use, more efficient water use, avoidance of embodied carbon emissions from materials, and "measures to improve indoor environmental quality".[74] As regards the energy efficiency target, the goal was to achieve a minimum 50% reduction (measured from energy spending costs) compared to the status quo.

One of the UN's key decisions in mitigating the GHG emissions impact of the work was to launch an LCA study to comparatively assess the whole lifecycle impact of demolishing and rebuilding the headquarters, as opposed to carrying out deep renovations. The study concluded that

[72] https://www.wbdg.org/additional-resources/case-studies/united-nations-headquarters

[73] Vidaris Inc, Syska Hennessy Group. (2016). Assessing the Carbon-Saving Value of Retrofitting versus Demolition and New Construction at the United Nations Headquarters. Retrieved from: https://cdn2.hubspot.net/hubfs/524291/Publications/assessing-the-carbon-saving-value-of-retrofitting-versus-demolition-and-new-construction-at-the-united-nations-headquarters-199.pdf

[74] Vidaris Inc, Syska Hennessy Group. (2016). Assessing the Carbon-Saving Value of Retrofitting versus Demolition and New Construction at the United Nations Headquarters. Page 1. Retrieved from: https://cdn2.hubspot.net/hubfs/524291/Publications/assessing-the-carbon-saving-value-of-retrofitting-versus-demolition-and-new-construction-at-the-united-nations-headquarters-199.pdf

demolition and reconstruction was significantly more impactful, estimating that "it would have taken between 35–70 years before the improved operating efficiencies of the new complex would have offset the initial outlays of carbon emissions associated with the demolition and new construction process".[75] The renovation works maintained the building's structure, envelope and interior core walls,[76] while less structural elements were replaced.

Applicability to the Commission

The Commission has made many improvements since the launch of EMAS 2005 in relation to the energy efficiency of buildings, to such an extent that today energy efficiency improvements require larger investments and new types of measures related to the use of buildings rather than the energy systems' hardware. As regards embodied carbon emissions, the footprint of the Commission's buildings is not well known and only average emission factors are used in the current GHG accounting practice. With the new Loi 130 construction project, the Commission is engaging in sustainable building design; however, the process is limited by low market readiness to offer green solutions and to conduct accurate LCA.

Procurement of sustainable buildings demands a certain skillbase in buildings' sustainability assessments and certification, in order to have an informed dialogue with the market (see also Collaborative procurement concept in section 4.2.2 below). As the Commission is quite advanced in the field, for instance with the development of the Level(s) framework, it is in principle able to use in-house knowledge to work on its own projects. One related challenge to involving this expertise is staff resource availability.

Another key challenge is that the Commission mostly rents buildings rather than owns them, therefore it is in principle not able to carry out building renovations in the buildings it occupies. The Commission can however seek out new occupancy arrangements, such as owning more buildings, or entering into different types of contracts such as usufruct. The Commission can also voluntarily enter into dialogue with real estate promoters about new constructions it wishes to rent, in order to influence the environmental performance of the buildings.

The choice of building materials represents an opportunity to reduce emissions from buildings' construction and can also offer the potential for carbon storage; however, these benefits are only accounted for once building projects are completed, which takes several years and sometimes over a decade. This is a challenge if the Commission is to significantly cut its emissions and reach GHG neutrality in the medium term, i.e. by 2030. Consequently, the Commission could move to lower embodied carbon buildings (provided real estate market availability) and account for the reduced embodied carbon of its fixed assets.

Other challenges include the availability of LCA data representative of market products available to the Commission, and the availability of standardised LCA methodologies. As a consequence, LCAs today are often not sufficiently accurate or capable of making informed decisions. Finally, due to the lack of streamlined methodologies, carbon assessments such as LCA are resource-intensive. There are however tools to support LCA, such as TOTEM,[77] which can be used to estimate the embodied carbon of existing and new buildings. Furthermore, the tool can enable assessment of the impact of renovation projects, and allow the comparison of new construction versus renovation projects, taking into account (in a rather simplified manner) energy used for heating, similar to the process undertaken in the United Nations Headquarters example given above.

[75] Ibid.

[76] Building elements bearing the most weight are often the highest sources of embodied carbon emissions, as explained in World Green Building Council. (2019). Bringing Embodied Carbon Upfront.

[77] https://www.totem-building.be/

Buildings' sustainability is typically evaluated using BREEAM,[78] DGNB[79] or other schemes. Recently, DG Environment developed the Level(s) framework, which also enables the assessment of building sustainability according to conventional criteria (including climate change impact). In Belgium, the Flanders Region has been using GRO[80] (also used for the Brussels buildings), a certification scheme considered more flexible than BREEAM and promoted by Bruxelles Environnement. These schemes can be used as key criteria in procurement procedures.

The resources put into GHG emissions calculations should however not be detrimental to GHG emissions reduction objectives,[81] i.e. finding practical solutions to reducing emissions. In sum, the Commission should find a balance between encouraging the use of LCA at the design stage of new construction and renovation projects, and seeking ways to achieve emissions reductions, such as implementing circular economy principles (e.g. reducing office space, reusing building components, and recycling materials) and using materials which generate more advantages in terms of carbon emissions over the entire building's lifecycle. In the absence of sufficient market capacity and methods to conduct comparable LCA, the approach taken for the Loi 130 building – to carry out LCA on already-proposed building designs to achieve improvements, while also looking for opportunities to reuse materials from demolished buildings – can be replicated in future projects.

4.2.2 Collaborative procurement

Definition

Innovative public procurement strategies can be key enablers of GHG neutrality due to the large share of the Commission's total emissions that result from procured goods and services (13% of the total in 2018) and buildings as fixed assets (25% of the total in 2018). However, market readiness to provide innovative and sustainable services is still lacking in most EU markets. Collaborative procurement can be a solution, as a means of involving market actors both in shaping demand and in offering more sustainable and lower-carbon products and services to procurement authorities.

When procurement relates to complex or innovative projects, one approach is the competitive dialogue procedure. According to the Smart Procurement European Alliance (SPEA)[82] and referring to Directive 2014/24/EU, "[competitive dialogue] is normally used in large, complex projects in which the technical specifications cannot be defined in advance. For example, when the contract awarding entities are not in a position to define the ideal means for satisfying their needs or assessing the solutions that the market has to offer. It can also be used when the needs of the purchasing entity cannot be satisfied without adapting the solutions currently available, or if their needs involve designing or creating innovative solutions and also used when the contract cannot be awarded without prior negotiation due to its complexity, financial or legal structure, or because of the risks associated therewith." The competitive dialogue procedure is a form of collaborative procurement which involves learning but also requires a minimum skillbase on both

[78] https://www.breeam.com/
[79] https://www.dgnb.de/en/index.php
[80] Note that the scheme currently only exists in Dutch, but may in future be translated into other languages. https://www.vlaanderen.be/vlaamse-overheid/werking-van-de-vlaamse-overheid/bouwprojecten-van-de-vlaamse-overheid/gro-op-weg-naar-toekomstgerichte-bouwprojecten
[81] Kadefors, A., Uppendberg, S., Olsson, J.A., Balian, D., Lingegard, S. (2019). Procurement Requirements for Carbon Reduction in Infrastructure Construction Projects – AN INTERNATIONAL CASE STUDY.
[82] https://www.speaproject.eu/

sides of the table (procurement authority and market) to have an informed dialogue about the project.[83]

Case example

Figure 4.2. Artist's impression of the renovation of Eindhoven's City Hall Tower

Source: Door Architecten[84]

Competitive procurement was applied by the city of Eindhoven[85] in the sustainable renovation of the City Hall Tower.[86] The process commenced with a selection stage in which five competing tenderers were selected for competitive dialogue. The dialogue stage took place in two rounds: the first round aimed at narrowing the selection to three candidates, who would then submit an offer, of which one would be selected during the second round.

The process was very successful, initially attracting some 400 companies. One consortium was selected for the renovation of the City Hall Tower, completed in 2018. The new tower was renovated using 95% reused materials and innovative energy-saving and insulation solutions, achieving a step up from a G-rating before renovation to an A+++ rating afterwards, while still achieving a good level of indoor natural lighting (sometimes sacrificed in favour of good insulation). Hot water pipes run through the building's floors, thus also providing heating. The building can be naturally ventilated with a smart window opening system connected to the

[83] Kadefors, A., Uppendberg, S., Olsson, J.A., Balian, D., Lingegard, S. (2019). Procurement Requirements for Carbon Reduction in Infrastructure Construction Projects – AN INTERNATIONAL CASE STUDY.

[84] http://www.doorarchitecten.nl/project-15-gemeentekantoren-eindhoven

[85] The "Climate Regulation Eindhoven 2016" (Klimaatverordening Eindhoven 2016) sets quantitative climate mitigation targets: by 2050, CO_2 emissions must be reduced by 95% compared to 1990 and by 55% by 2030.

[86] Municipality of Eindhoven - Land & Property, Construction and Maintenance. (2015). Selection Guidelines for "The Smart Way Towards Sustainable Municipal Buildings".
https://www.speaproject.eu/rcs_gene/extra/Selection_Guidelines_July_21_def__English_.pdf

heating system. The building also benefits from the installation of PV solar panels on the tower's roof.[87]

Applicability to the Commission

The Commission has expressed some difficulties in attracting innovative and sustainable offers to calls for proposals. The competitive dialogue approach incurs higher costs in terms of time for the procedure but can lead to more sustainable offers being proposed on the basis of discussion with the market.

The Commission could leverage its access to the Green Public Procurement helpdesk to build internal capacity for collaborative procurement applied to its most innovative demands for sustainable products and services. As capacity also needs to be built up on the side of the market, procurement authorities can publicise their environmental commitment and what upcoming requirements will come into effect in the future, in order to enable potential providers to have the time to adapt.

One potential risk when considering collaborative procurement approaches is infringing on EU competition rules for public procurement. To mitigate this risk, the initial stage of any competitive dialogue procedure must be as open as possible to all market actors.

4.2.3 New ways of working in public administration (including teleworking)

Definition

New ways of working can enable employees to work more flexibly in other places than the office and at different working hours, giving workers more autonomy and allowing a better balance between work and family, leisure, and other activities.[88] This flexibility can be enabled by different types of flexible work arrangements, such as job rotation and project-based work, as well as IT web-based solutions (such as cloud data hosting). Flextime and part-time work are commonly used. Compressed working weeks, trust-based working hours or telework are less frequent. The recent COVID-19 experience can be considered a forced trial for these new ways of working and has demonstrated to a certain extent how business continuity is possible with these new ways of working, with much reduced commuting and limited access to offices in Commission buildings.

These measures can be combined with open-plan offices and hot-desking (also called dynamic desking) to allow potentially more employees to come on different days of the week while maximizing the use of space in the building. Open-plan offices however need to be carefully designed to avoid impacting staff wellbeing and productivity. Good office design includes providing sufficient quiet spaces, meeting rooms, and call booths, maximizing sound absorption in open spaces with good room design (which can include green walls, for instance to also enhance room aesthetics, with many co-benefits including improved air quality, reduced stress and higher productivity), combined with rules such as maintaining devices on low volume or quiet mode.[89]

New ways of working can contribute to reducing both commuting and building energy consumption, as well as reducing the embodied carbon footprint of buildings per employee, provided that the question of possible rebound effects is considered. This is especially the case for teleworking.

[87] https://www.ed.nl/eindhoven/gemeente-eindhoven-95-materiaal-uit-stadhuistoren-is-hergebruikt~a4238e1d/

[88] Korunka, C., Kubicek, B. (2018). New Way of Working in Public Administration. Austrian Presidency of the European Union.

[89] See Morrison, L.R., Smollan, R.K. (2020). Open plan office space? If you're going to do it, do it right: A fourteen-month longitudinal case study.

Article 2 of the European Framework Agreement on Telework of 2002 defines that: "Telework is a form of organising and/or performing work, using information technology, in the context of an employment contract/relationship, where work, which could also be performed at the employer's premises, is carried out away from those premises on a regular basis."[90]

Over the last years, teleworking has grown considerably because of its advantages in terms of work-life balance and thanks to the evolution of IT infrastructure allowing for easier remote working. In 2020, due to the Covid-19 outbreak, working from home has become the norm for millions of workers in the EU and worldwide. In recent work, the European Foundation for the Improvement of Living and Working Conditions (Eurofound) (2020) estimates that 40% EU employees began to telework fulltime[91]. Considering that before the outbreak just 15% of employees in the EU had ever teleworked, large numbers of employees and employers are currently facing challenges in dealing with the sudden shift to telework.

When it comes to climate change, teleworking is generally considered to provide a reduction from GHG emissions, coming from the avoided commuting trips and the optimisation of building office space (e.g. when combined with dynamic desking[92]). Nevertheless, assessing the real climate benefit of teleworking is more complex than one might initially think, as the numerous uncertainties and ambiguities regarding rebound effects have to be considered.

The scientific paper *A systematic review of the energy and climate impacts of teleworking* (Hook and all, 2020)[93] lists possible rebound effects related to teleworking. Even though former studies used to conclude that teleworking does lead to energy reduction, more recent studies highlight the fact that important areas for rebound effects (heating the employees' homes during working hours, buying more IT equipment, moving into more remote and (in areas of lower rents/property prices) larger residences…) are missing in the system boundaries considered in older studies. The benefits of commuting reduction may also be impacted by the fact that staff might decide to move outside cities and therefore become more dependent on cars, with an extended commuting distance.[94] Also, trips to work are often combined with non-work trips (to school, shopping, doctors,…) that might still remain even when working every day in the office is no longer needed.[95] Therefore, the authors of the paper conclude on the negative impact on emissions under circumstances and suggest considering as many systemic criteria as possible in the consideration of teleworking.

Another recent publication *Does telecommuting save energy? A critical review of quantitative studies and their research methods*[96] (O'Brien and Aliabadi, July 2020) also based on a literature review, goes in the same direction and mentions that "spatial and temporal scope [of the study] are critical and can profoundly affect results". With regard to the question if governmental institutions and companies should promote teleworking, the publication reminds that the workplace's environmental accounting must consider the shift of burden from employer to employee, also known as carbon leakage. There is currently no consensus, under what conditions

[90] *Telework in the European Union*, European Foundation for the Improvement of Living and Working conditions, 2010

[91] *Science for policy briefs: telework in the EU before and after the Covid-19: where we were, where we head to*, European Commission, 2020

[92] Dynamic desking or flex desking refers to the practice of using any available desk in an office rather than having one individual desk per any one employee..

[93] https://iopscience.iop.org/article/10.1088/1748-9326/ab8a84

[94] Rebound effect due to urban exodus and longer commuting distance. "La crise du COVID-19, l'aube d'une nouvelle ère pour les territoires », La Tribune, April 2020, https://www.latribune.fr/opinions/tribunes/la-crise-du-covid-19-l-aube-d-une-nouvelle-ere-pour-les-territoires-846102.html; IEA article (2020) "Working from home can save energy and reduce emissions. But how much?": "However, habitual home working could lead to people living farther from their place of work, potentially offsetting the demand reductions in energy for commuting."

[95] "Does working from home reduce CO2 emissions? An analysis of travel patterns as dictated by workplaces", Transportation Research Part D: Transport and Environment, Volume 83 June 2020; Eugênia Dória Viana Cerqueira et al.

[96] 10.1016/j.enbuild.2020.110298

teleworking generates clear climate benefits and therefore, its implementation requires specific monitoring and conditions, which, however, most corporate or governmental institutions currently do not do.

Case example 1: The Republic of Latvia

Since January 2017, the Ministry of Environmental Protection and Regional Development of the Republic of Latvia has allowed employees to use flexible working hours (starting an eight-hour workday between 7:00 and 10:00 and ending between 15:30 and 18:30) and telework (20% of the week, or one working day) to help employees manage their work-life balance and motivate them to use their working hours more purposefully and efficiently.[97] Offering cloud solutions to offer employees remote access to digital working tools was key to this transition.

In the 2018 employee satisfaction survey, 87% of the ministry staff who participated replied that they "would recommend their institution as a place to work (an increase of 4%)".[98] Furthermore, "flexible working hours or telework in 2017 accounted for about 4% of the total number of ministry staff, but in 2018 it was 15%."[99] Information on GHG performance of the measure was not available.

Case example 2: the ZIN project of the Flemish Government, Brussels

The ZIN project is a multifunctional real estate project on the north side of Brussels. It has an above ground area of about 110,000 m2, of which 75,000 m2 is office space that will be fully occupied by the Flemish Government from 2023. This building will apply the principles of New Ways of Working (NWOW). This means a variety of different types of activity-based work environments – both individual and collaborative – can be found all over the building, in both publicly accessible and secure areas, and both indoors and outdoors.

[97] Korunka, C., Kubicek, B. (2018). New Way of Working in Public Administration. Austrian Presidency of the European Union.
[98] Ibid, page 88.
[99] Ibid, page 88.

Figure 4.3 The ZIN building in Brussels

Source: Befimmo

The building uses a mix of collaborative spaces (one to ten person rooms) to allow for a wide range of work environments (concentration or cooperation). As it is designed primarily for meeting and collaboration, it was decided to implement the concept of the meeting centre: a large, publicly accessible and shared area, exclusively intended to facilitate all forms of meetings, whether formal, informal, consultative, brainstorming, or presentation-based. Approximately 2,600 workstations are planned for a total of 3,900 employees, relying on hotdesking with a suggested two days/week teleworking rate (close to the current European Commission policy[100]) and based on observed occupancy rates. The flex ratio is foreseen to range from 50% to 60%. Employees will choose their work environment based on a specific task or need. This stresses the importance to apply the "clean desk" principle.

The office space requirement has been calculated, based on a ratio of 12.5 m² by FTE and a flex ratio of 50%-60%. A management support programme has been organised to prepare for the move and to familiarise everyone with the new way of working that the new environment will entail. The Flemish government conducted an audit with an external company, a leader in measuring workplace effectiveness among the employees of its ten largest buildings. This provided a good starting point for discussion regarding the new ZIN project, as the results

[100] 2.5 days/week or 50% of working time, but condition may change from one DG to another.

provided helpful insights into what was important in a new workspace: quietness, phone booths, good infrastructure and leisure activities such as coffee corners, gym, etc. The effectiveness of the workplace will also be periodically monitored in order to be continuously improved.

Applicability to the Commission

Overall, new ways of working can introduce benefits in terms of the Commission's GHG emissions footprint by reducing commuting and generating other co-benefits, such as avoiding the stress of home-to-work travel, reducing congestion in urban areas, and improving work-life balance. The Commission already implements some new ways of working, with important differences across Directorate-Generals. For instance, Commission staff are able to use a specific system (SYSPER) to report their hours worked inside the office or outside (teleworking), with a maximum 2.5 day per week allowance (50% of normal working time).

As regards open-plan offices, offices at the Commission are generally characterised by closed offices, either shared or individual, with a large amount of space per staff member. The new Loi 130 building will also include some open spaces. Most Commission offices can be redesigned as the interior is typically made to be modular (movable walls and furniture).

New ways of working however cannot be equally enforced upon every Commission service as their success will largely depend on the typical set of tasks staff must fulfil and the working culture. For instance, DG TRANSLATION has a high level of teleworking due to the possibility of carrying out translation assignments remotely. At DG DIGIT, some spaces are open and shared by larger groups of workers carrying out IT-related tasks.

The spread of new ways of working can be facilitated with the improvement of IT mobile and office communication facilities, such as to facilitate teleworking and remote participation in meetings. Overall, such tools can support changes to the Commission's working culture and acceptance of new ways of working. Flexible working hours and teleworking[101] also have downsides that may apply to Commission staff, such as social isolation when working remotely, and the potential issues that are associated with open-plan offices (described above). To successfully implement new ways of working, the flexible work environment should be structured with guidelines and rules.[102]

During interviews, Commission staff from DG HR have suggested teleworking is not encouraged equally across the Commission, so there would be some potential to increase teleworking practices by, for instance, trying to change managers' attitudes towards it.

Nevertheless, initial mitigation potential assessments of teleworking performed by the consultant as part of this study, considering an impact on commuting (reduction of commuting frequency) and building energy consumption (contribution to measures related to office space management and reduction), shows limited net GHG emissions reduction, when accounting for possible rebound effects (e.g. additional home heating and electricity emissions, increase of average commuting distance, increase of data streaming) and if generally applied at the scale of the Commission. A clear negative impact occurs when the provision of IT equipment for home office is considered (due to carbon footprint of new additional IT material, such as screens). These results are consistent with the conclusions of research publications on possible negative climate impacts when teleworking is considered on a systemic way, i.e. without precautionary measures to mitigate rebound effect.

[101] See 4.2.3 New ways of working in public administrations (including teleworking)

[102] Korunka, C., Kubicek, B. (2018). New Way of Working in Public Administration. Austrian Presidency of the European Union. Page 36.

That said, Commission sites appear to have very diverse characteristics, e.g. availability of public transport and energy efficiency of buildings. Moreover, the implementation of teleworking can show net climate benefits under circumstances where the rebound effects are mitigated (e.g. teleworking promoting during non-heating/cooling periods, when teleworking may allow to manage more efficiently the temporary closure of building zones, and when they clearly reduce longer-distance car commuting in cases where public transport services are limited and less attractive, etc.).

The Commission has a leverage to improve teleworking if the question is considered dynamically in a moving context depending on local and seasonal criteria. As teleworking is currently generally promoted and often requested by staff and perceived as a condition for climate action, it may be more profitable for the Commission to further analyse the conditions for its implementation rather than decide immediately for a support or non-support of teleworking policy.

The analysis of teleworking local conditions for climate benefit can also be used as a mean to improve staff awareness on the climate neutrality strategy challenges and especially the impact of rebound effects. As suggested in the research publications, "further studies in this area should aim to combine a range of methods, types of work, and work arrangements in order to attempt to capture the dynamic configurations of conditions that could potentially support teleworking as a socially, economically, and environmentally constructive practice for the future."[103] Today's possible rebound effects of teleworking will also reduce in the future as the whole EU economy moves to climate neutrality by 2050.

4.2.4 Corporate carbon budget

Definition

A carbon budget is a limited amount of emissions allocated to an individual, department or organisation to emit in a given period (usually in kilogram or tonne of CO_2 per year). Carbon budgeting restricts the GHG emissions allowance of an organisation for it to meet its emissions reduction targets. It follows the logic that GHG emissions should be capped in order to mitigate climate change within an acceptable global temperature increase, and that each individual, organisation and administered territory should contribute it or their "fair share" to global climate mitigation efforts.

Organisational targets should refer to scientific literature to be in line with the IPCC 1.5 degree scenario, and use robust tools such as those provided by the Science-Based Targets Initiative, in order to determine what carbon reduction effort would represent the organisation's "fair share".

A carbon budget's limit can also be self-defined rather than based on scientific assessments, particularly in the initial period of implementation, for instance by letting individuals or departments set their own budget limit. A reduction factor can also be introduced to decrease the carbon budget yearly and encourage further reductions to meet objectives.

In order to increase the flexibility of carbon budgets, individuals or units within an organisation can also be allowed to trade their emissions allowances with each other while still aiming to stay within an organisation-level limit. This system mimics the existing cap-and-trade mechanism of the EU Emissions Trading System.

Carbon budgeting can theoretically be applied to any consumed good or service, but it is typically applied to business travel within organisations as this tends to be the largest source of emissions.

[103] *A systematic review of the energy and climate impacts of teleworking*, Hook and all, 2020

The use of a budget on carbon is expected to influence individual behaviour as decisions are constrained by the quantitative target to be met, promoting less GHG-intensive options such as purchasing or even avoiding GHG-emitting behaviour altogether (e.g. not travelling where possible). Carbon budgeting also promotes the choice of options that are not only the most effective in terms of mitigation, but also the cheapest, thus enabling potential efficiency savings. In order to enhance effectiveness, it is a good idea to create a feedback mechanism for staff by making budget use and emissions performance visible to users (e.g. via a dashboard). This can be kept anonymous at an individual level, but accessible at the level of higher units within an organisation (e.g. departments), as this can lead to a race-to-the-top among organisational units in terms of carbon emission performance. Carbon budgeting measures should also be accompanied by measures enhancing the access to and visibility of low-carbon options.

Carbon budgeting does not contribute to levelling the cost of more GHG-intensive options to make the least GHG-intensive options more attractive, as there is no additional economic cost added. This is instead presented under the concept of the internal carbon fee (see section 4.2.5 below).

Case examples

Internal carbon budgeting is implemented at Lund University on staff travel. In this example, staff voluntarily self-identify personal carbon reduction targets. Progress is monitored and published anonymously, and a personal report can also be obtained to make staff more conscious of their impact. This travel policy was tested over one year (2019) and is currently being re-evaluated.[104]

Applicability to the Commission

Carbon budgeting is generally applicable to the Commission, which will be able to determine appropriate carbon budgets once it has defined GHG emissions reduction targets. The concept can for instance be applied to mission travel, where GHG emissions calculation and budgeting can be employed as part of the Commission's MIPS once the emissions from each trip are recorded by the system.

A carbon budget can be applied at the level of individual Commission staff, Commission sites, Units, or Directorate-Generals. It will be key to this decision to consider the importance of mission travel and travel distances when defining carbon budget limits, as some Commission employees need to emit more than others due to the nature of their work and should therefore have a higher carbon budget. A trading mechanism (cap-and-trade) similar to what is practiced under the EU ETS could be considered to introduce further flexibility. However, the carbon budget should still introduce a progressive and increasing restriction in order to increase the use of less GHG-intensive alternatives. In the case of travel, alternative transport modes (e.g. train travel) and avoidance of travel altogether should be encouraged by the mechanism wherever possible (e.g. videoconferences instead of in-person meetings).

Carbon budgets could also be introduced to other activities of the Commission that involve the purchase of goods and services, such as building energy use, event planning, catering, commuting, IT equipment procurement, etc. As such, carbon budgeting can also be imposed on the Commission's contractors, with clear carbon emission limits being stated in procurement contracts. Further research would however be needed on the likely opportunities and pitfalls of applying carbon budgets to these types of activities.

[104] Lund University Centre for Sustainability Studies (LUCSUS). Travel policy – adopted by the board 6/12/2018. https://www.lucsus.lu.se/sites/lucsus.lu.se/files/lucsus_travel_policy.pdf

The introduction of a carbon budget at the Commission must be accompanied by new guidelines and rules for purchasing goods and services, as the current rules often incentivise selecting the most financially advantageous options.

4.2.5 Internal carbon fee

Definition

An internal fee on carbon places a monetary value on GHG emissions which is actually paid by an organisation and its employees. Carbon fee instruments enable organisations to factor the impact of GHG emissions into investment decisions and business operations, and to raise funds to finance internal decarbonisation measures and/or channel funding externally towards global climate mitigation and adaptation efforts. It holds organisations accountable for their impact by implementing the polluter pays principle.[105]

A carbon fee takes the form of a price per tonne of GHG emitted from any activity within the scope of the tax. In principle, the fee can be attributed to any organisational source of emission so long as the emissions can be measured. An organisation must then therefore decide how much the price should be, what emissions sources are taxed (travel, mobility, energy use, purchase of goods, food, etc.), who should pay the tax (staff, suppliers, clients, beneficiaries), and what the levied tax should be used for.

The use of an internal carbon tax sends out a clear signal to internal and external stakeholders that the organisation is committing to the low-carbon transition and will no longer incentivise choosing the most economically advantageous option when it is also GHG-intensive. Goods and services that are normally taken for granted are likely to be consumed less as a result of the carbon fee, such as air travel, conventional car mobility, meat products, individual IT devices, etc.

Carbon fees naturally raise the overall cost of activities, unless the least GHG-intensive options are already cheaper than the more GHG-intensive options. Fairness is key to an effective carbon fee mechanism, so that those responsible for choosing the most GHG-intensive options are taxed, while the benefits from the levied funds are fairly shared.[106] Fairness increases acceptability of the mechanism and diminishes resistance to change.

A growing number of organisations are setting up internal carbon fees to reduce their carbon footprint cost-effectively.

Case examples

The Government of Ireland's Climate Action Plan aims to reduce national carbon emissions by 30% by 2030 relative to 2005 levels, achieving carbon neutrality overall by 2050.[107] The same targets are applied specifically to the public sector, called upon to lead by example in Ireland's Climate Action Plan.

As part of this Plan, the Government of Ireland recently announced its ambition to introduce an internal carbon price per tonne of CO_2 emitted from air travel by government staff (calculated per trip using the ICAO's travel calculator).[108] As of 1st January 2020, Irish government departments

[105] Carbon Pricing Leadership Coalition. (2018). WHAT IS CARBON PRICING? Web. https://www.carbonpricingleadership.org/what
[106] Carbon Pricing Leadership Coalition. (2018). WHAT IS CARBON PRICING? Web. https://www.carbonpricingleadership.org/what
[107] Government of Ireland. (2019). Climate Action Plan 2019. Retrieved from: https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/16/Climate_Action_Plan_2019.pdf
[108] Government of Ireland, Department of Public Expenditure and Reform. Minister Donohoe Introduces Carbon Offsetting for All Government Air Travel. Press release, 12 January 2020. Retrieved from: https://www.gov.ie/en/news/ac797d-minister-donohoe-introduces-carbon-offsetting-for-all-government-air/

and offices are measuring their CO_2 emissions from air travel and will be required to pay a price corresponding to their emissions using their travel budget.

This price is set according to Ireland's carbon tax of €26 per tonne of CO_2 as of 2020, with a plan to raise this to €32 in 2021, eventually reaching €80 by 2030. The money will be levied yearly for the previous year and directly from each government department's travel budget. It will be transferred to the Climate Action Fund and used to reduce Ireland's domestic GHG emissions through applicant projects.

In France, the banking and insurance company Société Générale introduced an internal carbon fee in 2011 with a price of €10 per tonne of CO_2. The price has not changed since then, and the carbon fee generates approximately €3 million per year. The fee is levied on multiple sectors (energy, transportation, paper, waste) and relies on carbon footprint monitoring of each branch of the company. To consider local specificities (such as different emission factors for electricity or difficulties in commuting), weights are assigned. Each agency contributes on a fairly similar basis to the carbon fee and the resulting funds are used each year to finance ongoing initiatives selected through a competition, which allocates prizes for projects that report environmental co-benefits. The initiative shows rising participation, with more than 100 files submitted each year. The initiative is also considered highly federative as small agencies may receive support and acknowledgement from top management. On average, the scheme has also generated yearly savings of €13 million and a GHG mitigation of 4,700 tonnes of CO_2.

Applicability to the Commission

The Commission would be able to introduce a carbon fee on certain activities, but it would need to reform its financial and budgetary principles and procedures both to enable the levy of the carbon fee and to allow for budget reallocation towards internal mitigation measures or external project finance as a result of the levied fee.

The scope of the carbon fee could be diverse. As described in the case example above, a carbon fee could be levied on mission travel using MIPS, and with additional accounting of GHG emissions (see also section 4.2.3 above). It could also be imposed on food, such as by making the price of meat higher at the Commission canteen to encourage employees to opt for plant-based options. A carbon fee could also be applied to the use of parking space to encourage low-carbon mobility, as parking is currently free for Commission employees. The carbon fee could also be applied to contractors in order to create a performance-based incentive.

In the EU, the Emission Trading System already puts a price on carbon. However this only applies to some sectors, mainly heavy industry. For instance, it does not apply to the food, transport and building sectors. By introducing a carbon fee on its activities, the Commission is taking the lead on what would be needed at policy level.

The additional cost incurred for carbon-intensive expenditure can be mitigated if other benefits and costs are internalised in decision tools, as explained in the next section on Productive travel time (4.2.6).

It is key however to be transparent about the use of the levied fee, as this could be perceived as a means to finance activities that are not related to climate mitigation, which would undermine the credibility of the mechanism.

Note: An alternative carbon pricing approach is based on shadow pricing, which calculates the potential social cost of investment decisions rather than taxing day-to-day activities. With this approach, a carbon price is not actually enforced, but it enables low-carbon investment decisions. This approach is for instance used by the European Bank for Reconstruction and Development

(EBRD).[109] It could be applied to the Commission's investment decisions under the different financing programmes.

4.2.6 Productive travel time

Definition

In organisational management, travel is often perceived as either outside of working hours, or as paid hours not accounted for as working time, but solely as an expense to the employer or using the employee's own free time. In fact, travel can allow employees to be productive, provided they have enough time during the trip, that the trip is sufficiently comfortable to allow for working, and that they have access to working tools such as a mobile phone, a laptop, and/or an internet connection.[110]

Some travel modes are more amenable to productive travel time, such as taking the train as opposed to air travel. Train stations are often located in city centres and therefore easily accessible, and trains are normally quick to board. Once a traveller has boarded, it is usually possible to start working immediately and until the train stops. Air travel offers more limited productive travel time due to the location of airports outside of city centres; the time needed for check-in, airport security checks and boarding; and the time during take-off and landing as well as during meals, when it is usually not possible to use electronic devices. Overall, the trade-off between potential productive travel time and non-productive travel time must be estimated and can potentially lead to opting for not only more productive travel options, but also less GHG-intensive (train vs. air travel).

Productive travel time can be monetised using staff hourly salary costs to compare the price of train vs. air travel, as the former tends to be at an economic disadvantage compared to the latter.

Case examples

In 2008, Gripsrud and Hjorthol (2012) conducted a study which aimed to challenge the assumption that travel time was time wasted. The study was conducted in Norway, where authors handed surveys to train travellers asking them about their use of time during trips. About 44% of travellers on business travel reported doing work-related activities.[111] The authors suggested that with the increased availability of ICT tools, travel time is increasingly used for work. These findings lead to the conclusion that travel time could more often be considered as productive time and accounted for economic calculations, in this case cost-benefit appraisal of transport projects.

As a hypothetical example to illustrate this reasoning, a door-to-door trip by train may take 5 hours and cost 250€, while a door-to-door trip by plane may take 2.5 hours and cost 125€; however, the train offers 2.5 hours of productive travel time while the plane offers only 40 minutes. Consequently, and assuming an hourly salary of 70€, the train trip may contribute to 2.5 hours' worth of working time, so that 175€ in salary costs can be 'deducted' from the train fare to reduce it to 75€. By contrast, the flight leads to a saving of about 45€ thus reducing the flight fare to 80€.

[109] Bennett, V. (2019). What is shadow carbon pricing? EBRD. Web. https://www.ebrd.com/news/2019/what-is-shadow-carbon-pricing.html

[110] Lyons, G., Holley, D., Jain, J. (2008). The business of train travel: A matter of time use. Chapter 6 in: Mobility and Technology in the Workplace. 1st edition. Routledge: London.

[111] Travelers surveyed were either on commute or on business travel. Commuters were less likely to report doing work (30%) than business travellers (44%).

Applicability to the Commission

Productive travel time could have a high potential for implementation at the Commission where air travel is prevalent and needs to be reduced to mitigate GHG emissions. Practically speaking, productive travel time calculations could be integrated into the MIPS travel booking system to encourage train travel.

The concept is less applicable to commuting in Brussels as opposed to mission travel, as most Brussels Commission staff live within five kilometres of their workplace. It may be a good solution in other Commission sites, however.

Whenever booking travel, Commission staff should be given the choice whether to consider travel time as working hours, as not all employees may have the ability to carry out their normal tasks during travel time. This concept therefore may be implemented in conjunction with new ways of working, such that travel time is considered in a similar manner as teleworking[112]

Salary-based costing of travel time and consequent estimates of the reduced cost of travel need to be considered as Commission staff have different salaries.

4.2.7 Active mobility support systems

Definition

The concept of 'active mobility' and its promotion in dense urbanisation is a key topic in urban mobility policies (such as the EU Urban Mobility Package[113] and the European Strategy for Low-Emission Mobility). These policies operate with an overarching aim of tackling the carbon footprint of mobility while simultaneously fostering healthier lifestyles.[114] Key to active mobility support is supporting the modal shift from the use of motorised transport for short journeys that could be completed by other more active modes (walking, cycling, etc.).

In terms of environmental benefits, traffic emissions are the primary source of intra-urban variation in air pollution concentrations across cities. It has been estimated that nearly 70% of environmental pollution and 40% of greenhouse gas emissions in Europe come from motorised transport, emphasising the need for more sustainable and active forms of mobility.[115]

The crucial distinction between active mobility and other modes however is the large health benefits that physical activity provides – the prevention of many cardiovascular diseases. Studies[116] have shown that cycling to work is also associated with reduced sickness absence.

Case examples

With respect to cycling, several support measures are available and promoted at both organisational and international levels. For example, the PRESTO scheme[117] from the Executive Agency for SMEs (EASME) encourages the use of "bike to work schemes" with the aim of raising awareness through information campaigns to make people more aware of current mobility issues

[112] See 4.2.3 New ways of working in public administrations (including teleworking)

[113] EC Communication on the UMP (2013): https://ec.europa.eu/transport/sites/transport/files/themes/urban/doc/ump/com%282013%29913_en.pdf.

[114] Howard, R. (2017). Active School Travel: the Associations between Perceptions of Road Safety and Active Travel for School Children and Their Parents - a Health Needs Assessment. Journal of Transport & Health, 5, p.S108.

[115] European Environment Agency Online Report (2010). Environment State and Outlook Report 2010. International Journal of Sustainability in Higher Education, 12(2).

[116] Mytton, O., Panter, J. and Ogilvie, D. (2016). OP39 Longitudinal associations of active commuting with wellbeing and sickness absence: findings from a cohort of adult workers in Cambridge. Journal of Epidemiology and Community Health, 70(Suppl 1), pp.A25.2-A25.

[117] Promoting cycling for everyone as daily transport mode (PRESTO): EU's Intelligent Energy – Europe Programme granted by EASME https://ec.europa.eu/energy/intelligent/projects/en/projects/presto.

(reducing car-centric behaviour). At its core, every scheme should promote the following series of steps to encourage travel to work through cycling:

- Offering personalised journey plans to staff;
- Secure cycle parking;
- Changing facilities, showers and lockers;
- Business cycle mileage allowances;
- Targeted cycling proficiency courses.

In addition, the MOBI[118] (Promoting Smart Mobility to Employees) programme (an EASME scheme which lasted for 36 months) highlighted the opportunities to encourage active mobility through an on-line sustainable mobility game. This operated with the aim of encouraging a modal change in travel through providing a team game where employees can compete with other teams to see how many sustainable trips were made per week. The results from this are an increase in walking trips from 2% to 4% and an increase in cycling trips from 4% to 8%.

The European Environmental Agency (EEA) has a no parking space policy, combined with cycle to work campaigns and encouraging public transport use. Newcomers to the EEA are also introduced to EMAS and encouraged to make an individual contribution to the Agency's progress in reducing its environmental impact. The EEA's commuting policy is likely to have contributed to 95% of its staff commuting by public transport, on foot, or by bicycle.

In a similar vein, the European Parliament implements a yearly EMAS action plan, with concrete actions to reduce its environmental impact, especially focusing on GHG emissions, energy efficiency and travel/transport including promotion, encouragement and facilitation of the use of sustainable transport for daily commutes. The Parliament has a fleet of service bicycles (bicycles, e-bikes, scooters, e-scooters). The bicycles can (occasionally) be kept at home overnight.

One initiative the European Parliament is examining is the possibility of introducing a "green card" or "eco-bonus" system allowing for the use of mobility solutions adapted to the needs of different staff but facilitating the use of sustainable modes of transport, such as the use of trains or city bicycles.

Changes in commuting strategies at the European Parliament imply some future additional administrative burden related to changing contractual agreements with mobility service providers.

Applicability to the Commission

The concept of active mobility has a high potential for implementation considering the current actions that are already being taken to encourage more active modes of transport in the Commission. According to an interview with the Office for Infrastructure and Logistics (OIB) conducted in this study, bicycle fleets are available to staff – 300 normal and 35 electric bicycles. This has reportedly generated 100,000 bicycle rides a year which accounts for 12-13% of staff.

In conjunction with the available bicycle fleet, the Commission has developed an action campaign to encourage more active and sustainable forms of mobility from its staff. Considering that around 50% of Commission staff live within a 5km radius of their place of work, the main focus of the campaign was on encouraging the use of bicycles.

In applying this concept, it should also be noted that necessary infrastructure should be in place to further encourage staff to use bicycles and other forms of active transport. This involves fostering a "bike culture" incorporating showering facilities, lockers, repair workshops and more

[118] "Promoting Smart Mobility to Employees - MOBI" under EU, Energy-efficient transport: https://ec.europa.eu/energy/intelligent/projects/en/projects/mobi.

cycling services. Similarly, the Commission could also provide an increased level of security for bicycle parking through the use of badge locked areas along with surveillance cameras.

However, one major issue currently disincentivising active mobility is Commission staff's access to free parking. This will need to change with the implementation of COBRACE in Brussels. It is important to note that the Commission may be at a disadvantage compared to other institutions which have supported active mobility, such as the EEA (being located in Copenhagen) and the European Parliament's Strasbourg operations. The infrastructure and municipal policy context in these locations facilitates low-carbon mobility behaviour more effectively than Brussels, where a modal shift away from car travel can appear cumbersome to some staff, as reported by Local Staff Committees. The Commission can nevertheless continue to lobby local governments where it is located to create better street infrastructure for cyclists.

4.2.8 Information and campaigns

Definition

Information and campaigns aim at providing information that can help staff and decision-makers make green decisions. Information tools include good practice guides on low-carbon practices, software allowing the easy calculation of carbon footprints, websites hosting information about campaigns, etc.

As carbon footprint information is often complex, it needs to be simplified to allow for quick decision-making, to avoid the risk of losing the user.

Campaigns are time-bound efforts to create awareness and foster change towards a goal (see also Collaborative change under section 4.2.10). Campaigns can focus on communication, or also encourage participation (e.g. challenges). They consequently require different levels and types of investment by the organisers.

It is useful to monitor to the greatest extent possible the impact of information tools and campaigns, both in terms of outreach and actual effects observed. Their actual effect may be limited or difficult to measure, but they can nonetheless contribute to a sense of ownership and commitment, which are key attributes of successful change processes.

Case examples

In the context of European Mobility Week, ADEME organises a mobility challenge to raise awareness of, and to stimulate, the adoption of means of commuting other than individual car journeys. The challenge takes place at a national level, with the employees of different public institutions and private companies reporting on their commuting modes (other than by car) on a dedicated website in a given day.

YouMeal is an online software programme dedicated to analysing the impact of food on human health and the environment. The objective is to provide accurate information to users along with advanced tools for the optimisation of products, and to inform consumers accurately and intuitively so that they can choose foods in a way that is sensitive to their health and the environment.

Applicability to the Commission

The Commission already organises communication on many of its actions. Nevertheless, some of the staff interviewed for the study pointed to some lack of clarity of communication concerning specific measures, which potentially contributes to misunderstanding and lack of effectiveness.

In order to enable greener decisions, Commission staff need better access to information on the carbon footprint of mission travel, event organisation, catering, etc. Carbon footprint information

tools could include calculators for goods and services for events, information on the impact of travel and food choices, energy use in buildings, etc. They should integrate existing methods and tools used already by Commission staff to minimise transition costs (such as MIPS).

The Commission also organises campaigns to raise awareness and foster action, for instance with the Vélo Mai challenge. Similar campaigns could be organised to encourage green behaviour in other fields (such as vegetarian week).

4.2.9 Ecosystemic communication

Definition

An ecosystemic approach to an organisation's climate strategy emphasises the interaction between the institution and the larger social context in which it operates. The ecosystem can include geographically proximate organisations and individuals (e.g. in the same city, region or country), or organisations that are similar in their role, activities, size, etc. Ecosystemic communication can encourage organisations to collectively act on climate change by pooling their commitments to hold each other accountable.

Case examples

The members of the Inspiring More Sustainability Luxembourg (IMS) network (over 60 enterprises) recently adopted a Zero Single-Use Plastic manifesto,[119] with the objective of eliminating all single-use plastic from their companies by the end of 2020. By signing the manifesto, the companies commit to implementing different actions, such as supporting sustainable alternatives to plastic, observing circular economy principles, appointing a dedicated reference person in their organisation committed to the implementation of the manifesto, raising awareness and communicating with stakeholders, and engaging in discussion with the suppliers. IMS also provides signatories with dedicated support in the identification of ideas and strategies to eliminate single-use plastic from their companies.

Similar initiatives are launched in Brussels, such as the 303030 City Climate Challenge supported by the Chamber of Commerce,[120] whereby the private sector aims to take a leading role in climate policy by proposing and supporting the sustainability transformation of the city, the government, and companies based in Brussels through collaborative innovation.

Applicability to the Commission

The Commission is a strong actor within the locations it occupies both as an EU regulator but also as a large consumer of goods and services, and as an employer. Through ecosystemic communication of its commitments and actions, the Commission would be able to send an important signal to surrounding stakeholders, business partners and suppliers. The Commission could take part in existing initiatives and build on existing momentum locally, and at the same time make a positive contribution to its local ecosystem.

Ecosystemic communication may also be an opportunity for the Commission to acknowledge its local presence and impact at a time when it might reduce its travel to the Member States for environmental reasons. As such, the Commission may start to show it is ready to "think global and act local".

[119] Inspiring More Sustainability Luxembourg, Zero Single-Use Plastic manifesto. Retrieved from: https://imslux.lu/assets/publication/52/MANIFESTE%20(1).pdf

[120] https://www.303030.eu/

4.2.10 Collaborative change

Definition

Collaborative change can be defined as an approach used in public, private and civil society organisations to develop and implement social innovation through stakeholder participation, including the staff of an organisation. Collaborative change is an alternative to top-down initiatives, which are developed by a centralised entity within the organisation and need to be followed by members of the organisation thereafter. Top-down change is necessary, but it can in some instances be ineffective if it is not well understood or poorly followed. By contrast, the purpose of collaborative change is to empower members of the organisation with the change to be made, by allowing them to contribute to developing and implementing a new initiative including potentially designing it, testing it, contributing to communication efforts, and monitoring its implementation and effectiveness.

By involving staff, collaborative change allows problems to be better understood, and produces solutions more tailored to staff needs and practices, thus potentially yielding better and faster results than top-down approaches. It creates a sense of ownership of the change and increases commitment and interest to see the initiative succeed. Staff not directly involved in the design and implementation of the initiative may also feel more committed to following the change if they know that it was developed by their peers.

Collaborative change can for instance be encouraged by collecting ideas for change from staff via simple surveys, "idea boxes", idea competitions, or other means. The implementation of an existing idea can also be made collaborative by organising focus groups with staff in order to tailor the initiative to their needs, involving volunteers in a testing phase, communicating clearly about the roll-out, etc.

The collaborative aspect of this approach can also relate to fostering collective action towards a common goal rather than disseminating a goal and letting staff contribute individually to the goal. Green competitions are such examples of collaborative change initiatives where staff are encouraged to contribute to a "greening" objective (e.g. carpooling to work, reducing waste, reducing energy use). The collaborative aspect is related to accounting the sum of individual actions to the common goal, recorded at the level of the different units of an organisation, and encouraging competition between the units.

In order to be effective, collaborative change should be supported by top management and by the centralised services normally in charge of designing and implementing new initiatives. Initiatives developed collaboratively may be successful in one part of an organisation and not in others, either because the approach used in the former needs to be adapted to be replicable, because the information about the change has not permeated across the organisation (meaning it is not well-known or understood), or because the initiative is not widely accepted.

Case examples

Some municipalities in the United States, including Houston and Chicago, have engaged in a yearly "green office challenge" organised by ICLEI – Local Governments for Sustainability, encouraging building owners, property managers and tenants located within the municipality to improve their building's or office's energy efficiency performance.

Applicability to the Commission

Feedback from interviews with some European Commission staff showed that staff had ideas to offer regarding how the Commission could cut its GHG emissions, as well as a desire to see change happen. Staff initiatives have for instance included the EUStaff4Climate, and DG MARE's strategy to reduce its carbon footprint.

Much of the change at the Commission today occurs as a result of the work of DG HR, OIB, OIL and management in the different DGs (including in the JRC sites). While it is a good thing and will continue to be needed, there was also a perception from staff that they were not encouraged to take new initiatives, that their views on how existing practices could be improved were not heard, and that change was sometimes not well communicated and understood. The Commission could provide platforms for staff to collaboratively instil the changes they would like to see, with support from horizontal services responsible for the different issues addressed.

The Commission has already organised some collaborative challenges, such as Vélo Mai, where the combined results of individual staff performance in the challenge (cycling to work for a month) contributed to each DG's overall performance in the challenge. Such experiences could be replicated to other fields of activity of the Commission and with different objectives.

4.2.11 Power purchase agreement

Definition

At the European level "green" electricity is recognised thanks to a scheme of guarantees of origin. Each guarantee is a freely transferable electronic title granted to a producer which can possibly be yielded to an intermediary at the time of a transaction, then used by a supplier. In order to ensure this single use and to make impossible any subsequent use, this title is cancelled after its use by a supplier.

In practice, on the network, the "green" electrons (resulting from renewable sources of production such as biomass, wind or hydroelectric powerplants) are not differentiated from their "grey" counterpart (resulting from fossil sources or nuclear power). The electricity suppliers must thus merely make sure they buy a number of guarantees which correspond to the quantity of sold "green" electricity.

Nowadays, because of low demand on the European market for the offer (some countries, like Austria or Sweden, produce a lot of "green" electricity, but end users do not necessarily request guarantees of origin), the prices of guarantees of origin remain quite low, easing the "greening" of electricity. Consequently, the purchase of green electricity does not always guarantee additional or local investment in renewables.

However, if a large number of actors make this choice, the demand should exceed the offer and thus stimulate the development of green energy in Europe. This is why the Bilan Carbone method of ADEME classes green electricity as CO2 neutral, while others[121] have chosen to only assign green electricity the average share of RES in the national power mix.

Note that in the United Kingdom, the DECC (Department of Energy and Climate Change), under the councils of OFGEM (Office of Gas and Electricity Markets), the British regulator of the energy market, recommends accounting for CO2 emissions using the average emission factor of the network, and classing "green" electricity as CO2 neutral only when it is produced and consumed on the site of the entity carrying out its CO2 audit.

The Greenhouse Gas Protocol published in 2014 gives additional guidance regarding the reporting of Scope 2 emissions (i.e. emissions associated with purchased energy, primarily electricity). The Scope 2 GHG Protocol guidance, in response to ongoing disagreement among stakeholders on the topic of contractual reporting, requires "dual reporting" of Scope 2 emissions using both contractual ("market-based approach") and grid-average ("location-based approach") emissions factors.

[121] E.g. the City of Freiburg i.Br. in Germany in its climate-neutrality strategy.

Even when not including criteria for low-carbon accounting, an organisation can make choices that foster or accelerate the deployment of new, low-carbon energy generation installations. These choices can be summarised and ranked according to their role in helping a project advance, as the table below shows.

Table 4.2 Ranking and description of actions related to green electricity

	Action	Description/examples
1	Own renewable electricity production	Deployment of PV solar panels on rooftops. This is the action offering most additionality.
2	Directly connected to producer; direct power purchase agreement (PPA)	A physical connection to a renewable energy producer, with a fixed price contract.
3	Using a PPA delivery of the grid (virtual PPA)	A direct purchase contract to a renewable energy producer, but without direct physical connection. The purchase of the electricity and the guarantee of origin are bundled in the same contract.
4	Dark green electricity using guarantees of origin with extra criteria	Purchase of guarantees of origin with extra criteria (type, country, date) and/or additional quality label (such as Ekonergy, which defines extra sustainability criteria to electricity production, such as the origin of the biomass, the location of the wind turbines, and other criteria).
5	Light green electricity using guarantees of origin without extra criteria	Purchase of electricity with guarantees of origin, without any additional criteria.

Case example

Since 2008, the European Parliament only buys electricity from renewable resources with guarantees of origin. The European Parliament also generates its own renewable energy on-site in Strasbourg (heat pumps) and Brussels (heat pumps, cogeneration, and solar photovoltaic). In 2018 this energy represented 19.1% of the Parliament's total energy consumption. For Strasbourg, the share of renewable energy generated on-site in terms of total energy use was 59.5%, whereas for Brussels it was 0.76%. The European Parliament EMAS unit considers the potential for further renewable energy installations as limited due to little free suitable space available, both on the roofs of buildings and at ground level, which makes investments very costly with small power output. Cogeneration and heat pumps are also difficult to install in existing buildings since they are often incompatible with the rest of the existing heating system. The European Parliament is therefore considering other options, such as investing in renewable energy off-site (in addition to indirectly supporting renewable energy investments by buying 100% green electricity). However, when it comes to the question of setting up renewable energy installations off-site, such as photovoltaic panels and heat pumps, there are technical and economic limits which need to be considered. Off-site installations are theoretical options with practical difficulties such as a lack of space and constraints from the Financial Regulation, which are not designed to manage these kinds of investments.

Applicability to the Commission

EU renewable energy policies aim to increase the share of renewable energy to 20% of total EU energy needs by 2020, and, at least, 32% by 2030.[122] In support of these policies, the Commission should foster the development of renewables in the purchase and production of its own energy.

[122] https://ec.europa.eu/energy/en/topics/renewable-energy/renewable-energy-directive/overview

The Commission already purchases green electricity for its sites in Brussels and Luxembourg, as well as JRC Geel and Ispra. However, it is important to note that public procurement rules make it difficult for public authorities to purchase truly additional green electricity. EU GPP criteria in the field of renewable electricity only make reference to guarantees of origin which can be purchased by the electricity provider on the market, not by potential consumers. Furthermore, GPP criteria do not require electricity to come from new, additional generation capacities or that the supplier invests in such capacities. Public procurement rules limit the criteria which can be set: for instance, it cannot be required that all electricity produced by a supplier must be renewable. Only requirements for the electricity bought under the contract can be set. Moreover, it would be difficult to set requirements for true additionality of electricity generation, because it could be difficult to verify.

In this regulatory context and in order to assure that the electricity the Commission consumes is truly green and additional, the Commission can generate more of its own renewable electricity, such as by placing solar panels on the roof of its buildings, possibly combined with energy storage capacities. In Belgium, this would also generate income from sales of green certificates, which would shorten the pay-back time of the initial investment.

In addition, the Commission can work to improve EU GPP criteria to increase the certainty that electricity purchased through guarantees of origin is truly green and additional.

5. PROPOSED ACTIONS FOR A CLIMATE NEUTRAL COMMISSION

This chapter provides a synthetic and analytical overview of the measures proposed for the European Commission's climate neutrality strategy and action plan. It builds on the work presented earlier in this report as well as close cooperation with relevant services of the European Commission, and in particular DG HR and OIB. The results presented in this draft final report are the outcome of multiple feedback loops.

This chapter corresponds to the second part of Task 2 in the terms of reference.

5.1 Overview of mitigation measures

Six action domains are defined based on the GHG scope and main sources of emissions. The action domains are: *AD#1 Design sustainable buildings and working space* and *AD#2 Optimise energy consumption and systems* for buildings; *AD#3 Avoid air travel and promote low carbon travel modes* and *AD#4 Reduce commuting emissions* for transport and mobility; *AD#5 Reduce GHG emissions from purchase and consumption* and *AD#6 Manage and communicate* for other sources of emissions.

Forty-five measures are identified as being relevant for the European Commission's action plan. They include a broad variety of initiatives that the European Commission can take to avoid or reduce emissions and reach climate neutrality. A detailed description of the measures and their computation details is available in Appendix 5 (Analytical grid). The detailed version is the reference document on the basis of which computation is made in Chapters 8 on the scenario analysis. Table 5.1 below provides an overview of the selected measures and their action domain.

Table 5.1: List of measures

Action domain	Code	Measure
AD#1: Design sustainable buildings and working space	1.1	Optimise office space
	1.2	Improve meeting room occupancy
	1.3	Use low-carbon material in construction and renovation
	1.4	Increase vegetation in the built environment
	1.5	Relocate to green and sustainable buildings
AD#2: Optimise energy consumption and systems	2.1	Close offices during holiday periods
	2.2	Optimise energy regulation systems
	2.3	Improve building insulation and passive protection
	2.4	Communicate on energy consumption and behaviours
	2.5	Conduct internal energy audits
	2.6	Optimise energy systems at replacement time
	2.7	Install on-site renewable energy production for heating/cooling
	2.8	Install on-site PV production
	2.9	Use cloud computing services
	2.10	Use new fuel sources for heating
	2.11	Purchase green electricity for all sites
	2.12	Switch to heat pumps
AD#3: Avoid air travel and promote low carbon travel modes	3.1	Develop remote meeting attendance for staff through enhanced videoconference facilities
	3.2	Implement a bonus/malus fee in mission booking process
	3.3	Implement carbon threshold on mission
	3.4	Improve booking criteria for missions
	3.5	Develop remote meeting attendance and promote low carbon travel for visitors
	3.6	Implement mandatory train transport up to a set distance
	3.7	Implement priority rules for the purchase of economy class flight tickets
AD#4: Reduce commuting emissions	4.1	Limit parking space and introduce parking fee
	4.2	Improve teleworking rules and practice
	4.3	Improve the commuting service helpdesk
	4.4	Improve carpooling in isolated zones
	4.5	Implement a commuting fee
	4.6	Promote active mobility
	4.7	Install chargers for electric 2-wheeled vehicles
AD#5: Reduce purchase and consumption GHG emissions	5.1	Ban single-use plastic
	5.2	Optimise food order quantities
	5.3	Promote low-carbon menus in canteens and events
	5.4	Reduce and change IT equipment
	5.5	Optimise the lifecycle of IT devices
	5.6	Install centralised recycling and waste points
	5.7	Optimise internet data consumption
	5.8	Develop green and collaborative procurement
AD#6: Manage & communicate	6.1	Exchange and cooperate with peers
	6.2	Conduct frequent feedback surveys
	6.3	Provide guidance and reporting tools
	6.4	Promote good practices
	6.5	Break down targets
	6.6	Provide GHG monitoring tools

Within each action domain, measures are defined and assessed based on a comprehensive set of qualitative and quantitative criteria that include plausibility (implementation, co-benefits, and drivers), feasibility (investment and operational costs, applicability and site sensitivity), and impact. The assessment framework is summarised in the following table. This framework has been used in the analytical grid (Appendix 5).[123]

Table 5.2: Measure assessment framework

Criterion	Details	Values
Plausibility for the Commission		
Planning	The implementation of the measures is assumed in terms of implementation timeline (start date, preparation and implementation, measure life expectancy). Measures based on simple management change show a very short preparation and implementation period, in contrast with measures requiring investment or incremental process.	• Start date (year) • Preparation period (betw. 1 and 9 years) • Implementation period (betw. 1 and 9 years) • Life expectancy (betw. 1 and 20 years)
Co-benefits	The co-benefits of the measures are mentioned. They can refer to stress reduction, improvement of work productivity, social relations, better quality of life, cost savings or environmental aspects.	• Health • Social • Work productivity • Cost • Environment
Key drivers	The key drivers for success and failure are mentioned. They include requirement for new procedures, top management support, training or market availability, etc.	• Capacity building • Behavioural aspects • Finance • Technology • Communication • Legal aspects
Feasibility for the Commission		
Budget	The cost impact of the measures is evaluated, based on the available Commission data and complementary cost benchmark. The uncertainty of the estimate is also assessed: high, medium, and low. A complementary uncertainty ratio is then applied to the evaluated values (10% for low, 20% for medium, 30% for high).	• Capital expenditure cost (CAPEX): estimated cost expense or savings (in €) • A depreciation period (in years) is linked to the CAPEX. It corresponds to standard depreciation periods depending on cost typology[124] • Operating cost (OPEX): estimated yearly expense or savings (in €)
	Also, the measure cost efficiency is assessed with a yearly marginal cost indicator (€/tonne of CO2). This indicator is based on the ratio between the yearly combined cost (CAPEX/depreciation time + OPEX) and the mitigation potential.	• €/tonne of CO2.e

123 The analytical grid summarises all assumptions and computation formulas. See Aappendix 5 - Analytical grid.
124 The depreciation periods used in EMAS monitoring are also considered (e.g. depreciation of IT equipment).

Criterion	Details	Values
Human resources	The need of complementary human resources for the implementation and monitoring of measures has been assessed. It is based on a computation ratio either linked to the measure implementation (e.g. 1 focal point for 50 employees) or to the task typology (e.g. 1 FTE needed for measure reporting). Depending on the measures, it can be an addition (e.g. more monitoring) or a deduction of HR (e.g. less maintenance).	• HR cost (in €) or number of FTE (Full Time Equivalent) added or deducted
Applicability to the Commission	The applicability to the Commission is assessed in terms of the proportion of the Commission which may be affected by the measure. Still, the maximum applicability is always considered. The goal is to assess the maximum portion of the Commission which might implement the measure. The applicability is estimated for each measure individually. It may be different from one site to another when site specificities are observed. Most of the time, it is a percentage of an indicator. When applied to external suppliers (mobility tickets, energy purchase), the applicability might refer to the estimated market availability, considering 2030 as a deadline.	• Share of an indicator (e.g. 100% of the staff, 20% of bicycle commuters, 63% of the building surface in Brussels)
Site consideration	8 sites are considered. The applicability of each measure to each site has been assessed individually as following: - If a measure is considered applicable for a site, then the site is considered for the cost and mitigation potential assessment; - For most measures, the applicability and objective applied to the site are based on BX assessment and extrapolated for each site (e.g. applicability ratio for replacement of heat pumps); - For some measures with noticeably different applicability per site, a dedicated applicability and objective ratio can be used (e.g. relocation of 90% LUX staff into green building as new construction is planned);[125] - If implementation limitations are assumed in the survey for some sites (e.g. building office surface reduction limited in JRC sites), the site is not considered in cost and mitigation potential assessment.[126] Some comments are provided in the grid regarding site specificities (e.g. the fact that IS already has a 530kWp photovoltaic installed capacity).	• BX (Brussels) • LX (Luxembourg) • PE (Petten) • GE (Geel) • SE (Sevilla) • IS (Ispra) • KA (Karlsruhe) • GR (Grange)

125 The new JMO2 building is planned for completion in 2024.

126 If further analysis reveals that the site may be considered despite initial assumptions, then the site can be targeted with similar objectives as BX.

Criterion	Details	Values
Ambition and impact to the Commission		
Objective	The objective of the measures corresponds to an achievement target for each measure, as for 2030. This objective is considered for a high level of ambition but is expected to be discussed individually during the preparation of the decarbonisation pathways.	• Share of an indicator (for instance 30% space reduction, 100% of buildings monitored)
Estimation of the yearly mitigation potential	Mitigation potential of the measure based on the Commission's baseline.	• Emissions in tonnes of CO2.equivalent
Share of current carbon footprint	Estimated share of the mitigation potential based on the Commission's carbon footprint.	• Share in percentage

The measures are presented in this section at their central level of ambition, meaning that all measures pursue a high but attainable GHG emissions reduction objective by 2030, with limited considerations of budget constraints. This corresponds to the so-called "central scenario" of 50% in-house GHG emissions reduction & 50% purchased CO2 removal credits by 2030 described in Chapter 8. Different levels of ambition for different scenarios will also be present in the next chapter.

The analysis presented in this section considers each measure individually and independently, i.e. without accounting for interactions between measures. However, it is important to recall that both mitigation potential and costs interact and overlap when measures are implemented together, meaning that in a dynamic scenario analysis, the total mitigation potential or total cost of a scenario does not correspond to the sum of the mitigation potentials or costs of each individual measure. This will be further discussed and analysed in Chapter 8.

The consultant also implements a bottom-up approach, starting from individual assessments of each measure and then aggregating them to obtain an overall budget and mitigation potential for the Commission.

Some limitations must be considered:

Applicability:

- The applicability suggested for each measure was discussed with the Commission during workshops and bilateral discussions and is the result of several feedback loops. As far as possible, it relates to information collected during the consultation process. When the information is missing, the consultant makes assumptions based on research and its own expertise;
- For building and energy measures, most assumptions are based on Brussels' buildings data where detailed information was available. The assessment was subject to several iterations to account for information and remarks provided by OIB. More details are given in the applicability criterion of each measure.

Budget:

- The assessment focuses on the most significant savings and expenses and is dependent upon available data (mostly retrieved from EMAS reporting). The information presented in this

report applies to a portfolio of buildings, and further analysis and downscaling are still needed for each site or building to obtain more precise estimates. However, the consultant believes that the budget information provided in this report is sufficient to inform decisions on a 10-year action plan.

- The cost assessments do consider main cost elements but are subject to uncertainties, such as cost evolution, cost assumption, cost variations in local sites, integration of subsidies or green certificates (e.g. the cost for new fuel sources such as biogas, which is likely to evolve significantly based on market supply and demand);
- The cost assessments for human resources are based on the Commission's standard contract agent cost.[127] Uncertainty remains as to whether human resources will be internal (Commission staff) or external (contract agents or service providers). Contract agents have been prioritised in the cost assessment, because of current difficulties in creating new internal positions. Ultimately staffing decisions will have an impact on the actual costs of measures;
- Cost evolution for 2030 was considered for energy, as energy costs (electricity and gas consumption) are expected to increase in the coming years with lower fossil fuel energy use and additional energy transition costs;[128] but this remains uncertain as it depends on national energy policies.

GHG mitigation potential:

- Due to the low electricity carbon footprint (green electricity represents a large majority of the energy purchased by the Commission), the mitigation potential might appear very low for measures related to electricity consumption and renewable energy production. Nevertheless, the consultant choses to consider measures with effective energy consumption reduction, which still provide additionality and generate savings;
- Most of the emissions factors originate from ADEME Base Carbone or EMAS revised emissions factors. These emissions factors are derived from a LCA (lifecycle analysis). However, some emissions factors still require complementary dedicated benchmarks, which can be difficult to obtain (e.g. emissions factors for the use of sustainably sourced bio-material);
- In order to mitigate the risk of double counting when multiple measures have an effect on the same source of emissions, the overlapping mitigation effects of measures is considered. An incremental computation process is applied to mitigation potential in the scenario assessment;
- The current carbon footprint of the Commission shows low values in some sectors where data are missing (e.g. for food). In some cases, a specific baseline value has been assumed to better account for the mitigation potential, and this is clearly indicated in the analysis.

127 An assumption of 80k€/year for one FTE is considered in the survey. DG Budget mentioned that the legal financial statement (LFS) indicates a HR cost of 150k€/year for official staff and 80k€/year for contract agents.

128 Depending on energy mix, an increase of 2 to 5% of energy cost is usually expected. "Evolution du marché de detail de l'énergie », Comité de Régulation de l'énergie, 2018. Up to 40% gas cost increase is assessed in « Etude prospective concernant la sécurité d'approvisionnement en gaz naturel à l'horizon 2025-2030 », Bureau Fédéral du Plan, 2016, economie.gov.be. A yearly inflation rate of 2.5% on energy costs has been assumed in the survey for gas and electricity and also corresponds to the 2.1% energy increase mentioned in another survey from the Bureau Fédéral du Plan, "Insights in a clean energy future for Belgium", 2018.

5.2 Description of mitigation measures

5.2.1 AD#1: Design sustainable buildings and working space

1/ Description

The objective of this action domain is to avoid and reduce GHG emissions from the Commission's buildings, focusing on working space organisation (following the principles of the Workplace of the Future in the European Commission,[129] available in Appendix 6) and the environmental quality of buildings.

This domain includes measures which aim to optimise space use and reduce the embodied carbon of buildings (e.g. using low-carbon construction materials, increasing building vegetation). It concerns the renovation of existing buildings, the relocation to new rented buildings when contracts end before 2030, and the construction of new buildings when possible despite time constraints.

2/ Measures already implemented in the European Commission

Currently the Commission owns 25% of the buildings it occupies, the rest being long-term leases and rentals.[130] A few construction projects are ongoing. In Luxembourg, the new JMO2 and Mercier buildings should provide a new workplace for staff before 2025. In Brussels, the new CC2.0 building is expected for 2024, while the construction of the flagship project Loi 130 will start before 2030 but will not be operational by then. Embodied carbon[131] has to some extent been considered in the design JMO2 and CC2.0;[132] Loi 130 is expected to be the tallest building with a wood structure[133] in Brussels.

The Commission set an objective of space reduction to match the EU standard average workstation surface[134] per capita of 12m²/staff (it is currently at 14.5 m²/staff).[135] DG DIGIT has also initiated the digitalisation of buildings, allowing for improved space management, such as digital room booking.

The experience of DG SCIC, as corporate domain leader for meeting room management, has demonstrated that the occupancy rate of the meeting rooms recently added to the corporate pool (managed using Webdor) has increased by 20%.

Finally, the EU Green Deal calls for actions to promote resource efficiency, circular economy and biodiversity protection.[136]

3/ Description of proposed measures

Suggested measures in this action domain are listed below:

[129] The internal Communication to the Commission "The Workplace of the Future in the European Commission" (2019) lists the main principles for the evolution of working spaces. https://ec.europa.eu/transparency/regdoc/rep/3/2019/EN/C-2019-7450-F1-EN-MAIN-PART-1.PDF.

[130] Source: ECA, Office accommodation of EU institutions – Some good management practices but also various weaknesses (2019)).

[131] The benefits of circularity for cuts in GHG emissions are summarised in the following survey. Greater circularity in the buildings sector can lead to major cuts in greenhouse gas emissions, European Environmental Agency, 2020, Link.

[132] JMO2 will however result in an increase of office space.

[133] Wood structure will be used for the two smaller towers of Loi 130.

[134] The workstation surface per capita is to be differentiated with the gross building surface per capita, the latter being reported in EMAS.

[135] Source: ECA, Office accommodation of EU institutions – Some good management practices but also various weaknesses (2019)).

[136] EU biodiversity strategy: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu/eu-biodiversity-strategy-2030_fr.

Table 5.3 Description of proposed measures for AD#1

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
1.1 Optimise office space	This measure aims at integrating the principles mentioned in the EC Communication "The Workplace of the Future in the European Commission", improving work effectiveness with various workspaces, and reducing the average building surface portfolio. It includes: - Reduce gross office building surface[137] portfolio with space optimisation to achieve a useful building surface/staff that is consistent with other surface targets);[138] - Combine individual and collaborative spaces to enhance collaboration, facilitate telephone and video calls, while also enabling concentration at work; - Integrate dynamic desking[139] to optimise space (relating to other measures such as measure 4.2 *Improve teleworking rules and practice*); - Integrate more meeting facilities (related to measure 1.2	This measure applies to: - Sites with large building portfolio; - Sites with building surface dedicated to office work (84% of average surface);[140] - Buildings with lease contracts ending before 2030 (in BX: 71%[141] of building surface with office space);[142] - *Addressed fully*: BX (combination of all measures including space reduction); - *Addressed partly*: LX, SE, GR (office space optimisation but not space reduction);	- More collaborative working practices, already initiated as a pilot in some BX & LX buildings;[143] - Possible resistance to change and negative effects on team-spirit mitigated by continuous monitoring of employee satisfaction and workplace effectiveness;[144] - Requires well-prepared implementation plan with various workspaces and improved facilities to foster positive perceptions and wellbeing at work;[145] - Requires agreement from OIB Board (MPF) & Commissioner & Budgetary

[137] The objective is based on the average *gross* (i.e. including walls, staircases, floors, space for technical equipment, parking, …) surface of buildings with office space per capita in Brussels, which is the building surface divided by the relevant number of staff members. Based on EMAS reporting, this surface is currently equal to 36m²/capita. Its relation to workplace surface/capita is explained in more detail in the report.

[138] The European Court of Auditors mentions that "The Commission in Brussels uses just one indicator linked to the efficiency of office accommodation in its building portfolio: the net office surface allocated per workstation. It reports an average of 14 m2 with a target of 12 m2 to be reached by 2020, mainly by introducing collaborative spaces." This workstation surface has to be differentiated from the gross building surface reported in EMAS, which was used in the survey. Reduction of gross building surface may be achieved while maintaining average standard workstation surface. Source: ECA, Office accommodation of EU institutions – Some good management practices but also various weaknesses (2019).

[139] Dynamic desking or flex desking refers to the practice of using any available desk in an office rather than having your own desk.

[140] Average ratio for the Commission. Source: ECA, Office accommodation of EU institutions – Some good management practices but also various weaknesses (2019)).

[141] Survey evaluation based on analysis of buildings portfolio with no relocation plan.

[142] In BXL, 12% of net office surface has relocation already planned and 19% of net office surface is assumed with possible relocation. Relocation planned: BU-1BU24G--1G-12G--6J-79J-99L102L84-86SPA3 , Relocation possible (contract ending before 2030, no relocation planned and contract = U): BU-5BU-9C-25COVE-COV2 J-59L-15L-56LX40N105PLB3SPA2.

[143] Observed 46% increase of the occupancy rate in the Commission buildings, after an introduction of collaborative spaces in three BXL buildings. Source: ECA, Office accommodation of EU institutions – Some good management practices but also various weaknesses (2019)).

[144] An example is the Leesman Index, as used in the ZIN building of the Flemish Government, Ipfa.org.uk. An average cost of 1500 to 2000€ per building has been mentioned by the Flemish Government.

[145] Communication from the European Civil Service Federation: Introducing open-plan offices can seriously affect working conditions, ffpe.bxl.eu.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
	Improve meeting room occupancy) and videoconference facilities (related to measure 3.1 *Develop remote meeting attendance for staff*); - Optimise office space in current buildings or in conjunction with the relocation of staff to buildings with optimised office space (relating to measure 1.5 *Relocate to green and sustainable buildings*).	- *Not addressed*: PE, GE, KA, IS (possible limitation on office space management - JRC site).	Authority.
1.2 Improve meeting room occupancy	This measure aims at optimising the use of meeting and shared rooms with the support of digital booking[146] and allowing for improved space management and energy consumption. It includes: - Increased and varied meeting facilities (related to measure 1.1 *Optimise office space*); - Improved booking management of meeting and shared rooms, based on digital booking and time rules.[147]	This measure applies to: - All new and future meeting rooms (current booking conditions restrict hourly booking); DG SCIC has already tested the use of booking systems. - *Addressed*: All sites.	- DG SCIC, as corporate domain leader, is developing a new IT Tool (MIRA) to manage meeting rooms and improve the booking process - Operational benefits (better meeting management); - Lever for measure 1.1 *Optimise office space* and measure 3.1 *Develop remote meeting attendance for staff*.
1.3 Use low-carbon material in construction and renovation	This measure aims at supporting the use of low-carbon and sustainably sourced bio-material in the Commission's renovation work. It includes: - Integration of low carbon and sustainably sourced bio-material in any renovation work (renovation, extension); - Require certification schemes in GPP; - Use of recycled and eco-friendly material; - Average additional cost of 15%[148] on material but 40%-60% savings on embodied carbon.[149]	This measure applies to: - All types of work (renovation of office space and new construction). - *Addressed*: All sites.	- Proven carbon sequestration power of sustainably sourced bio-material compared to standard construction material;[150] - Increasing market availability of sustainably sourced material[151] (from sustainably managed forest, located locally, as investigated for the new Loi130 buildings);

[146] Examples can be found at the following links: https://www.g2.com/categories/meeting-room-booking-systems and https://getjoan.com/.
[147] Based on its previous experience, DG DIGIT highlights the needs of monitoring besides using digital booking.
[148] Average value based on existing benchmarks like CEREMA: https://www.cerema.fr/system/files/documents/2017/10/170614-cerema-etat-connaissancecouts-biosources.pdf . But this value heavily depends on the type of work. Wood structured building.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
			- Aesthetic quality of wood and wellbeing for staff.
1.4 Increase vegetation in the built environment	This measure aims at developing green spaces for the Commission's buildings. It includes: - Increase and enhance green spaces: plantation of trees around buildings and installation of green roofs; - Improve insulation of old buildings (otherwise negligible[152]); - Improve thermal comfort in all buildings (better albedo leading to less cooling needed).	This measure applies to: - Building surface available for the use of green roofs[153] (5% of building surface on average assumed) on 63% of existing buildings;[154] - Plantation of trees in available green zones (1,300 trees assumed);[155] - 15% of electricity bill addressed (summer cooling); - *Addressed*: All sites.[156]	- Better biodiversity management; - Better thermal comfort (reduced use of heatingcooling systems due to reduction of heat transfer and improved albedo[157] of external areas).
1.5 Relocate to green and sustainable buildings	This measure aims at relocating staff into new green buildings with improved environmental quality. - Relocation of staff into new buildings with high environmental quality (low embodied carbon, high energy efficiency, passive building) either through reconstruction (LX, SE, where new buildings are expected to be operational before 2030) or rental	- 40% of the staff in BX can be relocated (building lease contract ending before 2030) either in existing buildings (measure 1.1 *Optimise office space*) or in new buildings; - New construction project already	- Mainly depends on market availability of green buildings in Brussels;[161] - Health co-benefits (better thermal comfort, natural light); - Significant energy saving; - Better thermal comfort.

[149] The decarbonisation benefits of sectoral circular economy actions; EEA/Ramboll, 2020 https://ramboll.com/-/media/files/rm/rapporter/methodology-and-analysis-of-decarbonization-benefits-of-sectoral-circular-economy-actions-17032020-f.pdf?la=en.

[150] Analysis of the demand for wood products in the construction sector, Thünen, https://www.thuenen.de/en/wf/projects/wood-in-the-construction-sector/.

[151] Benchmark biosources in the world, http://www.vegetal-e.com/fichiers/bbmworld-rapport-fin-v7_1475511645.pdf.

[152] The thermal performance of green roofs is debated and not considered in standard performance assessment, but a consensus is that a green roof is not insulation, but it can help building in terms of energy performance.

[153] The potential of green roofs on energy saving and mitigation potential has been analysed in the literature, Green roofs; building energy savings and the potential for retrofit, Castleton et al, 2010, https://www.sciencedirect.com/science/article/abs/pii/S0378778810001453.

[154] This estimation derives from BXL building portfolio with contracts allowing for external work (P, EA, EA*)*).

[155] This ratio has been assumed an objective, based on the number of Commission staff, but is subject to modification as no synthetic data has been used about available garden surface.

[156] For some rural sites,woodland and various green habitats can also be considered, as suggested by JRC Ispra.

[157] *Thermal performance of vegetation integrated with the building surface,* Ganji and all, 2013

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
	of new buildings (BX, as no new building is expected to be operational before 2030);[158] - Increased 5-8% rental rate[159] in urban areas; - Improved energy efficiency of buildings (70kWh/m² intensity energy consumption i.e. up to 60% energy saving);[160]	ongoing in LX (90% staff relocation) & BX (20% staff relocation after 2030); - 10% of staff relocation to new green buildings considered in BX; - *Addressed*: BX (10% of the staff); LX (90% staff, already planned), SE (100%).	

[161] A benchmark of Brussels buildings was conducted by Brussels Environment, "Bruxelles Exemplaire", 2012 https://document.environnement.brussels/opac_css/elecfile/RACINE_BATEX_FR_BD.pdf, or see example of Brussels Greenbizz (2015): https://architectura.be/fr/actualite/11164/pose-de-la-premiere-pierre-du-plus-grand-immeuble-de-bureaux-passif-en-belgique. Another example is the ZIN building (mentioned in previous section).

[158] The new Loi130 building will be available only after 2030. CC2.0 will be operational before 2030 but is expected to have limited office space.

[159] Analyse de la Valeur Verte dans l'immobilier de bureaux, CSTB, 2013, http://immobilierdurable.eu/medias/sites/5/2014/09/Laurenceau-%C3%A9tude-valeur-verte-CSTB-2013.pdf.

[160] When compared with current measured intensity energy consumption (electricity & gas) of BXL buildings and based on existing benchmarks http://www.green-office.fr/en/comment-ca-marche/confort-et-faible-consommation and current definition of high energy efficiency standards in EPB labelling.

Table 5.4: Quantitative assessment of the measures for: Design sustainable buildings and working space

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
1.1 Optimise office space	407M€ (renovation of office space, staff relocation)	-52M€ (energy saving, monitoring system, HR)	100% of office surface[162]	30% surface reduction for BX; 100% of the office space renovated	9,000 tonnes of CO2.e (reduction of embodied carbon[163] and energy saving for abandoned buildings, rebound effect due to renovation material)	3.4%
1.2 Improve meeting room occupancy	0.6M€ (meeting room digital equipment)	-0.3M€ (energy savings)[164]	100% of meeting rooms (assumed 10% of net building surface)	100% of meeting rooms equipped	500 tonnes of CO2.e (energy saving)	0.2%
1.3 Use low-carbon material in construction and renovation	32M€ (average additional cost for renovation)	/	70% of building net surface with renovation[165]	50% low carbon and sustainably sourced bio-material [166]	2,500 tonnes of CO2.e (carbon sequestration)[167][168]	0.9%

[162] This corresponds to 95% of net surface in BXL.
[163] The embodied carbon of Commission buildings is defined with standard emission factors but estimations of embodied carbon evolution can be found in the literature https://resources.taloen.fr/resources/documents/7765_191210_poids_carbone_ACV_vdef.pdf.
[164] Note that energy savings related to the improvement of meeting room occupancy is then counterbalanced by additional energy consumption with the measure 3.1 Develop remote meeting attendance for staff through enhanced videoconference facilities.
[165] This assumption is based on average building surface which may conduct renovation work (heavy or light) before 2030.
[166] This is an assumption used for the survey. Existing benchmark suggests site-level specific analysis as the mix of standard and sustainably sourced bio-material is subject to a high level of variation. CEREMA, Etat de la connaissance, 2016: https://www.cerema.fr/system/files/documents/2017/10/170614-cerema-etat-connaissancecouts-biosources.pdf.
[167] The assumptions used in the survey come from existing literature (Meta-analysis of greenhouse gas displacement factors of wood product substitutions, Sathre, O'Connor, 2010) and expert benchmarks.
[168] The embodied carbon of new construction buildings has not been assessed here as it'sit is part of measure 1.5 (Relocate staff to green buildings). The cost and CO2 assumptions are focused on existing building renovation work.

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
1.4 Increase vegetation in the built environment	5M€ (green roofs and tree plantation)	-0.2M€ (energy savings in summer, maintenance)	63% of buildings,[169] 5% roof surface,[170] 15% of electricity consumption (summer cooling)	100% of available zones vegetated	Mitigated: 130 tonnes of CO2.e Avoided: 100 tonnes of CO2.e[171] (energy savings on summer cooling, insulation power of green roofs considered negligible, carbon sequestration of trees)	0.2%
1.5 Relocate to green and sustainable buildings	5M€ (staff relocation and furniture)	2.5M€ (additional cast for rental and construction cost)[172][173]	100% of staff (we assume 40% of staff in BX can be relocated)	10% of BX staff relocated to green buildings,[174] 90% of staff in LX and 100% of staff in SE (planned new buildings)	6,200 tonnes of CO2.e (embodied carbon of green buildings compared to standard buildings, 50% energy savings)[175]	2.4%

[169] This assumption is based on buildings in BXL with contracts allowing for external renovation work (mainly P & EA type).
[170] This measure may overlap with measures based on solar panels (PV and solar thermal) which are also roof-based.
[171] Avoided carbon emissions through carbon sequestration with trees has to be accounted separately according to GHG protocol.
[172] An average cost of 250€/m² is considered for BXL and LX. Source: ECA, Office accommodation of EU institutions – Some good management practices but also various weaknesses (2019)).
173 An assumption has been made that the rental cost will be equal to the loan reimbursement cost. This is currently under investigation with OIL.
[174] The rest of the staff are to be relocated internally in existing buildings with surface optimisation (Measure 1.1).
[175] This assumption derives from the existing benchmark, with energy savings ranging from 30% to 70%. Do green buildings really save energy, 2016, https://www.greenbiz.com/article/do-green-buildings-really-save-energy-look-facts. 50% has been chosen, based on a comparison between average intensity of energy consumption in BXL and EPB standards.

4/ Mitigation potential

The energy consumption of buildings represents more than 35% of the carbon footprint of the European Commission (scopes 1, 2 and 3 based on energy consumption and embodied carbon). The detailed embodied carbon footprint of the Commission's buildings is not known at the time of this study but a standard emissions factor for buildings is used to assume it (1,03 tonnes of CO2.e/capita for the scope 3.2).

The entire mitigation potential of this action domain is approximately 26% of the related building baseline. It corresponds to 7% of the whole Commission's carbon footprint.

5/ Related tools and frameworks

Relevant tools for these measures are energy labels, the high environmental quality label of the buildings (e.g. BREEAM,[176] including refurbishments) as well as environment performance management frameworks such as Level(s) for procuring new buildings.[177]

The Commission communication "The Workplace of the Future of the European Commission"[178] (Appendix 6) provides a synthesis of the main principles for the evolution of the working space: it is a key element in this action domain, particularly measure 1.1 *Optimise office space*. Other experience in Brussels, such as that relating to the ZIN[179] building, also suggests that a key way to mitigate possible issues related to staff resistance to change or loss of wellbeing is to continuously monitor productivity and satisfaction at work, and to adjust workplace patterns depending on use by staff.

[176] BREEAM label: https://www.breeam.com/.
[177] Level(s) framework used for the new buildings https://ec.europa.eu/environment/eussd/buildings.htm
[178] https://ec.europa.eu/commission/publications/communication-commission-workplace-future_fr.
[179] See specific chapter in previous section about analysis of relevant concepts.

5.2.2 AD#2: Optimise energy consumption and systems

1/ Description

The objective of this action domain is to reduce buildings' energy-related GHG emissions focusing on energy systems. While the first action domain considers avoiding energy consumption though office space reduction and high environmental quality constructions, the second action domain focuses on energy performance (energy efficiency) and energy sources (renewable energy). Key drivers for this are local regulations (comply or go beyond). Another key driver is behavioural shift for energy efficiency measures, which rely on staff awareness and the ability to use systems efficiently.[180]

2/ Measures already implemented in the European Commission

The Commission's contract with the firm in charge of building systems installation and maintenance in Brussels already includes the obligation for the contractor to monitor resource consumption data (water, energy), conduct regular preventive and corrective maintenance, and propose environmental actions to improve performance.

OIB has already implemented numerous energy efficiency measures, which suggests that the remaining energy efficiency measures will be more difficult to address. OIB is also already setting up a plan to reduce primary energy consumption by 10% before 2025 in Brussels, with a current focus on the energy efficiency of boilers, in line with the Local Action Plan for Energy Management (PLAGE).[181]

The closing of some Commission offices during holiday periods has already been successfully implemented since 2010 for the Christmas break, and might be replicated for other periods, such as summer holidays, if an improvement in working space monitoring allows for it.

Regarding renewable energies, the European Commission's sites in Brussels and Luxembourg and JRC's sites in Geel and Petten have already been purchasing nearly all of their electricity from renewable sources (since August 2009 in Brussels). Ispra already delivers electricity to its site through its trigeneration gas plant. Capacity surveys have been conducted, for rooftop photovoltaic panels for instance. A geothermal power plant is also planned in Geel (where 90% of the heating and cooling consumption should be replaced with geothermal as from 2021).

3/ Description of proposed measures

Suggested measures in this action domain are listed below:

[180] It is usually considered that a 1-degree temperature set change allows for 7% of energy savings. Scientific publications highlight energy savings which may reach up to 30% energy savings (both for heating and cooling) only with the correct temperature set. "Extending air temperature setpoints simulated energy savings and design considerations for new and retrofit buildings, Hoyt et al, 2015, https://www.researchgate.net/publication/277646720_Extending_air_temperature_setpoints_Simulated_energy_savings_and_design_considerations_for_new_and_retrofit_buildings.

[181] « Un PLAGE pour les grands parcs immobiliers », Brussels Environment, https://environnement.brussels/thematiques/batiment-et-energie/obligations/plage/un-plage-pour-les-grands-parcs-immobiliers.

Table 5.5 Description of proposed measures for AD#1

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
2.1 Close offices during holidays	This measure aims at closing specific building zones when low occupancy rates are expected, especially during holiday periods. - Monitor staff holidays to decide when to close office zones for short periods (already done during 5-6 days for 65% of Brussels buildings); - Use dynamic desking for remaining staff; - Reduce buildings' office opening times.	- All buildings; - Assumption of 75% of the total surface of all buildings (except JRC) (25%[182] remains open for technical reasons); - *Addressed*: BX, LX, SE, GR; - *Not addressed*: JRC sites (GE, IS, KA) due to office space management uncertainties.	- Resistance to change; - Requires fine monitoring of staff presence; - Significant cost saving; - Avoids social isolation; - Limits other resource consumption (such as water).
2.2 Optimise energy regulation systems	This measure aims at improving the regulation of all building systems (ventilation, temperature, light), using detectors and automatic set features. - Improvement of BMS (building management systems) with for instance presence and CO2 detectors, automatic switch off of the light, hot and cold circuit regulation, automatic night cooling, etc. - Focus on temperature management to respect usual recommendations (for instance 21°C in winter, 26°C in summer but it depends on each site) based on MIT & EN15251 standard; A large diversity of systems exists and requests detailed analysis to interoperate with existing systems[183].	- All buildings may be concerned but some buildings are already considered as well equipped; - Assumption of 60% of total current building surface which would require improvement;[184] - *Addressed*: All sites except new constructions; - *Not addressed*: LX & SE are not addressed to avoid double counting with planned relocation in new buildings.[185]	- Requires audit of possible monitoring systems allowing for interoperability; - Possible partnership with ESCO (Energy service company); - Significant cost saving; - Improved thermal comfort (reduced hot/cold effect) and improved valuation of external temperature.[186]

[182] Estimation based on OIB experience.
[183] OIB circulated recent audit energy files during the survey; most of these features are already considered in the current renovation plan. For instance, hot and cold circuit regulation are suggested for the BERL building and automatic temperature set system is also suggested for L130. All measures for BXL are listed in the PLAGE synthesis file.
[184] This assumption has been made based on the list of BXL buildings considered equipped with detectors. It'sIt is also consistent with office space reduction assumptions.
[185] Because of planned relocation to new green buildings for LX and SEV, both sites are excluded from measures aiming at improved energy efficiency of buildings and systems to avoid double counting with the overall mitigation potential of measure 1.5 Relocate to green and sustainable buildings. Measures 2.2, 2.3, 2.6 & 2.12 are concerned.
[186] Numerous articles refer to an improved valuation of external temperatures with improved regulation or free-cooling system. EnergiePlus: https://energieplus-lesite.be/concevoir/climatisation3/questionner-necessite-climatiser/valoriser-la-fraicheur-de-l-environnement/.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
2.3 Improve building insulation and passive protection	This measure aims at insulating buildings. - Improvement of insulation (walls, roof) and passive protection (sun blockers) of buildings; - Focus on buildings with lowest energy performance labels (EPB), and lease contract allowing for heavy renovation work; - Replacement of windows when needed.	- Buildings with enabling contracts and expected to be kept in the Commission's portfolio; -Assumption of 55% of all building surface in BX[187] potentially concerned (the objective at 2030 will be lower due to the long implementation period of the measure); - *Addressed*: All sites; - *Not addressed*: LX & SE are not addressed to avoid double counting with planned relocation in new buildings.	- May require agreement from OIB Board (MPF) & Commissioner & Budgetary Authority to allow for more budget flexibility between individual buildings budget; - High investment needed but higher asset value and strong lever for downsizing heating/cooling systems; - Improved thermal comfort (cold wall sensation).[188]
2.4 Communicate on energy consumption and behaviours	This measure aims at supporting the effectiveness of technical solutions with awareness raising and training of staff. - Staff training for good practices;[189] - Focus on temperature set.	- All staff. This is already conducted (EMAS) and needs to be continued; - *Addressed*: All sites.	- Efficient if focused on co-benefits for the staff (health and wellbeing considerations);
2.5 Conduct internal energy audits	This measure aims at improving the monitoring of building energy efficiency and management of renovation. - Audits and yearly monitoring of energy efficiency; - Yearly budget reallocation based on audit conclusions;[190] - Anticipation of integration of future technologies.	- All buildings. This is already conducted and needs to be continued; - *Addressed*: BX.	- More human resources needed for individual audits and sub-contracting; - Requires refinement of budget rules.
2.6 Optimise energy systems	This measure aims at reaching a highest energy performance for energy systems at their replacement time.	- All energy systems. This measure is already conducted in most sites and	- Energy systems procurement rules need to evolve to account for higher

[187] The following contracts allowing for heavy work in the assumptions used are P (Propriété) and EA (Emphytéose avec option d'achat).
[188] "Les 6 paramètres traditionnels du confort thermique », EnergiePlus, https://energieplus-lesite.be/theories/confort11/le-confort-thermique-d1.
[189] This is already initiated by OIB and DG CLIMA.
[190] During the survey, feedback was given on the fact that renovation work which might mean high investment for a specific year and a specific site is currently difficult to manage respecting current budget rules.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
at replacement time	- Downsizing of heating/cooling equipment (due to improved insulation, measure 2.3 *Improve building insulation and passive protection*); - Improvement of energy performance (up to A+++ energy standard) for any equipment (light, ventilation, boiler); - Rehabilitation of energy system infrastructure to avoid losses; A large diversity of solutions exists such as standard boilers replaced with condensing boilers, use of co-generation, infrastructure insulation, led light, etc.[191]	needs to be continued. - A system replacement assumption of 70% for all energy systems (heating, ventilation, light), which would be replaced by 2030;[192] - *Addressed*: All sites except new constructions (JMO2 in LX for instance) which are considered already equipped with highly performant equipment. - *Not addressed*: LX & SE are not addressed to avoid double counting with planned relocation in new buildings.	performance expectations.
2.7 Install on-site renewable energy production for heating/cooling	This measure aims at developing on site renewable energy production for heating/cooling purposes. - Renewable energy self-consumption for heating/cooling (geothermal, solar thermal); - Use free grounds or internal networks between buildings in urban areas for geothermal (improved coefficient of performance of water/air heat pumps compared to standard boilers); - Use free space on roofs for thermal solar. Alternatives: roof concentrating solar cells, which may also produce cold.[193]	- In urban areas, the main option is on roofs, which have limited space. The installation of micro power plants (such as urban geothermal) requires investigation; - In rural sites, the natural environment allows for more opportunities; - Geel already has a plan for geothermal installation to cover 90% of its heating/cooling needs; JRC Ispra already uses geothermal, solar and thermal energy. - *Addressed*: BX, LX, SE (urban), PE, GE, IS, KA, GR (rural).	- Depends on site capacity; - Better environmental performance and improved control of energy price; - Consistent with the objective set by the RED II of, at least, 32% renewable energy by 2030.[194]

[191] Numerous ongoing improvement solutions are listed by OIB in the synthesis PLAGE file. Also, examples of solutions can be found in recent energy audits, such as new condensing boilers, co-generation heating, heating pump insulation for the BERL building, or heavy renovation of the pumping system and led equipment in L130.

[192] Estimation based on heating-cooling list of material from OIB where 82% of the material will be aged 15 y. or more in 2030. This is also consistent with the office space reduction.

[193] "La climatisation solaire réversible : une belle promesse », Quelle Energie, https://www.quelleenergie.fr/magazine/climatisation/climatisation-solaire-reversible-belle-promesse-37314/.

[194] " https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG&toc=OJ:L:2018:328:TOC.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
2.8 Install on-site PV production	This measure aims at developing on-site renewable energy production for electricity needs. - Renewable energy self-consumption for electricity (photovoltaic); - Direct consumption or grid selling; - Possible implementation with a leasing company; - Limitation of the impact of increasing electricity cost from external providers; - Alternatives: local wind turbines[195] and concentrated solar panels, or building integrated solar pv (photovoltaic glass[196]).	- In urban areas, the main option is on roofs, which have limited space. This measure may also overlap with other measures such as 1.4 *Increase vegetation in the built environment* and 2.7 *Install on-site renewable energy production for heating/cooling*; - Geel has installed PV panels recently, OIB has surveyed the BX capacity (1,8MWp assessment[197]); - In rural zones, the natural environment allows for more opportunities; -*Addressed*: BX, LX, SE (urban), GE, PE, KA, IS, GR (rural).	- Better environmental performance and improved control of energy price; - Requires internal credit management process for grid-selling; - Consistent towards the objective of, at least, 32% renewable energy by 2030.
2.9 Use cloud computing services	This measure aims at reducing energy consumption for data centre management. - Use cloud computing data to reduce data server energy consumption (both public cloud off premises and private cloud on premises);[198] - Lower maintenance needed and lower emissions due to optimised management.	- A plan for migration to cloud computing is already implemented on all sites. DG DIGIT has a general plan for localising servers in high specification data centres in LX;[199] - The data server electricity consumption is assumed to represent 15% of the electricity consumption of the whole Commission;[200]	- Might be negatively perceived as a transfer of emissions to outside Commission premises; this can be done off or on premises and does not have to necessitate external transfer; - Less local server maintenance but potential increase of cybersecurity risks; - Rebound effect: increase of emissions of data computing companies

[195] The Commission's staff mentioned the example of IBIS PowerNEST https://ibispower.eu/powernest-2.
[196] The Commission's staff mentioned the example of Onyx Solar https://www.onyxsolar.com.
[197] This assessment is based on the external contractor's assessment.
[198] Cloud computing allows to centralise but also choose more innovative solutions, such as immersed cooling datacentre. https://www.asperitas.com/.
[199] DG DIGIT mentions this plan has to be consistent with the recent increase of internet traffic due to the progressive shift from on-premises videoconferencing (Skype4business) to a cloud-based service (O365/Teams).
[200] This assumption is based on the analysis of current electricity capacity and consumption from main data centers in BXL.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
		- *Addressed*: All sites.	(considered in the mitigation potential of the measure).
2.10 Use new fuel sources for heating	This measure aims at procuring improved environmental fuel sources for heating. - Contract with local biogas supplier; - Support the development of low-carbon fuel sources; - Cost (circa 25% additional cost in 2020) might fluctuate; - Procure biogas through green certificates or power purchase agreement for direct contracting (more expensive but better control); Alternative: switch to district heating when available.	- All sites with gas consumption and local biogas alternatives (market supposed to offer tenfold demand by 2030);[201] - Average European demand in biogas in 2030 is estimated to be 10% of total gas consumption;[202] - *Addressed*: All sites	- Might be negatively perceived as this does not lower energy consumption (market-based, rather than in-house measure) despite high mitigation potential.[203] This aspect has been considered when prioritizing measures in scenarios; - Market availability and prices may evolve depending on supply and demand. Currently high additional cost (+25% assumed[204] for BX).
2.11 Purchase green electricity for all sites	This measure aims at extending the procurement of green electricity to other Commission sites. - Purchase green electricity either with certificates of origin (current practice and considered as such in the measure) or with power purchase agreement (direct contracting between two parties for more control of prices and origins); - Collaborative procurement approach to build market capacity.	- This measure is already largely implemented (95% of current electricity consumption) or planned (GR, IS, GE); - All sites with non-green electricity procurement (33% of current electricity consumption[205]) and local biogas alternatives; an assumption of 95% of remaining electricity is made);[206] - *Addressed*: All sites.	- Might be negatively perceived as this does not lower energy consumption despite high mitigation potential (market-based, rather than in-house measure); - Higher costs when based on high environmental performance (PPA);[207] - Market offer can also be limited depending on location.
2.12 Switch to	This measure aims at replacing fossil fuel sources for	Gas and diesel systems which can be	- Requires case by case feasibility study,

[201] "The future of biogas, it's a local affair", Euractiv, 2019, https://www.euractiv.com/section/energy/news/the-future-of-biogas-in-europe-its-a-local-affair/ or https://www.territoire-energie.com/article/biogaz-3-a-35-du-mix-energetique-en-2030-et-2050 or Territoire d'Energie.

[202] AAn IFP Energies Nouvelles study (2017) suggests 10% of gas consumption would be covered in 2030 with biogas: https://www.ifpenergiesnouvelles.com/article/biogas-europe-future-prospects.

[203] The emissions factors used for green energy consumption are considered negligible in current GHG accounting.

[204] Based on expert local benchmarks, an additional cost of 15€/MWh is considered for biogas consumption cost.

[205] Based on EMAS reporting and differentiation between sites according to reporting on scope 1 electricity consumption.

[206] Some sites face contracting or market availability obstacles, such as SEV.

[207] See Chapter 4 – Analysis of relevant concepts and instruments.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
heat pumps	heating/cooling systems, and especially focuses on the replacement of gas and diesel systems with heat pumps. - Replacement of boilers (gas & diesel) with low carbon alternatives, mainly air-sourced heat pumps, with similar or better energy efficiency; - Switch from gas boilers to heat pumps when technically feasible;[208] - Switch from diesel to gas boilers when not possible.	replaced by heat-pumps with the same energy efficiency at least.[209] Diesel is only used in one site, Grange, besides emergency generators. - An assumption of 25%[210] of gas and diesel possibly replaced before 2030 and technically replaceable is made.[211] - *Addressed*: All sites with gas/diesel energy consumption; - *Not addressed*: LX & SE are not addressed to avoid double counting with planned relocation in new buildings.	i.e. human resources; - Requires infrastructure investment; no cost-saving expected as price of electricity kWh in 2030 is assumed to be significantly higher than the cost of gas kWh;[212] - Possible loss of thermal comfort in some cases (air-air heat pumps).

[208] A list of advantages and disadvantages can be found in sources like « Boilers vs heat pumps », Green Match, 2020, https://www.greenmatch.co.uk/blog/2015/09/boilers-vs-heat-pumps.

[209] A review of the efficiency and current equipment ratio of heat pumps is available in the tracking report of IEA https://www.iea.org/reports/tracking-buildings-2019/heat-pumps and shows that an equipment ratio for heat pumps is expected to reach more than 20% in households by 2030.

[210] This assumption is based on 30% technically feasible replacement of 85% of current heating equipment replaced in 2030 (more than 15 years old).

[211] Assessment based on the list of OIB heating/cooling equipment: 70% of all boilers to be replaced (lifespan > 20 y. in 2030), assumption: 30% technically replaceable with air-sourced heat pumps, i.e. with infrastructure allowing for replacement and providing equivalent energy performance.

[212] With assumed inflation over energy cost. More details in the previous section about assessment framework.

Table 5.6: Quantitative assessment of the measures for: Design sustainable buildings and working space

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
2.1 Close offices during holiday periods	/	-0.6M€ (energy savings and HR for monitoring)	75% of all office zones (except JRC)	increase of the number of closure days (suggestion of 6% yearly closing)[213]	600 tonnes of CO2.e (energy savings)[214]	0.2%
2.2 Optimise energy regulation systems	8M€ (BMS & regulation system)[215])	-2M€ (energy savings)	60% of current surface	100% of buildings monitored	4,500 tonnes of CO2.e (energy savings)[216]	1.7%
2.3 Improve building insulation and passive protection	85M€ (insulation)[217]	-0.5M€ (energy savings)	55% of current surface	30% of applicable buildings (16% of current surface)	1,300 tonnes of CO2.e (energy savings)[218]	0.5%
2.4 Communicate on energy consumption and behaviours	/	-1.1M€ (energy savings[219])	100% of staff	100% staff addressed with yearly campaign	2,800 tonnes of CO2.e (energy savings)[220]	1.1%

[213] This assumption corresponds to 3 weeks of holidays, or 21 days/year. Currently the measure is mainly applied during the week of the winter holiday period.
[214] This assessment considers that 6 days of closure is already undertaken today.
[215] This assumption is based on an average value of 5-12€ investment/m², based on the benchmark of BMS cost and discussion with OIB.
[216] A 15% mitigation factor is considered for gas consumption and 10% for electricity consumption, based on reporting case studies such as the ones from Resource Efficient Scotland, "Building management System Procurement Guide", https://energy.zerowastescotland.org.uk.
[217] After discussion with OIB and considering current energy audits, a wide range of cost (310-900m²) has been considered for the Commission's buildings to reflect the diversity of buildings. This is also based on existing benchmarks such as the one from UCANSS, "Observatoire des coûts de la construction", 2017.
[218] An average of 18% energy savings is assumed in the survey (12 to 26% energy savings theoretically possible depending on EPB initial energy label). The mitigation potential appears relatively small as the overall objective is reduced to consider the long implementation time needed.
[219] A fixed cost of 10-30€/staff has been considered for yearly campaigns.
[220] This mitigation potential is highly uncertain as it relies on behavioural shift. But a 5% energy reduction mitigation factor has been applied based on the literature.

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
2.5 Conduct internal energy audits	2M€ (energy audit)[221]	1.2M€ (contract and HR for monitoring)	100% of buildings	100% monitored	Lever effect[222]	/
2.6 Optimise energy systems at replacement time	5M€ (additional cost[223] for high performance system)	-4M€ (energy savings)	70% of systems	100% replaced with maximum performance	7,100 tonnes of CO2.e (energy savings)[224]	2.7%
2.7 Install on-site renewable energy production for heating/cooling	12M€ (implementation)[225]	-0.1M€ (energy savings)[226]	5% of current heating/cooling consumption	100% of possible capacity covered with renewable	2,000 tonnes of CO2.e (energy savings, change of energy source)	0.8%
2.8 Install on-site PV production	13M€ (implementation)[227]	-1.1M€ (energy savings)	10% of the current electricity consumption (12MWp)	100% of possible capacity covered with renewable	600 tonnes of CO2.e (energy savings)[228]	0.2%
2.9 Use cloud computing services	9M€ (server migration)[229]	-2M€ (energy savings)	15% of current electricity consumption	70% server on cloud computing	400 tonnes of CO2.e (energy savings)[230]	0.1%

[221] This assumption is based on a 1,2-1,7€/m² average value for the conduction of the energy audit for all buildings. This cost may overlap with the current budget which already considers energy audits.
[222] The energy savings due to monitoring appear too uncertain to be assumed and overlap with measures based on implementation of systems.
[223] The additional cost of system replacement is considered here and assumed to be equal to circa 25% of the standard replacement cost, which is considered the business as usual cost.
[224] A 20% mitigation factor is considered for each system replaced based on 10-40% factors mentioned in the literature. For instance, A+++ new systems suggest 30% energy savings compared to standard systems.
[225] This assessment is based on geothermal and solar implementation, in order to reach 5% of initial energy consumption, with equal implementation rate between solar and geothermal.
[226] The electricity used for geothermal (with a COP 5) is assumed to be four times more expensive than the initial gas consumption. More savings may be achieved while relying on on-site PV production.
[227] The assessment is based on 12MWp solar PV installed, in order to reach 7% of initial electricity consumption.
[228] This mitigation potential has been computed based on the implementation of solar in sites without green electricity. The mitigation potential for sites with green electricity (like BXL) is negligible because of the emission factor of green electricity. The co-benefit relies then on the control of price and less energy loss due to on-site production.

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
2.10 Use new fuel sources for heating	/	0.7M€ (additional cost)	100% of gas consumption	25% of applicable gas consumption to reflect and support market demand in 2030	10,100 tonnes of CO2.e (change to non-fossil energy source)[231]	3.9%
2.11 Purchase green electricity for all sites	/	0.1M€ (additional cost)	95% of current electricity consumption	100% of applicable electricity consumption	7,000 tonnes of CO2.e (change to renewable energy source)	2.7%
2.12 Switch to heat pumps	7.2M€ (additional cost for equipment)[232]	0.7M€ (change of energy source)[233]	85% of gas and diesel boilers	30% replaced with heat pumps (i.e. 25% of current gas and diesel consumption)	5,300 tonnes of CO2.e	2.0%

[229] A 2000-3000€ cost/server migration has been assumed in the survey.
[230] The electricity consumption reduction due to cloud computing has been assumed to be 50%. Existing sources suggest a range of 20-90% mitigation potential, "Cloud computing saves energy", Scientific American, 2013, https://www.scientificamerican.com/article/cloud-computing-saves-energy.
[231] The emissions factor used for natural gas is 205gCO2.e/kWh (EMAS). The emissions factor suggested for biogas is 2,93 gCO2.e/kWh (expert).
[232] The assessment doesn't consider the full cost of material replacement, but the additional cost to switch to heat pumps compared to standard replacement.
[233] The cost of electricity is four times higher than the cost of gas consumption. Therefore even though a heat pump requires 1 kWh of electricity compared to 3 kWh of gas, the measure may show a cost increase.

4/ Mitigation potential

The energy consumption of buildings represents more than 20% of the carbon footprint of the European Commission (scopes 1 & 2). The AD#2 mitigation potential of energy efficiency measures addresses mainly existing buildings. The mitigation potential of energy efficiency in new green buildings has been assessed in AD#1 (especially for LX & SE with measure 1.5 *Relocate to green and sustainable buildings*). For both new and existing buildings, energy systems rely mainly on monitoring tools and behavioural aspects to achieve the best theoretical energy performance.

Measures related to energy purchase contracts (biogas, green electricity) have a high mitigation potential but need to be considered with caution because of market availability and environmental performance. They are market-based emissions and will not result in a reduction of the Commission's activity or energy consumption.

Based on the measures, the whole mitigation potential of this action domain is approximately 43%[234] of the related building baseline (scopes 1 & 2). It corresponds to 12% of the whole Commission's carbon footprint.

5/ Related tools and frameworks

The main tools for these measures are the energy labels of the buildings. EMAS is already targeting objectives that go beyond ISO regulations,[235] such as ISO 14001. For some specific energy uses such as data systems, specific guidelines do exist, such as the EU Code of Conduct.[236] The new national regulation (PLAGE) aims at 10% global energy consumption reduction by 2024-25, and a further 8% reduction by 2028. Green electricity procurement can be directly related to renewable projects (e.g. REScoop MECIS).[E237] A specific guide exists (MIT Manuel Immeuble Type)[238] which provides recommendations for the management of sustainable buildings (for instance, temperature set in hot temperatures and cold temperatures, instructions for humidity levels).

Among the possible useful tools, high performance monitoring tools (e.g. Vesta or Verdigris)[239] are required for a highly optimised control of the energy system but the compatibility of technical systems in place requires individual analysis for each building. Among other possible useful tools, smart power solutions can improve the management of specific zones (e.g. Cubelizer).[240] For temperature management, a common limit is difficult ergonomics of the existing thermostat. Smart thermostats (e.g. Netatmo)[241] allow for these features.

[234] The sum of the mitigation potential equals 74% of the related baseline but an overlapping factor of 70% is considered here to avoid double counting. It is then computed more precisely in the scenario computation.
[235] https://www.iso.org/standards.html.
236 https://e3p.jrc.ec.europa.eu/publications/2019-best-practice-guidelines-eu-code-conduct-data-centre-energy-efficiency.
[237] https://www.rescoop-mecise.eu/.
[238] Manuel Immeuble Type: https://ec.europa.eu/oib/pdf/mit-standard-building-specs_fr.pdf.
[239] https://www.vesta-system.fr/?lang=en and https://verdigris.co/.
[240] http://cubelizer.com/howitworks/.
[241] https://www.netatmo.com/en-eu/energy/thermostat/specifications.

5.2.3 AD#3: Avoid air travel and promote low-carbon travel modes

1/ Description

The objective of this action domain is to avoid air travel-related GHG emissions. It includes measures aiming to restrict aeroplane travel, enhance solutions for remote meetings, and promote alternative travel modes. Air travel is among the foremost concerns for institutions with regular meeting obligations in distant locations. For the European Commission, air travel for staff and visitors comprises the largest portion of the carbon footprint, reaching 47% of the whole baseline. Alternatives often involve time-consuming modes of transport with potentially higher costs. To address this concern, a key driver is the opportunity to avoid travel through better audio- and video-conferencing infrastructure for remote meetings. Additionally, door to door travel time for train and aeroplane travel can be equivalent, while a train ride offers more productive time windows. The price advantage of the aeroplane in some cases is a misleading signal, which can be addressed by accounting for the carbon impact of each flight within the mission budget.

2/ Measures already implemented in the European Commission

Videoconferencing is widespread, especially in the different JRCs. For instance, JRC-Seville implemented ten new VC facilities in 2020. However, facilities remain limited and compatibility issues with external systems frequently arise. The COVID-19 crisis, which overlapped with the study duration, had an impact on remote meetings as nearly all missions were cancelled, and teleworking became the standard. This forced experience should help the Commission to support the use of videoconferencing internally, as staff are now trained for videoconferencing and able to better anticipate obstacles and opportunities linked to remote meetings.

DG SCIC and DG DIGIT are jointly working on upgrading facilities for virtual and hybrid meetings, conferences and other events.

Commission-wide, business class tickets are not allowed for flights under six hours. According to collected feedback, the use of trains as the first option for a mission is a recommendation but not enforced as a strict rule.

3/ Description of proposed measures

Suggested measures in this action domain are listed below:

Table 5.7 Description of proposed measures for AD#3

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
3.1 Develop remote meeting attendance for staff through enhanced videoconference facilities	This measure aims at supporting the use of videoconferencing for remote meetings for the Commission's staff. It relies on measure 1.1 *Optimise office space*, as it requires more meeting rooms. - Install new videoconference facilities during renovation (meeting rooms to be redesigned into videoconference facilities of various sizes); - Improve videoconferencing material (hardware and software) and support; - Train employees for videoconferencing.	- All missions; - GR and SE recently installed new videoconference facilities. Collected feedback suggests that more videoconference facilities are needed; - *Addressed*: All sites.	- Requires technology analysis to avoid interoperability issues with external partners (proposing different alternatives); - Requires investment in new videoconferencing facilities; - Improved balance with personal life and improved productivity thanks to lower travel time; - The COVID-19 experience has opened up opportunities for wider support and acceptance, but physical meetings still matter in some situations, such as first meetings.
3.2 Implement a bonus/malus fee in mission booking process	This measure aims to integrate the ticket-pricing process in the booking tool based on carbon emissions and productive time criteria. - Develop specific carbon pricing (shadow price) method to travel fares in booking tool; - Apply bonus/malus principles based on cost of CO2 emissions and added value of productive working time on the train (in relation with measure 3.4 *Improve booking criteria for missions*); - Use the budget generated to balance the additional cost of	- All missions; - This measure is considered as pioneering but has been discussed with DG HR and the upcoming booking process update[242] offers an opportunity. A prototype was suggested during the survey[243] (Appendix 7 - Mission costing example for booking process); - This measure applies to Commission staff but may be extended to visitors (in relation with measure 3.5 *Develop*	- Requires a change in budgetary rules for money transferred out of the bonus/malus scheme; - Requires change in booking tool; - Requires communication with staff and travel agency to define pricing policy; - Pioneer measure that may be communicated for exemplarity; - Improves productive travel time.[244]

[242] The update of MIPS (booking tool) and the Mission Guide is planned starting next year.
[243] Available as Appendix 7, and mainly developed by DG HR after a discussion regarding this measure's applicability to the Commission.
[244] The productive time during a train trip is proven generally to be better than with aeroplane travel, especially for short-haul flights which require numerous waiting points. "Working on the train: from 'dead time' to productive and vital time", Gripsrud & Hjorthol, 2012, https://doi.org/10.1007/s11116-012-9396-7.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
	low carbon alternatives (night allowance, lower train ticket); still requires budget governance approval.	*remote meeting attendance for visitors*); - *Addressed*: All sites.	
3.3 Implement carbon threshold on missions	This measure aims to implement carbon thresholds for missions to challenge the use of travel modes. - Assess the feasibility of carbon accounting in booking and reporting tools (MIPS for mobility) for information purposes (related to measure 3.2 *Implement a bonus/malus fee in mission booking process*); - Define annual carbon budget for each unit, directorate or site;[245] - Integrate environmental performance in individual evaluations; - This measure may be extended to multiple other topics, such as buildings or procurement. Starting with missions appears to be the easiest approach.	- All missions; - The EMAS team will improve the reporting process and the booking process update[246] is forthcoming; - This measure targets Commission staff but may be extended to visitors (in relation to measure 3.5 Develop remote meeting attendance for visitors); - *Addressed*: All sites.	- May be integrated in incoming booking process update; - Cost neutrality (fewer missions but higher per-mission budget likely necessary to balance the additional cost of low-carbon alternatives).
3.4 Improve booking criteria for missions	This measure aims to improve the manner in which information about travel alternatives is displayed during the booking process. - Integrate productive work time as main choice parameter (in relation to measure 3.2 *Implement a bonus/malus fee in mission booking process*); - Display travel emissions alternatives during booking; - Provide intermodal alternatives to connection flights (direct flights & train or bus); - Add complementary criteria on flight efficiency (type of fuel,	- All missions; - The upcoming booking process update[248] offers an opportunity; - This measure targets Commission staff but may be extended to visitors (in relation to measure 3.5 *Develop remote meeting attendance for visitors*); - *Addressed*: All sites.	- Requires staff communication campaign; - Requires implementation in current mission planning process; - Increases productive travel time.

[245] DG HR also suggests using carbon budgets based on last year's breakdown of emissions per DG/service according to booking data, or displaying a dynamic counter in MIPS to show CO2 emitted per capita, compared to the average for the Commission or DG.
[246] The update of MIPS (booking tool) and the Mission Guide is planned starting next year.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
	airline efficiency based on Atmosfair) to focus on "Greenovate" airlines using bio- or synthetic fuels[247] (with details on environmental performance).		
3.5 Develop remote meeting attendance and promote low carbon travel for visitors	This measure aims to provide remote meeting solutions and carbon budget rules for visitors. - Implement carbon budget rules (evaluation, threshold, reporting) in the Commission's contracts (consultants, evaluators, monitors, member states) and conference organisation process, i.e. less travel or optimised meeting location; - Provide mandatory online alternatives through videoconference for each meeting or conference;[249] - Optimise event location (use travel simulator[250] to define most efficient meeting location for physical meetings or events).	- All visitor travel paid by the Commission; - This refers to monitors, evaluators, committees and conference attendees;[251] - *Addressed*: All sites.	- Requires improved communication and presence monitoring; - Requires inclusion of new contract rules (carbon reporting) for visitors; - Provides savings on external mission budgets; - The COVID-19 experience has opened up opportunities for wider support and acceptance.
3.6 Implement mandatory train transport up to a set distance	This measure aims at implementing new and binding rules for preferring train travel based on distance or route conditions for the Commission's staff. - Establish mandatory rule to travel by train (long distance or overnight) within a fixed distance limit or on well-defined routes used by staff and EU representatives; - Define a control procedure when an exemption is required.	- All missions within certain distance boundaries; - Based on staff mission data,[252] 4% of Commission-related air travel is to destinations less than 500 km distant from origin; - *Addressed*: All sites.	- Induces overtime or night travel, which needs to be addressed by new rules allowing e.g. a rest period after long trips; - Increases productive travel time.

[248] The update of MIPS (booking tool) and the Mission Guide is planned as from next year.
[247] Companies which are currently integrating biofuels into their fuel distribution. As an example, Air France recently committed to use 3% biofuel by 2025 after the COVID-19 crisis. The IEA International Energy Agency estimates at 10% the possible global share of biofuel for aeroplanes by 2030. https://www.iea.org/commentaries/are-aviation-biofuels-ready-for-take-off.
[249] The COVID-19 crisis highlighted some existing IT solutions for organising remote events. As an example, the ICTA-UAB International Conference on Low Carbon Lifestyle was organised fully online over the course of 3 days in May 2020 based on Discord (https://discord.com/) and Gather (https://gather.town/), which provides a virtual conferencing 2D venue.
[250] ICAO provides dedicated meeting simulators to limit the use of air travel such as "ICAO Green meetings Calculator" https://www.icao.int/environmental-protection/Pages/Tools.aspx.
[251] An assessment of the travel undertaken by visitors was carried out during the survey in cooperation with EASME, DG MARE, DG SCIC, RDT and REA.
[252] The assessment is based on Commission missions reporting data.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
3.7 Implement priority rules for the purchase of economy class flight tickets	This measure aims to implement new and binding rules for the use of business flights. - Implement new binding rules in travel policy regarding use of business and private jet flights in mission orders; - Use generated budget savings to balance with longer rest times; - Implement internal rules to establish travel needs control process: feasibility through videoconference, specific expertise required for physical meetings.	- All business and first-class flights; - Based on mission reporting data,[253] 42% of air travel in terms of distance happens in business or first class; - *Addressed*: All sites.	- Possible resistance to change; - Induces overtime or night travel, which needs to be addressed by new rules allowing e.g. a rest period after long trips; - Induces loss of travel comfort and productivity time; - Provides exemplarity.

[253] The assessment is based on Commission missions reporting data.

Table 5.8: Quantitative assessment of the measures for: Design sustainable buildings and working space

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
3.1 Develop remote meeting attendance for staff through enhanced videoconference facilities	9M€ (material)[254]	-23M€ (savings on travel tickets and daily allowances)	100% of staff missions	50% remote attendance (based on 2,000 new VC facilities)[255]	22,800 tonnes of CO2.e (reduction of travel emissions, rebound effect for IT material)[256]	8.8%
3.2 Implement a bonus/malus fee in mission booking process	0.3M€ (booking tool development)	0.2M€ (HR monitoring)[257]	100% of staff missions	20% switch to low carbon alternatives	7,900 tonnes of CO2.e (switch to alternative)[258]	3.0%
3.3 Implement carbon threshold on missions	0.3M€ (booking tool development)	0.2M€ (HR monitoring)	100% of staff missions	100% of trips monitored	Lever effect	/
3.4 Improve booking criteria for missions	0.2M€ (booking tool development)	2M€ (additional cost of travel tickets. HR for monitoring)	100% of staff missions	20% of bookings with more efficient airlines and/or sustainable fuels	6,800 tonnes of CO2.e (reduction due to flight efficiency)	2.6%

[254] A cost estimate of between 2,000-200,000€ per videoconference facility was used, depending on size (VC facility for 1- to 20- people).
[255] The consultant assumed one new VC facility for 15 staff members would be needed on average.
[256] The rebound effect for the use of data with videoconferencing has been investigated and research has been undertaken. Publications suggest that considering complete LCA, the energy/CO2 cost of remote attending would be equivalent to 7% of physical meetings on average. "Complete life-cycle assessment of the energy/CO2 costs of videoconferencing vs face-to-face meetings, 2012, DOI 10.1109/GreenCom.2012.6519615.
[257] The money potentially generated with the bonus/malus principles has not been assessed as this measure would be cost neutral; all the money would be reused to balance the additional cost of low-carbon missions.
[258] An average mitigation factor of 90% emissions reduction has been computed for the switch from aeroplane to train, based on emissions factors for common travel routes.

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
3.5 Develop remote meeting attendance and promote low carbon travel for visitors	0.2M€ (event monitoring tool development)	-2M€ (savings on visitors' reimbursement. HR cost for monitoring)	100% of visitors' travels (paid by the Commission)	50% less air travel for visitors' meetings and events[259]	29,400 tonnes of CO2.e (reduction of travel emissions and switch to alternative)	13.4%
3.6 Implement mandatory train transport up to a set distance	/	0.6M€ (additional cost for night allowances.[260] HR for monitoring)	4% of staff air travel distance	70% of air travel < 500 km switch to train	1,100 tonnes of CO2.e (switch to alternative)	0.4%
3.7 Implement priority rules for the purchase of economy class flight tickets	/	-4M€ (additional cost for rest time. Savings with economy tickets)[261]	42% of staff air travel distance	Economy class fares for 80% of intracontinental (<2500 km) and 60% of intercontinental (>2500 km)	3,300 tonnes of CO2.e (lower emissions due to flight class change)[262]	1.3%

[259] The consultant assumed 25% of visitors will use videoconferencing, 15% will switch to train, and 10% will use an intermodal solution based on train and shorter flight.
[260] The consultant assumed 50% of travels under 500 km distance may need a complementary night allowance.
[261] The consultant assumed 1one day of additional-rest time for long-haul flights (>2000 km), corresponding to the cost of a working day. The economy ticket cost has been considered divided by two compared to the business ticket cost, based on a benchmark of average aeroplane tickets for European companies.
[262] A 30% mitigation factor between economy and business class is considered in the survey.

4/ Mitigation potential

Mobility baseline emissions (from commuting) represent 47% of the European Commission's carbon footprint, since the scope 3 mission GHG emissions increased significantly with the addition of visitor travel emissions[263] during the survey. Proportionally, the mitigation potential related to mission travels for staff and visitors appears to be the most important.

The GHG mitigation potential of this action domain is directly related to the number of flights avoided. Emissions from short-distance flights (especially connecting flights) are particularly important here. Working on the booking process allows for the application of some measures to external partners, in cases where the Commission takes on travel costs.

The expansion of remote attendance through videoconferencing underpins its high mitigation potential, and the current experience with COVID-19, when 100% of missions were cancelled, suggests that it is possible to maintain work activity despite having fewer physical meetings. While a part of the GHG mitigation potential is directly addressed by travel avoidance, the use of alternative transport modes also carries high potential. For instance, switching from aeroplane to train offers a mitigation potential of up to 90% per trip.

Based on the measures, the entire mitigation potential of this action domain is approximately 43%[264] of the related baseline. It corresponds to 15% of the Commission's total carbon footprint.

5/ Related tools and frameworks

The mitigation potential for air travel strongly depends on measures which remain voluntary individual choices and thus hinges on the level of ambition of the in-house rules. Among the possible useful tools, intuitive videoconference providers easily accessible to external partners can be mentioned. A full range of recent and developing tools exists, answering to different types of needs: presentations, online discussions, conferences and even remote visits.

The use of airline information such as the Atmosfair ranking and carbon travel calculators should also be used either as part of the Commission's MIPS or using other short-decision existing tools (for example the energy & CO2 consumption comparator, Ecopassenger).[265] Some journey planners allow for the consideration of alternatives based on door to door travel time (e.g. Rome2rio)[266] and can be used as inspirational tools to display travel alternatives.

Remote attendance tools are already used within the Commission and recent positive feedback tends to show that remote attendance might even contribute to improving event attendance. For instance, DG SCIC mentioned that a recent BBI conference held during the COVID-19 crisis gathered 4,500 people who joined the event online, compared to 550 people in physical attendance the previous year.

[263] This addition is explained in task 1.

[264] The sum of the mitigation potential equals 74%%, but a 30% overlapping factor is considered due to the high number of measures with overlapping mitigation action.

[265] http://ecopassenger.org/.

[266] https://www.rome2rio.com/.

5.2.4 AD#4: Reduce commuting emissions

1/ Description

The objective of this action domain is to reduce the GHG emissions of commuting. Even though the European Commission's buildings are mainly located in urban areas, commuting remains an important part of the baseline emissions, being the fourth most important emission source and representing 5% of the baseline. While the mitigation potential from commuting might appear less important than that related to mission travels or to buildings' energy use, commuting nonetheless offers opportunities for climate mitigation through a leverage effect, allowing for increased awareness of overall carbon mitigation and significant co-benefits in terms of time management, stress reduction and productivity.

The measures mainly focus on supporting low-carbon commuting alternatives, but the tools vary from regulation to promotion.

2/ Measures already implemented in the European Commission

In Brussels, low-carbon mobility is encouraged. Campaigns are organised to promote the use of bicycle commuting (Mobility Week with VéloMai[267] and mobility challenges). A pool of bicycles is available (300 regular bicycles and 35 electric bicycles in Brussels) for the staff, to be used between Commission buildings. About 80% of the away staff live close to Commission premises, i.e. less than 20 km. Bicycle commuting has developed over recent years and is now at more than 10%.[268] In addition, reimbursement of 50% of public transport subscription is granted to staff willing to give up free parking access.

In Luxembourg, public transport is free throughout the whole country. For staff that live in a neighbouring country (Belgium, France, Germany), the European Commission pays for the portion of the trip from their home to the border.

In some JRC sites, a shuttle is organised to transport staff from home to work.

Teleworking is in principle allowed and encouraged but its implementation varies from one DG to another.

3/ Description of proposed measures

Suggested measures in this action domain are listed below:

[267] 500 participants attend each year an annual mobility campaign, with information stands and guided bicycle tours. Training actions are performed by OIB.

[268] Environmental statement 2018, EMAS.

Table 5.9 Description of proposed measures for AD#4

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
4.1 Limit parking space and introduce parking fee	This measure aims to abandon the principle of free parking space for Commission staff and reduce the number of parking places. - Abandon the principle of free parking space for staff paid by the Commission and implement a daily parking fee (except for internal fleet); - Limit the number of parking places, abandon rental of external parking places, and reuse remaining parking places for new purposes (bicycle racks, green zones); - Introduce an incremental fee (e.g. up to 5€/day)[269] for individual parking use; - Generates savings due to lower rental price for parking places (400k€/year[270] in BX) or lower building rental[271]; revenue from rental.	- Car commuters; - Based on the Commission's commuting survey in Brussels, it is assumed that 30% of daily commuters use individual cars, which corresponds to 74% of commuting emissions; - *Addressed*: Sites in urban areas (BX, LX, SE).	- Possible resistance to change mitigated with bonus/malus policy (Measure 4.5 *Implement a commuting fee*); - Generates high cost savings; - Co-benefits: reduced congestion and air quality improvement in urban area.
4.2 Improve teleworking rules and practice	This measure aims to improve teleworking practice and highlight circumstances when the net effect on GHG emissions can be positive[272]. - Analyse the (local) conditions when teleworking can be beneficial in terms of GHG emissions. This measure has to avoid supporting teleworking when rebound effects are more likely. For instance, the provision of equipment (chair, screen) has been assessed during the survey but is not suggested as the simulated rebound effect leads to a significant increase in GHG emissions.)[273]	- All staff without daily physical presence obligation; - *Addressed*: All sites. - Some sites, such as Petten, officially support teleworking development and the measure shows expectation from the staff.	- Requires legal consideration for insurance and responsibilities; - Rebound effect[277]: e.g. increase of home (non-renewable) power consumption, heating/cooling emissions and longer commuting trips and non-work-related trips;[278] - Possible feelings of isolation among staff, mitigated by good practices guidelines (see measure 1.1 *Optimise*

[269] Based on Brussels daily rates, this suggestion corresponds to approximately three hours of parking in "gray" zones. https://www.brussels.info/parking/.
[270] Budget assessment by OIB.
[271] The suggestion is to negotiate with building contractors to separate integrated parking places from existing contracts. Nevertheless, this action is considered unlikely by OIB.
[272] See 4.2.3 New ways of working in public administrations (including teleworking)
[273] This is mainly due to the LCA of IT equipment. Other institutions such as the European Parliament decided not to provide equipment.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
	- Support teleworking under certain conditions (e.g. during periods when a closure of offices is possible[274], during non-heating periods when rebound effect from home emissions is lower[275]. - Communicate on the extent to which and how teleworking can have a net positive impact on GHG emission. Transparent information about rebound effects can contribute to staff awareness raising about climate neutrality challenges. - Train managers for remote team working; - This measure is also an enabler for office space management as mentioned in measure 1.1 *Optimise office space*[276].		*office space*); - Increase of internet traffic; - Co-benefits: stress reduction.
4.3 Improve the commuting service helpdesk	This measure aims to further develop the commuting service helpdesk. - Integrate more focal points; - Organise communication campaigns about air quality and mobility (e.g. challenges); - Train staff in good practices (safe and eco-commuting); - Improve guidelines for low carbon commuting and	- All staff; - The Commission already runs a commuting service helpdesk and organises commuting events; - *Addressed*: All sites.	- Requires communication campaigns about the existence of the web desk; - Co-benefits: stress reduction, air quality improvement.

[277] See 4.2.3 New ways of working in public administrations (including teleworking)

[278] Onthe rebound effect due to an urban exodus and consequent longer commuting distances see also "La crise du COVID-19, l'aube d'une nouvelle ère pour les territoires », La Tribune, April 2020, https://www.latribune.fr/opinions/tribunes/la-crise-du-covid-19-l-aube-d-une-nouvelle-ere-pour-les-territoires-846102.html.

[274] Measure 2.1 *Close office zones during holiday periods*.

[275] During the COVID-19 crisis, a rebound effect has been reported for home heating emissions in Europe. An increase of 30% GHGH home emissions was stated (Financial Times article, "EU carbon emissions tumble during lockdowns", https://www.ft.com/content/4c59fd16-6020-4798-b8f1-5df686bbd97a . Another recent publication ("Does working from home reduce CO2 emissions? An analysis of travel patters as dictated by workplaces", Cerqueira et aland all, 2020) mentions that those working both at home and in an office may have a higher CO2 emission level than those with a single workplace under certain conditions. https://doi.org/10.1016/j.trd.2020.102338.

[276] The most obvious mitigation potential of teleworking is related to commuting but teleworking also contributes to the implementation of measures from AD#1 *Design sustainable building and working space* and AD#2~*Optimise energy assumptions and systems (*improved management of the office space and related energy consumption*)*.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
	individual counselling services (e.g. address data security and insurance).		
4.4 Improve carpooling in isolated zones	This measure aims to support carpooling under circumstances when the net benefit in terms of GHG mitigation is positive.[279] - Map carpooling opportunities depending on employees' travel means, home addresses and commuting destinations (on a voluntary basis); - Provide support for zones without public transport alternatives (rural sites and isolated zones).	- Car commuters; - Based on the Commission's commuting survey in Brussels, it is assumed that 30% of daily commuters use individual cars, which corresponds to 74% of commuting emissions. Carpooling is not used, and recent experience has not proved successful; - *Addressed*: Isolated staff from all sites.	- Requires facilitation when set up; - Requires an efficient monitoring tool; - Requires communication on co-benefits; - Favours social integration;[280] - Co-benefits: Stress reduction and air quality improvement; - Possible rebound effect.[281]
4.5 Implement a commuting fee	This measure aims to implement a mobility flat fee for all staff, without conditions,[282] to encourage mobility changes. - Implement an incremental flat fee depending on savings generated with other measures (our survey assessment suggests a 250€ annual fee)[283] and allow staff to choose how to use it; - Suggest actions for which the fee can be used, for instance to contribute to home rental for a decision to live closer to the workplace, rent a bicycle for commuting (measure 4.6 *Promote active mobility*, integrate in public transport cost, etc.).	- All staff; - *Addressed*: All sites.	- Improves feeling of fairness for employees living closer to the Commission's sites.
4.6 Promote	This measure aims to support the use of bicycles and more	- Bicycle commuters;	- Requires infrastructure investment;

[279] See Coulombel et al, 2020, "Substantial rebound effects in urban ridesharing: simulating travel decisions in Paris, France" https://hal-enpc.archives-ouvertes.fr/hal-01981292?. A rebound effect has been observed, cancelling out circa 70% of initial CO2 emissions reductions when public transport users switch to carpooling.
[280] Home-work carpooling for social mixing, Librino et al, 2019, https://doi.org/10.1007/s11116-019-10038-2.
[281] Substantial rebound effects in urban ridesharing: Simulating travel decisions in Paris, Coulombel & all, 2019, https://hal-enpc.archives-ouvertes.fr/hal-01981292.
[282] This suggestion originates from interviews with climate neutrality practitioners; the objective is to promote mobility fairness and avoid only providing subsidies.
[283] This assessment depends on economy savings generated with other commuting measures, especially measure 4.1 limit parking space and introduce parking fee.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
active mobility	generally active mobility, and focuses on some points of improvement of existing measures. - Provide floating programme (lease bicycles)[284] to staff with large bicycle diversity (cargo, folding, electric bicycles); - Improve bicycle parking access for all, including visitors (more places, also for cargo bicycles, better racks, improved security and access); - Improve facilities (showers, boxes); - A suggestion is to link this measure to measure 4.5 *Implement a commuting fee.*	- The bicycle is already promoted and used on many sites but comparison with other institutions suggests that it is possible to double the current ratio.[285] The Commission's staff also requested the use of active mobility allowance; - *Addressed*: All sites.	- Requires better security management for material and users; - Requires frequent communication campaigns; - Co-benefits: Stress reduction, improved physical conditions, air quality improvement, better commuting time management.
4.7 Install chargers for electric 2-wheeled vehicles	This measure aims to support the use of light electric vehicles. - Installation of charging points for electric 2-wheeled vehicles (bicycles, scooters);[286] - Alternative: charging points can be used for electric cars in isolated sites.	- All commuters; - The installation of electric chargers has already been initiated in Geel and Ispra for private cars. 14 places are available in Brussels for the internal fleet; - *Addressed*: All sites.	- Requires infrastructure investment; - Supports the use of light vehicles; - Co-benefits: air quality improvement.

[284] The assessment of this measure is based on existing lease programmes. Examples are Bikeyourcity https://www.bikeyourcity.be/leasing/ and KBC Brussels https://www.kbcbrussels.be/.
[285] An interview conducted with Brussels Environment reveals a feasible 20% bicycle commuters objective from 2030 for institutions, based on their observations and own experience.
[286] The measure initially aimed at all kinds of electric vehicles. ToHowever, to avoid supporting the development of car commuting, and after a discussion with OIB and DG CLIMA, the measure focuses now on electric 2-wheeled vehicles. The installation of chargers for electric cars, such as those from the internal fleet, does not have to be abandoned, but it is not the main objective of the measure.

Table 5.10: Quantitative assessment of the measures for: Design sustainable buildings and working space

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
4.1 Limit parking space and introduce parking fee	/	-4M€ (savings on parking rental and parking fee. HR monitoring cost)	30% of commuters (i.e. car commuters)	30% less parking places (from 11,000 to 7,700 places[287] in BX)	1,700 tonnes of CO2.e (switch to low-carbon commuting modes)[288]	0.6%
4.2 Improve teleworking rules and practice	0.3M€ (network capacity)[289] The cost of IT material is not assessed.[290]	0.3M€ (HR for monitoring and training)	100% of staff for whom teleworking is possible	100% of teleworking practices locally informed	Lever effect (commuting emissions avoided but risk of rebound effect[291])	Lever effect
4.3 Improve the commuting service helpdesk	/	0.1M€ (HR for monitoring and animation)[292]	100% of staff	100% staff with helpdesk available	Lever effect	Lever effect
4.4 Improve carpooling in isolated zones	/	0.3M€ (software[293] and HR for monitoring)	30% of commuters	15% of car commuters to switch to carpooling (i.e. 4% commuters)	800 tonnes of CO2.e (reduction of cars)[294]	0.3%

[287] An average assumption of 1000 rented places is considered in BXL, based on OIB idiscussions. The savings on parking rental provide for these places. The other parking places abandoned may be re-used internally for another purpose (e.g. infrastructure for bicycles).

[288] An assumption of a switch to electric public transport has been used, with a 64% mitigation factor (ratio between electric bus emission factor and standard hybrid car).

[289] The reinforcement of the network capacity has been suggested by DIGIT. An average 40-60€/staff assumption has been used. In previous assessments, the eventuality of providing equipment for the staff has been estimated, leading to an average value of 300€/staff for a screen and a chair, i.e. 11M€ investment. This is no longer considered.

[290] As mentioned in the measure description, there is no consideration of IT material provision staff in the survey because of related GHG emissions. Nevertheless, if the Commission decided to provide IT material for the staff, a cost estimation from DG DIGIT indicates 5-8M€ for an IT set (docking, screen, keyboard, mouse) for 20,000 officials, and an additional 1-2M€ yearly cost for replacement due to breakage/loss. They also mention a 1M€ yearly cost in 2020 for reinforcement (remote licences, infrastructure upgrades, internet lines, firewall services).

[291] See 4.2.3 New ways of working in public administrations (including teleworking)

[292] The consultant assumed one focal point will be needed for 50 staff and 10 staff would animate the helpdesk, on a limited part of their work time.

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
4.5 Implement a commuting fee	/	9M€ (flat fee for all staff)[295]	100% of staff	100% staff with commuting flat fee	Lever effect	/
4.6 Promote active mobility	1.5M€ (equipment)[296]	0.8M€ (lease bicycle fleet)[297]	100% of commuters	10% more bicycle commuters[298]	1,500 tonnes of CO2.e (switch to low carbon commuting modes)	0.6%
4.7 Install chargers for electric 2-wheeled vehicles	8M€ (equipment)[299]	0.5M€ (maintenance, electricity consumption)	100% of commuters	15% of car commuters to switch to electric 2W (3,700 new chargers)	1,400 tonnes of CO2.e (switch to low carbon commuting modes)[300]	0.5%

[293] An average yearly 30€/staff cost has been considered for support and eventual software needs for the staff concerned.
[294] The consultant assumed carpoolers will switch from an average occupancy rate of 1.5 passengers/car to 3 passengers/car, leading to a 50% mitigation factor.
[295] An average value of 250€/staff has been considered in the survey based on generated savings.
[296] A provision of 2,500 new bicycle racks and 370 new showers has been assumed in the survey.
[297] The consultant assumed a provision of 1,500 new bicycles (cargo, standard, folding, electric) with an average lease cost of 45-60€/month per bicycle. This cost may be paid by the Commission to provide a bicycle free for a certain period or paid by the staff and linked to measure 4.5 implement a bonus/malus fee for commuting.
[298] The assessment of 10% more commuters relies on 10% car commuters switching to bicycle and 10% public transport commuters switching to bicycle.
[299] The consultant assumed 3,700 new charging points, i.e. one charging point for every 10 staff.
[300] A recent survey conducted by Carbone 4 assesses up to 70% Gemissions reduction in Paris, with the support of light electric vehicles. "The role of e-scooters and light electric vehicles in decarbonizing cities", Carbone 4/Bird, 2019, http://www.carbone4.com/wp-content/uploads/2019/09/Carbone-4-for-Bird-E-Scooter-and-Cities-decarbonization.pdf.

3/ Mitigation potential

Commuting baseline emissions represent circa 5% of the carbon footprint of the European Commission.

The mitigation potential of this action domain is mainly related to the number of commuting trips avoided by car. As most employees in Brussels already use public transport and bicycles to commute, the mitigation potential might come from alternative lifestyle choices such as living closer to their workplace and avoiding the use of a car. This could be encouraged by the suggested commuting flat fee. For the remaining car commuters, the change of parking place policy, with the implementation of an incremental fee for parking slots, should encourage the use of car-sharing while not forbidding the use of cars for employees needing it. The reduction of parking space represents one of the highest mitigation potentials if binding targets about available parking places were to be set.

Based on these measures, the whole mitigation potential of this action domain is approximately 20%[301] of the related baseline. It corresponds to 2% of the whole Commission's carbon footprint.

4/ Related tools and frameworks

Some existing tools are the kilometre bicycle allowance and free public transport. The provision of the mobility flat fee allowing people to choose to avoid public transport and use the saved budget regardless is currently developing in Europe. One example is the city of Augsburg.[302]

Useful software to support low carbon commuting solutions exists. Some webtools allow for dedicated car-sharing groups (such as Carpool[303] or Weepil[304] in France). Bicycle GPS enables people to find secure daily trip alternatives (e.g. Bike Citizens).[305]

The COVID-19 crisis has forced staff to work from home and raised awareness of the co-benefits of avoiding commuting time every day. As the Commission allows for teleworking, it is highly likely that teleworking will develop over the coming years. However, the question of the Commission explicitly supporting teleworking needs to be addressed with care, to avoid rebound effects and other potential negative impacts on working culture. With a carefully improved teleworking policy, the Commission may have a pioneering role, providing a specific teleworking framework which would ensure the mitigation effect of the measure while fostering productivity and staff awareness.

[301] The sum of the mitigation potential equals 42% but a 50% overlapping factor is considered due to measures with overlapping mitigation action.

[302] https://www.intelligenttransport.com/transport-news/91851/germanys-first-mobility-flat-rate-starts-in-augsburg/

[303] https://www.carpool.be/fr

[304] https://www.weepil.fr/#/

[305] https://www.bikecitizens.net/

5.2.5 AD#5: Reduce purchase and consumption GHG emissions

1/ Description

The EU Green Deal states that:

Reliable, comparable and verifiable information also plays an important part in enabling buyers to make more sustainable decisions and reduces the risk of "green washing". Companies making "green claims" should substantiate these against a standard methodology to assess their impact on the environment. The Commission will step up its regulatory and non-regulatory efforts to tackle false green claims. […] Public authorities, including the EU institutions, should lead by example and ensure that their procurement is green.

The objective of this action domain is to reduce the GHG emissions of the consumption sectors for the Commission's daily activity, e.g. catering, cleaning, IT equipment and waste. The available levers apply to both in-house and procurement measures which employ existing EU Green Public Procurement (GPP) criteria and standards.

The aspects considered here in the suggested measures have an influence on different aspects of the procurement process (e.g. the origin/type/amount of food in canteens, the frequency/lifecycle/amount of IT equipment, and the environmental aspects (package, components) of purchased products).

2/ Measures already implemented in the European Commission

The Commission has already implemented or is about to implement a strong GPP policy, especially concerning the following services: catering, cleaning, building maintenance, waste collection, and office supplies. Some measures here relate to the procurement processes. All procurement contracts already contain environmental criteria but a stronger GPP policy could result from changes to the Financial Regulation that mandate carbon reduction measures in all contracts. The contractor is sometimes required to appoint an environmental coordinator, in order to discuss any issues regarding environmental criteria. However, an earlier and broader in-house consultation, drawing on the expertise of the EMAS correspondents' network and relevant desk officers, could improve the Commission's green procurement practices significantly. There is also a GPP helpdesk, whose objective is to promote and disseminate information about GPP, and to reply to any stakeholder enquiries to the Commission.

In addition, paper consumption has been greatly reduced through internal policies. Plastic use has also been addressed with internal policies and waste management has evolved through ongoing initiatives for centralised waste containers. In terms of IT management, the replacement of desktop computers with laptops is also underway.

3/ Description of proposed measures

Suggested measures in this action domain are listed below:

Table 5.11 Description of proposed measures for AD#5

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
5.1 Ban single-use plastic	This measure aims to further reduce the use of plastic in the daily activity of the Commission. - Install ban on single-use plastic in procurement; - Officially take part in local or sectoral initiatives to show leadership and commitment;[306] - Remove plastic items (e.g. cups, bottles, salad containers) and replace them with reusable items (eco-box, bottle, etc.) based on concession contracts for food catering services.	- All single-use plastic; - Based on EMAS reporting, it has been assessed that 15% of the Commission's waste emissions were due to plastic use; - Many sites already have internal policies. For instance, Geel has a plastic bottle free policy running; - *Addressed*: All sites.	- Requires evolution of green procurement criteria; - May interact with food safety concerns; - Positive impact (EU circular economy policy); - Awareness-raising among staff of environmental issues.
5.2 Optimise food order quantities	This measure aims to optimise the amount of food orders and avoid organic waste. - Enhance monitoring of meals (based on staff presence) and catering (based on events attendance); - Optimise catered food amounts for staff in the canteen and attendees in events based on close monitoring of staff presence.	- Canteen meals and events catering; - Food orders are already well monitored within the Commission. But the increase in teleworking and remote attendance may cause bigger uncertainties relative to daily presence; - *Addressed*: All sites.	- Requires update of catering order rules and monitoring of event attendance; - Avoids organic waste from food.
5.3 Promote low-carbon menus in canteens and at events	This measure aims to promote low-carbon menus. - Prioritise local, seasonal, vegetarian menus with only one meat alternative; - Provide vegetarian options for free; - Use LCA-based support tool to assess and communicate	- All meals; - The Commission already considers environmental criteria in food purchase and staff demands for more information on the origin and quality of food products. Geel, for instance, provides	- Requires communication about change of menus and dietary/gastronomic benefits; - Possible low attractivity of low-carbon menus, which can be mitigated with the support of chefs to enhance quality;[310]

[306] During interviews with practitioners, the IMS Manifesto in Luxembourg promoting a zero single-use plastic approach was mentioned as an example. https://imslux.lu/eng/news/189_ims-launches-its-zero-single-use-plastic-manifesto-join-the-movement.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
	carbon footprint of catering; - Implement sustainable catering initiatives: meat from EU and Belgium, training covering daily cooking practices based on "Cantine Good Food" label;[307] [308] - Another opportunity is to implement a price adjustment mechanism based on carbon considerations (on the model of the shadow pricing process suggested for missions).[309]	15% guaranteed organic food; - *Addressed*: All sites.	- Health co-benefits with flexitarian/vegetarian menus.
5.4 Reduce and change IT equipment	This measure aims to reduce the amount of IT equipment and switch to low-carbon IT material. - Avoid individual devices aside from screens and laptops; - Set an objective of one laptop/staff member and avoid desktop computers aside from specific needs; - Avoid individual printers and reduce the number of network printers; - This measure is an enabler for many other measures[311] and promotes remote attendance for staff, as it allows staff to take advantage of flexible work principles.	- All printers and computers; - The switch to laptops is initiated for the entire Commission. DG DIGIT adopted a shared IT devices policy in 2016 and finalises in 2020 the switch from desktops to personal laptops in all DG and agencies; - The amount of desktop printers and network printers has recently been reduced within the Commission, but numerous network printers are still available;[312] - *Addressed*: All sites.	- Requires finding the correct balance between equipment access and equipment reduction; - Cost savings on energy and device maintenance.
5.5 Optimise the lifecycle of IT	This measure aims to optimise the lifecycle of IT devices. - Prioritise IT devices meeting Ecolabel standards for energy	- All IT devices; - DIGIT already priorities Ecolabel	- Requires more human resources or contractors for repairs;

[310] Low attractivity has been mentioned in SEV for low-carbon food menus.
[307] The "Cantine Good Food" label, a specialised benchmarking tool, was validated in March 2020. https://environnement.brussels/thematiques/alimentation/restauration-et-cantines/label-cantine-good-food.
[308] The last version of the Green Public Procurement guideline (2019) already takes food quality labels into account and can be extended with more criteria.
[309] Measure 3.2 Implement a bonus/malus fee in mission booking process.
[311] Related measures: 1.1 Optimise office space, 3.1 Develop remote meeting attendance for staff, 2.1 Close office zones during holiday periods.
[312] EMAS reports one network printer for five persons on average.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
devices	performance; - Increase the average lifespan of standard IT equipment for one year;[313] - Improve procurement criteria of IT devices to account for breakdown ratio and promote upgradable components; - Contract with repair workshop.	equipment in end-user equipment procurement; - *Addressed*: All sites.	- Requires communication on best practices for device usage and maintenance; - Obsolete functionalities of long-lasting equipment might require improved security management.[314]
5.6 Establish centralised recycling and waste points	This measure aims to improve waste management through the centralisation of waste points. - Install five waste-compartment bins in offices;[315] - Improve information about waste sorting (may eventually contribute to organic waste management for biomass local boilers).	- All recycling points; - This measure is initiated in BX, as a pilot project, and is successful. Nevertheless, DG HR mentions that more effort on organic waste is required from the staff; - *Addressed*: All sites.	- Requires clear communication on recycling.
5.7 Optimise internet data consumption	This measure aims to optimise data consumption. - Train staff in the use of data compression (pictures, videos) and data archive management (digital hygiene)[316] using available guidelines; - Monitor daily internet data volumes (e.g. with integrated module);[317]	- All internet consumption; - No data monitoring is currently ongoing in the Commission; - *Addressed*: All sites.	- Requires capacity building and intensive communication efforts; - Reduces software lags due to automatic updates; - Currently difficult to estimate as no monitoring exists on internet traffic;

[313] The current IT lifecycle in EMAS is four years. ADEME suggests up to seven years. ADEME infographics "Une rentrée pour tout changer", 2017, https://www.ademe.fr/rentree-tout-changer. DIGIT also mentions that the current equipment policy sets the lifecycle of desktop and laptop PCs to 4.5 years, printers and MFDs to five years and PC monitors to six years.

[314] DG DIGIT mentions especially possible security issues with unsupported or unpatched devices.

[315] An average distance of 40 meters maximum from each workstation is suggested.

[316] Recent surveys show that internet data consumption will become one of the highest global GHG emitters in the coming years. Guidelines for digital hygiene are already available, e.g. ADEME, "La face cachée du numérique", 2019, https://www.ademe.fr/sites/default/files/assets/documents/guide-pratique-face-cachee-numerique.pdf and Energuide, "Do I emit CO2 when I surf the internet", https://www.energuide.be/en/questions-answers/do-i-emit-co2-when-i-surf-the-internet/69/.

[317] Carbonanalyser, developed by the Shift Project, provides interactive information on internet consumption. https://theshiftproject.org/carbonalyser-extension-navigateur/.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
	- Promote offline computing to limit backoffice consumption; - Monitor and limit the frequency and size of cloud storage.		- Mitigates the significant growing impact of streaming due to videoconferencing.
5.8 Develop green and collaborative procurement	This measure aims to reduce procurement-related emissions by improving procurement practices. - Implement a collaborative procurement process;[318] - Define binding green objectives (for instance 90% of products should be "green"); - Systematically use EU ecolabel and EU GPP criteria (e.g. list of criteria suggested below); - Require procurement contractors to monitor and gradually decrease their environmental impact, with incentives and/or penalties based on CO2 compensation proofs; - Implement carbon shadow price (based on OECD guidelines)[319] in procurement decisions; - This measure may be extended to any service contract or study procured by the European Commission. It could also be extended to grant agreements in EU-funded programmes.	- All procurement, subcontracting and survey contracts; - Currently, the Green Public Procurement rules are already applied within the Commission; - *Addressed*: All sites.	- Requires human resources and in-house expertise for collaborative procurement processes to improve the monitoring of contracts and optimise performance; - Can be strengthened within Financial Regulation (FR);[320] - May lead to fewer contractors and additional costs due to stringent goals, mitigated by collaborative process.

[318] See details in part 4, Analysis of relevant concepts and instruments.
[319] The environmental performance of public procurement, OECD, https://www.oecd.org/env/tools-evaluation/greenerpublicpurchasing.htm
[320] This is suggested by DG HR.

Table 5.12 Quantitative assessment of the measures for: Design sustainable buildings and working space

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
5.1 Ban single-use plastic	/	1.0M€ (communication, cost of green packaging)[321]	100% of single-use plastic	90% single-use plastic banned	300 tonnes of CO2.e (reduction of plastic emissions)[322]	0.1%
5.2 Optimise food order quantities	/	-0.2M€ (savings on meal trays)[323]	100% of canteen meals and event catering	20% reduction of food amounts	700 tonnes of CO2.e (reduction of food emissions)	0.4%
5.3 Promote low-carbon menus in canteens and events	/	-0.1M€ (cost savings on menus,[324] communication cost)	100% of canteen meals and event catering	50% more low carbon menus (to reach four meals/week)[325]	1,000 tonnes of CO2.e (switch to flexitarian/vegetarian menus)	0.4%

[321] The additional cost for switching to plastic has been considered neutral as the purchase of eco alternatives such as eco-box should cover the savings due to lower plastic consumption, based on the cost of packaging paid by the Commission. A recent BBC article "What's the real price of getting rid of plastic packaging", BBC, 2018, shows that green packaging may cost up to three times the price compared to plastic packaging. https://www.bbc.com/worklife/article/20180705-whats-the-real-price-of-getting-rid-of-plastic-packaging.

[322] This assessment is based on current EMAS reporting for plastic waste in BXL and extrapolated to all sites.

[323] The savings on reduced food order are not assessed as food is directly paid by the staff and not the Commission.

[324] The consultant assumed a 10% cost saving will apply on low-carbon menus compared to meat-inclusive menus.

[325] The consultant assumed an average of two green meals/week already in effect at this time in the Commission.

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
5.4 Reduce and change IT equipment	0.8M€ (additional cost to switch to laptops)[326]	-1M€ (savings on maintenance)	100% of IT devices	50% fewer individual printers 90% laptops instead of desktops 30% less computers[327]	3,200 tonnes of CO2.e (reduction of IT emissions, switch to laptops)[328]	1.2%
5.5 Optimise the lifecycle of IT devices	/	0.5M€ (maintenance, additional costs for better performance and savings due to lower replacement frequency)[329]	100% of IT devices	Extension of one-year lifecycle (five years).	2,700 tonnes of CO2.e (extension of lifecycles)[330]	1.0%
5.6 Establish centralised recycling and waste points	0.5M€ (waste containers)[331]	/	100% of waste points	20% more recycling 20% less waste amount	400 tonnes of CO2.e (reduction of waste emissions)	0.2%

[326] A 10% additional cost to switch from desktops to laptops has been assumed in the survey.
[327] EMAS currently reports circa 30% more computers than staff members.
[328] Emissions factors used in EMAS are 70% lower compared to emissions factors of laptops.
[329] This assessment is based on the lower replacement frequency (five years compared to four years) and a 20% increase in computer price to meet higher standards.
[330] The depreciation period of GHG emissions of IT material has been assumed to be five years.
[331] The assumption is based on one container for 20 staff with a range cost of 200-400€/container.

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope	Share of carbon footprint
5.7 Optimise internet data consumption	/	0.2M€ (information campaign & monitoring)	100% of internet consumption	30% less internet consumption[332]	Lever effect[333]	/
5.8 Develop green and collaborative procurement	/	1M€ (HR for implementation and conduction)[334]	100% of contracts	100% of contracts covered with improved procurement process	3,800 tonnes of CO2.e (improvement of environmental performance of contract)[335]	1.4%

[332] This objective appears highly uncertain as an increase of data streaming with videoconferencing is expected at the same time. DIGIT also highlights the uncertainty of the objective because of measures related to the usage of cloud and teleworking. The 30% less objective should therefore not apply to the current consumption but on a business as usual baseline, based on cloud and streaming consumption.

[333] Internet consumption is not being currently reported in EMAS, so no mitigation potential has been assessed. But a first assessment based on the Carbonanalyser GHG simulator suggests a mitigation potential of 300-500 tonnes of CO2.e.

[334] The survey assumed ten new full-time equivalent staff might be needed for the implementation of collaborative procurement. The survey does not consider the additional cost due to the potential increase in subcontracting costs mentioned by DG HR. Commission feedback suggests that this assessment may still be underestimated.

[335] This assessment appears highly uncertain as reporting on GHG emissions from contracts depends upon numerous criteria. An overall 30% mitigation factor was used to reflect the general objective of climate neutrality plans to subcontracting companies.

4/ Mitigation potential

Goods, services, contracts, food, IT and waste baseline emissions represent around 10% of the carbon footprint of the European Commission.

The mitigation potential for each scope mainly depends on the typology of purchase. Vegetarian or flexitarian menus can reach a mitigation factor of up to 50%, for instance. Some of these measures show co-benefits and lever effects for other action domains insofar as they relate to daily activity and influence mindsets and behaviours, like the zero single-use plastic target for instance, even though this represents a relatively small share of GHG baseline emissions.

The initial 2018 carbon footprint may appear lower than the reality because of the current extent of EMAS scope. Suggestions to expand the scope significantly increased the carbon footprint of the Commission during the survey, in particular in *AD#3* (event visitors) and *AD#5* (food). High uncertainty remains, however, especially for services and contracts which depend on external reporting processes.

Based on the measures, the complete mitigation potential of this action domain is approximately 52%[336] of the related baseline. It corresponds to 5% of the Commission's total carbon footprint.

5/ Related tools and frameworks

Relevant tools related to this action domain are existing guidelines provided by environmental agencies.[337] Web applications and software can also be used for sustainable challenges on an individual level with customised targets (e.g. We Act for Good).[338] Events can also be used for their leverage effect, such as vegetarian catering at events with the support of a chef, which could be organised on a regular basis.

Environmental quality is often linked to product quality, e.g. the "Cantine Good Food" label. Staff awareness about GHG mitigation can also be increased through dedicated analysis tools, with results displayed on vending machines or selling counters. One example mentioned by DG CLIMA during the survey is the food data analysis software Youmeal.[339]

Collaborative movements also contribute to the dissemination of good practice on these matters. For instance, the Zero Single-Use Plastic manifesto[340] in Luxembourg.

Finally, several ideas for improved GPP criteria are also suggested here, based on interview suggestions:

Catering:

- One non-vegetarian option only
- Offer a fully plant-based option
- Increase use of alternatives to animal proteins (e.g. soya)
- LCA assessment of ingredients (distance, production)
- Optimisation of food amount

[336] The sum of the mitigation potential equals 58% but a 90% overlapping factor is considered due to measures with overlapping mitigation action.

[337] For instance, ADEME provides general guidelines on IT, internet consumption, and paper consumption, also linked to general considerations of energy good practices in offices. "Eco-responsable au bureau", 2019, https://www.ademe.fr/ecoresponsable-bureau.

338 https://www.weactforgood.com/

[339] https://www.youmeal.io/

340 https://imslux.lu/eng/news/189_ims-launches-its-zero-single-use-plastic-manifesto-join-the-movement

IT:

- One printer/area with remote print confirm button
- Extension of IT lifecycle
- Implementation of a repair workshop service
- Online data efficiency evaluation of running software

Purchased products:

- Ecolabel certification
- LCA for each product (cleaning, office supplies)

Waste:

- Zero plastic: abolish plastic bottles and cups, as well as brown paper bags, promote eco-box for takeaway food

The Commission already works towards the implementation of these criteria, but this is an incremental and long-term process.

5.2.6 AD#6: Manage and communicate

1/ Description

A complementary set of cross-domain measures was also identified and considered important in the context of a climate neutrality action plan. Their mitigation potential has not been assessed individually as these measures essentially support the whole strategy and provide indirect mitigation potential.

The risk related to these measures is the resistance to change at all levels, but primarily at the top management level. The Commission's budget depends on the agreement of the Council and the European Parliament and this requires strong commitment and influence from Directors-General and Commissioners. In addition, a lack of transparency and preparation in the communication effort may result in misinterpretations that could jeopardise the Commission's effort. Hence, again the importance of time and communication. The communication programme should remain as open and transparent as possible, also for external partners, as some implementation challenges may find a solution with the support of peers (e.g. the Flemish administration in Brussels, the Region Bruxelles-Capitale, and national public administrations in other Member States). Good practices and experience conducted in advanced sites or DGs may also be shared, evaluated and extended to others. For instance, carbon shadow pricing and carbon budget,[341] suggested initially for the Commission's mission travel, may be extended to other sectors if it demonstrates successful results. The opportunity for the Commission relative to these measures is to take a leading role, especially if the Commission sets up innovative approaches and measures requiring top management decisions for process rules. Support from top management is crucial as some measures require modifications to internal rules which have been developed over several years in the Commission.

These measures are also suggested as part of the general recommendations for the Commission's climate neutrality strategy.[342]

2/ Measures already implemented in the European Commission

The Commission already has a dedicated directorate in charge of climate action: DG CLIMA leads the European Commission's efforts to fight climate change at EU and international level and coordinates the action with focal points in all other DGs.

The EMAS team, with the strong involvement of DG HR and OIB, has been active since 2005. EMAS provides an advanced performance management, monitoring and reporting system, and the Commission monitors its carbon footprint regularly in this context. It also shares good practice with other similar institutions.

This is a strong basis for a continuous monitoring and communication effort.

3/ Description of proposed measures

Suggested measures in this action domain are listed below:

[341] Measures 3.2 Implement a bonus/malus fee in mission booking process and 3.3 Implement carbon threshold on mission.
[342] See next section.

Table 5.13 Description of proposed measures for AD#6

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
6.1 Exchange and cooperate with peers	This measure aims to ensure that the climate neutrality strategy is communicated to every ecosystemic partner and peer it may interact with. - Engage with geographically clustered organisations or similar organisations, local authorities, national authorities, and service contractors; - Take part in existing initiatives related to climate neutrality;[343] - Get inspiration from GIME-type activities or existing common carbon reduction projects;[344] - Communicate on achievements and obstacles, in a transparent way;	- All; - DG CLIMA already oversees the animation of communication events; EMAS already brings together similar European institutions following the same objective; - *Addressed:* All sites.	- Facilitates collective actions through transparent communication
6.2 Conduct frequent feedback surveys	This measure aims to ensure a constant feedback loop with the staff. - Organise annual feedback and monitoring surveys covering all domains, all sites and DGs; - Provide an exchange platform with a clear transparent process of idea generation and implementation; - Integrate staff suggestions;[345] - Designate local focal points for the climate neutrality strategy.	- All; - The Commission already communicates with the staff, provides training and implements satisfaction surveys or consumption surveys (e.g. for commuting); - *Addressed:* All sites.	- Requires local focal points; - Generates commitment and encourages collaborative change; - Provides bottom-up improvement ideas; - Allows the identification and address of main issues.
6.3 Provide guidance and	This measure aims to improve the guidance and reporting	- All;	- Eases reporting on individual efforts;

[343] Existing initiatives such as Net Zero already provide lists of events and thematic workshops and share the latest GHG accounting framework evolution. http://www.netzero-initiative.com/fr

[344] For instance, the Clim Foot project (https://www.climfoot-project.eu/), funded by the LIFE 2014-2020 programme, aims to collect useful data to provide tool boxes for decision makers about climate neutrality strategies.

[345] The EUStaff4Climate initiative produces recommendations for numerous sectors (food, mobility, commuting and energy).) which can be investigated with staff and included in surveys to improve mitigation measures.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
reporting tools	process. - Develop clear guidance with general objectives summarised on briefing sheets; - Improve reporting tools, declarations of energy and goods consumption on dedicated platforms.	- The reporting process is already managed by EMAS but improvement is possible to ease and improve reporting accuracy;[346] - Guidance documents will facilitate continuous effort and also support the implementation of measures throughout all DGs and sites (beyond Brussels); - *Addressed*: All sites.	- Eases monitoring of GHG reductions; - Mitigates the risk of top management change.[347]
6.4 Promote good practices	This measure aims to promote initiatives and good practices observed in the Commission. - Communicate internally on benefits and co-benefits (for instance health co-benefits such as the air quality impact[348] in Brussels); - Promote good practices in an annual event;[349] - Financial rewards for existing practices can be provided using money generated via carbon shadow prices or internal carbon tax.	- All; - EMAS already reports numerous internal initiatives (>500). The Commission already use events to promote the co-benefits of the mitigation strategy (e.g. VéloMai) but may extend this communication to other areas (productive time, stress reduction, biodiversity protection); - *Addressed*: All sites.	- Requires defining the right balance between enthusiasm and fatalism, as the climate change topic may generate weariness or anxiety among the target population.
6.5 Break down targets	This measure aims to refine climate neutrality targets on a smaller scale, to consider specificities. - Conduct additional surveys in each site (and possibly DGs/buildings) to assess the feasibility of each measure, refine	- All; - *Addressed*: All sites.	- Improves the monitoring of measures advancement; - Considers site specificities and limitations;[350]

[346] General recommendations for EMAS monitoring improvement are also provided with this report.
[347] A main risk of failure mentioned during interviews with practitioners is top management change. Many interviewees suggest having the generic objectives clearly defined in briefing sheets.
[348] For instance, Be Mobilmix provides air quality information. https://www.mobilmix.brussels/fr/qualite-de-lair
[349] Societe Generale, which answered one of our interviews during the survey, mentions the fact that they introduced an internal carbon tax in 2011. They use the money generated through this to finance existing internal good practices which are presented during an annual event; more details in the aforementioned concept review.
[350] At a certain level, site specificities have been considered in the survey. But each site and each building being different, a discussion is needed with site managers to assess the under- or over-estimation of each target. Example of specificities may include variations in public transport access, availability of biogas suppliers, or building energy performance.

Measure label	Description	Applicability to the Commission	Key drivers (incl. co-benefits)
	objectives and set milestones; - Introduce a weighting process in the downscaling of targets to allow for down- and upsizing of each objective; - Rely on carbon budgets and individual carbon performance for reporting. In the eventuality of the setup of carbon budget and carbon fee, downscaling also allows for better clustering of the objectives and sets differentiated levels of ambition.		- Better clustering of the objectives and differentiated levels of ambition for each site and each year; - Mitigates the risk of non-commitment.
6.6 Provide GHG monitoring system and tools	This measure aims to acquire decision-making support tools. - Benchmark carbon simulators in each domain,[351] in parallel with suggested carbon process reporting improvement suggested in the measure;[352] suggested sectors: travel simulators, event carbon footprint simulator,[353] food environmental footprint analysis; - Enhance existing monitoring system to allow for overall monitoring, reporting and verification of the climate neutrality strategy.	- All; - These tools are often already used by individuals and not disseminated; - *Addressed*: All sites.	- Requires analysis to find the correct balance between tool intuitiveness and consistency with Commission activity;[354] - Improves performance management and decision making.

[351] Some suggestions are provided in this survey. But a dedicated fine analysis is needed to analyse the correct match between existing Commission processes and the specificities of each simulator or tool.
[352] An obvious example is the use of carbon and door to door travel time simulators which can be explored in parallel with suggested improvements to the booking system (measure 3.4 Improve booking criteria for missions)).
[353] Myclimate, event calculator, https://co2.myclimate.org/fr/event_calculators/new.
[354] For instance, these GHG monitoring tools may be integrated ininto Green Public Procurement to ease the monitoring of contracts.

Table 5.14: Quantitative assessment of the measures for: Design sustainable buildings and working space

Measure	Capital expenditure (average CAPEX)	Yearly operating cost (average OPEX)	Applicability to the Commission (2030)	Objective (2030)	Yearly mitigation potential for the related scope
6.1 Exchange and cooperate with peers	/	0.4M€ (event & HR for communication)	100% of staff	Increase the number of communication events (one annual main event)	Lever effect
6.2 Conduct frequent feedback surveys	/	0.2M€ (online survey & HR for management)	100% of staff	Increase of sectors and sites covered with annual feedback surveys (100%)	
6.3 Provide guidance and reporting tools	/	0.1M€ (HR for monitoring)	100% of staff	Improvement of the guidance process (briefing sheet available, reporting platform)	
6.4 Promote good practices	/	0.2M€ (event & HR for communication)	100% of staff	Increase of sectors and sites covered with good practices communication (100%), one annual event	
6.5 Break down targets	0.8M€ (contractors' mission)	0.1M€ (HR for monitoring)	100% of staff	Improvement of the downscaling granularity for targets (building/DG scale)	
6.6 Provide GHG monitoring system and tools	0.3M€ (software development)[355]	0.1M€ (HR for monitoring)	100% of staff	Increase of sectors and sites covered with GHG monitoring tools (100%)	

[355] A provision of 200-300k€ has been assumed in case of requested software adaptation to existing monitoring tools.

5.3 Analysis of mitigation measures

This section presents an analysis of the proposed measures based on their mitigation potential, cost-efficiency, level of investment and implementation period. We choose these indicators because we believe they matter most in the choice of measures and the planning of their implementation.

Measures are assessed based on the estimates provided in this chapter and in the analytical grid available in Appendix 5 (Analytical grid). This assessment is subject to a certain level of uncertainty that is estimated in a transparent way in the description of measures.

5.3.1 Mitigation potential

The mitigation potential of a measure is the tonnes of CO2.e avoided on an annual basis by the measure, in comparison with a business as usual figure based on the 2018 carbon footprint.

The table below presents the ten measures with the highest mitigation potential (at least 1.5% of the 2018 carbon footprint).

Table 5.15 Ranking of measures with the highest mitigation potential

Code	*Measure (short label)*	*Yearly mitigation potential by 2030 (tonnes of CO2.e)*	*Share of initial carbon footprint*
3.5	Develop remote meeting attendance and promote low carbon travel for visitors	34,900	13.4%
3.1	Develop remote meeting attendance for staff through enhanced videoconference facilities	22,800	8.8%
2.10	Use new fuel sources for heating	10,100	3.9%
1.1	Optimise office space	8,900	3.4%
3.2	Implement a bonus/malus fee in mission booking process	7,900	3.0%
2.6	Optimise energy systems at replacement time	7,100	2.7%
2.11	Purchase green electricity for all sites	7,000	2.7%
1.5	Relocate to green and sustainable buildings	6,200	2.4%
2.12	Switch to heat pumps	5,300	2.0%
2.2	Optimise energy regulation systems	4,500	1.7%

5.3.2 Cost-efficiency

The cost efficiency of a measure is the cost per tonne of CO2 equivalent avoided for the measure (€/tonne of CO2.e). This indicator may be negative or positive, depending on the annual cost or savings. It also depends on the depreciation period.[356]

The tables below present the 10 measures with the highest and lowest cost efficiency (lowest and highest €/tonne of CO2.e).

[356] The CAPEX depreciation period is considered in the €/tonne of CO2.e computation, to reflect different measure depreciation periods (e.g. measure 1.1 Optimise office space has a 15-year depreciation period while measure 3.1 Develop remote meeting attendance for staff has a 5-year depreciation period).

Table 5.16 Ranking of measures with the highest cost efficiency

Code	Measure (short label)	Yearly CAPEX+OPEX (M€)	Yearly mitigation potential by 2030 (tonnes of CO2.e)	€/tonne of CO2.e
1.1	Optimise office space	-25.4	8,900	-2,850
4.1	Limit parking space and introduce parking fee	-4.3	1,700	-2,590
3.7	Implement priority rules for the purchase of economy class flight tickets	-3.7	3,300	-1,120
3.1	Develop remote meeting attendance for staff through enhanced videoconference facilities	-21.8	22,800	-960
2.1	Close offices during holiday periods	-0.6	600	-940
2.8	Install on-site PV production	-0.5	600	-840
2.6	Optimise energy systems at replacement time	-5.0	7,100	-710
1.2	Improve meeting room occupancy	-0.2	500	-450
2.4	Communicate on energy consumption and behaviours	-1.2	2,800	-430

Table 5.17 Ranking of measures with the lowest cost efficiency

Code	Measure (*short* label)	Yearly CAPEX+OPEX (M€)	Yearly mitigation potential by 2030 (tonnes of CO2.e)	€/tonne of CO2.e
5.1	Ban single-use plastic	1.8	300	3,980
2.3	Improve building insulation and passive protection	3.7	1,300	2,880
2.9	Use cloud computing services	0.9	400	2,390
4.7	Install chargers for electric 2-wheeled vehicles	2.1	1,400	1,480
1.3	Use low-carbon material in construction and renovation	1.6	2,500	660
4.6	Promote active mobility	1.0	1,500	630
3.6	Implement mandatory train transport up to a set distance	0.6	1,100	550
1.5	Relocate to green and sustainable buildings	3.0	6,200	490
5.6	Install centralised recycling and waste points	0.2	400	450

5.3.3 Level of investment

The level of investment of a measure is the initial capital expenditure (CAPEX) necessary for a measure to be implemented. The investment depreciation periods considered correspond to standard accounting depreciation periods.

The table below presents the ten measures with the highest levels of investment.

Table 5.18 Ranking of the 10 measures with the highest CAPEX

Code	*Measure (short label)*	*Depreciation period (years)*	*CAPEX (M€)*
1.1	Optimise office space	15	407
2.3	Improve building insulation and passive protection	20	85
1.3	Use low-carbon material in construction and renovation	20	32
2.8	Install on-site PV production	20	13
2.7	Install on-site renewable energy production for heating/cooling	20	12
2.9	Use cloud computing services	3	9
3.1	Develop remote meeting attendance for staff through enhanced videoconference facilities	5	9
4.7	Install chargers for electric 2-wheeled vehicles	10	8
2.12	Switch to heat pumps	15	7

5.3.4 Planning

The planning of a measure refers to implementation steps and the time necessary for a measure to reach its full potential after a decision has been made to implement it. It accounts for a start date,[357] preparation period[358] and implementation period.[359]

The table below presents measures with the longest duration of implementation (preparation + implementation period >= 5 years).[360] The reasons behind this are mostly related to the complexity of the measures both in terms of design and financing. Additionally, building management contracts often create long implementation periods, as contract deadlines must be respected before changes can be made.[361] These periods shed light on the challenges ahead and the necessity for quick decisions and early planning. They suggest possible interdependencies between measures (e.g. measure 1.2 *Improve meeting room occupancy* is assumed to have a long implementation period, consistent with the implementation of measure 1.1 *Optimise office space*).

[357] Date when a measure is being prepared by the relevant service of the European Commission.
[358] Period in which all the relevant preparatory work is done, ahead of the implementation.
[359] Number of years needed for a measure to reach its objective.
[360] The definitions of implementation and preparation periods are provided in the note "Methodology for scenario build up".
[361] Uncertainties regarding contract management and contract update may cause delay for the implementation of some measures. Therefore, the implementation plan must consider prioritising site buildings with lower uncertainties. This especially concerns measure 1.1 optimise office space.

Table 5.19 List of measures with the longest implementation duration (>= 5 years)

Code	*Measure (short label)*	*Preparation period (years)*	*Implementation period (years)*	*Preparation + implementation*
1.1	Optimise office space	2	7	9
2.3	Improve building insulation and passive protection	4	5	9
1.3	Use low-carbon material in construction and renovation	2	7	9
2.7	Install on-site renewable energy production for heating/cooling	3	6	9
3.1	Develop remote meeting attendance for staff	2	7	9
2.12	Switch to heat pumps	1	8	9
2.2	Optimise energy regulation systems	1	8	9
1.5	Relocate to green and sustainable buildings	3	6	9
2.6	Optimise energy systems at replacement time	1	8	9
1.2	Improve meeting room occupancy	2	7	9
4.1	Limit parking space and introduce parking fee	1	6	7
4.5	Implement a commuting fee	1	6	7
4.7	Install chargers for electric 2-wheeled vehicles	1	5	6
2.8	Install on-site PV production	2	3	5
1.4	Increase vegetation in the built environment	2	3	5
5.4	Reduce and change IT equipment	1	4	5

Table 5.20 presents measures with a short duration of implementation (preparation + implementation period <= 3 years). These measures have the swiftest impact, as they rely on internal policies, the scaling up of existing initiatives, or the provision of information.

Table 5.20 List of measures with the shortest implementation duration (preparation + implementation <= 3 years)

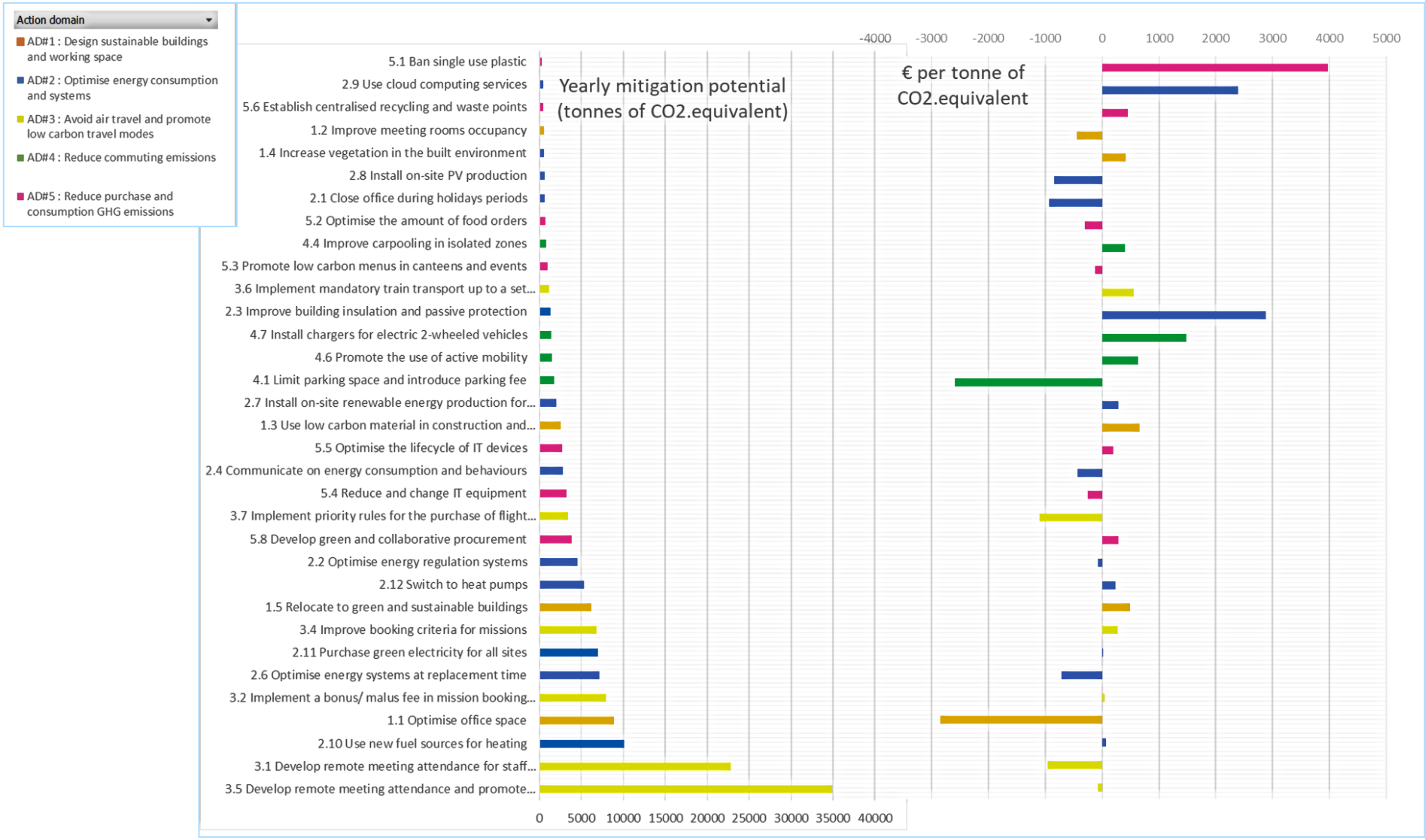
Code	*Measure (short label)*	*Preparation period (years)*	*Implementation period (years)*	*Preparation + implementation (years)*
5.6	Install centralised recycling and waste points	1	1	2
6.5	Break down targets	1	1	2
3.6	Implement mandatory train transport	1	1	2
3.7	Implement priority rules for the purchase of economy class flight tickets	1	1	2
4.3	Improve the commuting service helpdesk	1	1	2
5.1	Ban single-use plastic	1	1	2
5.2	Optimise food order quantities	1	1	2
5.3	Promote low-carbon menus	1	1	2
5.5	Optimise the lifecycle of IT devices	1	1	2
6.1	Exchange and cooperate with peers	1	1	2
6.2	Conduct frequent feedback surveys	1	1	2
6.3	Provide guidance and reporting tools	1	1	2
6.4	Promote good practices	1	1	2
6.6	Provide GHG monitoring tools	1	1	2
4.6	Promote active mobility	1	2	3
2.1	Close offices during holiday periods	1	2	3

5.3.5 Summary

Figure 5.1 illustrates all measures with their respective mitigation potential and cost efficiency ratio (€/tonne of CO2.e)[362]. It shows that there is great variety between all measures. It also shows that the two key indicators are not correlated.

[362] The measures with a mitigation potential considered as "lever effect" do not appear because they do not have an estimated CO2 mitigation potential.

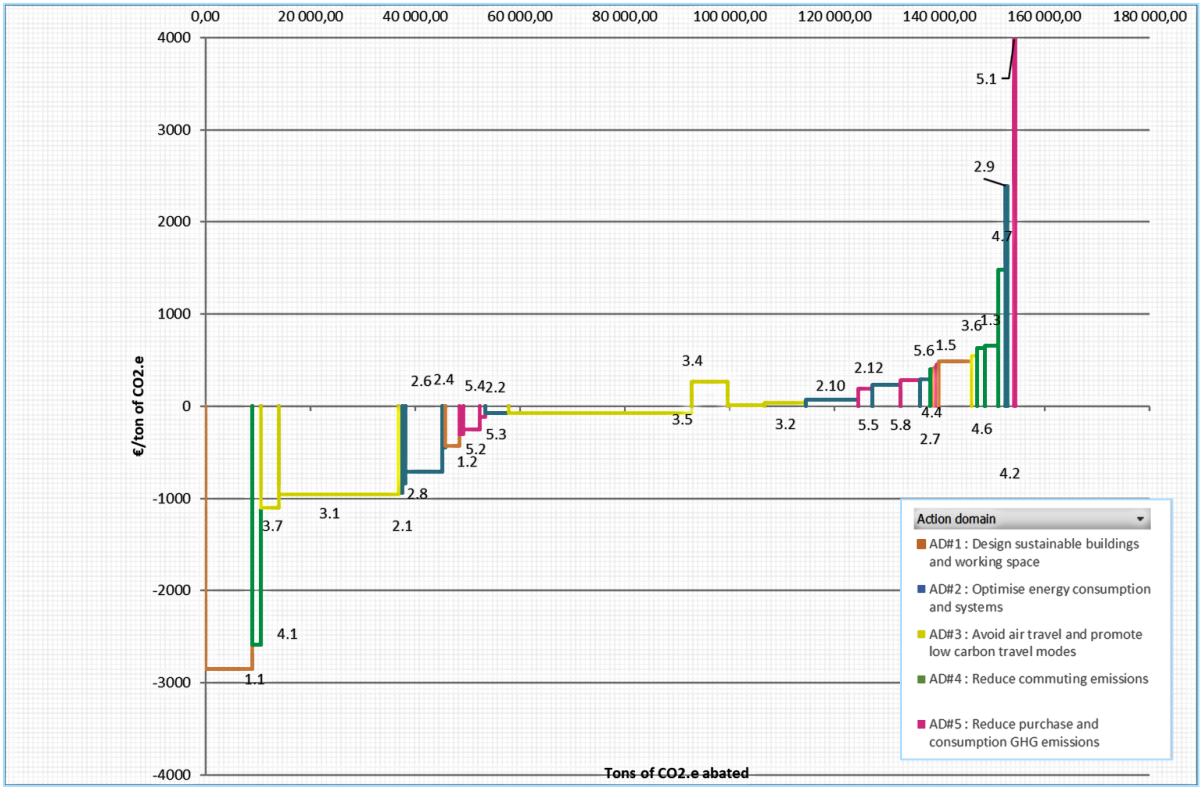
Figure 5.1 Ranking of measures based on their mitigation potential in tonnes of CO2.equivalent (left) and €/tonne of CO2.equivalent (right)



5.3.6 A standard framework for prioritisation: the MACC curves

A marginal abatement cost curve (MACC) is an estimate of the volume and costs of opportunities to reduce emissions in a given year. Each box on the curve represents a given opportunity to reduce emissions.

Figure 5.2 Marginal abatement cost curves for all action domains and measures from least to most costly measure (except AD6)



The figure above shows both mitigation potential (X-axis, tonnes of CO2.equivalent abated) and budgetary performance (Y-axis, €/tonne of CO2.equivalent per year). Most of the mitigation potential is covered by the measures of *AD#1 Design sustainable buildings and working space* (in brown), *AD#2 Optimise energy consumption and system* (in blue) and *AD#3 Avoid air travel and promote low-carbon travel modes* (in yellow). As mentioned earlier, note that this analysis does not account for dynamic interactions between measures.[363]

Positive and negative carbon-budget performance appears in each action domain, suggesting that a certain budget balance can be found between measures in each action domain (this will be further investigated in the scenarios), providing opportunities to respect budget limitations.

Some action domains show savings (especially AD#1 *Design sustainable buildings and working space* and AD#3 *Avoid air travel and promote low-carbon travel modes*), while others such as AD#2 *Optimise energy consumption and systems* require high investment. This suggests that budget reallocations may be needed, especially for the building sector. The implementation of these measures can be distributed over ten years or more to avoid incurring important

[363] For instance, using 100% biogas instead of natural gas (measure 2.10) may offer a very high mitigation potential, but if this choice was made, the mitigation potential of other measures based on gas consumption (insulation, regulation of energy systems, energy performance) would then have a negligible mitigation potential as the initial carbon footprint of gas consumption would also be negligible in the carbon accounting process.

investments over a short period. It also requires further analysis to assess to what extent the current contracts with building owners might constitute an obstacle.

For the climate neutrality strategy of the Commission, most of the measures identified are needed to reach a high level of ambition. The use of the MACC curve is therefore limited, and we propose below an alternative framework which helps to prioritise and plan the implementation of the measures.

5.3.7 Alternative framework for measure prioritising and planning

Based on the lists of measures and criteria, four categories of measures are suggested here:

- Category 1: Low hanging fruit
- Category 2: Lever effect
- Category 3: More preparation needed
- Category 4: other

Category 1: Low hanging fruit

This category gathers measures with short implementation periods, that are low cost (with potential cost savings in some cases), and that provide significant mitigation potential.

The criteria considered here are the following:

- Low initial investment (CAPEX < 1,5M€);
- Yearly mitigation potential >500 tonnes of CO2.e;
- Implementation period<5 years.

This category includes **15 measures**.[364]

These measures can be initiated quickly, are considered highly strategic for the climate neutrality strategy, and will be considered in the first steps of the scenarios.

[364] The measures relating to the procurement of new energy sources (green electricity and biogas) match these criteria but are considered differently due to their specificities, see other measures.

Table 5.3. Measures in category 1 "Low hanging fruit"

Measure	***Yearly mitigation potential by 2030 (tonnes of CO2.e)***	***€/tonne of CO2.e***
3.5 Develop remote meeting attendance and promote low carbon travel for visitors	34,900	-70
3.2 Implement a bonus/malus fee in mission booking process	7,900	40
3.4 Improve booking criteria for missions	6,800	270
5.8 Develop green and collaborative procurement	3,800	280
3.7 Implement priority rules for the purchase of economy class flight tickets	3,300	-1,120
5.4 Reduce and change IT equipment	3,200	-250
2.4 Communicate on energy consumption and behaviours	2,800	-430
5.5 Optimise the lifecycle of IT devices	2,700	190
4.1 Limit parking space and introduce a parking fee	1,700	-2,590
4.6 Promote active mobility	1,500	630
3.6 Implement mandatory train transport up to a set distance	1,100	550
5.3 Promote low-carbon menus in canteens and events	1,000	-120
5.2 Optimise food order quantities	700	-300
2.1 Close offices during holiday periods	600	-940
1.2 Improve meeting room occupancy	500	-450

Although these measures have an apparently simpler implementation process, they may require strong management support. For instance, *4.1 Limit parking space and introduce a parking fee* shows high mitigation potential against low investment. But it requires top management support to avoid resistance to change from the staff and the implementation period has therefore been extended to consider possible implementation obstacles. Nevertheless, the measure is strategically desirable as it connects to other measures (Measure 4.5 Implement a commuting fee) and has a high symbolic value for the climate neutrality strategy, besides its mitigation potential.

Category 2: Lever effect

This category gathers measures which do not allow for savings but can be enablers for other measures or have a specific relevance to public image, despite providing relatively limited mitigation potential.

The criteria considered here are the following ones:

- Low initial investment (CAPEX<1,5M€);
- Yearly mitigation potential <500 tonnes of CO2.e or lever effect;
- Implementation period<5 years.

This category includes **12 measures**.

These measures are considered necessary to support the overall strategy (especially measures from AD#6) and the implementation of other measures with higher mitigation potential. Their implementation is subject to budget availabilities.

Figure 5.3 Measures from category 2 "Lever effect"

Measure	***Yearly mitigation potential by 2030 (tonnes of CO2.e)***	***€/tonne of CO2.e***
5.1 Ban single-use plastic	300	3,980
5.6 Install centralised recycling and waste points	400	450
2.5 Conduct internal energy audits	Lever effect	n/a
3.3 Implement carbon threshold on mission	Lever effect	n/a
4.3 Improve the commuting service helpdesk	Lever effect	n/a
5.7 Optimise internet data consumption	Lever effect	n/a
6.1 Exchange and cooperate with peers	Lever effect	n/a
6.2 Conduct frequent feedback surveys	Lever effect	n/a
6.3 Provide guidance and reporting tools	Lever effect	n/a
6.4 Promote good practices	Lever effect	n/a
6.5 Break down targets	Lever effect	n/a
6.6 Provide GHG monitoring tools	Lever effect	n/a

Category 3: More preparation needed

This category assembles measures with a high mitigation potential for which a specific effort is needed, either in terms of investment support (possibly involving the Budget Authority) or in planning (complex implementation which requires feasibility surveys).

The criteria considered here are the following:

- High investment needed (CAPEX>1,5M€);
- Preparation + implementation period > 5y;
- Yearly mitigation potential >1000 tonnes of CO2.e.

This category includes **10 measures**.

They are considered strategically crucial in the scenarios but require some individual refinement concerning their objectives in order to consider budgetary or technical constraints, depending on the scenario.

Table 5.21 Measures from category 3 "More preparation needed"

Measure	***Yearly mitigation potential by 2030 (tonnes of CO2.e)***	***€/tonne of CO2.e***
3.1 Develop remote meeting attendance for staff through enhanced videoconference facilities[365]	22,800	-960
1.1 Optimise office space	8,900	-2,850
2.6 Optimise energy systems at replacement time	7,100	-710
1.5 Relocate to green and sustainable buildings	6,200	490
2.12 Switch to heat pumps	5,300	230
2.2 Optimise energy regulation systems	4,500	-70
1.3 Use low-carbon material in construction and renovation	2,500	660
2.7 Install on-site renewable energy production for heating/cooling	2,000	290
4.7 Install chargers for electric 2-wheeled vehicles	1,400	1,480
2.3 Improve building insulation and passive protection	1,300	2,880

Category 4: other measures

The remaining **eight measures** are not categorised. They will be considered individually in the scenario definition because of their specificities.

Measure 1.4 Increase vegetation in the built environment and *measure 2.8 Install on-site PV production* show limited mitigation potential but this is mainly because they offer energy savings based on electricity consumption, for which mitigation potential is currently considered negligible due to existing green electricity contracts (in the case of PV panels installed on sites with green electricity) or difficult to assess (energy saving with better albedo thanks to vegetation). They offer strong co-benefits,[366] and the measures can therefore be considered highly strategic. As detailed in the previous section,[367] on-site PV allows for better control of energy costs and lower energy losses, and is in line with renewable energy consumption targets. Building vegetation has an impact on wellbeing, urban heat island reduction, biodiversity protection and energy consumption reduction, especially in summer.

Some measures show a high level of uncertainty and were called for discussion during the survey, as counterproductive impacts may occur, with rebound effects. These require further analysis to find the correct modalities for implementation, ensuring they offer positive impacts on carbon mitigation. This is the case for measures 4.2 *Improve teleworking rules and practice* and 4.4 *Improve carpooling in isolated zones* for which several warnings have been rightly addressed during the survey by DG CLIMA.

Measure 4.2 Improve teleworking rules and practice requires attention and further analysis. During the survey, the net benefits regarding GHG emissions were difficult to demonstrate at the scale of the Commission. On the one hand, and even more so after the COVID-19 crisis,

[365] DG CLIMA and DG HR suggested that this measure should be taken in consideration in category 1 "low hanging fruit". This consideration depends on the fact that new videoconference facilities and equipment are considered in the measure. Nevertheless, the measure component focusing on the integration of improved videoconferencing software based on existing facilities may indeed be considered as low hanging fruit.

[366] As detailed in the measure's description, on-site PV enables better control of energy costs, lower energy loss, and is in line with renewable energy consumption targets. Building vegetation has an impact on wellbeing, urban heat island reduction, biodiversity protection and energy consumption reduction, especially in summer.

[367] Proposed actions for a climate neutral Commission.

teleworking is popular with staff for its co-benefits in terms of work-life balance.[368] On the other hand, COVID-19 also shows that, if commuting GHG emissions are drastically reduced, household GHG emissions increase significantly because of home heating and energy consumption.[369] Morevover numerous uncertainties regarding rebound effects have to be considered[370]. So it is difficult to draw a clear line for the use of teleworking in the Commission in all sites (some sites are in urban areas, others not, some staff live in energy efficient homes, while others do not, etc.).). The consultant recommends keeping teleworking as a lever but not necessarily engaging in active policy support, and instead continuing to follow current Commission policy (which already allows for two days of teleworking), as well as providing site by site information about teleworking GHG mitigation benefits to staff, depending on conditions.

Finally, *Measure 2.10 Use new fuel sources* and *Measure 2.11 Purchase green electricity* are also categorised differently. Even though they provide significant mitigation potential and are part of the Commission's Greenovate approach, the implementation of these measures is considered as the final step of the climate neutral strategy and their implementation effort will closely depend on the available budget. Accounting for purchased green electricity or synthetic fuels without an assurance of their additionality is problematic, as it disincentivises energy saving.

5.3.8 Conclusion

Some measures appear to be "low hanging fruit", with considerable mitigation potential and cost benefits and very low investment needed. Top management support is needed to initiate the modification of internal rules.[371] Top management exemplarity is also needed, as these measures rely on behavioural aspects to reach their optimum mitigation potential. Measures with a lever effect, despite being costly, support the implementation of other measures with higher mitigation potential. They either focus directly on behavioural aspects or provide technical guidance for the implementation of the climate neutrality strategy. Measures which require further analysis to support their implementation, either for technical feasibility, contractual feasibility or planning, can be compared with internal strategies to adjust the levels of applicability and ambition.

Our **recommendations** are the following:

- Begin by implementing category 1 and category 2, as these measures are **less costly and provide good results**, either in terms of mitigation potential (category 1) or awareness raising (category 2);
- Initiate planning for category 3 measures with **more complex implementation and budget management**;
- Consider category 4 measures **individually** and rely on the prioritisation framework: avoid/reduce/compensate/greenovate.[372]

[368] According to a PGI (provider of software services) 2014 survey, 80% of remote workers report higher morale. https://www.pgi.com/blog/2014/03/telework-week-survey/.

[369] An increase of 30% GHGH home emissions has been estimated in a Financial Times article, "EU carbon emissions tumble during lockdowns", https://www.ft.com/content/4c59fd16-6020-4798-b8f1-5df686bbd97a. Another recent publication ("Does working from home reduce CO2 emissions? An analysis of travel patterns as dictated by workplaces", Cerqueira et al, 2020) mentions that those working both at home and in an office may have a higher CO2 emissions level than those with a single workplace under certain conditions. https://doi.org/10.1016/j.trd.2020.102338.

[370] See 4.2.3 New ways of working in public administrations (including teleworking)

[371] Ee.g. in conjunction relation with measure 3.2 implement a bonus/ malus carbon fee for travel.

[372] As a reminder, the survey was conducted while considering a simple prioritisation framework. : first, avoid dispensable consumption and activity. ; second, reduce energy needs with energy efficiency solutions or low-carbon alternatives; and finally, compensate, i.e. offset and remove carbon. The Commission also adds the "Greenovate" aspect to this framework, which suggests focusing on green innovation first movers.

This individual categorisation provides initial guidance, but additional conclusions are provided in the next sections with scenarios, which consider links between measures.

5.4 Offsetting and carbon removal credits

Offsetting comes at the lowest priority level of a GHG neutrality strategy. Offsetting carbon emissions can be perceived as an easy and cheap way to claim carbon or climate neutrality without achieving any in-house GHG emissions reduction. Therefore, it should compensate only for those emissions that cannot be avoided or reduced, and it needs to be well prepared. If the offsetting policy of an institution appears to be questionable, it can be considered a high risk for the communication of the climate neutrality target and a demotivating factor for the staff.

However, reaching zero emissions for the Commission is not possible (for reaching a state of zero emissions, the European Commission would have to stop all activities and cease to exist), so carbon offsetting emissions is necessary to reach climate neutrality. Chapter 8 analyses a scenario of 65% in-house GHG emissions reduction, which according to our analysis and consultation with the European Commission services, is the highest level of emissions reduction that would be achievable by 2030. This means that at least 35% residual emissions must be offset to reach climate neutrality.

The present section defines offsetting and elaborates on general "good" offsetting principles, project cycles, standards and approaches. It also highlights potential risks pertaining to offsetting and carbon removal credits, including double counting in the post-2020 considerations and reputational risks.

5.4.1 Definition

Carbon neutrality is the result of "a transparent process of calculating emissions, reducing those emissions and offsetting residual emissions so that net carbon emissions equal zero", according to the PAS 2060 Norm, from the British Standard Institute. PAS 2060 is the norm that defines the specifications for the demonstration of carbon neutrality.

An offset is a reduction in emissions of greenhouse gases made in order to compensate for emissions made elsewhere. It is based on the fact that one tonne of CO_2 equivalent causes the same effect, no matter where it is emitted. Offsetting can be used at organisational level (full scope), at product or service level (for example, paper) or for a specific event.

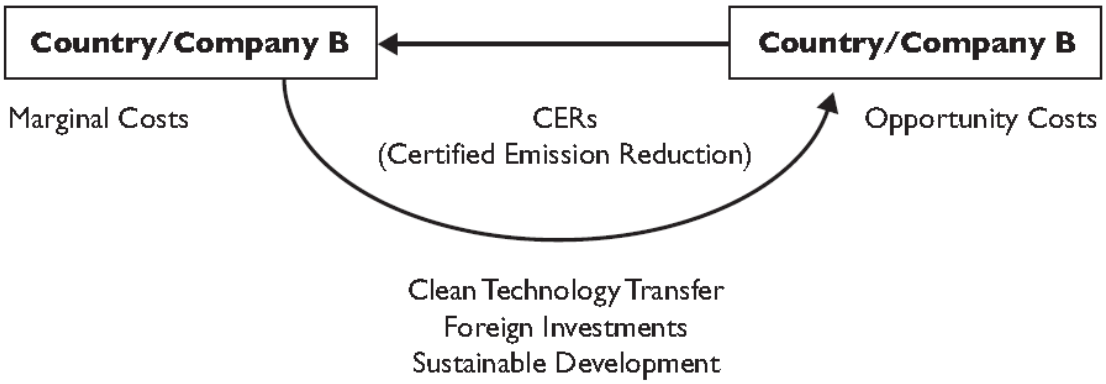
High quality standards (such as the Gold Standard) advocate that organisations should reduce their own carbon footprint in line with the science, before considering offsetting, in order to claim carbon neutrality and reach a global carbon neutral state.

Project cycle

Offsetting relies on the implementation of projects that result in a net reduction or removal/sequestration of GHG entering the atmosphere. These projects receive CO2 reduction **credits** for the emissions reductions they create, i.e. for each tonne of CO_2 equivalent reduced by a project compared to a "Business as Usual" (BAU) scenario[373], over a certain period of time ("crediting period"), a carbon credit is created. These carbon emissions reduction credits are **certified** by a voluntary standard (Gold Standard, VERRA, Plan Vivo, etc.).

[373] The choice and the robustness of the baseline is ensured by the carbon standard. It might become more stringent in the future in order to better reflect a carbon neutral trajectory.

Figure 5.4 Principle of offsetting projects



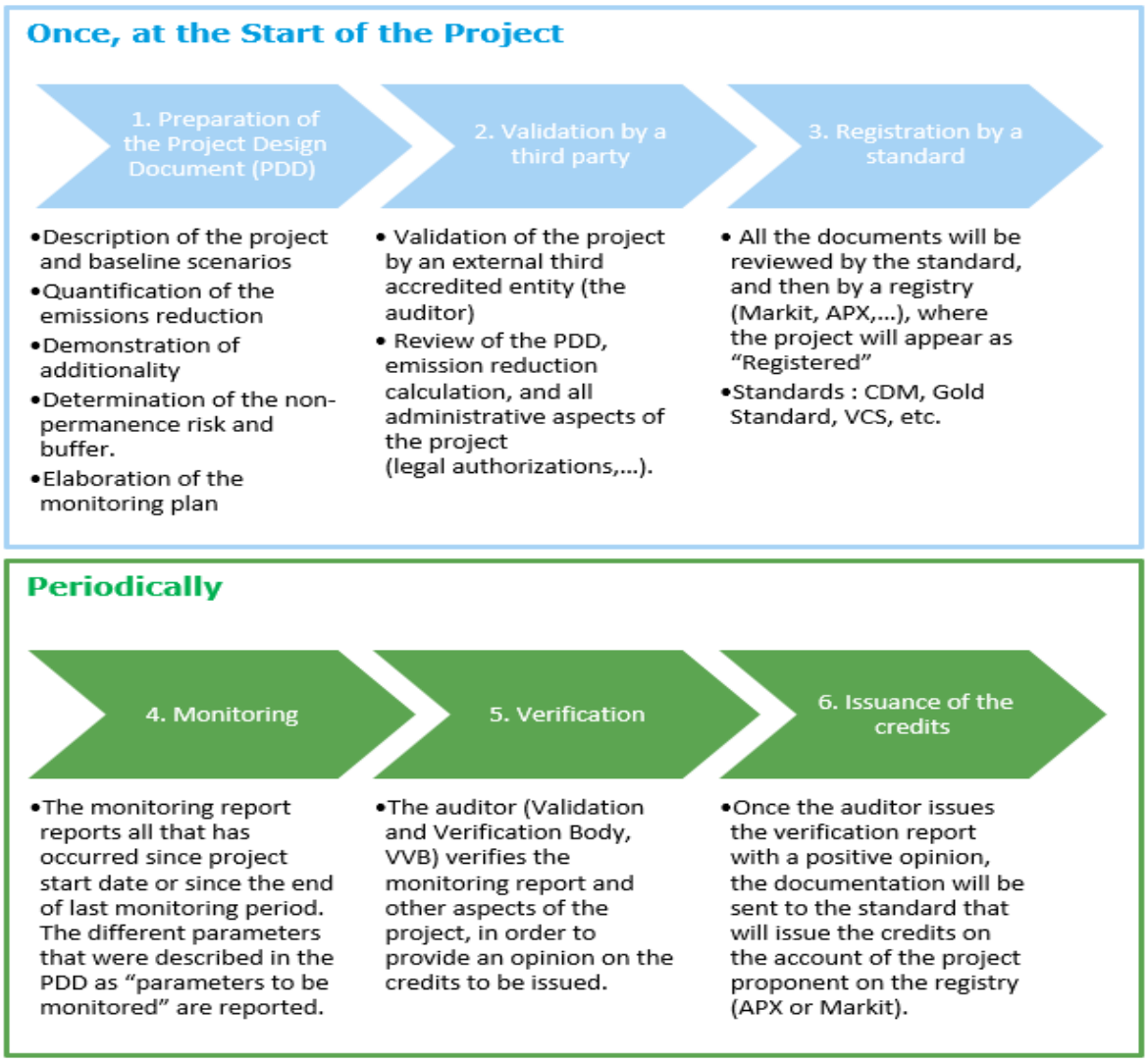
Source: Brohé 2009

All offsetting projects should meet the following criteria:

- *Additionality*: these carbon reduction projects generate emissions reductions that are additional to what would have happened in the absence of the project;
- *Real and measurable* reductions;
- *No carbon leakage*: the project should not displace emissions;
- *Permanent reductions*: as the CO_2 has a lifetime of more than 100 years, the reduction should be permanent for at least 100 years, in order to have a real effect on climate change;
- *Contribution to sustainable development*: the project should also contribute to sustainable development and have significant co-benefits, aligned with the Sustainable Development Goals (SDG) of the United Nations.

In order to issue carbon credits, a project should go through different steps, called the project cycle. The following figure represents the project cycle for a Gold Standard project, but it is very similar to any other voluntary carbon standard.

Figure 5.5 Offsetting project cycle



Standards

The most common voluntary standards are the following:

- Verified Carbon Standard (VCS): the world's most widely-used standard, launched in 2006 by business leaders and NGOs. In 2016, more than 25 $MtCO_2$ were transacted under this standard, at an average price of 2.3 USD.[374] The standard has registered a total of more than 1,400 projects removing more than 300 million tCO_2 from the atmosphere.[375]
- Gold Standard: founded in 2003 by the WWF and other environmental NGOs to ensure that the Clean Development Mechanism (CDM)[376] also contributed to sustainable development. More than 10 million credits were transacted under this standard in 2016, for an average

[374] State of the Voluntary Carbon Market 2017, Ecosystem Market Place.

[375] www.verra.org

[376] The CDM is a flexible mechanism established by the Kyoto Protocol (1997), which is based on the implementation of projects in developing countries that result in a net reduction of greenhouse gases (GHGs) entering the atmosphere. These projects receive CO2 reduction credits for the emissions reductions they create as certified by the UNFCCC and known as Certified Emissions Reductions (CER).

price of 4.6 USD. In 2017, it created the Gold Standard for the Global Goals, which validated the project against each of the 17 Sustainable Development Goals (SDGs).

- Plan Vivo: certifies the implementation of project activities that enhance ecosystem services and allows communities to formally recognise and quantify carbon sequestration, biodiversity or watershed protection. In 2016, 375,000 credits were transacted, at an average price of 8USD. The Plan Vivo Standard was released in 2008.

All of these standards use a registry (Markit or APX) which ensures that every single carbon credit is only issued once. This addresses a double issuance issue. Moreover, if a company decides to offset its emissions, the carbon credits are cancelled in the registry and cannot be used again.

4) General overview of trends and numbers at global level

The volume of transactions on the voluntary carbon market increased by 110% between 2017 and 2018, mostly driven by the increase in the number of transactions for forestry and land use projects. Table 5.22 shows the evolution of the volume and average prices, per project type. These numbers come from the State of the Voluntary Carbon Market 2019, produced by Ecosystem Market Place, which is the most comprehensive annual market study on the evolution of the volumes and prices of the voluntary carbon market.

Table 5.22 State of the voluntary carbon market

	2017			2018		
	Volume (MtCO2)	**Average price (€)**	**Value (M€)**	**Volume (MtCO2)**	**Average price (€)**	**Value (M€)**
Forestry and land use	16.6	2.84	52.92	50.7	2.80	150.16
Renewable energy	16.8	1.59	26.29	23.8	1.49	35.73
Waste disposal	3.7	1.67	6.18	4.5	1.92	8.74
Household devices	2.3	4.17	9.85	6.1	4.19	25.77
Chemical processes/industrial manufacturing	2.6	1.59	4.09	2.5	2.71	6.90
Energy efficiency/fuel switching	1.1	1.75	2.75	2.8	2.45	6.81
Transportation	0.1	2.42	0.17	0.3	1.49	0.44

Source: From Ecosystem Market Place, State of the Voluntary Carbon Market 2019, currency converter at December 31, 2017 (1 USD = 0.8834 Eur) and at December 31, 2018 (1 USD = 0.8736 Eur)

5.4.2 Main drivers of the costs of carbon removal projects

The cost of carbon credits varies depending on the choice of approach and specific projects. It is generally considered that a compensation of one tonne of CO2 costs between 3 and 25 EUR.

Different factors influence the cost of the offsetting:

- *Type of activities*: this is the main driver of costs. This depends on the nature of the activity and the methodology used:
  - Absorbed emissions afforestation/reforestation (offsetting) (approx.15 €/tCO2)
  - Avoided emissions: cookstoves (approx. 4-7 €/tCO2)
  - Avoided emissions: boreholes (approx. 4 -7 €/tCO2)
  - Absorbed emissions: mangroves (approx. 25 €/tCO2)
  - Avoided emissions: renewable energy projects (approx. 2-3 €/tCO2);
- *Standards*: each offsetting project has to be certified by a recognised standard (please refer to section 5.4.1). Every standard has its own requirements and specifications. For example, the Gold Standard for the Global Goals is considered a "premium" standard, as different co-benefits in line with the Sustainable Development Goals are also certified. It is therefore considered more stringent. Any project under this standard needs to have at least three SDG certified (SDG 13: "Climate Change" + 2 more). This leads to more expensive carbon credits, as other benefits than CO2 emissions reduction alone are valued (e.g. empowerment of women, health, etc.);
- *Host country*: general costs vary from country to country (due to difference in costs for manpower, fuel, etc.);
- *Scale of the project*: a larger-scale project tends to have a lower cost per tCO2e reduced, due to economies of scale.

Table 5.23 Examples of offsetting projects

Budget	Non-Europe						Europe					
	Price range	Type of project	Undertaken by (type of organisation)	Availability of carbon credits (high, low, etc.)	Environmental integrity	Example of projects	Price range	Type of project	Undertaken by	Availability of carbon credits (high, low, etc.)	Environmental integrity	Example
Low Cost	1 - 4 Eur	On-grid renewable energy (wind, solar, etc.)	Utility	High	Guaranteed by the standard	- Gold Standard: Solar energy project in India: GS7071 - 400 MW Solar Power Project at Bhadla, Rajasthan; - Gold Standard: Wind energy project - GS3969 - India - 100.5 MW Wind Power Project in Madhya Pradesh	1 - 4 Eur	Biomass project	Paper producer company	High (690,000 VER)	Guaranteed by the standard	Bulgaria - GS3379 - Bulgaria - Svilosa Biomass Project
Medium	4-7 Eur	Improved cookstove distribution Borehole rehabilitation projects	Typically, local NGOs	High	Guaranteed by the standard	Gold Standard - cookstove project: GS4271 - GS1247 VPA 44 BIOLITE improved stove programme, Uganda GS1247 - CO2balance - Improved Kitchen Regimes Multi-Country PoA Master Project - Malawi - Boreholes	10-20 Eur	Forestry activities in Spain, UK and France	Small holders	Currently low - certification scheme is new in France (2019) and in Spain (2014). In UK, more projects are available (more than 3,500 ha of projects validated in 2018)	No AAU cancellation	UK, France and Spain have their own certification schemes for agriculture and forestry projects
High Cost	> 7 Eur	Sustainable agriculture and land management	Typically, local NGOs	Low for agriculture, high for forestry projects	Guaranteed by the standard	Agriculture: GS2951 - AR Bolivia Phase II Forestry project: VCS934 - DRC - The Mai Ndombe REDD+ Project Agriculture - GS2940 - Panama - CO2OL Tropical Mix	> 40 Eur	Peatlands rewetting projects in Germany	Federal states	Low (less than 15,000 credits)	No AAU cancellation, since this activity is part of the national GHG inventory since 2013	Moorfutures project

5.4.3 Double counting and post-2020 considerations

During the Kyoto commitment period ending in 2020, voluntary carbon markets aimed at targeting emissions reductions beyond compliance targets. This is why most of the certified emissions reduction occurred in developing countries (Non-Annex I countries, as defined in the Kyoto Protocol). In this context, national inventories did not take into account any voluntary market-based mechanisms in accounting systems.

When the Paris Agreement comes into force in 2021, all countries will have GHG compliance emissions reduction targets. In this context, the host country of a GHG emissions reduction project will be able to account for a lower GHG emissions inventory. This emissions reduction should be counted only once, by the host country. Without further agreement between the host country and the buyer, if a carbon credit is issued, the emissions reduction might be counted twice: in the national inventory and by the entity that purchases it.

Currently, in order to avoid the risk of double counting, voluntary carbon standards allow for the issuance of certified carbon credits in countries with a compliance target (such as all EU Member States) and only if the host country cancels a corresponding amount of Assigned Amount Units (AAU).[377] This means that the emissions reduction achieved by the certified offsetting project does not count towards the achievement of the compliance target. The host country gives up this reduction to the buyer of the carbon credits.

As the current use of the voluntary carbon market is predominantly for offsetting purposes (in order to compensate for residual emissions on a defined scope), many organisations are rethinking different aspects of the voluntary carbon market. The Gold Standard, CDP, WRI, Carbon Market Watch and ICROA[378] have convened a working group to discuss future aspects of the voluntary carbon market, such as the nature of carbon credits, and related claims and accounting principles. The discussions of this working group are still ongoing, but one of the outcomes is to make a distinction between two types of climate actions which would lead to two different claims[379]:

1) "Beyond compliance" for compensation/offsetting claims: to allow unique and properly owned "offsetting" or "carbon neutral" claims by an organisation, the host country makes Corresponding Adjustments for the issued credits and does not include them in its national GHG emissions inventory. This ensures that the action of offsetting is not double counted.

2) Enabling Paris goal commitments to be met through "financing" or alternative claims: ideally working with the host country, the voluntary market serves as a mechanism to channel private finance and help countries meet their commitments under the Paris Agreement. In this case, the Gold Standard proposes a foundational and transparent claim by an organisation that purchases and retires voluntary carbon credits, which would avoid any confusion on the double counting issue, as it does not claim any offsetting of emissions:

Company X has purchased and retired YY carbon credits through the voluntary carbon market and has thus financed the reduction of YY tonnes of CO2e [outside its organisational boundaries], representing a tangible contribution to the climate mitigation goals of the host country and the Paris Agreement.

[377] AAn AAU is a tradable unit under the Kyoto Protocol that corresponds to an allowance to emit one tCO2.
[378] International Carbon Reduction and Offset Alliance.
[379] https://www.goldstandard.org/sites/default/files/documents/2020_gs_vcm_policy_consultation.pdf

This makes it clear that the carbon credit is not used twice to offset an emission (at both country and organisational level), but an organisation can claim that it has contributed financially to additional emissions reduction activities.[380]

5.4.4 Reputational risks regarding carbon removal and current carbon offsetting scheme

The world needs to reach carbon neutrality by 2050 in order to stabilise the temperature increase; a prerequisite is that all remaining carbon emissions should be absorbed by carbon sinks (natural or technological).

At an organisational level, a robust climate strategy should combine an ambitious GHG emissions reduction strategy with a strong and high-quality carbon absorption/ sequestration strategy.

Therefore, the choice of the carbon absorption approach and projects is paramount. It should demonstrate a real, additional, measurable and long-lasting impact. The certification of the project by a recognised standard (Gold Standard, VCS, Plan Vivo) provides assurance on the quantifiable benefits of the project and mitigates the reputational risk. However, supporting its **own (portfolio of) project(s)** in the long-term enhances even more the credibility of the action, as the European Commission would have full access to the project and be able to be completely transparent regarding the results achieved. These results relate not only to the amount of carbon sequestrated, but also to other impacts on sustainable development, such as the empowerment of women, the creation of decent jobs, and impact on education.

The International Carbon Reduction and Offset Alliance (ICROA) recommends considering the quality and the credibility of climate actions at different levels[381]:

- *Quality of the carbon reduction/sequestration*, certified by a recognized standard, which addresses the additionality issues, ensures that climate actions go beyond regulatory requirements that are expected to evolve as Parties implement their Nationally Determined Contribution (NDC).
- *Quality of the buyer's decarbonization pathway*: in order to reach carbon neutrality at global level, organizations that use carbon offset/credits need to align their decarbonisation pathway to the latest available science (IPCC).
- *Quality of the host country's Nationally Determined Contribution (NDC)*: a well-defined and economy-wide NDC will leave smaller room for the voluntary carbon market, without Carbon Adjustment's. However, NDCs are not defined in a common way in terms of sectors covered, targets, timeframe, etc. The voluntary carbon market can still play a role to identify GHG emission reduction opportunities.

It should be acknowledged that the current offsetting framework and standards need further development in order to raise the ambition of reaching climate neutrality at global level by 2050. Indeed, any offsetting approach needs to ensure that there are measures in place to avoid double counting with other targets, and that the reference levels for crediting are set below business-as-usual levels and re-set at levels that represent a dynamic contribution towards neutrality or zero emissions. Also, as GHG emissions are reduced to core emissions, available offsetting should in theory become confined to removals, supporting a policy focused on

[380] This group is currently studying other options to overcome the double counting issue. Please refer to its Double Counting Guidelines.

[381] https://www.icroa.org/resources/Documents/Gold_Standard_Consultation_-_ICROA_Response_17_August_2020.pdf

removals, as we approach 2040 and 2050. Ideally, offsetting would be undertaken in partnership with the host country, and the emissions/removals benefits would be shared to the benefit of both the host country and the emitter. Again, removals projects tend to credit the difference between a BAU reference scenario and outcome, arguably reference levels should be more ambitious.

The host countries and sectors cannot afford selling emissions reductions at levels that are inconsistent with their own targets. If the sales are accounted for (as they should be to avoid inflation in emissions) the host will be left with a deficit to make up (the difference between BAU and its target). There is often a disparity in knowledge and negotiating power between participants in the market. Hosts may be locked into obligations they cannot meet, or unconscionable terms, particularly if there are long crediting periods.

5.4.5 Possible offsetting approaches for a given scope

The European Commission can choose between different approaches in order to offset its residual emissions:

- Classic approach: Supporting an existing project or a mix of existing projects by buying carbon credits through an annual tender procedure that sets high quality requirements in terms of climate neutrality ambition of the host country, sector, switch from carbon reduction to carbon removals…;
- Premium approach: Supporting the development of its own project from the beginning, and offsetting all emissions from this project exclusively, taking into account the lead time to develop such a project;
- Hybrid approach: a mix of the above two options.

The following table describes the challenges and opportunities of the different approaches:

Table 5.24 Challenges and opportunities of different offsetting approaches

Approach	Challenges	Opportunities
Classic offsetting approach	- Fewer exclusivities on project as credits might already have been issued, and some of them might have been purchased by other organisations; - Less impactful communication potential, as there is less connection to the project developer; - More difficult to appraise the real impact of the Commission's contribution. - Existing offsets do no address post 2020 requirements of accounting, ambition, and overall transition to climate neutrality	+ Less risky, as the project already issues carbon credits, and all risk is borne by the project developer; + Budget equally distributed over the years; + Possibility to fine-tune the project selection criteria, as a wide range of already running projects is available. - Setting clear requirements on accounting, ambition, and transition to climate neutrality could influence the sector to address these issues
Premium offsetting approach	- Budget not equally distributed over time. Stronger financial needs at the beginning of the project (upfront finance needed to launch the project); - Risks related to the development of the project (political risks, methodological risks, issuance risks, etc.); - No assurance on the starting date of GHG neutrality (possible delay in the certification of credits), but can be backed up by other credits to guarantee GHG neutrality; - Limited number of projects can deliver every year a volume high enough to cover all Commission emissions (+/- 180,000 tCO2 per year, only large scale); - Requires considerable human resources to manage the project and certify it.	+ Strong involvement of the Commission in he development of a project; + Important commitment; + Strong image ("EU project"); + Exclusivity* on a project. * Possibility to involve other EU partners in the climate project (inter-institutional project). * Potential to influence the design of offset programme so that it meets the European Commission's concerns.
Hybrid offsetting approach	- Risks related to the development of the project (political risks, methodological risks, etc.); - Only a small proportion will be offset through an exclusive project. Most of the emissions will be offset through an already running climate project.	+ More flexible => no need to wait for the project to start to be carbon neutral; + Exclusivity on a small project; + Less risky than the premium approach; + More flexible in terms of costs (possibility to balance the high costs of a small-scale project by a larger and cheaper project); + Greater flexibility in terms of choice of projects as there is no need to support a large-scale project.

The choice of approach is also driven by procedural and financial aspects, availability of carbon credits, and impact of the project:

- *Financials*: annual, itemised and fixed budget for the classic approach, or variability of the needed budget across the years under the premium approach;
- *Procedures*: annual call for tenders, with fixed budget (classic approach) or call for project (more suitable for the premium approach);
- *Impact of the project*: possibility to quantify and monitor the different impacts related to the Commission's action: how many cookstoves have been distributed? How many hectares have been reforested? How many women have been positively impacted? It is easier to appraise the real impact of the Commission's action in the case of the premium approach, as there is a direct relationship;
- *Selection of a project*: in line with the Commission's values, priorities and political agenda; under a call for tender or a call for project.

6. RECOMMENDATIONS TOWARDS AN ACTION PLAN

This chapter provides intermediary conclusions to our work in the form of answers to key questions as asked in the Terms of Reference for the study. These questions were used to structure the work, including the analysis of concept and instruments, the identification of action domains and measures, and the appropriate balance between in-house action, targeted procurement and possible compensation. This section goes back to these questions and provides a summary answer to each of them. The aim is to stimulate discussion at the Commission and inform the decarbonisation paths and action plan of the Commission.

6.1 How to define an appropriate pathway to a climate neutral Commission by 2030?

The choice of the pathway and share between "in-house" GHG emissions reduction ("in-setting") and "off-setting' depends on different parameters:

- Level of ambition compared to what is needed at global level and what has been agreed in the Paris Agreements;
- Public image/compliance with desired political signal;
- Feasibility, including acceptance by staff and technical feasibility;
- Costs and budget constraints.

Different levels of climate ambition can be chosen by an organisation, as defined by the CDP, WRI, UN Global Compact and Science Based Targets Initiatives:[382]

- *GHG neutrality*: defined as the result of a process of 1) calculating own GHG emissions, 2) elaborating an ambitious action plan to reduce them, and 3) removing the remaining emissions through GHG credits that are certified by a recognised standard. This process is governed by the PAS 2060 specification, from the British Standard Institute.[383]
- *Net zero*: according to the World Resources Institute, the term "net zero" refers to a state where "any human-caused GHG emissions are balanced out by removing GHG from the atmosphere".[384] Article 4 of the Paris Agreement stipulates that this state should be reached in the second half of the century. According to the latest Special Report of the IPCC, in order to limit the temperature increase by 1.5°C, this equilibrium should be reached before 2050.
- *Climate neutrality*: according to the IPCC 5th Special Report, this is a state in which human activity results in no net effect on the climate system. Achieving such a state would require the balancing of residual emissions with emissions removal (carbon dioxide) as well as accounting for regional or local biogeophysical effects of human activity that, for example, affect surface albedo or local climate. It also includes the radiative forcing of aviation, in the case of the European Commission.
- *A negative emissions target* would go beyond the "net zero" strategy, by removing more carbon than the volume emitted, for instance to compensate for emissions accumulated in the past.

For most sectors, organisations and companies, net zero and climate neutrality are equivalent, as climate impacts correspond to the release of GHG emissions into the

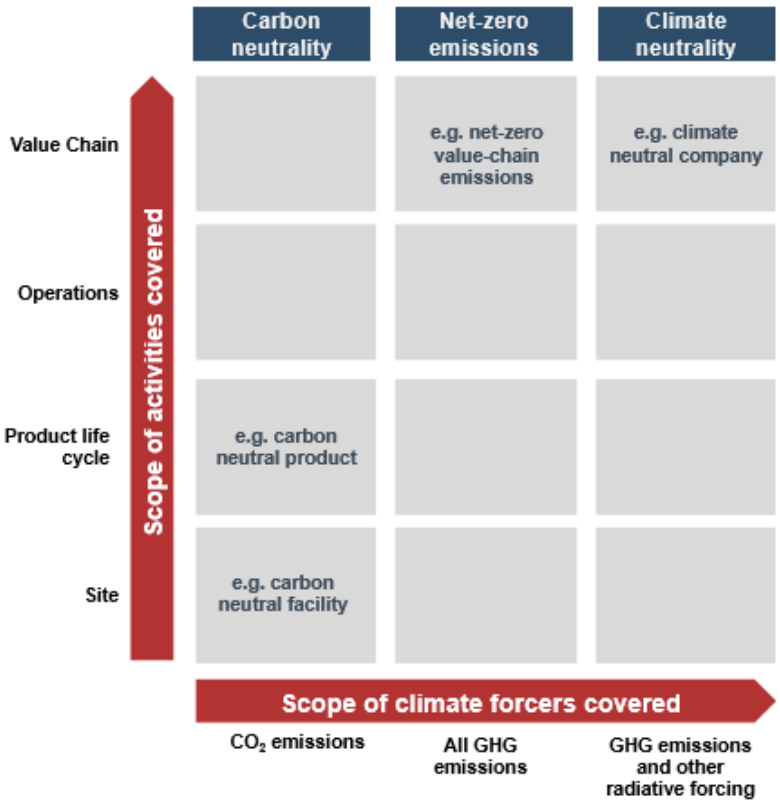
[382] https://sciencebasedtargets.org/wp-content/uploads/2019/11/Slides_Towards_Science_Based_Approach_Net_Zero_Webinar_Nov62019.pdf
383 https://www.bsigroup.com/fr-FR/PAS-2060-Neutralite-carbone/
[384] World Resource Institute

atmosphere. It is also important to note that a net zero and climate neutrality strategy should consider all GHG emissions, not just CO2.

The climate neutrality strategy of an organisation will combine an ambitious decarbonisation strategy that takes into account all climate impacts and the whole value chain with a carbon removal strategy focusing on carbon sequestration projects.

Figure 6.1 clarifies the above-mentioned terms and definitions:

Figure 6.1 Clarifying the different levels of climate ambitions[385]



The President of the European Commission, Ursula von der Leyen, has stated that the Commission's overall target is "to become climate neutral by 2030".

We set the base year at 2018, for the following reasons:

- It is the latest year for which all data are available and validated (except for the categories that are proposed to be added to the scope) at the moment of the study.
- It is the most representative picture of the current GHG emissions profile of the European Commission, especially in terms of number of staff, number and types of buildings, etc. Choosing a less recent year might give a misleading view of the efforts to be made to reduce GHG emissions.
- Choosing the most recent year reflects high ambition, as it does not capitalise on past efforts to reduce GHG emissions. While the European Commission deserves credit for past efforts to

[385] Source: www.sciencebasedtargets.org

reduce its carbon footprint (as indicated in Task 1), an ambitious target should push the European Commission to go beyond its current ambition and promote actions that have not been accomplished yet.

It is the view of most stakeholders interviewed, and of the consultant, that the Commission has no choice but to be very ambitious in its approach. The Commission is expected to be a role model and its actions will be scrutinised. For that reason, the consultant recommends that the Commission develops at least a *net zero strategy*, including all direct emissions and most indirect emissions (at least staff missions, events and committees, embodied carbon in buildings, and commuting), combined with a robust and credible carbon removal strategy to counterbalance remaining emissions.

Compensation should start at the latest in 2030, in order to meet the climate neutrality target. Before this, the European Commission could concentrate the limited financial resources available on actions that ensure effective and permanent emissions reduction, hence limiting the need for compensation afterwards.

A comparison with other organisations indicates that a climate neutrality target of 2030 with significant in-house emissions reduction is aligned with the best in class. The following table shows a benchmark of different organisations that have set ambitious climate GHG emissions targets. This enables a comparison of the proposed level of ambition of the European Commission with other organisations, either public administrations or corporations that have science-based targets.

Table 6.1 Benchmark of targets formulated by different companies/organisations

Sector	Organisation	Ambition	Intensity/ absolute?	Intensity, indicator	Scope[386]	Base year	Target year	%/ year	SBT?	Offsetting?	Comments on offsetting	State reached at horizon
Public Administration	***European Commission***	***50%***	***Absolute***		***All scopes***	***2018***	***2030***	***4.2%***	***Yes***	***Yes***		
Public Administration	European Parliament	40%	Absolute		All scopes	2006	2030	1.7%	No	Yes	Gold Standard in ACP, with max SDG impacted	Carbon Neutrality
Public Administration	Umweltbundesamt	70%	Intensity	tCO2/person	Scope 1+2 (buildings)	2016	2030	5.0%	No	Not yet		
Public Administration	European Central Bank	10%	Absolute		Not specified	2018	2030	0.8%	No	Yes	Joint procurement with European Parliament	Carbon Neutrality
Public Administration	Government of Ireland	30%	Absolute		Not specified	2005	2030	1.2%	No	Not yet		
Software	Microsoft	50%	Absolute		All scopes	2018	2030		Yes	Yes	Sequestration	Negative emissions target
Healthcare	UCB	35%	Absolute		All scopes	2015	2030	2.3%	Yes	Yes	Sequestration + avoided emissions	Carbon Neutrality
Services	Capgemini	40%	Absolute		All scopes	2014	2030	2.5%	Yes	No		
Software	Salesforce	50%	Absolute		Scope 1+2	2018	2030	4.2%	Yes	No		
Software	SAP	40%	Absolute		All scopes	2016	2025	4.4%	Yes	Not yet, by 2025		
Real Estate	Landsec	70%	Absolute		Scope 1+2+3 (downstream leased assets)	2014	2030	4.4%	Yes	Not specified		
Real Estate	Gecina	48%	Intensity	tCO2/m2	Scope 1+2+3 (downstream leased assets)	2014	2030	3.0%	Yes	Not specified		
Telco	Proximus	30%	Absolute		Scope 1+2	2014	2025	2.7%	Yes	Yes	Gold Standard - own project	Carbon Neutrality
Bank and	Axa	25%	Absolute		Scope 1+2	2012	2025	1.9%	No	No		

[386] This data is given for information purposes only, as scopes might differ from one organizationorganisation to another. Disparities may exist between the different scopes considered.

Insurance

6.2 What is an appropriate balance between/application of in-house action, targeted procurement and possibly compensation?

It is recommended to avoid or reduce in-house emissions reductions to the highest feasible extent, and to absorb all the remaining emissions through certified carbon credits from carbon sink projects, with strong co-benefits, by 2030 at the latest. In communicating this to the public, the Commission should be aware that the public is likely to wrongly compare the Green Deal ambition for the EU of 50-55% GHG reduction by 2030 with 1990 as a baseline for the Commission's in-house ambition (e.g. of a 50% GHG reduction also by 2030 (and carbon removal of the other 50%), but with 2018 as baseline). In that context, it will be important to recall in the communication the significant GHG emissions reductions already obtained since the introduction of EMAS in 2005.

A key issue remains over how to balance between in-house, targeted procurement and carbon removal now and tomorrow. The choice should take several factors into consideration:

- *The cost-effectiveness* of respective options, as introduced in Chapter 5;
- The existence of levers and opportunities for action (including behavioural change);
- *The reputational effect* for the Commission; e.g., given a clear need of exemplarity, relying only on tree plantation of offset emissions would create suspicions of green washing;
- *The sustainability of the option in the long run*, with respect for instance to the possibility of generalising an option at EU level, or the risk of creating undesired indirect effects. For instance, relying on biogas seems a promising option to reduce the GHG emission of buildings: it could be considered as "low hanging fruit" (although cost intensive), requiring very little organisational change. But the question is: is it sustainable in the long term? Here, given that biogas is produced from the fermentation of waste, it is known that there will not be enough biogas to replace all fossil gas supplies in Belgium and the EU, and therefore this option cannot be considered as a demonstrative option, with a high potential for generalisation/extension. It is probably a good choice as a transition measure, i.e. waiting for more structural changes in building design and use, allowing a direct, in-house reduction of energy consumption and associated GHG emissions, but not a definitive choice. Biofuels are also known to monopolise resources, compete with other land use and destroy the global sinks, at least with the current generation of biofuels.[387]

The consultant suggests to:

- First, prioritise in-house reductions, considering budget limitations;
- Second, progressively implement targeted procurement, while replicating the Commission's in-house commitment to contractors;
- Third, initiate carbon removal, where budget allows, at the latest by 2030.

6.3 How should the application develop over time?

Start with low hanging fruit, implement measures gradually, offset ultimately

The Commission should avoid moving too fast, focusing instead on the quality of its actions, to avoid the risk of being criticised for achieving climate-neutrality via poor carbon removal.

Therefore, the consultant proposes:

[387] For instance, certificates of some biogas used for kitchen purpose in the Commission show that this comes from palm oil plantations in Malaysia and Indonesia, which might lead to controversies owing to concerns at the increase in monoculture and the replacement of native forest.

- First, immediate implementation of the low hanging fruit (measures that eliminate GHG emissions with low investment and a short implementation period, such as measure 2.1 *Close offices during holiday periods*) combined with reductions obtainable from behavioural change and compensation measures.
- Second, gradual implementation of more resources or cost-intensive actions (particularly investment in energy systems, which require more time), and implementation of actions requiring transformative change, impacting the "core business" of the Commission (e.g. new travel and meeting policies as addressed in Action Domain 3); while doing so, it is expected that the share of carbon removal emissions will decrease over time.
- Third, offset the remaining GHG emissions in 2030 and beyond, with high quality carbon removal credits.

6.4 How do the different options perform economically and in terms of the required human resources?

A high level of variation in measures costs

The cost of GHG emissions reduction measures varies widely. Some measures require high levels of investment while others induce limited operational costs. Some measures present a "negative cost" and are called "no regret measures", as they lead to net economic benefits or cost savings. This will typically be the case for some energy efficiency measures, and videoconferencing installations that avoid a large amount of flights. Other measures will bear a cost. For example, this might be measures related to strong environmental criteria in tender procedures, which might increase the costs of the purchased goods or services (products with eco labels, green electricity contracts, etc.).

Long payback periods (ten years or more) can be expected for many measures. Financial mechanisms need to be used wisely to finance and incentivise carbon reduction. Hence, a possibility using carbon fee and carbon budget could be to allocate to each DG less mission budget for flights, based on the previous year's CO2 emissions data, and allocate it to building expenditure for investment in GHG emissions reduction options. This would be a budget transfer from mission to building expenditure, conditional upon the approval of the Budget Authority. This approach is illustrated in the case studies presented above.

The cost of carbon offsetting also varies. It is generally considered that a compensation of one tonne of CO2 costs between 3 and 25 EUR.

Human resources needed in each implementation step

A current limitation of the economic assessment is the hidden cost of the Commission's human resources needed to develop, implement, monitor, communicate, animate and report on the measures which will be chosen (especially OIB and DG HR).

This cost may require specific budget reconsiderations when reallocating human resources for that specific objective if it is clearly prioritised in the Commission's strategy.

An estimate of the needed additional human resources has been performed and integrated into the cost of measures.

6.5 How can the potential for behavioural change be realised?

Take advantage of existing initiatives

European Commission staff are already very active in trying to reduce the carbon and environmental footprint of the Commission. Actions that were brought to the consultant's attention include:

- Since 2005, implementation of the Eco-Management and Audit Scheme (EMAS).
- DG GROW on travels (appendix 8): proposition of climate policy principles:
  - Avoid any unnecessary business trips
  - Reduce: promote rail travel when possible
  - Offset remaining emissions
  - Greenovate: promote and give preference to airlines that innovate in the field of low carbon technologies.
- DG MARE plan (Appendix 9): initiative from the DG to set a baseline for their own carbon footprint, to set a target and an action plan to meet the target. This includes:
  - Promotion of video conferencing
  - Promotion of train, even if the distance is higher than 400 km, if the destination is well connected to Brussels
  - Use of economy class for flights outside the EU
  - Abolishment of allocated parking places for managers
  - Promotion of teleworking.
- DG SCIC:
  - Promotion and enabling of measures for reducing GHG emissions related to conferences
  - Sustainable modes of travel and transport
  - Reducing/eliminating conference material (promotional items and printouts)
  - Videoconferencing
  - Vegan/vegetarian catering, avoidance of red meat.
- EUStaff4Climate: a bottom-up initiative of EU Staff from different institutions, which has launched a petition to call for leadership and exemplarity in the fight against climate change from the EU institutions. A series of measures concerning buildings, business trips and catering is proposed.
- OIB supplied a thorough and complete plan of measures, including energy savings, building renovations, new real estate development projects, open-plan office policies, GPP criteria use, active mobility, full electrical or plug-in hybrid cars, waste reduction, sorting and reuse/recycling, a plastic ban, paperless measures, incentives, etc.

It is recommended to build on this momentum, engage with staff and peers, increase awareness and nudge staff, visitors and partners. This momentum is even stronger after the COVID-19 crisis, when teleworking and videoconferencing became common practices. New ways of working have been successfully adopted by staff, experts and participants at conferences. The Commission can take advantage of these important changes to make such practices more structural and long-lasting, as part of the climate neutral pathway.

Concrete measures to follow up are suggested in AD#6 *Manage and Communicate*. For instance, measure 6.1 *Exchange and cooperate with peers* insists on regular meetings with different levels of stakeholders, staff, local authorities or similar organisations.

Behavioural change of internal staff is likely to evolve with a mix of new voluntary measures, incentives, changing rules, and accompanying communication. The nature of the measures used (voluntary measures, incentives, rules) has a different impact on emissions and should be considered to avoid resistance but also ensure behavioural change.

Voluntary measures have no coercive power and can thus be better accepted by target groups. They can be combined with incentives and "nudging", such as monitoring and (anonymous or public) reporting of performance to encourage more conscious behaviour and self-improvement.

Stop environmentally harmful behaviour

However, there are still internal rules and practices in the European Commission that either encourage environmentally harmful behaviour (e.g. via providing free car parking at all EC buildings) and/or "prevent" environmentally friendly behaviour (e.g. the EC's budget-driven travel policy, which discourages train travel).

Consequently, top-down decisions are needed to rectify these, as members of staff do not have the levers to make a significant impact, or face resistance from the systems in place when attempting to use a different approach.

Communicate on co-benefits

The concept of GHG neutrality is gaining traction in society at large and within EU institutions as well, with different DGs such as MARE and RTD. Communication about these initiatives throughout EU institutions is likely to have a positive effect on staff behaviour and raise support for mitigation measures.

The European Commission's place within society as a policy-making body and as an organisation with a significant environmental impact should drive staff consciousness-raising and consequent behavioural change. Different initiatives within the European Commission have already arisen among the staff, such as the recent EUStaff4Climate[388] or the established European Union Cycling Group.[389]

Internal communication about new measures is also crucial to raise awareness about the purpose of each measure. It can serve to accompany behavioural change by providing clear guidelines regarding new concepts or instruments that are implemented. This significantly improves their effectiveness by mitigating indifference or ignorance on the part of staff. It is likely that such communication efforts need to come with additional human resources (such as within the EMAS unit) to develop and implement communication campaigns.

Behavioural and collaborative change

Behavioural change is also more likely to occur when staff feel they are being listened to and have a sense of ownership over the change required. Consequently, the implementation of new measures should come with consultative and/or participatory activities to ensure the adequacy of the measures to European Commission staff practices, preferences and facilities.

In that respect, key recommendations to ensure behavioural change are:

- First implement solutions with clear co-benefits: e.g. bicycle commuting and health, train travel and efficient and comfort travel time, etc.;
- Make changes desirable: e.g. propose first class train tickets, comfortable sleepers, high quality portable videoconferencing;
- Co-develop solutions with staff, to promote a sense of ownership: create working groups, communication campaigns on key issues;
- Incentivise the potential of behavioural change, also at home, on a purely voluntary basis, using carbon calculators and simulators, carbon challenges, etc. This is important for staff motivation.

[388] https://eustaff4climate.info/
[389] https://eucg.eu/

6.6 How is the milestone or target communicated?

Downscale the targets

A key element when communicating a strategy or a target is to let staff know what it implies for them. Therefore, the downscaling of targets is key so that all can understand their contribution to the objectives. Targets (and/or carbon budget) should be defined for the Commission as a whole, but also for DGs, units, sites and individuals. A dedicated measure 6.5 *Break down targets* focuses on this aspect.

Communicate widely

The Commission should take an ecosystemic approach and communicate not only internally, but also with similar international institutions, local stakeholders in Brussels, Luxembourg etc.

For instance, the Brussels Chamber of Commerce, BECI, launched an initiative in 2019 called 303030. The idea is to put forward 30 initiatives in Brussels that reduce GHG emissions by 30% by 2030.[390] The European Commission, being an important actor in the Brussels Region, could be part of this wider initiative and propose innovative measures. These would be visible and communicated beyond typical audiences.

A dedicated measure 6.1 *Exchange and cooperate with peers* focuses on this aspect.

Communicate transparently

Communicating and taking responsibility go hand in hand: the Commission should communicate clearly and broadly not only its commitments but also its achievements and difficulties. Carbon removal might cause negative public reactions and this needs to be anticipated in the communication plan and clearly shown to be only a last step.

6.7 How do the selected GHG-reduction measures correspond to a positive, consistent public image of the organisation?

Focus on absolute reduction of emissions

The Commission should lead by example, so it is essential to adopt an ambitious decarbonisation plan, credible measures and a coherent communication strategy. Furthermore, there is a need for the Commission to be a pioneer. For instance, actions on buildings are not sufficient; a leading role regarding air travel would be appreciated by the public and could be replicated by other organisations or companies.

[390] « Projet 303030: réduire l'impact CO2 d'ici 2030 », BECI, 2019, https://www.beci.be/2019/09/02/projet-30-30-30%E2%80%AF-reduire-limpact-co2-dici-2030/.

Doing this would enable the whole strategy to be endorsed and acknowledged by different recognised initiatives, such as:

- The Science Based Targets Initiative: endorsement of the level of ambition regarding the GHG emissions reduction target;
- The Net Zero Initiative accounting framework, which recommends clarifying the communication of a climate strategy around three pillars: in-house reduction, avoided emissions, and negative emissions.[391]

Climate neutrality is a dynamic process and should be aligned with the global effort/pathway to limit temperature increase at 1.5°C compare to the industrialised era.

In order to reach this ambitious target by 2050, two different types of actions are required: a drastic reduction of GHG emissions by today's societies and organisations, and an increase in the sequestration capacities of carbon sinks (including natural sinks, such as forests, wetlands, etc., and technological sinks, such as carbon capture and storage technologies).[392]

In order to align its individual efforts with these two needs, an organisation should be transparent about its actions and strategies. Therefore, the Net Zero Initiative was launched by Carbone4, a French consulting company, and endorsed by various companies (Orange, EDF, Engie, etc.). The project is also supported by a scientific council composed of members from the following organisations: Gold Standard, I4CE, European Climate Foundation, French National Institute of Agriculture and others. This initiative aims to provide an accounting framework to allow organisations to steer its strategy, by proposing to report on three indicators:

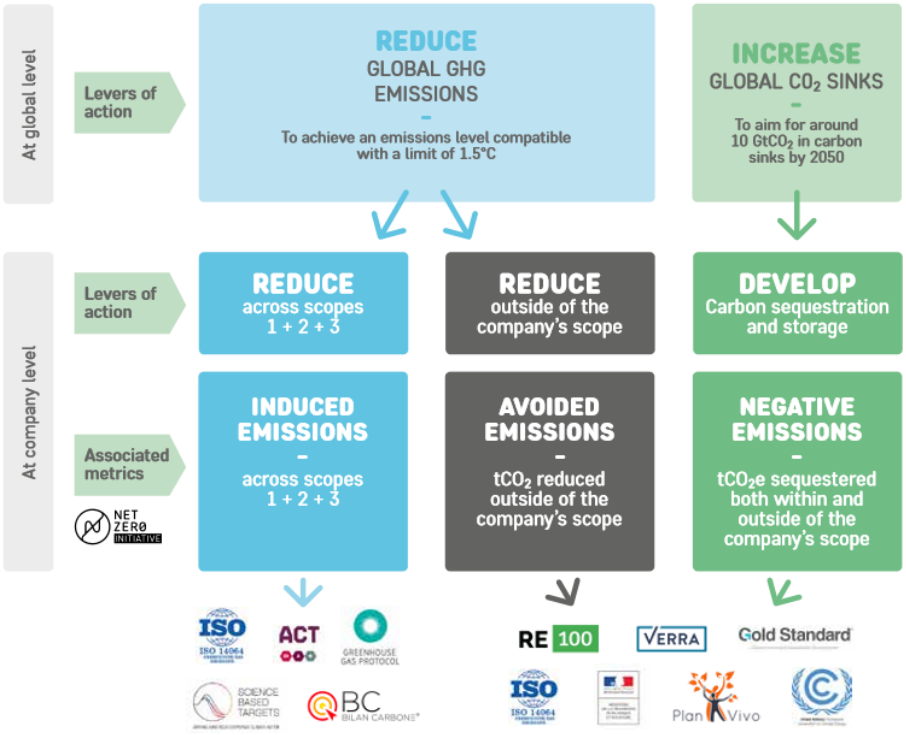
- *Induced emissions*: This includes all emissions that the organisation has caused across all of the three scopes and its annual progress with respect to the 1.5°C/"well below 2°C" objective that has been set. Existing methodologies and frameworks such as the GHG Protocol, Bilan Carbone and Science Based Targets are useful for this indicator.
- *Avoided emissions*: This indicator must be maximised via the following, or a combination of the following:
  - Providing funding for certified carbon credits;
  - Becoming involved in the construction of new low-carbon electricity production capacities by means of power purchase agreements (PPAs).
- *Negative emissions*: This indicator must be maximised via the following:
  - Providing funding for certified (carbon credits) or verified negative emissions from projects that capture and store carbon by either natural or technological means;
  - Developing products and services that sequester emissions, through subsidies, programmes (Life, H2020, etc.).

The following figure illustrates the three-entries accounting framework proposed by the Net Zero Initiative:

391 See: netzero-initiative.com. In-house reduction actions on the three scopes (use of a recognized standard (i.e. GHG Protocol or Bilan Carbon) to calculate the carbon footprint in a transparent way; report on the evolution of these emissions towards a reduction objective in line with the latest science (SBTi)). Avoided emissions: emissions reduction activities beyond the European Commission's scope, through offsetting with climate projects that avoid or reduce GHG emissions, support for renewable energy projectsetc. Negative emissions: increase carbon sinks within and beyond the European Commission's scope.

392 European Parliament, "What is carbon neutrality and how can it be achieved by 2050?", 2019, https://www.europarl.europa.eu/news/en/headlines/society/20190926STO62270/what-is-carbon-neutrality-and-how-can-it-be-achieved-by-2050.

Figure 6.2 Net Zero Initiative framework.



Source: Net Zero Initiative, 2020.

6.8 How should monitoring of progress be organised?

Downscale the monitoring

Monitoring of GHG emissions is currently in place. The system works well in the context of EMAS, and some recommendations for improvement have been formulated.

Monitoring should be used not only to track performance and trigger change at all levels. Performance should be tracked for all measures (not only in terms of CO_2 reduction but also using proxy), for DGs/Units, and at individual levels. It should also be enhanced for service contractors, as the measure 5.8 *Develop green and collaborative procurement* suggests.

Similar to targets, there should be a downscaling of results so that all members of the Commission can understand their contribution to the performance of the Commission. Results should be available for the Commission as a whole, but also for DGs, units and individuals. For example**, MIPS could integrate a CO_2 emissions calculator, to report to each staff member a CO2 indicator periodically on a dashboard**. Another example relates to the installation at the entrance of buildings of screens that indicate the amount of electricity produced by the solar panels.

In addition, the Commission's future contracts should oblige contractors to provide necessary information in order to calculate the GHG emissions related to their products or services. This would enable closer monitoring of emissions from purchased goods and services.

Success factors for a climate-neutral strategy for the Commission

The risks and opportunities, as well as factors of success and failure, are specific to each action domain and measure selected. However, from the detailed analysis conducted, the following factors of success and failure of a decarbonisation strategy in the Commission are evident:

- ***Top management implication is one of the main factors of success***: all strategic decisions in the organisation should be consistent with the GHG neutral (or net zero) strategy. Strict guidance is needed from top management, not only through rule definition, but also through monitoring adherence to golden rules. Finance and governance cannot be considered a barrier but only an obstacle; physics alone can be considered a limit for mitigation targets.
- ***Some mitigation measures have limited direct mitigation potential but strong leverage effects that should not be underestimated***. Some measures have a high mitigation effect but are not embedded in day to day activities nor visible (for example, a new efficient boiler, or PV solar panels on a building's rooftop). Other measures have a lower GHG emissions reduction effect but are part of the day to day life of the staff. This is the case for the prohibition of single-use plastics or the phasing out of individual printers, for example. Both categories of measures should go hand in hand and should be part of a consistent overall strategy, for example through dedicated communication campaigns.
- ***There are trade-offs and contradictions, but solutions exist***. For instance, some decisions driven by budgetary considerations could be contradictory to a GHG neutral strategy. This is the case for cheap flight tickets, which inhibit the promotion of train travel. Therefore, internal mechanisms could be implemented to correct this bias and include the negative externality in the decision-making process. This could be done, for example, by the introduction of a shadow price of carbon in MIPS. The principle would be to add to the price proposed by the travel agency (GBT) a cost per tCO2e. This way, the final decision regarding the travel arrangement can be done based on the total cost of the trip, including negative externalities.[393]

6.9 What conclusions and recommendations should be drawn with regards to a plan for a climate neutral Commission?

A main scenario based on absolute emissions and carbon removals

The European Commission should position itself on two different levels:

- The level of ambition in terms of in-house GHG emissions reduction.
- An offsetting strategy regarding the remaining GHG emissions.

[393] There are different ways to set a price on carbon:
The offsetting price: depending on the project: 3 – 25 Eur/tCO2;
The EU ETS price: 25 Eur/tCO2;
The carbon tax levels in some European countries (for example: France: 44.60 Eur/tCO2e in 2018; Ireland:26 Eur/tCO2e in 2018; Sweden: 125 Eur/tCO2e in 2018; Denmark: 29 Eur/tCO2e in 2018);
The social cost of carbon (SCC): an estimate of the monetised damages associated with an incremental increase in GHG emissions in a given year. To estimate the SCC, models are used to translate economic and population growth scenarios (and the resulting GHG emissions) into changes in atmospheric composition and global mean temperature. The SCC valuation is based on work conducted by the Interagency Working Group on the Social Cost of Carbon. Values proposed are calculated under a 3% discount rate, which represents an upper bound estimate of the future damages caused by climate change (IWGSCC, 2013). Currently 110 Eur, expected to rise to 220 Eur in 2030 and 360 Eur in 2050.

In order to select an appropriate level of ambition, decarbonisation pathway and course of action, three scenarios can be defined:

- *65%*[394] *in-house GHG emissions reduction scenario* (base year: 2018), with 35% of the remaining emissions absorbed through high quality certified sequestration projects;
- *50% in-house GHG emissions reduction scenario* (base year: 2018), with 50% of the remaining emissions absorbed through high quality certified sequestration projects. This scenario corresponds to an average 4.2% annual in-house GHG emissions reduction.
- *30% in-house GHG emissions reduction scenario*, with 70% of the remaining emissions absorbed through high quality certified sequestration projects. This scenario corresponds to an average 2.5% annual in-house GHG emissions reduction.

All 3 scenarios are ambitious, as they all lead to Climate Neutrality of the European Commission by 2030, well before the EU target to reach this state by 2050.

Overarching strategy principles

Additionally, in order to foster change at the Commission, it must build its climate neutrality strategy upon some overarching principles, such as:

- **Exemplarity**: in the context of the Green Deal, and as the main European policy-making body, the Commission needs to lead by example.
- **Transparency**: the monitoring should be open to everyone. Moreover, as mentioned, the achievements should be clearly communicated, but also the challenges and opportunities.
- **Pioneer role**: the European Commission will have a considerable influence on other policies when it considers pioneering ideas which require difficult decisions (internal carbon budget, mobile working).
- **Failure is not an option**: it is better to take the time to develop a clear strategy to avoid major mistakes that could be replicated in other institutions.
- **Experience based on good practices**: some initiatives are already implemented either by other institutions, or by staff of the Commission itself. The Commission should build upon this, in a bottom-up approach.
- **A right balance between behavioural changes and targeted procurement** should be found (Scope 1&2 vs Scope 3 emissions), as the net zero strategy will be comprehensive and will encompass a large scope of emissions.
- **A right balance between incentives and rules** will need to be reached: clear rules need to be established.

6.10 Key recommendations for the implementation

Once the strategy and action plan is approved on paper, its implementation remains key*:*

- The Commission's climate neutral strategy, if implemented seriously, has the potential to demonstrate that the European Commission, as an agile and innovative 21st century organisation, can successfully carry out and transform its operations in a climate-neutral way. To establish new ways of operating it is crucial to take time to communicate and establish working groups to initiate action and monitor progress.

[394] According to our assessment, this is the maximum possible.

- Some innovative methods, such as a declining carbon budget according to directorate/teams/personnel, will require changes in internal rules and long-standing practices; such barriers will have to be removed.
- Furthermore, current legal dispositions for budget management as enshrined in the Financial Regulation may have to be modified.
- It is necessary to take time for experimentation with innovative solutions, allowing for the possibility of trial and error, and periodic revisions of the initial plan.
- It is important to acknowledge different levels of implementation: 1) internal, 2) contractors (procurement, tenderers), 3) ecosystem (partners, stakeholders). Stakeholders should be associated with the definition and implementation of actions.
- True to its statement in the European Green Deal Communication that it "calls on all the other institutions, bodies and agencies of the EU to work with it and come forward with similar ambitious measures", the European Commission should not act alone, but participate in broader initiatives, seeking recognition from and providing support to its peers (e.g. the German Environmental Protection Agency's network of and guidelines (forthcoming) for climate-neutral administrations, the Danish "Climate-neutral Foreign Ministries" initiative, etc.), and boosting promising initiatives with its support.

7. SCENARIO ANALYSIS: METHODOLOGY

This chapter presents the methodology developed and used for assessing the three climate neutrality scenarios identified in the previous chapters.

This chapter corresponds to part of Task 3 in the terms of reference.

7.1 Characterisation of a scenario

A scenario is defined and characterised by the following elements:

- **An overall objective** of GHG emissions reduction by 2030, defined as a % of the Commission's carbon footprint in 2018 (base year); all scenarios reach climate-neutrality by 2030, but differ with regard to % of in-house GHG reductions and % of carbon removal credits purchased;
- **A set of measures** for GHG emissions reduction, including their objective at 2030;
- **A level of uncertainty**, calculated for each measure and aggregated for each scenario;
- **Human resources** for the plan's implementation and coordination;
- **GHG emissions reduction and cost**;
- **A net present value and an internal rate of return**, calculated for each scenario and for the emissions reductions only;
- **GHG emissions removal and cost**.

7.2 Measures

Based on an overall objective of GHG emissions reduction, a scenario is defined by a set of climate mitigation measures that are implemented by the European Commission across six action domains.

The measures selected may change from one scenario to another. However, considering the high level of ambition of all scenarios, almost all measures are included in each scenario.

Example: Measure 1.1 *Optimise office space* (Figure 1.1).

Figure 7.1 Example of one action for the 50% GHG emissions reduction scenario

Code	Main description	Start date	Preparation period	Implementation period	Life expectancy	Applicability for the European Commission (2030)	Objective (2030)	Mitigation potential (tCO2.e)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
AD1.1	Optimise office space	2021	2	7	15	100% of office surface.	30% space reduction for BXL; 100% of the office space renovated.	8914	0%	0%	0%	14%	29%	43%	57%	71%	86%	100%

Level of applicability to the Commission:

For each measure, the level of applicability to the Commission is defined in terms of the share of the Commission's resources or activity to which the measure applies.

In principle, the applicability of a measure is not expected to change from one scenario to another.

The applicability is estimated for each measure individually, considering the maximum share of the Commission's resources or activity to which the measure could apply. Methodologically, the applicability is processed as a percentage of a physical indicator (e.g. % of office buildings or surface, staff, travel etc.). In this assessment, a reality-check is conducted, e.g. in terms of technical feasibility, staff readiness, and/or market availability, considering 2030 as a reference year.

Example: For Measure 1.1 *Optimise office space*, the applicability is defined in terms of the building surface dedicated to office work and not considered in any relocation measure before 2030.

Objective at 2030:

For each measure, the objective at 2030 is defined as a target to be achieved by 2030.

The objective is expected to change from one scenario to another.

The objective is set for each measure individually, considering the overall level of ambition of the scenario and for each measure individually. Methodologically, the objective is initially processed as a percentage of increase or decrease of a physical indicator (e.g. % decrease of office buildings or surface, staff, travel etc.). This objective is then translated into a physical parameter, in order to make it clearer (e.g. office space in m^2, km of travel per train or aeroplane, m^2 of PV solar panels installed on rooftops, etc.).

Example: For Measure 1.1 *Optimise office space*, the objective is set as a % reduction of the average office building gross surface per staff member and then translated into m^2 per staff member. For the 50% of GHG emissions reduction scenario, the objective is a 30% reduction of the average office space per staff member, resulting in a decrease from 36 m^2 to 24 m^2 building gross surface per staff member.[395]

Start year:

The start year is the date when a measure begins preparation by the relevant service of the European Commission. For new measures, the start year may be the year when the services are evaluating and preparing the measure. For more simple measures, or measures that are ongoing, the start year may correspond to the implementation of the measure.

In the three GHG emissions reduction scenarios, all measures are expected to start as soon as possible, which is necessary to achieve the overall objective, considering the short timeframe of 10 years. Therefore, the start year is by default 2021, except in cases where different measures are linked, and the start year of some measure depends on the implementation of some other measures. In order to counterbalance the heavier investments and reach budget neutrality as soon as possible through cost reduction measures (payback), the "low hanging fruit" measures remaining after the considerable effort already made between 2005 and today should start as soon as possible, i.e. from 2021. This concerns particularly measures in AD#3 on travel that require very low or no investment and generate financial benefits in the short term (in particular *3.1: Implement new or improved videoconference facilities and improve practices* and *3.7: Implement priority rules for the purchase of economy class flights instead of business or private jet flights, and allow for train trip alternatives*).

Finally, in order to secure the support of European Commission staff and steer the overall climate neutrality strategy, it is important to implement all measures in AD#6 *Manage and Communicate* as soon as possible, even if they do not generate GHG emissions savings.

Preparation period:

For each measure, the preparation period is defined as the period in which all relevant preparatory work is done, ahead of the implementation. This comprises consultations with all relevant services in the Commission, feasibility studies, tendering procedures etc. This is a necessary step for most measures. No GHG reduction is observed during this phase. However, the financial implications related to the preparation period are accounted as CAPEX.

[395] Consideration of workstation surface is also explained in section Proposed actions for a climate neutral Commission.

The preparation period generally varies between one and three years.

Implementation period:

For each measure, the implementation period is defined as the number of years needed for a measure to reach its objective.

The implementation period of a measure is not expected to change from one scenario to another. In our model, the implementation period depends largely on technical feasibility, meaning that the start year and the objective of 2030 should take into account a "standard" implementation period as defined in the analytical grid. However, it is always possible to speed up the implementation of measures in case the implementation of the measure can only start later. In any case the implementation period cannot exceed ten years; according to the scenarios, all measures are expected to be fully implemented by 2030 (and therefore to reach their objective and full mitigation potential by that date).

Methodologically, the implementation period is used to calculate an implementation rate, defined as the annual incremental level of implementation of a measure, and is assumed to be linear. For instance, a measure that has a ten-year implementation period is assumed to have a 10% implementation rate; a measure that has a five-year implementation period is assumed to have a 20% implementation rate, and so on. In our model, this rate is used to calculate the annual benefit that can be attributed to a measure (in terms of GHG emissions reduction) during the implementation period and until it reaches its full mitigation potential (100% implementation).

Also, CAPEX is expected to be equally distributed over the entire preparation and implementation periods. OPEX starts to be accounted when the implementation period starts, and is multiplied by the cumulative implementation rate.

Example: For Measure 1.1 *Optimise office space*, there is a need to conduct feasibility studies before engaging in space optimisation, possibly in connection with renovation and relocation activities. The feasibility studies are expected to start after 2021 (start year) and to last for another two years (preparation period). Therefore, the implementation of the measure will start in 2024 and end in 2030, an implementation period of seven years. The implementation rate is therefore 14%. CAPEX will be equally distributed over nine years (preparation period + implementation period), and OPEX will start to be accounted from 2024 at a rate of 14%, then at a rate of 28% in 2025, in order to reach 100% in 2030. The GHG emissions reduction will follow the same evolution as the OPEX.

Life expectancy and renewal:

For each measure, a level of uncertainty (in years) is the period during which the measure has a GHG emissions reduction effect. When this period expires, additional CAPEX has to be invested in order to extend the GHG emissions reduction effect of the measure. Practically speaking, this corresponds to the life expectancy of the equipment (solar panels, energy systems, video conference facilities, etc.).

It is useful to foresee when new investments will need to be made after 2030, in order to maintain the level of GHG emissions reduction achieved in each scenario.

Example: For Measure 4.7 *Install chargers for electric 2-wheeled vehicles*, the life expectancy of the acquired electric vehicles is five years. After this period, a new investment has to be made in order to maintain the same level of GHG emissions reduction.

***

It is important to understand that, in order to reach a certain GHG emissions reduction target by 2030, the objective of each measure is what matters the most. In our scenario analysis, the start year and implementation period are fixed, with operational and financial implications detailed

below. The level of applicability is also set at a high level of ambition as a result of a feasibility assessment, and is assumed to be fixed.

7.3 Level of uncertainty

For each measure, a level of uncertainty (in %) is defined for the mitigation potential (tCO2e reduced) and costs (CAPEX and OPEX). This level of uncertainty is an appreciation of the error margin of the quantitative estimations made by our experts.

For each scenario, an overall level of uncertainty can be calculated for both the emissions reductions and the costs of a scenario. For the mitigation potential, this corresponds to the weighted average of the individual level of uncertainty of each measure (the weight of each individual level of uncertainty being expressed as the % of the mitigation potential of the measure compared to the total mitigation potential of all the measures that are part of a scenario).

For the financial information (CAPEX and OPEX), a lower and a higher bound have been defined for each measure. Therefore, the level of uncertainty of a scenario is the deviation (in %) between the average value presented in each scenario at 2030, and the lower and higher bounds.

7.4 Human resources

Additional human resources are needed to implement a measure, establish the required improvements of GHG-emission monitoring, for the necessary training of staff at different levels, and in the communication activities that are essential to making this a collectively supported effort. However, some measures will result in staff reductions as they imply an activity reduction (such as 2.9: *Use cloud computing*). These changes in human resources costs have been considered in the financial analysis of the scenarios.

The need for human resources is not expected to vary from one scenario to another: it is estimated that each scenario would require additional staff, calculated as a net addition of 40 FTE.

7.5 GHG emissions reduction and cost

The estimations of total GHG emissions reduction take into account the cumulative effect of the different measures. Indeed, most of the measures within a specific action domain are interconnected. The mitigation potentials of the measures are always evaluated individually, but the model developed in Excel takes into account the impact that a measure can have on another one.

Hence, the total GHG emissions reduction is not equal to the sum of each individual absolute mitigation potential. For example, in 2030, in the 50% GHG emission reduction scenario it was estimated that the total GHG abated is 18% lower than the sum of the individual mitigation potential of each individual measure. This is the so-called “overlap factor”. This overlap factor increases every year, as the implementation rate of the measure evolves.

This overlap factor is calculated annually and is also applied to the sum of the individual OPEX annual results, in order to take into account the cumulative impact of measures in terms of their operational costs and savings. On the other hand, it has been estimated that the CAPEX is fixed for each measure within a particular scenario.

7.6 Net Present Value and Internal Rate of Return

The Net Present Value (NPV) measures the value of all future cash flows until 2030 discounted to the present, in order to take into account the opportunity cost of capital, which suggests that any amount of money is worth more the sooner it is received. A zero discount rate would not differentiate between current and future investments, while a positive discount rate gives more importance to today's money.

Different social discount rates are used in the following formula:

$$PV = \sum_{t=1}^{n} \frac{FV_t}{(1+i)^t}$$

Where:

PV = Present Value

FV = Future Value = Net Results (CAPEX – OPEX) at year t

t = the year between 2021 and 2030 when the FV is calculated

i = the social discount rate: according to the recommendations of the European Commission (DG REGIO)[396] a rate of 5% should be applied in Cohesion Countries, and 3% in other Member States. Therefore, the following rates are proposed to be used in each scenario:

- 3%
- 4%
- 5%

The Internal Rate of Return (IRR) is the discount rate that makes the NPV equal to zero. The higher the IRR, the more profitable the scenario. It will be calculated for each scenario, in order to compare the profitability of each of them.

Since it had to be calculated at a time horizon at which the NPV is at least equal to 0, a longer period than 2030 was chosen; indeed, at 2030 all the scenarios have a negative result. Therefore, it is calculated at the 2040-time horizon for each scenario.

7.7 GHG emissions removal and cost

To reach climate neutrality, a remaining amount of GHG emissions will need to be removed by 2030 for each scenario.

The cost of emissions removal depends on the absorption projects, as also explained in section 5.4 on offsetting and carbon removal credits. Considering an average price range of 10-15 €/tCO2e for emissions absorption projects located in ACP countries (afforestation, reforestation or mangroves, as mentioned under Task 2), the additional cost in 2030 to reach climate neutrality is calculated for each scenario. For CO_2 emissions absorption projects located in Europe, an average price of 50 €/tCO_2e is considered.

However, the European Commission should first concentrate the limited financial resources available on actions that ensure effective and permanent emissions reduction, thus reducing the

[396] Guide to Cost-Benefit Analysis of Investment Projects, Economic Appraisal tool for Cohesion Policy 2014-2020, December 2014.

need for absorption afterwards. Therefore, the European Commission will start offsetting its emissions from 2030, and in the scenario analysis, the GHG emission removal costs will be presented as an annual cost from 2030.

8. SCENARIO ANALYSIS: RESULTS

This chapter presents the results of the scenario analysis and draws conclusions on the possible decarbonisation pathways for the European Commission to reach climate neutrality by 2030.

This chapter corresponds to part of Task 3 in the terms of reference.

8.1 Preliminary remarks common to the three scenarios

The 50% in-house GHG emissions reduction scenario is the result of the combination of the set of measures analysed at the central level of ambition in Chapter 5. Therefore, this scenario is presented as the central scenario of the study.

A maximum mitigation potential of 65% has been achieved in the analysis. Therefore, the initial target "towards 70% in-house GHG emissions reduction" was revised and a "65% in-house GHG emissions reduction" scenario is analysed in this chapter. It reflects the highest level of in-house GHG emissions reduction in a technically feasible scenario.

The 30% in-house GHG emissions reduction scenario and the 65% in-house GHG emissions reduction scenario derive from the central scenario (see Appendix 10 - Summary tables of measures for scenario 50% and modification of specific measures for scenario 30% and 65%), and the main differences and financial/technical implications are presented under each scenario's section.

The set of GHG emissions reduction measures contains measures that are already planned. This is the case for measures that intend to comply with regional or national regulations. It is mainly the case in Brussels, where the following policies are already planned at the Commission, leading to a reduction of 4,375 tCO2e by 2025, compared to 2018:

- COBRACE[397] aims to reduce the number of available parking spaces in the Brussels Region. Concretely, this means that the Commission should decrease spaces by 5,500 by 2025 (out of 11,000 in 2018). This is estimated to lead to approximately 2,200 tCO2e by 2025.
- PLAGE[398] aims to reduce the primary energy demand in offices and commercial buildings. Practically, the Commission will need to reduce by 10% the primary energy consumption in Brussels by 2023, compared to 2018. This will lead to an estimated absolute GHG emissions reduction of 2,175 tCO2e by 2023.

Moreover, the European Commission has initiated long-term real estate projects that are also taken into consideration in the analysis. The construction of the new JMO2 building in Luxembourg, where 90% of the staff in Luxembourg will be relocated, will be finalised by 2024, and it is taken into account in measure 1.5 *Relocate to green and sustainable buildings* with a mitigation potential of 3,750 tCO2e per year. However, the building Loi 130 in Brussels will not be operational before 2030 and is consequently excluded from the scenarios.

It has been estimated that due to an increase of the coverage of the different scopes across the sites in the reporting from 2019, the reported emissions will slightly increase (+3,717 tCO2)[399] compared to the 2018 base year. However, due to a current lack of data, these additional GHG

[397] Code Bruxelles du de l'air, du climat et de la maitrise de l'énergie.
[398] Plan Local d'Action pour la Gestion Energétique.
[399] This increase is due to the introduction of new categories in certain sites: Refrigerant gases in SE and KA, Staff commuting in LX and PE, Fixed assets (buildings) in SE and KA, Fixed assets (IT) in SE and KA, Purchased goods and services (excluding catering) in BXL, and waste in SE and KA. Catering has been added to the initial scope.

emissions have not been taken into account in the different scenarios for the calculation of the mitigation potential of the measures.

8.2 Scenario 50% in-house GHG emissions reduction & 50% purchased CO2 removal credits

8.2.1 General description of the scenario 50% in-house GHG emissions reduction

This scenario aims to reduce the European Commission's GHG emissions by 50% between 2018 and 2030. It contains the full set of 45 measures identified, which will be combined to abate an average of 78,000 tCO2e per year in the period 2021 to 2030.

In this scenario, all 45 mitigation measures are implemented according to their central level of ambition, meaning that all measures pursue a high but attainable level of ambition by 2030, according to the planning defined in Appendix 11 (Summary tables of measures implementations planning), which includes for each measure a start date, a preparation period and an implementation period.

As presented in the "Analytical grid" (Appendix 5) it includes the following key measures:

- a 30% office building gross surface reduction (applied to 70% of all office buildings of the European Commission), where the average office building gross surface will be reduced by 30%, from 36 m^2 to 24 m^2. This will imply the redesign of 70% of remaining surface into collaborative space (hot-desking, shared office);
- the relocation of 10% of the staff in Brussels, 100% in Seville and 90% in Luxembourg into highly energy efficient and low-carbon buildings;
- the use of 25% new fuel sources in existing systems (sustainable biogas);
- a high-level optimisation of the energy performance and size of energy systems (downsizing the heating and cooling equipment due to better insulation, improvement of energy performance of any equipment such as ventilation, boiler, etc.);
- the installation of heat pumps replacing 25% of the gas and fuel consumption across all buildings;
- a reduction of travel by air by 50% for the staff missions (replaced by videoconferences and train travel);[400]
- concerning travels by visitors attending meetings, events and committees organised by the European Commission, a replacement of 35% of physical attendance by virtual attendance (videoconferences and web streaming), and replacement of 15% of air travel by train travel;
- the implementation of a new travel policy in order to reduce flights from missions, events, meetings and committees (through the implementation of a mandatory threshold for the use of trains below 500 km, priority rules to limit flights in business class by allowing longer resting time after long-haul economy class flights, etc.);
- a new commuting policy to decrease the share of cars in the mobility mix of the staff (by promoting the use of carpooling for 15% of car commuters, increasing from 10% to 20% the number of commuters by bicycle) and decrease the number of daily trips (by fostering home-working for up to two days a week during half of the year).

8.2.2 Total GHG abated

Figure 8.1 shows the decarbonisation pathway of this scenario.

[400] This measure applies to all staff missions, whether they travel for a conference organized by the European Commission or not.

In 2030, a remaining amount of 131,366 tCO_2e will need to be removed from the atmosphere through carbon sequestration credits.

Figure 8.1 Decarbonisation pathway for the 50% in-house GHG emissions reduction scenario & 50% purchase of CO2 removal credits

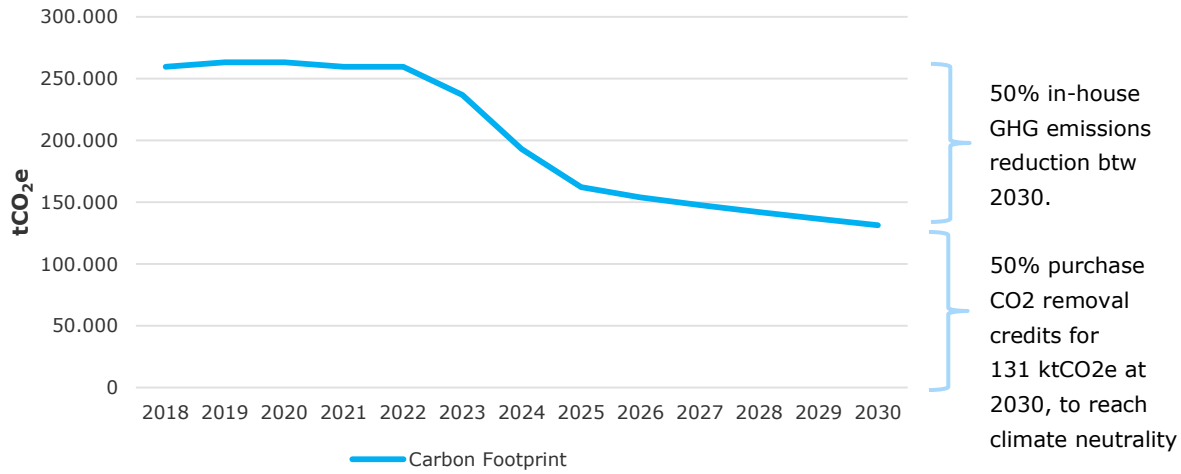
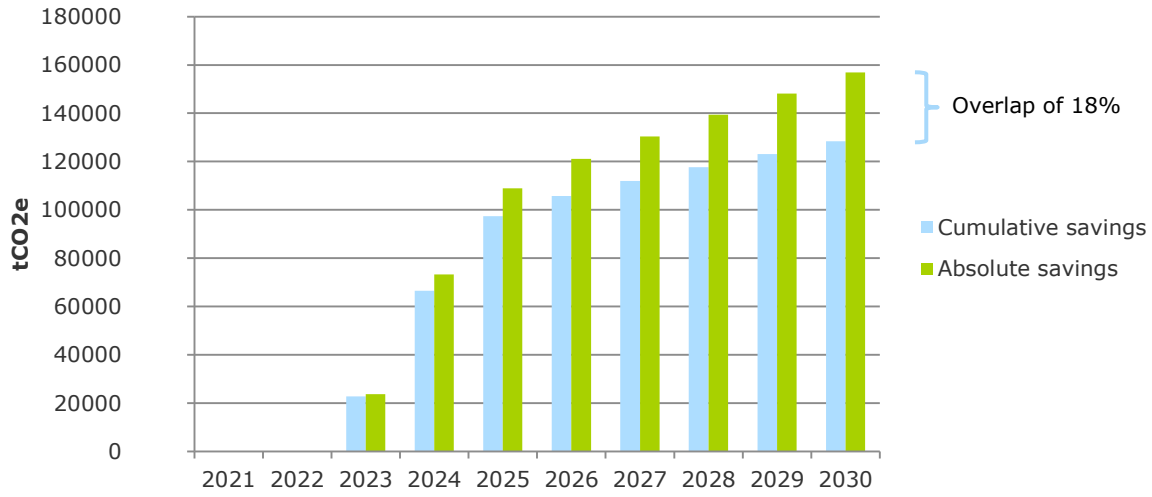


Figure 8.1 presents the annual GHG emissions reduction of the 50% in-house GHG emissions reduction scenario, taking into account the combination of all the measures proposed in this scenario.

The estimates presented above take into account the cumulative effect of the different measures. Indeed, most of the measures within a specific action domain are interdependent. In 2030, it is estimated that the total GHG abated will be 18% lower than the sum of the individual mitigation potential of each individual measure. This "overlap factor" increases every year, as the implementation rate of the measure increases. Figure 8.2 illustrates the difference between the cumulative savings in this scenario and the sum of absolute savings of each individual measure.

Figure 8.2. Cumulative GHG reduction in GHG emissions



The overall uncertainty of the calculation of the mitigation potential of this scenario is estimated to be 24%. This corresponds to the weighted average of the individual uncertainty for each measure.

Table 8.1 Annual GHG emissions abatement for the 50% in-house GHG emissions reduction scenario

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total scope (tCO2e)	263,240	259,523	259,523	236,861	193,156	162,328	153,923	147,760	141,991	136,600	131,366
Total reduction (tCO2)		0	0	22,662	66,368	97,195	105,600	111,763	117,532	122,923	128,158
Additional reduction (tCO2e)		0	0	22,662	43,705	30,827	8,405	6,163	5,765	5,391	5,234
Total reduction (%)		0%	0%	9%	26%	38%	41%	43%	45%	47%	49%
Delta (%)		0%	0%	-9%	-17%	-12%	-3%	-2%	-2%	-2%	-2%

Table 8.2 Annual GHG emissions abatement per action domain

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total reduction (tCO2)		0	0	22,662	66,368	97,195	105,600	111,763	117,532	122,923	128,158
AD#1 (tCO2)		0	0	-	1,800	4,594	7,347	9,973	12,562	15,115	17,632
AD#2 (tCO2)		0	0	9,280	17,446	23,300	24,446	25,489	26,391	27,163	27,814
AD#3 (tCO2)		0	0	4,645	36,419	55,930	57,985	60,040	62,095	64,150	66,205
AD#4 (tCO2)				1,432	2,757	3,414	3,852	4,281	4,491	4,491	4,491
AD#5 (tCO2)		0	0	7,305	7,946	9,957	11,970	11,982	11,993	12,004	12,015

Mobility contributes to 55% of the GHG emissions reductions, which is the largest contribution to the emissions reduction target. The reduction of the travel of external people ("visitors") contributes to 27% of the total reductions,[401] whereas the missions of staff (mainly by air) contribute to 24% of the total reductions thanks to new travel policies and the installation of videoconference facilities. A reduction in the GHG emissions of the home-work staff commuting contribute to 4% of the total reductions.

Buildings contributes to 35% of the GHG emissions reductions. This is mostly due to the reduction of fuel for heating (23%), of buildings surface (7%) and electricity consumption (6%).

Finally, the category other, which includes Scope 3 emissions of fixed assets and goods and services, represents almost 9% of the total reductions.

Figure 8.3. Distribution of in-house GHG emissions reduction 2018-2030

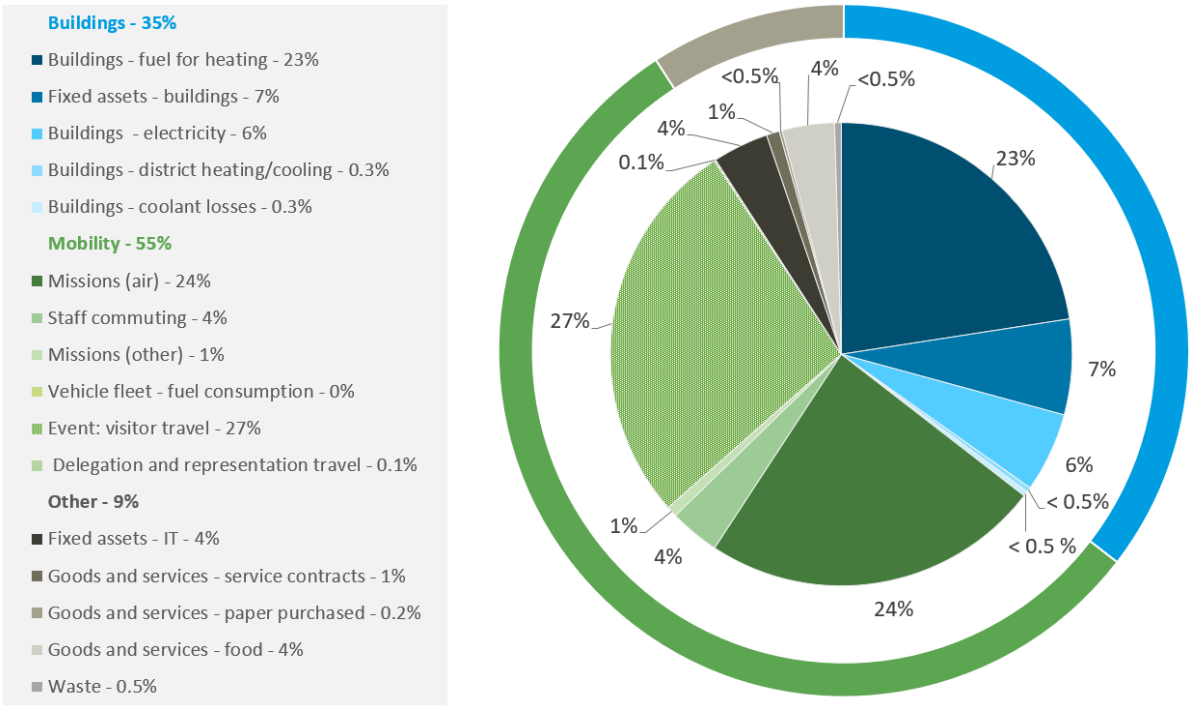
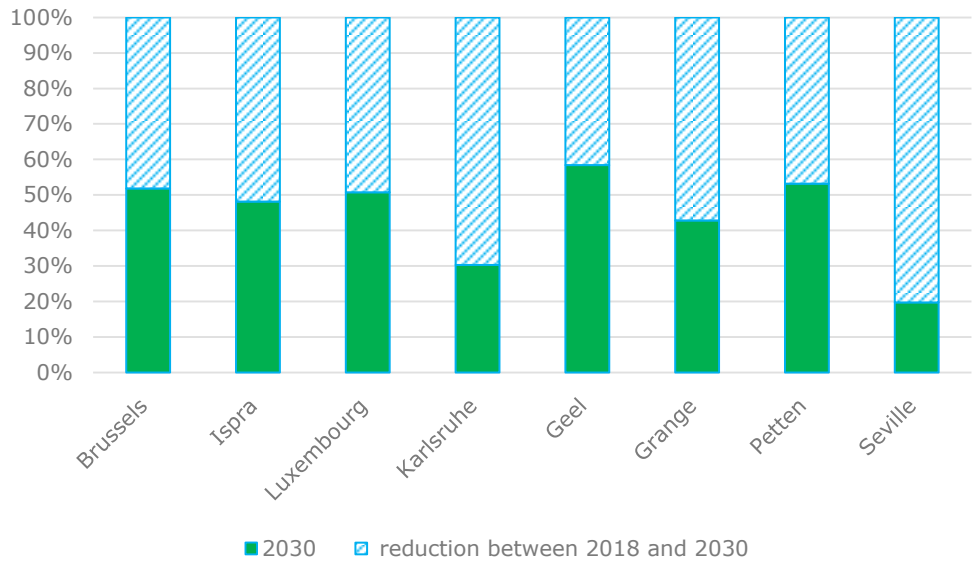


Figure 8.4 shows the relative in-house GHG emissions reduction of each site to reach the overall target of 50% in-house GHG emissions reduction. Seville and Karlsruhe will relatively reduce their emissions the most, as they are currently still consuming grey electricity. Switching to 100% green electricity contracts through guarantees of origin, power purchase agreements or any other type of contract implies an important Scope 2 GHG emissions reduction. Overall, the most important sites in terms of GHG emissions, Brussels, Ispra and Luxembourg, will on average reduce their carbon footprint by 50%.

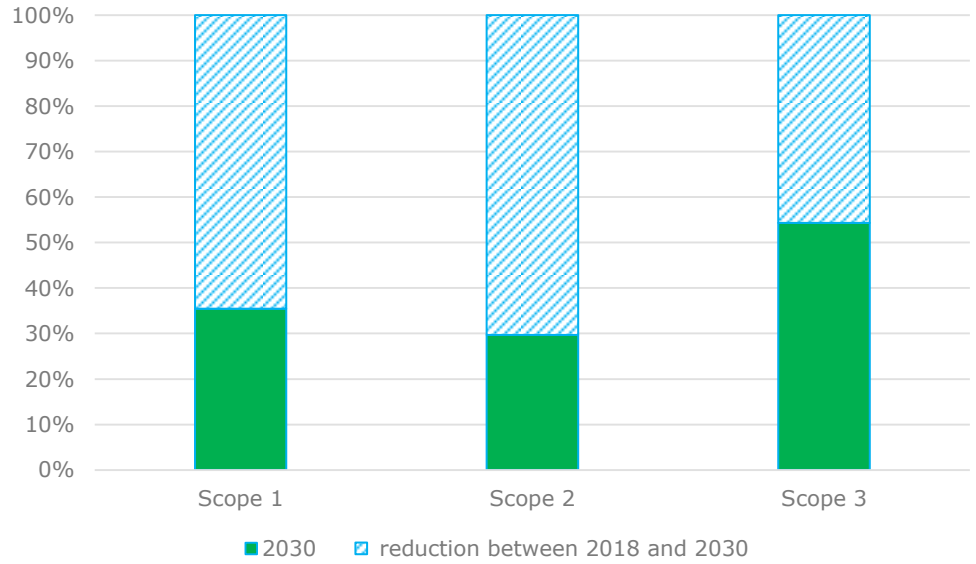
[401] It is important to keep in mind that an important share of these GHG emissions in the baseline are based on extrapolation, and not on real data.

Figure 8.4 Relative in-house GHG emissions reduction per site between 2018 and 2030



Finally, Figure 8.5 shows the relative in-house GHG emissions reduction per scope. The figure shows that the reductions are most important on Scope 1 and 2, which are the direct emissions. This means that in this scenario the European Commission will prioritise action on the sources of emissions that it fully controls. In 2030, 66% of Scope 1 and 2 emissions will be reduced, while 46% of Scope 3 emissions will be reduced.

Figure 8.5 Relative in-house GHG emissions reduction per scope between 2018 and 2030



8.2.3 Total costs of measures and offsetting to reach climate neutrality by 2030

The following graph and table present the annual investments needed (CAPEX) and the annual operating costs or savings (OPEX) induced by the implementation of the measures in the 50% GHG emissions reduction scenario, taking into account the combination of all the measures proposed. Only the costs of in-house GHG emissions reduction measures are included in this figure; the costs of CO2 removal credits are reported separately.

The uncertainty (or the "error margin") is 25% on the CAPEX at 2030 and 30% on the OPEX. This was calculated by estimating for each cost assumption (CAPEX and OPEX) a lower bound and a higher bound. Only the average values are presented in this figure.

Figure 8.6 Financial analysis for the 50% in-house GHG emissions reduction scenario

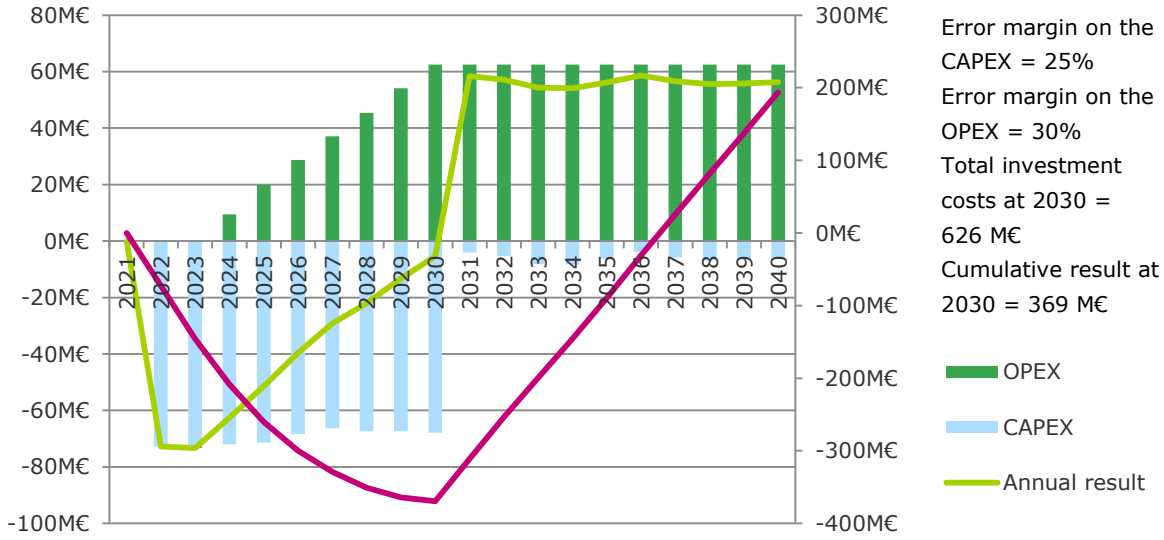


Figure 8.6 shows that the annual net result becomes positive from 2031. In 2030, the total (cumulated) cost of the scenario amounts to 369 M€ (nominal value). **The total cumulated result becomes positive as from 2037, as, according to the established planning, all investments are completed by 2030. After this horizon, a net financial benefit is generated.**

However, some measures have a limited life expectancy and require reinvestment after a certain time to continue generating GHG emissions reductions. This is why the annual result tends to decrease after 2031, as additional reinvestment will be needed (for example for measure *4.7 Install chargers for electric 2-wheeled vehicles,* which has a life expectancy of five years and requires reinvestment after that period).

This financial analysis takes into account the cumulative costs of the different measures, in order to avoid an overestimation of the operating costs or savings. The total costs or savings are not equal to the sum of each individual cost or saving of the measures. By assumption, the same "overlap factor" used for the GHG emissions reduction is applied. This overlap factor is applied to the OPEX only, as it has been evaluated that the CAPEX will not be impacted by the overlap of

the measures. The average annual investment needs are approximately 70 M€,[402] which corresponds to an increase of 8% of the Commission's annual administrative budget (excluding salary expenditure).

The following table shows the detailed results of the financial analysis. This does not take inflation into account.

Table 8.3 Annual investment and operating costs (in million €; M€) for the 50% GHG emissions reduction scenario

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Investment	0 €	-72.76M€	-72.76M€	-71.99M€	-71.36M€	-68.37M€	-66.33M€	-67.31M€	-67.31M€	-67.91M€
Operating costs (-) /Savings (+)	0 €	0 €	-0.55M€	9.47M€	19.88M€	28.68M€	37.14M€	45.41M€	54.09M€	62.51M€
Results	0 €	-72.76M€	-73.31M€	-62.52M€	-51.48M€	-39.69M€	-29.20M€	-21.90M€	-13.22M€	-5.40M€

The IRR at 2040 of this scenario is estimated to be 4%.

The NPVs at 2030, according to the different social discount rates, are the following:

- 3%: - 334 M€
- 4%: - 323 M€
- 5%: - 313 M€

It is important to stress that these estimates are made under the assumption that the implementation of all measures will begin according to the proposed planning. If the implementation of some measures is delayed, this will delay savings and, consequently, the break-even point as well (currently estimated to be 2037).

GHG compensation cost considerations:

Under the 50% in-house GHG emissions reduction scenario, in order to reach climate neutrality in 2030, a remaining amount of GHG emissions of 131 $ktCO_2e$ will need to be offset every year as from 2030. The annual costs to reach climate neutrality in 2030 would comprise between 1,312 k€ and 1,968 k€ for carbon absorption projects located in ACP countries (considering a price range between 10 €/tCO_2e and 15 €/tCO_2e, as explained in section 5.4), and would amount to 6,560 M€ for carbon absorption projects located in the European Union (considering a price of 50 €/tCO_2e, which corresponds to the high range for a carbon removal project in Europe, as explained in section 5.4).

These prices reflect the current market prices for high quality and credible carbon credits from certified carbon removal projects under the most recognised standards (Gold Standard, Plan Vivo). These estimates are rather conservative, as they do not take into account the discount the European Commission could obtain for a large volume of carbon credits and a multi-year commitment to a particular project.

[402] Accounting for uncertainty, the average annual CAPEX could reach 88 M€. This corresponds to an annual increase of 18 M€ (180 M€ over the entire period 2021–2030). On the other hand, this could equally be up to 18 M€ lower annually (180 M€ over the entire period).

8.2.4 Conclusion and critical assessment

This scenario requires a combination of measures that will impact considerably on the way of working at the European Commission. This will mostly be reflected in the new office landscape (flexible desks, open spaces, improved teleworking, flexible meeting rooms, etc.), new ways of organising meetings, conferences and other events for staff or external visitors and experts (through an extensive use of videoconferencing), restrictions on air travel, increased train use, etc. Therefore, these measures should be accompanied by a strong internal communication strategy as well as a participatory process and short-term feedback loops from staff and staff representatives. This will ensure that these measures will be smoothly adopted by staff. Most probably **accompanying measures** will be necessary to overcome the productivity loss a new working environment (such as hot-desking and open-plan offices) may cause.

This scenario requires a continued focus on technical measures that are currently being implemented by the European Commission. Measures affecting ways of working at the European Commission should be combined with more technical measures concerning energy consumption in buildings (energy efficiency and fuel switching) and new "green" and efficient buildings.

This scenario relies on 95% green electricity consumption at all the sites. This can be done in different ways, as mentioned previously in this report. As it is not an "in-house" GHG reduction measure, the additionality of the GHG emissions reductions through this measure should be guaranteed through different criteria in the contractual instruments (guarantees of origin with label, power purchase agreements, or similar). In some places, the decision is not directly under the responsibility of the Commission. For instance, the JRC in Karlsruhe is located in the Karlsruhe Institute of Technology (KIT), which provides electricity to the sites within its boundary. However, the JRC can engage with KIT in order to explore possibilities to be supplied by electricity from renewable sources.

A successful implementation of this scenario assumes that the objective of each measure is met by 2030. This scenario is a combination of measures with a certain level of ambition defined in terms of the objective at 2030, but also with certain time constraints in terms of their start date, preparation period and implementation period. Moreover, some measures are strongly interdependent. If an objective for a particular measure is not met, it can have an impact on one or more other measures. Therefore, in order to mitigate the risk of not reaching the 50% in-house GHG emissions reduction target, it is recommended to have a buffer on some measures and to try to go beyond the proposed objectives or applicability levels. This might also cover the overall uncertainty level of 24% on the mitigation potential.

Close monitoring of each action would allow the Commission to stick to the scenario and correct any deviation in a timely manner. It is recommended to define relevant KPIs that will be monitored at least annually, in order to follow the correct completion of the decided measures.

This scenario requires a high level of capital expenditure but will also generate paybacks. The average capital expenditure for this scenario is estimated to be 70 M€ per year. This would correspond to an 8% increase in the Commission's current annual administrative budget (excluding salary expenditure), whereas the upper limit, as proposed by the Commission for the next Multi-Annual Financial Framework, is only 2% (approximately 20 M€), corresponding to the estimated annual inflation. This scenario contains measures that are highly capital intensive, but most of them have a payback period and generate savings, such as Measure 1.1 *Optimise office space*. Indeed, this measure represents 69% of the total investment over the 2021-2030 period. This is mainly because the measure implies the redesign and renovation of 70% of the office area and the relocation of staff. However, the measure has a payback period of

ten years and is expected to generate net financial revenues from 2033 (more than 50 M€ per year as from 2033).

In order to counterbalance these large investments and reach budget neutrality as soon as possible, the European Commission should start implementing "low hanging fruit" measures as soon as possible. "Low hanging fruit" measures are limited due to the considerable effort already made between 2005 and today. They should start as soon as possible, meaning that they should be considered and analysed by the relevant services as from 2021 so that they can be implemented quickly. This particularly concerns measures in AD#3 *Avoid air travel and promote low-carbon travel modes* that require very low or no investment and generate financial benefits in the short term (in particular: measure 3.1: *Develop remote meeting attendance for staff through enhanced videoconference facilities* and measure 3.7: *Implement priority rules for the purchase of economy class flights*).

In order to secure the support of European Commission staff and European citizens and steer the overall climate neutrality strategy, accompanying and communication measures are essential. It is important to implement all measures in AD#6 *Manage and Communicate* as soon as possible, even if they do not generate GHG emissions savings.

8.3 Scenario 65% in-house GHG emissions reduction & 35% purchased CO2 removal credits

8.3.1 General description of the scenario 65% in-house GHG emissions reduction

This scenario differs from the 50% in-house GHG emissions reduction scenario on the six measures presented in Table 8.4. The combination of these measures and the remaining39 measures enables the achievement of an overall target of 65% GHG emissions reduction.

Table 8.4 Main differences between 65% scenario and 50% scenario

#	Measure description	Description of the objective	50% in-house GHG emissions reduction scenario	65% in-house GHG emissions reduction scenario
1.1	Optimise office space	% Reduction of average office building gross surface per employee	30% reduction in terms of m2/staff 24 m2/staff	50% reduction in terms of m2/staff 18 m2/staff
1.3	Use low-carbon material in construction and renovation[403]	Renovation with % of sustainably sourced bio-materials	Renovation with 50% of sustainably sourced bio-materials	Renovation with 70% of sustainably sourced bio-materials
1.5	Relocate to green and sustainable buildings	% of concerned staff relocated to new buildings	10%	20%
2.10	Use new fuel sources for heating	% of remaining natural gas consumption for heating covered by biogas certificates	25%	100%
3.1	Develop remote meeting attendance for staff through enhanced videoconference facilities	% of travel trip distance replaced by videoconferences	50%	75%
		# Videoconference devices	2,000	3,000
3.5	Develop remote meeting and conference attendance and promote low carbon travel for visitors	% of air travel trip distance avoided for meetings	35% by VC	65% by VC

Rationale for the scenario 65% in-house GHG emissions reduction:

One of the key criteria to select the measures that differ from the 50% in-house GHG emissions reduction scenario is the GHG emission mitigation impact of each measure, regardless of financial or technical considerations. Therefore, most of the changes concern the measures in AD#1 (*Design sustainable buildings and working space*), AD#2 (*Optimise energy consumption and systems*), and AD#3 (*Avoid air travel and promote low-carbon travel modes*), which contain the ten measures with the highest mitigation potential (please refer to section 5.3).

Each objective of these measures is set at a high but realistic level.

The key changes can be summarised as follows:

[403] https://ec.europa.eu/environment/eussd/buildings.htm

- a 50% office building gross surface reduction (applied to 70% of all office buildings of the European Commission), where the average office building surface will be reduced by 50% instead of 30%. Furthermore, 50% of the remaining surface will be redesigned into collaborative space (hot-desking, open-plan offices) and improved teleworking;
- the relocation of 20% of the staff into highly energy efficient and low-carbon buildings, instead of 10%;
- 100% use of new fuel sources in existing systems (sustainable biogas);
- a reduction of business trips by 75% (replaced by videoconferences), instead of 50%;
- concerning travels made by visitors attending meetings, events and committees organised by the European Commission, a replacement of 65% of physical attendance by virtual attendance (videoconferences and web streaming), instead of 35%.

8.3.2 Total GHG abated

Figure 8.7 shows the decarbonisation pathway of this scenario:

Figure 8.7 Decarbonisation pathway for the 65% in-house GHG emissions reduction scenario & 35% purchase of CO2 removal credits

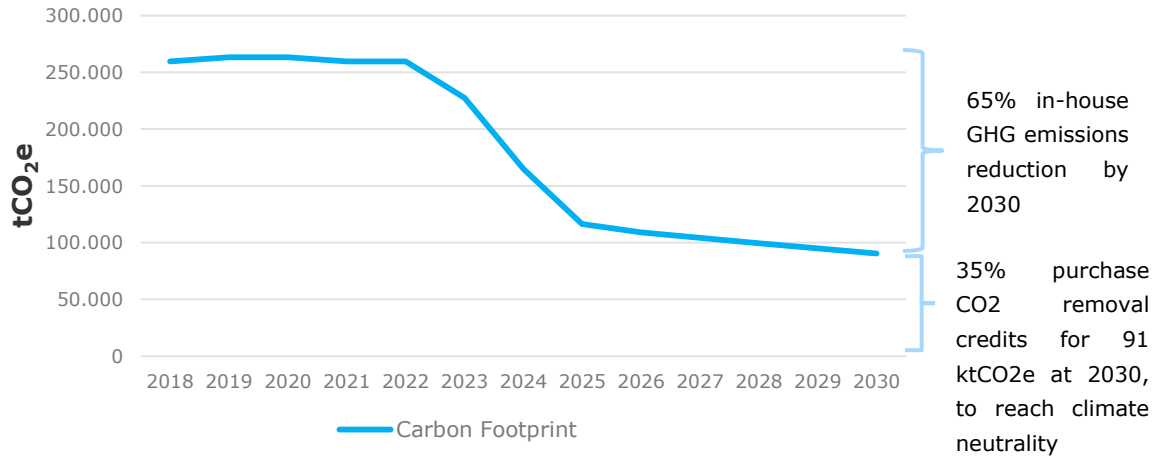


Table 8.5 presents the annual GHG emissions reduction of the 65% in-house GHG emissions reduction scenario, taking into account the combination of all the measures proposed in this scenario. The overlap factor in this scenario increases every year as the implementation rate of the measures increases, and reaches 24% by 2030. The uncertainty on the mitigation potential is estimated to be 25%.

Table 8.5 Annual GHG emissions abatement for the 65% in-house GHG emissions reduction scenario

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total scope (tCO_2e)	263,240	259,523	259,523	227,638	164,928	116,428	109,301	104,269	99,491	94,997	90,541
Total reduction (tCO_2e)		0	0	31,886	94,595	143,095	150,222	155,254	160,032	164,526	168,982
Additional reduction (tCO_2e)		0	0	31,886	62,709	48,500	7,127	5,032	4,778	4,494	4,457
Total reduction (%)		0%	0%	12%	36%	55%	58%	60%	62%	63%	65.11%

Table 8.6 Annual GHG emissions abatement per action domain

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total reduction (tCO2)		**0**	0	**31,886**	**94,595**	**143,095**	**150,222**	**155,254**	**160,032**	**164,526**	**168,982**
AD#1 (tCO2)		0	0	-	1,855	5,010	8,088	11,006	13,855	16,634	19,344
AD#2 (tCO2)		0	0	18,461	33,671	44,934	43,373	41,888	40,434	39,011	37,620
AD#3 (tCO2)		0	0	4,645	48,297	79,686	82,821	85,956	89,091	92,226	95,361
AD#4 (tCO2)		0	0	1,475	2,834	3,525	3,997	4,458	4,704	4,704	4,704
AD#5 (tCO2)		0	0	7,305	7,938	9,941	11,944	11,946	11,948	11,951	11,953

Figure 8.8 shows the distribution of the GHG emissions reduction between 2018 and 2030 across the different scopes. Similar to the 50% in-house GHG emissions reduction scenario, the highest share of GHG emissions reduction comes from mobility in general, which contributes to 59% of emissions reduction, instead of 55% in the 50% GHG emissions reduction scenario. The reduction of staff missions by air (mainly) contributes to 22% of the total reductions thanks to new travel policies and the installation of video conference facilities (compared to 24% in the 50% scenario), whereas a reduction in visitor travel to attend meetings, conferences and other events organised by the Commission corresponds to 33% of the total reductions (27% in the 50% scenario). A reduction in the emissions of home-work staff commuting is responsible for only 3% of the total reductions, less than in the 50% GHG emissions reduction scenario, where commuting accounts for 4% of the total reduction.

The second highest contribution to the total GHG emissions reduction concerns the buildings. This is mainly due to the important measures that will be implemented to reduce energy consumption, such as a reduction of working space, the switch to green electricity at all sites, the implementation of heat pumps to substitute natural gas and fuel boilers, the installation of solar panels on rooftops, and the purchase of biogas certificates for the remaining natural gas consumption. In total, 34% of the GHG emissions reduction comes from buildings, almost as much as in the 50% scenario (35%).

Finally, the measures that aim to reduce the embodied carbon of IT devices are responsible for 3% of total reductions, while in the 50% GHG emissions scenario they account for 4%.

Figure 8.8 Distribution of in-house GHG emissions reduction 2018-2030 for the 65% GHG emissions reduction scenario

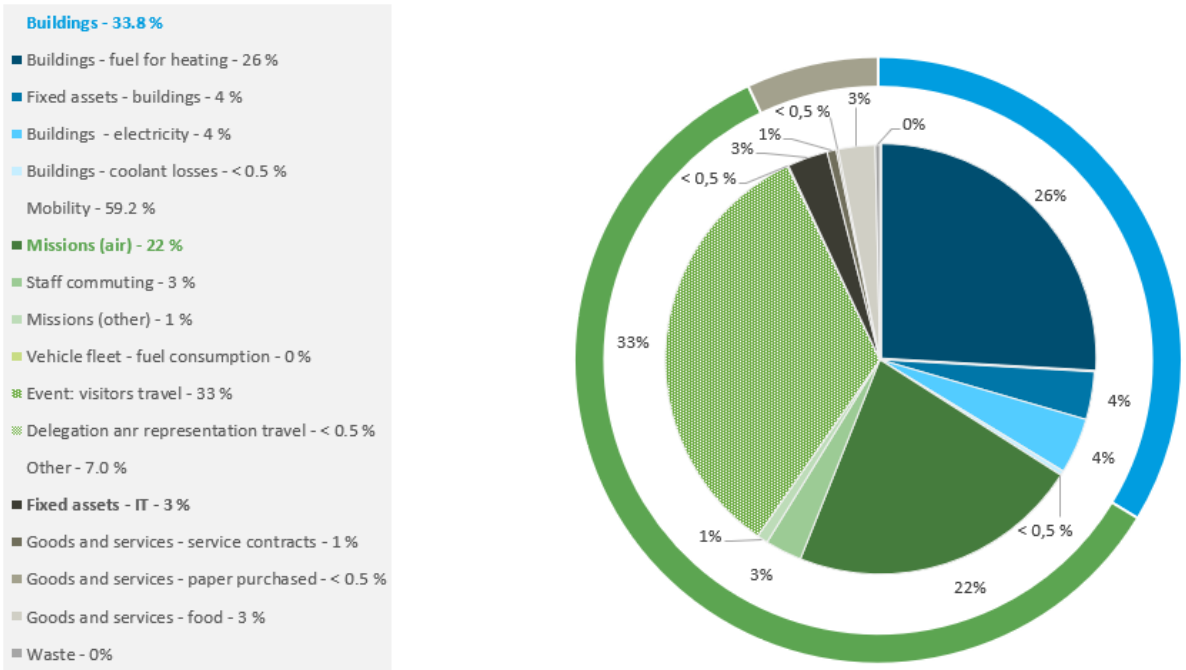


Figure 8.9 shows the relative GHG emissions reduction per site. Similar to the 50% in-house GHG emissions reduction scenario, it appears that Ispra, Karlsruhe and Seville will relatively decrease their emissions the most, as the measure of switching to 100% green electricity contracts is implemented. Furthermore, Ispra reduces by 77% its GHG emissions, mostly due to the decrease

in Scope 1 emissions (natural gas consumption), enabled by the installation of heat pumps and the purchase of biogas certificates for remaining natural gas consumption.

Figure 8.9 Relative emissions reduction per site between 2018 and 2030, for the 65% GHG emissions reduction scenario

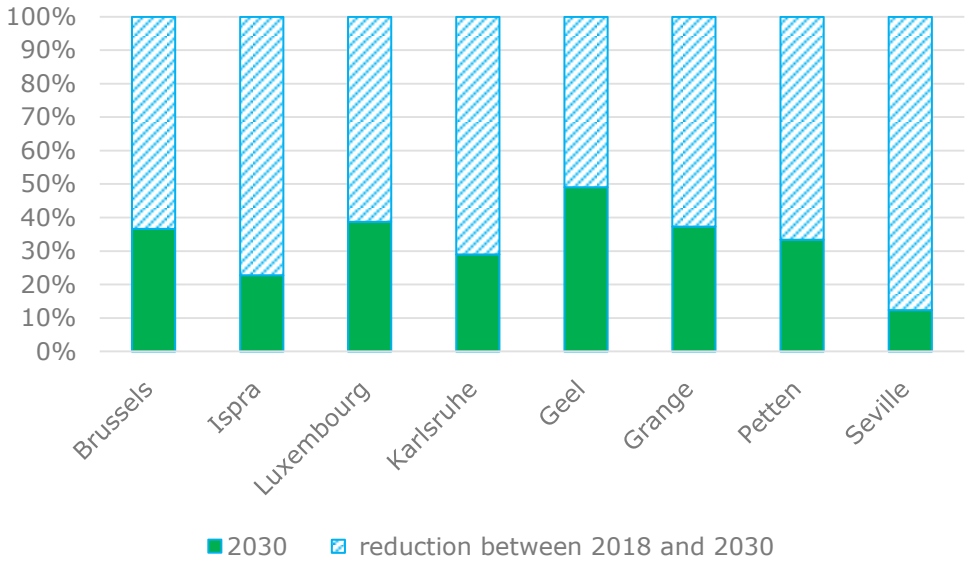
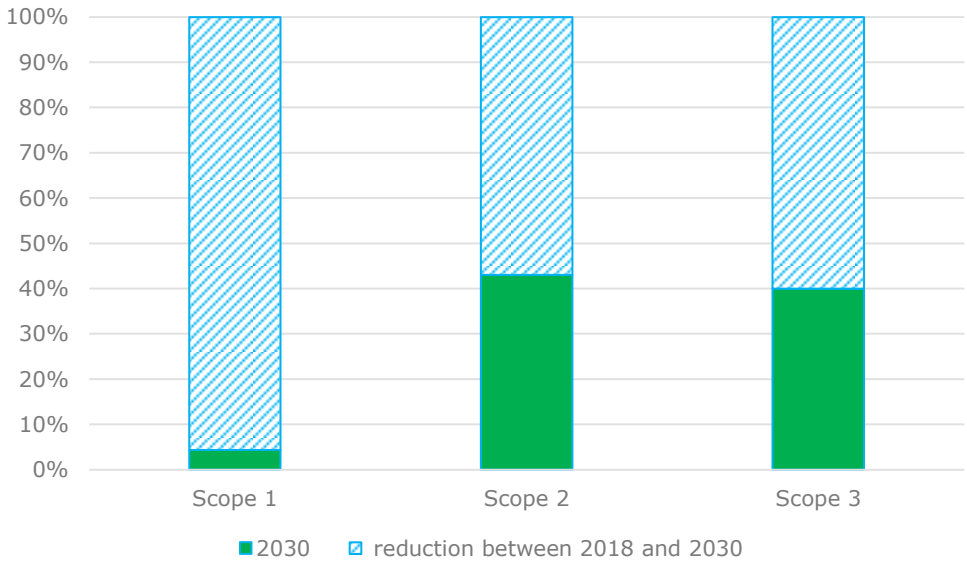


Figure 8.10 shows the relative GHG emissions reduction per scope. In contrast to the 50% in-house GHG emissions reduction scenario, the highest reductions are observed on Scope 1 (-96%), thanks to the decrease in fuel and natural gas consumption and the purchase of biogas certificates for 100% of the consumption.[404] As in the other scenarios, Scope 2 is reduced by 63%, thanks to the switch to green electricity.

Finally, Scope 3 emissions decrease by 60%, mostly due to a decrease in GHG emissions caused by staff missions by air and air travel of participants to the different meetings (evaluations of proposals, conferences, committees, etc.).

[404] This is possible already in 2020 for the sites located in BE, NL, GE, FR. The evolution of the market is still uncertain, and it will need to be further investigated for ES and IT.

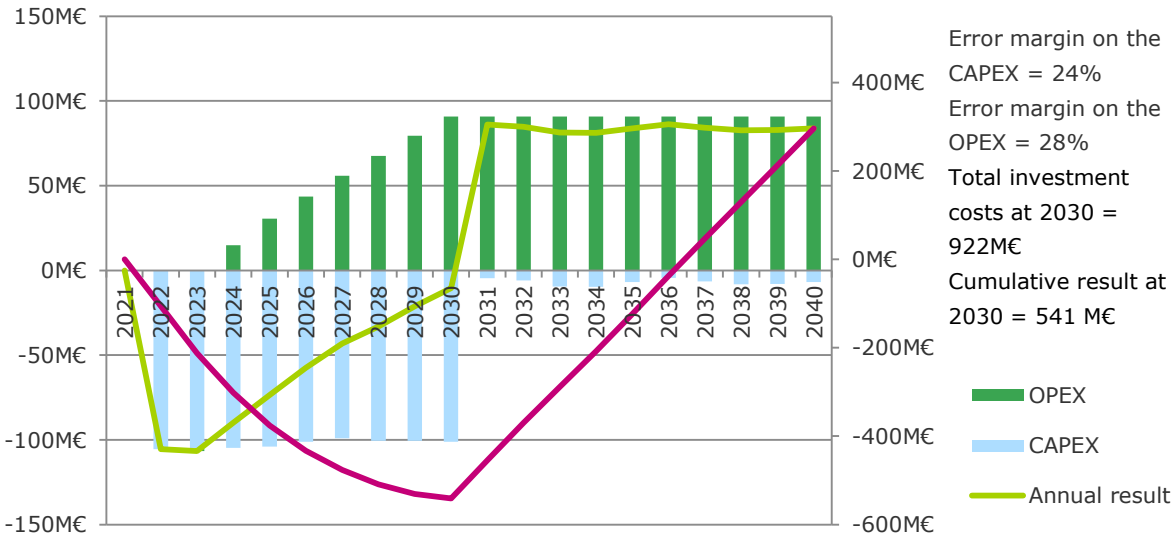
Figure 8.10 Relative GHG emissions reduction per scope between 2018 and 2030, for the 65% GHG emissions reduction scenario



8.3.3 Total costs of measures and offsetting to reach climate neutrality by 2030

The following graph and table present the annual investments needed (CAPEX) and the annual operating costs or savings (OPEX) caused by the implementation of the measures in the 65% GHG emissions reduction scenario, taking into account the combination of all the measures proposed. The uncertainty on the CAPEX is estimated to be 24%, and 28% on the OPEX. These estimates do not take into account the costs of carbon removal credits in 2030.

Figure 8.11 Financial analysis for the 65% in-house GHG emissions reduction scenario



The graph shows that the annual net result becomes positive from 2031. At 2030, the total (cumulated) cost of the scenario amounts to 541 M€ (nominal value). **The total cumulative result becomes positive from 2037.**

Table 8.7 shows the detailed results of the financial analysis. The average annual investment required in the 2022–2030 period is 102 M€.

Table 8.7 Annual investment and operating costs (in M€) for the 65% GHG emissions reduction scenario

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Investment	0 €	-105.45M€	-105.45M€	-104.68M€	-104.05M€	-101.06M€	-99.02M€	-100.63M€	-100.63M€	-101.23M€
Operating costs (-) /Savings (+)	0 €	0 €	-1.22M€	14.91M€	30.50M€	43.53M€	55.81M€	67.56M€	79.41M€	90.77M€
Results	0 €	-105.45M€	-106.66M€	-89.77M€	-73.55M€	-57.52M€	-43.21M€	-33.06M€	-21.22M€	-10.46M€

The IRR at 2040 in this scenario is estimated to be 4%.

The NPVs at 2030, according to the different social discount rates, are as follows:

- 3%: - 472 M€
- 4%: - 457 M€
- 5%: - 541 M€

GHG compensation cost considerations:

Under the 65% in-house GHG emissions reduction scenario, in order to reach climate neutrality in 2030, a remaining amount of GHG emissions of 90 $ktCO_2e$ will need to be offset every year as from 2030. The annual costs to reach climate neutrality from 2030 would be between 0,904 k€ and 1,355 k€ for carbon absorption projects located in ACP countries (considering a price range between 10 €/tCO_2e and 15 €/tCO_2e, as explained in section 5.4), and would amount to 4,518 k€ for carbon absorption projects located in the European Union (considering a price of 50 €/tCO_2e, which corresponds to the high range for a carbon removal project in Europe, as explained in section 5.4).

8.3.4 Conclusion and critical assessment

With an average 102 M€ annual investment on the 2022-2030 timeframe,[405] the 65% in-house GHG emissions reduction scenario requires significantly more CAPEX than the 50% in-house GHG emissions reduction scenario (70 M€ in annual investment). It also impacts considerably more on the way of working at the European Commission, in terms of the new office landscape (flexible desks, open-plan offices, improved teleworking, flexible meeting rooms, etc.), new ways of organising meetings (through the extensive use of videoconferencing), and restrictions on air travel. Indeed, the average office building gross surface (m^2/staff) will be reduced by 50%, and 75% of the missions will be replaced by video conferences.

[405] According to the uncertainty figure of 24%, the average annual CAPEX could reach 126 M€. This corresponds to an annual increase of 24 M€ (240 M€ over the entire period 2021–2030). On the other hand, this could equally be up to 24 M€ lower annually (240 M€ over the entire period).

This scenario therefore requires considerable investment capacity and a significant change in the way of working at the European Commission.

However, the payback point of this scenario is the same as in the 50% in-house GHG emission reduction scenario (2037). It is important to note that the IRR is also the same as for the 50% scenario (4%), which reflects the fact that it is equally financially attractive, under the assumption that there are no budgetary constraints.

8.4 Scenario 30% in-house GHG emissions reduction & 70% purchased CO2 removal credits

8.4.1 General description of the scenario 30% in-house GHG emissions reduction

This scenario differs from the 50% in-house GHG emissions reduction scenario on the ten measures presented in Table 8.8. The combination of these measures and the remaining35 measures enables the achievement of an overall target of 30% GHG emissions reduction.

Table 8.8 Main differences between 50% and 30% in-house GHG emissions reduction scenarios

#	Measure description	Description of the objective	50% in-house GHG emissions reduction scenario	30% in-house GHG emissions reduction scenario
1.1	Optimise office space	% Reduction of office building gross surface per employee	30% reduction in terms of m2/staff 24 m2/staff	10% reduction in terms of 32 m2/staff
1.3	Use low-carbon material in construction and renovation	Renovation with % of low carbon and sustainably sourced bio-materials	Renovation with 50% of low carbon and sustainably sourced bio-materials	Renovation with 20% of low carbon and sustainably sourced bio-materials
1.5	Relocate to green and sustainable buildings	% of staff relocated to new buildings	10%	4%
2.2	Optimise energy regulation systems	% of buildings monitored	100%	50%
2.3	Improve building insulation and passive protection	% of buildings with no relocation possible	30%	10%
2.10	Use new fuel sources for heating	% of remaining natural gas consumption for heating covered by biogas certificates	25%	Not implemented
2.12	Switch to heat pumps	% of gas and fuel replaced by heat pumps	30%	5%
3.1	Develop remote meeting attendance for staff through enhanced videoconference facilities	% of travel trip distance replaced by videoconferences	50%	20%
		# Videoconference devices	2,000	1,000
3.5	Develop remote meeting and conference attendance and promote low carbon travel for visitors	% of air travel trip distance avoided for meetings	35% by VC	15%
3.4	Improve booking criteria for missions	Sum of total % switch to more efficient airlines, use of biofuels and fewer connecting flights	20% of flights switch to more efficient airlines 10% of flights use biofuel 30% connecting flights to become direct flights	Not implemented

Rationale for the scenario 30% in-house GHG emissions reduction

One of the key criteria to select the measures that differ from the 50% in-house GHG emissions reduction scenario is the CAPEX requirements. Indeed, according to the current budgetary rules, financing major investments with a medium-term to long-term payback period (between five and ten years) represents a difficulty, as it is currently not possible to take out a loan (except for a new building or for an investment that increases the value of an asset). Therefore, most of the changes concern the measures in AD#1 *Design sustainable buildings and working space* and AD#2 *Optimise energy consumption and systems*, which contain eight of the ten most capital-intensive measures.

Additionally, Measure 2.10 *Use new fuel sources for heating* is withdrawn, as it does not lead to financial savings. It has a net annual cost, as it does not lead to a reduction in energy consumption. Furthermore, the evolution of the price of the biogas certificate is also uncertain, as it will depend on various factors (evolution of the production capacity, demand, etc.). Therefore, this measure has been withdrawn from the scenario.

Even though the measures concerning staff missions represent high GHG emissions reduction potential, the objective of Measure 3.1 *Develop remote meeting attendance for staff through enhanced videoconference facilities* is also lower in this scenario. The reason is that these measures imply important changes in the "pre-Covid" way of working at the Commission which might represent a burden.

However, it is important to stress that as these measures generate high financial savings, the higher the different objectives of measures in AD#3 *Avoid air travel and promote low-carbon travel modes*, the higher the financial savings.

The key changes can be summarised as follows, stressing the main differences of objective with the 50% in-house GHG emissions reduction scenario:

- a 10% average building office gross surface reduction instead of 30% (applied to 70% of all office buildings of the European Commission in Brussels), where the average building office gross surface will be reduced by 10%. However, only 50% of the remaining surface will be redesigned into collaborative space (hot-desking, shared office) and improved teleworking;
- the relocation of 4% of the staff, instead of 10%, into highly energy-efficient and low-carbon buildings;
- the use of new fuel sources in existing systems (synthetic fuels/sustainable biogas) is no longer applicable;
- a lower level optimisation of the energy performance and size of energy systems (only 50% of the buildings monitored, instead of 100%);
- the installation of heat pumps in order to replace 5% of the gas and fuel consumption across all buildings, instead of 30%;
- a reduction of staff missions by air by 20% (replaced by videoconferences), instead of 50%;
- Concerning travels made by visitors attending meetings, events and committees organised by the European Commission, a replacement of 15% of physical attendance by virtual attendance (videoconferences and web streaming), instead of 35%.

8.4.2 Total GHG abated

Figure 8.2 shows the decarbonisation pathway for this scenario:

Figure 8.12 Decarbonisation pathway for the 30% in-house GHG emissions reduction scenario & 70% purchase of CO2 removal credits

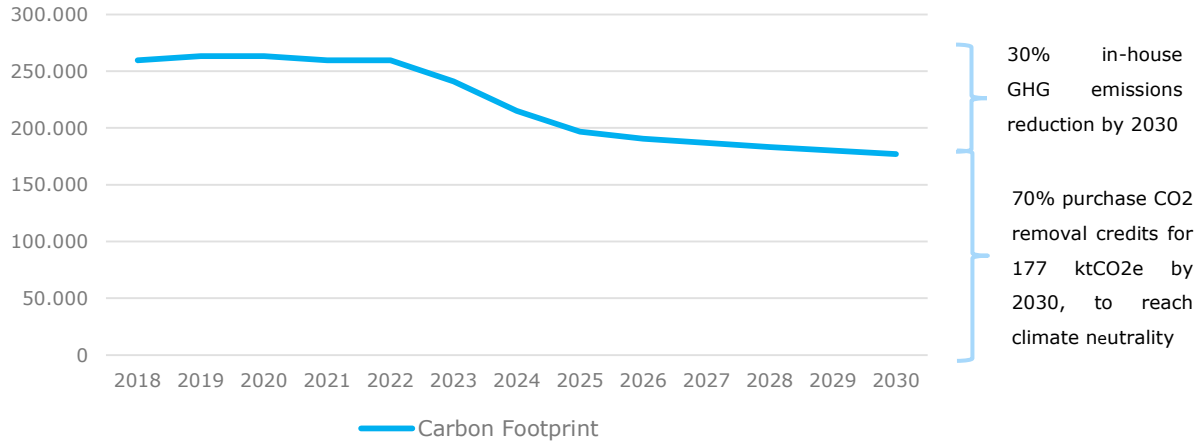


Table 8.9 Annual GHG emissions abatement for the 30% in-house GHG emissions reduction scenario presents the annual GHG emissions reduction of the 30% in-house GHG emissions reduction scenario, taking into account the combination of all the measures proposed in this scenario. The overlap factor in this scenario increases every year as the implementation rate of the measures increases, and reaches 12% by 2030. The uncertainty on the overall mitigation potential is 23%.

Table 8.9 Annual GHG emissions abatement for the 30% in-house GHG emissions reduction scenario

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total scope (tCO2e)	263,240	259,523	259,523	240,966	215,186	196,773	190,814	186,981	183,428	180,186	177,006
Total reduction (tCO2)		0	0	18,558	44,337	62,751	68,709	72,543	76,095	79,338	82,517
Additional reduction (tCO2e)		0	0	18,558	25,780	18,413	5,959	3,833	3,553	3,242	3,180
Total reduction (%)		0%	0%	7%	17%	24%	26%	28%	29%	31%	32%

Table 8.10 Annual GHG emissions abatement per action domain

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total reduction (tCO2)		**0**	**0**	**18,558**	**44,337**	**62,751**	**68,709**	**72,543**	**76,095**	**79,338**	**82,517**
AD#1 (tCO2)		0	0	-	535	1,887	3,227	4,467	5,698	6,920	8,134
AD#2 (tCO2)		0	0	5,133	9,998	13,128	14,291	15,442	16,535	17,573	18,557
AD#3 (tCO2)		0	0	4,645	23,034	34,273	35,255	36,236	37,218	38,199	39,181
AD#4 (tCO2)				1,475	2,834	3,525	3,997	4,458	4,704	4,704	4,704
AD#5 (tCO2)		0	0	7,305	7,937	9,938	11,939	11,940	11,941	11,941	11,942

Figure 8.13 shows the distribution of the GHG emissions reduction between 2018 and 2030 across the different scopes. Similar to the 50% in-house GHG emissions reduction scenario, the first contributor in terms of GHG emissions reduction is mobility, and more specifically the air travel of participants to meetings and events organised by the Commission, which contributes to 25% of the GHG emissions reduction, followed by the air travel of staff for missions (22% of the total reduction) and home-work commuting (6% of the total reduction).

The figure also shows that 32% of the reduction comes from buildings (mainly energy consumption in the buildings, but also the embodied carbon in the fixed assets). This is mainly due to the major measures that will be implemented to reduce energy consumption in AD#1 *Design sustainable buildings and working space* and AD#2 *Optimise energy consumption and systems*, such as a reduction of the working space, the switch to green electricity at all sites, the implementation of heat pumps to substitute natural gas and fuel boilers, the installation of solar panels on rooftops, and the purchase of biogas certificates. In the 50% in-house GHG emissions scenario, buildings account for 35% of the total GHG emissions reduction.

Finally, the measures that aim to reduce the embodied carbon of IT devices are responsible for 6% of the total reduction, while this figure is 4% in the 50% GHG emissions reduction scenario.

Figure 8.13 Distribution of in-house GHG emissions reduction 2018-2030 for the 30% in-house GHG emissions reduction scenario

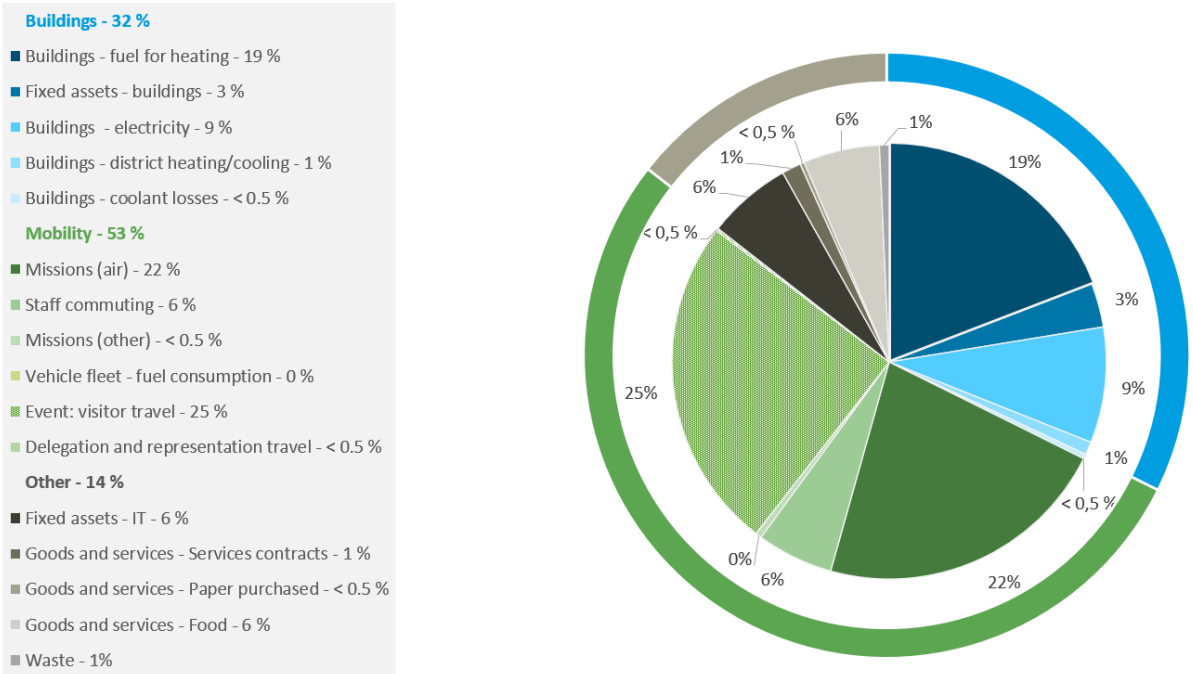


Figure 8.14 shows the relative emissions reduction per site. Similar to the 50% in-house GHG emissions reduction scenario, it appears that Karlsruhe and Seville will relatively reduce emissions the most, essentially due to the measure that consists in switching to 100% green electricity contracts. The other sites reduce their GHG emissions by approximately 30% each.

Figure 8.14 Relative emissions reduction per site between 2018 and 2030, for the 30% in-house GHG emissions reduction scenario

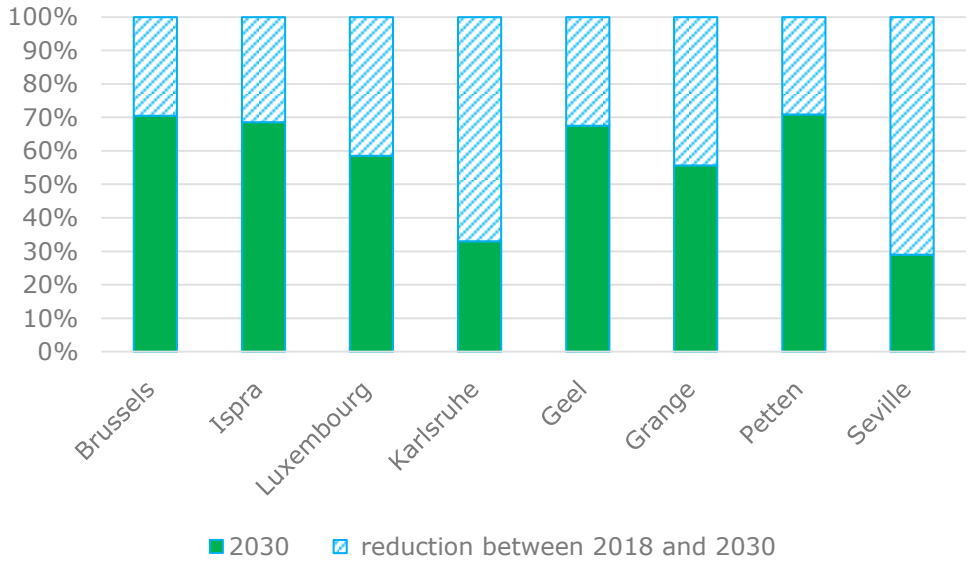
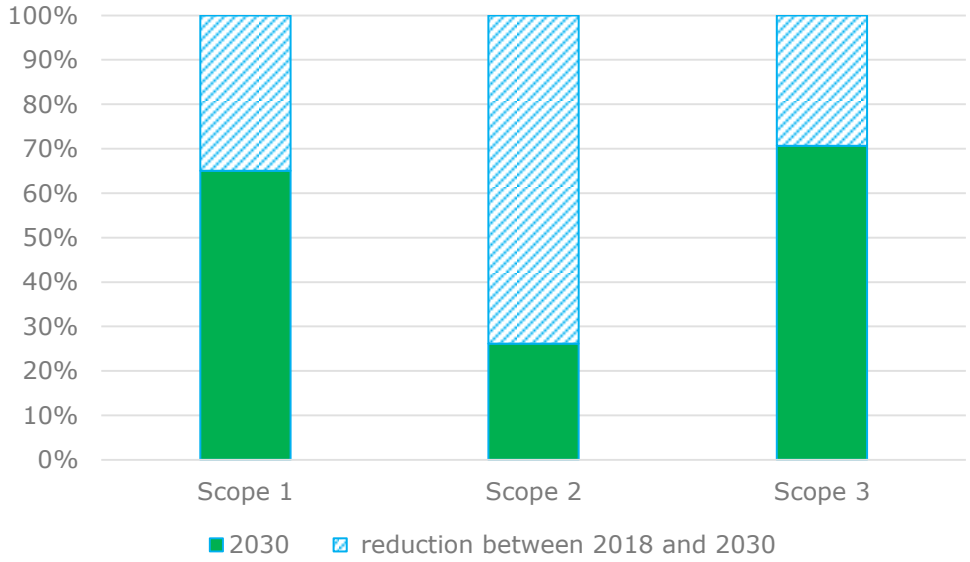


Figure 8.15 shows the relative GHG emissions reduction per scope. As already mentioned, the highest reductions are observed on Scope 2 (-74%), thanks to the switch to 100% green electricity in Karlsruhe, Grange and Seville. GHG emissions of Scope 1 are reduced by 35%, thanks to a combination of measures that aim to reduce energy consumption in the buildings.

Finally, Scope 3 emissions decrease by 29%, mostly due to a reduction of GHG emissions caused by staff air travel for missions and the air travel of participants to meetings and events organised by the Commission (evaluations of research proposals, conferences, committees, etc.).

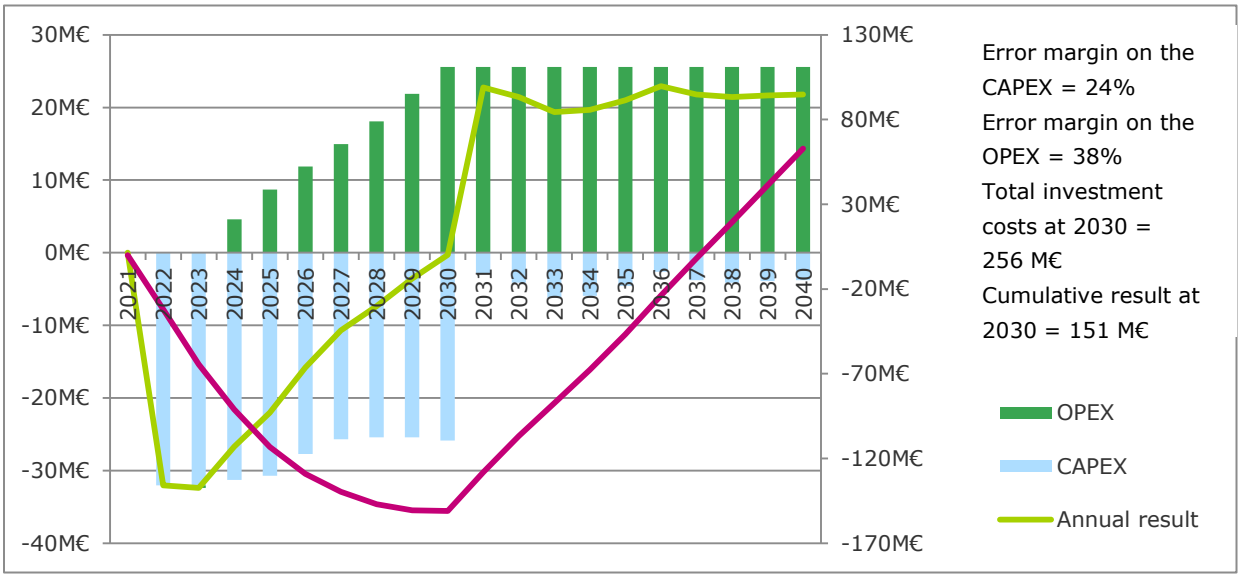
Figure 8.15 Relative GHG emissions reduction per scope between 2018 and 2030, for the 30% GHG emissions reduction scenario



8.4.3 Total costs of measures and offsetting to reach climate neutrality by 2030

The following graph and table present the annual investments needed (CAPEX) and the annual operating costs or savings (OPEX) induced by the implementation of the measures in the 30% GHG emissions reduction scenario, taking into account the combination of all the measures proposed. This estimation does not take into account the costs of carbon removal credits. The uncertainty on the CAPEX is estimated to be 24% and on the OPEX 38%.

Figure 8.16 Financial analysis (in M€) for the 30% in-house GHG emissions reduction scenario



The graph shows that the annual net result becomes positive from 2031. At 2030, the total (cumulative) cost of the scenario amounts to 151 M€ (nominal value). **The total cumulative result becomes positive from 2038. After this horizon, a net financial benefit is generated.**

The annual average investment needs over the 2022–2030 period amount to 28 M€.

The following table shows the detailed results of the financial analysis.

Table 8.11 Annual investment and operating costs (in M€) for the 30% GHG emissions reduction scenario

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Investment	0 €	-32.06M€	-32.06M€	-31.29M€	-30.71M€	-27.72M€	-25.68M€	-25.43M€	-25.43M€	-25.88M€
Operating costs (-) /Savings (+)	0 €	0 €	-0.34M€	4.59M€	8.68M€	11.89M€	14.96M€	18.09M€	21.86M€	25.58M€
Annual Results	0 €	-32.06M€	-32.40M€	-26.69M€	-22.03M€	-15.83M€	-10.72M€	-7.34M€	-3.56M€	-0.29M€

The IRR at 2040 for this scenario is estimated to be 3%.

The NPVs for 2030, according to the different social discount rates, are as follows:

- 3%: - 133 M€
- 4%: - 128 M€
- 5%: - 123 M€

GHG compensation cost considerations:

Under this 30% in-house GHG emissions reduction scenario, in order to reach climate neutrality by 2030, a remaining amount of GHG emissions of 177 $ktCO_2e$ will need to be offset every year from 2030. The annual costs to reach climate neutrality from 2030 would be between 1,769 k€ and 2,652 k€ for carbon absorption projects located in ACP countries (considering a price range between 10 €/tCO_2e and 15 €/tCO_2e, as explained in section 5.4), and would amount to 8,841 k€ for carbon absorption projects located in the European Union (considering a price of 50 €/tCO_2e, which corresponds to the high range for a carbon removal project in Europe, as explained in section 5.4).

8.4.4 Conclusion and critical assessment

With an average 28 M€ annual investment on the 2022-2030 timeframe,[406] the 30% in-house GHG emissions reduction scenario requires significantly less CAPEX than the 50% in-house GHG emissions reduction scenario (70 M€ annual investment). It also impacts less significantly on the way of working at the European Commission, in terms of the new office landscape (flexible desks, open-plan offices, improved teleworking, flexible meeting rooms, etc.), new ways of organising meetings (through the extensive use of videoconferencing), restrictions on air travel, etc.

The payback point for this scenario is slightly later (2038, instead of 2037 as in the 50% scenario), because it generates slightly less savings. It is important to mention that the measures which aim to limit missions are highly profitable, as they are low capital intensive (installation of video conferences) and generate immediate savings (travel avoidance). However, as these measures impact significantly on the way of working at the European Commission and might face a certain level of difficulty in their implementation, this scenario proposes a lower, more easily attainable objective for this measure.

[406] According to the uncertainty figure of 24%, the average annual CAPEX could reach 35 M€. This corresponds to an annual increase of 7 M€ (70 M€ over the entire period 2021–2030). On the other hand, this could equally be up to 7 M€ lower annually (70 M€ over the entire period).

8.5 Overall conclusion on the three scenarios

The following tables provide a summary of findings. Table 8.12 is a comparison focusing on the measures that change across the three scenarios. Table 8.13 is a comparison of the key indicators across the three scenarios.

Table 8.12 Comparison of the measures between scenarios

#	Measure description	Description of the objective	30% in-house GHG emissions reduction scenario	50% in-house GHG emissions reduction scenario	65% in-house GHG emissions reduction scenario
1.1	Optimise office space	% Reduction of average office building gross surface per employee	10% reduction in terms of m2/staff 32 m2/staff	30% reduction in terms of m2/staff 24 m2/staff	50% reduction in terms of m2/staff 18 m2/staff
1.3	Use low-carbon material in construction and renovation (based on LCA, see LEVEL(s))	Renovation with % of low carbon and sustainably sourced bio-materials	Renovation with 20% of low carbon and sustainably sourced bio-materials	Renovation with 50% of low carbon and sustainably sourced bio-materials	Renovation with 70% of low carbon and sustainably sourced bio-materials
1.5	Relocate to green and sustainable buildings	% of staff relocated to new buildings	4%	10%	20%
2.2	Optimise energy regulation systems	% of buildings monitored	50%	100%	100%
2.3	Improve building insulation and passive protection	% of buildings with no relocation possible	10%	30%	30%
2.10	Use new fuel sources for heating	% of remaining natural gas consumption for heating covered by biogas certificates	Not implemented	25%	100%
2.12	Switch to heat pumps	% of gas and fuel replaced by heat pumps	5%	25%	25%
3.1	Develop remote meeting attendance for staff through enhanced videoconference facilities	% of travel trip distance replaced by videoconference	20%	50%	75%
		# videoconference devices	1,000	2,000	3,000
3.5	Develop remote meeting attendance and promote low	% of air travel trip distance avoided for	15%	35%	65%

#	Measure description	Description of the objective	30% in-house GHG emissions reduction scenario	50% in-house GHG emissions reduction scenario	65% in-house GHG emissions reduction scenario
	carbon travel for visitors	meetings			
3.4	Improve booking criteria for missions	Sum of total % switch to more efficient airlines, use of biofuels and fewer connecting flights	Not implemented	20% of flights switch to more efficient airlines 10% of flights use biofuels 30% of connecting flights become direct flights	20% of flights switch to more efficient airlines 10% of flights use biofuels 30% of connecting flights become direct flights

Table 8.13 Comparison of GHG reductions/removals and costs between the three scenarios

Scenarios	Unit	30% in-house reduction	50% in-house reduction	65% in-house reduction
EMISSIONS REDUCTIONS				
Total GHG abated in 2030	tCO2e	82,517	128,158	168,982
Contribution of each sector: **- Buildings** **- Mobility** **- Other**	%	 - 32% - 53% - 14%	 - 35% - 55% - 9%	 - 34% - 59% - 7%
Average annual CAPEX 2022-2030	M€	-28	-70	-102
Average annual OPEX 2022-2030 - Operating costs (-) /Savings (+)	M€	12	29	42
Total cost of reduction by 2030	M€	151	370	541
Internal Rate of Return (IRR) at 2040	%	3	4	4
Date of budget neutrality	Year	2038	2037	2037
EMISSIONS ABSORPTIONS				
Total GHG to be offset in 2030	tCO2e	177,006	131,365	90,541
Price range of offsetting in 2030 in ACP countries	M€	1.8 – 2.7	1.3 – 2.0	0.9 – 1.4
Price of offsetting in 2030 in European countries	M€	8.8	6.6	4.5

Mobility and buildings are the main area of in-house GHG reduction for all scenarios.

For mobility, the main driver is air travel, for staff and for visitors attending events, meetings and committees organised by the Commission. This travel will have to be significantly reduced to reduce GHG emissions.

For buildings, the main contribution to in-house GHG emission reduction concerns the redesign of the office buildings and space, which involves a reduction of surface through optimisation of the work environment. This in turns generates a reduction of embodied carbon (lifecycle emissions related to construction) on the one hand, and a reduction of energy consumption on the other.

Both reduction drivers have a significant impact on the way of working at the European Commission, as they will require more remote meetings as well as more flexibility in daily office practices. The more ambitious the scenario, the more substantial the change.

Other measures matter but less significantly. For instance, measures related to food or office supply have a signalling effect on staff and visitors, but they are expected to have limited direct impact in terms of GHG emissions reduction.

A target year of 2030 enables a focus on measures with short- to medium-term effect. Long-term (flagship) measures, such as the construction of new highly sustainable buildings

(Loi130), are less relevant in this time horizon. However, they remain highly relevant to show leadership in the short term, and effectively reduce GHG emissions in the longer term and towards 2050.

More preparatory work is definitively needed to develop specific plans for important measures, particularly those related to buildings. The present study has tried to provide as much detail and accuracy as possible taking into consideration the characteristics of the current building portfolio, but a building-per-building assessment will be needed before action can be taken. The scenario analysis accounts for such a preparation period.

All scenarios include important payback which can help to finance the plan, conditional on the ability to spread the investment over several years, e.g. through loans.

It appears that the 30% in-house GHG emissions reduction scenario would potentially be more feasible considering the budgetary constraints in the next MFF, which would only allow an annual budget increase for administrative expenses of 20 M€ per year to compensate for inflation. However, this scenario reaches budget neutrality one year later than the other two scenarios (in 2038 instead of 2037).

In the longer run, the 50% in-house GHG emissions reduction scenario and the 65% in-house GHG emissions reductions scenario provide significantly higher GHG emissions reductions, and they also generate higher financial savings. Both scenarios present a sensibly higher return on investment and a slightly shorter payback period than the 30% scenario. The comparison with the 30% in-house GHG emissions reduction scenario becomes even more favourable when a longer period of time is taken into consideration.

The 65% in-house emissions reduction scenario appears to be highly beneficial from both an environmental and a financial point of view. It would reduce GHG emissions by 169 $ktCO_2e$ per year as of 2030 and would generate more than 84 M€ of financial benefits on average per year from 2035. This scenario would however require overcoming budgetary constraints to allow for higher investments in the short term, possibly through long-term loans.[407] It would also require significant changes in working practices at the Commission.

The 50% in-house emissions reduction scenario is a well-balanced scenario in terms of financial return and environmental impact. It would achieve an annual reduction in GHG emissions by 128 $ktCO_2e$ per year as of 2030 and deliver net financial benefits of 56 M€ per year from 2037.

[407] Under the current Financial Regulation, only loans related to the acquisition of buildings are possible. This also includes "structural renovation and/or demolition + re-building".

APPENDIX 1
CARBON FOOTPRINT 2018 SITE BY SITE

The site carbon footprints do not include two sources of emissions:

i. Delegation and representation travels (6,140 tCO_2e; 2.4% of the global corporate carbon footprint)
ii. Visitors travelling for events (70,215 tCO_2e; 27.2% of the Global corporate carbon footprint)

Consequently, the shares of the global carbon footprint, shown below, do not consider these sources of emissions.

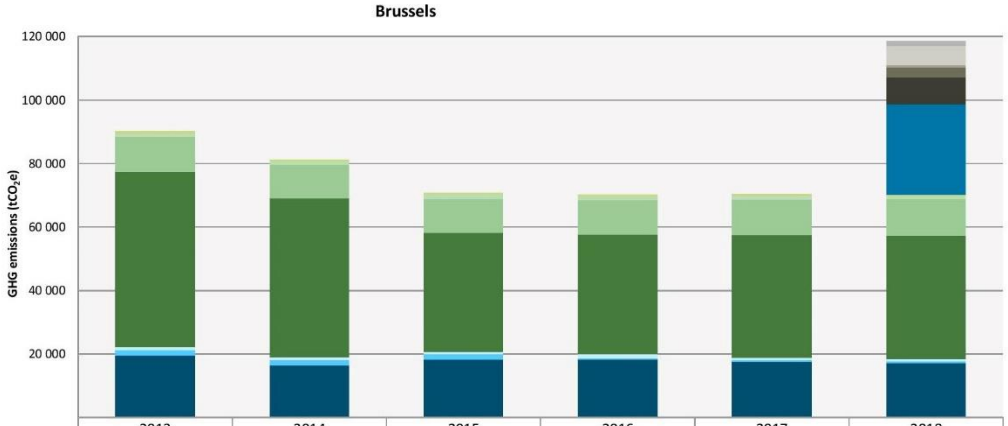
A. Carbon footprint of Brussels in 2018 – 65. 3 % of the global carbon footprint (excl. delegation and visitors travels)

In 2018, the Brussels' site was responsible for 65.3% of the corporate carbon footprint, this represents 118,496 tCO_2e of which 88.1 % is related to five sources of emissions:

- Air travel for missions (32.7% - 38,793 tCO_2e)
- Fixed assets for buildings constructions (24% - 28,466 tCO_2e)
- Fuel used for buildings heating (14.5% - 17,181 tCO_2e)
- Staff commuting (9.8% - 11,565 tCO_2e)
- Fixed assets for IT equipment (7% - 8,345 tCO_2e)

Regarding the consequent level of emissions in Brussels, those sources of emissions represent potential levers of emission reduction.

Emissions due to electricity consumption are very low thanks to green electricity contracted by the European Commission that covered almost 100% of electricity supply.

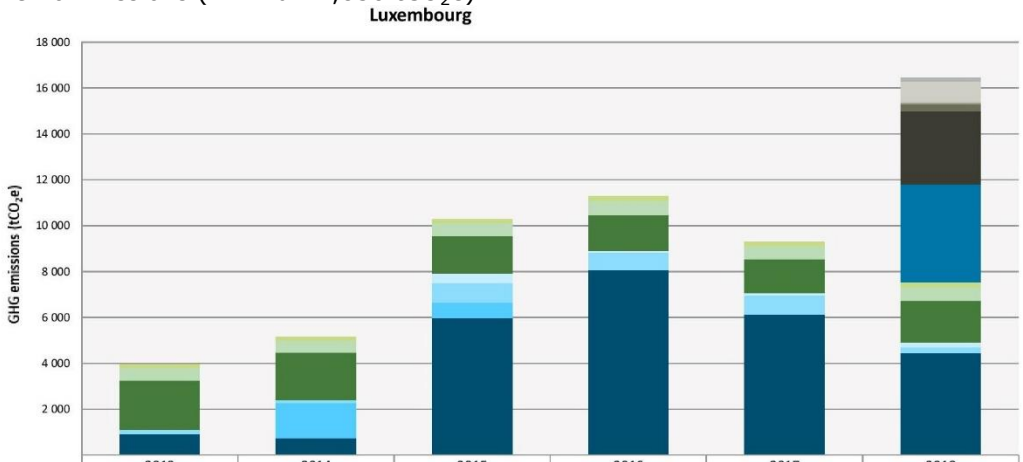


	2013	2014	2015	2016	2017	2018
Total (tCO2e)	90,110	81,278	70,782	70,288	70,347	118,496
Waste	0	0	0	0	0	1,391
Goods and services - food	0	0	0	0	0	5,994
Goods and services - paper purchased	0	0	0	0	0	776
Goods and services - service contracts	0	0	0	0	0	3,296
Fixed assets - IT	0	0	0	0	0	8,345
Fixed assets - buildings	0	0	0	0	0	28,466
Vehicle fleet - fuel consumption	704	653	659	663	623	626
Missions (other)	996	947	1,199	1,186	1,087	764
Staff commuting	10,850	10,672	10,672	10,672	11,046	11,565
Missions (air)	55,358	50,044	37,543	37,719	38,711	38,793
Buildings - coolant losses	864	821	763	1,315	749	820
Buildings - district heating/cooling	0	0	0	0	0	0
Buildings - electricity	1,652	1,685	1,675	530	623	477
Buildings - fuels for heating	19,685	16,456	18,272	18,204	17,508	17,181

B. Carbon footprint of Luxembourg in 2018 – 9.1 %

Luxembourg GHG emissions are equivalent to 16,454 tCO_2e in 2018, this is 9.1% of the corporate carbon footprint of which 83% are related to four sources of emissions:

- Fuel used for buildings heating (27% - 4,443 tCO_2e)
- Fixed assets for buildings construction (26% - 4,278 tCO_2e)
- Fixed assets for IT equipment (19.3% - 3,181 tCO_2e)
- Air travel for missions (11.1% - 1,830 tCO_2e)

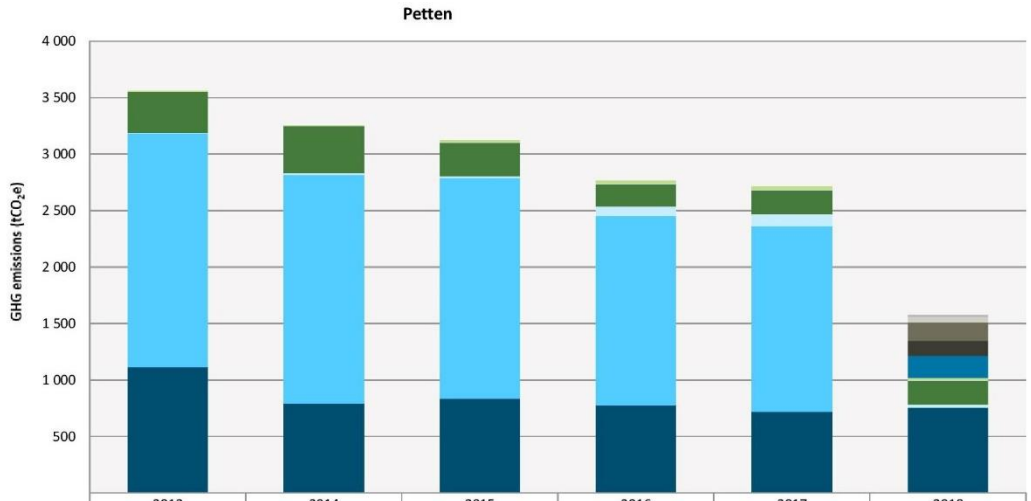


	2013	2014	2015	2016	2017	2018
Total (tCO2e)	3,965	5,149	10,282	11,294	9,297	16,454
Waste	0	0	0	0	0	157
Goods and services - food	0	0	0	0	0	926
Goods and services - paper purchased	0	0	0	0	0	73
Goods and services - service contracts	0	0	0	0	0	309
Fixed assets - IT	0	0	0	0	0	3,181
Fixed assets - buildings	0	0	0	0	0	4,278
Vehicle fleet - fuel consumption	155	163	172	203	187	204
Missions (other)	550	524	569	632	572	588
Staff commuting	0	0	0	0	0	0
Missions (air)	2,149	2,067	1,624	1,554	1,472	1,830
Buildings - coolant losses	0	0	407	89	108	191
Buildings - district heating/cooling	197	133	850	741	819	275
Buildings - electricity	0	1,522	680	0	0	0
Buildings - fuels for heating	914	740	5,981	8,074	6,139	4,443

C. Carbon footprint of Petten in 2018 – 0.9 %

Petten GHG emissions are equivalent to 1,572 tCO_2 in 2018, this is 0.9% of the corporate carbon footprint of which 84 % are related to four sources of emissions:

- Fuel used for buildings heating (48% - 755 tCO_2e)
- Air travel for missions (13.4% - 211 tCO_2e)
- Fixed assets for buildings construction (12.1% - 190 tCO_2e)
- Fixed assets for IT equipment (10.2% - 160 tCO_2e)

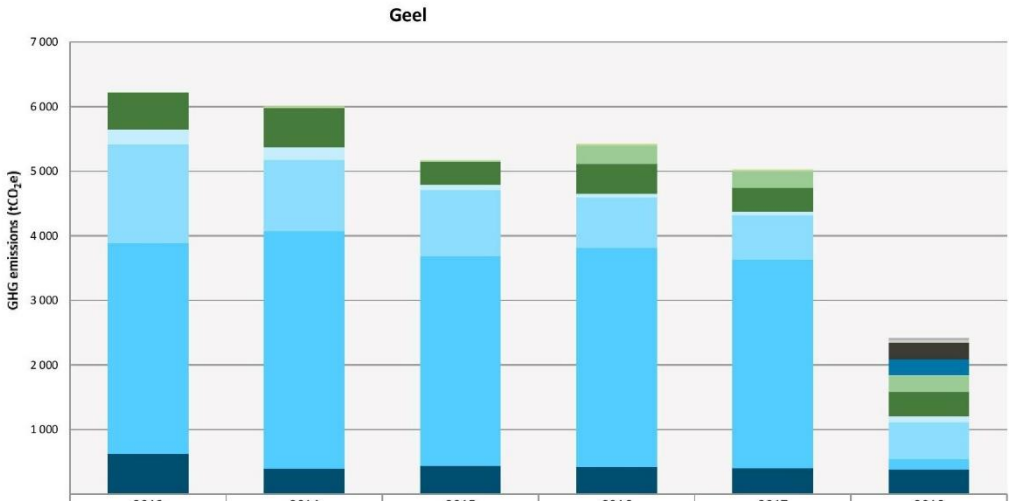


	2013	2014	2015	2016	2017	2018
Total (tCO2e)	3,558	3,255	3,122	2,763	2,710	1,572
Waste	0	0	0	0	0	6
Goods and services - food	0	0	0	0	0	54
Goods and services - paper purchased	0	0	0	0	0	2
Goods and services - service contracts	0	0	0	0	0	160
Fixed assets - IT	0	0	0	0	0	136
Fixed assets - buildings	0	0	0	0	0	190
Vehicle fleet - fuel consumption	2	2	9	15	16	16
Missions (other)	2	4	13	17	16	14
Staff commuting	0	0	0	0	0	0
Missions (air)	366	418	295	192	210	211
Buildings - coolant losses	5	12	17	88	103	28
Buildings - district heating/cooling	0	0	0	0	0	0
Buildings - electricity	2,068	2,026	1,953	1,671	1,643	0
Buildings - fuels for heating	1,114	792	836	780	721	755

D. Carbon footprint of Geel in 2018 – 1.3 %

Geel GHG emissions are equivalent to 2,414 tCO_2 in 2018, this is 1.3% of the corporate carbon footprint. Emissions of which almost 55% are related to three sources of emissions:

- District heating and cooling system (23.4% - 564 tCO_2e)
- Fuel used for buildings heating (16.2% - 390 tCO_2e)
- Air travel for missions (15.7% - 378 tCO_2e)

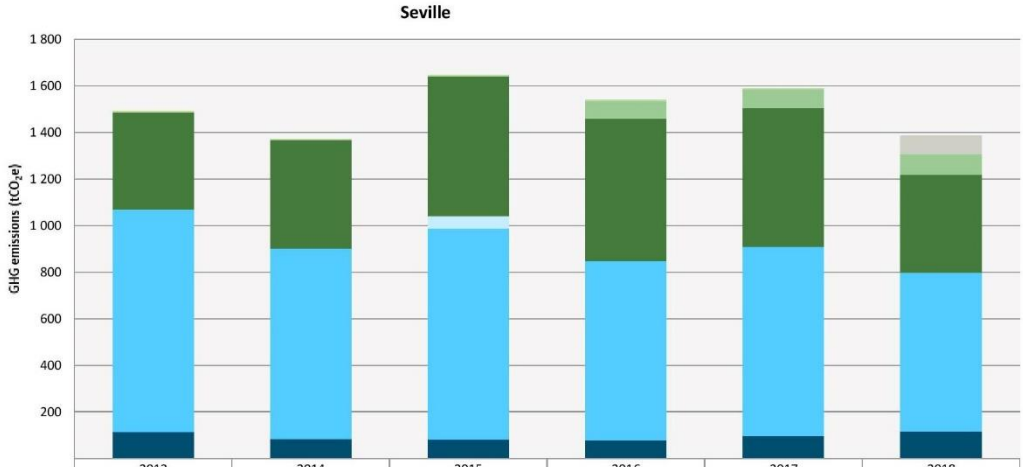


	2013	2014	2015	2016	2017	2018
Total (tCO2e)	6,223	5,996	5,176	5,419	5,021	2,414
Waste	0	0	0	0	0	31
Goods and services - food	0	0	0	0	0	31
Goods and services - paper purchased	0	0	0	0	0	3
Goods and services - service contracts	0	0	0	0	0	2
Fixed assets - IT	0	0	0	0	0	254
Fixed assets - buildings	0	0	0	0	0	246
Vehicle fleet - fuel consumption	0	9	9	8	8	7
Missions (other)	3	9	14	12	12	7
Staff commuting	0	0	0	281	251	246
Missions (air)	571	602	361	459	367	378
Buildings - coolant losses	226	196	85	60	59	98
Buildings - district heating/cooling	1,534	1,109	1,024	784	689	564
Buildings - electricity	3,264	3,678	3,242	3,396	3,229	157
Buildings - fuels for heating	626	394	441	418	405	390

F. Carbon footprint of Seville in 2018 – 0.8 %

Seville GHG emissions are equivalent to 1,385 tCO_2e in 2018, this is 0.8% of the corporate carbon footprint of which 80% are related to two sources of emissions:

- Electricity supplied (49% - 681 tCO_2e)
- Air travel for missions (31 % - 421 tCO_2e)



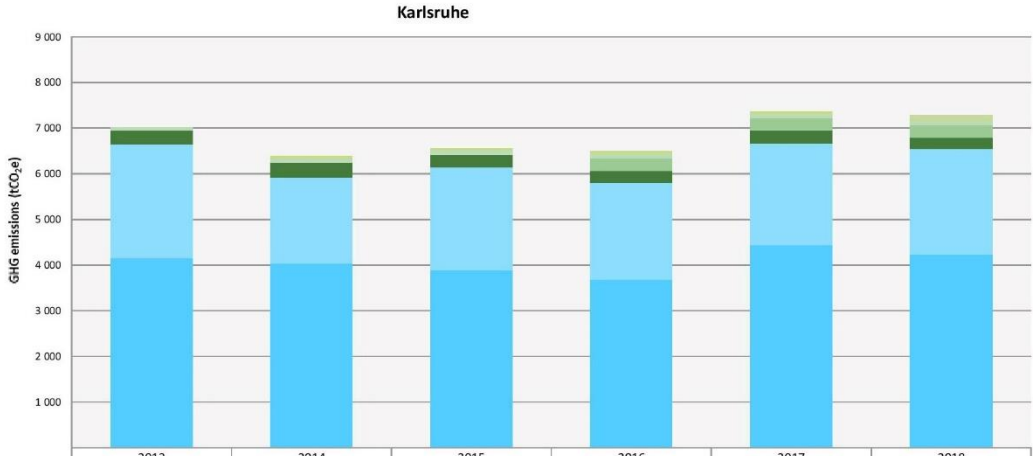
	2013	2014	2015	2016	2017	2018
Total (tCO2e)	1,492	1,371	1,648	1,540	1,589	1,385
Waste	0	0	0	0	0	0
Goods and services - food	0	0	0	0	0	74
Goods and services - paper purchased	0	0	0	0	0	0
Goods and services - service contracts	0	0	0	0	0	0
Fixed assets - IT	0	0	0	0	0	0
Fixed assets - buildings	0	0	0	0	0	0
Vehicle fleet - fuel consumption	1	1	1	1	1	1
Missions (other)	2	2	4	3	3	2
Staff commuting	0	0	0	76	82	89
Missions (air)	418	465	603	611	594	421
Buildings - coolant losses	0	0	51	0	0	0
Buildings - district heating/cooling	0	0	0	0	0	0
Buildings - electricity	956	818	907	770	814	681
Buildings - fuels for heating	114	85	82	79	96	117

G. Carbon footprint of Karlsruhe in 2018 – 4%

Karlsruhe GHG emissions are equivalent to 7,283 tCO_2e in 2018, this is 4% of the corporate carbon footprint of which 90% are related to two sources of emissions:

- Electricity supplied (58 % - 4,221 tCO_2e)
- District heating and cooling systems (32 % - 2,319 tCO_2e)

Nevertheless, due to resources issues[408], additional sources of emissions on scope 3 are not reported yet.



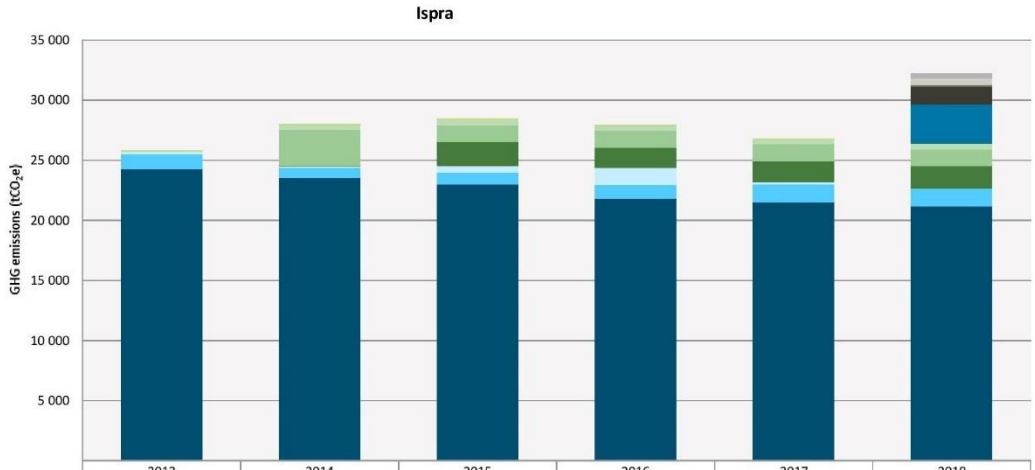
	2013	2014	2015	2016	2017	2018
Total (tCO2e)	7,019	6,394	6,559	6,489	7,367	7,283
Waste	0	0	0	0	0	0
Goods and services - food	0	0	0	0	0	69
Goods and services - paper purchased	0	0	0	0	0	0
Goods and services - service contracts	0	0	0	0	0	0
Fixed assets - IT	0	0	0	0	0	0
Fixed assets - buildings	0	0	0	0	0	0
Vehicle fleet - fuel consumption	0	51	41	44	48	41
Missions (other)	72	98	98	114	100	103
Staff commuting	0	0	0	273	273	273
Missions (air)	300	322	282	252	281	255
Buildings - coolant losses	0	0	0	0	0	0
Buildings - district heating/cooling	2,494	1,883	2,245	2,126	2,220	2,319
Buildings - electricity	4,150	4,037	3,890	3,677	4,442	4,221
Buildings - fuels for heating	3	3	3	3	3	3

408 Also due to resource issues, Karlsruhe did not respond to questionnaire and interview request. This situation has been picked up by the EMASA Steering Committee.

E. Carbon footprint of Ispra in 2018 – 17.8 %

Ispra GHG emissions are equivalent to 32,218 tCO_2 in 2018, this is 17.8% of the corporate carbon footprint of which 81,5% are related to three sources of emissions:

- Fuel used for buildings heating (65.7% - 21,163 tCO_2e)
- Fixed assets for building construction (10.,1% - 3,260 tCO_2e)
- Air travel for missions (5,7% - 1.847 tCO_2e)

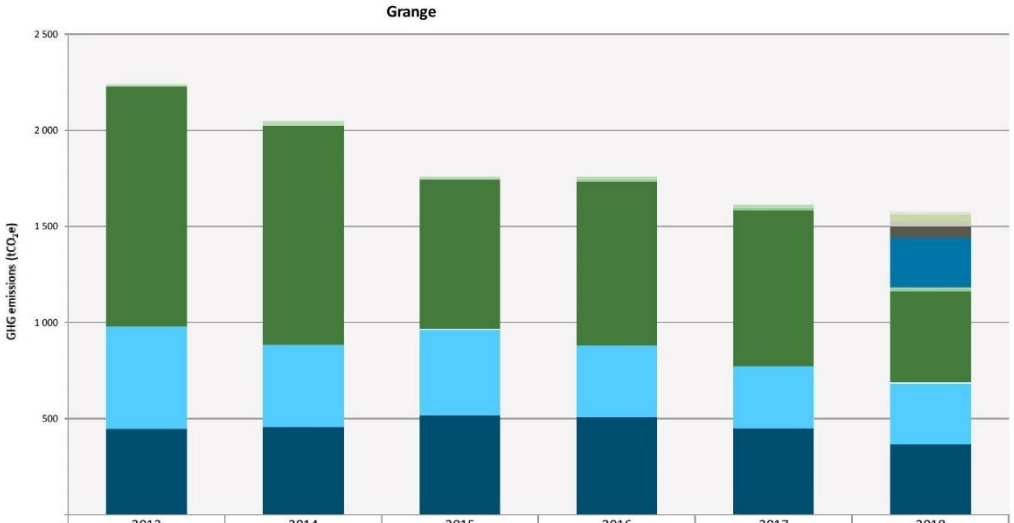


	2013	2014	2015	2016	2017	2018
Total (tCO2e)	25,823	28,039	28,452	27,913	26,785	32,218
Waste	0	0	0	0	0	405
Goods and services - food	0	0	0	0	0	520
Goods and services - paper purchased	0	0	0	0	0	31
Goods and services - service contracts	0	0	0	0	0	134
Fixed assets - IT	0	0	0	0	0	1,478
Fixed assets - buildings	0	0	0	0	0	3,260
Vehicle fleet - fuel consumption	90	89	87	70	65	55
Missions (other)	0	400	412	378	386	402
Staff commuting	0	3,019	1,389	1,409	1,420	1,425
Missions (air)	37	50	2,046	1,683	1,723	1,847
Buildings - coolant losses	162	92	513	1,410	161	10
Buildings - district heating/cooling	0	0	0	0	0	0
Buildings - electricity	1,267	852	993	1,157	1,500	1,488
Buildings - fuels for heating	24,267	23,536	23,012	21,805	21,530	21,163

H. Carbon footprint of Grange in 2018 – 0.9 %

Grange GHG emissions are equivalent to 1,577 tCO_2e in 2018, this is 0.9% of the corporate carbon footprint of which 90% are related to four sources of emissions:

- Air travel for missions (30% - 473 tCO_2e)
- Fuel used for buildings heating (23.3% - 368 tCO_2e)
- Electricity supplied (20 % - 316 tCO_2e)
- Fixed assets for buildings construction (16.4% - 258 tCO_2e)



	2013	2014	2015	2016	2017	2018
Total (tCO2e)	2,237	2,046	1,757	1,758	1,612	1,577
Waste	0	0	0	0	0	13
Goods and services - food	0	0	0	0	0	39
Goods and services - paper purchased	0	0	0	0	0	3
Goods and services - service contracts	0	0	0	0	0	21
Fixed assets - IT	0	0	0	0	0	58
Fixed assets - buildings	0	0	0	0	0	258
Vehicle fleet - fuel consumption	0	0	0	0	0	0
Missions (other)	10	19	12	11	14	8
Staff commuting	0	0	0	14	14	14
Missions (air)	1,248	1,142	776	850	811	473
Buildings - coolant losses	0	0	5	0	0	7
Buildings - district heating/cooling	0	0	0	0	0	0
Buildings - electricity	533	427	445	373	324	316
Buildings - fuels for heating	446	458	519	510	449	368

APPENDIX 2
LIST OF INTERVIEWS

Name of interviewee(s)	Organisation	Location of organisation	Date of interview	Status
TASK 1 Commission				
Mr. Michael Rourke Ms. Sofia Gregou Mr. Celso Sanchez Martinez	DG HR	BE (Belgium)	19/11/19	Completed
Ms. Melina Giannakis Mr. Antonio Nobre Baiao	OIB	BE (Belgium)	26/11/19	Completed
Mr. Desiderio Rodriguez-Robles	OIB	BE (Belgium)	14/11/19	Completed
Mr. Kadri Siilanarusk Mr. Didier Kessel	OIL	LU (Luxembourg)	19/11/19	Completed
Mr. Cornelis Wagenaar Mr. Franz Hukelmann	JRC Petten	NL (Netherlands)	08/11/19	Completed
Mr. Dominic Christian Ms. Elisa Dalle Molle	JRC Geel	BE (Belgium)	21/11/19	Completed
Mr. Ramon Compano Ms. Carmen Moron	JRC Sevilla	ES (Spain)	20/11/19	Completed
Mr. Andreas Bitterhof	JRC Karlsruhe	DE (Germany)	-	Declined Interview
Mr. Philip Costeloe	JRC Ispra	IT (Italy)	21/11/19	Completed
Mr. Matthew Heppleston	JRC Ispra	IT (Italy)	20/11/19	Completed
Mr. Humberto Latino	DG SANTE (Grange)	BE (Belgium)	18/11/19	Completed
Mr. Patrick Vandenryndt Mr. Marc Driessen	DG PMO	BE (Belgium)	19/11/19	Completed
Mr. Philippe Bellossi Mr. Luc Stan Mr. Florin-Adrian Sbarciog	DG DIGIT	LU (Luxembourg)	20/11/19	Completed
Mr. Marc Mansart Mr. Eric Leempoels	OIB OS 2 (Services)	BE (Belgium)	26/11/19	Completed
Mr. Juan Dominguez Mr. Benoit Losseau Mr. Alexandre Giacomini	OIB OS 2 (Mobility and transport)	BE (Belgium)	26/11/19	Completed
Lorenzo Buccellati	OIB OS 4 (catering)	BE (Belgium)	26/11/19	Completed
RE 2: José das Neves and Antonio Vargiu RE 3: Desiderio Rodriguez-Robles	OIB RE 1 and 3	BE (Belgium)	26/11/19	Completed
Nora Bednarski	DG ENER	BE (Belgium)	27/11/19	Completed
Ms. Ana Maria Sanchez-Infante Mr. Jan Steinkohl	DG ENER	BE (Belgium)	-	Information was sent in writing
Ms. Felicitas Green	DG BUDGET	BE (Belgium)	28/11/19	Completed
Mr. Tilmann Morata Libebert	DG CLIMA	BE (Belgium)	03/12/19	Completed
Mr. Piotr Rapacz	DG MOVE	BE (Belgium)	13/10/19	Completed
Ms. Eva Dalenstam	DG ENV	BE (Belgium)	06/12/19	Completed

Name of interviewee(s)	Organisation	Location of organisation	Date of interview	Status
Mr. Enrico Degiorgis Mr. Lionel Thellier				
Ms. Aline Spriet Mr. Baptiste Legay	SG	BE (Belgium)	17/01/20	Completed
Ms. Patricia Lambert or Ms. Nora Csanyi (EMAS correspondent)	DG SCIC	BE (Belgium)	18/11/19	Completed
Mr. Josick VANDROMME Mr. Daniel MOLENDOWSKI	DG DEVCO	BE (Belgium)	-	Did not respond

Name of interviewee(s)	Organisation	Location of organisation	Date of interview	Status
TASK 2 Practitioners				
Mr. François Dejean Ms. Ulrike Hoffmann	EEA European Environmental Agency	DK (Denmark)	14/11/19	Completed
Dr. Burkhard Huckestein	German Federal Government	DE (Germany)	21/11/19	Completed
Mr. Siegfried Breier Mr. David Hesslevik Mr. Srdan Randic.	European Parliament	BE (Belgium)	14/11/19	Completed
Mr. Parminder Plahe Mr. Lucius Haken	European Investment Bank	LU (Luxembourg)	14/11/19	Completed
Mr. Frank Hofmann	European Central Bank	DE (Germany)	13/12/19	Completed
Mr. Bram Cottyn	Belfius	BE (Belgium)	10/01/20	Completed
Ms. Fanny Fleuriot	ADEME	FR (France)	20/11/19	Completed
Mr. Lewis Dijkstra	DG REGIO	BE (Belgium)	04/11/19	Completed
Mr. Gaston Bastin	Bruxelles Environment – Sustainable mobility	BE (Belgium)	-	Completed
-	Bruxelles Environment – Energy	BE (Belgium)	-	Did not respond
Mr. Guillaume Lefebvre	STIB-MVIB	BE (Belgium)	-	Did not respond
Ms. Myrto Kolyva Ms. Audrey Barroux	European Economic and Social Committee	BE (Belgium)	-	Did not respond
Mr. Philipp Neff	Atmosfair	DE (Germany)	-	Did not respond
Mr. Renaud Bettin Mr. Alexandre Florentin	Carbone 4	FR (France)	-	Did not respond
TASK 2 Experts				
Mr. Paul Peeters	Centre for Sustainability, Tourism and Transport, Breda	NL (Netherlands)	17/12/19	Completed

Name of interviewee(s)	Organisation	Location of organisation	Date of interview	Status
	University			
Mr. Benoit Leguet	I4CE, Institute for climate economics	FR (France)	17/01/20	Completed
Mr. Chris Jones	Tyndall Centre, University of Manchester	UK (United Kingdom)	08/01/20	Completed
Ms. Anna Kadefors	KTH Royal Institute of Technology	SE (Sweden)	11/12/19	Completed
Mr. Fabian Wagner Mr. Jens Borken-Kleefeld	IIASA - International Institute for Applied Systems Analysis	AT (Austria)	15/01/20	Completed
Ms. Camille Callens	BECI (Brussels Chamber of Commerce and Industry)	BE (Belgium)	27/01/20	Completed
Mr. Stefan Gössling	Lund university	SE (Sweden)	-	Did not respond
Mr. Dominique Desjeux	University Paris V Sorbonne	FR (France)	-	Did not respond
Ms. Erica Udas Mr. Martin Wilmking	University of Greifswald	DE (Germany)	-	Did not respond

APPENDIX 3
PROPOSED CORRECTIONS TO THE INITIAL CARBON FOOTPRINT

The consultant received from the EMAS unit the carbon footprint analytical database (*MasterdataES2019*) at the beginning of the mission. After reviewing it, it appeared that it showed small errors impacting the Corporate's CFP and sites' CPF.
Consequently, in order to work on a robust base and to be clear on which data and assumptions the consultant would be working, its team proposed some corrections for these identified errors in the *MasterdataES2019*.

The consultant applied all proposed corrections, here below, to the CPF 2018 (the baseline). At the beginning of the mission, the ES2018 and the *Masterdata2019* shown a Corporate's CPF of 180,986 tCO_2e. After that, the consultant applied the proposed correction, the Corporate's CFP decreased down to 174,242 tCO_2e.

- **General comments**
  - The data provided in the Corporate Summary are not equal to the data provided in the Annexes A to H. The total of the Carbon Footprint of each annex is not equal to the value provided in the Corporate Summary.
  - Regarding the GHG emissions, the analysis of annexes A to H is not homogenous. Some sites that have already included the additional Scope 3 sources of emissions introduced for the 2018 carbon footprint (IT equipment, food,…) are reporting them and other do not. This is because reporting of scope 3 emissions was expanded significantly in 2019 to account for the large number of additional parameters that were added (more than 40). Although the HR-EMAS team suggested a new graphical way of presenting the data, it was not adopted immediately by all parties.
    For instance, see below, Annex A (Brussels) and Annex B (Luxembourg) both consider the added sources of emissions of Scope 3 but only annex A reports on it.
  - Sites do not always report the same sources of emissions, making comparison more confusing. Consequently, although the sites data template buildings energy and fuel for vehicles consumption between Scope 1 and Scope 3, this may not be clear in reporting.
    For instance, see below, Annex A (Brussels) uses the source of emissions "*Buildings – fuel for heating*" that includes each Scope 1 et Scope 3 of each type of fuel (without any explicit reference). While Annex B (Luxembourg) reports each fuel separately and reports three different sources of emissions: "*Scope 1 – Fuel for bldgs : mains gas"*, "*Scope 1 – Fuel for bldgs : tanked gas"* and *"Scope 1 – Fuel for bldgs : diesel"*.
  - The charts for each site do not report the information in the same way.
    For instance, see below, in addition to the fact that annexes A, B and C present different sources of emissions, charts in annexes A and B use the years as the x-axis whereas the chart of annex C uses the sources of emissions for the x-axis.

Brussels : ES2018, Annex A, page A14

	2014
Total (CO2 + CO2e)	134 937
Own waste	
Goods and services	
Fixed assets - IT	
Fixed assets - buildings	
Staff commuting (contributing sites)	13 577
Missions other	1 769
Missions (air, RFI=2)	55 111
Vehicle fleet - fuel consumption	967
Buildings - coolant losses (CO2 e)	1 121
Buildings - district heating/cooling	3 125
Buildings - electricity	16 803
Buildings - fuel for heating	42 465

Luxembourg : ES2018, Annex B, page B 14

	2013	2014
sum	3 965	5 149
Scope 3 - Commuting	0	0
Scope 3 - Business travel: air taxi	0,0	0,0
Scope 3 - Business travel: private car	120	126
Scope 3 - Business travel: hire car	419	390
Scope 3 - Business travel: rail	11	9
Scope 3 - Business travel: air	2.149	2.067
Scope 2 - District heating (+cooling)	197	133
Scope 2 - External electricity supply	0	1.522
Scope 1 - Refrigerant leaks	0	0
Scope 1 - Commission vehicle fleet	155	163
Scope 1 - Fuel for bldgs: diesel	0	0
Scope 1 - Fuel for bldgs: tanked gas	0	0
Scope 1 - Fuel for bldgs: mains gas	914	740

ES2018, Annex C, page C15

	Scope 1 - Fuel for bldgs: mains gas	Scope 1 - Fuel for bldgs: diesel	Scope 1 - Commissio n vehicle fleet	Scope 1 - Refrigerant leaks	Scope 2 - External electricity supply	Scope 3 - Business travel: air	Scope 3 - Business travel: rail	Scope 3 - Business travel: hire car	Scope 3 - Business travel: private car	Scope 3 - Business travel: air taxi	Scope 3 - Commutin g	Scope 3 - Fixed assets - buildings	Scope 3 - Fixed assets - IT	Scope 3 - Service and supply contracts	Scope 3 - Own waste	Sum
2013	1 114	0	2	5	2 068	366	1	0	1	0,0	0					3 558
2014	792	0	2	12	2 026	418	1	2	1	0,0	0					3 255

- **General clarifications related to the treatment of electricity (Scope 2)**
  - Green electricity is not identical to renewable energy. For instance, Nuclear energy could be considered as "Green" in the sense that no scope 1 CO2 is emitted, but it is not a renewable energy.
  - When grey electricity is supplied, the share of electricity from renewable energy production is already taken into account in the calculation of the emissions factor (calculated by the supplier or by the International Energy Agency (IEA)). Consequently, electricity from renewable energy cannot be excluded (and considered as zero emission) from the grey electricity while calculating the carbon footprint. Otherwise, the renewable energy will be counted twice, a first time by the entity providing the emission factor (supplier or IEA), and a second time by the European Commission.
- **Proposition of modification of some emission factors**
  - Scope 2: Emission factor used for the Upstream emissions from electricity (named in the MasterdataES2019 "*Kgs CO2 from 1 kWh of electricity (supplier) upstream*"), which corresponds to the line losses, is not correct. This emission factor corresponds to the line losses on the electricity grid and amounts to 10% of the electricity consumption. .
  - Scope 3: fixed assets – IT: The *Masterdata2019* did not take into account the new emission factors of laptops (updated[409] in December 2018 by the Base Carbone). The EF has decreased from 1,280 to 156 tCO_2e.
  - Scope 3 : Goods and services – Food. The following emissions factors have to be updated and taken into account the amount of CO_2e emitted by quantity of product bought in a grocery store :
    - Beef: 28.6 $kgCO_2e/kg$
    - Chicken: 4,75 $kgCO_2e/kg$
    - Fish: 9.59 $kgCO_2e/kg$
    - Pork: 5.89 $kgCO_2e/kg$
    - Milk : 1.22 $kgCO_2e/kg$
    - Coffee: 3.14 $kgCO_2e/kg$

- **Corporate carbon footprint**[410]
  - *Missions (air)*[411]
    - *Air taxi is not included in the global reporting*
  - *Missions (other)*[412]
    - *JRC Navette* (in Ispra) is not included in the global reporting
  - *Business travel: air taxi* has to be reported as Missions (air)*Staff Commuting*[413]
    - *Commuting JRC bus service* (in Ispra) is not included in the global corporate reporting.
  - Scope 3 : The *Masterdata2019* applied an upstream emission factor for Scope 2 "district heating (+cooling) and cooling". This should not be the case [414].

409 Reduction of 6,293 tCO2e of the Corporate Carbon Footprint 2018

[410] Reduction of 3,825 tCO_2e to the corporate CFP of 2018 (-2,1%)

411 + 572 tCO2e

[412] Reduction of 328 tCO_2e to the corporate CFP of 2018: -572 tCO2e from air taxi, + 244 tCO_2e for JRC Navette and + 6 tCO_2e for Business travel

[413] Addition of 112 tCO_2e

[414] - 256 tCO2e (Luxembourg)

- **Brussels**[415]
  - Annex A does not take into account the updated calculation of the GHG emissions of the fixed assets-IT[416]. Nevertheless, the corporate summary takes it into consideration.
  - The calculation of the GHG emissions related to the energy consumption in the buildings in Scope 1 and 2 (direct combustion of fuel, electricity and district heating) also considers the "Upstream" part of the emissions which has to be calculated under a separate Scope 3 source of emissions. Consequently, the Scope 3 component related to energy is reported twice[417]. For instance, in the excel file "*MasterdataES2019"*, sheet "*Annex A BX*":
    - Line 241; column Q to V. To be linked to the line 240; column L to Q of the sheet "BX" and not to the line 236
    - Line 243; column Q to V. To be linked to the line 247; column L to Q of the sheet "*BX"* and not to the line 276
    - Line 251; column R to V. To be linked to the line 230; column L to Q and not including a number.
  - "*Scope 3: "Own waste*" is not correct[418]. In the Annex A BX of the *MasterdataES2019* file, it refers to an unappropriated cell, the hazardous waste tonnage. The V263 (Annex A BX) has to be linked to case "*BX!Q657"* and not to "*BX!Q686"*

- **Luxembourg**[419]
  - Annex B does not report the added sources of emissions of Scope 3. Those sources of emissions are the following:
    - Scope 3; Fuel for buildings: mains gas
    - Scope 3; Fuel for buildings: tanked gas
    - Scope 3; Fuel for buildings: diesel
    - Scope 3; External electricity supply
    - Scope 3; District heating
    - Scope 3; Fixed assets - buildings
    - Scope 3; Service and supply contracts
    - Scope 3; Own waste
  - Scope 1 or 2 part (direct combustion) of energy used for buildings (fuel, electricity and district heating) are both reporting Scope 1 or 2 (direct combustion) plus Scope 3 (Upstream part).
    - "*Scope 1 for fuel heating*" is reporting Scope 1 and Scope 3
    - "*Scope 2- External electricity supply*" is reporting Scope 2 and scope 3

- **Petten**
  - Scope 1 and 2 part (direct combustion) from energy used for buildings (fuel, electricity and district heating) both report Scope 1 and 2 plus scope 3. Scope 3 has to be reported separately.

- **Geel**[420]

[415] Annex A: Brussels reports on 107,278 tCO_2e and after that all identified errors have been adjusted and food included it raises up to 115,197 tCO_2e (+ 7,920 tCO_2e; +7,4 %)

[416] Fixed assets – IT raised from 231 tCO_2e to 8,345 tCO_2e (+8,114 tCO_2e)

[417] Reduction of 699 tCO_2e of Buildings – electricity, from 1,176 tCO_2e to 477 tCO_2e

[418] Addition of 930 tCO_2e, from 461 tCO_2e to 1,391 tCO_2e

[419] Annex B: Luxembourg reports on 7,787 tCO_2e and after that all identified errors have been adjusted it raises up to 15,945 tCO_2e (+8,159 tCO_2e, +105%)

- Scope 1 and 2 part (direct combustion) from energy used for buildings (fuel, electricity and district heating) are both reporting Scope 1 or 2 plus Scope 3. Scope 3 has to be reported separately.
- Into the annex D of the ES2018, Missions (excluding air) only takes into account "Business *travel: rail*" and not the other relevant sources of emissions such as hired cars, private car,
- Air taxi was linked to a wrong cell into the *MasterdataES2019*[421]
- Into the annex D of the ES2018, "*Buildings- fuel for heating: Main gas*" only takes into account gas and not the other relevant sources of emissions (diesel)[422]

- **Seville[423]**
  - The site carbon footprint is not mentioned in the Annex E: JRC Seville of the ES2018. We can only find the evolution of CO_2e emissions per capita (page E23).
  - Scope 1 and 2 of energies used for buildings (fuel, electricity and district heating) are both reporting Scope 1 or 2 and Scope 3. Scope 3 has to be reported separately.

- **Karlsruhe[424]**
  - Scope 1 and 2 part (direct combustion) of energies used for buildings (fuel, electricity and district heating) are both reporting Scope 1 or 2 plus
    Scope 3. Scope 3 has to be reported separately.

- **Ispra[425]**
  - Scope 1 and 2 of energies part (direct combustion) used for buildings (fuel, electricity and district heating) are both reporting Scope 1 (direct emission by combustion of fuel) or Scope 2 (indirect emission by electricity used) plus Scope 3 (upstream emission of fuel or electricity production). Scope 3 has to be reported separately[426]. I.e. the source of emissions "S*cope 1 – Fuel for bldgs : mains gas*" is in fact scope 1 plus scope 3 ("*Scope 3 Upstream emissions of fuel for bldgs : mains gas"*). Furthermore, "*Scope 3: other upstream emissions*" also includes "*Scope 3 Upstream emissions of fuel for bldgs : mains gas*". Consequently, the upstream emissions of energy from mains gas is counted 2 times and the scope 3 of mains gas is wrongly reported.
    Furthermore, the source of emissions "*Scope 3 Other upstream emissions*" is also reporting those upstream emissions. To be sure to avoid double counting the same emissions and for clarity, better avoiding unclear source of emissions such as "*Scope 3: other upstream emissions*".

[420] Annex D: Geel reports on 2.446 tCO_2e and after that all identified errors have been adjusted it decreases down to 2,396 tCO_2e (-50 tCO_2e; - 2 %)
[421] Addition of 6 tCO_2e
[422] Addition of 12 tCO_2e
[423] Annex F: Seville reports on 1,404 tCO_2e and after that all identified errors have been adjusted it decreases down to 1,344 tCO_2e (-60 tCO_2e; -4.2 %) (see emission factors modification)
[424] Annex E: Karlsruhe reports on 7.873 tCO_2e and after that all identified errors have been adjusted it decreases down to 7.246 tCO_2e (-627 tCO_2e; -8,4 %) (see emission factors modification)
[425] Annex G: Ispra reports on 40.695 tCO_2e and after that all identified errors have been adjusted it decreases down to 31,932 tCO_2e (-8,762 tCO_2e; -21%)
[426] Reduction of 8,551 tCO_2e.

- **Grange**[427]
  - "*Scope 3: Own waste*" is not correct[428]. In the Annex H GR of the *MasterdataES2019* file, it refers to an unappropriated cell, the hazardous waste tonnage. The W264 (Annex H GRA BX) has to be linked to case "*GR!Q657"* and not to "*GR!Q687"*
  - *Air taxi (in the Annex H GR) is linked to the wrong cell*[429].
  - Scope 3 "Good and Services – Food" has to be estimated for each site with a conversion factor of 0.097 tCO2e per staff (EMAS)[430]

[427] Annex H: Grange reports on 2,302 tCO_2e and after that all identified errors have been adjusted it decreases down to 1,555 tCO_2e (-747 tCO_2e; -32.4%)

[428] Reduction of 693 tCO_2e, from 706 tCO_2e to 12.5 tCO_2e

[429] Reduction of 6 tCO_2e

[430] Addition of 17 tCO_2e

APPENDIX 4
GHG PROTOCOL SOURCES OF EMISSIONS

Sources of emissions are based on the GHG Protocol and adapted to the operational scope of the European Commission.

S1 – Scope 1, Own direct fuel consumption and direct losses

- S1.1. Building fuel consumption
- S1.2. Own fleet – fuel consumption
- S1.3. Refrigerant losses

S2 – Scope 2, Purchased energy (activities on site and emissions off site)

- S2.1. Electricity
- S2.2. District heating/cooling

S3 – Scope 3, Other indirect sources (Activities and emissions off site)

- S3.1. Purchased goods and services
    - S3.1.1. Contractors
        - Security contract
        - Cleaning contract
        - Consultants contract
        - Translators contract
        - Other services contracts
    - S3.1.2. Purchased Paper
    - S3.1.3. Catering food
- S3.2. Fixed assets
    - S3.2.1. Buildings
    - S3.2.2. IT
- S3.3. Fuel and energy related activities (not included in S1 et S2).
    - S3.3.1. Buildings' fuel consumption
    - S3.3.2. Vehicle fleet
    - S3.3.3 Electricity
- S3.4. Business travel
    - S3.4.1. Missions: Air travel (RF = 2)
    - S3.4.2. Missions: other (Non air travel)
- S3.5. Staff Commuting
- S3.6. Waste generated in operations

APPENDIX 5
ANALYTICAL GRID OF MEASURES

Principle
The analytical grid summarises all assumptions and computation formulas used for the assessment of GHG mitigation potential and cost of the measures.
It also provides information on co-benefits, site applicability and implementation agenda.

The analytical grid follows the computation methodology as described in detail in the section 5.1 Overview of mitigation measures and the table 5.2 Measure assessment framework.

It is available as an Excel file, attached to this report.

APPENDIX 6
THE WORKPLACE OF THE FUTURE IN THE EUROPEAN COMMISSION

See document attached

APPENDIX 7
MISSION COSTING EXAMPLE FOR BOOKING PROCESS

Improvement suggestion from DG HR:

Please note that there are a couple of small things that were missed out in that particular example though (Brussels-London):

- There should have been some more time for waiting for check in for the rail option; Eurostar (because you need formal check in unlike most other trains)
- The cost didn't account for the daily subsistence allowance for Officials on missions; but that shouldn't make a huge difference
  (It's a flat rate based on the country, but for missions over 24 hours it is pro rata on mission duration), and calculated as follows

A) The ticket price							
1	2	3	4	5	6	7	**8**
Option	Origin	Destination	Travel mode	Class (Air: 1st, Bus., Econ; Rail:1,2)	Departure time (date hh:mm)	Arrival time (date hh:mm)	**Ticket Price (EUR)**
(GBT)	(GBT)	(GBT)	(GBT)	(GBT)	(GBT)	(GBT)	(GBT)
1	Brussels	London	Rail	1	5/18/2020 8:52	5/18/2020 10:02	120
	London	Brussels	Rail	1	5/20/2020 19:34	5/20/2020 22:38	120
Total							**239**
2	Brussels	London	Air	Business	5/18/2020 9:50	5/18/2020 10:15	74
	London	Brussels	Air	Business	5/20/2020 17:50	5/20/2020 22:00	67
Total							**142**

NB: crosses time zone

B) Emissions cost			
9	10	11	**12**
Distance (km)	CO_2 emissions (tonnes)	CO_2 price (EUR/tonne)	**CO_2 price (EUR)**
(Atmosfair)	(Atmosfair)	(Specify-ETS?)	(10) x (11)
211	0.01	25	0.25
211	0.01	25	0.25
			0.50
400	0.1	25	2.50
400	0.1	25	2.50
			5.00

C) Cost of "unproductive" staff time while travelling								A) + B) + C)
13	14	15	16	17	18	19	20	21
Travel time (hh:mm)	Travel time (hours)	Adjusted travel time (hrs)	Cost of staff travel time (EUR)	Productive time (hrs)	Value of productive time (EUR)	Unproductive time (hrs)	Cost of unproductive time (EUR)	Total journey "cost" (EUR)
(7) - (6)				(User)		(15) - (17)		(8) + (12) + (20)
1:10	1.17	1.17	102	1	88	0.17	15	134
3:04	3.07	3.07	269	1	88	2.07	181	301
							196	**435**
0:25	0.42	1.42	124	0.5	44	0.92	80	157
4:10	4.17	5.17	453	0.5	44	4.67	409	479
							490	**636**

Factors referenced in formulae:

Additional time for flight security, check in (hrs)	1
Average administrator staff cost (RUF), per hour	88
CO2 price (EUR/per tonne)	25

APPENDIX 8
DG GROW CONCEPT FOR CARBON NEUTRALITY OF COMMISSION'S BUSINESS TRIPS

Proposal to achieve Carbon Neutrality of the European Commission Business Trips

1. CONTEXT AND SUMMARY OF THE PROPOSAL

Business trips, and in particular those using air travel, are the largest contributors to equivalent CO2 emissions in travel intensive organisations such as the Commission. The Commission should therefore **decide to avoid, reduce, offset**[431] **and greenovate the climate impact of its employees' business trips**. Following the proposal by the Commission for the EU to become climate –neutral by 2050[432][433] and a reflection paper on Sustainable Development Goals[434], this would give an important climate policy signal and an example to be followed by European private stakeholders, companies and public institutions and would be a first step towards achieving climate neutrality of the Commission. It should also be noted that the European Emission Trading System[435] covers CO_2 emissions from flights in 31 countries (all 28 EU countries plus Iceland, Liechtenstein and Norway), with a carbon price currently (as of 12 July 2019) at 28,35 Euro/tCO_2.

This approach is already in place in some Members States, notably Germany, where all Federal Government and a number of participating Authorities and Agencies offset the climate impact of its employees' business trips since 2014[436] (see factsheet[437] in Annex).

Some European institutions have also implemented carbon offsetting. The European Environment Agency (EEA) has been offsetting its staff's and meeting participants' business trips since 2006. Other institutions and organisations have implemented such a system or are in the process of implementing it:

[431] Offset is achieved through carbon offsetting, which is a mechanism whereby an organisation compensates for its own Green House Gas (GHG) emissions or for a part of them by paying for an equivalent carbon dioxide saving made elsewhere in the world, for example emissions savings made through wind farms that replace coal-fired power plants. If all the emissions that cannot be avoided are offset, an activity can be considered to be 'carbon neutral'. Carbon offsetting should not be confused with the European Union emissions trading system (EU ETS), which is a mandatory cap and trade system of GHG emission allowances for heavy energy-consuming activities.

[432] [COM(2018)773 final] A Clean Planet for all : A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy

[433] How the Commission in it operation can become greenhouse gas emission neutral will be discussed in the context of the scoping and feasibility study on "A greenhouse gas-neutral Commission to be achieved as early as possible prior to 2050" that DG CLIMA is currently supervising (final report planned for September 2020).

[434] [COM(2019)22 of 30 January 2019] Reflection Paper : Towards a sustainable Europe by 2030

[435] See: https://ec.europa.eu/clima/policies/transport/aviation_en. The ETS as a cap and trade system does not compensate the emissions of the covered flights.

[436] https://www.dehst.de/EN/carrying-out-climate-projects/business-trips-of-the-german-government/business-trips-of-the-german-government-node.html

[437] Also available at https://www.dehst.de/SharedDocs/downloads/EN/publications/Factsheet_business-trips.pdf?__blob=publicationFile&v=6

- the European Parliament has been offsetting its staff's, members' and visitors' travels since 2016 and claims to be the only carbon-neutral EU Institution[438];
- The European Investment Bank and the European Central Bank are currently assessing offsetting mechanisms.

Conversely, the Commission, which became the first EU institution to register under an Eco-Management and Audit Scheme (EMAS) in 2005, measures its carbon footprint on a yearly basis but has not yet taken steps to offset the climate impact of its staff business trips despite these representing the largest (over 35% of the total) equivalent CO2 emission contribution (see extract from the Commission 2018 EMAS Statement in Annex).

The above governments and organisations have develop criteria ensuring high quality offsets that are verified under a recognised scheme to make sure that emission reductions are additional (i.e. excluding reductions that would have happened anyway), permanent and not double counted.

To summarise, this proposal simply recommends that the Commission implements the best solutions for ensuring carbon neutrality of business trips that have already been developed and successfully applied by other organisations. It details the steps and principles of such implementation and also assesses the costs (deemed to be less than 2% of the total annual mission costs).

2. SPECIFIC PROPOSAL

A European Commission decision should be adopted to offset the climate impact of its employees' business trips as part of the transition to climate neutrality. The decision should be based on the following building blocks, inspired from the approach taken by the German Federal government and the European Environment Agency:

1/ Apply a climate policy principle: avoid – reduce – offset, i.e.:

- **Avoid** unnecessary business trips by the increased use of video and telephone conferences.

As good practice, the mission authorising officer should request evidence justifying the need for a mission.

- **Reduce:** Promote rail travel when available and reasonable.

Ideally the Commission mission rules should be adapted to take the carbon footprint as a criteria on top of the financial one, and should promote the use of lower emission travel means (e.g. train instead of plane; direct flight instead of

[438] http://www.europarl.europa.eu/about-parliament/files/organisation-and-rules/environmental-management/en-ep-environmental-statement-2018.pdf

indirect flights) whenever practical and even if reasonably more expensive[439]*. EEA experience is that this does not lead to any increase of the overall mission budget.*

- **Offset** the remaining, unavoidable emissions caused by the mission.

Based on EEA experience, the air travel is the main means of travel requiring offsetting. Business cars can be compensated as well, while train is not really an issue. EEA also recommends compensating hotels stay which accounts for up to 10% of the mission footprint[440]*.*

- **Greenovate:** As new climate-neutral technologies become available in the aviation-industry, and negative-carbon options in the off-setting sector, give precedence to these in our procurement; supporting a competitive, future-proof European industry.

A mere offsetting can only be a temporary solution for a system to render Commission business-trips carbon-neutral. Such a system also has to keep looking out for efforts by air lines to implement new low-carbon technologies such as climate-neutral synthetic fuels, or other efforts to reduce the emissions from the air travel (such as reducing air speed, electrifying taxiing).

As these technologies mature and become commercially available, a Commission climate-neutrality policy should also consider rewarding such efforts in its procurement, thus gradually adding to a mere offsetting an element of rewarding more climate-friendly technologies and thus encouraging the low-carbon innovation that we also support to develop in our R&I policies. ***In the climate-neutral world that we need to achieve, the only offsetting can come from negative emissions***[441]***, not from a reduction in other places.*** *In the off-setting sector, we can expect to see offers of negative emissions (= carbon-removal) in the future. Thus from the outset, we need to have continued ambition in the type of offsets that we purchase. (We hope that in a decade we can buy real 'carbon free synthetic fuel credits', but already before we may be able to give precedence to early movers, i.e. airlines that have credible decarbonisation strategy in place). Against this background, the initiative's name is "avoid-reduce-offset-greennovate", which also resonates well with GROW's policy objective of a competitive, future-proof European industry.*[442]

[439] See EEA Mission Rules slightly adapted from the Commission rules

[440] See EEA travel agent tender specifications delivering carbon offset scheme to allow all EEA's travel and accommodation to be carbon neutral and provision with suitable reporting and certification.

[441] Today already possible, e.g. a technological option with https://climeworks.shop/ , but very expensive (1000 Euro/t CO2).

[442] Admittedly, the 'greennovate' part has some practical challenges that we, probably in collaboration with CLIMA and RTD, would have to find solutions for in the procurement framework:

1. priority in the search for a business flight is the connection, rather than which airline and its decarbonisation strategy.
2. It may therefore be warranted to make this 'greennovate' portion more specific, e.g. where possible limit searches to connections undertaken by airlines which employ X% of synthetic aviation fuel usage across their fleet; and/or to connections undertaken by airlines which have e.g. the 5 highest CO2 emissions reductions (when assessing (part of) the basket of measures they employ to this end). The specifications would need to be updated as e.g. we see next gen tech (e.g. hybrid-electric engines) is being employed in commercial aircraft.

2/ Calculate emissions following state of the art principle[443]:

- For air travel, emissions should be calculated on the actual individual air travel sections and take into account to the extent possible the non-CO2 greenhouse gas effects at high altitudes (due to water vapour, nitrogen oxides and carbon black particle emissions)[444]
- For cars business trips and taxi, emissions are determined by the fuel consumption in conjunction with emission factors for different fuels.
- Rail travel would normally not need to be offset.

The entity in charge of calculating the emissions from Commission business trips can be a dedicated entity working for PMO or a subcontractor of the Travel Agency[445] that use established, science-based emission calculators.

3/ Define criteria ensuring a top grade offsetting scheme[446]:

- Experienced organisations recommend[447] not only to follow the UN CDM (Clean Development Mechanism) standard but also the international Gold Standard certification.
- The criterion not to use CDM ensures the additionality[448] of the climate protection projects financed via the offsetting.
- The Gold Standard ensures high quality projects with additional co-benefits such as local sustainable development.
- In addition, in order to protect the Commission against accusations of 'green-washing' it is recommended to purchase offsets issued after 2017, which are supported by WWF and other international NGOs and are recognised as best practice standard.

3. We could possibly even extend this to connections to and from airports that employ Airport Carbon Accreditation (ACA, https://www.airportcarbonaccreditation.org/about.html), but that adds a layer of complexity.
4. How to identify "early movers, i.e. airlines that have credible decarbonisation strategy in place" and to avoid rewarding greenwashing?. In reality today, given the overall same technology, the relative difference between airlines is minimal. So this needs to be based on objective data, e.g. operators that actually invest/procure sustainable biofuels (e-fuels in the hopefully not too distant future).

[443] This is in line with the methodology adopted by the Commission on 7th November 2017 to calculate carbon emissions in response to the European Court of Auditor (ECA) 2014 special report on the subject. American Express travel Agency already reports CO2 emissions for air train and hire cars, as calculated by Atmosfair who uses an approach developed with the German environmental authorities.

[444] The science on non-CO2 effects is evolving and may lead to higher CO2-equivants (and thus costs) for offsetting in the future, depending on the research results. The German Federal Environmental Protection Agency (UBA) has commissioned an expansive study on non-CO2 (still on-going), looking at the different impacts of flightpath, altitude/latitude, and weather conditions. Completed research (e.g. https://www.atmos-chem-phys.net/19/8163/2019/) suggests that contrails are more damaging than previously thought. Also DG CLIMA, together with DG MOVE, is in the process of commissioning a study on Non-CO2. An interim report is expected in December 2019 with the final report in April 2020.

[445] This is the approach taken by EEA.

[446] More details on the best practices and impact of the recommended carbon offset mechanisms can be found here: https://www.dehst.de/SharedDocs/downloads/EN/publications/Factsheet_Voluntary-offsetting.pdf?__blob=publicationFile&v=5 , stipulating e.g. that "In aviation, offsetting calculations are particularly important. The impact of aviation on the climate is not restricted to CO2 emissions. Nitrous oxides, soot particulates and water vapour all contribute to the warming of the atmosphere. According to estimates by the German Environment Agency (UBA), **the total climate impact of aviation is at least three times higher than the effect of its CO2 emissions alone**."

[447] This is the approach followed by both the German Federal Government and the EEA.

[448] i.e. the emissions reductions would not have been carried out anyway without the project.

The organisation purchasing the Carbon Offset project providing such eligible carbon offset projects can be a dedicated entity working for PMO or a subcontractor of the Travel Agency[449].

4/ Obtain Carbon Offset certificates

These should be obtained from the entity purchasing the Carbon Offset project. When combined with the entity calculating carbon footprint

5/ Stepwise implementation

Member States and experts meetings' participants business trips' carbon emission[450] should be offset in a second step by the European Commission when they do not already apply a national carbon offset system. This contribution is not yet accounted in the Commission EMAS evaluation contraty to practice in the European Parliament or the EEA.

1. Positive Impact

1/ carbon footprint reduction

The total Commission's carbon footprint (123,000 tonnes of CO2eq in 2017) consists of the following main contributors (ranked from most important to less important, see Annex 1 for more detail):

1. Staff business trips (47,000 tonnes)
2. Buildings heating (41,500 tonnes)
3. Staff commuting (14,250 tonnes)
4. Building electricity (11,700 tonnes)

As part of a general strategy to achieve carbon neutrality in the years to come, offsetting its employees' business trips will drastically reduce the average carbon footprint of the organisation expressed in equivalent CO2 emission per full time equivalent (CO2eq/FTE). The achievable carbon footprint reduction is:

- 47,000 tonnes of CO2eq per year (93% of it being due to air travel)
- A 40% reduction of the equivalent carbon footprint per staff (from 3.5 tonnes to 2.1 tonnes)
- In the most travel intensive sites and services, the reduction would be much higher (~5 tonnes per staff).

2/ Staff and public opinion

The various climate marches in 2018 and 2019 and the increased awareness about global warming clearly are many signs among others indicating that staff motivation and the Commission's image would be positively impacted by this proposal. Conversely, not doing such a reduction yields significant carbon footprint increase of staff that would normally care in their private life to limit their carbon emission. For instance, a staff member doing efforts in its private life to minimise his or her carbon footprint will see it increased threefold due to working in the

[449] This is the approach taken by EEA.

[450] EEA estimates this footprint to be even higher than the one of the staff business trips

European Commission. Implementing a carbon neutrality policy can therefore contribute to staff motivation.

1. Various positions

European Commission

The Commission's current environmental policy[451] as signed by DG HR already identifies as objective n°2 "taking measures to reduce overall CO2 emissions (mainly from building and **transport**)" but currently the main reduction focus is for the Commission fleet vehicle fuel consumption which represents a tiny contributor of transport-related CO2 emissions.

Court of Auditors

The Court of Auditors has criticised the European Commission performance regarding its Green House Gas emission policy in its report of 2014[452]. The "double" language of the Commission who recommends actions to citizens and organisations but do not apply them to itself is highlighted: on the Commission's website[453], the Commissioner for climate action suggests that EU citizens consider voluntary offsetting in connection with flights. Conversely, institutions such as the European Parliament or agencies such as the EEA are praised.

Criticism of voluntary offsetting

Critics of offsetting schemes argue that they leave the public under the impression that it is possible to buy their way out of climate-protecting lifestyle changes at apparently low cost. This would, in the long-term, delay urgently needed changes in consumer behaviour. Such an understanding of the offsetting concept would indeed be highly questionable because offsetting, even when effective, does comparatively little to halt climate change. In addition, not all available greenhouse gas offsetting schemes are really effective. Offsetting should therefore only be used if activities cannot simply be modified to reduce or avoid greenhouse gas emissions. Under such circumstances, however, offsetting has two further advantages. Firstly, voluntary offsetting of individual carbon dioxide (CO2)-intensive activities raises individual awareness of emissions caused and brings home the extent of emissions and the cost of a person's individual CO2 balance. Secondly, depending on the project quality, offsetting projects may yield additional benefits for sustainable development in the host countries.
We should bear in mind that a mere offsetting can only be a temporary solution for a system to render Commission business-trips carbon-neutral. In the climate-neutral world that we need to achieve, the only offsetting can come from negative emissions, not from a reduction in other places. Thus from the outset, we need to have continued ambition in the type of offsets that we purchase. (We hope that in a decade we can buy real 'carbon free synthetic fuel credits', but already before we may be able to give precedence to early movers, i.e. airlines that have credible decarbonisation strategy in place.) Against this background, the initiative's name is "avoid-reduce-offset-***greennovate***", which also resonates well with GROW's policy objective of a competitive, future-proof European industry. **Costs:**

Offsetting the climate impact of the Commission employees' business trips as part of a general strategy to achieve carbon neutrality would cost approximately **700,000 euros[454]**.

These additional costs, which represent less than 2% of the total mission cost[455], could be balanced by the "avoid – reduce – offset" climate policy (avoiding unnecessary travels that can take place through video and teleconferences notably).

[451] See Annex 1

[452] Special 2014 Report "How do the EU institutions and bodies calculate, reduce and offset their greenhouse gas emissions?"

[453] https://ec.europa.eu/clima/citizens/tips/mobility_en : Consider 'offsetting' the CO2 emissions of your trip. Many travel companies and other organisations will calculate your emissions footprint and invest a corresponding amount into a renewable energy or environmental project, for example.

[454] This is based on the average offsetting cost observed in the EEA (~15 euros/Ton)

Administrative efforts are assessed to be 140 man-days[456].

2. Communication issues

Offsetting the climate impact of its employees' business trips as part of a general strategy to achieve carbon neutrality would provide a nice communication opportunity for improving the Commission's image at a time of increasing concerns for the climate.

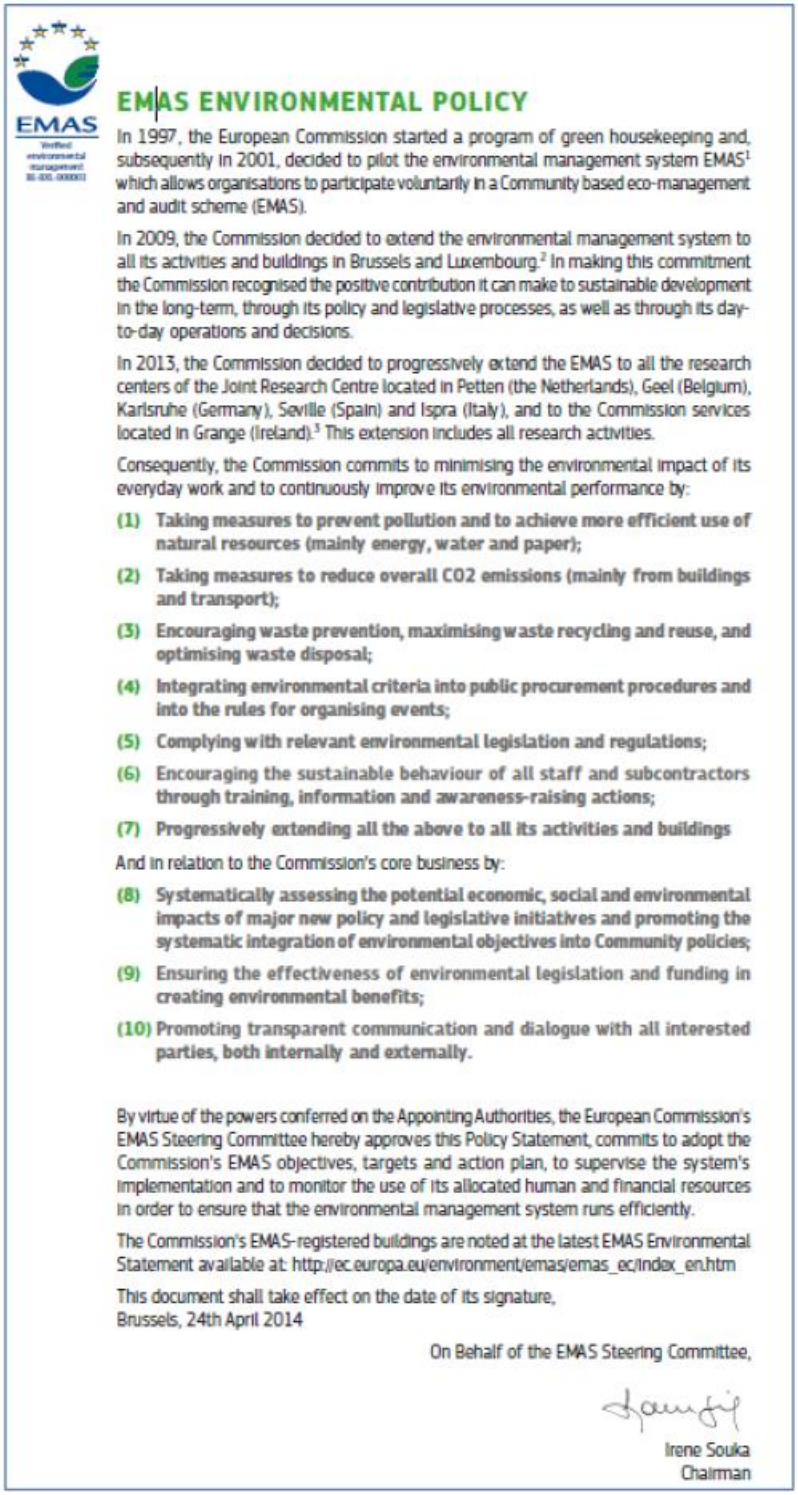
3. Evaluation

Impact: High / **Feasibility:** High / **Innovation:** Low

[455] Budget line XX 01 02 11 01

[456] Based on EEA administrative efforts extrapolated to the Commission

Annex 1 - extract from the Commission 2018 EMAS Statement[457]



EMAS

EMAS ENVIRONMENTAL POLICY

In 1997, the European Commission started a program of green housekeeping and, subsequently in 2001, decided to pilot the environmental management system EMAS[1] which allows organisations to participate voluntarily in a Community based eco-management and audit scheme (EMAS).

In 2009, the Commission decided to extend the environmental management system to all its activities and buildings in Brussels and Luxembourg.[2] In making this commitment the Commission recognised the positive contribution it can make to sustainable development in the long-term, through its policy and legislative processes, as well as through its day-to-day operations and decisions.

In 2013, the Commission decided to progressively extend the EMAS to all the research centers of the Joint Research Centre located in Petten (the Netherlands), Geel (Belgium), Karlsruhe (Germany), Seville (Spain) and Ispra (Italy), and to the Commission services located in Grange (Ireland).[3] This extension includes all research activities.

Consequently, the Commission commits to minimising the environmental impact of its everyday work and to continuously improve its environmental performance by:

(1) **Taking measures to prevent pollution and to achieve more efficient use of natural resources (mainly energy, water and paper);**

(2) **Taking measures to reduce overall CO2 emissions (mainly from buildings and transport);**

(3) **Encouraging waste prevention, maximising waste recycling and reuse, and optimising waste disposal;**

(4) **Integrating environmental criteria into public procurement procedures and into the rules for organising events;**

(5) **Complying with relevant environmental legislation and regulations;**

(6) **Encouraging the sustainable behaviour of all staff and subcontractors through training, information and awareness-raising actions;**

(7) **Progressively extending all the above to all its activities and buildings**

And in relation to the Commission's core business by:

(8) **Systematically assessing the potential economic, social and environmental impacts of major new policy and legislative initiatives and promoting the systematic integration of environmental objectives into Community policies;**

(9) **Ensuring the effectiveness of environmental legislation and funding in creating environmental benefits;**

(10) **Promoting transparent communication and dialogue with all interested parties, both internally and externally.**

By virtue of the powers conferred on the Appointing Authorities, the European Commission's EMAS Steering Committee hereby approves this Policy Statement, commits to adopt the Commission's EMAS objectives, targets and action plan, to supervise the system's implementation and to monitor the use of its allocated human and financial resources in order to ensure that the environmental management system runs efficiently.

The Commission's EMAS-registered buildings are noted at the latest EMAS Environmental Statement available at: http://ec.europa.eu/environment/emas/emas_ec/index_en.htm

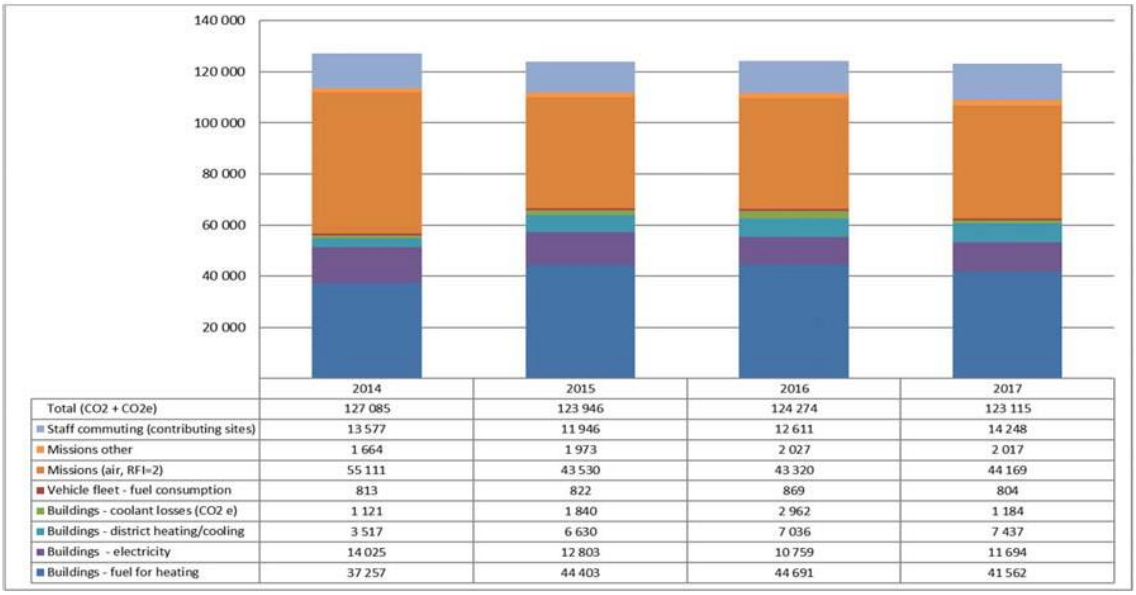
This document shall take effect on the date of its signature,
Brussels, 24th April 2014

On Behalf of the EMAS Steering Committee,

Irene Souka
Chairman

[457] http://ec.europa.eu/environment/emas/pdf/other/2018%2012%2007_ES%202018_Consolidated%20Volume.pdf

Figure 2.11: CO_2 or equivalent emissions generated by the Commission 2014 to 2017 (tonnes)



	2014	2015	2016	2017
Total (CO2 + CO2e)	127 085	123 946	124 274	123 115
Staff commuting (contributing sites)	13 577	11 946	12 611	14 248
Missions other	1 664	1 973	2 027	2 017
Missions (air, RFI=2)	55 111	43 530	43 320	44 169
Vehicle fleet - fuel consumption	813	822	869	804
Buildings - coolant losses (CO2 e)	1 121	1 840	2 962	1 184
Buildings - district heating/cooling	3 517	6 630	7 036	7 437
Buildings - electricity	14 025	12 803	10 759	11 694
Buildings - fuel for heating	37 257	44 403	44 691	41 562

Figure 2.18: CO_2 emissions from commuting and mission travel in 2017 (tonnes and %),

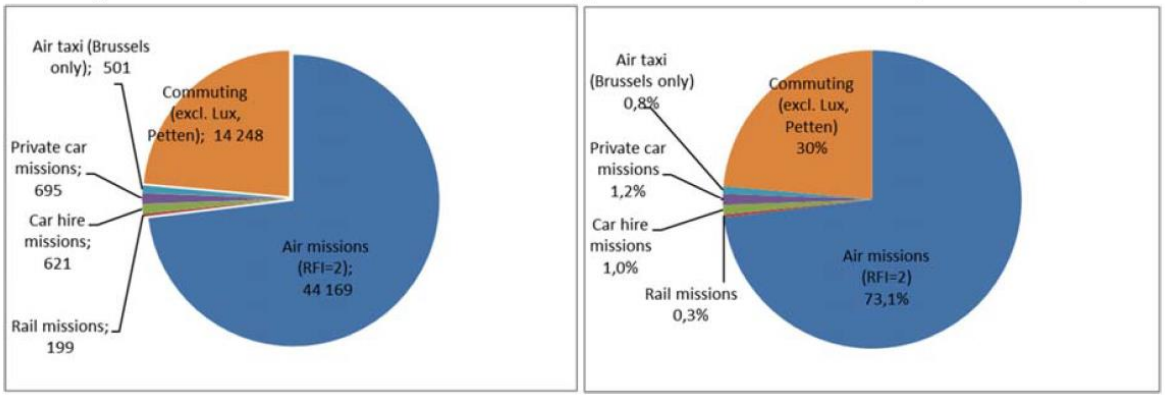
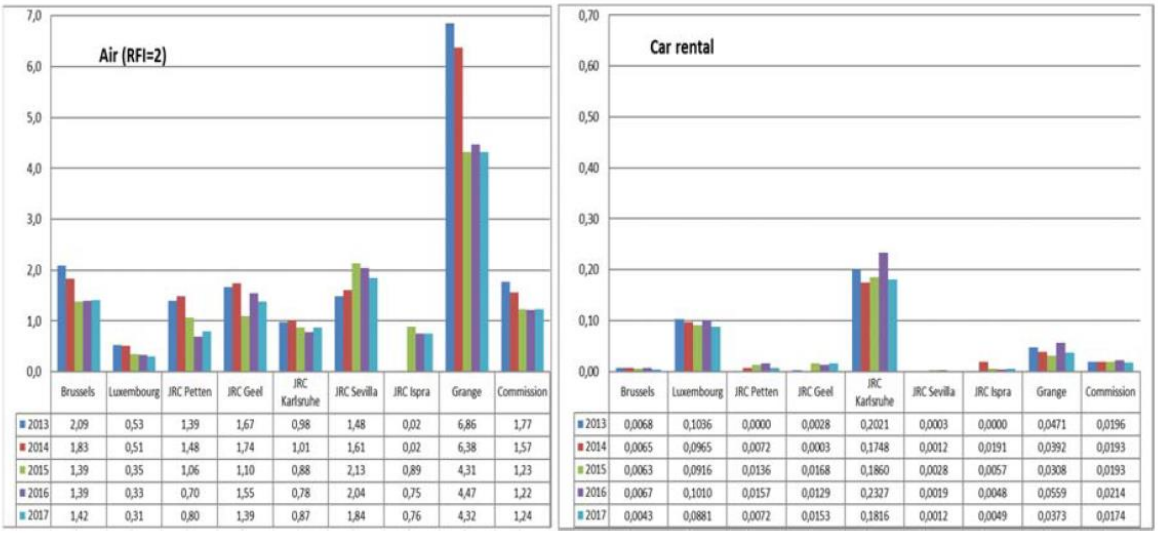
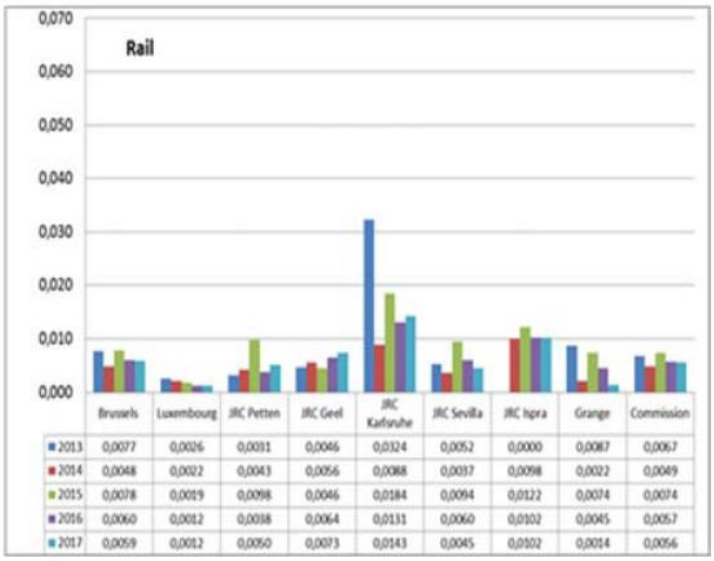


Figure 2.19: Per capita emissions for air for missions by air (RFI=2), car rental and rail [27]



	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Sevilla	JRC Ispra	Grange	Commission
2013	2,09	0,53	1,39	1,67	0,98	1,48	0,02	6,86	1,77
2014	1,83	0,51	1,48	1,74	1,01	1,61	0,02	6,38	1,57
2015	1,39	0,35	1,06	1,10	0,88	2,13	0,89	4,31	1,23
2016	1,39	0,33	0,70	1,55	0,78	2,04	0,75	4,47	1,22
2017	1,42	0,31	0,80	1,39	0,87	1,84	0,76	4,32	1,24

	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Sevilla	JRC Ispra	Grange	Commission
2013	0,0068	0,1036	0,0000	0,0028	0,2021	0,0003	0,0000	0,0471	0,0196
2014	0,0065	0,0965	0,0072	0,0003	0,1748	0,0012	0,0191	0,0392	0,0193
2015	0,0063	0,0916	0,0136	0,0168	0,1860	0,0028	0,0057	0,0308	0,0193
2016	0,0067	0,1010	0,0157	0,0129	0,2327	0,0019	0,0048	0,0559	0,0214
2017	0,0043	0,0881	0,0072	0,0153	0,1816	0,0012	0,0049	0,0373	0,0174



	Brussels	Luxembourg	JRC Petten	JRC Geel	JRC Karlsruhe	JRC Sevilla	JRC Ispra	Grange	Commission
2013	0,0077	0,0026	0,0031	0,0046	0,0324	0,0052	0,0000	0,0087	0,0067
2014	0,0048	0,0022	0,0043	0,0056	0,0088	0,0037	0,0098	0,0022	0,0049
2015	0,0078	0,0019	0,0098	0,0046	0,0184	0,0094	0,0122	0,0074	0,0074
2016	0,0060	0,0012	0,0038	0,0064	0,0131	0,0060	0,0102	0,0045	0,0057
2017	0,0059	0,0012	0,0050	0,0073	0,0143	0,0045	0,0102	0,0014	0,0056

Annex 2 – Factsheet: The German Federal Government case[458]

[458] This factsheet is from 2017. The EMAS report by the German Environmental Protection Agency of Nov. 2018 (https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/190107_uba_fb_emas_bf.pdf (not available in English)) says that today also GHG emissions from the Federalgovernment's rail travels are offset.

The German Federal Government's Business Trips are Climate-neutral

FACTSHEET

The German Federal Government was offsetting the climate impact of its employees' business trips for the 2014-2017 legislation period. This meant that the emissions were compensated for elsewhere by acquiring and surrendering emission allowances from prestigious climate protection projects. Allowances were obtained from projects that were certified according to UN rules for environmentally friendly development under the Clean Development Mechanism (CDM).

The German Emissions Trading Authority (DEHSt) at the German Environment Agency supports the German Federal Government by calculating emissions, selecting climate protection projects, and acquiring and surrendering CDM certificates (also known as Certified Emission Reductions, CERs). The compensation of greenhouse gas emissions from the Federal Government's business trips is an important climate policy signal and is an example to be followed by private stakeholders, companies and public institutions.

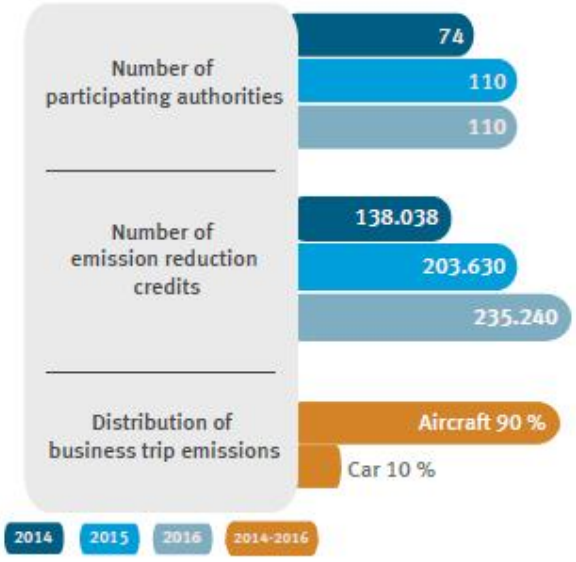
Avoid – Reduce – Offset Travel

The Federal Government follows the climate policy principle: **avoid – reduce – offset**. Business trips are avoided by the increased use of video and telephone conferences. In general, the number of business trips is reduced when it is decided whether the trip is necessary at all. Furthermore, rail travel is preferred. The Government acquires 'green tickets' for rail travel for which there is currently no compensation. The remaining, unavoidable emissions caused by business car journeys or air travel must then be offset.

Emissions from business trips by cars are determined from the fuel consumption and fuel-specific emission factors.

A key element is the inclusion of additional climate-relevant, non-CO_2 impacts (such as water vapour, nitrogen oxide and soot particle emissions) in aviation. The climate- relevant total emissions caused by air travel can be determined from this data pool.

The first years of compensation in figures



Umwelt Bundesamt

DEHSt
Deutsche Emissionshandelsstelle

Image source: © kalafoto/Fotolia

Project Examples

Project type:

Household biogas from biomass

How a biogas plant works:

Instead of the widespread disposal of animal and other faecal matter in open manure pits, biogas plants treat excrement in closed tanks in the absence of air and provide the farms with the biogas, i.e. methane produced for cooking. The original, smokey cooking systems using coal can thereby be replaced. This also often provides health improvements. In addition, a high-quality fertiliser remains after fermentation that can replace chemical fertilisers.

Image source: UPM

Project type:

Power generation from crop residues

How a biomass power station works:

Small-scale farmers can supply such a power plant with their crop residues and securing an additional income by selling the formerly useless waste to the plant operator.

The crop residues are burnt and heat a steam boiler to generate steam. This steam drives a turbine and a generator to generate electricity which is fed into the regional electricity grid.

Image source: atmosfair

High-quality and Plausible Climate Protection Projects are More Than Just Emission Reduction!

Only projects from the CDM are used. This ensures a certification of emission reductions under the umbrella of the applicable UN rules. Project assessments in the CDM in particular include the confirmation of additionality: whether emission reductions would not have been achieved without the CDM project considered.

The primary objective of compensation is off-setting by using emission savings elsewhere. Therefore, all projects meet the requirements of a proven emission reduction. In doing so, we are focusing on projects that go beyond pure CO_2 reduction and have additional, sustainable added value for the countries participating in the project (called co-benefits).

Co-benefit examples include:

- Increasing jobs in the area
- Local training and environmental education
- Support for local utilities
- Increasing a decentralised rural electrification rate
- Preservation of biodiversity
- Protection of natural resources, e.g. reducing deforestation rate
- Health protection, e.g. by eliminating smoke-intensive burning
- Additional income

GENERAL PROCESS FOR BUSINESS TRAVEL COMPENSATION BY THE FEDERAL GOVERNMENT

National and international providers may offer us certificates from one or more CDM projects within stipulated deadlines when an intended certificate acquisition is publicly announced. We then evaluate the offers based on the existing criteria and make a selection. The selected certificates from the projects are then acquired and irrevocably deleted in the German Kyoto registry.

German Emissions Trading Authority (DEHSt) at the German Environment Agency
Bismarckplatz 1
D-14193 Berlin

www.dehst.de/EN | emissionstrading@dehst.de

APPENDIX 9
DG MARE STRATEGY TO REDUCE THE CARBON FOOTPRINT

See document attached

APPENDIX 10
SUMMARY TABLES OF MEASURES FOR SCENARIO 50% AND MODIFICATION OF SPECIFIC MEASURES FOR SCENARIO 30% AND 65%

The first two tables below show all measures for the scenario 50% with the following elements:

- the description of the applicability,
- the objective,
- the absolute mitigation potential (in tCO_2e),
- the potential start date,
- the preparation period (in years),
- the implementation period (in years),
- the capital expenditures (CAPEX) and
- the operational costs (OPEX).

The two last tables show respectively the changes made for the scenario 30% and the scenario 65%

# of measure	Name of the measure	Applicability	Objective	Mitigation potential (tCO2e)	Start date	Prep. Period (year)	Impl. Period (year)	CAPEX (M eur)	OPEX (M eur)
1.1	Optimise office space	100% of office surface.	Reduction of average gross office building surface per employee	8,900	2021	2	7	407.2	-52.5
1.2	Improve meeting rooms occupancy	100% of meeting rooms (assumed 10% of net building surface)	Implementation of a digital booking system for meeting rooms	500	2021	2	7	0.6	-0.3
1.3	Use low-carbon material in construction and renovation	70% of building net surface with renovation	Increase of the share of biosourced and recycled material	2,500	2021	2	7	32.4	0.0
1.4	Increase vegetation in the built environment	63% of buildings , 5% roof surface , 15% of electricity consumption (summer cooling)	Increase of surface covered with vegetation	500	2021	2	3	4.5	-0.3
1.5	Relocate to green and sustainable buildings	100% of staff (we assume 40% of staff in BXL can be relocated)	Increase of the share of the staff relocated in green buildings	6,200	2021	3	6	5.4	2.5
2.1	Close offices during holidays periods	75% of all office zones (except JRC)	Increase of the number of average closure days	600	2021	1	2	0.0	-0.6
2.2	Optimise energy regulation systems	All buildings except the ones with collaborative space and presence detector already monitored 60% of current surface	100% of remaining buildings monitored	4,500	2021	1	8	7.5	-1.6
2.3	Improve building insulation and passive protection	All buildings with contract allowing for renovation work on surfaces 55% of current surface	Building insulation corresponding to the highest local insulation regulation level	1,300	2021	4	5	85.1	-0.5
2.4	Communicate on energy consumption and behaviours	100% of staff	Increase of the frequency of communication campaign	2,800	2021	1	2	0.0	-1.0
2.5	Conduct internal energy audits	All energy systems 100% of buildings	Provision of yearly recommendations for each building	Lever effect	2021	1	3	2.2	1.2
2.6	Optimise energy systems at replacement time	All energy systems which will be replaced before 2030 70% of systems	Increase of the ratio of systems with energy labels > A	7,100	2021	1	8	4.4	-4.5
2.7	Install on-site renewable energy production for heating/cooling	5% of current heating/cooling consumption	Increase of the share of heating/cooling energy covered with renewable (UE objective : 32% renewable)	2,000	2021	3	6	12.5	-0.1
2.8	Install on-site PV production	10% of the current electricity consumption (12MWp)	Increase of the share of electricity energy covered with renewable (UE objective : 32% renewable)	600	2021	2	3	12.8	-1.2
2.9	Use cloud computing services	In house data server energy consumption (Estimation of 15% of electricity consumption)	Increased share of data servers on cloud computing (70% of server on cloud computing)	400	2021	2	2	9.0	-2.1
2.10	Use new fuel sources for heating	100% of gas used in the Commission when the market allows for it and if network available (market supposed to offer the full demand in 2030)	Increase of share of biogas consumption (25 % to reflect on market demand in 2030)	10,100	2021	1	3	0.0	0.7
2.11	Purchase green electricity for all sites	Remaining electricity consumption without green electricity provider (30% of current electricity consumption)	Increase of green electricity consumption (100% of green electricity with high environmental standards)	7,000	2021	1	3	0.0	0.1
2.12	Switch to heat pumps	85% of gas and diesel boilers	Increase of number of heat pumps (30% of concerned boilers)	5,300	2021	1	8	7.2	0.7
3.1	Develop remote meetings attendance for staff through enhanced videoconference facilities	All missions without mandatory physical meeting	Increase of the number of VC facilities, improvement of VC material (50% of travel missions done by videoconference, with 2000 new VC facilities)	22,800	2021	2	7	8.9	-23.6
3.2	Implement a bonus/ malus fee in mission booking process	All missions	Update of the booking process (20% switch from air travel to train)	7,900	2021	2	1	0.3	0.2
3.3	Implement carbon threshold on missions	All missions	Update of the monitoring process	Lever effect	2021	2	2	0.3	0.2
3.4	Improve booking criteria for missions	All missions	Update of the booking process	6,800	2021	2	1	0.2	1.8
3.5	Develop remote meeting attendance and promore low carbon travels for visitors	100% of visitors' missions (paid by the Commission)	Decrease of percentage of air travels by visitors (replaced by videconferences or other transport modes)	34,900	2021	2	2	0.2	-3.7
3.6	Implement mandatory train transport up to a set distance	4% of air travel in the Commission < 500 km	Integration of a distance limit in Mission guide	1,100	2021	1	1	0.0	-4.3
3.7	Implement priority rules for the purchase of economy class flight tickets	42% of staff air travel distance	Reduction of business flights	3,300	2021	1	1	0.0	0.3

# of measure	Name of the measure	Applicability	Objective	Mitigation potential (tCO2e)	Start date	Prep. Period (year)	Impl. Period (year)	CAPEX (M eur)	OPEX (M eur)
4.1	Limit parking space and introduce parking fee	30% of commuters (i.e. car commuters)	Reduction of the number of parking places & 100% parking places with fee	1,700	2021	1	6	0.0	0.1
4.2	Improve teleworking rules and practice	20% of staff for specific support, 80% for general support	Increase of the average number of teleworking days	300	2021	1	3	0.3	0.3
4.3	Improve the commuting service helpdesk	100% of staff	Creation of a helpdesk	0	2021	1	1	0.0	9.0
4.4	Improve carpooling in isolated zones	30% of commuters (i.e. car commuters)	Increase of the number of carpoolers	800	2021	1	3	0.0	0.8
4.5	Implement a commuting fee	100% of staff	Provision of a commuting flat fee	0	2021	1	6	0.0	0.5
4.6	Promote active mobility	100% of commuters	Increase of the share of cycling commuters	1,500	2021	1	2	1.5	1.8
4.7	Install chargers for electric 2-wheeled vehicles	Staff electric 2-wheels vehicles	Increase of the number of charging points	1,400	2021	1	5	7.9	-0.2
5.1	Ban single-use plastic	Printers and desktops (Evaluation : 30% less computers possible)	50% less individual and network printers (from 1 net. print/5 staff to 1 net. print./10 staff), 30% less desktop computers and 90% of remaining desktop computers switch to laptop.	200	2021	1	1	0.0	1.8
5.2	Optimise food order quantities	All IT devices	Increase of average lifecycle (100% with lifecycles extented 1 year)	700	2021	1	1	0.0	-0.2
5.3	Promote low-carbon menus in canteens and events	Canteen meals and event catering	50% more alternatives based on low carbon menus (4 meals/week) to reach 80% of the offer	1,000	2021	1	1	0.0	-0.1
5.4	Reduce and change IT equipment	Printers and desktops (Evaluation : 30% less computers possible)	50% less individual and network printers (from 1 net. print/5 staff to 1 net. print./10 staff), 30% less desktop computers and 90% of remaining desktop computers switch to laptop.	3,300	2021	1	4	0.8	-1.0
5.5	Optimise the lifecycle of IT devices	All IT devices	Increase of average lifecycle (100% with lifecycles extented 1 year)	2,700	2021	1	1	0.0	0.5
5.6	Install recycling and waste points	All waste points	Increase of recycling and decrease of waste amount (20% more recycle and 20% less garbage)	400	2021	1	1	0.5	0.0
5.7	Optimise internet data consumption	Internet data consumption	Reduction of average daily data flow (30% less internet data, it is not currently monitored but expected to grow with videoconference use)	Lever effect	2021	1	2	0.0	0.2
5.8	Develop green and collaborative procurement	All procurement contractings	Improvement of GPP process (100% contracts covered)	2,500	2021	3	2	0.0	1.1
6.1	Communicate with ecosystemic partners	/	Increase of the number of communication events	Lever effect	2021	1	1	0.0	0.4
6.2	Conduct frequent feedback surveys	All consumption categories and sites	Increase of categories and sites covered with yearly feedback surveys	Lever effect	2021	1	1	0.0	0.2
6.3	Provide guidance and reporting tools	Existing guidance and reporting tools	Improvement of the guidance process	Lever effect	2021	1	1	0.0	0.1
6.4	Promote good practices	Existing initiatives of the Commission	Increase of the communication campaigns on co-benefits	Lever effect	2021	1	1	0.0	0.2
6.5	Break down targets	Targets of the climate neutrality strategy	Increase of the downscaling level for targets	Lever effect	2021	1	1	0.8	0.1
6.6	Provide Ghg monitoring tools	All categories and emission sources	Increase of the number of specific carbon simulators	Lever effect	2021	1	1	0.3	0.1

Modification for scenario 65 %									
# of measure	**Name of the measure**	**Applicability**	**Objective**	**Mitigation potential (tCO2e)**	**Start date**	**Prep. Period (year)**	**Impl. Period (year)**	**CAPEX (M eur)**	**OPEX (M eur)**
1.1	Optimise office space	All building surface dedicated to office work and not already considered in any relocation measure before 2030	Reduction of average office space per employee (**50 % space reduction**)	9,200	2021	2	7	678.6	-87.6
1.3	Use low-carbon material in construction and renovation	Any renovation and construction work	Increase of the share of biosourced and recycled material (Renovation with **70% low carbon** and biosourced material)	3,400	2021	2	7	45.3	0.0
1.5	Relocate to green and sustainable buildings	Staff which can be relocated before 2030 (building contract ending before 2030)	**50 % of concerned staff in Brussels** relocated to new buildings (the rest being relocated internally)	8,300	2021	3	6	10.7	5.0
2.10	Use new fuel sources for heating	100% of gas used in the Commission when the market allows for it and if network available (market supposed to offer the full demand in 2030)	Increase of share of biogas consumption (**100 %**)	39,900	2021	1	3	0.0	2.9
3.1	Develop remote meetings attendance for staff through enhanced videoconference facilities	All missions without mandatory physical meeting	Increase of the number of VC facilities, improvement of VC material (**75% of travel missions** done by videoconference, with **3000 new VC facilities**)	34,500	2021	2	7	26.5	-70.8
3.5	Develop remote meeting attendance and promore low carbon travels for visitors	Meetings and events organised by the European Commissions (100% of visitors travels)	Decrease of air travel share for events and meetings (**80 % less air travel for meetings and events**, **65% by VC** and 15 % switch to train)	56,500	2021	2	2	0.2	-6.9

Modification for scenario 30 %									
# of measure	Name of the measure	Applicability	Objective	Mitigation potential (tCO2e)	Start date	Prep. Period (year)	Impl. Period (year)	CAPEX (M eur)	OPEX (M eur)
1.1	Optimise office space	100% of office surface.	Reduction of average office space per employee (**10 % space reduction**)	1,800	2021	2	7	135.7	-17.5
1.3	Use low-carbon material in construction and renovation	70% of building net surface with renovation	Increase of the share of biosourced and recycled material (Renovation with **20%** low carbon and biosourced material)	1,000	2021	2	7	12.9	0.0
1.5	Relocate to green and sustainable buildings	100% of staff (we assume 40% of staff in BXL can be relocated)	**10 % of concerned staff in Brussels** relocated to new buildings (the rest being relocated internally)	5,000	2021	3	6	2.1	1.0
2.2	Optimise energy regulation systems	All buildings except the ones with collaborative space and presence detector already monitored 60% of current surface	**50 %** of remaining buildings monitored	2,200	2021	1	8	3.7	-0.8
2.3	Improve building insulation and passive protection	All buildings with contract allowing for renovation work on surfaces 55% of current surface	Building insulation corresponding to the highest local insulation regulation level (**10 % buildings with no relocation possible**)	500	2021	4	5	28.4	-0.2
2.10	Use new fuel sources for heating	Not included in 30% scenario							
2.12	Switch to heat pumps	85% of gas and diesel boilers	Increase of number of heat pumps (5% of concerned boilers)	7,000	2021	1	8	43.5	4.3
3.1	Develop remote meetings attendance for staff through enhanced videoconference facilities	All missions without mandatory physical meeting	Increase of the number of VC facilities, improvement of VC material (**20% of travel missions** done by videoconference, with **1000 new VC facilities**)	9,200	2021	2	7	7.1	-18.9
3.4	Improve booking criteria for missions	Not included in 30% scenario							
3.5	Develop remote meeting attendance and promore low carbon travels for visitors	100% of visitors' missions (paid by the Commission)	Decrease of air travel share for events and meetings (**30% less air travel** for meetings and events, **15% by VC** and 15 % switch to train)	20,500	2021	2	2	0.2	-1.6

APPENDIX 11
SUMMARY TABLE OF MEASURES FOR IMPLEMENTATION PLANNING

#	Name of the measure	Started date	End of the preparation period	End of the implementation period	Amortisation	Evolution of the implementation rate									
						2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1.1	Optimise office space	2021	2023	2030	15	0%	0%	0%	14%	29%	43%	57%	71%	86%	100%
1.2	Improve meeting rooms occupancy	2021	2023	2030	5	0%	0%	0%	14%	29%	43%	57%	71%	86%	100%
1.3	Use low-carbon material in construction and renovation	2021	2023	2030	20	0%	0%	0%	14%	29%	43%	57%	71%	86%	100%
1.4	Increase vegetation in the built environment	2021	2023	2026	10	0%	0%	0%	33%	67%	100%	100%	100%	100%	100%
1.5	Relocate to green and sustainable buildings	2021	2024	2030	10	0%	0%	0%	0%	17%	33%	50%	67%	83%	100%
2.1	Close offices during holidays periods	2021	2022	2024	1	0%	0%	50%	100%	100%	100%	100%	100%	100%	100%
2.2	Optimise energy regulation systems	2021	2022	2030	6	0%	0%	13%	25%	38%	50%	63%	75%	88%	100%
2.3	Improve building insulation and passive protection	2021	2025	2030	20	0%	0%	0%	0%	0%	20%	40%	60%	80%	100%
2.4	Communicate on energy consumption and behaviours	2021	2022	2024	1	0%	0%	50%	100%	100%	100%	100%	100%	100%	100%
2.5	Conduct internal energy audits	2021	2022	2025	10	0%	0%	33%	67%	100%	100%	100%	100%	100%	100%
2.6	Optimise energy systems at replacement time	2021	2022	2030	15	0%	0%	13%	25%	38%	50%	63%	75%	88%	100%
2.7	Install on-site renewable energy production for heating/cooling	2021	2024	2030	20	0%	0%	0%	0%	17%	33%	50%	67%	83%	100%
2.8	Install on-site PV production	2021	2023	2026	20	0%	0%	0%	33%	67%	100%	100%	100%	100%	100%
2.9	Use cloud computing services	2021	2023	2025	3	0%	0%	0%	50%	100%	100%	100%	100%	100%	100%
2.10	Use new fuel sources for heating	2021	2022	2025	1	0%	0%	33%	67%	100%	100%	100%	100%	100%	100%
2.11	Purchase green electricity for all sites	2021	2022	2025	1	0%	0%	33%	67%	100%	100%	100%	100%	100%	100%
2.12	Switch to heat pumps	2021	2022	2030	15	0%	0%	13%	25%	38%	50%	63%	75%	88%	100%
3.1	Develop remote meetings attendance for staff through enhanced videoconference facilities	2021	2023	2030	5	0%	0%	0%	14%	29%	43%	57%	71%	86%	100%
3.2	Implement a bonus/ malus fee in mission booking process	2021	2023	2024	3	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%
3.3	Implement carbon threshold on missions	2021	2023	2025	3	0%	0%	0%	50%	100%	100%	100%	100%	100%	100%
3.4	Improve booking criteria for missions	2021	2023	2024	3	0%	0%	0%	100%	100%	100%	100%	100%	100%	100%
3.5	Develop remote meeting and conference attendance for visitors	2021	2023	2025	3	0%	0%	0%	50%	100%	100%	100%	100%	100%	100%
3.6	Implement mandatory train transport up to a set distance	2021	2022	2023	1	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
3.7	Implement priority rules for the purchase of economy class flight tickets	2021	2022	2023	1	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%

#	Name of the measure	Started date	End of the preparation period	End of the implementation period	Amortisation	Evolution of the implementation rate									
						2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
4.1	**Limit parking space and introduce parking fee**	**2021**	**2022**	**2028**	**1**	0%	0%	17%	33%	50%	67%	83%	100%	100%	100%
4.2	Support teleworking	2021	2022	2025	5	0%	0%	33%	67%	100%	100%	100%	100%	100%	100%
4.3	**Improve the commuting service helpdesk**	**2021**	**2022**	**2023**	**1**	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
4.4	Improve carpooling in isolated zones	2021	2022	2025	1	0%	0%	33%	67%	100%	100%	100%	100%	100%	100%
4.5	**Implement a commuting fee**	**2021**	**2022**	**2028**	**1**	0%	0%	17%	33%	50%	67%	83%	100%	100%	100%
4.6	Promote active mobility	2021	2022	2024	10	0%	0%	50%	100%	100%	100%	100%	100%	100%	100%
4.7	**Install chargers for electric 2-wheeled vehicles**	**2021**	**2022**	**2027**	**5**	0%	0%	20%	40%	60%	80%	100%	100%	100%	100%
5.1	Ban single-use plastic	2021	2022	2023	1	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
5.2	**Optimise food order quantities**	**2021**	**2022**	**2023**	**1**	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
5.3	Promote low-carbon menus in canteens and events	2021	2022	2023	1	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
5.4	**Reduce and change IT equipment**	**2021**	**2022**	**2026**	**5**	0%	0%	25%	50%	75%	100%	100%	100%	100%	100%
5.5	Optimise the lifecycle of IT devices	2021	2022	2023	5	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
5.6	**Install recycling and waste points**	**2021**	**2022**	**2023**	**3**	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
5.7	Optimise internet data consumption	2021	2022	2024	1	0%	0%	50%	100%	100%	100%	100%	100%	100%	100%
5.8	**Develop green and collaborative procurement**	**2021**	**2024**	**2026**	**1**	0%	0%	0%	0%	50%	100%	100%	100%	100%	100%
6.1	Communicate with ecosystemic partners	2021	2022	2023	1	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
6.2	**Conduct frequent feedback surveys**	**2021**	**2022**	**2023**	**1**	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
6.3	Provide guidance and reporting tools	2021	2022	2023	1	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
6.4	**Promote good practices**	**2021**	**2022**	**2023**	**1**	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
6.5	Break down targets	2021	2022	2023	1	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%
6.6	**Provide Ghg monitoring tools**	**2021**	**2022**	**2023**	**1**	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%

APPENDIX 12
SUMMARY OF THE LUNCHTIME CONFERENCE OF 29 JUNE 2020

SUMMARY OF THE LUNCHTIME CONFERENCE FOR COMMISSION STAFF

Project name	**FEASIBILITY AND SCOPING STUDY FOR THE COMMISSION TO BECOME CLIMATE NEUTRAL BY 2030**
Subject	**Staff lunchtime conference**
Meeting date	**29/06/2020**
Location	**Webstreamed and recorded virtual conference**
Speakers/Panalists	**European Commission :** Artur Runge-Metzger,Sven Dammann; Cécile Hanoune; (DG CLIMA), Christian Roques (DG HR), Jennifer Brown (DG BUDG), Marc Becquet (OIB), **Ramboll:** Xavier Le Den; Sébastien Bruyère **CO2logic:** Carlos Garcia-Borreguero; Alexis Bary **Participants:** 173 participated via the interactive conference tool; There were 281 views via webstreaming

Agenda

1. **Introduction by DG HR and DG CLIMA**
2. **Presentation of the scope of GHG emissions and the actions domains and measures**
3. **Discussion with staff**
4. **Presentation of the scenarios: methodology, results and conclusion**
5. **Discussion with staff**

During the lunchtime conference, the organising team of the European Commission clustered and summarised participants' questions by topic in order to promote a framed and organized discussion between the consultants and the panellists.

Below you will find a summary of the comments raised by the participants (highlighted in bold) as well as the clarifications or answers to these topics given by the consultants and the Commission's panellists (only if the latter responded, is the DG indicated. No indication means that the consultants gave the response.)

- **Scoping: Commission Representations to Member States; Delegations of the EU to third countries; European agencies:**
  - **Participants' interventions :**
    - ***EMAS does not cover all EC buildings (e.g. agencies and if not mistaken, even the EU Delegations) neither all EU owned infrastructure being managed by EC***
    - **Reductions in travel/missions can also be made in EU delegations (part of their staff depending of EC budget lines) where personnel (including local) travel to BRU for trainings which could be followed on-line**
  - On EU-Delegations and representations: Currently, the Commission staff from EU-Delegations and representations is included. Consequently, missions of this staff are considered. However, measures take into account the fact that it is sometimes more

difficult to avoid travelling outside the EU especially for staff working in EU-Delegations. Finally, the management mode (including travelling) for the EU-Delegations is responsibility of the European External Action Service and not of the European Commission.
  - On the other hand, the European Commission has no leverage nor data on energy consumption in the buildings where the delegations are located. It was decided not to include the building of the Commission Representations to Member States and the Delegations of the EU to third countries in the scope. The European Commission often shares buildings with other institutions in Europe, whilst in third countries the European Commission is hosted in the EEAS premises.
  - On agencies: executive agencies are part of the scope, as they are part of the Commission. Decentralised agencies are not part of the scope, as the Commission has limited leverage on their governance/activities.

- **IT related & online conferencing**
  - **Participants' interventions**
    - ***Did you somehow take into account the emissions from all these videos (videoconferencing, streaming…)… still better then flying around, but not without emissions***
    - ***Any action for IT cleaning? To reduce CO2 emissions linked to sending of e-mails and storage of useless data in servers?***
    - ***To produce a new IT equipment is heavily energy efficient, while buying a new one, it should be taken into account as well***

  - Rebound effect regarding the manufacturing of additional IT equipment (Video conference facilities,..) is taken into account in assumptions: new IT equipment has a GHG emissions impact due to the production phase (energy consumption in the manufacture but also component used) but also for their use phase. Consequently, GHG emissions related to additional videoconferences facilities are also estimated[459].
  - Nevertheless, this new equipment avoids GHG emissions related to air travels, and the net GHG impact is much lower than the business as usual scenario.
    - No specific data is available to account for the climate impact of web streaming. Nevertheless, some measures in Action Domain (AD) #2 *Optimise energy consumption and systems* and AD#5 *Reduce purchase and consumption GHG emissions* refer to cloud computing energy efficiency and good practices on digital hygiene.
  - Regarding IT devices, the consultants proposes to keep on reducing the number of individual printers, extending their life-expectancy, reducing the number of desktops and replacing the remaining desktops by laptops. All of these measures have already been initiated by DG DIGIT for the whole Commission.

- **Teleworking**
  - **Participants' interventions:**
    - ***Telework will increase individual energy consumption, where we don't have control over energy efficiency***
    - ***With teleworking, office could be regularly shared, so the space could be easily further halved. And this could be done immediately, the Commission already started teleworking without any notice!***
    - ***A person teleworking is also a budget saving for the EC - there could be some fund reserved for offsetting emissions for the case that no renewable energy is available at the teleworking place.***

[459] A 2014 research article estimates to 7% the share of carbon emissions due to videoconferencing meetings compares with physical meetings. Ong & all, 2014, Comparison of the energy, carbon and time costs of videoconferencing and in-person meetings, https://www.sciencedirect.com/science/article/abs/pii/S0140366414000620

- The consultant proposes teleworking as a means to tackle GHG emissions related to home-work commuting and to improve the office space management. The consultant considered rebound effect from the energy used at home, but still assumes net GHG savings already at present, under certain conditions.

  [Comments by the study's steering board: As also raised in other exchanges with the consultants, this assumption is questionable, as the study does not underpin this assumption with any data, while other studies say that *"Despite the generally positive verdict on teleworking as an energy-saving practice, there are numerous uncertainties and ambiguities about its actual or potential benefits. These relate to the extent to which teleworking may lead to unpredictable increases in non-work travel and home energy use that may outweigh the gains from reduced work travel. The available evidence suggests that economy-wide energy savings are typically modest, and in many circumstances could be negative or non-existent."*[460] Another study[461] says *"The results suggest that workplace diversification is often reflected by longer average distances for work trips, which are often associated with more remote residential locations. […] We also hypothesize that the development of ICT and the consequent increase in the proportion of home-based workers and teleworkers does not necessarily generate fewer CO2 emissions due to potential rebound effects."*]
  [Answer to the steering board: the consultant acknowledges the uncertainties about teleworking and has highlighted these uncertainties in the final report. The assumptions on benefits in terms of GHG emission are more conservative, to reflect on Commissions situation. Disclaimers have been added in the report to highlight the needs for case by case studies, to avoid carbon leakage.]
- [DG CLIMA] The impact of energy consumption at home will decrease over time because of the EU policy aiming at decarbonizing the energy production in the EU by 2050.

- **Commuting**
  - **Participants' interventions :**
    - ***AD#4 the EC parking use, now does not imply any fee for the user –so opposite to the polluter pay principle, while promoted in the EU general policy… would you recommend to introduce a fee?***
    - ***What about equity/fairness when "fining" staff living further because house prices around Brussels not accessible for lower categories (SC?)***
    - ***Many colleagues drive ridiculous cars in terms of CO2 emissions and what is available on the market. Can we make parking fees, incentives to promote the use of low energy cars and electric cars?***

  - The consultant recommends a parking fee (`polluter pays" principle).
  - A complementary mobility budget could provide the possibility for each staff to finance their transport mode for commuting based on the same financial advantage, even if the staff has to walk from home and therefore does not receive any subsidy for now.
  - [OIB] Changing mobility habits will take time and awareness raising will be needed. A broad view on the different alternatives is needed: bicycles, public transport, walking, etc.
  - Installation of chargers for electric vehicles is proposed in measure 4.7. *Install chargers for electric vehicles*.
  - [OIB] OIB already promotes alternatives to car mobility, such as the 600 bicycles available to the staff.

[460] "A systematic review of the energy and climate impacts of teleworking" Hook at al. 2020, http://sro.sussex.ac.uk/id/eprint/90965/

[461] "Does working from home reduce CO2 emissions? An analysis of travel patterns as dictated by workplaces" Eugênia Dória Viana Cerqueira et al, Transportation Research Part D: Transport and Environment, Volume 83, June 2020, Article 102338 (Download PDF)

- **Energy consumption in buildings**
  - **Participants Interventions**
    - ***How did the contractor take into account the electricity contract of the Commission which is (only) based on guarantees of origin as a proof of greenness?***
    - ***With vertical PV on our buildings, we could sell electricity to the neighborhood in replacement of their fossil-based heating systems***
    - ***On purchasing of electricity: In various of its policies the Commission requires companies to achieve more than just buying green electricity from the grid. Shouldn't we fear a backlash from media and lobbies if we now say that for the Commission it is ok?***
    - ***What about smart thermostats? Led lights?***

  - The consultant considered renewable energy (if applicable to the site) for electricity as well as for heating, through geothermal and photovoltaic installations. Furthermore, the consultant also considered heat pumps as an alternative source of energy to fossil fuel for heating, as suggested by the Commission steering board.
  - A high share of the electricity consumed is already green and has a low impact on the current carbon footprint. Nevertheless, it is important to have a clear view on which type of green electricity is purchased by the European Commission. The report gives a detailed overview on the different types of "green" electricity: guarantees of origin, power purchase agreement.
  - During the study, consultants worked closely with OIB to get a deep understanding of the buildings' portfolio. Establishing an action plan for each building was not the aim of this study. Nevertheless, the study proposes various ways (relocation of staff, reduction of office area, hot-desking, etc.) to reduce building related GHG emissions. Further studies will be needed to have a better view on each building's specific opportunities and energy audits are already regularly conducted by OIB.

- **Office space and buildings**
  - **Participants' interventions :**
    - ***Building itself is very energy intensive. Is it necessary? Why not upgrade smaller, existing buildings?***
    - ***Indeed Loi130 energy specifications may be obsolete by 2030 and more difficult to adapt due to the dimension of the building, besides the architectural impact in the area.***

  - The construction of new buildings is not considered in the study due to the 10 years timeframe (to 2030). The measures proposed are to relocate staff into green buildings and to reduce the total area needed by the European Commission but the constraint is the availability on the market. However, the real estate market in Brussels is evolving. The specific case of the ZIN building is detailed in the report, as an example of what will be possible in Brussels in the coming years.
  - [OIB] OIB commented that having a large number of small buildings, instead of few big buildings, is not energy efficient. When thinking about renovation and construction, it is important to look at the external building envelope (volume) and the total floorspace.

- **Offsetting/GHG removal credits**
  - **Participants' intervention**
    - ***What assumptions have been made about the costs, sources and environmental integrity of the carbon offsets that would be used to account for half of Commission emissions***
    - ***Offsetting is shown as being cheaper on the slide, but how are offsetting measure monitored / assessed / certified? Are they real?***
    - ***DO we have now the legal basis to purchase offsets (through the EU budget)?***

- In all scenarios, carbon removals will be needed. Indeed, some emissions cannot be avoided (ex. computer manufacturing, public transport use, etc.).
- Environmental integrity will be ensured through high quality carbon credits, guaranteed by quality standards, such as the Gold Standard, Plan Vivo, VCS,...
- [DG HR] The possibility of not reducing in-house GHG emissions and using carbon removals credits only to reach climate neutrality is not an option in the study as it is not in line with the current EMAS registration, whose policy is to reduce internally different aspects (not only GHG emissions, but also water consumption, pollutants, biodiversity, etc.); also absorption capacity is limited by geophysical and technological constraints.
- [DG BUDG] The issue regarding the internal legal aspect of offsetting is not yet known and needs to be investigated further; however, no particular obstacle is foreseen.
- [OIB] The position of the European Commission is to decrease GHG emissions as far as it is financially reasonable.

- **Events, meetings and conferences**
  - **Participants' intervention:**
    - ***Conferences and events generate a lot of C02. Can you indicate if only emissions from flights have been considered or also others (catering, AV equipment, energy use)***
    - ***50% reduction in travel emissions for conferences and events - let's do it. The pandemic has shown we can have meaningful conferences online.***
    - ***We need to find a good balance. The EU is made also by individuals who meet and discuss, exchange ideas and views. Too much remote/distant meetings risk weakening the EU in my opinion***.

  - GHG emissions related to the travels of the participants to events, meetings and conferences are taken into account in the study baseline; estimates were used as data is not fully available yet

    [Comment by the study's steering board: The consultants modified the baseline emissions at the very end of the study (after they presented draft results to the EMAS Steering Committee on 16 June), and without reference to the study's steering board. The steering board wonders how certain the consultant is that these extra categories are fully covered (some doubt is implied ("data is not fully available yet")) and if it is not possible that a rigorous search, DG by DG, budget line by budget line, would yield additional emissions.]

  - Catering in the EC's premises is delivered by the same contractors for the canteens and restaurants; therefore, data collection will be included in the next contract (to be signed in 2020).

- **Scenarios and target**
  - **Participants' interventions:**
    - ***You seem to value CO2 removal credits in a similar way as in-house emission savings? Did you also consider a scenario with 0% in-house savings and 100% purchase of CO2 removal credits?***
    - ***what does the study say about the possibility of reaching 100% net zero by 2050 (without the use of offsets?)***

  - [DG BUDGET] From a budgetary point of view, it will not be easy to use the financial savings achieved by a measure to finance another one.
  - Xavier Le Den clarifies the fact that the study had to be adapted to the 2030 target. This is not the same approach as for a 2050 target, since all measures have to impact the carbon footprint within the next 10 years. It is a short timeframe, especially regarding the building policy. Furthermore, the use of synthetic fuel for flight is an efficient measure

to drastically reduce GHG emissions related to missions, but it has been decided not to take it into account, as there are many uncertainties concerning its availability in the next 10 years.
    - The study is considering green innovation when possible but there is a high uncertainty around the implementation of these innovations. With a 10-year horizon, the Commission has to rely on available technologies.
    - A plan at 2050 would give more room to implement new technologies. A 2030 scenario needs to build upon today's initiatives.
    - In any case, the chosen scenario will be ambitious. Since 2005, a lot has already been done. In regard to the building's measures, thanks to the EMAS team, low hanging fruits are already being implemented.

- **Other institutions on the best practices and the most sustainable way of working.**
    - **Participants' interventions:**
        - ***In comparing the best practice of similar kinds of operations, where are Commission practices most out of line with sustainability?***
        - ***Compared to other institutions and governments (in the EU), would you say the Commission is currently more carbon-efficient, less, or average?***

    - [DG CLIMA and Consultants] It is very difficult to compare the GHG performance of the European Commission with other EU Institutions, as it depends on the nature of the activities and the different scopes, base year and target year chosen by each institution.